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USER GUIDE

WM80

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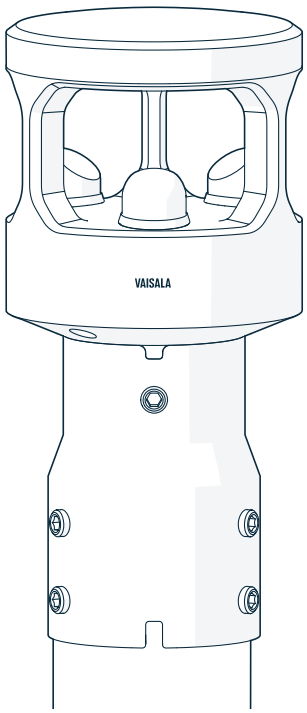
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M212995EN-F

User Guide

Vaisala Ultrasonic Wind Sensor
WM80



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1. About this document

1.1 Version information

This document provides detailed instructions for using and configuring Vaisala Ultrasonic Wind Sensor WM80.

Table 1 Document versions (English)

Document code	Date	Description
M212995EN-F	December 2025	Updated data message (ASCII) information. Updated ordering options information. Updated Modbus registers. Added a communication test values table.
M212995EN-E	October 2025	Updated OSS licenses. Updated instructions for downloading a new firmware version.

M212995EN-D	October 2025	For release 1.2 with the following new features:
		• Updated device diagnostics status information.
		• Updated heating information.
		• Updated device status information.
		Other changes:
		• Updated grounding instructions.
		• Updated information about default parameters.
		  • Aout1 output changed to 90 m/s.
		  • Default ASCII/NMEA autosend interval changed to 0.25 s.
		  • Calm wind threshold changed to 0.2 m/s.
		• Updated Modbus RTU protocol information.

1.2 Related manuals

Table 2 WM80 manuals

Document code	Name
M212994EN	Vaisala Ultrasonic Wind Sensor WM80 Setup Guide
M212995EN	Vaisala Ultrasonic Wind Sensor WM80 User Guide



For the latest versions of these documents, see docs.vaisala.com.

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1.3 Documentation conventions



WARNING! Alerts you to a serious hazard. If you do not read and follow instructions carefully at this point, there is a risk of injury or even death.



CAUTION! Alerts you to a potential hazard. If you do not read and follow instructions carefully at this point, the product could be damaged or important data could be lost.



Highlights important information on using the product.



Gives information for using the product more efficiently.



Lists tools needed to perform the task.



Indicates that you need to take some notes during the task.

1.4 Trademarks

Vaisala® and WINDCAP® are registered trademarks of Vaisala Oyj.

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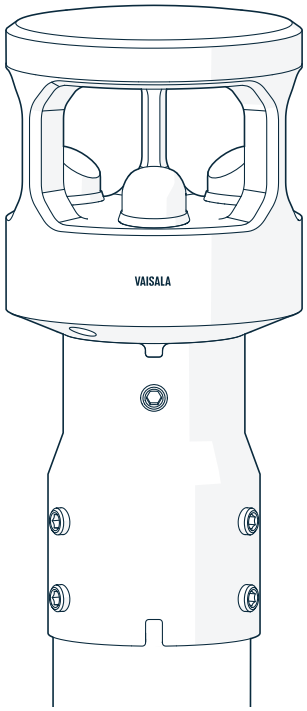
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2. Product overview

2.1 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.

2.2 Product and part names

Table 3 Product and part names

Item	Name
WM80	Ultrasonic Wind Sensor WM80
Insight	Vaisala Insight PC software

2.3 Safety

WARNING! Failure to comply with these precautions or with specific warnings elsewhere in these instructions violates safety standards of design, manufacture, and intended use of the product. Vaisala assumes no liability for the customer's failure to comply with these requirements.

WARNING! Do not substitute parts or modify the product. Improper modification can damage the product or lead to malfunction.

WARNING! Follow local and state legislation and regulations on occupational safety.

WARNING! The safety of any system incorporating the equipment is the responsibility of the assembler of the system.

WARNING! If the equipment is used in a manner not specified by Vaisala, the protection provided by the equipment may be impaired.

WARNING! Do not perform installation or maintenance procedures when there is a risk of thunderstorm or lightning activity in the area.

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WARNING! Only licensed experts may install electrical components. They must adhere to local and state legislation and regulations.

WARNING! Use only accessories which meet the manufacturer's specifications.

CAUTION! Any mechanical impact on the device may cause damage and lead to incorrect measurements. Handle the device with care.

Wear personal protective equipment (PPE).

The following image shows the product markings, including regulatory markings and manufacturer information on the device.

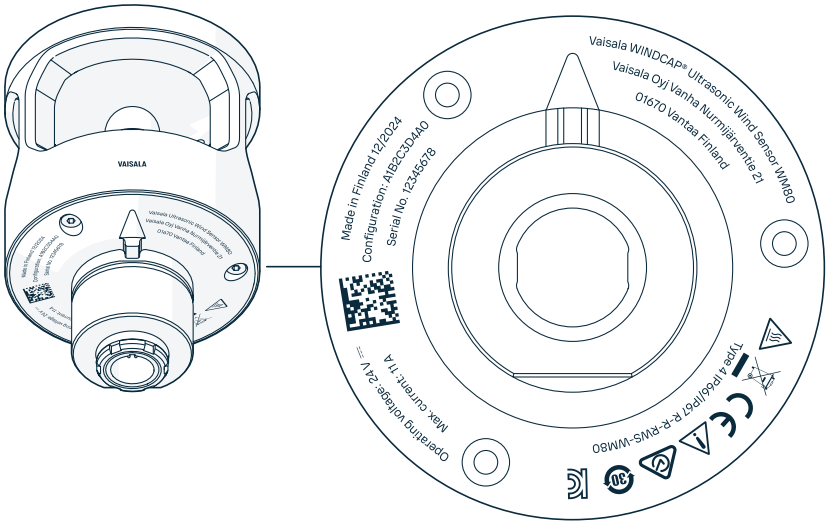


Figure 1 Type label on device

Table 4 Symbols on product

Symbol	Description
⎓	Direct current

Symbol	Description
	Warning. Potentially hot surfaces.
	Caution For instructions of use, see WM80 Setup Guide (M212994EN)

3. Ordering options

Table 5 Heating options

Option	Code
Heated transducers, device top, and device body	A
Heated transducers	B

Table 6 Physical communication options

Option	Code
Serial interface RS-485 only	1
Serial interface RS-485 and analog interface (2 × 4–20 mA sourcing)	2

After purchase, you cannot change the RS-485 only version to the RS-485 and analog version or the heated transducers version to the fully heated version.

Table 7 Communication profile options

Option	Code
NMEA 0183	A
Modbus RTU	C
Data message 21 (ASCII)	D
Data message 25 (ASCII)	E

Digital communication profile options can be changed or configured with Insight PC software.

Table 8 Measurement unit options

Option	Code
m/s	1
knots (for NMEA MWV and ASCII data messages only)	2

Table 9 Testing and calibration options

Option	Code
Default factory testing and calibration	A

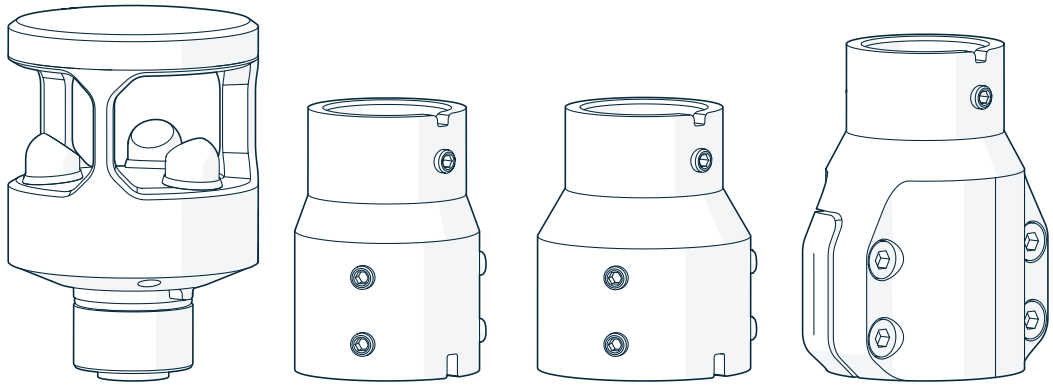


Figure 2 Mounting adapter options

Table 10 Mounting adapter options

Option	Code
50-mm mounting adapter for pole with outer diameter 48–51 mm (1.89–2.01 in)	1
60-mm mounting adapter for pole with outer diameter 58–61 mm (2.28–2.40 in)	2
50-mm isolated mounting adapter for pole with outer diameter 48–51 mm (1.89–2.01 in)	3

Table 11 Cable options

Option	Code
Cable 2 m, cable connector, cable cut on one end	1
Cable 11 m, cable connector, cable cut on one end	2
Cable 19 m, cable connector, cable cut on one end	3
No cable	4

Table 12 User guide options

Option	Code
English Setup Guide	A

Table 13 Available online

Option	Code
Vaisala Insight PC software	–

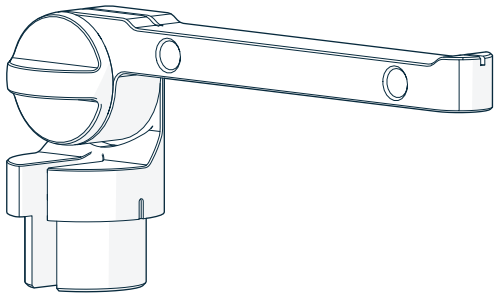


Figure 3 Alignment tool

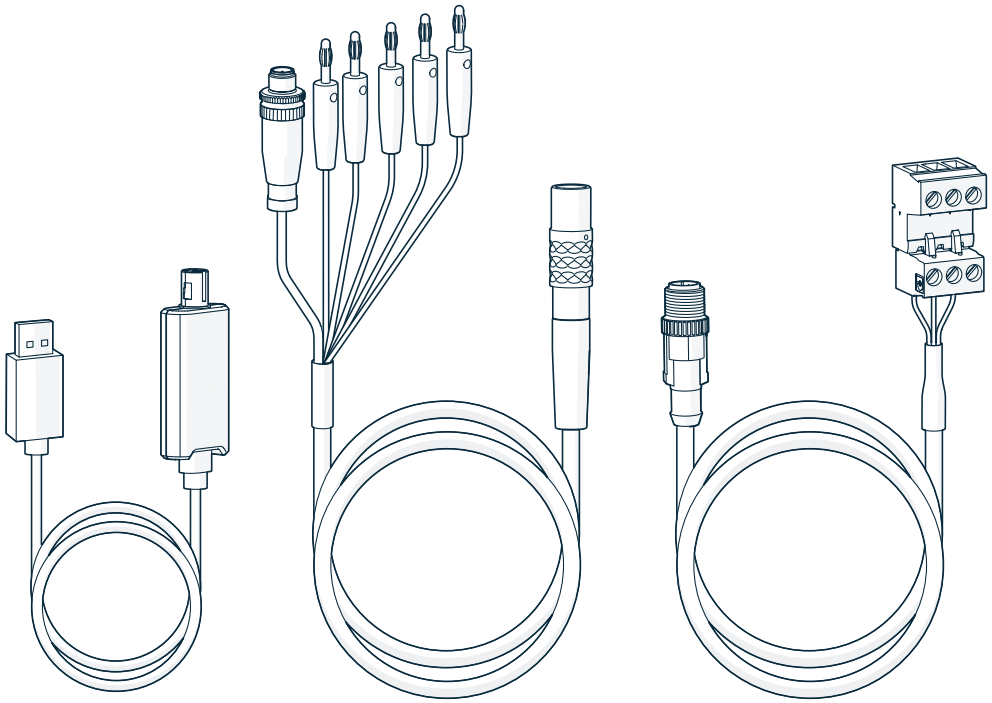


Figure 4 USB configuration set (USB adapter, service cable, and USB connection cable)

Table 14 Accessories

Accessory	Order code
Alignment tool	WM80ALIGNTOOL

Accessory	Order code
USB configuration set for use with Vaisala Insight PC software	WM80USBCONFSET

More information

- Spare parts (page 60)

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4. Functional description

WM80 takes wind measurements every 0.1 s at 10 Hz rate. The measurements are the basis for a set of measurement data that is available through different messages, protocols, and outputs.

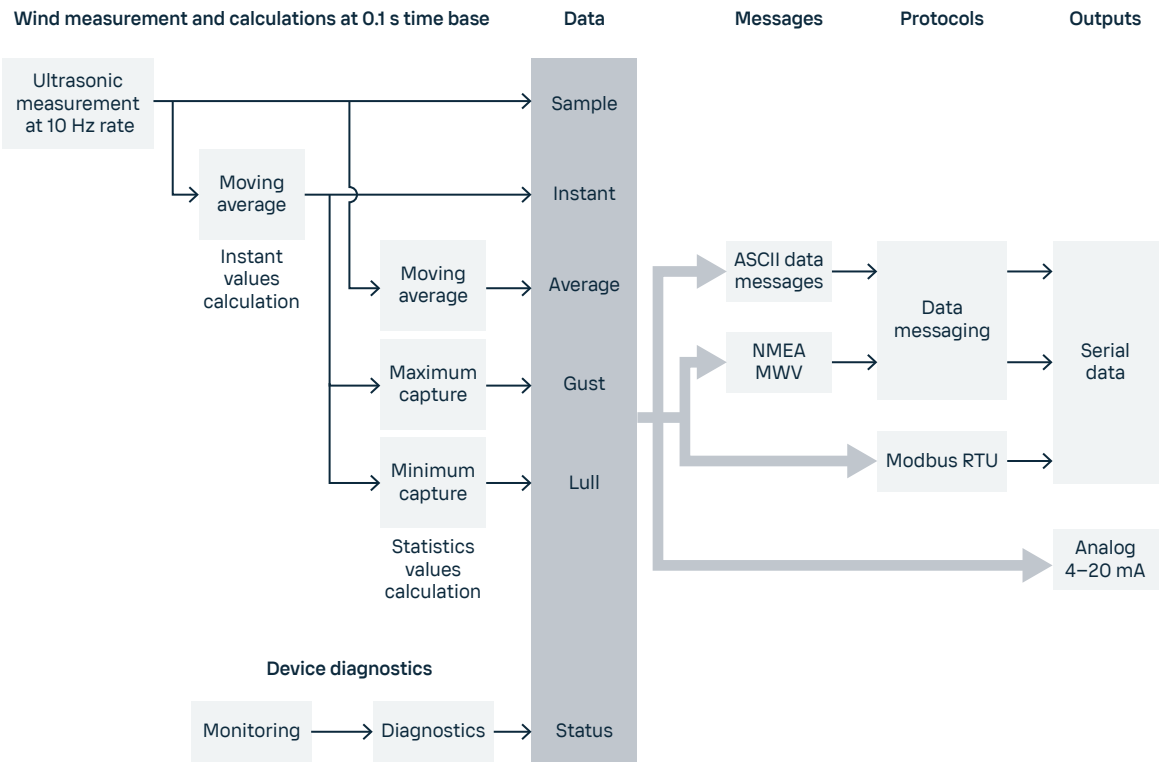


Figure 5 Functional description

The settings related to the wind measurement are the following:

- Instant values calculation period: 0.1–10 s
- Statistics value calculation period: 0.1–3600 s
- Calculation method for instant and average values: scalar or vector

To configure the settings, use Insight or Modbus.

For details about and differences between the messages, protocols, and outputs, see the information about the outputs and data communication.

The list of parameters and their default values is provided with the Modbus addresses.

More information

- Digital and analog outputs (page 19)
- Data communication (page 30)
- Analog output (page 41)
- Device parameters and Modbus addresses (page 72)

4.1 Measurement principle

WM80 wind measurement uses the Vaisala WINDCAP sensor technology and a novel reflector design that focuses the ultrasonic signal to the transducers providing up to 10 times stronger signal and exceptionally reliable wind measurements.

The WINDCAP sensor technology is based on the time-of-flight measurement principle that uses 3 ultrasonic transducers each acting as a transmitter and a receiver at a time.

A continuous measurement sequence provides time-of-flight values on 6 paths. The wind speed and wind direction are calculated from the measured time-of-flight values as the wind flow affects each of the 6 paths differently, depending on the wind speed and wind direction.

The wind direction is expressed in degrees where 0° represents north, 90° represents east, and so on, increasing clockwise and completing the circle at 359°. In addition, the information is available as vector output.

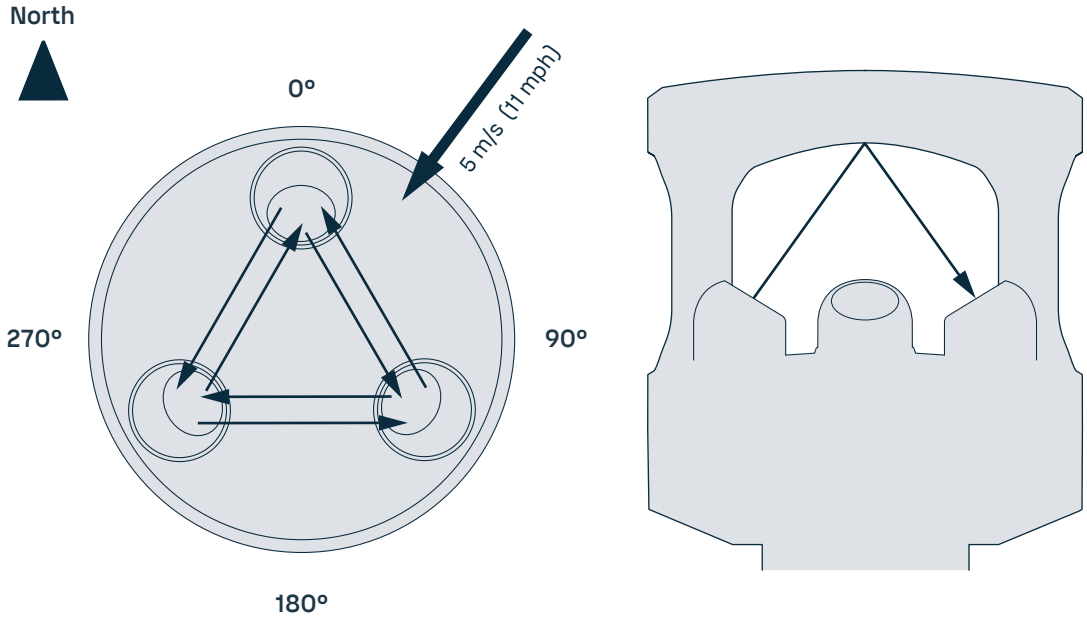


Figure 6 Time-of-flight measurement principle and reflector

4.2 Scalar and vector averaging methods

The established ways of calculating wind speed include 2 different methods that produce different results:

- Scalar averaging calculates the mean of wind speeds without considering the direction. For example, with a northerly and a southerly wind both at 5 m/s, the scalar average is 5 m/s.
- Vector averaging calculates the wind speed combining the magnitude of wind speed with wind direction information. For example, with a northerly and a southerly wind both at 5 m/s, the vector average is 0 m/s because the north and south wind components cancel each other out, resulting in a net wind speed of zero.

The result of vector average is always equal to or smaller than the scalar average.

In terms of applications, scalar averaging can be used to understand wind magnitude in wind energy, for example, and vector averaging can be used, for example, to understand the transport of particles by the wind, because winds in opposite directions cancel out in terms of transport.

In the following examples, 2 sequential measurements that are averaged with the scalar averaging method give 3.75 m/s as the wind speed. The same 2 measurements that are averaged with the vector averaging method give 2.75 m/s as the wind speed. The wind direction is also different for the 2 averaging methods.

Scalar averaging method

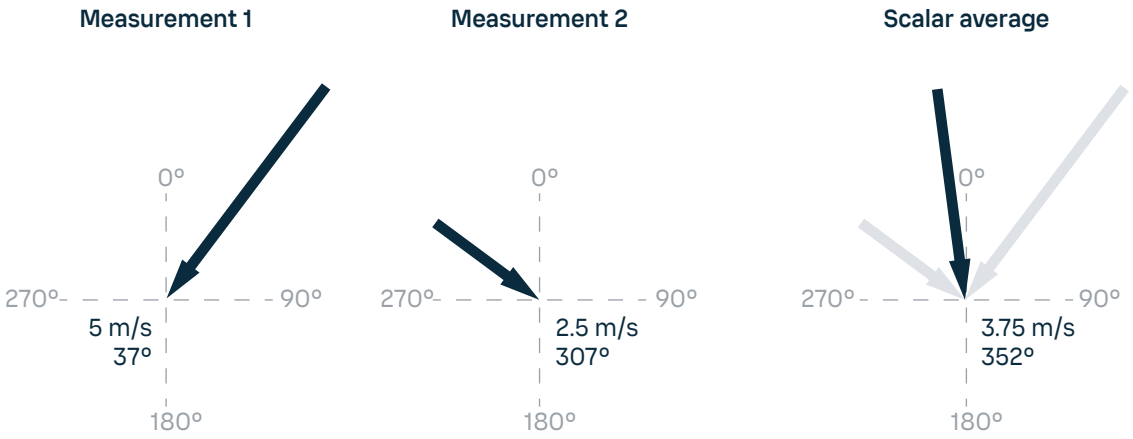


Figure 7 Scalar averaging 2 sequential wind measurements

Vector averaging method

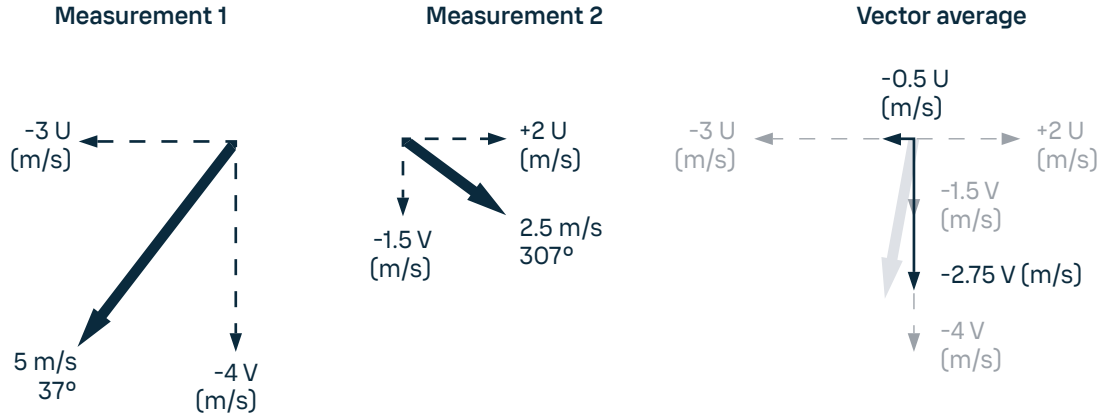


Figure 8 Vector averaging 2 sequential wind measurements

To choose the averaging method for the data output, adjust the calculation method setting in Insight or use Modbus register 0x0300.

The selected averaging method:

- Is specific to the device in question and affects all of its data outputs.
- Affects the instant and average measurement values. The sample values are not averaged.

Regardless of the averaging method, scalar averaging or vector averaging, you can get the values as scalar output and vector output in Modbus. For NMEA MWV and analog output, the values are always scalar output. For data messages (ASCII), you can choose the data message that provides either scalar or vector output.

More information

- Scalar and vector output (page 21)
- Configuring wind measurement (page 49)
- Device parameters and Modbus addresses (page 72)

4.3 WM80 measurement data

WM80 measures wind speed and wind direction, and provides the air temperature based on the sonic temperature.

Calculation principle

WM80 measures wind speed and wind direction at a 10-Hz rate, meaning that measurement is taken every 100 ms. The 10-Hz measurement data values are called **sample** values. The instant values and statistics values (average, gust, lull) are calculated according to the following table. All data values are updated at 100 ms intervals with a user-configurable data output rate.

Table 15 Measurement values

Measurement	Measurement value	Description	Calculation period
Sample	Wind speed, sample	Not averaged 10 Hz measurement values.	0.1 s Fixed value.
	Wind direction, sample		
	Sonic temperature		
Instant	Wind speed, instant	Moving average.	0.1–10 s (default 3 s) Configured with instant calculation period.
	Wind direction, instant		

Measurement	Measurement value	Description	Calculation period
Average	Wind speed, average	Moving average.	0.1–3600 s (default 600 s) Configured with statistics calculation period.
	Wind direction, average		
Gust	Wind speed, gust	Maximum registered instant wind speed value.	
	Wind direction, gust	Direction of maximum registered instant wind speed value.	
Lull	Wind speed, lull	Minimum registered instant wind speed value.	
	Wind direction, lull	Direction of minimum registered instant wind speed value.	

You can configure the calculation period for the instant and statistics values with Insight or through Modbus.

Additionally, the following wind measurement settings are available.

Table 16 Additional wind measurement settings

Setting	Description
Calm wind threshold	You can apply a configurable calm wind threshold during which the last calculated wind direction output is reported until the wind speed increases above the set threshold. The last calculated wind direction output is reported until the wind speed increases enough to reach the threshold.
Invalidation delay	A configurable invalidation delay is used in case of invalid sample values. During the specified invalidation delay period, the device outputs the last valid sample value. If invalid sample values extend beyond the invalidation delay, the device starts to report missing wind.

More information

- Digital and analog outputs (page 19)
- Configuring wind measurement (page 49)

4.4 Digital and analog outputs

The device uses serial communication over RS-485. The following protocols are used.

- NMEA 0183
- Data message (ASCII)
- Modbus RTU

Table 17 Data communication interfaces

Interface	Description	Output
RS-485	Serial data output that provides two-way communication	• NMEA 0183 • Data messages (ASCII) • Modbus RTU
2 ×analog (sourcing)	Analog data output that provides wind speed and wind direction output, as well as fault information.	4–20 mA

The measurement data output varies depending on the used protocol and message.

Table 18 Measurement data output

Output	NMEA MWV message	Data message 21	Data message 22 [1]	Data message 23	Data message 24	Data message 25	Modbus	4-20 mA analog output [2]
Sample							✓	✓
Instant							✓	✓
Average	✓	✓	✓	✓	✓	✓	✓	✓
Gust, wind speed				✓	✓	✓	✓	
Gust, wind direction							✓	
Lull, wind speed				✓	✓	✓	✓	
Lull, wind direction							✓	
Sonic temper-ature				✓	✓	✓	✓	

1) *Data message 22 provides vector output.*
2) *User can select which values are output.*

For configuration and troubleshooting, you can connect to the device using Insight.

After a restart, wait for 5 seconds before connecting to the device. After a restart, the device uses the default settings before loading the configured settings. This makes it possible to connect to the device with Insight regardless of the configured settings.

More information

- Scalar and vector output (page 21)
- WM80 measurement data (page 18)
- NMEA 0183 protocol (page 30)
- Data messages (ASCII) (page 32)
- Modbus RTU protocol (page 38)
- Analog output (page 41)

4.4.1 Scalar and vector output

WM80 has both vector and scalar outputs.

- The scalar output is the default option. It is available through the digital and analog outputs.
- The vector output is available in the data message 22 (ASCII) and through Modbus.

The scalar output is expressed with wind speed (m/s) and wind direction (degrees). In the scalar representation, the wind direction is the direction from which wind is blowing.

The vector output is expressed with U and V coordinates:

- Positive U component corresponds to the wind blowing from the west to east.
- Positive V component corresponds to the wind blowing from south to north.

The following example shows 5 m/s wind blowing from 37° in both scalar and vector representations.

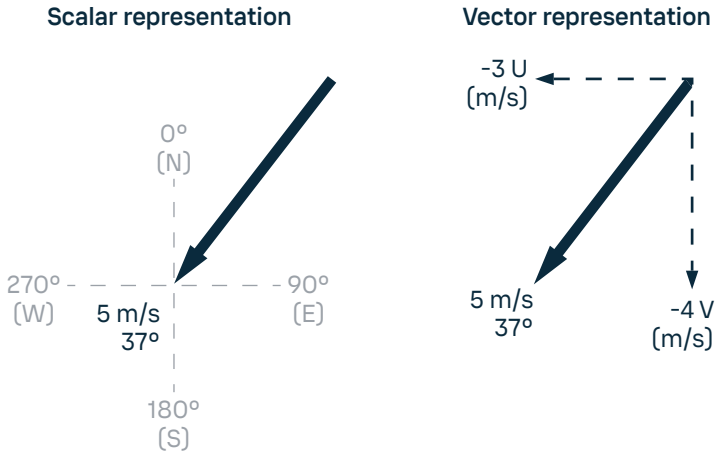


Figure 9 Scalar and vector representation

Table 19 Scalar output and vector output

Scalar output	Vector output
Wind speed: 5 m/s Wind direction: 37°	U component: −3 m/s V component: −4 m/s

The averaging of the wind values can be done either as scalar or vector quantities regardless of the representation of the output. This is defined with the calculation method setting in Insight or using Modbus register 0x0300.

To define the calculation period for the data output, use Modbus registers 0x0303 and 0x0305 or configure the calculation period in Insight. The calculation period is specific to the device in question and affects all of its data outputs.

More information

- Scalar and vector averaging methods (page 16)
- Digital and analog outputs (page 19)
- Data message 22 (page 34)
- Configuring wind measurement (page 49)
- Device parameters and Modbus addresses (page 72)

4.5 Heating

The heating in WM80 is needed to ensure measurement reliability in freezing and severe condensing environments. WM80 is available in 2 variants:

- Device with heated transducers, top, and device body
- Device with heated transducers

The automatically controlled heating keeps WM80 operational. There are a number of solid-state heating elements that provide optimized heat distribution for the different parts of the device, such as the device body, the top with a reflector, as well as the 3 transducers.

To keep the heating power suitable in all conditions, there is a target temperature the heating control is aiming to maintain. The heating power is controlled by continuously measuring the temperature at several spots of the device and adjusting the power of the distributed heating elements accordingly.

The heating is based on current-controlled solid-state elements. Depending on the voltage of the power supply and the length of the device cable, the current drawn by the heating is controlled automatically according to the needed power. The drawn current is controlled in a linear manner. As an advantage, there are no remarkable peak currents as in an on-off-style thermostat-based heating.

The heating can be enabled and disabled with a user setting. In case of limited current capability of the power supply, the value for the maximum heating current can be changed from the default value. The target temperature value is configurable. Be careful with the settings because the device may not operate optimally if the heating settings are changed from the default factory settings.

For safety reason, in case of a device failure, there is an overheat protection circuit that disables the heating. To reset the overheat protection, reconnect the supply voltage.

The device with heated transducers helps to ensure measurement reliability in severe condensing environments where icing is not an issue. The current consumption is significantly lower than that for the device with heated transducers, top, and device body.

More information

- Configuring device heating (page 49)
- Device status (page 56)

5. Installation and setup

5.1 WM80 parts

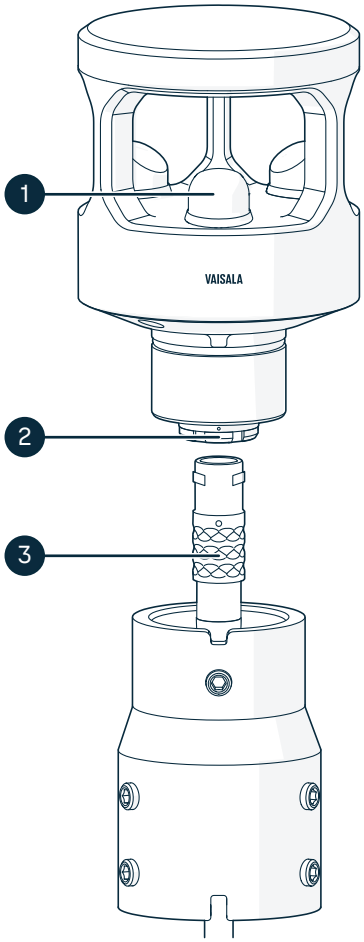


Table 20 WM80 parts

#	Part	Description
1	Transducer (3 pcs)	For ultrasonic measurement of wind speed and wind direction
2	Device connector	For cable connection
3	Device cable	For data and powering

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5.2 Installation and configuration

The device can be installed with the 50-mm or 60-mm mounting adapter on a pole. For site requirements and installation instructions, see WM80 Setup Guide (M212994EN).

If you need to modify the device from the default factory settings before use, configure the device as needed. After installation, verify that the device outputs data as expected.

5.3 Cybersecurity guidelines

Follow these cybersecurity guidelines:

- Do not expose the device interfaces to the internet.
- The device runs only on Vaisala-signed firmware.
- Known software vulnerabilities are documented in the firmware release notes.
- In case of critical software vulnerabilities, Vaisala provides a firmware update package or mitigation proposal.

5.4 Powering requirements

To ensure electrical safety of the device:

- Connect the device to an isolated power supply.
- Protect the device with an overcurrent protection device.
- Use the specified type of device cable.

For the requirements, see the following tables.

Table 21 Power supply

Property	Description
DC output, nominal	24 V DC
Insulation	Double/Reinforced insulation

The device requires an external overcurrent protection device. Protect the device and the cabling with a circuit breaker at operating voltage lines that has the following characteristics. The overcurrent protection device can be a fuse or a circuit breaker.

Table 22 Overcurrent protection device

Property	Description
Current rating for device with heated transducers, device top, and device body	13 A, with type B, C, or D tripping characteristics (according to IEC/EN 60898-1 or UL 1077)
Current rating for device with heated transducers	3 A, with type B, C, or D tripping characteristics (according to IEC/EN 60898-1 or UL 1077)
Minimum voltage rating	32 V DC

Property	Description
Circuit breaker Instead of a circuit breaker you can use a cartridge fuse with class T (slow acting) tripping characteristics.	2-pole (connected on both V+ and V–) or 1-pole (connected on V+)

Vaisala recommends using a cable provided by Vaisala. If you use another cable, it must meet the following requirements.

Table 23 Cable

Property	Description
Maximum cable length	19 m (62 ft)
Appliance Wiring Material (AWM) style 20236	External interconnection or internal wiring
Shield	Mandatory
Minimum wire thickness	4 (data) × (2 x 0.34 mm^2) + 4 (operating voltage) × 0.5 mm^2
Connector type	S22KHC-P10NJH0-900S manufactured by ODU

More information

- Grounding and lightning protection (page 26)
- WM80 specifications (page 66)
- Wiring for serial and analog data output (page 71)

5.4.1 Cable loss and heating in cold climates

In cold climates, use the device with heated transducers, top, and device body.

The power consumption of WM80 depends on the ambient conditions. For example, in arctic conditions at temperatures of −20 °C (−4 °F) and wind speeds of 15 m/s (34 mph), WM80 consumes approximately 100 W of power and remains operational. In extreme icing conditions, tested according to the MIL-STD-810H standard, WM80 remains operational with a power consumption of 160 W.

Higher heating power, due to higher current, leads to a higher voltage drop in the cable. The voltage drop depends also on the cable length. For this reason in cold climates, it is advisable to use a higher power supply output voltage, such as 30 V DC, to ensure proper heating performance of the device.

5.5 Grounding and lightning protection

WARNING! Always consult local authorities on decisions that relate to aviation safety, grounding, lightning protection, safe installation, and power supply. Follow local and state legislation and regulations.

WARNING! Consult local electricity professionals for the local and state legislation and regulations about grounding.

Install the device as instructed in WM80 Setup Guide (M212994EN).

Install the device at minimum in a lightning protection zone LPZ 0B.

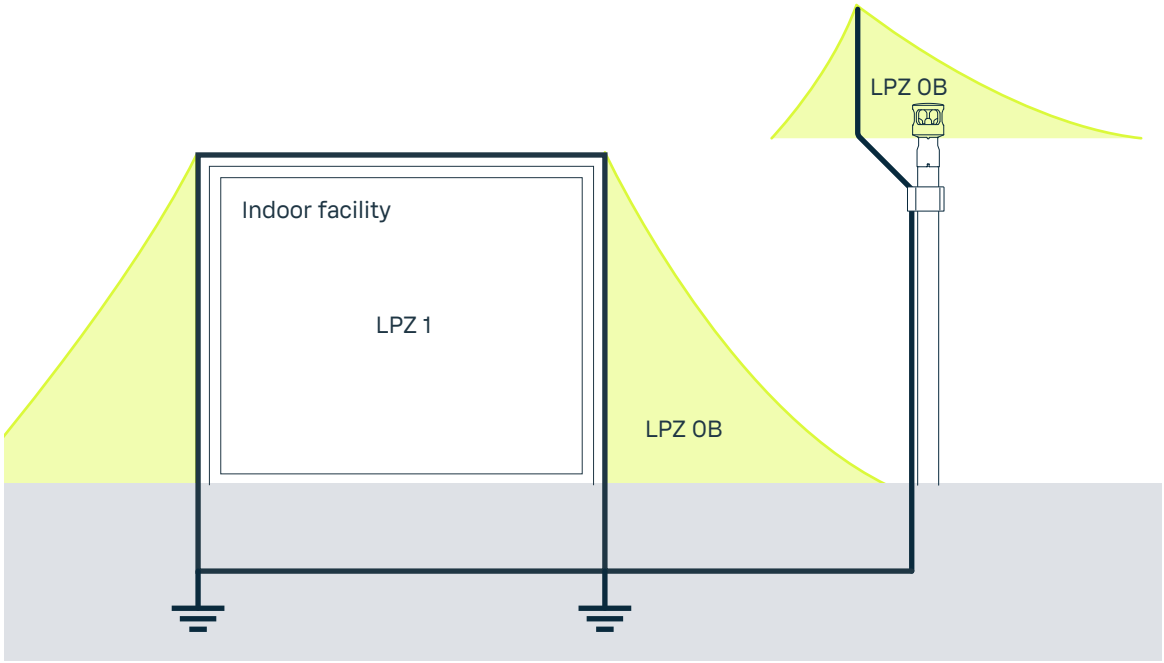


Figure 10 Lightning protection zone LPZ0B

If you use the isolated mounting adapter, separate external grounding is not required because sufficient grounding is achieved by grounding the cable shield.

External lightning protection is required to protect the device from direct lightning strikes.

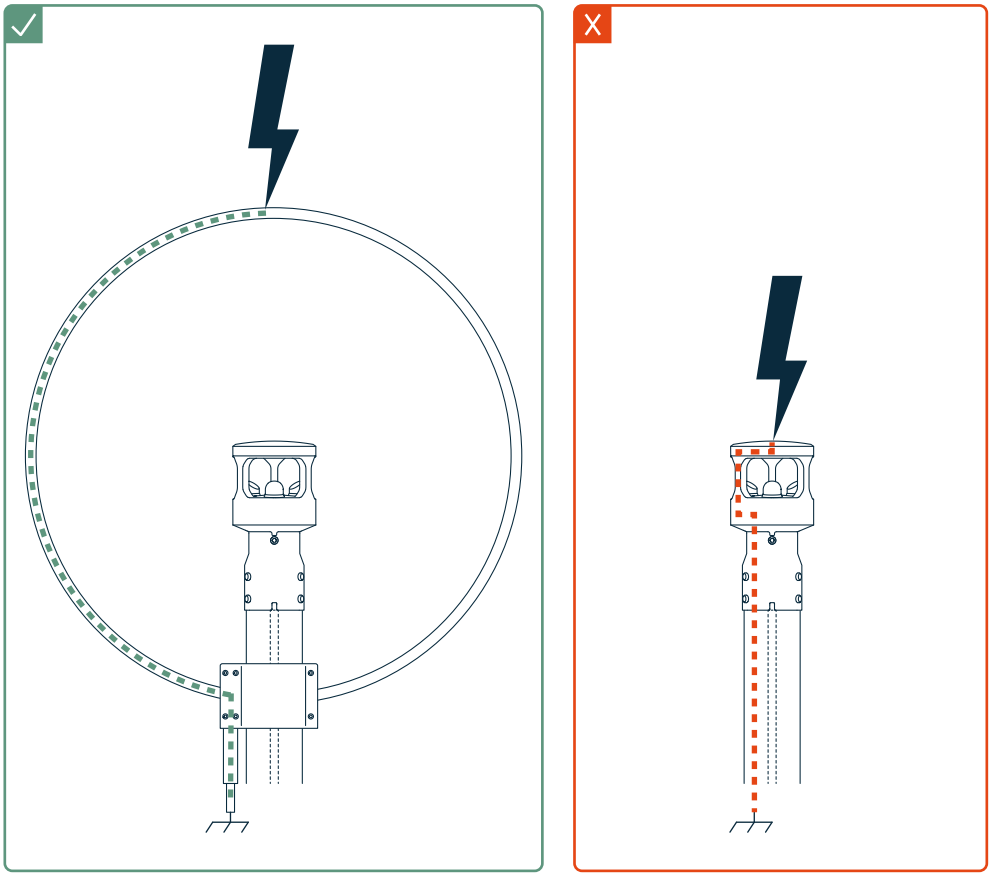


Figure 11 Device with and without lightning protection

CAUTION! To prevent equipment damage, install an air terminal so that the tip is as high above the instruments and sensors as possible.

To protect the system from lightning-induced surges, use shielded cables and metal cable conduits between units and terminate all with direct connections to the electronics housing and from the housing to the ground.

Make sure that you use a high-quality grounding cable or verify that the installation platform, such as a mast, is adequately grounded as illustrated in the following figure. For optimal performance, Vaisala recommends bundling the grounding cable with the shielded sensor cable and securing them firmly to the mast structure. This minimizes the risk of unintended antenna effects.

When mandatory surge protection is implemented at the power supply and data acquisition end, do not use additional surge protection near the sensor.

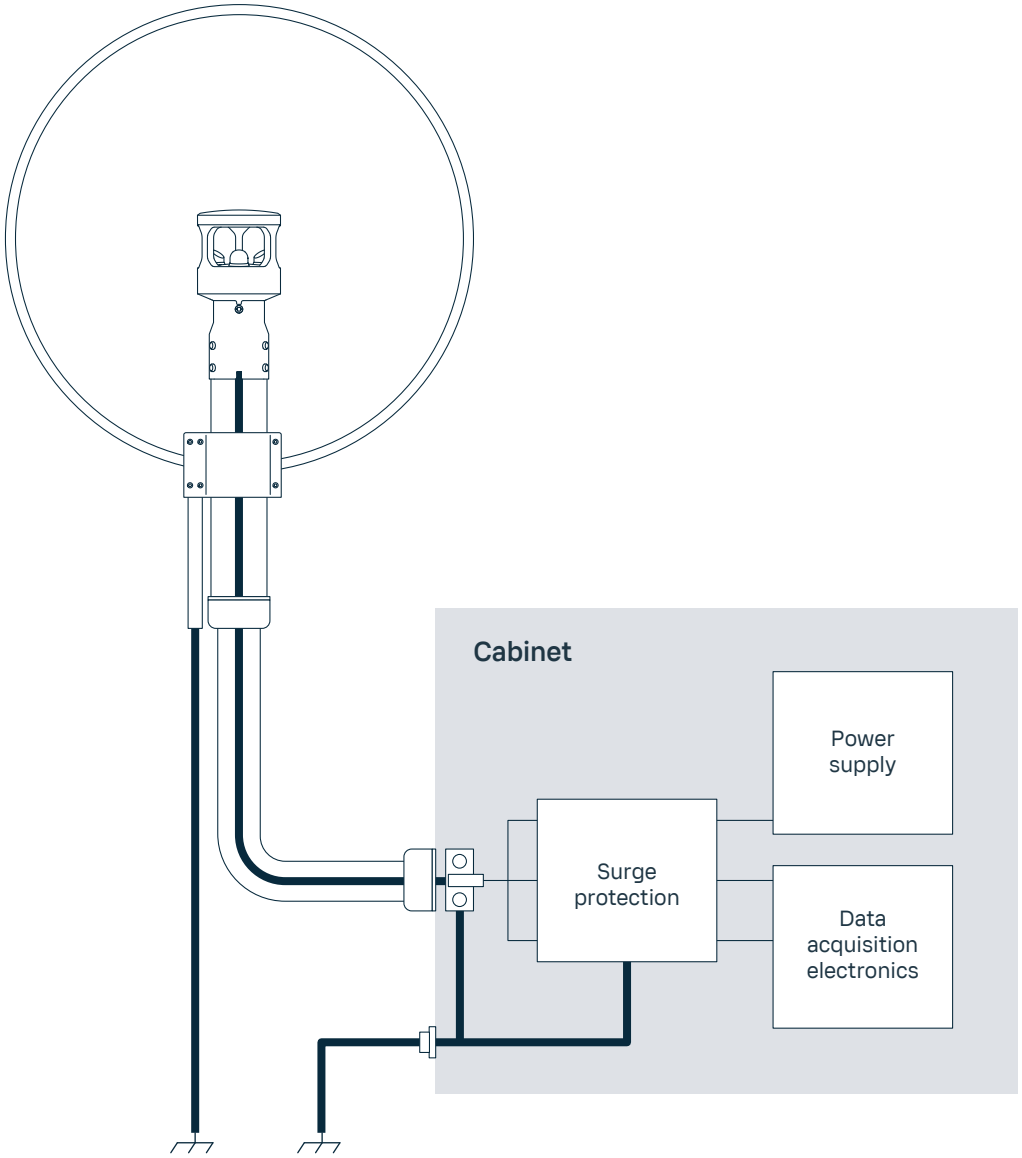


Figure 12 Lightning protection of system

More information

- Powering requirements (page 25)

6. Data communication

The following default values depend on the options you selected when ordering WM80: communication profile, customer-specific product, and measurement unit. For all the ordering options, see WM80 Order Form.

Table 24 Configuration parameters

Ordering option	Configuration parameter	Related Modbus register
Communication profile		
A	NMEA MWV autosend, 0.25 s interval, (4800 bps, N, 8, 1)	0x0605, interface mode 0x060c, message type 0x060d, autosend interval 0x0602, bit rate 0x0603 parity, data, stop bits
C	Modbus RTU, (19200 bps, N, 8, 2), address 240	
D	Data message 21 autosend, 1 s interval, (9600 bps, N, 8, 1)	
E	Data message 25 autosend, 1 s interval, (9600 bps, N, 8, 1)	
Measurement units		
1	Wind speed unit: m/s	0x0609, data messaging wind speed unit
2	Wind speed unit: knots	

More information

- NMEA 0183 protocol (page 30)
- Data messages (ASCII) (page 32)
- Modbus RTU protocol (page 38)

6.1 NMEA 0183 protocol

WM80 outputs a standard MWV message using the NMEA 0183 protocol (NMEA stands for the National Marine Electronics Association) over serial communication, using the standard weather instrument talker ID (WI).

For special purpose applications, any 2-character combination can be set instead of the default, standard (WI) NMEA Talker ID:

- User configurable talker (U0–U9) according to NMEA version 4.
- WMT700 compatible talker (AA–ZZ).

In the autosend protocol mode, the NMEA message is sent automatically with a user-defined interval.

More information

- Configuring NMEA 0813 settings (page 45)

6.1.1 MWV data message

NMEA MWV data message is as follows:

```
$<ID>MWV,<WDA>,R,<WSA>,<units>,<status>*<CHK><CR><LF>
```

Table 25 MWV data message

Name	Description
$	Start of message delimiter
<ID>	NMEA Talker identifier (default = **WI**) You can change the identifier with Insight or with Modbus register address 0x0607.
MWV	NMEA message formatter
<WDA>	Wind direction: 0 to 359°, average value
R	Wind direction reference: • R = relative
<WSA>	Wind speed, average value
<units>	Wind speed measurement unit: • M = m/s (default) • N = knots You can change the unit for wind speed (m/s or knots) with Insight or with Modbus register address 0x0609.
<status>	Status: • A = Valid data • V = Invalid data
*	Checksum delimiter
<CHK>	Checksum
<CR>	Carriage return, ASCII code 0x0D
<LF>	Line feed, ASCII code 0x0A

Example of MWV data message

```
$WIMWV,045,R,011.63,N,A*09<CR><LF>
```

Table 26 Example of MWV data message

Name	Data
NMEA Talker identifier	WI
NMEA message formatter	MWV
Wind direction, average value	45°

Name	Data
Wind direction reference	R
Wind speed, average value	11.63 knots
Wind speed measurement unit	Knots
Status	Valid data
Checksum	09

6.1.1.1 Checksum calculation, MWV message

Checksum of the MWV message is calculated as 8-bit XOR of all characters in the sentence between, but excluding, the delimiters $ and *.

Example of the message and characters included in the checksum calculation:

```
$WIMWV,045,R,011.63,N,A*09<CR><LF>
 WIMWV,045,R,011.63,N,A
```

6.2 Data messages (ASCII)

Data messages (ASCII) contain different data sets that can be sent periodically as defined by the autosend interval.

The WM80 data messages 21–25 are identical with the WMT700 data messages 21–25.

You can change the data message type with Insight PC software.

Table 27 Data message (ASCII) contents

Data	Data message 21	Data message 22	Data message 23	Data message 24	Data message 25
Wind speed, average	✓		✓	✓	✓
Wind direction, average	✓		✓	✓	✓
Wind speed, average, U component		✓			
Wind speed, average, V component		✓			
Wind speed, gust			✓	✓	✓
Wind speed, lull			✓	✓	✓
Sonic temperature			✓	✓	✓
Operating voltage			✓	✓	
Transducer temperature			✓	✓	

Data	Data message 21	Data message 22	Data message 23	Data message 24	Data message 25
Status code			✓	✓	✓
Checksum				✓	✓

Autosend mode

In the autosend mode, the selected message is sent automatically with a user-defined interval.

More information

- Data message 21 (page 33)
- Data message 22 (page 34)
- Data message 23 (page 34)
- Data message 24 (page 35)
- Data message 25 (page 36)
- Configuring data message (ASCII) settings (page 46)

6.2.1 Data message 21

Data message 21 outputs the wind speed and wind direction in the following format:

```
$<WSA>,<WDA><CR><LF>
```

Table 28 Data message 21

Name	Description
$	Start of message delimiter
WSA	Wind speed, average
WDA	Wind direction, average
<CR>	Carriage return, ASCII code 0x0D
<LF>	Line feed, ASCII code 0x0A

Example of data message 21

```
$00.08,299.20<CR><LF>
```

Table 29 Example of data message 21

Name	Data
Wind speed, average	0.08 m/s
Wind direction, average	299.2°

6.2.2 Data message 22

Data message 22 reports the wind speed U and V components in the following format:

```
$<WUA>,<WVA><CR><LF>
```

Name	Description
$	Start of message delimiter
WUA	Wind speed, average, U component
WVA	Wind speed, average, V component
<CR>	Carriage return, ASCII code 0x0D
<LF>	Line feed, ASCII code 0x0A

More information

- Scalar and vector output (page 21)

6.2.3 Data message 23

Data message 23 outputs the wind measurement, self-diagnostics monitoring values, and status code in the following format:

```
$<WSA>,<WDA>,<WSG>,<WSL>,<TS>,<VH>,<VO>,<TTR>,<STA><CR><LF>
```

Table 30 Data message 23

Name	Description
$	Start of message delimiter
<WSA>	Wind speed, average
<WDA>	Wind direction, average
<WSG>	Wind speed, gust
<WSL>	Wind speed, lull
<TS>	Sonic temperature

Name	Description
<VH>	Heater voltage (same as operating voltage)
<VO>	Operating voltage
<TTR>	Temperature of transducers (average of 3 transducer temperatures)
<STA>	Status code. See Checking device status (page 57).
<CR>	Carriage return, ASCII code 0x0D
<LF>	Line feed, ASCII code 0x0A

Example of data message 23

```
$03.21,75.83,03.34,03.15,22.37,23.5,23.5,20.0,0000<CR><LF>
```

Table 31 Example of data message 23

Name	Data
Wind speed, average	3.21 m/s
Wind direction, average	75.83°
Wind speed, gust	3.34 m/s
Wind speed, lull	3.15 m/s
Sonic temperature	22.37 °C
Heater voltage	23.5 V
Operating voltage	23.5 V
Temperature of transducers	20.0 °C
Status code	0000 = OK

6.2.4 Data message 24

Data message 24 outputs the wind measurement, self-diagnostics monitoring values, status code, and checksum in the following format:

```
$<WSA>,<WDA>,<WSG>,<WSL>,<TS>,<VH>,<VO>,<TTR>,<STA>,<CHK><CR><LF>
```

Table 32 Data message 24

Name	Description
$	Start of message delimiter
<WSA>	Wind speed, average

Name	Description
<WDA>	Wind direction, average
<WSG>	Wind speed, gust
<WSL>	Wind speed, lull
<TS>	Sonic temperature
<VH>	Heater voltage (same as operating voltage)
<VO>	Operating voltage
<TTR>	Temperature of transducers (average of 3 transducer temperatures)
<STA>	Status code. See Checking device status (page 57).
<CHK>	Checksum (8-bit XOR). See Checksum calculation, data messages (ASCII) (page 37).
<CR>	Carriage return, ASCII code 0x0D
<LF>	Line feed, ASCII code 0x0A

Example of data message 24

```
$03.21,75.83,03.34,03.15,22.37,23.5,23.5,20.0,0000,34<CR><LF>
```

Table 33 Example of data message 24

Name	Data
Wind speed, average	3.21 m/s
Wind direction, average	75.83°
Wind speed, gust	3.34 m/s
Wind speed, lull	3.15 m/s
Sonic temperature	22.37 °C
Heater voltage	23.5 V
Operating voltage	23.5 V
Temperature of transducers	20.0 °C
Status code	0000 = OK
Checksum	34

6.2.5 Data message 25

Data message 25 outputs the wind measurement, sonic temperature, status code, and checksum in the following format:

```
$<WSA>,<WDA>,<WSG>,<WSL>,<TS>,<STA>,<CHK><CR><LF>
```

Table 34 Data message 25

Name	Description
$	Start of message delimiter
<WSA>	Wind speed, average
<WDA>	Wind direction, average
<WSG>	Wind speed, gust
<WSL>	Wind speed, lull
<TS>	Sonic temperature
<STA>	Status code. See Checking device status (page 57).
<CHK>	Checksum (8-bit XOR), see Checksum calculation, data messages (ASCII) (page 37).
<CR>	Carriage return, ASCII code 0x0D
<LF>	Line feed, ASCII code 0x0A

Example of data message 25

```
$03.22,75.29,03.38,03.07,22.13,0000,0E<CR><LF>
```

Table 35 Example of data message 25

Name	Data
Wind speed, average	3.22 m/s
Wind direction, average	75.29°
Wind speed, gust	3.38 m/s
Wind speed, lull	3.07 m/s
Sonic temperature	22.13 °C
Status code	0000 = OK
Checksum	0E

6.2.6 Checksum calculation, data messages (ASCII)

Checksum of data messages (ASCII) is calculated as an 8-bit XOR of all characters in the message beginning from the delimiter ($) and ending at the last field separator (,) before the checksum itself.

Example of the message 25 and characters included in the checksum calculation:

```
$03.22,75.29,03.38,03.07,22.13,0000,0E<CR><LF>
$03.22,75.29,03.38,03.07,22.13,0000,
```

6.3 Modbus RTU protocol

The device supports the Modbus RTU protocol for measurement data and for configuring the device by using holding registers. Individual 16-bit registers follow the Modbus standard big-endian byte order for 16-bit values.

See also DMU801 Modbus RTU Sensor Integration Guide.

Function codes

The device supports the following function codes.

Table 36 Function codes

Function code	Function name
0x03	Read multiple holding registers
0x10	Write multiple holding registers
0x2B	Read device ID

Data addressing

The device provides 2 methods for easy register addressing.

Table 37 Data addressing

Method	Description	Value range
Register address	16-bit register address in hexadecimal and decimal formats.	0x0000–0xFFFF (0–65535)
Register number	Register address in decimal format + 1	1–65536

Related to addressing in decimal format, check the reference documentation of your Modbus host to verify which notation is used:

- Register address in decimal format (0–65535)
- Register number (1–65536)

Data types

The following data types are used in the device.

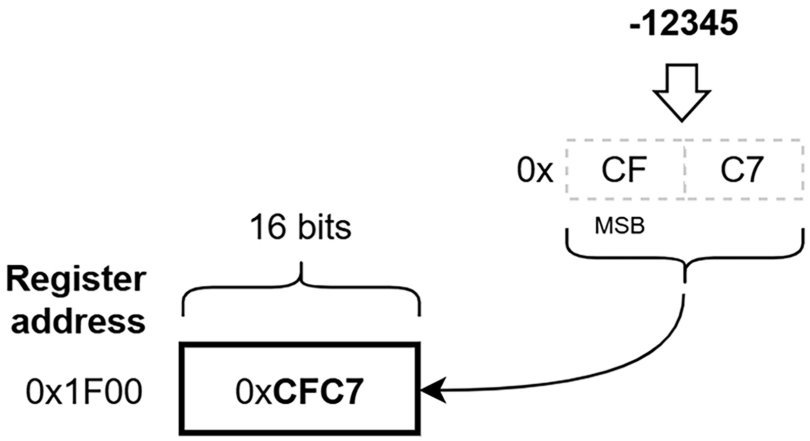
Data type	Description	Register coding
int16	16-bit signed integer value	Standard Modbus big-endian byte order
int32	32-bit signed integer value	Two 16-bit registers in little-endian word order
float	32-bit floating-point value. Binary32 encoding defined in IEEE 754, (single-precision floating point format).	Two 16-bit registers in little-endian word order
text	ASCII string in linear byte order	Standard Modbus big-endian byte order
register	Holding register address as 16-bit integer	Standard Modbus big-endian byte order
date	Date as 3 int16 values (YYYY, MM, and DD)	Standard Modbus big-endian byte order

Data formats

The values in the examples are as they are read from the Modbus communication test registers.

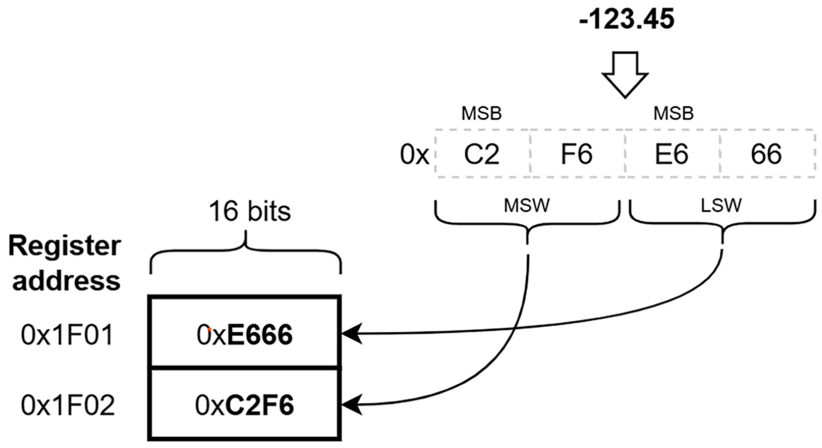
16-bit register big-endian byte order

16-bit register contains two 8-bit bytes. Big-endian byte order means that the most significant byte (MSB) is the first 8 bits in the register. For example, integer value -12345 is read from the holding register `0x1F00`. The value -12345 in hexadecimal form is `0xCFC7` and it splits into 2 bytes `0xCF` and `0xC7`.



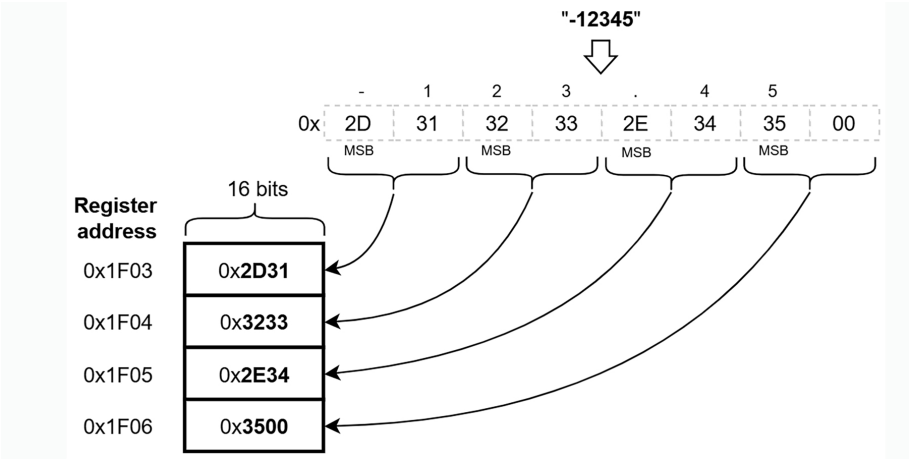
32-bit value little-endian word order

32-bit value needs two 16-bit registers (2 words). Little-endian word order means that the least significant word (LSW) is in the first register. Note that the 16-bit registers still follow big-endian byte order. For example, floating point value -123.45 is read from the holding register `0x1F01`. The value -123.45 in hexadecimal form is `0xC2F6E666` and it splits into 4 bytes `0xC2`, `0xF6`, `0xE6`, and `0x66`.



Text string

In the device, there are several fields that store text strings. The characters are packed into multiple 16-bit registers, 2 characters in each. For example, the text string "-123.45" is read from the holding register `0x1F03`. The characters of the string "-123.45" are respectively `0x2D`, `0x31`, `0x32`, `0x33`, `0x2E`, `0x34`, and `0x35`. Note that the LSB byte of the last word is filled as NUL value `00`.



More information

- Configuring Modbus settings (page 46)
- Device parameters and Modbus addresses (page 72)

7. Analog output

WM80 has 2 analog outputs at 4–20 mA: wind speed and wind direction. You can configure the analog output using Insight or Modbus.

Select the configuration setting for the measurement value as sample, instant, or average depending on your application.

Both outputs reside at common output block that is isolated from the operating voltages, as well as from the device housing.

Wind speed output

The output range for the wind speed is 4.0–20.0 mA and the value range 0–100 m/s (default).

The analog output for wind speed extends below the range down to 3.8 mA and above the range to 20.5 mA. The scaling for the wind speed is configurable. For example, you can set the scale of 4.0–20.0 mA to correspond to 0–50 m/s.

Wind direction output

The output range for the wind direction is 4.0–20.0 mA and the value range as shown in the following figure.

You can configure the 0° (datum) to be at 12.0 mA (default) or at 4.0 mA.

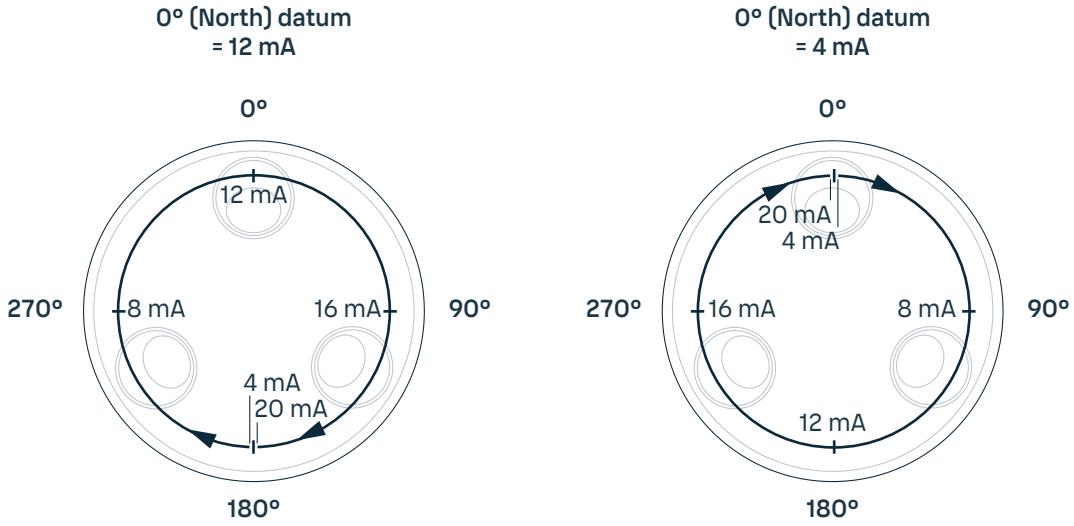


Figure 13 Wind direction 0° North datum

Analog output at 0.1–3.6 mA indicates device failure. The value is configurable (default 2.0 mA).

More information

- Configuring analog output (page 47)

8. Configuration with Insight PC software

8.1 Vaisala Insight PC software

Vaisala Insight PC software is an application for connecting to and accessing your device.

Connect the device to Insight using the USB configuration set (WM80USBCONFSET). Use only the USB configuration set provided by Vaisala to connect to Insight.

With Insight you can:

- View measurement data.
- View device information.
- Configure the device.
- Update device firmware.

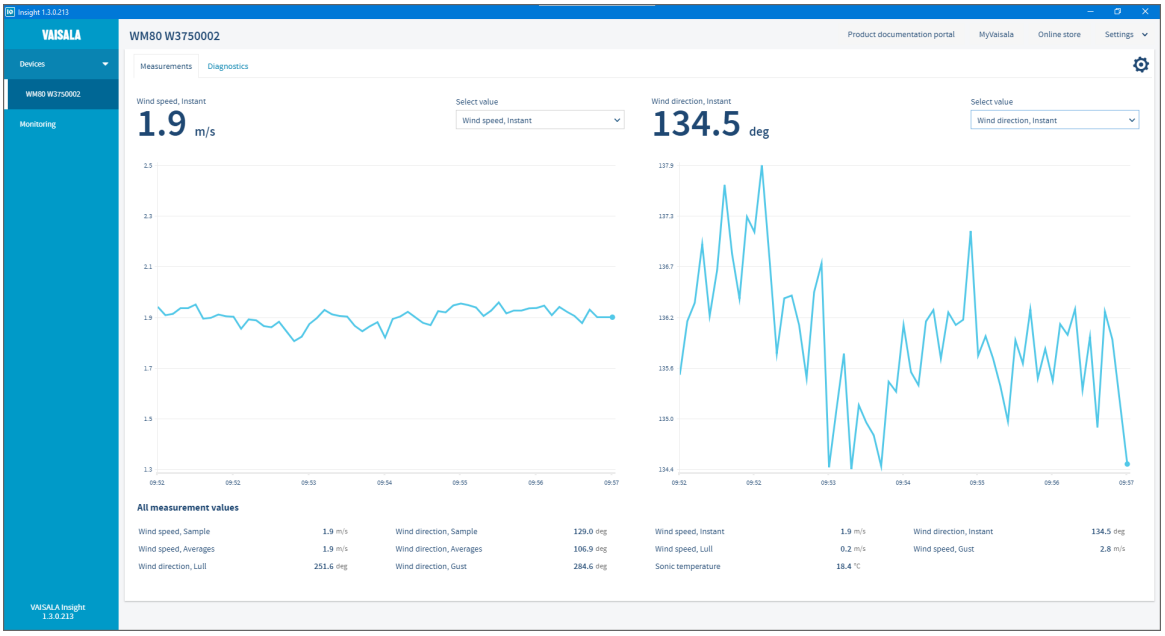


Figure 14 WM80 data on Insight

More information

- Ordering options (page 11)

8.2 Downloading Insight software

Download Vaisala Insight software at docs.vaisala.com.

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8.3 Configuring device before installation

- Service cable from the USB configuration set
- USB adapter from the USB configuration set
- 24 V DC power supply, min. 2 A
- Windows PC
- Vaisala Insight PC software (download from docs.vaisala.com)

If you are configuring the device before installation, connect to the device with the service cable and the USB adapter.

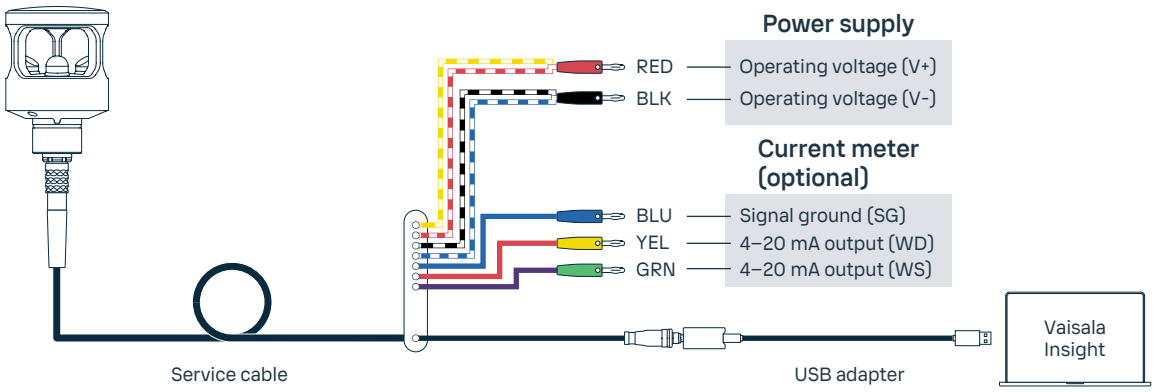


Figure 15 Configuration at office

1. Connect the USB adapter to a free USB port on a Windows PC.
2. Wait until the green LED is lit and the USB adapter is ready to use.
3. Connect the service cable to the device and to the USB adapter.
4. Start Insight PC software.
5. Power off and power on the device.

   During power-up Insight recognizes the device and opens the **Devices** view, showing the device name and serial number.
6. Select the device.
7. Select the settings icon (⚙) and **Configure device**, and configure the communication settings and wind measurement as needed.

If Insight does not recognize the device, try the following:

- Disconnect the power and connect it again.
- Download and install the USB instrument driver for cables from docs.vaisala.com.

8.4 Configuring device after installation

- USB adapter from the USB configuration set
- USB connection cable from the USB configuration set
- Windows PC
- Vaisala Insight PC software (download from www.vaisala.com/insight)

If you are configuring the device after installation, connect to the device with the USB connection cable and the USB adapter.

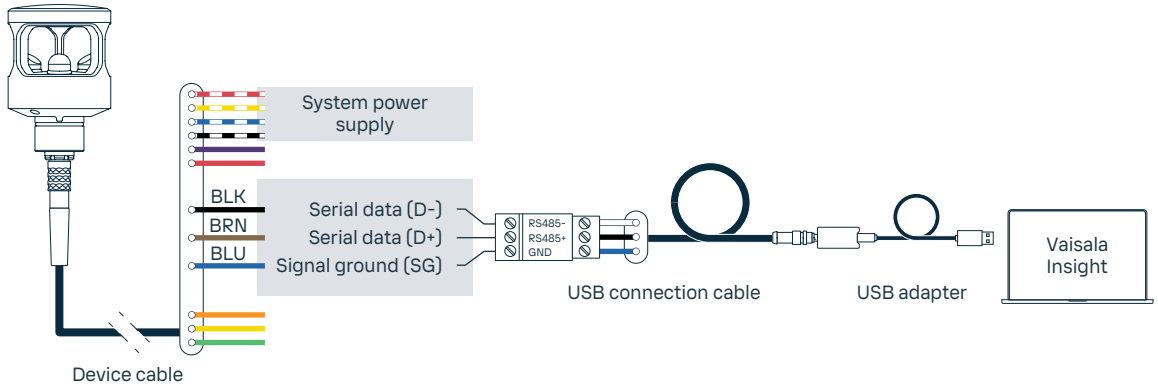


Figure 16 Configuration at installation location

1. Connect the USB adapter to a free USB port on a Windows PC.
2. Wait until the green LED is lit and the USB adapter is ready to use.
3. Connect the USB connection cable to the device and to the USB adapter.
4. Start Insight PC software.
5. Power off and power on the device.

   During power-up Insight recognizes the device and opens the **Devices** view, showing the device name and serial number.
6. Select the device.
7. Select the settings icon (⚙) and **Configure device**, and configure the communication settings and wind measurement as needed.

If Insight does not recognize the device, try the following:

- Disconnect the power and connect it again.
- Download and install the USB instrument driver for cables from docs.vaisala.com.

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8.5 Configuring communication settings

More information

- Configuring NMEA 0813 settings (page 45)
- Configuring data message (ASCII) settings (page 46)
- Configuring Modbus settings (page 46)
- Configuring analog output (page 47)

8.5.1 Configuring NMEA 0813 settings

1. Create a connection to the device with Insight PC software.
2. Select the settings icon (⚙) and **Configure device**.
3. Select **Communication** and configure the following settings.

   Bit rate
   Select the bit rate.

   Parity, data, stop bits
   Select the parity, data, and stop bits.

   Interface mode
   Select **Data messaging**.

   NMEA talker ID
   Identifier for NMEA messages to allow the use of several devices on the same bus.

4. Select **Data messaging** from the left and configure the following setting.

   Wind speed unit
   Select **m/s** or **kn**.

   Message type
   Select **NMEA MWV**.

   Autosend interval
   Message sending interval in seconds for the selected message type.

5. Select **Save**.
6. Close Insight and open a terminal software, such as PuTTY.
7. To restart, power down WM80 and then power up again and wait for 5 seconds.
8. Verify that the device starts sending NMEA messages in the defined interval. If not, close the terminal software, open Insight, and restart WM80.

More information

- Configuring wind measurement (page 49)
- NMEA 0183 protocol (page 30)

8.5.2 Configuring data message (ASCII) settings

1. Create a connection to the device with Insight PC software.
2. Select the settings icon (⚙) and **Configure device**.
3. Select **Communication** and configure the following settings.

   Bit rate
   Select the bit rate.

   Parity, data, stop bits
   Select the parity, data, and stop bits.

   Interface mode
   Select **Data messaging**.
4. Select **Data messaging** from the left and configure the following settings.

   Wind speed unit
   Select **m/s** or **kn**.

   Message type
   Select one of the data messages 21, 22, 23, 24, or 25.
   The diagnostic message is for troubleshooting only. Do not use it for data communication.
   The custom message is reserved for future. Do not use it for data communication.

   Autosend interval
   Message sending interval for the selected message type.
5. Select **Save**.
6. Close Insight and open a terminal software, such as PuTTY.
7. To restart, power down WM80 and then power up again and wait for 5 seconds.
8. Verify that the device starts sending ASCII messages in the defined interval. If not, close the terminal software, open Insight, and restart WM80.

More information

- Configuring wind measurement (page 49)
- Data messages (ASCII) (page 32)

8.5.3 Configuring Modbus settings

1. Create a connection to the device with Insight PC software.
2. Select the settings icon (⚙) and **Configure device**.

3. Select **Communication** and configure the following settings.

   Bit rate
   Select the bit rate.

   Parity, data, stop bits
   Select the parity, data, and stop bits.

   Interface mode
   Select **Modbus RTU**.

   Modbus address
   Type an address for the device. The default is **240**.

4. Select **Save**.
5. Connect WM80 to a Modbus client using the configured serial port settings.

   If the Modbus client is a PC software on the same computer as Insight, close Insight first.

6. To restart, power down WM80 and then power up again and wait for 5 seconds.
7. Verify device operation.
8. To troubleshoot, disconnect WM80 from the Modbus client and reconnect it to Insight and restart the device.

More information

- Modbus RTU protocol (page 38)
- Device parameters and Modbus addresses (page 72)

8.5.4 Configuring analog output

You can configure the analog output over Modbus RTU or by using Vaisala Insight PC software.

Configure the output for wind speed and wind direction separately.

1. Create a connection to the device with Insight PC software.
2. Select the settings icon (⚙) and **Configure device**.

3. Select **Analog output, wind speed** and configure the following settings.

   Output mode
   Fixed to **4–20 mA**.

   Output parameter
   Select sample, instant, or average as the measurement value.

   Output low end
   The wind speed value 4.0 mA output represents.

   Output high end
   The wind speed value 20.0 mA output represents.

   Error output level
   Current indicating device failure.

   Output level
   Read-only. The actual (calculated) electrical mA level of the output.

   Test output level
   Set the test output level.

4. Select **Save**.
5. Select **Analog output, wind direction** and configure the following settings.

   Output mode
   Fixed to **4–20 mA**.

   Output parameter
   Select sample, instant, or average as the measurement value.

   Error output level
   Current indicating device failure.

   Output level
   Read-only. The actual (calculated) electrical mA level of the output.

   Test output level
   Set the test output level.

   0° output level
   Zero degree output level for the wind direction.

6. Select **Save**.
7. To restart the device, select the settings icon (⚙) and **Restart device**.

   After a restart, wait for 5 s before connecting to the device because after restart the device uses the default settings before loading the configured settings.

8. Verify device operation.

More information

- Analog output (page 41)

8.6 Configuring wind measurement

The wind measurement settings affect all data outputs, including NMEA, data messages (ASCII), Modbus, and the analog output.

1. Create a connection to the device with Insight PC software.
2. Select the settings icon (⚙) and **Configure device**.
3. Select **Wind measurement** and configure the following settings.

   Wind averaging method
   Calculation method for the data output that affects the instant and average measurement values.

   Instant calculation period
   Calculation period for instant wind speed and wind direction calculation.

   Statistics calculation period
   Calculation period for statistics wind speed and wind direction calculation.

   Invalidation delay
   In case of invalid sample values, the duration of the repeating last valid sample value before reporting invalid wind.

   Wind direction offset
   Deviation of device alignment from reference direction (0° datum).

   Calm wind threshold
   Wind speed threshold during which the last calculated wind direction output is reported until the wind speed increases above the set threshold.
4. If you are using NMEA or ASCII data messages, you can change the unit for wind speed (m/s or knots) with Insight or with Modbus register address 0x0609. The default unit is m/s.

More information

- Scalar and vector averaging methods (page 16)
- Scalar and vector output (page 21)
- WM80 measurement data (page 18)
- Configuring NMEA 0813 settings (page 45)
- Configuring data message (ASCII) settings (page 46)
- Device parameters and Modbus addresses (page 72)

8.7 Configuring device heating

You can configure the device heating over Modbus RTU or by using Vaisala Insight PC software.

CAUTION! Be careful with the settings because the device may not operate optimally if the heating settings are changed from the default factory settings.

1. Create a connection to the device with Insight PC software.
2. Select the settings icon (⚙) and **Configure device**.
3. Select **Heating** and configure the following settings.

   Maximum current
   Maximum current the heating is allowed to use.

   Temperature setpoint
   Target temperature the heating control aims to maintain.

   Heating on/off
   Select **On** to apply heating (default).

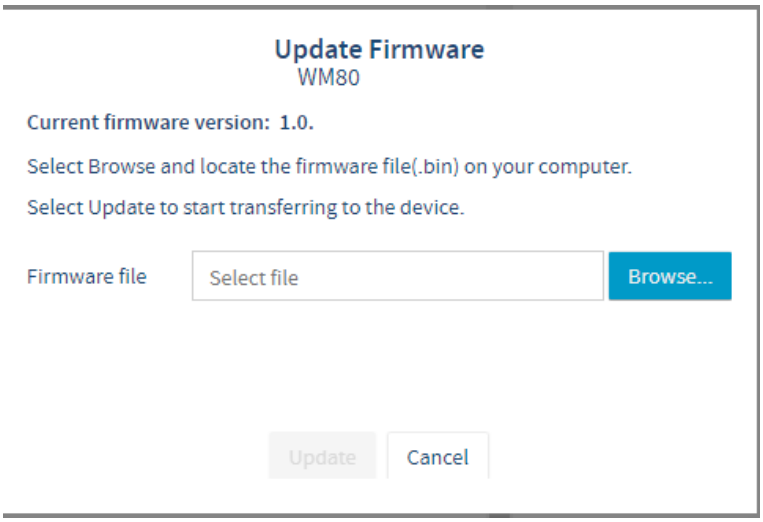
More information

‣ Heating (page 22)

9. Updating firmware

You can download the newest firmware version from docs.vaisala.com.

1. Create a connection to the device with Insight PC software.
2. Select the settings icon (⚙) and select **Update firmware**.
3. Browse to the firmware file and follow the onscreen instructions.



4. Verify operation.

10. Maintenance

The device has no moving or consumable parts, which means that only minimal maintenance is required.

WARNING! Do not perform installation or maintenance procedures when there is a risk of thunderstorm or lightning activity in the area.

CAUTION! Only qualified maintenance personnel may perform maintenance procedures.

Table 38 WM80 maintenance

Task	Frequency
Cleaning	As needed

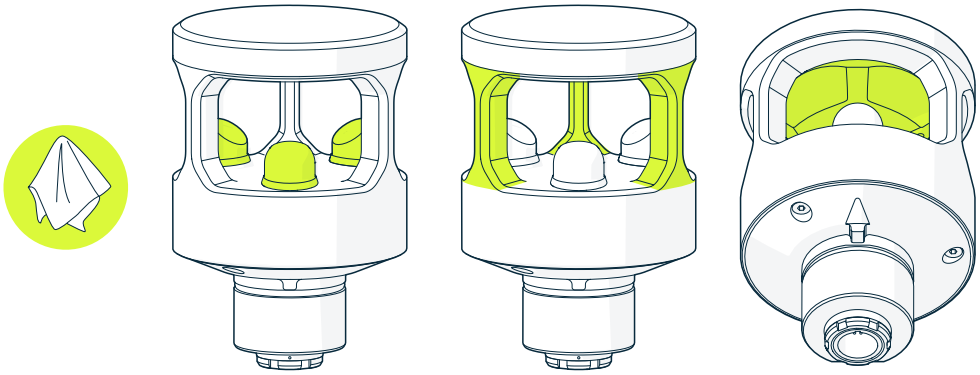
10.1 Cleaning device

- Mild detergent
- Soft, lint-free cloth

Clean the device if it becomes contaminated.

1. Clean the device carefully with a soft, lint-free cloth moistened with mild detergent.

   Do not use solvents or a pressure washer because they may damage the transducers. Check the transducers and the reflector for contamination and clean them.



2. Verify operation.

11. Troubleshooting

11.1 Troubleshooting procedure

If the product does not work as it should, go through this troubleshooting procedure.

1. Depending on the problem, do one of the following.
   - Data messages are coming through, but the measurement values are invalid. Check the device status. See Checking device status (page 57).
   - Data messages are not coming through: Continue with the next step. If the device is part of a larger system, check the troubleshooting information of that system first.
2. If you cannot connect to the device, check the operation of the communication devices at the host system.
3. Check the power supply.
4. Check the device cable and connector.
5. Check the communication and message settings.
6. Restart the device. See Restarting device (page 59).
7. Restore the default factory settings. See Restoring factory settings (page 59).
8. If the failure persists, contact Vaisala technical support.

11.2 Troubleshooting WM80

Table 39 Troubleshooting WM80

Problem	Probable cause	Actions
Serial data output is distorted.	D+ and D- wires are the wrong way around.	Correct the wiring. See Wiring for serial and analog data output (page 71) and the wiring instructions in WM80 Setup Guide (M212994EN).
	Wrong serial communication settings.	Check the settings. See Configuring communication settings (page 45).
	Several devices on the same bus.	Have only 1 device on the bus or use the Modbus protocol.
	A long device cable with no termination is in use.	Terminate the serial line.

Problem	Probable cause	Actions
No autosend data output.	Incorrect interface mode or data message type.	Select the correct interface mode (data messaging), and the correct message type in Insight. See Configuring data message (ASCII) settings (page 46), Configuring NMEA 0813 settings (page 45), or Device parameters and Modbus addresses (page 72) for details.
	The device is not getting power.	Check the powering.
	The wires are connected incorrectly or not connected.	Correct the wiring. See Wiring for serial and analog data output (page 71) and the wiring instructions in WM80 Setup Guide (M212994EN).
No Modbus response.	Incorrect communication settings.	Check the settings. See Configuring communication settings (page 45).
	Incorrect Modbus address in use.	Try using the default Modbus address 240 or select the correct Modbus address to use in Insight.
	Various.	Check the probable causes and actions for *Serial data output is garbled* in this table.
Measurement values are not as expected.	Device siting is not representative of wind conditions.	Check the site requirements. See WM80 Setup Guide (M212994EN).
	External disturbances on the device.	Inspect the device and remove possible blockage.
	Measurement volume is frozen because heating maximum current is too low.	Increase the heating current and make sure that the power supply supports the increased current.
	Measurement averaging periods not as expected.	Check the wind measurement settings.
	Reported wind direction has constant unwanted offset.	Check the wind direction offset settings of the device.
		Check that the device is aligned correctly. See WM80 Setup Guide (M212994EN).
Measurement values are marked as invalid.	External disturbances on the device.	Inspect the device and remove possible blockage.
	Device is starting up.	Wait for the startup to finish.
	Measurement volume is frozen because heating maximum current is too low.	Increase the maximum heating current setting of the device. Ensure the capability of the power supply for higher current.

Problem	Probable cause	Actions
Analog output is not working.	Wiring is wrong.	Correct the wiring. See Wiring for serial and analog data output (page 71) and the wiring instructions in WM80 Setup Guide (M212994EN).
Wind speed in analog output appears to be wrong.	Wind speed scaling is configured incorrectly.	Check and correct the following in Insight: **Output low end** and **Output high end**. See Configuring analog output (page 47).
Wind direction in analog output appears to be wrong.	Wind direction 0-degree output is configured incorrectly.	Check and correct the following in Insight: **0° output level**. See Configuring analog output (page 47).
Unable to connect to device due to forgotten serial communication settings.	Serial communication settings lost.	Connect to the device with Insight using the USB configuration set, see Configuring device after installation (page 44). The device remains connected to Insight when you establish the connection within 5 seconds of device power-up. Adjust the communication settings or, if needed, restore the factory settings (see Restoring factory settings (page 59)).
Unable to connect through Insight software.	Driver for the cable and adapter is missing.	Download and install the USB instrument driver for cables from www.vaisala.com/insight.
	PC unable to recognize device.	Connect cables and open Insight before connecting power or restart device. See Configuring device after installation (page 44) or Configuring device before installation (page 43).

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Problem	Probable cause	Actions
Heating is not working as expected.	Heating is turned off.	Turn heating on with Insight. See Configuring device heating (page 49).
	Heating temperature setpoint is configured too low.	Increase the heating temperature setpoint. See Configuring device heating (page 49).
	Heating is not sufficient due to insufficient power supply or cable loss.	Increase voltage by checking that the power supply is sufficient for the required heating current. See Heating (page 22), , and Cable loss and heating in cold climates (page 26). In case of limited current capability of the power supply, change the value for the maximum current from the default value with Insight. See Configuring device heating (page 49).
	Device with heated transducers is not sufficient for the environment.	Replace the device with the device that has heated transducers, device top, and device body. See Ordering options (page 11).
Startup is taking long.	In freezing conditions, startup can take longer than expected.	Wait for the startup to finish. For details, see Startup in freezing conditions (page 58).

11.3 Device status

WM80 monitors itself on a continuous basis. Diagnostics results are output in status field of NMEA and ASCII data messages, and as Modbus register values. The following status categories are in use:

- Device
  - Operating voltage
  - Heating status
  - Wind measurement

The device status is a high-level status that is triggered based on the lower-level statuses.

Table 40 Device status

Description	Severity	
Device is ok.	None	`0`
Non-recoverable failure. Device must be replaced.	Failure	`F`
Device or system may need maintenance.	Warning	`W`
Device is ok. Minor notification for user.	Information	`I`

The device status is **W** when any of the following lower-level statuses have a value other than **0**.

Table 41 Operating voltage status

Description	Severity		Device status
Operating voltage is OK.	None	0	0
Operating voltage is too low.	Under range	U	W
Operating voltage is too high.	Over range	O	W

Table 42 Heating status

Description	Severity		Device status
Heating is ok.	None	0	0
Target temperature value not reached or heating power is limited.	Information	I	I
Overheat protection is activated.	Warning	W	W
Non-recoverable failure. Device must be replaced.	Failure	F	F

Table 43 Wind measurement status

Description	Severity		Device status
Wind measurement is OK.	None	0	0
Measurement volume is blocked.	Unavailable	S	W
Startup in freezing conditions ongoing	Not ready	W	W
Non-recoverable failure. Device must be replaced.	Failure	F	F

11.4 Checking device status

You can check the device status in various ways.

1. Connect to the device.

2. Check the status with one of the following depending on your communication and message options.

   Table 44 Checking device status

Interface	Device status and diagnostics data
Insight software	Select **Settings > Advanced mode** and next select **Devices**, select the device, and **Diagnostics**.
NMEA	Check the status field: • `A` = Valid data • `V` = Invalid data See MWV data message (page 31).
Data messages (ASCII)	Status code in data message 23, 24, and 25 (`0000` = OK). • Character 1: overall device status • Character 2: quality of operating voltage • Character 3: heating status • Character 4: quality of wind measurement For example, `W00S` indicates that the measurement volume is blocked, triggering a device-level warning `W`. For details, see Device status (page 56).
	Diagnostics information in data message 24.
Modbus	See registers 0x0200, 0x0201, 0x0203, 0x0204, 0x0206, 0x0207, 0x0209, and 0x020a at Device parameters and Modbus addresses (page 72).
Analog	Range 0.1–3.6 mA indicates device failure. See Analog output (page 41).

3. Continue troubleshooting.

11.5 Startup in freezing conditions

For the device heating to reach a valid temperature, the startup of WM80 measurement in ambient temperatures below 0 °C (32 °F) takes longer than in temperatures above 0 °C (32 °F). In extreme conditions when the temperature is below −20 °C (−4 °F), the startup time can take a maximum of 3 minutes.

During this time, the measurement values are sent as invalid in the data messages and the related Modbus register values are NaN (not a number).

If the device needs to de-ice, the time to valid measurement can be tens of minutes depending on the temperature and the amount of accumulated ice.

11.6 Writing problem report

When troubleshooting the product, write a problem report including:

- What is the serial number and configuration code of the product?
- Were you using the serial or analog interface?
- Describe the application the device is used in. A picture of the installation site is helpful.
- What is the device status code (available in data messages 23, 24, and 25, as well as Modbus register 0x0201).
- 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)?

This information is helpful if you need to contact Vaisala technical support.

11.7 Restoring factory settings

You can restore the default factory settings through Vaisala Insight PC software or Modbus (register 0x1e00).

1. Create a connection to the device with Insight PC software.
2. Select the settings icon (⚙) and **Factory default settings > Restore settings**
3. Verify device operation.

11.8 Restarting device

You can restart the device by disconnecting power or through Vaisala Insight PC software or Modbus (register 0x0600).

After restart, the averaged values show the average since the reboot, not for the past defined averaging time period.

A restart is needed after configuring the communication settings whether through Insight or Modbus.

1. Create a connection to the device with Insight PC software.
2. Select the settings icon (⚙) and **Restart device**.

   After a restart, wait for 5 s before connecting to the device because after restart the device uses the default settings before loading the configured settings.
   In extreme conditions when the temperature is below −20 °C (−4 °F), the startup time can take up to 3 minutes.
3. Verify device operation.

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12. Spare parts

WARNING! Do not substitute parts or modify the product. Improper modification can damage the product or lead to malfunction.

WARNING! Use only accessories which meet the manufacturer's specifications.

WARNING! Only licensed experts may install electrical components. They must adhere to local and state legislation and regulations.

The device has no moving or consumable parts.

If you suspect a device failure, contact Vaisala technical support.

If you need a replacement mounting adapter or cable, order them as spare parts.

Table 45 Spare parts

Spare part	Order code
50-mm mounting adapter for pole with outer diameter 48–51 mm (1.89–2.01 in)	WM80ADAPTER50SP
60-mm mounting adapter for pole with outer diameter 58–61 mm (2.28–2.40 in)	WM80ADAPTER60SP
50-mm isolated mounting adapter for pole with outer diameter 48–51 mm (1.89–2.01 in)	WM80ADAPTER50MARSP
Cable 2 m, cable connector, cable cut on one end	WM80CABLE2MSP
Cable 11 m, cable connector, cable cut on one end	WM80CABLE11MSP
Cable 19 m, cable connector, cable cut on one end	WM80CABLE19MSP

More information

- Ordering options (page 11)
- Replacing device (page 61)
- Replacing mounting adapter (page 62)
- Replacing cable (page 64)

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12.1 Replacing device

- Allen key 4 mm

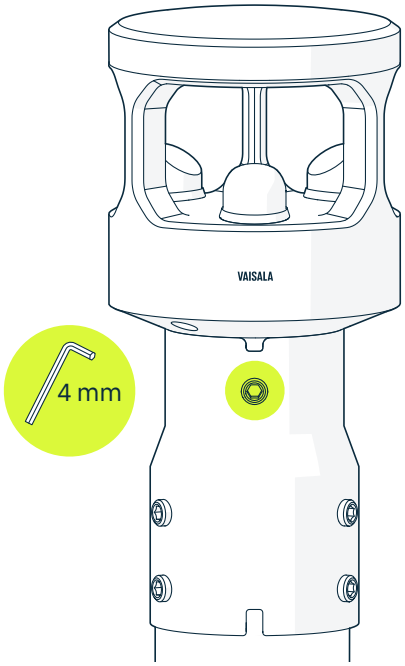
Wear personal protective equipment (PPE).

If the device breaks down, order a new device.

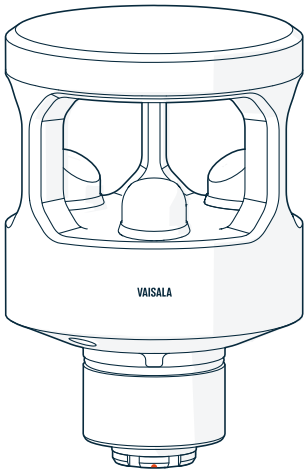
CAUTION! If you remove the device and do not mount a replacement device right away, protect the cable connector from the environment.

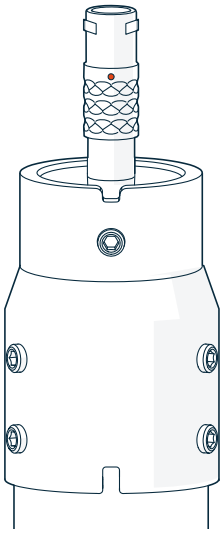
1. Switch off power supply to the device.

   Make sure that there is no power available for the system.
2. Loosen the screw that tightens the device to the mounting adapter.



3. Lift the device up and disconnect the device cable from the device.





4. Install the new device as instructed in WM80 Setup Guide (M212994EN).
5. Recycle the old device according to the recycling instructions.

More information

- Spare parts (page 60)
- Recycling instructions (page 82)

12.2 Replacing mounting adapter

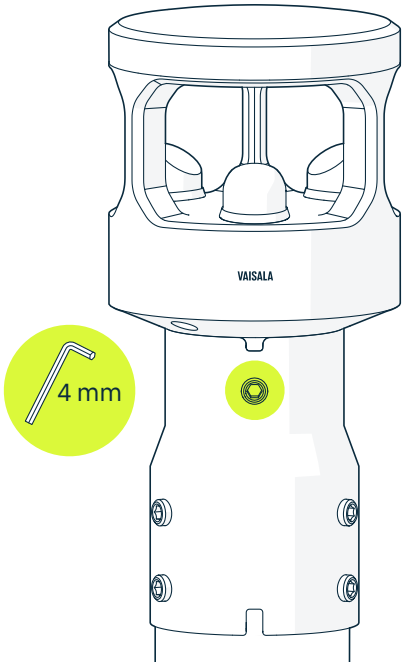
- Allen key 4 mm
- Allen key 6 mm (for isolated mounting adapter)

Wear personal protective equipment (PPE).

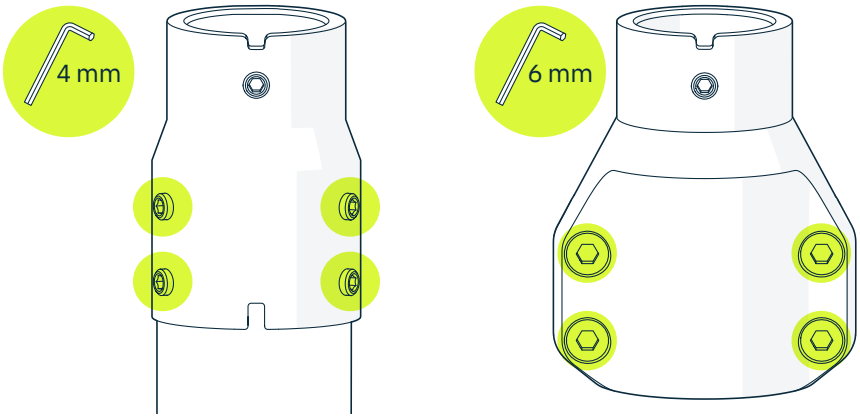
Make sure that you have the replacement spare part available.

1. Switch off power supply to the device.

   Make sure that there is no power available for the system.
2. Loosen the screw that tightens the device to the mounting adapter.



3. Loosen the screws that tighten the mounting adapter to the pole.



4. Align and install the new mounting adapter and the device as instructed in WM80 Setup Guide (M212994EN).

5. Recycle the old mounting adapter according to the recycling instructions.

More information

- Spare parts (page 60)
- Recycling instructions (page 82)

12.3 Replacing cable

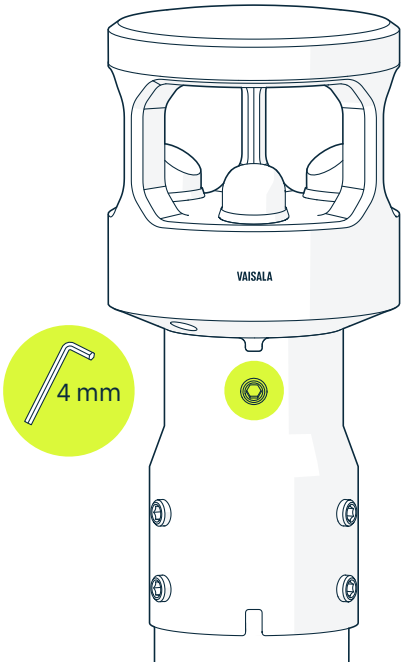
- Allen key 4 mm

Wear personal protective equipment (PPE).

Make sure that you have the replacement spare part available.

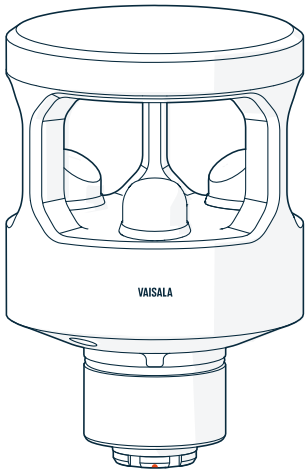
1. Switch off power supply to the device.

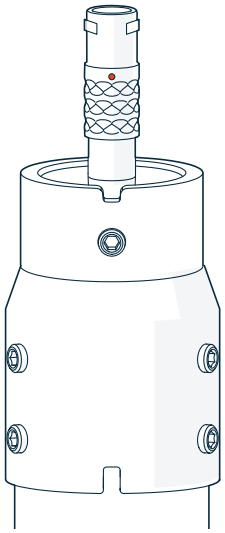
   Make sure that there is no power available for the system.
2. Loosen the screw that tightens the device to the mounting adapter.



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3. Lift the device up and disconnect the device cable from the device.





4. Disconnect the device cable from your system and remove the cable.
5. Route the replacement cable through the mounting adapter.
6. Install and wire the device as instructed in WM80 Setup Guide (M212994EN).
7. Recycle the old cable according to the recycling instructions.

More information

- Spare parts (page 60)
- Recycling instructions (page 82)

13. Technical data

13.1 WM80 specifications

Table 46 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 47 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.

Property	Description/Value
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
Heater control	Automatic

Table 48 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.

Table 49 Data communication

Property	Description/Value
Data communication interface	RS-485
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 50 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 51 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 52 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)

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

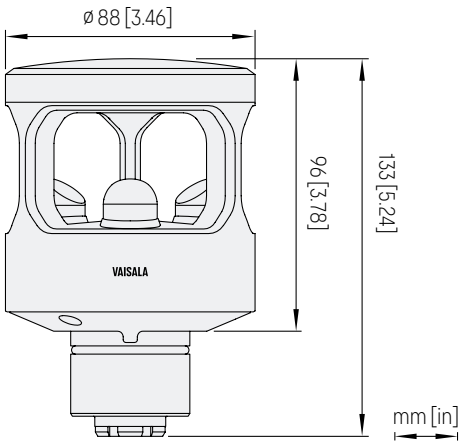


Figure 17 Dimensions

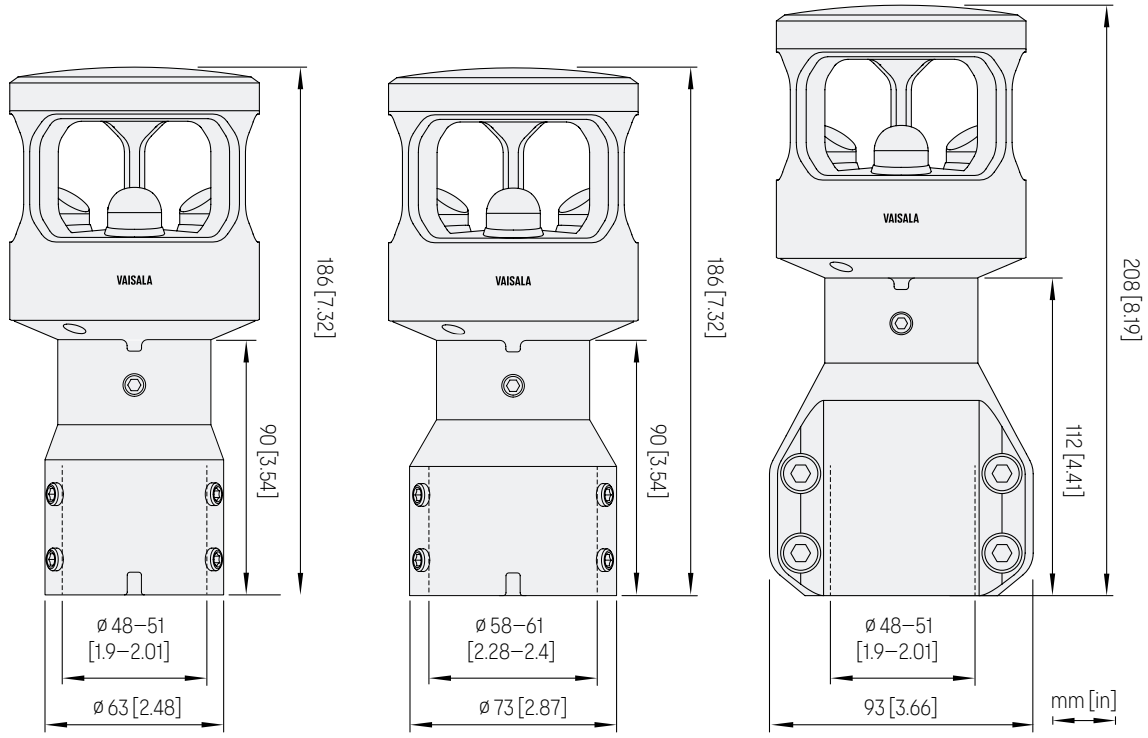


Figure 18 Dimensions with 50-mm and 60-mm mounting adapters

More information

- Powering requirements (page 25)

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Appendix A. Wiring for serial and analog data output

The following examples show how to wire the device cable for serial and analog data output.

Both serial and analog output can be connected at the same time.

See also the WM80 Setup Guide (M212994EN) for wiring instructions.

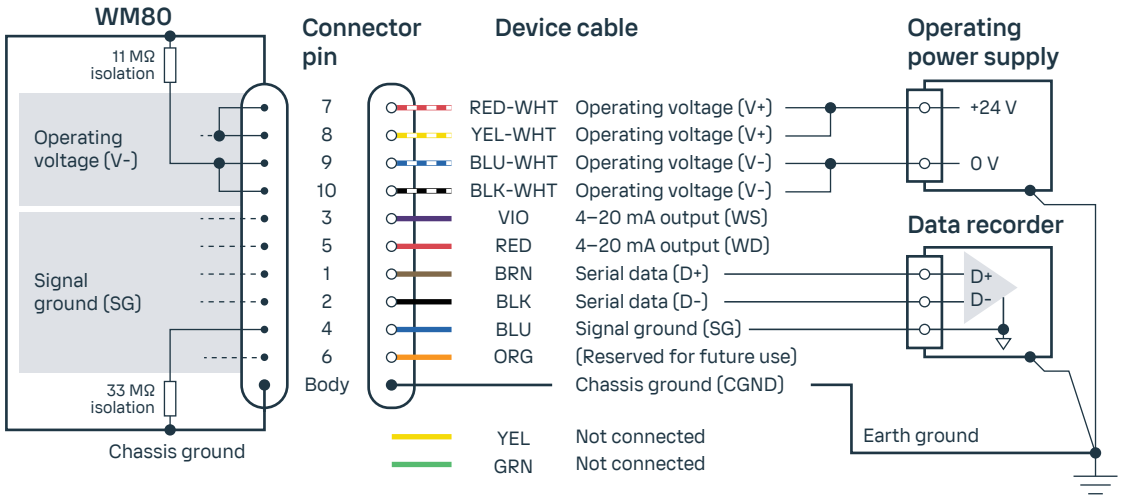


Figure 19 Serial data output

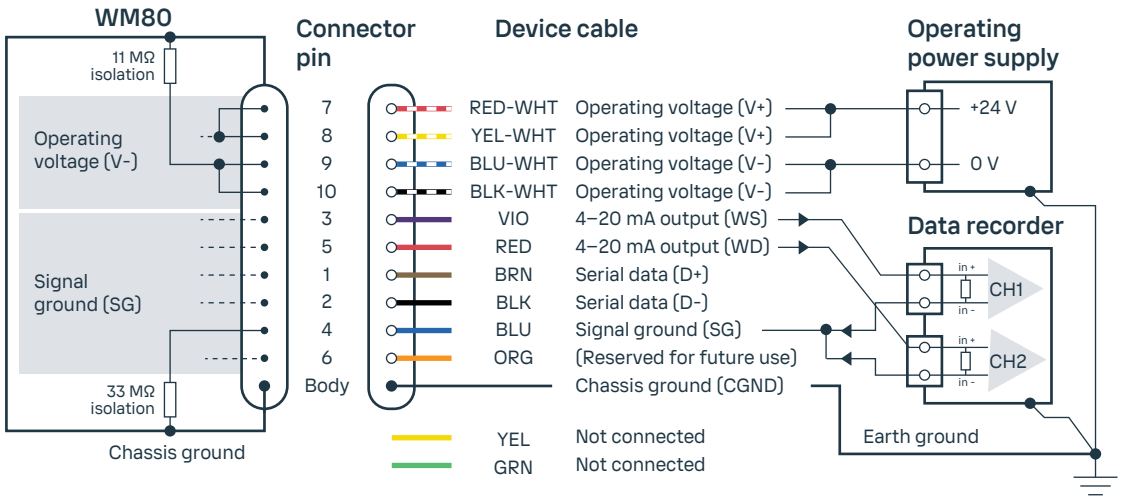


Figure 20 Analog data output

More information

- Powering requirements (page 25)

Appendix B. Device parameters and Modbus addresses

WM80 is configured with the following parameters and Modbus addresses.

The parameters and addresses are read only (R) or read/write (RW).

Register address and register number are defined as follows.

Table 53 Data addressing

Method	Description	Value range
Register address	16-bit register address in hexadecimal and decimal formats.	0x0000–0xFFFF (0-65535)
Register number	Register address in decimal format + 1	1–65536

Table 54 Measurement data (read only)

Register address	Register number	Name	Data type	Unit	Min.	Max.	Description
0x0000 (0)	1	Wind speed, sample	float	m/s	0	100	10 Hz sample.
0x0002 (2)	3	Wind direction, sample	float	deg	0	359.99	
0x0004 (4)	5	Wind speed, instant	float	m/s	0	100	Moving average 0.1–10 s (wind instant averaging period).
0x0006 (6)	7	Wind direction, instant	float	deg	0	359.99	
0x0008 (8)	9	Wind speed, average	float	m/s	0	100	Moving average 0.1–3600 s (wind statistics period).
0x000a (10)	11	Wind direction, average	float	deg	0	359.99	
0x000c (12)	13	Wind speed, lull	float	m/s	0	100	Minimum instant wind speed value over 0.1–3600 s (wind statistics period).
0x000e (14)	15	Wind speed, gust	float	m/s	0	100	Maximum instant wind speed value over 0.1–3600 s (wind statistics period).

Register address	Register number	Name	Data type	Unit	Min.	Max.	Description
0x0010 (16)	17	Wind direction, lull	float	deg	0	359.99	Direction of the wind speed, lull.
0x0012 (18)	19	Wind direction, gust	float	deg	0	359.99	Direction of the wind speed, gust.
0x0014 (20)	21	Sonic temperature	float	°C	−45	65	Sonic temperature.
0x0016 (22)	23	Wind speed, U sample	float	m/s	−100	100	10 Hz sample as wind vector component U.
0x0018 (24)	25	Wind speed, V sample	float	m/s	−100	100	10 Hz sample as wind vector component V.
0x001a (26)	27	Wind speed, U instant	float	m/s	−100	100	Moving average 0.1–10 s (wind instant averaging period) as wind vector component U.
0x001c (28)	29	Wind speed, V instant	float	m/s	−100	100	Moving average 0.1–10 s (wind instant averaging period) as wind vector component V.
0x001e (30)	31	Wind speed, U average	float	m/s	−100	100	Moving average 0.1–3600 s (wind statistics period) as wind vector component U.
0x0020 (32)	33	Wind speed, V average	float	m/s	−100	100	Moving average 0.1–3600 s (wind statistics period) as wind vector component V.

Table 55 Measurement and heating (read and write)

Register address	Register number	Name	Data type	Unit	Min.	Max.	Default	Description
0x0300 (768)	769	Wind averaging method	int16	–	0	0	0	• 0 = Scalar averaging • 1 = Vector averaging

Register address	Register number	Name	Data type	Unit	Min.	Max.	Default	Description
0x0303 (771)	772	Wind instant averaging period	float	s	0.1	10.0	3.0	Time period for calculation of instant values. Rounded to nearest 0.1 s.
0x0305 (773)	774	Wind statistics period	float	s	0.1	3600.0	600.0	Time period for calculation of average, gust, and lull values. Rounded to nearest 0.1 s.
0x0307 (775)	776	Invalidation delay	float	s	0.0	20.0	4.0	In case of invalid sample values, the duration of the repeating last valid sample value before reporting invalid wind.
0x0309 (777)	778	Wind direction offset	float	deg	-180	180	0	Deviation of device alignment from reference direction (0° datum).
0x030b (779)	780	Calm wind threshold	float	m/s	0.2	100.0	0.2	Wind speed threshold during which the last calculated wind direction output is reported until the wind speed increases above the set threshold.
0x030f (783)	784	Heating maximum current	float	A	0.0	10.0	10.0	Maximum current the heating is allowed to use.

Register address	Register number	Name	Data type	Unit	Min.	Max.	Default	Description
0x0311 (785)	786	Heating temperature setpoint	float	°C	0.0	55.0	45.0	Target temperature the heating control aims to maintain. Before adjusting, see Heating (page 22) and Configuring device heating (page 49).
0x0500 (1280)	1281	Heating enabled	int16	–	0	1	1	• 0 = Disabled • 1 = Enabled

Table 56 Serial port communication settings (read and write)

Register address	Register number	Name	Data type	Unit	Min.	Max.	Default [1)]	Description
0x0600 (1536)	1537	Restart device	int16	–	0	1	–	Write **1** to restart
0x0602 (1538)	1539	Bit rate	int16	bit/s	0	7	4	• 0 = 1200 • 1 = 2400 • 2 = 4800 • 3 = 9600 • 4 = 19 200 • 5 = 38 400 • 6 = 57 600 • 7 = 115 200
0x0603 (1539)	1540	Parity, data, stop bits	int16	–	0	11	1	• 0 = N81 • 1 = N82 • 2 = E81 • 3 = E82 • 4 = O81 • 5 = O82 • 6 = N71 • 7 = N72 • 8 = E71 • 9 = E72 • 10 = O71 • 11 = O72
0x0605 (1541)	1542	Interface mode	int16	–	0	1	0 [2)]	• 0 = Modbus • 1 = ASCII/ NMEA
0x0606 (1542)	1543	Modbus address	int16	–	1	247	240	–

Register address	Register number	Name	Data type	Unit	Min.	Max.	Default [1]	Description
0x0607 (1543)	1544	NMEA Talker ID	text[2]	–	–	–	WI	WI (default)
0x0609 (1545)	1546	ASCII/NMEA wind speed unit	int16	–	0	1	0	• 0 = m/s • 1 = knots
0x060c (1548)	1549	Data message type	int16	–	0	21	0 [2]	• 0 = None • 1 = NMEA MWV • 2 = Data message 21 • 3 = Data message 22 • 4 = Data message 23 • 5 = Data message 24 • 6 = Data message 25 • 7–15 = Reserved • 16 = WM80 diagnostic message • 17-20 = Reserved • 21 = Custom data message
0x060d (1549)	1550	Data messaging autosend interval	float	s	0.25	600.0	0.25	Message sending interval for the selected data message type

1) Unless specified otherwise in the ordered device configuration.
2) Depends on the ordered device configuration.

Table 57 Analog output 1 settings, wind speed

Register address	Register number	Name	R/ RW	Data type	Unit	Min.	Max.	Default	Description
0x0701 (1793)	1794	AOUT1 output parameter	RW	register	–	0x0000	0xFFFF	0x0004	Wind speed value to output • 0x0000 = Wind speed, sample • 0x0004 = Wind speed, instant • 0x0008 = Wind speed, average
0x0702 (1794)	1795	AOUT1 scale low end	RW	float	m/s	0.0	100.0	0.0	Wind speed value 4.0 mA output represents.
0x0704 (1796)	1797	AOUT1 scale high end	RW	float	m/s	0.0	90.0	90.0	Wind speed value 20.0 mA output represents.
0x0706 (1798)	1799	AOUT1 error output	RW	float	mA	0.100	3.600	2.000	Current indicating invalid measurement .
0x0710 (1808)	1809	AOUT1 output level	R	float	mA	0.000	24.000	–	The actual calculated electrical mA level of the output.
0x0712 (1810)	1811	AOUT1 test output level	RW	float	mA	0.000	24.000	–	Activates analog output test (forced output) when valid finite value is written here. Write **NaN** to end the test mode and return to normal operation.

Table 58 Analog output 2 settings, wind direction

Register address	Register number	Name	R/ RW	Data type	Unit	Min.	Max.	Default	Description
0x0741 (1857)	1858	AOUT2 output parameter	RW	register	–	0x0000	0xFFFF	0x0006	Wind direction value to output • 0x0002 = Wind direction, sample • 0x0006 = Wind direction, instant • 0x000a = Wind direction, average
0x0746 (1862)	1863	AOUT2 error output	RW	float	mA	0.100	3.600	2.000	Current indicating invalid measurement
0x0750 (1872)	1873	AOUT2 output level	R	float	mA	0.000	24.000	–	The actual calculated electrical mA level of the output.
0x0752 (1874)	1875	AOUT2 test output level	RW	float	mA	0.000	24.000	–	Activates analog output test (forced output) when valid finite value is written here. Write **NaN** to end the test mode and return to normal operation.
0x0754 (1876)	1877	AOUT2 zero degree output level	RW	int16	–	0	1	0	Zero degree output level for the wind direction • 0 = 0° at 12 mA • 1 = 0° at 4 mA

Table 59 Factory reset (read and write)

Register address	Register number	Name	Data type	Unit	Min.	Max.	Default	Description
0x1e00 (7680)	7681	Restore factory default settings	int16	–	0	1	0	Restore default factory settings and discard any changes made by user. Write **1** to restore.

Table 60 Status and diagnostic information (read only)

Register address	Register number	Name	Data type	Description
0x0200 (512)	513	Device status	int16	• Value = 0: Device OK. • Bit 2 = 1: Warning (W)
0x0201 (513)	514	Device diagnostic code	int32	Reserved for diagnostic purposes.
0x0203 (515)	516	Operating voltage status	int16	• Value = 0: Operating voltage OK • Bit 2 = 1: Operating voltage too low (U) • Bit 3 = 1: Operating voltage too high (O)
0x0204 (516)	517	Operating voltage diagnostic code	int32	Reserved for diagnostic purposes.
0x0206 (518)	519	Heating status	int16	• Value = 0: Heating OK • Bit 0 = 1: Failure (F) • Bit 2 = 1: Warning (W) • Bit 3 = 1: Information (I) .
0x0207 (519)	520	Heating diagnostic code	int32	Reserved for diagnostic purposes.
0x0209 (521)	522	Wind measurement status	int16	• Value 0: Wind measurement OK • Bit 0 = 1: Measurement volume is blocked (S).
0x020a (522)	523	Wind measurement diagnostic code	int32	Reserved for diagnostic purposes.

Table 61 Device monitoring (read only)

Register address	Register number	Name	Data type	Unit	Description
0x8000 (32768)	32769	Uptime	int32	s	Time since last restart.
0x8002 (32770)	32771	Operating voltage	float	V	Voltage measured at device.

Register address	Register number	Name	Data type	Unit	Description
0x800a (32778)	32779	Heating current	float	A	Device current used for heating.
0x800c (32780)	32781	Transducer 1 temperature	float	°C	–
0x800e (32782)	32783	Transducer 2 temperature	float	°C	–
0x8010 (32784)	32785	Transducer 3 temperature	float	°C	–

Table 62 Device identification (read only)

Register address	Register number	Name	Data type	Description
0x1d00 (7424)	7425	Vendor name	text[16]	`Vaisala`
0x1d08 (7432)	7433	Product code	text[16]	`WM80`
0x1d10 (7440)	7441	Product serial number	text[16]	Same as configuration code printed on device type label.
0x1d28 (7464)	7465	Product order code	text[32]	Same as printed on device type label
0x1d38 (7480)	7481	Product manufacturing date	date	Format YYYY-MM-DD
0x1d3b (7883)	7484	Product name	text[32]	`Ultrasonic Wind Sensor WM80`

Table 63 Communication test values

Register address	Register number	Name	Data type	User	Description
0x1f00 (7936)	7937	Signed integer	int16	R	Byte order test. Reading this register returns constant value -12345.
0x1f01 (7937)	7938	Floating point	float	R	Word order test. Reading this register returns constant value -123.45.

Register address	Register number	Name	Data type	User	Description
0x1f03 (7939)	7940	Text string	text[8]	R	Text string test. Reading this register returns constant value '-123.45'

More information

- Modbus RTU protocol (page 38)
- Configuring Modbus settings (page 46)

Appendix C. Recycling instructions

These recycling instructions guide you on the end-of-life treatment of this Vaisala product. As waste regulations and infrastructure vary in each country, these instructions only indicate the different components to be separated and common ways to handle them. Always follow local requirements when disposing of the product. Vaisala encourages to use the best available recycling practices to minimize related environmental impacts.

Vaisala is committed to meeting the requirements of the EU Waste Electrical and Electronic Equipment (WEEE) Directive. This directive aims to minimize the impact of electrical and electronic goods on the environment, by increasing reuse and recycling, and reducing the amount of WEEE going to landfill. This symbol indicates that the product should be collected separately from other waste streams and treated appropriately.

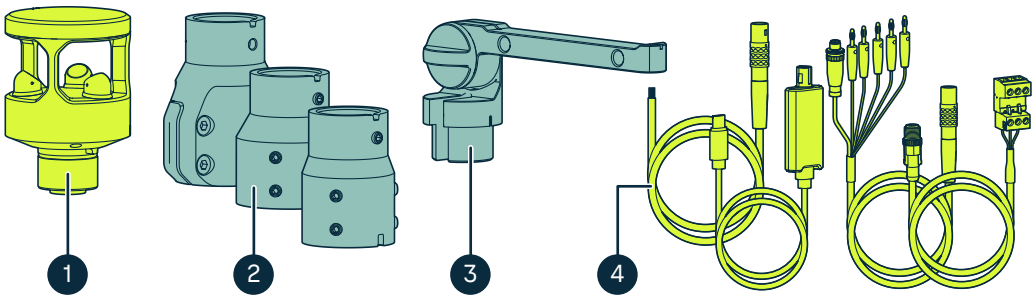


Table 64 Materials for recycling

Recycling	Part	Material
Electrical and electronic waste	1, 4	Various
Metal waste	2, 3	Aluminum

Appendix D. Regulatory statements

D.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 B digital device notice

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that the interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

CAN ICES-3 (B) / NMB-3 (B)

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

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

Appendix E. Open source software (OSS) licenses

This section contains the licenses and notices for the open source software used in this product. If you have any questions about the open source software, please contact us at opensourcesw@vaisala.com.

You may request a copy of certain open-source code as required by certain applicable OSS licenses by sending an email to opensourcesw@vaisala.com with the following subject line: *OSS source code request*.

Table 65 WM80 OSS licenses

Library	Version	License
nanopb	0.4.9.1	zlib
CMSIS	6.1.0	Apache-2.0
Mbed-TLS	3.6.2	
littlefs	2.11.1	BSD-3-Clause
Renesas FSP	5.7.0	

OSS license texts

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nanopb 0.4.9.1
https://jpa.kapsi.fi/nanopb/download/nanopb-0.4.9.1.tar.gz

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CMSIS drivers 6.1.0
https://github.com/ARM-software/CMSIS_5/blob/develop/LICENSE.txt

mbedtls 3.6.2
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++

littlefs 2.11.1
https://github.com/littlefs-project/littlefs

Renesas FSP 5.7.0
https://github.com/renesas/fsp/releases/tag//v5.7.0
RA MCU BSP
RA Board BSP
Ra MCU HAL Drivers
Renesas Middleware (Generic)

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Warranty

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

Note that 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.

Technical support



You can contact Vaisala technical support at helpdesk@vaisala.com. Provide the following supporting information 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

When contacting technical support for troubleshooting, also provide the following information as applicable:

- 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.

If available, provide the diagnostics package for the application.

Recycling



Recycle all applicable material according to local regulations.

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