

NIBCO®
AHEAD OF THE FLOW®

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MEFASCO

PRODUCT CATALOG

2014 - 2015

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CATALOG C-CF-0511

NIBCO®

AHEAD OF THE FLOW®











Copper Fittings

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ISO 9001 BUREAU VERITAS Certification

The manufacturing plants at Stuarts Draft, VA, Nacogdoches, TX and Reynosa, Mexico manufacture products under a Quality Management System conforming to the current revision of ISO-9001 International Standards

Specifications

All of the advantages found in copper as a metal have been capitalized to the utmost in the manufacture of NIBCO® Fittings. Because of the accuracy of construction and design, copper plumbing is more efficient and less expensive.

NIBCO manufactures nine general types of fittings: Wrot Pressure; Cast Pressure; Wrot Drainage; Cast Drainage; Flanges; Flared Tube; Threaded Bronze; Insert Fittings for PEX; Barbed Insert Fittings for Polybutylene. Each has its particular place and use and each offers its own advantages when used for the proper service requirement.

Material & Construction — NIBCO Fittings are made from the highest quality raw materials — Cast Fittings are offered in traditional copper alloys C83600, and C84400 and high quality lead-free* dezincification-resistant (DZR) silicon brass alloy C87850 per ASTM Specification B584. Wrot Copper Fittings are made from commercially pure copper mill products already meeting current lead-free* requirements per ASTM Specifications B75 Alloy C12200.

*Lead Free refers to the wetted surface of pipe, fittings and fixtures in potable water systems that have a weighted average lead content 0.25%. Source: California Health & Safety Code (116875); Vermont Act 193.

NIBCO Fittings are produced to meet the requirements of applicable standards.

The majority of NIBCO® brand wrot and cast fittings are manufactured in the U.S.A. and Mexico*. The manufacturing plants at Stuarts Draft, VA, Nacogdoches, TX and Reynosa, Mexico are registered to ISO 9001 quality standards.

Following is suggested phrasing to be incorporated in your specifications or bills of material for Copper Tube Fittings.

WROT SOLDER JOINT FITTINGS — "Solder Joint Fittings shall be produced to one of the following specifications:

1. "Material and workmanship shall be in accordance with ASME/ANSI B16.22; Wrought Copper and Copper Alloy Solder Joint Pressure Fittings."
2. "The dimensional, material and workmanship shall meet the requirements of MSS SP-104; Wrought Copper Solder Joint Pressure Fittings."
3. "The dimensional, material and workmanship of 5"–12" copper fittings shall meet the requirements of MSS SP-109 "Welded Fabricated Copper Solder Joint Pressure Fittings."
4. "Third party certified to NSF/ANSI61."
5. "Lead-free* fittings are certified by NSF/ANSI 61, Annex G and are in compliance with Section 116875 of the California Health & Safety Code and Vermont Act 193."

CAST COPPER ALLOY SOLDER JOINT FITTINGS — "Cast Copper Alloy Solder Joint Fittings shall be in accordance with ASME B16.18."

WROT DRAINAGE FITTINGS — "Wrot Drainage Fittings shall be in accordance with ASME B16.29."

CAST COPPER ALLOY SOLDER JOINT DRAINAGE FITTINGS — "Cast Copper Alloy Solder Joint Drainage Fittings shall be in accordance with ASME B16.23."

CAST COPPER ALLOY FLARED TUBE FITTINGS — "Cast Copper Alloy Flared Tube Fittings shall be in accordance with ASME B16.26."

CAST COPPER ALLOY FLANGES AND FLANGED FITTINGS —

CLASS 150 — "Cast Copper Alloy Flanges and Flanged Fittings shall meet the requirements of MSS SP-106" and/or "the workmanship and dimensions of Federal Specifications WW-F-406 or ASME Std. B16.24."

"CLASS 125 — Material, workmanship and dimensions of flanges shall be in accordance with MSS SP-106."

CAST BRONZE THREADED FITTINGS — "Cast Bronze Threaded Fittings shall be in accordance with ANSI/ASME B16.15."

POLYBUTYLENE COPPER INSERT TYPE VALVES AND FITTINGS — "Wrot Copper Insert Fittings shall be manufactured per MSS SP-103."

NIBCO® Copper Tube Fittings are all produced to above Standards. To simplify, write your specifications to read: "Copper Tube Fittings to be in accordance with specifications as outlined in NIBCO Copper Fittings Catalog."

WROT COPPER MEDICAL GAS SYSTEM COMPONENTS — "Wrot copper fittings that are to be installed in medical gas applications shall be prepared in accordance with NFPA 99, Health Care Facilities Gas and Vacuum Systems and the Compressed Gas Association, Pamphlet G4.1. Packaging shall be adequately protective and include labeling that identifies the preparer and states that the product has been cleaned and bagged for oxygen or med gas service."

For technical information and dimensions refer to the engineering section contained in this catalog.

* NIBCO, may, from time to time, source and/or supplement a wrot or cast fitting product from suppliers outside of the U.S.A. and/or Mexico.

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Wrot and Cast Pressure Fittings

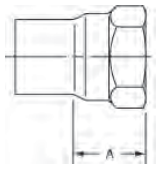
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700 Series – Cast

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The manufacturing plants at Stuarts Draft, VA, Nacogdoches, TX and Reynosa, Mexico manufacture products under a Quality Management System conforming to the current revision of ISO-9001 International Standards

ADAPTERS

603
Adapter C x F – Wrot

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1/8	0.03	13/32
1/8 x 1/4	0.03	1/2
1/4	0.03	5/8
1/4 x 3/8	0.04	7/8
3/8	0.04	11/16
3/8 x 1/4	0.03	9/16
3/8 x 1/2	0.09	29/32
3/8 x 3/4	0.10	1
1/2	0.09	27/32
1/2 x 1/4	0.06	1/2
1/2 x 3/8	0.04	17/32
1/2 x 3/4	0.14	1
5/8 x 1/2	0.11	3/4
5/8 x 3/4	0.13	29/32
3/4	0.15	29/32
3/4 x 1/2	0.10	5/8
3/4 x 1	0.21	1 1/8
1	0.24	31/32
1 x 1/2	0.25	5/8
1 x 3/4	0.19	25/32
1 x 1 1/4	0.28	1 7/32
1 1/4	0.33	1 3/32
1 1/4 x 1	0.28	29/32
1 1/4 x 1 1/2	0.40	1 1/4
1 1/2	0.44	1 1/8
1 1/2 x 1 1/4	0.42	1 1/32
1 1/2 x 2	0.73	1 13/32
2	0.63	1 3/32
2 x 1 1/2	0.74	1 11/32
2 1/2	1.15	1 3/16
3	1.88	1 5/16
4	3.14	1 7/8



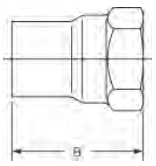
703
Adapter C x F – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1/4 x 1/2	0.13	27/32
1/2 x 1	0.28	1
3/4 x 3/8	0.17	3/4
3/4 x 1 1/4	0.54	1 1/8
1 x 1 1/2	0.68	1 3/32
1 1/4 x 3/4	0.29	13/16
1 1/4 x 2	0.98	1 5/32
1 1/2 x 1	0.43	25/32
1 1/2 x 1 1/4	0.47	1 1/32
1 1/2 x 2	0.78	1 1/32
2 x 1 1/4	0.81	27/32
2 1/2	1.62	1 3/8
3	2.34	1 1/2
4	4.23	1 9/16



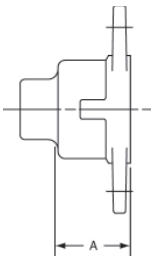

603-2
Fitting Adapter Ftg x F – Wrot

NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES
1/4	0.03	1 3/32
3/8	0.06	1 3/16
1/2	0.09	1 7/16
1/2 x 3/8	0.05	1 1/4
3/4	0.13	1 11/16
1	0.27	2 1/32
1 1/4	0.31	2 1/8
1 1/2	0.43	2 5/16
2	0.61	2 17/32

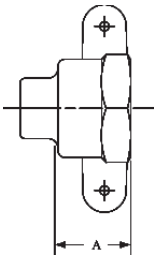
703-2
Fitting Adapter Ftg x F – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES
1/2 x 1/4	0.11	1 7/32
3/4 x 1/2	0.13	1 9/16
1 x 1/2	0.14	1 7/16
1 x 3/4	0.38	1 31/32
2 1/2	1.65	2 15/16
3	2.52	3 1/4

703-5 Special
Drop Adapter C x F – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1/2	0.16	3/4
3/4	0.24	7/8

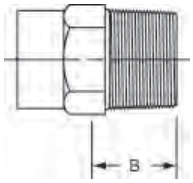
703-5B
Drop Adapter C x F – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1/2	0.15	3/4

Consult price sheet for Made to Order items and for minimum order quantities.

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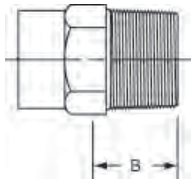
ADAPTERS *continued*

604
Adapter C x M – Wrot

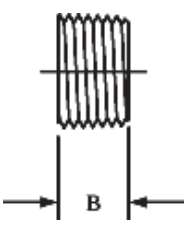
NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES
1/8 x 1/4	0.03	7/16
1/4	0.03	23/32
1/4 x 1/2	0.07	–
3/8	0.04	15/32
3/8 x 1/4	0.06	–
3/8 x 1/2	0.09	1
3/8 x 3/4	0.15	1 5/16
1/2	0.07	5/8
1/2 x 1/4	0.05	5/8
1/2 x 3/8	0.05	19/32
1/2 x 3/4	0.14	13/16
1/2 x 1	0.25	1 1/2
5/8 x 1/2	0.08	3/4
5/8 x 3/4	0.16	1 1/8
3/4	0.14	13/16
3/4 x 1/2	0.10	27/32
3/4 x 1	0.26	1 7/16
1	0.21	31/32
1 x 1/2	0.18	31/32
1 x 3/4	0.18	29/32
1 x 1 1/4	0.38	1 1/2
1 x 1 1/2	0.50	29/32
1 1/4	0.35	15/16
1 1/4 x 1	0.25	1 5/32
1 1/4 x 1 1/2	0.51	1 19/32
1 1/2	0.46	31/32
1 1/2 x 1	0.44	1 3/32
1 1/2 x 1 1/4	0.38	1 3/16
1 1/2 x 2	0.76	1 1/8
2	0.81	1 3/32
2 x 1 1/2	0.58	1 1/8
2 1/2	1.19	1 21/32
3	1.39	–
4	3.00	–

Consult price sheet for Made to Order items and for minimum order quantities.

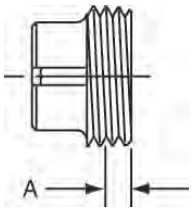
704
Adapter C x M – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES
3/4 x 3/8	0.16	13/16
3/4 x 1 1/4	0.38	1 7/32
3/4 x 1 1/2	0.59	1 17/32
1 x 1 1/2	0.64	29/32
1 x 2	1.15	–
1 1/4 x 3/4	0.30	31/32
1 1/4 x 2	0.87	1 9/32
1 1/2 x 2	0.81	1 1/8
2 x 1 1/4	1.08	–
2 x 1 1/2	0.71	1 1/8
2 x 2 1/2	1.57	1 15/32
2 1/2	1.49	1 21/32
2 1/2 x 2	1.83	1 11/16
3	1.97	1 1/2
4	3.66	1 11/16
5	8.60	2 5/8

704-F
Flush Adapter C x M – Cast

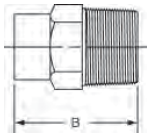
NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES
1/2	0.03	9/16
3/4	0.03	19/32

704-H
Hose Adapter C x Hose – Cast

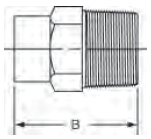
NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1/2	0.09	5/16

NOTE: Fits 1/2", 5/8" and 3/4" Garden Hose.

604-2
Fitting Adapter Ftg x M – Wrot

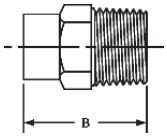
NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES
1/4	0.03	–
3/8	0.04	1 1/4
1/2	0.09	1 15/32
1/2 x 3/8	0.05	1 11/32
1/2 x 3/4	0.16	1 13/16
3/4	0.17	1 15/16
1	0.25	2 1/4
1 1/2	0.58	–

704-2
Fitting Adapter Ftg x M – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES
3/4 x 1/2	0.12	1 23/32
3/4 x 1	0.27	1 31/32
1 x 3/4	0.20	1 15/16
1 1/4	0.43	2 27/32
1 1/2	0.54	2 13/32
2	0.89	2 3/4
2 1/2	1.55	3 3/8
3	2.21	3 23/32

ADAPTERS *continued*

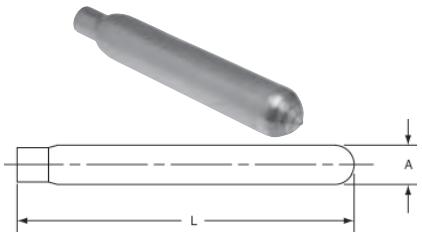



704-2-H
Hose Adapter Ftg x Hose – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES
3/4 F x 3/4 H	0.16	1 5/8

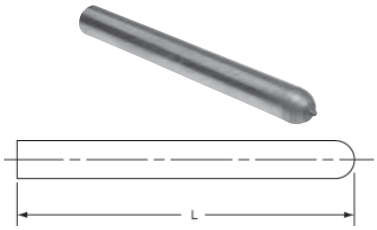
NOTE: Fits 1/2", 5/8" and 3/4" Garden Hose.

AIR CHAMBERS



619
Air Chamber Ftg. – Wrot

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. L INCHES
1/2 x 6	0.20	1	6
1/2 x 12	0.41	1	12
1/2 x 14	0.76	1 1/8	14

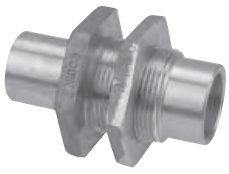
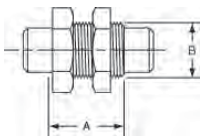


620-L
Air Chamber or Stub-Out Ftg – Wrot

As Air Chamber, just solder one joint. When used as Stub-Out, simply pressure test system then cut off stub-out (save piece for future use) and install valve or fixture.

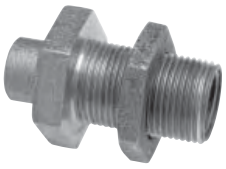
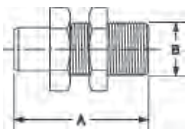
NOM. SIZE	APPROX. NET WT./LBS.	DIM. L INCHES
1/2 x 6	0.14	6
1/2 x 8	0.19	8
1/2 x 10	0.24	10
1/2 x 12	0.28	12
3/4 x 12	0.46	12

BULKHEAD FITTINGS

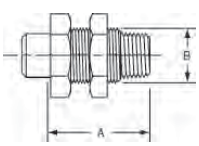
750
Bulkhead Fitting C x C – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
1/2	0.48	1 1/4	1
3/4	0.77	1 9/32	1 1/4
1	1.30	1 1/2	1 5/8
1 1/2	2.87	1 1/2	2 3/8
2	3.65	2 1/32	2 5/8

750-3
Bulkhead Fitting C x F – Cast

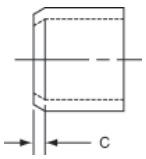
NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
1/2	0.50	1 15/16	1
3/4	0.79	2 1/16	1 1/4
1	1.39	2 15/32	1 5/8

750-4
Bulkhead Fitting C x M – Cast

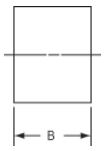
NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
1/2	0.51	1 31/32	1
3/4	0.79	2 5/32	1 1/4

BUSHINGS

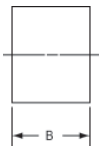
618
Flush Bushing Ftg x C – Wrot

NOM. SIZE	APPROX. NET WT./LBS.	DIM. C INCHES
1/4 x 1/8	0.01	1/16
3/8 x 1/4	0.01	1/16
1/2 x 1/4	0.04	1/4
1/2 x 3/8	0.02	3/32
5/8 x 1/2	0.03	1/16
3/4 x 3/8	0.11	7/16
3/4 x 1/2	0.08	3/32
3/4 x 5/8	0.04	3/16
1 x 1/2	0.22	15/32
1 x 3/4	0.12	1/8
1 1/4 x 1	0.17	3/32
1 1/2 x 1 1/4	0.22	5/32
2 x 1 1/2	0.66	1/8

618-3
Flush Bushing Ftg x F – Wrot

NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES
1/2 x 1/8	0.03	9/16
1/2 x 1/4	0.02	9/16

718-3
Flush Bushing Ftg x F – Cast

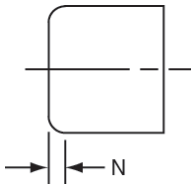
NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES
3/4 x 3/8	0.06	1 31/32
1 x 1/2	0.12	31/32
1 1/4 x 3/4	0.18	1 1/32
1 1/2 x 1	0.25	1 5/32

Consult price sheet for Made to Order items and for minimum order quantities.

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CAPS

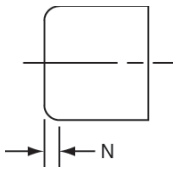




617
Tube Cap C – Wrot

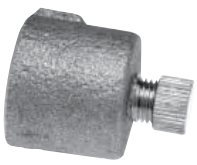
NOM. SIZE	APPROX. NET WT./LBS.	DIM. N INCHES
1/8	0.01	1/32
1/4	0.01	3/32
3/8	0.01	3/32
1/2	0.02	3/32
5/8	0.03	1/8
3/4	0.04	1/8
1	0.07	5/32
1 1/4	0.10	3/32
1 1/2	0.16	1/8
2	0.27	5/32
2 1/2	0.47	7/32
3	0.78	7/32
4	1.66	1/4

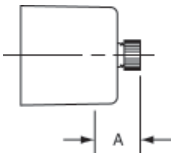




717
Tube Cap C – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. N INCHES
5	5.48	7/16
6	9.07	17/32





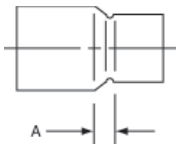
717-D
Drain Cap – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1/2	0.06	21/32

Consult price sheet for Made to Order items and for minimum order quantities.

COUPLINGS



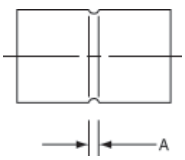


600
Reducing Coupling C x C – Wrot

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1/8 x 3/16 O.D.	0.01	5/32
5/16 O.D. x 1/8	0.01	3/16
1/4 x 5/16 O.D.	0.01	3/16
1/4 x 1/8	0.01	3/16
3/8 x 1/4	0.02	3/16
3/8 x 5/16 O.D.	0.01	1/4
3/8 x 1/8	0.01	1/4
1/2 x 1/8	0.03	11/32
1/2 x 1/4	0.02	1/4
1/2 x 3/8	0.02	3/16
5/8 x 1/4	0.03	13/32
5/8 x 3/8	0.04	11/32
5/8 x 1/2	0.05	3/16
3/4 x 1/4	0.05	11/32
3/4 x 3/8	0.06	3/8
3/4 x 1/2	0.06	9/32
3/4 x 5/8	0.07	3/16
1 x 3/8	0.10	13/32
1 x 1/2	0.10	11/32
1 x 5/8	0.10	3/8
1 x 3/4	0.11	11/32
1 1/4 x 1/2	0.14	7/16
1 1/4 x 5/8	0.18	5/8
1 1/4 x 3/4	0.18	17/32
1 1/4 x 1	0.16	5/16
1 1/2 x 1/2	0.19	1/2
1 1/2 x 3/4	0.20	3/8
1 1/2 x 1	0.22	9/16
1 1/2 x 1 1/4	0.23	5/16
2 x 1/2	0.38	23/32
2 x 3/4	0.36	17/32
2 x 1	0.37	7/16
2 x 1 1/4	0.37	11/16
2 x 1 1/2	0.40	9/16
2 1/2 x 1	0.58	29/32
2 1/2 x 1 1/4	0.57	13/16
2 1/2 x 1 1/2	0.59	11/16
2 1/2 x 2	0.59	9/16
3 x 1 1/2	0.92	1 1/32
3 x 2	1.06	15/16
3 x 2 1/2	0.98	1/2
3 1/2 x 3	1.52	1/2
4 x 2	1.91	1 1/4
4 x 2 1/2	1.78	1
4 x 3	1.93	27/32
4 x 3 1/2	2.12	19/32
5 x 2	2.94	2 1/32
5 x 2 1/2	3.00	13/16
5 x 3	3.01	1 15/32
5 x 4	3.30	3 31/32
6 x 2	4.41	2 1/2
6 x 2 1/2	4.48	2 1/4
6 x 3	4.54	2
6 x 4	4.94	1 1/2
6 x 5	5.40	1 1/8
8 x 2 1/2	12.67	3 3/8
8 x 3	11.80	3 3/32
8 x 4	12.22	2 19/32
8 x 6	13.07	1 19/32

Continues…

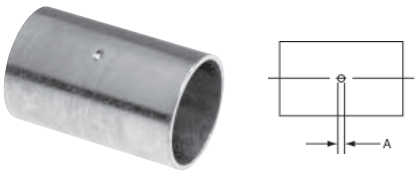




600-RS
Coupling with Rolled Tube Stop C x C – Wrot

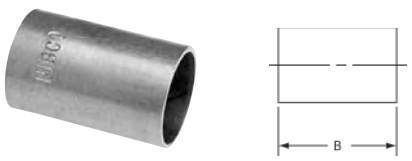
NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1/8 O.D.	0.01	1/16
3/16 O.D.	0.01	3/32
1/8	0.01	1/16
5/16 O.D.	0.01	3/32
1/4	0.01	1/16
3/8	0.01	3/32
1/2	0.03	3/32
5/8	0.04	3/32
3/4	0.06	3/32
7/8	0.09	3/32
1	0.11	3/32
1 1/4	0.15	1/8
1 1/2	0.22	1/8
2	0.40	1/8
2 1/2	0.66	1/8
3	1.00	1/8
3 1/2	1.45	5/32
4	1.93	7/32

COUPLINGS *continued*



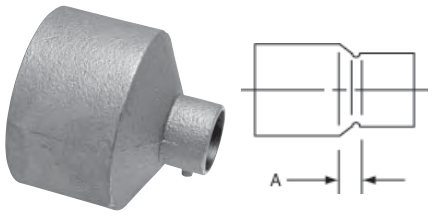
600-DS
Coupling with Dimpled Tube Stop
C x C – Wrot

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
3/16 O.D.	0.01	3/32
1/8	0.01	1/16
5/16 O.D.	0.01	3/32
1/4	0.01	1/16
3/8	0.01	3/32
1/2	0.03	3/32
5/8	0.04	3/32
3/4	0.06	3/32
7/8	0.09	3/32
1	0.11	3/32
1 1/4	0.15	1/8
1 1/2	0.22	1/8
2	0.40	1/8
2 1/2	0.67	1/8
3	1.00	1/8
3 1/2	1.45	5/32
4	1.93	7/32
5	3.53	7/32
6	5.63	7/32
8	14.48	15/32



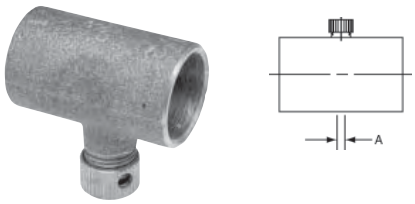
601
Coupling without Stop
C x C – Wrot

NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES
1/4	0.01	11/16
3/8	0.01	27/32
1/2	0.03	1
5/8	0.04	1 11/32
3/4	0.06	1 19/32
1	0.11	1 29/32
1 1/4	0.15	2 1/16
1 1/2	0.22	2 5/16
2	0.40	2 13/16
2 1/2	0.66	2 15/16
3	1.00	3 5/16
3 1/2	1.40	3 13/16
4	1.84	4 5/16
5	3.50	5 5/16
6	5.60	6 3/16
8	13.69	8 3/32



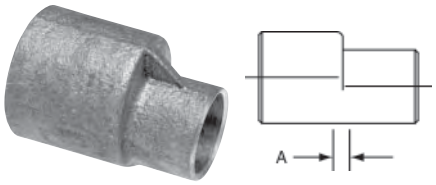
701
Reducing Coupling C x C – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
3 x 1 1/4	1.54	23/32
3 x 1	1.64	27/32



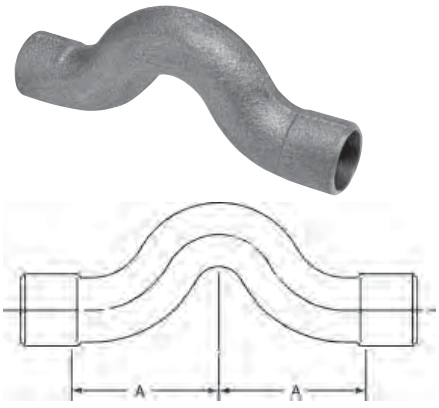
701-D
Drain Coupling C x C – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1/2	0.08	1/4
3/4	0.14	1/4
1	0.22	1/4



702
Eccentric Coupling C x C – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
3/4 x 1/2	0.12	17/32
1 x 3/4	0.18	1/4
1 1/4 x 1	0.25	1/4
1 1/4 x 3/4	0.24	9/32



736
Cross-Over Coupling
C x C – Cast

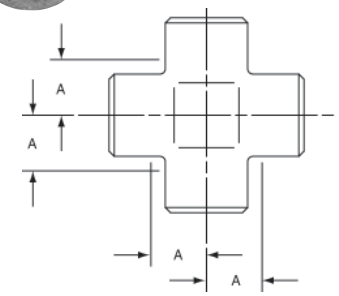
NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1/2	0.27	1 7/16
3/4	0.60	1 29/32

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CROSSES





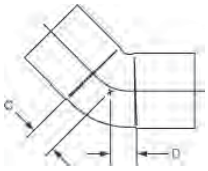
735
Cross C x C x C x C – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
3/8	0.08	3/8
1/2	0.14	7/16
3/4	0.28	9/16
1	0.54	23/32
1 1/4	0.78	7/8
1 1/2	1.05	1
2	2.00	1 1/4
2 1/2	2.96	1 1/2

Consult price sheet for Made to Order items and for minimum order quantities.

ELBOWS

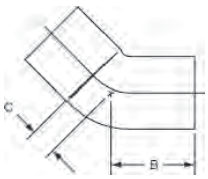




606
45° Elbow C x C – Wrot

NOM. SIZE	APPROX. NET WT./LBS.	DIM. C INCHES	DIM. D INCHES
1/8	0.01	1/4	1/4
1/4	0.02	9/32	9/32
3/8	0.03	3/16	3/16
1/2	0.04	9/32	9/32
5/8	0.09	15/32	15/32
3/4	0.10	11/32	11/32
7/8	0.20	11/16	11/16
1	0.15	3/8	3/8
1 1/4	0.25	17/32	17/32
1 1/2	0.35	19/32	19/32
2	0.65	25/32	25/32
2 1/2	1.07	29/32	29/32
3	1.58	1 1/8	1 1/8
4	3.35	1 7/16	1 7/16
5	5.57	1 9/16	1 9/16
6	9.57	2	2
8	23.00	2 9/32	2 9/32

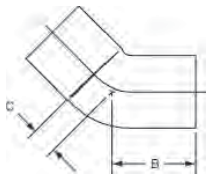




606-2
45° Fitting Elbow Ftg x C – Wrot

NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES	DIM. C INCHES
1/4	0.02	9/16	1/4
3/8	0.02	—	—
1/2	0.04	3/4	7/32
5/8	0.08	1 1/8	13/32
3/4	0.10	1 1/16	5/16
1	0.16	1 7/32	15/32
1 1/4	0.25	1 19/32	17/32
1 1/2	0.35	1 25/32	19/32
2	0.65	2 3/16	25/32
2 1/2	1.06	2 3/16	29/32
3	1.55	2 19/32	1 5/32

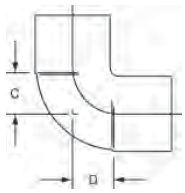




706-2
45° Fitting Elbow Ftg x C – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES	DIM. C INCHES
4	4.31	3 11/32	15/16

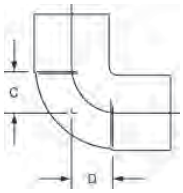




607
90° Elbow – Close Rough C x C – Wrot

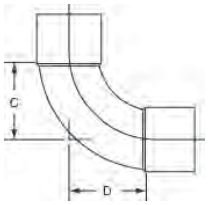
NOM. SIZE	APPROX. NET WT./LBS.	DIM. C INCHES	DIM. D INCHES
1/8	0.01	13/32	13/32
1/4	0.02	9/32	9/32
3/8	0.03	1/2	1/2
3/8 x 1/4	0.03	—	—
1/2	0.04	3/8	3/8
1/2 x 3/8	0.04	9/16	21/32
3/4	0.10	1/2	1/2
3/4 x 1/2	0.10	17/32	3/4
3/4 x 5/8	0.11	29/32	7/8
7/8	0.20	29/32	29/32
1	0.18	23/32	23/32
1 x 1/2	0.18	—	—
1 x 3/4	0.20	23/32	5/8
1 1/4	0.27	1 1/32	1 1/32
1 1/4 x 1	0.23	1 5/8	1 15/32
1 1/2	0.42	1 7/32	1 7/32
1 1/2 x 1 1/4	0.35	1 5/32	1 3/32
2	0.80	1 1/2	1 1/2
2 x 1 1/2	0.58	1 7/16	1 1/4
2 1/2	1.41	1 27/32	1 27/32
3	2.07	2 3/32	2 3/32
3 1/2	2.94	2 3/8	2 3/8
4	4.23	2 25/32	2 25/32
5	7.17	2 7/8	2 7/8
6	10.95	3 7/16	3 7/16
8	27.00	4 23/32	4 23/32

ELBOWS *continued*

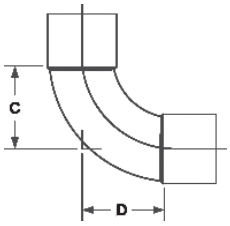
707
90° Elbow – Close Rough
C x C – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. C INCHES	DIM. D INCHES
1 1/4 x 1/2	0.28	15/32	27/32
1 1/4 x 3/4	0.34	9/16	13/16
1 1/4 x 1	0.42	1 5/8	1 15/32
1 1/2 x 1	0.55	11/16	1
1 1/2 x 3/4	0.45	19/32	31/32
1 1/2 x 1/2	0.40	5/8	29/32
2 x 1 1/4	0.86	7/8	1 1/4
2 x 1	0.78	3/4	1 1/4
2 x 3/4	0.69	5/8	1 1/4
2 1/2 x 2	2.16	1 3/16	19/32
3 x 2 1/2	2.26	1 11/16	1 1/2
3 x 2	2.68	1 3/8	1 9/16
4 x 3	5.18	1 29/32	2 15/32

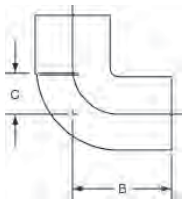
607-I
90° Elbow –
Intermediate Radius C x C –
Wrot

NOM. SIZE	APPROX. NET WT./LBS.	DIM. C INCHES	DIM. D INCHES
1/2	0.05	19/32	19/32
5/8	0.09	7/8	7/8
3/4	0.14	13/16	3/16
1	0.24	1 1/16	1 1/16

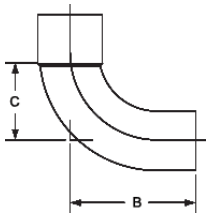
607-LT
90° Elbow – Long Radius
C x C – Wrot

NOM. SIZE	APPROX. NET WT./LBS.	DIM. C INCHES	DIM. D INCHES
3/16 O.D.	0.01	13/32	13/32
1/8	0.01	13/32	13/32
5/16 O.D.	0.02	9/16	9/16
1/4	0.02	17/32	17/32
1/4 x 1/8	0.01	19/32	1/2
3/8	0.04	23/32	23/32
1/2	0.08	7/8	7/8
1/2 x 3/8	0.06	13/16	13/16
1/2 x 1/4	0.03	25/32	21/32
5/8	0.11	1 3/32	1 3/32
5/8 x 1/2	0.09	1 1/16	1 1/16
3/4	0.16	1 1/8	1 1/8
3/4 x 5/8	0.13	1 1/4	1 3/32
3/4 x 1/2	0.10	1 1/8	1 1/16
7/8	0.28	1 19/32	1 19/32
1	0.28	1 7/16	1 7/16
1 x 3/4	0.20	1 1/4	1 1/8
1 x 5/8	0.15	1 13/32	1 3/32
1 1/4	0.42	1 7/8	1 7/8
1 1/4 x 1	0.33	1 25/32	1 1/2
1 1/2	0.66	2 1/4	2 1/4
2	1.23	2 15/16	2 15/16
2 1/2	2.15	3 11/16	3 11/16
2 1/2 x 2	1.53	–	–
3	2.93	4 1/32	4 1/32
3 1/2	5.63	–	–
4	5.96	5 1/4	5 1/4

607-2
90° Fitting Elbow – Close Rough
Ftg x C – Wrot

NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES	DIM. C INCHES
1/8	0.01	–	–
1/4	0.02	3/4	3/8
3/8	0.03	15/16	1/2
1/2	0.04	31/32	3/8
3/4	0.11	1 11/32	17/32
1	0.20	1 3/4	27/32
1 1/4	0.28	2 1/8	1 1/32
1 1/2	0.43	2 13/32	1 7/32
2	0.82	2 27/32	1 1/2
2 1/2	1.39	3 15/32	1 29/32
3	2.10	3 13/16	2 3/32
4	4.00	4 3/4	2 25/32

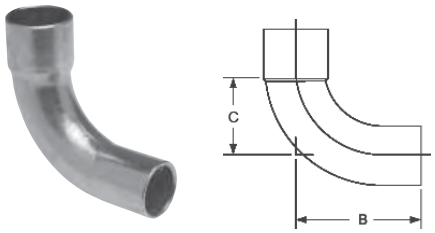
607-2-I
90° Fitting Elbow –
Intermediate Radius
Ftg x C – Wrot

NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES	DIM. C INCHES
1/2	0.05	1 5/32	19/32
5/8	0.09	1 9/16	7/8
3/4	0.14	1 5/8	13/16
1	0.24	2 1/32	1 1/16

Consult price sheet for Made to Order items and for minimum order quantities.

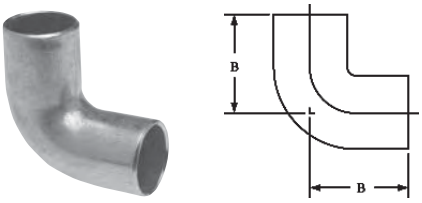
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ELBOWS *continued*



607-2-LT
90° Fitting Elbow – Long Radius
Ftg x C – Wrot

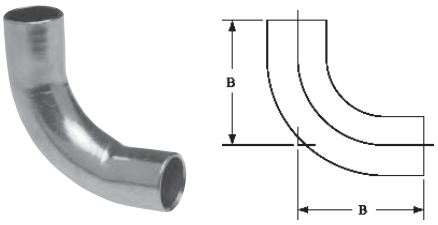
NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES	DIM. C INCHES
1/8	0.01	13/32	1/2
1/4	0.02	1 1/8	3/4
3/8	0.05	1 1/8	7/8
1/2	0.08	1 9/16	1 3/32
1/2 x 3/8	0.06	1 5/16	13/16
5/8	0.11	1 25/32	1 3/32
3/4	0.16	1 15/16	1 1/8
1	0.32	2 1/2	1 21/32
1 1/4	0.47	2 29/32	1 7/8
1 1/2	0.66	2 13/32	2 1/4
2	1.27	4 11/32	2 31/32
2 1/2	2.16	5 7/32	3 11/16
3	3.10	5 3/4	4 1/32
4	7.80	–	–



607-2-2
90° Fitting Elbow – Close Rough
Ftg x Ftg – Wrot

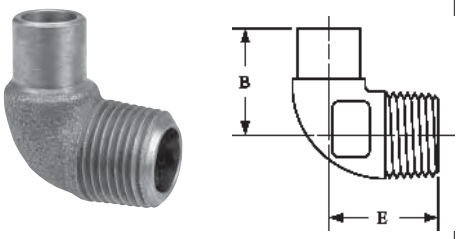
NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES
1/2	0.09	1 1/16
3/4	0.09	1 15/32
1	0.31	1 23/32
1 1/4	0.31	2 1/8
1 1/2	0.46	2 13/32
2	0.82	2 27/32
3	2.12	3 7/8

Consult price sheet for Made to Order items and for minimum order quantities.



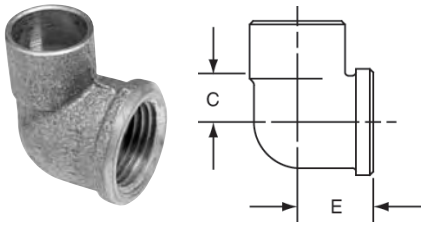
607-2-2-LT
90° Fitting Elbow – Long Radius
Ftg x Ftg – Wrot

NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES
1/4	0.02	27/32
3/8	0.04	1 1/8
1/2	0.08	1 19/32
5/8	0.11	1 11/16
3/4	0.16	1 15/16
1	0.31	2 1/2
1 1/4	0.43	2 29/32
1 1/2	0.65	3 7/16
2	1.25	4 11/32



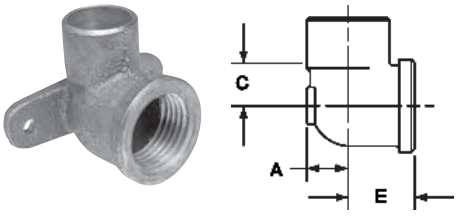
707-2-4
90° Fitting Elbow
Ftg x M – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES	DIM. E INCHES
1/2	0.13	7/8	25/32



707-3
90° Elbow C x F – Cast

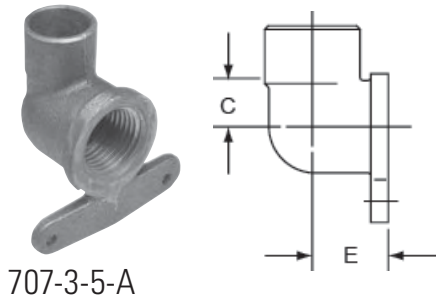
NOM. SIZE	APPROX. NET WT./LBS.	DIM. C INCHES	DIM. E INCHES
1/4	0.06	13/32	9/16
3/8	0.09	7/16	11/16
3/8 x 1/2	0.13	9/16	13/16
1/2	0.14	7/16	13/16
1/2 x 1/4	0.10	3/8	23/32
1/2 x 3/8	0.09	1/2	13/16
1/2 x 3/4	0.18	11/16	15/16
3/4	0.25	21/32	15/16
3/4 x 1/2	0.20	9/16	15/16
3/4 x 1	0.36	13/16	1 1/8
1	0.47	25/32	1 1/4
1 x 1/2	0.32	9/16	1 1/8
1 x 3/4	0.40	11/16	1 3/16
1 1/4	0.67	1	1 1/2
1 1/4 x 3/4	0.47	9/16	1 11/16
1 1/2	0.90	1 1/8	1 5/8
2	1.46	1 3/8	1 15/16



707-3-5
90° Drop Elbow C x F – Cast

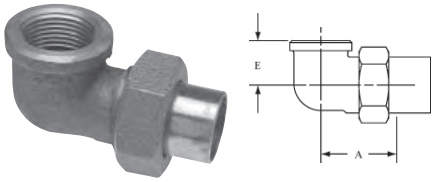
NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. C INCHES	DIM. E INCHES
3/8	0.12	11/32	7/16	11/16
3/8 x 1/2	0.18	11/32	9/16	13/16
1/2	0.18	13/32	9/16	7/8
1/2 x 3/8	0.17	3/8	1/2	13/16
3/4	0.32	17/32	21/32	15/16
3/4 x 1/2	0.24	17/32	9/16	15/16
1	0.49	5/8	25/32	1 1/4

ELBOWS *continued*



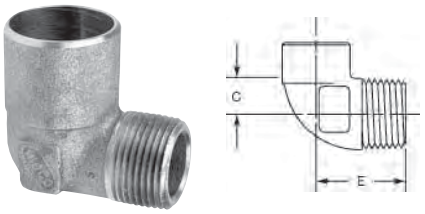
707-3-5-A
90° Hy-Set Elbow C x F – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. C INCHES	DIM. E INCHES
1/2	0.20	9/16	7/8



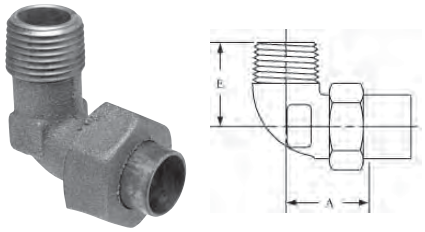
707-3-6
90° Union Elbow C x F – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. E INCHES
1/2	0.31	1 1/8	7/8
3/4	0.48	1 7/16	1
1	0.77	1 7/8	1 1/4



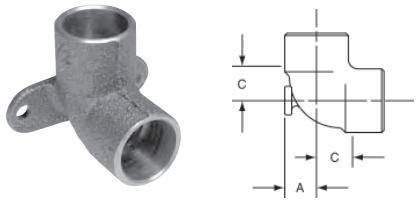
707-4
90° Elbow C x M – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. C INCHES	DIM. E INCHES
3/8	0.08	5/16	7/8
1/2	0.14	7/16	1 5/32
1/2 x 3/8	0.10	5/16	15/16
1/2 x 3/4	0.19	9/16	1 5/32
3/4	0.25	9/16	1 11/32
3/4 x 1/2	0.18	7/16	1 7/32
3/4 x 1	0.33	21/32	1 13/32
1	0.43	23/32	1 5/8
1 1/4	0.55	7/8	1 11/16
1 1/2	0.81	1	1 31/32
2	1.38	1 1/4	2 9/32



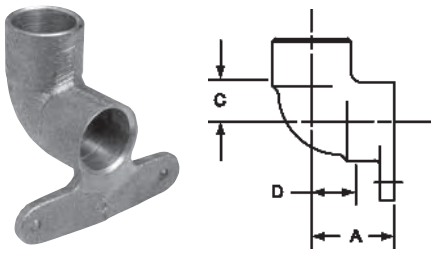
707-4-6
90° Union Elbow C x M – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. E INCHES
3/8	0.20	1 3/32	1 3/16
1/2	0.30	1 1/32	1 1/2
3/4	0.49	1 5/16	1 13/16
1	0.71	1 23/32	1 5/8
1 1/4	1.09	1 3/4	1 27/32



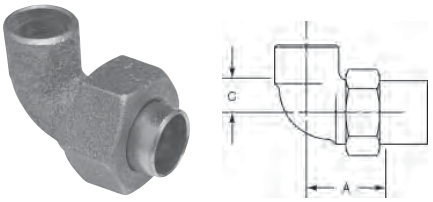
707-5
90° Drop Elbow C x C – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. C INCHES
1/2	0.13	13/32	7/16
3/4	0.24	17/32	9/16



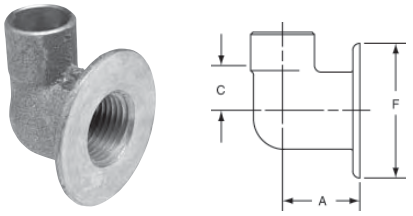
707-5-A
90° Hy-Set Elbow C x C – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. C INCHES	DIM. D INCHES
1/2	0.13	31/32	7/16	15/32
3/4	0.21	1 5/16	9/16	9/16



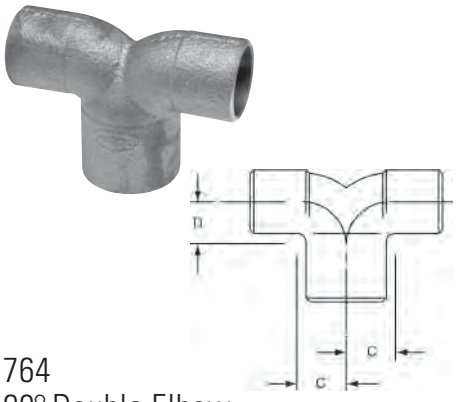
707-6
90° Union Elbow C x C – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. C INCHES
3/8	0.17	31/32	5/16
1/2	0.25	1	7/16
3/4	0.39	1 17/32	9/16
1	0.64	1 21/32	23/32
1 1/4	0.94	1 19/32	23/32



708
90° Flanged Sink Elbow C x F – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. C INCHES	DIM. F INCHES
1/2	0.21	7/8	9/16	1 3/4



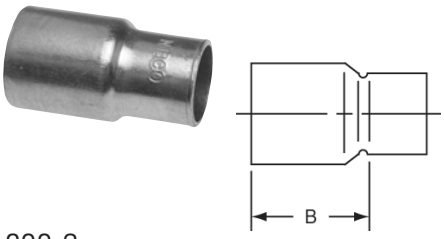
764
90° Double Elbow C x C x C – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. C INCHES	DIM. D INCHES
1 x 3/4 x 3/4	0.33	3/4	21/32

Consult price sheet for Made to Order items and for minimum order quantities.

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FITTING REDUCERS



600-2
Fitting Reducer Ftg x C – Wrot

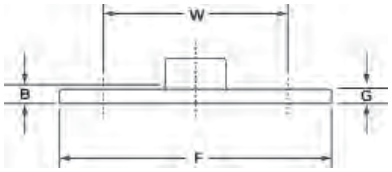
NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES
1/4 x 1/8	0.01	15/32
3/8 x 1/8	0.01	25/32
3/8 x 1/4	0.01	19/32
1/2 x 1/4	0.02	25/32
1/2 x 3/8	0.03	11/16
5/8 x 1/4	0.03	1 1/32
5/8 x 3/8	0.04	31/32
5/8 x 1/2	0.05	7/8
3/4 x 1/4	0.05	1 3/32
3/4 x 3/8	0.05	1 1/8
3/4 x 1/2	0.06	1 1/8
3/4 x 5/8	0.06	31/32
1 x 3/8	0.08	1 9/32
1 x 1/2	0.09	1 1/4
1 x 5/8	0.09	1 3/8
1 x 3/4	0.10	1 7/32
1 1/4 x 1/2	0.13	1 3/8
1 1/4 x 3/4	0.16	1 1/2
1 1/4 x 1	0.15	1 5/16
1 1/2 x 1/2	0.16	1 19/32
1 1/2 x 3/4	0.20	1 7/8
1 1/2 x 1	0.21	1 5/8
1 1/2 x 1 1/4	0.23	1 13/32
2 x 1/2	0.34	1 31/32
2 x 3/4	0.34	1 27/32
2 x 1	0.35	1 27/32
2 x 1 1/4	0.34	2 3/32
2 x 1 1/2	0.39	1 31/32
2 1/2 x 1	0.51	2 9/32
2 1/2 x 1 1/4	0.60	2 7/32
2 1/2 x 1 1/2	0.59	2 3/8
2 1/2 x 2	0.65	1 31/32
3 x 1 1/4	0.88	3 1/4
3 x 1 1/2	0.81	2 19/32
3 x 2	0.99	2 9/16
3 x 2 1/2	1.03	2 1/4
3 1/2 x 3	1.48	2 11/32
4 x 2	1.66	3 13/32
4 x 2 1/2	1.82	3 1/32
4 x 3	2.00	3 1/32
4 x 3 1/2	2.09	2 5/8
5 x 2	2.73	4 11/16
5 x 2 1/2	2.75	4 11/32
5 x 3	2.85	4 1/16
5 x 4	3.08	3 9/16
6 x 2	4.20	5 19/32
6 x 2 1/2	4.32	5 11/32
6 x 3	4.38	5 1/16
6 x 4	4.68	4 9/16
6 x 5	5.12	4 3/16
8 x 2	12.12	7 7/16
8 x 2 1/2	11.42	7 3/16
8 x 3	10.64	6 15/16
8 x 4	11.11	6 7/16
8 x 5	10.35	5 15/16
8 x 6	11.33	5 15/32

Continues…

Consult price sheet for Made to Order items and for minimum order quantities.

FLANGES – CLASS 125





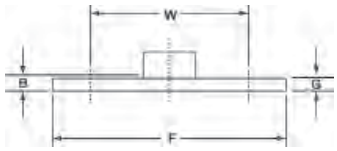
741
Companion Flange C – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES	DIM. F INCHES	DIM. G INCHES	DIM. W INCHES
1/2	0.56	1/16	3 1/2	3/16	2 3/8
3/4	0.71	1/16	3 7/8	3/16	2 3/4
1	1.27	1/16	4 1/4	1/4	3 1/8
1 1/4	1.42	1/16	4 5/8	1/4	3 1/2
1 1/2	1.82	1/16	5	5/16	3 7/8
2	2.76	1/16	6	3/8	4 3/4
2 1/2	4.29	1/8	7	3/8	5 1/2
3	5.26	1/8	7 1/2	7/16	6
4	7.35	1/8	9	7/16	7 1/2
5	9.04	1/8	10	7/16	8 1/2
6	12.68	1/8	11	1/2	9 1/2

NOTE: Dim. B = Tube Stop to Flange Face

FLANGES – CLASS 150



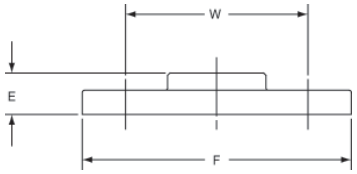


771
Companion Flange C – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES	DIM. F INCHES	DIM. G INCHES	DIM. W INCHES
3/4	1.15	1/16	3 7/8	11/32	2 3/4
1	1.59	1/16	4 1/4	3/8	3 1/8
1 1/4	1.91	1/16	4 5/8	13/32	3 1/2
1 1/2	2.57	1/16	5	7/16	3 7/8
2	4.10	1/16	6	1/2	4 3/4
2 1/2	6.22	1/8	7	9/16	5 1/2
3	8.03	1/8	7 1/2	5/8	6
4	11.85	1/8	9	11/16	7 1/2
5	15.69	1/8	10	3/4	8 1/2
6	19.12	1/8	11	13/16	9 1/2

NOTE: Dim. B = Tube Stop to Flange Face



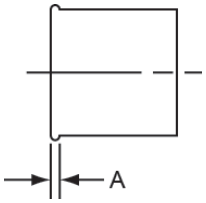


775
Threaded Companion Flange F – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. E INCHES	DIM. F INCHES	DIM. W INCHES
2	4.13	1	6	4 3/4
2 1/2	6.43	1 1/8	7	5 1/2
3	7.13	1 3/16	7 1/2	6
4	11.47	1 5/16	9	7 1/2

PLUGS



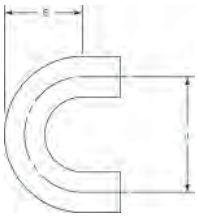


616
Fitted Plug Ftg - Wrot

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
3/8	0.012	1/16
1/2	0.02	3/32
3/4	0.04	1/8

RETURN BENDS

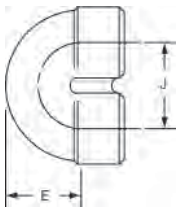




638
Return Bend C x C – Wrot

NOM. SIZE	APPROX. NET WT./LBS.	DIM. E INCHES	DIM. J INCHES
1/8	0.02	21/32	1
1/4	0.04	21/32	1 1/4
3/8	0.08	1 1/32	1 1/2
1/2	0.13	1 1/2	2
3/4	0.26	1 19/32	2 1/2
1	0.44	2 3/32	3
1 1/4	0.70	2 3/4	4
1 1/2	1.04	3 5/32	4 1/2
2	1.92	3 29/32	5 1/2

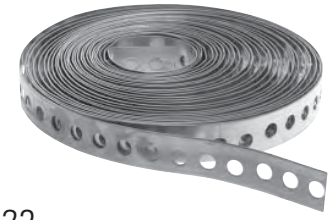




739
Return Bend – Closed
C x C – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. E INCHES	DIM. J INCHES
3/4	0.29	1 5/32	1 5/16

STRAPS & HANGERS



623
Copper Hanger Strap

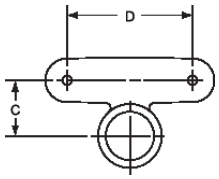
SIZE	APPROX. NET WT./LBS.
3/4" Wide x 25 Ft. Roll	1.93



624
Tube Strap

NOM. SIZE	APPROX. NET WT./LBS.
1/8	0.01
1/4	0.01
3/8	0.01
1/2	0.02
5/8	0.02
3/4	0.02
1	0.02
1 1/4	0.03
1 1/2	0.03
2	0.04



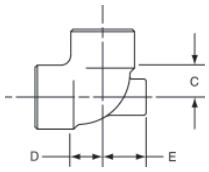


724-5-A
Hy-Set Hanger
C – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. C INCHES	DIM. D INCHES
1/2	0.05	1 5/8	23/32
3/4	0.09	1 5/8	27/32
1	0.13	1 5/8	1

TEES

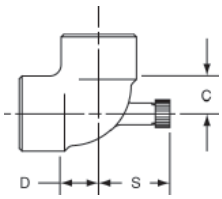




705
Baseboard Tee C x F x C – Cast

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES C	D	E
1/2 x 1/8 x 3/4	0.15	7/16	9/16	11/16
1/2 x 1/8 x 1/2	0.11	7/16	7/16	9/16
3/4 x 1/8 x 1	0.30	5/8	3/4	13/16
3/4 x 1/8 x 3/4	0.19	9/16	9/16	11/16
1 x 1/8 x 1	0.32	23/32	23/32	3/4
1 1/4 x 1/8 x 1 1/4	0.51	7/8	7/8	15/16





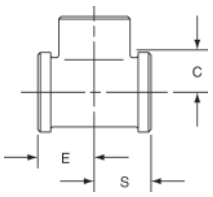
705-D
Vent Elbow C x C – Cast

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES C	D	S
1/2	0.10	7/16	7/16	25/32
3/4	0.20	9/16	9/16	29/32
1	0.31	23/32	23/32	1 1/32

Consult price sheet for Made to Order items and for minimum order quantities.

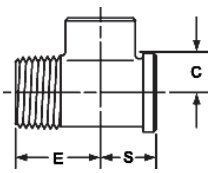
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TEES *continued*

710-3
Tee F x F x C – Cast

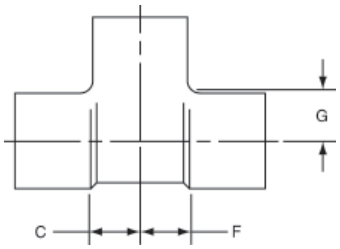
NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES C	E	S
1/2	0.20	9/16	7/8	7/8
3/4	0.37	11/16	1	1
3/4 x 1/2 x 1/2	0.26	11/16	31/32	7/8
3/4 x 1/2 x 3/4	0.30	11/16	1	15/16
3/4 x 3/4 x 1/2	0.31	11/16	31/32	31/32

710-3-4
Tee M x F x C – Cast

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES C	E	S
3/4	0.32	11/16	1 11/32	1
3/4 x 3/4 x 1/2	0.33	11/16	1 7/32	31/32

Consult price sheet for Made to Order items and for minimum order quantities.

611
Tee C x C x C – Wrot

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES C	F	G
3/16 O.D.	0.01	7/32	7/32	7/32
1/8	0.02	5/16	5/16	1/4
1/8 x 1/8 x 1/4	0.02	13/32	13/32	9/32
1/8 x 1/8 x 3/16 O.D.	0.01	5/16	5/16	5/16
1/8 x 3/16 O.D. x 1/8	0.01	5/16	11/32	1/4
5/16 O.D.	0.02	3/8	3/8	5/16
5/16 O.D. x 1/8 x 1/8	0.02	3/8	13/32	11/32
5/16 O.D. x 1/8 x 5/16 O.D.	0.02	3/8	13/32	5/16
5/16 O.D. x 5/16 O.D. x 1/8	0.03	3/8	3/8	5/16
5/16 O.D. x 5/16 O.D. x 1/4	0.02	3/8	3/8	9/32
1/4	0.02	5/16	5/16	1/4
1/4 x 1/8 x 1/8	0.02	5/16	13/32	11/32
1/4 x 1/8 x 1/4	0.02	5/16	13/32	9/32
1/4 x 5/16 O.D. x 1/4	0.02	5/16	3/8	9/32
1/4 x 1/4 x 1/8	0.03	5/16	5/16	5/16
1/4 x 1/4 x 3/8	0.04	17/32	17/32	11/32
1/4 x 1/4 x 1/2	0.07	19/32	19/32	3/8
1/4 x 1/4 x 3/16 O.D.	0.02	5/16	5/16	7/16
1/4 x 1/4 x 5/16 O.D.	0.02	5/16	5/16	5/16
3/8	0.04	11/32	11/32	11/32
3/8 x 1/8 x 1/8	0.04	11/32	19/32	19/32
3/8 x 1/8 x 3/8	0.04	11/32	19/32	11/32
3/8 x 1/4 x 1/8	0.04	11/32	17/32	9/16
3/8 x 1/4 x 1/4	0.04	11/32	17/32	15/32
3/8 x 1/4 x 3/8	0.04	11/32	17/32	11/32
3/8 x 3/8 x 1/8	0.04	11/32	11/32	9/16
3/8 x 3/8 x 5/16 O.D.	0.04	11/32	11/32	15/32
3/8 x 3/8 x 1/4	0.04	11/32	11/32	15/32
3/8 x 3/8 x 1/2	0.07	17/32	17/32	3/8
1/2	0.06	11/32	11/32	11/32
1/2 x 1/4 x 3/8	0.06	5/16	5/8	13/32
1/2 x 3/8 x 1/4	0.06	5/16	17/32	9/16
1/2 x 3/8 x 3/8	0.06	5/16	17/32	1/2
1/2 x 3/8 x 1/2	0.07	7/16	17/32	3/8
1/2 x 1/2 x 1/8	0.06	1/4	1/4	11/16
1/2 x 1/2 x 1/4	0.06	5/16	5/16	9/16
1/2 x 1/2 x 3/8	0.07	5/16	5/16	13/32
1/2 x 1/2 x 5/8	0.11	5/8	5/8	7/16
1/2 x 1/2 x 3/4	0.12	17/32	17/32	11/32
1/2 x 1/2 x 1	0.29	1	1	21/32

Continues…

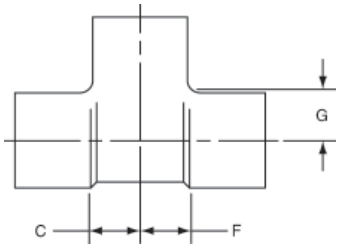
NOTE: Tee sizes are read Run x Run x Outlet.

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES C	F	G
5/8	0.12	7/16	7/16	7/16
5/8 x 3/8 x 3/8	0.11	7/16	3/4	5/8
5/8 x 3/8 x 5/8	0.10	7/16	3/4	7/16
5/8 x 1/2 x 1/2	0.11	7/16	19/32	13/32
5/8 x 1/2 x 5/8	0.10	7/16	5/8	7/16
5/8 x 5/8 x 1/4	0.11	7/16	7/16	3/4
5/8 x 5/8 x 3/8	0.09	7/16	7/16	5/8
5/8 x 5/8 x 1/2	0.11	7/16	7/16	13/32
5/8 x 5/8 x 3/4	0.15	23/32	23/32	1/2
3/4	0.16	7/16	7/16	7/16
3/4 x 3/8 x 3/8	0.12	7/16	23/32	21/32
3/4 x 3/8 x 1/2	0.12	7/16	23/32	17/32
3/4 x 3/8 x 3/4	0.15	17/32	27/32	1/2
3/4 x 1/2 x 3/8	0.12	7/16	21/32	21/32
3/4 x 1/2 x 1/2	0.12	13/32	19/32	1/2
3/4 x 1/2 x 3/4	0.16	1/2	5/8	15/32
3/4 x 5/8 x 5/8	0.15	1/2	3/4	11/16
3/4 x 5/8 x 3/4	0.15	17/32	11/16	1/2
3/4 x 3/4 x 1/8	0.12	7/16	7/16	13/16
3/4 x 3/4 x 1/4	0.12	13/32	13/32	25/32
3/4 x 3/4 x 3/8	0.12	13/32	13/32	21/32
3/4 x 3/4 x 1/2	0.12	3/8	3/8	15/32
3/4 x 3/4 x 5/8	0.16	17/32	17/32	11/16
3/4 x 3/4 x 1	0.22	23/32	23/32	1/2
7/8	0.30	23/32	23/32	23/32
1	0.31	11/16	11/16	21/32
1 x 1/2 x 1/2	0.22	1/2	25/32	11/16
1 x 1/2 x 3/4	0.24	9/16	7/8	11/16
1 x 1/2 x 1	0.30	11/16	1 1/32	21/32
1 x 3/4 x 1/2	0.22	15/32	11/16	11/16
1 x 3/4 x 3/4	0.24	9/16	25/32	23/32
1 x 3/4 x 1	0.31	11/16	31/32	21/32
1 x 1 x 1/4	0.22	1/2	1/2	1 3/16
1 x 1 x 3/8	0.22	1/2	1/2	29/32
1 x 1 x 1/2	0.23	1/2	1/2	11/16
1 x 1 x 5/8	0.24	19/32	19/32	29/32
1 x 1 x 3/4	0.25	19/32	19/32	23/32
1 x 1 x 1 1/4	0.42	1 5/32	1 5/32	7/8
1 x 1 x 1 1/2	0.59	1 11/32	1 11/32	31/32

Continues…

TEES *continued*





611
Tee C x C x C – Wrot continued

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES C	F	G
1 1/4	0.43	13/16	13/16	13/16
1 1/4 x 1/2 x 1 1/4	0.42	13/16	17/32	13/16
1 1/4 x 3/4 x 1/2	0.31	15/32	3/4	25/32
1 1/4 x 3/4 x 3/4	0.36	21/32	15/16	3/4
1 1/4 x 3/4 x 1	0.45	25/32	1 1/16	29/32
1 1/4 x 3/4 x 1 1/4	0.41	13/16	1 1/8	13/16
1 1/4 x 1 x 1/2	0.31	15/32	19/32	13/16
1 1/4 x 1 x 3/4	0.37	21/32	13/16	25/32
1 1/4 x 1 x 1	0.47	25/32	31/32	29/32
1 1/4 x 1 x 1 1/4	0.41	13/16	1 1/32	13/16
1 1/4 x 1 1/4 x 3/8	0.30	15/32	15/32	29/32
1 1/4 x 1 1/4 x 1/2	0.31	15/32	15/32	25/32
1 1/4 x 1 1/4 x 3/4	0.39	21/32	21/32	3/4
1 1/4 x 1 1/4 x 1	0.45	25/32	25/32	27/32
1 1/4 x 1 1/4 x 1 1/2	0.57	1 3/16	1 3/16	29/32
1 1/4 x 1 1/4 x 2	1.04	1 15/16	1 15/16	1 1/4
1 1/2	0.62	15/16	15/16	15/16
1 1/2 x 1/2 x 1 1/2	0.60	1 1/32	1 13/32	31/32
1 1/2 x 3/4 x 1/2	0.39	1/2	29/32	1 1/32
1 1/2 x 3/4 x 3/4	0.47	19/32	1 3/32	29/32
1 1/2 x 3/4 x 1	0.54	25/32	1 1/4	1 1/32
1 1/2 x 3/4 x 1 1/4	0.60	29/32	1 11/32	1 1/16
1 1/2 x 3/4 x 1 1/2	0.59	15/16	1 3/8	15/16
1 1/2 x 1 x 1/2	0.39	1/2	25/32	1 1/32
1 1/2 x 1 x 3/4	0.46	11/16	31/32	15/16
1 1/2 x 1 x 1	0.54	3/4	1 1/16	31/32
1 1/2 x 1 x 1 1/4	0.60	29/32	1 1/8	1 1/16
1 1/2 x 1 x 1 1/2	0.60	1 1/32	1 11/32	29/32
1 1/2 x 1 1/4 x 1/2	0.41	1/2	25/32	1 1/32
1 1/2 x 1 1/4 x 3/4	0.46	19/32	29/32	15/16
1 1/2 x 1 1/4 x 1	0.54	25/32	1	1 1/32
1 1/2 x 1 1/4 x 1 1/4	0.59	31/32	1 3/32	31/32
1 1/2 x 1 1/4 x 1 1/2	0.60	1 1/32	1 3/16	29/32
1 1/2 x 1 1/2 x 1/2	0.40	1/2	1/2	1
1 1/2 x 1 1/2 x 3/4	0.48	19/32	19/32	15/16
1 1/2 x 1 1/2 x 1	0.55	3/4	3/4	15/16
1 1/2 x 1 1/2 x 1 1/4	0.61	29/32	29/32	1
1 1/2 x 1 1/2 x 2	1.05	1 11/16	1 11/16	1 1/4

Continues…

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES C	F	G
2	1.11	1 9/32	1 9/32	1 1/32
2 x 1/2 x 2	1.09	1 9/32	2 3/8	1 1/4
2 x 3/4 x 2	1.07	1 9/32	2 3/16	1 1/4
2 x 1 x 1	0.91	27/32	1 19/32	1 11/32
2 x 1 x 2	1.06	1 1/8	1 25/32	1 1/4
2 x 1 1/4 x 3/4	1.04	1 1/4	1 31/32	2 3/32
2 x 1 1/4 x 1	0.90	27/32	1 9/32	1 23/64
2 x 1 1/4 x 1 1/4	1.06	1 7/32	2	1 15/16
2 x 1 1/4 x 1 1/2	1.04	1 3/32	1 7/32	1 3/8
2 x 1 1/4 x 2	1.08	1 9/32	1 31/32	1 1/32
2 x 1 1/2 x 1/2	0.79	11/16	29/32	1 5/16
2 x 1 1/2 x 3/4	1.04	1 1/4	1 23/32	23/32
2 x 1 1/2 x 1	0.91	29/32	1 1/8	1 7/32
2 x 1 1/2 x 1 1/4	1.07	1 15/16	1 25/32	1 7/8
2 x 1 1/2 x 1 1/2	1.06	1 3/32	1 15/32	1 11/32
2 x 1 1/2 x 2	1.07	1 9/32	1 25/32	1 1/32
2 x 2 x 1/2	0.77	19/32	19/32	1 5/16
2 x 2 x 3/4	0.66	7/16	7/16	1 1/4
2 x 2 x 1	0.91	27/32	27/32	1 1/4
2 x 2 x 1 1/4	1.09	1 9/32	1 9/32	1 27/32
2 x 2 x 1 1/2	1.07	1 1/4	1 1/4	1 23/32
2 x 2 x 2 1/2	2.11	2 3/16	2 3/16	1 7/8
2 1/2	2.08	1 9/16	1 9/16	1 7/8
2 1/2 x 3/4 x 2 1/2	2.16	1 9/16	2 15/16	1 7/8
2 1/2 x 1 x 2 1/2	2.22	1 9/16	2 9/16	1 7/8
2 1/2 x 1 1/4 x 2	2.26	1 9/16	2 5/8	2 3/16
2 1/2 x 1 1/4 x 2 1/2	2.20	1 9/16	2 5/8	1 7/8
2 1/2 x 1 1/2 x 2 1/2	2.20	1 9/16	2 17/32	1 7/8
2 1/2 x 2 x 3/4	1.34	25/32	1 3/16	1 27/32
2 1/2 x 2 x 1	1.34	25/32	1 5/32	1 11/16
2 1/2 x 2 x 1 1/4	1.62	1 3/32	1 13/32	1 27/32
2 1/2 x 2 x 1 1/2	1.61	1 3/32	2 13/32	1 21/32
2 1/2 x 2 x 2	1.72	1 7/16	1 11/16	1 9/16
2 1/2 x 2 x 2 1/2	2.20	1 9/16	2 3/16	1 7/8
2 1/2 x 2 1/2 x 1/2	1.30	25/32	25/32	2 1/8
2 1/2 x 2 1/2 x 3/4	1.28	25/32	25/32	1 13/16
2 1/2 x 2 1/2 x 1	1.26	25/32	25/32	1 11/16
2 1/2 x 2 1/2 x 1 1/4	1.58	1 3/32	1 3/32	1 27/32
2 1/2 x 2 1/2 x 1 1/2	1.58	1 3/32	1 3/32	1 21/32
2 1/2 x 2 1/2 x 2	1.70	1 13/32	1 13/32	1 19/32

Continues…

NOTE: Tee sizes are read Run x Run x Outlet.

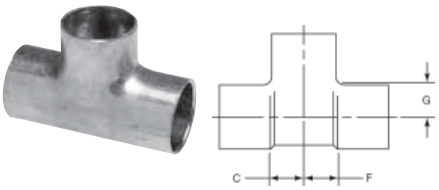
NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES C	F	G
3	3.12	1 7/8	1 7/8	2 1/32
3 x 3/4 x 3	3.28	1 13/16	3 1/4	2 3/16
3 x 1 x 3	3.34	1 13/16	3 1/4	2 3/16
3 x 1 1/4 x 3	3.28	1 13/16	2 7/8	2 3/16
3 x 1 1/2 x 3	3.31	1 13/16	2 29/32	2 3/16
3 x 2 x 2	2.34	1 15/32	1 31/32	1 31/32
3 x 2 x 2 1/2	3.18	1 13/16	2 25/32	2 1/2
3 x 2 x 3	3.31	1 13/16	2 21/32	2 3/16
3 x 2 1/2 x 1	3.08	1 13/16	2 15/32	3 1/4
3 x 2 1/2 x 1 1/4	3.07	1 13/16	2 15/32	2 29/32
3 x 2 1/2 x 2	2.34	1 15/32	1 27/32	1 31/32
3 x 2 1/2 x 2 1/2	3.21	1 13/16	2 15/32	2 1/2
3 x 2 1/2 x 3	3.35	1 13/16	2 15/32	3 3/16
3 x 3 x 1/2	1.94	27/32	27/32	2 3/8
3 x 3 x 3/4	1.94	27/32	27/32	2 3/16
3 x 3 x 1	1.88	27/32	27/32	15/16
3 x 3 x 1 1/4	2.44	1 15/32	1 15/32	2 7/16
3 x 3 x 1 1/2	2.40	1 15/32	1 15/32	2 9/32
3 x 3 x 2	2.32	1 15/32	1 15/32	1 31/32
3 x 3 x 2 1/2	3.34	1 13/16	1 13/16	2 1/2
3 1/2	6.57	2 17/32	2 17/32	2 17/32
4	7.89	2 13/32	2 13/32	2 17/32
4 x 1 x 4	7.58	2 3/8	4 1/4	2 23/32
4 x 2 x 2	7.62	2 3/8	4	3 15/16
4 x 2 x 4	7.86	2 3/8	4	2 23/32
4 x 2 1/2 x 2 1/2	7.52	2 3/8	3 25/32	3 29/32
4 x 2 1/2 x 4	7.84	2 3/8	3 25/32	2 23/32
4 x 3 x 2	7.50	2 3/8	3 9/16	3 15/16
4 x 3 x 2 1/2	7.42	2 3/8	3 9/16	3 29/32
4 x 3 x 3	7.43	2 3/8	3 9/16	3 1/2
4 x 3 x 4	7.76	2 3/8	3 23/32	2 23/32
4 x 4 x 1/2	4.42	1 3/32	1 3/32	2 7/8
4 x 4 x 3/4	4.17	1 3/32	1 3/32	2 29/32
4 x 4 x 1	4.45	31/32	31/32	2 9/16
4 x 4 x 1 1/4	4.60	1 11/32	1 11/32	2 7/8
4 x 4 x 1 1/2	4.50	1 9/32	1 9/32	2 3/4
4 x 4 x 2	4.98	1 11/32	1 11/32	2 7/16
4 x 4 x 2 1/2	7.78	2 3/8	2 3/8	3 29/32
4 x 4 x 3	7.77	2 3/8	2 3/8	3 1/2

Continued on next page.

Consult price sheet for Made to Order items and for minimum order quantities.

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TEES *continued*



611
Tee C x C x C – Wrot continued

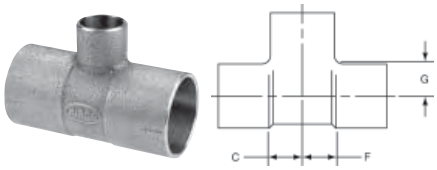
NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES C	F	G
5	8.29	2 27/32	2 27/32	3 13/32
5 x 2 x 5	9.47	2 3/4	5 1/16	3 1/2
5 x 4 x 4	8.18	2 1/4	4 17/32	3 3/8
5 x 4 x 5	8.58	2 27/32	4 29/32	3 13/32
5 x 5 x 1	4.20	9/16	9/16	3 3/16
5 x 5 x 1 1/4	4.76	11/16	11/16	3 3/16
5 x 5 x 1 1/2	4.88	1 1/32	1 1/32	3 3/16
5 x 5 x 2	5.30	1 1/16	1 1/16	3 3/16
5 x 5 x 2 1/2	5.91	1 5/16	1 5/16	3 3/16
5 x 5 x 3	5.91	1 25/32	1 25/32	3 3/16
5 x 5 x 4	7.10	2 7/32	2 9/32	3 3/16
6	13.50	3 9/32	3 9/32	4 1/32
6 x 4 x 1 1/2	9.62	15/16	2 15/16	3 3/4
6 x 4 x 4	11.37	–	–	–
6 x 4 x 6	16.60	3 3/16	5 1/8	4 1/8
6 x 6 x 1/2	7.17	9/16	9/16	4 11/16
6 x 6 x 3/4	7.19	9/16	9/16	4 9/16
6 x 6 x 1	7.18	9/16	9/16	3 11/16
6 x 6 x 1 1/4	6.67	29/32	29/32	3 11/16
6 x 6 x 1 1/2	6.87	1	1	3 11/16
6 x 6 x 2	7.78	1 9/32	1 9/32	3 11/16
6 x 6 x 2 1/2	8.12	1 17/32	1 17/32	3 3/4
6 x 6 x 3	8.92	1 25/32	1 25/32	3 11/16
6 x 6 x 4	10.17	2 9/32	2 9/32	3 11/16
6 x 6 x 5	11.67	2 25/32	2 25/32	4 1/32
8	36.81	4 1/16	4 1/16	5 1/32
8 x 8 x 2	18.02	1 1/16	1 1/16	4 3/4
8 x 8 x 2 1/2	19.02	1 5/16	1 5/16	4 3/4
8 x 8 x 3	20.02	1 9/16	1 9/16	4 3/4
8 x 8 x 4	22.26	2 1/16	2 1/16	4 3/4
8 x 8 x 5	24.90	2 25/32	2 25/32	4 15/16
8 x 8 x 6	27.86	3 1/16	3 1/16	5 1/8

NOTE: Tee sizes are read Run x Run x Outlet.

Consult price sheet for Made to Order items and for minimum order quantities.

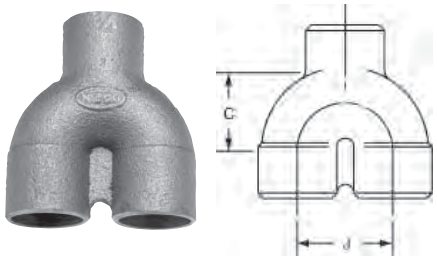
611-HE
Heat Exchanger Tee
C x C x C – Wrot

Tube slips entirely through fitting on small end of run. Sizes same as listed under 611 where tee has one or more reductions on one end of run.



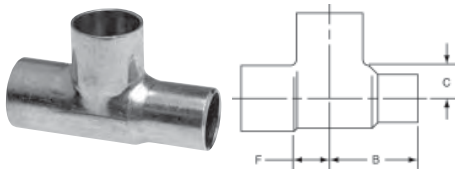
711
Tee C x C x C – Cast

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES C	F	G
1 1/4 x 1/2 x 1/2	0.50	9/16	5/8	1
1 1/4 x 1/2 x 1	0.48	3/4	3/4	7/8
1 1/2 x 1/2 x 1 1/4	0.70	7/8	31/32	1
2 x 3/4 x 3/4	0.82	21/32	7/8	1 1/4
2 x 1 x 1 1/2	1.23	1	1 1/4	1 1/4
2 x 2 x 3	3.11	1 21/32	1 21/32	1 5/16
2 1/2 x 1/2 x 2 1/2	2.46	1 1/2	2 7/32	1 1/2
2 1/2 x 1 1/2 x 1 1/2	1.76	1 3/32	1 13/32	1 3/8
2 1/2 x 1 1/2 x 2	2.02	1 1/4	1 15/32	1 1/2
2 1/2 x 2 1/2 x 3	2.98	1 3/4	1 3/4	1 17/32
3 x 2 x 1 1/2	2.63	1	1 1/4	1 3/4
3 x 2 1/2 x 1 1/2	2.53	1	1 3/32	1 3/4
3 x 3 x 4	6.96	2 11/32	2 11/32	1 23/32
4 x 2 x 2	4.64	1 1/4	1 3/4	2 1/4



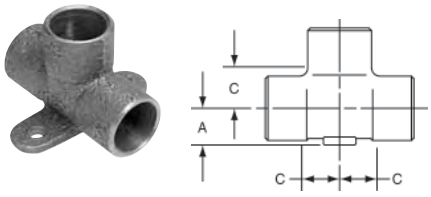
711-A
Supply and Return Tee
C x C x C – Cast

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES C	J
1/2	0.17	13/16	1



611-2
Fitting Tee C x Ftg x C – Wrot

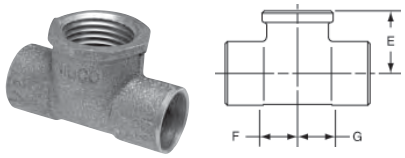
NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES B	C	F
1/2	0.07	1 1/32	3/8	7/16
3/4	0.15	1 15/32	1/2	17/32



711-5
Drop Tee C x C x C – Cast

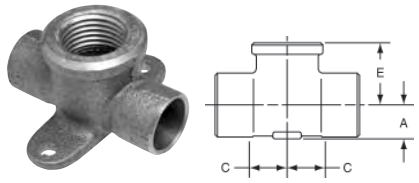
NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES A	C
1/2	0.16	3/8	7/16

TEES *continued*



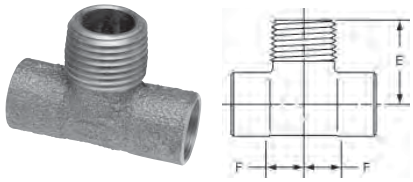
712
Tee C x C x F – Cast

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES E	F	G
1/4	0.08	13/16	9/32	9/32
3/8	0.11	11/16	7/16	7/16
3/8 x 3/8 x 1/4	0.12	11/16	7/16	7/16
1/2	0.14	13/16	7/16	7/16
1/2 x 1/2 x 1/4	0.16	13/16	1/2	1/2
1/2 x 1/2 x 3/8	0.15	13/16	1/2	1/2
1/2 x 1/2 x 3/4	0.23	15/16	11/16	11/16
3/4	0.33	1	21/32	21/32
3/4 x 1/2 x 3/4	0.28	1	21/32	11/16
3/4 x 3/4 x 3/8	0.23	7/8	1/2	1/2
3/4 x 3/4 x 1/2	0.24	57/64	17/32	17/32
3/4 x 3/4 x 1	0.40	1 1/8	7/8	7/8
1	0.54	1 1/4	7/8	7/8
1 x 1 x 1/2	0.35	1 1/8	9/16	9/16
1 x 1 x 3/4	0.42	1 3/16	11/16	11/16
1 1/4	0.76	1 7/16	1	1
1 1/4 x 1 1/4 x 1/2	0.49	1 1/4	9/16	9/16
1 1/4 x 1 1/4 x 3/4	0.55	1 5/16	11/16	11/16
1 1/4 x 1 1/4 x 1	0.66	1 7/16	7/8	7/8
1 1/2	1.08	1 5/8	1 1/8	1 1/8
1 1/2 x 1 1/2 x 1/2	0.62	1 3/8	9/16	9/16
1 1/2 x 1 1/2 x 3/4	0.70	1 7/16	11/16	11/16
1 1/2 x 1 1/2 x 1	0.79	1 1/2	13/16	13/16
2	1.74	1 7/8	1 3/8	1 3/8
2 x 2 x 1/2	0.97	1 5/8	17/32	17/32
2 x 2 x 3/4	1.10	1 11/16	11/16	11/16
2 x 2 x 1	1.23	1 3/4	13/16	13/16



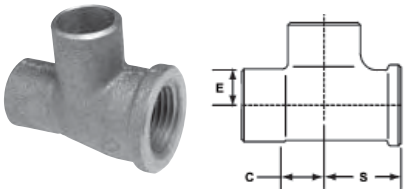
712-5
Drop Tee C x C x F – Cast

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES A	C	E
1/2	0.25	3/8	9/16	7/8
3/4	0.38	1/2	21/32	1



713
Tee C x C x M – Cast

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES E	F
1/2	0.14	1 3/32	7/16
3/4	0.29	1 9/32	9/16



714
Tee C x F x C – Cast

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES C	E	S
1/2	0.18	7/16	9/16	7/8
1/2 x 3/4 x 1/2	0.27	7/16	9/16	1 3/16
3/4	0.31	9/16	11/16	1
3/4 x 1/2 x 3/4	0.26	9/16	9/16	15/16
1	0.52	23/32	13/16	1 1/4
1 x 1/2 x 1	0.42	3/4	3/4	1 1/8
1 x 3/4 x 1	0.43	23/32	23/32	1 3/16
1 1/4	0.73	7/8	1	1 13/32
1 1/4 x 1/2 x 1 1/4	0.56	7/8	7/8	1 3/16
1 1/4 x 3/4 x 1 1/4	0.62	7/8	7/8	1 7/32
1 1/2	1.00	1	1 1/8	1 9/16
1 1/2 x 3/4 x 1 1/2	0.88	1	1	1 13/16
2	1.72	1 1/4	1 3/8	1 7/8
2 x 1/2 x 2	1.58	1 1/4	1 1/4	2
2 x 3/4 x 2	1.57	1 1/4	1 1/4	2

TRAPS



698
Suction Line P-Trap
C x C – Wrot

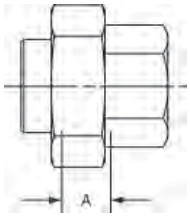
A major application of this fitting is on the suction line of a refregeration compressor. The line is looped, by use of the Suction Line P-Trap, to the floor prior to being run vertically upwards to prevent the drainage of oil back to the compressor during shut down periods. Additional P-Traps are used for each 20' or riser pipe. this prevents high velocity build-up as the oil or liquid begins to return to the compressor during this shut down period.

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES C	D	J	K
1/2	0.39	5 3/8	3	3	6
5/8	0.45	5 3/8	2 7/8	3	6
3/4	0.58	5 3/8	2 3/4	3	6
1	0.92	5 1/4	2 21/32	3	6
1 1/4	1.51	5 3/8	2 7/8	3 3/4	6 1/8
1 1/2	2.74	7 5/8	3 5/8	5	9
2	4.05	8	3 5/8	6	9 7/16

Consult price sheet for Made to Order items and for minimum order quantities.

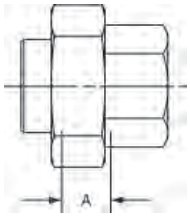
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UNIONS

633-W
Union C x C – Wrot

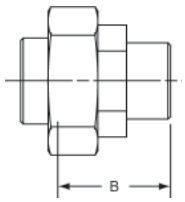
NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1/4	0.13	11/16
3/8	0.12	7/16
1/2	0.12	13/32
3/4	0.28	3/8
1	0.44	1/2

733
Union C x C – Cast

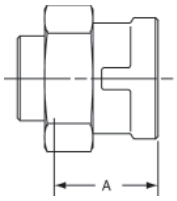
NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1/4	0.10	11/16
3/8	0.15	7/16
1/2	0.21	13/32
5/8	0.30	21/32
3/4	0.31	3/8
1	0.53	1/2
1 1/4	0.75	1/2
1 1/2	1.06	23/32
2	1.85	1/2
2 1/2	3.33	1
3	4.75	15/32

Consult price sheet for Made to Order items and for minimum order quantities.

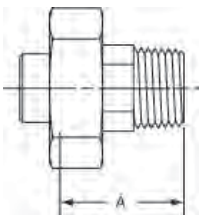
733-2
Fitting Union Ftg x C – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES
1/2	0.23	19/32
3/4	0.36	15/8
1	0.50	127/32

733-3
Fitting Union C x F – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1/4	0.14	15/32
3/8	0.19	13/32
1/2	0.27	11/8
3/4	0.40	15/16
1	0.60	17/16
1 1/4	0.93	119/32
1 1/2	1.35	113/16
2	1.89	25/32
2 1/2	3.66	–

733-4
Union C x M – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1/4	0.13	11/2
3/8	0.20	15/8
1/2	0.29	111/16
1/2 x 3/4	0.35	21/16
3/4	0.43	129/32
1	0.64	21/8
1 1/4	0.94	25/32
1 1/2	1.29	213/32
2	2.19	225/32
2 1/2	4.21	313/32

VENTURI

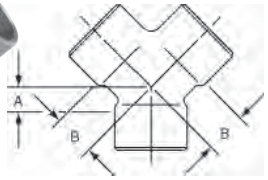


621
Venturi Insert – Wrot

Converts any tee into a special purpose venturi or scoop tee

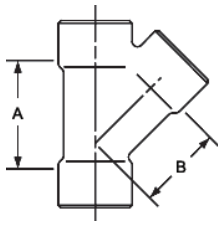
NOM. SIZE	APPROX. NET WT./LBS.
1/2	0.01
3/4	0.02
1	0.03
1 1/4	0.04

Y's

748
90° Y C x C x C – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
1/2	0.11	7/32	7/16
3/4	0.25	7/16	5/8
1	0.61	1/2	13/16

749
45° Y C x C x C – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
1/2	0.15	13/32	7/8
3/4	0.30	117/32	17/32
1	0.55	113/16	115/32
1 1/4	0.81	21/4	17/8
1 1/2	1.14	25/8	21/8
2	2.17	35/16	23/4

Cast Copper Alloy Flared Fittings

100 Series – Heavy Flared
500 Series – Flared

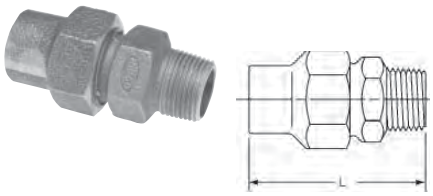
Adapters 23
Couplings 23
Elbows 23
Nuts 24
Tees 24

ISO 9001
BUREAU VERITAS
Certification

The manufacturing plants at Stuarts Draft, VA, Nacogdoches, TX and Reynosa, Mexico manufacture products under a Quality Management System conforming to the current revision of ISO-9001 International Standards

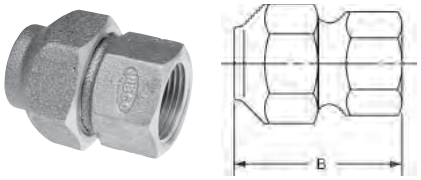
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ADAPTERS



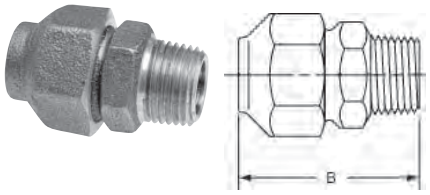
104
Heavy Flared Adapter
FL x M – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. L INCHES
3/4	0.71	$2^{1}/_{2}$
1	1.05	$3^{1}/_{4}$



503
Flared Adapter FL x F – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES
1/2	0.36	$1^{7}/_{8}$
3/4	0.49	$2^{1}/_{32}$
1	0.93	$2^{3}/_{4}$
1 1/2	1.98	$3^{7}/_{32}$
2	3.27	$3^{9}/_{16}$

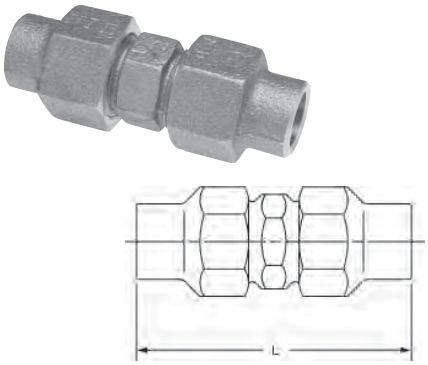


504
Flared Adapter FL x M – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES
1/2	0.28	$1^{32}/_{32}$
3/4	0.59	$2^{11}/_{16}$
1	0.84	$3^{3}/_{16}$
1 1/2	1.88	$3^{3}/_{4}$
2	2.93	$4^{15}/_{16}$

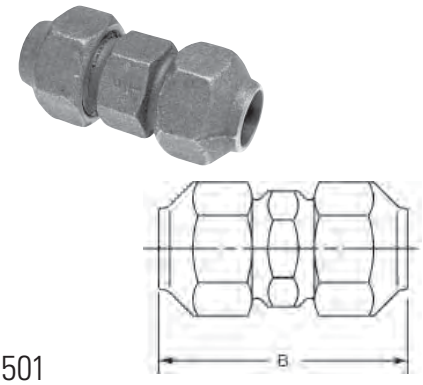
Consult price sheet for Made to Order items and for minimum order quantities.

COUPLINGS



101
Heavy Flared Coupling
FL x FL – Cast

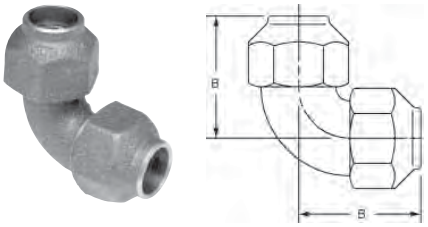
NOM. SIZE	APPROX. NET WT./LBS.	DIM. L INCHES
3/4	0.98	$3^{13}/_{16}$
1	1.63	$5^{5}/_{16}$



501
Flared Coupling FL x FL – Cast

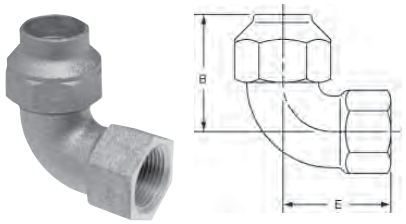
NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES
1/2	0.43	$2^{3}/_{8}$
3/4	0.74	$2^{1}/_{2}$
1	1.20	$3^{1}/_{4}$
1 1/4	1.93	$3^{1}/_{2}$
1 1/2	2.80	$3^{23}/_{32}$
2	4.60	$4^{1}/_{4}$

ELBOWS



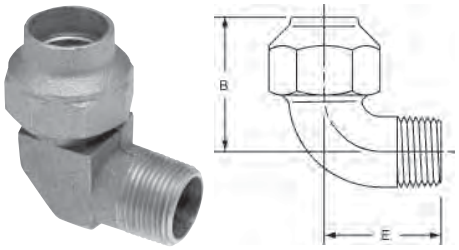
507
Flared 90° Elbow FL x FL – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES
1/2	0.54	$1^{5}/_{8}$
3/4	0.88	$1^{31}/_{32}$
1	1.59	$2^{9}/_{16}$
2	5.58	$3^{7}/_{8}$



507-3
Flared 90° Elbow FL x F – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES	DIM. E INCHES
1/2	0.51	$1^{5}/_{8}$	$1^{1}/_{2}$
3/4	0.72	$1^{15}/_{16}$	$1^{5}/_{8}$
1	1.45	$2^{9}/_{16}$	$2^{1}/_{4}$

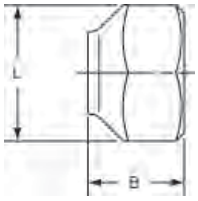


507-4
Flared 90° Elbow FL x M – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES	DIM. E INCHES
1/2	0.35	$1^{11}/_{16}$	$1^{13}/_{32}$
3/4	0.58	$1^{31}/_{32}$	$1^{19}/_{32}$
1	1.31	$2^{3}/_{32}$	2
1 1/2	2.79	$3^{5}/_{16}$	$2^{1}/_{2}$

NUTS



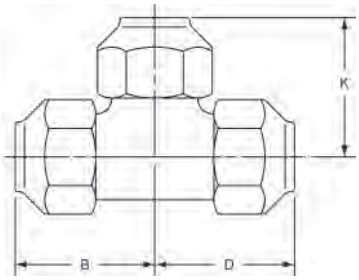


500
Tube Nut – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES	DIM. L INCHES
3/4	0.24	1 1/16	1 1/2
1	0.28	1 3/8	1 7/8

TEES





511
Flared Tee FL x FL x FL – Cast

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES B	D	K
1/2	0.66	1 5/8	1 5/8	1 5/8
3/4	1.21	2	2	2
1	2.00	2 5/8	2 5/8	2 5/8

Consult price sheet for Made to Order items and for minimum order quantities.

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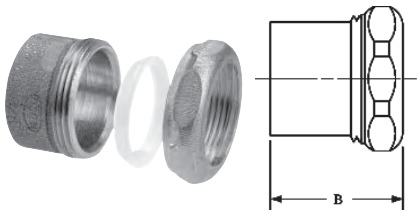
Wrot and Cast DWV Fittings

Adapters 26-28
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Cleanouts 28
Closet Flanges 29
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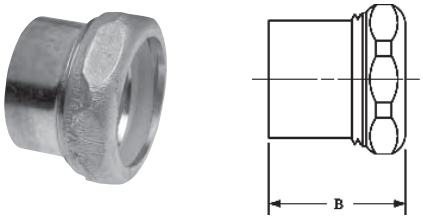
The manufacturing plants at Stuarts Draft, VA, Nacogdoches, TX and Reynosa, Mexico manufacture products under a Quality Management System conforming to the current revision of ISO-9001 International Standards

ADAPTERS – SLIP JOINT



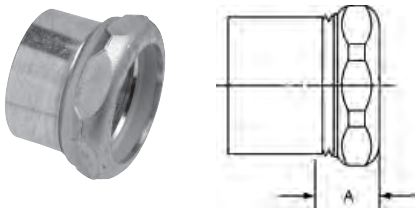
801-2-7
DWV Fitting Trap Adapter
Ftg x SJ – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES
1 1/4 x 1 1/4 O.D.	0.25	$1^{19}/_{32}$



901-2-7
DWV Fitting Trap Adapter
Ftg x SJ – Wrot

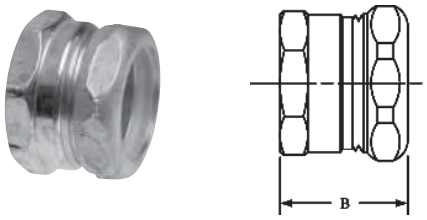
NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES
1 1/2 x 1 1/4 O.D.	0.24	$1^{7}/_{16}$
1 1/2 x 1 1/2 O.D.	0.29	$1^{7}/_{16}$



901-7
DWV Trap Adapter
C x SJ – Wrot

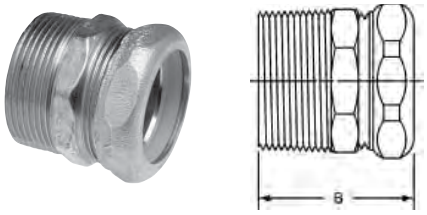
NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1 1/4 x 1 1/4 O.D.	0.21	$^{21}/_{32}$
1 1/2 x 1 1/4 O.D.	0.24	$^{7}/_{8}$
1 1/2 x 1 1/2 O.D.	0.27	$^{3}/_{4}$

Consult price sheet for Made to Order items and for minimum order quantities.



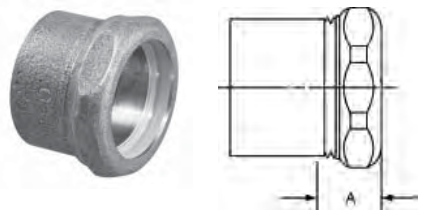
903-7
DWV Trap Adapter
F x SJ – Wrot

NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES
1 1/4 x 1 1/4 O.D.	0.32	$1^{7}/_{16}$
1 1/2 x 1 1/4 O.D.	0.43	$1^{19}/_{32}$
1 1/2 x 1 1/2 O.D.	0.42	$1^{7}/_{16}$



904-7
DWV Trap Adapter
M x SJ – Wrot

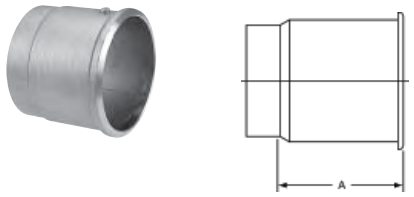
NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES
1 1/4 x 1 1/4 O.D.	0.41	$1^{3}/_{4}$
1 1/2 x 1 1/4 O.D.	0.49	$1^{29}/_{32}$
1 1/2 x 1 1/2 O.D.	0.51	$1^{25}/_{32}$



801-7
DWV Trap Adapter
C x SJ – Cast

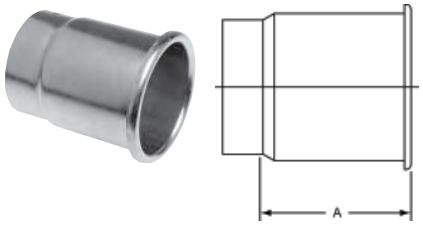
NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1 1/2 x 1 1/2 O.D.	0.31	$^{21}/_{32}$

ADAPTERS – SOIL PIPE



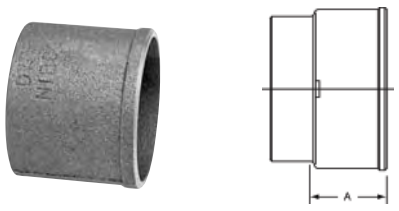
805
DWV Soil Pipe Adapter
C x Spigot – Cast
Joins copper tube to cast iron soil pipes.

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1 1/4 x 2	0.93	$3^{9}/_{32}$
2 x 4	2.49	$3^{7}/_{8}$
3	1.63	$2^{3}/_{4}$
3 x 4	2.78	$3^{13}/_{16}$
4	2.23	3



905
DWV Soil Pipe Adapter
C x Spigot – Wrot
Joins copper tube to cast iron soil pipes.

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1 1/2 x 2	0.60	$3^{7}/_{16}$
2	0.44	$2^{9}/_{16}$

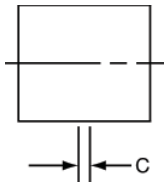


805-N
DWV No Hub Soil Pipe Adapter
C x No Hub – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1 1/2 x 2	0.42	$1^{7}/_{32}$
2	0.40	$1^{3}/_{16}$
3	0.75	$1^{3}/_{16}$
4	1.23	$1^{7}/_{32}$

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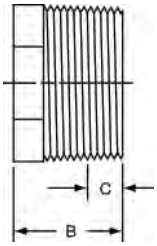
ADAPTERS – SPECIAL LEAD

801-T
DWV Trap Adapter
C x O.D. Tube – Cast

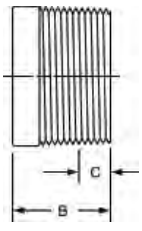
NOM. SIZE	APPROX. NET WT./LBS.	DIM. C INCHES
1 1/4 x 1 1/4 O.D.	0.21	1/8
1 1/2 x 1 1/4 O.D.	0.20	9/32
1 1/2 x 1 1/2 O.D.	0.22	7/32

ADAPTERS – THREADED

802
DWV Adapter
C x M – Cast

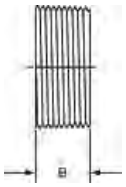
NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES	DIM. C INCHES
1 1/4	0.23	15/16	7/16
1 1/4 x 1 1/2	0.44	1	1/2
1 1/2	0.25	1	7/16
2	0.35	1 1/16	7/16
3	0.92	1 1/2	3/4

802-C
DWV Flush Adapter
C x M – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES	DIM. C INCHES
1 1/2	0.20	15/16	9/16
2	0.23	1 1/16	5/8

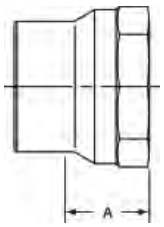
ADAPTERS – THREADED *continued*

802-F
DWV Threaded Piece
C x M – Cast

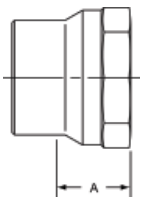
Makes slip joint connection when soldered to the end of tube and slip joint nut and washer added.

NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES
1 1/4	0.05	3/8
1 1/2	0.06	3/8
2	0.05	3/8

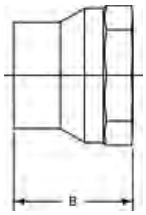
803
DWV Adapter
C x F – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
3	1.45	1 13/32
4	2.44	1 17/32

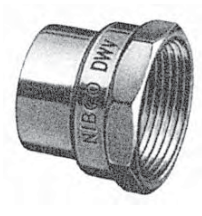
903
DWV Adapter
C x F – Wrot

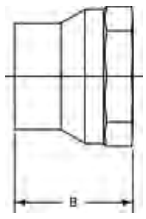
NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1 1/4	0.19	27/32
1 1/2	0.25	29/32
2	0.41	1

803-2
DWV Fitting Adapter
Ftg x F – Cast

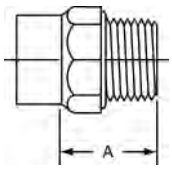
NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES
1 1/2	0.37	1 15/32
2	0.55	1 19/32
3	1.44	2 7/32





903-2
DWV Fitting Adapter
Ftg x F – Wrot

NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES
1 1/4	0.19	1 17/32

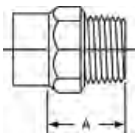



804
DWV Adapter
C x M – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1 1/2	0.34	1 3/64
1 1/2 x 1 1/4	0.31	27/32
1 1/2 x 2	0.67	1 5/16
2	0.43	7/8
2 x 1 1/2	0.52	15/16
3	1.35	1 25/32
4	2.59	2 1/32

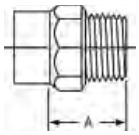
Consult price sheet for Made to Order items and for minimum order quantities.

ADAPTERS – THREADED *continued*

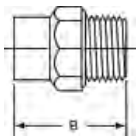
904
DWV Adapter
C x M – Wrot

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1 1/4	0.30	$1^{3}/_{32}$
1 1/4 x 1 1/2	0.37	$1^{3}/_{16}$

804-T
DWV Trap Adapter
O.D. Tube x M – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1 1/4 O.D. x 1 1/2	0.44	$1^{9}/_{32}$

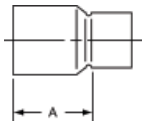



804-2
DWV Fitting Adapter
Ftg x M – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES
1 1/2	0.50	$1^{15}/_{16}$
2	0.71	$2^{1}/_{32}$

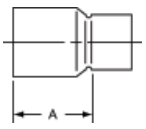
Consult price sheet for Made to Order items and for minimum order quantities.

BUSHINGS

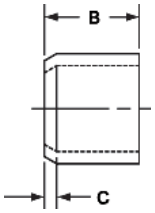
801-2
DWV External Bushing
Ftg x C – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
3 x 1 1/2	0.65	$1^{5}/_{16}$
3 x 2	0.61	$1^{11}/_{32}$
4 x 2	1.09	$1^{3}/_{4}$
4 x 3	1.12	$1^{21}/_{32}$

901-2
DWV External Bushing
Ftg x C – Wrot

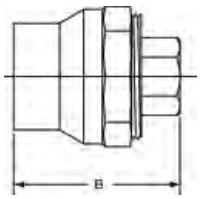
NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1 1/2 x 1 1/4	0.13	1
2 x 1 1/4	0.19	$1^{3}/_{8}$
2 x 1 1/2	0.19	$1^{7}/_{32}$

901-2-F
DWV Fitting Flush Bushing
Ftg x C – Wrot

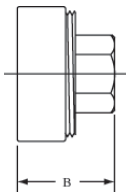
NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES	DIM. C INCHES
2 x 1 1/2	0.39	$^{13}/_{16}$	$^{1}/_{8}$

CLEANOUTS

816
DWV Fitting Cleanout
Ftg x Cleanout w/Plug – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES
1 1/4	0.49	$2^{5}/_{32}$
1 1/2	0.59	$2^{1}/_{4}$
2	0.88	$2^{3}/_{8}$
3	2.37	$3^{9}/_{32}$
4	4.04	$3^{5}/_{8}$

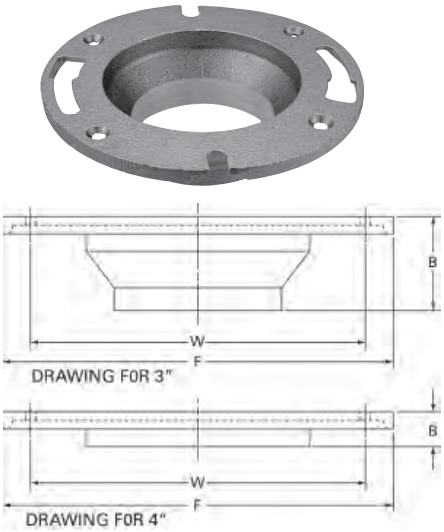



816-S
DWV Flush Fitting Cleanout
Ftg x Cleanout w/Plug – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES
1 1/4 x 3/4	0.20	$1^{5}/_{32}$
1 1/2 x 1	0.29	$1^{1}/_{16}$
2 x 1 1/2	0.41	$1^{7}/_{32}$
3 x 2 1/2	0.96	$1^{13}/_{16}$
4 x 3	2.13	$2^{1}/_{8}$

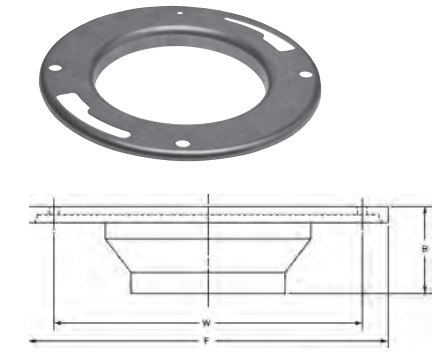
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CLOSET FLANGES



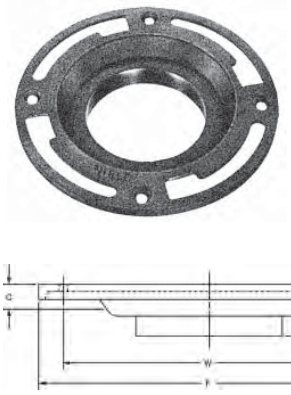
851
DWV Closet Flange
C – Cast

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES B	F	W
4	1.45	5/8	7	6
4 x 3	2.32	1 11/16	7	6



951
DWV Closet Flange
C – Wrot

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES B	F	W
4 x 3	0.84	1 11/16	6 3/4	6

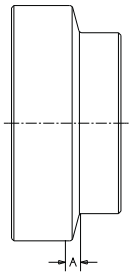


851-C
DWV Closet Flange
C – Cast

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES B	C	F	W
4 x 3	1.31	1 1/16	1/2	6 7/8	6

COUPLINGS

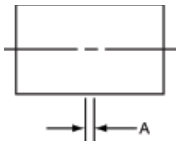




801
DWV Coupling
C x C – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
3 x 1 1/2	0.68	15/16
3 x 2	0.70	11/16
4 x 2	1.34	1 1/4
4 x 3	1.13	9/32

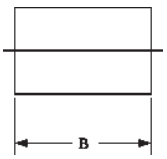




901
DWV Coupling
C x C – Wrot

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1 1/4	0.07	3/32
1 1/2	0.09	3/32
1 1/2 x 1 1/4	0.13	5/16
2	0.14	3/32
2 x 1 1/2	0.19	15/32
3	0.45	3/32
4	0.57	1/8



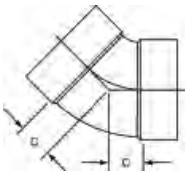


901-RP
DWV Repair Coupling (No Stop)
C x C – Wrot

NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES
1 1/2	0.09	1 13/32
2	0.14	1 17/32
3	0.42	1 29/32
4	0.57	2 13/32

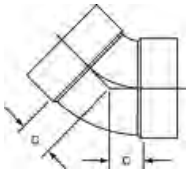
Consult price sheet for Made to Order items and for minimum order quantities.

ELBOWS

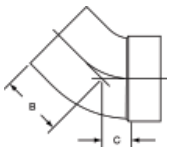
806
DWV 45° Elbow
C x C – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. C INCHES
4	2.47	$1\frac{17}{32}$

906
DWV 45° Elbow
C x C – Wrot

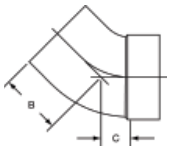
NOM. SIZE	APPROX. NET WT./LBS.	DIM. C INCHES
1 1/4	0.13	$\frac{1}{2}$
1 1/2	0.21	$\frac{9}{16}$
2	0.38	$\frac{13}{16}$
3	0.78	$1\frac{3}{16}$

806-2
DWV 45° Fitting Elbow
Ftg x C – Cast

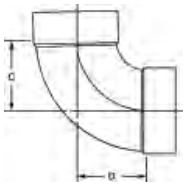
NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES	DIM. C INCHES
4	2.81	$2\frac{19}{32}$	$1\frac{17}{32}$

Consult price sheet for Made to Order items and for minimum order quantities.

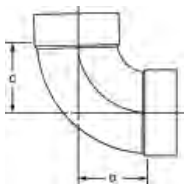
906-2
DWV 45° Fitting Elbow
Ftg x C – Wrot

NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES	DIM. C INCHES
1 1/4	0.13	$1\frac{3}{16}$	$\frac{1}{2}$
1 1/2	0.21	$1\frac{1}{4}$	$\frac{9}{16}$
2	0.39	$1\frac{5}{8}$	$\frac{13}{16}$
3	0.84	$1\frac{7}{8}$	$1\frac{3}{8}$

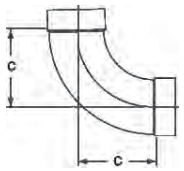
807
DWV 90° Elbow
C x C – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. C INCHES	DIM. D INCHES
1 1/2 x 1 1/4	0.43	$1\frac{1}{4}$	$1\frac{3}{16}$
2 x 1 1/2	0.71	$1\frac{11}{16}$	$1\frac{7}{16}$
3	2.46	$2\frac{7}{8}$	$2\frac{7}{8}$
4	3.92	$3\frac{25}{32}$	$3\frac{25}{32}$

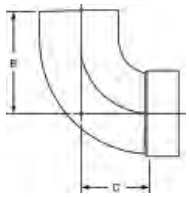
907
DWV 90° Elbow
C x C – Wrot

NOM. SIZE	APPROX. NET WT./LBS.	DIM. C INCHES	DIM. D INCHES
1 1/4	0.18	$1\frac{3}{16}$	$1\frac{3}{16}$
1 1/2	0.32	$1\frac{7}{16}$	$1\frac{7}{16}$
2	0.58	$1\frac{15}{16}$	$1\frac{15}{16}$
3	1.20	$2\frac{11}{16}$	$2\frac{11}{16}$

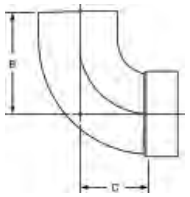
907-LT
DWV 90° Long Radius Elbow
C x C – Wrot

NOM. SIZE	APPROX. NET WT./LBS.	DIM. C INCHES
1 1/2	0.41	$2\frac{5}{16}$
2	0.62	$2\frac{3}{4}$

807-2
DWV 90° Fitting Elbow
Ftg x C – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES	DIM. C INCHES
4	3.84	$4\frac{13}{16}$	$3\frac{25}{32}$

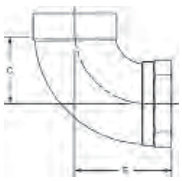



907-2
DWV 90° Fitting Elbow
Ftg x C – Wrot

NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES	DIM. C INCHES
1 1/4	0.19	$1\frac{7}{8}$	$1\frac{3}{16}$
1 1/2	0.33	$2\frac{3}{16}$	$1\frac{7}{16}$
2	0.59	$2\frac{11}{16}$	$1\frac{7}{8}$
3	1.21	$3\frac{11}{16}$	$2\frac{11}{16}$

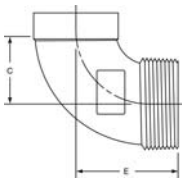
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ELBOWS *continued*

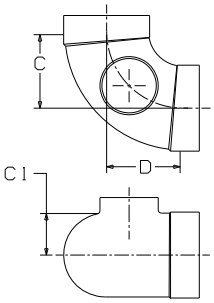
807-3
DWV 90° Elbow
C x F – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. C INCHES	DIM. E INCHES
1 1/2	0.72	$1^{13}/_{32}$	$2^{1}/_{8}$
2	1.21	$1^{7}/_{8}$	$2^{11}/_{16}$

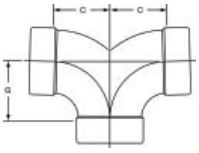
807-4
DWV 90° Elbow
C x M – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. C INCHES	DIM. E INCHES
1 1/2	0.66	$1^{13}/_{32}$	$2^{3}/_{32}$

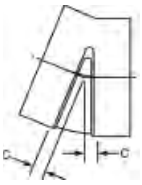
807-9
DWV 90° Elbow w/Side Inlet
C x C x C – Cast

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES C	C_1	D
3 x 3 x 2	2.55	$2^{7}/_{8}$	$1^{5}/_{8}$	$2^{7}/_{8}$

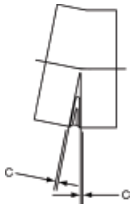
837
DWV 90° Double Elbow
C x C x C – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. C INCHES	DIM. G INCHES
1 1/2	0.78	$1^{13}/_{32}$	$1^{13}/_{32}$
2	1.31	$1^{7}/_{8}$	$1^{7}/_{8}$
2 x 1 1/2 x 1 1/2	0.97	$1^{5}/_{8}$	$1^{1}/_{2}$

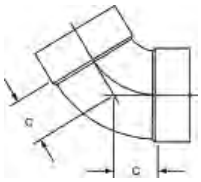
808
DWV $22^{1}/_{2}$° Elbow
C x C – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. C INCHES
1 1/4	0.22	$^{3}/_{16}$
1 1/2	0.27	$^{1}/_{4}$
2	0.49	$^{11}/_{32}$
3	0.99	$^{17}/_{32}$

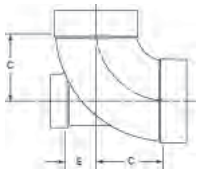
809
DWV $11^{1}/_{4}$° Elbow
C x C – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. C INCHES
1 1/2	0.30	$^{5}/_{32}$
2	0.41	$^{3}/_{16}$

960
DWV 60° Elbow
C x C – Wrot

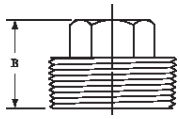
NOM. SIZE	APPROX. NET WT./LBS.	DIM. C INCHES
1 1/2	0.24	$^{13}/_{16}$
2	0.44	$1^{1}/_{8}$
3	0.95	$1^{7}/_{8}$

861-LH
DWV 90° Elbow
w/Low Heel Inlet
C x C x C – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. C INCHES	DIM. E INCHES
3 x 3 x 2	2.58	$2^{7}/_{8}$	$1^{9}/_{32}$

PLUGS

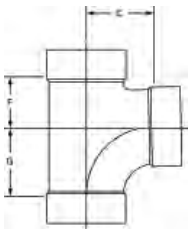



818 A.S.A.
DWV Plug
M – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES
3/4	0.08	$^{23}/_{32}$
1	0.12	$^{29}/_{32}$
1 1/4	0.19	$^{31}/_{32}$
1 1/2	0.22	$1^{3}/_{32}$
2	0.33	$^{15}/_{16}$

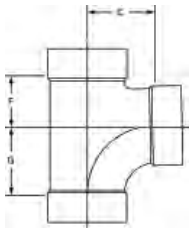
Consult price sheet for Made to Order items and for minimum order quantities.

TEES

811
DWV Tee
C x C x C – Cast

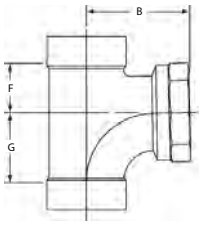
NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES C	F	G
3	2.84	$2\frac{53}{64}$	$1\frac{25}{64}$	$2\frac{53}{64}$
3 x 3 x 1 1/2	1.59	$2\frac{5}{32}$	$\frac{15}{16}$	$1\frac{7}{16}$
3 x 3 x 2	1.82	$2\frac{3}{8}$	$1\frac{1}{8}$	$1\frac{7}{8}$
4	5.42	$3\frac{13}{16}$	2	$3\frac{13}{16}$
4 x 4 x 2	2.91	$2\frac{7}{8}$	$1\frac{5}{32}$	$1\frac{13}{32}$
4 x 4 x 3	3.71	$3\frac{11}{32}$	$1\frac{19}{32}$	$2\frac{7}{8}$

911
DWV Tee
C x C x C – Wrot

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES C	F	G
1 1/4	0.32	$1\frac{1}{8}$	$\frac{13}{16}$	$1\frac{1}{8}$
1 1/2	0.49	$1\frac{13}{32}$	$\frac{29}{32}$	$1\frac{13}{32}$
1 1/2 x 1 1/2 x 1 1/4	0.39	$2\frac{5}{32}$	$\frac{15}{16}$	$1\frac{7}{16}$
2	0.78	$1\frac{27}{32}$	$1\frac{1}{8}$	$1\frac{7}{8}$
2 x 1 1/2 x 1 1/2	0.73	$1\frac{5}{8}$	$1\frac{1}{4}$	$1\frac{3}{8}$
2 x 1 1/2 x 2	0.80	$1\frac{27}{32}$	$1\frac{25}{32}$	$1\frac{13}{16}$
2 x 2 x 1 1/4	0.51	$1\frac{1}{2}$	$\frac{13}{16}$	$1\frac{1}{8}$
2 x 2 x 1 1/2	0.73	$1\frac{5}{8}$	$\frac{15}{16}$	$1\frac{3}{8}$

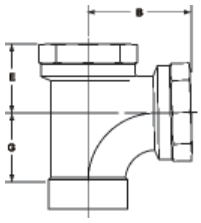
Consult price sheet for Made to Order items and for minimum order quantities.

811-14
DWV Tee
C x C x F – Cast

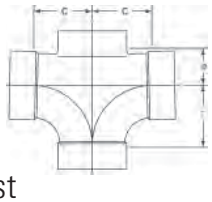
NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES B	F	G
1 1/2	0.88	$2\frac{3}{16}$	$\frac{13}{16}$	$1\frac{13}{32}$
2	1.57	$2\frac{23}{32}$	$1\frac{1}{16}$	$1\frac{7}{8}$
2 x 2 x 1 1/2	1.17	$2\frac{7}{16}$	$\frac{7}{8}$	$1\frac{7}{16}$





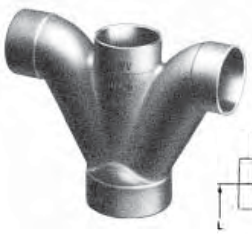
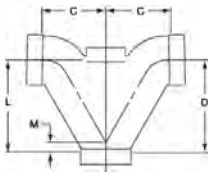
811-15
DWV Tee
C x F x F – Cast

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES B	E	G
1 1/4	0.82	$1\frac{25}{32}$	$1\frac{1}{2}$	$1\frac{5}{32}$

835
DWV Double Tee
C x C x C x C – Cast

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES C	F	G
1 1/4	0.65	$1\frac{5}{32}$	$\frac{3}{4}$	$1\frac{5}{32}$
1 1/2	0.85	$1\frac{13}{32}$	$\frac{13}{16}$	$1\frac{13}{16}$
1 1/2 x 1 1/2 x 1 1/4 x 1 1/4	0.72	$1\frac{9}{32}$	$\frac{3}{4}$	$\frac{15}{32}$
2	1.39	$1\frac{7}{8}$	$1\frac{1}{16}$	$1\frac{7}{8}$
2 x 1 1/2 x 1 1/2 x 1 1/2	0.94	$1\frac{21}{32}$	$\frac{25}{32}$	$1\frac{7}{16}$
2 x 2 x 1 1/4 x 1 1/4	0.93	$1\frac{17}{32}$	$\frac{25}{32}$	$1\frac{5}{32}$
2 x 2 x 1 1/2 x 1 1/2	0.99	$1\frac{21}{32}$	$\frac{7}{8}$	$1\frac{7}{16}$
3 x 3 x 1 1/2 x 1 1/2	1.51	$2\frac{5}{32}$	$\frac{31}{32}$	$1\frac{15}{32}$
3 x 3 x 2 x 2	2.53	$2\frac{3}{8}$	$1\frac{1}{8}$	$1\frac{7}{8}$

835-B
DWV Double LT Tee
C x C x C x C – Cast

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES C	D	L	M
2 x 1 1/2 x 1 1/2 x 1 1/2	1.90	$2\frac{3}{8}$	$3\frac{3}{16}$	$3\frac{21}{32}$	$\frac{3}{32}$

TEST CAPS



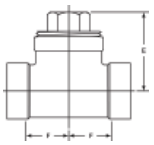

917-B
Test Caps – Copper
C – Wrot

NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES
1/2	0.01	$\frac{3}{16}$
3/4	0.01	$\frac{3}{16}$
1	0.01	$\frac{1}{8}$
1 1/4	0.01	$\frac{1}{4}$
1 1/2	0.01	$\frac{1}{4}$
2	0.02	$\frac{1}{4}$
3	0.03	$\frac{1}{4}$

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TEST TEES



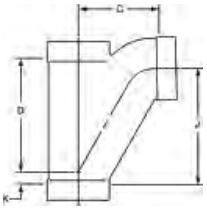


814
DWV Test Tee
C x C x Cleanout w/Plug – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. E INCHES	DIM. F INCHES
1 1/2	0.88	2 1/16	1 1/8
2	1.37	2 11/32	1 3/8
3	3.72	3 7/16	1 15/16

T-Y's

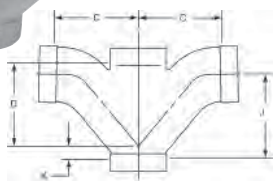




812
DWV Long Turn T-Y
C x C x C – Cast

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES C	D	J	K
§ 1 1/4	0.93	2 27/32	1 27/32	2 3/4	13/32
1 1/2	0.87	3 5/16	2 1/8	3 5/32	7/16
2	1.90	4 1/4	2 3/4	4 1/16	1/2
2 x 2 x 1 1/2	1.07	3 5/8	2 3/8	3 7/32	7/32
3	3.49	6 7/16	4 1/32	6 1/32	3/4
3 x 3 x 2	2.78	4 7/8	3 5/16	4 5/32	3/32



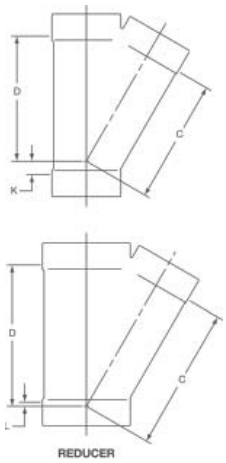


836
DWV Double Long Turn T-Y
C x C x C x C – Cast

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES C	D	J	K
1 1/2	1.25	3 5/16	2 1/8	3 5/32	7/32
2	2.83	3 5/16	2 1/8	3 5/32	7/16
2 x 2 x 1 1/2 x 1 1/2	1.96	3 5/8	2 3/8	3 7/32	7/32

Y's *continued*

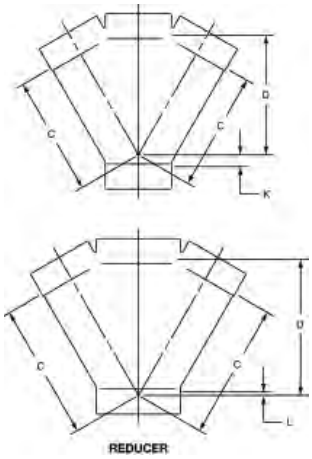




810
DWV 45° Y
C x C x C – Cast

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES C	D	K	L
1 1/4	0.68	2	2	3/8	–
1 1/2	0.94	2 5/16	2 5/16	1/2	–
2	1.26	2 7/8	2 7/8	17/32	–
2 x 1 1/2 x 1 1/2	0.85	2 5/32	2 5/32	5/16	–
2 x 1 1/2 x 2	1.16	2 17/32	2 5/8	17/32	–
2 x 2 x 1 1/4	1.15	2 9/16	2 11/32	1/16	–
2 x 2 x 1 1/2	1.15	2 11/16	2 9/16	3/16	–
3	3.19	4 1/64	4 1/64	45/64	–
3 x 3 x 1 1/2	1.69	3 1/4	2 15/16	–	3/16
3 x 3 x 2	2.02	3 17/32	3 5/16	1/8	–
4	5.55	5 15/32	5 15/32	1 1/16	–
4 x 4 x 2	2.90	4 7/32	3 13/16	–	3/8
4 x 4 x 3	3.96	4 11/16	4 1/2	5/16	–



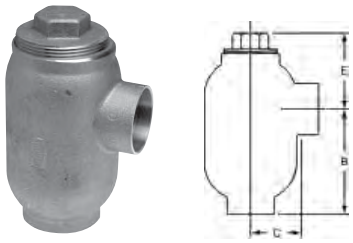


834
DWV 45° Double Y
C x C x C x C – Cast

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES C	D	K	L
1 1/2	1.12	–	–	–	–
2	2.26	2 7/8	2 7/8	17/32	–
2 x 2 x 1 1/2 x 1 1/2	1.41	2 11/16	2 9/16	3/16	–
3	4.18	4 13/32	4 13/32	25/32	–

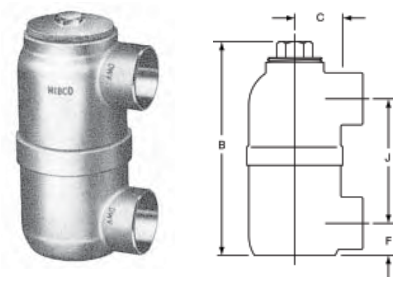
Consult price sheet for Made to Order items and for minimum order quantities.

TRAPS



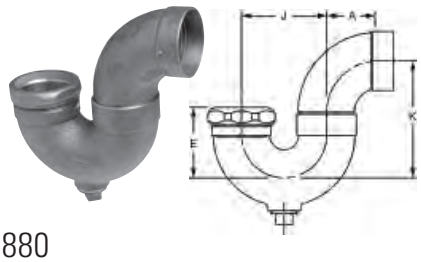
890
3 x 5 DWV Drum Trap
w/Bottom Inlet
C x F x Cleanout w/Plug – Cast

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES B	C	E
1 1/2	1.97	3 9/32	1 1/2	2 3/8



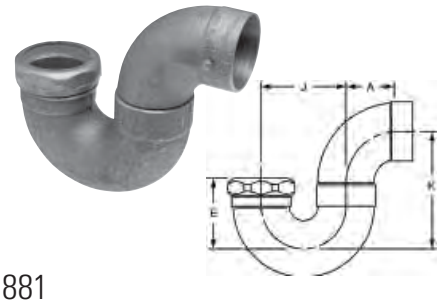
891
3 x 6 DWV Swivel Drum Trap
C x C x Cleanout w/Plug – Cast

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES B	C	F	J
1 1/2	2.90	6 21/32	1 1/2	1	3 7/8



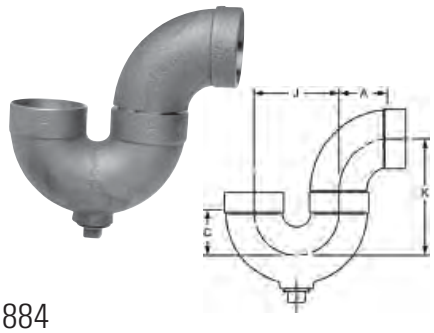
880
DWV P-Trap w/Cleanout
C x SJ x Cleanout w/Plug – Cast

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES A	E	J	K
1 1/2	1.80	1 13/32	2 7/32	2 1/2	3 17/32
2	2.76	1 7/8	2 7/16	3	4 3/16



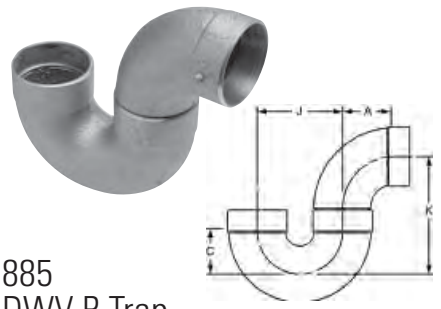
881
DWV P-Trap
C x SJ – Cast

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES A	E	J	K
1 1/2	1.60	1 13/32	2 7/32	2 1/2	3 17/32



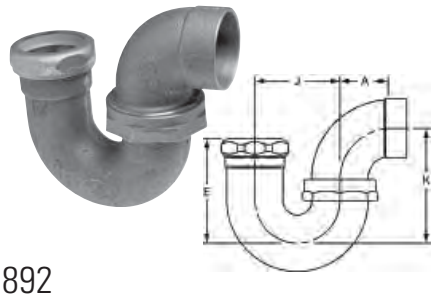
884
DWV P-Trap w/Cleanout
C x C x Cleanout w/Plug – Cast

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES A	C	J	K
1 1/4	1.27	1 5/32	1 17/32	2 1/4	3 9/32
1 1/2	1.55	1 13/32	1 15/32	2 1/2	3 17/32
2	2.40	1 7/8	1 13/32	3	4 3/32
3	5.74	2 7/8	1 15/16	4	5 21/32



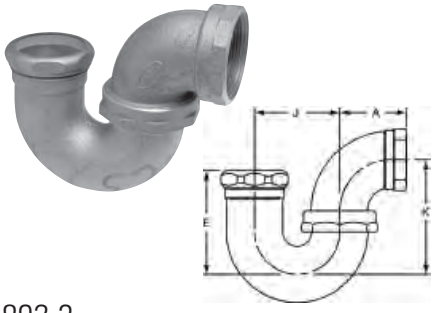
885
DWV P-Trap
C x C – Cast

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES A	C	J	K
1 1/4	1.16	1 5/32	1 17/32	2 1/4	3 9/32
1 1/2	1.41	1 13/32	1 15/32	2 1/2	3 17/32
2	2.27	1 7/8	1 13/32	3	4 3/32
3	5.17	2 7/8	1 15/16	4	5 21/32



892
DWV P-Trap w/Union Joint
C x SJ – Cast

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES A	E	J	K
1 1/2	1.86	1 1/8	3 5/32	2 5/8	3 7/16
2	2.63	1 15/32	3 13/32	3 1/8	3 29/32



892-3
DWV P-Trap w/Union Joint
F x SJ – Cast

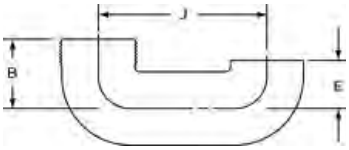
NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES A	E	J	K
2	2.96	1 13/32	3 13/32	3 1/8	3 29/32

Consult price sheet for Made to Order items and for minimum order quantities.

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TRAPS *cont.*



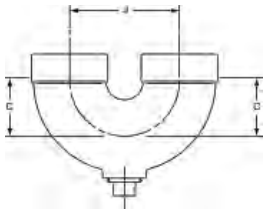


875-S
DWV Trap Upturn
M x S – Cast

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES B	E	J
1 1/2	1.20	$1^{41}/_{64}$	$1^{9}/_{64}$	4

RETURN BENDS

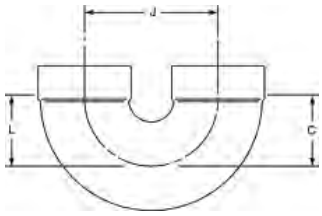




878
DWV Return Bend w/Cleanout
C x C x Cleanout w/Plug – Cast

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES C	J	
1 1/4	0.81	$1^{17}/_{32}$	$2^{1}/_{4}$	–
1 1/2	0.98	$1^{15}/_{32}$	$2^{1}/_{2}$	–
2	1.40	$1^{13}/_{32}$	3	–
3	3.34	$1^{15}/_{16}$	4	–





879
DWV Return Bend
C x C – Cast

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES C	J	L
1 1/4	0.76	$1^{17}/_{32}$	$2^{1}/_{4}$	–
1 1/2	0.83	$1^{15}/_{32}$	$2^{1}/_{2}$	–
2	1.27	$1^{13}/_{32}$	3	–
2 x 1 1/2	1.45	$1^{17}/_{32}$	3	$1^{19}/_{32}$
3	2.77	$1^{15}/_{16}$	4	–

Consult price sheet for Made to Order items and for minimum order quantities.

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ISO 9001 BUREAU VERITAS Certification

The manufacturing plants at Stuarts Draft, VA, Nacogdoches, TX and Reynosa, Mexico manufacture products under a Quality Management System conforming to the current revision of ISO-9001 International Standards

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Copper Tube Fittings

TYPES OF JOINTS

Flared Joint — The principle of the flared joint was first developed for copper tube plumbing in 1928 by NIBCO. The flared type joint is wholly a mechanical means of joining copper tubes. The tube nut is placed over the end of the copper tube to be joined; the tube end then is flared out at an approximate 45 degree angle by a flaring tool. The flared end is then drawn up by the tube nut so the inside surface is tightly secured against the ball seat of the fitting. This joint can be readily dismantled at any time and is, in effect, a type of union connection. Its use is generally restricted to soft (annealed) copper tubes since hard drawn tubes would be subject to splitting when flared (if the ends were not previously annealed). The flared ends of NIBCO® Flared Fittings are produced to the requirements of ASME B16.26, "Cast Copper Alloy Fittings for Flared Copper Tube."

Solder Joint — NIBCO pioneered the development of the solder joint and its application to the field of copper tube piping. Today the solder joint is widely adopted, as evidenced by the majority of cities and states that have written codes to include copper tube and solder joints as desirable for general plumbing, water lines, vent, stack, waste and drain lines, as well as other uses in industry. Testing has shown that often the solder joint has greater strength than the tubes being joined, depending upon the soldering alloy selected. While the method of preparing a solder joint is an exacting art to insure a full strength joint, it can be readily mastered by skilled tradesmen. It is for this reason — to insure the public of the protection afforded by properly prepared joints — that NIBCO® products are marketed through the reputable sources of supply to the piping trades. Important procedures for preparing a solder joint are graphically illustrated in this catalog on page 46.

Brazed Joint — This type of joint has long been used wherever and whenever critical situations have been encountered in copper piping. The joint itself is completed much in the same manner as the solder joint; however, considerably more heat and several refinements of technique require separate procedures that are described further in this catalog on pages 47-48.

Threaded Ends — To adapt copper tube to equipment having National Standard Pipe Taper (NPT) threads or to add copper tube to existing iron pipe installations or other threaded connections, NIBCO provides fittings having both external and internal NPT threads. These threaded ends are produced to the requirements of ASME B1.20.1, "Pipe Threads, General Purpose (Inch)."

Flanges — To adapt copper tube to equipment having flanged connections, or to add copper tube to flanged pipe installations or other purposes, NIBCO provides flanges. The flanges are produced in two standard types widely used in this field where copper tube can serve — Class 150, comply with ASME B16.24, "Cast Copper Alloy Pipe Flanges and Flanged Fittings Class 150, 300, 400, 600, 900, 1500 and 2500"; and Class 125, which conform to MSS SP-106, "Cast Copper Alloy Flanges and Flanged Fittings Class 125, 150 and 300."

Barbed Insert Fittings for Polybutylene (PB) — NIBCO offers a complete line of copper barbed insert fittings for joining PB tube. The insert fittings are produced to the requirements of ASTM F1380. Along with the insert fittings are copper crimp rings, which, when properly installed, provide a leak-tight mechanical joint. Transition fittings are available for adapting to new or existing threaded or solder joint ends.

Fitting Terms and Abbreviations

C	Female solder cup
Ftg	Male solder end
F	Female NPT thread
M	Male NPT thread
Hose	Standard hose thread
Hub	Female end for soil pipe
Spigot	Male end for soil pipe
No Hub	Used with mechanical coupling
O.D. Tube	Actual tube outside diameter
S	Straight thread
SJ	Slip joint
FL	Flared

WHAT MAKES A PLUMBING SYSTEM FAIL?

Failure in a copper plumbing system is rare, but may occur due to a variety of reasons. The most common causes of failure are:

1. Excessive fluid velocity causes erosion-corrosion or impingement (to strike or hit against) attack in the tube and/or fitting. For this reason, the copper plumbing industry has establish design velocity limits for copper plumbing systems to the following:

Hot Water > 140°F (60°C)	2 to 3 feet per second (0.6 to 0.9 meters per second)
Hot Water 140°F (60°C)	4 to 5 feet per second (1.2 to 1.5 meters per second)
Cold Water	5 to 8 feet per second (1.5 to 2.4 meters per second)

2. Localized high velocities and/or turbulence. The presence of a dent, tube ends which are not reamed or deburred before soldering, and sudden changes in direction can all cause localized high velocity conditions.
3. Flux Corrosion is typified by pin hole leaks, generally in the bottom of a horizontal line. Fluxes are mildly corrosive liquid or petroleum-based pastes containing chlorides of zinc and ammonia. Unless the flux is flushed from the system, it will lay in the bottom of the tube and remain active. ASTM B 813, "Liquid and Paste Fluxes for Soldering Applications of Copper and Copper-Alloy Tube," limits the corrosivity of soldering fluxes and ensures that these fluxes are flushable in cold water, which facilitates easy removal of flux residue following installation.
4. Galvanic Corrosion may be defined as the destruction of a material by electrochemical interaction between the environment and the material. Generally, it is slow but persistent in character and requires the presence of dissimilar metals. Galvanic corrosion requires the flow of an electric current between certain areas of dissimilar metal surfaces. To complete the electric circuit, there must be two electrodes, an anode and a cathode, and they must be connected by an electrolyte media (water) through which the current can pass. The amount of metal which dissolves at the anode is proportional to the number of electrons flowing, which in turn is dependent upon the potential and resistance of the two metals. The use of dissimilar metals in a plumbing system may or may not create a problem. For instance, copper and steel are perhaps the most common dissimilar metals found together in a plumbing system. In closed systems, such as a chilled or heating water piping, the use of dissimilar metals may not create a serious problem; this is because there is virtually no oxygen in the water and corrosion relations tend to be stifled. Where dissimilar metals must be used, some codes require that they should be separated by dielectric union or a similar type of fitting. The effectiveness depends upon; distance between the metals on the electromotive-force series (EMF) chart, ratio of cathode to anode area, degree of aeration, amount of agitation, temperature, presence of dissolved salts, and other factors.

ABBREVIATED EMF SERIES
(Electromotive-Force Series; Common Piping Materials in Sea Water)

CATHODE (+) Passive
- GOLD – Fixtures, Faucets, Plating
- PLATINUM
- SILVER – Brazing alloys, Silver-bearing solders
- TITANIUM – Condenser tubes
- MONEL (67% Ni - 33% Cu) – Specialty piping & equipment
- CUPRO-NICKEL – Condensers, Marine, Nuclear
- COPPER – Pressure, DWV, Gases, Air, Refrigeration, etc.
- BRASS (85/15 - Red) – Cast fittings, Valves
- BRASS (70/30 - Yellow) – Gas-cocks, Fittings, Connectors
- LEAD – Solder, Pipe, Sheet, Coating, Lining
- TIN – Solders, Coating, Lining
- CAST IRON – Pressure, DWV
- WROUGHT IRON – Pressure
- MILD STEEL – Fire Protection
- ALUMINUM – Refrigeration, Irrigation, some Solar
- GALVANIZED STEEL – Pressure, DWV
- ZINC – Coatings, Linings, some Fittings
- MAGNESIUM – Water Heater Anodes, Cathodic protection for pipelines

ANODE (-) Active; Sacrificial Material

5. Dezincification is a type of corrosion in which brass dissolves as an alloy and the copper constituent redeposits from solution onto the surface of the brass as a metal, but in the porous form. The zinc constituent may be carried away from the brass as a soluble salt, or may be deposited in place as an insoluble compound. Dezincification is normally associated with brass valves where the zinc content exceeds 15%. Generally, areas of high stress, such as valve stems and gate valve bodies, are primary targets of attack.
6. On rare occasion problems of corrosion by aggressive water, possibly aggravated by poor design or workmanship, do exist. Aggressive, hard well waters that cause pitting can be identified by chemical analysis and treated to bring their composition within acceptable limits. Typically these hard waters are found to have high total dissolved solids (t.d.s.) including sulfates and chlorides, a pH in the range of 7.2 to 7.8, a high content of carbon dioxide (CO_2) gas (over 10 parts per million, ppm), and the presence of dissolved oxygen (D.O.) gas. Soft acidic waters can cause the annoying problem of green staining of fixtures or "green water". Raising the pH of such waters to a value of about 7.2 or more usually solves the problem, but a qualified water treatment specialist should be consulted.
7. Aggressive soil conditions can be a cause for external corrosion of copper piping systems. Non-uniform soil characteristics, such as different soil aeration, resistivity, or moisture properties, between adjacent sections of tube can create galvanic corrosion cells. Soils contaminated with high concentrations of road salts or fertilizers containing ammonia, chlorides, and nitrogen are known to combine with water to form acids. Any metal pipe laid in ash or cinders is subject to attack by the acid generated when sulfur compounds combine with water to form sulfuric acid.

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Copper Tube Fittings continued

SOLDER JOINT SPECIFICATION

1. **Soldering Clearance** (between the outside of the tube and the inside diameter of the solder cup) **and the Depth of the Solder Cup** (into which the tube is inserted).

Chart 1 – Soldering Clearance and Solder Cup Depth

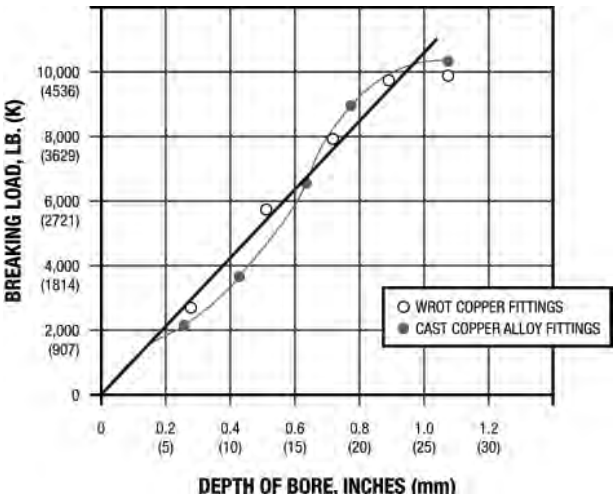
Nominal Size of Fitting (Inches)	Maximum I.D. of Fitting Inch	(mm)	Minimum O.D. of Tube Inch	(mm)	Maximum Clearance for Soldering Inch	(mm)	Depth of Solder Cup Inch	(mm)
1/4	0.381	(9.66)	0.374	(9.50)	0.007	(0.18)	0.31	(7.9)
3/8	0.506	(12.85)	0.499	(12.67)	0.007	(0.18)	0.38	(9.7)
1/2	0.631	(16.03)	0.622	(15.80)	0.009	(0.23)	0.50	(12.7)
5/8	0.756	(19.20)	0.749	(19.02)	0.007	(0.18)	0.62	(15.7)
3/4	0.881	(22.38)	0.872	(22.20)	0.009	(0.23)	0.75	(19.1)
1	1.132	(28.75)	1.123	(28.54)	0.009	(0.23)	0.91	(23.1)
1 1/4	1.382	(35.10)	1.373	(34.88)	0.009	(0.23)	0.97	(24.6)
1 1/2	1.633	(41.48)	1.623	(41.22)	0.010	(0.25)	1.09	(27.7)
2 (34.0)	2.133	(54.18)	2.123	(53.92)	0.010	(0.25)	1.34	
2 1/2 (37.3)	2.633	(66.88)	2.623	(66.62)	0.010	(0.25)	1.47	
3 (42.2)	3.133	(79.58)	3.123	(79.32)	0.010	(0.25)	1.66	
3 1/2	3.633	(92.28)	3.623	(92.02)	0.010	(0.25)	1.91	(48.5)
4	4.133	(104.98)	4.123	(104.72)	0.010	(0.25)	2.16	(54.9)
5 (67.6)	5.133	(130.38)	5.123	(130.12)	0.010	(0.25)	2.66	
6	6.133	(155.78)	6.123	(155.52)	0.010	(0.25)	3.09	(78.5)

The National Bureau of Standards Report BMS58, "Strength of Soft-Soldered Joints in Copper Tubing," reporting on tests conducted with 3/4-inch tubing and fitting, says "When the clearance is greater than 0.010 inch (0.25 mm), there is difficulty in filling the joint properly."

2. **Depth of Solder Penetration** drastically affects the breaking load of the joint. When there is too great a soldering clearance, there is no capillary flow to assure complete solder penetration. As shown in the chart below, the holding power of the 3/4-inch joint is directly proportional to the depth of solder penetration.

   For example: If you get only one-third penetration, you get approximately one-third the strength needed to assure complete satisfaction.

Chart 2 – Type K 3/4" Tubing





Solder penetration of one-third the cup depth — breaking load, approximately 2,100 lb. (955 kg)



Solder penetration of the entire cup depth — breaking load approximately 7,000 lb. (3175 kg)

HOW TO BE SURE OF PROPER TOLERANCES

It is apparent that all of the scientific apparatus used to test tube and fittings, according to the dimensions indicated in Chart 1, would be impractical to use on the job. It is therefore essential that you install tube and fittings manufactured by companies known to be dedicated to the highest quality control standards. Should you encounter a condition where there is difficulty in filling the joint properly, NIBCO will analyze the trouble without charge. Just send six inches of the tube, along with the fitting and our technicians will provide you with an authoritative report.

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BRAZING INFORMATION

Copper Water Tube Size (In Inches)	Brazing[A] Filler Required		Torch Tip Drill Size No.	For Estimating Purposes					
				Acetylene Consumption		Oxygen Pressure (Approx.)		Acetylene Pressure (Approx.)	
	Inches	(mm)		C.F.H.	(C.M.H.)	PSI	(kPa)	PSI	(kPa)
1/4	0.25[B]	(6.4)	54	15.9	(0.5)	4	(27)	4	(27)
3/8	0.38[B]	(9.7)	54	15.9	(0.5)	4	(27)	4	(27)
1/2	0.50	(12.7)	51	24.8	(0.7)	5	(34)	5	(34)
5/8	0.62	(15.7)	51	24.8	(0.7)	5	(34)	5	(34)
3/4	1.00	(25.0)	51	24.8	(0.7)	5	(34)	5	(34)
1	1.60	(41.0)	48	31.6	(0.9)	6	(41)	6	(41)
1 1/4	2.00	(51.0)	48	31.6	(0.9)	6	(41)	6	(41)
1 1/2	2.60	(66.0)	44	38.7	(1.1)	7	(48)	7	(48)
2	4.40	(112.0)	40	60.0	(1.7)	7	(48)	7	(48)
2 1/2	5.90	(150.0)	40	60.0	(1.7)	7	(48)	7	(48)
3	7.90	(200.0)	35	70.0	(2.0)	7 1/2	(52)	7 1/2	(52)
3 1/2	10.50	(207.0)	35	70.0	(2.0)	7 1/2	(52)	7 1/2	(52)
4	13.50	(343.0)	30	88.5	(2.5)	9	(62)	9	(62)
5	20.50	(521.0)	30	88.5	(2.5)	9	(62)	9	(62)
6	28.50	(724.0)	30	88.5	(2.5)	9	(62)	9	(62)

[A] Approximate consumption when brazing one cup of the fitting. Actual consumption depends on workmanship.
For filler sizes shown, one pound of filler alloy provides 1,068 inches (27.13 mm) of 1/16-inch wire or 475 inches (12,065 mm) of 3/32-inch wire.

[B] 1/16-inch (1.59 mm) diameter wire; all other is 3/32-inch (2.38 mm) diameter.

SOLDER AND FLUX REQUIREMENTS

Nom. Size Joint (In Inches)	Solder Required, LB (kg)		
	General Use	Drainage Use	
1/4	0.097	–	
3/8	0.159	–	
1/2	0.261	–	
5/8	0.389	–	
3/4	0.548	–	
1	0.856	–	
1 1/4	1.115	1.2	(0.5)
1 1/2	1.480	1.4	(0.6)
2	2.380	1.5	(0.7)
2 1/2	3.225	–	
3	4.335	2.8	(1.3)
3 1/2	5.786	–	
4	7.446	4.2	(1.9)
5	11.392	–	
6	15.815	–	
8	26.955	–	

Solder requirements in this table are based on estimate of weight of solder used to prepare 100 solder joints of sizes shown.

Two (2) ounces (0.06 kg) of solder flux will be required for each pound (0.45 kg) of solder.

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Copper Tube Fittings continued

RATED INTERNAL WORKING PRESSURES OF JOINTS MADE WITH COPPER WATER TUBE AND SOLDER TYPE FITTINGS, PSI (BAR)

Joining Material	Working Temperature °F	°C	Maximum Gauge Working Pressure for Standard Water Tube Sizes [Note (1)] 1/8" though 1" PSI	BAR	1 1/4" through 2" PSI	BAR	2 1/2" through 4" PSI	BAR	5" through 8" PSI	BAR	10" to 12" PSI	BAR	Saturated Steam LB (kg) All Sizes
Alloy Sn50 50-50 Tin-Lead solder [Notes (2), (3)]	100	38	200	(14)	175	(12)	150	(10)	135	(9)	100	(6)	15
	150	66	150	(10)	125	(9)	100	(7)	90	(6)	70	(5)	
	200	93	100	(7)	90	(6)	75	(5)	70	(5)	50	(3)	
	250	121	85	(6)	75	(5)	50	(3)	45	(3)	40	(3)	
Alloy Sb5 95-5 Tin-Antimony solder [Note (4)]	100	38	1090 [9]	(75)	850 [8]	(59)	705 [9]	(49)	660 [8]	(46)	340	(23)	15
	150	66	625 [10]	(43)	485 [10]	(34)	405 [10]	(28)	375 [10]	(26)	280	(19)	
	200	93	505 [11]	(35)	395 [10]	(27)	325 [10]	(32)	305 [10]	(21)	230	(16)	
	250	121	270	(19)	210	(15)	175	(12)	165	(11)	120	(8)	
Alloy E	100	38	710 [10]	(49)	555 [10]	(38)	460 [10]	(32)	430 [10]	(30)	320	(22)	15
	150	66	475 [11]	(33)	370 [10]	(26)	305 [10]	(21)	285 [11]	(20)	215	(15)	
	200	93	375	(26)	290	(20)	240 [11]	(17)	225 [11]	(16)	170	(12)	
	250	121	320	(22)	250	(17)	205	(14)	195	(13)	145	(9)	
Alloy HB [Note (6)]	100	38	1035 [9]	(71)	805 [8]	(56)	670 [8]	(46)	625 [9]	(43)	340	(23)	15
	150	66	710 [10]	(49)	555 [10]	(38)	460 [10]	(32)	430 [10]	(30)	320	(22)	
	200	93	440 [11]	(30)	345 [11]	(24)	285 [11]	(20)	265 [11]	(18)	200	(14)	
	250	121	430 [11]	(30)	335 [11]	(23)	275 [11]	(19)	260 [11]	(18)	195	(13)	
Joining materials at or above 593°C [Note (7)]	Pressure-temperature ratings consistent with the materials and procedures employed.												

GENERAL NOTE:

For extremely low working temperatures in the 0°F to 200°F range, it is recommended that a joint material melting at or above 1000°F be employed [see Note (5)].

NOTES:
(1) Standard water tube sizes per ASTM B 88
(2) ASTM B 32 Alloy Grade Sn50
(3) The Safe Drinking Water Act Amendment of 1986 prohibits the use of any solder having a lead content in excess of 0.2% in potable water systems.
(4) ASTM B 32 Alloy Grade Sb5
(5) ASTM B 32 Alloy Grade E
(6) ASTM B 32 Alloy Grade HB
(7) These joining materials are defined as *brazing alloys* by the American Welding Society.
(8) The solder joint exceeds the strength of Types K, L & M tube in drawn and annealed tempers.
(9) The solder joint exceeds the strength of Types L & M tube in drawn temper and Type K tube in annealed temper.
(10) The solder joint exceeds the strength of Type M tube in drawn temper and Types L & K in annealed temper.
(11) The solder joint exceeds the strength of Type L tube in annealed temper.

RATED INTERNAL WORKING PRESSURES OF JOINTS MADE WITH FLARED FITTINGS AND COPPER WATER TUBE

Nominal Size Joint (In Inches)	Temperature, °F (°C)[A]	Pressure, PSI (BAR)[A]
3/8, 1/2, 3/4, 1, 1 1/4, 1 1/2, 2	100 (38)	175 (12)

[A] ASME B16.26

RATED INTERNAL WORKING PRESSURES OF POLYBUTYLENE TUBE AND COPPER BARBED INSERT FITTINGS

Nominal Size Joint (In Inches)	Temperature, °F (°C)	Pressure, PSI (BAR)
3/8, 1/2, 3/4, 1	73 (23)	200 (14)
	140 (60)	160 (11)
	180 (82)	100 (7)
	200 (93)	80 (5)

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RATED INTERNAL WORKING PRESSURE[1] FOR COPPER FITTINGS, PSI (BAR)

Nominal Water Tube Size (In Inches)	Water Temperature Range						
	-20° to 100°F (-29° to 38°C)	150°F (66°C)	200°F (95°C)	250°F (120°C)	300°F (149°C)	350°F (177°C)	400°F (204°C)
1/4	912 (62)	775 (53)	729 (50)	729 (50)	714 (49)	608 (42)	456 (31)
3/8	779 (54)	662 (46)	623 (43)	623 (43)	610 (42)	519 (36)	389 (27)
1/2	722 (50)	613 (42)	577 (40)	577 (40)	565 (39)	481 (33)	361 (25)
5/8	631 (43)	537 (37)	505 (35)	505 (35)	495 (34)	421 (29)	316 (21)
3/4	582 (40)	495 (34)	466 (32)	466 (32)	456 (31)	388 (27)	291 (20)
1	494 (34)	420 (29)	395 (27)	395 (27)	387 (26)	330 (23)	247 (17)
1 1/4	439 (30)	373 (26)	351 (24)	351 (24)	344 (23)	293 (20)	219 (15)
1 1/2	408 (28)	347 (24)	327 (23)	327 (23)	320 (22)	272 (19)	204 (14)
2	364 (25)	309 (21)	291 (20)	291 (20)	285 (20)	242 (17)	182 (13)
2 1/2	336 (23)	285 (20)	269 (19)	269 (19)	263 (18)	224 (15)	168 (12)
3	317 (22)	270 (19)	254 (17)	254 (17)	248 (17)	211 (15)	159 (11)
3 1/2	304 (21)	258 (18)	243 (17)	243 (17)	238 (16)	202 (14)	152 (10)
4	293 (20)	249 (17)	235 (16)	235 (16)	230 (16)	196 (13)	147 (10)
5	269 (19)	229 (16)	215 (15)	215 (15)	211 (15)	179 (12)	135 (9)
6	251 (17)	213 (15)	201 (14)	201 (14)	196 (14)	167 (12)	125 (8)
8	270 (19)	230 (16)	216 (15)	216 (15)	212 (15)	180 (12)	135 (9)

[1] The fitting pressure rating applies to the largest opening of the fitting.

RATED INTERNAL WORKING PRESSURES OF CAST COPPER ALLOY FLANGES AND FLANGED FITTINGS

Nominal Size Joint (In Inches)	Temperature °F (°C) [A]	Pressure (PSI)		
		Class 125 [A, B]	Class 150 [B]	Class 150 [A, C]
1/2, 3/4, 1, 1 1/4, 1 1/2, 2, 2 1/2, 3, 4, 5, 6, 8 (also 10" for Class 125)	0 – 150 (0 – 66)	105 (7)	210 (14)	225 (15)
	175 (79)	100 (7)	205 (14)	220 (15)
	200 (93)	95 (7)	195 (13)	210 (15)
	225 (107)	90 (6)	190 (13)	205 (14)
	250 (121)	90 (6)	180 (12)	195 (13)
	275 (135)	85 (6)	175 (12)	190 (13)
	300 (149)	85 (6)	170 (12)	180 (12)
	350 (177)	75 (5)	150 (10)	165 (11)
	406 (208)	70 (5)	140 (9)	150 (10)

[A] MSS SP-106

[B] ASTM B584, UNS C83800 and UNS C84400

[C] ASTM B62, UNS C83600 and ASTM B584, UNS C83600

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Copper Fittings Dimensional Data

The mechanics of making both the solder joint and the brazing joint are comparatively similar. Complete instructions on proper techniques of both of these joining methods are outlined in this catalog on pages 46-48.

A very important consideration in Copper Piping is the selection of the proper bonding medium. As a general rule, the working temperature of the installation is a more important consideration than the working pressures. If the working temperature is not over 250°F (121°C), either 50-50%* or 95-5% solder can be used successfully. However, if the temperature exceeds 250°F (121°C), a low temperature brazing alloy should be used, with a melting temperature somewhat in excess of 1000°F (538°C).

According to BMS report No. 58, joints made with tin or tin-alloy solders should not be subject continuously to temperatures above 250°F (121°C). A number of brazing alloys are available and a careful study should be made in every case to determine the proper alloy for the particular application.

*The Safe Drinking Water Act Amendment of 1986 prohibits the use in potable water systems of any solder having a lead content in excess of 0.2%.

DIMENSIONAL DATA – SOLDER JOINT FITTING ENDS

Nominal Water Tube Size (In Inches)	Solder Joint Fittings – Tolerances								Solder Joint Fittings Copper Alloy – Pressure [1, 2]				Solder Joint Fittings Copper Alloy – Drainage [3, 4]			
	Male End (Fitting Connector) Diameter				Female End (Solder Cup) Diameter				Fitting End Length Min.		Solder Cup Length Min.		Fitting End Length Min.		Solder Cup Length Min.	
	Min.		Max.		Min.		Max.									
	Inch	(mm)	Inch	(mm)	Inch	(mm)	Inch	(mm)	Inch	(mm)	Inch	(mm)	Inch	(mm)	Inch	(mm)
1/8	0.248	(6.30)	0.251	(6.38)	0.252	(6.40)	0.256	(6.50)	0.31	(7.9)	0.25	(6.4)	N/A	N/A	N/A	N/A
1/4	0.373	(9.47)	0.376	(9.55)	0.377	(9.58)	0.381	(9.68)	0.38	(9.7)	0.31	(7.9)	N/A	N/A	N/A	N/A
3/8	0.497	(12.62)	0.501	(12.73)	0.502	(12.75)	0.506	(12.85)	0.44	(11.2)	0.38	(9.7)	N/A	N/A	N/A	N/A
1/2	0.622	(15.80)	0.626	(15.90)	0.627	(15.93)	0.631	(16.03)	0.56	(14.2)	0.50	(12.7)	N/A	N/A	N/A	N/A
5/8	0.747	(18.97)	0.751	(19.08)	0.752	(19.10)	0.756	(19.20)	0.69	(17.5)	0.62	(15.7)	N/A	N/A	N/A	N/A
3/4	0.872	(22.15)	0.876	(22.25)	0.877	(22.28)	0.881	(22.38)	0.81	(20.6)	0.75	(19.1)	N/A	N/A	N/A	N/A
1	1.122	(28.50)	1.127	(28.63)	1.128	(28.65)	1.132	(28.75)	0.97	(24.6)	0.91	(23.1)	N/A	N/A	N/A	N/A
1 1/4	1.372	(34.85)	1.377	(34.98)	1.378	(35.00)	1.382	(35.10)	1.03	(26.2)	0.97	(24.6)	0.56	(14.2)	0.50	(12.7)
1 1/2	1.621	(41.17)	1.627	(41.33)	1.628	(41.35)	1.633	(41.48)	1.16	(29.5)	1.09	(27.7)	0.62	(15.7)	0.56	(14.2)
2	2.121	(53.87)	2.127	(54.03)	2.128	(54.05)	2.133	(54.18)	1.41	(35.8)	1.34	(34.0)	0.69	(17.5)	0.62	(15.7)
2 1/2	2.621	(66.57)	2.627	(66.73)	2.628	(66.75)	2.633	(66.88)	1.53	(38.9)	1.47	(37.3)	N/A	N/A	N/A	N/A
3	3.121	(79.27)	3.127	(79.43)	3.128	(79.45)	3.133	(79.58)	1.72	(43.7)	1.66	(42.2)	0.81	(20.6)	0.75	(19.1)
3 1/2	3.621	(91.97)	3.627	(92.13)	3.628	(92.15)	3.633	(92.28)	1.97	(50.0)	1.91	(48.5)	N/A	N/A	N/A	N/A
4	4.121	(104.67)	4.127	(104.83)	4.128	(104.85)	4.133	(104.98)	2.22	(56.4)	2.16	(54.9)	1.06	(26.9)	1.00	(25.4)
5	5.121	(130.07)	5.127	(130.23)	5.128	(130.25)	5.133	(130.38)	2.72	(69.1)	2.66	(67.6)	1.31	(33.3)	1.25	(31.8)
6	6.121	(155.47)	6.127	(155.63)	6.128	(155.65)	3.133	(79.58)	3.22	(81.8)	3.09	(78.5)	1.62	(41.1)	1.50	(38.1)
8	8.119	(206.22)	8.127	(206.43)	8.128	(206.45)	8.133	(206.58)	4.09	(103.9)	3.97	(100.8)	2.12	(53.8)	2.00	(50.8)
10	10.119	(257.02)	10.127	(257.23)	10.128	(257.25)	10.133	(257.38)	4.12	(104.6)	4.00	(101.6)	N/A	N/A	N/A	N/A
12	12.119	(307.82)	12.127	(308.03)	12.128	(308.05)	12.133	(308.18)	4.62	(117.3)	4.50	(114.3)	N/A	N/A	N/A	N/A

[1] As shown Standard ASME B16.18
[2] As shown Standard ASME B16.22
[3] As shown Standard ASME B16.23
[4] As shown Standard ASME B16.29

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DIMENSIONAL DATA – BRAZING FITTING ENDS

Nominal Water Tube Size (In Inches)	Male End (Fitting Connector) Diameter				Female End (Brazing Cup) Diameter				Fitting End Length Min.		Solder Cup Length Min.	
	Min.		Max.		Min.		Max.					
	Inch	(mm)	Inch	(mm)	Inch	(mm)	Inch	(mm)	Inch	(mm)	Inch	(mm)
1/4	0.373	(9.47)	0.376	(9.55)	0.377	(9.58)	0.381	(9.68)	0.23	(5.8)	0.17	(4.3)
3/8	0.497	(12.62)	0.501	(12.73)	0.502	(12.75)	0.506	(12.85)	0.26	(6.6)	0.20	(5.1)
1/2	0.622	(15.80)	0.626	(15.90)	0.627	(15.93)	0.631	(16.03)	0.28	(7.1)	0.22	(5.6)
5/8	0.747	(18.97)	0.751	(19.08)	0.752	(19.10)	0.756	(19.20)	N/A	N/A	N/A	N/A
3/4	0.872	(22.15)	0.876	(22.25)	0.877	(22.28)	0.881	(22.38)	0.31	(7.9)	0.25	(6.4)
1	1.122	(28.50)	1.127	(28.63)	1.128	(28.65)	1.132	(28.75)	0.34	(8.6)	0.28	(7.1)
1 1/4	1.372	(34.85)	1.377	(34.98)	1.378	(35.00)	1.382	(35.10)	0.37	(9.4)	0.31	(7.9)
1 1/2	1.621	(41.17)	1.627	(41.33)	1.628	(41.35)	1.633	(41.48)	0.40	(10.2)	0.34	(8.6)
2	2.121	(53.87)	2.127	(54.03)	2.128	(54.05)	2.133	(54.18)	0.47	(11.9)	0.40	(10.2)
2 1/2	2.621	(66.57)	2.627	(66.73)	2.628	(66.75)	2.633	(66.88)	0.53	(13.5)	0.47	(11.9)
3	3.121	(79.27)	3.127	(79.43)	3.128	(79.45)	3.133	(79.58)	0.59	(15.0)	0.53	(13.5)
3 1/2	3.621	(91.97)	3.627	(92.13)	3.628	(92.15)	3.633	(92.28)	0.65	(16.5)	0.59	(15.0)
4	4.121	(104.67)	4.127	(104.83)	4.128	(104.85)	4.133	(104.98)	0.72	(18.3)	0.64	(16.3)
5	5.121	(130.07)	5.127	(130.23)	5.128	(130.25)	5.133	(130.38)	0.81	(20.6)	0.73	(18.5)
6	6.121	(155.47)	6.127	(155.63)	6.128	(155.65)	3.133	(79.58)	0.94	(23.9)	0.83	(21.1)
8	8.119	(206.22)	8.127	(206.43)	8.128	(206.45)	8.133	(206.58)	1.28	(32.5)	1.17	(29.7)
10	10.119	(257.02)	10.127	(257.23)	10.128	(257.25)	10.133	(257.38)	N/A	N/A	N/A	N/A
12	12.119	(307.82)	12.127	(308.03)	12.128	(308.05)	12.133	(308.18)	N/A	N/A	N/A	N/A

[1] In accordance with MS SP-73

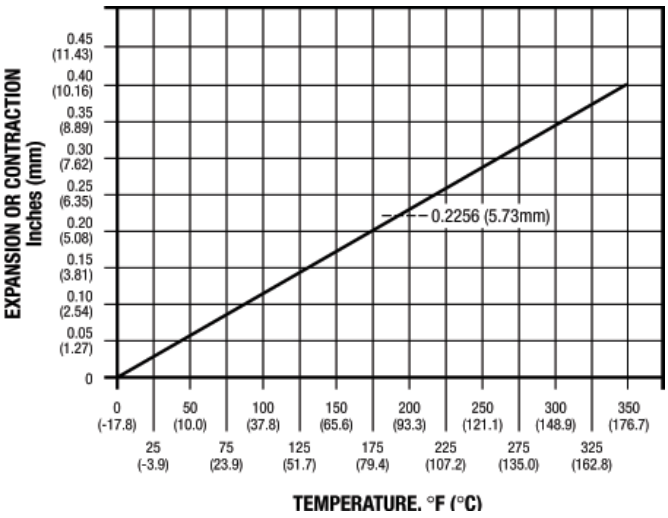
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EXPANSION AND CONTRACTION

In the majority of low-pressure heating systems employing copper tube and installed in small houses or private dwellings, provision for expansion and contraction is relatively simple. Mains, risers, and branches to radiators should be free or floating at one end of the line. Holes should be large enough to permit free movement of the tube, and care should be exercised so that pipe hangers and supports permit unrestricted movement and do not anchor the tube. Wrought copper tube hangers that are both practicable and neat in appearance are available.

Unusually long runs of copper tubing should be provided with an expansion bend or loop. By bending soft temper copper tube, a simple form of expansion loop can be made. With the addition of combination flared-tube to solder joint fittings, as illustrated in Figure 1, these types of loops can be used when space or other limitations exist. The correct proportions of such expansion loop to meet various conditions are shown in the accompanying table.



The above chart is calculated using 10ft (3.05m) of copper tubing as the reference point. You may use it as follows: 100ft (30.5m) of copper tube, with a 200°F (93.3°C) temperature change. Reference point .2256 inches for 10ft, (5.73mm for 3.05m), multipy by 10 for 100ft (30.5m), resulting in an answer of 2.256 inches (57.3mm) of expansion or contraction.

NOTE: Calculations for expansion and contraction should be based on the average coefficient of expansion of copper which is 0.0000094 per °F (0.00001692 per °C) between 77°F and 212°F (25°C and 100°C). For example, the expansion for each 10ft (3.05m) of any size of tube heated from room temperature of 70°F (21.1°C) to 170°F (76.7°C), that is, 100°F (55.6°C) rise, is:

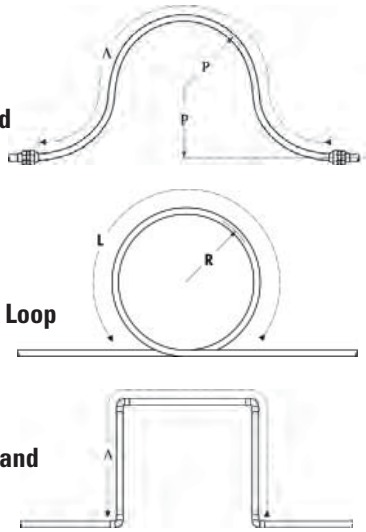
Rise						Coefficient		
100°F (55.6°C)	x	10ft (3.05m)	x	12 inches (1000mm)	x	0.000094 (0.00001692)	=	0.1128 in. (2.87mm)

FIGURE 1

a. U-Bend

b. Coiled Loop

c. Offset and Return



RADII OF COILED EXPANSION LOOPS AND DEVELOPED LENGTHS OF EXPANSION OFFSETS

Nominal Tube Size	Expected Expansion																			
	1/2		1		1 1/2		2		2 1/2		3		3 1/2		4					
	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L				
	Inch (mm)	Inch (mm)	Inch (mm)	Inch (mm)	Inch (mm)	Inch (mm)	Inch (mm)	Inch (mm)	Inch (mm)	Inch (mm)	Inch (mm)	Inch (mm)	Inch (mm)	Inch (mm)	Inch (mm)	Inch (mm)					
1/4	6 (152.4)	38 (965.2)	9 (228.6)	54 (1371.6)	11 (279.4)	66 (1676.4)	12 (304.8)	77 (1955.8)	14 (355.6)	86 (2184.4)	15 (381.0)	94 (2387.6)	16 (406.4)	102 (2590.8)	17 (431.8)	109 (2768.6)				
3/8	7 (177.8)	44 (1117.6)	10 (254.0)	63 (1600.2)	12 (304.8)	77 (1955.8)	14 (355.6)	89 (2260.6)	16 (406.4)	99 (2514.6)	17 (431.8)	109 (2768.6)	19 (482.6)	117 (2971.8)	20 (508.0)	126 (3200.4)				
1/2	8 (203.2)	50 (1270.0)	11 (279.4)	70 (1778.0)	14 (355.6)	89 (2260.6)	16 (406.4)	99 (2514.6)	18 (457.2)	111 (2819.4)	19 (482.6)	122 (3098.8)	21 (533.4)	131 (3327.4)	22 (558.8)	140 (3556.0)				
3/4	9 (228.6)	59 (1498.6)	13 (330.2)	83 (2108.2)	16 (406.4)	101 (2565.4)	19 (482.6)	117 (2971.8)	21 (533.4)	131 (3327.4)	23 (584.2)	143 (3632.2)	25 (635.0)	155 (3937.0)	26 (660.4)	166 (4216.4)				
1	11 (279.4)	67 (1701.8)	15 (381.0)	94 (2387.6)	18 (457.2)	115 (2921.0)	21 (533.4)	133 (3378.2)	24 (609.6)	149 (3784.6)	26 (660.4)	163 (4140.2)	28 (711.2)	176 (4470.4)	30 (762.0)	188 (4775.2)				
1 1/2	13 (330.2)	80 (2032.0)	18 (457.2)	113 (2870.2)	22 (558.8)	138 (3505.2)	25 (635.0)	160 (4064.0)	29 (736.6)	179 (4546.6)	31 (787.4)	196 (4978.4)	34 (863.6)	212 (5384.8)	36 (914.4)	226 (5740.4)				
2	15 (381.0)	91 (2311.4)	21 (533.4)	129 (3276.6)	25 (635.0)	158 (4013.2)	29 (736.6)	183 (4648.2)	33 (838.2)	205 (5207.0)	36 (914.4)	224 (5689.6)	39 (990.6)	242 (6146.8)	41 (1041.4)	259 (6578.6)				
2 1/2	16 (406.4)	102 (2590.8)	23 (584.2)	144 (3657.6)	28 (711.2)	176 (4470.4)	32 (812.8)	203 (5156.2)	36 (914.4)	227 (5765.8)	40 (1016.0)	249 (6324.6)	43 (1092.2)	269 (6832.6)	46 (1168.4)	288 (7315.2)				
3	18 (457.2)	111 (2819.4)	25 (635.0)	157 (3987.8)	30 (762.0)	191 (4851.4)	35 (889.0)	222 (5638.8)	40 (1016.0)	248 (6299.2)	43 (1092.2)	272 (6908.8)	47 (1193.8)	293 (7442.2)	50 (1270.0)	314 (7975.6)				
3 1/2	19 (482.6)	120 (3048.0)	27 (685.8)	169 (4292.6)	33 (838.2)	206 (5232.4)	38 (965.2)	239 (6070.6)	43 (1092.2)	267 (6781.8)	47 (1193.8)	293 (7442.2)	50 (1270.0)	316 (8026.4)	54 (1371.6)	338 (8585.2)				
4	20 (508.0)	128 (3251.2)	29 (736.6)	180 (4572.0)	35 (889.0)	220 (5588.0)	41 (1041.4)	255 (6477.0)	45 (1143.0)	285 (7239.0)	50 (1270.0)	312 (7924.8)	54 (1371.6)	337 (8559.8)	57 (1447.8)	361 (9169.4)				
5	23 (584.2)	142 (3606.8)	32 (812.8)	201 (5105.4)	39 (990.6)	245 (6223.0)	45 (1143.0)	284 (7213.6)	51 (1295.4)	318 (8077.2)	55 (1397.0)	348 (8839.2)	60 (1524.0)	376 (9550.4)	64 (1625.6)	402(10210.8)				

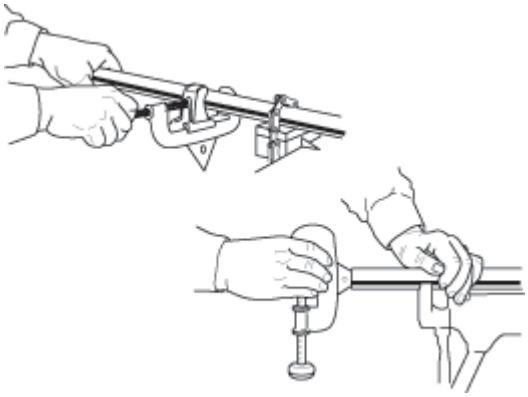
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The Fine Art of Soldering

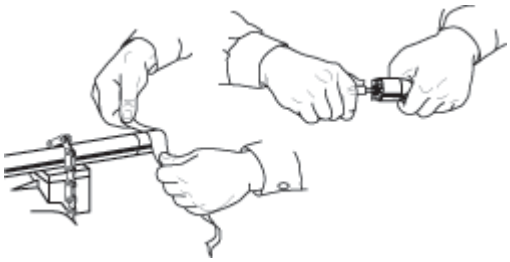
When adjoining surfaces of copper and copper alloys meet under proper conditions of cleanliness and temperature, solder will make a perfect adhesion. The strength of joint is equal to or even greater than the strength of tube alone. Surface tension seals the joint. Capillary attraction draws solder into, around, and all about the joint. It's easy to learn to make a perfect solder joint when you use NIBCO® Fittings.

WITH 95-5 SOLDER AND INTERMEDIATELY CORROSIVE FLUX

1. Cut tube end square, ream, burr and size.



2. Use sand cloth or steel wire brush to clean tube and cup to a bright metal finish.



3. Apply solder flux to outside of tube and inside of cup of fitting carefully so that surfaces to be joined are completely covered. **Use flux sparingly.**



4. Apply flame to the fitting to heat tube and solder cup of fitting until solder melts when placed at joint of tube and fitting.



5. Remove flame and feed solder into the joint at one or two points until a ring of solder appears at the end of the fitting. The correct amount of solder is approximately equal to $1\frac{1}{2}$ the diameter of the fitting… $\frac{3}{4}$" (20mm) solder for $\frac{1}{2}$" fitting, etc.



6. Remove excess solder with a small brush or wiping cloth while the solder is plastic.



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The Fine Art of Brazing

Best results will be obtained by a skilled operator employing the step-by-step brazing technique that follows:

1. The tube should be cut to desired length with a square cut, preferably in a square-end sawing vise. The cutting wheel of the type specifically designed for cutting copper tube will also do a satisfactory job. The tube should be the exact length needed, so that the tube will enter the cup of the fitting all the way to the shoulder of the cup. Remove all slivers and burrs left from cutting the tube, by reaming and filing, both inside and outside.

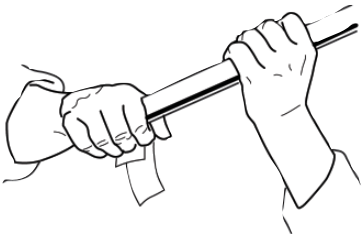
2. To make a proper brazing joint, the clearance between the solder cup and the tube should be approximately 0.001" to 0.010" (0.0254mm to 0.254mm). Maintaining a good fit on parts to be brazed insures:

   Ease of Application — Excessively wide tolerances tend to break capillary force; and, as a result the alloy will either fail to flow throughout the joint or may flush out of the joint.

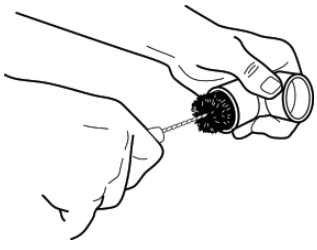
   Corrosion Resistance — There is also a direct relation between the corrosion resistance of a joint and the clearance between members.

   Economy — If brazing alloys are to be used economically, they, of necessity, must be applied in the joint proper and in minimum quantities, using merely enough alloy to fill the area between the members.

3. The surfaces to be joined must be clean and free from oil, grease and heavy oxides. The end of the tube need be cleaned only for a distance slightly more than it is to enter the cup. Special wire brushes designed to clean tube ends may be used, but they should be carefully used so that an excessive amount of metal will not be removed from the tube. Fine sand cloth or emery cloth may also be used with the same precautions. The cleaning should not be done with steel wool, because of the likelihood of leaving small slivers of the steel or oil in the joint.



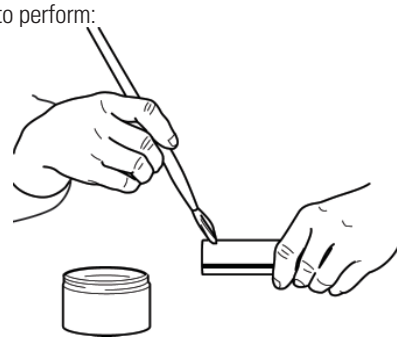
4. The cup of the fitting should be cleaned by methods similar to those used for the tube end, and care should be observed in removing residues of the cleaning medium. Attempting to braze a contaminated or an improperly cleaned surface will result in an unsatisfactory joint. Brazing alloys will not flow over or bond to oxides; and oily or greasy surfaces tend to repel fluxes, leaving bare spots which will oxidize, resulting in voids and inclusions.



5. Flux should be applied to the tube and solder cup sparingly and in a fairly thin consistency. Avoid flux on areas not cleaned. Particularly avoid getting excess flux into the inside of the tube itself. Flux has three principal functions to perform:

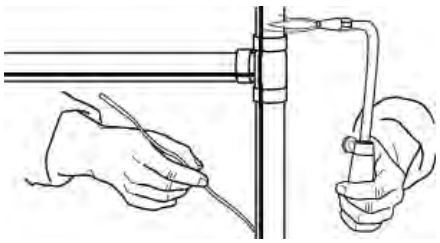
   A. It prevents the oxidation of the metal surfaces during the heating operation by excluding oxygen.

   B. It absorbs and dissolves residual oxides that are on the surface and those oxides which may form during the heating operation.



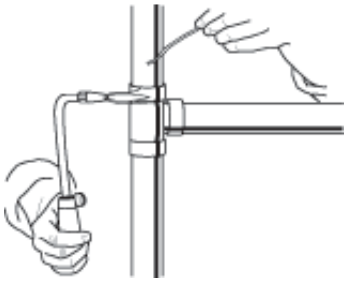
   C. It assists in the flow of the alloy by presenting a clean nascent surface for the melted alloy to flow over. In addition, it is an excellent temperature indicator, especially if an indicating flux is used.

6. Immediately after fluxing, the parts to be brazed should be assembled. If fluxed parts are allowed to stand, the water in the flux will evaporate, and dried flux is liable to flake off, exposing the metal surfaces to oxidation from the heat. Assemble the joint by inserting the tube into the cup, hard against the stop. The assembly should be firmly supported so that it will remain in alignment during the brazing operation.



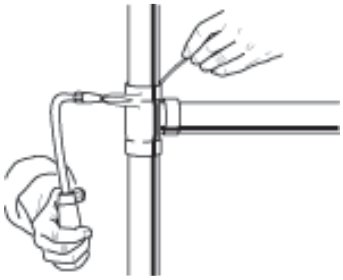
7. Brazing is started by applying heat to the parts to be joined. The preferred method is by the oxyacetylene flame. Propane and other gases are sometimes used on smaller sizes. A slightly reducing flame should be used, with a slight feather on the inner blue cone; the outer portion of the flame, pale green. Heat the tube first, beginning at about one inch from the edge of the fitting. Sweep the flames around the tube in short strokes up and down at right angles to the run of the tube. It is very important that the flame be in continuous motion and should not be allowed to remain on any one point to avoid burning through the tube. Generally, the flux may be used as a guide as to how long to heat the tube, continuing heating after the flux starts to bubble or work, and until the flux becomes quiet and transparent, like clear water. The flux will pass through four stages:
   A. At 212°F (100°C) the water boils off.
   B. At 600°F (315.6°C) the flux becomes white and slightly puffy and starts to work.
   C. At 800°F (426.7°C) it lays against the surface and has a milky appearance.
   D. At 1100°F (593.3°C) it is completely clear and active and has the appearance of water.

8. Now switch the flame to the fitting at the base of the cup. Heat uniformly, sweeping the flame from the fitting to the tube until the flux on the fitting becomes quiet. Avoid excessive heating of cast fittings.

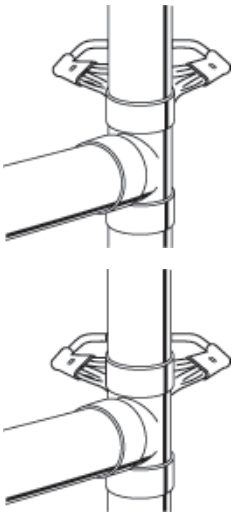


9. When the flux appears liquid and transparent on both the tube and the fitting, start sweeping the flame back and forth along the axis of the joint to maintain heat on the parts to be joined, especially toward the base of the cup of the fitting. The flame must be kept moving to avoid burning the tube or the fitting.

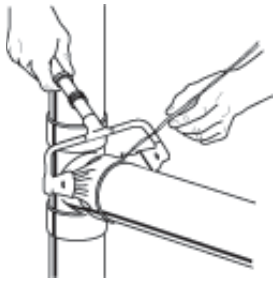
10. Apply the brazing wire or rod at a point where the tube enters the socket of the fitting. The temperature of the joint should be hot enough to melt the brazing alloy. Keep the flame away from the rod or wire as it is fed into the joint. Keep both the fitting and the tube heated by moving the flame back and forth from one to the other as the alloy is drawn into the joint. When the proper temperature is reached, the alloy will flow readily into the space between the tube outer wall and the fitting socket, drawn in by the natural force of capillary attraction. When the joint is filled, a continuous fillet of brazing alloy will be visible completely around the joint. Stop feeding as soon as the joint is filled.



NOTE: For tubing one inch and larger, it is difficult to bring the whole joint up to heat at one time. It frequently will be found desirable to use a double-tip torch to maintain the proper temperature over the larger area. A mild pre-heating of the whole fitting is recommended. The heating then can proceed as in steps 7, 8, 9, and 10. If difficulty is encountered in getting the whole joint up to heat at one time, then when the joint is nearly up to the desired temperature the alloy is concentrated in a limited area. At the brazing temperature the alloy is fed into the joint and the torch is then moved to an adjacent area and the operation carried on progressively all around the joint.



HORIZONTAL JOINTS — When making horizontal joints, it is preferable to start applying the brazing alloy at the 5 o'clock position, then move around to the 7 o'clock position and then move up the sides to the top of the joint, making sure that the operations overlap.



VERTICAL JOINTS — On vertical joints, it is immaterial where the start is made. If the opening of the cup is pointed down, care should be taken to avoid overheating the tube, as this may cause the alloy to run down the tube. If this condition is encountered, take the heat away and allow the alloy to set. Then reheat the solder cup of the fitting to draw up the alloy.

After the brazing alloy has set, remove residual flux from the joint area as it is corrosive and presents an unclean appearance and condition. Hot water or steam and a soft cloth should be used. Wrot fittings may be chilled; however it is advisable to allow cast fittings to cool naturally to some extent before applying a swab. All flux must be removed before inspection and pressure testing.



TROUBLE SPOTS

If the alloy fails to flow or has a tendency to ball up, it indicates oxidation on the metal surfaces, or insufficient heat on the parts to be joined. If work starts to oxidize during heating, it indicates too little flux, or a flux of too thin consistency. If the brazing alloy refuses to enter the joint and tends to flow over the outside of either member of the joint, it indicates this member is overheated, or the other is underheated, or both. In both cases, operations should be stopped and the joints disassembled, recleaned and fluxed.

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Frequently Asked Questions

Q: What is the pressure rating of a given fitting?

A: Fittings are rated per Table 1 of ASME B16.22. The system rated pressure shall be the lowest of the fitting, tube or joint.

Q: When copper fails in a system, what is the problem?

A: MOST COMMON:

1. Velocity – fluid is moving too fast. Recommendation: 2-3 fps (0.0508-0.0762 m/s) hot water 140°F, 5-8 fps (0.127-0.2032 m/s) cold water.
2. Turbulence – burrs left on the cut tubing causes a tumbling effect causing localized erosion and eventual failure.
3. Aggressive Waters – tend to cause pitting or green staining of fixtures. Aggressive, hard well waters that cause pitting typically are found to have total dissolved solids including suflates and chlorides, a pH in the range of 7.2 to 7.8, a high content of carbon dioxide gas and the pressence of dissolved oxygen gas. Soft acidic waters that cause green staining typically tend to be more corrosive. Low alkalinity, low mineralization, pH levels lower than 8 should be avoided.

LESS COMMON:

1. Flux Corrosion – using too much flux when making joints can potentially leave residue and cause isolated corrosion. Flux should be used sparingly and system adequately flushed.
2. Electrolysis – stray (D.C.) current; inadequate grounding for the piping.
3. Sand or other solid particulates – erosion/corrosion problems can occur. Lower velocities must be maintained if solids are present in flow media.
4. Galvanic Corrosion – destruction of a material by electrochemical interaction between the environment and the material.

Q: Copper tubing wall thickness is designated "K," "L" or "M." What are the copper fittings applicable to?

A: Copper fittings' wall thickness is determined by standards (ASME B16.22 and MSS SP-104). These standards address minimum wall thickness (per size) for the full range of copper fittings and are not intended to match tubing wall thicknesses.

Q: Can dissimilar metals (i.e., copper and iron) be joined together without use of dielectric insulators to prevent corrosion?

A: In most situations dissimilar metals (copper/iron/steel) can be joined successfully without using dielectric insulators. Factors to consider:

1. The composition of the two metals.
2. The rate of liquid flow past the two metals.
3. Chemicals in the water which could enhance or destroy protective films.
4. The relative areas of the two metals - unless the surface area of the less noble (steel) material is less that 5% of the more noble (copper) material, the need for a dielectric separator is not needed. (Failures due to galvanic corrosion are very unusual and only occur under very strict conditions.)
5. Local code requirements.

Q: What should the installer of copper unions know and do in order to assure a proper leak-free installation?

A. The following should be done:

1. Make sure the ground-joint(mating area of unionís tail and thread pieces) are free of nicks and scratches.
2. Spray the ground-joint area with a food grade silicone spray or apply bees wax to enhance seating.
3. Make sure alignment of line does not put lateral stress on the ground-joint seal.
4. Make sure that excess solder (droplets) do not reach the ground-joint area.

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CATALOG C-NPS-1011

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NIBCO® Press System®

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ISO 9001 BUREAU VERITAS Certification

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NIBCO pressystem®
EXPERIENCE THE CONNECTION™

Meeting your pressing needs...

Quick and Easy

The NIBCO® Press System® is user friendly, quick and easy to install. Installation can be completed in less time than traditional solder, threaded, brazed or grooved copper systems. Significant time savings means tight budgets and deadlines are met while project delays and cost overruns are avoided.

Full System Product Offering

The NIBCO® Press System® is more than just 1/2" to 4" fittings. Our offering also includes the industry's widest and most specified range of ball, gate, globe, angle, check and butterfly valves in addition to a full line of NIBCO® tools necessary to complete a total system installation.

Flameless

The NIBCO® Press System® is easier and safer to use because there is no flame, solder or flux required. Connections can even be made on a wet tube!

Reliable

With the NIBCO® Press System®, a watertight joint is formed between the EPDM seal and the crimped fitting or valve providing a permanent connection. Reliability you can count on ... NIBCO® Press Fittings are backed by a 107-year-old company and a 50-year written guarantee.

Approvals, Standards and Performance

The NIBCO® Press System® has undergone extensive and rigorous internal and external testing and meets various worldwide, industry and governmental standards and codes, including NSF-61, CSA and UPC. All valves and fittings are manufactured under a Quality Management System conforming to the current version of ISO-9001 standards. For a complete listing of testing criteria and results or certifications and approvals please contact NIBCO Technical Services or visit www.nibco.com.

Applications

The NIBCO® Press System® can be used in new construction or repair work and is designed for potable water, HVAC and process water systems for commercial, industrial and residential applications.

Professional Appearance

The NIBCO® Press System® creates a clean joint without the mess of excess solder or discoloration.

Joint Integrity

The NIBCO® Press System® uses engineered tools, jaws and chains that are tested and approved to ensure a consistent, reliable crimp.

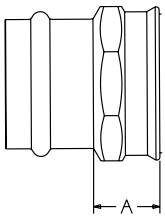
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Fittings

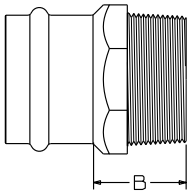


ADAPTERS

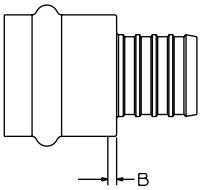
PC603
Adapter P x F – Brass Rod (*Wrot)

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1/2	.102	13/16
*1/2 x 3/8	.103	1 3/32
1/2 x 3/4	.151	31/32
3/4	.173	27/32
3/4 x 1/2	.153	25/32
1	.237	15/16
*1 x 1/2	.398	1 3/4
1 x 3/4	.217	13/16
*1 x 1 1/4	.436	2 1/4
1 1/4	.377	1 1/16
1 1/4 x 1	.302	15/16
*1 1/4 x 1 1/2	.602	2 11/32
1 1/2	.518	1 1/16
*1 1/2 x 3/4	.335	2 1/8
1 1/2 x 1 1/4	.648	1 1/16
2	.714	1
*2 1/2	1.342	1 13/32
*3	1.884	1 23/32
*4	3.238	1 7/8

PC604
Adapter P x M – Brass Rod (*Wrot)

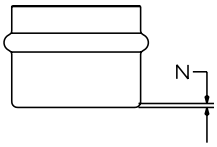
NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES
1/2	.112	7/8
*1/2 x 3/8	.107	1 5/32
1/2 x 3/4	.218	1 7/32
3/4	.207	1 1/16
3/4 x 1/2	.189	31/32
1	.268	1 3/32
1 x 3/4	.253	1 1/32
1 x 1 1/4	.518	1 21/32
1 1/4	.467	1 13/32
1 1/4 x 1	.408	1 15/32
1 1/4 x 1 1/2	.630	1 11/16
1 1/2	.696	1 1/2
1 1/2 x 1 1/4	.670	1 17/32
2	.927	1 7/16
*2 1/2	1.322	1 27/32
*3	2.104	2 1/8
*4	3.298	2 9/32

PC604-P
Adapter PEX x P – Wrot

NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES
1/2 x 1/2	.061	7/64
1/2 x 3/4	.111	7/32
3/4 x 1/2	.061	1/16
3/4 x 3/4	.108	9/64
1 x 1	.156	5/32

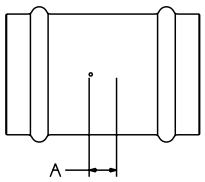
CAPS

PC617
Cap P – Wrot

NOM. SIZE	APPROX. NET WT./LBS.	DIM. N INCHES
1/2	.046	5/32
3/4	.091	5/32
1	.125	11/32
1 1/4	.171	1/8
1 1/2	.314	3/16
2	.493	3/16
2 1/2	.482	7/32
3	.792	7/32
4	1.674	1/4

COUPLINGS

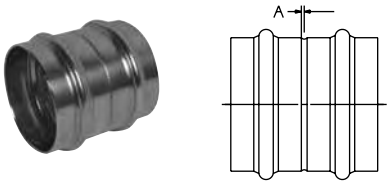
PC600-DS
Coupling P x P – Wrot

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1/2	.077	3/16
3/4	.151	5/32
1	.190	5/32
1 1/4	.250	5/32
1 1/2	.511	3/16
2	.741	3/16
2 1/2	.515	1/8
3	.979	1/8
4	1.969	7/32

NOTE: Some items not certified by NSF to NSF/ANSI 61. See manufacturer's listing for approved sizes and applications, or contact NIBCO Technical Services for a complete listing of current certifications.

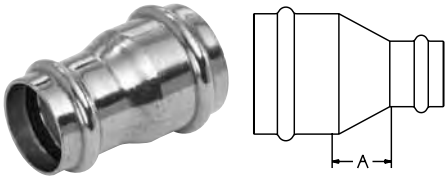
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COUPLINGS (*Cont.*)



PC600-RS
Coupling P x P – Wrot

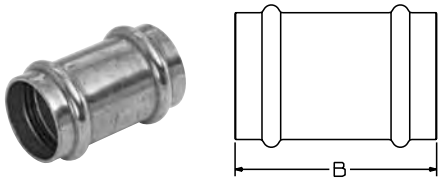
NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
2 1/2	.688	1/16
3	1.028	1/16
4	1.969	1/8



PC600-R
Reducing Coupling P x P – Wrot

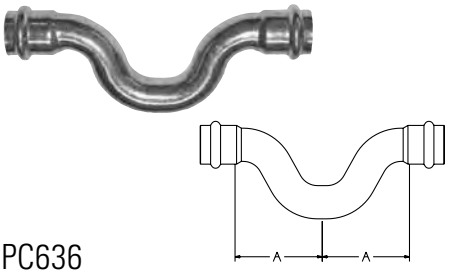
NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
3/4 x 1/2	.116	11/32
1 x 1/2	.154	11/32
1 x 3/4	.184	7/16
1 1/4 x 3/4	.232	17/32
1 1/4 x 1	.231	1/2
1 1/2 x 3/4	.362	3/8
1 1/2 x 1	.370	13/32
1 1/2 x 1 1/4	.388	5/16
2 x 3/4	.508	17/32
2 x 1	.552	11/16
2 x 1 1/4	.570	11/16
2 x 1 1/2	.662	7/16
2 1/2 x 1	.594	29/32
2 1/2 x 1 1/4	.587	13/16
2 1/2 x 1 1/2	.606	11/16
2 1/2 x 2	.608	9/16
3 x 1 1/2	.938	1 1/32
3 x 2	.940	31/32
3 x 2 1/2	.951	1/2
4 x 2	1.935	1 1/4
4 x 2 1/2	1.807	1
4 x 3	1.960	27/32

COUPLINGS (*Cont.*)



PC601 (No Stop)
Repair Coupling P x P – Wrot

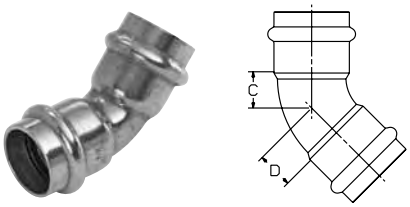
NOM. SIZE	APPROX. NET WT./LBS.	DIM. B INCHES
1/2	.077	1 3/4
3/4	.151	2 1/4
1	.190	2 1/4
1 1/4	.250	2 15/32
1 1/2	.511	3 11/32
2	.741	3 5/8
2 1/2	669	2 15/16
3	.979	3 5/16
4	1.878	4 5/16



PC636
Crossover Coupling P x P – Wrot

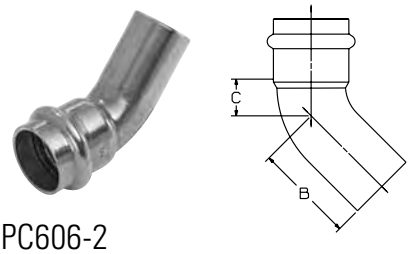
NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1/2	.402	1 25/32
3/4	.402	2 9/32

ELBOWS



PC606
45° Elbow P x P – Wrot

NOM. SIZE	APPROX. NET WT./LBS.	DIM. C INCHES	DIM. D INCHES
1/2	.092	3/8	3/8
3/4	.196	1/2	1/2
1	.251	9/16	9/16
1 1/4	.378	25/32	25/32
1 1/2	.666	7/8	7/8
2	1.218	1 3/16	1 3/16
2 1/2	1.041	29/32	29/32
3	1.536	1 1/8	1 1/8
4	3.226	1 11/16	1 11/16

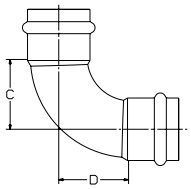


PC606-2
45° Elbow Ftg x P – Wrot

NOM. SIZE	APPROX. NET WT/LBS.	DIM. B INCHES	DIM. C INCHES
1/2	.087	1 11/32	11/32
3/4	.174	1 7/16	7/16
1	.248	1 19/32	9/16
1 1/4	.295	1 27/32	11/16
1 1/2	.673	2 3/8	7/8
2	.551	2 5/8	1 3/32
2 1/2	1.050	2 3/16	29/32
3	1.526	2 19/32	1 5/32
4	3.284	3 3/32	1 1/2

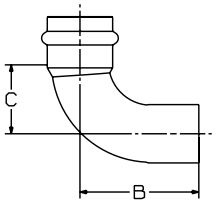
NOTE: Some items not certified by NSF to NSF/ANSI 61. See manufacturer's listing for approved sizes and applications, or contact NIBCO Technical Services for a complete listing of current certifications.

ELBOWS (*Cont.*)

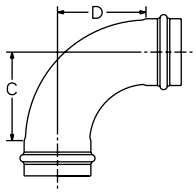
PC607
90° Elbow P x P – Wrot

NOM. SIZE	APPROX. NET WT./LBS.	DIM. C INCHES	DIM. D INCHES
1/2	.086	3/4	3/4
3/4	.200	1	1
3/4 x 1/2	.190	1 3/16	1 1/16
1	.323	1 7/16	1 7/16
1 1/4	.554	1 11/16	1 11/16
1 1/2	.863	2 7/32	2 7/32
2	1.562	2 15/16	2 15/16
2 1/2	1.364	1 27/32	1 27/32
3	1.998	2 3/32	2 3/32
4	4.060	2 25/32	2 25/32

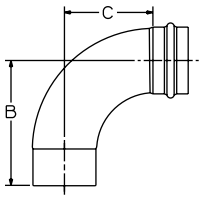
PC607-2
90° Elbow Ftg x P – Wrot

NOM. SIZE	APPROX. NET WT/LBS.	DIM. B INCHES	DIM. C INCHES
1/2	.125	1 23/32	25/32
3/4	.212	2 7/32	1 1/32
1	.319	2 1/2	1 13/32
1 1/4	.619	2 31/32	1 7/8
1 1/2	.974	3 21/32	2 1/4
2	1.469	4 15/32	2 15/16
2 1/2	1.356	3 15/32	1 29/32
3	2.065	3 13/16	2 3/32
4	3.920	4 3/4	2 25/32

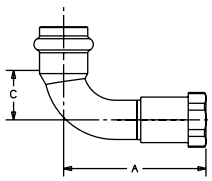
PC607-LT
90° Long Radius Elbow
P x P – Wrot

NOM. SIZE	APPROX. NET WT/LBS.	DIM. C INCHES	DIM. D INCHES
2 1/2	2.066	3 11/16	3 11/16
3	2.810	4 1/32	4 1/32
4	5.696	5 1/4	5 1/4

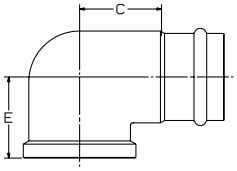
PC607-2-LT
90° Long Radius Elbow
Ftg x P - Wrot

NOM. SIZE	APPROX. NET WT/LBS.	DIM. B INCHES	DIM. C INCHES
2 1/2	2.114	5 7/32	3 11/16
3	3.037	5 3/4	4 1/32

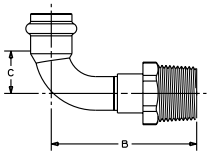
PC607-3
90° Elbow P x F - Wrot

NOM. SIZE	APPROX. NET WT/LBS.	DIM. A INCHES	DIM. C INCHES
1/2	.213	1 5/32	2 27/32
1/2 x 3/8	.148	2 1/4	25/32
1/2 x 3/4	.243	2 23/32	25/32
1	.513	3 15/32	1 13/32

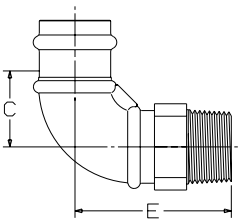
PC707-3
90° Elbow P x F – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. C INCHES	DIM. E INCHES
3/4	.374	1 5/32	1 1/16
3/4 x 1/2	.318	1 1/8	1 1/32
1 1/4	.901	1 19/32	1 19/32
1 1/2	1.327	1 19/32	1 11/16
2	1.327	2 1/4	2 5/32

PC607-4
90° Elbow P x M - Wrot

NOM. SIZE	APPROX. NET WT/LBS.	DIM. B INCHES	DIM. C INCHES
1/2 x 3/4	.245	2 11/16	25/32

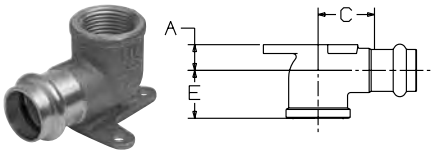
PC707-4
90° Elbow P x M – Cast

NOM. SIZE	APPROX. NET WT./LBS.	DIM. C INCHES	DIM. E INCHES
1/2	.263	1 1/8	1 23/32
3/4	.445	1 3/32	2 11/32
3/4 x 1/2	.445	15/16	1 7/8
1	.714	1 11/32	2 13/16
1 1/4	1.273	1 13/16	3 1/2
1 1/2	1.273	2 5/32	3 25/32
2	3.099	2 11/16	5 3/32

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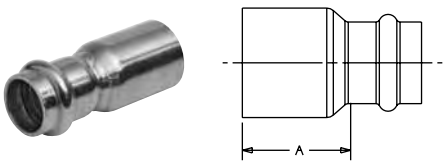
ELBOWS (*Cont.*)



PC707-3-5
90° Drop Elbow P x F – Cast

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES A	C	E
1/2	.172	17/32	7/8	27/32
3/4	.467	7/8	1 1/8	1 1/16

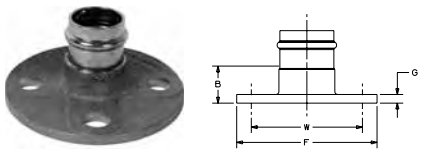
FITTING REDUCERS



PC600-2
Fitting Reducer Ftg x P – Wrot

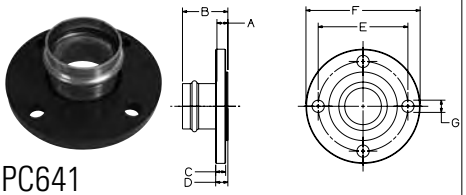
NOM. SIZE	APPROX. NET WT/LBS.	DIM. A INCHES
3/4 x 1/2	.108	1 3/8
1 x 1/2	.133	1 15/32
1 x 3/4	.167	1 13/32
1 1/4 x 3/4	.211	1 3/8
1 1/4 x 1	.247	1 17/32
1 1/2 x 1/2	.269	1 7/8
1 1/2 x 3/4	.281	1 27/32
1 1/2 x 1	.294	1 7/8
1 1/2 x 1 1/4	.311	1 3/4
2 x 1/2	.461	2 1/4
2 x 3/4	.470	2 3/16
2 x 1	.438	2 7/32
2 X 1 1/4	.459	1 15/16
2 x 1 1/2	.543	1 7/8
2 1/2 x 1	.507	2 11/32
2 1/2 x 1 1/4	.567	2 9/32
2 1/2 x 1 1/2	.594	2 13/32
2 1/2 x 2	.596	1 31/32
3 x 1 1/4	.882	3 9/32
3 x 1 1/2	.812	2 5/8
3 x 2	.814	2 9/16
3 x 2 1/2	.820	2 1/4
4 x 2	1.670	3 13/32
4 x 2 1/2	1.676	3 1/32
4 x 3	2.013	3 1/32

FLANGES



PC741
Companion Flange
P x Flange - Bronze Flange/Wrot Outlet

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES B	F	G	W
1	1.419	1 5/32	4 1/4	1/4	3 1/8
1 1/4	1.621	1 7/32	4 5/8	1/4	3 1/2
1 1/2	2.186	1 11/32	5	5/16	3 7/8
2	3.352	1 19/32	6	3/8	4 3/4



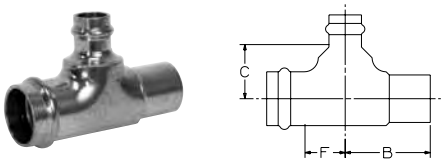
PC641
Companion Flange
P x Flange - Wrot

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES A	B	C
2 1/2	6.177	19/32	2 25/32	5/8
3	7.554	3/4	2 15/16	21/32
4	11.211	29/32	3 3/8	27/32

NOM. SIZE	DIMENSIONS INCHES D	E	F	G
2 1/2	3/4	5 1/2	7	3/4
3	13/16	6	7 1/2	3/4
4	1	7 1/2	9	3/4

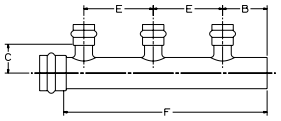
NOTE: 4" requires (8) "G" holes equally spaced.
NOTE: Mates with ANSI Class 125/150 flanges.

MANIFOLDS



PC695
1-Outlet Manifold
P x Ftg x P - Wrot

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES B	C	F
1 x 1 x 1/2	.522	1 15/16	1 1/8	15/16



PC696
3-Outlet Manifold
P x Ftg x P - Wrot

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES B	C	E	F
1 x 1 x 1/2	.700	1 21/32	3/4	1 31/32	6 3/8

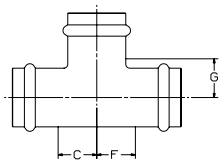
*See online catalog at www.nibco.com

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TEES

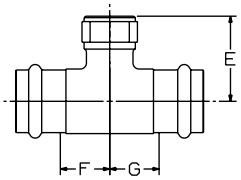




PC611
Tee P x P x P – Wrot

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES C	F	G
1/2	.182	11/16	11/16	15/32
1/2 x 1/2 x 3/4	.261	3/4	3/4	9/16
1/2 x 1/2 x 1	.491	13/16	13/16	29/32
3/4	.340	23/32	23/32	5/8
3/4 x 1/2 x 1/2	.329	23/32	13/16	11/16
3/4 x 1/2 x 3/4	.333	27/32	17/32	5/8
3/4 x 3/4 x 1/2	.339	23/32	23/32	11/16
3/4 x 3/4 x 1	.356	29/32	29/32	21/32
1	.486	7/8	7/8	29/32
1 x 1/2 x 1	.507	15/16	13/16	29/32
1 x 3/4 x 1/2	.368	11/16	29/32	3/4
1 x 3/4 x 3/4	.465	7/8	131/32	11/16
1 x 3/4 x 1	.524	15/16	1	29/32
1 x 1 x 1/2	.457	7/8	7/8	17/32
1 x 1 x 3/4	.505	27/32	27/32	11/16
1 x 1 x 1 1/4	.723	17/32	17/32	29/32
1 1/4	.714	1	1	29/32
1 1/4 x 1 x 3/4	.731	1	17/32	13/8
1 1/4 x 1 x 1	.725	31/32	17/32	15/32
1 1/4 x 1 1/4 x 1/2	.747	1	1	17/16
1 1/4 x 1 1/4 x 3/4	.734	1	1	13/8
1 1/4 x 1 1/4 x 1	.595	29/32	29/32	27/32
1 1/2	1.179	15/16	15/16	13/32
1 1/2 x 1/2 x 1 1/2	1.227	31/32	17/8	1
1 1/2 x 3/4 x 3/4	1.224	31/32	123/32	15/8
1 1/2 x 1 x 3/4	1.225	31/32	119/32	121/32
1 1/2 x 1 x 1	1.226	31/32	119/32	119/32
1 1/2 x 1 x 1 1/2	1.228	31/32	15/8	1
1 1/2 x 1 1/4 x 1	1.226	31/32	17/16	19/16
1 1/2 x 1 1/4 x 1 1/4	1.226	31/32	17/16	115/32
1 1/2 x 1 1/2 x 1/2	.845	5/8	5/8	15/32
1 1/2 x 1 1/2 x 3/4	1.070	15/16	15/16	13/16
1 1/2 x 1 1/2 x 1	.845	13/16	13/16	5/32
1 1/2 x 1 1/2 x 1 1/4	1.228	31/32	31/32	17/16
2	1.771	113/32	113/32	113/32
2 x 1/2 x 2	1.663	113/32	23/8	113/32
2 x 1 x 1	1.660	113/32	23/32	23/32
2 x 1 x 2	1.664	113/32	21/8	113/32
2 x 1 1/4 x 1 1/4	1.660	113/32	127/32	17/8
2 x 1 1/2 x 3/4	1.661	113/32	111/16	27/32
2 x 1 1/2 x 1	1.662	113/32	123/32	23/32
2 x 1 1/2 x 1 1/4	1.662	113/32	111/16	21/16
2 x 1 1/2 x 1 1/2	1.670	113/32	123/32	123/32
2 x 2 x 1/2	1.663	113/32	113/32	25/16
2 x 2 x 3/4	1.558	113/32	113/32	29/32
2 x 2 x 1	1.591	29/32	29/32	15/16
2 x 2 x 1 1/4	1.664	113/32	113/32	131/32
2 x 2 x 1 1/2	1.770	11/8	11/8	113/32
2 1/2	2.227	15/8	15/8	15/8
2 1/2 x 3/4 x 2 1/2	2.296	19/16	23/16	17/8
2 1/2 x 1 x 2 1/2	2.297	19/16	219/32	17/8
2 1/2 x 1 1/4 x 2 1/2	2.202	19/16	219/32	17/8
2 1/2 x 1 1/2 x 2 1/2	2.223	19/16	21/4	17/8
2 1/2 x 2 x 3/4	2.233	19/16	21/4	229/32
2 1/2 x 2 x 1	2.234	19/16	21/4	219/32
2 1/2 x 2 x 1 1/4	2.234	19/16	21/4	29/16
2 1/2 x 2 x 1 1/2	2.236	19/16	21/4	25/8
2 1/2 x 2 x 2	2.214	19/16	21/4	21/4
2 1/2 x 2 x 2 1/2	2.282	19/16	21/32	17/8
2 1/2 x 2 1/2 x 1/2	2.296	19/16	19/16	31/16
2 1/2 x 2 1/2 x 3/4	2.296	19/16	19/16	31/16
2 1/2 x 2 1/2 x 1	2.217	19/16	19/16	29/16
2 1/2 x 2 1/2 x 1 1/4	2.202	19/16	19/16	25/8
2 1/2 x 2 1/2 x 1 1/2	2.142	19/16	19/16	25/8
2 1/2 x 2 1/2 x 2	2.221	19/16	19/16	27/32
3	3.065	17/8	17/8	21/32
3 x 3/4 x 3	3.136	113/16	31/4	23/16
3 x 1 x 3	3.146	113/16	39/32	23/16
3 x 1 1/4 x 3	3.070	113/16	27/8	23/16
3 x 1 1/2 x 3	3.110	113/16	215/16	23/16
3 x 2 x 2	3.068	113/16	213/16	225/32
3 x 2 x 2 1/2	3.068	113/16	213/16	21/2
3 x 2 x 3	3.160	113/16	211/16	23/16
3 x 2 1/2 x 2	3.074	113/16	215/32	225/32
3 x 2 1/2 x 2 1/2	3.139	113/16	215/32	21/2
3 x 2 1/2 x 3	3.194	113/16	215/32	23/16
3 x 3 x 1/2	3.136	113/16	113/16	33/8
3 x 3 x 3/4	3.136	113/16	113/16	313/32
3 x 3 x 1	3.173	113/16	113/16	31/4
3 x 3 x 1 1/4	3.070	113/16	113/16	215/16
3 x 3 x 1 1/2	3.110	113/16	113/16	3
3 x 3 x 2	3.177	113/16	113/16	215/32
3 x 3 x 2 1/2	3.183	129/32	129/32	23/8
4	7.436	213/32	213/32	217/32
4 x 2 x 4	7.452	23/8	41/32	223/32
4 x 2 1/2 x 4	7.591	23/8	325/32	223/32
4 x 3 x 2	7.321	23/8	39/16	33/4
4 x 3 x 2 1/2	7.376	23/8	39/16	329/32
4 x 3 x 3	7.485	23/8	39/16	31/2
4 x 3 x 4	7.536	23/8	323/32	223/32
4 x 4 x 1/2	7.553	23/8	23/8	415/32
4 x 4 x 3/4	7.553	23/8	23/8	41/8
4 x 4 x 1	7.390	23/8	23/8	45/32
4 x 4 x 1 1/4	7.554	23/8	23/8	41/32
4 x 4 x 1 1/2	7.556	23/8	23/8	33/4
4 x 4 x 2	7.394	23/8	23/8	315/16
4 x 4 x 2 1/2	7.438	23/8	23/8	329/32
4 x 4 x 3	7.526	23/8	23/8	31/2





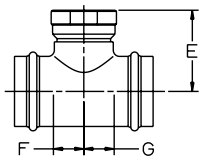
PC712
Tee P x P x F – Cast

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES E	F	G
1 1/2 x 1 1/2 x 1/2	.983	111/16	3/4	3/4
2 x 2 x 1/2	1.479	23/16	1	1

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TEES *(Cont.)*



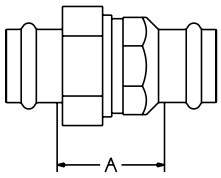


PC612
Tee P x P x F – Wrot

NOM. SIZE	APPROX. NET WT. LBS.	DIMENSIONS INCHES E	F	G
1/2	.266	1 31/32	11/16	11/16
3/4 x 3/4 x 1/2	.423	2 5/8	23/32	23/32
1 x 1 x 1/2	.541	2 11/16	7/8	7/8
1 x 1 x 3/4	.656	2 13/16	15/16	15/16
1 1/4 x 1 1/4 x 1/2	.832	2 7/8	1	1
1 1/4 x 1 1/4 x 3/4	.896	3 1/16	1	1
1 1/2 x 1 1/2 x 3/4	1.197	3 3/8	31/32	31/32
2 x 2 x 3/4	1.693	3 31/32	1 13/32	1 13/32
2 1/2 x 2 1/2 x 3/4	1.049	2 15/32	11/16	11/16
2 1/2 x 2 1/2 x 2	1.633	3 7/32	1 9/32	1 9/32
3 x 3 x 3/4	1.435	2 3/4	11/16	11/16
3 x 3 x 2	2.097	3 15/32	1 9/32	1 9/32
4 x 4 x 3/4	2.786	3 1/4	11/16	11/16
4 x 4 x 2	3.675	4	1 9/32	1 9/32

UNIONS





PC733
Union P x P – Brass Rod

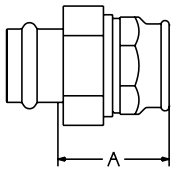
NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1/2	.334	1 1/4

PC633
Union P x P – Wrot

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
3/4	.590	1 9/32
1	.850	1 11/32
1 1/4	1.126	1 9/16
1 1/2	1.723	1 5/8
2	2.627	1 27/32

UNIONS *(Cont.)*

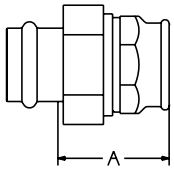




PC733-3
Union P x F – Brass Rod

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1/2	.304	1 1/2
1	.848	1 15/16
1 1/4	1.098	2 1/32
1 1/2	1.885	2 9/16

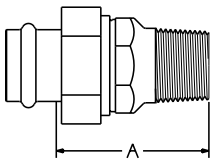




PC633-3
Union P x F – Wrot

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
3/4	.559	1 17/32
2	2.965	2 3/4





PC733-4
Union P x M – Brass Rod

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1 1/4	1.269	2 3/4
1 1/2	1.952	3 11/32

PC633-4
Union P x M – Wrot

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1/2	.386	1 13/16
3/4	.569	1 29/32
1	.904	2 5/32
2	2.789	2 3/4

ACCESSORIES



EPDM Seal

SIZE	PART No.
1/2	T048052
3/4	T048054
1	T048056
1 1/4	T048058
1 1/2	T048060
2	T048062
2 1/2	T048064
3	T048066
4	T048070



EPDM Seal (leak detection)

SIZE	PART No.
1/2	T048352
3/4	T048354
1	T048356
1 1/4	T048358
1 1/2	T048360
2	T048362

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Valves



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NIBCO® Press System®
Illustrated Valve Index

PC585-70
PC585-70-66
Bronze Ball Valve



- Press x Press Female End
- Full Port, Blowout-Proof Stem
- Standard Lever Handle
- 250 PSI CWP
- Sizes 1/2" thru 2"

Page 15, 16

PC585-70-NS
PC585-70-66-NS
Bronze Ball Valve



- Press Female End x Hose
- Full Port, Blowout-Proof Stem
- NIB-SEAL® Handle
- 250 PSI CWP
- Sizes 1/2" thru 2"

Page 17, 18

PC585-70-LL
PC585-70-66-LL
Bronze Ball Valve



- Press x Press Female End
- Full Port, Blowout-Proof Stem
- Locking Lever Handle
- 250 PSI CWP
- Sizes 1/2" thru 2"

Page 19, 20

PC585-70-HC
PC585-70-66-HC
Bronze Ball Valve



- Press Female End x Hose
- Full Port, Blowout-Proof Stem
- Standard Lever Handle
- Blow Down, End of Line
- Hose Cap with Chain
- 250 PSI CWP
- Sizes 1/2" and 3/4"

Page 21, 22

PFFP-600
Brass Ball Valve



- Press x Press Female End
- Full Port, Blowout-Proof Stem
- Standard Lever Handle
- 600 PSI CWP
- Sizes 1/2" thru 2"

Page 22

PF111
Bronze Gate Valve



- Press x Press Female End
- Rising Stem
- 200 PSI CWP
- Sizes 1/2" thru 2"

Page 23

PF113
Bronze Gate Valve



- Press x Press Female End
- Non-Rising Stem
- 200 PSI CWP
- Sizes 1/2" thru 2"

Page 24

PF211-Y
Bronze Globe Valve



- Press x Press Female End
- PTFE Resilient Seat
- 200 PSI CWP
- Sizes 1/2" thru 2"

Page 25

Note: Ball valves are down-rated from 600 PSI CWP to 200 PSI CWP to match the Press System.

NIBCO® Press System®
Illustrated Valve Index

PF311-Y
Bronze Angle Valve



- Press x Press Female End
- PTFE Resilient Seat
- 200 PSI CWP
- Sizes 1/2" thru 2"

Page 26

PF413-Y
Bronze Swing Check Valve



- Press x Press Female End
- PTFE Seat
- 200 PSI CWP
- Sizes 1/2" thru 2"

Page 27

PF480-Y
Bronze In-Line Check Valve



- Press x Press Female End
- PTFE Seat, Stainless Internals
- 250 PSI CWP
- Sizes 1/2" thru 2"

Page 28

PFD2000 Series
Ductile Iron Butterfly Valve



- Press x Press Female End
- Molded-in Liner
- Aluminum Bronze Disc
- Standard Lever Handle or Gear Operated
- 200 PSI CWP
- Sizes 2 1/2" thru 4"

Page 29

PS585-70
PS585-70-66
Bronze Ball Valve



- Press x Press Male End
- 2" Type L Copper
- Full Port, Blowout-Proof Stem
- Standard Lever Handle
- 600 PSI CWP
- Sizes 1/2" thru 2"

Page 30, 31

PS585-70-NS
PS585-70-66-NS
Bronze Ball Valve



- Press x Press Male End
- 2" Type L Copper
- Full Port, Blowout-Proof Stem
- NIB-SEAL® Handle
- 600 PSI CWP
- Sizes 1/2" thru 2"

Page 32, 33

PS585-70-HC
Bronze Ball Valve



- Press x Press Male End
- 2" Type L Copper
- Full Port, Blowout-Proof Stem
- Standard Lever Handle
- Blown Down, End of Line
- Hose Cap with Chain
- 600 PSI CWP
- Sizes 1/2" and 3/4"

Page 34

PS111
Bronze Gate Valve



- Press x Press Male End
- 2" Type L Copper
- Rising Stem
- 200 PSI CWP
- Sizes 1/2" thru 2"

Page 35

Note: Ball valves are down-rated from 600 PSI CWP to 200 PSI CWP to match the Press System.

Note: Check valves are down-rated from 250 PSI CWP to 200 PSI CWP to match the Press System.

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NIBCO® Press System®
Illustrated Valve Index

PS113
Bronze Gate Valve



- Press x Press Male End
- 2" Type L Copper
- Non-Rising Stem
- 200 PSI CWP
- Sizes 1/2" thru 2"

Page 36

PS211-Y
Bronze Globe Valve



- Press x Press Male End
- 2" Type L Copper
- PTFE Resilient Seat
- 200 PSI CWP
- Sizes 1/2" thru 2"

Page 37

PS311-Y
Bronze Angle Valve



- Press x Press Male End
- 2" Type L Copper
- PTFE Resilient Seat
- 200 PSI CWP
- Sizes 1/2" thru 2"

Page 38

PS413-Y
Bronze Swing Check Valve



- Press x Press Male End
- 2" Type L Copper
- PTFE Seat
- 200 PSI CWP
- Sizes 1/2" thru 2"

Page 39

PS480-Y
Bronze In-Line Check Valve



- Press x Press Male End
- 2" Type L Copper
- PTFE Seat, Stainless Internals
- 250 PSI CWP
- Sizes 1/2" thru 2"

Page 40

PF221/222-A/B
Bronze Y-Strainer



- Press x Press Female End
- Tapped cap w/ blow-off plug or solid cap
- 20 Mesh SS Screen or SS Perforated Screen
- 200 PSI CWP
- Sizes 1/2" thru 2"

Page 43

PCM480-Y
Bronze In-Line Check Valve



- Press x Press Male End
- Double Union Design
- PTFE Seat, Stainless Internals
- Repairable
- 250 PSI CWP
- Sizes 1/2" thru 2"

Page 41

PCM585-60
Bronze Ball Valve



- Press x Press Male End
- Double Union Design
- Full Port 316 SS Ball
- Repairable
- 600 PSI CWP
- Sizes 1/2" thru 2"

Page 42

Note: Ball valves are down-rated from 600 PSI CWP to 200 PSI CWP to match the Press System.

Note: Check valves are down-rated from 250 PSI CWP to 200 PSI CWP to match the Press System.

NIBCO® Press System® Bronze Ball Valves

Two-Piece Body • Full Port • Bronze Trim • Blowout-Proof Stem

Dezincification Resistant

250 PSI/17.2 Bar Non-Shock Cold Working Pressure
250°F Maximum Operating Temperature

CONFORMS TO MSS SP-110

MATERIAL LIST

	PART	SPECIFICATION
1.	Body	Bronze ASTM B584 Alloy C84400
2.	Body End	Bronze ASTM B584 Alloy C84400
3.	Press End Adapter (2)	Bronze ASTM B61 Alloy C92200
4.	Ball	Brass ASTM B16 Alloy C36000 or ASTM B283 Alloy C37700 (Chrome/Nickel Plated)
5.	Seat Ring (2)	Reinforced PTFE
6.	Boss seal o-ring (2)	EPDM
7.	O-Ring (2)	EPDM
8.	Packing	PTFE
9.	Pack Gland	Brass ASTM B16 Alloy C36000
10.	Stem	Silicon Bronze ASTM B371 Alloy C69430 or ASTM B371 Alloy C69430
11.	Handle Nut	Zinc Plated Steel
12.	Thrust Washer	Reinforced PTFE
13.	Handle Assembly	Zinc Plated Steel with Plastisol Coating

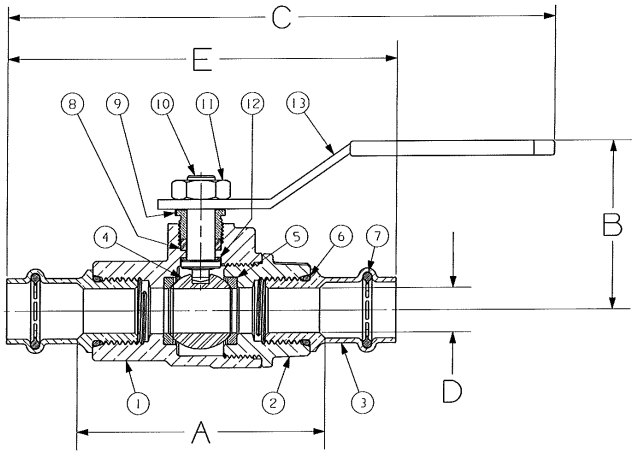


PC585-70
Press x Press
Female End

DIMENSIONS—WEIGHTS

SIZE		Dimensions A		B		C		D		E		Weight	
In.	mm.	In.	mm.	In.	mm.	In.	mm.	In.	mm.	In.	mm.	Lbs.	Kg.
1/2"	13	2.76	70	1.88	48	6.09	155	.50	13	4.34	110	.80	.36
3/4"	19	3.28	83	2.25	57	7.36	187	.75	19	5.20	132	1.56	.71
1"	25	3.59	91	2.38	60	7.44	189	1.00	25	5.55	141	2.13	1.00
1¼"	32	4.62	117	3.00	76	10.09	256	1.25	32	6.74	171	3.73	1.69
1½"	38	5.23	133	3.16	80	10.64	270	1.50	38	7.85	199	5.53	2.51
2"	50	5.63	143	3.50	89	11.13	283	2.00	50	8.81	224	7.95	3.61

NIBCO® Press System® ball valves are designed to meet MSS SP-110 with the exception of the end connection. Ball valves are down-rated from 600 PSI CWP to 250 PSI CWP to match the Press System®. Male and female press-to-connect ends are new technology not yet covered in the current edition of this specification.



PC585-70
P x P

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NIBCO® Press System® Bronze Ball Valves

Two-Piece Body • Full Port • Stainless Trim • Blowout-Proof Stem • Vented Ball

Dezincification Resistant

250 PSI/17.2 Bar Non-Shock Cold Working Pressure
250°F Maximum Operating Temperature

CONFORMS TO MSS SP-110

MATERIAL LIST

	PART	SPECIFICATION
1.	Body	Bronze ASTM B584 Alloy C84400
2.	Body End	Bronze ASTM B584 Alloy C84400
3.	Female Adapter (2)	Bronze ASTM B61 Alloy C92200
4.	Ball (vented)	Stainless Steel ASTM A276 Type 316 or ASTM A351 Type CF8M
5.	Seat Ring (2)	Reinforced PTFE
6.	Boss Seal O-Ring (2)	EPDM
7.	O-Ring (2)	EPDM
8.	Packing	PTFE
9.	Pack Gland	Brass ASTM B16 Alloy C36000
10.	Stem	Stainless Steel ASTM A276 Type 316
11.	Handle Nut	300 Series Stainless Steel
12.	Thrust Washer	Reinforced PTFE
13.	Handle Assembly	Zinc Plated Steel with Plastisol Coating

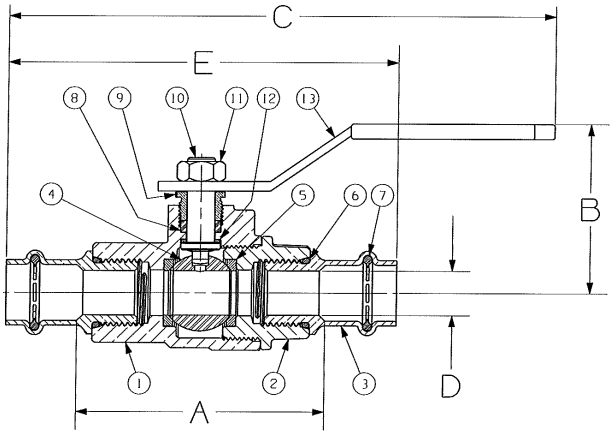


PC585-70-66
Press x Press
Female End

DIMENSIONS—WEIGHTS

SIZE		Dimensions A		B		C		D		E		Weight	
In.	mm.	In.	mm.	In.	mm.	In.	mm.	In.	mm.	In.	mm.	Lbs.	Kg.
1/2"	13	2.76	70	1.88	48	6.09	155	.50	13	4.34	110	.77	.35
3/4"	19	3.28	83	2.25	57	7.36	187	.75	19	5.20	132	1.55	.70
1"	25	3.59	91	2.38	60	7.44	189	1.00	25	5.55	141	2.29	1.04
1¼"	32	4.62	117	3.00	76	10.09	256	1.25	32	6.74	171	3.80	1.72
1½"	38	5.23	133	3.16	80	10.64	270	1.50	38	7.85	199	5.60	2.54
2"	50	5.63	143	3.50	89	11.13	283	2.00	50	8.81	220	8.69	3.94

NIBCO® Press System® ball valves are designed to meet MSS SP-110 with the exception of the end connection. Ball valves are down-rated from 600 PSI CWP to 250 PSI CWP to match the Press System®. Male and female press-to-connect ends are new technology not yet covered in the current edition of this specification.



PC585-70-66
P x P

NIBCO® Press System® Bronze Ball Valves

Two-Piece Body • Full Port • NIB-SEAL® Handle

Dezincification Resistant

250 PSI/17.2 Bar Non-Shock Cold Working Pressure
250°F Maximum Operating Temperature

CONFORMS TO MSS SP-110

MATERIAL LIST

	PART	SPECIFICATION
1.	Body	Bronze ASTM B584 Alloy C84000
2.	Body End	Bronze ASTM B584 Alloy C84400
3.	Female Adapter (2)	Bronze ASTM B61 Alloy C92200
4.	Ball	Brass ASTM B16 Alloy C36000 or ASTM B283 Alloy C37700 (Chrome/Nickel Plated)
5.	Seat Ring (2)	Reinforced PTFE
6.	Boss Seal O-Ring (2)	EPDM
7.	O-Ring (2)	EPDM
8.	Packing	PTFE
9.	Thread Pack Gland	Brass ASTM B16 Alloy C36000
10.	Stem	Silicon Bronze ASTM B371 Alloy C69300 or ASTM B371 Alloy C69430
11.	Handle Nut	Zinc Plated Steel
12.	Thrust Washer	Reinforced PTFE
13.	NIB-SealHandle Assembly	Zinc Plated Steel & Plastic

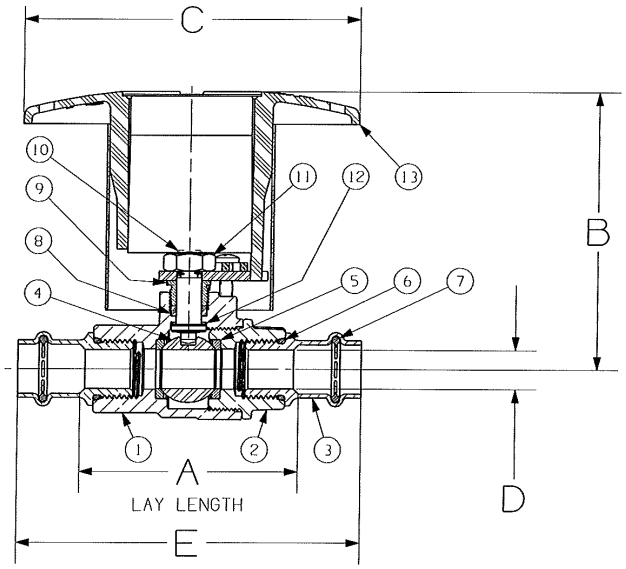


PC585-70-NS
Press x Press
Female End

DIMENSIONS—WEIGHTS

SIZE		Dimensions A		B		C		D		E		Weight	
In.	mm.	In.	mm.	In.	mm.	In.	mm.	In.	mm.	In.	mm.	Lbs.	Kg.
1/2"	13	2.76	70	3.75	95	4.25	108	.50	13	4.34	110	.88	.40
3/4"	19	3.28	83	4.00	102	4.25	108	.75	19	5.20	132	1.62	.73
1"	25	3.59	91	4.25	108	4.25	108	1.00	25	5.55	141	2.18	.99
1¼"	32	4.62	117	5.38	137	6.5	165	1.25	32	6.74	171	3.53	1.60
1½"	38	5.23	133	5.56	141	6.5	165	1.50	38	7.85	199	5.61	2.54
2"	50	5.63	143	5.88	149	6.5	165	2.00	50	8.81	224	8.03	3.64

NIBCO® Press System® ball valves are designed to meet MSS SP-110 with the exception of the end connection. Ball valves are down-rated from 600 PSI CWP to 250 PSI CWP to match the Press System®. Male and female press-to-connect ends are new technology not yet covered in the current edition of this specification.



PC585-70-NS
P x P

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NIBCO® Press System® Bronze Ball Valves

Two-Piece Body • Full Port • 316 SS Ball & Stem • NIB-SEAL® Handle • Vented Ball

Dezincification Resistant

250 PSI/17.2 Bar Non-Shock Cold Working Pressure
250°F Maximum Operating Temperature

CONFORMS TO MSS SP-110

CONFORMS TO MSS SP-110



PC585-70-66-NS
Press x Press
Female End

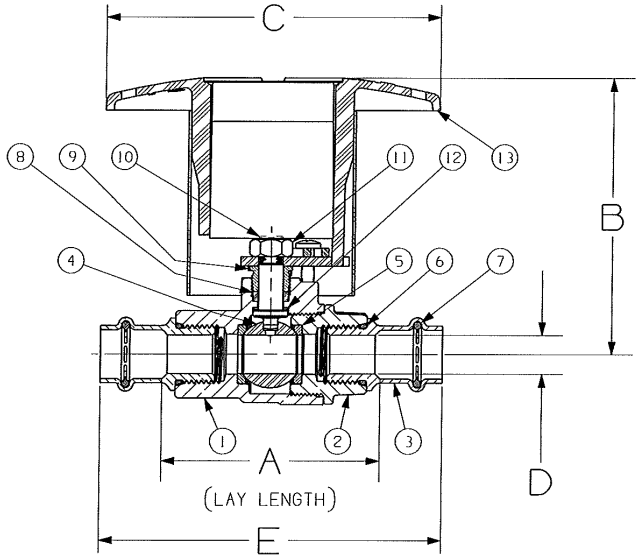
MATERIAL LIST

	PART	SPECIFICATION
1.	Body	Bronze ASTM B584 Alloy C84400
2.	Body End	Bronze ASTM B584 Alloy C84400
3.	Female Adapter (2)	Bronze ASTM B61 Alloy C92200
4.	Ball (vented)	ASTM A276 Type 316 Stainless Steel or ASTM A351 Type CF8M
5.	Seat Ring (2)	Reinforced PTFE
6.	Boss Seal O-Ring (2)	EPDM
7.	O-Ring (2)	EPDM
8.	Packing	PTFE
9.	Pack Gland	Brass ASTM B16 Alloy C36000
10.	Stem	ASTM A276 Alloy Type 316 Stainless Steel
11.	Handle Nut	300 Series Stainless Steel
12.	Thrust Washer	Reinforced PTFE
13.	NIB-SealHandle Assembly	Zinc Plated Steel & Plastic

DIMENSIONS—WEIGHTS

SIZE		Dimensions A		B		C		D		E		Weight	
In.	mm.	In.	mm.	In.	mm.	In.	mm.	In.	mm.	In.	mm.	Lbs.	Kg.
1/2"	13	2.76	70	3.75	95	4.25	108	.50	13	4.34	110	.90	.41
3/4"	19	3.28	83	4.00	102	4.25	108	.75	19	5.20	132	1.60	.73
1"	25	3.59	91	4.25	108	4.25	108	1.00	25	5.55	141	2.34	1.06
1¼"	32	4.62	117	5.38	137	6.50	165	1.25	32	6.74	171	3.88	1.76
1½"	38	5.23	133	5.56	141	6.50	165	1.50	38	7.85	199	5.68	2.58
2"	50	5.63	143	5.88	149	6.50	165	2.00	50	8.81	224	8.77	3.98

NIBCO® Press System® ball valves are designed to meet MSS SP-110 with the exception of the end connection. Ball valves are down-rated from 600 PSI CWP to 250 PSI CWP to match the Press System®. Male and female press-to-connect ends are new technology not yet covered in the current edition of this specification.



PC585-70-66-NS
P x P

NIBCO® Press System® Bronze Ball Valves

Two-Piece Body • Full Port • Bronze Trim • Blowout-Proof Stem • Locking Handle

Dezincification Resistant

250 PSI/17.2 Bar Non-Shock Cold Working Pressure
250°F Maximum Operating Temperature

CONFORMS TO MSS SP-110

MATERIAL LIST

PART	SPECIFICATION
1. Body	Bronze ASTM B584 Alloy C84400
2. Body End	Bronze ASTM B584 Alloy C84400
3. Female Adapter (2)	Bronze ASTM B61 Alloy C92200
4. Ball	Brass ASTM B16 Alloy C36000 or ASTM B283 C37700 (Chrome/Nickel Plated)
5. Seat Ring (2)	Reinforced PTFE
6. Boss Seal O-Ring (2)	EPDM
7. O-Ring (2)	EPDM
8. Packing	PTFE
9. Pack Gland	Brass ASTM B16 Alloy C36000
10. Stem	Silicon Bronze ASTM B371 Alloy C69300 or ASTM B371 Alloy C69430
11. Handle Nut	Zinc Plated Steel
12. Thrust Washer	Reinforced PTFE
13. Locking Handle	Zinc Plated Steel with Plastisol Coating
14. Locking Device	300 Series Stainless Steel

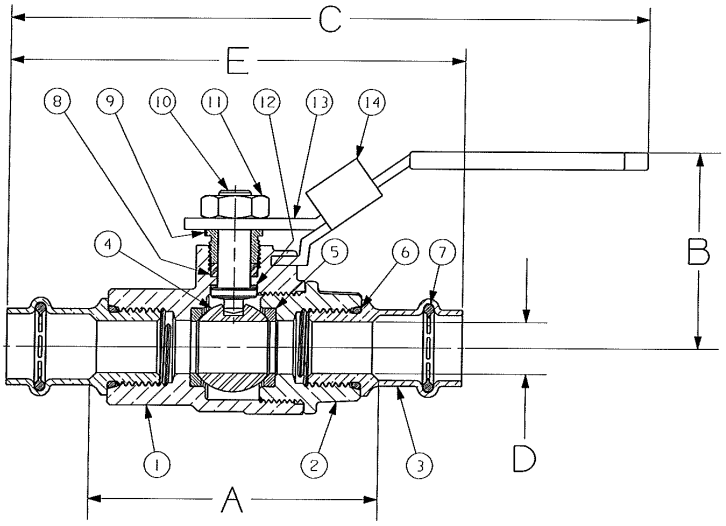


PC585-70-LL
Press x Press
Female End

DIMENSIONS—WEIGHTS

SIZE		Dimensions A		B		C		D		E		Weight	
In.	mm.	In.	mm.	In.	mm.	In.	mm.	In.	mm.	In.	mm.	Lbs.	Kg.
1/2"	13	2.76	70	1.88	48	6.09	155	.50	13	4.34	110	.79	.36
3/4"	19	3.28	83	2.25	57	7.36	187	.75	19	5.20	132	1.62	.73
1"	25	3.59	91	2.38	60	7.44	189	1.00	25	5.55	141	2.18	.99
1¼"	32	4.62	117	3.00	76	10.09	256	1.25	32	6.74	171	3.64	1.65
1½"	38	5.23	133	3.16	80	10.64	270	1.50	38	7.85	199	5.59	2.54
2"	50	5.63	143	3.50	89	11.13	283	2.00	50	8.81	224	8.02	3.64

NIBCO® Press System® ball valves are designed to meet MSS SP-110 with the exception of the end connection. Ball valves are down-rated from 600 PSI CWP to 250 PSI CWP to match the Press System®. Male and female press-to-connect ends are new technology not yet covered in the current edition of this specification.



PC585-70-LL
P x P

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NIBCO® Press System® Bronze Ball Valves

Dezincification Resistant

Two-Piece Body • Full Port • Stainless Trim • Blowout-Proof Stem • Vented Ball • Locking Handle

250 PSI/17.2 Bar Non-Shock Cold Working Pressure
250°F Maximum Operating Temperature

CONFORMS TO MSS SP-110

MATERIAL LIST

	PART	SPECIFICATION
1.	Body	Bronze ASTM B584 Alloy C84400
2.	Body End	Bronze ASTM B584 Alloy C84400
3.	Female Adapter (2)	Bronze ASTM B61 Alloy C92200
4.	Ball (vented)	Stainless Steel ASTM A276 Type 316 or ASTM A351 Type CF8M
5.	Seat Ring (2)	Reinforced PTFE
6.	Boss Seal O-Ring (2)	EPDM
7.	O-Ring (2)	EPDM
8.	Packing	PTFE
9.	Pack Gland	Brass ASTM B16 Alloy C36000
10.	Stem	Stainless Steel ASTM A276 Type 316
11.	Handle Nut	300 Series Stainless Steel
12.	Thrust Washer	Reinforced PTFE
13.	Locking Handle Assembly	Zinc Plated Steel with Plastisol Coating
14.	Locking Device	300 Series Stainless Steel

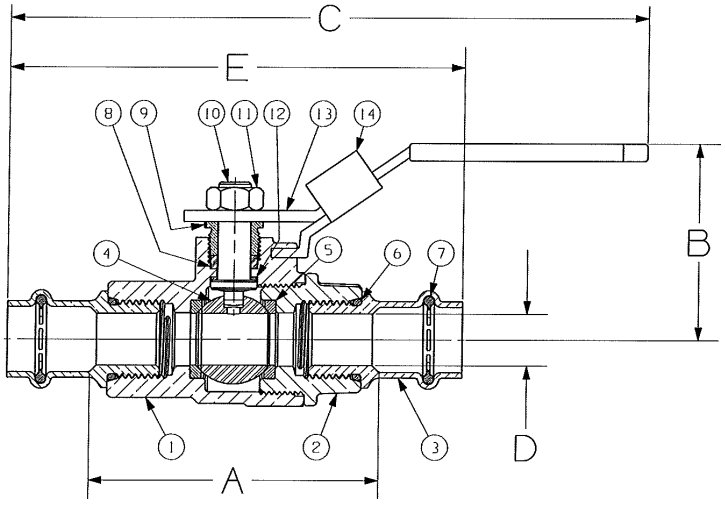


PC585-70-66-LL
Press x Press
Female End

DIMENSIONS—WEIGHTS

SIZE		Dimensions A		B		C		D		E		Weight	
In.	mm.	In.	mm.	In.	mm.	In.	mm.	In.	mm.	In.	mm.	Lbs.	Kg.
1/2"	13	2.76	70	1.88	48	6.09	155	.50	13	4.34	110	.81	.37
3/4"	19	3.28	83	2.25	57	7.36	187	.75	19	5.20	132	1.61	.73
1"	25	3.59	91	2.38	60	7.44	189	1.00	25	5.55	141	2.34	1.06
1¼"	32	4.62	117	3.00	76	10.09	256	1.25	32	6.74	171	3.64	1.65
1½"	38	5.23	133	3.16	80	10.64	270	1.50	38	7.85	199	5.59	2.54
2"	50	5.63	143	3.50	89	11.13	283	2.00	50	8.81	224	8.02	3.64

NIBCO® Press System® ball valves are designed to meet MSS SP-110 with the exception of the end connection. Ball valves are down-rated from 600 PSI CWP to 250 PSI CWP to match the Press System®. Male and female press-to-connect ends are new technology not yet covered in the current edition of this specification.



PC585-70-66-LL
P x P

NIBCO® Press System® Bronze Ball Valves

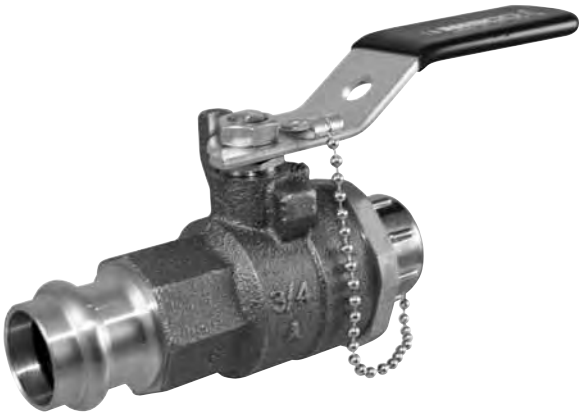
Two-Piece Body • Full Port • Bronze Trim • Blowout-Proof Stem
• 3/4" Hose Connection w/Cap and Chain

250 PSI/17.2 Bar Non-Shock Cold Working Pressure
250°F Maximum Operating Temperature

CONFORMS TO MSS SP-110

MATERIAL LIST

PART		SPECIFICATION
1.	Press End Adapter	Bronze ASTM B61 Alloy C92200
2.	Body	Bronze ASTM B584 Alloy C84400
3.	Hose Body End	Brass ASTM B124 Alloy C37700
4.	Cap	Die Cast Brass
5.	O-Ring	EPDM
6.	Boss seal o-ring	EPDM
7.	Ball	Brass ASTM B16 Alloy C36000 or ASTM B283 Alloy C37700 (Chrome/Nickel Plated)
8.	Packing	PTFE
9.	Pack Gland	Brass ASTM B16 Alloy C36000
10.	Stem	Silicon Bronze ASTM B371 Alloy C69300 or ASTM B371 Alloy C69430
11.	Handle Nut	Zinc Plated Steel
12.	Thrust Washer	Reinforced PTFE
13.	Handle Assembly	Zinc Plated Steel with Plastisol Coating
14.	Seat Ring (2)	Reinforced PTFE

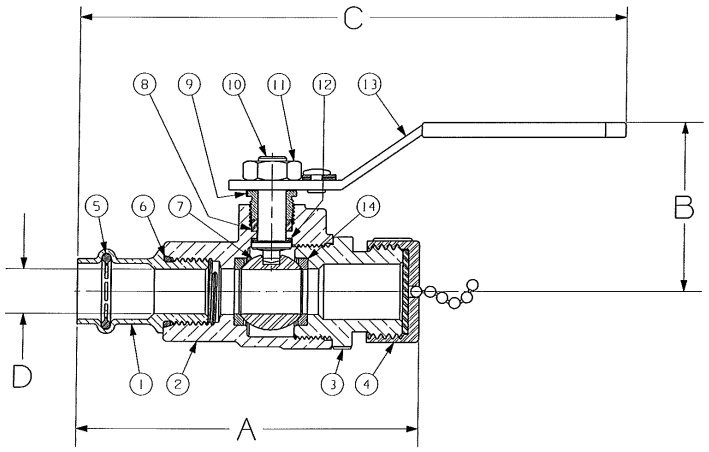


PC585-70-HC
Press Female x Hose End

DIMENSIONS—WEIGHTS

SIZE		Dimensions A		B		C		D		Weight	
In.	mm.	In.	mm.	In.	mm.	In.	mm.	In.	mm.	Lbs.	Kg.
1/2"	13	3.06	78	1.88	48	6.09	155	.50	13	.92	.42
3/4"	19	4.47	114	2.25	57	7.36	187	.75	19	1.70	.77

NIBCO® Press System® ball valves are designed to meet MSS SP-110 with the exception of the end connection. Ball valves are down-rated from 600 PSI CWP to 250 PSI CWP to match the Press System®. Male and female press-to-connect ends are new technology not yet covered in the current edition of this specification.



PC585-70-HC
P x Hose

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NIBCO® Press System® Bronze Ball Valves

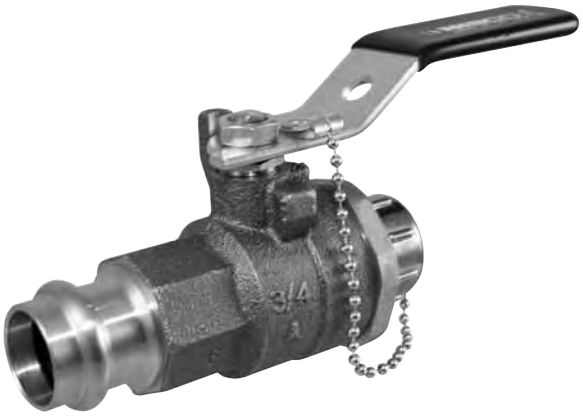
Two-Piece Body • Full Port • Stainless Trim • Blowout-Proof Stem • Vented Ball
• 3/4" Hose Connection w/Cap and Chain

250 PSI/17.2 Bar Non-Shock Cold Working Pressure
250°F Maximum Operating Temperature

CONFORMS TO MSS SP-110

MATERIAL LIST

PART	SPECIFICATION
1. Female Adapter	Bronze ASTM B61 Alloy C92200
2. Body	Bronze ASTM B584 Alloy C84400
3. Hose Body End	Brass ASTM B124 Alloy C37700
4. Cap	Die Cast Brass
5. O-Ring	EPDM
6. Boss seal o-ring	EPDM
7. Ball (vented)	Stainless Steel ASTM A276 Type 316 or ASTM A351 Type CF8M
8. Packing	PTFE
9. Pack Gland	Brass ASTM B16 Alloy C36000
10. Stem	Stainless Steel ASTM A276 Type 316
11. Handle Nut	300 Series Stainless Steel
12. Thrust Washer	Reinforced PTFE
13. Handle Assembly	Zinc Plated Steel with Plastisol Coating
14. Seat Ring (2)	Reinforced PTFE

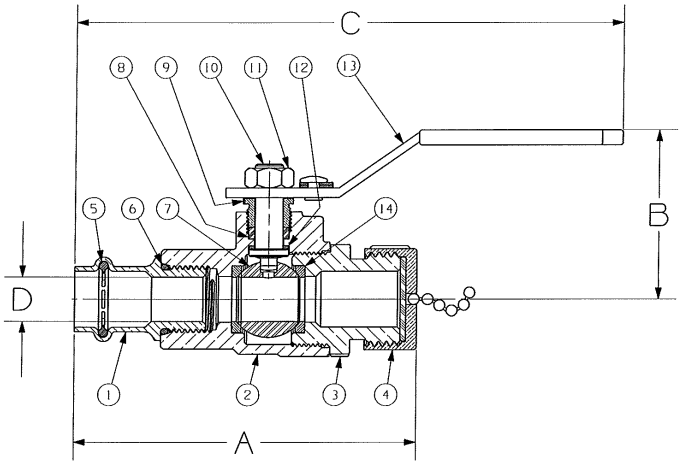


PC585-70-66-HC
Press Female x Hose End

DIMENSIONS—WEIGHTS

SIZE		Dimensions A		B		C		D		Weight	
In.	mm.	In.	mm.	In.	mm.	In.	mm.	In.	mm.	Lbs.	Kg.
1/2"	13	2.76	70	1.88	48	6.09	155	.50	13	.92	.42
3/4"	19	3.28	83	2.25	57	7.36	187	.75	19	1.70	.77

NIBCO® Press System® ball valves are designed to meet MSS SP-110 with the exception of the end connection. Ball valves are down-rated from 250 PSI CWP to 250 PSI CWP to match the Press System®. Male and female press-to-connect ends are new technology not yet covered in the current edition of this specification.



PC585-70-66-HC
P x Hose

NIBCO® Press System® Brass Ball Valves

Two-Piece Body • Full Port • Brass Trim • Blowout-Proof Stem • PTFE Seats

600 PSI/41.4 Bar Non-Shock Cold Working Pressure
250°F Maximum Operating Temperature

CONFORMS TO MSS SP-110

MATERIAL LIST

PART		SPECIFICATION
1. Handle		Plated Steel with Plastisol Cover
2. Handle Nut		Plated Steel
3. Pack Gland		Brass ASTM B16 Alloy C36000
4. Packing, Stem		Virgin PTFE
5. Flat Washer		430 Stainless
6. O-Ring (Stem Seal)		Fluorocarbon (FKM)
7. Thrust Washer		Reinforced PTFE
8. Stem	½" - 1"	Brass ASTM B16 Alloy C36000
	1¼" - 2"	Silicon Bronze ASTM B371 Alloy 69400 or 69430
9. Body		Forged Brass ASTM B283 Alloy C37700
10. Seat Ring (2)		Virgin PTFE
11. Ball	½" - ¾"	Brass ASTM B16 Alloy C36000 (Chrome/Nickel Plated)
	1" - 2"	Forged Brass ASTM B124 Alloy C37700 (Chrome/Nickel Plated)
12. Body End Piece		Forged Brass ASTM B283 Alloy C37700
13. Female Adapter (2)		Bronze ASTM B61 Alloy C92200
14. O-Ring (2)		EPDM

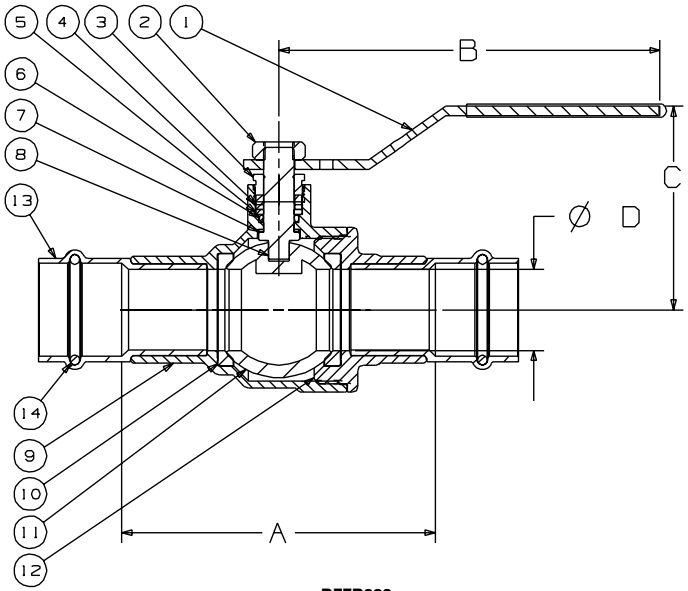


PFFP600
Press x Press
Female End

DIMENSIONS—WEIGHTS

Size		Dimensions A		B		C		D		Weight	
In.	mm.	In.	mm.	In.	mm.	In.	mm.	In.	mm.	Lbs.	Kg.
½	15	2.37	60	3.90	99	1.95	50	0.50	13	.54	1.19
¾	20	3.18	81	4.66	118	2.30	58	0.75	19	1.16	2.55
1	25	3.84	98	4.66	118	2.50	64	1.00	25	1.61	3.54
1 ¼	32	4.34	110	6.69	170	3.05	78	1.25	32	2.63	5.79
1 ½	40	4.88	124	6.69	170	3.23	82	1.50	38	3.69	8.12
2	50	6.04	153	6.69	170	3.55	90	2.00	51	5.76	12.68

NIBCO® Press System® ball valves are designed to meet MSS SP-110 with the exception of the end connection. Ball valves are down-rated from 600 PSI CWP to 200 PSI CWP to match the Press System®. Male and female press-to-connect ends are new technology not yet covered in the current edition of this specification.



PFFP600
P x P

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NIBCO® Press System® Bronze Gate Valves

Dezincification Resistant

Screw-in Bonnet • Rising Stem • Solid Wedge

200 PSI/13.8 Bar Non-Shock Cold Working Pressure
250°F Maximum Operating Temperature

CONFORMS TO MSS SP-80

MATERIAL LIST

PART		SPECIFICATION
1.	Handwheel Nut	300 Series Stainless Steel
2.	Identification Plate	Aluminum
3.	Handwheel	Malleable Iron ASTM A 47
4.	Stem	Silicon Bronze ASTM B 371 Alloy C69430 or ASTM B 99 Alloy C65100
5.	Pack Nut	Brass ASTM B 16 Alloy C36000
6.	Pack Gland	Brass ASTM B 16 Alloy C36000
7.	Packing	Aramid Fibers with Graphite
8.	Bonnet	Bronze ASTM B 62 Alloy C83600
9.	Body Assembly	Bronze ASTM B 62 Alloy C83600
10.	Wedge	Bronze ASTM B 62 Alloy C83600
11.	Female Adapter (2)	Bronze ASTM B 61 Alloy C92200
12.	O-Ring (2)	EPDM

DIMENSIONS—WEIGHTS

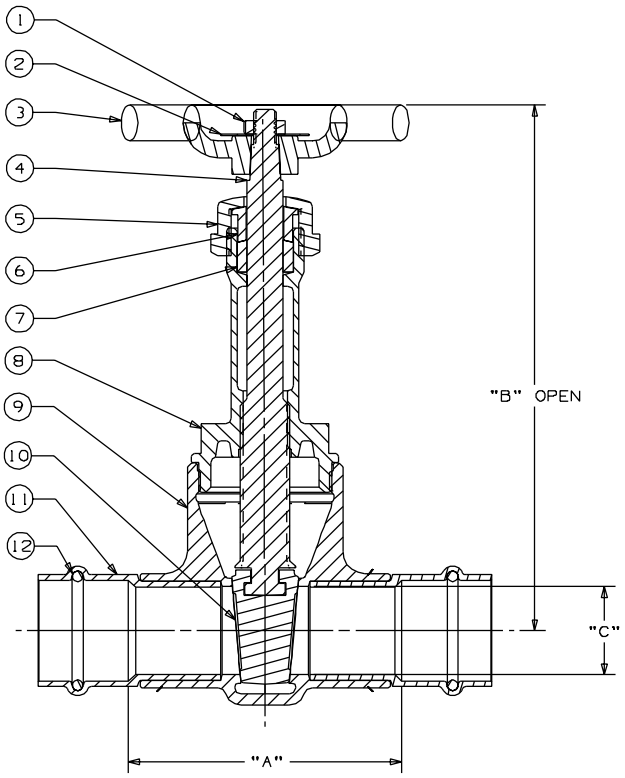
Size		Dimensions A		B		C		Weight	
In.	mm.	In.	mm.	In.	mm.	In.	mm.	Lbs.	Kg.
½ †	15	1.97	50	4.81	122	.50	13	.84	.38
¾	20	2.62	67	5.81	148	.75	19	1.30	.59
1	25	3.07	78	7.09	180	1.00	25	2.09	.95
1¼	32	3.36	85	8.13	206	1.25	32	2.95	1.34
1½	40	3.70	94	9.81	249	1.50	38	4.16	1.89
2	50	4.28	109	11.56	294	2.00	51	6.79	3.09

† No packing gland, packing only in this size.

NIBCO® Press System® gate valves are designed to meet MSS SP-80 with the exception of the end connection. Male and female press-to-connect ends are new technology not yet covered in the current edition of this specification.



PF111
Press x Press
Female End



PF111
P x P

NIBCO® Press System® Bronze Gate Valves

Screw-in Bonnet • Non-Rising Stem • Solid Wedge

Dezincification Resistant

200 PSI/13.8 Bar Non-Shock Cold Working Pressure
250°F Maximum Operating Temperature



PF113
Press x Press
Female End

CONFORMS TO MSS SP-80

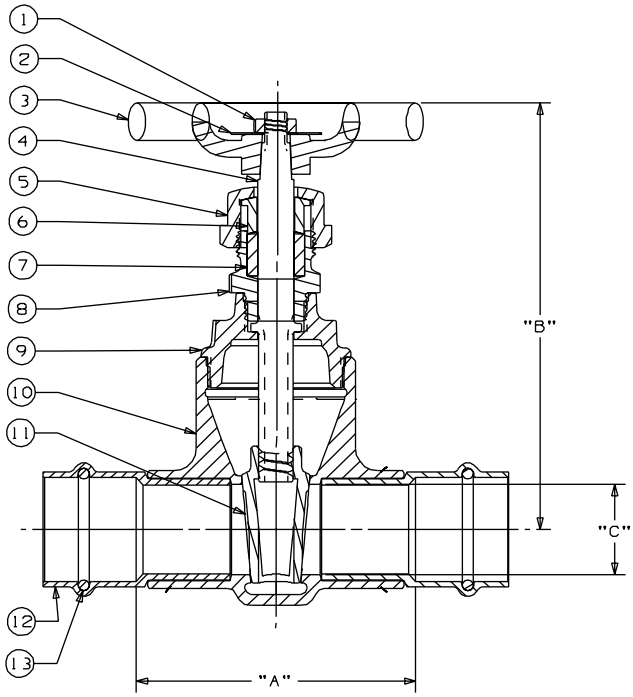
MATERIAL LIST

	PART	SPECIFICATION
1.	Handwheel Nut	300 Series Stainless Steel
2.	Identification Plate	Aluminum
3.	Handwheel	Malleable Iron ASTM A 47
4.	Stem	Silicon Bronze ASTM B 371 Alloy C69430 or ASTM B 99 Alloy C65100
5.	Pack Nut	Brass ASTM B 16 Alloy C36000
6.	Pack Gland	Brass ASTM B 16 Alloy C36000
7.	Packing	Aramid Fibers with Graphite
8.	Stuffing Box	Bronze ASTM B 62 Alloy C83600
9.	Bonnet	Bronze ASTM B 62 Alloy C83600
10.	Body Assembly	Bronze ASTM B 62 Alloy C83600
11.	Wedge	Bronze ASTM B 62 Alloy C83600
12.	Female Adapter (2)	Bronze ASTM B 61 Alloy C92200
13.	O-Ring (2)	EPDM

DIMENSIONS—WEIGHTS

Size		Dimensions A		B		C		Weight	
In.	mm.	In.	mm.	In.	mm.	In.	mm.	Lbs.	Kg.
½ †	15	1.97	50	3.63	92	.50	13	.78	.36
¾	20	2.62	67	3.91	99	.75	19	1.21	.55
1	25	3.07	78	4.69	119	1.00	25	1.92	.88
1 ¼	32	3.36	85	5.22	133	1.25	32	2.69	1.22
1 ½	40	3.70	94	6.25	159	1.50	38	3.91	1.78
2	50	4.28	109	7.06	179	2.00	51	6.21	2.83

†No packing gland, packing only in this size.



PF113
P x P

NIBCO® Press System® gate valves are designed to meet MSS SP-80 with the exception of the end connection. Male and female press-to-connect ends are new technology not yet covered in the current edition of this specification.

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NIBCO® Press System® Bronze Globe Valves

Screw-in Bonnet • Integral Seat • Renewable Seat and Disc

Dezincification Resistant



PF211-Y
Press x Press
Female End

CONFORMS TO MSS SP-80

MATERIAL LIST

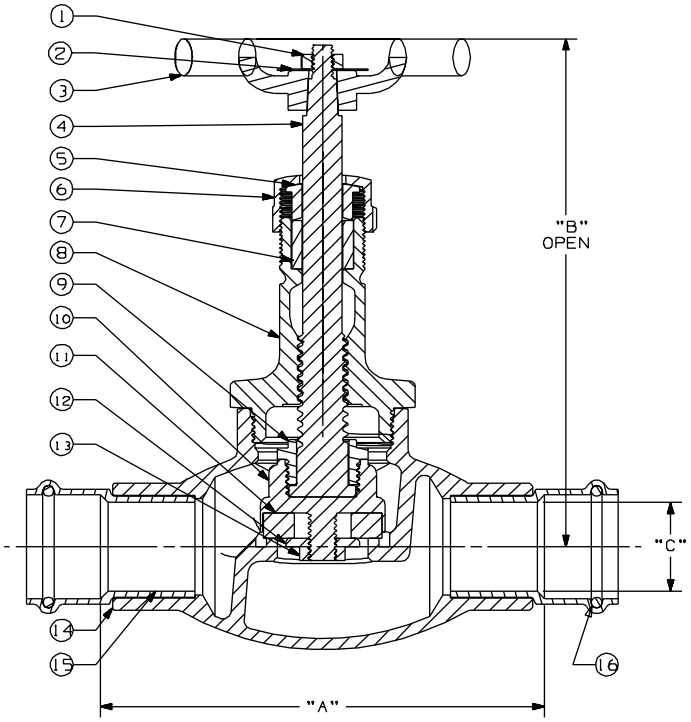
	PART	SPECIFICATION
1.	Handwheel Nut	300 Series Stainless Steel
2.	Identification Plate	Aluminum
3.	Handwheel	Malleable Iron ASTM A 47
4.	Stem	Silicon Bronze ASTM B 371 Alloy C69430
5.	Pack Gland	Brass ASTM B 16 Alloy C36000
6.	Pack Nut	Brass ASTM B 16 Alloy C36000
7.	Packing	Aramid Fibers with Graphite
8.	Bonnet	Bronze ASTM B 62 Alloy C83600
9.	Disc Holder Nut	Bronze ASTM B 62 Alloy C83600
10.	Disc Holder	Bronze ASTM B 62 Alloy C83600
11.	Disc	PTFE
12.	Disc Washer	304 Stainless Steel
13.	Disc Nut	Bronze ASTM B 98 Alloy C65100
14.	Body Assembly	Bronze ASTM B62 Alloy C83600
15.	Female Adapter (2)	Bronze ASTM B 61 Alloy C92200
16.	O-Ring (2)	EPDM

DIMENSIONS—WEIGHTS

Size		Dimensions A		B		C		Weight	
In.	mm.	In.	mm.	In.	mm.	In.	mm.	Lbs.	Kg.
*½†	15	2.91	74	3.38	86	.50	13	1.07	.48
¾	20	3.99	101	4.88	124	.75	19	2.04	.93
1	25	4.88	124	5.69	145	1.00	25	3.13	1.42
1 ¼	32	5.23	133	6.13	156	1.25	32	4.00	1.82
1 ½	40	6.01	153	7.38	187	1.50	38	6.44	2.93
2	50	7.41	188	7.94	202	2.00	51	10.16	4.62

† No packing gland, packing only in this size.

* Stem and disc (or disc holder) are integral.



PF211-Y
P x P

NIBCO® Press System® globe valves are designed to meet MSS SP-80 with the exception of the end connection. Male and female press-to-connect ends are new technology not yet covered in the current edition of this specification.

NIBCO® Press System® Bronze Angle Valves

Screw-in Bonnet • Integral Seat • Renewable Seat and Disc

Dezincification Resistant

200 PSI/13.8 Bar Non-Shock Cold Working Pressure
250°F Maximum Operating Temperature



PF311-Y
Press x Press
Female End

CONFORMS TO MSS SP-80

MATERIAL LIST

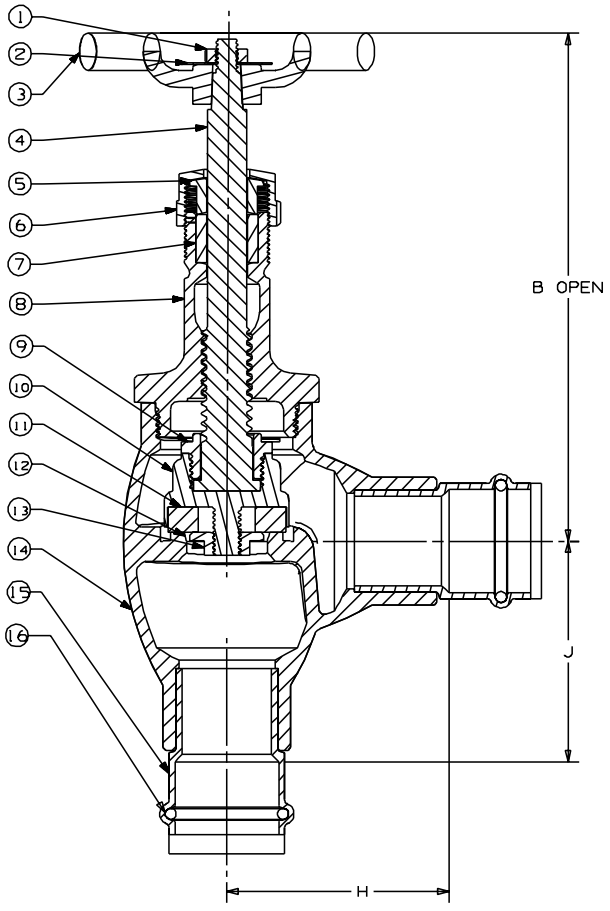
	PART	SPECIFICATION
1.	Handwheel Nut	300 Series Stainless Steel
2.	Identification Plate	Aluminum
3.	Handwheel	Malleable Iron ASTM A 47
4.	Stem	Silicon Bronze ASTM B 371 Alloy C69430
5.	Pack Gland	Brass ASTM B 16 Alloy C36000
6.	Pack Nut	Brass ASTM B 16 Alloy C36000
7.	Packing	Aramid Fibers with Graphite
8.	Bonnet	Bronze ASTM B 62 Alloy C83600
9.	Disc Holder Nut	Bronze ASTM B 62 Alloy C83600
10.	Disc Holder	Bronze ASTM B 62 Alloy C83600
11.	Disc	PTFE
12.	Disc Washer	304 Stainless Steel
13.	Disc Nut	Silicon Bronze ASTM B 96 Alloy C65100
14.	Body	Bronze ASTM B 62 Alloy C83600
15.	Female Adapter (2)	Bronze ASTM B 61 Alloy C92200
16.	O-Ring (2)	EPDM

DIMENSIONS—WEIGHTS

Size		Dimensions B		H		J		Weight	
In.	mm.	In.	mm.	In.	mm.	In.	mm.	Lbs.	Kg.
*½†	15	3.50	89	1.49	38	1.49	38	1.07	.48
¾	20	4.94	126	2.00	51	2.00	51	1.94	.88
1	25	5.75	146	2.48	63	2.48	63	3.12	1.42
1 ¼	32	6.13	156	2.59	66	2.59	66	4.21	1.92
1 ½	40	7.25	179	2.98	76	2.98	76	5.44	2.47
2	50	8.13	206	3.64	93	3.64	93	9.98	4.54

† No packing gland, packing only in this size.

* Stem and Disc or Disc Holder are integral.



PF311-Y
P x P

NIBCO® Press System® angle valves are designed to meet MSS SP-80 with the exception of the end connection. Male and female press-to-connect ends are new technology not yet covered in the current edition of this specification.

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NIBCO® Press System® Bronze Check Valves

Horizontal Swing • Regrinding Type • Y-Pattern • Renewable Seat and Disc

Dezincification Resistant

200 PSI/13.8 Bar Non-Shock Cold Working Pressure
250°F Maximum Operating Temperature

CONFORMS TO MSS SP-80



PF413-Y
Press x Press
Female End

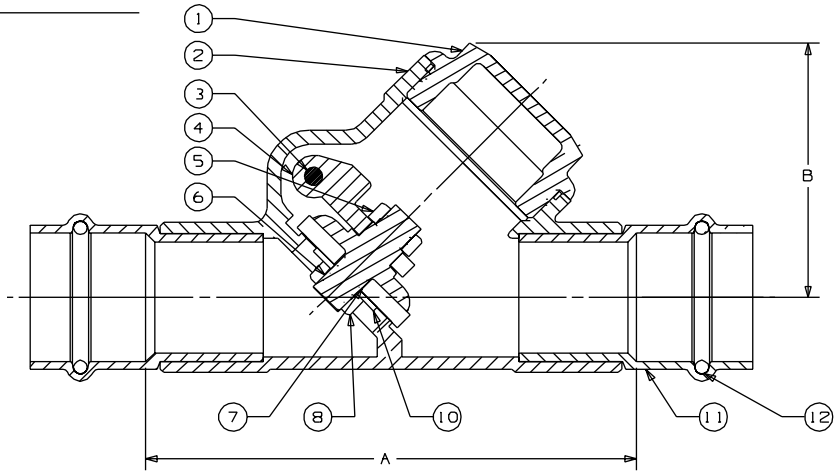
MATERIAL LIST

	PART	SPECIFICATION
1.	Bonnet	Bronze ASTM B 62 Alloy C83600
2.	Body	Bronze ASTM B 62 Alloy C83600
3.	Hinge Pin	Bronze ASTM B 140 Alloy C31400
4.	Disc Hanger	Bronze ASTM B 62 Alloy C83600 or 304 SS 1/2" and 3/4" sizes only
5.	Hanger Nut	Brass ASTM B 16 Alloy C36000
6.	Disc Holder	Bronze ASTM B 62 Alloy C83600
7.	Seat Disc	PTFE
8.	Seat Disc Nut	Brass ASTM B 16 Alloy C36000
9.	Hinge Pin Plug	Bronze ASTM B 140 Alloy C32000 (not shown)
*10.	Seat Disc Washer	ASTM B 98 Alloy C65500 or ASTM B 103
11.	Female Adapter (2)	Bronze ASTM B 61 Alloy C92200
12.	O-Ring (2)	EPDM

* Sizes 3/4" thru 2" only.

DIMENSIONS—WEIGHTS

Size		Dimensions A		Dimensions B		Weight	
In.	mm.	In.	mm.	In.	mm.	Lbs.	Kg.
½	15	2.72	69	1.54	39	.58	.26
¾	20	3.62	92	1.83	46	.96	.44
1	25	4.32	110	2.21	56	1.51	.69
1 ¼	32	4.92	125	2.69	68	2.29	1.04
1 ½	40	5.58	142	2.94	75	3.30	1.50
2	50	6.72	171	3.61	92	5.45	2.48



PF413-Y
P x P

NIBCO® Press System® check valves are designed to meet MSS SP-80 with the exception of the end connection. Male and female press-to-connect ends are new technology not yet covered in the current edition of this specification.

WARNING — Do not use for Reciprocating Air Compressor Service

NIBCO check valves may be installed in both horizontal and vertical lines with upward flow or in any intermediate position. They will operate satisfactorily in a declining plane (no more than 15º).

NIBCO® Press System® Bronze In-line Lift Check Valves

In-line Lift Type • Resilient Discs • Spring Actuated

Dezincification Resistant

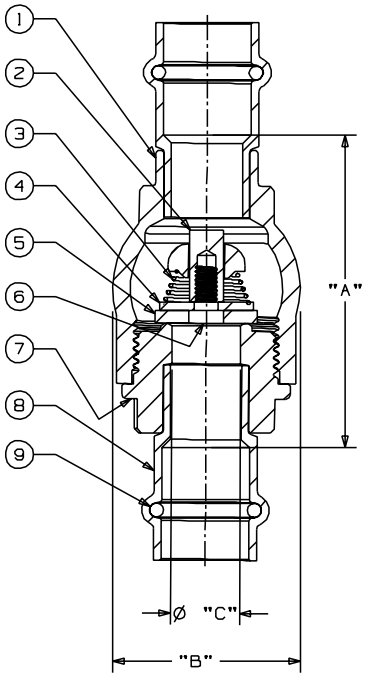
250 PSI/17.2 Bar Non-Shock Cold Working Pressure
250°F Maximum Operating Temperature

MATERIAL LIST

PART	SPECIFICATION
1. Body	Bronze ASTM B584 Alloy C84400
2. Stem	Stainless Steel ASTM A582 Alloy C30300
3. Spring	316 Stainless Steel
4. Disc Holder	Stainless Steel Type 301
5. Disc	PTFE
6. Seat Screw	Stainless Steel ASTM A276 Alloy S43000
7. Body End	Bronze ASTM B584 Alloy C84400
8. Adapter (2)	Bronze ASTM B61 Alloy C92200
9. O-Ring (2)	EPDM



PF480-Y
Press x Press
Female End



PF480-Y (PTFE Disc)
P x P

DIMENSIONS—WEIGHTS

Size		Dimensions A		B		C		Weight	
In.	mm.	In.	mm.	In.	mm.	In.	mm	Lbs.	Kg.
½	15	2.41	61	1.38	35	.50	13	0.52	0.24
¾	20	3.05	77	1.63	41	.75	19	0.75	0.34
1	25	3.56	90	2.00	51	1.00	25	1.18	0.54
1 ¼	32	3.86	98	2.38	60	1.25	32	1.72	0.78
1 ½	40	4.45	113	2.75	70	1.50	38	2.49	1.13
2	50	5.28	134	3.38	86	2.00	51	3.96	1.80

NIBCO® Press System® check valves may be installed in both horizontal and vertical lines with upward flow or in any intermediate position.

WARNING - Do Not Use for reciprocating air compressor service.

NOTE: 0.5 PSI pressure required to open spring.

NOTE: Check valves are down-rated from 250 PSI CWP to 200 PSI CWP to match the Press System.

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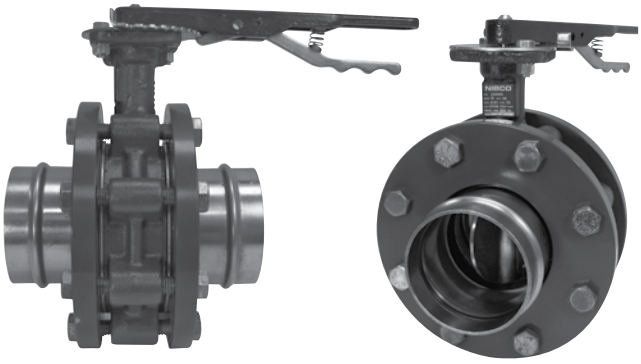
NIBCO® Press System® Butterfly Valves

Ductile Iron Body • Extended Neck • Geometric Drive
Molded-in Seat Liner • Lug Style with Press x Press Female Ends

Sizes 2 1/2" through 4"

200 PSI/13.8 Bar Non-Shock Cold Working Pressure
250°F Maximum Operating Temperature

CONFORMS TO MSS-SP67 • MSS-SP25 • API-609

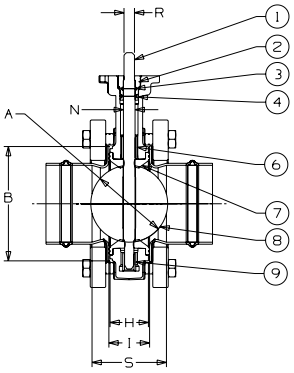


PFD2000
Lug Style
EPDM Liner
and Aluminum
Bronze Disc
Press x Press
Female End

MATERIAL LIST

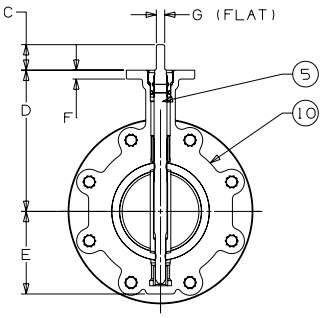
	PART	SPECIFICATION
1.	Stem	Stainless Steel ASTM A 582 Type 416
2.	Collar Bushing	Brass ASTM B 124
3.	Stem Seal	EPDM Rubber
4.	Body Seal	EPDM Rubber
5.	Nameplate	Aluminum
6.	Upper Bushing	Wrot Copper ASTM B 75 Alloy C12200
7.	Liner	EPDM Rubber
8.	Disc	Alum. Brz. ASTM B 148 Alloy 954/955
9.	Lower Bushing	Wrot Copper ASTM B 75 Alloy C12200
10.	Body Lug	Ductile Iron ASTM A 536
11.	Flange Body (2)	Carbon Steel
12.	Flange Gasket (2)	EPDM
13.	Flange Press Ends (2)	Wrot Copper ASTM B 75 Alloy C12200
14.	O-Ring (2)	EPDM
15.	Cap Screws	Carbon Steel

Available with lock lever handle or gear operator.

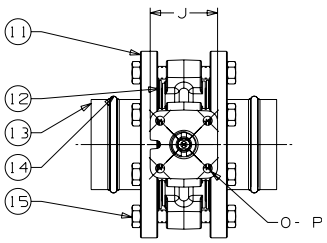


DIMENSIONS — WEIGHTS

Size In.	Size mm.	A	B	C	D	E	F	G Flat	Metal H	Rubber I
2½	65	2.90	4.69	1.25	5.88	3.27	.38	.370	1.812	1.938
3	80	3.15	5.12	1.25	6.12	3.40	.38	.370	1.812	1.938
4	100	4.09	6.12	1.25	6.88	4.00	.38	.403	2.062	2.188



Size In.	Size mm.	J Square	N Dia.	O B.C.	P Dia.	R Dia.	S No.	Lug Length	Total Weight Lbs.	Total Weight Kg.
2½	65	3.25	.562	3.25	.437	.500	3.13	Refer to page 47 for bolt lengths	24.00	10.88
3	80	3.25	.562	3.25	.437	.500	3.44		26.00	11.78
4	100	3.25	.625	3.25	.437	.562	4.00		38.00	17.23



NIBCO® Press System® butterfly valves are designed to meet MSS SP-67 with the exception of the end connection. Male and female press-to-connect ends are new technology not yet covered in the current edition of this specification.

NOT RECOMMENDED
FOR STEAM SERVICE

NIBCO® Press System® Bronze Ball Valves

Two-Piece Body • Full Port • Bronze Trim • Blowout-Proof Stem

Dezincification Resistant

600 PSI/41.4 Bar Non-Shock Cold Working Pressure
250°F Maximum Operating Temperature

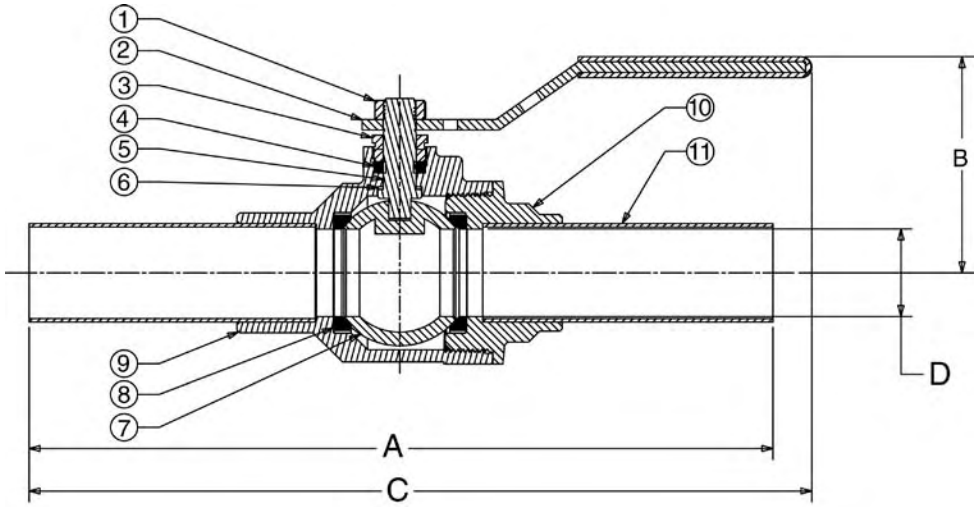
CONFORMS TO MSS SP-110

MATERIAL LIST

	PART	SPECIFICATION
1.	Handle Nut	Zinc Plated Steel
2.	Handle Assembly	Zinc Plated Steel with Plastisol Cover
3.	Pack Gland	Brass ASTM B 16 Alloy C36000
4.	Packing	PTFE
5.	Stem	Silicon Bronze ASTM B 371 Alloy C69430
6.	Thrust Washer	RPTFE
7.	Ball	Brass ASTM B 16 Alloy C36000 or ASTM B 124 Alloy C37700 (Chrome/Nickle Plated)
8.	Seat Ring (2)	RPTFE
9.	Body	Bronze ASTM B 584 Alloy C84400
10.	Body End Piece	Bronze ASTM B 584 Alloy C84400
11.	Stub Out (2)	Type "L" Copper Tube



PS585-70
Press x Press
Male End



PS585-70
P x P

DIMENSIONS—WEIGHTS

Size		Dimensions A		B		C		D		Weight	
In.	mm.	In.	mm.	In.	mm.	In.	mm.	In.	mm.	Lbs.	Kg.
½	15	6.56	167	1.88	48	7.25	184	.50	13	.73	.99
¾	20	7.25	184	2.25	57	8.25	210	.75	19	1.50	.68
1	25	7.75	197	2.38	60	8.63	219	1.00	25	2.05	.93
1 ¼	32	9.06	230	3.00	76	9.19	233	1.25	32	3.64	1.65
1 ½	40	9.99	254	3.16	80	11.69	297	1.50	38	5.73	2.60
2	50	10.72	272	3.50	89	12.06	306	2.00	51	8.11	3.68

NIBCO® Press System® ball valves are designed to meet MSS SP-110 with the exception of the end connection. Ball valves are down-rated from 600 PSI CWP to 200 PSI CWP to match the Press System®. Male and female press-to-connect ends are new technology not yet covered in the current edition of this specification.

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NIBCO® Press System® Bronze Ball Valves

Two-Piece Body • Full Port • Stainless Trim • Blowout-Proof Stem • Vented Ball

Dezincification Resistant

CLASSIFIED UL WATER QUALITY

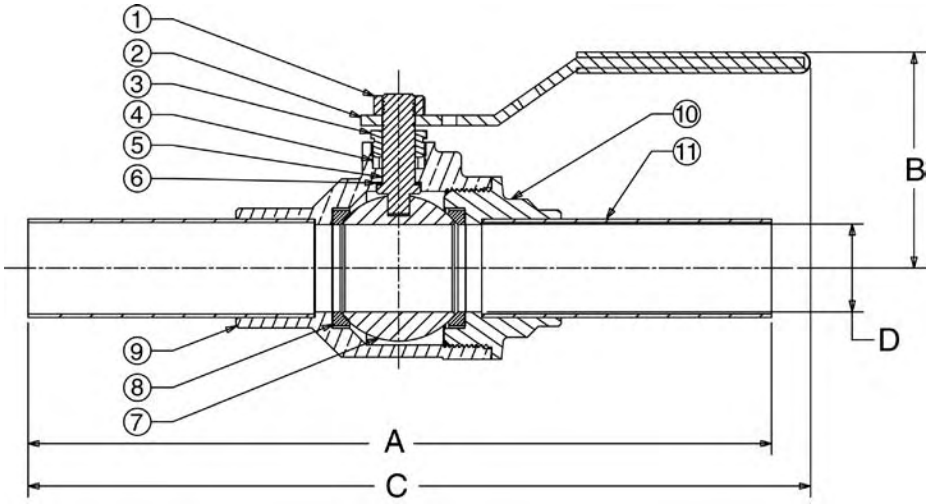
600 PSI/41.4 Bar Non-Shock Cold Working Pressure
250°F Maximum Operating Temperature
Nominal sizes 1/2" through 1" are UL certified to NSF/ANSI 61
CONFORMS TO MSS SP-110

MATERIAL LIST

	PART	SPECIFICATION
1.	Handle Nut	Zinc Plated Steel
2.	Handle Assembly	Zinc Plated Steel with Plastisol Cover
3.	Pack Gland	Brass ASTM B 16 Alloy C36000
4.	Packing	PTFE
5.	Stem	ASTM A 276 Alloy S31600 Stainless Steel
6.	Thrust Washer	RPTFE
7.	Ball	ASTM A 276 Alloy S31600 Stainless Steel
8.	Seat Ring (2)	RPTFE
9.	Body	Bronze ASTM B 584 Alloy C84400
10.	Body End Piece	Bronze ASTM B 584 Alloy C84400
11.	Stub Out (2)	Type "L" Copper Tube



PS585-70-66
Press x Press
Male End



PS585-70-66
P x P

DIMENSIONS—WEIGHTS

Size		Dimensions A		B		C		D		Weight	
In.	mm.	In.	mm.	In.	mm.	In.	mm.	In.	mm.	Lbs.	Kg.
½	15	6.56	167	1.88	48	7.25	184	.50	13	.73	.33
¾	20	7.25	184	2.25	57	8.25	210	.75	19	1.50	.68
1	25	7.75	197	2.38	60	8.63	219	1.00	25	2.05	.93
1 ¼	32	9.06	230	3.00	76	9.19	233	1.25	32	3.86	1.75
1 ½	40	9.99	254	3.16	80	11.69	297	1.50	38	5.79	2.63
2	50	10.72	272	3.50	89	12.06	306	2.00	51	8.84	4.00

NIBCO® Press System® ball valves are designed to meet MSS SP-110 with the exception of the end connection. Ball valves are down-rated from 600 PSI CWP to 200 PSI CWP to match the Press System®. Male and female press-to-connect ends are new technology not yet covered in the current edition of this specification.

NIBCO® Press System® Bronze Ball Valves

Two-Piece Body • Full Port • NIB-SEAL® Handle

Dezincification Resistant

600 PSI/41.4 Bar Non-Shock Cold Working Pressure
250°F Maximum Operating Temperature

CONFORMS TO MSS SP-110



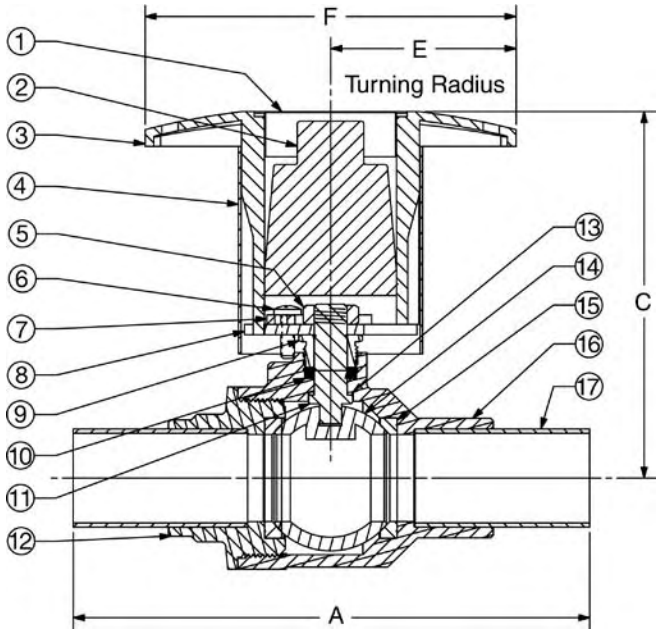
PS585-70-NS
Press x Press
Male End

MATERIAL LIST

	PART	SPECIFICATION
1.	Cap	Plastic
2.	Insulation	Styrofoam
3.	Extension Handle	Plastic
4.	Sleeve	Clear Plastic
5.	Handle Nut	Zinc Plated Steel
6.	Screw	Zinc Plated Steel
7.	Memory Stop Plate	Zinc Plated Steel
8.	Base Plate	Zinc Plated Steel
9.	Thread Pack Gland	Brass ASTM B 16 Alloy C36000
10.	Packing	PTFE
11.	Stem	Silicon Bronze ASTM B 371 Alloy C69430
12.	Body End	Bronze ASTM B 584 Alloy C84400
13.	Thrust Washer	RPTFE
14.	Ball	Brass ASTM B 16 Alloy C36000 (Chrome Plated)
15.	Seat Ring (2)	Reinforced PTFE
16.	Body	Bronze ASTM B 584 Alloy C84000
17.	Stub Out (2)	Type "L" Copper Tube

DIMENSIONS—WEIGHTS

Size		Dimensions A		C		E		F		Weight	
In.	mm.	In.	mm.	In.	mm.	In.	mm.	In.	mm.	Lbs.	Kg.
½	15	6.56	167	3.75	95	2.19	56	4.25	108	.97	.44
¾	20	7.25	184	4.00	101	2.19	56	4.25	108	1.74	.79
1	25	7.75	197	4.25	108	2.19	56	4.25	108	2.29	1.04
1 ¼	32	9.06	230	5.38	137	3.38	86	6.50	165	4.11	1.87
1 ½	40	9.99	254	5.56	141	3.38	86	6.50	165	6.20	2.81
2	50	10.72	272	5.88	149	3.38	86	6.50	165	8.58	3.89



PS585-70-NS
P x P

NIBCO® Press System® ball valves are designed to meet MSS SP-110 with the exception of the end connection. Ball valves are down-rated from 600 PSI CWP to 200 PSI CWP to match the Press System®. Male and female press-to-connect ends are new technology not yet covered in the current edition of this specification.

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NIBCO® Press System® Bronze Ball Valves

Two-Piece Body • Full Port • 316 SS Ball & Stem • NIB-SEAL® Handle

Dezincification Resistant

CLASSIFIED UL WATER QUALITY

600 PSI/41.4 Bar Non-Shock Cold Working Pressure
250°F Maximum Operating Temperature
Nominal sizes 1/2" through 1" are UL certified to NSF/ANSI 61

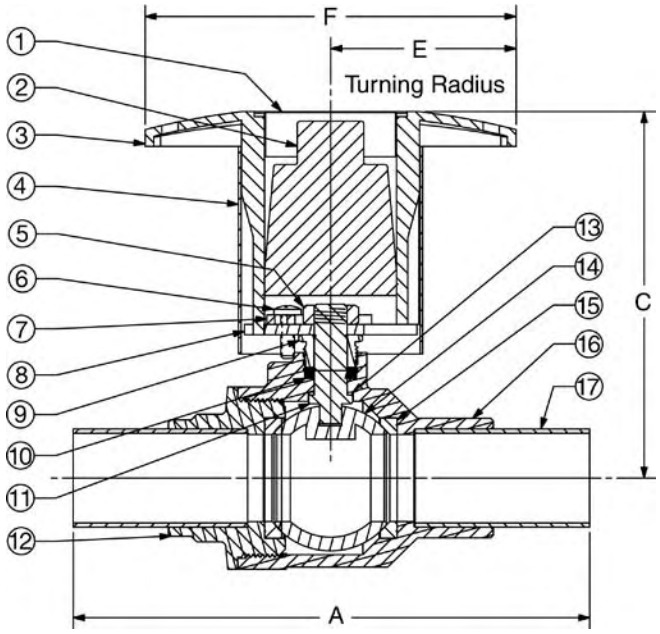
CONFORMS TO MSS SP-110



PS585-70-66-NS
Press x Press
Male End

MATERIAL LIST

	PART	SPECIFICATION
1.	Cap	Plastic
2.	Insulation	Styrofoam
3.	Extension Handle	Plastic
4.	Sleeve	Clear Plastic
5.	Handle Nut	Zinc Plated Steel
6.	Screw	Zinc Plated Steel
7.	Memory Stop Plate	Zinc Plated Steel
8.	Base Plate	Zinc Plated Steel
9.	Thread Pack Gland	Brass ASTM B 16 Alloy C36000
10.	Packing	PTFE
11.	Stem	ASTM A 276 Alloy S31600 Stainless Steel
12.	Body End	Bronze ASTM B 584 Alloy C84400
13.	Thrust Washer	RPTFE
14.	Ball	ASTM A 276 Alloy S31600 Stainless Steel
15.	Seat Ring (2)	Reinforced PTFE
16.	Body	Bronze ASTM B 584 Alloy C84000
17.	Stub Out (2)	Type "L" Copper Tube



PS585-70-66-NS
P x P

DIMENSIONS—WEIGHTS

Size		Dimensions A		C		E		F		Weight	
In.	mm.	In.	mm.	In.	mm.	In.	mm.	In.	mm.	Lbs.	Kg.
½	15	6.56	167	3.75	95	2.19	56	4.25	108	.97	.44
¾	20	7.25	184	4.00	101	2.19	56	4.25	108	1.74	.79
1	25	7.75	197	4.25	108	2.19	56	4.25	108	2.29	1.04
1 ¼	32	9.06	230	5.38	137	3.38	86	6.50	165	4.33	1.97
1 ½	40	9.99	254	5.56	141	3.38	86	6.50	165	6.26	2.84
2	50	10.72	272	5.88	149	3.38	86	6.50	165	9.31	4.22

NIBCO® Press System® ball valves are designed to meet MSS SP-110 with the exception of the end connection. Ball valves are down-rated from 600 PSI CWP to 200 PSI CWP to match the Press System®. Male and female press-to-connect ends are new technology not yet covered in the current edition of this specification.

NIBCO® Press System® Bronze Ball Valves

Two-Piece Body • Full Port • Bronze Trim • ¾" Hose Connection with Cap and Chain • Blowout-Proof Stem

600 PSI/41.4 Bar Non-Shock Cold Working Pressure
250°F Maximum Operating Temperature

CONFORMS TO MSS SP-110

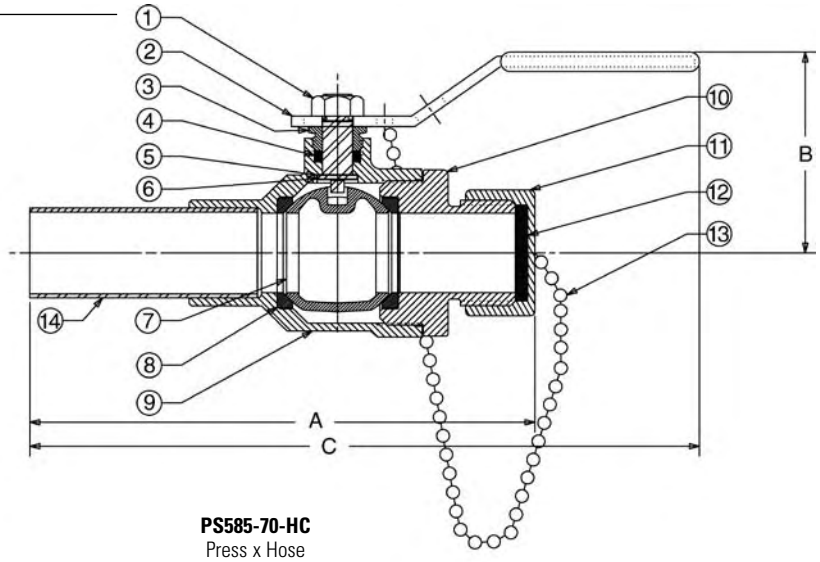
MATERIAL LIST

PART		SPECIFICATION
1.	Handle Nut	Zinc Plated Steel
2.	Handle	Zinc Plated Steel
3.	Pack Gland	Brass ASTM B 16 Alloy C36000
4.	Packing	PTFE
5.	Thrust Washer	RPTFE
6.	Stem	Silicon Bronze ASTM B 371 Alloy C69430
7.	Ball	Brass ASTM B 16 Alloy C36000 or ASTM B 124 Alloy C37700 (Chrome/Nickle Plated)
8.	Seat Rings	Reinforced PTFE
9.	Body Assembly	Bronze ASTM B 584 Alloy C84400
10.	Hose Body End	Brass ASTM B 124 Alloy C37700
11.	Cap	Die Cast Brass
12.	Gasket	Rubber
13.	Chain	Brass
14.	Stub Out	Type "L" Copper Tube

Cap is for hose end thread protection only. Not to be used for pressure containing purposes.



PS585-70-HC
Press Male x Hose End



PS585-70-HC
Press x Hose

DIMENSIONS—WEIGHTS

Size		Dimensions A		B		C		Weight	
In.	mm.	In.	mm.	In.	mm.	In.	mm.	Lbs.	Kg.
½	15	4.90	124	1.88	48	7.19	183	.81	.37
¾	20	5.47	139	2.25	57	8.25	210	1.54	.70

NIBCO® Press System® ball valves are designed to meet MSS SP-110 with the exception of the end connection. Ball valves are down-rated from 600 PSI CWP to 200 PSI CWP to match the Press System®. Male and female press-to-connect ends are new technology not yet covered in the current edition of this specification.

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NIBCO® Press System® Bronze Gate Valves

Dezincification Resistant

Screw-in Bonnet • Rising Stem • Solid Wedge

200 PSI/13.8 Bar Non-Shock Cold Working Pressure
250°F Maximum Operating Temperature

CONFORMS TO MSS SP-80

MATERIAL LIST

PART		SPECIFICATION
1.	Handwheel Nut	300 Series Stainless Steel
2.	Identification Plate	Aluminum
3.	Handwheel	Malleable Iron ASTM A 47
4.	Stem	Silicon Bronze ASTM B 371 Alloy C69430 or ASTM B 99 Alloy C65100
5.	Pack Nut	Brass ASTM B 16 Alloy C36000
6.	Pack Gland	Brass ASTM B 16 Alloy C36000
7.	Packing	Aramid Fibers with Graphite
8.	Bonnet	Bronze ASTM B 62 Alloy C83600
9.	Body Assembly	Bronze ASTM B 62 Alloy C83600
10.	Wedge	Bronze ASTM B 62 Alloy C83600
11.	Stub Out (2)	Type "L" Copper Tube

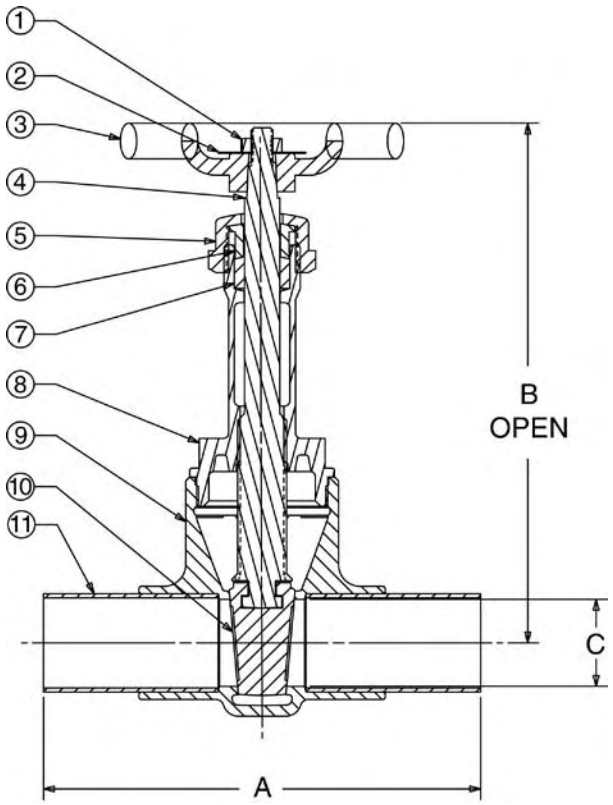


PS111
Press x Press
Male End

DIMENSIONS—WEIGHTS

Size		Dimensions A		B		C		Weight	
In.	mm.	In.	mm.	In.	mm.	In.	mm.	Lbs.	Kg.
½ †	15	5.75	146	4.81	122	.50	13	.86	.39
¾	20	6.38	162	5.81	148	.75	19	1.30	.59
1	25	6.82	173	7.09	180	1.00	25	2.10	.95
1 ¼	32	7.13	181	8.13	206	1.25	32	2.98	1.35
1 ½	40	7.43	189	9.81	249	1.50	38	4.03	1.83
2	50	7.99	203	11.56	294	2.00	51	6.24	2.83

† No packing gland, packing only in this size.



PS111
P x P

NIBCO® Press System® gate valves are designed to meet MSS SP-80 with the exception of the end connection. Male and female press-to-connect ends are new technology not yet covered in the current edition of this specification.

NIBCO® Press System® Bronze Gate Valves

Screw-in Bonnet • Non-Rising Stem • Solid Wedge

Dezincification Resistant

200 PSI/13.8 Bar Non-Shock Cold Working Pressure
250°F Maximum Operating Temperature



PS113
Press x Press
Male End

CONFORMS TO MSS SP-80

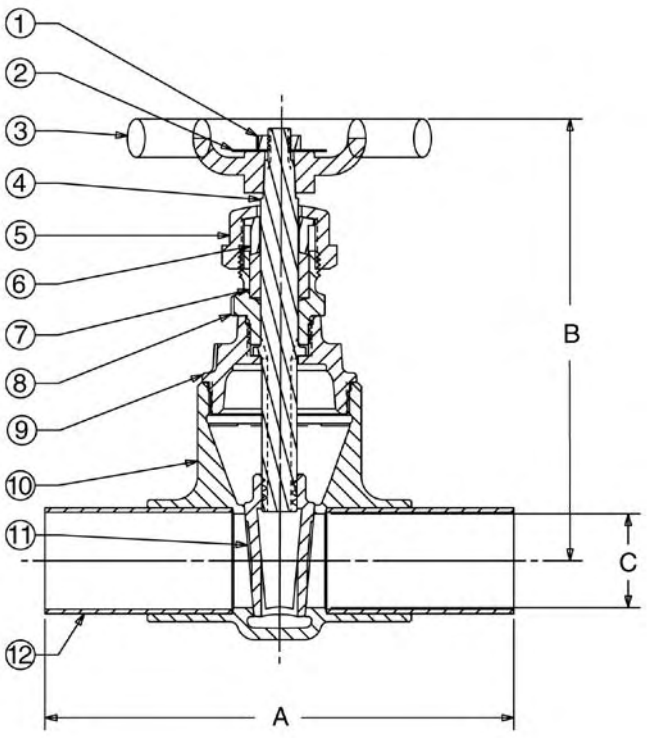
MATERIAL LIST

	PART	SPECIFICATION
1.	Handwheel Nut	300 Series Stainless Steel
2.	Identification Plate	Aluminum
3.	Handwheel	Malleable Iron ASTM A 47
4.	Stem	Silicon Bronze ASTM B 371 Alloy C69430 or ASTM B 99 Alloy C65100
5.	Pack Nut	Brass ASTM B 16 Alloy C36000
6.	Pack Gland	Brass ASTM B 16 Alloy C36000
7.	Packing	Aramid Fibers with Graphite
8.	Stuffing Box	Bronze ASTM B 62 Alloy C83600
9.	Bonnet	Bronze ASTM B 62 Alloy C83600
10.	Body Assembly	Bronze ASTM B 62 Alloy C83600
11.	Wedge	Bronze ASTM B 62 Alloy C83600
12.	Stub Out (2)	Type "L" Copper Tube

DIMENSIONS—WEIGHTS

Size		Dimensions A		B		C		Weight	
In.	mm.	In.	mm.	In.	mm.	In.	mm.	Lbs.	Kg.
½ †	15	5.75	146	3.63	92	.50	13	.80	.36
¾	20	6.38	162	3.91	99	.75	19	1.22	.55
1	25	6.82	173	4.69	119	1.00	25	1.93	.88
1 ¼	32	7.13	181	5.22	133	1.25	32	2.71	1.23
1 ½	40	7.43	189	6.25	159	1.50	38	3.78	1.72
2	50	7.99	203	7.06	179	2.00	51	5.61	2.54

†No packing gland, packing only in this size.



PS113
P x P

NIBCO® Press System® gate valves are designed to meet MSS SP-80 with the exception of the end connection. Male and female press-to-connect ends are new technology not yet covered in the current edition of this specification.

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NIBCO® Press System® Bronze Globe Valves

Dezincification Resistant

Screw-in Bonnet • Integral Seat • Renewable Seat and Disc

200 PSI/13.8 Bar Non-Shock Cold Working Pressure
250°F Maximum Operating Temperature

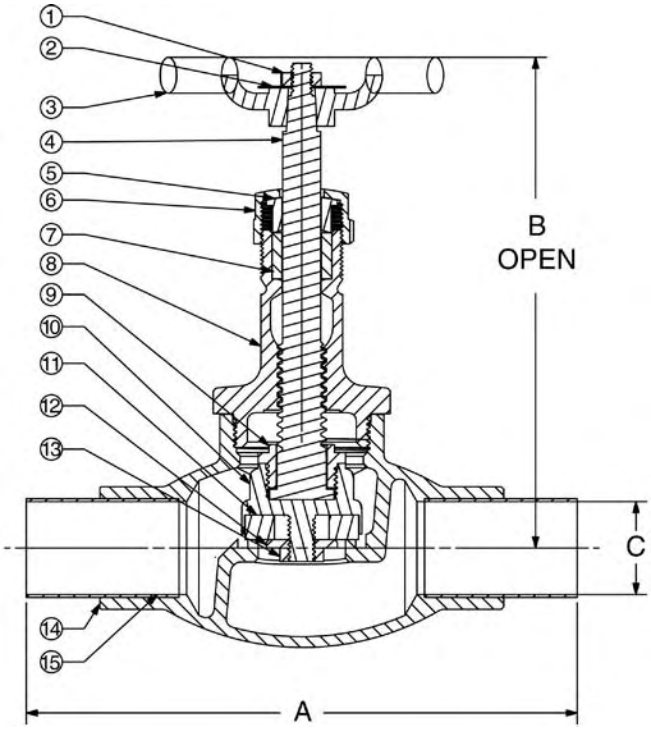


PS211-Y
Press x Press
Male End

CONFORMS TO MSS SP-80

MATERIAL LIST

	PART	SPECIFICATION
1.	Handwheel Nut	300 Series Stainless Steel
2.	Identification Plate	Aluminum
3.	Handwheel	Malleable Iron ASTM A 47
4.	Stem	Silicon Bronze ASTM B 371 Alloy C69430
5.	Pack Gland	Brass ASTM B 16 Alloy C36000
6.	Pack Nut	Brass ASTM B 16 Alloy C36000
7.	Packing	Aramid Fibers with Graphite
8.	Bonnet	Bronze ASTM B 62 Alloy C83600
9.	Disc Holder Nut	Bronze ASTM B 62 Alloy C83600
10.	Disc Holder	Bronze ASTM B 62 Alloy C83600
11.	Disc	PTFE
12.	Disc Washer	304 Stainless Steel
13.	Disc Nut	Bronze ASTM B 98 Alloy C65100
14.	Body Assembly	Bronze ASTM B62 Alloy C83600
15.	Stub Out (2)	Type "L" Copper Tube



PS211-Y
P x P

DIMENSIONS—WEIGHTS

Size		Dimensions A		B		C		Weight	
In.	mm.	In.	mm.	In.	mm.	In.	mm.	Lbs.	Kg.
*½†	15	6.69	170	3.38	86	.50	13	1.08	.49
¾	20	7.75	197	4.88	124	.75	19	2.03	.92
1	25	8.63	219	5.69	145	1.00	25	3.20	1.45
1¼	32	9.00	229	6.13	156	1.25	32	4.01	1.82
1½	40	9.74	247	7.38	187	1.50	38	6.31	2.86
2	50	11.12	282	7.94	202	2.00	51	9.92	4.50

† No packing gland, packing only in this size.

* Stem and disc (or disc holder) are integral.

NIBCO® Press System® globe valves are designed to meet MSS SP-80 with the exception of the end connection. Male and female press-to-connect ends are new technology not yet covered in the current edition of this specification.

NIBCO® Press System® Bronze Angle Valves

Screw-in Bonnet • Integral Seat • Renewable Seat and Disc

Dezincification Resistant

200 PSI/13.8 Bar Non-Shock Cold Working Pressure
250°F Maximum Operating Temperature



PS311-Y
Press x Press
Male End

CONFORMS TO MSS SP-80

MATERIAL LIST

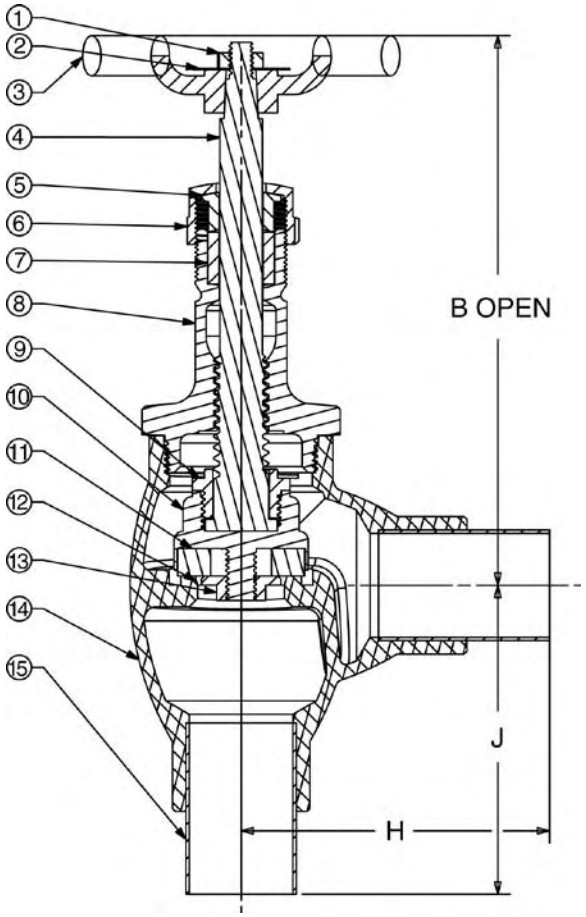
	PART	SPECIFICATION
1.	Handwheel Nut	300 Series Stainless Steel
2.	Identification Plate	Aluminum
3.	Handwheel	Malleable Iron ASTM A 47
4.	Stem	Silicon Bronze ASTM B 371 Alloy C69430
5.	Pack Gland	Brass ASTM B 16 Alloy C36000
6.	Pack Nut	Brass ASTM B 16 Alloy C36000
7.	Packing	Aramid Fibers with Graphite
8.	Bonnet	Bronze ASTM B 62 Alloy C83600
9.	Disc Holder Nut	Bronze ASTM B 62 Alloy C83600
10.	Disc Holder	Bronze ASTM B 62 Alloy C83600
11.	Disc	PTFE
12.	Disc Washer	304 Stainless Steel
13.	Disc Nut	Silicon Bronze ASTM B 96 Alloy C65100
14.	Body	Bronze ASTM B 62 Alloy C83600
15.	Stub Out (2)	Type "L" Copper Tube

DIMENSIONS—WEIGHTS

Size		Dimensions B		H		J		Weight	
In.	mm.	In.	mm.	In.	mm.	In.	mm.	Lbs.	Kg.
*½ †	15	3.50	89	3.38	86	3.38	86	1.08	.49
¾	20	4.94	126	3.88	99	3.88	99	1.94	.88
1	25	5.75	146	4.35	110	4.35	110	3.12	1.42
1 ¼	32	6.13	156	4.47	114	4.47	114	4.23	1.92
1 ½	40	7.25	179	4.84	123	4.84	123	5.31	2.41
2	50	8.13	206	5.50	140	5.50	140	9.74	4.42

† No packing gland, packing only in this size.

* Stem and Disc or Disc Holder are integral.



PS311-Y
P x P

NIBCO® Press System® angle valves are designed to meet MSS SP-80 with the exception of the end connection. Male and female press-to-connect ends are new technology not yet covered in the current edition of this specification.

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NIBCO® Press System® Bronze Check Valves

Horizontal Swing • Regrinding Type • Y-Pattern • Renewable Seat and Disc

Dezincification Resistant

200 PSI/13.8 Bar Non-Shock Cold Working Pressure
250°F Maximum Operating Temperature

CONFORMS TO MSS SP-80



PS413-Y
Press x Press
Male End

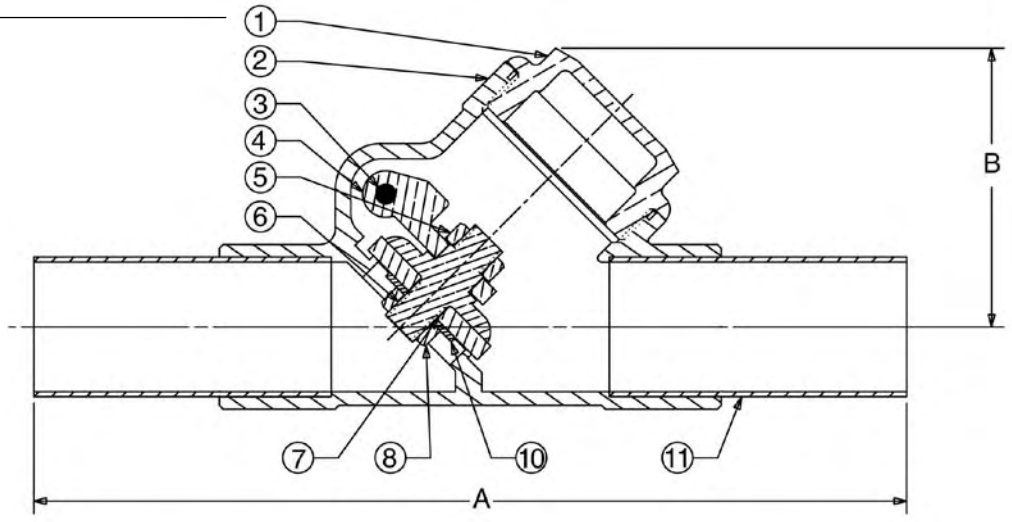
MATERIAL LIST

	PART	SPECIFICATION
1.	Bonnet	Bronze ASTM B 62 Alloy C83600
2.	Body	Bronze ASTM B 62 Alloy C83600
3.	Hinge Pin	Bronze ASTM B 140 Alloy C31400
4.	Disc Hanger	Bronze ASTM B 62 Alloy C83600 or 304 SS 1/2" and 3/4" only
5.	Hanger Nut	Brass ASTM B 16 Alloy C36000
6.	Disc Holder	Bronze ASTM B 62 Alloy C83600
7.	Seat Disc	PTFE
8.	Seat Disc Nut	Brass ASTM B 16 Alloy C36000
9.	Hinge Pin Plug	Bronze ASTM B 140 Alloy C32000 (not shown)
*10.	Seat Disc Washer	ASTM B 98 Alloy C65500 or ASTM B 103
11.	Stub Out (2)	Type "L" Copper Tube

* Sizes 3/4" thru 2" only.

DIMENSIONS—WEIGHTS

Size		Dimensions A		Dimensions B		Weight	
In.	mm.	In.	mm.	In.	mm.	Lbs.	Kg.
½	15	6.50	165	1.54	39	.68	.31
¾	20	7.38	187	1.83	46	1.11	.50
1	25	8.07	205	2.21	56	1.81	.82
1¼	32	8.69	221	2.69	68	2.68	1.22
1½	40	9.31	236	2.94	75	3.61	1.64
2	50	10.43	265	3.61	92	5.88	2.67



PS413-Y
P x P

NIBCO® Press System® check valves are designed to meet MSS SP-80 with the exception of the end connection. Male and female press-to-connect ends are new technology not yet covered in the current edition of this specification.

WARNING — Do not use for Reciprocating Air Compressor Service

NIBCO check valves may be installed in both horizontal and vertical lines with upward flow or in any intermediate position. They will operate satisfactorily in a declining plane (no more than 15º).

NIBCO® Press System® Bronze Ring Check® Valve

Dezincification Resistant

In-line Lift Type • Resilient Discs • Spring Actuated

250 PSI/17.2 Bar Non-Shock Cold Working Pressure
250°F Maximum Operating Temperature



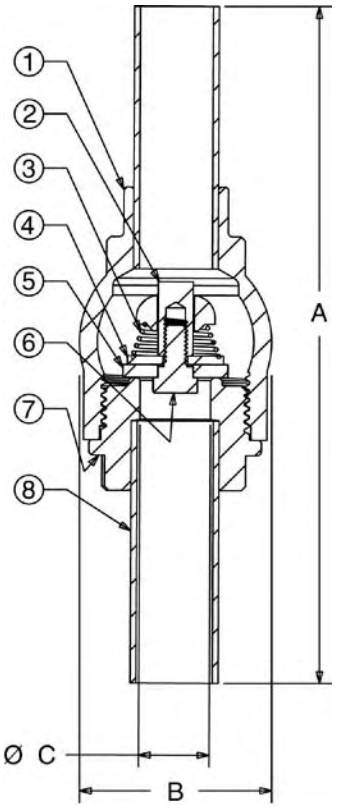
PS480-Y
Press x Press
Male End

MATERIAL LIST

	PART	SPECIFICATION
1.	Body	Bronze ASTM B 584 Alloy C84400
2.	Stem	Stainless Steel ASTM A 582 Alloy C30300
3.	Spring	316 Stainless Steel
4.	Disc Holder	Stainless Steel Type 301
5.	Disc	PTFE
6.	Seat Screw	Stainless Steel ASTM A 276 Alloy S43000
7.	Body End	Bronze ASTM B 584 Alloy C84400
8.	Stub Out (2)	Type "L" Copper Tube

DIMENSIONS—WEIGHTS

Size		Dimensions A		B		C		Weight	
In.	mm.	In.	mm.	In.	mm.	In.	mm.	Lbs.	Kg.
½	15	6.19	157	1.38	35	.50	13	.53	.24
¾	20	6.81	173	1.63	41	.75	19	.75	.34
1	25	7.32	186	2.00	51	1.00	25	1.18	.54
1 ¼	32	7.63	194	2.38	60	1.25	32	1.74	.79
1 ½	40	8.18	208	2.75	70	1.50	38	2.36	1.07
2	50	8.99	228	3.38	86	2.00	51	3.71	1.68



PS480-Y (PTFE Disc)
P x P

NIBCO check valves may be installed in both horizontal and vertical lines with upward flow or in any intermediate position.

WARNING – Do Not Use for reciprocating air compressor service.

NOTE: 0.5 PSI pressure required to open spring.

NOTE: Check valves are down-rated from 250 PSI CWP to 200 PSI CWP to match the Press System.

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NIBCO® Press System® Bronze Ring Check® Valve

Dezincification Resistant

In-line Lift Type • Resilient Discs • Spring Actuated • Double Union End

250 PSI/17.2 Bar Non-Shock Cold Working Pressure
250°F Maximum Operating Temperature



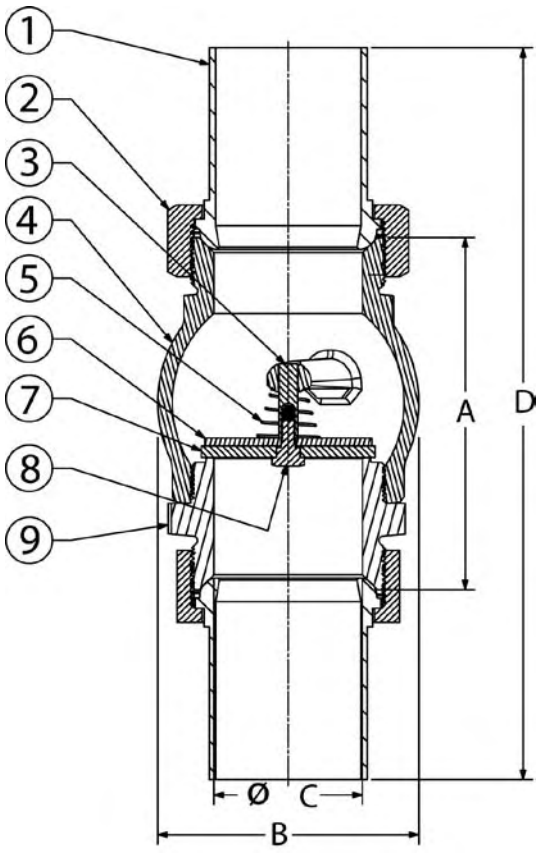
PCM480-Y
Press x Press
Male End

MATERIAL LIST

PART	SPECIFICATION
1. Tail Piece (2)	Copper C12200
2. Union Nut (2)	Bronze ASTM B 584 Alloy C84400
3. Stem	303 Stainless Steel
4. Body	Bronze ASTM B 584 Alloy C84400
5. Spring	316 Stainless Steel
6. Disc Holder	301 Stainless Steel
7. Disc	PTFE
8. Seat Screw	430 Stainless Steel
9. End	Bronze ASTM B 584 Alloy C84400

DIMENSIONS—WEIGHTS

Size		Dimensions A		B		C		D		Weight	
In.	mm.	In.	mm.	In.	mm.	In.	mm.	In	mm.	Lb.	Kg.
½	15	2.83	72	1.39	35	.52	13	5.49	139	1.06	.48
¾	20	2.88	73	1.64	42	.75	19	5.72	145	1.44	.65
1	25	3.50	89	2.09	53	1.00	25	6.53	166	2.45	1.11
1 ¼	32	3.74	95	2.42	61	1.25	32	7.66	195	3.43	1.56
1 ½	40	4.23	107	2.86	73	1.50	38	8.81	224	4.86	2.20
2	50	4.75	121	3.52	89	2.00	51	9.87	251	7.50	3.40



PCM480-Y (PTFE Disc)
P x P

NIBCO 480 check valves may be installed in both horizontal and vertical lines with upward flow or in any intermediate position.

WARNING – Do Not Use for reciprocating air compressor service.

NOTE: 0.5 PSI pressure required to open spring.

NOTE: Check valves are down-rated from 250 PSI CWP to 200 PSI CWP to match the Press System.

NIBCO® Press System® Bronze Ball Valves

Two-Piece Body • Full Port • Stainless Ball • Blowout-Proof Stem • Double Union End

Dezincification Resistant

600 PSI/41.4 Bar Non-Shock Cold Working Pressure
250°F Maximum Operating Temperature

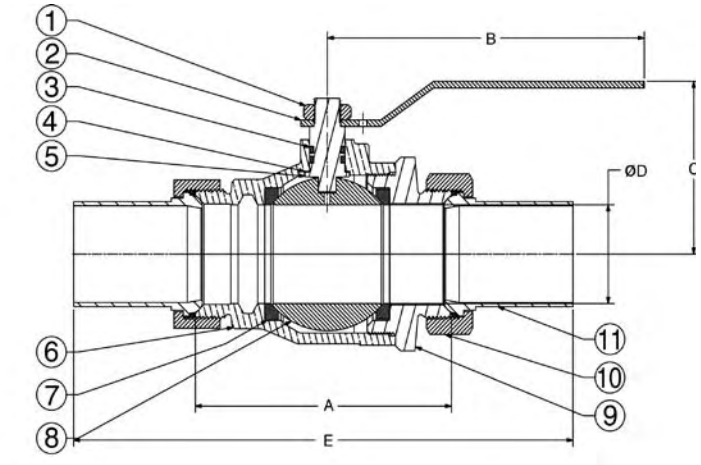
CONFORMS TO MSS SP-110

MATERIAL LIST

	PART	SPECIFICATION
1.	Handle Nut	Zinc Plated Steel
2.	Handle	Zinc Plated Steel with Plastisol Cover
3.	Stem Seal O-Ring (2)	FKM (Fluoroelastomer)
4.	Thrust Washer	RPTFE
5.	Stem	Silicon Bronze ASTM B 371 Alloy C69430
6.	Body	Bronze ASTM B584 Alloy C84000
7.	Seat Ring	Reinforced PTFE
8.	Ball	ASTM A 276 Alloy 316 Stainless Steel
9.	Body End Piece	Bronze ASTM B 584 Alloy C84000
10.	Union Nut (2)	Bronze ASTM B 584 Alloy C84000
11.	Tail Piece (2)	Copper C12200



PCM585-60
Press x Press
Male End



PCM585-60
P x P

DIMENSIONS—WEIGHTS

Size		Dimensions A		B		C		D		E		Weight	
In.	mm.	In.	mm.	In.	mm.	In.	mm.	In.	mm.	In.	mm.	Lbs.	Kg.
½	15	2.67	68	3.90	99	1.85	47	.50	13	5.32	135	1.22	.55
¾	20	3.22	82	4.66	118	2.22	56	.75	19	6.06	154	2.09	.95
1	25	3.99	101	4.66	118	2.41	61	1.00	25	7.03	179	3.45	1.56
1 ¼	32	4.78	121	6.69	170	3.03	77	1.25	32	8.70	221	5.52	2.50
1 ½	40	5.00	127	6.69	170	3.26	83	1.50	38	9.58	243	7.61	3.45
2	50	5.41	137	6.69	170	3.50	89	2.00	51	10.54	268	11.34	5.14

NIBCO® Press System® ball valves are designed to meet MSS SP-110 with the exception of the end connection. Ball valves are down-rated from 600 PSI CWP to 200 PSI CWP to match the Press System®. Male and female press-to-connect ends are new technology not yet covered in the current edition of this specification.

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Class 125 Bronze Y-Strainers

Screw-in Cap • Tapped Cap w/ Blow-off Plug or Solid Cap
• 20 Mesh SS Screen or SS Perforated Screen

200 PSI/13.8 Bar Non-Shock Cold Working Pressure
250° F Maximum Operating Temperature

CONFORMS TO MSS SP-110

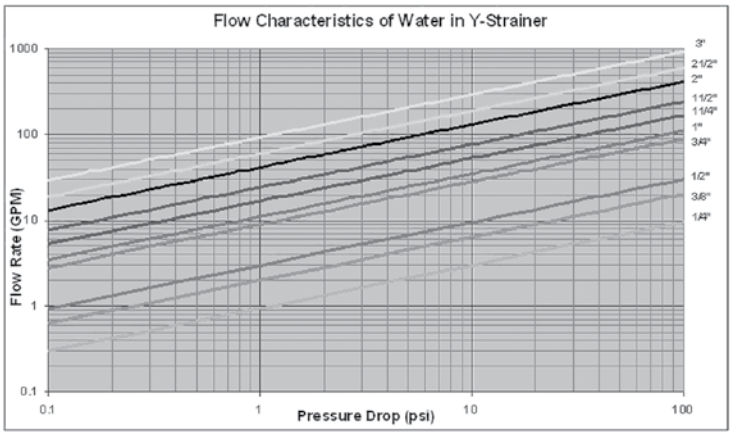
MATERIAL LIST

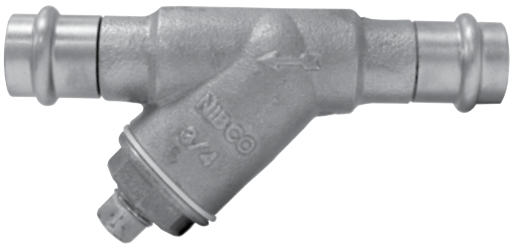
PART	SPECIFICATION
1. Body	Bronze ASTM B584 Alloy C84400
2. Cap	Bronze ASTM B62 Alloy C83600
3. Gasket	PTFE
4. Screen	ASTM E2016 20 Mesh - 304 Stainless Steel or ASTM E674 Perforated - 304 Stainless Steel
5. Plug	Brass ASTM B16 Alloy C36000 or Bronze ASTM B584 Alloy C84400
6. Female Adapter (2)	Bronze ASTM B61 Alloy C92200
7. O-Ring (2)	EPDM

END CONNECTION	SCREEN	CAP
PF- Female Press	221 - 20 Mesh (STD.)	A - Tapped Cap w/Plug (STD.)
PF - Female Press	222 - Perforated	B - Solid Cap

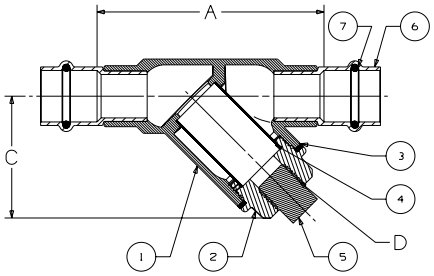
DIMENSIONS—WEIGHTS—QUANTITIES

Size		Dimensions A		C		D	Weight	
In.	mm.	In.	mm.	In.	mm.	Threads	Lbs.	Kg.
½	15	2.96	75	1.79	45	1/4 NPT	0.66	0.30
¾	20	3.94	100	2.14	54	3/8 NPT	1.21	0.55
1	25	4.66	118	2.79	71	3/8 NPT	1.88	0.86
1¼	32	5.47	139	3.23	82	3/4 NPT	3.10	1.41
1½	40	6.05	154	3.61	92	3/4 NPT	4.64	2.10
2	50	7.40	188	4.99	127	1 NPT	7.48	3.39

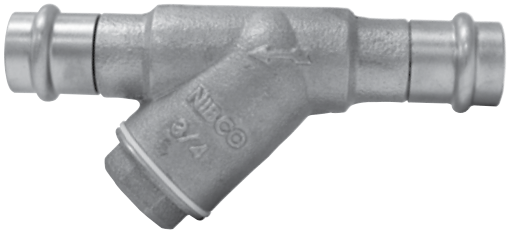




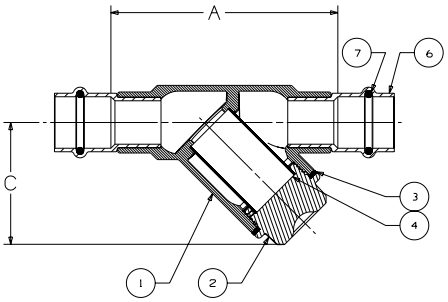
PF221/222-A
Press x Press
Female End



PF221/222-A
P x P



PF221/222-B
Press x Press
Female End



PF221/222-B
P x P

NIBCO® Press System® Ball Valve Handle Options

A wide variety of handles are available to fulfill safety and operation requirements in various processing and manufacturing industries. The lever handle with plastic cover is standard. Other handle options are shown. Stainless steel lever handles are available, as an option, also with plastic covers. If an optional handle is desired, please indicate which one when ordering. Many of these options are field assembly only.

 **CS Standard Lever Handle**	 **CS Extended Lever Handle with Memory Stop**	 **NIB-SEAL® Handle**
 **CS Locking Lever Handle**	 **CS Round Handle**	 **Vertical Chain Lever**
 **SS Standard Lever Handle**	 **CS Extended Round Handle**	 **Horizontal Chain Lever**
 **SS Locking Lever Handle**	 **CS Wing Handle**	 **Memory Stop Kit**
 **CS Extended Lever Handle**		

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NIBCO® Press System® Bronze Ball Valves
NIB-SEAL® Technical Data

NIBCO® bronze ball valves installed with NIB-SEAL® insulated handles are the only approach that keeps your insulated piping system completely intact.

The revolutionary NIB-SEAL® bronze ball valve stops condensate cold. Its unique thermal barrier design keeps moisture from infiltrating your insulated system while preventing thermal energy loss through exposed metal handles.

Designed for new installations or retrofitting existing systems, NIB-SEAL bronze ball valves offer a wide range of advantages for typical commercial HVAC systems as well as industrial applications where insulated piping is desirable.

- Protective sleeve provides a stationary surface to affix the insulation, allowing operation and maintenance of the valve without destroying the integrity of the insulated system.
- High-strength cylindrical handle design features easy access to standard adjustable memory stop for system balancing. The valve packing is also readily accessible for routine maintenance.
- Cap and insulating plug provide a vapor seal to prevent exchange of air to maximize the efficiency of your insulated piping system.
- Position indicators allow at-a-glance determination of whether valve is in open or closed position.
- Pre-formed hole allows for convenient tagging.



Cap keeps moisture-laden air out to reduce chance of condensate formation

Insulation plug provides vapor seal, keeping air from infiltrating the insulated system

Handle nut

Indicator gives at-a-glance valve position

Memory stop plate and screws for system balancing

Pre-formed hole for identification tag

Extension handle of durable non-thermal conductive material prevents formation of condensation

Protective sleeve allows operation of valve handle and maintenance of valve packing while maintaining integrity of piping insulation

NIBCO® Press System® bronze ball valve is an integral part of the NIB-SEAL® valve system

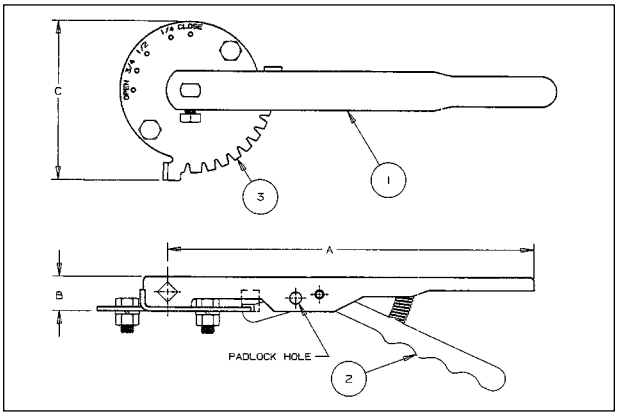
Temperature range: 15° F to 250° F

US PATENT 5,236,006

Butterfly Valve Options and Accessories

Lever-Lock Operator (Standard)

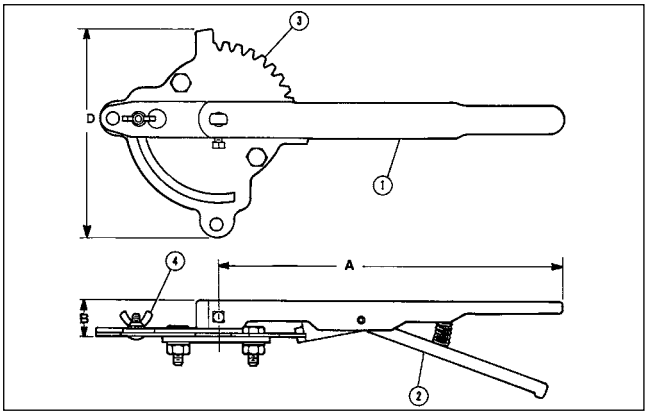
PFD2000



The lever-lock handle and throttling plate provide throttling notches every 10^{0} for excellent manual control in balancing up to 90^{0} or shut off service. The valve may be padlocked in any one of the positions including opened or closed by virtue of a locking hole located in the handle and lever.

Position-Lock Operator (Optional)

PFD2000



The position-lock can be used to set the valve in any position or as a memory stop so the valve may be reopened to the previous position. The valve may be padlocked in full open or full closed position.

Ordering: Sold as a field retrofitable kit only.

MATERIAL LIST

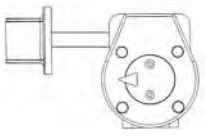
	PART	SPECIFICATION
1.	Handle	Polymer Coated Iron
2.	Lever-Lock	Zinc Plated Steel
3.	Throttle Plate	Zinc Plated Steel

DIMENSIONS AND TORQUE OUTPUT

PFD Lever Size	Throttle Plate (STD)	Throttle Plate/ (STD)	Infinite Pos. Kit	Dimensions				Torque Rated Output in Inch-Pounds	
				A	B	C	D	At 60 pounds Pull	At 100 pounds Pull
2½"-3"	T115107PP	T115138PP	T114841FG	10½	1	4⅝	6 3/16	540 In-Lbs.	900 In-Lbs.
4	T115108PP	T115138PP	T114842FG	10½	1	4⅝	6 3/16	540 In-Lbs.	900 In-Lbs.

Gear Operator options and accessories (2 1/2" through 4" 2000 series only)

2" Square Operating Nut

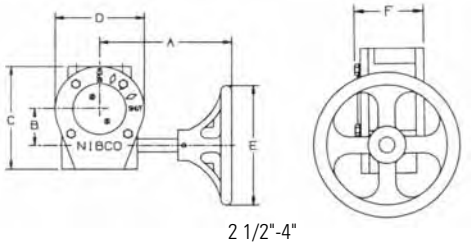


Memory Stop



Flag Indicator





Consult factory for: Square Operating Nut, Memory Stop and Flag Indicator

2 1/2"-4"

Cast Iron Gear Operator

The NIBCO® butterfly valve can be provided with heavy-duty operator and indicator. Recommended for valves 8" and larger, for trouble-free operation in all moisture and weather conditions (not submersible). Operator is a self-locking worm gear type. Equipped with adjustable stops at open and shut positions. Ordering: Specify by adding (-5) to Fig. No., i.e., PFD2000-5. Babbit Sprocket may be added to handwheel. See below for sizing information. Available options: Memory Stop Gear Operator Kit, 2" Square Operating Nut, Flag Indicator and Handwheel for GO.

GEAR OPERATOR DETAIL FOR SIZES 2 1/2" TO 4" (PFD2000 ONLY)										GEAR OPERATOR ACCESSORIES & REPLACEMENT PARTS					
PFD VALVE	GEAR OPERATOR NUMBER	RATIO	GEAR OP WEIGHT	DIMENSIONS (INCHES)						STEM ADAPTER BUSHING	SPROCKET RIM MODEL	SQUARE OPERATING NUT	FLAG INDICATOR	MEMORY STOP KIT	REPLACEMENT HANDWHEEL
				A	B	C	D	E	F						
2½ - 3	T117118PP	24:1	10	7.64	1.77	5.04	4.24	5.91	2.79	T046653PP	#1½	T117792FC	T116682PP	T026196PP	T117122PP
4	T117118PP	24:1	10	7.64	1.77	5.04	4.24	5.91	2.79	T046654PP	#1½	T117792FC	T116682PP	T026196PP	T117122PP

Notes - 1. Stem adapter bushing must be ordered seperately when needed for smaller size valves.
2. All other accessories must be ordered separately. (Sprocket rim, square operator nut, flag indicator & memory stop kit.)
3. Gear operator comes with handwheel.

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Butterfly Valve Technical Information

Valve Installation Procedure

Always position the connecting pipe flanges accurately in the line, allowing sufficient space between the flanges for the valve. Make sure the pipe flange faces are clean of any foreign material such as scale, metal shavings or welding slag. Valves should be installed with the disc in the closed position to prevent damage to sealing surfaces.

1. Carefully insert the valves between the pipe flanges. Do not apply any lubricants to the seat faces as this may damage them.
2. Line up, center and secure the valve between flanges using desired bolts or studs as listed in Table 4. Do not tighten bolts at this time.
3. Carefully open the valve to assure free unobstructed disc movement. Disc interference may result when valves are installed in pipelines having smaller than normal inside diameters, such as heavy wall pipe, plastic-lined pipe, as-cast flanges or reducing flanges. Interference can also occur when connecting directly to a swing check or silent check. Suitable corrective measures must be taken to remove these obstructions, such as taper boring the pipe or installing a spacer or spool piece.
4. After proper operation is verified, tighten the bolts using a cross-over pattern (Fig. 1) to the minimum recommended bolt torques listed in Table 3.
5. Pressurize piping to valve and inspect for leakage. If leakage is observed, tighten bolts using cross-over pattern, increasing torque until leak stops. DO NOT EXCEED MAXIMUM TORQUES LISTED IN TABLE 3.
6. Recommended torques are made without warranty. Installer must verify proper strength bolts for application. Bolts shall be clean and un-lubricated.

Caution

1. *Class 250 cast iron and Class 300 steel flanges **can not** be used on these valves.*
2. *Rubber faced or mechanical flanges are **not** recommended.*
3. *This valve is **not recommended** for steam service.*
4. *Valves should **not** be assembled to the flanges and then welded into the piping system.*
5. *Do not install EPDM liner in compressed air lines.*

Table 3 Recommended Bolt Tightening Torques

Flange Size	Bolt Size	Minimum Bolt Torque (ft.•lbs.)	Maximum Bolt Torque (ft.•lbs.)
2 1/2"- 4"	5/8"	20	70

Bolt Tightening Cross Over Pattern

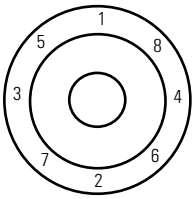
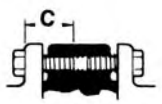


Fig. 1

Table 4 Recommended Bolt Lengths

VALVE SIZE 1000/2000/3000 SERIES ONLY	TOTAL VALVE BODY WIDTH	ANSI B16.1 **CLASS 125 CAST IRON** FLANGE THICKNESS	ANSI B16.5 **CLASS 150 STEEL** FLANGE THICKNESS	ANSI B16.47 (SERIES A) **CLASS 150 STEEL MSS SP-44** FLANGE THICKNESS	ANSI B16.47 (SERIES B) **CLASS 150 STEEL WELD NECK** FLANGE THICKNESS	ANSI B16.47 (SERIES B) **CLASS 150 STEEL BLIND STYLE** FLANGE THICKNESS	RECOMMENDED CAP SCREW LENGTH (LUGGED VALVES) (C)	TOTAL QUANTITY CAP SCREWS/BOLTS (TO MOUNT 2 FLANGES)	CAP SCREW SIZE
2 1/2"	1.81	0.69	—	—	—	—	1.50	8/4	5/8-11 UNC
		—	0.88	—	—	—	1.75	8/4	
3"	1.81	0.75	—	—	—	—	1.50	8/4	5/8-11 UNC
		—	0.94	—	—	—	1.75	8/4	
4"	2.06	0.94	0.94	—	—	—	1.75	16/8	5/8-11 UNC

Suggested Bolting Method



LUG STYLE

Resilient Liner Materials

EPDM – EPDM is a terpolymer elastomer made from ethylene-propylene diene monomer. EPDM has good abrasion and tear resistance and offers excellent chemical resistance to a variety of acids and alkalines. It is susceptible to attack by oils and is not recommended for applications involving petroleum oils, strong acids or strong alkalines. EPDM should not be used on compressed air lines. It has exceptionally good weather aging and ozone resistance. It is fairly good in ketones and alcohols.

Liner Temperature Ratings

Liner Material	Temperature
EPDM**	-20°F to + 250°F

** EPDM is rated at 250°F intermittent service and 225°F continuous service.

Proprietary compound formulas are used for each of the elastomers to provide the right combination of seat compression, abrasion resistance and chemical resistance to match your application. Elastomeric seat materials are not suitable for steam service.

NIBCO® pressystem®

Tools, Jaws & Chains



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NIBCO® Press System® Tools

PC-280
1/2" through 4"



MATERIAL LIST

MODEL NO.	DESCRIPTION	LBS.
PC-280	Pressing Tool with 2 - 18V, 3.0 Ah Lithium-ion batteries, 110V battery charger & case	25.40
PC-10S	1/2" Standard Pressing Jaw (for PC-100 or PC-280)	4.14
PC-11S	3/4" Standard Pressing Jaw (for PC-100 or PC-280)	4.18
PC-12S	1" Standard Pressing Jaw (for PC-100 or PC-280)	4.52
PC-13S	1 1/4" Standard Pressing Jaw (for PC-100 or PC-280)	4.30
PC-14S	1 1/2" Standard Pressing Jaw (for PC-100 or PC-280)	9.61
PC-15S	2" Standard Pressing Jaw (for PC-100 or PC-280)	9.26
PC-16S	1/2"-1 1/4" (4 jaws) Standard Press Jaw Kit w/Case (for PC-100 or PC-280)	25.25
PC-17S	1 1/2"-2" (2 jaws) Standard Press Jaw Kit w/Case (for PC-100 or PC-280)	23.76
PC-2	2 1/2" Pressing Chain w/Case (for PC-100 or PC-280)	18.58
PC-3	3" Pressing Chain w/Case (for PC-100 or PC-280)	19.40
PC-4	4" Pressing Chain w/Case (for PC-100 or PC-280)	23.81
PC-5	PC-5 Pressing Chain Adapter Jaw (note: must be used with 2 1/2", 3" & 4" chains)	7.01
PC-7L	18V, 3.0Ah Lithium-ion Battery (for PC-280 or PC-20M)	1.30
PC-8L	110V Battery Charger (for PC-4ML or PC-7L)	2.20
PC-9L	AC Adapter (for PC-280 or PC-20M)	1.70
PC-280C	Plastic Replacement Case for PC-280 Tool	7.50
PC-2C	Metal Replacement Case for PC-2 or PC-3 Chain	8.10
PC-4C	Metal Replacement Case for PC-4 Chain	8.10
PC-16SC	Metal Replacement Case for PC-16S (1/2" - 1 1/4" Jaws)	8.10
PC-17SC	Metal Replacement Case for PC-17S (1 1/2" - 2" Jaws)	4.40
PC-51	1/2" - 2" Deburring Tool	0.92



PC-10S thru PC-15S
Standard Pressing Jaw

PC-280
Pressing Tool



PC-2 thru PC-4
Pressing Chain



PC-5
Pressing Chain Adapter Jaw



PC-7L
18V, 3.0 Ah
Lithium-ion Battery



PC-8L
110V Battery Charger



PC-51
1/2" - 2" Deburring Tool



PC-9L
AC Adapter

NIBCO® Press System® Tools

PC-20M
1/2" through 1"

MATERIAL LIST

MODEL NO.	DESCRIPTION	LBS.
PC-20M	Mini Pressing Tool, 2 - 18V, 1.3 Ah Lithium-ion batteries, 110V charger & case (NO jaws)	11.00
PC-200M	Mini Pressing Tool, 3 Jaws, 2 - 18V, 1.3 Ah Lithium-ion batteries, 110V charger & case	18.00
PC-1M	1/2" Jaw (for Mini Pressing Tool - PC-10M or PC-20M)	2.09
PC-2M	3/4" Jaw (for Mini Pressing Tool - PC-10M or PC-20M)	2.05
PC-3M	1" Jaw (for Mini Pressing Tool - PC-10M or PC-20M)	2.07
PC-4ML	18V, 1.3Ah Lithium-ion Battery (for PC-20M)	0.80
PC-7L	18V, 3.0Ah Lithium-ion Battery (for PC-280 or PC-20M)	1.30
PC-8L	110V Battery Charger (for PC-4ML and PC-7L)	2.20
PC-9L	AC Adapter (for PC-280 or PC-20M)	1.70
PC-20MC	Plastic Replacement Case for PC-10M & PC-20M)	4.00
PC-50	1/2" - 1" Deburring Tool	0.42



PC-20M
Mini Pressing Tool



PC-200M
Mini Pressing Tool with
1/2", 3/4" and 1" Jaws



PC-1M, 2M, 3M
Mini Pressing Jaw



PC-4ML
18V, 1.3 Ah
Lithium-ion Battery



PC-8L
110V Battery Charger



PC-50
1/2" - 1" Deburring Tool



PC-7L
18V, 3.0 Ah
Lithium-ion Battery



PC-9L
AC Adapter

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NIBCO® Press System® Tools

PC-280 & PC-20M FEATURES

TOOLS

Light weight
PC-20M Mini: 3.7 lbs. (without jaw)
PC-280: 9.4 lbs. (without jaw)

Easy to handle / simple design
Jaws rotate 350°
No calibration necessary
No complicated switches or controls
Mini: Ergonomic compact design is easy to use in tight spaces

Interruptible crimp cycle
Safety feature prevents injuries
Can begin crimp, stop to align and level fitting / tube, and complete crimp

Battery
Can be changed during crimp cycle
Lithium-ion has short charging cycle and larger capacity
- PC-4ML: 15 minute recharge time
- PC-7L: 22 minute recharge time

AC Power Adapter
Converts the tool to electric power
Allows continuous use

Service light
Illuminates at 10,000 cycles
Tool will not stop operating when light illuminates
- RED indicates battery charge status, service intervals, tool functions & faults
- WHITE illuminates the work area

Hydraulic Pressure Check (HPC)
An audible warning signal sounds if adequate working pressure is not achieved

PRESSING CHAINS (2 1/2" to 4" ONLY)

Uniform crimp
Maintains proper pipe alignment

Easy to install and remove
Once secured to fitting, chain cannot fall off prior to crimp
Chain easily removed post crimp

Crimp Identification
Easy to identify crimp has been made from a distance

PC-100 and PC-10M Accessories

MATERIAL LIST

MODEL NO.	DESCRIPTION	LBS.
PC-6	12V, NiMH Battery - 2.6Ah for PC-100	1.51
PC-7	12V, NiMH Battery - 3.0Ah for PC-100	1.57
PC-8	120V Standard Battery Charger for PC-6 or PC-7	1.10
PC-9	AC Adapter for PC-100 Press Tool	1.32
PC-4M	1.3 Ah NiCd 9.6V Battery for Mini Pressing Tool	0.85
PC-5M	120V Charger for Mini Pressing Tool	1.13
PC-100C	Metal Case for PC-100 Tool	14.30



PC-4M
9.6V, 1.3 Ah
NiMH Battery



PC-7
12V, 3.0 Ah
NiMH Battery



PC-8
120V Battery Charger



PC-9
AC Adapter

NIBCO® Press System®
Approved Tool and Jaw Compatibility Matrix

Pressing tool, jaw and chain sets are an integral part of ensuring a reliable, permanent connection between NIBCO® Press System® fittings, valves and copper piping. ***Only use pressing tools, jaws and chain sets that have been tested and approved for use with NIBCO Press System fittings and valves.***

The following table details compatibility of **approved** pressing tools, chains and jaws with the NIBCO Press System fittings and valves:

		1/2" - 1" NIBCO PressSystem Mini Pressing Jaws (PC-1M, PC-2M, PC-3M)	1/2" - 1" RIDGID® ProPress® Compact Pressing Jaws	1/2" - 1-1/4" RIDGID® ProPress® C1 Compact Kit (C1 Actuator & Press Rings)	Rothenberger Compact Pressing Jaws	Stanley® VIRAX® Press Inserts	1/2" - 2" NIBCO PressSystem Standard Pressing Jaws (PC-10S, PC-11S, PC-12S, PC-13S,PC-14S, PC-15S)	1/2" - 2" RIDGID® ProPress® Standard Pressing Jaws	1/2" - 1-1/4" RIDGID® ProPress® V1 Kit (V1 Actuator & Press Rings)	1/2" - 2" Rothenberger Standard Pressing Jaws	1/2" 2" REMS Standard Pressing Jaws	Stanley® VIRAX® Pressing Jaws	2 1/2" - 4" NIBCO Pressing Chains (PC-2, PC-3, PC-4)
	SIZE	**1/2" - 1"**					**1/2" - 2"**						**2½" - 4"**
PRESSING TOOLS	NIBCO PC-280	—	—	—	—	—	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
	NIBCO PC-100	—	—	—	—	—	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
	RIDGID® 320-E	—	—	—	—	—	**YES**	**YES**	**YES**	—	—	—	—
	RIDGID® RP 330-B	—	—	—	—	—	**YES**	**YES**	**YES**	—	—	—	—
	RIDGID® CT400	—	—	—	—	—	**YES**	**YES**	**YES**	—	—	—	—
	RIDGID® RP 330-C	—	—	—	—	—	**YES**	**YES**	**YES**	—	—	—	—
	Rothenberger ROMAX® Pressliner	—	—	—	—	—	—	—	—	**YES**	—	—	—
	Rothenberger ROMAX® AC ECO	—	—	—	—	—	—	—	—	**YES**	—	—	—
	REMS Akku-Press	—	—	—	—	—	—	—	—	—	**YES**	—	—
	REMS Power-Press	—	—	—	—	—	—	—	—	—	**YES**	—	—
	Stanley® VIRAX® P20+	—	—	—	—	—	—	—	—	—	—	**YES**	—
	NIBCO PC-20M Mini	**YES**	—	—	**YES**	—	—	—	—	—	—	—	—
	NIBCO PC-10M Mini	**YES**	—	—	**YES**	—	—	—	—	—	—	—	—
	RIDGID® 100-B Compact	—	**YES**	**YES**	—	—	—	—	—	—	—	—	—
	RIDGID® RP 210-B Compact	—	**YES**	**YES**	—	—	—	—	—	—	—	—	—
	Rothenberger Compact	**YES**	—	—	**YES**	—	—	—	—	—	—	—	—
	Stanley® VIRAX® M20+ Compact	—	—	—	—	**YES**	—	—	—	—	—	—	—

For the latest listing of approved Pressing tool, jaw and chain combinations, visit nibco.com.
NIBCO recommends minor tool service performed once per year and major service every three years.
For technical or service assistance, contact NIBCO Technical Services 1-888-446-4226.

CAUTION:
NIBCO Press Fittings and Valves (2½", 3", 4" ends) to be installed ***ONLY*** with NIBCO Pressing Tools & Chains.

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ProPress® is a registered trademark of Viega NA.
ROMAX® is a registered trademark of ROTHENBERGER USA LLC
VIRAX® is a registered trademark of The Stanley Works.

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NIBCO® pressystem®

Engineering Data

NIBCO® Press System® — Engineering Data
Copper and Copper Alloy Fittings

Standards

O-Ring seal joints are not new to the piping industry, but joining techniques like the NIBCO® Press System® are providing new alternatives for copper piping assembly. Although there are no nationally recognized standards for these fittings, NIBCO has relied on its century of experience in copper and brass piping products to design the best performing and most dependable line of fittings possible.

Applications

The NIBCO® Press System® fittings are designed to join with ASTM B 88 seamless copper water tube in residential and commercial potable, hot, chilled and process water applications for plumbing and HVAC systems. Copper and copper alloy materials and EPDM elastomeric seals have a long history of compatibility with common chemicals used in these systems. A chemical resistance chart should always be referenced when other fluids are to be introduced.

NOTE: FLUIDS CONTAINING HYDROCARBONS ARE NOT COMPATIBLE WITH THE EPDM SEAL.

Pressure/Temperature Limitations

-20°F to 250°F up to 200 PSIG, non-shock working pressure.

Materials:

- Wrot Copper
  - ASTM B 75 Alloy C12200
- Cast Copper & Brass Rod Alloy
  - BS EN 1982:1999 Modified Alloy CC491K
  - European Red Brass comparable to ASTM B 62
- Elastomeric Seals
  - EPDM O-Rings compliant with BS EN 681-1



NIBCO® Press Fittings meet all performance requirements of ASME B16.22 and B16.18

NOTE: Freezing Weather Precaution — Subsequent to testing a piping system, valve should be in an open position to allow complete drainage.

Performance

In the absence of a nationally recognized standard, the following performance tests were developed and conducted. The fitting dimensions, materials of construction and performance tests were witnessed and verified by internationally recognized Underwriters Laboratories, Inc. A letter of verification is available upon request:

1. Dimensional Verification
   a. Inside diameter of press cup and waterway
   b. Outside diameter of press cup and waterway
   c. Wall thickness
   d. Threaded ends conformance to ASME B1.20.1
2. Hydrostatic Minimum Burst Strength Pressure
   a. Fitting samples hydrostatically tested to a minimum of 600 PSI (three times the rated internal working pressure) at 73°F.
3. Unrestrained Hydrostatic Pressure Test at 68°F (20°C) and 200°F (93°C)
   a. Fitting assemblies were filled with water and pressurized to 600 PSIG at 68° or 200°F for 48 hours.
4. Static Torque
   a. Fittings were filled with water, had a minimum torque applied and released. Each fitting was then pressurized to 400 PSIG for 48 hours.
5. Bending Test
   a. A sample fitting was installed between two equal lengths of hard-drawn copper tubing supported six (6) feet apart. A concentrated load was applied to the center of the fitting. The assembly was subjected to 400 PSIG water pressure for one (1) hour.
6. Vacuum Pressure Test
   a. Fittings were subjected to a vacuum pressure of 24.5 inches of mercury for one (1) hour.
7. Cyclic Pressure Test
   a. Fittings were subjected to a hydraulic shock pressure of 400 PSIG for 10,000 cycles.
8. Vibration Test
   a. Fitting assemblies were subjected to a hydrostatic cyclic vibration test at 350 PSIG for 1,000,000 cycles. After cycling, the assemblies were pressurized to 400 PSIG for 30 minutes.
9. Thermocycling Test
   a. Fitting and tube assemblies were filled with air and pressurized to 100 PSIG. The water temperature was cycled from 68°F to 200°F for 2,500 cycles. Each temperature was held for 2 minutes and changed within two (2) minutes.
10. Dynamic Torque at 68°F (20°C) and 200°F (93°C)
    a. Fittings were assembled between two lengths of hard-drawn copper tubing. With one tube fixed, the other tube twisted ±5° for 10,000 cycles at 68°F (20°C) or 200°F (93°C). Each assembly was then subjected to 400 PSIG water pressure at 68°F (20°C) or 200°F (93°C) for 48 hours.

Tests were performed with K, L and M hard drawn-copper tubing. A minimum of one fitting of each configuration of each size was tested.

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NIBCO® Press System® — Sample Specification

FITTINGS

2" and Smaller:

Fittings shall comply with NSF 61, CSA, UPC and be approved by the local jurisdiction. The NIBCO® Press System® may be used at the contractor's option for the following building services piping - 20°F to +250°F up to 200 PSI:

- **Hot and Cold Domestic Water**
- **Potable Water**
- **Condenser and Chilled Water Service**
- **Hot Water Heating Service**

Wrot copper press fittings shall be made from commercially pure copper mill products per ASTM B 75 Alloy C12200. Cast copper alloy press fittings shall be made from materials with a minimum of 78% copper and a maximum of 15% zinc. The press fittings connections shall be compatible with seamless K, L or M copper tube made to ASTM B 88. Fittings shall have a maximum non-shock working pressure of 200 PSI between the temperatures of -20°F and +250°F. Elastomeric seals shall be made of EPDM material, and the fittings shall be manufactured with an inboard bead design. All fittings shall be installed in accordance with the manufacturer's installation instructions and according to local plumbing and mechanical codes. The press-to-connect joint shall be made with pressing tools and jaw sets recommended and authorized by NIBCO.

2½" through 4":

Fittings shall comply with NSF 61, CSA, UPC and be approved by the local jurisdiction. The NIBCO® Press System® may be used at the contractor's option for the following building services piping - 20°F to +250°F up to 200 PSI:

- **Hot and Cold Domestic Water**
- **Potable Water**
- **Condenser and Chilled Water Service**
- **Hot Water Heating Service**

Wrot copper press fittings shall be made from commercially pure copper mill products per ASTM B 75 Alloy C12200. Cast copper alloy press fittings shall be made from materials with a minimum of 78% copper and a maximum of 15% zinc. The press fittings connections shall be compatible with seamless K, L or M copper tube made to ASTM B 88. Fittings shall have a maximum non-shock working pressure of 200 PSI between the temperatures of -20°F and +250°F. Elastomeric seals shall be made of EPDM material, and the fittings shall be manufactured with an inboard bead design. All fittings shall be installed in accordance with the manufacturer's installation instructions and according to local plumbing and mechanical codes. The press-to-connect joint shall be made with pressing tools and jaw sets recommended and authorized by NIBCO.

NIBCO® Press System® — Sample Specification

VALVES

2" and Smaller Ball Valves: (On/Off, Isolation or Throttling)

Ball valves with male or female press-to-connect ends shall be rated at 200 PSI CWP to +250°F maximum. Valves shall be manufactured in accordance with MSS SP-110 and constructed of dezincification resistant cast bronze bodies. No brass containing more than 15% zinc shall be approved. Valve shall have reinforced PTFE seats, blow-out proof stem, full-port ball, chrome/nickel plated ball or 316 SS ball for aggressive water conditions. Where piping is to be insulated, ball valves shall be equipped with 2" extended handles of non-thermal conductive material. Handle to have extended sleeve incorporating an insulation plug to provide a vapor barrier and allow valve operation without disturbing the insulation, and a memory stop, which can be set after installation.

Acceptable Valves: (non-insulated lines):

NIBCO® PC585-70, PF585-70 or PS585-70
(Chrome/nickel plated ball)
NIBCO® PC585-70-66, PF585-70-66, PS585-70-66 or PCM585-60
(316 SS ball)

Acceptable Valves: (insulated lines):

NIBCO® PC585-70-NS, PF585-70-NS or PS585-70-NS
(Chrome/nickel plated ball)
NIBCO® PC585-70-66-NS, PF585-70-66-NS or PCM585-60-NS
(316 SS ball)

(Note to Specifier: Include press gate valves in addition/in lieu of press ball valves for ON/OFF and isolation services if requested or required.)

2" and Smaller Gate Valves: (On/Off and Isolation)

Gate valves with male or female press-to-connect ends shall be rated to 200 PSI CWP at +250°F maximum. Valves shall be manufactured in accordance with MSS SP-80. Valve body, bonnet and wedge to be manufactured of dezincification resistant cast bronze (ASTM B 62). Stems shall be of silicon bronze (ASTM B 371) or low zinc alloy (ASTM B 99). Non-asbestos packing and malleable or ductile iron hand-wheel shall be standard.

Acceptable Valves:

NIBCO® PF111 or PS111 - Rising Stem Gate Valve
NIBCO® PF113 or PS113 - Non-Rising Stem Gate Valve

2" and Smaller Globe and Angle Valves: (Throttling Service)

Globe and angle valves with male or female press-to-connect ends shall be rated to 200 PSI CWP at +250°F maximum. Valves shall be manufactured in accordance with MSS SP-80. Valve body, bonnet and wedge to be manufactured of dezincification resistant cast bronze (ASTM B 62). Stems shall be of silicon bronze (ASTM B 371) or low zinc alloy (ASTM B 99). Non-asbestos packing and malleable or ductile iron hand-wheel shall be standard.

Acceptable Valves:

NIBCO® PF211-Y or PS211-Y - Globe Valve
NIBCO® PF311-Y or PS311-Y - Angle Valve

2" and Smaller Check Valves: (Back Flow Prevention)

Check valves (Y pattern, swing type or in-line) with male or female press-to-connect ends shall be rated at 200 PSI CWP to +250°F maximum. Valves shall be manufactured in accordance with MSS SP-80. Body and cap to be manufactured of dezincification resistant cast bronze (ASTM B 62 or ASTM B 584 Alloy C84400). Valves to have PTFE seat disc.

Acceptable Valves:

NIBCO® PF413-Y or PS413-Y - Y Pattern, Swing Type Check Valve
NIBCO® PF480-Y or PS480-Y - In-line spring loaded Silent Check Valve

Drain Valves

At all low points in water piping to be drained or vented, provide 1/2" or 3/4" ball valves with male or female press-to-connect ends by hose-end drain valves. Valves shall be rated by 200 PSI CWP to +250°F maximum. Valves shall be manufactured in accordance with MSS SP-110. Valves to be constructed of dezincification resistant cast bronze bodies. Valve shall have reinforced PTFE seats, blow-out proof stem, and be full port. All valves shall be provided with 3/4" hose connection with cap and chain.

Acceptable Valves:

NIBCO® PS585-70-HC or PF585-70-HC

2 1/2" thru 4" Butterfly Valves: (On/Off, Isolation or Throttling)

Butterfly valves with female press-to-connect ends shall be rated at 200 PSI CWP to +250°F maximum. Valves shall be manufactured in accordance with MSS SP-67 and constructed of a ductile-iron body, for bubble-tight shutoff, extended-neck for insulation, disc and lining suitable for potable water, valves shall be suitable for bi-directional dead end service at full rated pressure, one-piece Type 416 stainless-steel stem, copper bushing, fasteners and pins shall not be used to attach stem to disc, no pins or fasteners in waterway, aluminum-bronze disc, and molded-in EPDM seat (liner).

Acceptable Valves:

NIBCO® PFD2000 Series

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NIBCO® pressystem®

Installation Instructions

NIBCO® Press System® — Installation Instructions

NIBCO® Press System®

The NIBCO® Press System®, when used with tested and authorized pressing tools and jaws, is designed to mechanically crimp fittings and valves onto copper tubing to create a watertight, permanent seal. When the switch on the pressing tool is depressed, an internal motor powers a hydraulic pump which forces fluid into the cylinder of the tool, forcing the ram forward and applying thousands of pounds of crimping force onto the specially designed fittings and valves.

System Components

Fittings and Valves

NIBCO® Press System® copper or bronze fittings and valves

Tubing

ASTM B 88 seamless Hard Drawn Copper Water Tube: Types K, L and M.

Pressing Tools, Chains and Jaws

The pressing tool, chain and jaw are important parts of ensuring a reliable, permanent connection between NIBCO® Press System® fittings and valves and the copper water tube.

CAUTION — Use only pressing tools and jaw sets that have been tested and authorized for use with NIBCO® Press System® fittings and valves (1). Use of unauthorized pressing tools and/or jaws may result in an improper seal that could cause extensive property damage.

(1) See approved tool and jaw compatibility matrix on page 51.

Pressing Tool Safety

- Only use authorized pressing tools and jaws with NIBCO® Press System® fittings and valves. Other uses or modification of the jaws for other applications may damage the press tool, damage the jaws and/or cause personal injury.
- Keep fingers and hands away from jaws during pressing cycle. Your fingers or hands can be crushed, fractured or amputated if they become caught between the jaw tips or between the jaw and any other object.
- Always wear safety glasses while using pressing tools and jaws.
- Never attempt to repair a damaged jaw set. A jaw that has been welded, ground, drilled or modified in any manner can shatter during crimping resulting in serious injury. Discard the entire damaged jaw set. Replace with a new jaw set.

NOTE: Consult manufacturer's pressing tool and jaw set operators manual to determine replaceable jaw set components.

WARNING: Please read these installation instructions and the manufacturer's pressing tool and jaw operators manual(s) carefully prior to installation of the NIBCO® Press System®. Failure to understand and follow the contents of this manual may result in extensive property damage, severe personal injury or death.

Please contact NIBCO Technical Services at 888.446.4226 if you have installation questions.

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NIBCO® Press System® — Installation Instructions

Installation Instructions for 1/2" - 2" Press Fittings and Valves

WARNING: To prevent serious injury, inspect the pressing tool, battery charger (if applicable) and jaw sets according to the procedure outlined in the pressing tool instruction manual prior to beginning installation.

Failure to clean jaws can result in an improper connection that can lead to extensive property damage.

Work Area Set-Up

To prevent serious injury, proper set-up of the pressing tool and work area is required. The following procedure should be followed:

1. Check work area for:
   - Adequate lighting
   - Flammable liquids, vapors or dust that may ignite
2. Follow the tool set-up procedures specified in the manufacturer's pressing tool instruction manual.

Preparing the Copper Tube

1. Select clean, undamaged copper tube and cut to desired length. Cut tube end square using a tube cutter or fine-toothed saw *(Figure 1)*.

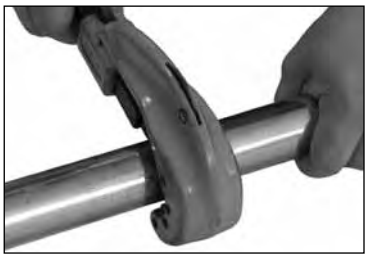


Figure 1 — Cut tube to desired length using a tube cutter

2. Deburr the tube inside and outside diameter using a half-round file or a deburring tool.
3. Clean the tube end of all dirt, oil and grease. (Emery cloth or sandpaper to clean the tube or remove oxidation is not required.)

Inserting the Tube into the Fitting or Valve

1. Check the fitting to make sure the EPDM seal is in place, clean and free of oil and grease *(Figure 2)*.



Figure 2 — Check for EPDM Seal

WARNING: Never lubricate the EPDM seal in the NIBCO® Press System® fitting or valve with anything other than water. Oil-based lubricant, dirt or debris may damage the seal. An improper seal can lead to extensive property damage.

2. Insert the tube into the fitting or valve using a twisting motion. Make sure that the tube is fully inserted into the fitting stop or shoulder.
3. Mark the tube with a permanent marker to indicate the proper tube insertion depth *(Figure 3)*.



Figure 3 — Inserting the tube to proper depth

4. Refer to the minimum insertion depth table for correct depths

Tube Size	Insertion Depth (min.)	
Inches	Inches	mm
1/2	11/16	18
3/4	7/8	22
1	7/8	22
1¼	1	25
1½	1⅜	35
2	1½	38

CAUTION: Tubing that is difficult to insert may have burrs or could be out-of-round. Burrs must be removed and tubing end should be undamaged. Make sure tube is inserted to the proper depth. Failure to do so may result in an improper seal.

Attaching Pressing Jaws

1. Make sure the battery is removed or the cord is unplugged on the pressing tool prior to attaching or changing the crimp jaws.
2. Push and twist to open the jaw set mounting pin. *(Figure 4)*.



Figure 4 — Pushing and twisting to open the jaw set mounting pin

3. If press tool contains a jaw set, slide it out of the crimping tool.

NIBCO® Press System® — Installation Instructions

4. Select the jaw set that corresponds to the size of the joint to be crimped and insert the jaw set into the pressing tool *(Figure 5)*.

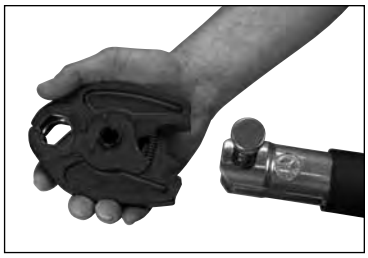


Figure 5 — Inserting the NIBCO® Press System® jaw

5. Push the jaw set mounting pin until it clicks into position.

   NOTE: The tool will not work unless the pin is fully engaged.

Crimping a NIBCO® Press System® Fitting or Valve

1. Make sure the tubing is inserted to the proper depth in the fitting, and that tube and fitting are aligned properly. *(Figure 6)*.

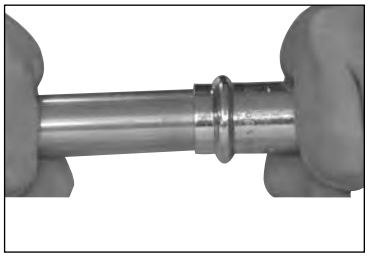


Figure 6 — Inserting the tube to proper depth

2. Squeeze jaw arms to open the jaw set.
3. Place the open jaws around the fitting and ensure that the contour of the jaw is properly aligned with the contour of the fitting *(Figure 7)*.



Figure 7 — Open the jaw set and place around the fitting

4. Make sure the tool is square to the tubing and depress the switch *(Figure 8)*. Once the crimp cycle begins and the rollers contact the jaw arms, the tool will complete the crimp cycle, as long as the trigger is depressed.

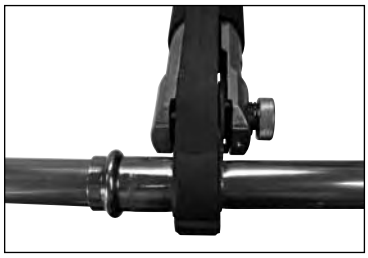


Figure 8 — Jaw set should be square to tubing

5. Once the crimp is complete, press the jaw arms to open the jaw and remove from the fitting.

   If the tool malfunctions, please refer to the tool instruction manual for troubleshooting suggestions.

CAUTION Avoid sharp edges that may have formed on the fitting during the crimping operation.

Inspecting the Crimp

1. Inspect the crimped fitting to ensure proper crimp.

NOTE: The use of the NIBCO® Press System® jaw will produce a unique witness mark "N" on the crimped fitting.

2. Inspect the crimped fitting checking the connection for the following problems:

   - Misaligned tube
   - Not fully inserted tube, double check depth marks
   - Incorrect jaw alignment with the fitting contour

   If one or more of these problems are found, a new section of tubing and a new fitting will need to be prepared, installed and crimped.

3. Test the NIBCO® Press System® in accordance with normal practice and to local jurisdiction piping code.

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NIBCO® Press System® — Installation Instructions

Installation Instructions for 2 1/2" - 4" Press Fittings and Valves

WARNING: To prevent serious injury, the pressing tool, battery charger (if applicable) and pressing chains should be inspected according to the procedure outlined in the pressing tool instruction manual prior to beginning installation.

Failure to clean pressing chains can result in an improper connection that can lead to extensive property damage.

Work Area Set-Up

To prevent serious injury, proper set-up of the pressing tool and work area is required. The following procedure should be followed:

1. Check work area for:
   - Adequate lighting
   - Flammable liquids, vapors or dust that may ignite
2. Follow the tool set-up procedures specified in the pressing tool instruction manual.

Preparing the Copper Tube

1. Select clean, undamaged copper tube and cut to the desired length. Cut tube end square using a tube cutter or fine-toothed saw *(Figure 1)*.



Figure 1: Cut tube to desired length using s tube cutter

2. Deburr the tube inside diameter using a half-round file or deburring tool. Remove any copper shavings or filings *(Figures 2 & 3)*.

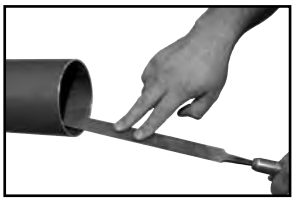


Figure 2: Deburr inside diameter using a half-round file

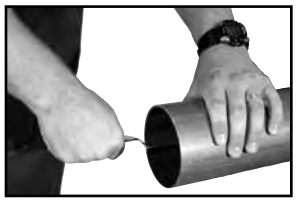


Figure 3: Deburr inside diameter deburring tool

3. Deburr the tube outside diameter using a half-round file to prevent damage to the EPDM seal *(Figure 4)*.



Figure 4: Deburr outside diameter using a half-round file

4. Clean the tube <u>end</u> of all contamination, oils and shavings. A smooth transition chamfer is recommended to ease tube insertion past the seal. (Emery cloth or sandpaper to clean the tube or remove oxidation <u>is not required</u>.)

Inserting the Tube into the Fitting or Valve

1. Check the fitting to make sure that the seal is in place and is free of oil or grease. Only original NIBCO® EPDM seals are to be used when making a press connection with NIBCO® Press System® fittings and valves. If it is necessary to lubricate the seals, use water only. **<u>DO NOT</u>** use any petroleum-based lubricants *(Figure 5)*.



Figure 5: Check for EPDM seal

WARNING: Never lubricate the EPDM seal in a NIBCO® Press System® fitting or valve with anything other than water. Oil-based lubricants, dirt or debris may damage the seal. An improper seal can lead to extensive property damage.

2. Mark the proper insertion depth on the tube with a permanent marker <u>prior</u> to insertion, based on insertion depth chart. Refer to minimum insertion depth table for correct depths.

NIBCO® Press System® Insertion Depth Chart

Tube Size	2½"	3"	4"
Insertion Depth (min.)	1½"	1⅝"	2⅛"

WARNING: If tube is not inserted to the proper depth, an inadequate seal may result.

3. Insert the tube into the fitting or valve using a twisting motion. Make sure that the tube is fullly inserted into the fitting or valve. If tube is not inserted to the proper depth, an inadequate seal may result.

CAUTION: Tubing that is difficult to insert may have burrs or could be out-of-round. Burrs must be removed and tubing end should be undamaged. Make sure tube is inserted to the proper depth. Failure to do so may result in an improper seal.

NIBCO® Press System® — Installation Instructions

Crimping a NIBCO® Press System® Fitting or Valve

CAUTION:
NIBCO Press Fittings and Valves (2½", 3", 4" ends) to be installed ***ONLY*** with:
- NIBCO PC-100 Pressing Tool
- NIBCO PC-5 Adapter Jaw
- NIBCO Pressing Chain - 2½" (PC-2), 3" (PC-3), 4" (PC-4)

1. Make sure that the battery is removed or that the cord is unplugged on the pressing tool prior to attaching or changing the adapter jaw.
2. Select the correct size pressing chain. Pull the pin on the chain which allows the segments to open. Position the chain on the raised bead and wrap the chain around the fitting with the "pipe side" designation facing the tube. When the chain is fully wrapped around the fitting, reinsert the pin to secure the chain on the assembled joint. Visually inspect the mark made for insertion depth, to ensure the tube remained in position *(Figure 6)*.



Figure 6: Placement of the pressing chain onto fitting or valve

3. Release the pin (push and twist) on the jaw holder of the pressing tool, and install the adapter jaw on the tool. Return the pin to its original position, securing the jaw. The red sleeve on the tool must be in the back position to allow for crimping sizes 2½", 3" and 4". (The red sleeve in the forward position allows for use with ½" - 2" standard pressing jaws.) Rollers on the pressing tool must be in the forward position to allow the red sleeve to move forward *(Figure 7)*.



Figure 7: Placement of adapter jaw into the tool

4. Squeeze adapter jaw arms to open the jaw. Rollers must be fully retracted to open the adapter jaw. Place the open adapter jaw into the grooves in the pressing chain and let go of the jaw arms (Figure 8).



Figure 8: Placement of adapter jaw into pressing chain

5. Make sure the tubing is inserted to the proper depth in the fitting or valve, and that the tube and fitting or valve are aligned properly.
6. With the pressing tool perpendicular to the tube, begin the pressing cycle by pulling the trigger of the pressing tool.
7. Allow the pressing cycle to complete. Remove the pressing tool and adapter jaw from the pressing chain. Remove the pressing chain from the fitting.

If the tool malfunctions, please refer to the tool instruction manual for troubleshooting suggestions.

CAUTION: Avoid sharp edges that may have formed on the fitting during the crimping operation.

Inspecting the Crimp

1. Inspect the crimped fitting or valve to ensure proper crimp. The final crimp should appear pressed uniformly around the fitting or valve *(Figure 9)*.



Figure 9: Inspection of final crimp

NOTE: The use of the NIBCO® Press System® chain will produce a unique witness mark "N".

2. Inspect the crimped fitting checking the connection for the following problems:
   - Misaligned tube
   - Not fully inserted tube, double check depth marks
   - Incorrect chain alignment with the fitting contour

   If one or more of these problems are found, a new section of tubing and a new fitting will need to be prepared, installed, and crimped.
3. Test the NIBCO® Press System® in accordance with normal practice and to local jurisdiction piping code.

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NIBCO® Press System® — Testing Instructions for Fittings & Valves with Leak Detection

PRESSURE TESTING:

NIBCO recommends the following leak testing procedures when installing NIBCO Press System with the leak detection feature. These test procedures allow the installer to find un-pressed connections while the system is being tested under pressure.The uniquely designed EPDM o-ring allows fluids or gases to flow past the seal and leak when the fitting has not yet been pressed. When the fitting has been pressed, the o-ring will create a water tight seal around the tube.

AIR LEAK TESTING

1. Pressurize system up to 15 psi maximum using dry, oil free compressed air, carbon dioxide, or nitrogen.
2. Allow system pressure to stabilize for a minimum of 2 hours.
3. If system pressure has dropped, add more air to bring entire system up to 15 psi maximum. If system pressure increases above 15 psi, bleed off excess pressure to ensure system is at a maximum pressure of 15 psi.
4. If the system pressure continues to drop, inspect all joints for un-pressed fittings. The NIBCO® Press System® press fittings with the leak detection feature are designed to leak in an un-pressed condition.
5. Check all press joints for air leaks using a commercially available leak test solution or a soap and water mixture.
6. Once the system has been confirmed to be leak free, pressure can be increased to the recommended working pressure to verify system integrity.

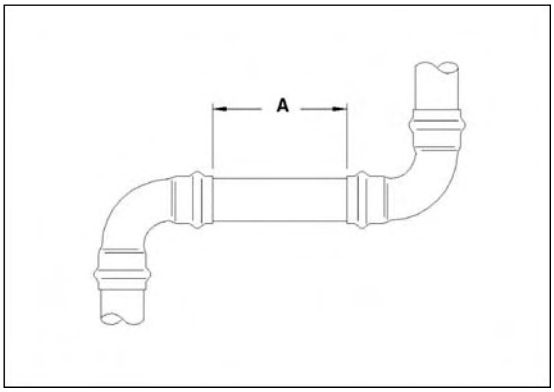
WATER LEAK TESTING

1. Pressurize system up to 50 psi maximum using potable water.
2. Allow system pressure to stabilize for a minimum of 2 hours.
3. If system pressure has dropped, add more water to bring entire system up to 50 psi maximum. If system pressure increases above 50 psi, bleed off excess pressure to ensure system is at a maximum pressure of 50 psi.
4. If the system pressure continues to drop, inspect all joints for un-pressed fittings. The NIBCO® Press System® press fittings with the leak detection feature are designed to leak in an un-pressed condition.
5. Check all press joints for leaking water.
6. Once the system has been confirmed to be leak free, water pressure can be increased to the recommended working pressure to verify system integrity

NIBCO® Press System® — Installation Instructions

Minimum Distance Between Joints

To prevent distortion of the tubing, certain fitting sizes require a minimum distance between crimp joints (refer to *Chart 1* below). Failure to provide this minimum distance may result in an improper seal.



Tube Dia.	A (min.)	
	Inches	mm
½"*	0	0
¾"*	0	0
1"*	0	0
1¼"*	0	0
1½"*	0	0
2"*	0	0
2½"	⅜"	10
3"	⅜"	10
4"	⅜"	10

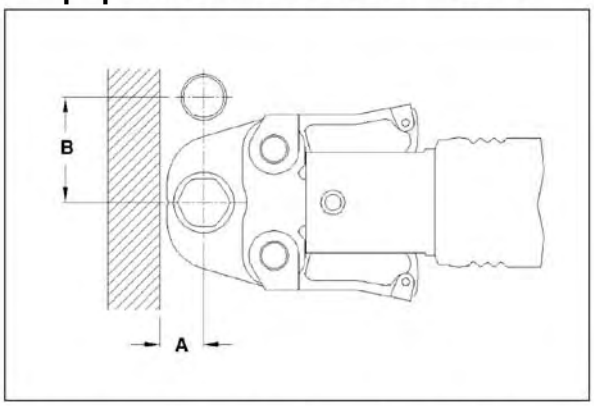
***No minimum distance required.**

Spacing

1. Sufficient clearance must be left around each joint to allow room for the pressing tool and jaw to be attached without interference.

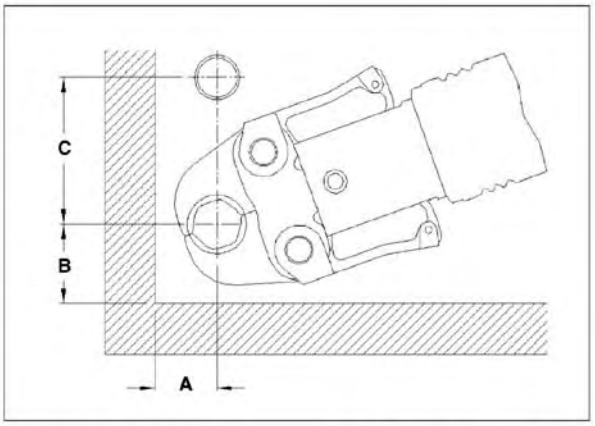
Clearance Requirements — Standard Jaw Sets

Tool perpendicular to wall



Tube Dia.	A (min.)		B (min.)	
	Inches	mm	Inches	mm
1/2	15/16	24	1 5/8	41
3/4	7/8	22	2 1/8	54
1	1 1/4	31	2 1/2	64
1 1/4	1 1/8	29	2 7/8	73
1 1/2	2	51	4 3/8	111
2	2	51	4 3/8	111

Tool angled to wall



Tube Dia.	A (min.)		B (min.)		C (min.)	
	Inches	mm	Inches	mm	Inches	mm
1/2	1 1/8	28	1 3/8	35	2 1/2	64
3/4	1	26	1 1/2	38	2 1/2	64
1	1 5/16	34	1 3/4	45	3	76
1 1/4	1 1/4	32	2 1/4	57	3 1/8	80
1 1/2	2 1/8	54	3 1/8	80	5	127
2	2 1/8	54	3 1/8	80	5	127
2 1/2	3 5/8	92	6	152	3 1/2	89
3	3 7/8	98	6 1/2	165	4	102
4	4 7/8	124	7 5/8	194	4 1/4	108

NOTE: Clearance dimensions for 2½", 3" & 4" are for wrapping pressing chains around fittings.

System Support

CAUTION — In any installation, the system should be suported to ensure the minimum stress is imposed on the tube and joints. The NIBCO® Press System® should be supported in accordance with normal practice and to local jurisdiction piping code.

Annealing of Copper Tube

A NIBCO® Press System® installation should not be conducted within 12" of a **brazed** joint. The high temperature required for capillary joinery may cause the copper tube to become annealed and render it too soft for proper crimping. However, a NIBCO® Press System® product may be crimped adjacent to a **soldered** joint, as normal temperatures created by silver soldering are not hot enough to cause the copper tube to become annealed.

CAUTION — Brazing or soldering should not be conducted within 12" of an existing NIBCO® Press System® connection as this may damage the EPDM seal. If there is any concern about heat damage to the o-ring, a cold, wet cloth should be wrapped around the crimped connection

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NIBCO® Press System® — Frequently Asked Questions

What is the NIBCO product offering?

The NIBCO® Press System® features a full range of copper and copper alloy fittings, commercial valves, accessories and pressing tools, jaws and chains for use with K, L and M copper water tube.

What is the system temperature rating?

The NIBCO® Press System® is rated at 200 PSIG over a temperature range of -20°F to 250°F.

What are the approved system applications?

Approved applications include residential and commercial potable, hot, chilled and process water for plumbing and HVAC systems. The NIBCO® Press System® is designed for use with water glycol mixtures of ethylene or propylene glycol up to 50% at 200°F.

What was the testing protocol for the NIBCO® Press System® fittings and valves?

NIBCO® Press System® fittings and valves were subjected to a wide range of performance tests including dimensional verification, thread end specification, hydrostatic burst strength, unrestrained pressure, static torque, bending, vacuum pressure, cyclic pressure, vibration, thermo-cycling and dynamic torque. The testing protocol included testing to a 3X safety factor above the 200 PSIG system rating.

NIBCO testing was witnessed and validated by the internationally recognized Underwriters Laboratories, Inc. (UL).

Can other available pressing tools and jaws be used on the NIBCO® Press System®?

See page 51 for a complete listing of approved tools and jaws.

Can a NIBCO® Press System® connection be re-crimped?

If for any reason the press cycle is interrupted, it is possible to re-crimp a NIBCO® Press System® connection. However, when re-crimping the connection, the jaws must be properly aligned so that the crimp is performed in the same location as the original.

How long will the EPDM seal last?

Accelerated life tests show that the EPDM seals used with the NIBCO® Press System® fittings and valves have a life expectancy of 50 years.

Are NIBCO® Press System® fittings available with solder or threaded by Press System connection?

NIBCO offers many Press System fitting combinations by soldered or threaded connection. Please note, always solder the standard wrot connection first when possible. Prior to soldering, remove the press end EPDM o-ring, solder, allow the fitting to cool, insert the EPDM o-ring, and then Press the connection.

Can a fitting be soldered close to a Press System connection?

NIBCO recommends soldering at least 12 inches away from the Press System connection. If this length is not possible, either solder the joint prior to connecting the press fitting or wrap the connection with a cold wet cloth.

Is the NIBCO® Press System® approved for underground use?

In accordance with local plumbing codes, the NIBCO® Press System® can be installed underground.

Is the NIBCO® Press System® compatible with standard disinfectant cleaning agents commonly utilized in a new water system?

Yes, the NIBCO® Press System® is typically compatible. For specific cleaning agent compatibility, contact NIBCO Technical Services at the below noted number.

NIBCO® Press System® Fittings Limited Warranty

NIBCO INC. warrants:

- NIBCO® Press System® fittings to be free from defects in materials and workmanship under normal use and service, for a period of 50 years from the Warranty Commencement Date. The Warranty Commencement Date for NIBCO® Press System® fittings shall be the date upon which the fitting is installed.

NIBCO does NOT warrant against failure of NIBCO® Press System® fittings (referred to hereafter as "product") for:

1. any product, parts or systems which are not manufactured or sold by NIBCO INC.;
2. any product which is used for any purposes other than a purpose authorized by NIBCO INC.;
3. any product not installed in accordance with either the recommended installation guidelines provided by NIBCO INC. and/or applicable plumbing codes;
4. damage to the product caused by, contributed in whole or in part by, or resulting from, any of the following:
    a. abuse, misuse, mishandling, tampering, neglect or accidental damage, such as, without limitation, vandalism
    b. natural disasters, such as, without limitation, flooding, windstorm and lightning
    c. attachments or modifications to the product that are not authorized by NIBCO INC.
    d. external causes, where external, physical or chemical qualities produce damage to the product, such as, without limitation, variation in water quality, aggressive water or an unsuitable or hostile environment, or
    e. any other cause beyond the control of NIBCO INC.

NIBCO shall NOT be liable under any circumstances for any other direct or indirect, incidental or consequential damages of any kind, including but not limited to loss of business, lost profits, mold intrusion, water damage, etc. The liability of NIBCO under this warranty is solely limited to the repair or replacement, including installation expenses, of any product that has been determined by NIBCO INC., or an authorized representative or agent thereof, to contain a defect in material or workmanship.

This warranty is the only warranty for the product provided by NIBCO INC., and is and shall be in lieu of any and all other warranties, expressed or implied, including but not limited to an implied warranty of merchantability, and for all other obligations or liabilities on the part of the Manufacturer. No employee of NIBCO INC., or any other distributor, agent or other person or business, is authorized to make any other warranty on behalf of NIBCO INC.

In the event any defect occurs which is believed to be covered by this warranty, NIBCO Technical Services should be immediately contacted either in writing or by telephone at 888.446.4226. NIBCO Technical Services will make further arrangements for the product's return to NIBCO INC. for review and evaluation. In the event that a returned product is determined by NIBCO INC. to be defective, NIBCO INC. will remediate the failure by repairing or replacing the product within a reasonable time, without charge to the owner of the product.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

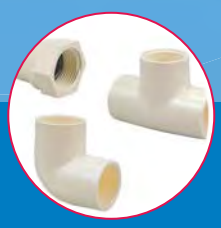
CATALOG C-PF-0311

NIBCO®

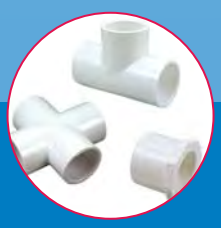
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Plastic Fittings

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Material Selection
Thermoplastic and Elastomers

ABS
(Acrylonitrile-butadiene-styrene) Class 3-2-2-2-2, conforming to ASTM D 3965, is a time proven material. The smooth inner surface and superior resistance to deposit formation makes ABS drain, waste and vent material ideal for residential and commercial sanitary systems. The residential DWV system can be exposed in service to a wide temperature span. ABS-DWV has proven satisfactory for use from -40°F to 180°F. These temperature variations can occur due to ambient temperature fluctuations or the discharge of hot liquids into the system. ABS-DWV is very resistant to a wide variety of materials ranging from sewage to commercial household chemical formulations. ABS-DWV is joined by solvent cementing or threading and can easily be connected to steel, copper, or cast iron through the use of transition fittings.

PVC
(Polyvinyl Chloride) conforming to ASTM D 1784 Class 12454, formerly designated Type 1, Grade 1. PVC is the most frequently specified of all thermoplastic materials. It has been used successfully for over 30 years in such areas as chemical processing, industrial plating, chilled water distribution, deionized water lines, chemical drainage, and irrigation systems. PVC is characterized by high physical properties and resistance to corrosion and chemical attack by acids, alkalies, salt solutions and many other chemicals. It is attacked, however, by polar solvents such as ketones, some chlorinated hydrocarbons, and aromatics. The maximum service temperature of PVC is 140°F. With a design stress of 2,000 psi, PVC has the highest long-term hydrostatic strength at 73°F of any of the major thermoplastics being used for piping systems. PVC is joined by solvent cementing, threading, or flanging.

CPVC
(Chlorinated Polyvinyl Chloride) Class 23447, formerly designated Type IV, Grade 1 conforming to ASTM D 1784, has physical properties at 73°F similar to those of PVC and its chemical resistance is similar to or generally better than that of PVC. CPVC, with a design stress of 2000 psi and maximum service temperature of 210°F, has, over a period of about 30 years, proven to be an excellent material for hot corrosive liquids, hot and cold-water distribution, and similar applications above the temperature range of PVC. CPVC is joined by solvent cementing, threading, or flanging.

PTFE
PTFE (Polytetrafluoroethylene) has outstanding resistance to chemical attack by most chemicals and solvents. PTFE has a temperature rating of -200°F to 500°F. PTFE, a self-lubricating compound, is used as a seat material in NIBCO/Chemtrol® ball valves.

FPM
FPM (Fluoroelastomers or Fluorocarbons) are inherently compatible with a broad spectrum of chemicals. Because of this extensive chemical compatibility, which spans considerable concentration and temperature ranges, fluorocarbons have gained wide acceptance as a material of construction for butterfly valve "O"-rings and seats. Fluorocarbons can be used in most applications involving mineral acids (with the exception of HCl), salt solutions, chlorinated hydrocarbons, and petroleum oils.

EPDM
EPDM is a terpolymer elastomer made from ethylene, propylene and diene monomer. EPDM has good abrasion and tear resistance and offers excellent chemical resistance to a variety of acids and alkalines. It is susceptible to attack by hydrocarbons and is not recommended for applications involving petroleum oils, strong acids, or strong alkalines.

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Material Selection

Plastic Piping Standards

THERMOPLASTIC PIPING MATERIALS

ASTM Test Methods	Properties	Material		
		ABS 3-2-2-2-2	PVC 12454	CPVC 23447
General D 792	Specific Gravity	1.00 - 1.08	1.38	1.55
D 570	Water Absorption % 24 Hrs. @ 73°F	0.3	0.05	0.05
Mechanical D 638	Tensile Strength psi @ 73°F	4,500	7,000	7,000
D 638	Modulus of Elasticity in Tension psi @ 73°F x 10^5	2.4	4.0	3.6
D 790	Flexural Strength psi	10,000	14,500	15,600
D 256	Izod Impact Strength @ 73°F (Notched)	4.0	0.65	1.5
Thermal D 696	Coefficient of Thermal Expansion in/in/°Fx10^{-5}	5.0	3.0	3.8
C 177	Thermal Conductivity BTU/HR/Sq. Ft./°F/in	1.35	1.2	0.95
D 648	Heat Distortion Temp. °F @ 66 psi	219	165	238
D 648	Heat Distortion Temp. °F @ 264 psi	180	158	212
	Resistance to Heat °F at Continuous Drainage	180	140	210
Flammability D 2863	Limiting Oxygen Index (%)	19	43	60
E 84	Flame Spread	150-250	15-20	15
	Underwriter's Lab Rating (Sub. 94)	94HB	94V-0	94V-0

Plastic Piping Standards

Many commercial, industrial, and governmental standards or specifications are available to assist the design engineer in specifying plastic piping systems. Standards most frequently specified in plastic piping systems are American Society for Testing and Materials (ASTM) Standards. Below is a list and description of those standards most typically applied to industrial plastic piping.

ASTM Standard D 1784

This standard covers PVC and CPVC compounds used in the manufacture of plastic pipe, valves, and fittings. It provides a means for selecting and identifying compounds on the basis of a number of physical and chemical criteria. Conformance to a particular material classification in this standard requires meeting a number of minimum physical and chemical properties.

ASTM Standards D 2665 and D 3311

These standards provide the material and test requirements as well as the fitting geometries for PVC-DWV (drain, waste and vent) fittings. These fittings are joined by threading or solvent cementing.

ASTM Standard D 2466

This standard covers Schedule 40 PVC threaded and socket pressure fittings. Included in the standard are thread and socket specifications, lay length, wall thickness, burst, material, quality, and identification requirements.

ASTM Standard D 2467

This standard covers Schedule 80 PVC threaded and socket fittings. Included in the standard are thread and socket specifications, lay length, wall thickness, burst, material, quality, and identification requirements.

ASTM Standard D 2846

This standard covers plastic hot and cold-water distribution system components made in one standard dimension ratio. This includes a series of CTS (copper tube size) CPVC fittings meant for use with SDR 11 tube and plastic-to-metal transition fittings.

ASTM Standard D 3965

This standard covers ABS compounds used in the manufacture of pipe and fittings. It identifies the chemical and physical properties of several ABS compositions based upon impact strength, deflection temperature under load, and tensile stress at yield point. These properties identify the polymers or blends of polymers that make up this rigid thermoplastic material.

ASTM Standards D 2661 and D 3311

These standards cover ABS-DWV (drain, waste and vent) by material and by physical configuration. These products are threaded or joined by solvent cement.

Material Selection

Plastic Piping Standards and Chemical Resistance

ASTM Standard F 1498

This standard covers dimensions, tolerances, and gaging of tapered pipe threads used on plastic ends of pipe and fittings.

ASTM Standard F 1970

This standard covers fittings and appurtenances intended to be used in PVC or CPVC plastic piping, or as a transition from such systems to metal systems. These products, such as unions, flanges, or valves, are not included in the scope of other ASTM specifications.

ASME B1.20.1 (American Society of Mechanical Engineers)

This specification details the dimensions, tolerances, and gaging of tapered pipe threads used on metallic ends of pipe and fittings, plus machined plastic threaded ends.

ANSI/NSF Standard 14 (NSF International, formerly National Sanitation Foundation)

This standard establishes the minimum physical and performance requirements for plastic piping system components and related materials. It also provides a basis for certification of products to consensus standards, or other physical and performance requirements where no consensus standard exists. It requires adherence to appropriate ASTM Standards and specifies minimum quality control programs. To comply with this standard the manufacturer must allow periodic testing of product and auditing of procedures by a third-party agency.

ANSI/NSF Standard 61

At the request of the U.S. Environmental Protection Agency (EPA), a consortium led by NSF International developed this standard. It was developed to establish minimum requirements for the control of potential adverse human health effects from products which contact drinking water. This Standard complements the performance requirements that are contained within ASTM product standards. NIBCO PVC & CPVC fitting products intended for potable water applications are tested and certified by a third-party agency for compliance to ANSI/NSF Standard 61.

CSA (Canadian Standards Association)

CSA tests piping products against Canadian standards. These standards require that products meet certain criteria such as dimensions, strength, and compatibility with potable water. Most products sold in Canada require the CSA listing.

IAPMO (International Association of Plumbing and Mechanical Officials)

IAPMO is responsible for the Uniform Plumbing Code (UPC). Products listed by IAPMO are tested by third-party organizations and/or meet PS (Product Standards) or IS (Installation Standards) which are written by IAPMO. Listed products will contain the UPC or IAPMO-T (1½" sizes for mobile home and recreational vehicle (MHRV) use) mark.

Chemical Resistance

Thermoplastics exhibit a 'GO' or 'NO-GO' type of resistance when contacted by aggressive chemicals. That is, they either resist attack completely or they deteriorate rapidly, in which case, the mechanism of attack is either solvation or reaction with the base molecule. Solvation, which is the most common form of attack, involves penetration of a chemical into the plastic causing softening, swelling, and loss of physical properties. Reaction with the base molecule involves the breakage of the molecular chain, crosslinking, or substitution reactions.

The NIBCO *Chemical Resistance Guide* contains specific chemical resistance information for the various plastic and elastomeric materials used in the NIBCO product line. When interpreting the information presented in this brochure it is important to note that it is based only on unstressed immersion testing at the temperatures noted, using pure chemicals or saturated solutions, except where otherwise specified. It is unwise to specify a plastic material without chemical resistance information relative to the specific environment of the intended application. Therefore, in situations where the aggressive environment involves a mixture of chemicals, the Chemical Resistance Guide can be used to investigate the effects of individual chemicals; however, because of possible synergisms, the suitability of a particular plastic for handling a chemical mixture should be verified. Also, since chemicals are more aggressive at higher temperatures and concentrations, chemical resistance information should not be extrapolated to higher temperatures and concentrations. Conversely, chemicals are generally less aggressive at lower temperatures and concentrations; therefore, extrapolation of chemical resistance information to lower temperatures and concentrations is generally acceptable.

When chemical resistance information is not available or a first-of-a-kind process is involved, data may be obtained through immersion testing. ASTM D 543 provides a method for conducting such tests, and the chemical, as well as, the temperature used in this test should be identical to the anticipated process condition.

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Key to NIBCO Figure Numbers

DWV Fittings 1 2 3 4 - 5

1 2 TYPE OF MATERIALS

48 = PVC
58 = ABS

3 4 TYPE OF FITTING & DESCRIPTION

01 = Coupling
03 = Female Adapter
04 = Male Adapter
05 = Soil Pipe Adapter
06 = 45° Ell
07 = 90° Ell
08 = 22½° Ell
10 = Wye
11 = Tee
12 = Long Turn TY
14 = Test Tee
16 = Cleanout
17 = Cap
18 = Plug
19 = Blind Flange
26 = Plug (Spg)
27 = Cap (FIPT)
28 = Cross
29 = Nipple
30 = True Y
34 = Double Y
35 = Double Tee
36 = Double Long Turn TY
37 = Double Ell
48 = Offset Closet Flange
51 = Closet Flange
53 = Closet Flange-Flush
55 = Closet Flange w/Knockout Test Plug
60 = 60° Ell
61 = 90° Ell w/Heel Inlet
63-73 = Various Stack Fittings
76 = Return Bend w/CO Hub x SJ
77 = Return Bend Hub x SJ
78 = Return Bend w/CO Hub x Hub
79 = Return Bend Hub x Hub
80 = P-Trap w/CO Hub x SJ
81 = P-Trap Hub x SJ
84 = P-Trap w/CO Hub x SJ
85 = P-Trap Hub x Hub
91 = Drum Trap
92 = P-Trap w/Union Hub x SJ
95 = P-Trap w/Union Hub x Hub

5 TYPE OF CONNECTIONS

Numerical Suffix
2 = Fitting Connection
3 = Female Connection
4 = Male Connection
7 = Slip Joint Connection
9 = Side Inlet
13 = Female Connection Indicating Hub x FIPT x Hub
14 = Female Connection Indicating Hub x Hub x FIPT
16 = Female Connection Indicating Hub x CO x Hub
17 = Female Connection Indicating FIPT x Hub x Hub
18 = Female Connection Indicating FIPT x FIPT x Hub
19 = Baffle Tee Hub x Hub x Hub

Letter Suffix
A = Adjustable Closet Flange
B = Double Fixture Tee
BAF = Baffle
CL = Water Closet Ell
CLAY = Clay
CO = Cleanout
DC = Dust Cap
DP = Dust Plug
EH = Extra Heavy
EL = Extra Long
F = Flush
FX = Fixture Tee
KO = Knockout
L = Lead & Left
LH = Low Heel
LR = Long Radius
LT = Long Turn
N = No Hub
NS = No Stop
P = Fits Pipe I.D.
R = Right
RP = Repair
S = Stack Upturn
SD = Sewer Drain ASTM-D2852
SE = Special
TE = Trap El
TPA = Tray Plug Adapter
TY = TY-Seal
V = Vent
XL = Extra Long

Schedule 40 - PVC Plastic Fittings

UNIV. PART NO.	DESCRIPTION	END CONNECTIONS
401	Tee	Slip x Slip x Slip
402	Tee	Slip x Slip x FIPT
405	Tee	FIPT x FIPT x FIPT
406	90° Ell	Slip x Slip
407	90° Ell	Slip x FIPT
408	90° Ell	FIPT x FIPT
409	90° Street Ell	Spg x Slip
410	90° Ell	MIPT x Slip
411	90° Street Ell	Spg x FIPT
412	90° Street Ell	MIPT x FIPT
414	90° Side Outlet Ell	Slip x Slip x FIPT
417	45° Ell	Slip x Slip
420	Cross	All Slip
429	Coupling	Slip x Slip
430	Coupling	FIPT x FIPT
434	Riser Extender	MIPT x FIPT
435	Female Adapter	Slip x FIPT
436	Male Adapter	MIPT x Slip
437	Bushing	Slip x Slip
438	Bushing	Spg x Slip
439	Thread Bushing	MIPT x FIPT
447	Cap	Slip
448	Thread Cap	FIPT
449	Plug	Spg
450	Thread Plug	MIPT
475	Wye	All Slip
488	Running Trap	Spg x Spg
489	P-Trap	Spg x Spg

SIZE KEY STRAIGHT SIZES		SIZE KEY REDUCING SIZES		SIZE KEY REDUCING SIZES	
1/4	002	1/2 x 1/2 x 1/4	072	2 x 1½ x 3/4	238
3/8	003	1/2 x 1/2 x 3/4	074	2 x 1½ x 1	239
1/2	005	3/4 x 1/2 x 1/2	094	2 x 1/2 x 1½	241
3/4	007	3/4 x 1/2 x 3/4	095	2 x 2 x 1/2	247
1	010	3/4 x 3/4 x 1/2	101	2 x 2 x 3/4	248
1¼	012	3/4 x 3/4 x 1	102	2 x 2 x 1	249
1½	015	1 x 1/2 x 1	122	2 x 2 x 1¼	250
2	020	1 x 3/4 x 1/2	124	2 x 2 x 1½	251
2½	025	1 x 3/4 x 3/4	125	2½ x 2½ x 1/2	287
3	030	1 x 3/4 x 1	126	2½ x 2½ x 3/4	288
4	040	1 x 1 x 1/2	130	2½ x 2½ x 1	289
5	050	1 x 1 x 3/4	131	2½ x 2½ x 1¼	290
6	060	1 x 1 x 1¼	132	2½ x 2½ x 1½	291
		1 x 1 x 1½	133	2½ x 2½ x 2	292
8	080	1¼ x 1 x 1/2	156	3 x 3 x 1/2	333
10	100	1¼ x 1 x 3/4	157	3 x 3 x 3/4	334
12	120	1¼ x 1 x 1	158	3 x 3 x 1	335
		1¼ x 1¼ x 1/2	166	3 x 3 x 1¼	336
		1¼ x 1¼ x 3/4	167	3 x 3 x 1½	337
		1¼ x 1¼ x 1	168	3 x 3 x 2	338
		1½ x 1¼ x 1/2	199	3 x 3 x 4	342
		1½ x 1¼ x 3/4	201	4 x 4 x 3/4	416
		1½ x 1¼ x 1	202	4 x 4 x 1	417
		1½ x 1½ x 1/2	209	4 x 4 x 1¼	418
		1½ x 1½ x 3/4	210	4 x 4 x 1½	419
		1½ x 1½ x 1	211	4 x 4 x 2	420
		1½ x 1½ x 1¼	212	4 x 4 x 3	422
		1½ x 1½ x 2	213		

Fitting Terms and Abbreviations

FIPT = Female NPT Thread
Spg = Male End (Spigot)
MIPT = Male NPT Thread
NPSM = Straight Thread for Mechanical Joint
SJ = Slip Joint
Hub = Plastic Socket

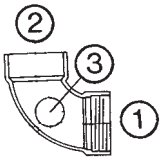
Schedule 40 Only
FIPT = Female NPT Thread
MIPT = Male NPT Thread
Slip = Female Socket
Spg = Male End (Spigot)

Ball Valve
S = Socket
T = Threaded

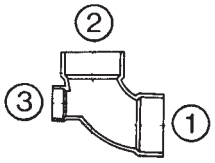
Schedule 80 Only
FIPT = Female NPT Thread
CL = Close
MIPT = Male NPT Thread
Slip = Female Socket
SH = Short
Spg = Male End (Spigot)

CPVC-CTS Only
C = Copper Solder Joint (Transition)
Compression = Transition Fitting
FIPT = Female NPT Thread
MIPT = Male NPT Thread
Slip = Female Socket
Spg = Male End (Spigot)
IPS = Iron Pipe Size
CTS = Copper Tube Size

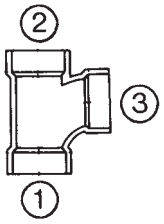
Methods of Designating Inlets of Fittings



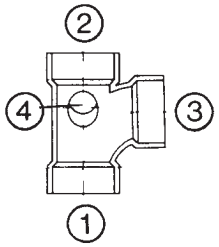
DWV 90° Ell w/Side Inlet



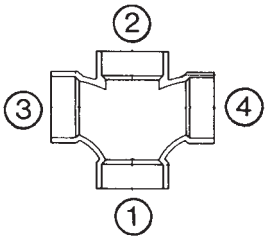
DWV 90° Ell w/High Heel Inlet



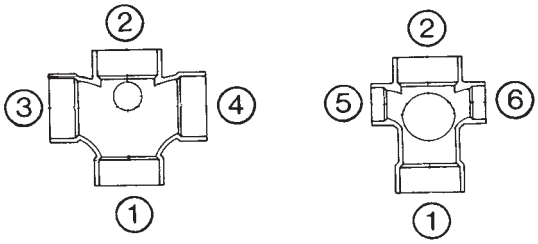
DWV Sanitary Tee



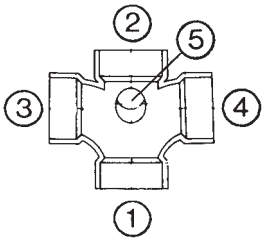
DWV Tee w/90° Right/Left Inlet



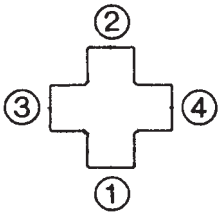
DWV Double Sanitary Tee



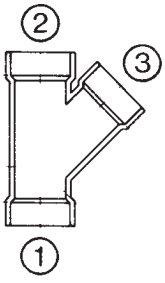
DWV Double Tee w/Two 90° Side Inlets



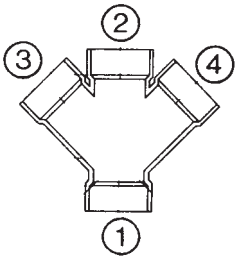
DWV Double Tee w/One 90° Side Inlet



Cross



DWV 45° Y



DWV 45° Double Y

General Note:
The largest opening establishes the basic size of a reducing fitting. The largest opening is named first, except for double branch elbows where both branches are reducing; the outlet is the largest opening and named last in both cases. In designating the openings of reducing fittings, they should be read in the order indicated by the sequence of the numbers 1, 2, 3, 4, 5 and 6. In designating the outlets of side outlet reducing fittings, the side outlet is named last.

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ABS & PVC-DWV Fittings

Adapters 12
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Couplings 17
Elbows 17
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Nipples 24
Plugs 24
Return Bends 25
Tees 25
Traps 28
TY's (Combinations) 30
Wyes 31

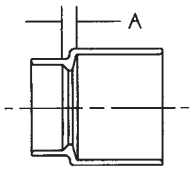
ABS & PVC-DWV Fittings

5800 Series - ABS/4800 Series PVC

ADAPTERS

5800 4800



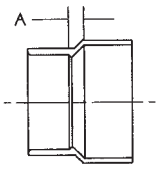


Soil Pipe Adapter (Hub x Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES
2	.200	.301	3/8
3	.500	.708	7/16
4	.834	1.158	1/2

5800-SD 4800-SD



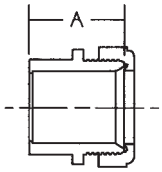


Sewer & Drain Adapter (Hub x Sewer & Drain)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES
3 x 4	.362	.502	9/16

5801-2-7 4801-2-7



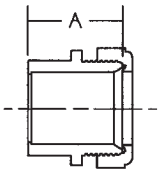


Trap Adapter (Spg x SJ)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES
1 1/4	.085	.102	1 21/32
1 1/2	.094	.120	1 21/32
1 1/2 x 1 1/4	.084	.105	1 21/32
2	.126	.174	1 13/16

5801-2-7-B



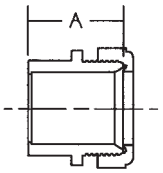


Trap Adapter (Spg x SJ w/Brass Nut)

NOM. SIZE	ABS APPROX. NET WT./LBS.	DIM. A INCHES
* 1 1/2	.166	1 21/32

5801-2-7-C 4801-2-7-C

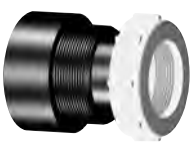


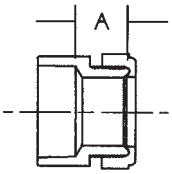


Trap Adapter (Spg x SJ w/Chrome Nut)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES
1 1/2	.123	.149	1 21/32
† 1 1/2 x 1 1/4	.107	.128	1 21/32
* 2 F	.202	N/A	1 13/16

5801-7 4801-7





Trap Adapter (Hub x SJ)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES
1 1/4	.082	.104	29/32
1 1/2	.091	.112	15/16
1 1/2 x 1 1/4	.087	.115	1 1/16
2	.125	.178	31/32

* Available in ABS only
† Available in PVC only

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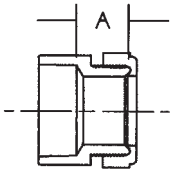
ABS & PVC-DWV Fittings

5800 Series - ABS/4800 Series PVC

ADAPTERS (Continued)

5801-7-B 4801-7-B



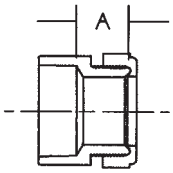


Trap Adapter (Hub x SJ w/Brass Nut)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES
* 1 1/4	.148	N/A	29/32
* 1 1/2	.163	N/A	15/16
1 1/2 x 1 1/4	.153	.181	1 1/16

5801-7-C 4801-7-C



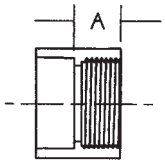


Trap Adapter (Hub x SJ w/Chrome Nut)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES
1 1/2	.120	.141	15/16
1 1/2 x 1 1/4	.110	.138	1 1/16

5803 4803



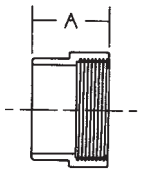


Adapter (Hub x FIPT)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES
1 1/4	.066	.091	27/32
1 1/2	.078	.101	1
2	.096	.135	1
3	.345	.475	1 1/2
4	.552	.756	1 5/8
6	1.282	1.815	2 1/32

5803-2 4803-2



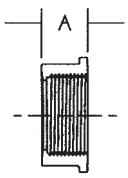


Adapter (Spg x FIPT)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES
1 1/4	.051	.066	1 13/32
1 1/2	.070	.098	1 21/32
2	.094	.132	1 25/32
3	.325	.453	2 29/32
4	.548	.727	3 5/16
6	1.203	1.689	4 25/32

5803-2-F 4803-2-F





Flush Adapter (Spg x FIPT)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES
1 1/2 x 1 1/4	.041	.055	15/16
2 x 1 1/2	.090	.118	1 1/16
3 x 2	.298	.407	1 3/4
† 3 x 1 1/2	.492	.407	1 3/4
* 4 x 3	.492	.674	2

* Available in ABS only
† Available in PVC only

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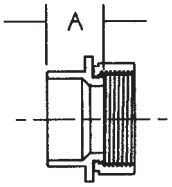
ABS & PVC-DWV Fittings

5800 Series - ABS/4800 Series PVC

ADAPTERS (Continued)

5803-2-SW



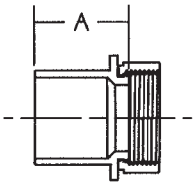


Swivel Adapter (Spg x FIPT)

NOM. SIZE	ABS APPROX. NET WT./LBS.	DIM. A INCHES
* 1 1/2	.085	1 1/8

5803-2-SW-EL



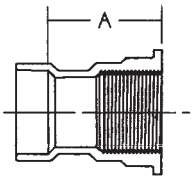


Swivel Adapter (Spg x FIPT)

NOM. SIZE	ABS APPROX. NET WT./LBS.	DIM. A INCHES
* 1 1/2	.109	1 7/8

5803-TPA



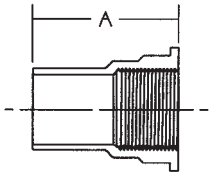


Tray Plug Adapter (Hub x NPSM Thread)

NOM. SIZE	ABS APPROX. NET WT./LBS.	DIM. A INCHES
* 1 1/2	.168	2 5/8

5803-2-TPA



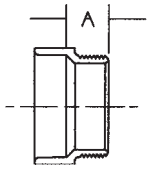


Tray Plug Adapter (Spg x NPSM Thread)

NOM. SIZE	ABS APPROX. NET WT./LBS.	DIM. A INCHES
* 1 1/2	.157	3 3/8

5804 4804





Adapter (Hub x MIPT)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES
1 1/4	.055	.077	29/32
1 1/2	.060	.081	15/16
1 1/2 x 1 1/4	.060	.088	1 1/16
2	.083	.117	31/32
3	.293	.400	1 19/32
4	.484	.695	2 1/8

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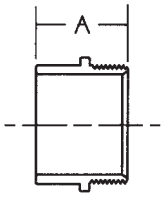
ABS & PVC-DWV Fittings

5800 Series - ABS/4800 Series PVC

ADAPTERS (Continued)

5804-2 4804-2



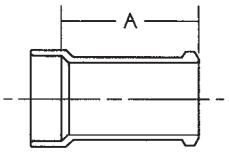


Adapter (Spg x MIPT)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES
1 1/4	.058	.075	1 21/32
1 1/2	.063	.089	1 21/32
1 1/2 x 1 1/4	.058	.078	1 21/32
2	.084	.113	1 13/16
3	.282	.385	3 1/2
4	.454	.609	3 7/8

5805 4805



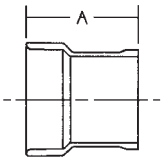


Soil Pipe Adapter (Hub x Spg)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES
1 1/2 x 2	.189	.265	3 1/2
* 1 13/16 x 3	.391	N/A	3 13/16
2	.234	.335	3 13/16
† 2 x 3	.386	.536	3 13/16
3	.533	.744	4 3/16
3 x 4	.722	1.026	4 1/16
4	.853	1.190	4 7/16

5805-N 4805-N





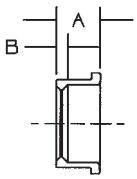
Soil Pipe Adapter (Hub x No Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES
1 1/2 x 2	.083	.111	3/4
2	.119	.163	1 3/4
3	.294	.399	1 15/16
3 x 4	.351	.492	1 29/32
4	.466	.665	1 15/16

BUSHINGS

5801-2-F 4801-2-F





Flush Bushing (Spg x Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
1 1/2 x 1 1/4	.031	.043	15/16	1/4
2 x 1 1/2	.079	.094	1 1/16	3/8
3 x 2	.283	.373	1 3/4	7/8
3 x 1 1/2	.290	.368	1 3/4	1
4 x 3	.411	.526	2	1/2
4 x 2	.506	.683	2	1 1/4
6 x 4	1.167	2.191	3 11/16	1 29/32
† 6 x 3	N/A	1.477	3 9/32	7/32
† 8 x 6	N/A	3.996	4 21/32	1 5/8
† 8 x 4	N/A	4.100	4 21/32	2 7/8

* Available in ABS only
† Available in PVC only

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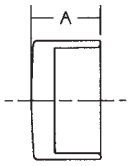
ABS & PVC-DWV Fittings

5800 Series - ABS/4800 Series PVC

CAPS

5817‡





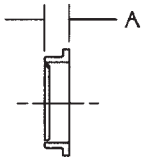
Cap (Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES
* 1 1/4	.074	N/A	7/8
1 1/2	.089	.115	7/8
2	.118	.169	3 1/32
3	.317	.469	1 23/32
4	.568	.789	2
6	1.150	3.755	3 1/16
† 8	N/A	4.056	6 3/16

‡ Cap available in Schedule 40 PVC only as Universal Fig. No. 447-XXX. See page 54.

5817-P



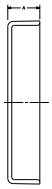


Test Cap (Polystyrene)

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1 1/2	.009	1/4
2	.013	1/4
3	.026	5/16
4	.045	3/8

4817-T



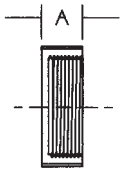


Outside Diameter Test Cap (Hub)

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
† 1 1/2	.036	5/8
† 2	.044	5/8
† 3	.075	5/8
† 4	.112	5/8
† 6	.205	5/8

5827





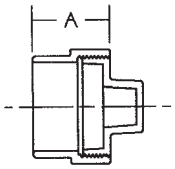
CAP (FIPT)

NOM. SIZE	ABS APPROX. NET WT./LBS.	DIM. A INCHES
1 1/2	.062	29/32
2	.082	15/16
3	.245	1 7/16

CLEANOUTS

5816 4816





Cleanout Adapter (Spg x Cleanout w/Plug)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES
1 1/2	.117	.160	1 21/32
2	.154	.215	1 25/32
3	.486	.679	2 29/32
4	.822	1.094	3 5/16
6	1.825	2.564	4 25/32

* Available in ABS only
† Available in PVC only

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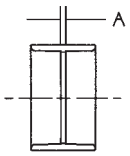
ABS & PVC-DWV Fittings

5800 Series - ABS/4800 Series PVC

COUPLINGS

5801 4801



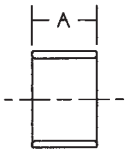


Coupling (Hub x Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES
1 1/4	.052	.075	1/8
1 1/2	.065	.090	1/8
1 1/2 x 1 1/4	.072	.100	13/32
2	.084	.119	1/8
2 x 1 1/2	.102	.132	23/32
3	.344	.466	3/16
3 x 2	.285	.397	7/8
3 x 1 1/2	.297	.418	1 3/32
4	.574	.780	1/4
4 x 3	.569	.784	15/16
4 x 2	.493	.690	1 3/8
6	1.541	1.541	1/4
† 8	N/A	5.100	1/4
† 10	N/A	8.533	1/2
† 12	N/A	14.490	1/2

5801-RP 4801-RP





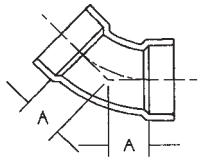
Repair Coupling (Hub x Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES
1 1/2	.062	.083	1 1/2
2	.086	.115	1 3/4
3	.303	.417	3
4	.510	.711	3 1/2
† 6	N/A	2.050	5 3/4

ELBOWS

5806 4806





45° Ell (Hub x Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES
1 1/4	.109	.151	1
1 1/2	.131	.188	1 1/8
2	.205	.281	1 1/2
3	.616	.842	1 3/4
4	1.058	1.515	2 3/16
6	2.875	4.151	3 3/8
† 8	N/A	6.134	2 1/16
† 8 x 6 F	N/A	10.234	2 1/16
† 8 x 4 F	N/A	10.130	2 1/16
† 10	N/A	19.64	2 5/8
† 12	N/A	32.12	3 1/8

* Available in ABS only
† Available in PVC only

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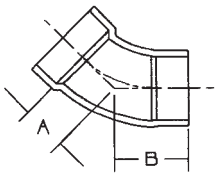
ABS & PVC-DWV Fittings

5800 Series - ABS/4800 Series PVC

ELBOWS (Continued)

5806-2 4806-2



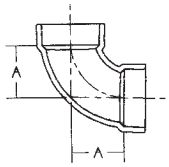


45° Street Ell (Spg x Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
1 1/4	.100	.136	1	1 3/4
1 1/2	.134	.174	1 1/8	1 7/8
2	.201	.277	1 7/16	2 1/4
3	.601	.818	1 3/4	3 1/4
4	1.048	1.464	2 3/16	3 15/16
6	2.772	3.950	3 3/8	6 3/8
† 8	N/A	5.738	2 1/16	6 1/16
† 8 x 6 F	N/A	6.500	2 1/16	5
† 8 x 4 F	N/A	6.200	2 1/16	3 3/4

5807 4807



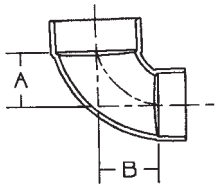


90° Ell (Hub x Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES
1 1/4	.122	.184	1 9/16
1 1/2	.149	.204	1 3/4
2	.248	.331	2 5/16
3	.724	1.008	3
4	1.278	1.840	3 7/8
6	3.453	4.666	5 5/8
† 8	N/A	8.553	5 31/32

5807-CL 4807-CL



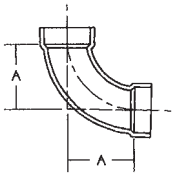


90° Closet Ell (Hub x Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
4 x 3	1.044	1.448	3	3 3/8

5807-LT 4807-LT





90° Long Turn Ell (Hub x Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES
* 1 1/4	.164	N/A	2 1/4
1 1/2	.206	.279	2 11/16
2	.291	.409	3 7/32
3	.855	1.268	4 1/16
4	1.542	2.114	4 15/16

† Available in PVC only
F Fabricated

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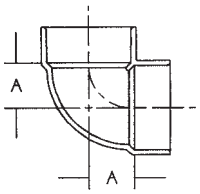
ABS & PVC-DWV Fittings

5800 Series - ABS/4800 Series PVC

ELBOWS (Continued)

5807-V 4807-V



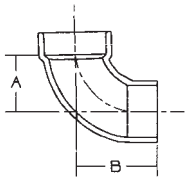


90° Vent Ell (Hub x Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES
* 1 1/4	.106	N/A	1
1 1/2	.145	.190	1 3/16
2	.194	.255	1 1/2
3	.584	.839	1 7/8
4	1.048	1.547	2 1/2
10	N/A	19.410	5 13/16
12	N/A	25.940	6 7/8

5807-2 4807-2



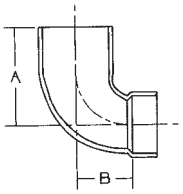


90° Street Ell (Spg x Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
1 1/4	.120	.164	1 21/32	2 5/16
1 1/2	.154	.200	1 3/4	2 1/2
2	.240	.313	2 5/16	3 3/16
3	.731	.993	3 1/16	4 9/16
4	1.224	1.731	3 7/8	5 5/8
6	3.319	4.530	5 5/8	8 5/8

5807-2-CL 4807-2-CL



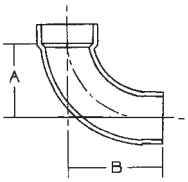


90° Street Closet Ell (Spg x Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
4 x 3	1.137	1.541	6	3 3/8
4 x 3 w/Cap F	1.182	1.586	6	3 3/8

5807-2-LT 4807-2-LT



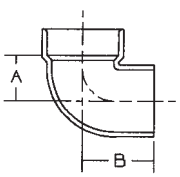


90° Long Turn Street Ell (Spg x Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
1 1/2	.214	.286	2 3/4	3 1/2
2	.293	.407	2 7/32	4 3/32
3	.854	1.138	4 1/16	5 9/16
4	1.477	2.021	4 15/16	6 11/16

5807-2-V 4807-2-V





90° Street Vent Ell (Spg x Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
1 1/2	.120	.173	1 3/16	1 15/16
2	.183	.251	1 1/2	2 3/8
3	.575	.930	1 7/8	3 3/8

* Available in ABS only
† Available in PVC only
F Fabricated

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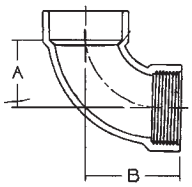
ABS & PVC-DWV Fittings

5800 Series - ABS/4800 Series PVC

ELBOWS (Continued)

5807-3 4807-3



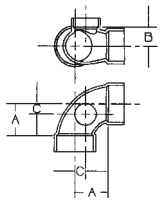


90° Ell (Hub x FIPT)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
3	.801	1.101	3 1/16	4 9/16

5807-9 4807-9



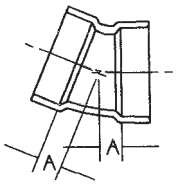


90° Ell w/Side Inlet (Hub x Hub x Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES
3 x 3 x 2	.780	1.127	3	1 21/32	1
3 x 3 x 1 1/2	.764	1.070	3	1 21/32	1

5808 4808



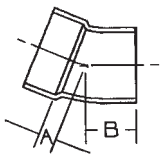


22½° Ell (Hub x Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES
1 1/2	.099	.131	7/16
2	.156	.195	5/8
3	.448	.637	1 3/16
4	.825	1.132	1
6	2.172	3.060	1 1/2

5808-2 4808-2



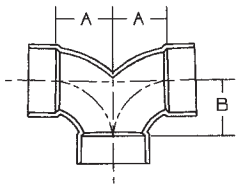


22½° Street Ell (Spg x Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
1 1/2	.093	.131	7/16	1 3/16
2	.145	.203	5/8	1 1/2
3	.442	.622	1 3/16	2 5/16
4	.768	1.049	1	2 3/4

5837 4837





Double Ell (Hub x Hub x Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
1 1/2	.225	.311	1 11/16	1 11/16
2	.331	.480	2 5/16	2 5/16
2 x 1 1/2 x 1 1/2	.230	.366	2 1/8	1 7/8
3	1.096	1.448	3 1/16	3 1/16
4	1.876	2.698	3 7/8	3 7/8

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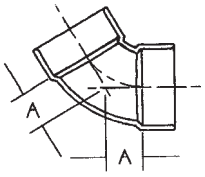
ABS & PVC-DWV Fittings

5800 Series - ABS/4800 Series PVC

ELBOWS (Continued)

5860 4860



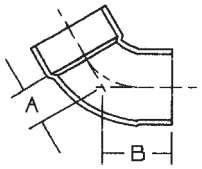


60° Ell (Hub x Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES
1 1/2	.128	.172	1
2	.190	.256	1 5/16
3	.564	.806	1 11/16
4	1.042	1.434	2 1/16

5860-2 4860-2



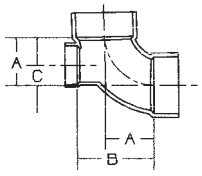


60° Street Ell (Spg x Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
1 1/2	.119	.165	1	1 3/4
2	.182	.250	1 1/4	2 1/8
3	.570	.855	1 11/16	3 3/16
4	1.012	1.266	2 1/16	3 13/16

5861 4861



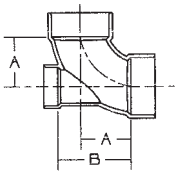


90° Ell w/High Heel Inlet (Hub x Hub x Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM.C INCHES
3 x 3 x 2	.780	1.119	3 1/16	4 3/4	1 1/4
3 x 3 x 1 1/2	.803	1.083	3 1/16	4 7/8	1 1/4

5861-LH 4861-LH



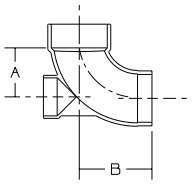


90° Ell w/Low Heel Inlet (Hub x Hub x Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
3 x 3 x 2	.823	1.141	3 1/16	4 7/16
3 x 3 x 1 1/2	.755	1.045	3 1/16	4 3/16
4 x 4 x 2	1.430	1.750	3 1/8	5 7/16

5861-2-LH 4861-2-LH





90° Ell w/Low Heel Inlet (Spg x Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
3 x 3 x 2	.83	1.089	3 1/16	4 7/16

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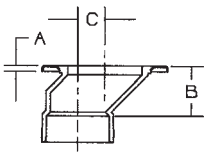
ABS & PVC-DWV Fittings

5800 Series - ABS/4800 Series PVC

FLANGES

5848-A 4848-A





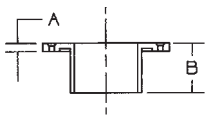
Offset Adjustable Closet Flange

w/Plastic Coated Steel Flange (Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES
4 x 3	.903	1.137	5/16	2 3/4	1 1/2

5851 4851



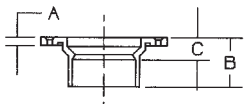


Closet Flange (Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
4	.466	.672	7/16	2

5851 4851



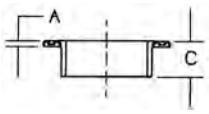


Reducing Closet Flange (Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES
4 x 3	.570	.769	7/16	2 3/4	1 1/4

5851-A 4851-A





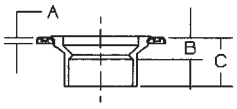
Adjustable Closet Flange

w/Plastic Coated Steel Flange (Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. C INCHES
4	.665	.777	5/16	2

5851-A 4851-A





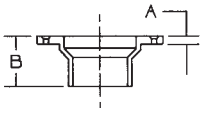
Reducing Adjustable Closet Flange

w/Plastic Coated Steel Flange (Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES
4 x 3	.770	.898	5/16	1 1/4	2 3/4

5851-2 4851-2



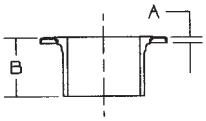


Closet Flange (Spg)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
4 x 3	.540	.719	7/16	2 25/32

5851-2-A 4851-2-A





Adjustable Closet Flange

w/Plastic Coated Steel Flange (Spg)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
4	.850	1.047	5/16	3 1/4
4 x 3	.748	.876	5/16	2 3/4

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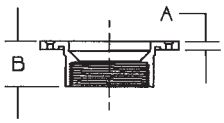
ABS & PVC-DWV Fittings

5800 Series - ABS/4800 Series PVC

FLANGES (Continued)

5851-3 4851-3



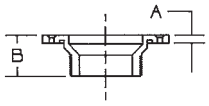


Closet Flange (FIPT)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
4 x 3	.583	.666	7/16	$2^{5}/_{16}$

5851-4 4851-4



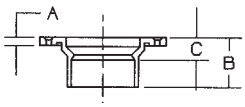


Closet Flange (MIPT)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
4 x 3	.430	.668	7/16	$2^{15}/_{32}$

5853 4853





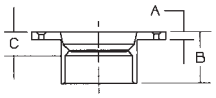
Flush Closet Flange

w/Pipe Stop (Fits Inside 4" DWV Pipe and Over 3" Pipe)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES
3 or 4	.570	.762	7/16	$2^{3}/_{4}$	$1^{1}/_{4}$

5853-KO 4853-KO





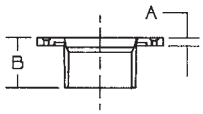
Flush Closet Flange

w/Pipe Stop & Knockout (Fits Inside 4" DWV Pipe and Over 3" Pipe)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES
3 or 4	.602	.800	7/16	$2^{3}/_{4}$	$1^{1}/_{4}$

5853-NS 4853-NS





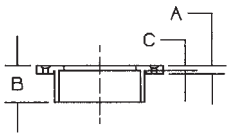
Flush Closet Flange

w/Out Pipe Stop (Fits Inside 4" DWV Pipe and Over 3" Pipe)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
3 or 4	.529	.742	7/16	$2^{3}/_{4}$

5855 4855





Closet Flange w/Knockout Test Plug (Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES
4	.585	.795	7/16	2	1/4
4 x 3	.581	.810	5/16	$2^{3}/_{4}$	$1^{1}/_{4}$

† Available in PVC only

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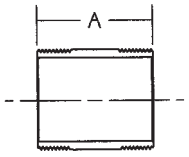
ABS & PVC-DWV Fittings

5800 Series - ABS/4800 Series PVC

NIPPLES

5829



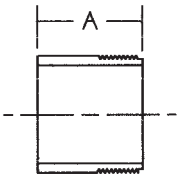


Nipples 3" (MIPT x MIPT)

NOM. SIZE	ABS APPROX. NET WT./LBS.	DIM. A INCHES
* 3	.272	3
* 4	.393	4
* 6	.595	6
* 8	.847	8
* 10	1.092	10
* 12	1.274	12

5829-2





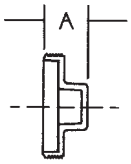
Nipples 3" (MIPT x Plain End)

NOM. SIZE	ABS APPROX. NET WT./LBS.	DIM. A INCHES
* 3	.315	3
* 4	.425	4
* 6	.670	6
* 8	.897	8
* 10	1.115	10

PLUGS

5818 4818



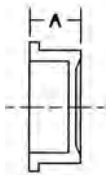


Plug (MIPT)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES
1 1/4	.029	.042	1
1 1/2	.047	.062	1 3/8
2	.060	.083	1 3/8
* 2 1/2	.090	N/A	2 1/2
3	.161	.226	1 3/4
* 3 1/2	.202	N/A	1 3/4
4	.274	.367	1 7/8
6	.622	.875	2

5826





Fitting Plug (Spg)

NOM. SIZE	ABS APPROX. NET WT./LBS.	DIM. A INCHES
* 1 1/2	.043	3/4
* 2	.090	7/8

* Available in ABS only

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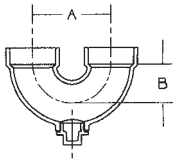
ABS & PVC-DWV Fittings

5800 Series - ABS/4800 Series PVC

RETURN BENDS

5878 4878



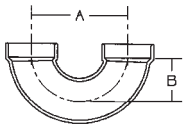


Return Bend (Hub x Hub x Cleanout w/Plug)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
1 1/2	.259	.366	3 1/4	1 3/8
2	.454	.643	5	2 1/4

5879 4879





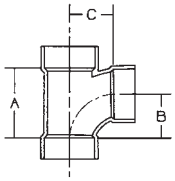
Return Bend (Hub x Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
1 1/2	.231	.333	3 1/4	1 3/8
2	.437	.620	5	2 1/4
3	1.151	1.632	6 5/16	2 11/16
4	2.255	3.083	8 1/2	3 11/16

TEES

5811 4811





Sanitary Tee (Hub x Hub x Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES
1 1/4	.168	.234	2 3/8	1 19/32	1 9/16
1 1/2	.204	.294	2 5/8	1 11/16	1 11/16
* 1 1/2 x 1 1/2 x 1 1/4	.202	N/A	2 1/2	1 11/16	1 13/16
* 1 1/2 x 1 1/4 x 1 1/2	.235	N/A	2 3/4	1 3/4	1 3/4
* 1 1/2 x 1 1/4 x 1 1/4	.233	N/A	2 5/16	1 9/16	1 9/16
2	.328	.435	3 11/16	2 5/16	2 5/16
2 x 2 x 1 1/2	.273	.379	3 1/8	1 15/16	2 3/16
2 x 1 1/2 x 2	.313	.432	3 11/16	2 5/16	2 5/16
2 x 1 1/2 x 1 1/2	.264	.375	3 1/8	1 15/16	2 3/16
3	.998	1.399	4 7/8	3 1/16	3 1/16
3 x 3 x 2	.674	.946	3 5/16	2 1/8	2 7/8
3 x 3 x 1 1/2	.586	.808	2 11/16	1 3/4	2 9/16
4	1.755	2.495	6 1/8	3 7/8	3 7/8
4 x 4 x 3	1.442	1.980	4 3/4	3	3 9/16
4 x 4 x 2	1.013	1.432	3 3/16	2 1/16	3 5/16
4 x 4 x 1 1/2	1.092	1.526	3 3/16	2 1/16	3 5/16
6	4.375	5.950	8 3/8	4 15/16	4 15/16
6 x 6 x 4	3.065	4.650	6 1/32	3 27/32	4 31/32
† 8	N/A	11.665	10 7/16	5 31/32	5 31/32

* Available in ABS only
† Available in PVC only

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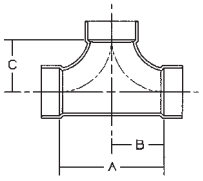
ABS & PVC-DWV Fittings

5800 Series - ABS/4800 Series PVC

TEES (Continued)

5811-C 4811-C



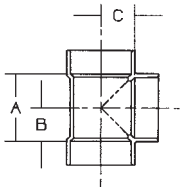


Two-Way Cleanout Tee (Hub x Hub x Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES
3	1.362	1.920	8 1/8	4 1/16	4 1/16
4	2.433	3.323	9 7/8	4 15/16	4 15/16

5811-V 4811-V



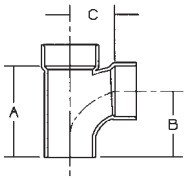


Vent Tee (Hub x Hub x Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES
1 1/2	.171	.246	2 3/8	1 3/16	1 3/16
2	.245	.382	3	1 1/2	1 1/2
3	.756	1.106	3 3/4	1 7/8	1 7/8
* 3 x 3 x 1 1/2	.545	N/A	2 3/8	1 3/16	1 7/8
* 3 x 3 x 2	.598	N/A	3	1 1/2	1 7/8
4	1.397	2.000	5	2 1/2	2 1/2
10	N/A	23.62	11 5/8	5 13/16	5 13/16
12	N/A	36.92	13 3/4	6 7/8	6 7/8

5811-2 4811-2





Sanitary Street Tee (Spg x Hub x Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES
1 1/2	.207	.275	3 1/2	2 1/2	1 3/4
2	.307	.436	4 9/16	3 3/16	2 5/16
2 x 2 x 1 1/2	.267	.368	3 7/8	2 3/4	2 1/8
2 x 1 1/2 x 2	.309	.407	4 9/16	3 3/16	2 5/16
2 x 1 1/2 x 1 1/2	.247	.373	4	2 13/16	2 3/16
3	.994	1.365	6 3/8	4 9/16	3 1/16
3 x 3 x 2	.658	.862	4 13/16	3 5/8	2 7/8
3 x 3 x 1 1/2	.576	.813	4 3/16	3 5/8	2 7/8
4	1.750	2.462	7 7/8	5 5/8	3 7/8
† 4 x 4 x 2	N/A	1.724	4 15/16	3 13/16	3 5/16

* Available in ABS only
† Available in PVC only

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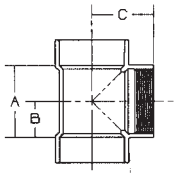
ABS & PVC-DWV Fittings

5800 Series - ABS/4800 Series PVC

TEES (Continued)

5811-14-V 4811-14-V



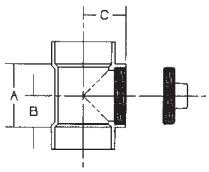


Test Tee (Hub x Hub x FIPT w/o plug)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES
1 1/2	.178	.277	2 3/8	1 3/16	1 13/16
2	.252	.388	3	1 1/2	2 1/8
3	.718	1.024	3 3/4	1 7/8	2 5/8
4	1.355	1.966	5	2 1/2	3 3/8

5814 4814



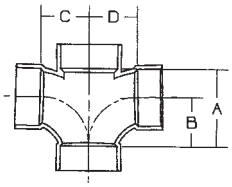


Test Tee (Hub x Hub x Cleanout w/Plug)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES
1 1/2	.225	.339	2 3/8	1 3/16	1 13/16
2	.312	.471	3	1 1/2	2 1/8
3	.879	1.250	3 3/4	1 7/8	2 5/8
4	1.629	2.333	5	2 1/2	3 3/8

5835 4835



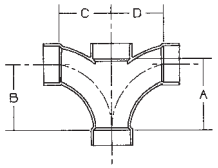


Double Sanitary Tee (All Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES	DIM. D INCHES
1 1/2	.262	.381	2 5/8	1 11/16	1 11/16	1 11/16
2	.394	.575	3 11/16	2 5/16	2 5/16	2 5/16
2 x 2 x 1 1/2 x 1 1/2	.356	.496	3	1 7/8	2 1/8	2 1/8
3	1.254	1.740	4 25/32	3 1/32	3 1/32	3 1/32
3 x 3 x 2 x 2	.784	1.025	3 5/16	2 1/8	2 7/8	2 7/8
3 x 3 x 2 x 1 1/2	.724	1.012	3 5/16	2 1/8	2 7/8	2 9/16
3 x 3 x 1 1/2 x 1 1/2	.644	.900	2 11/16	1 3/4	2 9/16	2 9/16
4	2.190	3.033	6 1/8	3 7/8	3 7/8	3 7/8
4 x 4 x 3 x 3	1.576	2.270	4 3/4	3	3 9/16	3 9/16
4 x 4 x 2 x 2	1.111	1.538	3 3/16	2 1/16	3 5/16	3 5/16

5835-B 4835-B

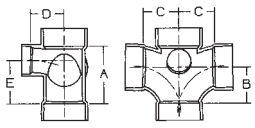




Double Fixture Tee (All Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES	DIM. D INCHES
2	.593	.818	4 5/8	4 1/4	3 1/2	3 1/2
2 x 1 1/2 x 2 x 2	.585	.810	4 5/8	4 1/4	3 1/2	3 1/2
2 x 1 1/2 x 1 1/2 x 1 1/2	.409	.526	3 9/16	3 3/16	2 7/8	2 7/8
3	1.813	2.607	6 3/4	6 1/4	4 15/16	4 15/16
3 x 2 x 3 x 3	1.689	2.409	6 3/4	6 1/4	4 15/16	4 15/16

5835-9 4835-9



Double Sanitary Tee w/One-90° Side Inlet (All Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES	DIM. D INCHES	DIM. E INCHES
3 x 3 x 3 x 3 x 2	1.392	1.885	4 7/8	3 1/16	3 1/16	2 7/8	3 11/16
3 x 3 x 3 x 3 x 1 1/2	1.338	1.858	4 7/8	3 1/16	3 1/16	2 9/16	3 11/16
4 x 4 x 4 x 4 x 2	2.282	3.187	6 1/8	3 7/8	3 7/8	3 5/16	5

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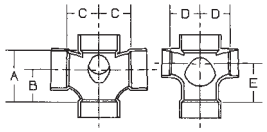
ABS & PVC-DWV Fittings

5800 Series - ABS/4800 Series PVC

TEES (Continued)

5835-9-9 4835-9-9



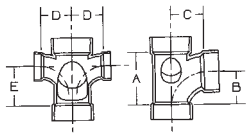


Double Sanitary Tee w/Two-90° Side Inlets (All Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES	DIM. D INCHES	DIM. E INCHES
3 x 3 x 3 x 3 x 2 x 2	1.549	2.063	4 7/8	3 1/16	3 1/16	2 7/8	3 11/16
4 x 4 x 4 x 4 x 2 x 2	2.477	3.329	6 1/8	3 7/8	3 7/8	3 5/16	5

5870 4870



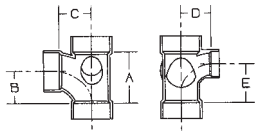


Sanitary Tee w/90° Right & Left Inlets (All Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES	DIM. D INCHES	DIM. E INCHES
3 x 3 x 3 x 2 x 2	1.354	1.775	4 7/8	3 1/16	3 1/16	2 7/8	3 11/16
† 3 x 3 x 3 x 1 1/2 x 1 1/2	N/A	1.620	4 7/8	3 1/16	3 1/16	2 9/16	3 11/16
† 4 x 4 x 4 x 2 x 2	2.079	2.735	6 1/8	3 7/8	3 7/8	3 5/16	5

5871 4871



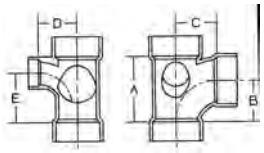


Sanitary Tee w/90° Left Inlet (All Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES	DIM. D INCHES	DIM. E INCHES
3 x 3 x 3 x 2	1.125	1.561	4 7/8	3 1/16	3 1/16	2 7/8	3 11/16
3 x 3 x 3 x 1 1/2	1.061	1.503	4 7/8	3 1/16	3 1/16	2 9/16	3 11/16
3 x 3 x 2 x 2 F	1.408	1.934	3 3/8	2 1/8	2 7/8	2 7/8	2 1/2
4 x 4 x 4 x 2	2.079	2.600	6 1/8	3 7/8	3 7/8	3 5/16	5

5872 4872





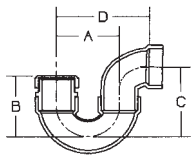
Sanitary Tee w/90° Right Inlet (All Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES	DIM. D INCHES	DIM. E INCHES
3 x 3 x 3 x 2 F	1.147	1.543	4 7/8	3 1/16	3 1/16	2 7/8	3 11/16
3 x 3 x 3 x 1 1/2	1.061	1.479	4 7/8	3 1/16	3 1/16	2 9/16	3 11/16
3 x 3 x 2 x 2	1.430	1.916	3 3/8	2 1/8	2 7/8	2 7/8	2 1/2
4 x 4 x 4 x 2	1.889	2.584	6 1/8	3 7/8	3 7/8	3 5/16	5

TRAPS

5881 4881



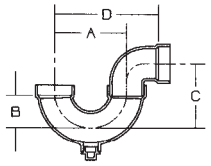


P-Trap (Hub x SJ)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES	DIM. D INCHES
1 1/2 F	.471	.634	3 3/16	2 5/16	3 5/8	4 7/16

5884 4884





P-Trap (Hub x Hub x Cleanout w/Plug)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES	DIM. D INCHES
1 1/2	.405	.547	3 1/4	1 3/8	3 5/8	4 7/16
2	.678	.946	5	2 1/4	4 5/8	6 1/2

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F Fabricated

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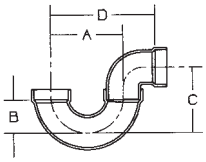
ABS & PVC-DWV Fittings

5800 Series - ABS/4800 Series PVC

TRAPS (Continued)

5885 4885



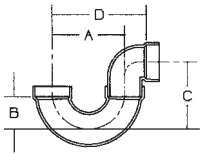


P-Trap (Hub x Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES	DIM. D INCHES
1 1/2	.377	.514	3 1/4	1 3/8	3 5/8	4 13/16
2	.661	.923	5	2 1/4	4 1/2	7 1/4
3	1.748	2.474	6 5/16	2 11/16	6 5/16	8 7/16
4	3.479	4.814	8 1/2	3 11/16	9 3/8	11 31/32

4885-WB



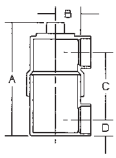


Washer Box P-Trap (Hub x Hub)

NOM. SIZE	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES	DIM. D INCHES
† 2	.871	5	2 1/4	4 5/8	6 1/2

5891 4891



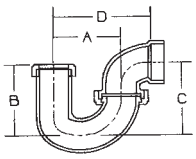


Swivel Drum Trap (Hub x Hub x Cleanout w/Plug)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES	DIM. D INCHES
1 1/2 x 3 x 6	.980	1.342	8	1 3/4	4 5/8	1 3/16

5892 4892



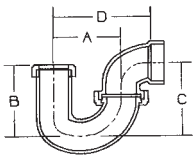


P-Trap w/Union Joint (Hub x SJ)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES	DIM. D INCHES
1 1/2	.453	.634	3 1/2	3 3/4	3 13/16	5 1/16
1 1/2 x 1 1/4	.412	.576	3 1/2	3 3/4	3 13/16	5 1/16

5892-B



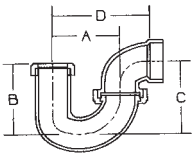


P-Trap w/Union Joint (Hub x SJ w/Brass Nut)

NOM. SIZE	ABS APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES	DIM. D INCHES
* 1 1/2 F	.525	3 1/2	3 3/4	3 13/16	5 1/16

5892-C 4892-C





P-Trap w/Union Joint (Hub x SJ w/Chrome Nut)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES	DIM. D INCHES
1 1/2 F	.482	.663	3 1/2	3 3/4	3 13/16	5 1/16
1 1/2 x 1 1/4 F	.435	.599	3 1/2	3 3/4	3 13/16	5 1/16

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F Fabricated

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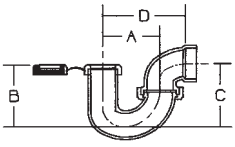
ABS & PVC-DWV Fittings

5800 Series - ABS/4800 Series PVC

TRAPS (Continued)

5893 4893



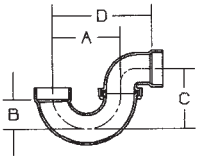


P-Trap w/Union Joint L.A. Pattern (Hub x SJ)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES	DIM. D INCHES
1 1/2 or 1 1/2 x 1 1/4	.485	.666	3 1/4	3 5/8	3 1/2	4 1/2

5895 4895



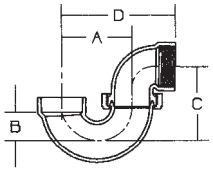


P-Trap w/Union Joint (Hub x Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES	DIM. D INCHES
1 1/4	.341	.468	3 1/2	1 3/8	3 5/8	4 5/8
1 1/2	.398	.572	3 1/4	1 3/8	3 5/8	4 13/16
2	.695	.929	5	2 1/4	5	7 1/4

5895-3 4895-3





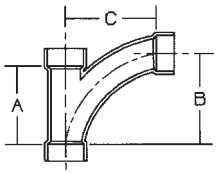
P-Trap w/Union Joint (Hub x FIPT)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES	DIM. D INCHES
1 1/2	.401	.566	3 1/4	1 3/8	3 1/2	5 1/4

TY'S

5812-LR 4812-LR





Long Radius TY (Hub x Hub x Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES
1 1/2	.338	.458	3 1/2	3 7/8	3 15/16
2	.520	.694	4 7/16	5 1/8	5 1/8
2 x 2 x 1 1/2	.360	.517	3 1/2	3 7/8	4 5/32
* 2 x 1 1/2 x 2	.522	N/A	4 7/16	5 1/8	5 1/8
2 x 1 1/2 x 1 1/2	.376	.537	3 1/2	3 7/8	4 5/32
3	1.608	2.226	6 1/2	7 9/16	7 9/16
3 x 3 x 2	.936	1.255	4 7/16	5 1/8	5 11/16
3 x 3 x 1 1/2	.750	1.075	3 1/2	3 15/16	43/4
4	3.174	4.152	8 1/2	10	10
4 x 4 x 3	2.089	2.919	6 1/2	7 9/16	8 1/16
4 x 4 x 2	1.340	1.845	4 1/2	5 1/8	6 1/8

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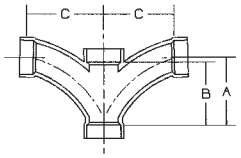
ABS & PVC-DWV Fittings

5800 Series - ABS/4800 Series PVC

TY'S (Continued)

5836 4836





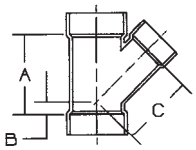
Double Long Turn TY (All Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES
† 2 F	N/A	1.341	4 7/16	5 1/8	5 1/8
2 x 2 x 1 1/2 x 1 1/2 F	.721	.967	3 1/2	3 15/16	4 3/16
† 3 F	2.759	3.897	6 1/2	7 9/16	7 9/16
† 3 x 3 x 2 x 2 F	N/A	1.900	4 7/16	5 1/8	5 11/16
* 4 F	4.896	6.884	8 1/2	10	10
† 4 x 4 x 2 x 2 F	N/A	2.549	4 1/2	5 1/8	6 1/8

WYES

5810 4810





45° Wye (Hub x Hub x Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES
1 1/4	.220	.312	3 5/8	1 1/16	2 9/16
1 1/2	.264	.373	3 7/8	1 1/16	2 13/16
2	.426	.567	5	1 3/8	3 5/8
2 x 2 x 1 1/2	.372	.470	4 1/4	1	3 3/8
2 x 1/2 x 1 1/2	.309	.413	3 19/32	1 1/16	2 31/32
3	1.254	1.697	6 5/8	1 5/8	5
3 x 3 x 2	.826	1.157	5	7/8	4 5/8
3 x 3 x 1 1/2	.781	1.099	4 5/32	7/16	4 9/32
4	2.305	3.171	8 1/4	1 7/8	6 3/8
4 x 4 x 3	1.753	2.418	6 5/8	1 1/16	6
4 x 4 x 2	1.311	1.828	5 1/16	3/8	5 9/16
4 x 4 x 1 1/2	1.390	1.922	5 1/16	3/8	5 7/8
6	5.053	7.144	10 3/8	1 3/4	8 7/16
6 x 6 x 4	3.562	5.040	7 1/4	1/4	7 1/2
6 x 6 x 3	3.973	5.566	7 1/4	1/4	7 3/4
† 8	N/A	15.200	14 3/4	2 3/8	11 3/4
† 8 x 8 x 6	N/A	10.720	9 1/2	1	9 13/16
† 8 x 8 x 4 F	N/A	12.911	9 1/2	1	11 23/32

* Available in ABS only
† Available in PVC only
F Fabricated

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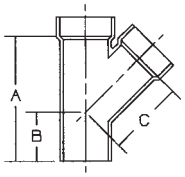
ABS & PVC-DWV Fittings

5800 Series - ABS/4800 Series PVC

WYES (Continued)

5810-2 4810-2



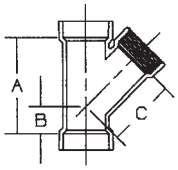


45° Street Wye (Spg x Hub x Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES
* 1 1/2	.258		4 11/16	1 13/16	2 7/8
2	.414	.567	5 29/32	2 1/4	3 21/32
3	1.199	.595	8 1/8	3 1/8	5
3 x 3 x 2	.827	1.158	6 1/2	2 3/8	4 5/8
† 3 x 3 x 1 1/2	.725	1.015	5 3/4	2	4 5/16
4	2.183	3.056	10	3 5/8	6 3/8
4 x 4 x 3	1.678	2.349	8 3/8	2 13/16	6
† 4 x 4 x 2	N/A	1.768	6 13/16	2 1/8	5 9/16

5810-14



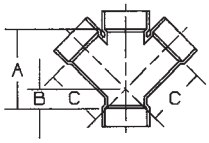


45° Wye (Hub x Hub x FIPT)

NOM. SIZE	ABS APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES
* 1 1/2	.287	3 7/8	1 1/16	3 13/16

5834 4834





45° Double Wye (All Hub)

NOM. SIZE	ABS APPROX. NET WT./LBS.	PVC APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES
1 1/2	.365	.504	4	1 1/8	2 7/8
2	.558	.787	5	1 3/8	3 5/8
2 x 2 x 1 1/2 x 1 1/2	.453	.619	4 3/8	1 1/16	3 7/16
3	1.557	2.261	6 5/8	1 5/8	5
3 x 3 x 2 x 2	.975	1.346	5	7/8	4 5/8
3 x 3 x 1 1/2 x 1 1/2	.815	1.170	4 1/4	1/2	4 5/16
4	2.800	3.956	8 1/4	1 7/8	6 3/8
4 x 4 x 3 x 3	2.072	2.899	6 5/8	1 1/16	6
4 x 4 x 2 x 2	1.400	1.995	5 1/16	3/8	5 9/16
† 6	N/A	5.000	10 3/16	1 3/4	8 7/16
6 x 6 x 4 x 4	4.079	5.706	7 1/4	1/4	7 1/2

* Available in ABS only
† Available in PVC only

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CPVC-CTS Pressure Fittings

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FlowGuard Gold® is a patented CPVC formulated compound developed by Lubrizol Advanced Materials, Inc. to improve the impact resistance of CPVC hot & cold water plumbing products.

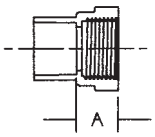


CPVC-CTS Pressure Fittings

ADAPTERS

4703



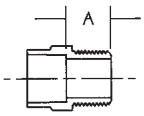


Female Adapter w/Washer (Slip x FIPT)

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1/2	.026	3/4
3/4	.039	25/32
1	.065	29/32

4704





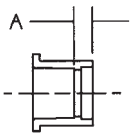
Male Adapter (Slip x MIPT)

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1/2	.023	7/8
3/4	.035	7/8
1	.060	1 1/16
1 1/4	.104	1 1/16
1 1/2	.155	1 1/8
2	.285	1 3/16

BUSHINGS

4718





Bushing (Spg x Slip)

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
3/4 x 1/2	.012	7/32
1 x 1/2	.031	1/2
1 x 3/4	.025	5/16
1 1/4 x 1/2	.052	23/32
1 1/4 x 3/4	.055	1/2
1 1/4 x 1	.039	5/16
1 1/2 x 1/2	.081	29/32
1 1/2 x 3/4	.083	29/32
1 1/2 x 1	.083	1/2
1 1/2 x 1 1/4	.053	5/16
2 x 1/2	.170	1 5/16
2 x 3/4	.171	1 1/8
2 x 1	.174	29/32
2 x 1 1/4	.182	23/32
2 x 1 1/2	.148	1/2

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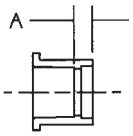
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CPVC-CTS Pressure Fittings

BUSHINGS (Continued)

4718-T





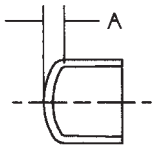
Transition Bushing (Spigot IPS x Slip CTS)

NOM. SIZE		APPROX. NET WT./LBS.	DIM. A INCHES
1	(IPS) x 1 (CTS)	.030	9/32
1 1/4	(IPS) x 1 1/4 (CTS)	.057	1/4
1 1/2	(IPS) x 1 1/2 (CTS)	.070	3/16
2	(IPS) x 2 (CTS)	.111	1/8

CAPS

4717





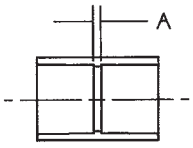
Cap (Slip)

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1/2	.012	1/8
3/4	.019	1/8
1	.034	5/16
1 1/4	.061	7/16
1 1/2	.100	1/2
2	.219	5/8

COUPLINGS

4701



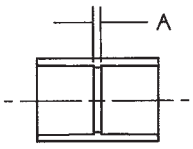


Coupling (Slip x Slip)

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1/2	.017	1/8
3/4	.030	1/8
3/4 x 1/2	.021	1/8
1	.048	1/8
1 x 3/4	.039	1/8
1 1/4	.086	1/8
1 1/2	.139	1/8
2	.305	1/8

4701-T





Transition Coupling (Slip IPS x Slip CTS)

NOM. SIZE		APPROX. NET WT./LBS.	DIM. A INCHES
3/4	(IPS) x 3/4 (CTS)	.039	1/8
1	(IPS) x 1 (CTS)	.068	1/8
2	(IPS) x 2 (CTS)	.330	1/8

FLOWGUARD GOLD® CPVC

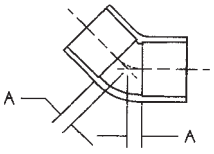
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CPVC-CTS Pressure Fittings

ELBOWS

4706



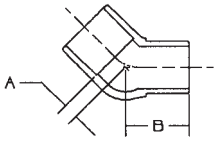


45° Ell (Slip x Slip)

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1/2	.020	3/16
3/4	.036	1/4
1	.077	5/16
1 1/4	.108	11/32
1 1/2	.174	13/32
2	.382	1/2

4706-2



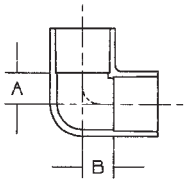


45° Street Ell (Spg x Slip)

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
1/2	.018	3/16	13/16
3/4	.032	1/4	1 1/16
1	.074	5/16	1 1/4

4707



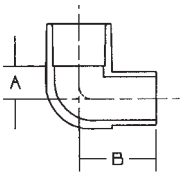


90° Ell (Slip x Slip)

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
1/2	.025	13/32	13/32
3/4	.052	17/32	17/32
3/4 x 1/2	.034	13/32	17/32
1	.077	21/32	21/32
1 1/4	.140	25/32	25/32
1 1/2	.223	29/32	29/32
2	.499	1 5/32	1 5/32

4707-2



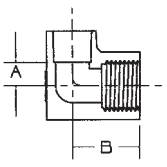


90° Street Ell (Spg x Slip)

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
1/2	.022	13/32	15/16
3/4	.039	21/32	1 9/32
1	.087	21/32	1 19/32

4707-3-5





90° Drop Ear Ell w/Washer (Slip x FIPT)

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
1/2	.067	13/32	1 1/8

FLOWGUARD GOLD® CPVC

F Fabricated using NSF listed Elbows, Bushings, and 1-Step Solvent Cement

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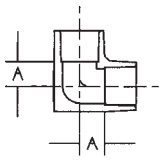
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CPVC-CTS Pressure Fittings

ELBOWS (Continued)

4707-5





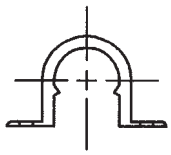
90° Drop Ear Ell (Slip x Slip)

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1/2	.036	13/32

STRAPS

4724





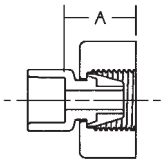
"Snap-On" Strap (Polypropylene)

NOM. SIZE	APPROX. NET WT./LBS.
1/2	.003
3/4	.004

SWIVEL ADAPTERS

4703-SW



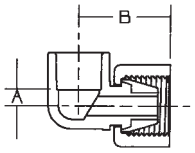


Coupling Adapter (Slip x NPSM)

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1/2	.034	1

4707-3-SW





90° Ell (Slip x NPSM)

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
1/2	.040	3/4	$1^{9}/_{32}$

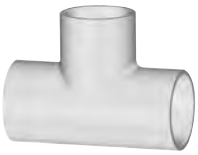
FLOWGUARD GOLD® CPVC

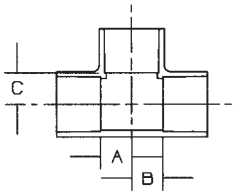
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CPVC-CTS Pressure Fittings

TEES

4711





Tee (Slip x Slip x Slip)

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES
1/2	.034	13/32	13/32	13/32
3/4	.063	17/32	17/32	17/32
3/4 x 3/4 x 1/2	.045	13/32	13/32	17/32
3/4 x 1/2 x 3/4	.053	17/32	19/32	17/32
3/4 x 1/2 x 1/2	.042	13/32	15/32	17/32
1	.100	21/32	21/32	21/32
1 x 1 x 3/4	.084	17/32	17/32	21/32
1 1/4	.174	25/32	25/32	25/32
1 1/2	.284	29/32	29/32	29/32
1 1/2 x 1 1/2 x 1	.215	21/32	21/32	29/32
2	.636	15/32	15/32	1 5/32
2 x 2 x 1	.421	21/32	21/32	1 5/32

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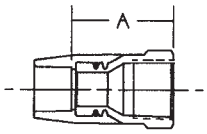
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CPVC-CTS Pressure Fittings

TRANSITION FITTINGS

4703-CT



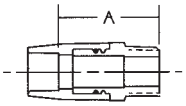


Female Adapter (CPVC Slip x Copper FIPT)

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1/2	.145	1 3/8
3/4	.218	1 11/16

4704-CT



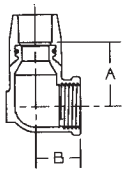


Male Adapter (CPVC Slip x Copper MIPT)

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1/2	.147	1 1/2
3/4	.227	1 11/16

4707-3-5-B



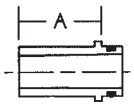


90° Drop Ear Ell (CPVC Slip x Bronze FIPT)

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
1/2	.214	1 3/16	13/16

4732-2





Compression Fitting (SPG)

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1/2	.020	1 7/16
3/4	.034	1 7/16

FLOWGUARD GOLD® CPVC

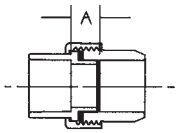
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CPVC-CTS Pressure Fittings

TRANSITION UNIONS

4733



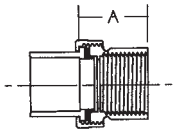


Union (CPVC Slip x Brass Solder)

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1/2	.106	17/32
3/4	.221	9/16

4733-3



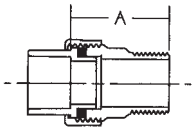


Union (CPVC Slip x Brass FIPT)

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1/2	.179	$1^{13}/_{32}$
3/4	.299	$1^{7}/_{16}$
1	.435	$1^{7}/_{16}$
$1^{1}/_{4}$	.607	$1^{5}/_{8}$
$1^{1}/_{2}$	.757	$1^{5}/_{8}$
2	1.298	$1^{7}/_{8}$

4733-4



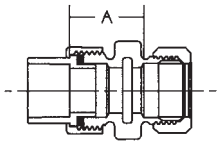


Union (CPVC Slip x Copper MIPT)

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1/2	.131	$1^{15}/_{32}$
1/2 x 3/4	.188	$1^{23}/_{32}$
3/4	.255	$1^{11}/_{32}$

4733-7



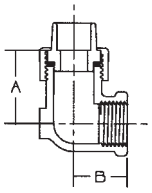


Union (CPVC Slip x Brass Compression)

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
1/2	.237	$1^{15}/_{32}$
1/2 x 3/8 O.D.	.290	$1^{23}/_{32}$
3/4	.453	$1^{11}/_{32}$

4707-3-5-6





Union 90° Drop Ell (CPVC Slip x Brass FIPT)

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
1/2	.322	$1^{11}/_{32}$	15/16

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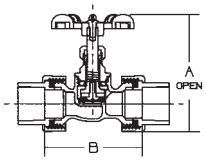
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CPVC-CTS Pressure Fittings

VALVES

4776





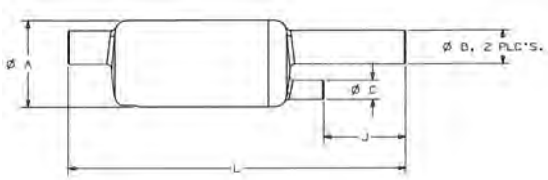
Stop & Waste Valve (CPVC Slip x CPVC Slip)

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	B OPEN INCHES
1/2	.620	$2\frac{9}{16}$	3
3/4	.740	$\frac{9}{16}$	$3\frac{1}{16}$

RAPID HOT WATER DELIVERY SYSTEM

4750





Just Right®

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES	DIM. D INCHES	DIM. E INCHES
3/4	1.405	$2\frac{1}{4}$	7/8	1/2	$8\frac{3}{4}$	$2\frac{1}{8}$

Just Right® is made with NIBCO FlowGuard Gold® CPVC, and is designed for use in both residential and light-commercial applications, including new and existing structures, where the hot-water line is located above the water heater. To complete the re-circulation loop, a return line must be run from the most distant hot-water outlet back to the Just Right® unit. Just Right® from NIBCO is a low-cost hot-water circulating unit that delivers hot water to every tap in a residence's plumbing loop within seconds.

FLOWGUARD GOLD® CPVC

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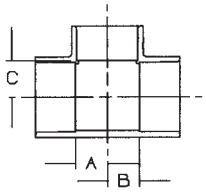
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PVC Schedule 40 Pressure Fittings

TEES

4611



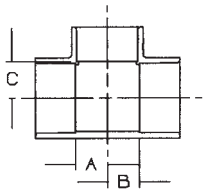


Tee (Slip x Slip x Slip)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES
401-005	1/2	.065	1/2	1/2	1/2
401-007	3/4	.099	9/16	9/16	9/16
401-010	1	.155	11/16	11/16	11/16
401-012	1 1/4	.241	7/8	7/8	7/8
401-015	1 1/2	.353	1	1	1
401-020	2	.448	1 1/4	1 1/4	1 1/4
401-025	2 1/2	.913	1 1/2	1 1/2	1 1/2
401-030	3	1.588	1 13/16	1 13/16	1 13/16
401-040	4	2.630	2 5/16	2 5/16	2 5/16
401-050	5	7.000	2 1/8	2 1/8	2 1/8
401-060	6	9.480	3 1/2	3 1/2	3 1/2
401-080	8	21.105	4 9/16	4 9/16	4 9/16

4611





Reducing Tee (Slip x Slip x Slip)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES
401-074	1/2 x 1/2 x 3/4	.125	9/16	9/16	1/2
401-094	3/4 x 1/2 x 1/2	.073	1/2	1/2	9/16
401-095	3/4 x 1/2 x 3/4	.155	9/16	9/16	9/16
401-101	3/4 x 3/4 x 1/2	.081	1/2	1/2	9/16
401-102	3/4 x 3/4 x 1	.220	23/32	23/32	19/32
401-124	1 x 3/4 x 1/2	.185	17/32	17/32	23/32
401-125	1 x 3/4 x 3/4	.204	23/32	23/32	23/32
401-130	1 x 2 x 1/2	.123	1/2	1/2	11/16
401-131	1 x 1 x 3/4	.132	9/16	9/16	11/16
401-133	1 x 1 x 1 1/2	.250	7/8	7/8	7/8
401-157	1 1/4 x 1 x 1 3/4	.290	1/2	1/2	7/8
401-166	1 1/4 x 1 1/4 x 1/2	.175	1/2	1/2	7/8
401-167	1 1/4 X 1 1/4 X 3/4	.170	9/16	9/16	7/8
401-168	1 1/4 X 1 1/4 X 1	.176	11/16	11/16	7/8
401-201	1 1/2 x 1 1/4 x 3/4	.385	1 1/16	1 1/16	1 1/16
401-202	1 1/2 x 1 1/4 x 1	.410	1 1/16	1 1/16	1 1/16
401-209	1 1/2 x 1 1/2 x 1/2	.209	1/2	1/2	1
401-210	1 1/2 x 1 1/2 x 3/4	.218	9/16	9/16	1
401-211	1 1/2 x 1 1/2 x 1	.248	11/16	11/16	1
401-212	1 1/2 x 1 1/2 x 1 1/4	.475	7/8	7/8	1
401-213	1 1/2 x 1 1/2 x 2	.673	1 5/16	1 5/16	1 1/16
401-241	2 x 1 1/2 x 1 1/2	.500	1 1/4	1 1/4	1
401-247	2 x 2 x 1/2	.275	1/2	1/2	1 1/4
401-248	2 x 2 x 3/4	.296	9/16	9/16	1 1/4
401-249	2 x 2 x 1	.325	11/16	11/16	1 1/4
401-250	2 x 2 x 1 1/4	.650	7/8	7/8	1 1/4
401-251	2 x 2 x 1 1/2	.673	1	1	1 1/4

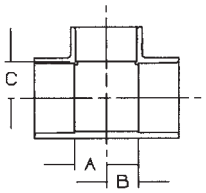
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PVC Schedule 40 Pressure Fittings

TEES (Continued)

4611

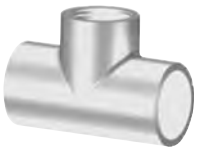


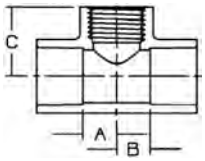


Reducing Tee (Slip x Slip x Slip) (continued)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES
401-287	2 1/2 x 2 1/2 x 1/2	1.100	1/2	1/2	1 1/2
401-288	2 1/2 x 2 1/2 x 3/4	1.100	19/32	19/32	1 1/2
401-289	2 1/2 x 2 1/2 x 1	.579	11/16	11/16	1 1/2
401-290	2 1/2 x 2 1/2 x 1 1/4	1.110	1 1/16	1 1/16	1 11/16
401-291	2 1/2 x 2 1/2 x 1 1/2	1.110	1 9/32	1 9/32	1 1/2
401-292	2 1/2 x 2 1/2 x 2	1.180	1 1/4	1 1/4	1 1/2
401-333	3 x 3 x 1/2	.950	23/32	23/32	1 15/16
401-334	3 x 3 x 3/4	.785	3/4	3/4	2
401-335	3 x 3 x 1	.965	11/16	11/16	1 13/16
401-336	3 x 3 x 1 1/4	1.200	7/8	7/8	1 13/16
401-337	3 x 3 x 1 1/2	1.112	1 1/4	1 1/4	1 3/4
401-338	3 x 3 x 2	.963	1 1/4	1 1/4	1 13/16
401-416	4 x 4 x 3/4	1.400	1 3/32	1 3/32	2 13/32
401-417	4 x 4 x 1	1.400	1 3/32	1 3/32	2 13/32
401-419	4 x 4 x 1 1/2	1.550	1 3/32	1 3/32	2 5/16
401-420	4 x 4 x 2	1.515	1 1/4	1 1/4	2 5/16
401-422	4 x 4 x 3	3.308	2 5/16	2 5/16	2 5/16
401-528	6 x 6 x 2	8.000	1 7/16	1 7/16	3 5/8
401-530	6 x 6 x 3	8.250	2	2	3 5/8
401-532	6 x 6 x 4	8.500	2 1/2	2 1/2	3 5/8
401-582	8 x 8 x 4	19.000	2 1/2	2 1/2	4 5/8
401-585	8 x 8 x 6	20.000	3 5/8	3 5/8	4 5/8

4612





Tee (Slip x Slip x FIPT)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES
402-005	1/2	.065	1/2	1/2	1 1/32
402-007	3/4	.097	9/16	9/16	1 1/8
402-010	1	.158	11/16	11/16	1 3/8
402-012	1 1/4	.390	7/8	7/8	1 19/32
402-015	1 1/2	.529	1	1	1 23/32
402-020	2	.760	1 1/4	1 1/4	2
402-030	3	1.850	1 13/16	1 13/16	3
402-040	4	3.220	2 5/16	2 5/16	3 5/8

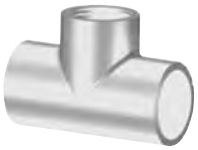
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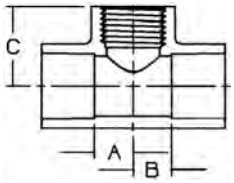
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PVC Schedule 40 Pressure Fittings

TEES (Continued)

4612



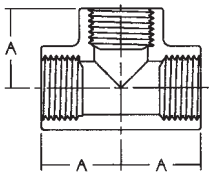


Reducing Tee (Slip x Slip x FIPT)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES
402-074	1/2 x 1/2 x 3/4	.145	21/32	21/32	19/16
402-094	3/4 x 1/2 x 1/2	.145	1/2	1/2	13/32
402-101	3/4 x 3/4 x 1/2	.088	1/2	1/2	13/32
402-124	1 x 3/4 x 1/2	.111	1/2	1/2	17/32
402-125	1 x 3/4 x 3/4	.211	9/16	9/16	11/4
402-130	1 x 1 x 1/2	.123	1/2	1/2	17/32
402-131	1 x 1 x 3/4	.130	9/16	9/16	11/4
402-156	11/4 x 1 x 1/2	.286	15/16	15/16	113/16
402-157	11/4 x 1 x 3/4	.298	15/16	15/16	115/16
402-158	11/4 x 1 x 1	.331	15/16	15/16	21/16
402-166	11/4 x 11/4 x 1/2	.170	1/2	1/2	113/32
402-167	11/4 x 11/4 x 3/4	.335	9/16	9/16	17/16
401-168	11/4 x 11/4 x 1	.357	11/16	11/16	19/16
402-199	11/2 x 11/4 x 1/2	.376	11/16	11/16	19/16
402-201	11/2 x 11/4 x 3/4	.380	11/16	11/16	21/16
402-202	11/2 x 11/4 x 1	.410	11/16	11/16	27/16
402-209	11/2 x 11/2 x 1/2	.410	1/2	1/2	117/32
402-210	11/2 x 11/2 x 3/4	.425	9/16	9/16	19/16
402-211	11/2 x 11/2 x 1	.453	11/16	11/16	23/16
402-212	11/2 x 11/2 x 11/4	.460	15/16	15/16	21/4
402-239	2 x 11/2 x 1	.556	19/32	19/32	213/32
402-247	2 x 2 x 1/2	.273	1/2	1/2	125/32
402-248	2 x 2 x 3/4	.287	9/16	9/16	113/16
402-249	2 x 2 x 1	.632	11/16	11/16	115/16
402-251	2 x 2 x 11/2	.698	1	1	131/32
402-288	21/2 x 21/2 x 3/4	.990	5/8	5/8	21/2
402-333	3 x 3 x 1/2	1.000	5/16	5/16	215/16
402-334	3 x 3 x 3/4	1.050	29/32	29/32	227/32
402-335	3 x 3 x 1	1.010	1	1	21/8
402-337	3 x 3 x 11/2	1.005	11/4	11/4	43/16
402-338	3 x 3 x 2	1.025	11/4	11/4	29/16
402-419	4 x 4 x 11/2	3.190	25/16	25/16	3
402-420	4 x 4 x 2	1.518	23/8	23/8	47/8
402-422	4 x 4 x 3	3.672	23/8	23/8	413/16

4612-3-3





Tee (FIPT x FIPT x FIPT)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
405-005	1/2	.115	13/8
405-007	3/4	.190	121/32
405-010	1	.290	129/32
405-015	11/2	.575	13/4

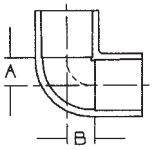
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PVC Schedule 40 Pressure Fittings

ELBOWS

4607



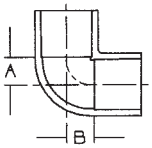


90° Ell (Slip x Slip)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
406-005	1/2	.047	1/2	1/2
406-007	3/4	.073	9/16	9/16
406-010	1	.117	11/16	11/16
406-012	1 1/4	.188	7/8	7/8
406-015	1 1/2	.240	1	1
406-020	2	.375	1 1/4	1 1/4
406-025	2 1/2	.869	1 1/2	1 1/2
406-030	3	1.189	1 13/16	1 13/16
406-040	4	2.100	2 5/16	2 5/16
406-050	5	5.000	3 1/4	3 1/4
406-060	6	4.245	3 1/2	3 1/2
406-080	8	14.585	4 9/16	4 9/16

4607



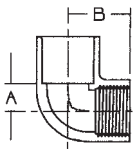


Reducing 90° Ell (Slip x Slip)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
406-101	3/4 x 1/2	.061	1/2	9/16
406-130	1 x 1/2	.085	1/2	11/16
406-131	1 x 3/4	.155	13/16	23/32
406-167	1 1/4 x 3/4	.205	3/4	29/32
406-168	1 1/4 x 1	.240	7/8	27/32
406-251	2 x 1 1/2	.396	1 15/16	1 1/8

4607-3



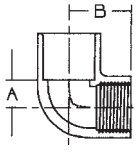


90° Ell (Slip x FIPT)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
407-005	1/2	.054	1/2	1 13/32
407-007	3/4	.076	9/16	1 9/16
407-010	1	.124	11/16	1 13/16
407-012	1 1/4	.297	7/8	2 13/16
407-020	2	.540	1 1/4	2 13/16
407-025	2 1/2	.927	1 9/16	3 19/32
407-030	3	1.609	1 3/16	3
407-040	4	2.460	2 5/16	3 5/8

4607-3





Reducing 90° Ell (Slip x FIPT)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
407-074	1/2 x 3/4	.098	9/16	1 15/32
407-101	3/4 x 1/2	.065	9/16	1 5/8
407-130	1 x 1/2	.089	1/2	1 13/32
407-131	1 x 3/4	.101	3/4	1 7/8
407-168	1 1/4 x 1	.255	7/8	2 1/8
407-211	1 1/2 x 1	.400	1	2 1/8
407-251	2 x 1 1/2	.575	1 1/4	2 5/32

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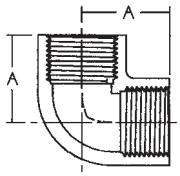
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PVC Schedule 40 Pressure Fittings

ELBOWS (Continued)

4607-3-3



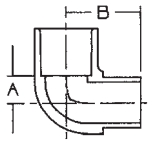


90° Ell (FIPT x FIPT)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
408-005	1/2	.085	17/32
408-007	3/4	.138	121/32
408-010	1	.209	17/8
408-012	11/4	.320	23/16
408-015	11/2	.434	27/16
408-020	2	.675	27/8

4607-2



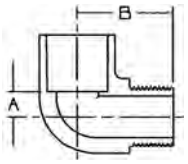


90° Street Ell (Spg x Slip)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
409-005	1/2	.060	1/2	17/16
409-007	3/4	.071	9/16	19/16
409-010	1	.118	11/16	2
409-012	11/4	.200	7/8	21/16
409-015	11/2	.240	1	219/32
409-020	2	.363	11/4	27/8

4607-4



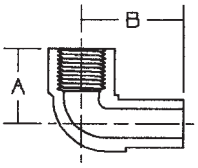


90° Street Ell (MIPT x Slip)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
410-005	1/2	.042	3/8	113/32
410-007	3/4	.061	15/32	111/16
410-010	1	.110	19/32	17/8
410-012	11/4	.225	7/8	27/16
410-015	11/2	.223	1	23/16
410-020	2	.470	11/4	31/4

4607-2-3



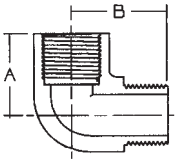


90° Street Ell (Spg x FIPT)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
411-005	1/2	.048	13/16	11/2
411-007	3/4	.071	13/16	11/2

4607-3-4





90° Street Ell (MIPT x FIPT)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
412-005	1/2	.049	17/32	113/32
412-007	3/4	.105	15/16	19/16
412-010	1	.118	19/16	127/32
412-012	11/4	.173	125/32	21/16
412-015	11/2	.224	21/2	211/16
412-020	2	.512	213/16	31/4

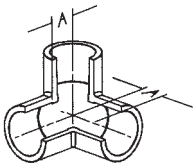
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PVC Schedule 40 Pressure Fittings

ELBOWS (Continued)

4607-9



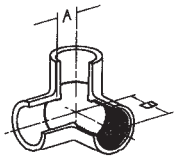


90° Ell w/Side Outlet (Slip x Slip x Slip)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
413-005	1/2	.060	17/32

4607-9-3



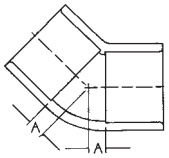


90° Ell w/Side Outlet (Slip x Slip x FIPT)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
414-005	1/2	.063	1/2	1 1/4
414-101	3/4 x 3/4 x 1/2	.090	9/16	1 1/4
414-130	1 x 1 x 1/2	.133	11/16	1 13/32

4606





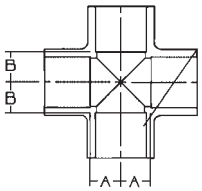
45° Ell (Slip x Slip)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
417-005	1/2	.037	1/4
417-007	3/4	.065	5/16
417-010	1	.098	11/32
417-012	1 1/4	.148	3/8
417-015	1 1/2	.191	7/16
417-020	2	.281	5/8
417-025	2 1/2	.676	11/16
417-030	3	.940	3/4
417-040	4	1.628	1
417-050	5	3.250	1 3/4
417-060	6	5.854	1 3/4
417-080	8	12.615	2

CROSSES

4635





Cross (All Slip)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
420-005	1/2	.076	1/2	1/2
420-007	3/4	.131	9/16	9/16
420-010	1	.180	11/16	11/16
420-012	1 1/4	.297	29/32	29/32
420-015	1 1/2	.377	1 1/32	1 1/32
420-020	2	.539	1 9/32	1 9/32
420-025	2 1/2	1.590	1 1/2	1 1/2
420-030	3	2.400	1 13/16	1 13/16
420-040	4	4.140	2 5/16	2 5/16

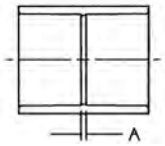
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COUPLINGS

4601



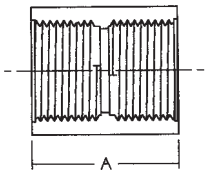


Coupling (Slip x Slip)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
429-005	1/2	.032	3/32
429-007	3/4	.049	3/32
429-010	1	.080	3/32
429-012	1 1/4	.121	3/32
429-015	1 1/2	.149	3/32
429-020	2	.200	3/32
429-025	2 1/2	.648	3/16
429-030	3	.570	3/16
429-040	4	.919	3/16
429-050	5	1.933	1/4
429-060	6	2.100	1/4
429-080	8	5.100	1/4
429-100	10	8.533	1/2
429-120	12	14.490	1/2

4601-3-3



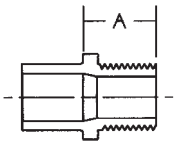


Coupling (FIPT x FIPT)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
430-005	1/2	.037	1 1/2
430-007	3/4	.047	1 17/32
430-010	1	.160	2 1/16
430-073	1/2 x 3/8	.054	1 11/16

ADAPTERS

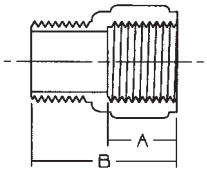




Male Fitting Adapter (Spg x MIPT)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
433-005	1/2	.025	29/32
433-007	3/4	.036	1 3/16





Riser Extender (MIPT x FIPT)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
434-005	1/2	.045	11/16	2 1/16
434-007	3/4	.110	13/16	1 19/32
434-010	1	.175	7/8	1 15/16

♦ Consult technical services for dimensions

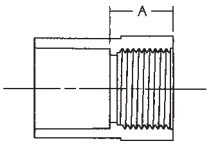
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PVC Schedule 40 Pressure Fittings

ADAPTERS (Continued)

4603



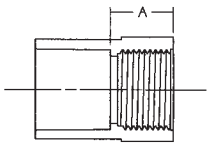


Female Adapter (Slip x FIPT)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
435-005	1/2	.038	13/16
435-007	3/4	.051	13/16
435-010	1	.082	3/32
435-012	1 1/4	.108	1
435-015	1 1/2	.132	1
435-020	2	.180	1
435-025	2 1/2	.624	1 13/32
435-030	3	.548	1 1/2
435-040	4	.838	1 19/32
435-050	5	.750	5 3/32
435-060	6	2.535	5 3/4
435-080	8	5.000	2 1/4

4603



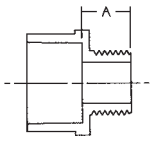


Reducing Female Adapter (Slip x FIPT)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
435-074	1/2 x 3/4	.038	13/16
435-075	1/2 x 1	.061	31/32
435-101	3/4 x 1/2	.045	13/16
435-102	3/4 x 1	.078	31/32
435-131	1 x 3/4	.065	5/8

4604





Male Adapter (MIPT x Slip)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
436-005	1/2	.027	7/8
436-007	3/4	.043	11/16
436-010	1	.072	7/8
436-012	1 1/4	.102	7/8
436-015	1 1/2	.126	29/32
436-020	2	.175	31/32
436-025	2 1/2	.351	1 1/2
436-030	3	.520	1 21/32
436-040	4	.846	1 3/4
436-060	6	2.500	2 1/4
436-080	8	4.040	2 1/4

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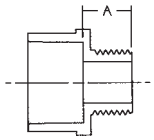
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PVC Schedule 40 Pressure Fittings

ADAPTERS (Continued)

4604





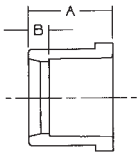
Reducing Male Adapter (MIPT X Slip)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
436-074	1/2 x 3/4	.039	7/8
436-101	3/4 x 1/2	.029	7/8
436-102	3/4 x 1	.064	15/16
436-130	1 x 1/2	.046	1 3/32
436-131	1 x 3/4	.049	13/32
436-132	1 x 1 1/4	.099	1 1/8
436-168	1 1/4 x 1	.112	1 1/32
436-169	1 1/4 x 1 1/2	.157	13/16
436-212	1 1/2 x 1 1/4	.107	1 1/32
436-213	1 1/2 x 2	.173	1 1/8
436-251	2 x 1 1/2	.154	1 1/16
436-252	2 x 2 1/2	.525	1 5/16

BUSHINGS

4618





Bushing (Spg x Slip)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
437-073	1/2 x 3/8	.010	15/16	1/4
437-101	3/4 x 1/2	.019	1 7/32	5/16
437-130	1 x 1/2	.046	1 9/32	1/2
437-131	1 x 3/4	.034	1 9/32	9/32
437-166	1 1/4 x 1/2	.085	1 7/8	11/16
437-167	1 1/4 x 3/4	.084	1 1/2	3/4
437-168	1 1/4 x 1	.061	1 15/16	13/32
437-209	1 1/2 x 1/2	.140	1 17/32	5/8
437-210	1 1/2 x 3/4	.114	1 1/2	17/32
437-211	1 1/2 x 1	.111	1 1/2	7/16
437-212	1 1/2 x 1 1/4	.057	1 1/2	1/4
437-247	2 x 1/2	.146	1 11/16	25/32
437-248	2 x 3/4	.200	1 9/16	13/16
437-249	2 x 1	.158	1 9/16	1/2
437-250	2 x 1 1/4	.170	1 9/16	5/16
437-251	2 x 1 1/2	.131	1 9/16	1/4
437-287	2 1/2 x 1/2	.320	1 15/16	1 3/32
437-288	2 1/2 x 3/4	.320	1 15/16	31/32
437-289	2 1/2 x 1	.330	1 15/16	27/32
437-290	2 1/2 x 1 1/4	.280	1 15/16	23/32
437-291	2 1/2 x 1 1/2	.330	1 15/16	19/32
437-292	2 1/2 x 2	.201	1 31/32	19/32

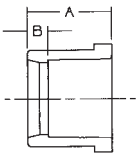
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PVC Schedule 40 Pressure Fittings

BUSHINGS (Continued)

4618



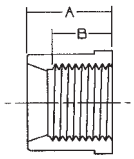


Bushing (Spg x Slip) (continued)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
437-335	3 x 1	.655	2 13/32	19/32
437-336	3 x 1 1/4	.736	1 31/32	11/16
437-337	3 x 1 1/2	.688	2 13/32	1 1/32
437-338	3 x 2	.417	2 1/8	3/4
437-339	3 x 2 1/2	.337	2 1/8	11/32
437-420	4 x 2	.680	2 1/2	11/8
437-421	4 x 2 1/2	1.145	2 15/16	1 1/32
437-422	4 x 3	.773	2 1/2	1 9/32
437-488	5 x 3	1.250	3 7/32	27/32
437-490	5 x 4	1.270	3 1/4	3/4
437-528	6 x 2	3.275	3 1/32	19/16
437-530	6 x 3	2.000	3 5/16	15/16
437-532	6 x 4	2.169	3 1/32	25/32
437-534	6 x 5	2.600	4	1
437-582	8 x 4	4.250	5 3/16	2 7/8
437-585	8 x 6	4.200	4 9/16	1 9/16
437-626	10 x 6	10.528	5 5/16	2 3/16
437-628	10 x 8	9.385	5 5/16	1 1/4
437-668	12 x 8	17.065	5 5/16	2 1/2
437-670	12 x 10	12.765	5 7/16	1 3/8

4618-3





Bushing (Spg x FIPT)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
438-072	1/2 x 1/4	.010	1 1/16	21/32
438-073	1/2 x 3/8	.010	15/16	1/4
438-098	3/4 x 1/4	.100	1 9/16	25/32
438-101	3/4 x 1/2	.026	2 9/32	11/16
438-130	1 x 1/2	.054	1 1/4	11/16
438-131	1 x 3/4	.041	1 1/16	23/32
438-166	1 1/4 x 1/2	.141	1 1/8	17/32
438-167	1 1/4 x 3/4	.082	1 1/8	9/16
438-168	1 1/4 x 1	.099	1 1/8	11/16
438-209	1 1/2 x 1/2	.205	1 25/32	15/32
438-210	1 1/2 x 3/4	.097	1 1/2	23/32
438-211	1 1/2 x 1	.164	1 1/2	7/8
438-212	1 1/2 x 1 1/4	.057	1 1/2	29/32

Do not use or test the products in this catalog with compressed air or other gasses.

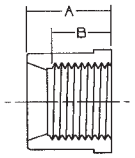
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PVC Schedule 40 Pressure Fittings

BUSHINGS (Continued)

4618-3



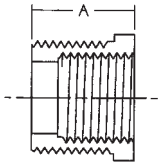


Bushing (Spg x FIPT) (continued)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
438-247	2 x 1/2	.338	1 11/32	17/32
438-248	2 x 3/4	.147	1 9/16	23/32
438-249	2 x 1	.292	1 29/32	9/16
438-250	2 x 1 1/4	.238	1 29/32	19/32
438-251	2 x 1 1/2	.130	1 29/32	19/32
438-289	2 1/2 x 1	.512	1 11/32	11/16
438-291	2 1/2 x 1 1/2	.416	1 11/32	23/32
438-292	2 1/2 x 2	.297	2 3/16	5/8
438-335	3 x 1	.671	2 7/16	9/16
438-337	3 x 1 1/2	.727	2 7/16	19/32
438-338	3 x 2	.668	2 1/16	3/4
438-339	3 x 2 1/2	.526	2 7/16	15/16
438-420	4 x 2	1.180	2 13/16	5/8
438-421	4 x 2 1/2	1.476	3 5/16	1 1/8
438-422	4 x 3	1.042	2 13/16	1 1/32
438-490	5 x 4	1.750	3 13/32	1 3/32
438-532	6 x 4	2.920	3 1/16	1 3/32

4618-3-4





Bushing (MIPT x FIPT)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
439-072	1/2 x 1/4	.016	15/16
439-098	3/4 x 1/4	.026	31/32
439-101	3/4 x 1/2	.030	31/32
439-130	1 x 1/2	.050	1 1/8
439-131	1 x 3/4	.048	1 1/8
439-166	1 1/4 x 1/2	.068	1 1/8
439-167	1 1/4 x 3/4	.100	1 1/8
439-168	1 1/4 x 1	.090	1 1/8
439-209	1 1/2 x 1/2	.180	1 1/4
439-210	1 1/2 x 3/4	.160	1 1/4
439-211	1 1/2 x 1	.135	1 1/4
439-212	1 1/2 x 1 1/4	.090	1 1/4
439-249	2 x 1	.230	1 15/32
439-250	2 x 1 1/4	.240	1 7/16
439-251	2 x 1 1/2	.093	1 1/8
439-338	3 x 2	.560	2 1/32

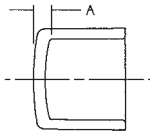
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PVC Schedule 40 Pressure Fittings

CAPS

4617





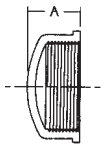
Cap (Slip)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
447-005	1/2	.022	7/32
447-007	3/4	.034	7/32
447-010	1	.055	1/4
447-012	1 1/4	.095	1/4
447-015	1 1/2	.115	1/4
447-020	2	.169	9/32
447-025	2 1/2	.405	11/32
447-030	3	.469	15/16
447-040	4	.789	1 3/32
447-050	5	2.000	15/16
447-060	6	1.940	1 3/4
447-080	8	3.900	1 3/8

Consult Customer Service to determine if caps are flat or domed.

4617-3





Cap (FIPT)

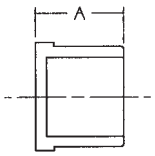
UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
448-005	1/2	.025	27/32
448-007	3/4	.030	7/8
448-010	1	.055	1 1/32
448-012	1 1/4	.161	1 7/32
448-015	1 1/2	.094	1 3/4
448-020	2	.132	1 3/8
448-025	2 1/2	.455	2 15/16
448-030	3	.665	2 29/32
448-040	4	.755	3 1/4

Consult Customer Service to determine if caps are flat or domed.

PLUGS

4616





Plug (Spg)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
449-005	1/2	.028	1 5/32
449-007	3/4	.040	1 9/16
449-010	1	.070	1 11/32
449-012	1 1/4	.116	1 21/32
449-015	1 1/2	.167	1 25/32
449-020	2	.235	1 15/16
449-025	2 1/2	.310	2 3/32
449-030	3	.450	2 13/32
449-040	4	.680	2 13/32

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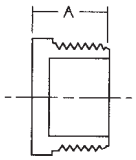
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PVC Schedule 40 Pressure Fittings

PLUGS (Continued)

4616-4





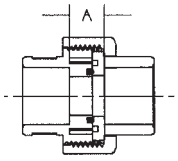
Plug (MIPT)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
450-002	1/4	.007	23/32
450-005	1/2	.020	1 1/16
450-007	3/4	.030	1 3/32
450-010	1	.070	1 1/4
450-012	1 1/4	.108	1 1/8
450-015	1 1/2	.160	1 25/32
450-020	2	.220	1 15/16
450-025	2 1/2	.340	2 3/32
450-030	3	.495	2 13/32
450-040	4	.560	2 13/16

UNIONS

4633





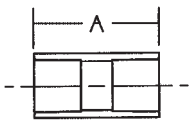
Union (Slip x Slip)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
457-015	1 1/2	.200	11/16
457-020	2	.500	25/32

NESTED COUPLING

4601-T-D





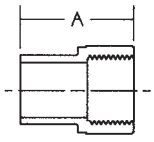
Nested Coupling (Slip x Slip)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
477-005	1/2	.033	1/2

FITTING ADAPTER

4603-2





Female Fitting Adapter (Spg x FIPT)

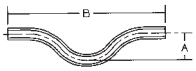
UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES
478-005	1/2	.030	1 9/16
478-007	3/4	.043	1 13/16
478-010	1	.076	2 1/8
478-020	2	.182	2 11/32

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PVC Schedule 40 Pressure Fittings

TRAPS

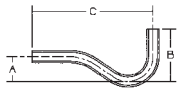




Running Trap (Spg x Spg)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
488-005	1/2	.163	1 7/8	10 7/8
488-007	3/4	.225	1 7/8	11 1/8





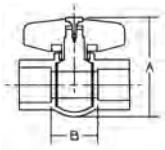
P-Trap (Spg x Spg)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES
489-005	1/2	.163	1 3/4	3 5/8	8 5/16
489-007	3/4	.225	2	4 1/32	8 5/8

VALVES

4660-S/4660-T





PVC Ball Valve (Cup, Female)

NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES
1/2	.180	2 7/16	1 17/32
3/4	.210	3 1/16	1 3/4
1	.490	3 21/32	1 15/16
1 1/4	.570	3 7/8	2
1 1/2	.180	4 17/32	2 3/8
2	.150	5 5/16	2 7/8
2 1/2	2.730	6 5/16	4 17/32
3	4.010	7 1/2	5 9/32
4	8.290	9 3/16	7 5/16

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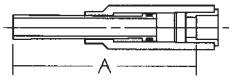
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Plastic Irrigation Products

EXPANSION JOINT

FSF





Slip-Fix™

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	A CLOSED	A OPEN
† FSF-050	1/2	.271	5 1/2	7 1/2
† FSF-075	3/4	.376	6	8
† FSF-100	1	.549	6 3/8	8 7/8
† FSF-125	1 1/4	.955	7 3/4	10 1/4
† FSF-150	1 1/2	1.192	8 1/8	11 1/8
† FSF-200	2	1.754	9 5/8	12 5/8
† FSF-250	2 1/2	2.765	11 1/4	15 1/4
† FSF-300	3	4.258	12 5/8	16 5/8
† FSF-400	4	6.452	13 3/4	17 3/4

Slip-Fix® is the fast, easy, leak-proof way to repair broken water lines. Slip-Fix is the original PVC Schedule 40 in-line repair coupling. It not only makes restoring a broken line simple, but it can also be used as a coupling for valve installations or for repairing lateral lines in a system.

PVC SCHEDULE 40 BALL VALVES

NIBCO PVC Schedule 40 Ball Valves are excellent for use in cold water pressure distribution systems in residential, commercial, agricultural and light industrial applications. Sizes range from 1/2" through 4" IPS. These valves feature a durable one-piece molded body, convenient quarter-turn action, and their 100 percent thermoplastic design eliminates process or atmospheric corrosion. PVC has excellent rigidity, corrosion and chemical resistance properties. PVC Schedule 40 Ball Valves are NSF approved and manufactured in an ISO 9002 certified facility. (Refer to page 56 for additional information)



PLASTIC FITTINGS



NIBCO PVC Schedule 40 Pressure Fittings are ideal for use in irrigation, golf course construction, pool & spa, potable water, and chilled-water applications. PVC, one of the most frequently specified of all thermoplastic materials, has a high resistance to corrosion and chemical attack by acids, alkalies, salt solutions, and many other chemicals.

ABS DWV fittings are used for residential and commercial drain, waste, and vent non-pressure applications. ABS is an excellent high strength, high-impact thermoplastic material, resistant to a wide variety of materials ranging from sewage to commercial household chemical formulations. ABS is lightweight, safe to handle and easy to install.

PVC DWV fittings have been used for over 30 years in residential and commercial drain, waste, and vent non-pressure applications. PVC DWV can be found in such areas as chemical processing, industrial plating, chilled water distribution, chemical drainage and irrigation systems.

Do not use or test the products in this catalog with compressed air or other gasses.

PVC Schedule 80 Pressure Fittings

Adapters 62
Bushings 63
Caps 64
Couplings 61
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Flanges 65
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Transition Unions 68
Unions 67

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PVC Schedule 80

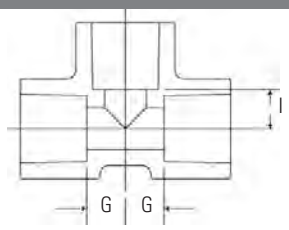
Chemtrol

Tees

4511 Socket Tee (S x S x S)

Chemtrol
Fig. No.





Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G	Dim. G	Dim. I
1/4	801-002	25	0.05	0.33	0.33	0.33
1/2	801-005	50	0.15	0.52	0.52	0.52
3/4	801-007	50	0.33	0.69	0.69	0.69
1	801-810	25	0.36	0.75	0.75	0.75
1 1/4	801-012	10	0.44	0.92	0.92	0.92
1 1/2	801-015	25	0.73	1.06	1.06	1.06
2	801-020	20	1.05	1.27	1.27	1.27
2 1/2	801-025	5	1.59	1.53	1.53	1.53
3	801-030	12	2.37	1.84	1.84	1.84
4	801-040	10	4.10	2.34	2.34	2.34
6	801-060	4	10.22	3.50	3.50	3.50
8	801-080	1	21.05	4.56	4.56	4.56
10	801-100	1	35.40	5.75	5.75	5.75
12	801-120	1	58.40	6.89	6.89	6.89

4511 Reducing Socket Tee (S x S x S)

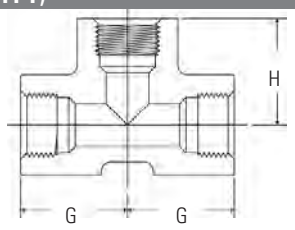
Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G	Dim. G	Dim. I
3/4 x 3/4 x 1/2	801-101	25	0.18	0.52	0.52	0.62
1 x 1 x 1/2	801-130	10	0.24	0.53	0.53	0.73
1 x 1 x 3/4	801-131	10	0.26	0.63	0.63	0.74
1 1/2 x 1 1/2 x 3/4	801-210	10	0.48	0.67	0.67	1.05
1 1/2 x 1 1/2 x 1	801-211	10	0.52	0.77	0.77	1.04
2 x 2 x 1/2	801-247	10	0.61	0.61	0.61	1.30
2 x 2 x 3/4	801-248	10	0.65	0.71	0.71	1.30
2 x 2 x 1	801-249	10	0.69	0.81	0.81	1.30
2 x 2 x 1 1/2	801-251	10	0.83	1.08	1.08	1.30
3 x 3 x 2	801-338	5	1.73	1.37	1.37	1.86
4 x 4 x 2	801-420	5	2.79	1.40	–	–
4 x 4 x 3	801-422	5	3.33	–	–	–
6 x 6 x 4	801-532	4	7.20	–	–	–

Flanged fitting certer-to-face dimensions may be found on page 12. When ordering, specify the figure number and the nominal size (e.t., 2" Schedule 80 PVC flanged tee—4511-12 2").

4512 Socket x Thread Tee (S x S x FPT)

Chemtrol
Fig. No.

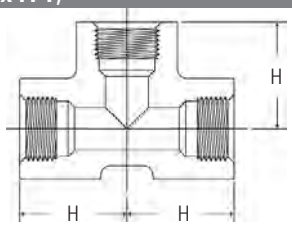




Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G	Dim. G	Dim. H
1/2	802-005	10	0.16	0.52	0.52	1.41
3/4	802-007	10	0.24	0.69	0.69	1.71
1	802-010	10	0.34	0.75	0.75	1.89
1 1/4	802-012	10	0.57	0.92	0.92	2.18
1 1/2	802-015	10	0.80	1.06	1.06	2.45
2	802-020	10	1.13	1.27	1.27	2.78

4512-3-3 Threaded Tee (FPT x FPT x FPT)





Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. H
1/4	805-002	25	0.05	0.97
1/2	805-005	25	0.16	1.41
3/4	805-007	25	0.26	1.71
1	805-010	25	0.40	1.89
1 1/4	805-012	10	0.57	2.18
1 1/2	805-015	10	0.80	2.45
2	805-020	10	1.13	2.78
2 1/2	805-025	5	1.79	3.31
3	805-030	5	2.60	3.74
4	805-040	5	4.63	4.62

For questions concerning thermoplastic piping systems, please contact Chemtrol Customer Service
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PVC Schedule 80

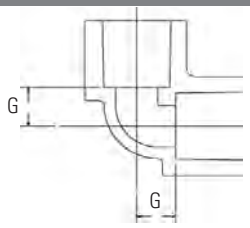
Chemtrol

Elbows

Chemtrol
Fig. No.

4507 Socket 90° ELL (S x S)

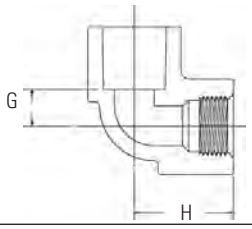




Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G
1/4	806-002	25	0.01	0.33
1/2	806-005	50	0.11	0.52
3/4	806-007	50	0.16	0.69
1	806-010	50	0.21	0.75
1 1/4	806-012	25	0.30	0.92
1 1/2	806-015	25	0.50	1.06
2	806-020	25	0.75	1.27
2 1/2	806-025	5	1.16	1.53
3	806-030	12	1.82	1.84
4	806-040	12	3.17	2.34
6	806-060	4	7.70	3.50
8	806-080	2	15.57	4.56
10	806-100	1	27.70	5.75
12	806-120	1	43.90	6.89

4507-3 Socket x Thread 90° ELL (S x FPT)



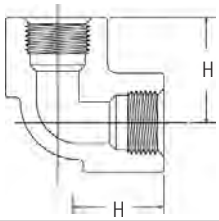


Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G	Dim. H
1/2	807-005	10	0.12	0.52	1.41
3/4	807-007	10	0.17	0.69	1.71
1	807-010	10	0.28	0.75	1.89
1 1/4	807-012	10	0.33	0.92	2.18
1 1/2	807-015	10	0.55	1.06	2.45
2	807-020	10	0.82	1.27	2.78

Chemtrol
Fig. No.

4507-3-3 Thread 90° ELL (FPT x FPT)

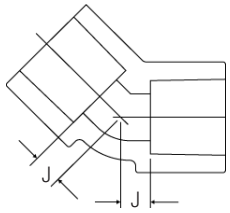




Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. H
1/4	808-002	25	0.04	0.97
1/2	808-005	25	0.12	1.41
3/4	808-007	25	0.18	1.71
1	808-010	25	0.28	1.89
1 1/4	808-012	10	0.33	2.18
1 1/2	808-015	10	0.55	2.45
2	808-020	10	0.82	2.78
2 1/2	808-025	5	1.25	3.31
3	808-030	5	1.90	3.74
4	808-040	5	3.62	4.62

4506 Socket 45° ELL (S x S)





Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. J
1/4	817-002	15	0.03	0.18
1/2	817-005	25	0.04	0.26
3/4	817-007	25	0.14	0.33
1	817-010	25	0.15	0.37
1 1/4	817-012	10	0.30	0.43
1 1/2	817-015	10	0.41	0.47
2	817-020	10	0.62	0.61
2 1/2	817-025	5	0.93	0.68
3	817-030	6	1.39	0.78
4	817-040	6	2.46	1.02
6	817-060	4	5.82	1.75
8	817-080	2	12.67	2.22
10	817-100	1	19.70	2.61
12	817-120	1	32.70	3.08

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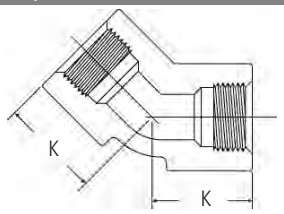
PVC Schedule 80

Chemtrol

Chemtrol
Fig. No.

4506-3-3 Thread 45° ELL (FPT x FPT)



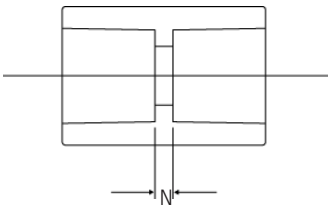


Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. K
1/4	819-002	15	0.04	0.82
1/2	819-005	25	0.11	1.15
3/4	819-007	25	0.13	1.35
1	819-010	25	0.25	1.51
1 1/4	819-012	10	0.35	1.70
1 1/2	819-015	10	0.48	1.86
2	819-020	10	0.71	2.13
2 1/2	819-025	5	1.03	2.46
3	819-030	6	1.53	2.69
4	819-040	6	2.52	3.30

Couplings

4501 Socket Coupling (S x S)





Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. N
1/4	829-002	25	0.05	0.12
1/2	829-005	50	0.09	0.25
3/4	829-007	50	0.13	0.25
1	829-010	40	0.20	0.25
1 1/4	829-012	25	0.29	0.25
1 1/2	829-015	20	0.37	0.25
2	829-020	25	0.52	0.25
2 1/2	829-025	5	1.68	0.20
3	829-030	12	1.05	0.19
4	829-040	10	1.83	0.19
6	829-060	4	4.07	0.25
8	829-080	2	8.89	0.25
10	829-100	1	13.88	0.38
12	829-120	1	21.37	0.50

Chemtrol
Fig. No.

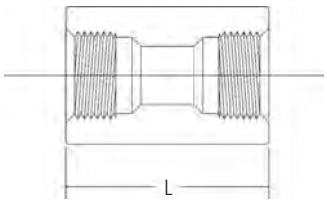
4501 Reducing Socket Coupling (S x S)

Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. N
3/4 x 1/2	829-101	25	0.12	0.44
1 x 1/2	829-130	25	0.18	0.67
1 x 3/4	829-131	25	0.19	0.55
1 1/4 x 3/4	829-167	25	0.26	0.72
1 1/4 x 1	829-168	10	0.27	0.60
1 1/2 x 3/4	829-210	10	0.31	0.76
1 1/2 x 1	829-211	10	0.33	0.63
1 1/2 x 1 1/4	829-212	10	0.50	0.51
2 x 1	829-249	10	0.44	0.75
2 x 1 1/2	829-251	10	0.50	0.50
3 x 2	829-338	5	1.00	1.24
4 x 2	829-420	5	1.59	1.59
4 x 3	829-422	5	1.88	1.20

Other Reducing Couplings are produced by solvent Reducer Bushings into Socket Couplings. They may be ordered as factory fabrications or may be assembled in the field.

4501-3-3 Thread Coupling (FPT x FPT)





Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. L
1/4	830-002	25	0.06	1.41
1/2	830-005	25	0.09	2.03
3/4	830-007	25	0.14	2.28
1	830-010	25	0.23	2.53
1 1/4	830-012	10	0.33	2.78
1 1/2	830-015	10	0.41	3.03
2	830-020	10	0.60	3.28
2 1/2	830-025	5	0.86	3.76
3	830-030	5	1.22	4.00
4	830-040	5	2.13	4.75

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Chemtrol

Chemtrol
Fig. No.

4501-3-3 Reducing Thread Coupling (FPT x FPT)

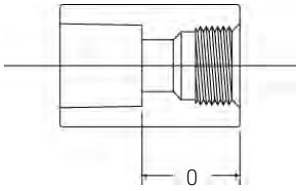
Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. L
3/4 x 1/2	830-101	25	0.09	2.34
1 x 1/2	830-130	25	0.20	2.70
1 x 3/4	830-131	25	0.18	2.70
1 1/4 x 3/4	830-167	10	0.29	3.00
1 1/4 x 1	830-168	10	0.31	3.00
1 1/2 x 3/4	830-210	10	0.35	3.16
1 1/2 x 1	830-211	10	0.38	3.16
1 1/2 x 1 1/4	830-212	10	0.40	3.16
2 x 1	830-249	10	0.50	3.40
2 x 1 1/2	830-251	10	0.56	3.40
3 x 2	830-338	5	1.15	4.66
4 x 2	830-420	5	1.79	5.38
4 x 3	830-422	5	2.11	5.38

Other Reducing Couplings are produced by solvent cementing appropriate Reducer Bushings into Socket Couplings. They may be ordered as factory fabrications or may be assembled in the field.

Adapters

4503 Female Adapter Coupling (S x FPT)





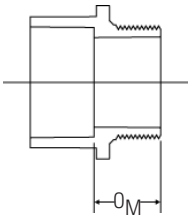
Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. O
1/4	835-002	15	0.04	0.77
1/2	835-005	25	0.09	1.14
3/4	835-007	25	0.14	1.27
1	835-010	20	0.21	1.39
1 1/4	835-012	10	0.30	1.52
1 1/2	835-015	10	0.38	1.64
2	835-020	10	0.56	1.77
2 1/2	835-025	5	0.77	1.98
3	835-030	5	1.15	2.10
4	835-040	5	1.95	2.47

For additional technical information, or a complete listing of Schedule 80 industrial plastic products, please refer to NIBCO's Chemtrol Fitting Guide, or visit our website at www.chemtrol.com.

Chemtrol
Fig. No.

4504 Male Adapter (S x MPT)

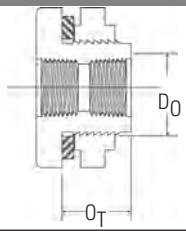




Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. O_M
1/2	836-005	25	0.04	0.94
3/4	836-007	25	0.06	0.97
1	836-010	25	0.10	1.15
1 1/4	836-012	10	0.14	1.12
1 1/2	836-015	10	0.19	1.12
2	836-020	10	0.27	1.20
2 1/2	836-025	5	0.56	1.89
3	836-030	5	0.79	1.99
4	836-040	5	1.39	2.09

4550 Tank Adapter (Tank x FPT)





Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. O_T	Dim. D_O
1/2		15	0.17	1.38	1.40
3/4	Use	15	0.23	1.38	1.40
1	Figure	15	0.27	1.90	2.28
1 1/4	No. &	10	0.42	1.90	2.28
1 1/2	Nom.	10	0.34	2.19	3.00
2	Size	5	1.04	2.19	3.00
3		5	2.33	3.40	5.70

Note: Gasket is EPDM and nut is self-tightening left hand thread.

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PVC Schedule 80

Chemtrol

Bushings

Design Styles

The design style of most bushings is to have a solid wall between the inside and outside connections. Some of the multistep reductions with exceedingly thick cross-sections are not solid. This design style achieves structural support with a web of ribs attaching the inner and outer connection walls, with the open area toward the exterior bushing face. The styles are denoted by W and S for webbed and solid designs respectively.



Webbed design

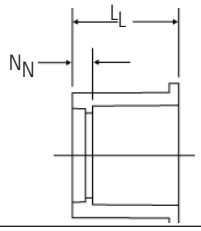


Solid design

Chemtrol
Fig. No.

4518 Flush Socket Reducer Bushing (SPG x S)





Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Design Style	Dim. L_L	Dim. N_N
1/2 x 1/4	837-072	50	0.03	S	1.17	0.53
3/4 x 1/2	837-101	50	0.05	S	1.15	0.26
1 x 1/2	837-130	50	0.06	S	1.28	0.39
1 x 3/4	837-131	50	0.05	S	1.28	0.27
1 1/4 x 1/2	837-166	10	0.10	S	1.41	0.52
1 1/4 x 3/4	837-167	10	0.05	S	1.41	0.40
1 1/4 x 1	837-168	10	0.06	S	1.41	0.27
1 1/2 x 1/2	837-209	25	0.12	W	1.53	0.64
1 1/2 x 3/4	837-210	25	0.10	S	1.53	0.52
1 1/2 x 1	837-211	25	0.08	S	1.53	0.39
1 1/2 x 1 1/4	837-212	10	0.06	S	1.53	0.27
2 x 1/2	837-247	25	0.25	S	1.66	0.77
2 x 3/4	837-248	25	0.25	S	1.66	0.65
2 x 1	837-249	25	0.25	W	1.66	0.52
2 x 1 1/4	837-250	10	0.22	W	1.66	0.40
2 x 1 1/2	837-251	25	0.20	W	1.66	0.27
2 1/2 x 1	837-289	10	0.31	W	1.94	0.80
2 1/2 x 1 1/4	837-290	10	0.31	W	1.94	0.68
2 1/2 x 1 1/2	837-291	10	0.27	S	1.94	0.55
2 1/2 x 2	837-292	10	0.24	S	1.94	0.43
3 x 1	837-335	10	0.65	W	2.42	1.28
3 x 1 1/2	837-337	10	0.67	W	2.42	1.03
3 x 2	837-338	10	0.64	S	2.42	0.91
3 x 2 1/2	837-339	10	0.48	S	2.42	0.64

Chemtrol
Fig. No.

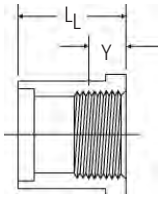
4518 Flush Socket Reducer Bushing (SPG x S) (cont.)

Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Design Style	Dim. L_L	Dim. N_N
4 x 2	837-420	10	1.14	W	2.81	1.30
4 x 2 1/2	837-421	5	1.14	W	2.81	1.03
4 x 3	837-422	10	0.93	S	2.81	0.91
6 x 2	837-528	5	3.28	W	3.06	1.55
6 x 4	837-532	10	2.68	S	3.06	0.78
8 x 6	837-585	3	5.51	S	4.59	1.56
10 x 6	837-626	1	10.68	W	5.59	2.56
10 x 8	837-628	1	9.36	S	5.59	1.09
12 x 8	837-668	1	16.73	W	6.59	2.09
12 x 10	837-670	1	12.77	S	6.59	1.09

Other Reducing Couplings are produced by solvent Reducer Bushings into Socket Couplings. They may be ordered as factory fabrications or may be assembled in the field.

4518-3 Flush Spigot x Thread Reducer Bushing (SPG x FPT)





Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Design Style	Dim. L_L	Dim. Y*
1/2 x 1/4	838-072	50	0.03	S	1.17	0.31
3/4 x 1/4	838-098	50	0.04	S	1.29	0.31
3/4 x 1/2	838-101	50	0.03	S	1.29	0.43
1 x 1/2	838-130	50	0.07	S	1.56	0.43
1 x 3/4	838-131	50	0.05	S	1.56	0.45
1 1/4 x 1/2	838-166	10	0.14	S	1.66	0.43
1 1/4 x 3/4	838-167	10	0.12	S	1.66	0.45
1 1/4 x 1	838-168	10	0.10	S	1.66	0.53
1 1/2 x 1/2	838-209	10	0.21	S	1.78	0.43
1 1/2 x 3/4	838-210	10	0.19	S	1.78	0.45
1 1/2 x 1	838-211	5	0.17	S	1.78	0.53
1 1/2 x 1 1/4	838-212	10	0.12	S	1.78	0.55
2 x 1/2	838-247	10	0.34	S	1.92	0.43
2 x 3/4	838-248	10	0.32	S	1.92	0.45
2 x 1	838-249	10	0.29	S	1.92	0.53
2 x 1 1/4	838-250	10	0.24	S	1.92	0.55
2 x 1 1/2	838-251	10	0.20	S	1.92	0.55
2 1/2 x 2	838-292	5	0.25	S	2.18	0.57
3 x 1	838-335	5	0.65	S	2.42	0.53
3 x 1 1/2	838-337	5	0.70	S	2.42	0.55
3 x 2	838-338	5	0.67	S	2.42	0.57
3 x 2 1/2	838-339	5	0.52	S	2.42	0.87
4 x 2	838-420	5	1.17	S	2.81	0.57
4 x 3	838-422	5	1.01	S	2.81	0.95

Other size reductions are produced by solvent cementing appropriate Reducer Bushings together. They may be ordered as factory fabrications or may be assembled in the field.

*Typical male component engagement, hand tight (L_1 in ANSI B1.20.1 thread spec.) plus 1 1/2 turns.

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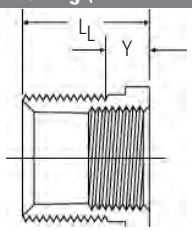
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Chemtrol

Chemtrol
Fig. No.

4518-3-4 Flush Thread Reducer Bushing (MPT x FPT)





Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Design Style	Dim. L_L	Dim. Y*
1/2 x 1/4	839-072	50	0.02	S	0.93	0.25
3/4 x 1/4	839-098	50	0.03	S	0.95	0.25
3/4 x 1/2	839-101	50	0.02	S	0.95	0.25
1 x 1/2	839-130	50	0.05	S	1.24	0.38
1 x 3/4	839-131	50	0.03	S	1.24	0.38
1 1/4 x 1/2	839-166	10	0.10	S	1.27	0.38
1 1/4 x 3/4	839-167	10	0.09	S	1.27	0.38
1 1/4 x 1	839-168	10	0.07	S	1.27	0.38
1 1/2 x 1/2	839-209	10	0.15	S	1.28	0.38
1 1/2 x 3/4	839-210	10	0.14	S	1.28	0.38
1 1/2 x 1	839-211	5	0.12	S	1.28	0.38
1 1/2 x 1 1/4	839-212	10	0.08	S	1.28	0.38
2 x 1/2	839-247	10	0.23	S	1.32	0.38
2 x 3/4	839-248	10	0.22	S	1.32	0.38
2 x 1	839-249	10	0.20	S	1.32	0.38
2 x 1 1/4	839-250	10	0.16	S	1.32	0.38
2 x 1 1/2	839-251	10	0.12	S	1.32	0.38
2 1/2 x 2	839-292	5	0.21	S	2.18	0.57
3 x 1 1/2	839-337	5	0.58	S	2.42	0.55
3 x 2	839-338	5	0.56	S	2.42	0.57
3 x 2 1/2	839-339	5	0.45	S	2.42	0.87
4 x 2	839-420	5	1.09	S	2.81	0.57
4 x 3	839-422	5	0.81	S	2.81	0.95

Other size reductions are produced by solvent cementing appropriate Reducer Bushings together. They may be ordered as factory fabrications or may be assembled in the field.

*Typical male component engagement, hand tight (L_1 in ANSI B1.20.1 thread spec.) plus 1 1/2 turns

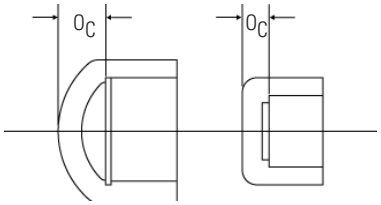
For additional technical information, or a complete listing of Schedule 80 industrial plastic products, please refer to NIBCO's Chemtrol Fitting Guide, or visit our website at www.chemtrol.com.

Caps

Chemtrol
Fig. No.

4517 Socket Cap* (S)



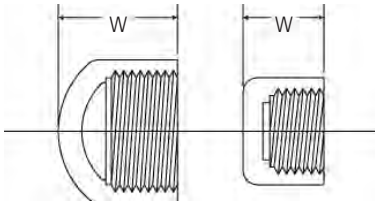


Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. Oc
1/4	847-002	15	0.03	0.25
1/2	847-005	25	0.06	0.39
3/4	847-007	25	0.08	0.37
1	847-010	25	0.14	0.41
1 1/4	847-012	10	0.20	0.40
1 1/2	847-015	10	0.26	0.41
2	847-020	10	0.38	0.42
2 1/2	847-025	5	0.57	0.57
3	847-030	5	0.87	1.29
4	847-040	5	1.53	1.58
6	847-060	5	3.77	2.13

*Sizes 2" and smaller are flat; 2 1/2" and larger are domed.

4517-3 Thread Cap* (FPT)





Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. W
1/4	848-002	15	0.01	0.89
1/2	848-005	25	0.06	1.28
3/4	848-007	25	0.10	1.38
1	848-010	25	0.15	1.55
1 1/4	848-012	10	0.22	1.66
1 1/2	848-015	10	0.29	1.80
2	848-020	10	0.41	1.93
2 1/2	848-025	5	0.64	2.35
3	848-030	5	0.93	3.19
4	848-040	5	1.73	3.86

*Sizes 2" and smaller are flat; 2 1/2" and larger are domed.

Do not use or test the products in this section of the catalog with compressed air or other gases.

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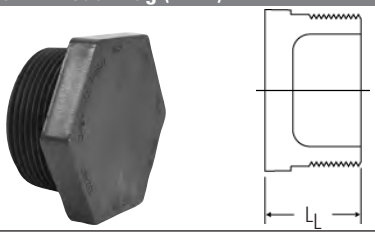
PVC Schedule 80

Chemtrol

Plugs

Chemtrol
Fig. No.

4516-4 Thread Plug (MPT)



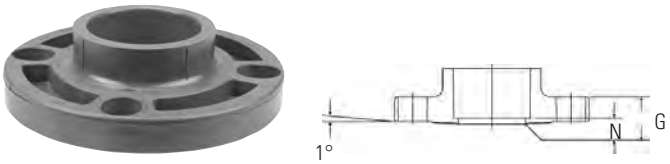
Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. LL
1/4	850-002	25	0.01	0.85
1/2	850-005	50	0.03	1.04
3/4	850-007	50	0.03	1.10
1	850-010	25	0.06	1.25
1 1/4	850-012	10	0.09	1.27
1 1/2	850-015	10	0.12	1.28
2	850-020	10	0.18	1.32
2 1/2	850-025	5	0.29	2.18
3	850-030	5	0.51	2.42
4	850-040	5	0.95	2.81

1/4" Plug is solid, only

Class 150 Flanges

For flange dimensions that comply with ANSI B16.5, 150 lb., steel flanges, see page 87.

4551-W Socket Flange (S), One-Piece (Webbed Design)



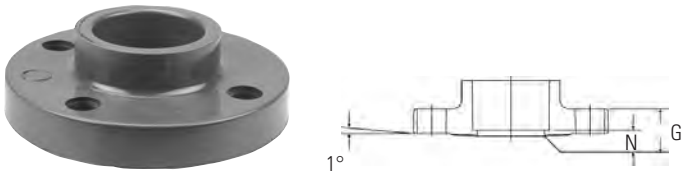
Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G	Dim. N
2	851-020	12	0.79	0.92	0.27
3	851-030	10	1.60	1.13	0.29
4	851-040	10	2.42	1.24	0.32
6	851-060	5	3.69	1.36	0.31

Reducing Flanges are produced by solvent cementing Reducer Bushings into Socket Flanges. They may be ordered as factory fabrications or may be assembled in the field.

Note: One-piece webbed flanges have oblong bolt holes which permit mating with ANSI B16.5, 150 lb.; BS 1560, class 150; ISO 2084, PN10; and DIN 2532, PN10 flanges.

Chemtrol
Fig. No.

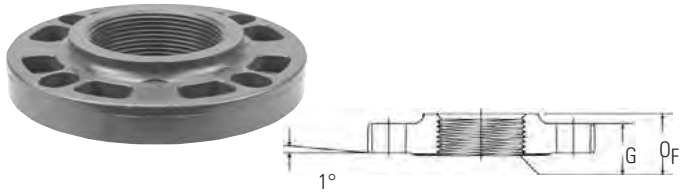
4551-H Socket Flange (S), One-Piece (Solid)



Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G	Dim. N
1/2	851-H05	10	0.21	0.54	0.20
3/4	851-H07	10	0.31	0.61	0.17
1	851-H10	24	0.41	0.68	0.18
1 1/4	851-H12	10	0.53	0.73	0.20
1 1/2	851-H15	12	0.68	0.82	0.23
2	851-H20	12	1.03	0.92	0.27
2 1/2	851-H25	5	1.61	1.02	0.20
3	851-H30	10	2.08	1.13	0.29
4	851-H40	10	3.14	1.24	0.32
6	851-H60	5	4.79	1.36	0.31
8	851-H80	2	8.67	1.50	0.35

Reducing Flanges are produced by solvent cementing Reducer Bushings into Socket Flanges. They may be ordered as factory fabrications or may be assembled in the field.

4551-W-3 Thread Flange (FPT), One-Piece (Webbed Design)



Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G	Dim. OF
2	852-020	10	0.78	0.92	1.18
3	852-030	5	1.54	1.13	1.55
4	852-040	5	2.25	1.24	1.67

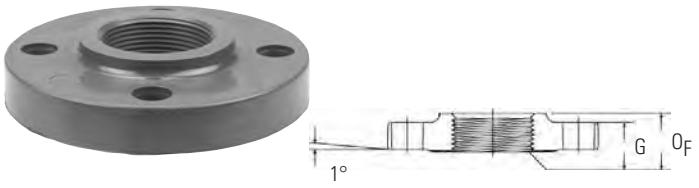
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PVC Schedule 80

Chemtrol

Chemtrol
Fig. No.

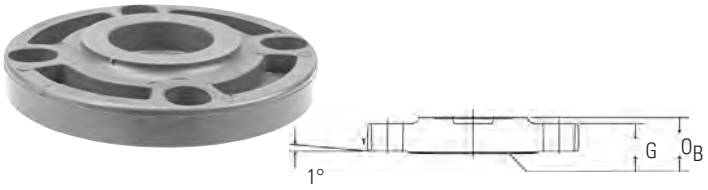
4551-H-3 Thread Flange (FPT), One-Piece (Solid)



Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G	Dim. O_F
1/2	852-H05	10	0.21	0.54	0.88
3/4	852-H07	10	0.30	0.61	0.91
1	852-H10	10	0.40	0.68	1.08
1 1/4	852-H12	10	0.50	0.73	1.11
1 1/2	852-H15	12	0.65	0.82	1.12
2	852-H20	10	0.97	0.92	1.18
2 1/2	852-H25	5	1.50	1.02	1.42
3	852-H30	5	1.93	1.13	1.55
4	852-H40	5	2.80	1.24	1.67

Reducing Flanges are produced by solvent cementing Reducer Bushings into Socket Flanges. They may be ordered as factory fabrications or may be assembled in the field.

4519-W Blind Flange, One-Piece (Webbed Design)



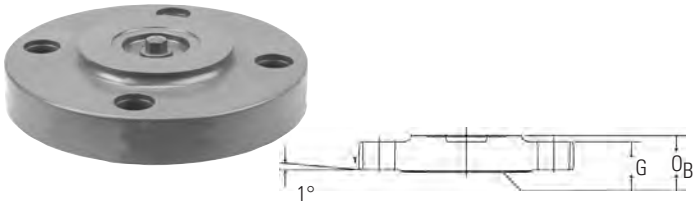
Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G	Dim. O_B
2	853-020	12	0.78	0.92	1.13
3	853-030	10	1.76	1.13	1.39
4	853-040	5	2.56	1.24	1.51
6	853-060	5	4.51	1.36	1.60

Note: One-piece webbed flanges have oblong bolt holes which permit mating with ANSI B16.5, 150 lb.; BS 1560, class 150; ISO 2084, PN10; and DIN 2532, PN10 flanges.

For additional technical information, or a complete listing of Schedule 80 industrial plastic products, please refer to NIBCO's Chemtrol Fittig Guide, or visit our website at www.chemtrol.com.

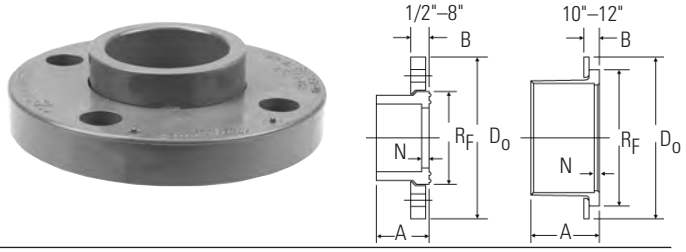
Chemtrol
Fig. No.

4519-H Blind Flange, One-Piece (Solid)



Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G	Dim. O_B
1/2	853-H05	10	0.21	0.54	0.76
3/4	853-H07	10	0.32	0.61	0.83
1	853-H10	10	0.43	0.68	0.88
1 1/4	853-H12	10	0.57	0.73	0.95
1 1/2	853-H15	12	0.69	0.82	1.04
2	853-H20	12	1.08	0.92	1.13
2 1/2	853-H25	5	1.81	1.02	1.22
3	853-H30	10	2.45	1.13	1.39
4	853-H40	5	3.56	1.24	1.51
6	853-H60	5	6.27	1.36	1.60
8	853-H80	2	10.35	1.50	1.78

4551-A Socket Flange (S), Van Stone



Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. A	Dim. B	Dim. D_O	Dim. R_F	Dim. N
1/2	854-005	10	0.19	1.00	.50	3.50	1.48	0.11
3/4	854-007	10	0.24	1.13	.50	3.88	1.75	0.11
1	854-010	24	0.38	1.25	.56	4.25	2.04	0.11
1 1/4	854-012	10	0.40	1.38	.63	4.63	2.50	0.11
1 1/2	854-015	12	0.54	1.50	.69	5.00	2.78	0.11
2	854-020	12	0.92	1.63	.75	6.00	3.41	0.11
2 1/2	854-025	5	1.37	1.94	.94	7.00	4.11	0.16
3	854-030	10	1.75	2.40	1.05	7.50	4.81	0.50
4	854-040	10	2.65	2.76	1.16	8.98	6.19	0.48
6	854-060	5	4.53	3.56	1.29	11.00	7.97	0.53
8	854-080	2	12.20	5.01	1.42	13.50	10.45	0.51
10*	854-100	1	10.20	5.83	1.31	16.00	13.29	0.33
12*	854-120	1	17.53	7.45	1.70	19.00	16.00	0.45

*Aluminum ring with PVC coating.

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PVC Schedule 80

Chemtrol

Chemtrol
Fig. No.

Van Stone Flange Assembly List

Item	Description	Material
1	Connector Hub	PVC
2	Flange Ring	PVC Coated Aluminum
3	Flange Ring	PVC

Chemtrol
Fig. No.

NR 51 Flange Gaskets, for Class 150 Flanges



Note: These gaskets are 1/8" thick, full face CR, 70 durometer.

Nominal Size	Part No.	Approx. Lbs./Ea.
1/2	Use Figure No. & Nom. Size	0.11
3/4		0.12
1		0.13
1 1/4		0.14
1 1/2		0.15
2		0.20
2 1/2		0.25
3		0.28
4		0.30
6		0.40
8		0.50
10		0.55
12		0.60

Flanged Fittings*– Fabricated from Molded Components

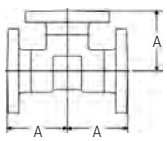


Fig. No. 4511-12
Flanged Tee

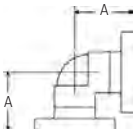


Fig. No. 4507-12
Flanged 90° ELL

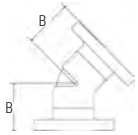


Fig. No. 4506-12
Flanged 45° ELL

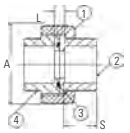
Nominal Size	Fig. No. 4511-12 Flanged Tee Approx. Lbs./Ea.	Dim. A	Fig. No. 4507-12 Flanged 90° ELL Approx. Lbs./Ea.	Dim. A	Fig. No. 4506-12 Flanged 45° ELL Approx. Lbs./Ea.	Dim. B
1	1.71	3 3/32	1.19	3 3/32	1.12	2 23/32
1 1/4	2.39	3 19/32	1.60	3 19/32	1.60	3 3/32
1 1/2	3.24	3 31/32	2.06	3 31/32	2.09	3 13/32
2	4.86	4 15/32	3.28	4 15/32	3.16	3 27/32
2 1/2	7.82	5 7/32	5.30	5 7/32	5.08	4 13/32
3	10.67	5 13/32	7.32	5 13/32	6.92	4 25/32
4	16.64	7 3/32	11.60	7 3/32	10.79	5 25/32
6	32.74	9 25/32	22.65	9 25/32	20.84	8 1/2
8	65.79	13 31/32	45.40	13 31/32	42.50	11 5/8

*Flanged fittings are produced by solvent cementing socket flanges to socket fittings with short plain end pipe nipples. They may be ordered as factory fabrications or may be assembled in the field.

Unions

4533 FKM / 4533E (EPDM) Socket Union (S x S)





Nominal Size	FKM Part No.	EPDM Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. A	Dim. L	Dim. S*
1/4	897-002	897E002	10	0.07	1.70	0.40	0.64
1/2	897-005	897E005	10	0.16	2.00	0.43	0.89
3/4	897-007	897E007	10	0.27	2.44	0.45	1.01
1	897-010	897E010	10	0.40	2.83	0.43	1.14
1 1/4	897-012	897E012	5	0.87	4.08	0.79	1.26
1 1/2	897-015	897E015	10	0.93	4.08	0.80	1.39
2	897-020	897E020	10	1.83	5.26	0.80	1.51
3	897-030	897E030	5	3.47	7.17	0.90	1.90

The 2 1/2" Socket Union is available as a fabrication from the 3" size Bushed down.
* Socket Depth

Do not use or test the products in this section of the catalog with compressed air or other gases.

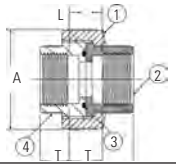
PVC Schedule 80

Chemtrol

Chemtrol
Fig. No.

4533-3-3 FKM / 4533E-3-3 (EPDM) Threaded Union (FPT x FPT)





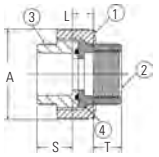
Nominal Size	FKM Part No.	EPDM Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. A	Dim. L	Dim. T*
1/4	898-002	898E002	10	0.11	1.70	1.07	0.31
1/2	898-005	898E005	10	0.16	2.00	1.30	0.43
3/4	898-007	898E007	10	0.28	2.44	1.38	0.45
1	898-010	898E010	10	0.41	2.83	1.51	0.53
1 1/4	898-012	898E012	5	0.90	4.08	2.01	0.55
1 1/2	898-015	898E015	10	0.92	4.08	2.16	0.55
2	898-020	898E020	10	1.82	5.26	2.36	0.57
3	898-030	898E030	5	3.47	7.17	2.88	0.95

The 2 1/2" Thread Union is available as a fabrication from the 3" size Bushed down.

* Thread Joint Engagement

4533E-3 FKM / 4533E-3 (EPDM) Female Adapter Union (S x FPT)





Nominal Size	FKM Part No.	EPDM Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. A	Dim. L	Dim. S*	Dim. T†
1/2	899-005	899E005	10	0.16	2.00	0.84	0.89	0.43
3/4	899-007	899E007	10	0.26	2.44	0.82	1.02	0.45
1	899-010	899E010	10	0.38	2.83	0.90	1.14	0.53
1 1/4	899-012	899E012	10	0.89	4.08	1.29	1.27	0.55
1 1/2	899-015	899E015	10	0.91	4.08	1.32	1.39	0.55
2	899-020	899E020	5	1.81	5.26	1.41	1.51	0.57
3	899-030	899E030	5	3.86	7.17	1.93	1.91	0.95

The 2 1/2" Socket x Thread Union is available as a fabrication from the 3" size Bushed down.

* Socket Depth
† Thread Joint Engagement

Transition Unions

Purchase and Assembly Instructions

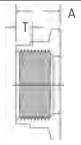
Transition Unions result from field assembly. First, the basic plastic Union is chosen, which includes selections for material of construction, O-ring type and connection style, remembering that the Union Nut screws onto the plastic Union Tailpiece. Next, the metal End Connector is chosen for material type and choice of thread connection style. Prior to installation, the mechanic must disassemble the Union, remove and discard the plastic End Connector, and then reassemble with the metal End Connector in its place.

For additional technical information, or a complete listing of Schedule 80 industrial plastic products, please refer to NIBCO's Chemtrol Fitting Guide, or visit our website at www.chemtrol.com.

Chemtrol
Fig. No.

TCBR-3 Brass End Connector (FPT)





Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. A	Dim. T*
1/2	↑	1	0.33	1.02	0.43
3/4		1	0.43	1.02	0.45
1	Use Fig. No.	1	0.52	1.19	0.53
1 1/4	& Nom. Size	1	0.85	1.42	0.55
1 1/2		1	1.81	1.42	0.55
2		1	2.74	1.57	0.57
3	↓	1	5.45	2.25	0.95

* Thread Joint Engagement

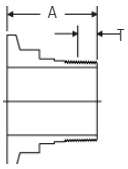
TCSS-3 Stainless Steel End Connector (FPT)

Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. A	Dim. T*
1/2	↑	1	0.30	1.02	0.43
3/4		1	0.39	1.02	0.45
1	Use Fig. No.	1	0.47	1.19	0.53
1 1/4	& Nom. Size	1	0.77	1.42	0.55
1 1/2		1	1.64	1.42	0.55
2		1	2.48	1.57	0.57
3	↓	1	4.97	2.25	0.95

* Thread Joint Engagement

TCBR-4 Brass End Connector (MPT) Brass End Connector (MPT)





Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. A	Dim. T*
1/2	↑	1	0.31	1.66	0.43
3/4		1	0.41	1.69	0.45
1	Use Fig. No.	1	0.49	2.19	0.53
1 1/4	& Nom. Size	1	0.81	2.38	0.55
1 1/2		1	1.72	2.38	0.55
2		1	2.60	2.63	0.57
3	↓	1	5.45	3.50	0.95

* Thread Joint Engagement

TCSS-4 Stainless Steel End Connector (MPT)

Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. A	Dim. T*
1/2	↑	1	0.28	1.66	0.43
3/4		1	0.37	1.69	0.45
1	Use Fig. No.	1	0.44	2.19	0.53
1 1/4	& Nom. Size	1	0.73	2.38	0.55
1 1/2		1	1.56	2.38	0.55
2		1	2.36	2.63	0.57
3	↓	1	4.97	3.50	0.95

* Thread Joint Engagement

Do not use or test the products in this section of the catalog with compressed air or other gases.

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Pressure Ratings

Pipe and Tube

[1]Based on water service, for more severe service, an additional correction factor may be required.

Maximum Non-Shock Operating Pressure (psi) AT 73°F[1]			
Nominal Size	**Schedule 40 PVC**	**Schedule 80 PVC**	**CPVC-CTS SDR-11**
3/8	620	920	400
1/2	600	850	400
3/4	480	690	400
1	450	630	400
1 1/4	370	520	400
1 1/2	330	470	400
2	280	400	400
2 1/2	300	425	N/A
3	260	375	N/A
4	220	325	N/A
6	180	280	N/A
8	160	250	N/A
10	140	230	N/A
12	130	230	N/A

NOTE: ABS & PVC DWV used for non-pressure applications only.
N. R. - Not Recommended.
N/A - Not Available.

Pipe and tube pressure ratings are based on non-shock service. As the severity of the service application increases, a service-correction factor should be considered. Specifically, for Schedule 40 applications that my experience severe cyclincal-pressure loading, such as in irrigation systems, the following maximum-suggested design pressures are suggested.

Systems with threaded Schedule 80 thermoplastic fittings shall have a maximum-suggested design pressure of 50% that of equivalent pipe size pressure rating. This reduction is because threads are formed by the removal of material. Refer to the following table for maximum-suggested design pressures.

Conversely, CPVC-CTS pipe and fittings do carry the same pressure rating, as defined by ASTM D2846. Refer to the following table for maximum-suggested design pressures.

Fittings with Service Correction Factors

NOTE: ABS & PVC DWV used for non-pressure applications only.

Maximum–Suggested Design Pressure (psi) AT 73°F[1]			
Nominal Size	**Schedule 40 PVC**	**Schedule 80 PVC**	**CPVC-CTS SDR-11**
	Socket End	**Threaded End**	**Socket End**
3/8	370	460	400
1/2	360	420	400
3/4	280	340	400
1	270	320	400
1 1/4	220	260	400
1 1/2	200	240	400
2	170	200	400
2 1/2	180	210	N/A
3	155	190	N/A
4	130	160	N/A
6	110	N.R.	N/A
8	95	N.R.	N/A
10	85	N.R.	N/A
12	80	N.R.	N/A

N. R. - Not Recommended.
N/A - Not Available.

The maximum-allowable non-shock pressure rating for PVC and CPVC-CTS thermoplastic piping is a function of temperature. For pipe and fitting applications above 73°F, refer to the table below for Temperature Correction Factors. To determine the maximum non-shock pressure rating at an elevated temperature, simply multiply the base pressure rating obtained from the appropriate table by the correction factor from the following table. Below 73°F the pressure rating will be the same as the base pressure in the tables above.

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Pressure Ratings (Continued)

Fittings Temperature Correction Factors

Operating Temperature, °F	FACTORS	
	PVC	CPVC-CTS
70	1.00	1.00
80	0.90	0.96
90	0.75	0.92
100	0.62	0.85
110	0.50	0.77
120	0.40	0.70
130	0.30	0.55
140	0.22	0.50
150	N.R.	0.47
160	N.R.	0.40
170	N.R.	0.32
180	N.R.	0.25
200	N.R.	0.18
210	N.R.	0.15

N.R. - Not Recommended.

Valves, Flanges, and Unions

The maximum pressure rating for NIBCO valves, flanges, and unions, regardless of size, is 150 psi at 73°F. As with all other thermoplastic piping components, the maximum non-shock operating pressure is related to temperature. Above 100°F refer to the chart below.

Temperature Correction Factors

Operating Temperature, °F	Maximum Non-Shock Operating Pressure, psi	
	PVC	CPVC
100	150	150
110	135	140
120	110	130
130	75	120
140	50	110
150	N.R.	100
160	N.R.	90
170	N.R.	80
180	N.R.	70
190	N.R.	60
200	N.R.	50

N.R. - Not Recommended

ABS & PVC-DWV Pipe & Fittings

NIBCO ABS 5800 series fittings conform to the material and dimensions of American Society for Testing and Materials, ASTM D 2661 and D 3311. ABS pipe meets the material requirements of ASTM D 3965 and the dimensions of ASTM D 2661.

NIBCO PVC 4800 series fittings are manufactured to meet the material and dimensional requirements of ASTM D 2665 and D 3311. PVC pipe is produced in compliance with ASTM D 2665 and D 1784.

NIBCO products have been designed to conform to the specifications listed above. Many of these products have been listed by and contain the mark of CSA, IAPMO, and NSF. For a current listing contact NIBCO INC.

ABS & PVC Schedule 40 Pipe Dimensions

Nominal Size	Average O.D., in.	Average I.D., in.	Min. Wall Thickness, in.
1 1/4	1.660	1.380	0.140
1 1/2	1.900	1.610	0.145
2	2.375	2.067	0.154
3	3.500	3.068	0.216
4	4.500	4.026	0.237
6	6.625	6.065	0.280
8*	8.625	7.981	0.322
10*	10.750	10.020	0.365
12*	12.750	11.938	0.406

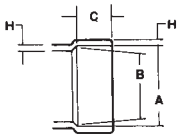
*These sizes of ABS pipe are not currently covered in ASTM D 2661.

Pipe

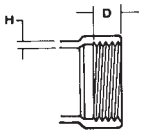


Dimensions of NIBCO ABS & PVC DWV Fitting Sockets, Threaded Ends and Male Ends

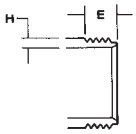
Solvent Socket (HUB)



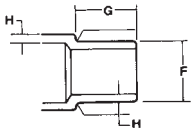
Internal (Female) Threads (FIPT)



External (Male) Threads (MIPT)



Spigot (Male) End (SPIG)



Nominal Size	A, avg.	B, avg.	C, min.	D	E	F	G, min.	H, min.
1 1/4	1.670	1.655	0.688	0.75	0.71	1.660	0.75	0.16
1 1/2	1.910	1.895	0.688	0.75	0.72	1.900	0.75	0.16
2	2.385	2.370	0.750	0.75	0.75	2.375	0.81	0.16
3	3.515	3.495	1.500	1.20	1.20	3.500	1.56	0.22
4	4.515	4.495	1.750	1.30	1.30	4.500	1.81	0.25
6	6.647	6.614	3.000	1.50	1.51	6.625	3.06	0.28
8	8.655	8.610	4.000	2.00	1.72	8.625	4.06	0.33
10	10.776	10.737	5.000	2.20	N/A	10.750	5.06	0.36
12	12.788	12.736	6.000	2.38	N/A	12.750	6.06	0.41

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CPVC-CTS Copper Tube Size (SDR 11)

Tube and Fittings

Dimensions and Pressure Ratings

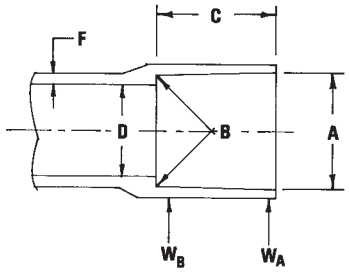
NIBCO CPVC-CTS tube and fittings are manufactured to the material and dimensional requirements of ASTM D 2846. Each product can be easily identified by the tan color. The outside diameter of the tube has the same dimension as the equivalent size copper tube; therefore, the product line is referred to as CPVC-CTS (Copper Tube Size).

The tube meets the dimensional requirements of SDR-11 (Standard Dimension Ratio). Through the ratio of tube O.D.-to-wall thickness, SDR design maintains the same pressure rating regardless of size . Tube dimensions and pressure ratings are shown below. All dimensions are in inches.

CPVC-CTS Tube Dimensions

Outside Diameter, Wall Thickness, and Tolerances for CPVC 4120, SDR 11 Plastic Tubing per ASTM D 2846

Nominal Size	Average Tubing O.D.	Tolerance on Average O.D.	Average Tubing I.D.	Wall Thickness	Tolerance on Wall
1/2	0.625	±0.003	0.489	0.060	+0.020
3/4	0.875	±0.003	0.715	0.080	+0.020
1	1.125	±0.003	0.921	0.102	+0.020
1 1/4	1.375	±0.003	1.125	0.125	+0.020
1 1/2	1.625	±0.004	1.329	0.148	+0.020
2	2.125	±0.004	1.739	0.193	+0.023



Fitting Dimensions

Nominal Size	Socket Entrance Dia., A		Socket Bottom Dia., B		C	D	WA	W_B	F
	Average	Tolerance	Average	Tolerance	Min.	Min.	Min.	Min.	Min.
1/2	0.633	±0.003	0.619	±0.003	0.500	0.489	0.068	0.102	0.128
3/4	0.884	±0.003	0.870	±0.003	0.700	0.715	0.080	0.102	0.128
1	1.135	±0.003	1.121	±0.003	0.900	0.921	0.102	0.102	0.128
1 1/4	1.386	±0.003	1.372	±0.003	1.100	1.125	0.125	0.125	0.156
1 1/2	1.640	±0.004	1.622	±0.004	1.300	1.329	0.148	0.148	0.185
2	2.141	±0.004	2.123	±0.004	1.700	1.739	0.193	0.193	0.241

NOTE: NIBCO recommends the use of proper transition fittings when joining plastic to metal threaded fittings or pipe.

PVC Schedule 40 Pipe & Pressure Fittings

PVC Schedule 40 pipe and fittings are made for use in cold water systems where the temperature does not exceed 140°F. PVC Schedule 40 fittings are made in compliance with ASTM D 2466. Schedule 40 pipe meets the requirements of ASTM D 1785. Both the pipe and fittings are manufactured from material conforming to ASTM D 1784 and meeting cell Class 12454.

Schedule 40
*Pipe Dimensions and References

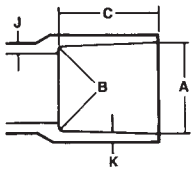


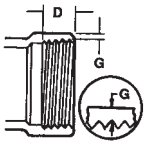
(20 ft. lengths)

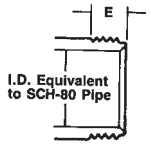
Nominal Size	Average Outside Diameter Inches	Average Inside Diameter Inches	Wall Thickness Inches		Pipe Wall Cross-Sectional Area Inches^2	Inside Diameter Area Inches^2
			Nom.	Min.		
1/2	0.840	0.602	0.119	0.109	0.270	0.285
3/4	1.050	0.804	0.123	0.113	0.358	0.508
1	1.315	1.029	0.143	0.133	0.527	0.832
1 1/4	1.660	1.360	0.150	0.140	0.712	1.453
1 1/2	1.900	1.590	0.155	0.145	0.850	1.986
2	2.375	2.047	0.164	0.154	1.139	3.291
2 1/2	2.875	2.445	0.215	0.203	1.797	4.695
3	3.500	3.042	0.229	0.216	2.353	7.268
4	4.500	3.998	0.251	0.237	3.351	12.554
6	6.625	6.031	0.297	0.280	5.904	28.567
8	8.625	7.942	0.341	0.322	8.887	49.539
10	10.750	9.976	0.387	0.365	12.599	78.164
12	12.750	11.889	0.430	0.406	16.662	111.015

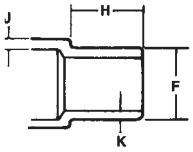
* Do not thread Schedule 40 pipe. Use appropriate fittings for threaded assembly.

Fittings[1]









Nominal Size	Average Outside Diameter Inches	Solvent Socket (Hub)			Internal Threads (FIPT)		External Threads (MIPT)	Male End (Spg)		Wall Thickness	
		A	B	C^2 Min.	D	G Min.	E	F	H Min.	J^2 Min.	K^2 Min.
1/2	0.840	0.848	0.836	0.688	0.463	0.072	0.463	0.840	0.688	0.136	0.109
3/4	1.050	1.058	1.046	0.719	0.482	0.079	0.482	1.050	0.719	0.141	0.113
1	1.315	1.325	1.310	0.875	0.574	0.087	0.574	1.315	0.875	0.166	0.133
1 1/4	1.660	1.670	1.655	0.938	0.594	0.098	0.594	1.660	0.938	0.175	0.140
1 1/2	1.900	1.912	1.894	1.094	0.594	0.106	0.594	1.900	1.094	0.181	0.145
2	2.375	2.387	2.369	1.156	0.610	0.123	0.610	2.375	1.156	0.193	0.154
2 1/2	2.875	2.889	2.868	1.750	0.932	0.139	0.932	2.875	1.750	0.254	0.203
3	3.500	3.516	3.492	1.875	1.016	0.160	1.016	3.500	1.875	0.270	0.216
4	4.500	4.518	4.491	2.000	1.094	0.194	1.094	4.500	2.000	0.296	0.237
6	6.625	6.647	6.614	3.000	1.208	0.280	1.513	6.625	3.000	0.350	0.280
8	8.625	8.655	8.610	4.000	1.313	0.322	1.723	8.625	4.000	0.403	0.322
10	10.750	10.776	10.737	5.375	-	-	-	10.750	5.375	0.487	0.402
12	12.750	12.765	12.700	6.875	-	-	-	12.750	6.875	0.532	0.465

[1]With exception of thread lengths, dimensions shown are listed in ASTM D 2466 for PVC Schedule 40 Fittings.
[2]NIBCO fittings may exceed certain minimum ASTM dimensional requirements shown in order to ensure functional satisfaction.

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PVC Schedule 80 Pipe & Pressure Fittings

NIBCO/Chemtrol grey PVC Schedule 80 fittings are manufactured to applicable national standards, such as, ASTM D 2467, for threaded and socket-type fittings. Schedule 80 pipe meets the dimensional requirements of ASTM D 1785. Both Schedule 80 pipe and fittings meet cell Class 12454 as specified in ASTM D 1784.

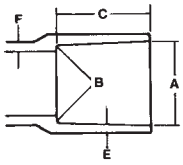
Schedule 80 Pipe Dimensions

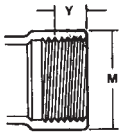


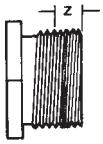
(20 ft. lengths)

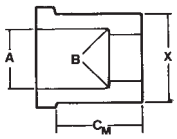
Nominal Size	Average Outside Diameter Inches	Average Inside Diameter Inches	Wall Thickness Inches		Pipe Wall Cross-Sectional Area Inches[2]
			Nom.	Min.	
1/4	0.540	0.282	0.129	0.119	0.167
1/2	0.840	0.526	0.157	0.147	0.337
3/4	1.050	0.722	0.164	0.154	0.457
1	1.315	0.936	0.189	0.179	0.670
1 1/4	1.660	1.255	0.202	0.191	0.927
1 1/2	1.900	1.476	0.212	0.200	1.124
2	2.375	1.913	0.231	0.218	1.556
2 1/2	2.875	2.290	0.292	0.276	2.373
3	3.500	2.864	0.318	0.300	3.179
4	4.500	3.786	0.357	0.337	4.647
6	6.625	5.709	0.458	0.432	8.873
8	8.625	7.565	0.530	0.500	13.479
10	10.750	9.493	0.628	0.593	19.985
12	12.750	11.294	0.728	0.687	27.495

Fittings[1]









Nominal Size	Average Outside Diameter Inches	Solvent Socket (Hub)			Internal Threads (FIPT)		External Threads (MIPT)	Male End (Spg)		Wall Thickness	
		A	B	C[2] Min.	Y[2]	M Min.	Z[2]	X	C_m Min.	F[2] Min.	E[2] Min.
1/4	0.540	0.552	0.536	0.625	0.339	0.840	0.339	0.540	0.625	0.149	0.119
1/2	0.840	0.848	0.836	0.875	0.463	1.280	0.463	0.840	0.875	0.185	0.147
3/4	1.050	1.058	1.046	1.000	0.482	1.500	0.482	1.050	1.000	0.195	0.154
1	1.315	1.325	1.310	1.125	0.574	1.810	0.574	1.315	1.125	0.225	0.179
1 1/4	1.660	1.670	1.655	1.250	0.594	2.200	0.594	1.660	1.250	0.240	0.191
1 1/2	1.900	1.912	1.894	1.375	0.594	2.500	0.594	1.900	1.375	0.250	0.200
2	2.375	2.387	2.369	1.500	0.610	3.000	0.610	2.375	1.500	0.275	0.218
2 1/2	2.875	2.889	2.868	1.750	0.932	3.560	0.932	2.875	1.750	0.345	0.276
3	3.500	3.516	3.492	1.875	1.016	4.300	1.016	3.500	1.875	0.375	0.300
4	4.500	4.518	4.491	2.250	1.094	5.430	1.094	4.500	2.250	0.420	0.337
6	6.625	6.647	6.614	3.000	N/A	N/A	N/A	6.625	3.000	0.540	0.432
8	8.625	8.655	8.610	4.000	N/A	N/A	N/A	8.625	4.000	0.625	0.500
10	10.750	10.798	10.725	5.500	N/A	N/A	N/A	N/A	N/A	0.741	0.593
12	12.750	12.785	12.725	7.000	N/A	N/A	N/A	N/A	N/A	0.859	0.687

[1]Dimensions shown are listed in ASTM D 2467 for Threaded and Socket-Type Schedule 80 Fittings.
[2]Fittings may exceed certain minimum ASTM dimensional requirements shown in order to insure functional satisfaction.

General Storage, Handling, and Safety Considerations for Thermoplastic Piping Components

STORAGE

Thermoplastic piping components are designed and manufactured for use in systems involving the transport of aggressive liquids as well as potable water. In order to ensure their integrity, they must be handled with reasonable care prior to installation.

Pipe

When pipe is received in standard lifts it should remain in the lift until ready for use. Lifts should not be stacked more than three high and should always be stacked wood-on-wood. Loose pipe should be stored on racks with a minimum support spacing of three feet. Pipe should be shaded but not covered directly when stored outside in high ambient temperatures. This will provide for free circulation of air and reduce the heat build-up due to direct sunlight exposure.

Fittings

Fittings should be stored in their original cartons to keep them free of dirt and reduce the possibility of damage. If possible, fittings should be stored indoors.

Solvent Cements and Primers

Solvent cements have a definitive shelf life and each can and carton is clearly marked with a date of manufacture. Stock should be rotated to insure that the oldest material is used first.

HANDLING

Pipe and Fittings

Care should be exercised to avoid rough handling of thermoplastic pipe and fittings. They should not be dragged over sharp projections, dropped, or have objects dropped upon them. Pipe ends should be inspected for cracks resulting from such abuse. Transportation by truck or pipe trailer will require that the pipe be continuously supported and all sharp edges on the trailer bed that come in contact with the pipe must be padded.

Solvent Cements and Primers

Keep containers for solvent cements tightly closed except when in use. Avoid prolonged breathing of solvent vapors, and when pipe and fittings are being joined in partially enclosed areas use a ventilating device to attenuate vapor levels. Keep solvent cements, primers, and cleaners away from all sources of ignition, heat, sparks, and open flames. Avoid repeated contact with the skin by wearing proper gloves impervious to the solvents. Application of the solvents or cements with rags and bare hands is not recommended; natural fiber brushes and other suitable applicators can produce satisfactory results.

IMPORTANT FACTS TO KNOW ABOUT ABS, PVC, AND CPVC SOLVENT CEMENT

1. ABS solvent cement should be used only for joining ABS pipe and fittings.
2. PVC solvent cement should be used only for joining PVC Pipe and fittings.
3. CPVC solvent cement should be used only for joining CPVC pipe and fittings.
4. A good joint is as strong as the pipe, since the solvent chemically welds the fitting to the pipe.
5. The solvent cement containers should always be covered when not in use to prevent excessive evaporation. Do not use thinner. Cement that shows signs of thickening and is lumpy should be discarded.
6. PVC solvent cement and primer can be used for both PVC pressure and DWV piping systems.

SAFETY CONSIDERATIONS

Pipe and Fittings

ABS, PVC, and CPVC products contained within this catalog are intended for use in the distribution of media that are chemically compatible with the piping materials. **Due to the inherent hazards associated with testing these components and piping systems with compressed air or other compressed gases, NIBCO does not allow pneumatic testing or use of these products in compressed air or gas piping systems.**

Note: pressurized (compressed) air and other compressed gases contain large amounts of stored energy, which present serious safety hazards should the system fail for any reason.

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General Storage, Handling, and Safety Considerations for Thermoplastic Piping Components (continued)

Solvent Cements and Primers

DANGER:

- Solvent cements and primers are extremely flammable.
- Vapors from solvent cements and primers may be harmful if inhaled for prolonged periods of time.
- Solvent cements and primers may be harmful if swallowed.
- Solvent cements and primers may cause skin or eye irritation.

CAUTION: Solvent Cements and Primers are composed of various solvents and as such require special conditions for storage. Because of their flammability they must not be stored in an area where they might be exposed to ignition, heats, sparks, or open flames.

Solvent Welding Instructions for ABS, PVC, & CPVC-CTS FlowGuard Gold® Pressure & DWV Piping Systems

Scope

The solvent welding procedure detailed herein applies to all NIBCO ABS-DWV, PVC-DWV, PVC, and CPVC-CTS pressure piping systems including molded fittings and valves. Belled-end pipe and sewer pipe can also be joined in this manner. NIBCO TECHNICAL SERVICES is available for additional solvent-welding guidance and recommendations.

Joining Equipment and Materials

- Cutting Tool
- Rags (non-synthetic, i.e., cotton)
- Deburring Tool
- Cement and Primer Applicators
- Applicator Can or Bucket
- Purple Primer
- Solvent Cement
- Tool Tray
- Notched Boards

TYPES OF CEMENT

- PVC Solvent Cement - Light Duty Industrial Grade is for use with all Sch. 40, DWV and SDR pipe through 6".
- PVC Solvent Cement - Heavy Duty Industrial Grade is for use with all Sch. 80 and SDR pipe through 6".
- PVC Solvent Cement - Extra Heavy Duty Industrial Grade is for use with all PVC pipe 6" and larger.
- ABS Solvent Cement - For use in joining Sch. 40, SDR, and DWV pipe through 12" size.
- CPVC-CTS, Orange Colored Solvent Cement is for use with all sizes of Copper Tube Size tube and fittings.
- Purple Primer is for use with all PVC and CPVC pipe/tube and fittings.

NOTE: Do not take shortcuts - follow instructions completely.

PIPE/TUBE PREPARATION

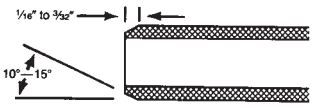
1. Cutting

Plastic pipe/tube can be easily cut with a powersaw, circular saw, band saw, or hand-saw. For best results, use a fine-toothed blade (16-18 teeth per inch) with little or no set (maximum 0.025 inch). A circumferential speed of about 6,000 ft./min. is suitable for circular saws; band saw speed should be approximately 3,000 ft./min. Carbide-tipped blades are preferable when quantities of pipe/tube are to be cut. To insure square-end cuts, a mitre box, hold-down, or jig should be used. Pipe or tubing cutters can be used for smaller diameter pipe/tube when the cutting wheel is specifically designed for plastic pipe.



2. Deburring and Beveling

All burrs, chips, filings, etc., should be removed from both the pipe/tube I.D. and O.D. before joining. Use a knife, deburring tool, or a half-round, coarse file to remove all burrs. All pipe/tube ends should be beveled to approximately the dimensions shown below for ease of socketing and to minimize the chances of wiping the solvent cement from the I.D. of the fitting as the pipe/tube is socketed:



The beveling can be done with a coarse file or a beveling tool such as that manufactured by Reed Manufacturing Company, Erie, Pennsylvania.

FITTING PREPARATION

Prior to solvent welding, all fittings and couplings should be removed from their cartons and exposed for at least one hour to the same temperature conditions as the pipe/tube in order to assure that they are thermally balanced before joining.

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Solvent Welding Instructions for ABS, PVC, & CPVC-CTS FlowGuard Gold® Pressure & DWV Piping Systems (continued)

CLEANING

Using a clean, dry cotton rag, wipe away all loose dirt and moisture from the I.D. and O.D. of the pipe/tube end and the I.D. of the fitting. DO NOT ATTEMPT TO SOLVENT-WELD WET SURFACES.

DANGER: Solvent cements and primers are extremely flammable and harmful if swallowed. Vapors are harmful. May cause eye irritation and repeated or prolonged skin contact causes skin irritation.
Keep away from heat, sparks and open flame. Use only with adequate ventilation. Avoid contact with eyes, skin, and clothing. Avoid prolonged breathing of vapor. Close container after each use.
FIRST AID: In case of skin contact, flush with water; for eyes, flush with water for at least 15 minutes and seek medical attention. Wash contaminated clothing before reuse. If swallowed, DO NOT INDUCE VOMITING, call a Physician immediately.

PRIMING

The function of purple primer is to penetrate and soften the bonding surfaces of PVC and CPVC pipe/tube and fittings. (Primer is not required with ABS.) It is a product that penetrates rapidly. It is very effective on the hard-finished, high-gloss products now being produced.

Apply primer to the pipe/tube with a paint brush approximately 1/2 of the pipe/tube diameter. A rag is not recommended as repeated contact with skin may cause irritation or blistering.

Apply primer freely in the socket, keeping surface and applicator wet and in motion 5 to 15 seconds. Redip applicator as necessary. Avoid puddling in the socket.



Apply again to the fitting socket. The second application is especially recommended for belled-end pipe and fittings fabricated from pipe stock, for many of them have especially hard inside-surfaces.

For checking penetration, you should be able to scratch or scrape a few thousandths of an inch of the primed surfaces away. Repeated application to either or both surfaces may be necessary. Weather conditions affect priming action. In cold weather more time is required for proper penetration.

NOTE: The pipe/tube ends can be rested on notched boards to keep them clean and for ease of solvent cement application.

Note: There are "one-step" cements available for CPVC that eliminate the need to use a primer. Cements approved for use with FlowGuard Gold® CPVC will produce pressure-tight joints when used with NIBCO CPVC pipe and fittings. NIBCO recommends that the use of "one-step" cements be limited to applications where established temperatures are 40°F or higher, following the cement manufacturer's instructions.

SOLVENT CEMENT APPLICATION

Using the proper applicator (see chart - page 158 for specific recommendations) proceed as follows:

1. Apply a full even layer of cement on the pipe O.D. for a distance slightly greater than the depth of the socket of the fitting.



2. Coat the fitting socket with a medium layer, avoiding puddling. On belled-end pipe or fabricated fittings, do not coat beyond the socket depth or allow cement to run beyond the bell.



3. Put a second full even layer on the pipe/tube O.D. Cement Layers must be without voids and sufficient to fill any gap in the joints.

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Solvent Welding Instructions for ABS, PVC, & CPVC-CTS FlowGuard Gold® Pressure & DWV Piping Systems (continued)

HANDLING OF PRIMER AND CEMENT

NOTE: Observe the "use prior to" date. Cement has a limited shelf life. Do not permit solvent cement cans to stand open. Do not use cement that has dried to the point where it becomes lumpy and stringy. Dispose of properly. Do not attempt to thin out sluggish cement with thinner or primer. The solvents in the primer and cement are highly flammable, like a fast drying lacquer, and should not be used near an open flame. Use them in a well ventilated area and avoid prolonged breathing of the fumes. Prolonged contact with the skin could cause minor irritation.

JOINING

1. Immediately upon finishing cement application and before it starts to set, insert the pipe/tube to the full socket depth while rotating the pipe or fitting a 1/4 turn to insure complete and even distribution of the cement. Hold joint together for a minimum of 10 to 15 seconds to make sure that pipe/tube does not move or back out of the socket.



2. For pipe sizes 6" and larger, a joining crew consisting of two persons is recommended and the following additional steps necessary:



   a. Rotation of the pipe in the fitting may be omitted.
   b. Hold joint together for 1 to 3 minutes depending on pipe size.
   c. As an aid for joining in these larger sizes it is recommended that a come-along or pipe joining tool similar to that manufactured by Reed Manufacturing Company be used.

EXCESS CEMENT

Immediately after joining and before joint is set, gently place it back onto a level surface, wipe off all excess cement from the circumference of the pipe and fitting.

JOINT INTEGRITY

ABS, PVC, and CPVC-CTS piping joint integrity depends greatly upon following exactly and by intent NIBCO's specific handling, inspection, storage, shipping, fabrication, installation, testing, and operating instructions. Joint integrity also depends greatly upon an infinitely wide, unpredictable, and uncontrollable set of product and environmental conditions that go into determining the length of drying times, before a joint should be moved, handled, or whether intended for low or high working-pressure applications. These conditions include size of pipe, surface temperature of the joint, dry joint interference fit, and relative humidity. Drying times will be faster with smaller pipe/tube, higher surface temperatures, tighter interference fits, and lower relative humidity. Drying times will be slower when these conditions are reversed.

Because of the uncontrollable and unpredictable variety of drying conditions that can exist from job-to-job and moment-to-moment, NIBCO recommends only the drying times and solvent-welding conditions specified below:

1. When exposed to direct sunlight, solvent-welding joining should not be done in atmospheric temperatures below 40°F or above 90°F.

2. NIBCO recommends that 24 hours of joint drying time should elapse for all sizes of pipe and drying temperatures, before the joint is moved or subjected to any appreciable internal or external pressure.

HANDLING

During the initial setting of the cement, which begins about two minutes after application, (on small sizes) be careful not to move or disturb the joint. NIBCO offers, as a non-liability supplier, the following drying times as a guide in aiding the installer, engineer, owner, or other decision making party in deciding at his own risk when the joints are sufficiently dry for movement, handling, low pressure, initial joint testing, application of high pressure tests, and introduction of working pressure. These drying times are based upon a combination of past field experience and laboratory tests.

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Solvent Welding Instructions for ABS, PVC, & CPVC-CTS FlowGuard Gold® Pressure & DWV Piping Systems (Continued)

ABS, PVC, and CPVC-CTS Joint Movement Times

*The temperatures above are only ***drying*** temperatures and should not be confused with atmospheric, joining-temperature recommendations and limitations. See Section on "Joint Integrity."

Nominal Size	HOT WEATHER* 90°-150°F Surface Temperature	MILD WEATHER* 50°-90°F Surface Temperature	COLD WEATHER* 10°-50°F Surface Temperature
1/2 - 1 1/4	12 Min.	20 Min.	30 Min.
1 1/2 - 2 1/2	30 Min.	45 Min.	1 Hr.
3 - 4	45 Min.	1 Hr.	1 Hr. & 30 Min.
6 - 8	1 Hr.	1 Hr. & 30 Min.	2 Hrs. & 30 Min.
10 -12	2 Hrs.	3 Hrs.	5 Hrs.

PRESSURE TESTING

CAUTION: AIR OR COMPRESSED GAS ARE *NOT* RECOMMENDED AS MEDIA FOR PRESSURE TESTING OF PLASTIC PIPING SYSTEMS.

1. Initial joint testing: Initial joint testing of PVC and CPVC-CTS pipe/tube could possibly be accomplished to 10% of its hydrostatic pressure rating after the below drying times have been observed:

PVC and CPVC-CTS Joint Drying Times at 10% Pressure.

*The temperatures above are only ***drying*** temperatures and should not be confused with atmospheric, joining-temperature recommendations and limitations. See Section on "Joint Integrity."

Nominal Size	HOT WEATHER* 90°-150°F Surface Temperature	MILD WEATHER* 50°-90°F Surface Temperature	COLD WEATHER* 10°-50°F Surface Temperature
1/2 - 1 1/4	1 Hr.	1 Hr. & 15 Min.	1 Hr. & 45 Min.
1 1/2 - 2 1/2	1 Hr. & 30 Min.	1 Hr. & 45 Min.	3 Hrs.
3 - 4	2 Hrs. & 45 Min.	3 Hrs. & 30 Min.	6 Hrs.
6 - 8	3 Hrs. & 30 Min.	4 Hrs.	12 Hrs.
10 -12	6 Hrs.	8 Hrs.	72 Hrs.

2. The PVC pipe and CPVC-CTS tube could possibly be pressure tested up to 100% of its hydrostatic pressure rating after the below drying times:

PVC and CPVC-CTS Joint Drying Times For 100% Pressure

*The temperatures above are only ***drying*** temperatures and should not be confused with atmospheric, joining-temperature recommendations and limitations. See Section on "Joint Integrity."

Nominal Size	HOT WEATHER* 90°-150°F Surface Temperature	MILD WEATHER* 50°-90°F Surface Temperature	COLD WEATHER* 10°-50°F Surface Temperature
1/2 - 1 1/4	4 Hrs.	5 Hrs.	7 Hrs.
1 1/2 - 2 1/2	6 Hrs.	8 Hrs.	10 Hrs.
3 - 4	8 Hrs.	18 Hrs.	24 Hrs.
6 - 8	12 Hrs.	24 Hrs.	48 Hrs.
10 -12	18 Hrs.	36 Hrs.	72 Hrs.

DO'S AND DON'TS

DO:

- Use the proper applicator.
- Use the proper type of solvent cement for the job.
- Follow the instructions completely.

DON'T:

- Attempt to solvent weld under the following conditions:
  1. If it is raining.
  2. If the atmospheric temperature is below 40°F.
  3. If under direct exposure to sun at atmospheric temperatures above 90°F
- Discard empty cans of solvent, primer or rags in trench or near piping. Concentrated fumes or dripping cement or primer can cause piping failure.

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Solvent Welding Instructions for ABS, PVC, & CPVC-CTS FlowGuard Gold® Pressure & DWV Piping Systems (Continued)

HOT WEATHER CEMENTING

Since cement contains a solvent, certain precautions or steps should be taken when the atmospheric temperature is above 90°F, to avoid evaporation of the solvent from the cement just prior to joining. Such evaporation will cause the cement to prematurely set before joining, thus, adversely affecting the joint integrity. Use one or a combination of the list below to reduce the chances of this condition occurring:

1. Shade or shelter the joint surfaces from direct exposure to the sun's rays for at least one hour prior to joining and during the joining process.
2. Make cement joints during early morning hours.
3. Apply cement quickly. On 6" and larger pipe, it is recommended that two persons apply cement to pipe sur face while the third applies it to the fitting socket.
4. Join pipe to fittings as quickly as possible after applying cement.

COLD WEATHER CEMENTING

Because the solvents in the cement will not evaporate as readily when the temperature is below 40°F, the pipe joints will not set up as rapidly in cold weather. If solvent cementing must be done when the temperature is below 40°F the following suggestions are offered:

1. Store pipe, fittings, cement and primer in a heated area.
2. Prefab as much of the system as possible in a heated work area.
3. Joints that must be made outside should be protected with a portable shelter and heated with indirect heat to surface temperatures above 40°F prior to joining. The shelter and heat should remain in place for at least two hours after joint assembly.
4. Pipe and fittings must be dry prior to joining and the joints should be kept dry until the cement has had sufficient time to set.

CAUTION: DO NOT ATTEMPT TO SPEED THE SETTING OR DRYING OF THE CEMENT BY APPLYING DIRECT HEAT TO THE SOLVENT WELDED JOINT. Forced rapid drying by heating will cause the cement solvents to boil off, forming porosity, bubbles, and blisters in the cement film.

Applicators

Nominal Size	Roller Size	Recommended Brush Width*, in.
1/4	Not Recommended	1/2
3/8		1/2
1/2		1/2
3/4		1/2
1		1/2
1 1/4		1
1 1/2		1
2		1
2 1/2		1 1/2
3	3	1 1/2
4		2
6		3
8	7	4
10		4, 6, or 8
12		4, 6, or 8

*Natural bristle brushes should always be specified. It is recognized that the recommended brush width may not always be readily available. However, the selection should come as close as possible to the recommended width in order to insure complete coverage with a minimum number of brush strokes.

REQUIREMENTS

The below estimated PVC, CPVC, and ABS IPS pipe solvent cement requirements should only be considered as a guideline for usage and could vary according to a wide variety of installation conditions. Further, these estimates should in no way be used to restrict the liberal cement application instructions recommended for the pipe.

Number of Joints Per...*

Nominal Size	Pint	Quart	Gallon
1/2	130	260	1040
3/4	80	160	640
1	70	140	560
1 1/4	50	100	400
1 1/2	35	70	280
2	20	40	160
2 1/2	17	34	136
3	15	30	120
4	10	20	80
5	8	16	64
6	N/R	8	24
8	N/R	3	12
10	N/R	N/R	10
12	N/R	N/R	6

*Each joint represents one socket in a fitting.
N/R - Not Recommended.

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Solvent Welding Instructions for ABS, PVC, & CPVC-CTS FlowGuard Gold® Pressure & DWV Piping Systems (Continued)

The estimated CPVC-CTS solvent cement requirements listed below should only be considered as a guideline for usage and could vary according to a wide variety of installation conditions. Further, these estimates should in no way be used to restrict the liberal cement application instructions recommended for the tube.

Number of Joints Per Pint

Nominal Size	Joints
1/2	255
3/4	170
1	138
1 1/4	95
1 1/2	68
2	38

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Threading Instructions for Thermoplastic Pipe

Scope

The procedure presented herein covers threading of all IPS Schedule 80 or heavier thermoplastic pipe. These tapered threads are National Pipe Threads (NPT) which are cut to the dimensions outlined in ANSI B1.20.1.

Thread Dimensions

PIPE		THREADS					
Nominal Size	Outside Diameter D, in.	Number of Threads Per Inch	Normal Engagement By Hand C, in.	Length of Effective Thread A, in.	Total Length: End of Pipe to Vanish Point B, in.	Pitch Diameter at End of Internal Thread E, in.	Depth of Thread (Max.) in.
1/4	0.540	18	0.228	0.4018	0.5946	0.49163	0.04444
1/2	0.840	14	0.320	0.5337	0.7815	0.77843	0.05714
3/4	1.050	14	0.339	0.5457	0.7935	0.98887	0.05714
1	1.315	11 1/2	0.400	0.6828	0.9845	1.23863	0.06957
1 1/4	1.660	11 1/2	0.420	0.7068	1.0085	1.58338	0.06957
1 1/2	1.900	11 1/2	0.420	0.7235	1.0252	1.82234	0.06957
2	2.375	11 1/2	0.436	0.7565	1.0582	2.29627	0.06957
2 1/2	2.875	8	0.682	1.1375	1.5712	2.76216	0.10000
3	3.500	8	0.766	1.2000	1.6337	3.38850	0.10000
4	4.500	8	0.844	1.3000	1.7337	4.38713	0.10000

Note: Do not thread Schedule 40 pipe.

THREADING EQUIPMENT AND MATERIALS

- Pipe Dies
- Pipe Vise
- Threading ratchet or power machine
- Tapered plug
- Cutting lubricant (soap and water)
- Strap wrench
- PTFE tape
- Cutting tools
- Deburring tool

PIPE PREPARATION

Plastic pipe can be easily cut with a powersaw, circular saw, band saw, or handsaw. For best results, use a fine-toothed blade (16-18 teeth per inch) with little or no set (maximum 0.025 inch). A circumferential speed of about 6,000 ft./min. is suitable for circular saws; band saw speed should be approximately 3,000 ft./min. Carbide-tipped blades are preferable when quantities of pipe are to be cut. To ensure square-end cuts, a mitre box, holddown, or jig should be used. Pipe or tubing cutters can be used for smaller diameter pipe when the cutting wheel is specifically designed for plastic pipe. Such a cutter is available from the Reed Manufacturing Co. or Ridge Tool Company.

THREADING DIES

Thread-cutting dies should be clean, sharp, and in good condition, and should not be used to cut materials other than plastics. Dies with a 5° negative front-rake angle are recommended when using power threading equipment and dies with a 5° to 10° negative front-rake angle are recommended when cutting threads by hand. When cutting threads with power threading equipment, self-opening die heads and a slight chamfer to lead the dies will speed production.

1. Hold pipe firmly in a pipe vise. Protect the pipe at the point of grip by inserting a rubber sheet or other material between the pipe and vise.



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Threading Instructions for Thermoplastic Pipe (Continued)

2. A tapered plug must be inserted in the end of the pipe to be threaded. This plug provides additional support and prevents distortion of the pipe in the threaded area. Distortion of the pipe during the threading operation will result in eccentric threads, non-uniform circumferential thread depth or gouging and tearing of the pipe wall. See table below for approximate plug O.D. dimensions.



Reinforcing Plug Dimensions*

Nominal Size	Plug O.D.*
1/2	0.526
3 3/4	0.722
1	0.935
1 1/4	1.254
1 1/2	1.476
2	1.913
2 1/2	2.289
3	2.864
4	3.786

These dimensions are based on the median wall thicknesses and average outside diameter for the respective pipe sizes. Variations in wall thickness and O. D. dimensions may require alteration of the plug dimensions.

3. Use a die stock with a proper guide that is free of burrs or sharp edges, so that the die will start and go on square to the pipe axis.



4. Push straight down on the handle, avoiding side pressure that might distort the sides of the threads. If power threading equipment is used, the dies should not be driven at high speeds or with heavy pressure. Apply an external lubricant liberally when cutting the threads. Advance the die to the point where the thread dimensions are equal to those listed in the table on Thread Dimensions above. Do not over-thread.



5. Periodically check the threads with a ring gage to insure that proper procedures are being followed. Thread dimensions are listed in the table on Thread Dimensions. The gauging tolerance is ± 1 1/2 turns.



6. Brush threads clean of chips and ribbons. Then starting with the second full thread, and continuing over the thread length, wrap PTFE thread tape in the direction of the threads. Overlap each wrap by one half the width of the tape. Thread lubricant/sealant may be used if approved by the manufacturer.



Threading Instructions for Thermoplastic Pipe (Continued)

7. Thread the fitting onto the pipe and tighten by hand. Using a strap wrench only, further tighten the connection an additional one to two threads past hand tightness. Avoid excessive torque as this may cause thread damage or fitting damage.



Pressure Testing

Threaded piping systems can be pressure tested up to 100% of their hydrostatic pressure rating as soon as the last connection is made.

CAUTION: AIR OR COMPRESSED GAS ARE NOT RECOMMENDED AS MEDIA FOR PRESSURE TESTING OF PLASTIC PIPING SYSTEMS.

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Flanged Joints

Scope
Flanging is used extensively for plastic process lines that require periodic dismantling. Plastic flanges and factory flanged valves and fittings in PVC, CPVC, PVDF and polypropylene are available in a full range of sizes and types for joining to pipe by solvent welding, threading, or thermosealing as in the case with polypropylene and PVDF. Gasket seals between the flange faces should be an elastomeric full flat-faced gasket with a hardness of 50 to 70 durometer A. NIBCO can provide polychloroprene (CR) gaskets nominal sizes 1/2 through 8 having a 1/8 inch thickness. For chemical environments too aggressive for polychloroprene other more resistant elastomers should be used.

Dimensions
Bolt circle and number of bolt holes for the flanges are the same as Class 150 metal flanges per ANSI B16.5. Threads are tapered iron pipe size threads per ANSI B1.20.1. The socket dimensions conform to ASTM D 2467, which describes nominal sizes 1/2 thru 8. Internal NIBCO specifications have been established for the size 10 and 12 PVC patterns.

Pressure Rating
As with all other thermoplastic piping components, the maximum non-shock operating pressure is a function of temperature. Maximum pressure rating for NIBCO valves, unions and flanges is 150 psi. Above 100°F refer to the chart.

Maximum Operating Pressure (psi)

Operating Temp. °F	PVC
100	150
110	135
120	110
130	75
140	50
150	N/R
160	N/R
170	N/R
180	N/R
190	N/R
200	N/R
250	N/R
280	N/R

N/R Not Recommended

ANSI B16.5 Dimensional Data for Flanges and Flanged Fittings
(Dimensions and Bolts Conform to Class 150 Steel Flanges)
Sealing

Dimensions				
		Drilling		
Nominal Size	Outside Diameter (inches)	Number of Holes	Diameter of Bolt (Inches)	Diameter of Bolt Circle (inches)
1/2	3.50	4	1/2	2.38
3/4	3.88	4	1/2	2.75
1	4.25	4	1/2	3.12
1 1/4	4.62	4	1/2	3.50
1 1/2	5.00	4	1/2	3.88
2	6.00	4	5/8	4.75
2 1/2	7.00	4	5/8	5.50
3	7.50	4	5/8	6.00
4	9.00	8	5/8	7.50
6	11.00	8	3/4	9.50
8	13.50	8	3/4	11.75
10	16.00	12	7/8	14.25
12	19.00	12	7/8	17.00

The faces of the flanges are tapered back away from the orifice area at a 1/2 to 1° pitch, so that when the bolts are tightened, the faces will be pulled together generating a force in the water way area to improve the sealing.

INSTALLATION TIPS
Once a flange is joined to the pipe, the method for joining two flanges together is as follows:

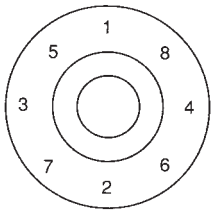
1. Make sure that all the bolt holes of the mating flanges match up. It is not necessary to twist the flange and pipe to achieve this.
2. Insert all bolts.
3. Make sure that the faces of the mating flanges are not separated by excessive distance prior to bolting down the flanges.
4. The bolts on the plastic flanges should be tightened by pulling down the nuts diametrically opposite each other using a torque wrench. Complete tightening should be accomplished in stages and the final torque values shown in the table should be followed for the various sizes of flanges. Uniform stress across the flange will eliminate leaky gaskets.

Flanged Joints (continued)

Flange Size	Recommended Torque*
1/2 - 1 1/2	10- 15 ft. lbs.
2 - 4	20- 30 ft. lbs.
6 - 8	33- 50 ft. lbs.
10	53- 75 ft. lbs.
12	80-110 ft. lbs.

*For a well-lubricated bolt with flat washers under bolt head and nut.

The following tightening pattern is suggested for the flange bolts:



5. If the flange is mated to a rigid and stationary flanged object, or a metal flange, particularly in a buried situation where settling could occur with the plastic pipe, the plastic flange must be supported to eliminate potential stressing.

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Adapting Plastic Piping to Other Piping Materials

THREADED CONNECTIONS - ABS, CPVC, & PVC pipe less than Schedule 80 wall should not be threaded. Most codes require transition from one material to another by use of appropriate adapter fittings. NIBCO offers a complete line of adapters for ABS, CPVC, & PVC.
Common thread sealants should not be used on threaded ABS, CPVC, or PVC joints. When necessary, PTFE pipe tape can be used.

CONNECTING CPVC TO METAL PIPE OR FITTINGS - The recommended methods of joining CPVC tube to metal threaded valves or piping are to use one of the special transition unions or a CPVC adapter with a threaded-brass insert. Threaded plastic-to-metal connections are not recommended. The difference in the rates of expansion of CPVC and metal may cause leakage in threaded joints.

CONNECTING CPVC TO HOT WATER HEATER

An approved temperature/pressure relief valve should be assembled to the hot water heater so that the probe or sensing element enters the water at the top of the heater. Using metal nipples, extend the metal piping at least 12 inches from the water heater on both the cold water supply and the hot water discharge lines. Special transition unions or CPVC adapters with a threaded-brass insert must be used to join the CPVC tube to the nipples. Do not use CPVC pipe and fittings with commercial type non-storage water heaters.

Pipe Support Spacing

ABS & PVC piping should be supported just as any other piping system. Ordinary hanger straps may be used for suspending below floor systems. The light weight of ABS & PVC may lead one to believe that wider hanger spacing could be permitted. Four or five foot spacing is recommended, with proper support at the base of each stack. CPVC Pressure pipe should be supported every three feet.

Since ABS, CPVC, & PVC are non-metallic, they are not as "stiff" as their metal counterparts, therefore the installer must exercise care to assure proper alignment of required grades.

Branch fittings serving trap arms should also be secured to the framing to prevent movement. Hanger straps should not be so tight as to compress, distort, cut, or abrade the piping.

ALLOWING FOR EXPANSION-In Pressure piping, allowance for expansion due to changing temperature is important. It is good practice to include a 12-inch offset every ten feet in a straight run. Illustrated below are several methods for providing off sets.

Specific Gravity	Correction Factor
1.1	0.98
1.2	0.96
1.4	0.93
1.6	0.90
2.0	0.85
2.5	0.80

The above data is for un-insulated lines. For insulated lines reduce spans to 70% of table values. For spans of less than 2 feet continuous support should be used.

Pipe Support Spacing, ABS-DWV, Ft.			
Nominal Size	70°F	100°F	140°F
1 1/4	4 1/2	4 1/2	4
1 1/2	5	5	4 1/2
2	5	5	4 1/2
3	6	6	5 1/2
4	6 1/4	6 1/4	5 3/4
6	6 3/4	6 3/4	6
8	7	7	6 1/2
10	7	7	6 1/2
12	7	7	6 1/2

Pipe Support Spacing, CPVC-CTS, Ft.				
Nominal Size	70°F	100°F	140°F	180°F
1/2	3	3	2 1/2	2 1/2
3/4	3	3	2 1/2	2 1/2
1	3	3	2 1/2	2 1/2
1 1/4	4	4	3 1/2	3 1/2
1 1/2	4	4	3 1/2	3 1/2
2	4	4	3 1/2	3 1/2

Pipe Support Spacing, PVC-Schedule 40, Ft.			
Nominal Size	70°F	100°F	140°F
1/2	4 1/2	4	2 1/2
3/4	5	4	2 1/2
1	5 1/2	4 1/2	2 1/2
1 1/4	6	5	3
1 1/2	6	5	3
2	6	5	3
2 1/2	7	6	3 1/2
3	7	6	3 1/2
4	7 1/2	6 1/2	4
5	7 1/2	6 1/2	4
6	8 1/2	7 1/2	4 1/2
8	9	8	4 1/2
10	10	8 1/2	5
12	10	8 1/2	5

Pipe Support Spacing, PVC-Schedule 80, Ft.			
Nominal Size	70°F	100°F	140°F
1/2	5	4 1/2	2 1/2
3/4	5 1/2	4	2 1/2
1	6	5	3
1 1/4	6 1/2	5 1/2	3 1/2
1 1/2	6 1/2	5 1/2	3 1/2
2	7	6	3 1/2
2 1/2	8	7	4
3	8	7	4
4	9	7 1/2	4 1/2
6	10	9	5
8	11	9 1/2	5 1/2

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Expansion and Contraction of Plastic Pipe

CALCULATING STRESS

Plastics, like other piping materials, undergo dimensional changes as a result of temperature variations above and below the installation temperature. If movement resulting from these dimensional changes is restricted by adjacent equipment or by a vessel to which the pipe may be rigidly attached, the resultant stresses and forces may cause damage to such items or even to the pipe itself. In such a case, where compensation is not provided for these dimensional changes and where the piping system is rigidly held or restricted at both ends, an estimate of the magnitude of the resultant stresses can be obtained with the following formula. This formula relates the temperature differential to the temperature dependent modulus and the expansion coefficient for the particular plastic material.

$S = EC(T_1-T_2)$

Where:
S = Stress (psi)
E = Modulus of Elasticity (psi) (See table below for specific values at various temperatures)
C = Coefficient of Expansion (in/in/°Fx10^5) (See physical property chart on page 7 for values)
T_1-T_2 = Temperature differential between the installation temperature and the maximum or minimum system temperature
N/A = Not Applicable

Temperature Vs. Modulus (x 10^5) psi						
Temperature, °F	73	90	100	140	180	210
PVC	4.20	3.75	3.60	2.70	N/A	N/A
CPVC	4.23	4.00	3.85	3.25	2.69	2.20
ABS	2.71	2.43	2.40	1.90	1.54	N/A

The magnitude of the resultant longitudinal forces can be determined by multiplying the stress, times the plastic cross-sectional area.

Example 1:
Assuming the temperature extremes are from 70°F to 100°F, what would be the amount of force developed in nominal size 2 Schedule 40 PVC pipe with the pipe rigidly held and restricted at both ends?

$S = EC(T_1-T_2)$
$S = EC(30)$
$S = (3.60 \times 10^5) \times (3.0 \times 10^{-5})(30)$
$S = 324$ psi

The magnitude of the resultant longitudinal forces:
$F = S \times A$

Where:
F = Force (lbs)
S = Stress (psi)
A = Cross-sectional Area (in^2)

Nominal size 2 Schedule 40 PVC Pipe has:
OD = 2.375 in
ID = 2.047 in

Cross-sectional area (A) = $\left[\left(\frac{OD}{2}\right)^2 - \left(\frac{ID}{2}\right)^2\right]$ X 3.14 = 1.14in^2

Therefore, the magnitude of the resultant longitudinal force is:
F = SA
F = 324 x 1.14
F = 369 lbs.

The extent of expansion or contraction is dependent upon the piping material of construction and its coefficient of linear expansion which, for convenience, is listed below for several materials in units of inches of expansion per 10°F temperature change per 100 feet of pipe or tube.

Expansion Coefficient	
Material	**Y, in/10°F/100ft**
PVC	0.360
CPVC	0.380
ABS	0.500

The degree of thermal expansion or contraction is also dependent upon the system temperature differential, as well as, the length of pipe run between changes in direction and it can be calculated using the following formula:

$$\Delta L = \frac{Y(T_1 - T_2)}{10} \times \frac{L}{100}$$

Expansion and Contraction of Plastic Pipe (Continued)

Where:

ΔL = Dimensional change due to thermal expansion or contraction (in.)

Y = Expansion coefficient (in/10°F/100ft) (See Table on previous page)

(T_1-T_2) = Temperature differential between the installation temperature and the maximum and minimum system temperature, which ever provides the greatest differential (°F)

L = Length of pipe run between changes in direction (ft)

Example 1:

How much expansion can be expected in a 200 foot straight run of nominal size 3 PVC Pipe that will be installed at 75°F when the piping system will be operated at a maximum of 120°F and a minimum of 40°?

$$\Delta L = \frac{0.360(120 - 75)}{10} \times \frac{200}{100}$$

ΔL = .360 x 4.5 x 2.0 = 3.24 inches

Stresses and forces that result from thermal expansion and contraction can be reduced or eliminated by providing for flexibility in the piping system through frequent changes in direction or introduction of loops as graphically depicted in the figures below.

Normally, piping systems are designed with sufficient directional changes which provide inherent flexibility to compensate for expansion and contraction. However, when this is not the case or when there is reasonable doubt as to the adequate flexibility of the system, expansion loops or expansion joints should be designed into the system. If an expansion loop (which is fabricated with 90° elbows and straight pipe as depicted in Fig. 1) is to be used, the leg length (R) should be determined by using the following formula to insure that it is of sufficient length to absorb expansion and contraction movement without damage.

$$R = 1.44 \sqrt{D\Delta L}$$

Where:

R = Expansion loop leg length (ft)

D = Nominal outside diameter of pipe (in)

ΔL = Dimensional change due to thermal expansion or contraction (in)

Example 2:

How long should the expansion loop legs be in order to compensate for the expansion in Example 1?

$$R = 1.44 \sqrt{D\Delta L}$$

Flexibility, through the introduction of flexural off-sets, must be inserted into a piping system design in situations where straight runs of pipe are long or the ends of a straight run are restricted from movement and also in situations where the system is restrained. Several examples of methods for inserting flexibility in these situations are graphically presented below. In each case, rigid supports or restraints should not be placed within the leg length of an expansion loop, off-set, or bend.

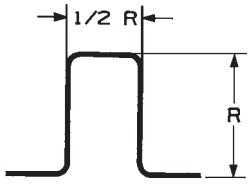


Fig. 1

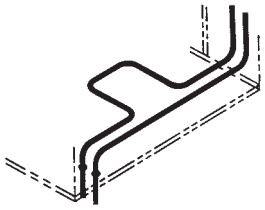


Fig. 3



Fig. 3

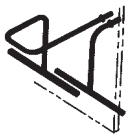


Fig. 4

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ABS-DWV Figure Number Comparison

NIBCO FIG. NO.	SIZE	CHARLOTTE FIG. NO.	MUELLER FIG. NO.
5800	2	_	_
5800	3	_	_
5800	4	122	02946
5800-SD	3 x 4	117	02962
5801	1 1/4	_	02932
5801	1 1/2	100	02933
5801	1 1/2 x 1 1/4	_	_
5801	2	100	02934
5801	2 x 1 1/2	102	02948
5801	3	100	02935
5801	3 x 1 1/2	102	02949
5801	3 x 2	102	02950
5801	4	100	02936
5801	4 x 2	102	02951
5801	4 x 3	102	02952
5801	6	100	03143
5801-2-7	1 1/4	_	03308
5801-2-7	1 1/2	103-P	03389
5801-2-7	1 1/2 x 1 1/4	103-P	03409
5801-2-7	2	103-P	03390
5801-2-7-B	1 1/2	_	_
5801-2-7-C	1 1/2	103-X	03392
5801-2-7-C	2	_	_
5801-2-F	1 1/2 x 1 1/4	107	02904
5801-2-F	2 x 1 1/2	107	02906
5801-2-F	3 x 1 1/2	107	02907
5801-2-F	3 x 2	107	02908
5801-2-F	4 x 2	107	02910
5801-2-F	4 x 3	107	02909
5801-2-F	6 x 4	107	03144
5801-7	1 1/4	_	03380
5801-7	1 1/2	104-P	03383
5801-7	1 1/2 x 1 1/4	104-P	03384
5801-7	2	_	_
5801-7-B	1 1/4	_	_
5801-7-B	1 1/2	_	03376
5801-7-B	1 1/2 x 1 1/4	_	03394
5801-7-C	1 1/2	104-X	03376
5801-7-C	1 1/2 x 1 1/4	104-X	03394
5801-RP	1 1/2	130	02965
5801-RP	2	130	02966
5801-RP	3	130	02967
5801-RP	4	130	02968
5803	1 1/4	_	03006
5803	1 1/2	101	02866
5803	2	101	02867
5803	3	101	02869
5803	4	101	03396
5803	6	101	03147
5803-2	1 1/4	_	02921
5803-2	1 1/2	105	02922
5803-2	2	105	02923
5803-2	3	105	02924
5803-2	4	105	02925
5803-2	6	105	03148
5803-2-F	1 1/2 x 1 1/4	_	02912
5803-2-F	2 x 1 1/2	_	02913
5803-2-F	3 x 2	_	_
5803-2-F	4 x 3	_	_
5803-2-SW	1 1/2	900	03418
5803-2-SW-EL	1 1/2	_	_
5803-2-TPA	1 1/2	_	03419
5803-TPA	1 1/2	_	03014
5804	1 1/4	_	02931
5804	1 1/2	109	02927
5804	1 1/2 x 1 1/4	_	02926
5804	2	109	02928
5804	3	109	02929
5804	4	109	02930
5804-2	1 1/4	_	03010
5804-2	1 1/2	103	03386
5804-2	1 1/2 x 1 1/4	_	03387
5804-2	2	103	03385
5804-2	3	_	03366
5804-2	4	_	_
5805	1 1/2 x 2	_	02961
5805	1 1/2 x 3	_	02964
5805	2	123	02957
5805	3	_	02958
5805	3 x 4	123-R	02960
5805	4	_	02959
5805-N	1 1/2 x 2	_	02947
5805-N	2	119	02954
5805-N	3	119	02955
5805-N	3 x 4	119	02953
5805-N	4	119	02956
5806	1 1/4	_	02884
5806	1 1/2	321	02885
5806	2	321	02886
5806	3	321	02887
5806	4	321	02888
5806	6	321	03132
5806	10	_	_
5806	12	_	_
5806-2	1 1/4	_	03016
5806-2	1 1/2	323	02890
5806-2	2	323	02891
5806-2	3	323	02892
5806-2	4	323	02893
5806-2	6	323	03133

ABS-DWV Figure Number Comparison

NIBCO FIG. NO.	SIZE	CHARLOTTE FIG. NO.	MUELLER FIG. NO.
5807	1 1/4	_	02875
5807	1 1/2	300	02876
5807	2	300	02877
5807	3	300	02878
5807	4	300	02979
5807	6	300	03130
5807-2	1 1/4	_	02894
5807-2	1 1/2	302	02880
5807-2	2	302	02881
5807-2	3	302	02882
5807-2	4	302	02883
5807-2	6	_	02889
5807-2-CL	4 x 3	330	03107
5807-2-CL	4 x 3 w/Cap	330-X	03108
5807-2-LT	1 1/2	309	03060
5807-2-LT	2	309	03061
5807-2-LT	3	309	03063
5807-2-LT	4	_	_
5807-2-V	1 1/2	333	03088
5807-2-V	2	333	03089
5807-2-V	3	_	03090
5807-3	3	_	02807
5807-9	3 x 3 x 1 1/2	_	03069
5807-9	3 x 3 x 2	300-S	03070
5807-CL	4 x 3	329	03093
5807-LT	1 1/4	_	02870
5807-LT	1 1/2	304	02871
5807-LT	2	304	02872
5807-LT	3	304	02873
5807-LT	4	304	02874
5807-V	1 1/4	_	03083
5807-V	1 1/2	331	03084
5807-V	2	331	03085
5807-V	3	331	03086
5807-V	4	_	03087
5807-V	10	_	_
5807-V	12	_	_
5808	1 1/2	324	02899
5808	2	324	02900
5808	3	324	02901
5808	4	324	02983
5808	6	324	02988
5808-2	1 1/2	326	02984
5808-2	2	326	02985
5808-2	3	326	02986
5808-2	4	326	02987
5810	1 1/4	_	02816
5810	1 1/2	600	02822
5810	2	600	02823
5810	2 x 1 1/2 x 1 1/2	601	02831
5810	2 x 2 x 1 1/2	601	02826
5810	3	600	02824
5810	3 x 3 x 1 1/2	601	02827
5810	3 x 3 x 2	601	02828
5810	4	600	02825
5810	4 x 4 x 1 1/2	601	02833
5810	4 x 4 x 2	601	02829
5810	4 x 4 x 3	601	02830
5810	6	600	03135
5810	6 x 6 x 3	_	_
5810	6 x 6 x 4	601	03137
5810-14	1 1/2	_	_
5810-2	1 1/2	_	03367
5810-2	2	602	03368
5810-2	3	602	03369
5810-2	3 x 3 x 1 1/2	_	03372
5810-2	3 x 3 x 2	603	03373
5810-2	4	_	03370
5810-2	4 x 4 x 3	_	03375
5811	1 1/4	_	02751
5811	1 1/2	400	02752
5811	1 1/2 x 1 1/4 x 1 1/4	_	02759
5811	1 1/2 x 1 1/4 x 1 1/2	_	02762
5811	1 1/2 x 1 1/2 x 1 1/4	_	02757
5811	2	400	02753
5811	2 x 1 1/2 x 1/2	401	02761
5811	2 x 1 1/2 x 2	401	02760
5811	2 x 2 x 1 1/2	401	02758
5811	3	400	02754
5811	3 x 3 x 1 1/2	401	02764
5811	3 x 3 x 2	401	02763
5811	4	400	02755
5811	4 x 4 x 1 1/2	_	_
5811	4 x 4 x 2	401	02765
5811	4 x 4 x 3	401	02766
5811	6	400	02756
5811	6 x 6 x 4	401	02768
5811-14-V	1 1/2	445	03413
5811-14-V	2	445	03414
5811-14-V	3	445	03415
5811-14-V	4	445	03416
5811-2	1 1/2	403	03112
5811-2	2	403	03113
5811-2	2 x 1 1/2 x 1 1/2	404	03115
5811-2	2 x 1 1/2 x 2	404	03116
5811-2	2 x 2 x 1 1/2	404	03117
5811-2	3	403	03114
5811-2	3 x 3 x 1 1/2	404	03118
5811-2	3 x 3 x 2	404	03119
5811-2	4	403	03120

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ABS-DWV Figure Number Comparison

NIBCO FIG. NO.	SIZE	CHARLOTTE FIG. NO.	MUELLER FIG. NO.
5811-C	3	448	02237
5811-C	4	448	02238
5811-V	1 1/2	441	03403
5811-V	2	441	03404
5811-V	3	441	03405
5811-V	3 x 3 x 1 1/2	_	_
5811-V	3 x 3 x 2	_	_
5811-V	4	_	03406
5811-V	10	_	_
5811-V	12	_	_
5812-LR	1 1/2	501	02853
5812-LR	2	501	02858
5812-LR	2 x 1 1/2 x 1 1/2	502	02835
5812-LR	2 x 1 1/2 x 2	502	02836
5812-LR	2 x 2 x 1 1/2	502	02865
5812-LR	3	501	02852
5812-LR	3 x 3 x 1 1/2	502	02837
5812-LR	3 x 3 x 2	502	02857
5812-LR	4	501	02860
5812-LR	4 x 4 x 2	502	02863
5812-LR	4 x 4 x 3	502	02864
5814	1 1/2	444-X	02997
5814	2	444-X	02998
5814	3	444-X	02999
5814	4	444-X	03000
5816	1 1/2	105-X	03001
5816	2	105-X	03002
5816	3	105-X	03003
5816	4	105-X	03004
5816	6	_	03005
5817	1 1/4	_	_
5817	1 1/2	116	02977
5817	2	116	02978
5817	3	116	02979
5817	4	116	02980
5817	6	_	_
5817-P	1 1/2	131	02411
5817-P	2	131	02412
5817-P	3	131	02413
5817-P	4	131	02414
5818	1 1/4	_	02937
5818	1 1/2	106	02938
5818	2	106	02939
5818	2 1/2	106	_
5818	3	106	02941
5818	3 1/2	106	02943
5818	4	106	02942
5818	6	106	03146
5826	1 1/2	_	03055
5826	2	_	03056

NIBCO FIG. NO.	SIZE	CHARLOTTE FIG. NO.	MUELLER FIG. NO.
5827	1 1/2	114	02993
5827	2	_	_
5827	3	_	_
5829	3 x 3	_	_
5829	3 x 4	_	_
5829	3 x 6	_	_
5829	3 x 8	_	_
5829	3 x 10	_	_
5829	3 x 12	_	_
5829-2	3 x 3	_	_
5829-2	3 x 4	_	_
5829-2	3 x 6	_	_
5829-2	3 x 8	_	_
5829-2	3 x 10	_	_
5834	1 1/2	611	02838
5834	2	611	02839
5834	2 x 2 x 1 1/2 x 1 1/2	612	02847
5834	3	611	02840
5834	3 x 3 x 1 1/2 x 1 1/2	_	02843
5834	3 x 3 x 2 x 2	612	02844
5834	4	611	02841
5834	4 x 4 x 2 x 2	_	02845
5834	4 x 4 x 3 x 3	612	02846
5834	6 x 6 x 4 x 4	_	03142
5835	1 1/2	428	02812
5835	2	428	02813
5835	2 x 2 x 1 1/2 x 1 1/2	429	02817
5835	3	428	02814
5835	3 x 3 x 1 1/2 x 1 1/2	429	02818
5835	3 x 3 x 2 x 1 1/2	_	02819
5835	3 x 3 x 2 x 2	429	02820
5835	4	428	02815
5835	4 x 4 x 2 x 2	429	02240
5835	4 x 4 x 3 x 3	429	02821
5835-9	3 x 3 x 3 x 3 x 1 1/2	_	_
5835-9	3 x 3 x 3 x 3 x 2	_	02772
5835-9	4 x 4 x 4 x 4 x 2	_	_
5835-9-9	3 x 3 x 3 x 3 x 2 x 2	_	02770
5835-9-9	4 x 4 x 4 x 4 x 2 x 2	_	_
5835-B	2	500	02246
5835-B	2 x 1 1/2 x 1 1/2 x 1 1/2	500	02247
5835-B	2 x 1 1/2 x 2 x 2	500	02248
5835-B	3	500	02249
5835-B	3 x 2 x 3 x 3	500	02250
5836	2 x 2 x 1 1/2 x 1 1/2	_	_
5836	3	_	02854
5836	4	_	02917
5837	1 1/2	327	03045
5837	2	327	03046
5837	2 x 1 1/2 x 1 1/2	327	03049

ABS-DWV Figure Number Comparison

NIBCO FIG. NO.	SIZE	CHARLOTTE FIG. NO.	MUELLER FIG. NO.
5837	3	327	03047
5837	4	_	03048
5848-A	4 x 3	820	02920
5851	4	800	02902
5851	4 x 3	800	02903
5851-2	4 x 3	801	02919
5851-2-A	4	812	02229
5851-2-A	4 x 3	812	02228
5851-3	4 x 3	_	02270
5851-4	4 x 3	_	02260
5851-A	4	811	02226
5851-A	4 x 3	811	02227
5853	3 or 4	_	_
5853-KO	3 or 4	815-KO	_
5853-NS	3 or 4	815	02255
5855	4	_	02253
5855	4 x 3	800-KO	02254
5860	1 1/2	319	02895
5860	2	319	02896
5860	3	319	02897
5860	4	319	02982
5860-2	1 1/2	320	03020
5860-2	2	320	03021
5860-2	3	320	03022
5860-2	4	_	03023
5861	3 x 3 x 1 1/2	_	03028
5861	3 x 3 x 2	_	03027
5861-LH	3 x 3 x 1 1/2	303	03041
5861-LH	3 x 3 x 2	303	03042
5861-LH	4 x 4 x 2	_	03043
5861-2-LH	3 x 3 x 2	_	_
5870	3 x 3 x 3 x 2 x 2	_	02811
5871	3 x 3 x 2 x 2	_	02780
5871	3 x 3 x 3 x 1 1/2	_	02781
5871	3 x 3 x 3 x 2	416	02782
5871	4 x 4 x 4 x 2	_	02784
5872	3 x 3 x 2 x 2	_	_
5872	3 x 3 x 3 x 1 1/2	_	02795
5872	3 x 3 x 3 x 2	417	02796
5872	4 x 4 x 4 x 2	_	02797
5878	1 1/2	_	03471
5878	2	_	03472
5879	1 1/2	700	03466
5879	2	700	03467
5879	3	700	03468
5879	4	700	03469
5881	1 1/2	_	_
5884	1 1/2	707-X	02223
5884	2	707-X	02224
5885	1 1/2	706-X	02214
5885	2	706-X	02222
5885	3	706-X	02230
5885	4	706-X	02231
5891	1 1/2 x 3 x 6	720-X	03100
5892	1 1/4	_	_
5892	1 1/2	_	_
5892	1 1/2 x 1 1/4	_	_
5892-B	1 1/2	_	_
5892-C	1 1/2	_	_
5892-C	1 1/2 x 1 1/4	_	_
5893	1 1/2 or 1 1/2 x 1 1/4	711-P	02220
5895	1 1/4	_	02212
5895	1 1/2	708-P	02215
5895	2	708-P	02216
5895-3	1 1/2	_	_

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PVC-DWV Figure Number Comparison

NIBCO FIG. NO.	SIZE	CHARLOTTE FIG. NO.	MUELLER FIG. NO.
4800	2	122	05944
4800	3	122	_
4800	4	122	05946
4800-SD	3 x 4	117	05962
4801	1 1/4	100	05932
4801	1 1/2	100	05933
4801	1 1/2 x 1 1/4	_	_
4801	2	100	05934
4801	2 x 1 1/2	102	05948
4801	3	100	05935
4801	3 x 1 1/2	102	05949
4801	3 x 2	102	05950
4801	4	100	05936
4801	4 x 2	102	05951
4801	4 x 3	102	05952
4801	6	100	06143
4801	8	100	06145
4801	10	100	_
4801	12	100	_
4801-2-7	1 1/4	_	_
4801-2-7	1 1/2	103-P	_
4801-2-7	1 1/2 x 1 1/4	103-P	_
4801-2-7	2	103-P	_
4801-2-7C	1 1/2	103-X	_
4801-2-7C	1 1/2 x 1 1/4	103-X	_
4801-2-F	1 1/2 x 1 1/4	107	05904
4801-2-F	2 x 1 1/2	107	05906
4801-2-F	3 x 1 1/2	107	05907
4801-2-F	3 x 2	107	05908
4801-2-F	4 x 2	107	05910
4801-2-F	4 x 3	107	05909
4801-2-F	6 x 3	_	_
4801-2-F	6 x 4	107	06144
4801-2-F	8 x 4	_	_
4801-2-F	8 x 6	107	06149
4801-7	1 1/4	_	06380
4801-7	1 1/2	104-P	06383
4801-7	1 1/2 x 1 1/4	104-P	06384
4801-7	2	_	06382
4801-7B	1 1/2 x 1 1/4	_	06394
4801-7C	1 1/2	104-X	06376
4801-7C	1 1/2 x 1 1/4	104-X	06394
4801-RP	1 1/2	130	05965
4801-RP	2	130	05966
4801-RP	3	130	05967
4801-RP	4	130	05968
4801-RP	6	130	_
4803	1 1/4	101	05868
4803	1 1/2	101	05866
4803	2	101	05867
4803	3	101	05869
4803	4	101	06396
4803	6	101	06147
4803-2	1 1/4	_	05918
4803-2	1 1/2	105	05922
4803-2	2	105	05923
4803-2	3	105	05924
4803-2	4	105	05925
4803-2	6	105	06148
4803-2-F	1 1/2 x 1 1/4	_	_
4803-2-F	2 x 1 1/2	108	05913
4803-2-F	3 x 1 1/2	_	_
4803-2-F	3 x 2	_	_
4803-2-F	4 x 3	_	_
4804	1 1/4	109	05931
4804	1 1/2	109	05927
4804	1 1/2 x 1 1/4	109	05926
4804	2	109	05928
4804	3	109	05929
4804	4	109	05930
4804-2	1 1/4	_	06010
4804-2	1 1/2	_	06386
4804-2	1 1/2 x 1 1/4	103	06387
4804-2	2	_	06385
4804-2	3	_	06366
4804-2	4	_	_
4805	1 1/2 x 2	123-R	_
4805	2	123	05957
4805	2 x 3	_	06398
4805	3	123	05958
4805	3 x 4	123-R	05960
4805	4	123	05959
4805-N	1 1/2 x 2	119	_
4805-N	2	119	05954
4805-N	3	119	05955
4805-N	3 x 4	119	05953
4805-N	4	119	05956
4806	1 1/4	321	05884
4806	1 1/2	321	05885
4806	2	321	05886
4806	3	321	05887
4806	4	321	05888
4806	6	321	06132
4806	8	321	06134
4806	8 x 4	_	_
4806	8 x 6	_	_
4806	10	_	_
4806	12	_	_
4806-2	1 1/4	323	06016
4806-2	1 1/2	323	05890

PVC-DWV Figure Number Comparison

NIBCO FIG. NO.	SIZE	CHARLOTTE FIG. NO.	MUELLER FIG. NO.
4806-2	2	323	05891
4806-2	3	323	05892
4806-2	4	323	05893
4806-2	6	323	06133
4806-2	8	323	06136
4806-2	8 x 4	_	_
4806-2	8 x 6	_	_
4807	1 1/4	300	05875
4807	1 1/2	300	05876
4807	2	300	05877
4807	3	300	05878
4807	4	300	05879
4807	6	300	06130
4807	8	300	06131
4807-2	1 1/4	302	05894
4807-2	1 1/2	302	05880
4807-2	2	302	05881
4807-2	3	302	05882
4807-2	4	302	05883
4807-2	6	302	05889
4807-2-CL	4 x 3	330	06107
4807-2-CL	4 x 3 w/Cap	330-X	06108
4807-2-LT	1 1/2	309	06060
4807-2-LT	2	309	06061
4807-2-LT	3	309	06063
4807-2-LT	4	309	06064
4807-2-V	1 1/2	333	06088
4807-2-V	2	333	06089
4807-2-V	3	333	06090
4807-3	3	_	_
4807-9	3 x 3 x 1 1/2	300-S	06069
4807-9	3 x 3 x 2	300-S	06070
4807-CL	4 x 3	329	06093
4807-LT	1 1/2	304	05871
4807-LT	2	304	05872
4807-LT	3	304	05873
4807-LT	4	304	05874
4807-V	1 1/2	331	06084
4807-V	2	331	06085
4807-V	3	331	06086
4807-V	4	_	_
4807-V	10	_	_
4807-V	12	_	_
4808	1 1/2	324	05899
4808	2	324	05900
4808	3	324	05901
4808	4	324	05983
4808	6	324	05988
4808-2	1 1/2	326	05984
4808-2	2	326	05985
4808-2	3	326	05986
4808-2	4	326	05987
4810	1 1/4	600	05816
4810	1 1/2	600	05822
4810	2	600	05823
4810	2 x 1 1/2 x 1 1/2	601	05831
4810	2 x 2 x 1 1/2	601	05826
4810	3	600	05824
4810	3 x 3 x 1 1/2	601	05827
4810	3 x 3 x 2	601	05828
4810	4	600	05825
4810	4 x 4 x 1 1/2	601	05833
4810	4 x 4 x 2	601	05829
4810	4 x 4 x 3	601	05830
4810	6	600	06135
4810	6 x 6 x 3	601	06138
4810	6 x 6 x 4	601	06137
4810	8	600	06139
4810	8 x 8 x 4	_	_
4810	8 x 8 x 6	601	05834
4810-2	2	602	06368
4810-2	3	602	06369
4810-2	3 x 3 x 1 1/2	603	06372
4810-2	3 x 3 x 2	603	06373
4810-2	4	602	06370
4810-2	4 x 4 x 2	603	06374
4810-2	4 x 4 x 3	603	06375
4811	1 1/4	400	_
4811	1 1/2	400	05752
4811	2	400	05753
4811	2 x 1 1/2 x 1 1/2	401	05761
4811	2 x 1 1/2 x 2	401	05760
4811	2 x 2 x 1 1/2	401	05758
4811	3	400	05754
4811	3 x 3 x 1 1/2	401	05764
4811	3 x 3 x 2	401	05763
4811	4	400	05755
4811	4 x 4 x 1 1/2	401	05767
4811	4 x 4 x 2	401	05765
4811	4 x 4 x 3	401	05766
4811	6	400	05756
4811	6 x 6 x 4	401	05768
4811	8	400	05775
4811-14-V	1 1/2	445	06413
4811-14-V	2	445	06414
4811-14-V	3	445	06415
4811-14-V	4	445	06416
4811-2	1 1/2	403	06112
4811-2	2	403	06113
4811-2	2 x 1 1/2 x 1 1/2	_	06115

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PVC-DWV Figure Number Comparison

NIBCO FIG. NO.	SIZE	CHARLOTTE FIG. NO.	MUELLER FIG. NO.
4811-2	2 x 1½ x 2	_	06116
4811-2	2 x 2 x 1½	404	06117
4811-2	3	403	06114
4811-2	3 x 3 x 1½	404	06118
4811-2	3 x 3 x 2	404	06119
4811-2	4	403	06120
4811-2	4 x 4 x 2	404	06121
4811-C	3	448	05237
4811-C	4	448	05238
4811-V	1½	441	06403
4811-V	2	441	06404
4811-V	3	441	06405
4811-V	4	441	06406
4811-V	10	_	_
4811-V	12	_	_
4812-LR	1½	501	05853
4812-LR	2	501	05858
4812-LR	2 x 1½ x 1½	502	05835
4812-LR	2 x 2 x 1½	502	05865
4812-LR	3	501	05852
4812-LR	3 x 3 x 1½	502	05837
4812-LR	3 x 3 x 2	502	05857
4812-LR	4	501	05860
4812-LR	4 x 4 x 2	502	05863
4812-LR	4 x 4 x 3	502	05864
4814	1½	444-X	05997
4814	2	444-X	05998
4814	3	444-X	05999
4814	4	444-X	06000
4816	1½	105-X	06001
4816	2	105-X	06002
4816	3	105-X	06003
4816	4	105-X	06004
4816	6	105-X	06005
4817	1½	116	05977
4817	2	116	05978
4817	3	116	05979
4817	4	116	05980
4817	6	116	06057
4817	8	_	06058
4818	1¼	_	05937
4818	1½	106	05938
4818	2	106	05939
4818	3	106	05941
4818	4	106	05942
4818	6	106	06146
4834	1½	611	05838
4834	2	611	05839
4834	2 x 2 x 1½ x 1½	612	05847
4834	3	611	05840
4834	3 x 3 x 1½ x 1½	612	05843
4834	3 x 3 x 2 x 2	612	05844
4834	4	611	05841
4834	4 x 4 x 2 x 2	612	05845
4834	4 x 4 x 3 x 3	612	05846
4834	6	611	05842
4834	6 x 6 x 4 x 4	_	06142
4835	1½	428	05812
4835	2	428	05813
4835	2 x 2 x 1½ x 1½	429	05817
4835	3	428	05814
4835	3 x 3 x 1½ x 1½	429	05818
4835	3 x 3 x 2 x 1½	_	_
4835	3 x 3 x 2 x 2	429	05820
4835	4	428	05815
4835	4 x 4 x 2 x 2	429	05240
4835	4 x 4 x 3 x 3	429	05821
4835-9	3 x 3 x 3 x 3 x 1½	_	_
4835-9	3 x 3 x 3 x 3 x 2	438	05772
4835-9	4 x 4 x 4 x 4 x 2	438	_
4835-9-9	3 x 3 x 3 x 3 x 2 x 2	439	05770
4835-9-9	4 x 4 x 4 x 4 x 2 x 2	_	_
4835-B	2	500	05246
4835-B	2 x 1½ x 1½ x 1½	500	05247
4835-B	2 x 1½ x 2 x 2	_	_
4835-B	3	500	05249
4835-B	3 x 2 x 3 x 3	_	05250
4836	2	_	_
4836	2 x 2 x 1½ x 1½	507	_
4836	3	507	06032
4836	3 x 3 x 2 x 2	_	_
4836	4	507	06033
4836	4 x 4 x 2 x 2	_	_
4836	4 x 4 x 3 x 3	_	_
4837	1½	327	06045
4837	2	327	06046
4837	2 x 1½ x 1½	327	06049
4837	3	327	06047
4837	4	_	06048
4848-A	4 x 3	820	05920
4851	4	800	05902
4851	4 x 3	800	05903
4851-2	4 x 3	801	05919
4851-2-A	4	812	05229
4851-2-A	4 x 3	812	05228
4851-3	4 x 3	_	_
4851-4	4 x 3	_	_
4851-A	4	811	05226
4851-A	4 x 3	811	05227
4853	3 or 4	815	05255

PVC-DWV Figure Number Comparison

NIBCO FIG. NO.	SIZE	CHARLOTTE FIG. NO.	MUELLER FIG. NO.
4853-KO	3 or 4	815-KO	05257
4853-NS	3 or 4	_	_
4855	4	800-KO	05253
4855	4 x 3	800-KO	05254
4860	1 1/2	319	05895
4860	2	319	05896
4860	3	319	05897
4860	4	319	05982
4860-2	1 1/2	320	06020
4860-2	2	320	06021
4860-2	3	320	06022
4860-2	4	320	06023
4861	3 x 3 x 1 1/2	_	06028
4861	3 x 3 x 2	_	06027
4861-LH	3 x 3 x 1 1/2	303	06041
4861-LH	3 x 3 x 2	303	06042
4861-LH	4 x 4 x 2	303	06043
4861-2-LH	3 x 3 x 2	_	_
4870	3 x 3 x 3 x 1 1/2 x 1 1/2	_	05810
4870	3 x 3 x 3 x 2 x 2	418	05811
4870	4 x 4 x 4 x 2 x 2	418	05808
4871	3 x 3 x 2 x 2	_	_
4871	3 x 3 x 3 x 1 1/2	416	05781
4871	3 x 3 x 3 x 2	416	05782
4871	4 x 4 x 4 x 2	416	05784
4872	3 x 3 x 2 x 2	_	_
4872	3 x 3 x 3 x 1 1/2	417	05795
4872	3 x 3 x 3 x 2	417	05796
4872	4 x 4 x 4 x 2	417	05797
4878	1 1/2	_	06471
4878	2	_	06472
4879	1 1/2	700	06466
4879	2	700	06467
4879	3	700	06468
4879	4	700	06469
4881	1 1/2	_	06471
4884	1 1/2	707-X	05223
4884	2	707-X	05224
4885	1 1/2	706-X	05214
4885	2	706-X	05222
4885	3	706-X	05230
4885	4	706-X	05231
4885-WB	2	_	_
4891	1 1/2 x 3 x 6	720-X	06100
4892	1 1/4	_	_
4892	1 1/2	_	_
4892	1 1/2 x 1 1/4	_	_
4892-C	1 1/2	711-X	_
4892-C	1 1/2 x 1 1/4	_	_

NIBCO FIG. NO.	SIZE	CHARLOTTE FIG. NO.	MUELLER FIG. NO.
4892-C	1 1/2	711-X	_
4892-C	1 1/2 x 1 1/4	_	_
4893	1 1/2 or 1 1/2 x 1 1/4	711-P	05220
4895	1 1/4	708-P	05921
4895	1 1/2	708-P	05215
4895	2	708-P	05216
4895-3	1 1/2	_	_

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NIBCO Limited Warranty

Applicable to NIBCO INC. Plumbing Plastic Fittings and Valves

NIBCO INC. warrants each NIBCO plumbing plastic fitting (including plumbing valves) to be free from defects in materials and workmanship under normal use and service for a period of five (5) years from the date of purchase.

In the event any defect occurs which the owner believes is covered by this Warranty, the owner should immediately contact NIBCO INC., Technical Services, either in writing or by telephone call, (888) 446-4226 or (574) 523-3480. The owner will be instructed to return said fitting or valve, at the owner's expense, to NIBCO INC. or an authorized NIBCO INC. representative for inspection. In the event said inspection discloses to NIBCO INC.'s satisfaction that said fitting or valve is defective, a replacement shall be mailed free of charge to the owner, and NIBCO INC. shall further pay the installing contractor the sum of ten ($10.00) dollars to apply on the cost of installation of said replacement fitting or valve.

TO THE EXTENT PERMITTED BY LAW, THIS WARRANTY SPECIFICALLY EXCLUDES INCIDENTAL AND CONSEQUENTIAL DAMAGES OF EVERY TYPE AND DESCRIPTION RESULTING FROM ANY CLAIMED DEFECT IN MATERIAL OR WORKMANSHIP, INCLUDING BUT NOT LIMITEDTO, PERSONAL INJURIES AND PROPERTY DAMAGES. Some states do not allow the exclusion or limitations of incidental or consequential damages, so these limitations may not apply to you. To **THE EXTENT PERMITTED BY LAW, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE LIMITED IN DURATION.**

This Warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Chemtrol® Thermoplastic Flow Solutions

Fitting Guide

Chemtrol®

PVC, CPVC, PP, PVDF



Chemtrol® is a brand of NIBCO

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Corzan® is a registered trademark of The Lubrizol Corporation.

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Kynar® is a registered trademark of Arkema Inc.

Introduction to Chemtrol Fittings

With more than 45 years of experience in industrial thermoplastics, Chemtrol offers dependable products that work in the most demanding environments.

Chemtrol's premium line of quality fittings are lightweight, weather-resistant, and maintenance-free–saving you time and money.

For ideas that fit your flow-control applications, call on Chemtrol–a company committed to superiority in thermoplastic fittings.

Materials

PVC

(Polyvinyl Chloride) PVC conforming to ASTM D-1784 Classification 12454-B, formerly designated Type I, Grade 1, is the most frequently specified of all thermoplastic piping materials. It has been used successfully for over 45 years in such diverse areas as chemical processing, industrial plating, chilled and tower cooling water, deionized water manufacture and distribution, and irrigation sprinkler systems. PVC is characterized by high physical properties and resistance to chemical attack by strong acids and other oxidizers, alkalis, salt solutions, some organic chemical solutions, and many other chemicals. It is attacked, however, by non-ionic surfactants, some vegetable oils (e.g., peanut), and many organic chemicals such as polar solvents (e.g., ketones), aromatics (i.e., benzene ring structure), and chlorinated hydrocarbons. The maximum service temperature of PVC is 140° F. With a design stress of 2,000 psi at 73° F, the long-term hydrostatic strength of PVC is as high as any of the major thermoplastic materials being used for solid piping systems. PVC is joined by solvent cementing, threading, or flanging.

CPVC (Corzan®)

(Chlorinated Polyvinyl Chloride) CPVC conforming to ASTM D-1784 Classification 23447-B, formerly designated Type IV, Grade 1, is a resin created by the post-chlorination of a PVC polymer. The material's resistance to chemical attack is almost identical to that of PVC. And the physical properties of CPVC are very similar to those of PVC at 73° F, but the additional chlorine in the CPVC polymer extends its maximum service temperature from 140° F to 210° F. For example, the design stress for CPVC is 2,000 psi at 73° F, identical to that of PVC. But its strength is only reduced to 500 psi at 180° F, as compared to 440 psi for PVC at 140° F. For more than 35 years, CPVC has proven to be an excellent material for hot corrosive liquids, hot and cold water distribution, and similar applications above the useful temperature range for PVC. CPVC may even be chosen over PVC in the 110° F to 140° F temperature range because its higher strength-at-temperature, requiring less frequent piping supports, can translate to a more favorable overall installed cost than PVC. CPVC is joined by solvent cementing, threading, or flanging.

PVDF (Kynar®)

(Polyvinylidene Fluoride) PVDF homopolymer conforming to ASTM D-3222, Type I, Grade 2, is a tough, abrasion-resistant fluorocarbon material that has a design stress of 1,360 psi at 73° F and a maximum service temperature of 280° F. It has versatile chemical resistance to salts, strong acids, dilute bases, and many organic solvents, such as the aromatics (i.e., benzene ring structure), the aliphadics (i.e., paraffin, olefin, and acetylene hydrocarbons), and the chlorinated groups. And PVDF is ideally suited for handling wet or dry chlorine bromine and other halogens. However, it is attacked by strong bases, hypochlorites, and some organic chemicals such as polar solvents (e.g., ketones) and esters. No other solid thermoplastic piping material can approach the combined strength, working temperature, and chemical resistance characteristics of PVDF. It is joined by the thermo-seal socket fusion process, threading, or flanging.

Since PVDF is transparent to ultraviolet (UV) radiation, the plastic material is not degraded by sunlight. However, the fluid medium in a PVDF piping system will be totally exposed to UV. To provide protection against UV degradation of the fluid medium, an FDA-approved red pigmentation is added to all piping components for general industrial consumption, particularly for outdoor installations. Conversely, in certain industries, such as electronics, pharmaceuticals, and processed foods/beverages, PVDF has become the piping material of choice because of its high purity, low surface and joint extractables, and elevated temperature sanitation capability. For these applications, another line of piping products made from natural (unpigmented) Kynar® is available.

PP

(Polypropylene) PP as specified by ASTM D-4101, is a member of the polyolefin family of pure hydrocarbon plastics. Although PP has half the strength of PVC and CPVC, with a design stress of 1,000 psi at 73° F, it may have the most versatile chemical resistance of the thermoplastic materials identified as the sentinels of industrial piping. Consider the fact that there are no known solvents for PP. As a result, it has been the material of choice for drainage of mixed industrial chemicals for all its 40-year life. As pressure piping, PP has no peers for concentrated acetic acid or hydroxides. It is also suitable for milder solutions of most acids, alkalis, salts, and many organic chemicals, including solvents. The nemeses for PP are strong oxidizers, such as the hypochlorites and higher concentrations of sulfuric, nitric, and hydrofluoric acids. They are Environmental Stress Cracking (ESC) agents for PP, meaning that time-to-failure is a function of the combined variables of concentration and temperature of the fluid and stress in the piping material. Although PP is not recommended for some organic chemicals, such as polar and chlorinated solvents and the aromatics, the concern is permeation through rather than catastrophic damage of the molecular chain.

All polyolefins are severely degraded by ultraviolet (UV) radiation. However, the plastic piping industry recognizes that PP compounds, containing more than 2 1/2% carbon black pigmentation, are adequately UV stabilized to realize an outside service life of more than 25 years. Chemtrol utilizes such a compound to make all piping components for general industrial consumption, particularly for outdoor installations. Because of the high purity and low surface and joint extractables from natural (unpigmented) PP, Chemtrol utilizes an optimum compound to also make piping components for DI water systems. These are intended as an economic alternative to the ultra high purity infrared (IR) butt fusion PVDF systems typically found in the highly sophisticated electronic semi-conductor industry. It has been demonstrated that an appropriately designed serpentine system, constructed by mechanics properly instructed in the heat fusion of socket joints for sanitary piping, can consistently produce water conforming to the quality standards for injectionable drugs.

FKM

(Fluoroelastomer) FKM is compatible with a broad spectrum of chemicals. Because of this extensive chemical compatibility, spanning wide ranges of concentration and temperature, FKM has gained wide acceptance as a material of construction for valve "O"-rings and seats. These fluoroelastomers can be used in most applications involving mineral acids (with the exception of HCl), salt solutions, chlorinated hydrocarbons, and petroleum oils. FKM is not recommended for most strong alkali solutions.

EPDM

(Also known as EPT) EPDM produced from ethylene-propylene-diene monomer, is a terpolymer elastomer that has good abrasion and tear resistance and offers excellent chemical resistance to a variety of salt, acidic, and organic chemical solutions. It is the best material for most alkali solutions and hydrochloric acid but is not recommended for applications involving petroleum oils or most strong acids.

PTFE

(Polytetrafluoroethylene) PTFE has outstanding resistance to chemical attack by most chemicals and solvents. PTFE has a temperature rating of -200° F to +500° F. It is a self-lubricating material used as a seat and/or bearing material in most Chemtrol valves.

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Fitting Terms and Abbreviations Schedule 80 only

FPT Female Pipe Thread
CL Close
MPT Male Pipe Thread
S Female Socket
SH Short
SPG Male End (Spigot)

Dimensions and Standards

Universal Part No.

XX XX - XXX
(1) (2) (4)

Chemtrol Part No.
(Discontinued)

XX XXX XXX
(1) (2) (4)

Material and Product Type

Product Line	(1) Universal Part Number	(1) Chemtrol Part Number	(1) Chemtrol Figure Number
PVC Sch. 40	4	08	46
PVC Sch. 80	8	01	45
CPVC Sch. 80	18	05	51
PP Black Sch. 80.	28	07	61
NPP Chem-Pure Sch. 80	78	10	62
PVDF Red Sch. 80	38	58	65
NPVDF Natural Sch. 80	48	06	66

Fitting Description

Fitting & End Connection	(2) Universal Part No.	(2) Chemtrol Part No.	(2) (3) Chemtrol Figure No. Fitting	(2) (3) Chemtrol Figure No. Connection(s)
Tee-Socket	01	013	00	Blank
Tee-Socket x Thread	02	015	12	Blank
Tee-Thread	05	014	12	3-3
90° ELL-Socket	06	001	07	Blank
90° ELL-Socket x Thread	07	003	07	3
90° ELL-Thread	08	002	07	3-3
90° Street ELL-Male Thread x Socket	10	219	07	4
90° Street ELL-Male Thread x Thread	12	213	07	3-4
45° ELL-Socket	17	007	06	Blank
45° ELL-Thread	19	008	06	3-3
Coupling-Socket	29	025	01	Blank
Coupling-Thread	30	026	01	3-3
Adapter Coupling-Socket x Thread	35	027	03	Blank
Male Adapter-Male Thread x Socket	36	217	04	Blank
Reducing Bushing-Socket	37	049	18	Blank
Reducing Bushing-Spigot x Thread	38	051	18	3
Reducing Bushing-Thread	39	050	18	3-4
Cap-Socket	47	031	17	Blank
Cap-Thread	48	032	17	3
Plug-Spigot	49	042	16	Blank
Plug-Thread	50	043	16	4
Flange-Socket	51	045	51	Blank
Flange-Thread	52	044	51	3
Flange-Blind	53	046	19	Blank
Van Stone Flange-Socket	54	069	51	A
Union-Socket	97	028	33	Blank
Union-Thread	98	029	33	3-3
Nipple-Thread x Thread	61	053	29	Blank

Chemtrol Figure

XX XX - X - X - SIZE
(1) (2) (3) (4)

Size Description

Size	(4) Universal Part Number	(4) Chemtrol Part Number	(4) Chemtrol Figure Number
1/4	002	004	
1/2	005	007	
3/4	007	008	
1	010	009	
1 1/4	012	010	
1 1/2	015	011	
2	020	012	
2 1/2	025	013	
3	030	014	
4	040	016	
6	060	018	
8	080	019	
10	100	020	
12	120	021	
1/2 x 1/4	072	027	
3/4 x 1/4	098	029	
3/4 x 1/2	101	031	
1 x 1/4	128	032	
1 x 1/2	130	034	
1 x 3/4	131	035	
1 1/4 x 1/2	166	038	
1 1/4 x 3/4	167	039	
1 1/4 x 1	168	040	Simply State Size
1 1/2 x 1/2	209	043	
1 1/2 x 3/4	210	044	
1 1/2 x 1	211	045	
1 1/2 x 1 1/4	212	046	
2 x 1/2	247	049	
2 x 3/4	248	050	
2 x 1	249	051	
2 x 1 1/4	250	052	
2 x 1 1/2	251	053	
2 1/2 x 1/2	287	056	
2 1/2 x 3/4	288	057	
2 1/2 x 1	289	058	
2 1/2 x 1 1/4	290	059	
2 1/2 x 1 1/2	291	060	
2 1/2 x 2	292	061	
3 x 1	335	066	
3 x 1 1/4	336	067	
3 x 1 1/2	337	068	
3 x 2	338	069	
3 x 2 1/2	339	069	
4 x 2	420	076	
4 x 2 1/2	421	077	
4 x 3	422	078	
6 x 2	528	082	
6 x 3	530	084	
6 x 4	532	085	
8 x 6	585	088	

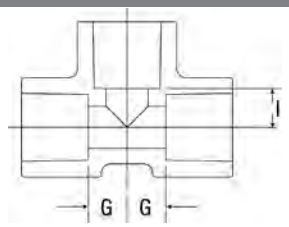
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Tees

Chemtrol
Fig. No.

4511 Socket Tee (S x S x S)





Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G	Dim. G	Dim. I
1/4	801-002	25	0.05	0.33	0.33	0.33
1/2	801-005	50	0.15	0.52	0.52	0.52
3/4	801-007	50	0.33	0.69	0.69	0.69
1	801-810	25	0.36	0.75	0.75	0.75
1 1/4	801-012	10	0.44	0.92	0.92	0.92
1 1/2	801-015	25	0.73	1.06	1.06	1.06
2	801-020	20	1.05	1.27	1.27	1.27
2 1/2	801-025	5	1.59	1.53	1.53	1.53
3	801-030	12	2.37	1.84	1.84	1.84
4	801-040	10	4.10	2.34	2.34	2.34
6	801-060	4	10.22	3.50	3.50	3.50
8	801-080	1	21.05	4.56	4.56	4.56
10	801-100	1	35.40	5.75	5.75	5.75
12	801-120	1	58.40	6.89	6.89	6.89

4511 Reducing Socket Tee (S x S x S)

Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G	Dim. G	Dim. I
3/4 x 3/4 x 1/2	801-101	25	0.18	0.52	0.52	0.62
1 x 1 x 1/2	801-130	10	0.24	0.53	0.53	0.73
1 x 1 x 3/4	801-131	10	0.26	0.63	0.63	0.74
1 1/2 x 1 1/2 x 3/4	801-210	10	0.48	0.67	0.67	1.05
1 1/2 x 1 1/2 x 1	801-211	10	0.52	0.77	0.77	1.04
2 x 2 x 1/2	801-247	10	0.61	0.61	0.61	1.30
2 x 2 x 3/4	801-248	10	0.65	0.71	0.71	1.30
2 x 2 x 1	801-249	10	0.69	0.81	0.81	1.30
2 x 2 x 1 1/2	801-251	10	0.83	1.08	1.08	1.30
3 x 3 x 2	801-338	5	1.73	1.37	1.37	1.86
4 x 4 x 2	801-420	5	2.79	1.42	1.42	2.36
4 x 4 x 3	801-422	5	3.33	1.90	1.90	2.38
6 x 6 x 4	801-532	4	7.20	2.60	2.60	3.56

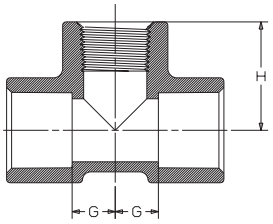
4511-12 Flanged Tee

Flanged fitting center-to-face dimensions may be found on page 12. When ordering, specify the figure number and the nominal size (e.g., 2" Schedule 80 PVC flanged tee–4511-12 2")

Chemtrol
Fig. No.

4512 Socket x Thread Tee (S x S x FPT)

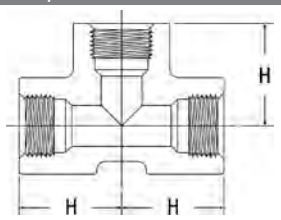




Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G	Dim. G	Dim. H
1/2	802-005	10	0.16	0.52	0.52	1.41
3/4	802-007	10	0.24	0.69	0.69	1.71
1	802-010	10	0.34	0.75	0.75	1.89
1 1/4	802-012	10	0.57	0.92	0.92	2.18
1 1/2	802-015	10	0.80	1.06	1.06	2.45
2	802-020	10	1.13	1.27	1.27	2.78

4512-3-3 Threaded Tee (FPT x FPT x FPT)





Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. H
1/4	805-002	25	0.05	0.97
1/2	805-005	25	0.16	1.41
3/4	805-007	25	0.26	1.71
1	805-010	25	0.40	1.89
1 1/4	805-012	10	0.57	2.18
1 1/2	805-015	10	0.80	2.45
2	805-020	10	1.13	2.78
2 1/2	805-025	5	1.79	3.31
3	805-030	5	2.60	3.74
4	805-040	5	4.63	4.62

For questions concerning thermoplastic piping systems, please call or fax: ***888.446.4226 (ph),*** *888.336.4226 (fx).*

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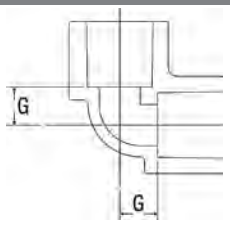
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Elbows

Chemtrol
Fig. No.

4507 Socket 90° ELL (S x S)

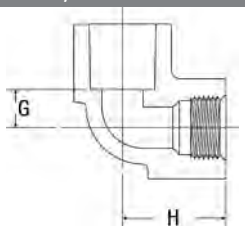




Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G
1/4	806-002	25	0.01	0.33
1/2	806-005	50	0.11	0.52
3/4	806-007	50	0.16	0.69
1	806-010	50	0.21	0.75
1 1/4	806-012	25	0.30	0.92
1 1/2	806-015	25	0.50	1.06
2	806-020	25	0.75	1.27
2 1/2	806-025	5	1.16	1.53
3	806-030	12	1.82	1.84
4	806-040	12	3.17	2.34
6	806-060	4	7.70	3.50
8	806-080	2	15.57	4.56
10	806-100	1	27.70	5.75
12	806-120	1	43.90	6.89

4507-3 Socket x Thread 90° ELL (S x FPT)





Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G	Dim. H
1/2	807-005	10	0.12	0.52	1.41
3/4	807-007	10	0.17	0.69	1.71
1	807-010	10	0.28	0.75	1.89
1 1/4	807-012	10	0.33	0.92	2.18
1 1/2	807-015	10	0.55	1.06	2.45
2	807-020	10	0.82	1.27	2.78

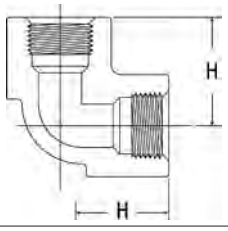
4507-12/4506-12 Flanged ELLs

Flanged fitting center-to-face dimensions may be found on page 12. When ordering, specify the figure number and the nominal size (e.g., 2" Schedule 80 PVC flanged 90° Elbow–4507-12 2")

Chemtrol
Fig. No.

4507-3-3 Thread 90° ELL (FPT x FPT)

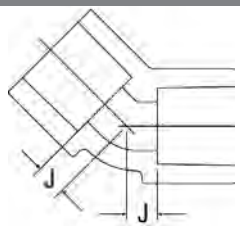




Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. H
1/4	808-002	25	0.04	0.97
1/2	808-005	25	0.12	1.41
3/4	808-007	25	0.18	1.71
1	808-010	25	0.28	1.89
1 1/4	808-012	10	0.33	2.18
1 1/2	808-015	10	0.55	2.45
2	808-020	10	0.82	2.78
2 1/2	808-025	5	1.25	3.31
3	808-030	5	1.90	3.74
4	808-040	5	3.62	4.62

4506 Socket 45° ELL (S x S)





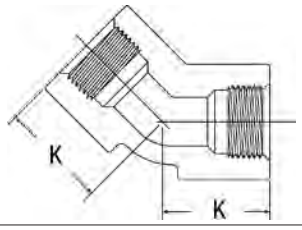
Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. J
1/4	817-002	15	0.03	0.18
1/2	817-005	25	0.04	0.26
3/4	817-007	25	0.14	0.33
1	817-010	25	0.15	0.37
1 1/4	817-012	10	0.30	0.43
1 1/2	817-015	10	0.41	0.47
2	817-020	10	0.62	0.61
2 1/2	817-025	5	0.93	0.68
3	817-030	6	1.39	0.78
4	817-040	6	2.46	1.02
6	817-060	4	5.82	1.75
8	817-080	2	12.67	2.22
10	817-100	1	19.70	2.61
12	817-120	1	32.70	3.08

DANGER: DO NOT USE OR TEST THE PRODUCTS IN THIS CATALOG WITH COMPRESSED AIR OR OTHER GASES. FAILURE TO FOLLOW THIS WARNING CAN RESULT IN PERSONAL INJURY OR DAMAGE TO PROPERTY.

Chemtrol
Fig. No.

4506-3-3 Thread 45° ELL (FPT x FPT)



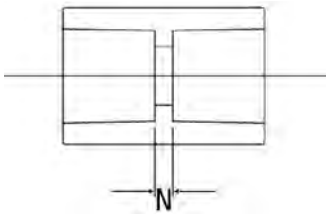


Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. K
1/4	819-002	15	0.04	0.82
1/2	819-005	25	0.11	1.15
3/4	819-007	25	0.13	1.35
1	819-010	25	0.25	1.51
1 1/4	819-012	10	0.35	1.70
1 1/2	819-015	10	0.48	1.86
2	819-020	10	0.71	2.13
2 1/2	819-025	5	1.03	2.46
3	819-030	6	1.53	2.69
4	819-040	6	2.52	3.30

Couplings

4501 Socket Coupling (S x S)





Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. N
1/4	829-002	25	0.05	0.12
1/2	829-005	50	0.09	0.25
3/4	829-007	50	0.13	0.25
1	829-010	40	0.20	0.25
1 1/4	829-012	25	0.29	0.25
1 1/2	829-015	20	0.37	0.25
2	829-020	25	0.52	0.25
2 1/2	829-025	5	1.68	0.20
3	829-030	12	1.05	0.19
4	829-040	10	1.83	0.19
6	829-060	4	4.07	0.25
8	829-080	2	8.89	0.25
10	829-100	1	13.88	0.38
12	829-120	1	21.37	0.50

Chemtrol
Fig. No.

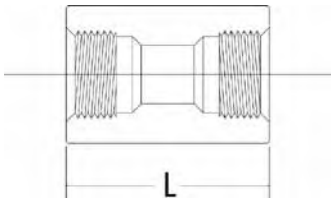
4501-R Reducing Socket Coupling (S x S)

Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. N
3/4 x 1/2	829-101	25	0.12	0.44
1 x 1/2	829-130	25	0.18	0.67
1 x 3/4	829-131	25	0.19	0.55
1 1/4 x 3/4	829-167	25	0.26	0.72
1 1/4 x 1	829-168	10	0.27	0.60
1 1/2 x 3/4	829-210	10	0.31	0.76
1 1/2 x 1	829-211	10	0.33	0.63
1 1/2 x 1 1/4	829-212	10	0.50	0.51
2 x 1	829-249	10	0.44	0.75
2 x 1 1/2	829-251	10	0.50	0.50
3 x 2	829-338	5	1.00	1.24
4 x 2	829-420	5	1.59	1.59
4 x 3	829-422	5	1.88	1.20

Other Reducing Couplings are produced by solvent cementing appropriate Reducer Bushings into Socket Couplings. They may be ordered as factory fabrications or may be assembled in the field.

4501-3-3 Thread Coupling (FPT x FPT)





Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. L
1/4	830-002	25	0.06	1.41
1/2	830-005	25	0.09	2.03
3/4	830-007	25	0.14	2.28
1	830-010	25	0.23	2.53
1 1/4	830-012	10	0.33	2.78
1 1/2	830-015	10	0.41	3.03
2	830-020	10	0.60	3.28
2 1/2	830-025	5	0.86	3.76
3	830-030	5	1.22	4.00
4	830-040	5	2.13	4.75

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Chemtrol
Fig. No.

4501-3-3-R Reducing Thread Coupling (FPT x FPT)

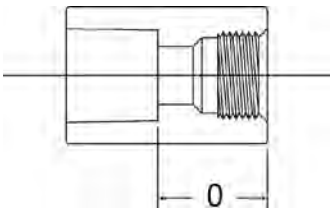
Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. L
3/4 x 1/2	830-101	25	0.09	2.34
1 x 1/2	830-130	25	0.20	2.70
1 x 3/4	830-131	25	0.18	2.70
1 1/4 x 3/4	830-167	10	0.29	3.00
1 1/4 x 1	830-168	10	0.31	3.00
1 1/2 x 3/4	830-210	10	0.35	3.16
1 1/2 x 1	830-211	10	0.38	3.16
1 1/2 x 1 1/4	830-212	10	0.40	3.16
2 x 1	830-249	10	0.50	3.40
2 x 1 1/2	830-251	10	0.56	3.40
3 x 2	830-338	5	1.15	4.66
4 x 2	830-420	5	1.79	5.38
4 x 3	830-422	5	2.11	5.38

Other Reducing Couplings are produced by solvent cementing appropriate Reducer Bushings into Socket Couplings. They may be ordered as factory fabrications or may be assembled in the field.

Adapters

4503 Female Adapter Coupling (S x FPT)



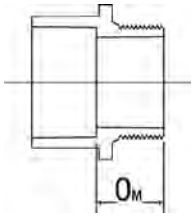


Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. O
1/4	835-002	15	0.04	0.77
1/2	835-005	25	0.09	1.14
3/4	835-007	25	0.14	1.27
1	835-010	20	0.21	1.39
1 1/4	835-012	10	0.30	1.52
1 1/2	835-015	10	0.38	1.64
2	835-020	10	0.56	1.77
2 1/2	835-025	5	0.77	1.98
3	835-030	5	1.15	2.10
4	835-040	5	1.95	2.47

Chemtrol
Fig. No.

4504 Male Adapter (S x MPT)

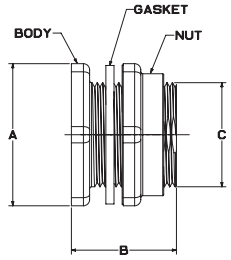




Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. O_M
1/2	836-005	25	0.04	0.94
3/4	836-007	25	0.06	0.97
1	836-010	25	0.10	1.15
1 1/4	836-012	10	0.14	1.12
1 1/2	836-015	10	0.19	1.12
2	836-020	10	0.27	1.20
2 1/2	836-025	5	0.56	1.89
3	836-030	5	0.79	1.99
4	836-040	5	1.39	2.09

4550 Tank Adapter (Tank x FPT)





Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. A	Dim. B	Dim C
1/2		15	0.20	2.00	2.75	1.38
3/4	Use	15	0.35	2.38	2.88	1.63
1	Figure	15	0.40	2.56	2.88	1.88
1 1/4	No. &	10	0.55	3.25	3.00	2.63
1 1/2	Nom.	10	0.65	3.25	3.00	2.63
2	Size	5	1.15	4.38	3.25	3.25
3		5	2.10	6.00	3.63	4.50

Note: Gasket is EPDM and nut is self-tightening left hand thread.

*For complete technical information and more, refer to our website at **www.chemtrol.com**.*

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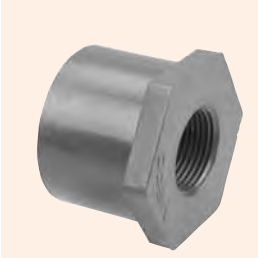
Bushings

Design Styles

The design style of most bushings is to have a solid wall between the inside and outside connections. Some of the multistep reductions with exceedingly thick cross-sections are not solid. This design style achieves structural support with a web of ribs attaching the inner and outer connection walls, with the open area toward the exterior bushing face. The styles are denoted by W and S for webbed and solid designs respectively.



Webbed design

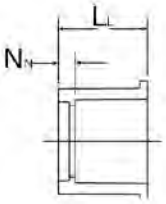


Solid design

Chemtrol
Fig. No.

4518 Flush Socket Reducer Bushing (SPG x S)





Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Design Style	Dim. L_L	Dim. N_N
1/2 x 1/4	837-072	50	0.03	S	1.17	0.53
3/4 x 1/2	837-101	50	0.05	S	1.15	0.26
1 x 1/2	837-130	50	0.06	S	1.28	0.39
1 x 3/4	837-131	50	0.05	S	1.28	0.27
1 1/4 x 1/2	837-166	10	0.10	S	1.41	0.52
1 1/4 x 3/4	837-167	10	0.05	S	1.41	0.40
1 1/4 x 1	837-168	10	0.06	S	1.41	0.27
1 1/2 x 1/2	837-209	25	0.12	W	1.53	0.64
1 1/2 x 3/4	837-210	25	0.10	S	1.53	0.52
1 1/2 x 1	837-211	25	0.08	S	1.53	0.39
1 1/2 x 1 1/4	837-212	10	0.06	S	1.53	0.27
2 x 1/2	837-247	25	0.25	W	1.66	0.77
2 x 3/4	837-248	25	0.25	S	1.66	0.65
2 x 1	837-249	25	0.25	W	1.66	0.52
2 x 1 1/4	837-250	10	0.22	W	1.66	0.40
2 x 1 1/2	837-251	25	0.20	W	1.66	0.27
2 1/2 x 1	837-289	10	0.31	W	1.94	0.80
2 1/2 x 1 1/4	837-290	10	0.31	W	1.94	0.68
2 1/2 x 1 1/2	837-291	10	0.27	S	1.94	0.55
2 1/2 x 2	837-292	10	0.24	S	1.94	0.43
3 x 1	837-335	10	0.65	W	2.42	1.28
3 x 1 1/2	837-337	10	0.67	W	2.42	1.03
3 x 2	837-338	10	0.64	S	2.42	0.91
3 x 2 1/2	837-339	10	0.48	S	2.42	0.64

Chemtrol
Fig. No.

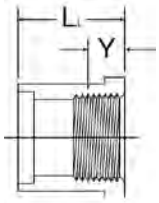
4518 Flush Socket Reducer Bushing (SPG x S) (cont.)

Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Design Style	Dim. L_L	Dim. N_N
4 x 2	837-420	10	1.14	W	2.81	1.30
4 x 2 1/2	837-421	5	1.14	W	2.81	1.03
4 x 3	837-422	10	0.93	S	2.81	0.91
6 x 2	837-528	5	3.28	W	3.06	1.55
6 x 4	837-532	10	2.68	S	3.06	0.78
8 x 6	837-585	3	5.51	S	4.59	1.56
10 x 6	837-626	1	10.68	W	5.59	2.56
10 x 8	837-628	1	9.36	S	5.59	1.09
12 x 8	837-668	1	16.73	W	6.59	2.09
12 x 10	837-670	1	12.77	S	6.59	1.09

Other Reducing Couplings are produced by solvent cementing appropriate Reducer Bushings into Socket Couplings. They may be ordered as factory fabrications or may be assembled in the field.

4518-3 Flush Spigot x Thread Reducer Bushing (SPG x FPT)





Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Design Style	Dim. L_L	Dim. Y*
1/2 x 1/4	838-072	50	0.03	S	1.17	0.31
3/4 x 1/4	838-098	50	0.04	S	1.29	0.31
3/4 x 1/2	838-101	50	0.03	S	1.29	0.43
1 x 1/2	838-130	50	0.07	S	1.56	0.43
1 x 3/4	838-131	50	0.05	S	1.56	0.45
1 1/4 x 1/2	838-166	10	0.14	S	1.66	0.43
1 1/4 x 3/4	838-167	10	0.12	S	1.66	0.45
1 1/4 x 1	838-168	10	0.10	S	1.66	0.53
1 1/2 x 1/2	838-209	10	0.21	S	1.78	0.43
1 1/2 x 3/4	838-210	10	0.19	S	1.78	0.45
1 1/2 x 1	838-211	5	0.17	S	1.78	0.53
1 1/2 x 1 1/4	838-212	10	0.12	S	1.78	0.55
2 x 1/2	838-247	10	0.34	S	1.92	0.43
2 x 3/4	838-248	10	0.32	S	1.92	0.45
2 x 1	838-249	10	0.29	S	1.92	0.53
2 x 1 1/4	838-250	10	0.24	S	1.92	0.55
2 x 1 1/2	838-251	10	0.20	S	1.92	0.55
2 1/2 x 2	838-292	5	0.25	S	2.18	0.57
3 x 1	838-335	5	0.65	S	2.42	0.53
3 x 1 1/2	838-337	5	0.70	S	2.42	0.55
3 x 2	838-338	5	0.67	S	2.42	0.57
3 x 2 1/2	838-339	5	0.52	S	2.42	0.87
4 x 2	838-420	5	1.17	S	2.81	0.57
4 x 3	838-422	5	1.01	S	2.81	0.95

Other size reductions are produced by solvent cementing appropriate Reducer Bushings together. They may be ordered as factory fabrications or may be assembled in the field.

*Typical male component engagement, hand tight (L_1 in ANSI B1.20.1 thread spec.) plus 1 1/2 turns.

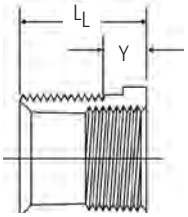
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Chemtrol
Fig. No.

4518-3-4 Flush Thread Reducer Bushing (MPT x FPT)





Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Design Style	Dim. L_L	Dim. Y*
1/2 x 1/4	839-072	50	0.02	S	0.93	0.25
3/4 x 1/4	839-098	50	0.03	S	0.95	0.25
3/4 x 1/2	839-101	50	0.02	S	0.95	0.25
1 x 1/2	839-130	50	0.05	S	1.24	0.38
1 x 3/4	839-131	50	0.03	S	1.24	0.38
1 1/4 x 1/2	839-166	10	0.10	S	1.27	0.38
1 1/4 x 3/4	839-167	10	0.09	S	1.27	0.38
1 1/4 x 1	839-168	10	0.07	S	1.27	0.38
1 1/2 x 1/2	839-209	10	0.15	S	1.28	0.38
1 1/2 x 3/4	839-210	10	0.14	S	1.28	0.38
1 1/2 x 1	839-211	5	0.12	S	1.28	0.38
1 1/2 x 1 1/4	839-212	10	0.08	S	1.28	0.38
2 x 1/2	839-247	10	0.23	S	1.32	0.38
2 x 3/4	839-248	10	0.22	S	1.32	0.38
2 x 1	839-249	10	0.20	S	1.32	0.38
2 x 1 1/4	839-250	10	0.16	S	1.32	0.38
2 x 1 1/2	839-251	10	0.12	S	1.32	0.38
2 1/2 x 2	839-292	5	0.21	S	2.18	0.57
3 x 1 1/2	839-337	5	0.58	S	2.42	0.55
3 x 2	839-338	5	0.56	S	2.42	0.57
3 x 2 1/2	839-339	5	0.45	S	2.42	0.87
4 x 2	839-420	5	1.09	S	2.81	0.57
4 x 3	839-422	5	0.81	S	2.81	0.95

Other size reductions are produced by solvent cementing appropriate Reducer Bushings together. They may be ordered as factory fabrications or may be assembled in the field.

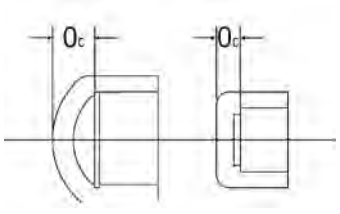
*Typical male component engagement, hand tight (L_1 in ANSI B1.20.1 thread spec.) plus 1 1/2 turns.

Caps

Chemtrol
Fig. No.

4517 Socket Cap* (S)



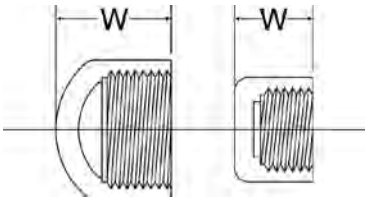


Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. Oc
1/4	847-002	15	0.03	0.25
1/2	847-005	25	0.06	0.39
3/4	847-007	25	0.08	0.37
1	847-010	25	0.14	0.41
1 1/4	847-012	10	0.20	0.40
1 1/2	847-015	10	0.26	0.41
2	847-020	10	0.38	0.42
2 1/2	847-025	5	0.57	0.57
3	847-030	5	0.87	1.29
4	847-040	5	1.53	1.58
6	847-060	5	3.77	2.13

*Sizes 2" and smaller are flat; 2 1/2" and larger are domed.

4517-3 Thread Cap* (FPT)





Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. W
1/4	848-002	15	0.01	0.89
1/2	848-005	25	0.06	1.28
3/4	848-007	25	0.10	1.38
1	848-010	25	0.15	1.55
1 1/4	848-012	10	0.22	1.66
1 1/2	848-015	10	0.29	1.80
2	848-020	10	0.41	1.93
2 1/2	848-025	5	0.64	2.35
3	848-030	5	0.93	3.19
4	848-040	5	1.73	3.86

*Sizes 2" and smaller are flat; 2 1/2" and larger are domed.

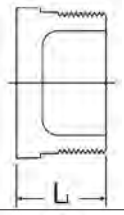
DANGER: DO NOT USE OR TEST THE PRODUCTS IN THIS CATALOG WITH COMPRESSED AIR OR OTHER GASES. FAILURE TO FOLLOW THIS WARNING CAN RESULT IN PERSONAL INJURY OR DAMAGE TO PROPERTY.

Plugs

Chemtrol
Fig. No.

4516-4 Thread Plug (MPT)





Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. L_L
1/4	850-002	25	0.01	0.85
1/2	850-005	50	0.03	1.04
3/4	850-007	50	0.03	1.10
1	850-010	25	0.06	1.25
1 1/4	850-012	10	0.10	1.66
1 1/2	850-015	10	0.14	1.78
2	850-020	10	0.19	1.92
2 1/2	850-025	5	0.29	2.18
3	850-030	5	0.51	2.42
4	850-040	5	0.95	2.81

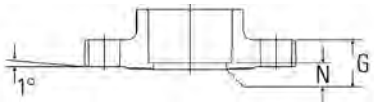
1/4" Plug is solid, only

Class 150 Flanges

For flange dimensions that comply with ANSI B16.5, 150 lb., steel flanges, see page 39.

4551-W Socket Flange (S), One-Piece (Webbed Design)





Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G	Dim. N
2	851-020	12	0.79	0.92	0.27
3	851-030	10	1.60	1.13	0.29
4	851-040	10	2.42	1.24	0.32
6	851-060	5	3.69	1.36	0.31

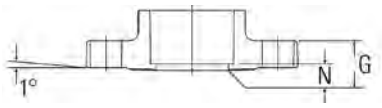
Reducing Flanges are produced by solvent cementing Reducer Bushings into Socket Flanges. They may be ordered as factory fabrications or may be assembled in the field.

Note: One-piece webbed flanges have oblong bolt holes which permit mating with ANSI B16.5, 150 lb.; BS 1560, class 150; ISO 2084, PN10; and DIN 2532, PN10 flanges.

Chemtrol
Fig. No.

4551-H Socket Flange (S), One-Piece (Solid)



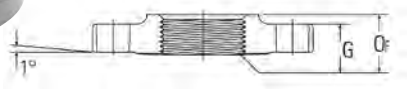


Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G	Dim. N
1/2	851-H05	10	0.21	0.54	0.20
3/4	851-H07	10	0.31	0.61	0.17
1	851-H10	24	0.41	0.68	0.18
1 1/4	851-H12	10	0.53	0.73	0.20
1 1/2	851-H15	12	0.68	0.82	0.23
2	851-H20	12	1.03	0.92	0.27
2 1/2	851-H25	5	1.61	1.02	0.20
3	851-H30	10	2.08	1.13	0.29
4	851-H40	10	3.14	1.24	0.32
6	851-H60	5	4.79	1.36	0.31
8	851-H80	2	8.67	1.50	0.35

Reducing Flanges are produced by solvent cementing Reducer Bushings into Socket Flanges. They may be ordered as factory fabrications or may be assembled in the field.

4551-W-3 Thread Flange (FPT), One-Piece (Webbed Design)





Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G	Dim. O_F
2	852-020	10	0.78	0.92	1.18
3	852-030	5	1.54	1.13	1.55
4	852-040	5	2.25	1.24	1.67

Reducing Flanges are produced by solvent cementing Reducer Bushings into Socket Flanges. They may be ordered as factory fabrications or may be assembled in the field.

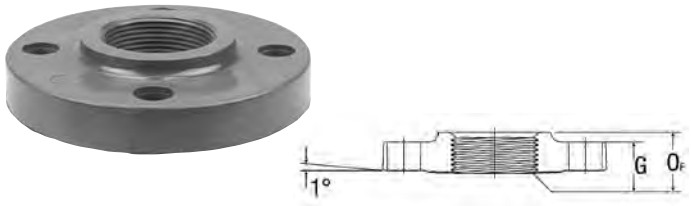
Note: One-piece webbed flanges have oblong bolt holes which permit mating with ANSI B16.5, 150 lb.; BS 1560, class 150; ISO 2084, PN10; and DIN 2532, PN10 flanges.

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Chemtrol
Fig. No.

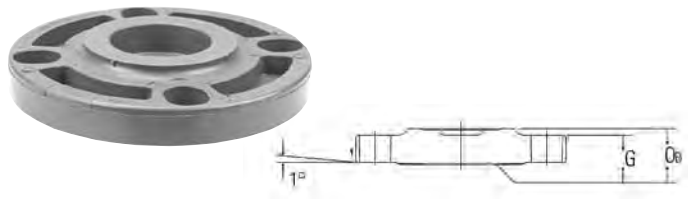
4551-H-3 Thread Flange (FPT), One-Piece (Solid)



Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G	Dim. OF
1/2	852-H05	10	0.21	0.54	0.88
3/4	852-H07	10	0.30	0.61	0.91
1	852-H10	10	0.40	0.68	1.08
1 1/4	852-H12	10	0.50	0.73	1.11
1 1/2	852-H15	12	0.65	0.82	1.12
2	852-H20	10	0.97	0.92	1.18
2 1/2	852-H25	5	1.50	1.02	1.42
3	852-H30	5	1.93	1.13	1.55
4	852-H40	5	2.80	1.24	1.67

Reducing Flanges are produced by solvent cementing Reducer Bushings into Socket Flanges. They may be ordered as factory fabrications or may be assembled in the field.

4519-W Blind Flange, One-Piece (Webbed Design)



Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G	Dim. OB
2	853-020	12	0.78	0.92	1.13
3	853-030	10	1.76	1.13	1.39
4	853-040	5	2.56	1.24	1.51
6	853-060	5	4.51	1.36	1.60

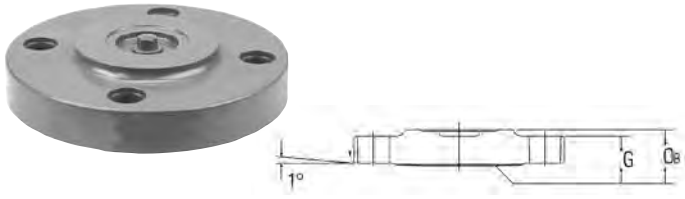
Note: One-piece webbed flanges have oblong bolt holes which permit mating with ANSI B16.5, 150 lb.; BS 1560, class 150; ISO 2084, PN10; and DIN 2532, PN10 flanges.

*Chemtrol sells its products through a select group of highly trained distributors. Please call **800.343.5455** for a listing of distributors in your area.*

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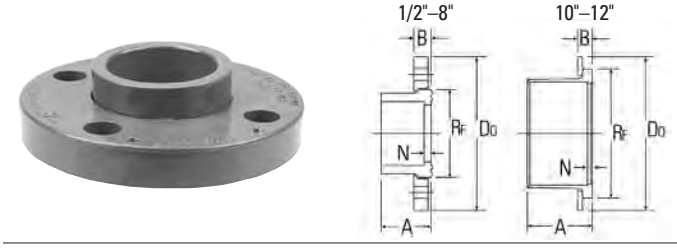
Chemtrol
Fig. No.

4519-H Blind Flange, One-Piece (Solid)



Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G	Dim. OB
1/2	853-H05	10	0.21	0.54	0.76
3/4	853-H07	10	0.32	0.61	0.83
1	853-H10	10	0.43	0.68	0.88
1 1/4	853-H12	10	0.57	0.73	0.95
1 1/2	853-H15	12	0.69	0.82	1.04
2	853-H20	12	1.08	0.92	1.13
2 1/2	853-H25	5	1.81	1.02	1.22
3	853-H30	10	2.45	1.13	1.39
4	853-H40	5	3.56	1.24	1.51
6	853-H60	5	6.27	1.36	1.60
8	853-H80	2	10.35	1.50	1.78

4551-A Socket Flange (S), Van Stone



Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. A	Dim. B	Dim. DO	Dim. RF	Dim. N
1/2	854-005	10	0.19	1.00	.50	3.50	1.48	0.11
3/4	854-007	10	0.24	1.13	.50	3.88	1.75	0.11
1	854-010	24	0.38	1.25	.56	4.25	2.04	0.11
1 1/4	854-012	10	0.40	1.38	.63	4.63	2.50	0.11
1 1/2	854-015	12	0.54	1.50	.69	5.00	2.78	0.11
2	854-020	12	0.92	1.63	.75	6.00	3.41	0.11
2 1/2	854-025	5	1.37	1.94	.94	7.00	4.11	0.16
3	854-030	10	1.75	2.40	1.05	7.50	4.81	0.50
4	854-040	10	2.65	2.76	1.16	8.98	6.19	0.48
6	854-060	5	4.53	3.56	1.29	11.00	7.97	0.53
8	854-080	2	12.20	5.01	1.42	13.50	10.45	0.51
10*	854-100	1	10.20	5.83	1.31	16.00	13.29	0.33
12*	854-120	1	17.53	7.45	1.70	19.00	16.00	0.45

*Aluminum ring with PVC coating.

Van Stone Flange Assembly List

Item	Description	Material
1	Connector Hub	PVC
2	Flange Ring	PVC Coated Aluminum
3	Flange Ring	PVC

Chemtrol
Fig. No.

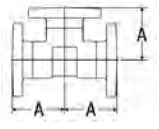
NR 51 Flange Gaskets, for Class 150 Flanges

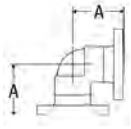


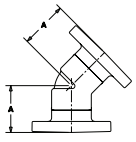
Note: These gaskets are 1/8" thick, full face polychloroprene (CR), 70 durometer.

Nominal Size	Part No.	Approx. Lbs./Ea.
1/2		0.11
3/4		0.12
1		0.13
1 1/4		0.14
1 1/2		0.15
2	Use	0.20
2 1/2	Figure No.	0.25
3	& Nom. Size	0.28
4		0.30
6		0.40
8		0.50
10		0.55
12		0.60

Flanged Fittings*– Fabricated from Molded Components







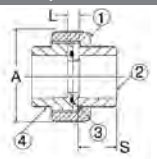
Nominal Size	Fig. No. 4511-12 Flanged Tee Approx. Lbs./Ea.	Fig. No. 4511-12 Flanged Tee Dim. A	Fig. No. 4507-12 Flanged 90° ELL Approx. Lbs./Ea.	Fig. No. 4507-12 Flanged 90° ELL Dim. A	Fig. No. 4506-12 Flanged 45° ELL Approx. Lbs./Ea.	Fig. No. 4506-12 Flanged 45° ELL Dim. B
1	1.71	3 3/32	1.19	3 3/32	1.12	2 23/32
1 1/4	2.39	3 19/32	1.60	3 19/32	1.60	3 3/32
1 1/2	3.24	3 31/32	2.06	3 31/32	2.09	3 13/32
2	4.86	4 15/32	3.28	4 15/32	3.16	3 27/32
2 1/2	7.82	5 7/32	5.30	5 7/32	5.08	4 13/32
3	10.67	5 13/32	7.32	5 13/32	6.92	4 25/32
4	16.64	7 3/32	11.60	7 3/32	10.79	5 25/32
6	32.74	9 25/32	22.65	9 25/32	20.84	8 1/2
8	65.79	13 31/32	45.40	13 31/32	42.50	11 5/8

*Flanged fittings are produced by solvent cementing socket flanges to socket fittings with short plain end pipe nipples. They may be ordered as factory fabrications or may be assembled in the field.

Unions

4533 FKM/4533E (EPDM) Socket Union (S x S)





Nominal Size	FKM Part No.	EPDM Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. A	Dim. L	Dim. S*
1/4	897-002	897E002	10	0.07	1.70	0.40	0.64
1/2	897-005	897E005	10	0.16	2.00	0.43	0.89
3/4	897-007	897E007	10	0.27	2.44	0.45	1.01
1	897-010	897E010	10	0.40	2.83	0.43	1.14
1 1/4	897-012	897E012	5	0.87	4.08	0.79	1.26
1 1/2	897-015	897E015	10	0.93	4.08	0.80	1.39
2	897-020	897E020	10	1.83	5.26	0.80	1.51
3	897-030	897E030	5	3.47	7.17	0.90	1.90

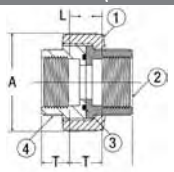
The 2 1/2" Socket Union is available as a fabrication from the 3" size Bushed down.

* Socket Depth

Chemtrol
Fig. No.

4533-3-3 FKM / 4533E-3-3 (EPDM) Threaded Union (FPT x FPT)





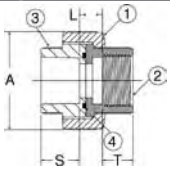
Nominal Size	FKM Part No.	EPDM Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. A	Dim. L	Dim. T*
1/4	898-002	898E002	10	0.11	1.70	1.07	0.31
1/2	898-005	898E005	10	0.16	2.00	1.30	0.43
3/4	898-007	898E007	10	0.28	2.44	1.38	0.45
1	898-010	898E010	10	0.41	2.83	1.51	0.53
1 1/4	898-012	898E012	5	0.90	4.08	2.01	0.55
1 1/2	898-015	898E015	10	0.92	4.08	2.16	0.55
2	898-020	898E020	10	1.82	5.26	2.36	0.57
3	898-030	898E030	5	3.47	7.17	2.88	0.95

The 2 1/2" Thread Union is available as a fabrication from the 3" size Bushed down.

* Thread Joint Engagement

4533E-3 FKM / 4533E-3 (EPDM) Female Adapter Union (S x FPT)





Nominal Size	FKM Part No.	EPDM Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. A	Dim. L	Dim. S*	Dim. T†
1/2	899-005	899E005	10	0.16	2.00	0.84	0.89	0.43
3/4	899-007	899E007	10	0.26	2.44	0.82	1.02	0.45
1	899-010	899E010	10	0.38	2.83	0.90	1.14	0.53
1 1/4	899-012	899E012	10	0.89	4.08	1.29	1.27	0.55
1 1/2	899-015	899E015	10	0.91	4.08	1.32	1.39	0.55
2	899-020	899E020	5	1.81	5.26	1.41	1.51	0.57
3	899-030	899E030	5	3.86	7.17	1.93	1.91	0.95

The 2 1/2" Socket x Thread Union is available as a fabrication from the 3" size Bushed down.

* Socket Depth
† Thread Joint Engagement

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Transition Unions

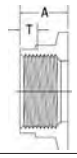
Purchase and Assembly Instructions

Transition Unions result from field assembly. First, the basic plastic Union is chosen, which includes selections for material of construction, O-ring type and connection style, remembering that the Union Nut screws onto the plastic Union Tailpiece. Next, the metal End Connector is chosen for material type and choice of thread connection style. Prior to installation, the mechanic must disassemble the Union, remove and discard the plastic End Connector, and then reassemble with the metal End Connector in its place.

Chemtrol Fig. No.

TCBR-3 Brass End Connector (FPT)





Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. A	Dim. T*
1/2	↑	1	0.33	1.02	0.43
3/4		1	0.43	1.02	0.45
1	Use Fig. No.	1	0.52	1.19	0.53
1 1/4	& Nom. Size	1	0.85	1.42	0.55
1 1/2		1	1.81	1.42	0.55
2		1	2.74	1.57	0.57
3	↓	1	5.45	2.25	0.95

* Thread Joint Engagement

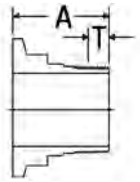
TCSS-3 Stainless Steel End Connector (FPT)

Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. A	Dim. T*
1/2	↑	1	0.30	1.02	0.43
3/4		1	0.39	1.02	0.45
1	Use Fig. No.	1	0.47	1.19	0.53
1 1/4	& Nom. Size	1	0.77	1.42	0.55
1 1/2		1	1.64	1.42	0.55
2		1	2.48	1.57	0.57
3	↓	1	4.97	2.25	0.95

* Thread Joint Engagement

TCBR-4 Brass End Connector (MPT) Brass End Connector (MPT)





Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. A	Dim. T*
1/2	↑	1	0.31	1.66	0.43
3/4		1	0.41	1.69	0.45
1	Use Fig. No.	1	0.49	2.19	0.53
1 1/4	& Nom. Size	1	0.81	2.38	0.55
1 1/2		1	1.72	2.38	0.55
2		1	2.60	2.63	0.57
3	↓	1	5.45	3.50	0.95

* Thread Joint Engagement

Chemtrol Fig. No.

TCSS-4 Stainless Steel End Connector (MPT)

Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. A	Dim. T*
1/2	↑	1	0.28	1.66	0.43
3/4		1	0.37	1.69	0.45
1	Use Fig. No.	1	0.44	2.19	0.53
1 1/4	& Nom. Size	1	0.73	2.38	0.55
1 1/2		1	1.56	2.38	0.55
2		1	2.36	2.63	0.57
3	↓	1	4.97	3.50	0.95

* Thread Joint Engagement

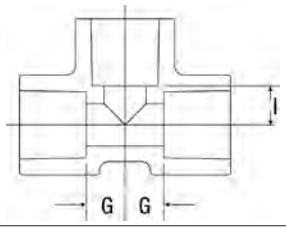
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Tees

Chemtrol Fig. No.

5111 Socket Tee (S x S x S)





Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G	Dim. G	Dim. I
1/4	1801-002	5	0.05	0.33	0.33	0.33
1/2	1801-005	25	0.16	0.52	0.52	0.52
3/4	1801-007	15	0.26	0.68	0.68	0.68
1	1801-010	20	0.39	0.74	0.74	0.74
1 1/4	1801-012	10	0.58	0.91	0.91	0.91
1 1/2	1801-015	10	0.78	1.05	1.05	1.05
2	1801-020	10	1.13	1.26	1.26	1.26
2 1/2	1801-025	5	1.72	1.52	1.52	1.52
3	1801-030	5	2.51	1.82	1.82	1.82
4	1801-040	5	4.41	2.33	2.33	2.33
6	1801-060	4	11.11	3.48	3.48	3.48
8*	1801-080	1	22.28	4.53	4.53	4.53
10	1801-100	1	38.52	5.72	5.72	5.72
12	1801-120	1	63.55	6.85	6.85	6.85

* Consult chart on page 41 of this catalog for special rating information.

5111R Reducing Socket Tee (S x S x S)

Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G	Dim. G	Dim. I
3/4 x 3/4 x 1/2	1801-101	10	0.19	0.51	0.51	0.62
1 x 1 x 1/2	1801-130	10	0.26	0.52	0.52	0.73
1 x 1 x 3/4	1801-131	10	0.28	0.62	0.62	0.73
1 1/2 x 1 1/2 x 3/4	1801-210	10	0.51	0.66	0.66	1.04
1 1/2 x 1 1/2 x 1	1801-211	10	0.56	0.76	0.76	1.03
2 x 2 x 1/2	1801-247	5	0.65	0.60	0.60	1.29
2 x 2 x 3/4	1801-248	5	0.70	0.70	0.70	1.29
2 x 2 x 1	1801-249	5	0.75	0.80	0.80	1.29
2 x 2 x 1 1/2	1801-251	5	0.89	1.07	1.07	1.29
3 x 3 x 2	1801-338	5	1.92	1.36	1.36	1.84
4 x 4 x 2	1801-420	5	3.02	1.39	1.39	2.34
4 x 4 x 3	1801-422	5	3.62	1.87	1.87	2.34
6 x 6 x 4	1801-532	4	7.69	2.56	2.56	3.52

Other Reducing Tees are produced by solvent cementing Reducer Bushings with Socket Tees. They may be ordered as factory fabrications or may be assembled in the field.

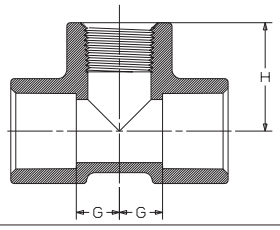
5111-12 Flanged Tees

Flanged fitting center-to-face dimensions may be found on page 21. When ordering, specify the figure number and the nominal size (e.g., 2" Schedule 80 CPVC flanged tee–5111-12 2")

Chemtrol Fig. No.

5112 Socket x Thread Tee (S x S x FPT)

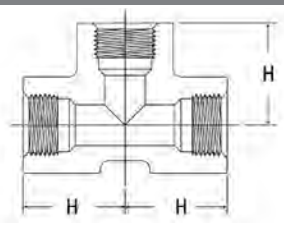




Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G	Dim. G	Dim. H
1/2	1802-005	10	0.17	0.52	0.52	1.41
3/4	1802-007	10	0.28	0.68	0.68	1.70
1	1802-010	10	0.43	0.74	0.74	1.88
1 1/4	1802-012	10	0.62	0.91	0.91	2.17
1 1/2	1802-015	10	0.88	1.05	1.05	2.44
2	1802-020	10	1.23	1.26	1.26	2.77

5112-3-3 Thread Tee (FPT x FPT x FPT)





Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. H
1/4	1805-002	5	0.06	0.97
1/2	1805-005	10	0.17	1.41
3/4	1805-007	15	0.28	1.70
1	1805-010	10	0.43	1.88
1 1/4	1805-012	5	0.62	2.17
1 1/2	1805-015	5	0.88	2.44
2	1805-020	5	1.23	2.77
2 1/2	1805-025	5	1.91	3.30
3	1805-030	5	2.48	3.73
4	1805-040	5	4.88	4.61

*For complete technical information and more, refer to our website at **www.chemtrol.com**.*

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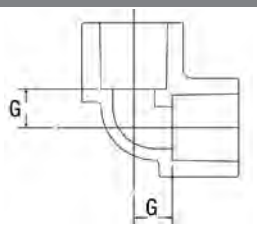
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Elbows

Chemtrol
Fig. No.

5107 Socket 90° ELL (S x S)



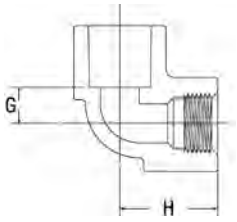


Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G
1/4	1806-002	5	0.03	0.33
1/2	1806-005	20	0.12	0.52
3/4	1806-007	20	0.18	0.68
1	1806-010	15	0.27	0.74
1 1/4	1806-012	10	0.41	0.91
1 1/2	1806-015	10	0.54	1.05
2	1806-020	10	0.81	1.26
2 1/2	1806-025	5	1.23	1.52
3	1806-030	5	1.98	1.82
4	1806-040	5	3.44	2.33
6	1806-060	4	8.38	3.48
8*	1806-080	2	16.67	4.53
10	1806-100	1	30.14	5.72
12	1806-120	1	47.77	6.85

* Consult chart on page 39 of this catalog for special rating information.

5107-3 Socket x Thread 90°Þ ELL (S x FPT)





Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G	Dim. H
1/2	1807-005	10	0.13	0.52	1.41
3/4	1807-007	10	0.19	0.68	1.70
1	1807-010	10	0.30	0.74	1.88
1 1/4	1807-012	10	0.45	0.91	2.17
1 1/2	1807-015	10	0.59	1.05	2.44
2	1807-020	10	0.86	1.26	2.77

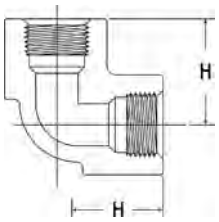
5107-12/5106-12 Flanged ELLs

Flanged fitting center-to-face dimensions may be found on page 21. When ordering, specify the figure number and the nominal size (e.g., 2" Schedule 80 CPVC flanged 90° Elbow–5107-12 2")

Chemtrol
Fig. No.

5107-3-3 Thread 90° ELL (FPT x FPT)

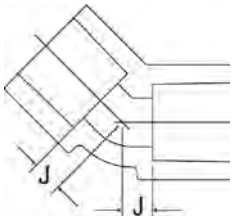




Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. H
1/4	1808-002	5	0.03	0.97
1/2	1808-005	10	0.13	1.41
3/4	1808-007	25	0.19	1.70
1	1808-010	15	0.30	1.88
1 1/4	1808-012	5	0.45	2.17
1 1/2	1808-015	5	0.59	2.44
2	1808-020	5	0.86	2.77
2 1/2	1808-025	5	1.34	3.30
3	1808-030	5	2.14	3.73
4	1808-040	5	3.85	4.61

5106 Socket 45° ELL (S x S)





Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. J
1/4	1817-002	5	0.03	0.18
1/2	1817-005	20	0.10	0.26
3/4	1817-007	10	0.15	0.33
1	1817-010	15	0.24	0.37
1 1/4	1817-012	10	0.34	0.42
1 1/2	1817-015	10	0.47	0.46
2	1817-020	10	0.67	0.60
2 1/2	1817-025	5	0.99	0.67
3	1817-030	6	1.48	0.77
4	1817-040	6	2.62	1.01
6	1817-060	4	6.62	1.74
8*	1817-080	2	13.63	2.20
10	1817-100	1	21.44	2.59
12	1817-120	1	35.59	3.05

*Consult chart on page 39 of this catalog for special rating information.

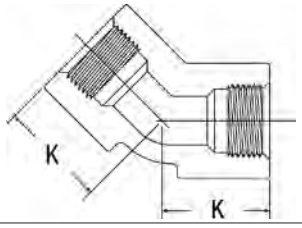
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Chemtrol
Fig. No.

5106-3-3 Thread 45° ELL (FPT x FPT)



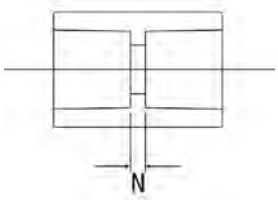


Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. K
1/4	1819-002	5	0.04	0.82
1/2	1819-005	10	0.11	1.15
3/4	1819-007	10	0.16	1.34
1	1819-010	15	0.27	1.51
1 1/4	1819-012	5	0.38	1.69
1 1/2	1819-015	5	0.52	1.85
2	1819-020	5	0.76	2.12
2 1/2	1819-025	5	1.09	2.45
3	1819-030	6	1.70	2.68
4	1819-040	6	3.06	3.29

Couplings

5101 Socket Couplings (S x S)





Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. N
1/4	1829-002	5	0.06	0.12
1/2	1829-005	25	0.10	0.24
3/4	1829-007	15	0.14	0.24
1	1829-010	20	0.22	0.24
1 1/4	1829-012	10	0.31	0.24
1 1/2	1829-015	10	0.40	0.24
2	1829-020	10	0.57	0.24
2 1/2	1829-025	55	0.73	0.19
3	1829-030	5	1.12	0.18
4	1829-040	5	1.94	0.18
6	1829-060	4	4.01	0.23
8*	1829-080	2	9.23	0.22
10	1829-100	1	14.62	0.35
12	1829-120	1	25.26	0.46

Chemtrol
Fig. No.

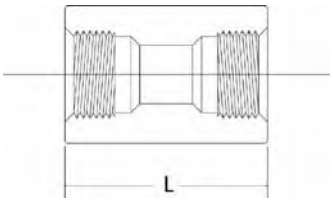
5101 Reducing Socket Coupling (S xS)

Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. N
3/4 x 1/2	1829-101	5	0.13	0.43
1 x 1/2	1829-130	5	0.20	0.66
1 x 3/4	1829-131	5	0.20	0.54
1 1/4 x 3/4	1829-167	5	0.28	0.71
1 1/4 x 1	1829-168	5	0.30	0.59
1 1/2 x 3/4	1829-210	5	0.35	0.75
1 1/2 x 1	1829-211	5	0.36	0.62
1 1/2 x 1 1/4	1829-212	5	0.38	0.50
2 x 1	1829-249	5	0.50	0.73
2 x 1 1/2	1829-251	5	0.54	0.48
3 x 2	1829-338	5	1.08	1.23
4 x 2	1829-420	5	1.73	1.57
4 x 3	1829-422	5	1.98	1.18

Other Reducing Couplings are produced by solvent cementing Reducer Bushings into Socket Couplings. They may be ordered as factory fabrications or may be assembled in the field.

5101-3-3 Thread Coupling (FPT x FPT)





Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. L
1/4	1830-002	5	0.07	1.40
1/2	1830-005	25	0.08	2.02
3/4	1830-007	25	0.13	2.27
1	1830-010	15	0.21	2.52
1 1/4	1830-012	5	0.31	2.77
1 1/2	1830-015	5	0.46	3.02
2	1830-020	5	0.64	3.27
2 1/2	1830-025	5	0.89	3.75
3	1830-030	5	1.30	3.99
4	1830-040	5	2.31	4.74

5101-3-3 Reducing Thread Coupling (FPT x FPT)

Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. L
3/4 x 1/2	1830-101	5	0.15	2.33
1 x 1/2	1830-130	5	0.22	2.69
1 x 3/4	1830-131	5	0.23	2.69
1 1/4 x 3/4	1830-167	5	0.32	2.99
1 1/4 x 1	1830-168	5	0.34	2.99
1 1/2 x 3/4	1830-210	5	0.39	3.15
1 1/2 x 1	1830-211	5	0.40	3.15
1 1/2 x 1 1/4	1830-212	5	0.42	3.15
2 x 1	1830-249	5	0.53	3.39
2 x 1 1/2	1830-251	5	0.58	3.39

Other Reducing Couplings are produced by solvent cementing Reducer Bushings into Socket Couplings. They may be ordered as factory fabrications or may be assembled in the field.

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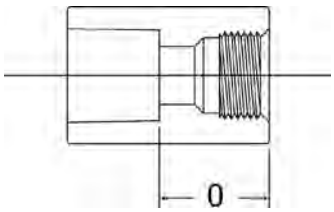
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Adapters

Chemtrol
Fig. No.

5103 Female Adapter Coupling (S x FPT)

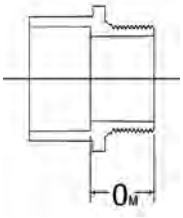




Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. O
1/4	1835-002	5	0.06	0.76
1/2	1835-005	15	0.10	1.13
3/4	1835-007	10	0.15	1.26
1	1835-010	10	0.23	1.38
1 1/4	1835-012	5	0.34	1.51
1 1/2	1835-015	5	0.43	1.63
2	1835-020	5	0.60	1.76
2 1/2	1835-025	5	0.82	1.97
3	1835-030	5	1.27	2.08
4	1835-040	5	1.13	2.46

5104 Male Adapter (S x MPT)



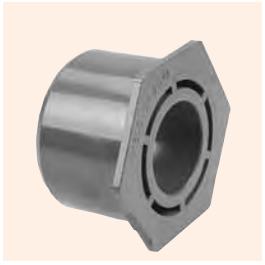


Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. OM
1/2	1836-005	25	0.04	0.94
3/4	1836-007	25	0.06	0.96
1	1836-010	25	0.10	1.14
1 1/4	1836-012	10	0.14	1.11
1 1/2	1836-015	10	0.19	1.11
2	1836-020	10	0.27	1.19
2 1/2	1836-025	5	0.56	1.88
3	1836-030	5	0.79	1.97
4	1836-040	5	1.56	2.08

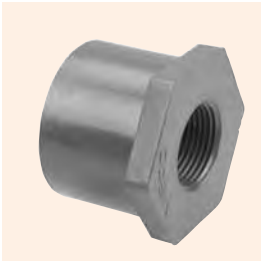
Bushings

Design Styles

The design style of most bushings is to have a solid wall between the inside and outside connections. Some of the multistep reductions with exceedingly thick cross-sections are not solid. This design style achieves structural support with a web of ribs attaching the inner and outer connection walls, with the open area toward the exterior bushing face. The styles are denoted by W and S for webbed and solid designs respectively.



Webbed design

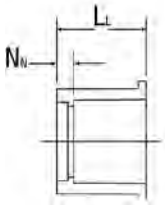


Solid design

Chemtrol
Fig. No.

5118 Flush Socket Reducer Bushing (SPG x S)





Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Design Style	Dim. LL	Dim. NN
1/2 x 1/4	1837-072	25	0.04	S	1.17	0.53
3/4 x 1/2	1837-101	25	0.06	S	1.15	0.26
1 x 1/2	1837-130	25	0.07	S	1.28	0.39
1 x 3/4	1837-131	25	0.06	S	1.28	0.26
1 1/4 x 1/2	1837-166	10	0.11	S	1.41	0.52
1 1/4 x 3/4	1837-167	10	0.09	S	1.41	0.39
1 1/4 x 1	1837-168	10	0.07	S	1.41	0.27
1 1/2 x 1/2	1837-209	10	0.13	W	1.53	0.64
1 1/2 x 3/4	1837-210	10	0.11	S	1.53	0.51
1 1/2 x 1	1837-211	10	0.09	S	1.53	0.39
1 1/2 x 1 1/4	1837-212	10	0.07	S	1.53	0.26
2 x 1/2	1837-247	10	0.27	W	1.66	0.77
2 x 3/4	1837-248	10	0.27	W	1.66	0.64
2 x 1	1837-249	10	0.27	W	1.66	0.52
2 x 1 1/4	1837-250	5	0.23	S	1.66	0.39
2 x 1 1/2	1837-251	10	0.21	S	1.66	0.27
2 1/2 x 2	1837-292	5	0.26	S	1.93	0.42
3 x 1 1/2	1837-337	5	0.75	W	2.41	1.02
3 x 2	1837-338	5	0.70	S	2.41	0.90
3 x 2 1/2	1837-339	5	0.49	S	2.41	0.63

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Chemtrol
Fig. No.

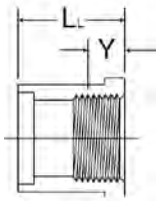
5118 Flush Socket Reducer Bushing (SPG x S) (cont.)

Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Design Style	Dim. L_L	Dim. N_N
4 x 2	1837-420	5	1.25	W	2.80	1.29
4 x 3	1837-422	5	1.01	S	2.80	0.90
6 x 4	1837-532	5	2.97	S	3.05	0.77
8 x 6	1837-585	2	6.00	S	4.58	1.55
10 x 6	1837-422	1	10.80	W	5.57	2.54
10 x 8	1837-626	1	9.36	S	5.57	1.07
12 x 8	1837-668	1	18.79	W	6.57	2.07
12 x 10	1837-670	1	12.78	S	6.57	1.07

Other size reductions are produced by solvent cementing appropriate Reducer Bushings together. They may be ordered as factory fabrications or may be assembled in the field.

5118-3 Flush Spigot x Thread Reducer Bushing (SPG x FPT)





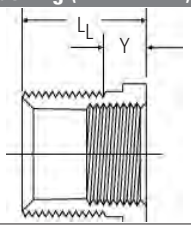
Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Design Style	Dim. L_L	Dim. Y*
1/2 x 1/4	1838-072	25	0.03	S	1.17	0.31
3/4 x 1/2	1838-101	25	0.03	S	1.29	0.43
1 x 1/2	1838-130	25	0.07	S	1.56	0.43
1 x 3/4	1838-131	25	0.06	S	1.56	0.45
1 1/4 x 1/2	1838-166	10	0.15	S	1.66	0.43
1 1/4 x 3/4	1838-167	10	0.13	S	1.66	0.45
1 1/4 x 1	1838-168	10	0.11	S	1.66	0.53
1 1/2 x 1/2	1838-209	10	0.23	S	1.77	0.43
1 1/2 x 3/4	1838-210	10	0.21	S	1.77	0.45
1 1/2 x 1	1838-211	10	0.19	S	1.77	0.53
1 1/2 x 1 1/4	1838-212	10	0.13	S	1.77	0.55
2 x 1/2	1838-247	10	0.36	S	1.91	0.43
2 x 3/4	1838-248	10	0.34	S	1.91	0.45
2 x 1	1838-249	10	0.32	S	1.91	0.53
2 x 1 1/4	1838-250	10	0.26	S	1.91	0.55
2 x 1 1/2	1838-251	10	0.21	S	1.91	0.55
2 1/2 x 2	1838-292	5	0.32	S	2.17	0.57
3 x 2	1838-338	5	0.73	S	2.41	0.57
3 x 2 1/2	1838-339	5	0.57	S	2.41	0.87
4 x 2	1838-420	5	1.30	W	2.80	0.57
4 x 3	1838-422	5	1.06	S	2.80	0.95

Other size reductions are produced by solvent cementing appropriate Reducer Bushings together. They may be ordered as factory fabrications or may be assembled in the field.
*Typical male component engagement, hand tight (L_1 in ANSI B1.20.1 thread spec.) plus 1 1/2 turns.

Chemtrol
Fig. No.

5118-3-4 Flush Thread Reducer Bushing (MPT x FPT)





Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Design Style	Dim. L_L	Dim. Y*
1/2 x 1/4	1839-072	25	0.02	S	0.95	0.25
3/4 x 1/2	1839-101	25	0.03	S	0.95	0.25
1 x 1/2	1839-130	25	0.06	S	1.24	0.38
1 x 3/4	1839-131	25	0.05	S	1.24	0.38
1 1/4 x 1/2	1839-166	10	0.13	S	1.27	0.38
1 1/4 x 3/4	1839-167	10	0.11	S	1.27	0.38
1 1/4 x 1	1839-168	10	0.09	S	1.27	0.38
1 1/2 x 1/2	1839-209	10	0.20	S	1.28	0.38
1 1/2 x 3/4	1839-210	10	0.18	S	1.28	0.38
1 1/2 x 1	1839-211	10	0.17	S	1.28	0.38
1 1/2 x 1 1/4	1839-212	10	0.11	S	1.28	0.38
2 x 1/2	1839-247	5	0.30	S	1.32	0.38
2 x 3/4	1839-248	5	0.28	S	1.32	0.38
2 x 1	1839-249	5	0.28	S	1.32	0.38
2 x 1 1/4	1839-250	5	0.27	S	1.32	0.38
2 x 1 1/2	1839-251	5	0.15	S	1.32	0.38
2 1/2 x 2	1839-292	5	0.24	S	2.18	0.57
3 x 1 1/2	1839-337	5	0.64	W	2.42	0.55
3 x 2	1839-338	5	0.59	S	2.42	0.57
3 x 2 1/2	1839-339	5	0.54	S	2.42	0.87
4 x 2	1839-420	5	1.01	W	2.81	0.57
4 x 3	1839-422	5	0.95	S	2.81	0.95

Other size reductions are produced by solvent cementing appropriate Reducer Bushings together. They may be ordered as factory fabrications or may be assembled in the field.
*Typical male component engagement, hand tight (L_1 in ANSI B1.20.1 thread spec.) plus 1 1/2 turns.

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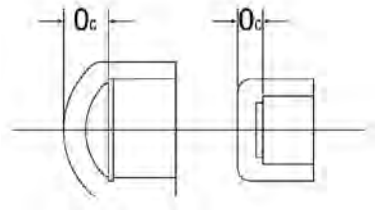
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Caps

Chemtrol
Fig. No.

5117 Socket Cap* (S)



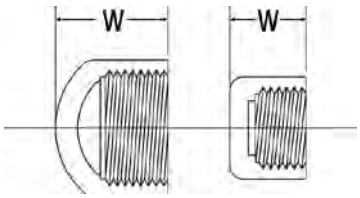


Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. Oc
1/4	1847-002	5	0.03	0.25
1/2	1847-005	10	0.06	0.39
3/4	1847-007	10	0.09	0.36
1	1847-010	5	0.14	0.41
1 1/4	1847-012	5	0.22	0.39
1 1/2	1847-015	5	0.28	0.41
2	1847-020	5	0.40	0.41
2 1/2	1847-025	5	0.62	1.56
3	1847-030	5	1.00	1.28
4	1847-040	5	1.61	1.57
6	1847-060	5	4.06	2.11

*Sizes 2" and smaller are flat; 2 1/2" and larger are domed.

5117-3 Thread Cap* (FPT)





Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. W
1/4	1848-002	5	0.02	0.89
1/2	1848-005	5	0.07	1.28
3/4	1848-007	5	0.10	1.38
1	1848-010	5	0.16	1.55
1 1/4	1848-012	5	0.25	1.66
1 1/2	1848-015	5	0.31	1.80
2	1848-020	5	0.46	1.92
2 1/2	1848-025	5	0.68	2.34
3	1848-030	5	1.03	3.18
4	1848-040	5	1.85	3.85

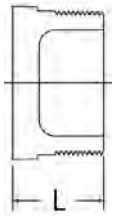
*Sizes 2" and smaller are flat; 2 1/2" and larger are domed.

Plugs

Chemtrol
Fig. No.

5116-4 Thread Plug (MPT)





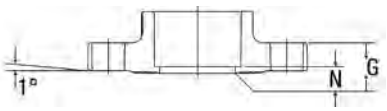
Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. LL
1/4	1850-002	5	0.01	0.85
1/2	1850-005	10	0.03	1.04
3/4	1850-007	10	0.04	1.10
1	1850-010	5	0.07	1.25
1 1/4	1850-012	5	0.11	1.66
1 1/2	1850-015	5	0.16	1.77
2	1850-020	5	0.20	1.91
2 1/2	1850-025	5	0.32	2.17
3	1850-030	5	0.56	2.41
4	1850-040	5	0.95	2.80

Class 150 Flanges

For flange dimensions that comply with ANSI B16.5, 150 lb., steel flanges, see page 37.

5151-W Socket Flange (S), One-Piece (Webbed Design)





Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G	Dim. N
2	1851-020	10	0.89	0.91	0.26
3	1851-030	10	1.80	1.13	0.28
4	1851-040	10	2.72	1.24	0.31
6	1851-060	5	4.14	1.36	0.31

Reducing Flanges are produced by solvent cementing Reducer Bushings into Socket Flanges. They may be ordered as factory fabrications or may be assembled in the field.

Note: One-piece webbed flanges have oblong bolt holes which permit mating with ANSI B16.5, 150 lb.; BS 1560, class 150; ISO 2084, PN10; and DIN 2532, PN10.

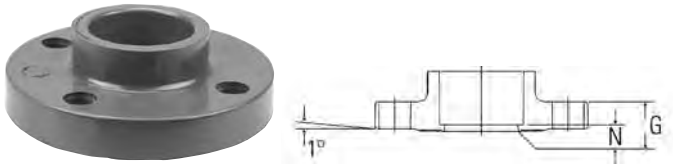
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Chemtrol
Fig. No.

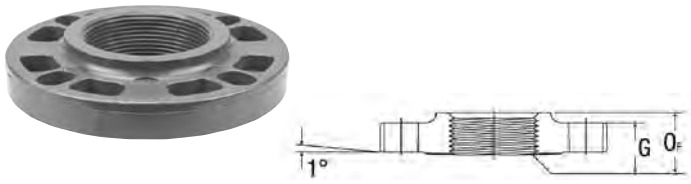
5151-H Socket Flange (S), One-Piece (Solid)



Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G	Dim. N
1/2	1851-H05	10	0.22	0.54	0.20
3/4	1851-H07	15	0.31	0.61	0.17
1	1851-H10	10	0.45	0.68	0.18
1 1/4	1851-H12	5	0.59	0.72	0.20
1 1/2	1851-H15	10	0.73	0.82	0.21
2	1851-H20	10	1.12	0.91	0.26
2 1/2	1851-H25	5	1.77	1.02	0.20
3	1851-H30	10	2.27	1.13	0.28
4	1851-H40	10	3.17	1.24	0.31
6	1851-H60	5	5.04	1.36	0.31
8	1851-H80	2	9.35	1.52	0.35

Reducing Flanges are produced by solvent cementing Reducer Bushings into Socket Flanges. They may be ordered as factory fabrications or may be assembled in the field.

5151-W-3 Thread Flange (FPT), One-Piece (Webbed Design)



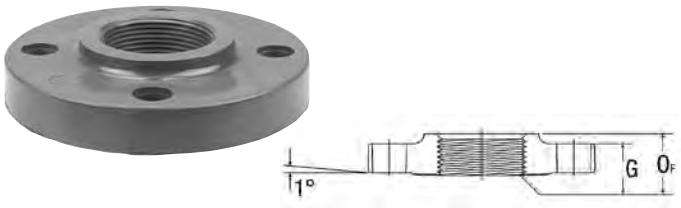
Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G	Dim. O_F
2	1852-020	5	0.88	0.91	1.17
3	1852-030	5	1.73	1.13	1.55
4	1852-040	5	2.53	1.24	1.67

Reducing Flanges are produced by solvent cementing Reducer Bushings into Socket Flanges. They may be ordered as factory fabrications or may be assembled in the field.

Note: One-piece webbed flanges have oblong bolt holes which permit mating with ANSI B16.5, 150 lb.; BS 1560, class 150; ISO 2084, PN10; and DIN 2532, PN10.

Chemtrol
Fig. No.

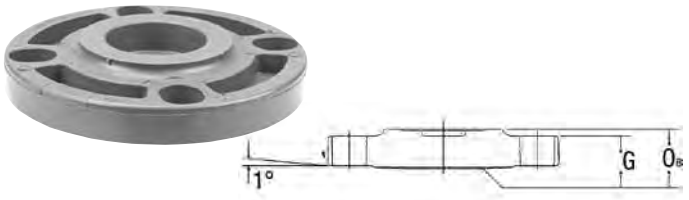
5151-H-3 Thread Flange (FPT), One-Piece (Solid)



Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G	Dim. O_F
1/2	1852-H05	10	0.23	0.54	0.88
3/4	1852-H07	10	0.34	0.61	0.91
1	1852-H10	10	0.44	0.68	1.08
1 1/4	1852-H12	5	0.55	0.72	1.11
1 1/2	1852-H15	5	0.69	0.82	1.12
2	1852-H20	5	1.05	0.91	1.17
2 1/2	1852-H25	5	1.65	1.02	1.42
3	1852-H30	5	1.84	1.13	1.55
4	1852-H40	5	2.80	1.24	1.67

Reducing Flanges are produced by solvent cementing Reducer Bushings into Socket Flanges. They may be ordered as factory fabrications or may be assembled in the field.

5119-W Blind Flange, One-Piece (Webbed Design)



Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G	Dim. O_B
2	1853-020	5	0.88	0.91	1.17
3	1853-030	5	1.98	1.13	1.39
4	1853-040	5	2.88	1.24	1.51
6	1853-060	5	5.07	1.36	1.60

Note: One-piece webbed flanges have oblong bolt holes which permit mating with ANSI B16.5, 150 lb.; BS 1560, class 150; ISO 2084, PN10; and DIN 2532, PN10.

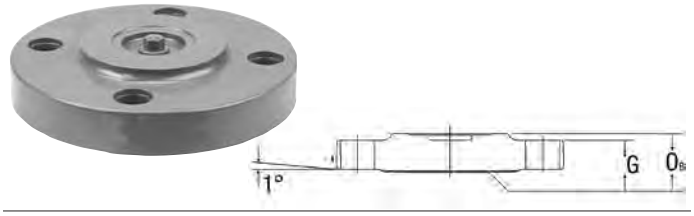
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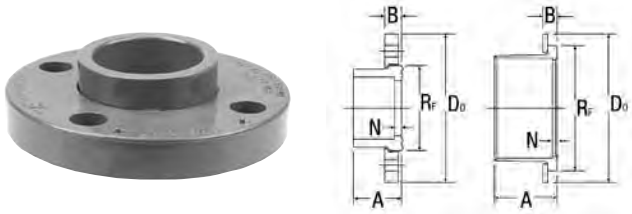
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5119-H Blind Flange, One-Piece (Solid)



Chemtrol Fig. No.	Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G	Dim. OB
	1/2	1853-H05	5	0.28	0.54	0.76
	3/4	1853-H07	5	0.34	0.61	0.83
	1	1853-H10	5	0.48	0.68	0.88
	1 1/4	1853-H12	5	0.63	0.72	0.95
	1 1/2	1853-H15	5	0.81	0.82	1.04
	2	1853-H20	5	1.24	0.91	1.12
	2 1/2	1853-H25	5	2.03	1.02	1.22
	3	1853-H30	5	2.65	1.13	1.39
	4	1853-H40	5	3.94	1.24	1.57
	6	1853-H60	5	6.93	1.36	1.60
	8	1853-H80	2	11.23	1.51	1.77

5151-A Socket Flange (S), Van Stone



Chemtrol Fig. No.	Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. A	Dim. B	Dim. D0	Dim. RF	Dim. N
	1/2	1854-005	10	0.21	1.00	.50	3.49	1.48	0.11
	3/4	1854-007	15	0.26	1.12	.50	3.86	1.75	0.11
	1	1854-010	10	0.41	1.25	.56	4.24	2.04	0.11
	1 1/4	1854-012	5	0.44	1.37	.63	4.61	2.50	0.11
	1 1/2	1854-015	10	0.59	1.50	.69	4.99	2.78	0.11
	2	1854-020	10	1.00	1.62	.75	5.98	3.41	0.11
	2 1/2	1854-025	5	1.49	1.93	.94	6.98	4.11	0.15
	3	1854-030	10	1.87	2.40	1.04	7.48	4.80	0.50
	4	1854-040	10	2.84	2.75	1.16	8.95	6.17	0.48
	6	1854-060	5	4.88	3.55	1.28	10.97	7.95	0.53
	8	1854-080	2	13.13	5.00	1.42	13.46	10.42	0.50

Van Stone Flange Assembly List

Item	Description	Material
1	Connector Hub	CPVC
3	Flange Ring	CPVC

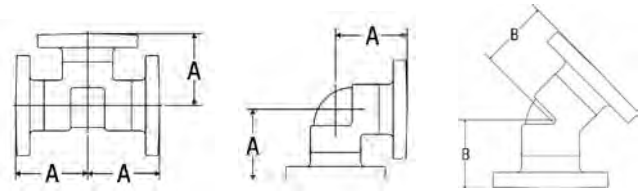
NR 51 Flange Gaskets, for Class 150 Flanges

Note: These gaskets are 1/8" thick, full face polychloroprene (CR), 70 durometer.



Chemtrol Fig. No.	Nominal Size	Part No.	Approx. Lbs./Ea.
	1/2	Use Figure No. & Nom.Size	0.11
	3/4		0.12
	1		0.13
	1 1/4		0.14
	1 1/2		0.15
	2		0.20
	2 1/2		0.25
	3		0.28
	4		0.30
	6		0.40
	8		0.50

Flanged Fittings*– Fabricated from Molded Components



Nominal Size	Fig. No. 4511-12 Flanged Tee Approx. Lbs./Ea.	Fig. No. 4511-12 Flanged Tee Dim. A	Fig. No. 4507-12 Flanged 90° ELL Approx. Lbs./Ea.	Fig. No. 4507-12 Flanged 90° ELL Dim. A	Fig. No. 4506-12 Flanged 45° ELL Approx. Lbs./Ea.	Fig. No. 4506-12 Flanged 45° ELL Dim. B
1	1.98	3 3/32	1.34	3 3/32	1.31	2 23/32
1 1/4	2.75	3 19/32	1.86	3 19/32	1.79	3 3/32
1 1/2	3.49	3 31/32	2.35	3 31/32	2.27	3 13/32
2	5.23	4 15/32	3.54	4 15/32	3.40	3 27/32
2 1/2	8.38	5 7/32	5.67	5 7/32	5.43	4 13/32
3	11.32	5 13/32	7.85	5 13/32	7.35	4 25/32
4	17.36	7 3/32	12.07	7 3/32	11.29	5 25/32
6	32.74	9 25/32	24.50	9 25/32	22.75	8 1/2
8	–	–	–	–	–	–

* Flanged fittings are produced by solvent cementing socket flanges to socket fittings with short plain end pipe nipples. They may be ordered as factory fabrications or may be assembled in the field.

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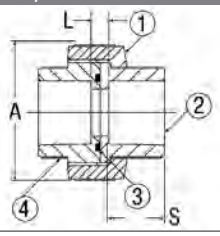
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Unions

Chemtrol
Fig. No.

5133 FKM/5133E (EPDM) Socket Union (S x S)





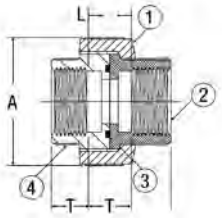
Nominal Size	FKM Part No.	EPDM Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. A	Dim. L	Dim. S*
1/4	1897-002	1897E002	5	0.10	1.70	0.41	0.64
1/2	1897-005	1897E005	10	0.17	1.99	0.43	0.89
3/4	1897-007	1897E007	10	0.30	2.43	0.44	1.02
1	1897-010	1897E010	5	0.43	2.82	0.43	1.14
1 1/4	1897-012	1897E012	5	0.94	4.07	0.79	1.27
1 1/2	1897-015	1897E015	5	1.01	4.07	0.81	1.39
2	1897-020	1897E020	5	1.98	5.24	0.80	1.52
3	1897-030	1897E030	5	3.77	7.15	0.94	1.91

Socket x Thread is available on request in all sizes except 2 1/2". The 2 1/2" Socket Union is available as a fabrication from the 3" size Bushed down.

* Socket Depth

5133-3-3 FKM/5133E-3-3 (EPDM) Threaded Union (FPT x FPT)





Nominal Size	FKM Part No.	EPDM Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. A	Dim. L	Dim. S*
1/4	1898-002	1898E002	5	0.10	1.69	1.07	0.31
1/2	1898-005	1898E005	5	0.17	1.99	1.30	0.43
3/4	1898-007	1898E007	5	0.30	2.43	1.37	0.45
1	1898-010	1898E010	5	0.44	2.82	1.51	0.53
1 1/4	1898-012	1898E012	5	0.97	4.07	2.01	0.55
1 1/2	1898-015	1898E015	5	1.00	4.07	2.16	0.57
2	1898-020	1898E020	5	1.98	5.24	2.36	0.57
3	1898-030	1898E030	5	3.99	7.15	2.685	0.95

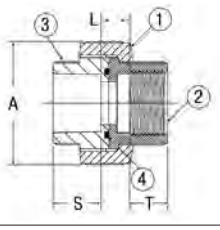
Socket x Thread is available on request in all sizes except 2 1/2". The 2 1/2" Socket Union is available as a fabrication from the 3" size Bushed down.

* Thread Joint Engagement

Chemtrol
Fig. No.

5133-3 FKM / 5133E-3 (EPDM) Female Adapter Union (S x FPT)





Nominal Size	FKM Part No.	EPDM Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. A	Dim. L	Dim. S*	Dim. T†
1/2	1899-005	1899E005	10/5	0.163	1.99	0.84	0.89	0.43
3/4	1899-007	1899E007	10	0.282	2.43	0.81	1.02	0.45
1	1899-010	1899E010	10	0.411	2.82	0.90	1.14	0.53
1 1/4	1899-012	1899E012	10	0.943	4.07	1.29	1.27	0.55
1 1/2	1899-015	1899E015	10	0.967	4.07	1.32	1.39	0.55
2	1899-020	1899E020	5	1.880	5.24	1.41	1.52	0.57
3	1899-030	1899E030	5	4.100	7.15	1.90	1.91	0.95

The 2 1/2" Socket x Thread Union is available as a fabrication from the 3" size Bushed down.

* Socket Depth
† Thread Joint Engagement

Transition Unions

Materials of Construction

Item	Decription	Material
1	Union Nut	CPVC
2	End Connector	Brass/SS
3	O-Ring	FKM/EPDM
4	Union Tailpiece	CPVC

TCBR-3 Brass End Connector (FPT)
TCBR-4 Brass End Connector (MPT)
TCSS-3 Stainless Steel End Connector (FPT)
TCSS-4 Stainless Steel End Connector (MPT)

Refer to page 13 for purchase and assembly instructions of Transition Unions and for part number, size, carton quantity, weights, and dimensions of Metal End Connectors.

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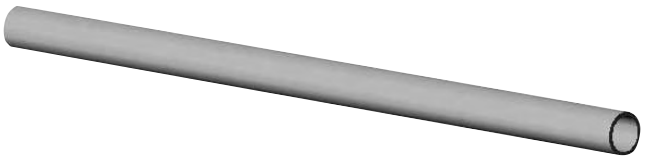
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Pipe

Chemtrol
Fig. No

6100-80(1/2"-6")/6200-80(1/2"-4") Plain End Schedule 80 Pipe (20 ft. Lengths)

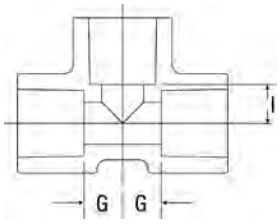


Pipe is ordered and specified with the Chemtrol figure number followed by the nominal size (e.g., 1 1/2" Schedule 80 PP Pipe – 6100 1 1/2"). Weights and dimensions for all pipe may be found on page 38 of this catalog.

Tees

6111/6211 Socket Tee (S x S x S)

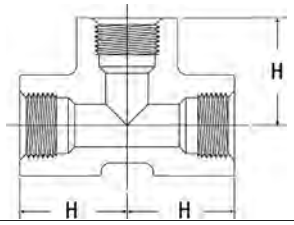




Nominal Size	Universal Part No. Black	Chem-Pure	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G	Dim. I
1/2	2801-005	7801-005	10	0.09	0.53	0.53
3/4	2801-007	7801-007	10	0.14	0.70	0.70
1	2801-010	7801-010	10	0.19	0.76	0.76
1 1/2	2801-015	7801-015	10	0.43	1.06	1.06
2	2801-020	7801-020	10	1.69	1.25	1.25
3	2801-030	7801-030	5	1.43	1.83	1.83
4	2801-040	7801-040	5	2.41	2.32	2.32
6	2801-060	–	2	5.71	3.44	3.44

6112-3-3/6212-3-3 Thread* Tee (FPT x FPT x FPT)





Nominal Size	Universal Part No. Black	Chem-Pure	Ctn. Qty.	Approx. Lbs./Ea.	Dim. H
1/2	2805-005	7805-005	10	0.10	1.38
3/4	2805-007	7805-007	10	0.16	1.67
1	2805-010	7805-010	10	0.24	1.86
1 1/4	2805-012	7805-012	10	0.35	2.14
1 1/2	2805-015	7805-015	10	0.46	2.41
2	2805-020	7805-020	10	0.67	2.73
3	2805-030	7805-030	5	1.54	3.67
4	2805-040	7805-040	5	1.97	4.54

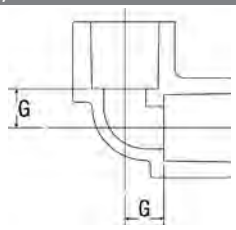
* Recommended for intermittent service not exceeding 20 psi.

Elbows

Chemtrol
Fig. No.

6107/6207 Socket 90° ELL (S x S)

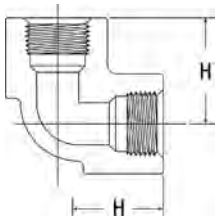




Nominal Size	Universal Part No. Black	Chem-Pure	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G
1/2	2806-005	7806-005	10	0.06	0.53
3/4	2806-007	7806-007	10	0.08	0.70
1	2806-010	7806-010	10	0.15	0.76
1 1/2	2806-015	7806-015	10	0.32	1.06
2	2806-020	7806-020	10	0.49	1.25
3	2806-030	7806-030	5	1.14	1.83
4	2806-040	7806-040	5	1.93	2.32
6	2806-060	—	2	4.47	3.44

6107-3-3/6207-3-3 Thread* 90° ELL (FPT x FPT)





Nominal Size	Universal Part No. Black	Chem-Pure	Ctn. Qty.	Approx. Lbs./Ea.	Dim. H
1/2	2808-005	7808-005	10	0.07	1.38
3/4	2808-007	7808-007	10	0.11	1.67
1	2808-010	7808-010	10	0.16	1.86
1 1/4	2808-012	7808-012	10	0.25	2.14
1 1/2	2808-015	7808-015	10	0.33	2.41
2	2808-020	7808-020	10	0.49	2.73
3	2808-030	7808-030	5	1.12	3.67
4	2808-040	7808-040	5	2.02	4.54

*Recommended for intermittent service not exceeding 20 psi.

6111-12/6211-12 Flanged Tees

Flanged fitting center-to-face dimensions may be found on page 30. When ordering, specify the figure number and the nominal size (e.g., 2" Schedule 80 PP Flanged Tee – 6111-12 2").

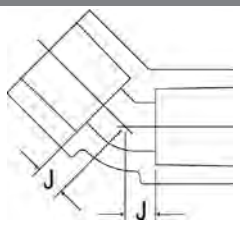
For questions concerning thermoplastic piping systems, please call or fax: ***888.446.4226 (ph),*** *888.336.4226 (fx).*

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Chemtrol
Fig. No.

6106/6206 Socket 45° ELL (S x S)

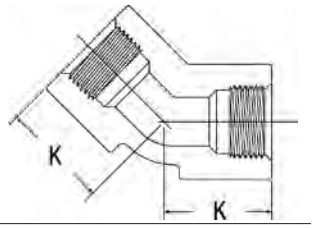




Nominal Size	Universal Part No. Black	Chem-Pure	Ctn. Qty.	Approx. Lbs./Ea.	Dim. J
1/2	2817-005	7817-005	10	0.06	0.28
3/4	2817-007	7817-007	10	0.08	0.35
1	2817-010	7817-010	10	0.14	0.38
1 1/2	2817-015	7817-015	10	0.25	0.48
2	2817-020	7817-020	10	0.37	0.61
3	2817-030	7817-030	5	0.80	0.79
4	2817-040	7817-040	5	1.54	1.02
6	2817-060	—	2	3.55	1.72

6106-3-3/6206-3-3 Thread* 45° ELL (FPT x FPT)





Nominal Size	Universal Part No. Black	Chem-Pure	Ctn. Qty.	Approx. Lbs./Ea.	Dim. K
1/2	2819-005	7819-005	10	0.06	1.13
3/4	2819-007	7819-007	10	0.11	1.32
1	2819-010	7819-010	10	0.15	1.48
1 1/4	2819-012	7819-012	10	0.21	1.66
1 1/2	2819-015	7819-015	10	0.30	1.83
2	2819-020	7819-020	10	0.42	2.09
3	2819-030	7819-030	5	0.92	2.64
4	2819-040	7819-040	5	1.62	3.24

*Recommended for intermittent service not exceeding 29 psi.

6107-12/6207-12
6106-12/6206-12 Flanged ELLs

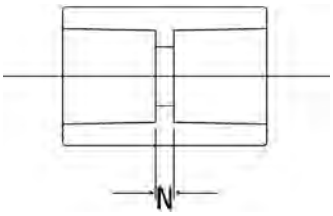
Flanged fitting center-to-face dimensions may be found on page 30. When ordering, specify the figure number and the nominal size (e.g., 2" Schedule 80 PP Flanged 45° Elbow – 6106-12 2").

Couplings

Chemtrol
Fig. No.

6101/6201 Socket Couplings (S x S)

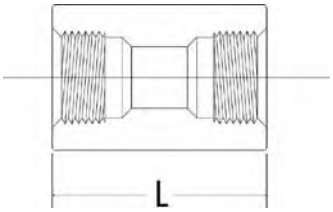




Nominal Size	Universal Part No. Black	Chem-Pure	Ctn. Qty.	Approx. Lbs./Ea.	Dim. N
1/2	2829-005	7829-005	10	0.06	0.29
3/4	2829-007	7829-007	10	0.08	0.29
1	2829-010	7829-010	10	0.13	0.28
1 1/2	2829-015	7829-015	10	0.22	0.28
2	2829-020	7829-020	10	0.35	0.27
3	2829-030	7829-030	5	0.60	0.24
4	2829-040	7829-040	5	1.01	0.22
6	2829-060	—	2	2.37	0.26

6101-3-3/6201-3-3 Thread* Coupling (FPT x FPT)





Nominal Size	Universal Part No. Black	Chem-Pure	Ctn. Qty.	Approx. Lbs./Ea.	Dim. L
1/2	2830-005	7830-005	10	0.06	1.99
3/4	2830-007	7830-007	10	0.09	2.24
1	2830-010	7830-010	10	0.14	2.48
1 1/4	2830-012	7830-012	10	0.19	2.73
1 1/2	2830-015	7830-015	10	0.26	2.98
2	2830-020	7830-020	10	0.35	3.22
3	2830-030	7830-030	5	0.73	3.93
4	2830-040	7830-040	5	1.21	4.66

*Recommended for intermittent service not exceeding 20 psi.

*Chemtrol has seminars available to educate in the design and installation of thermoplastic piping systems. For more information, call our customer service department at **800.343.5455**.*

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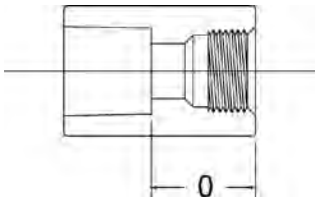
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Adapters

Chemtrol
Fig. No.

6103/6203 Female Adapter Coupling (S x FPT*)



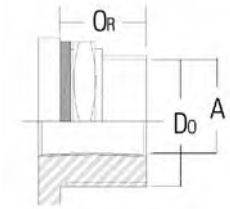


Nominal Size	Universal Part No. Black	Chem-Pure	Ctn. Qty.	Approx. Lbs./Ea.	Dim. O
1/2	2835-005	7835-005	10	0.06	1.14
3/4	2835-007	7835-007	10	0.08	1.26
1	2835-010	7835-010	10	0.13	1.38
1 1/2	2835-015	7835-015	10	0.24	1.63
2	2835-020	7835-020	10	0.34	1.75
3	2835-030	7835-030	5	0.65	2.08
4	2835-040	7835-040	5	1.16	2.44

*Recommended for intermittent service not exceeding 20 psi.

6150 Tank Adapter (Tank x FPT*)





Nom. Size	Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. A	Dim. OR	Dim. DO
1/2	Use	5	0.20	14npt	1.19	1.63
3/4	Figure	5	0.30	14npt	1.19	1.63
1	No. &	5	0.31	11 1/2npt	1.38	2.50
1 1/4	Nom. Size	5	0.35	11 1/2npt	1.38	2.50
1 1/2		5	0.39	11 1/2npt	1.38	2.50
2		5	0.52	11 1/2npt	1.56	3.13
3		5	0.81	8npt	1.75	4.25

*Recommended for intermittent service not exceeding 20 psi.
Note: 1. Gasket is EPDM

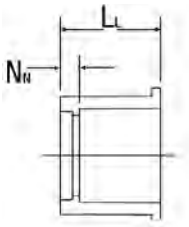
*For complete technical information and more, refer to our website at **www.chemtrol.com**.*

Bushings

Chemtrol
Fig. No.

6118/6218 Flush Socket Reducer Bushing (SPG x S)



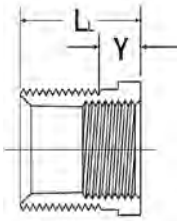


Nominal Size	Universal Part No. Black	Chem-Pure	Ctn. Qty.	Approx. Lbs./Ea.	Design Style†	Dim. LL	Dim. NN
3/4 x 1/2	2837-101	7837-101	10	0.02	S	1.28	0.43
1 x 1/2	2837-130	7837-130	10	0.04	S	1.53	0.68
1 x 3/4	2837-131	7837-131	10	0.03	S	1.53	0.56
1 1/2 x 1	2837-211	7837-211	10	0.10	S	1.78	0.68
2 x 1	2837-249	7837-249	10	0.18	S	1.91	0.81
2 x 1 1/2	2837-251	7837-251	10	0.12	S	1.91	0.56
3 x 2	2837-338	7837-338	5	0.42	S	2.38	0.90
4 x 3	2837-422	7837-422	5	0.62	S	2.76	0.91
6 x 4	2837-532	—	2	1.74	S	3.00	0.78

Note: 3" and 4" sizes are hex head, 3/4", 1", 1 1/2", 2", and 6" have round heads.
† All Bushings have solid walls. See pg. 8 for detailed explanation.

6118-3-4/6218-3-4 Flush Thread* Reducer Bushing (MPT x FPT)





Nominal Size	Universal Part No. Black	Chem-Pure	Ctn. Qty.	Approx. Lbs./Ea.	Design Style†	Dim. LL	Dim. Y**
3/4 x 1/2	2839-101	7839-101	10	0.02	S	1.27	0.43
1 x 1/2	2839-130	7839-130	10	0.04	S	1.53	0.43
1 x 3/4	2839-131	7839-131	10	0.03	S	1.53	0.45
1 1/4 x 3/4	2839-167	7839-167	10	0.09	S	1.38	0.45
1 1/4 x 1	2839-168	7839-168	10	0.07	S	1.38	0.53
1 1/2 x 1	2839-211	7839-211	10	0.11	S	1.55	0.53
1 1/2 x 1 1/4	2839-212	7839-212	10	0.07	S	1.55	0.55
2 x 1	2839-249	7839-249	10	0.18	S	1.57	0.53
2 x 1 1/2	2839-251	7839-251	10	0.13	S	1.57	0.55
3 x 2	2839-338	7839-338	5	0.38	S	2.38	0.57
4 x 3	2839-422	7839-422	5	0.49	S	2.76	0.95

* Recommended for intermittent service not exceeding 20 psi.
** Typical male component engagement, hand tight (L_1 in ANSI B1.20.1 thread spec.) plus 1 1/2 turns.

Note: 3/4", 1", 3", and 4" sizes are hex head; 1 1/4", 1 1/2", and 2" are knurled round.
† All Bushings have solid walls. See pg. 8 for detailed explanation.

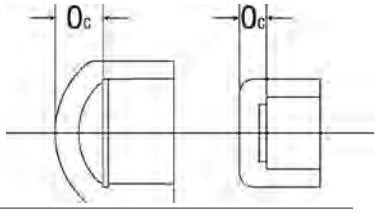
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Caps

Chemtrol
Fig. No.

6117/6217 Socket Cap‡ (S)



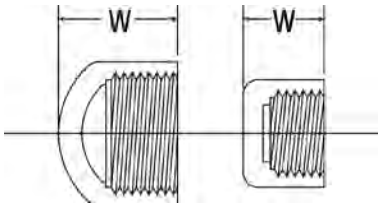


Nominal Size	Universal Part No. Black	Chem-Pure	Ctn. Qty.	Approx. Lbs./Ea.	Dim. Oc
1/2	2847-005	7847-005	10	0.04	0.41
3/4	2847-007	7847-007	10	0.05	0.38
1	2847-010	7847-010	10	0.09	0.42
1 1/2	2847-015	7847-015	10	0.17	0.42
2	2847-020	7847-020	10	0.23	0.42
3	2847-030	7847-030	5	0.52	1.29
4	2847-040	7847-040	5	0.90	1.57
6	2847-060	—	2	2.08	2.04

‡ Sizes 2" and smaller are flat; 3" and larger are domed.

6117-3/6217-3 Thread* Cap‡ (FPT)





Nominal Size	Universal Part No. Black	Chem-Pure	Ctn. Qty.	Approx. Lbs./Ea.	Dim. W
1/2	2848-005	7848-005	10	0.04	1.26
3/4	2848-007	7848-007	10	0.08	1.36
1	2848-010	7848-010	10	0.09	1.52
1 1/4	2848-012	7848-012	10	0.13	1.63
1 1/2	2848-015	7848-015	10	0.19	1.77
2	2848-020	7848-020	10	0.26	1.90
3	2848-030	7848-030	5	0.58	3.13
4	2848-040	7848-040	5	1.02	3.79

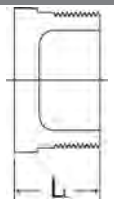
* Recommended for intermittent service not exceeding 20 psi.
‡ Sizes 2" and smaller are flat; 3" and larger are domed.

Plugs

Chemtrol
Fig. No.

6116-4/6216-4 Thread* Plug (MPT)





Nominal Size	Universal Part No. Black	Chem-Pure	Ctn. Qty.	Approx. Lbs./Ea.	Dim. L
1/2	2850-005	7850-005	10	0.02	1.15
3/4	2850-007	7850-007	10	0.02	1.27
1	2850-010	7850-010	10	0.04	1.53
1 1/4	2850-012	7850-012	5	0.13	1.57
1 1/2	2850-015	7850-015	5	0.16	1.55
2	2850-020	7850-020	5	0.25	1.55
3	2850-030	7850-030	5	0.33	2.38
4	2850-040	7850-040	5	0.66	2.76

* Recommended for intermittent service not exceeding 20 psi.

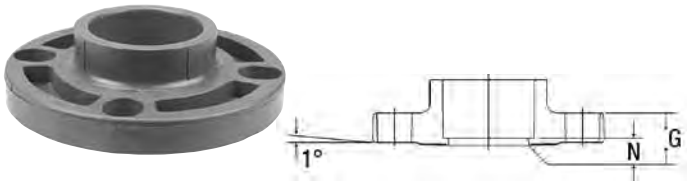
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Class 150 Flanges

Chemtrol
Fig. No.

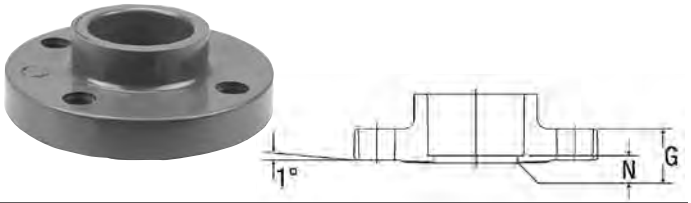
6116-4/6216-4 Thread* Plug (MPT)



Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G	Dim. N
2	2851-020	10	0.61	0.90	0.27
3	2851-030	5	1.16	1.12	0.34
4	2851-040	5	1.69	1.23	0.33
6	2851-060	2	2.66	1.33	0.28

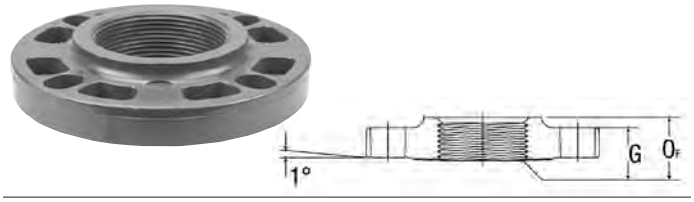
Note: One-piece webbed flanges have oblong bolt holes which permit mating with ANSI B16.5, 150 lb.; BS 1560, class 150; ISO 2084, PN10; and DIN 2532, PN10 flanges.

6151-H/6251-H Socket Flange (S), One-Piece (Solid)



Nominal Size	Universal Part No. Black	Chem-Pure	Ctn. Qty.	Approx. Lbs./Ea.	Dim G	Dim. N
1/2	2851-H05	7851-H05	10	0.13	0.54	0.23
3/4	2851-H07	7851-H07	10	0.20	0.60	0.20
1	2851-H10	7851-H10	10	0.24	0.67	0.21
1 1/2	2851-H15	7851-H15	10	0.41	0.72	0.23
2	2851-H20	7851-H20	10	0.79	0.90	0.27
3	2851-H30	7851-H30	5	1.50	1.12	0.34
4	2851-H40	7851-H40	5	2.20	1.23	0.33
6	2851-H60	—	2	3.45	1.33	0.28

6151-W-3/6215-W-3 Thread* Flange (FPT), One-Piece (Webbed Design)



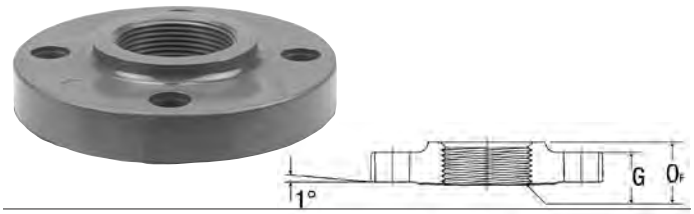
Nominal Size	Universal Part No. Black	Chem-Pure	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G	Dim. OF
2	2852-020	7852-020	5	0.56	0.90	1.17
3	2852-030	7852-030	5	0.98	1.12	1.53
4	2852-040	7852-040	5	1.62	1.23	1.65

* Recommended for intermittent service not exceeding 20 psi.

Note: One-piece webbed flanges have oblong bolt holes which permit mating with ANSI B16.5, 150 lb.; BS 1560, class 150; ISO 2084, PN10; and DIN 2532, PN10 flanges.

Chemtrol
Fig. No.

6151-H-3/6251-H-3 Thread* Flange (FPT), One-Piece (Solid)



Nominal Size	Universal Part No. Black	Chem-Pure	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G	Dim. OF
1/2	2852-H05	7852-H05	10	0.13	0.54	0.87
3/4	2852-H07	7852-H07	10	0.18	0.60	0.90
1	2852-H10	7852-H10	10	0.24	0.67	1.07
1 1/4	2852-H12	7852-H12	5	0.34	0.65	1.11
1 1/2	2852-H15	7852-H15	5	0.39	0.72	1.07
2	2852-H20	7852-H20	5	0.71	0.90	1.17
3	2852-H30	7852-H30	5	1.22	1.12	1.53
4	2852-H40	7852-H40	5	2.03	1.23	1.65

* Recommended for intermittent service not exceeding 20 psi.

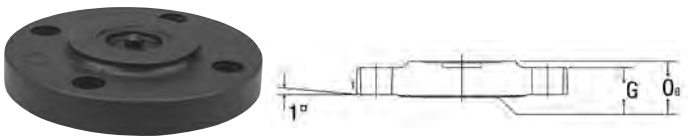
6119-W Blind Flange, One-Piece (Webbed Design)



Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G	Dim. OB
2	2853-020	5	0.59	0.90	1.11
3	2853-030	5	1.14	1.12	1.37
4	2853-040	5	1.94	1.23	1.49
6	2853-060	2	3.08	1.33	1.53

Note: One-piece webbed flanges have oblong bolt holes which permit mating with ANSI B16.5, 150 lb.; BS 1560, class 150; ISO 2084, PN10; and DIN 2532, PN10.

6119-H/6219-H Blind Flange, One-Piece (Solid)

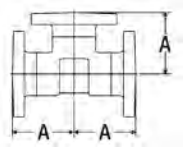


Nominal Size	Universal Part No. Black	Chem-Pure®	Ctn. Qty.	Approx. Lbs./Ea.	Dim G	Dim. OB
1/2	2853-H05	7853-H05	10	0.13	0.54	0.75
3/4	2853-H07	7853-H07	10	0.20	0.60	0.82
1	2853-H10	7853-H10	10	0.26	0.67	0.87
1 1/4	2853-H12	—	10	0.32	0.65	0.89
1 1/2	2853-H15	7853-H15	10	0.39	0.72	0.98
2	2853-H20	7853-H20	5	0.82	0.90	1.11
3	2853-H30	7853-H30	5	1.74	1.12	1.37
4	2853-H40	7853-H40	5	2.70	1.23	1.49
6	2853-H60	—	2	4.28	1.33	1.53

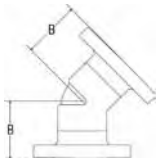
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Chemtrol
Fig. No.

Flanged Fittings*– Fabricated from Molded Components







Nominal Size	Fig. No. 6111-12 Flanged Tee Approx. Lbs./Ea.	Dim. A	Fig. No. 6107-12 Flanged 90° ELL Approx. Lbs./Ea.	Dim. A	Fig. No. 6106-12 Flanged 45° ELL Approx. Lbs./Ea.	Dim. B
1/2	0.24	2 13/32	0.21	2 13/32	0.21	2 5/32
3/4	0.37	2 23/32	0.31	2 23/32	0.31	2 15/32
1	0.48	3 3/32	0.44	3 3/32	0.43	2 23/32
1 1/2	0.94	3 31/32	0.83	3 31/32	0.76	3 13/32
2	1.64	5 7/32	1.44	4 15/32	1.32	3 27/32
3	4.97	5 15/32	3.04	5 13/32	2.70	4 25/32
4	5.30	7 3/32	4.82	7 3/32	4.43	5 25/32

*Flanged fittings are produced by heat fusion of socket flanges to socket fittings with short plain end pipe nipples. They may be ordered as factory fabrications or may be assembled in the field. See also plain end pipe nipples on page 29.

NR 51 Flange Gaskets, for Class 150 Flanges

Note: These gaskets are 1/8" thick, full face polychloroprene (CR), 70 duometer.



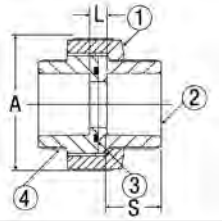
Nominal Size	Part No.	Approx. Lbs./Ea.
1/2	Use Figure No. & Nom. Size	0.11
3/4		0.12
1		0.13
1 1/4		0.14
1 1/2		0.15
2		0.20
2 1/2		0.25
3		0.28
4		0.30
6		0.40
8		0.50

Unions

Chemtrol
Fig. No.

6133/6233 FKM Socket Union (S x S)



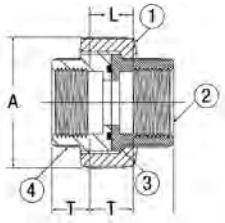


Nominal Size	Universal Black	Part No. Chem-Pure	Ctn. Qty.	Approx. Lbs./Ea.	Dim. A	Dim. L	Dim. S*
1/2	2897-005	7897-005	10	0.11	1.98	0.46	0.85
3/4	2897-007	7897-007	10	0.20	2.41	0.50	0.98
1	2897-010	7897-010	10	0.28	2.77	0.48	1.10
1 1/2	2897-015	7897-015	5	0.70	4.04	0.79	1.35
2	2897-020	7897-020	5	1.31	5.20	0.82	1.48

Unions are supplied with FKM O-Rings. EPDM O-Rings may be ordered for field replacement, where required. Socket x Thread is available on request. Threaded fittings are recommended for intermittent service not exceeding 20 psi.
* Socket Depth

6133-3-3/6233-3-3 FKM Threaded* Union (FPT x FPT)





Nominal Size	Universal Part No. Black	Chem-Pure	Ctn. Qty.	Approx. Lbs./Ea.	Dim. A	Dim. L	Dim. T**
1/2	2898-005	7898-005	10	0.12	1.17	1.30	0.43
3/4	2898-007	7898-007	10	0.20	2.41	1.55	0.45
1	2898-010	7898-010	10	0.29	2.77	1.62	0.53
1 1/4	2898-012	7898-012	5	0.67	4.04	2.17	0.55
1 1/2	2898-015	7898-015	5	0.74	4.04	2.39	0.55
2	2898-020	7898-020	5	1.39	5.20	2.63	0.57

Unions are supplied with FKM O-Rings. EPDM O-Rings may be ordered for field replacement, where required. Socket x Thread is available on request.
* Recommended for intermittent service not exceeding 20 psi.
** Thread Joint Engagement

*Chemtrol sells its products through a select group of highly trained distributors. Please call **800.343.5455** for a listing of distributors in your area.*

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Transition Unions

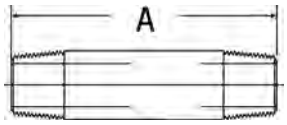
Chemtrol
Fig. No.

TCBR-3 Brass End Connector (FPT)
TCBR-4 Brass End Connector (MPT)
TCSS-3 Stainless Steel End Connector (FPT)
TCSS-4 Stainless Steel End Connector (MPT)

Refer to page 13 for purchase and assembly instructions of Transition Unions and for part number, size, carton quantity, weights, and dimensions of Metal End Connectors.

Nipples

6129 Threaded* Pipe Nipple (MPT x MPT)



	Length – 2"	
Nom. Size	Ctn. Qty.	Approx. Lbs./Ea.
1/2	10	0.02

Example of part identification
1/2" x Short PP Nipple – 6129 1/2" – SH

	Length – Close			Length – Short			Length – 3"	
Nom. Size	Ctn. Qty.	Approx. Lbs./Ea.	Dim. A	Ctn. Qty.	Approx. Lbs./Ea.	Dim. A	Ctn. Qty.	Approx. Lbs./Ea.
1/2	10	0.01	1.13	10	0.01	1.50	10	0.03
3/4	10	0.02	1.38	10	0.03	2.00	10	0.04
1	10	0.03	1.50	10	0.04	2.00	10	0.06
1 1/4	10	0.04	1.63	10	0.06	2.50	10	0.08
1 1/2	10	0.06	1.75	10	0.08	2.50	10	0.10
2	10	0.09	2.00	10	0.11	2.50	10	0.14
3	5	0.21	2.63	5	0.26	3.00	See Short	
4	5	0.35	2.88	5	0.50	4.00	See Close	

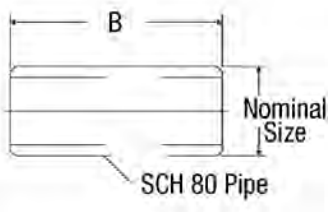
Chemtrol
Fig. No.

6129 Threaded* Pipe Nipple (MPT x MPT) (cont.)

	Length – 4"		Length – 5"		Length – 6"	
Nom. Size	Ctn. Qty.	Approx. Lbs./Ea.	Ctn. Qty.	Approx. Lbs./Ea.	Ctn. Qty.	Approx. Lbs./Ea.
1/2	10	0.04	10	0.05	10	0.06
3/4	10	0.06	10	0.07	10	0.09
1	10	0.08	10	0.10	10	0.12
1 1/4	10	0.12	10	0.14	10	0.18
1 1/2	10	0.14	10	0.18	10	0.21
2	10	0.20	10	0.24	10	0.30
3	5	0.37	5	0.46	5	0.59
4	See Short		5	0.72	5	0.85

*Recommended for intermittent service not exceeding 20 psi.

6131 Plain End Pipe Nipple (SPG x SPG)



Used for joining any Sch. 80 Polypropylene fitting face-to-face.

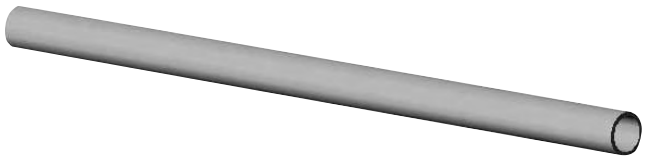
Nominal Size	Part Number	Ctn. Qty.	Approx. Lbs./Ea.	Dim. B
1/2	↑	6	0.02	1.62
3/4		10	0.03	2.86
1	Use	10	0.05	2.08
1 1/2	Figure No. &	10	0.10	2.56
2	Nom. Size	10	0.16	2.77
3		6	0.40	3.48
4		6	0.69	4.26
6	↓	3	1.80	5.70

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Pipe

Chemtrol
Fig. No.

6500/6600-80 (1/2"-6") Plain End Schedule 80 Pipe (20 ft. Lengths)

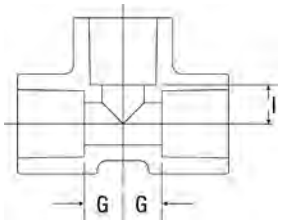


Pipe is ordered and specified with the Chemtrol figure number followed by the nominal size (e.g., 1 1/2" Schedule 80 PVDF Pipe – 6500-80- 1 1/2"). Weights and dimensions for all pipe may be found on page 38 of this catalog.

Tees

6511/6611 Socket Tee (S x S x S)

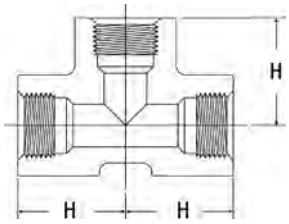




Nominal Size	Universal Part No. Red	Natural	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G	Dim. I
1/2	3801-005	4801-005	5	0.16	0.52	0.52
3/4	3801-007	4801-007	5	0.29	0.69	0.69
1	3801-010	4801-010	5	0.47	0.74	0.74
1 1/2	3801-015	4801-015	2	0.79	1.04	1.04
2	3801-020	4801-020	2	1.36	1.23	1.23
3	3801-030	4801-030	2	2.61	1.80	1.80
4	3801-040	4801-040	2	4.50	2.28	2.28
6	3801-060	4801-060	1	11.33	3.39	3.39

6512-3-3/6612-3-3 Thread Tee (FPT x FPT x FPT)





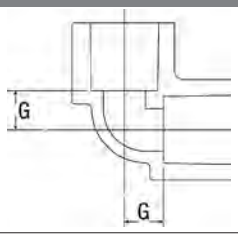
Nominal Size	Universal Part No. Red	Natural	Ctn. Qty.	Approx. Lbs./Ea.	Dim. H
1/2	3805-005	4805-005	5	0.18	1.37
3/4	3805-007	4805-007	5	0.30	1.60
1	3805-010	4805-010	5	0.44	1.84
1 1/2	3805-015	4805-015	2	0.92	2.39
2	3805-020	4805-020	2	1.31	2.71

Elbows

Chemtrol
Fig. No.

6507/6607 Socket 90° ELL (S x S)

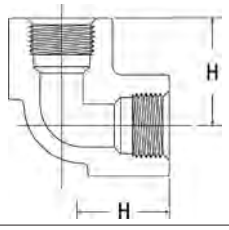




Nominal Size	Universal Part No. Red	Natural	Ctn. Qty.	Approx. Lbs./Ea.	Dim. G
1/2	3806-005	4806-005	5	0.12	0.52
3/4	3806-007	4806-007	5	0.18	0.69
1	3806-010	4806-010	5	0.28	0.74
1 1/2	3806-015	4806-015	2	0.56	1.04
2	3806-020	4806-020	2	0.95	1.23
3	3806-030	4806-030	2	2.51	1.80
4	3806-040	4806-040	2	4.02	2.28
6	3806-060	4806-060	1	9.76	3.39

6507-3-3/6607-3-3 Thread 90° ELL (FPT x FPT)

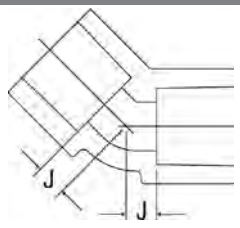




Nominal Size	Universal Part No. Red	Natural	Ctn. Qty.	Approx. Lbs./Ea.	Dim. H
1/2	3808-005	4808-005	5	0.13	1.37
3/4	3808-007	4808-007	5	0.20	1.60
1	3808-010	4808-010	5	0.32	1.84
1 1/2	3808-015	4808-015	2	0.64	2.39
2	3808-020	4808-020	2	0.80	2.71

6506/6606 Socket 45° ELL (S x S)





Nominal Size	Universal Part No. Red	Natural	Ctn. Qty.	Approx. Lbs./Ea.	Dim. J
1/2	3817-005	4817-005	5	0.10	0.27
3/4	3817-007	4817-007	5	0.14	0.33
1	3817-010	4817-010	5	0.29	0.37
1 1/2	3817-015	4817-015	2	0.49	0.46

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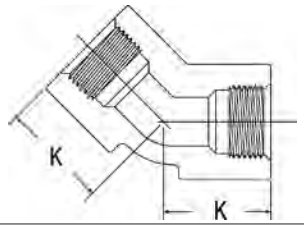
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6506/6607 Socket 45° ELL (S x S) (cont.)

Chemtrol Fig. No.	Nominal Size	Universal Part No. Red	Universal Part No. Natural	Ctn. Qty.	Approx. Lbs./Ea.	Dim. J
	2	3817-020	4817-020	2	0.68	0.59
	3	3817-030	4817-030	2	1.53	0.77
	4	3817-040	4817-040	2	2.71	0.99
	6	3817-060	4817-060	1	6.40	1.69

6506-3-3/6606-3-3 Thread 45° ELL (FPT x FPT)



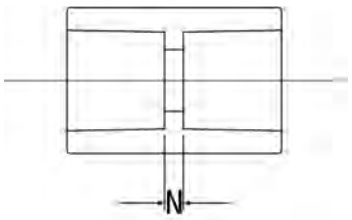


Chemtrol Fig. No.	Nominal Size	Universal Part No. Red	Universal Part No. Natural	Ctn. Qty.	Approx. Lbs./Ea.	Dim. K
	1/2	3819-005	4819-005	5	0.12	1.12
	3/4	3819-007	4819-007	5	0.18	1.31
	1	3819-010	4819-010	5	0.29	1.47
	1 1/2	3819-015	4819-015	2	0.55	1.81
	2	3819-020	4819-020	2	0.80	2.07

Couplings

6501/6601 Socket Coupling (S x S)

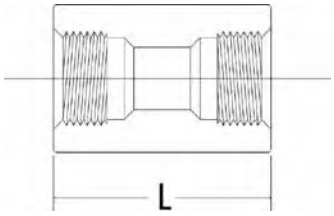




Chemtrol Fig. No.	Nominal Size	Universal Part No. Red	Universal Part No. Natural	Ctn. Qty.	Approx. Lbs./Ea.	Dim. N
	1/2	3829-005	4829-005	5	0.12	0.28
	3/4	3829-007	4829-007	5	0.16	0.27
	1	3829-010	4829-010	5	0.26	0.26
	1 1/2	3829-015	4829-015	2	0.49	0.25
	2	3829-020	4829-020	2	0.71	0.24
	3	3829-030	4829-030	2	1.43	0.21
	4	3829-040	4829-040	2	2.47	0.19
	6	3829-060	4829-060	1	5.49	0.21

6501-3-3/6601-3-3 Thread Coupling (FPT x FPT)



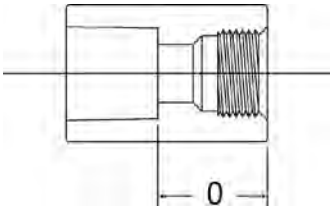


Chemtrol Fig. No.	Nominal Size	Universal Part No. Red	Universal Part No. Natural	Ctn. Qty.	Approx. Lbs./Ea.	Dim. L
	1/2	3830-005	4830-005	5	0.12	1.98
	3/4	3830-007	4830-007	5	0.16	2.22
	1	3830-010	4830-010	5	0.56	2.46
	1 1/2	3830-015	4830-015	2	0.49	2.95
	2	3830-020	4830-020	2	0.71	3.19

Adapters

6503/6603 Female Adapter Coupling (S x FPT)





Chemtrol Fig. No.	Nominal Size	Universal Part No. Red	Universal Part No. Natural	Ctn. Qty.	Approx. Lbs./Ea.	Dim. O
	1/2	3835-005	4835-005	5	0.12	1.13
	3/4	3835-007	4835-007	5	0.16	1.25
	1	3835-010	4835-010	5	0.26	1.36
	1 1/2	3835-015	4835-015	2	0.49	1.60
	2	3835-020	4835-020	2	0.71	1.72

*For complete technical information and more, refer to our website at **www.chemtrol.com**.*

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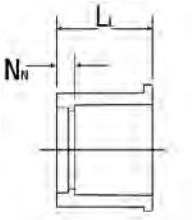
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Bushings

Chemtrol
Fig. No.

6518/6618 Flush Socket Reducer Bushing (SPG x S)



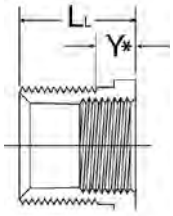


Nominal Size	Universal Part No. Red	Natural	Ctn. Qty.	Approx. Lbs./Ea.	Design Style*	Dim. LL	Dim. NN
3/4 x 1/2	3837-101	4837-101	5	0.08	S	1.40	0.55
1 x 3/4	3837-131	4837-131	5	0.08	S	1.52	0.55
1 1/2 x 1	3837-249	4837-168	5	0.34	S	1.79	0.69
2 x 1	3837-249	4837-249	5	0.63	S	1.89	0.79
2 x 1 1/2	3837-251	4837-251	5	0.50	S	1.89	0.54
3 x 2	3837-338	4837-338	5	0.88	S	2.36	0.88
4 x 3	3837-422	4837-442	5	1.36	S	2.74	0.89
6 x 4	3837-532	4837-532	2	4.67	S	2.98	0.76

* All Bushings have solid walls. See pg. 8 for detailed explanation.

6518-3-4/6618-3-4 Flush Thread Reducer Bushing (MPT x FPT)





Nominal Size	Universal Part No. Red	Natural	Ctn. Qty.	Approx. Lbs./Ea.	Design Style	Dim. LL	Dim. Y*
3/4 x 1/2	3839-101	4839-101	5	0.05	S	1.26	0.43
1 x 1/2	3839-130	4839-130	5	0.16	S	1.52	0.43
1 x 3/4	3839-131	4839-131	5	0.08	S	1.52	0.45
1 1/2 x 1	3839-211	4839-211	5	0.19	S	1.79	0.53
2 x 1	3839-249	4839-249	5	0.35	S	1.89	0.53
2 x 1 1/2	3839-251	4839-251	5	0.22	S	1.89	0.55

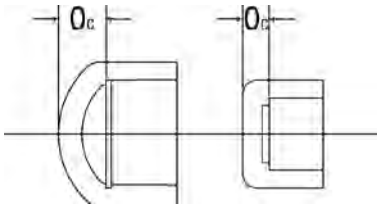
* Typical male component engagement, hand tight (L_1 in ANSI B1.20.1 thread spec.) plus 1 1/2 turns plus.
** All Bushings have solid walls. See pg. 8 for detailed explanation.

Caps

Chemtrol
Fig. No.

6517/6617 Socket Cap (S)



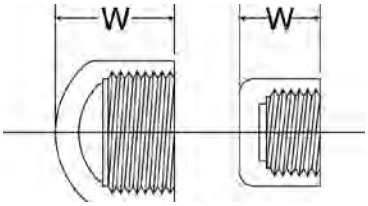


Nominal Size	Universal Part No. Red	Natural	Ctn. Qty.	Approx. Lbs./Ea.	Dim. OC
1/2	3847-005	4847-005	5	0.07	0.40
3/4	3847-007	4847-007	5	0.10	0.37
1	3847-010	4847-010	5	0.17	0.41
1 1/2	3847-015	4847-015	2	0.29	0.40
2	3847-020	4847-020	2	0.48	0.41

Note: Caps are flat top style.

6517-3/6617-3 Thread Cap (FPT)





Nominal Size	Universal Part No. Red	Natural	Ctn. Qty.	Approx. Lbs./Ea.	Dim. W
1/2	3848-005	4848-005	5	0.07	1.25
3/4	3848-007	4848-007	5	0.10	1.34
1	3848-010	4848-010	5	0.17	1.51
1 1/2	3848-015	4848-015	2	0.33	1.75
2	3848-020	4848-020	2	0.48	1.88

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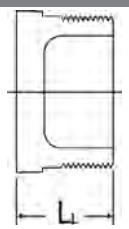
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Plugs

Chemtrol
Fig. No.

6516-4/6616-4 Thread Plug (MPT)



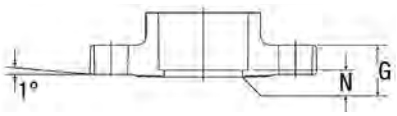


Nominal Size	Universal Part No. Red	Natural	Ctn. Qty.	Approx. Lbs./Ea.	Dim. L
1/2	3850-005	4850-005	5	0.03	1.14
3/4	3850-007	4850-007	5	0.08	1.26
1	3850-010	4850-010	5	0.10	1.48
1 1/2	3850-015	4850-015	2	0.18	1.78
2	3850-020	4850-020	2	0.26	1.89

Class 150 Flanges

6551-W/6651-W Socket Flange (S), One-Piece (Webbed Design)



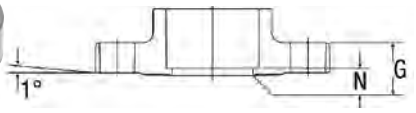


Nominal Size	Universal Part No. Red	Natural	Ctn. Qty.	Approx. Lbs./Ea.	Dim G	Dim. N
2	3851-020	4851-020	2	0.89	0.90	0.27
3	3851-030	4851-030	2	1.97	1.10	0.34
4	3851-040	4851-040	2	2.97	1.21	0.31
6	3851-060	4851-060	1	4.54	1.32	0.21

Note: One-piece webbed flanges have oblong bolt holes which permit mating with ANSI B16.5, 150lb.; BS 1560, class 150; ISO 2084, PN10; and DIN 2532, PN10.

6551-H/6651-H Socket Flange (S), One-Piece (Solid)





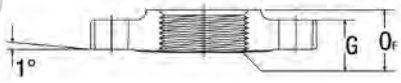
Nominal Size	Universal Part No. Red	Natural	Ctn. Qty.	Approx. Lbs./Ea.	Dim G	Dim. N
1/2	3851-H05	4851-H05	5	0.25	0.53	0.19
3/4	3851-H07	4851-H07	5	0.33	0.59	0.20
1	3851-H10	4851-H10	5	0.48	0.66	0.21
1 1/2	3851-H15	4851-H15	2	0.75	0.72	0.23
2	3851-H20	4851-H20	2	1.16	0.90	0.27
3	3851-H30	4851-H30	2	2.56	1.10	0.34
4	3851-H40	4851-H40	2	3.86	1.21	0.31
6	3851-H60	4851-H60	1	5.89	1.32	0.21

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Chemtrol
Fig. No.

6551-W-3/6651-W-3 Thread Flange (FPT), One-Pc (Webbed Design)



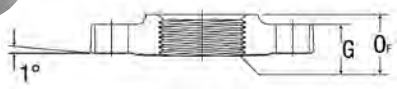


Nominal Size	Universal Part No. Red	Natural	Ctn. Qty.	Approx. Lbs./Ea.	Dim G	Dim. OF
2	3852-020	4852-020	2	0.88	0.90	1.15

Note: One-piece webbed flanges have oblong bolt holes which permit mating with ANSI B16.5, 150 lb.; BS 1560, class 150; ISO 2084, PN10; and DIN 2532, PN10.

6551-H-3/6651-H-3 Thread Flange (FPT), One Piece (Solid)

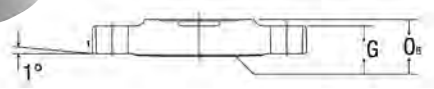




Nominal Size	Universal Part No. Red	Natural	Ctn. Qty.	Approx. Lbs./Ea.	Dim G	Dim. OF
1/2	3852-H05	4852-H05	5	0.25	0.53	0.87
3/4	3852-H07	4852-H07	5	0.34	0.59	0.88
1	3852-H10	4852-H10	5	0.47	0.66	1.07
1 1/2	3852-H15	4852-H15	2	0.71	0.72	1.11
2	3852-H20	4852-H20	2	1.10	0.90	1.15

6519-W/6619-W Blind Flange, One-Piece (Webbed Design)





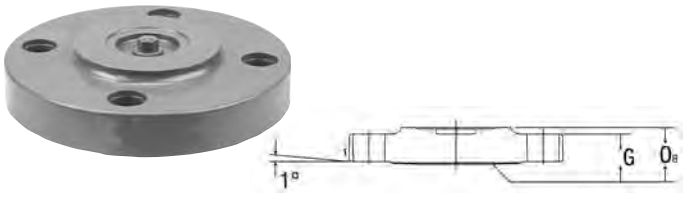
Nominal Size	Universal Part No. Red	Natural	Ctn. Qty.	Approx. Lbs./Ea.	Dim G	Dim. OB
2	3853-020	4853-020	2	0.91	0.90	1.10
3	3853-030	4853-030	2	2.08	1.10	1.36
4	3853-040	4853-040	2	3.02	1.21	1.45
6	3853-060	4853-060	1	5.33	1.32	1.58

Note: One-piece webbed flanges have oblong bolt holes which permit mating with ANSI B16.5, 150 lb.; BS 1560, class 150; ISO 2084, PN10; and DIN 2532, PN10.

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Chemtrol
Fig. No.

6519-H/6619-H Blind Flange, One-Piece (Solid)



Nominal Size	Universal Part No. Red	Natural	Ctn. Qty.	Approx. Lbs./Ea.	Dim G	Dim. OB
1/2	3853-H05	4853-H05	5	0.25	0.53	0.74
3/4	3853-H07	4853-H07	5	0.37	0.59	0.81
1	3853-H10	4853-H10	5	0.51	0.66	0.87
1 1/2	3853-H15	4853-H15	2	0.82	0.72	0.98
2	3853-H20	4853-H20	2	1.27	0.90	1.10
3	3853-H30	4853-H30	2	2.89	1.10	1.36
4	3853-H40	4853-H40	2	4.20	1.21	1.45
6	3853-H60	4853-H60	1	7.40	1.32	1.58

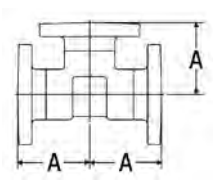
NR 51 Flange Gaskets, for Class 150 Flanges

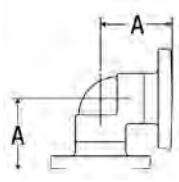
Note: These gaskets are 1/8" thick, full face Polychloroprene (CR), 70 duometer.

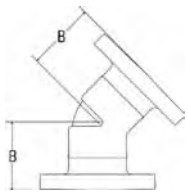
Nominal Size	Part No.	Approx. Lbs./Ea.
1/2	↑	0.11
3/4	|	0.12
1	Use Figure No.	0.13
1 1/4	& Nom. Size	0.14
1 1/2	|	0.15
2	↓	0.20

See page 12 for additional sizes.

Flanged Fittings*– Fabricated from Molded Components







Nominal Size	Fig. No. 6511-12 6611-12 Flanged Tee Approx. Lbs./Ea.	Dim. A	Fig. No. 6507-12 6607-12 Flanged 90° ELL Approx. Lbs./Ea.	Dim. A	Fig. No. 6506-12 6606-12 Flanged 45° ELL Approx. Lbs./Ea.	Dim. B
1/2	0.45	2 13/32	0.41	2 13/32	0.39	2 5/32
3/4	0.68	2 23/32	0.57	2 23/32	0.53	2 15/32
1	1.04	3 3/32	0.85	3 3/32	0.86	2 23/32
1 1/2	1.73	3 31/32	1.50	3 31/32	1.43	3 13/32
2	2.80	4 15/32	2.39	4 15/32	2.12	3 27/32

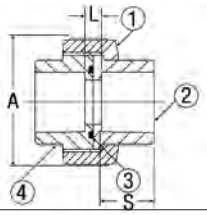
*Flanged fittings are produced by heat fusion of socket flanges to socket fittings with short plain end pipe nipples. They may be ordered as factory fabrications or may be assembled in the field. See also plain end pipe nipples on page 35.

Unions

Chemtrol
Fig. No.

6533/6633 FKM Socket Union (S x S)



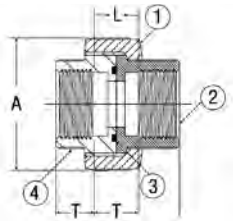


Nominal Size	Universal Part No. Red	Natural	Approx. Lbs./Ea.	Dim. A	Dim. L	Dim. S*
1/2	3897-005	4897-005	0.17	1.95	0.43	0.85
3/4	3897-007	4897-007	0.31	2.36	0.48	0.98
1	3897-010	4897-010	0.46	2.75	0.44	1.10
1 1/2	3897-015	4897-015	1.04	3.98	0.78	1.35
2	3897-020	4897-020	2.17	5.13	0.80	1.48

Unions are supplied with FKM O-Rings. EPDM O-Rings may be ordered for field replacement, where required. Socket x Thread is available on request.
*Socket Depth

6533-3-3/6633-3-3 FKM Socket Union (FPT x FPT)





Nominal Size	Universal Part No. Red	Natural	Approx. Lbs./Ea.	Dim. A	Dim. L	Dim. T*
1/2	3898-005	4898-005	0.18	1.95	1.27	0.43
3/4	3898-007	4898-007	0.32	2.36	1.53	0.45
1	3898-010	4898-010	0.47	2.75	1.58	0.53
1 1/2	3898-015	4898-015	1.11	3.98	2.38	0.55
2	3898-020	4898-020	2.24	5.13	2.61	0.57

Unions are supplied with FKM O-Rings. EPDM O-Rings may be ordered for field replacement, where required. Socket x Thread is available on request.
* Thread Joint Engagement

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Transition Unions

Materials of Construction

Item	Decription	Material
1	Union Nut	CPVC
2	End Connector	Brass/SS
3	O-Ring	EPDM
4	Union Tailpiece	CPVC

TCBR-3 Brass End Connector (FPT)
TCBR-4 Brass End Connector (MPT)
TCSS-3 Stainless Steel End Connector (FPT)
TCSS-4 Stainless Steel End Connector (MPT)

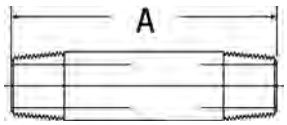
Refer to page 13 for purchase and assembly instructions of Transition Unions and for part number, size, carton, weights, and dimensions of Metal End Connectors.

Nipples

Chemtrol
Fig. No.

6529/6629 Threaded Pipe Nipple (MPT x MPT)

Example of part identification 1/2" x Short PVDF Nipple – 6129 1/2" – SH



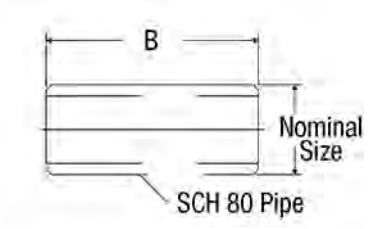
	Length – Close			Length – Short			Length – 3"	
Nom. Size	Ctn. Qty.	Approx. Lbs./Ea.	Dim. A	Ctn. Qty.	Approx. Lbs./Ea.	Dim. A	Ctn. Qty.	Approx. Lbs./Ea.
1/2	5	0.02	1.13	5	0.03	1.50	5	0.06
3/4	5	0.04	1.38	5	0.05	2.00	5	0.08
1	5	0.06	1.50	5	0.07	2.00	5	0.12
1 1/2	5	0.13	1.75	5	0.15	2.50	5	0.19
2	5	0.20	2.00	5	0.23	2.50	5	0.27

	Length – 4"		Length – 5"		Length – 6"	
Nom. Size	Ctn. Qty.	Approx. Lbs./Ea.	Ctn. Qty.	Approx. Lbs./Ea.	Ctn. Qty.	Approx. Lbs./Ea.
1/2	5	0.08	5	0.10	5	0.12
3/4	5	0.11	5	0.14	5	0.17
1	5	0.17	5	0.21	5	0.25
1 1/2	5	0.26	5	0.34	5	0.41
2	5	0.38	5	0.48	5	0.60

Chemtrol
Fig. No.

6531/6631 Plain End Pipe Nipple (SPG x SPG)

Used for fusion joining flanges to fitting or for joining any Sch. 80 fitting face-to-face.



Used for joining any Sch. 80 PVDF fitting face-to-face.

Nominal Size	Universal Part No.	Ctn. Qty.	Approx. Lbs./Ea.	Dim. B
1/2		12	0.04	1.63
3/4	Use Figure No.	12	0.06	1.86
1	&	12	0.09	2.08
1 1/2	Nom. Size	12	0.16	2.56
2		12	0.28	2.77
3		1	0.78	3.75

*For complete technical information and more, refer to our website at **www.chemtrol.com**.*

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Metric Equivalent Charts

Linear Conversion Table From Fractional Inches to Millimeters

inches		mm	inches		mm
1/64	.016	.397	33/64	.516	13.097
1/32	.031	.794	17/32	.531	13.494
3/64	.047	1.191	35/64	.547	13.891
1/16	.063	1.588	9/16	.563	14.288
5/64	.078	1.984	37/64	.578	14.684
3/32	.094	2.381	19/32	.594	15.081
7/64	.109	2.778	39/64	.609	15.478
1/8	.125	3.175	5/8	.625	15.875
9/64	.141	3.572	41/64	.641	16.272
5/32	.156	3.969	21/32	.656	16.669
11/64	.172	4.366	43/64	.672	17.066
3/16	.188	4.763	11/16	.688	17.463
13/64	.203	5.519	45/64	.703	17.859
7/32	.219	5.556	23/32	.719	18.256
15/64	.234	5.953	47/64	.734	18.653
1/4	.250	6.350	3/4	.750	19.050
17/64	.266	6.747	49/64	.766	19.447
9/32	.281	7.144	25/32	.781	19.844
19/64	.297	7.541	51/64	.797	20.241
5/16	.313	7.938	13/16	.813	20.638
21/64	.328	8.334	53/64	.828	21.034
11/32	.344	8.731	27/32	.844	21.431
23/64	.359	9.128	55/64	.859	21.828
3/8	.375	9.525	7/8	.875	22.225
25/64	.391	9.922	57/64	.891	22.622
13/32	.406	10.319	29/32	.906	23.019
27/64	.422	10.716	59/64	.922	23.416
7/16	.438	11.113	15/16	.938	23.813
29/64	.453	11.509	61/64	.953	24.209
15/32	.469	11.906	31/32	.969	24.606
31/64	.484	12.303	63/64	.984	25.003
1/2	.500	12.700	1	1.000	25.400

1 inch = 25.4 millimeters

English to Metric Conversion Table

Units	Change to	Multiply by
Inches	Millimeters	25.40
Inches	Centimeters	2.54
Inches	Meters	.0254
Feet	Meters	.3048
Miles	Kilometers	1.609347
Sq. Inches	Sq. Centimeters	6.452
Sq. Feet	Sq. Meters	.0929
Cu. Inches	Cu. Centimeters	16.3872
Cu. Feet	Cu. Meters	.02832
U.S. Gallons	Liters	3.7854
Pounds	Kilograms	.45359

Metric to English Conversion Table

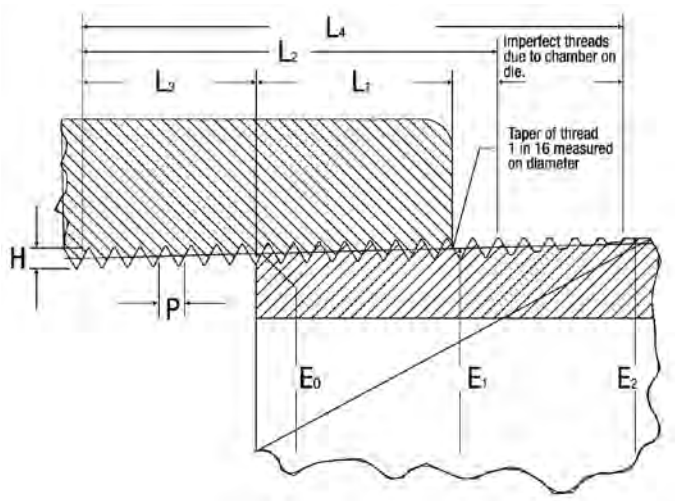
Units	Change to	Multiply by
Millimeters	Inches	.03937
Centimeters	Inches	.39371
Meters	Inches	39.371
Meters	Feet	3.281
Kilometers	Miles	.62137
Sq. Centimeters	Sq. Inches	.1550
Sq. Meters	Sq. Feet	10.7649
Cu. Centimeters	Cu. Inches	.061
Cu. Meters	Cu. Feet	35.314
Liters	U.S. Gallons	.26417
Kilograms	Pounds	2.20462

Physical Properties of Thermoplastic Piping Materials

ASTM Test Methods	Properties	Material PVC 12454-B	CPVC 23447-B	PVDF	Polypropylene
General					
D-792	Specific Gravity	1.38	1.55	1.76	.905
D-570	Water Absorption % 24 Hrs. @ 73° F	.05	.05	.04	.02
Mechanical					
D-638	Tensile Strength psi @ 73° F	7,940	8,400	6,000	5,000
D-638	Modulus of Elasticity in Tension psi @ 73° F x 10^5	4.2	4.2	2.1	1.7
D-790	Flexural Strength psi	14,500	15,600	9,700	7,000
D-256	Izod Impact Strength psi @ 73° F (Notched)	.65	3.0	3.8	1.3
Thermal					
D-696	Coefficient of Thermal Expansion in/in/° F x 10^{-5}	3.0	3.8	7.9	5.0
C-177	Thermal Conductivity BTU/HR/Sq. Ft./° F/in	1.2	.95	.79	1.2
D-648	Heat Distortion Temp. ° F @ 66 psi	NA	238	284	220
D-648	Heat Distortion Temp. ° F @ 264 psi	160	221	194	140
	Resistance to Heat ° F at Continuous Drainage	140	210	280	180
Flammability					
D-2863	Limiting Oxygen Index (%)	43	60	44	17
E-84	Flame Spread	15-20	15	0	NA
	Underwriters Lab Rating (Sub. 94)	94V-O	94V-O	94V-O	94HB

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American Standard Taper Pipe Thread, NPT

Nominal Size	Outside Diameter D	Number of Threads Per Inch n	Pitch of Thread p	Normal Engagement By Hand L_1	Length of Effective Thread L_2
in.	in.		in.	in.	in.
1/4	0.540	18	.05556	.228	.4018
1/2	0.840	14	.07143	.320	.5337
3/4	1.050	14	.07143	.339	.5457
1	1.315	11 1/2	.08696	.400	.6828
1 1/4	1.660	11 1/2	.08696	.420	.7068
1 1/2	1.900	11 1/2	.08696	.420	.7235
2	2.375	11 1/2	.08696	.436	.7565
2 1/2	2.875	8	.12500	.682	1.1375
3	3.500	8	.12500	.766	1.2000
4	4.500	8	.12500	.844	1.3000

Do not thread Schedule 40 pipe.

*For complete technical information and more, refer to our website at **www.chemtrol.com**.*

ANSI B16.5 Dimensional Data Flanges and Flanged Fittings

Dimensions‡		Drilling		
Nominal Pipe Size (In.)	Outside Diameter (In.)	Number of Holes	Diameter of Bolt (In.)	Diameter of Bolt Circle (In.)
1/2	3.50	4	1/2	2.38
3/4	3.88	4	1/2	2.75
1	4.25	4	1/2	3.12
1 1/4	4.62	4	1/2	3.50
1 1/2	5.00	4	1/2	3.88
2	6.00	4	5/8	4.75
2 1/2	7.00	4	5/8	5.50
3*	7.50	4	5/8	6.00
4*	9.00	8	5/8	7.50
6*	11.00	8	3/4	9.50
8*	13.50	8	3/4	11.75
10**	16.00	12	7/8	14.25
12**	19.00	12	7/8	17.00

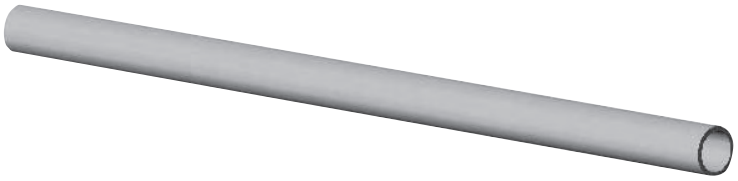
* Two piece "Van Stone" Design or one piece Solid Design.
** Two piece "Van Stone" Design only.
‡ Dimensions and bolts conform to ANSI B16.5 for 150 lb. steel flanges. Bolt holes are 1/8" larger in diameter than the required bolts.

(excerpt from ANSI B1.20.1 Thread Specifications)

Nominal Size (in.)	Wrench Makeup Length for Internal Thread L_3 (in.)	Total Length: End of Pipe to Vanish Point L_4 (in.)	Pitch Diameter at Beginning of External Thread E_0 (in.)	Pitch Diameter at Beginning of Internal Thread E_1 (in.)	Height of Thread (Max.) h (in.)
1/4	.1667	.5946	.47739	.49163	.04444
1/2	.2143	.7815	.75843	.77843	.05714
3/4	.2143	.7935	.96768	.98887	.05714
1	.2609	.9845	1.21363	1.23863	.06957
1 1/4	.2609	1.0085	1.55713	1.58338	.06957
1 1/2	.2609	1.0252	1.79609	1.82234	.06957
2	.2609	1.0582	2.26902	2.29627	.06957
2 1/2	.2500	1.5712	2.71953	2.76216	.10000
3	.2500	1.6337	3.34062	3.38850	.10000
4	.2500	1.7337	4.33438	4.38712	.10000

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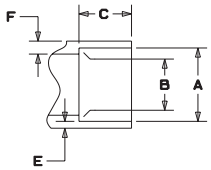
Schedule 80

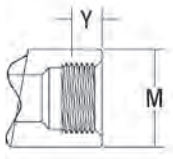


Pipe[1] 20 ft. Lengths

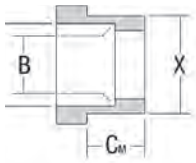
Nominal Pipe Size	Approximate Weight per 100 ft. PVC	CPVC	Polypropylene	Kynar® PVDF	Nom. Outside Diameter (In.)	Nom. Inside Diameter (In.)	Wall Thickness (in.) Nom.	Min.	Cross-sectional Area (in.²)	Internal Area (in.²)	Fluid Capacity (gal/100ft.)	Outside Surf. Area (ft²/100ft)	Threshold Flow[2] (GPM)
1/4"	10.1	11.9	-----	-----	.540	.282	.129	.119	.167	.062	.32	14.14	.97
1/2"	20.5	24.3	14.0	24.4	.840	.526	.157	.147	.337	.217	1.13	21.99	3.39
3/4"	27.8	32.9	18.9	33.0	1.050	.722	.164	.154	.457	.409	2.13	27.49	6.38
1"	40.4	48.5	27.1	48.7	1.315	.936	.1895	.179	.670	.688	3.57	34.43	10.72
1 1/4"	56.7	66.9	37.9	-----	1.660	1.255	.2025	.191	.927	1.237	6.43	43.46	19.28
1 1/2"	68.9	81.1	44.8	81.4	1.900	1.476	.212	.200	1.124	1.711	8.89	49.74	26.67
2"	94.9	108.5	62.3	112.6	2.375	1.913	.231	.218	1.556	2.874	14.93	62.18	44.79
2 1/2"	144.9	165.4	-----	-----	2.875	2.290	.2925	.276	2.373	4.119	21.40	75.27	64.19
3"	193.8	221.3	126.6	256.4	3.500	2.864	.318	.300	3.179	6.442	33.47	91.63	100.40
4"	283.3	323.4	185.2	357.0	4.500	3.786	.357	.337	4.647	11.258	58.48	117.81	175.44
6"	541.1	616.8	359.9	714.3	6.625	5.709	.458	.432	8.873	25.598	132.98	173.44	398.93
8"	821.9	905.8	-----	-----	8.625	7.565	.530	.500	13.479	44.948	233.49	225.80	700.48
10"	1227.7	-----	-----	-----	10.750	9.493	.6285	.593	19.985	70.778	367.68	281.43	1103.02
12"	1710.4	-----	-----	-----	12.750	11.294	.726	.687	27.495	100.181	520.79	333.79	1562.36

1 Dimensions shown are listed in ASTM D-1785 and F-441 for PVC and CPVC Schedule 80 Plastic Pipe, respectively.
2 Upper Threshold Rate of Flow = 5 ft./sec. fluid velocity.









Fittings[1]

Size	IPS Dia	Solvent Socket (S) A[3]	B[3]	C[4] Nom	Female Threads (FPT) Y[2]	M[5] Min	Male Threads (MPT) Z[2]	Male End (SPG) X	Cm[4] Nom	Wall Thickness F[4] Min	E[4] Min
1/4"	.540	.552	.536	.640	.311	.840	.311	.540	.655	.149	.119
1/2"	.840	.848	.836	.890	.427	1.280	.427	.840	.905	.185	.147
3/4"	1.050	1.058	1.046	1.015	.446	1.500	.446	1.050	1.030	.195	.154
1"	1.315	1.325	1.310	1.140	.530	1.810	.530	1.315	1.155	.225	.179
1 1/4"	1.660	1.670	1.655	1.265	.550	2.200	.550	1.660	1.280	.240	.191
1 1/2"	1.900	1.912	1.894	1.390	.550	2.500	.550	1.900	1.405	.250	.200
2"	2.375	2.387	2.369	1.515	.566	2.375	.566	2.375	1.530	.275	.218
2 1/2"	2.875	2.889	2.868	1.780	.870	3.560	.870	2.875	1.810	.345	.276
3"	3.500	3.516	3.492	1.905	.954	4.300	.954	3.500	1.933	.375	.300
4"	4.500	4.518	4.491	2.280	1.032	5.430	1.032	4.500	2.310	.420	.337
6"	6.625	6.647	6.614	3.030	–	–	–	6.625	3.060	.540	.432
8"	8.625	8.655	8.610	4.500	–	–	–	8.625	4.590	.625	.500
10"	10.750	10.780	10.735	5.500	–	–	–	10.750	5.590	.741	.593
12"	12.750	12.780	12.735	6.500	–	–	–	12.750	6.590	.859	.687

1 With exception of thread lengths, dimensions shown are listed in ASTM D-2467 and F-439 for PVC and CPVC Socket-Type Schedule 80 Fittings respectively.
2 Dimensions shown are typical male component engagement, hand tight (L_1 in ANSI B1.20.1 thread spec.) plus 1 1/2 turns lightening.
3 Dimensions shown are not applicable for polypropylene or PVDF. Socket diameters in these materials are designed for Chemtrol thermo-seal socket fusion joining.
4 Chemtrol fittings may exceed certain minimum ASTM dimensional requirements in order to ensure functional satisfaction.
5 Dimensions are listed in ASTM D-2464 and F-437 for PVC and CPVC Threaded Schedule 80 Fittings, respectively.

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Pressure Ratings of Chemtrol Products

Pipe and Fittings

In order to determine the pressure rating for product system, first find the plastic material and schedule (wall thickness—see Reference Data—Schedule 80 components on page 38 for additional information) of pipe and fittings in the heading of the Maximum Nonshock Operating Pressure table below. Then, locate the selected joining method in the subheading of the table and go down the column to the value across from a particular pipe size, listed in the far left column. This will be the maximum non-shock operating pressure at 73° F for the defined product system.

Maximum Nonshock Operating Pressure (psi) at 73° F[1]

Nom. Pipe Size	Schedule 40 PVC & CPVC	Schedule 80 PVC & CPVC		Schedule 80 Polypropylene		Schedule 80 PVDF (Kynar®)	
	Socket End	Socket End	Threaded End	Thermo-Seal Joint	Threaded[3] End	Thermo-Seal Joint	Threaded End
1/2	600	850	420	410	20	580	290
3/4	480	690	340	330	20	470	230
1	450	630	320	310	20	430	210
1 1/4	370	520	260	260	20	-----	-----
1 1/2	330	470	240	230	20	326	160
2	280	400	200	200	20	270	140
2 1/2	300	420	210	-----	-----	-----	-----
3	260	370	190	190	20	250	N.R.
4	220	320	160	160	20	220	N.R
6	180	280	N.R.	140	N.R.	190	N.R.
8	160	250[2]	N.R.	-----	-----	-----	-----
10	140	230	N.R.	-----	-----	-----	-----
12	130	230	N.R.	-----	-----	-----	-----

1 For more severe service, an additional correction factor may be required.
2 8" CPVC Tee, 90° ELL and 45° ELL rated at 1/2 of value shown.
3 Recommended for intermittent drainage pressure not exceeding 20 psi. Not available in natural polypropylene.
N.R. Not Recommended

As implied by the preceding, the pressure for all thermoplastic piping is a function of temperature. For pipe and fitting applications above 73° F, refer to the table at the top of the next column for the Temperature Correction Factors. To determine the maximum non-shock pressure rating at an elevated temperature, simply multiply the base pressure rating obtained from the upper table by the correction factor from the upper table in the next column. Below 73° F the pressure rating will be the same as the base pressure in the table above.

Temperature Conversion

F = C x 1.8 + 32 C= (F-32) ÷ 1.8

Temperature Correction Factors

Operating Temperature (° F)	Factors PVC	CPVC	PP	Kynar® PVDF
70	1.00	1.00	1.00	1.00
80	0.90	0.96	0.97	0.95
90	0.75	0.92	0.91	0.87
100	0.62	0.85	0.85	0.80
110	0.50	0.77	0.80	0.75
115	0.45	0.74	0.77	0.71
120	0.40	0.70	0.75	0.68
125	0.35	0.66	0.71	0.66
130	0.30	0.62	0.68	0.62
140	0.22	0.55	0.65	0.58
150	N.R.	0.47	0.57	0.52
160	N.R.	0.40	0.50	0.49
170	N.R.	0.32	0.26	0.45
180	N.R.	0.25	*	0.42
200	N.R.	0.18	N.R.	0.36
210	N.R.	0.15	N.R.	0.33
240	N.R.	N.R.	N.R.	0.25
280	N.R.	N.R.	N.R.	0.18

* Recommended for intermittent drainage pressure not exceeding 20 psi.
N.R. Not Recommended.

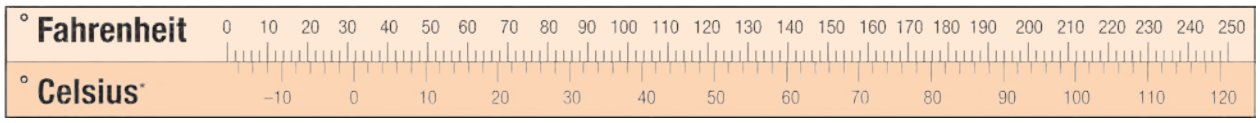
Valves, Unions, and Flanges

As with all other thermoplastic piping components, the maximum pressure rating for all Chemtrol valves, unions and flanges, regardless of size, is related to temperature as per the chart below.

Maximum Non-Shock Operating Pressure (psi) vs. Temperature

Operating Temperature (° F)	Model D Ball Valve PVC	CPVC	All Other Valves, Unions & Flanges PVC	CPVC	PP	PVDF
70	250	250	150	150	150	150
80	250	250	150	150	150	150
90	225	250	150	150	150	150
100	200	240	150	150	150	150
110	180	220	135	140	140	150
120	165	190	110	130	130	150
130	140	180	125	120	118	150
140	130	170	50	110	105	150
150	N.R.	160	N.R.	100	93	140
160	N.R.	150	N.R.	90	80	133
170	N.R.	140	N.R.	80	70	125
180	N.R.	130	N.R.	70	50	115
200	N.R.	65	N.R.	50	N.R.	97
210	N.R.	30	N.R.	25	N.R.	85
220	N.R.	N.R.	N.R.	N.R.	N.R.	75
240	N.R.	N.R.	N.R.	N.R.	N.R.	55
260	N.R.	N.R.	N.R.	N.R.	N.R.	40
280	N.R.	N.R.	N.R.	N.R.	N.R.	25

N.R. Not Recommended.



* Formerly known as Centigrade

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Many commercial, industrial, and governmental standards or specifications are available to assist the design engineer in specifying plastic piping systems. Standards most frequently referred to and most commonly called out in plastic piping specifications are ASTM Standards. These standards also often form the basis of other standards in existence. Below is a list and description of those standards most typically applied to industrial plastic piping.

ASTM D1784
(American Society for Testing and Materials)
This specification covers rigid PVC and CPVC compounds intended for general purpose use in extruded or molded formincluding pressure piping applications and nonpressure piping applicationscomposed of poly(vinyl chloride), chlorinated poly(vinyl chloride), or vinyl chloride copolymers containing at least 80 % vinyl chloride, and the necessary compounding ingredients.

ASTM D1785 and F441
These standards cover the specification and quality of Schedule 40, 80, and 120 PVC (D1785) and CPVC (F441) pressure pipe. Outlined in these standards are dimensional specifications, burst, sustained, and maximum operating pressure requirements and test procedures for determining pipe quality with respect to workmanship and materials.

ASTM D2466
This standard covers Schedule 40 PVC threaded and socket pressure fittings. Stipulated in the standard are thread and socket specifications, by lengths, wall thickness, burst, material, quality, and identification requirements.

ASTM D2467 and F439
These standards cover Schedule 80 PVC (D2467) and CPVC (F439) Socket Type and Threaded Pressure Fittings. Dimensions, burst strength, resin compound stipulation, and scheme of product identification requirements are specified.

ASTM D2564 and F493
These standards set forth requirements for PVC (D2564) and CPVC (F493) Solvent Cement. The specification identifies the resin compound to be used and stipulates minimum resin content, solution viscosities, and physical performance qualities.

ASTM F656
This specification covers requirements for primers for use with poly (vinyl chloride) (PVC) pipe and fittings that are to be joined by PVC solvent cements meeting the requirements of Specification .

ASTM D2855
This practice describes a procedure for making joints with poly (vinyl chloride) plastic (PVC) pipes, both plain ends and fittings, and bell ends, by means of solvent cements. These procedures are general ones for PVC piping.

ASTM D4101 (Formerly D2146)
This specification covers polypropylene materials suitable for injection molding and extrusion. Polymers consist of homopolymer, copolymers, and elastomer compounded with or without the addition of impact modifiers (ethylene-propylene rubber, polyisobutylene rubber, and butyl rubber), colorants, stabilizers, lubricants, or reinforcements.

ASTM D1599
This standard covers the test method for establishing the short-term hydraulic failure pressure of thermoplastic pipe, tubing, and fitting under specific temperature, time, and method of loading conditions. These test techniques are normally used for quality control.

ASTM D1598
This test method covers the determination of the time-to-failure of both thermoplastic and reinforced thermosetting/resin pipe under constant internal pressure.

ASTM D2837
This standard describes the procedure for obtaining the Hydrostatic Design Basis for all known thermoplastic pipe materials and for any practical temperature and medium. This was achieved by evaluating stress rupture data, taken from tests conforming to ASTM D1598, for the subject material and involved specified treatment and analysis of data.

ASTM D2657
This standard covers the procedure for heat-fusion bonding of polyolefin materials.

ASTM D3222
This standard covers the polymerization method and physical properties of PVDF (polyvinylidene fluoride) Fluoroplastic Materials for molding and extrusion.

Organizations other than ASTM issue standards that are commonly encountered in industrial thermoplastic piping design. The most important of these are described below.

ASME B1.20.1 (was B2.1)
(American National Standards Institute)
This specification details the dimensions and tolerance for tapered pipe threads. This standard is referenced in the ASTM standards for threaded fittings mentioned above. See page 37 for details.

ASME B16.5
This specification sets forth standards for bolt holes, bolt circles, and overall dimensions for steel 150# flanges. See page 37 for details.

NSF/ANSI 14
The physical, performance, and health effects requirements in this Standard apply to thermoplastic and thermoset plastic piping system components, including but not limited to pipes, fittings, valves, joining materials, gaskets, and appurtenances. The established physical, performance, and health effects requirements also apply to materials (resin or blended compounds) and ingredients used to manufacture plastic piping system components. This Standard provides definitions and requirements for materials, ingredients, products, quality assurance, marking, and record keeping.

Fittings and valves made from copper alloys containing more than 15% zinc by weight shall be resistant to dezincification and stress corrosion cracking (SCC) and shall meet the test requirements of this standard.

NSF/ANSI 61
This Standard establishes minimum health effects requirements for the chemical contaminants and impurities that are indirectly imparted to drinking water from products, components, and materials used in drinking water systems. This Standard does not establish performance, taste and odor, or microbial growth support requirements for drinking water system products, components, or materials.

This Standard is intended to cover specific materials or products that come into contact with: drinking water, drinking water treatment chemicals, or both. The focus of the Standard is evaluation of contaminants or impurities imparted indirectly to drinking water. The products and materials covered include, but are not limited to, process media (e.g., carbon, sand), protective materials (e.g., coatings, linings, liners), joining and sealing materials (e.g., solvent cements, welding materials, gaskets), pipes and related products (e.g., pipes, tanks, fittings), mechanical devices used in treatment/transmission/distribution systems (e.g., valves, chlorinators, separation membranes, point-of-entry drinking water treatment systems), and mechanical plumbing devices (e.g., faucets, endpoint control valves).

Technical Service
Technical assistance regarding standards, applications, product performance, design, and installation tips is available from Technical Services Technical Information Hotline: (888) 446-4226 phone; (888) 336-4226 fax.

Chemtrol is also able to provide:
- Material and Performance Certification Letters
- Returned Product Evaluation
- Product, Installation, and Design Seminars
- Technical Reports on a Variety of Subjects

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Chemtrol® offers a premium line of quality valves, fittings, and pipe for all of your flow-control applications.

		Polyvinyl Chloride (PVC) 	Chlorinated Polyvinyl Chloride (Corzan® CPVC) 
Typical Applications		Chemical processing, industrial plating, chilled water distribution, chemical drainage, and irrigation systems	Systems for hot corrosive liquids, hot and cold water distribution, chemical processing, industrial plating, deionized water lines, chemical drainage, waste water treatment systems, and similar applications above the temperature range of PVC
Joining Methods		Solvent cementing, threading, or flanging	Solvent cementing, threading, or flanging
Max. Service Temperature		140° F/60° C	210° F/99° C
Fittings	Schedule 80	Socket– 1/2" through 12" Threaded– 1/4" through 4"	Socket– 1/4" through 12" Threaded– 1/4" through 4", Van Stone flanges
	Large diameter	Schedules 40 and 80 10" and 12" couplings, tees, 90° and 45° elbows, reducer bushings, and Van Stone flanges	10" and 12" couplings, tees, 90° and 45° elbows, reducer bushings
Valves	Tru-Bloc/True Union ball valves*	1/2" through 6" socket, threaded, and flanged connections	1/2" through 6" socket, threaded, and flanged connections
	Tru-Bloc/True Union ball check valves	1/2" through 4" with socket, threaded, or flanged ends	1/2" through 4" with socket, threaded, or flanged ends
	Butterfly valves*	EPDM and FKM liner	EPDM and FKM liner 3" only
	Multiport valves*	True Union 3-way/3-position; 1/2" through 2" with socket or threaded ends	True Union 3-way/3-position; 1/2" through 2" with socket or threaded ends
	Specialty valves	Angle and Y pattern: 1/4" through 1" threaded Needle and Chemcock: 1/4" threaded	
Pipe			

*For pneumatic or electric actuation.

Refer to Chemtrol Technical Manuals for pressure ratings at various temperatures.

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Polypropylene (PP)		Polyvinylidene Fluoride (KYNAR® PVDF)	
Black Polypropylene: Clean chemical processes, hot corrosive liquids, industrial plating, waste treatment systems	**Natural Polypropylene:** Deionized water systems, clean chemical processes, pharmaceutical operations, food processing	**Red KYNAR®** PVDF, which protects fluid medium from UV exposure, is an excellent material for general industrial applications, especially outdoor installations.	**Natural KYNAR®** (Unpigmented) PVDF is ideal for industries such as electronics, pharmaceuticals, and processed foods or beverages.
Socket heat fusion, threading, or flanging	Socket heat fusion, threading, or flanging	Socket heat fusion, threading, or flanging	Socket heat fusion, threading, or flanging
180° F/82° C	180° F/82° C	280° F/138° C	280° F/138° C
IPS socket type– 1/2" through 6" Threaded– 1/2" through 4"	IPS socket type– 1/2" through 4" Threaded– 1/2" through 4"	IPS socket type– 1/2" through 6" Threaded– 1/2" through 2"	IPS socket type– 1/2" through 6" Threaded– 1/2" through 2"
1/2" through 4" with socket, threaded, or flanged ends	1/2" through 4" with socket ends	1/2" through 4" with socket, threaded, or flanged ends	1/2" through 4" with socket, threaded, or flanged ends
1/2" through 2" with socket, threaded, or flanged ends	1/2" through 2" with socket, threaded or flanged ends	1/2" through 2" with socket, threaded, or flanged ends	1/2" through 2" with socket, threaded, or flanged ends
NIBCO socket fusion equipment for joining PP and KYNAR® (PVDF) fittings 1/2" through 6"			
Schedule 40 and 80 wall thicknesses		Schedule 40 and 80 wall thicknesses	

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Every solution begins with a good idea.

We've got ideas that flow directly to solutions for your industrial piping applications. Ideas that make your installations easier and more cost-effective. Ideas that work, and ideas that last. Our ideas are strengthened by a sound foundation for growth and a solid commitment to service.

For ideas that fit your flow-control applications, call on us. We're Chemtrol, a product line committed to innovation, growth, and superiority in thermoplastics—**ideas whose time has come**.

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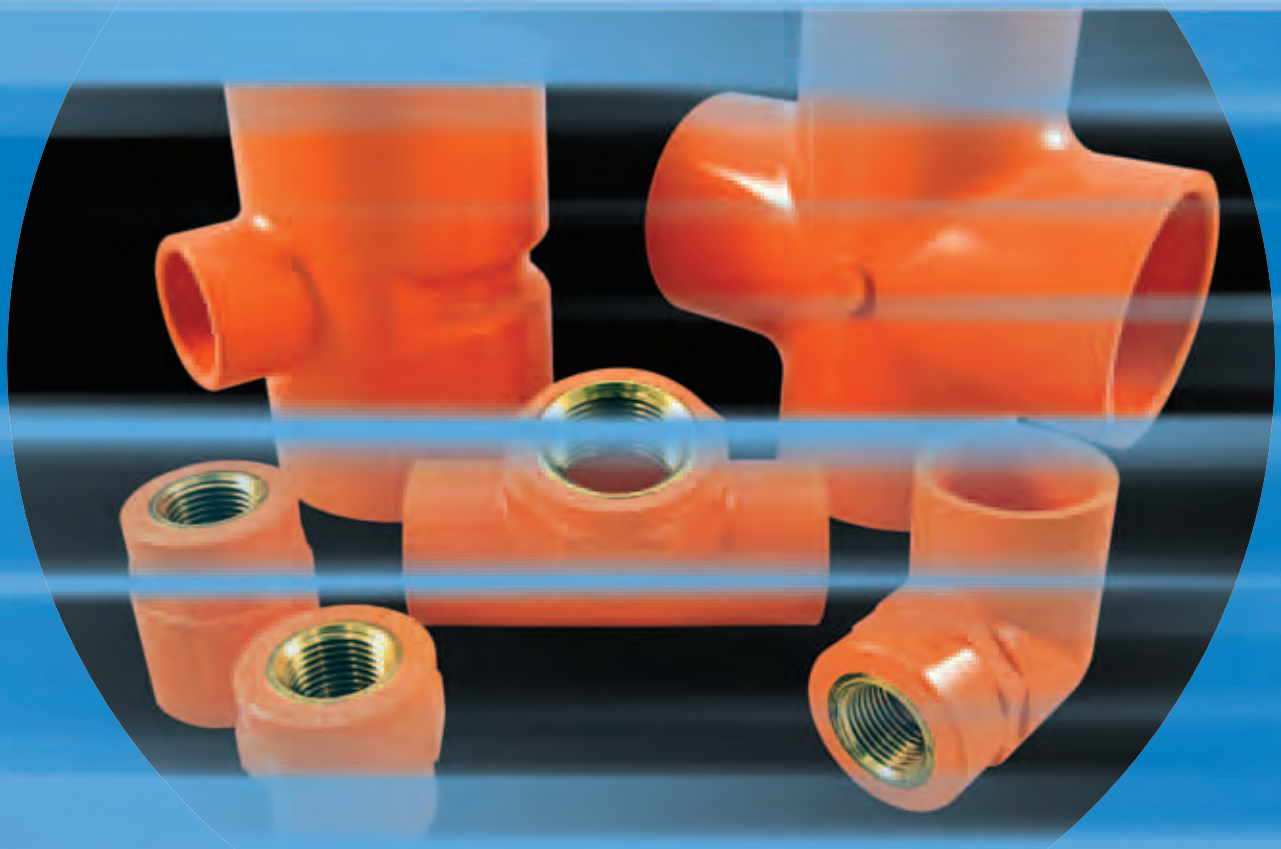
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C-CHFT-0412

CATALOG C-BLZM-0612

NIBCO®

AHEAD OF THE FLOW®









CPVC BlazeMaster® Fire Protection Fittings



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BlazeMaster® FIRE SPRINKLER FITTINGS

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Numerical Index

CPVC BlazeMaster® Fire Protection Fittings

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Key to NIBCO Figure Numbers

TYPE OF MATERIAL

50 = CPVC Fire Protection

TYPE OF FITTING & DESCRIPTION

01 = Coupling
03 = Female Adapter
04 = Male Adapter
06 = 45° Elbow
07 = 90° Elbow
11 = Tee
12 = Sprinkler Head Tee (Thread on Outlet)
14 = Sprinkler Head Tee (Thread on Run)
17 = Cap
18 = Bushing
19 = Blind Flange
33 = Unions
35 = Cross
51 = Solid Flange

TYPE OF CONNECTIONS

2 = Fitting Connection Spigot
3 = Female NPT Thread Connection
4 = Male NPT Thread Connection
S = Sprinkler Head Adapter
BI = Brass Insert
BT = BRASTIC®
R = Reducing

Fitting Terms and Abbreviations

FNPT = Female NPT Thread
MNPT = Male NPT Thread
S or SLIP = Female Socket
SPG = Male End (Spigot)
G = Grooved
L = Large
S = Small
H = Heavy
IPS = Iron Pipe Size
CTS = Copper Tube Size
Q = Quart
P = Pint

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FIRE SPRINKLER FITTINGS

Specifications and Engineering Data

Introduction

NIBCO® ***BlazeMaster***® CPVC Fire Sprinkler products produced by NIBCO are manufactured from high quality, Post-Chlorinated Polyvinyl Chloride (CPVC), a specialty thermoplastic material tested and listed by certifying agencies for use in CPVC fire sprinkler systems. NIBCO CPVC Fire Sprinkler products provide unique advantages over traditional metal fire sprinkler systems through superior hydraulics, ease of installation and handling and quick assembly using readily available, inexpensive tools. These products also are based on a technology with a continuous and proven service history of more than forty (40) years.

Pressure Rating

NIBCO ***BlazeMaster***® CPVC Fittings of nominal sizes 3/4" – 3" (20 – 80 mm) are rated for continuous service of 175 psi (1270 kPa) at 150°F (65°C).

Approvals

NIBCO ***BlazeMaster***® CPVC fittings for fire sprinkler systems meet the approval and listing requirements of NFPA 13, 13D, and 13R.

NIBCO ***BlazeMaster***® CPVC Fittings are listed by NSF to ANSI / NSF Standard 61 for health effects and may be used in potable water applications.

NIBCO ***BlazeMaster***® CPVC Fittings carry the markings of Factory Mutual (FM) and Underwriters Laboratories Inc. (C-UL-US) for listings in the United States and Canada.

NIBCO ***BlazeMaster***® CPVC 3/4" to 3" Fittings are listed by the Loss Prevention Safety Board (LPCB).

NIBCO ***BlazeMaster***® CPVC Fittings are accepted for use by the City of New York Department of Buildings MEA 280-07-E.

c UL us
LISTED
CPVC FIRE SPRINKLER FITTING
7TA2

NSF
Certified by NSF International. Listed for use with potable water.

LPCB
LOSS PREVENTION CERTIFICATION BOARD

FM
APPROVED

Use with other Manufacturers' Pipes, Fittings, & Solvent Cements

NIBCO ***BlazeMaster***® CPVC Fire Sprinkler products are listed by UL standard 1821 & C-UL standard UCC/ORD-C199P and FM standard 1635. These listings require rigorous testing to ensure the products will function as a component of the assembled fire protection system. For Fire Protection CPVC pipe the current UL standard is 1821 & C-UL standard UCC/ORD-C199P and FM standard 1635. NIBCO warrants our fittings with all CPVC pipe and fittings that are in compliance with the same listings by UL & FM. A current list of compatible UL and C-UL Listed CPVC manufacturers are: Viking (pipe), Harvel (pipe), TYCO Fire Products (pipe & fittings), IPEX (pipe & fittings) and Spears (pipe & fittings).

NOTICE: While NIBCO ***BlazeMaster***® CPVC Fire Sprinkler Products are UL Listed for use in combination with other listed manufacturers' products, specific application approvals may not be the same among manufacturers. It is the installer's responsibility to verify suitability of products used in combination according to each manufacturer's installation instructions. Contact NIBCO if you have questions on any application not addressed in this manual.

Engineering Data – Product Specifications

NIBCO ***BlazeMaster***® CPVC Fire Sprinkler Products are made for use with Listed CPVC Fire Sprinkler Pipe Produced in SDR 13.5 dimensions, as specified in ASTM F 442.

NIBCO ***BlazeMaster***® CPVC Fire Sprinkler Fittings are produced in Schedule 40 dimensions for sizes 3/4 inch (20 mm) through 1-1/4 inch (32 mm) in accordance with ASTM F 438 and Schedule 80 dimensions for sizes 1-1/2 inch (40 mm) through 3 inch (80 mm) in accordance with ASTM F 439. These products are UL and C-UL Listed, and FM Approved for a rated working pressure of 175 psi (1200 kPa) at 150°F (65°C) for sprinkler service.

Installation Instructions

For complete installation instructions see NIBCO's "Installation and Design Manual."

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CPVC Standard Fire Protection Fittings

Grooved Adapters 8
Bushings 8
Caps 9
Couplings 9
Crosses 9
Elbows 10
Tees 11
Unions 12

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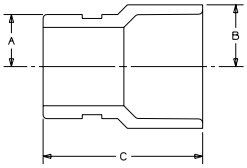
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BlazeMaster® Fire Protection Fittings – STANDARD

ADAPTERS

5001-G





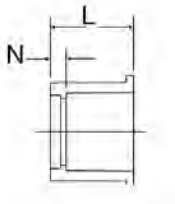
Grooved Coupling Adapters (G x S)

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES	JOINT
5001-G	1-1/4"	0.17	0.83	1.04	2.98	GXS
5001-G	1-1/2"	0.20	0.95	1.17	3.15	GXS
5001-G	2"	0.30	1.18	1.43	3.37	GXS
5001-G	2-1/2"	0.52	1.43	1.74	3.66	GXS
5001-G	3"	0.72	3.50	—	—	GXS

BUSHINGS

5018





Bushings

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. L INCHES	DIM. N INCHES	JOINT
5018	1"x3/4"	0.04	1.28	0.29	SPGXS
5018	1-1/4"x1"	0.08	1.41	0.29	SPGXS
5018	1-1/4"x3/4"	0.10	1.41	0.41	SPGXS
5018	1-1/2"x1-1/4"	0.07	1.54	0.27	SPGXS
5018	1-1/2"x1"	0.12	1.54	0.39	SPGXS
5018	1-1/2"x3/4"	0.16	1.54	0.53	SPGXS
5018	2"x1-1/2"	0.16	1.66	0.27	SPGXS
5018	2"x1-1/4"	0.20	1.66	0.40	SPGXS
5018	2"x1"	0.22	1.66	0.52	SPGXS
5018	2"x3/4"	0.22	1.66	0.64	SPGXS
5018	2-1/2"x2"	0.24	1.94	0.44	SPGXS
5018	2-1/2"x1-1/2"	0.36	1.94	0.57	SPGXS
5018	2-1/2"x1-1/4"	0.37	1.94	0.68	SPGXS
5018	2-1/2"x1"	0.36	1.94	0.81	SPGXS
5018	3"x2-1/2"	0.47	2.42	0.60	SPGXS
5018	3"x2"	0.66	2.42	0.93	SPGXS
5018	3"x1-1/2"	0.73	2.42	1.03	SPGXS

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FIRE SPRINKLER FITTINGS

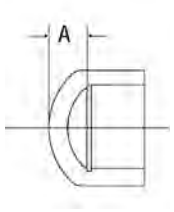
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CAPS

5017





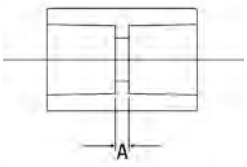
Caps

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	JOINT
5017	3/4"	0.04	0.31	S
5017	1"	0.06	0.39	S
5017	1-1/4"	0.22	0.56	S
5017	1-1/2"	0.30	0.68	S
5017	2"	0.42	0.68	S
5017	2-1/2"	0.62	1.20	S
5017	3"	0.96	1.26	S

COUPLINGS

5001
5001-R





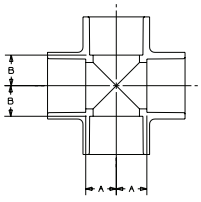
Couplings

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	JOINT
5001	3/4"	0.06	0.12	SXS
5001	1"	0.08	0.09	SXS
5001	1-1/4"	0.12	0.08	SXS
5001	1-1/2"	0.30	0.27	SXS
5001	2"	0.44	0.28	SXS
5001	2-1/2"	0.72	0.20	SXS
5001	3"	1.10	0.22	SXS
5001-R	1"x3/4"	0.08	0.29	SXS
5001-R	1-1/4"x1"	0.12	0.35	SXS
5001-R	1-1/2"x1-1/4"	0.38	0.51	SXS
5001-R	1-1/2"x1"	0.36	0.67	SXS
5001-R	1-1/2"x3/4"	0.34	0.80	SXS
5001-R	2"x1-1/2"	0.52	0.51	SXS
5001-R	2"x1"	0.48	0.75	SXS

CROSSES

5035
5035-R





Crosses

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	JOINT
5035	3/4"	0.12	0.61	0.61	SXSXSXS
5035	1"	0.24	0.75	0.75	SXSXSXS
5035	1-1/4"	0.34	0.90	0.90	SXSXSXS
5035	1-1/2"	0.69	1.23	1.23	SXSXSXS
5035	2"	1.02	1.53	1.53	SXSXSXS
5035	2-1/2"	1.70	1.75	1.75	SXSXSXS
5035	3"	3.12	1.89	1.89	SXSXSXS
5035-R	1"x1"x3/4"x3/4"	0.18	0.61	0.73	SXSXSXS

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FIRE SPRINKLER FITTINGS

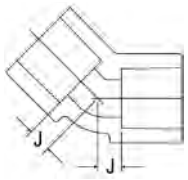
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ELBOWS

5006



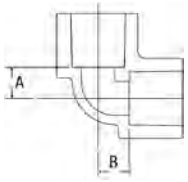


45° Elbows

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. J INCHES	JOINT
5006	3/4"	0.06	0.32	SXS
5006	1"	0.12	0.39	SXS
5006	1-1/4"	0.18	0.48	SXS
5006	1-1/2"	0.36	0.47	SXS
5006	2"	0.54	0.58	SXS
5006	2-1/2"	1.00	0.65	SXS
5006	3"	1.28	0.76	SXS

5007
5007-R





90° Elbows

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	JOINT
5007	3/4"	0.08	0.56	0.56	SXS
5007	1"	0.14	0.69	0.69	SXS
5007	1-1/4"	0.22	0.91	0.91	SXS
5007	1-1/2"	0.41	1.06	1.06	SXS
5007	2"	0.60	1.24	1.24	SXS
5007	2-1/2"	1.16	1.50	1.50	SXS
5007	3"	1.66	1.81	1.81	SXS
5007-R	1"x3/4"	0.12	0.61	0.75	SXS

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FIRE SPRINKLER FITTINGS

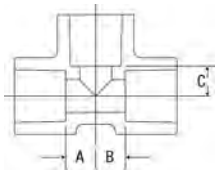
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TEES

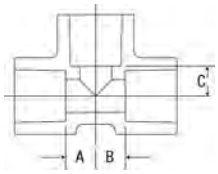
5011





5011-R





Tees

UNIV. FIG. NO.	NOM. NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES	JOINT
5011	3/4"	0.10	0.57	0.57	0.57	SXSXS
5011	1"	0.17	0.69	0.69	0.69	SXSXS
5011	1-1/4"	0.28	0.89	0.89	0.89	SXSXS
5011	1-1/2"	0.58	1.05	1.05	1.05	SXSXS
5011	2"	0.82	1.25	1.25	1.25	SXSXS
5011	2-1/2"	1.58	1.53	1.53	1.53	SXSXS
5011	3"	2.14	1.84	1.84	1.84	SXSXS
5011-R	3/4"x3/4"x1"	0.14	0.70	0.70	0.73	SXSXS
5011-R	1"x1"x3/4"	0.16	0.61	0.61	0.94	SXSXS
5011-R	1"x3/4"x1"	0.20	0.76	0.99	0.78	SXSXS
5011-R	1"x3/4"x3/4"	0.16	0.60	0.87	0.77	SXSXS
5011-R	1-1/4"x1-1/4"x1"	0.24	0.73	0.73	0.89	SXSXS
5011-R	1-1/4"x1-1/4"x3/4"	0.20	0.60	0.60	0.89	SXSXS
5011-R	1-1/4"x1"x1-1/4"	0.28	0.88	1.03	0.87	SXSXS
5011-R	1-1/4"x1"x1"	0.24	0.71	0.90	0.89	SXSXS
5011-R	1-1/4"x1"x3/4"	0.20	0.61	0.76	0.89	SXSXS
5011-R	1-1/4"x1-1/4"x1-1/2"	0.44	1.01	1.01	0.88	SXSXS
5011-R	1-1/2"x1-1/2"x1-1/4"	0.46	0.89	0.89	1.04	SXSXS
5011-R	1-1/2"x1-1/2"x1"	0.54	0.77	0.77	0.96	SXSXS
5011-R	1-1/2"x1-1/2"x3/4"	0.50	0.67	0.67	1.04	SXSXS
5011-R	1-1/2"x1-1/4"x1"	0.40	0.72	0.91	1.01	SXSXS
5011-R	1-1/2"x1-1/4"x3/4"	0.36	0.60	0.78	1.02	SXSXS
5011-R	1-1/2"x1-1/2"x2"	0.88	1.30	1.30	1.14	SXSXS
5011-R	2"x2"x1-1/2"	0.86	1.06	1.06	1.37	SXSXS
5011-R	2"x2"x1-1/4"	0.67	1.00	1.00	1.28	SXSXS
5011-R	2"x2"x1"	0.72	0.80	0.80	1.25	SXSXS
5011-R	2"x2"x3/4"	0.68	0.70	0.70	1.25	SXSXS
5011-R	2-1/2"x2-1/2"x2"	1.32	1.26	1.26	1.53	SXSXS
5011-R	2-1/2"x2-1/2"x1-1/2"	1.21	1.06	1.06	1.53	SXSXS
5011-R	2-1/2"x2-1/2"x1-1/4"	1.12	0.91	0.91	1.53	SXSXS
5011-R	2-1/2"x2-1/2"x1"	1.05	0.74	0.74	1.53	SXSXS
5011-R	3"x3"x2-1/2"	1.71	1.53	1.53	1.84	SXSXS
5011-R	3"x3"x2"	1.56	1.26	1.26	1.84	SXSXS
5011-R	3"x3"x1-1/2"	1.39	1.06	1.06	1.82	SXSXS

Note: All NIBCO reducing tees are molded to size, not fabricated.

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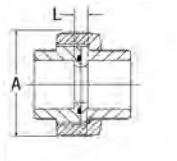
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FIRE SPRINKLER FITTINGS

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UNIONS

5033-E





Unions (O-ring Material EPDM)

UNIV. FIG. NO.	NOM. NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. L INCHES	JOINT
5033-E	3/4"	0.27	2.46	0.43	SXS
5033-E	1"	0.40	2.70	0.43	SXS

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CPVC Threaded Fire Protection Fittings

Adapters 14-15
Crosses 16
Elbows 16
Tees 17
Test Plugs 18

CPVC Transition Fittings

IPS to CTS Transition Fittings 18

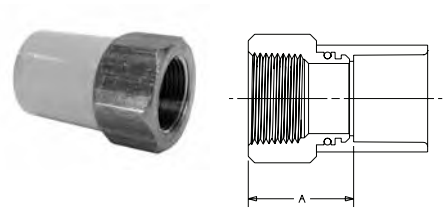
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FIRE SPRINKLER FITTINGS

BlazeMaster® Fire Protection Fittings – THREADED

ADAPTERS

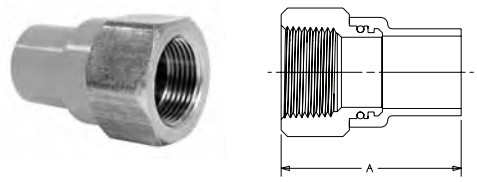
5003-BI



Female Adapters with Metal Thread Insert

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	JOINT
5003-BI	3/4"	0.28	1.19	SXFNPT
5003-BI	1"	0.63	1.59	SXFNPT
5003-BI	1-1/4"	1.02	1.96	SXFNPT
5003-BI	1-1/2"	1.26	1.98	SXFNPT
5003-BI	2"	1.98	1.99	SXFNPT

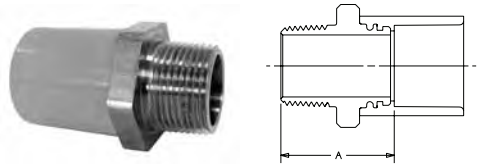
5003-2-BI



Spigot Female Adapters with Metal Thread Insert

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	JOINT
5003-2-BI	3/4"	0.28	2.00	SPGXFNPT
5003-2-BI	1"	0.61	2.72	SPGXFNPT

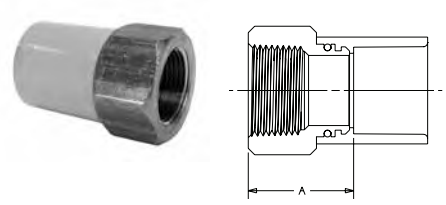
5004-BI



Male Adapters with Metal Thread Insert

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	JOINT
5004-BI	3/4"	0.22	1.35	SxMNPT
5004-BI	1"	0.46	1.82	SxMNPT
5004-BI	1-1/4"	0.74	2.05	SxMNPT
5004-BI	1-1/2"	1.06	2.14	SxMNPT
5004-BI	2"	1.80	2.31	SxMNPT

5003-BI-BSP



Female Adapters with Metal BSP Thread Insert

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	JOINT
5003-BI-BSP	1"	0.63	1.59	SXBSPT
5003-BI-BSP	1-1/4"	1.02	1.96	SXBSPT
5003-BI-BSP	1-1/2"	1.26	1.98	SXBSPT
5003-BI-BSP	2"	1.98	1.99	SXBSPT

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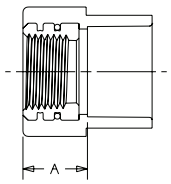
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ADAPTERS

5003-S-BI



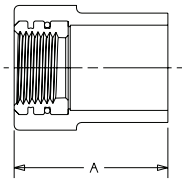


Female Sprinkler Head Adapters with Metal Thread Insert

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	JOINT
5003-S-BI	3/4"x1/2"	0.16	0.72	SXFNPT
5003-S-BI	1"x1/2"	0.18	0.73	SXFNPT
5003-S-BI	1"x3/4"	0.18	0.93	SXFNPT

5003-2-S-BI



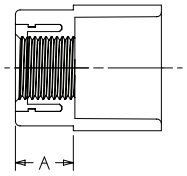


Spigot Female Sprinkler Head Adapters with Metal Thread Insert

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	JOINT
5003-2-S-BI	3/4"x1/2"	0.15	1.53	SPGXFNPT
5003-2-S-BI	1"X1/2"	0.16	1.84	SPGXFNPT

5003-S-BT



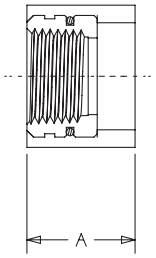


BRASTIC® Female Sprinkler Head Adapters with Metal Starter Thread

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	JOINT
5003-S-BT	3/4" x 1/2"	0.15	.75	SXFNPT
5003-S-BT	1" x 1/2"	0.17	.75	SXFNPT

5018-S-BI





Bushing Sprinkler Head Adapters with Metal Thread Insert

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	JOINT
5018-S-BI	1" x 1/2"	0.15	1.00	SPGXFNPT

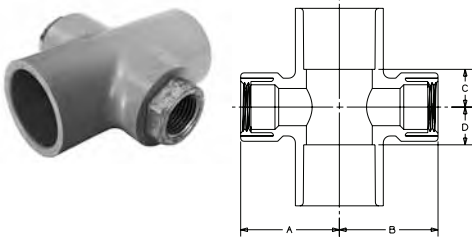
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CROSSES

5035-3-S-BI-S
5035-3-S-BI-L

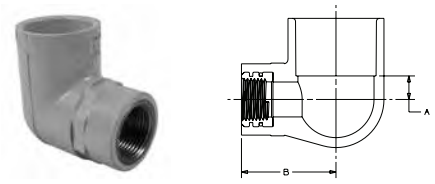


Sprinkler Head Back To Back Crosses with Metal Thread Inserts

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES	DIM. D INCHES	JOINT
5035-3-S-BI-S	1x1"x1/2"x1/2" 3-3/8" Take Out	0.46	1.69	1.69	0.62	0.62	SXSXFNPTXFNPT
5035-3-S-BI-L	1x1"x1/2"x1/2" 3-5/8" Take Out	0.48	1.81	1.81	0.62	0.62	SXSXFNPTXFNPT

ELBOWS

5007-3-S-BI



Sprinkler Head 90 with Metal Thread Insert

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	JOINT
5007-3-S-BI	3/4"x1/2"	0.22	0.56	1.62	SxFNPT
5007-3-S-BI	1"x1/2"	0.27	0.50	1.76	SxFNPT
5007-3-S-BI	1"x3/4"	0.26	0.59	1.88	SxFNPT
5007-3-S-BI	1-1/4"x1/2"	0.30	0.48	1.95	SxFNPT

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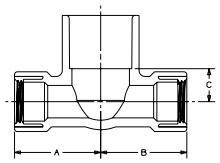
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TEES

5011-3-3-S-BI-S
5011-3-3-S-BI-L



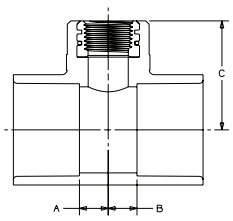


Back To Back Tees with Metal Thread Inserts

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES	JOINT
5011-3-3-S-BI-S	1/2"x1/2"x1" 3-3/8" Take Out	0.44	1.69	1.69	.62	FNPTXFNPTXS
5011-3-3-S-BI-L	1/2"x1/2"x1" 3-5/8" Take Out	0.46	1.81	1.81	.62	FNPTXFNPTXS

5012-S-BI
5012R-S-BI



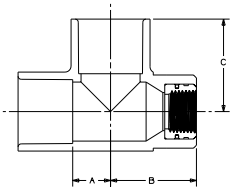


Sprinkler Head Tees with Metal Thread Insert

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES	JOINT
5012-S-BI	3/4"x3/4"x1/2"	0.22	0.42	0.42	1.60	SXSXFNPT
5012-S-BI	1"	0.44	0.80	0.80	1.48	SXSXFNPT
5012-S-BI	1"x1"x1/2"	0.29	0.41	0.41	1.76	SXSXFNPT
5012-S-BI	1-1/4"x1-1/4"x1/2"	0.34	0.52	0.52	1.95	SXSXFNPT
5012-S-BI	1-1/2"x1-1/2"x1/2"	0.46	0.45	0.45	2.13	SXSXFNPT
5012-S-BI	2"x2"x1/2"	0.58	0.47	0.47	1.68	SXSXFNPT
5012R-S-BI	1"x3/4"x1/2"	0.28	0.46	0.83	1.69	SXSXFNPT
5012R-S-BI	1-1/4"x1"x1/2"	0.34	0.51	0.63	1.94	SXSXFNPT
5012R-S-BI	1-1/2"x1-1/4"x1/2"	0.47	0.46	0.67	2.13	SXSXFNPT
5012R-S-BI	2"x1-1/2"x1/2"	0.58	0.48	0.78	2.38	SXSXFNPT

5014R-S-BI





Sprinkler Head Tees with Metal Thread Insert

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	DIM. B INCHES	DIM. C INCHES	JOINT
5014R-S-BI	1"x1/2"x1"	0.30	0.71	1.74	1.90	SXFNPTXS

BlazeMaster® FIRE SPRINKLER FITTINGS

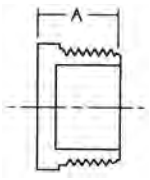
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BlazeMaster® Fire Protection Fittings – THREADED

TEST PLUG

450-005





Test Plugs

UNIV. FIG. NO.	NOM. SIZE	APPROX. NET WT./LBS.	DIM. A INCHES	JOINT
450-005	1/2"	0.03	1.06	MPT

Note: Test plug is white PVC Schedule 40 material and is intended for testing the system only. Test plug should not be included as a component in the completed system.

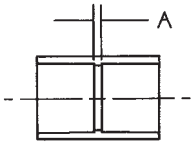
IPS TO CTS TRANSITION FITTINGS

FLOWGUARD GOLD® CPVC

FOR USE IN MULTI-PURPOSE NFPA-13D SYSTEMS (WHERE APPROVED).

4701-T



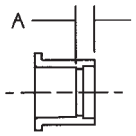


Transition Couplings (Slip IPS x Slip CTS)

NOM. SIZE		APPROX. NET WT./LBS.	DIM. A INCHES
3/4	(IPS) x 3/4 (CTS)	.039	1/8
1	(IPS) x 1 (CTS)	.068	1/8
2	(IPS) x 2 (CTS)	.330	1/8

4718-T





Transition Bushings (Spigot IPS x Slip CTS)

NOM. SIZE		APPROX. NET WT./LBS.	DIM. A INCHES
1	(IPS) x 1 (CTS)	.030	9/32
1 1/4	(IPS) x 1 1/4 (CTS)	.057	1/4
1 1/2	(IPS) x 1 1/2 (CTS)	.070	3/16
2	(IPS) x 2 (CTS)	.111	1/8

Note: For joining BlazeMaster® and FlowGuard Gold® pipe and fittings, use NIBCO® FP-1000 One-Step Cement.

IPS = Iron Pipe Size
CTS = Copper Tube Size

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BlazeMaster® Fire Protection Fittings – ACCESSORIES

CEMENT AND ACCESSORIES



Solvent Cement

FIG. NO.	SIZE	DESCRIPTION	LBS./CASE
5097Q	Quart	NIBCO FP-1000 One Step Cement	27
5097P	Pint	NIBCO FP-1000 One Step Cement	14
C5097Q	Quart	NIBCO FP-1000 One Step Cement Canada compliant label	27
C5097P	Pint	NIBCO FP-1000 One Step Cement Canada compliant label	14

Note: Pint can lid is the correct size dauber for 3/4" through 1-1/4" pipe and fitting assembly; quart can lid is the correct size dauber for 1-1/2" through 3" pipe and fittings.



Empty Can

FIG. NO.	SIZE	DESCRIPTION	LBS./CASE
5098Q	Quart	Empty Can Quart	3
5098P	Pint	Empty Can Pint	2
5098G	Gallon	Empty Can Gallon	5



Brush

FIG. NO.	SIZE	DESCRIPTION	LBS./CASE
5096	NA	Brush BP-1	11



Roller

FIG. NO.	SIZE	DESCRIPTION	LBS./CASE
5097	NA	Roller 6020	4



Dauber

FIG. NO.	SIZE	DESCRIPTION	LBS./CASE
5093S	Small	Dauber CM-75 (for pipe sizes 3/4" - 1-1/4")	2
5093L	Large	Dauber CM-150 (for pipe sizes 1-1/4" - 3")	2

BlazeMaster® FIRE SPRINKLER FITTINGS

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BlazeMaster® Fire Protection Fittings – ACCESSORIES

CEMENT AND ACCESSORIES



Thread Sealant

FIG. NO.	SIZE	DESCRIPTION	LBS./CASE	CANS/CASE
5094	Half Pint	Thread Sealant	24.0	24
5094	Pint	Thread Sealant	24.0	12
5094	Quart	Thread Sealant	38.4	12

NOTE: Only use thread sealant that is compatible with NIBCO manufactured BlazeMaster® CPVC fittings. Thread sealants which carry the FGG-BM-CZ SYSTEM COMPATIBLE mark have been determined to be chemically compatible.



PTFE Tape

FIG. NO.	SIZE	DESCRIPTION	LBS./CASE
5099	1/2"x260"	PTFE Tape	11

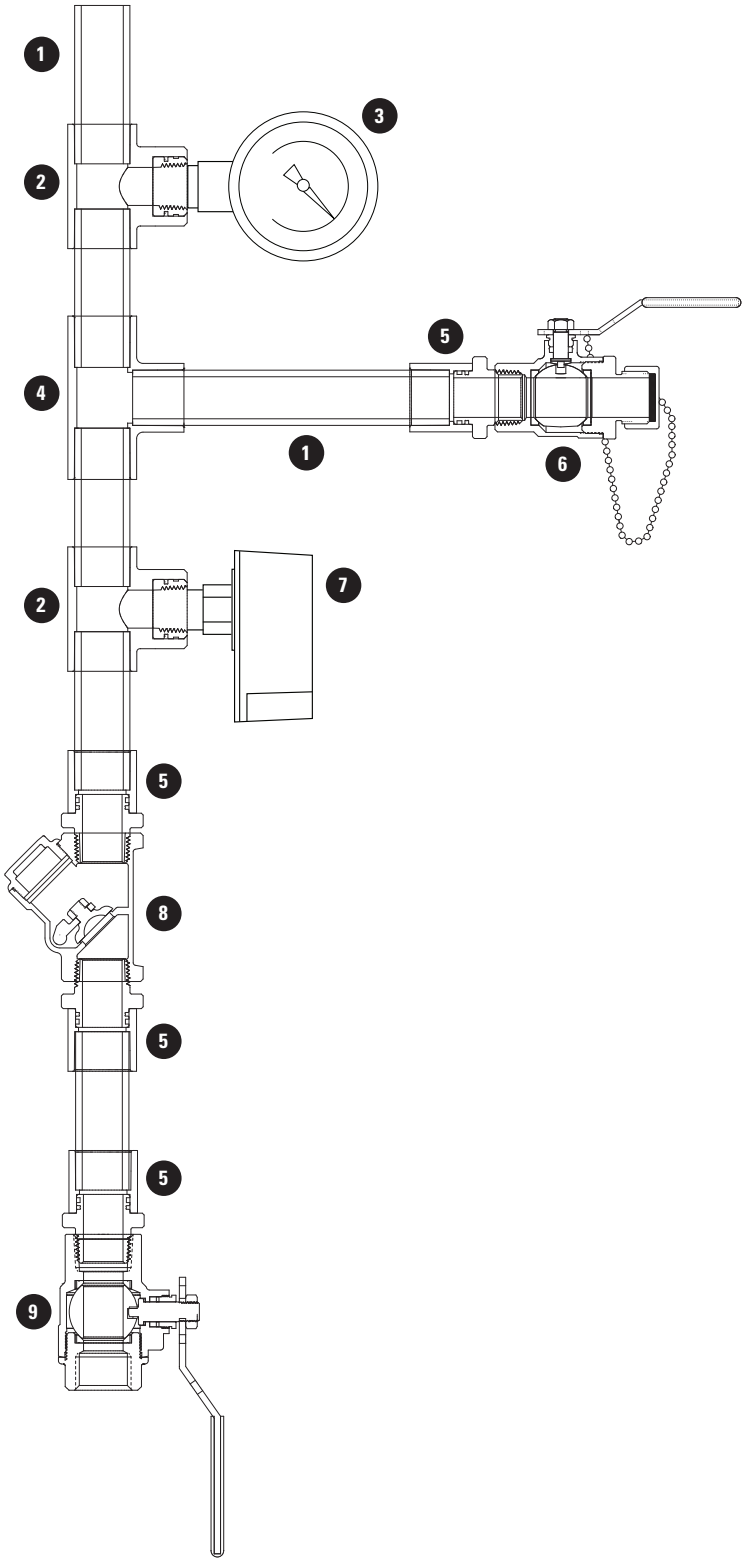
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Typical Residential Riser

NIBCO valves and fittings that are typically used with CPVC ***BlazeMaster***® pipe.



1. CPVC ***BlazeMaster***® Pipe
2. NIBCO #5012-S-BI
3. Pressure Gauge
4. NIBCO #5011
5. NIBCO #5004-BI
6. NIBCO Hose End
   T-585-70-HC / 66-HC
7. Flow Switch
8. NIBCO Check
   T-480, T-480-Y, T-413-Y, TI3
9. NIBCO Isolation
   T-585-70 / 66 / UL / IC
   MTT-585-70, T-FP-600

BlazeMaster® FIRE SPRINKLER FITTINGS

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Valves for Residential Fire Protection

ISOLATION VALVES

T-585-70 / 66



600 PSI CWP 150 PSI SWP
2-Piece Bronze Body
Full Port
Bronze or SS Stem
Chrome/Nickel Plate or SS Ball
Threaded Connection
MSS SP-110
1/4" – 2"

KT-580-70-UL
KT-585-70-UL



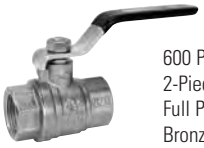
300 PSI Non-Shock Cold Water
2-Piece Bonze Body
Full Port 1/4" – 1", Convential Port 1-1/4" – 3"
Bronze Stem
Chrome/Nickel Plate Ball
Threaded Connection
MSS SP-110, UL/FM
1/4" – 3"

MTT-585-70



600 PSI CWP 150 PSI SWP
2-Piece Bronze Body
Full Port
Bronze Stem, Chrome
Chrome/Nickel Plate Ball
Male x Female Threaded End Connection
MSS SP-110
1/2" – 2"

T-FP-600A



600 PSI CWP
2-Piece Brass Body
Full Port
Bronze or Brass Stem
Chrome/Nickel Plate Ball
Threaded Connection
MSS SP-110, UL
1/4" – 2"

T-685-80-LF



Lead-Free*
600 PSI CWP
2-Piece Body
Full Port
Copper Silicon Alloy Ball/Stem
Threaded Connection
MSS SP-110
1/2" – 2"

CHECK VALVES

T-413-Y/W



200 PSI CWP
Horizontal Swing Check
Bronze Body
PTFE or Buna Disc
Integral Seat
Threaded Connection
MSS SP-80
1/2" – 2"

Lead-Free* version available as T-413-Y-LF

T-480-Y
T-480



250 PSI CWP
In-Line Lift Type Check
Bronze Body
PTFE or Buna Disc Integral Seat
Threaded Connection
3/8" – 2"

Lead-Free* version available as T-480-Y-LF

HOSE END DRAIN

T-585-70-HC / 66-HC



600 PSI CWP
Ball Valve with Cap & Chain
2-Piece Bronze Body
Full Port
Bronze or SS Stem
Chrome Plated or SS Ball
Threaded Connection
MSS SP-110
1/2" – 3/4"

*** Lead-Free refers to the wetted surface of pipe, fittings and fixtures in potable water systems that have a weighted average lead content <0.25%. Source: California Health & Safety Code (116875); Vermont Act 193.**

NOTE: To view NIBCO's entire fire protection valve offering, visit www.nibco.com.

BlazeMaster® FIRE SPRINKLER FITTINGS

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Review – Do's & Don'ts

Do's

- Installation should be made only by a qualified installer or contractor in accordance with all applicable codes and requirements.
- Read and follow the installation instructions.
- Follow recommended safe work practices.
- Make certain that thread sealants, gasket lubricants, or firestop materials are compatible with CPVC.
- Keep pipe and fittings in original packaging until needed.
- Cover pipe and fittings with an opaque tarp if stored outdoors.
- Follow proper handling procedures.
- Use tools specifically designed for use with plastic pipe and fittings.
- Use the proper solvent cement and follow application instructions.
- Use a drop cloth to protect interior finishes.
- Cut the pipe ends square.
- Deburr and bevel the pipe end with a chamfering tool.
- Rotate the pipe 1/4 turn when bottoming pipe in fitting socket.
- Make certain no solvent cement is on sprinkler head and adapter threads.
- Make certain that solvent cement does not run and plug the sprinkler head orifice.
- Follow the manufacturer's recommended cure times prior to pressure testing.
- Fill lines slowly and only at a proper pressure.
- Bleed the air from the system prior to pressure testing.
- Support sprinkler head properly to prevent lift up of the head through the ceiling when activated.
- Keep threaded rod within 1/16" of the pipe or use a surge arrestor.
- Install NIBCO® ***BlazeMaster***® CPVC Fire Sprinkler Products in wet systems only.
- Use only insulation and/or glycerin and water solutions for freeze protection.
- Allow for movement due to expansion and contraction.
- Ensure installers have been properly trained per the NIBCO ***BlazeMaster***® CPVC Fire Sprinkler System Installation and Design Manual and renew your training every three years at a minimum.

Don'ts

- Do not use edible oils as a gasket lubricant.
- Do not use petroleum or solvent-based sealants, lubricants, or fire stop materials.
- Do not use any glycol-based solutions as an anti-freeze.
- Do not contaminate the CPVC system with cutting oils or compressor oils.
- Do not mix glycerin and water solutions in contaminated containers.
- Do not use solvent cement that exceeds its shelf life or has become discolored or jellied.
- Do not allow solvent cement to plug the sprinkler head orifice.
- Do not connect rigid metal couplers to CPVC grooved adapters.
- Do not thread or groove CPVC pipe.
- Do not use solvent cement near sources of heat, open flame, or when smoking.
- Do not pressure test with air.
- Do not pressure test until recommended cure times are met.
- Do not exceed proper pressure for testing.
- Do not use ratchet cutters below 50°F.
- Do not use CPVC pipe that has been stored outdoors, unprotected and is faded in color.
- Do not allow threaded rod to come in contact with the pipe.
- Do not install NIBCO ***BlazeMaster***® CPVC Fire Sprinkler Products in cold weather without allowing for expansion.
- Do not install NIBCO ***BlazeMaster***® CPVC Fire Sprinkler Products in dry systems.
- Do not allow puddling of cement in fittings and pipe.
- Do not use dull or broken cutting tool blades when cutting pipe.

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BlazeMaster®
FIRE SPRINKLER FITTINGS

CPVC Cross Reference Sheet

STANDARD FITTINGS

	NIBCO FIG. NO.	SIZE	SPEARS FIG. NO.	TYCO FIG. NO.
ADAPTER	5001-G	1-1/4"	4233-012	80160
	5001-G	1-1/2"	4233-015	80161
	5001-G	2"	4233-020	80162
	5001-G	2-1/2"	4233-025	80163
	5001-G	3"	4233-030	80164
BUSHINGS	5018	1"x3/4"	4237-131	80200
	5018	1-1/4"x1"	4237-168	80202
	5018	1-1/4"x3/4"	4237-167	80201
	5018	1-1/2"x1-1/4"	4237-212	80205
	5018	1-1/2"x1"	4237-211	80204
	5018	1-1/2"x3/4"	4237-210	80203
	5018	2"x1-1/2"	4237-251	80209
	5018	2"x1-1/4"	4237-250	80208
	5018	2"x1"	4237-249	80207
	5018	2"x3/4"	4237-248	80206
	5018	2-1/2"x2"	4237-292	80211
	5018	2-1/2"x1-1/2"	4237-291	80213
	5018	2-1/2"x1-1/4"	4237-290	80214
	5018	2-1/2"x1"	N/A	80215
	5018	3"x2-1/2"	4237-339	80212
	5018	3″x2″	4237-338	80210
	5018	3"x1-1/2"	N/A	N/A
CAPS	5017	3/4"	4247-007	80100
	5017	1"	4247-010	80101
	5017	1-1/4"	4247-012	80102
	5017	1-1/2"	4247-015	80103
	5017	2"	4247-020	80104
	5017	2-1/2"	4247-025	80105
	5017	3"	4247-030	80106
COUPLINGS	5001	3/4"	4229-007	80075
	5001	1"	4229-010	80076
	5001	1-1/4"	4229-012	80077
	5001	1-1/2"	4229-015	80078
	5001	2"	4229-020	80079
	5001	2-1/2"	4229-025	80080
	5001	3"	4229-030	80081
	5001-R	1"x3/4"	4229-131	80220
	5001-R	1-1/4"x1"	4229-168	N/A
	5001-R	1-1/2"x3/4"	4229-210	N/A
	5001-R	1-1/2"x1"	4229-211	N/A
	5001-R	1-1/2"x1-1/4"	4229-212	N/A
	5001-R	2"x1"	4229-249	N/A
	5001-R	2"x1-1/2"	4229-251	N/A
CROSSES	5035	3/4"	4220-007	80009
	5035	1"	4220-010	80010
	5035	1-1/4"	4220-012	80011
	5035	1-1/2"	4220-015	80012

STANDARD FITTINGS

	NIBCO FIG. NO.	SIZE	SPEARS FIG. NO.	TYCO FIG. NO.
CROSSES	5035	2"	4220-020	80013
	5035	2-1/2"	4220-025	80014
	5035	3"	4220-030	80008
	5035-R	1"x3/4"x1"x3/4"	4220-131	80015
ELBOWS	5006	3/4"	4217-007	80050
	5006	1"	4217-010	80051
	5006	1-1/4"	4217-012	80052
	5006	1-1/2"	4217-015	80053
	5006	2"	4217-020	80054
	5006	2-1/2"	4217-025	80055
	5006	3"	4217-030	80056
	5007	3/4"	4206-007	80025
	5007	1"	4206-010	80026
	5007	1-1/4"	4206-012	80027
	5007	1-1/2"	4206-015	80028
	5007	2"	4206-020	80039
	5007	2-1/2"	4206-025	80030
	5007	3"	4206-030	80031
	5007-R	1"x3/4"	4206-131	80032
FLANGES	5019-H	3/4"	4253-007	N/A
	5019-H	1"	4253-010	N/A
	5019-H	1-1/4"	4253-012	N/A
	5019-H	1-1/2"	4253-015	N/A
	5019-H	2"	4253-020	N/A
	5019-H	2-1/2"	4253-025	N/A
	5019-H	3"	4253-030	N/A
	5051-A	3"	4254-030	N/A
	5051-2-A	3"	4256-030	N/A
	5051-H	3/4"	4251-007	N/A
	5051-H	1"	4251-010	N/A
	5051-H	1-1/4"	4251-012	N/A
	5051-H	1-1/2"	4251-015	N/A
	5051-H	2"	4251-020	N/A
	5051-H	2-1/2"	4251-025	N/A
	5051-H	3"	N/A	N/A
TEES	5011	3/4"	4201-007	8000
	5011	1"	4201-010	8001
	5011	1-1/4"	4201-012	8002
	5011	1-1/2"	4201-015	8003
	5011	2"	4201-020	80004
	5011	2-1/2"	4201-025	8005
	5011	3"	4201-030	80006
	5011-R	3/4"x3/4"x1"	4201-102	80132
	5011-R	1"x1"x3/4"	4201-131	80260
	5011-R	1"x3/4"x1"	4201-126	80134

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CPVC Cross Reference Sheet

STANDARD FITTINGS

	NIBCO FIG. NO.	SIZE	SPEARS FIG. NO.	TYCO FIG. NO.
TEES	5011-R	1"x3/4"x3/4"	4201-125	80133
	5011-R	1-1/4"x1-1/4"x1"	4201-168	80262
	5011-R	1-1/4"x1-1/4"x3/4"	4201-167	80261
	5011-R	1-1/4"x1"x1-1/4"	4201-159	80137
	5011-R	1-1/4"x1"x1"	4201-158	80136
	5011-R	1-1/4"x1"x3/4"	4201-157	80135
	5011-R	1-1/4"x1-1/4"x1-1/2"	4201-169	80138
	5011-R	1-1/2"x1-1/2"x1-1/4"	4201-212	80275
	5011-R	1-1/2"x1-1/2"x1"	4201-211	80264
	5011-R	1-1/2"x1-1/2"x3/4"	4201-210	80263
	5011-R	1-1/2"x1-1/4"x1"	4201-202	80140
	5011-R	1-1/2"x1-1/4"x3/4"	4201-201	80140
	5011-R	1-1/2"x1-1/2"x2"	4201-213	N/A
	5011-R	2"x2"x1-1/2"	4201-251	80274
	5011-R	2"x2"x1-1/4"	4201-250	80267
	5011-R	2"x2"x1"	4201-249	80266
	5011-R	2"x2"x3/4"	4201-248	80265
	5011-R	2-1/2"x2-1/2"x2"	4201-292	80276
	5011-R	2-1/2"x2-1/2"x1-1/2"	4201-291	80273
	5011-R	2-1/2"x2-1/2"x1-1/4"	4201-290	80272
	5011-R	2-1/2"x2-1/2"x1"	4201-289	80271
	5011-R	3"x3"x2-1/2"	4201-339	80269
	5011-R	3"x3"x2"	4201-338	80268
	5011-R	3"x3"x1-1/2"	4201-337	80270
UNIONS	5033-E	3/4"	4257-007	N/A
	5033-E	1"	4257-010	N/A
	5033-E	1-1/4"	4257-012	N/A
	5033-E	1-1/2"	4257-015	N/A
	5033-E	2"	4257-020	N/A

THREADED FITTINGS

	NIBCO FIG. NO.	SIZE	SPEARS FIG. NO.	TYCO FIG. NO.
ADAPTERS	5003-BI	3/4"	4235-007	80142
	5003-BI	1"	4235-010	80145
	5003-BI	1-1/4"	4235-012	80146
	5003-BI	1-1/2"	4235-015	80147
	5003-BI	2"	4235-020	80148
	5003-2-BI	3/4"	4278-007	N/A
	5003-2-BI	1"	4278-010	N/A
	5003-S-BI	3/4"x1/2"	4235-101	80175E or 80175W
	5003-S-BI	1"x1/2"	4235-130	80176E or 80175W
	5003-S-BI	1"x3/4"	4235-131	80179
	5003-2-S-BI	3/4"x1/2"	4238-101	N/A
	5003-2-S-BI	1"x1/2"	4238-130	N/A
	5003-S-BT	3/4"x1/2"	N/A	N/A

THREADED FITTINGS

	NIBCO FIG. NO.	SIZE	SPEARS FIG. NO.	TYCO FIG. NO.
ADAPTERS	5003-S-BT	1"x1/2"	N/A	N/A
	5003-BI-BSP	1"	N/A	N/A
	5003-BI-BSP	1-1/4"	N/A	N/A
	5003-BI-BSP	1-1/2"	N/A	N/A
	5003-BI-BSP	2"	N/A	N/A
	5004-BI	3/4"	N/A	80157
	5004-BI	1"	N/A	80158
	5004-BI	1-1/4"	N/A	N/A
	5004-BI	1-1/2"	N/A	N/A
	5004-BI	2"	N/A	N/A
	5018-S-BI	1"x1/2"	4238-130BR	N/A
CROSSES	5035-3-S-BI-S	1"x1"x1/2"x1/2"	N/A	80462
	5035-3-S-BI-L	1"x1"x1/2"x1/2"	N/A	80463
ELBOWS	5007-3-S-BI	3/4"x1/2"	4207-101	80199
	5007-3-S-BI	1"x1/2"	4207-130	80198
	5007-3-S-BI	1"x3/4"	4207-131	N/A
	5007-3-S-BI	1-1/4"x1/2"	4207-166	N/A
TEES	5011-3-3-S-BI-S	1/2"x1/2"x1"	N/A	80460
	5011-3-3-S-BI-L	1/2"x1/2"x1"	N/A	80459
	5012-S-BI	1"	4202-010	N/A
	5012-S-BI	3/4"x3/4"x1/2"	4202-101	80250
	5012-R-S-BI	1"x3/4"x1/2"	4202-124	N/A
	5012-S-BI	1"x1"x1/2"	4202-130	80251
	5012-R-S-BI	1"x1/2"x1"	4203-122	N/A
	5012-R-S-BI	1-1/4"x1"x1/2"	4202-156	80256
	5012-S-BI	1-1/4"x1-1/4"x1/2"	4202-166	80252
	5012-R-S-BI	1-1/2"x1-1/4"x1/2"	4202-199	80257
	5012-S-BI	1-1/2"x1-1/2"x1/2"	4202-209	80254
	5012-S-BI	2"x2"x1/2"	4202-247	80253
	5012-R-S-BI	2"x1-1/2"x1/2"	4202-237	80258
TEST PLUG	450-005	1/2"	4250-005	N/A

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BlazeMaster®
FIRE SPRINKLER FITTINGS

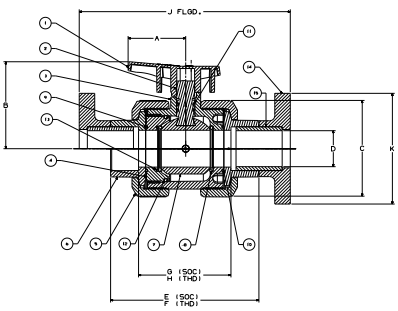
Chemtrol® Thermoplastic Flow Solutions



Thermoplastic Piping Technical Manual

Chemtrol®

PVC, CPVC, PP, PVDF



Chemtrol® is a brand of NIBCO®

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Copies of the Thermoplastic Piping Technical Manual and other Chemtrol publications are available for download on www.chemtrol.com

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Introduction to Chemtrol®

With more than 45 years of experience in industrial thermoplastics, Chemtrol offers dependable products that work in the most demanding environments.

For specific recommendations of chemical compatibility, see the *Chemtrol Chemical Resistance Guide*. For a wide variety of thermoplastic valves of superior design and quality, see the *Chemtrol Valve Guide.* For the best thermoplastic fittings and flanges available for industrial use, refer to the *Chemtrol Fitting Guide*.

These publications are available for download on www.nibco.com/chemtrol in PDF format.

Materials

PVC

(Polyvinyl Chloride) PVC conforming to ASTM D1784, Classification 12454 B, formerly designated Type I, Grade 1, is the most frequently specified of all thermoplastic piping materials. It has been used successfully for over 45 years in such diverse areas as chemical processing, industrial plating, chemical drainage, fresh and wastewater treatment, chilled and tower cooling water, deionized water manufacture and distribution, and irrigation sprinkler systems. PVC is characterized by high physical properties and resistance to chemical attack by strong acids and other oxidizers, alkalis, salt solutions, some organic chemical solutions, and many other chemicals. However, it is attacked by non-ionic surfactants, some vegetable oils (e.g., peanut), and many organic chemicals such as polar solvents (e.g., ketones), aromatics (i.e., benzene ring structure), and chlorinated hydrocarbons. The maximum service temperature of PVC is 140° F. With a design stress of 2,000 psi at 73° F, the long-term hydrostatic strength of PVC is as high as any of the major thermoplastic materials being used for solid piping systems. PVC is joined by solvent cementing, threading, or flanging.

CPVC (Corzan®)

(Chlorinated Polyvinyl Chloride) CPVC conforming to ASTM D1784, Classification 23447-B, formerly designated Type IV, Grade 1, is a resin created by the post-chlorination of a PVC polymer. The material's resistance to chemical attack is almost identical to that of PVC. And the physical properties of CPVC are very similar to those of PVC at 73° F, but the additional chlorine in the CPVC polymer extends its maximum service temperature from 140° F to 210° F. For example, the design stress for CPVC is 2,000 psi at 73° F, identical to that of PVC. But its strength is only reduced to 500 psi at 180° F, as compared to 440 psi for PVC at 140° F. For more than 35 years, CPVC has proven to be an excellent material for hot corrosive liquids, hot and cold water distribution, and similar applications above the useful temperature range for PVC. CPVC may even be chosen over PVC in the 110° F to 140° F temperature range because its higher strength-at-temperature, requiring less frequent piping supports, can translate to a more favorable overall installed cost than PVC. CPVC is joined by solvent cementing, threading, or flanging.

PVDF (Kynar®)

(Polyvinylidene Fluoride) PVDF homopolymer conforming to ASTM D3222, Type I, Grade 2, is a tough, abrasion-resistant fluorocarbon material that has a design stress of 1,360 psi at 73° F and a maximum service temperature of 280° F. It has versatile chemical resistance to salts, strong acids, dilute bases, and many organic solvents, such as the aromatics (i.e., benzene ring structure), the aliphadics (i.e., paraffin, olefin, and acetylene hydrocarbons), and the chlorinated groups. And PVDF is ideally suited for handling wet or dry chlorine, bromine, and other halogens. However strong bases, hypochlorites, and some organic chemicals such as polar solvents (e.g., ketones) and esters attack it. No other solid thermoplastic piping material can approach the combined strength, working temperature, and chemical resistance characteristics of PVDF. It is joined by the thermo-sealing socket fusion process, threading, or flanging. The basic PVDF resin is essentially transparent to ultraviolet (UV) radiation, and the plastic material is not degraded by sunlight. However, the fluid medium in a PVDF piping system could be exposed to UV radiation. To provide protection against UV degradation of the fluid medium, an FDA-approved red pigmentation is added to all piping components for general industrial consumption, particularly for outdoor installations. Conversely, in certain industries, such as electronics, pharmaceutical, and processed foods and beverages, PVDF has become the piping material of choice because of its high purity, low surface and joint extractables, and elevated temperature sanitation capability. For these applications, another line of piping products made from natural (unpigmented) Kynar is available.

PP

(Polypropylene) PP as specified by ASTM D4101, is a member of the polyolefin family of pure hydrocarbon plastics. Although PP has half the strength of PVC and CPVC, with a design stress of 1,000 psi at 73° F, it may have the most versatile chemical resistance of the thermoplastic materials identified as the sentinels of industrial piping. Consider the fact that there are no known solvents for PP. As a result, it has been the material of choice for drainage of mixed industrial chemicals for over 40 years. As pressure piping, PP has no peers for concentrated acetic acid or hydroxides. It is also suitable for milder solutions of most acids, alkalis, salts, and many organic chemicals, including solvents. The nemeses for PP are strong oxidizers, such as the hypochlorites and higher concentrations of sulfuric, nitric, and hydrofluoric acids. They are Environmental Stress Cracking (ESC) agents for PP, meaning that time-to-failure is a function of the combined variables of concentration and temperature of the fluid and stress in the piping material. Although PP is not recommended for some organic chemicals, such as polar and chlorinated solvents and the aromatics, the concern is permeation through rather than catastrophic damage of the molecular chain.

All polyolefins are severely degraded by ultraviolet (UV) radiation. However, the plastic piping industry recognizes that PP compounds, containing more than 2 1/2% carbon black pigmentation, are adequately UV stabilized to realize an outside service life of more than 25 years. Chemtrol utilizes such a compound to make all piping components for general industrial consumption, particularly for outdoor installations. Because of the high purity and low surface and joint extractables from natural (unpigmented) PP, Chemtrol utilizes an optimum compound to also make piping components for DI water systems. These are intended as an economic alternative to the ultra high purity infrared (IR) butt fusion PVDF systems typically found in the highly sophisticated electronic semi-conductor industry. It has been demonstrated that an appropriately designed serpentine system, constructed by mechanics properly instructed in the heat fusion of socket joints for sanitary piping, can consistently produce water conforming to the quality standards for injectable drugs.

FKM

(Fluoroelastomer) FKM is compatible with a broad spectrum of chemicals. Because of this extensive chemical compatibility, spanning wide ranges of concentration and temperature, FKM has gained wide acceptance as a material of construction for valve "O"-rings and seats. These fluoroelastomers can be used in most applications involving mineral acids (with the exception of HCl), salt solutions, chlorinated hydrocarbons, and petroleum oils. FKM is not recommended for most strong alkali solutions.

EPDM

(Also known as EPT) EPDM produced from ethylene-propylene-diene monomer, is a terpolymer elastomer that has good abrasion and tear resistance and offers excellent chemical resistance to a variety of salt, acidic, and organic chemical solutions. It is the best material for most alkali solutions and hydrochloric acid, but is not recommended for applications involving petroleum oils or most strong acids.

PTFE

(Polytetrafluoroethylene) PTFE has outstanding resistance to chemical attack by most chemicals and solvents. PTFE has a temperature rating of -200° F to +500° F. It is a self-lubricating material used as a seat and/or bearing material in most Chemtrol valves.

CR

Polychloroprene (CR) was the first commercial synthetic rubber. It is a moderately oil-resistant material with good general chemical resistance. It is specifically recommended for strong concentrations of alkalis, but not recommended for most organic solvents or any acid solutions, other than dilute.

Kynar® is a registered trademark of Arkema Inc.
Corzan® is a registered trademark of The Lubrizol Corporation

Physical Properties of Thermoplastic Piping Materials

ASTM Test Methods	Properties	Material PVC 12454-B	CPVC 23447-B	PVDF	Polypropylene
General					
D792	Specific Gravity	1.38	1.50	1.76	.905
D570	Water Absorption % 24 Hrs. @ 73° F	.05	.05	.04	.02
Mechanical					
D638	Tensile Strength psi @ 73° F	7,300	7,200	6,000	4,600
D638	Modulus of Elasticity in Tension psi @ 73° F x 10^5	4.2	3.7	2.1	2.0
D790	Flexural Strength psi	14,500	15,600	9,700	7,000
D256	Izod Impact Strength @ 73° F (Notched)	1.1	2.0	3.8	.8
Thermal					
D696	Coefficient of Thermal Expansion in/in/° F x 10^{-5}	3.0	3.8	7.9	5.0
C177	Thermal Conductivity BTU/HR/Sq. Ft./° F/in	1.2	.95	.79	1.2
D648	Heat Distortion Temp. ° F @ 66 psi	NA	NA	284	195
D648	Heat Distortion Temp. ° F @ 264 psi	163	212	194	140
	Resistance to Heat ° F at Continuous Drainage	140	210	280	180
Flammability					
D2863	Limiting Oxygen Index (%)	43	60	44	17
E84	Flame Spread (%)	15-20	15	0	NA
E84	Smoke Generation	>300	>350	50	>400
	Underwriters Lab Rating (Sub. 94)	94V-O	94V-O	94V-O	94HB

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Many commercial, industrial, and governmental standards or specifications are available to assist the design engineer in specifying plastic piping systems. Standards most frequently referred to and most commonly called out in plastic piping specifications are ASTM Standards. These standards also often form the basis of other standards in existence. Below is a list and description of those standards most typically applied to industrial plastic piping.

ASTM D1784
(American Society for Testing and Materials)
This specification covers rigid PVC and CPVC compounds intended for general purpose use in extruded or molded forminclude pressure piping applications and nonpressure piping applicationscomposed of poly(vinyl chloride), chlorinated poly(vinyl chloride), or vinyl chloride copolymers containing at least 80% vinyl chloride, and the necessary compounding ingredients.

ASTM D1785 and F441
These standards cover the specification and quality of Schedule 40, 80, and 120 PVC (D1785) and CPVC (F441) pressure pipe. Outlined in these standards are dimensional specifications, burst, sustained, and maximum operating pressure requirements and test procedures for determining pipe quality with respect to workmanship and materials.

ASTM D2466
This standard covers Schedule 40 PVC threaded and socket pressure fittings. Stipulated in the standard are thread and socket specifications, by lengths, wall thickness, burst, material, quality, and identification requirements.

ASTM D2467 and F439
These standards cover Schedule 80 PVC (D2467) and CPVC (F439) Socket Type and Threaded Pressure Fittings. Dimensions, burst strength, resin compound stipulation, and scheme of product identification requirements are specified.

ASTM D2564 and F493
These standards set forth requirements for PVC (D2564) and CPVC (F493) Solvent Cement. The specification identifies the resin compound to be used and stipulates minimum resin content, solution viscosities, and physical performance qualities.

ASTM F656
This specification covers requirements for primers for use with poly (vinyl chloride) (PVC) pipe and fittings that are to be joined by PVC solvent cements meeting the requirements of Specification.

ASTM Standard F1970
This specification covers special engineered fittings or appurtenances for use in PVC or CPVC systems. Flanges, unions, and valves not included in the scope of other ASTM specifications are specifically referenced. Minimum requirements are identified for testing, materials, dimensions, marking, and in-plant quality control.

ASTM Standard F1498
This specification adapts the General Purpose American Pipe Thread Specification, ASME B1.20.1, to taper pipe threads for use on plastic pipe and fittings with machined or molded threads. The standard covers dimensions and gaging of plastic tapered National Pipe Threads (NPT) for leak-tight joints, and it is now referenced in all ASTM Standards for plastic piping products.

ASTM Standard D2855
This standard describes the procedure for making joints with PVC pipe and fittings by means of solvent cementing.

ASTM D4101 (Formerly D2146)
This specification covers polypropylene materials suitable for injection molding and extrusion. Polymers consist of homopolymer, copolymers, and elastomer compounded with or without the addition of impact modifiers (ethylene-propylene rubber, polyisobutylene rubber, and butyl rubber), colorants, stabilizers, lubricants, or reinforcements.

ASTM D1598
This test method covers the determination of the time-to-failure of both thermoplastic and reinforced thermosetting/resin pipe under constant internal pressure.

ASTM D2837
This standard describes the procedure for obtaining the Hydrostatic Design Basis for all known thermoplastic pipe materials and for any practical temperature and medium. This was achieved by evaluating stress rupture data, taken from tests conforming to ASTM D1598, for the subject material and involved specified treatment and analysis of data.

ASTM D2657
This standard covers the procedure for heat-fusion bonding of polyolefin materials.

ASTM D3222
This standard covers the polymerization method and physical properties of PVDF (polyvinylidene fluoride) Fluoroplastic Materials for molding and extrusion.

Organizations other than ASTM issue standards that are commonly encountered in industrial thermoplastic piping design. The most important of these are described below.

ANSI/ASME B1.20.1 (was B2.1)
(American National Standards Institute)
This specification details the dimensions and tolerance for tapered pipe threads. This standard is referenced in the ASTM standards for threaded fittings mentioned within this document. See page 5 for details.

ASME B16.5
This specification sets forth standards for bolt holes, bolt circles, and overall dimensions for steel 150# flanges. See page 28 for details.

NSF/ANSI 14
The physical, performance, and health effects requirements in this standard apply to thermoplastic and thermoset plastic piping system components, including but not limited to pipes, fittings, valves, joining materials, gaskets, and appurtenances. The established physical, performance, and health effects requirements also apply to materials (resin or blended compounds) and ingredients used to manufacture plastic piping system components. This standard provides definitions and requirements for materials, ingredients, products, quality assurance, marking, and record keeping.

Fittings and valves made from copper alloys containing more than 15% zinc by weight shall be resistant to dezincification and stress corrosion cracking (SCC) and shall meet the test requirements of this standard.

NSF/ANSI 61
This standard establishes minimum health effects requirements for the chemical contaminants and impurities that are indirectly imparted to drinking water from products, components, and materials used in drinking water systems. This Standard does not establish performance, taste and odor, or microbial growth support requirements for drinking water system products, components, or materials.

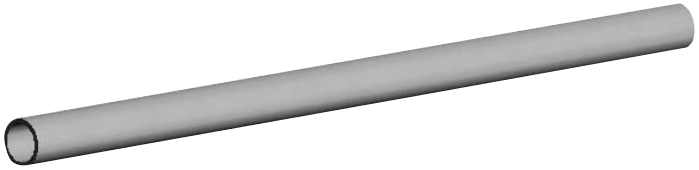
This standard is intended to cover specific materials or products that come into contact with: drinking water, drinking water treatment chemicals, or both. The focus of the Standard is evaluation of contaminants or impurities imparted indirectly to drinking water. The products and materials covered include, but are not limited to, process media (e.g., carbon, sand), protective materials (e.g., coatings, linings, liners), joining and sealing materials (e.g., solvent cements, welding materials, gaskets), pipes and related products (e.g., pipes, tanks, fittings), mechanical devices used in treatment/transmission/distribution systems (e.g., valves, chlorinators, separation membranes, point-of-entry drinking water treatment systems), and mechanical plumbing devices (e.g., faucets, endpoint control valves).

NSF/ANSI 61 Annex G
This annex establishes the weighted average lead content evaluation procedure of wetted components to a 0.25% maximum. As a part of NSF/ANSI 61 compliance to the applicable section or sections of the main document must also be met.

NSF/ANSI 372
This standard establishes the weighted average lead content evaluation procedure of wetted components to a 0.25% maximum. Prior to being developed as NSF/ANSI 372, part of the content of this Standard was established as NSF/ANSI 61, Annex G. While NSF/ANSI 61 establishes limits for the amount of lead that may migrate into drinking water from the water contact materials within a drinking water contact product, NSF/ANSI 372 establishes a limit on the amount of lead that may be contained within the water contact materials in a drinking water contact product. This standard also defines a test methodology for the analytical determination of the lead content of materials in these products.

Technical Service
Technical assistance regarding standards, applications, product performance, design, and installation tips is available from Technical Services Technical Information Hotline: (888) 446-4226 phone; (888) 336-4226 fax.

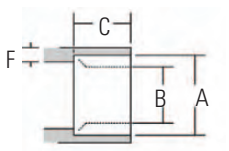
Dimensions and Reference Data–Schedule 80

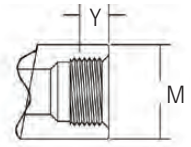


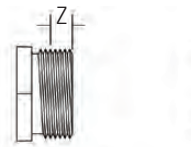
Pipe[1] 20 ft. Lengths

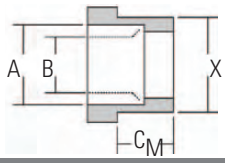
Nominal Pipe Size	Approximate Weight per 100 ft. PVC	CPVC	Polypropylene	PVDF	Nom. Outside Diameter (In.)	Nom. Inside Diameter (In.)	Wall Thickness (in.) Nom.	Min.	Cross-sectional Area (in.^{2})	Internal Area (in.^{2})	Fluid Capacity (gal/100 ft.)	Outside Surf. Area (ft.^{2}/100 ft.)	Threshold Flow[2] (GPM)
1/4	10.1	11.9	—	—	.540	.282	.129	.119	.167	.062	.32	14.14	.97
1/2	20.5	24.3	14.0	24.4	.840	.526	.157	.147	.337	.217	1.13	21.99	3.39
3/4	27.8	32.9	18.9	33.0	1.050	.722	.164	.154	.457	.409	2.13	27.49	6.38
1	40.4	48.5	27.1	48.7	1.315	.936	.1895	.179	.670	.688	3.57	34.43	10.72
1 1/4	56.7	66.9	37.9	—	1.660	1.255	.2025	.191	.927	1.237	6.43	43.46	19.28
1 1/2	68.9	81.1	44.8	81.4	1.900	1.476	.212	.200	1.124	1.711	8.89	49.74	26.67
2	94.9	108.5	62.3	112.6	2.375	1.913	.231	.218	1.556	2.874	14.93	62.18	44.79
2 1/2	144.9	165.4	—	—	2.875	2.290	.2925	.276	2.373	4.119	21.40	75.27	64.19
3	193.8	221.3	126.6	256.4	3.500	2.864	.318	.300	3.179	6.442	33.47	91.63	100.40
4	283.3	323.4	185.2	357.0	4.500	3.786	.357	.337	4.647	11.258	58.48	117.81	175.44
6	541.1	616.8	359.9	714.3	6.625	5.709	.458	.432	8.873	25.598	132.98	173.44	398.93
8	821.9	905.8	—	—	8.625	7.565	.530	.500	13.479	44.948	233.49	225.80	700.48
10	1227.7	—	—	—	10.750	9.493	.6285	.593	19.985	70.778	367.68	281.43	1103.02
12	1710.4	—	—	—	12.750	11.294	.726	.687	27.495	100.181	520.79	333.79	1562.36

1 Dimensions shown are listed in ASTM D1785 and F441 for PVC and CPVC Schedule 80 plastic pipe, respectively.
2 Upper threshold rate of flow = 5 ft./sec. fluid velocity.









Fittings[1]

Size	IPS Dia	Solvent Socket (S) A[3]	B[3]	C[4] Nom	Female Threads (FPT) Y[2]	M Min	Male Threads (MPT) Z[2]	Male End (SPG) X	Cm[4] Nom	Wall Thickness F[4] Min	E[4] Min
1/4	.540	.552	.536	.640	.311	.840	.311	.540	.655	.149	.119
1/2	.840	.848	.836	.890	.427	1.280	.427	.840	.905	.185	.147
3/4	1.050	1.058	1.046	1.015	.446	1.500	.446	1.050	1.030	.195	.154
1	1.315	1.325	1.310	1.140	.530	1.810	.530	1.315	1.155	.225	.179
1 1/4	1.660	1.670	1.655	1.265	.550	2.200	.550	1.660	1.280	.240	.191
1 1/2	1.900	1.912	1.894	1.390	.550	2.500	.550	1.900	1.405	.250	.200
2	2.375	2.387	2.369	1.515	.566	2.375	.566	2.375	1.530	.275	.218
2 1/2	2.875	2.889	2.868	1.780	.870	3.560	.870	2.875	1.810	.345	.276
3	3.500	3.516	3.492	1.905	.954	4.300	.954	3.500	1.933	.375	.300
4	4.500	4.518	4.491	2.280	1.032	5.430	1.032	4.500	2.310	.420	.337
6	6.625	6.647	6.614	3.030	–	–	–	6.625	3.060	.540	.432
8	8.625	8.655	8.610	4.500	–	–	–	8.625	4.590	.625	.500
10	10.750	10.780	10.735	5.500	–	–	–	10.750	5.590	.741	.593
12	12.750	12.780	12.735	6.500	–	–	–	12.750	6.590	.859	.687

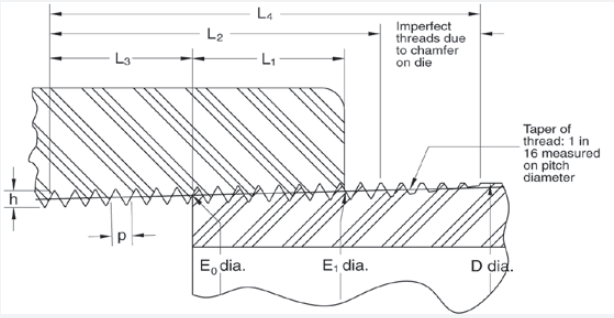
1 Dimensions shown are listed in ASTM D2467 and F439 for PVC and CPVC socket-type and threaded-type Schedule 80 fittings, respectively.
2 Dimensions shown are typical male component engagement, hand-tight (L1 in ANSI B1.20.1 thread spec.) plus 1 1/2 turns lightening.
3 Dimensions shown are not applicable for polypropylene or PVDF. Socket diameters in these materials are designed for Chemtrol® thermo-seal socket fusion joining.
4 Chemtrol® fittings may exceed certain minimum ASTM dimensional requirements in order to ensure functional satisfaction.

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Dimensions and References–Pipe Threads, Flanges, and Pressure Conversion Factors

American Standard Taper Pipe Thread, NPT (excerpt from ANSI B1.20.1)

Nominal Size	Outside Diameter D	Number of Threads Per Inch n	Pitch of Thread p	Normal Engagement By Hand L_1	Length of Effective Thread L_2	Wrench Makeup Length for Internal Thread L_3	Total Length: End of Pipe to Vanish Point L_4	Pitch Diameter at Beginning of External Thread E_0	Pitch Diameter at Beginning of Internal Thread E_1	Height of Thread (Max.) h
in.	in.		in.	in.	in.	in.	in.	in.	in.	in.
1/4	0.540	18	.05556	.228	.4018	.1667	.5946	.47739	.49163	.04444
1/2	0.840	14	.07143	.320	.5337	.2143	.7815	.75843	.77843	.05714
3/4	1.050	14	.07143	.339	.5457	.2143	.7935	.96768	.98887	.05714
1	1.315	11 1/2	.08696	.400	.6828	.2609	.9845	1.21363	1.23863	.06957
1 1/4	1.660	11 1/2	.08696	.420	.7068	.2609	1.0085	1.55713	1.58338	.06957
1 1/2	1.900	11 1/2	.08696	.420	.7235	.2609	1.0252	1.79609	1.82234	.06957
2	2.375	11 1/2	.08696	.436	.7565	.2609	1.0582	2.26902	2.29627	.06957
2 1/2	2.875	8	.12500	.682	1.1375	.2500	1.5712	2.71953	2.76216	.10000
3	3.500	8	.12500	.766	1.2000	.2500	1.6337	3.34062	3.38850	.10000
4	4.500	8	.12500	.844	1.3000	.2500	1.7337	4.33438	4.38712	.10000



Do not thread Schedule 40 pipe.

ANSI B16.5 Dimensional Data – Flanges and Flanged Fittings

Dimensions‡ Nominal Pipe Size (In.)	Outside Diameter (In.)	Number of Holes	Drilling Diameter of Bolt (In.)	Diameter of Bolt Circle (In.)
1/2	3.50	4	1/2	2.38
3/4	3.88	4	1/2	2.75
1	4.25	4	1/2	3.12
1 1/4	4.62	4	1/2	3.50
1 1/2	5.00	4	1/2	3.88
2	6.00	4	5/8	4.75
2 1/2	7.00	4	5/8	5.50
3	7.50	4	5/8	6.00
4	9.00	8	5/8	7.50
6	11.00	8	3/4	9.50
8	13.50	8	3/4	11.75
10	16.00	12	7/8	14.25
12	19.00	12	7/8	17.00

‡ Dimensions and bolts conform to ANSI B16.5 for 150 lb. steel flanges. Bolt holes are 1/8" larger in diameter than the required bolts.

Metric Equivalent Charts

Linear Conversion Table From Fractional Inches to Millimeters

inches		mm	inches		mm
1/64	.016	.397	33/64	.516	13.097
1/32	.031	.794	17/32	.531	13.494
3/64	.047	1.191	35/64	.547	13.891
1/16	.063	1.588	9/16	.563	14.288
5/64	.078	1.984	37/64	.578	14.684
3/32	.094	2.381	19/32	.594	15.081
7/64	.109	2.778	39/64	.609	15.478
1/8	.125	3.175	5/8	.625	15.875
9/64	.141	3.572	41/64	.641	16.272
5/32	.156	3.969	21/32	.656	16.669
11/64	.172	4.366	43/64	.672	17.066
3/16	.188	4.763	11/16	.688	17.463
13/64	.203	5.519	45/64	.703	17.859
7/32	.219	5.556	23/32	.719	18.256
15/64	.234	5.953	47/64	.734	18.653
1/4	.250	6.350	3/4	.750	19.050
17/64	.266	6.747	49/64	.766	19.447
9/32	.281	7.144	25/32	.781	19.844
19/64	.297	7.541	51/64	.797	20.241
5/16	.313	7.938	13/16	.813	20.638
21/64	.328	8.334	53/64	.828	21.034
11/32	.344	8.731	27/32	.844	21.431
23/64	.359	9.128	55/64	.859	21.828
3/8	.375	9.525	7/8	.875	22.225
25/64	.391	9.922	57/64	.891	22.622
13/32	.406	10.319	29/32	.906	23.019
27/64	.422	10.716	59/64	.922	23.416
7/16	.438	11.113	15/16	.938	23.813
29/64	.453	11.509	61/64	.953	24.209
15/32	.469	11.906	31/32	.969	24.606
31/64	.484	12.303	63/64	.984	25.003
1/2	.500	12.700	1	1.000	25.400

English to Metric Conversion Table

Units	Change to	Multiply by
Inches	Millimeters	25.40
Inches	Centimeters	2.54
Inches	Meters	.0254
Feet	Meters	.3048
Miles	Kilometers	1.609347
Sq. Inches	Sq. Centimeters	6.452
Sq. Feet	Sq. Meters	.0929
Cu. Inches	Cu. Centimeters	16.3872
Cu. Feet	Cu. Meters	.02832
U.S. Gallons	Liters	3.7854
Pounds	Kilograms	.45359

Pressure Conversion Factors

Pressure measurements are based on the standardized weight of water expressed in a variety of English and metric units.

1 psig (gauge)	=	2.3068	foot of water head
	=	2.036	inch of mercury head
	=	0.0689	bar
	=	0.0703	kgm/cm^2 (kilograms/centimeter^2)
	=	6894.757	N/m^2 (newton/meter^2)
	=	6.8948	kPa (kilopascal)
1 foot of water	=	0.4335	psig
	=	0.0305	kgm/cm^2 (kilograms/centimeter^2)
	=	2988.8837	N/m^2 (newton/meter^2)
	=	0.33457	kPa (kilopascal)
	=	0.02989	bar
1 bar	=	100000.0	N/m^2 (newton/meter^2)
	=	14.50377	psig
	=	100.0	kPa (kilopascal)
	=	10197.1621	kgm/cm^2 (kilograms/centimeter^2)
	=	33.456	foot of water head
1 N/m^2 (newton/meter^2)	=	1.0	Pa (pascal) = 0.001 kPa (kilopascal)
	=	0.000010197	kgm/cm^2
	=	0.000145	psig (gauge)
1 kilogram/centimeter^2	=	98066.5	N/m^2 (newton/meter^2)
	=	14.2233	psig

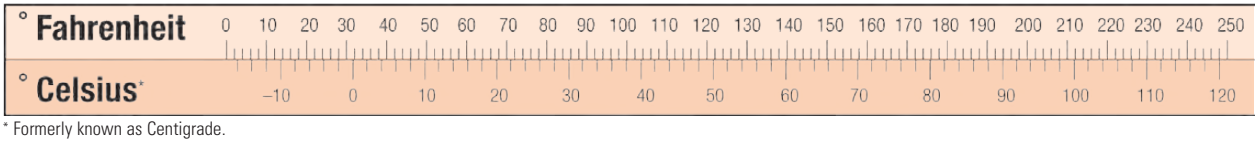
Vacuum Conversion Factors

Vacuum may be thought of as the absence of pressure. It is the measure of negative pressure between standardized atmospheric pressure and a theoretically perfect vacuum.

1 Std. Atmosphere	=	14.6959	psia (absolute)
	=	760.0	mm (millimeter) of mercury head
	=	1.0332276	kgm/cm^2 (kilograms/centimeter^2)
	=	1.01325	bar
	=	101.325	kPa (kilopascal)
1 mm	=	0.03937	inch
1 micron of mercury	=	0.001	mm (millimeter) of mercury head
	=	0.000019336	psig (gauge)
1 mm of mercury	=	1000.0	micron of mercury head
1 inch	=	25.4	mm (millimeter)
1 inch of mercury	=	25400.0	micron of mercury head
	=	0.4912	psig
1 inch of water	=	0.0361	psig
	=	1868.2742	micron of mercury head
1 psig (gauge)	=	27.6817	inch of water head

Temperature Conversion

F = C x 1.8 + 32 C= (F-32) ÷ 1.8



* Formerly known as Centigrade.

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Pressure Ratings of Chemtrol® Products

The pressure carrying capability of any pipe at a given temperature is a function of the material strength from which the pipe is made and the geometry of the pipe as defined by its diameter and wall thickness. The following expression, commonly known as the ISO equation, is used in thermoplastic pipe specifications to relate these factors:

$$P = 2S / (D_o/t - 1)$$

where: P = *maximum pressure rating, psi*
S = *maximum hydraulic design stress (max. working strength), psi*
D_o = *average outside pipe diameter, in.*
t = *minimum wall thickness, in.*

The allowable design stress, which is the tensile stress in the hoop direction of the pipe, is derived for each material in accordance with ASTM D2837, Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials, at 73° F. The pressure ratings below were calculated from the basic Hydraulic Design Stress for each of the materials.

Pipe and Fittings

In order to determine the pressure rating for a product system, first find the plastic material and schedule (wall thickness–see Dimensions and References–Schedule 80 components on page 4 for additional information) of pipe and fittings in the heading of the Maximum Non-Shock Operating Pressure table below. Then, locate the selected joining method in the subheading of the table and go down the column to the value across from a particular pipe size, listed in the far left column. This will be the maximum non-shock operating pressure at 73° F for the defined product system.

Maximum Non-Shock Operating Pressure (psi) at 73° F[1]

Nom. Pipe Size	Schedule 40 PVC & CPVC	Schedule 80 PVC & CPVC		Schedule 80 Polypropylene		Schedule 80 PVDF	
	Socket End	Socket End	Threaded End	Thermo-Seal Joint	Threaded[3] End	Thermo-Seal Joint	Threaded End
1/2	600	850	420	410	20	580	290
3/4	480	690	340	330	20	470	230
1	450	630	320	310	20	430	210
1 1/4	370	520	260	260	20	—	—
1 1/2	330	470	240	230	20	326	160
2	280	400	200	200	20	270	140
2 1/2	300	420	210	—	—	—	—
3	260	370	190	190	20	250	N.R.
4	220	320	160	160	20	220	N.R
6	180	280	N.R.	140	N.R.	190	N.R.
8	160	250[2]	N.R.	—	—	—	—
10	140	230	N.R.	—	—	—	—
12	130	230	N.R.	—	—	—	—

1 For more severe service, an additional correction factor may be required.
2 8" CPVC Tee, 90° ELL and 45° ELL rated at 1/2 of value shown. Pressure rating of 175 psi can be obtained by factory overwrapping with glass and polyester. Consult Customer Service for delivery information.
3 Recommended for intermittent drainage pressure not exceeding 20 psi.
N.R. Not Recommended.

Valves, Unions, and Flanges

As with all other thermoplastic piping components, the maximum pressure rating for all Chemtrol® valves, unions and flanges, regardless of size, is related to temperature as per the chart below.

Maximum Non-Shock Operating Pressure (psi) vs. Temperature

Operating Temperature (° F)	Model D Ball Valve		All Other Valves, Unions & Flanges			
	PVC	CPVC	PVC	CPVC	PP	PVDF
70	250	250	150	150	150	150
80	250	250	150	150	150	150
90	225	250	150	150	150	150
100	200	240	150	150	150	150
110	180	220	135	140	140	150
120	165	190	110	130	130	150
130	140	180	125	120	118	150
140	130	170	50	110	105	150
150	N.R.	160	N.R.	100	93	140
160	N.R.	150	N.R.	90	80	133
170	N.R.	140	N.R.	80	70	125
180	N.R.	130	N.R.	70	50	115
200	N.R.	65	N.R.	50	N.R.	97
210	N.R.	30	N.R.	25	N.R.	85
220	N.R.	N.R.	N.R.	N.R.	N.R.	75
240	N.R.	N.R.	N.R.	N.R.	N.R.	55
260	N.R.	N.R.	N.R.	N.R.	N.R.	40
280	N.R.	N.R.	N.R.	N.R.	N.R.	25

N.R. Not Recommended.

Temperature Ratings of Chemtrol Products

Since the strength of plastic pipe is sensitive to temperature, the identical test method is used to determine the material strength at elevated temperature levels. The correction factor for each temperature is the ratio of strength at that temperature level to the basic strength at 73° F. Because the hoop stress is directly proportional to the internal pressure, which created that pipe stress, the correction factors may be used for the temperature correction of pressure as well as stress. For pipe and fitting applications above 73° F, refer to the table below for the Temperature Correction Factors. To determine the maximum non-shock pressure rating at an elevated temperature, simply multiply the base pressure rating obtained from the table in the preceding column by the correction factor from the table below. The allowable pressure will be the same as the base pressure for all temperatures below 73° F.

Temperature Correction Factors

Operating Temperature (° F)	Factors			
	PVC	CPVC	PP	PVDF
70	1.00	1.00	1.00	1.00
80	0.90	0.96	0.97	0.95
90	0.75	0.92	0.91	0.87
100	0.62	0.85	0.85	0.80
110	0.50	0.77	0.80	0.75
115	0.45	0.74	0.77	0.71
120	0.40	0.70	0.75	0.68
125	0.35	0.66	0.71	0.66
130	0.30	0.62	0.68	0.62
140	0.22	0.55	0.65	0.58
150	N.R.	0.47	0.57	0.52
160	N.R.	0.40	0.50	0.49
170	N.R.	0.32	0.26	0.45
180	N.R.	0.25	*	0.42
200	N.R.	0.18	N.R.	0.36
210	N.R.	0.15	N.R.	0.33
240	N.R.	N.R.	N.R.	0.25
280	N.R.	N.R.	N.R.	0.18

* Recommended for intermittent drainage pressure not exceeding 20 psi.
N.R. Not Recommended.

Pressure Ratings of Chemtrol® Products

Chemtrol Products in Vacuum or Collapse Loading Situations

Thermoplastic pipe is often used in applications where the pressure on the outside of the pipe exceeds the pressure inside. Suction or vacuum lines and buried pipe are examples of this type of service.

As a matter of practical application, gauges indicate the pressure differential above or below atmospheric pressure. However, scientists and engineers frequently express pressure on an absolute scale where zero equals a theoretically perfect vacuum and standard atmospheric pressure equals 14.6959 psia.

Vacuum Conversion Factors: See page 6 for additional head and metric factors.

Solvent cemented or thermo-sealed joints are particularly recommended for vacuum service. In PVC, CPVC, PP, or PVDF vacuum systems, mechanical devices such as valves and transition joints at equipment will generally represent a greater intrusion problem than the thermoplastic piping system will. Experience indicates that PVC vacuum systems can be evacuated to pressures as low as 5 microns with continuous pumping. However, when the system is shut off, the pressure will rise and stabilize around 10,000 microns or approximately 10 mm of Mercury at 73° F.

The following chart lists the allowable collapse loading for plastic pipe at 73° F. It shows how much greater the external pressure may be than the internal pressure. (Thus, a pipe with 100 psi internal pressure can withstand 100 psi more external pressure than a pipe with zero psi internal pressure.) For temperatures other than 73° F, multiply the values in the chart by the correction factors listed in the temperature correction table on the preceding page.

The chart also applies to a vacuum. The external pressure is generally atmospheric pressure, or 0.0 psig, while the internal pressure is normally identified as a vacuum or negative gauge pressure. However, this negative value will never exceed –14.7 psig. Therefore, if the allowable pressure listed in the chart (after temperature correction) is greater than the difference for internal-to-external pressure, the plastic system is viable.

Maximum Collapse Pressure Rating, psi @ 73° F

Pipe Size	PVC Sch. 40	PVC Sch. 80	CPVC Sch. 80	PP Sch. 80	PVDF Sch. 80
1/2	450	575	575	230	391
3/4	285	499	499	200	339
1	245	469	469	188	319
1 1/4	160	340	340	136	—
1 1/2	120	270	270	108	183
2	75	190	190	76	129
2 1/2	100	220	220	—	—
3	70	155	155	62	105
4	45	115	115	46	78
6	25	80	80	32	54
8	16	50	50	—	—
10	12	43	—	—	—
12	9	39	—	—	—

Pressure Losses in a Piping System

Piping Calculations

As a fluid flows through a piping system, it will experience a head loss depending on, among other factors, fluid velocity, pipe wall smoothness and internal pipe surface area. The Tables on pages 9 and 10 give Friction Loss and Velocity data for Schedule 40 and Schedule 80 thermoplastic pipe based on the Williams and Hazen formula.

$$H = .2083 \left(\frac{100}{C}\right)^{1.852} \times \left(\frac{q^{1.852}}{d^{4.8655}}\right)$$

Where: H = Friction Head Loss in Feet of Water/100 Feet of Pipe
C = Surface Roughness Constant (150 for all thermoplastic pipe)
q = Fluid Flow (gallons/min.)
d = Inside Diameter of Pipe

Fittings and valves, due to their more complex configurations, contribute significant friction losses in a piping system. A common method of expressing the losses experienced in fittings is to relate them to pipe in terms of equivalent pipe length. This is the length of pipe required to give the same friction loss as a fitting of the same size. The Table at the bottom of page 10 is a tabulation of the equivalent pipe length in feet for the various sizes of a number of common fittings. By using this Table and the Friction Loss Tables, the total friction loss in a plastic piping system can be calculated for any fluid velocity.

For example, suppose we wanted to determine the pressure loss across a 2" Schedule 40, 90° elbow, at 75 gpm. From the lower table on page 10 we find the equivalent length of a 2" 90° elbow to be 5.5 feet of pipe. From the Schedule 40 Pipe Table on page 9 we find the friction loss to be 3.87 psi per 100 feet of pipe when the flow rate is 75 gpm. Therefore, the solution is as follows:

5.5 Feet/90° Elbow x 3.87 psi/100 Feet = 0.21 psi Pressure Drop/90° Elbow

which is the pressure drop across a 2" Schedule 40 elbow. But, what if it were a 2" Schedule 80 elbow, and we wanted to know the friction head loss? The solution is similar, except we look for the friction head in the Schedule 80 Pipe Table at the top of page 10 and find it to be 12.43 feet per 100 feet of pipe when the flow rate is 75 gpm. The solution follows:

5.5 Feet/90° Elbow x 12.43 Feet/100 Feet = 0.68 Feet Friction Head/90° Elbow

which is the friction head loss across a 2" Schedule 80 elbow.

Valve Calculations

As an aid to system design, liquid sizing constants (Cv values) are shown for NIBCO®/Chemtrol® valves where applicable. These values are defined as the flow rate through the valve required to produce a pressure drop of 1 psi.

To determine the pressure drop for a given condition the following formula may be used:

$$\triangle P = \frac{Q^2 S.G.}{Cv^2}$$

Where:
$\triangle P$ = Pressure drop across the valve in psi
Q = Flow through the valve in gpm
S.G. = Specific gravity of the liquid (Water = 1.0)
Cv = Flow coefficient

See the solution of the following example problem. For Cv values for specific valves, refer to the product description page in the Chemtrol Thermoplastic Valve Guide.

EXAMPLE:
Find the pressure drop across a 1 ½" PVC ball check valve with a water flow rate of 50 gpm.

The Cv is 56, as shown in the *Chemtrol Thermoplastic Valve Guide.*

$$\triangle P = \frac{(50)^2 \times 1.0}{(56)^2}$$

$$\triangle P = \left(\frac{50}{56}\right)^2$$

$$\triangle P = .797 \text{ psi}$$

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Flow Capacity and Friction Loss for Schedule 40 Thermoplastic Pipe Per 100 Ft.

Gals. Per Minute	1/4" Pipe Velocity (Feet per Second)	1/4" Pipe Friction Head (Feet)	1/4" Pipe Friction Loss (PSI)	1/2" Pipe Velocity (Feet per Second)	1/2" Pipe Friction Head (Feet)	1/2" Pipe Friction Loss (PSI)	3/4" Pipe Velocity (Feet per Second)	3/4" Pipe Friction Head (Feet)	3/4" Pipe Friction Loss (PSI)	1" Pipe Velocity (Feet per Second)	1" Pipe Friction Head (Feet)	1" Pipe Friction Loss (PSI)	1 1/4" Pipe Velocity (Feet per Second)	1 1/4" Pipe Friction Head (Feet)	1 1/4" Pipe Friction Loss (PSI)	1 1/2" Pipe Velocity (Feet per Second)	1 1/2" Pipe Friction Head (Feet)	1 1/2" Pipe Friction Loss (PSI)	2" Pipe Velocity (Feet per Second)	2" Pipe Friction Head (Feet)	2" Pipe Friction Loss (PSI)	2 1/2" Pipe Velocity (Feet per Second)	2 1/2" Pipe Friction Head (Feet)	2 1/2" Pipe Friction Loss (PSI)
1/2	1.73	4.90	2.12																					
3/4	2.59	10.38	4.50																					
1	3.45	17.68	7.66	1.13	1.16	.50	1.26	1.03	.45															
2	6.90	63.82	27.66	2.25	4.19	1.82	3.16	5.60	2.43															
5	17.26	348.29	150.93	5.64	22.88	9.92	4.42	10.44	4.52	1.93	1.69	.73	1.10	.43	.19									
7				7.89	42.66	18.49	6.32	20.21	8.76	2.70	3.14	1.36	1.55	.81	.35	1.13	.38	.16						
10				11.27	82.59	35.79	9.48	42.82	18.56	3.86	6.08	2.63	2.21	1.57	.68	1.62	.73	.32						
15		3" Pipe		16.91	175.01	75.84	12.64	72.95	31.61	5.79	12.89	5.59	3.31	3.32	1.44	2.42	1.55	.67	1.46	.45	.20	1.02	.19	.08
20							15.80	110.29	47.80	7.72	21.96	9.52	4.42	5.65	2.45	3.23	2.64	1.14	1.95	.77	.33	1.38	.33	.14
25	1.10	.17	.07							9.64	33.20	14.39	5.52	8.55	3.71	4.04	4.00	1.73	2.44	1.17	.51	1.71	.49	.21
30	1.32	.24	.10		4" Pipe					11.57	46.54	20.17	6.63	11.98	5.19	4.85	5.60	2.43	2.92	1.64	.71	2.05	.69	.30
35	1.54	.32	.14							13.50	61.91	26.83	7.73	15.94	6.91	5.65	7.45	3.23	3.41	2.18	.94	2.39	.92	.40
40	1.77	.41	.18	1.02	.11	.05				15.43	79.28	34.36	8.83	20.41	8.84	6.46	9.54	4.13	3.90	2.79	1.21	2.73	1.18	.51
45	1.99	.51	.22	1.15	.13	.06							9.94	25.39	11.00	7.27	11.87	5.14	4.39	3.47	1.50	3.07	1.46	.63
50	2.21	.61	.26	1.28	.16	.07							11.04	30.86	13.37	8.08	14.43	6.25	4.87	4.22	1.83	3.42	1.78	.77
60	2.65	.86	.37	1.53	.23	.10							13.25	43.25	18.74	9.69	20.22	8.76	5.85	5.92	2.57	4.10	2.49	1.08
70	3.09	1.15	.50	1.79	.30	.13							15.46	57.54	24.94	11.31	26.90	11.66	6.82	7.87	3.41	4.78	3.32	1.44
75	3.31	1.30	.56	1.92	.34	.15		6" Pipe								12.12	30.57	13.25	7.31	8.94	3.87	5.12	3.77	1.63
80	3.53	1.47	.64	2.04	.39	.17										12.93	34.45	14.93	7.80	10.08	4.37	5.47	4.25	1.84
90	3.97	1.82	.79	2.30	.48	.21	1.01	.07	.03							14.54	42.85	18.57	8.77	12.53	5.43	6.15	5.28	2.29
100	4.41	2.22	.96	2.56	.59	.26	1.12	.08	.03							16.16	52.08	22.57	9.75	15.23	6.60	6.83	6.42	2.78
125	5.52	3.35	1.45	3.19	.89	.39	1.40	.12	.05		8" Pipe								12.18	23.03	9.98	8.54	9.70	4.20
150	6.62	4.70	2.04	3.83	1.24	.54	1.68	.17	.07										14.62	32.28	13.99	10.25	13.60	5.89
175	7.72	6.25	2.71	4.47	1.65	.72	1.97	.22	.10	1.13	.06	.03		10" Pipe					17.06	42.95	18.61	11.96	18.09	7.84
200	8.83	8.00	3.47	5.11	2.12	.92	2.25	.29	.13	1.30	.08	.03										13.67	23.17	10.04
250	11.03	12.10	5.24	6.39	3.20	1.39	2.81	.43	.19	1.62	.11	.05	1.03	.04	.02		12" Pipe					17.08	35.03	15.18
300	13.24	16.96	7.35	7.67	4.49	1.95	3.37	.61	.26	1.94	.16	.07	1.23	.05	.02									
350	15.45	22.56	9.78	8.94	5.97	2.59	3.93	.81	.35	2.27	.21	.09	1.44	.07	.03	1.01	.03	.01						
400				10.22	7.64	3.31	4.49	1.03	.45	2.59	.27	.12	1.64	.09	.04	1.16	.04	.02						
450				11.50	9.51	4.12	5.05	1.29	.56	2.91	.34	.15	1.85	.11	.04	1.30	.05	.02						
500				12.78	11.54	5.01	5.61	1.56	.68	3.24	.41	.18	2.05	.14	.06	1.44	.06	.03						
750				19.17	24.49	10.61	8.42	3.31	1.43	4.86	.87	.38	3.08	.29	.13	2.17	.12	.05						
1000							11.23	5.64	2.44	6.48	1.48	.64	4.10	.49	.21	2.89	.21	.09						
1250							14.04	8.53	3.70	8.09	2.24	.97	5.13	.74	.32	3.61	.31	.13						
1500							16.84	11.96	5.18	9.71	3.13	1.36	6.16	1.03	.45	4.33	.44	.19						
2000										12.95	5.34	2.31	8.21	1.76	.76	5.78	.75	.33						
2500										16.19	8.07	3.50	10.26	2.66	1.15	7.22	1.13	.49						
3000													12.31	3.73	1.62	8.67	1.58	.68						
3500													14.36	4.96	2.15	10.11	2.11	.92						
4000													16.42	6.36	2.87	11.56	2.71	1.17						

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Flow Capacity and Friction Loss for Schedule 80 Thermoplastic Pipe Per 100 Ft.

Gals. Per Minute	Velocity (Feet per Second)	Friction Head (Feet)	Friction Loss (PSI)	Velocity (Feet per Second)	Friction Head (Feet)	Friction Loss (PSI)	Velocity (Feet per Second)	Friction Head (Feet)	Friction Loss (PSI)	Velocity (Feet per Second)	Friction Head (Feet)	Friction Loss (PSI)	Velocity (Feet per Second)	Friction Head (Feet)	Friction Loss (PSI)	Velocity (Feet per Second)	Friction Head (Feet)	Friction Loss (PSI)	Velocity (Feet per Second)	Friction Head (Feet)	Friction Loss (PSI)	Velocity (Feet per Second)	Friction Head (Feet)	Friction Loss (PSI)
		1/4" Pipe																						
1/4	1.28	3.57	1.55		1/2" Pipe																			
1/2	2.57	12.88	5.58					3/4" Pipe																
3/4	3.85	27.29	11.83	1.11	1.31	.57					1" Pipe													
1	5.14	46.49	20.15	1.48	2.24	.97	.78	.48	.21					1 1/4" Pipe										
3	15.41	355.60	154.20	4.43	17.13	7.43	2.35	3.65	1.59	1.40	1.04	.45					1 1/2" Pipe							
5				7.38	44.12	19.12	3.92	9.45	4.10	2.33	9.45	1.16	1.30	.64	.28					2" Pipe				
7				10.33	82.27	35.65	5.48	17.62	7.64	3.26	4.98	2.16	1.82	1.20	.52	1.31	.54	.23					2 1/2" Pipe	
10		3" Pipe		14.76	159.26	69.02	7.84	34.11	14.78	4.66	9.65	4.18	2.59	2.32	1.01	1.87	1.05	.46	1.12	.30	.13			
15							11.75	72.27	31.32	6.99	20.44	8.86	3.89	4.91	2.13	2.81	2.23	.97	1.67	.63	.27	1.17	.26	.11
20	1.00	.15	.07				15.67	123.13	53.36	9.32	34.82	15.09	5.19	8.36	3.62	3.75	3.80	1.65	2.23	1.07	.46	1.56	.45	.20
25	1.24	.23	.10		4" Pipe					11.66	52.64	22.81	6.48	12.64	5.48	4.69	5.74	2.49	2.79	1.63	.71	1.92	.68	.29
30	1.49	.32	.14							13.99	78.78	31.97	7.78	17.71	7.67	5.62	8.04	3.48	3.35	2.28	.99	2.34	.95	.41
35	1.74	.43	.19	1.00	.11	.05				16.32	98.16	42.54	9.08	23.56	10.21	6.56	10.70	4.64	3.91	3.03	1.31	2.73	1.26	.55
40	1.99	.54	.23	1.14	.14	.06							10.37	30.17	13.07	7.50	13.71	5.94	4.46	3.88	1.68	3.12	1.62	.70
45	2.24	.68	.29	1.28	.17	.07							11.67	37.53	16.26	8.44	17.05	7.39	5.02	4.38	2.09	3.50	2.01	.87
50	2.49	.82	.36	1.42	.21	.09							12.97	45.62	19.77	9.37	20.72	8.98	5.58	5.87	2.54	3.89	2.45	1.06
60	2.99	1.15	.50	1.71	.30	.13							15.56	69.94	27.71	11.25	29.04	12.58	6.07	8.22	3.56	4.67	3.43	1.49
70	3.49	1.54	.67	1.99	.39	.17		6" Pipe								13.12	38.64	16.74	7.81	10.94	4.74	5.45	4.56	1.98
75	3.73	1.74	.75	2.14	.45	.20										14.06	43.90	19.02	8.37	12.43	5.39	5.84	5.18	2.24
80	3.98	1.97	.85	2.28	.51	.22	1.00	.07	.03							15.00	49.48	21.44	8.93	14.01	6.07	6.23	5.84	2.53
90	4.48	2.45	1.06	2.56	.63	.27	1.13	.63	.27							16.87	61.54	26.67	10.05	17.42	7.55	7.01	7.26	3.15
100	4.98	2.97	1.29	2.85	.76	.33	1.25	.10	.04		8" Pipe								11.16	21.18	9.18	7.79	8.83	3.83
125	6.22	4.49	1.95	3.56	1.16	.50	1.57	.16	.07										13.95	32.02	13.88	9.74	13.34	5.78
150	7.47	6.30	2.73	4.27	1.62	.70	1.88	.22	.10	1.07	.06	.03							16.74	44.88	19.45	11.68	18.70	8.10
175	8.71	8.38	3.63	4.99	2.16	.94	2.19	.29	.13	1.25	.07	.03		10" Pipe								13.63	24.88	10.78
200	9.96	10.73	4.65	5.70	2.76	1.20	2.51	.37	.16	1.43	.10	.04										15.58	31.86	13.81
250	12.45	16.22	7.03	7.12	4.17	1.81	3.13	.57	.25	1.78	.14	.06	1.13	.05	.02		12" Pipe								
300	14.94	22.74	9.85	8.55	5.85	2.54	3.76	.79	.34	2.14	.20	.09	1.36	.07	.03									
350	17.43	30.25	13.11	9.97	7.78	3.37	4.39	1.05	.46	2.50	.27	.12	1.59	.09	.04	1.12	.04	.02						
400				11.40	9.96	4.32	5.01	1.35	.59	2.85	.34	.15	1.81	.11	.05	1.28	.05	.02						
450				12.85	12.39	5.37	5.64	1.68	.73	3.21	.43	.19	2.04	.14	.06	1.44	.06	.03						
500				14.25	15.06	6.53	6.27	2.04	.88	3.57	.52	.23	2.27	.17	.07	1.60	.07	.03						
750				21.37	31.92	13.83	9.40	4.33	1.88	5.35	1.10	.48	3.40	.36	.16	2.40	.16	.07						
1000							12.53	7.37	3.19	7.14	1.87	.81	4.53	.62	.27	3.20	.27	.12						
1250							15.67	11.14	4.83	8.92	2.83	1.23	5.67	.94	.41	4.00	.40	.17						
1500										10.71	3.97	1.72	6.80	1.32	.57	4.81	.57	.25						
2000										14.27	6.76	2.93	9.07	2.24	.97	6.41	.96	.42						
2500										17.84	10.23	4.43	11.33	3.39	1.47	8.01	1.46	.63						
3000													13.60	4.74	2.06	9.45	1.96	.85						
3500													15.86	6.23	2.74	11.03	2.61	1.13						
4000																12.60	3.34	1.45						

FRICTION LOSS IN FITTINGS — EQUIVALENT LENGTH OF PIPE, Feet

	SIZE FITTING													
TYPE FITTING	1/4"	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"	6"	8"	10"	12"
90° Standard Elbow	0.9	1.6	2.1	2.6	3.5	4.0	5.5	6.2	7.7	10.1	15.2	20.0	25.1	29.8
45° Standard Elbow	0.5	0.8	1.1	1.4	1.8	2.1	2.8	3.3	4.1	5.4	8.1	10.6	13.4	15.9
90° Long Radius Elbow	0.6	1.0	1.4	1.7	2.3	2.7	4.3	5.1	6.3	8.3	12.5	16.5	20.7	24.7
90° Street Elbow	1.5	2.6	3.4	4.4	5.8	6.7	8.6	10.3	12.8	16.8	25.3	33.3	41.8	49.7
45° Street Elbow	0.8	1.3	1.8	2.3	3.0	3.5	4.5	5.4	6.6	8.7	13.1	17.3	21.7	25.9
Square Corner Elbow	1.7	3.0	3.9	5.0	6.5	7.6	9.8	11.7	14.6	19.1	28.8	37.9	47.6	56.7
Standard — with flow thru run	0.6	1.0	1.4	1.7	2.3	2.7	4.3	5.1	6.3	8.3	12.5	16.5	20.7	24.7
Tee — with flow thru branch	1.8	4.0	5.1	6.0	6.9	8.1	12.0	14.3	16.3	22.1	32.2	39.9	50.1	59.7

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Hydraulic Shock

Hydraulic shock is the term used to describe the momentary pressure rise in a piping system which results when the liquid is started or stopped quickly. This pressure rise is caused by the momentum of the fluid; therefore, the pressure rise increases with the velocity of the liquid, the length of the system from the fluid source, or with an increase in the speed with which it is started or stopped. Examples of situations where hydraulic shock can occur are valves which are opened or closed quickly or pumps which start with an empty discharge line. Hydraulic shock can even occur if a high-speed wall of liquid (as from a starting pump) hits a sudden change of direction in the piping, such as an elbow.

The pressure rise created by the hydraulic shock effect is added to whatever fluid pressure exists in the piping system and, although only momentary, this shock load can be enough to burst pipe and break fittings or valves.

Proper design when laying out a piping system will limit the possibility of hydraulic shock damage.

The following suggestions will help in avoiding problems:

1. In a plastic piping system, a fluid velocity not exceeding 5 ft./sec. will minimize hydraulic shock effects, even with quickly closing valves, such as solenoid valves. (Flow is normally expressed in GALLONS PER MINUTE—GPM. To determine the fluid velocity in any segment of piping the following formula may be used):

$$v = \frac{.4085\ GPM}{D_i^2}$$

Where: v = fluid velocity in feet per second
D_i = inside diameter
GPM = rate of flow in gallons per minute

See the Flow Capacity Tables on pages 9 and 10 for the fluid velocities resulting from specific flow rates in Schedule 40 and Schedule 80 pipes. The upper threshold rate of flow for any pipe may be determined by substituting 5 ft./sec. Fluid velocity in the above formula and solving for GPM.

Upper Threshold Rate of Flow (GPM) = $12.24\ D_i^2$

See the Pipe Reference Table on page 4 for the Upper Threshold Flow Rate in specific sizes of Schedule 80 Pipes.

2. Using actuated valves, which have a specific closing time, will eliminate the possibility of someone inadvertently slamming a valve open or closed too quickly. With air-to-air and air-to-spring actuators, it will probably be necessary to place a flow control valve in the air line to slow down the valve operation cycle, particularly on valve sizes greater than 1 1/2".

3. If possible, when starting a pump, partially close the valve in the discharge line to minimize the volume of liquid that is rapidly accelerating through the system. Once the pump is up to speed and the line completely full, the valve may be opened.

4. A check valve installed near a pump in the discharge line will keep the line full and help prevent excessive hydraulic shock during pump start-up. Before initial start-up the discharge line should be vented of all air. Air trapped in the piping will substantially reduce the capability of plastic pipe withstanding shock loading.

Shock Surge Wave

Providing all air is removed from an affected system, a formula based on theory may closely predict hydraulic shock effect.

$$p = v\left(\frac{SG - 1}{2}\quad C + C\right)$$

Where: p = maximum surge pressure, psi
v = fluid velocity in feet per second (see Table on pages 9 and 10 for flow/velocity conversion).
C = surge wave constant for water at 73° F.
*SG = specific gravity of liquid

* if SG is 1, then $p = vC$

EXAMPLE:
A 2" PVC Schedule 80 pipe carries a fluid with a specific gravity of 1.2 at a rate of 30 gpm and at a line pressure of 160 psi. What would the surge pressure be if a valve were suddenly closed?

From table below: $c = 24.2$
From upper table on page 10: $v = 3.35$

$$p = 3.35\left(\frac{(1.2 - 1)}{2}\quad 24.2 + 24.2\right)$$

$p = (3.35)(26.6) = 90$ psi

Total line pressure = 90 + 160 = 250 psi

Schedule 80 2" PVC from the chart on page 7 has a pressure rating of 400 psi at room temperature. Therefore, 2" Schedule 80 PVC pipe is acceptable for this application.

Surge Wave Constant (C)

	PVC		CPVC		Polypropylene	PVDF
Pipe	Sch. 40	Sch. 80	Sch. 40	Sch. 80	Sch. 80	Sch. 80
1/4	31.3	34.7	33.2	37.3	—	—
3/8	29.3	32.7	31.0	34.7	—	—
1/2	28.7	31.7	30.3	33.7	25.9	28.3
3/4	26.3	29.8	27.8	31.6	23.1	25.2
1	25.7	29.2	27.0	30.7	21.7	24.0
1 1/4	23.2	27.0	24.5	28.6	19.8	—
1 1/2	22.0	25.8	23.2	27.3	18.8	20.6
2	20.2	24.2	21.3	25.3	17.3	19.0
2 1/2	21.1	24.7	22.2	26.0	—	—
3	19.5	23.2	20.6	24.5	16.6	18.3
4	17.8	21.8	18.8	22.9	15.4	17.0
6	15.7	20.2	16.8	21.3	14.2	15.8
8	14.8	18.8	15.8	19.8		
10	14.0	18.3	15.1	19.3		
12	13.7	18.0	14.7	19.2		
14	13.4	17.9	14.4	19.2		

CAUTION: The removal of all air from the system in order for the surge wave analysis method to be valid was pointed out at the beginning of this segment. However, this can be easier said than done. Over reliance on this method of analysis is not encouraged. Our experience suggests that the best approach to assure a successful installation is for the design to focus on strategic placements of air vents and the maintenance of fluid velocity near or below the threshold limit of 5 ft./sec.

Expansion and Thermal Contraction of Plastic Pipe

Calculating Dimensional Change

All materials undergo dimensional change as a result of temperature variation above or below the installation temperature. The extent of expansion or contraction is dependent upon the coefficient of linear expansion for the piping material. These coefficients are listed below for the essential industrial plastic piping materials in the more conventional form of inches of dimensional change, per ° F of temperature change, per inch of length. They are also presented in a more convenient form to use. Namely, the units are inches of dimensional change, per 10° F temperature change, per 100 feet of pipe.

Expansion Coefficient

Material	C – in/in/° F x 10^{-5}	Y – in/10° F/100 ft.
PVC	3.0	.360
CPVC	3.8	.456
PP	5.0	.600
PVDF	7.9	.948

The formula for calculating thermally induced dimensional change, utilizing the convenient coefficient (Y), is dependent upon the temperature change to which the system may be exposed – between the installation temperature and the greater differential to maximum or minimum temperature – as well as, the length of pipe run between directional changes or anchors points. Also, a handy chart is presented at the bottom of this column, which approximates the dimensional change based on temperature change vs. pipe length.

$$\triangle L = \frac{Y(T_1-T_2)}{10} \times \frac{L}{100}$$

$\triangle L$ = Dimensional change due to thermal expansion or contraction (in.)
Y = Expansion coefficient (See table above) (in/10°/100 ft)
(T_1-T_2) = Temperature differential between the installation temperature and the maximum or minimum system temperature, whichever provides the greatest differential (° F).
L = Length of pipe run between changes in direction (ft.)

EXAMPLE 1:
How much expansion can be expected in a 200 foot straight run of 3 inch PVC pipe that will be installed at 75° F when the piping system will be operated at a maximum of 120° F and a minimum of 40° F?

$$\triangle L = \frac{(120-75)}{10} \times \frac{200}{100} = .360 \times 4.50 \times 2.0 = 3.24 \text{ inches}$$

Expansion or Contraction of PVC Pipe (in.)

Temp. Change*	Length of Pipe to Closest Anchor Point (ft.)									
△T° F	10'	20'	30'	40'	50'	60'	70'	80'	90'	100'
10°	0.04	0.07	0.11	0.14	0.18	0.22	0.25	0.29	0.32	0.36
20°	0.07	0.14	0.22	0.29	0.36	0.43	0.50	0.58	0.65	0.72
30°0.11	0.22	0.32	0.43	0.54	0.65	0.76	0.86	0.97	1.08	
40°0.14	0.29	0.43	0.58	0.72	0.86	1.00	1.15	1.30	1.44	
50°0.18	0.36	0.54	0.72	0.90	1.08	1.26	1.44	1.62	1.80	
60°	0.22	0.43	0.65	0.86	1.08	1.30	1.51	1.73	1.94	2.16
70°0.25	0.50	0.76	1.01	1.26	1.51	1.76	2.02	2.27	2.52	80°
0.29	0.58	0.86	1.15	1.44	1.73	2.02	2.30	2.59	2.88	
90°0.32	0.65	0.97	1.30	1.62	1.94	2.27	2.59	2.92	3.24	
100°	0.36	0.72	1.08	1.44	1.80	2.16	2.52	2.88	3.24	3.60
110°	0.40	0.79	1.19	1.58	1.98	2.38	2.77	3.17	3.56	3.96
120°	0.43	0.86	1.30	1.73	2.16	2.59	3.02	3.46	3.89	4.32

* Temperature change (△T) from installation to the greater of maximum or minimum limits.

To determine the expansion or contraction for pipe of a material other than PVC, multiply the change in length given for PVC in the table above by 1.2667 for the change in CPVC, by 1.6667 for the change in PP, or by 2.6333 for the change in PVDF.

Calculating Stress

If movement resulting from thermal changes is restricted by the piping support system or the equipment to which it is attached, the resultant forces may damage the attached equipment or the pipe itself. Therefore, pipes should always be anchored independently at those attachments. If the piping system is rigidly held or restricted at both ends when no compensation has been made for thermally induced growth or shrinkage of the pipe, the resultant stress can be calculated with the following formula.

$$S_t = EC(T_1-T_2)$$

S_t = Stress (psi)
E = Modulus of Elasticity (psi) (See table below for specific values at various temperatures)
C = Coefficient of Expansion (in/in/ ° F x 10^5) (see physical property chart on page 2 for values)
(T_1-T_2) = Temperature change (° F) between the installation temperature and the maximum or minimum system temperature, whichever provides the greatest differential.

Temperature vs. Modulus (x 10^5) psi

	73° F	90° F	100° F	140° F	180° F	210° F	250° F
PVC	4.20	3.75	3.60	2.70	N/A	N/A	N/A
CPVC	4.23	4.00	3.85	3.25	2.69	2.20	N/A
PP	1.79	1.25	1.15	.72	.50	N/A	N/A
PVDF	2.19	1.88	1.74	1.32	1.12	.81	.59

N/A - Not Applicable

The magnitude of the resulting longitudinal force can be determined by multiplying the thermally induced stress by the cross sectional area of the plastic pipe.

$$F = S_t \times A$$

F = FORCE (lbs)
S_t = STRESS (psi)
A = CROSS SECTIONAL AREA (in^2)

EXAMPLE 2:
What would be the amount of force developed in 2" Schedule 80 PVC pipe with the pipe rigidly held and restricted at both ends? Assume the temperature extremes are from 70° F to 100° F.

$S_t = EC(T_1 - T_2)$
$S_t = EC(100 - 70)$
$S_t = (3.60 \times 10^5) \times (3.0 \times 10^{-5})(30)$
S_t = 324 psi

The Outside and Inside Diameters of the pipe are used for calculating the Cross Sectional Area (A) as follows: (See the Pipe Reference Table on page 4 for the pipe diameters and cross sectional area for specific sizes of schedule 80 Pipes.)

$$A = \pi/4 (OD^2 - ID^2) = 3.1416/4 (2.375^2 - 1.913^2) = 1.556 \text{ in.}^2$$

The force exerted by the 2" pipe, which has been restrained, is simply the compressive stress multiplied over the cross sectional area of that pipe.

$F = S_t \times A$
$F = 324 \text{ psi} \times 1.556 \text{ in.}^2$
F = 504 lbs.

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Managing Expansion/Contraction in System Design

Stresses and forces which result from thermal expansion and contraction can be reduced or eliminated by providing for flexibility in the piping system through frequent changes in direction or introduction of loops as graphically depicted on this page.

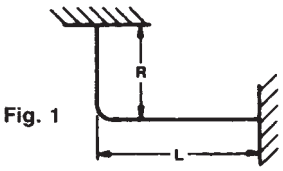


Fig. 1

Normally, piping systems are designed with sufficient directional changes, which provide inherent flexibility, to compensate for expansion and contraction. To determine if adequate flexibility exists in leg (R) (see Fig. 1) to accommodate the expected expansion and contraction in the adjacent leg (L) use the following formula:

$$R = 2.877\sqrt{D \triangle L}$$ SINGLE OFFSET FORMULA

Where: R = Length of opposite leg to be flexed (ft.)
D = Actual outside diameter of pipe (in.)
$\triangle$ L = Dimensional change in adjacent leg due to thermal expansion or contraction (in.)

Keep in mind the fact that both pipe legs will expand and contract. Therefore, the shortest leg must be selected for the adequacy test when analyzing inherent flexibility in naturally occurring offsets.

EXAMPLE 3:
What would the minimum length of a right angle leg need to be in order to compensate for the expansion if it were located at the unanchored end of the 200 ft. run of pipe in Example 1 from the previous page?

$$R = 2.877\sqrt{3.500 \times 3.24} = 9.69 \text{ ft.}$$

Flexibility must be designed into a piping system, through the introduction of flexural offsets, in the following situations:
1. Where straight runs of pipe are long.
2. Where the ends of a straight run are restricted from movement.
3. Where the system is restrained at branches and/or turns.

Several examples of methods for providing flexibility in these situations are graphically presented below. In each case, rigid supports or restraints should not be placed on a flexible leg of an expansion loop, offset or bend.

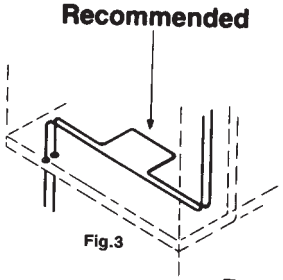


Fig.3

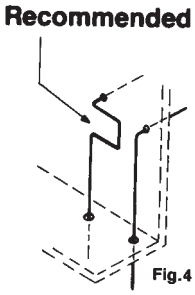


Fig.4

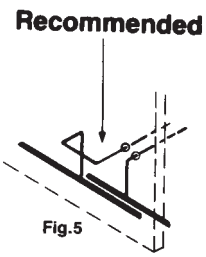


Fig.5

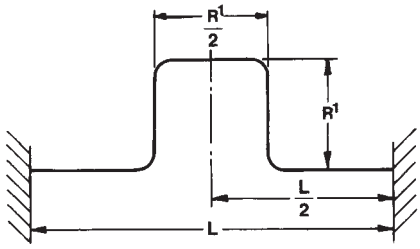


Fig. 2

An expansion loop (which is fabricated with 90° elbows and straight pipe as depicted in Fig. 2) is simply a double offset designed into an otherwise straight run of pipe. The length for each of the two loop legs (R'), required to accommodate the expected expansion and contraction in the pipe run (L), may be determined by modification of the SINGLE OFFSET FORMULA to produce a LOOP FORMULA, as shown below:

$$R' = 2.041\sqrt{D \triangle L}$$ LOOP FORMULA

EXAMPLE 4:
How long should the expansion loop legs be in order to compensate for the expansion in Example 1 from the previous page?

$$R' = 2.041\sqrt{3.500 \times 3.24} = 6.87 \text{ ft.}$$

Minimum Cold Bending Radius

The formulae above for Single Offset and Loop bends of pipe, which are designed to accommodate expansion or contraction in the pipe, are derived from the fundamental equation for a cantilevered beam – in this case a pipe fixed at one end. A formula can be derived from the same equation for calculating the minimum cold bending radius for any thermoplastic pipe diameter.

Minimum Cold Bend Radius

$$R_B = D_0 (0.6999\ E/S_B - 0.5)$$

Where: R_B = Minimum Cold Bend Radius (in.)
D_0 = Outside Pipe Diameter (in.)
E * = Modulus of Elasticity @ Maximum Operating Temperature (psi)
S_B * = Maximum Allowable Bending Stress @ Maximum Operating Temperature (psi)

*The three formulae on this page provide for the maximum bend in pipe while the pipe operates at maximum long-term internal pressure, creating maximum allowable hydrostatic design stress (tensile stress in the hoop direction). Accordingly, the maximum allowable bending stress will be one-half the basic hydraulic design stress at 73° F with correction to the maximum operating temperature. See the table at the top of the second column on page 7. The modulus of elasticity, corrected for temperature may be found in the table in the second column of the preceding page.

EXAMPLE 5:
What would be the minimum cold radius bend, which the installer could place at the anchored end of the 200 ft. straight run of pipe in Examples 1 and 3, when the maximum operating temperature is 100° F instead of 140°?

$R_B = 3.500\ (0.6999 \times 360{,}000/\ 1/2 \times 2000 \times 0.62 - 0.5) = 1{,}420.8$ inches or 118.4 feet

Pipe Support Spacing

Correct supporting of a piping system is essential to prevent excessive bending stress and to limit pipe "sag" to an acceptable amount. Horizontal pipe should be supported on uniform centers, which are determined for pipe size, schedule, temperature, loading and material.

Point support must not be used for thermoplastic piping and, in general, the wider the bearing surface of the support the better. Supports should not be clamped in such a way that will restrain the axial movement of pipe that will normally occur due to thermal expansion and contraction. Concentrated loads in a piping system, such as valves must be separately supported.

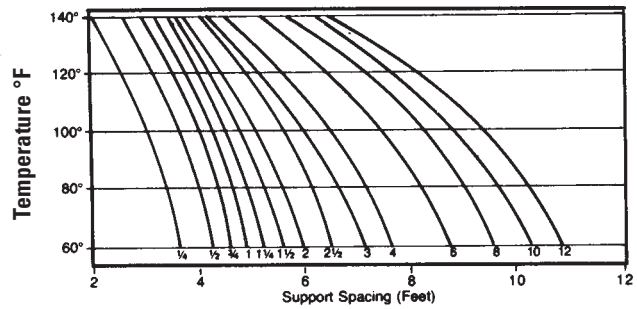
The graphs on this page give recommended support spacing for Chemtrol® thermoplastic piping materials at various temperatures. The data is based on fluids with a specific gravity of 1.0 and permits a sag of less than 0.1" between supports. For heavier fluids, the support spacing from the graphs should be multiplied by the correct factor in the table below.

Specific Gravity

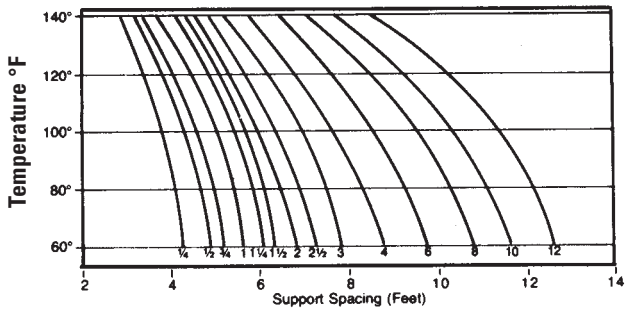
1.0	1.1	1.2	1.4	1.6	2.0	2.5
1.0	.98	.96	.93	.90	.85	.80

Correction Factor

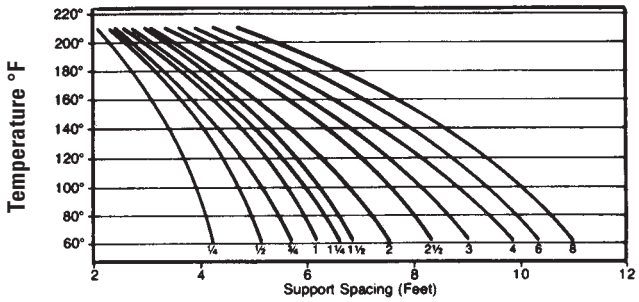
PVC Schedule 40



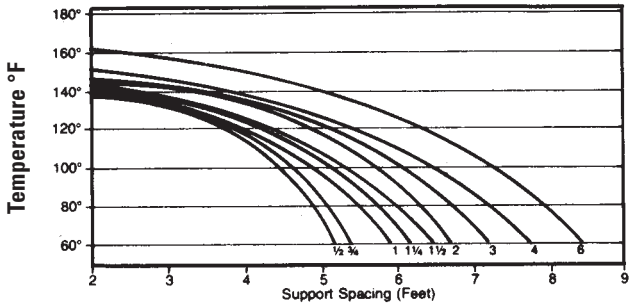
PVC Schedule 80



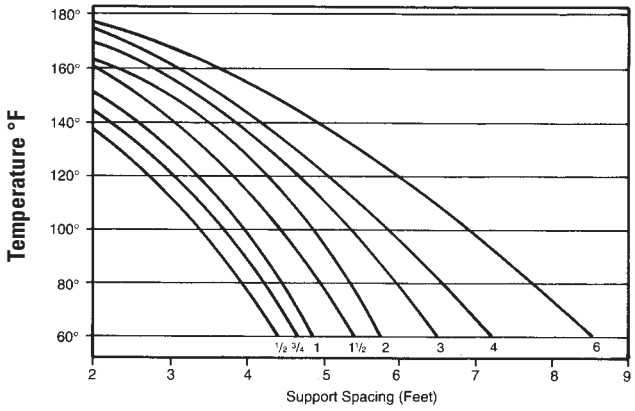
CPVC Schedule 80



Polypropylene Schedule 80



PVDF (KYNAR®) Schedule 80



The above data is for uninsulated lines. For insulated lines, reduce spans to 70% of graph values. For spans of less than 2 feet, continuous support should be used.

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Storage, Handling, Joining Methods and Preparation for Joining Industrial Thermoplastic Pressure Piping

Storage

Industrial thermoplastic piping components are designed and manufactured for use in systems for severe duty involving the transport of aggressive liquids. In order to ensure their integrity once installed, they must be handled with reasonable care prior to installation.

Pipe

When pipe is received in standard lifts it should remain in the lift until ready for use. Lifts should not be stacked more than eight feet high and should always be stacked wood on wood. Loose pipe should be stored on racks with a minimum support spacing of three to eight feet, depending on size. Pipe should be shaded but not covered directly when stored outside in high ambient temperature. This will provide for free circulation of air and reduce the heat build-up due to direct sunlight exposure.

Fittings and Valves

Fittings and valves should be stored in their original cartons to keep them free of dirt and reduce the potential for damage. If possible, fittings and valves should be stored indoors.

Solvent Cement and Primer

Solvent cement has a definite shelf life and each can and carton is clearly marked with a date of manufacture. Stock should be rotated to ensure that the oldest material is used first. Primer does not have a shelf life, but it is a good practice to rotate this stock also. Solvent cement and primer should be stored in a relatively cool shelter away from direct sun exposure.

CAUTION: Solvent cement and primer are composed of volatile solvents and require special conditions for storage. Because of the flammability, they must not be stored in an area where they might be exposed to ignition, heat, sparks or open flame.

Handling

Pipe, Fittings and Valves

Care should be exercised to avoid rough handling of thermoplastic piping appurtenances. They should not be dragged over sharp projections, dropped or have objects dropped upon them. Before use, pipe ends should be inspected for cracks resulting from such abuse. Whether pipe is transported by closed truck or open trailer, the plane of support must be level and continuous under the wood frames of lifts or bundles of loose pipe and all sharp edges of the truck bed, which may come in contact with the pipe must be padded.

Solvent Cement and Primer

Keep shipping containers of solvent cement and primer tightly closed except when transferring product to applicator containers, and keep a lid – even a piece of flat cardboard – on applicator containers when not in use. After each joint, wipe the respective cement and primer applicator brushes free of excess material on the top inside edge of the applicator containers and temporarily store the applicators in a container of high boiling solvent, such as MEK cleaner. This temporary brush storage container will not require a lid. Avoid prolonged breathing of solvent vapor, and when joints are being made in partially enclosed areas use a ventilating device to attenuate vapor levels. Keep solvent cement, primer and cleaners away from all sources of ignition, heat, sparks and open flames. Avoid repeated contact of the solvents with skin. Application of the cement or primer with rags and bare hands must be severely discouraged. Stiff olefin or polyester crimped-bristle brushes and other suitable applicators are safer and more effective.

DANGER: Extremely flammable. Vapor harmful. May be harmful if swallowed. Direct contact causes eye irritation and may cause skin irritation. Keep away from heat, sparks and open flame. Use only with adequate ventilation. *FIRST AID:* In case of skin contact, flush with water; for eyes, flush with water for at least 15 minutes and seek medical attention. Wash contaminated clothing before reuse. If swallowed, DO NOT INDUCE VOMITING, call physician immediately.

Joining Methods for Pressure Piping

One of the more important features of industrial thermoplastics is the ease with which they lend themselves to a variety of fabricating techniques, a marked contrast with high alloy metallic or reinforced thermoset plastic piping. This versatility, plus the wide selection of components and materials, makes fast and economical installation, maintenance and modification of industrial piping systems a reality.

Detailed step-by-step installation instructions are given in this section for joint preparation, solvent cementing and thermo-fusion of socket joints. These techniques are unique to thermoplastic piping. However, on-site training for design and contract administration engineers and installation mechanics is available from the network of Chemtrol Technical Service or Sales Engineers and approved Distributor Sales personnel. General instruction and comments are also presented in this section for the installation of thread, flange and union joints. These techniques are essentially borrowed from metal piping, so the basic training and job experience for installation mechanics should have included these subjects. As with all other mechanical construction, the contractual requirement for installer training is the province of the design engineer, while the quality control of installation workmanship is the province of the contract administrator.

Socket Fusion

Whenever possible the designer should choose socket fusion joining with flange or union assembly points. Whether solvent welding or thermo-sealing joints (material dependent), socket fusion is the most economical, as well as the most reliable, method for joining thermoplastic piping. Both joining processes are easy to master. So, after more than a 40 years existence for both, nothing less than consistent and manufacturer-proven joining techniques should be acceptable. The degree of reliability and cost associated with rework is solely a function of training and demonstrated technique by the installation mechanic.

Solvent Weld

The chemical fusion of pipe into a socket fitting is made possible by partial dissolution of the surface materials on pipe and the socket connector with a solvent primer followed by applications of solvent cement to those surfaces before pushing the joint together. Since the solvent cement contains dissolved parent material, there is a commingling of pipe, cement and fitting materials as the joint is made and twisted 90°, such that upon evaporation of the volatile solvents a single residual material is chemically bonded or fused. Traditional cement, or glue, i.e. foreign material carried in an organic solvent or water base and acting as an alien interface for bonding two surfaces together, has not been used for making thermoplastic piping joints. Solvent welding is an easy and inexpensive joining method for pipe. However, in order to be a candidate for this method, the piping material itself must be soluble in relatively volatile organic solvent(s). PVC, CPVC and ABS are such materials commonly used for commercial and industrial piping applications.

Thermo-Fusion (Heat Fusion)

The heat fusion of pipe into a socket fitting is made possible by partial melting of the surface materials on pipe and the socket connector with electrically heated female and male anvils, respectively, applied to those surfaces before pushing the joint together. Since the heated anvils are designed to diametrically interfere with the pipe and socket in matching geometric cones; and the plastic melt swells when passing through the phase change from solid material; there is a commingling of pipe and fitting materials as the joint is stabbed together. Upon cooling a single material is solidly fused. There is a similar joining method called butt fusion where pipe-to-pipe or pipe-to-fitting-face joints are made by partial melting the ends to be joined by holding them against an electrically heated plate, and then pushing the butt ends together. However, because of problems associated with longitudinal alignment, uneven cooling and differential melt pressure during cooling, butt fusion joining should never be used for conveying hazardous liquids, particularly above ground. These joints have been known to shatter without warning too frequently for industrial chemical usage. Butt fusion is an ideal joining method for under ground low-pressure gas piping and high-purity process water systems.

Polypropylene (PP) and PVDF (Kynar®) can not be dissolved by even the strongest of organic solvents. Therefore, it is not possible to join these materials by solvent cementing. But PP and PVDF lend themselves to being

joined using the socket heat fusion technique. For these fitting and valve product lines Chemtrol offers two different sizes of kits with hand-held heat tools applicable for pipe sizes through 4". Three different sizes of machines with self-contained heat tools applicable for pipe sizes through 6" offer perfect joint penetration depth and longitudinal alignment. PVC and CPVC are not candidates for the heat fusion joining method because they rapidly decompose and out-gas at the process temperature required to melt them. Hence, inadequate joint strength can be developed.

Thread (Tapered National Pipe Threads)
Threaded joints are sometimes used for emergency repairs and when a piping system must be dismantled for occasional cleaning or modifications. Since threading results in a reduction in the effective wall thickness of the pipe, the pressure rating of threaded pipe is reduced to one-half that of unthreaded pipe, i.e. pipe joined by solvent cementing or heat fusion. Because of the serious strength reduction, only Sch. 80 or greater wall thickness of plastic pipe is recommended for threading – never Sch. 40. Threaded joints are not a recommended method for material transition at vessels, equipment and pumps because external mechanical stresses are concentrated at the notch sensitive plastic thread – metals are typically stronger than plastic by five or more orders of magnitude. See the Pipe Union joint section below for the proper solution for material transition. A great difference in the thermal coefficients of expansion, between the materials to be joined, makes the threaded joint more susceptible to leakage. Threaded polypropylene systems are not recommended for pressure piping because of the material's extremely low modulus of elasticity and sensitivity to notching (the joints will leak in time).

Other Mechanical Joints

Flange
Flanges are an old method of joining, but they continue to be used extensively on vessels, equipment and pumps. Particularly in sizes above 3", flanges are the easiest way to disassemble piping for cleaning and modification or maintenance of equipment, so joining method and location within the system are important factors in planning for maintenance efficiency. Socket fittings and valves are flanged with plain-end short nipples by solvent welding or heat fusing (depending on material type) both joints. Flanges are similarly joined to straight pipe runs, or they can be threaded.

Pipe Union
Particularly in sizes 3" and below, unions are the easiest and most reliable way to disassemble piping for cleaning and modification or maintenance of equipment. They are, unfortunately, too often overlooked in planning the design of thermoplastic piping systems. The factors that make threaded joints unrealistic as a method for transition between materials are given in the paragraph above discussing threads. These reasons catalyzed Chemtrol development of: True Union Valves; Pipe Union with end connectors and union nuts that are interchangeable with the True Union Valve; and stainless steel or brass transition end connectors that are interchangeable with plastic end connectors for both the Pipe Unions and True Union Valves. So, transition end connectors may be affixed to equipment presenting male or female threads, or tank adapters may be used to replace tank connections designed to present threads. As with flanges, we urge the designer to plan the placement of pipe unions in order to enhance maintenance and modification efficiency.

Preparation of Pipe and Fittings & Valves for All Joining Methods

Before starting any type of joining method the first step is to always inspect the pipe and fitting or valve for any flaws, such as deep scratches or gouges, excessive warping or broken pipe ends. If there is any doubt about the soundness of the materials, it is always better to be on the safe side and discard a potentially defective pipe or fitting than to install it and have to repair it later. Regardless of which joining method is to be employed – thread, socket fusion [chemical fusion (solvent cement)] or thermo-sealing (heat fusion), grooved end (pioneered by Victaulic Co. of America) or integral bell gasketed joints (water and sewer piping) – the preparation for jointing is identical. The method will be presented below and referenced in each set of installation instructions for specific joining methods that follow.

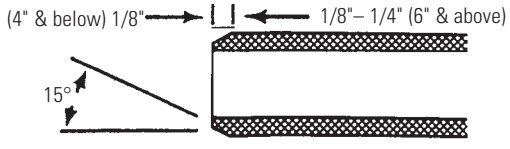
Cleaning
Surfaces to be joined must be free of dirt and dust, grease, paint splashes, water or other substances. If clean surfaces can not be achieved with a dry paper or cotton towel or rag, try a solvent such as Methyl Ethyl Ketone (MEK), available as a cleaner from many distributors of industrial plastic piping, or Isopropyl Alcohol. Use a light emery cloth for removal of paint splatters. If reasonable attention has been given to storage and handling of the products, a light dusting is all that will be required. Open all valves and/or remove end connectors from union ends prior to joining in order to provide ventilation and help prevent chemical or heat distortion of sealing surfaces during joining.

Pipe Cutting
The objective is to cut the pipe squarely so that it can be evenly chamfered on the outside edge. These steps are essential to enable a good joint fit between pipe and fitting and to optimize the ease of making the joint, particularly if the pipe is to be threaded or socket fused. The smaller sizes of plastic pipe can easily be cut with a pipe or tubing cutter, which has a cutting wheel that is specifically designed for plastic. Such a cutter is made by several manufacturers and supplied by mechanical distributors. Chemtrol supplies three different cutting tools for the range of pipe sizes through 6". Rigid Tool Div., T. D Williamson Co., Tulsa, OK, makes them. These same manufacturers also make wheel cutters for pipe through the 12" size. Palm gripped shear cutters, commonly used for thin-wall plastic condensate, irrigation or utility service pipe or tubing, are unacceptable for thick-wall industrial piping.



The pipe can also be cut with a power or hand saw provided the blade is guided to make a perfectly square cut. For example, "trying" to cut the pipe squarely, while holding it with one hand and operating a skill saw with the other, is unacceptable. Use a miter box for a hand saw or a guide rail for a table saw or a hold-down jig for a band saw. For best results use a fine-toothed blade (16-18 teeth per inch). And, if a large quantity of pipe is to be cut, use carbide-tipped blades.

Deburring and Beveling
All pipe ends should be beveled to approximately the dimensions shown below for easier installation, better fit and proper joint. There are several manufacturers of beveling tools specifically for plastic which are sold by mechanical distributors who provide plastic piping through 12" size. Chemtrol supplies two different beveling tools: a small one for pipe sizes through 4" and a large one for pipe sizes 11/2" – 8" manufactured by Reed Manufacturing Co., Erie, PA. Although it takes much longer to do an adequately neat job, the pipe can be beveled with a coarse file.
Then each cut pipe end should be deburred on the ID. Use a deburring tool, knife or a half-round coarse file to remove all burrs, chips, filings, etc., including any that may be left on the OD. To complete the pipe end, it may be necessary to wipe the surface and inside of the pipe again. Now the installer is ready to proceed with the selected joining method.



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Solvent Cement Joining for PVC & CPVC Pressure Piping Systems

Materials and Tools

Selection of Solvent Cement and Purple Primer

There are a variety of primers, solvent cleaners and solvent cements manufactured, but most are for the less demanding low-pressure water, drainage or conduit applications of piping. However, for the more demanding industrial pressure piping applications, PVC and CPVC each require its own solvent cement. These are dark gray and light gray, matching the respective colors of the Sch. 80 piping materials. Both are defined as heavy-bodied cements, containing more than 10% PVC resin, by weight. We recommend that the primer, used for both PVC and CPVC joining, contain a purple dye and that it have the capability of dissolving 10% PVC resin, by weight, as defined by ASTM Standard F656.

All CPVC solvent cement formulations manufactured, except one, contain small amounts of Fumed Silica, which acts as a thickening agent to keep the cement from flowing off applied surfaces. B. F. Goodrich, manufacturer of Corzan® brand CPVC material, and IPS Corp., manufacturer of Weld-On brand solvent cement products, have correlated slowly developing (one to two years) seep leakage from joints in concentrated Bleach service (15% Sodium Hypochlorite + 11/2% Sodium Hydroxide) with usage of cement containing the Fumed Silica. They also found that Bleach, other high alkalinity solutions and Hydrofluoric Acid dissolves Fumed Silica. Therefore, for the aforementioned services, we recommend the only known CPVC cement product without Fumed Silica, Weld-On 724, made by IPS Corp., Compton, CA, and formulated especially for industrial applications. In fact, we know of no CPVC applications, for which Weld-ON 724 would not be applicable. If PVC piping is to be used in the aforementioned services, we recommend the only currently known PVC cement without Fumed Silica, Oatey Industrial Grade Low VOC Heavy Duty Gray, made by Oatey Corp., Cleveland, OH. Again, we know of no PVC applications, for which this Oatey product would not be applicable.

Deep penetration of adhesion over 80%, or more, of joint surface areas will provide the desired bond strength and leak prevention in a joint. Leakage becomes problematical when less than 50% of joint surface areas exhibit adhesion, and/or when there is a break or absence of hardened cement bead trapped between the pipe chamfer and the ledge at the bottom of the socket. Joint strength will be jeopardized by the combination of shallow penetration and minimal adhesion area. These characteristics may be subjectively observed by sawing the joint in half longitudinally and then forcibly prying the pipe halves from the fitting socket shells. In this regard, the specifying engineer's insistence on use of purple primer will be useful to the piping mechanic as an indicator of surface area covered. It is also a valuable failure analysis tool because the indelible dye may be observed in the substrate of adequately primed joint surfaces.

Selection of Applicators for Primer and Cement

Daubers are frequently attached to the screw-top lids of both purple primer and solvent cement. In such cases we recommend cutting the dauber from the lid with wire pliers and discarding it when the container is first opened. It is essential to work the solvent into the joint surfaces to achieve partial dissolution and swelling. Unfortunately the strength of the dauber handles is inadequate for this purpose. Although the dauber may be used for application of solvent cement to pipe through 2" in size, we find that it is only practical to use them in pint cans for very small jobs done on an infrequent basis because they clump-up with partly dried cement. A stiff olefin or polyester crimped-bristle paintbrush, having a width approximately one-half the actual diameter of the pipe to be joined, is recommended for the proper application of purple primer. This type of brush also works well for spreading solvent cement on joint surfaces.

Job-site Management of Solvent Cement and Primer

The solvents in these products are volatile, so the objective is to minimize evaporation and maintain freshness. There is a shelf date on solvent cement, but not on purple primer. The shelf life is more directed at forcing inventories of products to be rotated because solvent, unlike the plastic products, will not last forever. As a result, the occasions of finding unopened product, which has become defective in the can, are seldom. However, it is easy for the installer to discern defective cement. A spatula or screwdriver should evenly stir the product with no sense of separation of solvent from solids when inserted the full depth of the container. And when the implement is lifted from the cement the product should smoothly flow from it as thoroughly mixed paint or rich cream would, with no signs of gelling, lumps or stringiness. Do not attempt to thin out sluggish cement with thinner or primer. Throw it away.

Product freshness and the avoidance of product wastage can best be managed for installations larger than a simple repair of small diameter piping by transferring purple primer and solvent cement from their shipping container to applicator containers. The shipping container should be kept tightly closed except when transferring product. A coffee can, which will accommodate brush widths up to 3", is acceptable, but polyethylene (PE) plastic works best for applicator containers. Every shape, form and description of PE container, with lids, may be found in a Kmart or Wal-Mart type of store. We have even seen a two-liter soft drink plastic bottle, evenly sheared off in the middle with a flat piece of cardboard as a top, used successfully.



Obviously, a third container, filled to a level greater than the length of brush bristles with MEK solvent cleaner, will be required for the storage of both applicator brushes between joints in order to keep them pliable and free of contaminated dried material. Following the applications of purple primer and solvent cement to a joint, both sides of the brushes should be wiped free of excess material on the top inside edge of the respective applicator containers and the brushes returned to their storage container. Except when using the products, keep lids on the applicator containers. Clean the brushes in the same way on the storage container when ready to dip them in the product applicator containers for the next joint. And when reloading the brushes with product, dip them no deeper than the bristle length to avoid dried material on the crimped metal. As the workday is completed, transfer the unused products to their respective shipping containers and close their tops tightly again. Leave the top off the applicator containers and allow them to dry overnight. The dried film can easily be peeled away from PE the next morning to provide a clean container for another day's work.

If overnight storage of materials and tools is inside, it is not necessary to do more than throw a shop towel across the tops of the brush handles in their storage container to keep contaminants out and further suppress the slow evaporation rate of MEK. If storage is outside, a plastic baggie could be placed over the tops of the brush handles and secured with a rubber band around the container top. For longer-term storage or movement between jobs, brushes may be hung on a homemade frame in a one-gallon paint can. The frame is coat hanger wire bent into a circle to go around the inside bottom of the can with a riser up the side and then bent to make a horizontal cross-member. The frame can be lifted up from the can by the horizontal cross-member and brushes slid on or off the horizontal piece to hang by the eye in the handle. The frame is lowered into the can and the top is pressed on. This arrangement has the added benefit of preventing the brushes from mushrooming due to the long-term support of their own weight on the bottom of the can. For now they will hang freely from the bottom. The brushes will stay pliable indefinitely if the level of MEK solvent covers the bristles.

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Tools and Equipment

- Cutting Tool (see Preparation for Joining, pg. 16)
- Beveling Tool (see Preparation for Joining, pg. 16)
- Paper Toweling or Cotton rags (see Preparation for Joining, pg. 16)
- Solvent Cement and Purple Primer Application Brushes (see Selection of… pg. 17)
- Heavy-Bodied Gray Solvent Cement (see Selection of Cement and…, pg. 17)
- Industrial Purple Primer for PVC or CPVC (see Selection of… and Primer, pg. 17)
- Cement and Primer Applicator Containers (see Job-Site Management… pg. 17)
- Job Storage Container for Brushes (see Job-Site Management… pg. 17
- Come-Along Pipe Joining Tool (following end of 6-Step Application Techniques)
- Pipe Vise (pipe sizes larger than 2")
- Deburring Tool (see Preparation for Joining, pg. 16)
- Pipe Cleaning solvent (see Preparation for Joining, pg. 16)
- Notched Boards (pipe sizes 2" or less)
- Tool Tray (transport materials and tool from joint to joint)

Six Step Application Techniques

Components should be wiped clean, pipe squarely cut, deburred and beveled according to the preparation instructions on page 16. Since the solvents in the cement and primer will absorb water, but water is deleterious to the joining process, the joint surfaces must be dry at the time of joining.

Primer Application

1. Using a stiff olefin or polyester crimped-bristle brush, apply purple primer to the fitting and pipe-end in a 3-step process alternating from fitting to pipe. Apply primer to the fitting freely. Wet the sub-strate of the socket surface by maintaining a rapid and vigorous scouring motion of the applicator over the entire inner socket for five to fifteen seconds. Re-dip the applicator and continue as necessary, but avoid puddling inside the fitting beyond the socket.



2. Apply purple primer to the outer pipe-end surface with the same vigorous scouring motion of the brush, re-dipping the applicator every five to fifteen seconds as necessary. Make sure that the evenly primed length of pipe is at least equal to the fitting socket depth. Quickness is of the essence in order to scrub primer into the surfaces and attain moistened substrata. Note that the pipe-end can be cradled and rotated on a notched block of wood, if working alone, to make application easier and to keep the surface clean.

3. Re-apply primer to the fitting socket in the same manner. When a continuous peel of a few thousandths of an inch thickness can be scraped from the primed surface with an edge, such as a knife blade, the substrate has been adequately primed for a joint. With practice one will learn to observe a slight tackiness and swell in the surfaces when priming is adequate. Alternate applications of the primer always start with the female component. Cementing should not begin until priming is adequate.



Solvent Cement Application

4. Before the primer dries, continue the alternating surface approach by applying solvent cement to the pipe and fitting in a 3-step process. Use a second plastic crimped-bristle brush to spread a continuous film of cement on the outer pipe-end surface for a length at least equal to that of the fitting socket depth. The cement film should be such that it does not run as a sheet and drool from the exterior or into the pipe interior. And the film thickness need be only thick enough to trap the continuing penetration of solvent into the pipe substrate.



5. While the moistened substrate of the fitting socket is still soft and swollen from priming, quickly spread a continuous film of solvent cement onto the entire socket surface. Avoid puddling and run-off of the cement anywhere in the fitting, or beyond the socket depth in belled-end pipe. The cement film need be only thick enough to trap the continuing penetration of solvent into the substrate and to provide an immediate and continuous wet filet around the pipe chamfer during its eminent insertion into the fitting socket. Most of this cement will be pushed ahead by the pipe throughout its insertion to the full depth of the socket. A final excess of cement at the bottom of the socket should be avoided because it cannot be removed. Large puddles formed inside the pipe and/or fitting bore serve to dramatically extend the drying time of these solvent affected areas, which translates to reduced strength of the parent material until drying does occur. Mounds of dried cement may also ultimately act as blockages to fluid flow, resulting in unacceptable pressure loss.



6. Put a second coat of solvent cement on the pipe-end. This completes the six steps of alternate surface application for a joint – three of primer and three of cement – starting with the female component. Cement layers on the pipe must be without voids and sufficient to provide an immediate and continuous wet filet around the socket entrance radius/chamfer during the eminent insertion of pipe into the fitting socket. Excess cement will be pushed off the pipe throughout its insertion to the full depth of the fitting socket. However, it is critical that the two wet beads – an inside one around the pipe chamfer and an outside one around the socket chamfer – be maintained to form vacuum seals while joining. Although much of the cement will be scraped off both the pipe and socket during joint insertion, some must be redrawn, by vacuum, to back-fill the diametrical gap between pipe and fitting socket. Air will back-fill the joint if either of the wet bead dynamic seals is broken during joint insertion, resulting in a loss of bonding area.



Crew Size

Obviously, the 6-step application method has a joining crew size of one in mind. When the crew size is increased to two, the 6-step principals must be modified such that each crewmember has their own set of primer and cement brushes and each would attend to the application of both solutions to a single joint surface. The total time to prime and spread cement to each surface is essentially the same when the 6-step concept is mimicked by a crew of two. A crew of two should be strongly considered for pipe sizes 2" through 4" and should be mandatory for larger sizes. A come-along type pipe-joining tool, similar to that manufactured by Reed Manufacturing, Erie, PA, is required for the 10" and larger sizes



Joining

Pipe Insertion

Immediately upon finishing the application of cement, and before it begins to dry, the pipe must be inserted squarely into the fitting socket. Too much time has elapsed if either of the surface films has dried to the point that the film folds in the socket chamfer upon pipe insertion, rather than forming a wet bead at that location. Rotation of the pipe/turn in the socket, following pipe insertion to the full socket depth, completes the joint. This encourages complete distribution of the cement and its commingling with joint surfaces. In addition to a crew size of two being mandatory for 6" and larger pipe, rotation of the pipe in the fitting may be omitted for these sizes.



DANGER: DO NOT USE OR TEST THE PRODUCTS IN THIS CATALOG WITH COMPRESSED AIR OR OTHER GASES. FAILURE TO FOLLOW THIS WARNING CAN RESULT IN PERSONAL INJURY OR DAMAGE TO PROPERTY.

After completing the joint it must be held together for a brief time while the cement begins to dry. This is to prevent the pipe from squirting back out of the fitting socket. The phenomena occurs because fresh cement is an excellent lubricant and product standards dictate the socket to be tapered, with the minimum entrance diameter equaling the maximum pipe diameter and the diameter at the bottom of the socket creating a statistical interference with the pipe diameter. Therefore, the joint must be held together for a minimum of 10 to 15 seconds – a little longer for larger sizes. For pipe sizes 6" and larger the holding time may be one to three minutes. If any pipe back-out does occur, the potential for joint failure/leakage is unacceptably great.

Excess Cement
Wipe off all excess cement from the circumference of the pipe and fitting immediately after the joint holding period and before the cement begins to harden. The localized quantity of cement will affect solvent evaporation by extending the drying time of the pipe. Then, gently place the joint onto a level surface to complete the hardening stage before further handling.

Joint Drying Time Guidelines

In the foregoing we have strongly suggested that PVC and CPVC chemical fusion joint integrity depends upon the installation mechanic following Chemtrol specific handling, storage, inspection, component preparation, bonding materials selection, job-site management of materials, tools usage, application techniques and joining recommendations. Although Chemtrol does not currently manufacture solvent cementing products, the credentials for these recommendations were derived from its pioneering role in the engineering development of these solvent products throughout the initial 42 years of their usage with industrial socket fittings and valves. Joint integrity also greatly depends upon an infinitely wide and uncontrollable set of product and environmental conditions that relate to the determination of joint drying times prior to handling, testing at low or high pressure or exposure to fulltime working pressure. These conditions include size and surface temperature of the joint, specific diametrical fit of joint components and relative humidity. Drying times will be slowed with larger pipe, lower surface temperature, greater clearance fit (product standards contain allowable diametrical tolerances) and higher humidity. Drying times will be become faster as these conditions are reversed.

Because of the variety of these unpredictable conditions that may exist from job to job, Chemtrol can only offer the following general recommendations relative to PVC and CPVC joint drying times:

1. It is best if the actual joining is done in atmospheric temperature above 35/40° F and below 90° F when the joint components are exposed to direct sun.

2. It is best if all joints can have 72 hours of drying time elapse for all sizes of pipe and drying temperatures before the joint is subjected to any appreciable pressure on a fulltime basis.

The installation manager must assume the risk of deciding when PVC or CPVC joints are sufficiently dry for movement or handling, initiating low pressure testing, applying high pressure testing and/or subjecting the new system to the maximum allowable fulltime working pressure. Chemtrol offers the following drying times as a guide in aiding the installer, engineer, owner or other interested parties in making these decisions. The drying times are based on a combination of past field experience and laboratory tests.

Handling
During the initial hardening of the cement, which begins about two minutes after its application (on small sizes), be careful not to move or disturb the joint less the bond of fragile material be broken. A guide for drying times prior to handling a joint appears below.

PVC and CPVC Joint Movement Times

Nominal Pipe Size	Hot Weather* 90° – 150° F Surface Temperature	Mild Weather* 50° – 90° F Surface Temperature	Cold Weather* 10° – 50° F Surface Temperature
1/4" – 1 1/4"	12 Min.	20 Min.	30 Min.
1 1/2" – 2 1/2"	30 Min.	45 Min.	1 Hr.
3" – 4"	45 Min.	1 Hr.	1 Hr. & 30 Min.
6" – 8"	1 Hr.	1 Hr. & 30 Min.	2 Hrs. & 30 Min.
10" – 12"	2 Hrs.	3 Hrs.	5 Hrs.

*The temperatures above are drying temperatures and should not be confused with atmospheric joining temperature recommendations and limitations. See section on "Joint Integrity."

Pressure Testing

CAUTION: Air or compressed gas is not recommended as a media for pressure testing of plastic piping systems.

Initial Low Pressure Joint Testing
Initial hydrostatic testing of PVC or CPVC solvent welded joints could be accomplished at 10% of the largest pipe's maximum non-shock operating pressure rating, corrected for ambient temperature (see page 7) after brief drying times.

PVC and CPVC Joint Drying Times for 10% Pressure Testing

Nominal Pipe Size	Hot Weather* 90° – 150° F Surface Temperature	Mild Weather* 50° – 90° F Surface Temperature	Cold Weather* 10° – 50° F Surface Temperature
1/4" – 1 1/4"	1 Hr.	1 Hr. & 15 Min.	1 Hr. & 45 Min.
1 1/2" – 2 1/2"	1 Hr. & 30 Min.	1 Hr. & 45 Min.	3 Hrs.
3" – 4"	2 Hrs. & 45 Min.	3 Hrs. & 30 Min.	6 Hrs.
6" – 8"	3 Hrs. & 30 Min.	4 Hrs.	12 Hrs.
10" – 12"	6 Hrs.	8 Hrs.	72 Hrs.

*The temperatures above are drying temperatures and should not be confused with atmospheric joining temperature recommendations and limitations. See section on "Joint Integrity."

High Pressure Testing
PVC or CPVC solvent cemented joints can be tested for no more than 15 minutes at 100% of the largest pipe's maximum non-shock operating pressure rating, corrected for ambient temperature (see page 7) after extended drying times.

PVC and CPVC Joint Drying Times for 100% Pressure Testing

Nominal Pipe Size	Hot Weather* 90° – 150° F Surface Temperature	Mild Weather* 50° – 90° F Surface Temperature	Cold Weather* 10° – 50° F Surface Temperature
1/4" – 1 1/4"	4 Hrs.	5 Hrs.	7 Hrs.
1 1/2" – 2 1/2"	6 Hrs.	8 Hrs.	10 Hrs.
3" – 4"	8 Hrs.	18 Hrs.	24 Hrs.
6" – 8"	12 Hrs.	24 Hrs.	48 Hrs.
10" – 12"	18 Hrs.	36 Hrs.	72 Hrs.

*The temperatures above are drying temperatures and should not be confused with atmospheric joining temperature recommendations and limitations. See section on "Joint Integrity."

Full-time Working Pressure or Maximum Test Pressure
PVC and CPVC joints may be introduced to maximum working pressure on a full-time basis after approximately four times the drying time shown above for 100% pressure testing. In compliance with ANSI B-31, Code for Pressure Piping, the system may be tested for up to one hour at one and one-half times the maximum non-shock operating pressure rating for the appurtenance with the least pressure rating in the system following the guideline drying times for fulltime working pressure. Or, if all devices with lower pressure ratings are isolated from the test, 2" Sch. 80 pipe, fittings and their joints could be so tested to 600 psi after correction for ambient temperature (see page 7).

General Comments and Hints

Do's and Don'ts

DO:

- Clean and prepare pipe and fitting (see Preparation for Joining, page 16).
- Use the proper applicators (see Selection of Applicators for…, page 17).
- Scrub primer into joint surfaces until a lemon peel may be curled with an edge.
- Apply Cement while the primer is still moistened.
- Maintain two wet beads at the pipe and fitting chamfers throughout joint insertion.
- Follow the instructions completely.

DON'T:

- Attempt to solvent weld in wet and/or wind without shielding.
- Solvent weld below 35° or above 90° F under direct sun exposure without precautions (see Hot and Cold Weather Cementing below).
- Discard leftover cans of solvent in trench with piping. Concentrated fumes can cause piping failure.
- Skip any priming or cementing steps.
- Skimp with cement on pipe or overdo cement in sockets, but apply enough for wet bead formation during joint insertion.

Hot Weather Cementing

Hot weather can be the nemesis of solvent cementing. As the temperature and/or wind increase, the rate of solvent evaporation quickens. Hence, it becomes more difficult to keep primed surfaces moistened. Even the cement itself can begin to "film over" prior to joining. Rather than using hot weather as an excuse to compromise the functional elements required for reliable joining, the problem must be overcome by adjusting the approach to priming, cement application and pipe insertion techniques in order to appropriately reduce the lapsed joining time. As corrective measures to combat wind and/or temperature in excess of 90° F, the following may be done:

1. Increase the crew size and organize the team to achieve speed while making no compromise to functional performance.

2. Construct a windscreen from polyethylene film or tenting around the joint and crew.

3. Shade the pipe, fittings, valves and solvent materials from the sun prior to joining in order to eliminate heat absorption by the dark color. Fittings, valves and solvent supplies may be kept in a box. Shading the pipe to be joined may be more difficult, but not impossible. Under adequate lighting, the joining may be done at night or early morning.

Cold Weather Cementing

Solvent in the primer and cement will not evaporate as readily when the temperature is below 35°/40° F. Severe scouring with a stiff bristle brush is required to work the primer solvents into the surfaces. Secondly, it takes appreciably more time for the solvents to evaporate once the joint is made. Therefore, joints must be held together longer to prevent the pipe backing out of the socket. Joints must be left undisturbed longer to prevent breaking the bond by movement. And joints must be given longer drying times before pressurization. We offer the following common sense recommendations if solvent cementing must be done when the temperature approaches freezing:
Store the pipe, fitting, valves and cementing supplies in a heated area until you are ready to use them. Also, water or moisture is an enemy and frost is commonplace at near freezing temperature. So, the pipe and fittings must be kept dry prior to joining and the joints should be kept dry until the cement has had sufficient time to set – not dry, just set so they can be moved without fear of breaking the initial bond.

1. Pre-fab as much of the system as possible in a heated work area. By using flange or union connections for system erection, the number of in-place cemented joints can be minimized.

2. Field joints that must be made outside should be protected with a portable shelter, preferably black to absorb heat from the sun, and otherwise heated indirectly to produce a 40° F surface temperature on the pipe, fittings, valves and cementing supplies. The shelter should remain in place until the joint is set. And you can figure the set time to be roughly twice what it would be for a 70° joint. Good ventilation of the shelter is an absolute safety necessity for worker health and fire prevention reasons.

CAUTION: DO NOT ATTEMPT TO SPEED THE DRYING OF THE CEMENT BY APPLYING DIRECT HEAT TO THE SOLVENT WELDED JOINT. Forced rapid drying by heating with an electric blow drier, for example, will cause the cement solvents to boil off, forming porosity, bubbles and blisters in the cement film.

Joint Integrity

In hot, mild or colder weather, if the basic joining steps are followed with discipline, the chemical fusion joining method for thermoplastic piping is extremely reliable and cost efficient. Because of significant contributions to commercial and industrial construction, both thermoplastic piping and solvent welding are here to stay. By virtue of their permanent resistance to chemical attack and undeniable economic impact, value engineering has reached the stage where even mundane processes, such as water disinfection, or exotic processes, such as bulk and dilute acid feed, are absolutely dependant upon PVC or CPVC piping with solvent cemented joints. In spite of the higher standards of skill required for industrial chemical installations, relative to the marginal standards required for domestic small diameter utility applications, we are beyond the time when joint failure can be excused because of inexperience or poor workmanship. Since the difference between cementing a joint and gluing it is common knowledge today, the 40 plus year-old technology for solvent cementing justifiably demands professional discipline in its execution. As a result, the low bidder for any PVC or CPVC piping installation can reasonably be expected to exercise control over joining performance.

Solvent Cement Usage Estimates

The PVC and CPVC solvent cement usage estimates given in the table below should only be considered as a guideline. Actual usage could vary according to a wide variety of installation conditions. Further, these estimates should in no way be used to restrict the liberal instructions in the Six Step Application Techniques starting on page 18.

Number of Joints per Container Size

Pipe Size	Pint	Quart	Gallon
½"	130	260	1040
¾"	80	160	640
1"	70	140	560
1¼"	50	100	400
1½"	35	70	280
2"	20	40	160
2½"	17	34	136
3"	15	30	120
4"	10	20	80
6"	N/R	8	32
8"	N/R	3	12
10"	N/R	N/R	10
12"	N/R	N/R	6

Thermo-Seal (Socket Fusion) Joining for Polypropylene and PVDF (KYNAR®) Pressure Piping Systems

Materials and Tools

Preparation of Components

A socket heat fusion joint requires pipe with a square cutoff and chamfered outside edge. Both pipe and fitting socket must be cleansed of clinging debris. For further insight see the Thermo-Fusion paragraph in the Joining Methods for Pressure Piping section on page 15. The theory of joining is extended in the Six-Steps of Joining Mechanics, which follows on page 24. The specific instructions for component preparation are provided in the Preparation of Pipe and Fittings for All Joining Methods section on page 16.

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Selection of Electrical Resistance Hand-Held Heat-Tools, Bench-Mount Joining Machines and Heating Anvils (heating face sets) for Pipe and Fittings

Chemtrol offers two sizes of Hand-Held electrical resistance Heat-Tools and three sizes of Bench-Mount Joining Machines, which make socket fusion joints for Polypropylene and PVDF (Kynar®) pressure piping. Gas fired tools are not acceptable. The thermostatically controlled heat source for electrical tool-plates automatically maintains fusion temperatures within the recommended range. There are other electrically heated joining tools available in this country and Europe. Chemtrol® Heating Anvils (heating face sets) may or may not fit onto some of this equipment. Only the heating anvils manufactured and sold by Chemtrol are acceptable for use with Chemtrol® pressure pipe and fittings. Within the marketplace, one will find heating anvils for the fusion joining of IPS drainage, metric pressure and IPS Polyethylene gas piping – none of which will satisfactorily join Chemtrol® fittings with pressure pipe for reasons of socket length and/or diametrical fit. Chemtrol Heating Anvils (heating face sets) are designed to diametrically interfere with the pipe, and principally the socket connection, so as to create matching geometric cones as the plastic melt swells when passing through the phase change from solid material. Therefore, NIBCO obviously can not warrant pipe, fittings and valves, which are not joined with Chemtrol Heating Anvils (heating face sets) as well as depth gages and pipe clamps, where applicable.

A set of male and female Heat Anvils (heating face sets) by Chemtrol is mounted; one on each side, to the electrically heated tool-plate of appropriate wattage capacity with clearance-holes for bolting. The Anvils are of aluminum construction, for good heat conduction, and have a permanent PTFE coating to promote the best possible release quality of the pipe and fitting polymer melts. A single 3/8" – 16 socket head bolt is included with a set of Heating Anvils (heating face sets) for pipe sizes ½" – 2". The ½" utilizes a flat head bolt while the remainder of small sizes utilize a standard bolt. Two ¼" – 20 socket head bolts are included with each set of Anvils for pipe sizes 3" – 6". These large sizes also have a 3/8" center hole for mounting to Bench-Mount Joining Machines. The ¼" bolts and holes, equally spaced from the center hole, are used for mounting to Hand-Held Heat-Tools. In all cases the male Anvil, for heating the socket connection, is tapped with the appropriate thread(s) to receive the mounting bolt(s). The Chemtrol Heating Anvils for pipe, fittings, flanges and valves are designed for interchangeable use on Chemtrol® Hand-Held Heat-Tools or Bench-Mount Joining Machines.

A brief description of Chemtrol® thermo-fusion equipment for joining Schedule 80 Polypropylene (PP) and PVDF (Kynar®) pipe to socket fittings, flanges, unions and valves follows:

1. Hand-Held Joining Kits for ½" – 2" Piping – The Multiple Size Joining Kit (MSJK – ½"–2") for small pipe sizes contains all of the components required for joining ½" to 2" socket fusion connections. The kit utilizes a TD-1 Hand-Held Heat-Tool that is operated by 110 volts (+/- 10%) of single-phase 800-watts power (fully on or off and triggered by a variable thermostat with direct reading thermometer). The kit also includes the five specified sets of male and female Heating Anvils (heating face sets), Depth Gauges, Pipe Clamp w/inserts, Pipe Cutter, Pipe Beveling tool, Timer, Thermal Blanket, Auxiliary Handle, hex-key wrenches for Heating Anvils and Pipe Clamp inserts, Thermostat Adjustment tool, and Joining Instructions – all in a rugged steel toolbox.

   – The (*) Single Size Joining Kit (SSJK – ½"–2") for small pipe contains all of the components required for joining the designated (*) size of socket fusion connections specified. Each kit utilizes a TD-1 Hand-Held Heat-Tool that is operated by 110 volts (+/- 10%) of single-phase 800-watts power (fully on or off and triggered by a variable thermostat with a direct reading thermometer). The tool kit also includes the specified (*) size set of male and female Heating Anvils (heating face sets), (*) size Depth Gauge, Pipe Clamp w/(*) size insert, Pipe Cutter, Pipe Beveling tool, Timer, Thermal Blanket, Auxiliary Handle, hex-key wrenches for the Heating Anvils and Pipe Clamp insert, Thermostat Adjustment tool, and Joining Instructions – all in a rugged steel toolbox. Single size kits may be expanded to include other sizes by ordering only the set of male and female Heating Anvils (heating face sets), Depth Gauge and Pipe Clamp inserts for each size to be added.

2. Bench-Mount Joining Machine for ½" – 2" Piping – The Model 75 Socket Fusion Tool is a manually operated machine for joining ½" – 2" sizes of pipe to fittings, flanges, unions and valves. Two clamps hold the pipe and one clamp, with an insertion stop, holds the corresponding fitting, flange, union or valve in the precise position for heat fusion joining. Proper use of the machine does not require the use of a Depth Gauge and Pipe Clamp, as the Hand-Held Heat-Tool does, in order to precisely heat and insert the pipe to the correct depth in the socket connection. The basic clamping and travel mechanisms of the machine, along with an electrically heated tool-plate that is operated by 110 volts (+/- 10%) of single-phase 650-watts power (fully on or off and monitored by a direct-set time-proportioning temperature controller), comes in a 23"W x 18"D x 12.5"H steel carrying case. The tool kit also includes wrenches, holding fixtures for pipe/fittings/flanges/valves, and operating instructions. A Pipe Cutter, a Pipe Beveling tool and sets of Heating Anvils (heat face sets), which are required for each size to be joined, must be ordered separately. However, instead of these purchases, the purchase of a small pipe Multiple Size Joining Kit or a Single Size Joining Kit with other selected sizes of Heating Anvil sets, Depth Gauges and Pipe Clamp inserts is recommended. While the Bench-Mount Joining Machine is very handy, it is nearly impossible to install a total system with only bench prefabrication. The Hand-Held Heat-Tool will have to be used for at least some final joint(s), so certain equipment in these kits will be required in addition to the Joining Machine.

3. Hand-Held Joining Kits for 3" and 4" Piping – The Multiple Size Joining Kit (MSJK – 3"–4") for large pipe sizes contains all of the components required for joining sizes of socket fusion connections specified. The kit utilizes a TD-3 Hand-Held Heat-Tool that is operated by 110 volts (+/- 10%) of single-phase 1650-watts power (fully on or off and triggered by a variable thermostat with a direct reading thermometer). The kit also includes two specified sets of male and female Heating Anvils (heat face sets), Depth Gauges, Pipe Clamp w/insert for the 3" size, Pipe Cutter, Pipe Beveling tool, Timer, Thermal Blanket, Auxiliary Handle, hex-key wrenches for Heating Anvils and Pipe Clamp inserts, Thermostat Adjustment tool, and Joining Instructions – all in a rugged steel toolbox.

   – The (*) Single Size Joining Kit (SSJK – 3"–4") for large pipe contains all of the components required for joining the designated (*) size of socket fusion connections specified. Each joining kit utilizes a TD-3 hand-held Heat-Tool that is operated by 110 volts (+/- 10%) of single-phase 1650-watts power (fully on or off and triggered by a variable thermostat with a direct reading thermometer). The joining kit also includes the specified (*) size set of male and female Heating Anvils, (*) size Depth Gauge, Pipe Clamp w/(*) size insert, Pipe Cutter, Pipe Beveling tool, Timer, Thermal Blanket, Auxiliary Handle, hex-key wrenches for Heating Anvils and Pipe Clamp inserts, Thermostat Adjustment tool, and Joining Instructions – all in a rugged steel toolbox. A (*) SSJK – 3"–4", may be expanded to include the other size by ordering only the set of male and female Heating Anvils, Depth Gage and Pipe Clamp insert (if required) for the other size to be added.

4. Bench-Mount Joining Machine for ½" – 4" Piping – The Model 3500 Socket Fusion Tool is a manually operated machine for joining ½" – 4" sizes of pipe to fittings, flanges, unions and valves. Two clamps hold the pipe and one clamp, with an insertion stop, holds the corresponding fitting, flange, union or valve in the precise position for heat fusion joining. Proper use of the machine does not require the use of a Depth Gauge and Pipe Clamp, as the Hand-Held Heat-Tool does, in order to precisely heat and insert the pipe to the correct depth in the socket connection. The basic clamping and travel mechanisms of the machine, along with an electrically heated tool-plate that is operated by 110 volts (+/- 10%) of single phase 1200-watts power (fully of or off and monitored by a direct-set time-proportioning temperature controller), comes in a

32"W x 24"D x 19"H wooden shipping crate that doubles as a workbench for the unit. The tool kit also includes wrenches, holding fixtures for pipe/fittings/flanges/valves, and operating instructions. Two sizes of Pipe Cutters, a Pipe Beveling tool and sets of Heating Anvils, which are required for each size to be joined, must be ordered separately. However, instead of these purchases, the purchase of small and large pipe Multiple Size Joining Kits or small and large pipe Single Size Joining Kits with other selected sizes of Heating Anvil sets, Depth Gauges and Pipe Clamp inserts is recommended. While the Bench-Mount Joining Machine is very handy, it is nearly impossible to install a total system with only bench prefabrication. The Hand-Held Heat-Tools will have to be used for at least some final joint(s), so certain equipment in these kits will be required in addition to the Joining Machine.

5. Bench-Mount Joining Machine for 4" and 6" Piping – The Model 3600 Socket Fusion Tool is a manually operated machine for joining 4" and 6" sizes of pipe to fittings, flanges and valves. Two clamps hold the pipe and one clamp, with an insertion stop, holds the corresponding fitting, flange or valve in the precise position for heat fusion joining. Proper use of the machine does not require the use of a Depth Gauge and Pipe Clamp, as the Hand-Held Heat-Tool does, in order to precisely heat and insert the pipe to the correct depth in the socket connection. The basic clamping and travel mechanisms of the machine, along with an electrically heated tool-plate that is operated by 220 volts (+/- 10%) of single phase 1200-watts power (fully on or off and monitored by a direct-set time-proportioning temperature controller), comes in a wooden shipping crate that doubles as a workbench for the unit. The tool kit also includes wrenches, holding fixtures for pipe/fittings/flanges/valves, a set of 6" male and female Heating Anvils (heat face sets), 6" Pipe Cutter, 6" Pipe Beveling tool, and operating instructions. A 3"- 4" Pipe Cutter, a ½"- 4" Pipe Beveling tool and a set of 4" Heating Anvils (heat face sets) must be ordered separately. However, instead of these purchases, the purchase of a large pipe Multiple Size Joining Kit or a 4" Single Size Joining Kit is recommended. While the Bench-Mount Joining Machine is very handy, it is nearly impossible to install a total system with only bench prefabrication. The Hand-Held Heat-Tool will have to be used for at least some final joint(s), so certain equipment in either of these kits will be required in addition to the Joining Machine.

Distributors may purchase or rent Bench-Mount Joining Machines on a weekly or monthly basis from Chemtrol for sub-rental to installers, while Hand-Held Joining Kits may only be purchased by the distributors of Chemtrol® socket thermo-fusion piping systems.

Selection of Lubricant for Heating Anvils and Cleaning Towels
The Heating Anvils (heat face sets), which mount on all electrically heated tool-plates in Chemtrol® Hand-Held thermo-fusion Joining Kits and Bench-Mount Joining Machines, are coated with a permanent PTFE finish. This surface allows the sticky plastic melt, which is heated on the pipe and socket connector surfaces, to release from the Heating Anvils (heat face sets). However, it has been found that release of the hot plastic cannot be consistently achieved with the permanent coating alone, even on new Anvils. At the same time it has been learned that the retention of hot melt on the Heat Anvils (heat face sets) invites the possibility of a joint leak, and that, without thorough cleaning, greater plastic retention will result from successive joint attempts.

We have also found that Heating Anvils (heat face sets), which are occasionally sprayed (every three joints for new tools to ten joints for older Anvils) with a good quality of silicone coating will completely eliminate plastic melt retention. We consider silicone spray for new or used Anvils, along with adherence to the recommended regimen of temperature and heating time for each pipe size, to be critical for reliable joining. When any sign of plastic retention does occur, the Heating Anvils (heat face sets) may be wiped clean with brown paper toweling, or approved "clean" (sanitary) wipes (paper) for high-purity installations, and re-sprayed with silicone. The use of cloth towels or rags for cleaning the hot Anvils (heat face sets) is discouraged. Natural fibers tend to stick to the residual plastic on the Anvils while synthetic fibers generally melt, making cleaning even more difficult.

Silicone should not be used for wash, paint, or spray systems.

Aerosol Silicone Spray, Product No. 62-4678-4930-3, is a "food grade" product manufactured by the 3M Company. A broad base of stocking industrial distributors, which are serviced through regional customer service centers, sell the product internationally. Call the 3M technical service customer center to get a list of distributors. We have found this 3M product to work better than most we have tried, to be more readily available than others, and to be an ideal choice for inert joints for high purity applications:

3M Company, Industrial Tape and Specialties Division/Adhesive Systems
Minneapolis, Minnesota
Technical Service Customer Center, Continental U. S. A., 1-800-362-3550
Technical Service Customer Center, International, 651-733-2914

Job-Site Management of Joining Equipment
Experience and practice leads to consistent achievement of centerline straightness in the joint and proper depth of pipe insertion into the socket connection. This joining technique offers no forgiveness for errors of joint alignment or depth because joint cooling occurs so rapidly that correction cannot be made once pipe insertion into the socket connection is stopped. For more insight on this matter see Six-Steps of Joining Mechanics, page 24. Socket thermo-fusion is more easily accomplished when there is sufficient space to properly secure the Hand-Held Heat-Tool and to maneuver pipes and socket connections on/into the Heating Anvils (heat face sets). Therefore, we recommend that the piping system be prefabricated, as much as possible, in an area of adequate space where the Heat-Tool can be secured in a bench vise. Bench-Mount Joining Machines are an outgrowth of the prefabrication concept. Their use is urged for larger jobs or jobs to be performed with larger pipe sizes and/or with installers having minimal experience making socket thermo-fusion joints. Bench-Mount Joining Machines automatically resolve the problems of joint alignment and depth. Manpower efficiency, scrap reduction and quality of system erection can usually absorb their rental cost. As few joints as possible should be made with a Hand-Held Heat-Tool in areas where there is limited working space. Prefabrication of components for final mechanical joining with flanges or unions should be considered in extremely tight areas.

The Heating Anvils (heat face sets) for making 6" pipe joints will mount on the large TD-3 Hand-Held Heat-Tool. There is ample heat capacity for making 6" joints. Joints can and have been made. However, properly made (good alignment and joint depth) joints are physically very difficult to execute. This is especially true for freehand final joints where one of the joining team members holds the Heat-Tool, another pushes a socket connection onto the male Heating Anvil (heat face set), while the third team member pushes the pipe into the female Anvil. A stout but steady force is required to melt those components on/into the Anvils – and they will only go on/in when melted, regardless of axial force. The real problem is developing the force to push the socket connection onto the pipe quickly enough and straight enough, so that the pipe alignment and depth of penetration into the socket is proper. Therefore, we recommend that every planning effort possible be made to prefabricate all 6" joints on the Bench-Mount Joining Machine. The next best alternative is to prefabricate the 6" joint(s) with the TD-3 Heat-Tool, held in a well-anchored bench vise. Making freehand 6" joints, as described above, should be the last option considered.

All Chemtrol® heat-plates, both the Hand-Held and Bench-Mount types, have generous tolerances for heating capacity. As a result, their responses for maintaining the temperature set-point are generally unaffected by cold temperature and/or a light breeze. Only the melting time to insert the cooler piping components on/into the Heating Anvils (heat face sets) will be lengthened. Let common sense prevail at what stage a shelter must be erected for blocking wind and/or cold around the Heat-Tool point of use.

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Making Equipment Ready for Joining

Field Check of Joints for Size

Socket connections are designed to produce interference with pipe and the Heating Anvils (heat face sets) in order to provide melt commingling for fusion bonding of Polypropylene and PVDF components. It should not be possible to easily slip the pipe into the socket connection past the initial socket entrance depth. In no case should it be possible to bottom the pipe in the socket prior to fusion. Before making socket thermo-fusion joints, socket connections may be field checked for proper socket dimensional tolerances, based on the above description. If a socket connection appears to be oversize, it should not be used.

Hand-Held Heat-Tool Set-Up

Pipe size is stamped into the mounting-flange face of both male and female Heating Anvils (heat face sets). Proper diameter of Anvils may be field checked by placing the female Anvil on a chamfered pipe end. The pipe should enter about half way into the unheated Anvil socket before meeting resistance. The pipe should not freely bottom in the Anvil socket. Place the male Heating Anvil in the female Anvil. It should bottom freely, but an extremely small amount of radial "play" should be detectable.

Install the set of male and female Heating Anvils (heat face sets) that are required for the joint size desired on either side of the heat-plate. Secure them as follows: ½" size – A 3/8" standard socket flat-head center bolt is screwed into the male Anvil; ¾" through 2" sizes – A 3/8" standard socket-head center bolt is screwed into the male Anvil; 3" and 4" sizes – two ¼" standard socket-head bolts, evenly spaced from the center hole, are screwed into the male Anvil.



Insert the electrical plug on the Heat-Tool into a grounded 110 VAC, single phase, 15 AMP source. Allow the tool to stabilize at operating temperature, which is read directly from the mounted temperature gauge. Heat-Tools are pre-set to 500° F (260° C) at the factory. Tool temperature may be adjusted by turning the thermostat adjustment screw with the tool provided in the Hand-Held Joining Kit. This tool is similar to a screwdriver blade, the shank of which has been bent 90°. A clockwise turning motion will reduce the temperature while a counterclockwise turning motion will increase the temperature.

Caution: One-quarter turn (90°) of the adjustment screw will produce a temperature change of approximately 25° F. Following a temperature adjustment, wait for stabilization at the new temperature. Assuming the Heat-Tool is correctly set for 500° F, one full counterclockwise turn of the adjustment screw will raise the tool temperature to 600° F. We do not recommend a temperature setting higher than 600° F under any circumstances. To back the adjusting screw any further from its threaded hole than the equivalent temperature setting of 600° F could result in the screw becoming totally disengaged from the thermostat.



When the screw is fully disengaged, the thermostat will not shut off power to the heater rods, and the temperature will eventually rise to 900° F, before the heating element begins to burn out. The adjustment screw cannot be re-engaged. Therefore, the Heat-Tool will have been rendered unusable (see Equipment Maintenance at the end of this chapter). Faster joining will not result from higher temperatures than those recommended.

Give the Heating Anvils (heat face sets) a good spraying of silicone lubricant so that it will have a chance to "burn in" while they are heating up.

IMPORTANT: Socket thermo-fusion joints, which leak or lack sufficient strength, are unlikely if the following rules are followed:

WHEN the heat-tool is operated within the guidelines for temperature and exposure time (pipe and socket connection to be in "home" position on the Heating Anvils) recommended in the table on the next page for specific pipe sizes,

AND the Six Steps of Joining Mechanics are followed.

Excessive heating temperature and/or exposure time will result in excessive melting below the surfaces of the socket connection I.D. and the pipe OD. Under such conditions, the inserted pipe will scrape melt swell from the socket wall and push it into the fitting waterway creating the potential for large pressure drops at the connections. Even worse, globs of melted plastic may adhere to the Heating Anvils (heat face sets) and be pulled away from the socket and/or pipe surface(s), resulting in an unsatisfactory joint. Fusion attempts with insufficient heating temperature and/or exposure time will result in incomplete melt penetration of the socket and pipe surfaces, resulting in excessive force being required to push the joint together. The lack of melt swell creates the potential for leakage and inadequate bonding to satisfy the joint shear stress presented by hydraulic end-load as a function of internal system pressure. (Heating exposure times in the following table are defined to begin after the pipe and socket connection have been completely placed in the home position on the Heating Anvils (heat face sets). See Step 4 in the Six Steps of Joining Mechanics for Hand-Held Heat-Tools for the definition of the home position; pg. 24.

Thermo-Fusion Socket Heating Times

Polypropylene				PVDF			
Size	Time (sec)	Temp ° F	Temp ° C	Size	Time (sec)	Temp ° F	Temp ° C
1/2"	5	495–505	257–263	1/2"	5	495–505	257–263
3/4"	5	495–505	257–263	3/4"	5	495–505	257–263
1"	5	495–505	257–263	1"	5	495–505	257–263
1-1/2"	5	495–505	257–263	1-1/2"	5	495–505	257–263
2"	5	495–505	257–263	2"	5	495–505	257–263
3"	7–9	500–510	260–266	3"	25–35	510–530	266–277
4"	12–15	500–510	260–266	4"	40–50	510–530	266–277
6"	15–20	500–520	260–271	6"	50–60	540–560	282–293

Heating times start after pipe and fitting are completely on heater faces (fitting face not to touch base of male heat face).

Chemtrol recommends using a fusion joining machine for sizes 3" and larger.

Inserts Set-Up in Pipe Clamp for Correct Pipe Size

While you are waiting for the Heat-Tool to come to temperature, select the inserts for the pipe size intended for joining. Pipe sizes are not stamped on the inserts, but figuring out the correct set for bolting into a Pipe Clamp is not difficult when you understand that the 2" and 4" pipe sizes do not require a set of inserts. Each of these Pipe Clamps is a vise-grip with clamshells, which match the respective pipe diameters, welded to the nosepiece of the pliers. The 1½", 1", 3/4" and ½" insert sets are bolted into the 2" Pipe Clamp while the 3" insert set is the only one to bolt into the 4" Pipe Clamp. The insert sets should be stored in the respective Hand-Held Joining Kit toolboxes for small and large diameter pipe. In the case of tool inserts for the smaller pipe sizes, the thickest obviously are for ½" and the thinnest are for 1½" pipe. If in doubt, you may fit the inserts to the pipe by hand until you find the pair that is the correct size.

The purpose of the Pipe Clamp is to provide a precise measurement on the pipe for its insertion into the Heating Anvil (heat face set) and for its insertion into the socket connection upon joining. Please note that there is some play in the lateral action of the vice-grip pliers. Note also that there is a bolt hole clearance in the clamshells for attachment of the inserts to the tool. The Pipe Clamp may be placed on the top, bottom, or opposite side of the pipe from any position. One must simply visualize the reference orientation so that a flush face of the Pipe Clamp will be available for the reference surface of precise pipe insertion.

Tools and Equipment

- Pipe Cutting Tool (see Preparation for Joining, pg. 16)
- Pipe Beveling tool (see Preparation for Joining, pg. 16)
- Hand-Held Heat-Tools (see Selection of Hand-Held Heat-Tools, Bench-Mount Joining Machines and Heating Anvils for Pipe and Fittings, pg. 21; and Six Steps of Joining Mechanics for Hand-Held Heat-Tools, pg. 24)
- Depth Gauges (see Six Steps of Joining Mechanics for Hand-Held Heat-Tools, pg. 24)
- Pipe Clamps w/inserts (see Six Steps of Joining Mechanics for Hand-Held Heat-Tools, pg. 24 ; and Inserts Set-Up in Pipe Clamp for Correct Pipe Size, pg. 23)
- Heating Anvils for male and female piping components (see Six Steps of Joining Mechanics for Hand-Held Heat-Tools, pg. 24; and Hand-Held Heat-Tool Set-Up, pg. 23)
- Timer (see Six Steps of Joining Mechanics for Hand-Held Heat-Tools, pg. 24; and Table of Recommended Heat-Tool Temperature & Exposure Time, pg. 23)
- Thermal Blanket (see Six Steps of Joining Mechanics for Hand-Held Heat-Tools, pg. 24; and Maintenance of Equipment, pg. 28)
- Auxiliary Handle for Heat-Tool (see Six Steps of Joining Mechanics for Hand-Held Heat-Tools, pg. 24)
- Hex-Key wrenches for Heating Anvils and Pipe Clamp inserts (see Hand-Held Heat-Tool Set-Up, 22; and Inserts Set-Up in Pipe Clamp for Correct Pipe Size, pg. 23)
- Thermostat Adjustment tool (see Hand-Held Heat-Tool Set-Up, pg. 22)
- Joining Instructions (see Selection of Hand-Held Heat-Tools Bench-Mount Joining Machines and Heating Anvils for Pipe and Fittings, pg. 21; Job-Site Management of Joining Equipment, pg. 22; and Six Steps of Joining Mechanics for Hand-Held Heat-Tools, pg. 24)
- All Above Equipment Contained in Hand-Held Joining Kits for Large and Small Pipe Sizes (see Selection of Hand-Held Heat-Tools, Bench-Mount Joining Machines and Heating Anvils for Pipe and Fittings, pg. 21)
- Deburring tool (see Preparation for Joining, pg. 16)
- Pipe Cleaning solvent (see Preparation for Joining, pg. 16)
- Paper Toweling or Clean Wipes (see Preparation for Joining, pg. 16; and Selection of Lubricant for Heating Anvils and Cleaning Towels, pg. 22)
- Silicone Lubricant (see Selection of Lubricant for Heating Anvils and Cleaning Towels, pg. 22; and Six Steps of Joining Mechanics for Hand-Held Heat-Tools, below)

Six Steps of Joining Mechanics for Hand-Held Heat-Tools

Crew Size

The Hand-Held Heat-Tool may be used for the prefabrication of most system joints at a heavy workbench where the Heat-Tool is clamped into and rigidly held by a solidly attached bench vise. Bench-Mount Joining Machines are an outgrowth of the prefabrication concept, and their use is urged for larger jobs or installations involving larger pipe sizes and/or with installers having minimal experience making socket thermo-fusion joints (see Job-Site Management of Joining Equipment pg. 22). When prefabricating with a Hand-Hand Heat-Tool the crew size will be two when the team member handling the pipe can easily hold the assembly that is already attached to the pipe. A very experienced installer may be able to make a 1", or smaller, joint alone if the pipe extension is short, but we recommend a minimum of two for a joining team. Or, the crew size will be three if a third team member must support and hold proper orientation of the assembly that is attached to the pipe.

When using the Heat-Tool in a freehand manner, making final joints in-place, one team member, using the Auxiliary Handle attached to the heat-plate, holds the Heat-Tool rigidly, another pushes a socket connection onto the male Heating Anvil, while the third team member pushes the pipe into the female Anvil. When prefabricating on a Bench-Mount Joining Machine, it only takes one team member to clamp the pipe and socket connection into the machine, and to operate it for creating a joint. But, a second team member is recommended for supporting and holding proper orientation of the assembly that is attached to the pipe.

The Heating Anvils will instantly vaporize moisture when they are at joining temperature. Therefore, joint surfaces must be dry at the time of joining.

For the sake of clarity of these instructions, we are assuming the usual installation crew of two, while prefabricating at a workbench. The first installer is in charge of the socket connection and will be referenced as installer #1, for simplicity. The second team member is in charge of the pipe end during the joining process and he shall be referenced as installer #2.



1. Installer #2 gives the Heating Anvils (heat face sets) a light fogging of silicone spray, making sure that the spray is directed into the Pipe Anvil and that some of the fog is directed at the top, bottom and both sides of the Fitting Anvil. Meanwhile, installer #1 grasps the pipe and inserts the pipe end to the bottom of the Pipe Gauge. Wipe excess spray from the Anvils with a clean paper towel. (See Selection of Lubricant for Heating Anvils and Cleaning Towels, pg. 22)



2. Installer #1 may need to adjust the clamp screw on the pliers, which governs the clamp opening. The Pipe Clamp must snuggly grasp the pipe, but not crush it out-of-round. He should then attach the Pipe Clamp w/insert to the pipe by butting the flush surface (see Inserts Set-Up in Pipe Clamp, pg. 23) against the face of the Depth Gauge while installer #1 continues holding the Gauge against the pipe end. Installer #2 should use his index and middle fingers to push both halves of the Pipe Clamp to insure they are flush against the Depth Gauge face.



3. Simultaneously, installer #1 should place the pipe and installer #2 should place the socket connection squarely on the Heating Anvils (heat face sets) so that the ID of the connection and the OD of the pipe are in contact with the heating surfaces. Care should be taken to insure that neither the pipe or socket connection are cocked as they are pushed in/on the Anvils. The Pipe Clamp's simple job is to precisely mark the location of socket depth on the pipe, so installer #1 should not use the tool as a push bar. Don't allow the clamp to slip on the pipe and lose the opportunity for making a quality joint. The socket connection will always have more initial interference with its Anvil than the pipe, so the force applied by installer #2 will probably be less than the force required from installer #1 as they match insertion rates on/in their respective Anvils. The plastic components will only slide on/in the Anvils when the plastic melts and allows forward progress. Therefore, the plastic components should not be moved by rocking or twisting them on their Anvils in an effort to hasten penetration. A solid steady force is all that is required. It is the responsibility of installer #2 to penetrate at the same rate as installer #1 so that both arrive at the same time at the home position on the Anvils. Progress is good when both installers see that the plastic melt bead forming on the male Anvil at the entrance radius/chamfer of the socket is uniform around the socket entrance.



4. Home positions on the Heating Anvils (heat socket set) are when the melt bead in the entrance radius/chamfer of the socket connection touches the mounting flange of the male Heating Anvil and the Pipe Clamp uniformly touches the face of the female Heating Anvil. **DO NOT SQUEEZE THE MELT BEAD. YOU ARE IN THE HOME POSITION.** With practice, installers will learn that the melt bead is an excellent reference for proper alignment. As the joint components of the installers approach their respective home positions of insertion on/in the Heating Anvils the installer #1 should make sightings of his bead distance from home position on top, bottom and both sides of the mounting flange. Installer #1 should insure the bead touches the Anvil flange – completely around the fitting – all at once. As the touch is made, he should stop. Installer #2, equaling the rate of his pipe

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penetration with the rate of fitting penetration in/on the respective Anvils, should also make 360° sightings of his distance from the Pipe Clamp to Anvil face. Installer #2 must insure the face of his Anvil touches the Pipe Clamp – completely around the pipe – all at once. This is the first reason for insuring that one end of the Pipe Clamp w/inserts is a true surface. As the touch is made he should also stop. Both installers should hold their positions for the prescribed time in the Table of Recommended Heat-Tool Temperature and Exposure Time, pg. 23. Installer #1 must continue to monitor the melt bead, while holding the socket connection in the home position. Installer #2 must concentrate on holding the Pipe Clamp flush against the face of the female Heating Anvil to allow heat to transfer into the pipe and fitting surfaces to be fusion bonded.

NOTE: The dwell time in the home position on the Heating Anvils at 500° F, for both PP and PVDF in pipe sizes ½" through 2", is five seconds. Use a timer, watch or voice count to control the duration of this step. It is critical that this time be maintained.

5. As soon as the proper time in the home position has expired, simultaneously remove the pipe and fitting straight away from the Heating Anvils. Only a thin layer of melt actual melt will exist on the heated surfaces. Avoid mashing the melt to one side or the other on either the pipe or socket connection while removing them from the Anvils.



Upon removal from the Heating Anvils installer #1 should immediately push the socket connection, squarely and fully and without purposeful rotation, onto the pipe. The pipe must be held steady and in the horizontal plane by installer #2. This assumes that prefabrication will normally be attached to the other pipe end. It is unproductive for both installers to actively push the components together. The ease of making straight joints is much greater when one team member blocks his component and the other team member aggressively pushes his component in/on the other stationary component. The joining team must mutually decide which shall block and which shall push the joint together before attempting the joint, because speed is of the essence in removal of the components from the Heating Anvils and insertion of the pipe in the socket connection.

As the pipe is steadily inserted into the socket connection, the flush faces of the Pipe Clamp may again be used as the reference plane to sight against the approaching melt bead at the face of the fitting. Be sure to maintain the forward motion of pipe insertion into the socket, because once stopped, rapid melt cooling will prevent any restart of insertion. The team member acting as the pusher must insure that the melt bead around the fitting uniformly touches the flush Pipe Clamp – all at once. **DO NOT SQUEEZE THE MELT BEAD. THE JOINT IS IN THE HOME POSITION.**

6. Hold the completed joint in the home position for about 10 seconds – a little longer for larger sizes – to permit cooling of the plastic bond. This will prevent the pipe from moving back in the tapered socket while the inner surfaces are fluid. Now that the joint is completed, remove the Pipe Clamp and begin preparations for the next joint. It is important that the Heating Anvils be kept as clean as possible. Any residue left on the Anvils should be removed immediately by wiping with a paper towel. (See Selection of Lubricant for Heating Anvils and Cleaning Towels; pg. 22.) Check the Heat-Tool temperature to make sure that that it is stable at the prescribed setting. (See Hand-Held Heat-Tool Set-Up; pg. 23.) If residue deposits on the Heating Anvils following the making of joints persists, try increasing the silicone spray to thoroughly coat the applicable surfaces and/or reduce the prescribed heating time by increments of 10 – 20%. Be cautious in the reduction of time for sizes 2" and below. Do not waver from the prescribed temperature settings. (See Recommended Heat-Tool Temperature & Exposure Time; pg. 23.)



CAUTION: Molten plastic material can cause severe burns. Avoid contact with the hot plastic and heat-tool. It is always a good idea to drape a thermal blanket over a hot heat-tool – Hand-held or bench-mount – when the installers must leave the work area. A – Caution Hot – sign, even crudely written on a cardboard box flap and posted on the workbench, is desirable when absent.

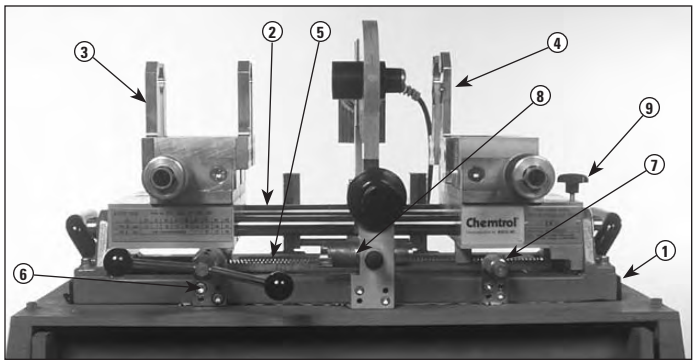
Fulltime Working Pressure or Maximum Test Pressure, Maintenance of Equipment, and Construction Tips

These issues will be addressed at the end of the following sections concerned with the use of Bench-Mount Joining Machines.

Superior Design and Construction Features of Bench-Mount Joining Machine

Description of Basic Components

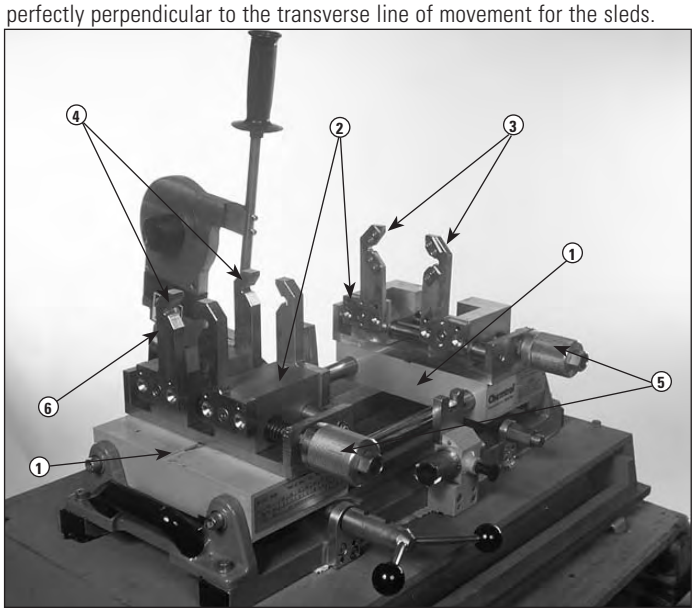
Bench-Mount Joining Machines are an outgrowth of the prefabrication concept. Each of the three Chemtrol® machines (see Selection of Electrical Resistance Hand-Held Heat-Tools, Bench-Mount Joining Machines and Heating Anvils for Pipe and Fittings; pg. 21) have a temperature controlled heat-plate attached to the machine, which can be swung from centerline of the machine to a rear position that does not interfere with machine travel perpendicular to the heat-plate. The PTFE clad Anvils (heat face sets), which heat pipes and socket connections, are used interchangeably for Hand-Held heat-plates and Bench-Mount heat-plates. All sizes of Heating Anvils (heat face sets) mount to Bench-Mount heat-plates with 3/8" standard bolts that pass through a clearance hole in the dead center of its heat-plate.



Features Forming the Foundation of Machines

No.	Name / Element
1	Machine base, Aluminum casting for rigidity and minimum weight during movement
2	Two Steel Rods with hard chrome finish, which are firmly attached to each end of machine base, act as the machine ways.
3	Pipe Sled, rides freely and precisely toward or away from center on ways through Bushings
4	Fitting Sled, rides freely and precisely toward or away from center on ways through Bushings
5	Rack and Pinion provides in-and-out movement of the sleds on the machine ways
6	Hand-Wheel, machine-tool spoke type, turned by operator clockwise or counter-clockwise respectively, to drive both sleds together or apart at same rate – each a slave to the other.
7	Depth Gauge Stroke-Limiter, spring-loaded plunger with latch on operator's right, which he can depress to engage the fitting sled as the operator brings both sleds together. This position correctly measures pipe projection from the entrance of a socket connection to the Prismatic Pipe Clamping Jaws
8	Joint Insertion Stroke-Limiter assembly, passes through the pedestal block that holds the heat-plate handle. It is located in front of the operator. An indexable steel tube having notches cut into the periphery at the end of the tube, which correspond to the joint insertion lengths for each pipe size, will be caught by an arresting arm, mounted on the bottom of the pipe sled.
9	Knob Handle for set-screw, which locks the pipe sled in place by bearing on the front machine Steel Rod way.

The tops of the fitting and pipe sleds are finished flat, relative to their bushing bearing holes. Each sled has mounted upon it a miniature Vise, which simultaneously advances or retracts the Holder-Blocks on each sled by the operator turning a Lead-Screw, fitted through Brass Bushings in each Holder-Block. Each Vise is centered on its sled by means of a slot in the sled and a dovetail projecting from the bottom of the Vice Base. This locating concept also insures that the independent action of each Vise is perfectly perpendicular to the transverse line of movement for the sleds.



Features of the Pipe and Fitting Clamping Vises

No.	Name / Element
1	Transverse Fitting and Pipe Vise Bases, permanently located in the longitudinal and horizontal planes by a slot in the top of the sleds and a dovetail projecting from the bottom of Vise Bases
2	Two Pair of Vice Holder-Blocks, each pair forming the Fitting Vise on the operator's right or the Pipe Vise on the operators left. The Clamping Jaws mount to the Holder-Blocks such that the four tangent points on each set of Jaws grasping the product (pipe or fitting) have equal radii to the dead center of the product, which coincides with the centerline of the machine
3	Pair of Fitting Prismatic (vee type) Clamping Jaws with stops for locating the face of the fitting and insuring alignment of socket connection within the clamping Jaws – operator's right on the machine. Each set of Jaws handles a range of fitting sizes; ½"-2", 2"-4", 4' flange-only for 3500 machine and 4"-6" respectively
4	Dual Pair of Pipe Prismatic Clamping Jaws, insuring alignment of pipe within the Clamping Jaws – operator's left on machine. Each set of Jaws handles a range of sizes; ½"-2", 2"-4" and 4"-6"
5	Two Handles, which the operators uses to advance or retract the pair of Holder-Blocks via the Lead-Screw, one each for the fitting and pipe Vises
6	Electronic Temperature Controller for the heat-plate permits setting the temperature directly, which the Controller can be expected to hold within several degrees

Making a Bench-Mount Machine Ready For Joining

Assumptions

Before the job of installing Polypropylene or PVDF is undertaken, it must be assumed that the detailed instructions, which come with the Bench-Mount Joining Machine, have been read and understood by the team that will operate the machine, or that they have otherwise been instructed by Chemtrol personnel or by their distributor's personnel. The second assumption is that the Bench-Mount Joining Machine, which was selected, includes the range of pipe size(s) on the job (see Selection of Electrical Resistance Hand-Held Heat-Tools, Bench-Mount Joining Machines and Heating Anvils for Pipe and Fittings; pg. 21). Both the Joining Machine and the socket connections of Chemtrol® fittings and valves require that Chemtrol® brand Heating Anvils (heat face sets) be used on the machine to successfully make joints with IPS sized pipe.

Machine set-up

After removal of the top of the steel storage case for the Model 75 (½" – 2" pipe sizes) Joining Machine, the machine may be picked up by the convenient handles at each end of the machine base and placed on a sturdy workbench at the job-site. Since all tools and fixtures required for the machine are located in the tool drawer housed in the machine base, the storage case can be set aside during use. For both Models 3500 (½" – 4" pipe sizes) and 3600-2 (4" and 6") the storage case is wooden. When the tops of these cases are removed, they may be set on the floor and the bottom of the case with the machine and its tool drawer set on its top, making an ideal workbench.

The heat-plate must be swung from its position on the Joining Machine centerline to its free position at the backside of the machine. Install the set of male and female Heating Anvils (heat face sets) that is required for the joint size desired. Pipe size is stamped into the mounting-flange face of both male and female Heating Anvils. When facing the machine on the operators side, the male Anvil for heating the fitting socket connection is mounted on the right side of the heat-plate and the female Anvil for heating the spigot or pipe end is mounted on the left side of the heat-plate. All sets of Heating Anvils, except the ½" size, are secured with a 3/8" standard socket-head bolt, which passes through center clearance holes in the female Anvil and heat-plate and screws into the male Anvil. For the ½" Heating Anvils, a 3/8' standard socket flat-head center bolt is screwed into the male Anvil.

The correct Pair of Fitting Prismatic Clamping Jaws and the Two Pairs of Pipe Prismatic Clamping Jaws must be mounted to the Holder Blocks of the Fitting and Pipe Vises respectively (see Design and Construction Features Nos. (3) and (4) in the table for Pipe and Fitting Clamping Vises; at left).

Then, insert the electrical plug on the machine into a grounded 110 VAC, single phase, 15 AMP standard electrical source. If the red power switch on the side of the temperature controller is in the OFF position, snap the switch to the ON position. When the power in ON, the operational switch-button will glow red and the small green indicator, adjacent to the red power switch, will glow green with the indication that the power to the heat-plate is fully ON. When the instrument begins to control the temperature within the range of set point, the green light will begin to blink ON and OFF. This means that the machine is ready to make joints.

Next, look closely at the temperature set point, which the pointer-arrow in the center of the window indicates on the white temperature dial. This set-point window is located on the same side of the controller and between the glowing lights. If the set point does not agree with the recommended joining temperature for the size of pipe and material to be jointed, adjust the instrument to the precise temperature recommended (see pg. 23). At the foot of the set point window of the controller, there is a small plastic button with a small screwdriver slot. Turning this button, with the small screwdriver in the tool drawer of the Joining Machine, will turn the temperature dial under the pointer-arrow in the set point window. Simply turn the temperature dial until the desired temperature is indicated by the pointer-arrow and let the controller instrument do the rest.

Now, give the Heating Anvils a good spraying of silicone lubricant and let it 'burn in' while the Anvils are heating up. Next, be sure that the proper pipe size is selected on the Joint Insertion Stroke-Limiter (see Design and Construction Feature No. (9) in the table, Forming the Foundation of Machines; pg. 25). To set, pull out the latch, at the front side of the pedestal block that holds the heat-plate handle. While holding the spring-loaded latch out, turn the knurled handle at the right side of the pedestal in either direction until the correct pipe size, inscribed around the Joint Insertion Stroke-Limiter notched tube at the left of the pedestal, faces straight up under the red bead on the pedestal. Then release the latch of the assembly, so that its nosepiece may engage the notched tube and hold it in the proper position to catch the Stroke-Limiter arresting arm, mounted on the pipe sled.

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FAILURE TO FOLLOW THIS WARNING CAN RESULT IN PERSONAL INJURY OR DAMAGE TO PROPERTY.

In the meantime, while the operator tends to the machine, his mate will relocate the pipe, fittings, and valves to the near proximity of the Bench-Mount. Then the mate should clear the area surrounding the machine location so the prefabricated modules may be turned this way and that as additional joints are added. Finally, the mate should pull several of the first lengths of pipe to be joined along with the first few fittings or valves to be joined and prepare them for the joining process. As with the Hand-Held unit, water is deleterious to the joining process, so the joint surfaces must be dry when joining (see Preparation of Pipe, Fittings and Valves for All Joining Methods, pg. 16). The joining team is now ready to make a joint with the Machine.

Six Steps of Joining Mechanics for Bench-Mount Joining Machines

Crew Size

As with the prefabrication of joints with a Hand-Held Heat-Tool clamped into a bench vise, the crew size will be two. One team member (the machine operator) will locate and clamp the fitting socket connection into the machine and attend to joint-making operation. The other team member (operator's assistant) will support the opposite end of pipe to be joined while the operator is clamping the end of pipe to be joined in the machine and attending to joint-making operation. There will be in-and-out motions of the joined pipe in the joint-making process; therefore the assistant must coordinate the movement of the machine with his supporting duty for the prefabricated module. If there is a prefabrication module already attached to the assistant's pipe end, he must make sure he holds his prefabrication to face the proper direction so that the orientation of the end to be joined has the correct relationship with the fitting to be joined.

As begun above, we will refer to the machine operator and his assistant to distinguish how a crew of two makes joints on a Bench-Mount Joining Machine.

1. The operator gives the Heating Anvils (heat face sets) a light fogging of silicone spray, making sure that the spray is directed into the pipe Anvil and that some of the fog is directed at the top, bottom and both sides of the socket connection Anvil. Should the operator overspray, such that droplets have formed, he should wipe the Anvils with a clean paper towel (see Selection of Lubricant for Heating Anvils and Cleaning Towels, pg. 22).

   Then the operator must drive the pipe and fitting sleds apart, using the spoke type machine tool hand-wheel at his left on the machine. With his right index finger he should depress the plunger of the Depth Gage Stroke-Limiter until the button on the other end of the plunger is free to fully project beyond the slotted arresting arm at the bottom of the fitting sled (see Design and Construction Feature No. (8) in the table, Forming the Foundations of Machines; pg. 25). While continuing to depress the plunger, he should now use the hand-wheel to advance the sleds toward each other until the button head of the plunger is inside the slot in the arresting arm. At this point the plunger may be released to pop outward and catch against the arm slot. Finally, when the Depth Gauge Stroke-Limiter arresting arm firmly rests against the shank of the plunger, the inward motion of the sleds will be stopped. Now, he may tighten the knob handle of the set-screw on the far rear top of the fitting sled in order to lock the sleds in the ideal Stroke-Limiting position (see Design and Construction Feature No. (10) in the table, Forming the Foundation of Machines; pg. 25).

2. The operator sets the socket connection of the fitting his assistant has prepared for joining into the Pair of Fitting Prismatic Clamping Jaws (see Design and Construction Feature No. (3) in the table for Pipe and Fitting Clamping Vises; pg. 26). He must square the face of the socket connection against the stop-plates at the end of the Jaws closest to center machine while he tightens the Fitting Vise with the Handle on the front of that Vise. Concurrently he must make sure that the orientation of other connections of the fitting agrees with the piping design relative to the design orientation of the fitting that will/has be/been placed on that opposite pipe end. Once the operator is confident that he has good alignment of the socket connection in its Vise, he must cinch the Vise Handle as strongly as he can with one hand, so that the fitting will not slip under joining force.

3. The assistant lifts and maneuvers the opposite end of the pipe he/she has prepared for joining. Meanwhile, the operator sets the pipe end to be joined into the Dual Pair of Pipe Prismatic Clamping Jaws (see Design and Construction Feature No. (4) in the table for Pipe and Fitting Clamping Vises; pg. 26). The operator must place the square cut, beveled, deburred and cleaned pipe end against the radius/chamfer of the socket connection in the Fitting Vice while he tightens the Pipe Vise with the Handle on the front of that Vise. Concurrently, he must instruct his assistant with maneuvers that assure alignment of the pipe in its Vise such that there is 8-point contact with the Pipe Vise Clamping Jaws, as well as contact with the entrance of the socket connection. Once the operator is sure that he has good alignment of pipe in its Vise, he must cinch the Vise Handle as strongly as he can with one hand, so that the pipe will not slip under joining force.

   The positioning of pipe against the fitting in this step eliminates the need for a Pipe Clamp and Depth Gauge, which is required for Hand-Held Heat-Tool joining. Perfect alignment of pipe and fitting in the Clamping Jaws of the Bench-Mount Machine insures perfect finished joint alignment, which is the most difficult outcome to learn when using a Hand-Held Heat-Tool.

4. To make the joint, the operator must release the set-screw clamping the fitting sled to the travel rod by turning the knob on top of the outer front of the sled. Next, he should back the pipe and fitting sleds away from each other with the machine tool hand-wheel. As both sleds move away from the machine center, the noise made by the plunger of the Depth Gauge Stroke-Limiter may be heard as its nose button is released by the slotted arresting arm and the plunger is sprung to its released position.

   After full retraction of the sleds, the operator must grasp the handle of the machine's Heat-Tool and swing the assembly into the centerline of the machine and rest the handle in the slot of the pedestal at the center front of the machine.

   Now, the operator must turn the machine tool hand-wheel in the clockwise direction to bring the pipe and socket connection toward the center of the machine. The male and female Heating Anvils (heat face sets) should have nearly perfect alignment with pipe and socket connection. If not, there is some latitude for horizontal movement by pushing or pulling on the Heat-Tool handle to make the necessary adjustment. Once the Heating Anvils and products to be joined are lined up, the assistant continues to work in coordination with the operator as he exerts reasonable force on the hand-wheel to drive the Anvils in/on the products to be joined. The operator should continue the steady hand-wheel force, accompanied by movement of the sleds as plastic melting takes place, until the melt bead, formed in the radius/chamfer of the socket connection, touches the mounting flange of the male Heating Anvil. **THIS IS THE HOME POSITION. DO NOT SQUEEZE THE MELT BEAD.** The operator must continue to remember to not squeeze the melt bead, while holding the Hand-Wheel steady in the home position to allow heating of the surfaces to be joined for the prescribed time in the Table of Recommended Heat-Tool Temperature and Exposure Time; pg. 23.

   Note: The dwell time in the home position on the Heating Anvils at 500° F, for both PP and PVDF in pipe sizes ½" through 2", is five seconds. This time sequence is so short that it is impractical to reach the home position on these sizes and instantly start the Timer to count down five seconds. After minimal practice with a timer or watch, an installer can learn to speak the football quarterback's cadence of, hut – one, hut – two, hut – three, etc. to count off five seconds even more accurately than moving the hand on command to activate a Timer and properly measure the time interval. Or, the juvenile cadence of, one-thousand-and-one, one-thousand-and-two, etc. works equally well for others. Certainly the cadence count would not be more accurate for 13 seconds or more. We leave it up to you, which method to use, for eight seconds, but by all means, adopt the discipline of using the Timer for longer time intervals.

5. As soon as the proper time in the home position has expired, the operator must again coordinate with his assistant to move the heated product back from the Heating Anvils. The operator does this by quickly turning the Hand-Wheel counterclockwise. As soon as the pipe and fitting sleds have been retracted, the operator must quickly lift the Heat-Tool handle and swing it from the machine centerline to its resting place behind the machine.

   Now the machine has been cleared for the operator and his assistant to move the pipe sled forward again to make the fusion joint. The operator does this by quickly turning the Hand-Wheel clockwise again. As resistance is met from the pipe being inserted into the socket, the operator must never let the forward motion stop. If the motion stops, it can be next to impossible to start again in order to complete the joint. Do not worry though. The force required for pipe insertion is no greater than the force to push the products onto the Heating Anvils. Quickness and steady force are the secrets for success. The machine's joining stroke will be terminated when the arresting arm on the pipe sled strikes the variable length tube of the Joint Insertion Stroke-Limiter assembly. You will recall that the notch on the tube, corresponding to joint pipe size, was selected in Step 1.

6. Hold the completed joint in the home position for about 10 seconds – a little longer for larger sizes – to permit cooling of the plastic bond. This will prevent the pipe from moving back in the tapered socket while the inner surfaces are fluid. If the operator would prefer to start making preparations for the next joint before cooling is complete, he can again tighten the Knob of the set-screw, on the far right of the fitting sled, which locks the sleds in place. Just remember to loosen the Knob before resetting the machine for the next joint, as in Step 2.

   It is important that the Heating Anvils (heat face sets) be kept as clean as possible. Any residue left on the Anvils should be removed immediately by wiping with a paper towel. Check the Heat-Tool temperature to make sure that it is stable at the prescribed setting. If residue deposits on the Heating Anvils – following the making of joints – persists, try increasing the silicone spray to thoroughly coat the applicable surfaces and/or reduce the prescribed heating time by increments of 10-20%. Be cautious in the reduction of time for sizes 2" and below. Do not waver from the prescribed temperature settings.

   Now that the joint has sufficiently cooled, the operator should remove it from the machine by loosening the Fitting Vise first and then the Pipe Vise.

Fulltime Working Pressure or Maximum Test Pressure

The strength of a socket fusion joint develops as the material in the bonded area cools to the to the extent that there is zero temperature gradient across the socket connection and pipe joint. One way of determining this is to hold the socket connection hub to your cheek, and determine whether the plastic feels cool relative to your skin temperature. Certainly, within an hour after the final joint, the heat will have dissipated from all joints. In compliance with ANSI B-31, Code for Pressure Piping, the system may be tested for up to one hour at one and one-half times the maximum design operating pressure for the system, but not more than one and one-half times the maximum non-shock operating pressure rating for the appurtenance with the least pressure rating in the system. This means that Chemtrol® flanges, unions and valves may be so tested, after correction for ambient temperature, at up to 225 psi. Or, if all devices with lower pressure ratings are isolated, 2" Sch 80 PP pipe, fittings and their joints could be so tested, after correction for ambient temperature, at up to 300 psi; (see pg. 7). As soon as testing is complete the PP or Kynar® (PVDF) system may be commissioned for continuous operation. There should be no leaks when the system is hydro-tested. We strongly recommend that no testing with air or other gas because of safety implications. Should any leaks be found refer to pg. 29 for instruction concerning the conditions and method of repair.

Maintenance of Equipment

As much of the equipment in both the Hand-Held Joining Kits and Bench-Mount Joining Machines is aluminum as is structurally prudent. The reason is weight reduction, so that the equipment may be as portable as possible. However, if reasonably care is not taken, some of the equipment, particularly the Heating Anvils (heat face sets), may not prove to be durable. If only the tools to be used are removed from the toolbox supplied with a Hand-Held Kit, or the tool-drawer supplied in a Bench-Mount Machine, and those tools are replaced at the end of the day or the job, their durability will be found quite acceptable. In fact, the Thermal Blanket is supplied with Hand-Held Kits so that the Heat-Tool with Anvils can be wrapped in the Blanket immediately after used and placed in the Toolbox for transport without worry of being burned by the box due to heat transfer. The faithful return of equipment to their places of storage will also minimize lost equipment – just when it is needed – and costly replacement.

If Heating Anvils are minimally dented, and are only in need of replacing the PTFE coating, they can be refurbished and re-coated at a standard cost of about three-quarters the as-new cost.

The only replacement part on a Hand-Held Heat-Tool is the thermometer. Other parts cannot be replaced as such. However, the tool may be rebuilt and resold to the owner at a standard cost of about three-quarters of the new cost.

Construction Tips

When a take-off of a mechanical design includes close-coupled flanged fittings or valves, purchase from the Chemtrol factory is strongly encouraged. This work is tedious and the factory has developed special equipment and fixtures for the purpose. This advice would certainly be valid if there is a reducer bushing included between close-coupled flanged fittings or valves. In the case of spigot-end diaphragm valves of PP or Kynar®, the joint dimensions are metric size, so that Chemtrol® IPS size Heating Anvils are not acceptable for making joints with metric or IPS size fittings or flanges. Again the factory is specially equipped to do this work.

When a reducer bushing is included in a system, we suggest that pipe be fused to the bushing's inside socket first. Then, as the bushing's spigot is fused into a socket connection, the pipe may be grasped for insertion instead of having only the round or hex bushing head to grasp, as would be the case if this step were done first.

Procedures for making good socket fusion joints can be summarized into six basic steps:

1. The tool must be operated at the proper temperature.
2. The pipe must be beveled.
3. The fitting must be slipped squarely onto the male heat face (without squeezing the bead against the end of heat face), while the pipe is simultaneously inserted into the female heat face.
4. The fitting and pipe must not remain on the heat faces for an excessive period of time. Recommended heating times must be followed.
5. The pipe must be inserted squarely into the fitting socket immediately after removal from the heated faces.
6. The heating tool must be kept clean at all times. Wipe away residual material from heat faces with a clean rag. Periodic application of silicone spray to heat faces will assist in maintaining performance.

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Flanged Joints

Scope
Flanging is used extensively for process lines that require periodic dismantling. Plastic flanges and factory flanged valves and fittings in PVC, CPVC, PVDF and polypropylene are available in a full range of sizes and types for joining to pipe by solvent welding, threading or socket fusion as in the case with polypropylene and PVDF.

Gasket seals between the flange faces should be an elastomeric full flat faced gasket with a hardness of 50 to 70 durometer A. Chemtrol can provide polychloroprene (CR) gaskets in the 1/2" through 12" range having a 1/8" thickness. For chemical environments too aggressive for polychloroprene (CR) another resistant elastomer should be used. When it is necessary to bolt plastic and metal flanges – use flat face metal flanges – not raised face, and use recommended torques shown in table under "Installation Tips."

Dimensions
Bolt circle and number of bolt holes for the flanges are the same as Class 150 metal flanges per ANSI B16.5. Threads are tapered iron pipe size threads per ANSI B1.20.1. The socket dimensions conform to ASTM D2467 which describes 1/2" through 8" sizes and ASTM D439 for Schedule 80 CPVC which gives dimensional data for 1/2" through 6". Internal Chemtrol specifications have been established for the 10" and 12" PVC patterns and 8" CPVC design, as well as socket designs for polypropylene and PVDF.

Pressure Rating
As with all other thermoplastic piping components, the maximum non-shock operating pressure is a function of temperature. Maximum pressure rating for Chemtrol® valves, unions and flanges is 150 psi. Above 100° F refer to the chart on page 8.

Sealing
The faces of flanges are tapered back away from the orifice area at a 1/2 to 1 degree pitch so that when the bolts are tightened the faces will be pulled together generating a force in the water way area to improve sealing.

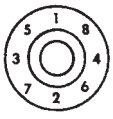
Installation Tips
Once a flange is joined to pipe, the method for joining two flanges together is as follows:

1. Make sure that all the bolt holes of the mating flanges match up. It is not advisable to twist the flange and pipe to achieve this.
2. Use flat washers under bolt heads and nuts.
3. Insert all bolts. (Lubricate bolts.)
4. Make sure that the faces of the flanges mate snuggly prior to tightening of the bolts.
5. The bolts on the plastic flanges should be tightened by pulling down the nuts diametrically opposite each other using a torque wrench. (See diagram below) Complete tightening should be accomplished in stages. The final torque values are shown in the table below. Uniform stress across the flange will prevent leaky gaskets.
6. If the flange is mated to a rigid and stationary flanged object, or to a metal flange, the adjacent plastic pipe must be supported or anchored to eliminate excessive stress on the flange joint.

Flange Size	Recommended Torque*
1/2 - 1 1/2"	10 - 15 ft.lbs.
2 - 4"	20 - 30 ft.lbs.
6 - 8"	33 - 50 ft.lbs.
10"	53 - 75 ft.lbs.
12"	80 - 110 ft.lbs.

*For a well lubricated bolt with flat washers under bolt head and nut.

The following tightening pattern is suggested for the flange bolts:



Repairing Thermoplastic Pipe Joints

Scope
The most common method for repairing faulty and leaking joints is hot gas welding at the fillet formed by the fitting socket entrance and the pipe. Fillet welding of thermoplastic is quite similar to the acetylene welding or brazing process used with metals. The fundamental differences are that the plastic rod must always be the same basic material as the pieces to be joined; and heated gas, rather than burning gas, is used to melt the rod and adjacent surfaces.

Welding with plastics involves only surface melting because plastics unlike metals must never be "puddled." Therefore, the resulting weld is not as strong as the parent pipe and fitting material. This being the case, fillet welding as a repair technique is recommended for minor leaks only. It is not recommended as a primary joining technique for pressure rated systems.

Welding Tools and Materials
- Plastic welding gun with pressure regulator, gauge and hose.
- Filler rod
- Emery cloth
- Cotton rags
- Cutting pliers
- Hand grinder (optional)
- Compressed air supply or bottled nitrogen (see Caution next page)
- Source of compressed air

Weld Area Preparation
Wipe all dirt, oil and moisture from the joint area. A very mild solvent may be necessary to remove oil.

CAUTION: Make sure that all liquid has been removed from the portion of the piping system where the weld is to be made.

Welding Faulty Joints
1. Remove residual solvent cement from the weld area using emery cloth. When welding threaded joints, a file can be used to remove threads in the weld area.



2. Wipe the weld area clean of dust, dirt and moisture.



3. Determine the mount of the correct filler rod (see Table, page 30) necessary to make one complete pass around the joint by wrapping the rod around the pipe to be welded. Increase this length enough to allow for handling the rod at the end of pass.



4. Make about a 60° angular cut on the lead end of the filler rod. This will make it easier to initiate melting and will insure fusion of the rod and base material at the beginning of the weld.



5. Welding temperatures vary for different thermoplastic materials (500° F - 550° F for PVC and CPVC, 550° F - 600° F for PP, 575° F - 600° F for PVDF). Welding temperatures can be adjusted for the various thermoplastic materials as well as any desired welding rate, by adjusting the pressure regulator (which controls the gas flow rate) between 3 and 8 psi.

CAUTION: For welding guns which require compressed gas, nitrogen is preferred when the compressed plant air system does not contain adequate drying and filtrations.

Because of its economy, compressed air is normally the gas of choice for most plastic welding. A welding gun which generates its own air supply is frequently desirable for field-made pipe joints where ultimate weld strength is not required. For welding guns which require compressed gas, nitrogen is preferable when the compressed plant air system does not contain adequate drying and filtration. (Presence of moisture in the gas stream causes premature failure in the heater element of the welding gun. Impurities in the gas stream, particularly those in oil, may oxidize the plastic polymer, resulting in loss of strength. Polypropylene is known to be affected in this manner.)

6. With air or inert gas flowing through the welding gun, insert the electrical plug for the heating element into an appropriate electrical socket to facilitate heating of the gas and wait approximately 7 minutes for the welding gas to reach the proper temperature.

CAUTION: The metal barrel of the welding gun houses the heating element so it can attain extremely high temperatures. Avoid contact with the barrel and do not allow it to contact any combustible materials.

Filler rod size and number of weld passes required to make a good plastic weld are dependent upon the size of the pipe to be welded as presented below:

Pipe Sizes	Rod Sizes	Number of Passes
1/2"- 3/4"	3/32"	3
1"- 2"	3/32"	3
2 1/2"- 4"	1/8"	3
6"- 8"	1/8" or 5/32"	5
10"- 12"	5/32" or 3/16"	5

Do not use filler rod larger than 1/8" in diameter when welding CPVC.

7. Place the leading end of the filler rod into the fillet formed by the junction of the pipe and fitting socket entrance. Holding the filler rod at an angle of 90° to the joint for PVC, CPVC and PVDF, 75° to the joint for polypropylene, preheat the surfaces of the rod and base materials at the weld starting point by holding the welding gun steady at approximately 1/4" to 3/4" from the weld starting point and directing the hot gas in this area until the surfaces become tacky. While preheating, move the rod up and down slightly so that the rod lightly touches the base material. When the surfaces become tacky, the rod will stick to the base material.



8. Advance the filler rod forward by applying a slight pressure to the rod. Simultaneously applying even heat to the surfaces of both the filler rod and base material by moving the gun with a fanning or arcing motion at a rate of about 2 cycles per second. The hot gas should be played equally on the rod and base material (along the weld line) for a distance of about 1/4" from the weld point.



9. Since the starting point for a plastic weld is frequently the weakest part of the weld, always terminate a weld by lapping the bead on top of itself for a distance of 3/8" to 1/2". Never terminate a weld by overlapping the bead side by side.

IMPORTANT: If charring of the base or rod material occurs, move the tip of the gun back slightly, increase the fanning frequency or increase the gas flow rate. If the rod or base materials do not melt sufficiently reverse the previously discussed corrective procedures. Do not apply too much pressure to the rod because this will tend to stretch the weld bead causing it to crack and separate after cooling.

10. When welding large diameter pipe, three weld passes may be required (see table to the left). The first bead should be deposited at the bottom of the fillet and subsequent beads should be deposited on each side of the first bead. When making multiple pass welds, the starting points for each bead should be staggered and ample time must be allowed for each weld to cool before proceeding with additional welds.



11. Properly applied plastic welds can be recognized by the presence of small flow lines or waves on both sides of the deposited bead. This indicates that sufficient heat was applied to the surfaces of the rod and base materials to effect adequate melting and that sufficient pressure was applied to the rod to force the rod melt to fuse with base material melt. If insufficient heat is used when welding PVC, CPVC, or PVDF, the filler rod will appear in its original form and can easily be pulled away from the base material. Excessive heat will result in a brown or black discoloration of the weld. In the case of polypropylene, excessive heat will result in a flat bead with oversized flow lines.

12. Always unplug the electrical connection to the heating element and allow the welding gun to cool before shutting off the gas to the gun.

Welding Principles

The procedures for making good thermoplastic welds can be summarized into four basic essentials:

- Correct Heating - Excessive heating will char or overmelt. Insufficient heating will result in incomplete melting.
- Correct Pressure - Excessive pressure can result in stress cracking when the weld cools. Insufficient pressure will result in incomplete fusion of the rod material with the base material.
- Correct Angle - Incorrect rod angle during welding will stretch the rod and the rod material with the base material.
- Correct Speed - Excessive welding speed will stretch the weld bead and the finished weld will crack upon cooling.

Threading Instructions for Thermoplastic Pipe

Scope

The procedure presented herein covers threading of IPS Schedule 80 or heavier thermoplastic pipe. The threads are National Pipe Threads (NPT) which are cut to the dimensions outlined in ANSI B1.20.1 and presented in the table on page 5.

Threading Equipment and Materials

– Pipe Dies
– Pipe Vise
– Threading ratchet or power machine
– Tapered plug
– Cutting lubricant (soap & water)
– Strap wrench
– PTFE tape
– Cutting tools
– Deburring tool

Pipe Preparation

Plastic pipe can be easily cut with a handsaw, power hacksaw, circular or band saw. For best results, use a fine-toothed blade (16-18 teeth per inch) with little or not set (maximum 0.025"). A circumferential speed of about 6,000 ft./min. is suitable for circular saws; band saw speed should be approximately 3,000 ft./min. Carbide-tipped blades are preferable when quantities of pipe are to be cut. To ensure square-end cuts, a miter box, hold-down or jig should be used. Pipe or tubing cutters can be used for smaller diameter pipe when the cutting wheel is specifically designed for plastic pipe. Such a cutter is available from the Reed Manufacturing Co. or Ridge Tool Company.

Threading Dies

Thread cutting dies should be clean, sharp and in good condition, and should not be used to cut materials other than plastics. Dies with a 5° negative front rake are recommended when using power threading equipment and dies with a 5° to 10° negative front rake are recommended when cutting threads by hand. (**NOTE:** Special dies for threading plastic pipe are available from Ridge Tool Company.)

When cutting threads with power threading equipment, self-opening die heads and a slight chamfer to lead the dies will speed production.

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Threading and Joining

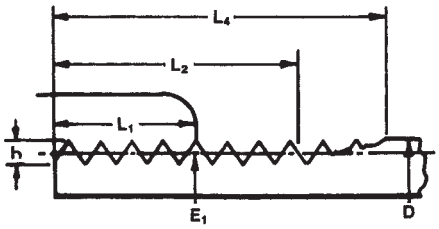
1. Hold pipe firmly in a pipe vise. Protect the pipe at the point of grip by inserting a rubber sheet or other material between the pipe and vise.
2. A tapered plug must be inserted in the end of the pipe to be threaded. This plug provides additional support and prevents distortion of the pipe in the threaded area. Distortion of the pipe during the threading operation will result in eccentric threads, non-uniform circumferential thread depth or gouging and tearing of the pipe wall. See the following Table for approximate plug O.D. dimensions.

Table: **Reinforcing Plug Dimensions***

Pipe Size	Plug O.D.
1/2"	.526
3/4"	.722
1"	.935
1 1/4"	1.254
1 1/2"	1.476
2"	1.913
2 1/2"	2.289
3"	2.864
4"	3.786

*These dimensions are based on the median wall thicknesses and average outside diameter for the respective pipe sizes. Variations in wall thicknesses and O.D. dimensions may require alteration of the plug dimensions.

3. Use a die stock with a proper guide that is free of burrs or sharp edges, so the die will start and go on square to the pipe axis.
4. Push straight down on the handle, avoiding side pressure that might distort the sides of the threads. If power threading equipment is used, the dies should not be driven at high speeds or with heavy pressure. Apply an external lubricant liberally when cutting the threads. Advance the die until the trailing end of the cutting chases approximately pass the end of the pipe.



DO NOT THREAD SCHEDULE 40 PIPE

Do not overthread because all threads between the end of the pipe and the trailing end of the chases will be straight and not tapered as indicated in the sketch above. Dimensional detail for National Pipe Threads may be found on page 5.

5. Periodically check the threads with a ring gauge to ensure that proper procedures are being followed. The gauging tolerance is ± 1 1/2 turns and diametrical adjustment to the cutting chases within the die may be required.
6. Brush threads clean of chips and ribbons. Then starting with the second full thread tape in the direction of the threads. Overlap each wrap by one half the width of the tape. NIBCO does not recommend the use of any thread lubricant/sealant other than PTFE tape.
7. Thread the fitting onto the pipe and tighten by hand. Using a strap wrench only, further tighten the connection an additional one to two threads past hand tightness. Avoid excessive torque as this may cause thread damage or fitting damage.

Pressure Testing

Threaded piping systems can be pressure tested up to 100% of the hydrostatic pressure rating as soon as the last connection is made.

CAUTION: Air or compressed gas is not recommended and should not be used as a media for pressure testing of plastic piping systems.

Ultraviolet Radiation of Thermoplastic Piping Materials

The presence of Ultraviolet (UV) must at least be considered for every material because of the effect of its radiation of pipe on the medium carried within the pipe depends upon the basic material as well as the pigmentation (colorant) package in the material.

PVC and CPVC

Both materials are attacked by UV radiation, resulting in degradation of the polymeric chains. Embrittlement is the first sign of deterioration, followed by loss of strength and general deterioration of all other physical properties. Industrial CPVC Sch. 80 piping components are traditionally colored light gray while PVC products are dark gray. The coloration for both systems of products is achieved by a blend of Titanium Dioxide (white) and Carbon Black (black). In order to maintain a consistent tone of color, a pigmentation package of approximately 2 1/2 % by weight is required. Through many years of experience it has been shown that the irradiation is blocked by pigment at the surface. B. F. Goodrich conducted one controlled experiment of PVC cooling tower piping on the roof of a motel in Orlando, Florida for over 30 years. Typically, after several years' exposure the gray color, particularly on the pipe top that bears the brunt from the sun, washed out to a lighter gray with white showing through. But when the surface was scratched with the edge of a knife blade the rich dark gray was present, indicating that radiation had not penetrated below the surface. Samples of pipe were taken from the installation at five-year intervals so that coupons could be extracted for physical property testing. After 30 years the testing was stopped with the conclusion that 25 years service could be expected because no statistical difference in results had been noted. The motel was demolished after more than 35 years service. UV protection is not a requirement for gray piping, so painting is not recommended except for cosmetic or color coding reasons.

PVC Sch 40 and SDR water and sewer piping, which are traditionally white in color, may be another story. There is no requirement for the amount of Titanium Dioxide to be included in the plastic compound for white coloration. As a result, minimal amounts of pigment may be present in these very cost competitive high volume products. Also, their time in the inventory supply chain is usually quite short, and the products are frequently buried at installation. With the exception of the highly specialized white piping products intended for furniture, which have a dramatically elevated content of pigment to promote deep color luster, the commercial white piping products should be suspect under long-term direct exposure to sun without some UV protection, painting being one option.

Polypropylene

Polyethylene and PP are rapidly degraded by UV irradiation from sun exposure. For further information on the consequences of the effect of UV radiation and the reasons for Chemtrol offering two complete product lines of pipe, fittings and valves, one black and the other natural (unpigmented), see Materials on page 1.

PVDF (Kynar®)

The basic PVDF resin is transparent to UV, so it is not degraded by sunlight. For further information on the consequences of the effect of UV radiation and the reasons for Chemtrol offering two complete product lines of pipe, fittings and valves, one red and the other natural (unpigmented), see Materials on page 1.

Painting

Although the slick hard surfaces of the thermoplastic piping systems listed above are not ideal for paint adhesion they may be effectively painted for facilities color coding, cosmetic enhancement or added UV protection. The paint should be a water-based 100% acrylic emulsion system for exterior use. The system will include a primer coat and one topcoat. If the reason for painting is to provide UV protection, white or another light color is the best choice. These contain a greater amount of pigment, principally Titanium Dioxide. Use any brand of high quality house or industrial paint because

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these have the higher concentration of pigment and it is the pigment that provides the UV protection. There are two hints, which will greatly contribute to adhesion. First, wash the entire exterior with solvent to clean and degrease it. Axial-grease and caked mud are obvious, but small particles of sand, dust, printing and body oil (fingerprints) are less obvious impurities that require removal. Therefore, do not get the cleaning process too far ahead of painting. Use Methyl Ethyl Ketone (MEK) (available as a plastic pipe cleaner from many distributors of industrial plastic piping) or Isopropyl Alcohol, although more elbow grease will be required with the later. Do not overlook the need for good ventilation when using solvents. Second, insure a continuous film of paint over the entire piping surface. The cohesion of the paint films themselves will help the coating to adhere to the piping. It becomes apparent that painting is not an inexpensive addition to the piping system. However, to specify it correctly the first time will reduce maintenance costs in the long run.

General Underground Installation Procedures for PVC and CPVC Solvent Welded Pipe

The general installation procedures detailed here apply to polyvinyl chloride (PVC) and chlorinated polyvinyl chloride (CPVC) pressure pipe that has solvent welded joints up through 8" in size. These procedures are applicable for all liquids that are conveyed at pressures up to the maximum hydrostatic pressure rating of the pipe or of any component in the piping system, whichever is lowest.

Chemtrol Technical Services should be consulted for installation guidance and recommendation on all sizes of pipe 10" and above and where the installer has had no experience in the installation of PVC or CPVC piping. For additional information, refer to ASTM D2774, "Underground Installation of Thermoplastic Pressure Piping."

Inspection

Before installation, all lengths of PVC or CPVC pipe and fittings should be thoroughly inspected for cuts, scratches, gouges, buckling, kinking and any other imperfections (such as splits on I.D. or ends of pipe due to impact) which may have been imparted to the pipe during shipping, unloading, storing and stringing. Any pipe or precoupled fittings containing harmful or even questionable defects should be removed by cutting out the damaged section as a complete cylinder.

Trenching

The trench should be of adequate width to allow convenient installation of PVC or CPVC pipe, at the same time being as narrow as possible. The following trench sizes have been used with success. However, actual sizes may vary with terrain and specific application.

Minimum trench widths may be utilized by joining pipe outside of the trench and lowering it into the trench after adequate joint strength has been obtained. Trench widths will have to be wider where the pipe is joined in the trench, or where thermal expansion and contraction is a factor. See section titled "Snaking of Pipe."

Pipe Size	Trench Width	Light Traffic Ground Cover Minimum	Heavy Traffic Ground Cover Minimum
3" & Under	8"	12" - 18"	24" - 30"
4" & 6"	12"	18" - 24"	30" - 36"
8"	16"	24" - 30"	36" - 42"

The trench bottoms should be continuous, relatively smooth and free of rocks. Where ledge rock, hardpan or boulders are encountered, it is advisable to pad the trench bottom using a minimum of four (4) inches of tamped earth or sand beneath the pipe as a cushion and for protection of the pipe from damage.

Sufficient cover must be maintained to keep external stress levels below acceptable design stress. Reliability and safety of service may assume major importance in determining minimum cover. Local, state and national codes may also govern.

Pipe intended for water service should be buried at least 12" below the maximum expected frost penetration.

Size of Joining Crew

Field practice has shown that the size of the joining crew will depend upon a number of variables, such as, size and length of the pipe, the atmospheric temperature, construction conditions, construction time element, amount of pipe to be layed, construction workers' experience in laying PVC or CPVC pipe, etc. Although it is possible for one man to join the smaller sizes of pipe (2" and under) by himself, it is not necessarily practical to do so. Therefore, the crew sizes presented here are intended as a guide for those PVC or CPVC pipe users who have not had a great deal of experience in the installation of such buried pipe:

1 MAN	Size Pipe 1 1/4" and under. Size Pipe 1 1/2" and 2" maximum 20' lengths.
2 MEN	1 1/2" and 2" where lengths are over 20' or atmospheric temperature temperature is over 90° F. 2 1/2" and 3" pipe in maximum lengths of 20'
3 MEN*	2 1/2" and 3" pipe where lengths are over 20' or atmospheric temperature is over 90° F. 4" through 8" size pipe.
4 MEN**	6" and 8" size pipe where atmospheric temperature is over 90° F.

* Two men do the priming and solvent welding while the third man is positioned at the end of the pipe in order to assist in pushing it into its fully bottomed position in the fitting socket.

** Two men do the priming and apply the cement to the pipe surface while the third man does the same to the fitting socket. The fourth man is positioned at the end of the pipe in order to assist in pushing it into its fully bottomed position in the fitting socket.

NOTE: The need for an extra man when the temperature is above 90° F, is necessary in order to quickly complete the solvent cement application and joining process before rapid evaporation of the cement's solvent causes it to prematurely set.

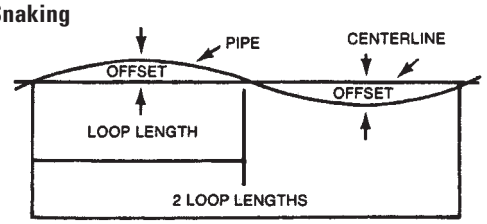
Solvent Welding

For joining recommendations, see the section titled "Solvent Welding Instructions for PVC and CPVC Pressure Pipe Systems" on page 16.

Snaking of Pipe

After the PVC and CPVC pipe has been solvent welded, it is advisable to snake the pipe beside the trench according to the following recommendation. **BE ESPECIALLY CAREFUL NOT TO APPLY ANY STRESS THAT WILL DISTURB THE UNDRIED JOINT.** This snaking is necessary in order to allow for any anticipated thermal contraction that will take place in the newly joined pipeline.

Pipe Snaking



Loop Offset in Inches for Contraction

Maximum Temperature Variation, ° F, Between Time of Solvent and Final Use

Loop Length	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°
20 Feet	3"	4"	5"	5"	6"	6"	7"	7"	8"	8"
50 Feet	7"	9"	11"	13"	14"	16"	17"	18"	19"	20"
100 Feet	13"	18"	22"	26"	29"	32"	35"	37"	40"	42"

Snaking is particularly necessary on the lengths that have been solvent welded during the late afternoon of a hot summer's day, because their drying time will extend through the cool of the night when thermal contraction of the pipe could stress the joints to the point of pull out. This snaking is also especially necessary with pipe that is layed in its trench (necessitating wider trenches than recommended) and is back-filled with cool earth before the joints are thoroughly dry.

Bending of Plastic Pipe

Whenever a change of direction is required in a pipeline, it is best accomplished using straight lengths of pipe and factory-made fittings. Bending of pipe leaves residual stresses and consequently bending is not recommended as a normal practice, particularly if the line is intended to operate at or near maximum temperatures and/or pressure.

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If field bending is required to meet special conditions the following techniques should be employed to give the best pressure carrying capability of the installed system.

1. Heating Media: The heating media may be hot air in a circulating oven operating at approximately 360° F. The heating media may also be radiant heat in which case the pipe surface in the area of the bend or the pipe may be immersed in hot oil. An open flame should never be used. Heating times will range from approximately one to five minutes or until it becomes soft and pliable to bend, depending upon pipe size and type of heat source.
2. To maintain the cross sectional area of the I.D. of the pipe in the area of the bend, it must be supported during the bending operations.

   There are three suggested methods for supporting the pipe.
   a. The I.D. can be supported by filling with preheated sand and plugging both ends.
   b. A heated reinforcing spring can be placed inside of the pipe after it has been heated to a soft, pliable condition. The spring should be made with 3/32" diameter wire and the O.D. of the spring should be slightly less than the nominal I.D. of the pipe to be bent. Springs can be custom made by any local spring manufacturer.
   c. When the pipe becomes soft and pliable it can be placed in forming jig or form and bent as quickly as possible to prevent weakening or deforming of the pipe.
3. The minimum radius to which a bend should be made, measured from the inner edge of the curve, should be 8 pipe diameter for 3/4" pipe size and below and 6 pipe diameters for larger pipe. The initial forming bend will have to be slightly greater to allow for spring back.
4. The bend should be kept in the bent form until the pipe cools and becomes rigid enough to be handled without deforming. It should then be immediately immersed in water to complete the cooling process. The sand or spring should not be removed until final cooling is completed.

   When plastic pipe is heated and then bent, it will shrink with the degree of shrinkage depending on the size of the pipe and the radius of the bend. Therefore, the pipe should be cut to lengths slightly greater than the total length of the bend and the tangents.
5. A straight section of at least two pipe diameters should be left at either side of the bend to insure a round, low stress section with which to make joints.

NOTE: Highly crystalline thermoplastics such as PVDF should never be formed in this way due to the potential detrimental effect of the process on the molecular structure and properties of the material.

The above discussion covers only the basics involved with bending plastic pipe. Experience and some trial-and-error will be required to develop an expertise in bending pipe. Contact the pipe manufacturer with further questions.

Cleaning
Even though care should be exercised at all times to prevent the entry of dirt, water, and other foreign material into the PVC or CPVC pipe fittings, it is advisable that the pipeline be thoroughly cleaned before working pressure is applied.

Testing
See section titled “Solvent Welding Instructions for PVC and CPVC Pressure Pipe Systems,” page 16.

Backfilling
Ideally, backfilling should only be done early in the morning during hot weather when the line is fully contracted and there is no chance of insufficiently dried joints being subject to contraction stresses.

The pipe should be uniformly and continuously supported over its entire length on firm, stable material. Blocking should not be used to change pipe grade or to intermittently support pipe across excavated sections.

Pipe is installed in a wide range of sub-soils. These soils should not only be stable but applied in such a manner so as to physically shield the pipe from damage. Attention should be given to local pipe laying experience which may indicate particular pipe bedding problems.

Backfill materials free of rocks with a particle size of 1/2" or less should be used to surround the pipe with 6" to 8" of cover. It should be placed in layers. Each solid layer should be sufficiently compacted to uniformly develop lateral passive soil forces during the backfill operation. It may be advisable to have the pipe under pressure, 15 to 25 psi during the backfilling.

Effects of ground freezing should be considered when pipe is installed at depths subject to frost penetration.

Vibratory methods are preferred when compacting sand or gravels. Best results are obtained when the soils are in nearly saturated condition. Where water flooding is used, the initial backfill should be sufficient to insure complete coverage of the pipe. Additional material should not be added until the water flooded backfill is firm enough to walk on. Care should be taken to avoid floating the pipe.

Sand and gravel containing a significant proportion of fine-grained material, such as silt and clay, should be compacted by hand or, preferably by mechanical tamper.

The remainder of the backfill should be placed and spread in approximately uniform layers in such a manner to fill the trench completely so that there will be no unfilled spaces under or about rocks or lumps of earth in the backfill. Large or sharp rocks, frozen clods and other debris greater than 3" in diameter should be removed. Rolling equipment or heavy tampers should only be used to consolidate the final backfill.

Additional information on underground installation is given in ASTM D2321 “Underground Installation of Flexible Thermoplastic Pressure Piping.“

Connecting Pipe Sections
Sections of PVC or CPVC pipe that have been backfilled or plowed in during the heat of the day should be sufficiently overlapped to allow for contraction and not joined up to one another or any stable connection or fitting until the morning following their night of cooling and thermal contraction. See the section “Expansion and Contraction of Plastic Pipe" page 12 for calculating anticipated contraction.

Pipe Locating
The location of all PVC and CPVC pipelines should be accurately and precisely recorded. Conductive wire can be trenched or plowed in with the pipe as an aid for future locating purposes.

Below Grade Valves, Anchors or other Connections
As a rule of thumb in designing and installing a PVC or CPVC underground piping system, it is pointed out that pipe made from these materials is not designed to be used for any structural applications beyond withstanding normal soil loads and internal pressures up to its hydrostatic pressure rating.

Anchors, valve boxes, etc. must be independently supported so as to not introduce additional bending or sheer stress on the pipe.

Roadways and Railroad Tracks
It is recommended that plastic pipe be run within a metal or concrete casing when it is installed beneath surfaces that are subject to heavyweight or constant traffic; such as roadways, railroad tracks, etc.

Concrete Anchors
Concrete anchors can be poured around PVC or CPVC pipe at direction changes. If the purpose for anchoring is to restrain axial movement of the pipe, this can be done by solvent welding split collars around the pipe O.D. to provide a shoulder against the concrete wall. Solvent welded surface between collar and pipe O.D. must dry 48 hours prior to pouring of concrete.

Risers
Although PVC or CPVC pipe has excellent weathering resistance, it should not be brought above grade under the following circumstances:

1. If it is expected to provide structural strength, such as supporting an above-grade metal valve. The metal valve should be installed with an independent support.
2. If it is subject to external damage. This could be remedied by sleeving the pipe with an independently and rigidly supported steel pipe.
3. If it is subject to high temperature environments; i.e. summer sun that could lower the pipe's pressure rating below an acceptable level. Such a situation might be remedied by insulating the PVC or CPVC pipe.

Product Line

Chemtrol offers a premium line of quality valves, fittings, and pipe for all of your flow-control applications.

		Polyvinyl Chloride (PVC) 	Chlorinated Polyvinyl Chloride (Corzan® CPVC) 
Typical Applications		Chemical processing, industrial plating, chilled water distribution, chemical drainage, and irrigation systems	Systems for hot corrosive liquids, hot and cold water distribution, chemical processing, industrial plating, deionized water lines, chemical drainage, waste water treatment systems, and similar applications above the temperature range of PVC
Joining Methods		Solvent cementing, threading, or flanging	Solvent cementing, threading, or flanging
Max. Service Temperature		140° F/60° C	210° F/99° C
Fittings	Schedule 80	Socket– 1/2" through 12" Threaded– 1/4" through 4"	Socket– 1/4" through 12" Threaded– 1/4" through 4"
	Large diameter	Schedules 40 and 80 10" and 12" couplings, tees, 90° and 45° elbows, reducer bushings, and Van Stone flanges	10" and 12" couplings, tees, 90° and 45° elbows, reducer bushings
Valves	Tru-Bloc/True Union ball valves*	1/2" through 6" socket, threaded, and flanged connections	1/2" through 6" socket, threaded, and flanged connections
	Tru-Bloc/True Union ball check valves	1/2" through 4" with socket, threaded, or flanged ends	1/2" through 4" with socket, threaded, or flanged ends
	Butterfly valves*	EPDM and FKM liner	EPDM and FKM liner 3" only
	Multiport valves*	True Union 3-way/3-position multiport ball valves, 1/2" through 2" with socket and threaded ends	True Union 3-way/3-position multiport ball valves, 1/2" through 2" with socket and threaded ends
	Specialty valves	Angle and Y pattern: 1/4" through 1" threaded Needle and Chemcock: 1/4" threaded	
Pipe			

*For pneumatic or electric actuation.

Refer to Chemtrol Technical Manuals for pressure ratings at various temperatures.

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	Polypropylene (PP) 		Polyvinylidene Fluoride (KYNAR® PVDF) 	
	Black Polypropylene: Clean chemical processes, hot corrosive liquids, industrial plating, waste treatment systems	**Natural Polypropylene:** Deionized water systems, clean chemical processes, pharmaceutical operations, food processing	**Red KYNAR®** PVDF, which protects fluid medium from UV exposure, is an excellent material for general industrial applications, especially outdoor installations.	**Natural KYNAR®** (Unpigmented) PVDF is ideal for industries such as electronics, pharmaceuticals, and processed foods or beverages.
	Thermo-seal fusion, threading, or flanging	Thermo-seal fusion, threading, or flanging	Socket heat fusion, threading, or flanging	Socket heat fusion, threading, or flanging
	180° F/82° C	180° F/82° C	280° F/138° C	280° F/138° C
	IPS socket type– 1/2" through 6" Threaded– 1/2" through 4"	IPS socket type– 1/2" through 4" Threaded– 1/2" through 4"	IPS socket type– 1/2" through 6" Threaded– 1/2" through 2"	IPS socket type– 1/2" through 6" Threaded– 1/2" through 2"
	1/2" through 4" with socket, threaded, or flanged ends	1/2" through 4" with socket, threaded, or flanged ends	1/2" through 4" with socket, threaded, or flanged ends	1/2" through 4" with socket, threaded, or flanged ends
	1/2" through 2" with socket, threaded, or flanged ends	1/2" through 2" with socket, threaded, or flanged ends	1/2" through 2" with socket, threaded, or flanged ends	1/2" through 2" with socket, threaded, or flanged ends
	NIBCO® socket fusion equipment for joining PP and KYNAR® (PVDF) fittings 1/2" through 6"			
	Schedule 40 and 80 wall thicknesses		Schedule 40 and 80 wall thicknesses	

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Polyvinyl Chloride (PVC) Schedule 80 Industrial Pipe and Fittings

Scope:
This specification establishes the manufacturing requirements for PVC Schedule 80 piping components intended for use in industrial, pressure-rated, fluid-handling systems for applications at 140° F or less, where resistance to corrosion is of prime importance.

Materials:
Pipe and fittings shall be manufactured from a PVC compound that meets the requirements of Cell Classification 12454 polyvinyl chloride as outlined in ASTM D1784. PVC shall be gray in color. Pipe and fitting materials shall be specifically formulated with sufficient UV stabilizers to provide for long-term outdoor exposure with no deleterious effects.

Materials from which pipe and fittings are manufactured shall have been tested and approved for conveying potable water by NSF International.

Dimensions/Design (IPS Size):
Socket-end connections shall have diameters, lengths, and wall thicknesses as required by ASTM D2467; taper pipe threaded-end connections shall have thread lengths, diameters, and configurations in conformance with ASTM D2467.

Fittings shall be industrial, heavy-duty, hub style.

Flanges shall be either a one-piece solid or a two-piece Van Stone design that utilizes the tapered, serrated-face and full-face gasket technique for joining and are compatible with ASME B16.5 Class 150 metal flanges.

Unions shall have an O-ring seal and components interchangeable with true union valves for maximum system versatility.

Transition unions, unions intended for joining dissimilar materials, shall utilize components of the two dissimilar materials, joined with an O-ring to absorb the thermal-expansion coefficient differential.

Pipe shall be as prescribed by ASTM D1785 for pressure-rated piping systems.

Pressure Ratings:
Socket fittings shall be rated at the same pressure as the corresponding size pipe prescribed by ASTM D1785. Threaded fittings shall be rated at 50% of the pressure rating of the corresponding size pipe prescribed by ASTM D1785.

Valves, unions, and flanges shall be rated at 150 psi for non-shock water service at 73° F and have a minimum 60 second burst requirement of 3.2 times the rated pressure.

Markings:
Fittings and pipe shall be clearly marked with the manufacturer's name or trademark, material designation, ASTM number or equivalent symbol indicating compliance with applicable standards, NSF International certification mark, NSF-pw, (verifying approval for the conveyance of potable water), and the country of manufacture.

Installation/Maintenance:
Installation and operation shall be as specified by the manufacturer's printed instructions.

Chlorinated Polyvinyl Chloride (CPVC) Schedule 80 Industrial Pipe and Fittings

Scope:
This specification establishes the manufacturing requirements for CPVC Schedule 80 piping components intended for use in industrial, pressure-rated, fluid-handling systems for applications at 210° F or less, where resistance to corrosion at elevated temperatures is of prime importance.

Materials:
Rigid CPVC (chlorinated polyvinyl chloride) used in the manufacture of Schedule 80 piping components shall be Cell Classification 23447 as identified in ASTM D1784. CPVC materials shall be light gray in color. Pipe and fitting materials shall be specifically formulated with sufficient UV stabilizers to provide for long-term outdoor exposure with no deleterious effects. CPVC material used to manufacture pipe and fittings shall be approved for the conveyance of potable water by a third-party certification agency.

Dimensions/Design (IPS Size):
Socket-end connections shall have diameters, lengths, and wall thicknesses as required by ASTM F439; taper pipe threaded-end connections shall have thread lengths, diameters, and configurations in conformance with ASTM F439.

Pipe shall have diameters and wall thicknesses in conformance with the requirements of ASTM F441.

Fittings shall be industrial, heavy-duty, hub style.

Flanges shall be either a one-piece design or a two-piece Van Stone design that utilizes the tapered, serrated-face and full-face gasket technique for joining and are compatible with ASME B16.5 Class 150 metal flanges.

Unions shall have an O-ring seal and components interchangeable with true union valves for maximum system versatility.

Transition unions, unions intended for joining dissimilar materials, shall utilize components of the two dissimilar materials, joined with an elastomeric seal to absorb the thermal-expansion coefficient differential.

Pressure Ratings:
Socket fittings shall be rated at the same pressure as the corresponding size pipe prescribed by ASTM F441. Threaded fittings shall be rated at 50% of the pressure rating as the corresponding size pipe prescribed by ASTM F441.

Valves, unions, and flanges shall be rated at 150 psi for non-shock water service at 73° F, and have a minimum 60 second burst requirement of 3.2 times the rated pressure.

Markings:
Fittings and pipe shall be clearly marked with the manufacturer's name or trademark, material designation, ASTM number or equivalent symbol indicating compliance with applicable standards, NSF International certification mark, NSF-pw, (verifying approval for the conveyance of potable water), and the country of manufacture.

Installation/Maintenance:
Installation and operation shall be as specified by the manufacturer's printed instructions.

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Polypropylene (PP) Schedule 80 Industrial Pipe and Fittings

Scope:
This specification establishes the manufacturing requirements for black and Chem-Pure® Schedule 80 polypropylene piping components intended for use in industrial, pressure-rated, fluid-handling systems for applications at 180° F or less, where resistance to corrosion are of prime importance.

Materials:
Rigid PP (polypropylene) used in the manufacture of Schedule 80 piping components shall be one of the following:
Black Polypropylene:
– Pipe-material shall be Cell Class PP0110-A2-1510 as per ASTM D4101. Fittings material shall be Cell Class PP0110-M30-A10120 (glass bead material) and Cell Class PP0110-B67154 (unfilled material) as per ASTM D4101. These materials shall be pigmented jet black.
Chem-Pure (Natural) Polypropylene:
– Pipe material shall be Cell Class PP0110-A2-1510 as per ASTM D4101. Fitting material shall be Cell Class PP0210-B45145 as per ASTM D4101. These materials shall be unpigmented.

Dimensions/Design (IPS Size):
Socket-end connections suitable for heat-fusion welding shall have socket lengths and wall thicknesses as required for Schedule 80 fittings in ASTM D2467. Socket diameters shall be in accordance with the manufacturer's recommendations for an interference fit with the pipe as prescribed in ASTM D2657; taper pipe threaded-ends shall have lengths, diameters, and configuration in accordance with ASTM D2467 for Schedule 80 fittings.

Pipe shall have diameters and wall thicknesses in conformance with ASTM D1785 for Schedule 80 pipe.

Fittings shall be industrial, heavy-duty, hub style.

Flanges shall be one-piece design utilizing the tapered-, serrated-, and full-face gasket technique for joining, with bolt pattern compatible with ASME B16.5 Class 150 metal flanges.

Unions shall have an O-ring seal and components interchangeable with true union valves for maximum system versatility.

Transition unions, unions intended for joining dissimilar materials, shall utilize components of the two dissimilar materials, joined with an elastomeric seal to absorb the thermal-expansion coefficient differential.

Pressure Ratings:
Pipe and fittings joined by the heat-fusion technique shall be rated according to the following pressures for a given nominal size at 73° F water service.

1/2 – 410 psi	1 – 310 psi	2 – 200 psi	4 – 160 psi
3/4 – 330 psi	1-1/2 – 230 psi	3 – 190 psi	6 – 140 psi

NOTE: Threaded pipe and fittings shall be rated at 20 psi maximum for all sizes at 73° water service.

Heat-fusion valves, unions, and flanges shall be rated at 150 psi for non-shock water service at 73° F and have a minimum 60 second burst requirement of 3.2 times the rated pressure.

Markings:
Fittings and pipe shall be clearly marked with the manufacturer's name or trademark, nominal size, material designation, and country of manufacture.

Installation/Maintenance:
Installation and operation shall be as specified by the manufacturer's printed instructions. Specialized joining equipment shall be as recommended by the manufacturer.

Polyvinylidene Fluoride (PVDF) (KYNAR®) Schedule 80 Industrial Pipe and Fittings

Scope:
This specification establishes the manufacturing requirements for red and natural PVDF Schedule 80 piping components intended for use in industrial, pressure-rated, fluid-handling systems of 280° F or less where resistance to corrosion are of prime importance.

Materials:
Rigid PVDF (polyvinylidene fluoride) used in the manufacture of Schedule 80 piping components shall conform to requirements in ASTM D3222 for Type I homopolymers. Pipe and fitting components shall be manufactured from one of the following:

Red Kynar®:
PVDF compound with a minimum of 1.7% red pigment content for opaqueness to UV radiation.

Natural Kynar®:
Unpigmented 700 series PVDF compound of the highest purity and maximum transparency to UV radiation.

Dimensions/Design:
Socket-end connections suitable for heat-fusion welding shall have socket lengths and wall thicknesses conforming to ASTM D2467 and socket diameters shall be in accordance with the manufacturer's printed recommendations to provide an interference-fit with the pipe; taper pipe threaded-ends shall have thread lengths, diameters, and configurations in conformance with ASTM D2467.

Pipe shall be manufactured to the same tolerances for outside diameter and wall thicknesses as outlined in ASTM D1785 for Schedule 80 pipe.

Fittings shall be industrial, heavy-duty, hub style.

Unions shall have an O-ring seal and components interchangeable with true union valves for maximum system versatility.

Transition unions, unions intended for joining dissimilar materials, shall utilize components of the two dissimilar materials, joined with an elastomeric seal to absorb the thermal-expansion coefficient differential.

Pressure Ratings:
Pipe and fittings joined by the heat-fusion technique shall be rated according to the following pressures for a given nominal size at 73° F water service.

1/2 – 580 psi	1 – 430 psi	2 – 270 psi	4 – 220 psi
3/4 – 470 psi	1-1/2 – 320 psi	3 – 260 psi	6 – 190 psi

NOTE: Threaded pipe and fittings shall be rated at 50% of the values given for socket ends.

Valves, unions, and flanges (either socket or threaded end) shall be pressure rated at 150 psi non-shock water service at 73° F and have a minimum 60 second burst requirement of 3.2 times the rated pressure.

Markings:
All pipe, fittings, and valves shall be clearly marked with the manufacturer's name or trademark, nominal size, and country of manufacture.

Installation:
Installation and operation shall be as specified by the manufacturer's printed instructions. Specialized joining equipment shall be as recommended by manufacturer.

Kynar® is a registered trademark of Arkema Inc.

250 PSI Tru-Bloc®, True Union Ball Valves Model D 1/2" through 2" Nominal Sizes

Scope: This specification establishes the requirements for dual blocking (Tru-Bloc®) quarter-turn ball valves of PVC and CPVC materials intended for use in industrial, commercial, and residential pressure-piping systems, where cost-effective, long-term resistance to corrosion is of prime importance, and the service temperature does not exceed: PVC, 140°F; CPVC, 210°F.

Major component parts shall be constructed from one of the following:

NPS ½" – 2" PVC (polyvinyl chloride), Cell Classification 12454 per ASTM D1784, industrial gray in color, and the valve shall be full-port Tru-Bloc.

NPS ½" – 2" Corzan HP CPVC (Chlorinated polyvinyl chloride), Cell Class 24448 per ASTM D1784, industrial light –port gray in color, and the valve shall be full Tru-Bloc®, with the material being pressure rated by an independent third party organization such as PPI (Plastic Piping institute).

Standard Dimensions: PVC and CPVC socket-end connections shall conform to the dimensional requirements of ASTM D2467 (PVC) and F439 (CPVC) for Schedule 80 pressure fittings.

All threaded-end connections shall conform to the dimensional requirements of ASTM D2467 (PVC) and F439 (CPVC) as well as ASTM F1498.

Performance: Valves shall be rated for 250 psi non-shock water service at 73°F and have a minimum 60 second burst rating of 3.2 times rated working pressure.

PVC Valves shall be rated at 165 psi non-shock water service at 120°F, with a minimum 60 second burst rating of 3.2 times rated working pressure.

CPVC Valves shall be rated to 190 psi non-shock water service at 120°F and 130 psi at 180°F, with a minimum 60 second bust rating of 3.2 times rated working pressure.

Valves shall be certified to ASTM D1970 by a recognized third-party agency such as NSF International.

Markings: Valves shall be clearly marked with the manufacturer's name or trademark, nominal size, material designation, ASTM D1970, Country of origin, and bare the NSF-PW-G (verifying listings for conveying potable water, dezincification resistant, and lead-free).

Installation and Operation: Installation and operation shall be as specified by the manufacturer's printed instructions.

150 PSI Tru-Bloc®, True Union Ball Valves Model C 3" through 6" Nominal Sizes

Scope:
This specification establishes the manufacturing requirements for dual-blocking (Tru-Bloc®) and downstream-only blocking (true union) quarter-turn ball valves of PVC, CPVC, PP, and PVDF materials intended for use in industrial, commercial, and residential pressure-piping systems, where cost-effective, long-term resistance to corrosion is of prime importance, and the service temperature does not exceed: PVC, 140° F; CPVC, 210° F; PP, 180° F; PVDF, 280° F.

Major component parts shall be constructed from one of the following:

NPS 1/2 – 6 PVC (polyvinyl chloride), Cell Class 12454 per ASTM D1784, industrial gray in color, and the valve style shall be full-port Tru-Bloc®, TU (NPS 6 is standard port) or Tru-Bloc®, SU (NPS 1/2 – 2 only).

NPS 1/2 – 6 CPVC (chlorinated polyvinyl chloride), Cell Class 23447 per ASTM D1784, industrial light gray in color, and the valve style shall be full-port Tru-Bloc®, TU (NPS 6 is standard port) or Tru-Bloc, SU (NPS 1/2 – 2 only).

NPS 1/2 – 4 PP (polypropylene) Cell Class PP0110-M30-A10120 (glass-filled material) and Cell Class PP0110-B67157 (unfilled material) as per ASTM D4101. These materials shall be pigmented jet black. Valve style shall be full-port True Union.

NPS 1/2 – 4 Chem-Pure® (natural polypropylene) Cell Class PP0210-B45I45 as per ASTM D4101. Materials shall be unpigmented and of the highest purity. Valve style shall be full-port True Union.

NPS 1/2 – 4 PVDF (polyvinylidene fluoride) Type I compound per ASTM D3222. The material shall be red Kynar® (pigmented red) for maximum UV opaqueness, and the valve style shall be full-port Tru-Bloc, TU or True Union.

NPS 1/2 – 4 PVDF (polyvinylidene fluoride) Type I compound per ASTM D3222. The material shall be natural (unpigmented) Kynar® of the highest purity and maximum transparency to UV radiation, and the valve style shall be full-port Tru-Bloc®, TU or True Union.

Dimensions/Valve Design:
PVC and CPVC socket-end connections shall conform to the requirements of ASTM D2467 and F439 for Schedule 80 pressure fittings, PP and PVDF socket-end connections shall be suitable for heat-fusion welding as specified in ASTM D2567 Technique I.

All threaded-end connections shall conform to the requirements of ASTM D2467 and F439 as well as ASTM F1498 for tapered pipe threads.

Performance:
Valves shall be rated for 150 psi non-shock water service at 73° F water and have a minimum 60 second burst rating of 3.2 times the rated working pressure. PVC and CPVC valves shall be certified to ASTM F1970 by a third-party agency.

Markings:
Valves shall be clearly marked with the manufacturer's name or trademark, nominal size, material designation, ASTM number or equivalent symbol indicating compliance with applicable standards, and country of manufacture. PVC and CPVC valves shall additionally bear the NSF International certification mark, NSF-pw, (verifying approval for conveyance of potable water).

Installation:
Installation and operation shall be as specified by the manufacturer's printed instructions.

PVC and CPVC Bleach Ball Valves True Union

Recommended Specification
In the interest of safety, owners of sodium hypochlorite transfer and injection piping systems must have confidence that the PVC or CPVC ball valves in their system were properly manufactured, cleaned, assembled, tested, and oriented during installation in accordance with intended system design. Therefore, engineering specifications for bleach transfer and injection systems should include the following product, installation, and pre-commissioning inspection requirements:

- All PVC or CPVC bleach ball valves must be of the True Union type *with an energized seat* that will concurrently provide automatic adjustment for wear and leak-free service at the lower pressure port. And *the ball must contain an adequate vent* to the pressure port opposite of the downstream sealing port.

- The manufacturer of all PVC or CPVC bleach ball valves must *complete all components prior to the factory assembly, test, and packaging of those valves.* Modification of assembled valves by any manufacturer or vendor is unacceptable. Also, the valves must be individually packaged with each carton label stating: *Bleach ball valve, size, material, and manufacturer.*

- Bleach ball valves must be *permanently marked externally* with: the word *Bleach; two opposing directional arrows*, one inscribed with *Flow* and other with *Vent; and NSF* (symbol of NSF International, indicating approval for use with potable water).

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150 PSI Ball Check and Foot Valves PVC, CPVC, PP, PVDF 1/2" through 4" Nominal Sizes

Scope:
This specification establishes the manufacturing requirements for PVC, CPVC, PP, and PVDF ball check and PVC, CPVC foot valves intended for use in industrial, commercial, and residential pressure-piping systems, where cost-effective, long-term resistance to corrosion is of prime importance. Maximum service temperatures are: PVC, 140° F; CPVC, 210° F; PP, 180° F; PVDF, 280° F.

Materials:
Major component parts shall be constructed from one of the following:

NPS 1/2 – 4 PVC (polyvinyl chloride), Cell Class 12454 per ASTM D1784, industrial gray in color.

NPS 1/2 – 4 CPVC (chlorinated polyvinyl chloride), Cell Class 23447 per ASTM D1784, industrial light gray in color.

NPS 1/2 – 2 PP (polypropylene) Cell Class PP0110-M30-A10120 (glass-filled material) and Cell Class PP0110-B67157 (unfilled material) as per ASTM D4101. These materials shall be pigmented jet black.

NPS 1/2 – 2 Chem-Pure® (natural polypropylene) Cell Class PP0210-B45145 as per ASTM D4101. Materials shall be unpigmented and of the highest purity.

NPS 1/2 – 2 PVDF (polyvinylidene fluoride) Type I compound per ASTM D3222. The material shall be pigmented red for maximum UV opaqueness.

NPS 1/2 – 2 PVDF (polyvinylidene fluoride) Type I compound per ASTM D3222. The material shall be natural (unpigmented) 700 Series Kynar® of the highest purity and maximum transparency to UV radiation.

Dimensions/Valve Design:
PVC and CPVC socket-end connections shall conform to the requirements of ASTM D2467 and F 439 for Schedule 80 pressure fittings. PP and PVDF socket-end connections shall be suitable for heat-fusion welding as specified in ASTM D2567 Technique I.All threaded-end connections shall conform to the requirements of ASTM D2467 and F439 as well as ASTM F1498 for tapered pipe threads.

The valve design shall be full port (NPS 6 size is standard port) with full flow around the rib-guided ball. Foot valve models shall have a minimum cumulative-area ratio of screen holes (inlet)-to-valve port of 3:1.

The valve seat shall be an elastomeric seal that will permit seating at low-head pressure, and an arrow shall be molded on the valve body for permanent visibility to indicate the intended direction of flow.

Markings:
Valves shall be clearly marked with the manufacturer's name or trademark, nominal size, material designation, ASTM number or equivalent symbol indicating compliance with applicable standards, and county of manufacture. PVC and CPVC valves shall additionally bear the NSF International certification mark NSF-pw, (verifying approval for conveyance of potable water).

Performance:
Valves shall be rated for 150 psi service at 73° F non-shock water service and have a minimum 60 second burst rating of 3.2 times the rated working pressure. PVC and CPVC valves shall be certified to ASTM F1970 by a third-party agency.

Installation:
Installation and operation shall be as specified by the manufacturer's printed instructions.

150 PSI Model "B" Wafer Style Butterfly Valves PVC or CPVC 3", 4", 6" Nominal Sizes

Scope:
This specification establishes the manufacturing requirements for PVC and CPVC, Butterfly Valves intended for use in industrial, commercial, and residential pressure-piping systems for service temperatures that do not exceed 140° F for PVC systems or 210° F for CPVC systems, where resistance to corrosion is of prime importance does not.

Materials (PVC NPS 4 & 6, CPVC 3):
The body and disc shall be manufactured from a PVC or CPVC compound that meets the requirements of Cell Class 12454 polyvinyl chloride or Cell Class 23447 chlorinated polyvinyl chloride as outlined in ASTM D1784.

The shaft shall be cadmium-plated steel alloy or 316 stainless steel as standard equipment. Optional shaft materials shall be available on request, i.e., titanium, stainless steel, etc.

The seat material shall be one of the following materials: ethylene-propylene-diene monomer (EPDM) or fluoroelastomer (FKM) with polytetrafluoroethylene (PTFE) bearing support at the top and bottom.

Bearings shall be corrosion-resistant, 20% glass-filled PTFE.

Secondary seal material shall be FKM or EPDM and correspond to the seat material for maximum chemical resistance.

Handles and worm-gear operators shall be of a contrasting color with corrosion-resistant epoxy coating per manufacturer's Engineering Specifications #AP00307002A.

Valve Design:
The valve body shall be of the wafer design for ease of installation and maintenance and shall be compatible with Class 150 ASME B16.5 flanges. Nominal sizes 3 through 6 shall also be compatible with DIN 8063 pattern.

The shaft shall be hexagonal or square to ensure positive rotation of the disc and be totally sealed from exposure to the process liquid.

The shaft shall be guided by glass-filled PTFE bearings to protect against deflection. The shaft also shall have a directional indicator on top to indicate disc position when the handle is removed.

Markings:
Valves shall be clearly marked with the manufacturer's name or trademark, nominal size, material designation, and country of manufacture. PVC and CPVC valves shall additionally bear the NSF International certification mark, NSF-pw, (verifying approval for conveyance of potable water).

Performance:
Valves shall be rated bubble-tight at 150 psi 73° F non-shock water service except NPS 6 size shall be de-rated by 25%. The valve shall have a minimum 60 second burst rating of 3.2 times the rated working pressure. Valves shall be certified to ASTM F1970 by a third-party agency.

Operation:
Valves shall be supplied by the manufacturer with one of the following:

a. Lever handle with index plate
b. Worm-Gear Operator
c. Pneumatic Operator
d. Electric Operator
e. 2" Square Operator Nut
f. 2" Locking Type Square Operator Nut
g. Lockable Lever Handle
h. Other Manual Accessories

Installation:
Installation and operation shall be as specified by the manufacturer's printed instructions.

150 PSI Model "C" Wafer Style Butterfly Valves PVC 2" through 10" Nominal Sizes

Scope:
This specification establishes the manufacturing requirements for PVC Butterfly Valves intended for use in industrial, commercial, and residential pressure-piping systems for non-corrosive or mildly corrosive applications, where the service temperature does not exceed 140° F.

Materials:
The body shall be manufactured from a PVC compound that meets the requirements of Cell Class 12454 polyvinyl chloride as outlined in ASTM D1784.

The disc shall be manufactured of ductile iron as specified in ASTM A395 with EPDM encapsulation.

The upper and lower shaft shall be manufactured from 416 stainless steel as specified in ASTM A582.

The O-ring seal material shall be manufactured from EPDM.

The bearing shall be manufactured from PTFE-coated bronze centered on steel.

The handle is of malleable iron with epoxy coating. The throttling index plates are made of zinc-plated steel.

Valve Design:
Valve body shall be of the wafer design for ease on installation and maintenance and shall be compatible with bolt hole pattern Class 150 ASME B16.5; BS 1560 class 150; DN 200 ISO 2084 PN 10; and DN 200 DIN 2532 PN 10.

The shaft is splined to lock into the disc to ensure positive rotation. The shaft is guided by PTFE-coated bearings to protect against deflection. Disc position is indicated by the shaft, when the handle is removed.

Laying length is compatible with MSS SP-67 narrow (W-1) and DN 200 ISO 5752 short.

Markings:
Valves shall be clearly marked with the manufacturer's name or trademark, nominal size, material designation, ASTM number or equivalent symbol indicating compliance with applicable standards, country of origin, and pressure rating. Valves additionally bear the NSF International certification seal, NSF-pw, (verifying approval for the conveyance of water).

Performance:
Valves shall be rated bubble-tight at 150 psi 73° F non-shock water service. The valve shall have a minimum 60 second burst rating of 3.2 times the rated working pressure. Valves shall be certified to ASTM F1970 by a third-party agency.

Installation:
Installation and operation shall be as specified by the manufacturer's printed instructions.

Y-Pattern – Chemcock – Calibrated Needle 1/4" through 1" Nominal Sizes

Scope:
This specification establishes the manufacturing requirements for PVC Schedule 80 specialty valves for use in industrial, pressure-rated, fluid-handling systems in applications up to 140° F, where precise control and corrosion resistance are of prime importance.

Materials:
Rigid PVC (polyvinyl chloride) used in the manufacture of Schedule 80 valves shall be Cell Classification 12454 as identified in ASTM D1784.

Dimensions/Valve Design:
Valves utilizing threaded-end connections shall have thread lengths, diameters, and configurations as required by ASTM D2467 and ASTM F1498.

Hose-barb connections (Chemcock Valve) shall be suitable for joining with ⁄" to 3/8" I.D. measured flexible hose.

Valves intended for multi-turn throttling control shall be globe design in NPS ⁄ – 1.

Y-Pattern for straight 180° installations using internal pipe threads and having double lead-thread stem control for rapid adjustment. Valves shall have glass-filled PTFE seals for positive shut-off and extended service-life and FKM seals for maximum protection against external leaks.

Angle valve for 90° installations using internal pipe threads and having double lead-thread stem control for rapid adjustment. Valves shall have glass-filled PTFE seals for positive shut-off and extended service-life and FKM seals for maximum protection against external leakage.

For maximum versatility, both A and B type valves shall have inter-changeable bonnet/stem assemblies.

Needle valves are intended for use in applications that require precise metering control . Needle valves shall have predictable flow patterns with (8) molded in increments on the body. These valves shall have PTFE seats and FKM seals for maximum service life and protection against external leakage. Needle valves have NPS ⁄ internal pipe threaded ends.

Chemcock valves are intended for use in laboratory sampling applications . The Chemcock valves have NPS ⁄ external thread-by-external thread-end connections; however, one end of the valve shall be capable of being changed to hose-threads for maximum versatility.

Pressure Ratings:
Valves shall be rated for 150 psi at 73° F non-shock water service and have a minimum 60 second burst requirement of 3.2 times the rated pressure.

Markings:
Valves shall be clearly marked with the manufacturer's name or trademark, nominal size, material designation, and country of manufacture. PVC and CPVC valves shall additionally bear the NSF International certification mark, NSF-pw, (verifying approval for conveyance of potable water).

Installation:
Installation and operation shall be as specified by the manufacturer's printed instructions.

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CHEM-GUIDE

CHEMICAL RESISTANCE
INFORMATION
FOR PLASTIC AND METAL
VALVES AND FITTINGS

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Material Ratings and Definitions

INTRODUCTION

This Chemical Resistance Guide has been compiled to assist the piping system designer in selecting chemical-resistant materials. The information given is intended as a guide only. Many conditions can affect the material choices. Careful consideration must be given to temperature, pressure and chemical concentrations before a final material can be selected.

The physical characteristics of thermoplastics and elastomers are more sensitive to temperature than metals. For this reason, a rating chart has been developed for each.

MATERIAL RATINGS FOR THERMOPLASTICS & ELASTOMERS

Temp. in °F	=	"A" rating, maximum temperature which is recommended, resistant under normal conditions
B to Temp. in °F	=	Conditional resistance, consult factory
C	=	Not recommended
Blank	=	No data available

MATERIAL RATINGS FOR METALS

A	=	Recommended, resistant under normal conditions
B	=	Conditional, consult factory
C	=	Not recommended
Blank	=	No data available

Temperature maximums for thermoplastics, elastomers and metals should always fall within published temp/pressure ratings for individual valves. **THERMOPLASTICS ARE NOT RECOMMENDED FOR COMPRESSED AIR OR GAS SERVICE.***

This guide considers the resistance of the total valve assembly as well as the resistance of individual trim and fitting materials. The rating assigned to the valve body plus trim combinations is always that of the least resistant part. In the cases where the valve body is the least resistant, there may be conditions under which the rate of corrosion is slow enough and the mass of the body large enough to be usable for a period of time. Such use should always be determined by test before installation of the component in a piping system.

In the selection of a butterfly valve for use with a particular chemical, the liner, disc, and stem must be resistant. All three materials should carry a rating of "A." The body of a properly functioning butterfly valve is isolated from the chemicals being handled and need not carry the same rating.

THERMOPLASTICS & ELASTOMERS

ABS — Acrylonitrile Butadiene Styrene Class 32222 conforming to ASTM D3965 is a time-proven material. The smooth inner surface and superior resistance to deposit formation makes ABS drain, waste, and vent material ideal for residential and commercial sanitary systems. The residential DWV system can be exposed in service to a wide temperature span. ABS-DWV has proven satisfactory for use from -40°F to 180°F. These temperature variations can occur due to ambient temperature or the discharge of hot liquids into the system. ABS-DWV is very resistant to a wide variety of materials ranging from sewage to commercial household chemical formulations. ABS-DWV is joined by solvent cementing or threading and can easily be connected to steel, copper, or cast iron through the use of transition fittings.

CPVC — Chlorinated Polyvinyl Chloride Class 23447 conforming to ASTM D1784, has physical properties at 73°F similar to those of PVC, and its chemical resistance is similar to or generally better than that of PVC. CPVC, with a design stress of 2000 psi and maximum service temperature of 210°F, has proven to be an excellent material for hot corrosive liquids, hot or cold water distribution, and similar applications above the temperature range of PVC. CPVC is joined by solvent cementing, threading or flanging.

PP (Polypropylene) — Polypropylene is a polyolefin, which is lightweight and generally high in chemical resistance. Although polypropylene is slightly lower in physical properties compared to PVC, it is chemically resistant to organic solvents as well as acids and alkalies. Generally, **polypropylene should not be used in contact with strong oxidizing acids, chlorinated hydrocarbons, and aromatics**. With a design stress of 1000 psi at 73° F, polypropylene has gained wide acceptance where its resistance to sulfur-bearing compounds is particularly useful in salt water disposal lines, crude oil piping, and low pressure gas gathering systems. Polypropylene has also proved to be an excellent material for laboratory and industrial drainage where mixtures of acids, bases, and solvents are involved. Polypropylene is joined by the heat fusion process, threading or flanging. **At 180°F, or when threaded, PP should be used for drainage only at a pressure not exceeding 20 psi.**

PVC — Polyvinyl Chloride Class 12454 conforming to ASTM D1784. PVC is the most frequently specified of all thermoplastic materials. It has been used successfully for over 40 years in such areas as chemical processing, industrial plating, chilled water distribution, deionized water lines, chemical drainage, and irrigation systems. PVC is characterized by high physical properties and resistance to corrosion and chemical attack by acids, alkalies, salt solutions, and many other chemicals. It is attacked, however, by polar solvents such as ketones, some chlorinated hydrocarbons and aromatics. The maximum service temperature of PVC is 140°F. With a design stress of 2000 psi, PVC has the highest long-term hydrostatic strength at 73°F of any of the major thermoplastics being used for piping systems. PVC is joined by solvent cementing, threading, or flanging.

PVDF — Polyvinylidene Fluoride is a strong, tough and abrasion-resistant fluorocarbon material. It resists distortion and retains most of its strength to 280°F. It is chemically resistant to most acids, bases, and organic solvents and is ideally suited for handling wet or dry chlorine, bromine and other halogens. No other

*** WARNING: Failure to follow these instructions could result in personal injury or property damage.**

Material Definitions

solid thermoplastic piping components can approach the combination of strength, chemical resistance and working temperatures of PVDF. PVDF is joined by the heat fusion process, threading or flanging.

EPDM — EPDM is a terpolymer elastomer made from ethylene-propylene diene monomer. EPDM has good abrasion and tear resistance and offers excellent chemical resistance to a variety of acids and alkalines. **It is susceptible to attack by oils and is not recommended for applications involving petroleum oils, strong acids, or strong alkalines.** It has good ozone resistance. It is fairly good with ketones and alcohols and has an excellent temperature range from -20°F to 250°F.

POLYCHLOROPRENE (CR) — Polychloroprenes were one of the first synthetic rubbers developed. Polychloroprene is an all-purpose polymer with many desirable characteristics and features high resiliency with low compression set, flame resistance, and is animal and vegetable oil resistant. Polychloroprene is principally recommended for food and beverage service. Generally, polychloroprene is not affected by moderate chemicals, fats, greases, and many oils and solvents. **Polychloroprene is attacked by strong oxidizing acids, most chlorinated solvents, esters, ketones, aromatic hydrocarbons, and hydraulic fluids. Polychloroprene has a moderate temperature range of -20°F to 160°F.**

NITRILE (NBR) — BUNA-N is a general purpose oil-resistant polymer known as nitrile rubber. Nitrile is a copolymer of butadiene and acrylonitrile and has a moderate temperature range of 20°F to 180°F. Nitrile has good solvent, oil, water, and hydraulic fluid resistance. It displays good compression set, abrasion resistance and tensile strength. **Nitrile should not be used in highly polar solvents such as acetone and methyl ethyl ketone, nor should it be used in chlorinated hydrocarbons, ozone or nitro hydrocarbons.**

FLUOROCARBON (FKM) — Fluorocarbon elastomers are inherently compatible with a broad spectrum of chemicals. Because of this extensive chemical compatibility, which spans considerable concentration and temperature ranges, fluorocarbon elastomers have gained wide acceptance as a material of construction for butterfly valve o-rings and seats. Fluorocarbon elastomers can be used in most applications involving mineral acids, salt solutions, chlorinated hydrocarbons, and petroleum oils. They are particularly good in hydrocarbon service. Fluorocarbon elastomers have one of the broadest temperature ranges of any of the elastomers, -20°F to 300°F; **however, they are not suited for steam service.**

PTFE — Polytetrafluoroethylene has outstanding resistance to chemical attack by most chemicals and solvents. PTFE has a temperature rating of -20°F to 400°F in valve applications. PTFE, a self-lubricating compound, is used as a seat material in ball valves.

GRAPHITE — Graphite is the packing and seal material of choice for most fire-rated products, primarily because of its high temperature rating of approximately 2000°F. Graphite has excellent chemical resistance, can retain compressibility at all temperatures and has a low coefficient of friction. **Graphite is not recommended for use in strong oxidizing atmospheres.**

METALS USED IN VALVES & FITTINGS

COPPER — Among the most important properties of wrot copper materials are their thermal and electrical conductivity, corrosion resistance, wear resistance, and ductility. Wrot copper performs well in high temperature applications and is easily joined by soldering or brazing. Wrot copper is exclusively used for fittings.

BRONZE — One of the first alloys developed in the bronze age is generally accepted as the industry standard for pressure-rated bronze valves and fittings. Bronze has a higher strength than pure copper, is easily cast, has improved machinability, and is very easily joined by soldering or brazing. Bronze is very resistant to pitting corrosion, with general resistance to most chemicals less than that of pure copper.

SILICONE BRONZE — Silicone bronze has the ductility of copper but much more strength. The corrosion resistance of silicon bronze is equal to or greater than that of copper. Commonly used as stem material in pressure-rated valves, silicon bronze has greater resistance to stress corrosion cracking than common brasses.

ALUMINUM BRONZE — The most widely accepted disc material used in butterfly valves, aluminum bronze is heat treatable and has the strength of steel. Formation of an aluminum oxide layer on exposed surfaces makes this metal very corrosion resistant. **Not recommended for high pH wet systems.**

BRASS — Generally, brass has good corrosion resistance. **Susceptible to de-zincification in specific applications**; excellent machinability. Primary uses for wrot brass are for ball valve stems and balls, and iron valve stems. A forging grade of brass is used in ball valve bodies and end pieces.

GRAY IRON — An alloy of iron, carbon and silicon, gray iron is easily cast, and has good pressure tightness in the as-cast condition. Gray iron has excellent dampening properties and is easily machined. It is standard material for bodies and bonnets of Class 125 and 250 iron body valves. Gray iron has corrosion resistance that is better than steel in certain environments.

DUCTILE IRON — Ductile iron has composition similar to gray iron. Special treatment modifies metallurgical structure, which yields higher mechanical properties; some grades are heat-treated to improve ductility. Ductile iron has the strength properties of steel using similar casting techniques to that of gray iron.

CARBON STEEL — Carbon steel has very good mechanical properties and is resistant to stress corrosion and sulfides. Carbon steel has high and low temperature strength, is very tough and has excellent fatigue strength. Mainly used in gate, globe, and check valves for applications up to 850°F, and in one-, two-, and three-piece ball valves.

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Material Definitions and Standards

3% NICKEL IRON — 3% Nickel iron has improved corrosion resistance over gray and ductile iron. Higher temperature corrosion resistance and mechanical properties. Very resistant to oxidizing atmospheres.

NICKEL-PLATED DUCTILE IRON — Nickel coatings have received wide acceptance for use in chemical processing. These coatings have very high tensile strength, 50 to 225 ksi. To some extent, the hardness of a material is indicative of its resistance to abrasion and wear characteristics. Nickel plating is widely specified as a disc coating for butterfly valves.

400 SERIES STAINLESS STEEL — An alloy of iron, carbon, and chromium, 400 series stainless steel is normally magnetic due to its martensitic structure and iron content. It is resistant to high temperature oxidation and has improved physical and mechanical properties over carbon steel. Most 400 series stainless steels are heat-treatable. The most common applications in valves are for stem material in butterfly valves and backseat bushings and wedges in cast steel valves.

316 STAINLESS STEEL — An alloy of iron, carbon, nickel, and chromium, 316 stainless steel is nonmagnetic with more ductility than 400SS. Austinetic in structure, 316 stainless steel has very good corrosion resistance to a wide range of environments, is not susceptible to stress corrosion cracking and is not affected by heat treatment. Most common uses in valves are stem, body and ball materials.

630 STAINLESS STEEL — 630 stainless steel is a martensitic precipitation/age hardening stainless steel, offering high strength and hardness. 630 SS withstands corrosive attack better than any of the 400 series stainless steels, and in most conditions its corrosion resistance closely approaches that of 300 series stainless steel. 630 SS is primarily used as a stem material for butterfly and ball valves.

MATERIAL DESIGNATIONS & ASTM STANDARDS FOR LISTED VALVE METALS

Copper	ASTM B75 Wrot & ASTM B88
Bronze	ASTM B61 Cast ASTM B62 Cast ASTM B584, Alloy 844
Silicon Bronze	ASTM B98 Alloy B ASTM B371 Wrot
Aluminum Bronze	ASTM B148 Cast ASTM B150 Rod
Brass	ASTM B16 Wrot ASTM B124 Forged
Gray Iron	ASTM A126 Class B
Ductile Iron	ASTM A395 Heat Treated ASTM A536 As Cast
Carbon Steel	ASTM A216-Grade WCB Cast ASTM A105 Forged ASTM A352-Grade LCB Cast
3% Ni-Iron	ASTM A126-Class B Modified
Ni-Plated Ductile Iron	ASTM B320 Plating
400 Series Stainless Steel	ASTM B582 Type 416 Wrot ASTM A217-Grade CA-15 ASTM A276 Type 410 Wrot
316 Stainless Steel	ASTM A276 Type 316 ASTM A351-Grade CF-8M
630 Stainless Steel	ASTM A564 Type 630

Chemical Resistance Guide for Valves and Fittings

CHEMICALS AND FORMULA	CONCENTRATION	PLASTICS MAX TEMPERATURE (°F)							SEAL MATERIALS MAX TEMPERATURE (°F)						METALS												
		ABS	CPVC	PP	PVC	PVDF	PEX	PPSU	PTFE	EPDM	NITRILE (Buna-N)	POLYCHLORO-PRENE	FKM	GRAPHITE	BRONZE (85% Cu)	SILICON BRONZE	ALUMINUM BRONZE	BRASS	GRAY IRON	DUCTILE IRON	CARBON STEEL	3% NI/IRON	NI PLATED DUCTILE	400 SERIES SS	316 SS	630 SS	COPPER
Acetaldehyde CH_3CHO	Conc.		C	140	C		C		350	B to 200	C	C	C	A	C	C	C	C	B	B	A		B	B	A		C
Acetamide CH_3CONH_2									200	B to 200	B to 180	B to 200	C		A		A		A	A			A	A	A	A	
Acetic Acid CH_3COOH	25%	C	180	180	140		140	B to 73	350	176	C	70	C	A	C	C	C	C	C	C	C	C	C	C	A	A	A	C
Acetic Acid CH_3COOH	50%					B to 140	B to 176		350	140	C	C	C	A	C	C	C	C	C	C	C	C	C	A	A	A	C
Acetic Acid CH_3COOH	85%	C	C	120	73		73		350	70	C	C	C	A	C	C	C	C	C	C	C	C	C	A	A	A	C
Acetic Acid CH_3COOH	Glacial	C	C	120	73	B to 104	B to 68		350					A	C	C	C	C	C	C	C	C	C	C	A	B	C
Acetic Anhydride $(CH_3CO)_2O$		C	C	73	C	C	73		350	C	C	B to 70	C	A	C	C	C	C	C	C	C	C	C	C	B	B	C
Acetone CH_3COCH_3		C	C	B	C	B	C	C	350	B to 300	C	C	C	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Acetophenone $C_6H_5COCH_3$									350	B to 176	C	C	C		C	C	C	C	C	C	C	C	C	C	C		C
Acetyl Chloride CH_3COCl		C	C		C	C			200	C	C	C	B		A	A	A	A	C	C	A		C		A	A	A
Acetylene	Gas, 100%	73	C	73	C		73		250	B to 250	200	104	200		C	C	C	C	A	A	A	A	A		A	A	C
Acrylonitrile $H_2C=CHCN$			C		C		140		350	104	C	C	C	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Adipic Acid $COOH(CH_2)_4COOH$	Sat'd.		180	140	140	B to 176	140		350	140	B to 220	B to 160	176						C	C	B		C		B to 200		A
Allyl Alcohol $CH_2=CHCH_2OH$	96%		C	140	B to 73		C		250	B to 300	B to 180	B to 120	B to 70		A	A	A	A	A	A	A	A	A	A	A	A	
Allyl Chloride $CH_2=CHCH_2Cl$			C		C	140	C		350	C	B to 70	C	C								C						
Aluminum Acetate $Al(C_2H_4O_2)_3$	Sat'd.								350	176	C	C	C		C		C			C					A		
Aluminum Ammonium Sulfate (Alum) $AlNH_4(SO_4)_212H_2O$	Sat'd.		180	140	140		140		250	B to 200	B to 140	C	190	A	B	B	B	B			C			B	A		B
Aluminum Chloride (Aqueous) $AlCl_3$	Sat'd.	160	180	180	140	B to 212	140		250	176	B to 200	B to 200	176	A	C	C	C	C	C	C	C	C	C	C	A	C	C
Aluminum Fluoride AlF_3	Sat'd.	160	180	180	73	B to 212	140		250	B to 300	B to 200	B to 200	176	A	C	C	C	C	C	C	C		C	C	B	C	C
Aluminum Hydroxide $Al(OH)_3$	Sat'd.	160	180	180	140	B to 212	140		250	176	160	B to 180	176		C	C	C	C	B	B	C		B	B	A	A	C

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CHEMICALS AND FORMULA	CONCENTRATION	PLASTICS MAX TEMPERATURE (°F)							SEAL MATERIALS MAX TEMPERATURE (°F)						METALS												
		ABS	CPVC	PP	PVC	PVDF	PEX	PPSU	PTFE	EPDM	NITRILE (Buna-N)	POLYCHLORO-PRENE	FKM	GRAPHITE	BRONZE (85% Cu)	SILICON BRONZE	ALUMINUM BRONZE	BRASS	GRAY IRON	DUCTILE IRON	CARBON STEEL	3% NI/IRON	NI PLATED DUCTILE	400 SERIES SS	316 SS	630 SS	COPPER
Aluminum Nitrate $Al(NO_3)_3 \bullet {}_9H_2O$	Sat'd.		180	180	140	B to 212	140		250	176	140	B to 200	B to 400	A	C	C	C	C	C	C	C	C	C		A	A	C
Aluminum Potassium Sulfate (Alum) $AlK(SO_4)_2 \bullet {}_{12}H_2O$	Sat'd.	160	180	140	140	B to 212	140		400	B to 200	B to 200	B to 200	248	A	B	B	B	B			C			B	A		B
Aluminum Sulfate (Alum) $Al_2(SO_4)_3$	Sat'd.	160	180	140	140	B to 212	140		250	B to 300	B to 300	B to 200	B to 390	A	C	C	C	C	C	C	C		C	C		B	
Ammonia Gas NH_3	100%	C	C	140	140		140		400	140	B to 140	140	C	A	B			C	A		A				A	A	B
Ammonia Liquid NH_3	100%	160	C	140	C		140		400	212	70	B to 160	C	A	C	C	C	C			A			A	A	A	C
Ammonium Acetate CH_3COONH_4	Sat'd.	120	180	73	140	B to 212	140		400	140	140	140			C	C	C	C							B		
Ammonium Bifluoride NH_4HF_2	Sat'd.		180	180	140		140		400	140	B to 140	C	140	A	C			C	C	C	C	C	C	C	B	B	B
Ammonium Carbonate $(NH_4)_2CO_3$	Sat'd.		180	212	140	B to 248	140		400	176	B to 200	B to 200	212		C			C			A to 140	C		B	B	B	B
Ammonium Chloride NH_4Cl	Sat'd.	120	180	212	140	B to 212	140		400	300	B to 200	B to 212	250	A	C			C	C	C	C	C	C	C	B	C	
Ammonium Fluoride NH_4F	10%	120	180	212	140	B to 212	140		400	300	B to 200	B to 100	140	A	C			C			C				C		C
Ammonium Fluoride NH_4F	25%	120	180	212	C		140		400	300	B to 120	B to 100	140	A	C			C			C				C		C
Ammonium Hydroxide NH_4OH	10%	120	C	212	140		140		400	B to 300	200	200	B to 190	A	C	C		C			C			B	A	A	C
Ammonia Hydroxide NH_4OH	Sat'd.								400	B to 300	C	200	B to 190	A	C	C					C			B to 70	A to 140		C
Ammonium Nitrate NH_4NO_3	Sat'd.	120	180	212	140	B to 212	140		400	B to 300	200	200	176	A	C	C		C								A	C
Ammonium Persulphate $(NH_4)_2S_2O_8$			180	140	140	B to 212	140		200	B to 70	C	70	B to 140		C	C	C	C	C	C	C	C	C	B	A		C
Ammonium Phosphate (Monobasic) $NH_4H_2PO_4$	All	120	180	212	140	B to 248	140		400	B to 200	200	B to 200	B to 180	A	C	C	C	C	B	B	C		B	A	A	A	C
Ammonium Sulfate $(NH_4)_2SO_4$		120	180	212	140	B to 212	140		400	300	200	200	176	A	C	C	C	C	B	B	C	B	B	B	B	B	C
Ammonium Sulfide $(NH_4)_2S$	Dilute	120	180	212	140		140		350	B to 300	B to 180	B to 160	B to 70		C	C	C	C	C	C	C		C		B		C
Ammonium Thiocyanate NH_4SCN	50 - 60%	120	180	212	140	B to 212	73			B to 300	B to 180	B to 200	B to 190		C	C	C	C	C	C	C		C		A	A	C
Amyl Acetate $CH_3COOC_5H_{11}$		C	C	C	C	B to 122	73		100	210	C	C	C		B	B	B	B	B	B	B	A	B	A	A	A	
Amyl Alcohol $C_5H_{11}OH$			C		C	B to 212	B to 140		400	B to 300	B to 180	B to 200	B to 212	A	A	A	A	A	B	B	B		B	A	A	A	A

CHEMICALS AND FORMULA	CONCENTRATION	PLASTICS MAX TEMPERATURE (°F)							SEAL MATERIALS MAX TEMPERATURE (°F)						METALS											
		ABS	CPVC	PP	PVC	PVDF	PEX	PPSU	PTFE	EPDM	NITRILE (Buna-N)	POLYCHLORO-PRENE	FKM	GRAPHITE	BRONZE (85% Cu)	SILICON BRONZE	ALUMINUM BRONZE	BRASS	GRAY IRON	DUCTILE IRON	CARBON STEEL	3% NI/IRON	NI PLATED DUCTILE	400 SERIES SS	316 SS	630 SS	COPPER
n-Amyl Chloride $CH_3(CH_2)_3CH_2Cl$		C	C	C	C		C		400	C	C	C	200		A	A	A	A	A	A	A	A	A	A	A	A	
Aniline $C_6H_5NH_2$		C	C		C	B to 68	C		200	B to 140	C	C	B to 70	A	C	C	C	C	B	B	C	B	B	A	A	A	C
Aniline Hydrocloride $C_6H_5NH_2 \bullet HCl$	Sat'd.		C		C		140							C	C	C	C	C	C	C	C	C	C	C	C	C	
Anthraquinone $C_{14}H_8O_2$			180		140		C						C						C	C	C						
Anthraquinone Sulfonic Acid $C_{14}H_7O_2 \bullet SO_3 \bullet H_2O$			180	73	140		C																				
Antimony Trichloride $SbCl_3$	Sat'd.		180	140	140	B to 140	140			C	70	B to 70	70	A	C	C	C	C	C	C	C	C	C	C	C	C	
Aqua Regia (Nitrohydrochloric Acid)		C	B to 73	C	C	C	C		200	C	C	C	B to 190	C	C	C	C	C	C	C	C	C	C		B		
Argon Ar	Dry								350	B to 400	250	B to 100	B to 500		A		A		A		A				A	A	A
Arsenic Acid H_3AsO_4	80%		180	140	140	B to 248	140		400	B to 176	B to 200	B to 180	140	A	C	C	C	C	C	C	C		C	B	A	B	
Asphalt			C	73	C		73		350	C	C	C	212		A	A	A	A	A	A	A	A	A	A	A	A	A
Barium Carbonate $BaCO_3$	Sat'd.	120	180	140	140	B to 248	140		400	B to 300	140	B to 160	248		A	A	A	A	B	B	B	B	B	A	A	A	
Barium Chloride $BaCl_2 \bullet {}_2H_2O$	Sat'd.	120	180	140	140	B to 212	140		400	B to 300	B to 200	B to 160	B to 400	A	A	A	A	A	B	B	C	B	B	B	A		A
Barium Hydroxide $Ba(OH)_2$	Sat'd.	73	180	140	140				400	B to 300	B to 220	B to 200	248		C	C	C	C	B	B	C		B	A	A	A	
Barium Nitrate $Ba(NO_3)_2$	Sat'd.	73	180	140	73		140		250	176	140	B to 200	248	A	C	C	C	C	A	A	A		A		A		
Barium Sulfate $BaSO_4$	Sat'd.	73	180	140	140	B to 212	140		400	B to 300	B to 200	B to 200	B to 380	A	B	B	B	B	B	B	A		B	A	A	A	
Barium Sulfide BaS	Sat'd.	73	180	140	140				400	B to 310	B to 200	B to 200	B to 400		C	C	C	C	B	B	C		B	A	A	A	C
Beer		120	180	180	140	B to 248	B to 140		300	120	B to 250	B to 140	B to 300		A	A	A	A	C	C	C		C	A	A	A	A
Beet Sugar Liquors			180	180	140		73			B to 300	200	B to 180	B to 400				A		B	B	B				A	A	
Benzaldehyde C_6H_5CHO	10%	C	B to 73	73	B to 73		73			200	C	C	C	A	A	A	A	A	C	C	B		C	A	A	A	A
Benzene C_6H_6		C	C	C	C	C	B to 68	C	250	C	C	C	B to 140	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Benzene Sulfonic Acid $C_6H_5SO_3H$	10%		180	180	140		B to 73			C	C	B to 100	200		B	B	B	B	C	C	C		C	B	B	B	
Benzoic Acid C_6H_5COOH		160	180	73	140				350	C	C	B to 150	176		C	C	C	C	C	C		C	A	A	A	A	

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		ABS	CPVC	PP	PVC	PVDF	PEX	PPSU	PTFE	EPDM	NITRILE (Buna-N)	POLYCHLORO-PRENE	FKM	GRAPHITE	BRONZE (85% Cu)	SILICON BRONZE	ALUMINUM BRONZE	BRASS	GRAY IRON	DUCTILE IRON	CARBON STEEL	3% NI/IRON	NI PLATED DUCTILE	400 SERIES SS	316 SS	630 SS	COPPER
Benzyl Alcohol $C_6H_5CH_2OH$			C	120	C	B to 122	140		400	C	C	B to 70	B to 250		A	A	A	A	B	B	B		B	A	A	A	A
Bismuth Carbonate $(BiO)_2CO_3$			180	180	140		140			70	70	70	B to 200														
Black Liquor	Sat'd.		180	140	140		120		225	220	140	70	212		C	C	C	C	B	B	B		B	B	A	B	
Bleach (Sodium Hypochlorite)	12% Cl	73	185	120	140		73																				
Blood									200	70	C	70	70		B		B		C	C			B		A	A	
Borax $Na_3B_4O_7 \bullet {}_{10}H_2O$	Sat'd.	160	180	212	140		140			300	B to 200	B to 200	200		A	A	A	A	A	A	B	A	A	A	A	A	
Boric Acid H_3BO_3	Sat'd.	160	180	212	140	B to 212	140			B to 300	B to 200	B to 200	185	A	B	B	B	B	C	C	B		C	B	A	B	
Brine	Sat'd.		180	140	140		140		400	B	B	B	B		A	A	A		C	C	C	B	C	B	A	B	
Bromic Acid $HBrO_3$			180	C	140	B to 212	C			200	C	C	200		C	C	C	C									C
Bromine Br_2	Liquid	73	C	C	C	B to 248	C		300	C	C	C	B to 350	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Bromine Br_2	Gas, 25%		180	C	140		C		200	C	C	C	B to 180	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Bromine Water	Sat'd.		180	C	140	B to 176	C		300	C	C	C	B to 210	C	C	C	C	C	C	C	C		C				C
Butadiene $H_2C=CHHC=CH_2$	50%		180	C	140		73		C	C	C	C	70		A	A	A	A	A	A	A	A	A	A	A	A	A
Butane C_4H_{10}	50%		180	140	140		140	73	350	C	B to 250	B to 200	B to 400		A	A	A	A	A	A	A	A	A	A	A	A	A
Butyl Acetate $CH_3COOCH_2CH_2CH_2CH_3$		C	C	C	C	C	C		175	C	C	C	C		B	B	B	B	B	B	B		B	A	A	A	
Butyl Alcohol $CH_3(CH_2)_2CH_2OH$			C	180	140		140		300	B to 250	B to 190	140	B to 390	A	B	B	B			B			A	A	A	A	B
Butyl Cellosolve			C		73				200	B to 300	C	C	C	A	A	A	A	A	A	A			A	A	A	A	
n-Butyl Chloride C_4H_9Cl		C	C						400	C	C	C	70		B	B	B	B	B	B	B		B	B	B	B	
Butylene © $CH_3CH=CHCH_3$	Liquid			C	140		120		400	C	250	C	B to 400		A	A	A	A			A			A	A	A	
Butyl Phthalate $C_{16}H_{22}O_4$			C	180		B to 140				250	C	C	C														
Butyl Stearate					73				250	C	C	C	B to 400		A	A	A	A	B	B			B	A	A	A	
Butyric Acid $CH_3CH_2CH_2COOH$		C	C	180	73		73		300	C	C	C	C		A	A	A	A	C	C	C	C	C	B	A	A	
Calcium Bisulfide $Ca(HS)_2 \bullet {}_6H_2O$			73		C		140		200	200	B to 140	140	140												A		

CHEMICALS AND FORMULA	CONCENTRATION	PLASTICS MAX TEMPERATURE (°F)							SEAL MATERIALS MAX TEMPERATURE (°F)						METALS												
		ABS	CPVC	PP	PVC	PVDF	PEX	PPSU	PTFE	EPDM	NITRILE (Buna-N)	POLYCHLORO-PRENE	FKM	GRAPHITE	BRONZE (85% Cu)	SILICON BRONZE	ALUMINUM BRONZE	BRASS	GRAY IRON	DUCTILE IRON	CARBON STEEL	3% NI/IRON	NI PLATED DUCTILE	400 SERIES SS	316 SS	630 SS	COPPER
Calcium Bisulfite $Ca(HSO_3)_2$			180	180	140		C		350	C	B to 200	B to 200	B to 400		C	C	C	C	C	C	C		C	B	A		
Calcium Carbonate $CaCO_3$			180	180	140	B to 248	140		350	B to 210	B	140	248		C	C	C	C	B	B	B		B	A	A	A	A
Calcium Chlorate $Ca(ClO_3)_2 \bullet {}_2H_2O$			180	180	140	B to 248	140		350	B to 200	B to 200	B to 200	B to 190	140	B	B	B	B	B	B	B	B	B	B	A		C
Calcium Chloride $CaCl_2$		120	180	180	140	B to 248	B to 176		350	B to 212	B to 200	B to 200	300	A	B	B	B	B	A	A	C		C	B	A	B	B
Calcium Hydroxide $Ca(OH)_2$		160	180	180	140		140		250	210	B to 200	B to 220	212		C	C	C	C	C	C	C		C	A	A	A	C
Calcium Hypochlorite $Ca(OCl)_2$	30%	160	180	140	140		140		200	B to 310	C	C	B to 400	90	C	C	C	C	C	C	C		C	B	B	B	C
Calcium Nitrate $Ca(NO_3)_2$			180	180	140		140		200	B to 300	B to 200	B to 200	B to 390	C	B	B	B	B	B	B			B		A		B
Calcium Oxide CaO			180		140		140			B	B to 200	B to 200	140						A	A	B				A	A	
Calcium Sulfate $CaSO_4$		100	180	180	140	B to 212	140		200	B to 300	B to 176	B to 70	B to 212	A	A	B	B	B	A	A	B	A	A	A	A	A	A
Camphor $C_{10}H_{16}O$		C		73	73		73		350	C	100	C	70		B	B	B	B	B	B	B		B	A	A	A	
Cane Sugar $C_{12}H_{22}O_{11}$			180	180	140		140		400						A	A	A	A	A	A	A	A	A	A	A	A	
Caprylic Acid $CH_3(CH_2)COOH$									350		C		B to 140						A	A	B		A		A		
Carbitol			C		73				200	B to 80	B to 80	C	C		B	B	B	B	B	B	B		B		B		
Carbon Dioxide CO_2	Dry, 100%	160	180	140	140	B to 212	140		400	B to 250	200	B to 200	212	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Carbon Dioxide CO_2	Wet	160	180	140	140		140		400	B to 250	140	C	212	A	A	A	A	A	B	B	B	B	B	A	A	A	A
Carbon Disulfide CS_2		C	C	C	C		B to 68		200	C	C	C	B to 400	A	B	B	B	B	A	A	A		A	A	A		C
Carbon Monoxide CO	Gas		180	180	140	B to 140	140		400	B to 300	160	140	B to 400	A	A	A	A	A	A	A	B		A	A	A	A	
Carbon Tetrachloride CCl_4		C	C	C	73	C	C	B to 73	350	C	C	C	B to 350	A	A	A	A	A	C	C	A		C	A	A	A	B
Carbonic Acid H_2CO_3	Sat'd.	185	180	140	140		140		350	B to 300	70	200	B to 400	A	C	C	C	C	B	B	B	B	B	A	A	A	
Castor Oil			C	140	140		73		350		212	200	B to 400	550	A	A	A	A	A	A	A	A	A	A	A	A	A
Caustic Potash (Potassium Hydroxide) KOH	50%	160	180	180	140		140			200	B to 150	B to 70	B to 140														

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CHEMICALS AND FORMULA	CONCENTRATION	PLASTICS MAX TEMPERATURE (°F)							SEAL MATERIALS MAX TEMPERATURE (°F)						METALS												
		ABS	CPVC	PP	PVC	PVDF	PEX	PPSU	PTFE	EPDM	NITRILE (Buna-N)	POLYCHLORO-PRENE	FKM	GRAPHITE	BRONZE (85% Cu)	SILICON BRONZE	ALUMINUM BRONZE	BRASS	GRAY IRON	DUCTILE IRON	CARBON STEEL	3% NI/IRON	NI PLATED DUCTILE	400 SERIES SS	316 SS	630 SS	COPPER
Caustic Soda (Sodium Hydroxide) NaOH	40%	160	180	180	140		140			B to 200	212	B to 200	80														
Cellosolve			C	73	73		C		200		C		C	A	A	A	A	A	A	A	A		A		A		
Cellosolve Acetate $CH_3COOCH_2CH_2OC_2H_5$			C	73	73				300	C	C	C	C		B		B			B					B		
Chloral Hydrate $CCl_3CH(OH)_2$			180	C	140		120			B to 70	C	70	C														
Chloramine NH_2Cl	Dilute		C	73	73		73			70		B to 80	70		B	B	B	B	C	C	C				B		
Chloric Acid $HClO_3 \bullet {}_7H_2O$	10%		180	73	140		73		140	212	C	B to 120	B to 120		C	C	C	C	C	C	C	C	C	C	B	C	
Chloric Acid $HClO_3 \bullet {}_7H_2O$	20%		185	73	140		73		140	212	C	70	C		C	C	C	C	C	C	C	C	C	C	C	C	
Chlorine Gas (Moisture Content < 150 ppm)									400	C	C	C	B	A	C	C	C	C	B	A*	A*	B	B	B	A		C
Chlorine Gas (Moisture Content > 150 ppm)		C	C	C	C		C		400	C	C	C	C		C	C	C	C	C	C	C	C	C	C	C	C	C
Chlorine	Liquid	C	C	C	C		C			C	C	C	B		B	B		B	C	C	C		C	C	C	C	
Chlorinated Water (< 3500 ppm)									400					73	B	B	C	C			C		C	B	A	A	C
Chlorinated Water (> 3500 ppm)									400					73	C	C	C	C			C			C	A	B	C
Chloroacetic Acid $CH_2ClCOOH$	50%	C	180	C	140		120		200	B to 175	C	C	C		C	C	C	C	C	C	C		C	C	C	C	C
Chlorobenzene C_6H_5Cl	Dry	C	C	73	C		C	C	200	C	C	C	B to 400	A	A	A	A	A	C	C	B		C	A	A	A	
Chloroform $CHCl_3$	Dry	C	C	C	C		C	C	200	C	C	C	B to 400	A	A	A	A	A	C	C	C		C	A	A	A	
Chlorosulfonic Acid $ClSO_2OH$			73	C	73		C		200	C	C	C	C		C	C	C	C	B	B	C	C	B	C	C	C	C
Chromic Acid H_2CrO_4	10%	73	180	140	140	B to 212	73		350	70	C	C	B to 400	C	C	C	C	C	C	C	C	C	C	B to 212	A to 70		C
Chromic Acid H_2CrO_4	30%	C	180	73	140	B to 212	73		350	70	C	C	B to 400	C	C	C	C	C	C	C	C	C	C	B to 212	B to 70		C
Chromic Acid H_2CrO_4	50%	C	C	73	C	B to 212	73		200	C	C	C	B to 400	C	C	C	C	C	C	C	C	C		C	B to 70		C
Citric Acid $C_6H_8O_7$	Sat'd.	160	180	140	140	B to 248	140		200					A	C	C	C	C	C	C	C		C	B	A	A	C
Coconut Oil			C	73	140	B to 248	73		400	C	250	C	B to 390		B	B	B	B	C	C	B		C	B	A		
Coffee			180	140	140		140			B to 140	140	140	B to 200		A	A	A	A	C	C	C			A	A	A	A
Coke Oven Gas				73	140		140		400	C	C	C	B to 390		B	B	B	B	A	A	A	A	A	A	A	A	

CHEMICALS AND FORMULA	CONCENTRATION	PLASTICS MAX TEMPERATURE (°F)							SEAL MATERIALS MAX TEMPERATURE (°F)						METALS											
		ABS	CPVC	PP	PVC	PVDF	PEX	PPSU	PTFE	EPDM	NITRILE (Buna-N)	POLYCHLORO-PRENE	FKM	GRAPHITE	BRONZE (85% Cu)	SILICON BRONZE	ALUMINUM BRONZE	BRASS	GRAY IRON	DUCTILE IRON	CARBON STEEL	3% NI/IRON	NI PLATED DUCTILE	400 SERIES SS	316 SS	630 SS	COPPER
Copper Acetate $Cu(C_2H_3O_2)_2 \bullet H_2O$	Sat'd.		73	73	73				350	B to 300	C	C	C		C	C	C	C	C	C	C		C	B	A		
Copper Carbonate $CuCO_3$	Sat'd.		180		140		140		350	B to 210	C	70	B to 190											B	A		
Copper Chloride $CuCl_2$	Sat'd.	73	180	140	140		140		350	B to 212	176	B to 210	B to 400	A	C	C	C	C	C	C	C	C	C	B	A		C
Copper Cyanide CuCN			180		140	B to 212	140		350	B to 300			B to 390		C	C	C	C	C	C	C	A	C	B	A		C
Copper Fluoride $CuF_2 \bullet {}_2H_2O$	2%		180	73	140		140			B to 250	80	140	B to 190	A													
Copper Nitrate $Cu(NO_3)_2 \bullet {}_3H_2O$	30%		180	140	140					B to 210	B to 230	B to 200	212	A	C	C	C	C	C	C	C		C	B	A		C
Copper Sulfate $CuSO_4 \bullet {}_5H_2O$	Sat'd.	120	180	120	140	B to 212	140			B to 300	B to 212	200	B to 212	A	C	C	C	C	C	C	C		C	A	A	A	C
Corn Oil			C	73	140		120		400	C	250	C	B to 400		B	B	B	B	B	B	B	B	B	A	A	A	A
Corn Syrup			185	140	140		140			200	200	C	212														
Cottonseed Oil		120	C	140	140		B to 140		400	B to 70	200	C	B to 400		B	B	B	B	B	B	B		B	A	A	A	
Creosote			C	73	C		140		350	C	B to 220	C	B to 400		B	B	B	B	A	A	A	A	A	A	A	A	B
Cresol $CH_3C_6H_4OH$	90%	C	C	B to 73	C	B to 68	73		200		C	C	B												B		
Cresylic Acid	50%		180		140		C		200	C	C	C	140		A	A	A	A	A	A	B	A	A	A	A	A	A
Crude Oil			C	140	140	B to 212	C		400	C	B to 250	C	B to 300		C	C	C	C	C	C	B			A	A	A	C
Cuprlc Sulfate $CuSO_4 \bullet {}_5H_2O$	Sat'd.	100	180	73	140				250					A													
Cuprous Chloride CuCl	Sat'd.	70	180		140		140		350					A	C			C									C
Cyclohexane C_6H_{12}		73	C	C	C	B to 248	C		300	C	250	C	B to 400		A	A	A	A	B	B	A		B	A	A	A	
Cyclohexanol $C_6H_{11}OH$		C	C	140	C	B to 104	73		250	C	B to 70	B to 70	B to 400						A	A			A	A	A	A	
Cyclohexanone $C_6H_{10}O$	Liquid	C	C	73	C	C	C	C	200	C	C	C	C		B	B	B	B	B	B	B		B	B	A		
Detergents (Heavy Duty)			C	180	140		B to 140								A	A	A	A	A	A	A	A	A	A	A	A	A
Dextrin (Starch Gum)	Sat'd.		180	140	140		140		200	176	B to 180	B to 200	212		A	A	A	A	B	B	B				A		A
Dextrose $C_6H_{12}O_6$			180	140	140		140		400	200	200	200	B to 400		A	A			A						A		
Diacetone Alcohol $CH_3COCH_2C(CH_3)_2OH$			C	120	C				350	B to 300	C	C	C		A	A	A	A	A	A	A	A	A	A	A	A	A

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CHEMICALS AND FORMULA	CONCENTRATION	PLASTICS MAX TEMPERATURE (°F)							SEAL MATERIALS MAX TEMPERATURE (°F)						METALS												
		ABS	CPVC	PP	PVC	PVDF	PEX	PPSU	PTFE	EPDM	NITRILE (Buna-N)	POLYCHLORO-PRENE	FKM	GRAPHITE	BRONZE (85% Cu)	SILICON BRONZE	ALUMINUM BRONZE	BRASS	GRAY IRON	DUCTILE IRON	CARBON STEEL	3% NI/IRON	NI PLATED DUCTILE	400 SERIES SS	316 SS	630 SS	COPPER
Dibutoxyethyl Phthalate $C_{20}H_{30}O_6$			C		C										A	A	A	A	A	A	A		A		A		
Dibutyl Phthalate $C_6H_4(COOC_4H_9)_2$		C	C	73	C		73		350	B to 250	C	C	C		A	A	A	A	A	A	A				A		
Dibutyl Sebacate $C_4H_9OCO(CH_2)_8OCOC_4H_9$				73	73		73		350	C	C	C	C														
Dichlorobenzene $C_6H_4Cl_2$		C	C	C	C		C			C	C	C	B						A	A			A		A		
Dichloroethylene $C_2H_4Cl_2$			C	C	C		C		350	C	C	C	200				B			B					B		
Diesel Fuels			C	140	140	B to 212	73		350	C	B	C	C		A	A	A	A	A	A	A	A	A	A	A	A	A
Diethylamine $C_4H_{10}NH$		C	C		C	C	C		200	70	C	70	C	A	C	C	C	C	A	A	C			A	A	A	C
Diethyl Cellosolve $C_6H_{14}O_2$																			A	A			A		A		
Diethyl Ether $C_4H_{10}O$		C	C	73	73		C	B to 73		C	C	C	C	A													
Diglycolic Acid $O(CH_2COOH)_2$	Sat'd.		180	140	140		140		250	B to 300	200	B to 200	C														
Dimethylamine $(CH_3)_2NH$				73	140	C	73			B to 140	C	C	C						C						A		
Dimethyl Formamide $HCON(CH_3)_2$		C	C	180	C		120	C	250	B to 122	C	C	C		B	B	B	B	B	B	B				A		
Dioctyl Phthalate $C_6H_4(COOC_8H_{17})_2$		C	C	C	C		73		200	C	C	C	C		A	A	A	A	C	C	C						
Dioxane $C_4H_8O_2$			C	C	C		140			B to 160	C	C	C	A	A	A	A	A	A	A	A					A	
Diphenyl Oxide $(C_6H_5)_2O$	Sat'd.						73			C	C	C	B to 310		A	A	A	A	A								
Disodium Phosphate Na_2HPO_4			180	140	140		140		400	B to 210	70	80	90	A	B	B	B	B	B	B					A		
Dow Therm A $C_{12}H_{10}•C_{12}H_{10}O$					C				212	C	C	C	B to 350	A	A	A	A	A	B	A	A		A	A	A	A	
Ether ROR		C	C	C	C		73			C	C	C	C		A	A	A		B	B	B	A	A	A	A	A	A
Ethyl Acetate $CH_3COOCH_2CH_3$		C	C	C	C		73	C	200	B to 158	C	C	C		A	A	B		A	A	A			A	A	A	
Ethyl Acrylate $CH_2=CHCOOC_2H_5$			C		C				350	C	C	C	C		A	A			A	A	A		A	A	A	A	
Ethyl Alcohol (Ethanol) C_2H_5OH			C	140	140		140	73	300	200	B to 200	158	C	A	A	A	A	A	A	A	A	A	A	A	A	A	
Ethyl Benzene $C_6H_5C_2H_5$				C	C				350	C	C	C	70		B	B			B	B	B		B		A		
Ethyl Chloride C_2H_5Cl	Dry		C	C	C		C		350	140	200	C	B to 400	A	A	A	B		A	A	A	A	A	A	A	A	

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Ethylene Bromide $BrCH_2CH_2Br$	Dry		C		C				350						A					A	A				A		
Ethylene Chloride (Vinyl Chloride) CH_2CHCl	Dry	C	C	C	C		C		350	C	C	C	200												A		
Ethylene Chlorohydrin $ClCH_2CH_2OH$			C	73	C				200	C	C	C	70	A								A					
Ethylene Diamine $NH_2CH_2CH_2NH_2$		C		73	C		140			B to 300	80	B to 90	C		A	C		A	A	B				A		A	A
Ethylene Dichloride $C_2H_4Cl_2$	Dry	C	C	C	C		C		350	C	C	C	B to 400	A	A	A			A	A	A		A		A	A	
Ethylene Glycol $OHCH_2CH_2OH$		73	C	212	140	B to 212		B to 220	400	250	250	250	B to 250	A	A	A	A	A	A	A	A		A	A	A	A	A
Ethylene Oxide CH_2CH_2O			C	C	C		73		400	C	C	C	C		A	A			B	A	A		A		A		
Ethyl Formate										C	C	C	B to 400		A	A			A	A			A		A		
Fatty Acids R-COOH		160	73	120	140		120		400	C	B to 250	C	250	A	C	C	C	C	C	C	C		C		A		
Ferric Chloride (Aqueous) $FeCl_3$	Sat'd.	120	180	140	140	B to 212	140		400	B to 300	B to 200	160	176	A	C	C	C	C	C	C	C	C		C	C	C	C
Ferric Hydroxide $Fe(OH)_3$	Sat'd.	160	180	140	140		140		400	B to 210	B to 176	B to 200	B to 200						C	C			C		A		C
Ferric Nitrate $Fe(NO_3)_3 \bullet {}_9H_2O$	Sat'd.	160	180	140	140	B to 212	140		400	B to 300	B to 176	B to 200	B to 400	A	C	C	C	C	C	C	C		C	B	A	A	C
Ferric Sulfate $Fe_2(SO_4)_3$		160	180	140	140	B to 212	140		200	B to 280	B to 200	B to 200	176	A	C	C	C	C	C	C	C		C	B	A	A	C
Ferrous Chloride $FeCl_2$	Sat'd.	160	180	140	140	B to 212	140		400	210	B to 200	200	185	A	C	C	C	C	C	C	C	C	C	C	C	C	C
Ferrous Hydroxide $Fe(OH)_2$	Sat'd.	160	180	140	140		140		400	B to 200	B to 176	B to 200	212						C						A		
Ferrous Nitrate $Fe(NO_3)_2$		160	180	140	140		140		400	B to 210	B to 200	B to 200	212	A											A	A	
Ferrous Sulfate $FeSO_4$		160	180	140	140	B to 212	140		400	B to 200	B to 200	B to 200	B to 200	A	C	C	B		C	C	C	C	C	A	A	A	B
Fish Oil			180	180	140		140		300	C	250	B to 70	B to 400		A	A	C		B	A	A		A	A	A	A	A
Flue Gas															A	A			A	A	A		A	A	A	A	
Fluoroboric Acid HBF_4		73	73	140	140		140		350	70	C	70	140		B	B			C	C			C		A		C
Fluorine Gas F_2	Dry, 100%		73	C	73		C		C		C		C	B to 300	B	B			C	C	A				A	A	
Fluorine Gas F_2	Wet	C	73	C	73		C		C		C		C	C	C	C			C	C	C				A	A	

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CHEMICALS AND FORMULA	CONCENTRATION	PLASTICS MAX TEMPERATURE (°F)							SEAL MATERIALS MAX TEMPERATURE (°F)						METALS												
		ABS	CPVC	PP	PVC	PVDF	PEX	PPSU	PTFE	EPDM	NITRILE (Buna-N)	POLYCHLORO-PRENE	FKM	GRAPHITE	BRONZE (85% Cu)	SILICON BRONZE	ALUMINUM BRONZE	BRASS	GRAY IRON	DUCTILE IRON	CARBON STEEL	3% NI/IRON	NI PLATED DUCTILE	400 SERIES SS	316 SS	630 SS	COPPER
Fluorosilicic Acid (Hydrofluosilicic Acid) H_2SiF_6	50%		73	73	140	B to 212			300	B to 300	160	158	185							C	C		C	B	B	B	C
Formaldehyde HCHO	Dilute	160	73	140	140	B to 176			300	212	140	150	C	A	A	A	B		C	C	B			A	A	A	
Formaldehyde HCHO	35%	160	C	140	140	B to 212	140	100	300	212	140	150	C	A	A	A	B		C		B			A	A	A	
Formaldehyde HCHO	50%		C		140		140		300	B to 140	C	B to 70	C	A	B	B	B		C		B			B	A	A	
Formic Acid HCOOH		C	C	140	73	B	140		300	210	C	B	B	A	C	C	B		C	C	C	B	C	A	A	A	
Freon $_{11}$ CCl_3F	100%	C	73	C	140		73		300	C	B to 250	C	C	A	A	A	A	A	B	B	B		B	A	A	A	A
Freon $_{12}$ CCl_2F_2	100%		73	73	140		73		C	B	B	B	C	A	A	A	A	A	B	B	B		B	A	A	A	A
Freon $_{21}$ $CHCl_2F$	100%			C	C		C		300	C	C	C	C	A	A	A	A	A	B	B	B		B	A	A	A	A
Freon $_{22}$ $CHClF_2$	100%		73	73	C		C		C	140	C	250	C	A	A	A	A	A	B	B	B		B	A	A	A	A
Freon $_{113}$ $C_2Cl_2F_3$	100%			C	140		73		300	C	B	B	C	A	A	A	A	A	B	B	B		B	A	A	A	A
Freon $_{114}$ $C_2Cl_2F_4$	100%			C	140		73		300	B	B	B	C	A	A	A	A	A	B	B	B		B	A	A	A	A
Fructose $C_6H_{12}O_6$	Sat'd.	73	180	180	140		140		300										A	A			A	A	A	A	
Furfural C_4H_3OCHO		C	C	C	C		C		300	B to 160	C	C	C		A	A	A	A	A	A	A		A	A	A	A	A
Gallic Acid $C_6H_2(OH)_3CO_2H \bullet H_2O$			73		140		73		300	C	C	C	B to 400		B	B	C		C	C	C		C	A	A	A	
Gasoline (Leaded)		C	C	C	B		73		200	C	190	C	250	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Gasoline (Unleaded)		C	C	C	B		73		200	C		C	190	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Gasohol		C	C	C	B		73		200					A	A	A	A	A	A	A	A	A	A	A	A	A	A
Gasoline (Sour)		C	C	C	B		C		200	C	250	C	B to 250	A	B	B			A	A	A		A	B	A	A	
Gelatin			180	180	140		140		300	200	200	200	212		C	C	B		C	C	C		C	C	C	A	
Glauber's Salt									200	B to 200	C	B to 200	B to 400		A	A		A	A	A			A	A	A	A	
Glucose $C_6H_{12}O_6 \bullet H_2O$		120	180	212	140		140		400	B to 212	200	200	B to 400		A	A	A	A	A	A	A	A	A	A	A	A	A
Glue				140	140		140		400	B	B	B	B		A	A	A	A	A	A	A	A	A	A	A	A	A
Glycerin $C_3H_5(OH)_3$		140	180	212	140		140	B to 320	400	B to 200	250	B to 180	250	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Glycol Amine															C	C	C		A	A	A		A		A		
Glycolic Acid $OHCH_2COOH$	Sat'd.		180	73	140		140		200	140	B	140	C		B	B			C	C	C		C		A		

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		ABS	CPVC	PP	PVC	PVDF	PEX	PPSU	PTFE	EPDM	NITRILE (Buna-N)	POLYCHLORO-PRENE	FKM	GRAPHITE	BRONZE (85% Cu)	SILICON BRONZE	ALUMINUM BRONZE	BRASS	GRAY IRON	DUCTILE IRON	CARBON STEEL	3% NI/IRON	NI PLATED DUCTILE	400 SERIES SS	316 SS	630 SS	COPPER
Glyoxal OCHCHO							140								B	B	B		C	C	C		C		A	A	
Grease										C	100	C	140		C	C	C	C	A	A	A		A		A	A	
Green Liquor		160	180		140					B to 300	B to 200	B to 160	B to 400		C	C	C		A	A		A	A		A	A	
Gypsum	Slurry								350						A	A	B	B	A	A	B	A	A	A	A	A	A
Heptane C_7H_{16}		73	180	C	140		73		300	C	250	B to 200	200		A	A	A		A	A	A	A	A	A	A	A	
n-Hexane C_6H_{14}		C	73	73	73				300	C	250	B to 140	B to 250		A	A	A		A	A	A	A	A	A	A	A	
Hexanol $CH_3(CH_2)_4CH_2OH$			180		140		140		300	C	140	C	212		A	A	A		A	A	A		A	A	A	A	
Hydraulic Oil (Petroleum)					73		73		300	C	250	C	70	A	A	A	B		A	A	A		A	A	A		
Hydrazine H_2NNH_2			C	73	C				250		C	C	C	A	C	C	C	C	C	C	C		C		A		
Hydrobromic Acid HBr	20%	73	73	140	140	B to 212	140		250	B to 300	C	C	200	A	C	C	C	C	C	C	C	C	C	C	C	C	C
Hydrobromic Acid HBr	50%	C		120		B to 140	140		250	200	C	C	200	A	C	C	C	C	C	C	C	C	C	C	C	C	C
Hydrochloric Acid HCl	10%	C	180	140	140	B to 212		73	250	176	B to 150	140	230	A	C	C	C	C	C	C	C	C	C	C	B	C	C
Hydrochloric Acid HCl	30%	C	180	140	140	B to 212			250	B to 130	B to 70	B to 100	160		C	C	C	C	C	C	C	C	C	C	B	C	C
Hydrocyanic Acid HCN	10%	160	180	73	140	B to 248	140		250	B to 300	B to 200	C	B to 400		C	C	C	C	C	C	C	C	C	C	A	B	C
Hydrofluoric Acid HF	Dilute	73	73	180	73	B to 212	140		300	212	B to 70	B to 185	212	A	C	C	C	C	C	C	C	C	C	C	C	C	C
Hydrofluoric Acid HF	30%	C	73	140	73		140		300	B to 140	C		212	A	C	C	C	C	C	C	C	C	C	C	C	C	C
Hydrofluoric Acid HF	50%	C	C	73	73	B to 212	120		300	B to 140	C	C	70	A	C	C	C	C	C	C	C	C	C	C	C	C	C
Hydrofluosilicic Acid	50%								300	140	B to 220	C	B to 400	C	B	B			C	C	C		C	B	B	B	C
Hydrogen H_2	Gas		73	140	140	B to 248	140		300	200	B to 220	200	210		A	A	A	A	A	A	A	A	A	A	A	A	A
Hydrogen Peroxide H_2O_2	50%		180	73	140	B to 212	140	B to 73	300	B to 100	C	C	70	A	C	C	C	C	C	C	B	C	C	A	A	A	C
Hydrogen Peroxide H_2O_2	90%		180	C	140		73		30	B to 70	C	C	C	C	C	C	C	C	C	C	B	C	C	A	A	A	C
Hydrogen Sulfide H_2S	Dry		180	150	140	B to 248	140			250	140	140	C	A	B				B		B				A	B	
Hydrogen Sulfide H_2S	Wet		180		140		140			130	C	70	C	A	C	C	C	C	C	C	C		C	C	A	C	C

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		ABS	CPVC	PP	PVC	PVDF	PEX	PPSU	PTFE	EPDM	NITRILE (Buna-N)	POLYCHLORO-PRENE	FKM	GRAPHITE	BRONZE (85% Cu)	SILICON BRONZE	ALUMINUM BRONZE	BRASS	GRAY IRON	DUCTILE IRON	CARBON STEEL	3% NI/IRON	NI PLATED DUCTILE	400 SERIES SS	316 SS	630 SS	COPPER
Hydrogen Sulfite H_2SO_3															C	C	C	C	C	C	C		C	C	A		C
Hypochlorous Acid HOCl	10%	73	180	73	140	B to 212	140		300	104	C	C	120														C
Inks				140			140		300	B	B	B	70		A	A	A		C	C	C		C		A		
Iodine I_2	10%	C	73	73	C	B to 176	C		200	B to 160	80	B to 80	190	B to 70	C	C	C	C	C	C	C		C	C	C	C	C
Iron Phosphate														A	C	C	C	C					B	A	A	A	C
Isobutane									140	C	250	C	250		A	A	A	A	A	A	A	A	A	A	A	A	A
Isobutyl Alcohol $(CH_3)_2CHCH_2OH$		C	C	73			140		300	B to 300	C	160	B to 400												A		
Isooctane $(CH_3)_3CCH_2CH(CH_3)_2$				C			73	73	300	C	250	C	250	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Isopropyl Acetate $CH_3COOCH(CH_3)_2$		C	C				73		200	B to 160	C	C	C	A	A				A	A	A		A	A	A	A	A
Isopropyl Alcohol $(CH_3)_2CHOH$			C	212	140	C	140	B to 130	300	160	70	B to 120	170	550	A	A	A	A	A	A	A	A	A	A	A	A	A
Isopropyl Ether $(CH_3)_2CHOCH(CH_3)_2$			C	C	C		73		140	C	C	C	C		A	A		A	A	A	A	A	A	A	A	A	
JP-3 Fuel									200	C	70	C	140		A	A	A	A	A	A	A	A	A	A	A	A	A
JP-4 Fuel			C	C	B		73		300	C	250	C	B to 400		A	A	A	A	A	A	A	A	A	A	A	A	A
JP-5 Fuel			C	C	B		73		300	C	250	C	B to 400		A	A	A	A	A	A	A	A	A	A	A	A	A
JP-6 Fuel									200	C	B to 120	C	70		A	A	A	A	A	A	A	A	A	A	A	A	A
Kelp Slurry															B	B	B	B	B	B	B		B	A	A	A	
Kerosene		73	B	C	B		C		250	C	250	C	B to 400	A	A	A	A	A	A	A	A	A	A		A	A	A	A
Ketchup					73				250	210	200	70	200		C	C	C		C	C	C		C	B	A	A	
Ketones		C	C	C	C		73		200	200	200	C	C	A	A	A	A		A	A	A		A	A	A	A	
Kraft Liquors		73	180		140		120		250						C	C	C	C	C	C	C		C		A		
Lactic Acid $CH_3CHOHCOOH$	25%	73	180	212	140		140		300	212	80	70	B to 400	A	C	C	C	C	C	B	C		B	A	A	A	
Lactic Acid $CH_3CHOHCOOH$	80%	C	C	140	73		140		300	176	80	70	B to 400	A	C	C	C	C	C	B	C		B	A	A	A	
Lard Oil			C		140		C		300						C	C	C	C	B	B	B		B		A		C
Latex				140			140		200	B to 200	200	160	160		A	A			A	A			A		A		
Lauric Acid $CH_3(CH_2)_{10}COOH$			180	140	140		120		300	C	70	70	70						C	C			C		A		
Lauryl Chloride $CH_3(CH_2)_{10}CH_2Cl$			73		140	B to 248	120		300										C	C			C		A		

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Lead Acetate $Pb(CH_3COO)_2 \bullet {}_3H_2O$	Sat'd.		180	180	140	B to 212	140		300	200	B to 140	B to 140	C		C	C			C	C	C		C		A		
Lead Chloride $PbCl_2$			180	140	140		120		300	176	140	C	212	A													
Lead Nitrate $Pb(NO_3)_2$	Sat'd.		180	140	140		120		300	B to 300	B to 220	200	212	A							A				A		
Lead Sulfate $PbSO_4$			180	140	140		120		300	B to 210	120	B to 180	212	A	B	B			C	C	C		C		B		
Lemon Oil			C	C				B to 73	300	C	70	C	70						C	C			C	B	A	A	
Lime Sulfur			73	73	73		120			B to 300	B to 220	B to 180	B to 420		C	C	C	C	A	A	A		A		A		
Linoleic Acid			180	180	140				300	C	C	C	C		C	C	C	C	C	C	C		C	C	B	B	C
Linseed Oil		73	C	140	140	B to 248	B to 73		300	C	200	B to 180	250		A	A	A	A	A	A	A	A	A	A	A	A	A
Lithium Bromide LiBr				140	140		140	B to 212	300					A													
Lithium Chloride LiCl				140	140		120			160	160	160	160	A	B	B	B		B	B	C		B		A		
Lithium Hydroxide LiOH				140			120			160	C	70	C		C	C	C	C	A	A			A		A		
Lubricating Oil (ASTM #1)			180	C	140	B to 248	73		350	C	180	150	70		A	A	A	A	A	A	A	A	A	A	A	A	A
Lubricating Oil (ASTM $\#_2$)			180	C	140		73		350	C	B to 180	C	70 - 300		A	A	A	A	A	A	A	A	A	A	A	A	A
Lubricating Oil (ASTM $\#_3$)			180	C	140		73		350	C	180	C	350		A	A	A	A	A	A	A	A	A	A	A	A	A
Ludox															C	C	C	C	A	A	A		A		A		
Magnesium Carbonate $MgCO_3$		120	180	212	140	B to 212	140		225	B to 300	140	B to 180	212		B	B			B	B	B		B	A	A	A	
Magnesium Chloride $MgCl_2$	Sat'd.	120	180	140	140	B to 140	140		400	230	176	B to 200	185	A	A	A	B	B	C	C	C		C	C	C	C	A
Magnesium Citrate $MgHC_6H_5O_7 \bullet {}_5H_2O$			180		140		140		300	176	140		212														
Magnesium Oxide MgO		160													A	A				A			A				
Magnesium Sulfate $MgSO_4 \bullet {}_7H_2O$		160	180	212	140	B to 212	140		300	194	B to 230	B to 200	B to 390	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Maleic Acid HOOCCH=CHCOOH	Sat'd.	160	180	140	140	B to 140	140		250		C	C	140	A	C	C	B	C	C	C	C		C	B	A	B	B
Manganese Sulfate $MnSO_4 \bullet {}_4H_2O$			180	180	140		140		300	176	B to 200	B to 200	212	A	A	A	A		C	C	B		C		A		
Mercuric Chloride $HgCl_2$			180	180	140		140		300	B to 210	B to 200	160	B to 300	A	C	C	C	C	C	C	C	C	C	C	C	C	C

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Mercuric Cyanide $Hg(CN)_2$	Sat'd.		180	140	140	B to 212	140		300	B to 210	B to 160	B to 70	C		C	C	C	C	C	C	C		C		A		C
Mercuric Sulfate $HgSO_4$	Sat'd.		180	140	140		140		300	70	70	B to 70	C	A	C	C	C	C									C
Mercurous Nitrate $HgNO_3 \bullet {}_2H_2O$	Sat'd.		180	140	140		140		300	100	B to 90	90	C	A	C	C	C	C	C	C	C		C	A	A	A	C
Mercury Hg			180	140	140	B to 248	140		300	210	140	140	185	A	C	C	C	C	A	A	A		A	A	A	A	C
Methane CH_4		C	73	73	140		140		300	C	B	B to 140	B		A	A	A	A	A	A	A	A	A	A	A	A	A
Methanol (Methyl Alcohol) CH_3OH			C	180	140		B to 140		300	B to 176	B to 160	160	C	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Methyl Acetate $CH_3CO_2CH_3$		C	C	140	C		C		300	160	C	C	C		B	B			B	B	B		B	B	A		
Methyl Acetone														C	A	A	A	A	A	A	A	A	A	A	A	A	A
Methyl Amine CH_3NH_2			C	C	C				300						C	C			A	A	B		A		A		
Methyl Bromide CH_3Br			C	C	C		C		300	C	C	C	185		C	C	B		C	C	B				B		
Methyl Cellosolve $HOCH_2CH_{20}CH_3$			C	73	C		C			C	C	C	C		A	A	B		B	B	B			A	A	A	
Methyl Chloride CH_3Cl	Dry	C	C	C	C		C		250	C	C	C	C		A	A	C	C	A	A	A	A	A	A	A	A	
Methyl Chloroform CH_3CCl_3		C	C	C	C		C		200	C	C	C	C						A	A			A		A		
Methyl Ethyl Ketone (MEK) $CH_3COC_2H_5$		C	C	73	C			C	200	B to 200	C	C	C	A	A	A	A	A	A	A	A		A	A	A	A	A
Methyl Formate										B to 120	C	C	C		A	A	A		A	A	C		A	A	A	A	
Methyl Isobutyl Ketone $(CH_3)_2CHCH_2COCH_3$		C	C	73	C		73		200	B to 130	C	C	C	A					A						A	A	
Methyl Isopropyl Ketone $CH_3COCH(CH_3)_2$			C		C		73		150	C	C	C	C														
Methyl Methacrylate $CH_2=C(CH_3)COOCH_3$			C		73		140		150	C	C	C	C								C						
Methylene Bromide CH_2Br_2			C	C	C		C		250	C	C	C	C														
Methylene Chloride CH_2Cl_2			C	C	C	C	C	C	250	C	C	C	C		B	B	B		B	B	B				A	A	
Methylene Chlorobromide CH_2ClBr			C		C														A	A					A		
Methylene Iodine CH_2I_2			C	C	C		C		200			C	70														
Methylsulfuric Acid CH_3HSO_4			180	140	140					70	C	70	C														
Milk		160	180	212	140	B to 212	140		400	250	250	250	250		B	B	B	B	C	C	C		C	C	A	A	A

CHEMICALS AND FORMULA	CONCENTRATION	PLASTICS MAX TEMPERATURE (°F)							SEAL MATERIALS MAX TEMPERATURE (°F)						METALS												
		ABS	CPVC	PP	PVC	PVDF	PEX	PPSU	PTFE	EPDM	NITRILE (Buna-N)	POLYCHLORO-PRENE	FKM	GRAPHITE	BRONZE (85% Cu)	SILICON BRONZE	ALUMINUM BRONZE	BRASS	GRAY IRON	DUCTILE IRON	CARBON STEEL	3% NI/IRON	NI PLATED DUCTILE	400 SERIES SS	316 SS	630 SS	COPPER
Mineral Oil		73	180	C	140	B to 212		B to 73	300	C	250	B to 200	B to 400		A	A	A	A	A	A	A	A	A	A	A	A	A
Molasses			180	140	140		140		300	B to 212	200	200	212		A	A	A	A	A	A	A		A	A	A	A	A
Monochloroacetic Acid $CH_2ClCOOH$	50%			140	140		140		200		C	70	C	A	C	C	C	C	C	C	C		C	C	C	C	C
Monochlorobenzene C_6H_5Cl			C	73	C		C		200	C	C	C	C	A	A	A			A	A	A	A	A	A	A	A	
Monoethanolamine $HOCH_2CH_2NH_2$					C				100	120	C	C	C	A			C		B	B	B		B		A		
Morpholine C_4H_8ONH				140			140		200	C	C	C	B to 70		B	B			B	B	B		B	B	B	B	
Motor Oil			180	C	140		B to 140		350	C	190	B to 70	190	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Muriatic Acid	37%								250						C	C	C	C	C	C	C	C	C	C	B	C	C
Naphtha			73	73	140	B to 122			200	C	B to 250	C	B to 400		A	A	B		A	A	A	A	A	A	A	A	
Naphthalene $C_{10}H_8$			C	73	C		73		250	C	C	C	176		A	A	B		A	A	A	A		A	A	A	
Natural Gas		73		73	140		140		300	C	250	140	250		A	A	A	A	A	A	A	A		A	A	A	A
Nickel Ammonium Sulfate									250	70	70	70	B to 70		C	C	C	C	C	C	C				A		
Nickel Chloride $NiCl_2$	Sat'd.	160	180	180	140	B to 212	140		406	176	176	B to 200	B to 400	A	C	C	B		C	C	C				A		
Nickel Nitrate $Ni(NO_3)_2 \bullet {}_6H_2O$	Sat'd.	160	180	180	140	B to 248	140		400	212	B to 200	B to 200	248	A	C	C			C	C	C			A	A	A	
Nickel Sulfate $NiSO_4$	Sat'd.	160	180	180	140	B to 212	140		400	176	176	160	B to 400	A	C	C	B		C	C	C						A
Nicotine $C_{10}H_{14}N_2$			180		140		140				C	C	C											B	A		
Nicotinic Acid C_5H_4NCOOH			180		140	B to 212	140			B to 140	70	B to 200			B	B			C	C	C			B	B	B	A
Nitric Acid HNO_3	<10%	C	180	180	140	B to 212			250	B to 104	C	C	B to 185	A	C	C	C	C	C	C	C	C		B	A	A	C
Nitric Acid HNO_3	30%	C	B to 130	140	140	B to 212			250		C	C	B to 185	C	C	C	C	C	C	C	C		B	A		A	C
Nitric Acid HNO_3	40%	C	B to 120	73	140				250	C	C	C	70	C	C	C	C	C	C	C	C		B	A		A	C
Nitric Acid HNO_3	50%	C	110	C	100				250	C	C	C	70	C	C	C	C	C	C	C	C	C		B	A		C
Nitric Acid HNO_3	70%	C	100	C	73				250	C	C	C	C	C	C	C	C	C	C	C	C	C		C	A		C
Nitric Acid	Fuming								70	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	A		C
Nitrobenzene $C_6H_5NO_2$		C	C	C	C	B to 122	C		400	C	C	C	C	A	B	B			A	A	A				A		

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CHEMICALS AND FORMULA	CONCENTRATION	PLASTICS MAX TEMPERATURE (°F)							SEAL MATERIALS MAX TEMPERATURE (°F)						METALS												
		ABS	CPVC	PP	PVC	PVDF	PEX	PPSU	PTFE	EPDM	NITRILE (Buna-N)	POLYCHLORO-PRENE	FKM	GRAPHITE	BRONZE (85% Cu)	SILICON BRONZE	ALUMINUM BRONZE	BRASS	GRAY IRON	DUCTILE IRON	CARBON STEEL	3% NI/IRON	NI PLATED DUCTILE	400 SERIES SS	316 SS	630 SS	COPPER
Nitrogen N_2	Gas								300	B to 350	B to 230	300	B to 400	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Nitroglycerin $CH_2NO_3CHNO_3CH_2NO_3$					C		73	B to 73	70	70	C	70	C		B	B				B	B				A		
Nitrous Acid HNO_2	10%		180	C	140		73		400	100	C	100	C		C	C	C	C	C	C	C			B	B	B	C
Nitrous Oxide N_2O			73	73	73		73	73	400	140	70	B to 80	C	A	B	B			C	B	B				A		
n-Octane C_8H_{18}			C					B to 250	400	C	B to 200	C	B to 400	550	A	A	A	A	A	A	A	A		A	A	A	A
Oleic Acid		160	180	73	140	B to 248	C		250	C	B to 225	C	B to 212	A	B	B	A		B	B	C			B	A	A	A
Oleum (Sulfuric Acid) $xH_2SO_4 \bullet ySO_3$	Fuming	C	C	C	C	C	C			C	C	C	C														
Olive Oil		160	C	73	140	B to 248	B to 68		350	C	250	C	250		A	A	A	A	A	A	A	A	A		A	A	A
Oxalic Acid $HOOCCOOH \bullet {}_2H_2O$	50%	160	180	140	140	B to 122	140		300	300	C	C	B to 400	A	C	C	C		C	C	C	C	C	B	A	A	
Oxygen O_2	Gas	160	180	C	140	B to 212	140		406		C		B to 190	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Ozone O_3			180	C	140		C		300	B	C	C	B	C	A	A	A	A	A	A	A	A	A	A	A	A	A
Palm Oil				73			140		200	C	250	C	250		C	C			C	C	C		C		A		
Palmitic Acid $CH_3(CH_2)_{14}COOH$	10%	73	73	180	140		120		300	C	220	C	400		B	B	B	A	B	B	B		B	B	A	A	A
Palmitic Acid $CH_3(CH_2)_{14}COOH$	70%		73	180	73		120		300	C	220	C	400		B	B	B	A	B	B	B		B	B	A	A	
Parafin $C_{36}H_{74}$		73	180	140	140	B to 212	C		250	C	250	C	400		A	A	A		B	A	A	B	B	A	A	A	A
Peanut Oil			C	140		B to 248			250	C	250	C	400		A	A			A	A			A		A		
n-Pentane $CH_3(CH_2)_3CH_3$		C	C	C	C		C		100	C	250	70	200		A	A	A	A	A	A	A	A	A	A	A	A	A
Peracetic Acid CH_3COOOH	40%	C		73	73			B to 73		C	C	70	C														
Perchloric Acid $HClO_4$	10%					B to 212			250	B to 140	C	140	400	A					C						A		
Perchloric Acid $HClO_4$	70%	73	180	C	73	B to 212	73			B to 140	C	70	400	C					C						B		
Perchloroethylene (Tetrachloroethylene) $Cl_2C{=}CCl_2$		C	C	C	C	C	C	C	200	C	C	C	400		B	B			B	B	B		B	A	A	A	
Perphosphate			73	140	73				250																		
Phenol C_6H_5OH		C	73	73	73		140	B to 140		C	C	C	B to 210	A	A	A	C		C	C	C		C	A	A	A	

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		ABS	CPVC	PP	PVC	PVDF	PEX	PPSU	PTFE	EPDM	NITRILE (Buna-N)	POLYCHLORO-PRENE	FKM	GRAPHITE	BRONZE (85% Cu)	SILICON BRONZE	ALUMINUM BRONZE	BRASS	GRAY IRON	DUCTILE IRON	CARBON STEEL	3% NI/IRON	NI PLATED DUCTILE	400 SERIES SS	316 SS	630 SS	COPPER
Phenylhydrazine $C_6H_5NHNH_2$			C	C	C	B to 104	C		B to 70	C	C	C	C														
Phosphate Esters										250	C	C			C	C			C	C			C		A		
Phosphoric Acid H_3PO_4	10%		180	212	140		140		300	B to 300	104	B to 206	B to 400	A	C	C	C	C	C	C	C	C	C	B	A	A	C
Phosphoric Acid H_3PO_4	50%	73	180	212	140	B to 212	140		300	176	B to 104	171	212	A	C	C	C	C	C	C	C	C	C	B	A	A	C
Phosphoric Acid H_3PO_4	85%		180	212	140		73		300	176	C	122	B to 185	A	C	C	C	C	C	C	C	C	C	B	A	B	C
Phosphoric Anhydride P_2O_5			73	73	73					200	B	B	B								C				A		
Phosphorus Pentoxide P_2O_5			73	73	73		140										C				B				A		
Phosphorus Trichloride PCl_3			C	73	C	C	120		300	70	C	C	70	A											A		
Photographic Solutions			180	140	140		140			B to 104	B to 70	B to 140	185							C					A		
Phthalic Acid $C_6H_4(COOH)_2$				140	C		140			B to 100	C	B to 100	C	A	A	A			B	B	C		B		A	A	A
Picric Acid $C_6H_2(NO_2)_3OH$	10%	C	C	73	C	B to 212	73			200	B to 200	70	400		C	C	C	C	C	C	C	C	C	B	A		C
Pine Oil			C	140			B to 73			C	70	C	70		C	C	B		B	B	B		B	A	A	A	
Plating Solutions (Brass)			180	140	140		140		300	70	B	140	140														
Plating Solutions (Cadmium)			180	140	140		140		300	300	B to 180	B to 200	190														
Plating Solutions (Chrome)			180	140	140		140		300	210	C	C	B to 400												A		
Plating Solutions (Copper)			180	140	140		140		300	B to 300	B to 190	B to 160	185														
Plating Solutions (Gold)			180	140	140		140		300	B	B	B	B														
Plating Solutions (Lead)			180	140	140		140		300	B to 300	B to 190	140	185														
Plating Solutions (Nickel)			180	140	140		140		300	B to 300	B	B to 200	185	A		C		C							A		C
Plating Solutions (Rhodium)			180	140	140		140		300	120	B to 200	80	B to 190														
Plating Solutions (Silver)			180	140	140		140		300	B to 300	B to 180	B to 200	B to 190												A		
Plating Solutions (Tin)			180	140	140		140		300	210	B to 180	140	140														
Plating Solutions (Zinc)			180	140	140		140		300	B to 300	B to 180	B	B to 190								B						

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		ABS	CPVC	PP	PVC	PVDF	PEX	PPSU	PTFE	EPDM	NITRILE (Buna-N)	POLYCHLORO-PRENE	FKM	GRAPHITE	BRONZE (85% Cu)	SILICON BRONZE	ALUMINUM BRONZE	BRASS	GRAY IRON	DUCTILE IRON	CARBON STEEL	3% NI/IRON	NI PLATED DUCTILE	400 SERIES SS	316 SS	630 SS	COPPER
Polysulfide Liquor									300						C	C	C	C	B	B			B		B		C
Polyvinyl Acetate									350	B to 280	80	C	C		B	B	B		A	A	C		A	B	B	B	
Potassium Alum			180		140		140		400	176	B to 180	B to 200	212														
Potassium Aluminum Sulphate			180		140		140		400	176	B to 180	B to 200	212			B		C			C			B	A		B
Potassium Bicarbonate $KHCO_3$	Sat'd.		180	140	140	B to 212	140		400	200	200	200	212								A				A		
Potassium Bichromate $K_2Cr_2O_7$	Sat'd.		180	140	140	B to 212			400	140	140	104	212	A		A		B			B			B	A		
Potassium Bisulfate $KHSO_4$			180	212	140	B to 212	140		400	B	140	70	212	A	B	B	B		C	C	C	C	C		A		
Potassium Bromate $KBrO_3$			180	212	140	B to 212	140		400	212	B to 70	B to 140	212						C	A	A		A		A		
Potassium Bromide KBr			180	212	140	B to 248	140		400	212	200	200	B to 212	A	B	B	B		C	C	C				A		
Potassium Carbonate (Potash) K_2CO_3		73	180	180	140	C	140		400	B	200	200	B to 212	A	B	B	B	B	A	A	A	A	A	A	A	A	B
Potassium Chlorate (Aqueous) $KClO_3$		160	180	212	140	C	140		400	B to 200	70	B to 200	B	C	B	B			A	A	A	A		A	A	A	B
Potassium Chloride KCl		160	180	212	140	B to 212	140		400	B	200	200	212			B	A	A	B	B	B	B	C	B	B	B	A
Potassium Chromate K_2CrO_4			180	212	140		140		400	176	B to 140	140	B to 212	C	A	A	B		B	B	B		B		A	A	
Potassium Cyanide KCN			180	180	140	B to 212	140		400	B	200	200	200		C	C	C	C	B	B	B	B		A	A	A	C
Potassium Dichromate $K_2Cr_2O_7$	Sat'd.		180	180	140		140		400	212	140	120	212	C	B	B	C		B	B	C			A	A	A	
Potassium Ferricyanide $K_3Fe(CN)_6$			180	180	140	B to 248	140		400	70	C	70	B to 212		C	C			B	B	C				A		
Potassium Ferrocyanide $K_4Fe(CN)_6 \bullet {}_3H_2O$			180	180	140	B to 248	140		400	140	C	70	140		B	B	C	C	C	C	C			B	A		C
Potassium Fluoride KF			180	180	140	B to 212	140		400	200	B to 180	70	212	A											A		
Potassium Hydroxide KOH	25%	160	180	212	140		B to 140	248	300	320	B to 80	B to 212	80	A	C	C	C		B	B	B	B		A	A	A	
Potassium Hypochlorite KClO		160	180		140		120		400	70	C	B to 70	C		C	C					C				A		
Potassium Iodide KI			180	73	73	B to 212	140		400	70		70	B	A	B	B					B	B			A		
Potassium Nitrate KNO_3		160	180	140	140		140		400	B	B to 200	B to 200	212	C	A	A	B	B	B	B	B	B		A	A	A	A

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Potassium Perborate KBO_3			180	140	140		140		400	70	B to 70	70	B to 70	A													
Potassium Perchlorate $KClO_4$			180	140	140		140		200	140	C	70	190														
Potassium Permanganate $KMnO_4$	10%		180	73	140		140		400	210	C	140	B to 212		B	B			A	A	A			A	A	A	
Potassium Permanganate $KMnO_4$	25%		180	73	73	B to 212	140		400	200	C	140	B to 212		B	B			A	A	A			A	A	A	
Potassium Persulfate $K_2S_2O_8$			180	140	140	B to 176	140		400	180	C	B	210														
Potassium Sulfate K_2SO_4		160	180	180	140	B to 212	140		200	176	B to 200	B to 200	212	A	A	A	B	B	A	A	A	A	B	A	A	A	A
Potassium Sulfide K_2S			180	140		68	140		300	70		70	210		C	C	C	C	C	C	C	B		B	B	B	C
Potassium Sulfite $K_2SO_3 \bullet {}_2H_2O$			180	140			140		300	200	B to 150	B to 150	210		B	B	B		C	C	C				A		
Potassium Tetraborate									400					A						A	A		A		A		
Potassium Tripolyphosphate									300					A			B		A		A	A			A		
Propane C_3H_8			73	73	140	B to 248	140		300	C	250	140	250	A	A	A	A	A	A	A	A	A		A	A	A	A
Propargyl Alcohol			C	140	140		140			140	70	70	140														
Propionic Acid $CH_3CH_2CO_2H$		C	C	140		B to 140	140			200		C	C												A		A
Propyl Acetate									140	C	C	C	C					A			A			A	A	A	
Propyl Alcohol $CH_3CH_2CH_2OH$		73	C	140	140	B to 122	B to 140		350	B to 225	180	B to 176	B to 300		A	A	A	A	A	A	A	A		A	A	A	A
n-Propyl Bromide									300						B	B	B		B	B	B				A		
Propylene Glycol	<25%							180	300	200	180	70	250	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Propylene Glycol	>25%							B to 180	300	200	180	70	250	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Propylene Oxide CH_3CHCH_2O			C	73	C		140		150	C	C	C	C							A					A		
n-Propyl Nitrate									200	C	C	C	C						A	A			A		A		
Pyridine $N(CH)_4CH$			C	C	C	B to 68	73			C	C	C	C		B	B			B	B	B		B	C	B		
Pyrogallic Acid $C_6H_3(OH)_3$					73				150	C	B to 100	C	140		A	A			A	A	A		A	A	A	A	
Pyrrole										C	C	C	C		B	B			B	B	B		B		B		
Quinone $C_6H_4O_2$				140			140			C	C	C	C						A	A			A		A		
Rosin									200	C	B to 200	200	B		C	C			C	C	C		C	A	A	A	

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		ABS	CPVC	PP	PVC	PVDF	PEX	PPSU	PTFE	EPDM	NITRILE (Buna-N)	POLYCHLORO-PRENE	FKM	GRAPHITE	BRONZE (85% Cu)	SILICON BRONZE	ALUMINUM BRONZE	BRASS	GRAY IRON	DUCTILE IRON	CARBON STEEL	3% NI/IRON	NI PLATED DUCTILE	400 SERIES SS	316 SS	630 SS	COPPER
Salicylic Acid $C_6H_4(OH)(COOH)$				140	140	B to 212	140		300	300	C		300		B	B			C	C	C		C		A		
Selenic Acid H_2SeO_4			180		140		140			70	C	70	C														
Silicic Acid $SiO_2 \bullet nH_2O$			180	140	140	B to 212	140		400	176	176	70	212														
Silicone Oil			180	212	73		73		350	140	212	212	400	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Silver Chloride AgCl		160	180	140	140					70	C	70	90	A	C	C	C	C	C	C	C		C	C	C	C	C
Silver Cyanide AgCN			180	180	140	B to 212	140		350	70	C	70	140		C	C	C	C	C	C	C		C		A to 100		C
Silver Nitrate $AgNO_3$		160	180	180	140		B to 140		350	300	C	B to 200	185	A	C	C	C	C	C	C	C		C	B	A		C
Silver Sulfate Ag_2SO_4		160	180	140	140		140		350	176	140	70	212	A													
Soaps		73	180	140	140		B to 140		400						B	B	A		B	B	B		B	A	A	A	
Sodium Acetate CH_3COONa	Sat'd.		180	212	140	B to 212	140		400	212	C	C	B		A	A	B		B	B	C		B	B	A		
Sodium Aluminate $Na_2Al_2O_4$	Sat'd.				140				300	B to 200	B to 180	140	B to 200		C	C	B		B	B	A		B		A		
Sodium Benzoate C_6H_5COONa			180	140	140		140		300	140	B to 140	B to 70	B to 140														
Sodium Bicarbonate $NaHCO_3$		73	180	212	140	B to 212	140		400	212	B to 200	B to 200	212		A	A	B	B	A	A	C		A	A	A	A	A
Sodium Bichromate	Sat'd.								400	176	140	B to 70	B to 212	C	C	C								A	A	A	
Sodium Bisulfate $NaHSO_4$		73	180	140	140		140			B to 200	B to 200	B to 200	212		C	C	C	C	C	C	C		C	B	A		C
Sodium Bisulfite $NaHSO_3$			180	140	140		140		400	176	160	B to 200	212		B	B			C	C	C		C		A		
Sodium Borate (Borax) $Na_2B_4O_7 \bullet {}_{10}H_2O$	Sat'd.	160	180	180	140		140		300	B to 300	B to 220	B to 200	210	A	A	A			B	B			B	A	A	A	
Sodium Bromide NaBr	Sat'd.	120	180	140	140		140		300	140	C	70	B to 180	A	B	B			C	C	C		C		A		
Sodium Carbonate Na_2CO_3		73	180	212	140	C	140	B to 73	400	176	B to 200	B to 200	212		A	A	B	B	A	A	A	A	A		A	A	C
Sodium Chlorate $NaClO_3$	Sat'd.		180	140	73	C	140		350	B to 200	B to 200	B to 200	B to 200		A	A	C		B	B	B		B	B	A	A	
Sodium Chloride NaCl		120	180	212	140		140		350	B to 212	160	120	212		B	A	A	A	B	B	B	B	C	A	B	B	A
Sodium Chlorite $NaClO_2$	25%		180	73	C		140		200	70	C		B to 140	C													

CHEMICALS AND FORMULA	CONCENTRATION	PLASTICS MAX TEMPERATURE (°F)							SEAL MATERIALS MAX TEMPERATURE (°F)						METALS												
		ABS	CPVC	PP	PVC	PVDF	PEX	PPSU	PTFE	EPDM	NITRILE (Buna-N)	POLYCHLORO-PRENE	FKM	GRAPHITE	BRONZE (85% Cu)	SILICON BRONZE	ALUMINUM BRONZE	BRASS	GRAY IRON	DUCTILE IRON	CARBON STEEL	3% NI/IRON	NI PLATED DUCTILE	400 SERIES SS	316 SS	630 SS	COPPER
Sodium Chromate $Na_2CrO_4 \bullet {}_4H_2O$		120	180	140		B to 176	140			140	140	70	140	C	A	A			B	B	B		B	A	A	A	
Sodium Cyanide NaCN			180	180	140	B to 212	140		350	176	B to 230	140	176	200	275	C	C	C	C	A	A	A	A		A	A	C
Sodium Dichromate $Na_2Cr_2O_7 \bullet {}_2H_2O$	20%		180	180	140		140		300	176	140	C	B to 212	C	C	C	C		B	B	B				A		
Sodium Ferricyanide $Na_3Fe(CN)_6 \bullet {}_2H_2O$	Sat'd.		180	140	140		140		350	300	70	70	140		C	C			C	C					A		
Sodium Ferrocyanide $Na_3Fe(CN)_6 \bullet {}_{10}H_2O$	Sat'd.		180	140	140		140		350	140	80	70	140												A		
Sodium Fluoride NaF		120	180	180	140	B to 212	140		350	140	100	140	140	A	A	A	B		C	C	C				A		
Sodium Hydroxide NaOH	<5%					B to 68																					
Sodium Hydroxide NaOH	<10%								400	B to 200	212	B to 200	B to 140	A	A		A			A	A		B	A	A	A	
Sodium Hydroxide NaOH	30%	120	180	212	140	C	B to 140		350	B to 130	212	B to 200	80	A	A		B			B	B		B	A	A	A	
Sodium Hydroxide NaOH	50%	120	180	212	140		B to 140	194	350	B to 130	212	B to 200	B to 70	A	B	C	C	C	B	B	B	B	B	A	A	A	B
Sodium Hydroxide NaOH	70%	120	180	212	140		B to 140		350	B to 130	B to 70	B to 200	B to 70	A	C	C	C	C	B	B	B	B	B	A	A	A	B
Sodium Hypochlorite $NaOCl \bullet {}_5H_2O$		120	180	73	73		140	B to 190	350	C	C	C	70		C	C	C	C	C	C	C	C	C	C	C	C	C
Sodium Metaphosphate $(NaPO_3)n$			180	120	140					300	220	150	B to 400	A	C	C	C		C	C	C				A		
Sodium Nitrate $NaNO_3$	Sat'd.	160	180	180	140	B to 212	140		400	200	B to 171	B to 200	212	A	A	A	B	B	A	A	A	A	A	A	A	A	B
Sodium Nitrite $NaNO_2$		160	180	73	140	B to 212	140		400	176	171	B to 140	212		A	A			B	B	B				A		
Sodium Perborate $NaBO_3 \bullet {}_4H_2O$		120	180	73	140		73		350	140	C	B	140	A	C	C			B	B	B			A	A	A	
Sodium Perchlorate $NaClO_4$			180	212	140		140		350	70	C	70	C														
Sodium Peroxide Na_2O_2	10%		180		140		140		250	300	C	C	400	C	C	C	C	C	C	C	C			A	A	A	B
Sodium Phosphate NaH_2PO_4	Acid	120	180	212	140	B to 140	140		400					A	B	B	B	B	B	B	B	A	B	A	A	A	B
Sodium Phosphate NaH_2PO_4	Alkaline		120	180	212		140		400					A	B	B	B	B	B	B	B	A	B	A	A	A	B
Sodium Phosphate NaH_2PO_4	Neutral		120	180	212				400					A	B	B	B	B	B	B	B	A	B	A	A	A	B
Sodium Silicate			180	140	140		140			B to 200	140	B to 200	212		C	C	B		A	A	A		A	A	A	A	

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CHEMICALS AND FORMULA	CONCENTRATION	PLASTICS MAX TEMPERATURE (°F)							SEAL MATERIALS MAX TEMPERATURE (°F)						METALS												
		ABS	CPVC	PP	PVC	PVDF	PEX	PPSU	PTFE	EPDM	NITRILE (Buna-N)	POLYCHLORO-PRENE	FKM	GRAPHITE	BRONZE (85% Cu)	SILICON BRONZE	ALUMINUM BRONZE	BRASS	GRAY IRON	DUCTILE IRON	CARBON STEEL	3% NI/IRON	NI PLATED DUCTILE	400 SERIES SS	316 SS	630 SS	COPPER
Sodium Sulfate Na_2SO_4	Sat'd.	160	180	212	140				400	B to 200	200	B to 200	212	A	A	A	B	B	A	A	A	A	A	A	A	A	A
Sodium Sulfide Na_2S	Sat'd.	160	180	212	140		140		350	200	B to 200	B to 200	176		C	C	C	C	B	B	C	B	B	A	A	A	C
Sodium Sulfite Na_2SO_3	Sat'd.	160	180	212	140	B to 212	140	B to 73	350	200	B to 200	B to 200	140		A	A	C		B	B	B		B	B	A	A	
Sodium Thiosulfate $Na_2S_2O_3 \bullet {}_5H_2O$			180	180	140		140		350	140		160	140		B	B	C		C	C	C		C		A		
Sour Crude Oil				140	140					C	C	C			C				A	A	A		B	A	A	A	
Soybean Oil				73			140		400	C	250	250	B to 400		A	A	B		A	A	B	A	A	A	A	A	
Stannic Chloride $SnCl_4$	Sat'd.		180	140	140		140		350	300	220	C	B to 400	A	C	C	C	C	C	C	C	C	C	C	C	C	C
Stannous Chloride $SnCl_2$	15%	120	180	140	140		140		350	B to 210	B to 150	B to 140	B to 185	A	C	C	C	C	C	C	C	C	C		A		
Starch			180	140	140		140		300	176	B to 176	212	212		B	B	B	B	B	B	B		B	A	A	A	
Steam (Low Pressure)									400					A	A	A	A	A	A	A	A	A	A	A	A	A	A
Steam (Medium Pressure)									400						A	A	A	A	A	A	A	A	A	A	A	A	A
Steam (High Pressure)									C						C	C	C	C	C	B	A	C	B	A	A	A	C
Stearic Acid $CH_3(CH_2)_{16}COOH$			180	73	140		120		350	C	B to 70	C	140	A	A	A	C	B	C	C	C	B	C	A	A	A	A
Stoddard's Solvent			C		C		73			C	250	C	250		A	A			A	A	A		A		A	A	
Styrene $C_6H_5CH=CH_2$				73			C		350	C	C	C	C		B	B	B		B	B	B		B		A		
Succinic Acid $COOH(CH_2)_2COOH$			180	140	140		140		200	140	70	B to 70	B to 176		A	A			A	A	A		A	A	A	A	
Sugar $C_6H_{12}O_6$			180		140		140		350						C	C				B	C		B	A	A	A	
Sulfamic Acid HSO_3NH_2	20%		C	180	C					70	C	B to 150	C		B	B	B		C	C	C		C		A		A
Sulfate Liquors (Oil)	6%		180	140	140				200	B to 250	B to 150	B to 150	170		C	C	C	C	B	A			A		A		C
Sulfite Liquors	6%	73	180		140				350	B	C	B to 70	140								C	B			A		
Sulfur S			180	212	140				350	250	C	70	266	A	C	C	C	C	B	B	C	B	B	B	A		C
Sulfur Chloride S_2Cl_2				C					350	C	C	C	140	A	C	C	C	C	C	C	C	C	C	C	C	C	C
Sulfur Dioxide SO_2	Gas (Dry)	C	73	140	140		140		350	160	C	C	B to 250	A	A	B	A	A	A	A	A		A	A	A	A	A
Sulfur Dioxide SO_2	Gas (Wet)	C	C	140	73		120			140	C	C	B to 140	A	C	B	B	C							C	A	C	C

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Sulfur Trioxide SO_3	Gas		C		73		C			B to 120	C	C	B	C	C			C						C	B	B	C
Sulfuric Acid H_2SO_4	<30%	120	180	180	140	B to 248	B to 140	B to 73	250	212	B	158	248	A	C	C	C	C	C	C	C	C	C	C	C	A	B	C
Sulfuric Acid H_2SO_4	50%	73	180	140	140	B to 212	B to 140	212	250	212	C	158	212	A	C	C	C	C	C	C	C	C	C	C	C	A	C	C
Sulfuric Acid H_2SO_4	70%	C	180	73	140				200	140	C	C	180	212	C	C	C	C	C	C	C	C	C	C	B	C	C
Sulfuric Acid H_2SO_4	90%	C	150	73	73	B to 212			200	70	C	C	158	212	C	C	C	C	C	C	C	C	C	C	C	C	C
Sulfuric Acid H_2SO_4	100%	C	C	C	C				200	C	C	C	158	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Sulfurous Acid H_2SO_3	Sat'd.		180	140	140	B to 212	140		350	C	C	C	C	A	C	C	C	C	C	C	C	C	C	B	A	A	C
Tall Oil			C	180	140		120		250	C	200	C	200		B	B	B		B	B	B		B	A	A	A	
Tannic Acid $C_{76}H_{52}O_{46}$	10%	C	180	73	140	B to 212	140		250	200	200	B to 200	200		A	A			B	B	C	B	B	B	A	A	
Tanning Liquors		160	180	73	140		120			200	B to 200	70	200		A	A			B						A		
Tar			C		C				250	C	C	C	B		A	A	A	A	A	A	A	A	A	A	A	A	A
Tartaric Acid $HOOC(CHOH)_2COOH$		160	180	140	140	B to 248	140		250	C	200	158	B to 200	A	A	A	C	C	C	C	C	C	C	A	A	A	B
Tetrachloroethane $CHCl_2CHCl_2$				C	C		C	C	400	C	C	C	200												A		
Tetrachloroethylene $Cl_2C=CCl_2$		C	C	C	C		C		350	C	C	C	212														
Tetraethyl Lead $Pb(C_2H_5)_4$			73	73	73				350	C	C	C	120		A	A				B	B		A				
Tetrahydrofuran C_4H_8O		C	C	C	C		C	C		C	C	C	C														
Thionyl Chloride $SOCl_2$			C	C	C	C	C	C		C	C	C	C	A													
Thread Cutting Oils			73	73	73			73	350						A				A	A	A			A	A	A	
Titanium Tetrachloride $TiCl_4$				140	C		120			C	C	C	160	A	C	C					C				B		
Toluene (Toluol) $CH_3C_6H_5$		C	C	C	C		C	C	200	C	C	C	B to 200		A	A	A	A	A	A	A	A		A	A	A	A
Tomato Juice			180	212	140		140		350	70	140	140	140		B				C	C	B				A	A	
Transformer Oil			180	73	140		C		300	C	B	C	300	A	A					A	A				A	A	
Transformer Oil $DTE/_{30}$			180		140		B to 120		300					A	A					A	A				A	A	
Tributyl Phosphate $(C_4H_9)_3PO_4$			C	C	C		73		300	250	C	C	C		B	B	B		A	A	A			B	A		
Trichloroacetic Acid CCl_3COOH	50%			140	140	B to 104	140		200	C	C	C	C	A	B	C			C	C	C			C	B		

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CHEMICALS AND FORMULA	CONCENTRATION	PLASTICS MAX TEMPERATURE (°F)							SEAL MATERIALS MAX TEMPERATURE (°F)						METALS												
		ABS	CPVC	PP	PVC	PVDF	PEX	PPSU	PTFE	EPDM	NITRILE (Buna-N)	POLYCHLORO-PRENE	FKM	GRAPHITE	BRONZE (85% Cu)	SILICON BRONZE	ALUMINUM BRONZE	BRASS	GRAY IRON	DUCTILE IRON	CARBON STEEL	3% NI/IRON	NI PLATED DUCTILE	400 SERIES SS	316 SS	630 SS	COPPER
Trichloroethylene $CHCl=CCl_2$		C	C	C	C	B to 176	C	C	200	C	C	C	200	A	A	A	A	A	B	B	B			A	A	A	A
Triethanolamine $(HOCH_2CH_2)_3N$		C	73	140	73	C	73	B to 190		B	C	B	C		C	C			C	C	C	C		C	A		
Triethylamine $(C_2H_5)_3N$				C	140		73	B to 73		160	140	B to 70	C			A	A										
Trimethylpropane $(CH_2OH)_3C_3H_5$				140	73		C			C	C	C	70														
Trisodium Phosphate $Na_3PO_4 \bullet {}_{12}H_2O$		73	180	140	140		140		350	212	C	C	B to 300	A	C	C			B	B		A			A	A	
Tung Oil										C	250	B to 120	250		B	B	B		B	B	B			B	A	A	
Turpentine		C	C	C	140		C			C	250	C	B to 200		A	A	A	A	A	A	A	A		A	A	A	A
Urea $CO(NH_2)_2$			180	180	140		140									B	B			C	C	C				A	C
Urine		160	180	180	140		140		400	140	140	C	140						C	C	C			A	A	A	
Varnish									350	C	C	C	B to 400		A	A	B	B	C	C	C			B	A	A	A
Vaseline (Petroleum Jelly)			C	140	C		120		300	C	140	140	140						A	A	A			A	A	A	
Vegetable Oil			C	140	140	B to 248	B to 140		300	C	200	C	200		A	A				A	A			A	A	A	
Vinegar		73	150	140	140		140		300	B to 210	C	C	200		C	C	C	C	C	C	C			A	A	A	B
Vinyl Acetate $CH_3COOCH=CH_2$			C	73	C	C	140		350	C	C	C	C		B	B		B	B	B				A		A	
Water (Acid Mine) H_2O		160	180	140	140		140		400	200	B to 210	C	B to 190	A	C	C	C	C	C	C	C	C	C	A	A	A	C
Water (Deionized) H_2O		160	180	140	140		140		400	B to 140	B to 200	B to 150	B to 200	A	B	B	C	C	C	C	C		C	B	A	A	A
Water (Distilled) H_2O		160	180	212	140	B to 248	140		400	140	B to 210		250	A	A	A	B	B	C	C	C	B	C	A	A	A	A
Water (Potable) H_2O		160	180	212	140	B to 248	140		400					A	A	A	A	A	B	B	B	A	B	A	A	A	A
Water (Salt) H_2O		160	180	212	140		140		400	B to 250	B to 210	140	B to 200	A	B	B	B	C	C	C	C	B	C	B	A	A	B
Water (Sea) H_2O		160	180	212	140	B to 248	140		400	B to 250	B to 210	B to 140	212	A	B	B	B	C	C	C	C	B	C	B	B	A	B
Water (Soft) H_2O		160	180	212	140		140		400					A	A	A	A	B	C	C	B	B	C	A	A	A	A
Water (Waste) H_2O		73	180	212	140		140		400					A	B	B	B	B	B	B	B	B	B	B	A		B

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Whiskey			180	140	140	B to 212	140		350	200	200	140	B		C	C	B		C	C	C		C	B	A		A
White Liquor		73	180		140					300	104	140	190		C	C	C		C	C	C		C		A		
Wine		73	180	140	140	B to 248	140		350	200	200	140	200		C	C			C	C	C		C	B	A		
Xylene (Xylol) $C_6H_4(CH_3)_2$		C	C	C	C	C	C	C	350	C	C	C	B to 200	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Zinc Acetate $Zn(CH_3COO)_2 \bullet {}_2H_2O$			180							140	C	C	C		C	C	C	C	C	C	C		C		A		
Zinc Carbonate $ZnCO_3$			180	140		B to 212	140			70	70	70	70		B	B									B		
Zinc Chloride $ZnCl_2$		120	180	180	140		140		400	210	B to 200	194	212	A	C	C	C		C	C	C		C	C	B	B	
Zinc Nitrate $Zn(NO_3)_2 \bullet {}_6H_2O$		160	180	180	140		140			180	140	100	190	A											A	A	
Zinc Sulfate $ZnSO_4 \bullet {}_7H_2O$		160	180	212	140		140		400	B to 300	B to 220	171	B	A	C	C	B		C	C	C	B	C	A	A	A	A

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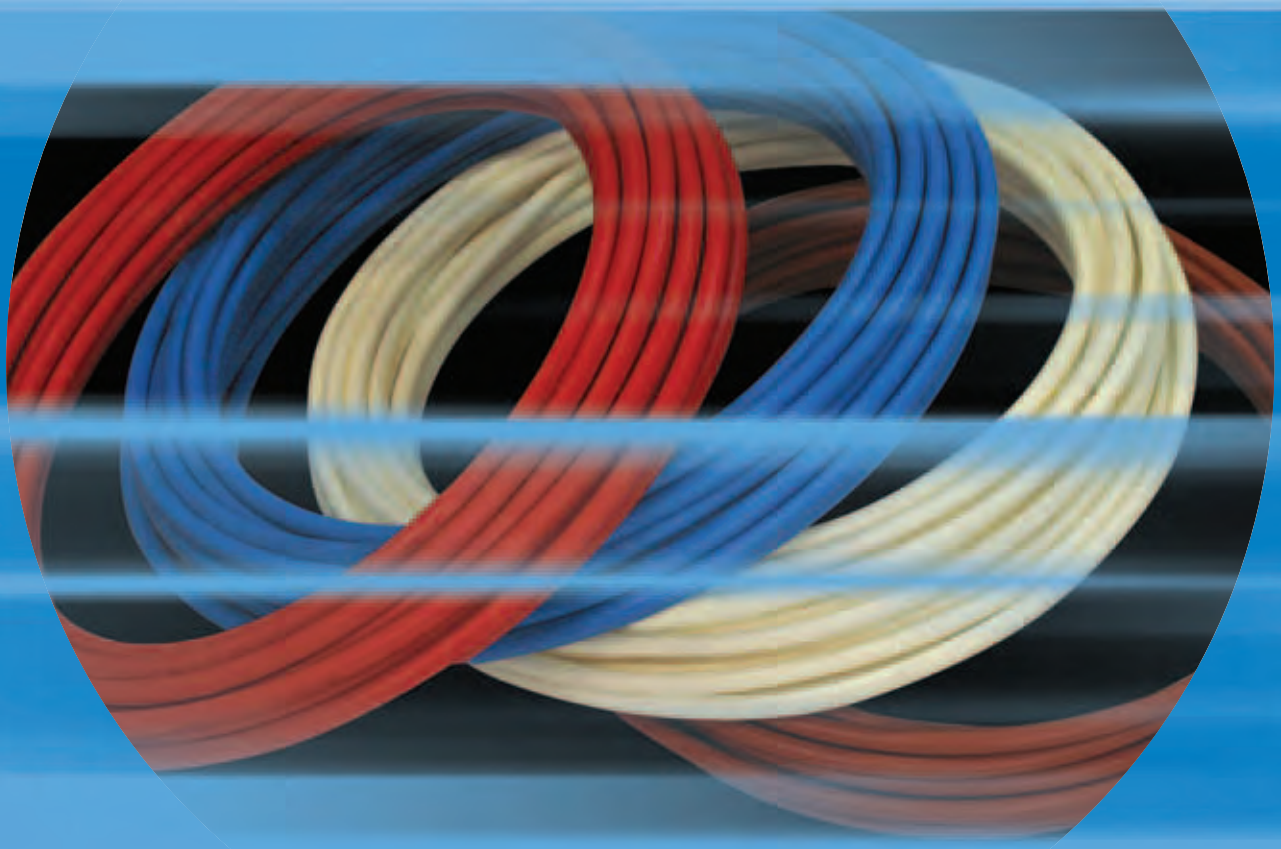
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NIBCO®

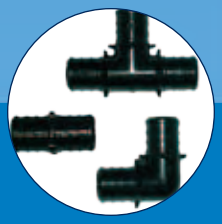
AHEAD OF THE FLOW®











NIBCO® PEX Piping Systems

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NIBCO® PEX is a Complete System

NIBCO® PEX tubing, fittings, valves, and manifolds are designed to be used as a complete system. Therefore, NIBCO cannot guarantee that tubing and/or components from other systems are compatible for use with the NIBCO® PEX system. NIBCO offers more versatility with the choice of three different connections - crimp, clamp or sleeve.

The NIBCO® PEX Manufacturing Process

Cross-linking is the process that gives NIBCO® PEX tubing its superior characteristics. The long, simple chains in a polyethylene molecule are altered to form a more stable, three-dimensional network. This process changes the material from a thermoplastic into a thermoset. A thermoset differs from a thermoplastic because a thermoset cannot be melted and then reformed. This change in molecular structure creates a polyethylene product with enhanced mechanical properties. Many manufacturers use a chemical additive to activate the cross-linking process, but NIBCO employs a sterile, electron beam process that provides superior properties. This process, which is called PEX-c, delivers the highest quality PEX tubing available today, while reducing the use of chemicals.

Standards and Approvals

NIBCO® PEX is an outside diameter controlled tubing of one standard dimension ratio (SDR 9) that is manufactured to comply with the requirements of CSA B137.5, ASTM F 876, and ASTM F 2023. NIBCO® PEX insert fittings and copper crimp rings are manufactured to comply with CSA B137.5 and ASTM F 1807. NIBCO® PEX tubing, fittings, and crimp rings are tested as a system to the requirements of ASTM F 877. NIBCO® PEX tubing components are listed for compliance to NSF/ANSI 14 and NSF/ANSI 61 by NSF International for use in potable water systems. NIBCO® PEX tubing has also been tested and certified by the International Association of Plumbing and Mechanical Officials (IAPMO).

Operating Limits

Water: 160 PSI @ 73° F (1.10 MPa @ 23° C)
100 PSI @ 180° F (0.69 MPa @ 82° C)
80 PSI @ 200° F (0.55 MPa @ 93° C)

Chlorinated Water: 80 PSI @ 140° F (0.55 MPa @ 60° C)
The water temperature must be 140° F (60° C) or lower and the water pressure must be 80 PSI (0.55 MPa) or lower

Thermal Expansion

Heated water expands and must be accommodated within the plumbing system. Protection against increased water pressure from thermal expansion utilizing a pressure relief valve and expansion tank to keep pressure under the maximum of 80 PSI (0.55 MPa) must be incorporated in the system.

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Look to NIBCO for Leadership on PEX Tubing Systems

NIBCO is proud to offer PEX for potable water distribution and radiant heating. With over 100 years of experience, you can trust NIBCO to provide the highest quality PEX products.

NIBCO® PEX tubing is processed though an electron beam in order to enhance the mechanical properties over conventional polyethylene. Available in a range from 1/4" to 1-1/4" copper tube size, NIBCO sets a new standard in PEX plumbing products.

NIBCO® PEX Pipe Offers Significant Advantages:

- NIBCO® PEX is pliable and can be easily straightened after removal from the coil.
- NIBCO® PEX has greater dimensional stability. The outside diameter dimensions of our tubes are held to strict tolerances. This means a better fit for you with no sliding of copper crimp rings on the tube.
- NIBCO® PEX is chlorine-resistant.
- NIBCO® PEX is non-toxic and employs no toxic chemicals in the manufacturing process, unlike other PEX manufacturing methods.
- NIBCO® PEX will not leach taste or odor and keeps water clear and clean.
- NIBCO® PEX requires fewer fittings than a traditional rigid plumbing system and is easier to install.
- NIBCO® PEX is abrasion resistant.
- NIBCO® PEX offers three different connection methods - crimp, clamp and sleeve.

Installation Notes

Use of recirculating loops with hot water distribution is gaining popularity in some areas of the country. However, there is debate about the efficiency of these systems due to the constant heating of hot water including during periods of low demand. Data published in the PPI/PPFA/NAHB PEX Design Guide shows a properly designed Home Run manifold system can reduce time to deliver hot water and water use 30 – 40%.

If recirculating loops are used with NIBCO PEX, the use of a timer is recommended and the following conditions must be observed:

Max Pressure	80 psi @ 140°F
Max Recirculation Time	6 hrs/day

Please note many building codes forbid constant recirculation and require the use of a timer or other device to make water heating periodic in nature.

Material Selection

Plastic Piping Standards

Many commercial, industrial, and governmental standards or specifications are available to assist the design engineer in specifying plastic piping systems. Standards most frequently specified in plastic piping systems are American Society for Testing and Materials (ASTM) Standards. Below is a list and description of those standards most typically applied to industrial plastic piping.

Polyethylene (PE)

Polyethylene is the most common olefin material and is typically used in transporting water. Because olefins cannot be joined with cements, barbed insert fittings are used for mechanical assembly. PE is light weight, low cost, has excellent chemical resistance, low coefficient of friction, and is non-toxic.

Cross-Linked Polyethylene (PEX)

PEX is the common name for cross-linked polyethylene. PEX tubing is predominantly used in water distribution systems, hydronic radiant heating systems, and natural gas systems.

Almost all PEX is made from high density polyethylene (HDPE). PEX contains cross-linked bonds that are introduced into the polymer structure, changing the thermoplastic into a thermoset. Cross-linking is accomplished during or after the extrusion of the tubing. The required degree of cross-linking, according to ASTM F 876, is between 65 to 89 percent.

The cross-linking process improves high-temperature mechanical properties, low-temperature impact, tensile strength, resistance to brittle fracture, and scratch resistance properties.

Cross-linking may be done by the peroxide (Engel) method, silane (moisture cure) method, or electron beam method. NIBCO® PEX is produced by the electron beam method. This is the cleanest and most environmentally friendly of the three methods. Also this method does not involve other chemicals and uses only high-energy electrons to split the carbon-hydrogen bonds and facilitate cross-linking.

Polyphenylsulfone (PPSU)

Polyphenylsulfone is a thermoplastic that is tough, rigid, high-strength, and retains its properties between -148° F and 302° F (-100° C and 150° C). PPSU has very high dimensional stability; the size change when exposed to boiling water or 302° F (150° C) air generally falls below 0.1 percent. Polyphenylsulfone is highly resistant to mineral acids, alkali, and electrolytes, in pH ranging from 2 to 13. PPSU is resistant to oxidizing agents; therefore, can be cleaned by bleaches. Also, PPSU is resistant to surfactants and hydrocarbon oils. However, PPSU is not resistant to low-polar organic solvents (e.g., ketones and chlorinated hydrocarbons) and aromatic hydrocarbons. In addition, PPSU is often chosen for difficult applications including high water temperatures, chlorides, or when water quality may increase the risk of dezincification, a type of corrosion that can adversely affect metal fittings.

Brass

Brass is the term used for copper alloys where zinc is the principle alloying element along with copper. Brass has a yellow color, somewhat similar to gold. Brass plumbing components may be machined from extruded shapes, forged, or cast. This alloy is mainly used for decorative fixtures, plumbing components, and electrical applications. Today, almost 90% of all brass alloys are recycled.

Copper (Cu)

Copper (Cu) is a natural element that has historically been the dominant material used in plumbing, heating, cooling, and other piping applications. Copper is a ductile metal with excellent thermal conductivity and is corrosion resistant. The materials used in copper piping products comply with the requirements of specifications established by the American Society for Testing and Materials (ASTM). The alloy customarily used for copper tube and copper fittings is designated as C12200 (Copper No. 122). This alloy contains a minimum of 99.9% pure copper and is deoxidized by the addition of phosphorus. Other copper alloys may be used.

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Material Selection
Plastic Piping Standards

NSF/ANSI 61
Drinking Water System Components - Health Effects. This is the American National Standard for health effects of drinking water system components. This standard establishes the health effects requirements for the chemical contaminants and impurities that are indirectly imparted to drinking water from products, components and materials used in drinking water systems. This Standard is maintained by a Joint Committee with equal representation from regulators (such as; EPA, Health Canada, and state drinking water officials), users (such as; water purveyors, utilities, and engineers) and manufacturers. NSF/ANSI Standard 61 is approved by the American National Standards Institute, which ensures the standard is developed and maintained using an open consensus process and has representation by all stakeholders.

NSF/ANSI 14
Plastics Piping System Components and Related Materials. NSF/ANSI Standard 14 establishes minimum physical, performance, health effects, quality assurance, marking, and record keeping requirements for plastic piping components and related materials such as: Thermoplastic Materials, Thermoset Materials, Non-plastic Components, Piping and Tubing, Fittings and Valves, Appurtenances, Joining Materials, and Gaskets, Ingredients of Materials and Special Engineered Products and Materials. Standard 14 outlines production facility inspection, quality control, short-term performance testing, long-term performance evaluation, and chemical extraction testing of the products to ensure continued compliance. The NSF Mark for these certified products include such things as the manufacturer name or trademark; the certification agency/laboratory name or trademark; the reference performance standard (such as ASTM F 876 and F 877); product end use (pw or rfh), material type designation such as PEX or PEX/AL/PEX; product size, date of production and manufacturer identification code for tubing. For products with size constraints that do not accommodate complete marking, the manufacturer must include all such details on the product packaging.

ASTM Standard F 876
Standard Specification for Cross-linked Polyethylene (PEX) Tubing. This Standard contains finite dimensional requirements for tubing in addition to burst, sustained pressure, and other relevant performance tests at different water temperatures. Other tubing products that are partially comprised of a PEX material are known as composites. These products usually have a PEX or PE outer layer bound to aluminum or an aluminum alloy, and an inner layer of PEX. The aluminum layer in the core of composite tubing involves additional installation and handling considerations. There are currently two ASTM standards that address performance requirements for such products: ASTM F 1281 and ASTM F 1335.

ASTM Standard F 877
Standard Specification for Cross-linked Polyethylene (PEX) Plastic Hot- and Cold-Water Distribution Systems. This Standard contains performance requirements for PEX tubing and fittings systems. Also, this Standard contains test methods and methods of marking for components used in PEX hot- and cold-water distribution systems intended for 100 psi (0.69 MPa) water service up to and including 180°F (82°C).

ASTM Standard F 1807
Standard Specification for Metal Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing. This Standard contains material and dimensional requirements for the insert fittings and crimp rings used with PEX tubing. The performance requirements for these products are defined within ASTM F 877.

ASTM Standard F 2098
Specification for Stainless Steel Clamps for Securing SDR9 Cross-Linked Polyethylene (PEX) Tubing to Metal Insert Fittings. This standard covers stainless steel clamps for use with insert fittings that comply with ASTM F 1807, and cross-linked polyethylene (PEX) tubing that complies with ASTM F 876. These clamps are intended as an alternative to the copper-alloy crimp-rings defined in ASTM F 1807 or ASTM F 2159 and for use in 100 psi (689.5 kPa) hot- and cold-water distribution systems operating at temperatures up to and including 180°F (82°C). This Standard includes requirements for materials, workmanship, dimensions, and marking of the stainless steel clamps. Also, these clamps are covered by international patents held by Oetiker International.

ASTM Standard F 2159
Specification for Plastic Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing. This Standard covers Polyphenylsulfone insert fittings and copper crimp rings for use with cross-linked polyethylene (PEX) tubing. These fittings are intended for use in 100 psi (689.5 kPa) hot- and cold-water distribution systems operating at temperatures up to and including 180°F (82°C). This Standard includes requirements for material, molded part properties, performance, workmanship, dimensions, and markings for the fittings and rings.

Material Selection
Plastic Piping Standards

ASTM Standard F 2023
Standard Test Method for Evaluating the Oxidative Resistance of Cross-linked Polyethylene (PEX) Tubing and Systems to Hot Chlorinated Water This test method describes the general requirements for evaluating the long-term, chlorinated water, oxidative resistance of cross-linked polyethylene (PEX) tubing produced in accordance with Specification F 876 or PEX systems in accordance with Specification F 877 used in hot- and cold-water distribution systems by exposure to hot, chlorinated water. This test method outlines the requirements of a pressurized flow-through test system, typical test pressures, test-fluid characteristics, failure type, and data analysis.

ASSE Standard 1061
Removable and Non-Removable Push-Fit Fittings. This Standard covers removable and non-removable push-fit fittings that employ a quick assembly push-fit connector, as well as push-fit connectors integrated into plumbing devices. This Standard applies to fittings that may be approved for use with PEX tubing that conforms to ASTM F 876, Type K, L, and M seamless copper tubing that conforms to ASTM B 88, and CPVC tubing that conforms to ASTM D 2846. The standard includes minimum requirements for materials, performance for the fitting joints, marking, and identification requirements. When this type of fitting connection is used with PEX tubing, a tube liner must be inserted into the end of the tubing before assembly.

NSF-pw
Identification mark for products that meet all applicable performance standards for pressure-rated potable water applications as required by NSF/ANSI Standard 14 and that comply with NSF/ANSI Standard 61 for health effects.

NSF-rfh
Identification mark for products that meet all applicable performance standards for a pressure-rated in-floor heating application as required by NSF/ANSI Standard 14. No heath effects evaluation is required.

NSF-61
Identification mark for products that meet the applicable requirements of NSF/ANSI 61.

California Proposition 65
In November 1986, California voters approved a ballot initiative to address concerns about exposures to toxic chemicals. That initiative became The Safe Drinking Water and Toxic Enforcement Act of 1986, better known by its original name, Proposition 65. This Proposition requires the Governor of California to publish a list of chemicals that are known to the State of California to cause cancer, birth defects or other reproductive harm. Over 750 chemicals and materials, including many metals and plastics, have been listed as of December 12, 2006. Second, Manufacturers are required to provide a "clear and reasonable" warning before exposing anyone to a listed chemical. This warning can be give by a variety of means, such as by labeling a consumer product, by posting signs at the workplace, or by publishing notices in a newspaper. A Proposition 65 warning means that the Manufacturer issuing the warning believes that one or more listed chemicals is present in its product, even if it is only present in trace quantities.

Kentucky
Cold expansion fittings with PEX reinforcing rings for use with cross-linked polyethylene (PEX) tubing must be produced and labeled as ASTM F 1960. Metal insert fittings utilizing a copper crimp ring for cross-linked polyethylene (PEX) tubing must be produced and labeled as ASTM F 1807. Stainless steel clamps substituted for the copper crimp ring must be produced and labeled as ASTM F 2098. Methods of joining other than mentioned above shall be prohibited unless documentation is provided, from the systems manufacturer, honoring full warranty of the system installed. Fittings which have a smaller ID (inside diameter) other than what is required for the insert portion of the fitting shall not be permitted. A system consisting of material from multiple manufacturers (i.e. fittings, tubing and crimp rings) shall be prohibited unless documentation from manufacturers is produced providing full warranty. Connections for PEX systems other than those in section 1 of this regulation will be prohibited.

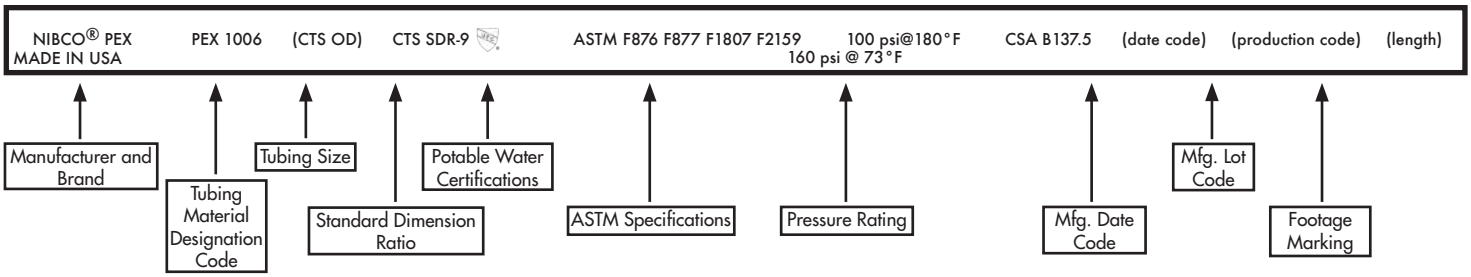
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Fitting Terms and Abbreviations

FIP = Female Iron Pipe
MIP = Male Iron Pipe
NPSM = Straight Pipe Thread
CTS = Copper Tube Size

Compression = Transition Fitting
Hub = Plastic Socket
SJ = Slip Joint
Spg = Male End (Spigot)
SVL = Swivel
PB = Polybutylene

Tube Markings



NIBCO® PEX Tube

Potable Water

COILS

NP60



PEX Red Coil

FIGURE NO.	MATERIAL NO.	SIZE	WEIGHT/ FOOT	WEIGHT/ COIL	FEET/ PALLET	COILS/ PALLET
NP60	PX40005*	3/8" x 100'	0.0410	4.10	3,500	35
NP60	PX40007*	3/8" x 250'	0.0410	10.25	5,000	20
NP60	PX40010*	3/8" x 500'	0.0410	20.50	5,000	10
NP60	PX40012*	3/8" x 1000'	0.0410	41.00	6,000	6
NP60	PX40014	1/2" x 100'	0.0540	5.40	2,000	20
NP60	PX40018	1/2" x 250'	0.0540	13.50	2,500	10
NP60	PX40019*	1/2" x 300'	0.0540	16.20	3,000	10
NP60	PX40020	1/2" x 500'	0.0540	27.00	4,000	8
NP60	PX40022	1/2" x 1000'	0.0540	54.00	5,000	5
NP60	PX40030	3/4" x 100'	0.1025	10.25	1,300	13
NP60	PX40034	3/4" x 250'	0.1025	25.63	2,250	9
NP60	PX40035*	3/4" x 300'	0.1025	30.75	2,100	7
NP60	PX40038	3/4" x 500'	0.1025	51.25	5,000	5
NP60	PX40040*	3/4" x 1000'	0.1025	102.50	2,000	2
NP60	PX40042*	1" x 100'	0.1670	16.70	1,000	10
NP60	PX40048*	1" x 300'	0.1670	50.10	900	3
NP60	PX40051*	1" x 500'	0.1670	83.50	1,500	3
NP60	PX40050	1" x 1,000'	0.1670	167.00	3,000	3
NP60	PX40060*	1" x 5000'	0.1670	835.00	5,000	1
NP60	PX40054	1-1/4" x 100'	0.2750	27.50	800	8
NP60	PX40055	1-1/4" x 250'	0.2750	68.78	1,000	4

NP70



PEX Blue Coil

FIGURE NO.	MATERIAL NO.	SIZE	WEIGHT/ FOOT	WEIGHT/ COIL	FEET/ PALLET	COILS/ PALLET
NP70	PX40101*	1/4" x 100'	0.0300	3.00	4,000	40
NP70	PX40105*	3/8" x 100'	0.0410	4.10	3,500	35
NP70	PX40107*	3/8" x 250'	0.0410	10.25	5,000	20
NP70	PX40108	3/8" x 300'	0.0410	12.30	3,000	10
NP70	PX40110*	3/8" x 500'	0.0410	20.50	5,000	10
NP70	PX40112*	3/8" x 1000'	0.0410	41.00	6,000	6
NP70	PX40114	1/2" x 100'	0.0540	5.40	2,000	20
NP70	PX40115*	1/2" x 150'	0.0540	8.10	2,500	15
NP70	PX40118	1/2" x 250'	0.0540	13.50	2,500	10
NP70	PX40119*	1/2" x 300'	0.0540	16.20	3,000	10
NP70	PX40120	1/2" x 500'	0.0540	27.00	4,000	8
NP70	PX40121*	1/2" x 600'	0.0540	32.40	4,200	7
NP70	PX40122	1/2" x 1000'	0.0540	54.00	5,000	5
NP70	PX40130	3/4" x 100'	0.1025	10.25	1,300	13
NP70	PX40134	3/4" x 250'	0.1025	25.63	2,250	9
NP70	PX40135*	3/4" x 300'	0.1025	30.75	2,100	7
NP70	PX40138	3/4" x 500'	0.1025	51.25	5,000	5
NP70	PX40140*	3/4" x 1000'	0.1025	102.50	2,000	2
NP70	PX40142	1" x 100'	0.1670	16.70	1,000	10
NP70	PX40146*	1" x 250'	0.1670	41.75	750	3
NP70	PX40148	1" x 300'	0.1670	50.10	900	3
NP70	PX40151*	1" x 500'	0.1670	83.50	1,000	2
NP70	PX40152	1" x 750'	0.1670	125.00	3,000	4
NP70	PX40160*	1" x 5000'	0.1670	835.00	5000	1
NP70	PX40154	1-1/4" x 100'	0.2530	25.30	800	8
NP70	PX40155	1-1/4" x 250'	0.2530	63.25	1,000	4

*SKU's are assemble-to-order or made-to-order, and may require longer lead times. Contact customer service or your account representative for details.

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NIBCO® PEX Tube

Potable Water

COILS

NP80



PEX White Coil

FIGURE NO.	MATERIAL NO.	SIZE	WEIGHT/ FOOT	WEIGHT/ COIL	FEET/ PALLET	COILS/ PALLET
NP80	PX40201	1/4" x 100'	0.0300	3.00	4,000	40
NP80	PX40203*	1/4" x 500'	0.0300	15.00	7,500	15
NP80	PX40204*	1/4" x 1000'	0.0300	30.00	5,000	5
NP80	PX40205	3/8" x 100'	0.0410	4.10	3,500	35
NP80	PX40207*	3/8" x 250'	0.0410	10.25	5,000	20
NP80	PX40208*	3/8" x 300'	0.0410	12.3	3,000	10
NP80	PX40210*	3/8" x 500'	0.0410	20.50	5,000	10
NP80	PX40212*	3/8" x 1000'	0.0410	41.00	6,000	6
NP80	PX40214	1/2" x 100'	0.0540	5.40	2,000	20
NP80	PX40216*	1/2" x 200'	0.0540	10.80	2,000	10
NP80	PX40218	1/2" x 250'	0.0540	13.50	2,500	10
NP80	PX40219*	1/2" x 300'	0.0540	16.20	3,000	10
NP80	PX40220	1/2" x 500'	0.0540	27.00	4,000	8
NP80	PX40222	1/2" x 1000'	0.0540	54.00	5,000	5
NP80	PX40230	3/4" x 100'	0.1025	10.25	1,300	13
NP80	PX40234	3/4" x 250'	0.1025	25.63	2,250	9
NP80	PX40235*	3/4" x 300'	0.1025	30.75	2,100	7
NP80	PX40238	3/4" x 500'	0.1025	51.25	5,000	5
NP80	PX40240*	3/4" x 1000"	0.1025	102.50	2,000	2
NP80	PX40242	1" x 100'	0.1670	16.70	1,000	10
NP80	PX40245*	1" x 200'	0.1670	33.40	1,000	5
NP80	PX40246*	1" x 250'	0.1670	41.75	750	3
NP80	PX40248	1" x 300'	0.1670	50.10	900	3
NP80	PX40251*	1" x 500'	0.1670	83.50	1,000	2
NP80	PX40260*	1" x 5000'	0.1670	835.00	5,000	1
NP80	PX40254	1-1/4" x 100'	0.2530	25.30	800	8
NP80	PX40255	1-1/4" x 250'	0.2530	63.25	1,000	4

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NIBCO® PEX Tube

Potable Water

COILS

NP65



PEX Terra Cotta Coil

FIGURE NO.	MATERIAL NO.	SIZE	WEIGHT/ FOOT	WEIGHT/ COIL	FEET/ PALLET	COILS/ PALLET
NP65	PX40501	1/4" x 100'	0.0300	3.00	4,000	40
NP65	PX40502*	1/4" x 300'	0.0300	9.00	3,000	12
NP65	PX40503*	1/4" x 500'	0.0300	15.00	7,500	15
NP65	PX40504*	1/4" x 1000'	0.0300	30.00	5,000	5
NP65	PX40505	3/8" x 100'	0.0410	4.10	3,500	35
NP65	PX40506*	3/8" x 200'	0.0410	8.20	2,000	10
NP65	PX40507*	3/8" x 250'	0.0410	10.25	5,000	20
NP65	PX40508*	3/8" x 300'	0.0410	12.30	3,000	10
NP65	PX40509*	3/8" x 350'	0.0410	14.35	3,500	10
NP65	PX40510*	3/8" x 500'	0.0410	20.50	5,000	10
NP65	PX40511*	3/8" x 600'	0.0410	24.60	6,000	10
NP65	PX40512*	3/8" x 1000'	0.0410	41.00	6,000	6
NP65	PX40514	1/2" x 100'	0.0540	5.40	2,000	20
NP65	PX40516*	1/2" x 200'	0.0540	10.80	2,000	10
NP65	PX40518	1/2" x 250'	0.0540	13.50	2,500	10
NP65	PX40519*	1/2" x 300'	0.0540	16.20	3,000	10
NP65	PX40564*	1/2" x 350'	0.0540	18.90	3,500	10
NP65	PX40520	1/2" x 500'	0.0540	27.00	4,000	8
NP65	PX40521*	1/2" x 600'	0.0540	32.40	4,200	7
NP65	PX40522	1/2" x 1000'	0.0540	54.00	5,000	5
NP65	PX40523*	1/2" x 1200'	0.0540	64.80	2,400	2
NP65	PX40524*	5/8" x 250'	0.0760	19.00	2,500	10
NP65	PX40527*	5/8" x 600'	0.0760	45.60	1,800	3
NP65	PX40529*	5/8" x 1200'	0.0760	91.20	2,400	2
NP65	PX40530	3/4" x 100'	0.1025	10.25	1,300	13
NP65	PX40531*	3/4" x 150'	0.1025	15.36	1,500	10
NP65	PX40532*	3/4" x 200'	0.1025	20.50	2,000	10
NP65	PX40534	3/4" x 250'	0.1025	25.63	2,250	9
NP65	PX40535*	3/4" x 300'	0.1025	30.75	2,100	7
NP65	PX40536*	3/4" x 350'	0.1025	35.88	2,800	8
NP65	PX40537*	3/4"x 400'	0.1025	41.00	1,600	4
NP65	PX40538	3/4" x 500'	0.1025	51.25	5,000	5
NP65	PX40539*	3/4" x 600'	0.1025	61.50	2,400	4
NP65	PX40540	3/4" x 1000'	0.1025	102.50	2,000	2
NP65	PX40542*	1" x 100'	0.1670	16.70	1,000	10
NP65	PX40544	1" x 150'	0.1670	25.05	900	6
NP65	PX40545*	1" x 200'	0.1670	33.4	1,000	5
NP65	PX40546*	1" x 250'	0.1670	41.75	750	3
NP65	PX40547*	1" x 275'	0.1670	45.93	1,100	4
NP65	PX40548	1" x 300'	0.1670	50.10	900	3
NP65	PX40549*	1" x 380'	0.1670	63.46	760	2
NP65	PX40550*	1" x 400'	0.1670	66.80	800	2
NP65	PX40551	1" x 500'	0.1670	83.50	1,500	3
NP65	PX40560*	1" x 5000'	0.1670	835.00	5,000	1
NP65	PX40554	1-1/4" x 100'	0.2530	25.30	800	8
NP65	PX40555*	1-1/4" x 250'	0.2530	63.25	1,000	4

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NIBCO® PEX Tube

Potable Water

SPOOLS

NP60
NP70
NP80
NP65



PEX Spools

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT/ FOOT
NP60	PX40010SP	3/8" X 500' Red Tube On Spool	0.0410
NP60	PX40019SP	1/2" X 300' Red Tube On Spool	0.0540
NP60	PX40030SP	3/4" X 100' Red Tube On Spool	0.1025
NP70	PX40110SP	3/8" X 500' Blue Tube On Spool	0.0410
NP70	PX40119SP	1/2" X 300' Blue Tube On Spool	0.0540
NP70	PX40130SP	3/4" X 100' Blue Tube On Spool	0.1025
NP80	PX40219SP	1/2" X 300' White Tube On Spool	0.0540
NP65	PX40510SP	3/8" X 500' Terra Cotta Tube On Spool	0.0410
NP65	PX40519SP	1/2" X 300' Terra Cotta Tube On Spool	0.0540
NP65	PX40530SP	3/4" X 100' Terra Cotta Tube On Spool	0.1025

STICKS

NP60



PEX Red Sticks

FIGURE NO.	MATERIAL NO.	SIZE	WEIGHT/ FOOT	WEIGHT/ STICK	FEET/ BUNDLE	PIECES/ BUNDLE
NP60	PX60006	3/8" x 5'	0.0410	0.21	250	50
NP60	PX60012*	1/2" x 5'	0.0540	0.27	250	50
NP60	PX60013*	1/2" x 10'	0.0540	0.54	500	50
NP60	PX60014	1/2" x 20'	0.0540	1.08	1,000	50
NP60	PX60016*	1/2" x 40'	0.0540	2.16	2,000	50
NP60	PX60019	3/4" x 5'	0.1025	0.51	250	50
NP60	PX60020*	3/4" x 10'	0.1025	1.03	250	25
NP60	PX60021	3/4" x 20'	0.1025	2.05	500	25
NP60	PX60023*	3/4" x 40'	0.1025	4.10	1,000	25
NP60	PX60026*	1" x 10'	0.1670	1.67	150	15
NP60	PX60027	1" x 20'	0.1670	3.34	300	15
NP60	PX60031	1-1/4" x 20'	0.2750	5.50	200	10

NP70



PEX Blue Sticks

FIGURE NO.	MATERIAL NO.	SIZE	WEIGHT/ FOOT	WEIGHT/ STICK	FEET/ BUNDLE	PIECES/ BUNDLE
NP70	PX60103*	1/4" x 20'	0.0300	0.60	1,000	50
NP70	PX60106*	3/8" x 5'	0.0410	0.21	250	50
NP70	PX60108*	3/8" x 20'	0.0410	0.82	1,000	50
NP70	PX60112*	1/2" x 5'	0.0540	0.27	250	50
NP70	PX60113*	1/2" x 10'	0.0540	0.54	500	50
NP70	PX60114	1/2" x 20'	0.0540	1.08	1,000	50
NP70	PX60115*	1/2" x 25'	0.0540	1.35	1,250	50
NP70	PX60116*	1/2" x 40'	0.0540	2.16	2,000	50
NP70	PX60119*	3/4" x 5'	0.1025	0.51	125	25
NP70	PX60120*	3/4" x 10'	0.1025	1.03	250	25
NP70	PX60121	3/4" x 20'	0.1025	2.05	500	25
NP70	PX60122*	3/4" x 25'	0.1025	2.56	1,000	40
NP70	PX60123*	3/4" x 40'	0.1025	4.10	1,000	25
NP70	PX60124*	3/4" x 50'	0.1025	5.13	1,250	25
NP70	PX60125*	1" x 5'	0.1670	0.84	75	15
NP70	PX60117*	1" x 10'	0.1670	1.67	150	15
NP70	PX60127	1" x 20'	0.1670	3.34	300	15
NP70	PX60131	1-1/4" x 20'	0.2530	5.06	200	10

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NIBCO® PEX Tube

Potable Water

STICKS

NP80



PEX White Sticks

FIGURE NO.	MATERIAL NO.	SIZE	WEIGHT/ FOOT	WEIGHT/ STICK	FEET/ BUNDLE	PIECES/ BUNDLE
NP80	PX60201*	1/4" x 5'	0.0300	0.15	250	50
NP80	PX60202*	1/4" x 10'	0.0300	0.30	500	50
NP80	PX60203*	1/4" x 20'	0.0300	0.60	1,000	50
NP80	PX60204*	1/4" x 25'	0.0300	0.75	2,500	100
NP80	PX60205*	1/4" x 50'	0.0300	1.50	3,000	60
NP80	PX60206*	3/8" x 5'	0.0410	0.21	250	50
NP80	PX60207*	3/8" x 10'	0.0410	0.41	500	50
NP80	PX60208*	3/8" x 20'	0.0410	0.82	1,000	50
NP80	PX60209*	3/8" x 25'	0.0410	1.03	1,750	70
NP80	PX60210*	3/8" x 50'	0.0410	2.05	2,500	50
NP80	PX60212	1/2" x 5'	0.0540	0.27	250	50
NP80	PX60213*	1/2" x 10'	0.0540	0.54	500	50
NP80	PX60214	1/2" x 20'	0.0540	1.08	1,000	50
NP80	PX60215*	1/2" x 25'	0.0540	1.35	1,250	50
NP80	PX60216*	1/2" x 40'	0.0540	2.16	2,000	50
NP80	PX60217*	1/2" x 50'	0.0540	2.70	1,500	30
NP80	PX60219*	3/4" x 5'	0.1025	0.51	125	25
NP80	PX60220*	3/4" x 10'	0.1025	1.03	250	25
NP80	PX60221	3/4" x 20'	0.1025	2.05	500	25
NP80	PX60222*	3/4" x 25'	0.1025	2.56	1,000	40
NP80	PX60223*	3/4" x 40'	0.1025	4.10	1,000	25
NP80	PX60224*	3/4" x 50'	0.1025	5.13	1,250	25
NP80	PX60225*	1" x 5'	0.1670	0.84	75	15
NP80	PX60226*	1" x 10'	0.1670	1.67	150	15
NP80	PX60227	1" x 20'	0.1670	3.34	300	15
NP80	PX60228*	1" x 25'	0.1670	4.18	625	25
NP80	PX60229*	1" x 40'	0.1670	6.68	600	15
NP80	PX60230*	1" x 50'	0.1670	8.35	750	15
NP80	PX60231	1-1/4" x 20'	0.2530	5.06	200	10

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NIBCO® PEX Tube

Potable Water

STICKS

NP65



PEX Terra Cotta Sticks

FIGURE NO.	MATERIAL NO.	SIZE	WEIGHT/ FOOT	WEIGHT/ STICK	FEET/ BUNDLE	PIECES/ BUNDLE
NP65	PX60501*	1/4" x 5'	0.0300	0.15	250	50
NP65	PX60502*	1/4" x 10'	0.0300	0.30	500	50
NP65	PX60503*	1/4" x 20'	0.0300	0.60	1,000	50
NP65	PX60504	1/4" x 25'	0.0300	0.75	2,500	100
NP65	PX60505*	1/4" x 50'	0.0300	1.50	3,000	60
NP65	PX60506	3/8" x 5'	0.0410	0.21	250	50
NP65	PX60507*	3/8" x 10'	0.0410	4.10	500	50
NP65	PX60508*	3/8" x 20'	0.0410	0.82	1,000	50
NP65	PX60509	3/8" x 25'	0.0410	1.03	1,750	70
NP65	PX60510*	3/8" x 50'	0.0410	2.05	2,500	50
NP65	PX60540	1/2" x 18"	0.0540	0.08	225	150
NP65	PX60512	1/2" x 5'	0.0540	0.27	250	50
NP65	PX60513	1/2" x 10'	0.0540	0.54	500	50
NP65	PX60514	1/2" x 20'	0.0540	1.08	1,000	50
NP65	PX60515	1/2" x 25'	0.0540	1.35	1,250	50
NP65	PX60516*	1/2" x 40'	0.0540	2.16	1,000	50
NP65	PX60517	1/2" x 50'	0.0540	2.70	1,500	30
NP65	PX60541*	3/4" x 18"	0.1025	0.15	225	150
NP65	PX60519	3/4" x 5'	0.1025	0.51	125	25
NP65	PX60520	3/4" x 10'	0.1025	1.03	250	25
NP65	PX60521	3/4" x 20'	0.1025	2.05	500	25
NP65	PX60522	3/4" x 25'	0.1025	2.56	1,000	40
NP65	PX60523*	3/4" x 40'	0.1025	4.10	1,000	25
NP65	PX60524*	3/4" x 50'	0.1025	5.13	1,250	25
NP65	PX60525*	1" x 5'	0.1670	0.84	75	15
NP65	PX60526	1" x 10'	0.1670	1.67	150	15
NP65	PX60527	1" x 20'	0.1670	3.34	300	15
NP65	PX60528*	1" x 25'	0.1670	4.18	625	25
NP65	PX60530*	1" x 50'	0.1670	8.35	750	15
NP65	PX60531	1-1/4" x 20'	0.2530	5.06	200	10

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NIBCO® PEX Tube

Radiant Heat

NP75



BARRIER-PEX Coil

FIGURE NO.	MATERIAL NO.	SIZE	WEIGHT/ FOOT	WEIGHT/ COIL	FEET/ PALLET	COILS/ PALLET
NP75	PX50014	1/2" x 100'	0.0535	5.40	2,000	20
NP75	PX50018	1/2" x 250'	0.0535	13.50	2,500	10
NP75	PX50019	1/2" x 300'	0.0535	16.20	3,000	10
NP75	PX50020	1/2" x 500'	0.0535	27.00	4,000	8
NP75	PX50021	1/2" x 600'	0.0535	32.40	4,200	7
NP75	PX50022	1/2" x 1000'	0.0535	54.00	3,000	3
NP75	PX50023	1/2" x 1200'	0.0535	64.80	2,400	2
NP75	PX50024	5/8" x 250'	0.0760	19.00	2,500	10
NP75	PX50025	5/8" x 300'	0.0760	22.80	3,000	10
NP75	PX50026	5/8" x 500'	0.0760	38.00	3,500	7
NP75	PX50028	5/8" x 1000'	0.0760	76.00	3,000	3
NP75	PX50030	3/4" x 100'	0.1030	10.30	1,300	13
NP75	PX50034	3/4" x 250'	0.1030	25.75	2,250	9
NP75	PX50035	3/4" x 300'	0.1030	30.90	2,100	7
NP75	PX50038	3/4" x 500'	0.1030	51.50	2,500	5
NP75	PX50039	3/4" x 600'	0.1030	61.80	1,800	3
NP75	PX50042	1" x 100'	0.1670	16.70	1,000	10
NP75	PX50048	1" x 300'	0.1670	50.10	900	3
NP75	PX50051	1" x 500'	0.1670	83.50	1,000	2

NP75



BARRIER-PEX Sticks

FIGURE NO.	MATERIAL NO.	SIZE	WEIGHT/ FOOT	WEIGHT/ STICK	FEET/ BUNDLE	PIECES/ BUNDLE
NP75	PX50066*	1/2" x 5'	0.0535	0.285	500	100
NP75	PX50068	1/2" x 20'	0.0535	1.140	500	25
NP75	PX50061*	3/4" x 5'	0.1023	0.525	200	40
NP75	PX50069	3/4" x 20'	0.1023	2.100	200	10
NP75	PX50062*	3/4" x 18"	0.1580	0.237	15	10
NP75	PX50073*	1" x 5'	0.1670	0.835	100	20
NP75	PX50064	1" x 20'	0.1670	3.340	100	5

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BARRIER-PEX is used for radiant systems with ferrous components (e.g. cast iron boiler). The oxygen barrier layer meets the standard DIN 4276.

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NIBCO® PEX Tube

Icemaker Tubing and Risers

NP80

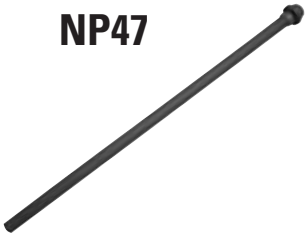


PEX Icemaker Tubing

FIGURE NO.	MATERIAL NO.	SIZE	WEIGHT/ FOOT	WEIGHT/ COIL	FEET/ PALLET	COILS/ PALLET
NP80	PX40700	1/8" (1/4" OD) x 100'	0.0300	0.88	2,500	25

RISERS

NP45
NP45F
NP46
NP46F
NP47



PEX Riser Tubing

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT/ PIECE	BAG QTY.	MASTER CTN. QTY.
NP45	PX01200	3/8" x 12" PEX Lav Tube	0.0280	50	50
NP45F	PX01212	3/8" x 20" PEX Lav Tube w/Ferrule	0.0460	50	50
NP45	PX01222	3/8" x 30" PEX Lav Tube	0.0690	50	50
NP45F	PX01232	3/8" x 36" PEX Lav Tube w/Ferrule	0.0840	50	50
NP46F	PX01242	3/8" x 12" PEX Closet Tube w/Ferrule	0.0290	50	50
NP46F	PX01252	3/8" x 20" PEX Closet Tube w/Ferrule	0.0510	50	50
NP47	PX01260	3/8" Nominal Poly Ferrule	0.0010	50	3,000

INSULATED TUBING

NP90



Insulated PEX Tubing

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT/ FOOT (EA.)	WEIGHT/ COIL	FEET/ PALLET	COILS/ PALLET
NP90	PX41010	2 x 1" x 75' Insulated PEX	0.8000	60	75	1
NP90	PX41015	2 x 1" x 100' Insulated PEX	0.8000	80	100	1
NP90	PX41020	2 x 1" x 125' Insulated PEX	0.8000	100	125	1
NP90	PX41025	2 x 1" x 150' Insulated PEX	0.8000	120	150	1

NP90CAP



Insulated PEX Tubing Accessories

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT/ PIECE	BAG QTY.	MASTER CTN. QTY.
NP90CAP	PX41005	Insulated PEX End Cap 2 x 1"	0.4000	1	25

NIBCO® PEX
Metal Insert Fittings

COUPLINGS

NP01
NP01R
NP01S



PEX Brass Insert Couplings

FIGURE NO.	MATERIAL NO.	SIZE	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP01	PX80500	3/8"	0.0220	25	2,000
NP01R	PX80510	1/2" x 3/8"	0.0310	50	1,000
NP01	PX80520	1/2"	0.0320	50	1,000
NP01	PX80530	5/8"	0.0330	25	500
NP01R	PX80540	3/4" x 1/2"	0.0560	25	500
NP01	PX80550	3/4"	0.0580	25	500
NP01R	PX80560	1" x 3/4"	0.0930	15	120
NP01	PX80570	1"	0.1060	15	120
NP01R	PX80590	1-1/4" x 3/4"	0.1450	10	80
NP01R	PX80600	1-1/4" x 1"	0.1500	10	80
NP01	PX80580	1-1/4"	0.1650	25	150

NP01
NP01R



PEX DZR Brass Insert Couplings

FIGURE NO.	MATERIAL NO.	SIZE	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP01	PX80500D	3/8 x 3/8" "	0.018	25	1500
NP01R	PX80510D	1/2 x 3/8" "	0.026	50	1000
NP01	PX80520D	1/2 x 1/2" "	0.026	50	1000
NP01	PX80530D	5/8 x 5/8" "	0.033	25	500
NP01	PX80550D	3/4 x 3/4" "	0.049	25	300
NP01R	PX80560D	1 x 3/4" "	0.073	15	240
NP01	PX80570D	1 x 1" "	0.082	15	240
NP01R	PX80590D	1-1/4 x 3/4" "	0.096	10	160
NP01	PX80580D	1-1/4 x 1 1/4" "	0.138	25	225

NP01-LF
NP01R-LF



PEX Lead-Free* Brass Insert Couplings

FIGURE NO.	MATERIAL NO.	SIZE	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP01-LF	PX80520E	1/2 "	0.032	50	1,000
NP01R-LF	PX80540E	3/4 x 1/2" "	0.056	25	500
NP01-LF	PX80550E	3/4 "	0.058	25	500
NP01R-LF	PX80560E	1 x 3/4" "	0.093	15	120
NP01-LF	PX80570E	1 "	0.106	15	120
NP01R-LF	PX80590E	1 1/4 x 3/4"	0.095	10	80
NP01R-LF	PX80600E	1 1/4 x 1"	0.126	10	80
NP01-LF	PX80580E	1 1/4"	0.126	25	150

*Lead Free refers to the wetted surface of pipe, fittings and fixtures in potable water systems that have a weighted average lead content ≤ 0.25% Source: California Health & Safety Code (116875); Vermont Act 193.

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NIBCO® PEX
Metal Insert Fittings

ELBOWS

NP07
NP07R



PEX Brass Insert Elbows

FIGURE NO.	MATERIAL NO.	SIZE	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP07	PX80620	3/8"	0.0550	25	500
NP07	PX80630	1/2"	0.0440	50	750
NP07R	PX80640	3/4" x 1/2"	0.1280	25	300
NP07	PX80650	3/4"	0.0820	25	300
NP07	PX80660	1"	0.1800	15	150
NP07	PX80670	1-1/4"	0.3550	10	100

NP07
NP07R



PEX DZR Brass Insert Elbows

FIGURE NO.	MATERIAL NO.	SIZE	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP07	PX80630D	1/2" x 1/2"	0.0500	50	500
NP07R	PX80640D	3/4" x 1/2"	0.1920	25	300
NP07	PX80650D	3/4" x 3/4"	0.0890	25	300
NP07	PX80660D	1" x 1"	0.1470	15	225
NP07	PX80670D	1-1/4" 1 1/4"	0.1920	25	300

NP07-LF
NP07R-LF



PEX Lead-Free* Brass Insert Elbows

FIGURE NO.	MATERIAL NO.	SIZE	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP07-LF	PX80630E	1/2"	0.0440	50	750
NP07R-LF	PX80640E	3/4" x 1/2"	0.1280	25	300
NP07-LF	PX80650E	3/4"	0.0820	25	300
NP07-LF	PX80660E	1"	0.1800	15	150

*Lead Free refers to the wetted surface of pipe, fittings and fixtures in potable water systems that have a weighted average lead content ≤ 0.25% Source: California Health & Safety Code (116875); Vermont Act 193.

NIBCO® PEX
Metal Insert Fittings

TEES

NP11
NP11R



PEX Brass Insert Tees

FIGURE NO.	MATERIAL NO.	SIZE	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP11	PX80680	3/8"	0.0660	25	250
NP11R	PX80690	3/8" x 3/8" x 1/2"	0.0750	50	500
NP11R	PX80700	1/2" x 1/2" x 3/8"	0.1000	50	500
NP11	PX80710	1/2"	0.0650	50	500
NP11R	PX80720	1/2" x 1/2" x 3/4"	0.1500	25	250
NP11R	PX80730	3/4" x 1/2" x 1/2"	0.1280	25	250
NP11R	PX80740	3/4" x 1/2" x 3/4"	0.1020	25	250
NP11R	PX80750	3/4" x 3/4" x 1/2"	0.0920	25	250
NP11	PX80760	3/4"	0.1250	25	250
NP11R	PX80770	3/4" x 3/4" x 1"	0.3030	15	120
NP11R	PX80830	1" x 1/2" x 3/4"	0.1900	15	120
NP11R	PX80840	1" x 1/2" x 1"	0.1430	15	120
NP11R	PX80850	1" x 3/4" x 1/2"	0.1960	15	120
NP11R	PX80780	1" x 3/4" x 3/4"	0.2020	15	120
NP11R	PX80790	1" x 3/4" x 1"	0.2200	15	120
NP11R	PX80800	1" x 1" x 1/2"	0.2110	15	120
NP11R	PX80810	1" x 1" x 3/4"	0.2110	15	120
NP11	PX80820	1"	0.3000	10	120
NP11R	PX80880	1-1/4" x 1" x 1"	0.2980	10	80
NP11R	PX80870	1-1/4" x 1-1/4" x 1"	0.4000	10	80
NP11	PX80860	1-1/4"	0.4200	10	60

NP11
NP11R



PEX DZR Brass Insert Tees

FIGURE NO.	MATERIAL NO.	SIZE	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP11	PX80680D	3/8 x 3/8" "	0.062	25	250
NP11	PX80710D	1/2 x 1/2" "	0.059	50	500
NP11	PX80760D	3/4 x 3/4" "	0.109	25	250
NP11	PX80820D	1 x 1" "	0.188	10	120
NP11	PX80860D	1-1/4 x 1-1/4" "	0.420	10	60
NP11R	PX80690D	3/8 x 3/8" x 1/2" "	0.062	50	600
NP11R	PX80700D	1/2 x 1/2" x 3/8" "	0.061	50	500
NP11R	PX80720D	1/2 x 1/2" x 3/4" "	0.083	25	250
NP11R	PX80730D	3/4 x 1/2" x 1/2" "	0.106	25	250
NP11R	PX80740D	3/4 x 1/2" x 3/4" "	0.111	25	250
NP11R	PX80750D	3/4 x 3/4" x 1/2" "	0.092	25	250
NP11R	PX80770D	3/4 x 3/4" x 1" "	0.303	15	120
NP11R	PX80830D	1 x 1/2" x 3/4" "	0.191	15	120
NP11R	PX80840D	1 x 1/2" x 1" "	0.186	15	120
NP11R	PX80850D	1 x 3/4" x 1/2" "	0.191	15	120
NP11R	PX80780D	1 x 3/4" x 3/4" "	0.250	15	120
NP11R	PX80790D	1 x 3/4" x 1" "	0.179	15	120
NP11R	PX80800D	1 x 1" x 1/2" "	0.198	15	120
NP11R	PX80810D	1 x 1" x 3/4" "	0.198	15	120
NP11R	PX80870D	1-1/4 x 1-1/4" x 1" "	0.400	10	80
NP11R	PX80880D	1-1/4 x 1" x 1" "	0.297	10	80

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NIBCO® PEX
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TEES

NP11-LF
NP11R-LF



PEX Lead-Free* Brass Insert Tees

FIGURE NO.	MATERIAL NO.	SIZE	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP11-LF	PX80710E	1/2 "	0.065	50	500
NP11R-LF	PX80720E	1/2 x 1/2" x 3/4" "	0.150	25	250
NP11R-LF	PX80730E	3/4 x 1/2" x 1/2" "	0.128	25	250
NP11R-LF	PX80740E	3/4 x 1/2" x 3/4" "	0.102	25	250
NP11R-LF	PX80750E	3/4 x 3/4" x 1/2" "	0.092	25	250
NP11-LF	PX80760E	3/4 "	0.125	25	250
NP11R-LF	PX80810E	1 x 1" x 3/4" "	0.211	15	120

MULTI-PORT HEADERS

NP203B
NP204B



PEX Multi-Port Headers

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT/ PIECE	BAG QTY.	MASTER CTN. QTY.
NP203B	PX01166	3-Outlet Multi-Port Header Open 3/4" x 1/2" Out	0.3040	1	10
NP204B	PX01168	4-Outlet Multi-Port Header Open 3/4" x 1/2" Out	0.3090	1	10

STUB OUTS*

NP21
NP21S



PEX Copper Stub Out Elbows

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP21	PX80950	1/2" Stub Out Elbow (3-1/2" x 8")	0.2580	25	25
NP21	PX80960	3/4" PEX Stub Out Elbow (4" x 8")	0.4120	50	50
NP21S	PX80970	1/2" Stub Out Elbow w/Flange (3-1/2"-8")	0.3070	25	25
NP21S	PX80990	3/4" Stub Out Elbow w/Sq O Strap (4"-8")	0.4860	25	25

NP43



PEX Copper Straight Stub Outs

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP43	PX01480	1/2" x 8" PEX Straight Stub Out	0.1780	100	100
NP43	PX81000	1/2" x 12" PEX Straight Stub Out	0.2670	25	25

* Not recommended for use with Stainless Steel Clamps

*Lead Free refers to the wetted surface of pipe, fittings and fixtures in potable water systems that have a weighted average lead content ≤ 0.25% Source: California Health & Safety Code (116875); Vermont Act 193.

NIBCO® PEX
Metal Insert Fittings

ADAPTERS

NP22F



PEX Brass PEX x Sweat Elbow Adapters

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP22F	PX81010	3/8" PEX x 1/2" Female Sweat Elbow Adapter	0.0600	25	100
NP22F	PX81020	1/2" PEX x 1/2" Female Sweat Elbow Adapter	0.0510	10	250
NP22	PX81040	5/8" PEX x 3/4" Male Sweat Elbow Adapter	0.1280	15	120
NP22F	PX81050	5/8" PEX x 3/4" Female Sweat Elbow Adapter	0.1500	15	120
NP22F	PX81030	3/4" PEX x 3/4" Female Sweat Elbow Adapter	0.0980	10	50

NP22F



PEX DZR Brass PEX x Sweat Elbow Adapters

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP22	PX81040D	5/8" PEX x 3/4" Male Sweat Elbow Adapter	0.1280	15	120
NP22F	PX81030D	3/4" PEX x 3/4" Female Sweat Elbow Adapter	0.1470	10	100
NP22F	PX81050D	5/8" PEX x 3/4" Female Sweat Elbow Adapter	0.1500	15	120

NP23
NP23F



PEX Brass PEX x Sweat Adapters

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP23	PX81060	3/8" PEX x 3/8" Male Sweat Adapter	0.0210	25	500
NP23	PX81070	1/2" PEX x 1/2" Male Sweat Adapter	0.0320	50	500
NP23	PX81090	3/4" PEX x 3/4" Male Sweat Adapter	0.0640	25	250
NP23	PX81100	1" PEX x 1" Male Sweat Adapter	0.1600	15	120
NP23	PX81110	1-1/4" PEX x 1-1/4" Male Sweat Adapter	0.2330	10	100
NP23F	PX81120	1/2" PEX x 1/2" Female Sweat Adapter	0.0320	50	500
NP23F	PX81080	5/8" PEX x 3/4" Female Sweat Adapter	0.0800	25	500
NP23F	PX81130	3/4" PEX x 3/4" Female Sweat Adapter	0.0620	25	250
NP23F	PX81140	1" PEX x 1" Female Sweat Adapter	0.1300	15	120
NP23F	PX81145	1-1/4" PEX x 1-1/4" Female Sweat Adapter	0.1960	10	80
NP23F	PX81646	1/2" PEX x 3/4" Male Sweat Adapter	0.0500	50	500
NP23F	PX81676	1/2" PEX x 3/4" Female Sweat Adapter	0.0600	50	500
NP23F	PX81751	3/4" PEX x 1/2" Male Sweat Adapter	0.0500	50	500

NP23
NP23F



PEX DZR Brass PEX x Sweat Adapters

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP23	PX81070D	1/2 PEX x 1/2" Male Sweat Adapter	0.034	50	500
NP23	PX01646D	1/2 PEX x 3/4" Male Sweat Adapter	0.050	50	300
NP23F	PX81080D	5/8 PEX x 3/4" Female Sweat Adapter	0.080	25	500
NP23	PX01751D	3/4 PEX x 1/2" Male Sweat Adapter	0.050	50	300
NP23	PX81090D	3/4 PEX x 3/4" Male Sweat Adapter	0.085	25	250
NP23	PX81100D	1 PEX x 1" Male" Sweat Adapter	0.160	15	180
NP23	PX81110D	1-1/4 PEX x 1-1/4 Male Sweat Adapter	0.233	10	150
NP23F	PX81120D	1/2 PEX x 1/2" Female Sweat Adapter	0.048	50	550
NP23F	PX01676D	1/2 PEX x 3/4" Female Sweat Adapter	0.060	50	300
NP23F	PX81130D	3/4 PEX x 3/4" Female Sweat Adapter	0.085	25	300
NP23F	PX81140D	1 PEX x 1" Female Sweat Adapter	0.166	15	150
NP23F	PX81145D	1-1/4 PEX x 1-1/4" Female Sweat Adapter	0.196	10	120

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NIBCO® PEX
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ADAPTERS

NP23-LF
NP23F-LF



PEX Lead-Free* PEX x Sweat Adapters

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP23-LF	PX81070E	1/2 PEX x 1/2" Male Sweat Adapter	0.032	50	500
NP23-LF	PX81090E	3/4 PEX x 3/4" Male Sweat Adapter	0.064	25	250
NP23F-LF	PX81120E	1/2 PEX x 1/2" Female Sweat Adapter	0.032	50	500
NP23F-LF	PX81130E	3/4 PEX x 3/4" Female Sweat Adapter	0.062	25	250
NP23F-LF	PX81140E	1 PEX x 1" Female Sweat Adapter	0.130	15	120

NP25B



PEX Brass PEX x MIP Adapters

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BOX QTY.	MASTER CTN. QTY.
NP25B	PX81180	3/8" PEX x 1/2" MIP Brass Adapter	0.0850	50	500
NP25B	PX81190	1/2" PEX x 1/2" MIP Brass Adapter	0.0840	50	500
NP25B	PX81200	1/2" PEX x 3/4" MIP Brass Adapter	0.1300	25	250
NP25B	PX81230	5/8" PEX x 3/4" MIP Brass Adapter	0.1150	25	250
NP25B	PX81210	3/4" PEX x 1/2" MIP Brass Adapter	0.0870	25	250
NP25B	PX81220	3/4" PEX x 3/4" MIP Brass Adapter	0.1510	10	300
NP25B	PX81250	3/4" PEX x 1" MIP Brass Adapter	0.2420	15	200
NP25B	PX81240	1" PEX x 3/4" MIP Brass Adapter	0.1490	15	120
NP25B	PX81260	1" PEX x 1" MIP Brass Adapter	0.2420	15	120
NP25B	PX81265	1-1/4" PEX x 1-1/4" MIP Brass Adapter	0.5560	10	80

NP25B



PEX DZR Brass PEX x MIP Adapters

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BOX QTY.	MASTER CTN. QTY.
NP25B	PX81180D	3/8 PEX x 1/2" MIP Brass Adapter	0.085	50	500
NP25B	PX81190D	1/2 PEX x 1/2" MIP Brass Adapter	0.084	50	500
NP25B	PX81200D	1/2 PEX x 3/4" MIP Brass Adapter	0.130	25	150
NP25B	PX81210D	3/4 PEX x 1/2" MIP Brass Adapter	0.087	25	150
NP25B	PX81220D	3/4 PEX x 3/4" MIP Brass Adapter	0.151	10	320
NP25B	PX81250D	3/4 PEX x 1" MIP Brass Adapter	0.242	25	200
NP25B	PX81240D	1 PEX x 3/4" MIP Brass Adapter	0.149	15	180
NP25B	PX81260D	1 PEX x 1" MIP Brass Adapter	0.242	15	180
NP25B	PX81265D	1-1/4 x 1-1/4" MIP Brass Adapter	0.556	10	100

NP25B-LF



PEX Lead-Free* Brass PEX x MIP Adapters

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BOX QTY.	MASTER CTN. QTY.
NP25B-LF	PX81190E	1/2 PEX x 1/2" MIP Brass Adapter	0.084	50	500
NP25B-LF	PX81200E	1/2 PEX x 3/4" MIP Brass Adapter	0.130	25	250
NP25B-LF	PX81210E	3/4 PEX x 1/2" MIP Brass Adapter	0.087	25	250
NP25B-LF	PX81220E	3/4 PEX x 3/4" MIP Brass Adapter	0.151	10	300
NP25B-LF	PX81260E	1 PEX x 1" MIP Brass Adapter	0.242	15	120

*Lead Free refers to the wetted surface of pipe, fittings and fixtures in potable water systems that have a weighted average lead content ≤ 0.25% Source: California Health & Safety Code (116875); Vermont Act 193.

NIBCO® PEX
Metal Insert Fittings

ADAPTERS

NP25BE



PEX Brass PEX x MIP Elbows

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BOX QTY.	MASTER CTN. QTY.
NP25BE	PX81490	1/2" x 3/8" MIP Brass Elbow	0.1770	50	250
NP25BE	PX81500	1/2" x 1/2" MIP Brass Elbow	0.1840	50	250
NP25BE	PX81505	1/2" x 3/4" MIP Brass Elbow	0.1900	25	250
NP25BE	PX81502	3/4" x 1/2" MIP Brass Elbow	0.1900	25	250
NP25BE	PX81510	3/4" x 3/4" MIP Brass Elbow	0.1920	25	250

NP25BE



PEX DZR Brass PEX x MIP Elbows

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BOX QTY.	MASTER CTN. QTY.
NP25BE	PX81500D	1/2 PEX x 1/2" MIP Brass Elbow	0.18	50	250
NP25BE	PX81510D	3/4 PEX x 3/4" MIP Brass Elbow	0.192	25	250
NP25BE	PX81490D	1/2 PEX x 3/8" MIP Brass Elbow	0.177	50	250
NP25BE	PX81505D	1/2 PEX x 3/4" MIP Brass Elbow	0.19	25	250

NP25BE-LF



PEX Lead-Free* Brass PEX x MIP Elbows

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BOX QTY.	MASTER CTN. QTY.
NP25BE-LF	PX81500E	1/2" PEX x 1/2" MIP Elbow	0.1840	50	250
NP25BE-LF	PX81502E	3/4" PEX x 1/2" MIP Elbow	0.1900	25	250

*Lead Free refers to the wetted surface of pipe, fittings and fixtures in potable water systems that have a weighted average lead content ≤ 0.25% Source: California Health & Safety Code (116875); Vermont Act 193.

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ADAPTERS

NP27
NP27SE
NP44



PEX Brass and Copper Faucet & Closet Adapters

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BOX QTY.	MASTER CTN. QTY.
NP27	PX81330	3/8" PEX x 1/2" NPSM Straight Swivel Faucet Adapter	0.0440	25	50
NP27	PX01870	1/2" PEX x 1/2" NPSM Straight Swivel Faucet Adapter	0.0570	50	500
NP27SE	PX81350	3/8" PEX x 1/2" NPSM Swivel Elbow Faucet Adapter	0.0680	25	500
NP27SE	PX01880	1/2" PEX x 1/2" NPSM Swivel Elbow Faucet Adapter	0.0700	50	500
NP44	PX81370	3/8" PEX x Straight Swivel Closet Adapter	0.0510	25	500
NP44	PX81380	1/2" PEX x Straight Swivel Closet Adapter	0.0580	10	50

NP27
NP27SE
NP44



PEX DZR Brass and Copper Faucet & Closet Adapters

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BOX QTY.	MASTER CTN. QTY.
NP27	PX81330D	3/8" PEX x 1/2" Straight Swivel Faucet Adapter	0.0440	25	100
NP27SE	PX81350D	3/8" PEX x 1/2" Swivel Elbow Adapter	0.0680	25	500
NP44	PX81370D	3/8" PEX x 3/8" Straight Swivel Closet Adapter	0.0510	25	500
NP44	PX81380D	1/2" PEX x 1/2" Straight Swivel Closet Adapter	0.0580	10	100

NP26BS
NP26PS



PEX Brass Swivel Adapters

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BOX QTY.	MASTER CTN. QTY.
NP26PS	PX02345	1/2" NPSM Swivel Adapter - Plastic Nut	0.0470	50	500
NP26BS	PX02346	1/2" NPSM Swivel Adapter - Brass Nut	0.1420	50	500
NP26BS	PX81340	1/2" x 3/4" NPSM Forged Swivel Adapter - Brass Nut	0.1500	25	250
NP26BS	PX81360	3/4" x 3/4" NPSM Forged Swivel Adapter - Brass Nut	0.1500	25	250

NP26BS
NP26PS



PEX DZR Brass Swivel Adapters

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BOX QTY.	MASTER CTN. QTY.
NP26PS	PX02345D	1/2 PEX x 1/2" NPSM Swivel Adapter - Plastic Nut	0.048	50	500
NP26BS	PX02346D	1/2 PEX x 1/2" NPSM Swivel Adapter - Brass Nut	0.142	50	250
NP26BS	PX81340D	1/2 PEX x 3/4" NPSM Swivel Adapter - Brass Nut	0.15	25	250
NP26BS	PX81360D	3/4 PEX x 3/4" NPSM Swivel Adapter - Brass Nut	0.15	25	250

NP26BS-LF
NP26PS-LF



PEX Lead-Free* Brass Swivel Adapters

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BOX QTY.	MASTER CTN. QTY.
NP26PS	PX02345D	1/2 PEX x 1/2" NPSM Swivel Adapter - Plastic Nut	0.048	50	500
NP26BS	PX02346D	1/2 PEX x 1/2" NPSM Swivel Adapter - Brass Nut	0.142	50	250
NP26BS	PX81340D	1/2 PEX x 3/4" NPSM Swivel Adapter - Brass Nut	0.15	25	250
NP26BS	PX81360D	3/4 PEX x 3/4" NPSM Swivel Adapter - Brass Nut	0.15	25	250

*Lead Free refers to the wetted surface of pipe, fittings and fixtures in potable water systems that have a weighted average lead content ≤ 0.25% Source: California Health & Safety Code (116875); Vermont Act 193.

NIBCO® PEX
Metal Insert Fittings

ADAPTERS

NP27B
NP27P



PEX Brass Swivel Elbows

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP27P	PX02245	1/2" x 1/2" NPSM Swivel Elbow (Plastic Nut)	0.0910	50	250
NP27B	PX02255	1/2" x 1/2" NPSM Swivel Elbow (Brass Nut)	0.1740	50	250

NP27B
NP27P



PEX DZR Swivel Elbows

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP26SE	PX81290D	1/2 PEX x 3/4" NPSM Swivel Elbow Brass Adapter	0.172	10	100
NP26SE	PX81320D	3/4 PEX x 3/4" NPSM Swivel Elbow Brass Adapter	0.174	10	100
NP27P	PX02245D	1/2X1/2 NPSM Swivel Elbow - (Plastic Nut)	0.092	50	300
NP27B	PX02255D	1/2 PEX x 1/2 NPSM Swivel Elbow - (Brass Nut)	0.176	50	250

NP27P-LF



PEX Lead-Free* Swivel Elbows

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP27P-LF	PX02245E	1/2 x 1/2" NPSM Swivel Elbow (Plastic Nut)	0.091	50	250

NP27BC
NP27G
NP27PN



PEX Replacement Parts for Swivel Adapters

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BOX QTY.	MASTER CTN. QTY.
NP27G	PX02265	1/2" Gasket	0.0020	25	1,000
NP27G	PX02275	3/4" Gasket	0.0020	25	1,000
NP27PN	PX02373	1/2" Plastic Nut	0.0100	10	300
NP27BC	PX02375	1/2" Brass Core	0.0100	25	25
NP27BC	PX02385	3/4" Brass Core	0.0800	5	100

NP27BC



PEX Replacement Parts for Swivel Adapters

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BOX QTY.	MASTER CTN. QTY.
NP27BC	PX02375D	1/2" Brass Core	0.0100	25	1000
NP27BC	PX02385D	3/4" Brass Core	0.0800	100	2500

NP26SE



PEX Brass and BARB x NPSM Adapters

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BOX QTY.	MASTER CTN. QTY.
NP26SE	PX81290	1/2" PEX x 3/4" NPSM Swivel Elbow Brass Adapter	0.1720	10	50
NP26SE	PX81320	3/4" PEX x 3/4" NPSM Swivel Elbow Brass Adapter	0.1740	10	20

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Metal Insert Fittings

ADAPTERS

NP26B



PEX Brass FIP Non-Swivel Adapters

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BOX QTY.	MASTER CTN. QTY.
NP26B	PX81270	1/2" x 1/2" FIP Non-Swivel Adapter	0.1200	50	250
NP26B	PX81280	1/2" x 3/4" FIP Non-Swivel Adapter	0.1140	25	250
NP26B	PX81300	3/4" x 3/4" FIP Non-Swivel Adapter	0.1650	25	250
NP26B	PX81305	3/4" x 1" FIP Non-Swivel Adapter	0.0980	15	120
NP26B	PX01835	1" x 3/4" FIP Non-Swivel Adapter	0.1470	15	120
NP26B	PX81310	1" x 1" FIP Non-Swivel Adapter	0.2640	15	120
NP26B	PX81313	1-1/4" x 1" FIP Non-Swivel Adapter	0.2640	10	80
NP26B	PX81315	1-1/4" x 1-1/4" FIP Non-Swivel Adapter	0.3150	10	80

NP26B



PEX DZR Brass FIP Non-Swivel Adapters

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BOX QTY.	MASTER CTN. QTY.
NP26B	PX81270D	1/2 PEX x 1/2" FIP Non-Swivel Adapter	0.120	50	350
NP26B	PX81280D	1/2 PEX x 3/4" FIP Non-Swivel Adapter	0.114	25	300
NP26B	PX81300D	3/4 PEX x 3/4" FIP Non-Swivel Adapter	0.165	25	300
NP26B	PX81310D	1 PEX x 1" FIP Non-Swivel Adapter	0.264	15	150
NP26B	PX81315D	1-1/4 PEX x 1-1/4" FIP Non-Swivel Adapter	0.315	10	100

NP26B-LF



PEX Lead-Free* Brass FIP Non-Swivel Adapters

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BOX QTY.	MASTER CTN. QTY.
NP26B-LF	PX81270E	1/2" x 1/2" FIP Non-Swivel Adapter	0.1200	50	250
NP26B-LF	PX81300E	3/4" x 3/4" FIP Non-Swivel Adapter	0.1650	25	250

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NIBCO® PEX
Metal Insert Fittings

MISCELLANEOUS FITTINGS

NP18



PEX Brass Insert Plugs

FIGURE NO.	MATERIAL NO.	SIZE	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP18	PX81440	3/8"	0.0170	25	400
NP18	PX81460	3/4"	0.0460	25	1,000

NP18



PEX DZR Brass Insert Plugs

FIGURE NO.	MATERIAL NO.	SIZE	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP18	PX81440D	3/8"	0.015	25	600
NP18	PX81450D	1/2"	0.024	50	1,500
NP18	PX81460D	3/4"	0.042	25	1,000
NP18	PX81470D	1-1/4"	0.160	15	150

NP18-LF



PEX Lead-Free* Brass Insert Plugs

FIGURE NO.	MATERIAL NO.	SIZE	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP18-LF	PX81450E	1/2"	0.023	50	1,500
NP18-LF	PX81460E	3/4"	0.046	25	1,000
NP18-LF	PX81480E	1"	0.066	15	120
NP18-LF	PX81470E	1 1/4"	0.071	15	120

NP24A



PEX Copper Tub/Shower Pressure Connections

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BOX QTY.	MASTER CTN. QTY.
NP24A	PX81160	1/2" PEX x 1/2" M Sweat (4x3) Tub/Shw	0.1400	25	25
NP24A	PX81170	1/2" PEX x 1/2" M Sweat (6x3) Tub/Shw	0.2000	25	25

NP28



PEX Brass FIP Drop Ear Elbows

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BOX QTY.	MASTER CTN. QTY.
NP28	PX81390	3/8" PEX x 1/2" FIP Drop Ear Elbow	0.1860	10	50

NP28



PEX DZR Brass FIP Drop Ear Elbows

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BOX QTY.	MASTER CTN. QTY.
NP28	PX81400D	1/2 PEX x 1/2" FIP Drop Ear Elbow	0.155	25	200
NP28	PX81410D	3/4 PEX x 1/2" FIP Drop Ear Elbow	0.208	10	100
NP28	PX81420D	3/4 PEX x 3/4" FIP Drop Ear Elbow	0.287	25	100

NP28-LF



PEX Lead-Free* Brass FIP Drop Ear Elbows

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BOX QTY.	MASTER CTN. QTY.
NP28-LF	PX81400E	1/2" PEX x 1/2" FIP Drop Ear Elbow	0.1780	25	200

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NIBCO® PEX
Metal Insert Fittings

MISCELLANEOUS FITTINGS

NP11B
NP29
NP29R
NP29PE



PEX Brass Transition Fittings

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP11B	PX00752	1/2" PB x 1/2" PB x 1/2" PEX Tee	0.1000	50	50
NP11B	PX00753	3/4" PB x 3/4" PB x 3/4" PEX Tee	0.1500	50	30
NP29	PX81530	1/2" PEX x PB Transition Fitting	0.0520	50	1,000
NP29	PX81540	3/4" PEX x PB Transition Fitting	0.0700	25	500
NP29	PX81550	1" PEX x PB Transition Fitting	0.0100	25	500
NP29R	PX02283	1/2" PEX x PB W/Rings Transition Fitting	0.0500	25	25
NP29R	PX02293	3/4" PEX x PB W/Rings Transition Fitting	0.1000	25	25
NP29	PX02303	1" PEX x PB W/Rings Transition Fitting	0.0100	20	20
NP29PE	PX81570	3/4" PEX x 3/4" PE Coupling Transition Fitting	0.1300	15	120
NP29PE	PX81560	1" PEX x 3/4" PE Coupling Transition Fitting	0.2060	15	120
NP29PE	PX81580	1" PEX x 1" PE Coupling Transition Fitting	0.1960	15	120

NP29
NP29R



PEX DZR Brass Transition Fittings

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP29	PX81530D	1/2 PEX x 1/2" PB Transition Fitting	0.035	50	500
NP29	PX81540D	3/4 PEX x 3/4" PB Transition Fitting	0.051	25	300
NP29	PX81550D	1 PEX x 1" PB Transition Fitting	0.082	25	500
NP29R	PX02283D	1/2 PEX x 1/2" PB Transition Fitting w/ Rings	0.05	1	25
NP29R	PX02293D	3/4 PEX x 3/4" PB Transition Fitting w/ Rings	0.1	1	25
NP29R	PX02303D	1 PEX x 1" PB Transition Fitting w/ Rings	0.15	1	20

NP100
NP100SW
NP101



PEX Compression Fittings

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP100SW	PX81650	1/2" PEX COMP x COMP Coupling	0.0300	10	80
NP100	PX81652	Compression Nut for 81650	0.0100	50	250
NP101	PX81654	Ferrule for 81650	0.0100	50	250
NP01WT083	PX81610	5/8" COMP .083 SDR9 Coupling	0.1800	10	80
NP100	PX79002	Compression Nut for 81610, 79000	0.0100	50	250
NP101	PX79004	Ferrule for 81610, 79000	0.0100	50	250
NP25W7083	PX81600	5/8" Compression x 3/4" Male Sweat	0.1830	10	80
NP100SWM	PX81640	1/2" Compression x 3/4" Male Sweat	0.0300	10	80

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NIBCO® PEX
Plastic Insert Fittings

NPD01
NPD01R



PEX Poly Couplings

FIGURE NO.	MATERIAL NO.	SIZE	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NPD01	PX00508C	3/8"	0.0070	50	2,500
NPD01R	PX00518C	1/2" x 3/8"	0.0070	50	2,000
NPD01	PX00528N	1/2"	0.0020	50	500
NPD01R	PX00538C	3/4" x 1/2"	0.0100	50	500
NPD01	PX00548N	3/4"	0.0100	50	500
NPD01R	PX00558C	3/4" x 1"	0.0200	25	500
NPD01	PX00578C	1"	0.0200	25	500

NPD07
NPD07R



PEX Poly Elbows

FIGURE NO.	MATERIAL NO.	SIZE	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NPD07	PX00588N	1/2"	0.0100	50	500
NPD07R	PX00598C	3/4" x 1/2"	0.0200	25	250
NPD07	PX00608N	3/4"	0.0200	25	400
NPD07	PX00618C	1"	0.0500	25	250

NPD11
NPD11R



PEX Poly Tees

FIGURE NO.	MATERIAL NO.	SIZE	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NPD11	PX00628C	3/8"	0.0160	25	1,200
NPD11	PX00638C	1/2"	0.0100	50	500
NPD11R	PX00648C	1/2" x 1/2" x 3/4"	0.0200	25	500
NPD11R	PX00658N	3/4" x 1/2" x 1/2"	0.0200	25	300
NPD11R	PX00668N	3/4" x 1/2" x 3/4"	0.0200	25	400
NPD11R	PX00678N	3/4" x 3/4" x 1/2"	0.0200	25	400
NPD11	PX00688N	3/4"	0.0300	25	300
NPD11R	PX00698C	3/4" x 3/4" x 1"	0.0500	25	300
NPD11R	PX00708C	1" x 3/4" x 3/4"	0.0500	25	250
NPD11R	PX00718C	1" x 3/4 "X 1"	0.0500	25	200
NPD11R	PX00728C	1" x 1" x 1/2"	0.0400	25	250
NPD11R	PX00738C	1" x 1" x 3/4"	0.0500	25	250
NPD11	PX00748C	1"	0.0600	25	150

PLUGS

NP18P



PEX Poly Plugs

FIGURE NO.	MATERIAL NO.	SIZE	WEIGHT	BAG QTY.	MASTER CTN. QTY.
N18P	PX01975C	3/8"	0.0060	20	3,000
NP18P	PX01980	1/2"	0.0060	100	1,000
NP18P	PX01990C	3/4"	0.0130	100	1,000
NP18P	PX01995C	1"	0.1690	25	250

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NIBCO® PEX
Plastic Insert Fittings

NPD22
NPD25BE



PEX Male Poly Adapters

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NPD22	PX01758C	1/2" x 1/2" MIP Poly Adapter	0.0200	50	500
NPD22	PX01768C	3/4" x 3/4" MIP Poly Adapter	0.0200	25	400
NPD22	PX01778C	1/2" x 3/4"MIP Poly Adapter	0.0180	25	700
NPD22	PX01788C	MIP Poly Adapter 3/4" x 1/2"	0.0180	25	600
NPD22	PX01798C	MIP Poly Adapter 1"	0.0200	25	300
NPD25BE	PX01968C	3/4" x 1/2" MIP Poly Adapter Elbow	0.0180	25	500
NPD25BE	PX01978C	3/4" MIP Poly Adapter Elbow	0.0180	25	400

NPD26
NPD26E



PEX Female Poly Swivel Adapters

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NPD26	PX01898C	3/4" x 3/4" NPSM Poly Swivel	0.0400	50	500
NPD26	PX02148C	3/8" x 1/2" NPSM Poly Swivel	0.0300	50	600
NPD26E	PX02248C	1/2" x 1/2" NPSM Poly Swivel Elbow	0.0300	10	500
NPD26E	PX02348C	3/4" x 3/4" NPSM Poly Swivel Elbow	0.0300	25	400

NIBCO® PUSH 'N GO®

Fittings

PG01
PG01F
PG01M
PG01RS



Push 'N Go® Couplings

FIGURE NO.	MATERIAL NO.	SIZE	WEIGHT	BAG QTY.	MASTER CTN. QTY.
PG01	PX20100	1/2"	0.0500	10	500
PG01	PX20110	3/4"	0.0950	10	250
PG01M	PX20120	1/2" Male	0.0350	10	600
PG01M	PX20130	3/4" Male	0.0650	10	400
PG01F	PX20140	1/2" Female	0.0500	10	500
PG01F	PX20150	3/4" Female	0.0800	10	300
PG01RS	PX20530	1/2" Stack x 3/8" Reducer	0.0250	10	600
PG01RS	PX20540	3/4" Stack x 1/2" Reducer	0.0400	10	500

PG07, PG07F
PG07M, PG07F
PG035E



Push 'N Go® Elbows

FIGURE NO.	MATERIAL NO.	SIZE	WEIGHT	BAG QTY.	MASTER CTN. QTY.
PG07	PX20200	1/2"	0.0600	10	500
PG07	PX20210	3/4"	0.1100	10	200
PG07M	PX20220	1/2" Male	0.0400	10	500
PG07F	PX20230	1/2" Female	0.0600	10	450
PG35E	PX20240	1/2" Closet Adapter (1/2" x 1/2" x 1/4" OD)	0.0700	10	400

PG11
PG11R



Push 'N Go® Tees

FIGURE NO.	MATERIAL NO.	SIZE	WEIGHT	BAG QTY.	MASTER CTN. QTY.
PG11	PX20000	1/2" x 1/2" x 1/2"	0.0800	10	300
PG11R	PX20020	3/4" x 3/4" x 1/2"	0.1300	10	200
PG11R	PX20010	3/4" x 3/4" x 3/4"	0.1600	10	160
PG11	PX20030	1/2" Icemaker Tee	7.2400	10	300

PG17



Push 'N Go® End Caps

FIGURE NO.	MATERIAL NO.	SIZE	WEIGHT	BAG QTY.	MASTER CTN. QTY.
PG17	PX20500	1/2"	0.0300	10	1,000
PG17	PX20501	3/4"	0.0300	10	500

It is recommended that Push 'N Go® fittings be used only with plastic CTS tubing.

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NIBCO® PUSH 'N GO®

Fittings

PG35
PG36
PG36E



Push 'N Go® Adapters

FIGURE NO.	MATERIAL NO.	SIZE	WEIGHT	BAG QTY.	MASTER CTN. QTY.
PG35	PX20300	1/2" Closet	0.0600	10	300
PG36	PX20310	1/2" Garden Hose Adapter	0.0550	10	400
PG36E	PX20320	1/2" Garden Hose Adapter Elbow	0.0650	10	300

PG11S



Push 'N Go® Stack Tees

FIGURE NO.	MATERIAL NO.	SIZE	WEIGHT	BAG QTY.	MASTER CTN. QTY.
PG11S	PX20400	1/2" Tee	0.0700	10	350
PG11S	PX20410	3/4" Tee	0.0450	10	150

PG07S



Push 'N Go® Stack Elbows

FIGURE NO.	MATERIAL NO.	SIZE	WEIGHT	BAG QTY.	MASTER CTN. QTY.
PG07S	PX20420	1/2" Elbow	0.0800	10	350
PG07S	PX20430	3/4" Elbow	0.0800	10	250

PGLC



Push 'N Go® Locking Clips

FIGURE NO.	MATERIAL NO.	SIZE	WEIGHT	BAG QTY.	MASTER CTN. QTY.
PGLC	PX20550	1/4" Icemaker	0.0010	10	1,000
PGLC	PX20560	3/8"	0.0020	100	2,000
PGLC	PX20570	1/2"	0.0020	100	2,000
PGLC	PX20580	3/4"	0.0020	100	3,000
PGLC	PX20590	1"	0.0020	100	3,000

PGV
PG97



Push 'N Go® Miscellaneous

FIGURE NO.	MATERIAL NO.	SIZE	WEIGHT	BAG QTY.	MASTER CTN. QTY.
PGV	PX20510	1/2" In-Line Valve	0.1050	10	200
PG97	PX20520	1/2" In-Line Union	0.0500	10	300

It is recommended that Push 'N Go® fittings be used only with plastic CTS tubing.

NIBCO® PEX

Connections (Crimp, Sleeve, Clamp)

CONNECTIONS

NP19



PEX Copper Crimp Rings

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP19	PX80900	3/8" Copper Crimp Ring (black)	0.0110	100	1,000
NP19	PX80910	1/2" Copper Crimp Ring (black)	0.0130	100	1,000
NP19	PX80920	3/4" Copper Crimp Ring (black)	0.0170	50	500
NP19	PX80930	1" Copper Crimp Ring (black)	0.0220	50	250
NP19	PX80940	1-1/4" Copper Crimp Ring (black)	0.2530	25	250

NP19CS



PEX Copper Crimp Sleeves

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP19CS	PX80911	1/2" Copper Crimp Sleeve	0.019	50	600
NP19CS	PX80921	3/4" Copper Crimp Sleeve	0.028	50	500
NP19CS	PX80931	1" Copper Crimp Sleeve	0.031	50	250

NP19PB



PEX Polybutylene Crimp Rings

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP19PB	PX02605	3/8" Polybutylene Crimp Ring	0.0100	100	1,000
NP19PB	PX02615	1/2" Polybutylene Crimp Ring	0.0130	100	1,000
NP19PB	PX02625	3/4" Polybutylene Crimp Ring	0.0180	100	500
NP19PB	PX02635	1" Polybutylene Crimp Ring	0.0220	25	250

NP50



PEX Stainless Steel Sleeves

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP50	PX02110	1/2" SS PEX Sleeve	0.0060	50	5,000
NP50	PX02120	3/4" SS PEX Sleeve	0.0100	50	2,500
NP50	PX02130	1" SS PEX Sleeve	0.0100	50	2,500

NP51



PEX Stainless Steel Clamps

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP51	PX02140	3/8" SS PEX Clamp	0.0060	100	2,000
NP51	PX02150	1/2" SS PEX Clamp	0.0090	100	2,000
NP51	PX02155	5/8" SS PEX Clamp	0.0160	100	1000
NP51	PX02160	3/4" SS PEX Clamp	0.0160	50	1,000
NP51	PX02170	1" SS PEX Clamp	0.0240	50	500

* Not intended for use with copper fittings, such as stub outs.

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NIBCO® PEX

Home Run Manifolds

HOME RUN MANIFOLD®

6-Port and 12-Port Manifolds - Lead Free*

1" CTS Trunk, 3/4" and 1" End Connections, 1/2" Ports

All manifolds (except bulk models) come with:

- Mounting clip(s) and screws
- Hot and cold label sheets
- Mounting template
- Instructions



6-Port



12-Port

FIGURE NO.	MATERIAL NO.	DESCRIPTION	TRUNK JOINTS END 1	TRUNK JOINTS END 2	VALVES 1/2"	DIMENSIONS LENGTH	DIMENSIONS WIDTH	DIMENSIONS HEIGHT
PM6-A	PX90002	6-Port Manifold	None	None	No	16"	3"	1-1/8"
PM6-LF	PX90003E	6-Port Manifold	1" PEX	1" Plug	No	17-1/4"	3"	1-1/8"
PM6-LF	PX90004E	6-Port Manifold	3/4" PEX	1" Plug	No	17-1/8"	3"	1-1/8"
PM6-V1-LF	PX90005E	6-Port Manifold w/Valves	1" PEX	1" Plug	6	17-1/4"	3"	1-1/8"
PM6-V1-LF	PX90006E	6-Port Manifold w/Valves	3/4" PEX	1" Plug	6	17-1/8"	3"	1-1/8"
PM6-B	PX90069	6-Port Manifold - Bulk	None	None	No	16"	3"	1-1/8"
PM6-P-LF	PX90067E	6-Port Manifold - 1" Plug Ends	1" Plug	1" Plug	No	16"	3"	1-1/8"
PM12-LF	PX90007E	12-Port Manifold	1" PEX	1" Plug	No	34-3/8"	3"	1-1/8"
PM12-LF	PX90008E	12-Port Manifold	3/4" PEX	1" Plug	No	33-7/8"	3"	1-1/8"
PM12-V1-LF	PX90009E	12-Port Manifold w/Valves	1" PEX	1" Plug	12	34-3/8"	3"	1-1/8"
PM12-V1-LF	PX90010E	12-Port Manifold w/Valves	3/4" PEX	1" Plug	12	33-7/8"	3"	1-1/8"
PM12-P-LF	PX90068E	12-Port Manifold - 1 1/4" Plug Ends	1" Plug	1" Plug	No	34-3/8"	3"	1-1/8"

*Lead Free refers to the wetted surface of pipe, fittings and fixtures in potable water systems that have a weighted average lead content ≤ 0.25% Source: California Health & Safety Code (116875); Vermont Act 193.

NIBCO® PEX

Home Run Manifolds

HOME RUN MANIFOLD®

8-Port and 16-Port Manifolds - Lead Free*

1 1/4" CTS Trunk, 3/4", 1" and 1-1/4" End Connections, 1/2" Ports

V1 Models - 1/2" Valves

All manifolds (except bulk models) come with:

- Mounting clip(s) and screws
- Hot and cold label sheets
- Mounting template
- Instructions



8-Port



16-Port

FIGURE NO.	MATERIAL NO.	DESCRIPTION	TRUNK JOINTS END 1	TRUNK JOINTS END 2	VALVES 1/2"	DIMENSIONS LENGTH	DIMENSIONS WIDTH	DIMENSIONS HEIGHT
PH8-A	PX90011	8-Port Manifold	None	None	No	9-1/8"	5"	1-3/8"
PH8-LF	PX90012E	8-Port Manifold	1-1/4" PEX	1-1/4" Plug	No	10-1/2"	5"	1-3/8"
PH8-LF	PX90013E	8-Port Manifold	1" PEX	1-1/4" Plug	No	10-1/4"	5"	1-3/8"
PH8-LF	PX90014E	8-Port Manifold	3/4" PEX	1-1/4" Plug	No	10-1/8"	5"	1-3/8"
PH8-V1-LF	PX90015E	8-Port Manifold w/valves	1-1/4" PEX	1-1/4" Plug	8	10-1/2"	5"	1-3/8"
PH8-V1-LF	PX90016E	8-Port Manifold w/valves	1" PEX	1-1/4" Plug	8	10-1/4"	5"	1-3/8"
PH8-V1-LF	PX90017E	8-Port Manifold w/valves	3/4" PEX	1-1/4" Plug	8	10-1/8"	5"	1-3/8"
PH16-A	PX90021	16-Port Manifold	None	None	No	18-1/4"	5"	1-3/8"
PH16-LF	PX90022E	16-Port Manifold	1-1/4" PEX	1-1/4" Plug	No	20-1/2"	5"	1-3/8"
PH16-LF	PX90023E	16-Port Manifold	1" PEX	1-1/4" Plug	No	20-1/4"	5"	1-3/8"
PH16-LF	PX90024E	16-Port Manifold	3/4" PEX	1-1/4" Plug	No	20-1/8"	5"	1-3/8"
PH16-LF	PX90088E	16-Port Manifold 1" FPT	1" FPT Adpt	1-1/4" Plug	No	20-1/4"	5"	1-3/8"
PH16-V1-LF	PX90025E	16-Port Manifold w/valves	1-1/4" PEX	1-1/4" Plug	16	20-1/2"	5"	1-3/8"
PH16-V1-LF	PX90026E	16-Port Manifold w/valves	1" PEX	1-1/4" Plug	16	20-1/4"	5"	1-3/8"
PH16-V1-LF	PX90027E	16-Port Manifold w/valves	3/4" PEX	1-1/4" Plug	16	20-1/8"	5"	1-3/8"

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NIBCO® PEX

Home Run Manifolds

16, 24, 32 and 40-Port Dual Temperature Manifolds - Lead Free*

1 1/4" CTS Trunk, 3/4", 1" and 1-1/4" End Connections, 1/2" Ports

V1 Models - 1/2" Valves



16-Port Dual Temperature

HOME RUN MANIFOLD®

All manifolds (except bulk models) come with:
- Mounting clip(s) and screws
- Hot and cold label sheets
- Mounting template
- Instructions

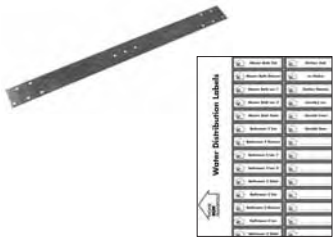
Manifold Size	Side A	Side B
16-Port	8	8
24-Port	16	8
32-Port	16	16
40-Port	24	16

FIGURE NO.	MATERIAL NO.	DESCRIPTION	TRUNK JOINTS END 1	TRUNK JOINTS END 2	VALVES 1/2"	DIMENSIONS LENGTH	DIMENSIONS WIDTH	DIMENSIONS HEIGHT
PH16D-LF	PX90031E	16-Port DUAL TEMP	1-1/4" PEX	1-1/4" PEX	No	20-1/2"	5"	1-3/8"
PH16D-LF	PX90032E	16-Port DUAL TEMP	1" PEX	1" PEX	No	20-1/4"	5"	1-3/8"
PH16D-LF	PX90033E	16-Port DUAL TEMP	3/4" PEX	3/4" PEX	No	20"	5"	1-3/8"
PH16D-V1-LF	PX90034E	16-Port DUAL TEMP w/valves	1-1/4" PEX	1-1/4" PEX	16	20-1/2"	5"	1-3/8"
PH16D-V1-LF	PX90035E	16-Port DUAL TEMP w/valves	1" PEX	1" PEX	16	20-1/4"	5"	1-3/8"
PH16D-V1-LF	PX90036E	16-Port DUAL TEMP w/valves	3/4" PEX	3/4" PEX	16	20"	5"	1-3/8"
PH24D-LF	PX90040E	24-Port DUAL TEMP	1-1/4" PEX	1-1/4" PEX	No	29-1/2"	5"	1-3/8"
PH24D-LF	PX90041E	24-Port DUAL TEMP	1" PEX	1" PEX	No	29-1/8"	5"	1-3/8"
PH24D-LF	PX90042E	24-Port DUAL TEMP	3/4" PEX	3/4" PEX	No	28-3/4"	5"	1-3/8"
PH24D-V1-LF	PX90043E	24-Port DUAL TEMP w/valves	1-1/4" PEX	1-1/4" PEX	24	29-1/2"	5"	1-3/8"
PH24D-V1-LF	PX90044E	24-Port DUAL TEMP w/valves	1" PEX	1" PEX	24	291/8"	5"	1-3/8"
PH24D-V1-LF	PX90045E	24-Port DUAL TEMP w/valves	3/4" PEX	3/4" PEX	24	28-3/4"	5"	1-3/8"
PH32D-LF	PX90049E	32-Port DUAL TEMP	1-1/4" PEX	1-1/4" PEX	No	38-3/4"	5"	1-3/8"
PH32D-LF	PX90050E	32-Port DUAL TEMP	1" PEX	1" PEX	No	38-1/2"	5"	1-3/8"
PH32D-LF	PX90051E	32-Port DUAL TEMP	3/4" PEX	3/4" PEX	No	38-1/8"	5"	1-3/8"
PH32D-V1-LF	PX90052E	32-Port DUAL TEMP w/valves	1-1/4" PEX	1-1/4" PEX	32	38-3/4"	5"	1-3/8"
PH32D-V1-LF	PX90053E	32-Port DUAL TEMP w/valves	1" PEX	1" PEX	32	38-1/2"	5"	1-3/8"
PH32D-V1-LF	PX90054E	32-Port DUAL TEMP w/valves	3/4" PEX	3/4" PEX	32	38-1/8"	5"	1-3/8"
PH40D-LF	PX90058E	40-Port DUAL TEMP	1-1/4" PEX	1-1/4" PEX	No	48"	5"	1-3/8"
PH40D-LF	PX90059E	40-Port DUAL TEMP	1" PEX	1" PEX	No	47-3/4"	5"	1-3/8"
PH40D-LF	PX90060E	40-Port DUAL TEMP	3/4" PEX	3/4" PEX	No	47-3/8"	5"	1-3/8"
PH40D-V1-LF	PX90061E	40-Port DUAL TEMP w/valves	1-1/4" PEX	1-1/4" PEX	40	48"	5"	1-3/8"
PH40D-V1-LF	PX90062E	40-Port DUAL TEMP w/valves	1" PEX	1" PEX	40	47-3/4"	5"	1-3/8"
PH40D-V1-LF	PX90063E	40-Port DUAL TEMP w/valves	3/4" PEX	3/4" PEX	40	47-3/8"	5"	1-3/8"

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NIBCO® PEX

Home Run & Copper Manifolds



PEX Home Run Manifold Accessories

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BOX QTY.	MASTER CTN. QTY.
PMLC	PX90072	Home Run Manifold Sheet of ID Labels - **COLD**	0.0030	100	1000
PMLH	PX90073	Home Run Manifold Sheet of ID Labels - **HOT**	0.0030	100	1000
PHSTRAP	PX90080	PH Manifold Stud Strap	0.0550	50	500
NP01S	PX80605	1" Brass Insert Coupling w/stop	0.1500	15	120
NP01S	PX80610	1-1/4" Brass Insert Coupling w/stop	0.1500	10	80
NP42	PX90077	Mounting Clip for 1" Trunk	0.0100	—	400
NP42	PX90078	Mounting Clip for 1-1/4" Trunk	0.0190	—	400



PEX Manifold Bracket

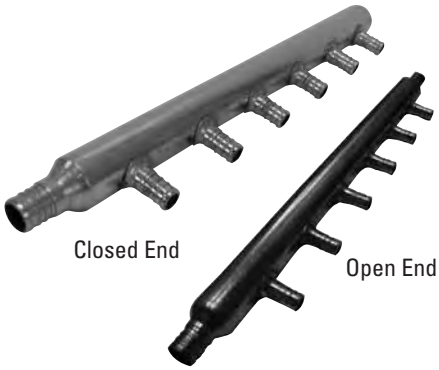
FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BOX QTY.	MASTER CTN. QTY.
11555	PX10299	Manifold Bracket	0.5000	1	10

COPPER MANIFOLDS

NP203, NP203C
NP204, NP204C
NP205, NP205C
NP206, NP206C
NP208, NP208C

PEX Branch Manifolds

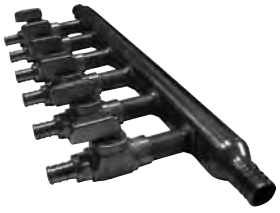
FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BOX QTY.	MASTER CTN. QTY.
NP203	PX01000	3 Br Cp Manifold Open 3/4" x 1/2" Out	0.5120		25
NP203C	PX01010	3 Br Cp Manifold Closed 3/4" x 1/2" Out	0.4520		25
NP204	PX01020	4 Br Cp Manifold Open 3/4" x 1/2" Out	0.5600		25
NP204C	PX01030	4 Br Cp Manifold Closed 3/4" x 1/2" Out	0.6580		25
NP205	PX01040	5 Br Cp Manifold Open 3/4" x 1/2" Out	0.7120		25
NP205C	PX01050	5 Br Cp Manifold Closed 3/4" x 1/2" Out	0.6800		25
NP206	PX01060	6 Br Cp Manifold Open 3/4" x 1/2" Out	0.8000		25
NP206C	PX01070	6 Br Cp Manifold Closed 3/4" x 1/2" Out	0.8960		25
NP208	PX01080	8 Br Cp Manifold Open 3/4" x 1/2" Out	1.0080		25
NP208C	PX01090	8 Br Cp Manifold Closed 3/4" x 1/2" Out	1.0160		25



NP204V, NP204VC
NP205V, NP205VC
NP206V, NP206VC

PEX Valve Manifolds

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BOX QTY.	MASTER CTN. QTY.
NP203V	PX01027	3 Br 1" Manifold F x M Swt w/Valves	1.6000	1	10
NP204V	PX01028	4 Br 1" Manifold F x M Swt w/Valves	1.8000	1	10
NP205V	PX01029	5 Br 1" Manifold F x M Swt w/Valves	2.3000	1	10
NP206V	PX01031	6 Br 1" Manifold F x M Swt w/Valves	2.6000	1	10
NP204VC	PX01100	4 Br Manifold w/Valve Closed 3/4" x 1/2" Out	1.8040	1	10
NP205VC	PX01110	5 Br Manifold w/Valve Closed 3/4" x 1/2" Out	2.2600	1	10
NP206VC	PX01120	6 Br Manifold w/Valve Closed 3/4" x 1/2" Out	2.6560	1	10



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NIBCO® PEX
Valves

VALVES

PXCP400, NPR50A NPR50B, NP48244



PEX Ball Valves

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
PXCP400	PX01500	3/8" PEX Brass Ball Valve w/ LH	0.2870	18	18
PXCP400	PX01526	1/2" PEX Brass Ball Valve w/ LH	0.2500	18	18
PXCP400	PX01546	3/4" PEX Brass Ball Valve w/ LH	0.4100	12	12
PXCP400	PX01566	1" PEX Brass Ball Valve w/ LH	0.5700	6	6
PXCP400	PX01576	1-1/4" PEX Brass Ball Valve w/ LH	0.5700	6	6
NPR50A	PX10297	1/2" PEX Brass Mini Ball Valve	0.1500	20	200
NPR50B	PX10326	1/2" PEX Brass Mini Ball Valve - NSF 61	0.1600	10	200
NP48244	PX60809	1/2" x 3/8" PEX Brass Valve	0.1800	10	250

PXCP400, NPR50A NPR50B, NP48244



PEX DZR Ball Valves

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
PXCP400	PX01526D	1/2" PEX DZR Brass Ball Valve w/ LH	0.2500		18
PXCP400	PX01546D	3/4" PEX DZR Brass Ball Valve w/ LH	0.4100		12
PXCP400	PX01566D	1" PEX DZR Brass Ball Valve w/ LH	0.5700		6
PXCP400	PX01576D	1-1/4" PEX DZR Brass Ball Valve w/ LH	0.5700		6
NPR50A	PX10297D	1/2" PEX DZR Brass Mini Ball Valve	0.1500	10	100

PXCP400-LF, NPR50A-LF



PEX Lead-Free* Ball Valves

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
PXCP400-LF	PX01526E	1/2" PEX Brass Ball Valve w/ LH	0.2500	18	18
PXCP400-LF	PX01546E	3/4" PEX Brass Ball Valve w /LH	0.4100	12	12
PXCP400-LF	PX01566E	1" PEX Brass Ball Valve w/ LH	0.5700	6	6
NPR50A- LF	PX10297E	1/2" PEX Mini Brass Ball Valve	0.1500	20	200

NIBCO® PEX
Valves



PEX Straight Stop Valves

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP7160	PX01580	1/2" PEX x 1/4" OD Straight Supply Stop	0.1760		30
7160A	ND618H6	Straight Supply Stop 1/2" PEX x 3/8"OD	0.1830		10
NP7160A	PX10298	Straight Supply Stop 1/2" PEX x 1/2" PEX	0.1600		20
7120APEX	ND601H8	PEX Straight Supply Stop 1/2" C x 1/2" PEX	0.2000		30
NP7160M	PX60815	1/2" PEX x 1/2" Male Straight Supply Stop	0.1800		10



PEX Angle Stop Valves

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP7165	PX01591	1/2" PEX x 1/4"OD Angle Supply Stop	0.1760		30
7165A	ND609H6	Angle Supply Stop 1/2" PEX x 3/8" OD	0.1000		30





PEX Other Valves

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP7170	PX01521	1/2" PEX x Hose Thread Valve	0.1500	10	150
95CPEX124	N74000H	95C 1/2" PEX x 4 FP w/Metal HW/VAC Breaker	1.2800	1	10
95CPEX126	N74000K	95C 1/2" PEX x 6 FP w/Metal HW/VAC Breaker	1.3700	1	10
95CPEX128	N74000L	95C 1/2" PEX x 8 FP w/Metal HW/VAC Breaker	1.4500	1	10
95CPEX1210	N74000M	95C 1/2" PEX x 10 FP w/Metal HW/VAC Breaker	1.4900	1	10
95CPEX1212	N74000N	95C 1/2" PEX x 12 FP w/Metal HW/VAC Breaker	1.5500	1	10
95CPEX1214	N74000T	95C 1/2" PEX x 14 FP w/Metal HW/VAC Breaker	1.6000	1	10
95CPEX344	N75000H	95C 3/4" PEX x 4 FP w/Metal HW/VAC Breaker	1.3000	1	10
95CPEX346	N75000K	95C 3/4" PEX x 6 FP w/Metal HW/VAC Breaker	1.3900	1	10
95CPEX348	N75000L	95C 3/4" PEX x 8 FP w/Metal HW/VAC Breaker	1.4600	1	10
95CPEX3410	N75000M	95C 3/4" PEX x 10 FP w/Metal HW/VAC Breaker	1.5100	1	10
95CPEX3412	N75000N	95C 3/4" PEX x 12 FP w/Metal HW/VAC Breaker	1.5600	1	10
95CPEX3414	N75000T	95C 3/4" PEX x 14 FP w/Metal HW/VAC Breaker	1.6100	1	10

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NIBCO® PEX
Heat Panels and Accessories

NIBCO PEX RADIANT SYSTEMS

NPRHP
NPR180C
NPR90HP2T



PEX Radiant Heat Panels

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NPRHP	PX10231	RHP Radiant Heat Panel	11.8000	1	1
NPRHP	PX10232	RHP-1 Radiant Heat Panel	18.4000	1	1
NPRHP	PX10233	RHP-2 Radiant Heat Panel	22.4000	1	1
NPRHP	PX10234	RHP-2-4 Radiant Heat Panel	25.6500	1	1
NPRHP	PX10235	RHP 3 Radiant Heat Panel	43.0500	1	1
NPR180C	PX10246	Zone Kit For RHP 2-4	1.7000	1	1
NPR90HP2T	PX10247	Radiant Heat Panel - Tankless	23.0000	1	1

Parts & Accessories for Panels

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NPR310ZV	PX10306	3/4" NPT Zone Valve w/ Union	.950	1	10
NPR315A	PX10308	Actuator 24V For Zone Valve	.330	1	10
NPR285TW	PX10312	FH Thermostat w/ Floor Sensor	.350	1	10
NPR285T	PX10313	FH Thermostat Only	.112	1	25
NPR290TW	PX10314	Floor Sensor	.080	1	25

NPR70ET, NPR50H
NPR125KG
NPR135KG
NPR140KG



PEX Radiant Kits and Gauges

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NPR70	PX10282	Air Vent 1/8" MIP	0.2500	1	96
NPR70H	PX10283	Air Fill Valve 1/8" MIP	0.0500	5	100
NPR125KG	PX10284	Pressure Gauge FHT	0.1500	1	1
NPR70A	PX10285	Adapter FHT x 1/8" FIP	0.1500	10	250
NPR135KG	PX10286	Pressure Test Kit (Use With PX10287)	0.2000	1	5
NPR140KG	PX10287	Fill & Purge Kit	1.6500	1	1

NPR230PMV
NPR240PMV
NPR250PMV
NPR260PMV
NPR211C



PEX Radiant Pumps and Mixing Valves

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NPR230PMV	PX10289	Grundfos® 1558 3-Speed Bronze Pump Union Connection	3.7800	1	1
NPR240PMV	PX10292	3/4" Thermostatic Mixing Valve	1.3500	1	42
NPR130KG	PX10293	1" Thermostatic Mix Valve	2.0000	1	40
NPR260PMV	PX10294	3/4" Flange Set for Taco® 007	1.9500	1	12
NPR260PMV	PX10295	1" Flange Set for Taco® 007	1.9500	1	12
NPR211C	PX10343	Taco® 007 Cartridge	1.1000	1	6
NPR194GP	PX10344	Pump Connection Kit Sweat x PEX for PX10289	0.0100	1	10

NIBCO® PEX
Heat Panels and Accessories

NIBCO PEX
RADIANT SYSTEMS

NPR60ET



PEX Radiant Expansion Tank

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NPR60ET	PX10241	5 Gallon Expansion Tank	11.0000	1	1

NPR120TP



Heat Transfer Plates

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NPR120TP	PX10250R1	4' Heat Transfer Plate for 1/2" PEX	1.2500	1	20
NPR120TP	PX10251	Rad-Trax™ Easy Install Heat Transfer Plate	1.7000	1	20

NPR10A, 11032





PEX Radiant Accessories

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BOX QTY.	MASTER CTN. QTY.
NPR10A	PX10296	Thermometer, Strap On	0.2500	1	25
11032	PX10300R	Radiant DVD/CD-ROM	0.3000	30	60
NPPP	PX10328	PEX-Pal Tube Holder	0.6560		40
NPPPEP	PX10329	PEX-Pal End Plate	0.1480		10

NPR145C, NPR150C
NPR160C, NPR170C
NPR305FC
NPR305WMC



PEX Radiant PEX Clips

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NPR160C	PX10270	PEX Clip Gun for 1/2" & 3/4" Clips	0.6500	1	1
NPR170C	PX10271	1/2" PEX Clips	0.0100	100	10,000
NPR170C	PX10272	3/4" PEX Clips	0.3500	100	10,000
NPR145C	PX10273	Reddi-Strip®* Stand Up Staple Gun	10.9500	1	1
NPR150C	PX10274	Reddi-Strip®* Staples - Box of 200	0.6500	1	50
NPR305FC	PX71250	1/2" PEX Clips for Styrofoam	0.0080	25	1,600
NPR305WMC	PX71251	1/2" PEX Clips for Wire Mesh	0.0160	25	1,000

* Reddi-Strip® is a registered trademark of Peter Mangone, Inc.

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NIBCO® PEX
Tools

NP32
NP33R
NP32LH



PEX Crimp Tools - Standard

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP32	PX01300	Standard 3/8" PEX Crimp Tool (12")	4.0000	1	10
NP32	PX01310	Standard 1/2" PEX Crimp Tool (12")	4.0000	1	10
NP32	PX01320	Standard 3/4" PEX Crimp Tool (12")	4.0000	1	10
NP32	PX01330	Standard 1" PEX Crimp Tool (16")	4.5000	1	10
NP32LH	PX02545	1-1/4" Long Handle Crimp Tool w/gauge (19")	6.0000	1	10
NP33R	PX01350	Ratchet 1/2" PEX Crimp Tool (11")	1.0000	1	10

NP32C
NP32S



PEX Crimp Tools - Compact

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP32C	PX02505	3/8" Compact Crimp Tool w/gauge (12")	2.1000	1	20
NP32C	PX02515	1/2" Compact Crimp Tool w/gauge (12")	2.0500	1	10
NP32S	PX02540	3/4" Compact Crimp Tool w/gauge(12")	2.000	1	10
NP32S	PX02530	1/2" Compact Crimp Tool	2.0000	1	10

NP32B
NP33C





PEX Crimp Tools - Economy & Combo

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP32B	PX02555	1/2" & 3/4" Block Combo Crimp Tool	0.8500	1	50
NP32B	PX02565	3/8" & 1" Block Combo Crimp Tool	0.9000	10	40
NP33C4IN1	PX01385	3/8", 1/2", 3/4", 1" Block Tool w/gauge	1.1500	1	50
NP32MH	PX02585	1/2" & 3/4" Combo Mid-Handle Crimp Tool	3.4000	1	12
NP33C	PX01340	Combo 1/2" & 3/4" PEX Crimp Tool (12")	4.0000	1	10

NP33RG
NP53



PEX Clamp Tools

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP53	PX01290	3/8" - 1" PEX Clamp Tool (12")	0.0100	1	18
NP33RG	PX01355	SS Clamp Tool Calibration Gauge	0.2500		1

NP52
NP52C





PEX Sleeve Tools

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP52	PX01364	1/2" PEX Sleeve Tool (12")	3.1000	1	16
NP52C	PX01365	1/2" Compact PEX Sleeve Tool	2.0000	1	10
NP52	PX01366	3/4" PEX Sleeve Tool (12")	4.0000	1	16
NP52	PX01368	1" PEX Sleeve Tool (12")	4.5000	1	12

NIBCO® PEX
Tools

NP32DC



NP34

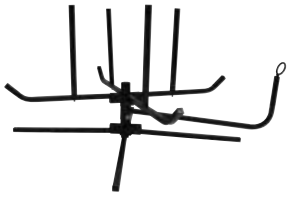


NP35





NP37



PEX Other Tools & Accessories

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP32DC	PX02575	Decrimping Tool For All Size Rings	0.6000	1	50
NP34	PX01370	3/8"-1/2"-5/8"-3/4" Go/No Go Gauge	0.2000	1	100
NP34	PX01380	1" Go/No Go Gauge	0.2000	1	50
NP34	PX01381	1-1/4" Go/No Go Gauge	0.1000	1	
NP35	PX01360	1/2" - 3/4" PEX Easy Cut Tool	0.3000	1	50
NP35	PX01390	3/8" - 1-1/4" Pipe Cutter	0.3400	1	50
NP37	PX01415	Tube Uncoiler	35.4000	1	1
NP200	PX14151	Access Panel 14" x 29"	4.1500	1	10
NP200	PX14152	Access Panel 14" x 38"	4.3600	1	10

NP32RP
NP32C
NP36B

PEX Replacement Parts

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BAG QTY.	MASTER CTN. QTY.
NP32RP	PX02516	Replacement Pin For 1/2" Tool	0.2500	1	25
NP32RP	PX02526	Replacement Pin For 3/4" Tool	0.5000	1	25
NP32C	PX02527	Replacement E-CLIP	0.0020	1	25
NP36B	PX01395	Pipe Cutter Replacement Blade	0.0420	1	30
NP36B	PX01400	Easy Cut Tool Replacement Blade	0.1000	1	50

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NIBCO® PEX

Mini Pressing Tool and Crimp Jaws



PC-20M



PCX-200M



PCX-1M
PCX-2M
PCX-3M
PCX-6M
PCX-7M

PEX PC-20M Mini Pressing Tool & Crimp Jaws

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BOX QTY.
PC-20M	R00205PC	Mini Pressing Tool, 2 - 18V, 1.3 Ah Lithium-ion batteries, 110V charger & case (NO jaws)	17.20	1
PCX-200M	R00205PCX	Mini Pressing Tool, 3 Crimp Jaws (1/2", 3/4" & 1"), 1/2", 3/4", & 1" Gauge, 2 - 18V, 1.3 Ah Lithium-ion batteries, 110V charger & case	18.05	1
PCX-1M	R00215PCX	1/2" Crimp Jaw for PC-20M and PC-10M (Includes 1/2", 3/4", & 1" Gauge)	2.94	1
PCX-6M	R00240PCX	5/8" Crimp Jaw for PC-20M and PC-10M (Includes 5/8", 1-1/4" Gauge)	2.97	1
PCX-2M	R00220PCX	3/4" Crimp Jaw for PC-20M and PC-10M (Includes 1/2", 3/4", & 1" Gauge)	2.90	1
PCX-3M	R00230PCX	1" Crimp Jaw for PC-20M and PC-10M (Includes 1/2", 3/4", & 1" Gauge)	2.92	1
PCX-7M	R00250PCX	1-1/4" Crimp Jaw for PC-20M and PC-10M (Includes 5/8", 1-1/4" Gauge)	3.11	1
PC-4ML	R00245PC	18V, 1.3Ah Lithium-ion Battery for PC-20M	0.80	1
PC-7L	R00175PC	18V, 3.0Ah Lithium-ion Battery for PC-20M	1.30	1
PC-8L	R00187PC	110V Battery Charger for PC-4ML and PC-7L	2.20	1
PC-9L	R00195PC	AC Adapter for PC-20M	1.70	1
NP34	PX01388	Go/No Go Crimp Gauge (1/2", 3/4", 1")	0.85	1
NP34	PX01389	Go/No Go Crimp Gauge (5/8", 1-1/4")	0.85	1



PC-4ML
18V, 1.3 Ah
Lithium-ion Battery



PC-7L
18V, 3.0 Ah
Lithium-ion Battery



PC-8L
110V Battery Charger



PC-9L
AC Adapter

NIBCO® PEX

Mini Pressing Tool and Crimp Jaws



PC-4M
9.6V, 1.3 Ah
NiMH Battery



PC-5M
120V Battery Charger

PEX PC-10M Accessories

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BOX QTY.
PC-4M	R00240PC	1.3 Ah NiCd 9.6V Battery for PC-10M	1.85	1
PC-5M	R00250PC	120V Charger for PC-10M	1.13	1

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NIBCO® PEX
Installation Accessories

NP38



PEX Tube Talon

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BOX QTY.	MASTER CTN. QTY.
NP38	PX02000	3/8" CTS Tube Talon w/Nail	0.0080	100	1,000
NP38	PX02010	1/2" CTS Tube Talon w/Nail	0.0110	100	1,000
NP38	PX02020	3/4" CTS Tube Talon w/Nail	0.0160	100	1,000
NP38	PX02030	1" CTS Tube Talon w/Nail	0.0240	50	500

NP39



PEX Insulator Clamps

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BOX QTY.	MASTER CTN. QTY.
NP39	PX02040	3/8" Tubing Insulator Clamp	0.0210	50	500
NP39	PX02050	1/2" Tubing Insulator Clamp	0.0230	50	500
NP39	PX02060	3/4" Tubing Insulator Clamp	0.0190	50	500
NP39	PX02070	1" Tubing Insulator Clamp	0.0170	25	250

NP40, NP40N
NP40P



Plastic Bend Support



Metal Bend Support

PEX Bend Supports

FIGURE NO.	MATERIAL NO.	DESCRIPTION	WEIGHT	BOX QTY.	MASTER CTN. QTY.
NP40	PX02080	1/2" CTS PEX Metal Bend Support	0.1010	50	50
NP40P	PX02081	1/2" PEX Plastic Bend Support	0.0800	25	250
NP40P	PX02082	3/4" PEX Plastic Bend Support	0.1600	25	25
NP40P	PX02085	1" PEX Plastic Support Bend	0.2600	5	50

NIBCO Limited Warranty

NIBCO INC. warrants that when NIBCO® PEX tube is used with NIBCO® PEX fittings, and NIBCO® valves and installation accessories, they will, under normal conditions, use and service in potable water and radiant heat systems, be free from defects in materials and workmanship for a period of twenty-five (25) years from the date of purchase when installed by a licensed professional contractor. This 25-year warranty is voided if any non-NIBCO products are used in the PEX system. NIBCO INC. warrants NIBCO® PEX tube, when used under normal conditions, use and service in potable water and radiant heat systems with brass insert fittings meeting NSF/ANSI 61, ASTM F 1807 and ASTM F 877 to be free from defects in materials and workmanship for a period of ten (10) years from the date of purchase. NIBCO INC. warrants NIBCO® PEX fittings, manifolds, transition fittings and valves under normal conditions, use and service in potable water and radiant heat systems, to be free from defects in materials and workmanship for a period of ten (10) years from the date of purchase. NIBCO INC. warrants NIBCO® associated hardware and tools for a period of 90 days from the date of purchase. In the event any defect occurs which the owner believes is covered by this Warranty, the owner should immediately contact NIBCO INC., Technical Services, either in writing or by telephone call, (888) 446-4226 or (574) 295-3000. The owner will be instructed to return said tube, fittings or accessories, at the owner's expense, to NIBCO INC. or an authorized NIBCO INC. representative for inspection. In the event said inspection discloses to NIBCO INC.'s satisfaction that said tube, fitting or accessory is defective, a replacement shall be mailed free of charge to the owner. **IN ORDER FOR THIS LIMITED WARRANTY TO APPLY, THE ABOVE REFERENCED PRODUCTS MUST BE INSTALLED BY A LICENSED PROFESSIONAL PLUMBER IN ACCORDANCE WITH NIBCO INSTALLATION INSTRUCTIONS AND IN COMPLIANCE WITH ALL APPLICABLE CODE REQUIREMENTS. FAILURE TO DO SO WILL VOID ALL APPLICABLE WARRANTIES.** This warranty does not apply and you do not have a right of reimbursement if the failure or resulting damage is caused by:

1) breaks, tearing, kinking, gouges, punctures or other external damages before, during, or after installation;
2) exposure to temperatures and pressures beyond the product ratings as specified on the product or in the NIBCO installation manual;
3) exposure to damaging chemicals, substances or corrosive water conditions;
4) damage from abnormal operating conditions;
5) damage due to accident, abuse, misuse, or unauthorized modification or repair;
6) improper installation due to worn, damaged, unauthorized or improperly calibrated tools;
7) components in the plumbing system other than those manufactured or sold by NIBCO;
8) not designing, installing, inspecting or testing the system in accordance with NIBCO installation instructions at the time of the installation; or
9) failure to follow applicable code requirements and good plumbing practices.

TO THE EXTENT PERMITTED BY LAW, THIS WARRANTY SPECIFICALLY EXCLUDES INCIDENTAL AND CONSEQUENTIAL DAMAGES OF EVERY TYPE AND DESCRIPTION RESULTING FROM ANY CLAIMED DEFECT IN MATERIAL OR WORKMANSHIP, INCLUDING BUT NOT LIMITED TO, PERSONAL INJURIES AND PROPERTY DAMAGES. Some states do not allow the exclusion or limitations of incidental or consequential damages, so these limitations may not apply to you. **TO THE EXTENT PERMITTED BY LAW, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE LIMITED IN DURATION.** This Warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

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