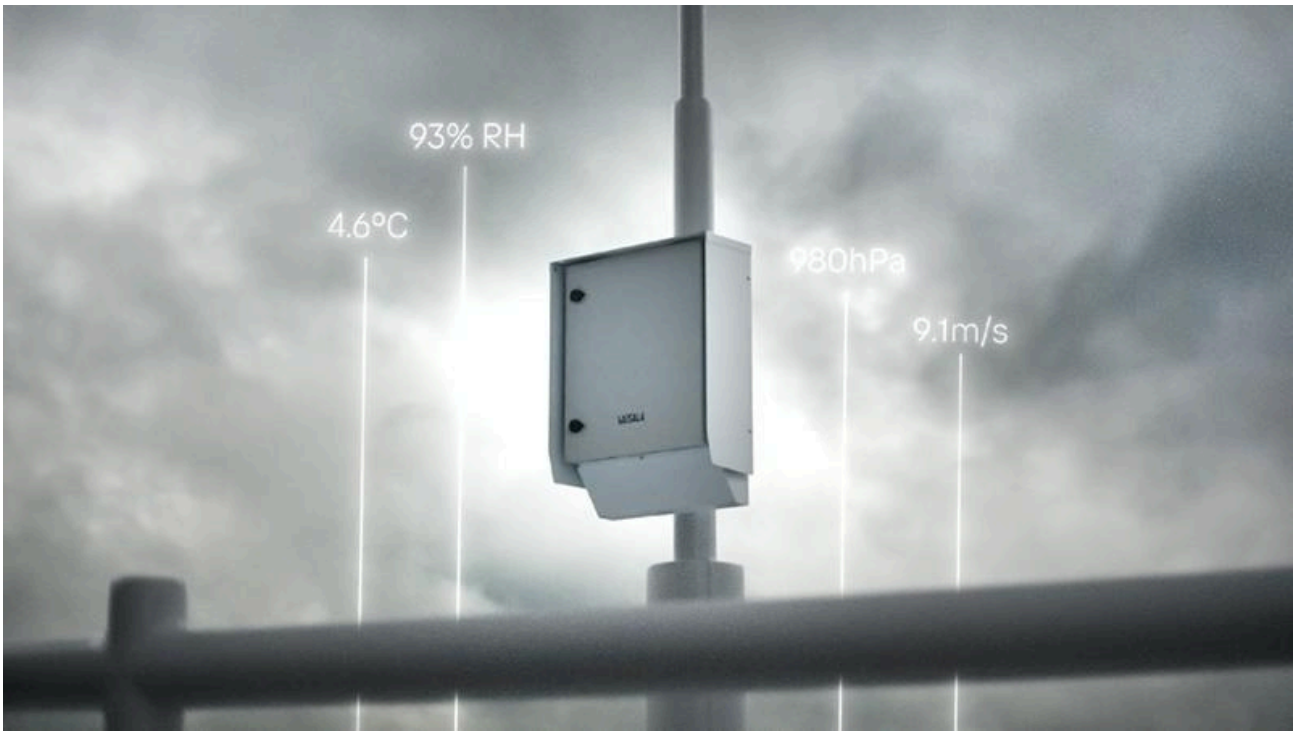
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USER GUIDE

AWS830

Vaisala · Authorized Partner

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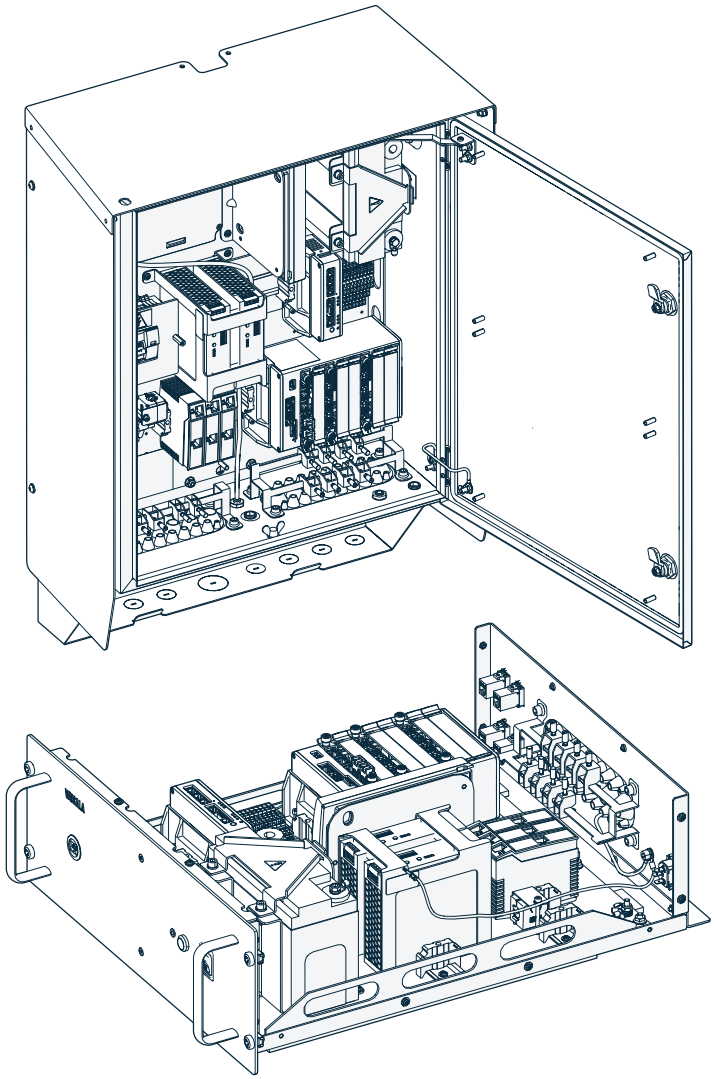


M213224EN-D

System Description

Vaisala Maritime Automatic Weather Station

AWS830



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Table of contents

1. About this document 7
1.1 Version information 7
1.2 Related manuals 7
1.3 Documentation conventions 9
1.4 Trademarks 9

2. Product overview 10
2.1 Vaisala Maritime Automatic Weather Station AWS830 10
2.1.1 AWS830 observations 10
2.1.2 AWS830 for HMS (Helideck Monitoring Systems) 12
2.1.3 Cybersecurity features in AWS830 design 12
2.1.4 Delivery and maintenance 13
2.2 Product and part names 13
2.3 Safety 14
2.3.1 Eye safety 18
2.3.2 ESD protection 19
2.3.3 UL/CSA C22.2 regulatory caution and warning statements 20

3. Physical structure and components 21
3.1 Vaisala Weather Station Enclosure ENC652 21
3.2 Rack enclosure 25
3.3 Vaisala Data Management Unit DMU801 27
3.4 DMU801 plug-in modules 28
3.4.1 Serial Modules DMS801 and DMS802 28
3.4.2 Analog Measurement Modules DMA801 and DMA803 30
3.4.3 Ethernet Switch Module DME801 31
3.4.4 Barometer Module DMB801 31
3.5 Powering the station 32
3.5.1 AWS830 isolation 33
3.5.2 AC (mains) power 34
3.5.3 AC/DC power supply unit 35
3.5.4 EMC filter for DC power 36
3.5.5 Vaisala Power Junction Box PJB480 37
3.5.6 Backup battery 38
3.5.7 Vaisala Battery Management Unit BMU801 39
3.6 Transient protection 40
3.6.1 Vaisala Surge Protection Unit QSP431 40
3.6.2 Surge protector for AC (mains) power 41
3.6.3 Surge protection for sensor interfaces 41
3.6.4 Vaisala TERMBOX 42
3.7 Communication devices 43
3.7.1 Fiber termination box 43
3.8 Display devices 44
3.8.1 DEIF weather or wind display 44
3.9 User interfaces 44
3.9.1 Vaisala Elements 45
3.9.2 Kaiku Web User Interface 46
3.9.3 Kaiku Designer 46

4. Sensors 49
4.1 Default sensors used in AWS830 for HMS 49
4.1.1 Vaisala HUMICAP Humidity and Temperature Probe HMP155 49
4.1.2 Vaisala WINDCAP Ultrasonic Wind Sensor WMT700 50
4.1.3 Vaisala BAROCAP Digital Barometer PTB330 51
4.1.4 Vaisala BAROCAP Pressure Module BARO-1 52
4.1.5 Vaisala Present Weather Detectors PWD12, PWD22, and PWD52 and Visibility Sensors PWD10, PWD20, and PWD50 53
4.1.6 Vaisala Ceilometer CL31 55
4.1.7 Motion reference units 56
4.2 Additional sensors 57
4.2.1 Vaisala Weather Transmitter WXT530 Series 58
4.2.2 Vaisala Ultrasonic Wind Sensor WM80 59
4.2.3 RADAC WaveGuide 5 series wave radars 60
4.2.4 ComNav G2 GPS satellite compass 60

5. Data reporting 62
5.1 Communication channels 62
5.2 Message formats 63
5.2.1 NMEA 0183 data message format 63
5.2.2 SMSAWS data message format 68

6. Technical data 72
6.1 AWS830 system specifications 72
6.1.1 AWS830 operating power consumption 77
6.1.2 AWS830 heating power consumption 78
6.2 DMU801 specifications 78
6.2.1 DMS801 specifications 81
6.2.2 DMS802 specifications 83
6.2.3 DMA801 specifications 84
6.2.4 DMA803 specifications 86
6.2.5 DME801 specifications 88
6.2.6 DMB801 specifications 90
6.3 Powering specifications 91
6.3.1 AC (mains) power supply specifications 91
6.3.2 PJB480 specifications 92
6.3.3 12 V / 13 Ah backup battery specifications 94
6.3.4 BMU801 specifications 95
6.4 Transient protection specifications 97
6.4.1 QSP431 specifications 97
6.4.2 Termbox specifications 99
6.5 Display device specifications 101
6.5.1 DEIF XDi-N display specifications 101
6.6 Sensor specifications 102
6.6.1 HMP155 specifications 102
6.6.2 WMT700 specifications 105
6.6.3 WM80 specifications 110
6.6.4 PTB330 specifications 114
6.6.5 PWD series specifications 117
6.6.6 CL31 specifications 123
6.6.7 WXT530 specifications 127

6.6.8 MRU Marine 3000 specifications.... 134
6.6.9 SMC-108 specifications.... 135
6.6.10 WaveGuide 5 series specifications.... 136
6.6.11 ComNav G2 specifications.... 137

7. Vaisala services.... 138
7.1 Service centers.... 138
7.2 Technical support.... 138
7.3 Warranty.... 138

Appendix A: AWS830 block diagram.... **140**

Appendix B: Observations.... **141**
B.1 Observations in SMSAWS data messages.... 141
B.2 WMO METAR codes for present weather.... 146
B.3 NWS codes for present weather.... 147
B.4 Air pressure tendency values.... 147

Appendix C: AWS830 Modbus register map.... **148**

Appendix D: Calculation formulas.... **151**
D.1 About calculation formulas.... 151
D.2 Dew point temperature calculation.... 151
D.3 Wet bulb temperature calculation.... 151
D.4 QFE pressure calculation.... 154
D.5 QFF pressure calculation.... 155
D.6 QNH pressure calculation (ICAO Doc 9837, second edition – 2011).... 156
D.7 Wind calculations.... 156
D.7.1 Wind speed average calculation.... 157
D.7.2 Wind direction average calculation.... 157
D.7.3 True wind calculation.... 160

Appendix E: Regulatory statements.... **162**
E.1 FCC/ISED regulatory notices.... 162
E.2 Korean conformity information.... 162

Index.... **164**

Open-source software (OSS).... **167**

Security support.... **167**

Recycling.... **167**

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1. About this document

1.1 Version information

This document describes Vaisala Maritime Automatic Weather Station AWS830.

Table 1 Document versions (English)

Document code	Date	Description
M213224EN-D	October 2026	The following changes have been made in Kaiku release 2.15: • Managing certificates is now possible through the Web UI (**Settings > Certificates**). You can assign a signed certificate to the web server, to enable web browsers to make a secure connection to DMU801. More use cases will be supported in future releases. • New stream-based architecture and components are available for applications. For monitoring data from stream components, there is a new **Stream console** view in the Web UI. AWS830 has received DNV type approval. Norwegian Subsea MRU Marine 3000 has been added to the offering. In addition, this manual has the following changes: • The corrected true wind calculation has been added to calculation formulas.
M213224EN-C	May 2026	Block diagram has been updated.
M213224EN-B	April 2026	Small changes to product specifications.

1.2 Related manuals



Some of these documents can be found in our product documentation portal at docs.vaisala.com.

Table 2 AWS830 manuals

Document code	Name
M213224EN	Vaisala Maritime Automatic Weather Station AWS830 System Description
M213225EN	*Vaisala Maritime Automatic Weather Station AWS830 Installation Guide*
M213226EN	*Vaisala Maritime Automatic Weather Station AWS830 Configuration and Maintenance Guide*

For third-party sensors and devices not listed in the following table, and for the latest product updates, see the manufacturer documentation.

Table 3 Other manuals

Document code	Name
M212436EN	Vaisala Data Management Unit DMU801 User Guide
M212407EN	Vaisala Kaiku Designer User Guide
M213151EN	Vaisala Kaiku Event Description
M213154EN	Vaisala Kaiku Device Management API Description
M213354EN	Vaisala Kaiku HTTPS Reports API Description
M213266EN	Vaisala Data Management Unit DMU801 Time Synchronization Management Guide
M212710EN	Vaisala Battery Management Unit BMU801 User Guide
M211786EN	Grounding and Lightning Protection in Vaisala Outdoor Installations Technical Reference
M210373EN	Vaisala Short Pole Mast DKP202, DKP203, DKP204, and DKP204W-CAMPOLE User Guide
M210310EN	Vaisala Termination Box TERMBOX-9000, 1200, 1212, 1222 User Guide
M212200EN	Vaisala Power Junction Box PJB480 Installation and Maintenance Guide
M210912EN	Vaisala HUMICAP® Humidity and Temperature Probe HMP155 User Guide
M211095EN	Vaisala WINDCAP® Ultrasonic Wind Sensor Series WMT700 User Guide
M212994EN	Vaisala Ultrasonic Wind Sensor WM80 Setup Guide
M212995EN	Vaisala Ultrasonic Wind Sensor WM80 User Guide
M210855EN	Vaisala BAROCAP® Digital Barometer PTB330 User Guide
M210482EN	Vaisala Ceilometer CL31 User Guide
M211840EN	Vaisala Weather Transmitter WXT530 Series User Guide
M210541EN	*Vaisala Visibility Sensor PWD10/20/50 User's Guide*
M210542EN	*Vaisala Present Weather Detector PWD12 User's Guide*
M210543EN	*Vaisala Present Weather Detector PWD22/52 User's Guide*
–	*Elements HMS Software User Guide*
–	*Ship Motion Control SMC IMU User Guide*
–	*Norwegian Subsea MRUs Product Description*
–	*WaveGuide 5 Series User Guides*
–	*ComNav G2 and G2B Satellite Compasses Installation and Operation Manual*

Table 4 Downloads

Code	Name	Download link
SW211572	Latest Kaiku firmware package	Kaiku firmware package

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Code	Name	Download link
SW211573	Latest Vaisala Kaiku Designer	Vaisala Kaiku Designer
DOC259983	AWS830 wiring diagrams package	AWS830 wiring diagrams

1.3 Documentation conventions

WARNING! Alerts you to a hazardous situation that, if not avoided, could result in death or serious injury.

CAUTION! Alerts you to a hazardous situation that, if not avoided, could result in minor or moderate injury.

NOTICE! Alerts you to a situation that, if not avoided, could result in the product to be damaged, or important data to be lost.

Highlights important information on using the product.

1.4 Trademarks

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2. Product overview

2.1 Vaisala Maritime Automatic Weather Station AWS830

Vaisala Maritime Automatic Weather Station AWS830 is a weather observation system specifically designed for the challenging marine environment. Typical installation locations are, for example, ships and offshore platforms.

AWS830 supports a variety of Vaisala and third-party sensors to measure all the needed weather and oceanographic parameters in maritime applications.

AWS830 main unit consists of an enclosure and its contents. There are two options for the enclosure:

- ENC652 for outdoor installation
- Rack enclosure for indoor installation

ENC652 can be installed on the wall or on a mast. The rack enclosure is mounted on an instrument rack in control rooms or vessel bridges.

All observation data from the sensors is collected and processed in DMU801 data management unit. To process the observation data, DMU801 performs advanced algorithm calculations. The internal data storage of DMU801 enables storing a large amount of data locally. An external SD memory card is also available for data storage.

Built-in algorithms are used to ensure data quality before sending the data forward. A testing system also continuously checks the hardware, reporting if a fault occurs.

AWS830 processes, displays, stores, and transmits weather data in the following formats:

- Standard NMEA 0183 format
- Vaisala SMSAWS data message
- Customer-specific formats

In addition, some sensors have proprietary message formats, which are also supported.

DMU801 enables integration with Vaisala Elements HMS (Helideck Monitoring System) and, on request, with external systems, such as third-party HMS.

2.1.1 AWS830 observations

With Vaisala and third-party sensors, AWS830 measures and calculates the following basic weather and oceanographic parameters:

- Wind speed and direction (relative wind, true wind)
- Atmospheric pressure (QFF, QFE, QNH pressure tendency)
- Air temperature and humidity (dew point)
- Cloud height
- Ship motion
- Present weather and visibility

Additional sensors can be installed to measure other parameters, such as wave height.

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The measurement data is transferred to and visualized in Vaisala Elements Helideck Monitoring Software or, optionally, customer systems.

The following figure shows the basic AWS830 system and sensors. Sensors marked with an asterisk (*) are typically included in the default AWS830 maritime application for helideck monitoring systems.

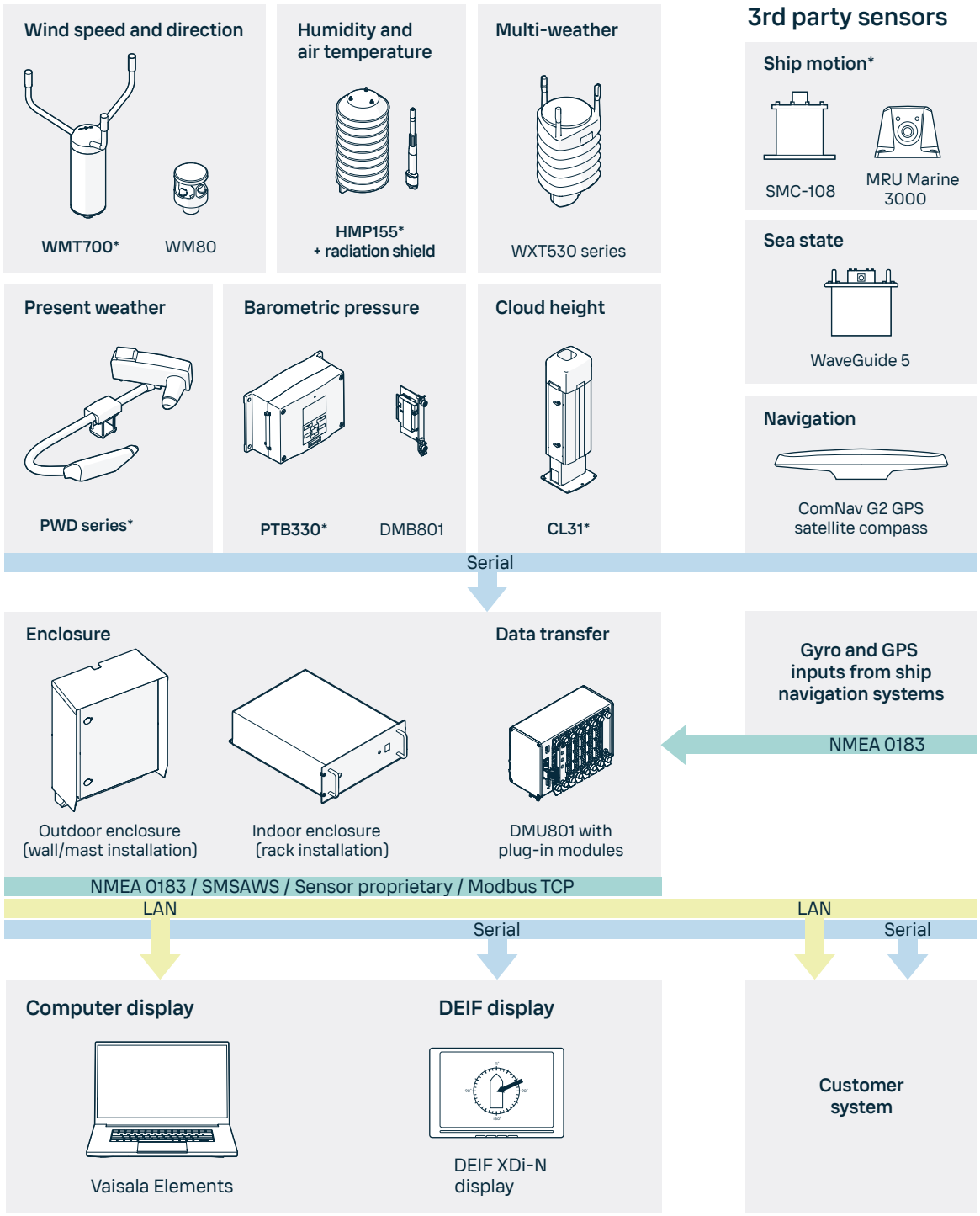


Figure 1 AWS830 system and sensors

2.1.2 AWS830 for HMS (Helideck Monitoring Systems)

The purpose of a Helideck Monitoring System is to ensure safe helicopter operations on offshore installations, vessels, and other facilities equipped with helidecks. Monitoring of weather conditions is important for pilots and helideck operators to be able to plan routes, improve safety, and minimize operational downtime. AWS830 provides all key weather and environmental parameters needed for the planning. A default AWS830 maritime application is available for Vaisala HMS and also other Helideck Monitoring Systems.

AWS830 complies with Civil Aviation Authority (CAA) CAP 437 and Helideck Certification Agency (HCA) standards, which regulate the design, operation, and certification of helidecks.

AWS830 for HMS typically includes the following components.

Sensors:

- Vaisala HUMICAP Humidity and Temperature Probe HMP155E
- Vaisala BAROCAP Digital Barometer PTB330
- 2 × wind sensors, either Vaisala WINDCAP Ultrasonic Wind Sensor WMT700 series or Vaisala Ultrasonic Wind Sensor WM80
- Vaisala Visibility and Present Weather Sensor PWD series
- Vaisala Ceilometer CL31
- Motion Reference Unit SMC-108 or MRU Marine 3000

Other components:

- Outdoor enclosure ENC652 or rack-mountable indoor enclosure that houses electrical components
- Vibration support inside the enclosure for relevant components
- DMU801 data management unit
- Cabling
- Power supply components: AC (mains) input, backup battery
- BMU801 battery management unit
- Installation and mounting accessories

2.1.3 Cybersecurity features in AWS830 design

AWS830 has been designed following the industry best practices for secure product development. The development process complies with the requirements in the IEC 62443-4-1 cybersecurity standard.

AWS830 has a number of features to ensure data security and protection against cyber threats, for example:

- Secure network protocols
- Secure communication interfaces with industry standard encryption protocols, for example TLS (Transport Layer Security) between AWS830 and Vaisala Elements
- Dynamic firewall protection
- Systematic user management to prevent unauthorized access
- Secure HTTPS reporting API for polling SMSAWS messages and other data from the system
- Regular firmware updates for continuous improvements

AWS830 is also type-tested against Denial of Service (DoS) attacks and network storms.

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2.1.4 Delivery and maintenance

The weather station requires only a minimal amount of regular maintenance and can be trusted to perform effectively in all weather conditions and climates. The modular design allows easy integration of additional sensors and quick replacement of individual components, reducing downtime and overall operating cost.

Vaisala offers a variety of services related to weather stations, for example:

- Project management for custom projects
- Factory acceptance test (FAT)
- Installation
- Preventive maintenance
- Training

Additional services, such as extended warranty and express spare part delivery are available on request. For more details and an up-to-date listing of the current offering, contact Vaisala.

More information

▸ Service centers (page 138)

2.2 Product and part names

Table 5 System components

Item	Name
AWS830	Vaisala Maritime Automatic Weather Station
ENC652	Vaisala Weather Station Enclosure
DMU801	Vaisala Data Management Unit
DMB801	Vaisala Barometer Module
DME801	Vaisala Ethernet Switch Module
DMS801 DMS802	Vaisala Serial Module
DMA801 DMA803	Vaisala Analog Measurement Module
BMU801	Vaisala Battery Management Unit
Termbox	Vaisala Termination Box
DEIF display	Weather and/or Wind Display
Vaisala Elements	Vaisala software for Helideck Monitoring System (HMS)
Vaisala Kaiku	Operating system and software platform running on DMU801
Kaiku Web UI	Web user interface for service connection between computer and DMU801

Item	Name
Kaiku Designer	Vaisala software for designing and modifying the application

Table 6 Sensors

Item	Name
HMP155E	Vaisala HUMICAP Humidity and Temperature Probe
PTB330	Vaisala BAROCAP Digital Barometer
WMT700	Vaisala WINDCAP Ultrasonic Wind Sensor
WM80	Vaisala Ultrasonic Wind Sensor
SMC-108	Ship Motion Control Motion Reference Unit
MRU Marine 3000	Norwegian Subsea Motion Reference Unit Marine 3000
PWD	Vaisala Visibility and Present Weather Sensor
CL31	Vaisala Ceilometer
WXT530	Vaisala Weather Transmitter
WaveGuide 5	RADAC Wave Radar
ComNav G2	ComNav GPS Satellite Compass

2.3 Safety

This product has been type-tested for safety and approved as shipped from the factory.

Note the following warning labels on the product:



WARNING! Electricity hazard



WARNING! Replacing the battery with an incorrect type of battery may result in serious injury. Always use the correct type of battery.



WARNING! Use Cu cable with operating temperature over +70 °C.

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WARNING! The system is powered from several power sources to ensure uninterrupted service. To make the system non-energized, disconnect all power sources.



Protective ground.

Note the following precautions:



Only a skilled or instructed person may install, operate, and service the device or system.
Skilled person = Persons with relevant education or experience to enable them to identify hazards and to take appropriate actions to reduce the risks of injury to themselves and others.
Instructed person = Persons instructed or supervised by a skilled person as to energy sources and who can responsibly use equipment safeguards and precautionary safeguards with respect to those energy sources.



CAUTION! Lifting hazard
The enclosure is heavy and contains sensitive equipment. Installing the enclosure alone can result in injury and damage the product. Safe installation requires at least 2 people.



WARNING! Electricity hazard
Failure to provide proper grounding can result in injury or death from electric shock and can severely damage the product. Ground the product and verify the grounding periodically.



WARNING! Electricity hazard
Lightning strikes and lightning-induced current surges can result in injury or death and damage the device or system. Ground the device or system properly, including any remote units, and install lightning protection.



WARNING! Electricity hazard
Lightning strikes can result in injury or death. Do not perform installation or maintenance procedures when there is a risk of thunderstorm or lightning in the area.



WARNING! Electricity hazard
Dangerous voltages can exist in disconnected circuits and cause electric shock when touched. Always disconnect power and discharge circuits before touching them.



WARNING! Electricity hazard
Handling energized wires can cause electric shock. Prepare or connect only de-energized wires.



WARNING! Electricity hazard
Replacing components when the system is powered up can result in injury. Always disconnect all power sources before servicing the system.



WARNING! Electricity hazard
Touching parts and assemblies that are AC (mains) powered and live can cause electric shock. Only service a powered-up system with someone who can provide first aid.



WARNING! Electricity hazard
Incorrect electrical installation can cause serious injury or death. Only licensed experts may install electrical components.



CAUTION! Hot surface hazard
Touching heated devices may cause injury. Do not touch heated parts when heating is on.



WARNING! Combustion hazard
Operating electrical equipment in an explosive atmosphere, for example, when flammable gases or fumes are present, may start a fire or cause an explosion. Do not operate electrical equipment in such an environment.



WARNING! Crushing hazard
Falling ice or snow may cause injury. Do not stand next to the mast when ice or snow has accumulated on the mast, guy wires, or sensors.

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NOTICE! Incorrect wiring can cause damage and prevent or limit operation. Do not damage or change the wiring.

Failure to comply with the warnings and cautions in these instructions violates safety standards of design, manufacture, and intended use of the product. Vaisala assumes no liability for the failure to comply with these requirements.



Wear protective eyewear, gloves, safety helmet, and safety shoes during installation and maintenance work.

If any instructions in this document conflict with your local or state legislation or regulations, always follow the local or state legislation or regulations.

Follow local and state legislation and regulations on occupational safety.

Consult local authorities and electricity professionals on decisions that relate to grounding, lightning protection, safe installation, and power supply.

The assembler is responsible for the safety of the system into which the device is integrated.

If the product is used in a manner not specified by Vaisala, the protection provided by the product may be impaired. Follow the instructions.

Only qualified maintenance personnel may perform maintenance procedures.

Make sure that unauthorized persons cannot access the work area during maintenance procedures.

CAUTION! Modification of the product can result in injury or damage the product. Do not modify the product or substitute parts unless instructed to do so. Improper modification voids your warranty.

CAUTION! Using components that do not meet Vaisala specifications can result in injury or damage the product. Use only accessories and spare parts that meet the specifications.

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2.3.1 Eye safety

CAUTION! Laser beam hazard
Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

With SFP modules, this device is classified as Class 1 laser device in accordance with EN 60825-1:2014.

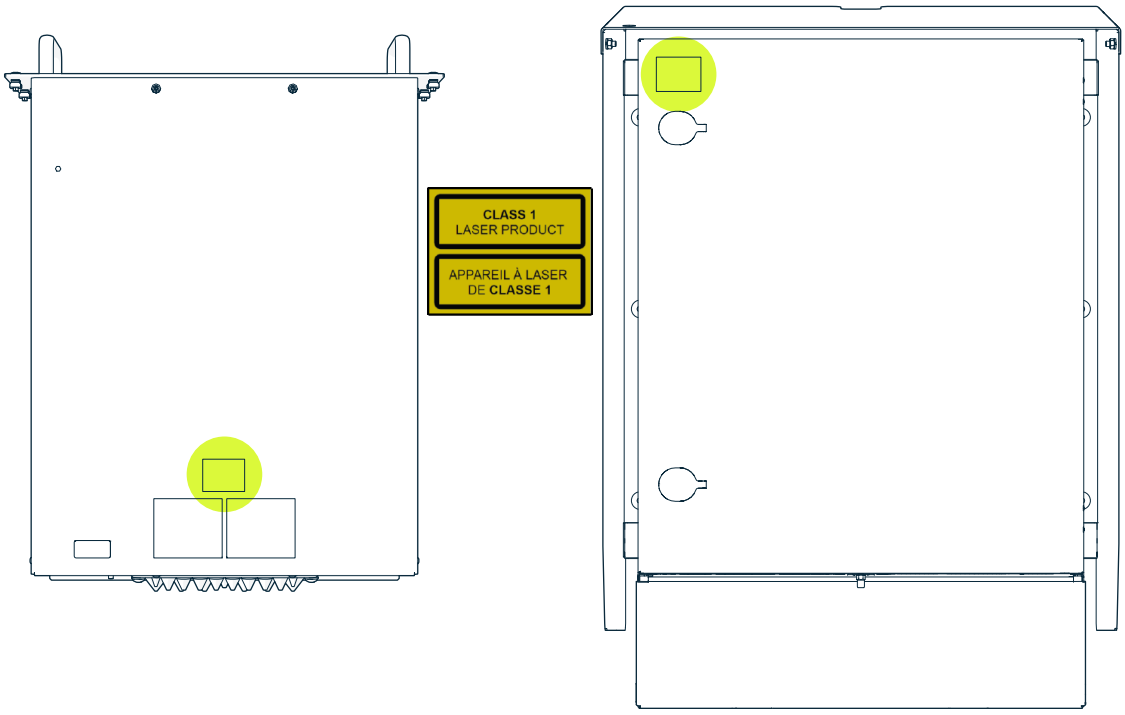


Figure 2 Location of laser warning label in rack enclosure and ENC652

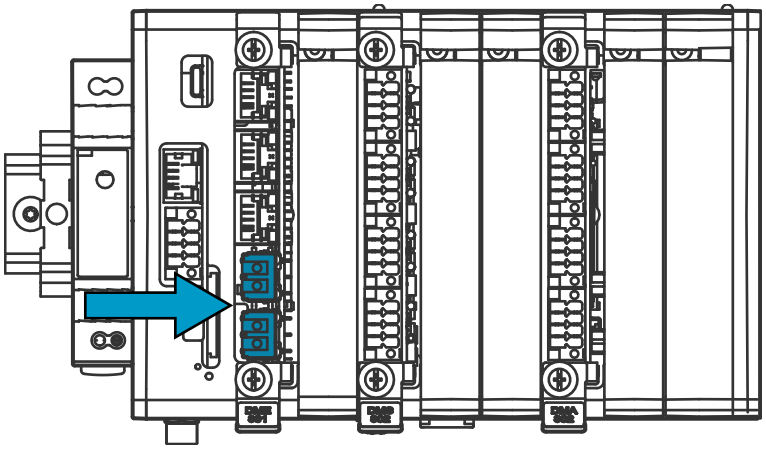


Figure 3 SFP modules in DME801 plug-in module in DMU801

When a connector is removed during installation, testing, or servicing, or when an energized fiber is broken, a risk of ocular exposure to optical energy that may be potentially hazardous occurs, depending on the laser output power. The primary hazards of exposure to laser radiation from an optical-fiber system are:

- Damage to the eye by accidental exposure to a beam emitted by a laser source
- Damage to the eye from viewing a connector attached to a broken fiber or an energized fiber

CAUTION! Laser beam hazard
Visible and invisible laser radiation when open. Staring into the beam or viewing the beam directly with optical instruments (for example, telescopes or binoculars) may result in an eye injury or blindness. Do not stare into the beam or point the beam at other people.

CAUTION! Laser beam hazard
Never attempt to check the functionality by viewing optical connectors that may be emitting laser energy. Do not power up the laser product without connecting the laser to the optical fiber and putting the cover in position, as laser outputs emit infrared laser light at this point.

2.3.2 ESD protection

Electrostatic discharge (ESD) can damage electronic circuits. Vaisala products are adequately protected against ESD for their intended use. However, it is possible to damage the product by delivering electrostatic discharges when touching, removing, or inserting any objects in the equipment housing.

To avoid delivering high static voltages to the product:

- Handle ESD-sensitive components on a properly grounded and protected ESD workbench or by grounding yourself to the equipment chassis with a wrist strap and a resistive connection cord.
- If you are unable to take either precaution, touch a conductive part of the equipment chassis with your other hand before touching ESD-sensitive components.
- Hold component boards by the edges and avoid touching component contacts.

2.3.3 UL/CSA C22.2 regulatory caution and warning statements

Note the following warning labels on the product:

Notez l'étiquette d'avertissement suivante sur le produit :



WARNING! The system is powered from several power sources to ensure uninterrupted service. To make the system non-energized, disconnect all power sources.
AVERTISSEMENT ! Le système est alimenté par plusieurs sources de courant afin de garantir un service ininterrompu. Pour mettre le système hors tension, déconnectez toutes les sources d'alimentation.



WARNING! Use Cu cable with operating temperature over +70 °C.
AVERTISSEMENT ! Utiliser un câble Cu avec une température de fonctionnement supérieure à +70 °C.

3. Physical structure and components

3.1 Vaisala Weather Station Enclosure ENC652

Enclosure ENC652 houses the DMU801 data management unit and other system components, including internal wiring.

The enclosure is stainless steel and has IP66 rating. It is intended for outdoor use. The enclosure can be installed on the wall or on a mast (wall installation is recommended in vibrating environments). A cabling box at the bottom of the enclosure protects the cable connections from vandalism and other external disturbances. There are 2 flanges for cable feed-through at the bottom of the enclosure.

There are two layout options available of the ENC652 enclosure, depending on the AWS830 powering choice (AC or DC powering). The following figures illustrate components inside the enclosure. Some of the components are optional.

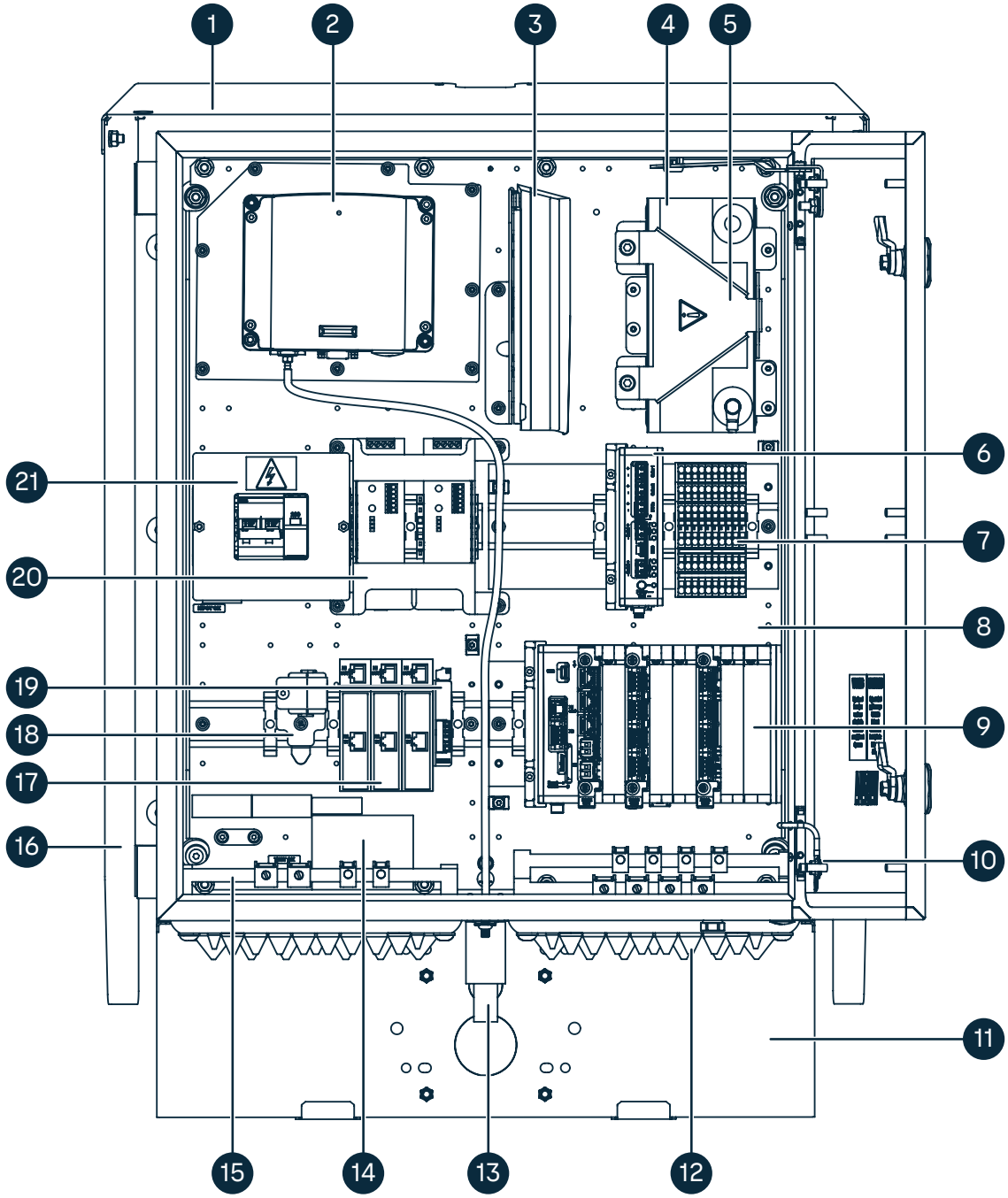


Figure 4 Main components of AC-powered AWS830 inside ENC652

1 Enclosure ENC652
2 Digital barometer PTB330
3 Fiber termination box
4 Backup battery 12 V / 13 Ah
5 Battery holder
6 Battery management unit BMU801
7 DC terminal block assembly
8 Backplate

9 Data management unit DMU801
10 Door switch
11 Cabling box
12 Rubber or stainless steel flange (2 pcs)
13 Pressure port
14 Type label
15 Sensor grounding rail
16 Radiation shield
17 Ethernet surge protector (0–3 pcs, depending on configuration)
18 Ferrite
19 Surge protection unit QSP431 (optional, depending on configuration)
20 AC/DC power supply 5 A (× 2)
21 AC (mains) input assembly

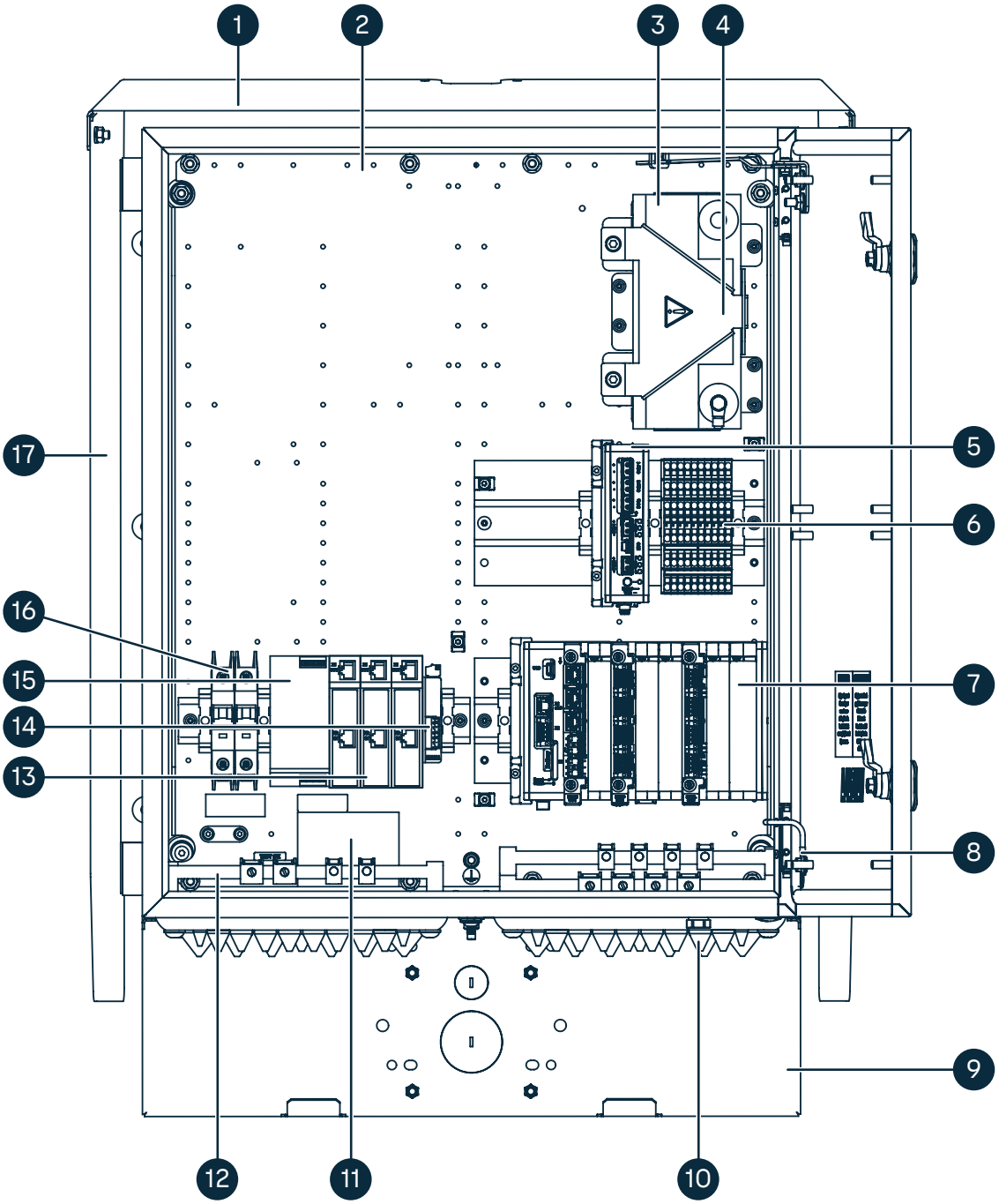


Figure 5 Main components of DC-powered AWS830 inside ENC652 (the optional PTB330 and fiber termination box are not shown)

1 Enclosure ENC652
2 Backplate
3 Battery
4 Battery holder
5 Battery management unit BMU801
6 DC terminal block assembly
7 Data management unit DMU801

8 Door switch
9 Cabling box
10 Rubber or stainless steel flange (2 pcs)
11 Type label
12 Sensor grounding rail
13 Ethernet surge protector (0–3 pcs, depending on configuration)
14 Surge protection unit QSP431 (optional, depending on configuration)
15 EMC filter
16 Circuit breaker for external DC
17 Radiation shield

More information

- AWS830 system specifications (page 72)

3.2 Rack enclosure

The 19” rack enclosure (indoor use only) is an alternative to the outdoor electronics enclosure. It can be mounted on an instrument rack in control rooms or vessel bridges. The rack enclosure houses DMU801 data management unit, backup battery and power supply, BMU801 battery management unit, as well as the (optional) communication devices and a terminal strip for cable connections.

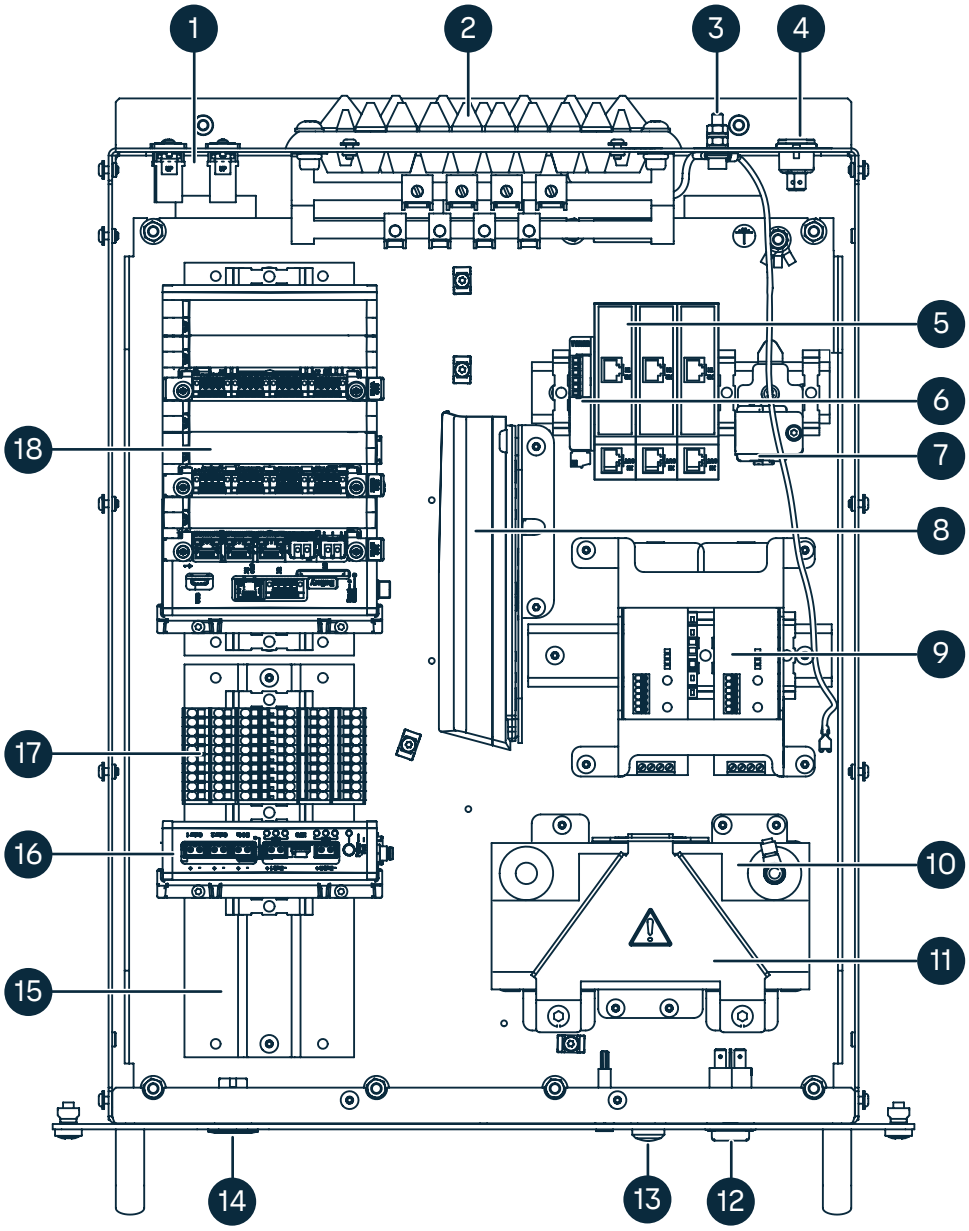


Figure 6 AWS830 main components inside rack enclosure

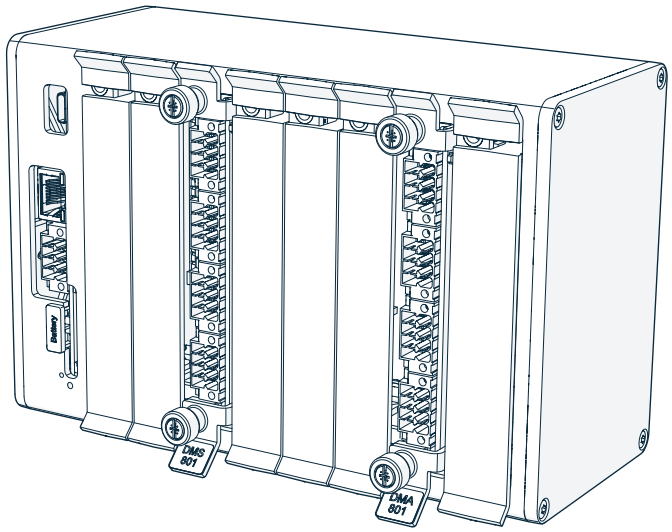
1 Ethernet outlet (× 4)
2 Rubber flange
3 Grounding point
4 AC (mains) input
5 Ethernet surge protector (0–3 pcs, depending on configuration)
6 Surge protection unit QSP431 (optional, depending on configuration)
7 Ferrite
8 Fiber termination box
9 AC/DC power supply 5 A (× 2)
10 Backup battery 12 V / 13 Ah
11 Battery holder
12 AC (mains) circuit breaker (used as AC power switch)

13 System power on/off button
14 USB-C service port
15 Isolation plate
16 Battery management unit BMU801
17 DC terminal block assembly
18 Data management unit DMU801

More information

- AWS830 system specifications (page 72)

3.3 Vaisala Data Management Unit DMU801



DMU801 collects and processes data from the sensors as defined in the application. To process the observation data, DMU801 performs advanced algorithm calculations. In addition, DMU801 validates sensor data accuracy using preconfigured criteria before sending the data forward. DMU801 also manages internal diagnostics of the system and reports the system status through a configurable reporting interface.

The sensors are connected to DMU801 through plug-in modules. DMU801 controls the power of the sensors and provides heating power through a separate connector.

DMU801 has an embedded web server through which observation data, sensor status, and many DMU801 maintenance functions can be managed. Information can be viewed and managed through a browser-based graphical user interface, the Kaiku Web UI.

DMU801 has an 8 GB internal eMMc Flash memory, of which 4 GB can be used for data logging. The logging capability can be extended with an external SD memory card. The data is logged in daily files, which makes it easy to locate any particular data set for further analysis. DMU801 supports SD cards of up to 32 GB.

More information

- DMU801 specifications (page 78)

3.4 DMU801 plug-in modules

DMU801 houses the plug-in modules that provide connections to the sensors. To safeguard the system and sensors from external power surges, analog and serial modules (DMA80X and DMS80X) have internal surge protection.

For Ethernet Switch Module (DME801), Vaisala recommends external surge protection when devices connected to it are located outside the weather station enclosure.

All the printed circuit boards (PCB) in the modules have conformal coating for better humidity resistance.

Table 7 DMU801 plug-in module types

Plug-in module type	Purpose
Serial Modules DMS801 and DMS802	Provide ports for sensors with serial interface.
Analog Measurement Modules DMA801 and DMA803	Add analog channels and convert the analog data into digital format.
Ethernet Switch Module DME801	Adds Ethernet connections.
Barometer Module DMB801	Includes a Class A calibrated barometer.

The number and type of plug-in modules in the installation depend on the application. Typically, DMU801 is delivered with plug-in modules installed but the modules are also available as spare parts and can be plugged in later to expand the selection of sensor interfaces. The plug-in modules have handles for easy installation.

The sensor cables are connected to the plug-in modules with lockable spring-cage connectors.

3.4.1 Serial Modules DMS801 and DMS802

DMS801 and DMS802 serial modules extend the number of serial ports in DMU801. Each module provides interfaces for 4 additional sensors. Depending on the size of your DMU801, it is possible to add up to 8 serial modules to the system.

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Table 8 DMS801 ports

Plug-in module	Port	Description
DMS801	RS-485 port (× 3)	Isolated
	Multipurpose port (× 1)	Support for 2-wire RS-485, RS-232, and SDI-12 connections.

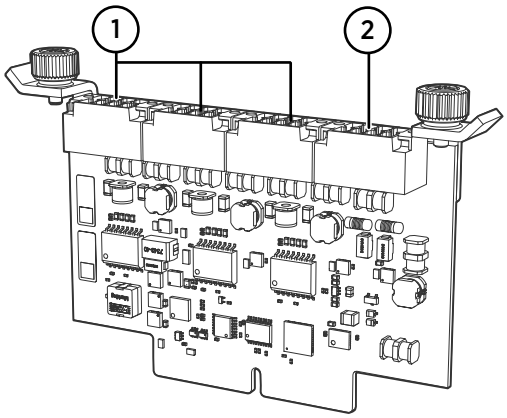


Figure 7 Serial Module DMS801

1 Isolated RS-485 port (3 pcs)
2 Multipurpose port

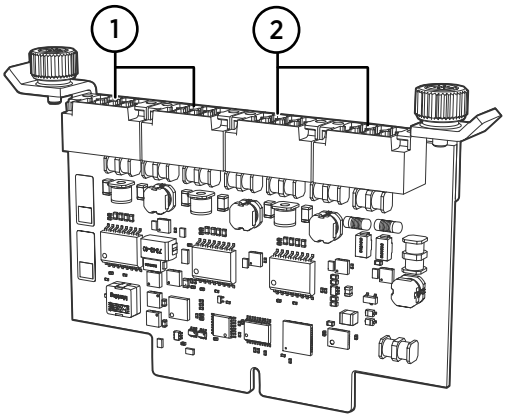


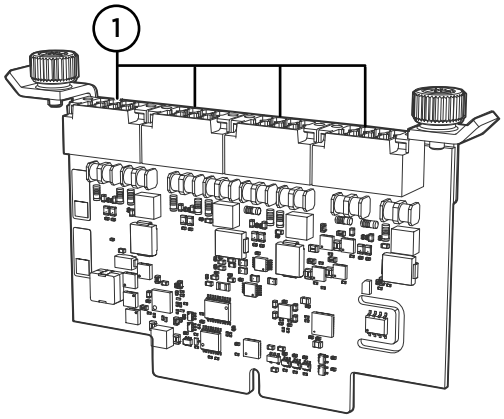
Figure 8 Serial Module DMS802

1 Standard RS-232 port (2 pcs)
2 Multipurpose port (2 pcs)

More information

- DMS801 specifications (page 81)
- DMS802 specifications (page 83)

3.4.2 Analog Measurement Modules DMA801 and DMA803



1 Analog input (4 pcs)

Many sensors for measuring temperature, pressure, and solar radiation have analog interfaces. DMA801 and DMA803 provide analog channels and convert the analog data into digital format for DMU801.

The analog inputs support Pt100, Pt1000, NTC thermistor, and voltage-out sensors such as pyranometers.

Each analog measurement module includes:

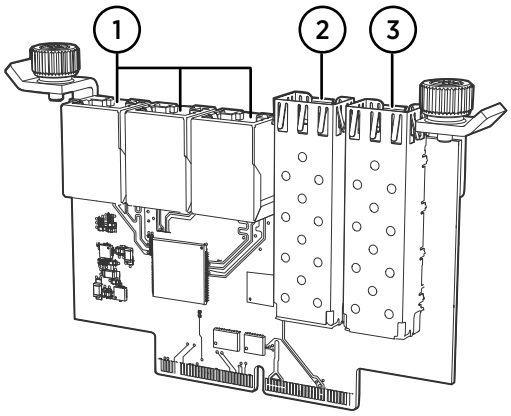
- 4 differential analog channels
- 2 additional single-ended high voltage channels
- 2 counter/frequency measurement channels

Depending on the size of DMU801, it is possible to add up to 8 analog measurement modules to DMU801.

More information

- DMA801 specifications (page 84)
- DMA803 specifications (page 86)

3.4.3 Ethernet Switch Module DME801



1 Gigabit copper port (3 pcs)
2 SFP module slot (default)
3 SFP module slot (not all firmware versions support this slot)

DME801 adds 5 Ethernet connections to DMU801. Its 1 Gb Ethernet connectors include 3 copper ports and 2 slots for fiber optic SFP module.

The small form-factor pluggable (SFP) is a compact, hot-pluggable transceiver used for data communications applications. SFP interfaces a switch to a fiber-optic or copper networking cable. SFP type depends on delivery specifications and on the type of the fiber.

DMU801 base unit has an Ethernet interface (port **X1 eth0**), too. If you need an additional Ethernet connection, use DME801.

More information

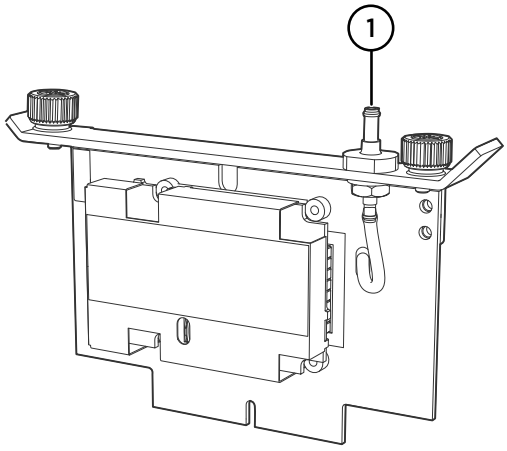
▸ DME801 specifications (page 88)

3.4.4 Barometer Module DMB801

DMB801 is a barometer carrier for BARO-1 barometer module.

DMB801 uses the capacitive Vaisala BAROCAP sensor and features barometric pressure measurement for DMU801 calculation and additional pressure calculations (QFF, QFE, and QNH). The module includes a self-diagnostics feature.

The observation range of DMB801 module is 500–1100 hPa and its accuracy is ±0.15 hPa.



1 Barometer pressure port

More information

- Vaisala BAROCAP Pressure Module BARO-1 (page 52)
- DMB801 specifications (page 90)

3.5 Powering the station

The weather station accepts power from the following alternative power supply sources:

- AC (mains) power 100–240 V AC, max. 6.8 A, 50/60 Hz
- External DC supply 22 V DC nominal (−10 ... +30 %), typical operating voltage 24 V DC, max. 10 A
- Internal backup battery 12 V DC / 13 Ah

The ENC652 enclosure (outdoor) is available as DC or AC (mains) -powered option. The rack enclosure (indoor) is AC-powered.

The system power is controlled by battery management unit BMU801. The battery management unit supplies power to the system when available from the backup batteries, AC (mains) connection, or external DC input. The battery management unit keeps the backup batteries fully charged and provides uninterrupted operating power, even during a power break in external supplies.

BMU801 powers the following:

- DMU801 data management unit
- Optional communication devices
- The power terminal strips that are used to distribute the operating and heating power to the sensors connected to the system

The following components require an external AC (mains) or DC power supply (not included in the Vaisala delivery):

- Vaisala Power Junction Box PJB480 (used with heated wind sensors)
- RADAC WaveGuide 5 (Height & Tide and Height & Tide & Direction)
- DEIF XDi-N display

3.5.1 AWS830 isolation

Isolation refers to the intentional separation of two electrical circuits so that there is no direct electrical connection between them. The ways to achieve isolation in maritime installations include:

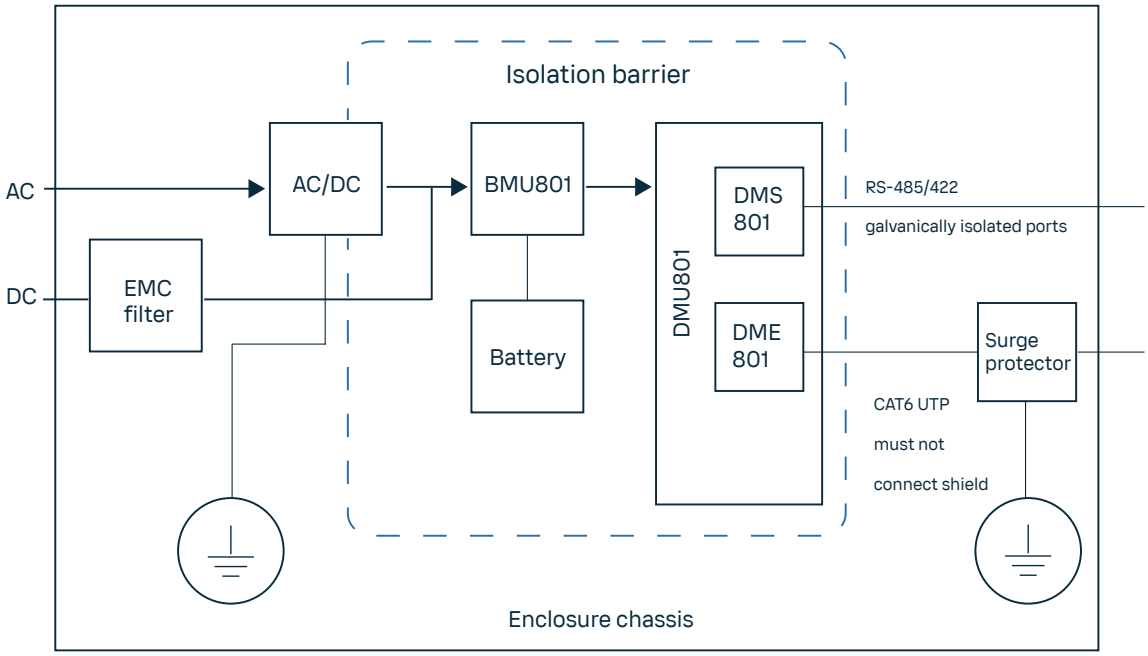
- Transformers for AC supply networks
- Galvanic signal isolators
- Fiber optics
- Isolated switch mode power supplies

The classification rules for ship's electrical installations prohibit using the ship's hull as the return conductor for power distribution systems (*DNV-RU-SHIP Pt.4 Ch.8. Edition July 2024*).

Any DC supply circuit may be grounded only at the power source, to prevent ground loops and fault currents, and to prevent electrochemical reactions that degrade the hull or fittings.

IEC 60945 (*Maritime navigation and radiocommunication equipment and systems – General Requirements*) Chapter 6.4 *Inter-unit connection* calls for arrangement to sustain a 1 kV isolation between EUT (Equipment Under Test) and connected units.

AWS830 is typically supplied using the built-in AC/DC converter, which provides isolation primarily for electrical safety, being also sufficient for ship installation requirements. However, when using AWS830 with DC supply, you must provide a way to prevent accidental shorting of isolation barrier to the ship's hull.



3.5.2 AC (mains) power

The AC power is brought into the weather station enclosure through the flange at the bottom of the enclosure and through the strain relief to the mains input assembly.

The ready-made mains input assembly includes all the components that are required by electric safety regulations. The assembly protects the whole system against:

- Overcurrent
- Voltage surges

The mains input assembly for the weather station is mounted on a DIN rail.

To enable switching off AC power, you must install a disconnecting device outside the enclosure.

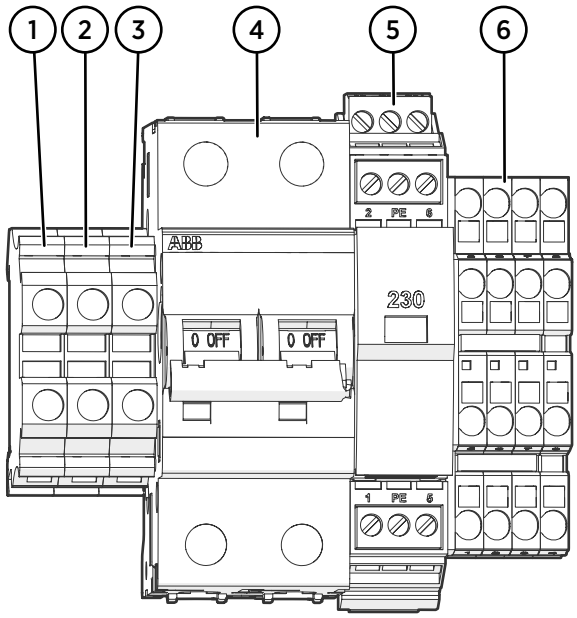
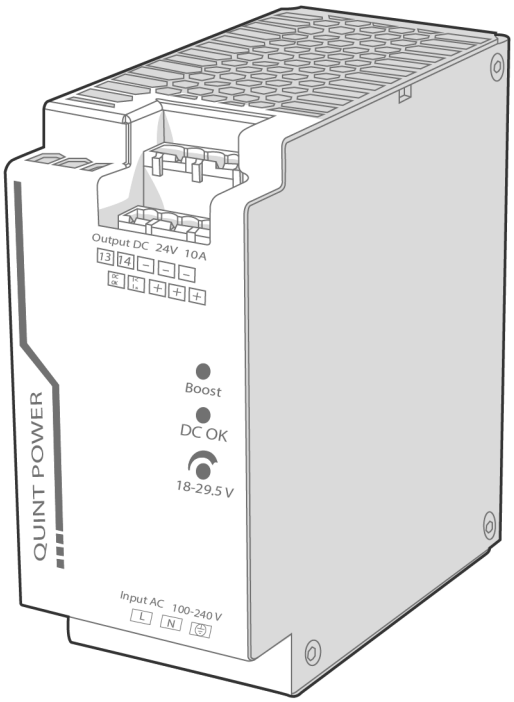


Figure 9 AC (mains) input components

1 Protective ground terminal (yellow-green). Protects against electric shock in case of a fault.
2 Phase terminal (gray)
3 Neutral terminal (blue)
4 Miniature curve B, 10 A circuit breaker. Protects against overcurrent (up to 6 kA).
5 Surge protector. Protects against overvoltage (between **L** and **N** ≤ 1.25 kV, between **L**/**N** and **PE** ≤ 1.4 kV) from AC power line (up to 10 kA, 5kA nominal). Rated voltage: 264 V AC.
6 Mains terminal strip. Connected to AC/DC power supply.

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3.5.3 AC/DC power supply unit



A standard AWS830 includes two AC/DC power supply units, which together have an output power of 240 W. The power supply unit has been specified and tested to suit operation in harsh environments, even as cold as −40 °C (−40 °F). The unit operates from the universal AC (mains) input between 100–240 V AC and 50/60 Hz. The output voltage is adjustable, and set to 24 V DC in the factory.

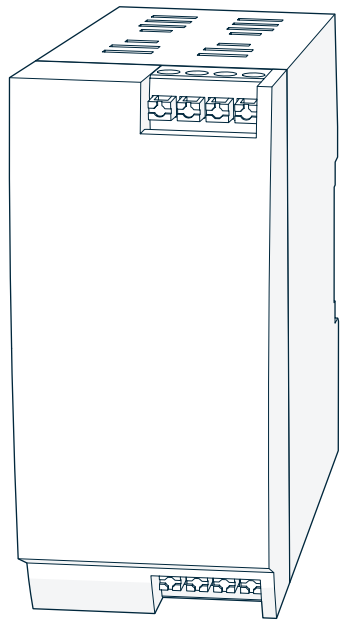
The power supply unit has power factor correction and short-circuit protection. Most of the output power reserve is intended to be used for supplying measurement electronics and charging internal backup battery, and also for sensor heating. If you have sensor with more extensive heating needs, such as arm-and-transducers heated version of WMT700, you need an additional power junction box.

Both the AC (mains) input and the DC output are equipped with overvoltage protection.

More information

- AC (mains) power supply specifications (page 91)

3.5.4 EMC filter for DC power

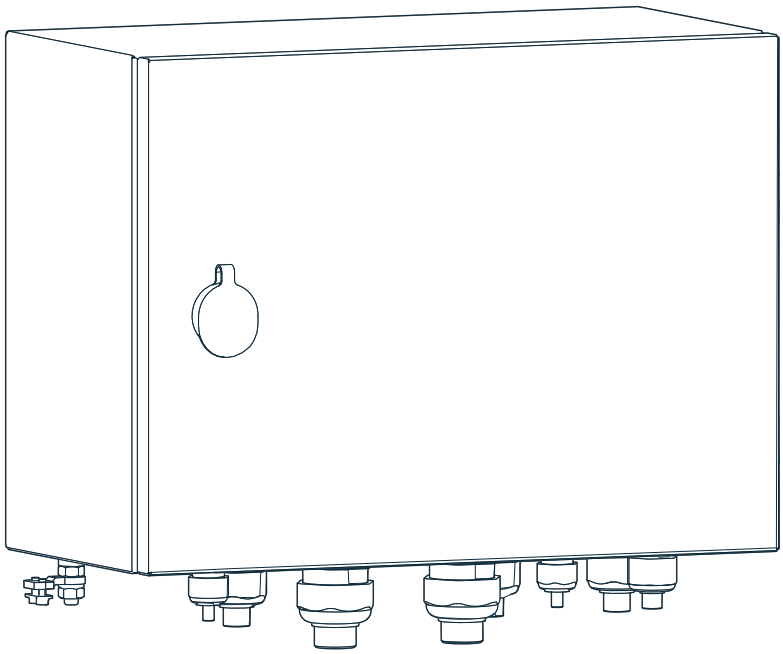


An EMC (Electromagnetic Compatibility) filter for power input suppresses unwanted noise and interference to both directions, from power line to system and the other way around. It blocks high-frequency conducted interference while allowing DC voltage to pass through.

The filter is included in the DC-powered weather station option.

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3.5.5 Vaisala Power Junction Box PJB480



Vaisala Power Junction Box PJB480 provides operational and heating power to Vaisala ultrasonic wind sensors WMT700 and WM80. PJB480 is designed for demanding conditions, such as maritime use and cold climates.

PJB480 is equipped with two 24 V DC power supplies and has the maximum output power of 480 W. It provides power for keeping the wind sensors operational and heated, thus preventing build-up of ice and snow. With PJB480, wind sensors can be fully heated to keep the sensors functional in the harshest and coldest environments.

Typically, you need one PJB480 per each WM80 (fully heated or transducers-heated) or WMT700 (fully heated or transducers-and-arms-heated). Only if you install two transducers-heated WM80 sensors near each other, you can connect them to the same PJB480.

More information

- PJB480 specifications (page 92)

3.5.6 Backup battery

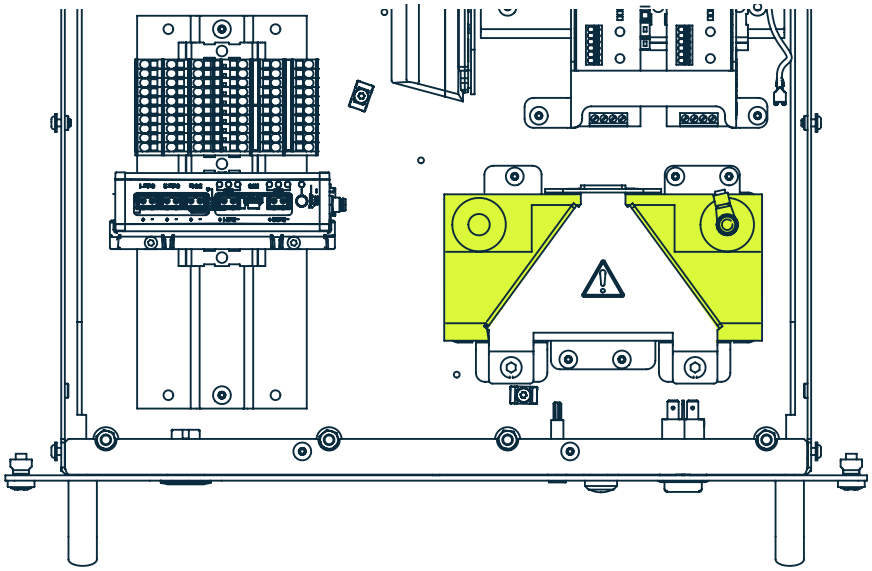


Figure 10 Backup battery in rack enclosure

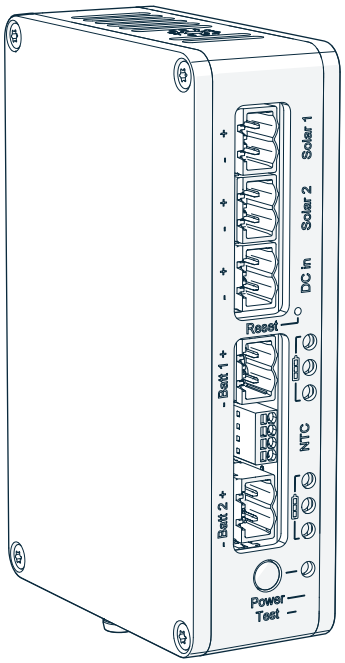
For reliable system operation, the system requires an internal battery. The backup battery is housed inside the weather station enclosure. In case of power failure or outage, the backup battery continues to supply power to the weather station electronics.

Battery management unit BMU801 monitors the backup battery and keeps it charged. When the station runs on battery power, sensor heating is disabled. When battery power runs out, the system powers down.

More information

- 12 V / 13 Ah backup battery specifications (page 94)

3.5.7 Vaisala Battery Management Unit BMU801



BMU801 is a smart battery management unit for charging and monitoring batteries. It supports 12 V valve-regulated lead-acid (VRLA) batteries. The correct battery capacity (2.4 Ah for AWS830) is configured using a rotary switch. BMU801 provides full battery status identification for the battery.

BMU801 also has a Modbus communication interface for additional parameter settings. With Modbus interface you can, for example, select the battery size more accurately and control charging parameters.

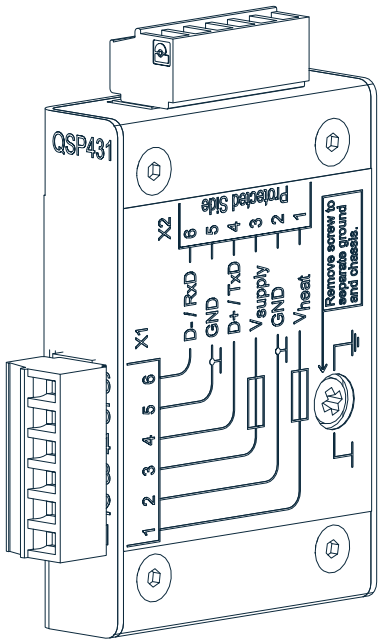
Together with AC/DC power supply unit, BMU801 makes a modular uninterruptible power supply (UPS). In case the input power to the system fails, BMU801 automatically switches to the backup battery and continues feeding power without any interruptions on the output line.

More information

- BMU801 specifications (page 95)

3.6 Transient protection

3.6.1 Vaisala Surge Protection Unit QSP431



QSP431 is a general-purpose composite device that provides heavy-duty protection for intelligent sensor interfaces. QSP431 has detachable plug connectors and is installed on a DIN rail.

QSP431 efficiently protects all signal lines that are used to connect serial sensors. These signal lines include the following:

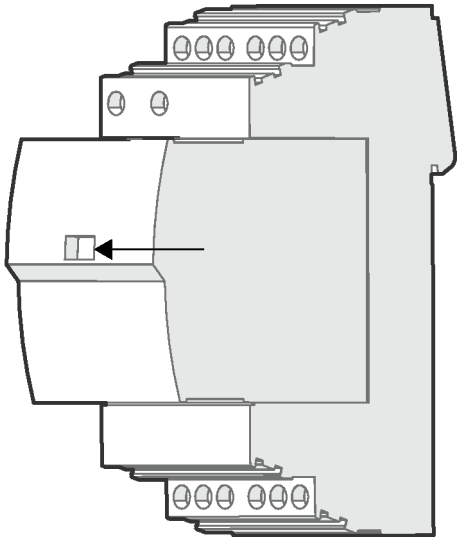
- Separate operating and heating voltage supplies
- RS-485 or RS-232 serial communication lines

QSP431 is added to the weather station if the system includes a PWD series sensor.

More information

▸ QSP431 specifications (page 97)

3.6.2 Surge protector for AC (mains) power



The surge protector for AC (mains) power input consists of a base socket and a removable plug. The LED indicator (shown with an arrow in the preceding figure) displays the status of the plug. If the indicator is green, the plug functions normally. If the indicator is red, the plug is broken and must be replaced with a new one.

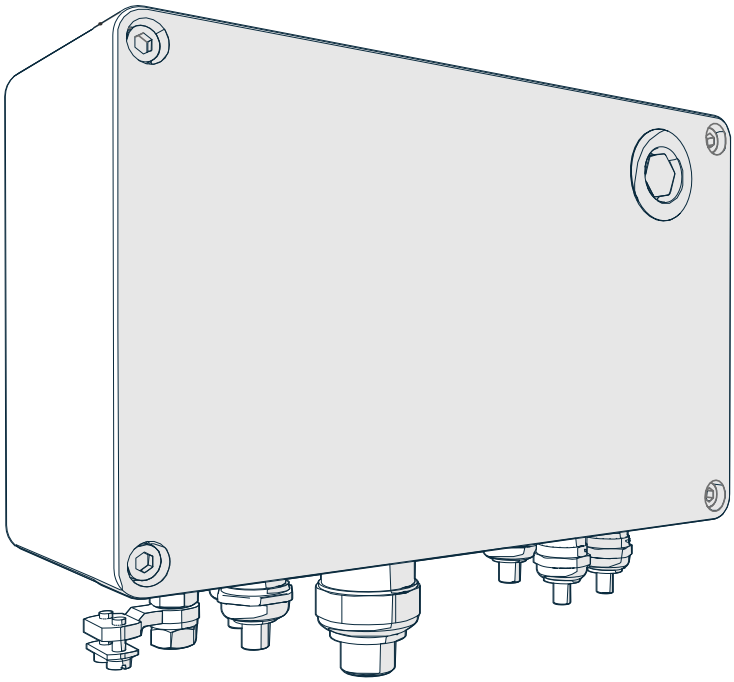
The surge protector is part of the AC (mains) input assembly.

3.6.3 Surge protection for sensor interfaces

DMS80X plug-in modules, which provide serial connection to sensors, have internal surge protection (up to 3 kA) to protect the serial interfaces. DMS801 plug-in modules are attached to DMU801 data management unit.

DMU801 base unit serial connectors **X2**, **X3**, and **X5** do not have strong surge protection. Vaisala recommends external surge protection when using DMU801 base unit serial ports for connecting sensors or other devices that are located outside the weather station enclosure. If the connected device is inside the enclosure, no extra surge protection is needed.

3.6.4 Vaisala TERMBOX



Vaisala Termbox is used when the weather station includes Vaisala Ceilometer CL31.

AWS830 uses TERMBOX-1200 that has one 12 V signal line protector.

Termbox acts as the connection point and surge protector device for AC (mains) power and signal line cables. The maximum diameter for an AC (mains) power cable inside the termination box is 25 mm (0.98 in). The connector contacts are suitable for cable leads up to 10 mm^2 (7 AWG).

Termbox offers connection points and surge protectors for up to 2 signal lines. Surge protectors are available for the following signal line types:

- Leased-line modem
- RS-485
- RS-232C
- Local operating network (LON)

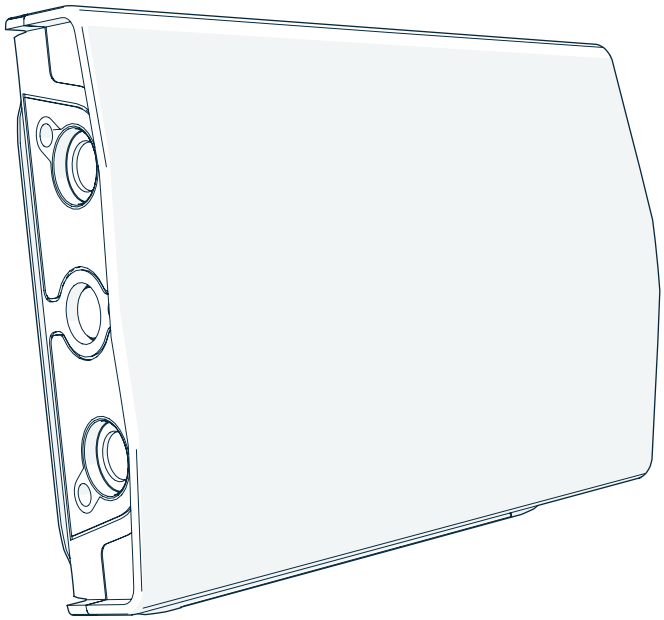
Termbox is adaptable for different needs. The number of signal line protectors can vary up to 2 units and the number of cable glands in use can also vary by replacing them with blocking plugs.

More information

▸ Termbox specifications (page 99)

3.7 Communication devices

3.7.1 Fiber termination box

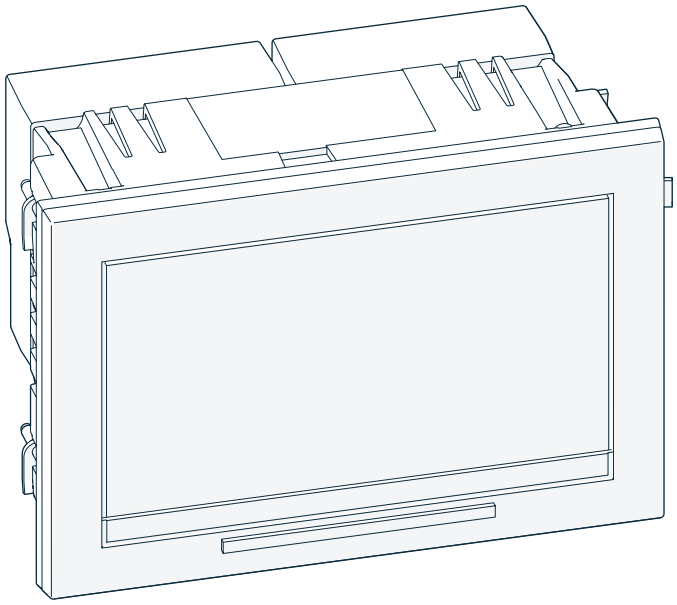


The fiber termination box provides a fiber-optic cable connection to the weather station. The fiber termination box supports point-to-point fiber networks, with single-mode or multimode cables.

Inside the weather station enclosure, the fiber termination box is connected with a cable to the small form-factor pluggable (SFP) module in DME801 plug-in module. Currently, the station supports one SFP module, but support for a second SFP module will be offered in the future.

3.8 Display devices

3.8.1 DEIF weather or wind display



DEIF's XDi range displays can display multiple parameters on one TFT graphical LED display screen. The XDi display connected with AWS830 takes in NMEA-formatted MWV and XDR messages to give graphical representations for parameters like wind, pressure, temperature, and so on. This makes the display a cost-effective and space-saving solution for bridge instrumentation needs.

The display is available as multi-parameter weather display or wind-only version, and in 2 sizes (XDi-N 144 or XDi-N 192). You can have 1 or 2 displays in your standard weather station setup.

More information

‣ DEIF XDi-N display specifications (page 101)

3.9 User interfaces

There are 3 user interfaces for different purposes available for AWS830:

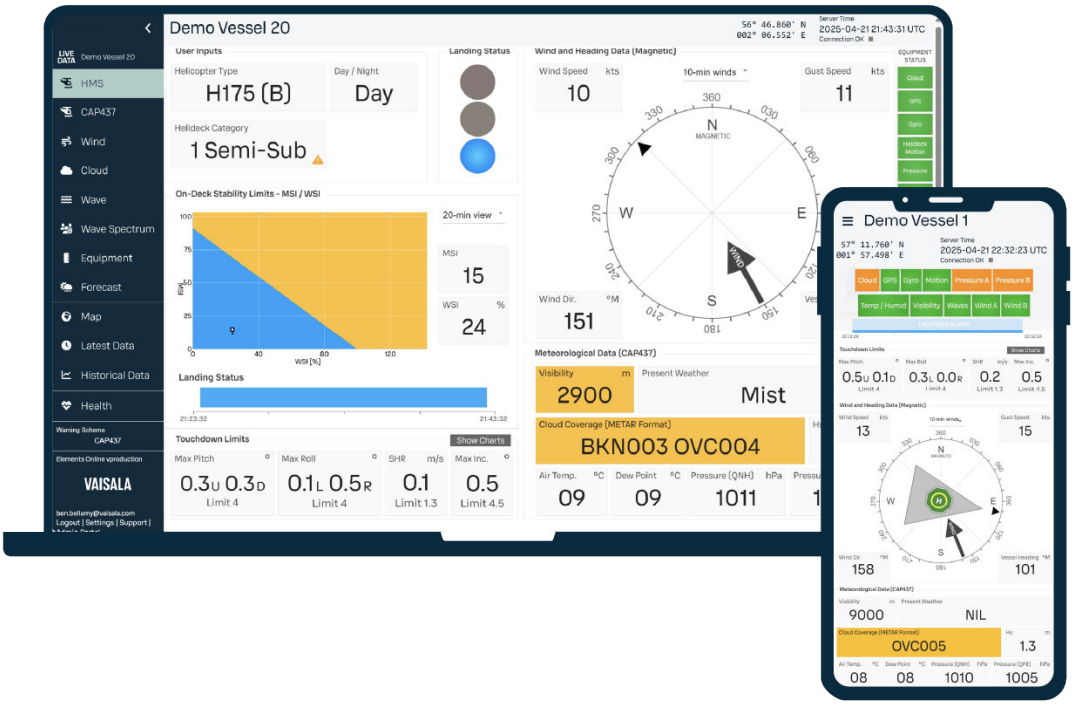
- Elements Helideck Monitoring Software is for visualizing the measurement data and for performing some HMS-related configuration tasks. It collects, processes, and displays the data.
- Kaiku Web UI is for configuring some of the station-specific parameters and performing typical maintenance and troubleshooting tasks.

- Kaiku Designer is for creating and modifying weather station applications. It is mainly needed if you are using other than the default maritime application.

More information

- Vaisala Elements (page 45)
- Kaiku Web User Interface (page 46)
- Kaiku Designer (page 46)

3.9.1 Vaisala Elements

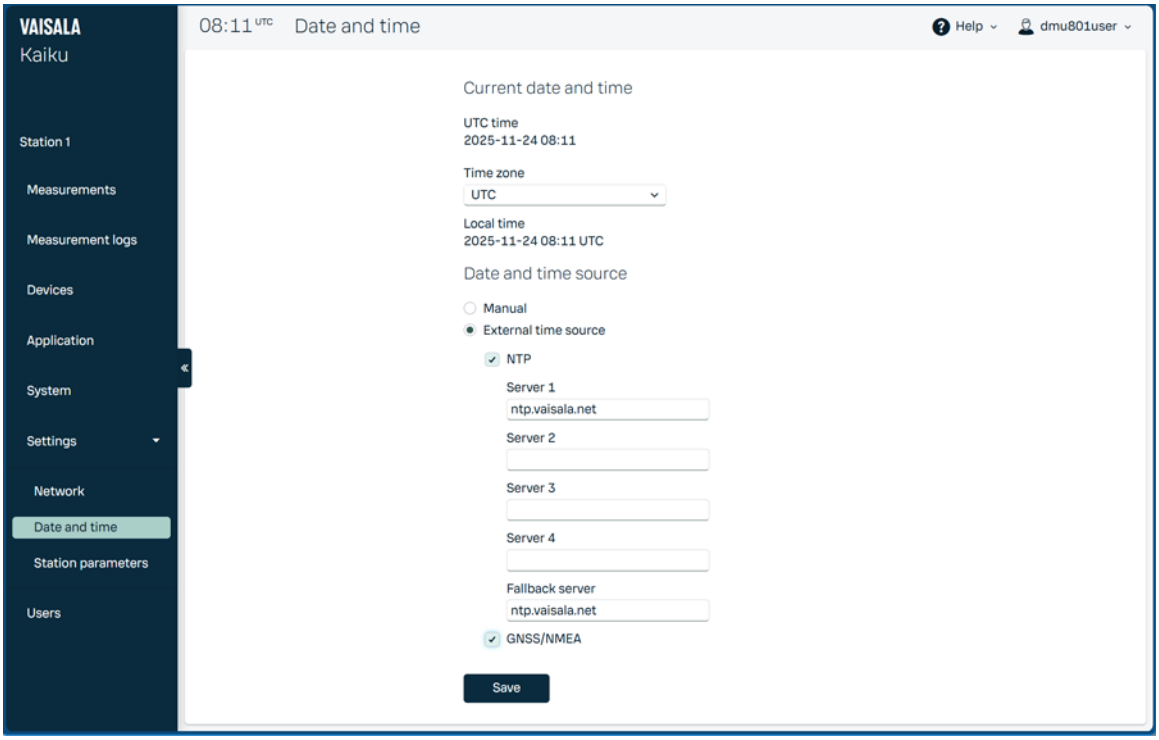


Vaisala Elements Helideck Monitoring Software collects, processes, and displays meteorological, oceanographic, and helideck motion data. It is also able to control helideck motion status repeater lights.

The Elements user interface has real-time data display, reporting tools, and critical alarms to quickly check data and helideck status. The user interface includes separate displays for pre-approach and on-deck data.

Elements is designed to comply with requirements from UK CAA CAP437 standard and other international aviation regulations.

3.9.2 Kaiku Web User Interface



The Kaiku Web UI is available through a web browser. It has been tested with the latest versions of Microsoft Edge, Mozilla Firefox, and Google Chrome at the time of publishing this document.

You can use the Web UI for maintenance tasks, such as restarting the station, updating the software, and viewing and downloading log files.

The Web UI allows setting station-specific parameters such as date and time. In addition, you can view real-time measurement data from the sensors.

User management is also handled in the Web UI.

3.9.3 Kaiku Designer

Kaiku Designer is a visual tool for creating and modifying applications. Kaiku Designer allows specifying the incoming and outgoing data connections, definitions for sensor and component connections, performed calculations, and outgoing reports, and displays a visualization of the data flow with colored nodes.

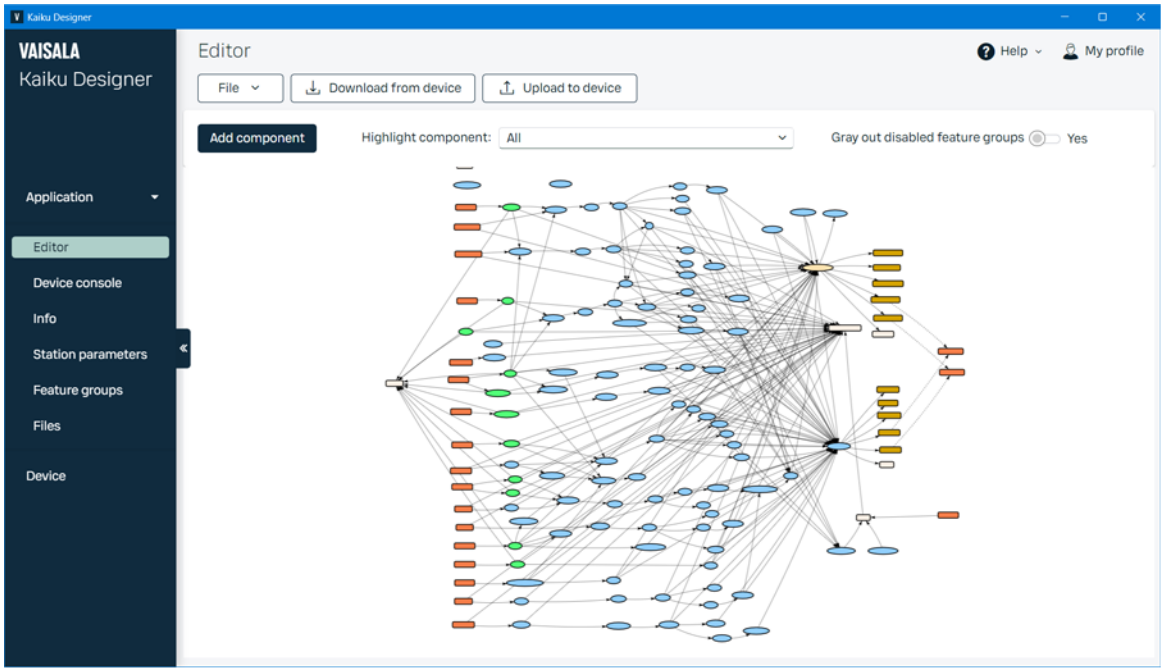


Figure 11 Kaiku Designer

Kaiku Designer comes with a library of basic calculations that can be extended with existing Python modules. You can also write custom Python calculation functions with the tool.

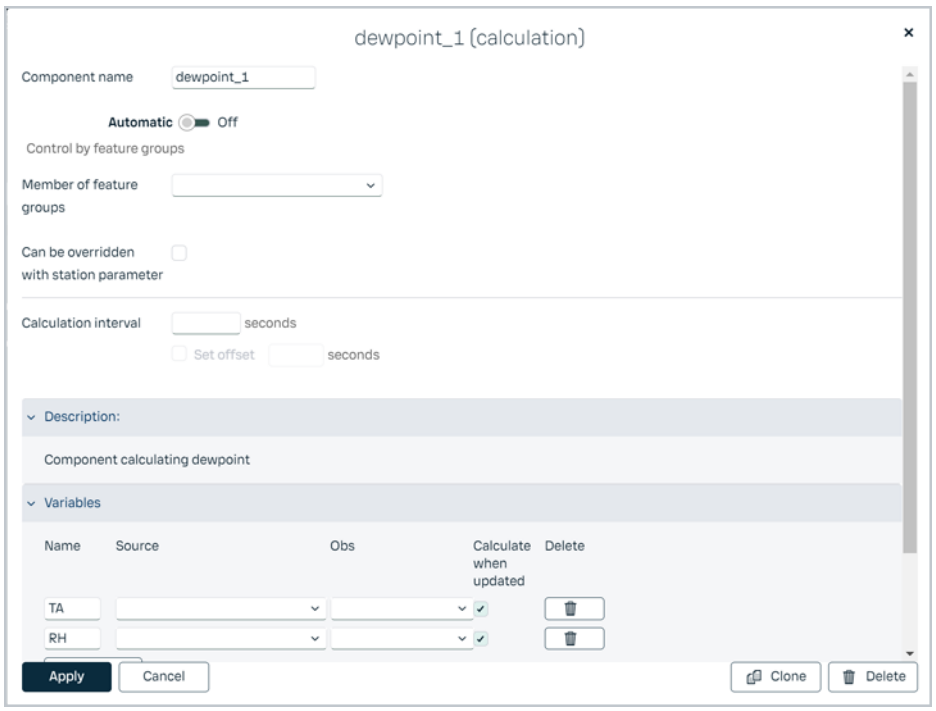


Figure 12 Calculation component example

You can upload the resulting application directly from Kaiku Designer to DMU801 over USB or TCP/IP connection.

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4. Sensors

4.1 Default sensors used in AWS830 for HMS

4.1.1 Vaisala HUMICAP Humidity and Temperature Probe HMP155

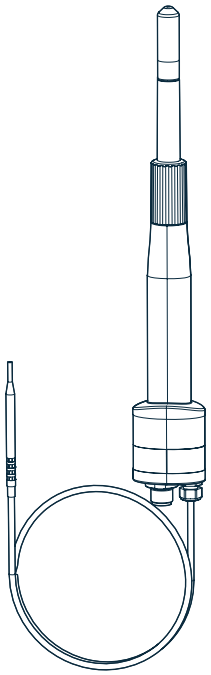


Figure 13 Vaisala HUMICAP Humidity and Temperature Probe HMP155 with additional T-Probe

HMP155 measures relative humidity and air temperature. Humidity measurement on the sensor is based on the capacitive thin film polymer HUMICAP sensor. Temperature measurement is based on platinum resistance (Pt100) sensors. Both the humidity and temperature sensors are located at the tip of the probe, protected by a removable filter.

The weather station uses the relative humidity and air temperature measurements for calculating the dew point temperature.

By default, AWS830 supports the HMP155E model that has an RS-485 digital output.

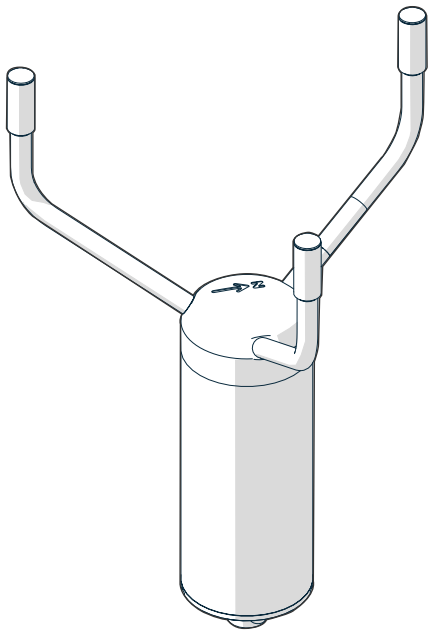
HMP155 is installed inside a radiation shield, which ensures proper ventilation while protecting the sensor from solar radiation and precipitation. The shield provides ventilation while blocking both direct and reflected solar radiation.

HMP155 housing has an IP66 classification. To counter condensation forming on the sensor in humid conditions, HMP155 can be equipped with an optional sensor tip warmer. When the warmed option is used, the additional T-(temperature) probe measures air temperature and the system calculates relative humidity.

More information

▸ HMP155 specifications (page 102)

4.1.2 Vaisala WINDCAP Ultrasonic Wind Sensor WMT700



WMT700 measures wind speed and direction. The following models are available:

- WMT704: measures wind speed up to 90 m/s (201 mph)
- WMT703: measures wind speed up to 75 m/s (168 mph)
- WMT702: measures wind speed up to 65 m/s (145 mph)
- WMT701: measures wind speed up to 40 m/s (89 mph)

WMT700 observations are based on Vaisala WINDCAP wind measurement technology that ensures accurate results in all wind directions. The wind sensor has an array of 3 equally spaced ultrasonic transducers on a horizontal plane. The sensor determines wind speed and direction by measuring the time it takes the ultrasound to travel from each transducer to the other two. This transit time depends on wind speed along the ultrasonic path. The effects of temperature, humidity, and pressure are fully compensated.

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WMT700 has no moving parts, which makes it very low maintenance and provide reliable operation in all conditions. The sensor performance does not degrade with wear, nor is it affected by natural contaminants, such as salt, dust, or sand.

More information

▸ WMT700 specifications (page 105)

4.1.2.1 WMT700 heating

Vaisala recommends using a heated version of WMT700 in environmental conditions where snow and ice buildup are possible. Heating keeps the transducer temperature above 0 °C (+32 °F) and adds heating power only when there is a risk of ice build-ups.

Vaisala recommends using the heated version also in maritime environments.

The following options are available:

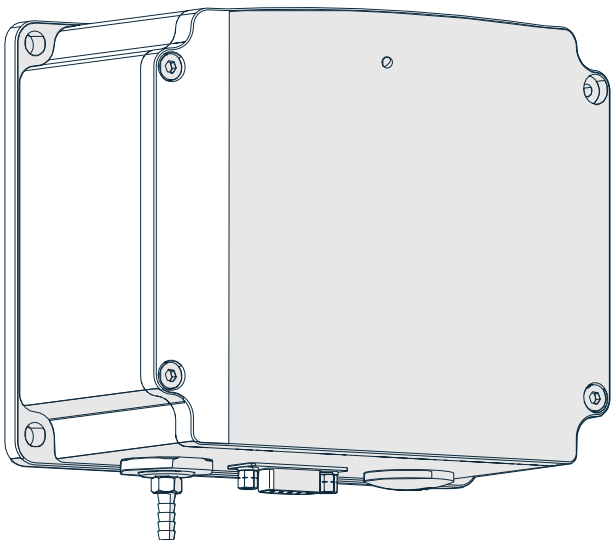
- Heating for transducers only (for freezing conditions). Maximum heating power is limited to 40 W and the average heating power to 30 W.
- Heating for both transducers and array arms (for extreme conditions). Maximum heating power is limited to 200 W and the average heating power to 150 W.
  This option requires the PJB480 power junction box to provide heating power.
- Heating for transducers, array arms, and body.
  This option requires the PJB480 power junction box to provide heating power.

The maximum power control is achieved by automatically sequencing the transducer heaters depending on the heating voltage:

- At low heating voltages, all the transducers are heated simultaneously.
- At mid-range, 2 of the transducers are heated.
- At high-voltage end, a single transducer is heated at a time.

A pulse width modulation (PWM) scheme is used to control the average heating power.

4.1.3 Vaisala BAROCAP Digital Barometer PTB330



PTB330 is a fully compensated digital barometer, designed to cover a wide range of environmental pressure and temperature. It uses the BAROCAP silicon capacitive absolute pressure sensor developed by Vaisala for barometric pressure measurement applications.

PTB330 measurement principle is based on an advanced RC oscillator and reference capacitors against which the capacitive pressure sensor is continuously measured. PTB330 microprocessor performs compensation for pressure linearity and temperature dependence.

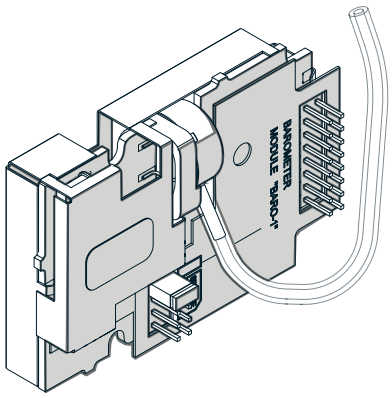
From the barometric pressure, the weather station also calculates aviation-related compensated pressure variables QNH and QFE.

If your weather station has the outdoor enclosure (ENC652), you can choose to have PTB330 mounted inside or outside the enclosure. When installed outside of the enclosure, PTB330 is mounted in a corrosion-resistant junction box (ASM211113) that provides protection from salt water and other environmental conditions. The junction box includes cable glands, a signal and power cable, and a pressure port.

More information

- PTB330 specifications (page 114)

4.1.4 Vaisala BAROCAP Pressure Module BARO-1



BARO-1 is a measurement module for determining barometric pressure. The module uses the capacitive Vaisala BAROCAP® sensor and features barometric pressure calculation, additional pressure calculations (HCP, QFE, and QNH), and internal temperature compensation, which ensure accurate, corrected readings for barometric pressure. The module includes a self-diagnostics feature.

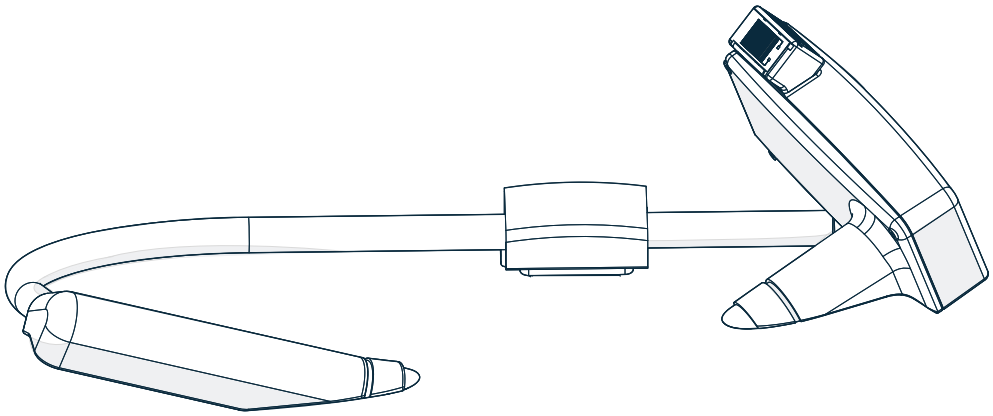
The pressure module is housed inside DMB801 barometer module and generally requires no scheduled maintenance.

More information

- Barometer Module DMB801 (page 31)

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4.1.5 Vaisala Present Weather Detectors PWD12, PWD22, and PWD52 and Visibility Sensors PWD10, PWD20, and PWD50



The Vaisala PWD series of present weather detectors and visibility sensors provide a mix of visibility measurement, characterization of reduced visibility, precipitation type identification, precipitation accumulation and intensity measurement, and report formats (WMO, NWS code tables).

The following variants are available:

- Vaisala Visibility Sensors PWD10, PWD20, and PWD50
- Vaisala Present Weather Detectors PWD12, PWD22, and PWD52

For more information on the PWD models, see the PWD documentation.

Table 9 PWD10, PWD12, PWD20, PWD22, PWD50, and PWD52 infobox

Property	Value
IP rating	IP66
Digital outputs	RS-485
Operating temperature	PWD12: −40 … +55 °C (−40 … +131 °F) PWD10, PWD20, PWD22, PWD50, PWD52: −40 … +60 °C (−40 … +140 °F)
Precipitation types	PWD10, PWD20, PWD50: None PWD12: 4 different types PWD22, PWD52: 7 different types
Visibility measurement range (MOR)	PWD10, PWD12: 10–2 km (32–1.24 mi) PWD20, PWD22: 10 m–20 km (32 ft–12.43 mi) PWD50, PWD52: 10 m–35 km (32 ft–21.75 mi)

Property	Value
Visibility measurement accuracy	PWD10, PWD12: • ±10 % at 10–2000 m (32–6500 ft) PWD20, PWD22: • ±10 % at 10–10 000 m (32–32 800 ft) • ±15 % at 10–20 km (2.6–12 mi) PWD50, PWD52: • ±10 % at 10–10 000 m (32–32 800 ft) • ±20 % at 10–50 km (6.2–3 mi)

The visibility sensors and present weather detectors measure visibility (meteorological optical range, MOR) using the principle of a forward-scatter measurement.

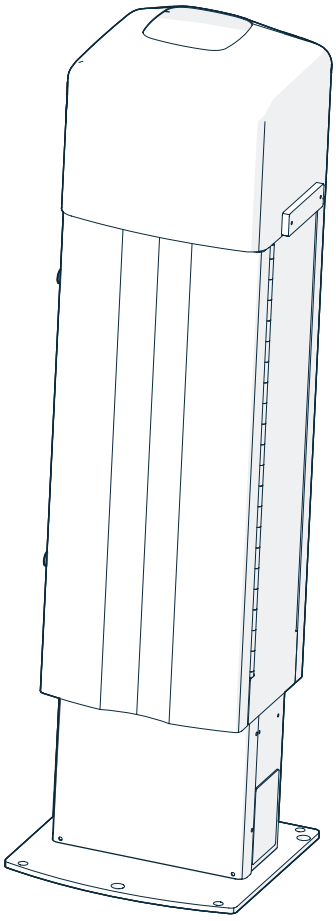
In addition, the present weather detectors measure precipitation intensity, precipitation type, and precipitation accumulation. The detector estimates the precipitation water content with a capacitive device, Vaisala RAINCAP rain sensor, and combines this information with optical scatter and temperature measurements. Together, these 3 independent measurements provide sufficient data for an accurate evaluation of the prevailing visibility and weather type.

More information

▸ PWD series specifications (page 117)

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4.1.6 Vaisala Ceilometer CL31



CL31 measures cloud base height and vertical visibility. It can detect up to 5 different cloud layers from 0 to 7600 m (0 to 25 000 ft) at a resolution of 5 m (16 ft 5 in). CL31 is suitable for aviation purposes and meteorological applications where reliable detection of clouds is essential.

CL31 employs pulsed diode laser light detection and ranging (LIDAR) technology through single-lens optics, where short, powerful laser pulses are sent out in a vertical or near-vertical direction. The reflection of light (backscatter) caused by clouds, precipitation, or other obscuration is analyzed and used to determine the cloud base height. The cloud coverage algorithm in CL31 gathers cloud information from the last 30 minutes, updated at a 5-minute interval. Cloud coverage is reported in 0–8 okta, according to WMO regulations.

An optional radiation shield provides better window protection during precipitation. In extreme temperatures, it protects against excessive heat or cooling. An automatic window blower with heater improves performance by keeping the window clean and dry. In cold conditions, heating prevents frost generation on the window.

CL31 is installed on the ground and connected to the weather station with a cable. In ship installations, Vaisala recommends installing CL31 on a shock absorbing mounting pad.

More information

- CL31 specifications (page 123)

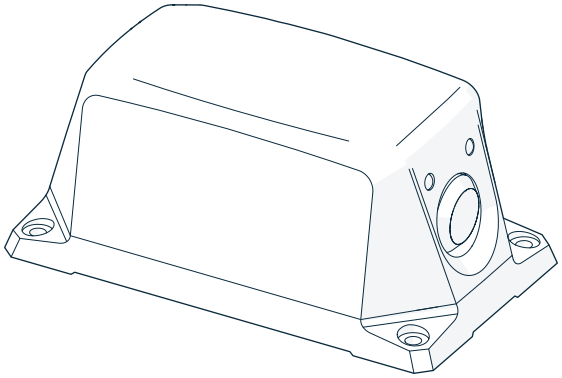
4.1.7 Motion reference units

One of the motion reference units available in the offering is included in the default HMS application.

More information

- Norwegian Subsea MRU Marine 3000 (page 56)
- Ship Motion Control SMC-108 motion reference unit (page 57)

4.1.7.1 Norwegian Subsea MRU Marine 3000



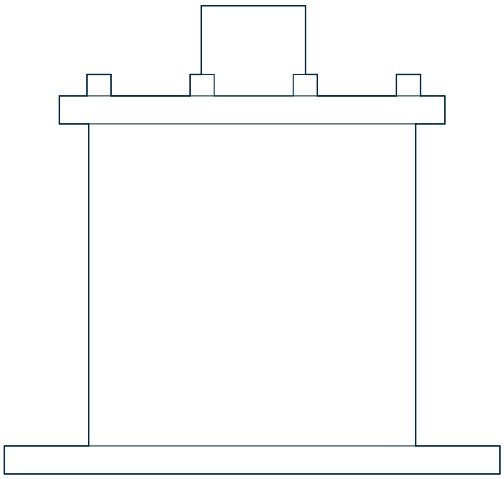
Norwegian Subsea MRU Marine 3000 is a motion reference unit that delivers accurate roll, pitch, and heave measurements. It uses MEMS (Micro-Electro-Mechanical System) gyroscopes and accelerometers combined with sensor fusion algorithms. The unit includes Ethernet, RS-232, RS-485, and PPS (pulse per second) time synchronization ports for easy integration.

With robust and compact anodizes aluminum housing, MRU Marine 3000 is built to withstand harsh conditions. You can mount the unit in any orientation.

More information

- MRU Marine 3000 specifications (page 134)

4.1.7.2 Ship Motion Control SMC-108 motion reference unit



Ship Motion Control's SMC-108 motion reference unit provides high accuracy motion measurements.

SMC-108 determines the orientation of an object relative to an inertial frame of reference or another body. It uses 3 accelerometers and 3 solid state MEMS (Micro-Electro-Mechanical System) gyroscopes, which are integrated with a built-in multi-core processor to output real-time pitch, roll, and heave data.

The durable titanium casing ensures that SMC-108 withstands the most demanding marine environments.

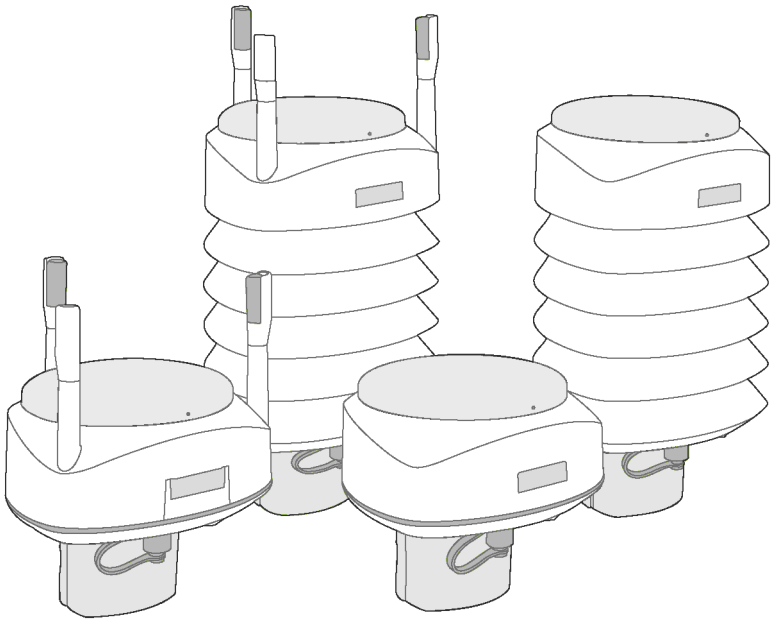
More information

- SMC-108 specifications (page 135)

4.2 Additional sensors

Other sensors not listed in this document may be integrated to the weather station upon request. For more information, contact Vaisala.

4.2.1 Vaisala Weather Transmitter WXT530 Series



WXT530 series sensors are multi-use weather measurement sensors built inside an IP66 housing. The sensors contain no moving parts. The sensors are available as heated and non-heated versions.

In maritime applications, the heated version is used. When heating is on, the system controls the heating power dynamically.

WXT530 is a small and lightweight transmitter that offers 6 weather parameters in one compact package. WXT530 measures pressure, temperature, humidity, precipitation, wind speed, and wind direction.

Based on these measurements, the weather station calculates, for example, wet bulb temperature, dew point, present weather, precipitation intensity, and precipitation accumulation. The weather transmitter reports precipitation as hail or rain.

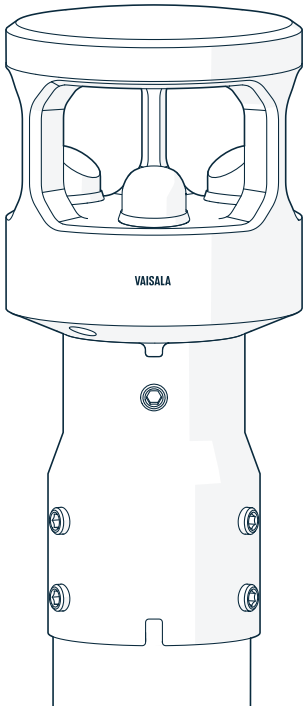
Table 10 Measurement configurations of WXT530 series sensors

Sensor	Pressure	Temperature	Humidity	Precipitation	Wind
WXT532	–	–	–	–	✔
WXT534	✔	✔	✔	–	–
WXT536	✔	✔	✔	✔	✔

More information

- WXT530 specifications (page 127)

4.2.2 Vaisala Ultrasonic Wind Sensor WM80



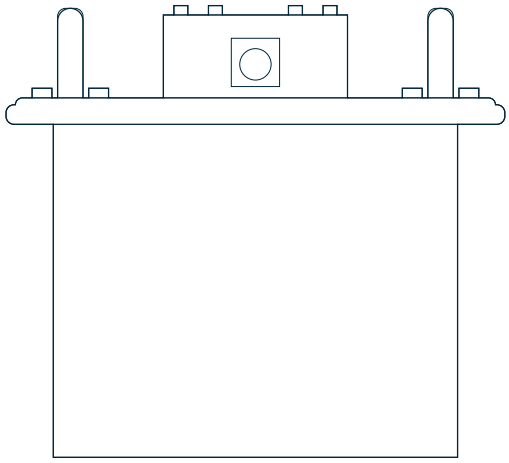
Vaisala Ultrasonic Wind Sensor WM80 offers unparalleled wind speed and wind direction measurement performance with the Vaisala WINDCAP® ultrasonic technology combined with an innovative, robust, and compact form factor. WM80 is designed for operations where uninterrupted wind data is crucial, such as wind turbine control, ship navigation, and dynamic positioning.

WM80 is designed and heavily tested to operate reliably in extreme conditions - whether tropical or freezing - measuring accurately in heavy precipitation and extreme temperatures. In icy conditions, the 11 automatically controlled heating elements keep the device operational, providing excellent heat distribution in the aluminum structure. For non-icing environments, a device model with heated transducers is available. The highly accelerated life test (HALT) methodology was used during product development to enhance product reliability.

More information

- WM80 specifications (page 110)

4.2.3 RADAC WaveGuide 5 series wave radars



The WaveGuide 5 series wave radars measure the distance to the water surface 10 times per second. They accurately measure wave heights and tides even in the most extreme conditions.

The radar technology is based on Honeywell Enraf core technology used for tank gauging.

WaveGuide 5 is mounted high above water and there are no moving parts, which is why there is no need for preventive maintenance or cleaning.

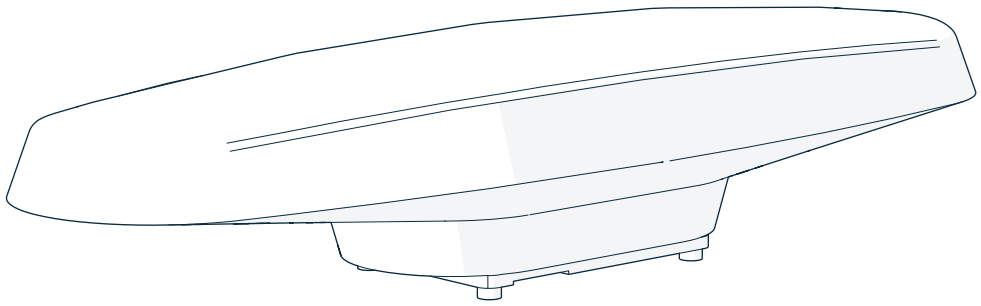
Multiple WaveGuide 5 models can be connected to AWS830. AWS830 supports the following models and their EX versions:

- Height & Tide
- Height & Tide Onboard
- Height & Tide & Direction

More information

▸ WaveGuide 5 series specifications (page 136)

4.2.4 ComNav G2 GPS satellite compass



ComNav's G2 is a complete GPS satellite compass in a single rugged, marine-grade enclosure. G2 enclosure contains a ComNav receiver module (including two GNSS receivers, a 3-axis gyro, a 3-axis accelerometer, and a 3-axis magnetometer), dual GNSS antennas, and a power supply.

G2 features fast start-up and signal re-acquisition times and heading and position updates at up to 20 times per second. It can operate at sustained turn rates of up to 90° per second.

The compass is mounted to the mast in the support arm and provides heading and GPS information in serial messages. Instead of the G2 compass, the ship's own compass can be used.

More information

- ComNav G2 specifications (page 137)

5. Data reporting

5.1 Communication channels

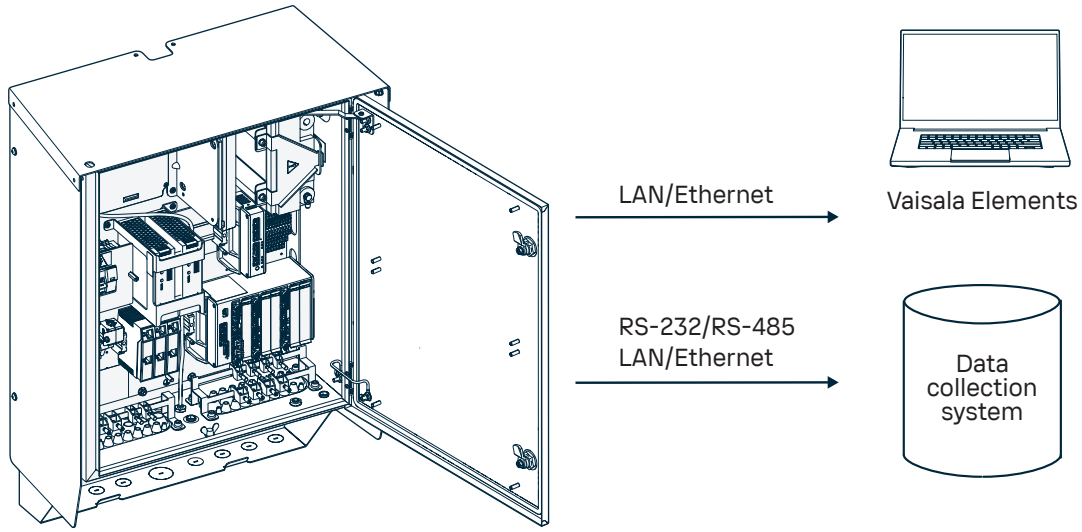


Figure 14 Communication channels

The following communication interfaces are available for transferring data from the station:

- Wired Ethernet adapter (copper or fiber-optic cable)
- Direct serial (RS-232/RS-485) connection

For convenient data access, the following options are available for the Ethernet interface:

- Sending data to Vaisala Elements
- Sending data to an SFTP or FTP server
- Polling data through an HTTPS Reports API
- Connecting to a TCP/IP socket
- Communicating through the Modbus TCP protocol

The preferred and secure way to access observation data is through Vaisala Elements. If Elements is not included in the setup, Vaisala recommends using the encrypted interfaces, SFTP server or polling of data through HTTPS Reports API.

Other, unencrypted interfaces are also available, including Modbus TCP, FTP server, and TCP/IP socket without Elements. These interfaces are intended for use in isolated local networks only, and should not be used over public networks. You must explicitly enable them when configuring data reports.

More information

- Vaisala Elements (page 45)
- AWS830 Modbus register map (page 148)

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5.2 Message formats

To make the observation data collected in the DMU801 data management unit available for storage and analysis, the weather station compiles the data into messages and transfers them through the selected communication interfaces.

The primary data message formats are the following:

- Standard NMEA 0183 format
- Vaisala SMSAWS
- Proprietary sensor messages (CL31, PWD22, motion sensor, wave radar)
- Dedicated messages for HMS, composed of NMEA 0183 and proprietary sensor messages

A configurable Modbus TCP interface is also supported for data transfer.

The data reports contain a list of observations, which come from sensors that are connected to the weather station. A single sensor can provide multiple observations to a report (such as stored minimum values from the last 10 minutes, 1 hour, and 24 hours). Some observations, such as sea-level adjusted pressure, are calculated from the inputs of multiple sensors or weather station settings.

5.2.1 NMEA 0183 data message format

NMEA 0183 messages are used to transfer, for example, navigational, wind, and ship motion data.

AWS830 NMEA 0183 interface supports both incoming navigation and position messages to utilize vessel navigation data or separate GNSS devices, and outgoing weather data messages.

Table 11 Supported NMEA 0183 messages

Message ID	Direction	Description	Notes
VTG	In/out	Course over ground and ground speed	Navigation data
GGA	In/out	Global positioning system fix data	GPS positioning
GLL	In/out	Geographic position (latitude/ longitude)	Position data
RMC	In/out	Recommended minimum navigation information	Essential GPS data
HDT	In/out	Heading, true	True heading information
PSMCC	In/out	Proprietary SMC motion control	Motion sensor data
WIXDR	Out	Weather transducer message	Primary weather data output
MWV	Out	Wind speed and angle	Wind measurements (multiple sensors supported)

5.2.1.1 Wind speed and angle message ($MWV)

MWV message provides wind speed and angle measurements from wind sensors. AWS830 supports multiple wind sensors with specific talker ID identification.

The format of the wind speed and angle message is:

```
$--MWV,<angle>,<reference>,<speed>,<units>,<status>*hh<CR><LF>
```

Table 12 Wind speed and angle message data fields

Name	Description
`$--MWV`	Sentence identifier
`--`	Two-character talker ID (see *Wind sensor identification* section)
`MWV`	Wind speed and angle identifier
`<angle>`	Wind direction in degrees (0–359°)
`<reference>`	Wind reference type
`R`	Relative (to vessel heading)
`T`	True (relative to ground/north)
`<speed>`	Wind speed value
`<units>`	Speed units
`M`	Meters per second (m/s)
`N`	Knots
`K`	Kilometers per hour (km/h)
`<status>`	Data validity
`A`	Active/valid data
`V`	Void/invalid data
`*hh`	Checksum for data integrity validation

Wind sensor identification

AWS830 supports up to 4 wind sensors, identified by specific talker IDs.

Table 13 Wind sensor talker IDs

Talker ID	Wind sensor	Application
PA	First wind sensor	Default maritime application
PB	Second wind sensor	Default maritime application
PC	Third wind sensor	Reserved/optional

Talker ID	Wind sensor	Application
PD	Fourth wind sensor	Reserved/optional
WI	Standard wind message	Selected wind sensor

With sensor selector option **$WIMWV** the message maps to the selected sensor.

Example of MWV messages

```
$PAMWV,045,R,12.5,M,A*06    // First sensor: 45° relative, 12.5 m/s
$WIMWV,045,R,12.5,M,A*09    // Standard wind message (same as PAMWV)
$PBMWV,047,R,12.8,M,A*0A    // Second sensor: 47° relative, 12.8 m/s
$PCMWV,044,R,12.3,M,A*03    // Third sensor: 44° relative, 12.3 m/s
$PDMWV,046,R,12.6,M,A*03    // Fourth sensor: 46° relative, 12.6 m/s
```

5.2.1.2 Weather transducer message ($WIXDR)

WIXDR message is the primary format for transmitting weather sensor data. It carries one or more measurements from various on-board sensors, for example, temperature, pressure, and humidity sensors, in a structured format.

The format of the weather transducer message is:

```
$--XDR,<Type1>,<Data1>,<Unit1>,<ID1>,<Data2>,<Unit2>,<Type2>,<ID2>,
...*hh<CR><LF>
```

Table 14 Weather transducer message data fields

Name	Description
$--XDR	Sentence identifier
--	Two-character talker ID
XDR	Transducer identifier
<TypeN>	Single-character transducer type code
<DataN>	Numeric measurement value, for example, 21.3 for temperature
<UnitN>	Unit of measure, for example, C for Celsius and Hpa for hectopascals
<IDN	Transducer identifier/label, for example, TA1 for air temperature
*hh	Checksum for data integrity validation

Table 15 Common transducer type codes

Code	Description	Typical units	Usage example
A	Angle/angular displacement	°, radians	Wind vane angle, tilt
C	Temperature	°C, °F, K	Air or water temperature
D	Distance/linear displacement	m, ft, %	Tank or water level
E	Conductivity	S/m	Water conductivity
F	Frequency	Hz, kHz	Sensor output frequency
H	Humidity	% (relative)	Environmental RH
I	Current	A	Electrical current
L	Salinity	S (practical salinity)	Water salinity
P	Pressure	bar, Pascal, psi, hPa	Barometric, water pressure
U	Voltage	V	Battery, power supply
W	Dew point	°C	Vaisala-specific usage

Vaisala mappings for $WIXDR

The following table lists Vaisala AWS830 transducer ID mappings for the XDR message. Note that the table describes all the defined codes, but the actual content may vary according to the system setup.

Table 16 Vaisala AWS830 transducer mappings

Code	Parameter	Unit	Statistics	Period	Transducer ID
C	Air temperature	°C	Average	1 minute	TA1
C	Dew point temperature	°C	Average	1 minute	TD
C	Water temperature	°C	Average	1 minute	TW
D	Water level	m	–	–	WL
D	Vessel draft	m	–	–	DRAFT
E	Water conductivity	S/m	–	–	WATERC
H	Relative humidity	%	Average	1 minute	RH
L	Salinity	S	Average	1 minute	DLSAL
P	Air pressure	hPa	Average	1 minute	PA1
P	Air pressure values	hPa	Value	–	PA11, PA12, PA13

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Code	Parameter	Unit	Statistics	Period	Transducer ID
U	Station operation voltage	V	Value	–	EXTDC
U	Battery charge voltage	V	Value	–	VCHRBATTERY

Example of WIXDR message

```
$WIXDR,C,22.5,C,TA1,C,15.3,C,TD,C,18.4,C,TW,L,35.0,S,DLSAL,H,85.2,%,RH,P,1013.2
,Hpa,PA1*77
```

5.2.1.3 PSMCC message ($PSMCC)

PSMCC message is a proprietary NMEA format used by Ship Motion Control's SMC-108 motion sensors to convey vessel motion data for maritime applications. For more information, see the manufacturer documentation.

The format of the PSMCC message is:

```
$PSMCC,+xx.xx,+yy.yy,+zzz.z,+ss.ss,+ww.ww,+hh.hh,+sv.sv,+sw.sw,+hv.hv,+ax.axa,+
ay.aya,+az.aza*cs
```

Table 17 PSMCC message data fields

Name	Description	Form
$PSMCC	Start characters	–
xx.xx	Roll angle	Degrees resolution 0.01° (+ve = port up)
yy.yy	Pitch angle	Degrees resolution 0.01° (+ve = bow down)
zzz.z	Yaw	Degrees resolution 0.1°
ss.ss	Surge	Meters resolution 0.01 m
ww.ww	Sway	Meters resolution 0.01 m
hh.hh	Heave	Meters resolution 0.01 m
sv.sv	Surge velocity	Meter/second resolution 0.01 m/s
sw.sw	Sway velocity	Meter/second resolution 0.01 m/s
hv.hv	Heave velocity	Meter/second resolution 0.01 m/s
ax.axa	Acceleration X	Meter/second² resolution 0.001 m/s²
ay.aya	Acceleration Y	Meter/second² resolution 0.001 m/s²
az.aza	Acceleration Z	Meter/second² resolution 0.001 m/s²

Name	Description	Form
cs	XOR checksum	–
<CR><LF>	Termination characters	–

Example of PSMCC message

```
$PSMCC,+09.42,-02.85,+144.1,+00.28,-00.05,+00.00,+00.01,-00.00,+00.00,+00.004,
-00.000,-00.005*77
```

Bit rate and maximum output rate

Table 18 Bit rate and maximum output rate

Bit rate	Maximum output rate
115 200	100
57 600	50
38 400	25
19 200	10
9600	5
4800	2

5.2.2 SMSAWS data message format

The SMSAWS data message is a Vaisala standard ASCII-based observation data message. The update intervals for the message types are:

- Instant wind: 3 s
- Instant: 10 s
- Meteorological: 1 min

The format of the SMSAWS data message is:

```
(S:<station name>;D:<YYMMDD>;T:<HHMMSS>;
STNID:<station ID>;MSGID:<message ID>;<tag 1>:<value 1>;...<tag N>:<value N>)
<CRC><CR><LF>
```

Table 19 SMSAWS message data fields

Name	Description
(	Start character, ASCII code 40
:	Tag and value delimiter

Name	Description
;	Element delimiter
S:<station name>	Station name
D:<YYMMDD>	Date of data message generation (UTC), according to ISO 8601 standard
T:<HHMMSS>	Time of data message generation (UTC), according to ISO 8601 standard
STNID:<station ID>	Station identifier
MSGID:<message ID>	Message identifier, running number, not unique
<tag>	Observation tag. See the following table.
<value>	Observation value
)	End character, ASCII code 41
<CRC>	32-bit CRC checksum, which is calculated over all characters between the (and) characters, including (and). The checksum has fixed length of 8 characters, and it is presented in ASCII HEX format. The properties of the checksum are: • Polynomial: 0x04C11DB7 • Initial value: 0xFFFFFFFF • Reverse data bytes: True • Reverse CRC result: True • Invert result bits: True With these properties, the result of the commonly used test vector 123456789 is 0xCBF43926.
<CR>	Carriage return character, ASCII code 13
<LF>	Line feed character, ASCII code 10

Observation tags in SMSAWS data message

Observation tags consist of the following fields, separated by the pipe character (|):

```
<observation>|<statistics>|<period>|<height>|<sequence number>|<unit>|
```

For example: TA|AVG|PT1M|||degC|

Table 20 SMSAWS observation tag fields

Name	Description
<observation>	Observation code
<statistics>	Method used for calculating the observation. Possible values: • VALUE: A single measurement or datum. • MIN: The smallest value in the sample. • MAX: The largest value in the sample. • AVG: The sum of the values divided by the sample size (mean). • SUM: The sum of all values in the sample.

Name	Description

<period>	The period related to the statistics name. The period field consists of the following:
	• Duration designator **P**
	• Time designator **T**
	• Time value, for example, **1**
	• Time element designator:
	  • **H** for hours
	  • **M** for minutes
	  • **S** for seconds
	For example, **PT1M** for 1 minute.

<height>	The height (in meters) in which the observation was created. Empty if not set.
<sequence number>	The index for identifying the observation when the weather station contains multiple sensors that provide the observation in question. Empty if not set.
<unit>	Unit of the observation. Empty if the observation does not have a unit.

Example of SMSAWS instant message

The actual message does not contain line feeds.

```
(S:AWS830 Marine;D:251128;T:091110;MSGID:16;LAT:60.28;LON:24.88;ALT:0;TA|AVG|
PT1M|||degC|:22.4;RH|AVG|PT1M|||%|:33;TD|AVG|PT1M|||degC|:5.3;PA|AVG|PT1M|||
hPa|:998.7)0A15118D\x0d\x0a
```

Example of SMSAWS instant wind message

The actual message does not contain line feeds.

```
(S:AWS830 Marine;D:251128;T:091124;MSGID:58;LAT:60.28;LON:24.88;ALT:0;WS|VALUE|
PT3S|||mps|:3.7;WD|VALUE|PT3S|||deg|:264)CE3C3055\x0d\x0a
```

Example of SMSAWS meteorological message

```
(S:AWS830 Marine;D:251128;T:091702;MSGID:8;LAT:60.28;LON:24.88;ALT:0;UPTIME|
VALUE|PT1H|||h|:4;EXTDC|VALUE|PT1M|||V|:24.10;TA|AVG|PT1M|||degC|:22.4;TA|
MIN|PT24H|||degC|:/;TA|MAX|PT24H|||degC|:/;RH|AVG|PT1M|||%|:33;RH|MIN|PT24H|||
%|:/;RH|MAX|PT24H|||%|:/;TD|AVG|PT1M|||degC|:5.4;TAB|AVG|PT1M|||degC|:13.1;PA|
AVG|PT1M|||hPa|:998.7;QFE|AVG|PT1M|||hPa|:998.7;QFF|AVG|PT1M|||hPa|:998.7;QNH|
AVG|PT1M|||hPa|:998.6;PATE|VALUE|PT3H|||WMO-306-0200|:/;PATR|VALUE|PT3H|||
hPa|:/;PR|SUM|PT1M|||mm|:0.0;PR|SUM|PT1H|||mm|:0.0;PR|SUM|PT24H|||mm|:0.0;PRF|
AVG|PT1M|||mmph|:0.0;WS|AVG|PT3S||1|mps|:3.6;WD|AVG|PT3S||1|deg|:264;WS|AVG|
PT2M||1|mps|:3.7;WS|MIN|PT2M||1|mps|:3.4;WS|MAX|PT2M||1|mps|:3.8;WD|AVG|PT2M||
1|deg|:265;WD|MIN|PT2M||1|deg|:263;WD|MAX|PT2M||1|deg|:271;WS|AVG|PT10M||1|
mps|:3.7;WS|MIN|PT10M||1|mps|:3.4;WS|MAX|PT10M||1|mps|:3.9;WD|AVG|PT10M||1|
deg|:264;WD|MIN|PT10M||1|deg|:262;WD|MAX|PT10M||1|deg|:271;WGD|VALUE|PT10M||
1|deg|:263;WS|AVG|PT3S||2|mps|:2.4;WD|AVG|PT3S||2|deg|:330;WS|AVG|PT2M||
2|mps|:2.5;WS|MIN|PT2M||2|mps|:2.4;WS|MAX|PT2M||2|mps|:2.5;WD|AVG|PT2M||2|
deg|:332;WD|MIN|PT2M||2|deg|:330;WD|MAX|PT2M||2|deg|:333;WS|AVG|PT10M||2|
mps|:2.5;WS|MIN|PT10M||2|mps|:2.4;WS|MAX|PT10M||2|mps|:2.6;WD|AVG|PT10M||2|
deg|:332;WD|MIN|PT10M||2|deg|:329;WD|MAX|PT10M||2|deg|:335;WGD|VALUE|PT10M||
2|deg|:333;VIS|AVG|PT1M|||m|:2254;PW|VALUE|PT15M|||WMO-306-4680|:4;CB1|AVG|
PT1M|||m|:3990;CL1|AVG|PT30M|||m|:/;CA1|VALUE|PT30M|||octa|:/;VV|AVG|PT10M|||
m|:/)7B3F644B\x0d\x0a
```

More information

- Observations in SMSAWS data messages (page 141)

6. Technical data

6.1 AWS830 system specifications

Table 21 Specifications for AWS830 with outdoor enclosure

Property	Description/Value
Operating environment	
Operating environment	Outdoor use
Use in wet location	Yes
Operating temperature	−50 ... +60 °C (−58 ... +140 °F), cold start at −40 °C (−40 °F) [1]
Operating humidity	0–100 %RH
Storage temperature	−60 ... +70 °C (−76 ... +158 °F) [2]
Storage humidity	0–100 %RH, non-condensing
IP rating	IP66: Dust-tight. Protected from powerful water jets from any direction.
UL 50E/NEMA rating	Type 4X: Dust-tight. Protected from corrosion and hose-directed water.
Enclosure mechanical specifications	
Dimensions (H × W × L)	600 × 500 × 207 mm (23.62 × 19.69 × 8.15 in)
Lifting weight (enclosure with backplate), depending on configuration	Approx. 27 kg (60 lb)
Materials	
Enclosure	Stainless steel AISI 316L, painted white (RAL9003, gloss 80)
Coating	Powder paint
Flanges and cable glands	Stainless steel AISI 316 or rubber (TPE)
Cable glands	Nickel-plated brass or stainless steel AISI 304
Radiation shield	Aluminum EN AW-5754

1) *Excluding PJB480 and DEIF XDi-N display.*
2) *Excluding backup battery, WM80, PTB330, and DEIF XDi-N display.*

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Table 22 Specifications for AWS830 with 19″ rack enclosure

Property	Description/Value
Operating environment	
Operating environment	Indoor use
Use in wet location	No
Operating temperature	–25 … +60 °C (–13 …+140 °F) [1]
Operating humidity	0–100 %RH, non-condensing
Storage temperature	–60 … +70 °C (–76 … +158 °F) [2]
Storage humidity	0–100 %RH, non-condensing
IP rating	IP20: Protected against solid foreign objects of 12.5 mm Ø and greater.
UL 50E/NEMA rating	Type 1: Protected against solid foreign objects of 50 mm Ø and greater.
Enclosure mechanical specifications	
Dimensions (H × W × L)	177 × 425 × 547 mm (6.97 × 16.73 × 21.54 in)
Lifting weight, depending on configuration	Approx. 21 kg (46 lb)
Material	Aluminum EN AW-5754
Faceplate coating	Anodized, black
Flange	Rubber (TPE)
Connectors	4 × Ethernet ports USB-C service port AC (mains) input port (IEC 60320-C14)

1) *Excluding PJB480 and DEIF XDi-N display.*
2) *Excluding backup battery, WM80, PTB330, and DEIF XDi-N display.*

Table 23 AWS830 powering specifications

Property	Description/Value
AC (mains) power	100–240 V AC, –15 … +10 % 50–60 Hz, ±10 % 6.8 A maximum (100 V DC)
AC (mains) fuse (nominal)	ENC652 enclosure model: 10 A Rack enclosure model: 5 A
External DC	22 V DC nominal (–10 … +30 %), typical operating voltage 24 V DC 10 A maximum
Backup battery	12 V 13 Ah, VRLA (valve-regulated lead-acid) battery

Property	Description/Value
Output voltage	12 V, 24 V, and variable
Overvoltage category	II
Power consumption (without sensor heating)	Typical: 16 W Maximum: 24 W
Power consumption (with sensor heating) [1)]	Typical: 145 W Maximum: 274 W

1) Calculated with 2 × WMT700 and PWD22 with heating on.

Table 24 AWS830 data communication

Property	Description/Value
Data communication interfaces	Serial (RS-485) Ethernet SDI-12
Maintenance interfaces	Web UI (through USB-C or Ethernet)
Communication protocols	NMEA 0183 Secured HMS protocol SMSAWS Custom Modbus TCP
Data collection and visualization	NMEA-dominated messages with proprietary sensor messages (for example, wave radar and motion sensors) Visualization and data collection with Vaisala Elements Helideck Monitoring Software
Data format	Outputs: • NMEA MWV • NMEA XDR (multiple) • Forwarded Vaisala ASCII messages • Forwarded PSMCC message • Forwarded wave radar messages Inputs: • Vaisala ASCII sensor inputs • PSMCC (motion sensor) • Wave radar proprietary ASCII message
Measurement and output interval	Wind: 4 Hz Motion: 10 Hz Wave: 4 Hz Weather sensors: 15–30 s

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Table 25 AWS830 compliance

Property	Description/Value
EU directives and regulations	EMC, LVD, RoHS EMC Directive (2014/30/EU) Low Voltage Directive (2014/35/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
EMC immunity	IEC/EN 61326-1, industrial environment FCC part 15 B, Class A CAN ICES-3(A)/NMB-3(A) IEC 60945
EMC emissions	CISPR 11 / EN 55011, Class B [1)] IEC 60945 IEC 301908-1
Safety	IEC/EN 62368-1
Type approvals	DNV certificate no. TAA00003X1
Safety listing (U.S. and Canada)	MET Listed
Cybersecurity	Developed in accordance with ISO/IEC 27001 and IEC 62443-4-1 for secure product development practices
Compliance marks	CE, China RoHS, FCC, KC, RCM

1) Class A if the system includes ComNav G2 satellite compass.

Table 26 AWS830 environmental compliance

Test	Applied standard or test procedure
Cold	IEC 60068-2-1
Dry heat	IEC 60068-2-2
Vibration (sinusoidal)	IEC 60068-2-6
Change of temperature	IEC 60068-2-14
Shock	MIL-STD-202G, method 213B, condition J
Damp heat, cyclic	IEC 60068-2-30
Vibration (random)	IEC 60068-2-64
Outdoor enclosure ENC652 only	
Corrosion and salt mist	VDA-621-415

Table 27 AWS830 electromagnetic compatibility

Test	Applied standard or test procedure
Conducted RF immunity	IEC 61000-4-6
Electrical fast transient immunity	IEC 61000-4-4
Surge immunity	IEC 61000-4-5
ESD immunity	IEC 61000-4-2
Radiated emissions	CISPR 16-2-3
Conducted emissions	CISPR 16-2-1
RF field immunity	IEC 61000-4-3
Power supply variation	IEC 60945
Power supply failure immunity	IEC 60945

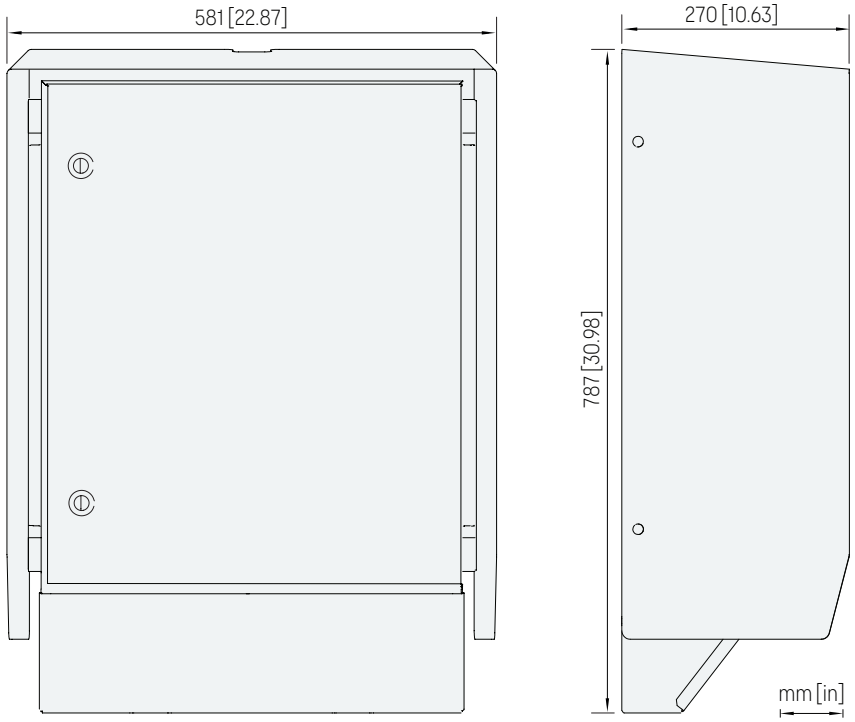


Figure 15 ENC652 dimensions

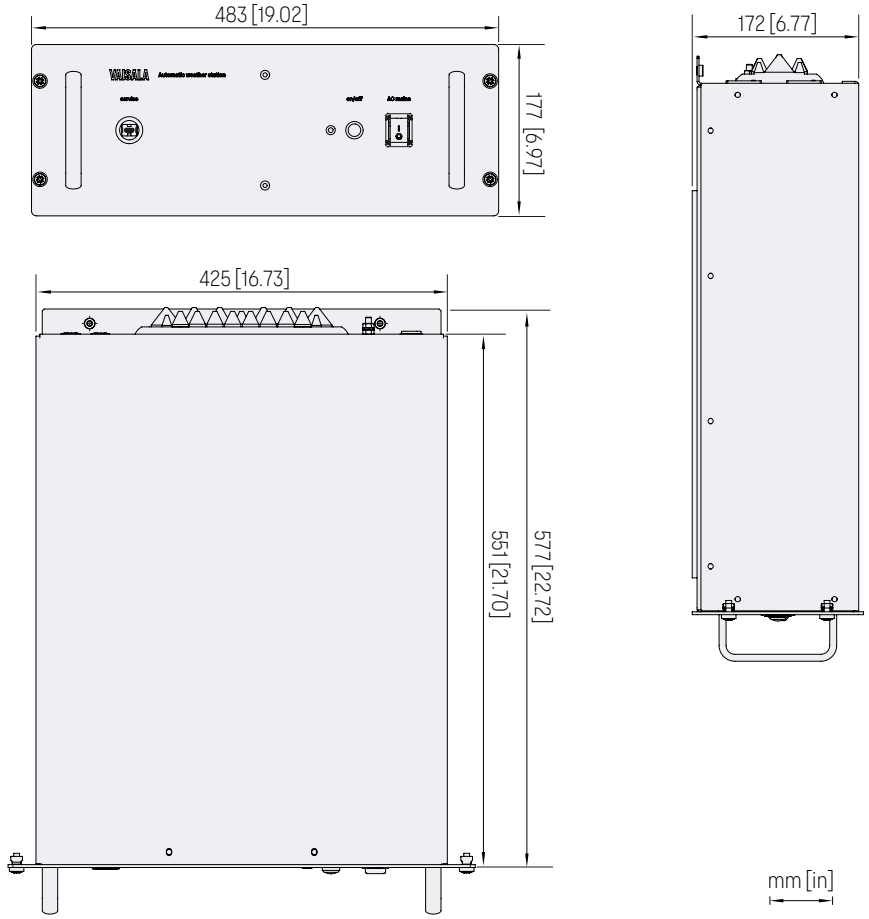


Figure 16 Rack enclosure dimensions

More information

- Vaisala Weather Station Enclosure ENC652 (page 21)
- Rack enclosure (page 25)

6.1.1 AWS830 operating power consumption

The following table shows the typical power consumption that can be used to estimate battery backup time for 12 V DC backup battery operation. The backup battery does not support sensor heating power.

Table 28 AWS830 operating power consumption

Equipment	Operating power consumption (excluding heating power)
Basic system (DMU801 data management unit, BMU801 battery management unit)	0.5 W
HMP155	0.02 W
WMT700	1.5 W

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Equipment	Operating power consumption (excluding heating power)
WXT530	0.036 W
PTB330	0.36 W
BARO-1	0.004 W
PWD22	6 W
CL31 (typical, measurement unit only)	0.15 W
SMC-108	4 W
MRU Marine 3000	6 W
ComNav G2	< 3 W
WaveGuide 5	Height & Tide: 8 W [1)] Height & Tide & Direction: 24 W [1)] Processing unit: 4.8 W Moxa device server: 2.7 W

1) External power supply required.

6.1.2 AWS830 heating power consumption

The following table lists the typical heating power consumption for some sensors. For the peak values, see the sensor manuals.

Table 29 AWS830 heating power consumption

Equipment	Heating power consumption
HMP155	< 2.5 W
WMT700	With transducer heating: 30 W With transducer and arm heating: 150 W [1)]
WM80 (heating and operating)	With transducers, device top, and device body heating: 264 W (peak) [1)]
WXT530	12 W
PWD22	65 W

1) PJB480 power junction box required.

6.2 DMU801 specifications

Table 30 DMU801 operating environment

Property	Description/Value
Operating temperature	−40 … +85 °C (−40 … +185 °F)

Property	Description/Value
Extended operating temperature (available on request)	−60 … +85 °C (−76 … +185 °F)
Storage temperature	−60 … +85 °C (−76 … +185 °F)
Operating humidity	0–100 %RH, non-condensing

1) Operating temperature of some of the DMU801 plug-in modules may be different. See the plug-in module datasheets.

Table 31 DMU801 powering specifications

Property	Description/Value
Operating voltage	8–32 V DC (maximum 10 A)
Power consumption, typical	500 mW
Heating voltage	24 V DC nominal
Maximum input current for heating	12 A
Mating connectors (power/heating input)	2 × Phoenix Contact FKCN 2,5/2-ST-5,08 (included)

Table 32 DMU801 processing system

Property	Description/Value
Processor	ARM Cortex A9, 800 MHz
Memory	1 GB DDR3L RAM, 8 GB eMMC Flash
External memory	SD card up to 32 GB [1)]
Operating system	Linux
Communications protocol	IPv4 and IPv6
Real-time clock (standard)	
Accuracy	Better than 20 s/month
Backup battery	CR1225/BR1225
Backup time	Minimum 5 years

1) SD card available as an accessory.

Table 33 DMU801 compliance

Property	Description/Value
EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
EMC immunity	EN 61326-1, industrial environment

Property	Description/Value	
EMC emissions	CISPR 32 / EN 55032, Class B FCC part 15 B, Class B CAN ICES-3(B)/NMB-3(B)	
Cybersecurity	Developed in accordance with ISO/IEC 27001 and IEC 62443-4-1 for secure product development practices	
Compliance marks	CE, China RoHS, FCC, ICES, RCM, UKCA	
Test	**Applied standard**	**Description/Value**
Maritime	IEC 60945	–
Vibration (sinusoidal)	IEC 60068-2-6	5–13.2 Hz, 1 mm (0.04 in) amplitude 13.2–200 Hz, 0.7 g
Rough handling	IEC 60068-2-31	Drop height 100 cm (39.37 in)
Shock	IEC 60068-2-27	15 g, 11 ms, saw-tooth
Dry heat	IEC 60068-2-2	+85 °C (+185 °F)
Damp heat	IEC 60068-2-78	+40 °C (+104 °F), 95 %RH
Cold	IEC 60068-2-1	−60 °C (−76 °F)

Table 34 DMU801 inputs and outputs

Property	Description/Value
Ethernet	
Ports	**eth0** on CPU, additional ports with plug-in modules
Supported standard	IEEE 802.3u
Physical layer	Base-T
Data rate	10/100 Mbps
Connectors	RJ45 with link LEDs
Data transmission	Full/Half-duplex with auto-negotiation
USB	
Ports	1
Supported standard	USB 2.0
Signaling	High speed
Connectors	USB-C
Serial	
Ports	• 1 × RS-232 / RS-485 / SDI-12 port • 2 × RS-485 ports • Additional ports with plug-in modules
Supported bit rate	1200–115 200 bps

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Property	Description/Value
Power output	5 × software controllable power output pins
Signals	• RS-232: RXD, TXD • RS-485: D+/D–
Digital I/O	4 × 3.3 V logic level GPIO pins, pulse count capable
Mating connectors	• 2 × Phoenix Contact DFMC 1,5/4-ST-3,5-LR (included) • 1 × M8 4-pin male
Note: 4-wire RS-485/RS-422 is supported by using 2 × 2-wire RS-485.	
TCP/IP	
Supported protocols	DHCP, DNS, NTP, ARP, ICMP Echo, TCP/IP, SSH, UDP, DTLS, HTTPS [1)]

1) The list is subject to change.

Table 35 DMU801 mechanical specifications

Property	Description/Value
Weight	8-slot unit: 0.71 kg (1.57 lb)
Mounting	DIN rail 35 mm (1.4 in)
Dimensions (H × W × D)	
8 slots	120 × 185 × 84 mm (4.72 × 7.28 × 3.31 in)
Materials	
Screws, washers	Stainless steel AISI 316
DIN rail locking piece	Stainless steel AISI 630
Frame profile	Aluminum EN AW-6060 T6
End covers	Plastic PC/ABS

More information

▸ Vaisala Data Management Unit DMU801 (page 27)

6.2.1 DMS801 specifications

Table 36 DMS801 inputs and outputs

Property	Description/Value
Ports	• 3 × serial ports for isolated RS-485 • 1 × multipurpose serial port supporting 2-wire RS-485, RS-232, and SDI-12
Mating connectors	4 × Phoenix Contact DFMC 1,5/4-ST-3,5-LR (included)

Property	Description/Value
Supported bit rate	1200–115 200 bps
Power output	Each serial port has a separate, software controllable power output pin
Heating output	Each serial port has separate heating power supply pins
Signals, RS-232	RXD, TXD, GND
Signals, RS-485 serial	D+/D−
Signals, RS-485 serial, isolated	D+/D−
Note: 4-wire RS-485/RS-422 is supported by using 2 × 2-wire RS-485.	

Table 37 DMS801 powering specifications

Property	Description/Value
Sensor supply voltage	3–26 V, software controllable
Current limit	1.4 A, −25 % ... +20 % per port
Sensor heating current limit	2 A per plug-in module

Table 38 DMS801 mechanical specifications

Property	Description/Value
Dimensions (H x D)	123 × 79 mm (4.84 × 3.11 in)
Distance between 2 plug-in module slots in DMU801 frame	18 mm (0.71 in)
Weight	68 g (2.4 oz)
Material	UL-rated fire-resistive FR4
Handles	Stainless steel
Coating	Conformally coated against humidity

More information

- Serial Modules DMS801 and DMS802 (page 28)

6.2.2 DMS802 specifications

Table 39 DMS802 inputs and outputs

Property	Description/Value
Ports	• 2 × standard RS-232 serial ports • 1 × multipurpose serial port supporting 2-wire RS-485 and RS-232 • 1 × multipurpose serial port supporting 2-wire RS-485, RS-232, and SDI-12
Mating connectors	4 × Phoenix Contact DFMC 1,5/4-ST-3,5-LR (included)
Supported bit rate	1200–115 200 bps
Power output	Each serial port has a separate, software controllable power output pin
Heating output	Each serial port has separate heating power supply pins
Signals, RS-232	RXD, TXD, GND
Signals, RS-485 serial	D+/D–
Note: 4-wire RS-485/RS-422 is supported by using 2 × 2-wire RS-485.	

Table 40 DMS802 powering specifications

Property	Description/Value
Sensor supply voltage	3–26 V, software controllable
Current limit	1.4 A, –25 % ... +20 % per port
Sensor heating current limit	2 A per plug-in module

Table 41 DMS802 mechanical specifications

Property	Description/Value
Dimensions (H x D)	123 × 79 mm (4.84 × 3.11 in)
Distance between 2 plug-in module slots in DMU801 frame	18 mm (0.71 in)
Weight	65 g (2.3 oz)
Material	UL-rated fire-resistive FR4
Handles	Stainless steel
Coating	Conformally coated against humidity

More information

- Serial Modules DMS801 and DMS802 (page 28)

6.2.3 DMA801 specifications

Table 42 DMA801 accuracy specifications

Property	Description/Value
Temperature measurement (Pt100 sensor) [1) 2)]	
Measurement range	−60 … +85 °C (−76 … +185 °F)
Uncertainty over temperature range −60 … +85 °C (−76 … +185 °F)	< ±0.04 °C
Typical error at 0 °C (+32 °F) [3)]	< ±0.01 °C
Temperature measurement (Pt1000 sensor) [1) 2)]	
Measurement range	−60 … +85 °C (−76 … +185 °F)
Uncertainty over temperature range −60 … +85 °C (−76 … +185 °F)	< ±0.35 °C
Typical error at 0 °C (+32 °F) [3)]	< ±0.2 °C
NTC thermistor [2)]	
Uncertainty over temperature range −60 … +85 °C (−76 … +185 °F)	
1–360 kΩ	±0.14 %
360 kΩ – 1.5 MΩ	±0.7 %
Voltage measurement	
Uncertainty over temperature range −40 … +70 °C (−40 … +158 °F):	
±2.5 V range	< 0.05 % of reading ±1.85 µV
±1.25 V range	< 0.04 % of reading ±2.3 µV
±620 mV range	< 0.04 % of reading ±0.9 µV
±310 mV range	< 0.04 % of reading ±0.75 µV
±156 mV range	< 0.04 % of reading ±0.8 µV
±78 mV range	< 0.04 % of reading ±1.25 µV
±39 mV range	< 0.04 % of reading ±0.8 µV
Uncertainty over temperature range −60 … +85 °C (−76 … +185 °F):	
±2.5 V range	< 0.05 % of reading ±1.85 µV
±1.25 V range	< 0.04 % of reading ±2.3 µV
±620 mV range	< 0.04 % of reading ±0.9 µV
±310 mV range	< 0.04 % of reading ±0.85 µV
±156 mV range	< 0.04 % of reading ±1.2 µV
±78 mV range	< 0.05 % of reading ±1.25 µV
±39 mV range	< 0.06 % of reading ±0.95 µV

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Property	Description/Value
Common mode range	+2.5 V / −0.9 V
Voltage measurement 0–30 V	
Uncertainty over temperature range −60 … +50 °C (−76 … +122 °F)	±0.3 % of reading ±3 mV, typical
Uncertainty over temperature range −60 … +85 °C (−76 … +185 °F)	±1.2 % of reading ±3 mV, typical
Input impedance	> 900 kΩ
Maximum measurable voltage	32.765 V
Frequency measurement	
Measurement range	0–10 000 Hz
Uncertainty over temperature range −60 … +85 °C (−76 … +158 °F):	
3–100 Hz	< 0.04 % of reading
100–1000 Hz	< 0.082 % of reading
1000–10 000 Hz	< 0.82 % of reading

1) *Verified by measuring ±20 °C from ambient temperature, while ambient temperature spreads across the entire range.*
2) *Confidence level k=2.*
3) *Verified with DMU801 at 0 °C (+32 °F).*

Table 43 DMA801 inputs and outputs

Property	Description/Value
Inputs	• 4 × differential analog inputs • 2 × 0–30 V single-ended measurement channels • 2 × frequency/counter measurement channels
Mating connectors	4 × Phoenix Contact DFMC 1,5/4-ST-3,5-LR (included)
Power output	Each port has a separate, software-controllable power output pin and a separate excitation pin
Heating output	Each port has separate heating power supply pins
A/D conversion	Low noise 24-bit A/D converter with internal diagnostics

Table 44 DMA801 powering specifications

Property	Description/Value
Sensor supply voltage	3–26 V, software controllable
Current limit	0.7 A, −25 % … +20 % per port
Sensor heating current limit	2 A per plug-in module

Table 45 DMA801 mechanical specifications

Property	Description/Value
Dimensions (H x D)	123 × 79 mm (4.84 × 3.11 in)
Distance between 2 plug-in module slots in DMU801 frame	18 mm (0.71 in)
Weight	64 g (2.26 oz)
Material	UL-rated fire-resistive FR4
Handles	Stainless steel
Coating	Conformally coated against humidity

More information

- Analog Measurement Modules DMA801 and DMA803 (page 30)

6.2.4 DMA803 specifications

Table 46 DMA803 accuracy specifications

Property	Description/Value
Temperature measurement (Pt100 sensor) [1) 2)]	
Measurement range	−60 ... +85 °C (−76 ... +185 °F)
Uncertainty over temperature range −40 ... +60 °C (−40 ... +140 °F)	< ±0.03 °C
Uncertainty over temperature range −60 ... +85 °C (−76 ... +185 °F)	< ±0.04 °C
Typical error at 0 °C (+32 °F) [3)]	< ±0.01 °C
Long-term stability	1.7 mK / year, typical
Temperature measurement (Pt1000 sensor) [1) 2)]	
Measurement range	−60 ... +85 °C (−76 ... +185 °F)
Uncertainty over temperature range −60 ... +85 °C (−76 ... +185 °F)	< ±0.35 °C
Typical error at 0 °C (+32 °F) [3)]	< ±0.2 °C
Long-term stability	1.7 mK / year, typical
NTC thermistor [2)]	
Uncertainty over temperature range −60 ... +85 °C (−76 ... +185 °F)	
1–360 kΩ	±0.14 %
360 kΩ – 1.5 MΩ	±0.7 %
Voltage measurement	

Property	Description/Value
Uncertainty over temperature range −40 … +70 °C (−40 … +158 °F):	
±2.5 V range	< 0.05 % of reading ±1.85 µV
±1.25 V range	< 0.04 % of reading ±2.3 µV
±620 mV range	< 0.04 % of reading ±0.9 µV
±310 mV range	< 0.04 % of reading ±0.75 µV
±156 mV range	< 0.04 % of reading ±0.8 µV
±78 mV range	< 0.04 % of reading ±1.25 µV
±39 mV range	< 0.04 % of reading ±0.8 µV
Uncertainty over temperature range −60 … +85 °C (−76 … +185 °F):	
±2.5 V range	< 0.05 % of reading ±1.85 µV
±1.25 V range	< 0.04 % of reading ±2.3 µV
±620 mV range	< 0.04 % of reading ±0.9 µV
±310 mV range	< 0.04 % of reading ±0.85 µV
±156 mV range	< 0.04 % of reading ±1.2 µV
±78 mV range	< 0.05 % of reading ±1.25 µV
±39 mV range	< 0.06 % of reading ±0.95 µV
Common mode range	+2.5 V / −0.9 V
Voltage measurement 0–30 V	
Uncertainty over temperature range −60 … +50 °C (−76 … +122 °F)	±0.3 % of reading ±3 mV, typical
Uncertainty over temperature range −60 … +85 °C (−76 … +185 °F)	±1.2 % of reading ±3 mV, typical
Input impedance	> 900 kΩ
Maximum measurable voltage	32.765 V
Frequency measurement [4]	
Measurement range	0–10 000 Hz
Uncertainty over temperature range −60 … +85 °C (−76 … +158 °F):	
3–100 Hz	< 0.025 % of reading
100–1000 Hz	< 0.082 % of reading
1000–10 000 Hz	< 0.82 % of reading

1) *Verified by measuring ±20 °C from ambient temperature, while ambient temperature spreads across the entire range.*
2) *Confidence level k=2.*
3) *Verified with DMU801 at 0 °C (+32 °F).*
4) *The given values are the maximum uncertainty percentages of single measurements. Average calculation gives better results.*

Table 47 DMA803 inputs and outputs

Property	Description/Value
Inputs	• 4 × differential analog inputs • 2 × 0–30 V single-ended measurement channels • 2 × frequency/counter measurement channels
Mating connectors	4 × Phoenix Contact DFMC 1,5/4-ST-3,5-LR (included)
Power output	Each port has a separate, software-controllable power output pin and a separate excitation pin
Heating output	Each port has separate heating power supply pins
A/D conversion	Low noise 24-bit A/D converter with internal diagnostics

Table 48 DMA803 powering specifications

Property	Description/Value
Sensor supply voltage	3–26 V, software-controllable
Current limit	1.26 A, ±20 % per port
Sensor heating current limit	2 A per plug-in module

Table 49 DMA803 mechanical specifications

Property	Description/Value
Dimensions (H x D)	123 × 79 mm (4.84 × 3.11 in)
Distance between 2 plug-in module slots in DMU801 frame	18 mm (0.71 in)
Weight	64 g (2.26 oz)
Material	UL-rated fire-resistive FR4
Handles	Stainless steel
Coating	Conformally coated against humidity

More information

▸ Analog Measurement Modules DMA801 and DMA803 (page 30)

6.2.5 DME801 specifications

Table 50 DME801 inputs and outputs

Property	Description/Value
Ports	• 3 × copper ports, RJ45 connectors • 2 × SFP module slots [1)]

Property	Description/Value
Supported standard	IEEE 802.3
Physical layer, copper ports	Base-T
Data rate	10/100/1000 Mbps
Data transmission	Full/Half-duplex with auto-negotiation

1) Support for the second SFP module will be available in the future releases.

Table 51 DME801 mechanical specifications

Property	Description/Value
Dimensions (H × D)	123 × 79 mm (4.84 × 3.11 in)
Distance between 2 plug-in module slots in DMU801 frame	18 mm (0.71 in)
Weight	65 g (2.3 oz)
Material	UL-rated fire-resistive FR4
Handles	Stainless steel
Coating	Conformally coated against humidity

More information

- Ethernet Switch Module DME801 (page 31)

6.2.5.1 SFP module specifications

The small form-factor pluggable (SFP) is a compact, hot-pluggable transceiver used for data communications applications. SFP interfaces a switch to a fiber-optic or copper networking cable. The type of the SFP module varies depending on the fiber type (single-mode/multi-mode) and the used wavelength.



These specifications apply to the specified devices only (Vaisala items 279188 for single-mode and 234930 for multi-mode operation). The type of the device may differ in individual deliveries. For details, see the project documentation.

Table 52 SFP module specifications

Property	Description/Value
Operating temperature	−40 ... +85 °C (−40 ... +185 °F)
Wave length	1310 nm
Maximum communication distance	Single-mode: 10 km (6.21 mi) Multi-mode: 2 km (1.24 mi)
Fiber mode	Single-mode or multi-mode

Property	Description/Value
Compliance	Class 1 laser product, EN 60825-1:2014

6.2.6 DMB801 specifications

Table 53 BARO-1 specifications

Property	Description/Value
Sensor type	Vaisala BAROCAP® (silicon capacitive)
Observation range	500–1100 hPa
Resolution	0.01 hPa
Operating temperature	−40 … +60 °C (−40 … +140 °F)

Table 54 DMB801 measurement performance

Property	Description/Value
Pressure range	500–1100 hPa
Accuracy	Class A
Linearity [1)]	±0.05 hPa
Hysteresis [1)]	±0.03 hPa
Repeatability [1)]	±0.03 hPa
Calibration uncertainty [2)]	±0.07 hPa
Accuracy at +20 °C (+68 °F) [3)]	±0.10 hPa
Total accuracy at −40 … +60 °C (−40 … +140 °F)	±0.15 hPa
Temperature dependence [4)]	±0.10 hPa
Long-term stability	±0.10 hPa/year
Response time	1 s

1) *Defined as ±2 standard deviation limits of endpoint non-linearity, hysteresis error, or repeatability error.*
2) *Defined as ± 2 standard deviation limits of inaccuracy of the working standard including traceability to NIST.*
3) *Defined as the root sum of the squares (RSS) of endpoint non-linearity, hysteresis error, repeatability error and calibration uncertainty at room temperature.*
4) *Defined as ±2 standard deviation limits of temperature dependence over the operating temperature range.*

Table 55 DMB801 mechanical specifications

Property	Description/Value
Dimensions (H × D)	123 × 79 mm (4.84 × 3.11 in)
Distance between 2 plug-in module slots in DMU801 frame	18 mm (0.71 in)

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Property	Description/Value
Weight	88 g (3.1 oz)
Material	UL-rated fire-resistive FR4
Handles	Stainless steel
Coating	Conformally coated against humidity

More information

- Barometer Module DMB801 (page 31)

6.3 Powering specifications

6.3.1 AC (mains) power supply specifications

Standard AWS830 includes two AC (mains) power supply units.

Table 56 AC (mains) power supply specifications

Property	Description/Value
Output power	240 W (2 × 120 W)
Input voltage	100–240 V AC, –15 % ... +10 %
Frequency	50–60 Hz
Input current on full load	120 V AC: 3.0 A (2 × 1.5 A) 230 V AC: 1.8 A (2 × 0.9 A)
Nominal output voltage	24 V DC (setting range 24–29.5 V DC)
Efficiency	88.8 % (120 V AC), typical 89.2 % (230 V AC), typical
Operating temperature	–25 ... +75 °C (–13 ... +167 °F), startup type tested at –40 °C (–40 °F) > +60 °C (+140 °F), derating: 2.5 %/K
Mean time between failures	766 000 h (combined value for 2 units), according to IEC 61709

More information

- AC/DC power supply unit (page 35)

6.3.2 PJB480 specifications

Table 57 PJB480 operating environment

Property	Description/Value
Operating temperature	−55 … +55 °C (−67 … +131 °F) [1]
Storage temperature	−60 … +70 °C (−76 … +158 °F)
Operating humidity	0–100 %RH, non-condensing
Maximum operating altitude	2000 m (approx. 6500 ft)
IP rating	IP66: Dust-tight. Protected from powerful water jets from any direction.

1) *Cold start at −40 °C (−40 °F)*

Table 58 PJB480 inputs and outputs

Property	Description/Value
Input voltage	100–240 V AC
Input current	10 A
Operating frequency	50/60 Hz
Output voltage	24 V DC
Output current	16 A
Maximum output power	480 W
Nominal output power	300 W

Table 59 PJB480 mechanical specifications

Property	Description/Value
Enclosure dimensions (H × W × D)	300 × 400 × 200 mm (11.81 × 15.75 × 7.87 in)
Weight	14 kg (30 lb)
Materials (enclosure and mounting plate)	Stainless steel AISI 316 / EN 1.4404
Coating (enclosure and mounting plate)	Painted white, polyester powder coating RAL9003



In maritime environments, Vaisala recommends installing PJB480 without the mounting plate assembly (ASM212478).

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Table 60 PJB480 environmental compliance

Property	Description/Value
Maritime	IEC 60945
Vibration	IEC 60068-2-6/IEC 60945
Dry heat	IEC 60068-2-2
Damp heat	Cyclic IEC 60068-2-30
Low temperature	IEC 60068-2-1
Corrosion and salt mist	IEC60068-2-52, VDA 621-415

Table 61 PJB480 compliance

Property	Description/Value
EU directives and regulations	Low Voltage Directive (2014/35/EU) RoHS Directive (2011/65/EU) as amended by 2015/863 EMC Directive (2014/30/EU)
Compliance marks	CE, China RoHS, RCM
Safety	61010-1:2010 + A1:2019
Environmental	EN IEC 63000:2018
Electromagnetic compatibility (EMC)	
Emissions	EN 55032:2015 + A11:2020, Class B
Immunity	EN/IEC 61321-1:2020-2021, industrial environment

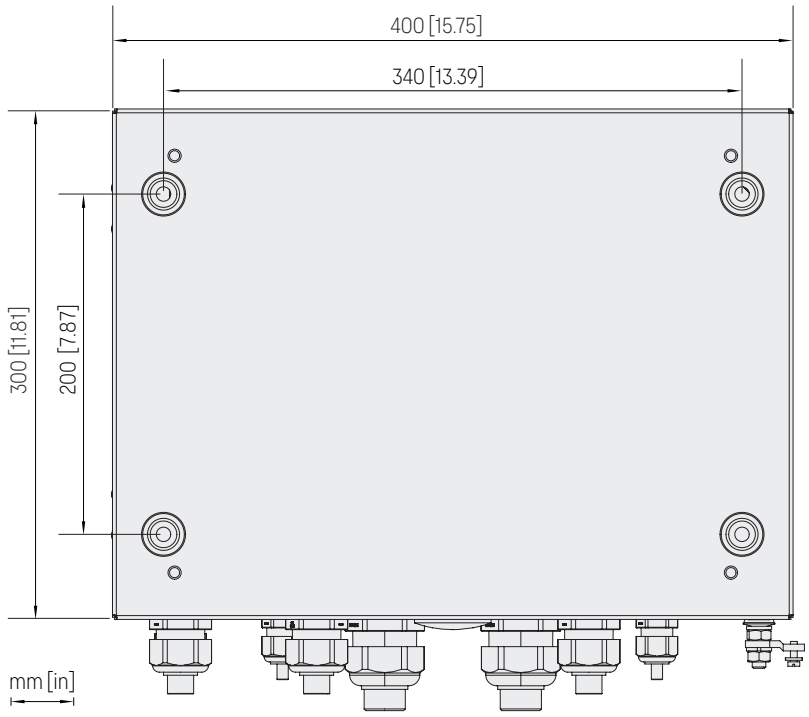


Figure 17 PJB480 dimensions (no mounting plate), back view

More information

- Vaisala Power Junction Box PJB480 (page 37)

6.3.3 12 V / 13 Ah backup battery specifications

For operating and storage temperature, see manufacturer documentation.

Table 62 12 V / 13 Ah backup battery specifications

Property	Description/Value
Model	EnerSys XE13X
Type	Valve-regulated lead-acid, absorbent glass mat (VRLA AGM) battery
Nominal voltage	12 V
Nominal capacity	13 Ah

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Property	Description/Value
Self-discharge	Batteries self-discharge when stored for longer periods, and a refresh charge may be required. The refresh charge interval depends on the battery model and the storage temperature. For details, see the manufacturer documentation.
Dimensions (H × W × L)	129 × 83 × 175 mm (5.01 × 3.27 × 6.89 in)
Weight	5.4 kg (11.9 lb)

More information

- Backup battery (page 38)

6.3.4 BMU801 specifications

Table 63 BMU801 operating environment

Property	Description/Value
Operating environment	Outdoor use [1]
Use in wet location	Yes [1]
Operating temperature	−40 … +70 °C (−40 …+158 °F) [2] [3]
Storage temperature	−60 … +85 °C (−76 … +185 °F)
Operating humidity	0–100 %RH, non-condensing
Pollution degree	2
Maximum operating altitude	3000 m (approx. 9800 ft)
IP rating	IP20: Protected against solid foreign objects of 12.5 mm Ø and greater.

1) *Inside a weather-proof enclosure (IP65).*
2) *Recommended operating temperature for batteries may be different. See manufacturer documentation.*
3) *When the battery or its ambient temperature exceeds the operating temperature limit of the battery, BMU801 stops charging but the capability to supply power to the weather station (or other system) remains.*

Table 64 BMU801 inputs and outputs

Property	Description/Value
Compatible battery types	Valve-regulated lead-acid (VRLA) battery
Input voltage (all DC inputs)	9–28 V DC [1] [2]
Input voltage (for 12 V VRLA battery charging)	15–28 V DC
Overvoltage category	I
Maximum input current	10 A
Charging voltage (for 12 V VRLA battery charging)	12–15.6 V

Property	Description/Value
Maximum battery charging current	6 A
Nominal output voltage	24 V [3)]
Maximum continuous output (load) current	10 A
Nominal voltage, solar panel	12 V DC
Maximum power, solar panel	100 W
NTC connectors	2 × push-in connector for NTC temperature sensors
Mating connectors	
2 × battery, 2 × solar panel, power in/out	Phoenix Contact FKCN 2,5/2-ST-5,08
Modbus	M8 4-pin female
GPIO	Phoenix Contact DFMC 1,5/3-ST-3,5-LR • 2 × status output (max. 100 mA / 30 V) • 1 × battery voltage output • 1 × force-off input

1) *The short-term maximum voltage is 30 V DC.*
2) *When using external DC power supply, install an external 10 A or 16 A disconnecting device, such as slow-blow fuse, for the DC input.*
3) *The actual output equals the DC input voltage when DC power supply or solar panel is connected. If no DC power or solar power is available, the output equals the battery voltage.*

Table 65 BMU801 compliance

Test	Applied standard	Description/Value
EU directives and regulations	EMC Directive (2014/30/EU) Low Voltage Directive (2014/35/EU) RoHS Directive (2011/65/EU) as amended by 2015/863	
EMC immunity	EN 61326-1, industrial environment	
EMC emissions	CISPR 32 / EN 55032, Class B	
Safety	IEC/EN/UL/CSA-C22.2 61010-1	
Compliance marks	CE, RCM, UKCA	
Safety listing (U.S. and Canada)	MET Recognized	
Test	**Applied standard**	**Description/Values**
Vibration (sinusoidal)	IEC 60068-2-6 IEC 60945	5–13.2 Hz, 1 mm (0.04 in) amplitude 13.2–200 Hz, 0.7 g
Shock	IEC 60068-2-27	15 g, 11 ms, saw-tooth 30 g, 11 ms, half-sine
Dry heat	IEC 60068-2-2	+70 °C (+158 °F)
Damp heat	IEC 60068-2-78	+40 °C (+104 °F), 95 %RH

Test	Applied standard	Description/Value
Cold	IEC 60068-2-1	−60 °C (−76 °F)

Table 66 BMU801 mechanical specifications

Property	Description/Value
Dimensions (H × W × D)	120 × 33 × 84 mm (4.72 × 1.30 × 3.31 in)
Weight	0.22 kg (0.49 lb)
Mounting	DIN rail 35 mm (1.4 in)
Materials	
Screws, washers	Stainless steel AISI 316
DIN rail locking piece	Stainless steel AISI 630
Frame profile	Aluminum EN AW-6060 T6
End covers	Plastic PC/ABS

More information

- Vaisala Battery Management Unit BMU801 (page 39)

6.4 Transient protection specifications

6.4.1 QSP431 specifications

Table 67 QSP431 operating environment

Property	Description/Value
Operating temperature	−40 … +60 °C (−40 … +140 °F)
Storage temperature	−60 … +70 °C (−76 … +158 °F)
Operating humidity	0–100 %RH

Table 68 QSP431 inputs and outputs

Property	Description/Value
Signal line	2 lines (with common ground pin)
Maximum data rate	57 600 bps
Maximum voltage	±12 V DC
Maximum current	750 mA
Signal line series resistance	15 Ω

Property	Description/Value
Power line	2 lines (with common ground pin)
Maximum voltage	±32 V DC
Maximum current	3 A
Maximum surge current (IEC 61000-4-5 8/20 µs pulse), common and differential modes	3 kA

Table 69 QSP431 mechanical specifications

Property	Description/Value
Dimensions (H × W × L)	74 × 14 × 62 mm (2.91 × 0.55 × 2.44 in)
Screw terminal connectors	6 pins with detachable plugs (2 pcs), pitch 3.81 mm (0.15 in)
Conductor cross-sections	
Plain wire	0.14–1.5 mm^2 (26–16 AWG)
Wire with plastic collar, with ferrules	0.25–0.5 mm^2 (24–21 AWG)
Wire without collar, with ferrules	0.25–1.5 mm^2 (24–16 AWG)

Table 70 QSP431 frame isolation (applicable only when chassis screw is removed)

Property	Description/Value
Nominal isolation voltage	500 V
Insulation resistance	> 10 MΩ
Protection breakdown voltage	700 V

Table 71 QSP431 compliance

Property	Description/Value
EU directives and regulations	RoHS Directive (2011/65/EU) as amended by 2015/863
Compliance marks	CE

More information

- Vaisala Surge Protection Unit QSP431 (page 40)

6.4.2 Termbox specifications

Table 72 Termbox operating environment

Property	Description/Value
Operating environment	Outdoor use
Use in wet location	Yes
Operating temperature	–40 ... +60 °C (–40 ... +140 °F)
Operating humidity	0–100 %RH
IP rating	IP66: Dust-tight. Protected from powerful water jets from any direction.
Pollution degree	2

Table 73 Termbox inputs and outputs

Property	Description/Value
Line types	AC (mains) 115/230 V AC Signal lines
Signal line types	2-wire RS-485 RS-232C
Mains in connector	Number of contacts: 5 (L1, L2, L3, N, PE) Contact area: 10 mm^2
Mains out connectors	Number of contacts: 2 × 3 (L, N, PE) Contact area: 10 mm^2
Signal line connectors	Integrated to signal line protectors 2.5 mm^2 Contact area: 2.5 mm^2
Grounding cable clamp	For 16 mm^2 jacketed cable
Cable glands	The shield can be grounded to the following sizes of cable glands: • 5–10 mm (0.20–0.39 in) • 7–12 mm (0.28–0.47 in)
AC (mains) 115/230 V AC in	1 × Ø 18–25 mm (0.71–0.98 in)
AC (mains) 115/230 V AC out	1 × Ø 18–25 mm (0.71–0.98 in) 2 × Ø 7–12 mm (0.28–0.47 in)
Signal line in	1 × Ø 7–12 mm (0.28–0.47 in)
Signal line out	1 × Ø 5–10 mm (0.20–0.39 in)
Overvoltage category	III

Table 74 Termbox AC (mains) power protection specifications

Property	Description/Value
Input voltage range	100–240 V AC, –10/+6 %
I_{rms}	Maximum 10 A
Phoenix Plugtrap VAL-SEC-T2-1S-350-FM[1)]	IEC category IIEN type T2
I_{max} (8/20 µs)	15 kA
Protection level	1500 V DC at 10 kA

1) For 230 V AC networks. Also suitable for 115 V AC networks.

Table 75 Termbox compliance

Property	Description/Value
EU directives and regulations	Low Voltage Directive (2014/35/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Safety	EN 61010-1:2010+A1:2019
Environmental	EN IEC 63000:2018

Table 76 TERMBOX-1200 RS-485/RS-232C protection specifications

Property	Description/Value
Protection component	Phoenix Contact PT 1×2-BE base element (rail-mountable) Phoenix Contact PT 3-HF-12DC-ST plug Base element PT 1×2+F-BE
I_{max} (8/20 µs)	10 kA
Protection level (1kV/1µs)	25 V
Serial resistance	2.2 Ω

Table 77 Termbox mechanical specifications

Property	Description/Value
Dimensions (W × D × H)	260 × 160 × 91 mm (10.24 × 6.30 × 3.58 in)
Color	RAL 9003
Weight	3.1 kg (6.8 lb)
Material	Aluminum

More information

- Vaisala TERMBOX (page 42)

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6.5 Display device specifications

6.5.1 DEIF XDi-N display specifications

For latest product information and updates, see the manufacturer documentation.

Table 78 DEIF XDi-N 144 display specifications

Property	Value/Description
Operating temperature	–25 ... +55 °C (–13 ...+131 °F)
Storage temperature	–30 ... +80 °C (–22 ... +176 °F)
Display	High quality wide-angle TFT
Resolution	WVGA 800 × 480
Weight	375 g (13 oz)
Dimensions (H × W × L)	
Without module	148 × 58.2 × 102 mm (5.83 × 2.29 × 4.02 in)
With module	148 × 87.1 × 102 mm (5.83 × 3.43 × 4.02 in)

Table 79 DEIF XDi-N 192 display specifications

Property	Value/Description
Operating temperature	–25 ... +55 °C (–13 ...+131 °F)
Storage temperature	–30 ... +80 °C (–22 ... +176 °F)
Display	High-quality wide-angle TFT
Resolution	WVGA 800 × 480
Weight	550 g (19 oz)
Dimensions (H × W × L)	
Without module	148 × 60.6 × 196 mm (5.83 × 2.39 × 7.72 in)
With module	148 × 89.5 × 196 mm (5.83 × 3.53 × 7.72 in)

Table 80 NX2 NMEA I/O module specifications

Property	Value/Description
Remote push-button controls	2 × contact input

Property	Value/Description
Inputs and outputs	2 × serial input 1 × output 1 × RS-485 port that be configured as either an input or an output
Input protocol	NMEA 0183
Output protocol	NMEA 0183, according to IEC 61162-1

More information

- DEIF weather or wind display (page 44)

6.6 Sensor specifications

6.6.1 HMP155 specifications

Table 81 HMP155 humidity measurement performance

Property	Description/value
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).*

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Table 82 HMP155 temperature measurement performance

Description	Value
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

Table 83 HMP155 inputs and outputs

Property	Description/value
Operating voltage	7–28 V DC
Minimum operating voltage	0–1 V output or RS-485: 7 V 0–5 V output, or warmed probe: 12 V 0–10 V output, chemical purge, or XHEAT: 16 V
Outputs	Voltage output: 0–1 V, 0–5 V, 0–10 V Resistive Pt100 4-wire connection RS-485
Average power consumption (+15 V DC, load 100 kΩ)	0–1 V output: < 3 mA 0–10 V output: +0.5 mA RS-485: < 4 mA During chemical purge: Max. 110 mA With warmed probe: Max. 150 mA
Settling time at startup	Voltage output: 2 s RS-485: 3 s

Table 84 HMP155 operating environment

Property	Description/value
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: Dust-tight. Protected from powerful water jets from any direction.

Table 85 HMP155 compliance

Property	Description/value
EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, Electrical equipment for measurement, control and laboratory use - EMC requirements; industrial environment CISPR 32 / EN 55032, Class B
RoHS	EN IEC 63000:2018
Application standards	EN 15518-3:2023, Winter maintenance equipment - Road weather information systems - Part 3: Requirements on measured values of stationary equipment

Table 86 HMP155 mechanical specifications

Property	Description/value
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

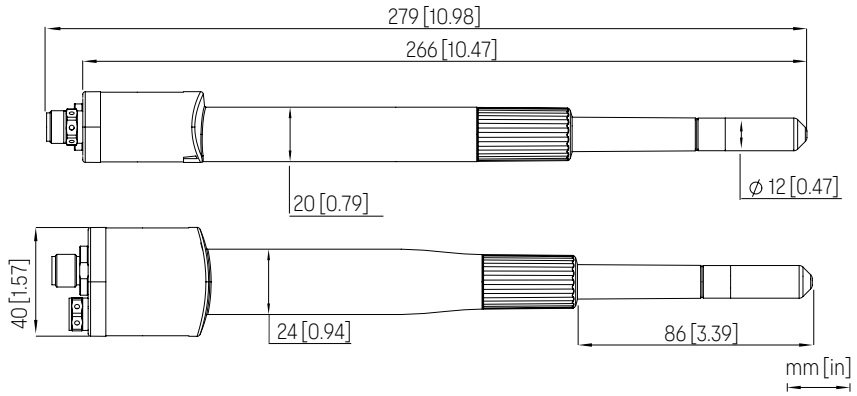


Figure 18 HMP155 dimensions

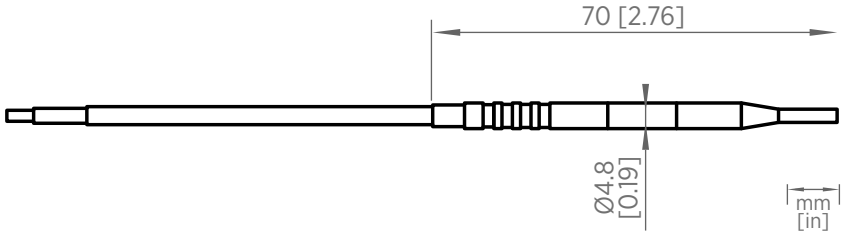


Figure 19 Additional T-probe dimensions

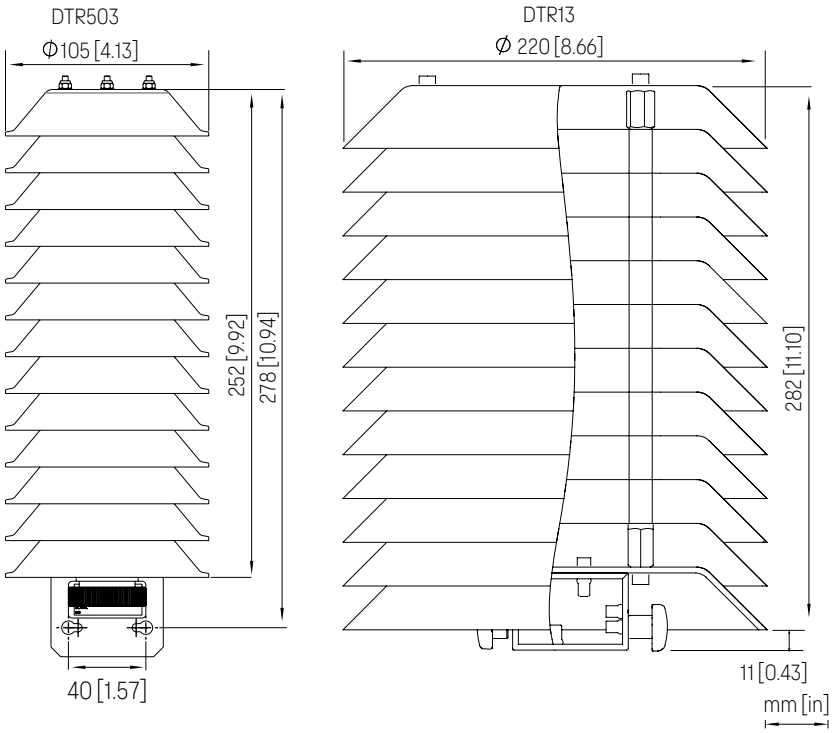


Figure 20 DTR503 and DTR13 dimensions

More information

- Vaisala HUMICAP Humidity and Temperature Probe HMP155 (page 49)

6.6.2 WMT700 specifications

Table 87 WMT700 wind speed measurement performance

Property	Description/Value
Observation range	WMT701: 0–40 m/s (89 mph) WMT702: 0–65 m/s (145 mph) WMT703: 0–75 m/s (168 mph) WMT704: 0–90 m/s (201 mph)

Property	Description/Value
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 75–90 m/s (201 mph): ±5 % of reading
Available variables	Instant, peak, average, maximum, minimum, gust, lull

Table 88 WMT700 wind direction measurement performance

Property	Description/Value
Observation range	0–360°
Starting threshold	0.1 m/s (0.2 mph)
Resolution	0.01°
Response time	250 ms
Accuracy	±2°
Available variables	Instant, average, maximum, minimum

Table 89 WMT700 operating environment

Property	Description/Value
Operating temperature	−55 ...+70 °C (−67 ...+158 °F)
Storage temperature	−60 ... +80 °C (−76 ... +176 °F)
Operating humidity	0–100 %RH
IP rating	IP66: Dust-tight. Protected from powerful water jets from any direction. IP67: Dust-tight. Protected from the effects of temporary immersion in water under standardized conditions of pressure and time.

Table 90 WMT700 powering specifications

Property	Description/Value
Operating voltage	9–36 V DC (absolute max. 40 V DC) [1)]
Heating voltage	24–36 V DC (absolute max. 40 V DC) [1)]
Heating power supply requirement [2)]	
Heated transducers	Average 32 W Peak 40 W

Property	Description/Value
Heated transducers and arms [3]	Average 152 W Peak 200 W
Heated transducers, arms, and body [3]	Average 252 W Peak 350 W at 24 V DC

1) *In maritime environments, the normal input voltage ranges are: operating voltage 12–30 V DC (–25 … +30 %) and heating voltage 24–30 V DC (–25 … +30 %), as defined in the maritime standard IEC 60945.*
2) *The actual power consumption depends on the temperature.*
3) *PJB480 power junction box required.*

Table 91 WMT700 messaging specifications

Property	Description/Value
Readout update interval	4 Hz (default) and 8 Hz (optional)
Units available	m/s, knots, mph, km/h, V, mA, Hz
Operating mode	Automatic message or poll mode
Sonic temperature	Celsius degrees
Data format outputs	Polar coordinates and vectors

Table 92 WMT700 digital outputs

Property	Description/Value
Communication interfaces	COM1: RS-485 COM2: RS-485, RS-422, RS-232, SDI-12
Communication profiles	NMEA Extended, 9600, 8, N, 1 Autosend 0.25/s
Bit rate	9600
Available averages	Max. 3600 s

Table 93 WMT700 compliance

Property	Description/Value
EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863 REACH Regulation (EC 1907/2006)
EMC immunity	IEC 61326-1:2013, IEC 60945
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

Property	Description/Value
Maritime	IEC 60945:2002 + IEC 60945/Cor1:2008, DNVGL-CG-0339
Safety	UL 61010-1 CAN/CSA C22.2 No. 61010-1-12
Application standards	EN 15518-3:2023, Winter maintenance equipment - Road weather information systems - Part 3: Requirements on measured values of stationary equipment
Compliance marks	CE, China RoHS, RCM, UKCA
Listing marks	SGS (USA and Canada) [1]

1) *Not applicable to the integrated cable.*

Table 94 WMT700 mechanical specifications

Property	Description/Value
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.*

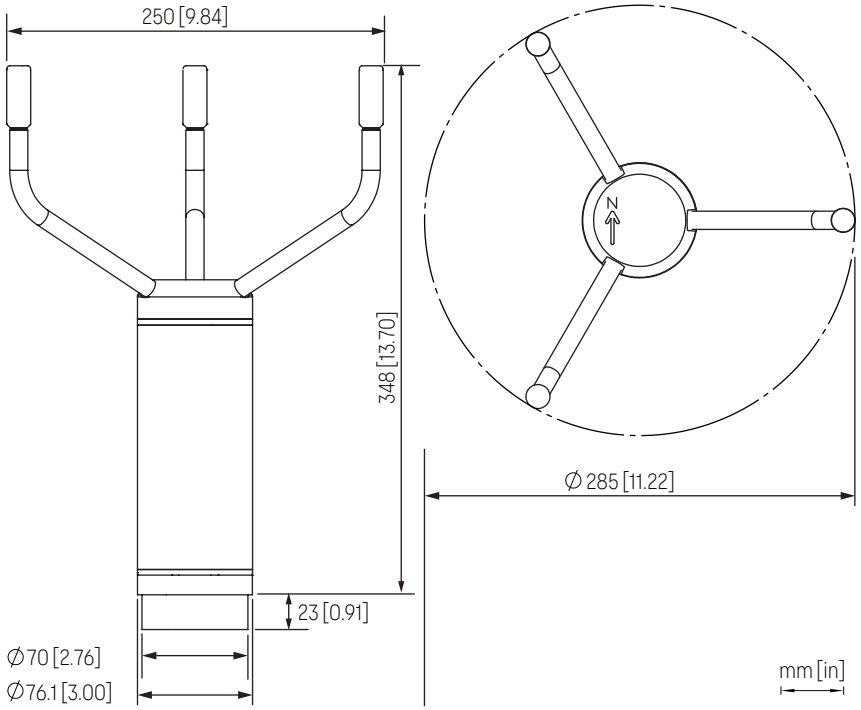


Figure 21 WMT700 dimensions

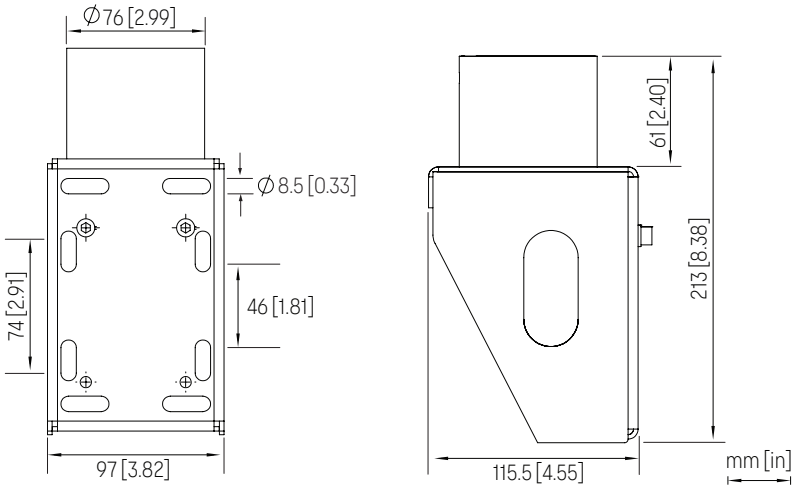


Figure 22 WMT70FIX mounting kit dimensions

More information

- Vaisala WINDCAP Ultrasonic Wind Sensor WMT700 (page 50)

6.6.3 WM80 specifications

Table 95 WM80 wind measurement performance

Property	Description/Value
Measurement rate	10 Hz
Averaging	Up to 3600 s
Wind speed	
Measurement range	0–90 m/s (0–200 mph)
Accuracy	0.1 m/s or 2 % at 0–50 m/s (0–112 mph) 5 % at > 50–90 m/s (112–200 mph)
Resolution	0.01 m/s (0.0223 mph)
Wind direction	
Measurement range	0–360°
Accuracy	4° at 1–5 m/s (2–11 mph) 2° at 5–50 m/s (11–112 mph) 5° at > 50 m/s (112 mph)
Resolution	0.01°, 0.1°, or 1° (depending on the protocol)

Table 96 WM80 operating environment

Property	Description/Value
Operating environment	Outdoor use
Use in wet location	Yes
Operating temperature	–40 … +60 °C (–40 … +140 °F)
Solar radiation	1120 W/m^2 at +60 °C (+140 °F)
Operating humidity	0–100 %RH, condensing
Survival wind speed	100 m/s (224 mph)
Maximum operating altitude	4000 m (approx. 13 100 ft)
Pollution degree	4
IP rating	IP66: Dust-tight. Protected from powerful water jets from any direction. IP67: Dust-tight. Protected from the effects of temporary immersion in water under standardized conditions of pressure and time.
UL 50E/NEMA rating	Type 4: Dust-tight. Protected from hose-directed water.
Storage temperature	–40 … +85 °C (–40 … +185 °F)
Storage humidity	0–100 %RH, non-condensing

Property	Description/Value
Heater control	Automatic

Table 97 WM80 powering

Property	Description/Value
Operating voltage	24 V DC, +30 / −25 %
Overvoltage category	CAT I
Operating current [1)]	
Heated transducers, device top, and device body	Max. 11 A
Heated transducers	Max. 2 A

1) The operating current of WM80 depends on the ambient conditions.

PJB480 power junction box is needed with heated WM80.

Table 98 WM80 data communication

Property	Description/Value
Data communication interface	RS-485, RS-422
Communication protocols	NMEA 0183 Data messages (ASCII) Modbus RTU
Measurement unit, wind speed	m/s (NMEA 0183, data messages (ASCII), Modbus) knots (NMEA, data messages (ASCII))
Configuration interface	Modbus RTU Vaisala Insight PC software
Output update interval	0.1–600 s, configurable

Table 99 WM80 mechanical specifications

Property	Description/Value
Dimensions, sensor (H × Ø)	133 × 88 mm (5.24 × 3.46 in)
Dimensions, sensor with 50-mm mounting adapter (H × Ø)	186 × 63 mm (7.32 × 2.48 in)
Dimensions, sensor with 60-mm mounting adapter (H × Ø)	186 × 73 mm (7.32 × 2.87 in)

Property	Description/Value
Dimensions, sensor with 50-mm isolated mounting adapter (H × Ø)	208 × 93 mm (8.19 × 3.66 in)
Weight, sensor	650 g (22.9 oz)
Weight, sensor with 50-mm mounting adapter	900 g (31.7 oz)
Weight, sensor with 60-mm mounting adapter	950 g (33.5 oz)
Weight, sensor with 50-mm isolated mounting adapter	1200 g (42.3 oz)
Connector	10-pin push-pull connector
Materials	Anodized aluminum (6026LF marine and offshore grade)
Installation	With mounting adapter to hollow pole

Table 100 WM80 compliance

Property	Description/Value
EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	IEC/EN 61326-1, industrial environment IEC/EN 61000-6-2 IEC/EN 61000-6-4
Safety	IEC/EN/AS/UL/CSA-C22.2 61010-1
Type approvals	DNV GL certificate no. TAA00003KF
Listing marks	NRTL safety listing, USA and Canada (SGS)
Compliance marks	CE, China RoHS, FCC, ICES, KC, RCM

Table 101 WM80 environmental compliance

Property	Description/Value	Test level
Icing and freezing rain	MIL-STD-810H, method 521.3	–10 °C and 10 m/s (+14 °F and 22 mph) Rain intensity approx. 0.3 mm/min (0.012 in/min) Recovery from de-icing of 37 mm (1.46 in) in 30 min after power-up
Wind driven rain	MIL-STD-810H, method 506.5	Rainfall 1.7 mm/min (0.067 in/min) Wind speed 17.7 m/s (40 mph)
Sand and dust tolerance	MIL-STD-810H, method 510.5	+60 °C, 9 m/s (+140 °F, 20 mph) (dust) 18–29 m/s (40–65 mph) (sand)

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Property	Description/Value	Test level
Hail tolerance	EN IEC 61215-2	50 mm (1.97 in) hail impact
Corrosion and salt mist	EN ISO 9227	1680 hours
Rough handling	IEC 60068-2-31	Drop height: 100 cm (40 in) without packaging 120 cm (47 in) with packaging
Cold	IEC 60068-2-1	−40 °C (−40 °F)
Low air pressure	IEC 60068-2-13	616 hPa / 4000 m (13 100 ft)
Change of temperature	IEC 60068-2-14	−40 ... +70 °C (−40 ... +158 °F)
Dry heat	IEC 60068-2-2	+70 °C (+158 °F), operative +85 °C (+185 °F), storage
Damp heat, cyclic	IEC 60068-2-30	+25 ... +55 °C (+77 ... +131 °F) at 93 %RH
Damp heat	IEC 60068-2-78	+40 °C (+104 °F) at 93 %RH
Composite temperature/humidity cyclic test	IEC 60068-2-38	−10 ... +65 °C (+14 ... +149 °F), 80–93 %RH
Simulated solar radiation at ground level	EN 60068-2-5	+55 °C (+131 °F), 1120 W/m^2 radiation
Vibration (sinusoidal)	IEC 60068-2-6	5–500 Hz
Vibration (random)	IEC 60068-2-64	10–2000 Hz, 4.78 g RMS
Shock	IEC 60068-2-27	30 g, 100 shocks/direction/axis

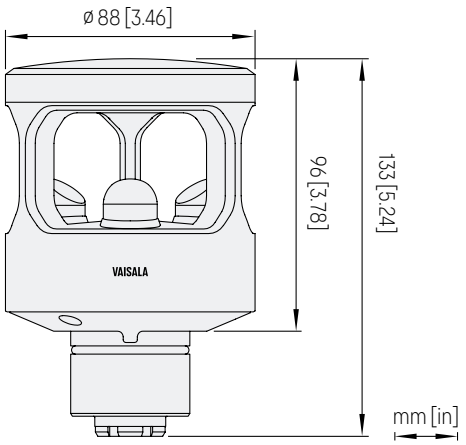


Figure 23 WM80 dimensions

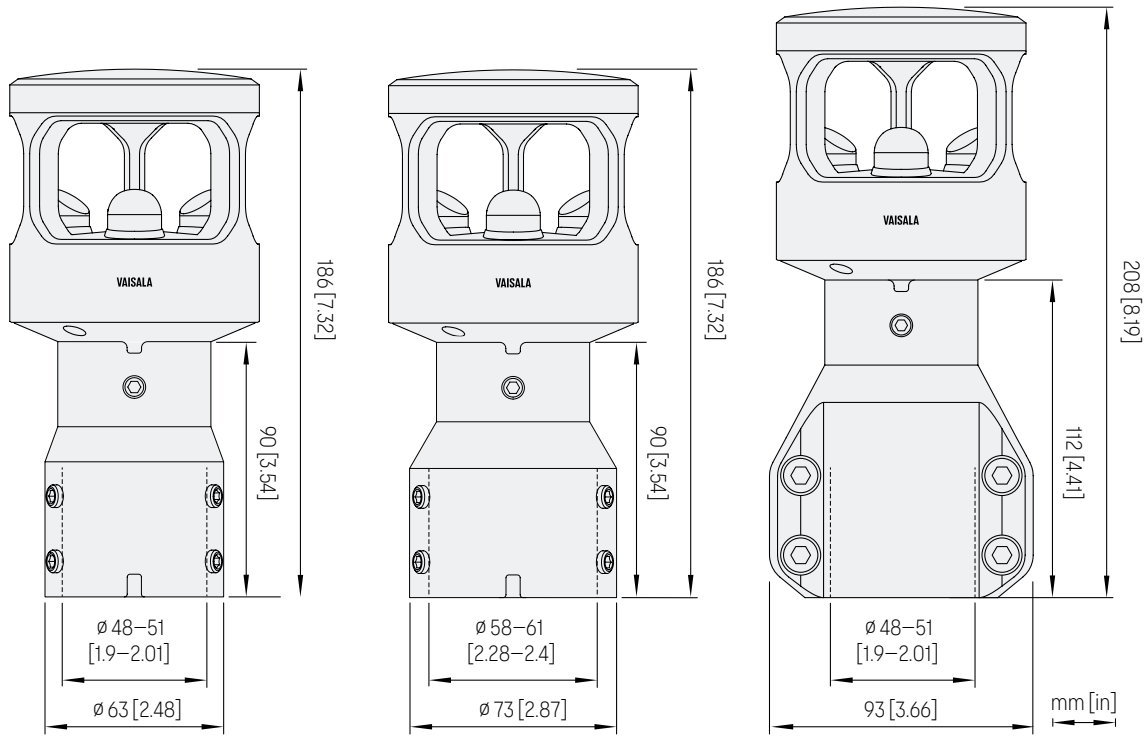


Figure 24 WM80 dimensions with 50-mm, 60-mm, and isolated mounting adapters

More information

- Vaisala Ultrasonic Wind Sensor WM80 (page 59)

6.6.4 PTB330 specifications

Table 102 PTB330 measurement performance

Property	Class A	Class B
Barometric pressure range 500–1100 hPA		
Linearity [1]	±0.05 hPa	±0.10 hPa
Hysteresis [1]	±0.03 hPa	±0.03 hPa
Repeatability [1]	±0.03 hPa	±0.03 hPa
Calibration uncertainty [2]	±0.07 hPa	±0.15 hPa
Accuracy at +20 °C (+68 °F) [3]	±0.10 hPa	±0.20 hPa
Barometric pressure range 50–1100 hPA		
Linearity [1]	–	±0.20 hPa
Hysteresis [1]	–	±0.08 hPa

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Property	Class A	Class B
Repeatability [1]	–	±0.08 hPa
Calibration uncertainty [2]	–	±0.15 hPa
Accuracy at +20 °C (+68 °F) [3]	–	±0.20 hPa
Temperature dependence [4]		
500–1100 hPa	±0.1 hPa	±0.1 hPa
50–1100 hPa	±0.3 hPa	±0.3 hPa
Total accuracy −40 … +60 °C (−40 … +140 °F)		
500–1100 hPa	±0.15 hPa	±0.25 hPa
50–1100 hPa	–	±0.45 hPa
Long-term stability		
500–1100 hPa	±0.1 hPa/year	±0.1 hPa/year
50–1100 hPa	±0.2 hPa/year	±0.2 hPa/year
Miscellaneous		
Pressure units	hPa, mbar, kPa, Pa inHg, mmH20, mmHg, torr, psia	hPa, mbar, kPa, Pa inHg, mmH20, mmHg, torr, psia
Resolution	0.01 hPa	0.1 hPa
Settling time at startup (1 sensor)	4 s	3 s
Response time (1 sensor)	2 s	1 s
Acceleration sensitivity	–	Negligible
Maximum pressure limit	–	5000 hPa absolute
Maximum measurement rate [5]	–	10 Hz

1) *Defined as ±2 standard deviation limits of endpoint non-linearity, hysteresis, 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 endpoint non-linearity, hysteresis error, repeatability error, and calibration uncertainty at room temperature.*
4) *Defined as ±2 standard deviation limits of temperature dependence over the operating temperature range.*
5) *For class A you need a longer averaging time or measurement interval.*

Table 103 PTB330 inputs and outputs

Property	Description/Value
Supply voltage	10–35 V DC
Supply voltage sensitivity	Negligible

Property	Description/Value
Typical power consumption at +20 °C (+68 °F) (voltage at 24 V DC with 1 pressure sensor)	RS-232: 25 mA RS-485: 40 mA Output voltage U_{out}: 25 mA Output current I_{out}: 40 mA
Serial communication	RS-232, RS-485, RS-422

Table 104 PTB330 operating environment

Property	Description/Value
Operating pressure	500–1100 hPa, 50–1100 hPa
Operating temperature	−40 ... +60 °C (−40 ... +140 °F)
Operating humidity	0–100 %RH, non-condensing
Storage temperature	−55 ... +80 °C (−67 ... +176 °F)
IP rating	IP40: Protected against solid foreign objects of 1 mm Ø and greater.

Table 105 PTB330 mechanical specifications

Property	Description/Value
Pressure fitting	Barbed fitting for 1/8-inch (inside diameter) tubing or quick connector with shutoff valve for 1/8-inch hose
Pressure connector	M5 (10-32) internal thread
Housing material	G AlSi10 Mg (DIN 1725)
Weight	1–1.5 kg (2.2–3.3 lb)

Table 106 PTB330 compliance

Property	Value
EU directives and regulations	RoHS Directive (2011/65/EU) as amended by 2015/863 EMC Directive (2014/30/EU) Low Voltage Directive (2014/35/EU), applies to units equipped with single-phase AC power supply Power-1
Safety	EN 61010-1:2010 + A1:2019, applies to units equipped with single-phase AC power supply Power-1
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment EN 55011:2009 + A1:2010

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Property	Value
Environmental	EN IEC 63000:2018

More information

- Vaisala BAROCAP Digital Barometer PTB330 (page 51)

6.6.5 PWD series specifications

Table 107 PWD10 measurement performance

Property	Description/Value
Operating principle	Forward scatter measurement with 45° scattering angle
Measurement interval	15 s
Reporting range of MOR (visibility)	10–2000 m (32–6500 ft)
Reporting resolution	1 m (3 ft)
Reporting uncertainty in operational conditions	±10 % at 10–2000 m (32–6500 ft) [1)]
Measurement error (instrument consistency)	±2.5 %

1) Fulfills ICAO Annex 3: ±50 m (164 ft) up to 600 m (1968 ft)

Table 108 PWD12 measurement performance

Property	Description/Value
Operating principle	Forward scatter measurement with 45° scattering angle
Measurement interval	15 s
Reporting range of MOR (visibility)	10–2000 m (32–6500 ft)
Reporting resolution	1 m (3 ft)
Reporting uncertainty in operational conditions	±10 % at 10–2000 m (32–6500 ft) [1)]
Measurement error (instrument consistency)	±2.5 %
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 (threshold)	0.05 mm/h (0.0020 in/h) or less, within 10 minutes

Property	Description/Value
Precipitation reporting resolution	Intensity 0.01 mm/h Accumulation 0.01 mm
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)

1) *Fulfills ICAO Annex 3: ±50 m (164 ft) up to 600 m (1968 ft)*

Table 109 PWD20 measurement performance

Property	Description/Value
Operating principle	Forward scatter measurement with 45° scattering angle
Measurement interval	15 s
Reporting range of MOR (visibility)	10–20 000 m (32–65 600 ft)
Reporting resolution	1 m (3 ft)
Reporting uncertainty in operational conditions	±10 % at 10–10 000 m (32–32 800 ft) [1)] ±15 % at 10–20 km (2.6–12 mi)
Measurement error (instrument consistency)	±2.5 %

1) *Fulfills ICAO Annex 3: ±50 m (164 ft) up to 600 m (1968 ft)*

Table 110 PWD22 measurement performance

Property	Description/Value
Operating principle	Forward scatter measurement with 45° scattering angle
Measurement interval	15 s
Reporting range of MOR (visibility)	10–20 000 m (32–65 600 ft)
Reporting resolution	1 m (3 ft)
Reporting uncertainty in operational conditions	±10 % at 10–10 000 m (32–32 800 ft) [1)] ±15 % at 10–20 km (2.6–12 mi)
Measurement error (instrument consistency)	+2.5 %
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

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Property	Description/Value
Weather type reporting	WMO 4680 (SYNOP), 4678 (METAR) and NWS code tables: 49 different codes supported from WMO 4680 code table
Precipitation detection sensitivity (threshold)	0.05 mm/h (0.0020 in/h) or less, within 10 minutes
Precipitation reporting resolution	Intensity 0.01 mm/h Accumulation 0.01 mm
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)

1) Fulfills ICAO Annex 3: ±50 m (164 ft) up to 600 m (1968 ft)

Table 111 PWD50 measurement performance

Property	Description/Value
Operating principle	Forward scatter measurement with 45° scattering angle
Measurement interval	15 s
Reporting range of MOR (visibility)	10–50 000 m (32–164 000 ft)
Reporting resolution	1 m (3 ft)
Reporting uncertainty in operational conditions	±10 % at 10–10 000 m (32–32 800 ft) [1] ±20 % at 10–50 km (6.2–31 mi)
Measurement error (instrument consistency)	+2.5 %

1) Fulfills ICAO Annex 3: ±50 m (164 ft) up to 600 m (1968 ft)

Table 112 PWD52 measurement performance

Property	Description/Value
Operating principle	Forward scatter measurement with 45° scattering angle
Measurement interval	15 s
Reporting range of MOR (visibility)	10–50 000 m (32–164 000 ft)
Reporting resolution	1 m (3 ft)
Reporting uncertainty in operational conditions	±10 % at 10–10 000 m (32–32 800 ft) [1] ±20 % at 10–50 km (2.6–31 mi)
Measurement error (instrument consistency)	±2.5 %

Property	Description/Value
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 the WMO 4680 code table
Precipitation detection sensitivity (threshold)	0.05 mm/h (0.0020 in/h) or less, within 10 minutes
Precipitation reporting resolution	Intensity 0.01 mm/h Accumulation 0.01 mm
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)

1) *Fulfills ICAO Annex 3: ±50 m (164 ft) up to 600 m (1968 ft)*

Table 113 PWD operating environment

Property	Description/Value
Operating temperature	−55 … +60 °C (−67 … +140 °F)
Storage temperature	−40 … +60 °C (−40 … +140 °F)
Operating humidity	0–100 %RH
Maximum operating wind speed	60 m/s (134 mph)
Sensor orientation	Align receiver to look away from bright lights (sun or flashing beacons)
IP rating	IP66: Dust-tight. Protected from powerful water jets from any direction.

Table 114 PWD inputs and outputs

Property	Description/Value
Power supply	12–50 V DC 24 V AC or 24 V DC for heater option
Average power consumption with hood heaters off	4.68 W at 24 V
Average power consumption with optional hood heaters on	Maximum 70.00 W at 24 V [1)]

1) *The actual power consumption depends on the temperature.*

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Table 115 PWD mechanical specifications

Property	Description/Value
Weight	3.1 kg (6.83 lb)
Material	Aluminum
Dimensions (H × W × L)	PWD10 and PWD20: 146 × 404 × 695 mm (5.75 × 15.91 × 27.36 in) PWD12: 152 × 404 × 695 mm (5.98 × 15.91 × 27.36 in) PWD22: 167 × 404 × 695 mm (6.57 × 15.91 × 27.36 in)

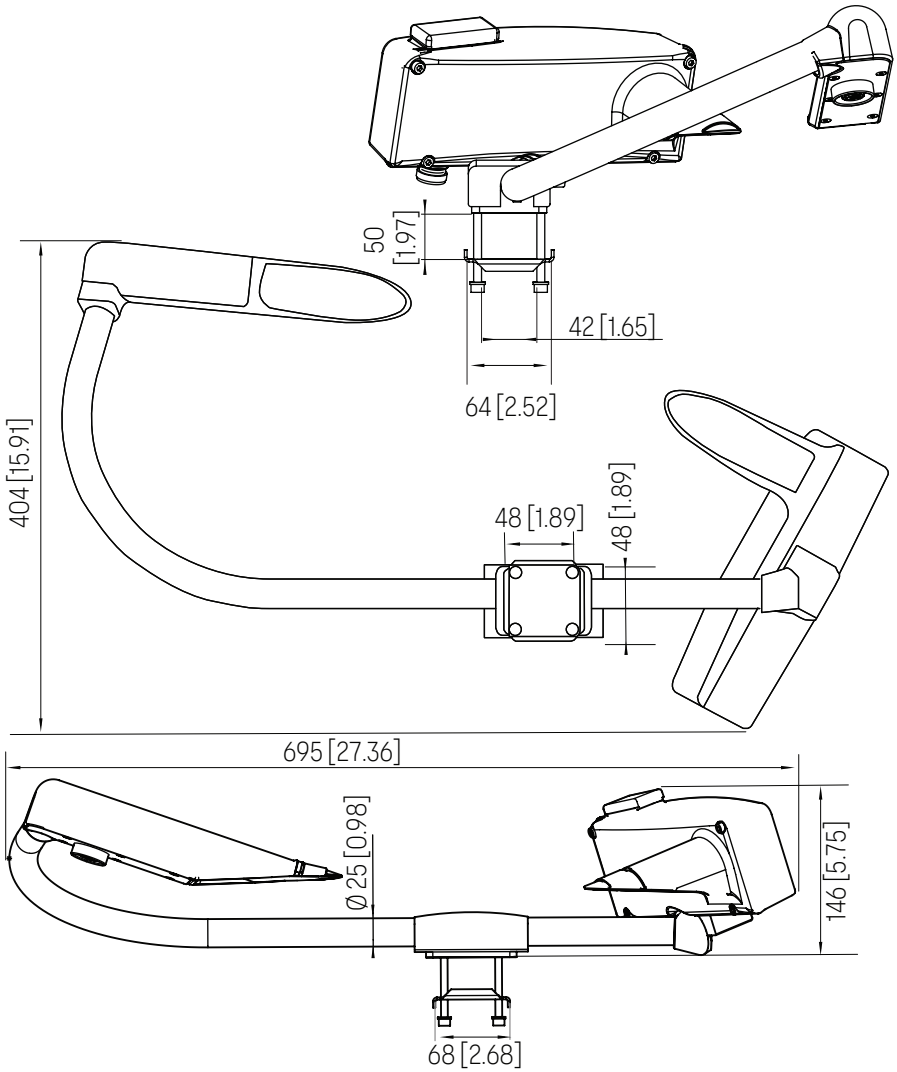


Figure 25 PWD10/20/50 dimensions

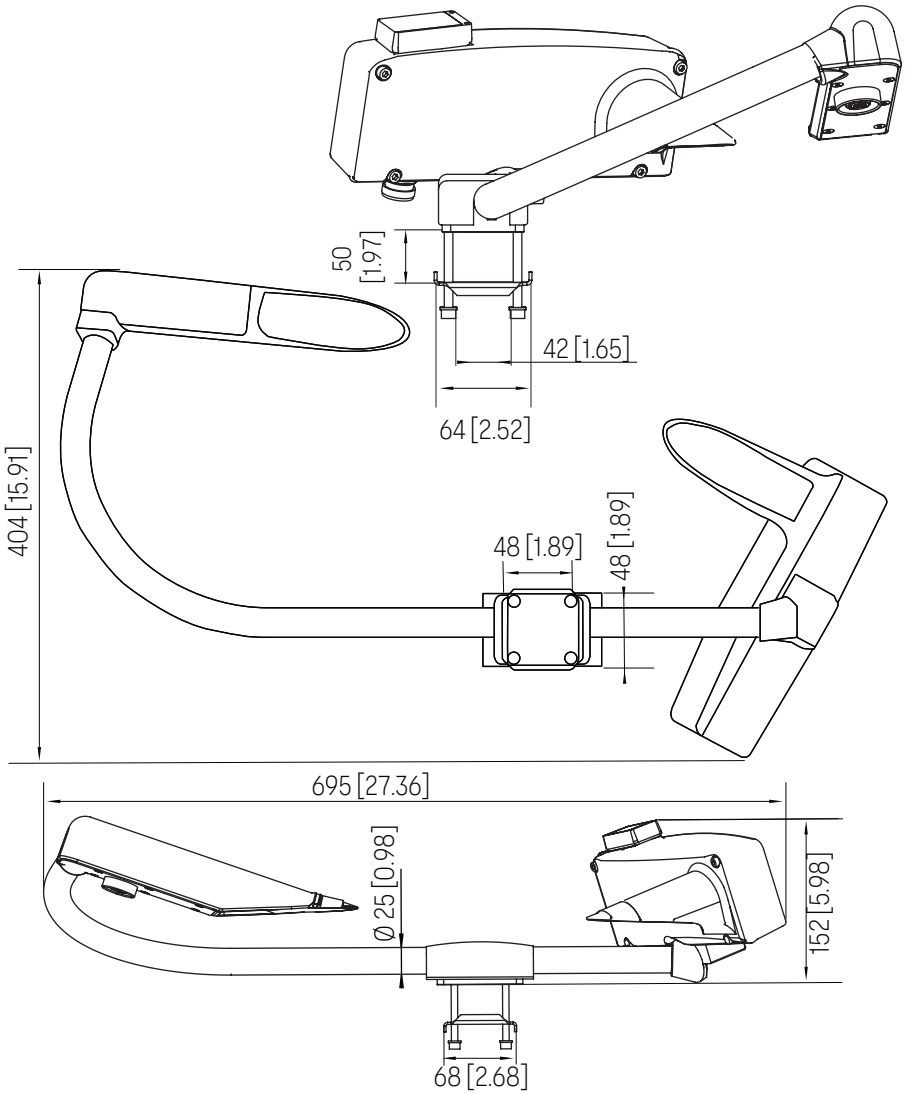


Figure 26 PWD12 dimensions

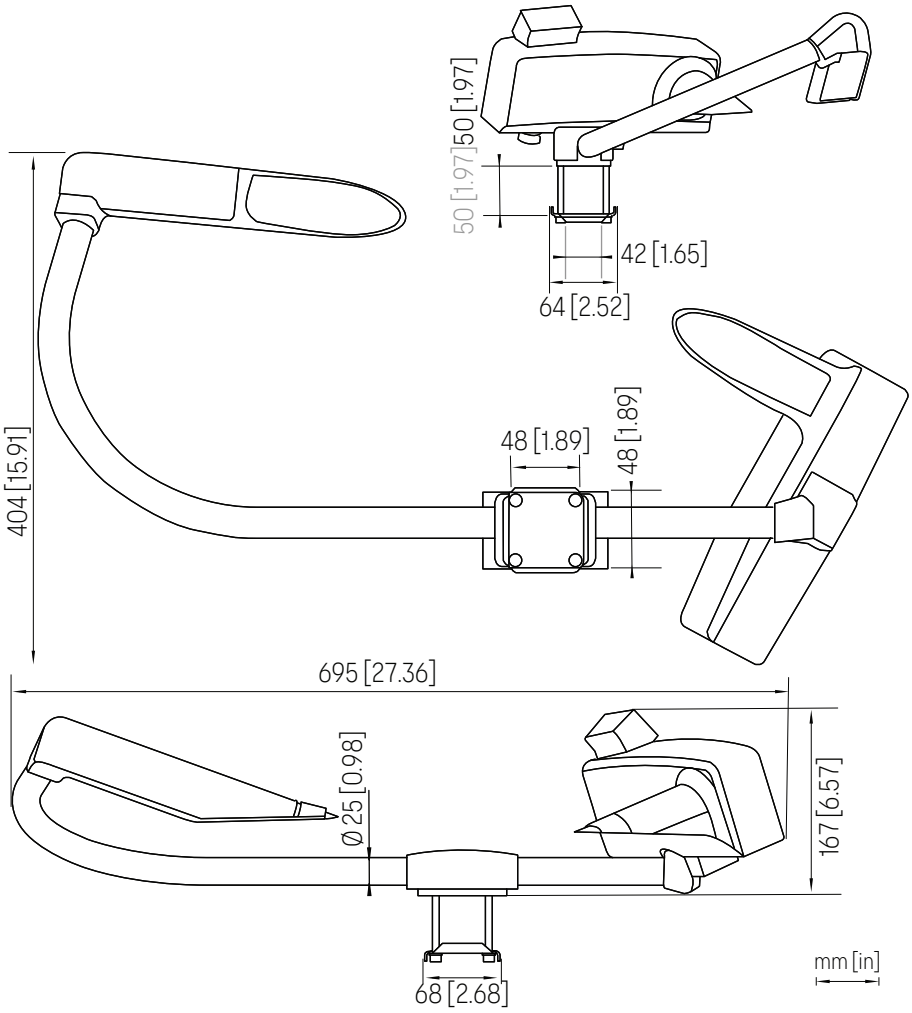


Figure 27 PWD22/52 dimensions

More information

- Vaisala Present Weather Detectors PWD12, PWD22, and PWD52 and Visibility Sensors PWD10, PWD20, and PWD50 (page 53)

6.6.6 CL31 specifications

Table 116 CL31 measurement performance

Property	Value
Measurement range	0–7.6 km (0–25 000 ft)
Reporting resolution (units selectable)	With 5-m resolution: 5 m or 10 ft With 10-m resolution: 10 m or 30 ft
Reporting interval	Programmable 2–120 s, or polling
Measurement interval	2 s default

Property	Value
Distance measurement accuracy against a hard target	±5 m (16 ft)

Table 117 CL31 inputs and outputs

Property	Description/Value
Operating voltage	115/230 V AC ±10 % (320 W)
Current consumption	
Current consumption (maximum)	2.7/1.4 A
Measurement unit	0.1/0.1 A
Internal heater	0.9/0.4 A
Window conditioner heater	1.5/0.8 A
Window blower	0.2/0.1 A
Frequency (min./max.)	50/60 Hz
Battery backup	12 V internal, VRLA (valve regulated lead acid), 2.4 Ah
Overvoltage protection	Low-pass filter, VDR
Overvoltage category	II
Interfaces	
Data	• RS-232 • RS-485, multidrop, 2-wire • DXL421 modem module • LAN (Ethernet) interface option
Maintenance	RS-232
Baud rate	
RS-232/RS--485	300–57 600 bps
Modem V.21, V.22	300–1200 bps

Table 118 CL31 operating environment

Property	Value
Operating environment	Outdoor use
Use in wet location	Yes
Operating temperature	−50 ... +60 °C (−58 ... +140 °F)
Operating humidity	0–100 %RH
Wind tolerance	Up to 55 m/s (123 mph)

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Property	Value
Vibration	Lloyds Register / IEC 60068-2-6 5–13.2 Hz, ±1.0 mm 13.2–100 Hz, ±0.79 g 9.1–150 Hz, ±0.5 g
Pollution degree for inside electronics	2
Maximum operating altitude	3000 m (approx. 9800 ft)
IP rating [1)]	IP65 (measurement unit) Dust-tight. Protected from water jets from any direction. IPX6 (with radiation shield) : Protected against strong jets of water.
UL 50E rating	Type 4: Dust-tight. Protected from hose-directed water.

1) The IP rating is valid only when the ceilometer is installed according to Vaisala instructions.

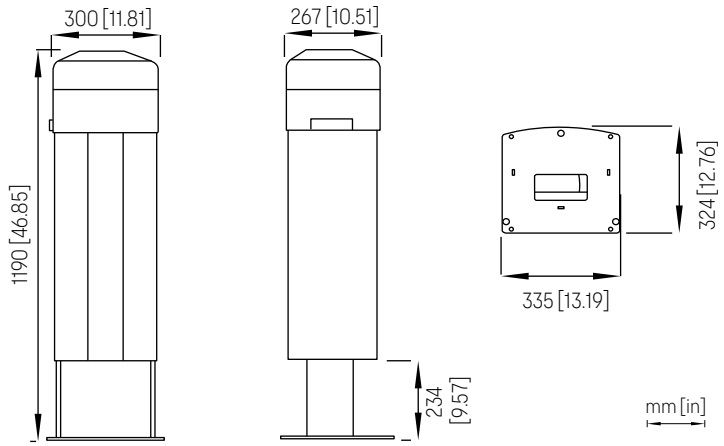
Table 119 CL31 transmitter specifications

Property	Value
Laser source	Indium gallium arsenide (InGaAs) diode laser
Center wavelength	910 ±10 nm at 25 °C (77 °F)
Operating mode	Pulsed
Radiated pattern emitted from the protective housing (measurement unit window)	
Maximum average power through 7-mm aperture in the plane of the laser aperture	570 µW
Average pulse power	11 W
Peak power	18.5 W
Average power	16.0 mW
Beam divergence	±0.4 mrad × ±0.7 mrad
Pulse duration	110 ns
Repetition rate	10.0 kHz
Laser classification	Class 1M laser product, IEC 60825-1:2014 (Edition 3.0) and EN 60825-1:2014 + A11:2021
Incorporated laser source (CLT321 transmitter)	
Peak power	91 W
Maximum average power	82.5 mW
Typical beam divergence	±5 × 12.5 degrees FWHM
Pulse duration	110 ns
Repetition rate	10 kHz

Property	Value
Laser class according to IEC/EN 60825-1:2014	3B

Table 120 CL31 mechanical specifications

Property	Value
Tilt positions	Vertical or 12° tilted
Dimensions	
Measurement unit	620 × 235 × 200 mm (24.41 × 9.25 × 7.87 in)
Height with radiation shield	1190 mm (47 in)
Total	1190 × 335 × 324 mm (46.85 × 13.19 × 12.76 in)
Weight	
Measurement unit	12 kg (26.46 lb)
Radiation shield and blower	19 kg (41.89 lb)
Total	31 kg (68.34 lb)
Plywood transport container	
Container size	1400 × 490 × 450 mm (55.12 × 19.30 × 17.72 in)
Container weight	47 kg (103.62 lb)



More information

- Vaisala Ceilometer CL31 (page 55)

6.6.7 WXT530 specifications

Table 121 WXT530 barometric pressure measurement performance

Property	Description/Value
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
Units available	hPa, Pa, bar, mmHg, inHg

Table 122 WXT530 air temperature measurement performance

Property	Description/Value
Observation range	−52 ... +60 °C (−60 ... +140 °F)
Accuracy (for sensor element) at +20 °C (+68 °F) [1)]	±0.3 °C (±0.54 °F)
Output resolution	0.1 °C (0.1 °F)
Units available	°C, °F

1) A naturally aspirated radiation shield is applied which can affect readings in calm wind.

Table 123 WXT530 relative humidity measurement performance

Property	Description/Value
Observation range	0–100 %RH
Accuracy (for sensor element) [1)]	±3 %RH at 0–90 %RH ±5 %RH at 90–100 %RH
Output resolution	0.1 %RH
PTU measuring interval	1–3600 s (= 60 min), at 1 s steps

1) A naturally aspirated radiation shield is applied which can affect readings in calm wind.

Table 124 WXT530 precipitation measurement performance

Property [1)]	Description/Value
Collecting area	60 cm^2 (9.3 in^2)
Rainfall [2)]	
Output resolution	0.01 mm (0.001 in)
Field accuracy for daily accumulation [3)]	Better than 5 %, weather-dependent
Units available	mm, in

Property [1]	Description/Value
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)
Units available	mm/h, in/h
Hail [4]	
Output resolution	0.1 hits/cm^2 (1 hits/in^2), 1 hit
Units available	hits/cm^2, hits/in^2, hits
Intensity output resolution	0.1 hits/cm^{2}h (1 hits/in^{2}h), 1 hit/h
Units available	hits/cm^{2}h, hits/in^{2}h, hits/h

1) Precipitation measurement is performed for liquid precipitation.
2) Cumulative accumulation after the latest automatic or manual reset.
3) Due to the nature of the phenomenon, deviations caused by spatial variations may exist in precipitation readings, especially in short time scale. The accuracy specification does not include possible wind-induced error.
4) Cumulative number of hits against collecting surface.

Table 125 WXT530 wind measurement performance

Property	Description/Value
Wind speed [1]	
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)
Units available	m/s, km/h, mph, knots
Wind direction [1]	
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°

Property	Description/Value
Averaging time	1–3600 s, sample rate 1, 2, or 4 Hz (configurable)

1) *NTP (normal temperature and pressure) condition applied for wind tunnel testing.*

Table 126 WXT530 inputs and outputs

Property	Description/Value
Operating voltage	6–24 V DC (−10 … +30 %)
Average power consumption	Minimum: 0.1 mA at 12 V DC (SDI-12 standby) Typical: 3.5 mA at 12 V DC (typical measuring intervals) [1)] Maximum: 15 mA at 6 V DC (constant measurement of all parameters)
Heating voltage	DC, AC, or full-wave rectified AC 12–24 V DC (−10 … +30 %) 12–17 V AC_{rms} (−10 … +30 %)
Typical heating current	12 V DC: 800 mA, 24 V DC: 400 mA 12 V AC_{rms}: 1.1 A 17 V AC_{rms}: 800 mA
Digital outputs	SDI-12, RS-232, RS-485, RS-422
Communication protocols	SDI-12 v1.3, Modbus RTU, ASCII automatic and polled, NMEA 0183 v3.0 with query option
Self-diagnostic	Separate supervisor message, unit/status fields to validate measurement stability
Startup	Automatic, < 5 seconds from power on to the first valid output

1) *Wind 10-second average with 2-minute interval at 4 Hz sampling rate, RS-232 19200 bps with jumper wires, PTU 10-second interval, Pt1000, level, tipping bucket, and solar radiation 5-second interval.*

Table 127 WXT530 operating environment

Property	Description/Value
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	500–1100 hPa
Wind [1)]	0–60 m/s (0–134 mph)

Property	Description/Value
IP rating	Without mounting kit: IP65: Dust-tight. Protected from water jets from any direction. With mounting kit: IP66: Dust-tight. Protected from powerful water jets from any direction.

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

Table 128 WXT530 mechanical specifications

Property	Description/Value
Weight	
WXT534, WXT536	0.7 kg (1.54 lb)
WXT532	0.5 kg (1.1 lb)
Materials	
Radiation shield, top, and bottom parts	Polycarbonate +20 % fiberglass
Precipitation sensor plate	Stainless steel (AISI 316)

Table 129 WXT530 compliance

Property	Description/Value
EU directives and regulations	EMC Directive (2014/30/EU) RoHS Directive (2011/65/EU) as amended by 2015/863
Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment CISPR 32 / EN 55032, Class B
Environmental	IEC 60068-2-1, 2, 6, 14, 30, 31, 78 IEC 60529, VDA 621-415
Maritime	IEC 60945 (Exposed) DNV GL Type Examination Certificate No. TAA00000VF
Compliance marks	CE, RCM, RoHS, China RoHS, UKCA



Any temporary object, such as snow, ice, or a bird, that blocks the observation path between the ultrasonic transducers may lead to inaccurate measurements.



Extreme operating conditions can alter the performance temporarily.

NOTICE! Make sure that you power up the sensor after installation. Storing the sensor outdoors without a proper package or not powering up after installation can affect the expected lifespan of the sensor.

Select a heated sensor model if you operate the sensor in humid conditions.

Select a heated sensor model if you operate the sensor in temperatures below 0 °C (+32 °F).

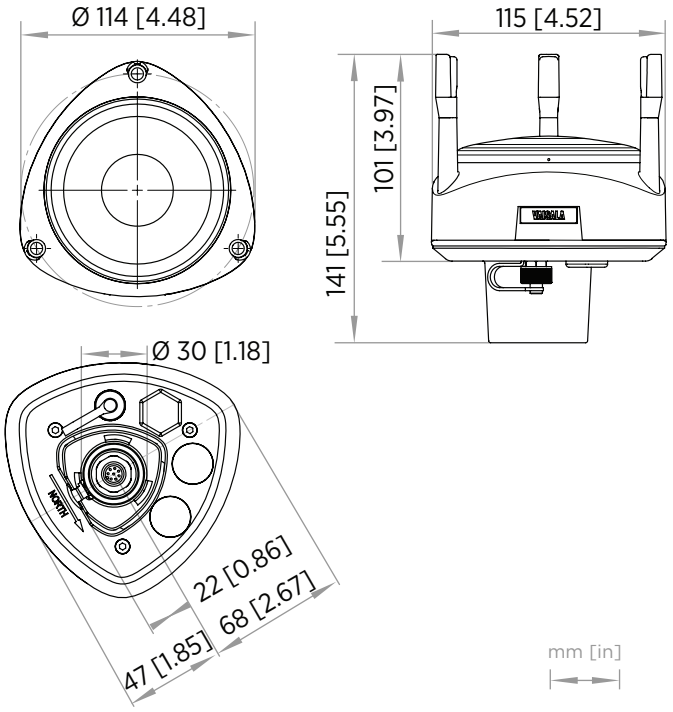


Figure 28 WXT533 and WXT532 dimensions

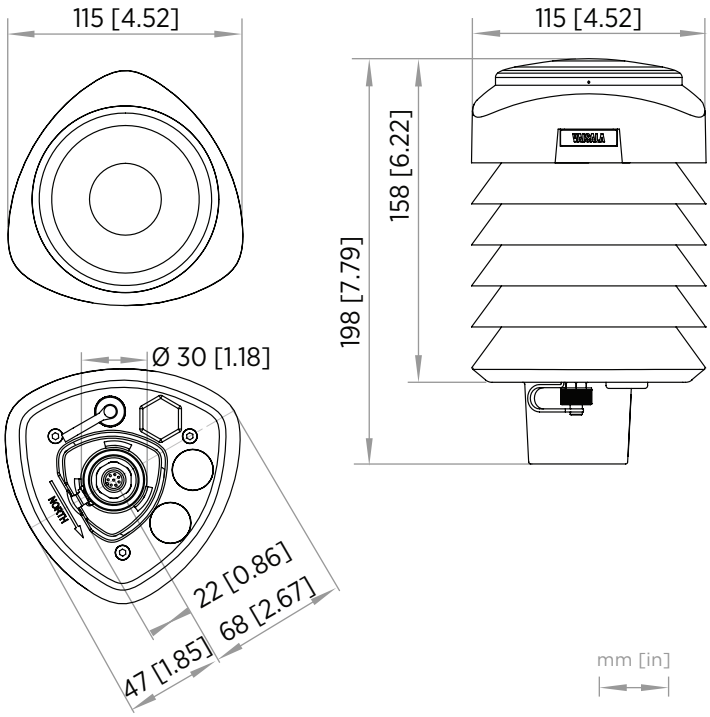


Figure 29 WXT535 and WXT534 dimensions

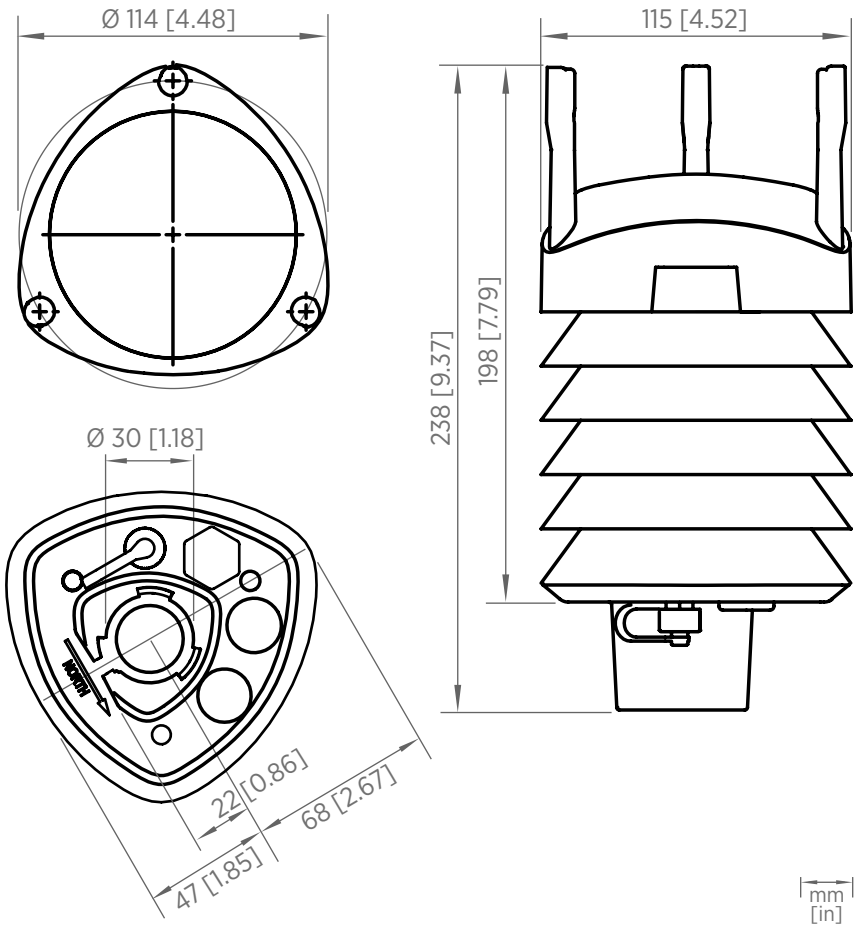


Figure 30 WXT536 dimensions

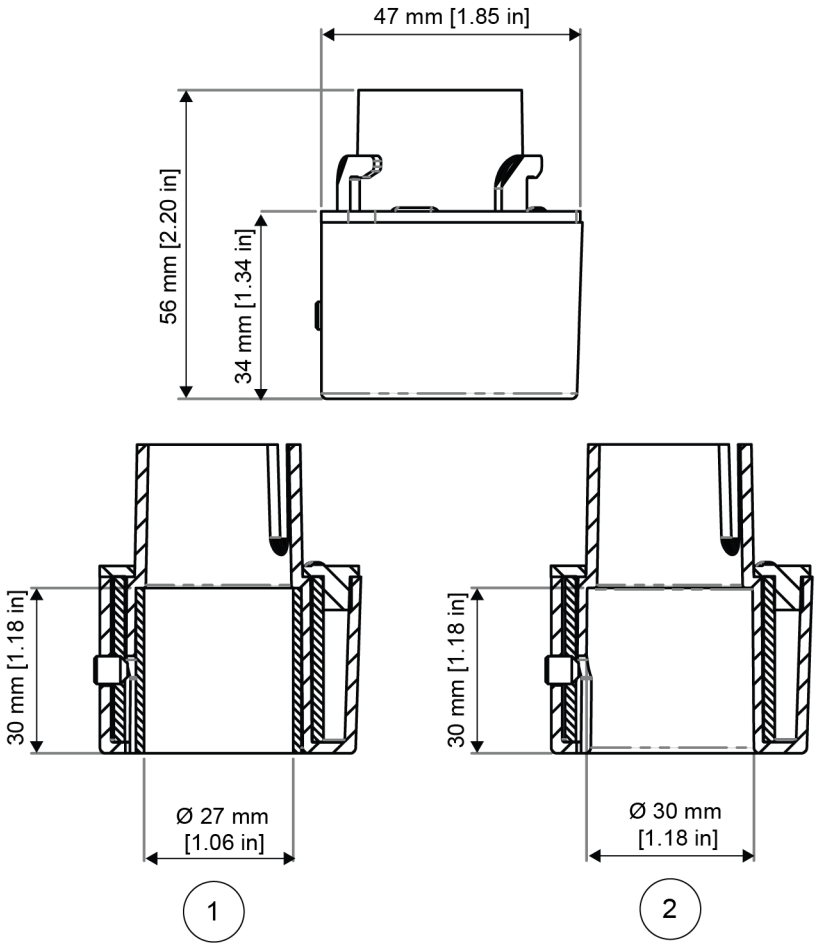


Figure 31 WXT530 mounting kit (212792) dimensions

1 Mounting kit with adapter sleeve for Ø 26.7 mm (1.05 in) mast tube
2 Mounting kit without adapter sleeve for Ø 30 mm (1.18 in) mast tube

More information

- Vaisala Weather Transmitter WXT530 Series (page 58)

6.6.8 MRU Marine 3000 specifications

For latest product information and updates, see the manufacturer documentation.

Table 130 MRU Marine 3000 specifications

Property	Description/Value
Operating temperature	−40 ... +85 °C (−40 ... +185 °F)

Property	Description/Value
Operating voltage	9–36 V DC (24 V nominal)
Dimensions (W × D × H)	154 × 86 × 67 mm (6.06 × 3.39 × 2.64 in)
Weight	1.2 kg (2.65 lb)
Housing material	Marine anodized aluminum 6061-T6
Performance	
Roll and pitch accuracy	0.05° RMS (root mean square)
Heave accuracy (real-time)	5 cm (1.97 in) or 5%
Acceleration accuracy	0.01 m/s^2 RMS

More information

- Norwegian Subsea MRU Marine 3000 (page 56)

6.6.9 SMC-108 specifications

For latest product information and updates, see the manufacturer documentation.

Table 131 SMC-108 specifications

Property	Description/Value
Operating temperature	−20 ... +55 °C (−4 ... +131 °F)
Operating voltage	12–30 V DC
Dimensions (W × D × H)	134 × 134 × 85 mm (5.28 × 5.28 × 3.35 in)
Weight	1.7 kg (3.75 lb)
Housing material	Titanium
Performance	
Roll and pitch accuracy [1)]	0.03° RMS (root mean square)
Angle range roll/pitch	±30°
Heave accuracy	5 cm (1.97 in) or 5%
Acceleration accuracy	0.01 m/s^2 RMS

1) ±5° simultaneous roll and pitch

More information

- Ship Motion Control SMC-108 motion reference unit (page 57)

6.6.10 WaveGuide 5 series specifications

For latest product information and updates, see the manufacturer documentation.

This table includes specifications of WaveGuide 5 Height & Tide. For specifications of other models, see the manufacturer documentation.

Table 132 WaveGuide 5 specifications

Property	Description/Value
Power	24–65 V DC 65–240 V AC 8 W
Frequency	10 GHz (X-band)
Modulation	Triangular FMCW (frequency-modulated continuous wave)
Network	1 × Ethernet
Dimensions (Ø × h)	265 × 245 mm (10.43 × 9.65 in)
Weight	12.5 kg (27.56 lb)
Material	Stainless steel AISI 316L
Heave	
Range	2–75 m (6.6–246 ft)
Accuracy	±3 mm (0.12 in)
Frequency	10 Hz
Water level	
Accuracy	±1 cm (0.39 in)
Interval	1 min
Wave height	
Range	0–60 m (0–197 ft)
Accuracy	±1 cm (0.39 in)
Interval	1 min
Wave period	
Range	1–100 s
Accuracy	±50 ms

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Property	Description/Value
Interval	1 min

More information

- RADAC WaveGuide 5 series wave radars (page 60)

6.6.11 ComNav G2 specifications

For latest product information and updates, see the manufacturer documentation.

Table 133 ComNav G2 specifications

Property	Description/Value
GPS receiver type	L1, C/A code, with carrier phase smoothing
Channels	2 × 32 parallel tracking GPS, GLONASS, SBAS
Update rate	Standard 10 Hz, selectable up to 20 Hz (position and heading)
Horizontal accuracy	< 0.3 m 95 % confidence (DGPS) < 2.5 m 95 % confidence (autonomous, no SA)
Heading accuracy	< 0.25º RMS (root mean square)
Pitch/roll accuracy	< 1º RMS
Heave accuracy	< 30 cm RMS
Rate of turn	Max. 45º/s
Start-up time	< 60 s, typical
Heading fix	< 10 s
Satellite reacquisition	< 1 s
Timing output	1PPS, 50 ns accuracy, CMOS
Input voltage	10–36 V DC
Operating temperature	–32 ... +74 °C (–25 ... +165 °F)
Dimensions (L × H × W)	670 × 122 × 213 mm (26.38 × 4.80 × 8.39 in)
Weight	2.2 kg (4.85 lb)

More information

- ComNav G2 GPS satellite compass (page 60)

7. Vaisala services

7.1 Service centers

Vaisala offers comprehensive customer care throughout the life cycle of our products. Our service centers offer maintenance, calibration, upgrade, and repair services. All the services are provided worldwide with fast deliveries. For more information, go to vaisala.com/services.

The services are available from:

- Vaisala Online Store, store.vaisala.com
- Vaisala Services, helpdesk@vaisala.com

The provided services vary product by product.

7.2 Technical support



You can contact Vaisala technical support at my.vaisala.com or helpdesk@vaisala.com.
You can find all our support channels at vaisala.com/support.
When contacting technical support, provide the following as applicable:

- Product name, model, and serial number
- Software/Firmware version
- Name and location of the installation site
- Name and contact information of a technical person who can provide further information
- Diagnostics package for the application

If applicable, also provide the following details:

- What failed (what worked / did not work)?
- Where did it fail (location and environment)?
- When did it fail (date, immediately / after a while / periodically / randomly)?
- How many failed (only one defect / other same or similar defects / several failures in one unit)?
- What was done when the failure was noticed?
- What was connected to the product and to which connectors?
- What is the input power source type, voltage, and what else (such as lighting, heaters, and motors) was connected to the same power output?
- Are all parts connected and grounded properly? Take a photo to help the troubleshooting.

7.3 Warranty

For warranty terms and conditions and the warranty claim process, see vaisala.com/warranty.

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Warranty coverage may not apply if the product is damaged due to normal wear and tear, exceptional operating conditions, negligent handling or installation, or unauthorized modifications. See the applicable supply contract or Conditions of Sale for details of the warranty for each product.

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Appendix A. AWS830 block diagram

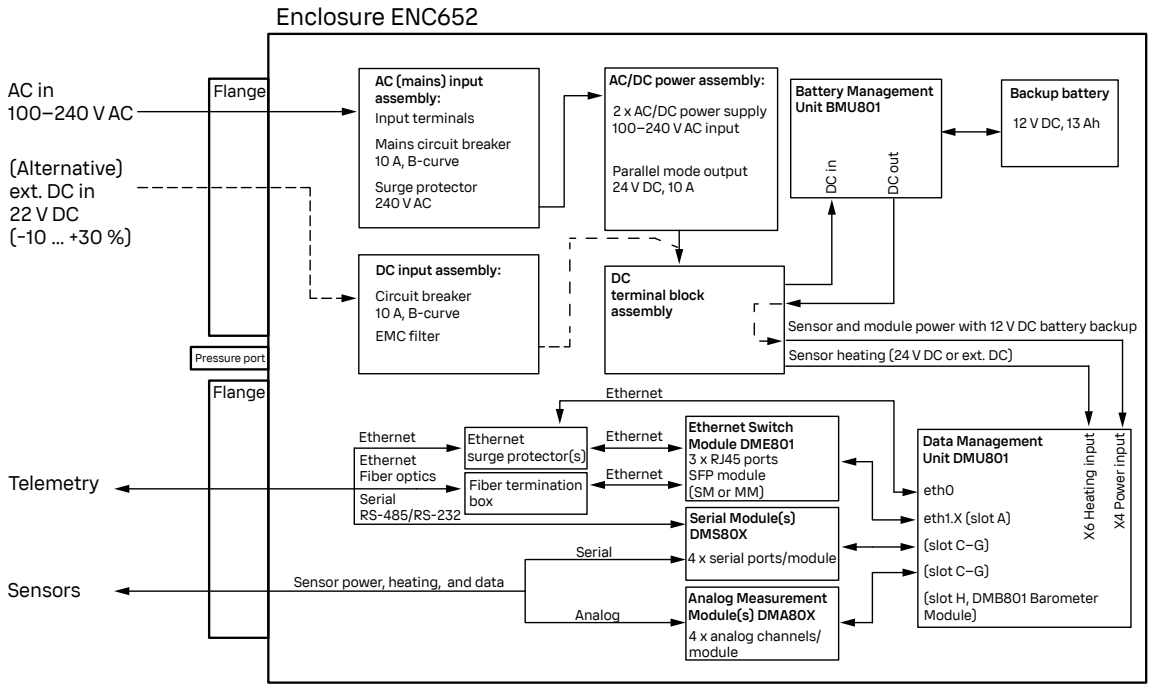


Figure 32 Example block diagram of AWS830

Appendix B. Observations

B.1 Observations in SMSAWS data messages

Your application may not include all the listed observations.

Table 134 Observations in SMSAWS instant messages

Observation	Period and statistics	SMSAWS tag	Unit
Air temperature instant	1-minute average	TA|AVG|PT1M|||degC|	°C
Relative humidity instant	1-minute average	RH|AVG|PT1M|||%|	%
Dew point temperature instant	1-minute average	TD|AVG|PT1M|||degC|	°C
Air pressure instant	1-minute average	PA|AVG|PT1M|||hPa|	hPa
Water level instant	1-minute average	WL|AVG|PT1M|||m|	m
Water current speed instant	1-minute average	FLOWV|AVG|PT1M|||mps|	m/s
Water current direction instant	1-minute average	FLOWD|AVG|PT1M|||deg|	degrees

Table 135 Observations in SMSAWS instant wind messages

Observation	Period and statistics	SMSAWS tag	Unit
Wind speed instant	3-second value	WS|VALUE|PT3S|||mps|	m/s
Wind direction instant	3-second value	WD|VALUE|PT3S|||%|	degrees
True wind speed instant	3-second value	TWS|VALUE|PT3S|||degC|	m/s
True wind direction instant	3-second value	TWD|VALUE|PT3S|||hPa|	degrees

A dash in the table indicates that the observation period is not included in the default maritime application SMSAWS message.

Table 136 Meteorological observations in SMSAWS messages

Observation	Period and statistics	SMSAWS tag	Unit
Air temperature (dry bulb temperature)	1-minute average	TA|AVG|PT1M|||degC|	°C
	10-minute average	–	
	1-hour average	–	
	24-hour average	–	
	24-hour minimum	TA|MIN|PT24H|||degC|	
	24-hour maximum	TA|MAX|PT24H|||degC|	
Relative humidity	1-minute average	RH|AVG|PT1M|||%|	%
	10-minute average	–	
	1-hour average	–	
	24-hour average	–	
	24-hour minimum	RH|MIN|PT24H|||%|	
	24-hour maximum	RH|MAX|PT24H|||%|	
Dew point	1-minute average	TD|AVG|PT1M|||degC|	°C
	1-hour average	–	
Atmospheric pressure	1-minute average	PA|AVG|PT1M|||hPa|	hPa
	10-minute average	–	
Wind direction (primary sensor)	3-second average	WD|AVG|PT3S||1|deg|	degrees
	2-minute average	WD|AVG|PT2M||1|deg|	
	2-minute minimum	WD|MIN|PT2M||1|deg|	
	2-minute maximum	WD|MAX|PT2M||1|deg|	
	10-minute average	WD|AVG|PT10M||1|deg|	
	10-minute minimum	WD|MIN|PT10M||1|deg|	
	10-minute maximum	WD|MAX|PT10M||1|deg|	

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Observation	Period and statistics	SMSAWS tag	Unit
Wind speed (primary sensor)	3-second average	WS|AVG|PT3S||1|mps|	m/s
	2-minute average	WS|AVG|PT2M||1|mps|	
	2-minute minimum	WS|MIN|PT2M||1|mps|	
	2-minute maximum	WS|MAX|PT2M||1|mps|	
	10-minute average	WS|AVG|PT10M||1|mps|	
	10-minute minimum	WS|MIN|PT10M||1|mps|	
	10-minute maximum	WS|MAX|PT10M||1|mps|	
Wind direction (secondary sensor)	3-second average	WD|AVG|PT3S||2|deg|	degrees
	2-minute average	WD|AVG|PT2M||2|deg|	
	2-minute minimum	WD|MIN|PT2M||2|deg|	
	2-minute maximum	WD|MAX|PT2M||2|deg|	
	10-minute average	WD|AVG|PT10M||2|deg|	
	10-minute minimum	WD|MIN|PT10M||2|deg|	
	10-minute maximum	WD|MAX|PT10M||2|deg|	
Wind speed (secondary sensor)	3-second average	WS|AVG|PT3S||2|mps|	m/s
	2-minute average	WS|AVG|PT2M||2|mps|	
	2-minute minimum	WS|MIN|PT2M||2|mps|	
	2-minute maximum	WS|MAX|PT2M||2|mps|	
	10-minute average	WS|AVG|PT10M||2|mps|	
	10-minute minimum	WS|MIN|PT10M||2|mps|	
	10-minute maximum	WS|MAX|PT10M||2|mps|	
Wind gust (primary sensor)	Direction of maximum gust within the last 10 minutes	WGD|VALUE|PT10M||1|deg|	degrees
Wind gust (secondary sensor)	Direction of maximum gust within the last 10 minutes	WGD|VALUE|PT10M||2|deg|	degrees

Observation	Period and statistics	SMSAWS tag	Unit
Rain accumulation	1 minute	PR|SUM|PT1M|||mm|	mm
	10 minutes	–	
	30 minutes	–	
	1 hour	PR|SUM|PT1H|||mm|	
	3 hours	–	
	6 hours	–	
	12 hours	–	
	24 hours	PR|SUM|PT24H|||mm|	
Rain intensity	1-minute average	PRF|AVG|PT1M|||mmph|	mm/h
Cloud base altitude	Cloud layer 2	–	m
	Cloud layer 3	–	
Cloud coverage	Cloud layer 1	CA1|VALUE|PT30M|||octa|	octa
	Cloud layer 2	–	
	Cloud layer 3	–	
	Cloud layer 4	–	
	Cloud layer 5	–	
Cloud altitude	Cloud layer 1	CL1|AVG|PT30M|||m|	m
	Cloud layer 2	–	
	Cloud layer 3	–	
	Cloud layer 4	–	
	Cloud layer 5	–	
Vertical visibility	Current visibility	VV|AVG|PT10M|||m|	m
Visibility	1-minute average	VIS|AVG|PT1M|||m|	m
	10-minute average	–	
Present weather (WMO)	Instant present weather	–	WMO METAR codes for present weather (page 146)
	15-minute present weather	PW|VALUE|PT15M|||WMO-306-4680|	
	1-hour present weather	–	
Present weather (METAR)	–	–	WMO METAR codes for present weather (page 146)

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Observation	Period and statistics	SMSAWS tag	Unit
Present weather (NWS)	–	–	NWS codes for present weather (page 147)

Table 137 Calculated observations in SMSAWS data messages

Observation (Calculation)	Period and statistic	SMSAWS tag	Unit
Wet bulb temperature (MDICALC/ PRESCALC)	1-minute average	TAB|AVG|PT1M|||degC|	°C
	1-hour average	–	
QFE pressure (PRESCALC)	1-minute average	QFE|AVG|PT1M|||hPa|	hPa
	1-hour average	–	
	1-hour minimum	–	
	1-hour maximum	–	
	24-hour average	–	
	24-hour minimum	–	
	24-hour maximum	–	
QFF pressure (PRESCALC)	1-minute average	QFF|AVG|PT1M|||hPa|	hPa
	1-hour average	–	
	1-hour minimum	–	
	1-hour maximum	–	
	24-hour average	–	
	24-hour minimum	–	
	24-hour maximum	–	
QNH pressure (PRESCALC)	1-minute average	QNH|AVG|PT1M|||hPa|	hPa
	1-hour average	–	
	1-hour minimum	–	
	1-hour maximum	–	
	24-hour average	–	
	24-hour minimum	–	
	24-hour maximum	–	

Observation (Calculation)	Period and statistic	SMSAWS tag	Unit
Atmospheric pressure trend (PRESCALC)	3-hour trend	PATR|VALUE|PT3H|||hPa|	hPa
Atmospheric pressure tendency (PRESCALC)	3-hour tendency	PATE|VALUE|PT3H||||	Air pressure tendency values (page 147)

Table 138 System status parameters

Description	CSV tag	SMSAWS tag	Unit
DMU801 data management unit status	STATUS	STATUS|VALUE||||SCODE|	Possible values: • 0: OK • Other than 0: Internal voltages are outside of acceptable limits
Battery voltage	BATTERYV	BATTERYV|VALUE|PT1M|||V|	V
External DC voltage	EXTDC	EXTDC|VALUE|PT1M|||V|	V
System uptime	UPTIME	UPTIME|VALUE|PT1H|||h|	h

More information

- SMSAWS data message format (page 68)

B.2 WMO METAR codes for present weather

The present weather detector reports instant present weather according to the WMO (World Meteorological Organization) code table 4678 (METAR) format.

Table 139 WMO METAR codes for present weather

Qualifier				Weather phenomena				
INTENSITY 1		DESCRIPTOR 2		PRECIPITATION 3		OBSCURATION 4		OTHER 5
–	Light	BH	Patches	DZ	Drizzle	BR	Mist	–
No qualifier	Moderate	SH	Showers	RA	Rain	FG	Fog	–
+	Heavy	FZ	Freezing	SN	Snow	DU	Widespread dust	–
				PL	Ice pellets	HZ	Haze	–

B.3 NWS codes for present weather

The present weather detector reports instant present weather according to the U.S. National Weather Service (NWS) classification.

Table 140 NWS present weather types

Present weather type	NWS code
No precipitation	C
Precipitation	P
Drizzle	L
Rain	R
Snow	S
Ice pellets	IP
Freezing drizzle	ZL
Freezing rain	ZR

NWS codes are used with an intensity indicator:

- – (minus) for light precipitation
- No indicator (space) for moderate precipitation
- + (plus) for heavy precipitation

For example, **R+** means heavy rain.

B.4 Air pressure tendency values

Table 141 Atmospheric pressure tendency as WMO code 0200

Code	Explanation
0	Increasing, then decreasing: the same as or higher than 3 hours ago.
1	Increasing, then steady: now higher than 3 hours ago.
2	Increasing (steadily or unsteadily): now higher than 3 hours ago.
3	Decreasing or steady, then increasing, or increasing, then increasing more rapidly: now higher than 3 hours ago.
4	Steady: the same as 3 hours ago.
5	Decreasing, then increasing: the same as or lower than 3 hours ago.
6	Decreasing, then steady, or decreasing, then decreasing more slowly: now lower than 3 hours ago.
7	Decreasing (steadily or unsteadily): now lower than 3 hours ago.
8	Steady or increasing, then decreasing, or decreasing, then decreasing more: now lower than 3 hours ago.

Appendix C. AWS830 Modbus register map

Modbus server configuration

- Default port: 5020 (must be opened in DMU801 firewall)
- IP address: 0.0.0.0 (uses the DMU801 IP address automatically)
- Byte endian: Big
- Word endian: Big
- Register type: Holding registers (function code 3)

Table 142 Table reading instructions

Value	Description
Address	Modbus register address (each 32-bit value uses 2 registers)
Parameter	Parameter code identifying the measurement
Description	Description of the parameter
Data type	Modbus data type (all values use 32-bit float)
Words	Number of 16-bit words (always 2 for float32)
Statistics	Type of statistic (average, sum, value)
Period	Aggregation period (1 minute, 2 minutes, 30 minutes, and so on)
Unit	Unit of measure
Invalid value	Value shown when observation is unavailable

Table 143 AWS830 Modbus register map

Address	Parameter	Description	Data type	Words	Statistics	Period	Unit	Invalid value
0–1	TA	Air temperature	float32	2	Average	1 minute	°C	NaN (Not a Number)
2–3	RH	Relative humidity	float32	2	Average	1 minute	%	NaN
4–5	PA	Air pressure	float32	2	Average	1 minute	hPa	NaN
6–7	PR	Precipitation 1-minute sum	float32	2	Sum	1 minute	mm	NaN
8–9	WD	Wind direction 2-minute average	float32	2	Average	2 minutes	°	NaN
10–11	WS	Wind speed 2-minute average	float32	2	Average	2 minutes	m/s	NaN

Address	Parameter	Description	Data type	Words	Statistics	Period	Unit	Invalid value
12–13	WD	Wind direction 2-minute average	float32	2	Average	2 minutes	°	NaN
14–15	WS	Wind speed 2-minute average	float32	2	Average	2 minutes	m/s	NaN
16–17	VIS	Visibility	float32	2	Average	1 minute	m	NaN
18–19	CB1	Cloud base altitude	float32	2	Average	1 minute	m	NaN
20–21	CA1	Cloud coverage	float32	2	Value	30 minutes	octa	NaN

Register details

Table 144 Basic meteorological parameters (addresses 0–7)

Parameter	Measured by	Update interval	Notes
Air temperature (0–1)	PTU sensor	1-minute average	Available in all AWS830 applications.
Relative humidity (2–3)	PTU sensor	1-minute average	Available in all AWS830 applications.
Air pressure (4–5)	PTU sensor	1-minute average	Barometric pressure at sensor location. Available in all AWS830 applications.
Precipitation 1 minute sum (6–7)	PWD sensor	1-minute sum	Accumulation over last minute. Requires PWD22/PWD52 Present Weather Detector in the application.

Table 145 Wind parameters (addresses 8–15)

Parameter	Measured by	Update interval	Notes
Wind direction 2-minute average (8–9)	Wind sensor (ultrasonic or mechanical)	2-minute average	Sequence #1 (primary wind sensor). Available when wind sensor is configured.
Wind speed 2-minute average (10–11)	Wind sensor (ultrasonic or mechanical)	2-minute average	Sequence #1 (primary wind sensor). Available when wind sensor is configured.

Parameter	Measured by	Update interval	Notes
Wind direction 2-minute average (12–13)	Wind sensor (ultrasonic or mechanical)	2-minute average	Sequence #2 (secondary wind sensor). Available when second wind sensor is configured.
Wind speed 2-minute average (14–15)	Wind sensor (ultrasonic or mechanical)	2-minute average	Sequence #2 (secondary wind sensor). Available when second wind sensor is configured.

Table 146 Visibility and cloud parameters (addresses 16–21)

Parameter	Measured by	Update interval	Notes
Visibility (16–17)	PWD sensor	1-minute average	Meteorological optical range (MOR). Requires PWD22/PWD52 Present Weather Detector in the application.
Cloud base altitude (18–19)	Ceilometer	1-minute average	Height of lowest cloud layer. Requires CL31/CL51 Ceilometer in the application.
Cloud coverage (20–21)	Ceilometer	30-minute value	Sky condition in octas (0–8 scale). • 0 = clear sky • 8 = overcast Requires CL31/CL51 Ceilometer in the application.

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Appendix D. Calculation formulas

D.1 About calculation formulas

The calculation formulas used in the measurements are WMO-compliant.

D.2 Dew point temperature calculation

The dew point component calculates the temperature where dew begins to form from moist air. This calculation is based on air temperature and relative humidity.

Dew point temperature (t_d) is calculated with the following WMO (Annex 4.B) formulas:

$$t_d = \frac{243.12 \cdot \ln\left(\frac{e`}{6.112 \cdot f(p)}\right)}{17.62 - \ln\left(\frac{e`}{6.112 \cdot f(p)}\right)}$$

and

$$U = 100 \cdot \frac{e`_w(p, t_d)}{e`_w(p, t)}$$

which give:

$$t_d = \frac{243.12 \cdot \ln[(U \cdot \exp[(17.62 \cdot t)/(243.12 + t)])/100]}{17.62 - \ln[(U \cdot \exp[(17.62 \cdot t)/(243.12 + t)])/100]}$$

Table 147 Inputs for dew point calculation

Input	Variable
Air temperature (T)	Average 1-minute temperature
Relative humidity (U)	Average 1-minute relative humidity

D.3 Wet bulb temperature calculation

Wet bulb temperature is calculated iteratively as follows:

1. First the initial estimate of wet bulb temperature is calculated with the following formula:

$$T_{wet} = 243.12 \cdot \frac{\log\left(\frac{P_{ws}(T_d)}{6.112}\right)}{17.62 - \log\left(\frac{P_{ws}(T_d)}{6.112}\right)}$$

2. Then the wet bulb temperature is iteratively re-calculated as long as ABS(P_{hit} – $P_{ws}(T_d)$) > 0.01 with the following formula:

$$T_{wet} = T_{wet} - \frac{P_{hit} - P_{ws}(T_d)}{2 \cdot P_{der}}$$

P_{hit} and P_{der} are calculated depending on the value of T_{wet}:

- If $T_{wet} > 0$:

$$P_{hit} = P_{ws}(T_{wet}) - 0.000662 \cdot P_A \cdot (T_A - T_{wet})$$

$$P_{der} = (P_{ws}(T_{wet} + 0.1) - 0.000662 \cdot T_A \cdot (T_A - (T_{wet} + 0.1)) - P_{hit}) \cdot 10.0$$

- If $T_{wet} \leq 0$:

$$P_{hit} = P_{wi}(P_{wet}) - 0.000583 \cdot P_A \cdot (T_A - T_{wet})$$

$$P_{der} = (P_{wi}(T_{wet} + 0.1) - 0.000583 \cdot T_A \cdot (T_A - (T_{wet} + 0.1)) - P_{hit}) \cdot 10.0$$

Table 148 Explanation of wet bulb temperature calculation formulas

Item	Explanation
T_{wet}	Wet bulb temperature [°C]
T_d	Dew point temperature [°C]
T_A	Ambient air temperature [°C]
P_A	Ambient air pressure [hPa]
$P_{ws}(t)$	Aqueous vapor pressure of water at temperature t [hPa]
$P_{wi}(t)$	Aqueous vapor pressure of ice at temperature t [hPa]

$P_{ws}(t)$ calculation

$$P_{ws}\left(t\right) = \exp\left(\frac{b_1}{v} + b0 + b1 \cdot v + b2 \cdot v^2 + b3 \cdot v^3 + b4 \cdot \log(v)\right) \cdot 0.01$$

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Table 149 Explanation of $P_{ws}(t)$ calculation formula

Item	Explanation
$P_{ws}(t)$	Aqueous vapor pressure of water at temperature t [hPa]
b_1	−5800.2206
b0	1.3914993
b1	−0.048640239
b2	0.000041764768
b3	−0.000000014452093
b4	6.5459673

v Calculation

$$v = t - c0 - c1 \cdot t - c2 \cdot t^2 - c3 \cdot r^3$$

Table 150 Explanation of v calculation formula

Item	Explanation
t	Temperature [K]
c0	0.4931358
c1	−0.0046094296
c2	0.000013746454
c3	−0.000000012743214

$P_{wi}(t)$ calculation

$$P_{wi}(t) = \exp\left(\frac{a0}{t} + a1 + a2 \cdot t + a3 \cdot t^2 + a4 \cdot t^3 + a5 \cdot t^4 + a6 \cdot \log(t)\right) \cdot 0.01$$

Table 151 Explanation of $P_{wi}(t)$ calculation formula

Item	Explanation
$P_{wi}(t)$	Aqueous vapor pressure of ice at temperature t [hPa]
a0	−5674.5359
a1	6.3925247
a2	−9.677843E − 03

Item	Explanation
a3	0.00000062215701
a4	2.0747825E – 09
a5	–9.484024E – 13
a6	4.1635019
t	Temperature [K]

Table 152 Inputs for wet bulb temperature calculation

Input	Variable
Air temperature (T_A)	Average 1-minute temperature
Dew point temperature (T_d)	Average 1-minute dew point
Atmospheric pressure (P_A)	Average 1-minute QFE pressure

D.4 QFE pressure calculation

The reduced air pressure QFE (pressure at a certain level) is calculated with the following formula:

$$QFE = P_A \cdot e^{\frac{L}{T_1}}$$

Table 153 Explanation of QFE pressure calculation formula

Item	Explanation
QFE	Reduced pressure [hPa]
P_A	Atmospheric pressure [hPa]
L	Reduction level [m]
T_1	7996 + 0.0086 * L + 29.33 * T_A
T_A	Air temperature [°C]

The reduction level for QFE processing is the elevation difference of the pressure sensor and the QFE level into which the pressure will be reduced. If the pressure sensor is above the QFE level, the reduction level to get the QFE level pressure is a positive value. If the sensor is below the QFE level, the reduction level is a negative value.

Table 154 Inputs for QFE pressure calculation

Input	Variable
Air temperature (T_A)	Average 1-minute temperature
Atmospheric pressure (P_A)	Average 1-minute measured atmospheric pressure
Reduction level (L)	Station parameter `pressureSensorLevel`

D.5 QFF pressure calculation

The reduced air pressure QFF (pressure at sea level) is calculated with the following formula:

$$QFF = QFE \cdot e^{\frac{L}{T_1}}$$

Table 155 Explanation of QFF pressure calculation formula

Item	Explanation
QFF	Reduced pressure [hPa]
QFE	Field elevation pressure [hPa]
L	Reduction level [m] (altitude)
T_1	7996 + 0.0086 * L + 29.33 * T_A
T_A	Air temperature [°C]



The reduction level is the elevation difference of the station altitude and the mean sea level.

Table 156 Inputs for QFF pressure calculation

Input	Variable
Air temperature (T_A)	Average 1-minute temperature
QFE pressure	Average 1-minute QFE pressure
Reduction level (L)	Station parameter `altitude`

D.6 QNH pressure calculation (ICAO Doc 9837, second edition – 2011)

QNH, the pressure reduced to mean sea level according to ICAO standard atmosphere, is calculated with the following formulas:

1. First, the elevation of pressure QFE in International Standard Atmosphere (ISA) is calculated with the following formula:

$$H_{ISA} = 44330.77 - 11880.32 * QFE^{0.190263}$$

2. Then, QNH of the elevation difference is calculated with the following formula:

$$QNH = 1013.25 * \left(1 - 0.0065 * \frac{H_{ISA} - H}{288.15}\right)^{5.25588}$$

Table 157 Explanation of QNH pressure (ICAO Doc 9837, second edition – 2011) calculation formula

Item	Explanation
H_{ISA}	Elevation of pressure QFE in International Standard Atmosphere (ISA)
QNH	Sea level pressure [hPa]
QFE	Station level air pressure [hPa]
H	Station altitude

Table 158 Inputs for QNH (ICAO Doc 9837, second edition – 2011) pressure calculation

Input	Variable
Atmospheric pressure (P_A) (QFE)	Average 1-minute QFE pressure

D.7 Wind calculations

Wind calculation takes wind speed and wind direction observations as input, and calculates 3-second averages of them once every second. The 3-second wind speed and wind direction averages are then used as source data for further wind calculations.

Table 159 Wind calculation outputs

Output	Description
DIR	Latest wind direction value
SPD	Latest wind speed value
WD	Latest 3-second wind direction average

Output	Description
WS	Latest 3-second wind speed average
WDAVG1, WDAVG2	Wind direction average for each wind period
WDMIN1, WDMIN2	Wind direction minimum for each wind period
WDMAX1, WDMAX2	Wind direction maximum for each wind period
WSAVG1, WSAVG2	Wind speed average for each wind period
WSMIN1, WSMIN2	Wind speed minimum for each wind period
WSMAX1, WSMAX2	Wind speed maximum for each wind period
WGD1, WGD2	Wind gust direction for each wind period

Wind calculation outputs wind direction and speed at 0 degrees when the wind speed is less than the configured calm limit (typically 0.5 m/s).
When the wind speed is greater than the calm limit and the wind is from North, the output is 360 degrees.

D.7.1 Wind speed average calculation

Wind speed average is calculated as an arithmetic mean of the speed measurements:

$$WSA = \frac{1}{n}\sum_{i=1}^{n} WS_i$$

Table 160 Explanation of wind speed average calculation formula

Item	Explanation
WSA	Wind speed average
WS_i	Wind speed instant value

D.7.2 Wind direction average calculation

Wind direction average is calculated using the unit vector method.

The following formulas are used:

Formula 1

$$XSUM = \sum_{i=1}^{n} \sin(WD_i)$$

Formula 2

$$YSUM = \sum_{i=1}^{n} \cos(WD_i)$$

Formula 3

$$WDA = \text{atan2}\,(XSUM, YSUM)$$

Table 161 Explanation of wind direction average calculation formulas

Item	Explanation
WD_i	Wind direction
XSUM	Sum of wind direction components parallel to X-axis (East-West)
YSUM	Sum of wind direction components parallel to Y-axis (North-South)
WDA	Wind direction average

Table 162 Inputs for wind direction average calculation

Input	Variable
Wind directions	List of wind directions: • For 3-second average the measurements for the last 3 seconds • For longer averages the list of 3-second averages from the time window

D.7.2.1 Wind direction minimum and maximum calculation

The following formulas are used:

Formula 1

$$diff = WD_i - WDA$$

Formula 2

Formula 2 is applied if *diff* > 180.

$$diff = diff - 360$$

Formula 3

Formula 3 is applied if *diff* < −180.

$$diff = diff + 360$$

Formula 4

$$MINDIFF = \min(diffs)$$

Formula 5

$$MAXDIFF = \max(diffs)$$

Formula 6

$$WDMIN = WD[MINDIFF]$$

Formula 7

$$WDMAX = WD[MAXDIFF]$$

Table 163 Explanation of wind direction minimum and maximum calculation formulas

Item	Explanation
WD_i	Wind direction in degrees
WDA	Wind direction average
diff	Difference between WD_i and WDA scaled between [−180, 180]
diffs	A list containing all calculated diff values
MINDIFF	Minimum difference between WD_i and WDA scaled between [−180, 180]

Item	Explanation
MAXDIFF	Maximum difference between WD_i and WDA scaled between [−180, 180]
WDMIN	Minimum wind direction from input list with no scaling applied
WDMAX	Maximum wind direction from input list with no scaling applied

Table 164 Inputs for wind direction minimum and maximum calculation

Input	Variable
Wind directions	List of wind directions: • For longer averages the list of 3-second averages from the time window
Wind direction average	Wind direction for the given measurement window

D.7.3 True wind calculation

True wind is calculated from apparent wind and ship motion with the following formulas.

Convert angles to radians

$$\theta_a = \frac{\pi}{180}(H + WD_a)$$

$$\theta_c = \frac{\pi}{180}C$$

Apparent wind components (East, North)

$$A_E = WS_a \sin\theta_a$$

$$A_N = WS_a \cos\theta_a$$

Ship movement components (East, North)

$$V_E = S\sin\theta_c$$

$$V_N = S\cos\theta_c$$

True wind components (East, North)

$$T_E = A_E - V_E$$

$$T_N = A_N - V_N$$

True wind speed and direction

$$WS_t = \sqrt{T_E^2 + T_N^2}$$

$$WD_t = \left(\frac{180}{\pi}\text{atan2}(T_E, T_N)\right) \mod 360$$

Outputs

- WS_t = True wind speed
- WD_t = True wind direction

Table 165 Explanation of true wind calculation formulas

Item	Explanation
WS_a	Apparent wind speed, as measured by the sensor
WD_a	Apparent wind direction relative to the bow
H	Ship heading
C	Course over ground
S	Ship speed over ground
WS_t	True wind speed
WD_t	True wind direction

Appendix E. Regulatory statements

E.1 FCC/ISED regulatory notices

Modification statement

Vaisala Oyj has not approved any changes or modifications to this device by the user. Any changes or modifications could void the user's authority to operate the equipment.

Vaisala Oyj n'approuve aucune modification apportée à l'appareil par l'utilisateur, quelle qu'en soit la nature. Tout changement ou modification peuvent annuler le droit d'utilisation de l'appareil par l'utilisateur.

Interference statement

This device complies with Part 15 of the FCC Rules and Innovation, Science and Economic Development Canada (ISED) licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR Innovation, Sciences et Développement économique Canada (ISDE) applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

FCC Class A digital device notice

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Canada ICES-3 (A) / NMB-3 (A)

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de classe A est conforme à la norme canadienne NMB-003.

E.2 Korean conformity information

Company name: Vaisala Oyj

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Name of equipment: Maritime Automatic Weather Station AWS830

Country of manufacture: Finland

Links to RRA registration information:

http://www.rra.go.kr/selform/rws-AWS830-outdoor

http://www.rra.go.kr/selform/rws-AWS830-rack

Index

A

abbreviations....13
AC (mains) input....34
AC (mains) power....35
AC (mains) power supply
  specifications....91
additional sensors....57
air pressure....147
analog measurement module....30
AWS830
  heating power consumption....78
  operating power consumption....77
  system specifications....72

B

backup battery....38
  specifications....94
BARO-1....52
barometer
  see BARO-1
  see PTB330
barometer module....31
battery, *see* backup battery
battery management unit, *see* BMU801
block diagram....140
BMU801....39
  specifications....95

C

cabinet, *see* ENC652
calculation
  dew point....151
  QFE pressure....154
  QFF pressure....155
  QNH pressure (ICAO Doc 9837)....156
  true wind....160
  wet bulb temperature....151
  wind....156
  wind direction average....157
  wind direction minimum and maximum....158
  wind speed average....157
calculation formulas....151
ceilometer, *see* CL31
CL31....55
  specifications....123
communication devices....43
communications equipment....62
ComNav G2
  specifications....137
ComNav G2 GPS satellite compass....60
compass, *see* ComNav G2
components....13
cybersecurity....12

D

data management unit, *see* DMU801
data protection....12
data security....12
DC power supply....34
DEIF display....44
delivery....13
dew point calculation....151
display, *see* DEIF weather or wind display
display device
  specifications....101
DMA801....30
  specifications....84
DMA803....30
  specifications....86
DMB801....31
  specifications....90
DME801....31
  specifications....88
DMS801....28
  specifications....81
DMS802....28
  specifications....83
DMU801....27
  Kaiku Designer....46
  plug-in modules....28
  specifications....78

E

electromagnetic compatibility filter, *see* EMC filter
Elements Helideck Monitoring Software....45
EMC filter....36
ENC652....21
enclosure, *see* ENC652
ESD protection....19
ethernet switch module....31

F

fiber termination box....43

H

heating
  power consumption....78
  WMT700....51
HMP155
  radiation shield....49
  specifications....102
HMS
  sensors....49
humidity and temperature probe, *see* HMP155

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I
isolation....33

K
Kaiku Designer....46

L
laser....18
lifecycle....
M
mains power....35
message formats....63
Modbus register map....148
motion reference unit....56
see MRU Marine 3000
see SMC-108
motion sensor
see MRU Marine 3000
see SMC-108
MRU Marine 3000....56
specifications....134
multi-weather sensor, *see* WXT530

N
NMEA 0183 data message....63
PSMCC....67
weather transducer....65
wind speed and angle....64
NWS codes....147

O
observations....10, 141
operating power consumption....77

P
parts....13
plug-in module
see DMA801
see DMA803
see DMB801
see DME801
see DMS801/DMS802
powering....32, 34
specifications....91
power junction box, *see* PJB480
power supply....35
present weather codes....146, 147
present weather detector, *see* PWD22
pressure....147
pressure calculation....154, 155
ICAO Doc 9837....156
pressure sensor
see BARO-1
see PTB330
PTB330....51
observations....147
specifications....114
PWD
specifications....117
PWD10....53
PWD12....53
PWD20....53
PWD22....53
PWD50....53
PWD52....53
PWD series
NWS codes....147

Q
QSP431....40
specifications....97

R
RADAC WaveGuide 5....60
radiation....18
radiation shield
HMP155....49
reporting
NMEA 0183 data message....63
SMSAWS data message....68, 141

S
safety....14, 18, 19
security....
sensor interface surge protection....41
sensors
helideck monitoring system....49
optional....57
options....10
specifications....102
serial modules....28
service centers....138
ship motion sensor....56
SMC-108....57
specifications....135
SMSAWS data message....68, 141
standard sensors....49
surge protection
sensor interfaces....41
surge protection unit, *see* QSP431
surge protector....41
system specifications....72

T

telemetry, *see* communication devices
Termbox..... 42
specifications..... 99
trademarks..... 9
transient protection..... 40
specifications..... 97
true wind calculation..... 160

U

UL/CSA C22.2
warnings and cautions..... 20
ultrasonic wind sensor
see WM80
see WMT700
user interfaces..... 44
Elements..... 45
Kaiku Designer..... 46
Kaiku Web UI..... 46

V

Vaisala Elements..... 45
visibility sensor, *see* PWD10
vulnerability.....

W

WaveGuide 5 series
specifications..... 136
wave radar, *see* RADAC WaveGuide 5
weather or wind display..... 44
weather transmitter, *see* WXT530
Web User Interface..... 46
wet bulb temperature calculation..... 151
wind calculation..... 156
wind direction average calculation..... 157
wind direction minimum and maximum calculation
158
wind sensor
see see WM80
see WMT700
wind sensor heating
power junction box..... 37
wind speed average calculation..... 157
WM80..... 59
WMO code 200..... 147
WMO compliance..... 151
WMO METAR codes..... 146
WMT700..... 50
heating..... 51
specifications..... 105
WXT530..... 58
specifications..... 127

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Security support

Vaisala provides security and software support for this product for 5 years from the date of purchase. During this period, Vaisala will:

- Monitor for and evaluate reported vulnerabilities
- Provide security updates or mitigation guidance as needed

If you believe that you have discovered a security vulnerability in this product, please contact us at security@vaisala.com.

Recycling



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