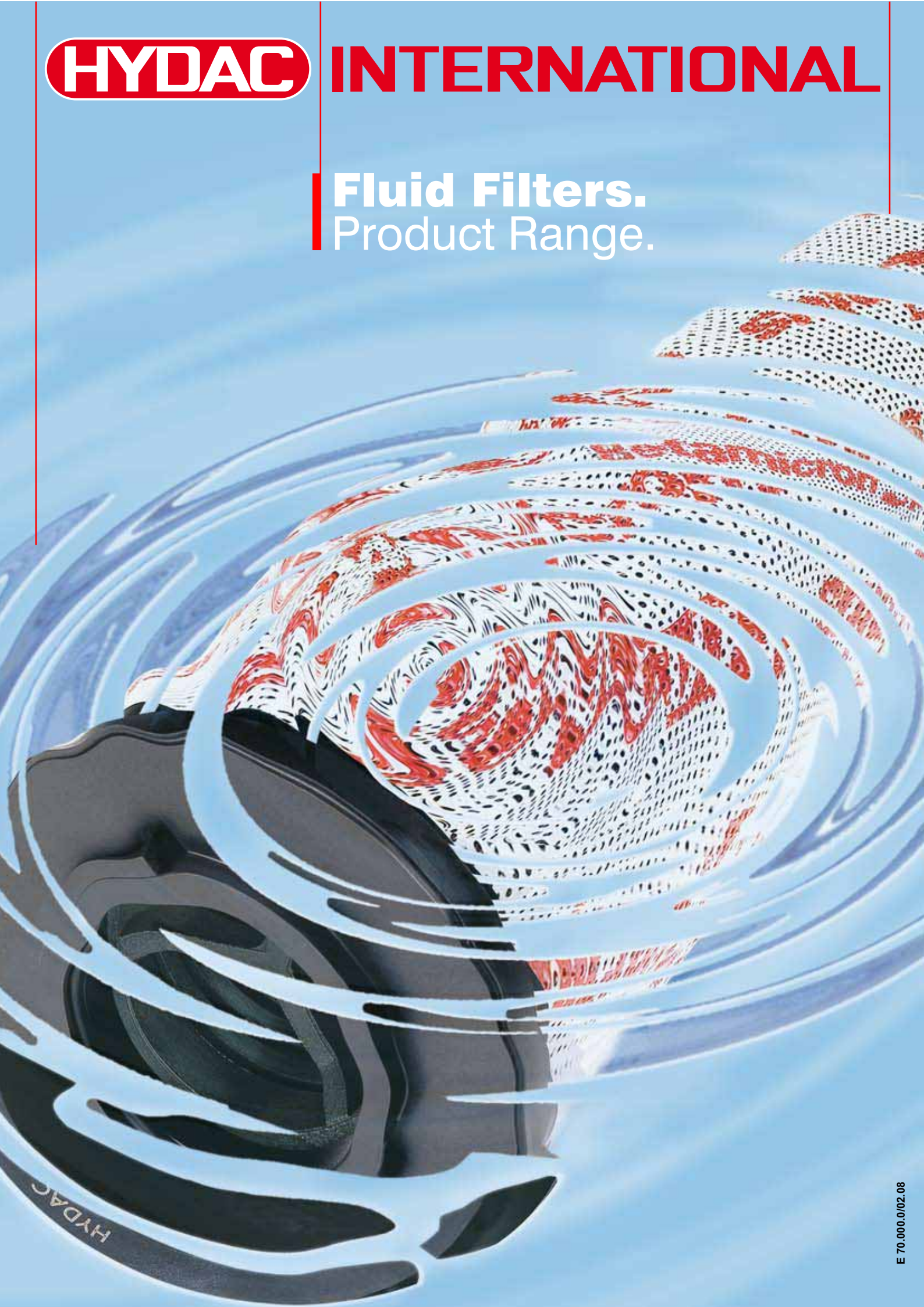
HYDAC INTERNATIONAL

# Fluid Filters.
## Product Range.



E 70.000.0/02.08

## HYDAC Filtration Technology...

### ...a Synonym for Reliable Filtration.

HYDAC Filtration Technology is the culmination of tests carried out in our laboratories and of the experience gained in the field. It offers a complete range of filters for liquid and gaseous media.

The HYDAC Filter Division manufactures products tailored to market requirements and to the highest quality standards, backed by modern machinery and a large production capacity.

HYDAC Filtration Technology is based on intensive basic research, the solving of technical problems, specific customer requirements, and international standardisation.

## Development, Design, Production, Quality, Service and Distribution...

... are equally important to HYDAC. The concentration of all these functions in our independent filter division guarantees continuous processing, optimum cost/performance ratio, and a constant quality standard.

Development at HYDAC means designing application orientated filtration systems based on test results from our research and test laboratories and results gained from tests and investigations on site, taking into account the requirements of the user and the manufacturer.

A highly qualified development team, using computer-aided analysis, measuring and testing equipment and test rigs, ensures rapid conversion of test results.

Production at HYDAC means large production capacity coupled with modern machinery; and this in connection with rational manufacturing processes gives an optimum price/performance ratio.

Quality has absolute priority at HYDAC. It is guaranteed by continuous production control and systematic laboratory tests.

Service and Distribution – worldwide – through our international network of sales offices and production facilities.

- **Many years of experience and fast CAD design,**
- **supported by intensive research and tests,**
- **result in market-orientated product range.**

- **Quality and safety guaranteed by consistent clean room production.**
- **Every piece a quality product: NC controlled processing,**
- **semi and fully automatic manufacturing plant,**
- **strict controls, careful packaging, rapid dispatch.**

## HYDAC Filter.
## High Efficiency.



## HYDAC filters...

...Their quality guarantees reliable performance and increases the service life of components, systems and machinery.

Due to their design and application orientated properties, HYDAC filters provide optimum performance characteristics, such as:

- high beta stability across a wide differential pressure range
- high pressure stability
- high contamination retention capacity
- long service life
- low pressure drops
- wide selection of filtration ratings
- extensive model range
- optimum filter materials for specific applications
- wide range of applications

and therefore increase the protection of components and reduce the downtime of machinery and systems.





## HYDAC Servicenter









The HYDAC Servicenter, together with its service partners offers you a complete package of services. After in-depth consultation, you can compile a service package tailored to your needs. Whether it be support of existing in-house maintenance or sub-contracting the complete package, we will always find the best solution for you.

## ...more about filtration?



Filter for Process Engineering
Max. working pressure: up to 600 bar
Working temperature: up to 400 °C
Filter elements: from 1µm absolute
Brochure no.: 7.700../..



Units for in-house servicing
Oil sampling and other laboratory units, portable and stationary filter pump transfer units, combined oil transportation and filtration units, dewatering units.
Brochure no.: 7.929../..

## Filter-IT! – The electronic filter catalogue.



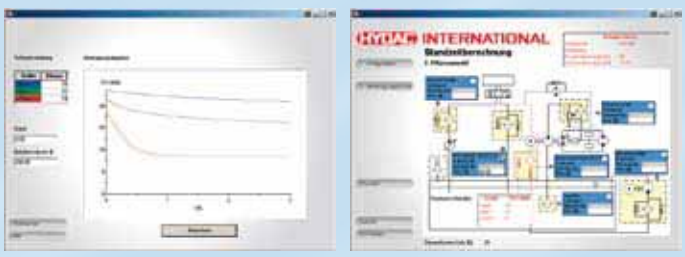

Here you will find the whole product range of HYDAC Filtertechnik consolidated on CD-ROM: from technical data to product benefits, from brochures to spare part lists and parts explosion diagrams for every filter size and type of connection.

In addition, using the "Look-at-IT!" function, it is possible to download the 3-D models and 2-D drawings for all filters in any format.




The sizing program "Size-IT!" further provides computer-aided filter sizing, specific to your particular system and application profile.

For our in-house filter specialists the automatic price generator "Price-IT!" and the concept creation tool "Optimize-IT!" are available for computer-aided optimization of systems. It enables our specialists to identify and compare cleanliness classes and achievable service lives for different filter concepts.
Based on the expected contamination, the optimum filter combination and filter size combination can be determined, right down to a specific calculation of the element costs per year.




We will, of course, be pleased to send you a copy of the CD **"Filter-IT!"**. Alternatively, the program is available on our website **www.hydac.com**.

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# Filtration Handbook

In the following pages you will find the basic principles of filtration illustrated and explained using simple examples.

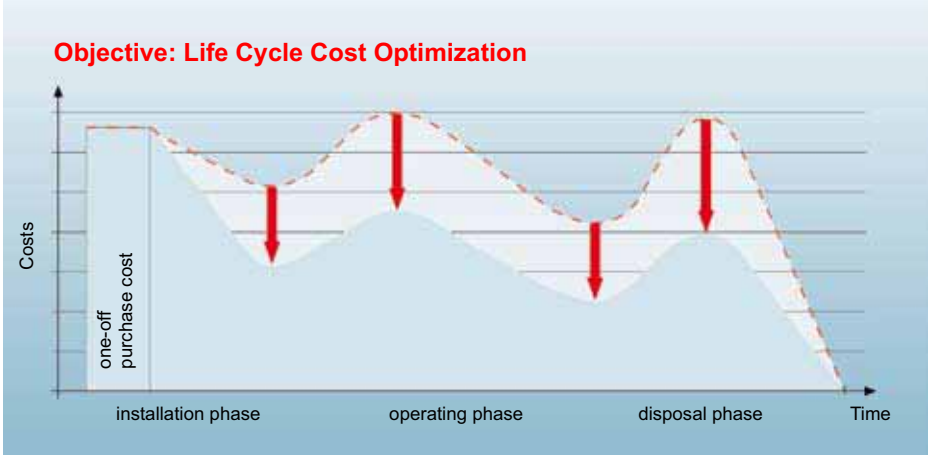
**For filtration and hydraulics specialists requiring more detailed information, we recommend downloading our complete filtration handbook (www.hydac.com).**

If you have any questions about the contents of this brochure or if you have a specific problem to solve, we will be happy to help you in person. Please contact your nearest HYDAC representative or contact our headquarters.

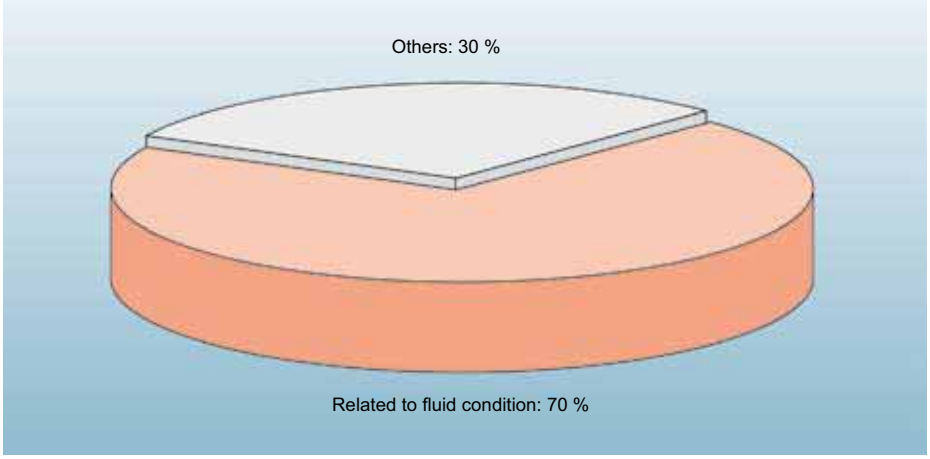
## Awareness of fluids

As a manufacturer or operator of machines or systems in today's fast moving and globalized market in Central Europe, every possible means must be taken to continually improve competitiveness.

In the first instance, this implies reduction in costs, not only of the purchase cost but of all costs generated during the **whole lifetime** of the system (life cycle cost reduction).




The condition of the operating fluid plays a key role in this objective since approximately **70 % of all breakdowns of hydraulic and lubrication systems can be attributed to the condition of the oil** - with proven detrimental effects on the efficiency and profitability of systems and equipment.



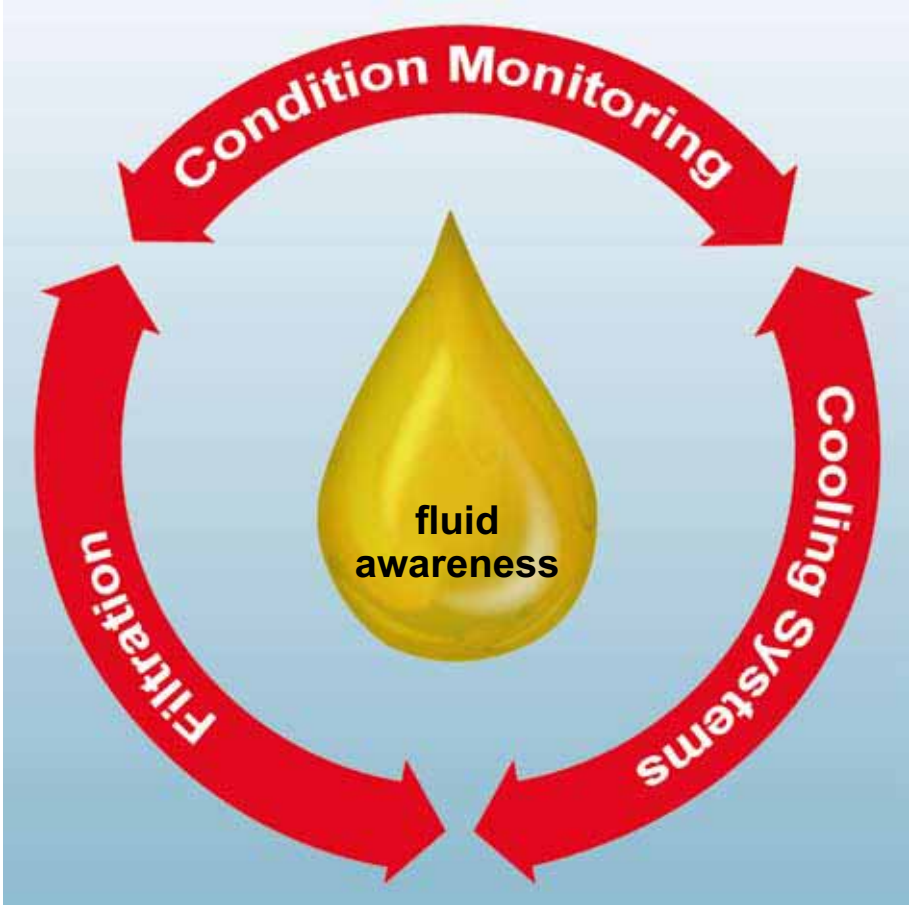

Causes of breakdowns in hydraulic and lubrication systems

Once the direct connection between fluid condition and the profitability and efficiency of hydraulic and lubrication systems is recognized, the action required becomes obvious: cooling, continuous online conditioning and a well-engineered filtration concept guarantee the efficiency and operating reliability of the whole system.

Although this filtration handbook - as the name suggests - deals primarily with the "filter" component, HYDAC experts will also provide you with modern solutions which are specific to your system in the areas of cooling and condition monitoring.

Only by taking a holistic approach is it possible to improve the condition of the fluid used and to reduce the Life Cycle Costs.

As HYDAC's hydraulic experts, we want to focus attention on **fluid awareness** and we would like to share our experience with you. The following pages relate to filtration, but we can also help you in relation to cooling and condition monitioring if required.



## Why is filtration so important?

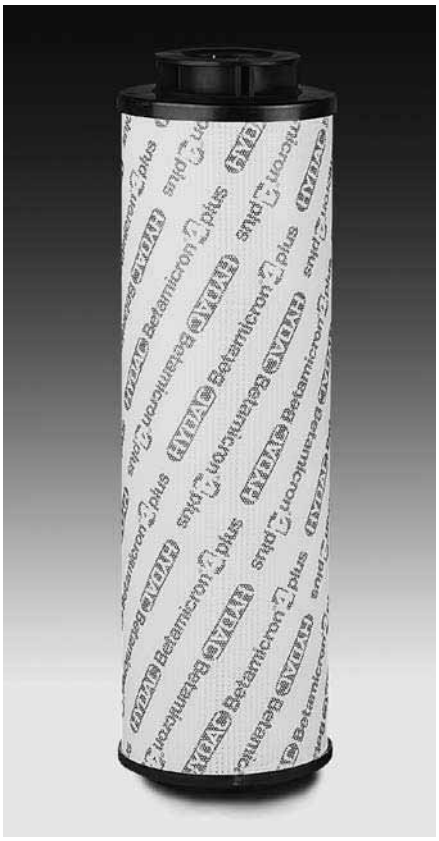
The selection of the perfect filtration solution contributes significantly to preventing damage caused by contamination, to increasing the availability of the system and therefore to increasing productivity considerably.

The new filter element technology Betamicron®4 has been specially developed for the reduction of the Life Cycle Cost. The previous glass fibre elements from HYDAC (Betamicron®3 generation) provided complete security: a high level of fluid cleanliness and long-term stability for your hydraulic or lubrication system.

The new generation goes one better: with further improvements to the performance data the elements with Betamicron®4 technology ensure the highest fluid cleanliness. By optimizing the filter media structure both the separation performance and the contamination retention capacity have increased to a large extent. This means that sensitive components are protected over the long term and the filter element has a significantly longer service life.

Furthermore, even fluids with extremely low conductivity can be filtered without electrostatic discharge taking place within the filter element, due to a special feature on the filter mesh pack. This is another benefit therefore in the area of operating reliability and gives HYDAC the cutting edge in the area of element innovation.

The table below summarizes the positive effect of the new element technology, Betamicron®4, on the Life Cycle Cost of your machine or system.




| | | Optimized mat structure | Optimized longitudinal seam | Zinc-free structure | Spiro lock seam support tubes | Protective envelope | Discharge capability |
|---|---|---|---|---|---|---|---|
| | | minimized | | | | | |
| Energy | cost | ● | | | | | |
| Personnel | | ● | ● | | | ● | ● |
| Logistics | | | | ● | ● | | |
| Failure | | ● | ● | ● | | ● | ● |
| Production | | ● | ● | | | | ● |
| Repair | | ● | ● | ● | | ● | ● |
| Maint enance | | ● | ● | ● | | ● | ● |
| Spare parts | | ● | ● | ● | | ● | ● |
| Waste disposal | | | | | ● | | |

More detailed information such as technical specificatons and customer benefits can be found in the brochure **"Filter Elements Betamicron®4. For Reduced Life Cycle Cost"**.

## What kinds of damage does contamination cause?

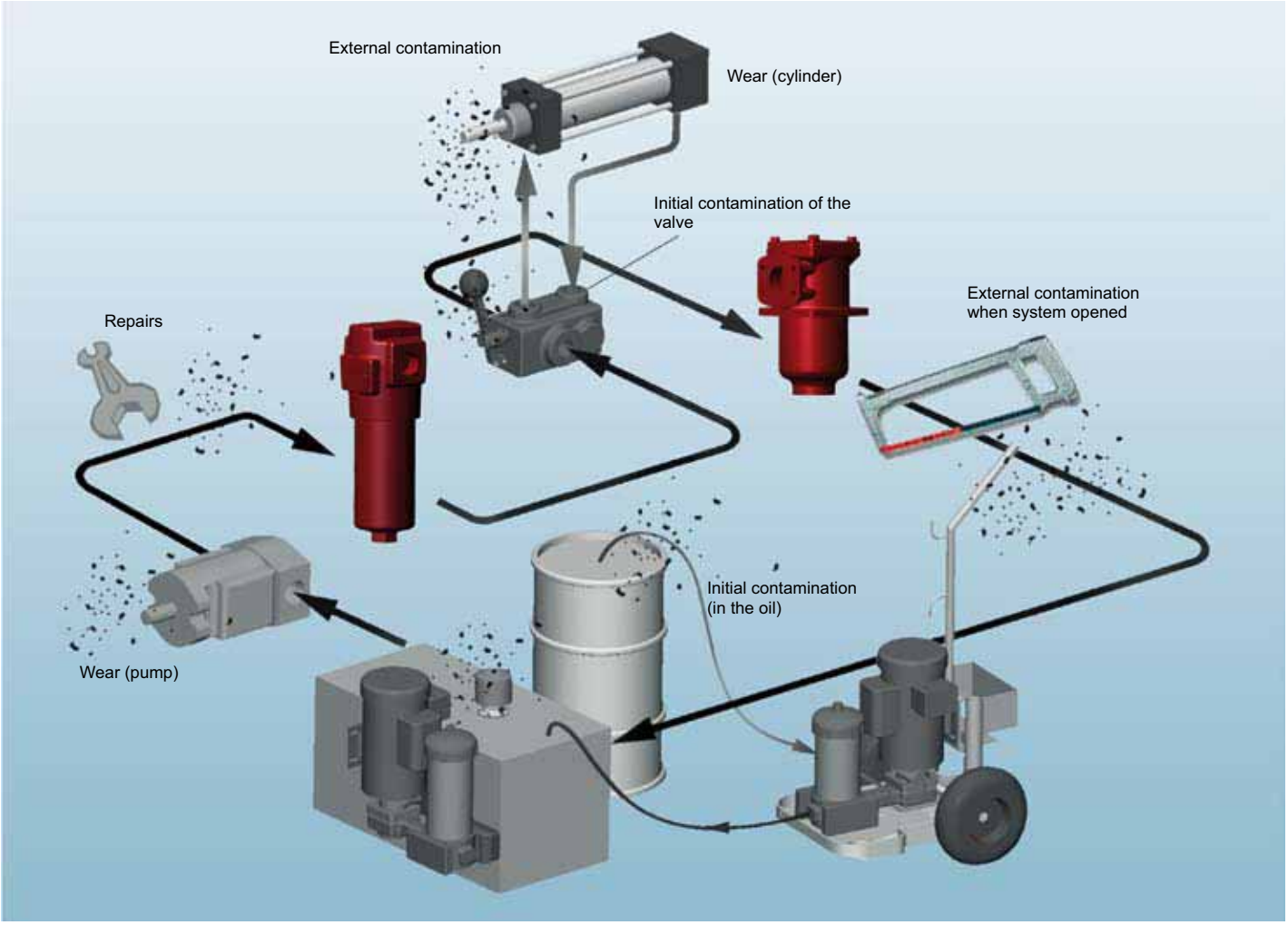
Contamination has a detrimental effect on the functions of hydraulic and lubricating fluids, e. g. transfer of heat and energy, right up to system failure.

From subsequent damage analyses approx. 75 % of system failures can be attributed to damage to the components used, caused by contamination of the operating fluid.

# Causes of contamination

**What are the causes of contamination and which mechanisms can lead to a rise in the above-mentioned costs?**

The following illustration indicates possible contamination sources:




**Origin / formation of contamination:**

- Built-in contamination from components fitted (e.g. valves, fluids, cylinders, pumps, tanks, hydraulic motors, hoses, pipes)
- Contamination produced during assembly of the system, by opening the system, during system operation and during fluid-related system failure
- Contamination entering from outside the system, through:
  - tank breathing
  - cylinders, seals
- Contamination entering the system during maintenance procedures
  - system assembly
  - opening the system
  - filling with oil

If the usually expensive components are damaged by solid contamination in the hydraulic and lubricating media, system faults right up to unplanned shutdowns can occur.

The severity of the component damage depends on the material of the contamination, the operating type V02, must be fitted (round or sharp-edged) and on the size and quantity of particles.

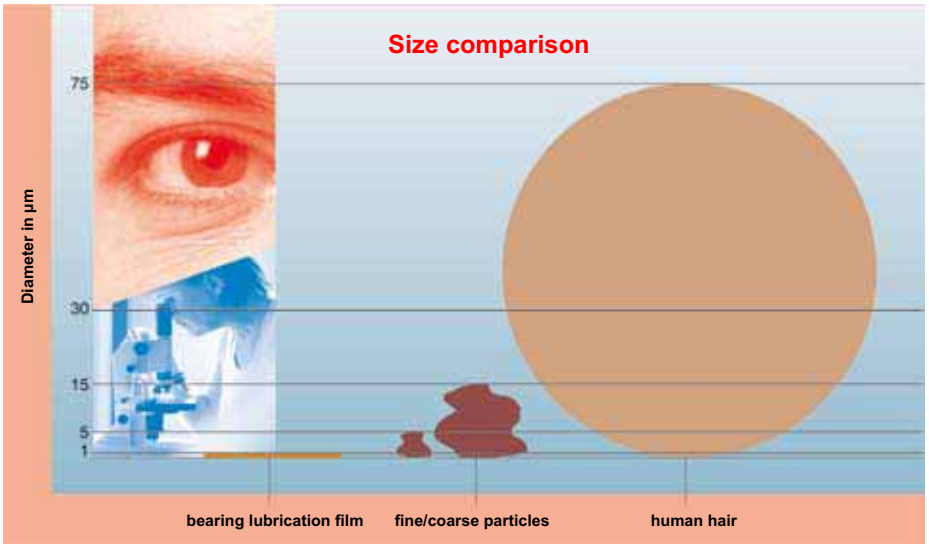
The following rule applies: The harder the particles, the greater the component damage and the higher the operating pressure the more forcefully the particles become lodged in the lubrication clearance.

It often goes unrecognized that the majority of these solid particles is smaller than 30 µm and they are therefore not visible to the naked eye. This means an apparently clean fluid can in fact be badly contaminated.

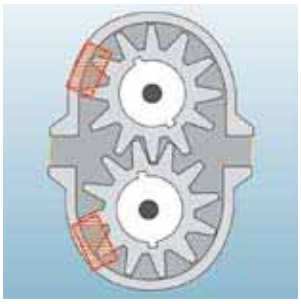
Particularly critical are particles which are the same size as the clearance between moving parts.

What makes it worse is that hydraulic users are always stipulating smaller and lighter, high-performance components which reduces the clearances even further.

In the following diagrams you will find the typical clearances.

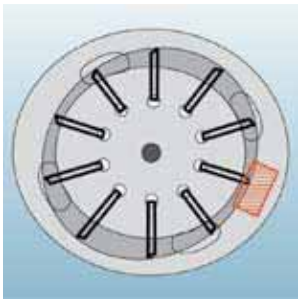



## On hydraulic pumps:



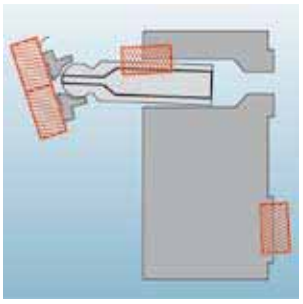
**Gear pump**
**Dynamic clearance**

Tooth to side panel: 0.5-5 µm
Tooth point to housing: 0.5-5 µm



**Vane pump**
**Dynamic clearance**

Vane rim: 5-13 µm
Vane duct: 0.5-1 µm

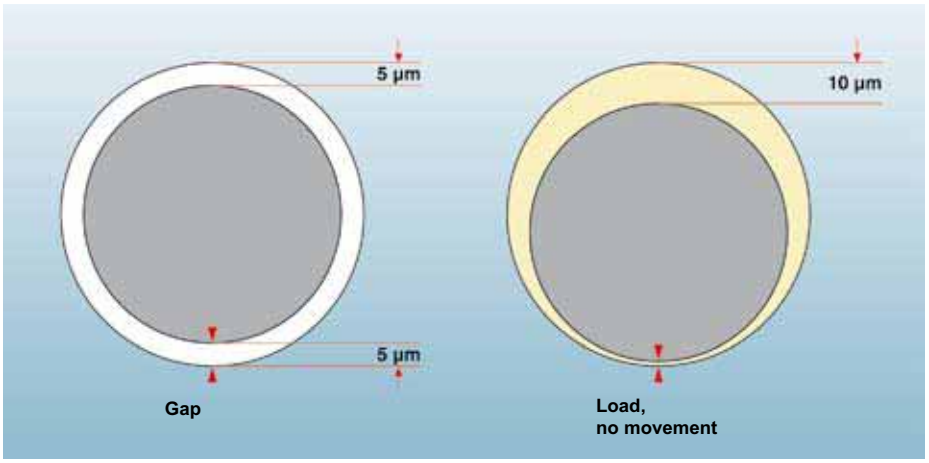


**Piston pump**
**Dynamic clearance**

Piston to bore: 5-40 µm
Valve plate to cylinder: 0.5-5 µm

## On valves:

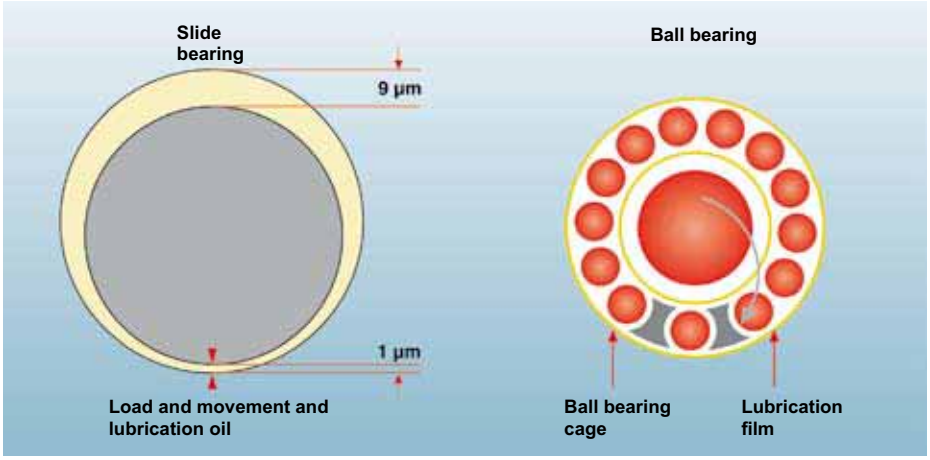
| | |
|---|---|
| Servo valve | 1-4 µm |
| Proportional valve | 1-6 µm |
| Direction control valve | 2-8 µm |




The operational or dynamic lubricating film is not the same as the machine clearance and is dependent on the force, speed and viscosity of the lubrication oil.

Therefore the lubricating film separates the moving surfaces in order to prevent metal-to-metal contact.

| Components | Clearance (µm) |
|---|---|
| Slide bearing | 0.5-100 |
| Ball bearing | 0.1-3 |
| Hydrostatic ball bearing | 1-25 |



# What types of wear are there?

**1. Abrasion**
by particles between adjacent moving surfaces.

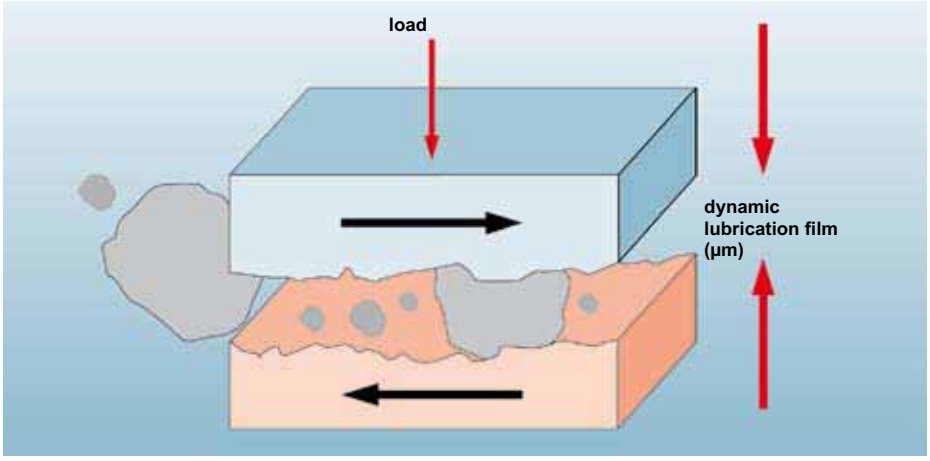
**2. Erosion**
by particles and high fluid velocity.

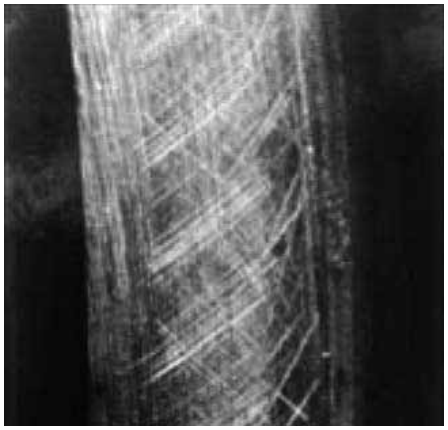
**3. Adhesion**
from metal-to-metal friction (loss of fluid).

**4. Fatigue wear**
surfaces damaged by particles are subjected to repeated stress.

**5. Corrosion**
by water or chemicals (not covered below).

## 1. Abrasion



Abrasion caused by foreign bodies

**Effects of abrasion:**
- Changes to tolerances
- Leakages
- Reduced efficiency
- Particles produced in the system create more wear!

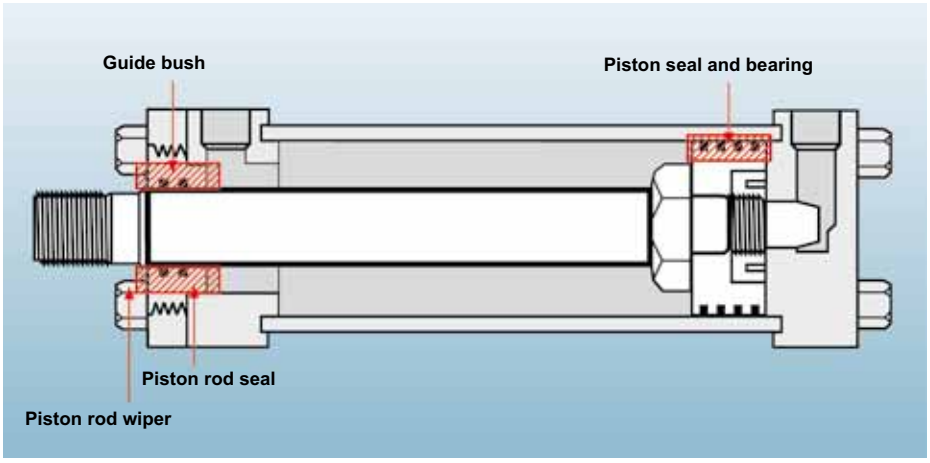
**Effects of wear in the case of a hydraulic cylinder:**

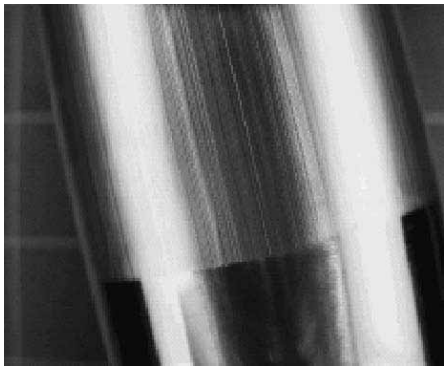
Rod seal wear
➡ External oil leakage

Guide bush wear
➡ Loss of rod alignment

Piston seal wear
➡ Loss of cylinder speed
➡ Loss of holding ability

Piston bearing wear
➡ Loss of rod alignment



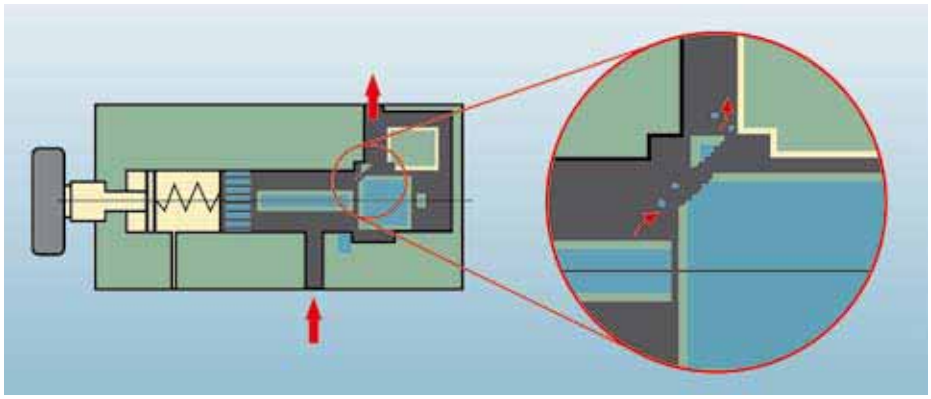



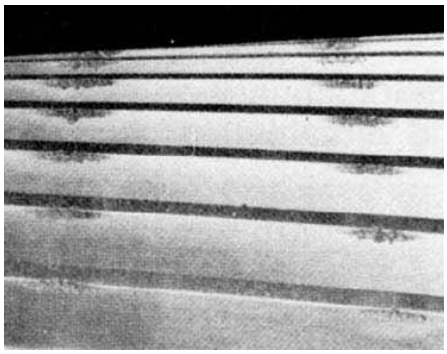
Damaged cylinder piston

**Effect of erosion:**

The high velocity of the fluid forces existing particles against the corners and edges of the system.
Other coarse and fine particles therefore become detached from the surface and there is a gradual attack on the surfaces in the system.

## 2. Erosion



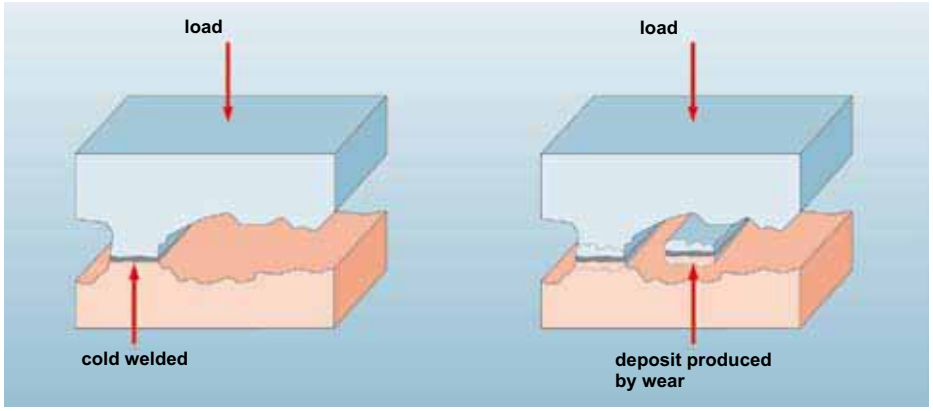


Erosion damage on the cog wheel

**Effect of adhesion:**

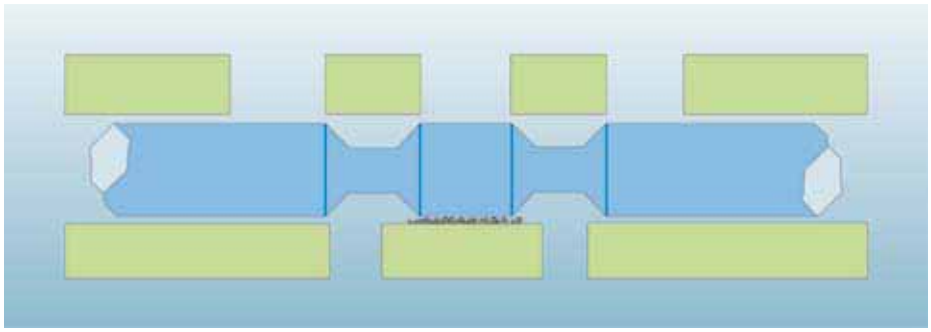
Low speed, excessive load and/or a reduction in fluid viscosity can reduce the oil film thickness.
This can result in metal-to-metal contact, and also possible shearing.

## 3. Adhesion



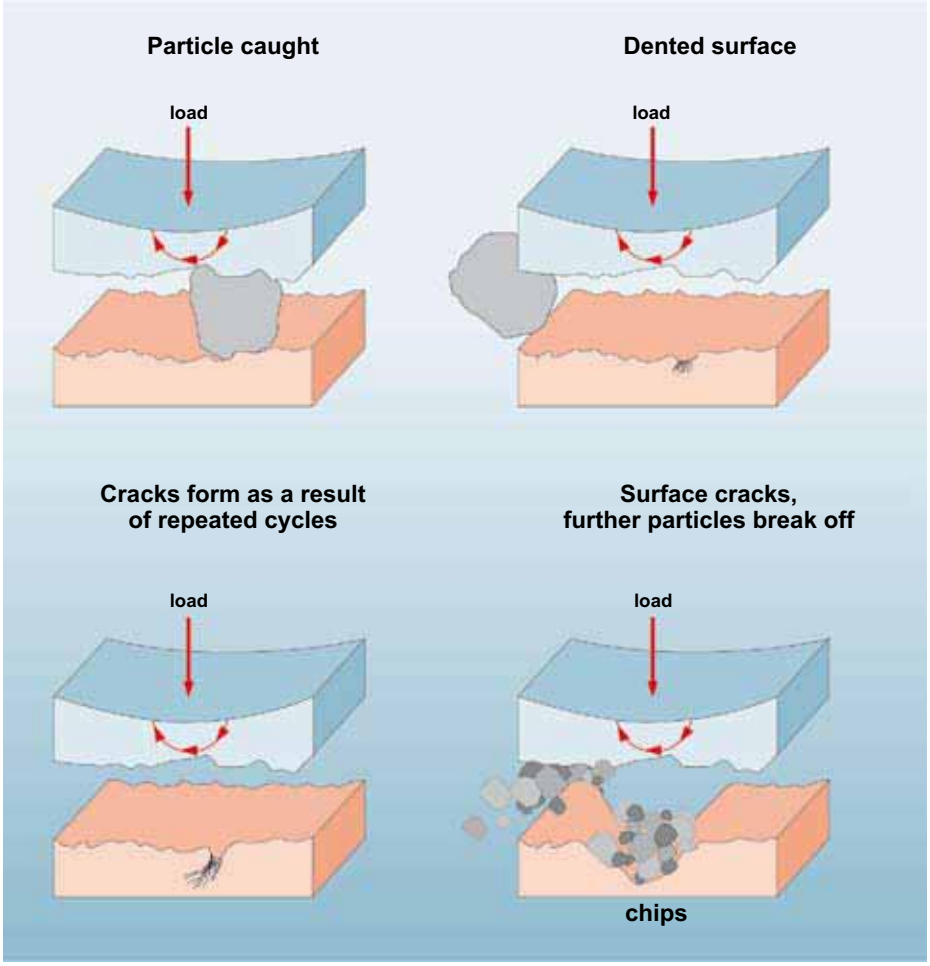


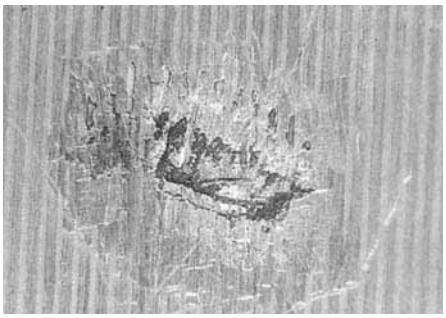

Adhesion on ball bearing



The smallest cracks in the surface are hollowed out causing material to break off, therefore creating new particles. This action causes an increase in wear.

## 4. Surface fatigue



Surface fatigue on ball bearing

# How clean should the fluid be?

## Classification of the solid particle contamination

The classification of solid particle contamination in lubrication and hydraulic fluids follows ISO 4406/1999.

To determine the cleanliness level the solid particles present in 100 ml fluid are counted, sorted according to size and quantity and classified into particle ranges.

Depending on the method of particle counting, there are 2 or 3 ranges:

| Particle counting method | Particle sizes (Code no.) | | |
|---|---|---|---|
| Automatic particle counter | > 4 µm$_{(C)}$ | > 6 µm$_{(C)}$ | > 14 µm$_{(C)}$ |
| Microscopic counting | --- | > 5 µm | > 15 µm |

The ISO Code can be "translated" into a maximum particle quantity for each particle size range with the aid of the adjacent table.

This code is specified for each size range.

The oil cleanliness level determined by electronic particle counters is expressed as a combination of three numbers, e.g. 21/18/15; the particle quantity determined by microscopic counting is expressed as a combination of two numbers, e.g. -/18/15.

| ISO Code | Particle quantity/100ml | |
|---|---|---|
| (to ISO 4406) | from | to |
| 5 | 16 | 32 |
| 6 | 32 | 64 |
| 7 | 64 | 130 |
| 8 | 130 | 250 |
| 9 | 250 | 500 |
| 10 | 500 | 1000 |
| 11 | 1000 | 2000 |
| 12 | 2000 | 4000 |
| 13 | 4000 | 8000 |
| 14 | 8000 | 16000 |
| 15 | 16000 | 32000 |
| 16 | 32000 | 64000 |
| 17 | 64000 | 130000 |
| 18 | 130000 | 260000 |
| 19 | 260000 | 500000 |
| 20 | 500000 | 1000000 |
| 21 | 1000000 | 2000000 |
| 22 | 2000000 | 4000000 |
| 23 | 4000000 | 8000000 |
| 24 | 8000000 | 16000000 |
| 25 | 16000000 | 32000000 |
| 26 | 32000000 | 64000000 |
| 27 | 64000000 | 130000000 |
| 28 | 130000000 | 250000000 |

**Determined using...**

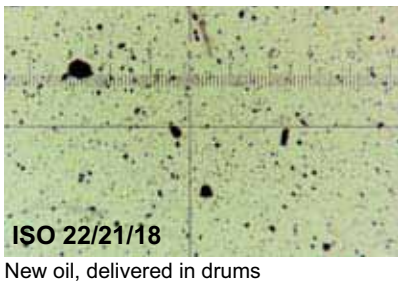
**...electronic particle counter**

**21 / 18 / 15**
**>4µmc >6µmc 14µmc**

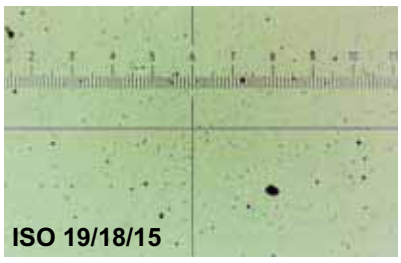
**...microscopic counting**

**– / 18 / 15**
**>5µmc 15µmc**

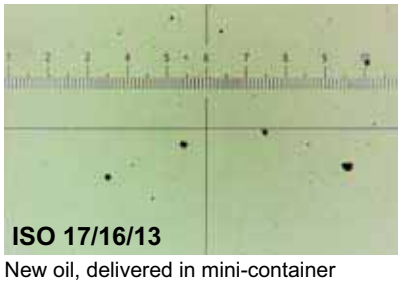
## Typical cleanliness level:



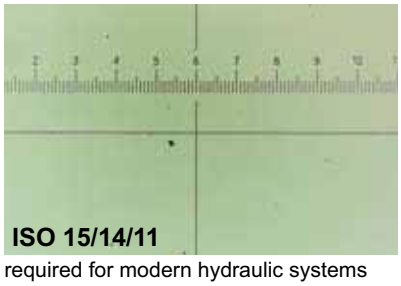
New oil, delivered in drums



New oil, delivered in road tanker



New oil, delivered in mini-container



required for modern hydraulic systems

## Cleanliness requirements for lubricating and hydraulic components

The cleanliness level in lubricating and hydraulic systems is determined by the most sensitive component.

Numerous manufacturers of components for lubrication, industrial and mobile hydraulics specify the optimum cleanliness requirements for their components. More heavily contaminated fluids can lead to a significant reduction in service life of those components. Therefore we recommend contacting the particular manufacturer for written recommendations concerning the cleanliness of the fluid.

In the case of warranty claims, this information is important in order to reject claims for damages. If the component manufacturers do not have specific data concerning the required cleanliness level available, the following table can be used:

| Type of system/Area of application/ Components | Recommended cleanliness class |
|---|---|
| Systems with servo hydraulics sensitive to fine contamination | 15/13/10 |
| Industrial hydraulics<br>● Proportional technology<br>● High pressure systems | 17/15/12 |
| Industrial and mobile hydraulics<br>● Solenoid control valve technology<br>● Medium pressure and low pressure systems | <br>18/15/12<br>19/16/14 |
| Industrial and mobile hydraulics with low requirement for wear protection | 20/18/15 |
| Forced-feed circulatory lubrication on transmissions | 18/16/13 |
| New oil | 21/19/16 |
| Pumps/Motors<br>● Axial piston pump<br>● Radial piston pump<br>● Gear pump<br>● Vane pump | <br>18/16/13<br>19/17/13<br>20/18/15<br>19/17/14 |
| Valves<br>● Directional valves<br>● Pressure valves<br>● Flow control valves<br>● Check valves<br>● Proportional valves<br>● Servo valves | <br>20/18/15<br>19/17/14<br>19/17/14<br>20/18/15<br>18/16/13<br>16/14/11 |
| Cylinders | 20/18/15 |

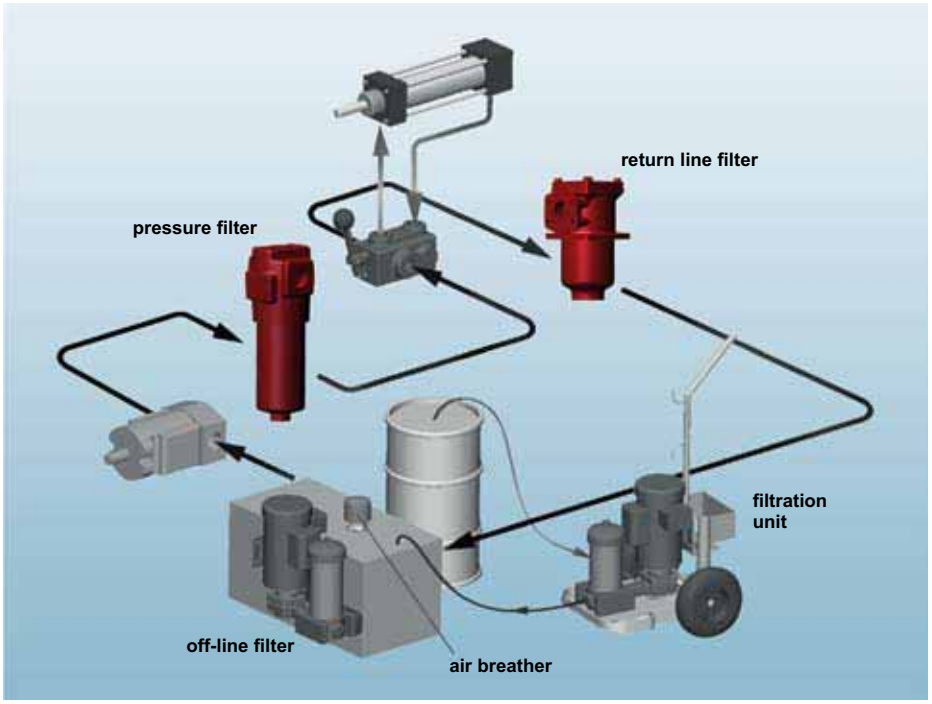
The cleanliness levels shown in the table are based on an operating pressure from 100 to 160 bar, a normal level of ambient contamination and normal system availability.

Therefore the following criteria must be taken into account when determining the required cleanliness levels of the fluid:

| | | Correction factor for the recommended cleanliness |
|---|---|---|
| Operating pressure | less than 100 bar<br>more than 160 bar | 1 class worse<br>1 class better |
| Expected life expectancy of the machine | up to 10 years<br>over 10 years | no correction<br>1 class better |
| Repair and spare part costs | high | 1 class better |
| Stoppage costs due to shutdown | up to 10,000 €/hr.<br>over 10,000 €/hr. | no correction<br>1 class better |
| Pilot system (system which significantly affects the manufacturing process or cycle) | | 1 class better |

# What kind of filters are there and when are they used?

## Installation location of filters

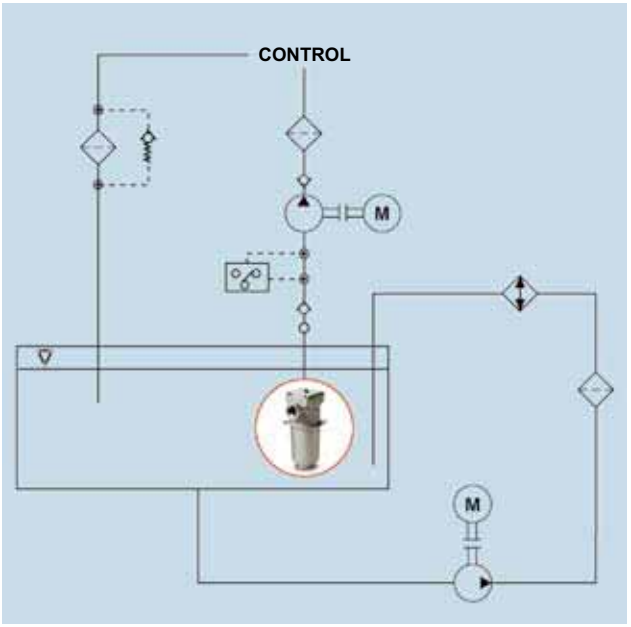



## Suction filter

Suction filters serve to protect the pump from coarse fluid contamination which can cause a sudden pump failure.

Due to the risk of cavitation of the pump, relatively coarse filter materials with a filtration rating of > 25 µm are used.

For this reason, suction filters are **not** suitable for ensuring the component protection necessary for the economical operation of the system.






SF, SFM, suction filter element

Extract from product range

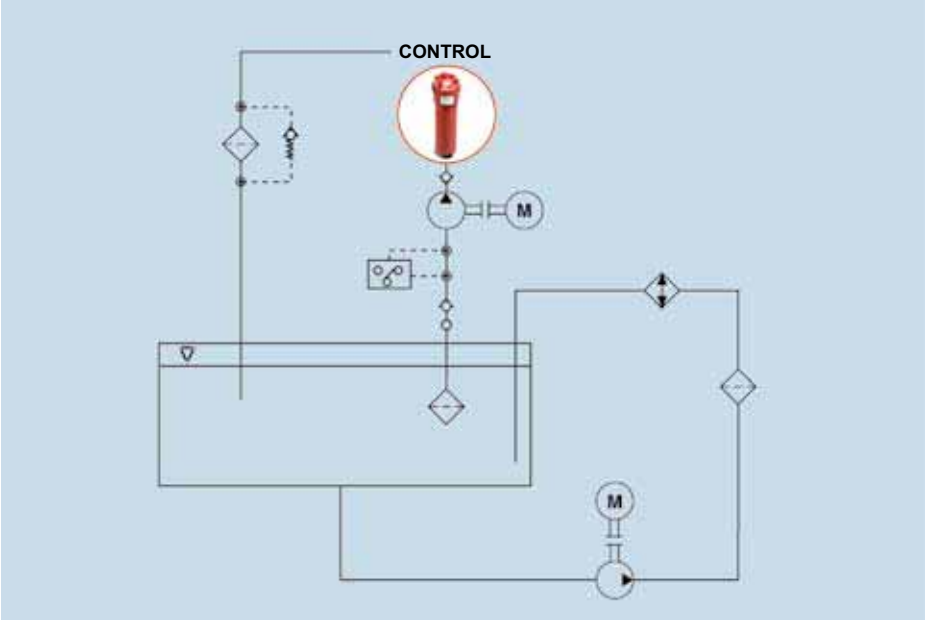
| Suction filter | |
|---|---|
| Benefits | Remember |
| ● Protects the pump against coarse contamination | ● Fine filtration not possible<br>● Pump must be protected against cavitation (vacuum switch)<br>● Risk of cavitation, particularly at low temperatures (cold start)<br>● To guarantee protection from wear, another filter must be installed |

## Pressure filters

Pressure filters are fitted after the pump and they are sized for the system pressure and the flow rate of the pressure line in which they are installed. Pressure filters are particularly suitable for protecting sensitive components, located directly after the filter, such as servo valves. High pressure filters must withstand the maximum system pressure and the fatigue strength must also be guaranteed owing to the frequent pressure peaks in the system in many cases.

Pressure filters must always be fitted with a clogging indicator. Before particularly critical components, only inline filters without bypass valves should be used. Such filters must be fitted with a filter element which must itself be able to withstand higher differential pressures without sustaining any damage.

The filter housings must withstand the maximum dynamic system pressure.




### Inline filters



DF 420 bar



MFM 280 bar



LPF 50 bar

Extract from product range

### Manifold-mounted filters



DFZ 315 bar



DF...M A 250 bar
DF...Q E 315 bar



DFP 315 bar

Extract from product range

| Pressure filters | |
|---|---|
| Benefits | Remember |
| ● Filtration directly before the components which need protection<br>● Required cleanliness level is guaranteed | ● More expensive filter housing and element due to pressure load<br>● Complex element construction as a result of the necessary differential pressure resistance<br>● Pump is not protected<br>● In the case of single filters, the system must be switched off for element changes. |

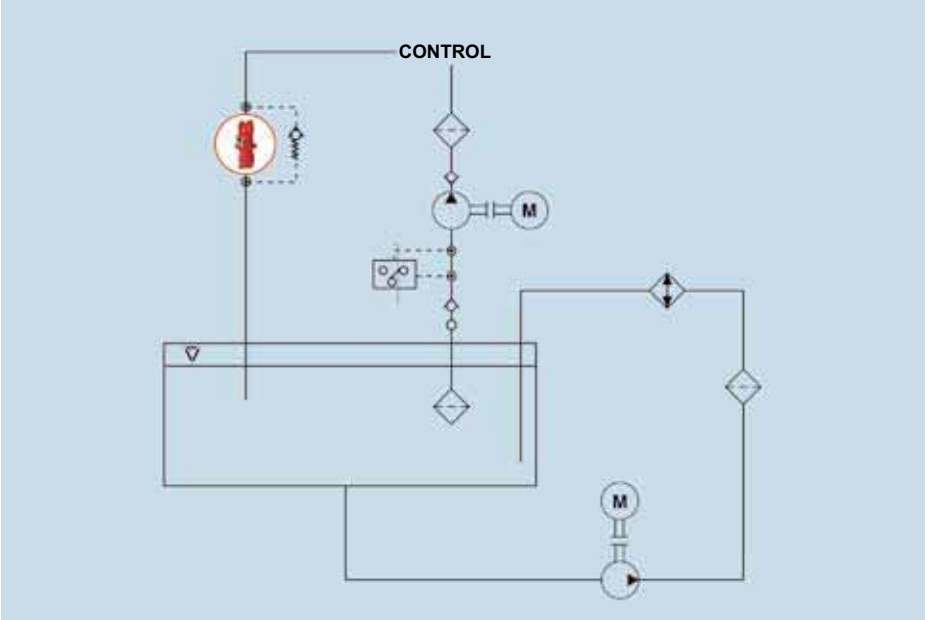
## Return line filters

Return line filters are located in the return line as an inline filter or as a tank-mounted filter on the tank or in the tank. This means that the operating fluid coming from the system flows back into the tank completely filtered. Therefore all contamination particles are filtered out of the fluid before reaching the tank.

When selecting the correct filter size, the maximum possible flow rate must be taken in account. This corresponds to the area ratio of piston to piston minus the rod of hydraulic cylinders and can be greater than the flow rate generated by the pumps.

In order to avoid possible foaming of the fluid in the tank, make absolutely sure than the fluid outlet from the filter is always below the fluid level in all operating conditons. It may be necessary to fit a pipe or a flow rate diffuser in the filter outlet. It is important that the distance between the floor of the tank and the end of the pipe is no less than two to three times the pipe diameter.

Return line filters can be fitted with breather filters as additional equipment.




**Return line filters**


RF


NF


RFN

Extract from filter range

| Return line filters | |
|---|---|
| Benefits | Remember |
| ● All fluid flowing back to the tank is filtered<br>● No system contamination reaches the tank<br>● Filter housing and element are excellent value | ● In the case of high-value components a pressure filter must be used in addition<br>● It is advisable to fit a bypass valve<br>● In the case of elements with low differential pressure resistance, it is possible for the element to burst as a result of multiple pulsations<br>● In the case of single filters, the system must be switched off to change the element<br>● Large filters are required for high flow rates (area conversion for differential cylinders) |

## Return line & suction boost filters

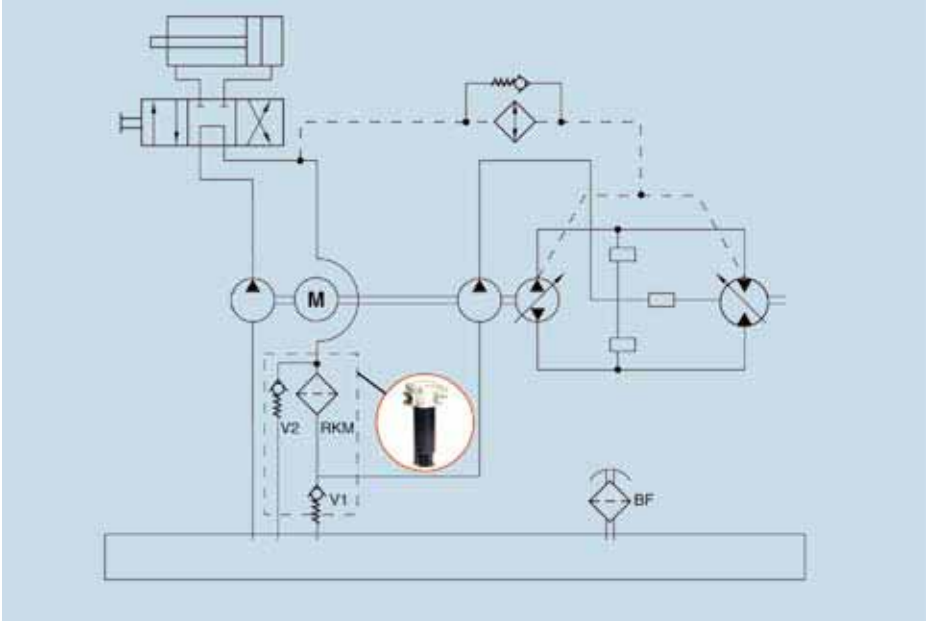
The return line & suction boost filter RKM was designed primarily for mobile machines with working hydraulics (e.g. extending and retracting cylinders) and drive hydraulics.

These filters have the advantage that filtered oil at a pressure of approx. 0.5 bar is supplied to the charge pump of the traction drive, which reduces the risk of cavitation in the charge pump and therefore provides excellent cold start characteristics.

In order to maintain the initial load of approx. 0.5 bar at the connection to the charge pump, a surplus of at least 10% between the return line volume and the suction volume is required under all operating conditions.

Through the use of a pressure relief valve, when the $\Delta p$ reaches 2.5 bar, the oil flows directly into the tank (no bypass to the closed circuit).

If, in addition to the flow from the open circuit, the leakage oil from the hydrostatic drive also goes through the filter, then the permissible pressure of the leakage oil at the filter must not be exceeded (taking into account the pressure drop of the leakage oil lines, of the oil cooler and of the pressure relief valve) to protect the radial shaft seal rings.




**Return line & suction boost filter**



RKM

| Return line & suction boost filter | |
|---|---|
| Benefits | Remember |
| ● Finely filtered oil reaches the user unit (increases the availability)<br>● Oil is precharged in the suction connection (0.5 bar) (prevents cavitation, less wear)<br>● Replaces several filters (lower fitting costs, only ONE spare element)<br>● Extremely low pressure drop (full filtration at low temperatures)<br>● Various options (thermal bypass valve, multi port) | ● It makes sense if under operating conditions the return line volume is greater than the volume needed on the suction side |

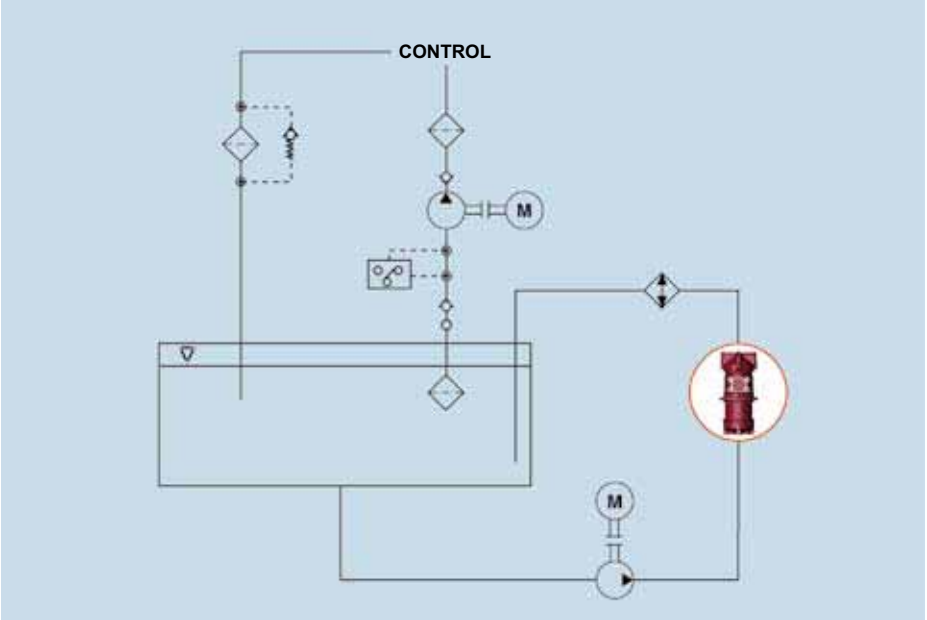
## Offline filter

In hydraulic systems with heavy loads, additional offline filters are used increasingly to avoid the accumulation of fine particles.

In contrast to main filters, only part of the whole flow in the system is filtered by offline filters.

Excellent oil cleanliness levels can be achieved through continual filtration, regardless of the operating cycle of the machine. In addition, the main filters are relieved, meaning that element changing intervals can be extended.

Offline filter systems should be used in addition to main filters. In this case the main filter should be sized as a protective filter, i.e. filtering less finely and without a bypass valve.




**Offline filter**



Extract from the product range

NF

| Offline filter |
|---|
| Advantages |
| ● Excellent cleanliness classes |
| ● Filtration independent of the system |
| ● High contamination retention capacity of filter elements as a result of pulsation-free, low and constant flow through the filter elements |
| ● Element change possible without stopping the machine |
| ● Cost savings as a result of lower material costs |
| ● Less time spent on maintenance |
| ● Fewer downtimes |
| ● Cost-effective filter elements |
| ● Possible to fill hydraulic system |
| ● Can be easily retrofitted in systems with insufficient filtration |
| ● Dewatering of the fluid is possible |
| ● Service life of fluid in the system is extended |

Generally speaking, offline filters should be installed:

- if a high rate of contamination is expected, e. g. on production test rigs, large-scale systems in dusty areas, cleaning systems
- when installing a separate cooling circuit
- when there are vigorous changes in system flow rate

## Tank breather filters

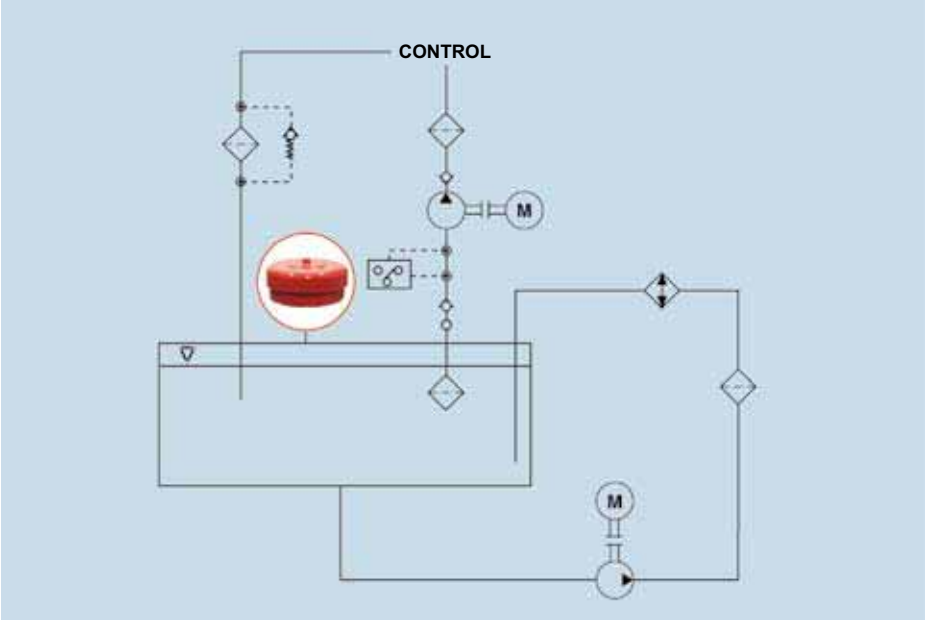
Tank breather filters are one of the most important components in filter design.

As a result of changes in temperature and of using cylinders or accumulators, the oil level in the tanks of hydraulic and lubrication systems is subject to constant fluctuations.

The resulting pressure differential to the ambient is equalized by an exchange of air which means contamination can get into the tanks.

The entry of contamination can be prevented by breather filters. Ideally the breather filter should be of at least the same filtration rating as the system filter in the hydraulic circuit. By using breather filters with double check valves, the air exchange between the tank and the ambient can be significantly reduced, minimizing the amount of contamination and dust entering the tank and increasing the service life of the breather filter.

Where there are high temperature changes and high humidity, water also enters the tank. HYDAC BD filters prevent water from entering and therefore improve the fluid performance.




**Tank breather filter**



BF



ELF/L



BD/BDH/BDL

Extract from the product range

| Breather filter | |
|---|---|
| Benefits | Remember |
| ● Relieves the system filter by preventing contamination from entering the tank during tank breathing<br>● High air flow rate<br>● Cost-effective<br>● Environmentally friendly | ● If the filter is incorrectly sized, damage may occur to the tank and the pump. |

## Summary

| Filter location | Benefits | Remember | Filter designation |
|---|---|---|---|
| Breather filter | ● Relieves the system filter by preventing contamination from entering the tank during tank breathing<br>● High air flow rate<br>● Cost-effective<br>● Environmentally friendly | ● If the filter is incorrectly sized, damage may occur to the tank and the pump. | ELF, BF, BL, BD, ELFL, BT |
| In the suction line | ● Pump protection | ● Coarse filtration only<br>● Due to the pump suction conditions generously sized filters with a low differential pressure are required<br>● No protection of components further downstream from pump wear<br>● Unsuitable for many control pumps<br>● Minimal system protection<br>● It is imperative to safeguard the pump against vacuum pressure | SFE, SF, MF, MFD, LPF, LF, RFL, RFLN, SFM, SFF, SFR, SFFZ |
| In the pressure line | ● Direct protection of the components<br>● Contributes to general cleanliness of the system<br>● Highly efficient fine filter elements can be used<br>● Filters pump drive systems | ● Housing and element expensive since they must be sized for the max. system pressure<br>● Does not filter contamination from components further downstream<br>● High energy costs | DF, DFZ, DFN DFP, ILF, LFDK, MDF, MFM, LPF, LF MF, MFD, LFM, DFM, LFN, LFNF, LPF, LPFR, LFR, DFF, DFG, DFDK, DF..M A, DF..Q E, HFM |
| In the return line | ● Filters the contamination which has entered the system as a result of component friction and worn wipers before they can reach the hydraulic tank<br>● Low pressure sizing of the filter housing enables costs to be reduced<br>● Can be fitted inline or in the tank | ● No protection of the pump<br>● Return line flow rate fluctuations can reduce the filtration efficiency<br>● No direct component protection<br>● Large filters may be required, since the return flow is often larger than the pump flow | RF, RFM, RKM, RFL, RFLD, RFN, RFD, RFND, RFLN, RFLR, RFMR, RKMR |
| Offline e. g. cooling circuit | ● Continual cleaning of the hydraulic fluid, also when the system is switched off<br>● Possible to carry out maintenance when system running<br>● Filtration performance is not affected by flow rate fluctuations and provides optimum service life and performance from the filter elements<br>● Possible to fill tank with filtered oil<br>● Particular cleanliness level can be achieved more accurately and can be maintained.<br>● Possible to integrate fluid cooling easily | ● High investment costs<br>● Additional space required<br>● No direct component protection | NF, NFD, LF, MF |

# Filter selection

Filter efficiency is the most important but not the only factor involved when evaluating the filter design. A filter can be ineffective if it is installed in the wrong place and if it is given the wrong job.

When creating a filtration concept, some **fundamental rules** play an important role.

For example, the function of a hydraulic filter is always to reduce wear which means it should filter to a finer level than the critical tolerances. Filters should be used with the highest possible flow rate. Suitable seals on cylinders and on breather filters should prevent contamination from entering the system etc.

Therefore we can distinguish between **protective filters** and **working filters**.

| Protective filter | Working filter |
|---|---|
| ● Component protection | ● Cleaning function |
| ● No bypass valve | ● Flow with least possible pulsations where filter installed |
| ● Does not prevent long term wear | ● Optional with bypass valve |
| ● Filters more coarsely than working filter | ● Differential pressure indicator is recommended |
| ● High differential pressure resistant filter elements | ● Use of low differential pressure resistant elements is possible |

## Restricting the flow velocity

Since specific flow velocities in the connection lines must not be exceeded, depending on the filter type, we recommend only special maximum flow rates.

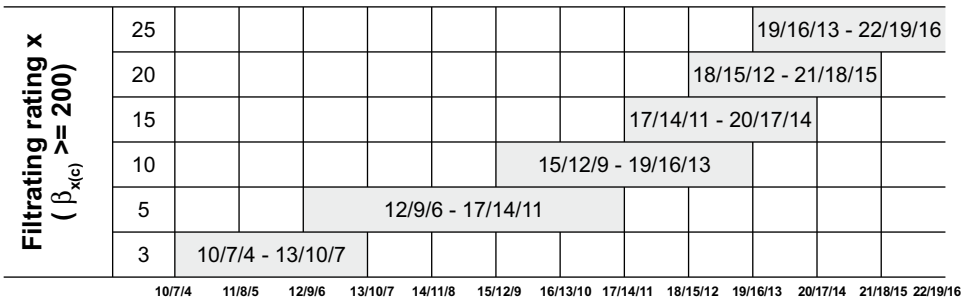
Here we give guideline values which are based on our experience. Exceptions, depending on the application, are of course possible and reasonable.

| | Maximum recommended flow rate in l/min | | | | |
|---|---|---|---|---|---|
| Threaded connection | Suction filter 1.5 m/s | Return line filter 4.5 m/s | Pressure filter up to 100 bar 4.5 m/s | Pressure filter up to 280 bar 8 m/s | Pressure filter up to 420 bar 12 m/s |
| G ½ | 14 | 42 | 42 | 46 | 68 |
| G ¾ | 23 | 69 | 69 | 74 | 111 |
| G 1 | 37 | 112 | 112 | 119 | 178 |
| G 1 ¼ | 59 | 178 | 178 | 182 | 274 |
| G 1 ½ | 92 | 275 | 275 | 295 | 443 |

## Determining the appropriate filter element

Depending on the ambient system conditions, the same filtration ratings will achieve different oil cleanliness levels.

The following oil cleanliness classes are typically achieved with HYDAC elements:




**Oil cleanliness to ISO 4406**

## Selection of the appropriate filter material

The variety of applications of HYDAC filters has given rise to different element models, each specifically optimized for particular requirements. We are therefore in a position to provide you with the type of element most technically and economically appropriate for your special application. The following table outlines the most important filtration media. Our sales team is always available to help you select the filtration media which is most appropriate for your application.

| | Element designation | Construction of filter mesh pack | Typical features |
|---|---|---|---|
| | Synthetic fine filtration materials | | |
|  | Betamicron®<br>BN4HC (20 bar)<br>BH4HC (210 bar) | Multi-layer, supported, pleated filter mesh pack with glass fibre | ● High contamination retention<br>● High rate of particle separation over a wide differential pressure range<br>● High resistance to pressure and low rate fluctuations |
|  | Mobilemicron<br>MM | Multi-layer, supported, pleated filter mesh pack with synthetic fibre | ● High rate of particle separation<br>● Low pressure drop<br>● Sufficient contamination retention<br>● First class filtration in the suction range possible |
|  | Ecomicron<br>ECON2 | Multi-layer, supported, pleated filter mesh pack with synthetic fibre<br><br>Support tube and end caps in electrically conductive synthetic material | ● High rate of particle separation<br>● Low pressure drop<br>● High contamination retention<br>● Use of first class synthetic materials which can be easily disposed of<br>● Low weight<br>● Free of steel and iron |
|  | Lubimicron<br>G/HC | Multi-layer, supported, pleated filter mesh pack with synthetic fibre | ● Definition of the filtration performance according to API specifications |
|  | Dimicron®<br>DM | Filter discs with at least two filtration layers in synthetic material | ● High contamination retention (500 g/element)<br>● High rate of particle separation<br>● High cleaning effect in the single pass (fuelling stations) |
| | Paper | | |
|  | Paper<br>P/HC | Simply supported, pleated, organic paper (usually impregnated with phenolic resin) | ● Cheap element<br>● Low level of particle separation and contamination retention (multipass usually not possible)<br>● Low pressure drop<br>● Low pressure stability (bypass absolutely necessary) |
| | Stainless steel and wire mesh materials | | |
|  | Wire mesh<br>or dutch weave<br>W/HC<br>or<br>T/HC | Multi-layer or single-layer, supported, pleated square mesh in stainless steel or dutch weave | ● Protective filter with low filtration performance and contamination retention |
|  | Chemicron<br>and<br>metal fibre<br>V | Multi-layer construction, pleated meshpack with sintered stainless steel fibre | ● All the components in the element are made of stainless steel.<br>● For element type "Metal fibre V" these components are bonded with 2-component adhesive (max. temperature 100 °C).<br>● For element type "Chemicron" the element components are bonded without the use of other materials. |

## Filter sizing

Once the element material, the required filtration rating and the filter construction have been established, the size of the filter can be determined.

Here we can assume that the initial pressure drop of a filter does not exceed a specific value, or that it comes as close as possible to this value (see adjacent table).

| Use as | Filter construction | Total initial differential pressure (with new filter element) |
|---|---|---|
| Working filter | Return line filter, Pressure filter with bypass valve | 0.15 to 0.2 • $P_{indicator}$ |
| | Offline filter, Inline filter, Separate units | 0.15 to 0.2 bar |
| Protective filter | Pressure filter without bypass valve | 0.3 • $P_{indicator}$ |
| | Suction filter | 0.04 bar |

The total pressure drop of a filter (at a specific flow rate Q) consists of the housing Δp and the element Δp and is calculated as follows:

$$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$$

$$\Delta p_{housing} = \text{please refer to housing curve (see brochure)}$$

$$\Delta p_{element} = Q \cdot \frac{\text{element gradient coefficient}}{1000} \cdot \frac{\text{operating viscosity}}{30}$$

## Example

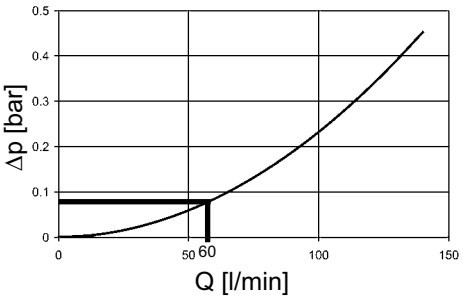
Sizing a return line filter, tank-mounted, type RFM 150, element material Betamicron®4,
10 µm filtration rating,
Flow rate in the return line: 60 l/min,
Operating fluid: ISO VG 46,
Operating temperature: 40 °C.

Note:
At 40 °C this oil has an operating viscosity of approx. 46 mm²/s (always take manufacturer's data into account).

**Maximum initial differential pressure: 1 bar (=0.2 • $P_{indicator}$ = 0.2 • 2 bar = 0.4 bar)**

$\Delta p_{housing}$:
(please refer to "RFM" brochure)

**RFM 90, 150**




$\Delta p_{element}$:
(for gradient coefficients for element 0150 R 010 BN4HC please refer to "Filter Elements" brochure or "RFM" brochure)

$$60 \text{ l/min} \cdot \frac{4{,}0}{1000} \cdot \frac{46 \text{ mm}^2/\text{s}}{30} = 0.368$$

$$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$$
$$0.09 + 0.368 = 0.458 \text{ bar}$$

## How to proceed in practice?

If you calculate on the generous side, i.e. choosing the larger filter, this will provide a longer service life, and will probably cost more. But if the sizing is only just adequate, i.e. you select the smallest possible filter, you risk a shorter service life and reduced component protection despite lower purchase costs.

The aim, of course, is to find the most economical filter whilst taking into consideration the total system life cycle (reduction of the Life Cycle Cost).

The size of the filter can be determined with the help of

- Housing and element pressure drop curves in the brochures (= manual filter sizing)
- Filter sizing program **Size-IT** (= computer-aided filter sizing)
- Concept creation tool **Optimize-IT** (= computer-aided system optimisation)

### Computer-aided filter sizing using Filter Sizing Program "Size-IT".

**Size-IT** enables computer-aided filter sizing, specific to the particular system and application profile.

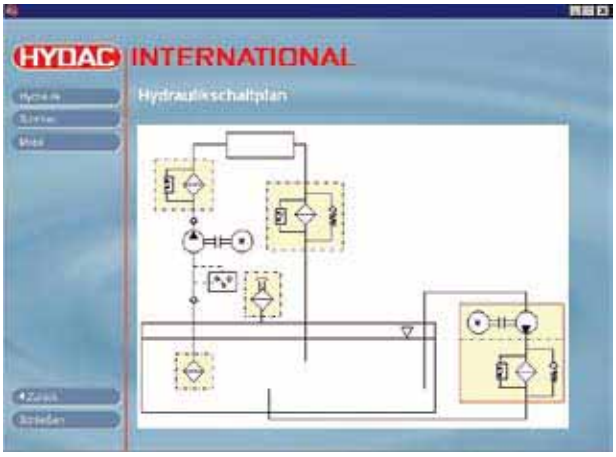
**Size-IT** is a component of our electronic product catalogue on CD-ROM, **Filter-IT**.

We will of course be pleased to send you a copy. Alternatively the program is available on our website (www.hydac.com).

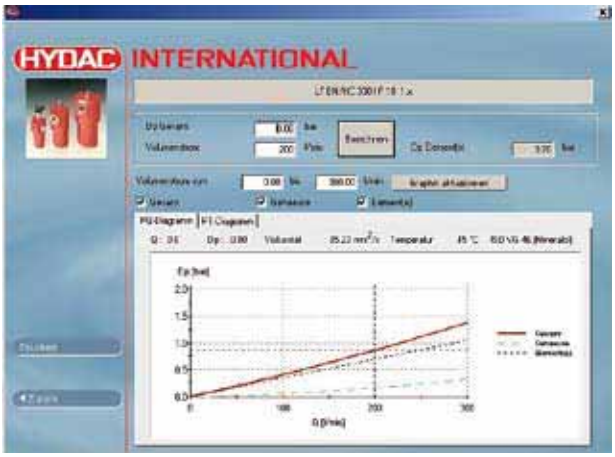
By using **Size-IT**, all the calculations which in the previous example had to be carried out painstakingly step by step, are done fully automatically.

Possible errors when reading out graph values are avoided; the time saving is considerable.

### Example of filter calculation using sizing software "Size-IT":




Selecting a filter type in the hydraulic circuit diagram




Display of element, housing and total curve for the selected filter type

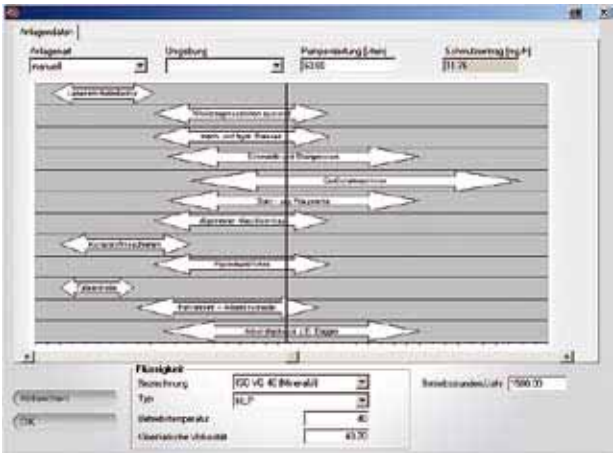
## Filter calculation according to the expected contamination rate using the concept creation tool "Optimize-IT"

This electronic tool, called **Optimize-IT**, is also a component of our electronic product catalogue, but is only available to our filter specialists.

Cleanliness classes and achievable service lives for different filter designs can be identified and compared using this tool.

Based on the expected contamination, the optimum filter combination and filter size combination can be determined, right down to a specific calculation of the element costs per year.

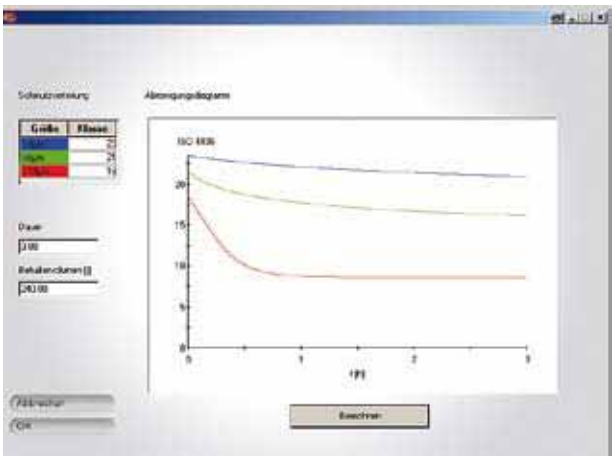
## Example of concept optimization using the electronic tool "Optimize-IT":



Determining the expected contamination for a particular system




Calculation of the service lives and element costs/year

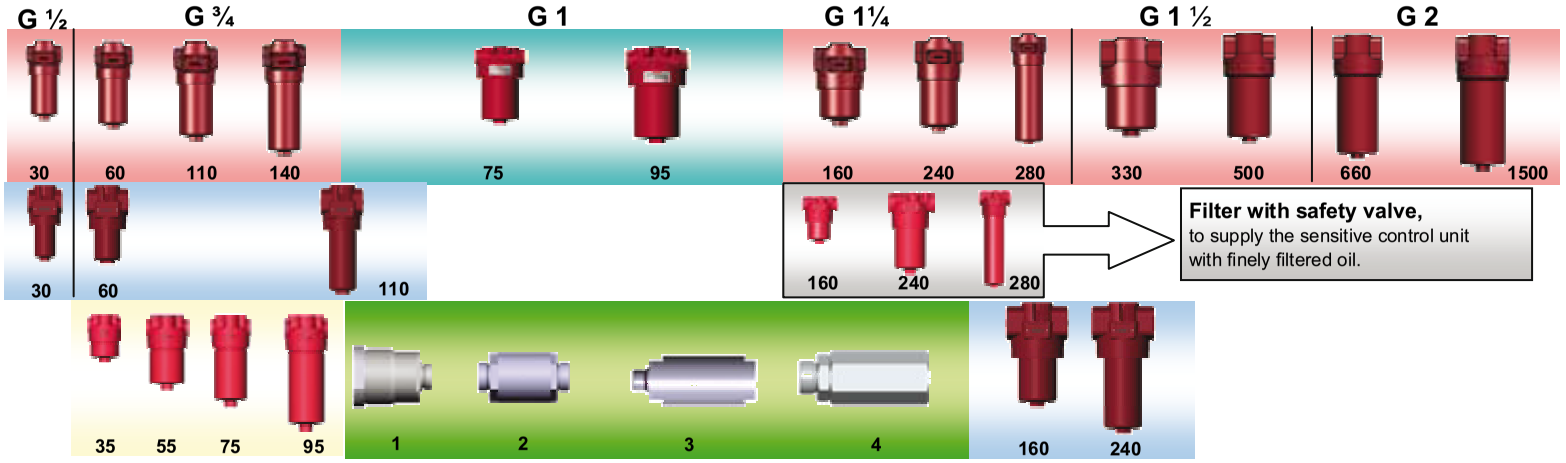


Graph showing cleaning

# Standard Models – Mobile Filters

## Pressure line filters
Working hydraulics

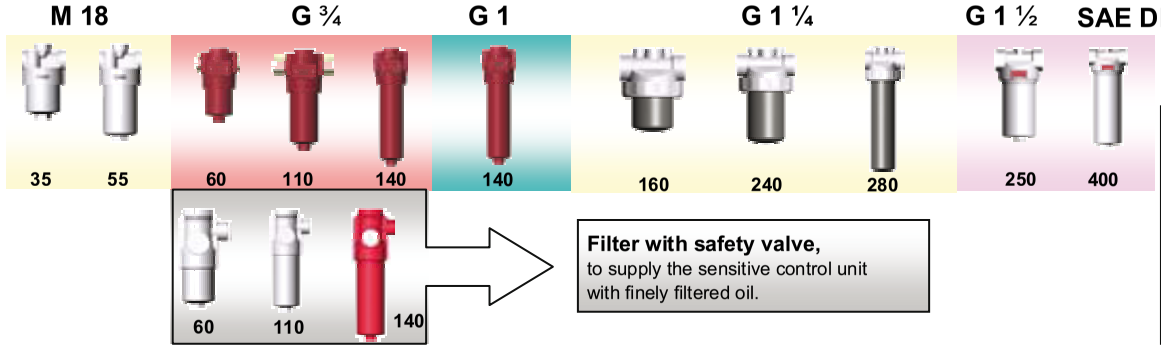
| | |
|---|---|
| DF | 420 bar |
| HFM | 400 bar |
| DFM | 400 bar |
| ILF | 350 bar |
| MFM MDF | 280 bar |
| ILF R | 350 bar |




**Filter with safety valve,**
to supply the sensitive control unit with finely filtered oil.

## Pressure line filters
Charge pump

| | |
|---|---|
| LF LFN | 100 bar |
| LFM | 63 bar |
| LPF | 25-50 bar |
| FLN | 25 bar |



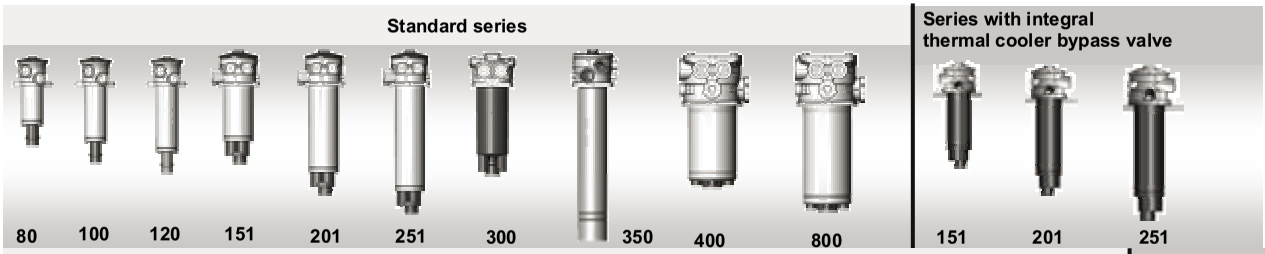

**Filter with safety valve,**
to supply the sensitive control unit with finely filtered oil.

**Suction filter**



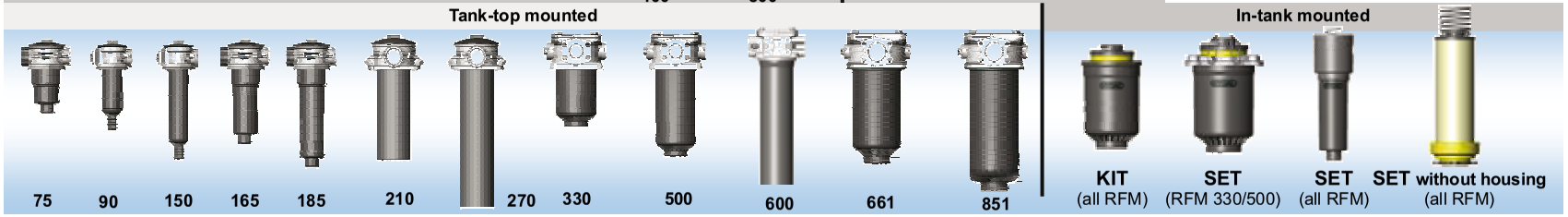

## Return line & suction boost filters

| Combined circuits | |
|---|---|
| RKM | 10 bar |




## Return line filters

| In-tank or tank-top mounted | |
|---|---|
| RFM | 10 bar |

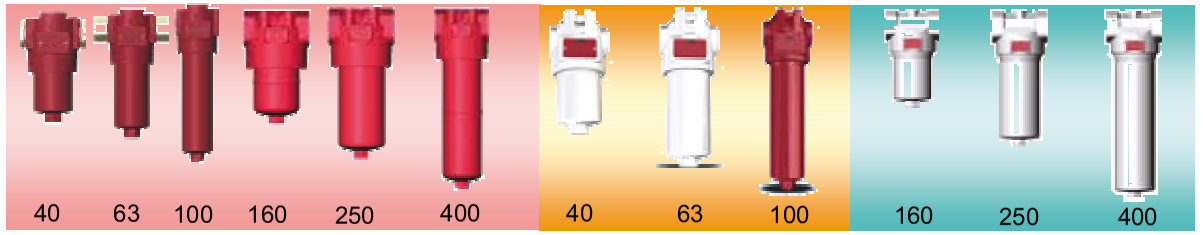


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# Standard Models – Filters to DIN 24550 Standard

## Inline pressure filters –Single– –Change-Over–

| | |
|---|---|
| DFN | 400 bar |
| LFN/LFNF | 100 bar |
| FLN | 25 bar |

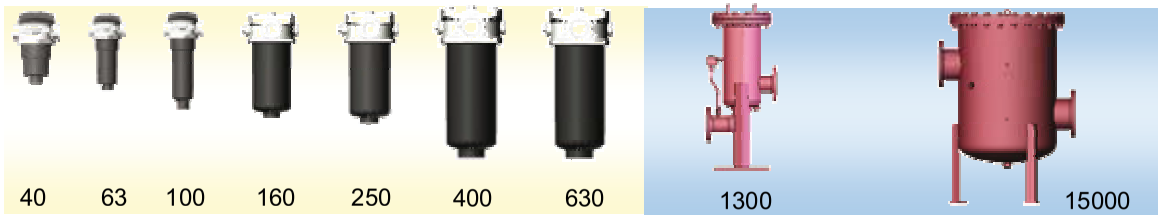



| | |
|---|---|
| DFDKN | 315 bar |
| FMND | 210 bar |
| FLND | 25 bar |

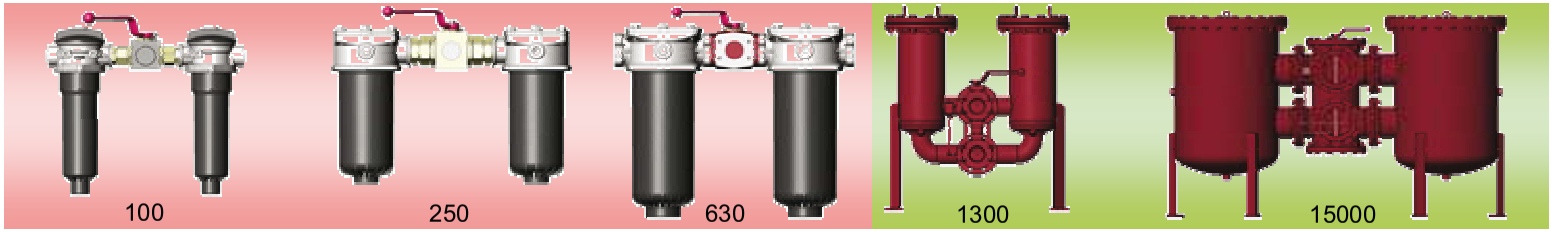



## Return line filters –Single– –Change-Over–

| | |
|---|---|
| RFLN | 16 bar |
| RFN | 10 bar |

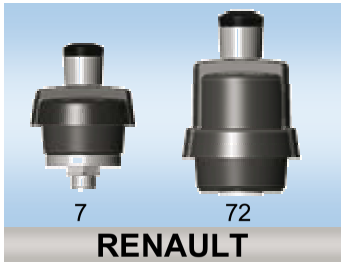



| | |
|---|---|
| RFND | 25 bar |
| RFLND | 16 bar |




## Breather filters

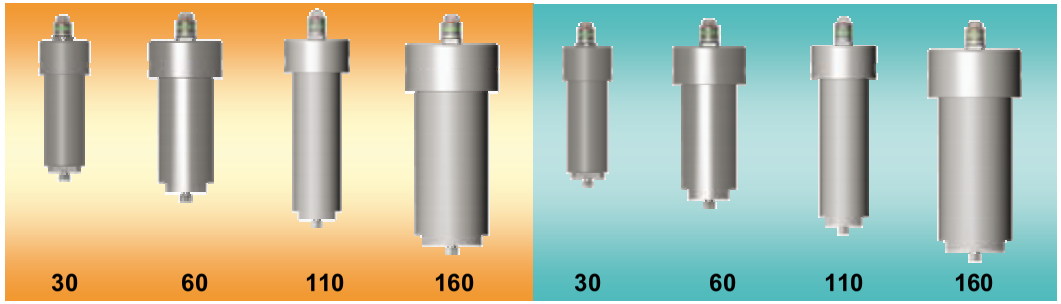
| | |
|---|---|
| ELF | --------- |



# Standard Models – Onshore – Offshore – Marine

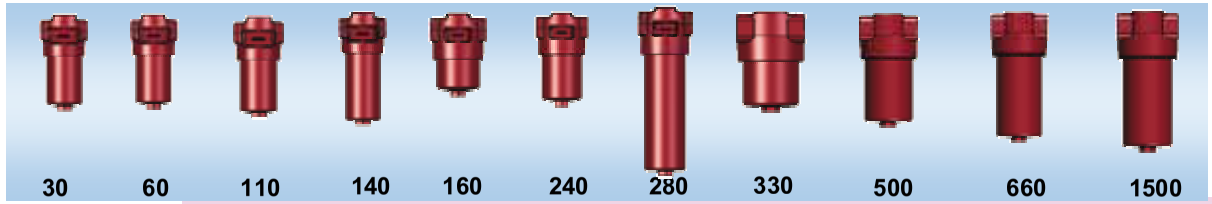
## Stainless steel filters

| | |
|---|---|
| ACSSF | 1000 bar |
| HPSSF | 700 bar |




## Standard filters with special offshore paint

| | |
|---|---|
| DF | 420 bar |
| RFLD | up to 64 bar |

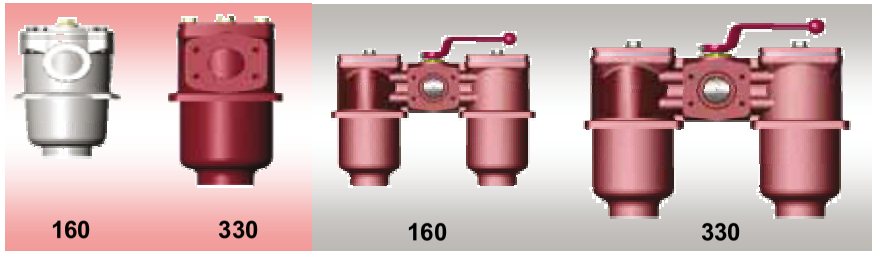






## Return line filters
Single/Change-over

| | |
|---|---|
| RF | 25 bar |
| RFD | 25 bar |




## Breather filters

| | |
|---|---|
| BF | 25 bar |



HYDAC INTERNATIONAL

# Filter Elements Betamicron®4. For Reduced Life Cycle Cost.

## Good. Better. Betamicron®4

Already with the previous Betamicron®3 technology you were always on the safe side: High and in particular long-term-stable fluid cleanliness for hydraulic and lubrication systems.
The new generation Betamicron®4 goes one better:
**Excellent performance data for reduced Life Cycle Cost.**

### The key innovations of generation 4 are:

- Optimized mat structure with newly developed filter media and additional drainage layer
- Improved performance data (particle separation, contamination retention, Δp/Q characteristics)
- Patented process for longitudinal seam bonding
- Element is fully discharge-capable
- Use of spiro lock seam support tubes
- Outer envelope made of plastic (previously metal)

### Technical data:

- Collapse burst pressure: Low pressure differential stability: 20 bar (BN4HC); High pressure differential stability: 210 bar (BH4HC)
- Filter ratings: 3, 5, 10, 20 µm

# Attach

■■■ Improved
operational reliability



■■■ Longer
maintenance intervals

■■■ Reduced
energy cost

■■■ Longer
system service life

# Importance to...



■■■ Better
component protection

■■■ Reduced
downtime cost

■■■ Reduced
operating cost

■■■ Reduced shipping
and waste disposal cost

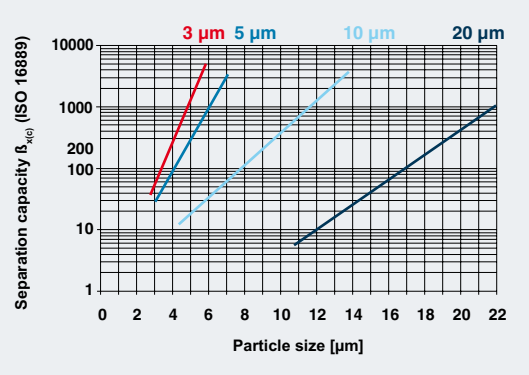
# Betamicron®4. Top-

## Optimized three-layer filter mat structure with new glass fibers

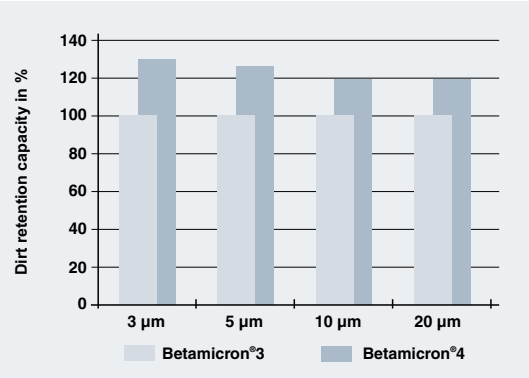
Absolutely new filter media were developed for the new Betamicron®4 filter elements. Due to the 3-stage structure, highest contamination retention and separation capacity are ensured.As a result of the integration of an additional drainage layer, the fluid flow is directed in an optimum way, and particularly favorable Δp/Q characteristics are achieved.

**Longer element service life and energy cost savings due to particularly low pressure losses across the element**

**Better component protection and longer system service life due to improved separation capacity**
(with filter ratings 3 and 5 µm)




**Longer element service life and lower operating costs due to increase in the contamination retention capacity by up to 30 %**




## Patented longitudinal seam bonding method

Due to an innovative bonding process of the longitudinal seam, a completely tight integration of open filter mat ends is ensured, even in the case of varying loads. A particle transition from the dirt to the clean side is reliably prevented.

**High operational reliability, even under dynamic loads, due to tight longitudinal seam bonding.**

## Zinc-free structure

To prevent the formation of zinc soap, which occurs mainly when water-containing fluids (HFA/HFC) and bio-oils are used, no zinc-containing components are employed.

**High operational reliability, because elements cannot be blocked as a result of the formation of zinc soap**

**Savings in storage costs, because the filter elements can be used universally**

## Use of spiro lock seam support tubes

The metal tube provided inside the element for stabilization purposes is designed as spiro lock seam tube, which offers unchanged stability while significantly reducing the element weight.

**Reduced shipping and waste disposal costs due to weight reduction by up to 30 %**



# class Filter Element Technology.



## Protection of the filter mat through outer envelope

The star-shaped pleated filter mat is enclosed by a stable envelope made of plastic. This envelope distributes the incoming fluid evenly over the mat (diffusor). Moreover, the fluid does not flow directly through the mat, which protects it from pulsating flows. In this way, the element reaches extremely high flow fatigue strength values. Moreover, the mat is naturally protected against mechanical damage, e.g. when elements are being installed. Because the outer envelope allows customer logos to be imprinted, it can be used as advertising medium for OEMs, thus ensuring spare parts business. At the same time, the user can rely on the fact that he will always get a genuine spare part.

- **High operational reliability, because the sensitive filter mat is protected against direct fluid flows and pulsation**
- **Low energy consumption, because due the uniform distribution of the fluid (diffusor effect), a particularly low Δp is achieved across the element**
- **Ease of handling, because the compact element is protected against damage in transit and during its installation**
- **Protection against product piracy through “brand labeling”**



The figure shows elements with customer logo, which are increasingly used across all industrial sectors.

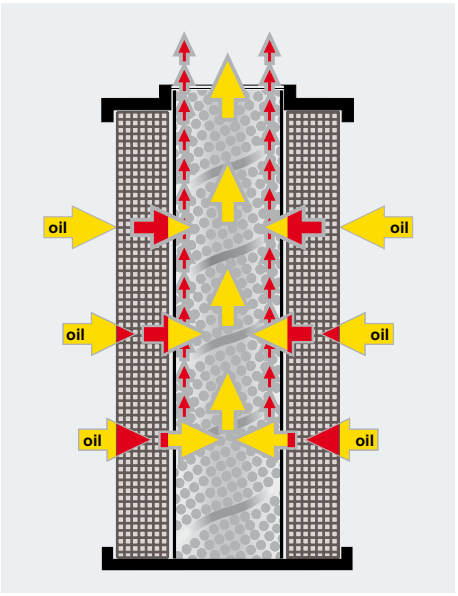
Particularly advantageous: The logo is also perfectly legible when the filter is dirty, that is, when the element is actually changed. „Brand labeling“ by HYDAC will result in an enormous increase in your spare parts business and improve the process quality through the use of genuine spare parts.

## Use of electrically conductive plastics and innovative filter media

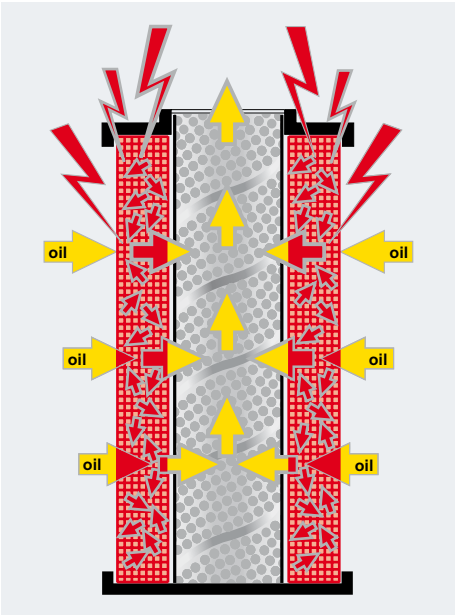
Due to a complete revision of the materials used, e.g. conductive plastics, full discharge-capability of the filter elements was achieved.

Charging of the filter elements during operation was therefore reduced to an absolutely uncritical level. This means that risks such as sudden sparking and the subsequent formation of black carbon or sludging of the oil are reliably eliminated.

- **High operational reliability, because the filter element is fully discharge-capable**




**Discharge on a discharge-capable element**




**No discharge on an element, which is not discharge-capable**

# Better in Quality, Performance and Efficiency.

## Performance data:

### Contamination retention capacity

Established in line with the multipass test ISO 16889

| Return flow elements (R) | | | | |
|---|---|---|---|---|
| | Betamicron BN4HC | | | |
| Size | 3 µm | 5 µm | 10 µm | 20 µm |
| 30 | 2.6 | 2.9 | 3.5 | 4.0 |
| 60 | 5.7 | 6.3 | 7.6 | 8.6 |
| 75 | 10.3 | 11.4 | 13.7 | 15.5 |
| 90 | 12.2 | 13.5 | 16.2 | 18.3 |
| 110 | 12.0 | 13.3 | 16.0 | 18.1 |
| 150 | 20.4 | 22.6 | 27.2 | 30.8 |
| 160 | 18.6 | 20.7 | 24.9 | 28.1 |
| 165 | 18.7 | 20.7 | 24.9 | 28.2 |
| 185 | 25.6 | 28.4 | 34.1 | 38.6 |
| 210 | 50.7 | 56.2 | 67.6 | 76.5 |
| 240 | 29.3 | 32.5 | 39.1 | 44.2 |
| 270 | 78.4 | 86.9 | 104.5 | 118.2 |
| 280 | 62.3 | 69.0 | 83.0 | 93.9 |
| 330 | 38.4 | 42.6 | 51.2 | 57.9 |
| 480 | 62.3 | 69.0 | 83.0 | 93.9 |
| 500 | 58.9 | 65.3 | 78.6 | 88.9 |
| 660 | 87.1 | 96.5 | 116.1 | 131.3 |
| 750 | 147.1 | 163.0 | 196.1 | 221.9 |
| 850 | 112.1 | 124.2 | 149.5 | 169.1 |
| 950 | 130.0 | 144.1 | 173.3 | 196.1 |
| 1200 | 179.1 | 198.5 | 238.8 | 270.1 |
| 1300 | 181.0 | 200.7 | 241.4 | 273.1 |
| 1700 | 229.8 | 254.7 | 306.4 | 346.6 |
| 2600 | 369.4 | 409.4 | 492.5 | 557.2 |

| Pressure elements (D) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Betamicron BN4HC | | | | Betamicron BH4HC | | | |
| Size | 3 µm | 5 µm | 10 µm | 20 µm | 3 µm | 5 µm | 10 µm | 20 µm |
| 30 | 4.6 | 5.1 | 5.4 | 5.6 | 3.0 | 2.9 | 3.2 | 3.7 |
| 35 | 7.2 | 8.1 | 8.6 | 8.8 | – | – | – | – |
| 55 | 14.0 | 15.8 | 16.6 | 17.2 | – | – | – | – |
| 60 | 6.5 | 7.3 | 7.8 | 8.0 | 4.6 | 4.5 | 5.0 | 5.7 |
| 75 | 21.6 | 24.3 | 25.7 | 26.5 | – | – | – | – |
| 95 | 27.6 | 30.9 | 32.7 | 33.7 | – | – | – | – |
| 110 | 13.8 | 15.5 | 16.4 | 16.9 | 10.1 | 9.9 | 10.9 | 12.4 |
| 140 | 18.1 | 20.3 | 21.5 | 22.2 | 13.3 | 13.0 | 14.3 | 16.3 |
| 160 | 19.8 | 22.2 | 23.5 | 24.3 | 12.9 | 12.6 | 13.9 | 15.9 |
| 240 | 32.3 | 36.3 | 38.4 | 39.6 | 21.6 | 21.1 | 23.2 | 26.5 |
| 280 | 70.6 | 79.3 | 83.9 | 86.6 | 48.1 | 47.1 | 51.8 | 59.1 |
| 330 | 47.2 | 53.1 | 56.1 | 57.9 | 34.6 | 33.9 | 37.2 | 42.5 |
| 500 | 76.9 | 86.5 | 91.5 | 94.4 | 57.5 | 56.3 | 61.8 | 70.5 |
| 660 | 102.2 | 114.9 | 121.5 | 125.4 | 76.8 | 75.2 | 82.6 | 94.3 |
| 990 | 154.5 | 173.7 | 183.7 | 189.5 | 111.8 | 109.4 | 120.2 | 137.2 |
| 1320 | 209.9 | 236.0 | 249.6 | 257.5 | 153.8 | 150.7 | 165.5 | 188.8 |

### Δp/Q gradient coefficients in mbar/l/min

Flow rate established in line with ISO 3968

| Return flow elements (R) | | | | |
|---|---|---|---|---|
| | Betamicron BN4HC | | | |
| Size | 3 µm | 5 µm | 10 µm | 20 µm |
| 30 | 68.4 | 43.9 | 26.8 | 14.7 |
| 60 | 26.8 | 18.3 | 10.9 | 6.9 |
| 75 | 22.0 | 14.2 | 8.1 | 4.4 |
| 90 | 14.9 | 10.1 | 6.7 | 3.2 |
| 110 | 14.9 | 9.4 | 6.0 | 3.2 |
| 150 | 8.9 | 6.0 | 4.0 | 1.9 |
| 160 | 9.5 | 5.9 | 3.8 | 2.9 |
| 165 | 11.2 | 7.8 | 4.5 | 2.4 |
| 185 | 8.9 | 6.1 | 3.3 | 1.8 |
| 210 | 3.9 | 2.6 | 1.8 | 1.1 |
| 240 | 6.2 | 3.8 | 2.6 | 1.8 |
| 270 | 2.5 | 1.7 | 1.1 | 0.7 |
| 280 | 3.1 | 2.2 | 1.6 | 1.0 |
| 330 | 4.2 | 2.7 | 1.7 | 1.2 |
| 480 | 3.1 | 2.2 | 1.6 | 1.0 |
| 500 | 3.0 | 1.9 | 1.3 | 0.8 |
| 660 | 1.9 | 1.2 | 0.8 | 0.5 |
| 750 | 1.3 | 0.9 | 0.6 | 0.4 |
| 850 | 1.5 | 1.0 | 0.7 | 0.4 |
| 950 | 1.2 | 0.8 | 0.5 | 0.4 |
| 1200 | 1.0 | 0.8 | 0.5 | 0.3 |
| 1300 | 0.8 | 0.6 | 0.4 | 0.3 |
| 1700 | 0.7 | 0.5 | 0.3 | 0.2 |
| 2600 | 0.4 | 0.3 | 0.2 | 0.1 |

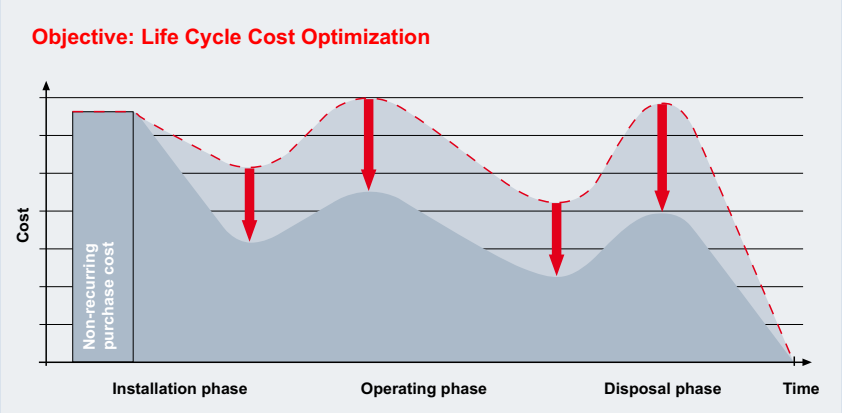
| Pressure elements (D) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Betamicron BN4HC | | | | Betamicron BH4HC | | | |
| Size | 3 µm | 5 µm | 10 µm | 20 µm | 3 µm | 5 µm | 10 µm | 20 µm |
| 30 | 63.9 | 43.3 | 22.8 | 11.3 | 91.2 | 50.7 | 36.3 | 19.0 |
| 35 | 23.6 | 19.0 | 14.8 | 9.3 | – | – | – | – |
| 55 | 13.7 | 11.0 | 8.1 | 4.8 | – | – | – | – |
| 60 | 28.9 | 20.4 | 13.2 | 7.9 | 58.6 | 32.6 | 18.1 | 12.2 |
| 75 | 9.3 | 7.5 | 5.3 | 3.1 | – | – | – | – |
| 95 | 7.5 | 6.0 | 4.1 | 2.4 | – | – | – | – |
| 110 | 14.9 | 10.7 | 6.6 | 3.7 | 25.4 | 14.9 | 8.9 | 5.6 |
| 140 | 12.8 | 8.2 | 4.8 | 2.9 | 19.9 | 11.3 | 8.1 | 4.3 |
| 160 | 13.1 | 8.8 | 4.6 | 3.5 | 16.8 | 10.4 | 5.9 | 4.4 |
| 240 | 8.2 | 6.1 | 3.6 | 2.3 | 10.6 | 6.8 | 3.9 | 2.9 |
| 280 | 4.0 | 3.1 | 1.7 | 1.3 | 5.7 | 3.4 | 1.8 | 1.6 |
| 330 | 5.4 | 3.9 | 3.0 | 1.7 | 7.7 | 4.5 | 2.8 | 2.0 |
| 500 | 3.3 | 2.4 | 1.5 | 1.1 | 4.2 | 2.6 | 1.5 | 1.2 |
| 660 | 2.5 | 1.8 | 1.1 | 0.8 | 3.3 | 1.9 | 1.0 | 0.9 |
| 990 | 1.6 | 1.2 | 0.7 | 0.5 | 2.2 | 1.3 | 0.8 | 0.6 |
| 1320 | 1.2 | 0.9 | 0.5 | 0.4 | 1.6 | 1.0 | 0.6 | 0.4 |
| 1500 | 1.1 | 0.8 | 0.6 | 0.4 | 1.4 | 0.8 | 0.6 | 0.5 |

# Betamicron®4 Reduces Life Cycle Cost.

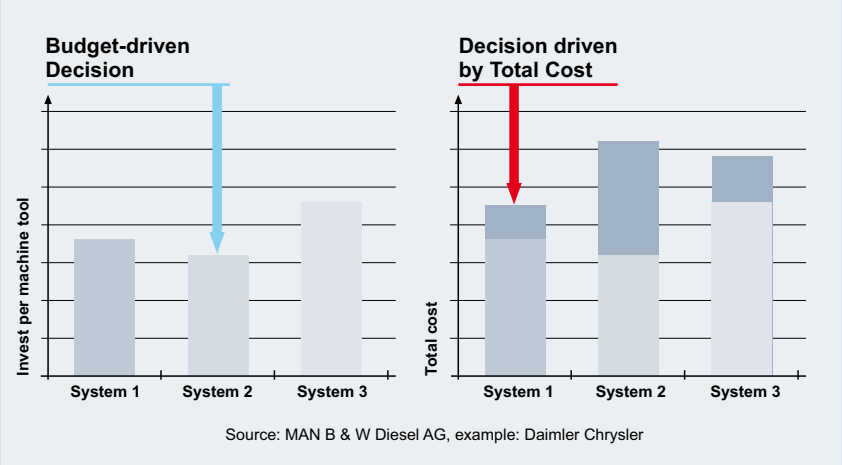
## Life Cycle Cost – what does this mean?

The term Life Cycle Cost is today a dominating topic among suppliers, machine builders and end customers.
We understand by this the total cost of a system, machine or component from the procurement through to its scrapping.

The reduction of Life Cycle Cost is one of the mega trends in mechanical engineering. The objective is to make product costs transparent beyond the purchase price over the entire lifecycle, thus creating a better basis for the customer's buying decision.
Big end customers set this trend.
Leading car makers, for example, require binding information about the Life Cycle Cost and derived variables – e.g. for machine tools for 10 years, for presses even for up to 30 years. Decisions on new investments by machine manufacturers are based on the machine price and the Life Cycle Cost calculation offered.




**Cost curve during the total lifecycle of the machine / system**




Source: MAN B & W Diesel AG, example: Daimler Chrysler

**Winner in the system properties**

This changed and holistic understanding of cost by end customers naturally results in new challenges that machine manufacturers have to take.
For system concepts, subsystems and components used must also stand the test with regard to their influence on the Life Cycle Cost.

## Betamicron® 4 elements are the winners in the "Life Cycle Cost contest"

The table summarizes it:
Betamicron®4 elements result in a minimization of, for example, the following types of cost:

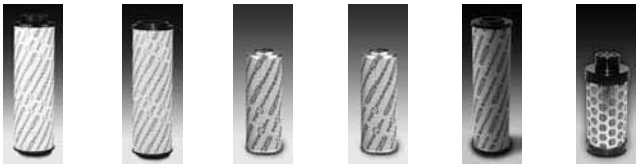
| | | Optimized mat structure | Optimized longitudinal seam | Zinc-free structure | Spiro lock seam support tubes | Protective envelope | Discharge capability |
|---|---|---|---|---|---|---|---|
| | | minimized | | | | | |
| Energy | cost | ● | | | | | |
| Personnel | | ● | ● | | | ● | ● |
| Logistics | | | | ● | ● | | |
| Failure | | ● | ● | ● | | ● | ● |
| Production | | ● | ● | | | | ● |
| Repair | | ● | ● | ● | | ● | ● |
| Maintenance | | ● | ● | ● | | ● | ● |
| Spare parts | | ● | ● | ● | | ● | ● |
| Waste disposal | | | | | ● | | |



# Filter Elements
## for use in HYDAC filters*

*** For HYDAC filter elements for use in other manufacturers' filters, please see brochure no. 7.205**

| Return line filter elements | Return line filter elements (to DIN 24550) | Pressure filter elements | Pressure filter elements (to DIN 24550) | Return line filter elements for RKM filters | Suction filter elements for suction filters |
|---|---|---|---|---|---|
| **R** | **RN** | **D** | **DN** | **RK** | **RS** |



## 1. TECHNICAL SPECIFICATIONS

### 1.1 CONSTRUCTION

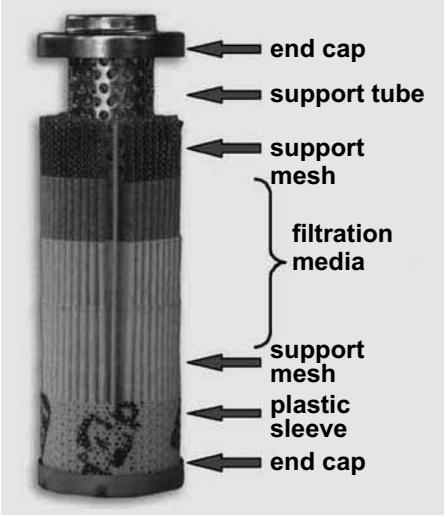
As the core of the filter, it is the filter element which performs the actual filtration and/or dewatering function in the housing.

They consist of several pleated filtration and support layers which are placed as a cylinder around or inside the stabilising support tube. These mesh packs are sealed by the end-caps.

Regardless of the type of filter, flow direction through the filter elements is from out to in.

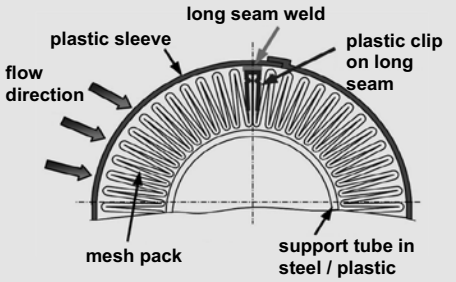
Depending on the filter material, the filter mesh pack is encased in an additional outer plastic sleeve.

The example below shows the construction of a Betamicron®-4 element.




### 1.2 SPECIFICATIONS

| | |
|---|---|
| Pressure stability (permissible Δp across the element) | 10 to 210 bar depending on the selection of filter material (see point 2.2) |
| Temperature range | **-30 °C to +100 °C** for FPM seal material to -10 °C<br><br>**0 °C to +100 °C** (for water-absorbing filter material) |
| Filtration ratings | 3 µm to 200 µm (1 µm on request) |
| Filtration performance | depending on filter material, nominal or absolute filtration up to $\beta_{x(c)} \geq 1000$ |




### 1.3 SEALS

NBR (= Perbunan)

### 1.4 INSTALLATION

- in return line filters (element type **R**)
- in return line filters to DIN 24550 (element type **RN**)
- in inline pressure filters (element type **D**)
- in inline pressure filters to DIN 24550 (element type **DN**)
- in return line & suction boost filters (element type **RK**)
- in suction filters (element type **RS**)

Please refer to the table at point 2.1 for the allocation of the element types to the HYDAC housings.

### 1.5 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Non-flam operating fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

### 1.6 QUALITY ASSURANCE

Hydac filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

### 1.7 SPECIAL MODELS AND ACCESSORIES

- Bypass valve models which differ from the particular standard
- Only wire mesh elements are suitable for filtering HFA and HFC emulsions
- Seals in FPM, EPDM
- Customized versions

# 2. SELECTING THE FILTER ELEMENT

## 2.1 MODELS

**From the table, please select the type of HYDAC housing for which the element is required.**

| For installation in housing types | Element type | Sizes | Direction of flow | Element description |
|---|---|---|---|---|
| DF, DFF, DFDK, DFM, DF...M A, DF...Q E, DFP, DFZ, HFM, LF, LFM, LPF, MDF, MFM, LPF...DA | D | 30, 35, 55, 60, 75, 95, 110, 140, 160, 240, 280, 330, 500, 660, 990, 1320, 1500 | From out to in | - without bypass valve |
| DFN, LFN, LFNF, FLN, FLND, FMND, DFDKN, DFN...Q E | DN | 40, 63, 100, 160, 250, 400 | From out to in | - without bypass valve |
| NF, NFD, RF, RFD, RFL, RFLD, RFM | R | 30, 60, 75, 90, 110, 150, 160, 165, 185, 210, 240, 270, 330, 500, 600, 660, 750, 850, 950, 1300, 1700, 2600 | From out to in | - with bypass valve |
| RFN, RFND, RFLN, RFLND | RN | 40, 63, 100, 160, 250, 400, 630 | From out to in | - without bypass valve |
| RKM | RK | 80, 100, 120, 151, 201, 251, 300, 350, 400, 800 | From out to in | - without bypass valve |
| SF, SFF, SFM | RS | 60, 110, 160, 240, 330, 400, 500 | From out to in | - with bypass valve |

## 2.2 FILTER MATERIALS

**The following are available for the filtration of solid particles:**

| Photo | Filter material | Short description | Filtration rating in µm | Pressure stability |
|---|---|---|---|---|
|  | BN4HC<br>BH4HC<br>BNK<br>BHK | Betamicron®4<br>glass fibre,<br>multi-layer, with support | 3, 5, 10, 20*<br>3, 5, 10, 20*<br>3, 5, 10, 20*<br>3, 5, 10, 20*<br>*or 3, 6, 10, 25 when dimensions are to DIN 24550 | 20 bar<br>210 bar<br>20 bar<br>210 bar |
|  | MM | Mobilemicron<br>synthetic fibre,<br>multi-layer, with support | 10, 15 | 10 bar |
| | ECON2 | ECOmicron®<br>synthetic fibre,<br>multi-layer, with support | 3, 5, 10, 20 | 10 bar |
| | G/HC | Lubimicron<br>synthetic fibre,<br>multi-layer, with support | 10 | 10 bar |
|  | W, W/HC | Stainless steel wire mesh | 25, 50, 100, 200,.... | 20 bar |
|  | P, P/HC | Paper<br>(cellulose fibre) | 10, 20 | 10 bar |
|  | V<br><br>VB | Metal fibre | 3, 5, 10, 20<br><br>3, 5, 10, 20 | 210 bar<br><br>210 bar |

**For the removal of emulsified or free water, we recommend using HYDAC-Aquamicron® filter elements: A super absorber reacts with the water present in the medium and expands to form a gel, from which the water can no longer be extracted even by increasing the pressure.**
**These filter elements cannot remove dissolved water from the system, i.e. water below the saturation level of the hydraulic medium.**

| | | | | |
|---|---|---|---|---|
|  | BN4AM | Betamicron® / Aquamicron®<br>glass fibre with super absorber | 3, 10 | 10 bar |
|  | AM | Aquamicron®<br>super absorber | 40 | 10 bar |

## 2.3 EXAMPLE MODEL CODE

**0060 D 010 BN4HC /-V**

**Size**
0060

**Type**
D

**Filtration rating in µm**
010

**Filter material**
BN4HC

**Supplementary details**
V = FPM seal

To order the filter element with the correct size, filtration rating and material for the filter you are using, see the "REPLACEMENT ELEMENT" section, Point 2.2, of the relevant complete filter brochure.

| Plastic sleeve | Flow direction | Notes | Typical applications |
|---|---|---|---|
| Yes | From out to in | 4th generation, improved performance data | working filter in mobile and industrial systems; for systems with high pressure-flow rate fluctuations; improved static conductivity |
| Yes | From out to in | particularly low pressure drop; ECON2 is 100% incinerable | for mobile applications; transmission lubrication, systems with high temperature fluctuations and high viscosity oils > ISO VG 100, ... |
| No, cleaning effect is improved! | From out to in | low pressure drop; can be cleaned to limited extent; | protective filter in cooling lubricant systems |
| No | From out to in | for low filtration demands | waste compacters, high viscosity oils > ISO VG 100, ... |
| No, cleaning effect is improved! | From out to in | can be cleaned to limited extent | as protective filter for high dynamic applications<br><br>as working filter for high dynamic applications |

**As an added bonus when using the straight Aquamicron® elements (filter material AM), solid contamination is also filtered out of the hydraulic medium;**
**with the combined element Betamicron®/Aquamicron® (BN4AM) the particle filtration is further increased by the integration of glass fibre in the construction.**
**These filter elements are particularly suitable for use offline for servicing fluids.**

| | | | |
|---|---|---|---|
| No | From out to in | filtration of particles and water removal | fluid servicing in mobile machines, hydraulic steel engineering, blast furnace and foundry machines |
| No | From out to in | primarily for water removal where there is a risk of water condensation forming | hydraulic steel engineering, blast furnace and foundry machines |

# 3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see point 3.1)

$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see point 3.2)

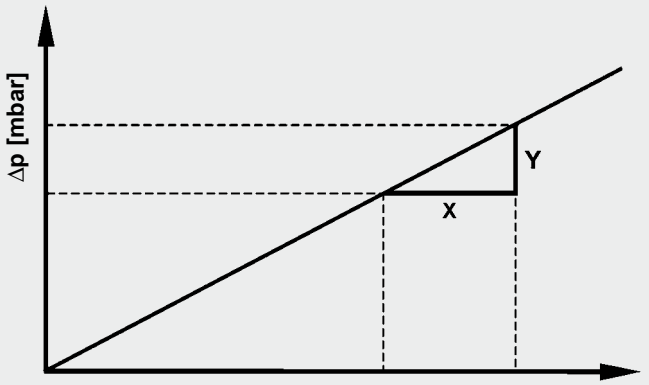
For ease of calculation, our Filter Sizing Program is available on request free of charge.

**NEW:** Sizing online at www.hydac.com

## 3.1 DETERMINING THE ELEMENT GRAPH

The element graph is determined according to ISO 3968 and always corresponds to a straight line with a specific gradient coefficient SK.

This represents the ratio of the flow rate to the pressure drop for a clean element (see below).




$$SK = \frac{Y\ [mbar]}{X\ [l/min]}$$

## 3.2 QUICK SIZING FOR AQUAMICRON ELEMENTS

When sizing elements with the water absorbing filter material Aquamicron® (AM or BN/AM) we recommend using the quick sizing tables:

**Betamicron® - Aquamicron® BN4AM**

| Size | Recommended filter flow rate [l/min] | Water retention capacity in cm³ at Δp=2.5 bar and a viscosity of 30 mm²/s |
|---|---|---|
| 330 | 13 | 190 |
| 660 | 28 | 400 |
| 950 | 39 | 560 |
| 1300 | 54 | 790 |
| 2600 | 109 | 1570 |

**Aquamicron® AM**

| Size | Recommended filter flow rate [l/min] | Water retention capacity in cm³ at Δp=2.5 bar and a viscosity of 30mm²/s |
|---|---|---|
| 330 | 13 ideal<br>100 maximum | 260<br>180 |
| 500 | 19 ideal<br>155 maximum | 400<br>280 |
| 660 | 28 ideal<br>255 maximum | 570<br>400 |
| 850 | 35 ideal<br>286 maximum | 730<br>520 |
| 950 | 39 ideal<br>314 maximum | 800<br>570 |
| 1300 | 54 ideal<br>437 maximum | 1120<br>790 |
| 2600 | 109 ideal<br>870 maximum | 2230<br>1570 |

### 3.3 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 $mm^2/s$. The pressure drop changes proportionally to the change in viscosity.

| Size | Filter material: BN4HC | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Element type: D | | | | Element type: R | | | |
| | 3 µm | 5 µm | 10 µm | 20 µm | 3 µm | 5 µm | 10 µm | 20 µm |
| 30 | 63.9 | 43.3 | 22.8 | 11.3 | 68.4 | 43.9 | 26.8 | 14.7 |
| 35 | 23.6 | 19 | 14.8 | 9.3 | - | - | - | - |
| 55 | 13.7 | 11 | 8.1 | 4.8 | - | - | - | - |
| 60 | 28.9 | 20.4 | 13.2 | 7.9 | 26.8 | 18.3 | 10.9 | 6.9 |
| 75 | 9.3 | 7.5 | 5.3 | 3.1 | 22 | 14.2 | 8.1 | 4.4 |
| 90 | - | - | - | - | 14.9 | 10.1 | 6.7 | 3.2 |
| 95 | 7.5 | 6 | 4.1 | 2.4 | - | - | - | - |
| 110 | 14.9 | 10.7 | 6.6 | 3.7 | 14.9 | 9.4 | 6 | 3.2 |
| 140 | 12.8 | 8.2 | 4.8 | 2.9 | - | - | - | - |
| 150 | - | - | - | - | 8.9 | 6 | 4 | 1.9 |
| 160 | 13.1 | 8.8 | 4.6 | 3.5 | 9.5 | 5.9 | 3.8 | 2.9 |
| 165 | - | - | - | - | 11.2 | 7.8 | 4.5 | 2.4 |
| 185 | - | - | - | - | 8.9 | 6.1 | 3.3 | 1.8 |
| 210 | - | - | - | - | 3.9 | 2.6 | 1.8 | 1.1 |
| 240 | 8.2 | 6.1 | 3.6 | 2.3 | 6.2 | 3.8 | 2.6 | 1.8 |
| 270 | - | - | - | - | 2.5 | 1.7 | 1.1 | 0.7 |
| 280 | 4 | 3.1 | 1.7 | 1.3 | 3.1 | 2.2 | 1.6 | 1 |
| 330 | 5.4 | 3.9 | 3 | 1.7 | 4.2 | 2.7 | 1.7 | 1.2 |
| 500 | 3.3 | 2.4 | 1.5 | 1.1 | 3 | 1.9 | 1.3 | 0.8 |
| 600 | - | - | - | - | 1.4 | 1.1 | 0.7 | 0.4 |
| 660 | 2.5 | 1.8 | 1.1 | 0.8 | 1.9 | 1.2 | 0.8 | 0.5 |
| 750 | - | - | - | - | 1.3 | 0.9 | 0.6 | 0.4 |
| 850 | - | - | - | - | 1.5 | 1 | 0.7 | 0.4 |
| 950 | - | - | - | - | 1.2 | 0.8 | 0.5 | 0.4 |
| 990 | 1.6 | 1.2 | 0.7 | 0.5 | - | - | - | - |
| 1300 | - | - | - | - | 0.8 | 0.6 | 0.4 | 0.3 |
| 1320 | 1.2 | 0.9 | 0.5 | 0.4 | - | - | - | - |
| 1500 | 1.1 | 0.8 | 0.6 | 0.4 | - | - | - | - |
| 1700 | - | - | - | - | 0.7 | 0.5 | 0.3 | 0.2 |
| 2600 | - | - | - | - | 0.4 | 0.3 | 0.2 | 0.1 |

| Size | Filter material: BH4HC | | | |
|---|---|---|---|---|
| | Element type: D | | | |
| | 3 µm | 5 µm | 10 µm | 20 µm |
| 30 | 91.2 | 50.7 | 36.3 | 19.0 |
| 60 | 58.6 | 32.6 | 18.1 | 12.2 |
| 110 | 25.4 | 14.9 | 8.9 | 5.6 |
| 140 | 19.9 | 11.3 | 8.1 | 4.3 |
| 160 | 16.8 | 10.4 | 5.9 | 4.4 |
| 240 | 10.6 | 6.8 | 3.9 | 2.9 |
| 280 | 5.7 | 3.4 | 1.8 | 1.6 |
| 330 | 7.7 | 4.5 | 2.8 | 2.0 |
| 500 | 4.2 | 2.6 | 1.5 | 1.2 |
| 660 | 3.3 | 1.9 | 1.0 | 0.9 |
| 990 | 2.2 | 1.3 | 0.8 | 0.6 |
| 1320 | 1.6 | 1.0 | 0.6 | 0.4 |
| 1500 | 1.4 | 0.8 | 0.6 | 0.5 |

| Size | Filter material: BN4HC (dimensions to DIN 24550) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Element type: DN | | | | Element type: RN | | | |
| | 3 µm | 6 µm | 10 µm | 25 µm | 3 µm | 6 µm | 10 µm | 25 µm |
| 40 | 23.9 | 14.9 | 8.6 | 6.6 | 14.2 | 7.8 | 4.8 | 2.6 |
| 63 | 16.3 | 9.9 | 6.0 | 4.6 | 9.5 | 5.2 | 3.4 | 1.8 |
| 100 | 11.9 | 6.6 | 4.0 | 3.2 | 6.8 | 3.3 | 2.3 | 1.2 |
| 160 | 7.9 | 5.1 | 3.4 | 2.6 | 3.6 | 1.8 | 1.2 | 0.5 |
| 250 | 5.1 | 3.2 | 2.1 | 1.8 | 2.8 | 1.4 | 0.9 | 0.4 |
| 400 | 3.2 | 2.0 | 1.3 | 1.0 | 2.2 | 1.6 | 1.3 | 1.0 |
| 630 | - | - | - | - | 2.1 | 1.2 | 0.9 | 0.7 |

| Size | Filter material: BH4HC (dimensions to DIN 24550) | | | |
|---|---|---|---|---|
| | Element type: DN | | | |
| | 3 µm | 6 µm | 10 µm | 25 µm |
| 40 | 40.4 | 24.8 | 16.4 | 10.9 |
| 63 | 29.0 | 18.2 | 11.7 | 7.6 |
| 100 | 19.0 | 11.7 | 7.7 | 5.3 |
| 160 | 8.0 | 5.1 | 3.8 | 2.5 |
| 250 | 5.4 | 3.4 | 2.8 | 1.9 |
| 400 | 3.4 | 2.1 | 1.7 | 1.1 |

| Size | Filter material: W and W/HC | |
|---|---|---|
| | Element type: D W -W/HC | Element type: R W/HC |
| 30 | 3.030 | - |
| 60 | 0.757 | 0.912 |
| 75 | - | 0.720 |
| 110 | 0.413 | 0.502 |
| 140 | 0.324 | - |
| 150 | - | 0.320 |
| 160 | 0.284 | 0.348 |
| 165 | - | 0.328 |
| 240 | 0.189 | 0.228 |
| 280 | 0.162 | 0.114 |
| 330 | 0.138 | 0.164 |
| 500 | 0.091 | 0.109 |
| 660 | 0.069 | 0.082 |
| 750 | - | 0.049 |
| 850 | - | 0.063 |
| 950 | - | 0.058 |
| 990 | 0.046 | - |
| 1300 | - | 0.043 |
| 1320 | 0.035 | - |
| 1700 | - | 0.033 |
| 2600 | - | 0.022 |

| Size | Filter material: V | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Element type: D | | | | Element type: R | | | |
| | 3 µm | 5 µm | 10 µm | 20 µm | 3 µm | 5 µm | 10 µm | 20 µm |
| 30 | 18.4 | 13.5 | 7.5 | 3.6 | 19.4 | 14.2 | 7.9 | 3.8 |
| 60 | 16.0 | 9.3 | 5.4 | 3.3 | 15.9 | 9.3 | 5.4 | 3.3 |
| 110 | 8.2 | 5.6 | 3.3 | 2.2 | 7.6 | 5.1 | 3.0 | 2.0 |
| 140 | 5.8 | 4.8 | 3.1 | 2.3 | - | - | - | - |
| 160 | 4.6 | 3.2 | 2.3 | 1.4 | 4.9 | 3.5 | 2.4 | 1.5 |
| 240 | 3.1 | 2.5 | 1.7 | 1.1 | 3.2 | 2.6 | 1.7 | 1.2 |
| 280 | 2.3 | 1.7 | 1.2 | 0.8 | 1.4 | 1.1 | 0.7 | 0.5 |
| 330 | 2.2 | 1.8 | 1.2 | 0.8 | 2.1 | 1.7 | 1.1 | 0.8 |
| 500 | 1.5 | 1.2 | 0.8 | 0.5 | 1.5 | 1.2 | 0.8 | 0.5 |
| 660 | 1.1 | 0.9 | 0.6 | 0.4 | 1.0 | 0.8 | 0.6 | 0.4 |
| 750 | - | - | - | - | 0.6 | 0.5 | 0.3 | 0.2 |
| 850 | - | - | - | - | 0.8 | 0.6 | 0.4 | 0.3 |
| 950 | - | - | - | - | 0.7 | 0.6 | 0.4 | 0.2 |
| 990 | 0.8 | 0.6 | 0.4 | 0.3 | - | - | - | - |
| 1300 | - | - | - | - | 0.5 | 0.4 | 0.3 | 0.2 |
| 1320 | 0.6 | 0.5 | 0.3 | 0.2 | - | - | - | - |
| 1700 | - | - | - | - | 0.4 | 0.3 | 0.2 | 0.1 |
| 2600 | - | - | - | - | 0.3 | 0.2 | 0.1 | 0.1 |

| Size | Filter material: P/HC | | Filter material: ECON2 | | | |
|---|---|---|---|---|---|---|
| | Element type: R | | | | | |
| | 10 µm | 20 µm | 3 µm | 5 µm | 10 µm | 20 µm |
| 30 | 3.30 | 1.67 | 68.4 | 43.9 | 26.8 | 14.7 |
| 60 | 1.67 | 0.83 | 26.8 | 18.3 | 10.9 | 6.9 |
| 75 | 1.29 | 0.65 | 22.0 | 14.2 | 8.1 | 4.4 |
| 90 | - | - | 14.9 | 10.1 | 6.7 | 3.2 |
| 110 | 0.91 | 0.46 | 14.9 | 9.4 | 6.0 | 3.2 |
| 150 | - | - | 8.9 | 6.0 | 4.0 | 1.9 |
| 160 | 0.63 | 0.31 | 9.5 | 5.9 | 3.8 | 2.9 |
| 165 | 0.61 | 0.30 | 11.2 | 7.8 | 4.5 | 2.4 |
| 185 | - | - | 8.9 | 6.1 | 3.3 | 1.8 |
| 240 | 0.42 | 0.21 | 6.2 | 3.8 | 2.6 | 1.8 |
| 280 | - | - | 3.1 | 2.2 | 1.6 | 1.0 |
| 330 | 0.30 | 0.15 | 4.2 | 2.7 | 1.7 | 1.2 |
| 500 | 0.20 | 0.10 | 3.0 | 1.9 | 1.3 | 0.8 |
| 660 | 0.15 | 0.08 | 1.9 | 1.2 | 0.8 | 0.5 |
| 750 | - | - | 1.3 | 0.9 | 0.6 | 0.4 |
| 850 | 0.12 | 0.06 | 1.5 | 1.0 | 0.7 | 0.4 |
| 950 | 0.11 | 0.05 | 1.2 | 0.8 | 0.5 | 0.4 |
| 1300 | 0.08 | 0.04 | 0.8 | 0.6 | 0.4 | 0.3 |
| 1700 | 0.06 | 0.03 | 0.7 | 0.5 | 0.3 | 0.2 |
| 2600 | 0.04 | 0.02 | 0.4 | 0.3 | 0.2 | 0.1 |

| Size | Filter material: W | | | |
|---|---|---|---|---|
| | Element type: RS | | | |
| | 25 µm | 50 µm | 75 µm | 125 µm |
| 60 | 2.00 | 1.70 | 1.03 | 0.54 |
| 110 | 0.98 | 0.83 | 0.50 | 0.26 |
| 160 | - | - | 0.36 | 0.19 |
| 240 | - | - | 0.25 | 0.13 |
| 330 | - | - | 0.19 | 0.10 |
| 400 | - | - | 0.20 | 0.16 |
| 500 | - | - | 0.20 | 0.16 |

| Size | Filter material: AM | Filter material: BN4AM | |
|---|---|---|---|
| | Element type: R | | |
| | 40 µm | 3 µm | 10 µm |
| 330 | 2.10 | 8.7 | 3.0 |
| 500 | 1.38 | - | - |
| 660 | 0.93 | 3.5 | 1.2 |
| 850 | 0.72 | - | - |
| 950 | 0.66 | 2.4 | 0.8 |
| 1300 | 0.47 | 1.6 | 0.6 |
| 2600 | 0.23 | 1.0 | 0.3 |

| Size | Filter material: MM | |
|---|---|---|
| | Element type: RK | |
| | 10 µm | 15 µm |
| 80 | 2.70 | 1.60 |
| 100 | 1.80 | 1.10 |
| 120 | 1.40 | 0.90 |
| 151 | 1.00 | 0.65 |
| 201 | 0.75 | 0.47 |
| 251 | 0.58 | 0.36 |
| 300 | 0.62 | 0.39 |
| 350 | 0.30 | 0.20 |
| 400 | 0.56 | 0.35 |
| 800 | 0.44 | 0.27 |

| Size | Filter material: G/HC |
|---|---|
| | Element type: R |
| | 10 µm |
| 110 | 1.91 |
| 240 | 0.92 |
| 330 | 0.69 |
| 500 | 0.45 |
| 660 | 0.30 |
| 850 | 0.23 |
| 950 | 0.21 |
| 1300 | 0.15 |
| 1700 | 0.11 |
| 2600 | 0.08 |

# 4. MULTI-PASS FILTER PERFORMANCE DATA TO ISO 16889

The contamination retention and particle filtration performance of an element (with the exception of: paper P, P/HC, wire mesh W, W/HC, V and super absorber AM) are established in the multipass-test to ISO 16889. This procedure with its precisely defined test conditions and standard test dust (ISO MTD) enables the performance data of different elements to be compared.

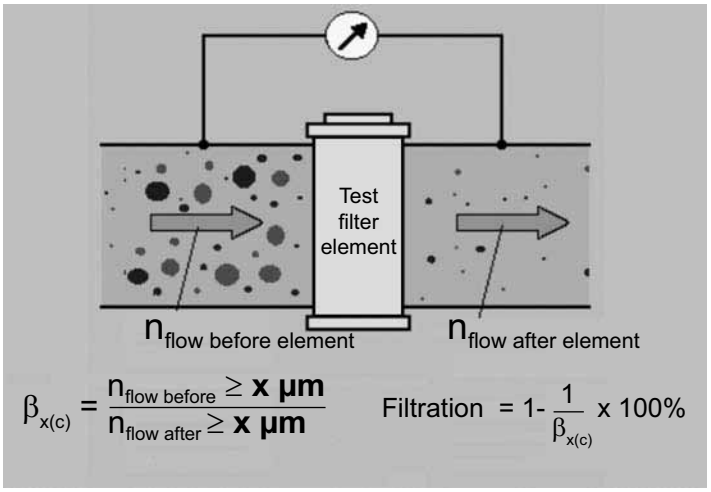
## 4.1 EXPLANATION OF THE MULTIPASS-TEST

The multipass-test is an idealised hydraulic circuit, in which the filter element under test is subjected to a constant flow rate. The size and number of contamination particles are calculated before and after the element,.

The ratio of the number of particles of a certain size (and larger) before the filter to the number of particles of a certain size after the filter indicates the filtration performance, the so-called $\beta_{x(c)}$ value. The "x" stands for the particular particle size under consideration. A $\beta_{x(c)}$ value of 200 or above is considered to be absolute filtration (to ISO 24550).

It is important that the $\beta_{x(c)}$ values remain at absolute level over a wide differential pressure range and do not fall as the element contamination and operating time increase.

The filtration rating is determined from the $\beta_{x(c)}$ value (see illustration).



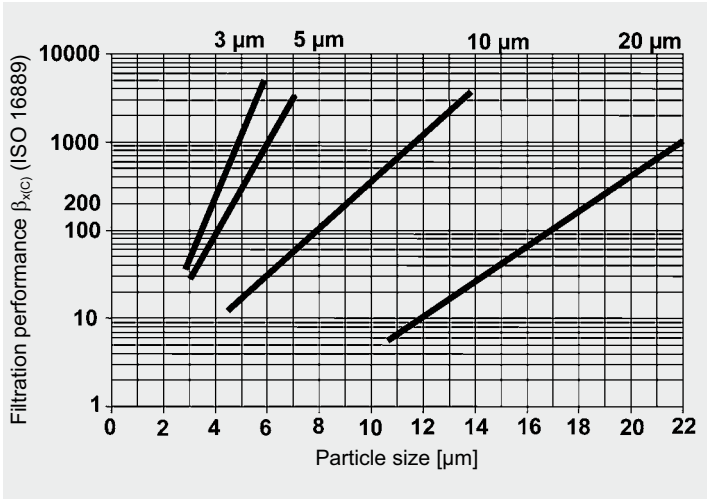

**Performance features**

Owing to their high performance standard, HYDAC absolute elements protect the functions of important and expensive hydraulic components and increase their service life. The most important performance features are:

- High level of particle filtration ($\beta_{x(c)}$ values)
- High level of particle filtration over a wide range of differential pressure (high $\beta_{x(c)}$ value stability)
- High contamination retention capacity
- High pressure stability values
- Low initial differential pressure
- Good flow fatigue strength
- Good water retention capacity (for water-absorbing filter material)

## 4.2 FILTRATION PERFORMANCE

The graph below shows the filtration performances of different filtration ratings.



## 4.3 REAL CONTAMINATION RETENTION CAPACITY [g]

| Size | Filter material: BN4HC | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Element type: D | | | | Element type: R | | | |
| | 3 µm | 5 µm | 10 µm | 20 µm | 3 µm | 5 µm | 10 µm | 20 µm |
| 30 | 4.6 | 5.1 | 5.4 | 5.6 | 2.6 | 2.9 | 3.5 | 4.0 |
| 35 | 7.2 | 8.1 | 8.6 | 8.8 | - | - | - | - |
| 55 | 14.0 | 15.8 | 16.6 | 17.2 | - | - | - | - |
| 60 | 6.5 | 7.3 | 7.8 | 8.0 | 5.7 | 6.3 | 7.6 | 8.6 |
| 75 | 21.6 | 24.3 | 25.7 | 26.5 | 10.3 | 11.4 | 13.7 | 15.5 |
| 90 | - | - | - | - | 12.2 | 13.5 | 16.2 | 18.3 |
| 95 | 27.5 | 30.9 | 32.7 | 33.7 | - | - | - | - |
| 110 | 13.8 | 15.5 | 16.4 | 16.9 | 12.0 | 13.3 | 16.0 | 18.1 |
| 140 | 18.1 | 20.3 | 21.5 | 22.2 | - | - | - | - |
| 150 | - | - | - | - | 20.4 | 22.6 | 27.2 | 30.8 |
| 160 | 19.8 | 22.2 | 23.5 | 24.3 | 18.6 | 20.7 | 24.9 | 28.1 |
| 165 | - | - | - | - | 18.7 | 20.7 | 24.9 | 28.2 |
| 185 | - | - | - | - | 25.6 | 28.4 | 34.1 | 38.6 |
| 210 | - | - | - | - | 50.7 | 56.2 | 67.6 | 76.5 |
| 240 | 32.3 | 36.3 | 38.4 | 39.6 | 29.3 | 32.5 | 39.1 | 44.2 |
| 270 | - | - | - | - | 78.4 | 86.9 | 104.5 | 118.2 |
| 280 | 70.6 | 79.3 | 83.9 | 86.6 | 62.3 | 69.0 | 83.0 | 93.9 |
| 330 | 47.2 | 53.1 | 56.1 | 57.9 | 38.4 | 42.6 | 51.2 | 57.9 |
| 500 | 76.9 | 86.5 | 91.5 | 94.4 | 58.9 | 65.3 | 78.6 | 88.9 |
| 600 | - | - | - | - | 145.5 | 161.3 | 194.0 | 219.4 |
| 660 | 102.2 | 114.9 | 121.5 | 125.4 | 87.1 | 96.5 | 116.1 | 131.3 |
| 750 | - | - | - | - | 147.1 | 163.0 | 196.1 | 221.9 |
| 850 | - | - | - | - | 112.1 | 124.2 | 149.5 | 169.1 |
| 950 | - | - | - | - | 130.0 | 144.1 | 173.3 | 196.1 |
| 990 | 154.5 | 173.7 | 183.7 | 189.5 | - | - | - | - |
| 1300 | - | - | - | - | 181.0 | 200.7 | 241.4 | 273.1 |
| 1320 | 209.9 | 236.0 | 249.6 | 257.5 | - | - | - | - |
| 1500 | 220.0 | 226.0 | 238.0 | 246.0 | - | - | - | - |
| 1700 | - | - | - | - | 229.8 | 254.7 | 306.4 | 346.6 |
| 2600 | - | - | - | - | 369.4 | 409.4 | 492.5 | 557.2 |

| Size | Filter material: BH4HC<br>Element type: D | | | |
|---|---|---|---|---|
| | 3 µm | 5 µm | 10 µm | 20 µm |
| 30 | 3.0 | 2.9 | 3.2 | 3.7 |
| 60 | 4.6 | 4.5 | 5.0 | 5.7 |
| 110 | 10.1 | 9.9 | 10.9 | 12.4 |
| 140 | 13.3 | 13.0 | 14.3 | 16.3 |
| 160 | 12.9 | 12.6 | 13.9 | 15.9 |
| 240 | 21.6 | 21.1 | 23.2 | 26.5 |
| 280 | 48.1 | 47.1 | 51.8 | 59.1 |
| 330 | 34.6 | 33.9 | 37.2 | 42.5 |
| 500 | 57.5 | 56.3 | 61.8 | 70.5 |
| 660 | 76.8 | 75.2 | 82.6 | 94.3 |
| 990 | 111,8 | 109.4 | 120.2 | 137.2 |
| 1320 | 153.8 | 150.7 | 165.5 | 188.8 |
| 1500 | 126.4 | 137.8 | 160.9 | 195.3 |

| Size | Filter material: BN4HC (Dimensions to DIN 24550) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Element type: DN | | | | Element type: RN | | | |
| | 3 µm | 6 µm | 10 µm | 25 µm | 3 µm | 6 µm | 10 µm | 25 µm |
| 40 | 5.2 | 5.6 | 6.3 | 7.0 | 7.1 | 8.0 | 8.9 | 10.6 |
| 63 | 9.2 | 9.9 | 11.1 | 12.8 | 13.0 | 14.7 | 16.3 | 19.6 |
| 100 | 15.4 | 16.5 | 18.6 | 20.6 | 22.0 | 24.7 | 27.5 | 33.0 |
| 160 | 27.5 | 29.3 | 33.1 | 36.7 | 36.2 | 40.7 | 45.3 | 54.2 |
| 250 | 46.0 | 49.0 | 55.2 | 61.3 | 61.4 | 69.1 | 76.8 | 92.1 |
| 400 | 76.2 | 81.3 | 91.4 | 101.5 | 88.2 | 99.2 | 110.2 | 132.3 |
| 630 | - | - | - | - | 148.6 | 167.3 | 185.8 | 222.9 |

| Size | Filter material: BH4HC (Dimensions to DIN 24550)<br>Element type: DN | | | |
|---|---|---|---|---|
| | 3 µm | 6 µm | 10 µm | 25 µm |
| 40 | 4.1 | 4.4 | 5.2 | 6.2 |
| 63 | 7.3 | 7.9 | 9.2 | 11.2 |
| 100 | 12.2 | 13.2 | 15.5 | 18.9 |
| 160 | 21.8 | 23.9 | 27.8 | 33.8 |
| 250 | 38.1 | 41.7 | 48.6 | 59.0 |
| 400 | 63.6 | 69.5 | 81.0 | 98.3 |

| Size | Filter material: MM<br>Element type: RK | |
|---|---|---|
| | 10 µm | 15 µm |
| 80 | 11.0 | 13.3 |
| 100 | 16.3 | 19.6 |
| 120 | 20.7 | 25.0 |
| 151 | 26.6 | 31.4 |
| 201 | 50.9 | 61.4 |
| 251 | 61.9 | 74.7 |
| 300 | 55.6 | 67.1 |
| 350 | 87.0 | 105.0 |
| 400 | 67.4 | 81.3 |
| 800 | 86.3 | 104.2 |

| Size | Filter material: ECON2<br>Element type: R | | | |
|---|---|---|---|---|
| | 3 µm | 5 µm | 10 µm | 20 µm |
| 30 | 2.6 | 2.9 | 3.5 | 4.0 |
| 60 | 5.7 | 6.3 | 7.6 | 8.6 |
| 75 | 10.3 | 11.4 | 13.7 | 15.5 |
| 90 | 12.2 | 13.5 | 16.2 | 18.3 |
| 110 | 12.0 | 13.3 | 16.0 | 18.1 |
| 150 | 20.4 | 22.6 | 27.2 | 30.8 |
| 160 | 18.6 | 20.7 | 24.9 | 28.1 |
| 165 | 18.7 | 20.7 | 24.9 | 28.2 |
| 185 | 25.6 | 28.4 | 34.1 | 38.6 |
| 240 | 29.3 | 32.5 | 39.1 | 44.2 |
| 280 | 62.3 | 69.0 | 83.0 | 93.9 |
| 330 | 38.4 | 42.6 | 51.2 | 57.9 |
| 500 | 58.9 | 65.3 | 78.6 | 88.9 |
| 660 | 87.1 | 96.5 | 116.1 | 131.3 |
| 750 | 147.1 | 163.0 | 196.1 | 221.9 |
| 850 | 112.1 | 124.2 | 149.5 | 169.1 |
| 950 | 130.0 | 144.1 | 173.3 | 196.1 |
| 1300 | 181.0 | 200.7 | 241.4 | 273.1 |
| 1700 | 229.8 | 254.7 | 306.4 | 346.6 |
| 2600 | 369.4 | 409.4 | 492.5 | 557.2 |

| Size | Filter material: BN4AM<br>Element type: R | |
|---|---|---|
| | 3 µm | 10 µm |
| 330 | 55.0 | 60.0 |
| 660 | 120.0 | 140.0 |
| 950 | 170.0 | 190.0 |
| 1300 | 240.0 | 270.0 |
| 2600 | 490.0 | 540.0 |

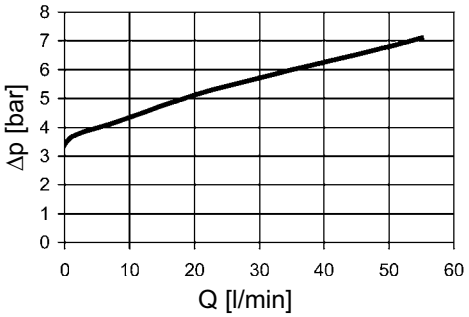
## 5. FILTER AREAS [cm²]

| Size | Filter material: V (VB on request) | Filter material: W/HC Element type: D | Filter material: W | Filter material: V (VB on request) | Filter material: W Element type: R | Filter material: W/HC | Filter material: P/HC |
|---|---|---|---|---|---|---|---|
| 30 | 268 | - | 256 | 221 | 256 | - | 283 |
| 60 | 318 | 418 | 330 | 372 | 330 | 507 | 572 |
| 110 | 648 | 910 | 672 | 758 | 672 | 1034 | 1166 |
| 140 | 852 | 1200 | 884 | - | - | - | - |
| 160 | 1082 | 1144 | 857 | 1071 | 857 | 1607 | 1978 |
| 165 | - | - | - | - | 1556 | 1556 | 1915 |
| 240 | 1702 | 1911 | 1348 | 1685 | 1348 | 2527 | 3110 |
| 280 | 3615 | 4264 | 2862 | - | - | - | - |
| 330 | 2260 | 3133 | 1795 | 2081 | 1795 | 3695 | 4230 |
| 500 | 3640 | 5207 | 2891 | 3182 | 2745 | 5651 | 6470 |
| 660 | 4770 | 6958 | 3795 | 4659 | 3998 | 8232 | 8722 |
| 850 | - | - | - | 5999 | 5148 | 10599 | 11230 |
| 950 | - | - | - | 6813 | 5596 | 11521 | 15221 |
| 990 | - | 10091 | - | - | - | - | - |
| 1300 | - | - | - | 9520 | 7820 | 16099 | 21269 |
| 1320 | - | 13916 | - | - | - | - | - |
| 1700 | - | - | - | - | 10550 | 21730 | 23020 |
| 2600 | - | - | - | 19424 | 15954 | 32847 | 43394 |

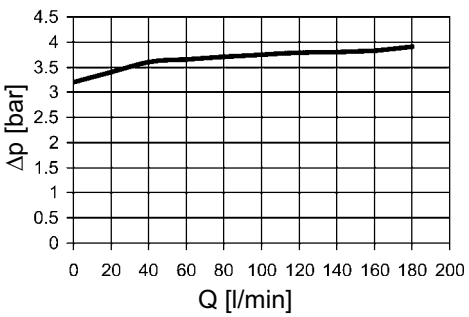
## 6. BYPASS VALVE GRAPHS

The bypass graphs apply to mineral oil with a density of 0.86 kg/dm³.
The valve differential pressure changes proportionally to the density.

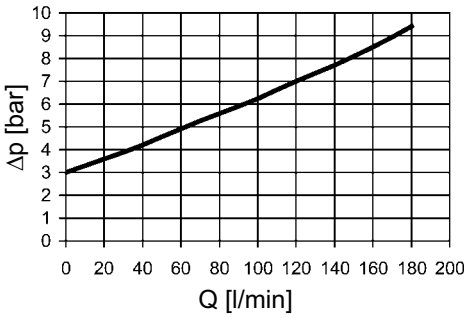
**30**



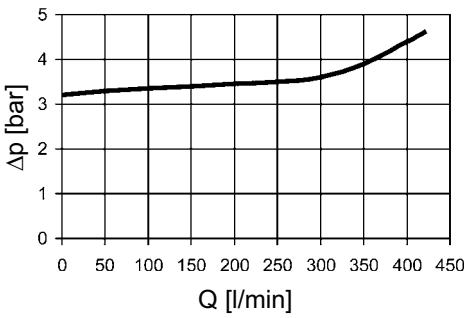

**75, 160, 165, 185, 240, 280**



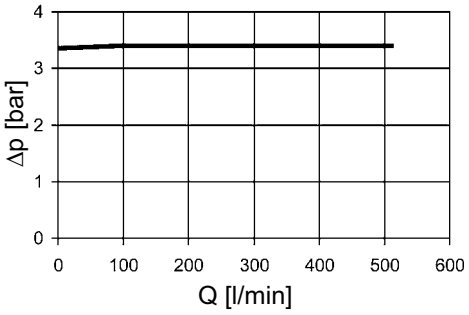

**60, 90, 110, 140, 150**



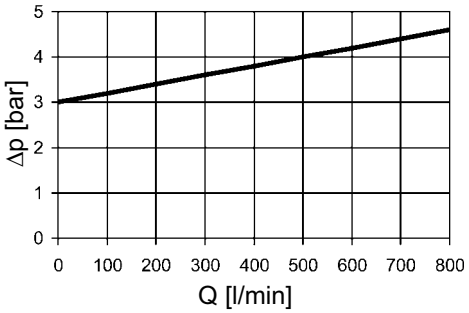

**210, 270, 330, 500, 750**




**660, 850, 1700**




**950, 1300, 2600**




## NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.


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# Filter Clogging Indicators

## 1. TECHNICAL SPECIFICATIONS

### 1.1 GENERAL

HYDAC clogging indicators are designed to show visually and/or electrically when a filter element must be changed or cleaned. Operational safety of a system and efficient utilisation of a filter element can only be guaranteed if clogging indicators are used.

Depending on the type of filter, vacuum, return line or differential pressure clogging indicators are used.

### 1.2 SEALS

NBR (= Perbunan) or V (= Viton)

### 1.3 INSTALLATION

Some users install filters without clogging indicators and prefer instead to replace or clean the elements according to a specified time schedule or according to a set number of operating hours. However this involves some risk.

Fitting a clogging indicator has two main advantages:

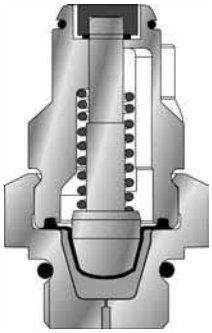
- The operator no longer has to estimate when the element is clogged
- The unnecessary costs of changing the element too early are avoided

All standard filters can be fitted with a clogging indicator at any time, by simply screwing it in.

### 1.4 CONSTRUCTION

**Return line indicators**

These are used for return line and suction filters.
In return line filters they react to the increasing static pressure before the filter element, caused by increasing contamination; in suction filters to the decreasing pressure after the filter element.

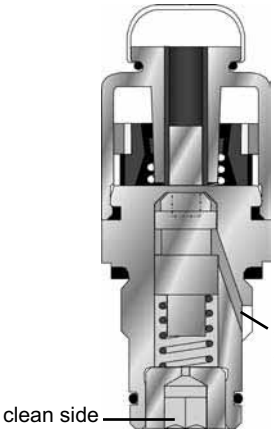


**Differential pressure indicators**

These are used for all inline filters and react to the increasing pressure differential caused by increasing contamination of the filter element.

Simple mounting of the differential clogging indicator: G ½" cavity (according to HYDAC works standard HN 28-22)

The differential pressure indicator, type V02, must be fitted separately inline.




### 1.5 SPECIAL INDICATORS

**Mobile indicators**

These indicators have been developed for special applications and are fitted with AMP, Deutsch and Junior Power Timer plugs.

**ATEX indicators**

These indicators are used in potentially explosive locations and are subject to the ATEX Equipment Directive 94/9/EC and the ATEX Operator Directive 1999/92/EC.

**UL indicators**

Indicators which are exported to the USA often require classification according to the UL standards in force. The UL symbol is found on many products, particularly in the field of electrotechnology.

### 1.6 TABLE OF CONTENTS


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## 2. QUICK SELECTION TABLES FOR CLOGGING INDICATORS

### 2.1 BY INDICATOR TYPE

Please select the type of indicator you require from the table.

| Type | | Vacuum indicator | Return line indicator | Differential pressure indicator |
|---|---|---|---|---|
| Visual | B | | ● | ● |
| | BM | | | ● |
| | E | | ● | |
| | ES | | ● | |
| | K | ● | | |
| | R | | ● | |
| | UBM | ● | | |
| | UE | ● | | |
| | V | | | ● |
| Electrical | C | | ● | ● |
| | D | | ● | ● |
| | F | | ● | |
| | LE | | ● | ● |
| | LZ | | ● | ● |
| | UF | ● | | |
| | VE | | | ● |
| | VZ | | | ● |
| Electronic | GC | | ● | ● |
| | GW | | | ● |
| Mobile | CD | | ● | ● |
| | CJ | | ● | ● |
| | FD | | ● | |
| ATEX | B | | ● | ● |
| | C | | ● | ● |
| UL approval (=CRUUS) | C | | | ● |
| | D | | | ● |

## 2.2 BY FILTER TYPE

Please select the type of indicator required for your filter from the table.

| Type | BF | BL | BLT | DF DFF | DFDK | DF MA/QE | DFM | DFN | DFP | DFZ | ELF | FLN | FLND FMND | HFM | LF | LFM | LFN LFNF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B | | | | ● | ● | ● | ● | ● | | | | ● | ● | ● | ● | ● | ● |
| BM | | | | ● | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | ● | ● |
| E | | | | | | | | | | | | | | | | | |
| ES | | | | | | | | | | | | | | | | | |
| K | ● | ● | ● | | | | | | | | ● | | | | | | |
| R | | | | | | | | | | | | | | | | | |
| UBM | ● | ● | ● | | | | | | | | ● | | | | | | |
| UE | | | | | | | | | | | | ●[2] | | | ●[2] | | |
| V | | | | | | | | | | | | | | | | | |
| C | | | | ● | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | ● | ● |
| D | | | | ● | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | ● | ● |
| F | | | | | | | | | | | | | | | | | |
| LE | | | | ● | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | ● | ● |
| LZ | | | | ● | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | ● | ● |
| UF | | | | | | | | | | | | ●[2] | | | ●[2] | | |
| VE | | | | | | | | | | | | | | | | | |
| VZ | | | | | | | | | | | | | | | | | |
| GC | | | | ● | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | ● | ● |
| GW | | | | | | | | | | | | | | | | | |
| CD | | | | ● | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | ● | ● |
| CJ | | | | ● | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | ● | ● |
| FD | | | | | | | | | | | | | | | | | |

| Type | LPF | MDF | MF | MFD | MFM | NF | NFD | RF | RFD | RFL | RFLD | RFN | RFND | RFM | RKM | SF | SFF | SFM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B | ● | ● | | | ● | ●[1] | ●[1] | ● | ● | ● | ● | ● | ● | ● | ● | | | |
| BM | ● | ● | | | ● | ● | ● | | | ● | ● | | | | | | | |
| E | | | ●[3] | ●[3] | | ●[1] | ●[1] | ● | ● | | | ● | ● | ● | | | | |
| ES | | | | | | ●[1] | ●[1] | ● | ● | | | ● | ● | ● | | | | |
| K | | | | | | | | | | | | | | | | | | |
| R | | | | | | | | | | | | | | | ● | | | |
| UBM | | | | | | | | | | | | | | | | | | |
| UE | ●[2] | | ●[2] | ●[2] | | | | | | ●[2] | | | | | ● | ● | ● | ● |
| V | | | | | | | | | | ● | ● | | | | | | | |
| C | ● | ● | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | | | |
| D | ● | ● | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | | | |
| F | | | ● | ● | | ●[1] | ●[1] | ● | ● | | | ● | ● | ● | ● | | | |
| LE | ● | ● | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | | | |
| LZ | ● | ● | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | | | |
| UF | ●[2] | | ●[2] | ●[2] | | | | | | ●[2] | | | | | ● | ● | ● | ● |
| VE | | | | | | | | | | ● | ● | | | | | | | |
| VZ | | | | | | | | | | ● | ● | | | | | | | |
| GC | ● | ● | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | | | |
| GW | ● | | | | | ● | ● | | | ● | ● | | | | | | | |
| CD | ● | ● | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | | | |
| CJ | ● | ● | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | | | |
| FD | | | ● | ● | | ●[1] | ●[1] | ● | ● | | | ● | ● | ● | ● | | | |

[1] Filter type NF: Version 1.X only (= tank mounted)

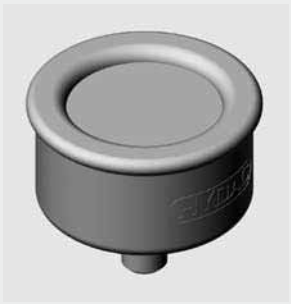
[2] can only be used for suction operation

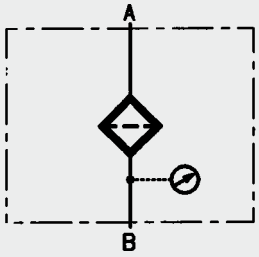
[3] use VMF 16 E.0 only

# 3. SPECIFICATIONS

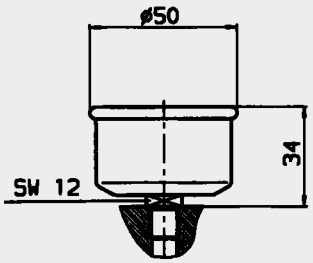
## 3.1 VACUUM INDICATORS

### VMF x UE.x






| | |
|---|---|
| Type of indication | visual-analogue, scale indication |
| Weight | 100 g |
| Pressure setting / indication range | -1 bar to 0 bar |
| Permiss. operating pressure | -0.7 to 0 bar continuous |
| Permiss. temperature range | -20 °C to +60 °C |
| Connection thread | G 1/8 |
| Max. torque | 15 Nm |
| Switching type | – |
| Max. switching voltage | – |
| Electrical connection | – |
| Max. switching output at resistive load | – |
| Switching capacity | – |
| Protection class to DIN 40050 | – |
| Order example | VMF 1 UE.0 |

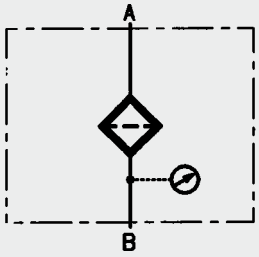




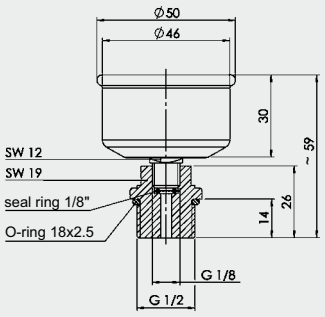


### VR x UE.x






| | |
|---|---|
| Type of indication | visual analogue, scale indication |
| Weight | 100 g |
| Pressure setting / indication range | -1 bar to 0 bar |
| Permiss. operating pressure | -0.7 to 0 bar continuous |
| Permiss. temperature range | -20 °C to +60 °C |
| Connection thread | G 1/2 |
| Max. torque | 30 Nm |
| Switching type | – |
| Max. switching voltage | – |
| Electrical connection | – |
| Max. switching output at resistive load | – |
| Switching capacity | – |
| Protection class to DIN 40050 | – |
| Order example | VR 1 UE.0 |

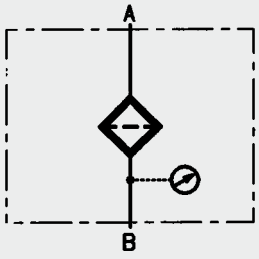




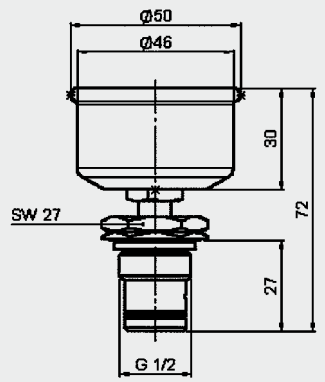


### VRD x UE.x





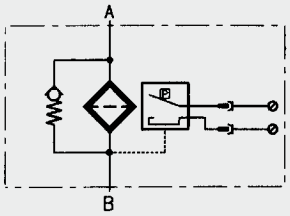

| | |
|---|---|
| Type of indication | visual analogue, scale indication |
| Weight | 100 g |
| Pressure setting / indication range | -1 bar to 0 bar |
| Permiss. operating pressure | -0.7 to 0 bar continous |
| Permiss. temperature range | -20 °C to +60 °C |
| Connection thread | G 1/2 |
| Max. torque | 33 Nm |
| Switching type | – |
| Max. switching voltage | – |
| Electrical connection | – |
| Max. switching output at resistive load | – |
| Switching capacity | – |
| Protection class to DIN 40050 | – |
| Order example | VRD 1 UE.0 |



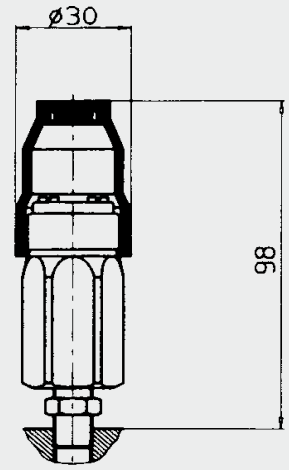



## VMF x UF.x

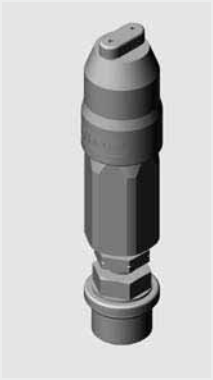


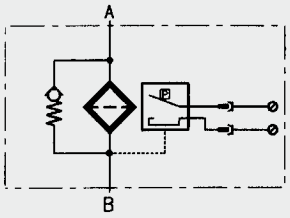



| | |
|---|---|
| Type of indication | electrical switch |
| Weight | 170 g |
| Pressure setting / indication range | -0.2 bar ± 0.1 bar |
| Permiss. operating pressure | 20 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G 1/8 |
| Max. torque | 15 Nm |
| Switching type | N/O contact |
| Max. switching voltage | 42 V |
| Electrical connection | threaded connection |
| Max. switching output at resistive load | 60 W =<br>100 VA ~ |
| Switching capacity | ohmic 2.5 A at 24 V =<br>ohmic 2.5 A at 42 V ~ |
| Protection class to DIN 40050 | IP 65, terminals IP 00 |
| Order example | VMF 0.2 UF.0 |

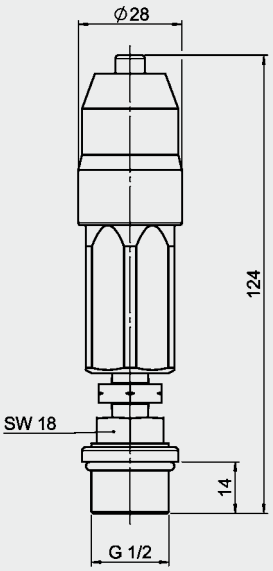



## VR x UF.x



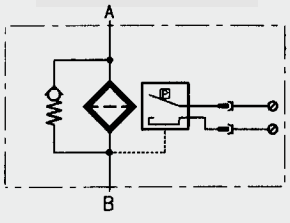



| | |
|---|---|
| Type of indication | electrical switch |
| Weight | 170 g |
| Pressure setting / indication range | -0.2 bar ± 0.1 bar |
| Permiss. operating pressure | 20 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G 1/2 |
| Max. torque | 30 Nm |
| Switching type | N/O contact |
| Max. switching voltage | 42 V |
| Electrical connection | threaded connection |
| Max. switching output at resistive load | 60 W =<br>100 VA ~ |
| Switching capacity | ohmic 2.5 A at 24 V =<br>ohmic 2.5 A at 42 V ~ |
| Protection class to DIN 40050 | IP 65, terminals IP 00 |
| Order example | VR 0.2 UF.0 |

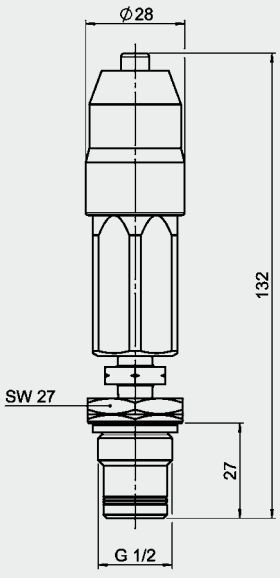



## VRD x UF.x





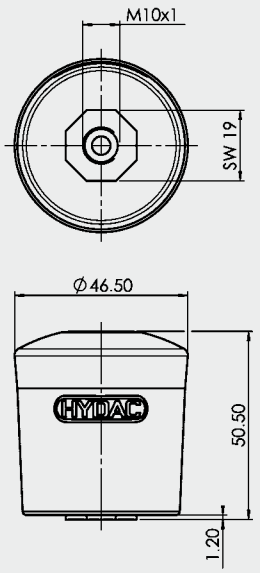

| | |
|---|---|
| Type of indication | electrical switch |
| Weight | 170 g |
| Pressure setting / indication range | -0.2 bar ± 0.1 bar |
| Permiss. operating pressure | 20 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G 1/2 |
| Max. torque | 33 Nm |
| Switching type | N/O contact |
| Max. switching voltage | 42 V |
| Electrical connection | threaded connection |
| Max. switching output at resistive load | 60 W =<br>100 VA ~ |
| Switching capacity | ohmic 2.5 A at 24 V =<br>ohmic 2.5 A at 42 V ~ |
| Protection class to DIN 40050 | IP 65, terminals IP 00 |
| Order example | VRD 0.2 UF.0 |



## VMF x UBM.x

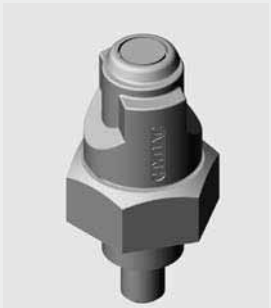


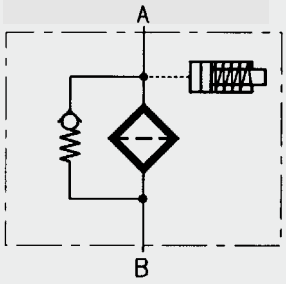
| | |
|---|---|
| Type of indication | visual, yellow pin |
| Weight | 0.05 g |
| Pressure setting / indication range | -0.035 bar |
| Permiss. operating pressure | 1 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | M10 x 1 |
| Max. torque | 15 Nm |
| Switching type | - |
| Max. switching voltage | - |
| Electrical connection | - |
| Max. switching output at resistive load | - |
| Switching capacity | - |
| Protection class to DIN 40050 | - |
| Order example | VMF 0.035 UBM.0 |



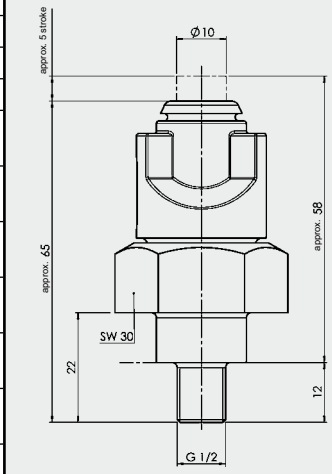
## 3.2 RETURN LINE INDICATORS

### VMF x B.x



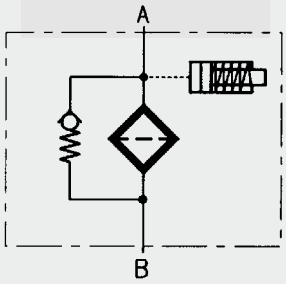



| | |
|---|---|
| Type of indication | visual, red pin |
| Weight | 84 g |
| Pressure setting / indication range | 2 bar - 0.2 bar |
| Permiss. operating pressure | 7 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G 1/8 |
| Max. torque | 15 Nm |
| Switching type | – |
| Max. switching voltage | – |
| Electrical connection | – |
| Max. switching output at resistive load | – |
| Switching capacity | – |
| Protection class to DIN 40050 | – |
| Order example | VMF 2 B.1 |

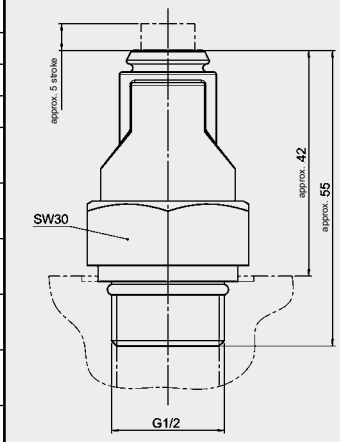



### VR x B.x



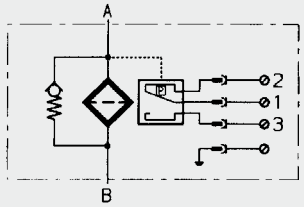



| | |
|---|---|
| Type of indication | visual, red pin |
| Weight | 44 g |
| Pressure setting / indication range | 2 bar - 0.2 bar |
| Permiss. operating pressure | 7 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 15 Nm |
| Switching type | – |
| Max. switching voltage | – |
| Electrical connection | – |
| Max. switching output at resistive load | – |
| Switching capacity | – |
| Protection class to DIN 40050 | – |
| Order example | VR 2 B.1 |

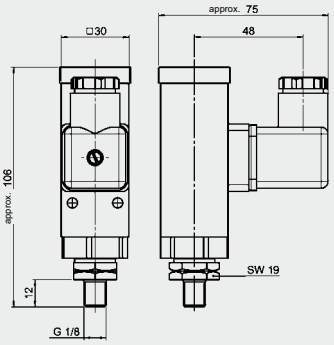



### VMF x C.x



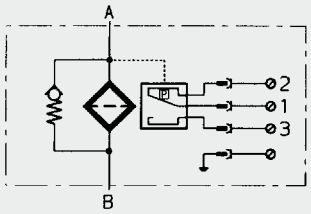



| | |
|---|---|
| Type of indication | electrical switch |
| Weight | 270 g |
| Pressure setting / indication range | 2 bar - 0.3 bar |
| Permiss. operating pressure | 40 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G 1/8 |
| Max. torque | 15 Nm |
| Switching type | N/C or N/O, (change-over contacts) |
| Max. switching voltage | 230 V |
| Electrical connection | plug connection, PG 11 socket to DIN 43650 |
| Max. switching output at resistive load | 250 W = 300 VA ~ |
| Switching capacity | ohmic 6 A at 24 V = ohmic 0.03 to 6 A to max. 230 V ~ |
| Protection class to DIN 40050 | IP 65 (only if the plug is wired and fitted correctly) |
| Order example | VMF 2 C.0 |

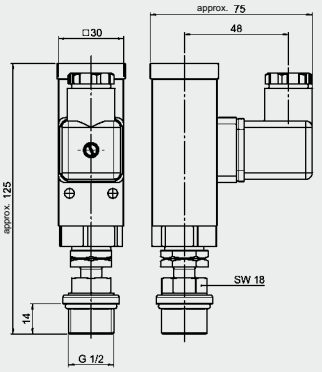


## VR x C.x

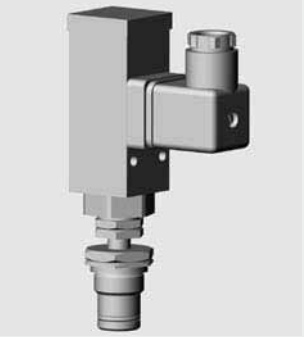


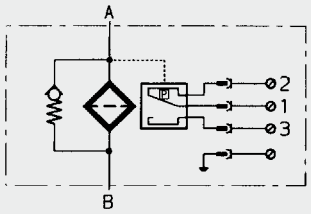



| | |
|---|---|
| Type of indication | electrical switch |
| Weight | 340 g |
| Pressure setting / indication range | 2 bar - 0.3 bar |
| Permiss. operating pressure | 40 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 30 Nm |
| Switching type | N/C or N/O, (change-over contacts) |
| Max. switching voltage | 230 V |
| Electrical connection | plug connection, PG 11 socket to DIN 43650 |
| Max. switching output at resistive load | 250 W = 300 VA ~ |
| Switching capacity | ohmic 6 A at 24 V ohmic 0.03 to 6 A at max. 230 V ~ |
| Protection class to DIN 40050 | IP 65 (only if the plug is wired and fitted correctly) |
| Order example | VR 2 C.0 |

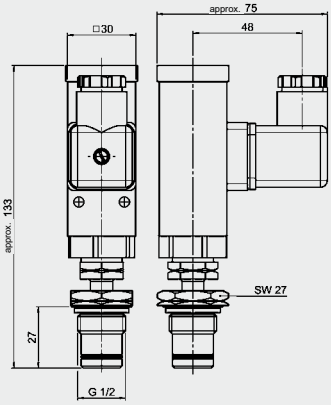



## VRD x C.x

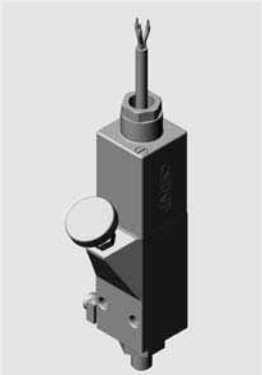


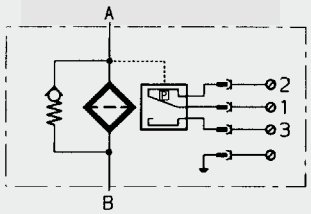



| | |
|---|---|
| Type of indication | electrical switch |
| Weight | 340 g |
| Pressure setting / indication range | 2 bar - 0.3 bar |
| Permiss. operating pressure | 40 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 33 Nm |
| Switching type | N/C or N/O, (change-over contacts) |
| Max. switching voltage | 230 V |
| Electrical connection | plug connection, PG 11 socket to DIN 43650 |
| Max. switching output at resistive load | 250 W = 300 VA ~ |
| Switching capacity | ohmic 6 A at 24 V ohmic 0.03 to 6 A at max. 230 V ~ |
| Protection class to DIN 40050 | IP 65 (only if the plug is wired and fitted correctly) |
| Order example | VRD 2 C.0 |

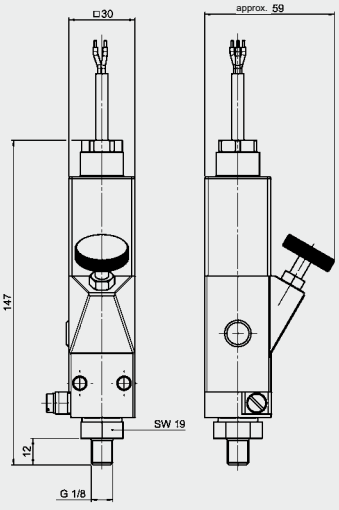



## VMF x C.x /-Ex

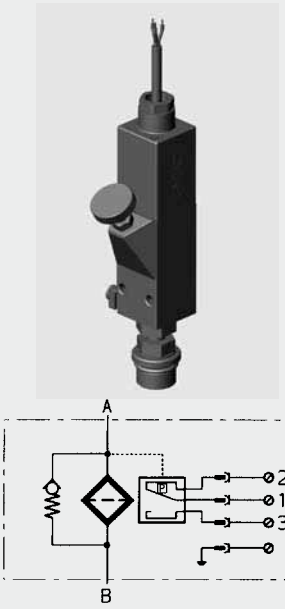




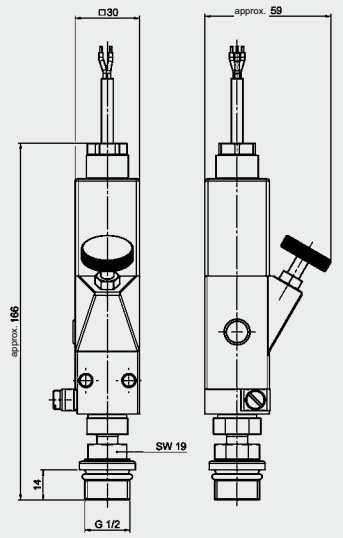

| | |
|---|---|
| Type of indication | electrical switch |
| Weight | 270 g |
| Pressure setting / indication range | 2 bar ± 0.3 bar |
| Permiss. operating pressure | 200 bar |
| Permiss. temperature range | -10 °C to +100 °C |
| Connection thread | G 1/8 |
| Max. torque | 15 Nm |
| Switching type | N/C or N/O, (change-over contacts) |
| Max. switching voltage | 250 V |
| Electrical connection | cable connection PG 9 cable length 2 m |
| Max. switching output at resistive load | 62.5 W = 250 VA ~ |
| Switching capacity | ohmic 0. 25 A at 250 V = ohmic 1 A at 250 V ~ |
| Protection class to DIN 40050 | EX II 2G EEx d II C T6 / T5 |
| Order example | VMF 2 C.0 /-Ex |



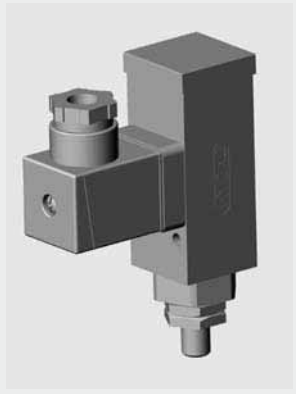
## VR x C.x /-Ex



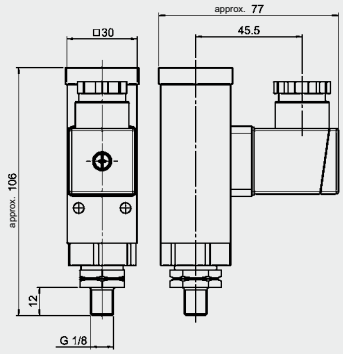

| | |
|---|---|
| Type of indication | electrical switch |
| Weight | 340 g |
| Pressure setting / indication range | 2 bar ± 0.3 bar |
| Permiss. operating pressure | 40 bar |
| Permiss. temperature range | -10 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 30 Nm |
| Switching type | N/C or N/O, (change-over contacts) |
| Max. switching voltage | 230 V |
| Electrical connection | plug connection, PG 11 socket to DIN 43650 |
| Max. switching output at resistive load | 250 W = 300 VA ~ |
| Switching capacity | ohmic 6 A to 24 V ohmic 0.03 to 6 A to max. 230 V ~ |
| Protection class to DIN 40050 | EX II 2G EEx d II C T6 / T5 |
| Order example | VR 2 C.0 /-Ex |



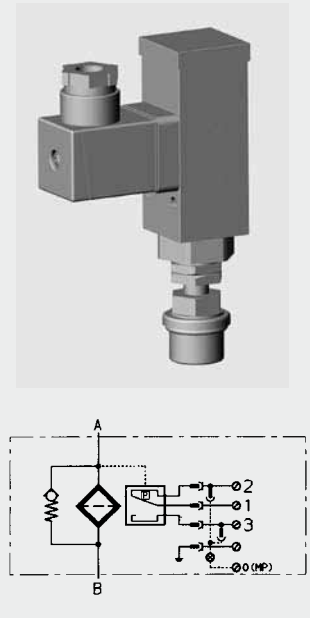

## VMF x D.x /-L...



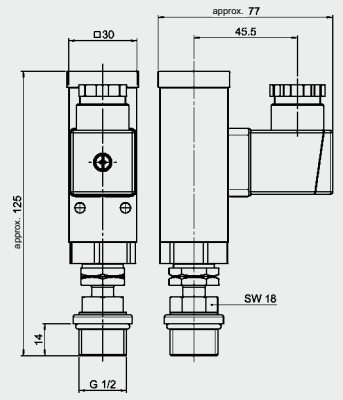

| | |
|---|---|
| Type of indication | visual indicator and electrical switch |
| Weight | 300 g |
| Pressure setting / indication range | 2 bar - 0.3 bar |
| Permiss. operating pressure | 40 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G 1/8 |
| Max. torque | 15 Nm |
| Switching type | N/C or N/O, (change-over contacts) |
| Max. switching voltage | 24, 48, 110, 230 V (depending on the type of light insert) |
| Electrical connection | plug connection PG 11 socket to DIN 43650 |
| Max. switching output at resistive load | 250 W = 300 VA ~ |
| Switching capacity | ohmic 6 A at 230 V = ohmic 0.03 to 6 A at max. 230 V ~ |
| Protection class to DIN 40050 | IP 65 (only if the plug is wired and fitted correctly) |
| Order example | VMF 2 D.0 /-L24 |



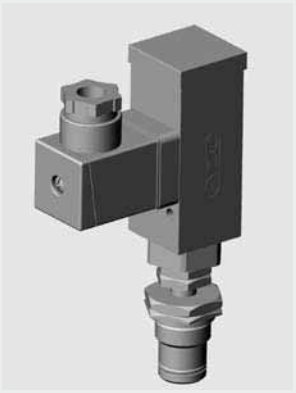

## VR x D.x /-L...

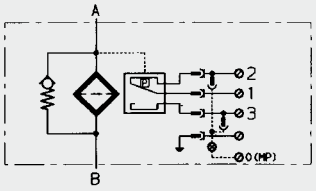



| | |
|---|---|
| Type of indication | visual indicator and electrical switch |
| Weight | 360 g |
| Pressure setting / indication range | 2 bar - 0.3 bar |
| Permiss. operating pressure | 40 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 30 Nm |
| Switching type | N/C or N/O, (change-over contacts) |
| Max. switching voltage | 24, 48, 110, 230 V (depending on the type of light insert) |
| Electrical connection | plug connection, PG 11 socket to DIN 43650 |
| Max. switching output at resistive load | 250 W = 300 VA ~ |
| Switching capacity | ohmic 6 A at 24 V = ohmic 0.03 to 6 A at max. 230 V ~ |
| Protection class to DIN 40050 | IP 65 (only if the plug is wired and fitted correctly) |
| Order example | VR 2 D.0 /-L110 |

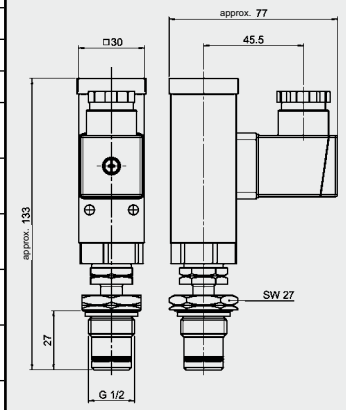


## VRD x D.x /-L...

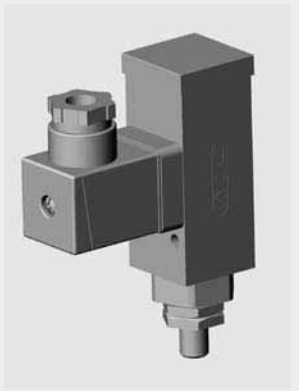


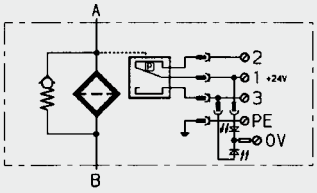



| | |
|---|---|
| Type of indication | visual/electrical, electrical switch |
| Weight | 360 g |
| Pressure setting / indication range | 2 bar - 0.3 bar |
| Permiss. operating pressure | 40 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 33 Nm |
| Switching type | N/C or N/O, (change-over contacts) |
| Max. switching voltage | 24, 48, 110, 230 V (depending on the type of light insert) |
| Electrical connection | plug connection, PG 11 socket to DIN 43650 |
| Max. switching output at resistive load | 250 W = 300 VA ~ |
| Switching capacity | ohmic 6 A at 24 V = ohmic 0.03 to 6 A at max. 230 V ~ |
| Protection class to DIN 40050 | IP 65 (only if the plug is wired and fitted correctly) |
| Order example | VRD 2 D.0 /-L110 |

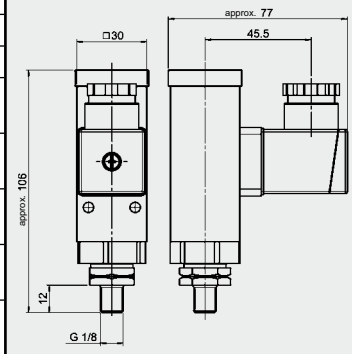



## VMF x D.x /-LED

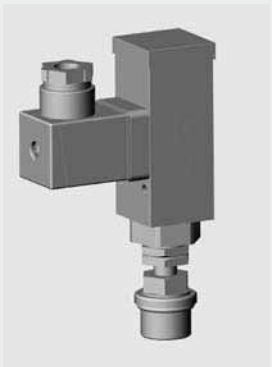


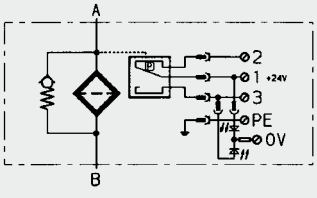



| | |
|---|---|
| Type of indication | visual/electrical, electrical switch |
| Weight | 300 g |
| Pressure setting/indication range | 2 bar - 0.3 bar |
| Permiss. operating pressure | 40 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G 1/8 |
| Max. torque | 15 Nm |
| Switching type | N/O contact |
| Max. switching voltage | 24 V |
| Electrical connection | plug connection PG 11 socket to DIN 43650 |
| Max. switching output at resistive load | 250 W = 300 VA ~ |
| Switching capacity | ohmic 6 A at 24 V = |
| Protection class to DIN 40050 | IP 65 (only if the plug is wired and fitted correctly) |
| Order example | VMF 2 D.0 /-LED |

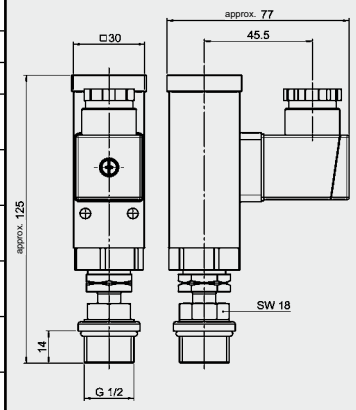



## VR x D.x /-LED



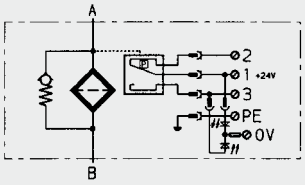



| | |
|---|---|
| Type of indication | visual/electrical, electrical switch |
| Weight | 360 g |
| Pressure setting/indication range | 2 bar - 0.3 bar |
| Permiss. operating pressure | 40 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G 1/8 |
| Max. torque | 30 Nm |
| Switching type | N/O contact |
| Max. switching voltage | 24 V |
| Electrical connection | plug connection PG 11 socket to DIN 43650 |
| Max. switching output at resistive load | 250 W = 300 VA ~ |
| Switching capacity | ohmic 6 A at 24 V = |
| Protection class to DIN 40050 | IP 65 (only if the plug is wired and fitted correctly) |
| Order example | VR 2 D.0 /-LED |

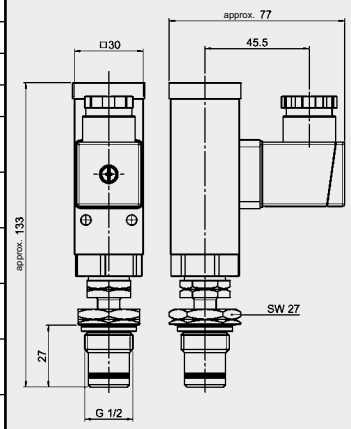


## VRD x D.x /-LED



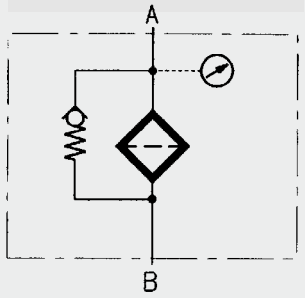



| | |
|---|---|
| Type of indication | visual/electrical, electrical switch |
| Weight | 360 g |
| Pressure setting / indication range | 2 bar - 0.3 bar |
| Permiss. operating pressure | 40 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G 1/8 |
| Max. torque | 33 Nm |
| Switching type | N/O contact |
| Max. switching voltage | 24 V |
| Electrical connection | plug connection PG 11<br>socket to DIN 43650 |
| Max. switching output at resistive load | 250 W =<br>300 VA ~ |
| Switching capacity | ohmic 6 A at 24 V = |
| Protection class to DIN 40050 | IP 65 (only if the plug is wired and fitted correctly) |
| Order example | VRD 2 D.0 /-LED |

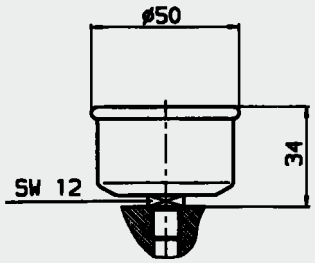



## VMF x E.x






| | |
|---|---|
| Type of indication | visual/analogue, scale indication |
| Weight | 80 g |
| Pressure setting / indication range | 0 bar to +10 bar |
| Permiss. operating pressure | 7 bar continuous |
| Permiss. temperature range | -20 °C to +60 °C |
| Connection thread | G 1/8 |
| Max. torque | 15 Nm |
| Switching type | – |
| Max. switching voltage | – |
| Electrical connection | – |
| Max. switching output at resistive load | – |
| Switching capacity | – |
| Protection class to DIN 40050 | – |
| Order example | VMF 2 E.0 |

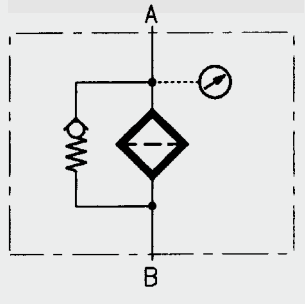




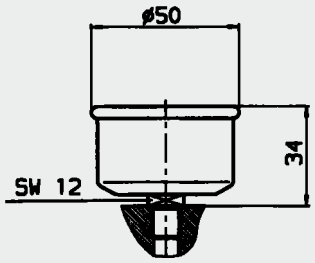


## VMF 16 E.x





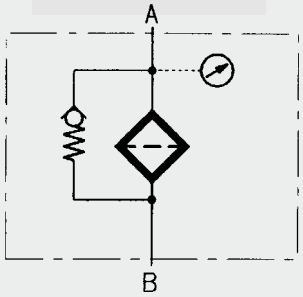

| | |
|---|---|
| Type of indication | visual/analogue, scale indication |
| Weight | 80 g |
| Pressure setting / indication range | 0 bar to +16 bar |
| Permiss. operating pressure | 11 bar continuous |
| Permiss. temperature range | -20 °C to +60 °C |
| Connection thread | G 1/8 |
| Max. torque | 15 Nm |
| Switching type | – |
| Max. switching voltage | – |
| Electrical connection | – |
| Max. switching output at resistive load | – |
| Switching capacity | – |
| Protection class to DIN 40050 | – |
| Order example | VMF 16 E.0 |



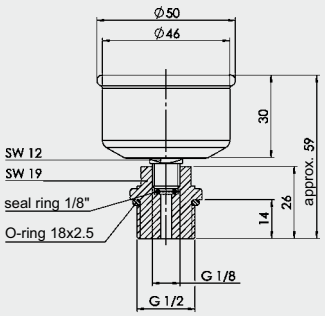



## VR x E.x






| | |
|---|---|
| Type of indication | visual/analogue, scale indication |
| Weight | 140 g |
| Pressure setting / indication range | 0 bar to +10 bar |
| Permiss. operating pressure | 7 bar continuous |
| Permiss. temperature range | -20 °C to +60 °C |
| Connection thread | G ½ |
| Max. torque | 30 Nm |
| Switching type | – |
| Max. switching voltage | – |
| Electrical connection | – |
| Max. switching output at resistive load | – |
| Switching capacity | – |
| Protection class to DIN 40050 | – |
| Order example | VR 2 E.0 |

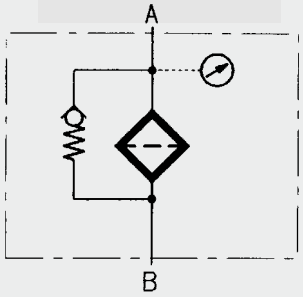




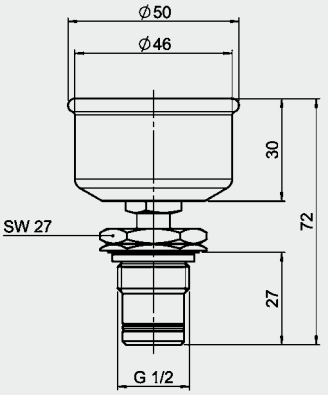


## VRD x E.x






| | |
|---|---|
| Type of indication | visual/analogue, scale indication |
| Weight | 140 g |
| Pressure setting / indication range | 0 bar to +10 bar |
| Permiss. operating pressure | 7 bar continuous |
| Permiss. temperature range | -20 °C to +60 °C |
| Connection thread | G ½ |
| Max. torque | 33 Nm |
| Switching type | – |
| Max. switching voltage | – |
| Electrical connection | – |
| Max. switching output at resistive load | – |
| Switching capacity | – |
| Protection class to DIN 40050 | – |
| Order example | VRD 2 E.0 |

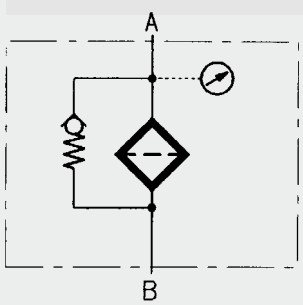




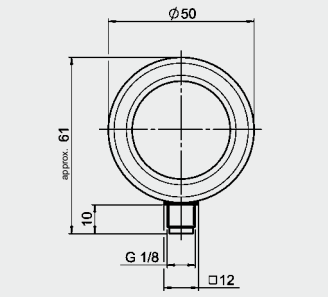


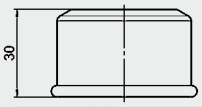
## VMF x ES.x






| | |
|---|---|
| Type of indication | visual/analogue, scale indication |
| Weight | 100 g |
| Pressure setting / indication range | 0 bar to +10 bar |
| Permiss. operating pressure | 7 bar continuous |
| Permiss. temperature range | -20 °C to +60 °C |
| Connection thread | G 1/8 |
| Max. torque | 15 Nm |
| Switching type | – |
| Max. switching voltage | – |
| Electrical connection | – |
| Max. switching output at resistive load | – |
| Switching capacity | – |
| Protection class to DIN 40050 | – |
| Order example | VMF 2 ES.0 |

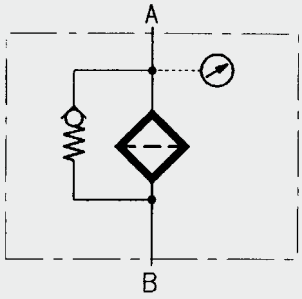


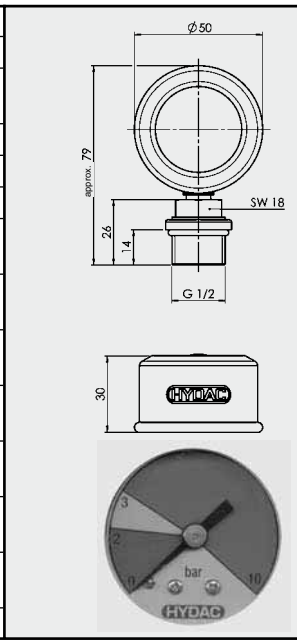



## VR x ES.x



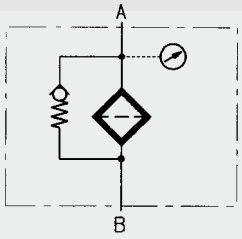



| | |
|---|---|
| Type of indication | visual/analogue, scale indication |
| Weight | 120 g |
| Pressure setting / indication range | 0 bar to +10 bar |
| Permiss. operating pressure | 7 bar continuous |
| Permiss. temperature range | -20 °C to +60 °C |
| Connection thread | G ½ |
| Max. torque | 30 Nm |
| Switching type | – |
| Max. switching voltage | – |
| Electrical connection | – |
| Max. switching output at resistive load | – |
| Switching capacity | – |
| Protection class to DIN 40050 | – |
| Order example | VR 2 ES.0 |

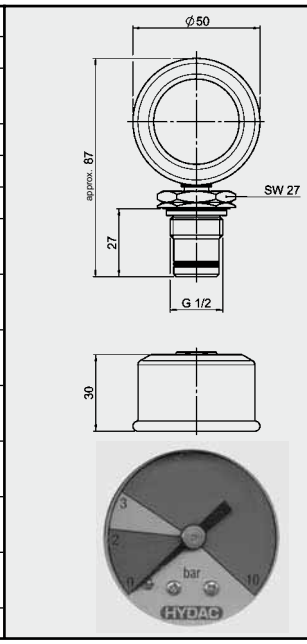



## VRD x ES.x



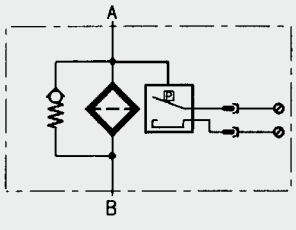



| | |
|---|---|
| Type of indication | visual/analogue, scale indication |
| Weight | 120 g |
| Pressure setting / indication range | 0 bar to +10 bar |
| Permiss. operating pressure | 7 bar continuous |
| Permiss. temperature range | -20 °C to +60 °C |
| Connection thread | G ½ |
| Max. torque | 33 Nm |
| Switching type | – |
| Max. switching voltage | – |
| Electrical connection | – |
| Max. switching output at resistive load | – |
| Switching capacity | – |
| Protection class to DIN 40050 | – |
| Order example | VRD 2 ES.0 |

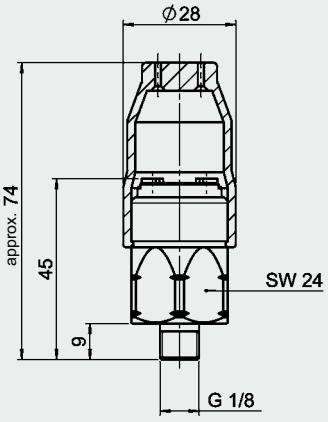



## VMF x F.x

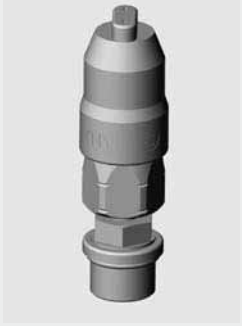


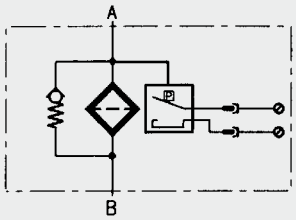



| | |
|---|---|
| Type of indication | electrical switch |
| Weight | 70 g |
| Pressure setting / indication range | 2 bar ± 0.4 bar |
| Permiss. operating pressure | 40 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G 1/8 |
| Max. torque | 15 Nm |
| Switching type | N/O contact |
| Max. switching voltage | 42 V |
| Electrical connection | threaded connection |
| Max. switching output at resistive load | 60 W = 100 VA ~ |
| Switching capacity | ohmic 2.5 A at 24 V = ohmic 2.5 A at 42 V ~ |
| Protection class to DIN 40050 | IP 65, terminals IP 00 |
| Order example | VMF 2 F.0 |

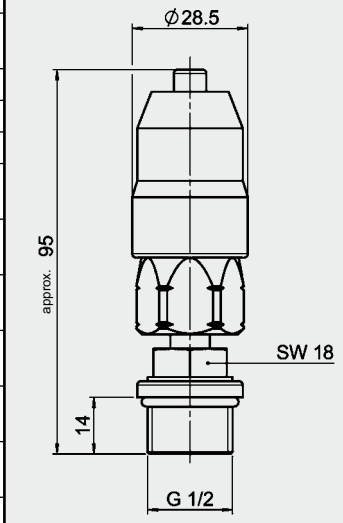


## VR x F.x



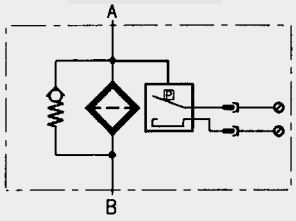



| | |
|---|---|
| Type of indication | electrical switch |
| Weight | 130 g |
| Pressure setting / indication range | 2 bar ± 0.4 bar |
| Permiss. operating pressure | 40 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 30 Nm |
| Switching type | N/O contact |
| Max. switching voltage | 42 V |
| Electrical connection | threaded connection |
| Max. switching output at resistive load | 60 W = 100 VA ~ |
| Switching capacity | ohmic 2.5 A at 24 V = ohmic 2.5 A at 42 V ~ |
| Protection class to DIN 40050 | IP 65, terminals IP 00 |
| Order example | VR 2 F.0 |

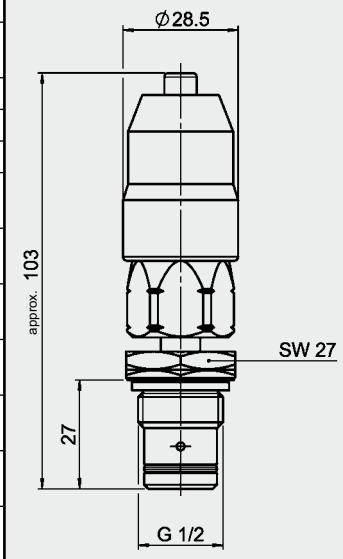



## VRD x F.x



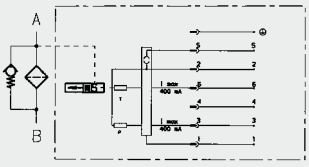



| | |
|---|---|
| Type of indication | electrical switch |
| Weight | 130 g |
| Pressure setting / indication range | 2 bar ± 0.4 bar |
| Permiss. operating pressure | 40 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 33 Nm |
| Switching type | N/O contact |
| Max. switching voltage | 42 V |
| Electrical connection | threaded connection |
| Max. switching output at resistive load | 60 W = 100 VA ~ |
| Switching capacity | ohmic 2.5 A at 24 V = ohmic 2.5 A at 42 V ~ |
| Protection class to DIN 40050 | IP 65, terminals IP 00 |
| Order example | VRD 2 F.0 |

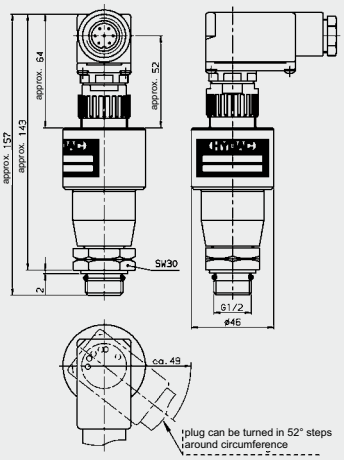



## VR x GC.x

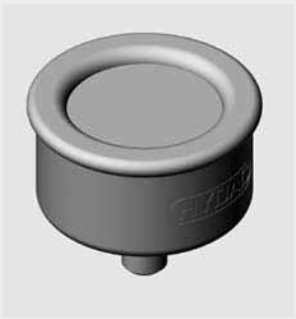


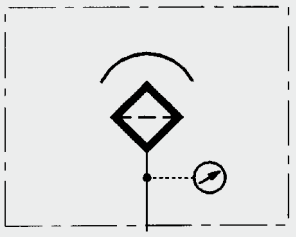



| | |
|---|---|
| Type of indication | electronic/analogue (4-20 mA or 1-10 V) 1 electrical switching contact at 75% and at 100% of the pressure setting Analogue signal up to 20% of the pressure setting constant at 4mA or 1 V |
| Weight | 340 g |
| Pressure setting / indication range | 2 bar -10% |
| Permiss. operating pressure | 7 bar |
| Permiss. temperature range | -30 °C to +80 °C |
| Threaded connection | G ½ |
| Max. torque | 15 Nm |
| Switching type | N/C or N/O electronic PNP positive switching (factory setting) |
| Max. switching voltage | operating voltage 20-30 V DC |
| Electrical connection | 7 pole plug to DIN 43651 |
| Max. switching output at resistive load | 12 W |
| Switching capacity | ohmic 0.4 A at 30 V = |
| Protection class to DIN 40050 | IP 65 (only if the plug is wired and fitted correctly) |
| Order example | VR 2 GC.0 /-LED-SQ-123 |

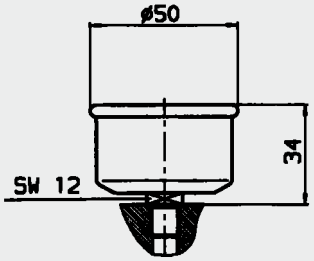


## VMF x K.x





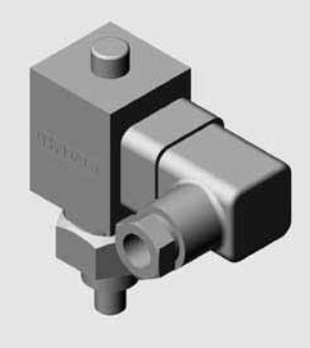
| | |
|---|---|
| Type of indication | visual/analogue, scale indication |
| Weight | 100 g |
| Pressure setting / indication range | -1 bar to + 0.6 bar |
| Permiss. operating pressure | -0.7 to +0.4 bar continuous |
| Permiss. temperature range | -20 °C to +60 °C |
| Connection thread | G 1/8 |
| Max. torque | 15 Nm |
| Switching type | – |
| Max. switching voltage | – |
| Electrical connection | – |
| Max. switching output at resistive load | – |
| Switching capacity | – |
| Protection class to DIN 40050 | – |
| Order example | VMF 0.6 K.0 |

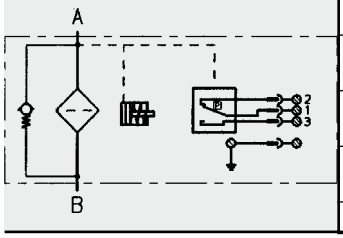




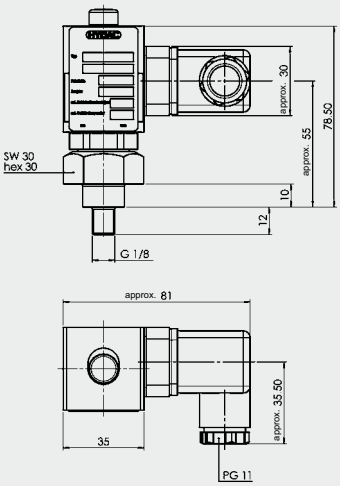


## VMF x LE.x



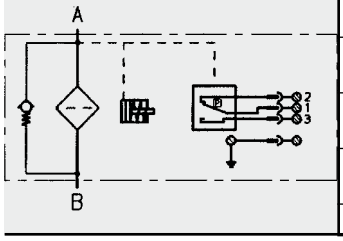



| | |
|---|---|
| Type of indication | visual, red pin and electrical switch 1 switching contact at 100% of the pressure setting |
| Weight | 120 g |
| Pressure setting / indication range | 2 bar - 0.2 bar |
| Permiss. operating pressure | 7 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G 1/8 |
| Max. torque | 15 Nm |
| Switching type | N/C or N/O contacts Reed contacts (change-over contacts) |
| Max. switching voltage | 115 V |
| Electrical connection | plug connection PG 11 socket to DIN 43650 |
| Max. switching output at resistive load | 15 W = max. 15 VA ~ |
| Switching capacity | ohmic 1 A at 15 V = ohmic 1 A at 15 V ~ |
| Protection class to DIN 40050 | IP 65 (only if the plug is wired and fitted correctly) |
| Order example | VMF 2 LE.1 |

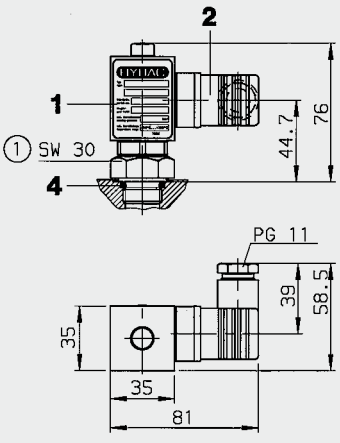



## VR x LE.x

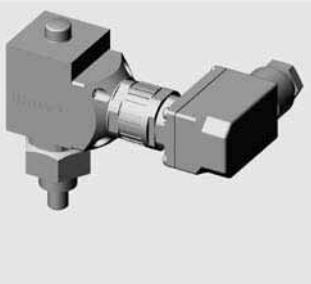


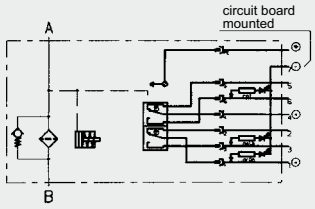



| | |
|---|---|
| Type of indication | visual, red pin and electrical switch 1 switching contact at 100% of the pressure setting |
| Weight | 143 g |
| Pressure setting / indication range | 2 bar - 0.2 bar |
| Permiss. operating pressure | 7 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 15 Nm |
| Switching type | N/C or N/O contacts Reed contacts (change-over contacts) |
| Max. switching voltage | 115 V |
| Electrical connection | plug connection PG 11 socket to DIN 43650 |
| Max. switching output at resistive load | 15 W = max. 15 VA ~ |
| Switching capacity | ohmic 1 A at 15 V = ohmic 1 A at 15 V ~ |
| Protection class to DIN 40050 | IP 65 (only if the plug is wired and fitted correctly) |
| Order example | VR 2 LE.1 |

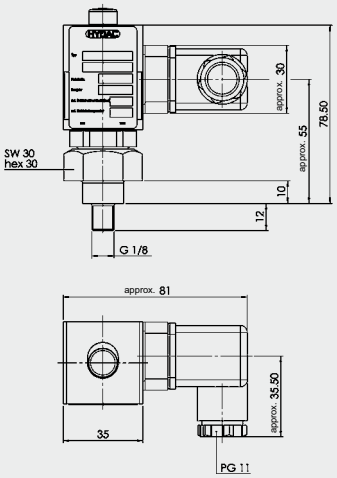


## VMF x LZ.x /-DB

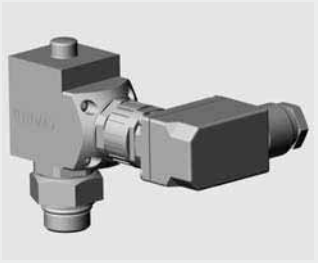


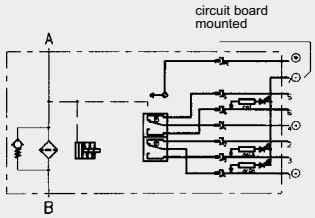



| | |
|---|---|
| Type of indication | visual, red pin<br>and 1 electrical switching contact at 75% and at 100% of the pressure setting<br>1 green LED constantly lit<br>1 yellow LED lit from 75%<br>1 red LED lit from 100% Δp |
| Weight | 170 g |
| Pressure setting / indication range | 2 bar - 0.2 bar |
| Permiss. operating pressure | 7 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G 1/8 |
| Max. torque | 15 Nm |
| Switching type | N/C or N/O contacts<br>Reed contacts (change-over contacts) |
| Max. switching voltage | 24 V |
| Electrical connection | plug connection PG 11<br>socket to DIN 43651 |
| Max. switching output at resistive load | 15 W =<br>max. 15 VA ~ |
| Switching capacity | ohmic 1 A at 15 V =<br>ohmic 1 A at 15 V ~ |
| Protection class to DIN 40050 | IP 65 (only if the plug is wired and fitted correctly) |
| Order example | VMF 2 LZ.1 /-DB |

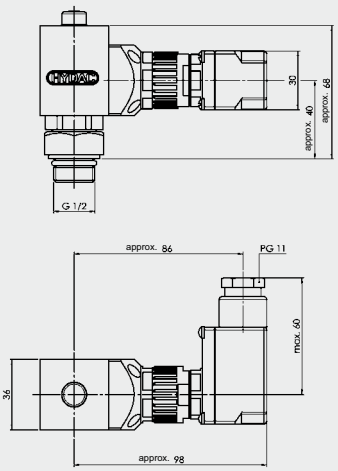



## VR x LZ.x /-DB

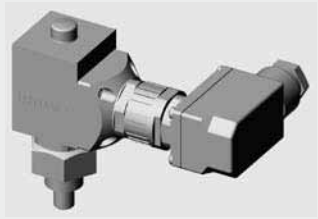


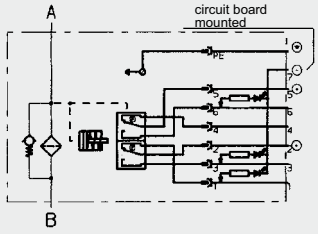



| | |
|---|---|
| Type of indication | visual, red pin<br>and 1 electrical switching contact at 75% and at 100% of the pressure setting<br>1 green LED constantly lit<br>1 yellow LED lit from 75%<br>1 red LED lit from 100% Δp |
| Weight | 190 g |
| Pressure setting / indication range | 2 bar - 0.2 bar |
| Permiss. operating pressure | 7 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 15 Nm |
| Switching type | N/C or N/O contacts<br>Reed contacts (change-over contacts) |
| Max. switching voltage | 24 V |
| Electrical connection | plug connection PG 11<br>socket to DIN 43651 |
| Max. switching output at resistive load | 15 W =<br>max. 15 VA ~ |
| Switching capacity | ohmic 1 A at 15 V =<br>ohmic 1 A at 15 V ~ |
| Protection class to DIN 40050 | IP 65 (only if the plug is wired and fitted correctly) |
| Order example | VR 2 LZ.1 /-DB |

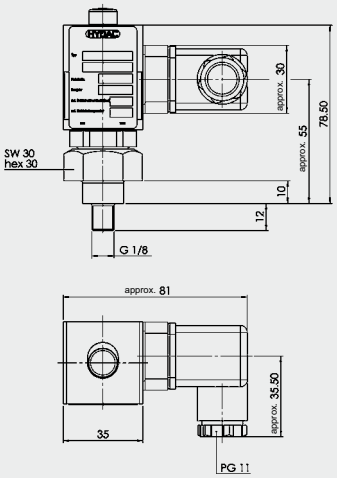



## VMF x LZ.x /-CN

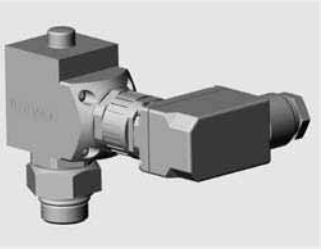


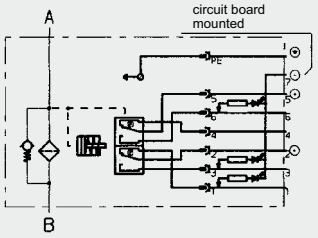



| | |
|---|---|
| Type of indication | visual, red pin<br>and 1 electrical switching contact at 75% and at 100% of the pressure setting<br>1 green LED goes out on reaching 75%<br>1 yellow LED lit from 75%<br>1 red LED lit from 100% Δp |
| Weight | 170 g |
| Pressure setting / indication range | 2 bar - 0.2 bar |
| Permiss. operating pressure | 7 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G 1/8 |
| Max. torque | 15 Nm |
| Switching type | N/C or N/O contacts<br>Reed contacts (change-over contacts) |
| Max. switching voltage | 24 V |
| Electrical connection | plug connection PG 11<br>socket to DIN 43651 |
| Max. switching output at resistive load | 15 W =<br>max. 15 VA ~ |
| Switching capacity | ohmic 1 A at 15 V =<br>ohmic 1 A at 15 V ~ |
| Protection class to DIN 40050 | IP 65 (only if the plug is wired and fitted correctly) |
| Order example | VMF 2 LZ.1 /-CN |

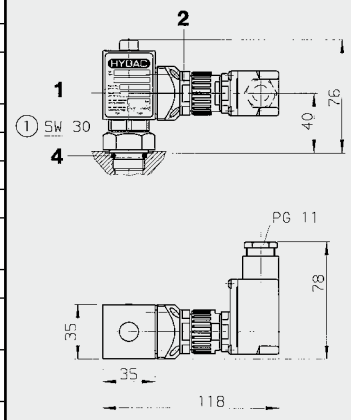


## VR x LZ.x /-CN

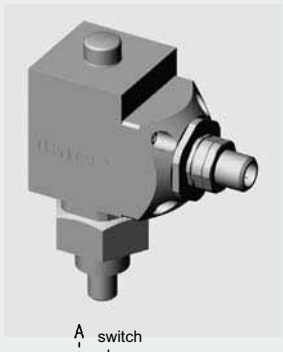


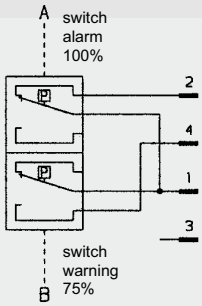



| | |
|---|---|
| Type of indication | visual, red pin<br>and 1 electrical switching contact at 75% and at 100% of the pressure setting<br>1 green LED goes out on reaching 75%<br>1 yellow LED lit from 75%<br>1 red LED lit from 100% Δp |
| Weight | 190 g |
| Pressure setting / indication range | 2 bar - 0.2 bar |
| Permiss. operating pressure | 7 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 15 Nm |
| Switching type | N/C or N/O contacts<br>Reed contacts (change-over contacts) |
| Max. switching voltage | 24 V |
| Electrical connection | plug connection PG 11<br>socket to DIN 43651 |
| Max. switching output at resistive load | 15 W =<br>max. 15 VA ~ |
| Switching capacity | ohmic 1 A at 15 V =<br>ohmic 1 A at 15 V ~ |
| Protection class to DIN 40050 | IP 65 (only if the plug is wired and fitted correctly) |
| Order example | VR 2 LZ.1 /-CN |

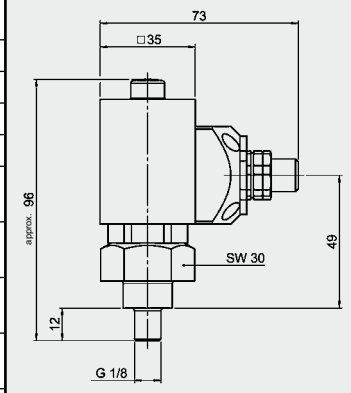



## VMF x LZ.x /-BO



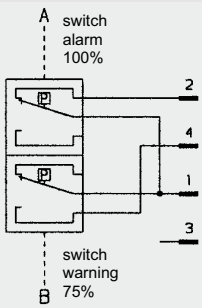



| | |
|---|---|
| Type of indication | visual, red pin<br>and 1 electrical switching contact at 75% and at 100% of the pressure setting |
| Weight | 120 g |
| Pressure setting / indication range | 2 bar (or 2.5 bar) - 10% |
| Permiss. operating pressure | 7 bar |
| Permiss. temperature range | -10 °C to +100 °C |
| Connection thread | G 1/8 |
| Max. torque | 15 Nm |
| Switching type | N/O contact (75%)<br>N/C contact (100%) |
| Max. switching voltage | 24 V |
| Electrical connection | plug connection<br>M12 x 1 |
| Max. switching output at resistive load | 15 W =<br>max. 15 VA ~ |
| Switching capacity | ohmic 1 A at 15 V =<br>ohmic 1 A at 15 V ~ |
| Protection class to DIN 40050 | IP 67 |
| Order example | VMF 2 LZ.1 /-BO |

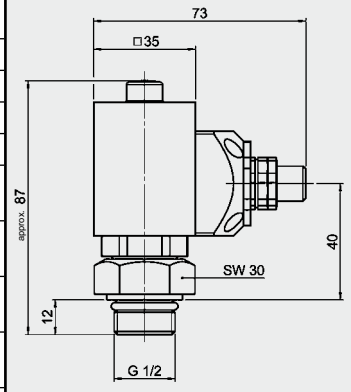



## VR x LZ.x /-BO



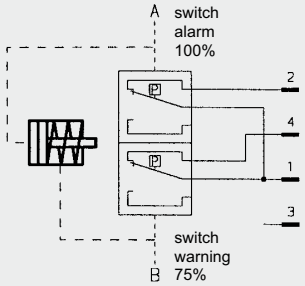



| | |
|---|---|
| Type of indication | visual, red pin<br>and 1 electrical switching contact at 75% and at 100% of the pressure setting |
| Weight | 145 g |
| Pressure setting / indication range | 2 bar (or 2.5 bar) - 10% |
| Permiss. operating pressure | 7 bar |
| Permiss. temperature range | -10 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 15 Nm |
| Switching type | N/O contact (75%)<br>N/C contact (100%) |
| Max. switching voltage | 24 V |
| Electrical connection | plug connection<br>M12 x 1 |
| Max. switching output at resistive load | 15 W =<br>max. 15 VA ~ |
| Switching capacity | ohmic 1 A at 15 V =<br>ohmic 1 A at 15 V ~ |
| Protection class to DIN 40050 | IP 67 |
| Order example | VR 2 LZ.1 /-BO |

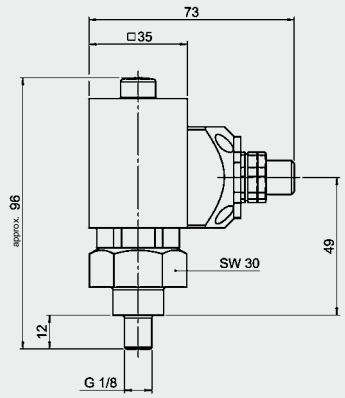


## VMF x LZ.x /-AV



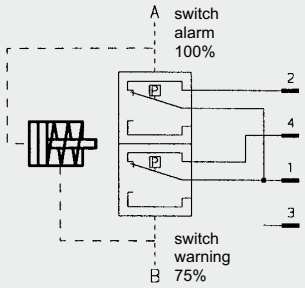



| | |
|---|---|
| Type of indication | visual, red pin<br>and 1 electrical switching contact at 75%<br>and at 100% of the pressure setting |
| Weight | 120 g |
| Pressure setting /<br>indication range | 2 bar (or 2.5 bar) - 10% |
| Permiss. operating pressure | 7 bar |
| Permiss. temperature range | -10 °C to +100 °C |
| Connection thread | G 1/8 |
| Max. torque | 15 Nm |
| Switching type | N/C contact (75% and 100%) |
| Max. switching voltage | 24 V |
| Electrical connection | plug connection<br>M12 x 1 |
| Max. switching output<br>at resistive load | 15 W =<br>max. 15 VA ~ |
| Switching capacity | ohmic 1 A at 15 V =<br>ohmic 1 A at 15 V ~ |
| Protection class<br>to DIN 40050 | IP 67 |
| Order example | VMF 2 LZ.1 /-AV |

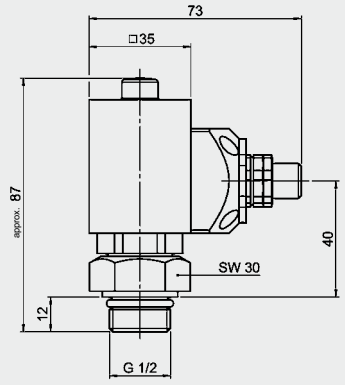



## VR x LZ.x /-AV



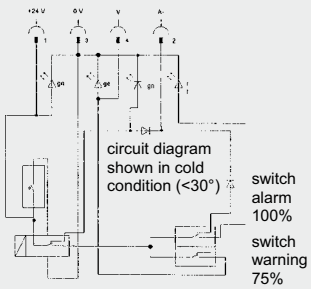



| | |
|---|---|
| Type of indication | visual, red pin<br>and 1 electrical switching contact at 75%<br>and at 100% of the pressure setting |
| Weight | 145 g |
| Pressure setting /<br>indication range | 2 bar (or 2.5 bar) - 10% |
| Permiss. operating pressure | 7 bar |
| Permiss. temperature range | -10 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 15 Nm |
| Switching type | N/C contact (75% and 100%) |
| Max. switching voltage | 24 V |
| Electrical connection | plug connection<br>M12 x 1 |
| Max. switching output<br>at resistive load | 15 W =<br>max. 15 VA ~ |
| Switching capacity | ohmic 1 A at 15 V =<br>ohmic 1 A at 15 V ~ |
| Protection class<br>to DIN 40050 | IP 67 |
| Order example | VR 2 LZ.1 /-AV |

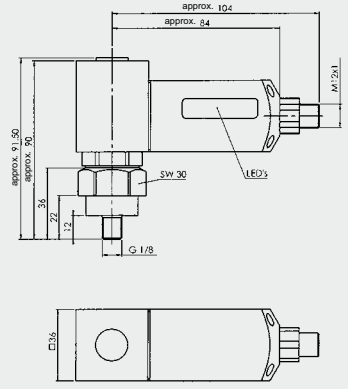



## VMF x LZ.x /-D4C



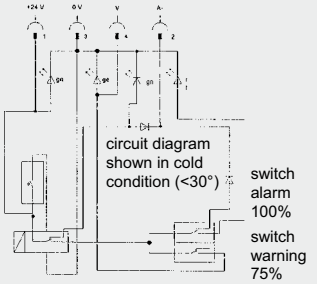



| | |
|---|---|
| Type of indication | 1 electrical switching contact at 75%<br>and at 100% of the pressure setting and<br>suppression of the switching signal when<br>operating temperature is below 30 °C<br>1 green LED constantly lit<br>1 yellow LED lit from 75%<br>1 red LED lit from 100% Δp |
| Weight | 245 g |
| Pressure setting /<br>indication range | 2.5 bar - 10% |
| Permiss. operating pressure | 7 bar |
| Permiss. temperature range | -10 °C to +100 °C |
| Connection thread | G 1/8 |
| Max. torque | 15 Nm |
| Switching type | N/O contact (75%)<br>N/C contact (100%) |
| Max. switching voltage | 24 V |
| Electrical connection | plug connection<br>M12 x 1 |
| Max. switching output<br>at resistive load | 15 W =<br>max. 15 VA ~ |
| Switching capacity | ohmic 1 A at 15 V =<br>ohmic 1 A at 15 V ~ |
| Protection class<br>to DIN 40050 | IP 67 |
| Order example | VMF 2 LZ.1 /-D4C |

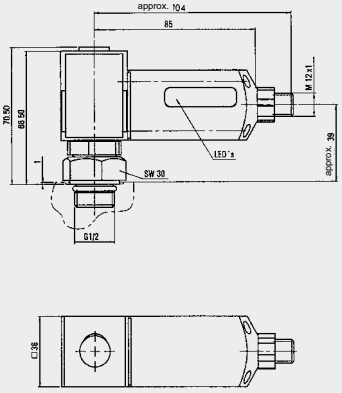


## VR x LZ.x /-D4C



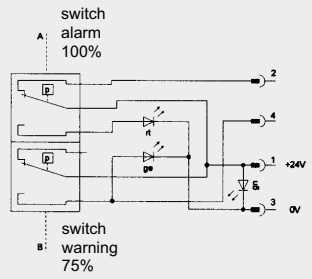



| | |
|---|---|
| Type of indication | 1 electrical switching contact at 75% and at 100% of the pressure setting and suppression of the switching signal when operating temperature is below 30 °C<br>1 green LED constantly lit<br>1 yellow LED lit from 75%<br>1 red LED lit from 100% Δp |
| Weight | 205 g |
| Pressure setting / indication range | 2.5 bar - 10% |
| Permiss. operating pressure | 7 bar |
| Permiss. temperature range | -10 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 15 Nm |
| Switching type | N/O contact (75%)<br>N/C contact (100%) |
| Max. switching voltage | 24 V |
| Electrical connection | plug connection<br>M12 x 1 |
| Max. switching output at resistive load | 15 W =<br>max. 15 VA ~ |
| Switching capacity | ohmic 1 A at 15 V =<br>ohmic 1 A at 15 V ~ |
| Protection class to DIN 40050 | IP 67 |
| Order example | VR 2 LZ.1 /-D4C |

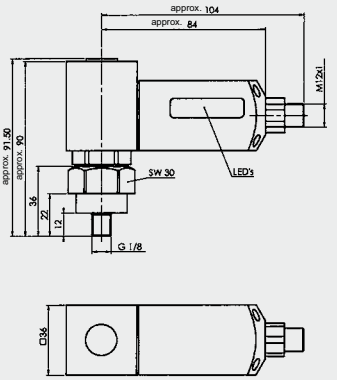



## VMF x LZ.x /-BO-LED



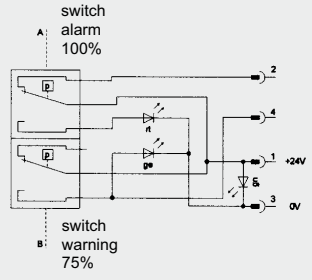



| | |
|---|---|
| Type of indication | 1 electrical switching contact at 75% and at 100% of the pressure setting<br>1 green LED constantly lit<br>1 yellow LED lit from 75%<br>1 red LED lit from 100% Δp |
| Weight | 245 g |
| Pressure setting / indication range | 2.5 bar - 10% |
| Permiss. operating pressure | 7 bar |
| Permiss. temperature range | -10 °C to +100 °C |
| Threaded connection | G 1/8 |
| Max. torque | 15 Nm |
| Switching type | N/O contact (75%), N/C contact (100%) |
| Max. switching voltage | 24 V |
| Electrical connection | plug connection<br>M12 x 1 |
| Max. switching output at resistive load | 15 W =<br>max. 15 VA ~ |
| Switching capacity | ohmic 1 A at 15 V =<br>ohmic 1 A at 15 V ~ |
| Protection class to DIN 40050 | IP 67 |
| Order example | VMF 2 LZ.1 /-BO-LED |

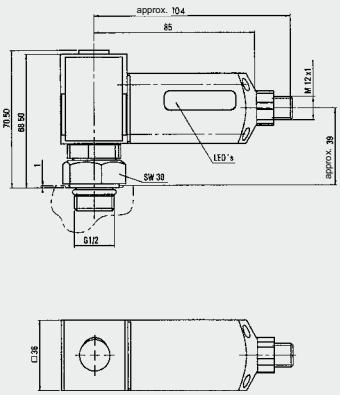



## VR x LZ.x /-BO-LED



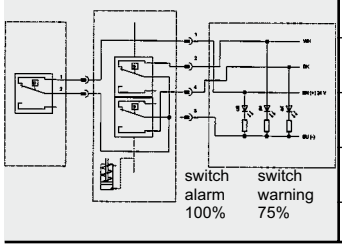



| | |
|---|---|
| Type of indication | 1 electrical switching contact at 75% and at 100% of the pressure setting<br>1 green LED constantly lit<br>1 yellow LED lit from 75%<br>1 red LED lit from 100% Δp |
| Weight | 205 g |
| Pressure setting / indication range | 2.5 bar - 10% |
| Permiss. operating pressure | 7 bar |
| Permiss. temperature range | -10 °C to +100 °C |
| Threaded connection | G ½ |
| Max. torque | 15 Nm |
| Switching type | N/O contact (75%), N/C contact (100%) |
| Max. switching voltage | 24 V |
| Electrical connection | plug connection<br>M12 x 1 |
| Max. switching output at resistive load | 15 W =<br>max. 15 VA ~ |
| Switching capacity | ohmic 1 A at 15 V =<br>ohmic 1 A at 15 V ~ |
| Protection class to DIN 40050 | IP 67 |
| Order example | VR 2 LZ.1 /-BO-LED |

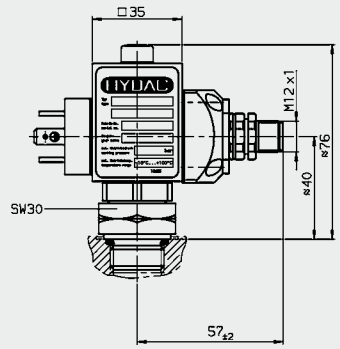


## VR x LZ.x /-GM

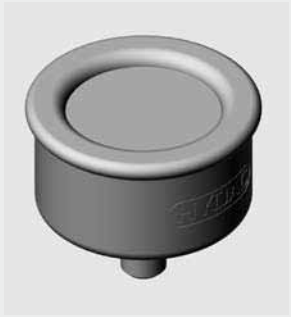


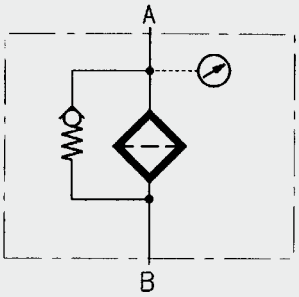



| | |
|---|---|
| Type of indication | visual, red pin<br>and 1 electrical switching contact at 75% and at 100% of the pressure setting<br>Indicator function possible only in conjunction with the "No element"indicator |
| Weight | 290 g |
| Pressure setting / indication range | 2.5 bar - 10% |
| Permiss. operating pressure | 7 bar |
| Permiss. temperature range | -10 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 15 Nm |
| Switching type | - |
| Max. switching voltage | 24 V |
| Electrical connection | plug connection<br>M12 x 1 |
| Max. switching output at resistive load | 15 W =<br>max. 15 VA ~ |
| Switching capacity | ohmic 1 A at 15 V =<br>ohmic 1 A at 15 V ~ |
| Protection class to DIN 40050 | IP 67 |
| Order example | VR 2 LZ.1 /-GM |

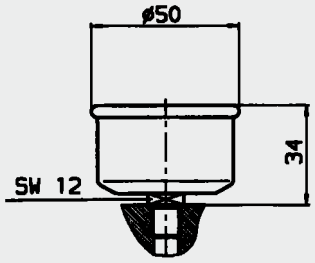


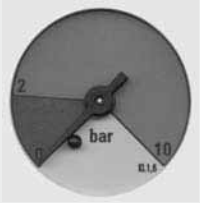

## VMF x R.x





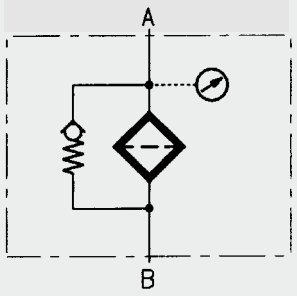

| | |
|---|---|
| Type of indication | visual/analogue, scale indication |
| Weight | 80 g |
| Pressure setting / indication range | 0 to 10 bar |
| Permiss. operating pressure | 7 bar continuous |
| Permiss. temperature range | -20 °C to +60 °C |
| Connection thread | G 1/8 |
| Max. torque | – |
| Switching type | – |
| Max. switching voltage | – |
| Electrical connection | – |
| Max. switching output at resistive load | – |
| Switching capacity | – |
| Protection class to DIN 40050 | – |
| Order example | VMF 2 R.0 |



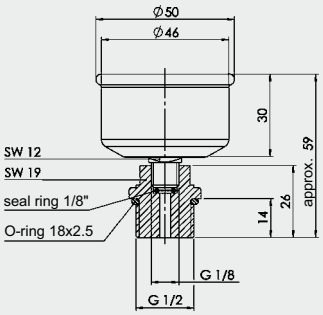



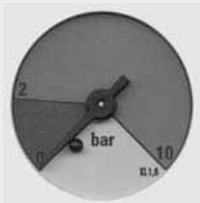

## VR x R.x






| | |
|---|---|
| Type of indication | visual/analogue, scale indication |
| Weight | 140 g |
| Pressure setting / indication range | 0 to 10 bar |
| Permiss. operating pressure | 7 bar continuous |
| Permiss. temperature range | -20 °C to +60 °C |
| Connection thread | G ½ |
| Max. torque | 15 Nm |
| Switching type | – |
| Max. switching voltage | – |
| Electrical connection | – |
| Max. switching output at resistive load | – |
| Switching capacity | – |
| Protection class to DIN 40050 | – |
| Order example | VR 2 R.0 |

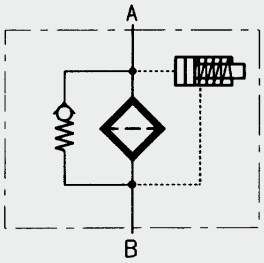


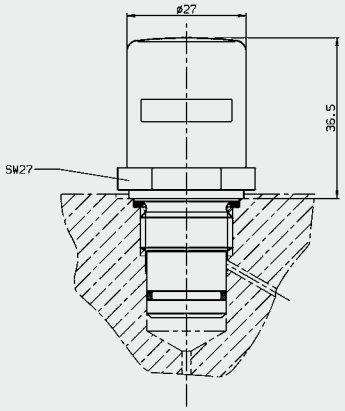
## 3.3 DIFFERENTIAL PRESSURE INDICATORS

### VM x B.x



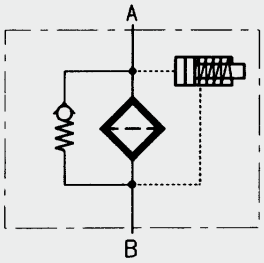



| | |
|---|---|
| Type of indication | visual, green-red zone<br>automatic reset |
| Weight | 55 g |
| Pressure setting /<br>indication range | 2 bar - 10%<br>5 bar - 10%<br>8 bar ± 10% |
| Permiss. operating pressure | 210 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 33 Nm |
| Switching type | – |
| Max. switching voltage | – |
| Electrical connection | – |
| Max. switching output<br>at resistive load | – |
| Switching capacity | – |
| Protection class<br>to DIN 40050 | – |
| Order example | VM 5 B.1 |

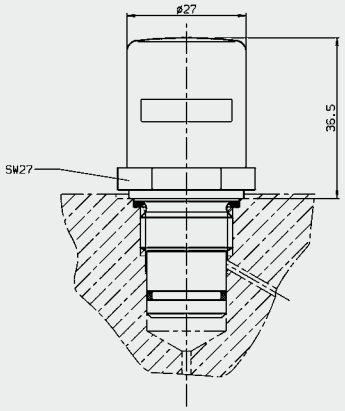



### VD x B.x



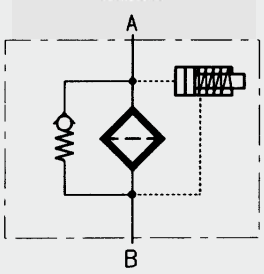



| | |
|---|---|
| Type of indication | visual, green-red zone<br>automatic reset |
| Weight | 110 g |
| Pressure setting /<br>indication range | 5 bar - 10%<br>8 bar ± 10% |
| Permiss. operating pressure | 420 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 100 Nm |
| Switching type | – |
| Max. switching voltage | – |
| Electrical connection | – |
| Max. switching output<br>at resistive load | – |
| Switching capacity | – |
| Protection class<br>to DIN 40050 | – |
| Order example | VD 5 B.1 |

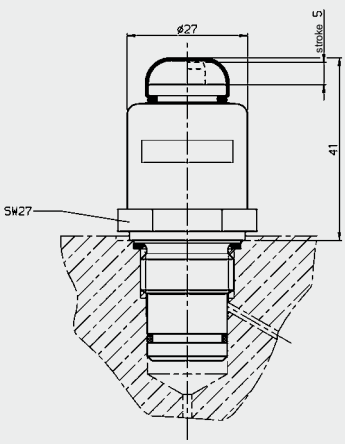



### VM x BM.x



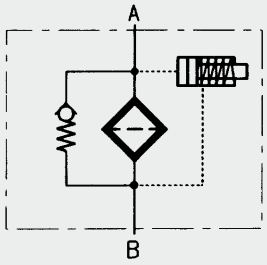



| | |
|---|---|
| Type of indication | visual, green-red zone<br>manual reset |
| Weight | 55 g |
| Pressure setting /<br>indication range | 2 bar - 10%<br>5 bar - 10%<br>8 bar ± 10% |
| Permiss. operating pressure | 210 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 33 Nm |
| Switching type | – |
| Max. switching voltage | – |
| Electrical connection | – |
| Max. switching output<br>at resistive load | – |
| Switching capacity | – |
| Protection class<br>to DIN 40050 | – |
| Order example | VM 5 BM.1 |

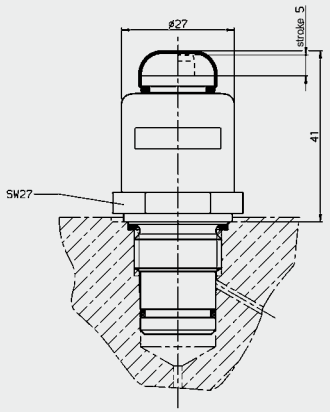


## VD x BM.x



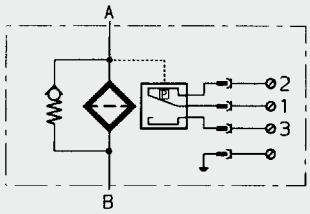



| | |
|---|---|
| Type of indication | visual, green-red zone<br>manual reset |
| Weight | 110 g |
| Pressure setting /<br>indication range | 5 bar - 10%<br>8 bar ± 10% |
| Permiss. operating pressure | 420 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 100 Nm |
| Switching type | – |
| Max. switching voltage | – |
| Electrical connection | – |
| Max. switching output<br>at resistive load | – |
| Switching capacity | – |
| Protection class<br>to DIN 40050 | – |
| Order example | VD 5 BM.1 |

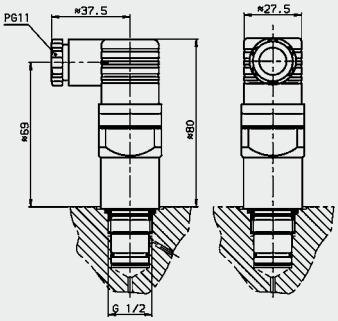



## VM x C.x



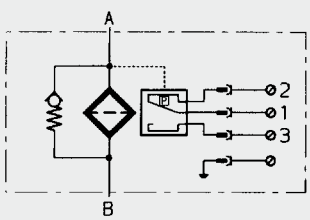



| | |
|---|---|
| Type of indication | electrical switch |
| Weight | 120 g |
| Pressure setting /<br>indication range | 2 bar - 10%<br>5 bar - 10%<br>8 bar ± 10% |
| Permiss. operating pressure | 210 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 33 Nm |
| Switching type | N/C or N/O contacts<br>(change-over contacts) |
| Max. switching voltage | 230 V |
| Electrical connection | plug connection PG 11<br>socket to DIN 43650 |
| Max. switching output<br>at resistive load | 60 W =<br>100 VA ~ |
| Switching capacity | ohmic 3 A at 24 V =<br>ohmic 0.03 to 5 A at max. 230 V ~ |
| Protection class<br>to DIN 40050 | IP 65 (only if the plug is wired and fitted<br>correctly) |
| Order example | VM 5 C.0 |

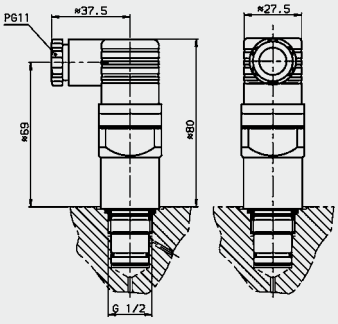



## VD x C.x



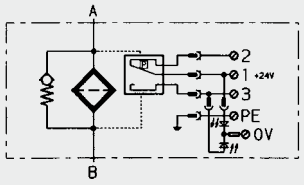



| | |
|---|---|
| Type of indication | electrical switch |
| Weight | 220 g |
| Pressure setting /<br>indication range | 5 bar - 10%<br>8 bar ± 10% |
| Permiss. operating pressure | 420 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 100 Nm |
| Switching type | N/C or N/O contacts<br>contacts (change-over contacts) |
| Max. switching voltage | 230 V |
| Electrical connection | plug connection PG 11<br>socket to DIN 43650 |
| Max. switching output<br>at resistive load | 60 W =<br>100 VA ~ |
| Switching capacity | ohmic 3 A at 24 V =<br>ohmic 0.03 to 5 A at max. 230 V ~ |
| Protection class<br>to DIN 40050 | IP 65 (only if the plug is wired and fitted<br>correctly) |
| Order example | VD 5 C.0 |

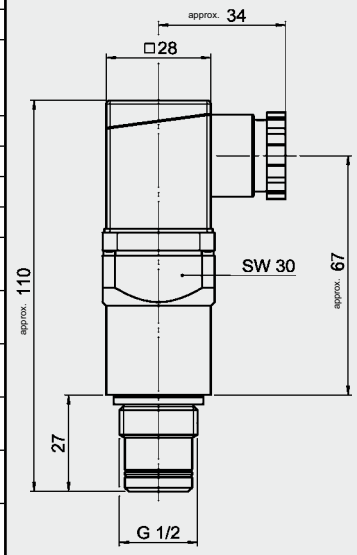


## VM x D.x /-L...



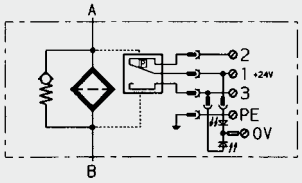



| | |
|---|---|
| Type of indication | visual<br>and electrical switch |
| Weight | 150 g |
| Pressure setting /<br>indication range | 2 bar - 10%<br>5 bar - 10%<br>8 bar ± 10% |
| Permiss. operating pressure | 210 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 33 Nm |
| Switching type | N/C or N/O contacts<br>(change-over contact) |
| Max. switching voltage | 24, 48, 110, 230 V<br>depending on type of light insert |
| Electrical connection | plug connection PG 11<br>socket to DIN 43650 |
| Max. switching output<br>at resistive load | 60 W =<br>100 VA ~ |
| Switching capacity | ohmic 3 A at 24 V =<br>ohmic 0.03 to 5 A to max. 230 V ~ |
| Protection class<br>to DIN 40050 | IP 65 (only if the plug is wired and fitted<br>correctly) |
| Order example | VM 5 D.0 /-L24 |

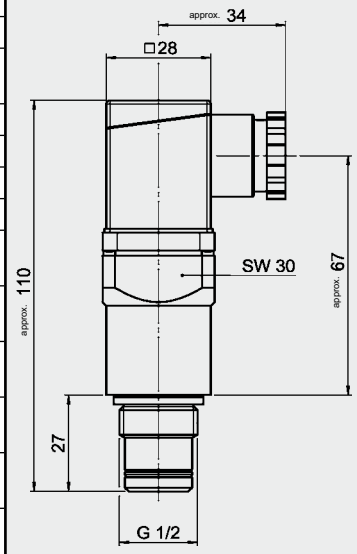



## VD x D.x /-L...



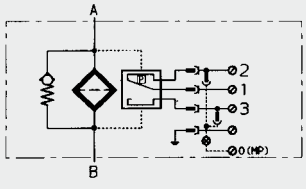



| | |
|---|---|
| Type of indication | visual<br>and electrical switch |
| Weight | 250 g |
| Pressure setting /<br>indication range | 5 bar - 10%<br>8 bar ± 10% |
| Permiss. operating pressure | 420 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 100 Nm |
| Switching type | N/C or N/O contacts,<br>(change-over contacts) |
| Max. switching voltage | 24, 48, 110, 230 V<br>depending on type of light insert |
| Electrical connection | plug connection PG 11<br>socket to DIN 43650 |
| Max. switching output<br>at resistive load | 60 W =<br>100 VA ~ |
| Switching capacity | ohmic 3 A at 24 V =<br>ohmic 0.03 to 5 A at max. 230 V ~ |
| Protection class<br>to DIN 40050 | IP 65 (only if the plug is wired and fitted<br>correctly) |
| Order example | VD 5 D.0 /-L24 |

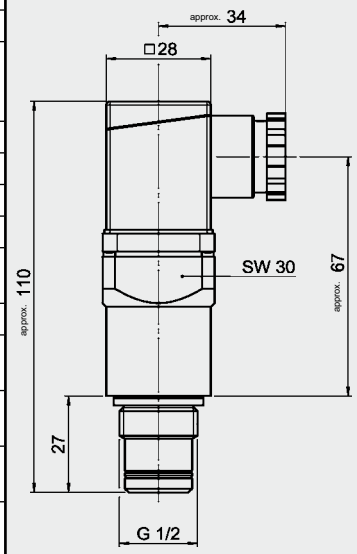



## VM x D.x /-LED



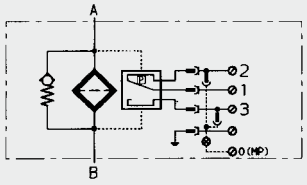



| | |
|---|---|
| Type of indication | visual<br>and electrical switch |
| Weight | 150 g |
| Pressure setting /<br>indication range | 2 bar - 10%<br>5 bar - 10%<br>8 bar ± 10% |
| Permiss. operating pressure | 210 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 33 Nm |
| Switching type | N/C or N/O contacts<br>(change-over contacts) |
| Max. switching voltage | 24 V |
| Electrical connection | plug connection PG 11<br>socket to DIN 43650 |
| Max. switching output<br>at resistive load | 60 W =<br>100 VA ~ |
| Switching capacity | ohmic 3 A at 24 V = |
| Protection class<br>to DIN 40050 | IP 65 (only if the plug is wired and fitted<br>correctly) |
| Order example | VM 5 D.0 /-LED |

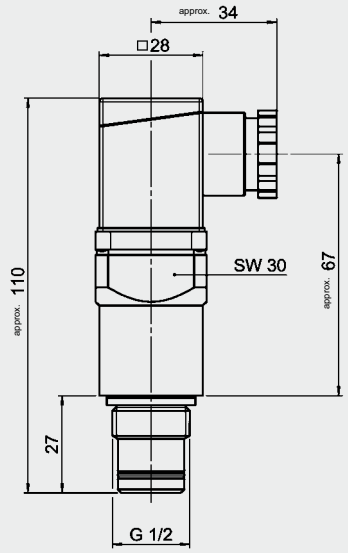


## VD x D.x /-LED



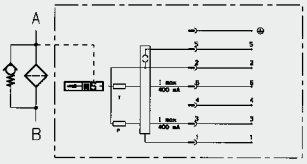



| | |
|---|---|
| Type of indication | visual<br>and electrical switch |
| Weight | 250 g |
| Pressure setting /<br>indication range | 5 bar - 10%<br>8 bar ± 10% |
| Permiss. operating pressure | 420 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 100 Nm |
| Switching type | N/C or N/O contacts<br>(change-over contacts) |
| Max. switching voltage | 24 V |
| Electrical connection | plug connection PG 11<br>socket to DIN 43650 |
| Max. switching output<br>at resistive load | 60 W =<br>100 VA ~ |
| Switching capacity | ohmic 3 A at 24 V = |
| Protection class<br>to DIN 40050 | IP 65 (only if the plug is wired and fitted correctly) |
| Order example | VD 5 D.0 /-LED |

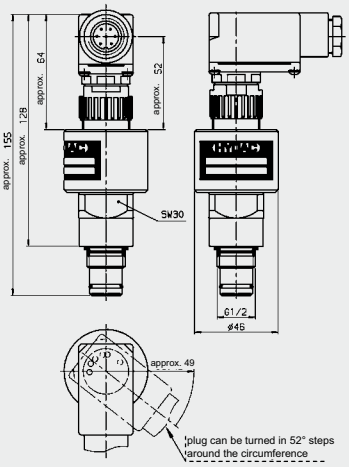



## VD x GC.x



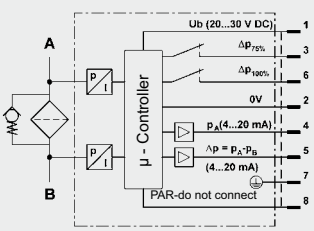



| | |
|---|---|
| Type of indication | electronic/analogue<br>(4-20 mA or 1-10 V)<br>1 electrical switching contact at 75% and at 100% of the pressure setting<br>Analogue signal up to 20% of the pressure setting constant at 4 mA or 1 V |
| Weight | 400 g |
| Pressure setting /<br><br>indication range | 2 bar - 10%<br>5 bar - 10%<br>8 bar - 10% |
| Permiss. operating pressure | 420 bar |
| Permiss. temperature range | -30 °C to +80 °C |
| Threaded connection | G ½ |
| Max. torque | 100 Nm |
| Switching type | N/C or N/O contacts electronic<br>PNP positive switching (factory setting) |
| Max. switching voltage | operating voltage 20 - 30 V DC |
| Electrical connection | 7 pole plug connector to DIN 43651 |
| Max. switching output<br>at resistive load | 12 W |
| Switching capacity | ohmic 0.4 A at 30 V = |
| Protection class<br>to DIN 40050 | IP 65 (only if the plug is wired and fitted correctly) |
| Order example | VD 5 GC.0 /-LED-SQ-123 |

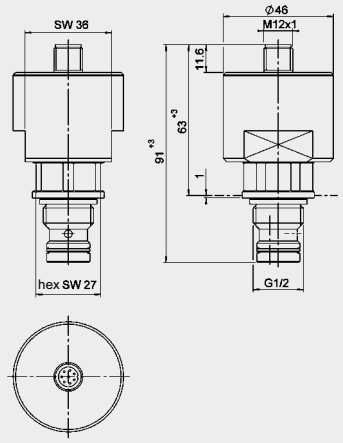



## VL x GW.x



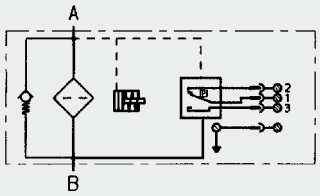



| | | | |
|---|---|---|---|
| Type of indication | electronic/analogue (4-20 mA) for condition monitoring filters incl. bypass monitoring. 1 switching contact at 75% and at 100% of the pressure setting | | |
| Weight | 157 g | | |
| Pressure setting p<br>(switching contact 100%) | 2 bar ± 5% | 3 bar ± 5% | 5 bar ± 5% |
| Indication range Δp | 0 - 5 bar | 0 - 5 bar | 0 - 8 bar |
| Indication range<br>"pressure before filter" | 25 bar | | |
| Type of switching<br>switching outputs Δp | electronic switch, PNP positive switching<br>N/O or N/C contacts (factory setting) | | |
| Output load | 400 mA | | |
| Max. switching voltage /<br>operating voltage | 20...30V DC | | |
| Analogue outputs<br>"pressure before filter" and Δp | 4...20 mA (max. 600Ω) | | |
| Electrical connection | M12 x 1 / 8 pole | | |
| Protection class<br>to DIN 40050 | IP 65 | | |
| Permiss. operating pressure | 25 bar | | |
| Permiss. temperature range | -40 °C to +85 °C | | |
| Connection thread | G ½ | | |
| Max. torque | 33 Nm | | |
| Order example | VL 5 GW.0 /-V-123 | | |

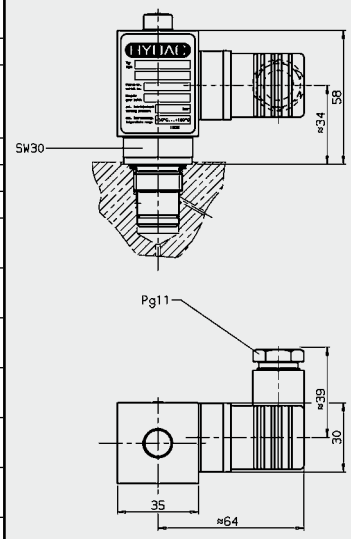


## VD x LE.x

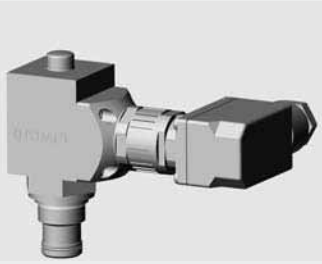


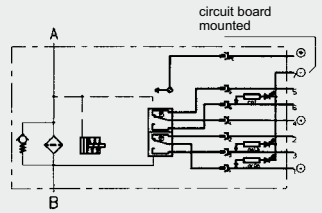



| | |
|---|---|
| Type of indication | visual, red pin<br>and electrical switch<br>1 switching contact at 100% of the pressure setting |
| Weight | 198 g |
| Pressure setting / indication range | 2 bar - 10%<br>5 bar - 10%<br>8 bar - 10% |
| Permiss. operating pressure | 420 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 50 Nm |
| Switching type | N/C or N/O contacts<br>Reed contacts (change-over contacts) |
| Max. switching voltage | 115 V |
| Electrical connection | plug connection PG 11<br>socket to DIN 43650 |
| Max. switching output at resistive load | 15 W =<br>max. 15 VA ~ |
| Switching capacity | ohmic 1 A at 15 V =<br>ohmic 1 A at 15 V ~ |
| Protection class to DIN 40050 | IP 65 (only if the plug is wired and fitted correctly) |
| Order example | VD 5 LE.1 |

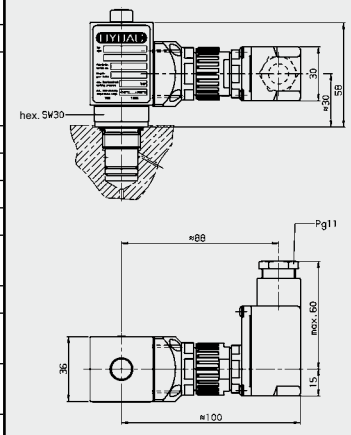



## VD x LZ.x /-DB

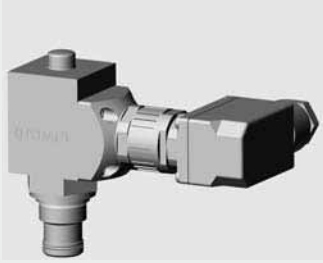


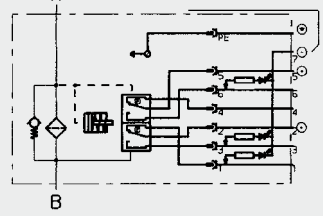



| | |
|---|---|
| Type of indication | visual, red pin<br>and 1 electrical switching contact at 75% and at 100% of the pressure setting<br>1 green LED constantly lit<br>1 yellow LED lit from 75%<br>1 red LED lit from 100% Δp |
| Weight | 245 g |
| Pressure setting / indication range | 2 bar - 10%<br>5 bar - 10%<br>8 bar - 10% |
| Permiss. operating pressure | 420 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 50 Nm |
| Switching type | N/C or N/O contacts<br>Reed contacts (change-over contacts) |
| Max. switching voltage | 24 V |
| Electrical connection | plug connection PG 11<br>socket to DIN 43651 |
| Max. switching output at resistive load | 15 W =<br>max. 15 VA ~ |
| Switching capacity | ohmic 1 A at 15 V =<br>ohmic 1 A at 15 V ~ |
| Protection class to DIN 40050 | IP 65 (only if the plug is wired and fitted correctly) |
| Order example | VD 5 LZ.1 /-DB |

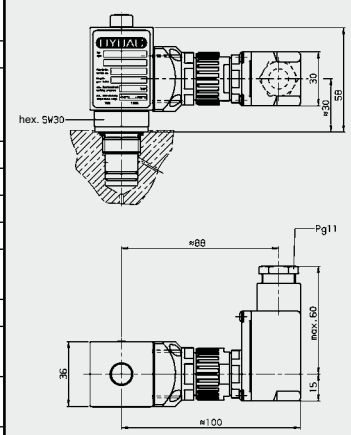



## VD x LZ.x /-CN



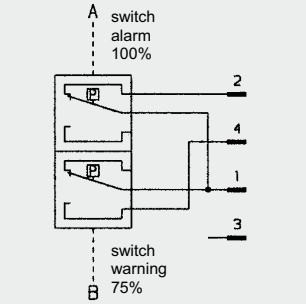



| | |
|---|---|
| Type of indication | visual, red pin<br>and 1 electrical switching contact at 75% and at 100% of the pressure setting<br>1 green LED goes out at 75%<br>1 yellow LED lit from 75%<br>1 red LED lit from 100% Δp |
| Weight | 245 g |
| Pressure setting / indication range | 2 bar - 10%<br>5 bar - 10%<br>8 bar - 10% |
| Permiss. operating pressure | 420 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 50 Nm |
| Switching type | N/C or N/O contacts<br>Reed contacts (change-over contacts) |
| Max. switching voltage | 24 V |
| Electrical connection | plug connection PG 11<br>socket to DIN 43651 |
| Max. switching output at resistive load | 15 W =<br>max. 15 VA ~ |
| Switching capacity | ohmic 1 A at 15 V =<br>ohmic 1 A at 15 V ~ |
| Protection class to DIN 40050 | IP 65 (only if the plug is wired and fitted correctly) |
| Order example | VD 5 LZ.1 /-CN |

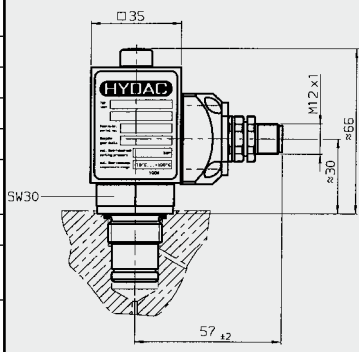


## VD x LZ.x /-BO



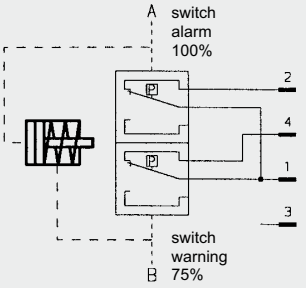



| | |
|---|---|
| Type of indication | visual, red pin<br>and 1 electrical switching contact at 75%<br>and at 100% of the pressure setting |
| Weight | 197 g |
| Pressure setting /<br>indication range | 2 bar - 10%<br>5 bar - 10%<br>8 bar - 10% |
| Permiss. operating pressure | 420 bar |
| Permiss. temperature range | -10 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 50 Nm |
| Switching type | N/O contact (75%)<br>N/C contact (100%) |
| Max. switching voltage | 24 V |
| Electrical connection | plug connection<br>M12 x 1 |
| Max. switching output<br>at resistive load | 15 W =<br>max. 15 VA ~ |
| Switching capacity | ohmic 1 A at 15 V =<br>ohmic 1 A at 15 V ~ |
| Protection class<br>to DIN 40050 | IP 65 |
| Order example | VD 5 LZ.1 /-BO |

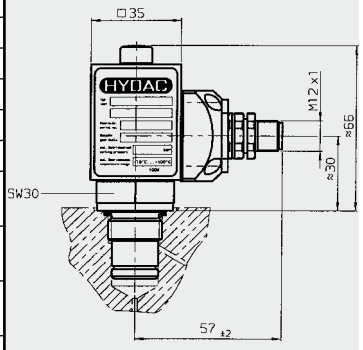



## VD x LZ.x /-AV



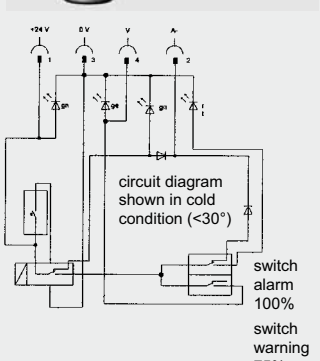



| | |
|---|---|
| Type of indication | visual, red pin<br>and 1 electrical switching contact at 75%<br>and at 100% of the pressure setting |
| Weight | 197 g |
| Pressure setting /<br>indication range | 2 bar - 10%<br>5 bar - 10%<br>8 bar - 10% |
| Permiss. operating pressure | 420 bar |
| Permiss. temperature range | -10 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 50 Nm |
| Switching type | N/C contact (75% and 100%) |
| Max. switching voltage | 24 V |
| Electrical connection | plug connection<br>M12 x 1 |
| Max. switching output<br>at resistive load | 15 W =<br>max. 15 VA ~ |
| Switching capacity | ohmic 1 A at 15 V =<br>ohmic 1 A at 15 V ~ |
| Protection class<br>to DIN 40050 | IP 65 |
| Order example | VD 5 LZ.1 /-AV |

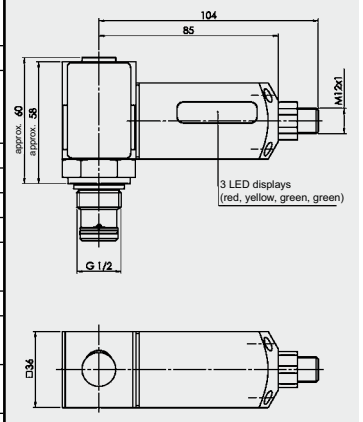



## VD x LZ.x /-D4C



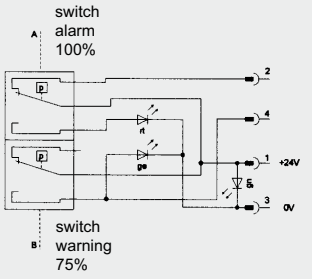



| | |
|---|---|
| Type of indication | 1 electrical switching contact at 75%<br>and at 100% of the pressure setting and<br>suppression of the switching signal when<br>operating temperature is below 30 °C<br>1 green LED constantly lit<br>1 yellow LED lit from 75%<br>1 red LED lit from 100% Δp |
| Weight | 256 g |
| Pressure setting /<br>indication range | 2 bar - 10%<br>5 bar - 10%<br>8 bar - 10% |
| Permiss. operating pressure | 420 bar |
| Permiss. temperature range | -10 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 50 Nm |
| Switching type | N/O contact (75%)<br>N/C contact (100%) |
| Max. switching voltage | 24 V |
| Electrical connection | plug connection<br>M12 x 1 |
| Max. switching output<br>at resistive load | 15 W =<br>max. 15 VA ~ |
| Switching capacity | ohmic 1 A at 15 V =<br>ohmic 1 A at 15 V ~ |
| Protection class<br>to DIN 40050 | IP 65 |
| Order example | VD 5 LZ.1 /-D4C |

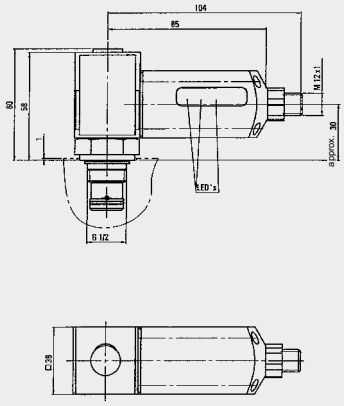


## VD x LZ.x /-BO-LED



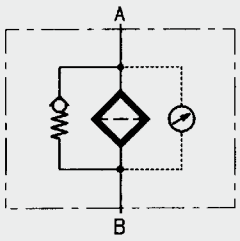



| | |
|---|---|
| Type of indication | 1 electrical switching contact at 75% and at 100% of the pressure setting<br>1 green LED constantly lit<br>1 yellow LED lit from 75%<br>1 red LED lit from 100% Δp |
| Weight | 250 g |
| Pressure setting / indication range | 2 bar - 10%<br>5 bar - 10%<br>8 bar - 10% |
| Permiss. operating pressure | 420 bar |
| Permiss. temperature range | -10 °C to +100 °C |
| Threaded connection | G ½ |
| Max. torque | 50 Nm |
| Switching type | N/O contact (75%)<br>N/C contact (100%) |
| Max. switching voltage | 24 V |
| Electrical connection | plug connection M12 x 1 |
| Max. switching output at resistive load | 15 W =<br>max. 15 VA ~ |
| Switching capacity | ohmic 1 A at 15 V =<br>ohmic 1 A at 15 V ~ |
| Protection class to DIN 40050 | IP 65 |
| Order example | VD 5 LZ.1 /-BO-LED |

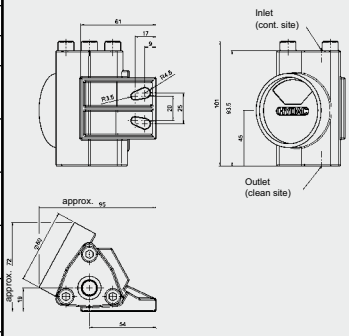


## V02 x V.x



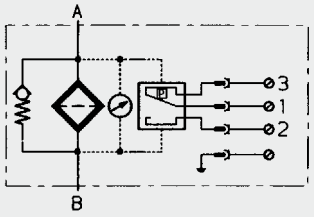



| | |
|---|---|
| Type of indication | visual/analogue |
| Weight | 580 g |
| Pressure setting / indication range | 0.8 bar ± 10%<br>2.0 bar ± 10%<br>4.3 bar ± 10% |
| Permiss. operating pressure | 160 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ¼ |
| Max. torque | – |
| Switching type | – |
| Max. switching voltage | – |
| Electrical connection | – |
| Max. switching output at resistive load | – |
| Switching capacity | – |
| Protection class to DIN 40050 | – |
| Order example | V02 2 V.0 |

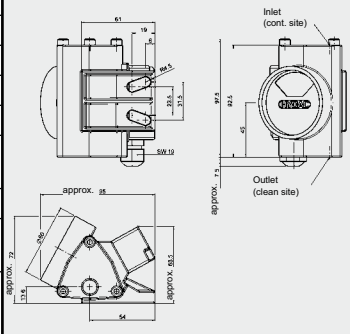



## V02 x VE.x

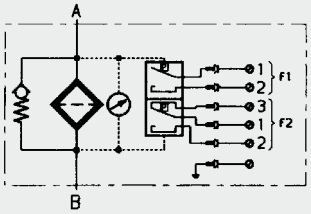




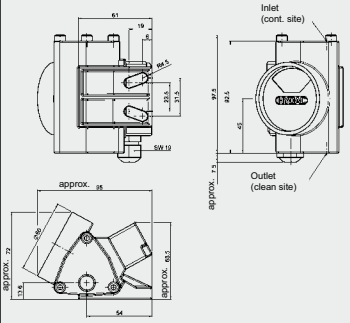

| | |
|---|---|
| Type of indication | visual/analogue<br>electrical switching contact at 100% of the pressure setting |
| Weight | 640 g |
| Pressure setting / indication range | 0.8 bar ± 10%<br>2.0 bar ± 10%<br>4.3 bar ± 10% |
| Permiss. operating pressure | 160 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ¼ |
| Max. torque | – |
| Switching type | 100% contact<br>change-over |
| Max. switching voltage | 250 V |
| Electrical connection | threaded connection<br>PG 11 |
| Max. switching output at resistive load | 100% contact<br>30 W =<br>60 VA ~ |
| Switching capacity | ohmic 2.5 A at 24 V =<br>ohmic 1 A at 220 V ~ |
| Protection class to DIN 40050 | IP 55 |
| Order example | V02 2 VE.0 |







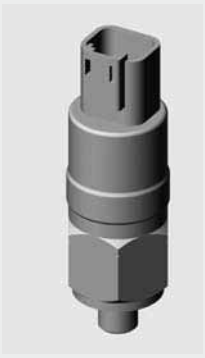

| | | |
|---|---|---|
| Type of indication | visual/analogue<br>1 electrical switching contact at 75% and 100% of the pressure setting | |
| Weight | 650 g | |
| Pressure setting / indication range | 0.8 bar ± 10%<br>2.0 bar ± 10%<br>4.3 bar ± 10% | |
| Permiss. operating pressure | 160 bar | |
| Permiss. temperature range | -30 °C to +100 °C | |
| Connection thread | G ¼ | |
| Max. torque | – | |
| Switching type | 75% - N/O contact<br>100% - N/C contact | |
| Max. switching voltage | 250 V | |
| Electrical connection | threaded connection<br>PG 11 | |
| Max. switching output at resistive load | 75% contact<br>120 W =<br>120 VA ~ | 100% contact<br>30 W =<br>60 VA ~ |
| Switching capacity | ohmic 2.5 A at 24 V =<br>ohmic 1 A at 220 V ~ | |
| Protection class to DIN 40050 | IP 55 | |
| Order example | V02 2 VZ.0 | |

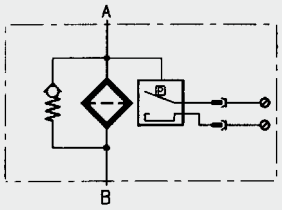


## 3.4 MOBILE INDICATORS

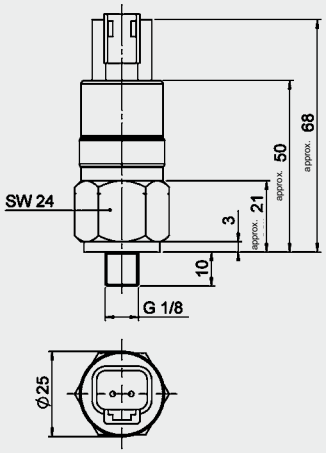
### 3.4.1 RETURN LINE

**VMF x FD.x (plug type: Deutsch DT 04-2P)**



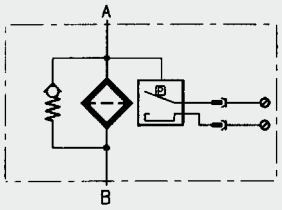



| | |
|---|---|
| Type of indication | visual/analogue, scale indication |
| Weight | 70 g |
| Pressure setting / indication range | 2 bar ± 0.4 bar |
| Permiss. operating pressure | 11 bar -continuous |
| Permiss. temperature range | -20 °C to +60 °C |
| Connection thread | G 1/8 |
| Max. torque | 30 Nm |
| Switching type | – |
| Max. switching voltage | – |
| Electrical connection | – |
| Max. switching output at resistive load | – |
| Switching capacity | – |
| Protection class to DIN 40050 | – |
| Order example | VMF 2 FD.0 /-2M0 |

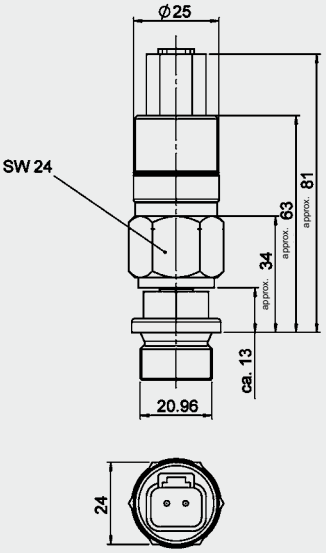



**VR x FD.x (plug type: Deutsch DT 04-2P)**





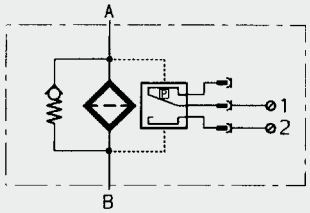

| | |
|---|---|
| Type of indication | visual/analogue, scale indication |
| Weight | 90 g |
| Pressure setting/ indication range | 2 bar ± 0.4 bar |
| Permiss. operating pressure | 11 bar continuous |
| Permiss. temperature range | -20 °C to +60 °C |
| Connection thread | G ½ |
| Max. torque | 30 Nm |
| Switching type | – |
| Max. switching voltage | – |
| Electrical connection | – |
| Max. switching output at resistive load | – |
| Switching capacity | – |
| Protection class to DIN 40050 | – |
| Order example | VR 2 FD.0 /-2M0 |



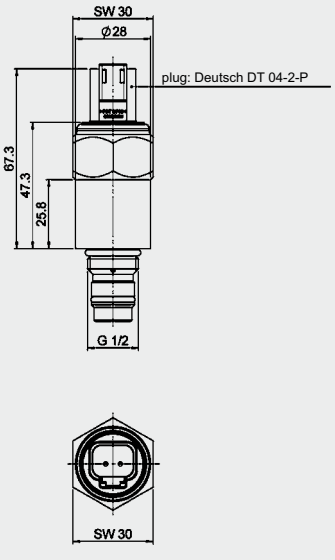

### 3.4.2 DIFFERENTIAL PRESSURE

**VM x CD.x (plug type: Deutsch DT 04-2P)**

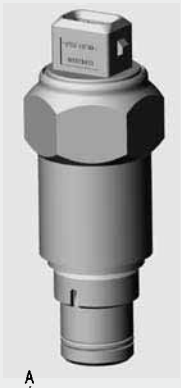


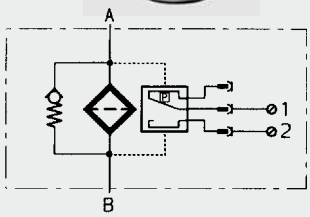



| | |
|---|---|
| Type of indication | electrical switch |
| Weight | 100 g |
| Pressure setting / indication range | 2 bar - 10%<br>5 bar - 10%<br>8 bar ± 10% |
| Permiss. operating pressure | 210 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 33 Nm |
| Switching type | N/C or N/O contact, (change-over contact) |
| Max. switching voltage | 230 V |
| Electrical connection | – |
| Max. switching output at resistive load | 60 W =<br>100 VA ~ |
| Switching capacity | ohmic 3 A at 24 V =<br>ohmic 0.03 to 5 A at max. 230 V ~ |
| Protection class to DIN 40050 | IP 65 (only if the plug is wired and fitted correctly) |
| Order example | VM 5 CD.0 /-2M0 |

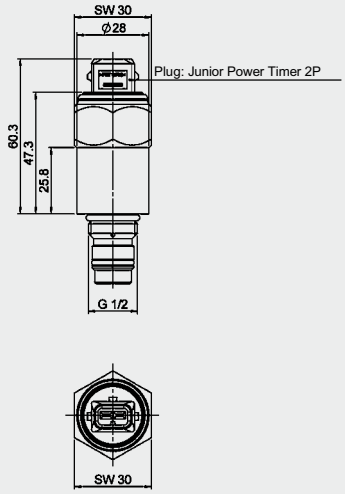


## VM x CJ.x (plug type: Junior Power Timer)



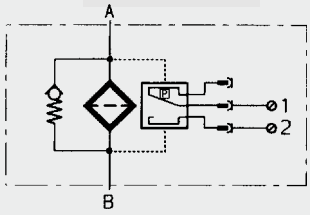



| | |
|---|---|
| Type of indication | electrical switch |
| Weight | 100 g |
| Pressure setting / indication range | 2 bar - 10%<br>5 bar - 10%<br>8 bar ± 10% |
| Permiss. operating pressure | 210 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 33 Nm |
| Switching type | N/O or N/C contacts<br>(change-over contact) |
| Max. switching voltage | 230 V |
| Electrical connection | – |
| Max. switching output at resistive load | 60 W =<br>100 VA ~ |
| Switching capacity | ohmic 3 A at 24 V =<br>ohmic 0.03 to 5 A at max. 230 V ~ |
| Protection class to DIN 40050 | IP 65 (only if the plug is wired and fitted correctly) |
| Order example | VM 5 CJ.0 /-2M0 |

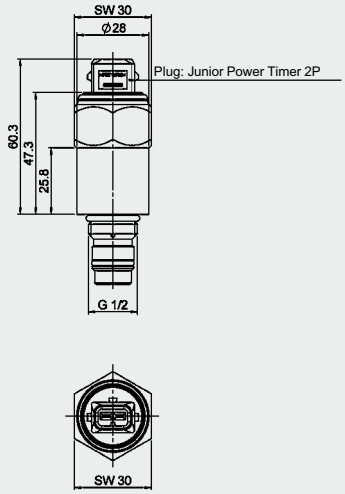



## VD x CJ.x (plug type: Junior Power Timer)






| | |
|---|---|
| Type of indication | electrical switch |
| Weight | 200 g |
| Pressure setting / indication range | 2 bar - 10%<br>5 bar - 10%<br>8 bar ± 10% |
| Permiss. operating pressure | 420 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 100 Nm |
| Switching type | N/O or N/C contacts<br>(change-over contact) |
| Max. switching voltage | 230 V |
| Electrical connection | – |
| Max. switching output at resistive load | 60 W =<br>100 VA ~ |
| Switching capacity | ohmic 3 A at 24 V =<br>ohmic 0.03 to 5 A at max. 230 V ~ |
| Protection class to DIN 40050 | IP 65 (only if the plug is wired and fitted correctly) |
| Order example | VD 5 CJ.0 /-2M0 |

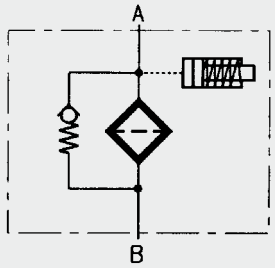


## 3.5 INDICATORS IN ACCORDANCE WITH ATEX DIRECTIVE

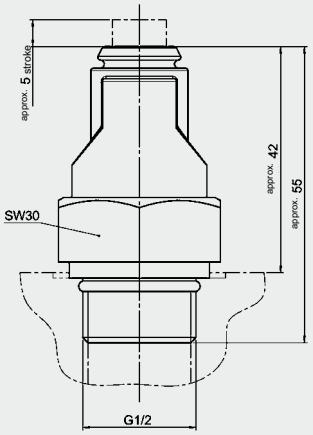
### 3.5.1 RETURN LINE

**VR x B.x (ATEX) Can be used on aluminium filters up to Zone 1**



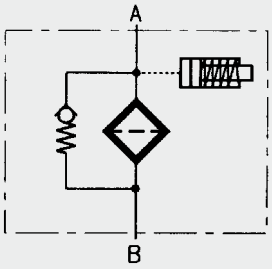



| | |
|---|---|
| Type of indication | visual, red pin |
| Weight | 44 g |
| Pressure setting / indication range | 2 bar - 0.2 bar |
| Permiss. operating pressure | 7 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 15 Nm |
| Switching type | – |
| Max. switching voltage | – |
| Electrical connection | – |
| Max. switching output at resistive load | – |
| Switching capacity | – |
| Protection class to DIN 40050 | – |
| Order example | VR 2 B.0 /-2GC |

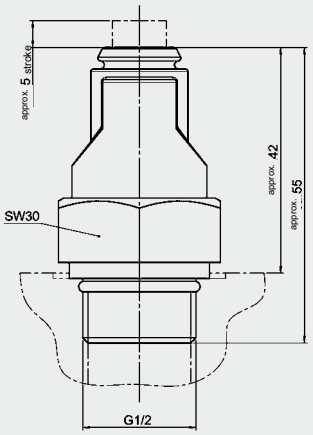



**VR x B.x (ATEX) Can be used on steel/cast iron filters up to Zone 1**

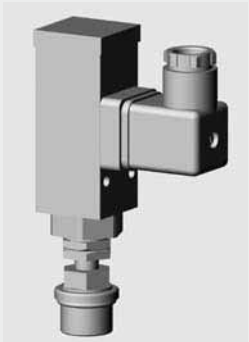


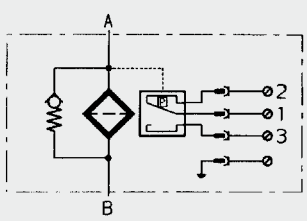



| | |
|---|---|
| Type of indication | visual, red pin |
| Weight | 44 g |
| Pressure setting / indication range | 2 bar - 0.2 bar |
| Permiss. operating pressure | 7 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 15 Nm |
| Switching type | – |
| Max. switching voltage | – |
| Electrical connection | – |
| Max. switching output at resistive load | – |
| Switching capacity | – |
| Protection class to DIN 40050 | – |
| Order example | VR 2 B.0 /-2GC-SO174 |

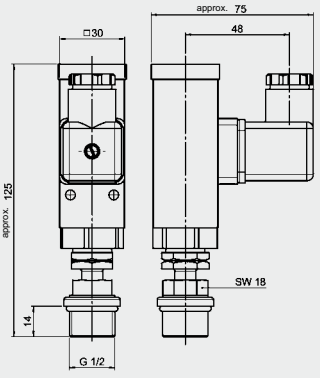



**VR x C.x (ATEX) Can be used on steel/cast iron filters up to Zone 1**





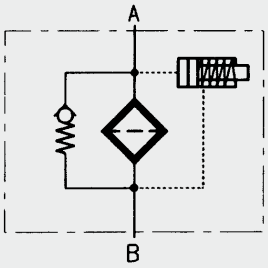

| | |
|---|---|
| Type of indication | electrical switch |
| Weight | 340 g |
| Pressure setting / indication range | 2 bar ± 0.3 bar |
| Permiss. operating pressure | 40 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 30 Nm |
| Switching type | N/C or N/O contacts, (change-over contact) |
| Max. switching voltage | 230 V |
| Electrical connection | plug connection, PG 11 socket to DIN 43650 |
| Max. switching output at resistive load | 250 W = 300 VA ~ |
| Switching capacity | ohmic 6 A bei 24 V ohmic 0.03 to 6 A at max. 230 V ~ |
| Protection class to DIN 40050 | IP 65 (only if the plug is wired and fitted correctly) |
| Order example | VR 2 C.0 /-2GBC |



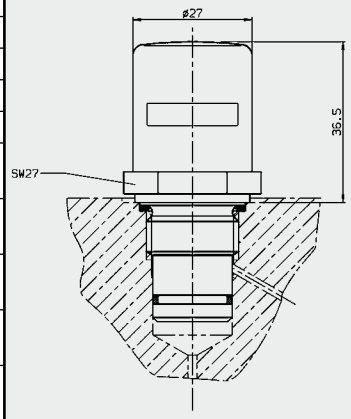
## 3.5.2 **DIFFERENTIAL PRESSURE**

### VM x B.x (ATEX) Can be used on aluminium filters up to Zone 1



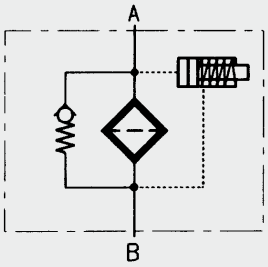



| | |
|---|---|
| Type of indication | visual, green-red zone<br>automatic reset |
| Weight | 110 g |
| Pressure setting /<br>indication range | 5 bar - 10%<br>8 bar ± 10% |
| Permiss. operating pressure | 210 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 100 Nm |
| Switching type | – |
| Max. switching voltage | – |
| Electrical connection | – |
| Max. switching output<br>at resistive load | – |
| Switching capacity | – |
| Protection class<br>to DIN 40050 | – |
| Order example | VM 5 B.0 /-2GC |

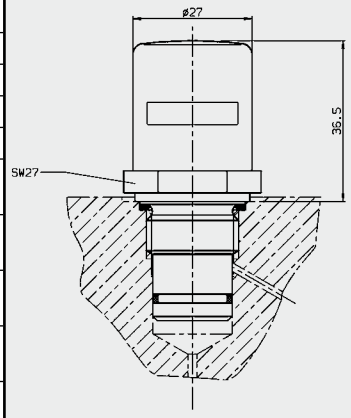



### VD x B.x (ATEX) Can be used on steel/cast iron filters up to Zone 1



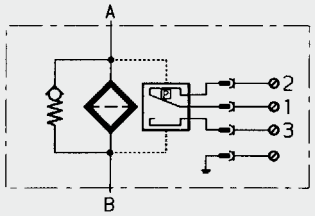



| | |
|---|---|
| Type of indication | visual, green-red zone<br>automatic reset |
| Weight | 110 g |
| Pressure setting /<br>indication range | 5 bar - 10%<br>8 bar ± 10% |
| Permiss. operating pressure | 420 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 100 Nm |
| Switching type | – |
| Max. switching voltage | – |
| Electrical connection | – |
| Max. switching output<br>at resistive load | – |
| Switching capacity | – |
| Protection class<br>to DIN 40050 | – |
| Order example | VD 5 B.0 /-2GC |

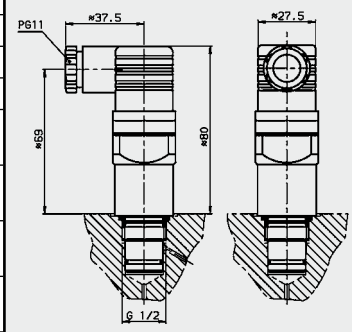



### VM x C.x (ATEX) Can be used on aluminium filters up to Zone 1



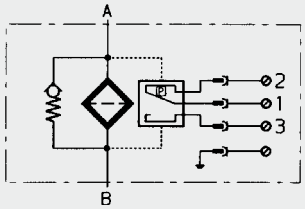



| | |
|---|---|
| Type of indication | electrical switch |
| Weight | 120 g |
| Pressure setting /<br>indication range | 2 bar - 10%<br>5 bar - 10%<br>8 bar ± 10% |
| Permiss. operating pressure | 210 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 100 Nm |
| Switching type | N/C or N/O contacts<br>(change-over contacts) |
| Max. switching voltage | 230 V |
| Electrical connection | plug connection PG 11<br>socket to DIN 43650 |
| Max. switching output<br>at resistive load | 60 W =<br>100 VA ~ |
| Switching capacity | ohmic 3 A at 24 V =<br>ohmic 0.03 to 5 A at max. 230 V ~ |
| Protection class<br>to DIN 40050 | IP 65 (only if the plug is wired and fitted<br>correctly) |
| Order example | VM 5 C.0 /-2GBC-SO135 |

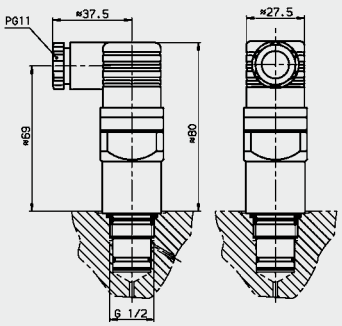


**VD x C.x (ATEX) Can be used on steel/cast iron filters up to Zone 1**






| | |
|---|---|
| Type of indication | electrical switch |
| Weight | 120 g |
| Pressure setting / indication range | 2 bar - 10%<br>5 bar - 10%<br>8 bar ± 10% |
| Permiss. operating pressure | 420 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 100 Nm |
| Switching type | N/C or N/O contacts,<br>(change-over contact) |
| Max. switching voltage | 230 V |
| Electrical connection | plug connection PG 11<br>socket to DIN 43650 |
| Max. switching output at resistive load | 60 W =<br>100 VA ~ |
| Switching capacity | ohmic 3 A at 24 V =<br>ohmic 0.03 to 5 A at max. 230 V ~ |
| Protection class to DIN 40050 | IP 65 (only if the plug is wired and fitted correctly) |
| Order example | VD 5 C.0 /-2GBC-SO135 |

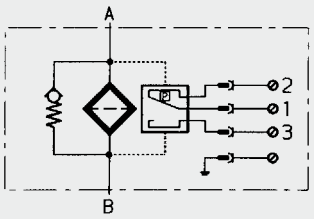


## 3.6 INDICATORS WITH UL APPROVAL

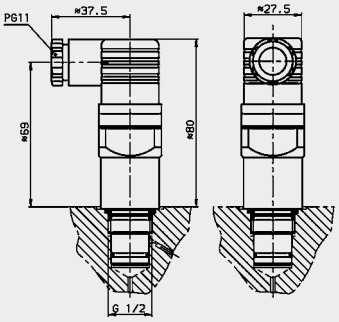
### 3.6.1 DIFFERENTIAL PRESSURE

**VM x C.x (UL)**



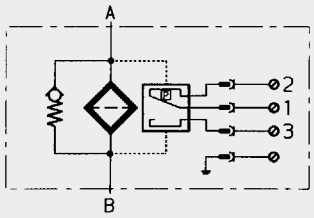



| | |
|---|---|
| Type of indication | electrical switch |
| Weight | 120 g |
| Pressure setting / indication range | 2 bar - 10%<br>5 bar - 10%<br>8 bar ± 10% |
| Permiss. operating pressure | 210 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 33 Nm |
| Switching type | N/C or N/O contacts, (change-over contact) |
| Max. switching voltage | 230 V |
| Electrical connection | plug connection PG 11<br>socket to DIN 43650 |
| Max. switching output at resistive load | 60 W =<br>100 VA ~ |
| Switching capacity | ohmic 3 A at 24 V =<br>ohmic 0.03 to 5 A at max. 230 V ~ |
| Protection class to DIN 40050 | IP 65 (only if the plug is wired and fitted correctly) |
| Order example | VM 5 C.0 /-CRUUS |

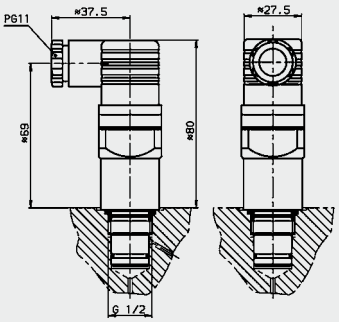



**VD x C.x (UL)**



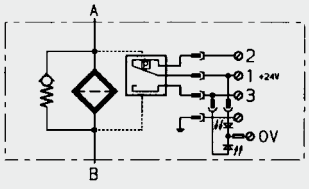



| | |
|---|---|
| Type of indication | electrical switch |
| Weight | 120 g |
| Pressure setting / indication range | 2 bar - 10%<br>5 bar - 10%<br>8 bar ± 10% |
| Permiss. operating pressure | 420 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 100 Nm |
| Switching type | N/C or N/O contacts, (change-over contact) |
| Max. switching voltage | 230 V |
| Electrical connection | plug connection PG 11<br>socket to DIN 43650 |
| Max. switching output at resistive load | 60 W =<br>100 VA ~ |
| Switching capacity | ohmic 3 A at 24 V =<br>ohmic 0.03 to 5 A at max. 230 V ~ |
| Protection class to DIN 40050 | IP 65 (only if the plug is wired and fitted correctly) |
| Order example | VD 5 C.0 /-CRUUS |

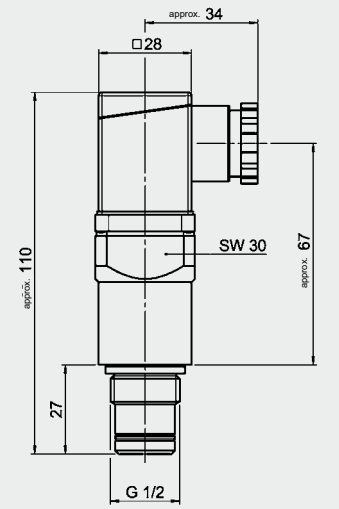



**VM x D.x /-L... (UL)**



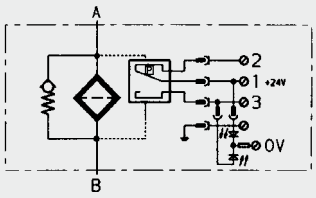



| | |
|---|---|
| Type of indication | visual and electrical switch |
| Weight | 150 g |
| Pressure setting / indication range | 2 bar - 10%<br>5 bar - 10%<br>8 bar ± 10% |
| Permiss. operating pressure | 210 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 33 Nm |
| Switching type | N/C or N/O contacts, (change-over contact) |
| Max. switching voltage | 24, 48, 110, 230 V<br>depending on the type of light insert |
| Electrical connection | plug connection PG 11<br>socket to DIN 43650 |
| Max. switching output at resistive load | 60 W =<br>100 VA ~ |
| Switching capacity | ohmic 3 A at 24 V =<br>ohmic 0.03 to 5 A at max. 230 V ~ |
| Protection class to DIN 40050 | IP 65 (only if the plug is wired and fitted correctly) |
| Order example | VM 5 D.0 /-L24-CRUUS |

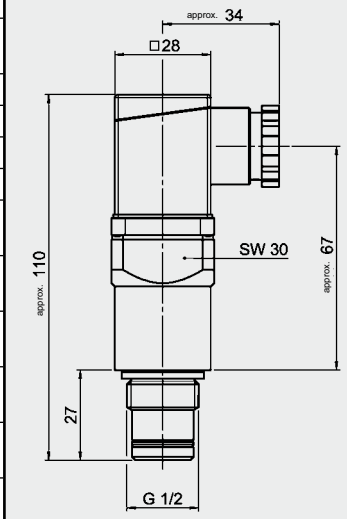


## VD x D.x /-L... (UL)



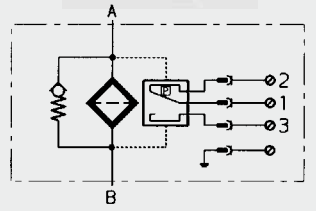



| | |
|---|---|
| Type of indication | visual and electrical switch |
| Weight | 250 g |
| Pressure setting / indication range | 5 bar - 10%<br>8 bar ± 10% |
| Permiss. operating pressure | 420 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 100 Nm |
| Switching type | N/C or N/O contacts, (change-over contact) |
| Max. switching voltage | 24, 48, 110, 230 V<br>depending on the type of light insert |
| Electrical connection | plug connection PG 11<br>socket to DIN 43650 |
| Max. switching output at resistive load | 60 W =<br>100 VA ~ |
| Switching capacity | ohmic 3 A at 24 V =<br>ohmic 0.03 to 5 A at max. 230 V ~ |
| Protection class to DIN 40050 | IP 65 (only if the plug is wired and fitted correctly) |
| Order example | VD 5 D.0 /-L24-CRUUS |

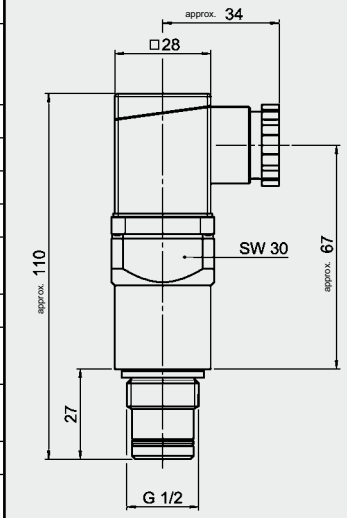



## VM x D.x /-LED (UL)



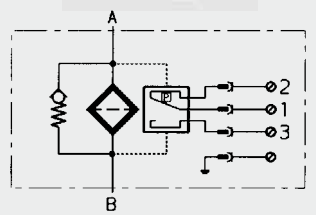



| | |
|---|---|
| Type of indication | visual and electrical switch |
| Weight | 150 g |
| Pressure setting / indication range | 2 bar - 10%<br>5 bar - 10%<br>8 bar ± 10% |
| Permiss. operating pressure | 210 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 33 Nm |
| Switching type | N/C or N/O contacts, (change-over contact) |
| Max. switching voltage | 24 V |
| Electrical connection | plug connection PG 11<br>socket to DIN 43650 |
| Max. switching output at resistive load | 60 W =<br>100 VA ~ |
| Switching capacity | ohmic 3 A at 24 V = |
| Protection class to DIN 40050 | IP 65 (only if the plug is wired and fitted correctly) |
| Order example | VM 5 D.0 /-LED-CRUUS |

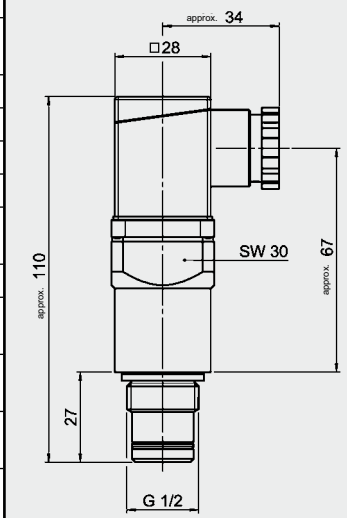



## VD x D.x /-LED (UL)






| | |
|---|---|
| Type of indication | visual and electrical switch |
| Weight | 250 g |
| Pressure setting / indication range | 5 bar - 10%<br>8 bar ± 10% |
| Permiss. operating pressure | 420 bar |
| Permiss. temperature range | -30 °C to +100 °C |
| Connection thread | G ½ |
| Max. torque | 100 Nm |
| Switching type | N/C or N/O contacts, (change-over contact) |
| Max. switching voltage | 24 V |
| Electrical connection | plug connection PG 11<br>socket to DIN 43650 |
| Max. switching output at resistive load | 60 W =<br>100 VA ~ |
| Switching capacity | ohmic 3 A at 24 V = |
| Protection class to DIN 40050 | IP 65 (only if the plug is wired and fitted correctly) |
| Order example | VD 5 D.0 /-LED-CRUUS |



# 4. MODEL CODE

VR 2 D . X /-V-L24

## 4.1 STANDARD CLOGGING INDICATORS

**Type of clogging indicator**

VMF return line indicator; connection G 1/8
VR return line indicator; connection G ½
VRD return line indicator; for differential pressure cavity
VM differential pressure indicator; up to 210 bar operating pressure
VD differential pressure indicator; up to 420 bar operating pressure
VL differential pressure indicator; up to 25 bar operating pressure
V02 differential pressure indicator; piped separately; up to 160 bar operating pressure

**Pressure setting**

see particular clogging indicator

**Type**

B visual with automatic reset
BM visual with manual reset
C electrical
CA electrical with AMP plug (Mark II)
CD electrical with Deutsch plug (DT 04-2P)
CJ electrical with Junior Power Timer
D visual/electrical
E pressure gauge, horizontal
ES pressure gauge, vertical
F pressure switch
FD pressure switch with Deutsch plug (DT 04-2P)
GC electronic
GW electronic
H pressure switch
K pressure gauge, horizontal, for breather filters
LE visual/mechanical indicator with 100% switching contact
LZ visual/mechanical indicator with 75% and 100% switching contact
R pressure gauge, horizontal
UBM visual, vacuum
UE vacuum pressure gauge, horizontal
UF vacuum switch
V visual/analogue
VE visual/analogue with 100% switching contact
VZ visual/analogue with 75% and 100% switching contact

**Modification number**

X the latest version is always supplied

**Supplementary details**

30C cold start suppression of switching outputs up to 30 °C ±5 °C
(only for C, D, LZ indicators; DC voltage supply only; on D indicators, contacts must be wired N/O only)
EX Ex version for return line indicators, type "C"
L... light with corresponding voltage (24, 48, 110, 230 Volt) ] only for
LED 2 light emitting diodes up to 24 Volt ] type "D"
SO135 indicator suitable for PLC controls due to Gold Crosspoint contacts
W suitable for oil-water emulsions (HFA, HFC)
V seal in Viton (FPM), suitable for phosphate esters (HFD-R) and biodegradable oils
**(must be specified for type "GW")**

**Supplementary details for "GC" type**

113 N/O function — pressure peak suppression up to 10 sec.; cold start suppression of switching outputs (PNP technique, positive switching) up to 25 °C
123 N/C function — pressure peak suppression up to 10 sec.; cold start suppression of switching outputs (PNP technique, positive switching) up to 25 °C

**must be specified!** others on request

30C cold start suppression of switching outputs up to 30 °C (other temperatures on request)
LED 3 LEDs (green, yellow, red) in terminal box
PF floating switching outputs (due to relay in the plug)
SP analogue signal: voltage output 1-10 V
SQ analogue signal: voltage output 4...20 mA (current source)

if SP or SQ not specified "current sink" model supplied

**Supplementary details for "GW" type**

113 N/O function — pressure peak suppression up to 10 sec.; cold start suppression of switching outputs (PNP technique, positive switching) up to 25 °C
123 N/C function — pressure peak suppression up to 10 sec.; cold start suppression of switching outputs (PNP technique, positive switching) up to 25 °C

**must be specified!** others on request

**Supplementary details for "LZ" type**
AV plug and connector to AUDI, VW specification
BO plug and connector to BMW, Opel, Ford specification
BO-LED as for BO, but with progressive LED strip
CN electrical connection, 1 connector to DIN 43651 with 3 LEDs (to CNOMO specification NF E 48-700)
DB electrical connection, 1 connector to DIN 43651 with 3 LEDs (to Daimler-Benz and BMW specification)
D4C plug and connector to Daimler-Chrysler specification with cold start suppression 30 °C

**Supplementary details for "ATEX" type**
2GC for visual indicator type "B" with ATEX certificate
2GBC for electrical indicator type "C" with ATEX certificate (the switch used in the indicator is a passive component according to EN 50020 and can therefore be used in intrinsically safe circuits as simple apparatus in accordance with EN 60079-14)

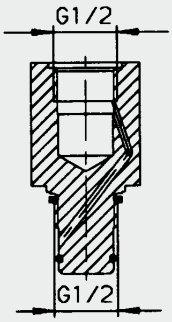
**Supplementary details for "UL" approval**
CRUUS for electrical indicator type "C" or visual/electrical indicator type "D" with UL approval

# 5. ADAPTORS

## 5.1 TYPES

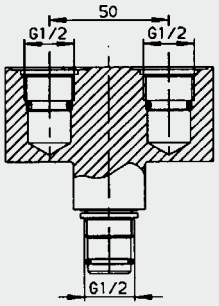


| | |
|---|---|
| Designation | ADAPTOR VD-D-S.0 |
| Material-Nr. | 00318736 |
| Explanation | Extending adaptor for differential pressure cavity according to HYDAC works standard HN 28-22.<br><br>On the manifold mounted, rear flanged filters DF...M A, DF...MHA, DF...MHE and DF...Q E this adaptor must used! |



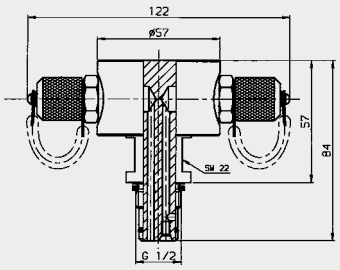


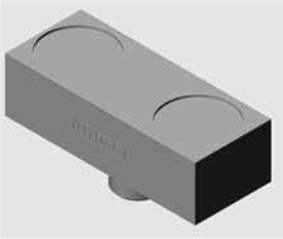

| | |
|---|---|
| Designation | ADAPTOR VD-D+D-S+S.0 |
| Part no. | 00318732 |
| Explanation | Y-adaptor to convert 1 differential pressure cavity into 2 differential pressure cavities according to HYDAC works standard HN 28-22.<br><br>Swivel-type on request! |



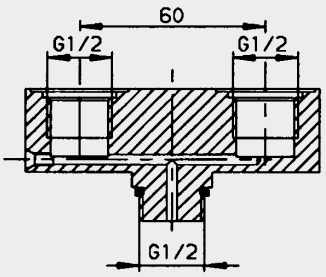



| | |
|---|---|
| Designation | ADAPTOR VD-1/4+1/4-W+W.0 /-00404337 |
| Part no. | 00404337 |
| Explanation | Test adaptor for differential pressure cavity according to HYDAC works standard HN 28-22.<br>To test the pressure before and after the filter element.<br><br>Also available without Minimess couplings (on request)! |



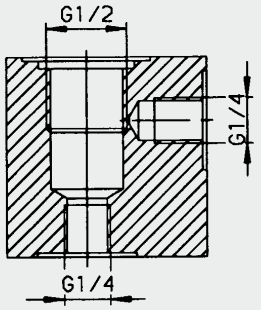



| | |
|---|---|
| Designation | ADAPTOR VR-R+R-S+S.0 |
| Part no. | 00318741 |
| Explanation | Y-adaptor to convert 1 return line cavity into 2 return line cavities (G ½ )<br><br>Swivel-type on request! |



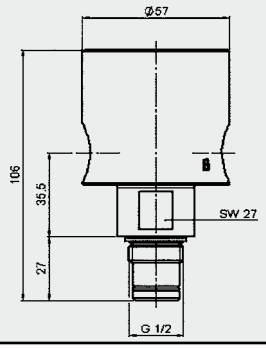


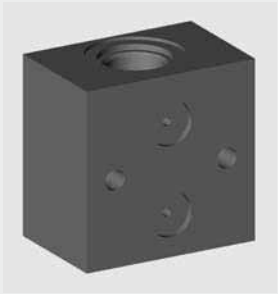

| | |
|---|---|
| Designation | ADAPTOR V ¼ I-D-S.0 |
| Part no. | 00318730 |
| Explanation | Connection adaptor for piping clogging indicators separately with differential pressure cavity according to HYDAC works standard HN 28-22.<br><br>Two connections G ¼, one before and one after the filter element |



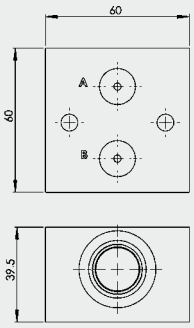


| | |
|---|---|
| Designation | ADAPTOR VD-D+1/4+1/4-S+W+W.0 |
| Part no. | 00318744 |
| Explanation | Extending adaptor for differential pressure cavity according to HYDAC works standard HN 28-22.<br>Also two connections, one before and one after the filter element. |



| | |
|---|---|
| Designation | ADAPTOR VF-D-S.0 /-RT |
| Part no. | on request |
| Explanation | only for the following filters:<br>LFR, LPFR, MDFR, RFLR, RFMR, RKMR, SFFR |




## 5.2 MODEL CODE (= EXAMPLE)

**ADAPTOR VD-D+1/4+1/4-S+W+W.X /-ESB**

**Connection**
- VD differential pressure indicator; connection G ½
- VR return line indicator; connection G ½
- V¼I differential pressure indicator; connection G ¼ internal
- VF differential pressure indicator; flange type

**Ports (several ports are possible!)** (cavity 1 / port 2 / port 3)
- D differential pressure cavity G ½
- R return line cavity G ½
- MF cavity for pressure gauge and pressure switch
- 1/4 cavity G ¼ for Minimess test points (M16 x 1,5)
- 1/8 cavity G 1/8 for Minimess test points (plug-in connection)

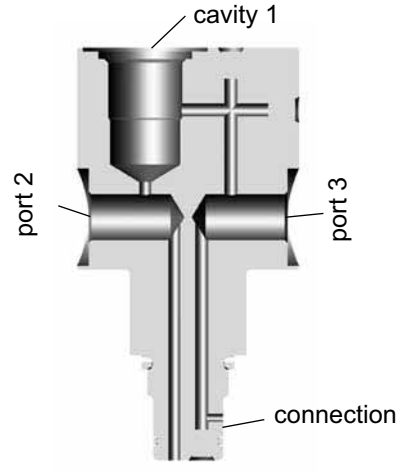
(cavity 1 / port 2 / port 3)

**Orientation of the ports**
- S vertical
- W horizontal

**Type code**
- X the latest version is always supplied

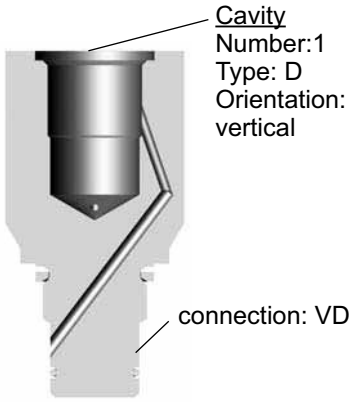
**Supplementary details**
- ESB swivel type
- V seal in Viton (FPM), suitable for phosphate ester (HFD-R) and biodegradable oils

VD-D+1/4+1/4-S+W+W.0

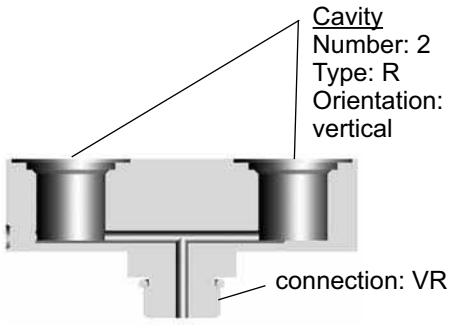



## 5.3 OTHER EXAMPLES

VD-D-S.0



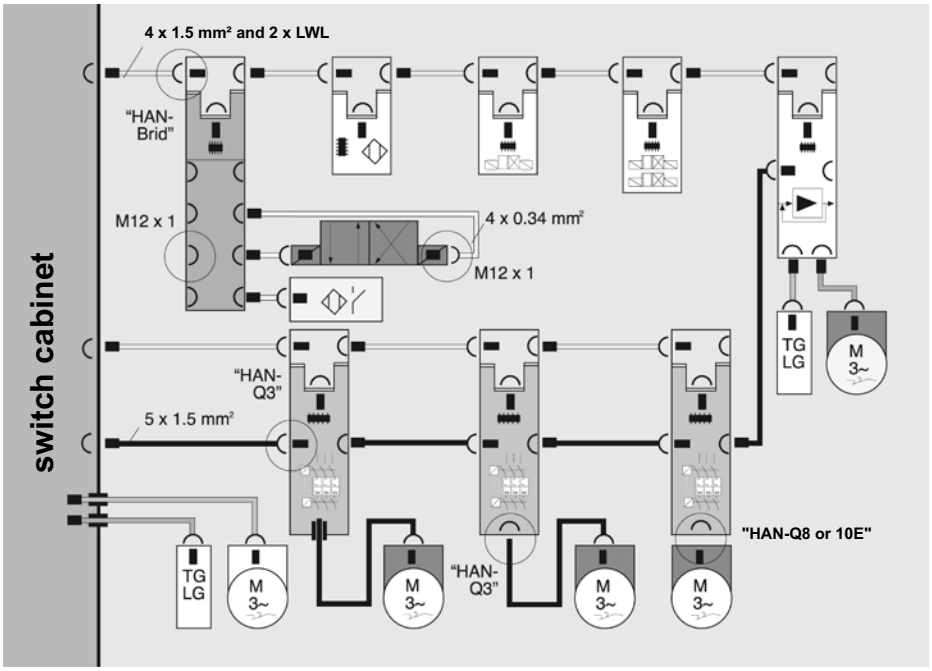

VR-R+R-S+S.0



# 6. DESINA SPECIFICATION

DESINA is a fully comprehensive system intended to bring standardisation and decentralisation to the field of fluid technology and to electrical installation of machinery and systems. The system engineering, automotive and supply industries have worked together to draw up specifications of the necessary components. DESINA makes use of tried-and-tested solutions, such as open bus systems, standard industrial plugs etc.
By standardising components, interfaces and connection systems, such as a hybrid field bus cable (Cu/LWL), a wide range of different field bus systems can be made compatible on a single physical base.

## 6.1. TOTAL CONCEPT FOR MACHINE TOOL INSTALLATION




## 6.2. CLOGGING INDICATORS

The following clogging indicators are approved to DESINA specification:

VD 5 LZ.1 /-D4C
VR 2.5 LZ. 1 /-D4C
VD 5 LZ.1 /-BO
VR 2.5 LZ. 1 /-BO
VD 5 LZ. 1 /-AV
VR 2.5 LZ. 1 /-AV
VR 2.5 LZ. 0 /-GM

all with M 12 x 1 connector!

DESINA

The DESINA logo is shown on the type code label of approved clogging indicators.

## NOTE

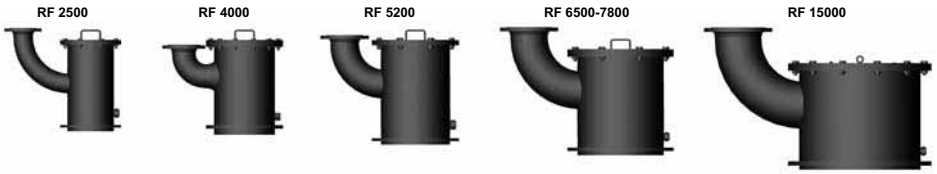
The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.


HYDAC **Filtertechnik GmbH**
Industriegebiet
**D-66280 Sulzbach/Saar**
Tel.: 0 68 97 / 509-01
Fax: 0 68 97 / 509-300
Internet: www.hydac.com
E-Mail: filter@hydac.com



# Return Line Filter RF
## up to 15000 l/min, up to 25 bar




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. They consist of a filter housing with a screw-on cover plate.

Standard equipment:

- with bypass valve
- connection for a clogging indicator

### 1.2 FILTER ELEMENTS

Hydac filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

**Contamination retention capacities in g**

| | | Betamicron® (BN4HC) | | | |
|---|---|---|---|---|---|
| RF | Elements | 3 µm | 5 µm | 10 µm | 20 µm |
| 30 | 1x0030R | 2.6 | 2.9 | 3.5 | 4.0 |
| 60 | 1x0060R | 5.7 | 6.3 | 7.6 | 8.6 |
| 110 | 1x0110R | 12.0 | 13.3 | 16.0 | 18.1 |
| 160 | 1x0160R | 18.6 | 20.7 | 24.9 | 28.1 |
| 240 | 1x0240R | 29.3 | 32.5 | 39.1 | 44.2 |
| 330 | 1x0330R | 38.4 | 42.6 | 51.2 | 57.9 |
| 660 | 1x0660R | 87.1 | 96.5 | 116.1 | 131.3 |
| 950 | 1x0950R | 130.0 | 144.1 | 173.3 | 196.1 |
| 1300 | 1x1300R | 181.0 | 200.7 | 241.4 | 273.1 |
| 2500 | 3x0850R | 336.3 | 372.6 | 448.5 | 507.3 |
| 4000 | 5x0850R | 560.5 | 621.0 | 747.5 | 845.5 |
| 5200 | 4x1300R | 724.0 | 802.8 | 965.6 | 1092.4 |
| 6500 | 5x1300R | 905.0 | 1003.5 | 1207.0 | 1365.5 |
| 7800 | 6x1300R | 1086.0 | 1204.2 | 1448.4 | 1638.6 |
| 15000 | 10x1300R | 1810.0 | 2007.0 | 2414.0 | 2731.0 |

Filter elements are available with the following pressure stability values:

| | |
|---|---|
| Betamicron® (BN4HC): | 20 bar |
| Paper (P/HC): | 10 bar |
| Wire mesh (W/HC): | 20 bar |
| Stainless steel fibre (V): | 210 bar |
| Betamicron®/Aquamicron® (BN4AM): | 10 bar |
| Aquamicron® (AM): | 10 bar |

### 1.3 FILTER SPECIFICATIONS

| | | |
|---|---|---|
| Nominal pressure | RF 30, 2500 to 15000:<br>RF 60 to 1300: | 10 bar<br>25 bar |
| Temperature range | -10 °C to +100 °C | |
| Material of filter housing and cover plate | RF 30:<br>RF 60 to 330:<br>RF 660 to 1300:<br>RF 2500 to 15000: | PA 66<br>Aluminium<br>EN-GJS-400-15<br>Welded steel |
| Type of clogging indicator | VR connection thread G ½<br>(return line indicator up to 25 bar operating pressure) | |
| Pressure setting of clogging indicator | 2 bar (others on request) | |
| Bypass cracking pressure | 3 bar (others on request) | |

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 MOUNTING

As tank-top or inline filter

### 1.6 SPECIAL MODELS AND ACCESSORIES

On request

### 1.7 SPARE PARTS

See Original Spare Parts List

### 1.8 CERTIFICATES AND APPROVALS

On request

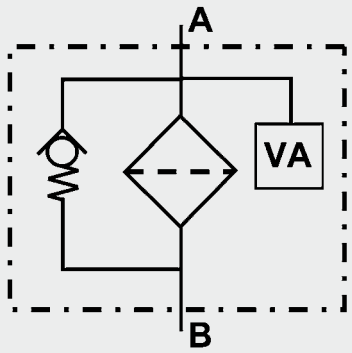
### 1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Non-flam operating fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

### 1.10 IMPORTANT INFORMATION

- Filter housing must be earthed
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector

**Symbol for hydraulic systems**




VA = clogging indicator

## 2. MODEL CODE (ALSO ORDER EXAMPLE)

**RF BN/HC 330 D L 10 D 1 . X /-L24**

### 2.1 COMPLETE FILTER

**Filter type**
RF

**Filter material of element**

| | | | | | |
|---|---|---|---|---|---|
| BN/HC | Betamicron® (BN4HC) | P/HC | Paper | AM | Aquamicron® |
| V | Stainless steel fibre | W/HC | Stainless steel wire mesh | BN/AM | Betamicron®/Aquamicron® |

**Size of filter or element**
RF: 30, 60, 110, 160, 240, 330, 660, 950, 1300, 2500, 4000, 5200, 6500, 7800, 15000

**Operating pressure**
B = 10 bar (RF 30, 2500 to 15000)
D = 25 bar (RF 60 to 1300)

**Type and size of port**

| Type | Port | Filter size | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 30 | 60 | 110 | 160 | 240 | 330 | 660 | 950 | 1300 | 2500 | 4000 | 5200 | 6500 | 7800 | 15000 |
| B | G ½ | ● | | | | | | | | | | | | | | |
| C | G ¾ | | ● | ● | | | | | | | | | | | | |
| E | G 1¼ | | | | ● | ● | | | | | | | | | | |
| G | G 2 | | | | | | ● | | | | | | | | | |
| L | SAE DN 50 (2“) | | | | | | ● | | | | | | | | | |
| M | SAE DN 80 (3“) | | | | | | | ● | | | | | | | | |
| N* | G 3 | | | | | | | ● | | | | | | | | |
| O | SAE DN 90 (3½“) | | | | | | | | ● | | | | | | | |
| P | SAE DN 100 (4“) | | | | | | | | | ● | | | | | | |
| R | DIN DN 100 | | | | | | | | | | ● | | | | | |
| U | DIN DN 125 | | | | | | | | | | ● | ● | ● | | | |
| V | DIN DN 150 | | | | | | | | | | | ● | ● | ● | | |
| W | DIN DN 200 | | | | | | | | | | | | | ● | ● | |
| X | DIN DN 250 | | | | | | | | | | | | | | ● | ● |
| Y | DIN DN 300 | | | | | | | | | | | | | | | ● |

* This port G3 applies to filter outlet only

**Filtration rating in µm**
BN/HC, V: 3, 5, 10, 20 P/HC: 10, 20 AM: 40
W/HC: 25, 50, 100, 200 BN/AM: 3, 10

**Type of clogging indicator**
Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
] for other clogging indicators see brochure no. E 7.050../..

**Type code**
1 Standard connection
2 RF 2500 to 15000: outlet for each filter element location spigot has threaded connection for pipe extension
3 RF 2500 to 15000: common elbow outlet

**Modification number**
X the latest version is always supplied

**Supplementary details**
B. cracking pressure of bypass (e.g. B6 = 6 bar)
DE differential pressure measurement across element (RF 660, 950, 1300)
DH cover plate lifting device (only for RF 2500 to 15000)
GA mating weld connection flange in steel
KB no bypass valve
L... light with appropriate voltage (24V, 48V, 110V, 220V)
LED 2 light emitting diodes up to 24 Volt
] only for clogging indicators type D
O O-ring groove on the DIN inlet flange (only for RF 2500 to 15000)
T with tank breather filter (only RF 30)
V FPM seals

### 2.2 REPLACEMENT ELEMENT

**0330 R 010 BN4HC /-V**

**Size**
0030, 060, 0110, 0160, 0240, 0330, 0660, 0950, 1300

**Type**
R

**Filtration rating in µm**
BN4HC, V: 003, 005, 010, 020 P/HC: 010, 020 AM: 040
W/HC: 025, 050, 100, 200 BN4AM: 003, 010

**Filter material**
BN4HC, V, W/HC, P/HC, BN4AM, AM

**Supplementary details**
V (for descriptions, see point 2.1)

### 2.3 REPLACEMENT CLOGGING INDICATOR

**VR 2 D . X /-L24**

**Type**
VR return line indicator up to 25 bar operating pressure

**Pressure setting**
2 standard 2 bar, others on request

**Type of clogging indicator** (see point 2.1)

**Modification number**
X the latest version is always supplied

**Supplementary details**
L..., LED, V (for descriptions, see point 2.1)

## 3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see point 3.1)

$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see point 3.2)

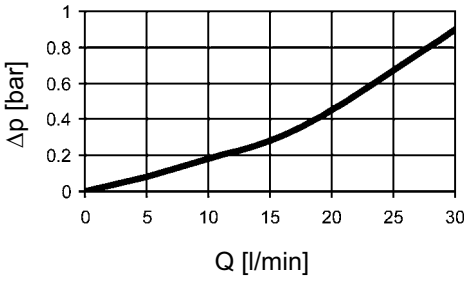
For ease of calculation, our Filter Sizing Program is available on request free of charge.

**NEW:** Sizing online at www.hydac.com

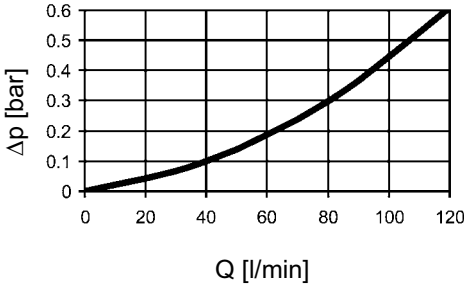
### 3.1 Δp-Q HOUSING GRAPHS BASED ON ISO 3968

The housing graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

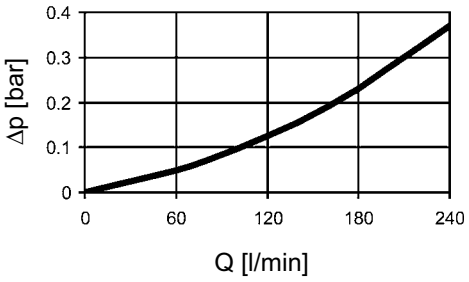
**RF 30**



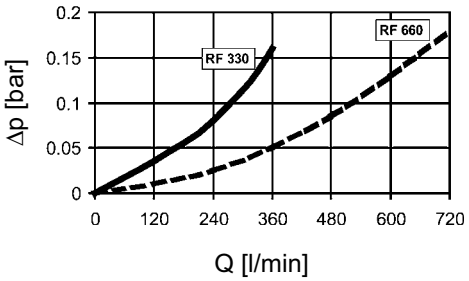

**RF 60, 110**



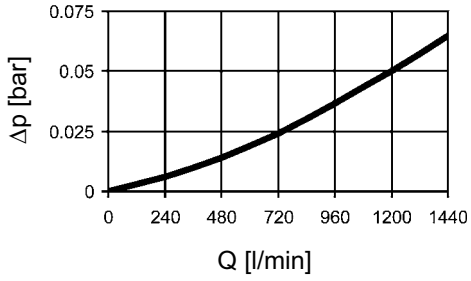

**RF 160, 240**



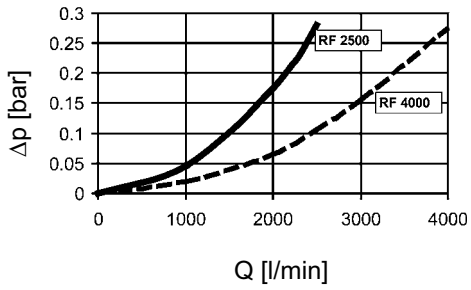

**RF 330, 660**



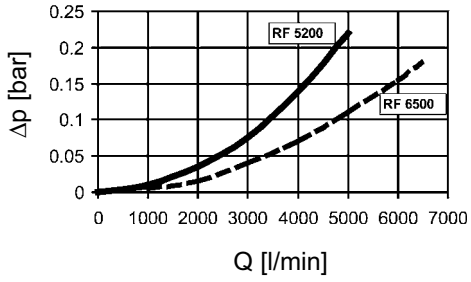

**RF 950, 1300**



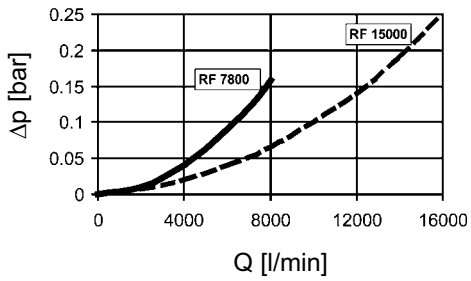

**RF 2500, 4000**




**RF 5200, 6500**




**RF 7800, 15000**

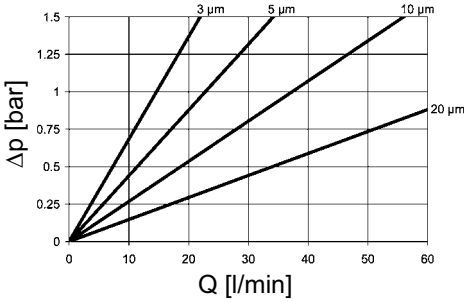


## 3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

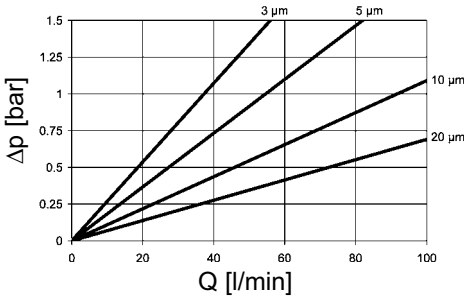
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 $mm^2/s$. The pressure drop changes proportionally to the change in viscosity.

| RF | V | | | | W/HC |
|---|---|---|---|---|---|
| | 3 µm | 5 µm | 10 µm | 20 µm | – |
| 30 | 19.4 | 14.2 | 7.9 | 3.8 | - |
| 60 | 15.9 | 9.3 | 5.4 | 3.3 | 0.900 |
| 110 | 7.6 | 5.1 | 3.0 | 2.0 | 0.495 |
| 160 | 4.9 | 3.5 | 2.4 | 1.5 | 0.338 |
| 240 | 3.2 | 2.6 | 1.7 | 1.2 | 0.225 |
| 330 | 2.1 | 1.7 | 1.1 | 0.8 | 0.162 |
| 660 | 1.0 | 0.8 | 0.6 | 0.4 | 0.081 |
| 950 | 0.7 | 0.6 | 0.4 | 0.2 | 0.054 |
| 1300 | 0.5 | 0.4 | 0.3 | 0.2 | 0.045 |

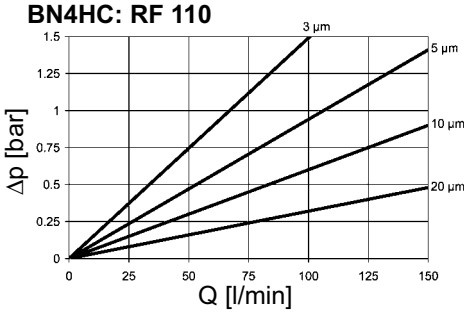
**BN4HC: RF 30**



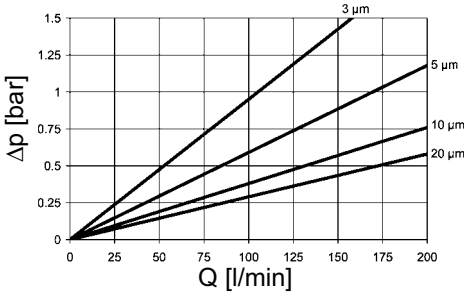

**BN4HC: RF 60**



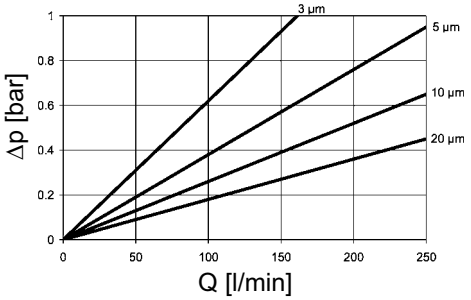

**BN4HC: RF 110**



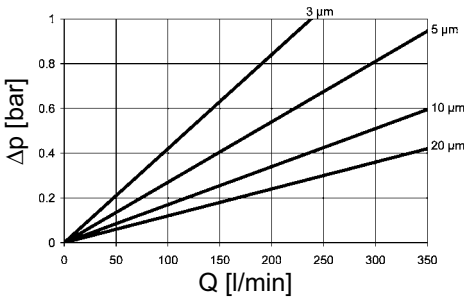

**BN4HC: RF 160**



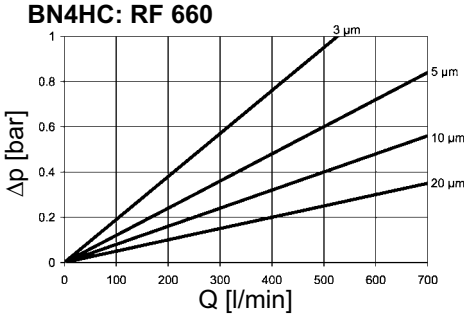

**BN4HC: RF 240**



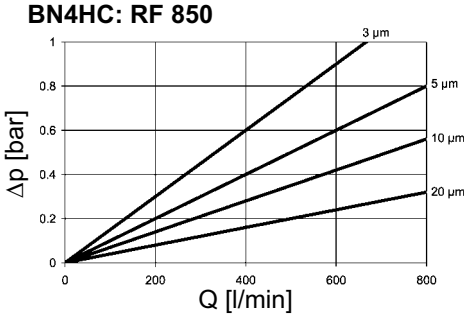

**BN4HC: RF 330**



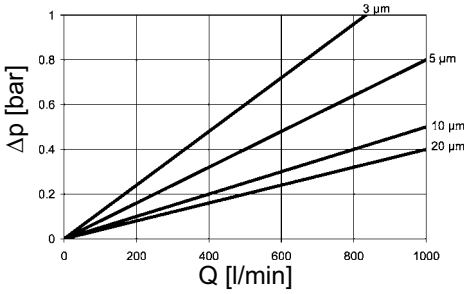

**BN4HC: RF 660**



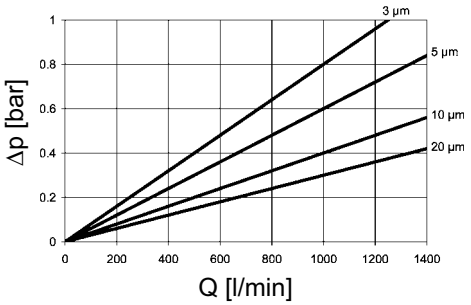

**BN4HC: RF 850**




**BN4HC: RF 950**

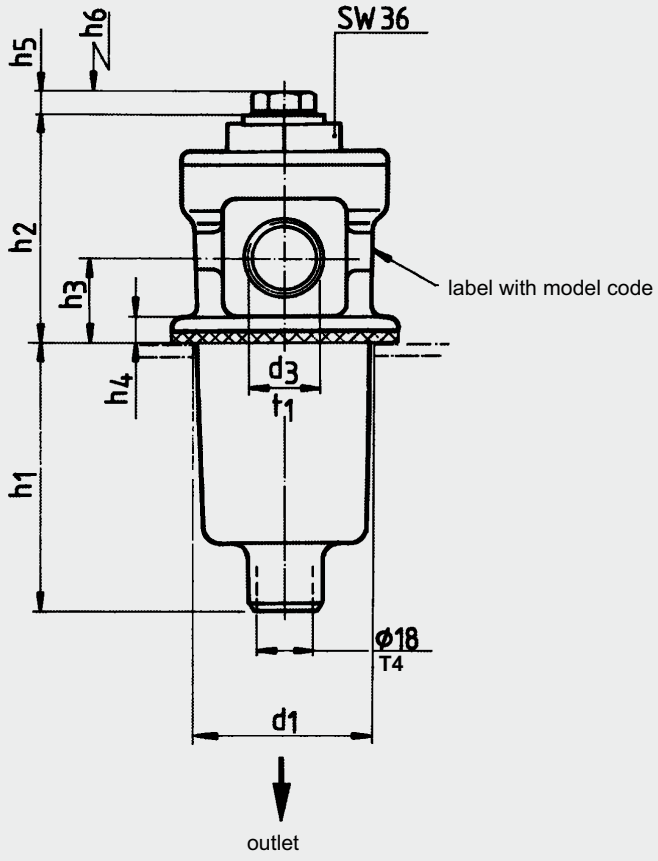


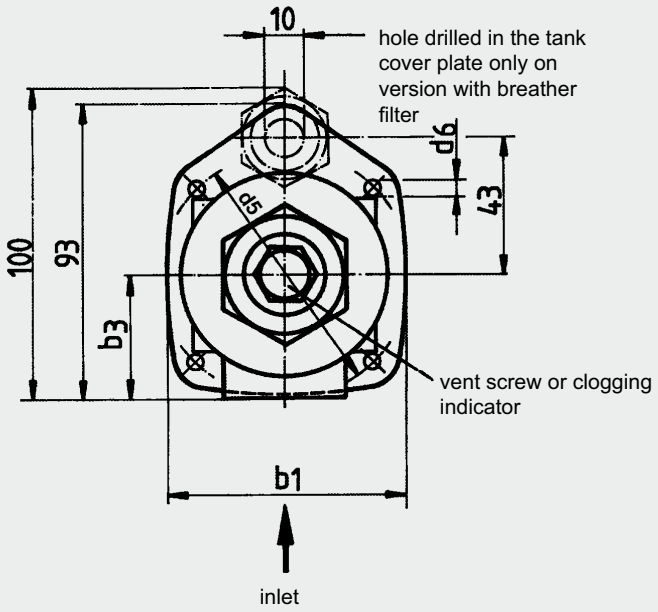

**BN4HC: RF 1300**



## 4. DIMENSIONS

RF 30

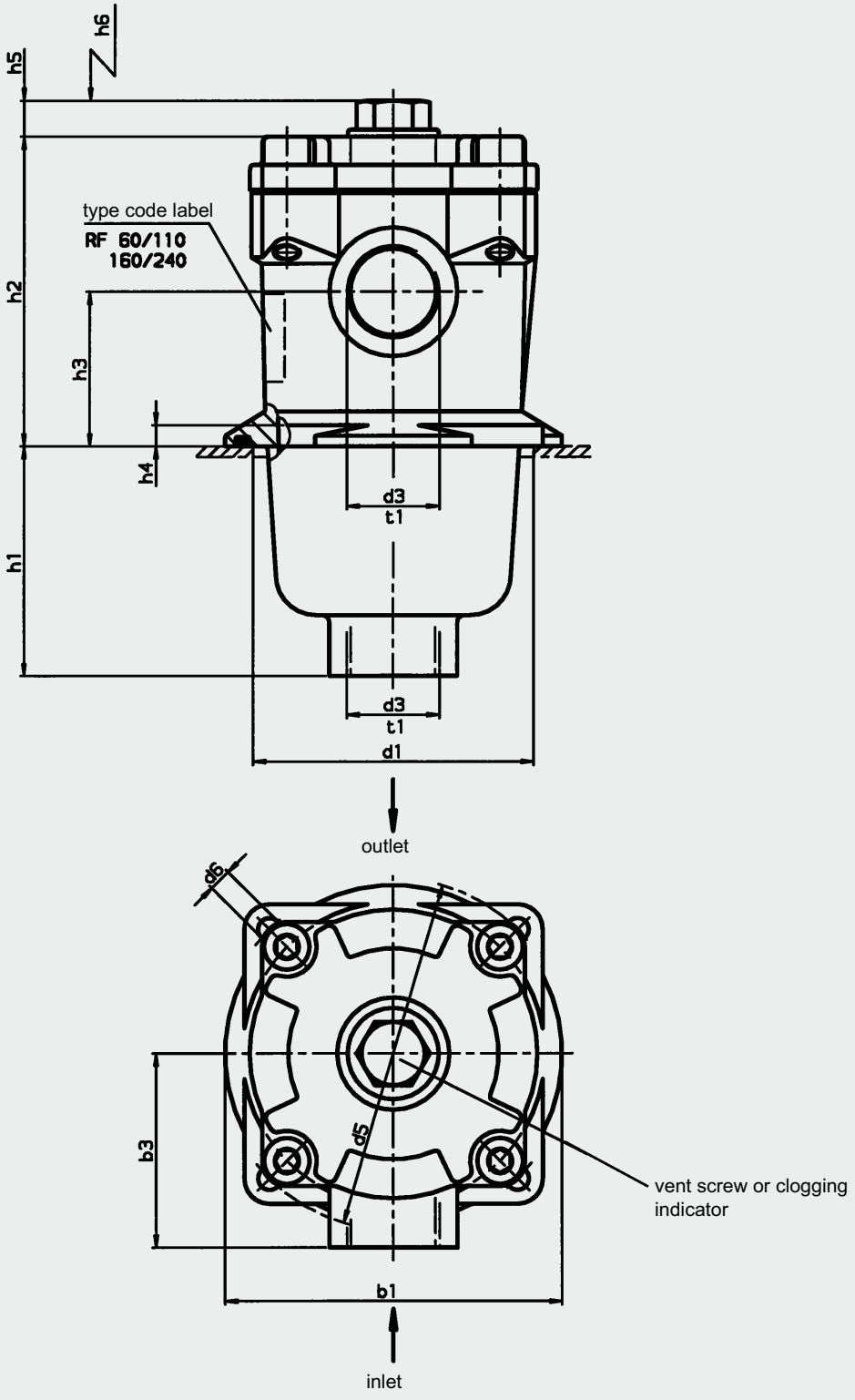



| RF | b1 | b3 | d1 | d3[1)] | d5 | d6[2)] | h1 | h2 | h3 | h4 | h5 | h6 | t1 | t4 | Weight including element [kg] | Volume of pressure chamber [l] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30 | 71 | 38 | 60 | G ½ | 78 | M4 | 86 | 70 | 27 | 8 | 11 | 90 | 14 | 14 | 0.4 | 0.18 |

[1)] Threaded port to ISO 228 / [2)] mounting hole for screw

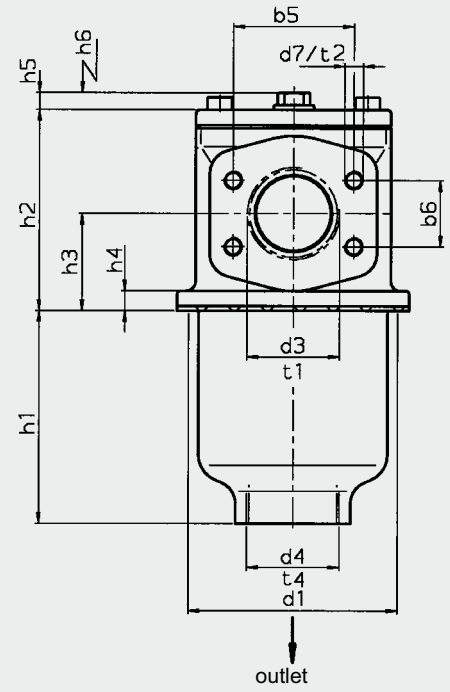
RF 60-240

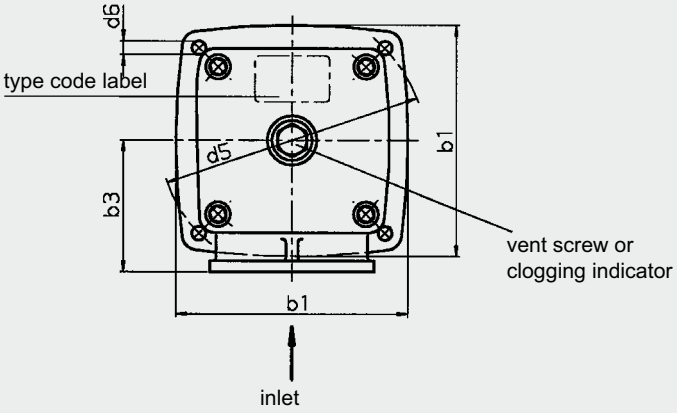



| RF | b1 | b3 | d1 | d3[1)] | d5 | d6[2)] | h1 | h2 | h3 | h4 | h5 | h6 | t1 | t4 | Weight including element [kg] | Volume of pressure chamber [l] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 60 | 96 | 55 | 80 | G ¾ | 100 | M5 | 66 | 88 | 44 | 6 | 12 | 80 | 17 | - | 0.9 | 0.40 |
| 110 | 96 | 55 | 80 | G ¾ | 100 | M5 | 133 | 88 | 44 | 6 | 12 | 145 | 17 | - | 1.1 | 0.60 |
| 160 | 126 | 72 | 106 | G 1¼ | 135 | M6 | 89 | 108 | 54 | 6 | 12 | 120 | 20 | - | 1.8 | 1.00 |
| 240 | 126 | 72 | 106 | G 1¼ | 135 | M6 | 150 | 108 | 54 | 6 | 12 | 180 | 20 | - | 2.2 | 1.40 |

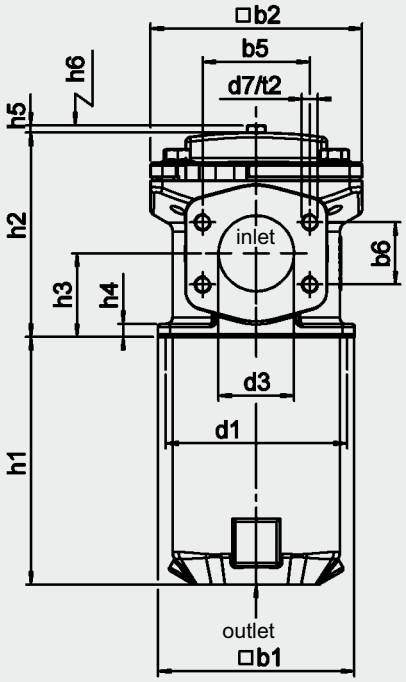
[1)] Threaded port to ISO 228 / [2)] mounting hole for screw

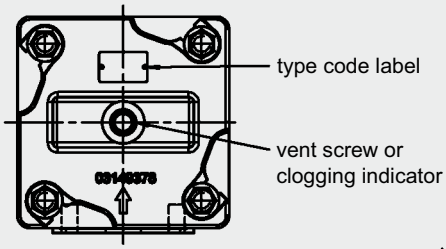
RF 330

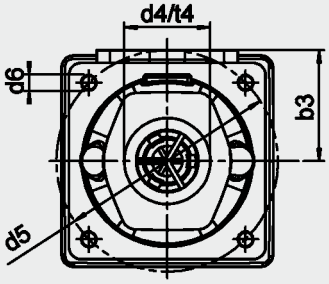


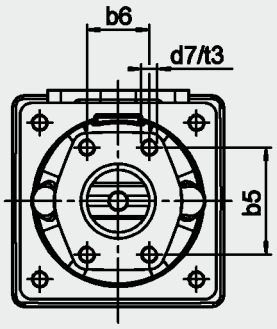

RF 660 - 1300




outlet: view
from below
RF 660 D N

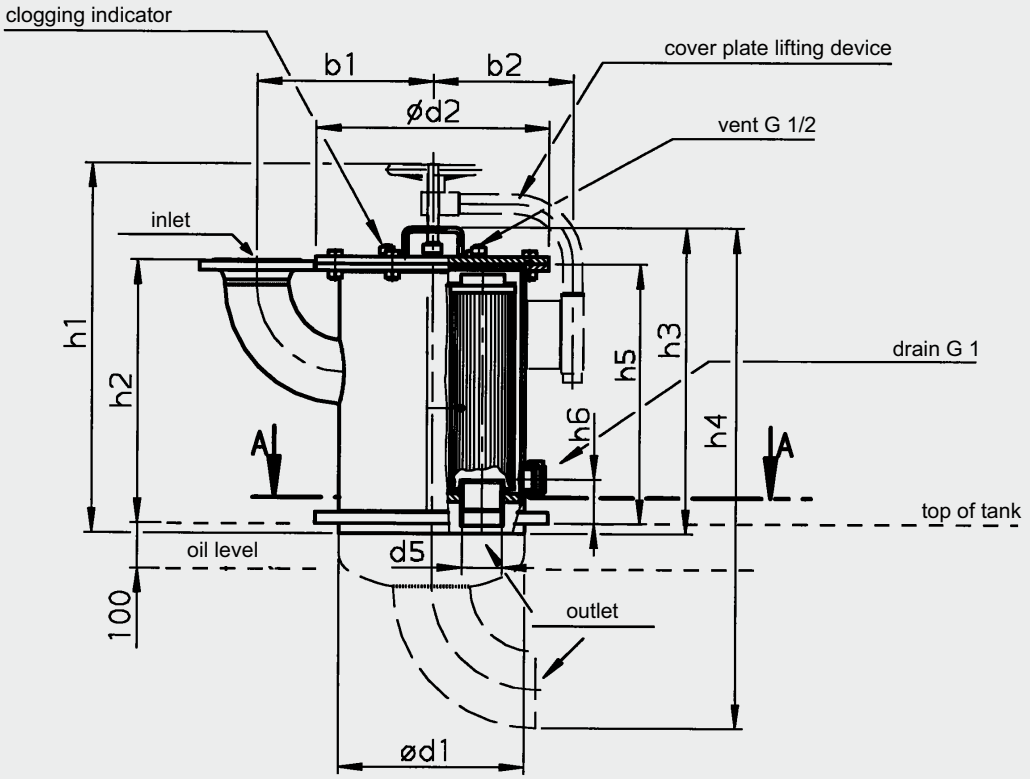


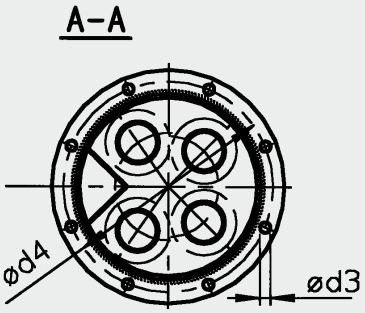

outlet: view
from below
RF 660 D M
RF 950 D O
RF 1300 D P

| RF | b1 | b2 | b3 | b5 | b6 | d1 | d3 | d4 | d5 | d6[1)] | d7 | h1 | h2 | h3 | h4 | h5 | h6 | t1 | t2 | t3 | t4 | Weight incl. element [kg] | Volume of pressure chamber [l] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 330 | 150 | 126 | 85 | - 77.8 | - 42.9 | 135 | G2 SAE DN 50 (2") | G2 | 170 | M8 | - M12 | 139 | 130 | 63 | 13 | 12 | 180 | 27 | - 23 | - | 27 | 4.1 | 2.0 |
| 660 | 195 | 210 | 110 | 106.4 | 61.9 | 180 | SAE DN 80 (3") | G3 SAE DN 80 (3") | 220 | M12 | M16 | 246 | 203 | 83 | 13 | 8 | 320 | - | 28 | 18 | 28 | 31.0 | 6.8 |
| 950 | 250 | 244 | 135 | 120.7 | 69.9 | 208 | SAE DN 90 (3½") | SAE DN 90 (3½") | 290 | M16 | M16 | 252.5 | 225 | 93 | 13 | 8 | 385 | - | 20 | 20 | - | 44.5 | 10.3 |
| 1300 | 250 | 244 | 145 | 130.2 | 77.8 | 208 | SAE DN 100 (4") | SAE DN 100 (4") | 290 | M16 | M16 | 330.5 | 269 | 121 | 13 | 8 | 485 | - | 20 | 20 | - | 52.5 | 13.5 |

Filter connection for SAE flanges to SAE-J 518c / 3000 PSI / [1)] mounting hole for screw

RF 2500 - 15000




dimension h4 on request!

| RF | Flange connection | h1 | h2 | h3 | h5 | h6 | b1 | b2 | d1 | d2 | d3 | d4 | d5 | No. of cover plate screws | Weight including element [kg] | Volume of pressure chamber [l] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2500 | DIN DN 100<br>DIN DN 125 | 732 | 578<br>505 | 590 | 496 | 84 | 395<br>317 | 240 | 273 | 360 | 18 | 320 | G2 | 8 | 55.3<br>58.3 | 26.0<br>29.0 |
| 4000 | DIN DN 125<br>DIN DN 150 | 738 | 501<br>540 | 596 | 496 | 84 | 355<br>388 | 282 | 356 | 450 | 18 | 410 | G2 | 12 | 97.3<br>101.3 | 44.0<br>48.0 |
| 5200 | DIN DN 125<br>DIN DN 150 | 812 | 576<br>615 | 670 | 571 | 84 | 382<br>416 | 308 | 406 | 510 | 23 | 460 | G3 | 8 | 119.1<br>126.1 | 64.0<br>68.0 |
| 6500 | DIN DN 150<br>DIN DN 200 | 817 | 615<br>720 | 680 | 571 | 84 | 470<br>535 | 358 | 508 | 620 | 26 | 572 | G3 | 8 | 175.1<br>186.1 | 98.0<br>108.0 |
| 7800 | DIN DN 200<br>DIN DN 250 | 817 | 720<br>800 | 680 | 571 | 84 | 535<br>605 | 358 | 508 | 620 | 26 | 572 | G3 | 8 | 187.1<br>202.1 | 108.0<br>126.0 |
| 15000 | DIN DN 250<br>DIN DN 300 | 817 | 800<br>866 | 709 | 571 | 84 | 712<br>777 | 460 | 711 | 840 | 26 | 780 | G3 | 12 | 329.1<br>382.1 | 224.0<br>247.0 |

## NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.

HYDAC **Filtertechnik GmbH**
Industriegebiet
**D-66280 Sulzbach/Saar**
Tel.: 0 68 97 / 509-01
Fax: 0 68 97 / 509-300
Internet: www.hydac.com
E-Mail: filter@hydac.com



# Change-Over Return Line Filter RFD up to 1300 l/min, up to 25 bar




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. They consist of one-piece housings with bolt-on cover plates. The two housings are connected by a ball change-over valve with negative overlap and single-lever operation.

Standard equipment:

- with bypass valve
- connection for a clogging indicator (1 clogging indicator per filter side)

### 1.2 FILTER ELEMENTS

Hydac filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

**Contamination retention capacities in g**

| | | Betamicron® (BN4HC) | | | |
|---|---|---|---|---|---|
| RFD | Elements | 3 µm | 5 µm | 10 µm | 20 µm |
| 60 | 1x0060R | 5.7 | 6.3 | 7.6 | 8.6 |
| 110 | 1x0110R | 12.0 | 13.3 | 16.0 | 18.1 |
| 160 | 1x0160R | 18.6 | 20.7 | 24.9 | 28.1 |
| 240 | 1x0240R | 29.3 | 32.5 | 39.1 | 44.2 |
| 330 | 1x0330R | 38.4 | 42.6 | 51.2 | 57.9 |
| 660 | 1x0660R | 87.1 | 96.5 | 116.1 | 131.3 |
| 950 | 1x0950R | 130.0 | 144.1 | 173.3 | 196.1 |
| 1300 | 1x1300R | 181.0 | 200.7 | 241.4 | 273.1 |

Filter elements are available with the following pressure stability values:

| | |
|---|---|
| Betamicron® (BN4HC): | 20 bar |
| Paper (P/HC): | 10 bar |
| Wire mesh (W/HC): | 20 bar |
| Stainless steel fibre (V): | 210 bar |
| Betamicron®/Aquamicron® (BN4AM): | 10 bar |
| Aquamicron® (AM): | 10 bar |

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Nominal pressure | 25 bar |
| Temperature range | -10 °C to +100 °C |
| Material of filter housing and cover plate | RFD 60 to 330: Aluminium<br>RFD 660 to 1300: EN-GJS-400-15 |
| Type of clogging indicator | VR connection thread G ½<br>(return line indicator up to 25 bar operating pressure) |
| Pressure setting of clogging indicator | 2 bar (others on request) |
| Bypass cracking pressure | 3 bar (others on request) |

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 MOUNTING

As tank-top mounted filter

### 1.6 SPECIAL MODELS AND ACCESSORIES

On request

### 1.7 SPARE PARTS

See Original Spare Parts List

### 1.8 CERTIFICATES AND APPROVALS

On request

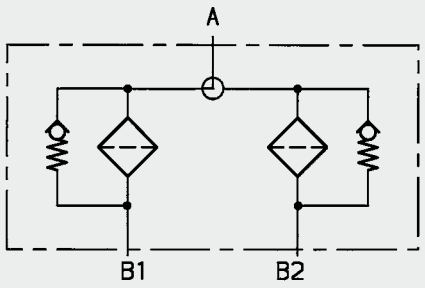
### 1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Non-flam operating fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

### 1.10 IMPORTANT INFORMATION

- Filter housings must be earthed
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector

**Symbol for hydraulic systems**



## 2. MODEL CODE (also order example)

**RFD BN/HC 330 D A L 10 D 1 . X /-L24**

### 2.1 COMPLETE FILTER

**Filter type**
RFD

**Filter material of element**

| | | | |
|---|---|---|---|
| BN/HC | Betamicron® (BN4HC) | W/HC | Stainless steel wire mesh |
| V | Stainless steel fibre | AM | Aquamicron® |
| P/HC | Paper | BN/AM | Betamicron®/Aquamicron® |

**Size of filter or element**
RFD: 60, 110, 160, 240, 330, 660, 950, 1300

**Operating pressure**
D = 25 bar

**Type of change-over**
A ball

**Type and size of port**

| Type | Port | Filter size | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 60 | 110 | 160 | 240 | 330 | 660 | 950 | 1300 |
| C | G ¾ | ● | ● | | | | | | |
| D | G 1 | | | ● | ● | | | | |
| G | G 2 | | | | | ● | | | |
| L | SAE DN 50 (2“) | | | | | ● | | | |
| M | SAE DN 80 (3“) | | | | | | ● | | |
| N* | G3 | | | | | | ● | | |
| P | SAE DN 100 (4“) | | | | | | | ● | ● |

* This port G3 applies to filter outlet only

**Filtration rating in µm**
BN/HC, V: 3, 5, 10, 20 P/HC: 10, 20 AM: 40
W/HC: 25, 50, 100, 200 BN/AM: 3, 10

**Type of clogging indicator**
Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
] for other clogging indicators see brochure no. E 7.050../..

**Type code**
1

**Modification number**
X the latest version is always supplied

**Supplementary details**
B. cracking pressure of bypass (e.g. B6 = 6 bar)
KB no bypass valve
L... light with appropriate voltage (24V, 48V, 110V, 220V) ] only for clogging indicators type D
LED 2 light emitting diodes up to 24 Volt
SO136 filter housing RFD 330 in EN-GJS-400-15
V FPM seals

### 2.2 REPLACEMENT ELEMENT

**0330 R 010 BN/HC /-V**

**Size**
0060, 0110, 0160, 0240, 0330, 0660, 0950, 1300

**Type**
R

**Filtration rating in µm**
BN/HC, V: 003, 005, 010, 020 P/HC: 010, 020 AM: 040
W/HC: 025, 050, 100, 200 BN4AM: 003, 010

**Filter material**
BN4HC, V, W/HC, P/HC, BN4AM, AM

**Supplementary details**
V (for descriptions, see point 2.1)

### 2.3 REPLACEMENT CLOGGING INDICATOR

**VR 2 D . X /-L24**

**Type**
VR return line indicator up to 25 bar operating pressure

**Pressure setting**
2 standard 2 bar, others on request

**Type of clogging indicator**
D (see point 2.1 )

**Modification number**
X the latest version is always supplied

**Supplementary details**
L..., LED, V (for descriptions, see point 2.1)

## 3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see point 3.1)

$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see point 3.2)

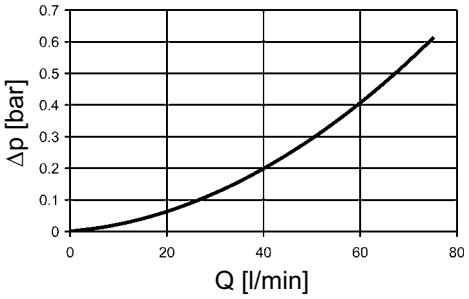
For ease of calculation, our Filter Sizing Program is available on request free of charge.

**NEW:** Sizing online at www.hydac.com

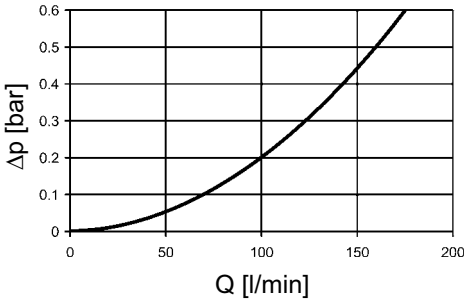
### 3.1 Δp-Q HOUSING GRAPHS BASED ON ISO 3968

The housing graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

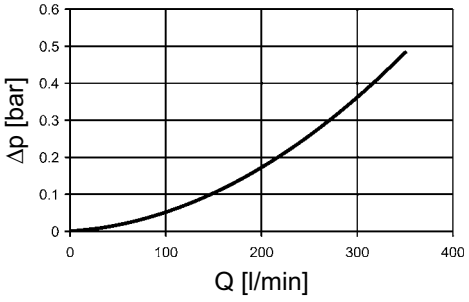
**RFD 60, 110**



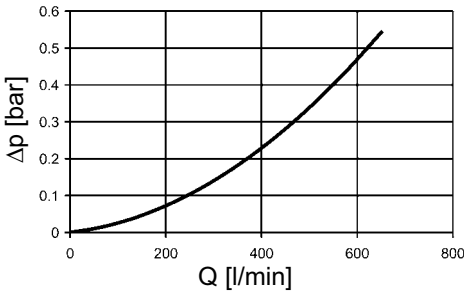

**RFD 160, 240**



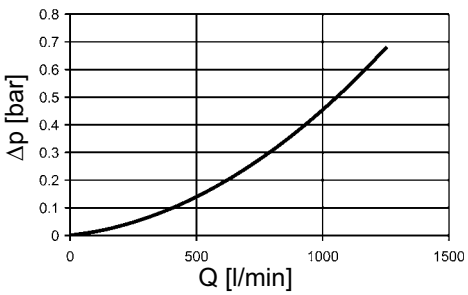

**RFD 330**




**RFD 660, 950**




**RFD 1300**

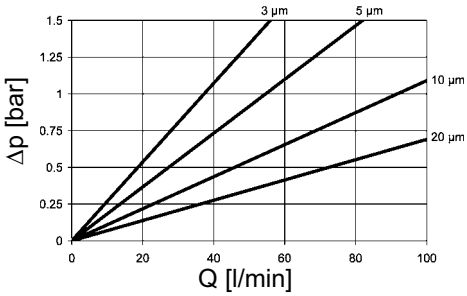



### 3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

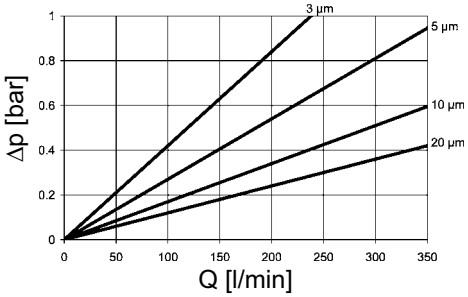
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

| RFD | V | | | | W/HC |
|---|---|---|---|---|---|
| | 3 µm | 5 µm | 10 µm | 20 µm | – |
| 60 | 15.9 | 9.3 | 5.4 | 3.3 | 0.900 |
| 110 | 7.6 | 5.1 | 3.0 | 2.0 | 0.495 |
| 160 | 4.9 | 3.5 | 2.4 | 1.5 | 0.338 |
| 240 | 3.2 | 2.6 | 1.7 | 1.2 | 0.225 |
| 330 | 2.1 | 1.7 | 1.1 | 0.8 | 0.162 |
| 660 | 1.0 | 0.8 | 0.6 | 0.4 | 0.081 |
| 950 | 0.7 | 0.6 | 0.4 | 0.2 | 0.054 |
| 1300 | 0.5 | 0.4 | 0.3 | 0.2 | 0.045 |

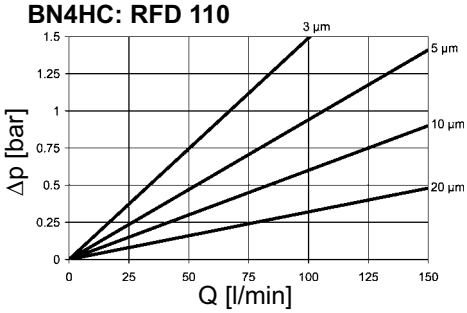
**BN4HC: RFD 60**



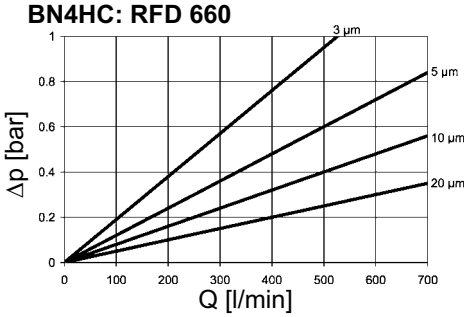

**BN4HC: RFD 330**



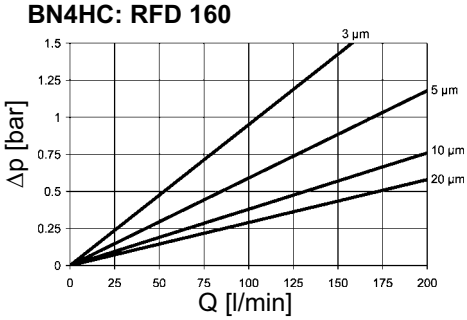

**BN4HC: RFD 110**



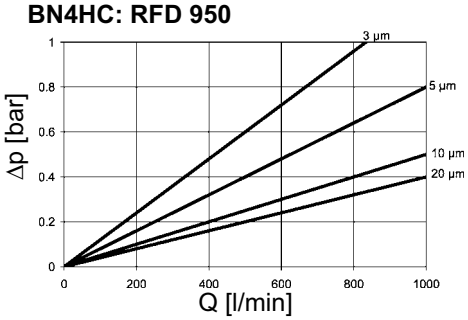

**BN4HC: RFD 660**



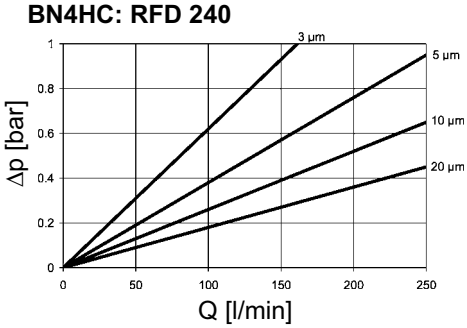

**BN4HC: RFD 160**



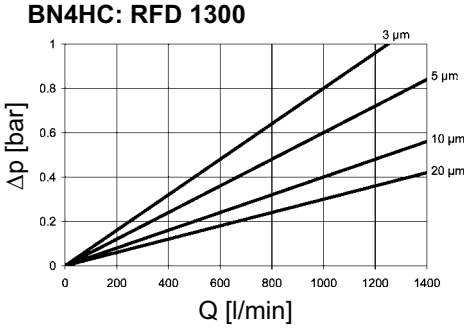

**BN4HC: RFD 950**




**BN4HC: RFD 240**

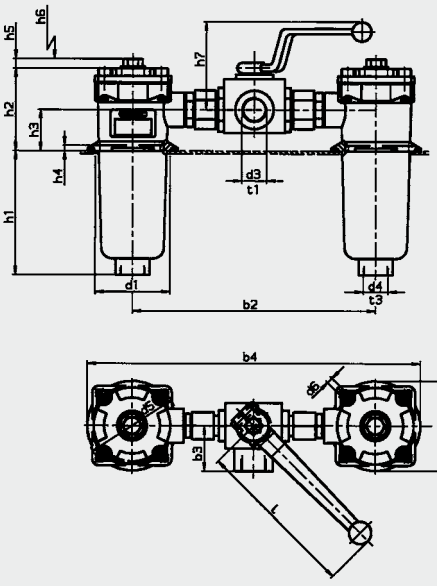



**BN4HC: RFD 1300**



## 4. DIMENSIONS

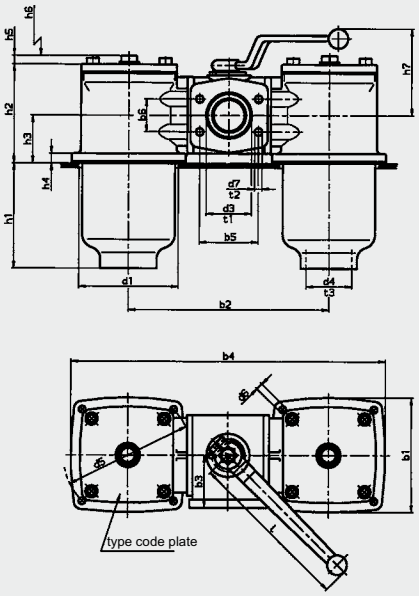
RFD 60-240







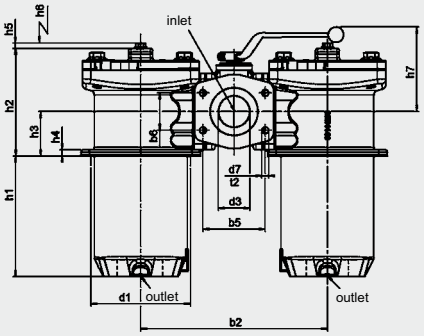
RFD 330

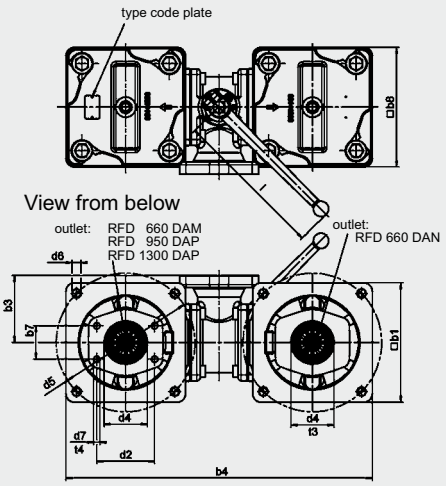






RFD 660-1300




| RFD | 60 | 110 | 160 | 240 | 330 | 660 | 950 | 1300 |
|---|---|---|---|---|---|---|---|---|
| b1 | 96 | 96 | 126 | 126 | 150 | 195 | 250 | 250 |
| $b2_{\pm 1,3}$ | 260.5 | 260.5 | 335.5 | 335.5 | 254 | 330 | 390 | 410 |
| b3 | 47.5 | 47.5 | 56.5 | 56.5 | 69 | 100 | 140 | 140 |
| b4 | 357 | 357 | 461 | 461 | 404 | 540 | 640 | 660 |
| b5 | - | - | - | - | 77.8 | 106.5 | 130.2 | 130.2 |
| b6 | - | - | - | - | 42.9 | 61.9 | 77.8 | 77.8 |
| b7 | - | - | - | - | - | 61.9 | 69.9 | 77.8 |
| b8 | - | - | - | - | - | 210 | 244 | 244 |
| d1 | 80 | 80 | 106 | 106 | 135 | 180 | 208 | 208 |
| d2 | - | - | - | - | - | 106.4 | 120.7 | 130.2 |
| d3 | G ¾ | G ¾ | G 1 | G 1 | G 2 / SAE DN 50 (2") | SAE DN 80 (3") | SAE DN 100 (4") | SAE DN 100 (4") |
| d4 | G ¾ | G ¾ | G 1¼ | G 1¼ | G 2 | G 3 or SAE DN 80 (3") | SAE DN 90 (3½ ") | SAE DN 100 (4") |
| d5 | 100 | 100 | 135 | 135 | 170 | 220 | 290 | 290 |
| d6[1)] | M5 | M5 | M6 | M6 | M8 | M12 | M16 | M16 |
| d7[2)] | - | - | - | - | - / M12 | M16 | M16 | M16 |
| h1 | 66 | 133 | 89 | 150 | 139 | 246 | 252.5 | 330.5 |
| h2 | 88 | 88 | 108 | 108 | 130 | 203 | 225 | 269 |
| h3 | 44 | 44 | 54 | 54 | 63 | 83 | 93 | 121 |
| h4 | 6 | 6 | 6 | 6 | 13 | 13 | 13 | 13 |
| h5 | 11 | 11 | 11 | 11 | 11 | 8 | 8 | 8 |
| h6 | 80 | 145 | 120 | 180 | 180 | 320 | 385 | 485 |
| h7 | 92 | 92 | 95 | 95 | 110 | 114 | 170 | 170 |
| l | 173 | 173 | 173 | 173 | 229 | 229 | 318 | 318 |
| t1[2)] | 16 | 16 | 24 | 24 | 24 / - | - | - | - |
| t2[2)] | - | - | - | - | - / 17 | 20 | 25 | 25 |
| t3 | 17 | 17 | 20 | 20 | 27 | 28 | - | - |
| t4 | - | - | - | - | - | 18 | 20 | 20 |
| Weight including element [kg] | 3.2 | 3.7 | 7.0 | 7.8 | 13.4 | 72.0 | 105.0 | 118.0 |
| Volume of pressure chamber [l] | 2x 0.30 | 2x 0.60 | 2x 1.00 | 2x 1.40 | 2x 2.00 | 2x 6.80 | 2x 10.30 | 2x 13.50 |

[1)] mounting hole for bolt
[2)] refers to the appropriate port (d3)

## NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

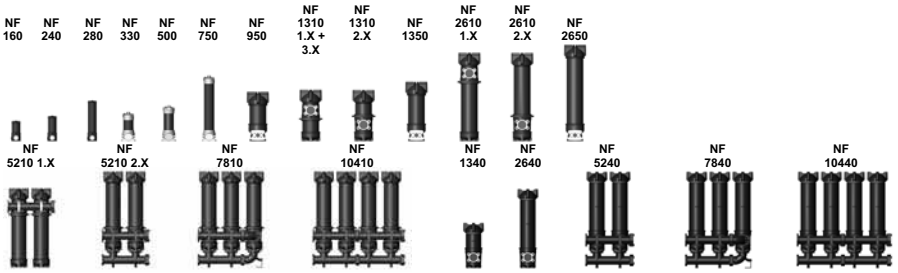
Subject to technical modifications.


HYDAC **Filtertechnik GmbH**
Industriegebiet
**D-66280 Sulzbach/Saar**
Tel.: 0 68 97 / 509-01
Fax: 0 68 97 / 509-300
Internet: www.hydac.com
E-Mail: filter@hydac.com



# Inline Filter or Tank Top Return Line Filter NF

## up to 3500 l/min, up to 25 bar




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. They consist of a filter housing and a threaded cover plate. Standard equipment:

- with bypass valve
- connection for a clogging indicator

### 1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

**Contamination retention capacities in g**

| | | Betamicron® (BN4HC) | | | |
|---|---|---|---|---|---|
| NF | Elements | 3 µm | 5 µm | 10 µm | 20 µm |
| 160 | 1x0160R | 18.6 | 20.7 | 24.9 | 28.1 |
| 240 | 1x0240R | 29.3 | 32.5 | 39.1 | 44.2 |
| 280 | 1x0280R | 62.3 | 69.0 | 83.0 | 93.9 |
| 330 | 1x0330R | 38.4 | 42.6 | 51.2 | 57.9 |
| 500 | 1x0500R | 58.9 | 65.3 | 78.6 | 88.9 |
| 750 | 1x0750R | 147.1 | 163.0 | 196.1 | 221.9 |
| 950 | 1x0950R | 130.0 | 144.1 | 173.3 | 196.1 |
| 13XX | 1x1300R | 181.0 | 200.7 | 241.4 | 273.1 |
| 26XX | 1x2600R | 369.4 | 409.4 | 492.5 | 557.2 |
| 52XX | 2x2600R | 738.8 | 818.8 | 985.0 | 1114.4 |
| 78XX | 3x2600R | 1108.2 | 1228.2 | 1477.5 | 1671.6 |
| 104XX | 4x2600R | 1477.6 | 1637.6 | 1970.0 | 2228.8 |

Filter elements are available with the following pressure stability values

| | |
|---|---|
| Betamicron® (BN4HC): | 20 bar |
| Wire mesh (W/HC): | 20 bar |
| Stainless steel fibre (V): | 30 bar |
| ECOmicron® (ECON2) | 10 bar |
| Paper (P/HC) | 10 bar |
| Betamicron®/Aquamicron® (BN4AM): | 10 bar |
| Aquamicron® (AM) | 10 bar |

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Nominal pressure | 25 bar |
| Temperature range | -10 °C to +100 °C |
| Material of filter head | Aluminium |
| Material of tube (housing) | Steel (aluminium for NF 1300) |
| Material of cover plate | Aluminium |
| Type of clogging indicator | VM (differential pressure indicator; for inline mounting)<br>VR (return line indicator; for tank-top mounting) |
| Setting pressure of clogging indicator | 5 bar (others on request) |
| Bypass cracking pressure | 3 bar (others on request) |

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 MOUNTING

As inline filter or tank-top return line filter.

### 1.6 SPECIAL MODELS AND ACCESSORIES

- Mounting bracket for NF 1310/2610
- Filling connection for NF 330, 500, 750, 950, 1350, 2650 on the contaminated side
- Foot bracket option for NF 160-750, 950, 1350, 2650
- Quick release coupling on the filling connection for NF 160, 240, 280
- Check valve on the clean side for NF 160, 240, 280
- For applications up to 40 bar please enquire separately! (only for NF 950, 1350, 2650)

### 1.7 SPARE PARTS

See Original Spare Parts List

### 1.8 CERTIFICATES AND APPROVALS

On request

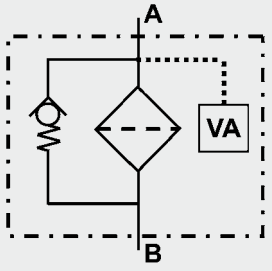
### 1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Non-flam operating fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

### 1.10 IMPORTANT INFORMATION

- Filter housing must be earthed
- When using visual clogging indicators, the BM version (visual with manual reset) only should be used.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector

**Symbol for hydraulic systems**



## 2. MODEL CODE (also order example)

NF BN/HC 2610 D P 10 D 2 . X /-L24

### 2.1 COMPLETE FILTER

**Filter type**
NF

**Filter material of element**
BN/HC: Betamicron® (BN4HC) P/HC: Paper V: stainless steel fibre
ECO/N: ECOmicron® (ECON2) BN/AM: Betamicron®/Aquamicron®
W/HC: Stainless steel wire mesh AM: Aquamicron®

**Size of filter or element**
NF: 160, 240, 280, 330, 500, 750, 950, 1310, 1340, 1350, 2610, 2640, 2650, 5210, 5240, 7810, 7840, 10410, 10440

**Operating pressure**
D = 25 bar

**Type and size of port**

| Type | Port | Filter size | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 160 | 240 | 280 | 330 | 500 | 750 | 950 | 1310 | 1340 | 1350 | 2610 | 2640 | 2650 | 5210 | 5240 | 7810 | 7840 | 10410 | 10440 |
| E | G1¼ | ● | ● | ● | | | | | | | | | | | | | | | | |
| K | SAE DN 40 (1½") | | | | ● | ● | ● | | | | | | | | | | | | | |
| L | SAE DN 50 (2") | | | | | | | ● | | | ● | | | ● | | | | | | |
| M | SAE DN 65 (2½") | | | | | | | ● | | | ● | | | ● | | | | | | |
| N | SAE DN 80 (3") | | | | | | | ● | | | ● | | | ● | | | | | | |
| P | SAE DN 100 (4") | | | | | | | ● | O | ● | ● | O | ● | ● | O | ● | O | ● | O | ● |

O = Discontinued model

**Filtration rating in µm**
BN4HC, ECO/N, V: 3, 5, 10, 20 BN/AM: 3, 10 P/HC: 10, 20
W/HC: 25, 50, 100, 200 AM: 40

**Type of clogging indicator**
A with steel blanking plug in indicator port
BM visual indicator
C electrical indicator
D visual and electrical indication
] for other clogging indicators, see brochure no. E 7.050.../...

**Type code**
1 - Tank-top return line filter
- return line indicator VR
- inlet flange horizontal at top, outlet vertical - from size NF 5210: horizontal
- tank seal supplied

2 - Inline filter
- differential pressure indicator VM
- inlet flange horizontal at bottom, outlet vertical - from size NF 5210 horizontal, only for NF 950, 1350, 2650:
  - differential pressure indicator VM
  - inlet and outlet horizontal and opposite

3 - Inline filter
- differential pressure indicator VM
- inlet flange horizontal at top, outlet vertical

| Code | Filter size | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 160 | 240 | 280 | 330 | 500 | 750 | 950 | 1310 | 1340 | 1350 | 2610 | 2640 | 2650 | 5210 | 5240 | 7810 | 7840 | 10410 | 10440 |
| 1 | | | | | | | | x | | | x | | | x | | | | | |
| 2 | ● | ● | ● | ● | ● | ● | ● | O | ● | ● | O | ● | ● | O | ● | O | ● | O | ● |
| 3 | | | | | | | | O | | | O | | | | | | | | |

x = on request
= standard model
O = discontinued model

**Modification number**
X the latest version is always supplied

**Supplementary details**
B. special cracking pressure of bypass valve (e. g.: B6 = 6 bar); no details = standard 3 bar
EM manual vent with shut-off valve
EP permanent vent via Minimess hose
KB without bypass valve
L... light with appropriate voltage (24, 48, 110, 220 Volt)
LED 2 light emitting diodes up to 24 Volt
] only for clogging indicators type D
SB4 filling line with Ø 4 mm orifice
V FPM seals

### 2.2 REPLACEMENT ELEMENT

2600 R 010 BN4HC /-V

**Size**
0160, 0240, 0280, 0330, 0500, 0750, 0950, 1300, 2600

**Type**
R

**Filtration rating in µm**
BN4HC, ECON2, V: 003, 005, 010, 020 BN4AM: 003, 010 P/HC: 010, 020
W/HC: 025, 050, 100, 200 AM: 040

**Filter material**
BN4HC, ECON2, V, W/HC, BN4AM, AM, P/HC

**Supplementary details**
V (for descriptions, see point 2.1)

### 2.3 REPLACEMENT CLOGGING INDICATOR

VM 5 D . X /-L24

**(IMPORTANT: the clogging indicator must not be screwed into the cover plate!)**

**Type**
VM differential pressure indicator (only for inline filter in version 2.X and 3.X)
VR return line indicator (only for tank-top filter in version 1.X)

**Pressure setting**
2 2 bar (5 = 5 bar), others on request

**Type of clogging indicator** (see point 2.1)

**Modification number**
X the latest version is always supplied

**Supplementary details**
L..., LED, V (for descriptions see point 2.1)

## 3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see point 3.1)

$\Delta p_{Element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see point 3.2)

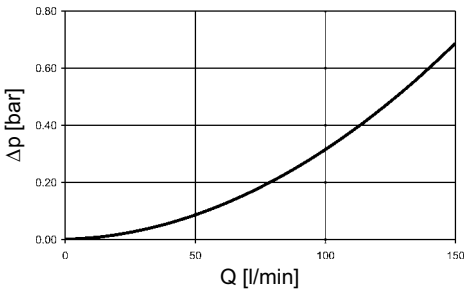
n = no. of elements (see point 1.2 filter elements)

For ease of calculation, our Filter Sizing Program is available on request free of charge.
**NEW:** Sizing online at www.hydac.com

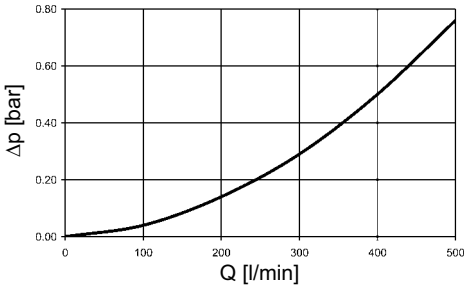
### 3.1 ΔP-Q HOUSING GRAPHS BASED ON ISO 3968

The housing graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

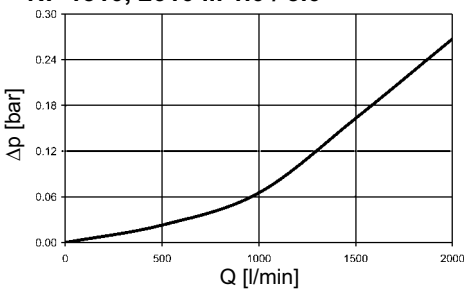
**NF 160, 240, 280 ... 2.0**



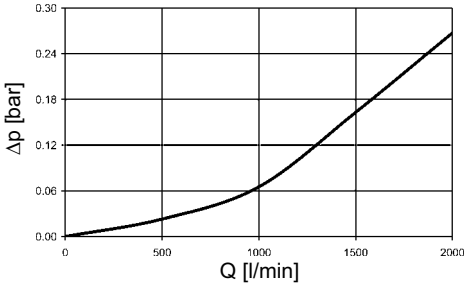

**NF 330, 500, 750 ... 2.0**



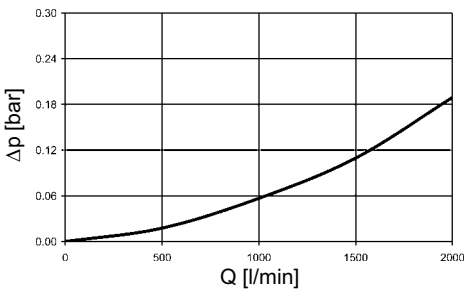

**NF 1310, 2610 ... 1.0 / 3.0**



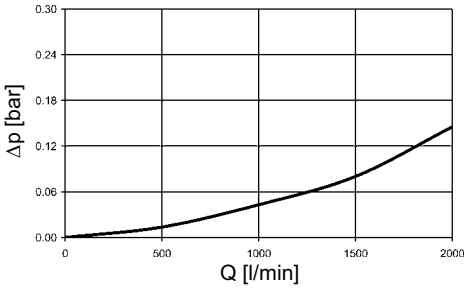

**NF 1310, 1340, 2610, 2640 ... 2.0**
**NF 950, 1350, 2650 ... 2.0**



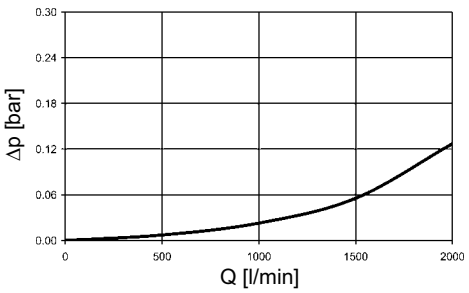

**NF 5210 ... 1.0 / 2.0**
**NF 5240 ... 2.0**




**NF 7810 / 7840 ... 2.0**




**NF 10410 / 10440 ... 2.0**

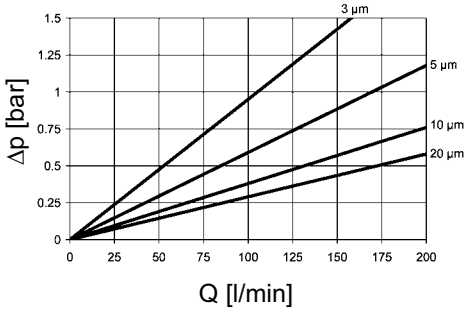


## 3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

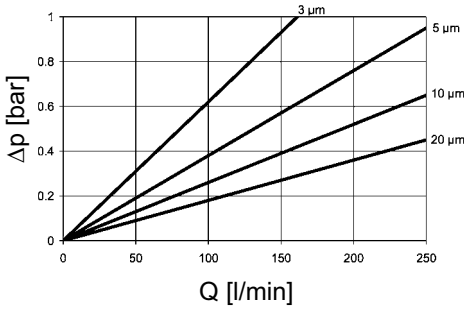
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

| | V | | | | W/HC | ECON2 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 3 µm | 5 µm | 10 µm | 20 µm | – | 3 µm | 5 µm | 10 µm | 20 µm |
| 160 | 4.9 | 3.5 | 2.4 | 1.5 | 0.338 | 9.5 | 5.9 | 3.8 | 2.9 |
| 240 | 3.2 | 2.6 | 1.7 | 1.2 | 0.225 | 6.2 | 3.8 | 2.6 | 1.8 |
| 280 | 1.4 | 1.1 | 0.7 | 0.5 | 0.115 | 3.1 | 2.2 | 1.6 | 1.0 |
| 330 | 2.1 | 1.7 | 1.1 | 0.8 | 0.162 | 4.2 | 2.7 | 1.7 | 1.2 |
| 500 | 1.5 | 1.2 | 0.8 | 0.5 | 0.108 | 3.0 | 1.9 | 1.3 | 0.8 |
| 750 | 0.6 | 0.5 | 0.3 | 0.2 | 0.049 | 1.3 | 0.9 | 0.6 | 0.4 |
| 950 | 0.7 | 0.6 | 0.4 | 0.2 | 0.054 | 1.2 | 0.8 | 0.5 | 0.4 |
| 1300 | 0.5 | 0.4 | 0.3 | 0.2 | 0.045 | 0.8 | 0.6 | 0.4 | 0.3 |
| 2600 | 0.3 | 0.2 | 0.1 | 0.1 | 0.018 | 0.4 | 0.3 | 0.2 | 0.1 |

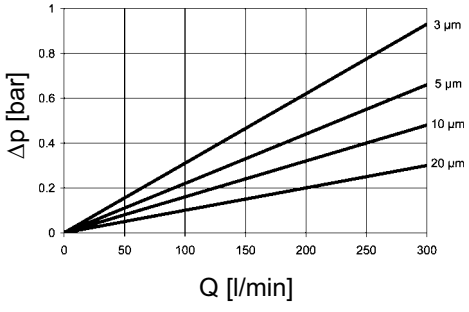
**BN4HC: 160 R...**



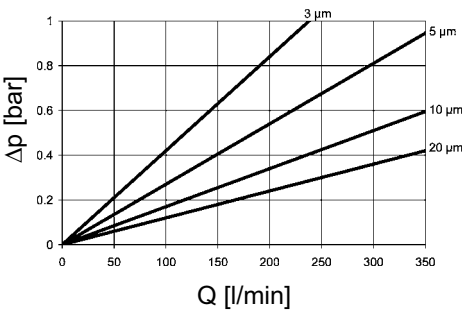

**BN4HC: 240 R...**



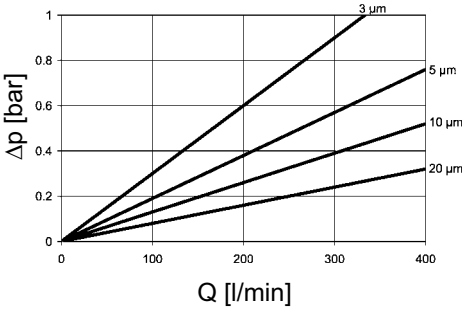

**BN4HC: 280 R...**



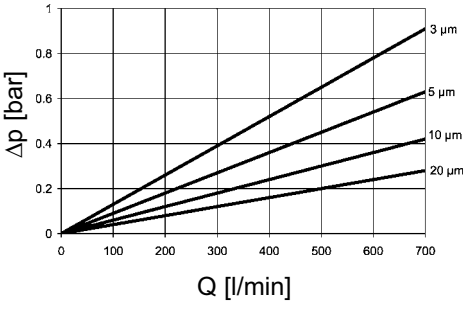

**BN4HC: 330 R...**



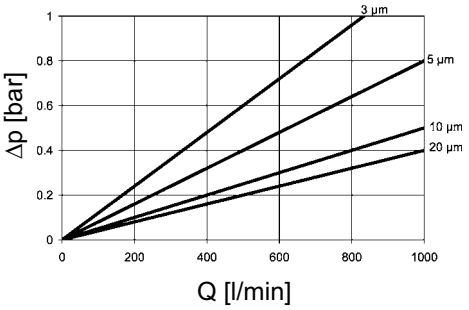

**BN4HC: 500 R...**



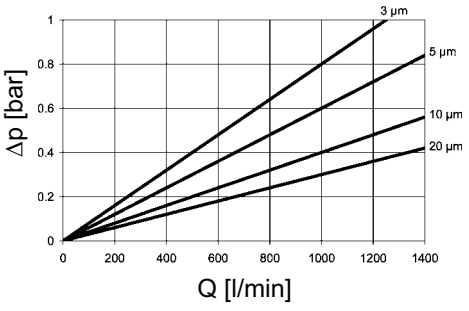

**BN4HC: 750 R...**



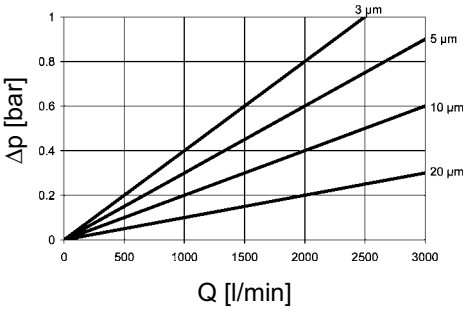

**BN4HC: 950 R...**




**BN4HC: 1300 R...**

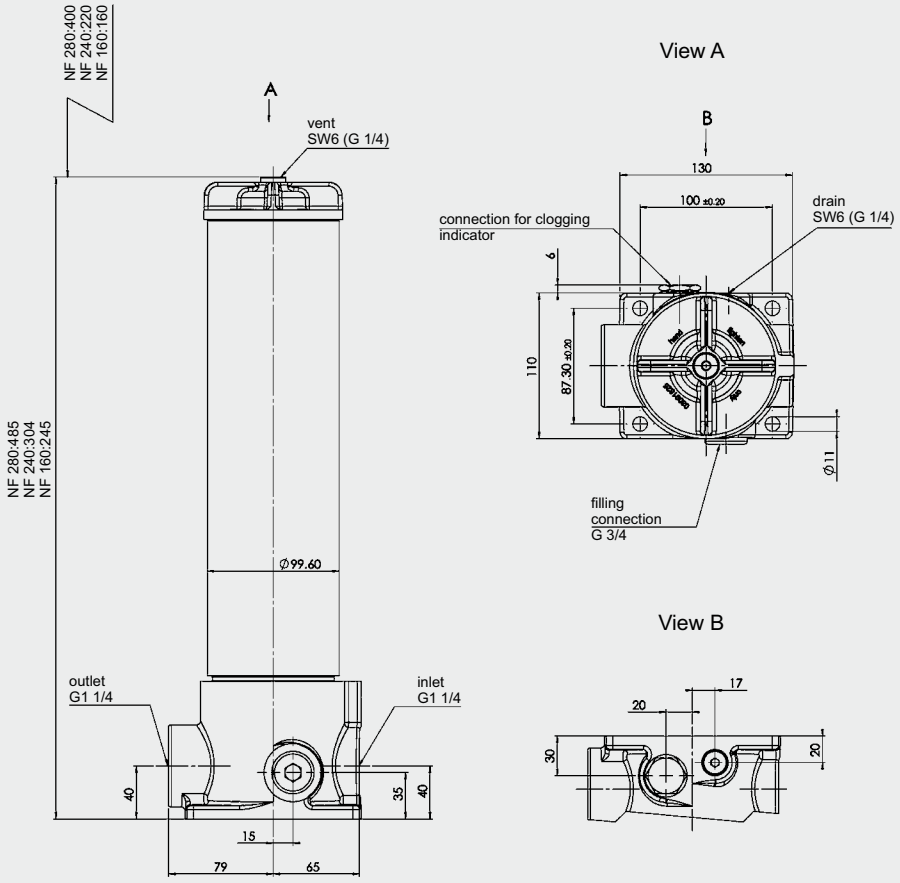



**BN4HC: 2600 R...**

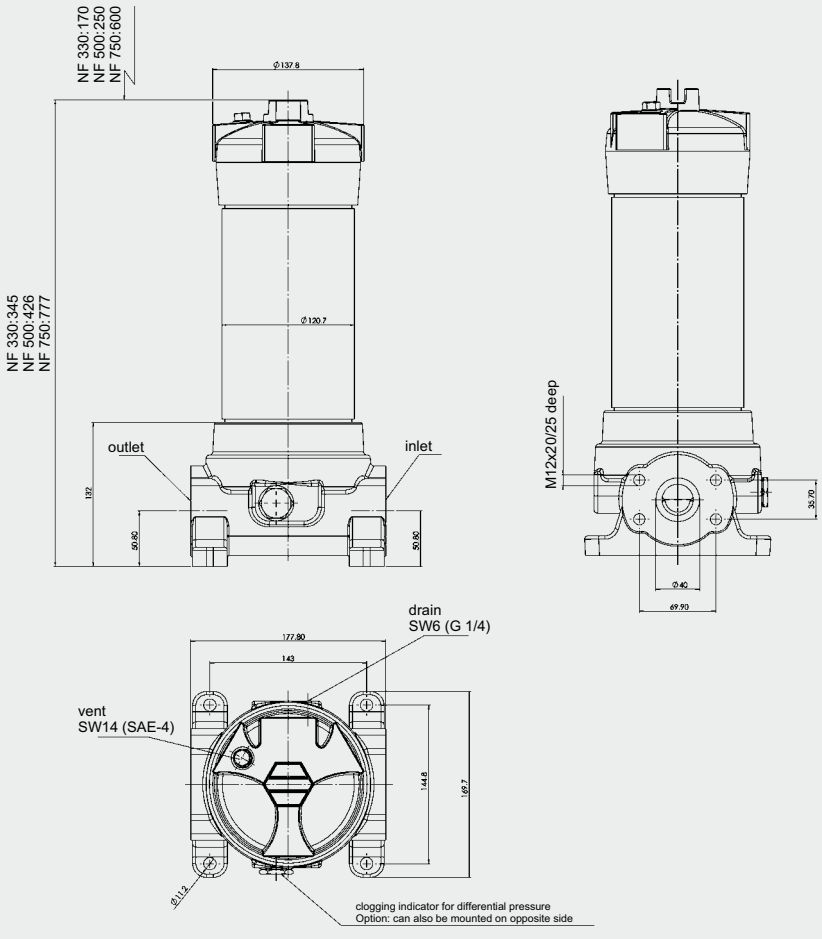


# 4. DIMENSIONS

NF 160-280



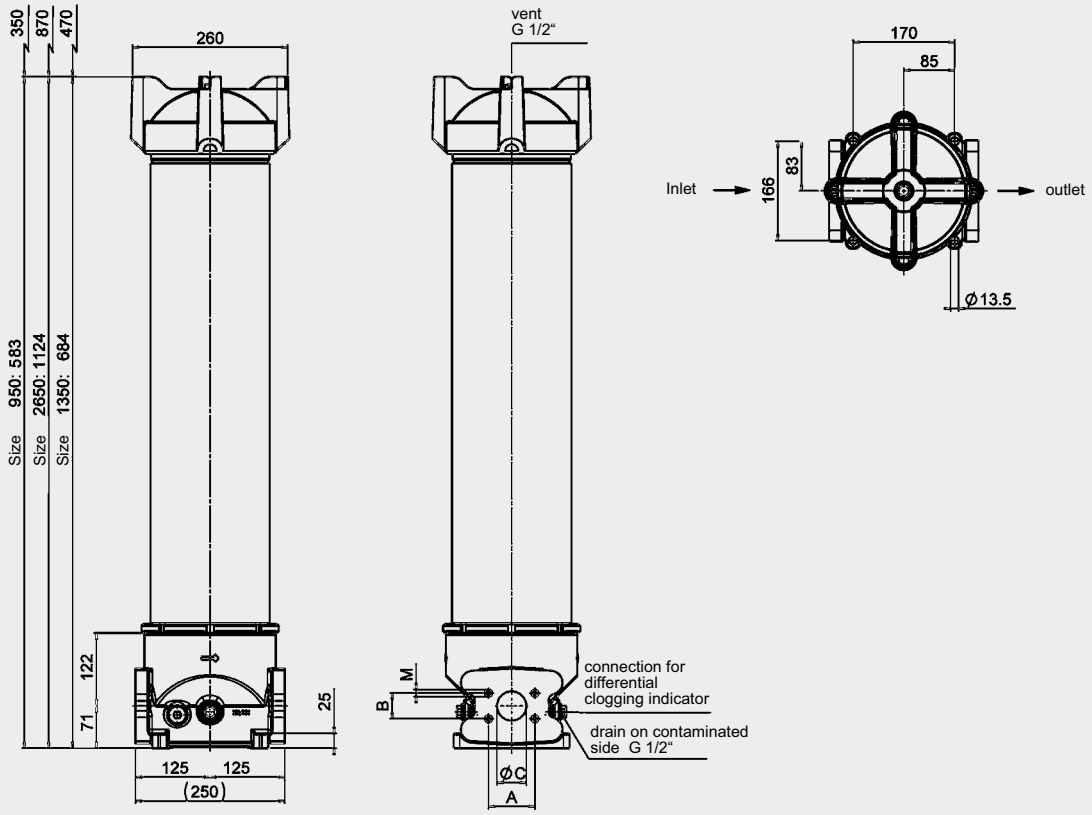

NF 330-750



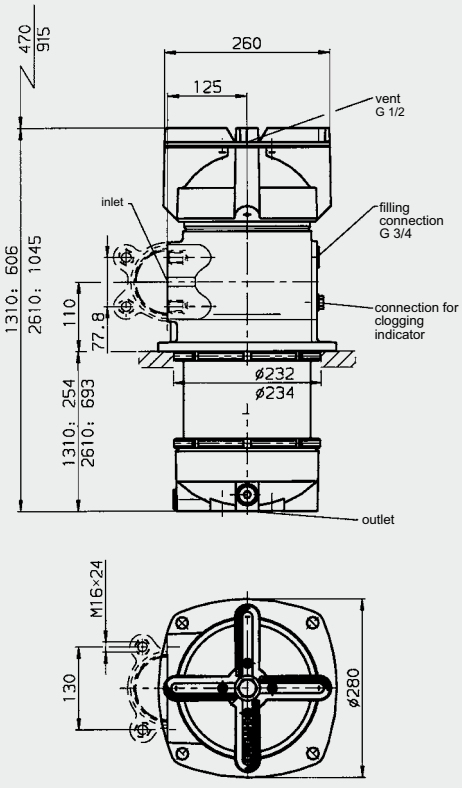

| NF | No. of elements | Weight incl. element [kg] | Vol. of pressure chamber[l] |
|---|---|---|---|
| 160 | 1x0160 R... | 4.5 | 0.8 |
| 240 | 1x0240 R... | 5.6 | 1.1 |
| 280 | 1x0280 R... | 9.1 | 2.1 |

| NF | No. of elements | Weight incl. element [kg] | Vol. of pressure chamber[l] |
|---|---|---|---|
| 330 | 1x0330 R... | 7.8 | 2.05 |
| 500 | 1x0500 R... | 9.0 | 2.80 |
| 750 | 1x0750 R... | 14.1 | 6.08 |

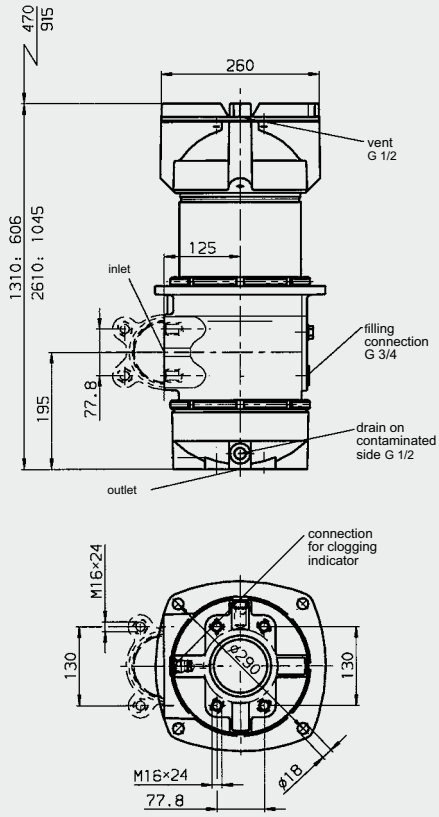
## NF 950, 1350, 2650




## NF 1310/2610 ... 1.X




## NF 1310/2610 ... 2.X



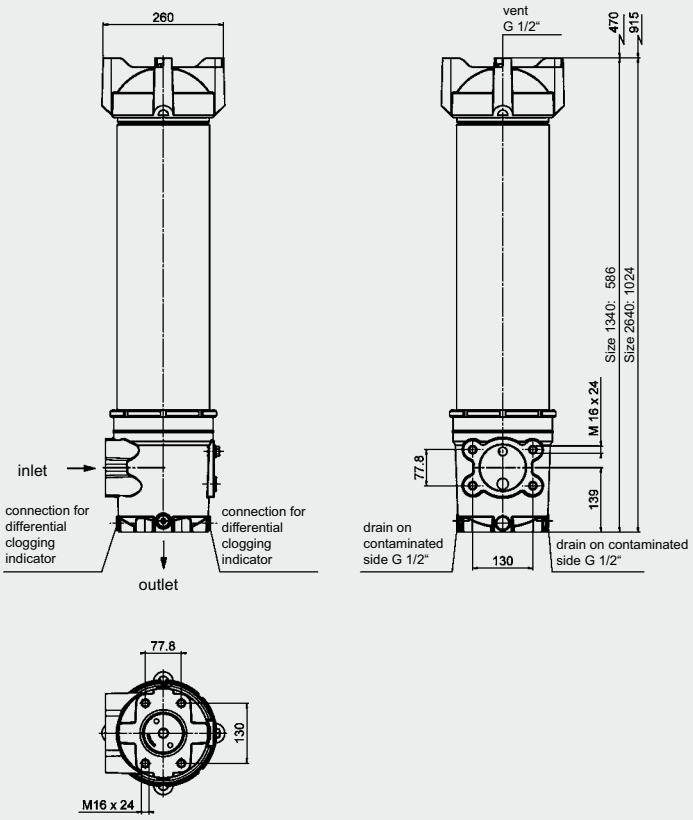

| Port | A | B | ØC | M |
|---|---|---|---|---|
| SAE DN 50 (2“) | 77.8 | 42.9 | 50 | M12x15 |
| SAE DN 65 (2½“) | 88.9 | 50.8 | 65 | M12x15 |
| SAE DN 80 (3“) | 106.4 | 62.9 | 75 | M16x24 |
| SAE DN 100 (4“) | 130.2 | 77.8 | 100 | M16 |

| NF | No. of elements | Weight incl. element [kg] | Vol. of pressure chamber |
|---|---|---|---|
| 1310...1.X | 1x1300 R... | 17 | 14 |
| 1310...2.X<br>1340...2.X | 1x1300 R... | 17 | 14 |

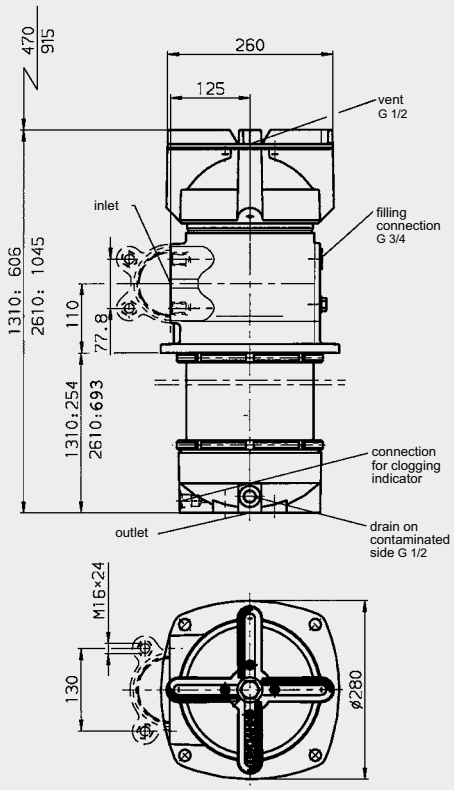
| NF | No. of elements | Weight incl. element [kg] | Vol. of pressure chamber[l] |
|---|---|---|---|
| 950 | 1x0950 R... | 16 | 10 |
| 1350 | 1x1300 R... | 18 | 13 |
| 2650 | 1x2600 R... | 25 | 25 |

| NF | No. of elements | Weight incl. element [kg] | Vol. of pressure chamber[l] |
|---|---|---|---|
| 2610...1.X | 1x2600 R... | 23 | 25 |
| 2610...2.X<br>2640...2.X | 1x2600 R... | 23 | 25 |

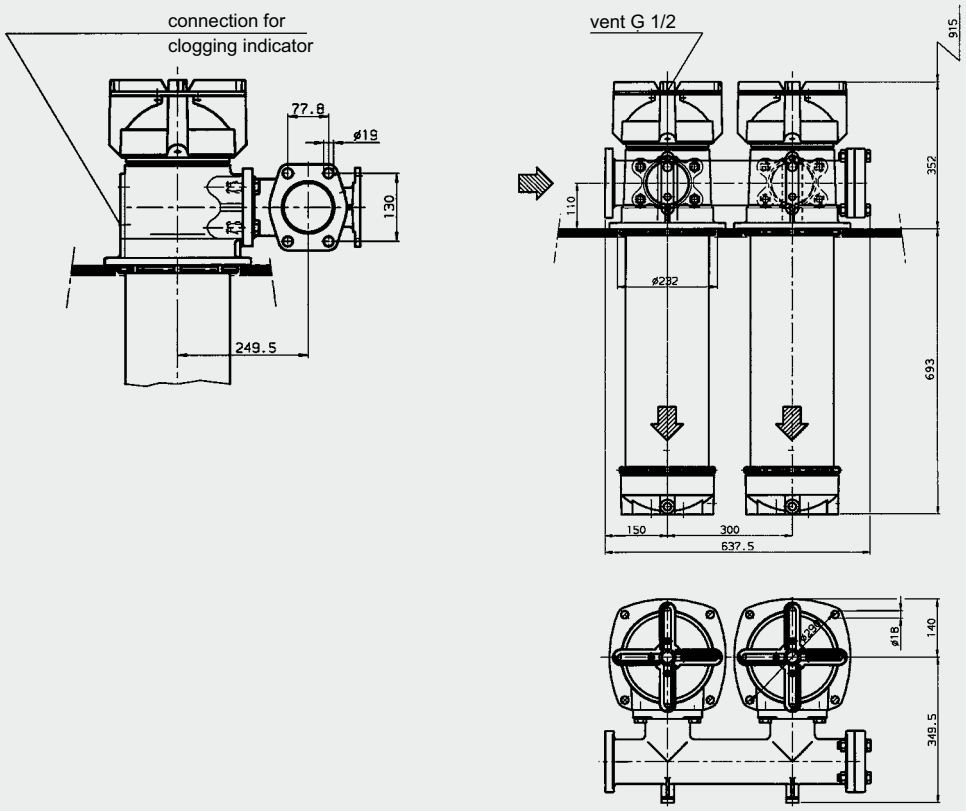
NF 1340/2640 ... 2.X
Standard series




NF 1310/2610 ... 3.X
On request




NF 5210 ... 1.X
On request

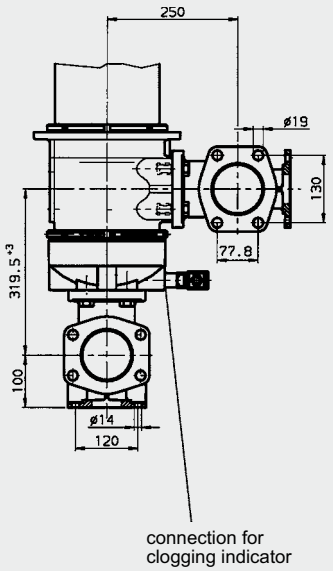


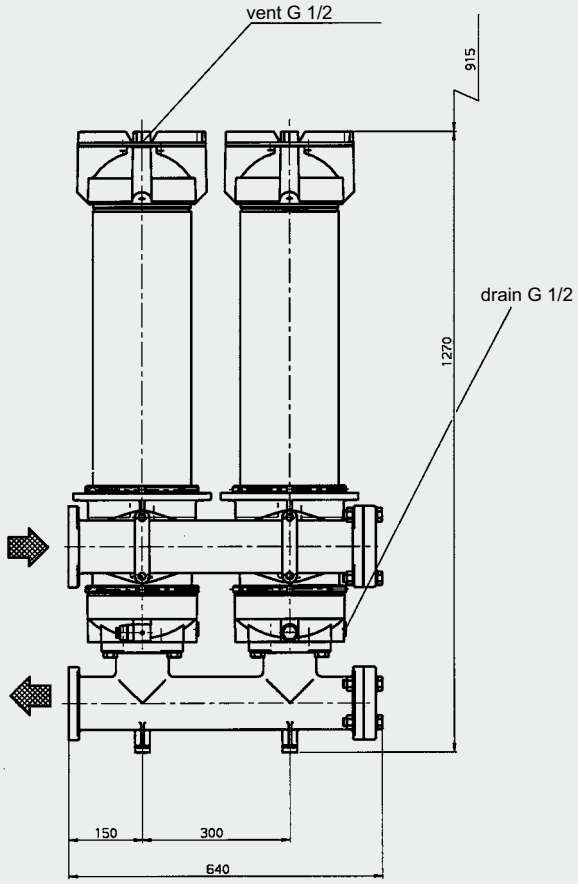

| NF | No. of elements | Weight incl. element [kg] | Vol. of pressure chamber [l] |
|---|---|---|---|
| 1310...2.X<br>1340...2.X | 1x1300 R... | 17 | 14 |
| 1310...3.X | 1x1300 R... | 17 | 14 |

| NF | No. of elements | Weight incl. element [kg] | Vol. of pressure chamber [l] |
|---|---|---|---|
| 5210...1.X | 2x2600 R... | 68 | 55 |

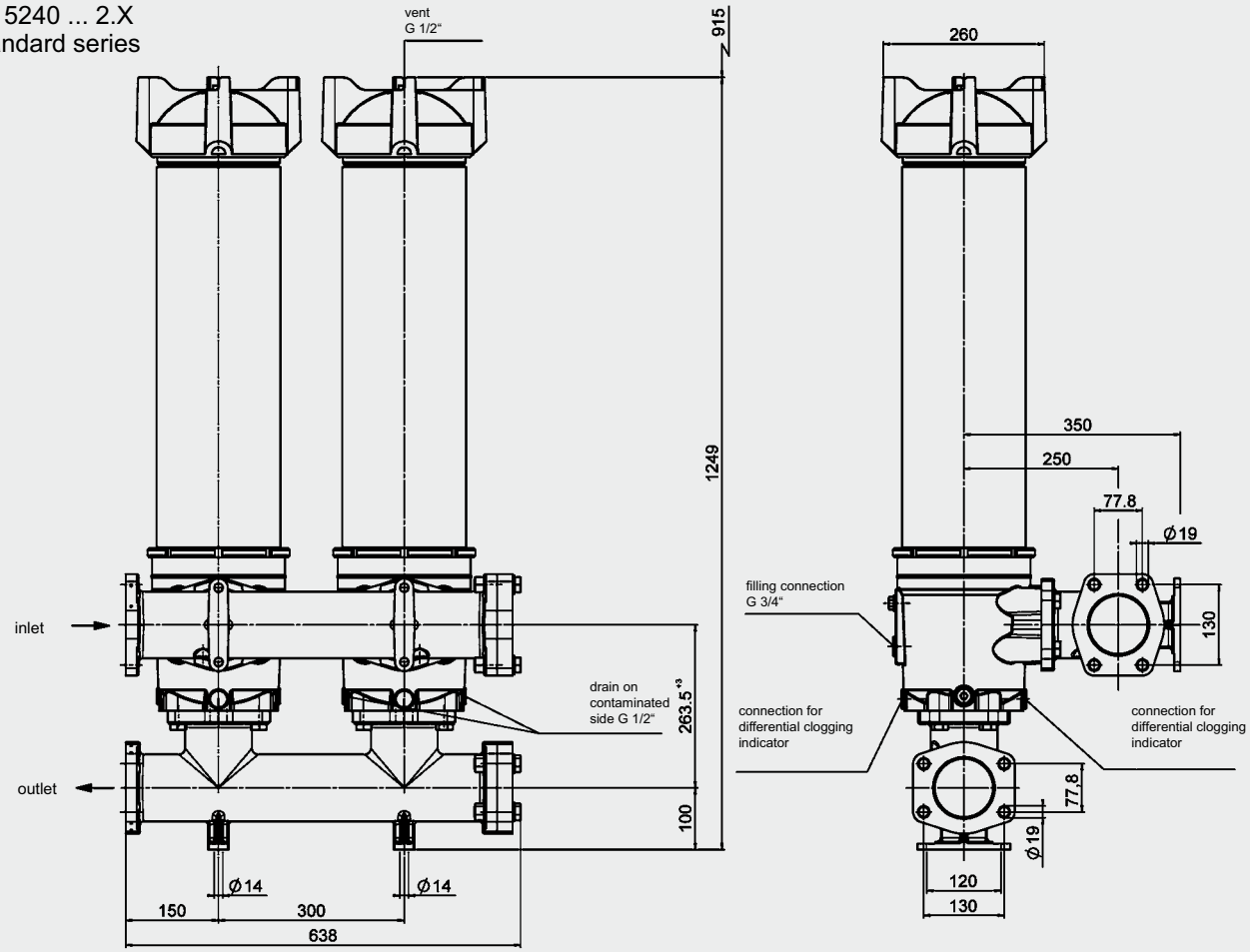
| NF | No. of elements | Weight incl. element [kg] | Vol. of pressure chamber [l] |
|---|---|---|---|
| 2610...2.X<br>2640...2.X | 1x2600 R... | 23 | 25 |
| 2610...3.X | 1x2600 R... | 23 | 25 |

## NF 5210 ... 2.X



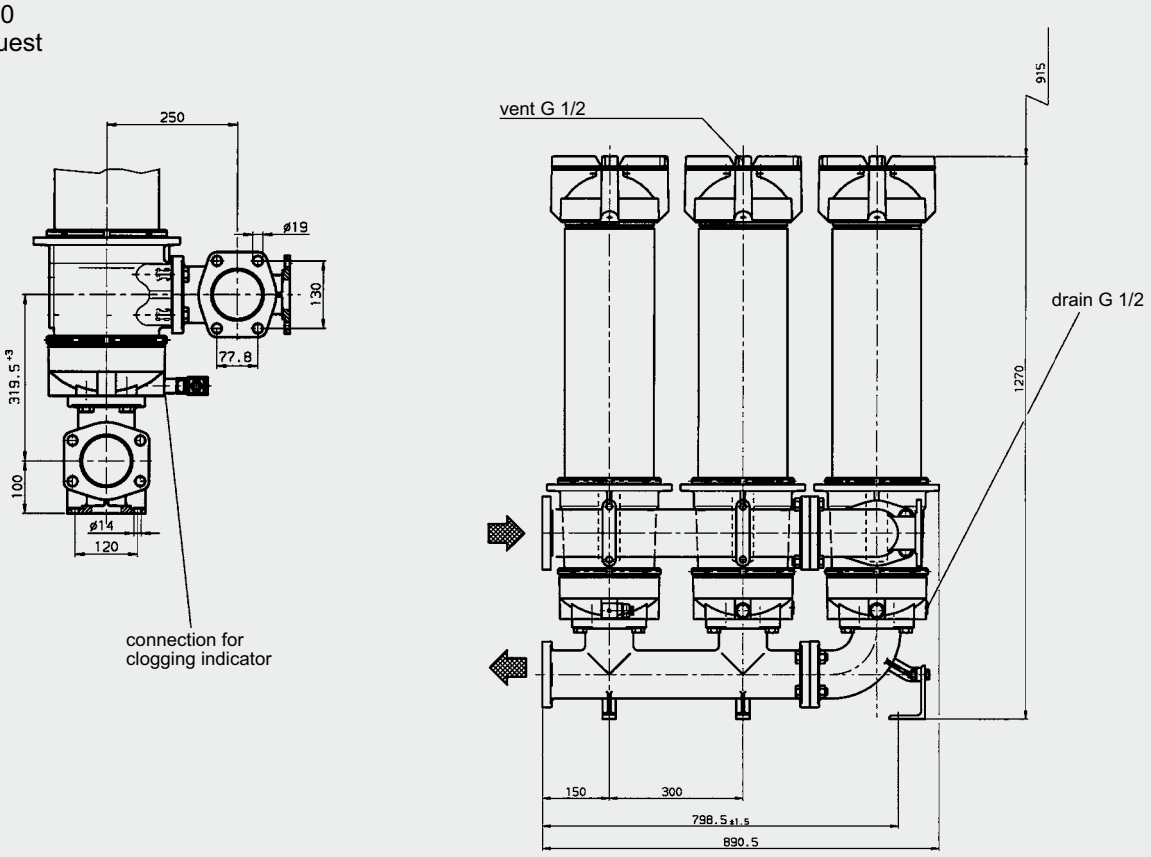




## NF 5240 ... 2.X
Standard series

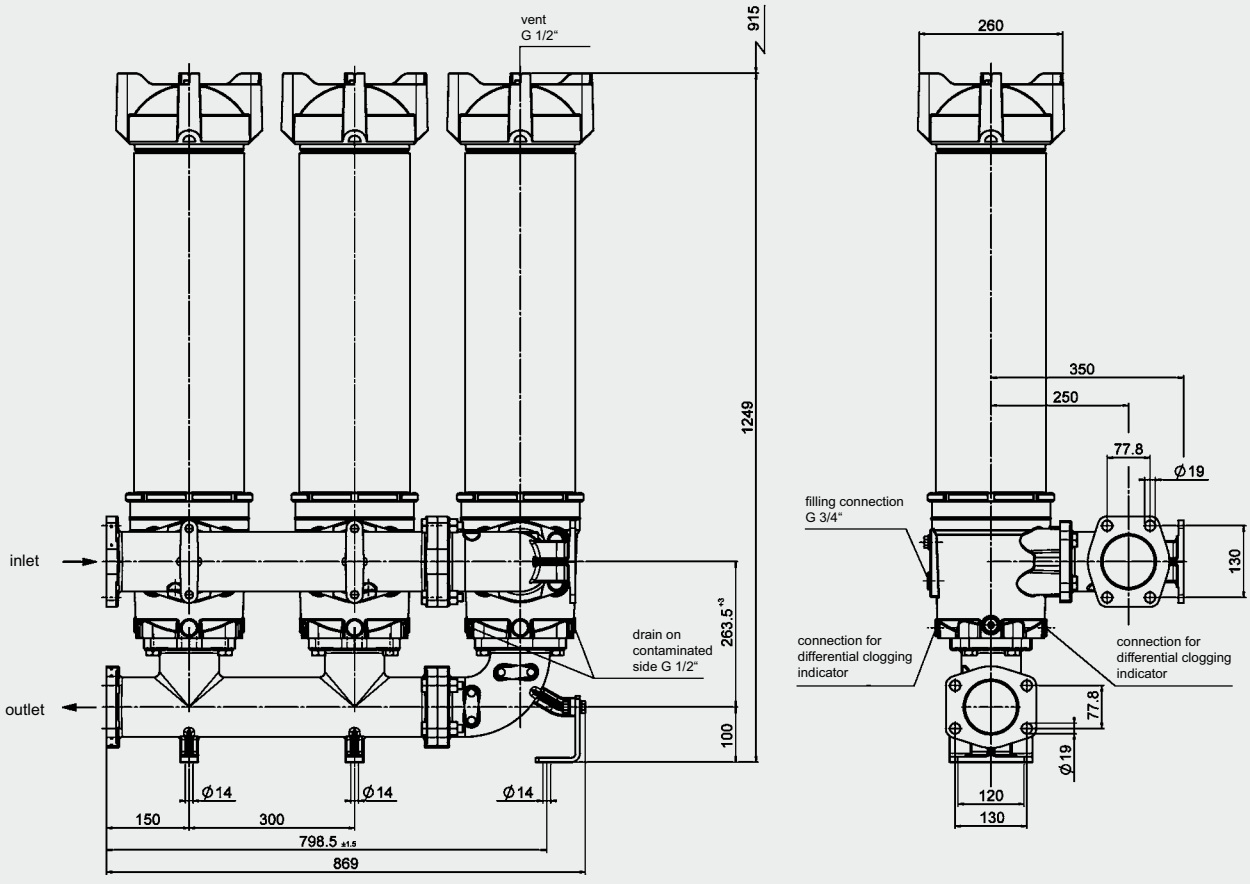



| NF | No. of elements | Weight incl. element [kg] | Vol. of pressure chamber[l] |
|---|---|---|---|
| 5210...2.X<br>5240...2.X | 2x2600 R... | 90 | 60 |

NF 7810
On request

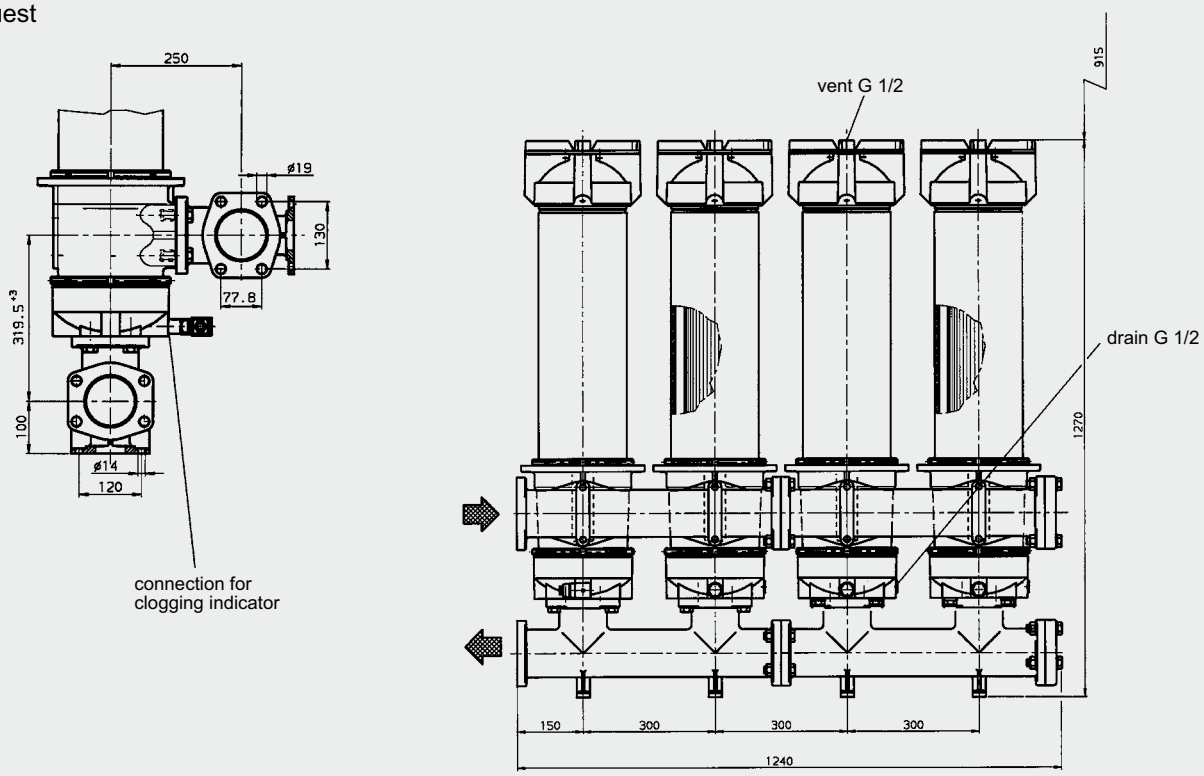



NF 7840
Standard series

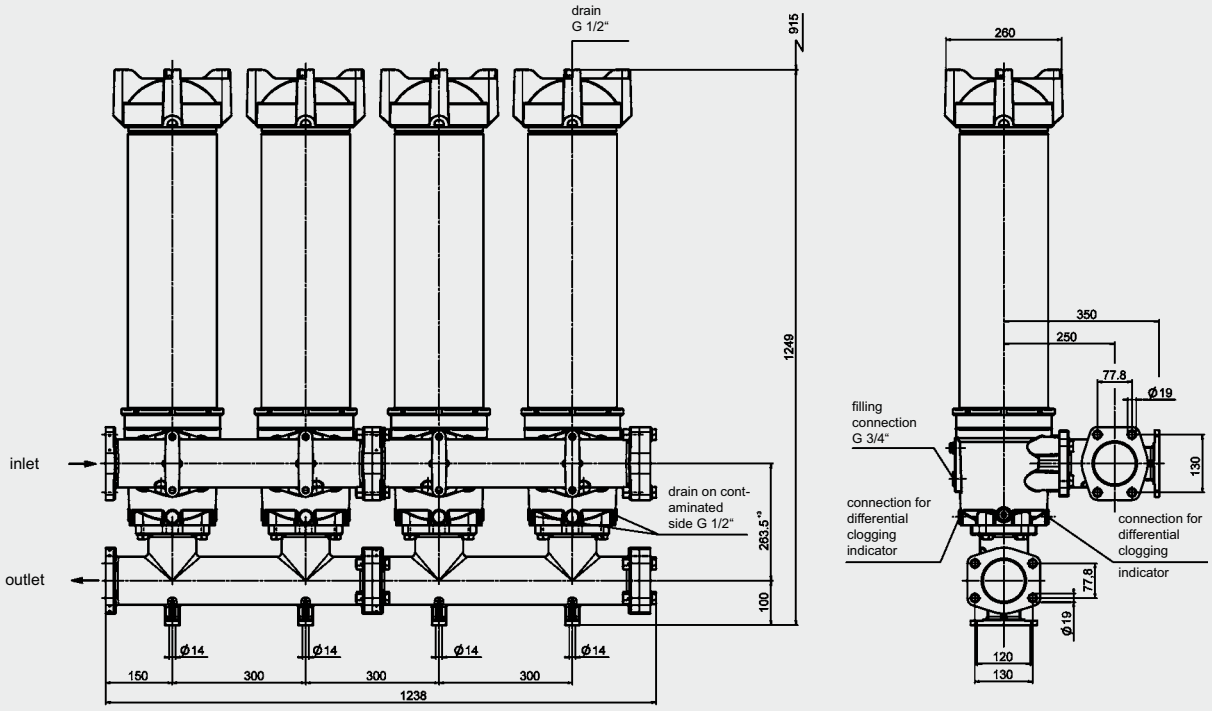



| NF | No. of elements | Weight incl. element [kg] | Vol. of pressure chamber [l] |
|---|---|---|---|
| 7810 / 7840 | 3x2600 R... | 125 | 88 |

NF 10410
On request




NF 10440
Standard series




| NF | No. of elements | Weight incl. element [kg] | Vol. of pressure chamber [l] |
|---|---|---|---|
| 10410 / 10440 | 4x2600 R... | 180 | 120 |

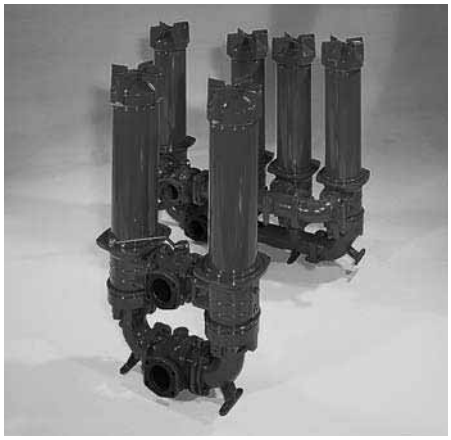
## NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

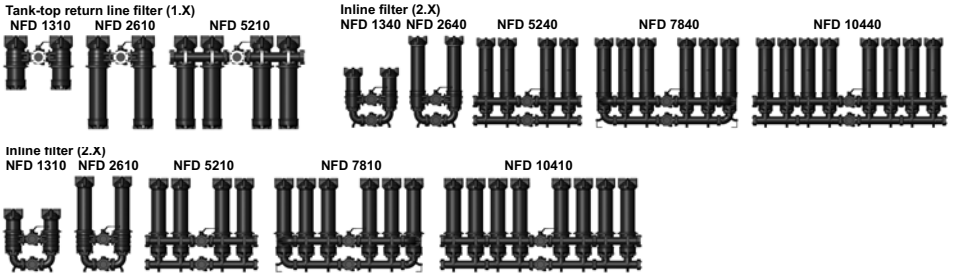
Subject to technical modifications.


HYDAC **Filtertechnik GmbH**
Industriegebiet
**D-66280 Sulzbach/Saar**
Tel.: 0 68 97 / 509-01
Fax: 0 68 97 / 509-300
Internet: www.hydac.com
E-Mail: filter@hydac.com



# Change-Over Filter NFD

## up to10400 l/min, up to 25 bar




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. They consist of a filter housing and a threaded cover plate. The housings are connected by a ball change-over valve.

Standard equipment:

- connection for a clogging indicator in filter head

### 1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

**Contamination retention capacities in g**

| NFD | Elements per side | Betamicron® (BN4HC) 3 µm | 5 µm | 10 µm | 20 µm |
|---|---|---|---|---|---|
| 13XX | 1x1300 R | 181.0 | 200.7 | 241.4 | 273.1 |
| 26XX | 1x2600 R | 369.4 | 409.4 | 492.5 | 557.2 |
| 52XX | 2x2600 R | 738.8 | 818.8 | 985.0 | 1114.4 |
| 78XX | 3x2600 R | 1108.2 | 1228.2 | 1477.5 | 1671.6 |
| 104XX | 4x2600 R | 1477.6 | 1637.6 | 1970.0 | 2228.8 |

Filter elements are available with the following pressure stability values:

| | |
|---|---|
| Betamicron® (BN4HC): | 20 bar |
| Wire mesh (W/HC): | 20 bar |
| Stainless steel fibre (V): | 210 bar |
| Paper (P/HC) | 10 bar |
| Betamicron®/Aquamicron® (BN4AM): | 10 bar |
| Aquamicron® (AM) | 10 bar |

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Nominal pressure | 25 bar |
| Temperature range | -10 °C to +100 °C |
| Material of filter housing and cover plate | Aluminium |
| Material of tube (housing) | Steel |
| Material of ball change-over valve | EN-GJS-400-15 |
| Type of clogging indicator | VM (differential pressure indicator)<br>VR (return line indicator) |
| Setting pressure of clogging indicator | 2 bar (others on request) |
| Bypass cracking pressure | 3 bar (others on request) |

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 MOUNTING

As tank-top return line filter or inline filter.

### 1.6 SPECIAL MODELS AND ACCESSORIES

On request

### 1.7 SPARE PARTS

See Original Spare Parts List

### 1.8 CERTIFICATES AND APPROVALS

On request

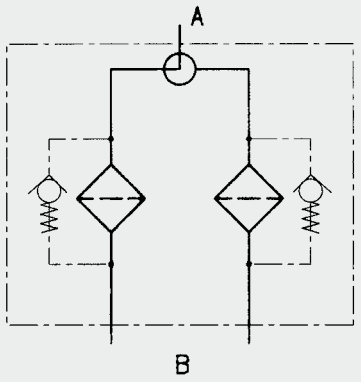
### 1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Non-flam operating fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

### 1.10 IMPORTANT INFORMATION

- Filter housing must be earthed
- When using visual clogging indicators, the BM version (visual with manual reset) only should be used.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

**Symbol for hydraulic systems**



## 2. MODEL CODE (also order example)

**NFD BN/HC 2610 D A P 10 D 1 . X /-L24**

### 2.1. COMPLETE FILTER

**Filter type**
NFD

**Filter material of element**

| | | | |
|---|---|---|---|
| BN/HC | Betamicron® (BN4HC) | P/HC | Paper |
| ECO/N | ECOmicron® (ECON2) | BN/AM | Betamicron®/Aquamicron® |
| W/HC | stainless steel wire mesh | AM | Aquamicron® |
| V | stainless steel fibre | | |

**Size of filter or element**
NFD: 1310, 1340, 2610, 2640, 5210, 5240, 7810, 7840, 10410, 10440

**Operating pressure**
D = 25 bar

**Type of change over**
A = ball

**Type and size of port**

| Type | Port | Filter size | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1310 | 1340 | 2610 | 2640 | 5210 | 5240 | 7810 | 7840 | 10410 | 10440 |
| P | SAE DN 100 | O | ● | O | ● | O | ● | O | ● | O | ● |

Further types and sizes of port on request!
For examples, see point 3.3
O = discontinued model

**Filtration rating in µm**
BN4HC, ECO/N, V: 3, 5, 10, 20 P/HC: 10, 20 AM: 40
W/HC: 25, 50, 100, 200 BN/AM: 3, 10

**Type of clogging indicator**

| | |
|---|---|
| Y | with plastic blanking plug in indicator port |
| A | with steel blanking plug in indicator port |
| B | visual indicator (version 1.X only) |
| BM | visual indicator |
| C | electrical indicator |
| D | visual and electrical indicator |

for other clogging indicators, see brochure no. 7.050.../...

**Type code**

1 Tank-top return line filter
- return line indicator (VR...)
- inlet flange horizontal at top, outlet vertical (from size NFD 5210 horizontal)
- tank seal supplied

2 Inline filter
- differential pressure indicator (VM...)
- inlet flange horizontal at bottom, outlet vertical (from size NFD 5210 horizontal)

| Code | Filter size | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1310 | 1340 | 2610 | 2640 | 5210 | 5240 | 7810 | 7840 | 10410 | 10440 |
| 1 | x | | x | | x | | | | | |
| 2 | O | ● | O | ● | O | ● | O | ● | O | ● |

x = on request
● = standard model
O = discontinued model

**Modification number**
X the latest version is always supplied

**Supplementary details**

| | |
|---|---|
| B. | special cracking pressure of bypass valve (e. g.: B6 = 6 bar) |
| EM | manual vent with shut-off valve |
| EP | permanent vent via Minimess hose |
| KB | no bypass valve |
| L... | light with appropriate voltage (24, 48, 110, 220 Volt) |
| LED | 2 light emitting diodes up to 24 Volt |
| SB4 | filling line with Ø4 mm orifice |
| V | FPM seals |
| VKD | drain fitted with ball shut-off valve |
| 39 | connection alternative (see point 2.4) |

only for clogging indicators type D

### 2.2 REPLACEMENT ELEMENT

**2600 R 010 BN4HC /-V**

**Size**
1300, 2600

**Type**

**Filtration rating in µm**
BN4HC, ECON2, V: 003, 005, 010, 020 P/HC: 010, 020 AM: 040
W/HC: 025, 050, 100, 200 BN4AM: 003, 010

**Filter material**
BN4HC, ECON2, V, W/HC, P/HC, BN4AM, AM

**Supplementary details**
V (for descriptions, see point 2.1)

### 2.3 REPLACEMENT CLOGGING INDICATOR

**VM 2 D . X /-L24**

**Type**

| | |
|---|---|
| VM | differential pressure indicator up to 210 bar operating pressure (only for inline filter code 2) |
| VR | return line indicator up to 25 bar operating pressure (only for tank-top filter code 1) |

**Pressure setting**
2 standard 2 bar, others on request

**Type of clogging indicator** (see point 2.1 )

**Modification number**
X the latest version is always supplied

**Supplementary details**
L..., LED, V (for descriptions, see point 2.1)

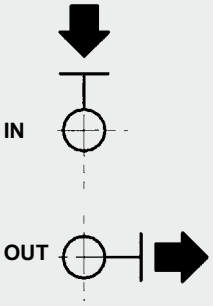
## 2.4 CONNECTION ALTERNATIVES

(Example)

**Supplementary details .. / – 0 3**

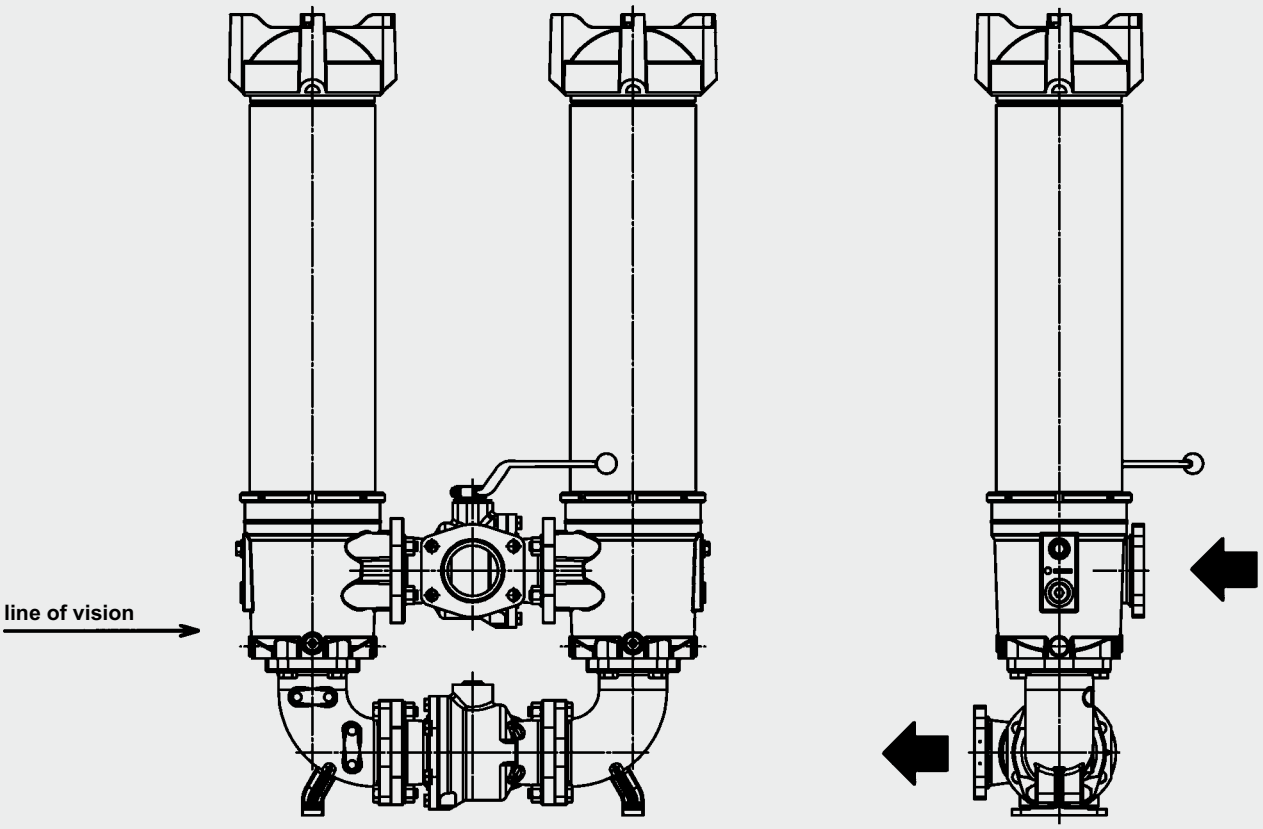
1st digit = position of inlet valve

2nd digit = position of the outlet valve



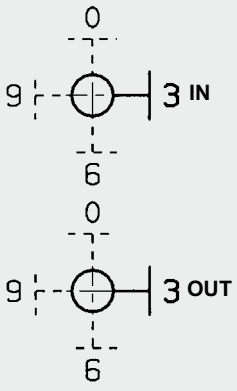

33 stand. **Standard model**
Not given as a supplementary detail in the model code

63 **Not available!**




**Line of vision**
Type code .. / –39

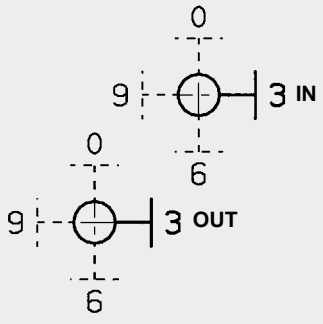
**NFD 2610/2640 .. A 2.0 / –XX**
(possible supplementary detail)




| | | | |
|---|---|---|---|
| 00 | 03 | 06 | 09 1) |
| 30 | 33 stand. | 36 | 39 |
| 60 | 63 | 66 | 69 |
| 90 | 93 2) | 96 | 99 3) |

1) corresponds to type 03
2) corresponds to type 39
3) corresponds to type 33

**NFD 5210/5240 .. A 2.0 / –XX**
(possible supplementary detail)




| | | | |
|---|---|---|---|
| 00 | 03 | 06 | 09 |
| 30 | 33 stand. | 36 | 39 |
| 60 | 63 | 66 | 69 |
| 90 | 93 | 96 | 99 |

# 3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = use graphs (see point 3.1)

$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see point 3.2)

n = no. of elements (see point 1.2 filter elements)

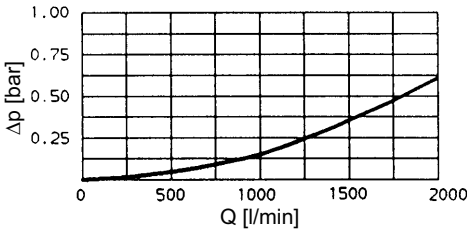
For ease of calculation, our Filter Sizing Program is available on request free of charge.

**NEW**: Sizing online at www.hydac.com

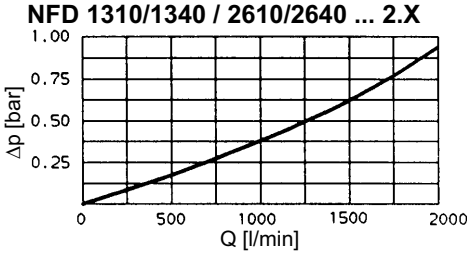
## 3.1 ΔP-Q HOUSING GRAPHS BASED ON ISO 3968

The housing graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

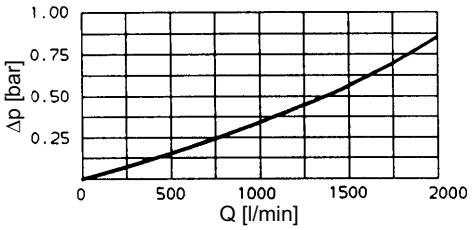
**NFD 1310/2610 ... 1.X**



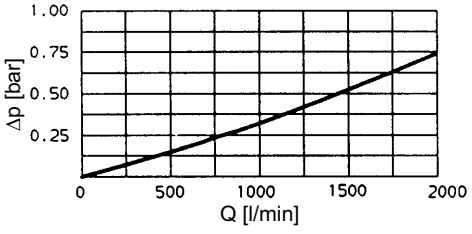

**NFD 1310/1340 / 2610/2640 ... 2.X**



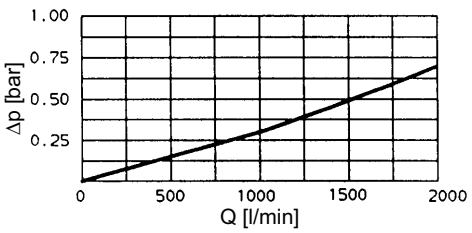

**NFD 5210 ... 1.X/2.X / 5240 ... 2.X**




**NFD 7810/7840 ... 2.X**




**NFD 10410/10440 ... 2.X**

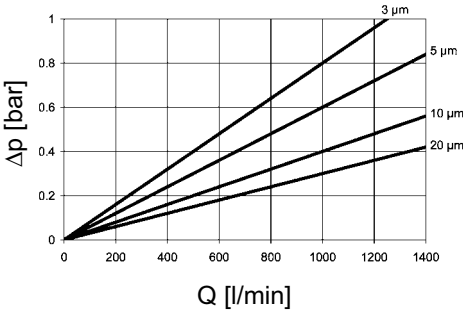



## 3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

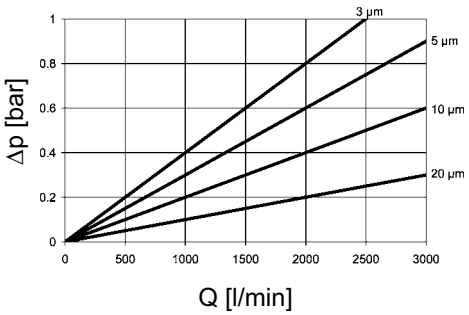
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

| NFD | V | | | | W/HC | ECON2 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 3 µm | 5 µm | 10 µm | 20 µm | – | 3 µm | 5 µm | 10 µm | 20 µm |
| 1300 | 0.5 | 0.4 | 0.3 | 0.2 | 0.045 | 0.8 | 0.6 | 0.4 | 0.3 |
| 2600 | 0.3 | 0.2 | 0.1 | 0.1 | 0.018 | 0.4 | 0.3 | 0.2 | 0.1 |

**BN4HC: 1300 R...**

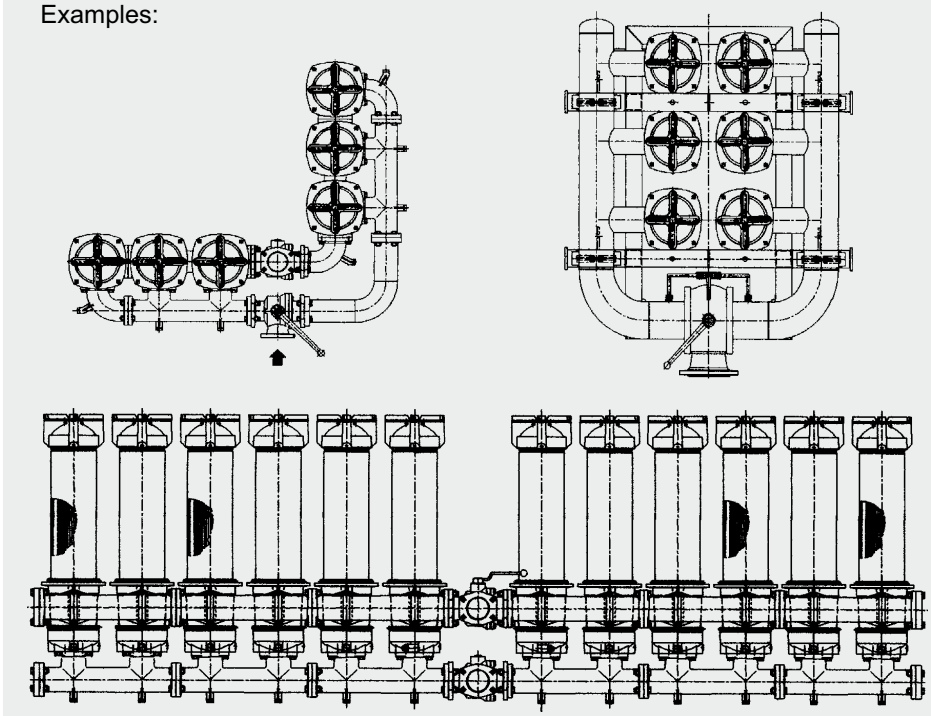



**BN4HC: 2600 R...**



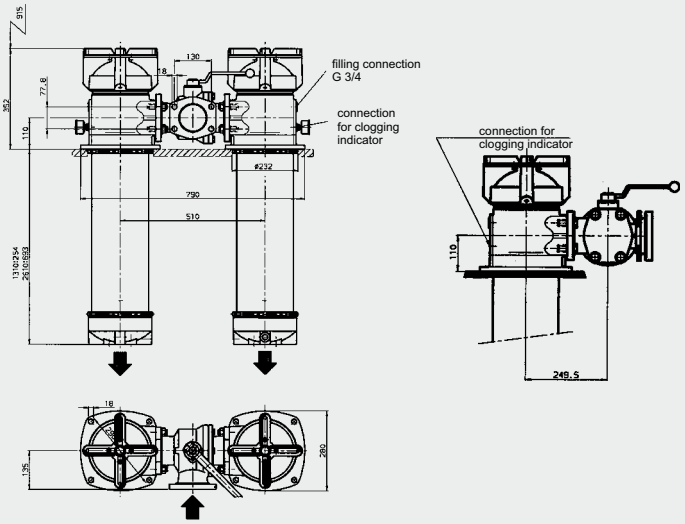

## 3.3. OTHER CONNECTION SIZES AND TYPES ON REQUEST!

Examples:

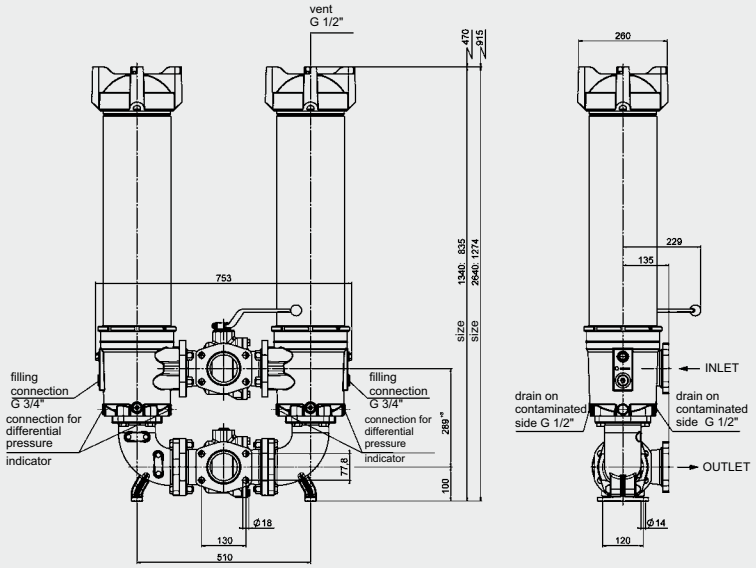


# 4. DIMENSIONS

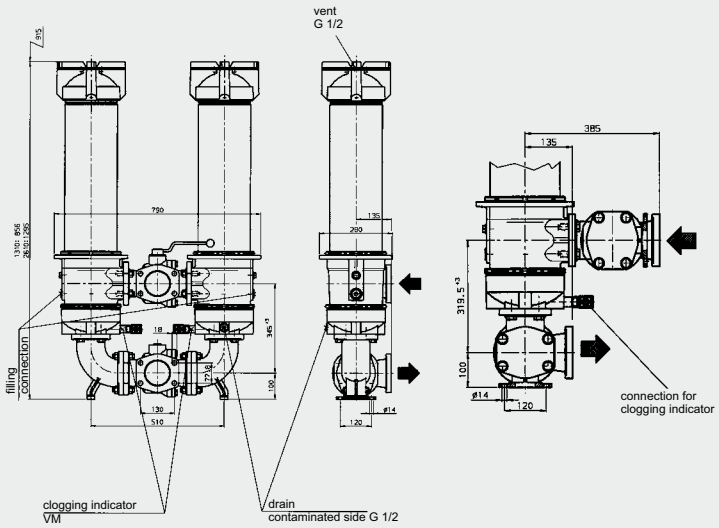
NFD 1310/2610...1.X
On request




NFD 1340/2640...2.X
Standard series

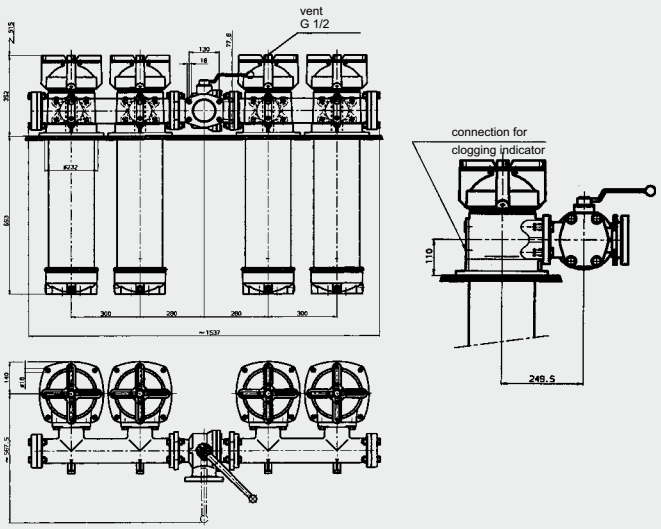



NFD 1310/2610...2.X

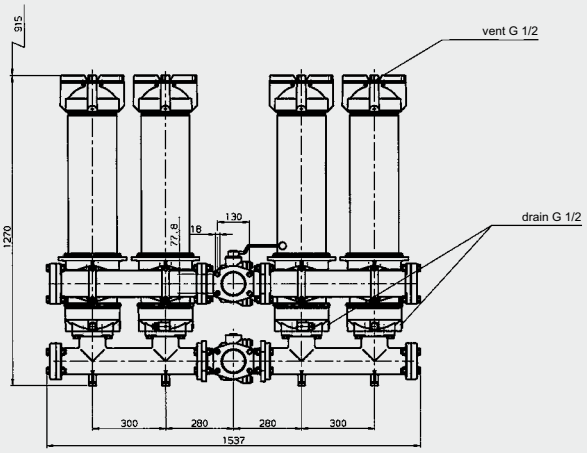



| NFD | No. of elements per side | Weight incl. element [kg] | Volume of pressure chamber [l] |
|---|---|---|---|
| 1310...1.X | 1x 1300 R... | 83.7 | 28.2 |
| 2610...1.X | 1x 2600 R... | 101.0 | 50.8 |
| 1310...2.X<br>1340...2.X | 1x 1300 R... | 122.7 | 35.8 |
| 2610...2.X<br>2640...2.X | 1x 2600 R... | 140.0 | 58.1 |

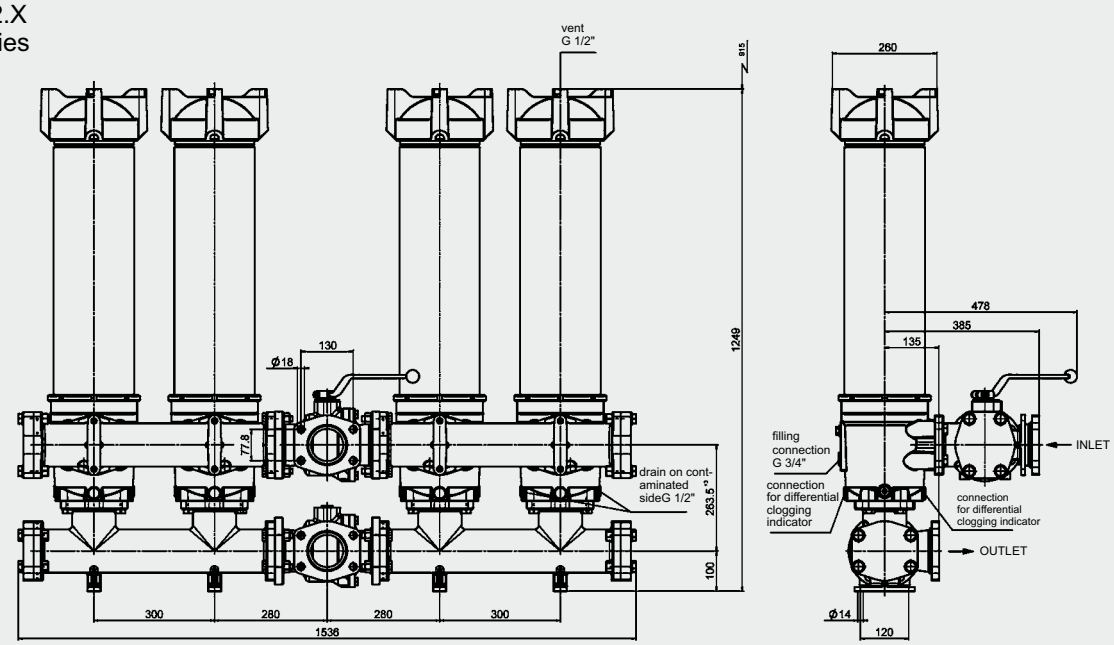
NFD 5210...1.X
On request



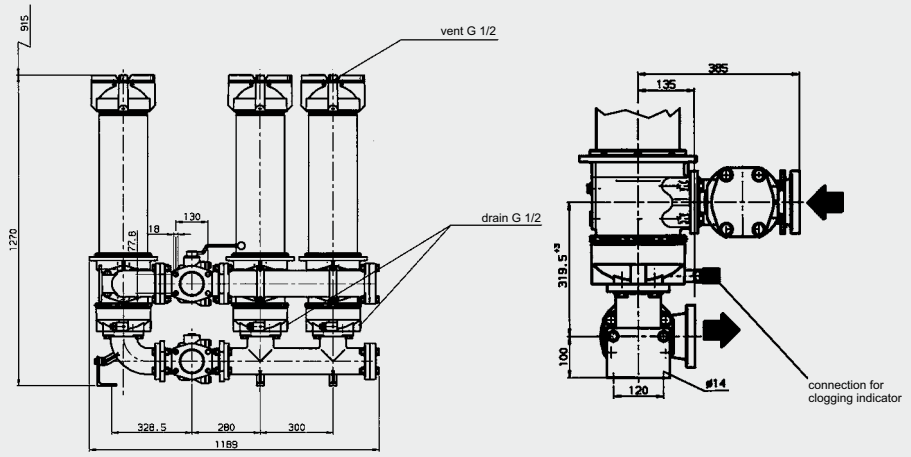

NFD 5210...2.X




NFD 5240...2.X
Standard series

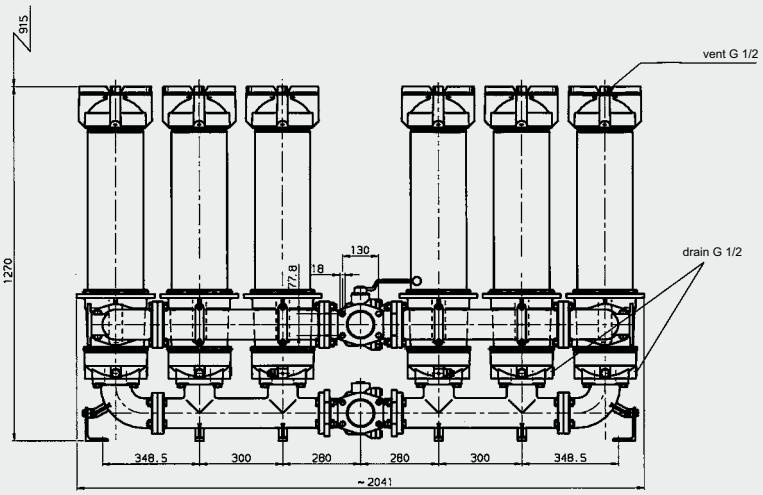



NFD 52XX...2.X /-1+2

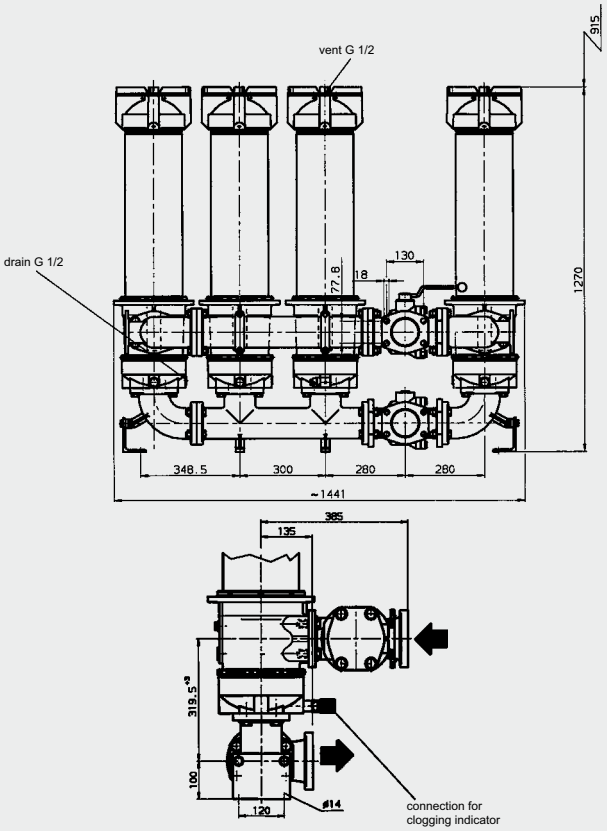



| NFD | No. of elements per side | Weight incl. element [kg] | Volume of pressure chamber [l] |
|---|---|---|---|
| 5210...1.X | 2x 2600 R... | 258.0 | 124.0 |
| 5210...2.X<br>5240...2.X | 2x 2600 R... | 276.8 | 126.4 |
| 5210../-1+2...2.X | 1x 2600 R... and<br>2x 2600 R... | 217.4 | 94.3 |

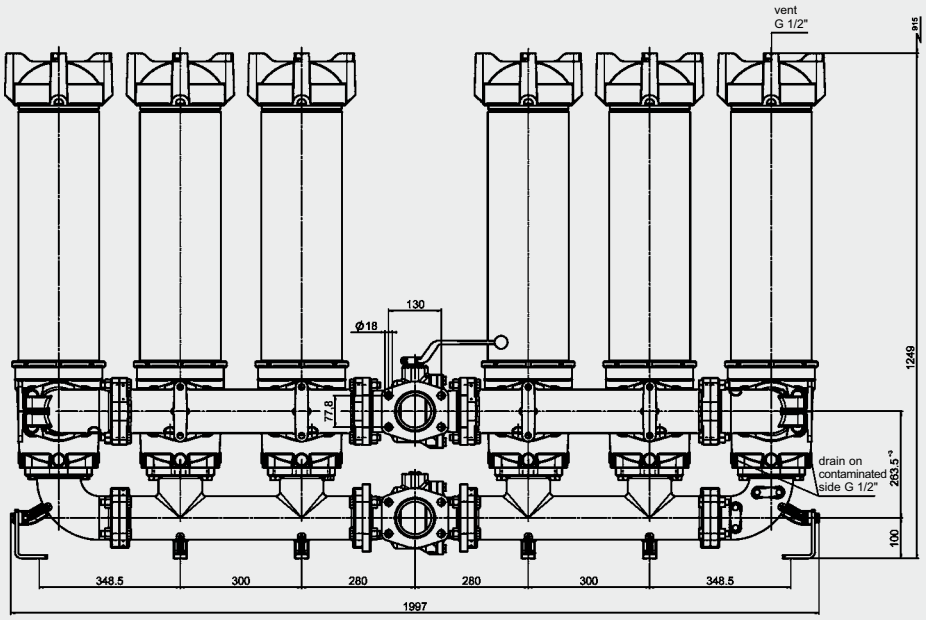
NFD 7810...2.X

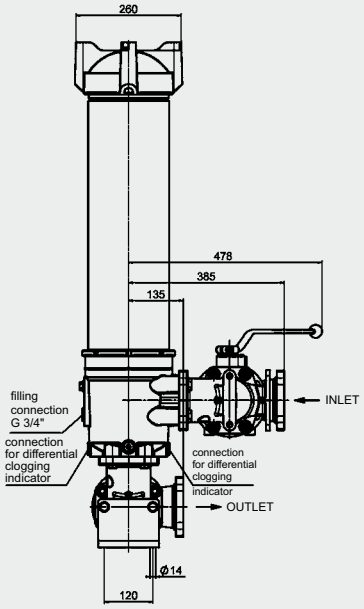



NFD 78XX...2.X /-3+1



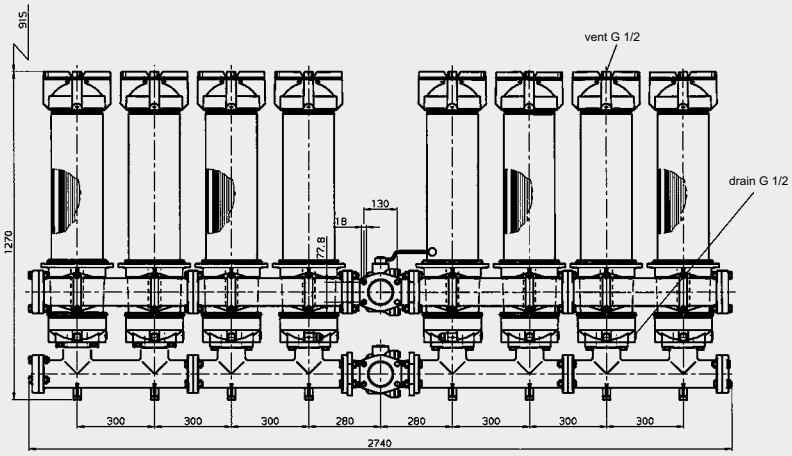

NFD 7840...2.X
Standard series



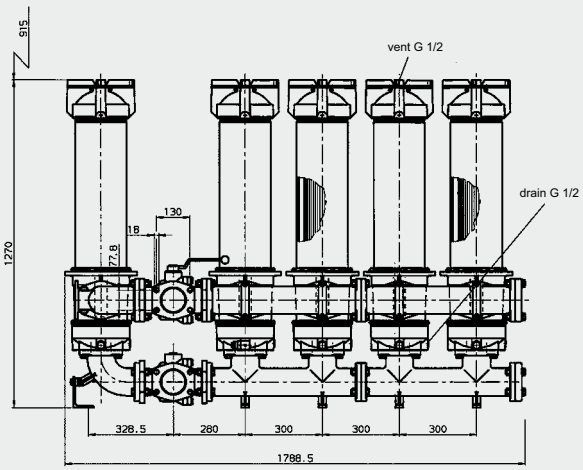



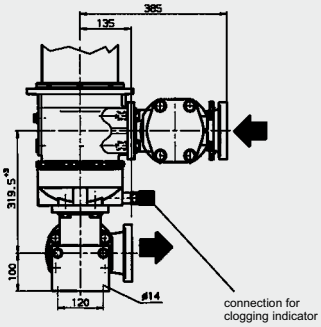

| NFD | No. of elements per side | Weight incl. element [kg] | Vol. of pressure chamber [l] |
|---|---|---|---|
| 7810<br>7840 | 3x 2600 R... | 391.6 | 182.8 |
| 7810../-3+1 | 3x 2600 R... and 1x 2600 R... | 286.6 | 122.2 |

NFD 10410...2.X

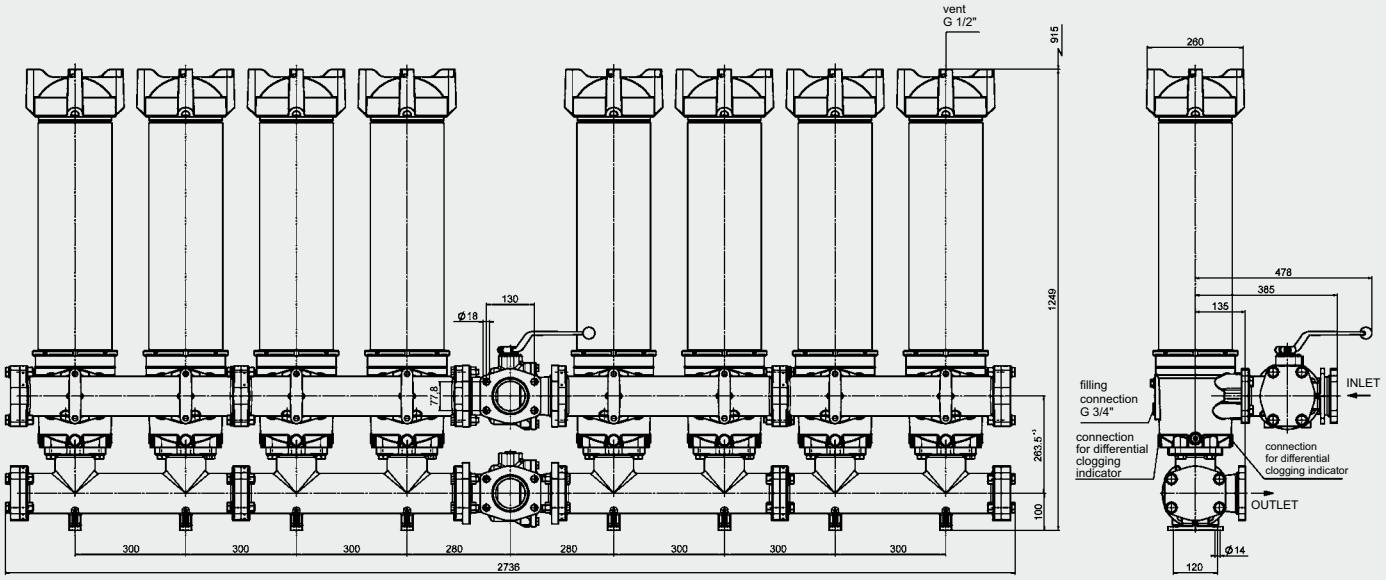



NFD 104XX...2.X /-1+4




NFD 10440...2.X
Standard series




| NFD | No. of elements per side | Weight incl. element [kg] | Volume of pressure chamber [l] |
|---|---|---|---|
| 10410<br>10440 | 4x 2600 R... | 510.4 | 251.0 |
| 10410../-1+4 | 1x 2600 R... and<br>4x 2600 R... | 328.3 | 154.0 |

## NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

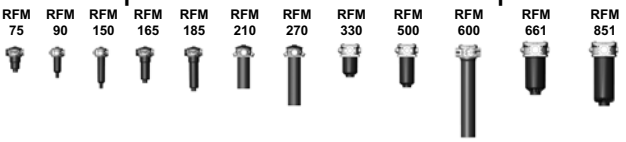
Subject to technical modifications.


HYDAC **Filtertechnik GmbH**
Industriegebiet
**D-66280 Sulzbach/Saar**
Tel.: 0 68 97 / 509-01
Fax: 0 68 97 / 509-300
Internet: www.hydac.com
E-Mail: filter@hydac.com



# Return Line Filter RFM

Tank-top mounted versions: up to 850 l/min, up to 10 bar




In-tank mounted versions: up to 2600 l/min, up to 10 bar




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. They consist of a filter head, filter bowl and a screw-on cover plate.

Standard equipment:

- with bypass valve
- connection for a clogging indicator (Important: For RFM 75 to 851 please indicate mounting position for indicator!)

### 1.2 FILTER ELEMENTS

Hydac filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

**Contamination retention capacities in g**

| | Betamicron® (BN4HC) | | | |
|---|---|---|---|---|
| RFM | 3 µm | 5 µm | 10 µm | 20 µm |
| 75 | 10.3 | 11.4 | 13.7 | 15.5 |
| 90 | 12.2 | 13.5 | 16.2 | 18.3 |
| 150 | 20.4 | 22.6 | 27.2 | 30.8 |
| 165 | 18.7 | 20.7 | 24.9 | 28.2 |
| 185 | 25.6 | 28.4 | 34.1 | 38.6 |
| 210 | 50.7 | 56.2 | 67.6 | 76.5 |
| 270 | 78.4 | 86.9 | 104.5 | 118.2 |
| 330 | 38.4 | 42.6 | 51.2 | 57.9 |
| 500 | 58.9 | 65.3 | 78.6 | 88.9 |
| 600 | 145.5 | 161.3 | 194.0 | 219.4 |
| 660 | 87.1 | 96.5 | 116.1 | 131.3 |
| 850 | 112.1 | 124.2 | 149.5 | 169.1 |
| 950 | 130.0 | 144.1 | 173.3 | 196.1 |
| 1300 | 181.0 | 200.7 | 241.4 | 273.1 |
| 2600 | 369.4 | 409.4 | 492.5 | 557.2 |

Filter elements are available with the following pressure stability values:

| | |
|---|---|
| Betamicron® (BN4HC): | 20 bar |
| ECOmicron® (ECON2): | 10 bar |
| Wire mesh (W/HC): | 20 bar |
| Paper (P/HC): | 10 bar |
| Betamicron® / Aquamicron® (BN4AM): | 10 bar |
| Aquamicron® (AM): | 10 bar |
| Mobilemicron (MM): | 10 bar |

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Nominal pressure | 10 bar |
| Temperature range | -30 °C to +100 °C (short-term: -40 °C) |
| Material of filter head | Aluminium |
| Material of filter bowl | Polyamide: all RFM except 210, 270<br>Steel : RFM 210, 270, 600 |
| Material of cover plate | Polyamide: RFM 75 to 270<br>Aluminium: RFM 330 to 851 |
| Type of clogging indicator | VR connection thread G ½<br>VMF connection thread G 1/8 |
| Pressure setting of clogging indicator | 2 bar (others on request) |
| Bypass cracking pressure | 3 bar (others on request) |

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 MOUNTING

As tank-top or in-tank filter

### 1.6 SPECIAL MODELS AND ACCESSORIES

- Connections for filling the hydraulic system via return line element (RFM 330 and above)
- Threaded connection in the outlet on request
- Breather filter built into the head on RFM 75 to 185
- Dipstick for RFM 75, 165, 185 (RFM 90 and 150 on request)
- Various in-tank versions

### 1.7 SPARE PARTS

See Original Spare Parts List

### 1.8 CERTIFICATES AND APPROVALS

On request

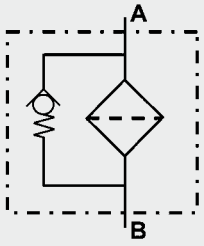
### 1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Non-flam operating fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

### 1.10 IMPORTANT INFORMATION

- Filter housing must be earthed
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector
- If a pipe extension is to be fitted to the two-piece filter housing, the pipe must be made of synthetic material or thin-wall aluminium.
- Extensions must be protected by fitting a bulkhead or other means of protection so that no forces can be transmitted to the filter housing or the extension.
- The filter can normally only be used for tank-mounting.
- The filter must be fitted absolutely vertically, or, after consultation with the manufacturer, only within the tolerances specified.
- The filter must not be used as a suction filter.
- Components (e.g. coolers) must not be fitted after the filter.

**Symbol for hydraulic systems**



## 2. MODEL CODE (also order example)

RFM BN/HC 500 B F F 10 D 1 . X /-L24

### 2.1 COMPLETE FILTER: TANK-TOP VERSION (for in-tank version, see point 2.5)

**Filter type**
RFM

**Filter material of element***

| | | | |
|---|---|---|---|
| BN/HC | Betamicron® (BN4HC) | ECO/N | ECOmicron® - not RFM 210, 270 and SET-Version 2600 |
| P/HC | Paper | BN/AM | Betamicron®/Aquamicron® - only RFM 330 to 851 |
| W/HC | Stainless steel wire mesh | AM | Aquamicron® - only RFM 330 to 851 |
| MM | Mobilemicron | * RFM 600 only available in BN4HC material! | |

**Size of filter or element**
RFM: 75, 90, 150, 165, 185, 210, 270, 330, 500, 600, 661, 851

**Operating pressure**
B = 10 bar

**Additional inlet**

| Type | Port | Filter size 330 | 500 | 600 | 661 | 851 |
|---|---|---|---|---|---|---|
| F | G 1 ½ | ● | ● | | | |
| K | SAE DN 40 | ● | ● | | | |
| M | SAE DN 65 | | | | ● | ● |
| Z | To customer spec. | | | ● | | |

**Type and size of port (1 inlet)**

| Type | Port | Filter size 75 | 90 | 150 | 165 | 185 | 210 | 270 | 330 | 500 | 600 | 661 | 851 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B | G ½ | ● | X | X | ● | ● | | | | | | | |
| C | G ¾ | ● | ● | ● | ● | ● | | | | | | | |
| D | G 1 | ● | X | X | ● | ● | ● | ● | | | | | |
| E | G 1¼ | | | | | | ● | ● | | | ● | | |
| F | G 1½ | | | | | | ● | ● | ● | ● | ● | | |
| K | SAE DN 40 | | | | | | | | ● | ● | ● | | |
| L | SAE DN 50 | | | | | | | | | | ● | | |
| M | SAE DN 65 | | | | | | | | | | | ● | ● |

For KIT, SET and S versions see point 2.6

X on request

**Filtration rating in µm**

| | | | | | |
|---|---|---|---|---|---|
| BN/HC, ECO/N: | 3, 5, 10, 20 | BN/AM: | 3, 10 (only RFM 330 to 851) | W/HC: | 25, 50, 100, 200 |
| P/HC: | 10, 20 | AM: | 40 (only RFM 330 to 851) | MM: | 10, 15 |

**Type of clogging indicator**
Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
B/BM visual (only RFM 330 to 851)
C electrical
D visual and electrical

for other clogging indicators see brochure no. E 7.050../..

**Type code**
0 no indicator port, no clogging indicator
1-4 see point 2.5 - note position of clogging indicator!

**Modification number**
X the latest version is always supplied

**Supplementary details**
A..-B.. setting pressure of indicator and cracking pressure of bypass in bar (e.g.: A5-B6)
BA filling connection (RFM 330 to 851)
L... light with appropriate voltage (24V, 48V, 110V, 220V)
LED 2 light emitting diodes up to 24 Volt

only for clogging indicators type D

PSxx dipstick for RFM 75, 165, 185 on request
PZxx dipstick for RFM 90, 150 on request
T with tank breather filter (only for RFM 75 to185)
V FPM seals
Vxxx with pipe extension (where xxx is the final dimension of the extension)
W suitable for HFA and HFC emulsions
xxxxx RFM 600 only (see point 2.4)

### 2.2 REPLACEMENT ELEMENT

0500 R 010 BN4HC /-V

**Size**
0075, 0090, 0150, 0165, 0185, 0210, 0270, 0330, 0500, 0600, 0660, 0850

**Type**
R

**Filtration rating in µm**

| | | | | | |
|---|---|---|---|---|---|
| BN4HC, ECON2: | 003, 005, 010, 020 | W/HC: | 025, 050, 100, 200 | AM: | 040 |
| P/HC: | 010 | BN4AM: | 003, 010 | MM: | 010, 015 |

**Filter material**
BN4HC, ECON2, P/HC, W/HC, BN4AM, AM, MM

**Supplementary details**
V (for descriptions, see point 2.1)

## 2.3 REPLACEMENT CLOGGING INDICATOR

**VR 2 D . X /-L24**

**Type**
VR connection thread G 1/2 ] return line indicator up to
VMF connection thread G 1/8 ] 25 bar operating pressure

**Pressure setting**
2 2 bar standard, others on request

**Type of clogging indicator**
see point 2.1

**Modification number**
X the latest version is always supplied

**Supplementary details**
L..., LED, V (for descriptions, see point 2.1)

## 2.4 PORT CONFIGURATION RFM 600

Since there are numerous options for machining the ports on the head of the RFM 600, the code B**Z**x is selected here as standard. In order to determine the position and size of the ports, a 5-digit code is added as a supplementary detail. This is determined using the table below. Unused ports are indicated by a "0".

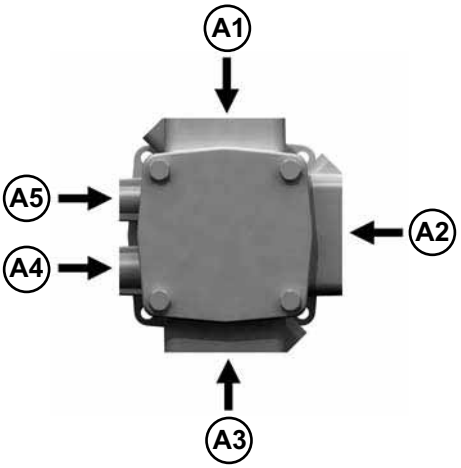
for RFM 600...B**ZK**

| Port | A1 | A2 | A3 | A4 | A5 |
|---|---|---|---|---|---|
| G ¾ | | | | | C |
| G 1 | | | | D | |
| G 1¼ | E | E | E | | |
| SAE DN 40 | K | K | K | | |
| plugged | 0 | 0 | 0 | 0 | 0 |

for RFM 600...B**ZL**

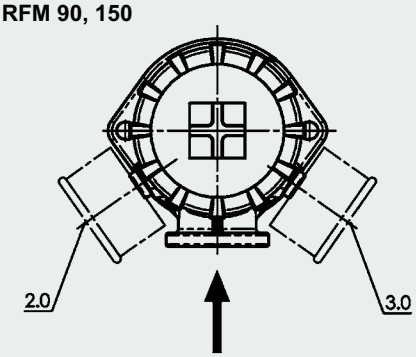
| Port | A1 | A2 | A3 | A4 | A5 |
|---|---|---|---|---|---|
| G ¾ | | | | | (C) |
| G 1 | | | | D | |
| G 1½ | F | (F) | F | | |
| SAE DN 50 | L | L | (L) | | |
| plugged | (0) | 0 | 0 | (0) | 0 |

Example:
RFM BN/HC 600 BZL 10 A 1.0 /-0FL0C



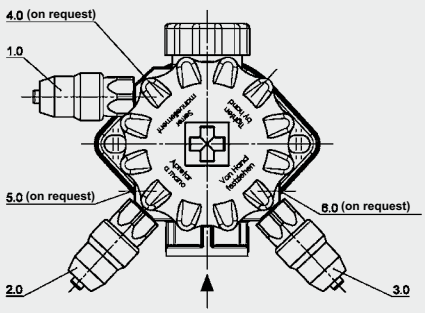

## 2.5 TYPE CODE: MOUNTING POSITION OF THE CLOGGING INDICATOR

**RFM 90, 150**



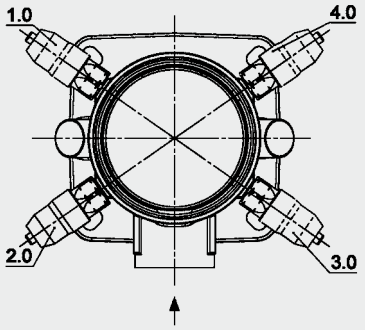

| Type code | Mounting position of the clogging indicator | Type of indicator |
|---|---|---|
| 2.X | Clogging indicator on front left, 45° to the inlet | VMF... |
| 3.X | Clogging indicator on front right, 45° to the inlet | VMF... |

**RFM 75, 165, 185**



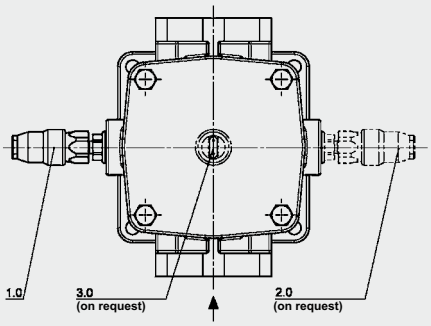

| Type code | Mounting position of the clogging indicator | Type of indicator |
|---|---|---|
| 1.X | Clogging indicator on left back, 90° to the inlet | VMF... |
| 2.X | Clogging indicator on left front, 45° to the inlet | VMF... |
| 3.X | Clogging indicator on right front, 45° to the inlet | VMF... |

**RFM 210, 270**



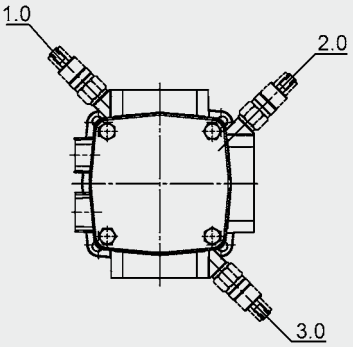

| Type code | Mounting position of the clogging indicator | Type of clogging indicator |
|---|---|---|
| 1.X | Clogging indicator on left back, 135° to the inlet | VMF... |
| 2.X | Clogging indicator on left front, 45° to the inlet | VMF... |
| 3.X | Clogging indicator on right front, 45° to the inlet | VMF... |
| 4.X | Clogging indicator on right back, 135° to the inlet | VMF... |

**RFM 330, 500**



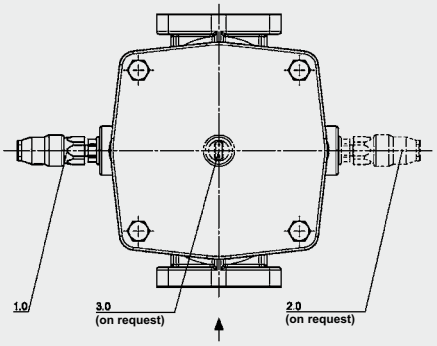

| Type code | Mounting position of the clogging indicator | Type of clogging indicator |
|---|---|---|
| 1.X | Clogging indicator on left, 90° to the inlet | VR... |

**RFM 600**




| Type code | Mounting position of the clogging indicator | Type of clogging indicator |
|---|---|---|
| 1.X | see drawing | VMF... |
| 2.X | see drawing | VMF... |
| 3.X | see drawing | VMF... |

**RFM 661, 851**




| Type code | Mounting position of the clogging indicator | Type of clogging indicator |
|---|---|---|
| 1.X | Clogging indicator on left, 90° to the inlet | VR... |

**NOTE**
Other type codes on request

## 2.6 MODEL CODE: IN-TANK MOUNTING FILTER

### KIT VERSION



**RFM BN/HC 165 KIT 10 W 1.0 /-V**

**Size**
75, 90, 150, 165, 185, 210, 270, 330, 500, 661, 851

**In-tank mounting version**
KIT bowl only with element and seal

**Supplementary details**
B. bypass cracking pressure (e.g. B6 = 6 bar)
DFxxx spring extension (where xxx is the corresponding length) - on request
G threaded connection in outlet (RFM 330 to 851)
V FPM seal
Vxxx pipe extension (where xxx is the final dimension of the extension)

### SET VERSION, screw-on Sizes 330 and 500



**RFM BN/HC 330 SET 10 W 1.0 /-V**

**Size**
330, 500

**In-tank mounting version**
SET bowl only with element and seal, plus adaptor ring

**Supplementary details**
B. bypass cracking pressure (e.g. B6 = 6 bar)
G threaded connection in outlet
V FPM seal
Vxxx pipe extension (where xxx is the final dimension of the extension)

### SET - VERSION, screw-on Sizes 950 to 2600



**RFM ECO/N 950 SET 10 W 1.0 /-SO441**

**Size**
950, 1300 (ECO/N)
2600 (BN/HC)

**In-tank mounting version**
SET element only with integral contamination retainer, element location spigot and spring

**Supplementary details**
SO441 this code must be added, also required for replacement element
V FPM seal

### S VERSION, weld-in version



**RFM BN/HC 165 S 10 W 1.0 /-V**

**Size**
75, 165, 185

**In-tank mounting version**
S bowl only with element and seal, plus adaptor ring

**Supplementary details**
B. bypass cracking pressure (e.g. B6 = 6 bar)
V FPM seal
Vxxx pipe extension (where xxx is the final dimension of the extension)

* Other supplementary details on request (or point 2.1)

## 3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see point 3.1)

$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see point 3.2)

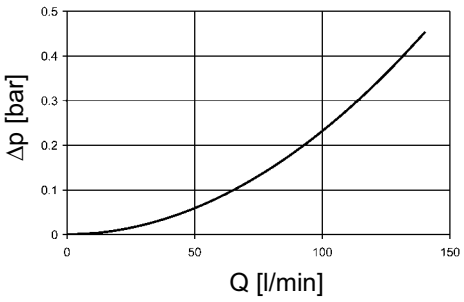
For ease of calculation, our Filter Sizing Program is available on request free of charge.

**NEW:** Sizing online at www.hydac.com

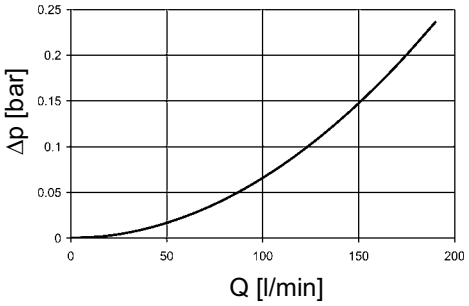
### 3.1 Δp-Q HOUSING GRAPHS BASED ON ISO 3968

The housing graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

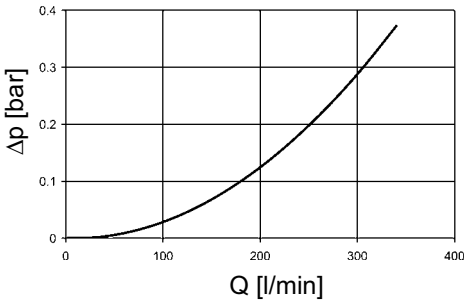
**RFM 90, 150**



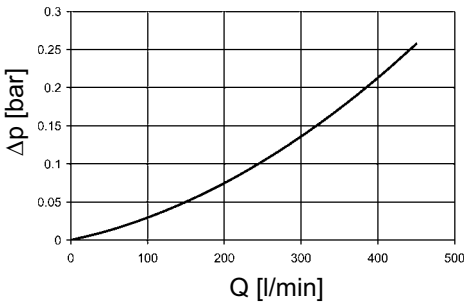

**RFM 75, 165, 185**



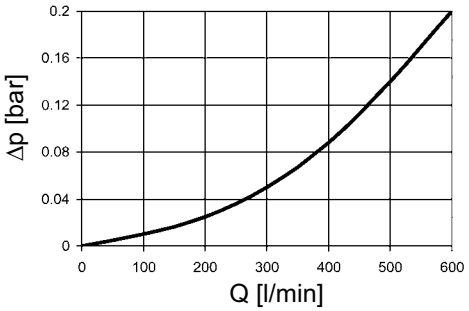

**RFM 210, 270**



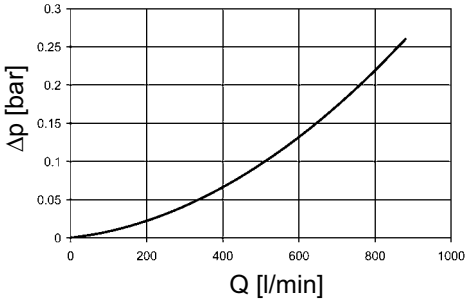

**RFM 330, 500**




**RFM 600**




**RFM 661, 851**

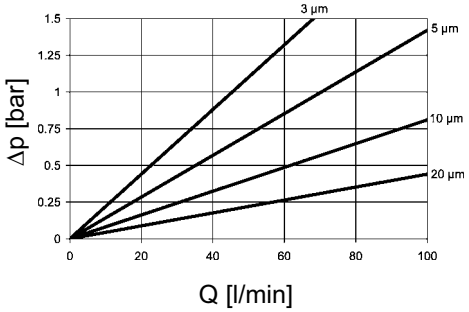


## 3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

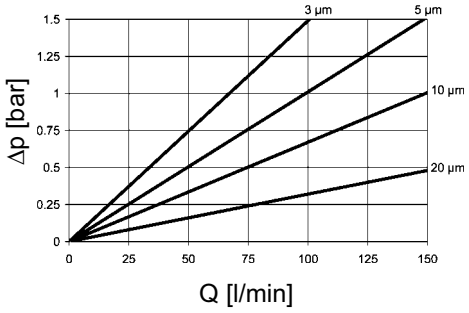
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 $mm^2/s$. The pressure drop changes proportionally to the change in viscosity.

| RFM | ECON2 | | | | W/HC |
|---|---|---|---|---|---|
| | 3 µm | 5 µm | 10 µm | 20 µm | – |
| 75 | - | - | 8.1 | 4.4 | 0.702 |
| 90 | - | - | 6.7 | 3.2 | - |
| 150 | 8.9 | 6.0 | 4.0 | 1.9 | - |
| 165 | 11.2 | 7.8 | 4.5 | 2.4 | 0.324 |
| 185 | 8.9 | 6.1 | 3.3 | 1.8 | - |
| 210 | - | - | - | - | - |
| 270 | - | - | - | - | - |
| 330 | 4.2 | 2.7 | 1.7 | 1.2 | 0.162 |
| 500 | 3.0 | 1.9 | 1.3 | 0.8 | 0.108 |
| 600 | - | - | - | - | - |
| 660 | 1.9 | 1.2 | 0.8 | 0.5 | 0.081 |
| 850 | 1.5 | 1.0 | 0.7 | 0.4 | 0.063 |
| 950 | 1.2 | 0.8 | 0.5 | 0.4 | 0.054 |
| 1300 | 0.8 | 0.6 | 0.4 | 0.3 | 0.045 |
| 2600 | 0.4 | 0.3 | 0.2 | 0.1 | 0.018 |

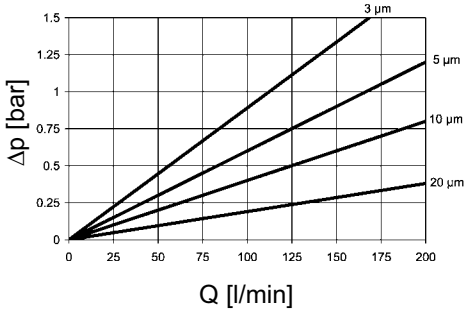
### BN4HC: RFM 75



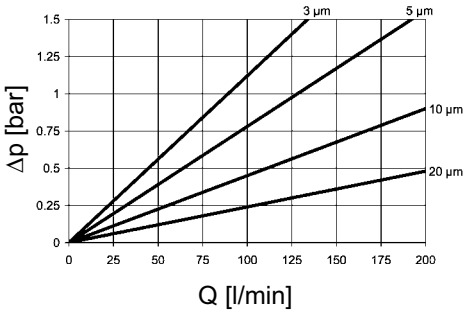

### BN4HC: RFM 90



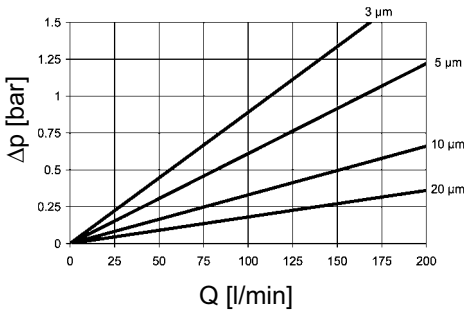

### BN4HC: RFM 150



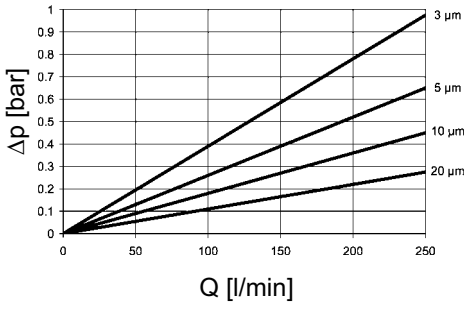

### BN4HC: RFM 165



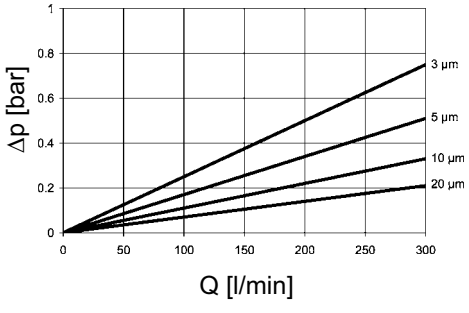

### BN4HC: RFM 185



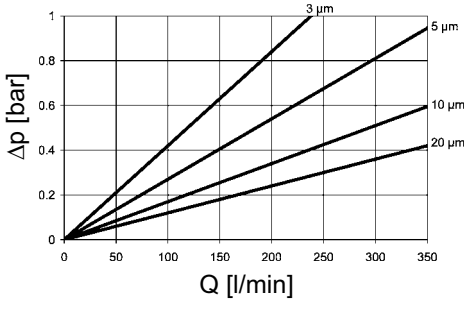

### BN4HC: RFM 210



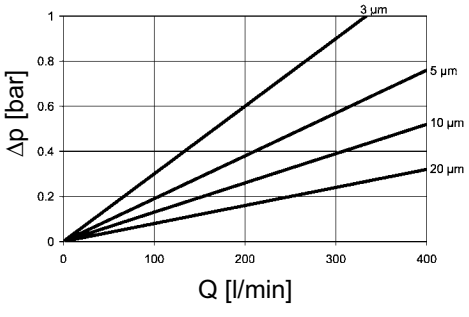

### BN4HC: RFM 270



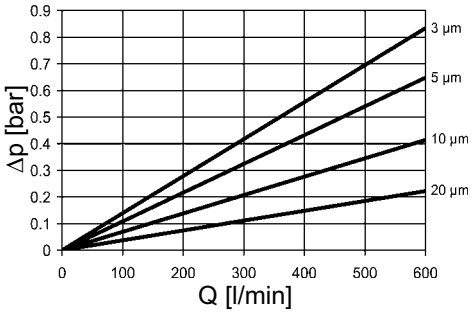

### BN4HC: RFM 330



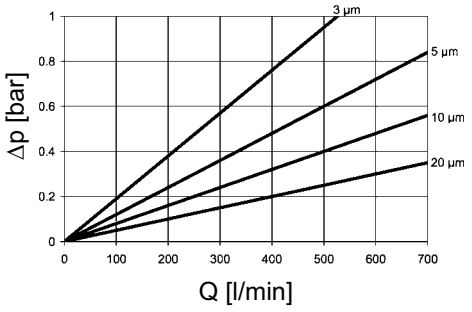

### BN4HC: RFM 500



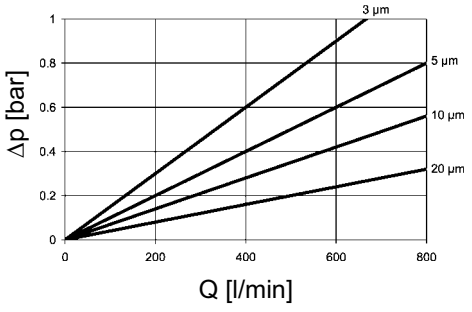

### BN4HC: RFM 600



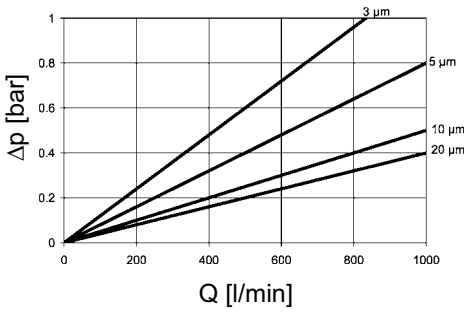

### BN4HC: RFM 660



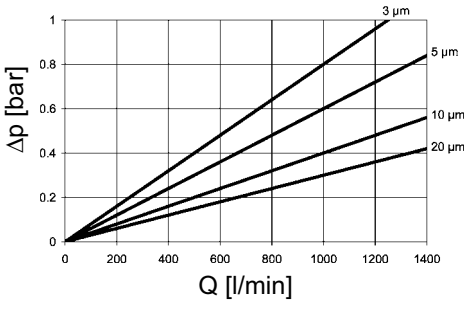

### BN4HC: RFM 850



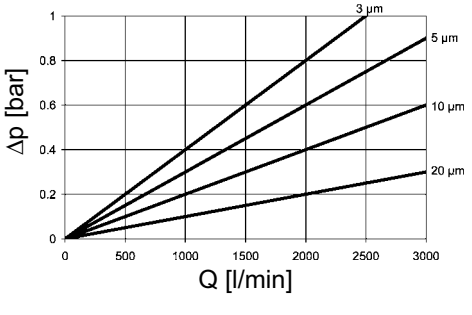

### BN4HC: RFM 950




### BN4HC: RFM 1300

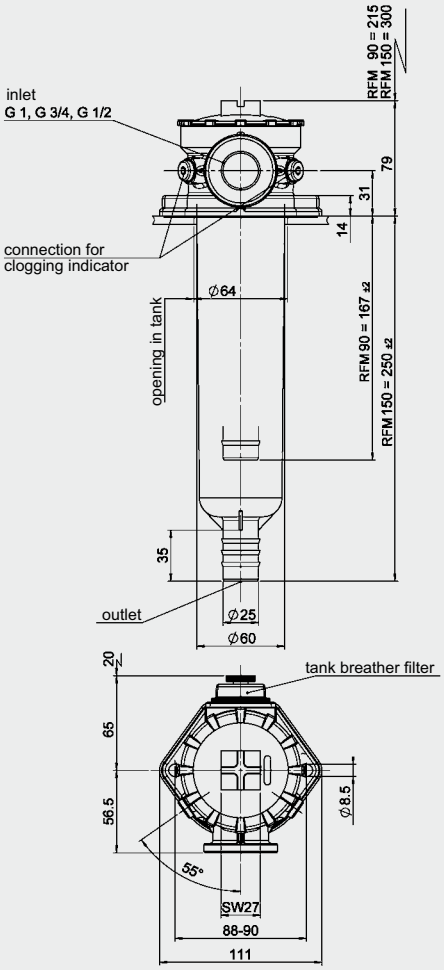



### BN4HC: RFM 2600

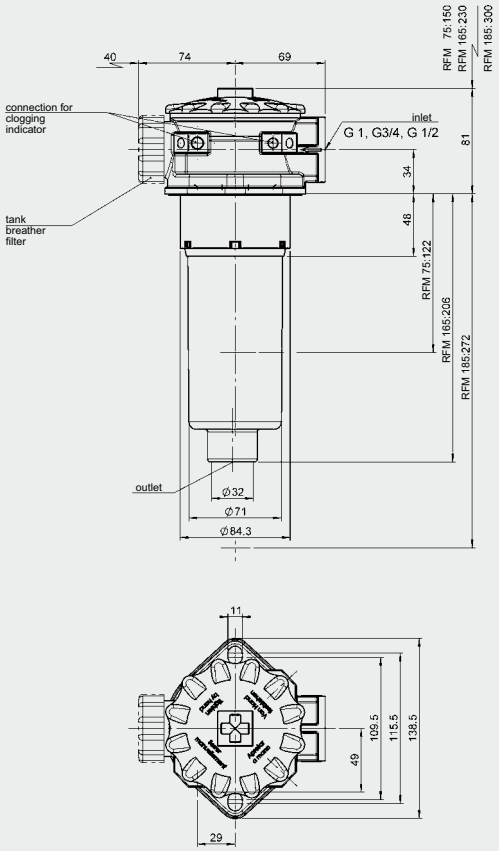


# 4. DIMENSIONS

RFM 90, 150

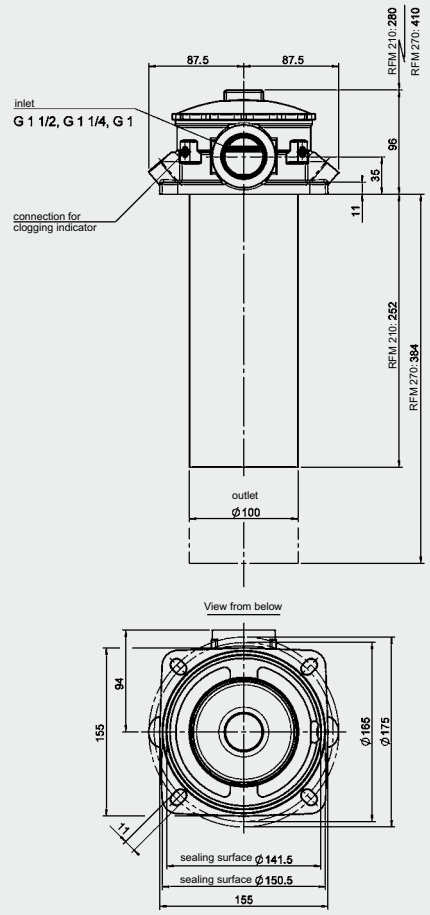



RFM 75, 165, 185

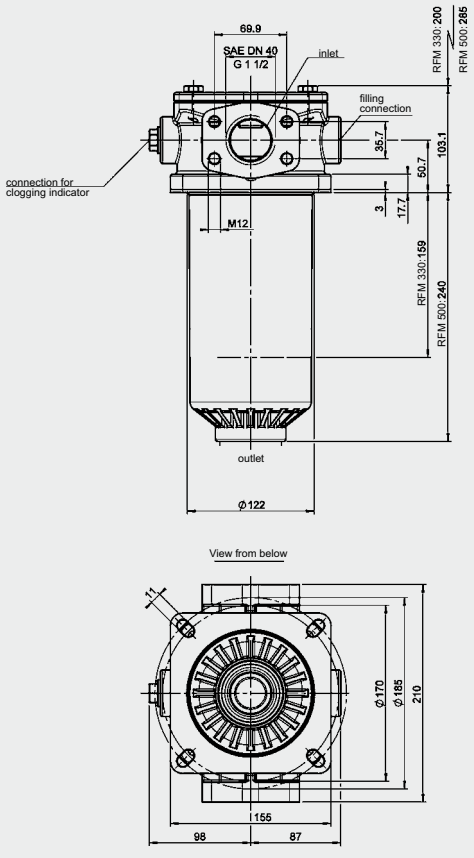



| RFM | Weight incl. element [kg] | Vol. of pressure chamber[l] |
|---|---|---|
| 75 | 0.90 | 0.60 |
| 90 | 0.54 | 0.60 |
| 150 | 0.75 | 0.80 |
| 165 | 1.10 | 0.90 |
| 185 | 1.14 | 1.10 |

## RFM 210, 270

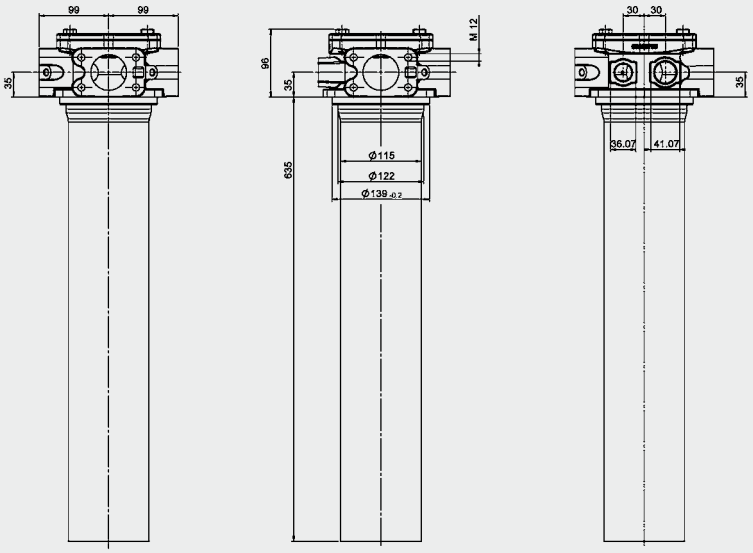



## RFM 330, 500

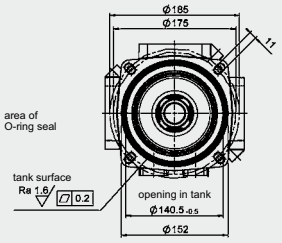



| RFM | Weight incl. element [kg] | Vol. of pressure chamber [l] |
|---|---|---|
| 210 | 3.10 | 2.20 |
| 270 | 4.30 | 3.60 |
| 330 | 3.90 | 2.00 |
| 500 | 4.50 | 3.00 |

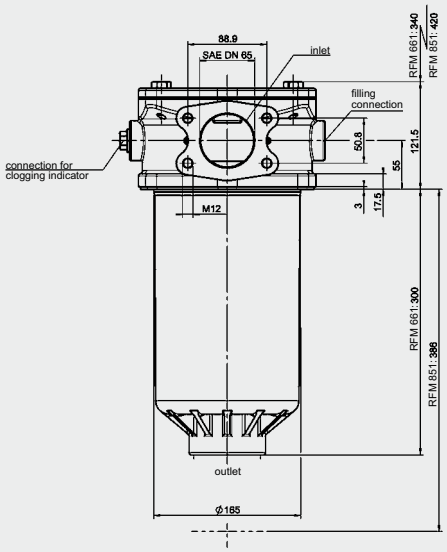
RFM 600



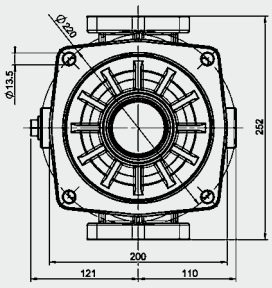

**View from below**




RFM 661, 851




View from below




**Dimensions for in-tank mounting filters (KIT, SET, S versions) on request!**

| RFM | Weight incl. element [kg] | Vol. of pressure chamber [l] |
|---|---|---|
| 600 | 7.30 | 7.70 |
| 661 | 9.00 | 7.20 |
| 851 | 10.50 | 8.50 |

## NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

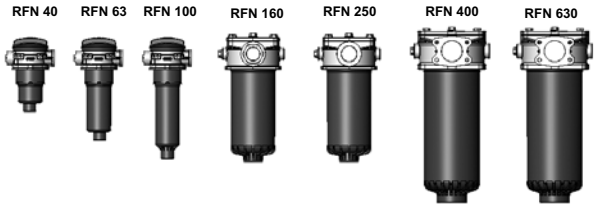
Subject to technical modifications.


HYDAC **Filtertechnik GmbH**
Industriegebiet
**D-66280 Sulzbach/Saar**
Tel.: 0 68 97 / 509-01
Fax: 0 68 97 / 509-300
Internet: www.hydac.com
E-Mail: filter@hydac.com



# Tank-Top Return Line Filter RFN with Elements to DIN 24550

up to 630 l/min, up to 10 bar




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. They consist of a filter head, filter bowl and screw-on cover plate.

Standard equipment:

- with bypass valve
- connection for a clogging indicator

### 1.2 FILTER ELEMENTS

Hydac filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

**Contamination retention capacities in g**

| | Betamicron BN4HC | | | |
|---|---|---|---|---|
| RFN | 3 µm | 6 µm | 10 µm | 25 µm |
| 40 | 7.1 | 8.0 | 8.9 | 10.6 |
| 63 | 13.0 | 14.7 | 16.3 | 19.6 |
| 100 | 22.0 | 24.7 | 27.5 | 33.0 |
| 160 | 36.2 | 40.7 | 45.3 | 54.2 |
| 250 | 61.4 | 69.1 | 76.8 | 92.1 |
| 400 | 88.2 | 99.2 | 110.2 | 132.3 |
| 630 | 148.6 | 167.3 | 185.8 | 222.9 |

Filter elements are available with the following pressure stability values:
Betamicron® (BN4HC): 20 bar

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Nominal pressure | 10 bar |
| Temperature range | -10 °C to +100 °C |
| Material of filter head | Aluminium |
| Material of filter bowl | Polyamide |
| Material of cover plate | Polyamide (RFN 40 to 100)<br>Aluminium (RFN 160 to 630) |
| Type of clogging indicator | VR connection thread G 1/2<br>VMF connection thread G 1/8 |
| Pressure setting of clogging indicator | 2.5 bar (others on request) |
| Bypass cracking pressure | 3.5 bar (others on request) |

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 MOUNTING

As tank-top filter

### 1.6 SPECIAL MODELS AND ACCESSORIES

On request

### 1.7 SPARE PARTS

See Original Spare Parts List

### 1.8 CERTIFICATES AND APPROVALS

On request

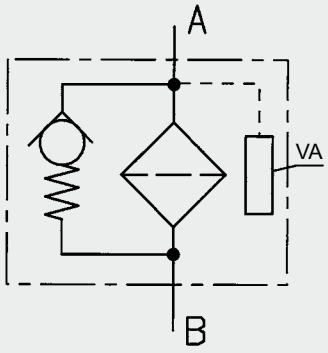
### 1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Non-flam operating fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

### 1.10 IMPORTANT INFORMATION

- Filter housing must be earthed
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector

**Symbol for hydraulic systems**



## 2. MODEL CODE (also order example)

**RFN BN4HC 250 B F 10 D 1 . X /-L24**

### 2.1 COMPLETE FILTER

**Filter type**
RFN

**Filter material of element**
BN4HC Betamicron® (BN4HC)

**Size of filter or element**
RFN: 40, 63, 100, 160, 250, 400, 630

**Operating pressure**
B = 10 bar

**Type and size of port**
to DIN 24550 ( ● ), possible ports ( X )

| Type | Port | Filter size | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 40 | 63 | 100 | 160 | 250 | 400 | 630 |
| B | G ½ | X | X | | | | | |
| C | G ¾ | X | X | | | | | |
| D | G 1 | X | X | ● | | | | |
| E | G1 ¼ | | | | X | | | |
| F | G1 ½ | | | | X | | | |
| M | DN 64 | | | | | | X | ● |

**Filtration rating in µm**
BN4HC: 3, 6, 10, 25

**Type of clogging indicator**
Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
LZ visual-mechanical / electrical
] for other clogging indicators see brochure no. E 7.050../..

**Type code**
1

**Modification number**
X the latest version is always supplied

**Supplementary details**
L... light with appropriate voltage (24V, 48V, 110V, 220V) ] only for clogging
LED 2 light emitting diodes up to 24 Volt ] indicators Type D
A V LZ indicator with plug to AUDI and VW specification
BO LZ indicator with plug and pin connection to BMW and Opel specification (M12x1)
CN LZ indicator with plug to DIN 43651 with 3 LEDs (CNOMO standard)
DB LZ indicator with plug to DIN 43651 with 3 LEDs (Daimler-Benz standard)
D4C LZ indicator with plug and pin connection to Daimler-Chrysler specification and cold start suppression 30 °C
BO-LED as for BO, but with progressive diode strip
GM LZ indicator with "no element" indicator
30C LZ indicator with temperature limiter (only in conjunction with type DB)
T with tank breather filter (only RFN 40, 63, 100)
BAN filling connection G ¾ (from size RFN 160)
Vxxx outlet extension (xxx = corresponding length in mm)
V FPM seals
W suitable for HFA and HFC emulsions

### 2.2 REPLACEMENT ELEMENT

**0250 RN 010 BN4HC /-V**

**Size**
0040, 0063, 0100, 0160, 0250, 0400, 0630

**Type**
RN

**Filtration rating in µm**
BN4HC: 003, 006, 010, 025

**Filter material**
BN4HC

**Supplementary details**
V (for descriptions, see point 2.1)

### 2.3 REPLACEMENT CLOGGING INDICATOR

**VR 2.5 D . X /-L24**

**Type**
VR threaded connection G 1/2
VMF threaded connection G 1/8

**Pressure setting**
2.5 2.5 bar standard, others on request

**Type of clogging indicator**
D (see point 2.1 )

**Modification number**
X the latest version is always supplied

**Supplementary details**
L..., LED, V (for descriptions, see point 2.1)

# 3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see point 3.1)

$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see point 3.2)

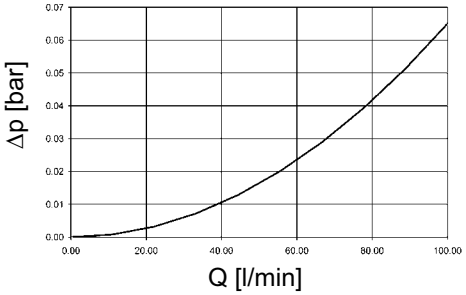
For ease of calculation, our Filter Sizing Program is available on request free of charge.

**NEW:** Sizing online at www.hydac.com

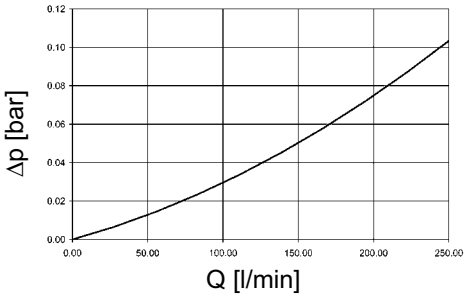
## 3.1 Δp-Q HOUSING GRAPHS BASED ON ISO 3968

The housing graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

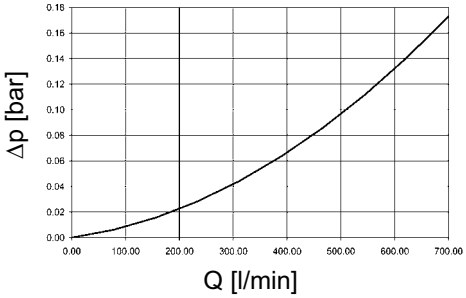
### RFN 40/63/100




### RFN 160/250




### RFN 400/630

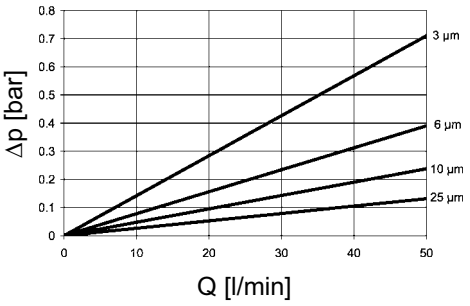



## 3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

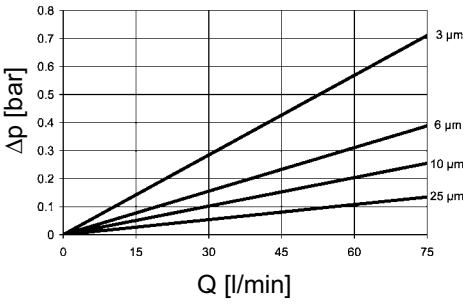
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

| RFN | BN4HC | | | |
|---|---|---|---|---|
| | 3 µm | 6 µm | 10 µm | 25 µm |
| 40 | 14.2 | 7.8 | 4.8 | 2.6 |
| 63 | 9.5 | 5.2 | 3.4 | 1.8 |
| 100 | 6.8 | 3.3 | 2.3 | 1.2 |
| 160 | 3.6 | 1.8 | 1.2 | 0.5 |
| 250 | 2.8 | 1.4 | 0.9 | 0.4 |
| 400 | 2.2 | 1.6 | 1.3 | 1.0 |
| 630 | 2.1 | 1.6 | 1.3 | 0.9 |

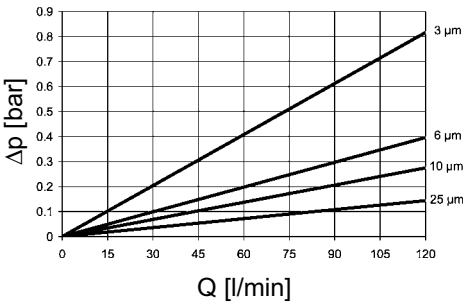
### BN4HC: RFN 40



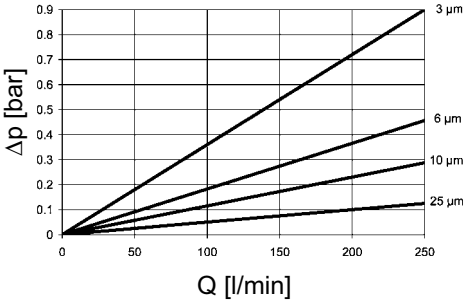

### BN4HC: RFN 63



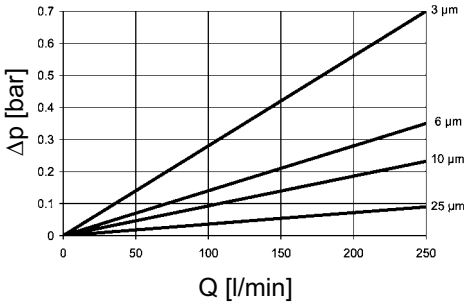

### BN4HC: RFN 100



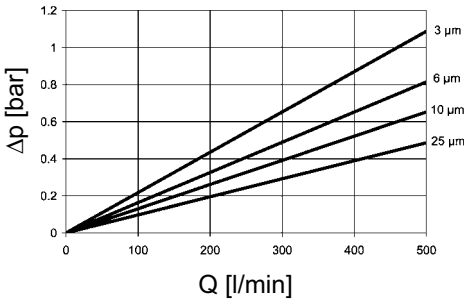

### BN4HC: RFN 160



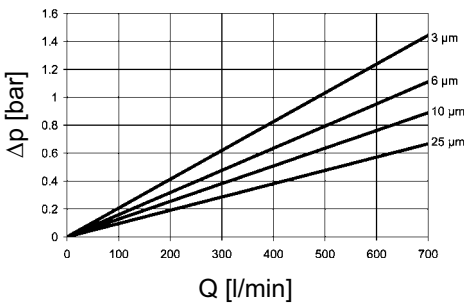

### BN4HC: RFN 250




### BN4HC: RFN 400

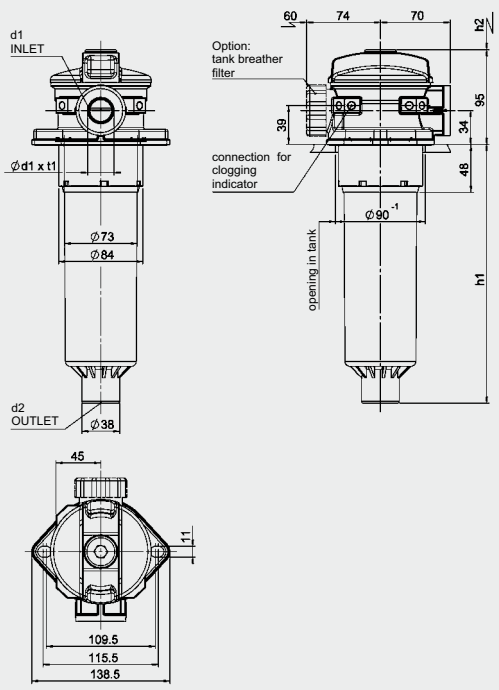



### BN4HC: RFN 630

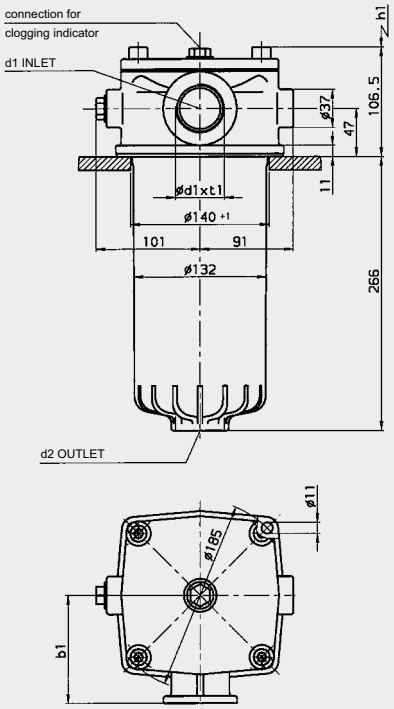


## 4. DIMENSIONS

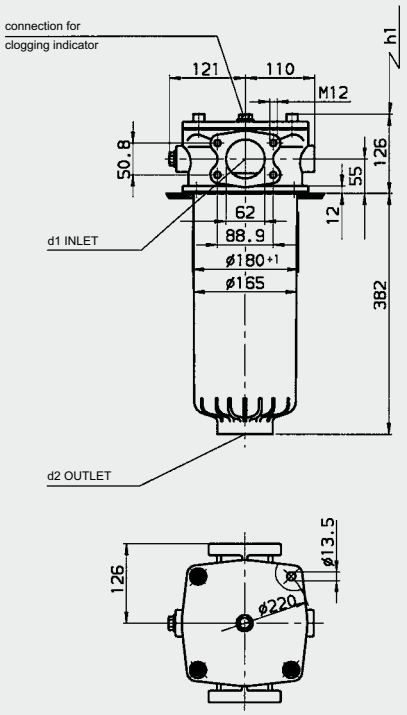
RFN 40, 63, 100




RFN 160, 250




RFN 400, 630




Flange interface / opening in tank to DIN 24550

| RFN | d1 inlet | d2 outlet | b1 | h1 | h2 | $t1^{+2}$ | Weight including element [kg] | Volume of pressure chamber [l] |
|---|---|---|---|---|---|---|---|---|
| 40 | G ½ | 32 | 70 | 122 | 150 | 14 | 1.0 | 0.6 |
| 40 | G ¾ | 32 | 70 | 122 | 150 | 16 | 1.0 | 0.6 |
| 40 | G 1 | 32 | 70 | 122 | 150 | 18 | 1.0 | 0.6 |
| 63 | G ½ | 32 | 70 | 206 | 200 | 14 | 1.2 | 0.9 |
| 63 | G ¾ | 32 | 70 | 206 | 200 | 16 | 1.2 | 0.9 |
| 63 | G 1 | 32 | 70 | 206 | 200 | 18 | 1.2 | 0.9 |
| 100 | G ½ | 32 | 70 | 260 | 290 | 14 | 1.3 | 1.0 |
| 100 | G ¾ | 32 | 70 | 260 | 290 | 16 | 1.3 | 1.0 |
| 100 | G 1 | 32 | 70 | 260 | 290 | 18 | 1.3 | 1.0 |
| 160 | G 1¼ | G 1½ | 141 | 210 | - | 20 | 4.6 | 3.5 |
| 160 | G 1½ | G 1½ | 105 | 210 | - | 22 | 4.6 | 3.5 |
| 250 | G 1¼ | G 1½ | 141 | 300 | - | 20 | 6.0 | 3.5 |
| 250 | G 1½ | G 1½ | 105 | 300 | - | 22 | 6.0 | 3.5 |
| 400 | DN 64 | G 2½ | - | 270 | - | - | 9.3 | 8.0 |
| 630 | DN 64 | G 2½ | - | 420 | - | - | 10.0 | 8.0 |

## NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

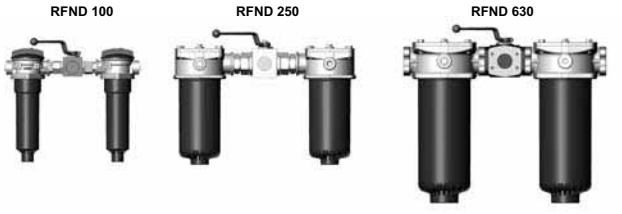
Subject to technical modifications.


HYDAC **Filtertechnik GmbH**
Industriegebiet
**D-66280 Sulzbach/Saar**
Tel.: 0 68 97 / 509-01
Fax: 0 68 97 / 509-300
Internet: www.hydac.com
E-Mail: filter@hydac.com



# Tank-Top Return Line Filter RFND Change-Over Version

to DIN 24550
up to 630 l/min, up to 10 bar




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. Each housing consists of a filter head, filter bowl and screw-on cover plate.

Standard equipment:

- with bypass valve
- connection for a clogging indicator

### 1.2 FILTER ELEMENTS

Hydac filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

**Contamination retention capacities in g**

| | Betamicron® BN4HC | | | |
|---|---|---|---|---|
| RFND | 3 µm | 6 µm | 10 µm | 25 µm |
| 100 | 22.0 | 24.7 | 27.5 | 33.0 |
| 250 | 61.4 | 69.1 | 76.8 | 92.1 |
| 630 | 148.6 | 167.3 | 185.8 | 222.9 |

Filter elements are available with the following pressure stability values:
Betamicron® (BN4HC): 20 bar

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Nominal pressure | 10 bar |
| Temperature range | -10 °C to +100 °C |
| Material of filter head | Aluminium |
| Material of filter bowl | Polyamide |
| Material of cover plate | Polyamide (RFN 100)<br>Aluminium (RFN 250 and 630) |
| Type of clogging indicator | VR Connection thread G 1/2<br>VMF Connection thread G 1/8 |
| Pressure setting of clogging indicator | 2.5 bar (others on request) |
| Bypass cracking pressure | 3.5 bar (others on request) |

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 MOUNTING

As tank-top filter

### 1.6 SPECIAL MODELS AND ACCESSORIES

On request

### 1.7 SPARE PARTS

See Original Spare Parts List

### 1.8 CERTIFICATES AND APPROVALS

On request

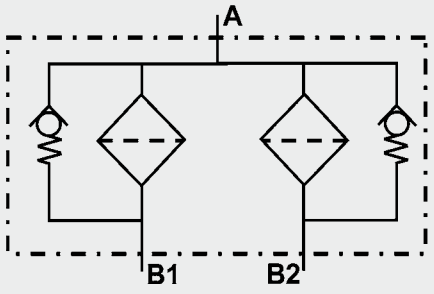
### 1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Non-flam operating fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

### 1.10 IMPORTANT INFORMATION

- Filter housing must be earthed
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector

**Symbol for hydraulic systems**



## 2. MODEL CODE (ALSO ORDER EXAMPLE)

**RFND BN/HC 250 B A E 10 D 1 . X /-L24**

### 2.1 COMPLETE FILTER

**Filter type**
RFND

**Filter material of element**
BN/HC Betamicron® (BN4HC)

**Size of filter or element**
RFND: 100, 250, 630

**Operating pressure**
B = 10 bar

**Type of change-over**
A ball

**Type and size of port**

| Type | Port | Filter size | | |
|---|---|---|---|---|
| | | 100 | 250 | 630 |
| C | G ¾ | ● | | |
| E | G1 ¼ | | ● | |
| L | SAE DN 50 | | | ● |

**Filtration rating in µm**
BN4HC: 3, 6, 10, 25

**Type of clogging indicator**
Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
LZ visual-mechanical / electrical
(for other clogging indicators see brochure no. E 7.050../..)

**Type code**
1

**Modification number**
X the latest version is always supplied

**Supplementary details**
L... light with appropriate voltage (24V, 48V, 110V, 220V) (only for clogging indicators Type D)
LED 2 light emitting diodes up to 24 Volt (only for clogging indicators Type D)
A V LZ indicator with plug to AUDI and VW specification
BO LZ indicator with plug and pin connection to BMW and Opel specification (M12x1)
CN LZ indicator with plug to DIN 43651 with 3 LEDs (CNOMO standard)
DB LZ indicator with plug to DIN 43651 with 3 LEDs (Daimler-Benz standard)
D4C LZ indicator with plug and pin connection to Daimler-Chrysler specification and cold start suppression 30 °C
BO-LED as for BO, but with progressive diode strip
GM LZ indicator with "no element" indicator
30C LZ indicator with temperature limiter (only in conjunction with type DB)
V FPM seals
W suitable for HFA and HFC emulsions

### 2.2 REPLACEMENT ELEMENT

**0250 RN 010 BN4HC /-V**

**Size**
0100, 0250, 0630

**Type**
RN

**Filtration rating in µm**
BN4HC: 003, 006, 010, 025

**Filter material**
BN4HC

**Supplementary details**
V (for descriptions, see point 2.1)

### 2.3 REPLACEMENT CLOGGING INDICATOR

**VR 2.5 D . X /-L24**

**Type**
VR Connection thread G 1/2
VMF Connection thread G 1/8

**Pressure setting**
2.5 2.5 bar standard, others on request

**Type of clogging indicator**
D (see point 2.1)

**Modification number**
X the latest version is always supplied

**Supplementary details**
L..., LED, V (for descriptions, see point 2.1)

# 3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing} =$ (see point 3.1)

$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see point 3.2)

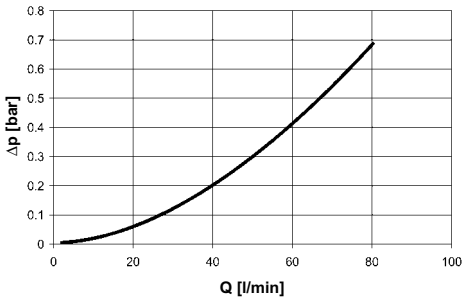
For ease of calculation, our Filter Sizing Program is available on request free of charge.

**NEW:** Sizing online at www.hydac.com

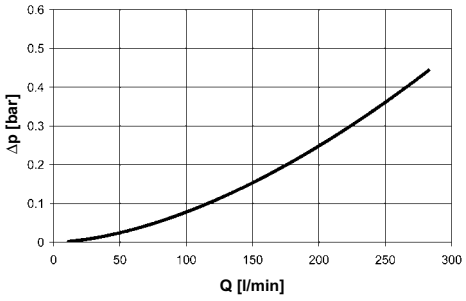
## 3.1 Δp-Q HOUSING GRAPHS BASED ON ISO 3968

The housing graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s.
In this case, the differential pressure changes proportionally to the density.

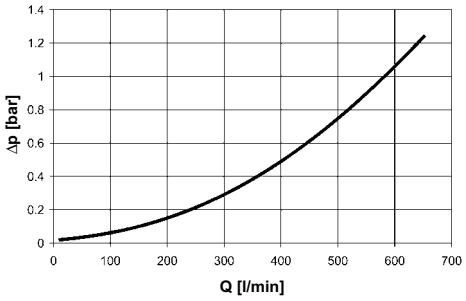
### RFND 100




### RFND 250




### RFND 630

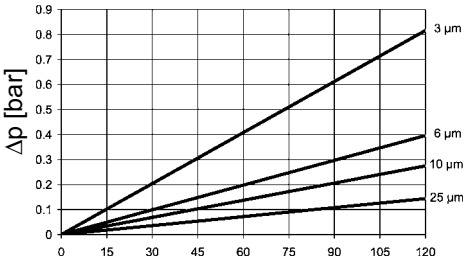



## 3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

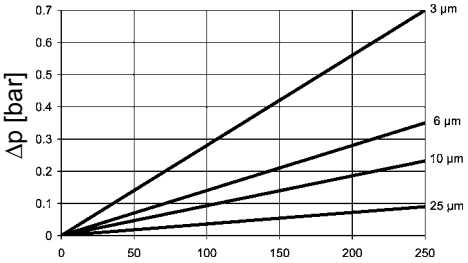
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

| RFND | BN4HC | | | |
|---|---|---|---|---|
| | 3 µm | 6 µm | 10 µm | 25 µm |
| 100 | 6.8 | 3.3 | 2.3 | 1.2 |
| 250 | 2.8 | 1.4 | 0.9 | 0.4 |
| 630 | 2.1 | 1.2 | 0.9 | 0.7 |

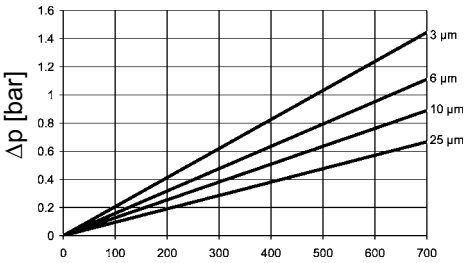
### BN4HC: 100




### BN4HC: 250

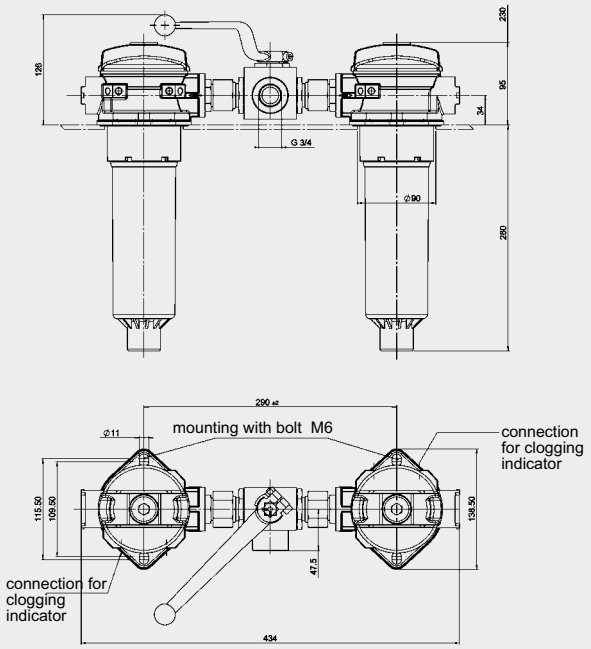



### BN4HC: 630

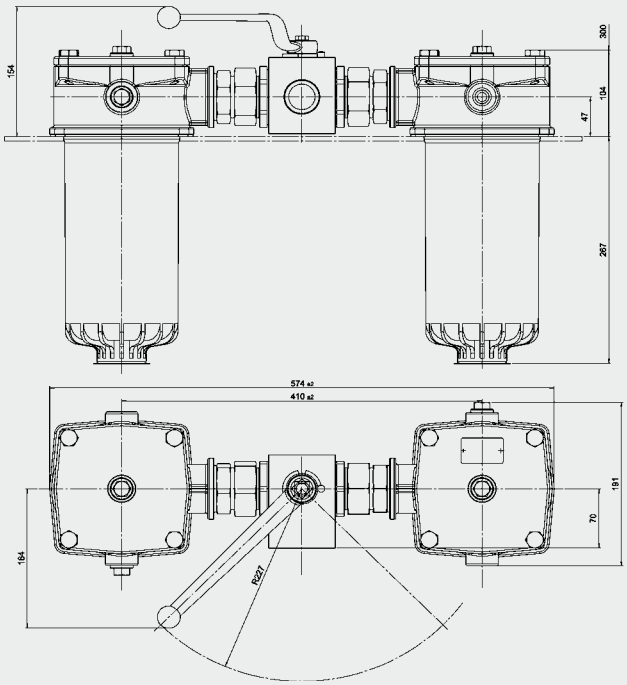


## 4. DIMENSIONS

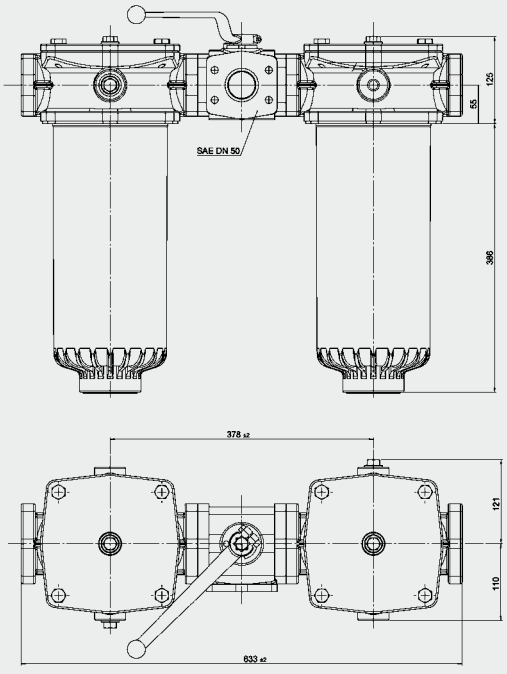
RFND 100




RFND 250

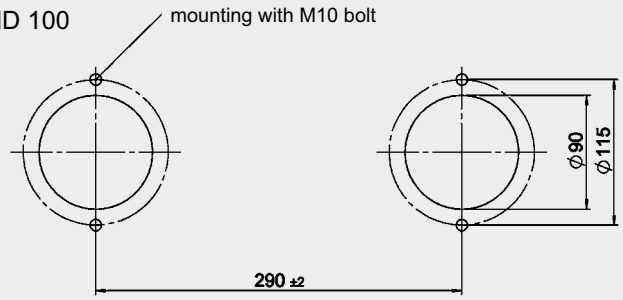


RFND 630

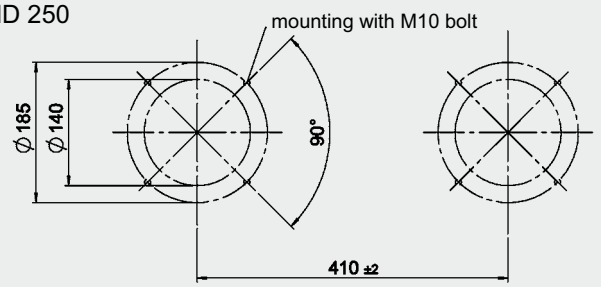



**Flange interface / opening in tank to DIN 24550**

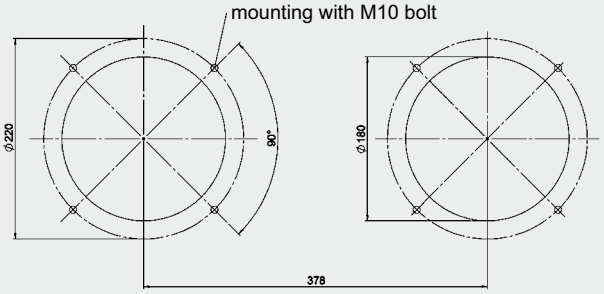
RFND 100




RFND 250




RFND 630




| RFND | Weight incl. element [kg] | Vol. of pressure chamber[l] |
|---|---|---|
| 100 | 5.4 | 2 x 1.00 |
| 250 | 13.0 | 2 x 3.50 |
| 630 | 23.0 | 2 x 8.00 |

## NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

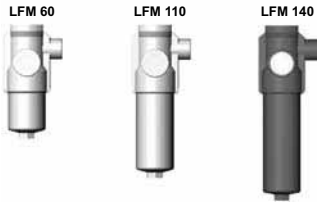
Subject to technical modifications.


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# Inline Filter LFM with Differential Pressure Relief Valve

up to 120 l/min, up to 63 bar




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. They consist of a filter head with screw-in filter bowl.

Standard equipment:

- With differential pressure controlled relief valve
- Port for clogging indicator in filter head

### 1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

**Contamination retention capacities in g**

| | Betamicron® BN4HC | | | |
|---|---|---|---|---|
| LFM | 3 µm | 5 µm | 10 µm | 20 µm |
| 60 | 6.5 | 7.3 | 7.8 | 8.0 |
| 110 | 13.8 | 15.5 | 16.4 | 16.9 |
| 140 | 18.1 | 20.3 | 21.5 | 22.2 |

Filter elements are available with the following pressure stability values:
Betamicron® (BN4HC): 20 bar

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Nominal pressure | 63 bar |
| Fatigue strength | at nominal pressure $10^6$ load cycles from 0 to nominal pressure |
| Temperature range | -30 °C to +100 °C (LFM 140: -30 °C to -10 °C: $p_{max}$=31.5 bar) |
| Material of filter head | aluminium |
| Material of filter bowl | aluminium (steel on LFM 140) |
| Type of clogging indicator | VM (differential pressure indicator up to 210 bar operating pressure) |
| Pressure setting of clogging indicator | 2 bar (others on request) |
| Cracking pressure of diff. pressure relief valve | 3.5 bar (others on request) |

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 MOUNTING

As inline filter

### 1.6 SPECIAL MODELS AND ACCESSORIES

- Pressure release / oil drain plug (SO184)

### 1.7 SPARE PARTS

See Original Spare Parts List

### 1.8 CERTIFICATES AND APPROVALS

On request

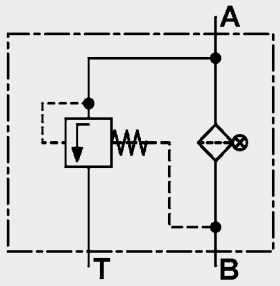
### 1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS TO ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Non-flam operating fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

### 1.10 IMPORTANT INFORMATION

- Filter housing must be earthed
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

**Symbol for hydraulic systems**



## 2. MODEL CODE (also order example)

**LFM BN/HC 110 F C 10 D 1 . X /-L24**

### 2.1 COMPLETE FILTER

**Filter type**
LFM

**Filter material of element**
BN/HC Betamicron® (BN4HC)

**Size of filter or element**
LFM: 60, 110, 140

**Operating pressure**
F = 63 bar

**Type and size of port**

| Type | Port | Filter size | | |
|---|---|---|---|---|
| | | 60 | 110 | 140 |
| C | G ¾ | ● | ● | ● |

**Filtration rating in µm**
BN4HC: 3, 5, 10, 20

**Type of clogging indicator**
Y with plastic blanking plug in indicator port
A with steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
] for other clogging indicators see brochure no. 7.050../..

**Type code**
1

**Modification number**
X the latest version is always supplied

**Supplementary details**
DBV5.5 cracking pressure of pressure relief valve 5.5 bar
L... light with appropriate voltage (24V, 48V, 110V, 220V)
LED 2 light emitting diodes up to 24 Volt
SO 184 pressure release / oil drain plug
V FPM seals
] only for clogging indicators type D

### 2.2 REPLACEMENT ELEMENT

**0110 D 010 BN4HC /-V**

**Size**
0060, 0110, 0140

**Type**
D

**Filtration rating in µm**
BN4HC: 003, 005, 010, 020

**Filter material**
BN4HC

**Supplementary details**
V (for descriptions, see point 2.1)

### 2.3 REPLACEMENT CLOGGING INDICATOR

**VM 2 D . X /-L24**

**Type**
VM differential pressure indicator up to 210 bar operating pressure

**Pressure setting**
2 standard 2 bar, others on request

**Type of clogging indicator**
D (see point 2.1 )

**Modification number**
X the latest version is always supplied

**Supplementary details**
L..., LED, V (for descriptions, see point 2.1)

# 3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see point 3.1)

$\Delta p_{Element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see point 3.2)

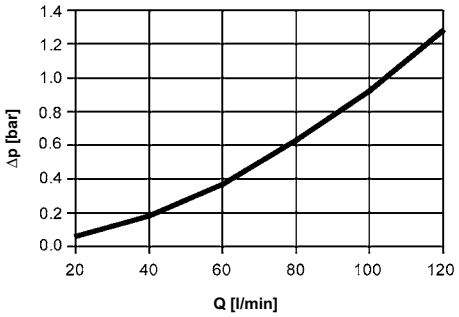
For ease of calculation, our Filter Sizing Program is available on request free of charge.

**NEW:** Sizing online at www.hydac.com

## 3.1 ΔP-Q HOUSING GRAPHS BASED ON ISO 3968

The housing graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s.
In this case, the differential pressure changes proportionally to the density.

### LFM 60/110/140

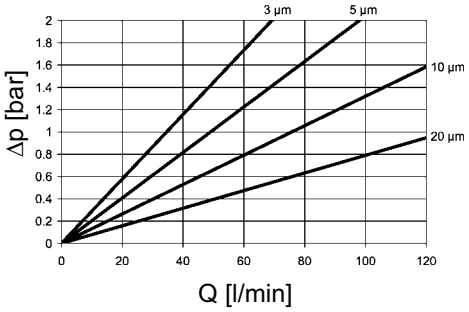



## 3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

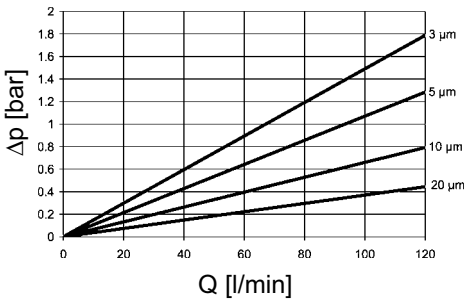
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

| LFM | BN4HC | | | |
|---|---|---|---|---|
| | 3 µm | 5 µm | 10 µm | 20 µm |
| 60 | 28.9 | 20.4 | 13.2 | 7.9 |
| 110 | 14.9 | 10.7 | 6.6 | 3.7 |
| 140 | 12.8 | 8.2 | 4.8 | 2.9 |

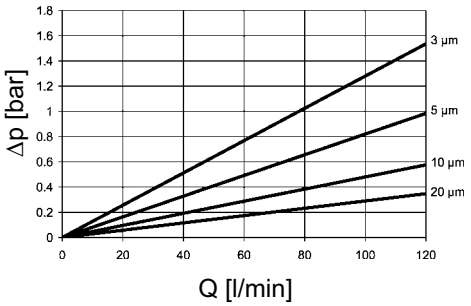
### BN4HC: LFM 60



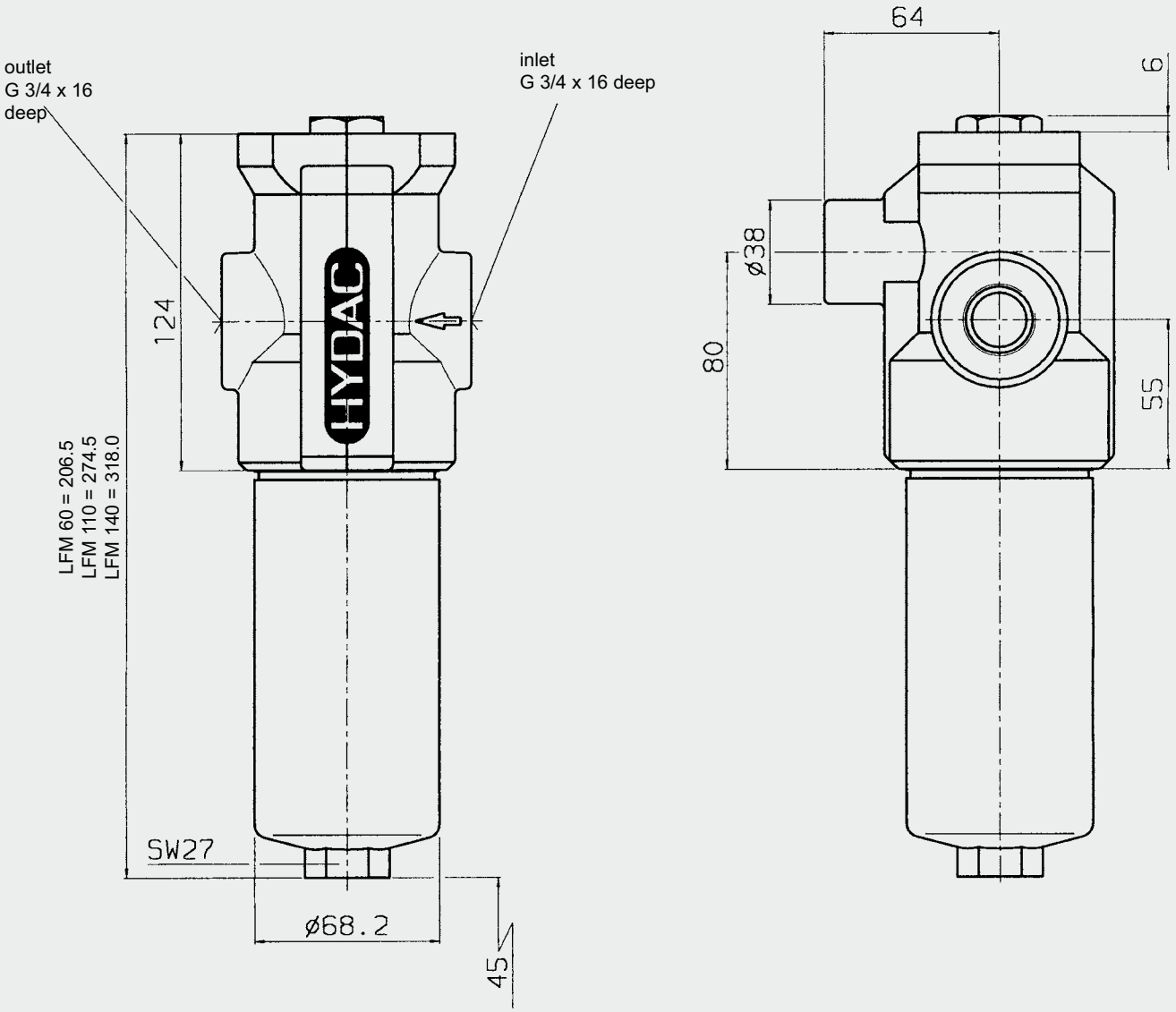

### BN4HC: LFM 110

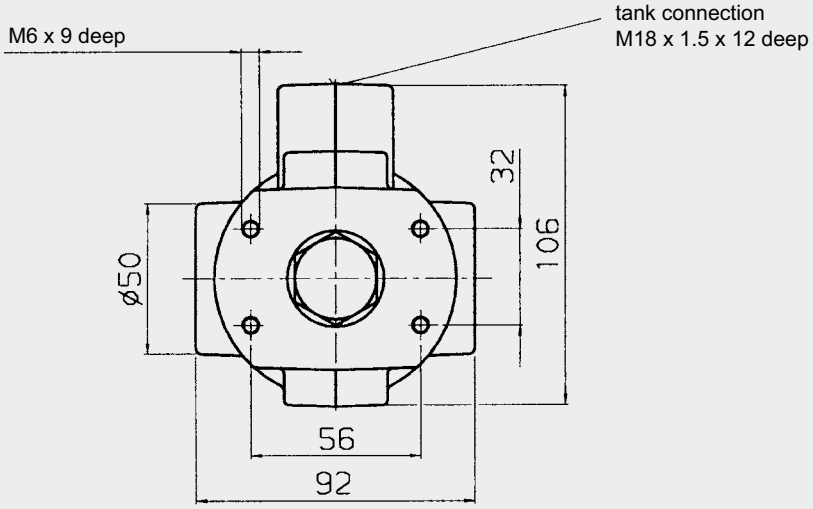



### BN4HC: LFM 140



## 4. DIMENSIONS




| LFM | Weight incl. Element [kg] | Vol. of pressure chamber [l] |
|---|---|---|
| 60 | 1.9 | 0.20 |
| 110 | 2.3 | 0.33 |
| 140 | 4.5 | 0.40 |

## NOTE

The information in this brochure relates to the operating conditions and applications described.

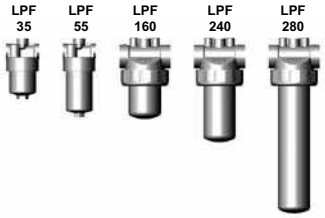
For applications or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.


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# Low Pressure Filter LPF
## up to 280 l/min, up to 50 bar




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. They consist of a filter head and a screw-in filter bowl (LPF 35 and 55) or the filter bowl is fixed to the filter head with a retaining nut (LPF 160, 240, 280).

Standard equipment:

- without bypass valve
- connection for a clogging indicator

### 1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

**Contamination retention capacities in g**

| | Betamicron® (BN4HC) | | | |
|---|---|---|---|---|
| LPF | 3 µm | 5 µm | 10 µm | 20 µm |
| 35 | 7.2 | 8.1 | 8.6 | 8.8 |
| 55 | 14.0 | 15.8 | 16.6 | 17.2 |
| 160 | 19.8 | 22.2 | 23.5 | 24.3 |
| 240 | 32.3 | 36.3 | 38.4 | 39.6 |
| 280 | 70.6 | 79.3 | 83.9 | 86.6 |

Filter elements are available with the following pressure stability values:

| | |
|---|---|
| Betamicron® (BN4HC): | 20 bar |
| Betamicron® (BH4HC): | 210 bar |
| Wire mesh (W/HC)*: | 20 bar |

*only for LPF 160, 240, 280

**IMPORTANT:**
Only filter elements in ...HC material can be used in LPF filters!

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Nominal pressure | LPF 35, 55: 40 bar<br>LPF 160, 240, 280: 25 or 50 bar |
| Fatigue strength | at nominal pressure $10^6$ load cycles from 0 to nominal pressure<br>LPF 35 and 55: $10^7$ load cycles at 40 bar |
| Temperature range | -30 °C to +100 °C |
| Material of filter head | aluminium |
| Material of filter bowl | LPF 35, 55: aluminium<br>LPF 160, 240, 280: steel |
| Material of retaining nut (LPF 160, 240, 280) | aluminium (25 bar)<br>steel (50 bar) |
| Type of clogging indicator | VM (differential pressure indicator up to 210 bar operating pressure) |
| Pressure setting of clogging indicator | 5 bar (others on request) |
| Cracking pressure of bypass valve (optional) | on request |

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 MOUNTING

As inline filter

### 1.6 SPECIAL MODELS AND ACCESSORIES

- Seals in FPM, EPDM
- With bypass valve (1, 3, 6, or 7 bar)
- Without port for clogging indicator (LPF 160, 240, 280)

### 1.7 SPARE PARTS

See Original Spare Parts List

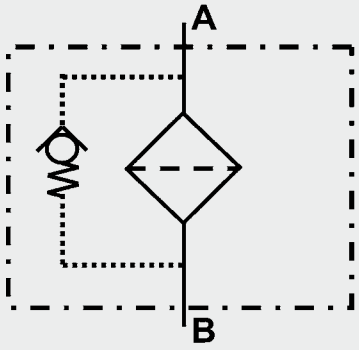
### 1.8 CERTIFICATES AND APPROVALS

On request

### 1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Operating fluids with high water content (>50% water content) on request

**Symbol for hydraulic systems**




**Note:**
One-piece bowl version for sizes 160, 240 and 280 on request!

## 2. MODEL CODE (also order example)

LPF BN/HC 160 D E 10 D 1 . X /-L24

### 2.1 COMPLETE FILTER

**Filter type**
LPF

**Filter material of element**
BN/HC Betamicron® (BN4HC)
BH/HC Betamicron® (BH4HC)
W/HC Stainless steel wire mesh (only LPF160, 240, 280)

**Size of filter or element**
LPF: 35, 55, 160, 240, 280

**Operating pressure**
D = 25 bar (LPF 160, 240, 280: retaining nut in aluminium)
E = 40 bar (LPF 35, 55)
G = 50 bar (LPF 160, 240, 280: retaining nut in steel)

**Type and size of port**

| Type | Port | Filter size | | | | |
|---|---|---|---|---|---|---|
| | | 35 | 55 | 160 | 240 | 280 |
| A | M18 x 1.5 | ● | ● | | | |
| B | G ½ | ● | ● | | | |
| E | G 1¼ | | | ● | ● | ● |

**Filtration rating in µm**
BN/HC, BH/HC: 3, 5, 10, 20
W/HC: 25, 50, 100, 200 (only LPF 160, 240, 280)

**Type of clogging indicator**
W without port for clogging indicator
Y plastic blanking plug in indicator port
A with steel blanking plug in indicator port
B visual indicator
C electrical indicator
D visual and electrical indicator
] for other clogging indicators, see brochure no. E 7.050.../...

**Type code**
1

**Modification number**
X the latest version is always supplied

**Supplementary details**
B. cracking pressure of bypass valve (e. g.: B6 = 6 bar); no details = without bypass valve
L... light with appropriate voltage (24, 48, 110, 220 Volt)
LED 2 light emitting diodes up to 24 Volt
V FPM seals
W suitable for HFA and HFC emulsions
] only for clogging indicators type D

### 2.2 REPLACEMENT ELEMENT

0160 D 010 BN4HC /-V

**Size**
0035, 0055, 0160, 0240, 0280

**Type**
D

**Filtration rating in µm**
BN4HC, BH4HC: 003, 005, 010, 020
W/HC: 025, 050, 100, 200 (only LPF 160, 240, 280)

**Filter material**
BN4HC, BH4HC, W/HC

**Supplementary details**
V, W (for descriptions, see point 2.1)

### 2.3 REPLACEMENT CLOGGING INDICATOR

VM 5 D . X /-L24

**Type**
VM differential pressure indicator up to 210 bar operating pressure

**Pressure setting**
5 standard 5 bar, others on request

**Type of clogging indicator**
D (see point 2.1 )

**Modification number**
X the latest version is always supplied

**Supplementary details**
L..., LED, V, W (for descriptions, see point 2.1)

# 3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see point 3.1)

$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see point 3.2)

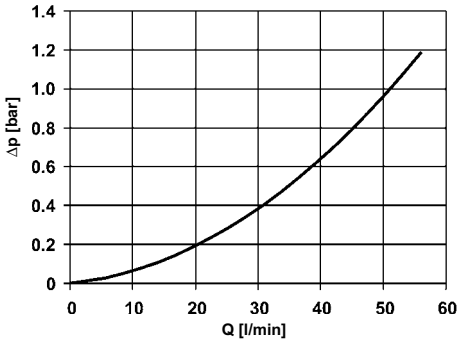
For ease of calculation, our Filter Sizing Program is available on request free of charge.

**NEW**: Sizing online at www.hydac.com

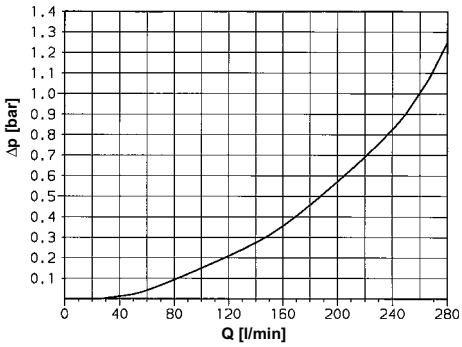
## 3.1 ΔP-Q HOUSING GRAPHS BASED ON ISO 3968

The housing graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

### LPF 35, 55




### LPF 160, 240, 280

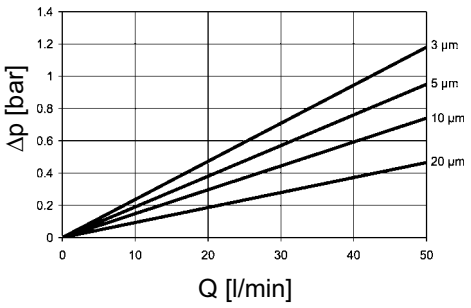



## 3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

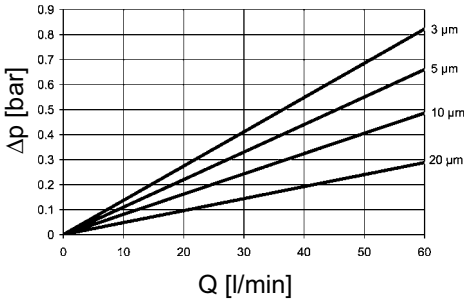
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

| LPF | BH4HC | | | | W/HC |
|---|---|---|---|---|---|
| | 3 µm | 5 µm | 10 µm | 20 µm | – |
| 35 | - | - | - | - | - |
| 55 | - | - | - | - | - |
| 160 | 16.8 | 10.4 | 5.9 | 4.4 | 0.316 |
| 240 | 10.6 | 6.8 | 3.9 | 2.9 | 0.211 |
| 280 | 5.7 | 3.4 | 1.8 | 1.6 | 0.181 |

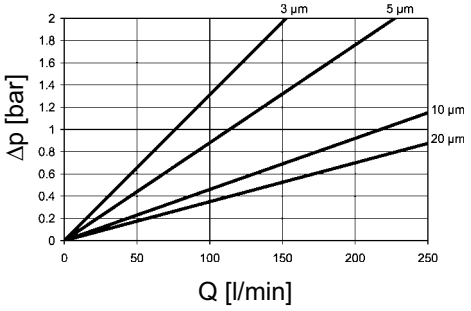
### BN4HC: LPF 35



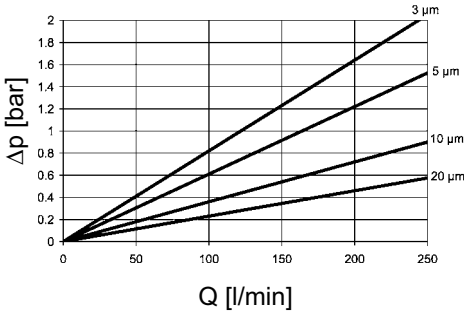

### BN4HC: LPF 55



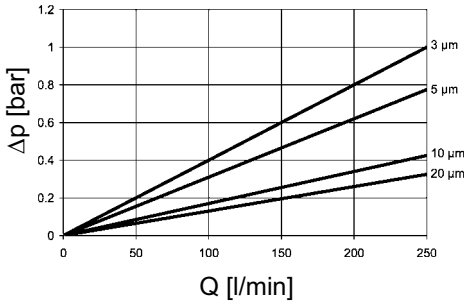

### BN4HC: LPF 160




### BN4HC: LPF 240

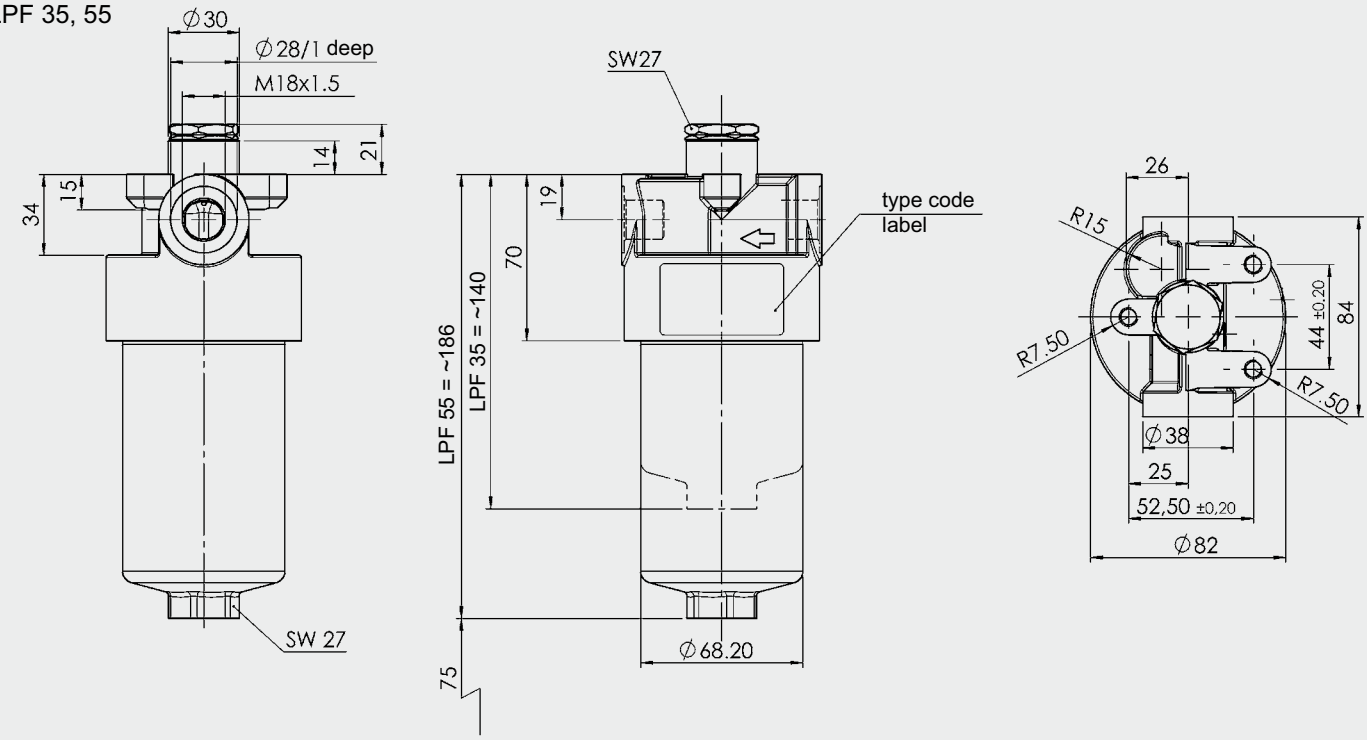



### BN4HC: LPF 280

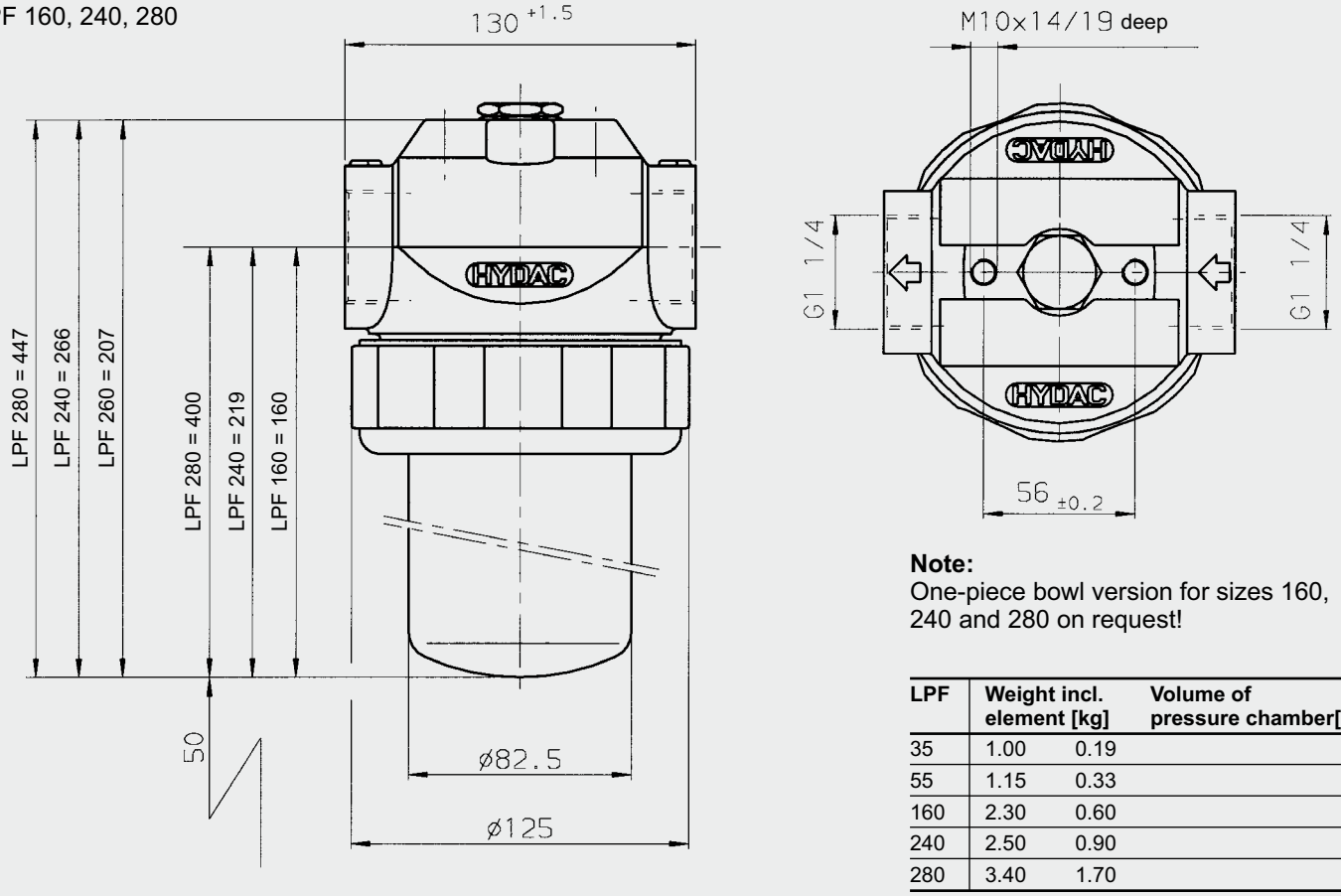


## 4. DIMENSIONS

LPF 35, 55




LPF 160, 240, 280




**Note:**
One-piece bowl version for sizes 160, 240 and 280 on request!

| LPF | Weight incl. element [kg] | | Volume of pressure chamber[l] |
|---|---|---|---|
| 35 | 1.00 | 0.19 | |
| 55 | 1.15 | 0.33 | |
| 160 | 2.30 | 0.60 | |
| 240 | 2.50 | 0.90 | |
| 280 | 3.40 | 1.70 | |

## NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.


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E-Mail: filter@hydac.com



# Inline Filter FLN to DIN 24550

## up to 400 l/min, up to 25 bar




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. They consist of a filter head with a screw-in filter bowl. Standard equipment:

- without bypass valve
- with oil drain plug
- connection for a clogging indicator

### 1.2 FILTER ELEMENTS

Hydac filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

**Contamination retention capacities in g**

| | Betamicron® BN4HC | | | |
|---|---|---|---|---|
| FLN | 3 µm | 6 µm | 10 µm | 25 µm |
| 160 | 27.5 | 29.3 | 33.1 | 36.7 |
| 250 | 46.0 | 49.0 | 55.2 | 61.3 |
| 400 | 76.2 | 81.3 | 91.4 | 101.5 |

Filter elements are available with the following pressure stability values:

Betamicron® (BN4HC): 20 bar
Wire mesh (W/HC): 20 bar

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Nominal pressure | 25 bar |
| Fatigue strength | at nominal pressure $10^6$ load cycles from 0 to nominal pressure |
| Temperature range | -30 °C up to +100 °C |
| Material of filter head | Aluminium |
| Material of filter bowl | Aluminium |
| Type of clogging indicator | VM (differential pressure indication up to 210 bar operating pressure)<br>VD (differential pressure indication up to 420 bar operating pressure: types LE and LZ only) |
| Pressure setting of clogging indicator | 5 bar (others on request) |
| Cracking pressure of bypass (optional) | 3.5, 7 bar (others on request) |

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 MOUNTING

As inline filter

### 1.6 SPECIAL MODELS AND ACCESSORIES

with bypass valve

### 1.7 SPARE PARTS

See Original Spare Parts List

### 1.8 CERTIFICATES AND APPROVALS

On request

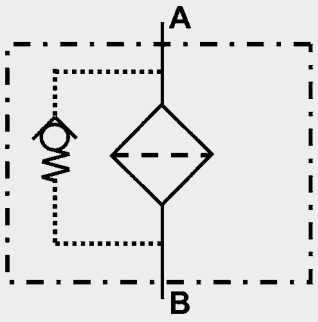
### 1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Operating fluids with high water content (>50% water content) on request

### 1.10 IMPORTANT INFORMATION

- Filter housing must be earthed
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector

**Symbol for hydraulic systems**



## 2. MODEL CODE (also order example)

**FLN BN/HC 250 D F 10 D 1 . X /-L24**

### 2.1 COMPLETE FILTER

**Filter type**
FLN

**Filter material of element**
BN/HC Betamicron® (BN4HC)
W/HC Stainless steel wire mesh

**Size of filter or element**
FLN: 160, 250, 400

**Operating pressure**
D = 25 bar

**Type and size of port**
to DIN 24550 (●), possible ports (x)

| Type | Port | Filter size | | |
|---|---|---|---|---|
| | | 160 | 250 | 400 |
| E | G 1¼ | ● | X | X |
| F | G 1½ | X | ● | X |
| K | DN 38* | X | X | ● |

*Flange SAE 1½", 3000 PSI

**Filtration rating in µm**
BN4HC: 3, 6, 10, 25
W/HC: 25, 50, 100, 200

**Type of clogging indicator**
Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
LZ visual-mechanical / electrical
(for other clogging indicators see brochure no. E 7.050../..)

**Type code**
1

**Modification number**
X the latest version is always supplied

**Supplementary details**
A. pressure setting (e.g. A2 = 2 bar)
B. bypass cracking pressure (e.g.: B3.5 = 3.5 bar, B7 = 7 bar); no details = without bypass valve
L... light with appropriate voltage (24V, 48V, 110V, 220V) (only for clogging indicators Type D)
LED 2 light emitting diodes up to 24 Volt (only for clogging indicators Type D)
A V LZ indicator with plug to AUDI and VW specification
BO LZ indicator with plug and pin connection to BMW and Opel specification (M12x1)
CN LZ indicator with plug to DIN 43651 with 3 LEDs (CNOMO standard)
DB LZ indicator with plug to DIN 43651 with 3 LEDs (Daimler-Benz standard)
D4C LZ indicator with plug and pin connection to Daimler-Chrysler specification and cold start suppression 30 °C
BO-LED as for BO, but with progressive diode strip
V FPM seals
W suitable for HFA and HFC emulsions

### 2.2 REPLACEMENT ELEMENT

**0250 DN 010 BN4HC /-V**

**Size**
0160, 0250, 0400

**Type**
DN

**Filtration rating in µm**
BN4HC : 003, 006, 010, 025
W/HC : 025, 050, 100, 200

**Filter material**
BN4HC, W/HC

**Supplementary details**
V, W (for descriptions, see point 2.1)

### 2.3 REPLACEMENT CLOGGING INDICATOR

**VM 5 D . X /-L24**

**Type**
VM differential pressure indicator up to 210 bar operating pressure
VD differential pressure indicator up to 420 bar operating pressure (only for LE and LZ)

**Pressure setting**
5 5 bar standard, others on request

**Type of clogging indicator**
D (see point 2.1 )

**Modification number**
X the latest version is always supplied

**Supplementary details**
L..., LED, V, W (for descriptions, see point 2.1)

# 3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see point 3.1)

$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see point 3.2)

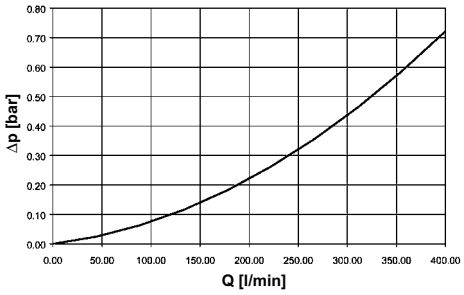
For ease of calculation, our Filter Sizing Program is available on request free of charge.

**NEW:** Sizing online at www.hydac.com

## 3.1 Δp-Q HOUSING GRAPHS BASED ON ISO 3968

The housing graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

**FLN 160, 250, 400**

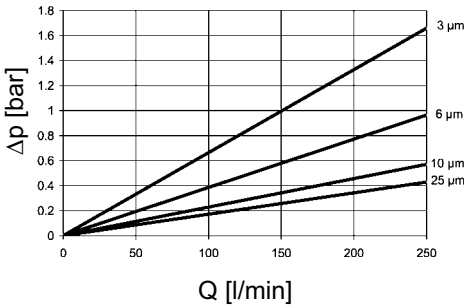



## 3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

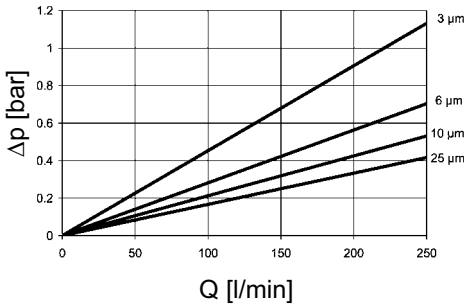
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

| FLN | BN4HC | | | | W/HC |
|---|---|---|---|---|---|
| | 3 µm | 6 µm | 10 µm | 25 µm | – |
| 160 | 7.9 | 5.1 | 3.4 | 2.6 | 0.168 |
| 250 | 5.1 | 3.2 | 2.1 | 1.7 | 0.101 |
| 400 | 3.2 | 2.0 | 1.3 | 1.0 | 0.068 |

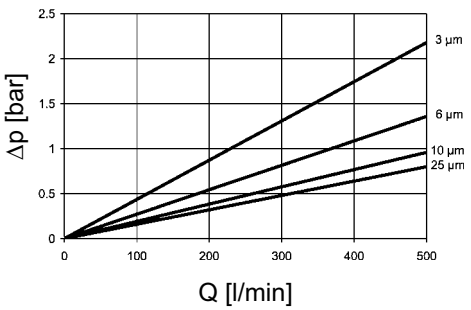
**BN4HC: FLN 160**



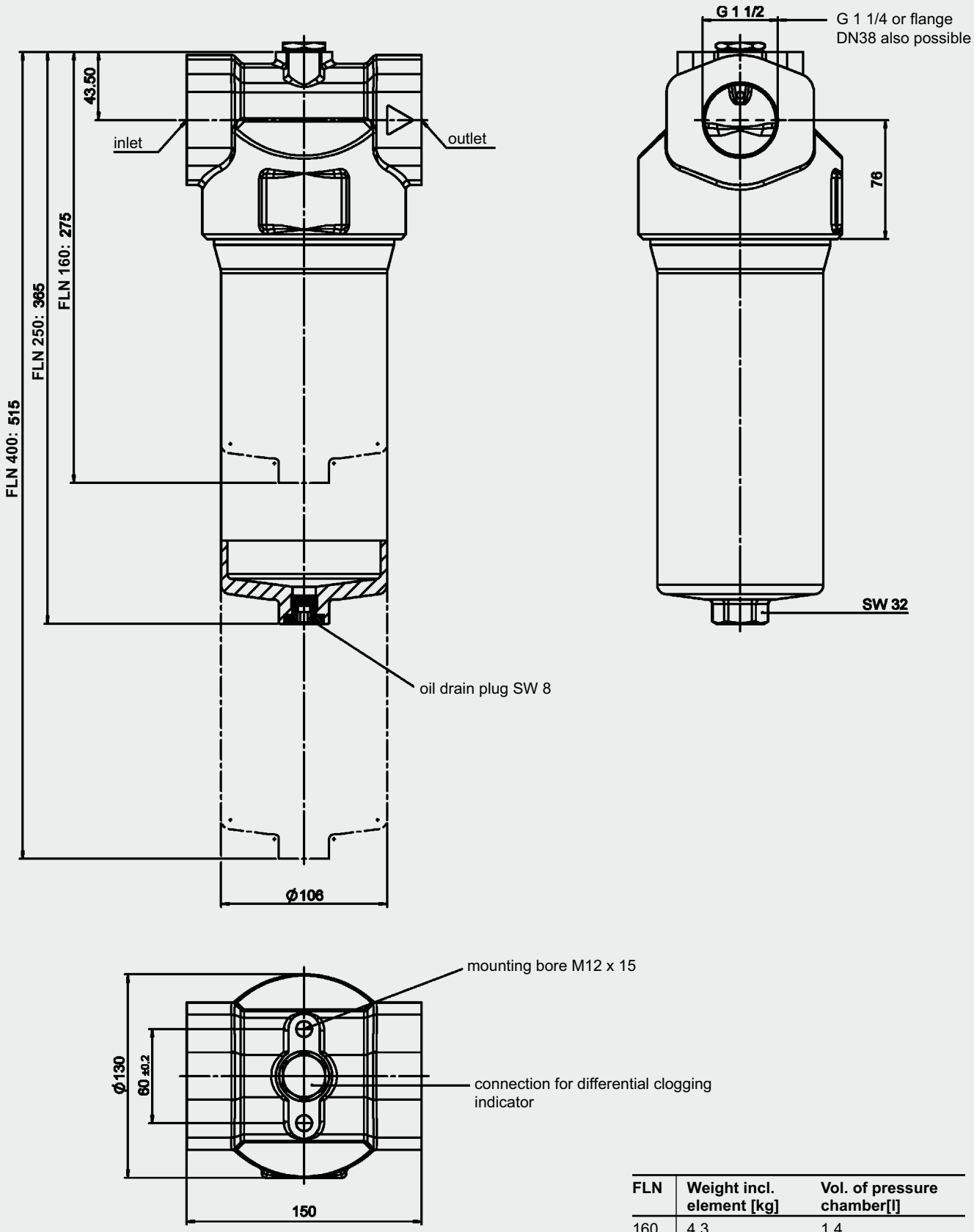

**BN4HC: FLN 250**




**BN4HC: FLN 400**



## 4. DIMENSIONS




| FLN | Weight incl. element [kg] | Vol. of pressure chamber[l] |
|---|---|---|
| 160 | 4.3 | 1.4 |
| 250 | 4.9 | 2.0 |
| 400 | 5.9 | 3.1 |

## NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

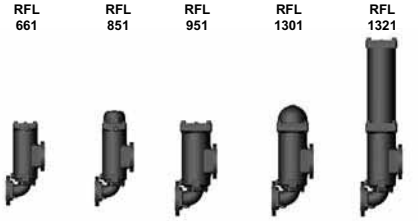
Subject to technical modifications.sind vorbehalten.


HYDAC **Filtertechnik GmbH**
Industriegebiet
**D-66280 Sulzbach/Saar**
Tel.: 0 68 97 / 509-01
Fax: 0 68 97 / 509-300
Internet: www.hydac.com
E-Mail: filter@hydac.com



# Inline Filter RFL Cast Version

## up to 1300 l/min, up to 40 bar




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. They consist of a two-piece filter housing with a bolt-on cover plate.

Standard equipment:

- connections for venting and draining
- connection for a clogging indicator

### 1.2 FILTER ELEMENTS

Hydac filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

**Contamination retention capacities in g**

| | | Betamicron® (BN4HC) | | | |
|---|---|---|---|---|---|
| RFL | Elements | 3 µm | 5 µm | 10 µm | 20 µm |
| 66x | 1x0660 R | 87.1 | 96.5 | 116.1 | 131.3 |
| 85x | 1x0850 R | 112.1 | 124.2 | 149.5 | 169.1 |
| 95x | 1x0950 R | 130.0 | 144.1 | 173.3 | 196.1 |
| 130x | 1x1300 R | 181.0 | 200.7 | 241.4 | 273.1 |
| 132x | 1x2600 R | 369.4 | 409.4 | 492.5 | 557.2 |

Filter elements are available with the following pressure stability values:

| | |
|---|---|
| Betamicron® (BN4HC): | 20 bar |
| Paper (P/HC): | 10 bar |
| Wire mesh (W/HC): | 20 bar |
| Stainless steel fibre (V): | 30 bar |
| Betamicron®/Aquamicron® (BN4AM): | 10 bar |
| Aquamicron® (AM): | 10 bar |

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Nominal pressure | 25 bar<br>40 bar (RFL 662 to 1322 to AD) |
| Temperature range | -10 °C to +100 °C |
| Material of filter housing and cover plate | EN-GJS-400-15 : RFL 661 to 1321<br>GP 240 GH+N : RFL 662 to 1322<br>1.4581/4571 : RFL 853*<br>On RFL 1321 and 1322 the extension is in steel! |
| Type of clogging indicator | VM (differential pressure measurement up to 210 bar operating pressure) |
| Pressure setting of clogging indicator | 2 bar (others on request) |
| Bypass cracking pressure | 3 bar (others on request) |

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 MOUNTING

As inline filter

### 1.6 SPECIAL MODELS AND ACCESSORIES

- Inlet and outlet positioned one above the other
- Counter flanges as welding or blank flanges

### 1.7 SPARE PARTS

See Original Spare Parts List

### 1.8 CERTIFICATES AND APPROVALS

Material code (final digit of filter size) - 1:
These filters can be supplied with manufacturer's certificates O and M to DIN 55350, Part 18.
Test certificates 3.1 to DIN EN 10204 and approval certificates (Type Approval) for different approval authorities.
Areas of application, amongst others: lubrication.

Material code (final digit of filter size) - 2:
These filters are designed according to API 614, which contains guidelines for the design and designation of basic types of oil supply systems for bearings and shaft seals of larger machines.

Material code (final digit of filter size) - 3:
Filters for use in separation technology with low viscosity, high viscosity and aggressive fluids as well as gaseous media.*

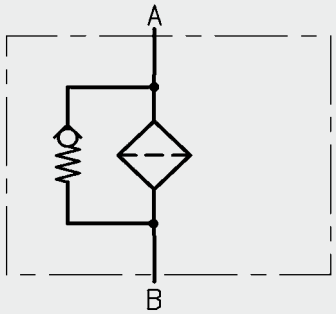
### 1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Non-flam operating fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

### 1.10 IMPORTANT INFORMATION

- Filter housing must be earthed
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector
- Filters must be flexibly mounted and not fixed rigidly to the floor or used as a pipe support.

**Symbol for hydraulic systems**




* These filters are available from our Process Technology Department:
HYDAC PROCESS TECHNOLOGY GMBH
Industriegebiet Grube König
Am Wrangelflöz 1
D-66583 Neunkirchen
Tel.: +49 (0)6821 - 86 90-0
Fax: +49 (0)6821 - 86 90-200
Email: prozess-technik@hydac.com

## 2. MODEL CODE (also order example)

**RFL BN/HC 851 D N 10 D 1 . X /-L24**

### 2.1 COMPLETE FILTER

**Filter type**
RFL

**Filter material of element**

| | | | | | |
|---|---|---|---|---|---|
| BN/HC | Betamicron® (BN4HC) | P/HC | Paper | AM | Aquamicron® |
| V | Stainless steel fibre | W/HC | Wire mesh | BN/AM | Betamicron®/Aquamicron® |

**Size of filter or element**
RFL: 661, 662, 851, 853, 951, 952, 1301, 1302, 1321, 1322

**Operating pressure**
D = 25 bar
E = 40 bar (RFL 662-1322 to AD)

**Type and size of port**

| Type | Port | Filter size 661 662 | 851 853 | 951 952 | 1301 1302 | 1321 1322 |
|---|---|---|---|---|---|---|
| N | SAE DN 80 (3“) | ● | ● | | | |
| P | SAE DN 100 (4“) | | | ● | ● | ● |
| Q | DIN DN 80 | ● | ● | | | |
| R | DIN DN 100 | | | ● | ● | ● |

Other nominal widths and ANSI ports on request

**Filtration rating in µm**
BN/HC, V: 3, 5, 10, 20 P/HC: 10, 20 AM: 40
W/HC: 25, 50, 100, 200 BN/AM: 3, 10

**Type of clogging indicator**
Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
] for other clogging indicators see brochure no. E 7.050../..

**Type code**
1

**Modification number**
X the latest version is always supplied

**Supplementary details**
B. special cracking pressure of bypass (e.g. B1 = 1 bar)
GA counter flange as welding flange
GB counter flange as blank flange
KB without bypass flange
L... light with appropriate voltage (24V, 48V, 110V, 220V) ] only for clogging indicators type D
LED 2 light emitting diodes up to 24 Volt
OR O-ring groove on the DIN flange (inlet and outlet) to Rexroth standard AB 22-04
V FPM seals
33 inlet and outlet positioned one above the other
SAK contamination retainer

### 2.2 REPLACEMENT ELEMENT

**0850 R 010 BN4HC /-V**

**Size**
0660, 0850, 0950, 1300, 2600

**Type**
R

**Filtration rating in µm**
BN4HC, V: 003, 005, 010, 020 P/HC: 010, 020 AM: 040
W/HC: 025, 050, 100, 200 BN4AM: 003, 010

**Filter material**
BN4HC, V, W/HC, P/HC, BN4AM, AM

**Supplementary details**
V (for descriptions, see point 2.1)

### 2.3 REPLACEMENT CLOGGING INDICATOR

**VM 2 D . X /-L24**

**Type**
VM differential pressure measurement up to 210 bar operating pressure

**Pressure setting**
2 2 bar standard, others on request

**Type of clogging indicator** (see point 2.1)

**Modification number**
X the latest version is always supplied

**Supplementary details**
L..., LED, V (for descriptions, see point 2.1)

# 3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see point 3.1)

$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see point 3.2)

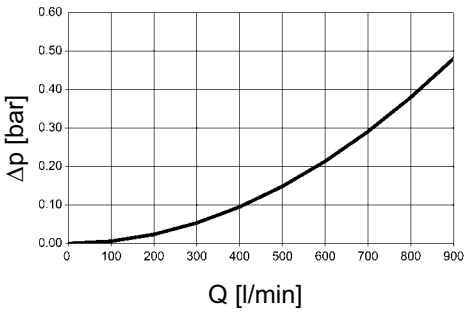
For ease of calculation, our Filter Sizing Program is available on request free of charge.

**NEW:** Sizing online at www.hydac.com

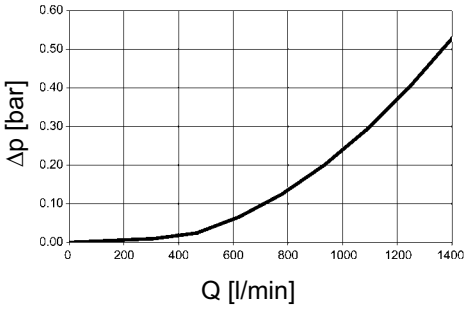
## 3.1 Δp-Q HOUSING GRAPHS BASED ON ISO 3968

The housing graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

**RFL 661, 662, 851, 853**




**RFL 951, 952, 1301, 1302, 1321, 1322**

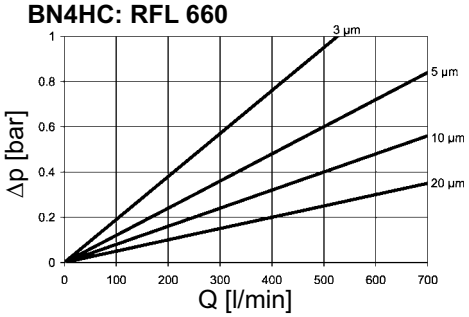



## 3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

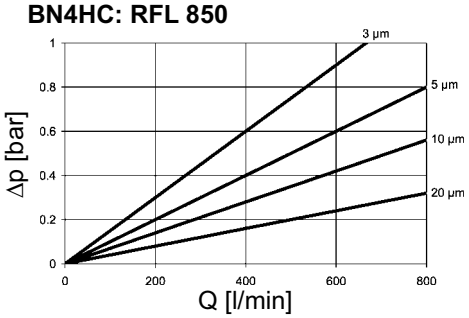
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

| RFL | V | | | | W/HC |
|---|---|---|---|---|---|
| | 3 µm | 5 µm | 10 µm | 20 µm | – |
| 660 | 1.0 | 0.8 | 0.6 | 0.4 | 0.081 |
| 850 | 0.8 | 0.6 | 0.4 | 0.3 | 0.063 |
| 950 | 0.7 | 0.6 | 0.4 | 0.2 | 0.054 |
| 1300 | 0.5 | 0.4 | 0.3 | 0.2 | 0.045 |
| 2600 | 0.3 | 0.2 | 0.1 | 0.1 | 0.022 |

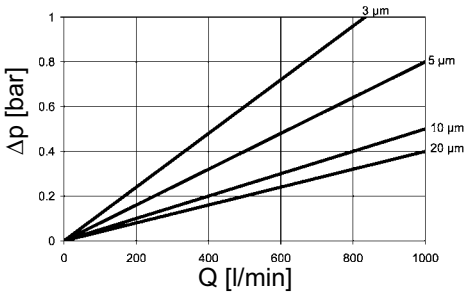
**BN4HC: RFL 660**



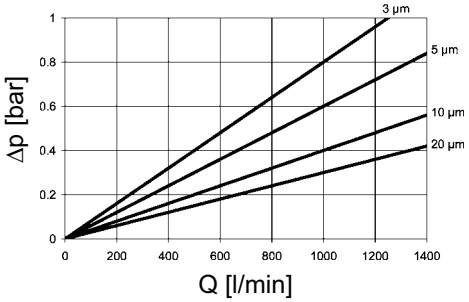

**BN4HC: RFL 850**



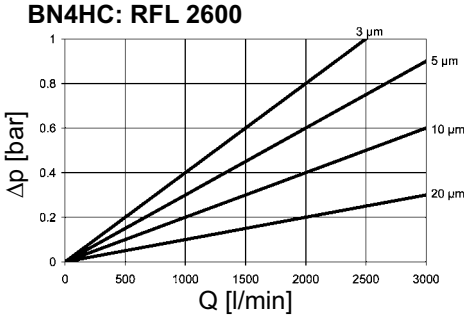

**BN4HC: RFL 950**



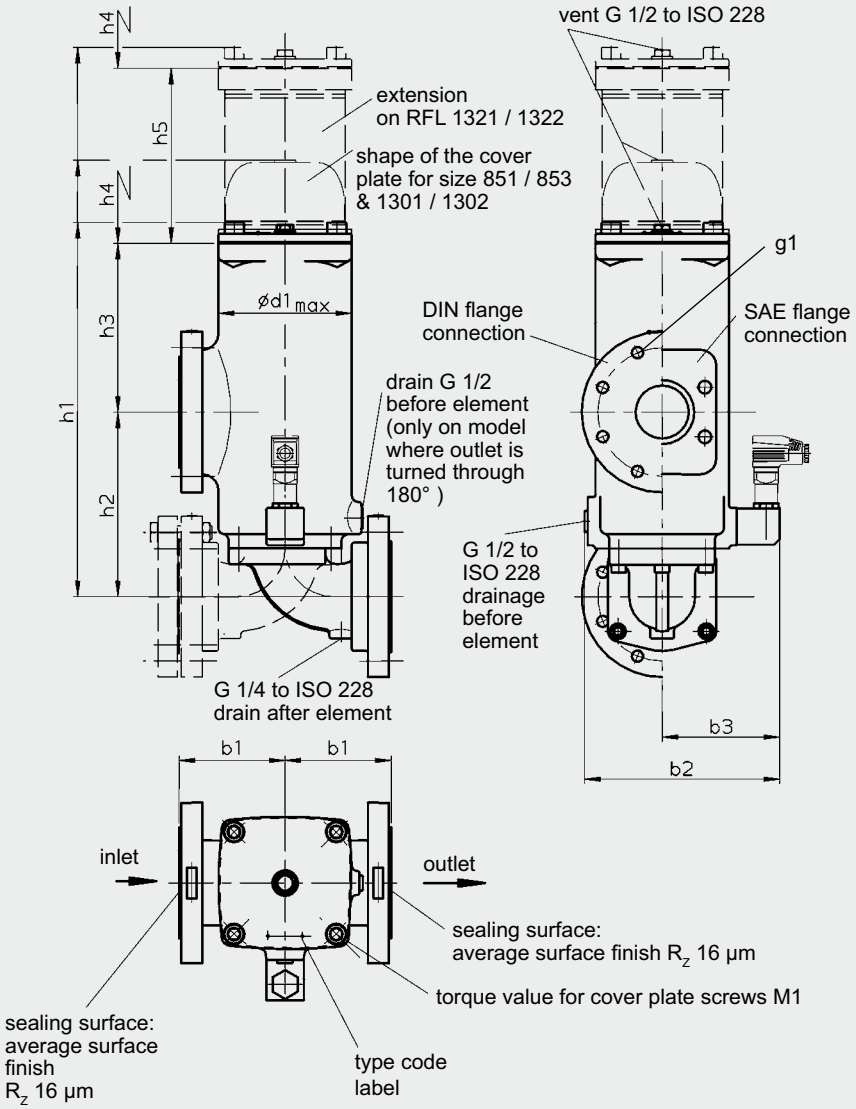

**BN4HC: RFL 1300**




**BN4HC: RFL 2600**



## 4. DIMENSIONS




| RFL | Flange port | b1 | b2 | b3 | d1 | h1 | h2 | h3 | h4 | h5 (Nm) | M1 | g1 | Weight including element [kg] | Volume of pressure chamber [l] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 661 | SAE DN 80<br>DIN DN 80 | 133 | 192<br>184 | 239 | 172 | 465 | 230 | 210 | 350 | - | 150 | M16<br>M16 | 36 | 8.2 |
| 662 | SAE DN 80<br>DIN DN 80 | 133 | 192<br>184 | 239 | 172 | 465 | 230 | 210 | 350 | - | 150 | M16<br>M16 | 42 | 8.2 |
| 851 | SAE DN 80<br>DIN DN 80 | 133 | 192<br>184 | 239 | 172 | 552 | 230 | 210 | 420 | - | 150 | M16<br>M16 | 38.5 | 9.5 |
| 853 | SAE DN 80<br>DIN DN 80 | 133 | 192<br>184 | 239 | 172 | 552 | 230 | 210 | 420 | - | 150 | M16<br>M16 | 45 | 9.5 |
| 951 | SAE DN 100<br>DIN DN 100 | 143 | 223<br>215 | 267 | 220 | 523 | 250 | 238 | 380 | - | 250 | M16<br>M20 | 54 | 13 |
| 952 | SAE DN 100<br>DIN DN 100 | 143 | 223<br>215 | 267 | 220 | 523 | 250 | 238 | 380 | - | 250 | M16<br>M20 | 67.5 | 13 |
| 1301 | SAE DN 100<br>DIN DN 100 | 143 | 223<br>215 | 267 | 220 | 630 | 250 | 238 | 500 | - | 250 | M16<br>M20 | 55.5 | 16 |
| 1302 | SAE DN 100<br>DIN DN 100 | 143 | 223<br>215 | 267 | 220 | 630 | 250 | 238 | 500 | - | 250 | M16<br>M20 | 75.5 | 16 |
| 1321 | SAE DN 100<br>DIN DN 100 | 143 | 223<br>215 | 267 | 220 | 1084 | 250 | 238 | 940 | 561 | 250 | M16<br>M20 | 82 | 31 |
| 1322 | SAE DN 100<br>DIN DN 100 | 143 | 223<br>215 | 267 | 220 | 1084 | 250 | 238 | 940 | 561 | 250 | M16<br>M20 | 96 | 31 |

## NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.

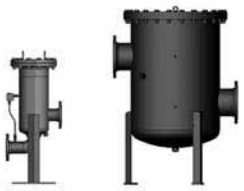

HYDAC **Filtertechnik GmbH**
Industriegebiet
**D-66280 Sulzbach/Saar**
Tel.: 0 68 97 / 509-01
Fax: 0 68 97 / 509-300
Internet: www.hydac.com
E-Mail: filter@hydac.com



# Inline Filter RFL Welded Version

## up to 15000 l/min, up to 16 bar

RFL 1300 C Q to RFL 15000 C W



## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. They consist of a two-piece filter housing with a bolt-on cover plate.

Standard equipment:

- stand
- inlet and outlet are positioned at different heights on opposite sides
- connections for venting and draining
- connection for a clogging indicator

### 1.2 FILTER ELEMENTS

Hydac filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

**Contamination retention capacities in g**

| | | Betamicron® (BN4HC) | | | |
|---|---|---|---|---|---|
| RFL | Elements | 3 µm | 5 µm | 10 µm | 20 µm |
| 130x | 1x1300 R | 181.0 | 200.7 | 241.4 | 273.1 |
| 132x | 1x2600 R | 369.4 | 409.4 | 492.5 | 557.2 |
| 250x | 3x0850 R | 336.3 | 372.6 | 448.5 | 507.3 |
| 252x | 3x1700 R | 689.4 | 764.1 | 919.2 | 1039.8 |
| 400x | 5x0850 R | 560.5 | 621.0 | 747.5 | 845.5 |
| 402x | 5x1700 R | 1149.0 | 1273.5 | 1532.0 | 1733.0 |
| 520x | 4x1300 R | 724.0 | 802.8 | 965.6 | 1092.4 |
| 522x | 4x2600 R | 1477.6 | 1637.6 | 1970.0 | 2228.8 |
| 650x | 5x1300 R | 905.0 | 1003.5 | 1207.0 | 1365.5 |
| 652x | 5x2600 R | 1847.0 | 2047.0 | 2462.5 | 2786.0 |
| 780x | 6x1300 R | 1086.0 | 1204.2 | 1448.4 | 1638.6 |
| 782x | 6x2600 R | 2216.4 | 2456.4 | 2955.0 | 3343.2 |
| 1500x | 10x1300 R | 1810.0 | 2007.0 | 2414.0 | 2731.0 |
| 1502x | 10x2600 R | 3694.0 | 4094.0 | 4925.0 | 5572.0 |

Filter elements are available with the following pressure stability values:

| | |
|---|---|
| Betamicron® (BN4HC): | 20 bar |
| Paper (P/HC): | 10 bar |
| Wire mesh (W/HC): | 20 bar |
| Stainless steel fibre (V): | 30 bar |
| Betamicron®/Aquamicron® (BN4AM): | 10 bar |
| Aquamicron® (AM): | 10 bar |

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Nominal pressure | 16 bar |
| Temperature range | -10 °C to +100 °C |
| Material of filter housing and cover plate | RFL 1300 to 15020: Welded steel<br>RFL 1303 to 15023: Stainl. steel 1.4571 |
| Type of clogging indicator | VM (differential pressure measurement up to 210 bar operating pressure) |
| Pressure setting of clogging indicator | 2 bar (others on request) |
| Bypass cracking pressure | 3 bar (others on request) |

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 MOUNTING

As inline filter

### 1.6 SPECIAL MODELS AND ACCESSORIES

- Drain and vent ports with ball valves or other shut-off valves
- Inlet and outlet positioned one above the other
- Counter flanges available for all sizes
- Venting line with sight gauges
- Cover plate lifting device

### 1.7 SPARE PARTS

See Original Spare Parts List

### 1.8 CERTIFICATES AND APPROVALS

Material code (final digit of filter size) - 1:
These filters can be supplied with manufacturer's certificates O and M to DIN 55350, Part 18.
Test certificates 3.1 to DIN EN 10204

Material code (final digit of filter size) - 3:
Filters for use in separation technology with low viscosity, high viscosity and aggressive fluids as well as gaseous media.*

* *These filters are available from HYDAC Process Technology Department.*

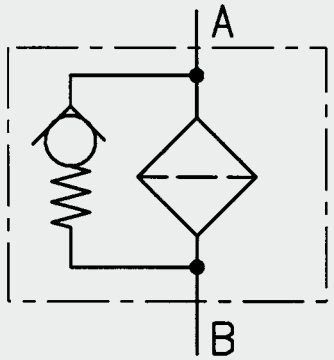
### 1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Non-flam operating fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

### 1.10 IMPORTANT INFORMATION

- Filter housing must be earthed
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector
- Filters must be flexibly mounted and not fixed rigidly to the floor or used as a pipe support.

**Symbol for hydraulic systems**



## 2. MODEL CODE (also order example)

**RFL BN/HC 1300 C K 10 D 1 . X /-L24**

### 2.1 COMPLETE FILTER

**Filter type**
RFL

**Filter material of element**

| | | | | | |
|---|---|---|---|---|---|
| BN/HC | Betamicron® (BN4HC) | P/HC | Paper | AM | Aquamicron® |
| V | Stainless steel fibre | W/HC | Wire mesh | BN/AM | Betamicron®/Aquamicron® |

**Size of filter or element**
RFL: 1300, 1303, 1320, 1323, 2500, 2503, 2520, 2523, 4000, 4003, 4020, 4023, 5200, 5203, 5220, 5223, 6500, 6503, 6520, 6523, 7800, 7803, 7820, 7823, 15000, 15003, 15020, 15023

**Operating pressure**
C = 16 bar

**Type and size of port**

| Type | Port | Filter size | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1300 | 1320 | 2500 | 4000 | 5200 | 6500 | 7800 | 15000 |
| | | 1303 | 1323 | 2503 | 4003 | 5203 | 6503 | 7803 | 15003 |
| | | | | 2520 | 4020 | 5220 | 6520 | 7820 | 15020 |
| | | | | 2523 | 4023 | 5223 | 6523 | 7823 | 15023 |
| K | DIN DN 40 | ● | ● | | | | | | |
| L | DIN DN 50 | ● | ● | ● | | | | | |
| M | DIN DN 65 | ● | ● | ● | | | | | |
| Q | DIN DN 80 | ● | ● | ● | ● | ● | | | |
| R | DIN DN 100 | ● | ● | ● | ● | ● | ● | ● | |
| U | DIN DN 125 | | ● | ● | ● | ● | ● | ● | |
| V | DIN DN 150 | | | ● | ● | ● | ● | ● | |
| W | DIN DN 200 | | | | ● | ● | ● | ● | ● |
| X | DIN DN 250 | | | | | ● | ● | ● | ● |
| Y | DIN DN 300 | | | | | | | | ● |

**Filtration rating in µm**
BN4HC, V: 3, 5, 10, 20 P/HC: 10, 20 AM: 40
W/HC: 25, 50, 100, 200 BN/AM: 3, 10

**Type of clogging indicator**
Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
] for other clogging indicators see brochure no. E 7.050../..

**Type code**
1

**Modification number**
X the latest version is always supplied

**Supplementary details**
B. special cracking pressure of bypass (e.g. B1 = 1 bar)
DH cover plate lifting device
KB without bypass flange
L... light with appropriate voltage (24V, 48V, 110V, 220V)
LED 2 light emitting diodes up to 24 Volt
] only for clogging indicators type D
OR O-ring groove on the DIN flange (inlet and outlet) to Rexroth standard AB 22-04
RE sealing strip E on the flange (inlet and outlet): surface finish 3.6 µm
V FPM seals
33 inlet and outlet positioned one above the other

### 2.2 REPLACEMENT ELEMENT

**1300 R 010 BN/HC /-V**

**Size**
0850, 1300, 1700, 2600

**Type**
R

**Filtration rating in µm**
BN4HC, V: 003, 005, 010, 020 P/HC: 010, 020 AM: 040
W/HC: 025, 050, 100, 200 BN4AM: 003, 010

**Filter material**
BN4HC, V, W/HC, P/HC, BN4AM, AM

**Supplementary details**
V (for descriptions, see point 2.1)

### 2.3 REPLACEMENT CLOGGING INDICATOR

**VM 2 D . X /-L24**

**Type**
VM differential pressure measurement up to 210 bar operating pressure

**Pressure setting**
2 2 bar standard, others on request

**Type of clogging indicator** (see point 2.1)

**Modification number**
X the latest version is always supplied

**Supplementary details**
L..., LED, V (for descriptions, see point 2.1)

# 3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see point 3.1)

$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see point 3.2)

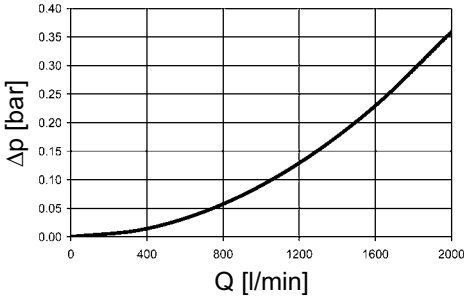
For ease of calculation, our Filter Sizing Program is available on request free of charge.

**NEW:** Sizing online at www.hydac.com

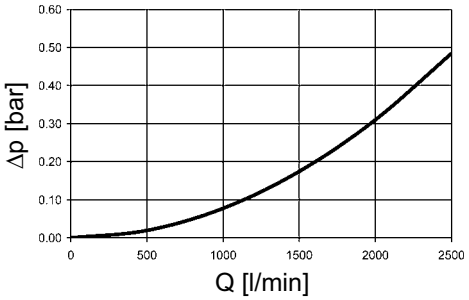
## 3.1 Δp-Q HOUSING GRAPHS BASED ON ISO 3968

The housing graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

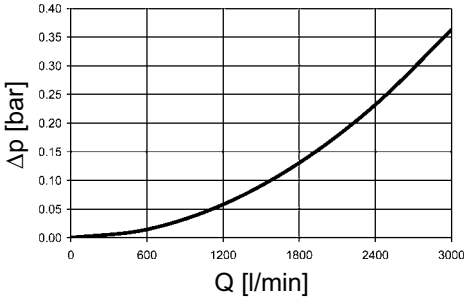
**RFL 1300, 1303**



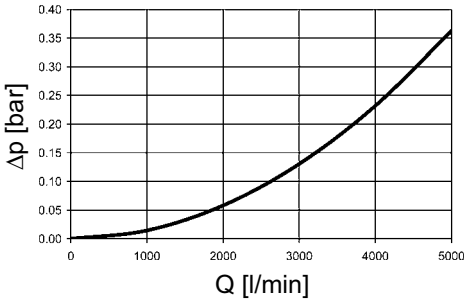

**RFL 1320, 1323**



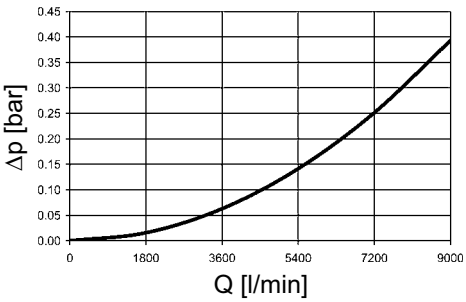

**RFL 2500, 2503, 2520, 2523**



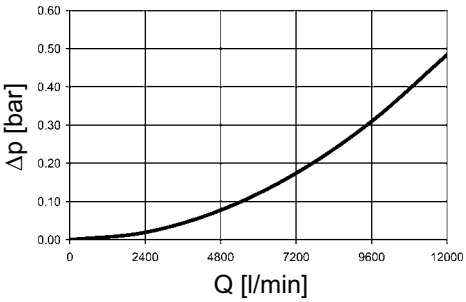

**RFL 4000, 4003, 4020, 4023**



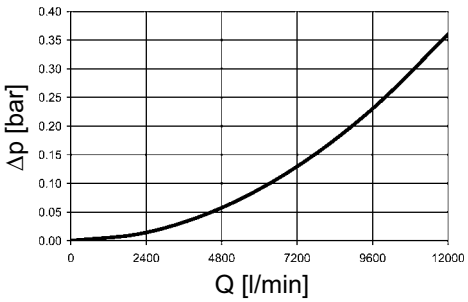

**RFL 5200, 5203, 5220, 5223**



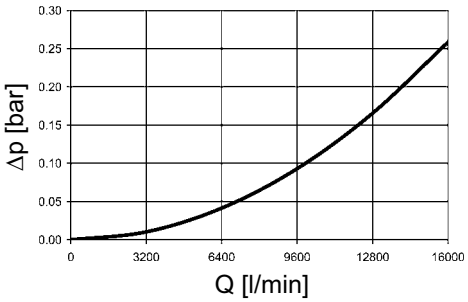

**RFL 6500, 6503, 6520, 6523**




**RFL 7800, 7803, 7820, 7823**




**RFL 15000, 15003, 15020, 15023**

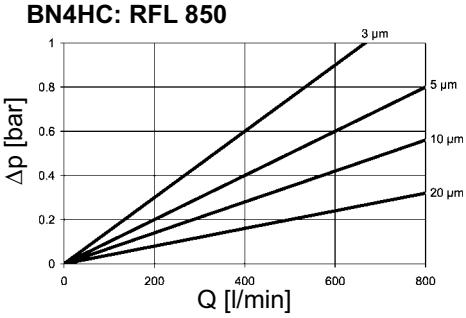



## 3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

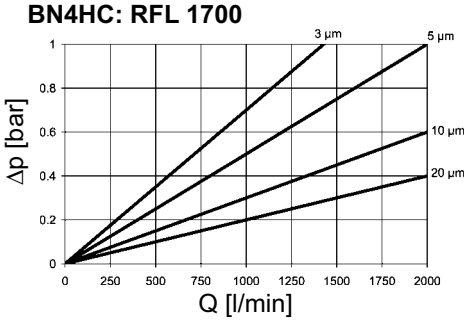
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

| RFL | V | | | | W/HC |
|---|---|---|---|---|---|
| | 3 µm | 5 µm | 10 µm | 20 µm | – |
| 850 | 0.8 | 0.6 | 0.4 | 0.3 | 0.063 |
| 1300 | 0.5 | 0.4 | 0.3 | 0.2 | 0.045 |
| 1700 | 0.4 | 0.3 | 0.2 | 0.1 | 0.032 |
| 2600 | 0.3 | 0.2 | 0.1 | 0.1 | 0.018 |

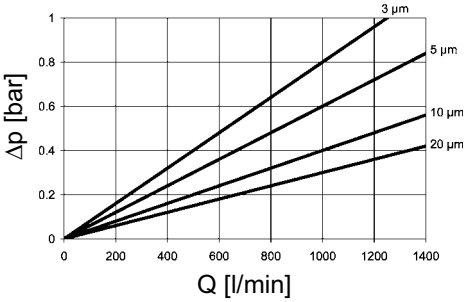
**BN4HC: RFL 850**



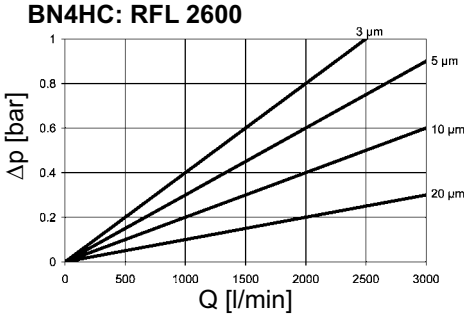

**BN4HC: RFL 1700**




**BN4HC: RFL 1300**

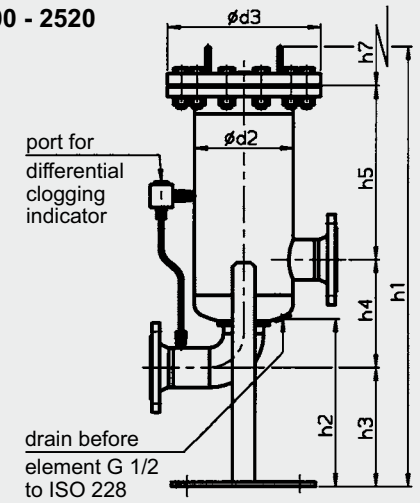



**BN4HC: RFL 2600**

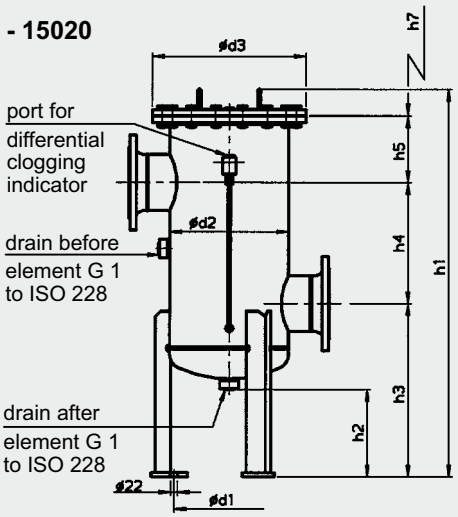


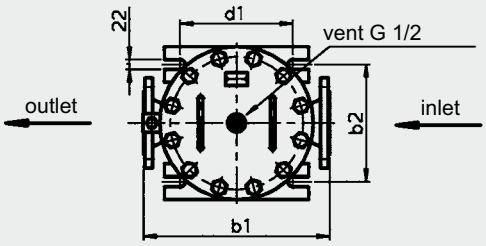
## 4. DIMENSIONS

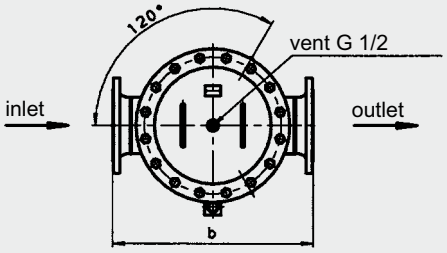
**RFL 1300 - 2520**




**RFL 4000 - 15020**




| RFL | Flange port | b1 | b2 | d1 | d2 | d3 | h1 | h2 | h3 | h4 | h5 | h7 | Weight including element [kg] | Volume of pressure chamber [l] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 130x/132x | DIN DN 40<br>DIN DN 50<br>DIN DN 65<br>DIN DN 80<br>DIN DN 100 | 412 | 260 | 250 | 219.1 | 340 | 972/1416 | 370 | 294<br>266<br>279<br>266<br>253 | 212<br>240<br>227<br>240<br>275 | 384/824<br>384/824<br>384/824<br>384/824<br>362/802 | 500/940 | 64.1/78.1<br>64.1/78.1<br>65.1/79.1<br>67.1/81.1<br>69.1/83.1 | 18/33<br>18/33<br>18/33<br>19/34<br>19/34 |
| 132x | DIN DN 125 | 480 | 260 | 250 | 219.1 | 340 | /1416 | 370 | 215 | 291 | /824 | /940 | 87.1 | /36 |
| 250x/252x | DIN DN 50<br>DIN DN 65<br>DIN DN 80<br>DIN DN 100<br>DIN DN 125<br>DIN DN 150 | 466 | 312 | 250 | 273 | 360 | 942/1332 | 220 | 378<br>408<br>388<br>438<br>438<br>438 | 270<br>350<br>410<br>304<br>380<br>365 | 222/612<br>160/550<br>120/510<br>236/626<br>160/550<br>175/565 | 420/810<br>420/810<br>420/810<br>420/810<br>420/810<br>420/810 | 73.9/82.4<br>70.9/85.4<br>72.9/87.4<br>75.9/90.4<br>79.9/94.4<br>83.9/98.4 | 34/54<br>36/56<br>36/56<br>40/60<br>40/60<br>45/65 |
| 400x/402x | DIN DN 80<br>DIN DN 100<br>DIN DN 125<br>DIN DN 150<br>DIN DN 200 | 600 | - | 330 | 355.6 | 460 | 1079/1469<br>1079/1469<br>1169/1459<br>1169/1559<br>1204/1594 | 266 | 475<br>475<br>525<br>525<br>525 | 410<br>304<br>380<br>365<br>365 | 115/505<br>221/661<br>185/575<br>200/590<br>235/625 | 420/810<br>420/810<br>420/810<br>420/810<br>420/810 | 119.5/145.0<br>121.5/147.0<br>127.5/153.0<br>133.5/159.0<br>140.5/166.0 | 64/99<br>65/100<br>75/110<br>75/110<br>83/118 |
| 520x/522x | DIN DN 80<br>DIN DN 100<br>DIN DN 125<br>DIN DN 150<br>DIN DN 200<br>DIN DN 250 | 600<br>600<br>600<br>600<br>640<br>660 | - | 380 | 406.4 | 510 | 1144/1584<br>1144/1584<br>1256/1696<br>1256/1696<br>1256/1696<br>1324/1764 | 244 | 465<br>465<br>525<br>525<br>525<br>560 | 410<br>304<br>380<br>365<br>365<br>450 | 191/631<br>297/737<br>271/711<br>286/726<br>286/726<br>236/676 | 500/940 | 158.4/202.4<br>160.4/204.4<br>170.4/214.4<br>175.4/219.4<br>179.4/223.4<br>194.4/238.4 | 89/142<br>90/143<br>104/157<br>106/159<br>110/162<br>125/178 |
| 650x/652x | DIN DN 100<br>DIN DN 125<br>DIN DN 150<br>DIN DN 200<br>DIN DN 250 | 740<br>740<br>740<br>740<br>780 | - | 480 | 508 | 620 | 1260/1700<br>1260/1700<br>1260/1700<br>1380/1820<br>1380/1820 | 255 | 540<br>540<br>540<br>600<br>600 | 304<br>380<br>365<br>460<br>450 | 3367776<br>260/700<br>275/715<br>240/680<br>250/690 | 500/940 | 221.5/274.5<br>225.5/278.5<br>230.5/283.5<br>245.5/298.5<br>255.5/308.5 | 161/246<br>162/247<br>163/248<br>190/275<br>194/279 |
| 780x/782x | DIN DN 100<br>DIN DN 125<br>DIN DN 150<br>DIN DN 200<br>DIN DN 250 | 740<br>740<br>740<br>740<br>780 | - | 480 | 508 | 620 | 1260/1700<br>1260/1700<br>1260/1700<br>1380/1820<br>1380/1820 | 255 | 540<br>540<br>540<br>600<br>600 | 304<br>380<br>365<br>460<br>450 | 336/776<br>260/700<br>275/715<br>240/680<br>250/690 | 500/940 | 225.6/282.6<br>229.6/286.6<br>234.6/291.6<br>249.6/306.6<br>259.6/316.6 | 161/246<br>162/247<br>163/248<br>190/275<br>194/279 |
| 1500x/<br>1502x | DIN DN 200<br>DIN DN 250<br>DIN DN 300 | 1000 | - | 690 | 711 | 830 | 1425/1865<br>1425/1865<br>1495/1935 | 263 | 655<br>655<br>670 | 365<br>450<br>515 | 330/770<br>245/685<br>235/675 | 500/940 | 476.0/570.0<br>488.0/582.0<br>513.0/607.0 | 391/558<br>397/564<br>426/593 |

## NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.


**HYDAC Filtertechnik GmbH**
Industriegebiet
**D-66280 Sulzbach/Saar**
Tel.: 0 68 97 / 509-01
Fax: 0 68 97 / 509-300
Internet: www.hydac.com
E-Mail: filter@hydac.com



# Spin-On Filter MF/MFD
## up to 300 l/min, up to 8 bar




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

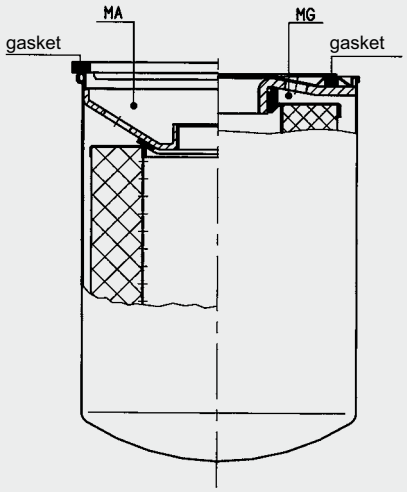
The filter consists of a filter head with built-in bypass valve and a screw-on filter cartridge.
Standard equipment:

- with 1.7 bar bypass valve

### 1.2 FILTER CARTRIDGES

MG: Cartridge connection thread to ISO 228
Sealing on inside
(note: the seal on the 0080 MA cartridge is also on the inside!)

MA: Cartridge connection UN thread
Sealing on the outside




### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Nominal pressure | 8 bar |
| Temperature range | -30 °C to +100 °C |
| Pressure setting of clogging indicator: $\Delta p_a$ | Type E: 0 to 16 bar<br>Type F: 1.5 or 2 bar<br>Type UE: 0 to -1.0 bar<br>Type UF: -0.2 bar |
| Type of clogging indicator | VMF (return line pressure indicator) |
| Material of filter head | Aluminium |
| Material of filter cartridge | Sheet steel |
| Cracking pressure of bypass valve | 1.7 bar (standard) |

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 MOUNTING

As inline filter

### 1.6 SPECIAL MODELS AND ACCESSORIES

without bypass valve or with other bypass cracking pressures

### 1.7 SPARE PARTS

See Original Spare Parts List

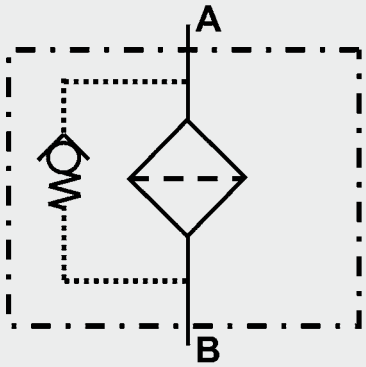
### 1.8 CERTIFICATES AND APPROVALS

On request

### 1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Non-flam operating fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

**Symbol for hydraulic systems**



## 2. MODEL CODE (ALSO ORDER EXAMPLE)

**MF BN 160 A U E 10 F 1 .X /-KB**

### 2.1 COMPLETE FILTER

**Filter type**
MF (all sizes; 1 filter cartridge)
MFD (size 160 and 180; 2 filter cartridges)

**Filter material of element**
BN Betamicron®
P Paper (only MF 80 and MF/MFD 160)

**Size of filter or cartridge**
MF: 80, 160, 180
MFD: 160, 180

**Operating pressure**
A 8 bar

**Type of cartridge connection**
G thread to ISO 228 (G1¼)
U UN thread (1-12 UNF, 1½ x 16 UN-2B)

**Type and size of port**

| Type | Port | Filter size | | |
|---|---|---|---|---|
| | | 80 | 160 | 180 |
| C | G ¾ | MF | – | – |
| E | G1 ¼ | – | MF | MF |
| F | G1 ½ | – | MFD | MFD |

**Filtration rate in µm**
BN 3, 5, 10, 20
P 10

**Type of clogging indicator**
A steel blanking plug in indicator port
E pressure gauge
F pressure switch
(pressure indicators)
UE vacuum gauge
UF vacuum switch
(vacuum indicators)
for other clogging indicators see brochure no. E 7.050../..

**Type code**
0
1 - 8 see point 2.4

**Modification number**
X the latest version is always supplied

**Supplementary details**
B. bypass cracking pressure (e.g.: B0.2 = 0.2 bar; B0.25 = 0.25 bar; B2 = 2 bar)
KB without bypass valve

### 2.2 REPLACEMENT CARTRIDGE

**0160 MA 010 BN**

**Size**
0080, 0160, 0180

**Type**
MG for filters with cartridge connection G (= thread to ISO 228); paper filter material only (exception: MF 80: 20 BN)
MA for filters with cartridge connection U (= UN thread)

**Filtration rate in µm**
BN 003, 005, 010, 020 (for MF 80: MA = all filtration ratings; MG = 20 µm)
P 010

**Filter material**
BN, P

### 2.3 REPLACEMENT CLOGGING INDICATOR

**VMF 2 F . X**

**Type**
VMF return line pressure indicator

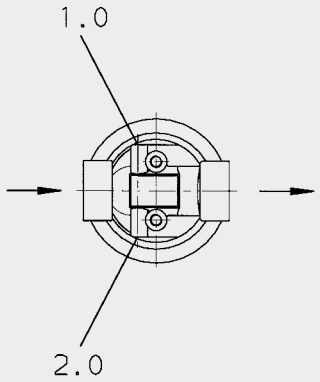
**Pressure setting**
2 (see point 1.3)

**Type of clogging indicator**
F (see point 2.1)

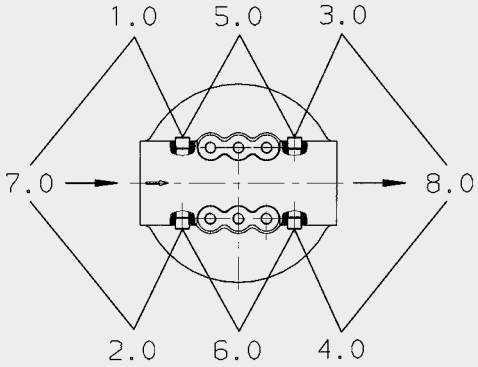
**Modification number**
X the latest version is always supplied

## 2.4 MOUNTING POSITION OF THE CLOGGING INDICATOR

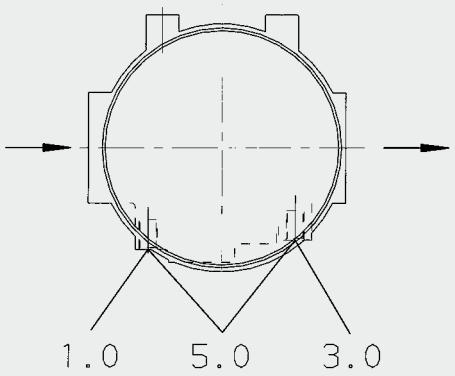
MF 80




MF 160/180




MFD 160/180




**For MF filters**

| Type code | Mounting position of the clogging indicator | Application of complete filter | Type of indicator | Specials |
|---|---|---|---|---|
| 0.X | Without clogging indicator, blanking plug in all indicator ports | | | – |
| 1.X | Filter inlet: on left | Return line filter | Pressure indicator | – |
| 2.X | Filter inlet: on right | Return line filter | Pressure indicator | – |
| 3.X | Filter outlet: on left | Suction filter | Vacuum indicator | Only for sizes 160 and 180, on versions:<br>- with bypass cracking pressure 0.2 bar (.../-B0.2)<br>- without bypass valve (.../-KB) |
| 4.X | Filter outlet: on right | Suction filter | Vacuum indicator | Only for sizes 160 and 180, on versions:<br>- with bypass cracking pressure 0.2 bar (.../-B0.2)<br>- without bypass valve (.../-KB) |
| 5.X | Filter inlet & outlet: on left | Pressure filter | Pressure and vacuum indicator | – |
| 6.X | Filter inlet & outlet: on right | Pressure filter | Pressure and vacuum indicator | – |
| 7.X | Filter inlet: on right & left | Return line filter | Pressure indicator | – |
| 8.X | Filter outlet: on right & left | Suction filter | Vacuum indicator | Only for sizes 160 and 180, on versions:<br>- with bypass cracking pressure 0.2 bar (.../-B0.2)<br>- without bypass valve (.../-KB) |

**For MFD filters**

| Type code | Mounting position of the clogging indicator | Application of complete filter | Type of indicator | Specials |
|---|---|---|---|---|
| 0.X | Without clogging indicator, blanking plug in all indicator ports | | | – |
| 1.X | Filter inlet: on right | Return line filter | Pressure indicator | – |
| 3.X | Filter outlet: on right | Suction filter | Vacuum indicator | Only on versions:<br>- with bypass cracking pressure 0.2 bar (.../-B0.2)<br>- without bypass valve (.../-KB) |
| 5.X | Filter inlet & outlet: on right | Pressure filter | Pressure & vacuum indicator | |

## 2.5 CARTRIDGE SELECTION TABLE

**Filter type MF**

| Size 80 | Cartridge |
|---|---|
| MF P 80 AGC 10 ... | 0080 MG 010 P |
| MF BN 80 AUC 10 ... | 0080 MA 010 BN |
| MF BN 80 AGC 20 ... | 0080 MG 020 BN |

| Size 160 | Cartridge |
|---|---|
| MF P 160 AGE 10... | 0160 MG 010 P |
| MF BN 160 AUE 3... | 0160 MA 003 BN |
| MF BN 160 AUE 5... | 0160 MA 005 BN |
| MF BN 160 AUE 10... | 0160 MA 010 BN |
| MF BN 160 AUE 20... | 0160 MA 020 BN |

| Size 180 | Cartridge |
|---|---|
| MF BN 180 AUE 3... | 0180 MA 003 BN |
| MF BN 180 AUE 5... | 0180 MA 005 BN |
| MF BN 180 AUE 10... | 0180 MA 010 BN |
| MF BN 180 AUE 20... | 0180 MA 020 BN |

**Filter type MFD**

| Size 80 | Cartridge |
|---|---|
| – | not available |
| – | not available |
| – | not available |

| Size 160 | Cartridge |
|---|---|
| MFD P 160 AGF 10... | 0160 MG 010 P |
| MFD BN 160 AUF 3... | 0160 MA 003 BN |
| MFD BN 160 AUF 5... | 0160 MA 005 BN |
| MFD BN 160 AUF 10... | 0160 MA 010 BN |
| MFD BN 160 AUF 20... | 0160 MA 020 BN |

| Size 180 | Cartridge |
|---|---|
| MFD BN 180 AUF 3... | 0180 MA 003 BN |
| MFD BN 180 AUF 5... | 0180 MA 005 BN |
| MFD BN 180 AUF 10... | 0180 MA 010 BN |
| MFD BN 180 AUF 20... | 0180 MA 020 BN |

## 2.6 CHANGING THE CARTRIDGE

**Filter cartridge type MG:**

Unscrew filter cartridge (using a strap wrench, if necessary). Lubricate seal on the new cartridge. Screw in new cartridge until contact is made with the sealing surface. Then hand-tighten. Check for leakage and tighten further if necessary.

**Filter cartridge type MA:**

Unscrew filter cartridge (using a strap wrench, if necessary). Lubricate new seal and insert it into the filter head. Screw in new cartridge until contact is made with the sealing surface. Then hand-tighten.
Check for leakage and tighten further if necessary.

# 3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see point 3.2)

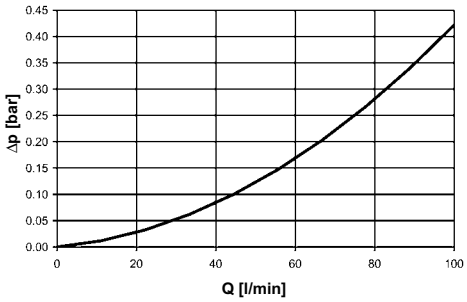
For ease of calculation, our Filter Sizing Program is available on request free of charge.

**NEW:** Sizing online at www.hydac.com

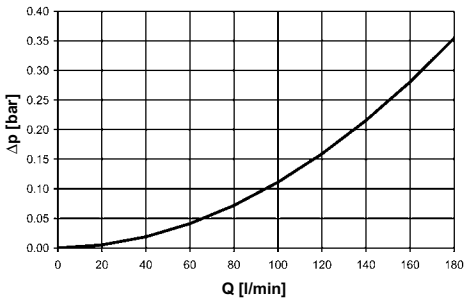
## 3.1 Δp-Q HOUSING GRAPHS BASED ON ISO 3968

The housing graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

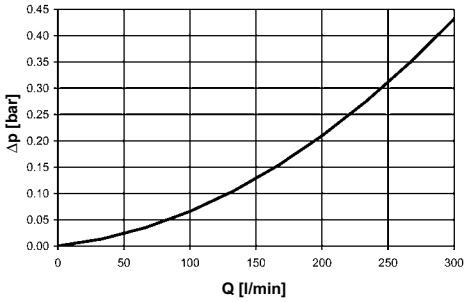
### MF 80




### MF 160, 180




### MFD 160, 180




## 3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

| BN | Filtration rating | | | |
|---|---|---|---|---|
| | 3 µm | 5 µm | 10 µm | 20 µm |
| 80 | 9.5 | 8.1 | 4.3 | 2.5 |
| 160 | 4.3 | 3.6 | 2.0 | 1.1 |
| 180 | 2.2 | 1.9 | 1.1 | 0.6 |

## 3.3 CALCULATION CRITERIA

Filters should be calculated on the basis of a total differential pressure with clean element and at operating temperature; for use as:

Suction filter: 0.03 - 0.05 bar

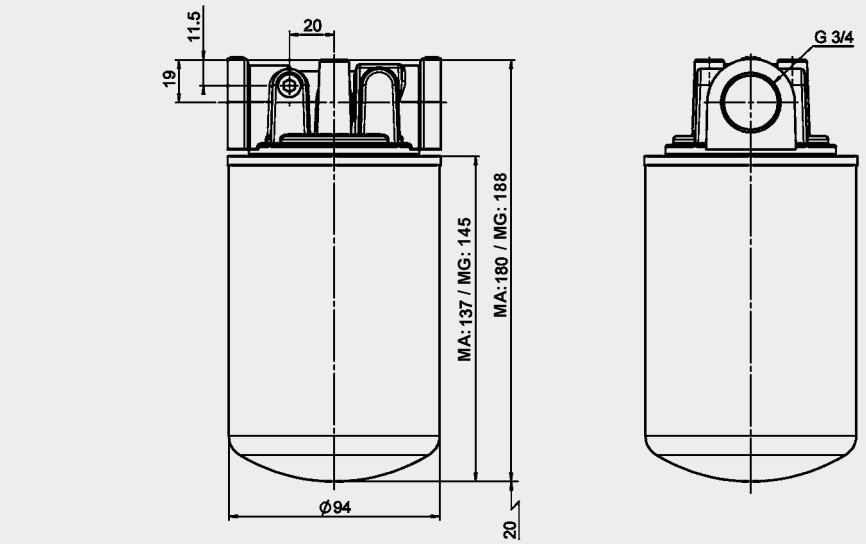
Return line filter: 0.3 - 0.5 bar

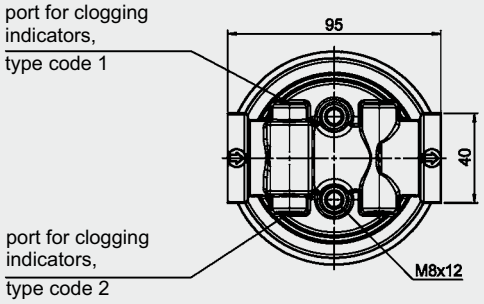
Pressure filter: 0.3 - 0.5 bar

However, cold start conditions must be taken into account!

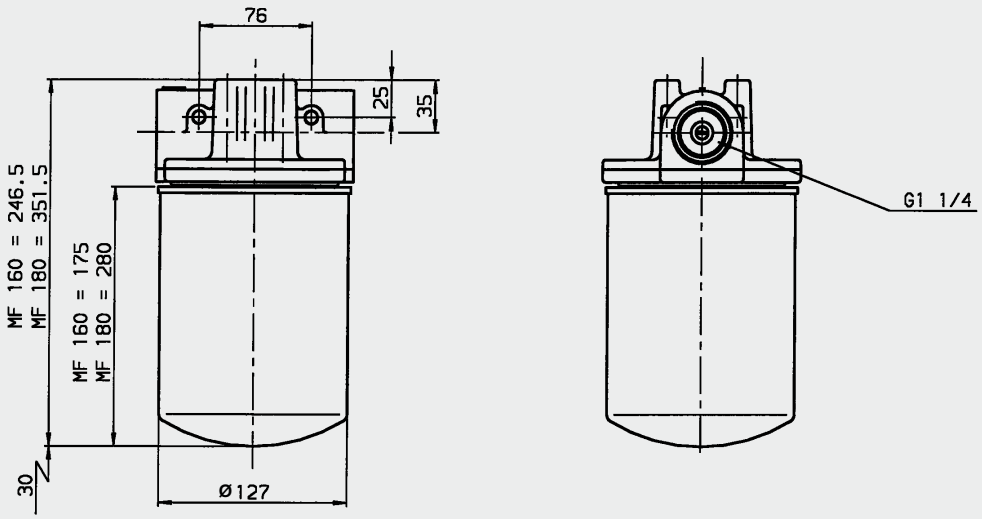
## 4. DIMENSIONS

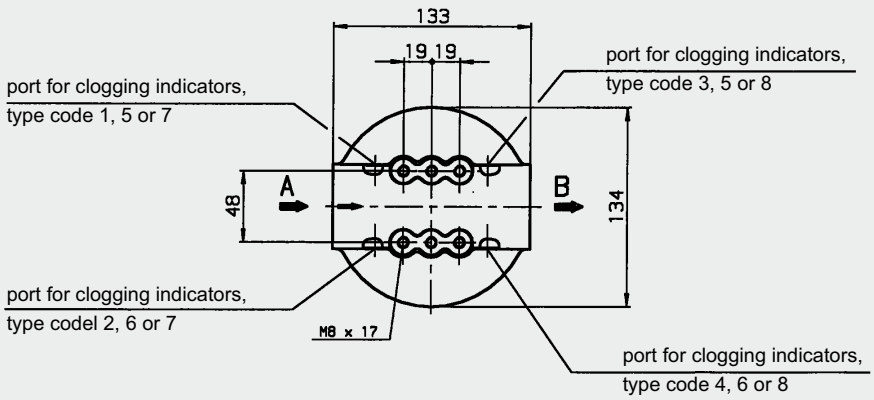
MF 80

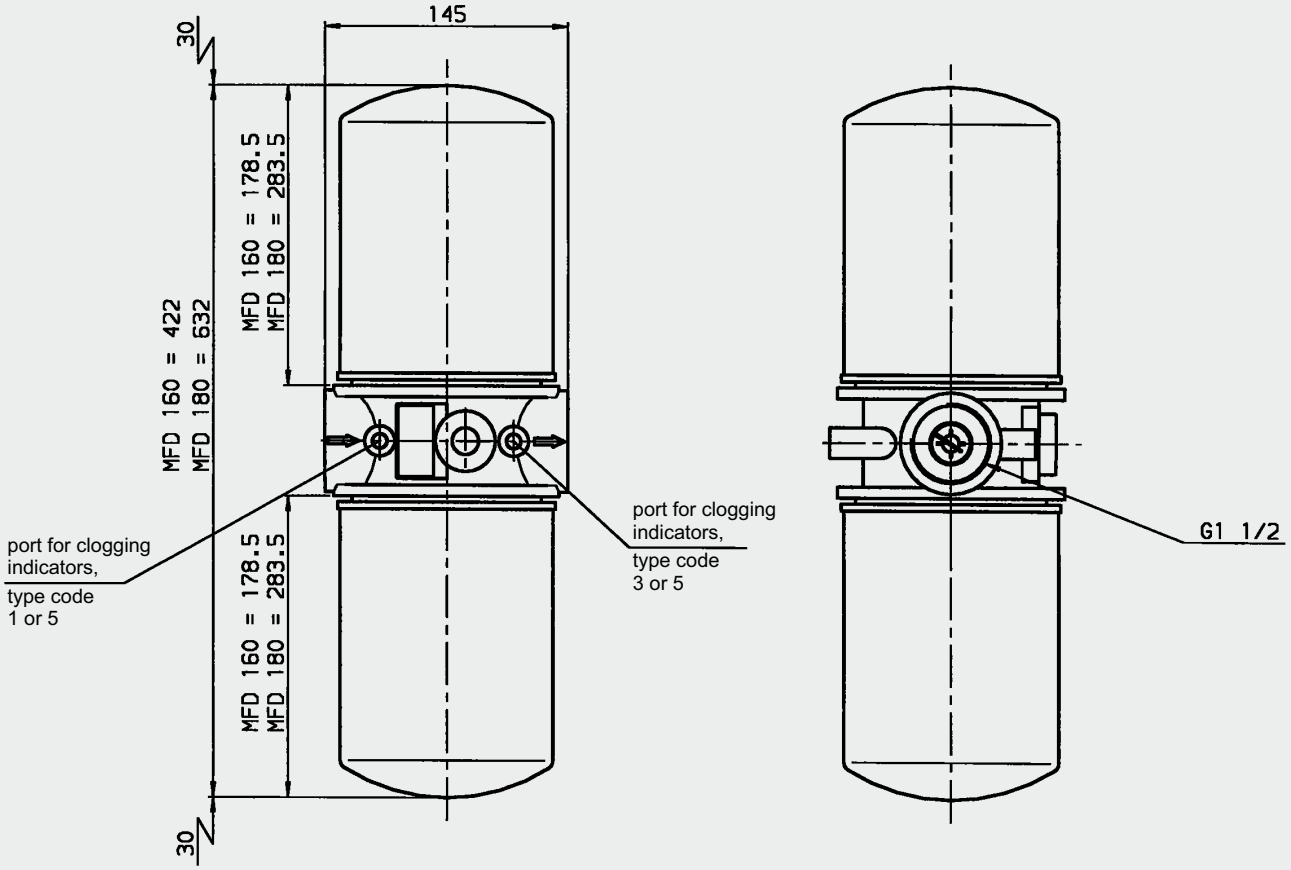


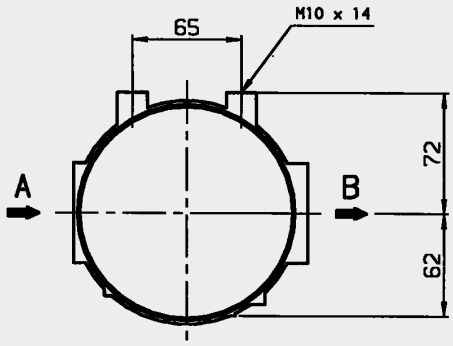




MF 160/180






**Summary**

| Filter type | Port size Inlet / Outlet | Port size Cartridge | Weight incl. element [kg] | Vol. of pressure chamber[l] |
|---|---|---|---|---|
| MF 80 | G¾ | G¾, 1-12 UNF | 0.9 | 1.00 |
| MF 160 | G1¼ | G1¼, 1½x16 UN-2B | 2.3 | 2.00 |
| MF 180 | G1¼ | 1½x16 UN-2B | 2.8 | 3.30 |
| MFD 160 | G1½ | G1¼, 1½x16 UN-2B | 3.7 | 4.00 |
| MFD 180 | G1½ | 1½x16 UN-2B | 4.5 | 6.60 |

## NOTE

The information in this brochure relates to the operating conditions and applications described.

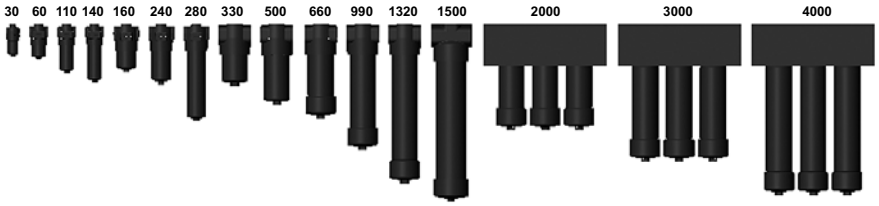
For applications or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.

HYDAC **Filtertechnik GmbH**
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**D-66280 Sulzbach/Saar**
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Internet: www.hydac.com
E-Mail: filter@hydac.com



# Pressure Filter DF
# Pressure Filter for Reversible Oil Flow DFF
up to 2000 l/min, up to 420 bar




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. They consist of a filter head with a screw-in filter bowl. DFF filters are suitable for flow in both directions.

Standard equipment:

- connection for a clogging indicator in filter head
- drain screw with pressure relief (size DF 330 and above)
- 1 or 2-piece filter bowl available as an option for DF/DFF 280-660 and DF 2000
- 2-piece filter bowl for size DF/DFF 990 and above

### 1.2 FILTER ELEMENTS

Hydac filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

**Contamination retention capacities in g**

| | | Betamicron® (BN4HC) | | | |
|---|---|---|---|---|---|
| DF/DFF | Elements | 3 µm | 5 µm | 10 µm | 20 µm |
| 30 | 1x0030 D | 4.6 | 5.1 | 5.4 | 5.6 |
| 60 | 1x0060 D | 6.5 | 7.3 | 7.8 | 8.0 |
| 110 | 1x0110 D | 13.8 | 15.5 | 16.4 | 16.9 |
| 140 | 1x0140 D | 18.1 | 20.3 | 21.5 | 22.2 |
| 160 | 1x0160 D | 19.8 | 22.2 | 23.5 | 24.3 |
| 240 | 1x0240 D | 32.3 | 36.3 | 38.4 | 39.6 |
| 280 | 1x0280 D | 70.6 | 79.3 | 83.9 | 86.6 |
| 330 | 1x0330 D | 47.2 | 53.1 | 56.1 | 57.9 |
| 500 | 1x0500 D | 76.9 | 86.5 | 91.5 | 94.4 |
| 660 | 1x0660 D | 102.2 | 114.9 | 121.5 | 125.4 |
| 990 | 1x0990 D | 154.5 | 173.7 | 183.7 | 189.5 |
| 1320 | 1x1320 D | 209.9 | 236.0 | 249.6 | 257.5 |
| 1500 | 1x1500 D | 159.5 | 170.0 | 191.3 | 212.7 |
| 2000 | 3x0660 D | 306.6 | 344.7 | 364.5 | 376.2 |
| 3000 | 3x0990 D | 463.5 | 521.1 | 551.1 | 568.5 |
| 4000 | 3x1320 D | 629.7 | 708.0 | 748.8 | 772.5 |

Filter elements are available with the following pressure stability values:

| | |
|---|---|
| Betamicron® (BN4HC): | 20 bar |
| Betamicron® (BH4HC): | 210 bar |
| Wire mesh (W): | 20 bar |
| Stainless steel fibre (V): | 210 bar |

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Nominal pressure | 420 bar |
| Fatigue strength | at nominal pressure $2x10^6$ load cycles from 0 to nominal pressure (size 30 to 1320)<br>$3x10^5$ load cycles at 420 bar (size 1500)<br>$3x10^6$ load cycles at 280 bar (size 1500)<br>$10^6$ load cycles at 315 bar (size 2000-4000) |
| Temperature range | -30 °C to +100 °C<br>(-30 °C to -10 °C: $p_{max}$= 210 bar) |
| Material of filter head | EN-GJS 400-15 |
| Material of filter bowl | Steel |
| Type of clogging indicator | VD (differential pressure indication up to 420 bar operating pressure) |
| Pressure setting of clogging indicator | 5 bar (others on request) |
| Cracking pressure of bypass, only for DF filters (optional) | 6 bar (others on request) |

| | | Betamicron® (BH4HC) | | | |
|---|---|---|---|---|---|
| DF/DFF | Elements | 3 µm | 5 µm | 10 µm | 20 µm |
| 30 | 1x0030 D | 3.0 | 2.9 | 3.2 | 3.7 |
| 60 | 1x0060 D | 4.6 | 4.5 | 5.0 | 5.7 |
| 110 | 1x0110 D | 10.1 | 9.9 | 10.9 | 12.4 |
| 140 | 1x0140 D | 13.3 | 13.0 | 14.3 | 16.3 |
| 160 | 1x0160 D | 12.9 | 12.6 | 13.9 | 15.9 |
| 240 | 1x0240 D | 21.6 | 21.1 | 23.2 | 26.5 |
| 280 | 1x0280 D | 48.1 | 47.1 | 51.8 | 59.1 |
| 330 | 1x0330 D | 34.6 | 33.9 | 37.2 | 42.5 |
| 500 | 1x0500 D | 57.5 | 56.3 | 61.8 | 70.5 |
| 660 | 1x0660 D | 76.8 | 75.2 | 82.6 | 94.3 |
| 990 | 1x0990 D | 111.8 | 109.4 | 120.2 | 137.2 |
| 1320 | 1x1320 D | 153.8 | 150.7 | 165.5 | 188.8 |
| 1500 | 1x1500 D | 126.4 | 137.8 | 160.9 | 195.3 |
| 2000 | 3x0660 D | 230.4 | 225.6 | 247.8 | 282.9 |
| 3000 | 3x0990 D | 335.4 | 328.2 | 360.6 | 411.6 |
| 4000 | 3x1320 D | 461.4 | 452.1 | 496.5 | 566.4 |

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 MOUNTING

As inline filter with or without reversible oil flow

### 1.6 SPECIAL MODELS AND ACCESSORIES

- Seals in FPM, EPDM
- With bypass valve (only DF-Filter)
- Oil drain screw up to DF/DFF 280

### 1.7 SPARE PARTS

See Original Spare Parts List

### 1.8 CERTIFICATES AND APPROVALS

On request

### 1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

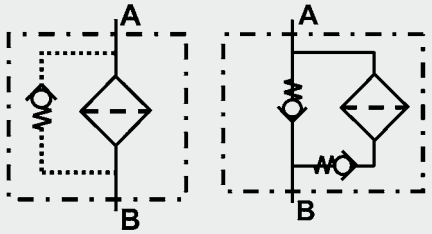
- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Non-flam operating fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

### 1.10 IMPORTANT INFORMATION

- Filter housing must be earthed
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector

**Symbol for hydraulic systems**

DF DFF



## 2. MODEL CODE (ALSO ORDER EXAMPLE)

**DF BN/HC 1500 T L L 10 D 1 . X /-L24**

### 2.1 COMPLETE FILTER

**Filter type**
DF or DFF

**Filter material of element**

| | | | |
|---|---|---|---|
| BN/HC | Betamicron® (BN4HC) | W | Wire mesh |
| BH/HC | Betamicron® (BH4HC) | V | Stainless steel fibre |

**Size of filter or element**
DF/DFF: 30*, 60, 110, 140, 160, 240, 280, 330, 500, 660, 990, 1320, 1500, 2000*, 3000*, 4000*

**Operating pressure**
T 420 bar

**Head design**
no details inline filter ports
L filter ports in L configuration (DF/DFF 1500 only)

**Type and size of port**

| Type | Port | Filter size | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 30* | 60 | 110 | 140 | 160 | 240 | 280 | 330 | 500 | 660 | 990 | 1320 | 1500 | 2000* | 3000* | 4000* |
| B | G ½ | ● | | | | | | | | | | | | | | | |
| C | G ¾ | | ● | ● | ● | | | | | | | | | | | | |
| E | G1 ¼ | | | | | ● | ● | ● | | | | | | | | | |
| F | G1 ½ | | | | | | | | ● | ● | ● | ● | ● | | | | |
| G | G2 | | | | | | | | | | | | | ● | | | |
| I | SAE DN 20 | | ● | ● | ● | | | | | | | | | | | | |
| J | SAE DN 32 | | | | | ● | ● | ● | | | | | | | | | |
| L | SAE DN 50 | | | | | | | | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| N | SAE DN 80 | | | | | | | | | | | | | | ● | ● | ● |

standard models

**Filtration rating in µm**
BN/HC, BH/HC, V: 3, 5, 10, 20 W: 25, 50, 100, 200

**Type of clogging indicator**
Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
] for other clogging indicators see brochure no. E 7.050../..

**Type code**
1 one-piece filter bowl (up to DF/DFF 660; DF 2000)
2 two-piece filter bowl (size DF/DFF 280 and above)

**Modification number**
X the latest version is always supplied

**Supplementary details**
B. bypass cracking pressure (e.g. B6 = 6 bar)*; no details = without bypass valve
L... light with appropriate voltage (24V, 48V, 110V, 220V) ] only for clogging
LED 2 light emitting diodes up to 24 Volt ] indicators Type D
P26 with 26" element (DF/DFF 1500 only)
P39 with 39" element (DF/DFF 1500 only)
SO184 pressure release/oil drain screw (sizes DF/DFF 330 and above)
V FPM seals
W suitable for HFA and HFC oil-water emulsions (only necessary when using a clogging indicator or V or W elements)
* only possible with DF filters

### 2.2 REPLACEMENT ELEMENT

**1500 D 010 BN4HC /-V**

**Size**
0030, 0060, 0110, 0140, 0160, 0240, 0280, 0330, 0500, 0660, 0990, 1320, 1500

**Type**
D

**Filtration rating in µm**
BN4HC, BH4HC, V: 003, 005, 010, 020
W: 025, 050, 100, 200

**Filter material**
BN4HC, BH4HC, W, V

**Supplementary details**
P26, P39, V, W (for descriptions, see point 2.1)

### 2.3 REPLACEMENT CLOGGING INDICATOR

**VD 5 D . X /-L24**

**Type**
VD differential pressure indicator up to 420 bar operating pressure

**Pressure setting**
5 5 bar standard, others on request

**Type of clogging indicator** (see point 2.1)

**Modification number**
X the latest version is always supplied

**Supplementary details**
L..., LED, V, W (for descriptions, see point 2.1)

## 3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see point 3.1)

$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see point 3.2)

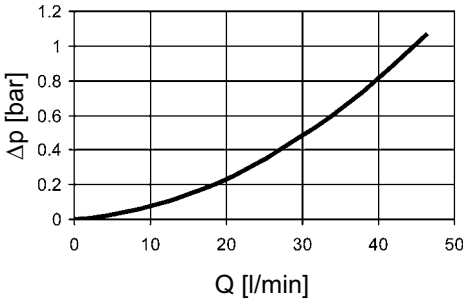
For ease of calculation, our Filter Sizing Program Filter-IT is available on request free of charge.

**NEW:** Sizing online at www.hydac.com

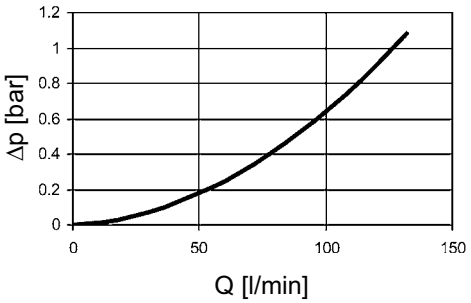
### 3.1 Δp-Q HOUSING GRAPHS BASED ON ISO 3968

The housing graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

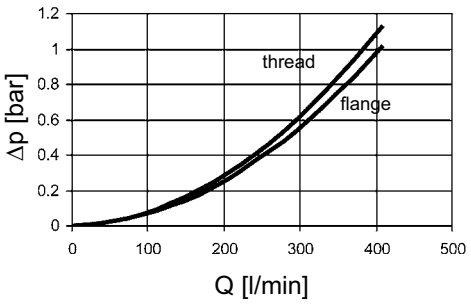
**DF 30**



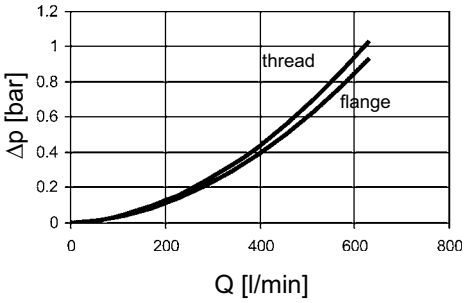

**DF 60, 110, 140**



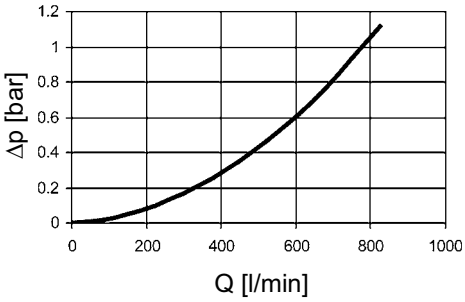

**DF 160, 240, 280**



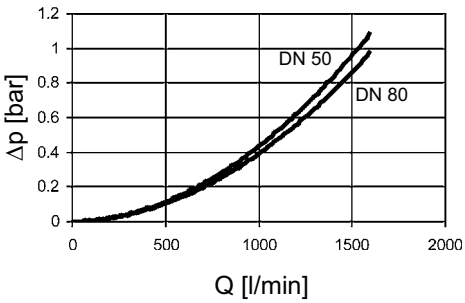

**DF 330, 500, 660, 990, 1320**



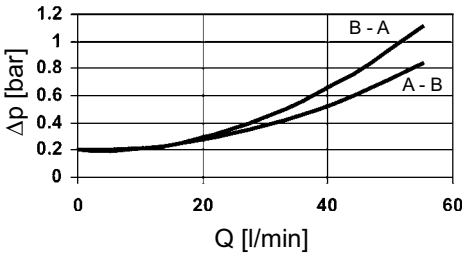

**DF 1500**



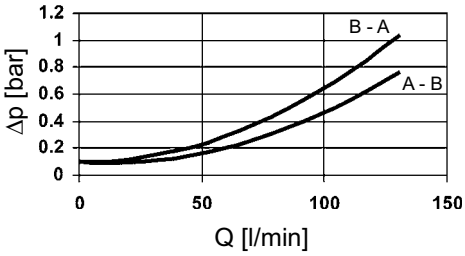

**DF 2000, 3000, 4000**



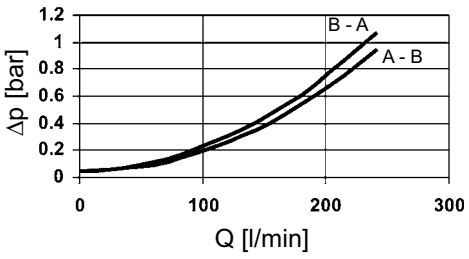

**DFF 60, 110, 140**



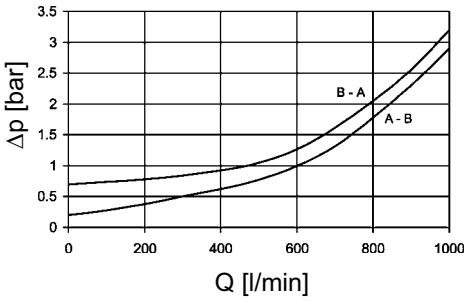

**DFF 160, 240, 280**




**DFF 330, 500, 660, 990, 1320**




**DFF 1500**

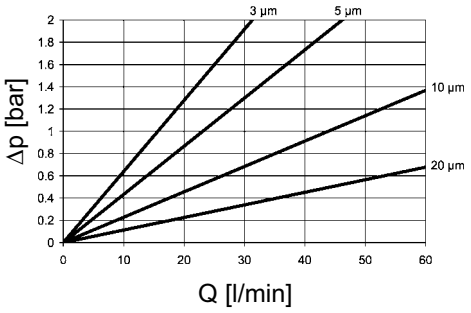


## 3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

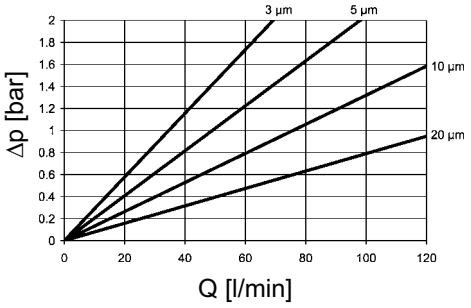
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 $mm^2/s$. The pressure drop changes proportionally to the change in viscosity.

| DF/ | V | | | | W | BH4HC | | | |
|---|---|---|---|---|---|---|---|---|---|
| DFF | 3 µm | 5 µm | 10 µm | 20 µm | – | 3 µm | 5 µm | 10 µm | 20 µm |
| 30 | 18.4 | 13.5 | 7.5 | 3.6 | 3.030 | 91.2 | 50.7 | 36.3 | 19.0 |
| 60 | 16.0 | 9.3 | 5.4 | 3.3 | 0.757 | 58.6 | 32.6 | 18.1 | 12.2 |
| 110 | 8.2 | 5.6 | 3.3 | 2.2 | 0.413 | 25.4 | 14.9 | 8.9 | 5.6 |
| 140 | 5.8 | 4.8 | 3.1 | 2.3 | 0.324 | 19.9 | 11.3 | 8.1 | 4.3 |
| 160 | 4.6 | 3.2 | 2.3 | 1.4 | 0.284 | 16.8 | 10.4 | 5.9 | 4.4 |
| 240 | 3.1 | 2.5 | 1.7 | 1.1 | 0.189 | 10.6 | 6.8 | 3.9 | 2.9 |
| 280 | 2.3 | 1.7 | 1.2 | 0.8 | 0.162 | 5.7 | 3.4 | 1.8 | 1.6 |
| 330 | 2.2 | 1.8 | 1.2 | 0.8 | 0.138 | 7.7 | 4.5 | 2.8 | 2.0 |
| 500 | 1.5 | 1.2 | 0.8 | 0.5 | 0.091 | 4.2 | 2.6 | 1.5 | 1.2 |
| 660 | 1.1 | 0.9 | 0.6 | 0.4 | 0.069 | 3.3 | 1.9 | 1.0 | 0.9 |
| 990 | 0.8 | 0.6 | 0.4 | 0.3 | 0.046 | 2.2 | 1.3 | 0.8 | 0.6 |
| 1320 | 0.6 | 0.5 | 0.3 | 0.2 | 0.035 | 1.6 | 1.0 | 0.6 | 0.4 |
| 1500 | - | - | - | - | - | 1.4 | 0.8 | 0.6 | 0.5 |

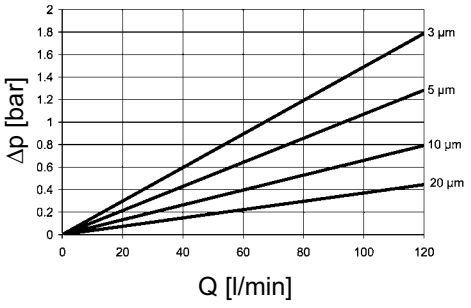
### BN4HC: 30



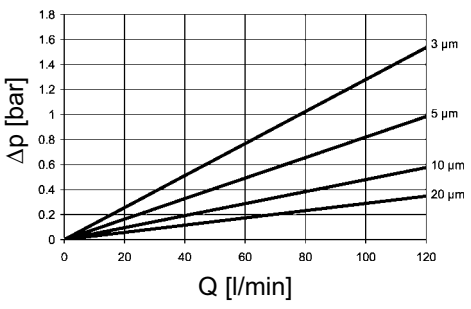

### BN4HC: 60



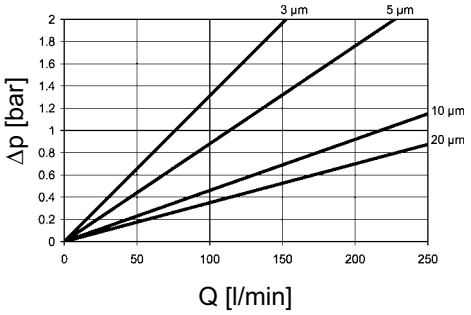

### BN4HC: 110



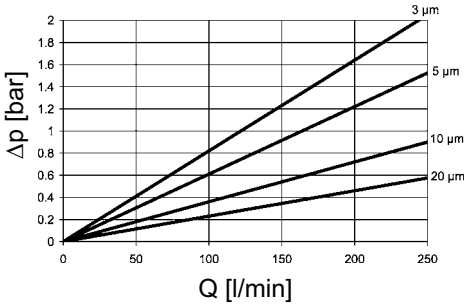

### BN4HC: 140



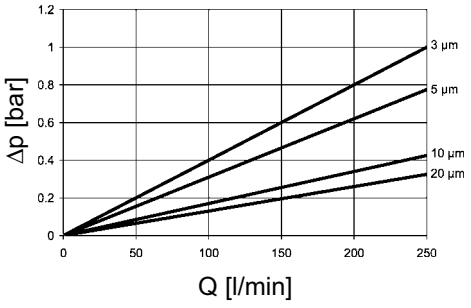

### BN4HC: 160



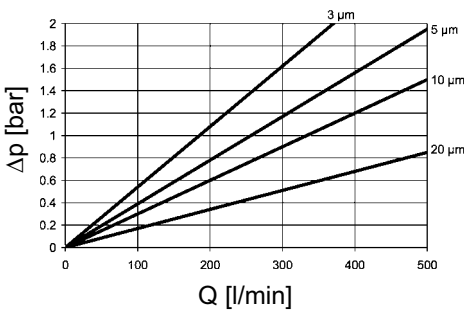

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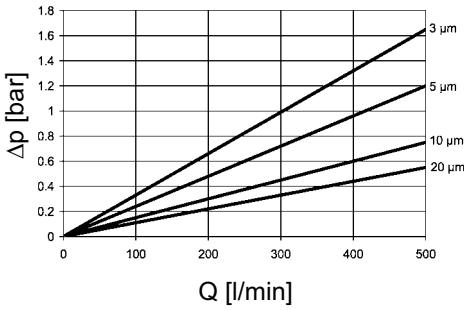

### BN4HC: 280



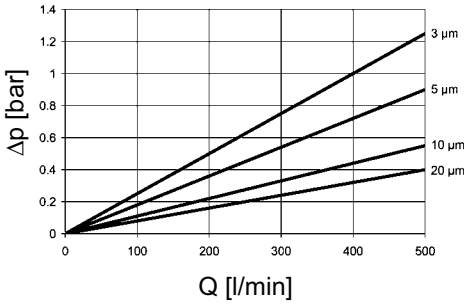

### BN4HC: 330



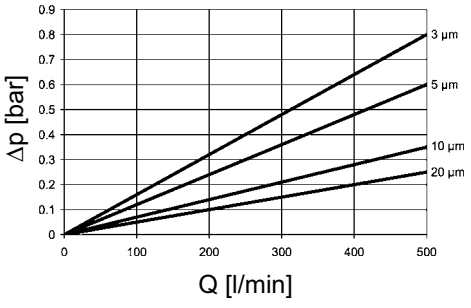

### BN4HC: 500



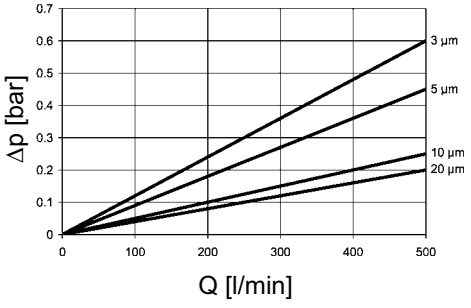

### BN4HC: 660



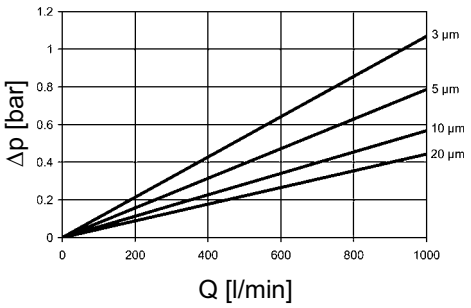

### BN4HC: 990




### BN4HC: 1320

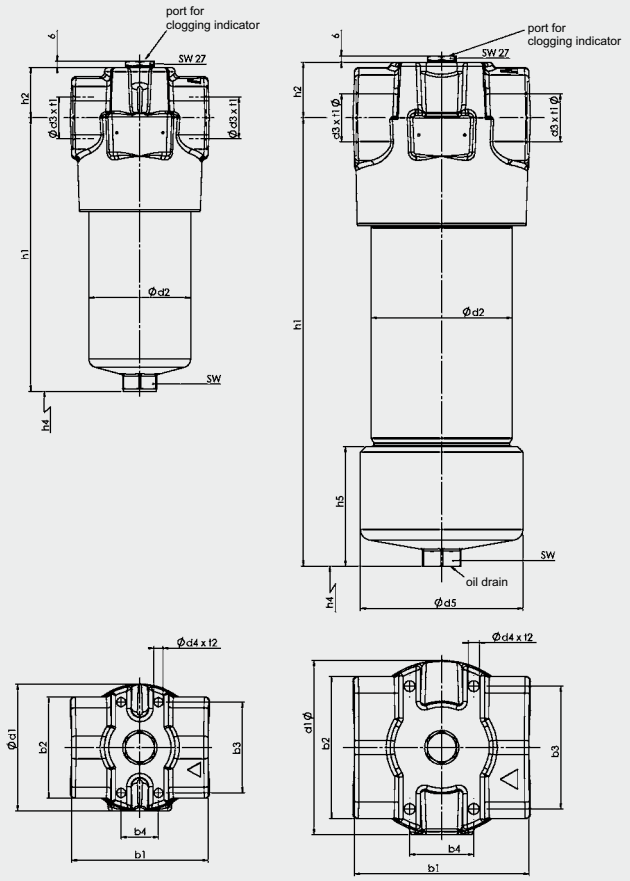



### BN4HC: 1500



# 4. DIMENSIONS

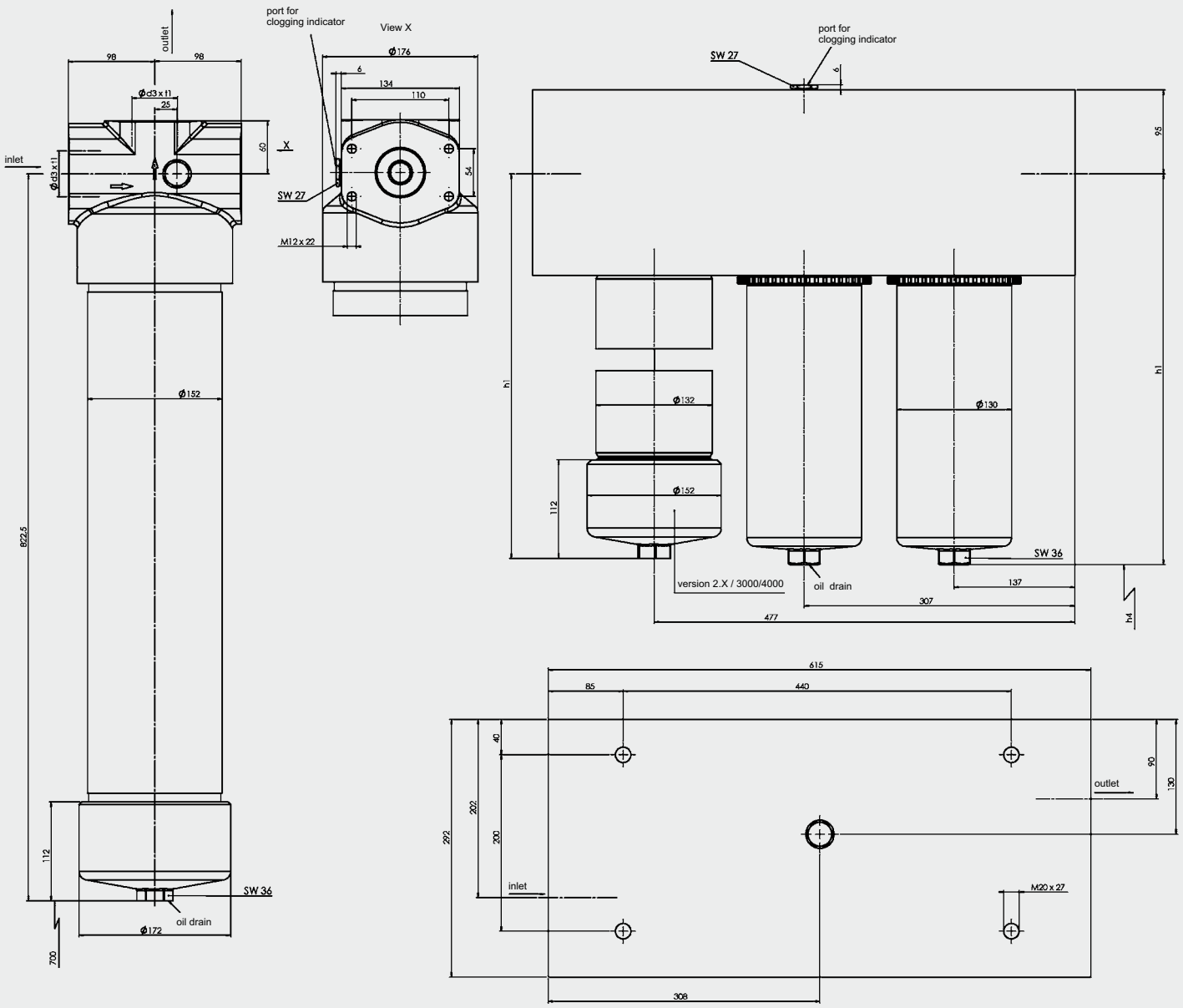
## DF 30, DF/DFF 60 to 1500 (inline filter ports)




| Type | b1 | b2 | b3 | b4 | d1 | d2 | d3 | d4 | d5 | h1 | h2 | h4 | h5 | SW | t1 | t2 | Weight including element [kg] | Vol. of pressure chamber [l] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30 ... B ... 1.X | 68 | 38 | 45 | 30 | 69 | 52 | G ½ | M5 | - | 131.5 | 38 | 75 | - | 24 | 14 | 6 | 2.3 | 0.13 |
| 60 ... C ... 1.X | 90 | 71 | 56 | 32 | 86 | 68 | G ¾ | M6 | - | 140 | 40 | 85 | - | 27 | 17 | 9 | 4.5 | 0.20 |
| 60 ... I ... 1.X | 89 | 71 | 56 | 32 | 86 | 68 | SAE DN 20 | M6 | - | 140 | 40 | 85 | - | 27 | - | 9 | 4.5 | 0.20 |
| 110 ... C ... 1.X | 90 | 71 | 56 | 32 | 86 | 68 | G ¾ | M6 | - | 209.5 | 40 | 85 | - | 27 | 17 | 9 | 5.4 | 0.33 |
| 110 ... I ... 1.X | 89 | 71 | 56 | 32 | 86 | 68 | SAE DN 20 | M6 | - | 209.5 | 40 | 85 | - | 27 | - | 9 | 5.4 | 0.33 |
| 140 ... C ... 1.X | 89 | 71 | 56 | 32 | 86 | 68 | G ¾ | M6 | - | 250.5 | 40 | 85 | - | 27 | 17 | 9 | 6.0 | 0.40 |
| 140 ... I ... 1.X | 89 | 71 | 56 | 32 | 86 | 68 | SAE DN 20 | M6 | - | 250.5 | 40 | 85 | - | 27 | - | 9 | 6.0 | 0.40 |
| 160 ... E ... 1.X | 125 | 95 | 85 | 35 | 119 | 95 | G1¼ | M10 | - | 196.5 | 47 | 105 | - | 32 | 21 | 14 | 10.3 | 0.60 |
| 160 ... J ... 1.X | 125 | 95 | 85 | 35 | 119 | 95 | SAE DN 32 | M10 | - | 196.5 | 47 | 105 | - | 32 | - | 14 | 10.3 | 0.60 |
| 240 ... E ... 1.X | 125 | 95 | 85 | 35 | 119 | 95 | G1¼ | M10 | - | 256 | 47 | 105 | - | 32 | 21 | 14 | 11.8 | 0.80 |
| 240 ... J ... 1.X | 125 | 95 | 85 | 35 | 119 | 95 | SAE DN 32 | M10 | - | 256 | 47 | 105 | - | 32 | - | 14 | 11.8 | 0.80 |
| 280 ... E ... 1.X | 125 | 95 | 85 | 35 | 119 | 95 | G1¼ | M10 | - | 438 | 47 | 105 | - | 32 | 21 | 14 | 16.3 | 1.60 |
| 280 ... J ... 1.X | 125 | 95 | 85 | 35 | 119 | 95 | SAE DN 32 | M10 | - | 438 | 47 | 105 | - | 32 | - | 14 | 16.3 | 1.60 |
| 330 ... F ... 1.X | 160 | 133 | 115 | 60 | 163 | 130 | G1½ | M12 | - | 257.5 | 52 | 115 | - | 36 | 23 | 17 | 24.5 | 1.50 |
| 330 ... L ... 1.X | 160 | 133 | 115 | 60 | 163 | 130 | SAE DN 50 | M12 | - | 257.5 | 52 | 115 | - | 36 | - | 17 | 24.5 | 1.50 |
| 500 ... F ... 1.X | 160 | 133 | 115 | 60 | 163 | 130 | G1½ | M12 | - | 350.5 | 52 | 115 | - | 36 | 23 | 17 | 28.6 | 2.30 |
| 500 ... L ... 1.X | 160 | 133 | 115 | 60 | 163 | 130 | SAE DN 50 | M12 | - | 350.5 | 52 | 115 | - | 36 | - | 17 | 28.6 | 2.30 |
| 660 ... F ... 1.X | 160 | 133 | 115 | 60 | 163 | 130 | G1½ | M12 | - | 428 | 52 | 115 | - | 36 | 23 | 17 | 31.6 | 3.00 |
| 660 ... L ... 1.X | 160 | 133 | 115 | 60 | 163 | 130 | SAE DN 50 | M12 | - | 428 | 52 | 115 | - | 36 | - | 17 | 31.6 | 3.00 |
| 330 ... F ... 2.X | 160 | 133 | 115 | 60 | 163 | 132 | G1½ | M12 | 152 | 254 | 52 | 180 | 112 | 36 | 23 | 17 | 27.4 | 1.50 |
| 330 ... L ... 2.X | 160 | 133 | 115 | 60 | 163 | 132 | SAE DN 50 | M12 | 152 | 254 | 52 | 180 | 112 | 36 | - | 17 | 27.4 | 1.50 |
| 500 ... F ... 2.X | 160 | 133 | 115 | 60 | 163 | 132 | G1½ | M12 | 152 | 343 | 52 | 270 | 112 | 36 | 23 | 17 | 31.5 | 2.30 |
| 500 ... L ... 2.X | 160 | 133 | 115 | 60 | 163 | 132 | SAE DN 50 | M12 | 152 | 343 | 52 | 270 | 112 | 36 | - | 17 | 31.5 | 2.30 |
| 660 ... F ... 2.X | 160 | 133 | 115 | 60 | 163 | 132 | G1½ | M12 | 152 | 420 | 52 | 350 | 112 | 36 | 23 | 17 | 34.4 | 3.00 |
| 660 ... L ... 2.X | 160 | 133 | 115 | 60 | 163 | 132 | SAE DN 50 | M12 | 152 | 420 | 52 | 350 | 112 | 36 | - | 17 | 34.4 | 3.00 |
| 990 ... F ... 2.X | 160 | 133 | 115 | 60 | 163 | 132 | G1½ | M12 | 152 | 576 | 52 | 500 | 112 | 36 | 23 | 17 | 43.4 | 4.20 |
| 990 ... L ... 2.X | 160 | 133 | 115 | 60 | 163 | 132 | SAE DN 50 | M12 | 152 | 576 | 52 | 500 | 112 | 36 | - | 17 | 43.4 | 4.20 |
| 1320 .. F ... 2.X | 160 | 133 | 115 | 60 | 163 | 132 | G1½ | M12 | 152 | 742 | 52 | 670 | 112 | 36 | 23 | 17 | 51.1 | 5.60 |
| 1320 .. L ... 2.X | 160 | 133 | 115 | 60 | 163 | 132 | SAE DN 50 | M12 | 152 | 742 | 52 | 670 | 112 | 36 | - | 17 | 51.1 | 5.60 |
| 1500 .. G ... 2.X | 196 | 134 | 110 | 54 | 176 | 152 | G2 | M12 | 172 | 822.5 | 60 | 700 | 112 | 36 | 30 | 22 | 69.3 | 8.20 |
| 1500 .. L ... 2.X | 196 | 134 | 110 | 54 | 176 | 152 | SAE DN 50 | M12 | 172 | 822.5 | 60 | 700 | 112 | 36 | - | 22 | 69.3 | 8.20 |

B, C, E, F, G = threaded connection
I, J, L = flange connection to DIN ISO 6162, 6000 psi with metric thread

**DF/DFF 1500 (filter ports in L configuration)** **DF 2000, 3000, 4000**




| Type | d3 | h1 | h4 | t1 | Weight incl. element [kg] | Vol. of pressure chamber[l] |
|---|---|---|---|---|---|---|
| 1500 .. LG .. 2.X | G2 | - | 700 | 30 | 69.3 | 8.20 |
| 1500 .. LL .. 2.X | SAE DN 50 | - | 700 | - | 69.3 | 8.20 |
| 2000 .. N ... 1.X | SAE DN 80 | 447 | 95 | - | 265 | 14.00 |
| 2000 .. N ... 2.X | SAE DN 80 | 440 | 350 | - | 274 | 14.00 |
| 3000 .. N ... 2.X | SAE DN 80 | 596 | 500 | - | 302 | 17.60 |
| 4000 .. N ... 2.X | SAE DN 80 | 762 | 670 | - | 326 | 21.80 |

G = threaded connection

L, N = flange connection to DIN ISO 6162, 6000 psi with metric thread

## NOTE

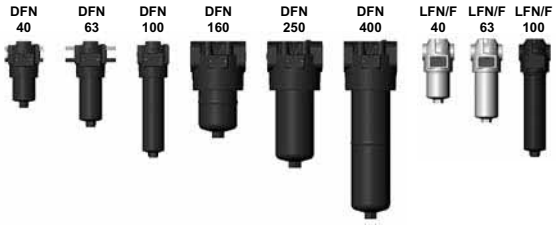
The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.


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**D-66280 Sulzbach/Saar**
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Fax: 0 68 97 / 509-300
Internet: www.hydac.com
E-Mail: filter@hydac.com



# Inline Filter DFN/LFN/LFNF to DIN 24550

up to 400 l/min, up to 400 bar




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. They consist of a filter head with a screw-in filter bowl. Standard equipment:

- without bypass valve
- connection for a clogging indicator

### 1.2 FILTER ELEMENTS

Hydac filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

**Contamination retention capacities in g**

| | Betamicron® (BN4HC) | | | |
|---|---|---|---|---|
| LFN, LFNF DFN | 3 µm | 6 µm | 10 µm | 25 µm |
| 40 | 5.2 | 5.6 | 6.3 | 7.0 |
| 63 | 9.2 | 9.9 | 11.1 | 12.8 |
| 100 | 15.4 | 16.5 | 18.6 | 20.6 |
| 160 | 27.5 | 29.3 | 33.1 | 36.7 |
| 250 | 46.0 | 49.0 | 55.2 | 61.3 |
| 400 | 76.2 | 81.3 | 91.4 | 101.5 |

| | Betamicron® (BH4HC) | | | |
|---|---|---|---|---|
| LFN, LFNF | 3 µm | 6 µm | 10 µm | 25 µm |
| 40 | 4.1 | 4.4 | 5.2 | 6.2 |
| 63 | 7.3 | 7.9 | 9.2 | 11.2 |
| 100 | 12.2 | 13.2 | 15.5 | 18.9 |
| 160 | 21.8 | 23.9 | 27.8 | 33.8 |
| 250 | 38.1 | 41.7 | 48.6 | 59.0 |
| 400 | 63.6 | 69.5 | 81.0 | 98.3 |

Filter elements are available with the following pressure stability values:

| | |
|---|---|
| Betamicron® (BN4HC): | 20 bar |
| Betamicron® (BH4HC): | 160 bar |
| Wire mesh (W/HC): | 20 bar |

### 1.3 FILTER SPECIFICATIONS

| | | |
|---|---|---|
| Nominal pressure | 100 bar<br>210 bar<br>400 bar | : all LFN and LFNF<br>: DFN 160, 400<br>: DFN 40, 63, 100, 250 |
| Fatigue strength | at nominal pressure $10^6$ load cycles from 0 to nominal pressure | |
| Temperature range | -30 °C up to +100 °C<br>(-30 °C up to -10 °C = 200 bar - DFN only) | |
| Material of filter head (and cover plate) | EN-GJS-400-15: DFN<br>Aluminium | : LFN/F |
| Material of filter bowl (tube) | Steel<br>Aluminium<br>Steel | : DFN<br>: LFN/F 40, 63<br>: LFN/F 100 |
| Type of clogging indicator | VM (differential pressure indication up to 210 bar operating pressure - not for LZ)<br>VD (differential pressure indication up to 420 bar operating pressure) | |
| Pressure setting of clogging indicator | 5 bar (others on request) | |
| Cracking pressure of bypass (optional) | 7 bar (others on request) | |

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 MOUNTING

As inline filter

### 1.6 SPECIAL MODELS AND ACCESSORIES

- with bypassventil
- FPM seals

### 1.7 SPARE PARTS

See Original Spare Parts List

### 1.8 CERTIFICATES AND APPROVALS

On request

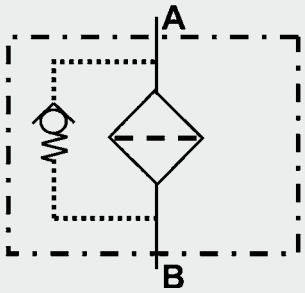
### 1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Non-flam operating fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

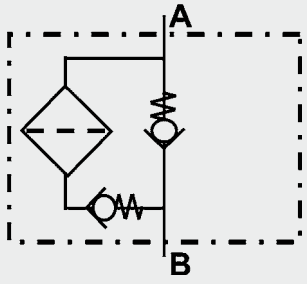
### 1.10 IMPORTANT INFORMATION

- Filter housing must be earthed
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector

**Symbol for hydraulic systems DFN / LFN**




**LFNF**



## 2. MODEL CODE (also order example)

**DFN BN/HC 250 S F 10 D 1 . X /-L24**

### 2.1 COMPLETE FILTER

**Filter type**
DFN, LFN, LFNF

**Filter material of element**
BN/HC Betamicron® (BN4HC) BH/HC Betamicron® (BH4HC)
W/HC Wire mesh

**Size of filter or element**
DFN: 40*, 63, 100, 160*, 250, 400 (* on request)
LFN/F: 40, 63, 100

**Operating pressure**
I = 100 bar (LFN and LFNF)
L = 210 bar (DFN 160, 400)
S = 400 bar (DFN 40, 63, 100, 250)

**Type and size of port**
to DIN 24550 (●), possible ports (x)

| Type | Port | Filter size | | | | | |
|---|---|---|---|---|---|---|---|
| | | 40 | 63 | 100 | 160 | 250 | 400 |
| B | G ½ | ● | x | x | | | |
| C | G ¾ | x | ● | x | | | |
| D | G 1 | x | x | ● | | | |
| E | G 1¼ | | | | ● | x | x |
| F | G 1½ | | | | x | ● | x |
| K | DN 40* | | | | x | x | ● |

*Flange SAE, 6000 PSI

**Filtration rating in µm**
BN4HC, BH4HC: 3, 6, 10, 25 W/HC: 25, 50, 100, 200

**Type of clogging indicator**
Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
LZ visual-mechanical / electrical
] for other clogging indicators see brochure no. E 7.050../..

**Type code**
1 DFN
2 LFN / LFNF

**Modification number**
X the latest version is always supplied

**Supplementary details**
B. bypass cracking pressure (e. g.: B7 = 7 bar); no details = without bypass valve
L... light with appropriate voltage (24V, 48V, 110V, 220V) ] only for clogging
LED 2 light emitting diodes up to 24 Volt ] indicators Type D
A V LZ indicator with plug to AUDI and VW specification
BO LZ indicator with plug and pin connection to BMW and Opel specification (M12x1)
CN LZ indicator with plug to DIN 43651 with 3 LEDs (CNOMO standard)
DB LZ indicator with plug to DIN 43651 with 3 LEDs (Daimler-Benz standard)
D4C LZ indicator with plug and pin connection to Daimler-Chrysler specification and cold start suppression 30 °C
BO-LED as for BO, but with progressive diode strip
SO368 inlet and outlet G ½ (without RI connection; only for DFN 40, 63, 100)
V FPM seals
W suitable for HFA and HFC emulsions

### 2.2 REPLACEMENT ELEMENT

**0250 DN 010 BN4HC /-V**

**Size**
0040, 0063, 0100, 0160, 0250, 0400

**Type**
DN

**Filtration rating in µm**
BN4HC, BH4HC: 003, 006, 010, 025 W/HC: 025, 050, 100, 200

**Filter material**
BN4HC, BH4HC, W/HC

**Supplementary details**
V (for descriptions, see point 2.1)

### 2.3 REPLACEMENT CLOGGING INDICATOR

**VM 5 D . X /-L24**

**Type**
VM differential pressure indicator up to 210 bar operating pressure (not for type LZ)
VD differential pressure indicator up to 420 bar operating pressure

**Pressure setting**
5 5 bar standard, others on request

**Type of clogging indicator** (see point 2.1 )

**Modification number**
X the latest version is always supplied

**Supplementary details**
L..., LED, V, W (for descriptions, see point 2.1)

# 3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see point 3.1)

$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see point 3.2)

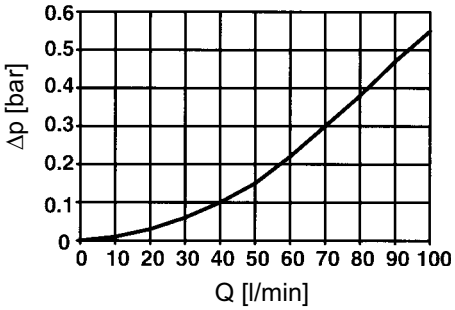
For ease of calculation, our Filter Sizing Program is available on request free of charge.

**NEW:** Sizing online at www.hydac.com

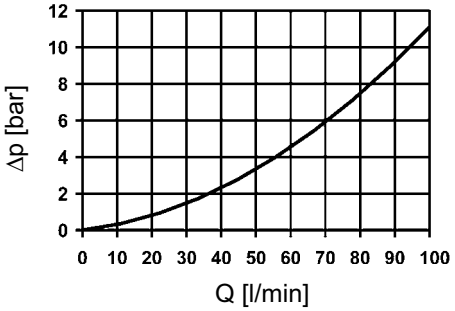
## 3.1 Δp-Q HOUSING GRAPHS BASED ON ISO 3968

The housing graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

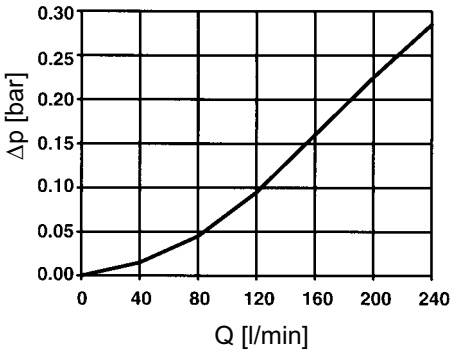
**DFN (40), 63, 100**
**LFN 40, 63, 100**




**LFNF 40, 63, 100**




**DFN 160, 250, 400**

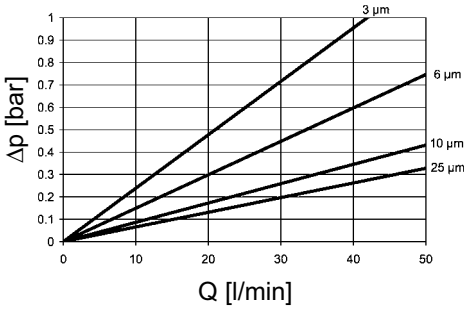



## 3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

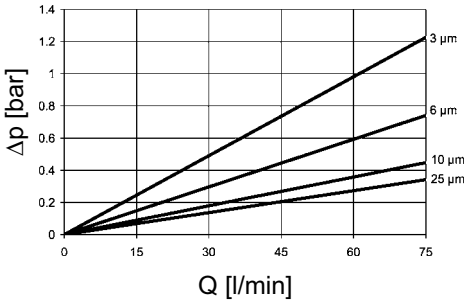
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

| LFN/F | BH4HC | | | | W/HC |
|---|---|---|---|---|---|
| DFN | 3 µm | 5 µm | 10 µm | 20 µm | – |
| 40 | 40.4 | 24.8 | 16.4 | 10.9 | 0.966 |
| 63 | 29.0 | 18.2 | 11.7 | 7.6 | 0.540 |
| 100 | 19.0 | 11.7 | 7.7 | 5.3 | 0.325 |
| 160 | 8.0 | 5.1 | 3.8 | 2.5 | 0.168 |
| 250 | 5.4 | 3.4 | 2.8 | 1.9 | 0.101 |
| 400 | 3.4 | 2.1 | 1.7 | 1.1 | 0.068 |

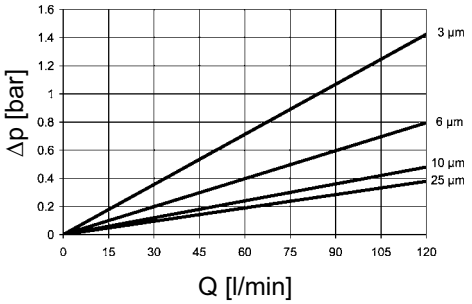
**BN4HC: DFN / LFN / LFNF 40**



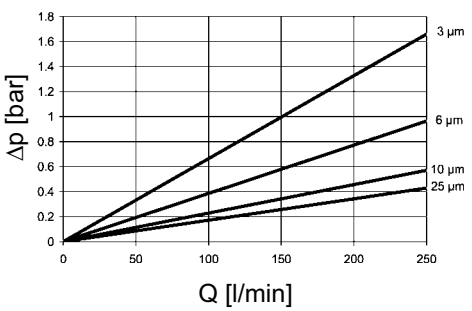

**BN4HC: DFN / LFN / LFNF 63**



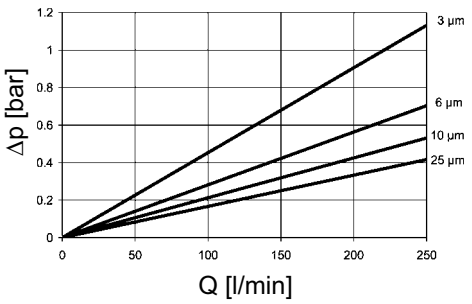

**BN4HC: DFN / LFN / LFNF 100**



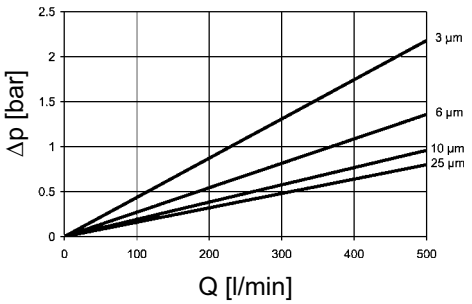

**BN4HC: DFN / LFN / LFNF 160**




**BN4HC: DFN / LFN / LFNF 250**

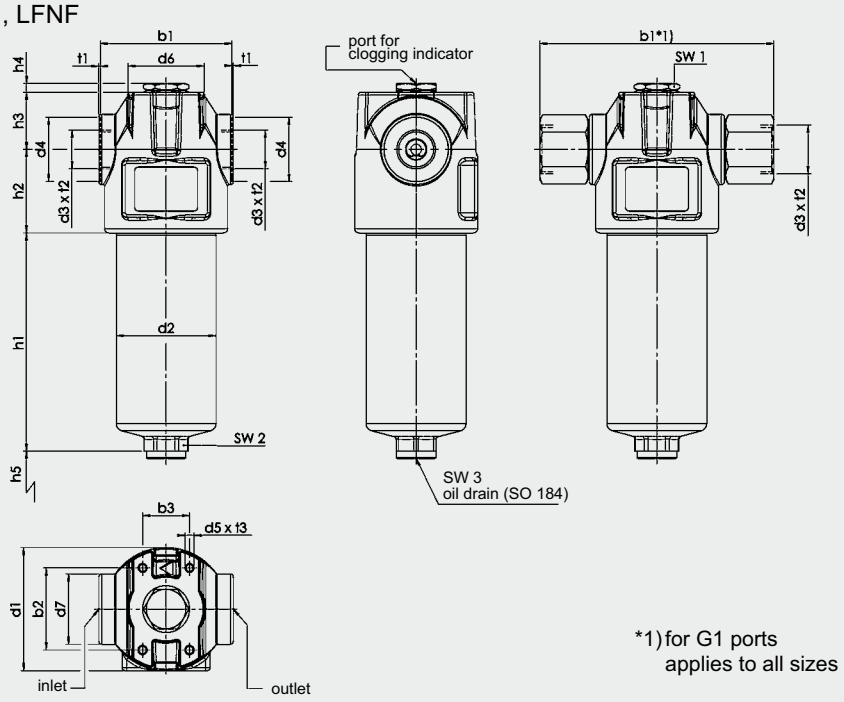



**BN4HC: DFN / LFN / LFNF 400**



# 4. DIMENSIONS

LFN, LFNF

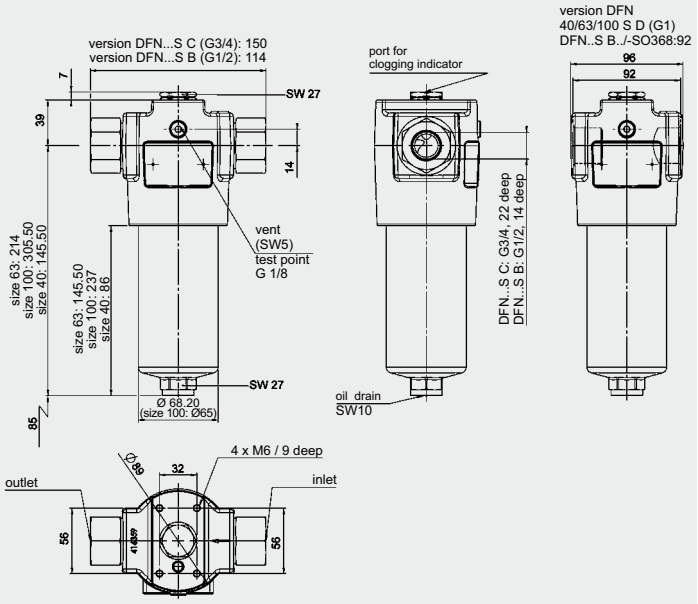



*1) for G1 ports applies to all sizes

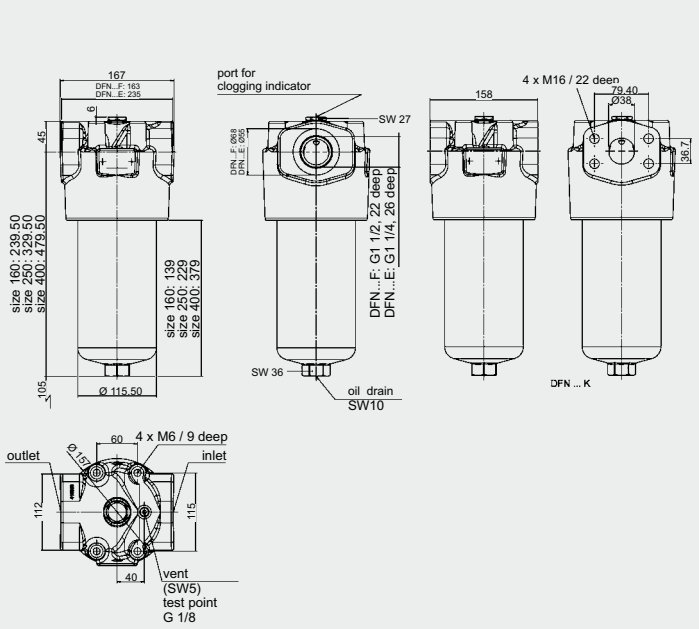
| Type | Weight incl. element [kg] | Volume of pressure chamber [l] |
|---|---|---|
| LFN 40 | 1.45 | 0.26 |
| LFN 63 | 1.8 | 0.40 |
| LFN 100 | 4.3 | 0.50 |
| LFNF 40 | 1.45 | 0.26 |
| LFNF 63 | 1.8 | 0.40 |
| LFNF 100 | 4.3 | 0.50 |
| DFN 40 | 5.0 | 0.22 |
| DFN 63 | 6.0 | 0.33 |
| DFN 100 | 6.25 | 0.50 |
| DFN 160 | 20.0 | 1.10 |
| DFN 250 | 22.0 | 1.70 |
| DFN 400 | 26.5 | 2.70 |

| Type | b1 | b2 | b3 | d1 | d2 | d3 | d4 | d5 | d6 | d7 | h1 | h2 | h3 | h4 | h5 | SW1 | SW2 | t1 | t2 | t3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LFN 40 | 90 | 56 | 32 | 84 | 68 | G ½ | 34 | M6 | 52 | 48 | 90 | 57 | 39 | 6 | 75 | 27 | 27 | 1 | 14 | 9 |
| LFN 63 | 90 | 56 | 32 | 84 | 68 | G ¾ | 44 | M6 | 52 | 48 | 150 | 57 | 39 | 6 | 75 | 27 | 27 | 1 | 17 | 9 |
| LFN 100 | 160*1) | 56 | 32 | 84 | 65 | G 1 | - | M6 | 52 | 48 | 245.5 | 57 | 39 | 6 | 75 | 27 | 27 | - | 24.5 | 9 |
| LFNF 40 | 90 | 56 | 32 | 84 | 68.2 | G ½ | 34 | M6 | 52 | 48 | 90 | 57 | 39 | 6 | 75 | 27 | 27 | 1 | 14 | 9 |
| LFNF 63 | 90 | 56 | 32 | 84 | 68.2 | G ¾ | 44 | M6 | 52 | 48 | 150 | 57 | 39 | 6 | 75 | 27 | 27 | 1 | 17 | 9 |
| LFNF 100 | 160*1) | 56 | 32 | 84 | 65 | G 1 | - | M6 | 52 | 48 | 245.5 | 57 | 39 | 6 | 75 | 27 | 27 | - | 24.5 | 9 |

DFN 40 - 100




DFN 160 - 400




## NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.


HYDAC **Filtertechnik GmbH**
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# Pressure Filter HFM
## up to 140 l/min, up to 400 bar




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. They consist of a filter head with screw-in filter bowl.

Standard equipment:

- with bypass valve
- connection for a clogging indicator on the top of the head as standard (4 mounting holes)

### 1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

**Contamination retention capacities in g**

| | Betamicron® BN4HC | | | |
|---|---|---|---|---|
| HFM | 3 µm | 5 µm | 10 µm | 20 µm |
| 75 | 21.6 | 24.3 | 25.7 | 26.5 |
| 95 | 27.5 | 30.9 | 32.7 | 33.7 |

Filter elements are available with the following pressure stability values:
Betamicron® (BN4HC): 20 bar

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Nominal pressure | 400 bar |
| Fatigue strength | at nominal pressure $10^6$ load cycles from 0 to nominal pressure |
| Temperature range | -10 °C to +100 °C (-30 °C to -10 °C: $p_{max}$= 200 bar) |
| Material of filter head | EN-GJS 400-15 |
| Material of filter bowl | cold impact formed steel |
| Type of clogging indicator | VD (differential pressure indicator up to 420 bar operating pressure) |
| Pressure setting of clogging indicator | 5 bar (others on request) |
| Bypass cracking pressure | 7 bar (others on request) |

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 MOUNTING

As inline filter

### 1.6 SPECIAL MODELS AND ACCESSORIES

On request

### 1.7 SPARE PARTS

See Original Spare Parts List

### 1.8 CERTIFICATES AND APPROVALS

On request

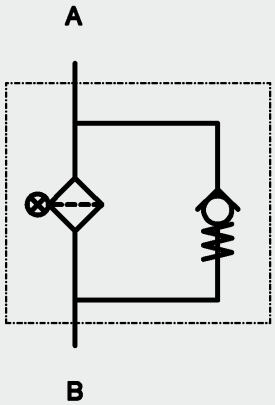
### 1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS TO ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Operating fluids with high water content (>50% water content) on request

### 1.10 IMPORTANT INFORMATION

- Filter housing must be earthed
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

**Symbol for hydraulic systems**



## 2. MODEL CODE (also order example)

**HFM BN/HC 75 S J 10 D 1 . X /-L24**

### 2.1 COMPLETE FILTER

**Filter type**
HFM

**Filter material of element**
BN/HC Betamicron® (BN4HC)

**Size of filter or element**
HFM: 75, 95

**Operating pressure**
S = 400 bar

**Type and size of port**

| Type | Port | Filter size | |
|---|---|---|---|
| | | 75 | 95 |
| H | G ¾ | ● | ● |
| J | G 1 | ● | ● |

**Filtration rating in µm**
BN4HC: 3, 5, 10, 20

**Type of clogging indicator**
W without port for clogging indicator
A with steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
] for other clogging indicators see brochure no. 7.050../..

**Type code**
1

**Modification number**
X the latest version is always supplied

**Supplementary details**
B7 standard: cracking pressure of bypass 7 bar
L... light with appropriate voltage (24, 48, 110, 220 Volt) ] only for clogging
LED 2 light emitting diodes up to 24 volt ] indicators type D
V FPM seals
W suitable for HFA and HFC emulsions

### 2.2 REPLACEMENT ELEMENT

**0075 D 010 BN4HC /-V**

**Size**
0075, 0095

**Type**
D

**Filtration rating in µm**
BN4HC: 003, 005, 010, 020

**Filter material**
BN4HC

**Supplementary details**
V (for descriptions, see point 2.1)

### 2.3 REPLACEMENT CLOGGING INDICATOR

**VD 5 D . X /-L24**

**Type**
VD differential pressure indicator up to 420 bar operating pressure

**Pressure setting**
5 standard 5 bar, others on request

**Type of clogging indicator**
D (see point 2.1)

**Modification number**
X the latest version is always supplied

**Supplementary details**
L..., LED, V, W (for descriptions, see point 2.1)

# 3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see point 3.1)

$\Delta p_{Element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see point 3.2)

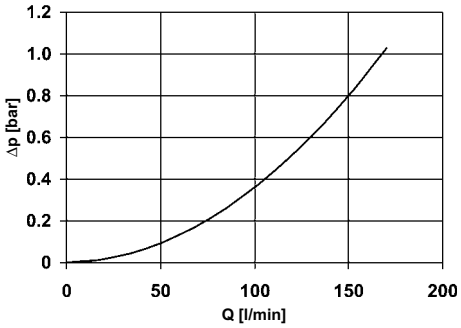
For ease of calculation, our Filter Sizing Program is available on request free of charge.

**NEW:** Sizing online at www.hydac.com

## 3.1 ΔP-Q HOUSING GRAPHS BASED ON ISO 3968

The housing graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s.
In this case, the differential pressure changes proportionally to the density.

**HFM**

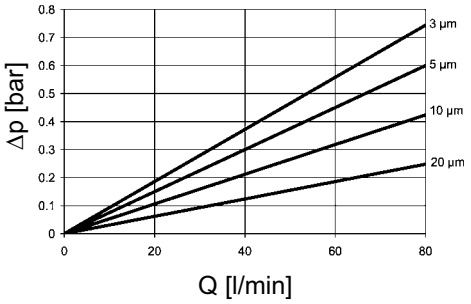



## 3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

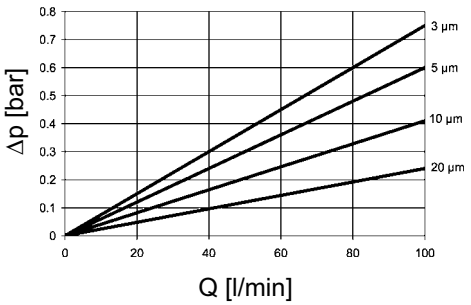
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

| HFM | BN4HC | | | |
|---|---|---|---|---|
| | 3 µm | 5 µm | 10 µm | 20 µm |
| 75 | 9.3 | 7.5 | 5.3 | 3.1 |
| 95 | 7.5 | 6.0 | 4.1 | 2.4 |

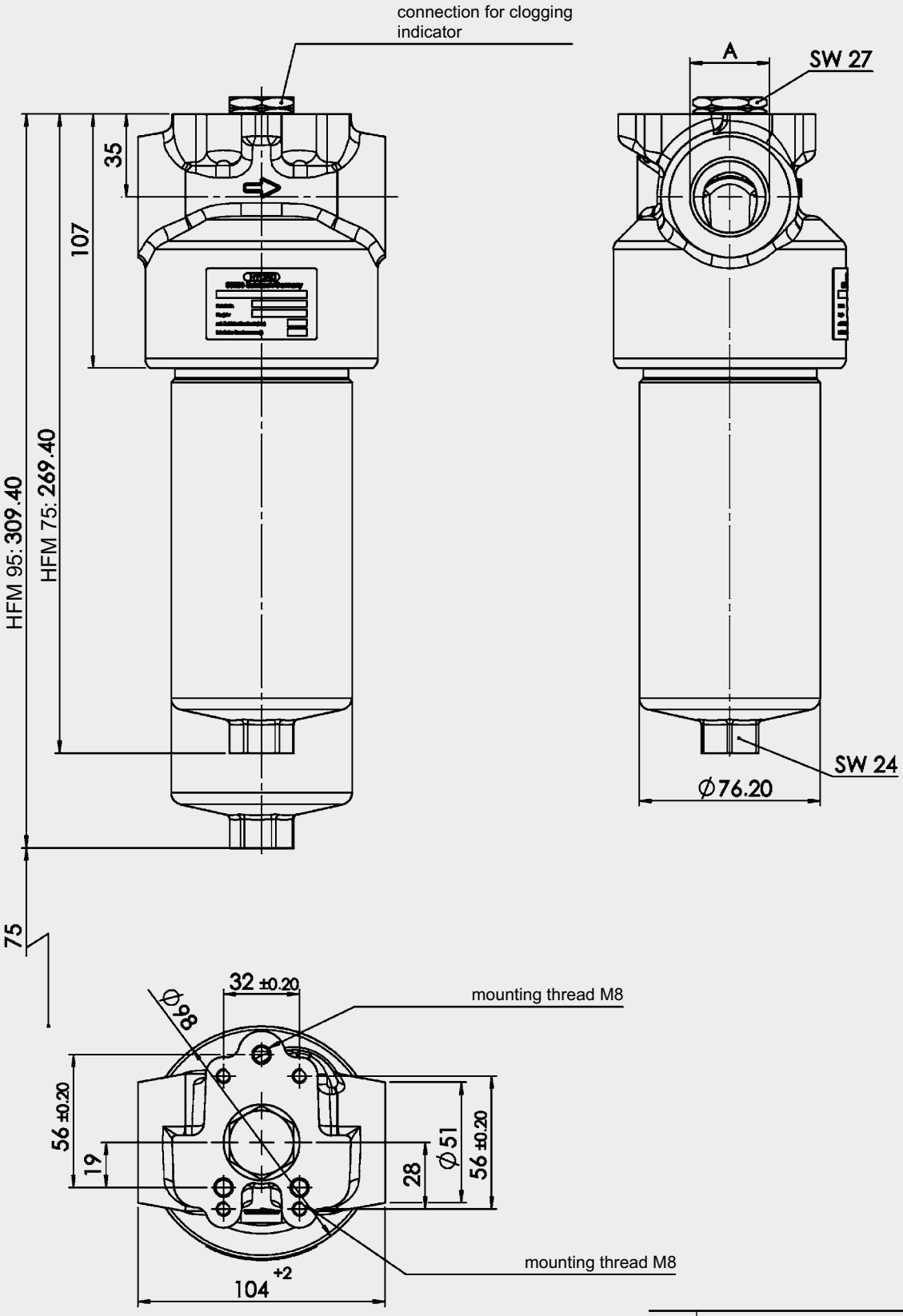
**BN4HC: HFM 75**




**BN4HC: HFM 95**



## 4. DIMENSIONS




| HFM | Weight incl. element [kg] | Vol. of pressure chamber [l] |
|---|---|---|
| 75 | 5.6 | 0.56 |
| 95 | 6.1 | 0.69 |

## NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.


HYDAC **Filtertechnik GmbH**
Industriegebiet
**D-66280 Sulzbach/Saar**
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Internet: www.hydac.com
E-Mail: filter@hydac.com



# Pressure Filter DFM with Differential Pressure Relief Valve

up to 280 l/min, up to 400 bar




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. They consist of a filter head with screw-in filter bowl.

Standard equipment:

- With differential pressure controlled relief valve
- Port for clogging indicator in filter head

### 1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

**Contamination retention capacities in g**

| | Betamicron® BH4HC | | | |
|---|---|---|---|---|
| DFM | 3 µm | 5 µm | 10 µm | 20 µm |
| 160 | 12.9 | 12.6 | 13.9 | 15.9 |
| 240 | 21.6 | 21.1 | 23.2 | 26.5 |
| 280 | 48.1 | 47.1 | 51.8 | 59.1 |

Filter elements are available with the following pressure stability values:
Betamicron® (BH4HC): 210 bar

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Nominal pressure | 400 bar |
| Fatigue strength | at nominal pressure $10^6$ load cycles from 0 to nominal pressure |
| Temperature range | -30 °C to +100 °C<br>(-30 °C to -10 °C: $p_{max}$= 200 bar) |
| Material of filter head | EN-GJS-400-15 |
| Material of filter bowl | steel |
| Type of clogging indicator | VD (differential pressure indicator up to 420 bar operating pressure) |
| Pressure setting of clogging indicator | 5 bar (others on request) |
| Cracking pressure of differential pressure controlled relief valve | 20 bar (others on request)<br>**NOTE:**<br>On request, BN4HC elements (pressure stability up to 20 bar) can also be used at lower cracking pressures. |

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 MOUNTING

As inline filter

### 1.6 SPECIAL MODELS AND ACCESSORIES

Pressure release / oil drain plug (SO184)

### 1.7 SPARE PARTS

See Original Spare Parts List

### 1.8 CERTIFICATES AND APPROVALS

on request

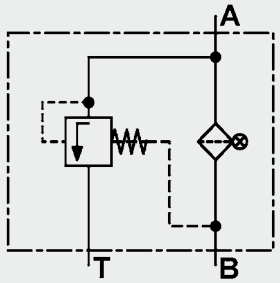
### 1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS TO ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Non-flam operating fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

### 1.10 IMPORTANT INFORMATION

- Filter housing must be earthed
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

**Symbol for hydraulic systems**



## 2. MODEL CODE (also order example)

**DFM BH/HC 240 S E 10 D 1 . X /-L24**

### 2.1 COMPLETE FILTER

**Filter type**
DFM

**Filter material of element**
BH/HC Betamicron® (BH4HC)

**Size of filter or element**
DFM: 160, 240, 280

**Operating pressure**
S = 400 bar

**Type and size of port**

| Type | Port | Filter size | | |
|---|---|---|---|---|
| | | 160 | 240 | 280 |
| E | G1 ¼ | ● | ● | ● |

**Filtration rating in µm**
BH4HC : 3, 5, 10, 20

**Type of clogging indicator**
Y with plastic blanking plug in indicator port
A with steel blanking plug in indicator port
B visual
C electrical
D visual and electrical

for other clogging indicators, see brochure no. E 7.050.../...

**Type code**
1

**Modification number**
X the latest version is always supplied

**Supplementary details**
L... light with appropriate voltage (24V, 48V, 110V, 220V)
LED 2 light emitting diodes up to 24 Volt
SO 184 pressure release / oil drain plug
V FPM seals

only for clogging indicators type D

### 2.2 REPLACEMENT ELEMENT

**0240 D 010 BH4HC /-V**

**Size**
0160, 0240, 0280

**Type**
D

**Filtration rating in µm**
BH4HC: 003, 005, 010, 020

**Filter material**
BH4HC

**Supplementary details**
V (for descriptions, see point 2.1)

### 2.3 REPLACEMENT CLOGGING INDICATOR

**VD 5 D . X /-L24**

**Type**
VD differential pressure indicator up to 420 bar operating pressure

**Pressure setting**
5 standard 5 bar, others on request

**Type of clogging indicator**
D (see point 2.1)

**Modification number**
X the latest version is always supplied

**Supplementary details**
L..., LED, V (for descriptions, see point 2.1)

# 3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see point 3.1)

$\Delta p_{Element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see point 3.2)

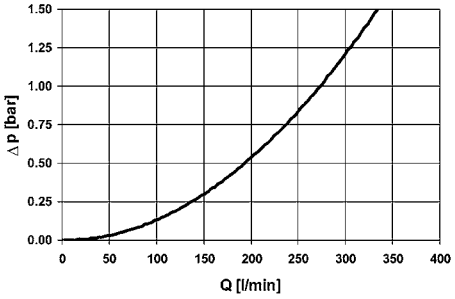
For ease of calculation, our Filter Sizing Program is available on request free of charge.

**NEW:** Sizing online at www.hydac.com

## 3.1 ΔP-Q HOUSING GRAPHS BASED ON ISO 3968

The housing graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

### DFM 160/240/280

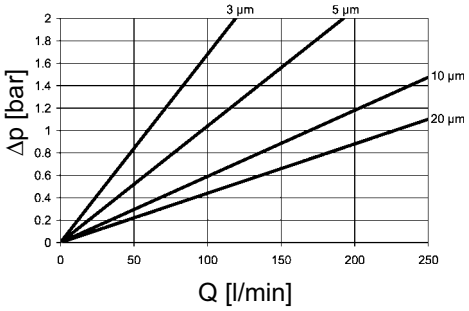



## 3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

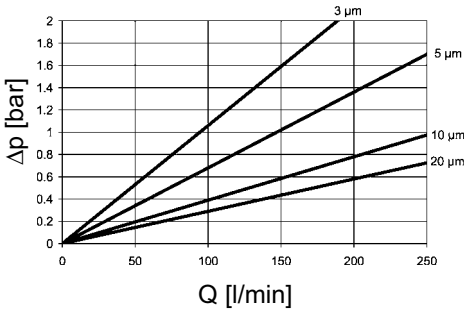
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

| DFM | BH4HC | | | |
|---|---|---|---|---|
| | 3 µm | 5 µm | 10 µm | 20 µm |
| 160 | 16.8 | 10.4 | 5.9 | 4.4 |
| 240 | 10.6 | 6.8 | 3.9 | 2.9 |
| 280 | 5.7 | 3.4 | 1.8 | 1.6 |

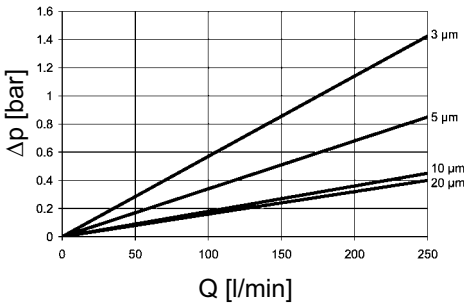
### BH4HC: DFM 160



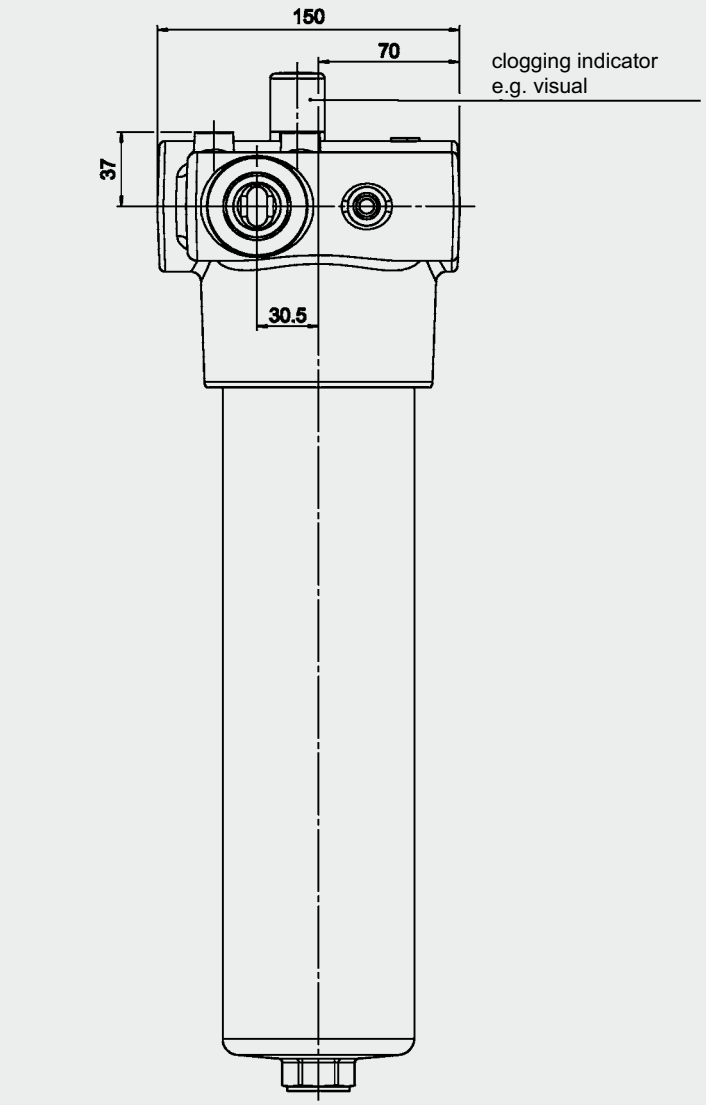

### BH4HC: DFM 240

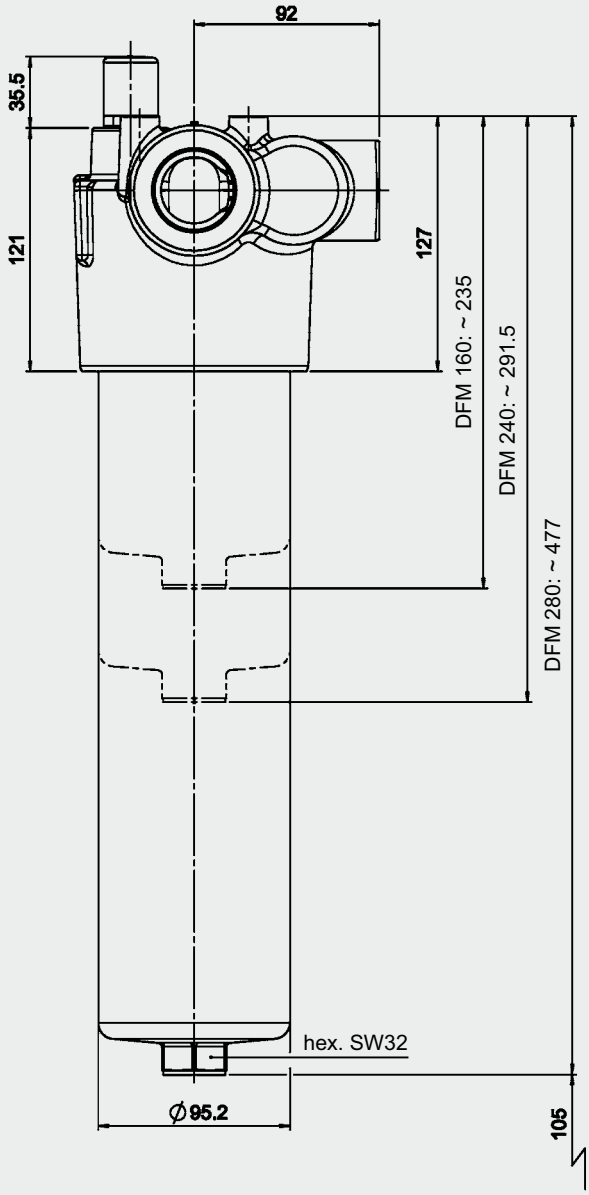


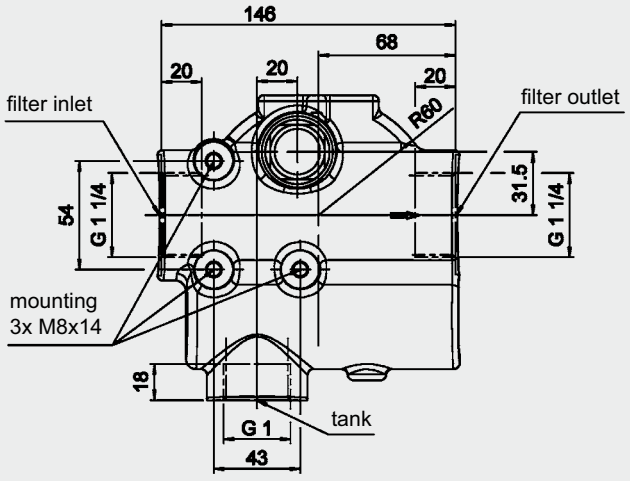

### BH4HC: DFM 280



## 4. DIMENSIONS




| DFM | Weight incl. element [kg] | Vol. of pressure chamber [l] |
|---|---|---|
| 160 | 11.0 | 0.6 |
| 240 | 12.5 | 0.8 |
| 280 | 17.1 | 1.45 |

## NOTE

The information in this brochure relates to the operating conditions and applications described.

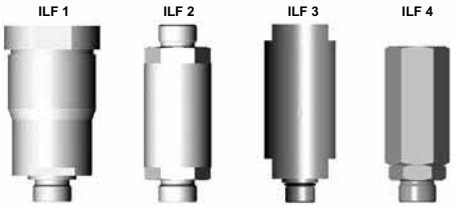
For applications or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.


HYDAC **Filtertechnik GmbH**
Industriegebiet
**D-66280 Sulzbach/Saar**
Tel.: 0 68 97 / 509-01
Fax: 0 68 97 / 509-300
Internet: www.hydac.com
E-Mail: filter@hydac.com



# Inline Filter ILF
## up to 120 l/min, up to 350 bar




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. They consist of a filter head with screw-in filter bowl.

Standard equipment:

- without bypass valve (only ILF 1, ILF 3 and ILF 4)
- with and without bypass valve (only ILF 2 and ILF 3)

### 1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 16889

Filter elements are available with the following pressure stability values:

| | |
|---|---|
| Betamicron® (BN4HC): | 20 bar |
| Betamicron® (BH4HC): | 210 bar |
| Wire mesh (W): | up to 100 bar |

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Nominal pressure | ILF 1, 2, 3: 350 bar<br>The permiss. operating pressure will be reduced depending on the max. permiss. value of the threaded connection used!<br>ILF 4: 160 bar |
| Fatigue strength | at nominal pressure $10^6$ load cycles from 0 to nominal pressure |
| Temperature range | -10 °C to +100 °C |
| Material of filter housing and cover plate | ILF 1, 2, 3: Steel 52-3<br>ILF 4: Aluminium |
| Bypass cracking pressure optional: | ILF 2: 5.5 bar<br>ILF 3: 3 or 6 bar |

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 MOUNTING

As inline filter

### 1.6 SPECIAL MODELS AND ACCESSORIES

- bypass valve for ILF 3
- others on request

### 1.7 SPARE PARTS

See Original Spare Parts List

### 1.8 CERTIFICATES AND APPROVALS

On request

### 1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS TO ISO 2943

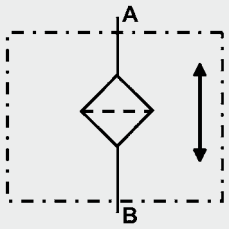
- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Operating fluids with high water content (>50% water content) on request

### 1.10 IMPORTANT INFORMATION

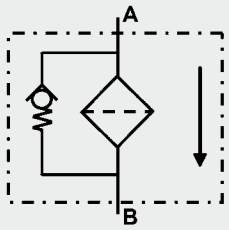
Filter housing must be earthed

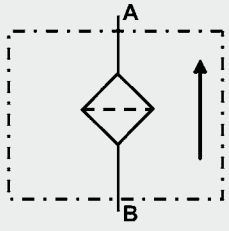
**Symbol for hydraulic systems**

**ILF 1**

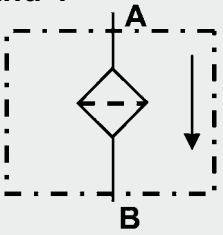



**ILF 2**




**ILF 3 and 4**




E 7.569.0/02.08

## 2. MODEL CODE (also order example)

**ILF W 2 R F F 100 W 1 . X /-B5.5-IA**

### 2.1 COMPLETE FILTER

**Filter type**
ILF

**Filter material of element**
W Wire mesh
BN/HC Betamicron® (only ILF 3)
BH/HC Betamicron® (only ILF 3)

**Size of filter or element**
ILF: 1, 2, 3, 4

**Operating pressure**
K = 160 bar (only ILF 4)
R = 350 bar
The permiss. operating pressure will be reduced depending on the max. permiss. value of the threaded connection used!

**Type and size of port - Inlet**

| Type | Port | Filter size 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| A | M18x1.5 | ● | ● | | |
| B | G ½ | | | X | |
| D | M22x1.5 | ● | ● | ● | |
| F | M24x1.5 | ● | ● | | ● |
| H | M30x2 | | ● | | |

**NOTE:**
Same port size at
inlet and outlet (for ILF 1 and 2)
Please see point 4 "Dimensions" !

X = only possible for female thread
(Supplementary detail code: II)

**Type and size of port - Outlet**

| Type | Port | Filter size 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| A | M18x1.5 | ● | ● | | |
| B | G ½ | | | X | |
| D | M22x1.5 | ● | ● | ● | ● |
| F | M24x1.5 | ● | ● | | |
| H | M30x2 | | ● | | |

X = only possible for female thread
(Supplementary detail code: II)

**Filtration rating in µm**
BN/HC, BH/HC : 10, 20 (only ILF 3)
W : 40, 80[1], 100, 200 others on request

**Type of clogging indicator**
W without port for clogging indicator

**Type code**
1

**Modification number**
X the latest version is always supplied

**Supplementary details**
B5.5 Standard: bypass cracking pressure 5.5 bar = **required info for ILF 2**[2]
B3 or B6 = **required info for ILF 3** (if bypass valve is required!)
V FPM seals

Connection type = **required info:**

| Inlet | Outlet | Code |
|---|---|---|
| Female | Female | II |
| Female | Male | IA |
| Male | Female | AI |
| Male | Male | AA |

**NOTE:**
Same port size at
inlet and outlet (for ILF 1 and 2)
Please see point 4 "Dimensions" !

[1] Only for ILF 4
[2] not possible for ILF 1 and ILF 4

### 2.2 REPLACEMENT ELEMENT [1]

**HE03119932 100 -W /-V**

**Size**
0015 R[2] ] only ILF 3
0015 D[2] ]
HE1468 only ILF 1
HE03119932 only ILF 2

**Filtration rating in µm**
BN4HC, BH4HC : 10, 20 (only ILF 3)
W : 40, 100, 200 (others on request)

**Filter material**
BN4HC, BH4HC, W

**Supplementary details**
B3 Standard bypass cracking pressure for R elements
B6 Special bypass cracking pressure 6 bar (only for BN4HC elements)
V (for descriptions, see point 2.1)

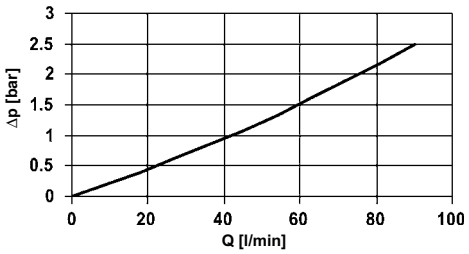
[1] Replacement element for ILF 4 on request!
[2] Replacement element 0015 R... (bypass version) or 0015 D... (version without bypass)

# 3. FILTER CALCULATION / SIZING

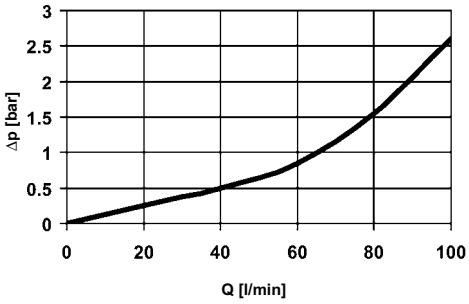
## 3.1 GRAPHS FOR COMPLETE FILTER

The housing graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s.

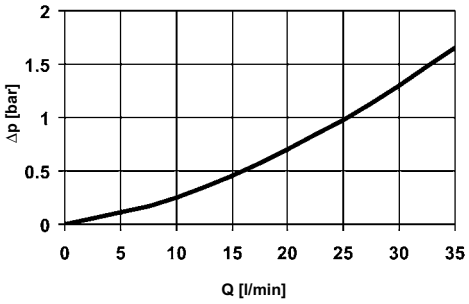
### ILF 1



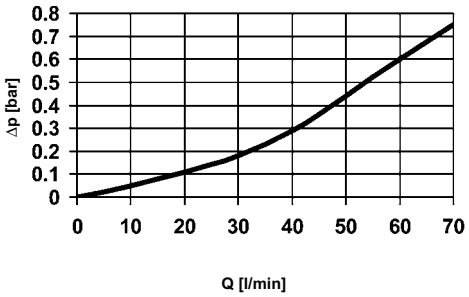

### ILF 2




### ILF 3

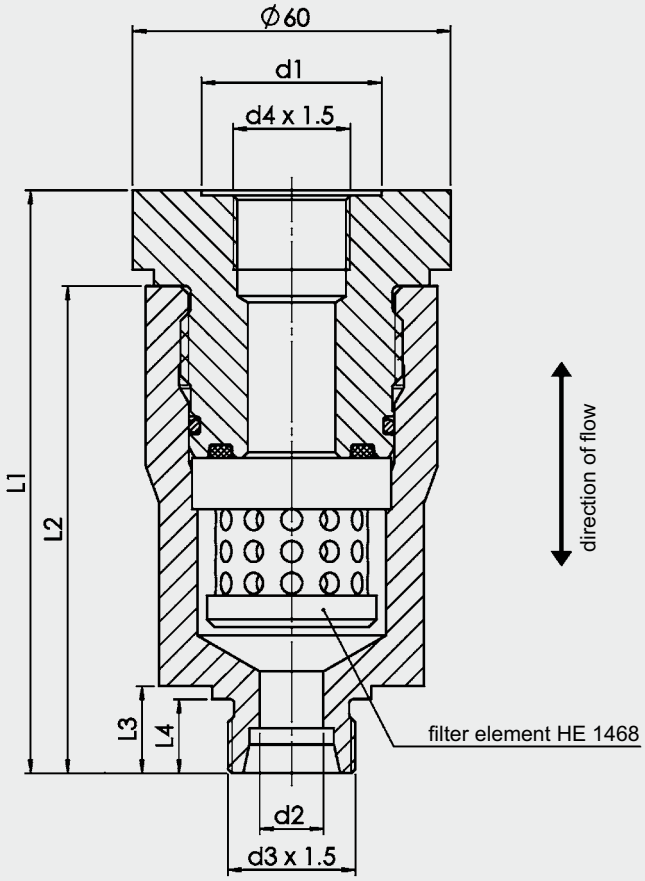


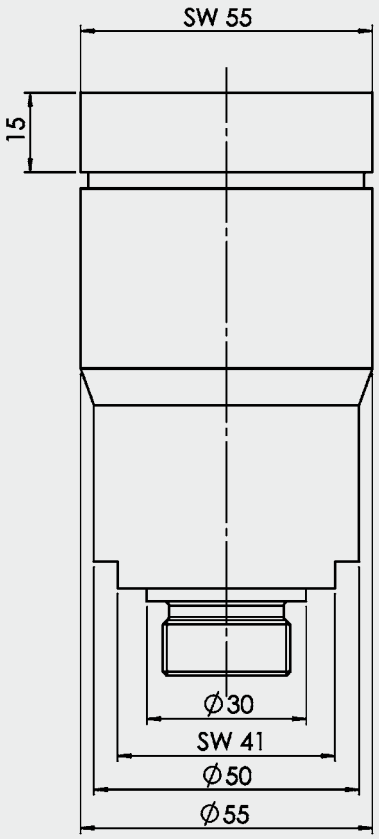

### ILF 4




# 4. DIMENSIONS

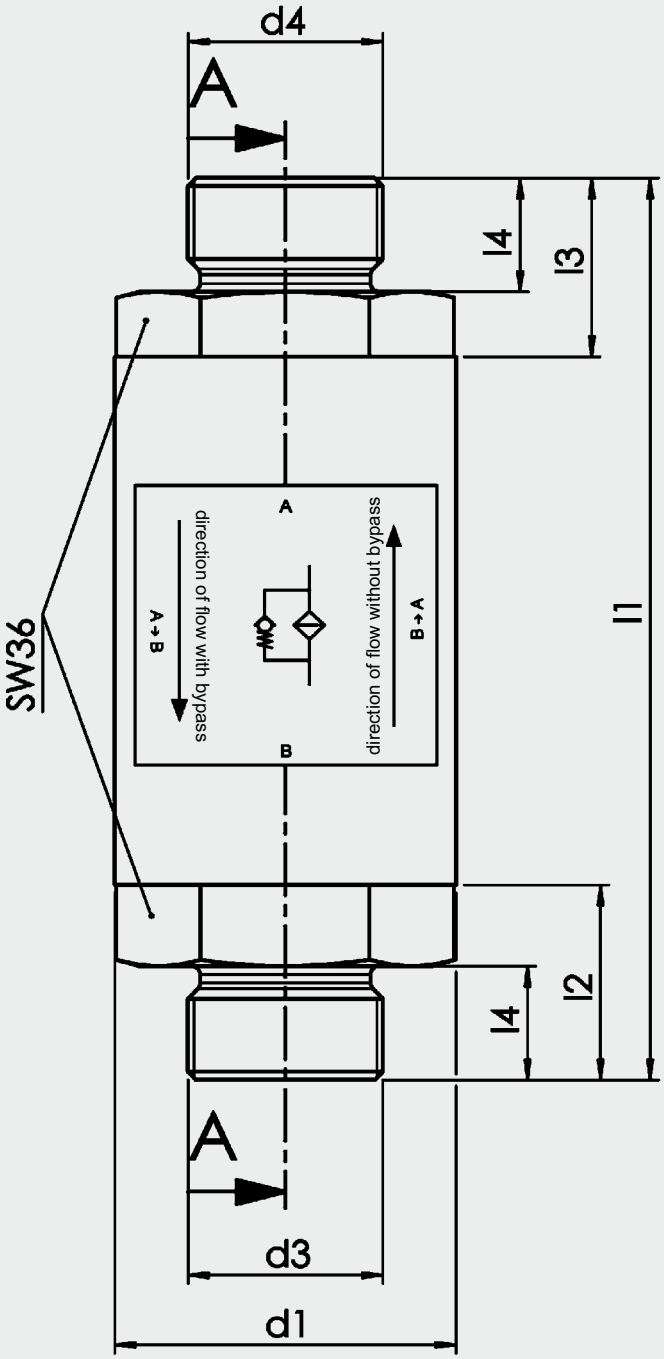
ILF 1

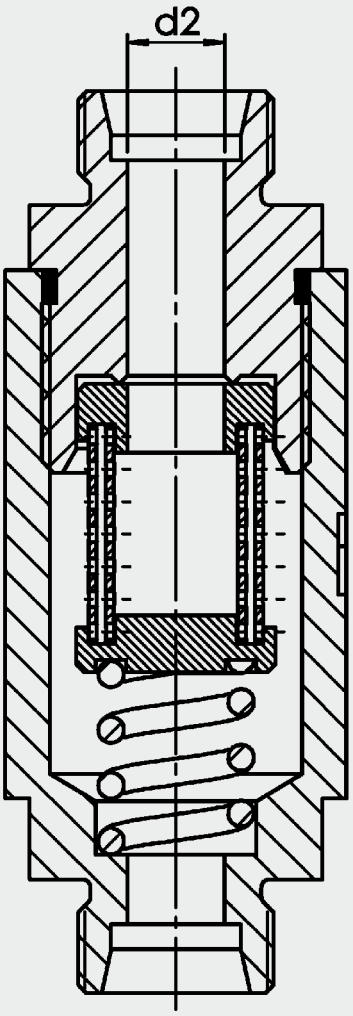



| ILF | d1 | d2 | d3 | d4 | L1 | L2 | L3 | L4 | Weight incl. element [kg] | Vol. of pressure chamber [l] |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 28 | 10 | M18 | M18 | 108 | 90 | 13.5 | 11 | 1.40 | 0.03 |
| | 34 | 12 | M22 | M22 | 109 | 91 | 14.5 | 12 | 1.39 | |
| | 34 | 12 | M24 | M24 | 110 | 92 | 16.5 | 14 | 1.39 | |

ILF 2



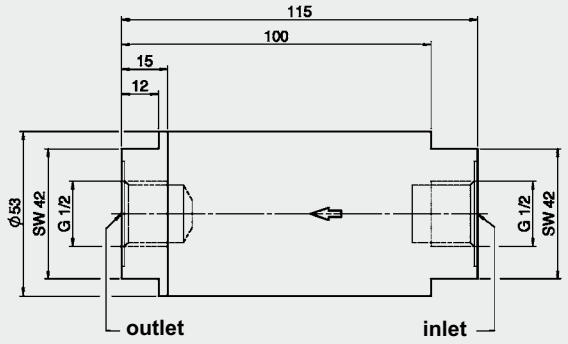



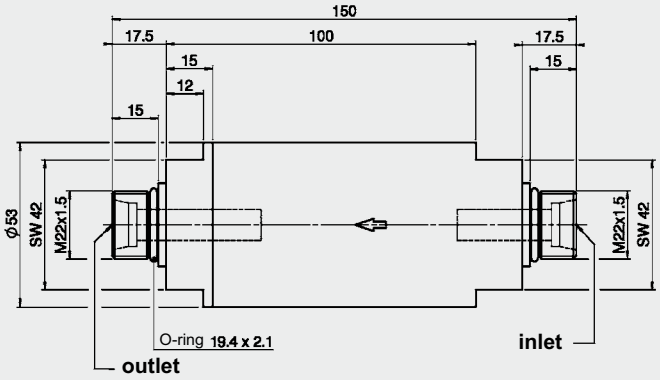

A-A

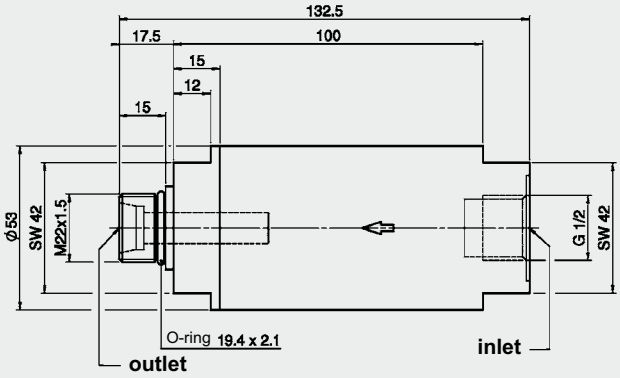
| ILF | d1 | d2 | d3 | d4 | L1 | L2 | L3 | L4 | Weight incl. element [kg] | Vol. of pressure chamber [l] |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 42 | 9 | M18x1.5 | M18x1.5 | 107 | 22 | 22 | 12 | 0.77 | 0.04 |
| | | 12 | M22x1.5 | M22x1.5 | 111 | 24 | 22 | 14 | 0.78 | |
| | | 12 | M24x1.5* | M24x1.5* | 111 | 24 | 22 | 14 | 0.79 | |
| | | 12 | M30x2 | M30x2 | 115 | 26 | 24 | 16 | 0.83 | |

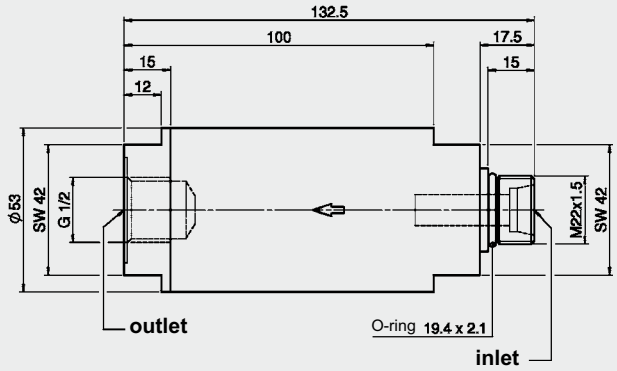
* standard models

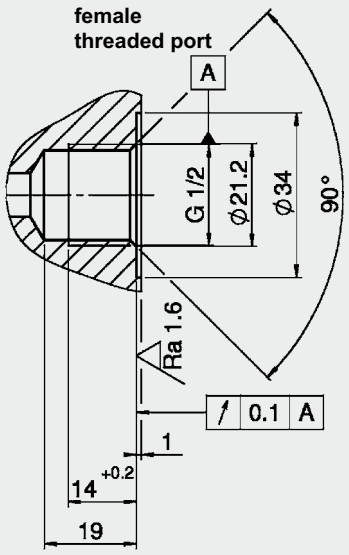
ILF 3



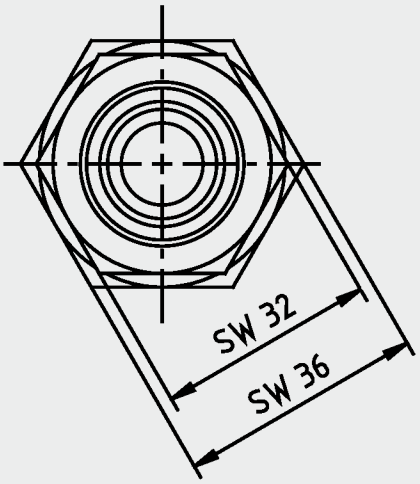



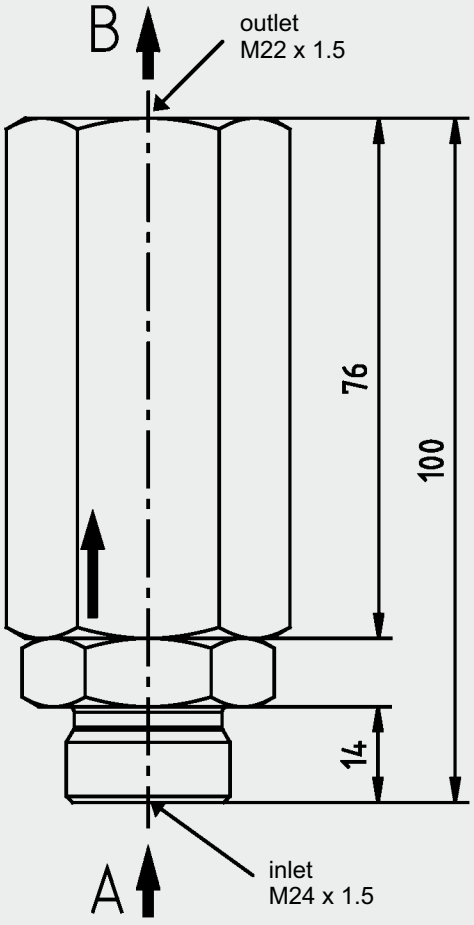




| ILF | Weight incl. element [kg] | Vol. of pressure chamber [l] |
|---|---|---|
| 3 | approx. 1.4 | 0.07 |

ILF 4




## NOTE

The information in this brochure relates to the operating conditions and applications described.

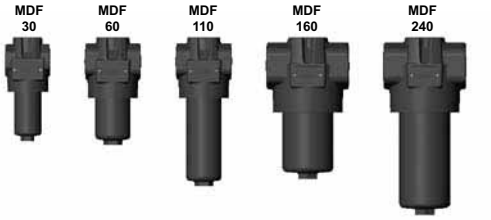
For applications or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.

HYDAC **Filtertechnik GmbH**
Industriegebiet
**D-66280 Sulzbach/Saar**
Tel.: 0 68 97 / 509-01
Fax: 0 68 97 / 509-300
Internet: www.hydac.com
E-Mail: filter@hydac.com



# Pressure Filter MDF
## up to 350 l/min, up to 280 bar




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. They consist of a filter head with screw-in filter bowl.

Standard equipment:

- Port for clogging indicator in filter head
- Mounting holes in the head

### 1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

**Contamination retention capacities in g**

| | Betamicron® (BN4HC) | | | |
|---|---|---|---|---|
| MDF | 3 µm | 5 µm | 10 µm | 20 µm |
| 30 | 4.6 | 5.1 | 5.4 | 5.6 |
| 60 | 6.5 | 7.3 | 7.8 | 8.0 |
| 110 | 13.8 | 15.5 | 16.4 | 16.9 |
| 160 | 19.8 | 22.2 | 23.5 | 24.3 |
| 240 | 32.3 | 36.3 | 38.4 | 39.6 |

| | Betamicron® (BH4HC) | | | |
|---|---|---|---|---|
| MDF | 3 µm | 5 µm | 10 µm | 20 µm |
| 30 | 3 | 2.9 | 3.2 | 3.7 |
| 60 | 4.6 | 4.5 | 5 | 5.7 |
| 110 | 10.1 | 9.9 | 10.9 | 12.4 |
| 160 | 12.9 | 12.6 | 13.9 | 15.9 |
| 240 | 21.6 | 21.1 | 23.2 | 26.5 |

Filter elements are available with the following pressure stability values:

| | |
|---|---|
| Betamicron® (BN4HC): | 20 bar |
| Betamicron® (BH4HC): | 210 bar |
| Wire mesh (W): | 20 bar |
| Stainless steel fibre (V): | 210 bar |

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Nominal pressure | 210 bar or 280 bar |
| Fatigue strength | min. 5 million load cycles at 1.2 times nominal pressure (for other pressures see graph under 1.8) |
| Temperature range | -30 °C to +100 °C (-30 °C to -10 °C: $p_{max}$= 140 bar) |
| Material of filter head | EN-GJS-400-15 |
| Material of filter bowl | Steel |
| Type of clogging indicator | VM (Differential pressure indicator up to 210 bar operating pressure) VD (Differential pressure indicator up to 420 bar operating pressure) |
| Pressure setting of clogging indicator | 5 bar (others on request) |
| Bypass valve cracking pressure (optional) | 6 bar (others on request) |

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 MOUNTING

As inline filter

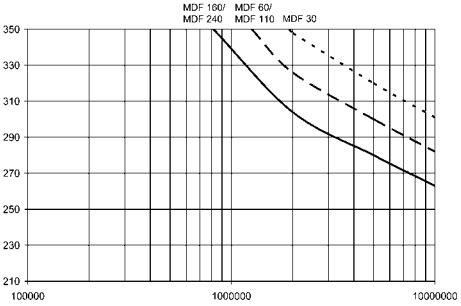
### 1.6 SPECIAL MODELS AND ACCESSORIES

- Bypass valve built into the head, separate from the main flow
- Oil drain plug
- Seals in FPM, EPDM
- Test and approval certificates

### 1.7 SPARE PARTS

See Original Spare Parts List

### 1.8 FATIGUE STRENGTH




### 1.9 CERTIFICATES AND APPROVALS

- Test certificate 2.2
- Manufacturer's certificate O and M to DIN 55350, part 18
  Other certificates on request

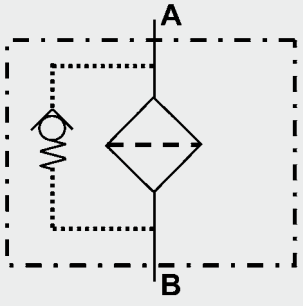
### 1.10 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Non-flam operating fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

### 1.11 IMPORTANT INFORMATION

- Filter housing must be earthed
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

**Symbol for hydraulic systems**



## 2. MODEL CODE (also order example)

**MDF BN/HC 60 O C 10 D 1 . X /-L24**

### 2.1 COMPLETE FILTER

**Filter type**
MDF

**Filter material of element**

| | | | |
|---|---|---|---|
| BN/HC | Betamicron® (BN4HC) | W | Stainless steel wire mesh |
| BH/HC | Betamicron® (BH4HC) | V | Stainless steel fibre |

**Size of filter or element**
MDF: 30, 60, 110, 160, 240

**Operating pressure**
Threaded port: L = 210 bar (VM clogging indicator)
O = 280 bar (standard; VD clogging indicator)
Flange port: L = 210 bar (3000 PSI flange) → VM clogging indicator

**Type and size of port**

| Type | Port | Filter size | | | | |
|---|---|---|---|---|---|---|
| | | 30 | 60 | 110 | 160 | 240 |
| B | G ½ | ● | | | | |
| C | G¾ | ● | ● | ● | | |
| D | G1 | | ● | ● | | |
| E | G1¼ | | | | ● | ● |
| F | G1½ | | | | ● | ● |
| H | SAE DN 13 | ● | | | | |
| I | SAE DN 20 | | ● | ● | | |
| J | SAE DN 32 | | | | ● | ● |

standard models

**Filtration rating in µm**
BN4HC, BH4HC, V: 3, 5, 10, 20
W: 25, 50, 100, 200

**Type of clogging indicator**
Y with plastic blanking plug in indicator port
A with steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
] for other clogging indicators, see brochure no. E 7.050.../...

**Type code**
1

**Modification number**
X the latest version is always supplied

**Supplementary details**
B. cracking pressure of bypass valve (e. g.: B6 = 6 bar); no details = without bypass valve
L... light with appropriate voltage (24V, 48V, 110V, 220V) ] only for clogging indicators type D
LED 2 light emitting diodes up to 24 Volt
SO 184 pressure release / oil drain plug
V FPM seals
W suitable for HFA and HFC oil-water emulsions (only required when using a clogging indicator or V or W elements)

### 2.2 REPLACEMENT ELEMENT

**0060 D 010 BN4HC /-V**

**Size**
0030, 0060, 0110, 0160, 0240

**Type**
D

**Filtration rating in µm**
BN4HC, BH4HC, V: 003, 005, 010, 020
W: 025, 050, 100, 200

**Filter material**
BN4HC, BH4HC, V, W

**Supplementary details**
V, W (for descriptions, see point 2.1)

### 2.3 REPLACEMENT CLOGGING INDICATOR

**VM 5 D . X /-L24**

**Type**
VM differential pressure indicator up to 210 bar operating pressure
VD differential pressure indicator up to 420 bar operating pressure

**Pressure setting**
5 standard 5 bar, others on request

**Type of clogging indicator**
D (see point 2.1)

**Modification number**
X the latest version is always supplied

**Supplementary details**
L..., LED, V, W (for descriptions, see point 2.1)

# 3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see point 3.1)

$\Delta p_{Element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see point 3.2)

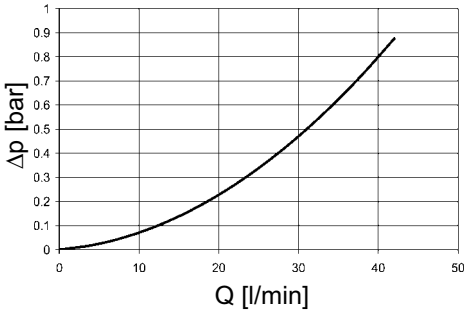
For ease of calculation, our Filter Sizing Program is available on request free of charge.

**NEW:** Sizing online at www.hydac.com

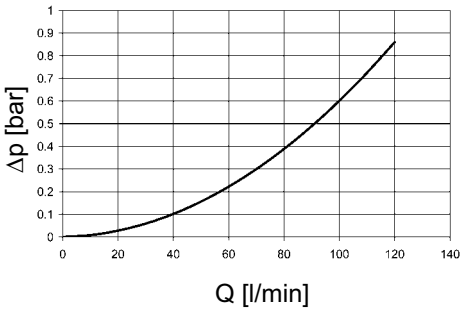
## 3.1 ΔP-Q HOUSING GRAPHS BASED ON ISO 3968

The housing graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

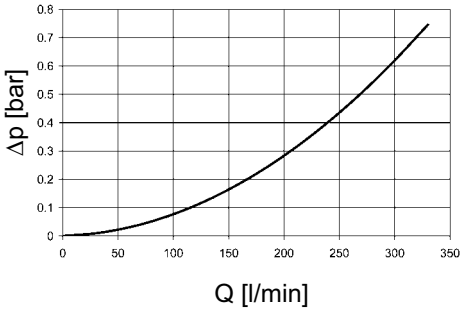
**MDF 30**




**MDF 60-110**




**MDF 160-240**

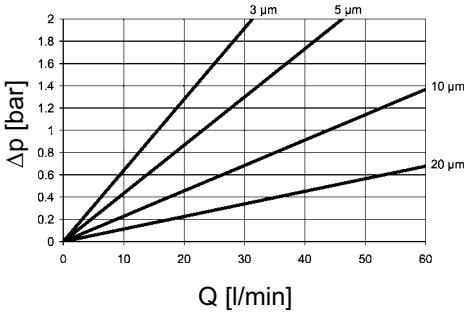



## 3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

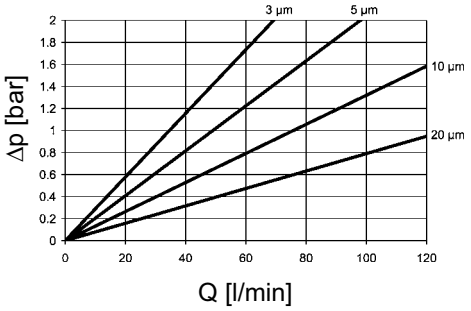
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

| MDF | V | | | | W | BH4HC | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 3 µm | 5 µm | 10 µm | 20 µm | – | 3 µm | 5 µm | 10 µm | 20 µm |
| 30 | 18.0 | 13.0 | 7.4 | 3.7 | 3.367 | 91.2 | 50.7 | 36.3 | 19.0 |
| 60 | 16.0 | 11.0 | 6.5 | 3.3 | 1.683 | 58.6 | 32.6 | 18.1 | 12.2 |
| 110 | 8.3 | 6.0 | 4.2 | 2.1 | 0.918 | 25.4 | 14.9 | 8.9 | 5.6 |
| 160 | 4.5 | 3.2 | 2.3 | 1.4 | 0.631 | 16.8 | 10,4 | 5.9 | 4.4 |
| 240 | 3.2 | 2.4 | 1.9 | 1.1 | 0.421 | 10.6 | 6,8 | 3.9 | 2.9 |

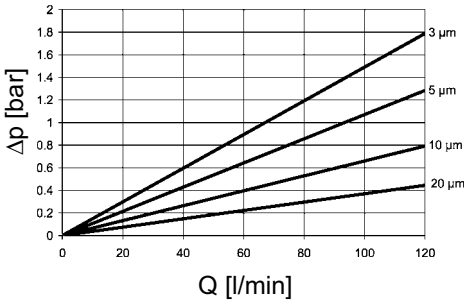
**BN4HC: MDF 30**



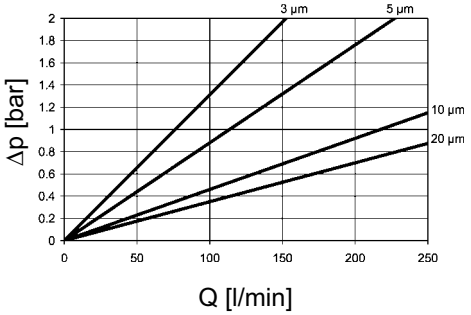

**BN4HC: MDF 60**



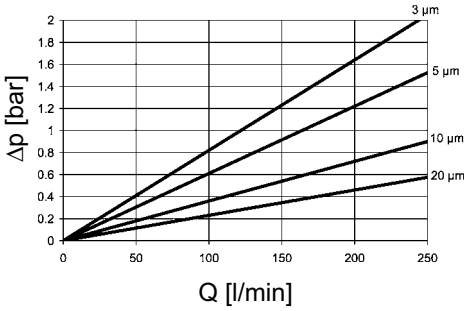

**BN4HC: MDF 110**



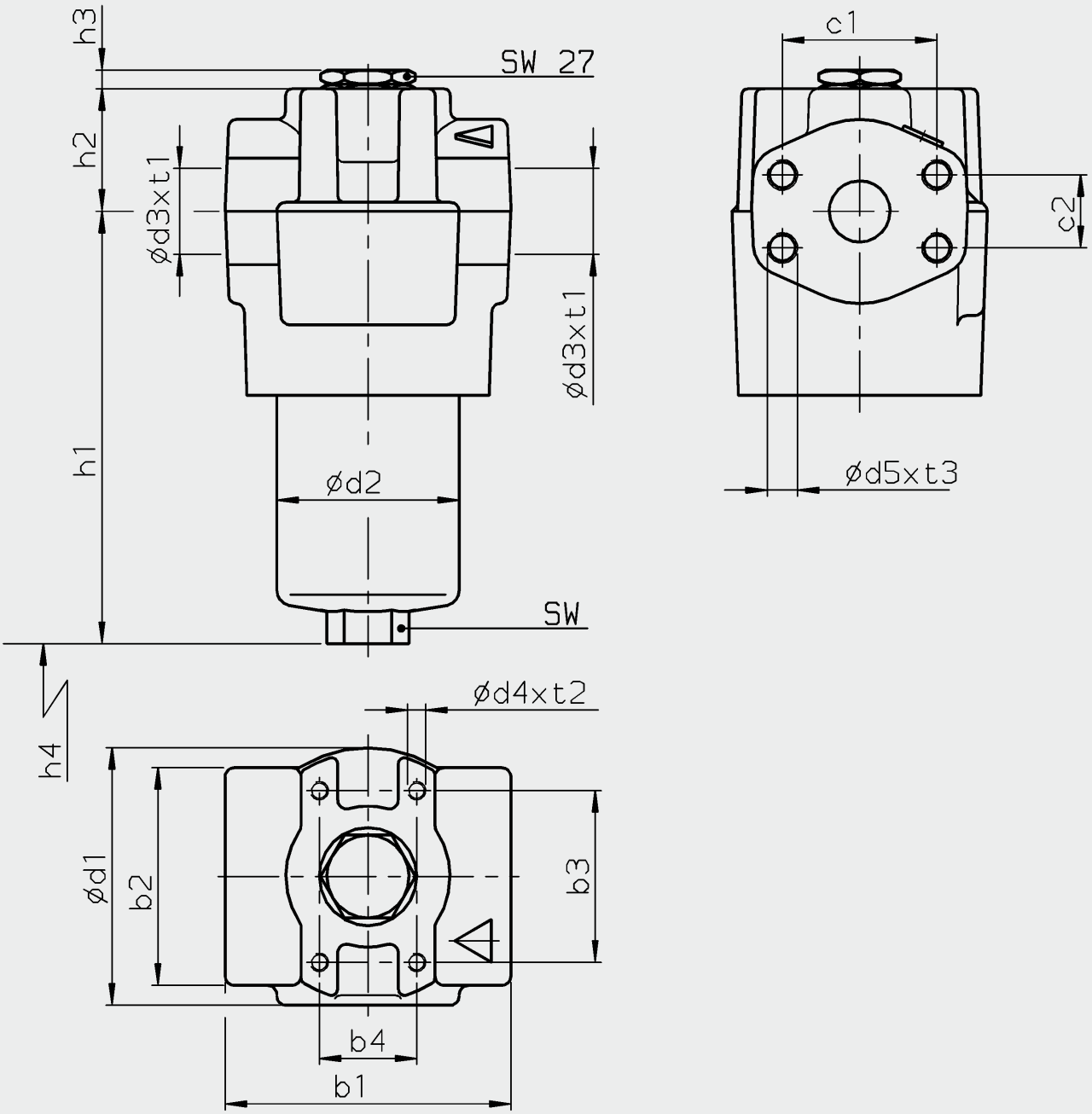

**BN4HC: MDF 160**




**BN4HC: MDF 240**



## 4. DIMENSIONS




| MDF | b1 | b2 | b3 | b4 | c1 | c2 | d1 | d2 | d3 | d4 | d5 | h1 | h2 | h3 | h4 | SW | t1 | t2 | t3 | Weight incl. element [kg] | Vol. of pressure chamber [l] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30 (B/C) | 71 | 55 | 45 | 30 | - | - | 69 | 45 | G½ - G¾ | M5 | - | 133 | 38 | 6 | 75 | 19 | 14 - 17 | 6 | - | 2.3 | 0.1 |
| 30 (H) | 70 | 55 | 45 | 30 | 38.1 | 17.5 | 69 | 45 | SAE DN 13 | M5 | M8 | 133 | 38 | 6 | 75 | 19 | - | 6 | 12 | 2.3 | 0.1 |
| 60 (C/D) | 90 | 71 | 56 | 32 | - | - | 86 | 59 | G¾ - G1 | M6 | - | 138 | 40 | 6 | 85 | 27 | 17 - 19 | 9 | - | 4.1 | 0.18 |
| 60 (I) | 89 | 71 | 56 | 32 | 47.6 | 22.2 | 86 | 59 | SAE DN 20 | M6 | M10 | 138 | 40 | 6 | 85 | 27 | - | 9 | 15 | 4.1 | 0.18 |
| 110 (C/D) | 90 | 71 | 56 | 32 | - | - | 86 | 59 | G¾ - G1 | M6 | - | 206 | 40 | 6 | 85 | 27 | 17 - 19 | 9 | - | 4.6 | 0.32 |
| 110 (I) | 89 | 71 | 56 | 32 | 47.6 | 22.2 | 86 | 59 | SAE DN 20 | M6 | M10 | 206 | 40 | 6 | 85 | 27 | - | 9 | 15 | 4.6 | 0.32 |
| 160 (E/F) | 133 | 95 | 85 | 35 | - | - | 119 | 84 | G1¼ - G1½ | M10 | - | 187 | 47 | 6 | 105 | 32 | 21 - 23 | 14 | - | 9.6 | 0.55 |
| 160 (J) | 133 | 95 | 85 | 35 | 58.7 | 30.2 | 119 | 84 | SAE DN 32 | M10 | M10 | 187 | 47 | 6 | 105 | 32 | - | 14 | 15 | 9.6 | 0.55 |
| 240 (E/F) | 133 | 95 | 85 | 35 | - | - | 119 | 84 | G1¼ - G1½ | M10 | - | 246 | 47 | 6 | 105 | 32 | 21 - 23 | 14 | - | 10.5 | 0.79 |
| 240 (J) | 133 | 95 | 85 | 35 | 58.7 | 30.2 | 119 | 84 | SAE DN 32 | M10 | M10 | 246 | 47 | 6 | 105 | 32 | - | 14 | 15 | 10.5 | 0.79 |

(.) = port size (see point 2.1: Type and size of port)

## NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.


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# Inline Filter MFM
## up to 100 l/min, up to 280 bar




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. They consist of a filter head with screw-in filter bowl.

Standard equipment:

- with bypass valve
- connection for a clogging indicator on the top of the head as standard (4 mounting holes)
- Filters are supplied phosphate-plated and primed.

### 1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

**Contamination retention capacities in g**

| | Betamicron® BN4HC | | | |
|---|---|---|---|---|
| MFM | 3 µm | 5 µm | 10 µm | 20 µm |
| 35 | 7.2 | 8.1 | 8.6 | 8.8 |
| 55 | 14 | 15.8 | 16.6 | 17.2 |
| 75 | 21.6 | 24.3 | 25.7 | 26.5 |
| 95 | 27.5 | 30.9 | 32.7 | 33.7 |

Filter elements are available with the following pressure stability values:
Betamicron® (BN4HC): 20 bar

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Nominal pressure | 280 bar |
| Fatigue strength | 0...280 bar, min. $10^7$ load cycles<br>0...320 bar, min. $10^5$ load cycles |
| Temperature range | -10 °C to +100 °C<br>(-30 °C to -10 °C: $p_{max}$= 140 bar) |
| Material of filter head | EN-GJS-400-15 |
| Material of filter bowl | Steel |
| Type of clogging indicator | VD (differential pressure indicator up to 420 bar operating pressure) |
| Pressure setting of clogging indicator | 5 bar (others on request) |
| Bypass cracking pressure | 7 bar (others on request) |

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 MOUNTING

As inline filter

### 1.6 SPECIAL MODELS AND ACCESSORIES

Connection for a clogging indicator on the side of the head (3 mounting holes)

### 1.7 SPARE PARTS

See Original Spare Parts List

### 1.8 CERTIFICATES AND APPROVALS

On request

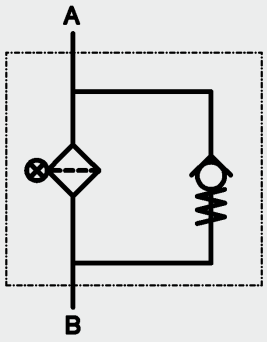
### 1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS TO ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Operating fluids with high water content (>50% water content) on request

### 1.10 IMPORTANT INFORMATION

- Filter housing must be earthed
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

**Symbol for hydraulic systems**



## 2. MODEL CODE (also order example)

**MFM BN/HC 55 O D 10 D 4 . X /-L24**

### 2.1 COMPLETE FILTER

**Filter type**
MFM

**Filter material of element**
BN/HC Betamicron® (BN4HC)

**Size of filter or element**
MFM: 35, 55, 75, 95

**Operating pressure**
O = 280 bar

**Type and size of port**

| Type | Port | Filter size | | | |
|---|---|---|---|---|---|
| | | 35 | 55 | 75 | 95 |
| A | M18 x 1.5 | ● | ● | ● | ● |
| B | G ½ | ● | ● | ● | ● |
| D | M22 x 1.5 | ● | ● | ● | ● |
| H | G ¾ | ● | ● | ● | ● |

**Filtration rating in µm**
BN4HC: 3, 5, 10, 20

**Type of clogging indicator**
W without port for clogging indicator
A with steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
] for other clogging indicators see brochure no. 7.050../..

**Type code**
3 clogging indicator port on side of head - 3 mounting holes
4 clogging indicator port on top of head - 4 mounting holes

**Modification number**
X the latest version is always supplied

**Supplementary details**
B7 standard: cracking pressure of bypass 7 bar
L... light with appropriate voltage (24, 48, 110, 220 Volt) ] only for clogging
LED 2 light emitting diodes up to 24 volt ] indicators type D
V FPM seals
W suitable for HFA and HFC emulsions
WAL right-angled bracket for side mounting, inlet on left (only possible for type code 4.x)
WAR right-angled bracket for side mounting, inlet on right (only possible for type code 4.x)

### 2.2 REPLACEMENT ELEMENT

**0055 D 010 BN4HC /-V**

**Size**
0035, 0055, 0075, 0095

**Type**
D

**Filtration rating in µm**
BN4HC: 003, 005, 010, 020

**Filter material**
BN4HC

**Supplementary details**
V (for descriptions, see point 2.1)

### 2.3 REPLACEMENT CLOGGING INDICATOR

**VD 5 D . X /-L24**

**Type**
VD differential pressure indicator up to 420 bar operating pressure

**Pressure setting**
5 standard 5 bar, others on request

**Type of clogging indicator**
D (see point 2.1)

**Modification number**
X the latest version is always supplied

**Supplementary details**
L..., LED, V, W (for descriptions, see point 2.1)

# 3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see point 3.1)

$\Delta p_{Element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see point 3.2)

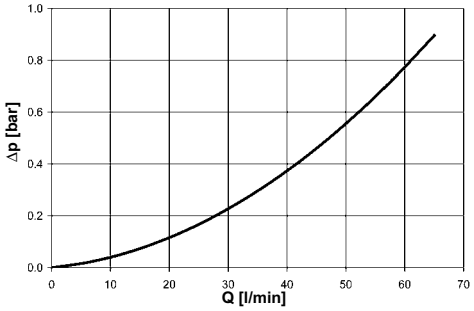
For ease of calculation, our Filter Sizing Program is available on request free of charge.

**NEW:** Sizing online at www.hydac.com

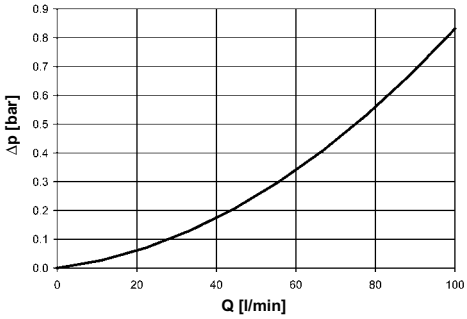
## 3.1 ΔP-Q HOUSING GRAPHS BASED ON ISO 3968

The housing graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s.
In this case, the differential pressure changes proportionally to the density.

**MFM - Port M18 x 1.5 / G ½**




**MFM - Port M22 x 1.5 / G ¾**

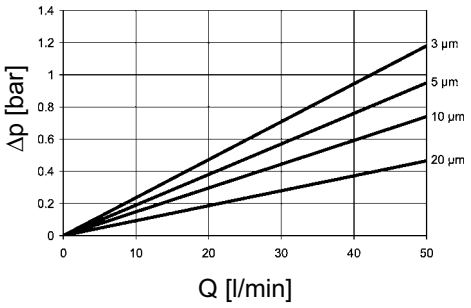



## 3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

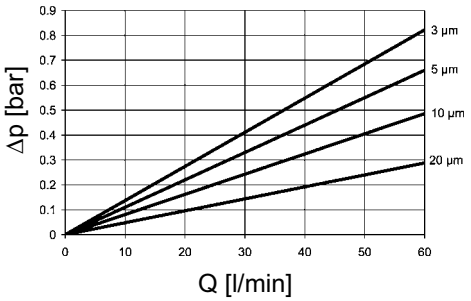
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

| MFM | BN4HC | | | |
|---|---|---|---|---|
| | 3 µm | 5 µm | 10 µm | 20 µm |
| 35 | 23.6 | 19.0 | 14.8 | 9.3 |
| 55 | 13.7 | 11.0 | 8.1 | 4.8 |
| 75 | 9.3 | 7.5 | 5.3 | 3.1 |
| 95 | 7.5 | 6.0 | 4.1 | 2.4 |

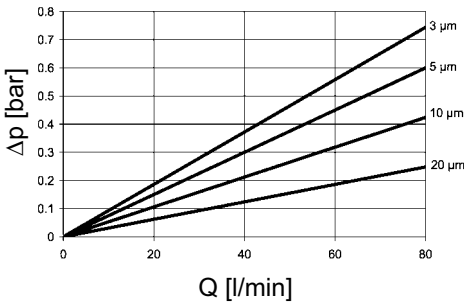
**BN4HC: MFM 35**



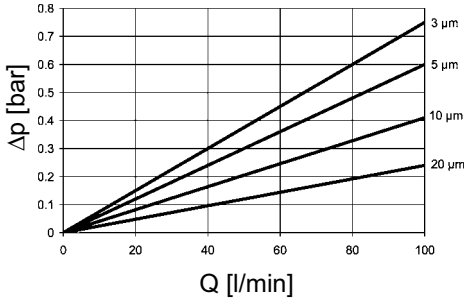

**BN4HC: MFM 55**




**BN4HC: MFM 75**

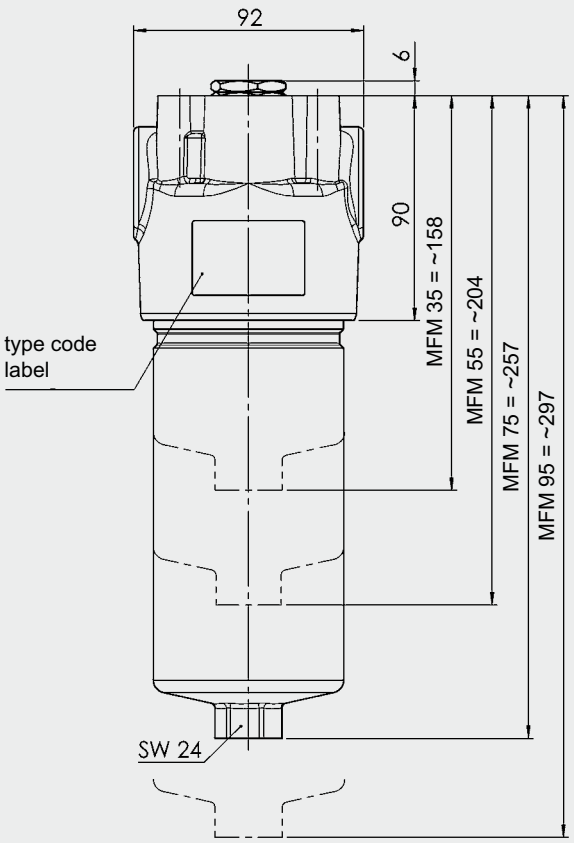


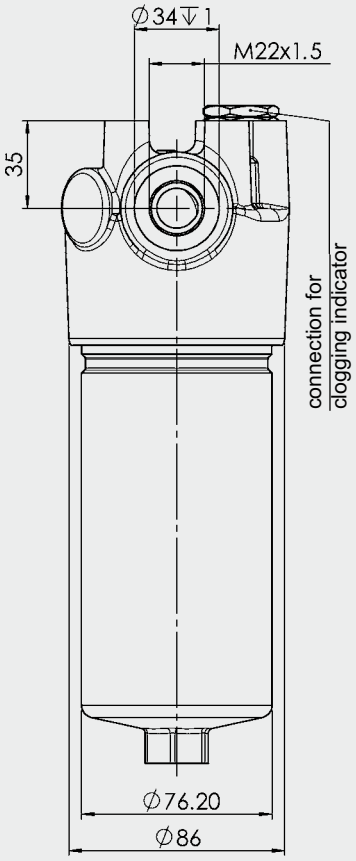

**BN4HC: MFM 95**

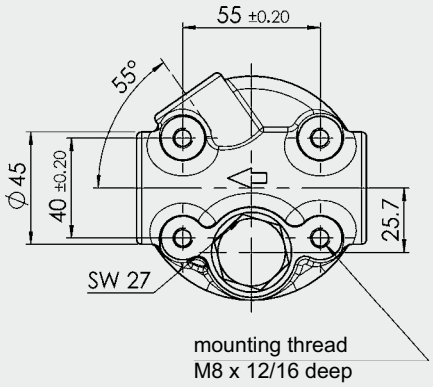


## 4. DIMENSIONS

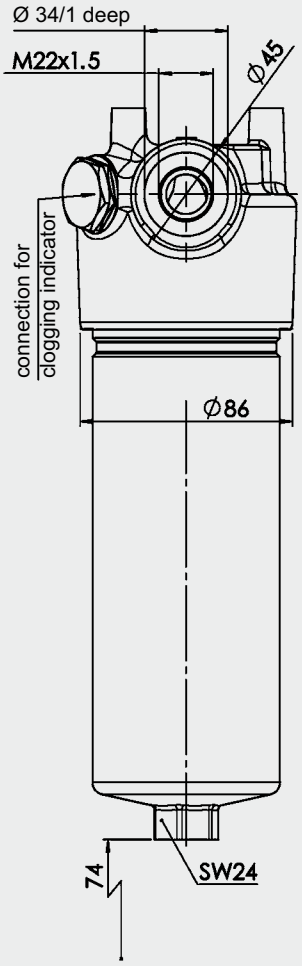
STANDARD: VERSION 4.X

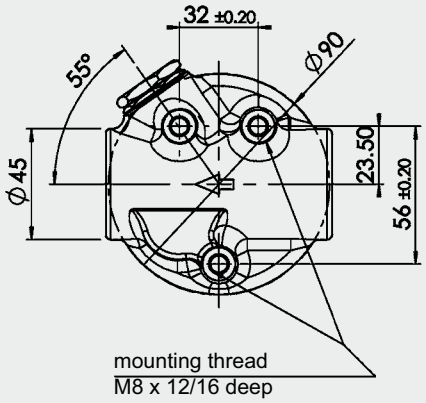



SPECIAL VERSION 3.X




| MFM | Weight incl. element [kg] | Vol. of pressure chamber [l] |
|---|---|---|
| 35 | 3.7 | 0.24 |
| 55 | 4.2 | 0.39 |
| 75 | 4.7 | 0.56 |
| 95 | 5.1 | 0.69 |

## NOTE

The information in this brochure relates to the operating conditions and applications described.

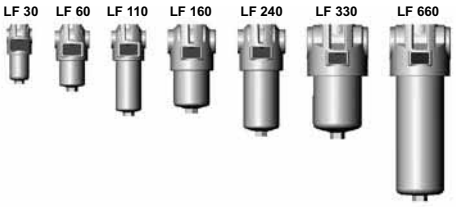
For applications or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.


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E-Mail: filter@hydac.com



# Inline Filter LF
## up to 660 l/min, up to 100 bar




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. They consist of a filter head with screw-in filter bowl.

Standard equipment:

- port for clogging indicator in filter head
- mounting holes in the head
- pressure release/oil drain plug (LF 330 and above)

### 1.2 FILTER ELEMENTS

Hydac filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

**Contamination retention capacities in g**

| | Betamicron® (BN4HC) | | | |
|---|---|---|---|---|
| LF | 3 µm | 5 µm | 10 µm | 20 µm |
| 30 | 4.6 | 5.1 | 5.4 | 5.6 |
| 60 | 6.5 | 7.3 | 7.8 | 8.0 |
| 110 | 13.8 | 15.5 | 16.4 | 16.9 |
| 160 | 19.8 | 22.2 | 23.5 | 24.3 |
| 240 | 32.3 | 36.3 | 38.4 | 39.6 |
| 330 | 47.2 | 53.1 | 56.1 | 57.9 |
| 660 | 102.2 | 114.9 | 121.5 | 125.4 |

| | Betamicron® (BH4HC) | | | |
|---|---|---|---|---|
| LF | 3 µm | 5 µm | 10 µm | 20 µm |
| 30 | 3.0 | 2.9 | 3.2 | 3.7 |
| 60 | 4.6 | 4.5 | 5.0 | 5.7 |
| 110 | 10.1 | 9.9 | 10.9 | 12.4 |
| 160 | 12.9 | 12.6 | 13.9 | 15.9 |
| 240 | 21.6 | 21.1 | 23.2 | 26.5 |
| 330 | 34.6 | 33.9 | 37.2 | 42.5 |
| 660 | 76.8 | 75.2 | 82.6 | 94.3 |

Filter elements are available with the following pressure stability values:

| | |
|---|---|
| Betamicron® (BN4HC): | 20 bar |
| Betamicron® (BH4HC): | 210 bar |
| Wire mesh (W): | 20 bar |
| Stainless steel fibre (V): | 210 bar |

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Nominal pressure | 100 bar |
| Fatigue strength | at nominal pressure $10^6$ load cycles from 0 to nominal pressure (For other pressures, see graph at 1.8) |
| Temperature range | -30 °C to +100 °C (LF 660: -30 °C to -10 °C: $p_{max}$= 75 bar) |
| Material of filter head | Aluminium |
| Material of filter bowl | Aluminium (LF 660: steel) |
| Type of clogging indicator | VM (differential pressure indicator up to 210 bar operating pressure) |
| Setting pressure of clogging indicator | 5 bar (others on request) |
| Bypass cracking pressure (optional) | 6 bar (others on request) |

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 MOUNTING

As inline filter

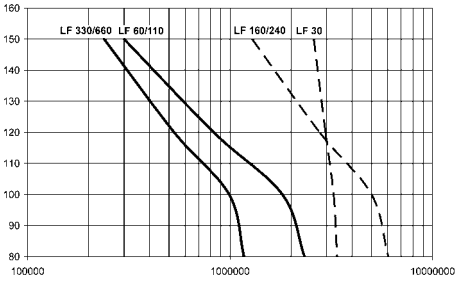
### 1.6 SPECIAL MODELS AND ACCESSORIES

- bypass valve built into the head, separate from the main flow
- oil drain plug up to LF 240
- seals in FPM, EPDM
- test and approval certificates

### 1.7 SPARE PARTS

See Original Spare Parts List

### 1.8 FATIGUE STRENGTH




### 1.9 CERTIFICATES AND APPROVALS

On request

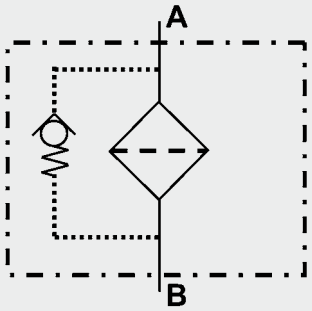
### 1.10 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Non-flam operating fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

### 1.11 IMPORTANT INFORMATION

- Filter housing must be earthed
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector

**Symbol for hydraulic systems**



## 2. MODEL CODE (ALSO ORDER EXAMPLE)

**LF BN/HC 60 I C 10 D 1 . X /-L24**

### 2.1 COMPLETE FILTER

**Filter type**
LF

**Filter material of element**
BN/HC Betamicron® (BN4HC)
BH/HC Betamicron® (BH4HC)
W Stainless steel wire mesh
V Stainless steel fibre

**Size of filter or element**
LF: 30, 60, 110, 160, 240, 330, 660

**Operating pressure**
I = 100 bar

**Type and size of port**

| Port | Filter size | | | | | | |
|---|---|---|---|---|---|---|---|
| | 30 | 60 | 110 | 160 | 240 | 330 | 660 |
| G ½ | ● | | | | | | |
| G ¾ | | ● | ● | | | | |
| G1 ¼ | | | | ● | ● | | |
| G1 ½ | | | | | | ● | ● |

**Filtration rate in µm**
BN4HC, BH4HC, V: 3, 5, 10, 20
W: 25, 50, 100, 200

**Type of clogging indicator**
Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
] for other clogging indicators see brochure no. E 7.050../..

**Type code**
1

**Modification number**
X the latest version is always supplied

**Supplementary details**
B. cracking pressure of bypass (e.g.: B6 = 6 bar); no details = without bypass valve
L... light with appropriate voltage (24V, 48V, 110V, 220V) ] only for clogging
LED 2 light emitting diodes up to 24 Volt ] indicators Type D
SO 184 pressure release/oil drain plug (LF 330 series and above)
V FPM seals
W suitable for HFA and HFC emulsions
(only required when using a clogging indicator, or V or W elements)

### 2.2 REPLACEMENT ELEMENT

**0060 D 010 BN4HC /-V**

**Size**
0030, 0060, 0110, 0160, 0240, 0330, 0660

**Type**
D

**Filtration rate in µm**
BN4HC, BH4HC, V: 003, 005, 010, 020
W: 025, 050, 100, 200

**Filter material**
BN4HC, BH4HC, V, W

**Supplementary details**
V, W (for descriptions, see point 2.1)

### 2.3 REPLACEMENT CLOGGING INDICATOR

**VM 5 D . X /-L24**

**Type**
VM differential pressure indicator up to 210 bar operating pressure

**Pressure setting**
5 5 bar standard, others on request

**Type of clogging indicator**
D (see point 2.1 )

**Modification number**
X the latest version is always supplied

**Supplementary details**
L..., LED, V, W (for descriptions, see point 2.1)

# 3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see point 3.1)

$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see point 3.2)

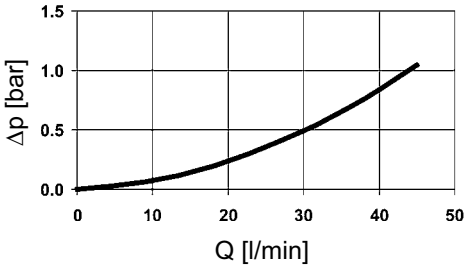
For ease of calculation, our Filter Sizing Program is available on request free of charge.

**NEW:** Sizing online at www.hydac.com

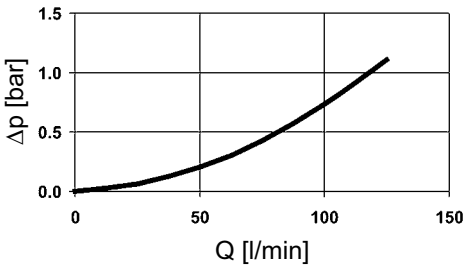
## 3.1 Δp-Q HOUSING GRAPHS BASED ON ISO 3968

The housing graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

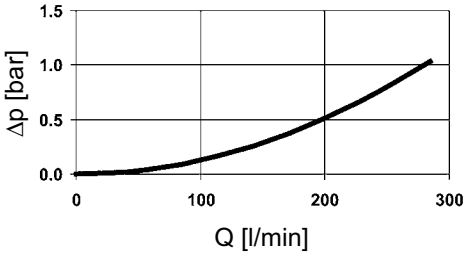
**LF 30**



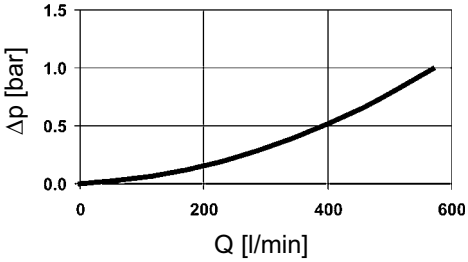

**LF 60-110**




**LF 160-240**




**LF 330-660**

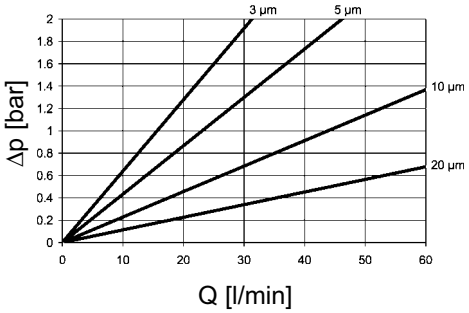



## 3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

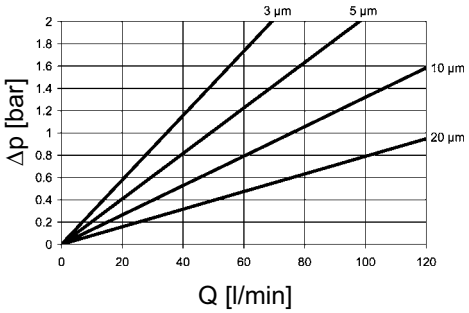
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

| LF | V | | | | W | BH4HC | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 3 µm | 5 µm | 10 µm | 20 µm | – | 3 µm | 5 µm | 10 µm | 20 µm |
| 30 | 18.0 | 13.0 | 7.4 | 3.7 | 3.367 | 91.2 | 50.7 | 36.3 | 19.0 |
| 60 | 16.0 | 11.0 | 6.5 | 3.3 | 1.683 | 58.6 | 32.6 | 18.1 | 12.2 |
| 110 | 8.3 | 6.0 | 4.2 | 2.1 | 0.918 | 25.4 | 14.9 | 8.9 | 5.6 |
| 160 | 4.5 | 3.2 | 2.3 | 1.4 | 0.631 | 16.8 | 10.4 | 5.9 | 4.4 |
| 240 | 3.2 | 2.4 | 1.9 | 1.1 | 0.421 | 10.6 | 6.8 | 3.9 | 2.9 |
| 330 | 2.1 | 1.5 | 1.3 | 0.8 | 0.307 | 7.7 | 4.5 | 2.8 | 2.0 |
| 660 | 1.1 | 0.9 | 0.6 | 0.3 | 0.153 | 3.3 | 1.9 | 1.0 | 0.9 |

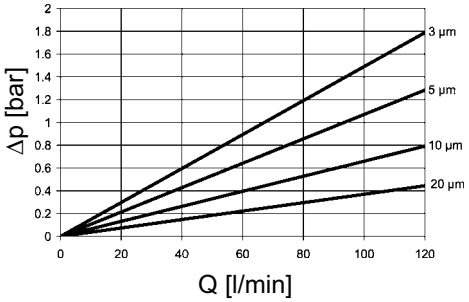
**BN4HC: LF 30**



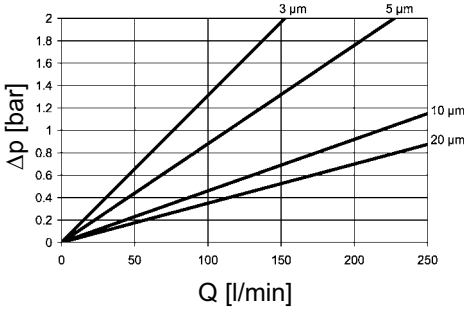

**BN4HC: LF 60**



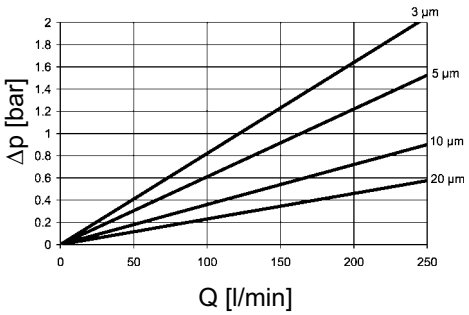

**BN4HC: LF 110**



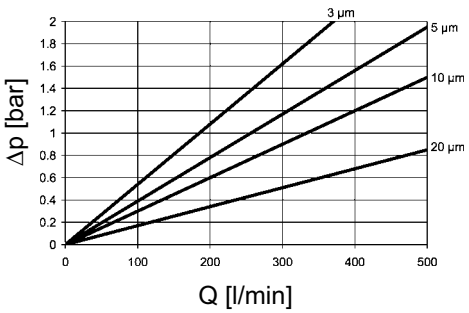

**BN4HC: LF 160**



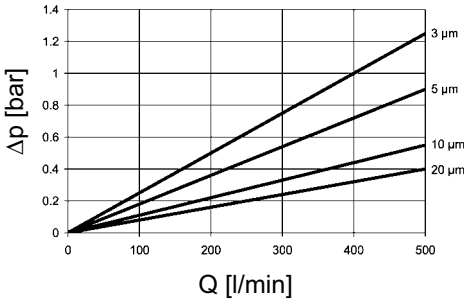

**BN4HC: LF 240**



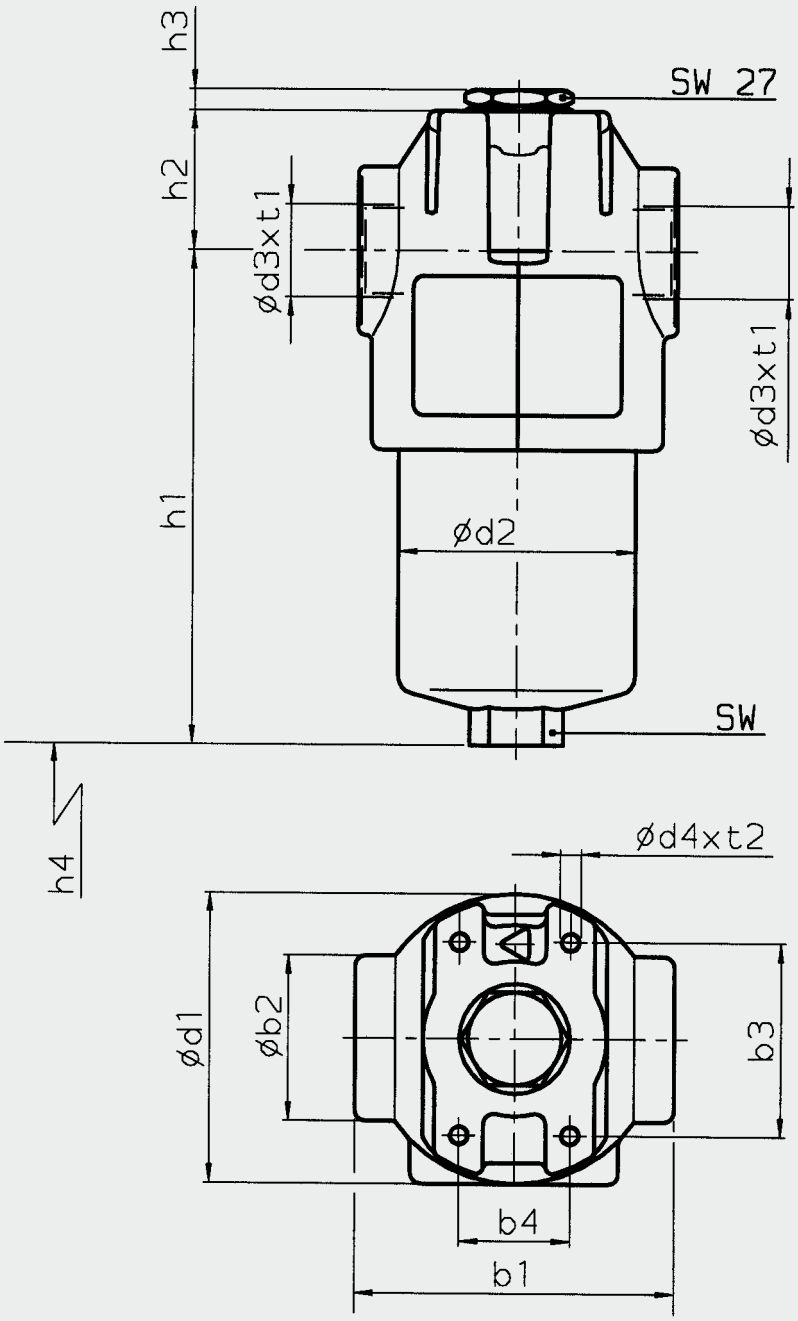

**BN4HC: LF 330**




**BN4HC: LF 660**



## 4. DIMENSIONS




| LF | b1 | b2 | b3 | b4 | d1 | d2 | d3 | d4 | h1 | h2 | h3 | h4 | SW | t1 | t2 | Weight including element [kg] | Volume of pressure chamber [l] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30 | 69 | 36 | 45 | 30 | 67 | 52 | G½ | M5 | 125.5 | 31 | 7 | 75 | 24 | 15 | 8 | 0.8 | 0.13 |
| 60 | 90 | 48 | 56 | 32 | 84 | 68 | G¾ | M6 | 137.5 | 39 | 6 | 75 | 27 | 17 | 9 | 1.5 | 0.20 |
| 110 | 90 | 48 | 56 | 32 | 84 | 68 | G¾ | M6 | 207.0 | 39 | 6 | 75 | 27 | 17 | 9 | 1.8 | 0.33 |
| 160 | 125 | 65 | 85 | 35 | 116 | 95 | G1¼ | M10 | 190.5 | 46 | 6 | 95 | 32 | 21 | 14 | 3.7 | 0.60 |
| 240 | 125 | 65 | 85 | 35 | 116 | 95 | G1¼ | M10 | 250.5 | 46 | 6 | 95 | 32 | 21 | 14 | 4.3 | 0.80 |
| 330 | 159 | 85 | 115 | 60 | 160 | 130 | G1½ | M12 | 252.5 | 50 | 6 | 105 | 36 | 23 | 17 | 8.0 | 1.50 |
| 660 | 159 | 85 | 115 | 60 | 160 | 127 | G1½ | M12 | 417.5 | 50 | 6 | 105 | 36 | 23 | 17 | 17.6 | 3.00 |

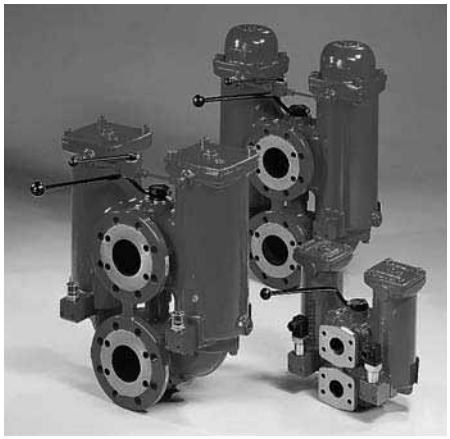
## NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

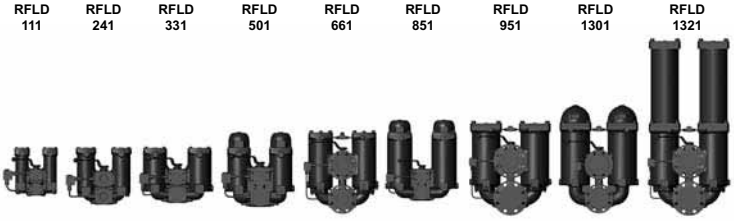
Subject to technical modifications.


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# Change-Over Inline Filter RFLD Cast Version

## up to 1300 l/min, up to 64 bar




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. The two sections of the filter housing with screw-on cover plates are connected by means of a ball change-over valve.

Standard equipment:

- connections for venting and draining
- connection for a clogging indicator
- from size DN 80 the filters are fitted with a pressure equalisation line and a ball shut-off valve
- with bypass valve

### 1.2 FILTER ELEMENTS

Hydac filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

**Contamination retention capacities in g**

| RFLD | Elements per side | Betamicron® (BN4HC) 3 µm | 5 µm | 10 µm | 20 µm |
|---|---|---|---|---|---|
| 111 | 1x0110 R | 12 | 13.3 | 16 | 18.1 |
| 241 | 1x0240 R | 29.3 | 32.5 | 39.1 | 44.2 |
| 33x | 1x0330 R | 38.4 | 42.6 | 51.2 | 57.9 |
| 50x | 1x0500 R | 58.9 | 65.3 | 78.6 | 88.9 |
| 66x | 1x0660 R | 87.1 | 96.5 | 116.1 | 131.3 |
| 85x | 1x0850 R | 112.1 | 124.2 | 149.5 | 169.1 |
| 95x | 1x0950 R | 130.0 | 144.1 | 173.3 | 196.1 |
| 130x | 1x1300 R | 181.0 | 200.7 | 241.4 | 273.1 |
| 132x | 1x2600 R | 369.4 | 409.4 | 492.5 | 557.2 |

Filter elements are available with the following pressure stability values:

| | |
|---|---|
| Betamicron® (BN4HC): | 20 bar |
| Paper (P/HC): | 10 bar |
| Wire mesh(W/HC): | 20 bar |
| Stainless steel fibre(V): | 30 bar |
| Betamicron®/Aquamicron® (BN4AM): | 10 bar |
| Aquamicron® (AM): | 10 bar |

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Nominal pressure | 25 bar (RFLD 331-1321, 853)<br>40 bar (RFLD 111-241, 503, 662-1322)<br>64 bar (RFLD 332-502) |
| Temperature range | -10 °C to +100 °C |
| **Material of filter housing and cover plate**<br>Material code (final digit of filter size) | 1 = EN-GJS-400-15<br>2 = GP 240 GH+N<br>3* = stainless steel 1.4581 |
| Type of clogging indicator | VM (differential pressure measurement up to 210 bar operating pressure) |
| Pressure setting of clogging indicator | 2 bar (others on request) |
| Bypass cracking pressure | 3 bar (others on request) |

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 MOUNTING

As inline filter

### 1.6 SPECIAL MODELS AND ACCESSORIES

- Orifice in the pressure equalisation line
- Stand
- Draining and venting connections with ball valves or other shut-off valves
- Mating flanges available for all sizes
- Change-over valve lockable
- Venting line with sight gauges

### 1.7 SPARE PARTS

See Original Spare Parts List

### 1.8 CERTIFICATES AND APPROVALS

Material code (final digit of filter size) - 1:
These filters can be supplied with manufacturer's certificates O and M to DIN 55350, Part 18.
Test certificates 3.1 to DIN EN 10204 and approval certificates (Type Approval) for different approval authorities.
Areas of application, amongst others: lubrication.

Material code (final digit of filter size) - 2:
These filters are designed according to API 614, which contains guidelines for the design and designation of basic types of oil supply systems for bearings and shaft seals of larger machines.

Material code (final digit of filter size) - 3:
Filters for use in separation technology with low viscosity, high viscosity and aggressive fluids as well as gaseous media.*

* These filters are available from our HYDAC Process Technology dept.

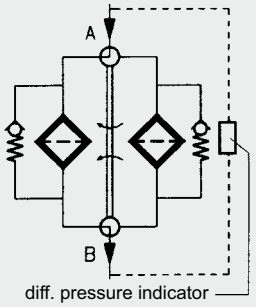
### 1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Non-flam operating fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

### 1.10 IMPORTANT INFORMATION

- Filter housing must be earthed
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector
- Filters must be flexibly mounted and not fixed rigidly to the floor or used as a pipe support.
- When used with W/HC and P/HC-elements, please follow the sizing recommendation under Point 3.3!

**Symbol for hydraulic systems**



## 2. MODEL CODE (also order example)

**RFLD BN/HC 851 D A L 10 D 1 . X /-L24**

### 2.1 COMPLETE FILTER

**Filter type**
RFLD

**Filter material of element**

| | | | | | |
|---|---|---|---|---|---|
| BN/HC | Betamicron® (BN4HC) | P/HC | Paper | AM | Aquamicron® |
| V | Stainless steel fibre | W/HC | Wire mesh | BN/AM | Betamicron®/Aquamicron® |

**Size of filter or element**

| | |
|---|---|
| EN-GJS-400-15: | 111, 241, 331, 501, 661, 851, 951, 1301, 1321 |
| GP 240 GH+N: | 332, 502, 662, 852, 952, 1302, 1322 |
| Stainless steel 1.4581: | 503, 853 |

**Operating pressure**

| | | |
|---|---|---|
| D | = 25 bar | RFLD 331-1301, 853 |
| E | = 40 bar | RFLD 111-241, 503, 662-1302 |
| F | = 64 bar | RFLD 332-502 |

**Type of change-over**
A Ball

**Type and size of port**
EN-GJS-400-15 (●) = Hydraulic systems;
GP 240 GH+N (X) = API 614 applications; 1.4581 (★)

| Type | Port | Filter size 111 | 241 | 331 332 | 501 502 503 | 661 662 | 851 852 853 | 951 952 | 1301 1302 | 1321 1322 |
|---|---|---|---|---|---|---|---|---|---|---|
| D | G 1 | ● | | | | | | | | |
| F | G 1½ | | ● | | | | | | | |
| I | SAE DN 25 | ● | | | | | | | | |
| J | DIN DN 50 | | | X | X★ | | | | | |
| K | SAE DN 40 | | ● | ● | ● | | | | | |
| L | SAE DN 50 | | | ●X | ●X | ● | ● | | | |
| M | SAE DN 65 | | | | | ● | ● | | | |
| Q | DIN DN 80 | | | | | X | X★ | | | |
| R | DIN DN 100 | | | | | | | X | X | X |
| S | SAE/DIN DN 80 | | | | | ● | ● | ● | ● | ● |
| T | SAE/DIN DN 100 | | | | | | | ● | ● | ● |

Other nominal widths and ANSI flange version on request

**Filtration rating in µm**

| | | | | | |
|---|---|---|---|---|---|
| BN/HC, V: | 3, 5, 10, 20 | P/HC: | 10, 20 | AM: | 40 |
| W/HC: | 25, 50, 100, 200 | BN/AM: | 3, 10 | | |

**Type of clogging indicator**

| | | |
|---|---|---|
| Y | plastic blanking plug in indicator port | |
| A | steel blanking plug in indicator port | |
| B | visual | for other clogging indicators see brochure no. E 7.050../.. |
| C | electrical | |
| D | visual and electrical | |

**Type code**
1

**Modification number**
X the latest version is always supplied

**Supplementary details**

| | | |
|---|---|---|
| B. | special cracking pressure of bypass (e.g. B1 = 1 bar) | |
| DE | differential pressure measurement across element | |
| KB | no bypass valve | |
| L... | light with appropriate voltage (24V, 48V, 110V, 220V) | only for clogging indicators type D |
| LED | 2 light emitting diodes up to 24 Volt | |
| SAK | contamination retainer | |
| SB | pressure equalisation line (SB2 = with 2mm orifice) | |
| STV | stand | |
| V | FPM seals | |

### 2.2 REPLACEMENT ELEMENT

**0850 R 010 BN4HC /-V**

**Size**
0110, 0240, 0330, 0500, 0660, 0850, 0950, 1300, 2600

**Type**
R

**Filtration rating in µm**

| | | | | | |
|---|---|---|---|---|---|
| BN4HC, V: | 003, 005, 010, 020 | P/HC: | 010, 020 | AM: | 040 |
| W/HC: | 025, 050, 100, 200 | BN4AM: | 003, 010 | | |

**Filter material**
BN4HC, V, W/HC, P/HC, BN4AM, AM

**Supplementary details**
V (for descriptions, see point 2.1)

### 2.3 REPLACEMENT CLOGGING INDICATOR

**VM 2 D . X /-L24**

**Type**
VM differential pressure measurement up to 210 bar operating pressure

**Pressure setting**
2 2 bar standard, others on request

**Type of clogging indicator** (see point 2.1)

**Modification number**
X the latest version is always supplied

**Supplementary details**
L..., LED, V (for descriptions, see point 2.1)

# 3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see point 3.1)

$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see point 3.2)

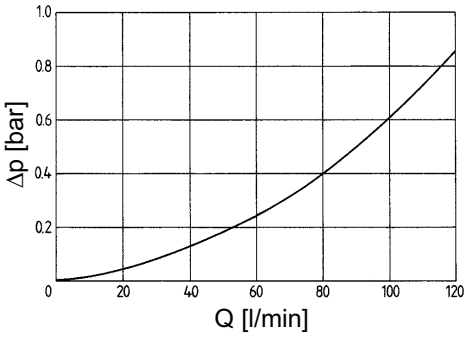
For ease of calculation, our Filter Sizing Program is available on request free of charge.

**NEW:** Sizing online at www.hydac.com

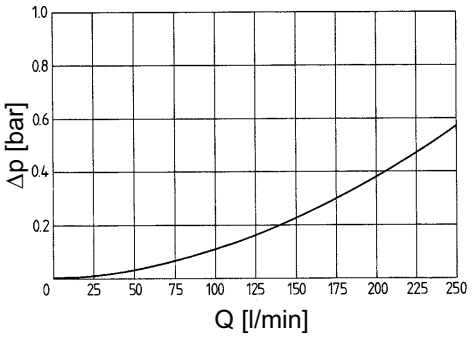
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The housing graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

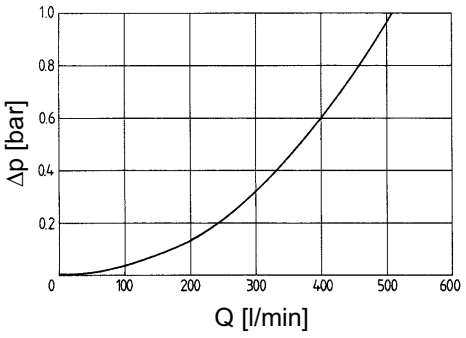
**RFLD 111**



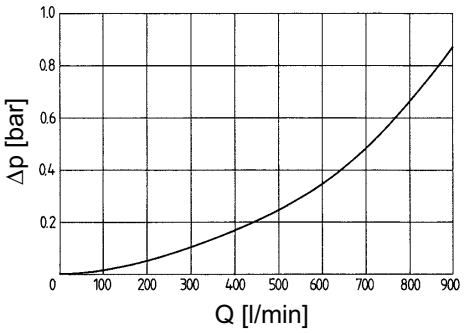

**RFLD 241**



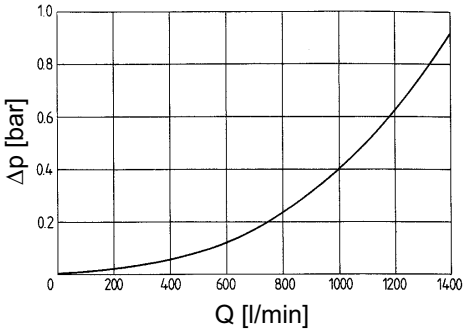

**RFLD 331, 332, 501, 502, 503**




**RFLD 661, 662, 851, 852, 853**




**RFLD 951, 952, 1301, 1302, 1321, 1322**

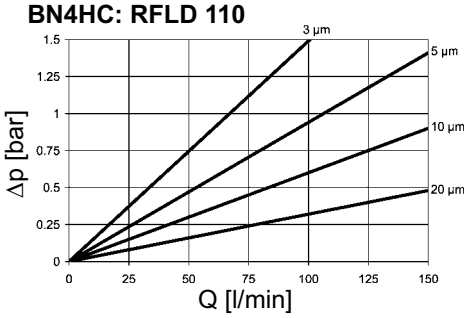



## 3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

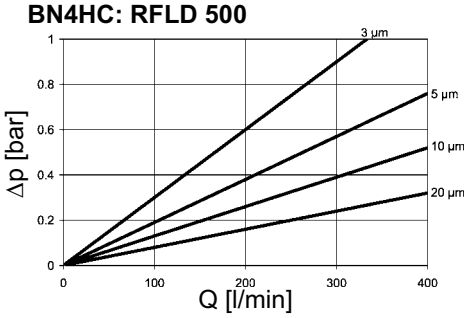
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

| RFLD | V | | | | W/HC |
|---|---|---|---|---|---|
| | 3 µm | 5 µm | 10 µm | 20 µm | – |
| 110 | 7.6 | 5.1 | 3.0 | 2.0 | 0.502 |
| 240 | 3.2 | 2.6 | 1.7 | 1.2 | 0.228 |
| 330 | 2.1 | 1.7 | 1.1 | 0.8 | 0.164 |
| 500 | 1.5 | 1.2 | 0.8 | 0.5 | 0.109 |
| 660 | 1.0 | 0.8 | 0.6 | 0.4 | 0.081 |
| 850 | 0.8 | 0.6 | 0.4 | 0.3 | 0.063 |
| 950 | 0.7 | 0.6 | 0.4 | 0.2 | 0.054 |
| 1300 | 0.5 | 0.4 | 0.3 | 0.2 | 0.045 |
| 2600 | 0.3 | 0.2 | 0.1 | 0.1 | 0.022 |

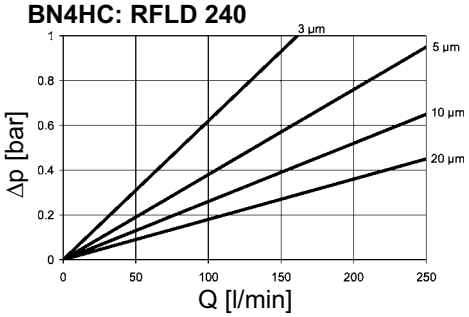
**BN4HC: RFLD 110**



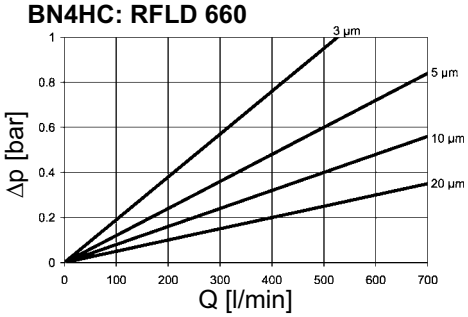

**BN4HC: RFLD 500**



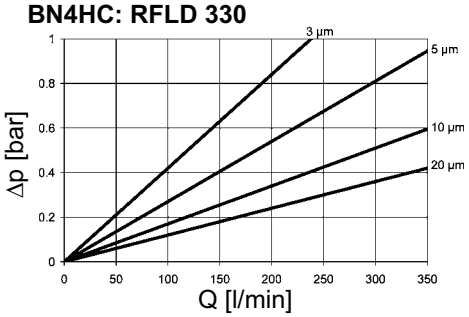

**BN4HC: RFLD 240**



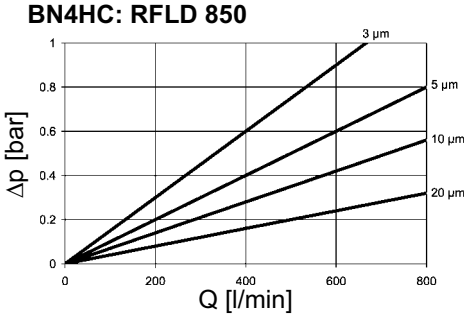

**BN4HC: RFLD 660**



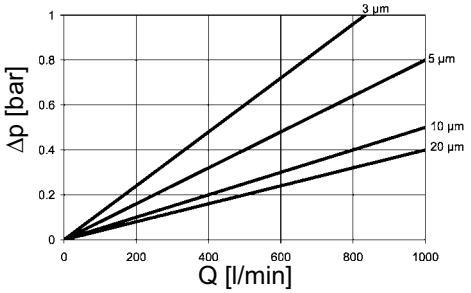

**BN4HC: RFLD 330**



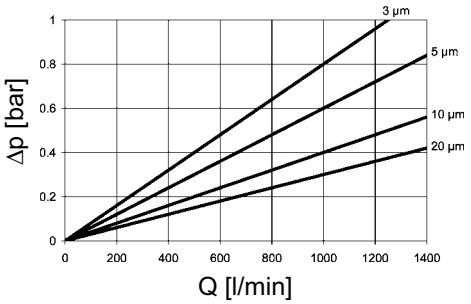

**BN4HC: RFLD 850**



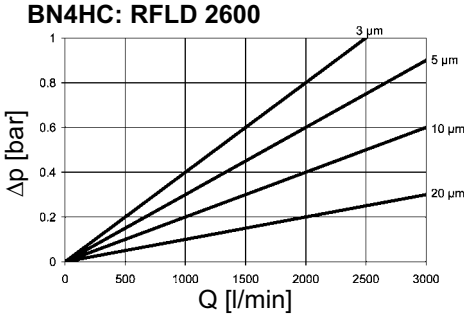
**BN4HC: RFLD 950**




**BN4HC: RFLD 1300**




**BN4HC: RFLD 2600**

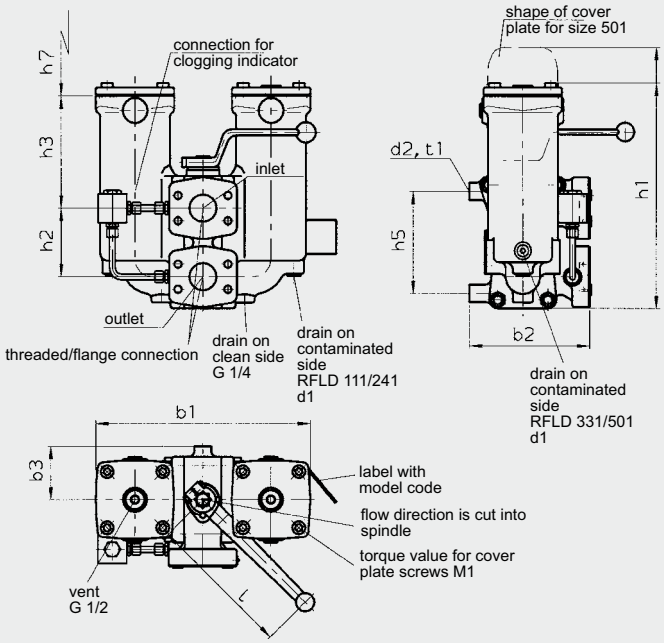



## 3.3 SIZING RECOMMENDATION

| Filter type | Connection | $Q_{max}$ when using W/HC and P/HC elements |
|---|---|---|
| RFLD 111 | G1 | 70 l/min |
| | SAE DN 25 | 70 l/min |
| RFLD 241 | G 1½ | 170 l/min |
| | SAE DN 40 | 170 l/min |
| RFLD 331 | SAE DN 40 | 170 l/min |
| RFLD 331/332 | SAE DN 50 | 260 l/min |
| RFLD 332 | DIN DN 50 | 260 l/min |
| RFLD 501 | SAE DN 40 | 170 l/min |
| RFLD 501/502 | SAE DN 50 | 260 l/min |
| RFLD 502/503 | DIN DN 50 | 260 l/min |
| RFLD 661 | SAE DN 50 | 260 l/min |
| | SAE DN 65 | 310 l/min |
| | SAE /DIN DN 80 | 480 l/min |
| RFLD 662 | DIN DN 80 | 480 l/min |
| RFLD 851 | SAE DN 50 | 260 l/min |
| | SAE DN 65 | 310 l/min |
| RFLD 851/853 | SAE/DIN DN 80 | 480 l/min |
| RFLD 852 | DIN DN 80 | 480 l/min |
| RFLD 951 | SAE/DIN DN 80 | 480 l/min |
| | SAE/DIN DN 100 | 900 l/min |
| RFLD 952 | DIN DN 100 | 900 l/min |
| RFLD 1301/1321 | SAE/DIN DN 80 | 480 l/min |
| | SAE/DIN DN 100 | 900 l/min |
| RFLD 1302/1322 | DIN DN 100 | 900 l/min |

# 4. DIMENSIONS

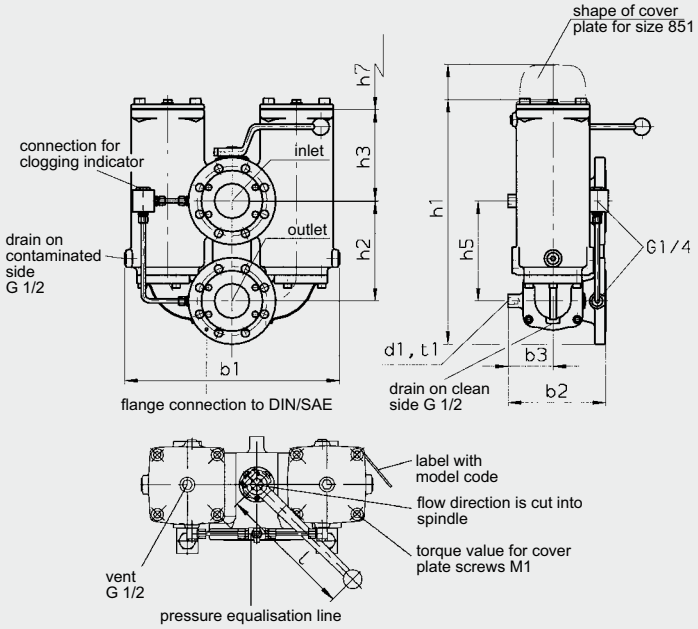
## RFLD 111-501




| RFLD | Flange connection[1] | Threaded connection[2] | b1 | b2 | b3 | d1 | d2 | h1 | h2 | h3 | h5 | h7 | l | M1 (Nm) | t1 | Weight including element [kg] | Volume of pressure chamber [l] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 111 | DN 25 (1") | G 1 | 233 | 157 | 63 | G ¼ | M12 | 263 | 80 | 132 | 80 | 175 | 173 | 24 | 25 | 17 | 2 x 0.60 |
| 241 | DN 40 (1½") | G 1½ | 302 | 167 | 75 | G ¼ | M12 | 312 | 95 | 155 | 140 | 210 | 216 | 40 | 18 | 27 | 2 x 1.40 |
| 331 | DN 40 (1½") | - | 396 | 167 | 75 | G ½ | M12 | 302 | 95 | 145 | 140 | 200 | 216 | 40 | 18 | 33 | 2 x 2.30 |
| 331 | DN 50 (2") | - | 380 | 187 | 85 | G ½ | M12 | 323 | 110 | 140 | 165 | 200 | 216 | 45 | 18 | 37 | 2 x 2.40 |
| 501 | DN 40 (1½") | - | 396 | 167 | 75 | G ½ | M12 | 382 | 95 | 145 | 140 | 280 | 216 | 45 | 18 | 35 | 2 x 3.00 |
| 501 | DN 50 (2") | - | 380 | 187 | 85 | G ½ | M12 | 400 | 110 | 140 | 165 | 280 | 216 | 45 | 18 | 39 | 2 x 3.10 |

[1] Flange connection to SAE J 518 C (standard pressure range 3000 psi) [2] Threaded connection to ISO 228

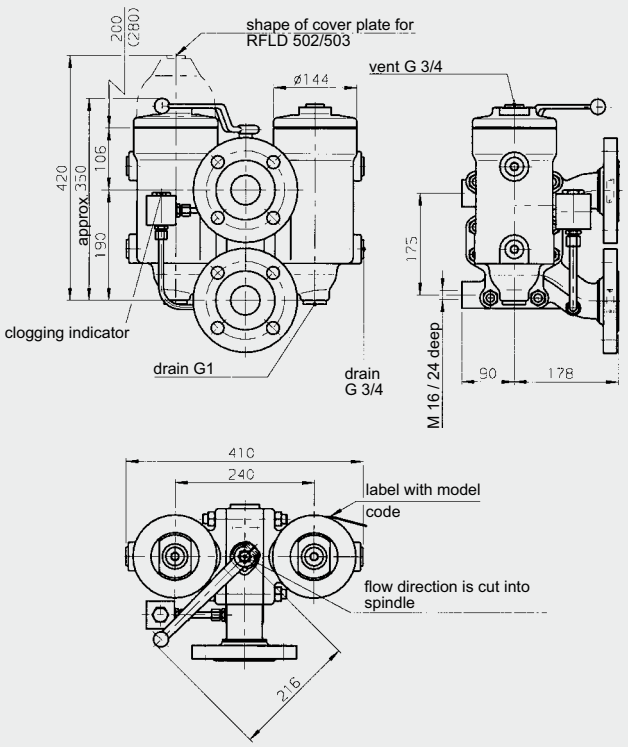
## RFLD 661-1321




| RFLD | Flange connection[1] | b1 | b2 | b3 | d1 | h1 | h2 | h3 | h5 | h7 | l | M1 (Nm) | t1 | Weight including element [kg] | Volume of pressure chamber [l] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 661 | DN 50 (2") | 496 | 187 | 85 | M12 | 460 | 110 | 282 | 165 | 340 | 216 | 150 | 18 | 56 | 2 x 6.80 |
| 661 | DN 65 (2½") | 496 | 237 | 85 | M12 | 472 | 110 | 282 | 165 | 340 | 216 | 150 | 18 | 74 | 2 x 6.80 |
| 661 | DN 80 (3") | 490 | 222 | 102 | M12 | 566 | 230 | 210 | 230 | 340 | 301 | 150 | 23 | 82 | 2 x 8.20 |
| 851 | DN 50 (2") | 496 | 187 | 85 | M12 | 544 | 110 | 282 | 165 | 420 | 216 | 150 | 18 | 62 | 2 x 8.10 |
| 851 | DN 65 (2½") | 496 | 237 | 85 | M12 | 556 | 110 | 282 | 165 | 420 | 216 | 150 | 18 | 80 | 2 x 8.10 |
| 851 | DN 80 (3") | 490 | 222 | 102 | M12 | 650 | 230 | 210 | 230 | 420 | 301 | 150 | 23 | 88 | 2 x 9.50 |
| 951 | DN 80 (3") | 548 | 222 | 102 | M12 | 595 | 230 | 243 | 230 | 370 | 301 | 250 | 23 | 105 | 2 x 10.80 |
| 951 | DN 100 (4") | 555 | 248 | 118 | M16 | 640 | 250 | 238 | 250 | 370 | 301 | 250 | 23 | 120 | 2 x 13.00 |
| 1301 | DN 80 (3") | 548 | 222 | 102 | M12 | 701 | 230 | 243 | 230 | 490 | 301 | 250 | 23 | 110 | 2 x 13.80 |
| 1301 | DN 100 (4") | 555 | 248 | 118 | M16 | 746 | 250 | 238 | 250 | 490 | 301 | 250 | 23 | 125 | 2 x 16.00 |
| 1321 | DN 80 (3") | 548 | 222 | 102 | M12 | 1262 | 230 | 804 | 230 | 950 | 301 | 250 | 23 | 167 | 2 x 28.80 |
| 1321 | DN 100 (4") | 555 | 248 | 118 | M16 | 1307 | 250 | 799 | 250 | 950 | 301 | 250 | 23 | 167 | 2 x 31.00 |

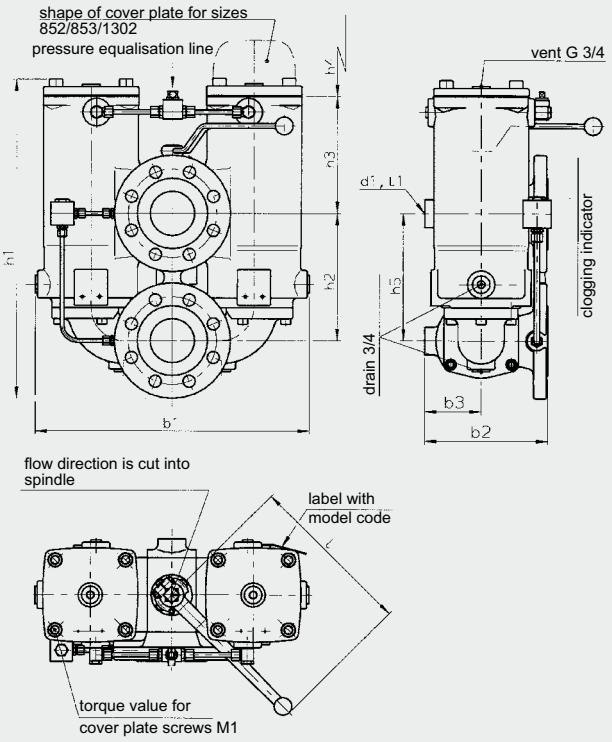
[1] Flange connection to SAE J 518 C (standard pressure range 3000 psi) DIN flange connection to DIN 2501/1 for PN 25/40 (sealing strip "D" or "E")

## RFLD 332, 502, 503




| RFLD | Weight including element [kg] | Volume of pressure chamber [l] |
|---|---|---|
| 332 | 37 | 2 x 2.40 |
| 502 | 39 | 2 x 3.10 |
| 503 | 39 | 2 x 3.10 |

## RFLD 662-1322, 853




| RFLD | Flange connection[1)] | b1 | b2 | b3 | d1 | h1 | h2 | h3 | h4 | h5 | l | M1 (Nm) | t1 | Weight including element [kg] | Volume of pressure chamber [l] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 662 | DN 80 (3") | 495 | 222 | 102 | M12 | 574 | 230 | 210 | 340 | 230 | 301 | 150 | 23 | 82 | 2 x 8.20 |
| 852 | DN 80 (3") | 495 | 222 | 102 | M12 | 665 | 230 | 210 | 420 | 230 | 301 | 150 | 23 | 88 | 2 x 9.50 |
| 853 | DN 80 (3") | 495 | 222 | 102 | M12 | 665 | 230 | 210 | 420 | 230 | 301 | 150 | 23 | 88 | 2 x 9.50 |
| 952 | DN 100 (4") | 573 | 248 | 118 | M16 | 672 | 250 | 238 | 380 | 250 | 301 | 250 | 17 | 120 | 2 x 13.00 |
| 1302 | DN 100 (4") | 573 | 248 | 118 | M16 | 745 | 250 | 238 | 490 | 250 | 301 | 250 | 17 | 125 | 2 x 16.00 |
| 1322 | DN 100 (4") | 573 | 248 | 118 | M16 | 1307 | 250 | 238 | 950 | 250 | 301 | 250 | 17 | 167 | 2 x 31.00 |

[1)] Flange connection to SAE J 518 C (standard pressure range 3000 psi) DIN flange connection to DIN 2501/1 for PN 25/40 (sealing strip "D" or "E")

## NOTE

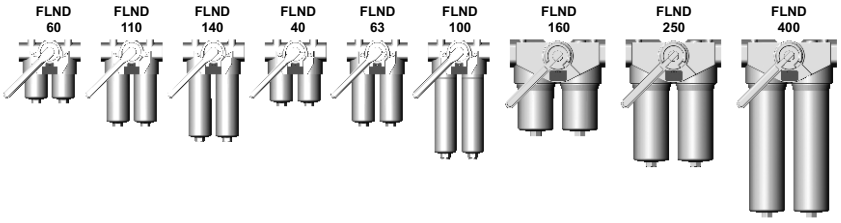
The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.


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E-Mail: filter@hydac.com



# Change-Over Inline Filter FLND to DIN 24550*, up to 400 l/min, up to 63 bar

*Filter and filter elements also available with HYDAC dimensions




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. They consist of a filter head with integral change-over valve and screw-in filter bowls.

Standard equipment:

- without bypass valve
- connection for a clogging indicator
- with drain screw (FLND 160 to 400)

### 1.2 FILTER ELEMENTS

Hydac filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941, ISO 2942, ISO 2943, ISO 3724, ISO 3968, ISO 11170, ISO 16889

**Contamination retention capacities in g**

| Betamicron® (BN4HC) | | | | |
|---|---|---|---|---|
| FLND | 3 µm | 5 µm | 10 µm | 20 µm |
| 60 | 6.5 | 7.3 | 7.8 | 8.0 |
| 110 | 13.8 | 15.5 | 16.4 | 16.9 |
| 140 | 18.1 | 20.3 | 21.5 | 22.2 |
| **Betamicron® (BN4HC)** | | | | |
| FLND | 3 µm | 6 µm | 10 µm | 25 µm |
| 40 | 5.2 | 5.6 | 6.3 | 7.0 |
| 63 | 9.2 | 9.9 | 11.1 | 12.8 |
| 100 | 15.4 | 16.5 | 18.6 | 20.6 |
| 160 | 27.5 | 29.3 | 33.1 | 36.7 |
| 250 | 46.0 | 49.0 | 55.2 | 61.3 |
| 400 | 76.2 | 81.3 | 91.4 | 101.5 |
| **Betamicron® (BH4HC)** | | | | |
| FLND | 3 µm | 5 µm | 10 µm | 20 µm |
| 60 | 4.6 | 4.5 | 5.0 | 5.7 |
| 110 | 10.1 | 9.9 | 10.9 | 12.4 |
| 140 | 13.3 | 13.0 | 14.3 | 16.3 |
| **Betamicron® (BH4HC)** | | | | |
| FLND | 3 µm | 6 µm | 10 µm | 25 µm |
| 40 | 4.1 | 4.4 | 5.2 | 6.2 |
| 63 | 7.3 | 7.9 | 9.2 | 11.2 |
| 100 | 12.2 | 13.2 | 15.5 | 18.9 |
| 160 | 21.8 | 23.9 | 27.8 | 33.8 |
| 250 | 38.1 | 41.7 | 48.6 | 59.0 |
| 400 | 63.6 | 69.5 | 81.0 | 98.3 |

Filter elements are available with the following pressure stability values:

| | |
|---|---|
| Betamicron® (BN4HC): | 20 bar |
| Betamicron® (BH4HC): | 210 bar |
| Wire mesh(W/HC, W): | 20 bar |

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Nominal pressure | 25 bar (FLND 160 to 400)<br>63 bar (FLND 40 to 140) |
| Fatigue strength | at nominal pressure $10^6$ load cycles from 0 to nominal pressure |
| Temperature range | -10 °C to +100 °C |
| Material of filter head | Aluminium |
| Material of filter bowl | Aluminium (FLND 100 and 140: steel) |
| Type of clogging indicator | VM (differential pressure indicator up to 210 bar operating pressure) |
| Pressure setting of clogging indicator | 5 bar (others on request) |
| Bypass cracking pressure (optional) | 3.5 bar, 7 bar (others on request) |

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 MOUNTING

As inline filter

### 1.6 SPECIAL MODELS AND ACCESSORIES

- with bypass valve
- with oil drain plug (FLND 40 to 140 = SO184)
- seals in FPM, EPDM

### 1.7 SPARE PARTS

See Original Spare Parts List

### 1.8 CERTIFICATES AND APPROVALS

On request

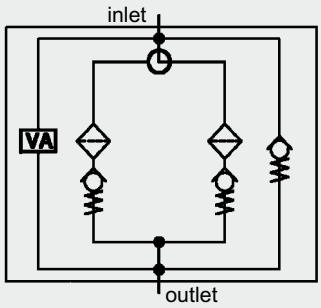
### 1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Non-flam operating fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

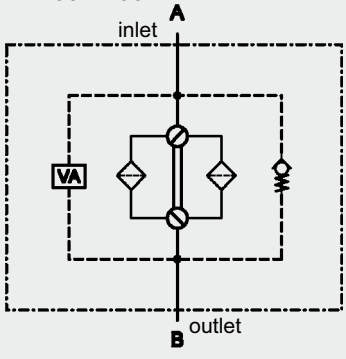
### 1.10 IMPORTANT INFORMATION

- Filter housing must be earthed
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector

**Symbol for hydraulic systems**
**FLND 40 - 140**




**FLND 160 - 400**



## 2. MODEL CODE (also order example)

**FLND BN/HC 250 D D F 10 D 1 . X /-L24**

### 2.1 COMPLETE FILTER

**Filter type**
FLND

**Filter material of element**
BN/HC Betamicron® (BN4HC) BH/HC Betamicron® (BH4HC)
W/HC, W Stainless steel wire mesh

**Size of filter or element**
FLND: 40, 60, 63, 100, 110, 140, 160, 250, 400

**Operating pressure**
D = 25 bar (FLND 160 to 400)
F = 63 bar (FLND 40 to 140)

**Type of change-over**
D single switching valve and check valve (FLND 40 to 140); segment valve (FLND 160 to 400)

**Type and size of port**
to DIN 24550 (●); ports available (X)

| Type | Port | Filter size | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | ... not to DIN 24550 | | | ... to DIN 24550 | | | | | |
| | | 60 | 110 | 140 | 40 | 63 | 100 | 160 | 250 | 400 |
| B | G ½ | X | X | X | ● | X | X | | | |
| C | G ¾ | X | X | X | X | ● | X | | | |
| D | G 1 | X | X | X | X | X | ● | | | |
| E | G 1¼ | | | | | | | ● | X | X |
| F | G 1½ | | | | | | | X | ● | X |
| I | DN 25* | X | X | X | X | X | X | | | |
| K | DN 38* | | | | | | | X | X | ● |

*SAE flange , 3000 PSI

**Filtration rating in µm**
BN4HC, BH4HC: 3, 5, 10, 20 BN4HC, BH4HC to DIN 24550: 3, 6, 10, 25
W/HC, W: 25, 50, 100, 200 W/HC to DIN 24550: 25, 50, 100, 200

**Type of clogging indicator**
Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
LZ visual-mechanical / electrical
(for other clogging indicators see brochure no. E 7.050../..)

**Type code**
1

**Modification number**
X the latest version is always supplied

**Supplementary details**
B. cracking pressure of bypass (e.g. B3.5 = 3.5 bar, B7 = 7 bar); no details = without bypass valve
EV air bleed valve
L... light with appropriate voltage (24V, 48V, 110V, 220V)
LED 2 light emitting diodes up to 24 Volt
(only for clogging indicators Type D)
A V LZ indicator with plug to AUDI and VW specification
BO LZ indicator with plug and pin connection to BMW and Opel specification (M12x1)
CN LZ indicator with plug to DIN 43651 with 3 LEDs (CNOMO standard)
DB LZ indicator with plug to DIN 43651 with 3 LEDs (Daimler-Benz standard)
D4C LZ indicator with plug and pin connection to Daimler-Chrysler specification and cold start suppression 30 °C
BO-LED as for BO, but with progressive diode strip
SO184 oil drain screw (FLND 40 to 140)
V FPM seals
W suitable for HFA and HFC emulsions

### 2.2 REPLACEMENT ELEMENT

**250 DN 010 BN4HC /-V**

**Size**
0040, 0060, 0063, 0100, 0110, 0140, 0160, 0250, 0400

**Type**
D 0060, 0110, 0140
DN to DIN 24550: 0040, 0063, 0100, 0160, 0250, 0400

**Filtration rating in µm**
BN4HC, BH4HC: 003, 005, 010, 020 BN4HC, BH4HC to DIN 24550: 003, 006, 010, 025
W/HC, W: 025, 050, 100, 200 W/HC to DIN 24550: 025, 050, 100, 200

**Filter material**
BN4HC, BH4HC, W/HC, W

**Supplementary details**
V, W (for descriptions, see point 2.1)

### 2.3 REPLACEMENT CLOGGING INDICATOR

**VM 5 D . X /-L24**

**Type**
VM differential pressure indicator up to 210 bar operating pressure

**Pressure setting**
5 5 bar standard, others on request

**Type of clogging indicator**
D (see point 2.1 )

**Modification number**
X the latest version is always supplied

**Supplementary details**
L..., LED, V, W, AV, BO, CN, DB, D4C, BO-LED (for descriptions, see point 2.1)

# 3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see point 3.1)

$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see point 3.2)

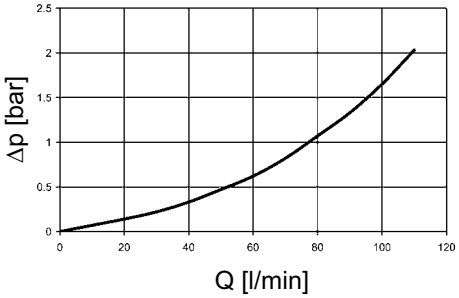
For ease of calculation, our Filter Sizing Program is available on request free of charge.

**NEW:** Sizing online at www.hydac.com

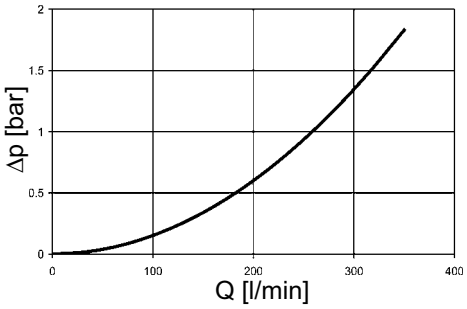
## 3.1 Δp-Q HOUSING GRAPHS BASED ON ISO 3968

The housing graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

**FLND 40, 60, 63, 100, 110, 140**




**FLND 160, 250, 400**

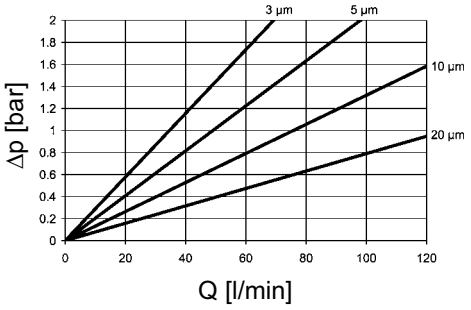



## 3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

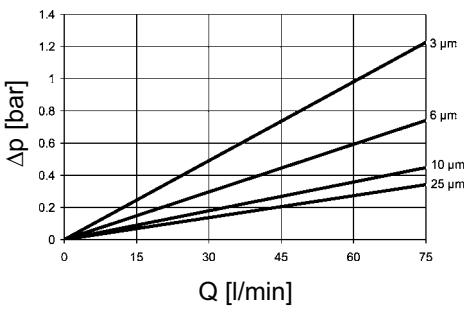
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

| FLND | ... D ... BH4HC | | | | W/HC - W | ... DN ... BH4HC | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 3 µm | 5 µm | 10 µm | 20 µm | – | 3 µm | 6 µm | 10 µm | 25 µm |
| 60 | 58.6 | 32.6 | 18.1 | 12.2 | 0.757 | - | - | - | - |
| 110 | 25.4 | 14.9 | 8.9 | 5.6 | 0.413 | - | - | - | - |
| 140 | 19.9 | 11.3 | 8.1 | 4.3 | 0.324 | - | - | - | - |
| 40 | - | - | - | - | 0.966 | 40.4 | 24.8 | 16.4 | 10,9 |
| 63 | - | - | - | - | 0.540 | 29.0 | 18.2 | 11.7 | 7,6 |
| 100 | - | - | - | - | 0.325 | 19.0 | 11.7 | 7.7 | 5,3 |
| 160 | - | - | - | - | 0.168 | 8.0 | 5.1 | 3.8 | 2,5 |
| 250 | - | - | - | - | 0.101 | 5.4 | 3.4 | 2.8 | 1,9 |
| 400 | - | - | - | - | 0.068 | 3.4 | 2.1 | 1.7 | 1,1 |

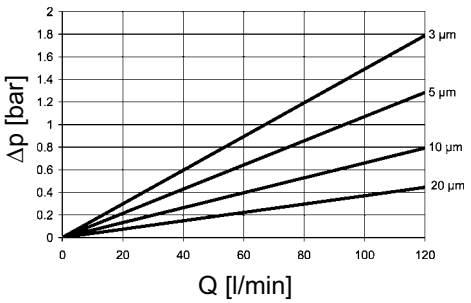
**BN4HC: FLND 60**



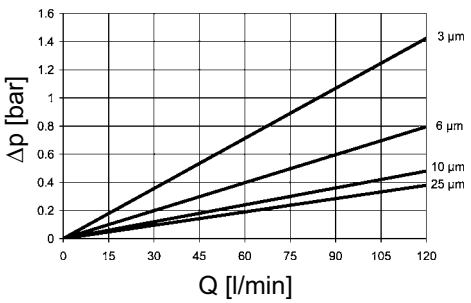

**BN4HC: FLND 63**



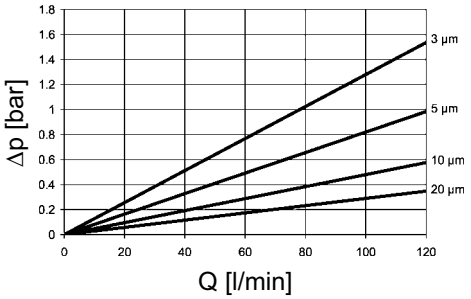

**BN4HC: FLND 110**



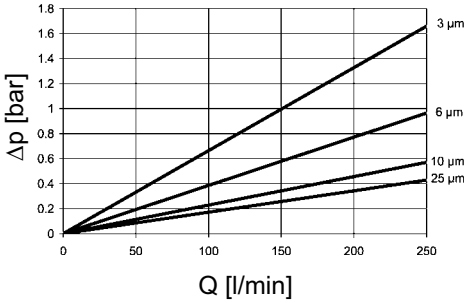

**BN4HC: FLND 100**



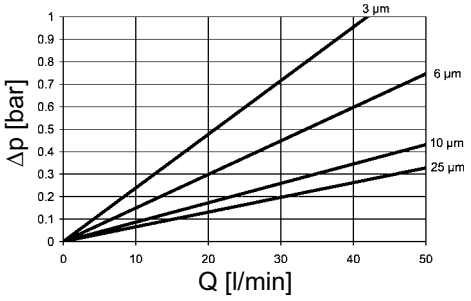

**BN4HC: FLND 140**



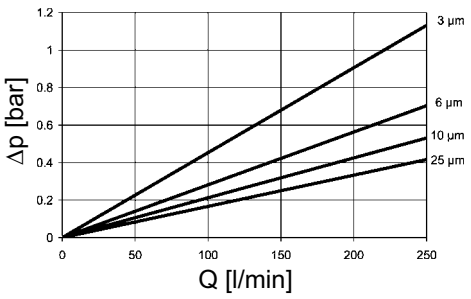

**BN4HC: FLND 160**



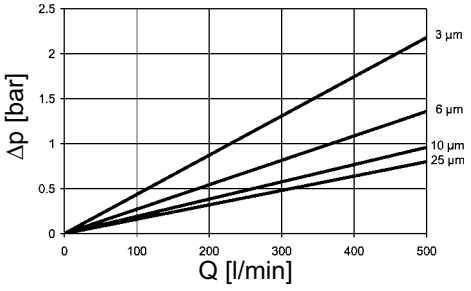

**BN4HC: FLND 40**




**BN4HC: FLND 250**

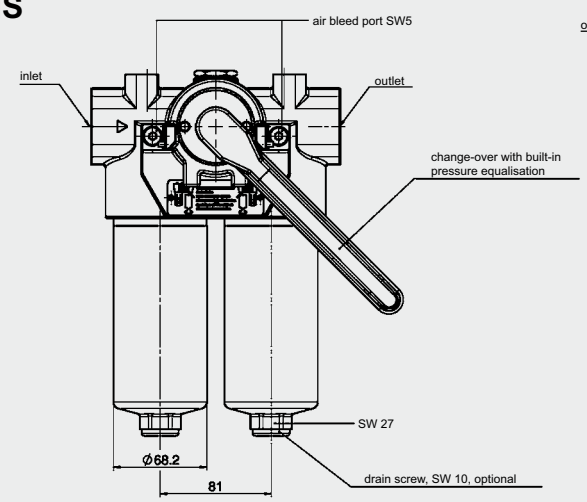


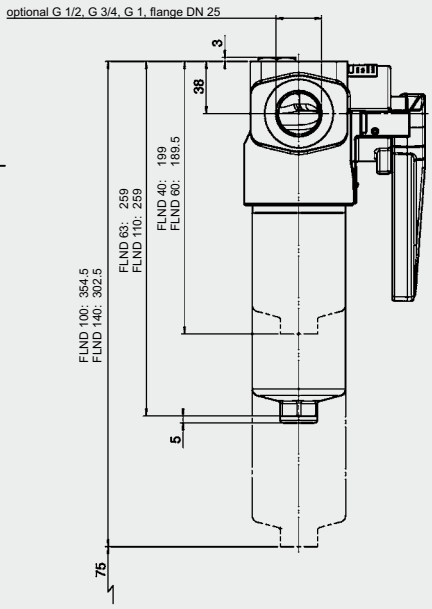

**BN4HC: FLND 400**

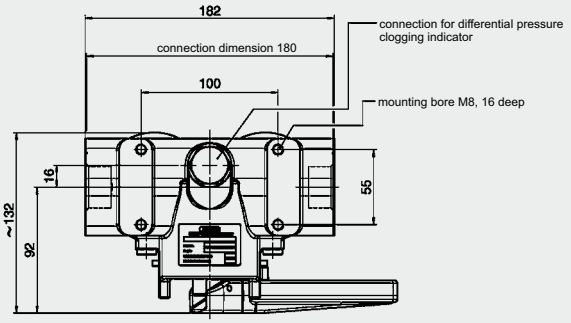


# 4. DIMENSIONS

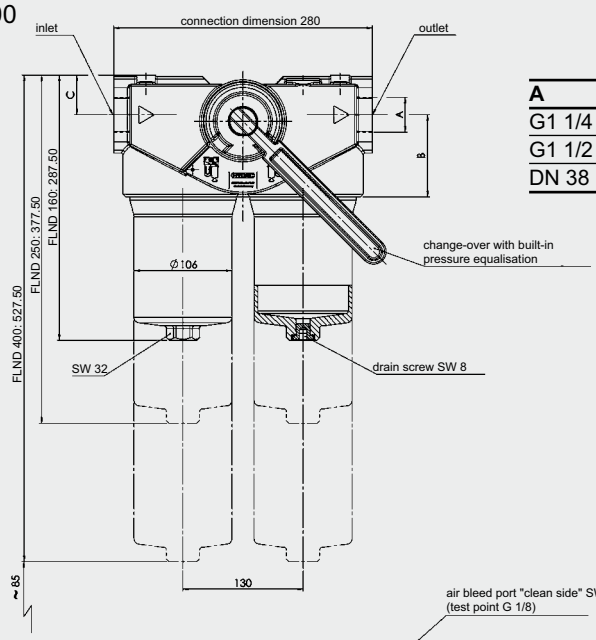
FLND 40 - 140



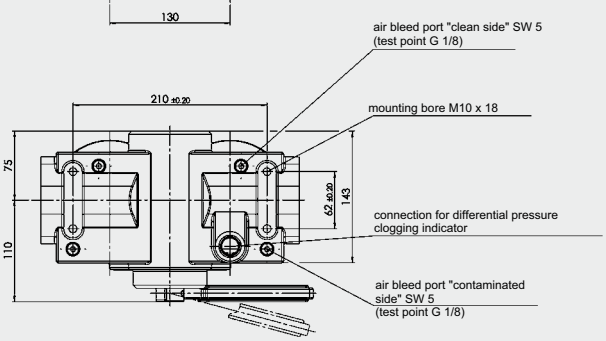




FLND 160 - 400




| A | B | C |
|---|---|---|
| G1 1/4 | 89 | 43 |
| G1 1/2 | 92 | 40 |
| DN 38 | 89 | 43 |




| FLND | Weight incl. element [kg] | Vol. of pressure chamber [l] |
|---|---|---|
| 40 | 6.73 | 2x 0.26 |
| 60 | 6.83 | 2x 0.25 |
| 63 | 7.10 | 2x 0.40 |
| 100 | 11.33 | 2x 0.50 |
| 110 | 7.32 | 2x 0.40 |
| 140 | 11.78 | 2x 0.40 |
| 160 | 10.3 | 2x 1.40 |
| 250 | 11.6 | 2x 2.00 |
| 400 | 13.0 | 2x 3.10 |

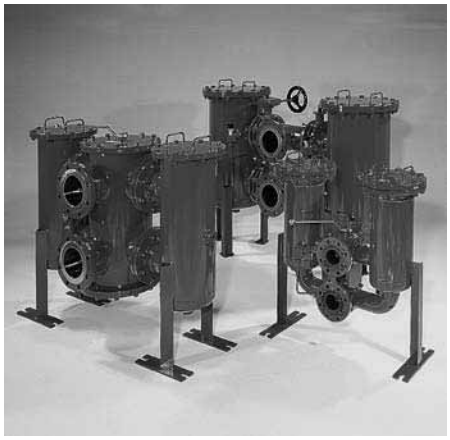
## NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

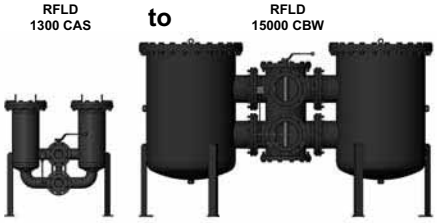
Subject to technical modifications.


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E-Mail: filter@hydac.com



# Change-Over Inline Filter RFLD Welded Version

up to 15000 l/min, up to 16 bar




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. The two sections of the filter housing (with screw-on cover plates) are connected by means of a ball change-over valve with negative overlap and single lever operation (ball, segment ) or hand-wheel (butterfly).

Standard equipment:

- connections for venting and draining
- connection for a clogging indicator
- pressure equalisation line
- with bypass valve

### 1.2 FILTER ELEMENTS

Hydac filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

**Contamination retention capacities in g**

| | | Betamicron® (BN4HC) | | | |
|---|---|---|---|---|---|
| RFLD | Elements per side | 3 µm | 5 µm | 10 µm | 20 µm |
| 130x | 1x1300 R | 181.0 | 200.7 | 241.4 | 273.1 |
| 132x | 1x2600 R | 369.4 | 409.4 | 492.5 | 557.2 |
| 250x | 3x0850 R | 336.3 | 372.6 | 448.5 | 507.3 |
| 252x | 3x1700 R | 689.4 | 764.1 | 919.2 | 1039.8 |
| 400x | 5x0850 R | 560.5 | 621.0 | 747.5 | 845.5 |
| 402x | 5x1700 R | 1149.0 | 1273.5 | 1532.0 | 1733.0 |
| 520x | 4x1300 R | 724.0 | 802.8 | 965.6 | 1092.4 |
| 522x | 4x2600 R | 1477.6 | 1637.6 | 1970.0 | 2228.8 |
| 650x | 5x1300 R | 905.0 | 1003.5 | 1207.0 | 1365.5 |
| 652x | 5x2600 R | 1847.0 | 2047.0 | 2462.5 | 2786.0 |
| 780x | 6x1300 R | 1086.0 | 1204.2 | 1448.4 | 1638.6 |
| 782x | 6x2600 R | 2216.4 | 2456.4 | 2955.0 | 3343.2 |
| 1500x | 10x1300 R | 1810.0 | 2007.0 | 2414.0 | 2731.0 |
| 1502x | 10x2600 R | 3694.0 | 4094.0 | 4925.0 | 5572.0 |

Filter elements are available with the following pressure stability values:

| | |
|---|---|
| Betamicron® (BN4HC): | 20 bar |
| Paper (P/HC): | 10 bar |
| Wire mesh (W/HC): | 20 bar |
| Stainless steel fibre (V): | 30 bar |
| Betamicron®/Aquamicron®(BN4AM): | 10 bar |
| Aquamicron® (AM): | 10 bar |

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Nominal pressure | 16 bar (or 10 bar: depending on size and nominal width) |
| Temperature range | -10 °C to +100 °C |
| **Material of filter housing and cover plate**<br>Material code (final digit of filter size) | 1 = steel, welded<br>3* = stainless steel 1.4571 |
| Type of clogging indicator | VM (differential pressure measurement up to 210 bar operating pressure) |
| Pressure setting of clogging indicator | 2 bar (others on request) |
| Bypass cracking pressure | 3 bar (others on request) |

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 MOUNTING

As inline filter

### 1.6 SPECIAL MODELS AND ACCESSORIES

- Orifice in the pressure equalisation line
- Draining and venting connections with ball valves or other shut-off valves
- Mating flanges available for all sizes
- Change-over valve lockable
- Venting line with sight gauges
- Flanges to DIN 2501 with O-ring seal
- Cover plate lifting device for sizes RFLD 4000 and above

### 1.7 SPARE PARTS

See Original Spare Parts List

### 1.8 CERTIFICATES AND APPROVALS

Material code (final digit of filter size) - 1:
These filters can be supplied with manufacturer's certificates O and M to DIN 55350, Part 18.
Test certificates 3.1 to DIN EN 10204 and approval certificates (Type Approval) for different approval authorities.
Areas of application, amongst others: lubrication.

Material code (final digit of filter size) - 3:
Filters for use in separation technology with low viscosity, high viscosity and aggressive fluids as well as gaseous media.*

* These filters are available from our HYDAC Process Technology dept.

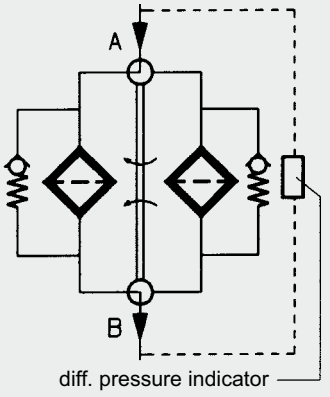
### 1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Non-flam operating fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

### 1.10 IMPORTANT INFORMATION

- Filter housing must be earthed
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector
- Filters must be flexibly mounted and not fixed rigidly to the floor or used as a pipe support.

**Symbol for hydraulic systems**



## 2. MODEL CODE (also order example)

**RFLD BN/HC 1300 C A K 10 D 1 . X /-L24**

### 2.1 COMPLETE FILTER

**Filter type**
RFLD

**Filter material of element**

| | | | | | |
|---|---|---|---|---|---|
| BN/HC | Betamicron® (BN4HC) | P/HC | Paper | AM | Aquamicron® |
| V | Stainless steel fibre | W/HC | Wire mesh | BN/AM | Betamicron®/Aquamicron® |

**Size of filter or element**
Steel, welded: 1300, 1320, 2500, 2520, 4000, 4020, 5200, 5220, 6500, 6520, 7800, 7820, 15000, 15020
Stainl. steel 1.4571: 1303, 1323, 2503, 2523, 4003, 4023, 5203, 5223, 6503, 6523, 7803, 7823, 15003, 15023

**Operating pressure**
C = 16 bar (other operating pressures on request)

**Type of change-over**

| | | |
|---|---|---|
| A | ball | all nominal widths except DN 200, 250, 300 |
| B | segment | nominal widths DN 200, 250 |
| C | butterfly | nominal widths DN 150, 200, 250, 300 |

**Type and size of port**
Steel, welded (●) - For lubrication applications: 1.4571 (★) - For emulsion applications (please contact Process Technology Dept.)

| Type | Port | Filter size 1300 1303 | 1320 1323 | 2500 2503 2520 2523 | 4000 4003 4020 4023 | 5200 5203 5220 5223 | 6500 6503 6520 6523 | 7800 7803 7820 7823 | 15000 15003 15020 15023 |
|---|---|---|---|---|---|---|---|---|---|
| K | SAE DN 40 | ●★ | ●★ | | | | | | |
| L | SAE DN 50 | ●★ | ●★ | ●★ | | | | | |
| M | SAE DN 65 | ●★ | ●★ | ●★ | | | | | |
| S | SAE/DIN DN 80 | | ●★ | ●★ | ●★ | ●★ | ●★ | | |
| T | SAE/DIN DN 100 | ●★ | ●★ | ●★ | ●★ | ●★ | ●★ | ●★ | |
| U | DIN DN 125 | | ●★ | ●★ | ●★ | ●★ | ●★ | ●★ | |
| V | DIN DN 150 | | | ●★ | ●★ | ●★ | ●★ | ●★ | |
| W | DIN DN 200 | | | | ●★ | ●★ | ●★ | ●★ | ●★ |
| X | DIN DN 250 | | | | | ●★ | ●★ | ●★ | ●★ |
| Y | DIN DN 300 | | | | | | | | ●★ |

Other nominal widths and ANSI flange version on request

**Filtration rating in µm**
BN4HC, V: 3, 5, 10, 20 P/HC: 10, 20 AM: 40
W/HC: 25, 50, 100, 200 BN/AM: 3, 10

**Type of clogging indicator**
Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
for other clogging indicators see brochure no. E 7.050../..

**Type code**
1

**Modification number**
X the latest version is always supplied

**Supplementary details**
B. special cracking pressure of bypass (e.g. B1 = 1 bar)
DE differential pressure measurement across element
DH cover plate lifting device
KB no bypass valve
L... light with appropriate voltage (24V, 48V, 110V, 220V)
LED 2 light emitting diodes up to 24 Volt
(only for clogging indicators type D)
OR O-ring groove on the DIN flange (inlet, outlet) to Rexroth standard AB22-04
RE sealing strip E on the flange (inlet and outlet): surface finish 3.6 µm
- ball change-over, up to port width 150
- segment change-over port widths CBV, CBW, CBX
- butterfly change-over all port widths
SB pressure equalisation line (SB2 = with 2mm orifice)
V FPM seals

### 2.2 REPLACEMENT ELEMENT

**0850 R 010 BN4HC /-V**

**Size**
0850, 1300, 1700, 2600

**Type**
R

**Filtration rating in µm**
BN4HC, V: 003, 005, 010, 020 P/HC: 010, 020 AM: 040
W/HC: 025, 050, 100, 200 BN4AM: 003, 010

**Filter material**
BN4HC, V, W/HC, P/HC, BN4AM, AM

**Supplementary details**
V (for descriptions, see point 2.1)

### 2.3 REPLACEMENT CLOGGING INDICATOR

**VM 2 D . X /-L24**

**Type**
VM differential pressure measurement up to 210 bar operating pressure

**Pressure setting**
2 2 bar standard, others on request

**Type of clogging indicator** (see point 2.1)

**Modification number**
X the latest version is always supplied

**Supplementary details**
L..., LED, V (for descriptions, see point 2.1)

# 3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see point 3.1)

$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see point 3.2)

For ease of calculation, our Filter Sizing Program is available on request free of charge.

**NEW:** Sizing online at www.hydac.com

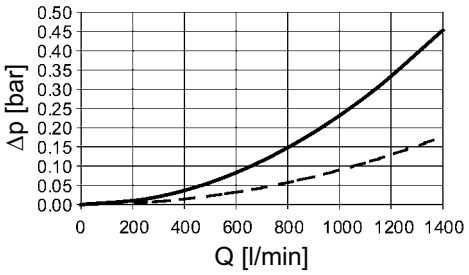
## 3.1 Δp-Q HOUSING GRAPHS BASED ON ISO 3968

The housing graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

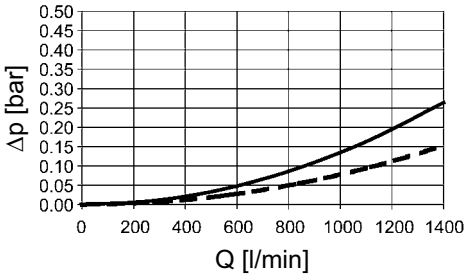
– – – without change-over valve

——— with change-over valve

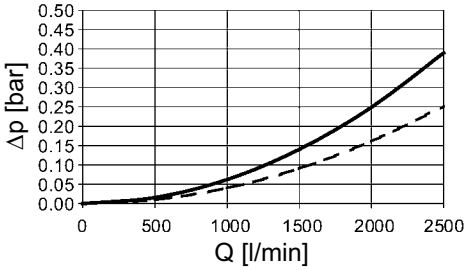
**RFLD 1300, 1303**



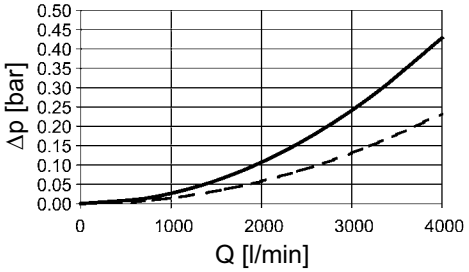

**RFLD 1320, 1323**



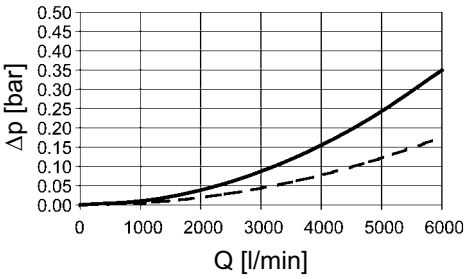

**RFLD 2500, 2503, 2520, 2523**



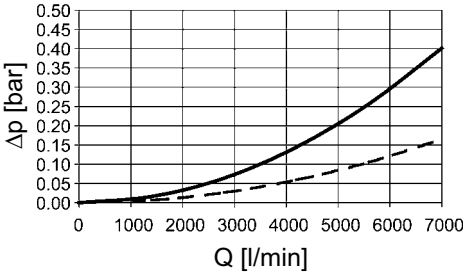

**RFLD 4000, 4003, 4020, 4023**



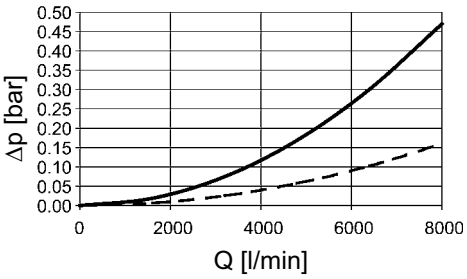

**RFLD 5200, 5203, 5220, 5223**



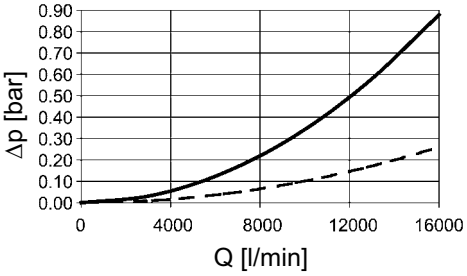

**RFLD 6500, 6503, 6520, 6523**




**RFLD 7800, 7803, 7820, 7823**




**RFLD 15000, 15003, 15020, 15023**

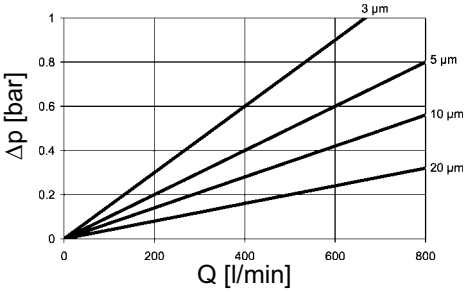



## 3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

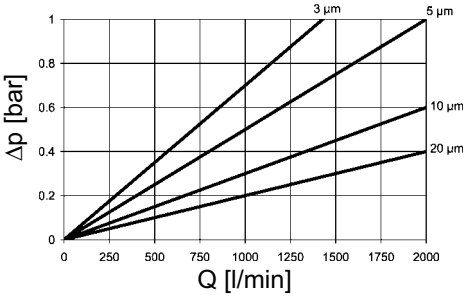
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

| RFLD | V | | | | W/HC |
|---|---|---|---|---|---|
| | 3 µm | 5 µm | 10 µm | 20 µm | – |
| 850 | 0.8 | 0.6 | 0.4 | 0.3 | 0.063 |
| 1300 | 0.5 | 0.4 | 0.3 | 0.2 | 0.045 |
| 1700 | 0.4 | 0.3 | 0.2 | 0.1 | 0.032 |
| 2600 | 0.3 | 0.2 | 0.1 | 0.1 | 0.018 |

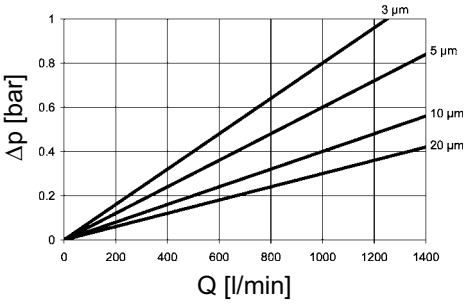
**BN4HC: RFLD 850**



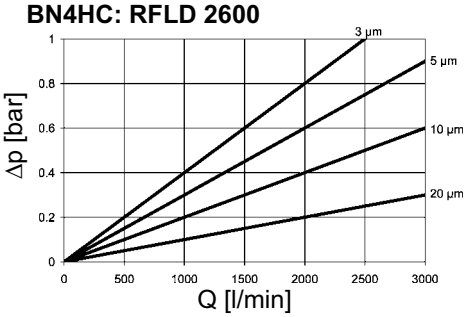

**BN4HC: RFLD 1700**




**BN4HC: RFLD 1300**




**BN4HC: RFLD 2600**



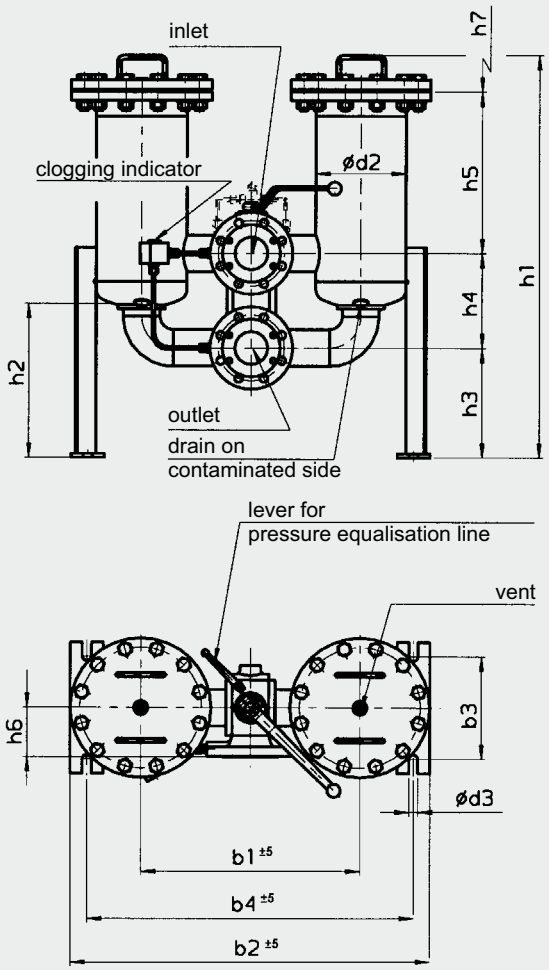
## 3.3 FILTER SPECIFICATIONS (TYPE OF CHANGE-OVER: A=BALL; B=SEGMENT; C=BUTTERFLY)

| Filter type | Connection | Change-over | Volume of pressure chamber [l] | Weight [kg] incl. change-over valve and elements | | |
|---|---|---|---|---|---|---|
| | | | | A (ball) | B (segment) | C (butterfly) |
| 1300, 1303 | SAE DN 40 | ball | 2 x 22.0 | 105 | | |
| | SAE DN 50 | ball | 2 x 22.0 | 110 | | |
| | SAE DN 65 | ball | 2 x 22.0 | 115 | | |
| | SAE/DIN DN 80 | ball | 2 x 19.0 | 136 | | |
| | SAE/DIN DN 100 | ball | 2 x 19.0 | 150 | | |
| 1320, 1323 | SAE DN 40 | ball | 2 x 37.0 | 138 | | |
| | SAE DN 50 | ball | 2 x 37.0 | 143 | | |
| | SAE DN 65 | ball | 2 x 37.0 | 148 | | |
| | SAE/DIN DN 80 | ball | 2 x 34.0 | 169 | | |
| | SAE/DIN DN 100 | ball | 2 x 34.0 | 183 | | |
| | DIN DN 125 | ball | 2 x 45.0 | 209 | | |
| 2500, 2503/ 2520, 2523 | SAE DN 50 | ball | 2 x 34.0 / 2 x 54.0 | 144/174 | | |
| | SAE DN 65 | ball | 2 x 34.0 / 2 x 54.0 | 149/179 | | |
| | SAE/DIN DN 80 | ball | 2 x 37.0 / 2 x 57.0 | 170/200 | | |
| | SAE/DIN DN 100 | ball | 2 x 39.0 / 2 x 59.0 | 184/214 | | |
| | DIN DN 125 | ball, | 2 x 40.0 / 2 x 60.0 | 208/238 | | |
| | DIN DN 150 | ball, butterfly | 2 x 45.0 / 2 x 65.0 | 262/292 | | 287/327 |
| 4000, 4003/ 4020, 4023 | SAE/DIN DN 80 | ball | 2 x 63.0 / 2 x 96.0 | 210/270 | | |
| | SAE/DIN DN 100 | ball | 2 x 63.0 / 2 x 96.0 | 222/283 | | |
| | DIN DN 125 | ball | 2 x 74.0 / 2 x 109.0 | 246/307 | | |
| | DIN DN 150 | ball, butterfly | 2 x 75.0 / 2 x 110.0 | 292/352 | | 313/373 |
| | DIN DN 200 | segment, butterfly | 2 x 83.0 / 2 x 118.0 | | 262/504 | 393/453 |
| 5200, 5203/ 5220, 5223 | SAE/DIN DN 80 | ball | 2 x 89.0 / 2 x 142.0 | 384/494 | | |
| | SAE/DIN DN 100 | ball | 2 x 90.0 / 2 x 143.0 | 398/507 | | |
| | DIN DN 125 | ball | 2 x 104.0 / 2 x 157.0 | 422/532 | | |
| | DIN DN 150 | ball, butterfly | 2 x 106.0 / 2 x 159.0 | 476/586 | | 503/614 |
| | DIN DN 200 | segment, butterfly | 2 x 110.0 / 2 x 162.0 | | 646/756 | 596/706 |
| | DIN DN 250 | segment, butterfly | 2 x 128.0 / 2 x 180.0 | | 890/1000 | 956/1118 |
| 6500, 6503/ 6520, 6523 | SAE/DIN DN 100 | ball | 2 x 161.0 / 2 x 246.0 | 628/782 | | |
| | DIN DN 125 | ball | 2 x 162.0 / 2 x 247.0 | 652/806 | | |
| | DIN DN 150 | ball, butterfly | 2 x 163.0 / 2 x 248.0 | 706/868 | | 738/901 |
| | DIN DN 200 | segment, butterfly | 2 x 190.0 / 2 x 275.0 | | 877/1039 | 826/988 |
| | DIN DN 250 | segment, butterfly | 2 x 194.0 / 2 x 279.0 | | 1121/1282 | 956/1118 |
| 7800, 7803/ 7820, 7823 | SAE/DIN DN 100 | ball | 2 x 161.0 / 2 x 246.0 | 636/798 | | |
| | DIN DN 125 | ball | 2 x 162.0 / 2 x 247.0 | 660/822 | | |
| | DIN DN 150 | ball, butterfly | 2 x 163.0 / 2 x 248.0 | 714/884 | | 746/917 |
| | DIN DN 200 | segment, butterfly | 2 x 190.0 / 2 x 275.0 | | 885/1055 | 834/1004 |
| | DIN DN 250 | segment, butterfly | 2 x 194.0 / 2 x 279.0 | | 1129/1298 | 964/1134 |
| 15000, 15003/ 15020, 15023 | DIN DN 200 | segment, butterfly | 2 x 391.0 / 2 x 558.0 | | 1210/1380 | 1143/1250 |
| | DIN DN 250 | segment, butterfly | 2 x 397.0 / 2 x 564.0 | | 1454/1623 | 1271/1379 |
| | DIN DN 300 | butterfly | 2 x 433.0 / 2 x 600.0 | | | 1487/1547 |

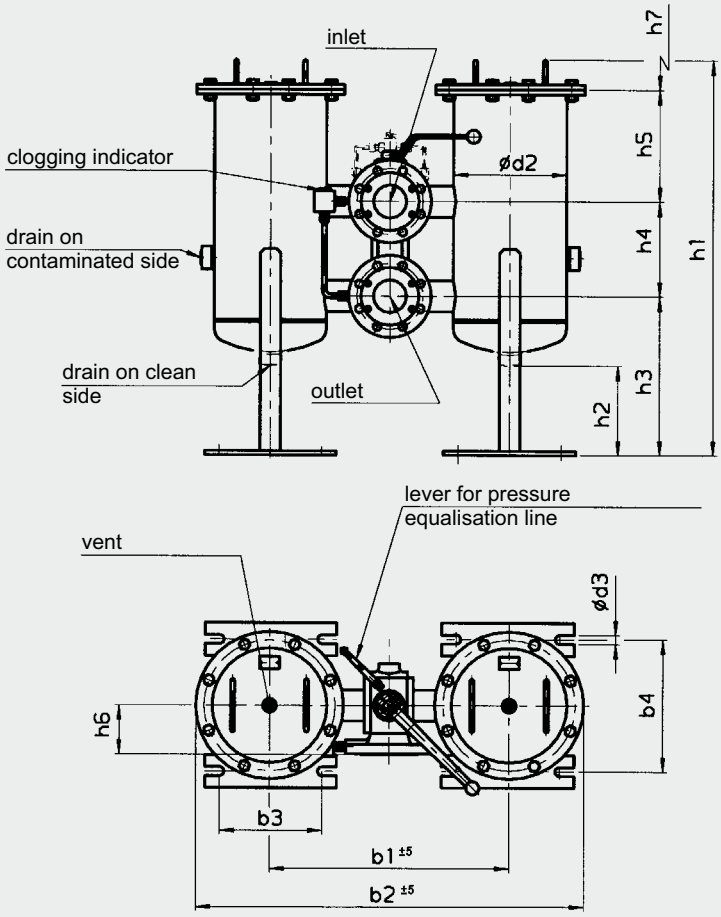
# 4. DIMENSIONS

## 4.1 WELDED FILTER SERIES - BALL VERSON RFLD 130x - 252x (CHANGE-OVER TYPE A)

RFLD 1300/1320




RFLD 2500/2520

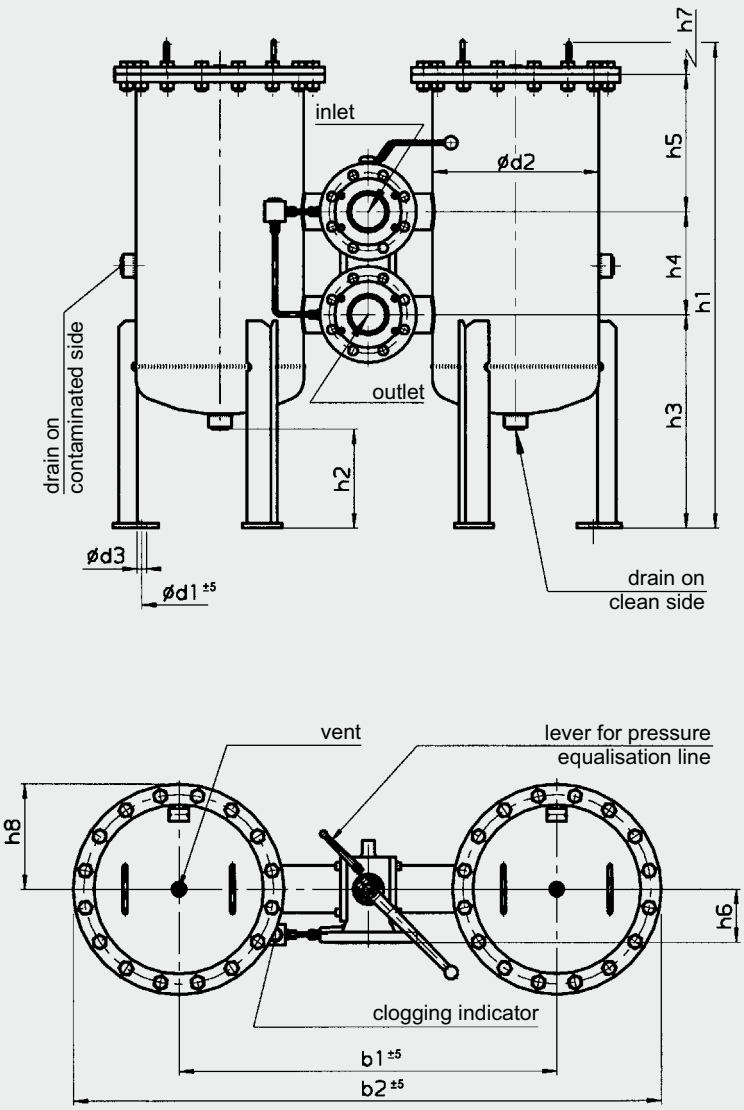



**Dimensions in mm**

| Type | Flange connection[1)] | $b_1$ | $b_2$ | $b_3$ | $b_4$ | $d_2$ | $d_3$ | $h_1$ | $h_2$ | $h_3$ | $h_4$ | $h_5$ | $h_6$ | $h_7$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RFLD | SAE DN 40 | 495 | 835 | 250 | 755 | 220 | 22 | 970/1410 | 205 | 335 | 95 | 460/900 | 92 | 500/940 |
| 1300/1320 | SAE DN 50 | 506 | 846 | 250 | 766 | 220 | 22 | 970/1410 | 210 | 328 | 110 | 452/892 | 102 | 500/940 |
| | SAE DN 65 | 506 | 846 | 250 | 766 | 220 | 22 | 970/1410 | 210 | 328 | 110 | 452/892 | 167 | 500/940 |
| | SAE/DIN DN 80 | 530 | 870 | 250 | 790 | 220 | 22 | 970/1410 | 370 | 260 | 230 | 400/840 | 120 | 500/940 |
| | SAE/DIN DN 100 | 588 | 926 | 250 | 846 | 220 | 22 | 970/1410 | 375 | 266 | 250 | 374/814 | 130 | 500/940 |
| RFLD 1320 | DIN DN 125 | 603 | 943 | 250 | 863 | 220 | 22 | 1536 | 190 | 385 | 300 | 765 | 188 | 940 |
| RFLD | SAE DN 50 | 548 | 908 | 250 | 312 | 273 | 22 | 940/1330 | 220 | 383 | 110 | 378/768 | 102 | 420/810 |
| 2500/2520 | SAE DN 65 | 548 | 908 | 250 | 312 | 273 | 22 | 990/1380 | 220 | 383 | 230 | 280/670 | 167 | 420/810 |
| | SAE/DIN DN 80 | 572 | 932 | 250 | 312 | 273 | 22 | 990/1380 | 220 | 408 | 230 | 280/670 | 120 | 420/810 |
| | SAE/DIN DN 100 | 588 | 948 | 250 | 312 | 273 | 22 | 990/1380 | 220 | 408 | 250 | 260/650 | 130 | 420/810 |
| | DIN DN 125 | 589 | 949 | 250 | 312 | 273 | 22 | 1050/1440 | 220 | 438 | 300 | 240/630 | 188 | 420/810 |
| | DIN DN 150 | 641 | 1001 | 250 | 312 | 273 | 22 | 1050/1440 | 220 | 438 | 300 | 240/630 | 187 | 420/810 |

[1)] Flange connection to SAE J 518 C (standard pressure range 3000 psi)
DIN flange connection to DIN 2501/1 for PN 16 from DN 125 and PN 25/40 up to DN 100
(sealing strip "D" or "E")

## 4.2 WELDED FILTER SERIES - BALL VERSION RFLD 400x - 782x (CHANGE-OVER TYPE A)

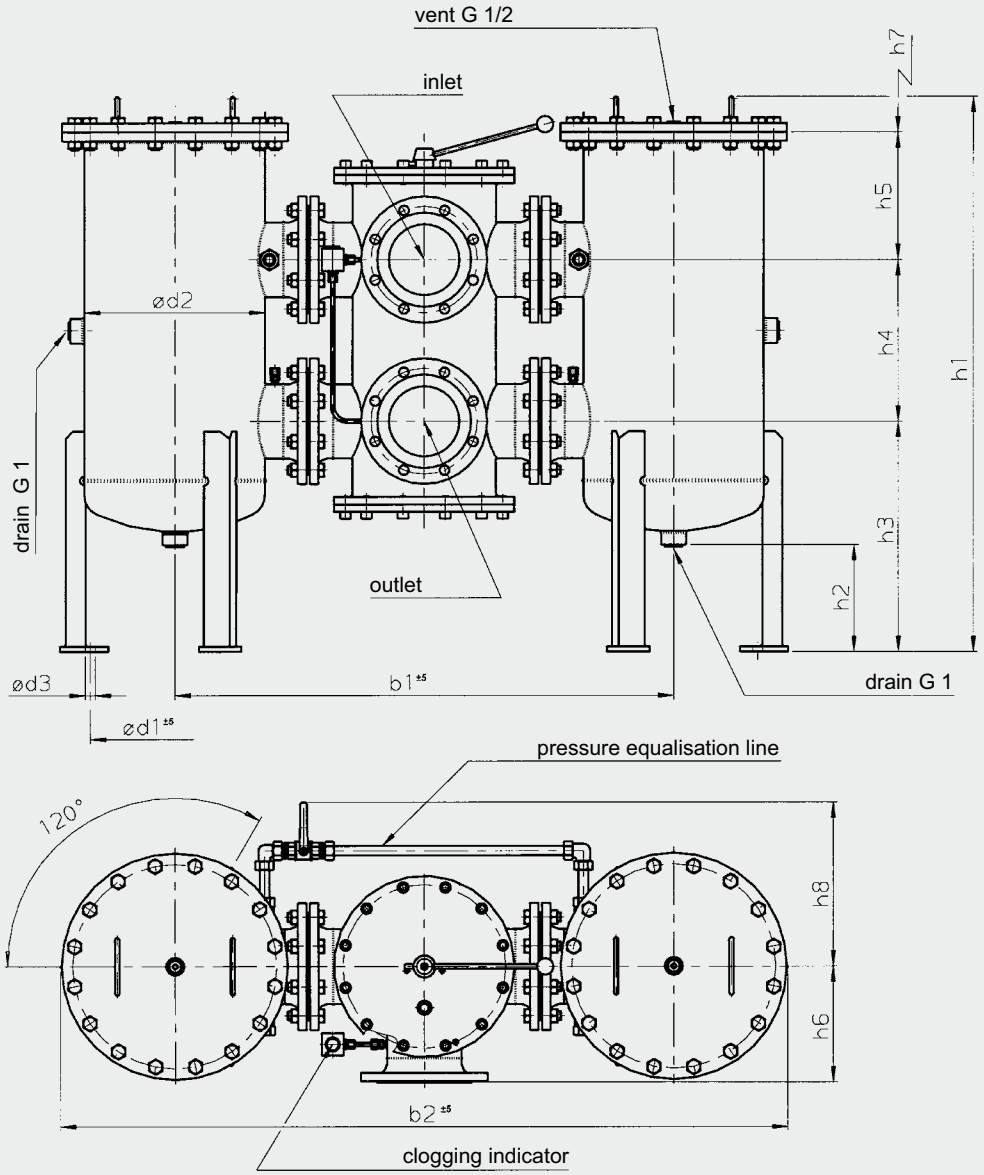



**Dimensions in mm**

| Type | Flange connection[1)] | $b_1$ | $b_2$ | $d_1$ | $d_2$ | $d_3$ | $h_1$ | $h_2$ | $h_3$ | $h_4$ | $h_5$ | $h_6$ | $h_7$ | $h_8$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RFLD 4000/4020 | SAE/DIN DN 80 | 688 | 1152 | 330 | 356 | 22 | 1080/1470 | 260 | 475 | 230 | 295/685 | 120 | 420/810 | 230 |
| | SAE/DIN DN 100 | 704 | 1164 | 330 | 356 | 22 | 1080/1470 | 260 | 475 | 250 | 275/665 | 130 | 420/810 | 230 |
| | DIN DN 125 | 723 | 1183 | 330 | 356 | 22 | 1170/1560 | 260 | 525 | 300 | 265/655 | 188 | 420/810 | 230 |
| | DIN DN 150 | 775 | 1240 | 330 | 356 | 22 | 1170/1560 | 260 | 525 | 300 | 265/655 | 187 | 420/810 | 230 |
| RFLD 5200/5220 | SAE/DIN DN 80 | 728 | 1244 | 380 | 406 | 22 | 1144/1584 | 250 | 465 | 230 | 371/811 | 120 | 500/940 | 255 |
| | SAE/DIN DN 100 | 744 | 1260 | 380 | 406 | 22 | 1144/1584 | 250 | 465 | 250 | 351/791 | 130 | 500/940 | 255 |
| | DIN DN 125 | 763 | 1275 | 380 | 406 | 22 | 1256/1696 | 250 | 525 | 300 | 351/791 | 188 | 500/940 | 255 |
| | DIN DN 150 | 815 | 1330 | 380 | 406 | 22 | 1256/1696 | 250 | 525 | 300 | 351/791 | 187 | 500/940 | 255 |
| RFLD 6500/6520 | SAE/DIN DN 100 | 1024 | 1644 | 480 | 508 | 22 | 1260/1700 | 260 | 540 | 250 | 390/830 | 130 | 500/940 | 310 |
| | DIN DN 125 | 863 | 1483 | 480 | 508 | 22 | 1260/1700 | 260 | 540 | 300 | 340/780 | 188 | 500/940 | 310 |
| | DIN DN 150 | 915 | 1535 | 480 | 508 | 22 | 1260/1700 | 260 | 540 | 300 | 340/780 | 187 | 500/940 | 310 |
| RFLD 7800/7820 | SAE/DIN DN 100 | 1024 | 1644 | 480 | 508 | 22 | 1260/1700 | 260 | 540 | 250 | 390/830 | 130 | 500/940 | 310 |
| | DIN DN 125 | 863 | 1483 | 480 | 508 | 22 | 1260/1700 | 260 | 540 | 300 | 340/780 | 188 | 500/940 | 310 |
| | DIN DN 150 | 915 | 1535 | 480 | 508 | 22 | 1260/1700 | 260 | 540 | 300 | 340/780 | 187 | 500/940 | 310 |

[1)] DIN flange connection DIN 2501/1 for PN 16 from DN 125 and PN 25/40 up to DN 100 (sealing strip "D" or "E")

## 4.3 WELDED FILTER SERIES - SEGMENT VERSION RFLD 250x - 1502x (CHANGE-OVER TYPE B)

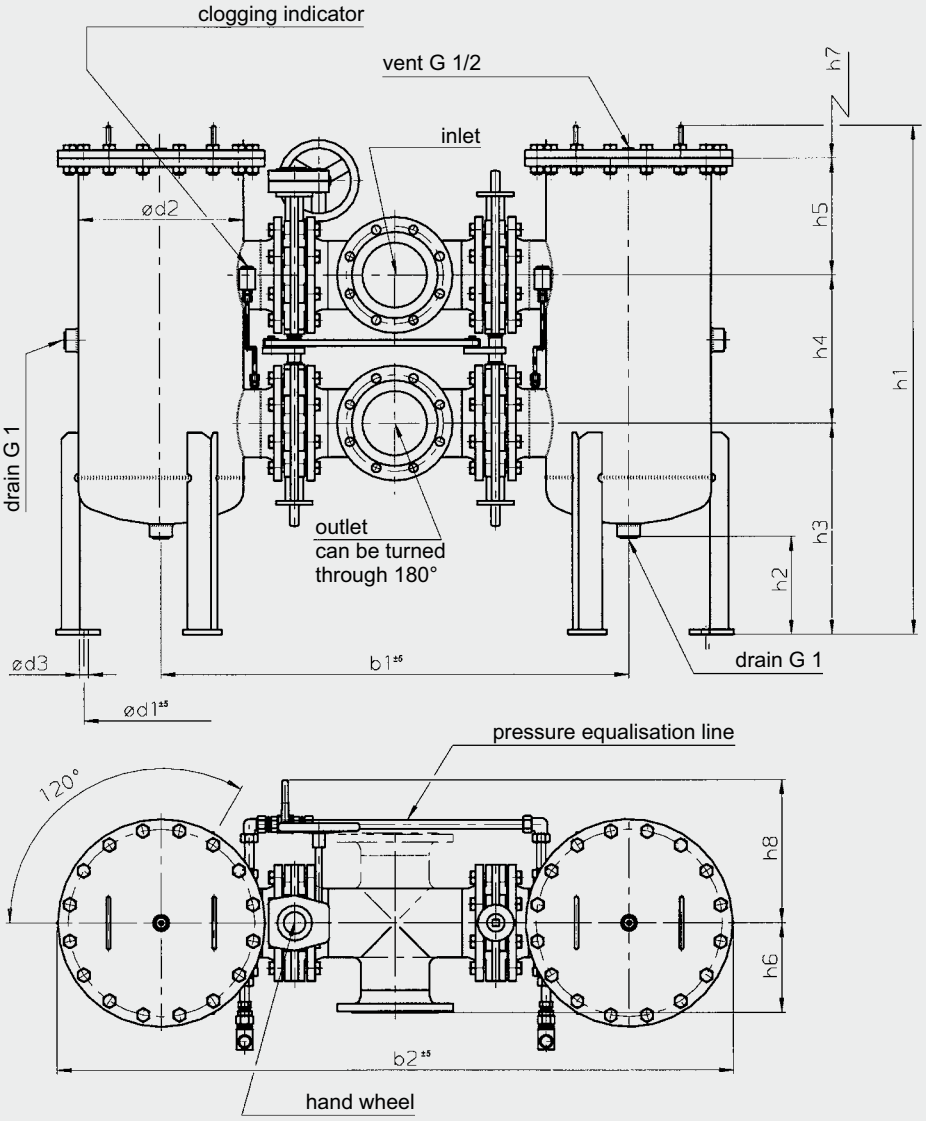



**Dimensions in mm**

| Type | Flange connection[1)] | $b_1$ | $b_2$ | $d_1$ | $d_2$ | $d_3$ | $h_1$ | $h_2$ | $h_3$ | $h_4$ | $h_5$ | $h_6$ | $h_7$ | $h_8$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RFLD 4000/4020 | DN 200 | 1124 | 1590 | 330 | 356 | 22 | 1250/1595 | 260 | 525 | 365 | 235/625 | 261 | 420/810 | 370 |
| RFLD 5200/5220 | DN 200 | 1166 | 1680 | 380 | 406 | 22 | 1265/1705 | 250 | 525 | 365 | 286/726 | 261 | 500/940 | 370 |
| | DN 250 | 1312 | 1825 | 380 | 406 | 22 | 1324/1764 | 250 | 560 | 450 | 236/676 | 322 | 500/940 | 400 |
| RFLD 6500/6520 | DN 200 | 1266 | 1886 | 480 | 508 | 22 | 1380/1820 | 260 | 600 | 365 | 335/775 | 261 | 500/940 | 370 |
| | DN 250 | 1402 | 2022 | 480 | 508 | 22 | 1380/1820 | 260 | 600 | 450 | 250/690 | 322 | 500/940 | 400 |
| RFLD 7800/7820 | DN 200 | 1266 | 1886 | 480 | 508 | 22 | 1380/1820 | 260 | 600 | 365 | 335/775 | 261 | 500/940 | 370 |
| | DN 250 | 1402 | 2022 | 480 | 508 | 22 | 1380/1820 | 260 | 600 | 450 | 250/690 | 322 | 500/940 | 400 |
| RFLD 15000/15020 | DN 200 | 1506 | 2016 | 690 | 711 | 22 | 1425/1865 | 263 | 655 | 365 | 330/770 | 261 | 500/940 | 415 |
| | DN 250 | 1628 | 2458 | 690 | 711 | 22 | 1425/1865 | 263 | 640 | 450 | 260/700 | 322 | 500/940 | 415 |

[1)] DIN flange connection to DIN 2501/1 for PN 16 (sealing strip "C")

## 4.4 WELDED FILTER SERIES - BUTTERFLY VERSION RFLD 250x - 1502x (CHANGE-OVER TYPE C)




**Dimensions in mm**

| Type | Flange connection[1)] | $b_1$ | $b_2$ | $d_1$ | $d_2$ | $d_3$ | $h_1$ | $h_2$ | $h_3$ | $h_4$ | $h_5$ | $h_6$ | $h_7$ | $h_8$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RFLD 2500/2520 | DN 150 | 1018 | 1378 | | 273 | 22 | 1108/1498 | 220 | 460 | 365 | 211/601 | 220 | 420/810 | 330 |
| RFLD 4000/4020 | DN 150 | 1152 | 1616 | 330 | 356 | 22 | 1170/1560 | 260 | 525 | 365 | 200/590 | 220 | 420/810 | 350 |
| | DN 200 | 1240 | 1724 | 330 | 356 | 22 | 1205/1595 | 260 | 525 | 365 | 235/625 | 260 | 420/810 | 370 |
| RFLD 5200/5220 | DN 150 | 1152 | 1666 | 380 | 406 | 22 | 1256/1696 | 250 | 525 | 365 | 286/726 | 220 | 500/940 | 350 |
| | DN 200 | 1280 | 1794 | 380 | 406 | 22 | 1256/1696 | 250 | 525 | 365 | 286/726 | 260 | 500/940 | 370 |
| | DN 250 | 1496 | 2010 | 380 | 406 | 22 | 1326/1766 | 250 | 560 | 450 | 236/676 | 350 | 500/940 | 400 |
| RFLD 6500/6520 | DN 150 | 1292 | 1916 | 480 | 508 | 22 | 1260/1700 | 260 | 540 | 365 | 275/715 | 220 | 500/940 | 350 |
| | DN 200 | 1380 | 2004 | 480 | 508 | 22 | 1380/1820 | 260 | 600 | 365 | 335/775 | 260 | 500/940 | 370 |
| | DN 250 | 1586 | 2210 | 480 | 508 | 22 | 1380/1820 | 260 | 600 | 450 | 250/690 | 350 | 500/940 | 400 |
| RFLD 7800/7820 | DN 150 | 1292 | 1916 | 480 | 508 | 22 | 1260/1700 | 260 | 540 | 365 | 275/715 | 220 | 500/940 | 350 |
| | DN 200 | 1380 | 2004 | 480 | 508 | 22 | 1380/1820 | 260 | 600 | 365 | 335/775 | 260 | 500/940 | 370 |
| | DN 250 | 1586 | 2210 | 480 | 508 | 22 | 1380/1820 | 260 | 600 | 450 | 250/690 | 350 | 500/940 | 400 |
| RFLD 15000/15020 | DN 200 | 1620 | 2450 | 690 | 711 | 22 | 1425/1865 | 260 | 655 | 365 | 330/770 | 260 | 500/940 | 370 |
| | DN 250 | 1816 | 2646 | 690 | 711 | 22 | 1425/1865 | 260 | 655 | 450 | 250/690 | 350 | 500/940 | 400 |
| | DN 300 | 1956 | 2786 | 690 | 711 | 22 | 1500/1940 | 260 | 670 | 515 | 235/675 | 400 | 500/940 | 430 |

[1)] DIN flange connection to DIN 2501/1 for PN 16 (sealing strip "C")

## NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

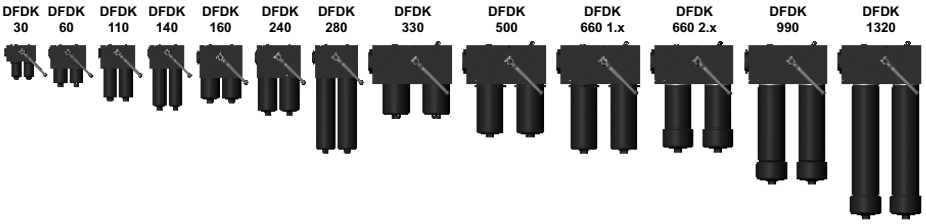
Subject to technical modifications.


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**D-66280 Sulzbach/Saar**
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Internet: www.hydac.com
E-Mail: filter@hydac.com



# Change-Over Pressure Filter DFDK

## up to 600 l/min, up to 315 bar




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. They consist of a filter head with screw-in filter bowls.

Standard equipment:

- with ball change-over valve
- 2-piece filter bowl for DFDK 990 and above (available as an option for DFDK 660 and above)
- connection for a clogging indicator
- with drain screw with pressure relief (for DFDK 330 and above)

### 1.2 FILTER ELEMENTS

Hydac filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

**Contamination retention capacities in g**

| Betamicron® (BN4HC) | | | | |
|---|---|---|---|---|
| DFDK | 3 µm | 5 µm | 10 µm | 20 µm |
| 30 | 4.6 | 5.1 | 5.4 | 5.6 |
| 60 | 6.5 | 7.3 | 7.8 | 8.0 |
| 110 | 13.8 | 15.5 | 16.4 | 16.9 |
| 140 | 18.1 | 20.3 | 21.5 | 22.2 |
| 160 | 19.8 | 22.2 | 23.5 | 24.3 |
| 240 | 32.3 | 36.3 | 38.4 | 39.6 |
| 280 | 70.6 | 79.3 | 83.9 | 86.6 |
| 330 | 47.2 | 53.1 | 56.1 | 57.9 |
| 500 | 76.9 | 86.5 | 91.5 | 94.4 |
| 660 | 102.2 | 114.9 | 121.5 | 125.4 |
| 990 | 154.5 | 173.7 | 183.7 | 189.5 |
| 1320 | 209.9 | 236.0 | 249.6 | 257.5 |

| Betamicron® (BH4HC) | | | | |
|---|---|---|---|---|
| DFDK | 3 µm | 5 µm | 10 µm | 20 µm |
| 30 | 3.0 | 2.9 | 3.2 | 3.7 |
| 60 | 4.6 | 4.5 | 5.0 | 5.7 |
| 110 | 10.1 | 9.9 | 10.9 | 12.4 |
| 140 | 13.3 | 13.0 | 14.3 | 16.3 |
| 160 | 12.9 | 12.6 | 13.9 | 15.9 |
| 240 | 21.6 | 21.1 | 23.2 | 26.5 |
| 280 | 48.1 | 47.1 | 51.8 | 59.1 |
| 330 | 34.6 | 33.9 | 37.2 | 42.5 |
| 500 | 57.5 | 56.3 | 61.8 | 70.5 |
| 660 | 76.8 | 75.2 | 82.6 | 94.3 |
| 990 | 111.8 | 109.4 | 120.2 | 137.2 |
| 1320 | 153.8 | 150.7 | 165.5 | 188.8 |

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Nominal pressure | 315 bar |
| Fatigue strength | at nominal pressure $10^6$ load cycles from 0 to nominal pressure |
| Temperature range | -10 °C to +100 °C<br>(-30 °C to -10 °C: $p_{max}$ = 157.5 bar) |
| Material of filter head | EN-GJS-400-15 |
| Material of filter bowl | Steel |
| Type of clogging indicator | VD (differential pressure indication up to 420 bar operating pressure) |
| Setting pressure of clogging indicator | 8 bar (others on request) |

Filter elements are available with the following pressure stability values:

| | |
|---|---|
| Betamicron® (BN4HC): | 20 bar |
| Betamicron® (BH4HC): | 210 bar |
| Wire mesh (W/HC, W): | 20 bar |
| Stainless steel fibre (V): | 210 bar |

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 MOUNTING

As inline filter

### 1.6 SPECIAL MODELS AND ACCESSORIES

On request

### 1.7 SPARE PARTS

See Original Spare Parts List

### 1.8 CERTIFICATES AND APPROVALS

On request

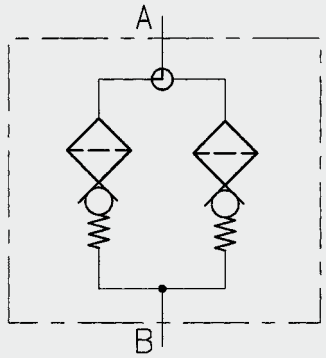
### 1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Non-flam operating fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

### 1.10 IMPORTANT INFORMATION

- Filter housing must be earthed
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector

**Symbol for hydraulic systems**



## 2. MODEL CODE (ALSO ORDER EXAMPLE)

**DFDK BN/HC 160 Q A F 10 D 1 . X /-L24**

### 2.1 COMPLETE FILTER

**Filter type**
DFDK

**Filter material of element**
BN/HC Betamicron® (BN4HC)
BH/HC Betamicron® (BH4HC)
V Stainless steel fibre
W/HC, W Wire mesh

**Size of filter of element**
DFDK: 30, 60, 110, 140, 160, 240, 280, 330, 500, 660, 990, 1320

**Operating pressure**
Q = 315 bar

**Type of change-over**
A Ball change-over

**Type and size of port**

| Type | Port | Filter size | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 30 | 60 | 110 | 140 | 160 | 240 | 280 | 330 | 500 | 660 | 990 | 1320 |
| B | G ½ | ● | | | | | | | | | | | |
| C | G ¾ | | ● | ● | ● | | | | | | | | |
| F | G1 ½ | | | | | ● | ● | ● | | | | | |
| L | DN 50* | | | | | | | | ● | ● | ● | ● | ● |

*DIN ISO 228 (6000 PSI)

**Filtration rate in µm**
BN4HC, BH4HC, V: 3, 5, 10, 20
W/HC, W: 25, 50, 100, 200

**Type of clogging indicator**
Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
] for other clogging indicators see brochure no. E 7.050../..

**Type code**
1 model with one-piece filter bowls
2 model with two-piece filter bowls (only for DFDK 660 to 1320)

**Modification number**
X the latest version is always supplied

**Supplementary details**
L... light with appropriate voltage (24V, 48V, 110V, 220V)
LED 2 light emitting diodes up to 24 Volt
] only for clogging indicators Type D
V FPM seals
W suitable for HFA and HFC emulsions

### 2.2 REPLACEMENT ELEMENT

**0160 D 010 BN4HC /-V**

**Size**
0030, 0060, 0110, 0140, 0160, 0240, 0280, 0330, 0500, 0660, 0990, 1320

**Type**
D

**Filtration rate in µm**
BN4HC, BH4HC, V: 003, 005, 010, 020
W/HC, W: 025, 050, 100, 200

**Filter material**
BN4HC, BH4HC, V, W/HC, W

**Supplementary details**
V, W (for descriptions, see point 2.1)

### 2.3 REPLACEMENT CLOGGING INDICATOR

**VD 8 D . X /-L24**

**Type**
VD differential pressure indicator up to 420 bar operating pressure

**Pressure setting**
8 8 bar standard, others on request

**Type of clogging indicator**
D (see point 2.1 )

**Modification number**
X the latest version is always supplied

**Supplementary details**
L..., LED, V, W (for descriptions, see point 2.1)

## 3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see point 3.1)

$$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$$

(*see point 3.2)

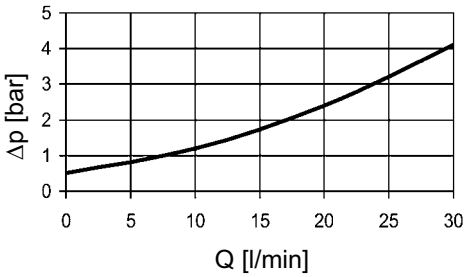
For ease of calculation, our Filter Sizing Program is available on request free of charge.

**NEW:** Sizing online at www.hydac.com

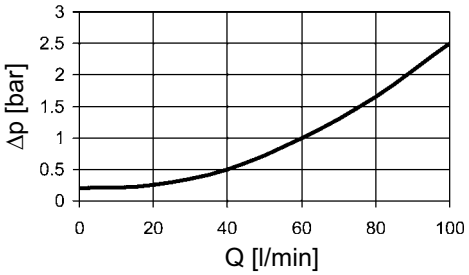
### 3.1 Δp-Q HOUSING GRAPHS BASED ON ISO 3968

The housing graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

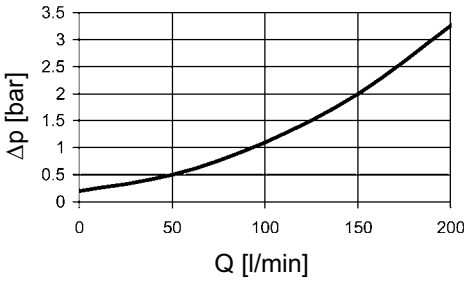
**DFDK 30**



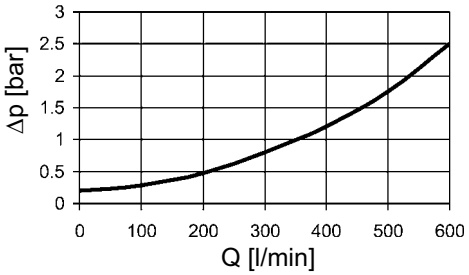

**DFDK 60, 110, 140**




**DFDK 160, 240, 280**




**DFDK 330, 500, 660, 990, 1320**

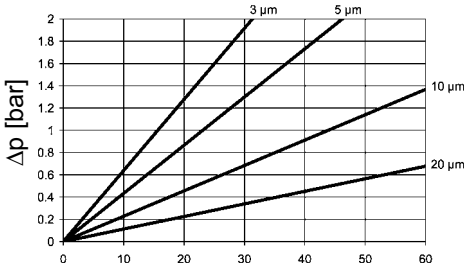


## 3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

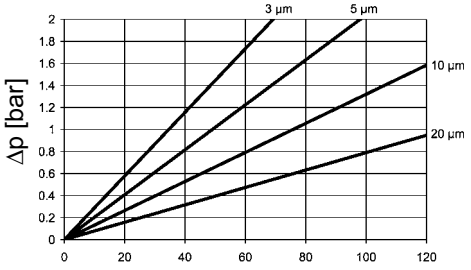
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 $mm^2/s$. The pressure drop changes proportionally to the change in viscosity.

| DFDK | V | | | | W/HC, W | BH4HC | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 3 µm | 5 µm | 10 µm | 20 µm | – | 3 µm | 5 µm | 10 µm | 20 µm |
| 30 | 18.4 | 13.5 | 7.5 | 3.6 | 3.030 | 91.2 | 50.7 | 36.3 | 19.0 |
| 60 | 16.0 | 9.3 | 5.4 | 3.3 | 0.757 | 58.6 | 32.6 | 18.1 | 12.2 |
| 110 | 8.2 | 5.6 | 3.3 | 2.2 | 0.413 | 25.4 | 14.9 | 8.9 | 5.6 |
| 140 | 5.8 | 4.8 | 3.1 | 2.3 | 0.324 | 19.9 | 11.3 | 8.1 | 4.3 |
| 160 | 4.6 | 3.2 | 2.3 | 1.4 | 0.284 | 16.8 | 10.4 | 5.9 | 4.4 |
| 240 | 3.1 | 2.5 | 1.7 | 1.1 | 0.189 | 10.6 | 6.8 | 3.9 | 2.9 |
| 280 | 2.3 | 1.7 | 1.2 | 0.8 | 0.162 | 5.7 | 3.4 | 1.8 | 1.6 |
| 330 | 2.2 | 1.8 | 1.2 | 0.8 | 0.138 | 7.7 | 4.5 | 2.8 | 2.0 |
| 500 | 1.5 | 1.2 | 0.8 | 0.5 | 0.091 | 4.2 | 2.6 | 1.5 | 1.2 |
| 660 | 1.1 | 0.9 | 0.6 | 0.4 | 0.069 | 3.3 | 1.9 | 1.0 | 0.9 |
| 990 | 0.8 | 0.6 | 0.4 | 0.3 | 0.046 | 2.2 | 1.3 | 0.8 | 0.6 |
| 1320 | 0.6 | 0.5 | 0.3 | 0.2 | 0.035 | 1.6 | 1.0 | 0.6 | 0.4 |

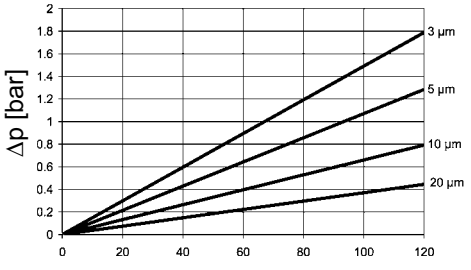
### BN4HC: DFDK... 30



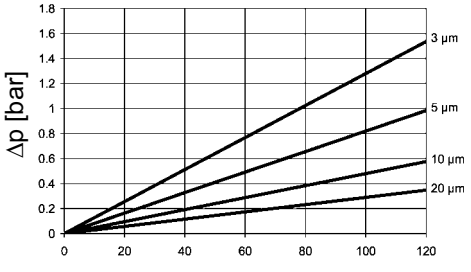

### BN4HC: DFDK... 60



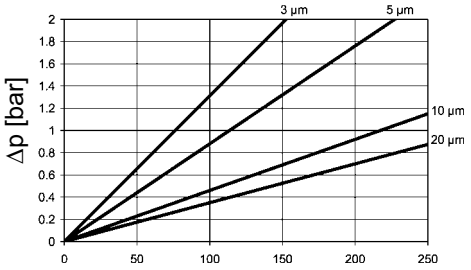

### BN4HC: DFDK... 110



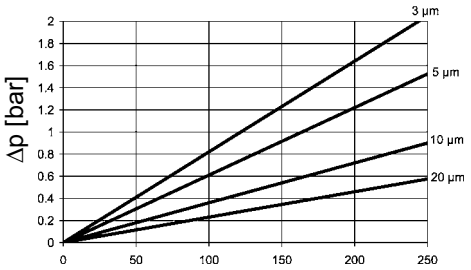

### BN4HC: DFDK... 140



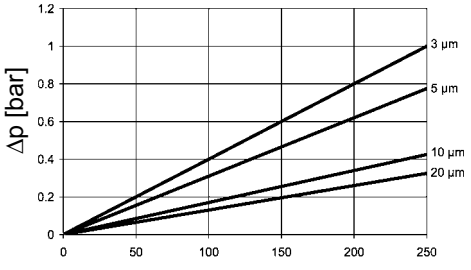

### BN4HC: DFDK... 160



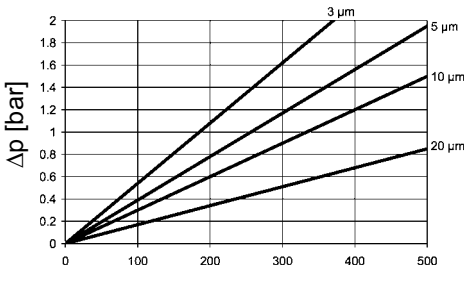

### BN4HC: DFDK... 240



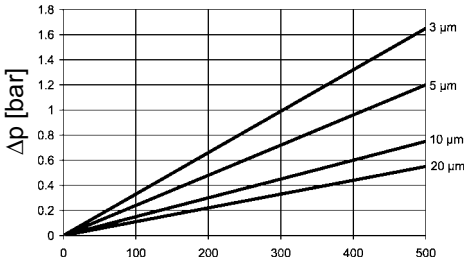

### BN4HC: DFDK... 280



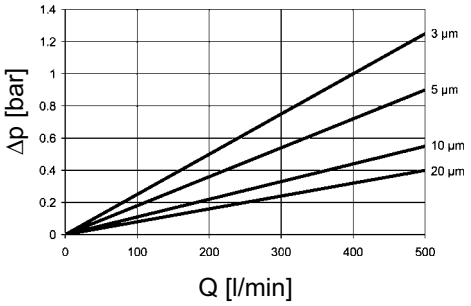

### BN4HC: DFDK... 330



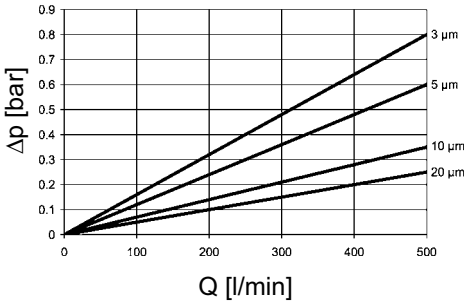

### BN4HC: DFDK... 500



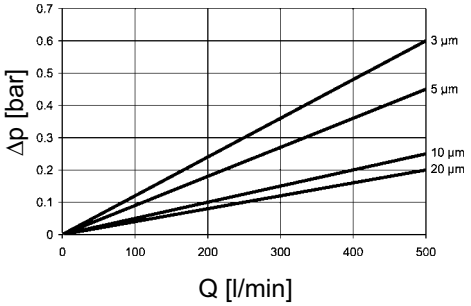

### BN4HC: DFDK... 660




### BN4HC: DFDK... 990

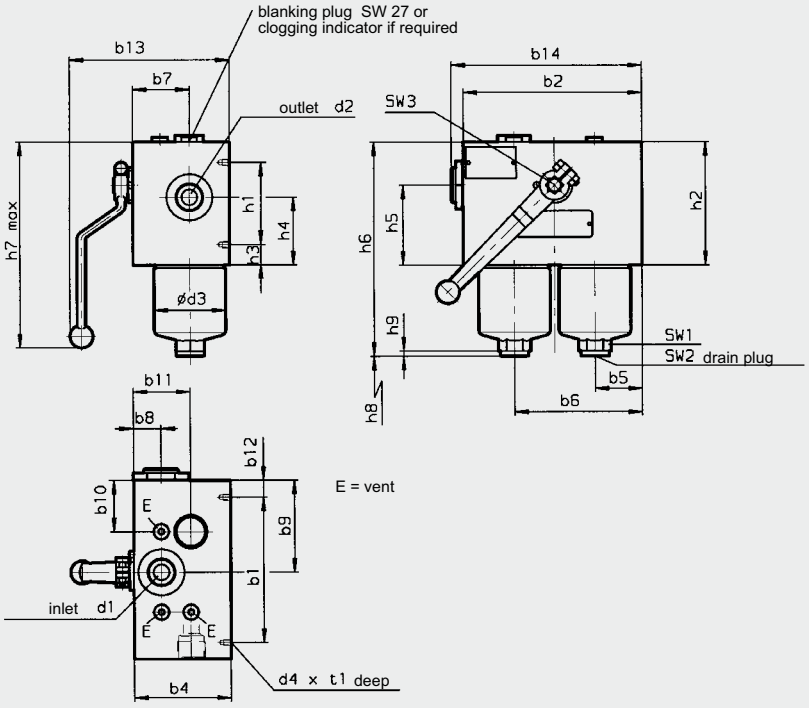



### BN4HC: DFDK... 1320



## 4. DIMENSIONS

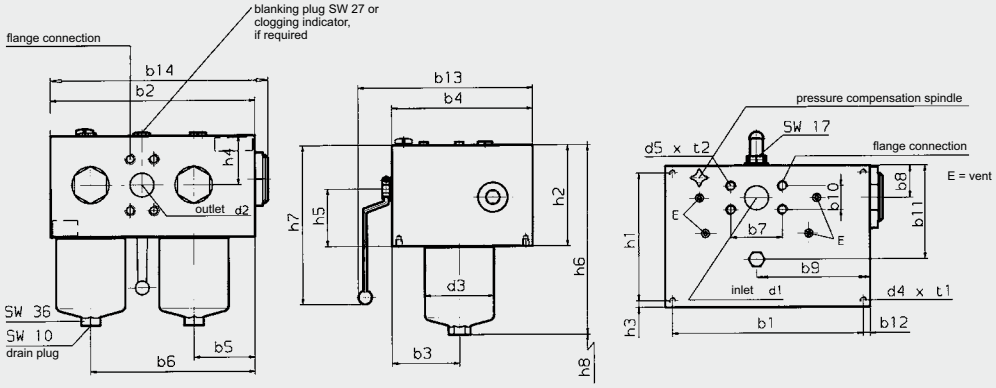
DFDK 30 - 280



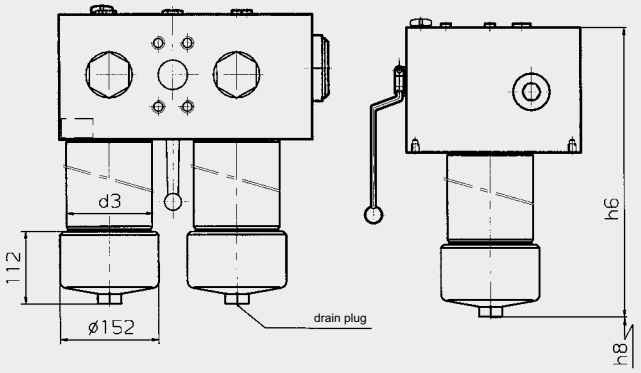

* SAE connection 6000 psi

| DFDK | 30 | 60 | 110 | 140 | 160 | 240 | 280 |
|---|---|---|---|---|---|---|---|
| b1 | 130 | 138 | 138 | 138 | 190 | 190 | 190 |
| b2 | 145 | 170 | 170 | 170 | 210 | 210 | 210 |
| b4 | 80 | 92 | 92 | 92 | 128 | 128 | 128 |
| b5 | 35 | 45 | 45 | 45 | 52.5 | 52.5 | 52.5 |
| b6 | 96 | 121.5 | 121.5 | 121.5 | 157.5 | 157.5 | 157.5 |
| b7 | 47 | 54 | 54 | 54 | 75.5 | 75.5 | 75.5 |
| b8 | 22.8 | 26 | 26 | 26 | 35.5 | 35.5 | 35.5 |
| b9 | 80.9 | 87 | 87 | 87 | 105 | 105 | 105 |
| b10 | 80.9 | 48.5 | 48.5 | 48.5 | 52.5 | 52.5 | 52.5 |
| b11 | 59 | 54 | 54 | 54 | 75.5 | 75.5 | 75.5 |
| b12 | 7.5 | 16 | 16 | 16 | 10 | 10 | 10 |
| b13 (approx.) | 131 | 150 | 150 | 150 | 193 | 193 | 193 |
| b14 (approx.) | 155 | 181 | 181 | 181 | 221 | 221 | 221 |
| d1* | G ½ | G ¾ | G ¾ | G ¾ | G 1½ | G 1½ | G 1½ |
| d2* | G ½ | G ¾ | G ¾ | G ¾ | G 1½ | G 1½ | G 1½ |
| d3 | 52.2 | 68.2 | 68.2 | 68.2 | 95.2 | 95.2 | 95.2 |
| d4 | M6 | M6 | M6 | M6 | M10 | M10 | M10 |
| h1 | 64 | 78 | 78 | 78 | 96 | 96 | 96 |
| h2 | 80 | 117 | 117 | 117 | 162 | 162 | 162 |
| h3 | 8 | 19.5 | 19.5 | 19.5 | 33 | 33 | 33 |
| h4 | 47 | 64.5 | 64.5 | 64.5 | 106 | 106 | 106 |
| h5 | 43 | 76 | 76 | 76 | 100 | 100 | 100 |
| h6 | 171 | 204.5 | 272.0 | 315.5 | 282.5 | 342.5 | 524.5 |
| h7 (approx.) | 180 | 205 | 205 | 205 | 245 | 245 | 245 |
| h8 | 75 | 75 | 75 | 75 | 85 | 85 | 85 |
| h9 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| t1 | 7 | 7 | 7 | 7 | 11 | 11 | 11 |
| SW1 | 24 | 27 | 27 | 27 | 32 | 32 | 32 |
| SW2 | 6 | 10 | 10 | 10 | 10 | 10 | 10 |
| SW3 | 9 | 12 | 12 | 12 | 14 | 14 | 14 |
| Weight incl. element [kg] | 7.4 | 15.0 | 17.0 | 18.9 | 33.0 | 36.0 | 45.0 |
| Volume of pressure chamber [l] | 2x0.13 | 2x0.20 | 2x0.33 | 2x0.40 | 2x0.60 | 2x0.80 | 2x1.60 |

DFDK 330 - 660..1.x




DFDK 660 - 1320..2.x




* SAE connection 6000 psi

| DFDK | 330 | 500 | 660 1.x | 660 2.x | 990 | 1320 |
|---|---|---|---|---|---|---|
| b1 | 359 | 359 | 359 | 359 | 359 | 359 |
| b2 | 385 | 385 | 385 | 385 | 385 | 385 |
| b3 | 127 | 127 | 127 | 127 | 127 | 127 |
| b4 | 265 | 265 | 265 | 265 | 265 | 265 |
| b5 | 115 | 115 | 115 | 115 | 115 | 115 |
| b6 | 309 | 309 | 309 | 309 | 309 | 309 |
| b7 | 96.8 | 96.8 | 96.8 | 96.8 | 96.8 | 96.8 |
| b8 | 60.5 | 60.5 | 60.5 | 60.5 | 60.5 | 60.5 |
| b9 | 212 | 212 | 212 | 212 | 212 | 212 |
| b10 | 44.5 | 44.5 | 44.5 | 44.5 | 44.5 | 44.5 |
| b11 | 175.5 | 175.5 | 175.5 | 175.5 | 175.5 | 175.5 |
| b12 | 13 | 13 | 13 | 13 | 13 | 13 |
| b13 (approx.) | 326 | 326 | 326 | 326 | 326 | 326 |
| b14 (approx.) | 405 | 405 | 405 | 405 | 405 | 405 |
| d1* | DN 50 (2") | DN 50 (2") | DN 50 (2") | DN 50 (2") | DN 50 (2") | DN 50 (2") |
| d2* | DN 50 (2") | DN 50 (2") | DN 50 (2") | DN 50 (2") | DN 50 (2") | DN 50 (2") |
| d3 | 130.2 | 130.2 | 130.2 | 130 | 130 | 130 |
| d4 | M12 | M12 | M12 | M12 | M12 | M12 |
| d5 | M20 | M20 | M20 | M20 | M20 | M20 |
| h1 | 239 | 239 | 239 | 239 | 239 | 239 |
| h2 | 190 | 190 | 190 | 190 | 190 | 190 |
| h3 | 13 | 13 | 13 | 13 | 13 | 13 |
| h4 | 98 | 98 | 98 | 98 | 98 | 98 |
| h5 | 108 | 108 | 108 | 108 | 108 | 108 |
| h6 | 357.5 | 450.5 | 527.0 | 521.5 | 677.5 | 843.5 |
| h7 (approx.) | 309 | 309 | 309 | 309 | 309 | 309 |
| h8 | 95 | 95 | 95 | 95 | 500 | 670 |
| t1 | 13 | 13 | 13 | 13 | 13 | 13 |
| t2 | 27 | 27 | 27 | 27 | 27 | 27 |
| Weight incl. element [kg] | 151.5 | 159.0 | 165.0 | 171.0 | 184.4 | 202.4 |
| Volume of pressure chamber [l] | 2x1.50 | 2x2.20 | 2x3.00 | 2x3.00 | 2x4.50 | 2x6.00 |

## NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.

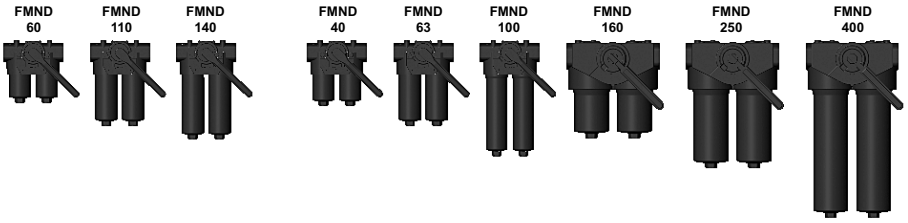

HYDAC **Filtertechnik GmbH**
Industriegebiet
**D-66280 Sulzbach/Saar**
Tel.: 0 68 97 / 509-01
Fax: 0 68 97 / 509-300
Internet: www.hydac.com
E-Mail: filter@hydac.com



# Change-Over Inline Filter FMND

## to DIN 24550*, up to 400 l/min, up to 250 bar

*Filters and filter elements also available with HYDAC dimensions (FMND 40 to 140 only)




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. They consist of a filter head with integral change-over valve and screw-in filter bowls.

Standard equipment:

- without bypass valve
- connection for a clogging indicator as standard
- with drain screw (FMND 160 to 400)

### 1.2 FILTER ELEMENTS

Hydac filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

**Contamination retention capacities in g**

| | Betamicron® (BN4HC) | | | |
|---|---|---|---|---|
| FMND | 3 µm | 5 µm | 10 µm | 20 µm |
| 60 | 6.5 | 7.3 | 7.8 | 8.0 |
| 110 | 13.8 | 15.5 | 16.4 | 16.9 |
| 140 | 18.1 | 20.3 | 21.5 | 22.2 |
| | Betamicron® (BN4HC) | | | |
| FMND | 3 µm | 6 µm | 10 µm | 25 µm |
| 40 | 5.2 | 5.6 | 6.3 | 7.0 |
| 63 | 9.2 | 9.9 | 11.1 | 12.8 |
| 100 | 15.4 | 16.5 | 18.6 | 20.6 |
| 160 | 27.5 | 29.3 | 33.1 | 36.7 |
| 250 | 46.0 | 49.0 | 55.2 | 61.3 |
| 400 | 76.2 | 81.3 | 91.4 | 101.5 |
| | Betamicron® (BH4HC) | | | |
| FMND | 3 µm | 5 µm | 10 µm | 20 µm |
| 60 | 4.6 | 4.5 | 5.0 | 5.7 |
| 110 | 10.1 | 9.9 | 10.9 | 12.4 |
| 140 | 13.3 | 13.0 | 14.3 | 16.3 |
| | Betamicron® (BH4HC) | | | |
| FMND | 3 µm | 6 µm | 10 µm | 25 µm |
| 40 | 4.1 | 4.4 | 5.2 | 6.2 |
| 63 | 7.3 | 7.9 | 9.2 | 11.2 |
| 100 | 12.2 | 13.2 | 15.5 | 18.9 |
| 160 | 21.8 | 23.9 | 27.8 | 33.8 |
| 250 | 38.1 | 41.7 | 48.6 | 59.0 |
| 400 | 63.6 | 69.5 | 81.0 | 98.3 |

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Nominal pressure | 210 bar (FMND 160 to 400)<br>250 bar (FMND 40 to 140) |
| Fatigue strength | at nominal pressure $10^6$ load cycles from 0 to nominal pressure |
| Temperature range | -10 °C to +100 °C |
| Material of filter head | EN-GJS-400-15 |
| Material of filter bowl | Steel |
| Type of clogging indicator | VM (differential pressure indication up to 210 bar operating pressure)<br>VD (differential pressure indication up to 420 bar operating pressure) |
| Setting pressure of clogging indicator | 5 bar (others on request) |
| Bypass cracking pressure (optional) | 7 bar (others on request) |

Filter elements are available with the following pressure stability values:

| | |
|---|---|
| Betamicron® (BN4HC): | 20 bar |
| Betamicron® (BH4HC): | 210 bar |
| Wire mesh (W/HC, W): | 20 bar |

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 MOUNTING

As inline filter

### 1.6 SPECIAL MODELS AND ACCESSORIES

- with bypass valve
- with oil drain screw (FMND 40 to 140 = SO184)
- seals in FPM, EPDM

### 1.7 SPARE PARTS

See Original Spare Parts List

### 1.8 CERTIFICATES AND APPROVALS

On request

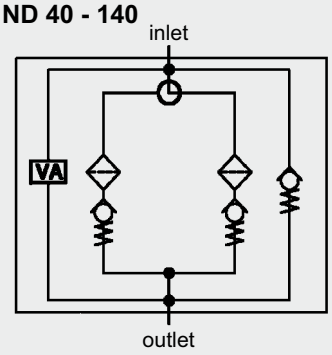
### 1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Non-flam operating fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

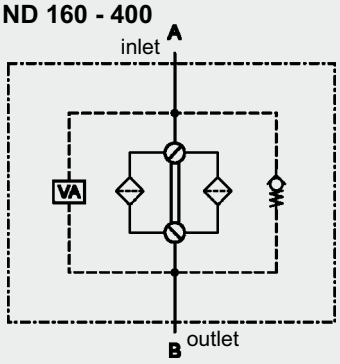
### 1.10 IMPORTANT INFORMATION

- Filter housing must be earthed
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector

**Symbol for hydraulic systems**
**FMND 40 - 140**




**FMND 160 - 400**



## 2. MODEL CODE (ALSO ORDER EXAMPLE)

**FMND BN/HC 250 L D F 10 D 1 . X /-L24**

### 2.1 COMPLETE FILTER

**Filter type**
FMND

**Filter material of element**
BN/HC Betamicron® (BN4HC) BH/HC Betamicron® (BH4HC)
W/HC, W Stainless steel wire mesh

**Size of filter of element**
FMND: 40, 60, 63, 100, 110, 140, 160, 250, 400

**Operating pressure**
L = 210 bar (FMND 160 to 400)
M = 250 bar (FMND 40 to 140)

**Type of change-over**
D single switching valve and check valve (FMND 40 to 140); segment valve (FMND 160 to 400)

**Type and size of port**
to DIN 24550 (●); ports available (X)

| Type | Port | Filter size not to DIN 24550 | | | ... to DIN 24550 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 60 | 110 | 140 | 40 | 63 | 100 | 160 | 250 | 400 |
| B | G ½ | X | X | X | ● | X | X | | | |
| C | G ¾ | X | X | X | X | ● | X | | | |
| D | G 1 | X | X | X | X | X | ● | | | |
| E | G 1¼ | | | | | | | ● | X | X |
| F | G 1½ | | | | | | | X | ● | X |
| I | DN 25* | X | X | X | X | X | X | | | |
| K | DN 38* | | | | | | | X | X | ● |

*SAE flange, 3000 PSI

**Filtration rate in µm**
BN4HC, BH4HC: 3, 5, 10, 20 BN4HC, BH4HC to DIN 24550: 3, 6, 10, 25
W/HC, W: 25, 50, 100, 200 W/HC to DIN 24550: 25, 50, 100, 200

**Type of clogging indicator**
Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
LZ visual-mechanical / electrical
] for other clogging indicators see brochure no. E 7.050../..

**Type code**
1

**Modification number**
X the latest version is always supplied

**Supplementary details**
B. cracking pressure of bypass (e. g.: B7 = 7 bar); no details = without bypass valve
L... light with appropriate voltage (24V, 48V, 110V, 220V) ] only for clogging
LED 2 light emitting diodes up to 24 Volt ] indicators Type D
AV LZ indicator with plug to AUDI and VW specification
BO LZ indicator with plug and pin connection to BMW and Opel specification (M12x1)
CN LZ indicator with plug to DIN 43651 with 3 LEDs (CNOMO standard)
DB LZ indicator with plug to DIN 43651 with 3 LEDs (Daimler-Benz standard)
D4C LZ indicator with plug and pin connection to Daimler-Chrysler specification and cold start suppression 30 °C
BO-LED as for BO, but with progressive diode strip
SO184 oil drain screw (FMND 40 to 140)
V FPM seals
W suitable for HFA and HFC emulsions

### 2.2 REPLACEMENT ELEMENT

**250 DN 010 BN4HC /-V**

**Size**
0040, 0060, 0063, 0100, 0110, 0140, 0160, 0250, 0400

**Type**
D 0060, 0110, 0140
DN to DIN 24550: 0040, 0063, 0100, 0160, 0250, 0400

**Filtration rating in µm**
BN4HC, BH4HC: 003, 005, 010, 020 BN4HC, BH4HC to DIN 24550: 003, 006, 010, 025
W/HC, W: 025, 050, 100, 200 W/HC to DIN 24550: 025, 050, 100, 200

**Filter material**
BN4HC, BH4HC, W/HC, W

**Supplementary details**
V, W (for descriptions, see point 2.1)

### 2.3 REPLACEMENT CLOGGING INDICATOR

**VM 5 D . X /-L24**

**Typ**
VM differential pressure indicator up to 210 bar operating pressure
VD differential pressure indicator up to 420 bar operating pressure

**Pressure setting**
5 5 bar standard, others on request

**Type of clogging indicator**
D (see point 2.1 )

**Modification number**
X the latest version is always supplied

**Supplementary details**
L..., LED, V, W, AV, BO, CN, DB, D4C, BO-LED (for descriptions, see point 2.1)

# 3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see point 3.1)

$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see point 3.2)

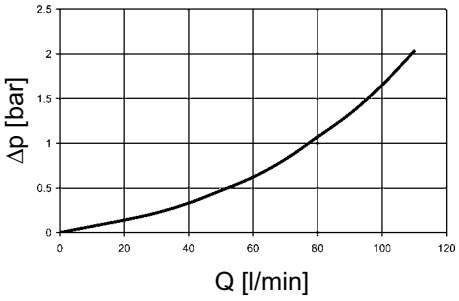
For ease of calculation, our Filter Sizing Program is available on request free of charge.

**NEW:** Sizing online at www.hydac.com

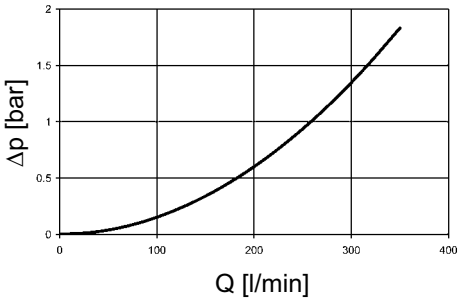
## 3.1 Δp-Q HOUSING GRAPHS IN ACCORDANCE WITH ISO 3968

The housing graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

**FMND 40, 60, 63, 100, 110, 140**




**FMND 160, 250, 400**

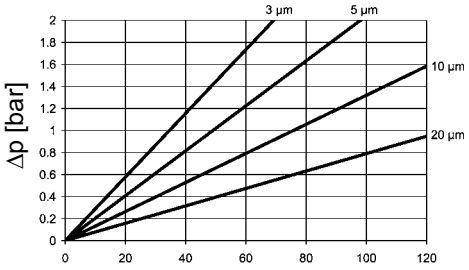



## 3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

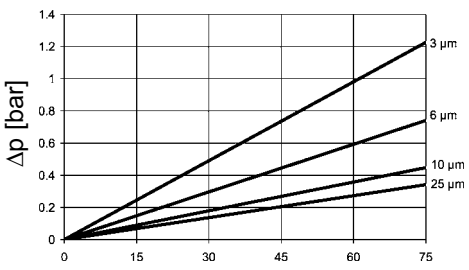
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

| FMND | ... D ... BH4HC | | | | W/HC - W | ... DN ... BH4HC | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 3 µm | 5 µm | 10 µm | 20 µm | – | 3 µm | 6 µm | 10 µm | 25 µm |
| 60 | 58.6 | 32.6 | 18.1 | 12.2 | 0.757 | - | - | - | - |
| 110 | 25.4 | 14.9 | 8.9 | 5.6 | 0.413 | - | - | - | - |
| 140 | 19.9 | 11.3 | 8.1 | 4.3 | 0.324 | - | - | - | - |
| 40 | - | - | - | - | 0.966 | 40.4 | 24.8 | 16.4 | 10.9 |
| 63 | - | - | - | - | 0.540 | 29.0 | 18.2 | 11.7 | 7.6 |
| 100 | - | - | - | - | 0.325 | 19.0 | 11.7 | 7.7 | 5.3 |
| 160 | - | - | - | - | 0.168 | 8.0 | 5.1 | 3.8 | 2.5 |
| 250 | - | - | - | - | 0.101 | 5.4 | 3.4 | 2.8 | 1.9 |
| 400 | - | - | - | - | 0.068 | 3.4 | 2.1 | 1.7 | 1.1 |

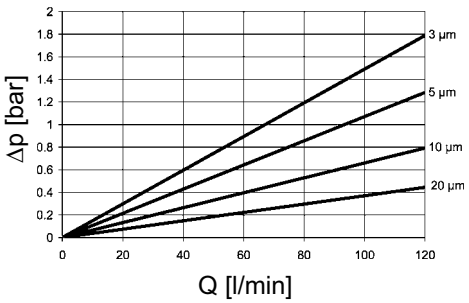
**BN4HC: FMND 60**



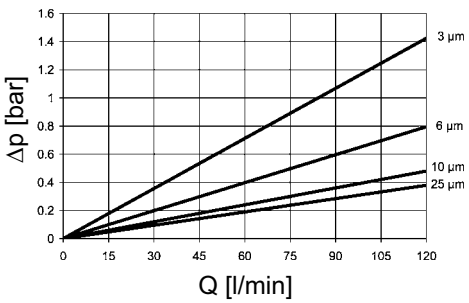

**BN4HC: FMND 63**



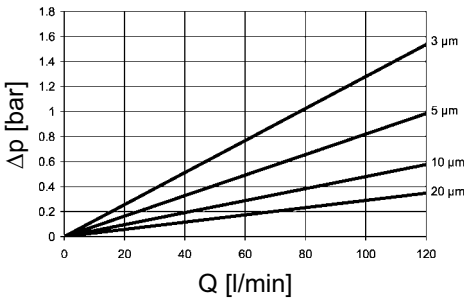

**BN4HC: FMND 110**



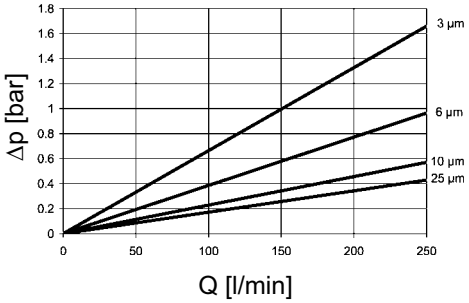

**BN4HC: FMND 100**



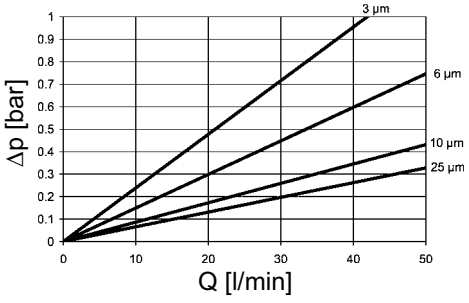

**BN4HC: FMND 140**



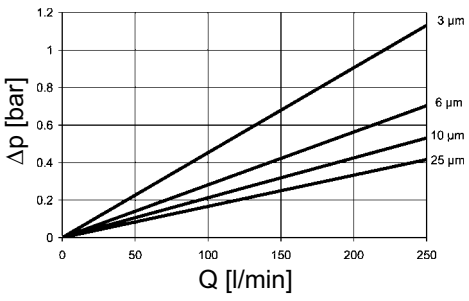

**BN4HC: FMND 160**



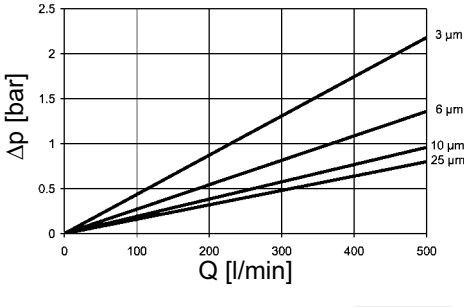

**BN4HC: FMND 40**




**BN4HC: FMND 250**

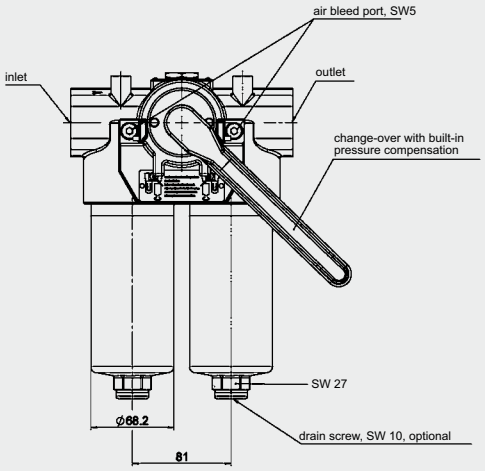


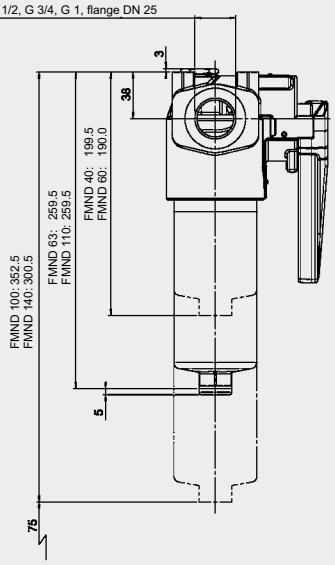

**BN4HC: FMND 400**

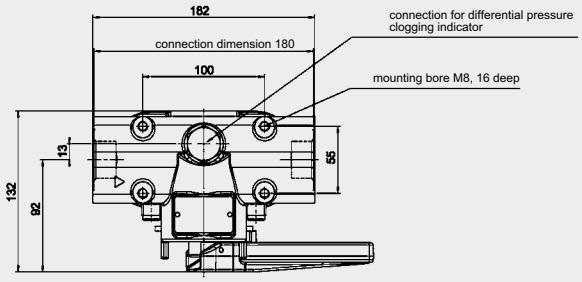


# 4. DIMENSIONS

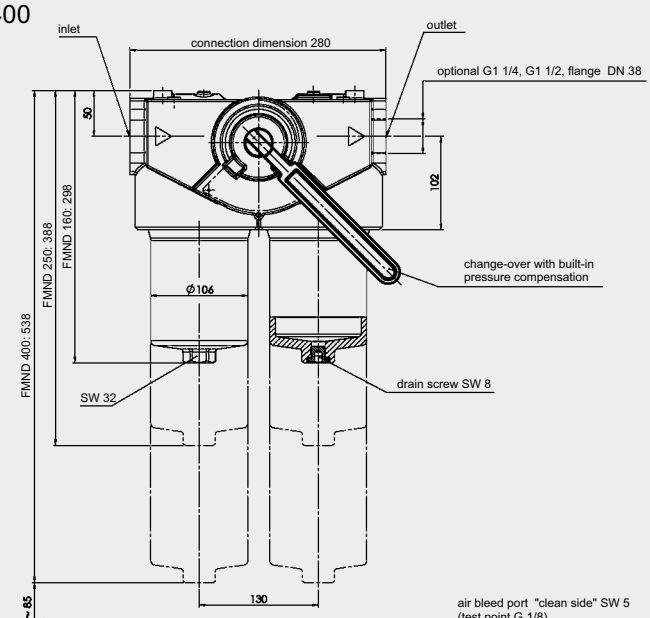
FMND 40 - 140

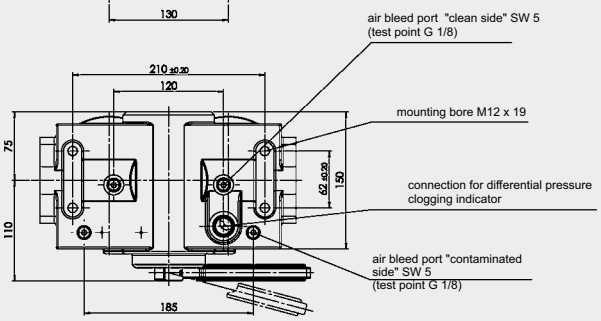



FMND 160 - 400




| FMND | Weight incl. element [kg] | Volume of pressure chamber[l] |
|---|---|---|
| 40 | 9.2 | 2x 0.22 |
| 60 | 9.2 | 2x 0.20 |
| 63 | 10.5 | 2x 0.33 |
| 100 | 11.5 | 2x 0.50 |
| 110 | 10.8 | 2x 0.33 |
| 140 | 12.0 | 2x 0.40 |
| 160 | 42.9 | 2x 1.10 |
| 250 | 44.2 | 2x 1.70 |
| 400 | 45.6 | 2x 2.70 |

## NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

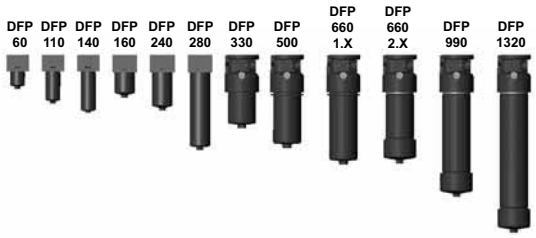
Subject to technical modifications.


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**D-66280 Sulzbach/Saar**
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Internet: www.hydac.com
E-Mail: filter@hydac.com



# Pressure Filter for Manifold Block Mounting DFP

up to 600 l/min, up to 315 bar




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. They consist of a filter head with a screw-in filter bowl. Standard equipment:

- connection for a clogging indicator in filter head
- two-piece bowl for size DFP 990 and above (optional for size DFP 660)
- drain plug with pressure relief (size DFP 330 and above)

### 1.2 FILTER ELEMENTS

Hydac filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

**Contamination retention capacities in g**

| | Betamicron® (BN4HC) | | | |
|---|---|---|---|---|
| DFP | 3 µm | 5 µm | 10 µm | 20 µm |
| 60 | 6.5 | 7.3 | 7.8 | 8.0 |
| 110 | 13.8 | 15.5 | 16.4 | 16.9 |
| 140 | 18.1 | 20.3 | 21.5 | 22.2 |
| 160 | 19.8 | 22.2 | 23.5 | 24.3 |
| 240 | 32.3 | 36.3 | 38.4 | 39.6 |
| 280 | 70.6 | 79.3 | 83.9 | 86.6 |
| 330 | 47.2 | 53.1 | 56.1 | 57.9 |
| 500 | 76.9 | 86.5 | 91.5 | 94.4 |
| 660 | 102.2 | 114.9 | 121.5 | 125.4 |
| 990 | 154.5 | 173.7 | 183.7 | 189.5 |
| 1320 | 209.9 | 236.0 | 249.6 | 257.5 |

| | Betamicron® (BH4HC) | | | |
|---|---|---|---|---|
| DFP | 3 µm | 5 µm | 10 µm | 20 µm |
| 60 | 4.6 | 4.5 | 5.0 | 5.7 |
| 110 | 10.1 | 9.9 | 10.9 | 12.4 |
| 140 | 13.3 | 13.0 | 14.3 | 16.3 |
| 160 | 12.9 | 12.6 | 13.9 | 15.9 |
| 240 | 21.6 | 21.1 | 23.2 | 26.5 |
| 280 | 48.1 | 47.1 | 51.8 | 59.1 |
| 330 | 34.6 | 33.9 | 37.2 | 42.5 |
| 500 | 57.5 | 56.3 | 61.8 | 70.5 |
| 660 | 76.8 | 75.2 | 82.6 | 94.3 |
| 990 | 111.8 | 109.4 | 120.2 | 137.2 |
| 1320 | 153.8 | 150.7 | 165.5 | 188.8 |

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Nominal pressure | 315 bar |
| Fatigue strength | at nominal pressure $10^6$ load cycles from 0 to nominal pressure |
| Temperature range | -30 °C to +100 °C (-30 °C to -10 °C: $p_{max}$= 157.5 bar) |
| Material of filter head | EN-GJS 400-15 |
| Material of filter bowl | Steel |
| Type of clogging indicator | VD (differential pressure indication up to 420 bar operating pressure) |
| Pressure setting of clogging indicator | 5 bar (others on request) |
| Cracking pressure of bypass (optional) | 6 bar (others on request) |

Filter elements are available with the following pressure stability values:

| | |
|---|---|
| Betamicron® (BN4HC): | 20 bar |
| Betamicron® (BH4HC): | 210 bar |
| Wire mesh (W): | 20 bar |
| Stainless steel fibre (V): | 210 bar |

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 MOUNTING

As pressure filter for manifold block mounting

### 1.6 SPECIAL MODELS AND ACCESSORIES

- Bypass valve in head
- Seals in FPM, EPDM

### 1.7 SPARE PARTS

See Original Spare Parts List

### 1.8 CERTIFICATES AND APPROVALS

On request

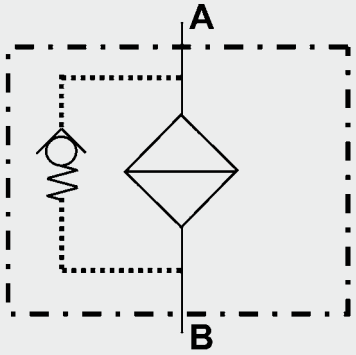
### 1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Non-flam operating fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

### 1.10 IMPORTANT INFORMATION

- Filter housing must be earthed
- When using visual clogging indicators only the BM version should be used (visual with manual re-set).
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector

**Symbol for hydraulic systems**



## 2. MODEL CODE (also order example)

**DFP BN/HC 60 Q B 10 D 1 . X /-L24**

### 2.1 COMPLETE FILTER

**Filter type**
DFP

**Filter material of element**
BN/HC Betamicron® (BN4HC)
BH/HC Betamicron® (BH4HC)
V Stainless steel fibre
W Wire mesh

**Size of filter or element**
DFP: 60, 110, 140, 160, 240, 280, 330, 500, 660, 990, 1320

**Operating pressure**
Q = 315 bar

**Type and size of port**

| Type | Port | Filter size | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 60 | 110 | 140 | 160 | 240 | 280 | 330 | 500 | 660 | 990 | 1320 |
| B | G ½ | ● | ● | ● | | | | | | | | |
| C | G ¾ | | | | ● | ● | ● | | | | | |
| D | G1 ½ | | | | | | | ● | ● | ● | ● | ● |

**Filtration rating in µm**
BN4HC, BH4HC, V: 3, 5, 10, 20
W: 25, 50, 100, 200

**Type of clogging indicator**
Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
BM visual
C electrical
D visual and electrical
] for other clogging indicators see brochure no. E 7.050../..

**Type code**
1 one-piece filter bowl
2 two-piece filter bowl (size DFP 660 to 1320)

**Modification number**
X the latest version is always supplied

**Supplementary details**
B. bypass cracking pressure (e.g. B6 = 6 bar); no details = without bypass valve
L... light with appropriate voltage (24V, 48V, 110V, 220V) ] only for clogging
LED 2 light emitting diodes up to 24 Volt ] indicators Type D
SO184 pressure release/oil drain screw (sizes DFP 660 to 1320)
V FPM seals
W suitable for HFA and HFC emulsions

### 2.2 REPLACEMENT ELEMENT

**0060 D 010 BN4HC /-V**

**Size**
0060, 0110, 0140, 0160, 0240, 0280, 0330, 0500, 0660, 0990, 1320

**Type**
D

**Filtration rating in µm**
BN4HC, BH4HC, V: 003, 005, 010, 020
W: 025, 050, 100, 200

**Filter material**
BN4HC, BH4HC, V, W

**Supplementary details**
V, W (for descriptions, see point 2.1)

### 2.3 REPLACEMENT CLOGGING INDICATOR

**VD 5 D . X /-L24**

**Type**
VD differential pressure indicator up to 420 bar operating pressure

**Pressure setting**
5 5 bar standard, others on request

**Type of clogging indicator** (see point 2.1 )

**Modification number**
X the latest version is always supplied

**Supplementary details**
L..., LED, V, W (for descriptions, see point 2.1)

# 3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see point 3.1)

$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see point 3.2)

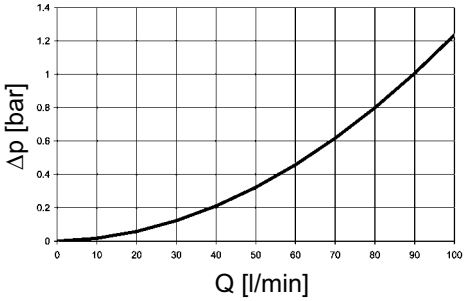
For ease of calculation, our Filter Sizing Program is available on request free of charge.

**NEW:** Sizing online at www.hydac.com

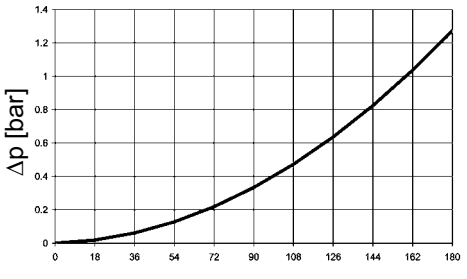
## 3.1 Δp-Q HOUSING GRAPHS BASED ON ISO 3968

The housing graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

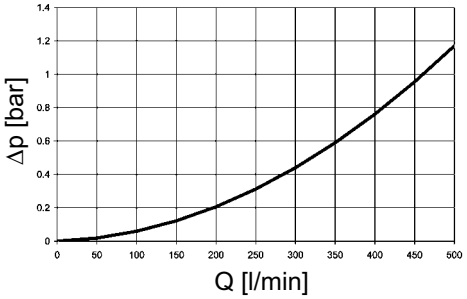
**DFP 60/110/140**




**DFP 160/240/280**




**DFP 330/500/660/990/1320**

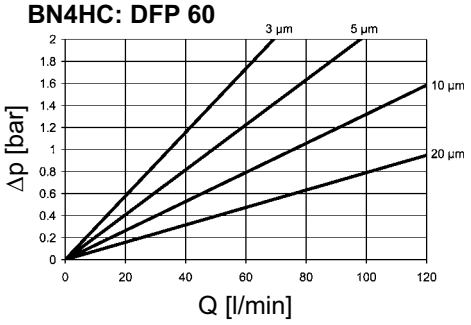



## 3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

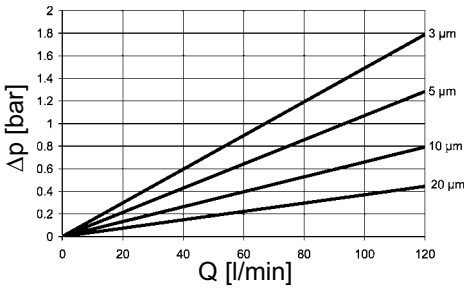
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

| DFP | V | | | | W | BH4HC | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 3 µm | 5 µm | 10 µm | 20 µm | – | 3 µm | 5 µm | 10 µm | 20 µm |
| 60 | 16.0 | 11.0 | 6.5 | 3.3 | 1.683 | 58.6 | 32.6 | 18.1 | 12.2 |
| 110 | 8.3 | 6.0 | 4.2 | 2.1 | 0.918 | 25.4 | 14.9 | 8,9 | 5.6 |
| 140 | 5.9 | 3.8 | 3.0 | 1.7 | 0.721 | 19.9 | 11.3 | 8.1 | 4.3 |
| 160 | 4.5 | 3.2 | 2.3 | 1.4 | 0.631 | 16.8 | 10.4 | 5.9 | 4.4 |
| 240 | 3.2 | 2.4 | 1.9 | 1.1 | 0.421 | 10.6 | 6.8 | 3.9 | 2.9 |
| 280 | 1.5 | 1.2 | 1.0 | 0.8 | 0.361 | 5.7 | 3.4 | 1.8 | 1.6 |
| 330 | 2.1 | 1.5 | 1.3 | 0.8 | 0.307 | 7.7 | 4.5 | 2.8 | 2.0 |
| 500 | 1.4 | 1.0 | 0.8 | 0.5 | 0.202 | 4.2 | 2.6 | 1.5 | 1.2 |
| 660 | 1.1 | 0.9 | 0.6 | 0.3 | 0.153 | 3.3 | 1.9 | 1.0 | 0.9 |
| 990 | 0.7 | 0.5 | 0.4 | 0.3 | 0.102 | 2.2 | 1.3 | 0.8 | 0.6 |
| 1320 | 0.6 | 0.5 | 0.3 | 0.2 | 0.077 | 1.6 | 1.0 | 0.6 | 0.4 |

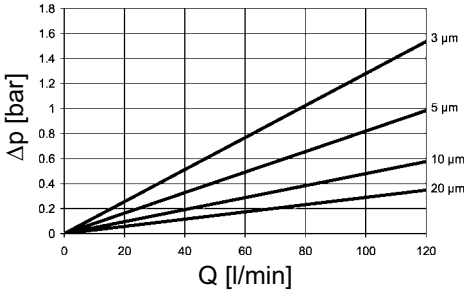
**BN4HC: DFP 60**



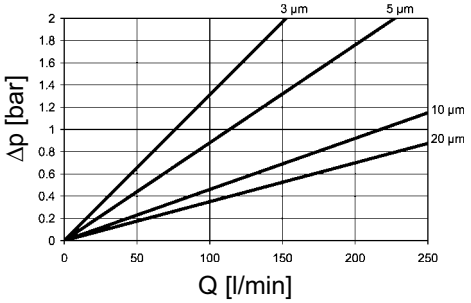

**BN4HC: DFP 110**



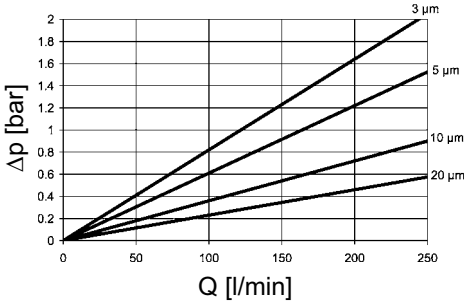

**BN4HC: DFP 140**



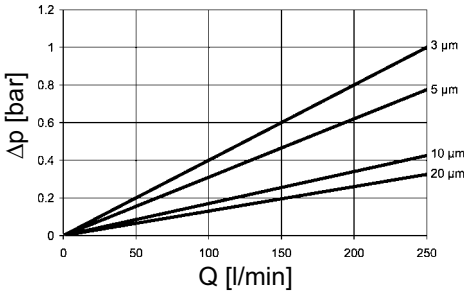

**BN4HC: DFP 160**



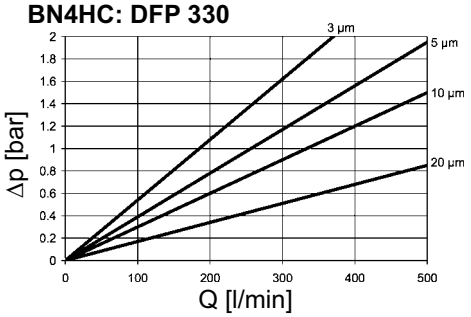

**BN4HC: DFP 240**



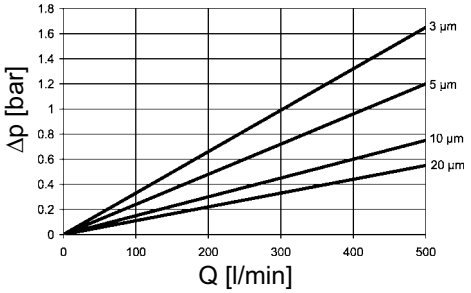

**BN4HC: DFP 280**



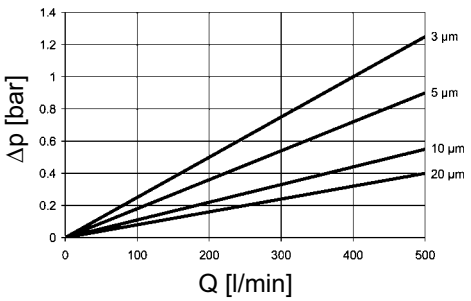

**BN4HC: DFP 330**



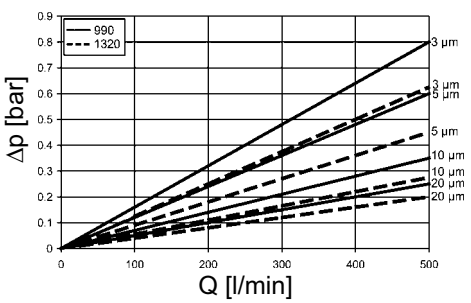

**BN4HC: DFP 500**




**BN4HC: DFP 660**

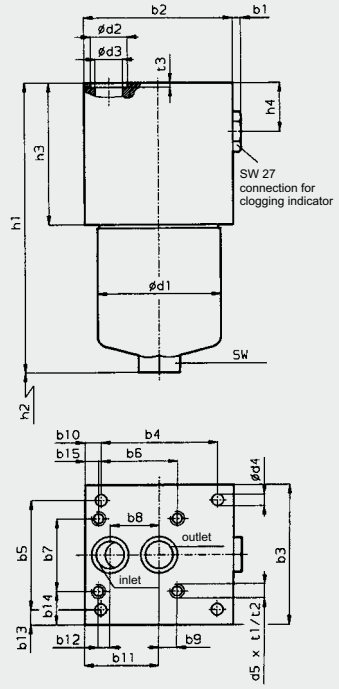



**BN4HC: DFP 990/1320**



## 4. DIMENSIONS

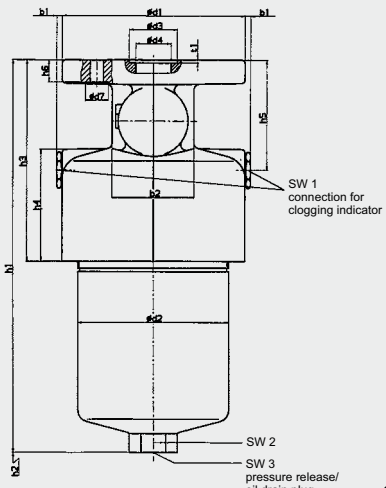
DFP 60 - 280

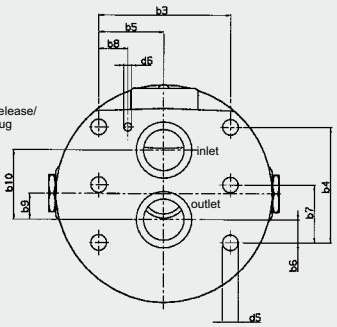


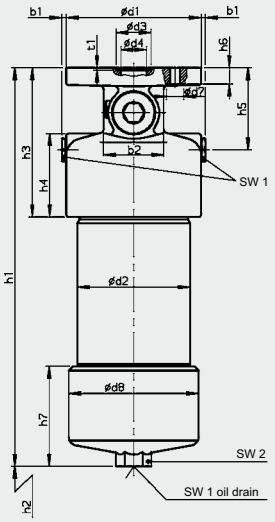




DFP 330 - 1320




| DFP | 60 | 110 | 140 | 160 | 240 | 280 | 330 | 500 | 660 | 990 | 1320 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| b1 | 6 | 6 | 6 | 6 | 6 | 6 | 5 | 5 | 5 | 5 | 5 |
| b2 | 104 | 104 | 104 | 115 | 115 | 115 | 70 | 70 | 70 | 70 | 70 |
| b3 | 80 | 80 | 80 | 110 | 110 | 110 | 96.8 | 96,8 | 96.8 | 96.8 | 96.8 |
| b4 | 89 | 89 | 89 | 90 | 90 | 90 | 84.1 | 84.1 | 84.1 | 84.1 | 84.1 |
| b5 | 31.8 | 31.8 | 31.8 | 86 | 86 | 86 | 48.4 | 48.4 | 48.4 | 48.4 | 48.4 |
| b6 | - | - | - | 61 | 61 | 61 | 16.7 | 16.7 | 16.7 | 16.7 | 16.7 |
| b7 | - | - | - | 57 | 57 | 57 | 42.05 | 42.05 | 42.05 | 42.05 | 42.05 |
| b8 | 31.6 | 31.6 | 31.6 | 38 | 38 | 38 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 |
| b9 | - | - | - | 14 | 14 | 14 | 19 | 19 | 19 | 19 | 19 |
| b10 | 7.5 | 7.5 | 7.5 | 12.5 | 12.5 | 12.5 | 50.7 | 50.7 | 50.7 | 50.7 | 50.7 |
| b11 | 55.9 | 55.9 | 55.9 | 57.5 | 57.5 | 57.5 | - | - | - | - | - |
| b12 | - | - | - | 9 | 9 | 9 | - | - | - | - | - |
| b13 | 24.1 | 24.1 | 24.1 | 12 | 12 | 12 | - | - | - | - | - |
| b14 | - | - | - | 26.5 | 26.5 | 26.5 | - | - | - | - | - |
| b15 | - | - | - | 10.5 | 10.5 | 10.5 | - | - | - | - | - |
| d1 | 68.2 | 68.2 | 68.2 | 95.2 | 95.2 | 95.2 | 158 | 158 | 158 | 158 | 158 |
| d2 | 25.3 | 25.3 | 25.3 | 28.6 | 28.6 | 28.6 | 130 | 130 | 130 | 130 | 130 |
| d3 | 17.5 | 17.5 | 17.5 | 21.4 | 21.4 | 21.4 | 41 | 41 | 41 | 41 | 41 |
| d4 | 8.5 | 8.5 | 8.5 | 9 | 9 | 9 | 30 | 30 | 30 | 30 | 30 |
| d5 | - | - | - | 7/18-14 UNC | 7/18-14 UNC | 7/18-14 UNC | 11.5 | 11.5 | 11.5 | 11.5 | 11.5 |
| d6 | - | - | - | - | - | - | 6 | 6 | 6 | 6 | 6 |
| d7 | - | - | - | - | - | - | 20 | 20 | 20 | 20 | 20 |
| d8 | - | - | - | - | - | - | - | - | - | 152 | 152 |
| h1 | 158.5 | 227.5 | 269.5 | 199.5 | 259.5 | 441.5 | 339.5 | 432.5 | 510.0 | 660.0 | 826.0 |
| h2 | 75 | 75 | 75 | 85 | 85 | 85 | 95 | 95 | 95 | 500 | 670 |
| h3 | 76 | 76 | 76 | 83 | 83 | 83 | 174.5 | 174.5 | 174.5 | 174.5 | 174.5 |
| h4 | 25 | 25 | 25 | 25 | 25 | 25 | 98 | 98 | 98 | 98 | 98 |
| h5 | - | - | - | - | - | - | 96 | 96 | 96 | 96 | 96 |
| h6 | - | - | - | - | - | - | 19 | 19 | 19 | 19 | 19 |
| h7 | - | - | - | - | - | - | - | - | - | 112 | 112 |
| t1 | - | - | - | 13 | 13 | 13 | 2.6 | 2.6 | 2.6 | 2.6 | 2.6 |
| t2 | - | - | - | 18 | 18 | 18 | - | - | - | - | - |
| t3 | 2 | 2 | 2 | 2 | 2 | 2 | - | - | - | - | - |
| SW | 27 | 27 | 27 | 32 | 32 | 32 | - | - | - | - | - |
| SW1 | - | - | - | - | - | - | 27 | 27 | 27 | 27 | 27 |
| SW2 | - | - | - | - | - | - | 36 | 36 | 36 | 36 | 36 |
| SW 3 | - | - | - | - | - | - | 10 | 10 | 10 | 10 | 10 |
| Weight incl. element [kg] | 5.1 | 6.0 | 6.6 | 9.1 | 10.4 | 14.7 | 21.0 | 25.5 | 29.0 | 39.2 | 47.1 |
| Volume of pressure chamber [l] | 0.20 | 0.33 | 0.40 | 0.60 | 0.80 | 1.60 | 1,50 | 2.30 | 3.00 | 4.20 | 5.60 |

## NOTE

The information in this brochure relates to the operating conditions and applications described.

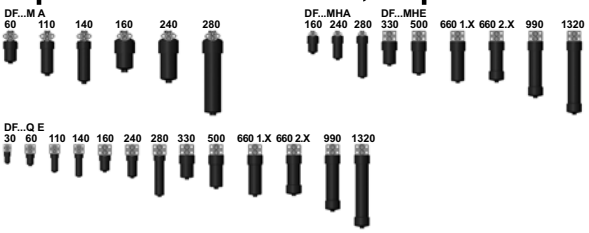
For applications or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.


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# Pressure Filters DF...M A, DF...Q E, DF...MHA, DF...MHE
## Manifold Mounted, Rear Flanged
up to 550 l/min, up to 315 bar




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**
The filter housings are designed in accordance with international regulations. They consist of a filter head with a screw-in filter bowl.
Standard equipment:

- mounting holes in the head
- 2-piece bowl for size DF...990 and above (optional for DF...660)
- oil drain plug with pressure relief (for size DF...330 and above)

### 1.2 FILTER ELEMENTS

Hydac filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

**Contamination retention capacities in g**

| | Betamicron® (BN4HC) | | | |
|---|---|---|---|---|
| DF... | 3 µm | 5 µm | 10 µm | 20 µm |
| 30 | 4.6 | 5.1 | 5.4 | 5.6 |
| 60 | 6.5 | 7.3 | 7.8 | 8.0 |
| 110 | 13.8 | 15.5 | 16.4 | 16.9 |
| 140 | 18.1 | 20.3 | 21.5 | 22.2 |
| 160 | 19.8 | 22.2 | 23.5 | 24.3 |
| 240 | 32.3 | 36.3 | 38.4 | 39.6 |
| 280 | 70.6 | 79.3 | 83.9 | 86.6 |
| 330 | 47.2 | 53.1 | 56.1 | 57.9 |
| 500 | 76.9 | 86.5 | 91.5 | 94.4 |
| 660 | 102.2 | 114.9 | 121.5 | 125.4 |
| 990 | 154.5 | 173.7 | 183.7 | 189.5 |
| 1320 | 209.9 | 236.0 | 249.6 | 257.5 |

| | Betamicron® (BH4HC) | | | |
|---|---|---|---|---|
| DF... | 3 µm | 5 µm | 10 µm | 20 µm |
| 30 | 3.0 | 2.9 | 3.2 | 3.7 |
| 60 | 4.6 | 4.5 | 5.0 | 5.7 |
| 110 | 10.1 | 9.9 | 10.9 | 12.4 |
| 140 | 13.3 | 13.0 | 14.3 | 16.3 |
| 160 | 12.9 | 12.6 | 13.9 | 15.9 |
| 240 | 21.6 | 21.1 | 23.2 | 26.5 |
| 280 | 48.1 | 47.1 | 51.8 | 59.1 |
| 330 | 34.6 | 33.9 | 37.2 | 42.5 |
| 500 | 57.5 | 56.3 | 61.8 | 70.5 |
| 660 | 76.8 | 75.2 | 82.6 | 94.3 |
| 990 | 111.8 | 109.4 | 120.2 | 137.2 |
| 1320 | 153.8 | 150.7 | 165.5 | 188.8 |

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Nominal pressure | DF...M A/MHA/MHE: 250 bar<br>DF...Q E: 315 bar |
| Fatigue strength | $10^6$ load cycles (DF...M A/DF...Q E)<br>$10^8$ load cycles (DF...MHA/DF...MHE)<br>from 0 to nominal pressure<br>(for other pressures see graph, point 1.8) |
| Temperature range | -10 °C to +100 °C<br>(-30 °C to -10 °C: $p_{max}$ = 0.5 x nom.pressure) |
| Material of filter head | EN-GJS-400-15 (DF...M A/DF...Q E)<br>ADI (DF...MHA/DF...MHE) |
| Material of filter bowl | Steel |
| Type of clogging indicator | VD (differential pressure indication up to 420 bar operating pressure) |
| Pressure setting of clogging indicator | 5 bar (others on request) |
| Cracking pressure of bypass (optional) | 6 bar (only DF...M A / Q E) |

Filter elements are available with the following pressure stability values:
Betamicron® (BN4HC): 20 bar
Betamicron® (BH4HC): 210 bar
Wire mesh (W/HC): 20 bar
Stainless steel fibre (V): 210 bar

### 1.4 SEALS
NBR (= Perbunan)

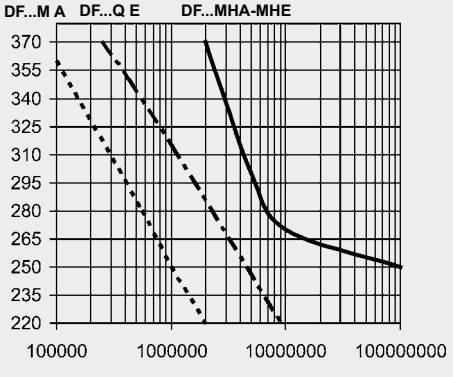
### 1.5 MOUNTING
As pressure filter for manifold block mounting

### 1.6 SPECIAL MODELS AND ACCESSORIES

- Bypass valve in head sited away from main flow
- Seals in FPM, EPDM
- Test and inspection certificates

### 1.7 SPARE PARTS
See Original Spare Parts List

### 1.8 FATIGUE STRENGTH

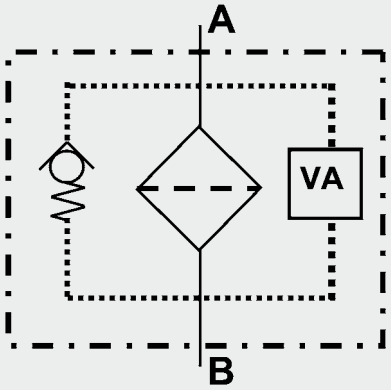



### 1.9 CERTIFICATES AND APPROVALS
On request

### 1.10 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Non-flam operating fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

**Symbol for hydraulic systems**




VA = clogging indicator

## 2. MODEL CODE (also order example)

DF BN/HC 240 M H A 10 D 1 . X /-L24

### 2.1. COMPLETE FILTER

**Filter type**
DF... manifold mounted, rear flanged

**Filter material of element**
BN/HC Betamicron® (BN4HC)
BH/HC Betamicron® (BH4HC)
W/HC Stainless steel wire mesh
V Stainless steel fibre

**Size of filter or element**
M A: 60, 110, 140, 160, 240, 280
Q E: 30, 60, 110, 140, 160, 240, 280, 330, 500, 660, 990, 1320
MHA: 160, 240, 280
MHE: 330, 500, 660, 990, 1320

**Operating pressure**
M = 250 bar
Q = 315 bar

**Applicaton**
no details: $10^6$ load cycles
H: high dynamic for $10^8$ load cycles (only for DF...MHA / DF...MHE)

**Type and size of connection**
A 2 mounting holes
E 4 mounting holes

**Filtration rating in µm**
BN4HC, BH4HC, V: 3, 5, 10, 20
W/HC: 25, 50, 100, 200

**Type of clogging indicator**
Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
] for other clogging indicators see brochure no. E 7.050../..

**Type code**
1 one-piece filter bowl (up to size 660)
2 two-piece filter bowl (from size 660 and above)

**Modification number**
X the latest version is always supplied

**Supplementary details**
B. bypass cracking pressure (e.g. B6 = 6 bar; only possible for DF...M A / DF...Q E)
L... light with appropriate voltage (24V, 48V, 110V, 220V) ] only for clogging
LED 2 light emitting diodes up to 24 Volt ] indicators Type D
OAI outlet above inlet (only for DF...160, 240, 280 Q E)
SO184 pressure release/oil drain screw (only for DF...60-240)
SO348 for operating pressure $p_{max} \leq 210$ bar (type of clogging indicator = VM)
V FPM seals
W suitable for HFA and HFC emulsions

### 2.2 REPLACEMENT ELEMENT

0240 D 010 BN4HC /-V

**Size**
0030, 0060, 0110, 0140, 0160, 0240, 0280, 0330, 0500, 0660, 0990, 1320

**Type**
D

**Filtration rating in µm**
BN4HC, BH4HC, V: 003, 005, 010, 020
W/HC: 025, 050, 100, 200

**Filter material**
BN4HC, BH4HC, V, W/HC

**Supplementary details**
V, W (for descriptions, see point 2.1)

### 2.3 REPLACEMENT CLOGGING INDICATOR

VD 5 D . X /-L24

**Type**
VD differential pressure indicator up to 420 bar operating pressure
VM differential pressure indicator up to 210 bar operating pressure (only in conjunction with SO348)

**Pressure setting**
5 5 bar standard, others on request

**Type of clogging indicator**
D (see point 2.1)

**Modification number**
X the latest version is always supplied

**Supplementary details**
L..., LED, V, W (for descriptions, see point 2.1)

## 3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see point 3.1)

$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see point 3.2)

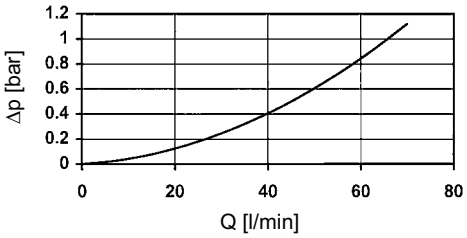
For ease of calculation, our Filter Sizing Program is available on request free of charge.

**NEW:** Sizing online at www.hydac.com

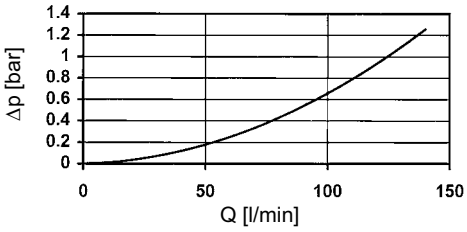
### 3.1 Δp-Q HOUSING GRAPHS BASED ON ISO 3968

The housing graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

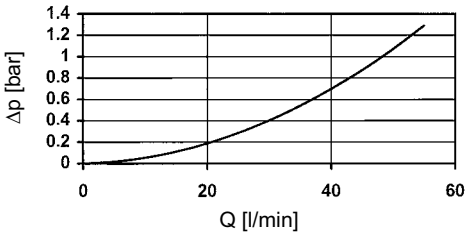
**DF 60, 110, 140 M A**



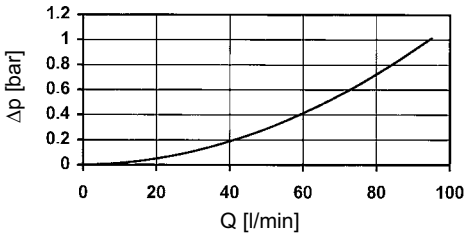

**DF 160, 240, 280 M A / MHA**



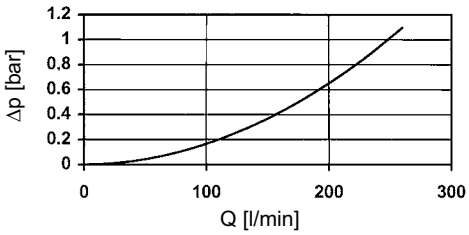

**DF 30 Q E**



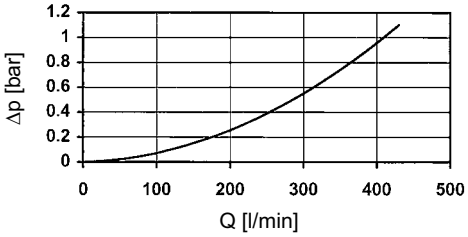

**DF 60, 110, 140 QE**




**DF 160, 240, 280 Q E (also /-OAI)**




**DF 330, 500, 660, 990, 1320 Q E / MHE**

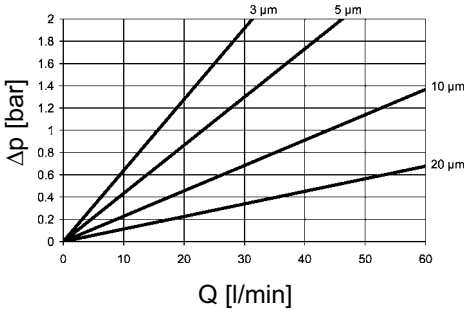


## 3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

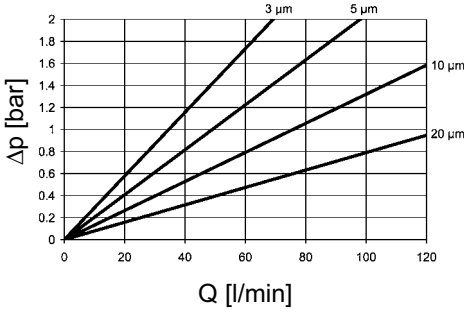
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 $mm^2/s$. The pressure drop changes proportionally to the change in viscosity.

| DF... | V | | | | W/HC | BH4HC | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 3 µm | 5 µm | 10 µm | 20 µm | – | 3 µm | 5 µm | 10 µm | 20 µm |
| 30 | 18.4 | 13.5 | 7.5 | 3.6 | 3.030 | 91.2 | 50.7 | 36.3 | 19.0 |
| 60 | 16.0 | 9.3 | 5.4 | 3.3 | 0.757 | 58.6 | 32.6 | 18.1 | 12.2 |
| 110 | 8.2 | 5.6 | 3.3 | 2.2 | 0.413 | 25.4 | 14.9 | 8.9 | 5.6 |
| 140 | 5.8 | 4.8 | 3.1 | 2.3 | 0.324 | 19.9 | 11.3 | 8.1 | 4.3 |
| 160 | 4.6 | 3.2 | 2.3 | 1.4 | 0.284 | 16.8 | 10.4 | 5.9 | 4.4 |
| 240 | 3.1 | 2.5 | 1.7 | 1.1 | 0.189 | 10.6 | 6.8 | 3.9 | 2.9 |
| 280 | 2.3 | 1.7 | 1.2 | 0.8 | 0.162 | 5.7 | 3.4 | 1.8 | 1.6 |
| 330 | 2.2 | 1.8 | 1.2 | 0.8 | 0.138 | 7.7 | 4.5 | 2.8 | 2.0 |
| 500 | 1.5 | 1.2 | 0.8 | 0.5 | 0.091 | 4.2 | 2.6 | 1.5 | 1.2 |
| 660 | 1.1 | 0.9 | 0.6 | 0.4 | 0.069 | 3.3 | 1.9 | 1.0 | 0.9 |
| 990 | 0.8 | 0.6 | 0.4 | 0.3 | 0.046 | 2.2 | 1.3 | 0.8 | 0.6 |
| 1320 | 0.6 | 0.5 | 0.3 | 0.2 | 0.035 | 1.6 | 1.0 | 0.6 | 0.4 |

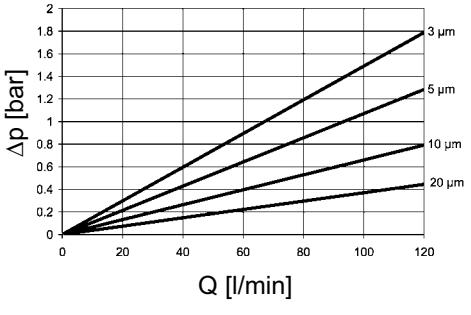
### BN4HC: DF... 30



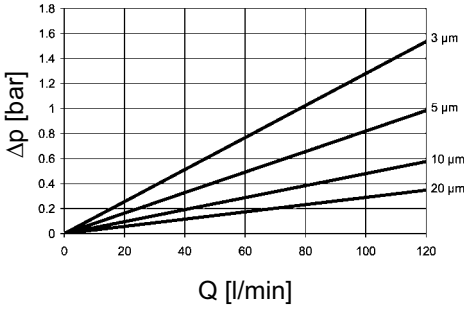

### BN4HC: DF... 60



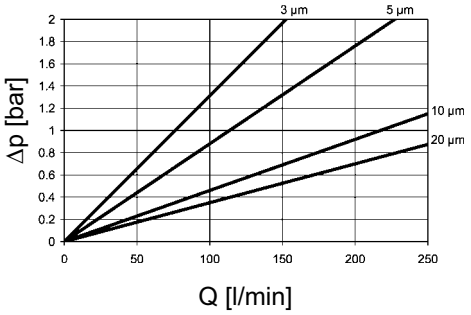

### BN4HC: DF... 110



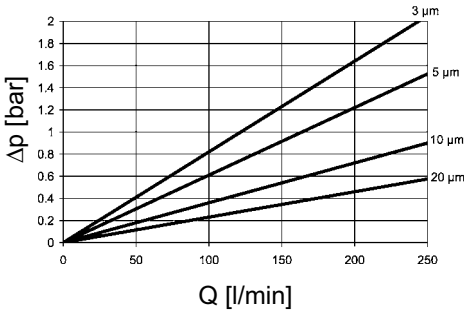

### BN4HC: DF... 140



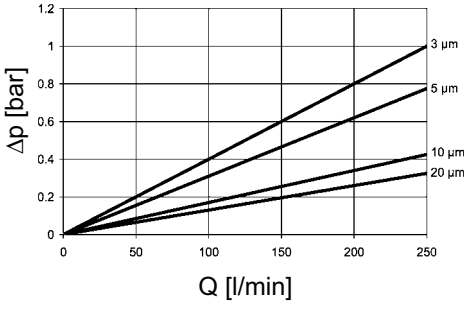

### BN4HC: DF... 160



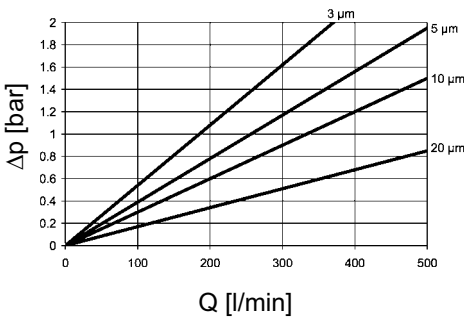

### BN4HC: DF... 240



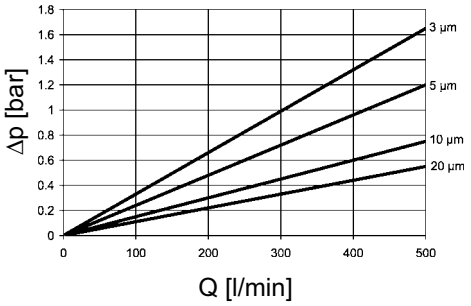

### BN4HC: DF... 280



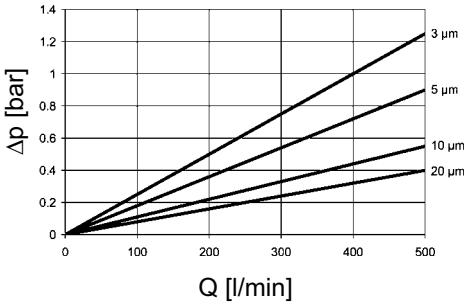

### BN4HC: DF... 330



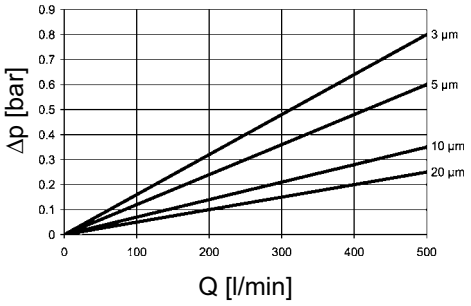

### BN4HC: DF... 500



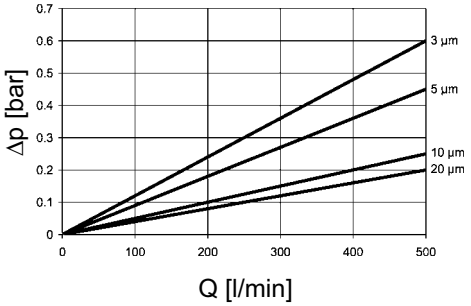

### BN4HC: DF... 660




### BN4HC: DF... 990

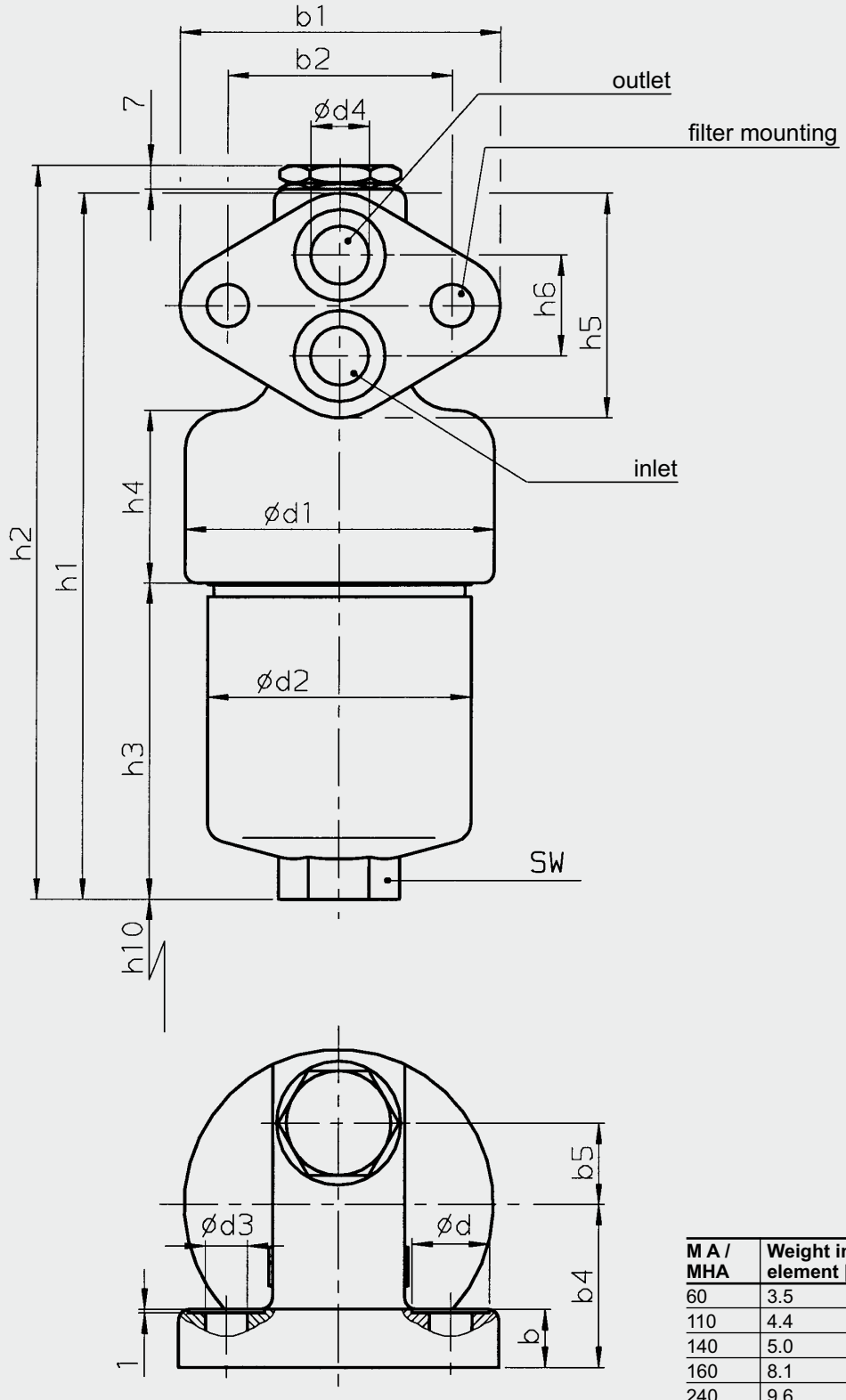



### BN4HC: DF... 1320



## 4. DIMENSIONS

DF... M A: Size 60 - 280
DF... MHA: Size 160 - 280

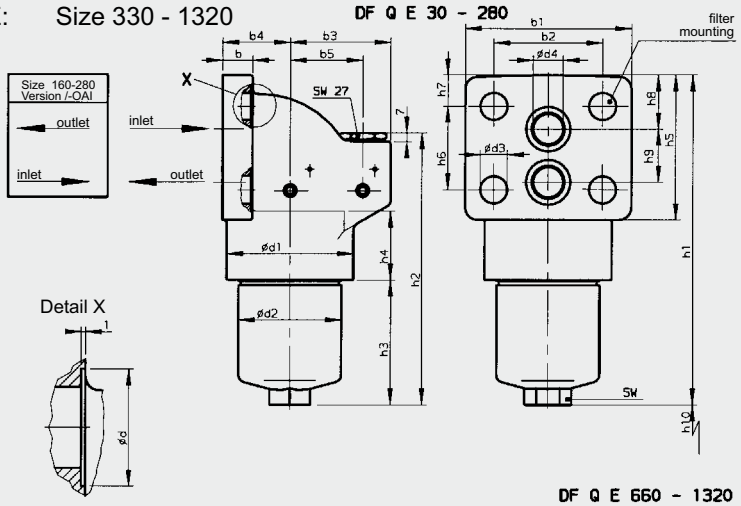


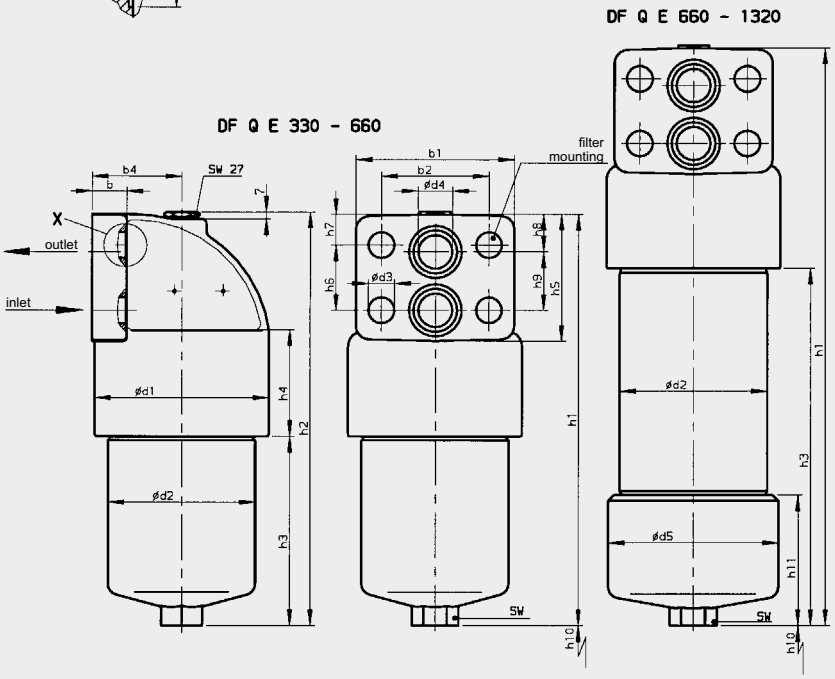

| M A / MHA | Weight incl. element [kg] | Vol. of pressure chamber [l] |
|---|---|---|
| 60 | 3.5 | 0.20 |
| 110 | 4.4 | 0.33 |
| 140 | 5.0 | 0.40 |
| 160 | 8.1 | 0.60 |
| 240 | 9.6 | 0.80 |
| 280 | 14.2 | 1.60 |

| M A / MHA | b | b1 | b2 | b3 | b4 | b5 | d | d1 | d2 | d3 | d4 | d5 | h1 | h2 | h3 | h4 | h5 | h6 | h7 | h8 | h9 | h10 | h11 | SW | O-ring[1)] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 60 | 15 | 83 | 58 | - | 42 | 21 | 20 | 80 | 68 | 11 | 15 | - | 185 | 192 | 83 | 45 | 58 | 26 | - | - | - | 75 | - | 27 | 19 x 2.5 |
| 110 | 15 | 83 | 58 | - | 42 | 21 | 20 | 80 | 68 | 11 | 15 | - | 252.5 | 259.5 | 150.5 | 45 | 58 | 26 | - | - | - | 75 | - | 27 | 19 x 2.5 |
| 140 | 15 | 83 | 58 | - | 42 | 21 | 20 | 80 | 68 | 11 | 15 | - | 296 | 303 | 194 | 45 | 58 | 26 | - | - | - | 75 | - | 27 | 19 x 2.5 |
| 160 | 20 | 83 | 58 | - | 60 | 26 | 20 | 116 | 95 | 13.5 | 15 | - | 232 | 239 | 107 | 79 | 58 | 26 | - | - | - | 85 | - | 32 | 19 x 2.5 |
| 240 | 20 | 83 | 58 | - | 60 | 26 | 20 | 116 | 95 | 13.5 | 15 | - | 292 | 299 | 167 | 79 | 58 | 26 | - | - | - | 85 | - | 32 | 19 x 2.5 |
| 280 | 20 | 83 | 58 | - | 60 | 26 | 20 | 116 | 95 | 13.5 | 15 | - | 474 | 481 | 349 | 79 | 58 | 26 | - | - | - | 85 | - | 32 | 19 x 2.5 |

[1)] supplied

DF... Q E: Size 30 - 1320
DF... MHE: Size 330 - 1320




| Q E / MHE | Weight incl. element [kg] | Vol. of pressure chamber [l] |
|---|---|---|
| 30 | 2.9 | 0.13 |
| 60 | 5.2 | 0.20 |
| 110 | 6.1 | 0.33 |
| 140 | 6.7 | 0.40 |
| 160 3) | 9.6 | 0.60 |
| 240 3) | 11.6 | 0.80 |
| 280 3) | 15.9 | 1.60 |
| 330 | 22.9 | 1.50 |
| 500 | 27.3 | 2.30 |
| 660 | 30.9 | 3.00 |
| 660 2) | 34.1 | 3.00 |
| 990 2) | 42.1 | 4.20 |
| 1320 2) | 50.3 | 5.60 |
| **Q E /-OAI** | **Weight incl. element [kg]** | **Vol. of pressure chamber [l]** |
| 160 | 10.7 | 0.60 |
| 240 | 12.7 | 0.80 |
| 280 | 17.0 | 1.60 |

| Q E / MHE | b | b1 | b2 | b3 | b4 | b5 | d | d1 | d2 | d3 | d4 | d5 | h1 | h2 | h3 | h4 | h5 | h6 | h7 | h8 | h9 | h10 | h11 | SW | O-ring[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30 | 18 | 80 | 57 | 56 | 37 | 38 | 20 | 67 | 52 | 13 | 14 | - | 197 | 176 | 78 | 48 | 76 | 45 | 15.5 | 30.5 | 28 | 75 | - | 24 | 18 x 2.5 |
| 60 | 20 | 110 | 72 | 66 | 45 | 48 | 26 | 84 | 68 | 18 | 20 | - | 217 | 181 | 83 | 45.5 | 94 | 55 | 19.5 | 34.5 | 35 | 75 | - | 27 | 24 x 3 |
| 110 | 20 | 110 | 72 | 66 | 45 | 48 | 26 | 84 | 68 | 18 | 20 | - | 284 | 248 | 150 | 45.5 | 94 | 55 | 19.5 | 34.5 | 35 | 75 | - | 27 | 24 x 3 |
| 140 | 20 | 110 | 72 | 66 | 45 | 48 | 26 | 84 | 68 | 18 | 20 | - | 328 | 292 | 194 | 45.5 | 94 | 55 | 19.5 | 34.5 | 35 | 75 | - | 27 | 24 x 3 |
| 160 3) | 30 | 140 | 95 | 89 | 59 | 69 | 32 | 116 | 95 | 22 | 32 | - | 280 | 222 | 117 | 61 | 110 | 60 | 25 | 31 | 52 | 85 | - | 32 | 40 x 3.5 |
| 240 3) | 30 | 140 | 95 | 89 | 56 | 69 | 32 | 116 | 95 | 22 | 32 | - | 340 | 282 | 177 | 61 | 110 | 60 | 25 | 31 | 52 | 85 | - | 32 | 40 x 3.5 |
| 280 3) | 30 | 140 | 95 | 89 | 59 | 69 | 32 | 116 | 95 | 22 | 32 | - | 522 | 464 | 359 | 61 | 110 | 60 | 25 | 31 | 52 | 85 | - | 32 | 40 x 3.5 |
| 330 | 30 | 140 | 95 | - | 79.5 | - | 32 | 154 | 130 | 23 | 30 | - | 353 | 357 | 157 | 94 | 110 | 58 | 26 | 32 | 52 | 115 | - | 36 | 40 x 3.5 |
| 500 | 30 | 140 | 95 | - | 79.5 | - | 32 | 154 | 130 | 23 | 30 | - | 446 | 450 | 250 | 94 | 110 | 58 | 26 | 32 | 52 | 115 | - | 36 | 40 x 3.5 |
| 660 | 30 | 140 | 95 | - | 79.5 | - | 32 | 154 | 130 | 23 | 30 | - | 523 | 527 | 329 | 94 | 110 | 58 | 26 | 32 | 52 | 115 | - | 36 | 40 x 3.5 |
| 660 2) | 30 | 140 | 95 | - | 79.5 | - | 32 | 154 | 132 | 23 | 30 | 152 | 517 | 521 | 321 | 94 | 110 | 58 | 26 | 32 | 52 | 350 | 112 | 36 | 40 x 3.5 |
| 990 2) | 30 | 140 | 95 | - | 79.5 | - | 32 | 154 | 132 | 23 | 30 | 152 | 673 | 677 | 477 | 94 | 110 | 58 | 26 | 32 | 52 | 500 | 112 | 36 | 40 x 3.5 |
| 1320 2) | 30 | 140 | 95 | - | 79.5 | - | 32 | 154 | 132 | 23 | 30 | 152 | 839 | 843 | 643 | 94 | 110 | 58 | 26 | 32 | 52 | 670 | 112 | 36 | 40 x 3.5 |
| **Q E /-OAI** | **b** | **b1** | **b2** | **b3** | **b4** | **b5** | **d** | **d1** | **d2** | **d3** | **d4** | **d5** | **h1** | **h2** | **h3** | **h4** | **h5** | **h6** | **h7** | **h8** | **h9** | **h10** | **h11** | **SW** | **O-ring[1]** |
| 160 | 30 | 140 | 95 | 83 | 84 | 59 | 32 | 116 | 95 | 22 | 32 | - | 284 | 239 | 119 | 64 | 110 | 58 | 26 | 31 | 52 | 85 | - | 32 | 40 x 3.5 |
| 240 | 30 | 140 | 95 | 83 | 84 | 59 | 32 | 116 | 95 | 22 | 32 | - | 344 | 299 | 179 | 64 | 110 | 58 | 26 | 31 | 52 | 85 | - | 32 | 40 x 3.5 |
| 280 | 30 | 140 | 95 | 83 | 84 | 59 | 32 | 116 | 95 | 22 | 32 | - | 526 | 481 | 361 | 64 | 110 | 58 | 26 | 31 | 52 | 85 | - | 32 | 40 x 3.5 |

[1] supplied / [2] 2-piece bowl version / [3] not OAI (outlet above inlet)

## NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

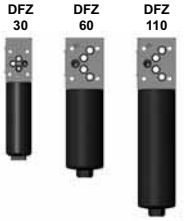
Subject to technical modifications.


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# Pressure Filter for Sandwich Stacking DFZ

up to 80 l/min, up to 315 bar




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. They consist of a filter head with a screw-in filter bowl.

Standard equipment:

- Service access on the right
- Without clogging indicator

### 1.2 FILTER ELEMENTS

Hydac filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

**Contamination retention capacities in g**

| | Betamicron® (BN4HC) | | | |
|---|---|---|---|---|
| DFZ | 3 µm | 5 µm | 10 µm | 20 µm |
| 30 | 4.6 | 5.1 | 5.4 | 5.6 |
| 60 | 6.5 | 7.3 | 7.8 | 8.0 |
| 110 | 13.8 | 15.5 | 16.4 | 16.9 |

| | Betamicron® (BH4HC) | | | |
|---|---|---|---|---|
| DFZ | 3 µm | 5 µm | 10 µm | 20 µm |
| 30 | 3.0 | 2.9 | 3.2 | 3.7 |
| 60 | 4.6 | 4.5 | 5.0 | 5.7 |
| 110 | 10.1 | 9.9 | 10.9 | 12.4 |

Filter elements are available with the following pressure stability values:

| | |
|---|---|
| Betamicron® (BN4HC): | 20 bar |
| Betamicron® (BH4HC): | 210 bar |
| Stainless steel fibre (V): | 210 bar |

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Nominal pressure | 315 bar |
| Fatigue strength | at nominal pressure $10^6$ load cycles from 0 to nominal pressure |
| Temperature range | -30 °C up to +100 °C<br>(-30 °C up to -10 °C: $p_{max}$= 157.5 bar) |
| Material of filter head | Steel |
| Material of filter bowl | Steel |
| Type of clogging indicator | VD (differential pressure indication up to 420 bar operating pressure) |
| Setting pressure of clogging indicator | 8 bar (others on request) |

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 MOUNTING

As pressure filter for sandwich stacking

### 1.6 SPECIAL MODELS AND ACCESSORIES

On request

### 1.7 SPARE PARTS

See Original Spare Parts List

### 1.8 CERTIFICATES AND APPROVALS

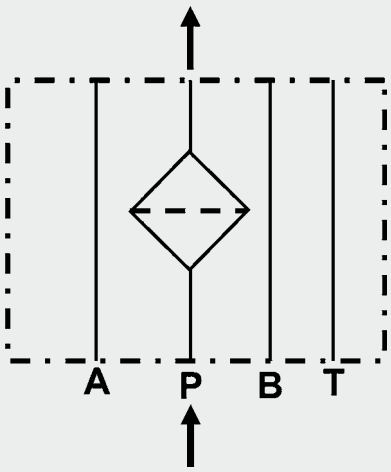
On request

### 1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

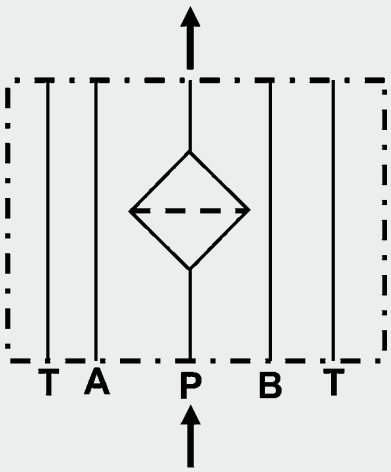
- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Non-flam operating fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

**Symbol for hydraulic systems**

**DFZ 30**




**DFZ 60/110**



## 2. MODEL CODE (ALSO ORDER EXAMPLE)

### 2.1 COMPLETE FILTER

**DFZ BN/HC 60 Q C 10 D 1 . X /-L24**

**Filter type**
DFZ

**Filter material of element**
BN/HC Betamicron® (BN4HC)
BH/HC Betamicron® (BH4HC)
V Stainless steel fibre

**Size of filter of element**
DFZ: 30, 60, 110

**Operating pressure**
Q = 315 bar

**Type and size of port**

| Type | Port | Filter size | | |
|---|---|---|---|---|
| | | 30 | 60 | 110 |
| B | 4 ports<br>A 6 DIN 24340/<br>Cetop R 35 H | ● | | |
| C | 5 ports<br>A 10 DIN 24340/<br>Cetop R 35 H | | ● | ● |

**Filtration rate in µm**
BN4HC, BH4HC, V: 3, 5, 10, 20

**Type of clogging indicator**
Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
BM visual
C electrical
D visual and electrical
] for other clogging indicators see brochure no. E 7.050../..

**Type code**
1

**Modification number**
X the latest version is always supplied

**Supplementary details**
L... light with appropriate voltage (24V, 48V, 110V, 220V)
LED 2 light emitting diodes up to 24 Volt
] only for clogging indicators Type D
V FPM seals
W suitable for HFA and HFC emulsions
1 service access on the left

### 2.2 REPLACEMENT ELEMENT

**0060 D 010 BN4HC /-V**

**Size**
0030, 0060, 0110

**Type**
D

**Filtration rate in µm**
BN4HC, BH4HC, V: 003, 005, 010, 020

**Filter material**
BN4HC, BH4HC, V

**Supplementary details**
V, W (for descriptions, see point 2.1)

### 2.3 REPLACEMENT CLOGGING INDICATOR

**VD 8 D . X /-L24**

**Type**
VD differential pressure indicator up to 420 bar operating pressure

**Pressure setting**
8 8 bar standard, others on request

**Type of clogging indicator**
D (see point 2.1 )

**Modification number**
X the latest version is always supplied

**Supplementary details**
L..., LED, V, W (for descriptions, see point 2.1)

# 3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see point 3.1)

$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see point 3.2)

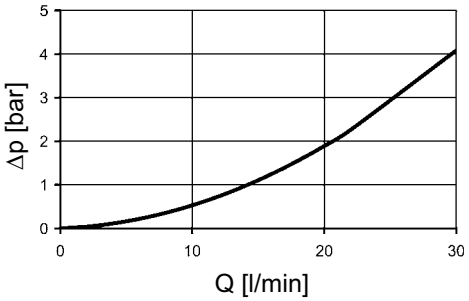
For ease of calculation, our Filter Sizing Program is available on request free of charge.

**NEW:** Sizing online at www.hydac.com

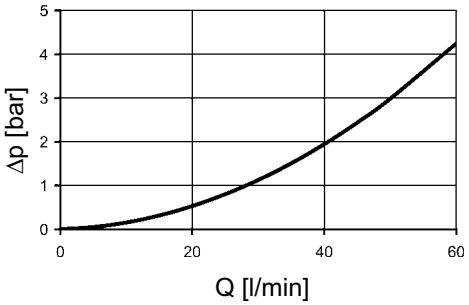
## 3.1 Δp-Q HOUSING GRAPHS BASED ON ISO 3968

The housing graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

**DFZ 30**




**DFZ 60/110**

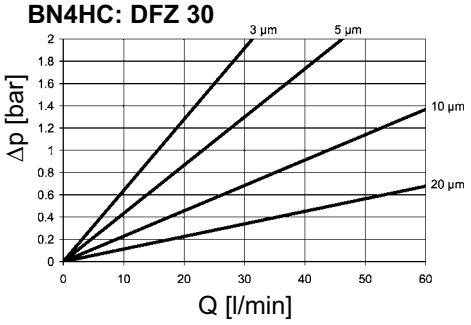



## 3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

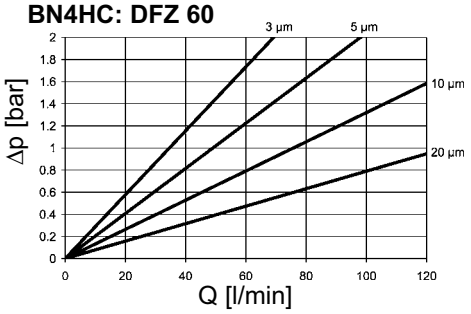
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

| DFZ | V | | | | BH4HC | | | |
|---|---|---|---|---|---|---|---|---|
| | 3 µm | 5 µm | 10 µm | 20 µm | 3 µm | 5 µm | 10 µm | 20 µm |
| 30 | 18.4 | 13.5 | 7.5 | 3.6 | 91.2 | 50.7 | 36.3 | 19.0 |
| 60 | 16.0 | 9.3 | 5.4 | 3.3 | 58.6 | 32.6 | 18.1 | 12.2 |
| 110 | 8.2 | 5.6 | 3.3 | 2.2 | 25.4 | 14.9 | 8.9 | 5.6 |

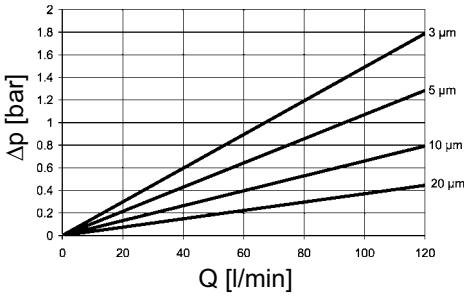
**BN4HC: DFZ 30**




**BN4HC: DFZ 60**

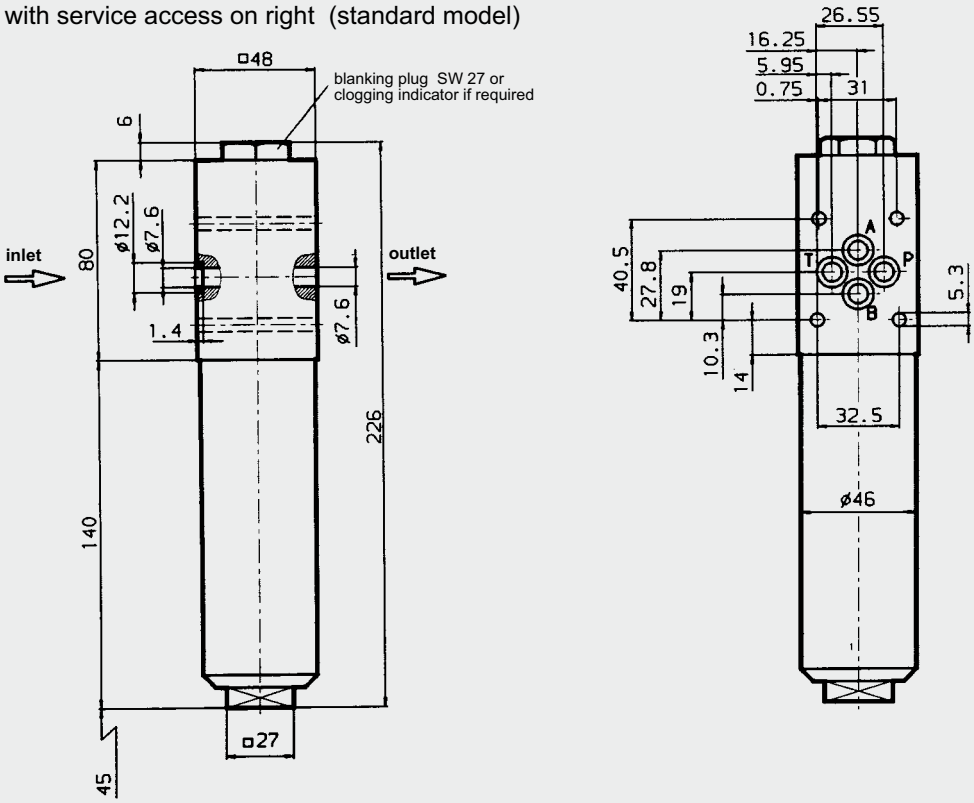



**BN4HC: DFZ 110**

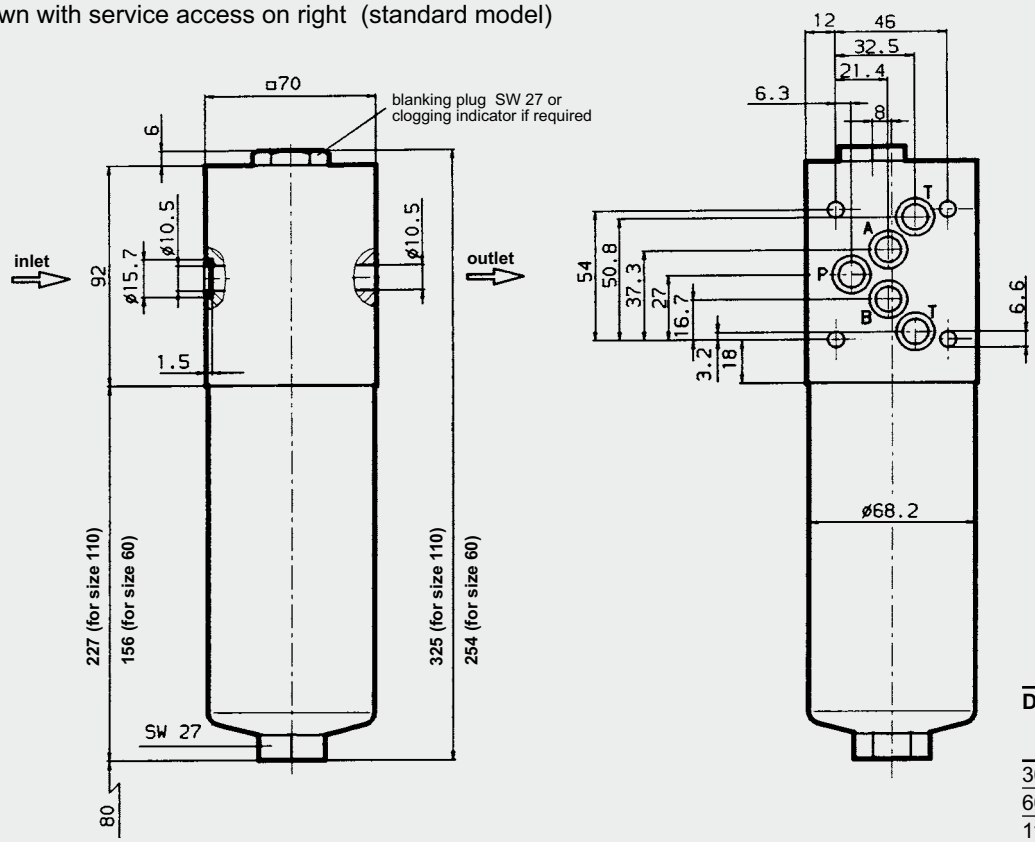


## 4. DIMENSIONS

DFZ 30
shown with service access on right (standard model)




DFZ 60/110
shown with service access on right (standard model)




| DFZ | Weight incl. elem. [kg] | Vol. of pressure chamber [l] |
|---|---|---|
| 30 | 2.4 | 0.13 |
| 60 | 5.9 | 0.20 |
| 110 | 6.8 | 0.33 |

## NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.


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# Inline Filter LPF...D A Manifold Mounted, Rear Flanged

up to 160 l/min, up to 25 bar




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. They consist of a filter head and a screw-in filter bowl.

Standard equipment:

- with bypass valve
- connection for a clogging indicator

### 1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

**Contamination retention capacities in g**

| | Betamicron® (BN4HC) | | | |
|---|---|---|---|---|
| LPF...D A | 3 µm | 5 µm | 10 µm | 20 µm |
| 160 | 19.8 | 22.2 | 23.5 | 24.3 |

Filter elements are available with the following pressure stability values:

Betamicron® (BN4HC): 20 bar
Wire mesh (W/HC): 20 bar

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Nominal pressure | 25 bar |
| Fatigue strength | at nominal pressure $10^6$ load cycles from 0 to nominal pressure |
| Temperature range | -30 °C to +100 °C |
| Material of filter head | aluminium |
| Material of filter bowl | aluminium |
| Type of clogging indicator | VM (differential pressure indicator up to 210 bar operating pressure) |
| Pressure setting of clogging indicator | 5 bar (others on request) |
| Cracking pressure of bypass valve | 3.5 bar (others on request) |

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 MOUNTING

As inline filter

### 1.6 SPECIAL MODELS AND ACCESSORIES

- without bypass valve
- without port for clogging indicator
- with bowl locking clip

### 1.7 SPARE PARTS

See Original Spare Parts List

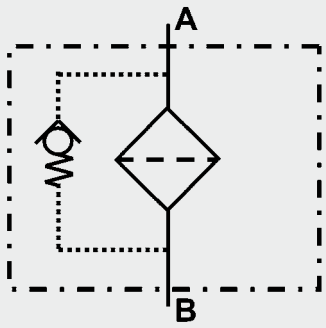
### 1.8 CERTIFICATES AND APPROVALS

On request

### 1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Non-flam operating fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

**Symbol for hydraulic systems**



## 2. MODEL CODE (also order example)

LPF BN/HC 160 D A 10 D 1 . X /-L24

### 2.1 COMPLETE FILTER

**Filter type**
LPF

**Filter material of element**
BN/HC Betamicron® (BN4HC)
W/HC Stainless steel wire mesh

**Size of filter or element**
LPF..DA: 160 (Sizes 240 and 280 on request!)

**Operating pressure**
D = 25 bar

**Type and size of port**
A 2 mounting bores

**Filtration rating in µm**
BN4HC : 3, 5, 10, 20
W/HC : 25, 50, 100, 200

**Type of clogging indicator**
W without port for clogging indicator
Y plastic blanking plug in indicator port
A with steel blanking plug in indicator port
B visual indicator
C electrical indicator
D visual and electrical indicator

for other clogging indicators, see brochure no. E 7.050.../...

**Type code**
1

**Modification number**
X the latest version is always supplied

**Supplementary details**
B. cracking pressure of bypass valve (e. g.: B3.5 = 3.5 bar); no details = without bypass valve
GS bowl locking clip
L... light with appropriate voltage (24, 48, 110, 220 Volt)
LED 2 light emitting diodes up to 24 Volt
V FPM seals
W suitable for HFA and HFC emulsions

only for clogging indicators type "D"

### 2.2 REPLACEMENT ELEMENT

0160 D 010 BN4HC /-V

**Size**
0160

**Type**
D

**Filtration rating in µm**
BN4HC : 003, 005, 010, 020
W/HC : 025, 050, 100, 200

**Filter material**
BN4HC, W/HC

**Supplementary details**
V (for descriptions, see point 2.1)

### 2.3 REPLACEMENT CLOGGING INDICATOR

VM 5 D . X /-L24

**Type**
VM differential pressure indicator up to 210 bar operating pressure

**Pressure setting**
5 standard 5 bar, others on request

**Type of clogging indicator**
D (see point 2.1 )

**Modification number**
X the latest version is always supplied

**Supplementary details**
L..., LED, V, W (for descriptions, see point 2.1)

# 3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see point 3.1)

$\Delta p_{Element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

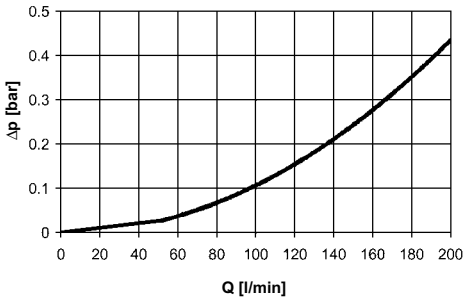
(*see point 3.2)

For ease of calculation, our Filter Sizing Program is available on request free of charge.
**NEW**: Sizing online at www.hydac.com

## 3.1 ΔP-Q HOUSING GRAPHS BASED ON ISO 3968

The housing graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

### LPF 160

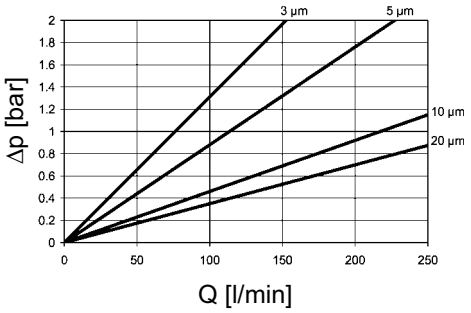



## 3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

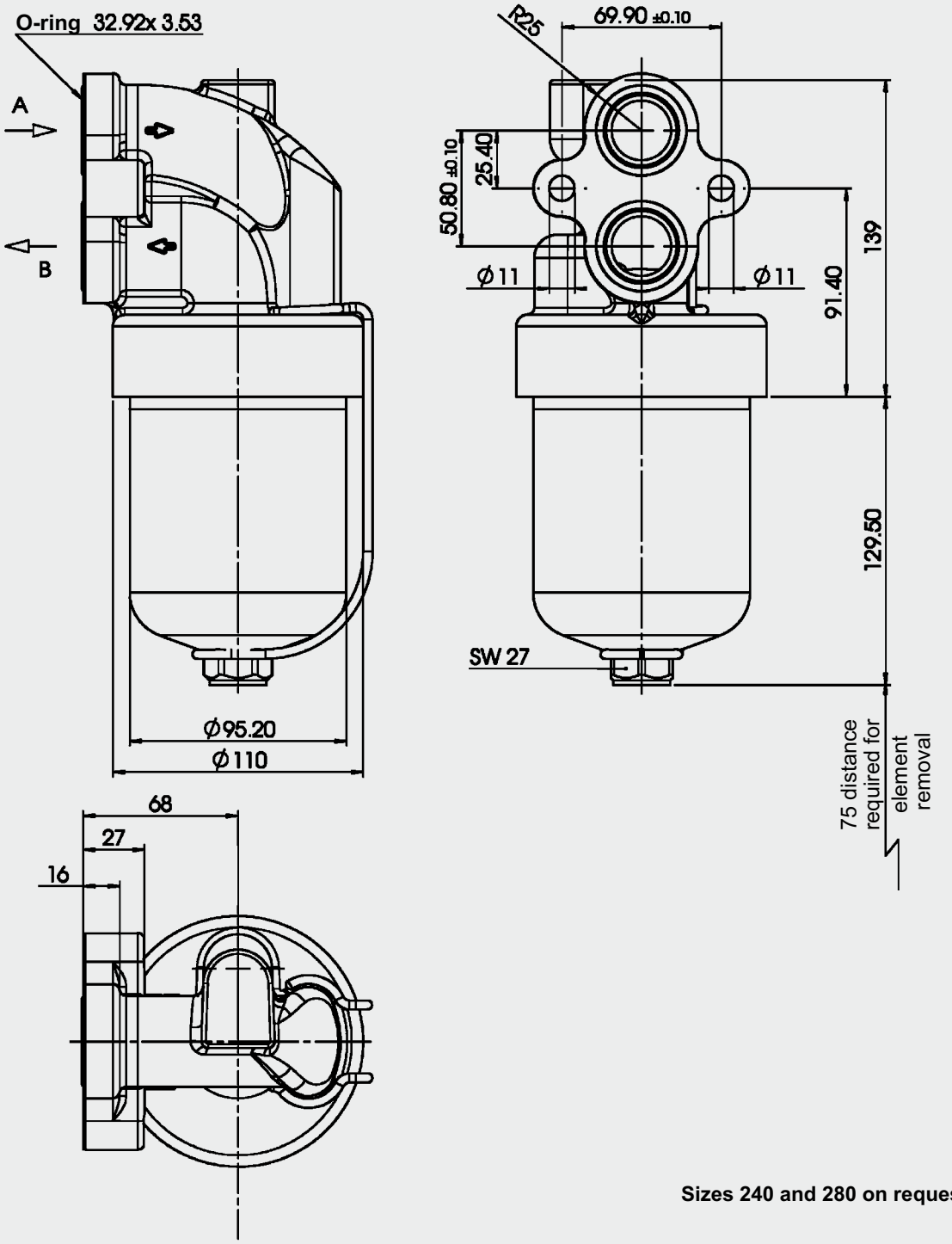
| LPF... | BN4HC | | | | W/HC |
|---|---|---|---|---|---|
| | 3 µm | 5 µm | 10 µm | 20 µm | – |
| 160 | 13.1 | 8.8 | 4.6 | 3.5 | 0.28 |

### BN4HC: LPF 160



## 4. DIMENSIONS

LPF 160...D A (SHOWN WITH BOWL LOCKING CLIP)




**Sizes 240 and 280 on request!**

| LPF... D A | Weight incl. element [kg] | Volume of pressure chamber [l] |
|---|---|---|
| 160 | 2.30 | 0.60 |

## NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

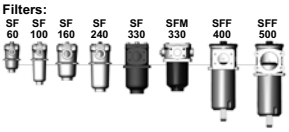
Subject to technical modifications.

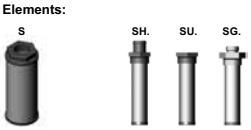

HYDAC **Filtertechnik GmbH**
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Tel.: 0 68 97 / 509-01
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# Suction Filter SF/SFM/SFF and Suction Filter Elements S and S..

up to 500 l/min




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. The SF filters consist of a filter housing and a bolt-on cover plate. The SFM and SFF filters consist of a filter head with filter bowl and bolt-on cover plate (on the SFF there is an automatic shut-off valve at the base of the filter bowl).

Standard equipment:

- with bypass valve
- connection for a clogging indicator

### 1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

The suction elements S are designed to be screwed into the suction line on pumps or inside tanks.
The suction filter elements S.. are designed to be mounted simply onto the outside of the tank. Hoses and fittings must be supported to avoid any load on the connection. Elements can be changed very simply.

It is essential that suction filter elements are always installed well below the minimum oil level.

Standard equipment:

- without bypass valve

Filter elements are available with the following pressure stability values:

| | |
|---|---|
| Paper (P): | 5 bar |
| Wire mesh(W): | 5 bar |

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Nominal pressure | suction operation |
| Temperature range | -10 °C to+100 °C |
| Material of SF filter | Cover plate: aluminium<br>Housing: aluminium |
| Material of SFM filter | Cover plate: aluminium<br>Filter head: aluminium<br>Filter bowl: polyamide |
| Material of SFF filter | Cover plate: GGG40 (SG Iron)<br>Filter head: aluminium<br>Filter bowl: steel |
| Material of S elements | Filter mesh: wire mesh<br>End caps: polyamide<br>Central tube: steel plate, zinc plated |
| Material of S.. elements | Filter mesh: wire mesh<br>End caps: on request<br>Central tube: on request |
| Type of clogging indicator | VR connection thread G ½<br>V1/4 conn. thread NPT (SFF only) |
| Pressure setting of clogging indicator | 0.2 to 2 bar (others on request) |
| Cracking pressure of bypass valve | 0.25 bar (SFF filter)<br>0.3 bar (SF and SFM filter)<br>(others on request) |
| Cracking pressure of bypass valve for suction filter elements S (optional) | 0.2 bar |

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 MOUNTING

As tank-top or inline filter.

### 1.6 SPECIAL MODELS AND ACCESSORIES

On request

### 1.7 SPARE PARTS

See Original Spare Parts List

### 1.8 CERTIFICATES AND APPROVALS

On request

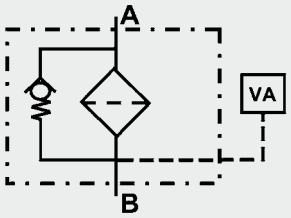
### 1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Non-flam operating fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50%) on request

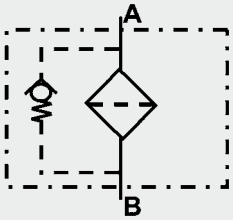
### 1.10 IMPORTANT INFORMATION

- Filter housing must be earthed
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

**Symbol for hydraulic systems SF, SFM, SFF**




**S elements**



## 2. MODEL CODE (also order example)

**SF W 330 W L 10 UE 1 . X /-V**

### 2.1 COMPLETE FILTER

**Filter type**
SF, SFM, SFF

**Filter material of element**
P paper (not for SFF)
W stainless steel wire mesh

**Size of filter or element**
SF: 60, 110, 160, 240, 330
SFM: 330
SFF: 400, 500

**Operating pressure**
W suction operation

**Type and size of port**

| Type | Port | Filter size | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | SF 60 | SF 110 | SF 160 | SF 240 | SF 330 | SFM 330 | SFF 400 | SFF 500 |
| C | G ¾ | ● | ● | | | | | | |
| E | G 1¼ | | | ● | ● | | | | |
| F | G 1½ | | | | | | ● | | |
| G | G 2 | | | | | ● | | | |
| K | SAE DN 40 (1½") | | | | | | ● | | |
| L | SAE DN 50 (2") | | | | | ● | | | |
| M | SAE DN 65 (2½") | | | | | | | ● | |
| P | SAE DN 100 (4") | | | | | | | | ● |

**Filtration rating in µm**
P: 10, 20 (not for SFF)
W: 75, 125

**Type of clogging indicator**
A with steel blanking plug in indicator port
E pressure gauge
UE vacuum pressure gauge
UF vacuum pressure switch
for other clogging indicators, see brochure no. E 7.050../..

**Type code**
1

**Modification number**
X the latest version is always supplied

**Supplementary details**
KB without bypass valve
V FPM seals
W suitable for HFA and HFC emulsions

### 2.2 REPLACEMENT ELEMENT FOR SF/SFM/SFF FILTERS

**0330 RS 075 W /-V**

**Size**
0060, 0110, 0160, 0240, 0330, 0400, 0500

**Type**
RS

**Filtration rating in µm**
P: 010, 020 (not for SFF)
W: 075, 125

**Filter material**
P, W

**Supplementary details**
SFF must be added to model code for SFF filter
V, W (for descriptions, see point 2.1)

### 2.3 REPLACEMENT CLOGGING INDICATOR

**VR 1 UE . X /-V**

**Type**
VR connection thread G ½ (only for SF and SFM filter)
V1/4 connection thread NPT (only for SFF filter)

**Pressure setting**
2 2 bar (for type E)
1 1 bar (for type UE)
0.2 0.2 bar (for type UF)

**Type** (see point 2.1)

**Modification number**
X the latest version is always supplied

**Supplementary details**
V (for descriptions, see point 2.1)

## 2.4 SUCTION FILTER ELEMENT S

**0050 S 125 W /-B0.2**

**Size**
0015, 0025, 0050, 0100, 0180

**Type**
S

**Filtration rating in µm**
075, 125

**Filter material**
W

**Supplementary details**
B0.2 special bypass cracking pressure 0.2 bar;
no details = standard

## 2.5 SUCTION FILTER ELEMENT S..

**0070 SGD 125 W**

**Size**
0040, 0060, 0070, 0110

**Type**
SHB* suction filter element hose connection
( 38.1 and 32)
SUI* suction filter element UN thread
( 1 1/16-12 UN and 1 6/16-12UN)
SG.* suction filter element thread
(G ¾ , G 1, G 1½)

**Filtration rating in µm**
125

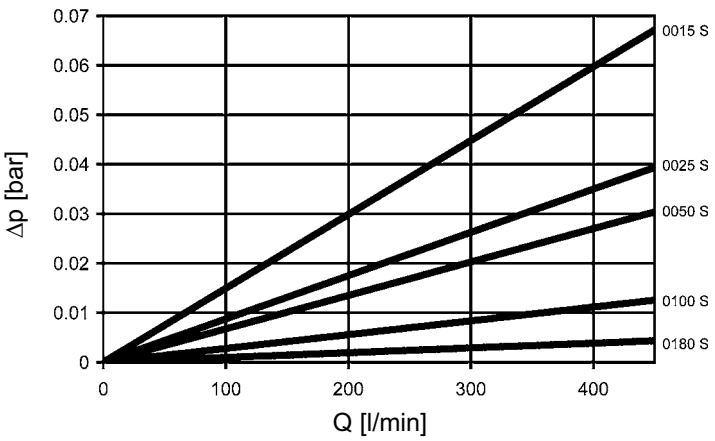
**Filter material**
W

*for further details on the designation, please see point 5

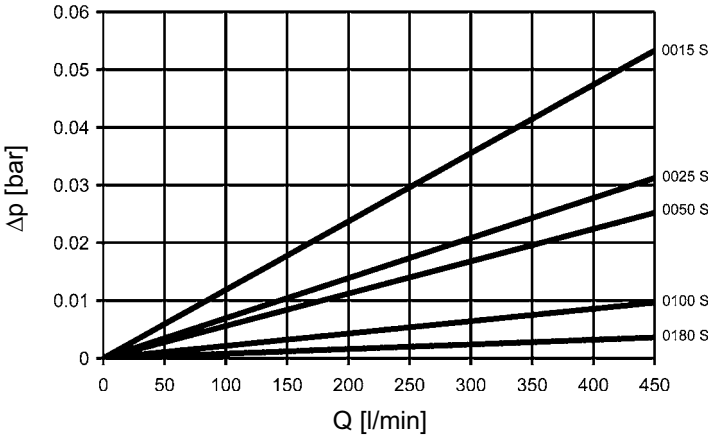
# 3. FILTER CALCULATION / SIZING S AND S..

## 3.1 ΔP-Q-GRAPHS FOR SUCTION FILTER ELEMENTS S (AT 30 MM²/S)

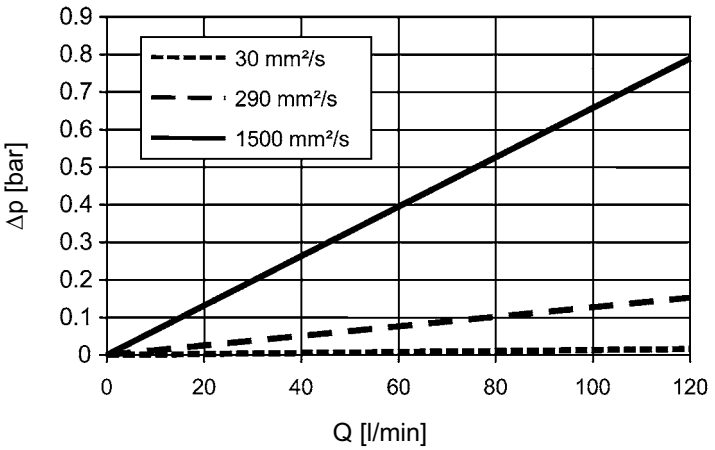
**75 µm**




**125 µm**




## 3.2 ΔP-Q-GRAPHS FOR SUCTION FILTER ELEMENTS S..



# 4. FILTER CALCULATION / SIZING SF, SFM, SFF

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and element Δp and is calculated as follows

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see point 3.1)

$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see point 3.2)

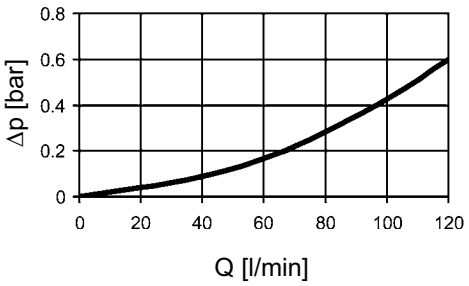
For ease of calculation, our Filter Sizing Program (Filter-IT) is available on request free of charge.

**NEW:** Sizing online at www.hydac.com

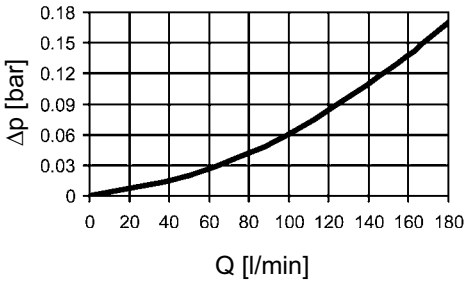
## 4.1 ΔP-Q HOUSING GRAPHS BASED ON ISO 3968

The housing graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

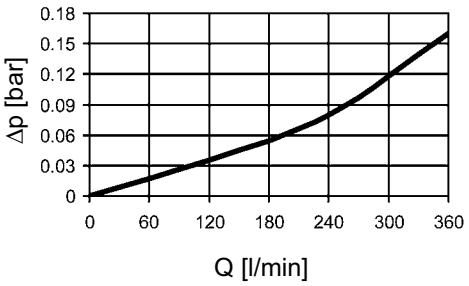
### SF 60, 100



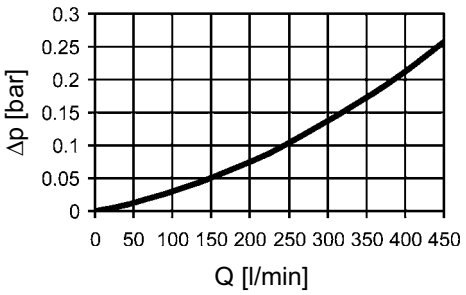

### SF 160, 240



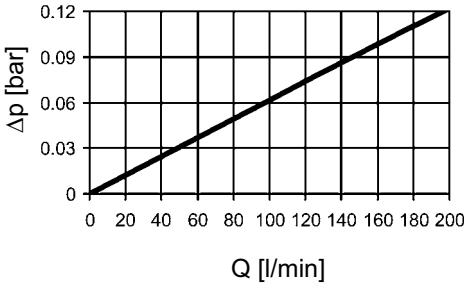

### SF 330




### SFM 330




### SFF 400, 500

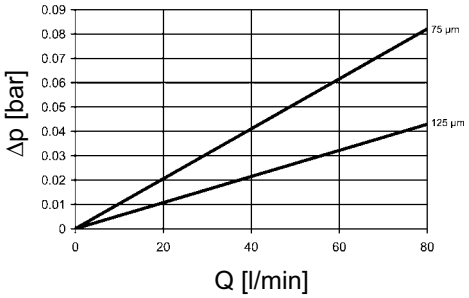



## 4.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS (FOR FILTER ELEMENTS SF/SFM/SFF)

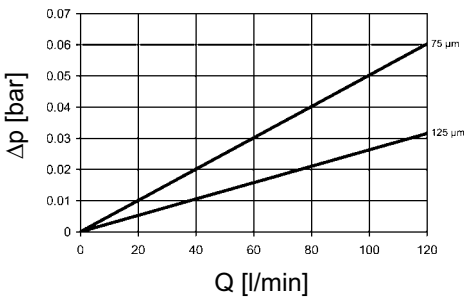
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

| RS | W | |
|---|---|---|
| | 75 µm | 125 µm |
| 60 | 1.03 | 0.54 |
| 110 | 0.52 | 0.26 |
| 160 | 0.36 | 0.19 |
| 240 | 0.25 | 0.13 |
| 330 | 0.19 | 0.10 |
| 400 | 0.20 | 0.16 |
| 500 | 0.20 | 0.16 |

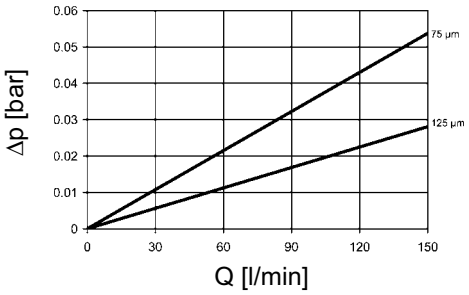
### 60 W



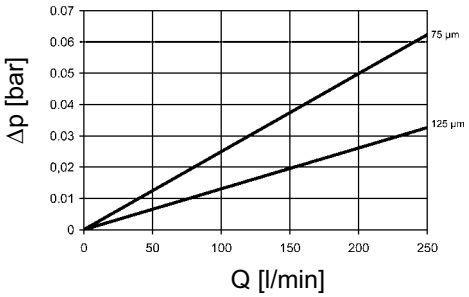

### 110 W



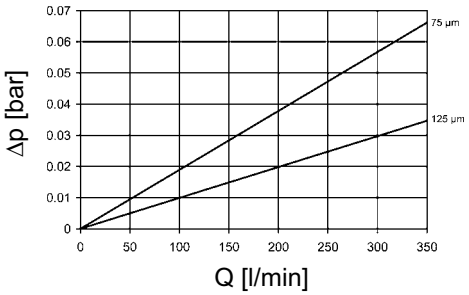

### 160 W



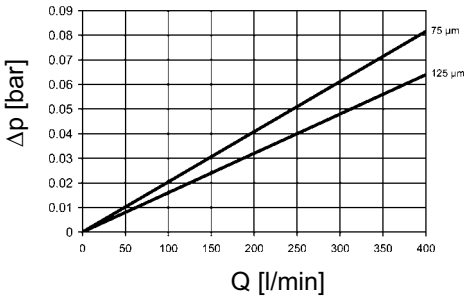

### 240 W



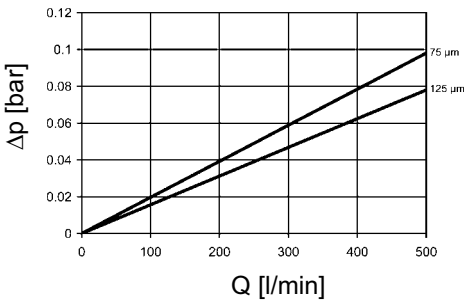

### 330 W




### 400 W

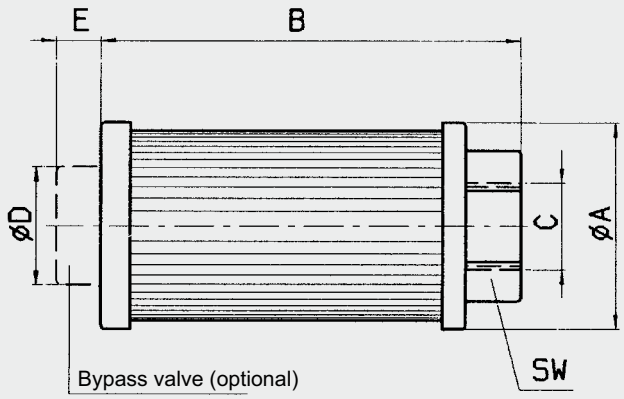



### 500 W



## 5. DIMENSIONS

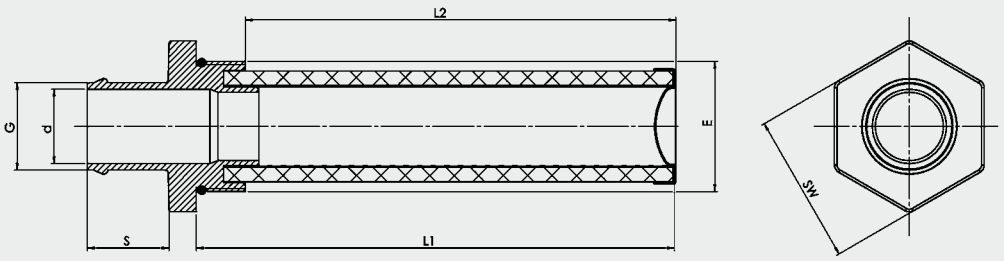
Suction filter element S
for mounting on pumps or
inside tanks



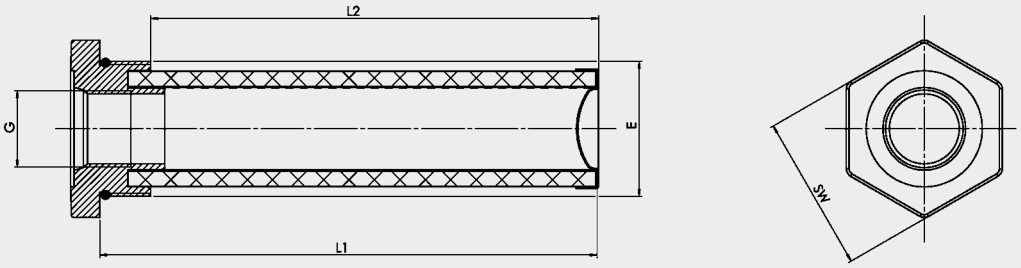

| Types | A | B | C | D (ISO 228) | E | SW | Flow rate l/min |
|---|---|---|---|---|---|---|---|
| 0015 S | 44 | 104 | G ½ | 24 | 10.5 | 30 | 15 |
| 0025 S | 63 | 127 | G ¾ | 36 | 13.5 | 46 | 25 |
| 0050 S | 63 | 159 | G 1 | 36 | 13.5 | 46 | 50 |
| 0100 S | 86 | 210 | G 1½ | 46 | 18.5 | 69 | 100 |
| 0180 S | 86.5 | 311 | G 2 | 46 | 18.5 | 69 | 180 |

Suction filter element S.. for mounting on outside of tank

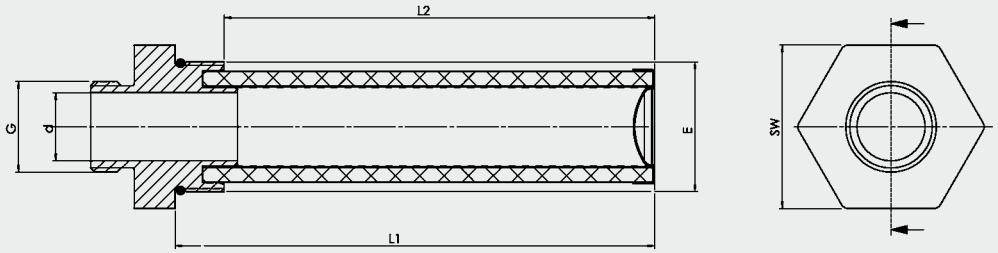
Type SHB




Type SUI

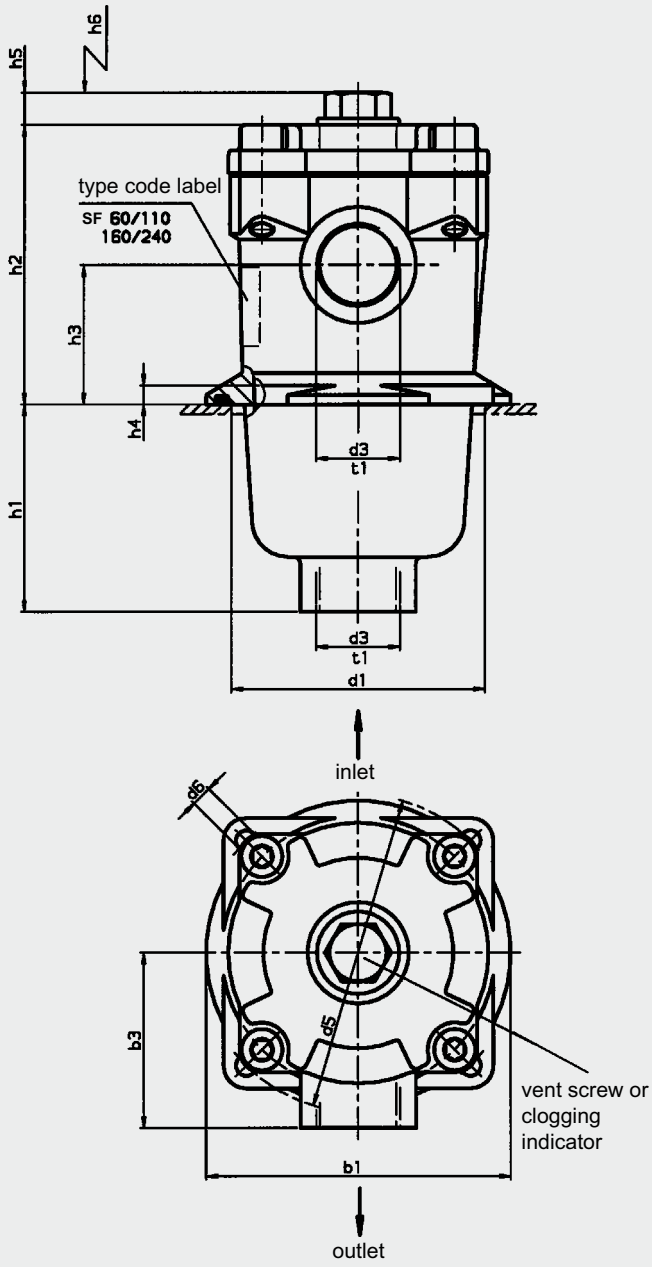



Type SGx

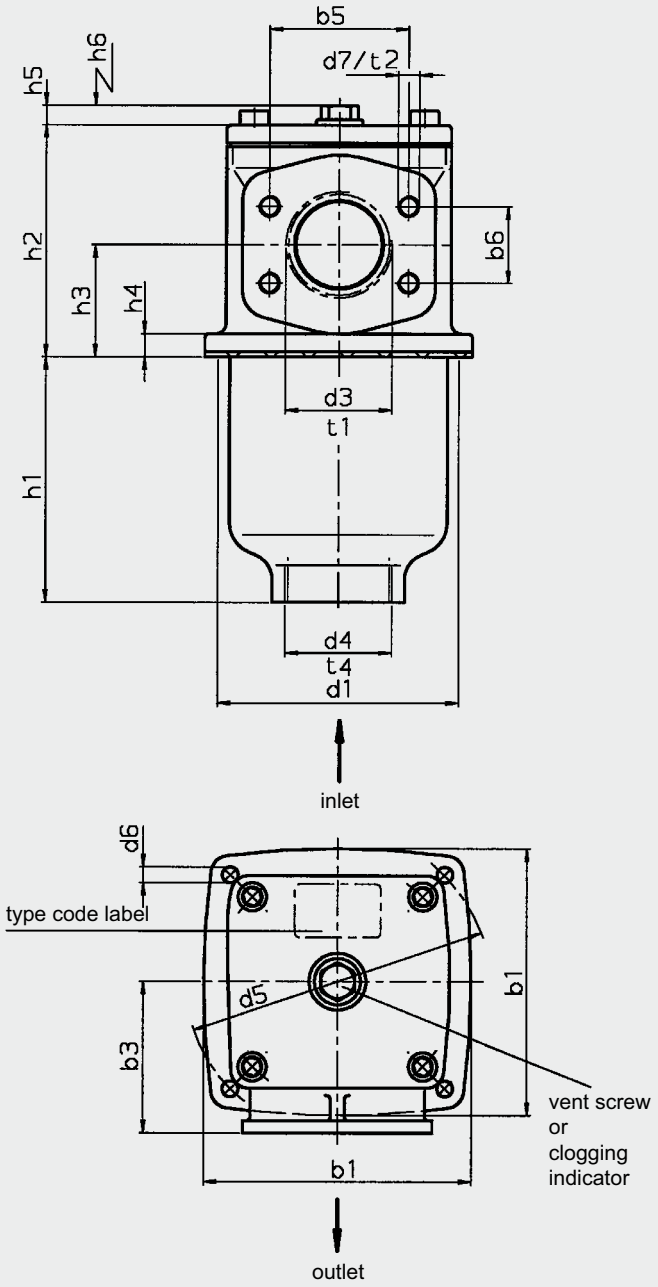



| Designation | G | E | d | L1 | L2 | SW |
|---|---|---|---|---|---|---|
| 0110 SHB 125 W | 38.1 | 2½-12 UN 2 B | 32 | 176 | 158 | 70 |
| 0070 SHB 125 W | 32.0 | 1 7/8-12 UNF | 25 | 176 | 158 | 55 |
| 0060 SHB 125 W | 32.0 | 1 7/8-12 UNF | 25 | 143 | 125 | 55 |
| 0070 SUI 125 W | 1 1/16-12 UN | 1 7/8-12 UNF | - | 176 | 158 | 55 |
| 0060 SUI 125 W | 1 1/16-12 UN | 1 7/8-12 UNF | - | 143 | 125 | 55 |
| 0110 SGF 125 W | G 1½ | 2½-12 UN 2 B | 34 | 176 | 158 | 70 |
| 0070 SGD 125 W | G 1 | 2½-12 UN 2 B | 25 | 176 | 158 | 60 |
| 0040 SGC 125 W | G ¾ | 1 7/8-12 UNF | 20 | 143 | 125 | 55 |

SF 60 to 240

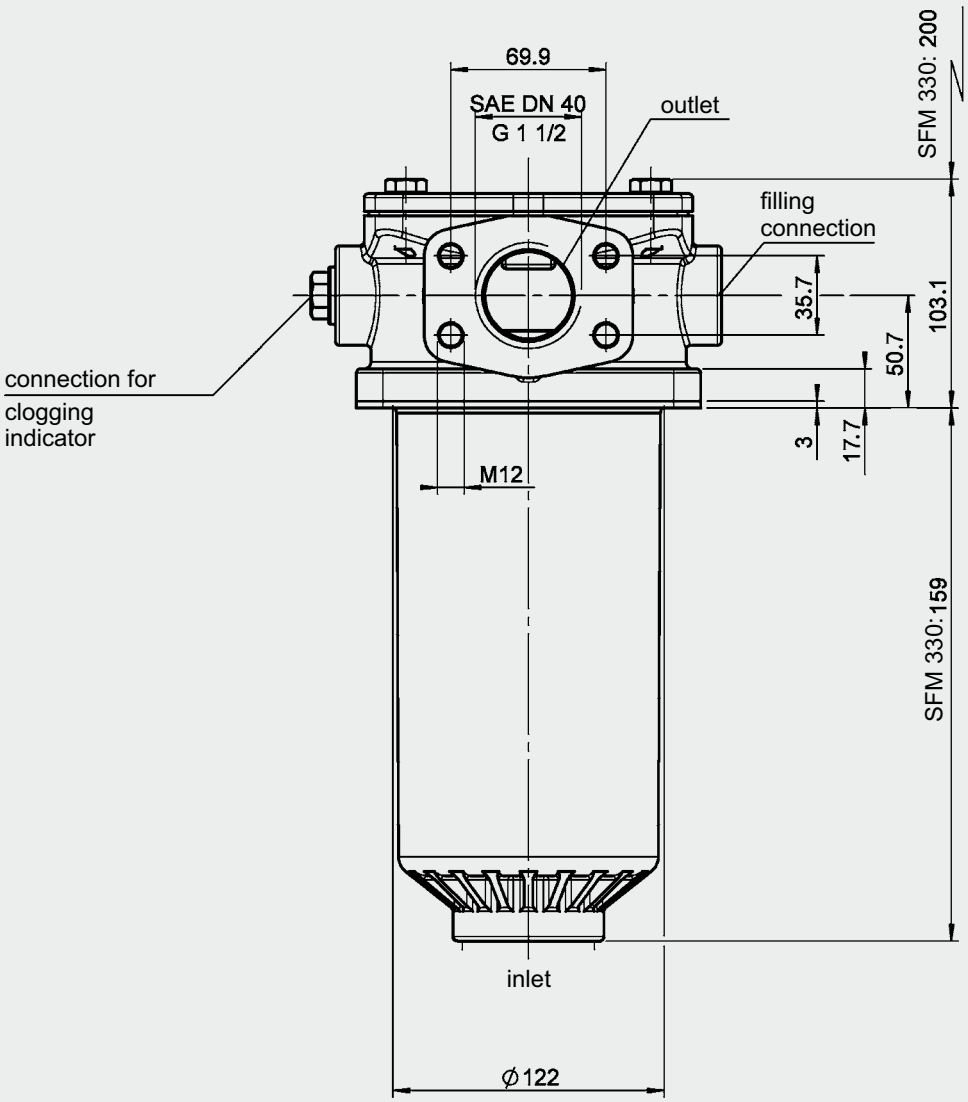



SF 330

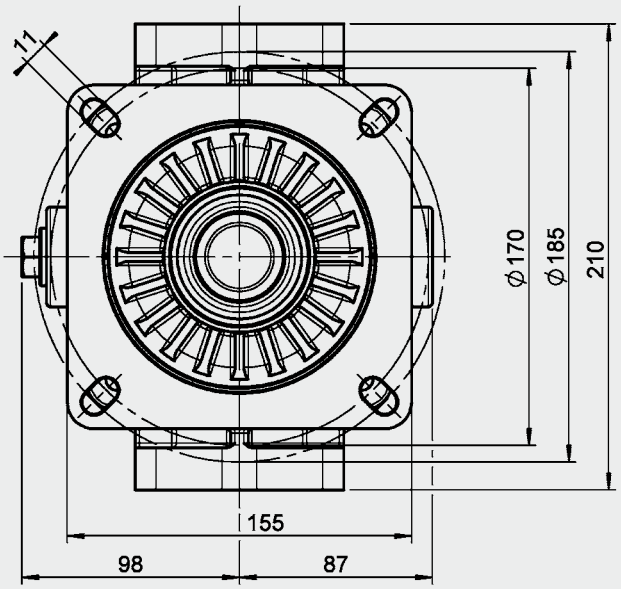



| SF | b1 | b3 | b5 | b6 | d1 | d3[1)] | d4 | d5 | d6[2)] | d7 | h1 | h2 | h3 | h4 | h5 | h6 | t1 | t2 | t4 | Weight incl. element [kg] | Volume of pressure chamber [l] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 60 | 96 | 55 | - | - | 80 | G ¾ | - | 100 | M5 | - | 63 | 88 | 44 | 6 | 12 | 80 | 17 | - | - | 0.9 | 0.4 |
| 110 | 96 | 55 | - | - | 80 | G ¾ | - | 100 | M5 | - | 130 | 88 | 44 | 6 | 12 | 145 | 17 | - | - | 1.1 | 0.6 |
| 160 | 126 | 72 | - | - | 106 | G 1¼ | - | 135 | M6 | - | 89 | 108 | 54 | 6 | 12 | 120 | 20 | - | - | 1.8 | 1.0 |
| 240 | 126 | 72 | - | - | 106 | G 1¼ | - | 135 | M6 | - | 150 | 108 | 54 | 6 | 12 | 180 | 20 | - | - | 2.2 | 1.4 |
| 330 | 150 | 85 | - 77.8 | - 42.9 | 135 | G2 SAE DN 50 | G2 | 170 | M8 | - M12 | 138 | 131 | 63 | 13 | 12 | 180 | 27 | - 23 | 27 | 4.1 | 2.0 |

[1)] Threaded connection to ISO 228 / [2)] through-hole for bolt

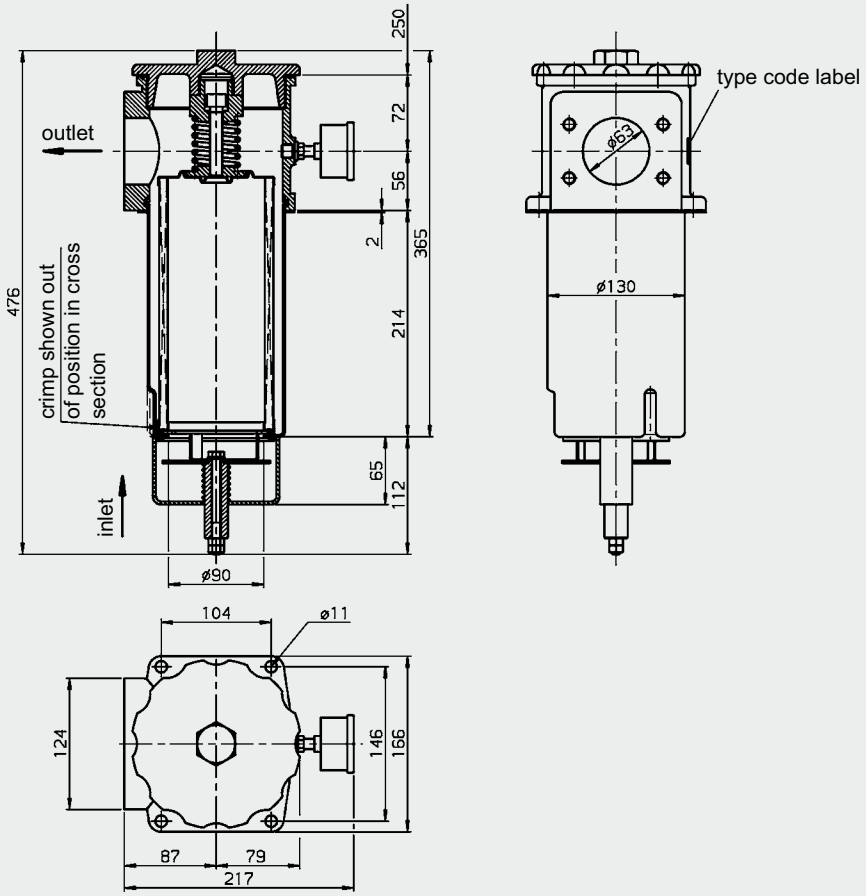



View from below

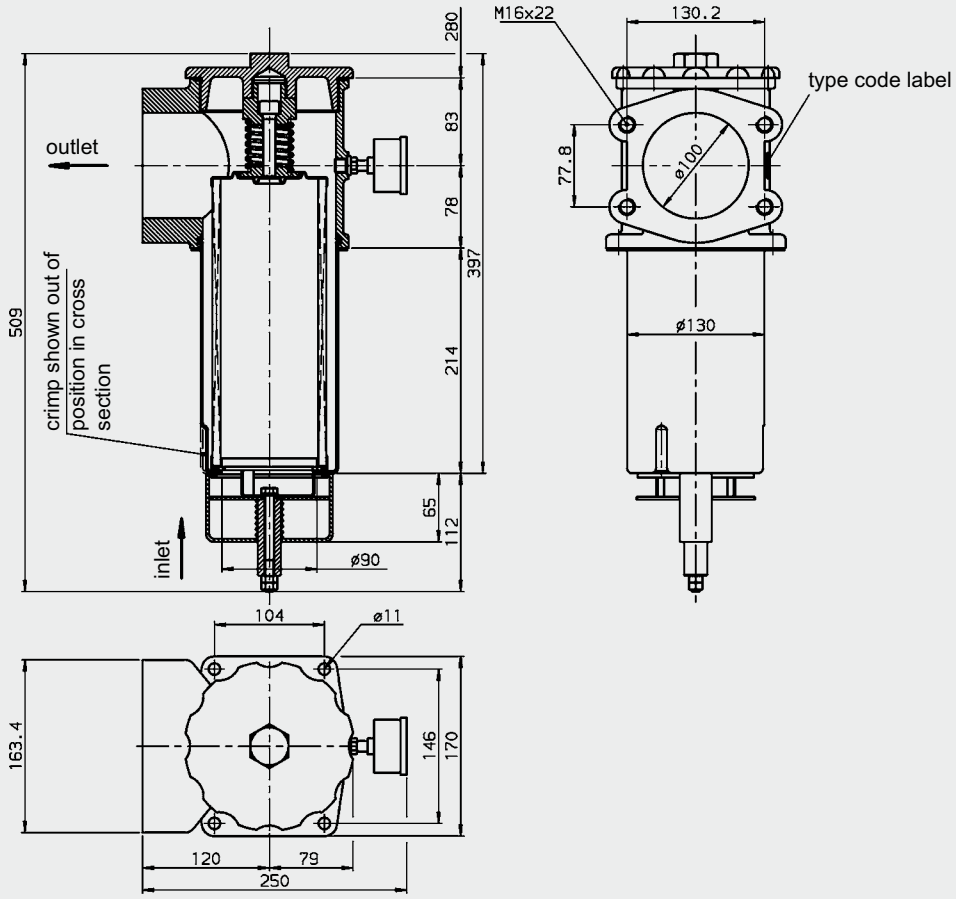



| SFM | Weight including element [kg] | Volume of pressure range [l] |
|---|---|---|
| 330 | 3.9 | 2.0 |

SFF 400




SFF 500




| SFF | Volume of pressure chamber [l] |
|---|---|
| 400 | 4.23 |
| 500 | 4.63 |

## NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.


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# Return Line and Suction Boost Filter RKM

up to 800 l/min, up to 10 bar




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. They consist of a filter head, filter bowl and a screw-on cover plate.

Standard equipment:

- with bypass valve
- with back-pressure valve
- without anti-cavitation valve

**Application**

RKM return line & suction boost filters are ideally suited for use in units with two or more circuits.

In particular this filter is the "first choice" for mobile machinery using hydrostatic drives (e.g. wheel loaders, fork-lift trucks, harvesting machines), if the return flow is greater than the flow required on the suction side under operating conditions.

**Function**

The return flow $Q_R$ of the operating hydraulics is supplied to the filter via one or several inlets "A" and is cleaned by the filter element (full flow return line filtration). A pressure of 0.5 bar (standard) is applied inside the element by the back-pressure valve "V1". This ensures that the filtered return line flow is available to the hydrostatic feed pumps connected in "B" ports (full flow suction boost filtration). The risk of cavitation is significantly reduced. The excess flow is drained to the tank via port "T".

A bypass valve "V2" (standard = 2.5 bar) is fitted to relieve excessive back-pressures in the element (important on cold starts). This valve arrangement ensures that only finely filtered oil is available to the suction port during operation (exception: RKM 350).

With optional valve "V3", oil can be drawn from the tank for short periods, e.g. initial filling, venting after changing the element.

### 1.2 FILTER ELEMENTS

The filter elements used in RKM filters are characterised by low back-pressures, especially at high viscosities (e.g. cold starts).

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Nominal pressure | 10 bar |
| Temperature range | -30 °C to +100 °C (short-term -40 °C) |
| Material of filter head | Aluminium |
| Material of filter bowl | Steel (except RKM 300)<br>Polyamide (RKM 300) |
| Material of cover plate | Polyamide (RKM 80 to 251, 350)<br>Aluminium (RKM 300, 400, 800) |
| Type of clogging indicator | VMF – connection thread G 1/8 |
| Pressure setting of clogging indicator | -0.2 bar (vacuum pressure)<br>2 bar (back-pressure)<br>(others on request) |
| Bypass cracking pressure (V2) | 2.5 bar (others on request) |
| Setting for back-pressure valve (V1) | 0.5 bar (others on request) |

Hydac filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

**Contamination retention capacities in g**

| | Mobilemicron (MM) | |
|---|---|---|
| RKM | 10 µm | 15 µm |
| 80 | 11.0 | 13.3 |
| 100 | 16.3 | 19.6 |
| 120 | 20.7 | 25.0 |
| 151 | 26.6 | 31.4 |
| 201 | 50.9 | 61.4 |
| 251 | 61.9 | 74.7 |
| 300 | 55.6 | 67.1 |
| 350 | 87.0 | 105.0 |
| 400 | 67.4 | 81.3 |
| 800 | 86.3 | 104.2 |

Pressure stability value: 10 bar

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 INSTALLATION

As tank-top mounted filter

### 1.6 SPECIAL MODELS AND ACCESSORIES

- air bleed valve
- integral thermal bypass valve (only RKM 151, 201, 251; see Point 2.5)
- anti-cavitation valve (V3)

### 1.7 SPARE PARTS

See Original Spare Parts List

### 1.8 CERTIFICATES AND APPROVALS

On request

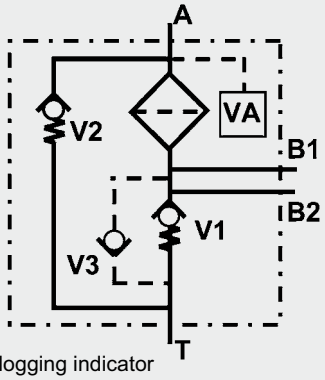
### 1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Non-flam operating fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

### 1.10 IMPORTANT INFORMATION

- Filter housing must be earthed
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

**Symbol for hydraulic systems**




VA = clogging indicator

## 2. MODEL CODE (ALSO ORDER EXAMPLE)

**RKM MM 300 B T F 10 W 0 . X /-NR-EV**

### 2.1 COMPLETE FILTER

**Filter type**
RKM

**Filter material of element**
MM Mobilemicron

**Size of filter or element**
RKM: 80, 100, 120, 151, 201, 251, 300, 350, 400, 800

**Operating pressure**
B 10 bar

**Type and size of suction line**

| Type | Port | Filter size 80 | 100 | 120 | 151 | 201 | 251 | 300 | 350 | 400 | 800 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T | 2 x CS1¼ | | | | ● | ● | ● | ● | | | |
| V | 2 x G1 | | | | ● | ● | ● | | | | |
| X | 1 x G1 | ● | ● | ● | | | | | ● | | |
| Y | 1 x G¾ | ● | ● | ● | | | | | | | |
| Z | To customer spec. | | | | ●* | ●* | ●* | | | ● | ● |

**Type and size of return line**

| Type | Port | Filter size 80 | 100 | 120 | 151 | 201 | 251 | 300 | 350 | 400 | 800 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| C | 1 x G¾ | ● | ● | ● | | | | | | | |
| D | 1 x G1 | ● | ● | ● | | | | | | | |
| E | 1 x G1¼ | | | | ● | ● | ● | | | | |
| F | 1 x CS1½ | | | | | | | ● | | | |
| G | 1 x G1½ | | | | | | | | ● | | |
| Z | To customer spec. | | | | ●* | ●* | ●* | | | ● | ● |

*only in conjunction with thermal cooler bypass valve

**Filtration rating in µm**
MM: 10, 15

**Type of clogging indicator**
W no port for clogging indicator
Y plastic blanking plug in indicator port
A steel blanking plug in indicator port
F pressure switch
K return line and vacuum pressure gauge
R return line pressure gauge
UF vacuum switch
→ for other clogging indicators see brochure No. E 7.050../..

**Type code**
0 no indicator
1-5 see point 2.6

**Modification number**
X the latest version is always supplied

**Supplementary details**
No details = standard (without anti-cavitation valve; seals NBR; bypass valve 2.5 bar; back-pressure valve 0.5 bar)
B2 bypass valve with 2 bar cracking pressure
B3-CV3.5 bypass valve with 3 bar cracking pressure and back-pressure valve with 3.5 bar cracking pressure (only on RKM 350)
B6-CV3 bypass valve with 6 bar cracking pressure and back-pressure valve with 3 bar cracking pressure (only on RKM 100, 300)
ES vent plug
EV air bleed valve
NR anti-cavitation valve (not on RKM 350)
NRF125 anti-cavitation valve and coarse strainer 125 µm (not on RKM 350)
ND pressure release valve in back-pressure valve
→ for symbols see point 2.7
UT filter suitable for use when immersed horizontally in oil
V FPM seals
xxxxxxxx only RKM 400 and 800 (see point 2.4)
THxx only for RKM 151, 201, 251 (see point 2.5)

### 2.2 REPLACEMENT ELEMENT

**0300 RK 010 MM /-V**

**Size**
0080, 0100, 0120, 0151, 0201, 0251, 0300, 0350, 0400, 0800

**Type**
RK

**Filtration rating in µm**
MM 010, 015

**Filter material**
MM

**Supplementary details**
V FPM seal

### 2.3 REPLACEMENT CLOGGING INDICATOR

**VMF 2 F . X /-V**

The return line indicator monitors the level of contamination in the element.
The vacuum indicator monitors the suction side pressure

**Type**
VMF connection thread G 1/8

**Pressure setting**
0.2 -0.2 bar (vacuum)
2 2 bar (back-pressure)
→ others on request

**Type** (see point 2.1 )

**Modification number**
X the latest version is always supplied

**Supplementary details**
V FPM seal

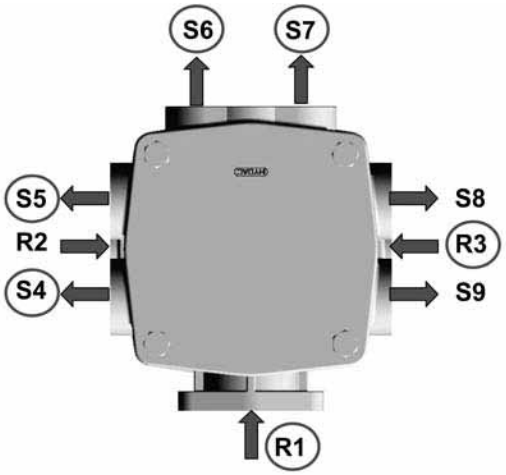
## 2.4 PORT CONFIGURATION RKM 400 AND 800

Since there are numerous options for machining the ports on the head of the RKM 400/800, the code BZZ is selected here as standard. In order to determine the position and size of the ports, a 9-digit code is added as a supplementary detail. This is determined using the table below. Unused ports are indicated by a "0".

**Example: RKM MM 400 BZZ 15 A 1.0 /-102CC2200**

| Position in code | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Port | R1 | R2 | R3 | S4 | S5 | S6 | S7 | S8 | S9 |
| SAE DN 50 | (1) | | | | | | | | |
| SAE DN 65 | 2 | | | | | | | | |
| G1 | | 1 | 1 | A | A | 1 | 1 | A | A |
| G1¼ | | 2 | (2) | B | B | (2) | (2) | B | B |
| G1½ | | 3 | 3 | (C) | (C) | 3 | 3 | C | C |

R = Return line port; S = Suction port




## 2.5 PORT CONFIGURATION RKM 151, 201, 251 USING THERMAL COOLER BYPASS VALVE

The part flow which requires cooling can be directed via separate ports over the thermal valve. During a cold start, the spool of the thermal valve shuts off the flow to the cooler so that the fluid flows directly through the filter element. The position of the spool is regulated by the oil temperature. From approx. 50 - 60 °C the inlet to the cooler is completely open (diagram 1).

Alternative connection option according to diagram 2: A hose connects the inlet line of the cooler to the thermal valve.

The connection configuration is determined by agreement with the customer.

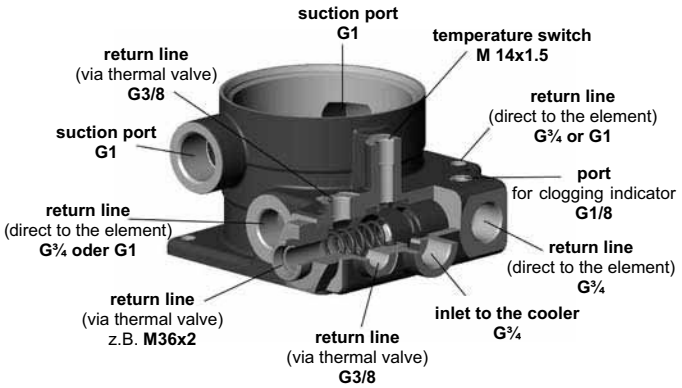



**Diagram 1**

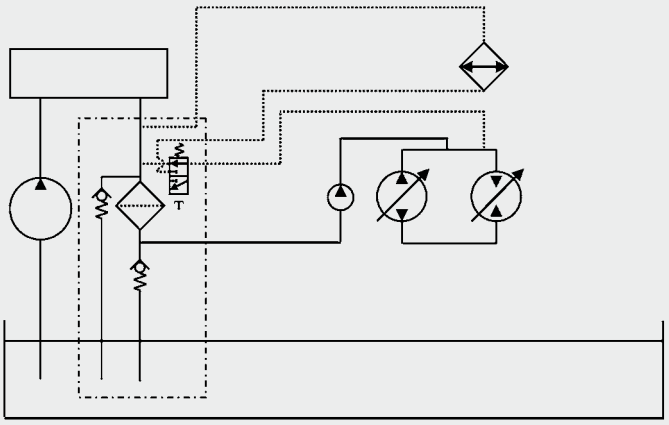
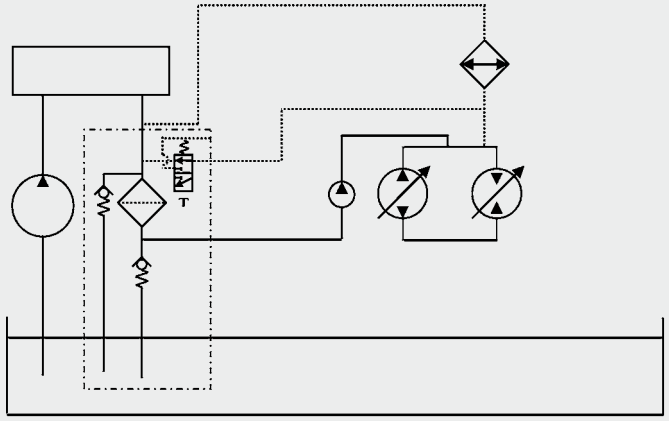
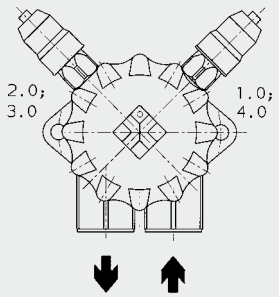


**Diagram 2**



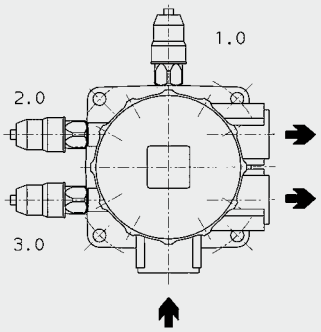
## 2.6 TYPE CODE

RKM 80, 100, 120



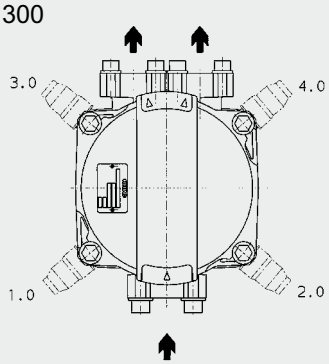

| Type code | Mounting position of the clogging indicator | Type of clogging indicator | Measuring |
|---|---|---|---|
| 1.X | On the filter inlet - right-hand side, bottom | Return line | Before the filter element |
| 2.X | On the filter inlet - left-hand side, bottom | Return line | Before the filter element |
| 3.X | On the filter outlet - right-hand side, top | Vacuum | After the filter element |
| 4.X | On the filter outlet - left-hand side, top | Vacuum | After the filter element |
| 5.X | Type code 1.X and 3.X | 2 indicators: return line & vacuum | Before & after element |

RKM 151, 201, 251



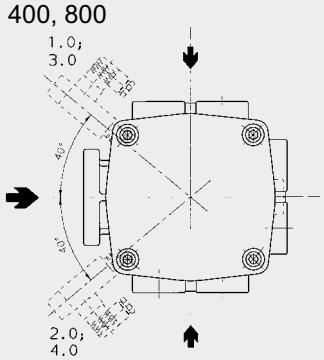

| Type code | Mounting position of the clogging indicator | Type of clogging indicator | Measuring |
|---|---|---|---|
| 1.X | Opposite the filter inlet | Return line | Before the filter element |
| 2.X | On the filter inlet - left-hand side | Return line | Before the filter element |
| 3.X | On the filter inlet - right-hand side | Vacuum | After the filter element |
| 5.X | Type code 1.X and 3.X | 2 indicators: return line & vacuum | Before & after element |

RKM 300




| Type code | Mounting position of the clogging indicator | Type of clogging indicator | Measuring |
|---|---|---|---|
| 1.X | On the filter inlet - left-hand side | Return line | Before the filter element |
| 2.X | On the filter inlet - right-hand side | Return line | Before the filter element |
| 3.X | On the filter outlet - left-hand side | Vacuum | After the filter element |
| 4.X | On the filter outlet - right-hand side | Vacuum | After the filter element |
| 5.X | Type code 1.X and 3.X | 2 indicators: return line & vacuum | Before & after element |

RKM 400, 800

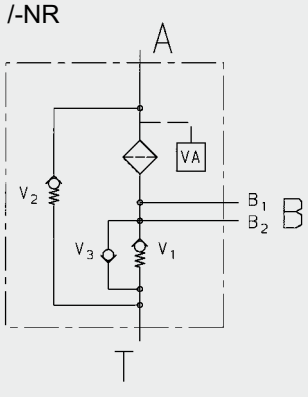



| Type code | Mounting position of the clogging indicator | Type of clogging indicator | Measuring |
|---|---|---|---|
| 1.X | On the filter inlet - left-hand side, bottom | Return line | Before the filter element |
| 2.X | On the filter inlet - right-hand side, bottom | Return line | Before the filter element |
| 3.X | On the filter inlet - left-hand side, top | Vacuum | After the filter element |
| 4.X | On the filter inlet - right-hand side, top | Vacuum | After the filter element |
| 5.X | Type code 1.X and 3.X | 2 indicators: return line & vacuum | Before & after element |

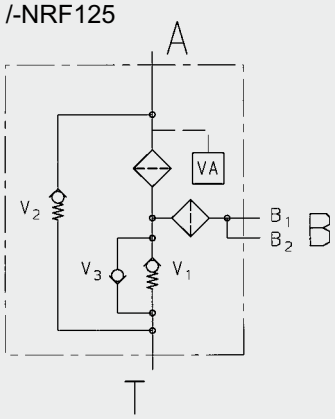
Other indicator configurations on request!

## 2.7 SYMBOLS

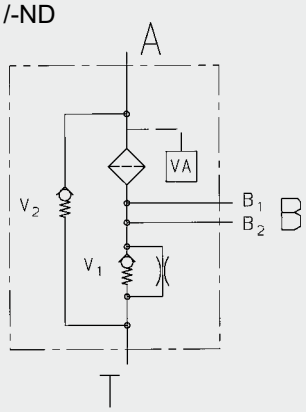
/-NR



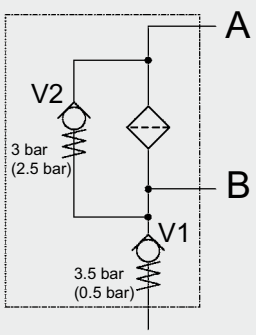

/-NRF125




/-ND




RKM 350



# 3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and element Δp and is calculated as follows:

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see point 3.2)

$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see point 3.1)

For ease of calculation, our Filter Sizing Program is available on request free of charge.

**NEW:** Sizing online at www.hydac.com

## 3.1 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

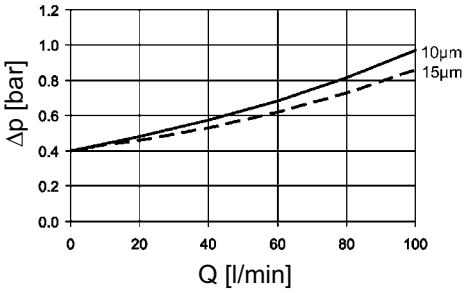
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

| RKM | MM | |
|---|---|---|
| | 10 µm | 15 µm |
| 80 | 2.70 | 1.60 |
| 100 | 1.80 | 1.10 |
| 120 | 1.40 | 0.90 |
| 151 | 1.00 | 0.65 |
| 201 | 0.75 | 0.47 |
| 251 | 0.58 | 0.36 |
| 300 | 0.62 | 0.39 |
| 350 | 0.30 | 0.20 |
| 400 | 0.56 | 0.35 |
| 800 | 0.44 | 0.27 |

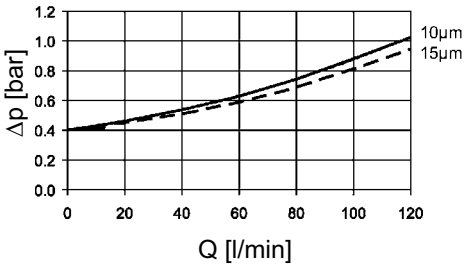
## 3.2 Δp-Q HOUSING GRAPHS BASED ON ISO 3968

The housing graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s. In this case, the differential pressure changes proportionally to the density.

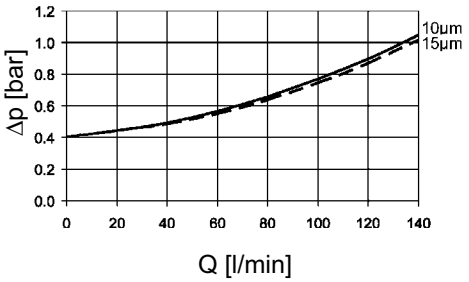
**RKM 80**



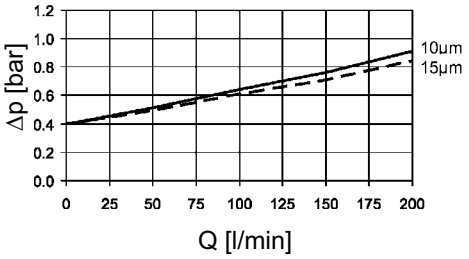

**RKM 100**



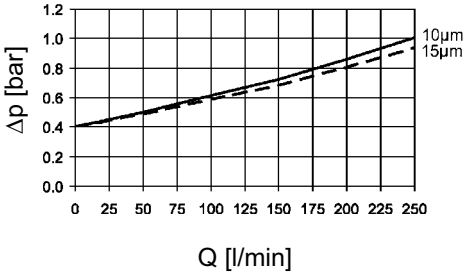

**RKM 120**



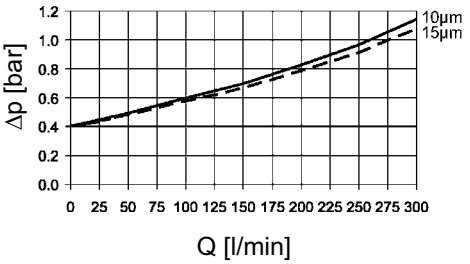

**RKM 151**



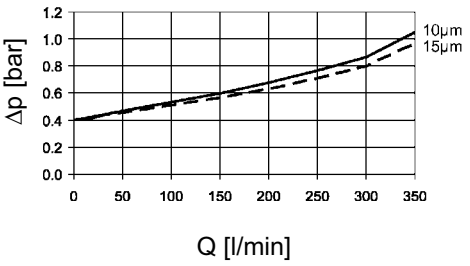

**RKM 201**



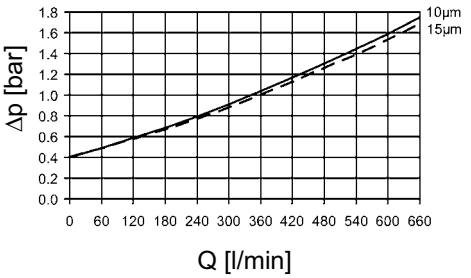

**RKM 251**



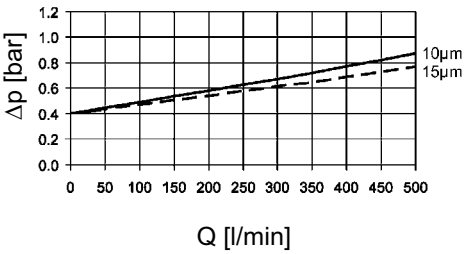

**RKM 300**



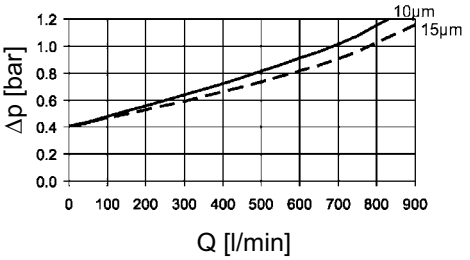

**RKM 350**




**RKM 400**

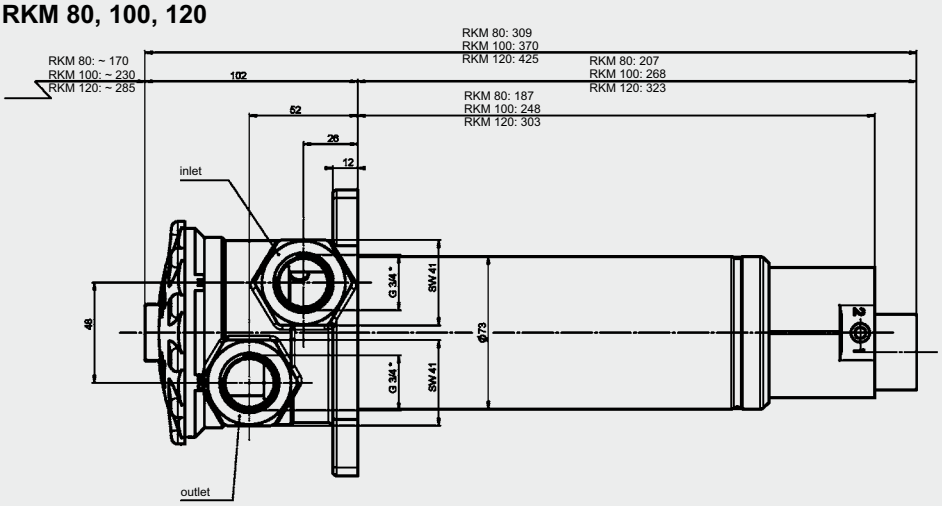


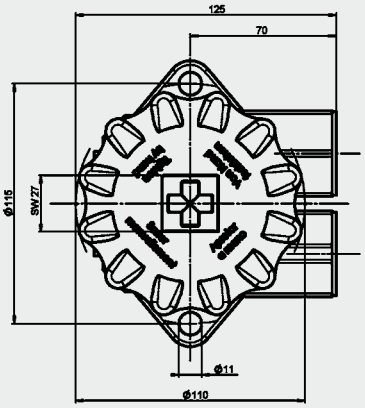

**RKM 800**

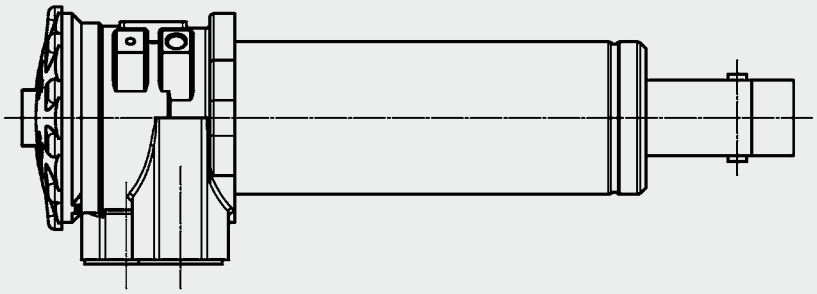


# 4. DIMENSIONS

## RKM 80, 100, 120



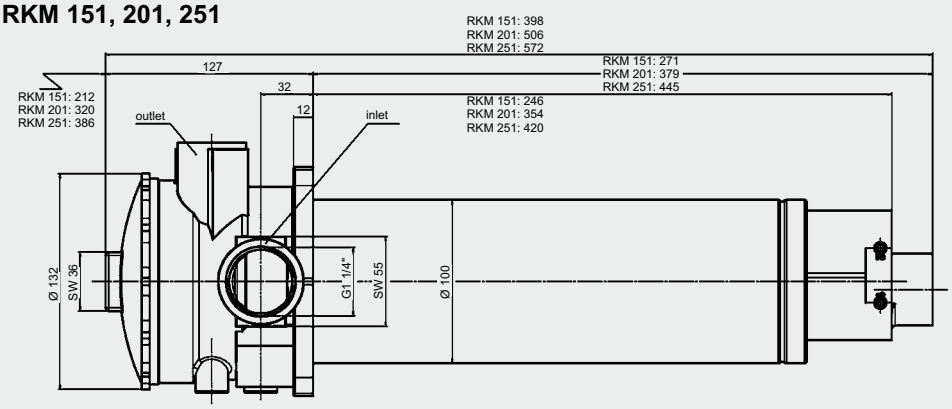



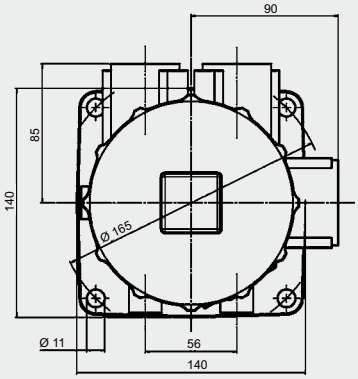



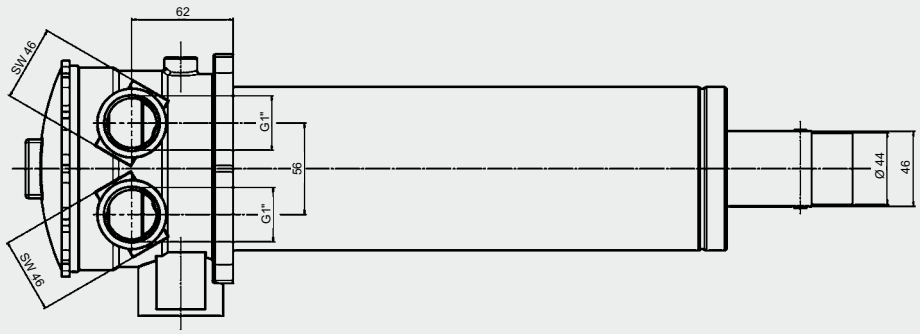
| Port sizes | | |
|---|---|---|
| Inlet | G 3/4 | G1 |
| Outlet | G 3/4 | G1 |

| RKM | Weight incl. element [kg] | Vol. of pressure chamber [l] |
|---|---|---|
| 80 | 1.5 | 0.80 |
| 100 | 1.7 | 1.00 |
| 120 | 1.9 | 1.20 |

## RKM 151, 201, 251



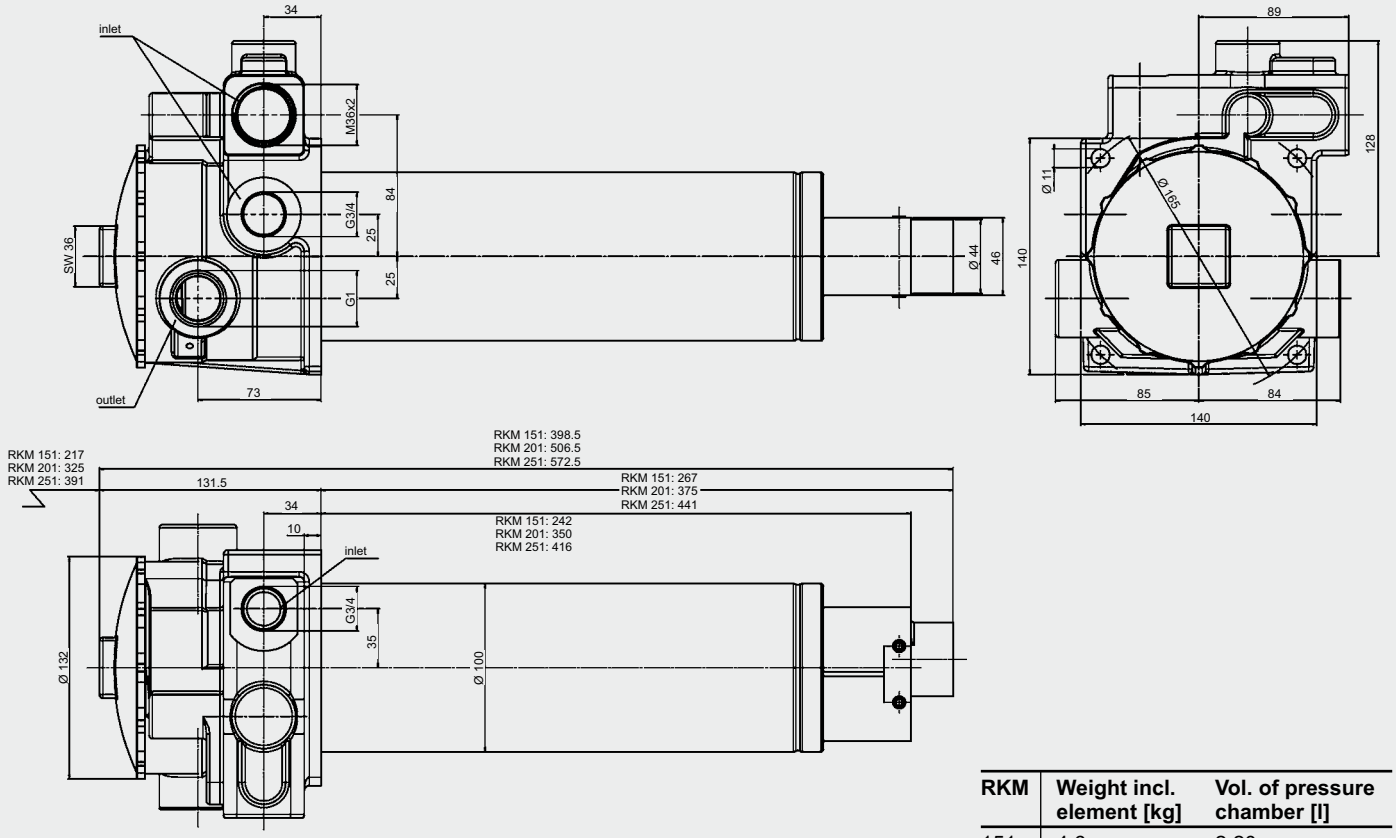




**Multi-port version**
on request!



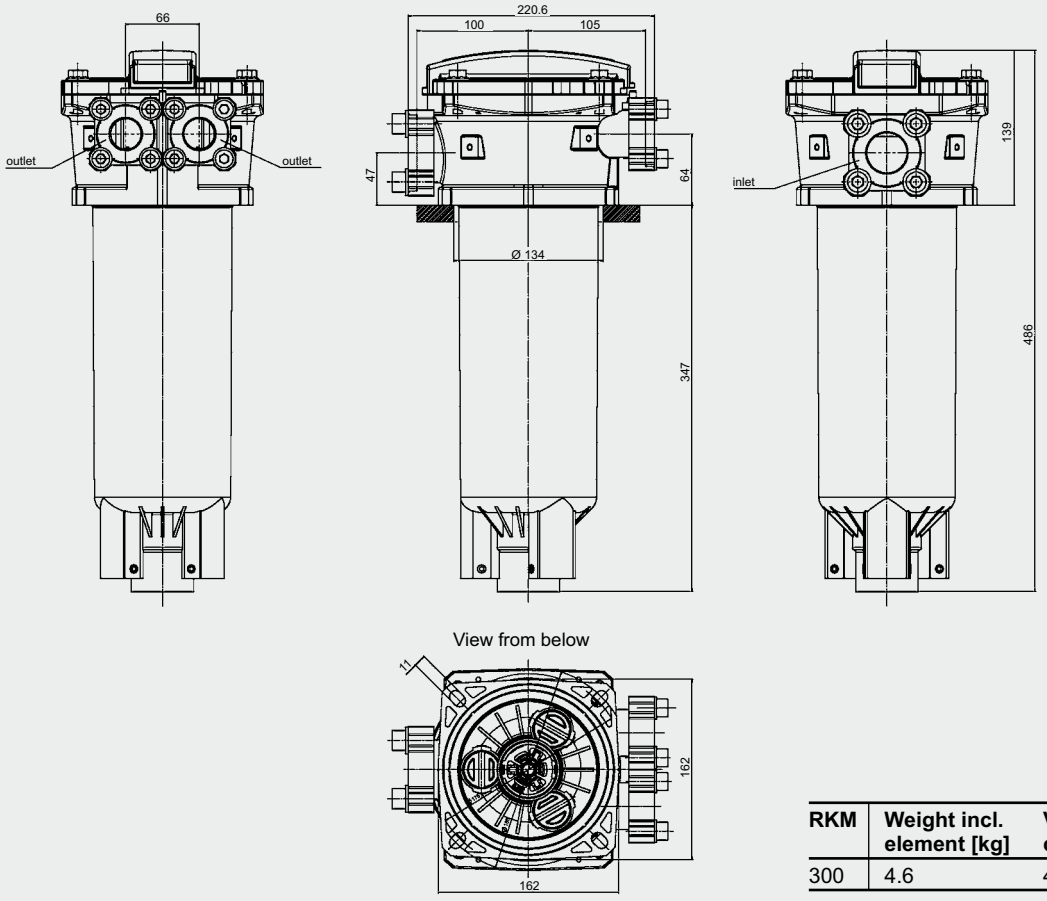
| RKM | Weight incl. element [kg] | Vol. of pressure chamber [l] |
|---|---|---|
| 151 | 3.1 | 2.20 |
| 201 | 3.7 | 2.50 |
| 251 | 4.0 | 3.00 |

## RKM 151, 201, 251 with thermal cooler bypass valve



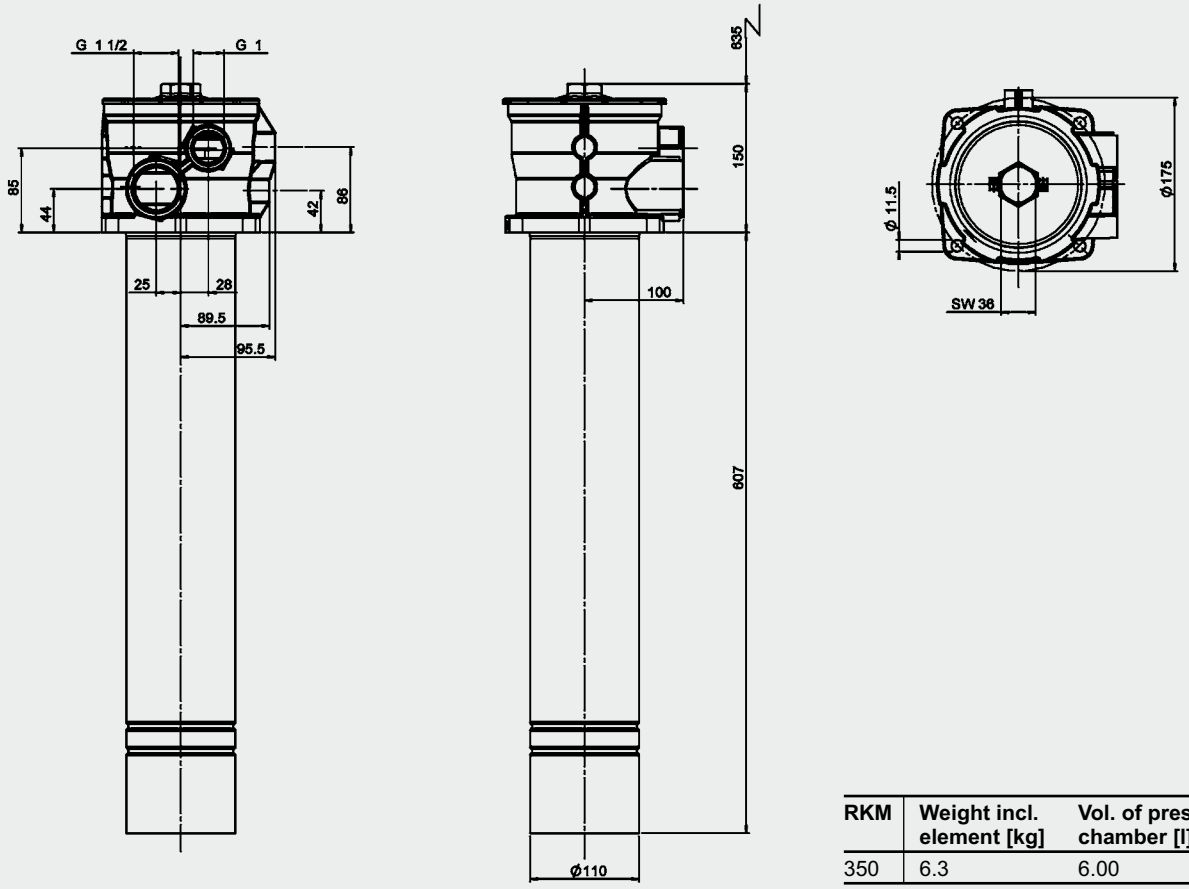

| RKM | Weight incl. element [kg] | Vol. of pressure chamber [l] |
|---|---|---|
| 151 | 4.6 | 2.20 |
| 201 | 5.2 | 2.50 |
| 251 | 5.5 | 3.00 |

## RKM 300



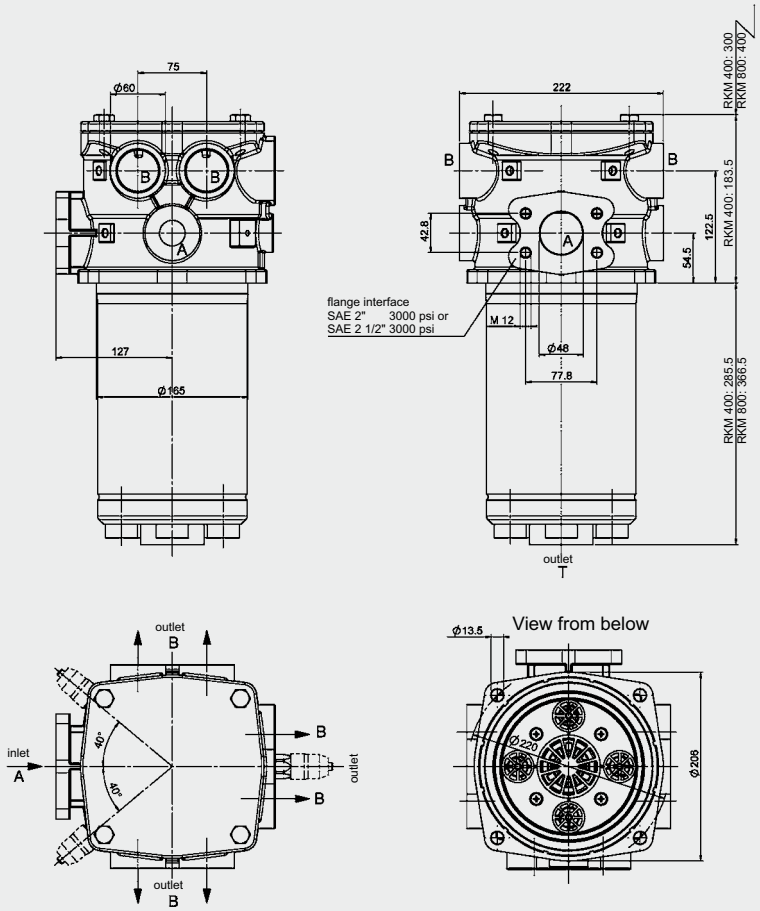

| RKM | Weight incl. element [kg] | Vol. of pressure chamber [l] |
|---|---|---|
| 300 | 4.6 | 4.00 |

## RKM 350




| RKM | Weight incl. element [kg] | Vol. of pressure chamber [l] |
|---|---|---|
| 350 | 6.3 | 6.00 |

## RKM 400, 800




| RKM | Weight incl. element [kg] | Vol. of pressure chamber[l] |
|---|---|---|
| 400 | 6.5 | 8.50 |
| 800 | 7.5 | 10.00 |

## NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.


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# Tank Breather Filter BF
## up to 11000 l/min




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

Breather filter sizes 4, 10, 3 and 30 consist of a housing which is screwed onto the oil tank, and a built-in filter element.

Sizes 5, 52, 7 and 72 have housings which are screwed onto the oil tank and have one or two exchangeable filter element(s).
BF 5 and 52 are fitted with a built-in oil mist trap as standard.

Sizes 8 and 9 consist of a flange for mounting to the tank, an exchangeable element and a cap. The BF 9 also has an oil mist trap which allows the oil to be drained via an oil drain plug.

### 1.2 FILTER ELEMENTS

Hydac filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

**Contamination retention capacities in g**

| | Paper | |
|---|---|---|
| BF | 3 µm | 10 µm |
| 4 | 2.9 | 4.1 |
| 10 | 2.9 | – |
| 3 | 6.2 | 8.7 |
| 30 | 6.2 | 8.7 |
| 7 | 26.1 | 36.7 |
| 72 | 52.2 | 73.4 |
| 5 | 85.1 | 119.6 |
| 52 | 170.2 | 239.2 |

The filter elements are made from phenolic resin impregnated paper and cannot therefore be cleaned!

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Temperature range | -30 °C to +100 °C |
| Material of housing | Steel, zinc-plated/plastic coated (BF 4, 3)<br>Steel (BF 5, 52)<br>Steel, galvanised (BF 8)<br>Aluminium (BF 9)<br>Glass fibre reinforced synthetic material (BF 10, 30, 7, 72) |
| Type of clogging indicator | VMF (return line indicator) |
| Pressure setting of clogging indicator | 0.6 bar K pressure gauge<br>0.035 bar UBM indicator<br>(others on request) |

### 1.4 SEALS

NBR (= Perbunan) on filter
Polyurethane on element
Cardboard on mounting flange

### 1.5 SPECIAL MODELS AND ACCESSORIES

- with check/bypass valve to support the suction characteristics of the pump
  Not 100% air-tight or leakage-free!
  (only BF 10 (but not G¼), 3, 30, 5 and 52)
- with anti-splash device
  (only BF 10, 3, 30, 7, 72)
- with connection for a clogging indicator
  (only BF 7, 72, 8, 9)

### 1.6 SPARE PARTS

See Original Spare Parts List

### 1.7 CERTIFICATES, APPROVALS, STANDARDS

BF 7, 72 to Renault specification; others on request

### 1.8 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

The standard models are suitable for use with mineral and lubrication oils. For non-flam and biodegradable oils, see tables:

Non-flam fluids

| BF | HFA | HFC | HFD-R |
|---|---|---|---|
| 4, 10, 3, 30 | – | – | – |
| 7, 72, 5, 52 | ● | ● | – |
| 8, 9 | ● | ● | ● |

- HFA oil in water emulsion
  ($H_2O$ content ≥ 80%)
- HFC water polyglycol solution
  ($H_2O$ content 35-55%)
- HFD-R synthetic, water free phosphate ester

Biodegradable fluids

| BF | HTG | HE | HPG | |
|---|---|---|---|---|
| | | | PAG | PRG |
| 4, 10, 3, 30, | + | + | ● | ● |
| 7, 72, 5, 52 | + | + | ● | ● |
| 8, 9 | + | + | ● | ● |

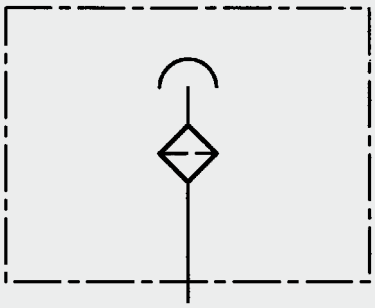
\+ suitable for all
● contact our Technical Sales Department
– not suitable

- HTG vegetable oil based hydraulic fluids
- HE ester-based synthetic hydraulic fluids
- HPG polyglycol-based synthetic hydraulic fluids
- PAG sub-group HPG: polyalkalene glycol
- PEG sub-group HPG: polyethylene glycol

### 1.9 CHANGING INTERVALS

The breather filter elements or filters must be replaced as frequently as the fluid filters, but at least once a year.

**Symbol**



# 2. MODEL CODE (also order example)

## 2.1 COMPLETE FILTER

### 2.1.1 BF 4 and 3

**BF P 3 G 10 W 4 . X /-RV**

**Filter type**
BF

**Filter material**
P Paper

**Size**
BF 4, 3

**Type and size of connection**

| Desig. | Type | Connection | Filter size BF4 | Filter size BF3 |
|---|---|---|---|---|
| G | Thread ISO 228 | G ¼ | • | |
| | | G ½ | | • |
| | | G ¾ | | • |
| | | G 3/8 | | • |

**Filtration rating in µm**
P 3, 10 (absolute)

**Type of clogging indicator**
W no port for clogging indicator

**Type code**

| Size | Code | Connection | Δp [bar] |
|---|---|---|---|
| BF 3 | 1.X | G ¾ | - |
| BF 3 | 2.X | G 3/8 | - |
| BF 3 | 3.X | G ½ | - |
| BF 3../-RV | 4.X | G ¾ | 0.4 |
| BF 3../-RV | 5.X | G ¾ | 0.7 |
| BF 3../-RV | 6.X | G ¾ | 0.2 |
| BF 3../-RV | 7.X | G ¾ | 1.0 |
| BF 4 | 1.X | G ¼ | - |

**Modification number**
X the latest version is always supplied

**Supplementary details**
RV check/bypass valve (not for BF 4)

### 2.1.2 BF 10 and 30

**BF P 30 G 10 W 4 . X /-RV**

**Filter type**
BF

**Filter material**
P Paper

**Size**
BF 10, 30

**Type and size of connection**

| Desig. | Type | Connection | Filter size BF10 | Filter size BF30 |
|---|---|---|---|---|
| G | Thread ISO 228 | G ¼ | • | |
| | | G ¾ | | • |
| M | metr. connection | M 42x2 | | • |
| | | M 30x1.5 | | • |
| | | M 22x1.5 | • | |
| N | NPT thread | ½ | • | |
| | | ¾ | | • |
| U | UNF thread | 1 1/16-12UN-2A | | • |

**Filtration rating in µm**
P 3, 10 (absolute) -10 µm only for BF 30

**Type of clogging indicator**
W no port for clogging indicator

**Type code**

| Size | Code | Connection |
|---|---|---|
| BF 30 G… | 1.X | G ¾ |
| BF 30 M… | 1.X | M 42x2 |
| BF 30 M... | 2.X | M 30x1.5 |
| BF 30 N... | 1.X | NPT ¾ |
| BF 30 U... | 1.X | 1 1/16-12UN-2A |
| BF 10 G... | 1.X | G ¼ |
| BF 10 M... | 1.X | M 22x1.5 |
| BF 10 N | 1.X | NPT ½ |

**Modification number**
X the latest version is always supplied

**Supplementary details**
AS anti-splash without check/bypass valve
RV0.2, RV0.4, RV0.7 valve with relevant pressure setting

### 2.1.3 BF 7 and 72

**BF P 72 G 3 W 1 . X /-AS**

**Filter type**
BF

**Filter material**
P Paper

**Size**
BF 7, 72

**Type and size of connection**

| Desig. | Type | Connection | Filter size 7 | Filter size 72 |
|---|---|---|---|---|
| G | Thread ISO 228 | G 1 | • | • |

**Filtration rating in µm**
P 3, 10 (absolute)

**Type of clogging indicator**
W no port for clogging indicator
K pressure gauge (measuring range: -1 to +0.6 bar)
UBM visual/analogue vacuum gauge with manual reset (pressure setting: -0.035 bar)

**Type code**
0 for type UBM
1 for types W and K

**Modification number**
X the latest version is always supplied

**Supplementary details**
AS anti-splash device (only BF 7, 72)

### 2.1.4 BF 5 and 52

**BF P 52 G 3 W 1 . X /-RV0.4**

**Filter type**
BF

**Filter material**
P Paper
BN Betamicron®

**Size**
BF 5, 52

**Type and size of connection**

| Desig. | Type | Connection | Filter size 5 | Filter size 52 |
|---|---|---|---|---|
| G | Thread ISO 228 | G 2½ | • | • |

**Filtration rating in µm**
BN, P 3, 10 (absolute)

**Type of clogging indicator**
W no port for clogging indicator

**Type code**
1

**Modification number**
X the latest version is always supplied

**Supplementary details**
RV0.4 check/bypass valve 0.4 bar pressure setting

### 2.1.5 **BF 8 and 9**

**BF P 8 F 10 W 1 . X**

**Filter type**
BF

**Filter material**
BN Betamicron®
BN/AM Betamicron®/Aquamicron®

**Size**
BF 8, 9

**Type and size of connection**

| Desig. | Type | Filter size 8 | Filter size 9 |
|---|---|---|---|
| F | Flange | • | • |

**Filtration rating in µm**
BN 3, 10, 20 - for BF 8
BN 2 - for BF 9
BN/AM 10 - for BF 8

**Type of clogging indicator**
A blanking plug in indicator port
K pressure gauge (measuring range: -1 to +0.6 bar)

**Type code**
1

**Modification number**
X the latest version is always supplied

## 2.2 REPLACEMENT ELEMENT

**0005 L 003 P**

**Size**
0005 for BF 5, 52
0007 for BF 7
0072 for BF 72
0008 for BF 8
0009 for BF 9

**Type**
L

**Filtration rating in µm**
P: 003, 010 (BF 5, 52, 7, 72)
BN: 001, 002 (BF 8)
BN: 002 (BF 9)
BN: 003, 010 (BF 5, 52)
BN4AM: 001 (BF 8)

**Filter material**
P Paper (BF 5, 52, 7, 72)
BN Betamicron® (BF 5, 52, 8, 9)
BN4AM Betamicron®/Aquamicron® (BF 8)

Replacement elements cannot be ordered for BF 4, 10, 3, 30 .

These filters are only available complete !

## 2.3 REPLACEMENT CLOGGING INDICATOR

**VMF 0.6 K . X**

**Type**
VMF Return line indicator

**Pressure setting**
0.6 -1 to +0.6 bar
0.035 -0.035 bar

**Type**
K pressure gauge
UMB visual/analogue vacuum gauge

**Modification number**
X the latest version is always supplied

## 2.4 MODEL CODE FOR BF 7 AND 72 TO RENAULT SPECIFICATION

**BF P 7 F 10 UBM 0 . X**

**Size**
7 Tank volume from 20 to 400 litre
72 Tank volume over 400 litre

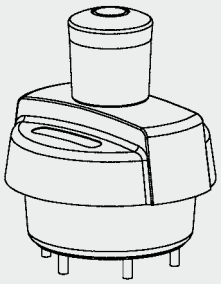
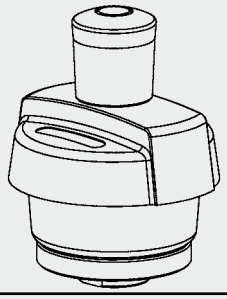
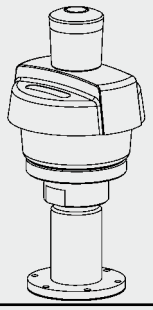
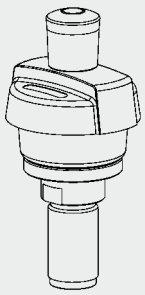
**Type and size of connection**

| Desig. | Type | Filter size 7 | Filter size 72 |
|---|---|---|---|
| G | with threaded adaptor | • | • |
| F | with flange adaptor | • | • |
| S | with weld adaptor | • | • |

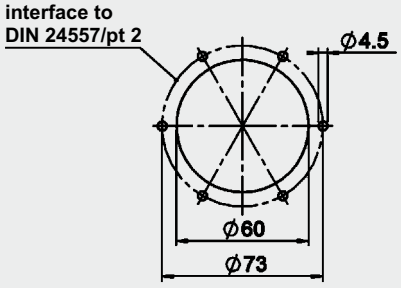
**Type of clogging indicator**
UBM visual analogue vacuum pressure gauge with manual reset, measuring range 0 to +0.035 bar

**Type code**
0 without adaptor (basic model)
2 incl. adaptor with male thread G ¾
3 incl. adaptor with female thread 1½-16 UNC
4 incl. adaptor with female thread G ¾
5 incl. flange adaptor (1½-16 UNC)
6 incl. flange adaptor (G ¾)
7 incl. weld adaptor (1½-16 UNC)
8 incl. weld adaptor (G ¾)
9 incl. adaptor with male thread G 1¼

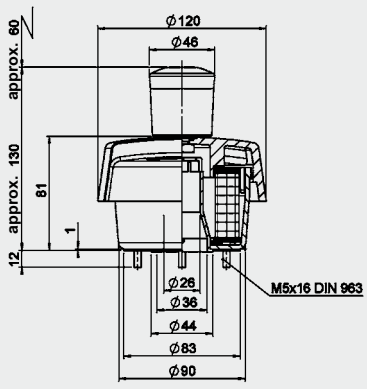
**Modification number**
X the latest version is always supplied

| Basic model | With threaded adaptor | With flange adaptor | With weld adaptor |
|---|---|---|---|
|  |  |  |  |

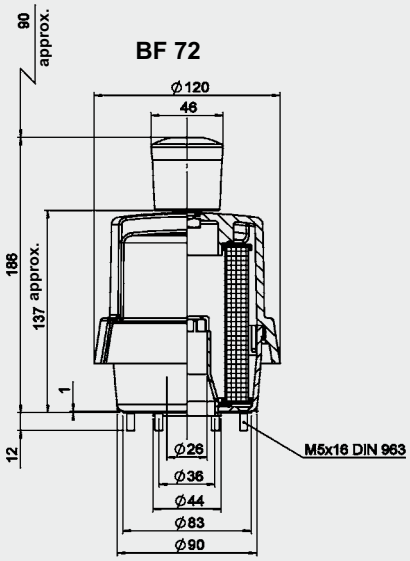
**Dimensions: BF 7/72 to RENAULT specification**




BF 7




BF 72




For further information on the BF7/72 to Renault specification, please contact Hydac!

# 3. FILTER CALCULATION / SIZING

## 3.1 SINGLE PASS FILTRATION PERFORMANCE DATA FOR AIR FILTER ELEMENTS

The following separation values were established under real-life simulated conditions. This means that the selected velocity of the flow against the filter mesh was 20 cm/s and the contamination added was 40 mg/m³ of ISO MTD test dust.

| Filtration rating | Retention value d.. | For particle size | Filter material |
|---|---|---|---|
| 3 µm | d 80 | 0.74 µm | Paper |
| | d 100 | 2.64 µm | |
| 10 µm | d 80 | 1.49 µm | |
| | d 100 | 9.56 µm | |
| 10 µm | d 80 | 0.25 µm | BN |
| | d 100 | 0.84 µm | |

The d 80 value refers to the particle size which is filtered out at a rate of 80% during the retention test. The particle size determined by this method is called the nominal filtration rating of the air filter. The d 100 value therefore refers to the particle size which is filtered out at a rate of 100% during the single-pass test. The particle size determined by this method is called the absolute filtration rating of the air filter.

Table of average dust concentrations in real life:

| | |
|---|---|
| Urban regions with a low level of industry | 3-7 mg/m³ air |
| General mechanical engineering | 9-23 mg/m³ air |
| Construction industry (wheeled vehicles) | 8-35 mg/m³ air |
| Construction industry (tracked vehicles) | 35-100 mg/m³ air |
| Heavy industry | 50-70 mg/m³ air |

## 3.2 DIFFERENTIAL PRESSURE ACROSS BREATHER FILTER

The differential pressure (with clean element) for the various filter sizes is shown in the graphs under point 3.4.

## 3.3 SIZING GUIDELINES

For ease of calculation, our Filter Sizing Program is available on request free of charge.

**NEW:** Sizing online at www.hydac.com

The rate at which contamination enters a hydraulic system can be considerably reduced by using efficient tank breather filtration.

**NOTE:**

Incorrectly sized breather filters can place additional strain on the system and reduce the service life of hydraulic filter elements.

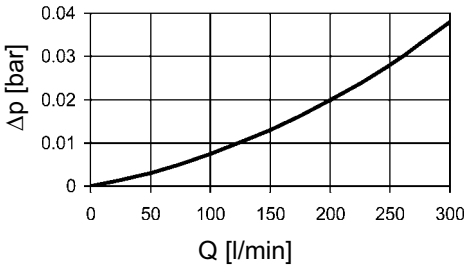
For optimum sizing the following should therefore be observed:

- Filtration rating of air breather filter ≤ filtration rating of hydraulic filter
- Only use air breather filters with an absolute retention rate (d100 ≤ x µm; x = given filtration rating)
- Max. permissible initial pressure loss: 0.05 bar, optionally 0.01 bar (with a clean filter element and calculated air flow rate)
- Determination of the calculated air flow rate:
  QA = f5 x Qp
  QA = air flow rate for sizing purposes in $l_N$/min
  f5 = factor for operating conditions
  Qp = max. flow rate of the hydraulic pump in l/min

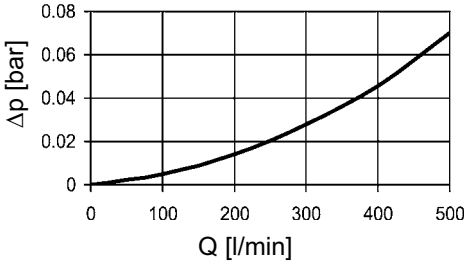
  For Factor f5, see table on p. 275, ELF Tank Breather Filter, E 7.404.0/06.07.

## 3.4 AIR FLOW RATE

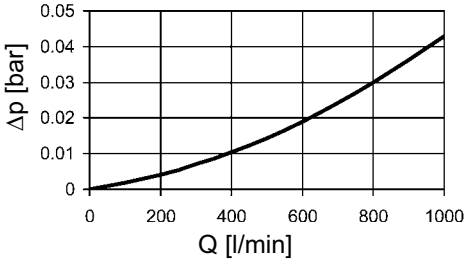
### BF 4



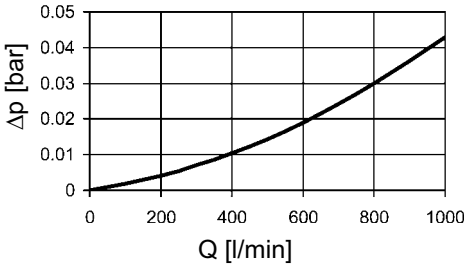

### BF 10



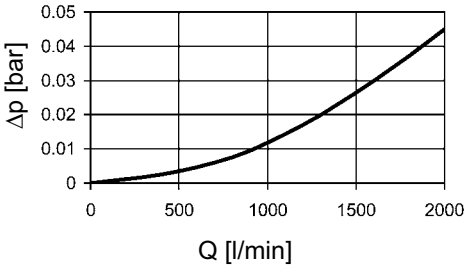

### BF 3



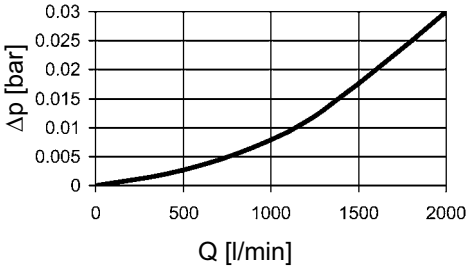

### BF 30



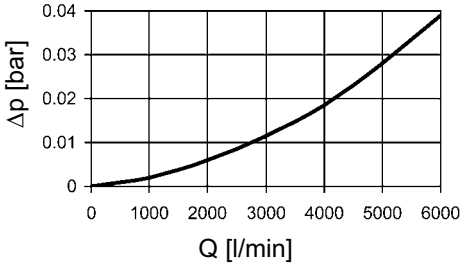

### BF 7



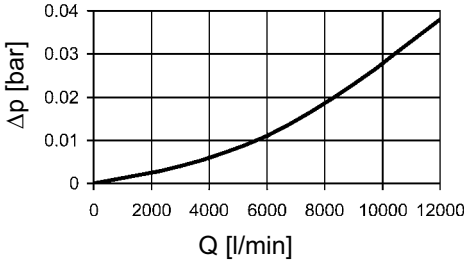

### BF 72



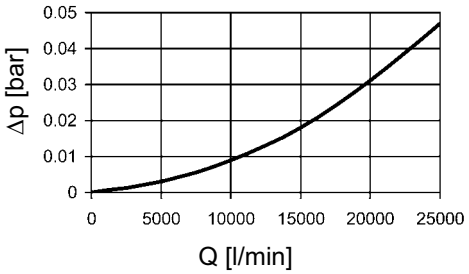

### BF 5



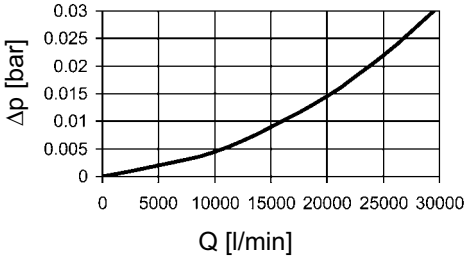

### BF 52




### BF 8

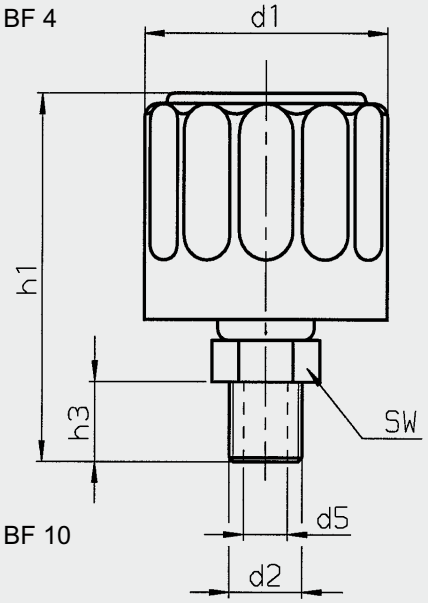



### BF 9

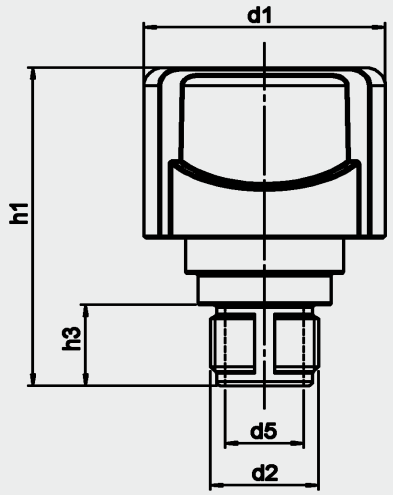


## 4. DIMENSIONS

BF 4




BF 10

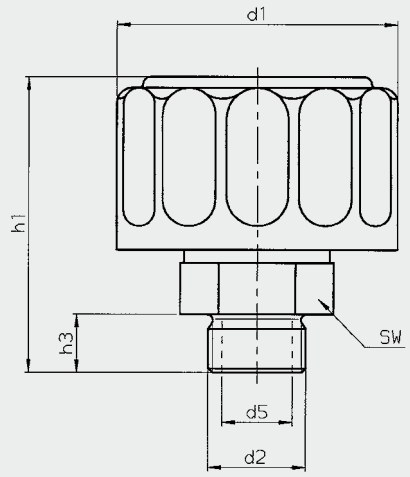



| Type | BF 4... |
|---|---|
| d1 | 44 |
| d2 | G ¼ |
| d5 | 8 |
| h1 | 62 |
| h3 | 13.5 |
| SW | 17 |
| Weight | 0.08 kg |

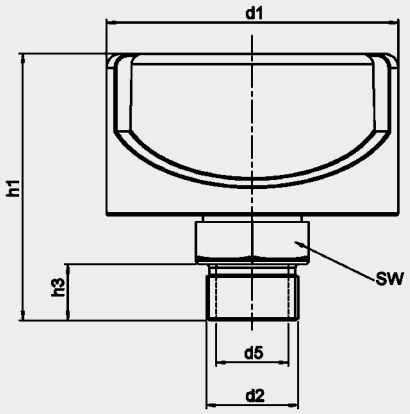
| Type | BF 10 "G"... | BF 10 "M"... |
|---|---|---|
| d1 | 49 | 49 |
| d2 | G ¼ | M22x1.5 |
| d5 | 7 | 16 |
| h1 | 64 | 71 |
| h3 | 13.5 | 18 |
| Weight | 0.047 kg | 0.052 kg |

| Type | BF 10 "U"... | BF 10 "N"... |
|---|---|---|
| d1 | 49 | 49 |
| d2 | 1 1/16-12 UN | NPT ½ |
| d5 | 16 | 14 |
| h1 | 71 | 71 |
| h3 | 18 | 18 |
| Weight | 0.059 kg | 0.049 kg |

BF 3




BF 30

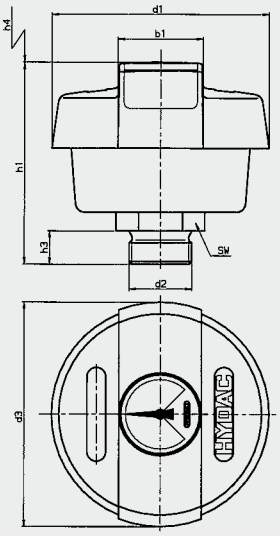



| Type | BF 3 ...1.X | BF 3 ...2.X | BF 3 ...3.X |
|---|---|---|---|
| d1 | 76 | 76 | 76 |
| d2 | G ¾ | G 3/8 | G ½ |
| d5 | 19 | 12 | 15 |
| h1 | 79 | 72 | 76 |
| h3 | 16 | 12 | 14 |
| SW | 36 | 22 | 27 |
| Weight | | 0.33 kg | |

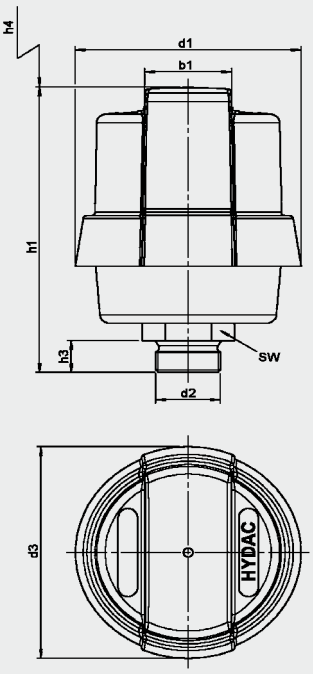
| Type | BF 30 "G"...1.X | BF 30 "M"...1.X | BF 30 "M"...2.X |
|---|---|---|---|
| d1 | 83 | 83 | 83 |
| d2 | G ¾ | M42x2 | M30x1.5 |
| d5 | 20.5 | 34.5 | 20.5 |
| h1 | 76 | 76 | 76 |
| h3 | 16 | 16 | 16 |
| SW | 32 | 46 | 32 |
| Weight | 0.12 kg | 0.13 kg | 0.12 kg |

| Type | BF 30 "N"...1.X | BF 30 "U"...1.X |
|---|---|---|
| d1 | 83 | 83 |
| d2 | NPT ¾ | 1 1/16-12 UN |
| d5 | 20.5 | 20.5 |
| h1 | 76 | 76 |
| h3 | 16 | 16 |
| SW | 32 | 32 |
| Weight | 0.12 kg | 0.12 kg |

BF 7

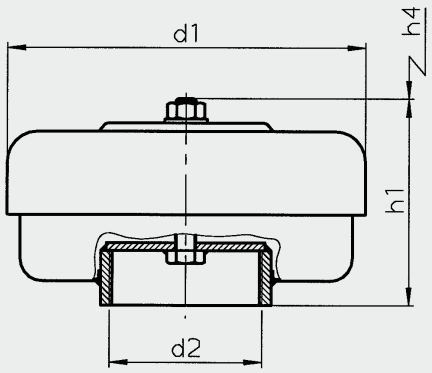



BF 72

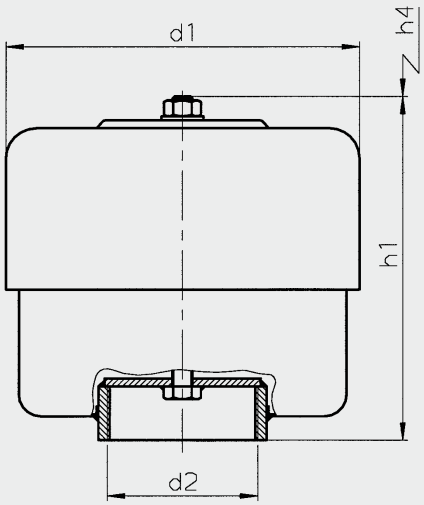



| Type | BF 7... | BF 72... |
|---|---|---|
| d1 | 116 | 116 |
| d2 | G 1 | G 1 |
| d3 | 120 | 120 |
| h1 | 110 | 162 |
| h3 | 18 | 18 |
| h4 | 60 | 90 |
| b1 | 44 | 44 |
| SW | 41 | 41 |
| Weight | 0.40 kg | 0.65 kg |

BF 5

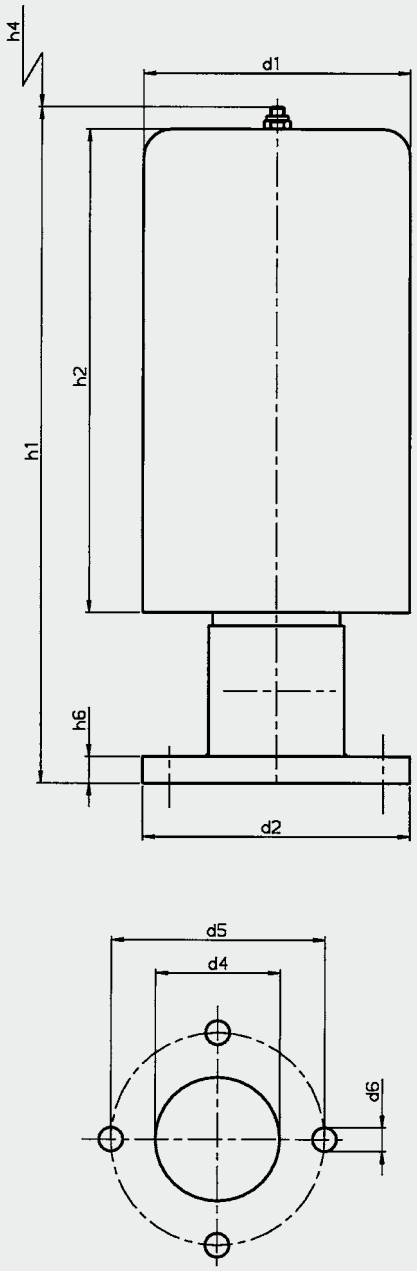



BF 52



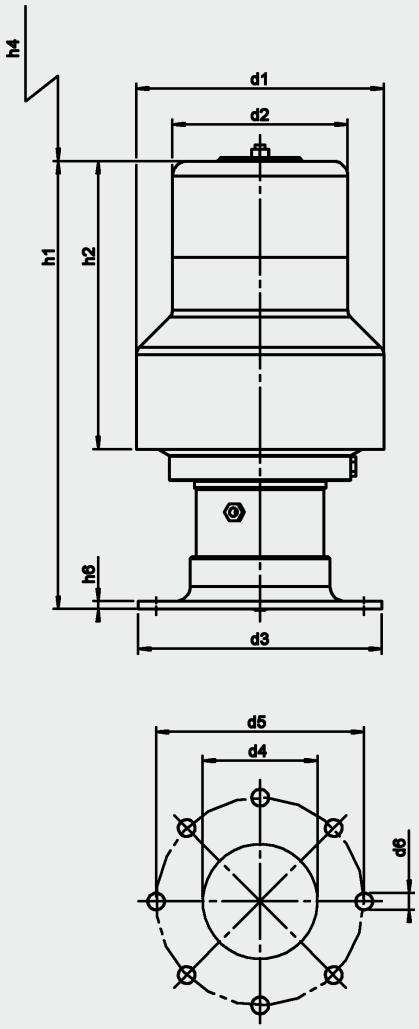

| Type | BF 5... | BF 52... |
|---|---|---|
| d1 | 177 | 177 |
| d2 | G 2½ | G 2½ |
| h1 | 107 | 173 |
| h4 | 90 | 90 |
| Weight | 2.00 kg | 2.60 kg |

BF 8




| Type | BF 8... |
|---|---|
| d1 | 200 |
| d2 | 200 |
| d4 | 93 |
| d5 | 160 |
| d6 | 18 |
| h1 | 510 |
| h2 | 365 |
| h4 | 400 |
| h6 | 20 |
| Weight | 12.4 kg |

BF 9




| Type | BF 9... |
|---|---|
| d1 | 250 |
| d2 | 177 |
| d3 | 246 |
| d4 | 116 |
| d5 | 210 |
| d6 | 17 |
| h1 | 455 |
| h2 | 290 |
| h4 | 330 |
| h6 | 8 |
| Weight | 6.2 kg |

## NOTE

The information in this brochure relates to the operating conditions and applications described.

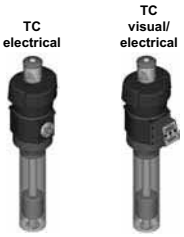
For applications or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.


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# TankConditioner® TC
## with Breather Filter, Float Switch and Temperature Monitoring System




## 1. TECHNICAL SPECIFICATIONS

### 1.1 UNIT CONSTRUCTION

The TankConditioner® TC is a multi-functional unit consisting of a fluid level and temperature monitoring system, an optional temperature display and a breather filter BF7 or BF 72.

### 1.2 FLUID LEVEL MONITORING

Values are measured using the float principle. For simple monitoring functions (e.g. pump protection or tank level monitoring) the fluid level monitoring device has two bi-stable switch contacts which can be turned through 180° for either N/O or N/C function.

A resolution of 10 mm makes it easy to set the switch points to suit the requirements of the system. The switch points can also be displayed via 3 LEDs (green, yellow, red), if specially requested by the customer.

Depending on the type of unit, the actual oil level can also be output as an analogue control signal for system control.

Oil level monitoring is maintenance-free for fluids which do not form a residue on the sensor tube during operation.

### 1.3 FLUID TEMPERATURE MONITORING

The thermal contact required for this is fitted to the end of the contact strip and therefore monitors the oil temperature in the lower part of the tank.

The normally closed contact responds at 70 °C and acts as an emergency cut-out.

If switching functions are to be carried out in conjunction with temperature monitoring (to control an oil cooler, for example) then, depending on the model, up to 2 PNP switch outputs can either be programmed hysteresis-free from 0-100 °C, or can be output as an analogue control signal.

### 1.4 TANK BREATHER FILTER

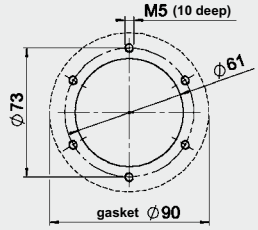
To meet the most likely customer requirements, the TankConditioner® TC is fitted with the BF 7 or BF 72 breather filter as standard.

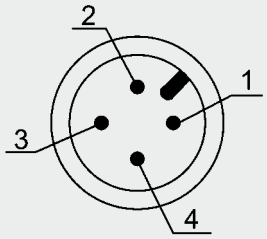
The breather filter is designed in such a way that it is impossible to fill or top up the tank with hydraulic fluid via the filter housing (exception: version FABF).

The TankConditioner® TC can be supplied without a port for a clogging indicator or with a visual-analogue clogging indicator. To make the breather filter even more maintenance-friendly, we recommend fitting a UBM type clogging indicator, which is easily visible and includes a memory function.The yellow reset button is used to reset the indicator after changing the element.

### 1.5 GENERAL TECHNICAL SPECIFICATIONS

| | |
|---|---|
| Flange connection | DIN 24557/ Part 2: mounting hole Ø61 |
| Installation position | vertical ±30° |
| Operating voltage | 12V ... 30V DC |
| Electrical connection | Male: Series M12x1 / 4 pole IP67<br>For type S44 screened cables must be provided by customer! |
| Filter element | 3 µm |
| Air flow rate | BF 7: max. 900 $l_N$/min<br>BF 72: max. 1200 $l_N$/min |
| Sensor tube / float / protective sleeve (option) | synthetic material / brass (optional stainless steel) |
| Nominal pressure | max. 1 bar |
| Temperature of fluid | max. 100 °C |
| Flange connection to DIN 24557 / Part 2 | For pin assignment see point 3 Dimensions |




For further information, please see point 3

### 1.6 TANK FILLING OPTION

For simple applications the tank can be filled via the breather filter (see Supplementary Details code FABF).
To protect the hydraulics a filler-strainer is built into the tank flange as a coarse filter.
For high performance hydraulic systems we recommend the filling connection which allows the filling of filtered oil to be monitored (Supplementary Details FA34). The required quick release coupling is not supplied.

### 1.7 FILTER ELEMENTS

**Contamination retention capacities in g**

| | Paper |
|---|---|
| BF | 3 µm |
| 7 | 26.1 |
| 72 | 52.2 |

### 1.8 SEALS

NBR (= Perbunan)
NBR and cork for version FA34

### 1.9 WAVE MOTION PROTECTION

Wave motion on the surface of the oil can affect the float and can therefore cause measurement errors, particularly in large tanks. A protective sleeve is therefore available in brass (type code 1.x) or stainless steel (type code 2.x) as an accessory for these applications.

### 1.10 FLOAT

To ensure compatibility with many standard hydraulic fluids, the TankConditioner® TC sensor tube and float are made from synthetic material and brass, with stainless steel as an option.

### 1.11 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

Brass version:

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743

Stainless steel version:

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Non-flam operating fluids HFA, HFB, HFC and HFD

## 2. MODEL CODE (also order example)

**TC P 7 F 3 UBM + D 1 . X /-S12-V250 -SSR**

### 2.1 COMPLETE FILTER

**Filter type**
TankConditioner® TC

**Filter material of element**
P Paper

**Size of breather filter**
7, 72

**Connection**
F flange (to DIN 24557 / part 2)

**Filtration rating in µm**
3

**Type of clogging indicator**
W without port for clogging indicator
UBM with visual vacuum indicator

**Type of temperature monitoring**
C electrical
D visual/electrical

**Type code**
1 material of float: polyurethane; material of sensor tube: brass
2 material of float and sensor tube: stainless steel

**Modification number**
X the latest version is always supplied

**Supplementary details**

Required: Switch assignment:

| Switch | Fluid Level | Temperature |
|---|---|---|
| S | 1 | 2 |
| S | 4 | 4 |

1 = fluid level contact; normal setting: L1 = rising N/O, L2 = rising N/C
2 = N/C, 4 = measuring range 4-20 mA

V250 Length of the sensor tube = 250 mm
V370 Length of the sensor tube = 370 mm
V520 Length of the sensor tube = 520 mm

Optional:
SSR wave protection sleeve
(the type of material (brass or stainless steel) is indicated by the type code 1 or 2;
i.e. 1 = brass; 2 = stainless steel)
FA34 filling adaptor with G 3/4 connection (including wave protection sleeve)
FABF filling via breather filter (including wave protection sleeve)
LED optional LED display for fluid level
(green = operating; yellow = warning; red = critical)
(for this option, please contact HYDAC)




### 2.2 REPLACEMENT ELEMENT

**0007 L 003 P**

**Size**
0007, 0072

**Type**
L

**Filtration rating in µm**
003

**Filter material**
P Paper

### 2.3 STANDARD MODELS

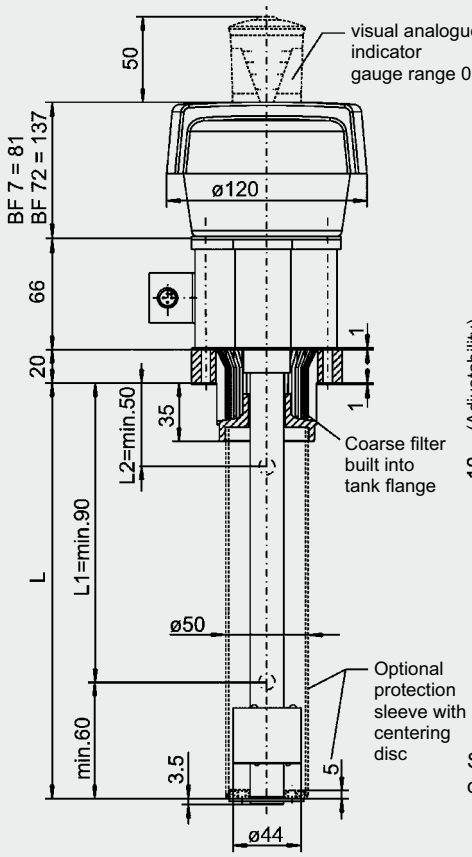
Out of the different models of TankConditioner® TC, with all the options available to the customer, the following are designated "Standard models":

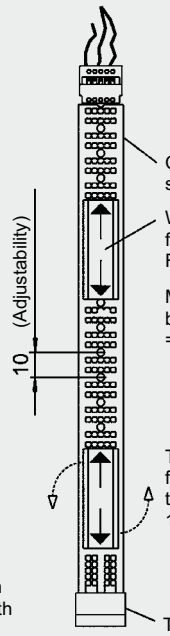
- TC P 7 F 3 UBM+C 1.0 /-S12-Vxxx
- TC P 7 F 3 UBM+D 1.0 /-S12-Vxxx
- TC P 7 F 3 UBM+C 1.0 /-S12-Vxxx-FABF
- TC P 7 F 3 UBM+D 1.0 /-S12-Vxxx-FABF
- TC P 7 F 3 UBM+D 1.0 /-S12-Vxxx-FA34
- TC P 7 F 3 UBM+C 1.0 /-S44-Vxxx-FA34

# 3. DIMENSIONS AND TECHNICAL SPECIFICATIONS

## 3.1 TANKCONDITIONER® TC WITH SUPPLEMENTARY CODE "S12"

Version TC...**C** 1.x/-**S12**-Vxxx...(Brass/synthetic material)

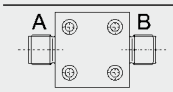



Sectional diagram of sensor tube

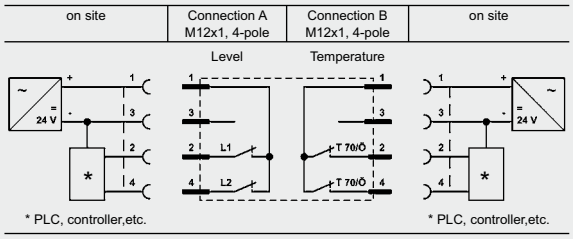
**TECHNICAL SPECIFICATIONS**

| | |
|---|---|
| Fluid level switch points | bi-stable N/O / N/C<br>Max. 2 can be set |
| Resolution | 10 mm |
| Hysteresis | 4 mm |
| Thermal contact | T70 °C / N/C |
| Switching capacity | 10W / VA max<br>30 V / DC max. |
| Switching current | 1 A max. |



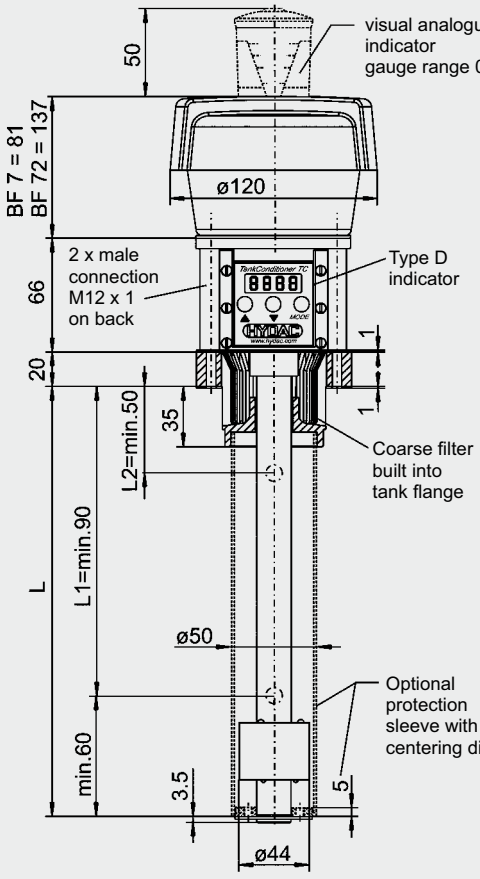

**Male connections**

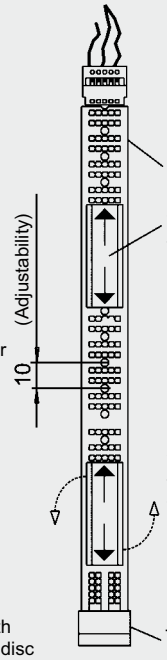
| Connection A | Connection B |
|---|---|
| Level contact(s):<br>1 = 12V-30V DC<br>2 = Level L1 (+UB)<br>3 = not used<br>4 = Level L2 (+UB) | Temperature contact(s):<br>1 = 12V-30V DC<br>2 + 4 = T70 / O (+UB)<br>3 = not used |




| Factory normal setting for type S12: "pump protection monitoring" | | | | | |
|---|---|---|---|---|---|
| Swit. points | Sensor tube length L 250 | 370 | 520 | Contact function of fluid level contacts | Possible application |
| L2 | 150 | 270 | 420 | NC - rising NC | Warning "min. tank level" |
| L1 | 190 | 310 | 460 | NO - rising NO | Cut-out "min. tank level" |

Version TC...**D** 1.x /-**S12**-Vxxx... (Brass/synthetic material)

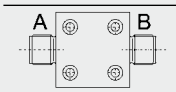



Sectional diagram of sensor tube

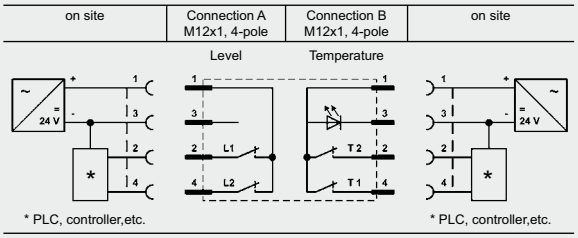
**TECHNICAL SPECIFICATIONS**

| | |
|---|---|
| Fluid level switch points | bi-stable N/O / N/C<br>Max. 2 can be set |
| Resolution | 10 mm |
| Hysteresis | 4 mm |
| Thermal element | Pt100 |
| Temperature switch pt. | Max. 2 can be set |
| Hysteresis | 1 – 99 K can be set |
| Switching capacity | 10W / VA max<br>30 V / DC max. |
| Switching current | 1 A max. |
| Display for temperature monitoring | LED 3-digit<br>(4-digit w/o unit of meas.) |
| Indication range | -20 °C to +120 °C (-4 ° to +248 °F) |



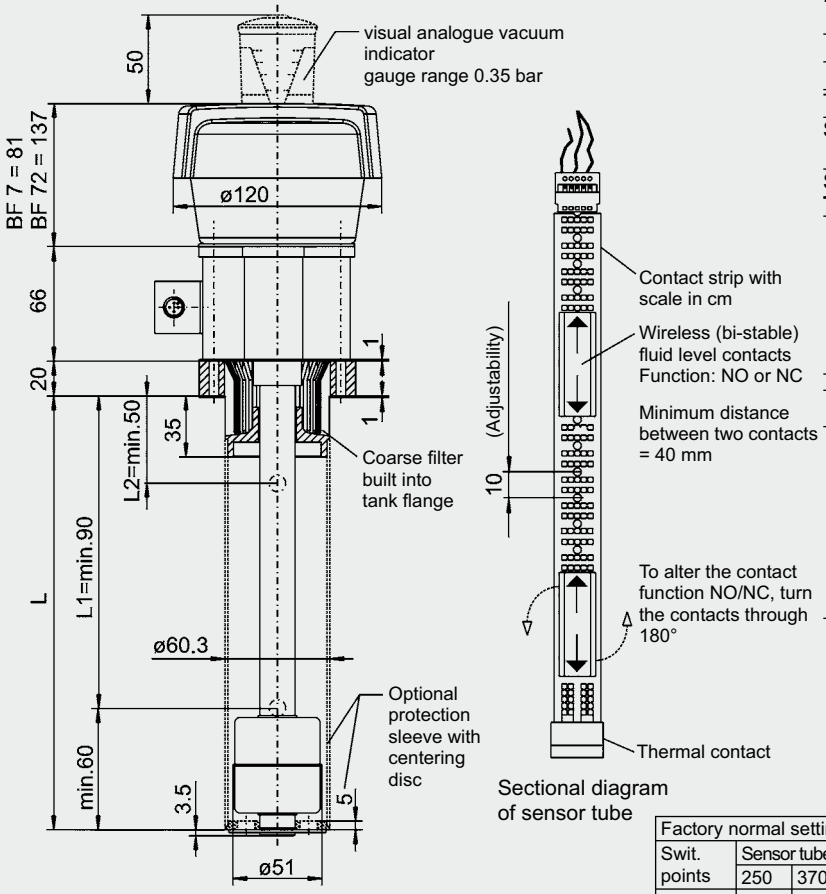

**Male connections**

| Connection A | Connection B |
|---|---|
| Level contact(s):<br>1 = 12V-30V DC<br>2 = Level L1 (+UB)<br>3 = not used<br>4 = Level L2 (+UB) | Temperature contact(s):<br>1 = 12V-30V DC<br>2 = Temperature 2 (+UB)<br>3 = GND (0V)<br>4 = Temperature 1 (+UB) |




| Factory normal setting for type S12: "pump protection monitoring" | | | | | |
|---|---|---|---|---|---|
| Swit. points | Sensor tube length L 250 | 370 | 520 | Contact function of fluid level contacts | Possible application |
| L2 | 150 | 270 | 420 | NC - rising NC | Warning "min. tank level" |
| L1 | 190 | 310 | 460 | NO - rising NO | Cut-out "min. tank level" |

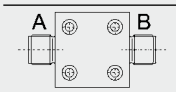
## Version TC...**C** 2.x /-**S12**-Vxxx... (Stainless steel)




Sectional diagram of sensor tube

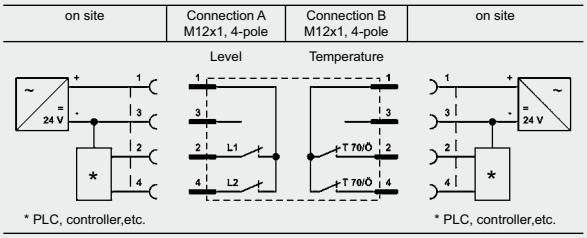
### TECHNICAL SPECIFICATIONS

| | |
|---|---|
| Fluid level switch points | bi-stable N/O / N/C<br>Max. 2 can be set |
| Resolution | 10 mm |
| Hysteresis | 4 mm |
| Thermal contact | T70 °C / N/C |
| Switching capacity | 10W / VA max<br>30 V / DC max. |
| Switching current | 1 A max. |



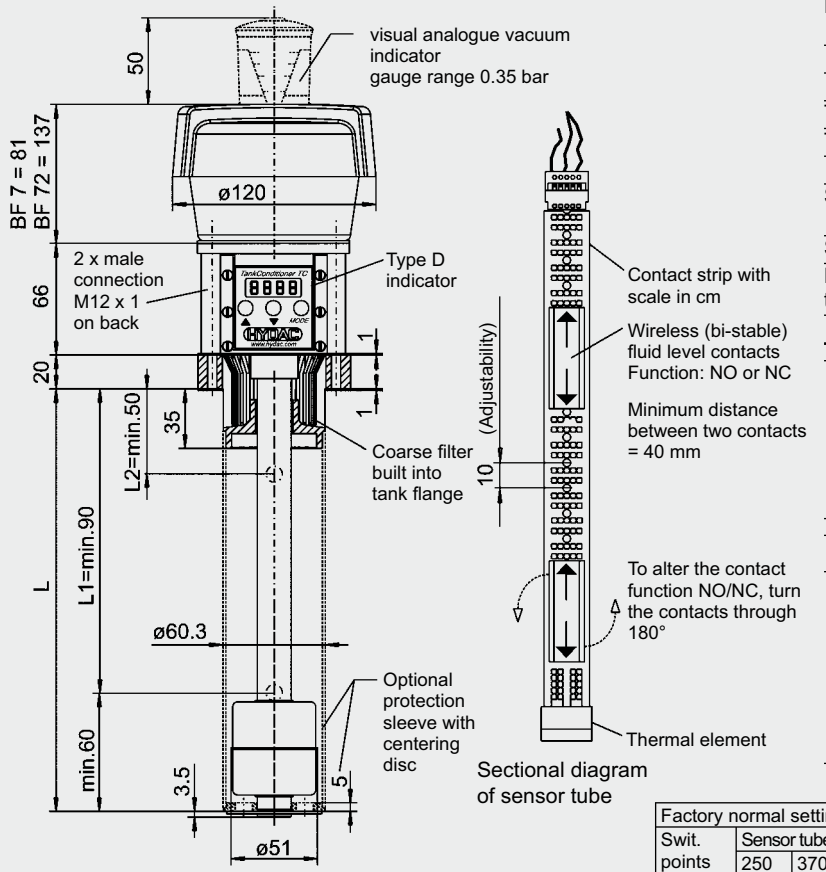

**Male connections**

| Connection A | Connection B |
|---|---|
| Level contact(s):<br>1 = 12V-30V DC<br>2 = Level L1 (+UB)<br>3 = not used<br>4 = Level L2 (+UB) | Temperature contact(s):<br>1 = 12V-30V DC<br>2 + 4 = T70 / O (+UB)<br>3 = not used |




| Factory normal setting for type S12: "pump protection monitoring" | | | | | |
|---|---|---|---|---|---|
| Swit. points | Sensor tube length L 250 | 370 | 520 | Contact function of fluid level contacts | Possible application |
| L2 | 150 | 270 | 420 | NC - rising NC | Warning "min. tank level" |
| L1 | 190 | 310 | 460 | NO - rising NO | Cut-out "min. tank level" |

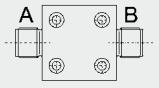
## Version TC...**D** 1.x /-**S12**-Vxxx... (Stainless steel)




Sectional diagram of sensor tube

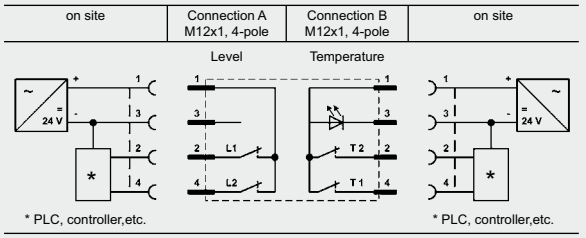
### TECHNICAL SPECIFICATIONS

| | |
|---|---|
| Fluid level switch points | bi-stable N/O / N/C<br>Max. 2 can be set |
| Resolution | 10 mm |
| Hysteresis | 4 mm |
| Thermal element | Pt100 |
| Temperature switch pt. | Max. 2 can be set |
| Hysteresis | 1 – 99 K can be set |
| Switching capacity | 10W / VA max<br>30 V / DC max. |
| Switching current | 1 A max. |
| Display for temperature monitoring | LED 3-digit<br>(4-digit w/o unit of meas.) |
| Indication range | -20 °C to +120 °C (-4 ° to +248 °F) |




**Male connections**

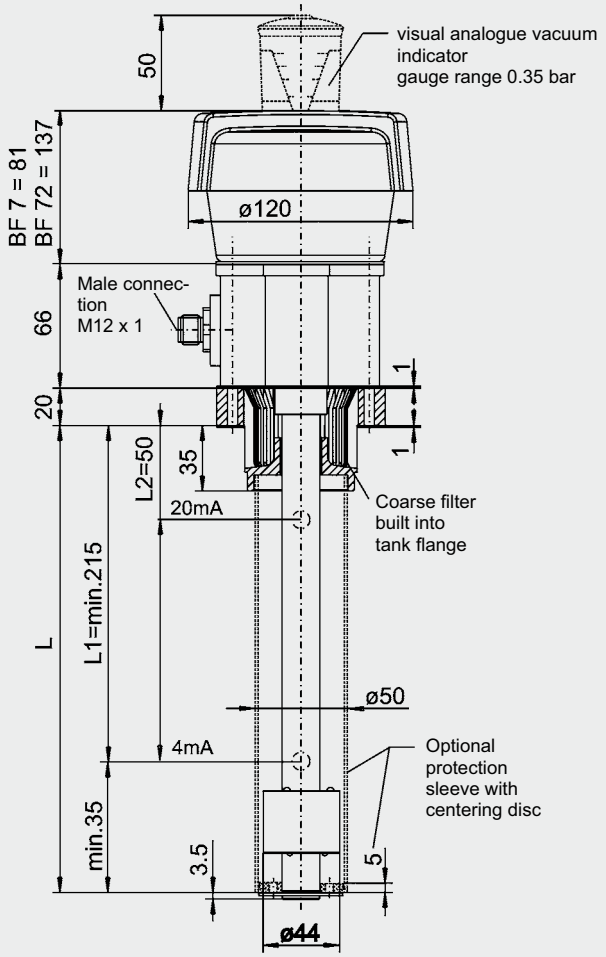
| Connection A | Connection B |
|---|---|
| Level contact(s):<br>1 = 12V-30V DC<br>2 = Level L1 (+UB)<br>3 = not used<br>4 = Level L2 (+UB) | Temperature contact(s):<br>1 = 12V-30V DC<br>2 = Temperature 2 (+UB)<br>3 = GND (0V)<br>4 = Temperature 1 (+UB) |




| Factory normal setting for type S12: "pump protection monitoring" | | | | | |
|---|---|---|---|---|---|
| Swit. points | Sensor tube length L 250 | 370 | 520 | Contact function of fluid level contacts | Possible application |
| L2 | 150 | 270 | 420 | NC - rising NC | Warning "min. tank level" |
| L1 | 190 | 310 | 460 | NO - rising NO | Cut-out "min. tank level" |

## 3.2 TANKCONDITIONER® TC MIT ERGÄNZENDER ANGABE „S44“

Version TC...**C** 1.x /-**S44**-Vxxx... (Brass/synthetic material)



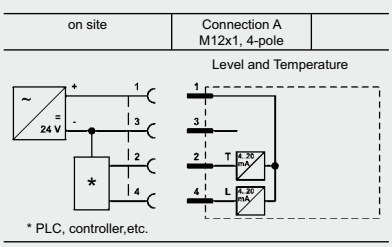

**TECHNICAL SPECIFICATIONS**

| | |
|---|---|
| Fluid level monitoring | |
| Output signal | 4 – 20 mA |
| Meas. range for V250 | 165 mm |
| Meas. range for V370 | 285 mm |
| Meas. range for V520 | 435 mm |
| Resolution | 4 mm |
| Hysteresis | 0 – 10% |
| Temperature monitoring | |
| Output signal | 4 – 20 mA |
| Measuring range | 0 – 100 °C |
| Hysteresis | 0 – 1 K |
| Ohmic resistance | RB = U – 8 V / 20 mA |
| Data transfer | Screened cable must be provided! |

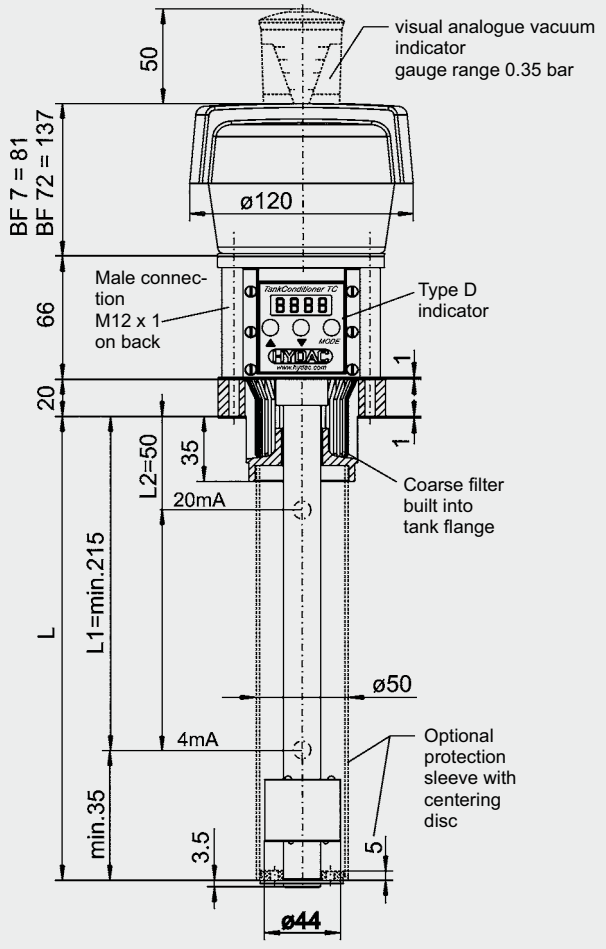
**Male connections**

Connection

Fluid level/Temperature signals:
1 = 12V-30V DC
2 = Temperature 4 – 20 mA
3 = not used
4 = Fluid level 4 – 20 mA




Version TC...**D** 1.x /-**S44**-Vxxx... (Brass/synthetic material)



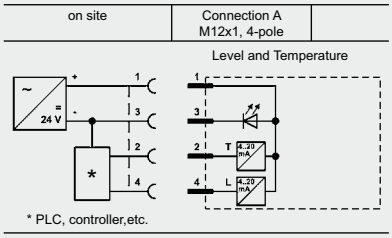

**TECHNICAL SPECIFICATIONS**

| | |
|---|---|
| Fluid level monitoring | |
| Output signal | 4 – 20 mA |
| Meas. range for V250 | 165 mm |
| Meas. range for V370 | 285 mm |
| Meas. range for V520 | 435 mm |
| Resolution | 4 mm |
| Hysteresis | 0 – 10% |
| Temperature monitoring | |
| Output signal | 4 – 20 mA |
| Measuring range | 0 – 100 °C |
| Hysteresis | 0 – 1 K |
| Ohmic resistance | RB = U – 8 V / 20 mA |
| Data transfer | Screened cable must be provided! |
| Display for temperature monitoring | LED 3-digit (4-digit w/o unit of meas.) |
| Indication range | -20 °C to +120 °C (-4 ° to +248 °F) |

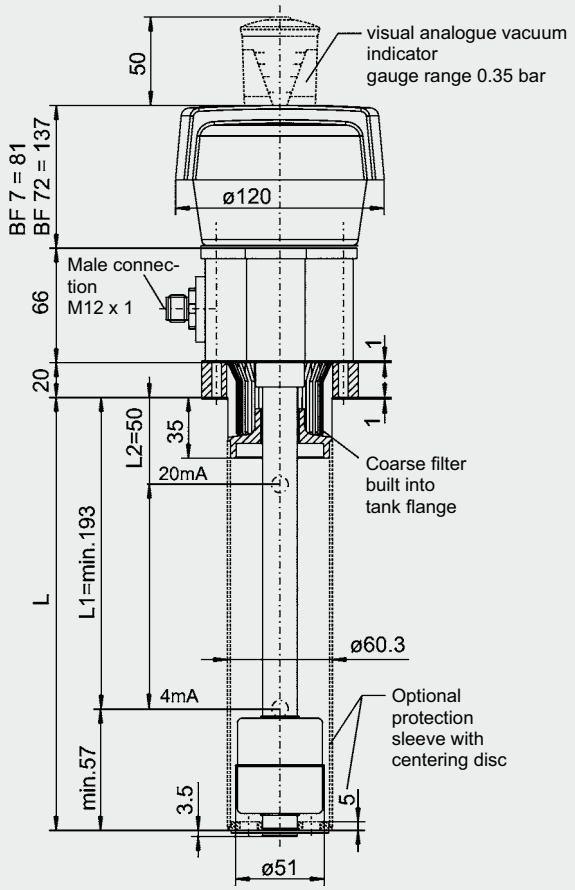
**Male connections**

Connection

Fluid level/Temperature signals:
1 = 12V-30V DC
2 = Temperature 4 – 20 mA
3 = GND (0V)
4 = Fluid level 4 – 20 mA



## Version TC...**C** 2.x /-**S44**-Vxxx-... (Stainless steel)




**TECHNICAL SPECIFICATIONS**

| | |
|---|---|
| Fluid level monitoring | |
| Output signal | 4 – 20 mA |
| Meas. range for V250 | 143 mm |
| Meas. range for V370 | 263 mm |
| Meas. range for V520 | 413 mm |
| Resolution | 7.5 mm |
| Hysteresis | 0 – 10% |
| Temperature monitoring | |
| Output signal | 4 – 20 mA |
| Measuring range | 0 – 100 °C |
| Hysteresis | 0 – 1 K |
| Ohmic resistance | RB = U – 8 V / 20 mA |
| Data transfer | Screened cable must be provided! |

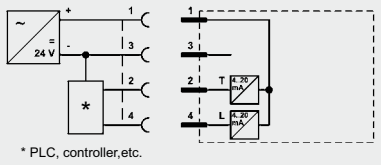
**Male connections**

Connection

Fluid level/Temperature signals:
1 = 12V-30V DC
2 = Temperature 4 – 20 mA
3 = not used
4 = Fluid level 4 – 20 mA

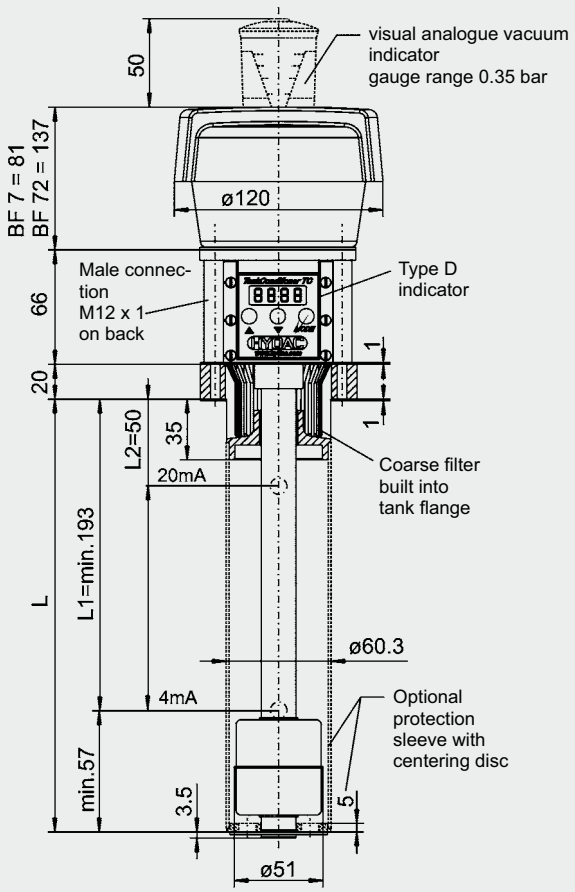
| on site | Connection A M12x1, 4-pole |
|---|---|

Level and Temperature




* PLC, controller,etc.

## Version TC...**D** 2.x /-**S44**-Vxxx... (Stainless steel)




**TECHNICAL SPECIFICATIONS**

| | |
|---|---|
| Fluid level monitoring | |
| Output signal | 4 – 20 mA |
| Meas. range for V250 | 143 mm |
| Meas. range for V370 | 263 mm |
| Meas. range for V520 | 413 mm |
| Resolution | 7.5 mm |
| Hysteresis | 0 – 10% |
| Temperature monitoring | |
| Output signal | 4 – 20 mA |
| Measuring range | 0 – 100 °C |
| Hysteresis | 0 – 1 K |
| Ohmic resistance | RB = U – 8 V / 20 mA |
| Data transfer | Screened cable must be provided! |
| Display for temperature monitoring | LED 3-digit (4-digit w/o unit of meas.) |
| Indication range | -20 °C to +120 °C (-4 ° to +248 °F) |

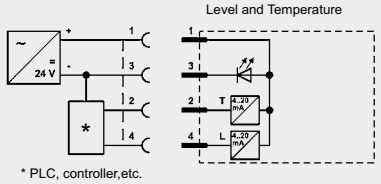
**Male connections**

Connection

Fluid level/Temperature signals:
1 = 12V-30V DC
2 = Temperature 4 – 20 mA
3 = GND (0V)
4 = Fluid level 4 – 20 mA

| on site | Connection A M12x1, 4-pole |
|---|---|

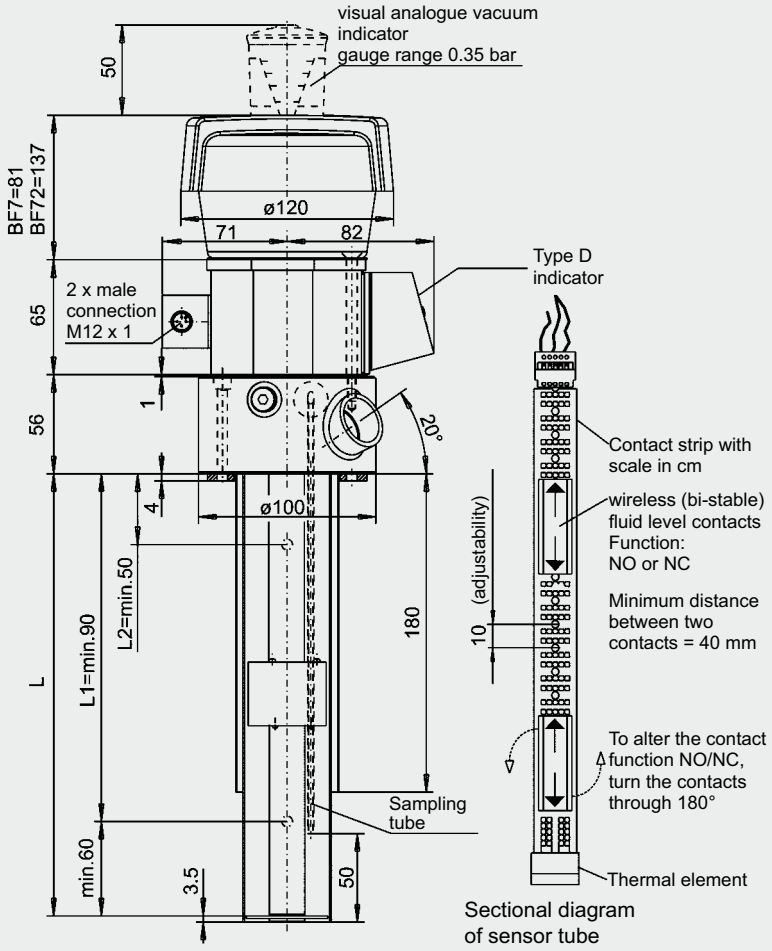
Level and Temperature




* PLC, controller,etc.

## 3.3 TANKCONDITIONER® TC WITH ADDITIONAL SUPPLEMENTARY DETAIL "FA34"

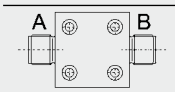
Version TC...**D** 1.x /-**S12**-Vxxx-FA34 (FA34 with filling adaptor)




Sectional diagram of sensor tube

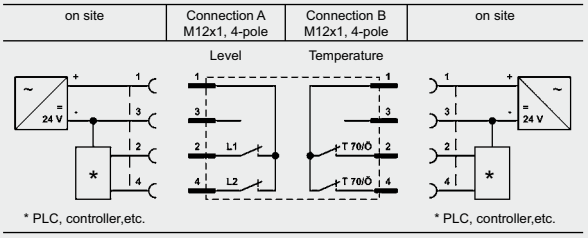
**TECHNICAL SPECIFICATIONS**

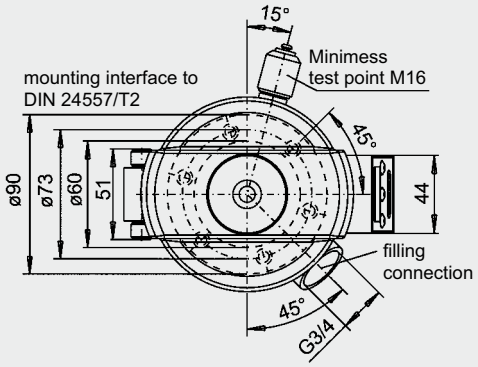
| | |
|---|---|
| Fluid level switch points | bi-stable N/O / N/C<br>Max. 2 can be set |
| Resolution | 10 mm |
| Hysteresis | 4 mm |
| Thermal element | Pt100 |
| Temperature switch pt. | Max. 2 can be set |
| Hysteresis | 1 – 99 K can be set |
| Switching capacity | 10W / VA max<br>30 V / DC max. |
| Switching current | 1 A max. |
| Display for temperature monitoring | LED 3-digit<br>(4-digit w/o unit of meas.) |
| Indication range | -20 °C to +120 °C (-4 ° to +248 °F) |




**Male connections**

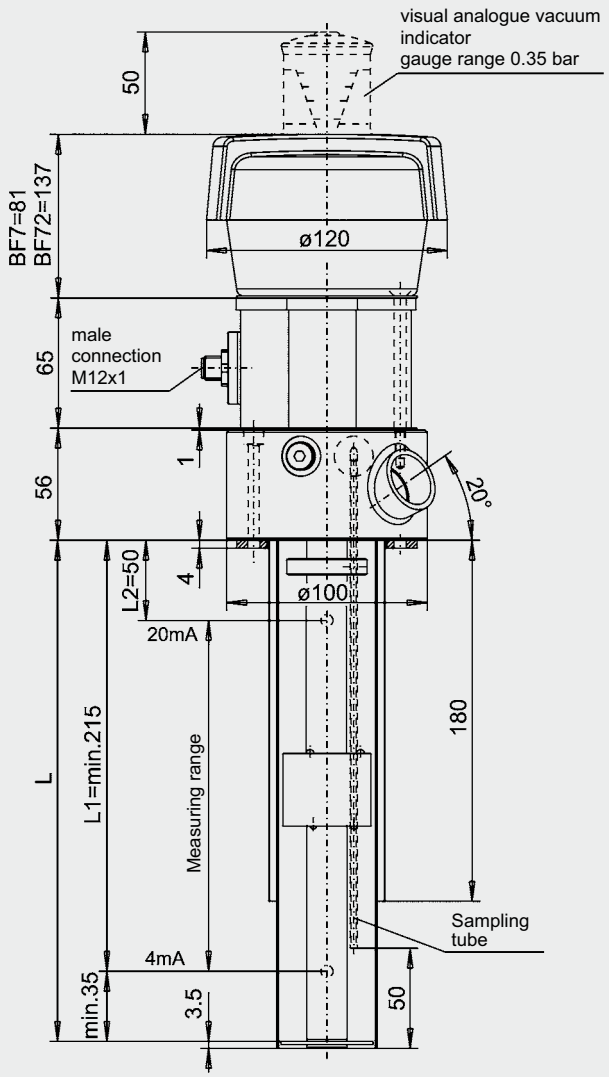
| Connection A | Connection B |
|---|---|
| Level contact(s):<br>1 = 12V-30V DC<br>2 = Level L1 (+UB)<br>3 = not used<br>4 = Level L2 (+UB) | Temperature contact(s):<br>1 = 12V-30V DC<br>2 + 4 = T70 / O (+UB)<br>3 = not used |

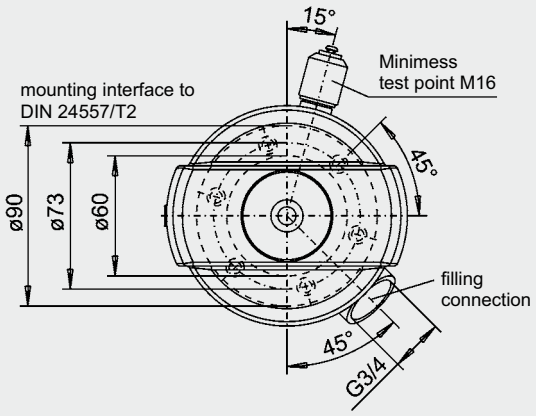



| Factory normal setting for type S12: "pump protection monitoring" | | | | | |
|---|---|---|---|---|---|
| Swit. points | Sensor tube length L | | | Contact function of fluid level contacts | Possible application |
| | 250 | 370 | 520 | | |
| L2 | 150 | 270 | 420 | NC - rising NC | Warning "min. tank level" |
| L1 | 190 | 310 | 460 | NO - rising NO | Cut-out "min. tank level" |

Version TC...**C** 1.x /-**S44**-Vxxx-FA34 (FA34 with filling adaptor)



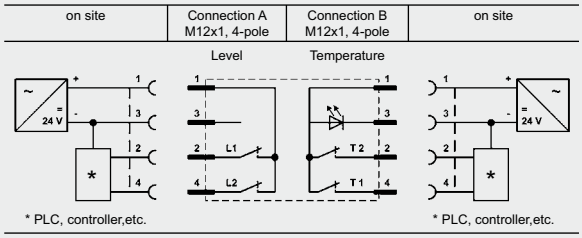

**TECHNICAL SPECIFICATIONS**

| | |
|---|---|
| Fluid level monitoring | |
| Output signal | 4 – 20 mA |
| Meas. range for V250 | 165 mm |
| Meas. range for V370 | 285 mm |
| Meas. range for V520 | 435 mm |
| Resolution | 4 mm |
| Hysteresis | 0 – 10% |
| Temperature monitoring | |
| Output signal | 4 – 20 mA |
| Measuring range | 0 – 100°C |
| Hysteresis | 0 – 1 K |
| Ohmic resistance | RB = U – 8 V / 20 mA |
| Data transfer | Screened cable must be provided! |

**Male connections**

Connection

Fluid level/Temperature signals:
1 = 12V-30V DC
2 = Temperature 4 – 20 mA
3 = not used
4 = Fluid level 4 – 20 mA




## NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

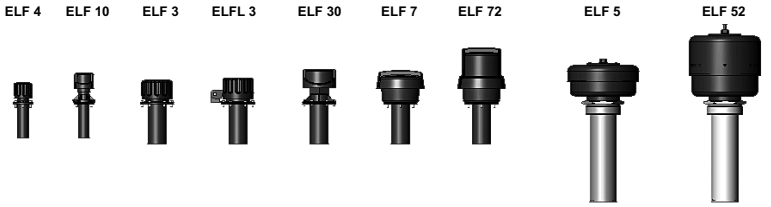
Subject to technical modifications.


HYDAC **Filtertechnik GmbH**
Industriegebiet
**D-66280 Sulzbach/Saar**
Tel.: 0 68 97 / 509-01
Fax: 0 68 97 / 509-300
Internet: www.hydac.com
E-Mail: filter@hydac.com



# Tank Breather Filter with Filler Strainer ELF

up to 5500 l/min




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

Tank breather filters size 4, 10, 3 and 30 consist of an air filter top, which is connected to the mounting flange by a bayonet plate or a threaded boss, and a filler strainer.

Sizes 5 and 52 consist of a two-part threaded air filter top, with built-in oil mist trap, one or two exchangeable filter element(s) and a filler strainer.

Sizes 7 and 72 consist of a two-part flanged filter top, an exchangeable filter element and a filler strainer.

### 1.2 FILTER ELEMENTS

**Contamination retention capacities in g**

| | Paper | |
|---|---|---|
| ELF | 3 µm | 10 µm |
| 4 | 2.9 | 4.1 |
| 10 | 2.9 | 4.1 |
| 3 | 6.2 | 8.7 |
| 30 | 6.2 | 8.7 |
| 7 | 26.1 | 36.7 |
| 72 | 52.2 | 73.4 |
| 5 | 85.1 | 119.6 |
| 52 | 170.2 | 239.2 |

The filter elements are made from phenolic resin impregnated paper and cannot therefore be cleaned!

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Temperature range | -30 °C to +100 °C |
| Material of housing | Steel, zinc-plated/plastic coated (ELF 4, 3), steel (ELF 5, 52) glass fibre reinforced synthetic material (ELF 10, 30, 7, 72) |
| Material of filler strainer | Synth. material: ELF 10, 4, 30, 3, 7, 72<br>Metal: ELF 5, 52 |
| Type of clogging indicator | VMF (return line indicator) |
| Pressure setting of clogging indicator | 0.6 bar K pressure gauge<br>0.035 bar UBM indicator<br>(others on request) |

### 1.4 SEALS

NBR (= Perbunan) on filter
NBR/polyurethane on element
Cardboard on mounting flange

### 1.5 SPECIAL MODELS AND ACCESSORIES

- lockable model (only ELFL 3)
- with check/bypass valve to support the suction characteristics of the pump
  Not 100% air-tight or leakage-free!
  (only ELF 10, 3, 30, 5 and 52)
- with anti-splash device
  (only ELF 10, 3, 30, 7, 72)
- with connection for a clogging indicator
  (only ELF 7, 72)
- with filler adaptor for automotive applications
  (only ELF 7 and 72) - see point 5.

### 1.6 SPARE PARTS

See Original Spare Parts List

### 1.7 CERTIFICATES AND APPROVALS

On request

### 1.8 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

The standard models are suitable for use with mineral and lubrication oils. For non-flam and biodegradable oils, see tables:

Non-flam fluids

| ELF | HFA | HFC | HFD-R |
|---|---|---|---|
| 4, 10, 3, 30 | – | – | – |
| 7, 72, 5, 52 | ● | ● | – |

- HFA oil in water emulsion ($H_2O$ content ≥ 80%)
- HFC water polyglycol solution ($H_2O$ content 35-55%)
- HFD-R synthetic, water free phosphate ester

Biodegradable fluids

| ELF | HTG | HE | HPG PAG | HPG PRG |
|---|---|---|---|---|
| all sizes | + | + | ● | ● |

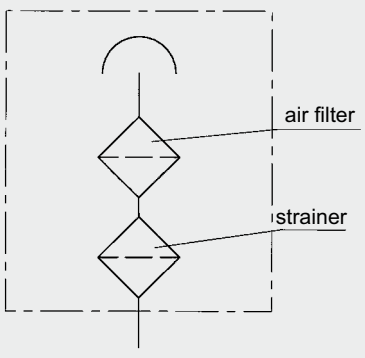
+ suitable for all
● contact our Technical Sales Department
– not suitable

- HTG vegetable oil based hydraulic fluids
- HE ester-based synthetic hydraulic fluids
- HPG polyglycol-based synthetic hydraulic fluids
- PAG sub-group HPG: polyalkalene glycol
- PEG sub-group HPG: polyethylene glycol

### 1.9 CHANGING INTERVALS

The breather filter elements or filters must be replaced as frequently as the fluid filters, but at least once a year.

**Symbol**



# 2. MODEL CODE (also order example)

## 2.1 COMPLETE FILTER

### 2.1.1 ELF 4, 10, 3, 30 and ELFL 3

**ELF P 30 F 3 W 1 . X /-RV0.4**

**Filter type**
ELF
ELFL (lockable)

**Filter material**
P Paper

**Size**
ELF 4, 10, 3, 30
ELFL 3

**Type and size of connection**

| | Filter size 4 | 10 | 3 | 30 |
|---|---|---|---|---|
| F = Flange | ● | ● | ● | ● |

**Filtration rating in µm**
P 3 (absolute)

**Type of clogging indicator**
W no port for clogging indicator

**Type code**

| Size | Code | Δp [bar] |
|---|---|---|
| ELF 4 | 1.X | - |
| ELF 10 | 1.X | - |
| ELF 3 | 1.X | - |
| ELF 3.../-RV | 4.X | 0.4 |
| ELF 3.../-RV | 5.X | 0.7 |
| ELF 3.../-RV | 6.X | 0.2 |
| ELF 3.../-RV | 7.X | 1.0 |
| ELF 30 | 1.X | - |

**Modification number**
X the latest version is always supplied

**Supplementary details**
AS anti-splash without check/bypass valve (not ELF 3 & 4)
RV check/bypass valve (not ELF 4)
RV0.2, RV0.4, RV0.7 valve with relevant cracking pressure (only ELF 10 and 30)
SO148 metal filler strainer, 200 mm long (only ELF 3 and 30)
SO175 metal filler strainer, 100 mm long (only ELF 3 and 30)

### 2.1.2 ELF 7 and 72

**ELF P 72 F 3 W 1 . X /-SO148**

**Filter type**
ELF

**Filter material**
P Paper

**Size**
ELF 7, 72

**Type and size of connection**

| | Filter size 7 | 72 |
|---|---|---|
| F = Flange DIN 24557/Pt2 | ● | ● |

**Filtration rating in µm**
P 3 (absolute)

**Type of clogging indicator**
W no port for clogging indicator
K pressure gauge (measuring range: -1 to +0.6 bar)
UBM visual/analogue vacuum gauge with manual reset (pressure setting: -0.035 bar)

**Type code**
0 for type UBM
1 for types W and K

**Modification number**
X the latest version is always supplied

**Supplementary details**
AS anti-splash (only ELF 7, 72 without check/bypass valve)
SO148 metal filler strainer, 200 mm long
SO175 metal filler strainer, 100 mm long
SO394 ELF filter without strainer

### 2.1.3 ELF 5 and 52

**ELF P 52 G 3 W 2 . X /-RV0.4**

**Filter type**
ELF

**Filter material**
P Paper
BN Betamicron®

**Size**
ELF 5, 52

**Type and size of connection**

| | | Filter size 5 | 52 |
|---|---|---|---|
| G = Thread | G1 1/2 | ● | ● |
| | G2 | ● | ● |
| | G2 1/2 | ● | ● |
| | G3 | ● | ● |

**Filtration rating in µm**
P 3 (absolute)
BN 3 (absolute)

**Type of clogging indicator**
W no port for clogging indicator

**Type code**

| Code | Connection |
|---|---|
| 2.X | G 2½ |
| 3.X | G 3 |
| 4.X | G 2 |
| 5.X | G 1½ |

**Modification number**
X the latest version is always supplied

**Supplementary details**
RV0.4 check/bypass valve with 0.4 bar pressure setting

## 2.2 REPLACEMENT ELEMENT

**0005 L 003 P**

**Size**
0005 for ELF 5, 52
0007 for ELF 7
0072 for ELF 72

**Type**
L

**Filtration rating in µm**
P 003
BN 003 (only for 0005)

**Filter material**
P Paper
BN Betamicron®

**Replacement elements cannot be ordered for ELF 4, 10, 3, 30 and ELFL 3. These filters are only available complete !**

## 2.3 REPLACEMENT CLOGGING INDICATOR

**VMF 0.6 K . X**

**Type**
VMF Return line indicator

**Pressure setting**
0.6 -1 to +0.6 bar
0.035 -0.035 bar

**Type**
(see point 2.1)

**Modification number**
X the latest version is always supplied

# 3. FILTER CALCULATION / SIZING

## 3.1 SINGLE PASS FILTRATION PERFORMANCE DATA FOR AIR FILTER ELEMENTS

The following separation values were established under real-life simulated conditions. This means that the selected velocity of the flow against the filter mesh was 20 cm/s and the contamination added was 40 mg/m³ of ISO MTD test dust.

| Filtration rating | Retention value d.. | For particle size | Filter material |
|---|---|---|---|
| 3 µm | d 80 | 0.74 µm | |
| | d 100 | 2.64 µm | Paper |
| 10 µm | d 80 | 1.49 µm | |
| | d 100 | 9.56 µm | |
| 10 µm | d 80 | 0.25 µm | BN |
| | d 100 | 0.84 µm | |

The d 80 value refers to the particle size which is filtered out at a rate of 80% during the retention test. The particle size determined by this method is called the nominal filtration rating of the air filter. The d 100 value therefore refers to the particle size which is filtered out at a rate of 100% during the single-pass test. The particle size determined by this method is called the absolute filtration rating of the air filter.

Table of average dust concentrations in real life:

| | |
|---|---|
| Urban regions with a low level of industry | 3-7 mg/m³ air |
| General mechanical engineering | 9-23 mg/m³ air |
| Construction industry (wheeled vehicles) | 8-35 mg/m³ air |
| Construction industry (tracked vehicles) | 35-100 mg/m³ air |
| Heavy industry | 50-70 mg/m³ air |

## 3.2 DIFFERENTIAL PRESSURE ACROSS BREATHER FILTER

The differential pressure (with clean element) for the various filter sizes is shown in the graphs under point 3.4.

## 3.3 SIZING GUIDELINES

For ease of calculation, our Filter Sizing Program is available on request free of charge.

**NEW:** Sizing online at www.hydac.com

The rate at which contamination enters a hydraulic system can be considerably reduced by using efficient tank breather filtration.

**NOTE:**

Incorrectly sized breather filters can place additional strain on the system and reduce the service life of hydraulic filter elements.

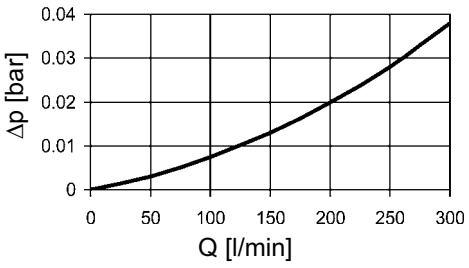
For optimum sizing the following should therefore be observed:

- Filtration rating of air breather filter ≤ filtration rating of hydraulic filter
- Only use air breather filters with an absolute retention rate (d100 ≤ x µm; x = given filtration rating)
- Max. permissible initial pressure loss: 0.01 bar (with a clean filter element and calculated air flow rate)
- Determination of the calculated air flow rate:
  QA = f5 x Qp
  QA = air flow rate for sizing purposes in $l_N$/min
  f5 = factor for operating conditions
  Qp = max. flow rate of the hydraulic pump in l/min

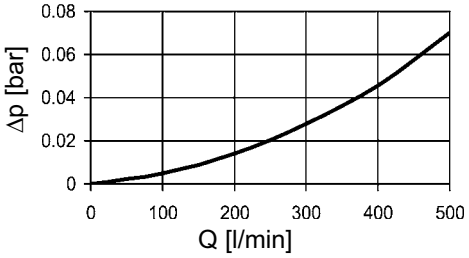
| Ambient conditions | Factor f5 |
|---|---|
| Low dust concentration; filter fitted with clogging indicator; continuous monitoring of the filter | 1-2 |
| Average dust concentration; filter without clogging indicator; intermittent monitoring of the filter | 3-6 |
| High dust concentration; filter without clogging indicator; infrequent or no monitoring of the filter | 7-10 |

## 3.4 AIR FLOW RATE

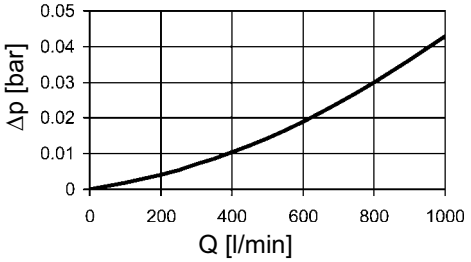
### ELF 4



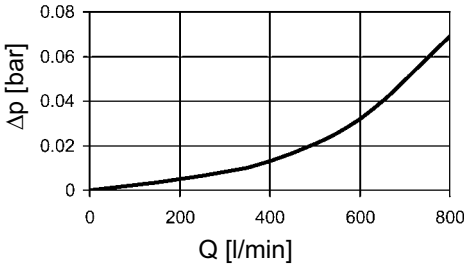

### ELF 10



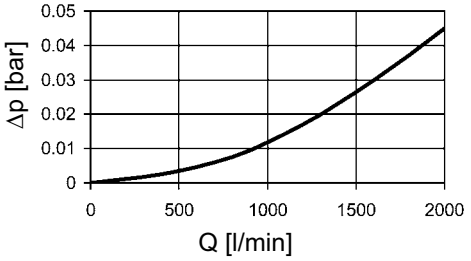

### ELF 3



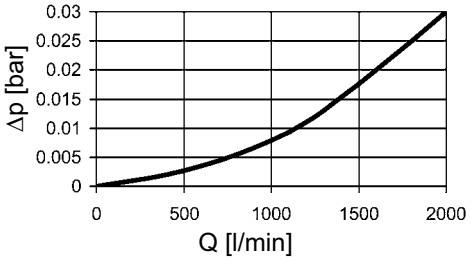

### ELF 30



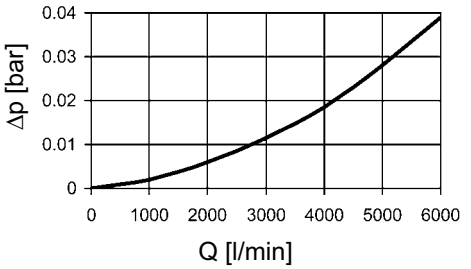

### ELF 7



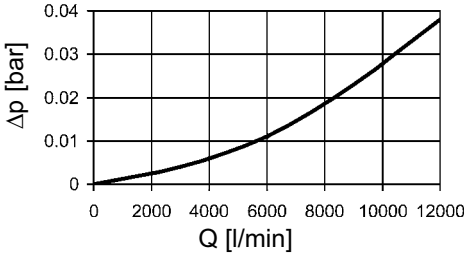

### ELF 72




### ELF 5

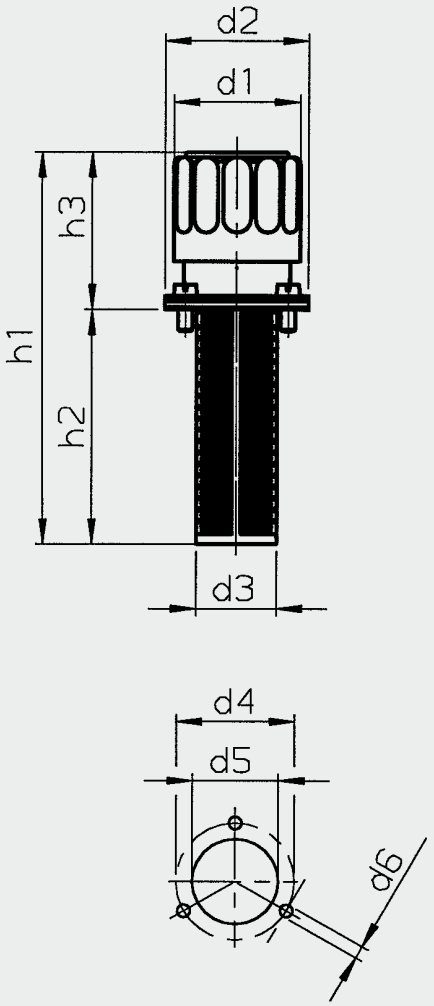



### ELF 52

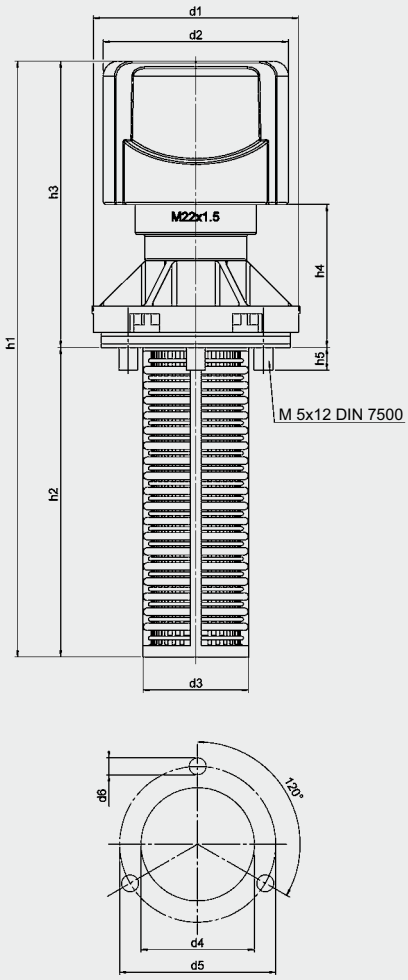


## 4. DIMENSIONS

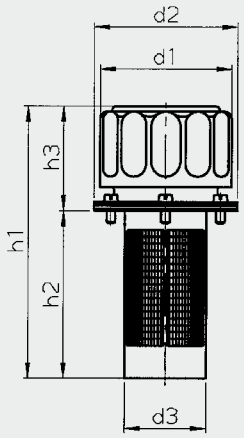
ELF 4



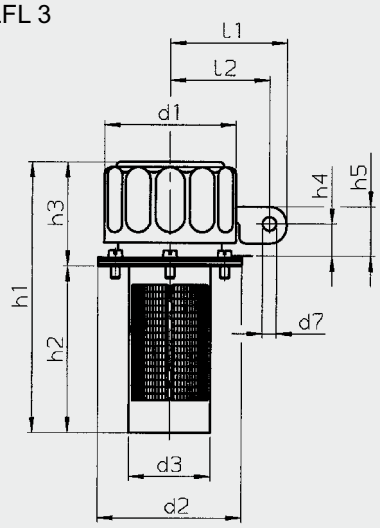

ELF 10

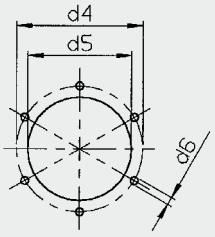



ELF 3




ELFL 3



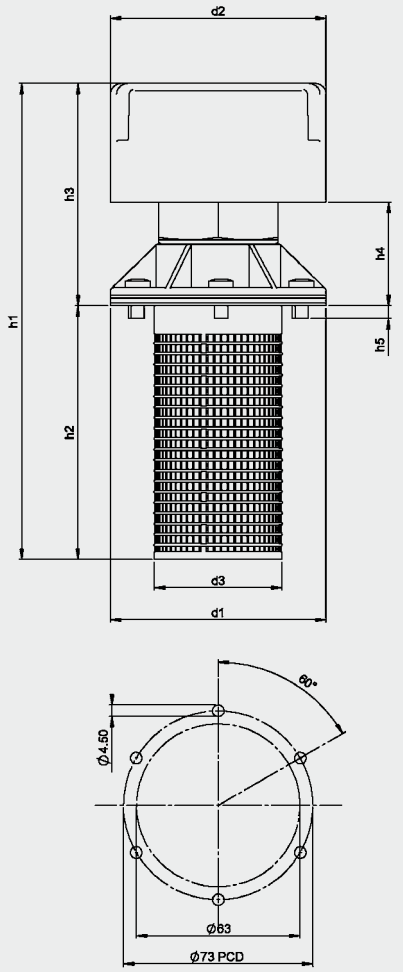

Interface DIN 24557/Part 2

| | ELF 4... |
|---|---|
| d1 | 44 |
| d2 | 50 |
| d3 | 28 |
| d4 | 41.3 |
| d5 | 30 |
| d6 | 4.5 |
| h1 | 135 |
| h2 | 81.5 |
| h3 | 53.5 |
| Weight | 0.20 kg |

| | ELF 10... |
|---|---|
| d1 | 54 |
| d2 | 49 |
| d3 | 28 |
| d4 | 30 |
| d5 | 41.3 |
| d6 | 4.5 |
| h1 | 158 |
| h2 | 82 |
| h3 | 76 |
| h4 | 38 |
| h5 | 6 |
| Weight | 0.08 kg |

| | ELF 3.../ELFL 3... |
|---|---|
| d1 | 76 |
| d2 | 83 |
| d3 | 49 |
| d4 | 73 |
| d5 | 60 |
| d6 | 4.5 |
| d7 | 8 |
| h1 | 159 |
| h2 | 96.5 |
| h3 | 61.5 |
| h4 | 21 |
| h5 | 31 |
| l1 | 67.5 |
| l2 | 57.5 |
| Weight | 0.25 kg |

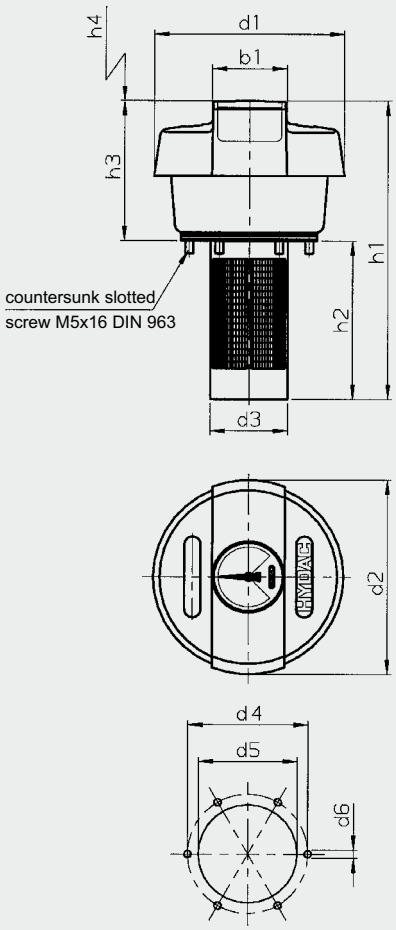
## ELF 30




Interface to DIN 24557/Part 2

| | ELF 30... |
|---|---|
| d1 | 83 |
| d2 | 83 |
| d3 | 49 |
| h1 | 185 |
| h2 | 100 |
| h3 | 85 |
| h4 | 40 |
| h5 | 5 |
| Weight | 0.23 kg |

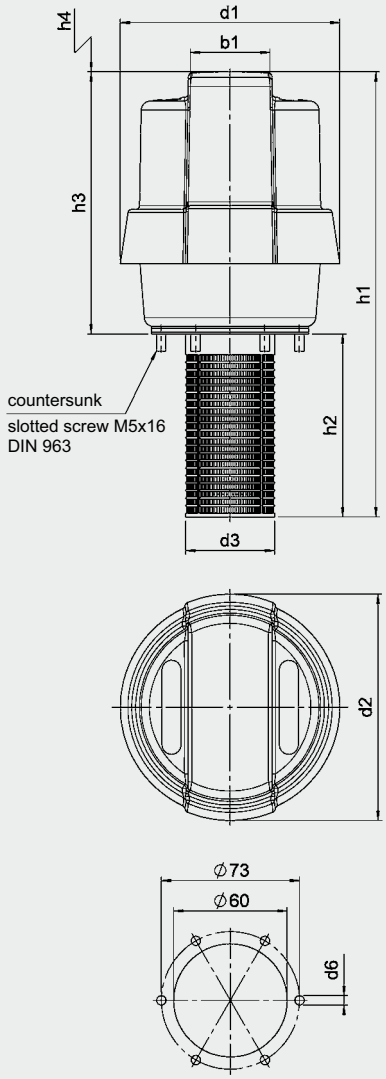
## ELF 7




Interface to DIN 24557/Part 2

| | ELF 7... |
|---|---|
| d1 | 116 |
| d2 | 120 |
| d3 | 47 |
| d4 | 73 |
| d5 | 60 |
| d6 | M5 |
| h1 | 181 |
| h2 | 97 |
| h3 | 84 |
| h4 | 60 |
| b1 | 44 |
| Weight | 0.38 kg |

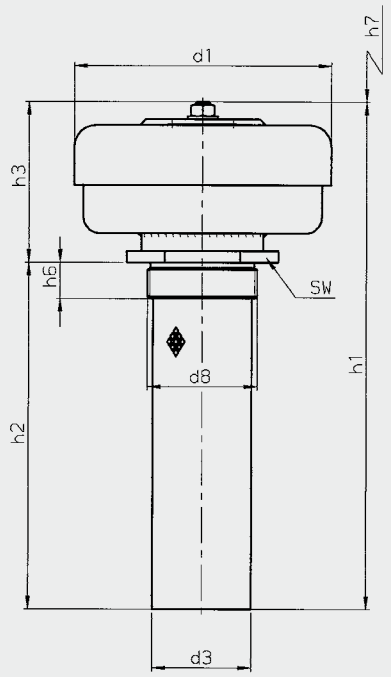
## ELF 72



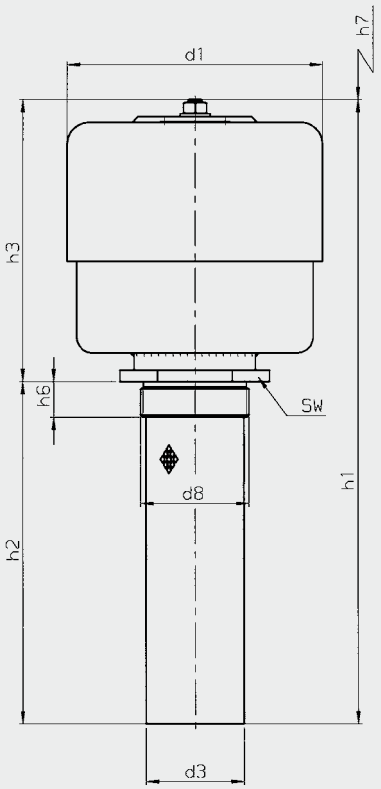

Interface to DIN 24557/Part 2

| | ELF 72... |
|---|---|
| d1 | 116 |
| d2 | 120 |
| d3 | 47 |
| d6 | M5 |
| h1 | 236 |
| h2 | 97 |
| h3 | 139 |
| h4 | 60 |
| b1 | 44 |
| Weight | 0.58 kg |

ELF 5

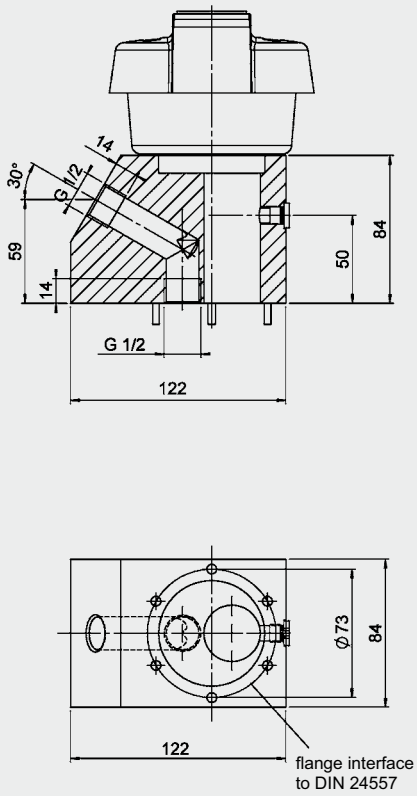



ELF 52




## 5. FILLER ADAPTOR

This adaptor can only be used on ELF 7 and ELF 72 filters!




| | | ELF 5... | ELF 5... /-RV |
|---|---|---|---|
| d1 | | 177 | |
| d3 | | 68 | |
| d8 | ...2.X | G 2½ | |
| | ...3.X | G 3 | |
| | ...4.X | G 2 | |
| | ...5.X | G 1½ | |
| h1 | | 350 | 360 |
| h2 | | 240 | |
| h3 | | 105 | 126 |
| h6 | | 25 | |
| h7 | | 90 | |
| SW | | 90 | |
| Weight | ...2.X | 2.70 kg | |
| | ...3.X | 3.10 kg | |
| | ...4.X | 2.70 kg | |
| | ...5.X | 2.60 kg | |

| | | ELF 52... | ELF 52... /-RV |
|---|---|---|---|
| d1 | | 177 | |
| d3 | | 68 | |
| d8 | ...2.X | G 2½ | |
| | ...3.X | G 3 | |
| | ...4.X | G 2 | |
| | ...5.X | G 1½ | |
| h1 | | 416 | 438 |
| h2 | | 240 | |
| h3 | | 176 | 198 |
| h6 | | 25 | |
| h7 | | 125 | 112 |
| SW | | 90 | |
| Weight | ...2.X | 3.10 kg | |
| | ...3.X | 3.50 kg | |
| | ...4.X | 3.10 kg | |
| | ...5.X | 3.00 kg | |

These filler adaptors are available in the following threaded connections:

- Adaptor ELF /-FA12 (G ½)
  (Part No.: 03100932)
- Adaptor ELF /-FA34 (G ¾)
  (Part No.: 03100933)
- Adaptor ELF /-FA1 (G 1)
  (Part No.: 03100931)

## NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

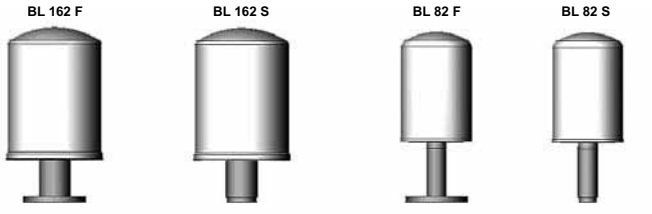
Subject to technical modifications.


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**D-66280 Sulzbach/Saar**
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Fax: 0 68 97 / 509-300
Internet: www.hydac.com
E-Mail: filter@hydac.com



# Tank Breather Filter with Spin-On Filter Cartridge BL

up to 1800 l/min




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filters consist of a spin-on filter can which screws onto a connection tube which is fitted to the oil tank. The connection can either be a flanged or weld version.

### 1.2 FILTER ELEMENTS

**Contamination retention capacities in g**

| BL | 10 µm | 20 µm |
|---|---|---|
| 82 | 67.6 | 99.4 |
| 162 | 192.0 | 201.3 |

The filter elements are made from phenolic resin impregnated paper and cannot therefore be cleaned!

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Temperature range | -30 °C to +100 °C |
| Material of connection tube | Steel |
| Material of spin-on can | Sheet steel |
| Type of clogging indicator | VMF (pressure gauge) |
| Pressure setting of clogging indicator | 0.6 bar (K pressure gauge) |

### 1.4 SEALS

Perbunan (= NBR)
cardboard on the mounting flange

### 1.5 SPECIAL MODELS AND ACCESSORIES

- With port for clogging indicator
- With filler adaptor

### 1.6 SPARE PARTS

See Original Spare Parts List

### 1.7 CERTIFICATES AND APPROVALS

On request

### 1.8 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

The standard models are suitable for mineral and lubrication oils. For non-flam and biodegradable oils, see tables:

Non-flam fluids

| BL | HFA | HFC | HFD-R |
|---|---|---|---|
| 82 | ● | ● | – |
| 162 | ● | ● | – |

- HFA oil in water emulsion ($H_2O$ content ≥ 80%)
- HFC water polyglycol solution ($H_2O$ content 35-55%)
- HFD-R synthetic, water free phosphate ester

Biodegradable fluids

| BF | HTG | HE | HPG | |
|---|---|---|---|---|
| | | | PAG | PRG |
| 82, 162 | + | + | ● | ● |

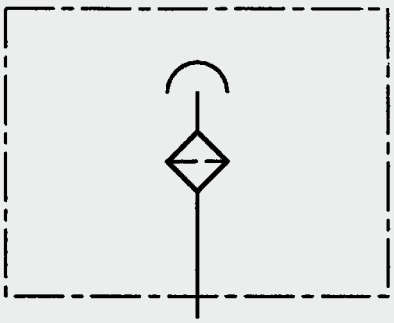
+ suitable for all
● contact our Technical Sales Department
– not suitable

- HTG vegetable oil based hydraulic fluids
- HE ester-based synthetic hydraulic fluids
- HPG polyglycol-based synthetic hydraulic fluids
- PAG sub-group HPG: polyalkalene glycol
- PEG sub-group HPG: polyethylene glycol

### 1.9 CHANGING INTERVALS

The breather filter elements or filters must be replaced as frequently as the fluid filters, but at least once a year.

**Symbol**



## 2. MODEL CODE (also order example)

**BL P 162 S 10 W 1 . X /-FA12**

### 2.1 COMPLETE FILTER

**Filter type**
BL

**Filter material of element**
P paper
BN Betamicron®

**Size of filter or element**
BL: 82, 162

**Type and size of connection**

| Type | Connection | Filter size | |
|---|---|---|---|
| | | 82 | 162 |
| F | Flange connection | ● | ● |
| S | Weld connection | ● | ● |

**Filtration rating in µm**
P 10 absolute = 3µm in air
BN 10 = 1 µm absolute in air
20 = 2 µm absolute in air

**Type of clogging indicator**
W without port for clogging indicator
K pressure gauge, measurement range -1 to +0.6 bar

**Type code**
1 for BL 82
2 for BL 162

**Modification number**
X the latest version is always supplied

**Supplementary details**
FA12 with filler adaptor G ½
FA34 with filler adaptor G ¾
FA1 with filler adaptor G 1
] only for BL 162

### 2.2 REPLACEMENT ELEMENT

**0080 MG 010 P**

**Size**
0080 only BL 82
0160 only BL 162

**Type**
MA only BL BN 162...
MU only BL P 162...
MG only BL .. 82...

**Filtration rating in µm**
P : 010
BN : 010, 020

**Filter material**
P, BN

### 2.3 SPARE CLOGGING INDICATOR

**VMF 0.6 K . X**

**Type**
VMF pressure gauge

**Pressure setting**
0.6 -1 to +0.6 bar

**Type of clogging indicator**
K (see point 2.1)

**Modification number**
X the latest version is always supplied

# 3. FILTER CALCULATION / SIZING

## 3.1 SINGLE PASS FILTRATION PERFORMANCE DATA FOR AIR FILTER ELEMENTS

The following separation values were established under real-life simulated conditions. This means that the selected velocity of the flow against the filter mesh was 20 cm/s and the contamination added was 40 mg/m³ of ISO MTD test dust

| Filtration rating | Retention value d.. | For particle size | Filter material |
|---|---|---|---|
| 10 µm | d 80 | 0.25 µm | BN |
| | d 100 | 0.84 µm | |
| 20 µm | d 80 | 0.36 µm | |
| | d 100 | 1.21 µm | |
| 10 µm | d 80 | 1.49 µm | P |
| | d 100 | 9.56 µm | |

The d 80 value refers to the particle size which is filtered out at a rate of 80% during the retention test. The particle size determined by this method is called the nominal filtration rating of the air filter. The d 100 value therefore refers to the particle size which is filtered out at a rate of 100% during the single-pass test. The particle size determined by this method is called the absolute filtration rating of the air filter.

Table of average dust concentrations in real life:

| | |
|---|---|
| Urban regions with a low level of industry | 3-7 mg/m³ air |
| General mechanical engineering | 9-23 mg/m³ air |
| Construction industry (wheeled vehicles) | 8-35 mg/m³ air |
| Construction industry (tracked vehicles) | 35-100 mg/m³ air |
| Heavy industry | 50-70 mg/m³ air |

## 3.2 DIFFERENTIAL PRESSURE ACROSS BREATHER FILTER

The differential pressure (with clean element) for the various filter sizes is shown in the graphs under point 3.4.

## 3.3 SIZING GUIDELINES

For ease of calculation, our Filter Sizing Program is available on request free of charge.

**NEW:**
**Sizing online at www.hydac.com**

The rate at which contamination enters a hydraulic system can be considerably reduced by using efficient tank breather filtration.

NOTE:

Incorrectly sized tank breather filters can place additional strain on the system and reduce the service life of hydraulic filter elements.

For optimum sizing the following should therefore be observed:

- Filtration rating of air breather filter ≤ filtration rating of hydraulic filter
- Only use air breather filters with an absolute retention rate (d100 ≤ x µm; x = given filtration rating)
- Max. permissible initial pressure loss: 0.01 bar (with a clean filter element and calculated air flow rate)
- Determination of the calculated air flow rate:

  $Q_A$ = f5 x Qp

  $Q_A$ = air flow rate for sizing purposes in $l_N$/min

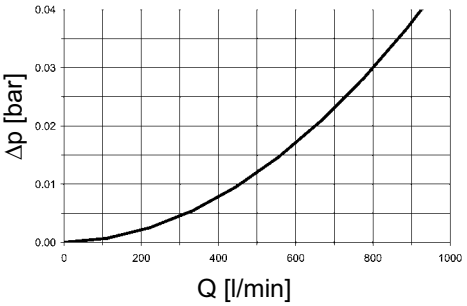
  f5 = factor for operating conditions

  $Q_p$ = max. flow rate of the hydraulic pump in l/min

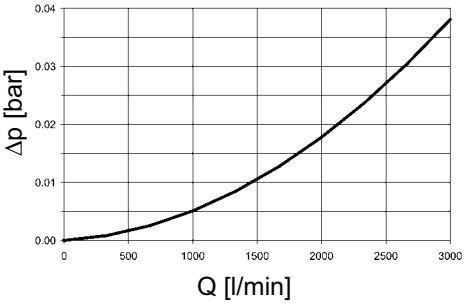
For Factor f5, see table on p. 275, ELF Tank Breather Filter, E 7.404.0/06.07.

## 3.4 AIR FLOW RATE

**BL 82**

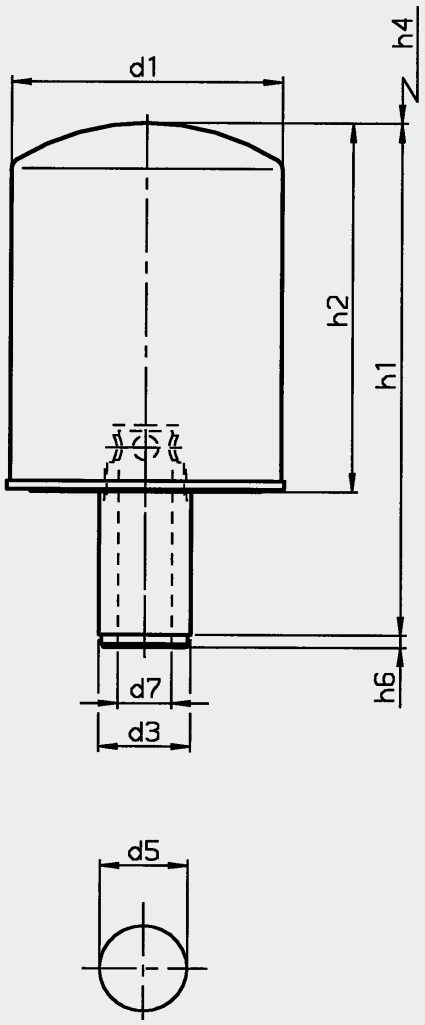



**BL 162**



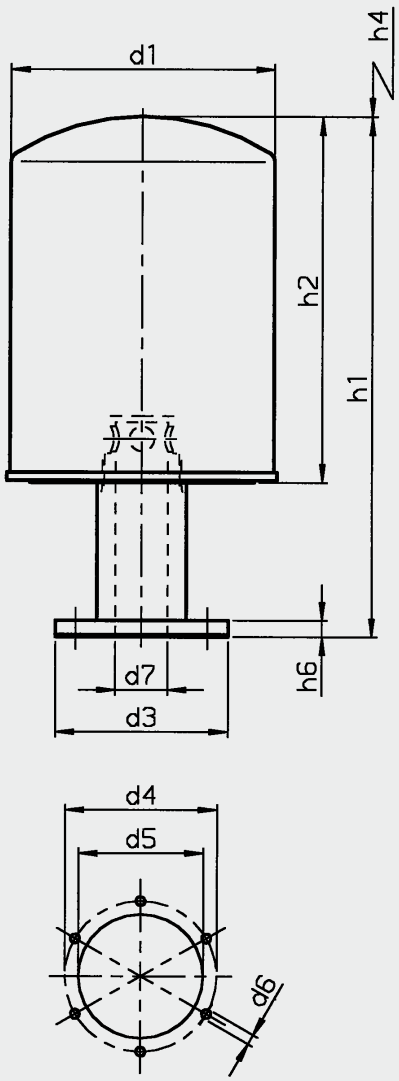
## 4. DIMENSIONS

BL 82 S..., BL 162 S...



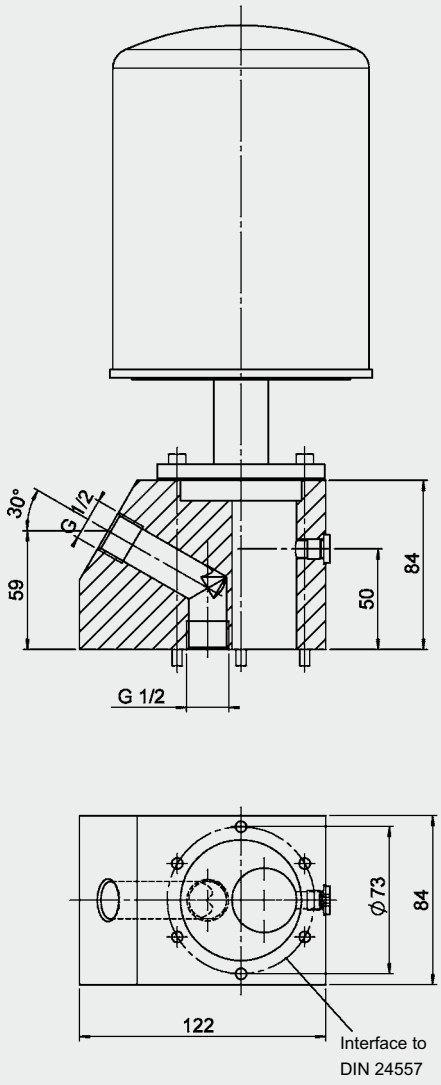

| | BL 82 S... | BL 162 S... |
|---|---|---|
| d1 | 98 | 127 |
| d3 | 27 | 43 |
| d5 | 25 | 41 |
| d7 | 16 | 25 |
| h1 | 186 | 245 |
| h2 | 142 | 175 |
| h4 | 90 | 90 |
| h6 | 6 | 6 |
| Weight | 0.95 kg | 1.75 kg |

BL 82 F..., BL 162 F...




| | BL 82 F... | BL 162 F... |
|---|---|---|
| d1 | 98 | 127 |
| d3 | 80 | 80 |
| d4 | 73 | 73 |
| d5 | 60 | 60 |
| d6 | M5 | M5 |
| d7 | 16 | 25 |
| h1 | 204 | 260 |
| h2 | 142 | 175 |
| h4 | 90 | 90 |
| h6 | 7 | 7 |
| Weight | 1.30 kg | 2.10 kg |

## 5. FILLER ADAPTOR




These filler adaptors are available in the following threaded connections

- Adaptor FA12
  Connection: G ½
  (Part no.: 03100932)
- Adaptor FA34
  Connection: G ¾
  (Part no.: 03100933)
- Adaptor FA1
  Connection: G1
  (Part no.: 03100931)

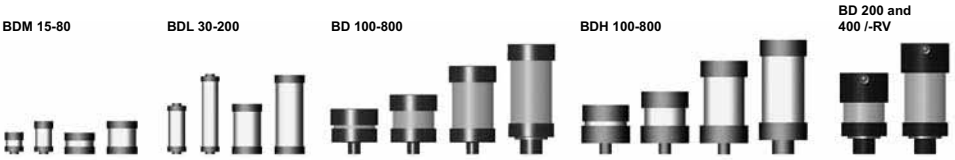
## NOTE

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For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.


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Internet: www.hydac.com
E-Mail: filter@hydac.com




# Breather Dryer
# BD, BDH, BDL, BDM
up to 2850 l/min




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The breather dryers BD consist of a filter cartridge and the relevant adaptor: bayonet, bypass, flange or threaded.

The inline version BDL and the smaller breather dryer BDM consist of a filter cartridge only.

The heavy-duty version BDH has a strengthened lower section with 1" BSP or NPT threaded connection and an exchangeable top section.

### 1.2 FILTER ELEMENTS

The replacement breather dryer cartridges consist of silica gel (orange) which, once completely saturated, cannot be regenerated.

An active carbon filter layer on the bottom (absorbs oil mist) and a 2 µm filtration layer above and below the silica gel prevent contamination from entering the inside of the cartridge (applies only to BD).
=> filtration of particles > 2 µm

This ensures optimum humidity absorption.

To guarantee the performance of the protective filter layers, the entire cartridge must be replaced.

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Temperature range | -32 °C to +100 °C |
| Material of filter cartridge | Plastic, with silica gel filling (orange) |
| Material of lower section (BDH) | Plastic with aluminium plate |

### 1.4 SEALS

NBR (= Perbunan) on the bayonet adaptor;
Cardboard on the mounting flange

### 1.5 SPECIAL MODELS AND ACCESSORIES

- with different adaptors (only BD and BDH - except for size 800)
- with filler strainer (only BD)
- with check valve (only BD)

### 1.6 SPARE PARTS

See Original Spare Parts List

### 1.7 CERTIFICATES AND APPROVALS

On request

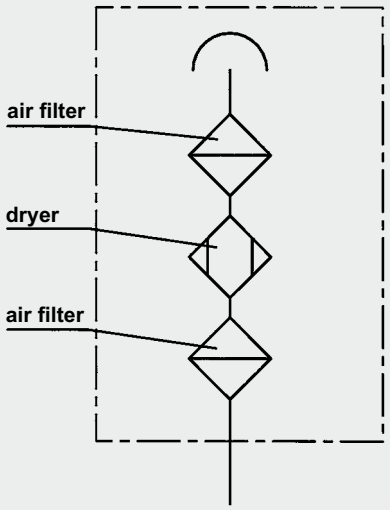
### 1.8 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

The filter cartridge efficiently prevents contamination particles and humidity from entering the tank. Compatible with mineral oils, biodegradable oils and diesel fuel.

### 1.9 CHANGING INTERVALS

The filter reliably changes colour from gold-orange to green when it is due to be changed.

**Symbol**



## 2. MODEL CODE (also order example)

**BD 200 B 2 W 1 . X /-ELF**

### 2.1 COMPLETE FILTER BD AND BDH

**Filter type**
BD standard version
BDH heavy-duty version

**Size of filter**
BD: 100, 200, 400, 800
BDH: 100, 200, 400, 800

**Type of connection, including adaptor**
B bayonet connection (not BDH)
F flange connection (not BDH)
G threaded connection
N NPT threaded connection

**Filtration rating in µm**
2 2 µm

**Type of clogging indicator**
W no port for clogging indicator

**Type code**

| Code | Bayonet connection | Flange connection | Threaded connection | NPT connection | |
|---|---|---|---|---|---|
| 1 | ● | ● | G ¾ | | |
| 2 | | | G 1 | 2“ male | (only BD and BDH 800) |
| 3 | | | 1½-16UNF | 1“ male | (only BD, BDH 100-400) |

**Modification number**
X the latest version is always supplied

**Supplementary details**
BYP with bypass adaptor (only BD 100-400)
ELF with filler strainer (only BD 100-400)
RV with check valve (only BD 200 and 400 - in conjunction with NPT thread 2" - please contact Hydac!)

### 2.2 COMPLETE FILTER BDL AND BDM (ALSO REPLACEMENT CARTRIDGE)

**BDL 200 N 2 W 1 . X**

**Filter type**
BDL inline version
BDM mini version

**Size of filter**
BDL: 30, 50, 60, 200
BDM: 15, 30, 50, 80

**Type and size of connection**
N NPT threaded (½" female)

**Filtration rating in µm**
2 2 µm

**Type of clogging indicator**
W no port for clogging indicator

**Type code**
1

**Modification number**
X the latest version is always supplied

### 2.3 REPLACEMENT CARTRIDGE

**BD 200 X 2 W 0 . 0 /-SIXPACK**

**Filter type**
BD

**Size**
100, 200, 400, 800

**Connection**
X replacement cartridge (only BD and BDH 100-400)
N replacement cartridge (only BD and BDH 800)

**Filtration rating in µm**
2 2 µm

**Type of clogging indicator**
W no port for clogging indicator

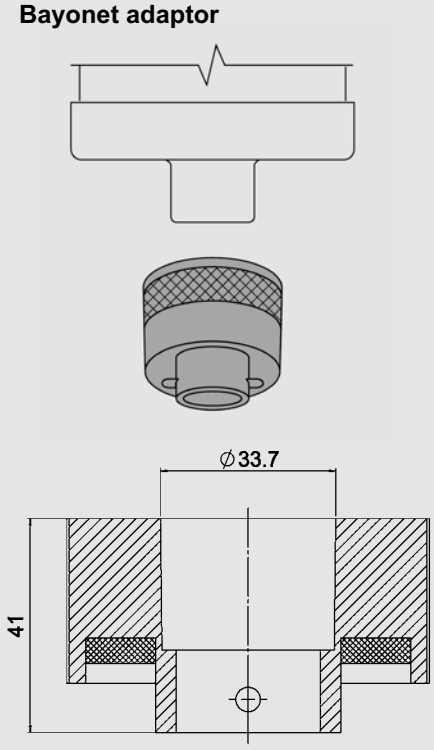
**Type code**
0 replacement cartridge

**Modification number**
X the latest version is always supplied

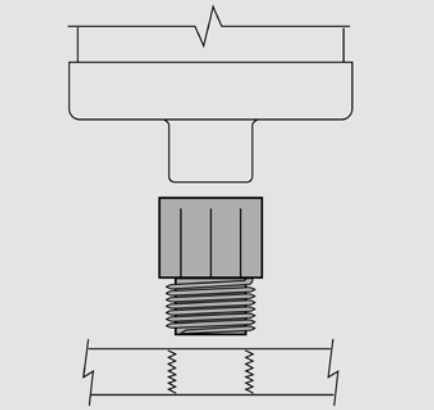
**Supplementary details**
RV-SPARE replacement cartridge for version with check valve (only BD 200-400)
SIXPACK 6 replacement cartridges in 1 pack (only for BD)

## 2.4 ADAPTER

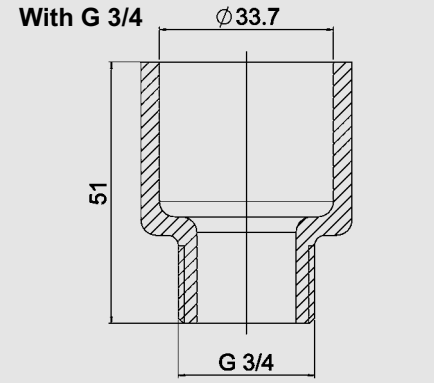
### Bayonet adaptor



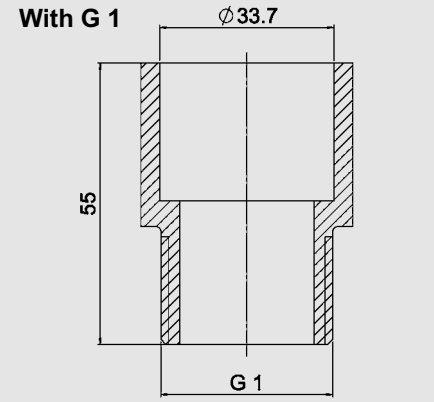

### Threaded adaptor



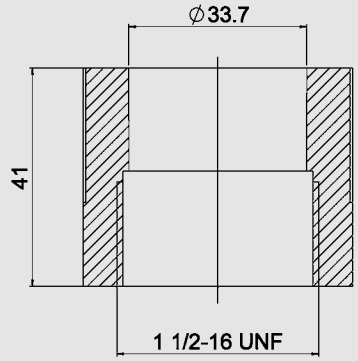
### With G 3/4



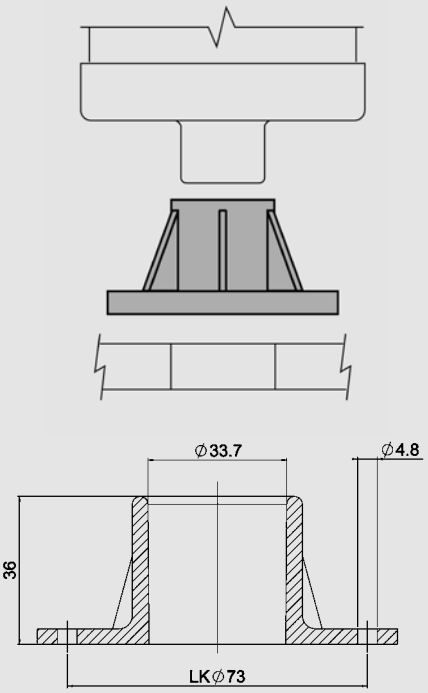

### With G 1



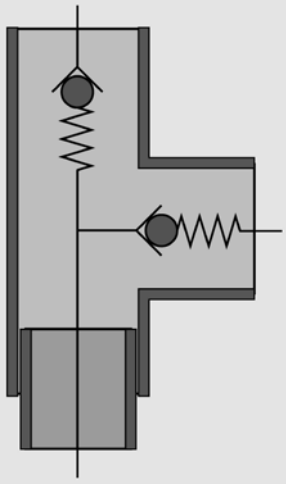

### With 1 1/2-12 UNF




### Flange adaptor to DIN 24557/Part 2




### Bypass adaptor



# 3. FILTER CALCULATION / SIZING

## 3.1 SIZING GUIDELINES

The rate at which contamination enters a hydraulic system can be considerably reduced by using efficient tank breather filtration.

**NOTE:**

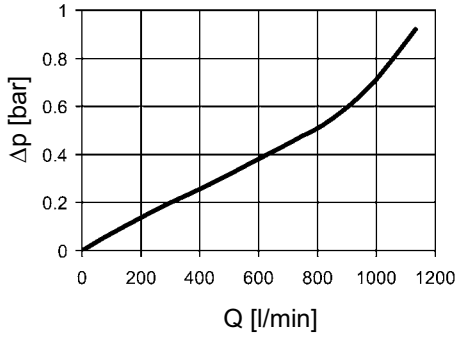
Incorrectly sized breather filters can place additional strain on the system and reduce the service life of hydraulic filter elements.

## 3.2 WATER RETENTION CAPACITY

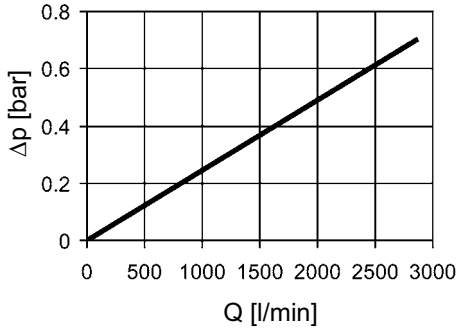
| Type | $H_2O$ |
|---|---|
| BD 100 | 0.1 l |
| BD 200 | 0.2 l |
| BD 400 | 0.4 l |
| BD 800 | 0.6 l |
| BDH 100 | 0.1 l |
| BDH 200 | 0.2 l |
| BDH 400 | 0.4 l |
| BDH 800 | 0.6 l |
| BDL 30 | 0.03 l |
| BDL 50 | 0.05 l |
| BDL 60 | 0.06 l |
| BDL 200 | 0.19 l |
| BDM 15 | 0.01 l |
| BDM 30 | 0.03 l |
| BDM 50 | 0.05 l |
| BDM 80 | 0.08 l |

## 3.3 AIR FLOW RATE

### BD 100 - 400

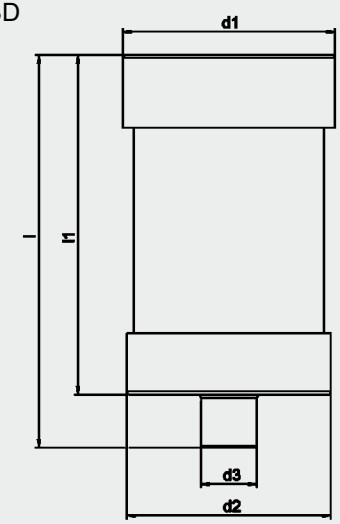



### BD 800



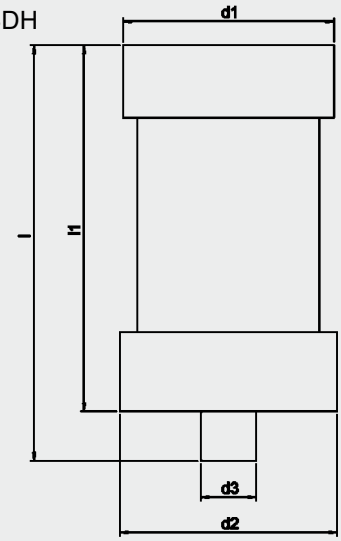
## 4. DIMENSIONS

BD



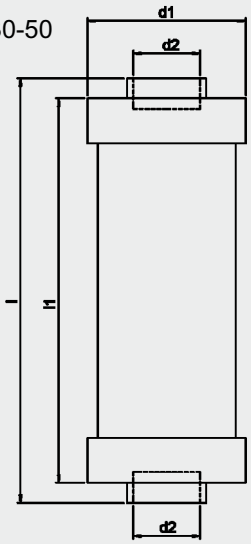

| Type | BD 100 | BD 200 | BD 400 | BD 800 |
|---|---|---|---|---|
| d1 | 128 | 128 | 128 | 128 |
| d2 | 123 | 123 | 123 | 123 |
| d3 | 33.8 | 33.8 | 33.8 | NPT 2” |
| l | 122 | 160 | 237 | 296 |
| l1 | 90 | 128 | 205 | 256 |
| Weight [kg] | 0.63 | 0.91 | 1.6 | 2.1 |

BDH



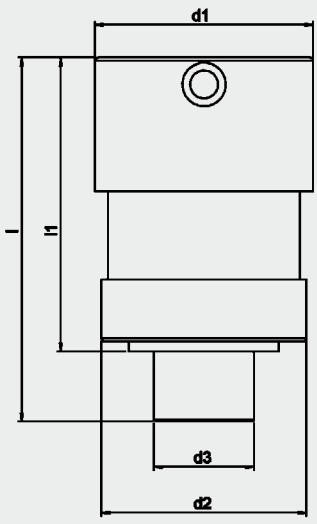

| Type | BDH 100 | BDH 200 | BDH 400 | BDH 800 |
|---|---|---|---|---|
| d1 | 127 | 127 | 127 | 127 |
| d2 | 131 | 131 | 131 | 131 |
| d3 | G1 | G1 | G1 | NPT 2" |
| l | 132 | 168 | 252 | 307 |
| l1 | 103 | 139 | 222 | 269 |
| Weight [kg] | 1.00 | 1.40 | 2.10 | 2.50 |

BDL 30-50



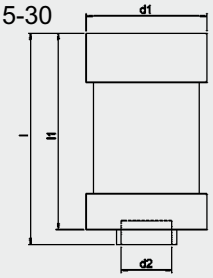

| Type | BDL 30 | BDL 50 |
|---|---|---|
| d1 | 51 | 51 |
| d2 | NPT ½" | NPT ½" |
| l | 137 | 216 |
| l1 | 124 | 203 |
| Weight [kg] | 0.10 | 0.21 |

BD.../-RV

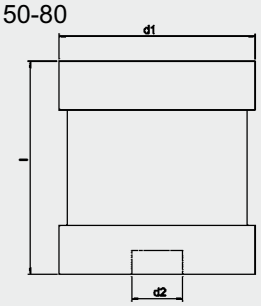



| Type | BD 200.../-RV | BD 400.../-RV |
|---|---|---|
| d1 | 131 | 131 |
| d2 | 123 | 123 |
| d3 | NPT 2" 33.8 | NPT 2" 33.8 |
| l | 218 | 298 |
| l1 | 176 | 256 |
| Weight [kg] | 1.20 | 1.86 |

BDM 15-30

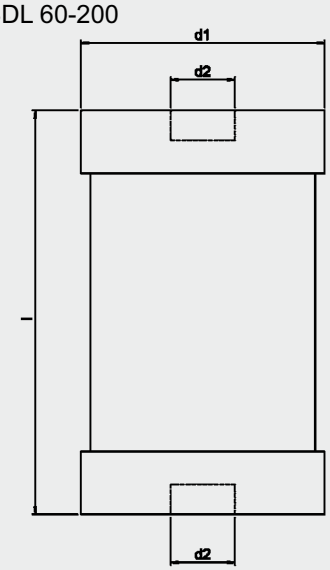



BDM 50-80




| Type | BDM 15 | BDM 30 | BDM 50 | BDM 80 |
|---|---|---|---|---|
| d1 | 51 | 51 | 83 | 83 |
| d2 | NPT ½" | NPT ½" | NPT ½" | NPT ½" |
| l | 59 | 89 | 57 | 90 |
| l1 | 52 | 82 | - | - |
| Weight [kg] | 0.09 | 0.14 | 0.28 | 0.40 |

BDL 60-200




| Type | BDL 60 | BDL 200 |
|---|---|---|
| d1 | 82 | 82 |
| d2 | NPT ½" | NPT ½" |
| l | 135 | 212 |
| Weight [kg] | 0.48 | 0.80 |

## NOTE

The information in this brochure relates to the operating conditions and applications described.

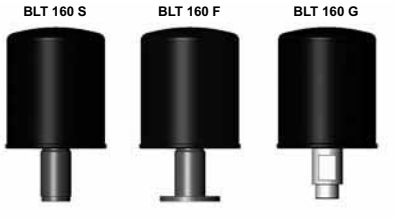
For applications or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.


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E-Mail: filter@hydac.com



# Tank Breather Filter and Dehumidifier BLT
up to 270 l/min




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filters consist of a spin-on can which screws onto a connection tube which is fitted to the oil tank.
The connection can either be a flange, weld or threaded version.

### 1.2 REPLACEMENT CARTRIDGES

The replacement cartridges comply with all relevant ISO test criteria.

### 1.3 SEALS

Cardboard for flange model

### 1.4 SPECIAL MODELS AND ACCESSORIES

On request

### 1.5 SPARE PARTS

See Original Spare Parts List

### 1.6 CERTIFICATES AND APPROVALS

On request

### 1.7 FILTER SPECIFICATIONS

| | |
|---|---|
| Temperature range | -30 °C to +100 °C |
| Material of connection tube | Steel |
| Material of spin-on can | Sheet steel |

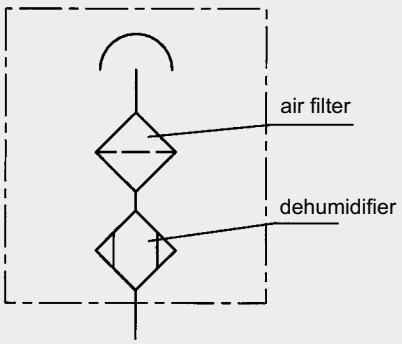
### 1.8 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

The tank breather filter/dehumidifier BLT is suitable for use with all standard mineral and lubrication oils.

### 1.9 CHANGING INTERVALS

The filter elements or filters must be replaced as frequently as the fluid filters, but at least every 6 months.

**Symbol**




## 2. MODEL CODE

BLT M 160 F 3 W 1 . X

### 2.1 COMPLETE FILTER

**Filter type**
BLT

**Filter material of element**
M molecular sieve

**Size of filter**
160

**Type and size of connection**

| Type | Connection | Filter size |
|---|---|---|
| | | 160 |
| F | Flange connection | ● |
| S | Weld connection | ● |
| G | Threaded connection | ● |

**Filtration rating in µm**
3 3 µm absolute

**Type of clogging indicator**
W without port for clogging indicator

**Type code**
1

**Modification number**
X the latest version is always supplied

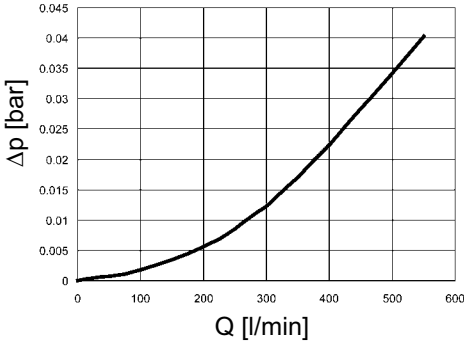
**2.2 REPLACEMENT ELEMENT:** 0160 MU 003 M

## 3.FILTER CALCULATION / SIZING

**Differential pressure across breather filter**

The differential pressure (with clean element) is shown in the graph below.

**BLT 160**




### 3.1 SIZING GUIDELINES

The rate at which contamination and humidity enters a hydraulic system can be considerably reduced by using efficient tank breather filtration.

**NOTE:**

Incorrectly sized breather filters can place additional strain on the system and reduce the service life of hydraulic filter elements.

For optimum sizing the following should therefore be observed:

- Filtration rating of air breather filter ≤ filtration rating of hydraulic filter
- Only use air breather filters with an absolute retention rate (d100 ≤ x µm; x = given filtration rating)
- Max. permissible initial pressure loss: 0.01 bar (with a clean filter element and calculated air flow rate)
- Determination of the calculated air flow rate:
  $Q_A$ = f5 x Qp
  $Q_A$ = air flow rate for sizing purposes in $l_N$/min
  f5 = factor for operating conditions
  $Q_p$ = max. flow rate of the hydraulic pump in l/min

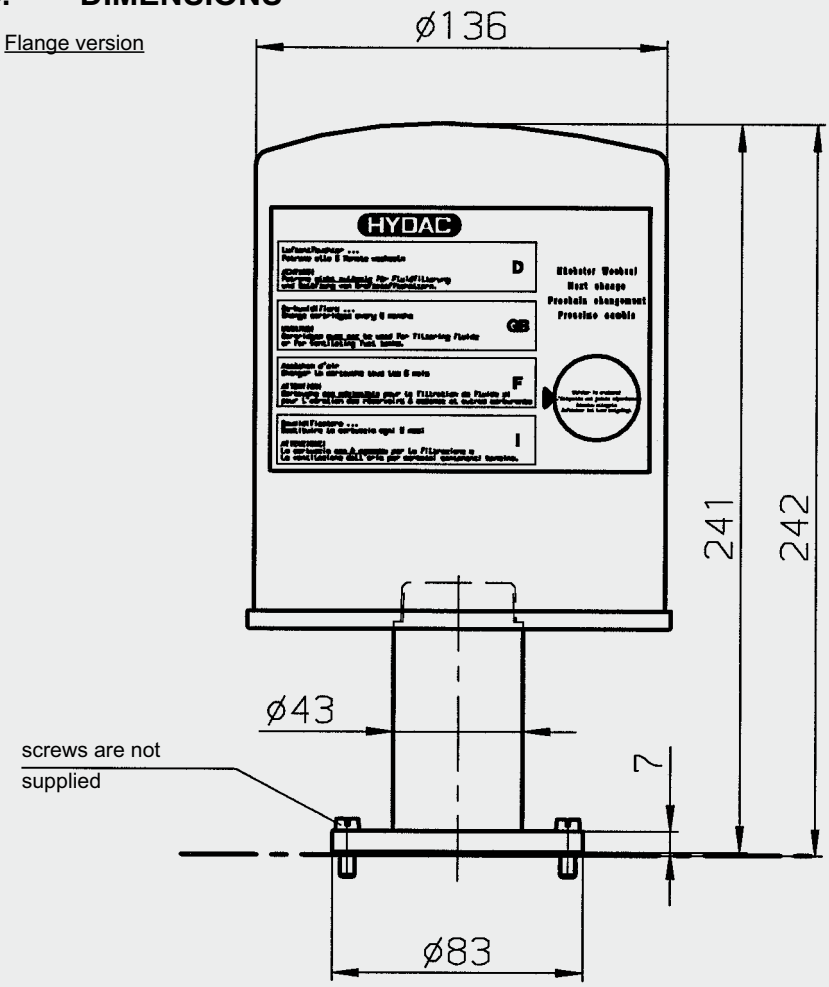
For Factor f5, see table on p. 275, ELF Tank Breather Filter, E 7.404.0/06.07.

### 3.2 WATER RETENTION CAPACITY

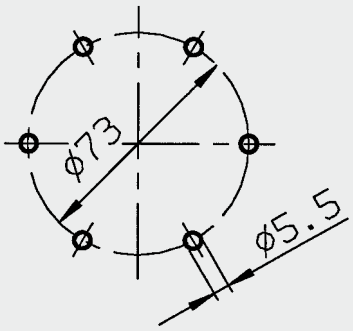
| Temperature | Rel. humidity | $gH_2O$ |
|---|---|---|
| 0 °C | 30% | 190 |
| 15 °C | 60% | 210 |
| 25 °C | 90% | 230 |

## 4. DIMENSIONS

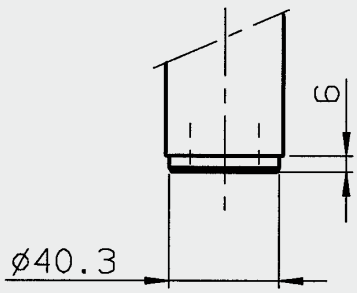
Flange version



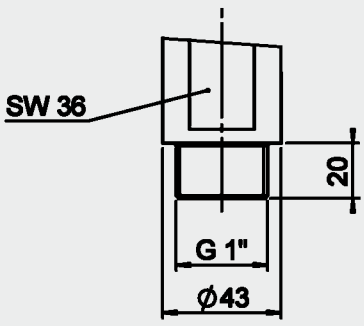

Interface to DIN 24557/T2




Weld version




Threaded version




## NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

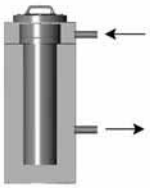

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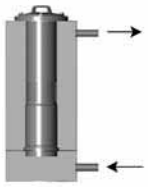
# Return Line Filter RFMR

## Element flow direction from in to out
## In-tank mounted version:
## up to 1100 l/min, up to 10 bar

RFMR
600, 800, 1000 KIT



RFMR
600, 800, SET



## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. There are two types of RFMR. The RFMR-KIT series consists of a housing tube and cover plate. The RFMR-SET series consists of a filter cover plate and element location spigot. The element is removed from the top in both cases.

Standard equipment:

- with bypass valve
- magnetic core built into cover plate

### 1.2 FILTER ELEMENTS

Hydac filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941, ISO 2942, ISO 2943, ISO 3724, ISO 3968, ISO 11170, ISO 16889

**Contamination retention capacities in g**

| Glass fibre (PGN) | | | |
|---|---|---|---|
| RFMR-KIT | 5 µm | 10 µm | 25 µm |
| 600 | 85 | 153 | 170 |
| 800 | 115 | 207 | 230 |
| 1100 | 170 | 306 | 340 |

| Glass fibre with pre-filter (GSN) | | | |
|---|---|---|---|
| RFMR-KIT | 5 µm | 10 µm | 20 µm |
| 600 | 272 | 408 | 459 |
| 800 | 368 | 552 | 621 |
| 1100 | 544 | 816 | 918 |

| Glass fibre (PGN) | | | |
|---|---|---|---|
| RFMR-SET | 5 µm | 10 µm | 25 µm |
| 600 | 85 | 153 | 170 |
| 800 | 115 | 207 | 230 |

| Glass fibre with pre-filter (GSN) | | | |
|---|---|---|---|
| RFMR-SET | 5 µm | 10 µm | 20 µm |
| 600 | 272 | 408 | 459 |
| 800 | 368 | 552 | 621 |

Filter elements are available with the following pressure stability values:

Glass fibre (PGN): 6 bar
Glass fibre with pre-filter (GSN) 6 bar
Wire mesh (WR): 6 bar

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Nominal pressure | up to 10 bar |
| Temperature range | -30 °C to +120 °C |
| Material of housing tube | Steel |
| Material of cover plate | GGG: RFMR-KIT<br>GG: RFMR-SET |
| Cracking pressure of bypass valve | 3 bar (others on request) |

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 MOUNTING

In-tank filter.

### 1.6 SPECIAL MODELS AND ACCESSORIES

without magnetic core

### 1.7 SPARE PARTS

See Original Spare Parts List

### 1.8 CERTIFICATES AND APPROVALS

Test certificate 2.2
Other approvals on request

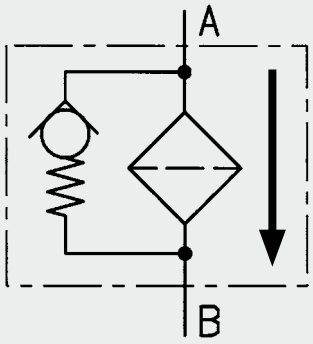
### 1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Non-flam operating fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

### 1.10 IMPORTANT INFORMATION

- Filter housing must be earthed
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector

**Symbol for hydraulic systems**



## 2. MODEL CODE (also order example)

**RFMR PGN 800 KIT 10 W 1 . X /-V**

### 2.1 COMPLETE FILTER

**Filter type**
RFMR

**Filter material of element**
PGN glass fibre
GSN glass fibre with pre-filter
WR wire mesh

**Size of filter or element**
RFMR: 600, 800, 1100

**In-tank version**
KIT housing tube and cover plate only

**Filtration rating in µm**
PGN : 5, 10, 25
GSN : 5, 10, 20
WR : 25, 40, 60

**Type of clogging indicator**
W without connection for clogging indicator

**Type code**
1

**Modification number**
X the latest version is always supplied

**Supplementary details**
without details = standard bypass cracking pressure B6 = 6 bar
B. special bypass cracking pressure (e.g. B3 = 3 bar)
OM without magnetic core
V FPM seals

### 2.2 IN-TANK MOUNTED VERSION RFMR - SET

**RFMR PGN 800 SET 10 W 1 . X /-V**

**Filter type**
RFMR

**Filter material of element**
PGN glass fibre
GSN glass fibre with pre-filter
WR wire mesh

**Size of filter or element**
RFMR: 600, 800

**In-tank version**
SET filter cover plate and element location spigot only

**Filtration rating in µm**
PGN : 5, 10, 25
GSN : 5, 10, 20
WR : 25, 40, 60

**Type of clogging indicator**
W without connection for clogging indicator

**Type code**
1

**Modification number**
X the latest version is always supplied

**Supplementary details**
without details = standard bypass cracking pressure B6 = 6 bar
B. special bypass cracking pressure (e.g. B3 = 3 bar)
OM without magnetic core
V FPM seals

### 2.3 REPLACEMENT ELEMENT

**0800 RX 010 PGN /-V**

**Size**
0600, 0800, 1100

**Type**
RX Element for KIT-Version
RY Element for SET-Version

**Filtration rating in µm**
PGN : 005, 010, 025
GSN : 005, 010, 020
WR : 025, 040, 060

**Filter material of element**
PGN, GSN, WR

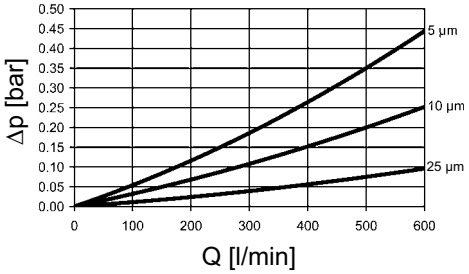
**Supplementary details**
V (for description, see point 2.1 or 2.2)

# 3. FILTER CALCULATION / SIZING

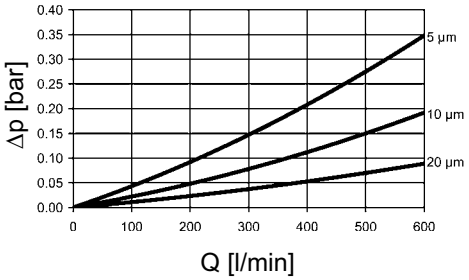
## 3.1 GRAPHS FOR COMPLETE FILTER

The total pressure drop graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s.

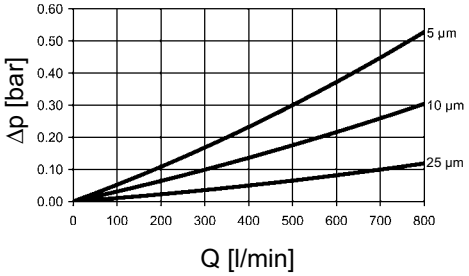
### RFMR 600 KIT: PGN



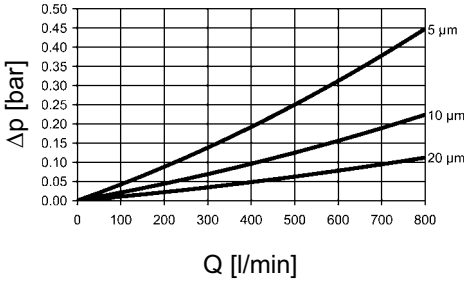

### RFMR 600 KIT: GSN



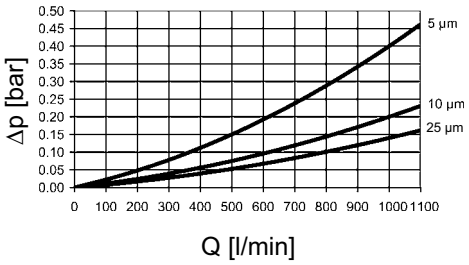

### RFMR 800 KIT: PGN



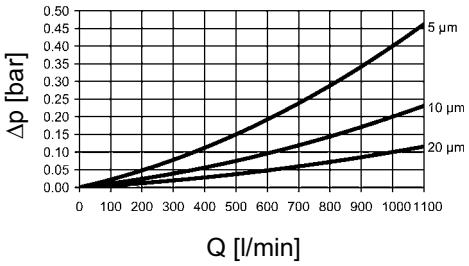

### RFMR 800 KIT: GSN



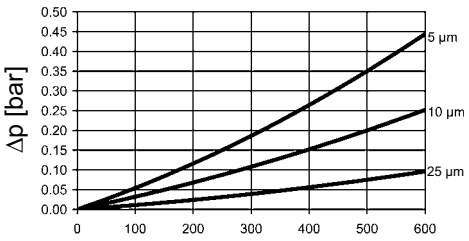

### RFMR 1100 KIT: PGN



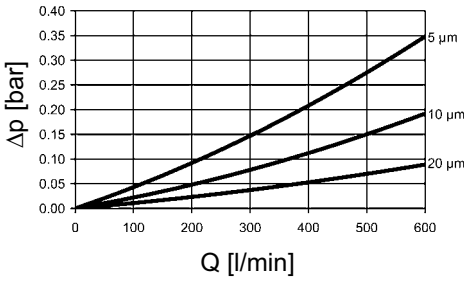

### RFMR 1100 KIT: GSN



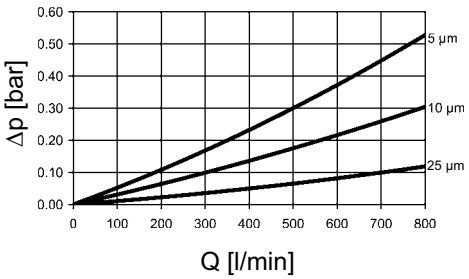

### RFMR 600 SET: PGN



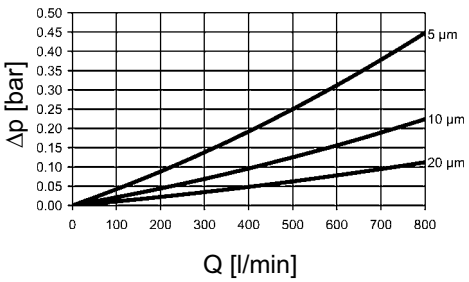

### RFMR 600 SET: GSN




### RFMR 800 SET: PGN

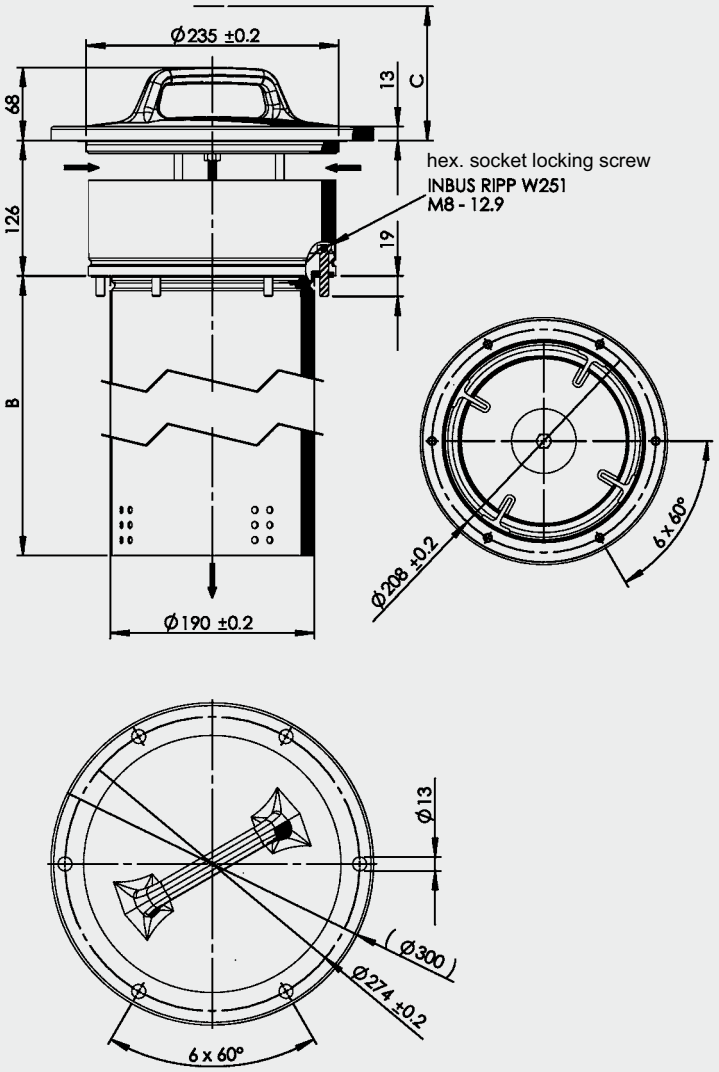



### RFMR 800 SET: GSN



## 4. DIMENSIONS

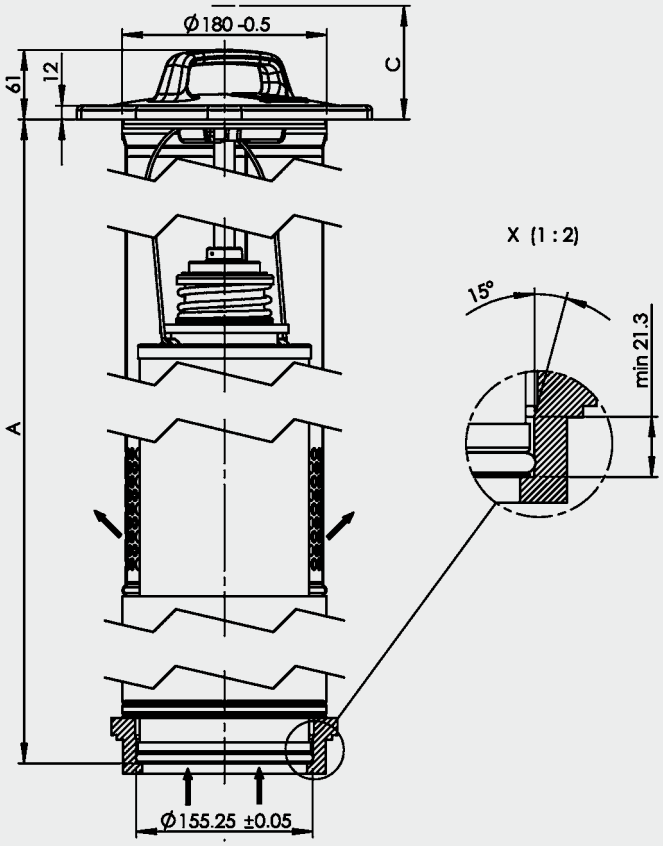
RFMR 600 - 1100 KIT

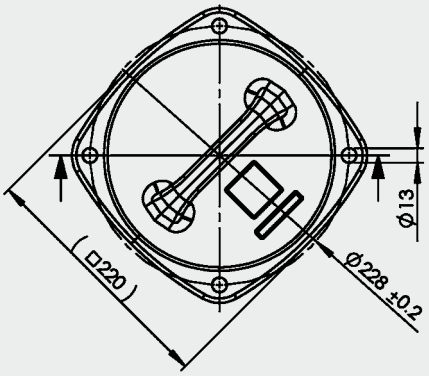






RFMR 600 - 800 SET




| RFMR KIT | B | C min. | Weight incl. element [kg] |
|---|---|---|---|
| 600 | 694 | 570 | 23.9 |
| 800 | 680 | 685 | 25.2 |
| 1100 | 1324 | 1005 | 32.1 |

| RFMR SET | A | B | Weight incl. element [kg] |
|---|---|---|---|
| 600 | 780 | 775 | 11.0 |
| 800 | 980 | 975 | 12.2 |

## NOTE

The information in this brochure relates to the operating conditions and applications described.

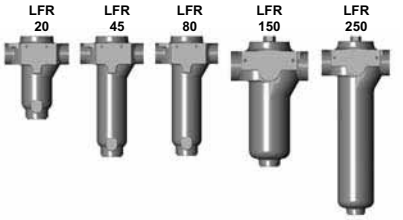
For applications or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.


HYDAC **Filtertechnik GmbH**
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**D-66280 Sulzbach/Saar**
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# Inline Filter LFR
## up to 120 bar, up to 250 l/min




**ELEMENT FLOW DIRECTION FROM IN TO OUT**

## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. They consist of a filter housing with bolt-on cover plate. The element is removed from the top.

Standard equipment:

- mounting holes in the housing
- magnetic core built into cover plate
- without bypass valve
- oil drain plug

### 1.2 FILTER ELEMENTS

Hydac filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941, ISO 2942, ISO 2943 ISO 3968, ISO 11170, ISO 16889

**Contamination retention capacities in g**

| Glass fibre (PGN) | | | |
|---|---|---|---|
| LFR | 5 µm | 10 µm | 25 µm |
| 20 | 1.45 | 2.61 | 2.9 |
| 45 | 3.35 | 6.03 | 6.7 |
| 80 | 4.18 | 7.51 | 8.35 |
| 150 | 5.25 | 9.45 | 10.5 |
| 250 | 8.5 | 15.3 | 17 |

| Glass fibre with pre-filter (GSN) | | | |
|---|---|---|---|
| LFR | 5 µm | 10 µm | 20 µm |
| 20 | 4.64 | 6.96 | 7.83 |
| 45 | 10.72 | 16.08 | 18.09 |
| 80 | 13.36 | 20.04 | 22.55 |
| 150 | 16.8 | 25.2 | 28.35 |
| 250 | 27.2 | 40.8 | 45.9 |

Filter elements are available with the following pressure stability values:
Glass fibre (PGN): 6 bar
Glass fibre with pre-filter (GSN) 6 bar
Wire mesh (WR): 6 bar
Other filtration ratings on request.

### 1.4 SEALS

NBR (= Perbunan)

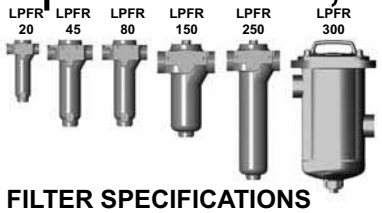
### 1.6 SPECIAL MODELS

- Connection for clogging indicator in filter housing
- Without magnetic core
- Bypass valve built into housing
- Seals in FPM, EPDM

**FILTER SPECIFICATIONS**

| | |
|---|---|
| Nominal pressure | 120 bar |
| Temperature range | -10 °C to +120 °C |
| Material of filter housing | EN-GJS |
| Material of cover plate | EN-GJS: LFR 20 to 80<br>9SMn28k: LFR 15 to 250 |
| Type of clogging indicator | VMR (differential pressure indicator up to 210 bar operating pressure) |
| Pressure setting of clogging indicator | 1.8 bar (others on request) |
| Cracking pressure of bypass valve (optional) | 3 bar (others on request) |

# Inline Filter LPFR
## up to 25 bar, up to 250 l/min

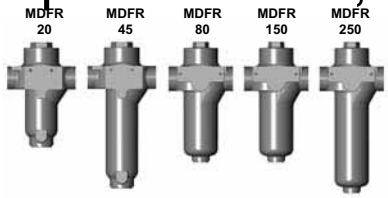



**ELEMENT FLOW DIRECTION FROM IN TO OUT**

**FILTER SPECIFICATIONS**

| | |
|---|---|
| Nominal pressure | 25 bar |
| Temperature range | -10 °C to +120 °C |
| Material of filter housing | EN-GJS: LPFR 20 to 250<br>Steel: LPFR 300 |
| Material of cover plate | EN-GJS: LPFR 20 to 80<br>EN-GJL: LPFR 150 to 300 |
| Type of clogging indicator | VMR (differential pressure indicator up to 210 bar operating pressure) |
| Pressure setting of clogging indicator | 1.8 bar (others on request) |
| Cracking pressure of bypass valve (optional) | 3 bar (others on request) |

# Inline Filter MDFR
## up to 250 bar, up to 250 l/min




**ELEMENT FLOW DIRECTION FROM IN TO OUT**

**FILTER SPECIFICATIONS**

| | |
|---|---|
| Nominal pressure | 250 bar |
| Temperature range | -10 °C to +120 °C |
| Material of filter housing | EN-GJS |
| Material of cover plate | S355JR: MDFR 20 to 80<br>EN-GJS: MDFR 150 to 250 |
| Type of clogging indicator | VDR (differential pressure indicator up to 400 bar operating pressure) |
| Pressure setting of clogging indicator | 1.8 bar (others on request) |
| Cracking pressure of bypass valve (optional) | 3 bar (others on request) |

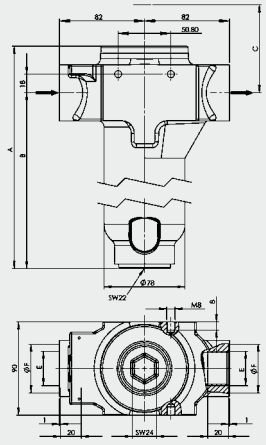
## 2. MODEL CODE

### 2.1 COMPLETE FILTER

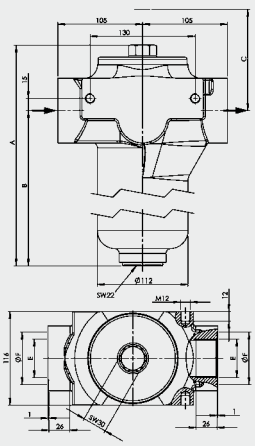
| Type | Filter material of element | Size | Operating pressure | Port | Filtration rating | Clogging indicator | Type code | Modification number | Supplementary details |
|---|---|---|---|---|---|---|---|---|---|
| **LFR**<br>**LPFR**<br>**MDFR** | **PGN**=glass fibre<br>**GSN**=glass fibre with pre-filter<br>**WR**=wire mesh | 20<br>45<br>80<br>150<br>250<br>300* | **D**=25 bar (only LPFR)<br>**I**=120 bar (only LFR)<br>**M**=250 bar (only MDFR) | **B**=G 1/2<br>**C**=G 3/4<br>**D**=G1<br>**F**=G1 1/2<br>**G**=2 | 5<br>10<br>20 (GSN only)<br>25 (PGN only) | **W**=no port for indicator<br>**B**=visual<br>**C**=electrical<br>**D**=visual / electrical<br>only possible with special adapter! | **1**=<br>standard | **.x**=<br>the latest version is always supplied | **-V**=<br>FPM seal (Viton)<br>**-B3**=<br>special bypass cracking pressure 3 bar<br>**-OM**=<br>without magnetic core |

## 3. DIMENSIONS

LFR 20 - 80

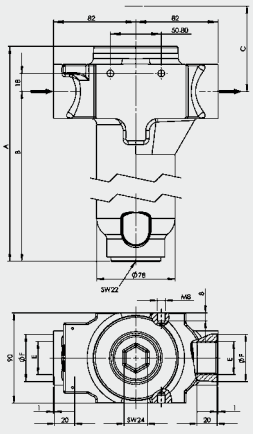


LFR 150 - 250

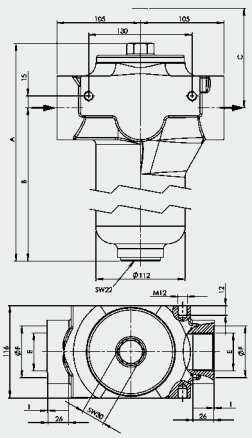


| LFR | A | B | C | E | F Ø | Weight incl. element [kg] |
|---|---|---|---|---|---|---|
| 20 | 212 | 167 | 180 | G ½ | 34 | 5.3 |
| 45 | 312 | 267 | 250 | G ¾ | 42 | 5.8 |
| 80 | 312 | 267 | 280 | G 1 | 47 | 6.6 |
| 150 | 354 | 273 | 335 | G 1½ | 68 | 14.2 |
| 250 | 454 | 373 | 435 | G 2 | 65 | 15.0 |

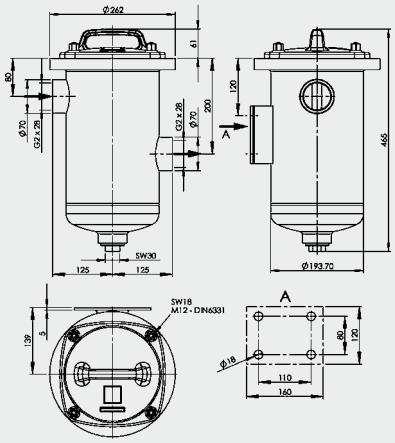
LPFR 20 - 80



LPFR 150 - 250

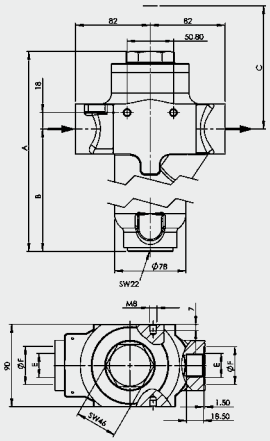


LPFR 300

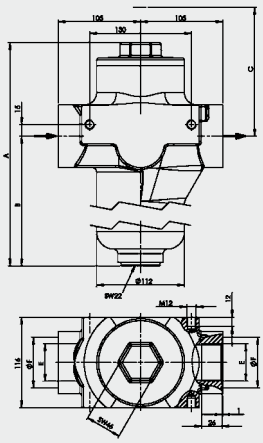


| LPFR | A | B | E | F Ø | Weight incl. element [kg] |
|---|---|---|---|---|---|
| 20 | 212 | 167 | G ½ | 34 | 5.3 |
| 45 | 312 | 267 | G ¾ | 42 | 5.8 |
| 80 | 312 | 267 | G 1 | 47 | 6.6 |
| 150 | 354 | 273 | G 1½ | 68 | 14.2 |
| 250 | 454 | 373 | G 2 | 65 | 15.0 |
| 300 | - | - | - | - | 24.2 |

MDFR 20 - 80



MDFR 150 - 250



| MDFR | A | B | C | E | F Ø | Weight incl. element [kg] |
|---|---|---|---|---|---|---|
| 20 | 260 | 174 | 200 | G ½ | 34 | 6.2 |
| 45 | 360 | 274 | 275 | G ¾ | 42 | 7.9 |
| 80 | 360 | 274 | 305 | G 1 | 47 | 8.6 |
| 150 | 405 | 282 | 365 | G 1 ½ | 65 | 18.4 |
| 250 | 505 | 382 | 465 | G 2 | 68 | 19.0 |

## NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

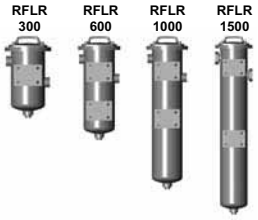
Subject to technical modifications.

HYDAC **Filtertechnik GmbH**
Industriegebiet
**D-66280 Sulzbach/Saar**
Tel.: 0 68 97 / 509-01
Fax: 0 68 97 / 509-300
Internet: www.hydac.com
E-Mail: filter@hydac.com



# Inline Filter RFLR

## Element flow direction from in to out up to 25 bar, up to 1500 l/min




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. They consist of a filter housing and cover plate. The element is removed from the top.

Standard equipment:

- mounting holes in the housing
- oil drain plug
- magnetic core built into cover plate
- without bypass valve

### 1.2 FILTER ELEMENTS

Hydac filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3968
- ISO 11170
- ISO 16889

**Contamination retention capacities in g**

| Glass fibre (PGN) | | | |
|---|---|---|---|
| RFLR | 5 µm | 10 µm | 25 µm |
| 300 | 27.5 | 49.5 | 55 |
| 600 | 60 | 108 | 120 |
| 1000 | 85 | 153 | 170 |
| 1500 | 170 | 306 | 340 |

| Glass fibre with pre-filter (GSN) | | | |
|---|---|---|---|
| RFLR | 5 µm | 10 µm | 20 µm |
| 300 | 88 | 132 | 148.5 |
| 600 | 192 | 288 | 324 |
| 1000 | 368 | 552 | 621 |
| 1500 | 544 | 816 | 918 |

Filter elements are available with the following pressure stability values:

Glass fibre (PGN): 6 bar
Glass fibre with pre-filter (GSN) 6 bar
Wire mesh (WR): 6 bar

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 MOUNTING

In-tank filter

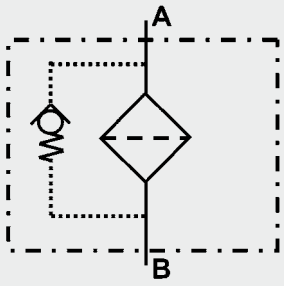
### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Nominal pressure | 25 bar |
| Temperature range | -10 °C to + 120 °C |
| Material of filter housing | ST |
| Material of cover plate | EN-GJL |
| Type of clogging indicator | VMR (differential pressure indicator up to 210 bar operating pressure) |
| Pressure setting of clogging indicator | 1.8 bar (others on request) |
| Cracking pressure of bypass valve (optional) | 3 bar (others on request) |

### 1.6 SPECIAL MODELS

- Connection for clogging indicator in filter housing
- Without magnetic core
- Bypass valve built into housing
- Seals in FPM, EPDM

**Symbol for hydraulic systems**

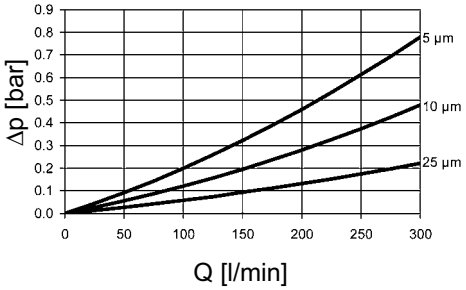



### 1.7 FILTER CALCULATION / SIZING

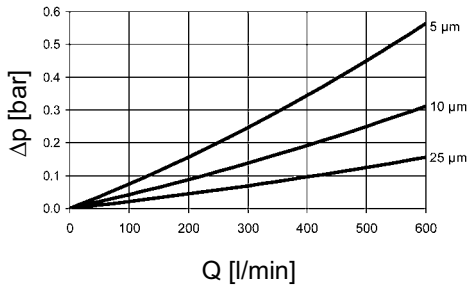
GRAPHS FOR COMPLETE FILTER

The total pressure drop graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s.

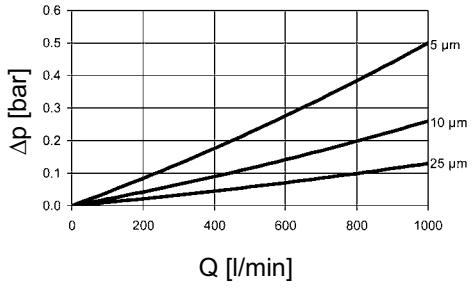
**RFLR 300: PGN**



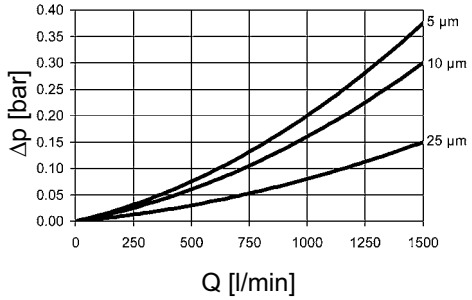

**RFLR 600: PGN**




**RFLR 1000: PGN**




**RFLR 1500: PGN**




**Other graphs on request!**

## 2. MODEL CODE

### 2.1 COMPLETE FILTER

| Type | Filter material of element | Size | Operating pressure | Port | Filtration rating | Clogging indicator | Type code | Modification number | Supplementary details |
|---|---|---|---|---|---|---|---|---|---|
| **RFLR** | **PGN**=glass fibre<br><br>**GSN**=glass fibre with pre-filter<br><br>**WR**=wire mesh | 300<br>600<br>1000<br>1500 | **D**=25 bar | **F**=G1 1/2 (only RFLR 300-1000)<br><br>**L**=SAE DN 50 (only RFLR 1500) | 5<br>10<br>20 (GSN only)<br>25 (PGN only) | **W**=no port for indicator<br><br>**B**=visual<br><br>**C**=electrical<br><br>**D**=visual / electrical | **1**= standard | **.x**= the latest version is always supplied | **-V**= FPM seal (Viton)<br><br>**-B3**= special bypass cracking pressure 3 bar<br><br>**-OM**= without magnetic core |

### 2.2 REPLACEMENT ELEMENT

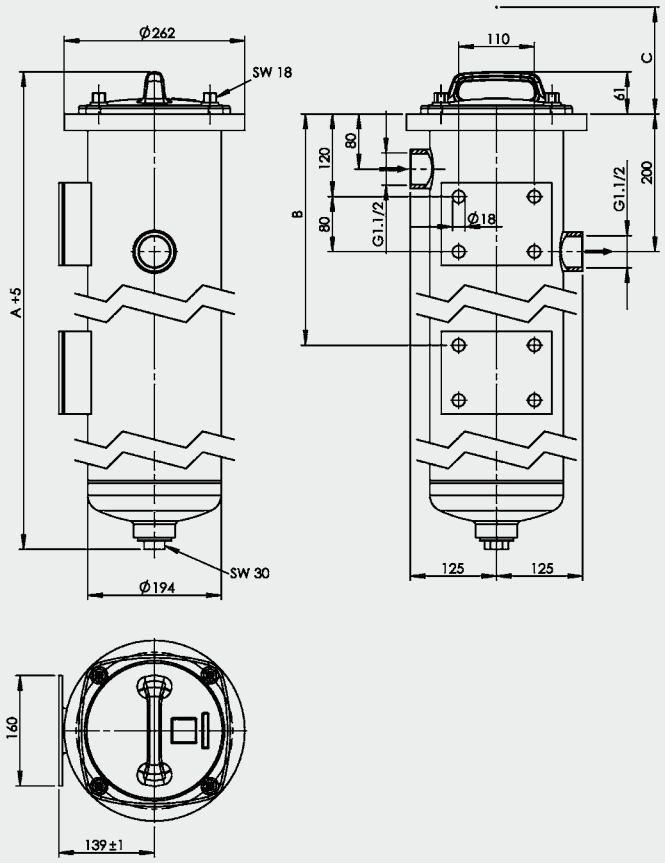
| Size | Type | Filtration rating | Filter material of element | Supplementary details |
|---|---|---|---|---|
| **0300**<br>**0600**<br>**1000**<br>**1500** | R | 5<br>10<br>20 | **PGN**=glass fibre<br>**GSN**=glass fibre with pre-filter<br>**WR**=wire mesh | **-V**= FPM seal (Viton)<br>**-B3**= special bypass cracking pressure 3 bar |

### 2.3 CLOGGING INDICATOR

| Type | Pressure setting | Clogging indicator | Modification number | Supplementary details |
|---|---|---|---|---|
| **VMR** | **1.8** (standard: 1.8 bar) | **W**=no port for indicator<br>**B**=visual<br>**C**=electrical<br>**D**=visual/ electrical | **.x**= the latest version is always supplied | **-V**= FPM seal (Viton) |

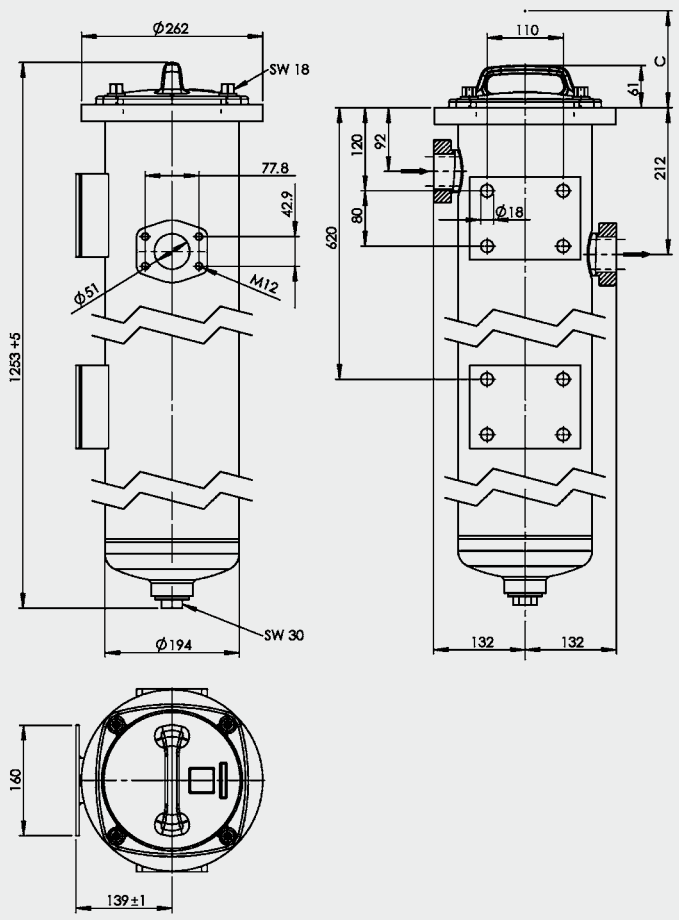
## 3. DIMENSIONS

RFLR 300 - 1000




| RFLR | A | B | C min | Weight incl. element [kg] |
|---|---|---|---|---|
| 300 | 465 | - | 210 | 23.0 |
| 600 | 646 | 360 | 390 | 30.2 |
| 1000 | 970 | 420 | 680 | 47.9 |

RFLR 1500




| RFLR | C min | Weight including element [kg] |
|---|---|---|
| 1500 | 140 | 52.3 |

## NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

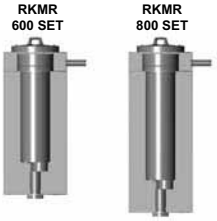
Subject to technical modifications.


**HYDAC Filtertechnik GmbH**
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# Return Line Suction Filter RKMR

## Element flow direction from in to out
## In-tank versions:
## up to 800 l/min, up to 10 bar




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. They consist of a filter cover plate and element location spigot. The element is removed from the top.

Standard equipment:

- with bypass valve
- magnetic core built into cover plate

### 1.2 FILTER ELEMENTS

Hydac filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

**Contamination retention capacities in g**

| Glass fibre (PGN) | | | |
|---|---|---|---|
| RKMR-KIT | 5 µm | 10 µm | 25 µm |
| 600 | 85 | 153 | 170 |
| 800 | 115 | 207 | 230 |

| Glass fibre with pre-filter (GSN) | | | |
|---|---|---|---|
| RKMR-KIT | 5 µm | 10 µm | 20 µm |
| 600 | 272 | 408 | 459 |
| 800 | 368 | 552 | 621 |

Filter elements are available with the following pressure stability values:

| | |
|---|---|
| Glass fibre (PGN): | 6 bar |
| Glass fibre with pre-filter (GSN) | 6 bar |
| Wire mesh (WR): | 6 bar |

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Nominal pressure | up to 10 bar |
| Temperature range | -30 °C to +120 °C |
| Material of cover plate | aluminium |
| Cracking pressure of bypass valve (optional) | on request |

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 MOUNTING

In-tank filter.

### 1.6 SPECIAL MODELS AND ACCESSORIES

- without magnetic core
- air bleed valve in cover plate
- protective strainer for bypass and anti-cavitation valve

### 1.7 SPARE PARTS

See Original Spare Parts List

### 1.8 CERTIFICATES AND APPROVALS

Test certificate 2.2
Other approvals on request

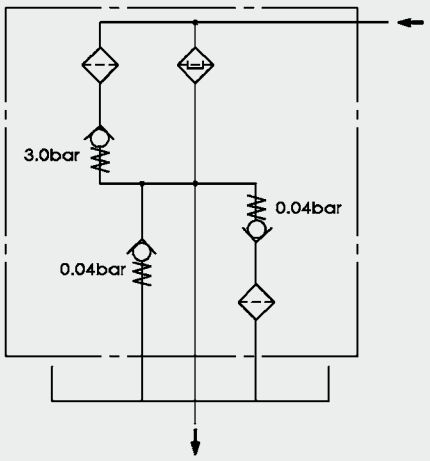
### 1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Non-flam operating fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

### 1.10 IMPORTANT INFORMATION

- Filter housing must be earthed
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.

**Symbol for hydraulic systems**



## 2. MODEL CODE (also order example)

**RKMR PGN 800 SET 10 W 1 . X /-V**

### 2.1 COMPLETE FILTER

**Filter type**
RKMR

**Filter material of element**
PGN glass fibre
GSN glass fibre with pre-filter
WR wire mesh

**Size of filter or element**
RKMR: 600, 800

**In-tank version**
SET filter cover plate and element location spigot only

**Filtration rating in µm**
PGN : 5, 10, 25
GSN : 5, 10, 20
WR : 25, 40, 60

**Type of clogging indicator**
W without connection for clogging indicator

**Type code**
1

**Modification number**
X the latest version is always supplied

**Supplementary details**
without details = standard bypass cracking pressure B3 = 3 bar
B. special bypass cracking pressure
V FPM seals

### 2.2 REPLACEMENT ELEMENT

**0800 R 010 PGN /-V**

**Size**
0600, 0800

**Type**
R

**Filtration rating in µm**
PGN : 005, 010, 025
GSN : 005, 010, 020
WR : 025, 040, 060

**Filter material**
PGN, GSN, WR

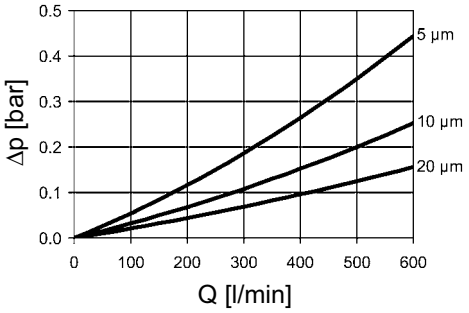
**Supplementary details**
V (for description, see point 2.1)

# 3. FILTER CALCULATION / SIZING

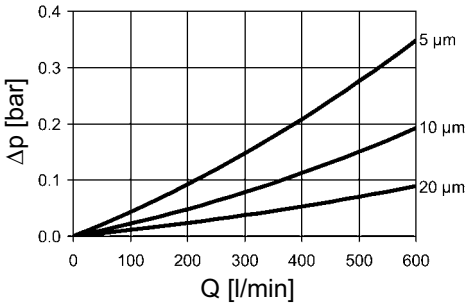
## 3.1 GRAPHS FOR COMPLETE FILTER

The total pressure drop graphs apply to mineral oil with a density of 0.86 kg/dm$^3$ and a kinematic viscosity of 30 mm$^2$/s.

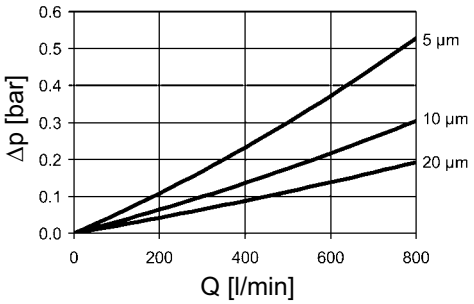
### RKMR 600 SET: PGN



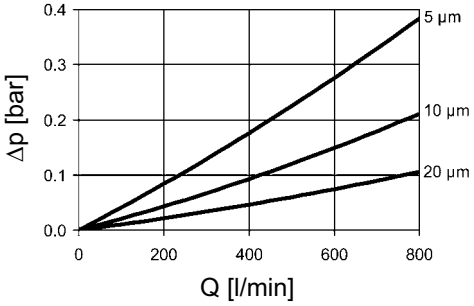

### RKMR 600 SET: GSN




### RKMR 800 SET: PGN

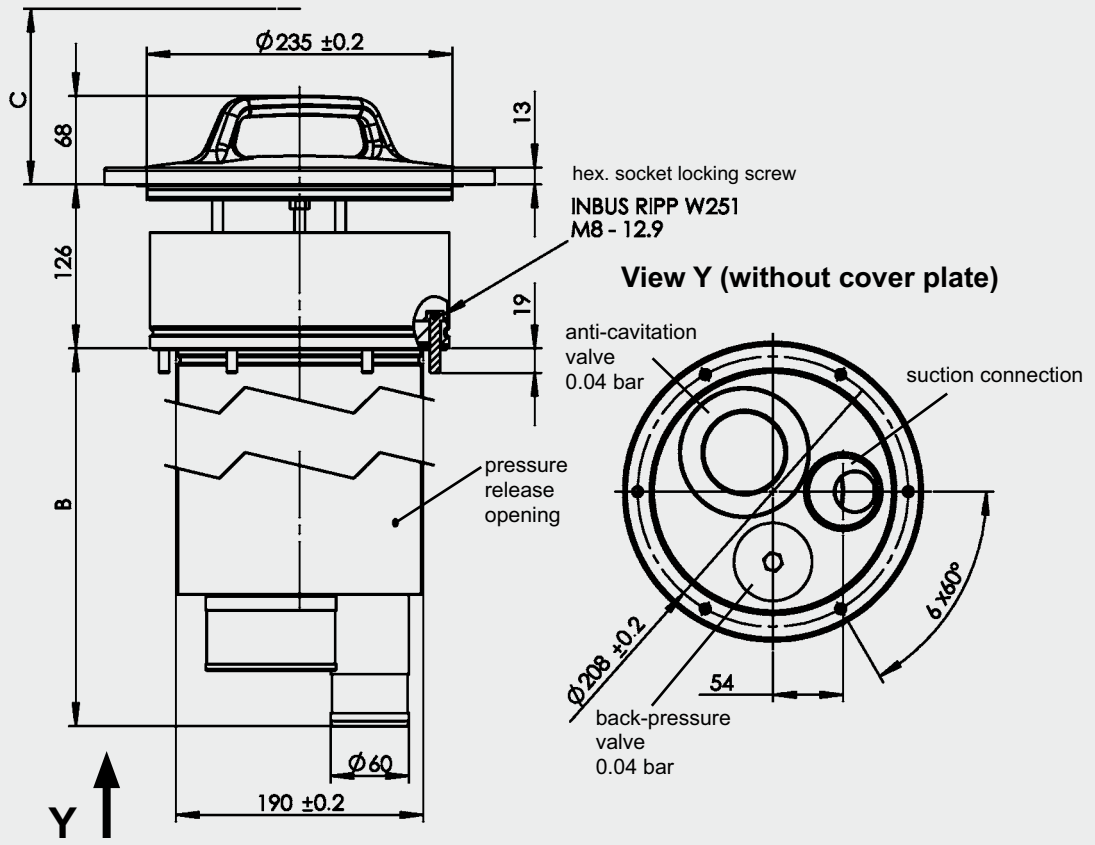


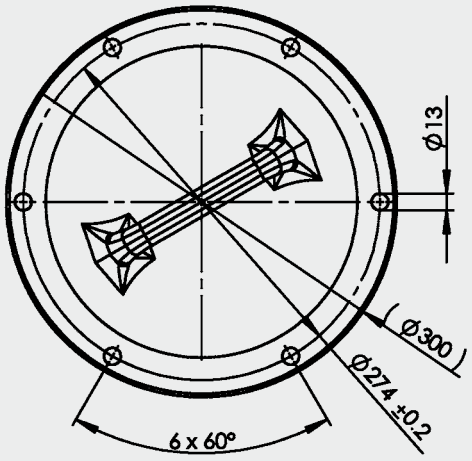

### RKMR 800 SET: GSN

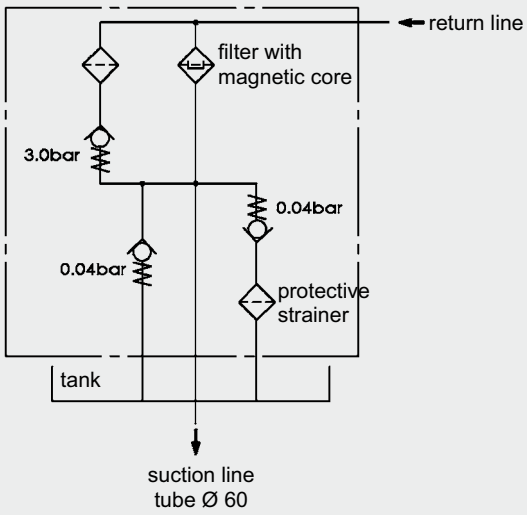


## 4. DIMENSIONS

RKMR 600 - 800 SET




| RKMR SET | B | C min. | Weight incl. element [kg] |
|---|---|---|---|
| 600 | 695 | 570 | 29.4 |
| 800 | 807 | 685 | 32.4 |

## NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

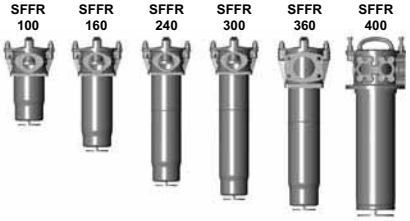
Subject to technical modifications.


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Internet: www.hydac.com
E-Mail: filter@hydac.com



# Suction Filter SFFR

## Element flow direction from in to out up to 400 l/min




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. They consist of a cover plate, filter head and housing tube. The element is removed from the top. These filters can be installed horizontally below the oil level.

Standard equipment:

- mounting holes on the filter head
- magnetic core built into cover plate
- automatic shut-off valve in base of filter

### 1.2 FILTER ELEMENTS

Hydac filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

**Contamination retention capacities in g**

| | Polyester (PE) |
|---|---|
| SFFR | 10 µm (nominal) |
| 100 | 70.4 |
| 160 | 112.0 |
| 240 | 163.2 |
| 300 | 198.4 |
| 360 | 211.2 |
| 400 | 224.0 |

Filter elements are available with the following pressure stability values:

Polyester (PE): 6 bar
Wire mesh (WR): 6 bar

Other filtration ratings on request.

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Temperature range | -30 °C to +120 °C |
| Material of housing tube | Steel |
| Material of filter head | Aluminium |
| Material of cover plate | Aluminium |
| Type of clogging indicator | VRR connection thread G ½ |
| Pressure setting of clogging indicator | -0.25 bar (others on request) |

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 MOUNTING

Tank-top filter.

### 1.6 SPECIAL MODELS AND ACCESSORIES

- connection for clogging indicator in filter head
- without magnetic core

### 1.7 SPARE PARTS

See Original Spare Parts List

### 1.8 CERTIFICATES AND APPROVALS

Test certificate 2.2
Other approvals on request

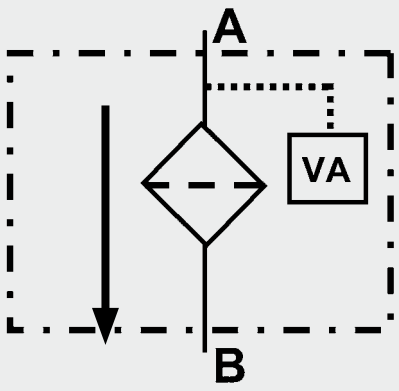
### 1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Operating fluids with high water content (>50% water content) on request

### 1.10 IMPORTANT INFORMATION

- Filter housing must be earthed
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector

**Symbol for hydraulic systems**




VA = Clogging Indicator

## 2. MODEL CODE (also order example)

**SFFR PE 160 W F 10 W 1 . 0 /-V**

### 2.1 COMPLETE FILTER

**Filter type**
SFFR

**Filter material of element**
PE Polyester
WR Wire mesh

**Size of filter or element**
SFFR: 100, 160, 240, 300, 360, 400

**Operating pressure**
W Suction operation

**Type and size of port**

| Type | Port | Filter size | | | | | |
|---|---|---|---|---|---|---|---|
| | | 100 | 160 | 240 | 300 | 360 | 400 |
| D | G 1 + G1 | ● | ● | ● | ● | | |
| F | G 1½ | ● | ● | | | | |
| G | G 2 | | | ● | ● | | |
| I | M33 x 2 + M33 x 2 | ● | ● | ● | ● | | |
| J | M48 x 2 + M48 x 2 + G2 | | | | | | ● |
| L | SAE DN 50 | ● | ● | ● | ● | | |
| N | SAE DN 80 | | | | | ● | |

**Filtration rating in µm**
PE : 10
WR : 25, 40, 60

**Type of clogging indicator**
W without connection for clogging indicator
E pressure gauge
UE vacuum pressure gauge
UF vacuum pressure switch
for other clogging indicators see brochure no. 7.050../..

**Type code**
1

**Modification number**
X the latest version is always supplied

**Supplementary details**
V FPM seals
OM without magnetic core

### 2.2 REPLACEMENT ELEMENT

**0160 RS 010 PE /-V**

**Size**
0100, 0160, 0240, 0300, 0360, 0400

**Type**
RS

**Filtration rating in µm**
PE: 010
WR: 025, 040, 060

**Filter material**
PE, WR

**Supplementary details**
V (for description, see point 2.1)

### 2.3 REPLACEMENT CLOGGING INDICATOR

**VMF 1 UE . X /-V**

**Type**
VMF connection thread G 1/8

**Pressure setting**
2 2 bar (for model E)
1 1 bar (for model UE)
0.2 0.2 bar (for model UF)

**Type of clogging indicator**
see point 2.1

**Modification number**
X the latest version is always supplied

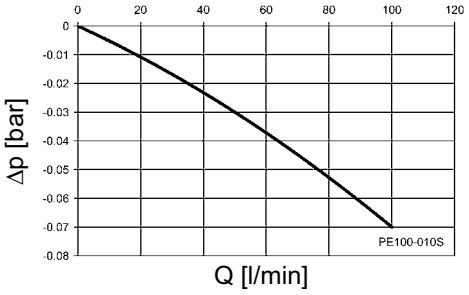
**Supplementary details**
V (for description, see point 2.1)

# 3. FILTER CALCULATION / SIZING

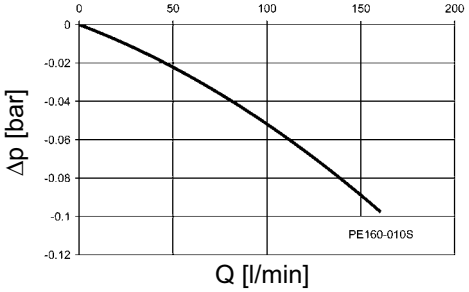
## 3.1 GRAPHS FOR COMPLETE FILTER

The total pressure drop graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s.

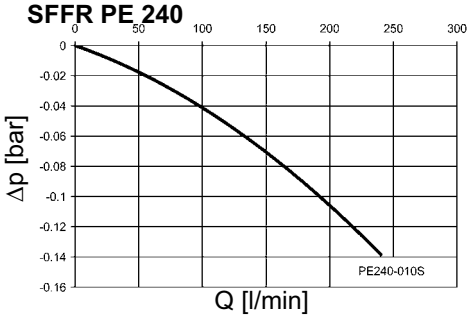
**SFFR PE 100**



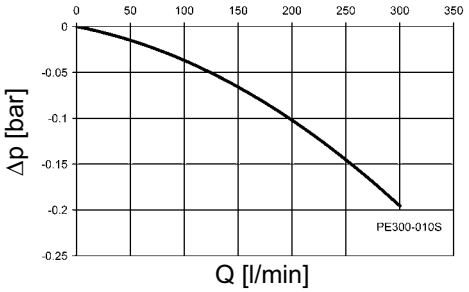

**SFFR PE 160**



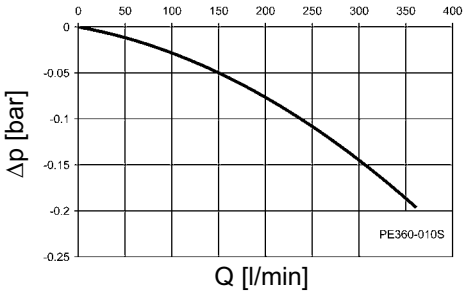

**SFFR PE 240**



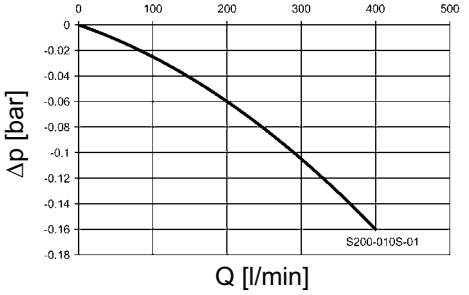

**SFFR PE 300**



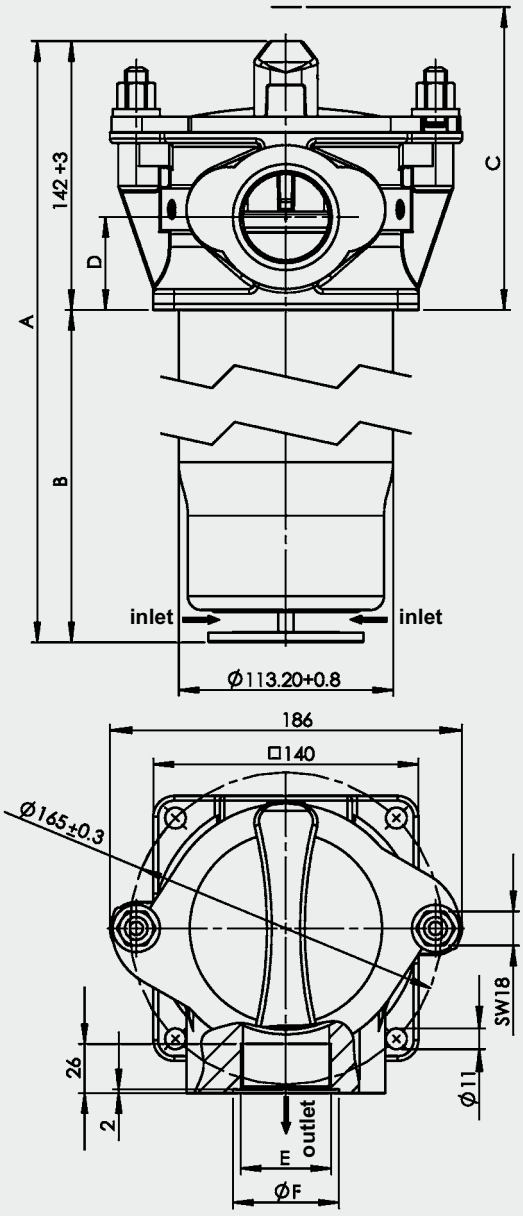

**SFFR PE 360**

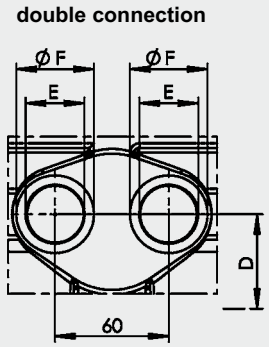


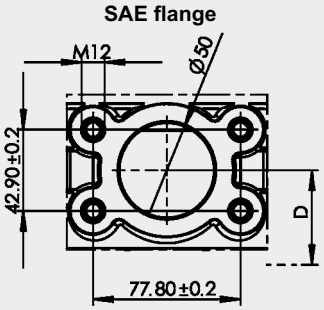

**SFFR PE 400**




# 4. DIMENSIONS

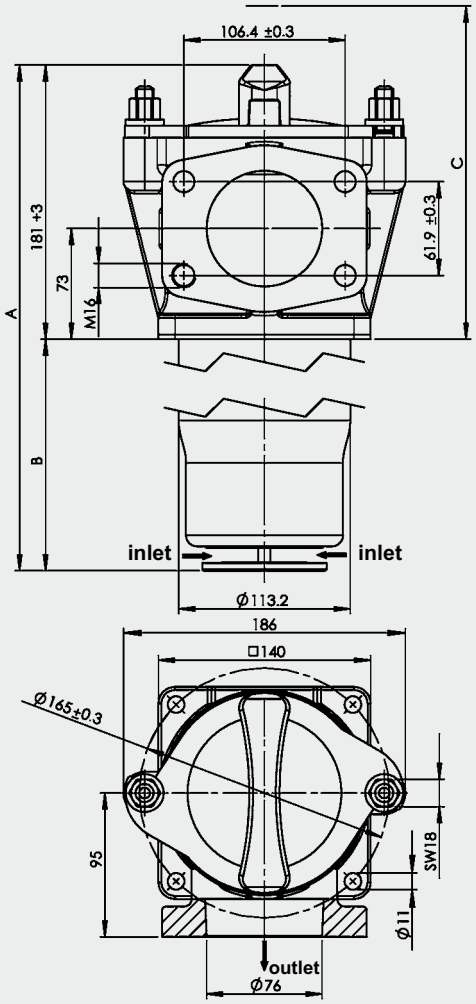



| Type | A | B | C | D | Connection E | Weight incl. element [kg] |
|---|---|---|---|---|---|---|
| SFFR 100 | 321 | 179 | 375 | 53 | G 1 (2x) | 3.4 |
| | | | | 49 | G 1½ | |
| | | | | 53 | M33 x 2 (2x) | |
| | | | | 49 | SAE DN 50 | |
| SFFR 160 | 416 | 274 | 375 | 53 | G 1 (2x) | 4.1 |
| | | | | 49 | G 1½ | |
| | | | | 53 | M33 x 2 (2x) | |
| | | | | 49 | SAE DN 50 | |
| SFFR 240 | 558 | 415 | 670 | 53 | G 1 (2x) | 4.9 |
| | | | | 49 | G 2 | |
| | | | | 53 | M33 x 2 (2x) | |
| | | | | 49 | SAE DN 50 | |
| SFFR 300 | 614 | 471 | 670 | 53 | G 1 (2x) | 5.3 |
| | | | | 49 | G 2 | |
| | | | | 53 | M33 x 2 (2x) | |
| | | | | 49 | SAE DN 50 | |

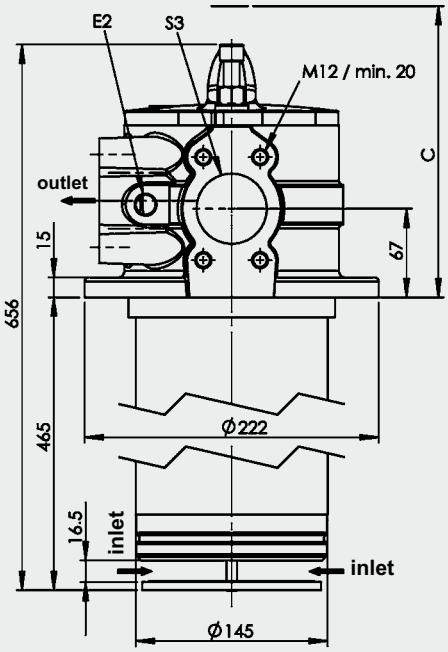
SFFR 360

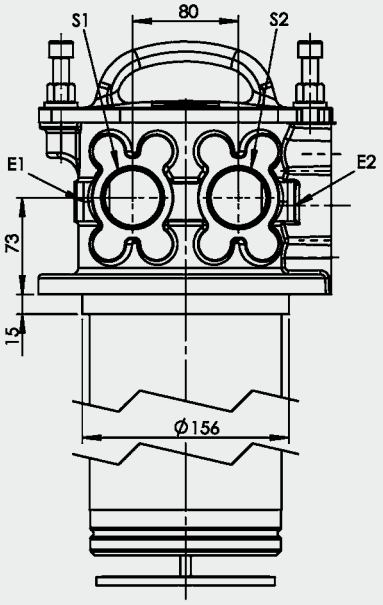


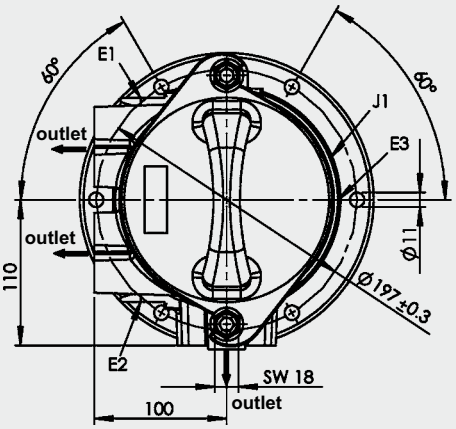




SFFR 400




| Type | Connection | A | B | C | Weight incl. element [kg] |
|---|---|---|---|---|---|
| SFFR 360 | SAE DN 80 | 613 | 431 | 680 | 7.6 |
| SFFR 400 | M48x2 (S1); M48x2 (S2); G2 (S3) | - | - | 730 | 14.3 |

## NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.


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E-Mail: filter@hydac.com



# Return Line Filter HF4R
## up to 450 l/min, up to 10 bar




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. They consist of a filter head with filter bowl and bolt-on cover plate

Standard equipment:

- with bypass valve
- connection for a clogging indicator

### 1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

Filter elements are available with the following pressure stability values:

| | |
|---|---|
| Betamicron® (BN): | 10 bar |
| Wire mesh (W/HC): | 10 bar |
| Paper (P) | 10 bar |

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Nominal pressure | 10 bar |
| Fatigue strength | at nominal pressure $10^6$ load cycles from 0 to nominal pressure |
| Temperature range | -30 °C to +100 °C |
| Material of filter head | Aluminium |
| Material of filter bowl | Steel |
| Type of clogging indicator | VMF (return line indicator) |
| Pressure setting of clogging indicator | 2 bar (others on request) |
| Cracking pressure of bypass valve | 3 bar (others on request) |

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 MOUNTING

As inline filter.

### 1.6 SPECIAL MODELS AND ACCESSORIES

- without bypass valve
- without connection for a clogging indicator

### 1.7 SPARE PARTS

See Original Spare Parts List

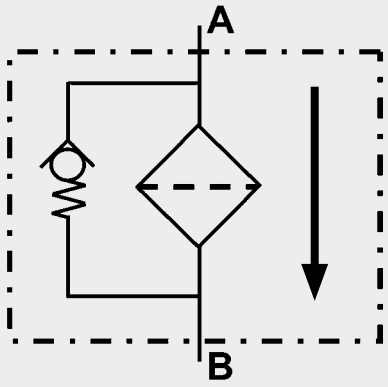
### 1.8 CERTIFICATES AND APPROVALS

On request

### 1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Non-flam operating fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50%) on request

**Symbol for hydraulic systems**



## 2. MODEL CODE (also order example)

**HF4R BN 09 G 3 C 1 . X /12 V-B6**

### 2.1 COMPLETE FILTER

**Filter type**
HF4R

**Filter material**
BN Betamicron® (BN)
W Wire mesh
P Paper

**Size of filter or element**
09 9"
18 18"
27 27"

**Port**
G threaded port
F flange port

**Filtration rating in µm**
BN : 3, 5, 10, 20
W/HC : 25, 74, 149
P : 10, 20

**Type of clogging indicator**
W without connection for clogging indicator
A with steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
(for other clogging indicators see brochure no. 7.050../..)
J electrical switch (Brad Harrison 5 Pin Mini)
J4 electrical switch (Brad Harrison 4 Pin Micro)

**Type code**
1 1 inlet
2 2 inlets

**Modification number**
X the latest version is always supplied

**Supplementary details**
0 BSPP 1¼"
3 NPT 1½"
12 SAE-24-O-ring boss
16 SAE 1½" flange (210 bar)

B. bypass cracking pressure (e.g. B1 = 1 bar); no details = without bypass valve
L... light with appropriate voltage (24, 48, 110, 220 Volt) (only for clogging indicator type "D")
LED 2 light emitting diodes up to 24 Volt (only for clogging indicator type "D")
V FPM seals
W suitable for HFA and HFC emulsions

### 2.2 REPLACEMENT ELEMENT

**5.03.09 D 03 BN /-V**

**Size**
09 9"
18 18"
27 27"

**Type**
D

**Filtration rating in µm**
BN : 03, 05, 10, 20
W/HC : 25, 74, 149
P : 10, 20

**Filter material**
BN, W/HC, P

**Supplementary details**
V, W (for descriptions, see point 2.1)

### 2.3 REPLACEMENT CLOGGING INDICATOR

**VMF 2 D . X /-L24**

**Type**
VMF return line indicator

**Pressure setting**
2 2 bar standard, others on request

**Type of clogging indicator**
D (see point 2.1)

**Modification number**
X the latest version is always supplied

**Supplementary details**
L..., LED, V, W (for descriptions, see point 2.1)

# 4. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and element Δp and is calculated as follows

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see point 3.1)

$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see point 3.2)

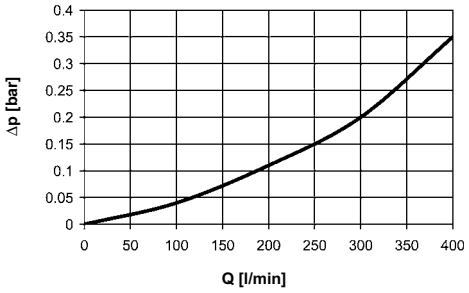
For ease of calculation, our Filter Sizing Program is available on request free of charge.

**NEW:** Sizing online at www.hydac.com

## 4.1 ΔP-Q HOUSING GRAPHS BASED ON ISO 3968

The housing graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s.
In this case, the differential pressure changes proportionally to the density.

### HF4R

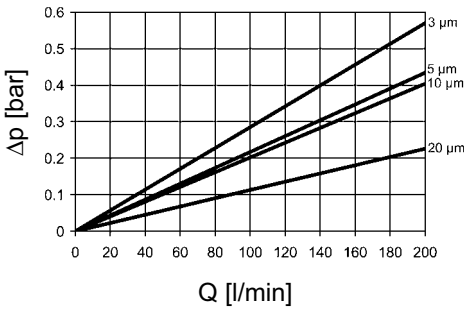



## 4.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

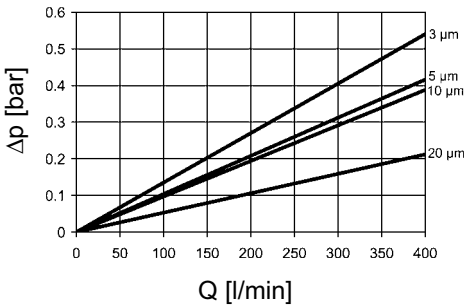
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s.
The pressure drop changes proportionally to the change in viscosity.

| HF4R | BN | | | | W |
|---|---|---|---|---|---|
| | 3 µm | 5 µm | 10 µm | 20 µm | - |
| 09 | 2.85 | 2.17 | 2.02 | 1.13 | 0.128 |
| 18 | 1.35 | 1.04 | 0.97 | 0.53 | 0.073 |
| 27 | 0.88 | 0.67 | 0.62 | 0.35 | 0.036 |

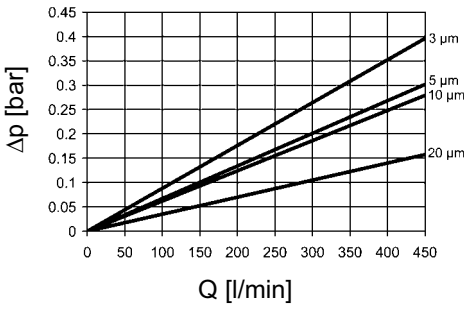
### 09 BN:




### 18 BN:



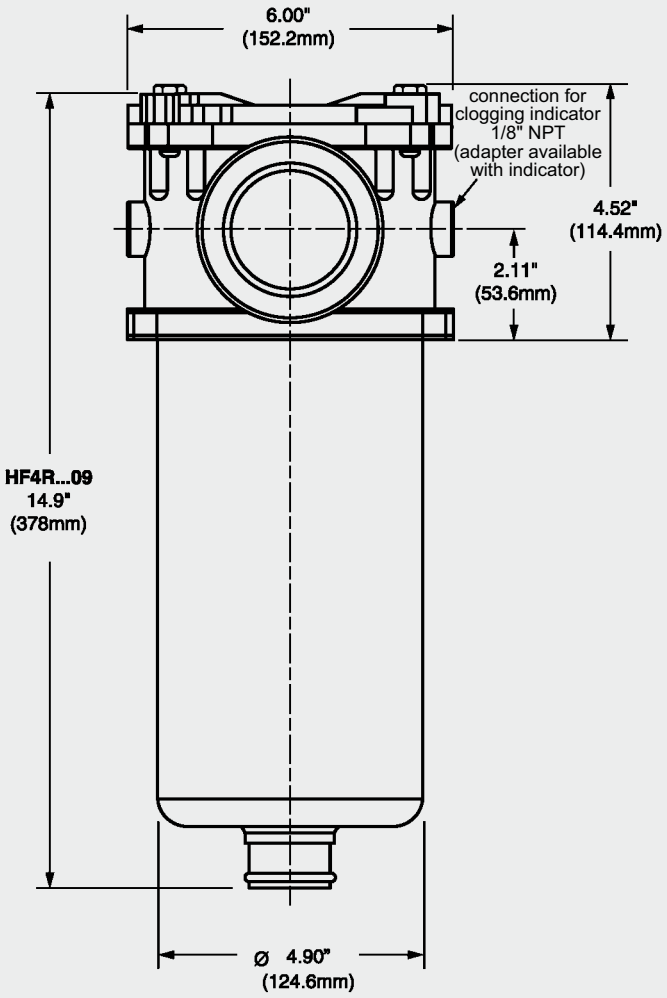

### 27 BN:



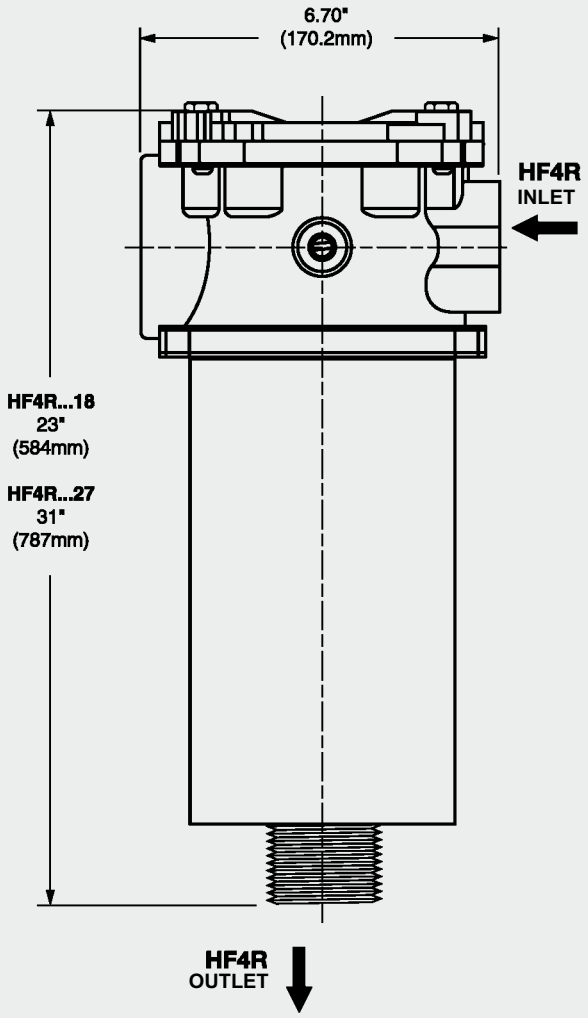
## 4. DIMENSIONS

**HF4R**

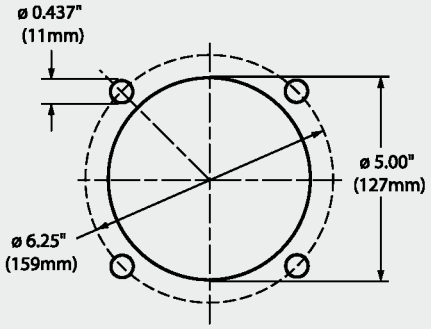
**Size 9**




**Sizes 18 and 27**




**Mounting specifications**




| HF4R | Weight incl. element [kg] |
|---|---|
| 09 | 4.53 |
| 18 | 6.58 |
| 27 | 8.44 |

## NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

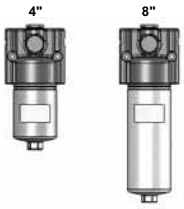
Subject to technical modifications.


HYDAC **Filtertechnik GmbH**
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E-Mail: filter@hydac.com



# Inline Filter or Pressure Filter for Manifold Mounting HF2P

## up to 100 l/min, up to 280 bar




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. They consist of a filter head with screw-in filter bowl.

Standard equipment:

- with bypass valve
- connection for a clogging indicator

### 1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

Filter elements are available with the following pressure stability values:

Betamicron® (BN): 20 bar
Betamicron® (BH): 210 bar

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Nominal pressure | 280 bar |
| Fatigue strength | at nominal pressure $10^6$ load cycles from 0 to nominal pressure |
| Temperature range | -30 °C to +100 °C |
| Material of filter head | EN-GJS |
| Material of filter bowl | Steel |
| Type of clogging indicator | VD (differential pressure indicator up to 420 bar operating pressure) |
| Pressure setting of clogging indicator | 5 bar (others on request) |
| Cracking pressure of bypass valve | 6 bar (others on request) |

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 MOUNTING

As inline filter or pressure filter for manifold mounting

### 1.6 SPECIAL MODELS AND ACCESSORIES

- without bypass valve
- without connection for a clogging indicator

### 1.7 SPARE PARTS

See Original Spare Parts List

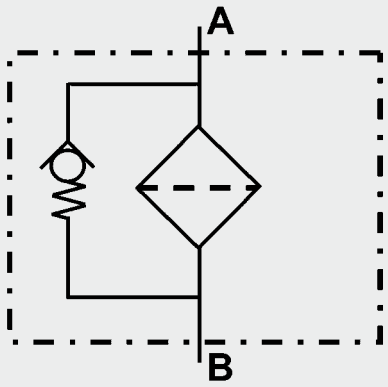
### 1.8 CERTIFICATES AND APPROVALS

On request

### 1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Non-flam operating fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50%) on request

**Symbol for hydraulic systems**



## 2. MODEL CODE (also order example)

**HF2P BN 04 G 3 C 1 . X /12 V-B6**

### 2.1 COMPLETE FILTER

**Filter type**
HF2P

**Filter material of element**
BN Betamicron® (BN)
BH Betamicron® (BH)

**Size of filter or element**
04 4"
08 8"

**Port**
G threaded port
F flange port

**Filtration rating in µm**
BN : 3, 6, 12, 25
BH : 3, 6, 10, 17

**Type of clogging indicator**
W without connection for clogging indicator
A with steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
for other clogging indicators see brochure no. 7.050../..
J electrical switch (Brad Harrison 5 Pin Mini)
J4 electrical switch (Brad Harrison 4 Pin Micro)

**Type code**
1

**Modification number**
X the latest version is always supplied

**Supplementary details**
no details = manifold mounted version
0 G ¾" BSPP
12 SAE-12 O-ring boss

B. bypass cracking pressure (e.g. B3 = 3 bar); no details = without bypass valve
L... light with appropriate voltage (24, 48, 110, 220 Volt)
LED 2 light emitting diodes up to 24 Volt
only for clogging indicator type "D"
V FPM seals
W suitable for HFA and HFC emulsions

### 2.2 REPLACEMENT ELEMENT

**1.07.04 D 03 BN /-V**

**Size**
04 4"
08 8"

**Type**
D

**Filtration rating in µm**
BN: 03, 06, 12, 25
BH: 03, 06, 10, 17

**Filter material**
BN, BH

**Supplementary details**
V (for descriptions, see point 2.1)

### 2.3 REPLACEMENT CLOGGING INDICATOR

**VD 5 D . X /-L24**

**Type**
VD differential pressure indicator up to 420 bar operating pressure

**Pressure setting**
5 5 bar standard, others on request

**Type of clogging indicator**
D (see point 2.1)

**Modification number**
X the latest version is always supplied

**Supplementary details**
L..., LED, V, W (for descriptions, see point 2.1)

# 3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and element Δp and is calculated as follows

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see point 3.1)

$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see point 3.2)

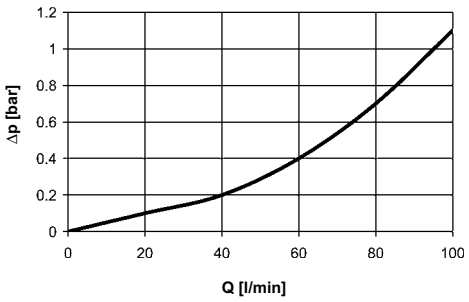
For ease of calculation, our Filter Sizing Program is available on request free of charge.

**NEW:** Sizing online at www.hydac.com

## 3.1 ΔP-Q HOUSING GRAPHS BASED ON ISO 3968

The housing graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s.
In this case, the differential pressure changes proportionally to the density.

**HF2P**

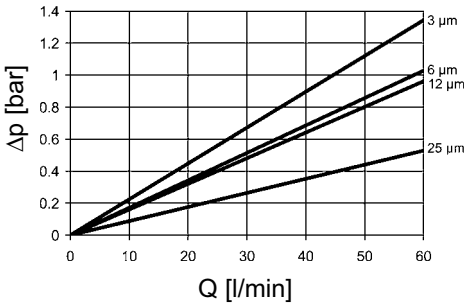



## 3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

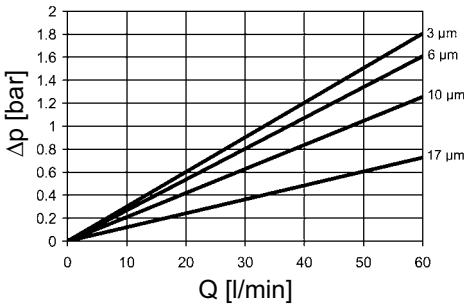
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

| HF2P | BN | | | | BH | | | |
|---|---|---|---|---|---|---|---|---|
| | 3 µm | 6 µm | 12 µm | 25 µm | 3 µm | 6 µm | 10 µm | 17 µm |
| 04 | 22.40 | 17.14 | 16.03 | 8.81 | 30.11 | 26.81 | 20.93 | 12.12 |
| 08 | 11.14 | 8.45 | 7.96 | 4.41 | 14.57 | 13.10 | 10.16 | 5.88 |

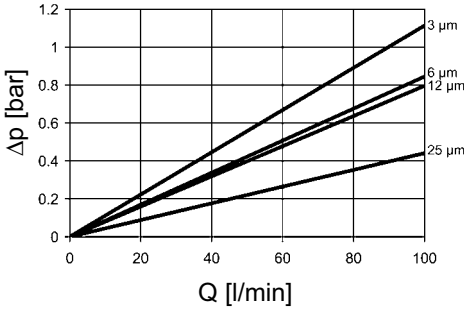
**04 BN:**



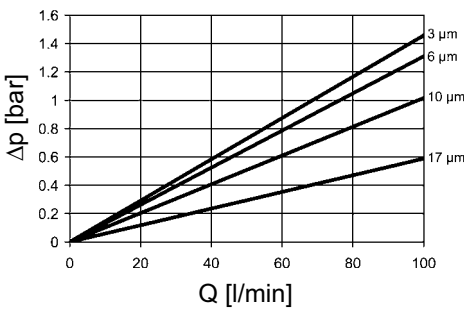

**04 BH:**




**08 BN:**

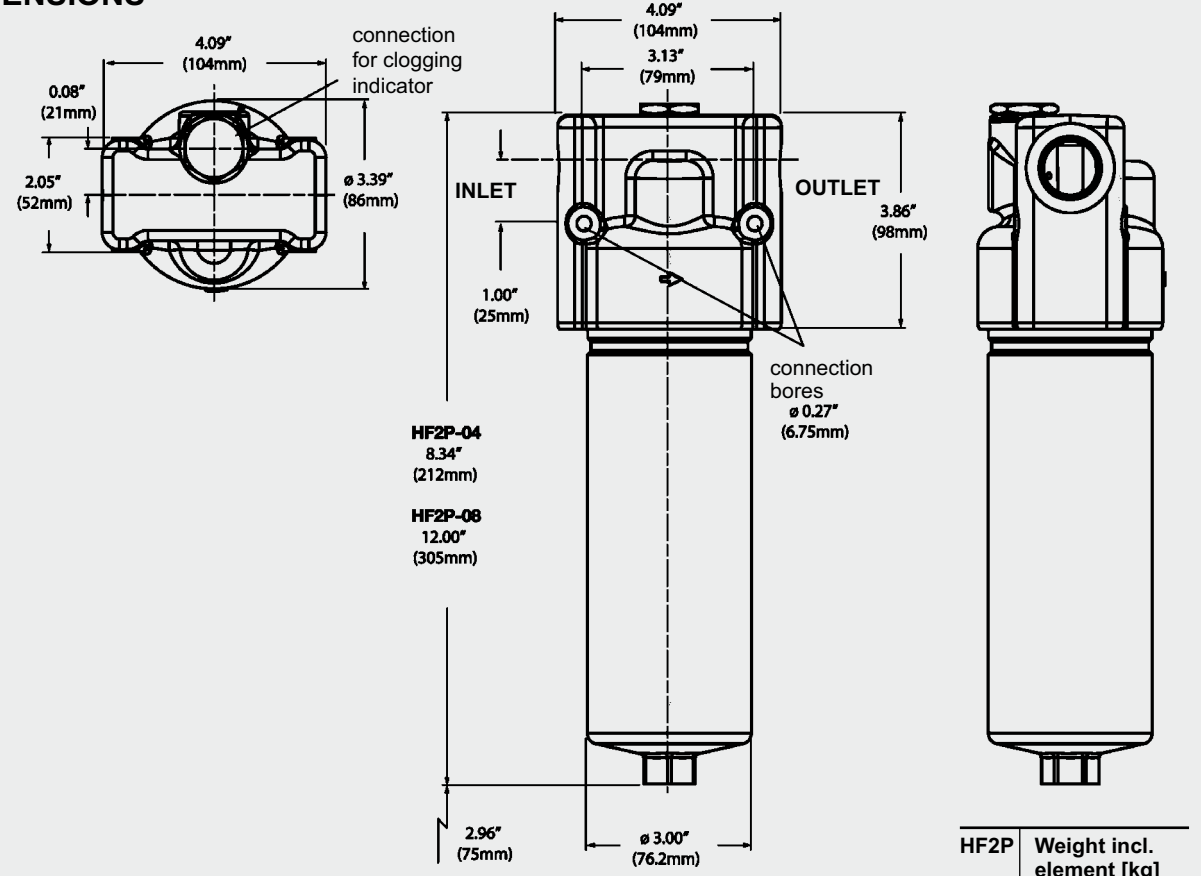



**08 BH:**



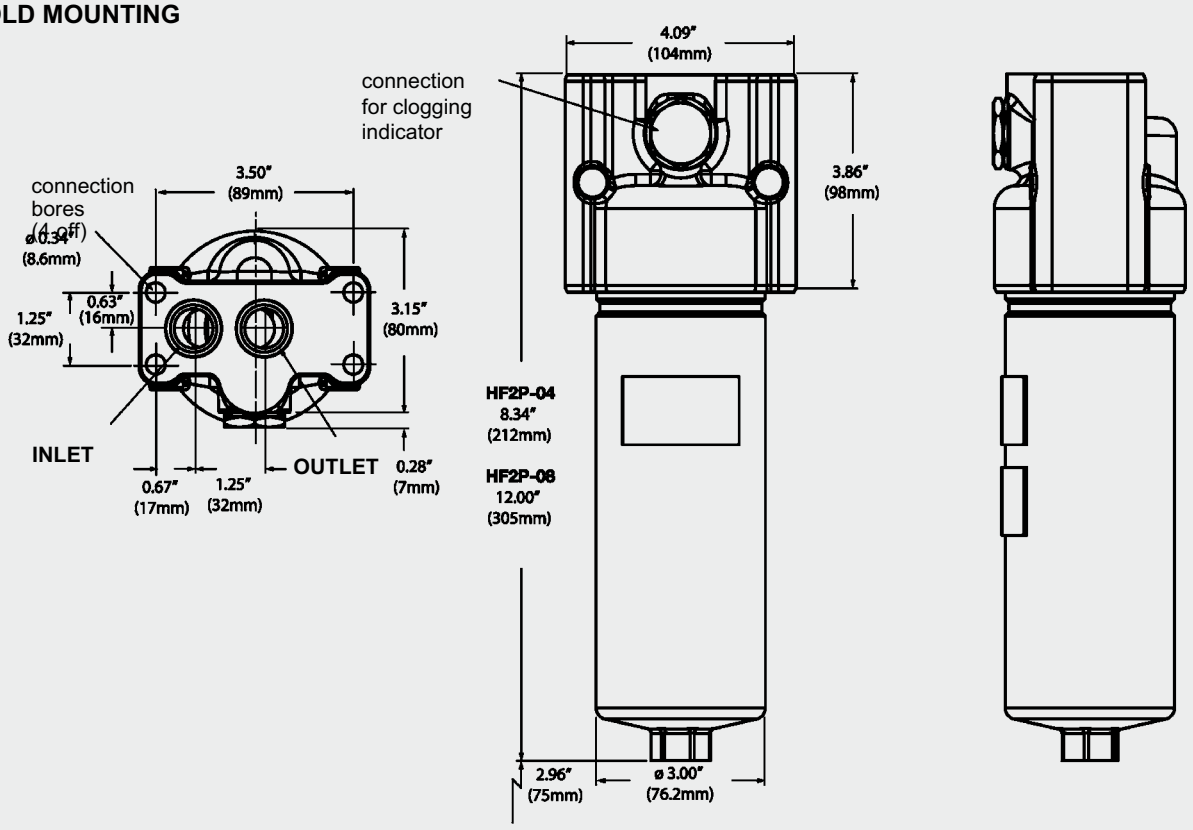
## 4. DIMENSIONS

### HF2P




| HF2P | Weight incl. element [kg] |
|---|---|
| 04 | 4.58 |
| 08 | 6.08 |

### MANIFOLD MOUNTING




## NOTE

The information in this brochure relates to the operating conditions and applications described.

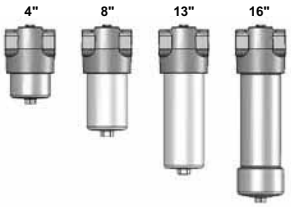
For applications or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.


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E-Mail: filter@hydac.com



# Inline Filter HF3P
## up to 450 l/min, up to 420 bar




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. They consist of a filter head with screw-in filter bowl.

Standard equipment:

- with bypass valve
- connection for a clogging indicator

### 1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

Filter elements are available with the following pressure stability values:

| | |
|---|---|
| Betamicron® (BN): | 20 bar |
| Betamicron® (BH): | 210 bar |

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Nominal pressure | 420 bar |
| Fatigue strength | at nominal pressure $10^6$ load cycles from 0 to nominal pressure |
| Temperature range | -30 °C to +100 °C |
| Material of filter head | EN-GJS |
| Material of filter bowl | Steel |
| Type of clogging indicator | VD (differential pressure indicator up to 420 bar operating pressure) |
| Pressure setting of clogging indicator | 5 bar (others on request) |
| Cracking pressure of bypass valve | 6 bar (others on request) |

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 MOUNTING

As inline filter

### 1.6 SPECIAL MODELS AND ACCESSORIES

- without bypass valve
- without connection for a clogging indicator

### 1.7 SPARE PARTS

See Original Spare Parts List

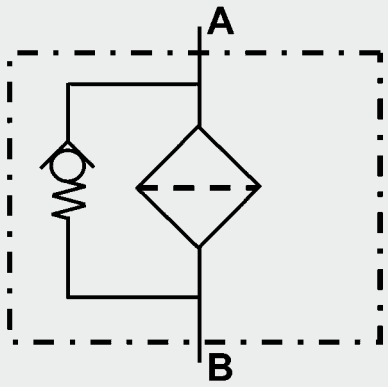
### 1.8 CERTIFICATES AND APPROVALS

On request

### 1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Non-flam operating fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50%) on request

**Symbol for hydraulic systems**



## 2. MODEL CODE (also order example)

**HF3P BN 08 G 3 C 1 . X /12 V-B6**

### 2.1 COMPLETE FILTER

**Filter type**
HF3P

**Filter material of element**
BN Betamicron® (BN)
BH Betamicron® (BH)

**Size of filter or element**
04 4"
08 8"
13 13"
16 16"

**Port**
G threaded port
F flange port

**Filtration rating in µm**
BN : 3, 6, 12, 25
BH : 3, 6, 10, 17

**Type of clogging indicator**
W without connection for clogging indicator
A with steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
(for other clogging indicators see brochure no. 7.050../..)
J electrical switch (Brad Harrison 5 Pin Mini)
J4 electrical switch (Brad Harrison 4 Pin Micro)

**Type code**
1 2" flange (420 bar) or SAE 24" or G ½
2 1½" flange (210 bar)
3 1" SAE 16 or G 1" thread

**Modification number**
X the latest version is always supplied

**Supplementary details**
0 G 1½" or G 1 BSPP
12 SAE 24" or 16" O-ring boss
16 SAE 2" flange (420 bar ) or 1½" (210 bar)

B. bypass cracking pressure (e.g. B3 = 3 bar); no details = without bypass valve
L... light with appropriate voltage (24, 48, 110, 220 Volt) (only for clogging indicator type "D")
LED 2 light emitting diodes up to 24 Volt (only for clogging indicator type "D")
V FPM seals
W suitable for HFA and HFC emulsions

### 2.2 REPLACEMENT ELEMENT

**1.11.08 D 03 BN /-V**

**Size**
04 4"
08 8"
13 13"
16 16"

**Type**
D

**Filtration rating in µm**
BN: 03, 06, 12, 25
BH: 03, 06, 10, 17

**Filter material**
BN, BH

**Supplementary details**
V (for descriptions, see point 2.1)

### 2.3 REPLACEMENT CLOGGING INDICATOR

**VD 5 D . X /-L24**

**Type**
VD differential pressure indicator up to 420 bar operating pressure

**Pressure setting**
5 5 bar standard, others on request

**Type of clogging indicator**
D (see point 2.1)

**Modification number**
X the latest version is always supplied

**Supplementary details**
L..., LED, V, W (for descriptions, see point 2.1)

# 3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and element Δp and is calculated as follows

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see point 3.1)

$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see point 3.2)

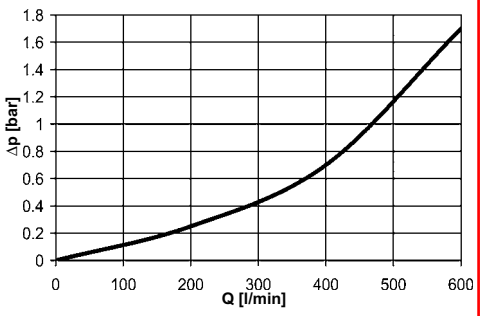
For ease of calculation, our Filter Sizing Program is available on request free of charge.

**NEW:** Sizing online at www.hydac.com

## 3.1 ΔP-Q HOUSING GRAPHS BASED ON ISO 3968

The housing graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s.
In this case, the differential pressure changes proportionally to the density.

**HF3P**

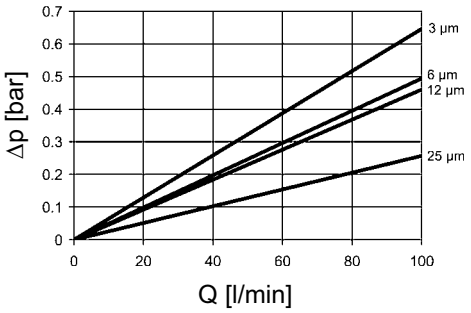



## 3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

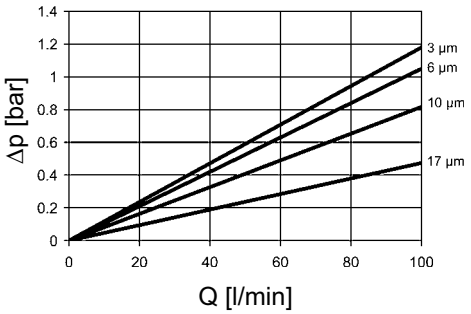
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

| HF3P | BN | | | | BH | | | |
|---|---|---|---|---|---|---|---|---|
| | 3 µm | 6 µm | 12 µm | 25 µm | 3 µm | 6 µm | 10 µm | 17 µm |
| 04 | 6.46 | 4.94 | 4.60 | 2.57 | 11.79 | 10.49 | 8.16 | 4.74 |
| 08 | 3.28 | 2.51 | 2.43 | 1.30 | 5.73 | 5.10 | 3.98 | 2.30 |
| 13 | 1.98 | 1.52 | 1.41 | 0.78 | 3.44 | 3.06 | 2.38 | 1.38 |
| 16 | 1.51 | 1.15 | 1.08 | 0.60 | 2.59 | 2.28 | 1.80 | 1.04 |

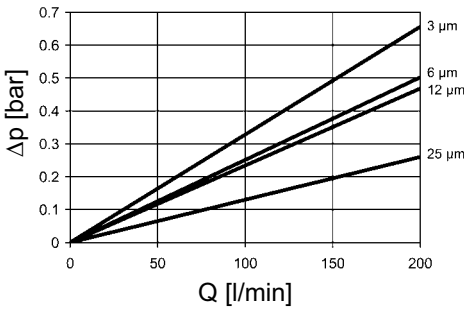
**04 BN:**



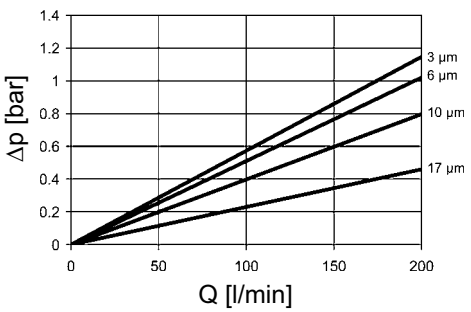

**04 BH:**



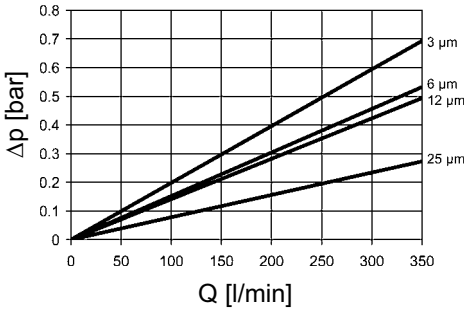

**08 BN:**



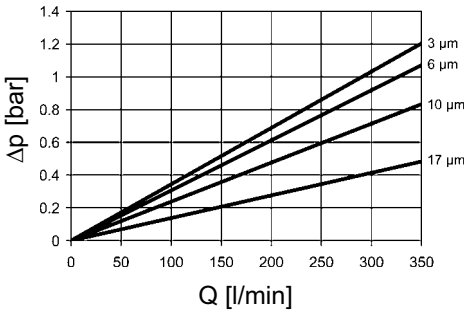

**08 BH:**



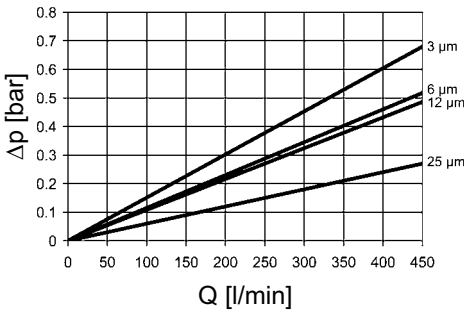

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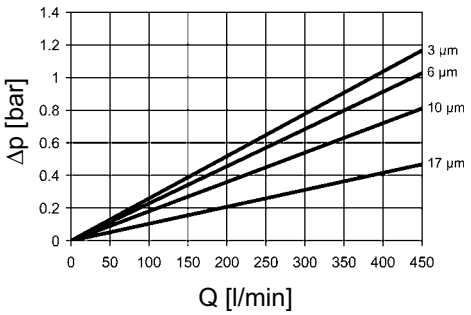

**13 BH:**




**16 BN:**

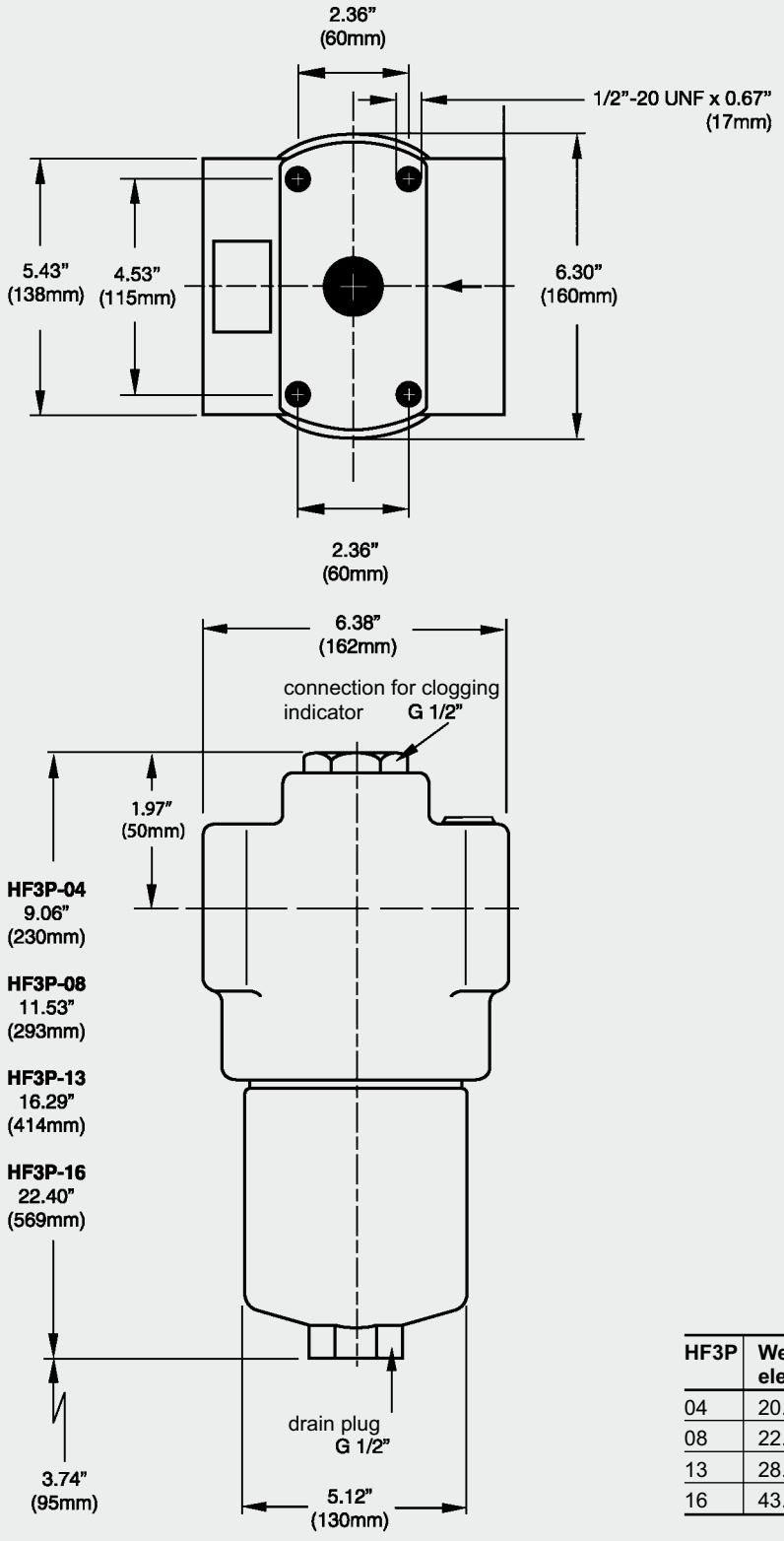



**16 BH:**



## 4. DIMENSIONS

**HF3P**




| HF3P | Weight incl. element [kg] |
|---|---|
| 04 | 20.32 |
| 08 | 22.45 |
| 13 | 28.53 |
| 16 | 43.41 |

## NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

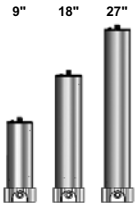
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# Inline Filter or Pressure Filter for Manifold Mounting HF4P

up to 450 l/min, up to 350 bar




## 1. TECHNICAL SPECIFICATIONS

### 1.1 FILTER HOUSING

**Construction**

The filter housings are designed in accordance with international regulations. They consist of a filter head with screw-in filter bowl.

Standard equipment:

- with bypass valve
- connection for a clogging indicator

### 1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941
- ISO 2942
- ISO 2943
- ISO 3724
- ISO 3968
- ISO 11170
- ISO 16889

Filter elements are available with the following pressure stability values:

| | |
|---|---|
| Betamicron® (BN): | 20 bar |
| Betamicron® (BH): | 210 bar |
| Wire mesh (W): | 20 bar |

### 1.3 FILTER SPECIFICATIONS

| | |
|---|---|
| Nominal pressure | 420 bar |
| Fatigue strength | at nominal pressure $10^6$ load cycles from 0 to nominal pressure |
| Temperature range | -30 °C to +100 °C |
| Material of filter head | EN-GJS |
| Material of filter bowl | Steel |
| Type of clogging indicator | VD (differential pressure indicator up to 420 bar operating pressure) |
| Pressure setting of clogging indicator | 5 bar (others on request) |
| Cracking pressure of bypass valve | 6 bar (others on request) |

### 1.4 SEALS

NBR (= Perbunan)

### 1.5 MOUNTING

As inline filter and manifold mounted filter

### 1.6 SPECIAL MODELS AND ACCESSORIES

- without bypass valve
- without connection for a clogging indicator

### 1.7 SPARE PARTS

See Original Spare Parts List

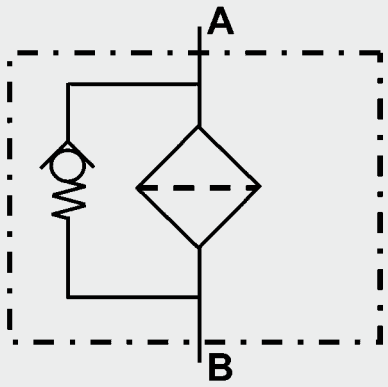
### 1.8 CERTIFICATES AND APPROVALS

On request

### 1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Non-flam operating fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50%) on request

**Symbol for hydraulic systems**



## 2. MODEL CODE (also order example)

HF4P BN 09 G 3 C 1 . X /12 V-B6

### 2.1 COMPLETE FILTER

**Filter type**
HF4P

**Filter material of element**
BN Betamicron® (BN)
BH Betamicron® (BH)

**Size of filter or element**
09 9"
18 18"
27 27"

**Port**
G threaded port
F flange port
P manifold mounting

**Filtration rating in µm**
BN, BH : 3, 5, 10, 20
W : 25, 74, 149

**Type of clogging indicator**
W without connection for clogging indicator
A with steel blanking plug in indicator port
B visual
C electrical
D visual and electrical
(for other clogging indicators see brochure no. 7.050../..)
J electrical switch (Brad Harrison 5 Pin Mini)
J4 electrical switch (Brad Harrison 4 Pin Micro)

**Type code**
1

**Modification number**
X the latest version is always supplied

**Supplementary details**
no details = manifold mounted version
0 BSPP 1½"
12 SAE-24 O-ring boss
16 SAE 1½" flange (210 or 420 bar )
B. bypass cracking pressure (e.g. B6 = 6 bar); no details = without bypass valve
L... light with appropriate voltage (24, 48, 110, 220 Volt) (only for clogging indicator type "D")
LED 2 light emitting diodes up to 24 Volt (only for clogging indicator type "D")
V FPM seals
W suitable for HFA and HFC emulsions

### 2.2 REPLACEMENT ELEMENT

5.03.09 D 03 BN /-V

**Size**
09 9"
18 18"
27 27"

**Type**
D

**Filtration rating in µm**
BN, BH : 03, 05, 10, 20
W : 25, 74, 149

**Filter material**
BN, BH, W

**Supplementary details**
V (for descriptions, see point 2.1)

### 2.3 REPLACEMENT CLOGGING INDICATOR

VD 5 D . X /-L24

**Type**
VD differential pressure indicator up to 420 bar operating pressure

**Pressure setting**
5 5 bar standard, others on request

**Type of clogging indicator**
D (see point 2.1)

**Modification number**
X the latest version is always supplied

**Supplementary details**
L..., LED, V, W (for descriptions, see point 2.1)

# 3. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate Q is the sum of the housing Δp and element Δp and is calculated as follows

$\Delta p_{total} = \Delta p_{housing} + \Delta p_{element}$

$\Delta p_{housing}$ = (see point 3.1)

$\Delta p_{element} = Q \cdot \frac{SK^*}{1000} \cdot \frac{viscosity}{30}$

(*see point 3.2)

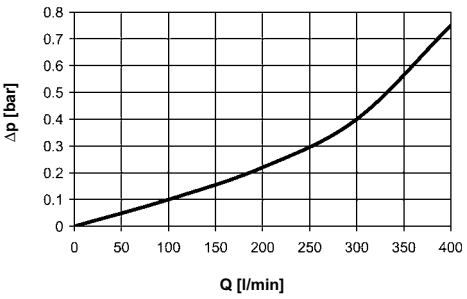
For ease of calculation, our Filter Sizing Program is available on request free of charge.

**NEW:** Sizing online at www.hydac.com

## 3.1 ΔP-Q HOUSING GRAPHS BASED ON ISO 3968

The housing graphs apply to mineral oil with a density of 0.86 kg/dm³ and a kinematic viscosity of 30 mm²/s.
In this case, the differential pressure changes proportionally to the density.

**HF4P**

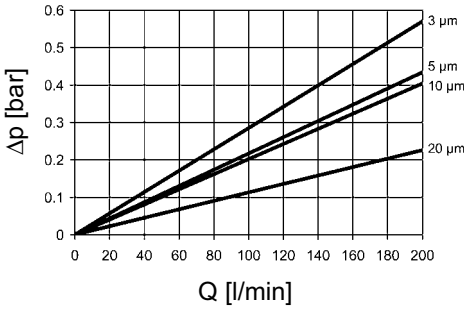



## 3.2 GRADIENT COEFFICIENTS (SK) FOR FILTER ELEMENTS

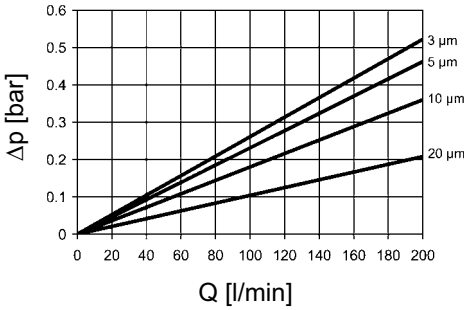
The gradient coefficients in mbar/(l/min) apply to mineral oils with a kinematic viscosity of 30 mm²/s. The pressure drop changes proportionally to the change in viscosity.

| HF4P | BN | | | | BH | | | | W |
|---|---|---|---|---|---|---|---|---|---|
| | 3 µm | 5 µm | 10 µm | 20 µm | 3 µm | 5 µm | 10 µm | 20 µm | - |
| 09 | 2.85 | 2.17 | 2.02 | 1.13 | 2.61 | 2.31 | 1.80 | 1.04 | 0.128 |
| 18 | 1.35 | 1.04 | 0.97 | 0.53 | 1.21 | 1.05 | 0.84 | 0.49 | 0.073 |
| 27 | 0.88 | 0.67 | 0.62 | 0.35 | 0.80 | 0.71 | 0.55 | 0.32 | 0.036 |

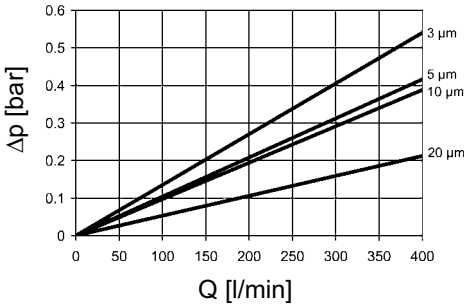
**09 BN:**



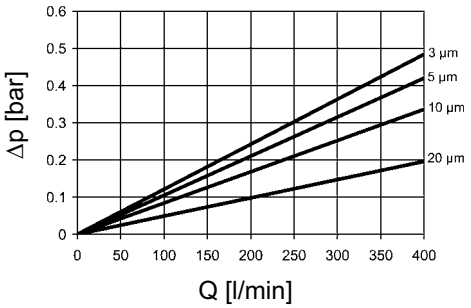

**09 BH:**



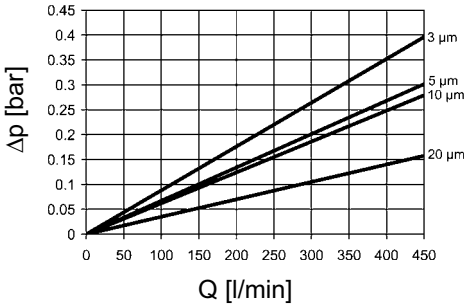

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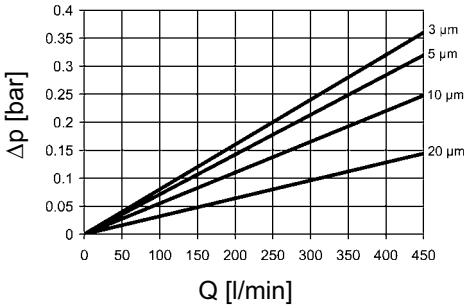

**18 BH:**




**27 BN:**



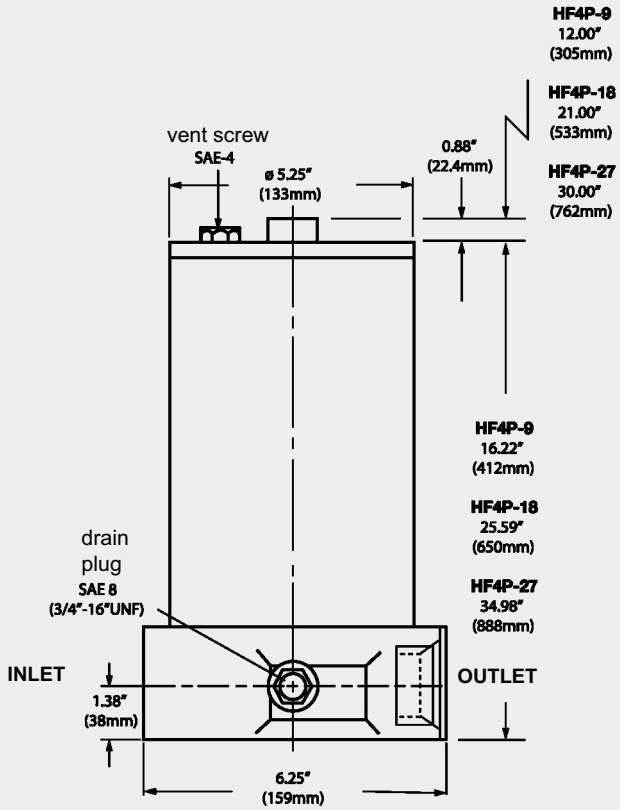

**27 BH:**

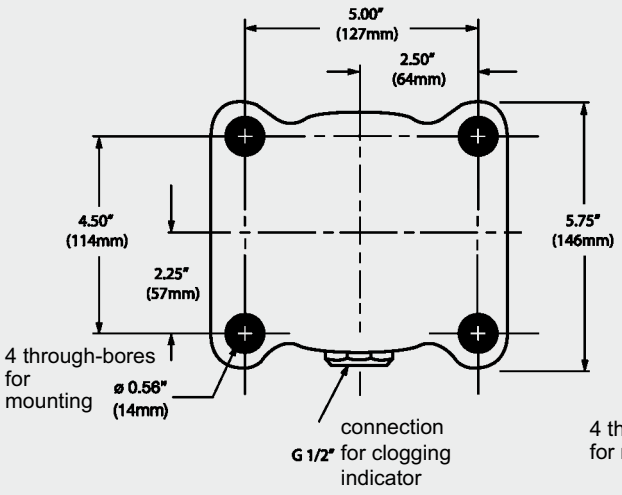


# 4. DIMENSIONS

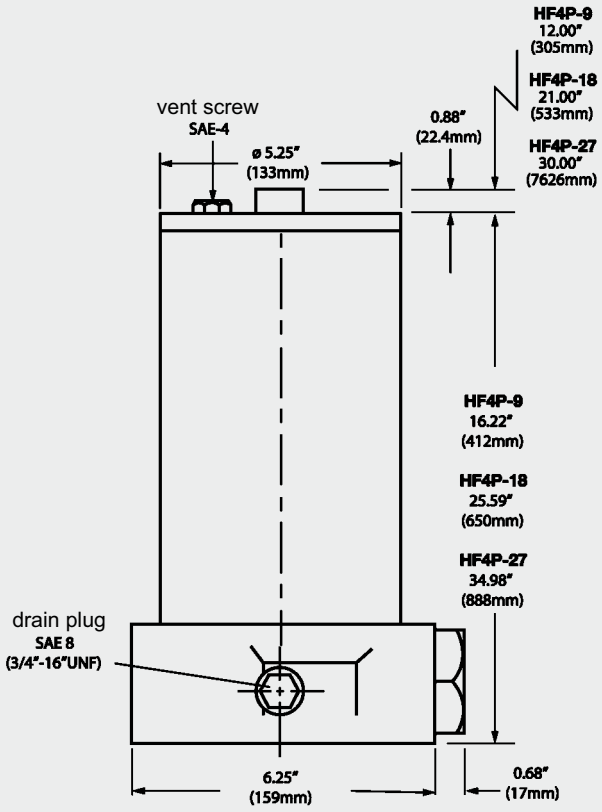
## HF4P

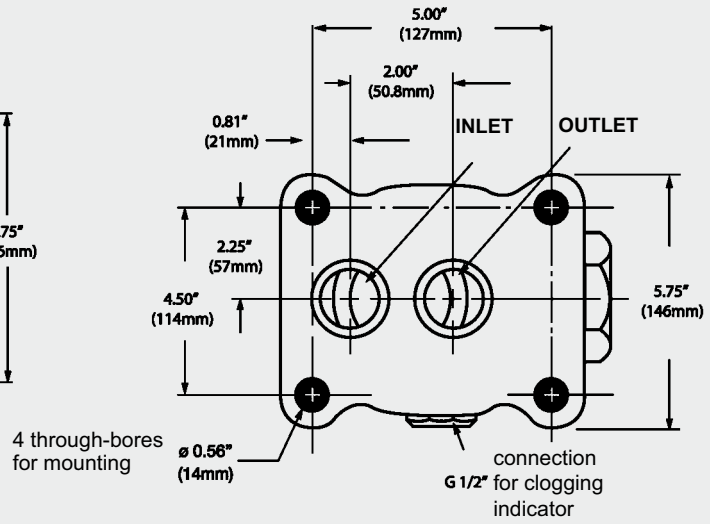
### As inline filter




### As manifold mounted filter




| HF4P | Weight incl. element [kg] |
|---|---|
| 09 | 26.94 |
| 18 | 35.97 |
| 27 | 47.90 |

## NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.


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# MAINTENANCE INSTRUCTIONS

## INSTRUCTIONS FOR USE FOR FILTERS


Information

**The pressure unit must only be operated in conjunction with a machine or system.**


Information

**This pressure unit must only be used in accordance with the requirements of the operating instructions of the machine or system.**


Information

**This pressure unit must only be operated using hydraulic or lubrication fluid.**


Caution

**The user must, by appropriate action (e.g. venting), prevent the formation of air pockets.**


Caution

**Repair, maintenance work and commissioning must only be carried out by trained personnel.**

**Ensure the pressure unit has cooled down before handling.**

**The stipulations of the operating instructions of the machine or the system must be followed.**


Danger

**Caution: pressure unit! Before any work is carried out on the pressure unit, ensure the pressure chamber concerned (filter housing) is depressurized.**


Danger

**On no account must any alterations (welding, drilling, or opening by force…) be carried out on the pressure unit.**


Information

**It is the responsibility of the operator to comply with the water regulations of the country concerned.**


Caution

**Statutory accident prevention regulations, safety regulations and safety data sheets for fluids must be observed.**


Caution

**When working on, or in the vicinity of, hydraulic systems, naked flames, spark generation and smoking are forbidden.**


Caution

**Hydraulic oils and water polluting fluids must not be allowed to enter the soil or watercourses or sewerage systems.**

**Please ensure safe and environmentally friendly disposal of hydraulic oils. The relevant regulations in the country concerned with regard to ground water pollution, used oil and waste must be complied with.**


Caution

**Whenever work is carried out on the filter, be prepared for hot oil to escape which can cause injury or scalding due to high pressure or high temperature.**


Caution

**Filter housing must be earthed.**


Danger

**When using electrical clogging indicators, before removing the clogging indicator connector, the electrical power supply to the system must be switched off.**

## SERVICE ADDRESSES

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## GENERAL MAINTENANCE

This section describes maintenance work which should be carried out periodically. The operational safety and life expectancy of the filter, and whether it is ready for use, depend to a large degree on regular and careful maintenance.

## MAINTENANCE PROCEDURES

- Spare parts must fulfil the technical requirements specified by the manufacturer. This is always guaranteed for HYDAC original spare parts.
- Keep tools, working area and equipment clean.
- After disassembling the filter, clean all parts, check for damage or wear and replace parts if necessary.
- When changing a filter element a high level of cleanliness must be observed!

## INTERVAL BETWEEN CHANGING ELEMENTS

We recommend fitting the filter with a clogging indicator (visual and/or electric or electronic) to monitor the filter element.

If the clogging indicator responds, it is necessary to change or to clean the filter element without delay (only W and V elements can be cleaned).

If no clogging indicator is fitted, we recommend changing the elements after specified intervals (changing the filter element depends on the design of the filter and the conditions). Higher dynamic loads across the element might necessitate shorter intervals between changes. Shorter intervals can also be expected during commissioning, repairs, oil changes etc. on the hydraulic system.

The standard clogging indicators only respond when fluid is flowing through the filter. With electrical indicators the signal can also be converted into a continuous display on the control panel. In this case the continuous display must be switched off during a cold start or after changing the element.

If the clogging indicator responds during a cold start only, it is possible that the element does not need to be changed yet.

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