RWS200 Product Catalog

Road Weather Station RWS200 for roads, rail, and runways

Features

- Reliable and quality data for educated decision making
- Increased system reliability through centralized power management
- Local database for data storage
- Battery backup
- Fast return of investment through operational savings
- Built-in web user interface
- On-site wireless network access to ease annual maintenance
- Easy upgrade and sensor retrofit from previous versions

Vaisala Road Weather Station RWS200 is designed for the future of road weather systems and Intelligent Transportation Systems (ITS). RWS200 provides a complete road weather solution to improve road, rail, or runway winter maintenance activities in your organization.

RWS200 is reliable, sustainable, expandable, and upgradable. It provides remote access for maintenance and for viewing the observations. You can also integrate RWS200 to your data collection system using the various interfaces it offers.

RWS200 comprises of high-quality components that have been specifically designed for and tested in harsh conditions. Each RWS200 system is thoroughly tested before it leaves the Vaisala factory. A comprehensive documentation set, including the test reports, is delivered with each RWS200.

Vaisala Road Weather Station RWS200

Challenges of road maintenance

To keep the roads and runways safe and passable at all times, the pavement and atmospheric weather must be continuously monitored. Weather conditions such as snow and ice, heavy rains, fog, high winds, and sand storms can impact road and runway safety in many different ways.

Unfortunately, you cannot usually observe the weather impact from your office window, so it is important to have a reliable tool for information gathering.

Importance of road weather stations

Road weather stations, also known as Road Weather Information Systems (RWIS), have been developed for several decades to collect information about road and runway conditions. The stations not only collect data in remote locations but also provide a quantitative measurement to weather, which in the past was typically done with the human eye.

Over the years, several studies and research have been done to prove that road weather technology provides a significant return on your investment. This largely comes through operational savings of road maintenance and Intelligent Transportation Systems (ITS) activities, which improve mobility and increase safety of travelers.

Surface sensors

Road weather stations consist of a variety of sensors that collect atmospheric and road or runway condition data. The sensor selection depends on your needs.

Surface sensors come in two types, embedded and remote. Embedded sensors are placed into the road or runway surface. They provide data on the conditions on their surface.

Remote (or non-invasive) sensors are a newer innovation using infrared and laser technology to measure surface conditions. They are installed on the side of the road. Remote sensors are easier to install and maintain, as no traffic control or cutting of the road surface is required. This also provides additional safety by taking the workers out of the roadway.

In addition, the remote surface state sensor provides a value of grip that gives decision makers a quantitative reading of the current road slipperiness. This grip value can be used for a variety of decision-making tools, such as performance indexes or a trigger for variable message signs.

Atmospheric sensors

Atmospheric sensors enhance the performance of the algorithms when determining the road and runway surface conditions. They also provide additional information that can be critical to the overall traveling environment. This kind of information can be, for example, alert of heavy rain.

Why RWS200?

Intelligent

The Vaisala Road Weather Station RWS200 is the key component to Vaisala road weather and runway condition solutions. It has been designed with the future of road weather and ITS in mind.

RWS200 is intelligent: it contains several sophisticated algorithms that bring in raw data from the surface state sensors. By using other atmospheric observations, RWS200 can produce more accurate surface state analysis.

RWS200 is equipped with smart power management. The full featured RWS200 comes with a backup battery. When main power is lost, RWS200 detects the change and begins shutting down operations that drain the most power. This ensures that in an environment where power is not always stable, RWS200 continues to provide observations and access to the system as long as battery power is available.

Vaisala sensors are sold around the world for many different applications, both separately and with Vaisala weather stations. RWS200 supports a large range of Vaisala sensors and a selected set of third-party sensors.

Scalable

What if you do not want or need a full-feature, complete weather station? What if you need a supplemental station that collects only a couple of observations? RWS200 is scalable, allowing you to add the features that you need to match the requirements at each location. You can choose from different enclosures, various sensor options, or use a selected set of existing retrofit sensors, if you want.

If you need to upgrade the station later on, you can add new sensors or update the station software to add new features. This allows you to fully benefit from the future improvements in sensor and communication technology, and ensure your return of investment.

Reliable

RWS200 is not just a roadside processor designed to collect, store, and transmit data from surface sensors. RWS200 provides a complete road weather solution to improve road, rail, or runway winter maintenance activities in your organization. RWS200 features a configurable graphical user interface for a variety of data viewing and maintenance needs.

The use of Ethernet communications and 3G/4G cellular network enable remote access to RWS200 and continuous data flow to data collection systems. However, one of the reasons for having an onsite processor is the ability to store historical data locally for at least two weeks. Observation data is not lost even if remote communication is lost.

In winter road and runway maintenance, accurate and reliable data must be trustworthy and available when you need to make decisions.

Value of Vaisala

Global leader in measurement

Vaisala is a global leader in environmental and industrial measurement. Building on 80 years of experience, Vaisala provides observations for a better world. We are a reliable partner for customers around the world, offering a comprehensive range of innovative observation and measurement products and services.

Whether you are upgrading a legacy Vaisala road weather station, replacing another manufacturer's equipment, or adding a new weather site, Vaisala Road Weather Station RWS200 is worth the investment.

Road specific design

Vaisala offers a wide variety of sensors for every weather observation. The sensors available for RWS200 were carefully chosen to make sure that they fit the demanding conditions that exist alongside the roadway. The ability to have the right sensor for your local conditions greatly increases the accuracy of observations that are necessary for critical decisions.

Vaisala also offers an all-in-one sensor that can measure multiple weather observations at once, but its accuracy is not as good as with dedicated sensors.

Looking ahead

Vaisala is consistently the leader in introducing new road specific sensors. The remote sensors provide a level of decision support unique in the road weather market. Vaisala continues to innovate and develop new and exciting surface sensors and solutions.

Our quality sensors, decision support software, and expert consultation make the Vaisala Road Weather Station RWS200 more than just a remote processor – it is a complete road weather station for intelligent transportation systems.

System components

Acquisition of road weather observations

- Observations with history
- Observation data quality
- Camera pictures
- Protocols: DTO XML, NTCIP, Datex II, MES 14/MES 16

Visualization and decision support

Vaisala Wx Horizon, Vaisala Road DSS Navigator, or any 3rd party application

Network management

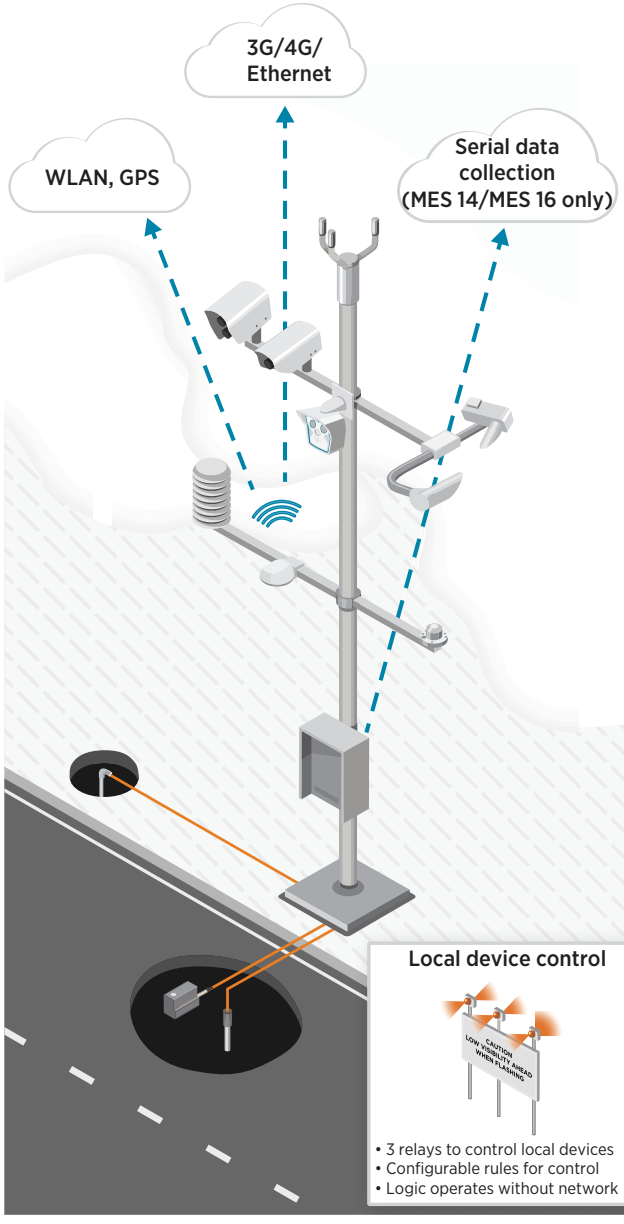
Vaisala NM10
- Monitoring, events, alerts
- Metadata management
- Remote restart
- Centralized software update

Direct remote maintenance connection

- Maintenance and configuration
- Software update and restart
- Observation visualization

Local maintenance connection (wired and wireless)

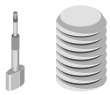
- Local station configuration
- Calibrations
- Maintenance actions
- Observation visualization



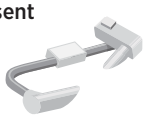
Local device control

- 3 relays to control local devices
- Configurable rules for control
- Logic operates without network

Humidity and temperature
HMP155E
DTR radiation shield



Visibility and present weather detector
PWD12/PWD22

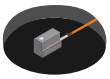


Wind speed and direction
WMT70 WA15

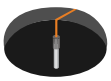
Remote road sensor
DSC211

Remote road temperature sensor
DST111

Embedded road sensor
DRS511



Surface temperature probe
DTS12G



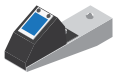
Multidepth temperature probe
TPS10

Air quality
AQT530

Weather transmitter
WXT536

Pressure
PTB110

Rain detector
DRD11A



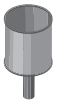
Global radiation sensor
SP Lite2

Water level and snow depth
SR50A

Fixed camera
Mobotix

PTZ camera
Axis

Tipping bucket
RG13H



Multiband antenna
Cellular, GPS, WLAN

Vaisala Road Weather Station RWS200

Operating environment

Operating environment	Outdoor use
Use in wet location	Yes
Operating temperature [1]	−40 ... +60 °C (−40 ... +140 °F)
Storage temperature [2]	−60 ... +80 °C (−76 ... +176 °F)
Operating humidity [3]	5 ... 100 %RH
Pollution degree	2
Maximum operating altitude	3000 m (approx. 9800 ft)

1) *Excluding cellular router, DRD11A, RG13H, AQT530, Mobotix, and AXIS PTZ camera. See the manufacturer documentation.*
2) *Excluding backup battery. See the manufacturer documentation.*
3) *Excluding cellular router and AQT530. See the manufacturer documentation.*

Compliance

EU directives	EMC Directive (2014/30/EU) Low Voltage Directive (2014/35/EU) Radio Equipment Directive, RED (2014/53/EU) RoHS Directive (2011/65/EU) amended by 2015/863
EMC immunity	EN 61326-1, industrial environment FCC part 15, class B ICES-3 (B)
EMC emissions	CISPR 32 / EN 55032, Class B [1]
Electrical safety	EN 61010-1
Cold	IEC 60068-2-1
Dry heat	IEC 60068-2-2
Vibration	IEC 60068-2-6
Shock	IEC 60068-2-27
Rough handling	IEC 60068-2-31
Damp heat	IEC 60068-2-78
Corrosion and salt mist	VDA 621-415
Compliance marks	CE, FCC, ICES, RCM

1) *AXIS PTZ camera and Wavetronix traffic sensor emissions: Class A*

Powering specifications

AC (mains) power	100 ... 240 V AC, ±10 % 50 ... 60 Hz 5.6 A maximum (120 V AC)
Mains fuse (nominal)	10 A
AC (mains) surge protection	Type 3, 1.5 kV / 3 kA Max. continuous voltage: 264 V AC
Overvoltage category	II
External power	10 ... 32 V DC 15 A maximum
Internal backup battery	
Standard backplate (ENC652, BOXALU-US, BOXSS-US)	26 Ah / 12 V
Slim backplate (ENC722)	2.6 Ah / 12 V
Average operating power consumption [1]	
Without sensor heating	18 W
At −10 °C (+14 °F) with sensor heating on [2]	102 W

1) *With the following configuration: cellular router (4.7 W), DSC211, DST111, WMT700 , PWD22, two DRS511 sensors, and HMP155E.*
2) *DSC211 lens heating (5 W), WMT700 transducer heating (22 W), and PWD22 lens heating and hood heating (57 W).*

Communication options

Standard communication options	2.5G/3G/4G cellular, WLAN, and Ethernet
Customer-provided communication options	Cellular, Ethernet, and serial
User interface	Browser-based Web UI Java POWERED

Data reporting

Polled interfaces	Vaisala DTO XML DATEX II NTCIP (1201 v03.15r, 1204 v03.08r2, 1204 v04.22d) Vaisala MES 14 Vaisala MES 16
Pushed interfaces	Vaisala DTO XML Images Vaisala MES 14 Vaisala MES 16
Station reports	Station summary report Event log
Road surface state	Vaisala classes EN 15518-3 classes

Standard sensor options

Road state, remote	DSC211
Road temperature, remote	DST111
Road state and temperature, embedded	DRS511
Subsurface temperature	DTS12G
Subsurface temperature multidepth	TPS10
Humidity and temperature	HMP155E
Visibility and present weather	PWD12/PWD22
Rain	DRD11A
Tipping bucket	RG13H
Wind speed and direction (ultrasonic)	WMT700
Wind speed and direction (mechanical)	WA15 (WAC155)
Wind speed and direction (combined/mechanical)	R.M. Young Wind
Pressure	PTB110
Multiparameter	WXT536
Water level	SR50A
Snow depth	SR50A
Global radiation	SP Lite2
Air quality	AQT530
Fixed camera	Mobotix M16
Pan-tilt-zoom (PTZ) camera	Axis Q6154-E

Other supported sensors

Air quality	AQT420
Road state and temperature, embedded	FP2000
Subsurface temperature	DTS210
Multiparameter	WXT520
Fixed camera	Mobotix M12, M15
PTZ camera	Axis Q6032-E, Q6042-E, Q6052-E, Q6124-E
Traffic sensor	Wavetronix SmartSensor HD [1]

1) *Project item.*

Remote Road Sensor DSC211

DSC211 is the latest member of the DSC family with more sensitive measurement of the amount of water, ice, or snow on the road. Also, the improved autocalibration provides long-term stability by better adapting to the wear and tear of the road surface.

DSC211 has a clearly improved sensitivity and accuracy compared to DSC111. It provides an accurate measurement of the presence of ice crystals well before they make the road slippery. The earlier warnings enable the winter maintenance engineer to react before the road becomes hazardous for drivers.

Operating environment

Operating temperature	−40 … +60 °C (−40 … +140 °F)
Storage temperature	−55 … +60 °C (−67 … +140 °F)
Operating humidity	0 … 100 %RH
IP rating	IP65

Compliance

EU directives	Low Voltage Directive (2014/35/EU) EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) amended by 2015/863
EMC immunity	EN 61326-1, industrial environment FCC part 15, class B ICES-3 (B)
EMC emissions	CISPR 32 / EN 55032, Class B
Eye safety	IEC 60825-1:2014 Class 1 laser product
Vibration	IEC 60068-2-6

Mechanical specifications

Dimensions (H × W × D)	210 × 133 × 448 mm (8.27 × 5.24 × 17.64 in)
Weight	Sensor: 2.69 kg (5.93 lb) Mounting bracket: 0.71 kg (1.57 lb)
Mounting	Fits on a sensor support arm with cross-section of 40 × 40 mm (1.57 × 1.57 in)
Materials	
Cover	ABS plastic
Transmitter body	POM plastic
Bolts, screws, and washers Fixture plate of the cover	Stainless steel
Lenses and windows	Glass
Other parts	Aluminum

Measurement performance

Measuring distance with visibility observation disabled	2 … 15 m (6 ft 7 in … 49 ft 3 in)
Measuring distance with visibility observation enabled	8 … 15 m (26 ft 3 in … 49 ft 3 in)
Installation angle from the horizontal line	30 … 80° (35 … 65° recommended)
Diameter of measuring area at 10 m (33 ft)	20 cm (7.87 in)
Surface layer thickness	
Water	0.00 … 2 mm (0.00 … 0.06 in)
Ice	0.00 … 2 mm (0.00 … 0.06 in)
Snow	0.00 … 10 mm (0.00 … 0.40 in)
Snow (water equivalent)	0.00 … 1 mm (0.00 … 0.04 in)
Accuracy, water and ice	±0.1 mm in the range of 0 … 1 mm (0 … 0.04 in)
Grip	
Reported level of grip	0.09 … 0.82
Reported surface states	
Vaisala classes	Dry, moist, wet, frosty [1], snowy, icy, slushy
EN 15518-3 classes	Dry, moist, wet, streaming water, slippery
Visibility (optional)	
Observation range (meteorological optical range, MOR)	10 … 2000 m (33 … 6572 ft)
Resolution	1 m (3 ft 3 in)
Accuracy (fog and snowfall)	±20 % (average)
Response time	60 s

1) Frost is only reported when dew point and road temperature information is available.

Options, spare parts, and accessories

Item	Order code
DSC211 sensor (maximum 2 pcs)	DSC211RWS
Cable 10 m (32 ft 10 in)	216546
Cable 25 m (82 ft 3 in)	216547
Cable 50 m (164 ft 1 in)	DR221741Z50MSP
Cable 100 m (328 ft 1 in)	DR221741Z100MSP
Cable 150 m (492 ft 2 in)	DR221741Z150MSP
Hood	DRW217593SP
Mounting bracket	236372SP
Visibility reporting	DSCVIS

Remote Road Temperature Sensor DST111

DST111 provides a unique remote alternative to measuring road surface temperature. By measuring the infrared radiation emitted by the surface and applying intelligent signal processing, the sensor provides a reliable remote surface temperature measurement.

DST111 provides reliable results in conditions where most of the commercially available infrared sensors fail. At nighttime, when the road surface is cooling under a clear sky, conventional infrared sensors provide an error of up to −3 °C (−26.6 °F) due to emissivity conditions of the road surface. DST111 compensates for this error by its unique design.

Operating environment

Operating temperature	−40 ... +60 °C (−40 ... +140 °F)
Storage temperature	−55 ... +60 °C (−67 ... +140 °F)
Operating humidity	0 ... 100 %RH
IP rating	IP65

Compliance

EU directives	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) amended by 2015/863
EMC compatibility	EN 61326-1, industrial environment FCC part 15, class B ICES-3 (B)
Vibration	IEC 60068-2-6, Level 2 g

Mechanical specifications

Dimensions (H × W × D)	125 × 100 × 320 mm (4.92 × 3.94 × 12.60 in)
Weight	1.9 kg (4.19 lb)
Mounting	Fits on a sensor support arm with cross-section of 40 × 40 mm (1.57 × 1.57 in)
Materials	
Cover	ABS plastic
Mounting bracket	POM-C
Other parts	Aluminum

Measurement performance

Measuring distance	2 ... 15 m (6 ft 7 in ... 49 ft)
Installation angle from the horizontal line	30 ... 85° (35 ... 65° recommended)
Measuring area	Ø 150 cm at 10 m (59.1 in at 32 ft)
Road temperature	
Observation range	−40 ... +60 °C (−40 ... +140 °F)
Resolution	0.1 °C
RMS error [1)]	0.3 °C (0.5 °F)
Time constant	1 min
Data refresh time	30 s
Air temperature	
Observation range [2)]	−40 ... +60 °C (−40 ... +140 °F)
Resolution	0.1 °C
Typical accuracy at +20 °C (+68 °F)	±0.6 °C (±1.1 °F)
Relative humidity	
Observation range [3)]	0 ... 98 %RH
Resolution	0.1 %RH
Typical accuracy at +20 °C (+68 °F)	±3 %RH
Typical accuracy at +20 °C (+68 °F)	±5 %RH
Stability	±2 %RH over 2 years
Dew point	
Observation range	−40 ... +60 °C (−40 ... +140 °F)
Resolution	0.1 °C

1) *The RMS (root mean square) error of the surface temperature reading is 0.3 °C in typical freezing conditions when compared to a reference thermometer installed on the road surface. This accuracy is valid when the difference between the device temperature and the surface temperature is less than 10 °C and the device temperature is in the range of -40 ... +40 °C. (In the range of +40 ... +60 °C the error may be increased by an offset of ±1.5 °C.)*
2) *Air temperature readings are mainly intended for the internal compensation of DST111. The accuracy is not as high as that of the HMP155 sensor with a proper solar radiation shield.*
3) *Relative humidity readings are mainly intended for the internal compensation of DST111. The accuracy is not as high as that of the HMP155 sensor with a proper solar radiation shield.*

Options, spare parts, and accessories

Item	Order Code
DST111 sensor (maximum 2 pcs)	DST111RWS
Cable 10 m (32 ft 10 in)	216546
Cable 25 m (82 ft)	216547
Cable 50 m (164 ft 1 in)	DR221741Z50MSP
Cable 100 m (328 ft 1 in)	DR221741Z100MSP
Cable 150 m (492 ft 2 in)	DR221741Z150MSP
Hood	DRW218846SP
Mounting bracket	236372SP

Embedded Road Sensor DRS511

Vaisala DRS511 is an embedded road and runway sensor that takes a variety of measurements and observations of the road or runway surface. It is used in a road weather station to provide accurate and reliable information on the surface state.

DRS511 is embedded directly in the pavement. It gathers its readings by being installed flush with the surface. The sensor design features open-end carbon fiber electrodes and optical fiber technology. These are molded into a solid sensor block consisting of an epoxy compound with properties matching the surface for thermal conductivity and emissivity.

Measurement performance

Surface temperature and temperature at 6 cm (2.36 in) below the surface [1]	
Observation range	−40 … +60 °C (−40 … +140 °F)
Pt100 accuracy	±(0.1 + 0.00167 × temperature) °C
Water layer thickness [1]	
Observation range	0 … 7 mm (0 … 0.28 in)
Accuracy	0.1 mm in the range of 0 … 1.0 mm [2]
Reported surface states [1]	
Vaisala classes	Dry, Moist, Wet, Snowy, Icy, Frosty [3], Moist and chemical, Wet and chemical
EN 15518-3 classes	Dry, Moist, Wet, Streaming water, Slippery
Sky condition	No rain, Rain, Cloudy, Clear
Chemicals	
Supported de-icing chemicals	Sodium chloride (NaCl), calcium chloride ($CaCl_2$), sodium acetate ($NaOOC_2H_3$), potassium formate (KOOCH), magnesium chloride (MgCl)

1) *Temperature at −6 cm (−2.36 in), water layer thickness, and surface state are only available when DRS511 is used with a Vaisala road weather station.*
2) *Applies to an even layer of water on the sensor. The detection accuracy of the average water layer thickness on the road depends on sensor installation, pavement material, and water impurities.*
3) *Requires dew point information.*

Operating environment

Operating temperature	−40 … +60 °C (−40 … +140 °F)
IP rating	IP67
EU directives	EMC Directive (2014/30/EU) [1] RoHS Directive (2011/65/EU) amended by 2015/863 [1]
EMC immunity	EN 61326-1, industrial environment [1]
EMC emissions	CISPR 22 / EN 55022, Class B [1]

1) *When connected to a Vaisala weather station.*

Mechanical specifications

Temperature sensors	2 Pt100 elements at 0 cm (0 in) and −6 cm (−2.36 in) from the surface 1/3 IEC 751 Class B
Dimensions (H × W × D) [1]	DRS511AB: 75 × 84 × 30 mm, bottom 38 mm (2.95 × 3.31 × 1.18 in, bottom 1.50 in) DRS511BB for bridge applications: 50 × 84 × 30 mm, bottom 38 mm (1.97 × 3.31 × 1.18 in, bottom 1.50 in)
Weight including 50 m (165 ft 1 in) cable	3.1 kg (6.8 lb)
Materials	
Epoxy compound	Araldite D, HY 956, lamp black for color
Cable tubing	Stainless steel AISI 316L
Cable	4 × (2 × 0.22 mm^2 / 24 AWG and shield) PUR, high density polyethylene lead isolation
Sensing electrodes	Carbon fiber in epoxy
Optical sensor	Acrylic optical fibers

1) *To make sure that the sensor remains even with the road surface, the sensor can wear up to 35 mm (1.38 in).*

Options

Option	**Order code**	
DRS511 sensor with cable: [1]	**Road sensor**	**Bridge sensor**
20 m (65 ft 7 in)	DRS511AB2	DRS511BB2
30 m (98 ft 5 in)	DRS511AB3	DRS511BB3
50 m (164 ft 1 in)	DRS511AB5	DRS511BB5
100 m (328 ft 1 in)	DRS511AB10	DRS511BB10
150 m (492 ft 2 in)	DRS511AB15	DRS511BB15
200 m (656 ft 2 in)	DRS511AB20	DRS511BB20
300 m (984 ft 3 in)	DRS511AB30	DRS511BB30

1) *Maximum 4 pcs.*

Accessories

Accessory	**Order code**
Calibrator kit	DRC511
Splice kit	24051020
Type V extension cable 1524 m (5000 ft) [1]	North America local content

1) *Manufacturer: General Cable, cable type: filled solid cable RDUP (RUS) PE-39 AL, 6 pairs (19 AWG).*

Subsurface Temperature Probe DTS12G

DTS12G is specially designed for automatic weather stations. It can be used to measure the temperature at a certain level beneath the surface.

The housing of the platinum resistance (Pt100 sensor) sensing element is made of stainless steel, and it is located in the tip part of the assembly. The cable screen attached to the sensor housing provides a good shield against electromagnetic interference (EMI).

Specifications

IP rating	IP67
Sensor	Platinum resistance element (Pt100)
Accuracy	1/4 EN 60751 Class B ±0.08 °C at 0 °C (+32 °F)
Sensitivity	0.385 Ω/°C
Measurement range	−80 ... +80 °C (−112 ... +176 °F)
Housing material	Stainless steel AISI 316
Probe	Max. diameter: 9.5 mm (0.37 in) Length: 100 mm (3.94 in)
Cable	Screened multicore 4 × 0.22 mm (24 AWG) and shield Diameter: 5 mm (0.20 in)

Options

Option	Order code
DTS12G sensor with cable: [1]	
10 m (32 ft 10 in)	DTS12G1
20 m (65 ft 7 in)	DTS12G2
30 m (98 ft 5 in)	DTS12G3
50 m (164 ft 1 in)	DTS12G5
100 m (328 ft 1 in)	DTS12G10
120 m (393 ft 8 in)	DTS12G12
150 m (492 ft 2 in)	DTS12G15
200 m (656 ft 2 in)	DTS12G20

1) Maximum 4 pcs.

Accessories

Accessory	Order code
Splice kit	24051020
Type V extension cable, maximum 1524 m (5000 ft) [1]	North America local content

1) Manufacturer: General Cable, cable type: filled solid cable RDUP (RUS) PE-39 AL, 6 pairs (19 AWG).

Visibility and Present Weather Detector PWD12/PWD22

PWD12 and PWD22 identify precipitation type by accurately estimating the water content of precipitation with a capacitive device (Vaisala RAINCAP® sensor element) and combining this information with optical forward scatter and temperature measurements. These three independent measurements are processed through sophisticated algorithms in order to produce an accurate evaluation of the weather type according to the WMO and NWS code tables.

The PWD sensors' ability to detect precipitation and identify precipitation type gives the road authority valuable information for the short-range planning of road maintenance operations. PWD22's ability to detect freezing precipitation makes it possible to issue warnings when the weather presents safety hazards for road and air traffic. Both models also include visibility measurements ranging from 0 m up to 2000 or 20 000 m (6562 or 65 617 ft), depending of the selected model.

Light transmitter optical specifications

Light source	Near-infrared LED
Peak wavelength	875 nm
Reference photodiode	For light source control
Backscatter photodiode	For contamination and blockage measurement
Eye safety	Eye safe in accordance with International Standard IEC/EN 60825-1; edition 1.2

Light receiver optical specifications

Detector	Photodiode
Optical filter/window	RG780 glass
Backscatter light source	Near-infrared LED for contamination and blockage measurement

Operating environment

Operating temperature	−40 … +60 °C (−40 … +140 °F)
Operating humidity	0 … 100 %RH
IP rating	IP66

PWD12 measurement performance

Operating principle	Forward scatter measurement with 45° scattering angle
Observation range of MOR	10 … 2000 m (32 … 6500 ft)
Accuracy	±10 % at 10 … 2000 m (32 … 6500 ft)
Weather type identification	4 different types of precipitation (rain, drizzle, mixed rain/snow, snow) Precipitation (unknown type) Fog (mist), haze (smoke, sand) or clear
Weather type reporting	WMO 4680 (SYNOP) and NWS code tables; 39 different codes supported from WMO 4680 code table
Precipitation detection sensitivity	0.05 mm/h (0.0020 in/h) or less, within 10 minutes
Precipitation intensity measurement	0.00 … 999.99 mm/h (0.00 … 39.37 in/h)
Precipitation amount measurement	0.00 … 99.99 mm (0.00 … 3.94 in)
Amount of new snow	0.00 … 999 mm (0.00 … 39.33 in)

PWD22 measurement performance

Operating principle	Forward scatter measurement with 45° scattering angle
Observation range of MOR	10 … 20 000 m (32 … 65 600 ft)
Accuracy	±10 % at 10 … 10 000 m (32 … 32 800 ft) ±15 % at 10 … 20 km (2.6 … 12 mi)
Weather type identification	7 different types of precipitation (rain, freezing rain, drizzle, freezing drizzle, mixed rain/snow, snow, ice pellets) Precipitation (unknown type) Fog (mist), haze (smoke, sand) or clear
Weather type reporting	WMO 4680 (SYNOP), 4678 (METAR) and NWS code tables; 49 different codes supported from WMO 4680 code table
Precipitation detection sensitivity	0.05 mm/h (0.0020 in/h) or less, within 10 minutes
Precipitation intensity measurement	0.00 … 999.99 mm/h (0.00 … 39.37 in/h)
Precipitation amount measurement	0.00 … 99.99 mm (0.00 … 3.94 in)
Amount of new snow	0.00 … 999 mm (0.00 … 39.33 in)

Compliance

EU directives	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) amended by 2015/863
Corrosion and salt mist	VDA 621-415
EMC compliance	
EMC emissions	CISPR 32 / EN 55032, Class B
Radiated susceptibility	IEC 61000-4-3, 10 V/m
Conducted susceptibility	IEC 61000-4-6
EFT immunity	IEC 61000-4-4
ESD immunity	IEC 61000-4-2
Surge	IEC 61000-4-5

Mechanical specifications

Weight	3 kg (6.61 lb)
Dimensions (H × W × L)	167 × 404 × 695 mm (6.57 × 15.91 × 27.36 in)

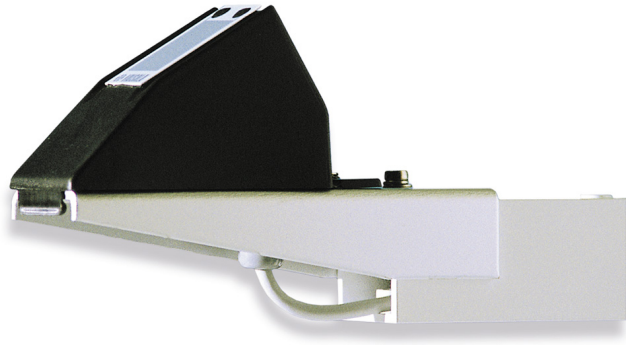
Options

Option	Configuration code
Present weather detector PWD22, no heating (PWD-CFG07)	DNNNN4NANNNNNN
Present weather detector PWD22, heated (PWD-CFG08)	DNHNN4NANNNNNN
Present weather detector PWD12, heated (PWD-CFG09)	CNHNN4NANNNNNN
Present weather detector PWD12, no heating (PWD-CFG10)	CNNNN4NANNNNNN

Spare parts and accessories

Spare part or accessory	Order code
Cable 10 m (32 ft 10 in)	241767
Cable 15 m (49 ft 3 in)	217148
Cable 35 m (114 ft 10 in)	217149
Calibration kit	PWA12
Controller/Receiver	PWC22 (for PWD22) PWC12 (for PWD12)
RAINCAP sensor	PWR211SP (for PWD22) PWR111SP (for PWD12)
Hood heater set	PWH111
Transmitter	PWT11

Rain Detector DRD11A



The DRD11A sensor offers fast and accurate precipitation detection and estimation about the intensity in the scale of low-mid-high. DRD11A has an in-built heating element for keeping the detection plate always ready for precipitation identification. The sensor requires periodical cleaning but is otherwise maintenance-free.

In the weather station, DRD11A provides rain on/off, intensity, and accumulation information. When air temperature and relative humidity observations are available, the system capabilities increase to also recognizing snow and sleet.

Measurement performance

Sensor	Capacitive principle, thick layer sensor RAINCAP®, with a thin glass shield Integrated heater element
Rain detection sensitivity	
Minimum wet area	0.05 cm^2 (0.008 in^2)
Detection delay	< 0.1 ms
OFF delay (active)	< 5 min
Precipitation type identification	
DRD11A only	Rain
When air temperature and relative humidity are available	Rain, Sleet/Mixed, Snow
Sensor plate	
Sensing area	7.2 cm^2 (1.12 in^2)
Angle	30°

Operating environment

Operating temperature	–15 … +55 °C (+5 … +131 °F)
Storage temperature	–40 … +65 °C (–40 … +149 °F)

Mechanical specifications

Weight	0.5 kg (1.1 lb)
Cable length	10 m (32 ft 10 in)
Ground wiring	Separate ground wires for signal and heater
Mounting	By one screw (M5×20 mm) to sensor support arm
Dimensions (H × W × L)	
With wind shield	110 × 80 × 175 mm (4.33 × 3.15 × 6.89 in)
Without wind shield	90 × 46 × 157 mm (3.54 × 1.81 × 6.18 in)
Materials	
Housing	Polypropylene
Windshield and support bracket	Aluminum
Moisture shield	Polyurethane

Options and spare parts

Item	Order code
DRD11A sensor with cable 10 m (32 ft 10 in)	DRD11A-10M

Rain Gauge RG13H

RG13H uses a pulse-based tipping-bucket mechanism to produce a contact closure every time it receives a predetermined small quantity of rainfall (0.1 mm / 0.004 in).

RG13H provides accurate measurements. It is a robust system component that is suitable for remote and unattended locations.

Measurement performance

Precipitation	Liquid
Accuracy	2 % at 1 l/h (0.26 gal/h)
Diameter of aperture	225 mm (8.86 in)
Area of aperture	400 cm^2 (62 in^2)
Rainfall capacity	Unlimited
Resolution	0.2 mm (0.008 in) 0.1 mm (0.004 in) [1]

1) *In standard RWS200 offering.*

Operating environment

Operating temperature	RG13H: −20 … +85 °C (−4 … +185 °F)
Storage temperature	−40 … +85 °C (−40 … +185 °F)
Heating (RG13H)	
Heating connection/disconnection at	+4 °C (+39 °F)
Heating power	RG13H: 33W / 48 V DC

Mechanical specifications

Dimensions (H × Ø)	338 × 248 mm (13.31 × 9.76 in)
Weight	2.6 kg (5.73 lb)
Material	
Base, septum ring	Aluminum alloy LM25
Outer ring, funnel	Aluminum alloy sheet
Inlet/Outlet ports, pins	Stainless steel
Tipping mechanism	Injection-moulded plastic
Transducer	Reed switch
Output	
Circuit	Contact closure
Connection	Screw terminal

Options

Option	Order code	Configuration code
Rain gauge RG13H, heated (RG13-CFG01), rainfall per pulse 0.1 mm (0.004 in), with cable 15 m (49 ft 3 in)	RG13	J1N5

Spare parts and accessories

Spare part or accessory	Order code
Rain gauge pedestal 1140 mm (44.88 in) with installation kit	RGSTAND1140

Humidity and Temperature Sensor HMP155E

The HMP155 sensor provides reliable humidity and temperature measurements, which are crucial for dewpoint and frost point calculations. HMP155 is also available with a patented warmed probe, which is specifically designed for demanding outdoor applications where humidity is near saturation.

A proper radiation shield is vital for reliable measurements. DTR503A is suitable for most installations but in areas with a risk of high level of pollution and for the warmed probe sensor, DTR13 is recommended because of its special surface finishing which resists contamination well.

Humidity measurement performance

Sensor	HUMICAP®R2, 180R and INTERCAP for typical applications HUMICAP®R2C, 180RC and INTERCAPC for applications with chemical purge and/or warmed probe
Observation range	0 ... 100 %RH
Response time at +20 °C (+68 °F) in still air with sintered Teflon filter	63 %: 20 s 90 %: 60 s
Factory calibration uncertainty at +20 °C (+68 °F)[1)]	±0.6 %RH (0 ... 40 %RH) ±1.0 %RH (40 ... 95 %RH)
Accuracy (including non-linearity, hysteresis, and repeatability)	
At +15 ... +25 °C (+59 ... +77 °F)	±1 %RH (0 ... 90 %RH) ±1.7 %RH (90 ... 100 %RH)
At −20 ... +40 °C (−4 ... +104 °F)	±(1.0 + 0.008 × reading) %RH
At −40 ... −20 °C (−40 ... −4 °F)	±(1.2 + 0.012 × reading) %RH
At +40 ... +60 °C (+104 ... +140 °F)	±(1.2 + 0.012 × reading) %RH
At −60 ... −40 °C (−76 ... −40 °F)	±(1.4 + 0.032 × reading) %RH

1) Defined as ±2 standard deviation limits. Small variations possible (see also the calibration certificate).

Temperature measurement performance

Sensor	Pt100 RTD element, Class F 0.1 IEC 60751
Observation range	−80 ... +60 °C (−112 ... +140 °F)
Response time for additional temperature probe in 3 m/s (7 mph) air flow	63 %: < 20 s 90 %: < 35 s
Accuracy with RS-485 output	
At −80 ... +20 °C (−112 ... +68 °F)	±(0.176 - 0.0028 × temperature) °C
At +20 ... +60 °C (+68 ... +140 °F)	±(0.07 + 0.0025 × temperature) °C

Dew point calculation specifications

Accuracy at −20 ... +40 °C (−4 ... +104 °F)	±0.6 at 90 ... 100 %RH

Operating environment

Operating temperature for humidity measurement	−80 ... +60 °C (−112 ... +140 °F)
Storage temperature	−80 ... +60 °C (−112 ... +140 °F)
Operating humidity	0 ... 100 %RH
IP rating	IP66

Compliance

EU directives	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) amended by 2015/863
EMC compatibility	EN 61326-1, Electrical equipment for measurement, control and laboratory use - EMC requirements; industrial environment FCC part 15, class B ICES-3 (B) CISPR 32 / EN 55032, Class B
RoHS	EN IEC 63000:2018

Mechanical specifications

Dimensions (H × W)	279 × 40 mm (10.9 × 1.6 in)
Weight	93 g (3.25 oz)
Materials	
Filter	Sintered Teflon or membrane
Housing	Polycarbonate (PC)
Additional temperature probe	Stainless steel AISI 316L

Options

Option	Order code	Configuration code
Humidity and temperature probe HMP155E, no heating (HMP155-CFG08)	HMP155	E1AA11A0A0E1A0A
Humidity and temperature probe HMP155E, heated (HMP155-CFG10)	HMP155	E1AA14B1B0G1A0A

Spare parts and accessories

Spare part or accessory	Order code
Cable 10 m (32 ft 10 in)	220497
Cable 30 m (98 ft 5 in)	220498
DTR13 radiation shield with mounting equipment	DTR13
T-probe installation adapter for DTR13	221069
DTR503A radiation shield with mounting equipment	DTR503ASP
T-probe installation adapter for DTR503	221072
Sensor support arm for pole mast or wall	DKPFIXP44H
Sensor support arm for lattice mast	DKPFIXP44HLTT
Installation kit for Stevenson screen	221321
Humidity sensor	HUMICAP180R
Membrane filter	230727SP

Wind Speed and Direction Sensor WMT700 (ultrasonic)

Vaisala WINDCAP® Ultrasonic Wind Sensor WMT700 Series is a robust and reliable ultrasonic anemometer. It measures surface wind, which is one of the key parameters for meteorology and aviation.

WMT700 series has a durable full steel structure with welded arms, clear North indication, and one-point, quick bayonet-style mounting. It has no moving parts, and it is resistant to contamination and corrosion.

Wind speed measurement performance

Measurement range	WMT703: 0 ... 75 m/s (168 mph)
Starting threshold	0.01 m/s (0.0223 mph)
Resolution	0.01 m/s (0.0223 mph)
Response time	250 ms
Accuracy	0 ... 75 m/s (168 mph): ±0.1 m/s (0.2 mph) or 2 % of reading, whichever is greater

Wind direction measurement performance

Observation range	0 ... 360°
Starting threshold	0.1 m/s (0.2 mph)
Resolution	0.01°
Response time	250 ms
Accuracy	±2°

Operating environment

Heating [1)]	0 W, 30 W, 150 W, or 250 W
Operating temperature [1)]	−55 ...+70 °C (−67 ...+158 °F)
Storage temperature	−60 ... +80 °C (−76 ... +176 °F)
Operating humidity	0 ... 100 %RH
IP rating	IP66 and IP67

1) For freezing conditions, select appropriate combination of heating and temperature ranges.

Compliance

EMC immunity	IEC 61326-1, IEC 60945 FCC part 15, class B ICES-3 (B)
EMC emissions	CISPR 32 / EN 55032, Class B
Environmental	IEC 60068-2-1, 2, 6/34, 30, 31, 67, 78, IEC 60529 VDA 621-415
Maritime	DNVGL-CG-0339; IEC 60945
Electrical safety	EN 61010-1
Compliance marks	CE, China RoHS, FCC, ICES, RCM,
Type approvals	DNV GL certificate no.
Listing marks	US (SGS)

Mechanical specifications

Dimensions (H × W × Ø [1)])	348 × 250 × 285 mm (13.70 × 9.84 × 11.22 in)
Weight	
WMT700 wind sensor	1.8 kg (4.0 lb)
Mounting adapter	0.3 kg (0.7 lb)
WMT70FIX mounting kit	1.4 kg (2.2 lb)
Materials	
Body and arms, mounting kit	Stainless steel AISI 316
Transducers	Silicone
Connector housing surface	Nickel-plated brass

1) Diameter of area covered by transducers.

Options

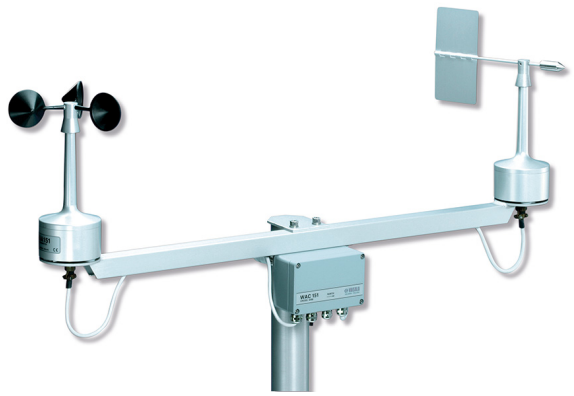
Option	Order code	Configuration code
WMT703 sensor, heated transducers and arms (WMT700-CFG05), 150 W [1)]	WMT700	3C3A0A001A1A1
WMT703 sensor, heated transducers (WMT700-CFG06), 30 W	WMT700	3C2A0A001A1A1
WMT703 sensor, no heating (WMT700-CFG07), 0 W	WMT700	3C1A0A001A1A1

1) Requires an additional power supply.

Spare parts and accessories

Spare part or accessory	Order code
Cable 10 m (32 ft 10 in)	227568SP
Cable 15 m (49 ft 3 in)	237890SP
Cable 26 m (85 ft 4 in)	237889SP
Connector cover kit	ASM211309
Mounting adapter for sensor support arm and pole mast	WMT70FIXSP
Mounting bracket for sensor support arm	SENSORARMFIX60
Bird cage	WMT70BIRDKIT
Zero wind verifier	WMT70VERIFIER

Wind Speed and Direction Sensor WA15 (mechanical)



The WA15 wind set consists of Vaisala Anemometer WAA151, Vaisala Wind Vane WAV151, and Vaisala Serial Transmitter WAC155.

WAA151 is a fast-response, low-threshold anemometer. Three lightweight, conical cups mounted on the cup wheel provide excellent linearity over the entire operating range, up to 75 m/s (168 mph).

WAV151 is a counter-balanced, low-threshold, optoelectronic wind vane. Infrared LEDs and phototransistors are mounted on 6 orbits on each side of a 6-bit GRAY-coded disc. Turned by the vane, the disc creates changes in the code received by the phototransistors. The output code resolution is ±2.8°.

Heating elements in the shaft tunnels of both the anemometer and vane keep the bearings above freezing temperatures in cold climates.

WAC155 operating environment

Operating temperature	−55 ... +60 °C (−67 ... +140 °F)
Storage temperature	−60 ... +70 °C (−76 ... +158 °F)
Operating humidity	0 ... 100 %RH
IP rating	IP65

WAC155 measurement performance

Averaging interval	1 s
Updating interval	0.25 s
Wind speed	
Observation range	0 ... 75 m/s (0 ... 168 mph)
Observation frequency	4 Hz
Resolution	0.1 m/s
Wind direction	
Observation range	0 ... 360°
Observation frequency	32 Hz
Resolution [1]	2.0°

1) Gained by averaging the eight samples in each 0.25-second period.

WAC155 mechanical specifications

Weight	1.5 kg (3.3 lb)
Material	Aluminum
Mounting	To Ø 60 mm (2.36 in) pole mast
Dimensions	
Crossarm and junction box (W × H × D)	887 × 165 × 157 mm (34.92 × 6.50 × 6.18 in)
Junction box (W × H × D)	Without cable glands: 127 × 82 × 58 mm (5.00 × 3.23 × 2.28 in) With cable glands: 127 × 110 × 58 mm (5.00 × 4.33 × 2.28 in)

WAA151 measurement performance

Sensor/Transducer type	Cup anemometer/opto-chopper
Observation range	0.4 ... 75 m/s (0.9 ... 168 mph)
Starting threshold [1]	< 0.5 m/s (1.1 mph)
Distance constant	2.0 m (6 ft 7 in)
Transducer output	
0 ... 75 m/s (0 ... 168 mph)	0 ... 750 Hz square wave
Characteristic transfer function	Uf (wind speed) = 0.328 + 0.101 × R (output pulse rate)
Transducer output level	
(I_{out} < +5 mA)	High state > U_{in} –1.5 V
(I_{out} > -5 mA)	Low state < 2.0 V
Accuracy within 0.4 ... 60 m/s (0.9 ... 134 mph)	
With characteristic transfer function (standard deviation)	±0.17 m/s (0.38 mph)
With simple transfer function U_f = 0.1 × R	±0.5 m/s (1.12 mph)

1) Measured with the cup wheel in position least favored by flow direction. The optimum position yields a < 0.35 m/s (0.8 mph) starting threshold.

WAA151 compliance

EU directives	Low Voltage Directive (2014/35/EU) RoHS Directive (2011/65/EU) amended by 2015/863
EMC compatibility	IEC EN 61326-1:2013
Wind tunnel tests	ASTM standard method D5366-96 (for starting threshold, damping ratio, overshoot ratio, and delay distance)
Exploratory vibration test	MIL-STD-167-1
Humidity test	MIL-STD-810E, Method 507.3
Salt fog test	MIL-STD-810E, Method 509.3
Compliance marks	CE, China RoHS, RCM

WAA151 mechanical specifications

Dimensions (H × Ø)	240 × 90 mm (9.45 × 3.54 in)
Swept radius of cup wheel	91 mm (3.58 in)
Weight	570 g (1.26 lb)
Materials	
Housing	AlMgSi, gray anodized
Cup	PA, reinforced with carbon fiber

WAV151 measurement performance

Sensor/Transducer type	Optical code disc
Observation range at wind speed 0.4 ... 75 m/s (0.9 ... 168 mph)	0 ... 360°
Starting threshold	< 0.4 m/s (0.9 mph)
Resolution	±2.8°
Damping ratio	0.19
Overshoot ratio	0.55
Delay distance	0.4 m (1 ft 4 in)
Accuracy	Better than ±3°
Output	6-bit parallel GRAY code
Transducer output level	
(I_{out} < +5 mA)	High state > U_{in} –1.5 V
(I_{out} > -5 mA)	Low state < 1.5 V

WAV151 compliance

EU directives	Low Voltage Directive (2014/35/EU) RoHS Directive (2011/65/EU) amended by 2015/863
EMC compatibility	IEC EN 61326-1:1997 + Am1:1998, Am2:2001, Generic environment
Wind tunnel tests	ASTM standard method D5366-96 (for starting threshold, damping ratio, overshoot ratio, and delay distance)
Exploratory vibration test	MIL-STD-167-1
Humidity test	MIL-STD-810E, Method 507.3
Salt fog test	MIL-STD-810E, Method 509.3
Compliance marks	CE, China RoHS, RCM

WAV151 mechanical specifications

Dimensions (H × Ø)	300 × 90 mm (11.81 × 3.54 in)
Swept radius of vane	172 mm (6.77 in)
Weight	660 g (1.46 lb)
Materials	
Housing	AlMgSi, gray anodized
Vane	AISI 12, anodized

WAC155 options, spare parts, and accessories

Item	Order code
Serial transmitter WAC155, cross arm, and mounting set for Ø 60 mm (2.36 in) pole mast	WAC155AWS
Mounting bracket for sensor support arm	SENSORARMFIX60
Cable 10 m (32 ft 10 in)	ZZ45049

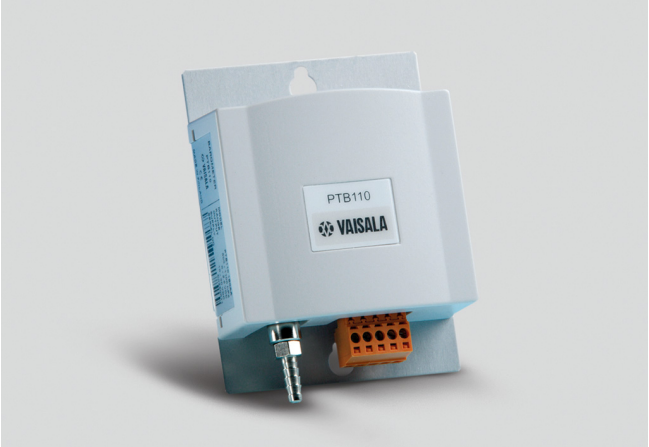
WAA151 spare parts and accessories

Item	Order code
Anemometer WAA151	WAA151
Service kit for wind sensors	16644WA
Cable	ZZ45036
Cable connector	230118
Sensor board	1433WA
Cup assembly	7150WA

WAV151 spare parts and accessories

Item	Order code
Wind vane WAV151	WAV151
Service kit for wind sensors	16644WA
Cable	ZZ45037
Cable connector	230119
Sensor board	1434WA
Standard tail	6389WA

BAROCAP® Barometer PTB110



Vaisala BAROCAP® Barometer PTB110 is designed both for accurate barometric pressure measurements at room temperature and for general environmental pressure monitoring over a wide temperature range.

The excellent long-term stability of the barometer minimizes or even removes the need for field adjustment in many applications.

PTB110 is typically used in the Road Weather Information System (RWIS) which complements synoptic weather station networks.

Operating environment

Operating temperature	−40 … +60 °C (−40 … +140 °F)
Storage temperature	−40 … +60 °C (−40 … +140 °F)
Operating humidity	Non-condensing
IP rating	IP32
EMC compatibility	EN 61326-1, industrial environment

Mechanical specifications

Dimensions (H × W × D)	97.3 × 68.4 × 28.1 mm (3.83 × 2.69 × 1.10 in)
Weight	90 g (3.2 oz)
Materials	
Housing cover	Plastic ABS/PC blend
Mounting plate	Aluminum

Measurement performance

Pressure range (1 hPa= 1 mbar)	500 … 1 100 hPa
Resolution	0.1 hPa
Load resistance	10 000 Ω minimum
Load capacitance	47 nF maximum
Settling time to full accuracy after startup	1 s
Response time to full accuracy after a pressure step	500 ms
Acceleration sensitivity	Negligible
Accuracy	
Linearity [1)]	±0.25 hPa
Hysteresis [1)]	±0.03 hPa
Repeatability [1)]	±0.03 hPa
Pressure calibration uncertainty [2)]	±0.15 hPa
Voltage calibration uncertainty	±0.7 mV
Frequency calibration uncertainty	±0.3 Hz
Accuracy at +20 °C (+68 °F) [3)]	±0.3 hPa
Total accuracy at	
+15 … +25 °C (+59 … +77 °F)	±0.3 hPa
0 … +40 °C (+32 … +104 °F)	±0.6 hPa
−20 … +45 °C (−4 … +113 °F)	±1.0 hPa
−40 … +60 °C (−40 … +140 °F)	±1.5 hPa
Long-term stability	±0.1 hPa / year

1) *Defined as ±2 standard deviation limits of end-point non-linearity, hysteresis error, or repeatability error.*
2) *Defined as ±2 standard deviation limits of inaccuracy of the working standard including traceability to international standards.*
3) *Defined as the root sum of the squares (RSS) of end-point non-linearity, hysteresis error, repeatability error, and calibration uncertainty at room temperature.*

Options

Option	Order code	Configuration code
PTB110 sensor, class B calibration (PTB110-CFG02)	PTB110	1S1AA

Spare parts and accessories

Spare part or accessory	Order code
Plastic cover	219268
DIN rail connector	219269

Weather Transmitter WXT536

WXT530 Series has a unique Vaisala solid state sensor technology. To measure wind, Vaisala WINDCAP® ultrasonic wind sensors are applied to determine horizontal wind speed and direction. Barometric pressure, temperature, and humidity measurements are combined in the PTU module using capacitive measurement for each parameter. This module is easy to change without any contact with the sensors. The precipitation measurement is based on the unique acoustic Vaisala RAINCAP® Sensor without flooding, clogging, wetting, and evaporation losses.

WXT536 reports precipitation as hail or rain. When WXT536 is used with DRD11A, the system capabilities increase to recognize also snow and sleet.

Wind measurement performance

Wind speed	
Observation range	0 ... 60 m/s (134 mph)
Reporting range	0 ... 75 m/s (168 mph)
Response time	0.25 s
Available variables	Average, maximum, and minimum
Accuracy	±3 % at 10 m/s (22 mph)
Output resolution	0.1 m/s (km/h, mph, knots)
Wind direction	
Azimuth	0 ... 360°
Response time	0.25 s
Available variables	Average, maximum, and minimum
Accuracy	±3.0° at 10 m/s (22 mph)
Output resolution	1°
Averaging time	1 ... 3600 s, sample rate 1, 2, or 4 Hz

Barometric pressure measurement performance

Observation range	500 ... 1100 hPa
Accuracy (for sensor element) at 600 ... 1100 hPa	±0.5 hPa at 0 ... +30 °C (+32 ... +86 °F) ±1 hPa at −52 ... +60 °C (−60 ... +140 °F)
Output resolution	0.1 hPa / 10 Pa / 0.001 bar / 0.1 mmHg / 0.01 inHg

Air temperature measurement performance

Observation range	−52 ... +60 °C (−60 ... +140 °F)
Accuracy (for sensor element) at +20 °C (+68 °F)	±0.3 °C (±0.54 °F)
Output resolution	0.1 °C (0.1 °F)

Relative humidity measurement performance

Observation range	0 ... 100 %RH
Accuracy (for sensor element)	±3 %RH at 0 ... 90 %RH ±5 %RH at 90 ... 100 %RH
Output resolution	0.1 %RH

Precipitation measurement performance

Collecting area	60 cm^2 (9.3 in^2)
Rainfall [1]	
Output resolution	0.01 mm (0.001 in)
Field accuracy for daily accumulation	Better than 5 %, weather-dependent
Duration	Counting each 10-second increment whenever droplet detected
Duration output resolution	10 s
Intensity	Running 1-minute average, 10 s steps
Intensity observation range	0 ... 200 mm/h (0 ... 7.87 in/h) (broader with reduced accuracy)
Intensity output resolution	0.1 mm/h (0.01 in/h)
Hail [2]	
Output resolution	0.1 hits/cm^2 (1 hits/in^2), 1 hit
Intensity output resolution	0.1 hits/cm^2h (1 hits/in^2h), 1 hit/h

1) *Cumulative accumulation after the latest automatic or manual reset.*
2) *Cumulative number of hits against collecting surface.*

Operating environment

Operating environment	Outdoor use
Operating temperature	−52 ... +60 °C (−60 ... +140 °F)
Storage temperature	−60 ... +70 °C (−76 ... +158 °F)
Operating humidity	0 ... 100 %RH
Operating pressure	600 ... 1100 hPa
Wind [1]	0 ... 60 m/s (0 ... 134 mph)
IP rating	IP65 With mounting kit: IP66

1) *Due to the measurement frequency used in the sonic transducers, RF interference in the 200 ... 400 kHz range can disturb wind measurement.*

Compliance

EU directives	LVD, EMC, RoHS
EMC compatibility	EN 61326-1, industrial environment CISPR 32 / EN 55032, Class B
Environmental	IEC 60068-2-1, 2, 6, 14, 30, 31, 52, 78 IEC 60529, VDA 621-415
Compliance marks	CE, RCM, RoHS, China RoHS

Mechanical specifications

Weight	0.7 kg (1.54 lb)
Materials	
Radiation shield, top, and bottom parts	Polycarbonate +20 % fiberglass
Precipitation sensor plate	Stainless steel (AISI 316)

Options

Option	Order code	Configuration code
Weather transmitter WXT536, no heating (WXT536-CFG01)	WXT530	6D1B1K1A1A1B
Weather transmitter WXT536, heated (WXT536-CFG02)	WXT530	6D1B2K1A1A1B

Spare parts and accessories

Spare part or accessory	Order code
Mounting kit	212792
Mounting adapter for pole mast and sensor support arm	WMSFIX60
Mounting bracket for sensor support arm	SENSORARMFIX60
Vaisala Configuration Tool, USB service cable	220614
Cable 10 m (32 ft 10 in)	222288
Radiation shield	218817SP
PTU module	WXTPTUSP

Air Quality Sensor AQT530

Vaisala Air Quality Transmitter AQT530 measures the pollution content of ambient air. AQT530 is available in different models for measuring gases, particles, or both.

AQT530 is specifically designed for air quality monitoring networks in areas with traffic, road networks, or around transportation hubs.

Measurement performance – gases

Property	NO_2	NO	O_3	CO
Concentration range	2000 ppb	2000 ppb	2000 ppb	10 000 ppb
Detection limit	5 ppb	5 ppb	5 ppb	10 ppb

Field performance – gases

Property [1]	NO_2 [2]	NO	O_3 [2]	CO
Correlation with reference [3]	R^2: 0.70	R^2: 0.75	R^2: 0.50	R^2: 0.85
Accuracy [4]	7 ppb	15 ppb	11 ppb	183 ppb
Unit-to-unit correlation [5]	R^2: 0.93	R^2: 0.96	R^2: 0.84	R^2: 0.97
Precision [5]	3 ppb	3 ppb	4 ppb	25 ppb

1) *All values are based on 1-hour averages with factory calibration, no linear correction applied. Values are obtained from global field testing in major climate zones against reference instruments. The values represent typical values and may be different based on the location.*
2) *At 10 V/m RF field test, the presence of electromagnetic interference in the range of 800 ... 900 MHz may cause additional deviation for NO_2 and O_3.*
3) *Typical R^2 against a reference grade instrument derived from field tests globally.*
4) *Mean absolute error against reference.*
5) *Mean absolute difference of AQT530 reading from average reading of AQT530s.*

Measurement performance – gases

Property	NO_2	O_3	CO	SO_2	H_2S
Concentration range	2000 ppb	2000 ppb	10 000 ppb	2000 ppb	2000 ppb
Detection limit	5 ppb	5 ppb	10 ppb	5 ppb	5 ppb

Field performance – gases

Property [1]	NO_2 [2]	O_3 [2]	CO [2]	SO_2 [3]	H_2S [3]
Correlation with reference [4]	R^2: 0.70	R^2: 0.50	R^2: 0.85	–	–
Accuracy	7 ppb	11 ppb	183 ppb		
Unit-to-unit correlation [6]	R^2: 0.93	R^2: 0.84	R^2: 0.97	–	–
Precision [6]	3 ppb	4 ppb	25 ppb		

1) *All values are based on 1-hour averages with factory calibration, no linear correction applied. Values are obtained from global field testing in major climate zones against reference instruments. The values represent typical values and may be different based on the location.*
2) *At 10 V/m RF field test, the presence of electromagnetic interference in the range of 800 ... 900 MHz may cause additional deviation for NO_2 and O_3.*
3) *Performance has not been tested and therefore not specified. This is because of not having these gases present in the field test sites and/or reference instruments available at test sites. With these gases the performance is not expected to be at the same level as for the other gases due to cross-sensitivity issues.*
4) *Typical R^2 against a reference grade instrument derived from field tests globally*
5) *Mean absolute error against reference.*
6) *Mean absolute difference of AQT530 reading from average reading of AQT530s.*

Measurement performance – particles

Property	$PM_{2.5}$	PM_{10}
Size range [1]	0.6 ... 2.5 µm	0.6 ... 10 µm
Concentration range [2]	0 ... 1000 µg/m³	0 ... 2500 µg/m³
Detection limit	0.1 µg/m³	0.1 µg/m³

1) *Spherical equivalent size of DEHS particles. Lower detection limit of 0.6 µm defined as 50 % detection efficiency for DEHS particles.*
2) *Specified with ISO12103-1, A1 ultrafine test dust.*

Field performance – particles

Property [1]	$PM_{2.5}$	PM_{10}
Correlation with reference [2]	R^2: 0.65	R^2: 0.75
Accuracy [3]	9 µg/m³	13 µg/m³
Unit-to-unit correlation [4]	R^2: 0.97	R^2: 0.97
Precision [4]	2 µg/m³	3 µg/m³

1) *All values are based on 1-hour averages with factory calibration, no linear correction applied. Values are obtained from global field testing in major climate zones against different reference equivalent methods. The values represent typical values and may be different based on the location and reference instrument. Majority of particle mass within size range.*
2) *Typical R^2 against a reference grade instrument derived from field tests globally.*
3) *Mean absolute error against reference.*
4) *Mean absolute difference of AQT530 reading from average reading of AQT530s.*

Measurement performance – environmental parameters

Humidity	
Accuracy for sensor element	0 ... 90 %RH: ±3 %RH 90 ... 100 %RH: ±5 %RH
Resolution	0.1 %RH
Temperature	
Accuracy for sensor element at +20 °C (+68 °F)	0.3 °C (0.17 °F)
Resolution	0.1 °C
Pressure (indicative)	
Accuracy	15 hPa
Resolution	1 hPa

Operating environment

Operating temperature	−30 … +40 °C (−22 … +104 °F) [1]
Storage temperature	+20 … +25 °C (+68 … +77 °F)
Operating humidity	15 … 100 %RH, non-condensing [2]
Storage humidity	20 … 75 %RH
Operating pressure	800 … 1150 hPa
IP rating	IP65 [3]

1) *Optimal performance at −10 … +30 °C (−14 … +86 °F).*
2) *Optimal performance at 15 … 90 %RH. Operation in low humidity environments may weaken the gas measurement performance.*
3) *Specified for gas measurement device only.*

Powering

Operating voltage	10 - 25 V DC Max. 1 A at 10 V DC [1]
Power consumption, max. peak [1]	10 W
Power consumption (average with default settings)	
Gas and particle measurement	1.8 … 4.4 W [2]
Gas measurement	1.4 … 3.8 W [3]
Particle measurement	1.7 … 2.0 W [4]

1) *Humidity management active, particle measurement active, temperature < 0 °C (32 °F).*
2) *Maximum consumption when humidity > 85 %RH, temperature < 0 °C (32 °F), default particle measurement cycle.*
3) *Maximum consumption when humidity > 85 %RH.*
4) *Maximum consumption when temperature < 0 °C (32 °F), default particle measurement cycle.*

Mechanical specifications

Dimensions (H × Ø)	335 × 133 mm (13.19 × 5.24 in)
Weight, with mounting kit	2.4 kg (5.29 lb)
Color, radiation shield	White (RAL9003)
Material, base module	Anodized aluminum
Material, radiation shield	Polycarbonate (PC)
Power and data connector	Standard 8-pin M12 male

Compliance

EU directives	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) amended by 2015/863
EMC immunity [1]	EN 61326-1, industrial environment
EMC emissions	CISPR 32 / EN 55032, Class B
Cold	IEC 60068-2-1
Dry heat	IEC 60068-2-2
Damp heat	IEC 60068-2-78
Eye safety	IEC 60825-1:2014 Class 1 laser product
Compliance marks	CE, China RoHS, FCC, RCM, UKCA

1) *At 10 V/m RF field test, the presence of electromagnetic interference in the range of 800 … 900 MHz may cause additional deviation for NO_2 and O_3.*

AQT530 options

Option	Order code	Configuration code
Air Quality Transmitter AQT530, no particles, with NO_2, NO, O_3, and CO (AQT530-CFG05)	AQT530	N1R0N
Air Quality Transmitter AQT530, particles (AQT530-CFG06)	AQT530	P0R0N
Air Quality Transmitter AQT530, particles and NO_2, NO, O_3, and CO (AQT530-CFG07)	AQT530	P1R0N
Air Quality Transmitter AQT530, particles and NO_2 (AQT530-CFG08)	AQT530	P4R04

AQT530 accessories and spare parts

Option	Order code
Cable 5 m (32 ft 10 in)	AQT530CABLE5M
Cable 10 m (32 ft 10 in)	AQT530CABLE10M
Mounting kit for sensor support arm	270176

Third-party sensors

RWS200 supports the following third-party sensors:

Subsurface temperature sensors

FinMeas multidepth sensor TPS10:
www.finmeas.com

Wind sensors

R.M. Young combined wind sensor:
www.youngusa.com

Level sensors

Campbell Scientific water level and snow depth sensor SR50A:
www.campbellsci.com

Global radiation sensors

For example, Kipp & Zonen global radiation sensor SP Lite2:
www.kippzonen.com

For more information on the third-party sensors, see the manufacturer documentation.

Precipitation sensors

For example, Casella tipping buckets:
www.casellasolutions.com

Cameras

Axis pan-tilt-zoom (PTZ) camera:
www.axis.com
Mobotix fixed camera:
www.mobotix.com

Traffic sensors

Wavetronix SmartSensor HD:
www.wavetronix.com

RWS200 Data Management Unit DMU703

Vaisala Data Management Unit DMU703 is specifically designed and built to be the brains of Vaisala Road Weather Station RWS200. DMU703 handles the storage, analysis, and reporting of observation data.

DMU703 contains the algorithms that make RWS200 more than a collection of road weather sensors. The algorithms process the observation data from the atmospheric and road weather sensors and provide accurate data to support decision making.

A web user interface provides direct access to the weather station. The user interface is available locally and remotely and it is used for station setup and maintenance, as well as for viewing observation data and reports.

Computer specifications

Processor	ARM Cortex A8
Memory	512 MB DDR3 RAM, 2 GB flash
Operating system	Linux
RTC backup battery	CR2032
Web services	HTTPS
Graphical user interface	Java POWERED

GPS receiver specifications

Receiver type	72-channel u-blox M8 engine GPS/QZSS L1 C/A, GLONASS L10F BeiDou B1I, Galileo E1B/C SBAS L1 C/A: WAAS, EGNOS, MSAS, GAGAN
Time-to-first-fix	Cold/Warm start 26 s
Horizontal position accuracy [1)]	2.5 m (8.2 ft)
Antenna connector	SMA (female)

1) LEP, 50 % 24-hour static, -130dBm

WLAN transmitter specifications

Supported standards	IEEE 802.11 b/g/n (single stream n)
Transmit power	+17.5 dBm, 11 Mbps, CCK (b) +14.0 dBm, 54 Mbps, OFDM (g) +12.5 dBm, HT20 MCS7 (n)
Acceptance	FCC, IC, ETSI, Giteki, RCM Contains FCC ID: TFB-1003 Contains IC: 5969A-1003
Antenna connector	RP-SMA (female)

Inputs and outputs

Ethernet	
Ports	ETH 0, ETH 1
Supported standard	IEEE 802.3
Physical layer	Base-T
Data rate	10/100 Mbps
Connectors	RJ45 with link LEDs
USB	
Ports	4 (reserved)
Supported standard	USB 2.0
Signaling	High speed
Connectors	Standard-A
RS-232 serial	
Ports	COM 1, COM 5 (configurable)
Signals	COM 1: RXD, TXD, CTS, RTS, DTR, DSR, DCD, and RI COM 5: RXD, TXD, CTS, and RTS
Connectors	Phoenix Contact DFMC 1,5/3-ST-3,5-LR
RS-485 serial	
Ports	COM 5 (configurable), COM 6, COM 7
Signals	D+/D− for all ports COM 5 also has R+/R−
Connectors	1 × Phoenix Contact DFMC 1,5/3-ST-3,5-LR 1 × RJ45 (expansion bus)
RS-485 serial, isolated	
Ports	COM 2, COM 3
Signals	R+/R−/T+/T−
Connectors	Phoenix Contact DFMC 1,5/3-ST-3,5-LR
Other serial ports	
1 × CAN (reserved)	Connector: RJ45
1 × SDI-12 (reserved)	Connector: Phoenix Contact DFMC 1,5/3-ST-3,5-LR
Analog	
Lines	CH A, CH B
Frequency input signal	1 Hz ... 20 kHz, 2.5 ... 14 V DC, or 10 mV ... 15 V DC
Excitation voltage signal	0 ... 12 V DC at 20 mA
Fast input high signal	0 ... 1.8 V DC, 12-bit ADC
Fast input low signal	0 ... 1.8 V DC, 12-bit ADC
Single-ended/Differential measurement mode	Ground
Connectors	Phoenix Contact DFMC 1,5/3-ST-3,5-LR
I/O digital	
Ports	4 × input, 4 × output
Input signal	0 ... 30 V DC
Output signal	Open collector, maximum load 30 V DC at 1 A
Connectors	Phoenix Contact DFMC 1,5/3-ST-3,5-LR

Operating environment

Operating temperature	−40 ... +60 °C (−40 ... +140 °F)
Storage temperature	−60 ... +80 °C (−76 ... +176 °F)
Operating humidity	5 ... 95 %RH, non-condensing

Compliance

EU directives	Low Voltage Directive (2014/35/EU) EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) amended by 2015/863
EMC immunity	EN 61326-1, industrial environment FCC part 15, class B ICES-3 (B)
EMC emissions	CISPR 32 / EN 55032, Class B
Electrical safety	EN 61010-1
Compliance marks	CE, FCC, ICES, RCM

Test compliance

Dry heat	IEC 60068-2-2	+60 °C (+140 °F)
Vibration	IEC 60068-2-6	0.2 g (0.007 oz), 62 ... 200 Hz 5 ... 62 Hz, 1.5 mm (0.06 in) displacement
Shock	IEC 60068-2-27	3.0 g (0.106 oz) Pulse duration 11 ms with 3 pulses in each direction.
Rough handling	IEC 60068-2-31	Drop height 50 cm (19.69 in)
Damp heat	IEC 60068-2-78	+40 °C (+104 °F), 93 %RH

Mechanical specifications

Dimensions (H × W × L)	126 × 55 × 127 mm (4.96 × 2.17 × 5.00 in)
Weight	0.4 kg (0.8 lb)
Mounting	DIN rail 35 mm (1.4 in)
Materials	
Screws, washers, DIN rail locking piece	Stainless steel AISI 316
Frame profile	Aluminum EN AW-6060 T6
Side plates	Plastic PC/ABS

Spare parts and accessories

Spare part or accessory	Order code
DMU703-RWS unit including: • Ethernet cable 40 cm (15.75 in) • Phoenix Contact DFMC 1,5/3-ST-3,5-LR 6-pin cable connector (2 pc) • Phoenix Contact DFMC 1,5/5-ST-3,5-LR 10-pin cable connector (5 pc)	DMU703-RWSSP
Phoenix Contact DFMC 6-pin cable connector set (10 pcs)	262926
Phoenix Contact DFMC 10-pin cable connector set (10 pcs)	262924
Insulated ferrules 0.5 mm^2, length 10 mm, white (100 pcs)	237754SP

RWS200 Digital Road Interface DRI701

DRI701 provides power to the sensors, and converts analog and frequency signals from these sensors to a message for internal system communication.

Operating environment

Operating temperature	−40 … +60 °C (−40 … +140 °F)
Storage temperature	−60 … +80 °C (−76 … +176 °F)
Operating humidity	5 … 95 %RH, non-condensing

Inputs and outputs

Operating voltage	9 … 32 V DC
Average power consumption	
With two DRS511 sensors	0.76 W
With two FP2000 sensors	1.06 W

Compliance

EU directives	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) amended by 2015/863
EMC immunity	EN 61326-1, industrial environment FCC part 15, class B ICES-3 (B)
EMC emissions	CISPR 32 / EN 55032, Class B
Electrical safety	EN 61010-1
Dry heat	IEC 60068-2-2
Vibration	IEC 60068-2-6
Shock	IEC 60068-2-27
Rough handling	IEC 60068-2-31
Damp heat	IEC 60068-2-78
Compliance marks	CE, FCC, ICES, RCM

Mechanical specifications

Dimensions (H × W × D)	126 × 37 × 127 mm (5.0 × 1.5 × 5.0 in)
Weight	0.3 kg (0.7 lb)
Materials	
Screws, washers	Stainless steel AISI 316
DIN rail locking piece	Stainless steel AISI 630
Frame profile	Aluminum EN AW-6060 T6
Side plates	Plastic PC/ABS

Supported sensors

Road state sensors, embedded	2 × DRS511 / 2 × FP2000 [1]
Subsurface temperature sensors	2 × DTS12G / 2 × DTS210 [2]
Global radiation sensor	For example, SP Lite2 [3]

1) For FP2000 availability, contact Vaisala.
2) DTS210 only in retrofit installations.
3) The first DRI701 supports one global radiation sensor and one subsurface temperature sensor or two subsurface temperature sensors.

Spare parts and accessories

Spare part or accessory	Order code
DRI701 with: • Power cable 30 cm (11.81 in) • Ethernet cable 30 cm (11.81 in)	DRI701SP
Phoenix Contact DFMC 8-pin cable connector set (10 pcs)	262923
Phoenix Contact DFMC 16-pin cable connector set (10 pcs)	262925
Insulated ferrules 0.5 mm^2, length 10 mm, white (100 pcs)	237754SP

RWS200 Power Management Unit PMU701

PMU701 handles the specific power requirements of the sensors, making sure that each sensor receives steady and suitable power at all times.

PMU701 is also responsible for charging the internal backup battery inside the RWS200 enclosure. If an external DC power supply is used with the road weather station, the power is routed through PMU701.

In total, PMU701 provides 1 external DC input, 2 solar panel inputs, 4 inputs for analog sensor communications, and 14 inputs for serial communication, 8 of which can be Ethernet-based communication.

Inputs and outputs

Operating voltage	24 V DC (10 … 32 V DC)
Solar panel input (requires PMP701)	10 … 32 V DC
External DC power (requires PMP701)	12 … 28 V DC (max. range 10 … 32 V DC)
Output power	12 V at 3 A and 24 V at 7 A
Maximum charging current	3.8 A (total) for 26 Ah battery 1.9 A (total) for 2.6 Ah battery
Nominal charging voltage	13.5 V at +25 °C (+77 °F)
Connectors	
DC INPUT	23 … 32 V at 10 A Phoenix Contact MVSTBR 2,5HC/ 2-ST-5.08
BATTERY 1, **BATTERY 2**	2 separately controlled 12 V lead-acid batteries Temperature compensation Deep discharge protection Charging within battery operating temperature only Phoenix Contact MVSTBR 2,5HC/ 2-ST-5.08
SERVICE PORT	RS-232 Phoenix Contact DFMC 1,5/5-ST-3,5-LR
POWER OUT C	12 V out at 1.4 A, 24 V out at 2.8 A Phoenix Contact DFMC 1,5/5-ST-3,5-LR
ETH 1, **ETH 2**	10/100 Mbps 2 × RJ45
DMU	Serial and I/O Molex 90130-3250
TELECOM	RS-232/RS-485, DC output Phoenix Contact DFMC 1,5/10-ST-3,5-LR

Operating environment

Operating temperature	−40 … +60 °C (−40 … +140 °F)
Storage temperature	−60 … +80 °C (−76 … +176 °F)
Operating humidity	5 … 95 %RH, non-condensing

Compliance

EU directives	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) amended by 2015/863
EMC immunity	EN 61326-1, industrial environment FCC part 15, class B ICES-3 (B)
EMC emissions	CISPR 32 / EN 55032, Class B
Electrical safety	EN 61010-1
Dry heat	IEC 60068-2-2
Vibration	IEC 60068-2-6
Shock	IEC 60068-2-27
Rough handling	IEC 60068-2-31
Damp heat	IEC 60068-2-78
Compliance marks	CE, FCC, ICES, RCM

External DC / solar panel input module PMP701 specifications

Surge protection	IEC 61000-4-5: external DC input up to 6 kV (line to GND) / 6 kV (line to line)
Reverse voltage protection	Yes
Solar panel input	2 pcs Maximum 10 … 32 V DC at 4 A/port
External DC input	1 pc Maximum 10 … 32 V DC at 15 A
Status LED	Green for each input

Serial input/output module PMS701 specifications

Surge protection	IEC 61000-4-5
Sensor power	12 V at maximum 2 A/port
Sensor power	24 V at maximum 3 A/port
Heat output	24 V at maximum 5 A/port
Supports	RS-232 2-wire and 4-wire RS-485 Isolated 2-wire and 4-wire RS-485
Status LED	Green/Orange

Ethernet / Power over Ethernet module PME701 specifications

Surge protection	IEC 61000-4-5
Supported IEEE 802.3af PoE classes / module	1 × PoE class 0 (0.44 … 12.94 W) device 1 × PoE class 3 (6.49 … 12.95 W) device 2 × PoE class 1 (0.44 … 3.84 W) device 2 × PoE class 2 (3.84 … 6.49 W) device
Status LED	Ethernet link and speed built into connectors

Analog input/output module PMA701 specifications

Surge protection	IEC 61000-4-5
Sensor power	12 V at maximum 2 A/port
Sensor power	24 V at maximum 3 A/port
Status LED	Green/Red
Mechanical	Has red circuit board
Digital I/O and differential	
Lines	2
Frequency input signal	1 Hz ... 20 kHz, 2.5 ... 14 V DC, or 10 mV ... 15 V DC
Excitation voltage signal	0 ... 12 V DC at 20 mA
Fast input high signal	0 ... 1.8 V DC, 12-bit ADC
Fast input low signal	0 ... 1.8 V DC, 12-bit ADC
Single-ended/Differential measurement mode	Ground
Connectors	Phoenix Contact DFMC 1,5/3-ST-3,5-LR

Mechanical specifications

Dimensions (H × W × D)	126 × 224 × 142 mm (4.96 × 8.82 × 5.59 in)
Weight	1.4 kg (3.1 lb)
Materials	
Screws, washers, DIN rail locking piece	Stainless steel AISI 316
Grounding rail clamps	Stainless steel AISI 630
Frame profile	Aluminum EN AW-6060 T6
Cooling plate	Aluminum EN AW-6082 T6
Side plates	Plastic PC/ABS
Grounding rail	Copper (Cu)
Available plug-in module slots	10 pcs
PMP701	Maximum 1 pcs
PMA701	Maximum 2 pcs
PMS701	Maximum 7 pcs [1)]
PME701	Maximum 4 pcs [1)]

1) SERIAL/ETHERNET slots can house either PME701 or PMS701 plug-in modules.

Spare parts and accessories

Spare part or accessory	Order code
PMU701 unit including: • Sensor data cable • Phoenix Contact DFMC 1,5/10-ST-3,5-LR 20-pin cable connector (1 pc)	PMU701SP
PMU701 accessories including: • Torx screws M4×8 ISO14583 TX A4 (4 pcs) • Torx screws M3×6 ISO14583 A4-60 (6 pcs) • Cable shield grounding clamps SK 8 (10 pcs) (217844) • Cable shield grounding clamps SK 14 (10 pcs) (237528) • Hex-tapped spacers M4×55 FeZn Female/Male (2 pcs) • Enclosure grounding rail for sensor cables (DRW240852) • PMU701 grounding rail for sensor cables (DRW240399)	PMU701ACC1SP
PMU701 accessories including: • Cable shield grounding clamps SK 8 (10 pcs) • Cable shield grounding clamps SK 14 (10 pcs)	PMU701ACC2SP
PMU701 accessories including: • Set of quick reference cards • Cable ferrules 0.5 mm^2 / 10 mm (100 pcs) (237754) • Phoenix Contact DFMC 1,5/1-ST-3,5-LR 2-pin cable connectors (4 pcs) • Phoenix Contact DFMC 1,5/3-ST-3,5-LR 6-pin cable connectors (10 pcs) • Phoenix Contact DFMC 1,5/4-ST-3,5-LR 8-pin cable connectors (10 pcs) • Phoenix Contact DFMC 1,5/5-ST-3,5-LR 10-pin cable connectors (30 pcs) • Phoenix Contact DFMC 1,5/8-ST-3,5-LR 16-pin cable connectors (10 pcs) • Phoenix Contact DFMC 1,5/10-ST-3,5-LR 20-pin cable connectors (5 pcs) • Phoenix Contact MVSTBR 2,5HC/2-ST-5.08 cable connectors (4 pcs) • Narrow cover plates for empty slots (7 pcs) • Wide cover plates for empty slots (3 pcs)	PMU701ACC3SP
Phoenix Contact DFMC 6-pin cable connector set (10 pcs)	262926
Phoenix Contact DFMC 8-pin cable connector set (10 pcs)	262923
Phoenix Contact DFMC 10-pin cable connector set (10 pcs)	262924
Phoenix Contact DFMC 16-pin cable connector set (10 pcs)	262925
Phoenix Contact DFMC 20-pin cable connector set (10 pc)	262927
Accessory set, screws and washers	262928
Insulated ferrules 0.5 mm^2, length 10 mm, white (100 pcs)	237754SP

PMU701 plug-in module spare parts

Spare part	Order code
External DC / Solar panel input module	PMP701SP
Analog input/output module with 10-pin cable connectors (2 pcs)	PMA701SP
Serial input/output module with 10-pin cable connectors (2 pcs)	PMS701SP
Ethernet / power over Ethernet module	PME701SP

Cellular Router WR21

The Digi TransPort® WR21 cellular router provides primary and backup WWAN connectivity over 3G/4G/LTE. The connection allows data transmission and access to the browser-based user interface.

Wireless specifications

3G international model	
3G HSPA+	850 / 900 / 1700 AWS / 1900 / 2100 MHz
2G EDGE/GPRS	850 / 900 / 1800 / 1900 MHz
Maximum transfer rate	21 Mbps down, 5.76 Mbps up
Approvals	PTCRB, Vodafone
4G LTE international model	
LTE Cat 4	800 (B20) / 900 (B8) / 1800 (B3) / 2100 (B1) / 2600 (B7)
HSPA	900 / 2100 MHz
EDGE	900 / 1800 MHz
Maximum transfer rate	150 Mbps down, 50 Mbps up
4G LTE North America model	
LTE Cat 4	700 (B12, B13) / 850 (B5) / AWS (B4) / 1900 (B2)
3G HSPA+	850 / 1900 MHz
2G/3G CDMA fallback to	800 / 1900 MHz
Maximum transfer rate	150 Mbps down, 50 Mbps up
Approvals	PTCRB, AT&T, Verizon, Telus (pending)

Operating environment

Operating temperature	–35 … +70 °C (–31 … +158 °F)
Storage temperature	–40 … +85 °C (–40 … +185 °F)
Operating humidity at 25 °C (77 °F)	0 … 95 %RH, non-condensing
IP rating	IP30

Mechanical specifications

Enclosure material	Industrial (metal)
Dimensions (H × W × D)	32 × 131 × 100 mm (1.26 × 5.16 × 3.94 in)
Weight	0.5 kg (1.1 lb)

Specifications

Input voltage	9 … 30 V DC
Average power consumption	4.70 W
Connector	Screw-down removable terminal block
Connectors	2 × 50 Ω SMA (center pin female)
Protocols	HTTP, HTTPS, FTP, SFTP, SSL, SMTP, SNMP (v1/v2c/v3), SSH, Telnet, and CLI for web management Remote management via Digi Remote Manager SMS management, protocol analyzer, ability to capture PCAP for use with Wireshark Dynamic DNS client compatible with BIND9/ No-IP/DynDNS
Security/VPN	Stateful inspection firewall with scripting, address and port translation VPN: IPSec with IKEv1, IKEv2, NAT Traversal SSL, SSLv2, FIPS 197, open VPN client and server PPTP, L2TP Maximum 5 VPN tunnels (not upgradable) Cryptology: SHA-1, MD5, RSA Encryption: DES, 3DES and AES up to 256-bit (CBC mode for IPsec) Authentication: RADIUS, TACACS+, SCEP for X.509 certificates Content filtering (via third party) MAC Address Filtering VLAN support Ethernet port isolation
Routing/Failover	IP pass-through NAT, NAPT with IP port forwarding Ethernet bridging GRE Multicast routing Routing protocols: PPP, PPPoE, RIP (v1, v2) OSPF, SRI, BGP, iGMP routing (multicast) IP failover: VRRP, VRRP+TM; Automatic failover/failback to second GSM network / standby APN Verizon NEMO/DMNR for primary wireless access
Other protocols	DHCP Dynamic DNS client compatible with BIND9/ No-IP/Dynamic DNS QoS via TOS/DSCP/WRED Modbus UDP/TCP to serial X.25 including XOT, SNA/IP, TPAD, and PAD, protocol switch Modbus bridging for connecting diverse field assets

Spare parts and accessories

Spare part or accessory	Order code
WR21 cellular router, 3G International [1)]	237829-RWSSP
WR21 cellular router, 4G LTE International [1)]	241542-RWSSP
WR21 cellular router, 4G LTE North America [1)]	241508-RWSSP
WR21 mounting bracket	ASM211746SP

1) With mounting bracket, Ethernet cable, and power cable.

RWS200 mounting equipment and accessories

Enclosure options

ENC652	
IP rating / NEMA rating	IP66 / NEMA 4X
Approvals	UL 50 / UL 50E-listing
Vibration	IEC 60068-2-6
Shock	IEC 60068-2-27
Size (H × W × D), incl. mounting frame, radiation shield, and cabling box	787 × 581 × 270 mm (30.98 × 22.87 × 10.62 in)
Weight after installation	Approx. 46 kg (101 lb)
ENC722	
IP rating	IP66
Vibration	IEC 60068-2-6
Shock	IEC 60068-2-27
Size (H × W × D), incl. mounting frame, radiation shield, and cabling box	887 × 322 × 270 mm (34.92 × 12.67 × 10.62 in)
Weight after installation	Approx. 29 kg (64 lb)
BOXALU-US, BOXSS-US (North America only)	
NEMA rating	NEMA 4X
Size (H × W × D), enclosure only	838 × 610 × 330 mm (33.00 × 24.00 × 13.00 in)
Weight after installation	BOXALU-US: Approx. 35.3 kg (77.8 lb) BOXSS-US: Approx. 55.5 kg (122.3 lb)
Backplate only	
Vibration	IEC 60068-2-6
Shock	IEC 60068-2-27
Size (H × W × D)	555 × 455 × 42 mm (21.85 × 17.91 × 1.65 in)
Weight after installation	Approx. 12.8 kg (28.2 lb)

ENC652 spare parts and accessories

Spare part or accessory	Order code
Enclosure ENC652 with mounting plate, locks and flanges, mounting frame, radiation shield, and cabling box	ENC652KIT
Pressure port	16941DM
Cabling box	ASM210466SP
Radiation shield	ASM210463SP
Rubber flange set (2 pcs)	DRFLANGE10SP
Enclosure lock set (2 pcs)	ASM213869SP
Backplate assembly	ASM211817SP
Enclosure accessories: • Cable ties 2.5×100 mm (20 pcs) • Cable tie holders FTH-13R-01 (5 pcs) • DIN rail end brackets (10 pcs) • Washers with EPDM gasket 6.8/16×1.5/A2/EPDM (4 pcs) • Hex screws M6×16 ISO7380 A4 (2 pcs) • Hex nuts M6 Wulock Fe/Zn (2 pcs) • Torx screws M4×8 ISO14583 TX A4 (10 pcs) • Flat washers A6.4 DIN125 A4 (4 pcs)	BOX652ACC1SP
Accessory set, screws and washers	262928

ENC722 spare parts and accessories

Spare part or accessory	Order code
Enclosure ENC722 with mounting plate, locks and flanges, mounting frame, radiation shield, and cabling box	ENC722KIT
Cabling box	ASM211127SP
Radiation shield	ASM211081SP
Rubber flange set (2 pcs)	DRFLANGE10SP
Enclosure lock set (2 pcs)	ASM213869SP
Enclosure accessories: • Cable ties 2.5×100 mm (20 pcs) • Cable tie holders FTH-13R-01 (5 pcs) • DIN rail end brackets (10 pcs) • Washers with EPDM gasket 6.8/16×1.5/A2/EPDM (4 pcs) • Hex screws M6×16 ISO7380 A4 (2 pcs) • Hex nuts M6 Wulock Fe/Zn (2 pcs) • Torx screws M4×8 ISO14583 TX A4 (10 pcs) • Flat washers A6.4 DIN125 A4 (4 pcs)	BOX652ACC1SP
Accessory set, screws and washers	262928

ENC652 and ENC722 mounting kit options

Mounting kit	Order code
Mounting kit for lattice mast [1]	ASM210998
Mounting kit for 60 mm (2.36 in) pole mast [2]	APPK-SET60
Mounting kit for 75 mm (2.95 in) pole mast [2]	APPK-SET75
Mounting kit for 100 mm (3.94 in) pole mast [2]	APPK-SET100
Mounting kit for 80 ... 600 mm (3.15 ... 23.62 in) pole mast, excluding stainless steel band and locks [2] [3]	DRUNIV-US
Mounting kit for 80 ... 600 mm (3.15 ... 23.62 in) pole mast, including stainless steel band and locks [2]	DRUNIV

1) Installation requires 1 pc of the mounting kit.
2) Installation requires 2 pcs of the mounting kit.
3) You can use any suitable stainless steel band and locks for attaching the mounting support to the pole mast, for example, Band-It 19.1 mm (0.75 in) with Ear-Lokt buckles. If you only need the band for a few installations, use the DRUNIV mounting kit instead.

BOXALU-US and BOXSS-US spare parts and accessories

Item	Code
Aluminum enclosure	BOXALU-US
Stainless steel enclosure	BOXSS-US
Backplate mounting frame	ASM211177
Mounting support for lattice mast	60030004

RWS200 spare parts

AC (mains) input spare parts

Item	Order code
Mains input assembly with EU socket	ASM210483SP
Mains input assembly with US socket	ASM210483USSP
Mains input assembly with UK socket	ASM210483UKSP
Mains input assembly with FR socket	ASM210483FRSP
Mains input assembly without service socket	ASM213653SP
Surge protector (in production until spring 2019): • Surge protection plug (Phoenix Contact 2905235) • Surge protection socket (Phoenix Contact 2905557)	 • 242575SP • 242574SP
Surge protector (in production since spring 2019): • Surge protection plug (Phoenix Contact 2907923) • Surge protection socket (Phoenix Contact 2907924)	 • 254404SP • 254402SP

AC/DC power supply unit spare parts

Item	Order code
Phoenix QUINT-PS/ 1AC/24DC/10 AC/DC power supply unit with: • Power cable to PMU701 • AC wires	234881-RWSSP

Backup battery spare parts for standard backplate

Item	Order code
12 V / 26 Ah battery	247257SP
Battery clamp	ASM211696SP
Battery cables	CBL210269SP

Backup battery spare parts for slim backplate

Item	Order code
12 V / 2.6 Ah battery	233012SP

Antenna options and spare parts

Item	Order code
Mobile Mark LTM301 cellular/LTE and GPS antenna with fixed cables 10 m (32 ft 10 in)	251867
Mobile Mark LTM401 cellular/LTE, GPS, and WLAN antenna with fixed cables 4.5 m (14 ft 9 in)	243833SP
Mobile Mark LTM301 cellular/LTE and GPS antenna with fixed cables 4.5 m (14 ft 9 in) and mounting kit, and WLAN whip antenna	236774SP
Antenna mounting kit	ASM211224SP

Device control spare parts

Item	Order code
Device control spare part with: • Pre-assembled Phoenix Contact relays (3 pcs) • Wire set • DIN rail • Mounting screw M4×8 ECO-Fix Zn TX20 (3 pcs)	RWS200DEVCSP

Mobotix options, spare parts, and accessories

Item	Item code	Order code
Mobotix M16 fixed camera with optics	253369	CAM200
Mounting frame kit	ASM211036	–
Cable options		
10 m (32 ft 10 in)	CBL210324-10M	–
25 m (82 ft 3 in)	CBL210324-25M	–
35 m (114 ft 10 in)	CBL210324-35M	–
Mounting kit options		
Sensor support arm and mounting kit for lattice tower	ASM211057	–
Sensor support arm and mounting kit for 63 mm (2.48 in) pole mast	DM32ARM63	–
Sensor support arm and mounting kit for 75 mm (2.95 in) pole mast	DM32ARM75	–
Sensor support arm and mounting kit for 102 mm (4.02 in) pole mast	DM32ARM102	–
Sensor support arm and mounting kit for 80 ... 600 mm (3.15 ... 23.62 in) pole mast, excluding stainless steel band and locks	DRUNIVARM	–
Sensor support arm and mounting kit for 80 ... 600 mm (3.15 ... 23.62 in) pole mast, including stainless steel band and locks	DRUNIVARM-US	–
Spare parts		
Mounting frame kit with Ethernet cable 10 m (32 ft 10 in)	MOUNTINGFRAMEKIT-1	CAM200

PTZ camera options, spare parts, and accessories

Item	Order code
PTZ camera 50 Hz	
AXIS Q6154-E PTZ camera for countries with 50 Hz AC power	260776
AXIS T8124-E power unit 50 Hz with international power cable	241532
PTZ camera 60 Hz	
AXIS Q6154-E PTZ camera for countries with 60 Hz AC power	260759
AXIS T8124-E power unit 60 Hz with US power cable	241898
Mounting kits	
AXIS T91L61 wall mount	251078
Mounting bracket kit for camera or power unit (2 pcs)	ASM211304
Lattice tower mounting clamp kit for camera or power unit (4 pcs)	ASM211305
Cabling	
Camera Ethernet PoE cable 10 m (32 ft 10 in)	CBL210362-10M
Power unit Ethernet PoE cable 3 m (9 ft 10 in)	CBL210362-3M

IR illuminator options, spare parts, and accessories

Item	Item code	Order code
VARIO i4 24 W IR Illuminator (maximum 2 pcs) with cable 10 m (32 ft 10 in)	240980	CAM200
Fastening set	241641	–
Mounting frame kit (the IR illuminator can also be attached to the same mounting frame as Mobotix M15 camera)	ASM211036	–

Traffic sensor options, accessories, and spare parts

Item	Order code
Wavetronix SmartSensor HD SS126	Project item
Wavetronix Click 301 serial-to-Ethernet converter	Project item
Wavetronix Click 200 surge protector	Project item
Device holder kit containing: • Power cable between PMU701 and the surge protector • Ethernet cable between PME701 and the serial-to-Ethernet converter • 2-channel Ethernet / Power over Ethernet plug-in module (PME701) • Device holder kit for mounting the traffic sensor on sensor support arm	ASM211623

TPS10 options and accessories

Option	Order code
Standard TPS10 sensor with: • 15 sensing elements • Sensor length 1.88 m (6 ft 2 in) • Cable 10-m (32-ft 10 in) between the sensor and the electronic unit • Cable 65 m (213 ft 3 in)	263207
Custom TPS10 sensor with: • 10-m (32-ft 10 in) cable between the sensor and the electronic unit • Maximum 20 sensing elements • Maximum sensor length 250 cm (98.43 in) • Maximum cable length 300 m (984 ft 3 in)	TPS10

R.M. Young Wind options, spare parts, and accessories

Item	Order code
Wind monitor 05103-15 R.M. Young with: • Cable 15 m (49 ft 3 in) • Mounting accessories	59020001
Mounting bracket for sensor support arm	SENSORARMFIX 60

SR50A options and accessories

Option	Order code
Water and snow level sensor SR50A (maximum 2 pcs)	SR50A-RS485
Mounting kit	ASM210958
Cable 10 m (32 ft 10 in)	SR50ACBL-10M
Cable 30 m (98 ft 5 in)	SR50ACBL-30M
Cable 100 m (328 ft 1 in)	SR50ACBL-100M

SP Lite2 options, spare parts, and accessories

Item	Order code
Pyranometer SP Lite2 with cable 15 m (49 ft 3 in)	245430
Mounting kit	KZFIXPLATE
Extension cable 5 m (16 ft 5 in)	26720

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