

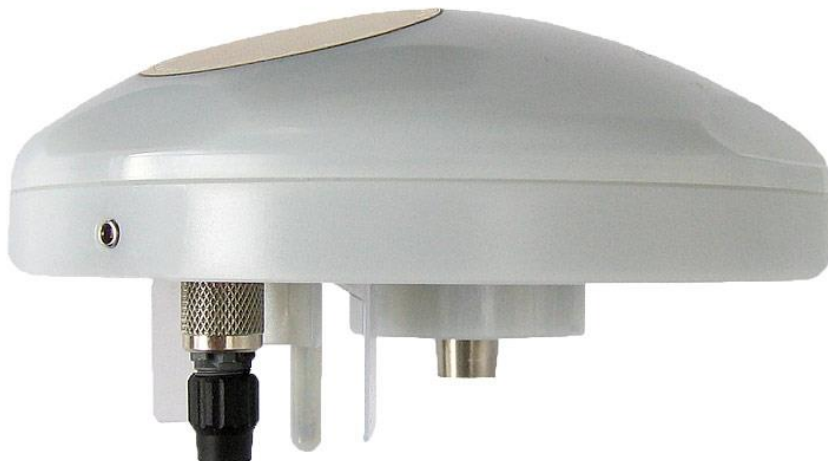


FuehlerSysteme eNET International
Die Marke für Sensorik

Instructions for Use

Weather Station Compact

FS6003



Safety Instructions

- Before operating with or at the device/product, read through the operating instructions. This manual contains instructions which should be followed on mounting, start-up, and operation. A non-observance might cause:
 - failure of important functions
 - endangering of persons by electrical or mechanical effect
 - damages to objects
- Mounting, electrical connection and wiring of the device/product must be carried out only by a qualified technician who is familiar with and observes the engineering regulations, provisions and standards applicable in each case.
- Repairs and maintenance may only be carried out by trained staff or the manufacturer. Only components and spare parts supplied and/or recommended by the manufacturer should be used for repairs.
- Electrical devices/products must be mounted and wired in zero potential state only.
- The manufacturer guarantees proper functioning of the device/products provided that no modifications have been made to the mechanics, electronics or software, and that the following points are observed:
- All information, warnings and instructions for use included in these operating instructions must be taken into account and observed as this is essential to ensure trouble-free operation and a safe condition of the measuring system / device / product.
- The device / product is designed for a specific application as described in these operating instructions.
- The device / product should be operated with the accessories and consumables supplied and/or recommended by the manufacturer.
- Recommendation: As it is possible that each measuring system / device / product under certain conditions, and in rare cases, may also output erroneous measuring values, it is recommended to use redundant systems with plausibility checks with **security-relevant applications**.

Environment

- Products governed by the provisions of "*ElektroG*" (German Electrical and Electronic Equipment Act) will be taken back and will be recycled or environmentally compatible disposed. We are prepared to take back all products concerned free of charge if returned to us by our customers carriage-paid.
- Make sure you retain packaging for storage or transport of products. Should packaging however no longer be required, arrange for recycling as the packaging materials are designed to be recycled.



Documentation

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- Subject to modification in terms of content.
- The device / product should not be passed on without the/these operating instructions.

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Instructions for use

These instructions for use describe all application and adjustment options for the device.

These detailed instructions allow users to modify the factory settings to their needs via the serial interface of the Weather Station Compact WS3/O.

Scope of supply

- 1 Weather Station Compact WS3/O.
- 1 Copy of the instructions for uses.

1 Device version

Designation	Order No.	Output terminal	Data format	Operating voltage
WETTERSTATION COMPACT WS3/O	WS3/O-MB	1 x RS485	Data in binary format (command interpreter: MODBUS RTU)	18...30V DC 18...28V AC

2 Application

The WEATHER STATION COMPACT WS3/O is designed for use in building services automation systems (e.g. shade protection control). The WS3/O features the following measured variables:

- Wind speed.
- Wind direction.
- 4 x brightness (north / east / south / west).
- Twilight.
- Global irradiance.
- Precipitation.
- Air temperature.
- Absolute air pressure.
- Relative air pressure.
- Time / date.
- Geostationary data (local altitude, longitude and latitude).
- Position of the sun (elevation / azimuth).
- Relative air humidity.
- Absolute humidity.
- Dew-point temperature.
- Inside temperature of housing.

The interface to the device is digital and consists of an RS485 interface in half-duplex mode. Together with ID-based communications the interface allows the Weather Station to be operated in a bus.

3 Structure / Mode of operation

Wind speed / wind direction:

Wind measurement is based on the hot wire principle. The underside of the housing is equipped with a heated cylindrical sensor. A PID controller adjusts the temperature of the cylinder to a temperature that is constantly increased in relation to the environment. The supplied heat energy is a measure of wind speed.

The metal cylinder contains four temperature-measuring resistors. These resistors are thermally coupled with the cylinder and positioned according to the 4 points of the compass. When an incident flow affects the cylinder as a function of the wind direction, this is accompanied by a temperature gradient which is registered by the measuring resistors. The relationships between the 4 temperature values are used to calculate the wind direction.

In case the wind direction cannot be determined because the wind velocity is 0m/s, the value is set to 0. Wind from the north is displayed with 360°.

Brightness:

The brightness measurement is carried out via 4 Silicon photo sensors, which are aligned to the 4 cardinal directions in the mean elevation angle (40°).

Twilight:

Twilight means the light diffusion in the atmosphere, which arises with the smooth transition between day and night before the beginning or after the end of day.

i.e., the solar disc is not visible.

The twilight is direction-independent.

It is calculated from the sum of the 4 measuring values of the direction-independent brightness sensors.

A change to the mean value from the 4 brightness values is possible by command.

Global irradiance:

A silicon PIN photodiode is used to measure global irradiance. The sensor is positioned horizontally and registers the diurnal values of the solar irradiation intensity.

Precipitation:

The detection of precipitation is based on capacitance measurement, i.e. the capacity of the sensor surface varies when wet. The sensor is installed in the housing cover. An integrated heating system adjusts the sensor area to an overtemperature in relation to the ambient temperature. This overtemperature (approx. 2K) prevents bedewing of the sensor surface. The thermal output is increased with precipitation. This accelerates drying of the sensor, allowing the time at which precipitation ended to be identified more accurately.

Air temperature:

A PT1000 measuring resistor is used to measure the air temperature. The sensor is mounted on a flexible printed board and positioned in the lower section of the housing.

Air pressure:

Absolute air pressure is measured with a piezoresistive MEMS sensor.

To make a meaningful comparison between air pressure values simultaneously measured at different locations, they need to be converted to a common datum (height above sea level). The calculation is referred to the height above sea level (QNH) according to the international altitude formula (DIN ISO2533).

$$p(h) = p_b \left(1 + \frac{\beta}{T_b} \cdot h\right)^{-\frac{g_n}{\beta \cdot R}}$$

P_h = air pressure at local altitude

P_b = air pressure at height above sea level

β = -0065K/m

g_n = 9.80665m/s²

R = 287.05287m²/K/s²

T_b = 288.15K

The station height, required for the calculation, can be entered manually by the **Command SH**, or can be determined automatically by GPS.

If you want to achieve an accuracy of 0.1hPa, referred to sea level, the local altitude (altitude of the baro transmitter) must be given up to an accuracy of 0.8m.

Time / date and geostationary data:

The Weather Station has a GPS receiver with a built-in RTC. This allows it to receive the position of the Weather Station (degree of longitude/latitude, local altitude) time (UTC) and date. The GPS receiver does not need alignment.

The built-in RTC (Real Time Clock) is buffered with a backup capacitor and retains its data without a voltage supply for a period of minimum 3 days.

Position of the sun (elevation / azimuth):

On the basis of the GPS data the current sun position is calculated every second.

Humidity measurement:

A built-in hygro-thermosensor is used to measure humidity levels. The sensor has a small air exchange volume thanks to its compact design and responds to changes in humidity in seconds.

A software module uses the relative humidity and air temperature to calculate absolute humidity and the dew-point temperature.

Inside temperature of housing:

A silicon temperature sensor measures the temperature inside the housing.

GPS-Receiver:

The weather station has a GPS receiver with integrated RTC (Real Time Clock) for receiving the position of the weather station, and time + date (UTC).

An alignment of the GPS receiver is not necessary.

The integrated RTC is buffered for a period of 3 days.

General information:

After activation of the WS3/O the first satellite data are available after approx. 2.5min.

When receiving the signals from one satellite: time with an accuracy of $< 1\mu\text{s}$.

When receiving the signals from three satellites: position with an accuracy of $< 20\text{m}$

When receiving the signals from four satellites: altitude, referred to the WGS84-ellipsoid, with an accuracy $< 30\text{m}$

4 Installation of COMPACT WS3/O Weather Station

Please note:

The working position of the COMPACT WS3/O Weather Station is horizontal (plug connection underneath).

During installation, de-installation, transport or maintenance of the COMPACT WS3/O Weather Station make sure that no water gets into the device and connector.

4.1 Selection of installation site

An exposed position should be selected for this site. Measurement properties should not be influenced by light reflections, cast shadows or the device being positioned in the lee of the wind. Protection against lightning and overvoltages should also be provided by the customer.

4.2 Mechanical installation

The intended installation of the Weather Station WS3/O requires the use of a pipe socket / pipe with an **outside diameter of $\leq 25\text{mm}$** . The **inside diameter must be $\geq 19\text{mm}$** to admit the connector and cable.

Tool:

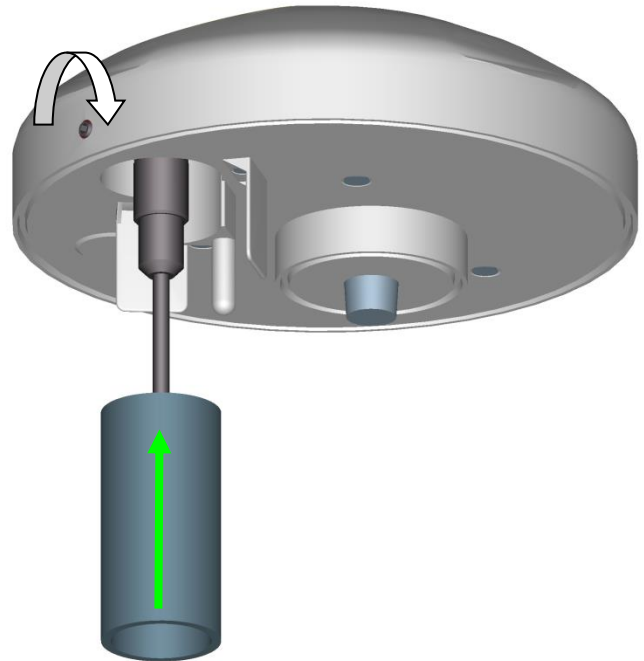
Hexagon socket wrench SW2mm
(socket wrench).

Procedure:

1. Push cable/plug connection through the bore hole of the mast, tube, bracket etc.
2. Put WS3/O on mast, tube.
3. Align WS3/O to "north".
(**Procedure see chapter 4.2.1**).
4. Secure WS3/O by the M4-hexagon socket screw.

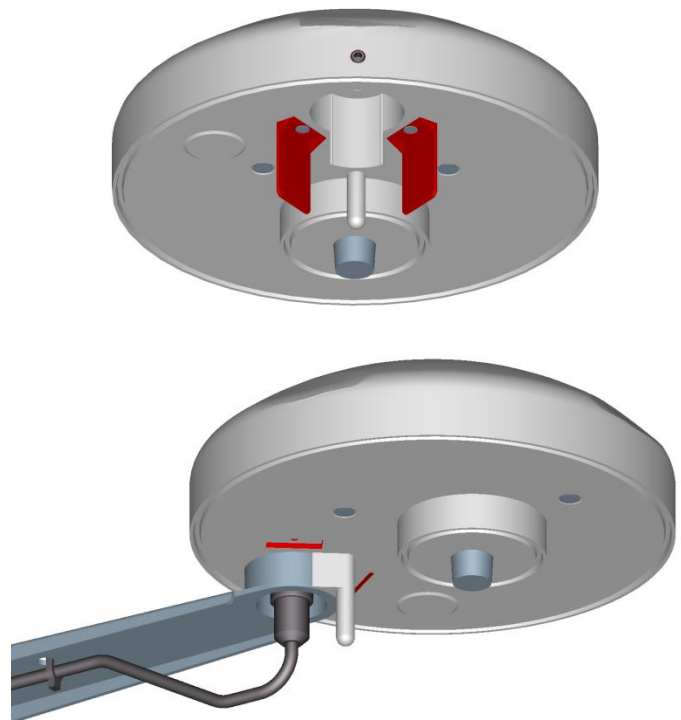
Attention:

The hexagon socket screw is to be tightened by max. 0.6Nm.



When using the **mounting angel** (see chapter accessories) the **guide angles must be removed**, see fig.

The mounting angle is not included in delivery.



Remark: Tube and mounting angle are not included in delivery.

4.2.1 Alignment to north

For the exact determination of wind- and brightness direction the WEATHER STATION COMPACT WS3/O must be mounted in **north alignment** (geographic north).

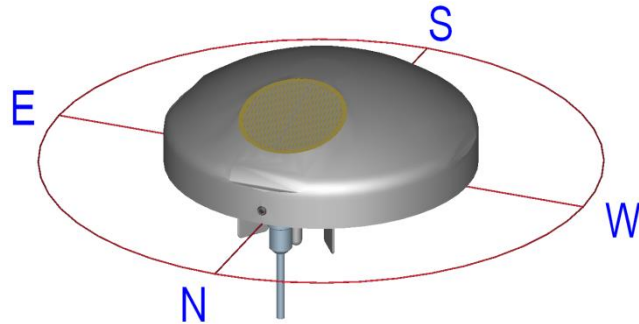
The hexagon socket screw **serves as north marking (N)**

Tool:

Hexagon socket wrench SW 2mm (socket wrench).

Procedure:

1. Detect a prominent object in the surrounding area (tree, building etc.) in north direction by means of a compass.
2. Via the north marking (N) and an imaginary north-south axis the weather station is to be located on the prominent object.
3. Align weather station.
The north marking must indicate to the geographic north.
4. In case of match the weather station is to be secured by an M4-hexagon socket screw.



Attention:

The hexagon socket screw is to be tightened by max. 0.6Nm.

Remark:

With the north alignment by means of a compass, the local variation (deviation in direction of a compass needle from the true north direction) by interfering magnetic fields, and magnetic field influences by hardware and electric cable are to be considered.

4.3 Electrical installation

The COMPACT WS3/O Weather Station is equipped with a 7-pin plug for electrical connection. A cable socket (mating connector) is included in the scope of supply.

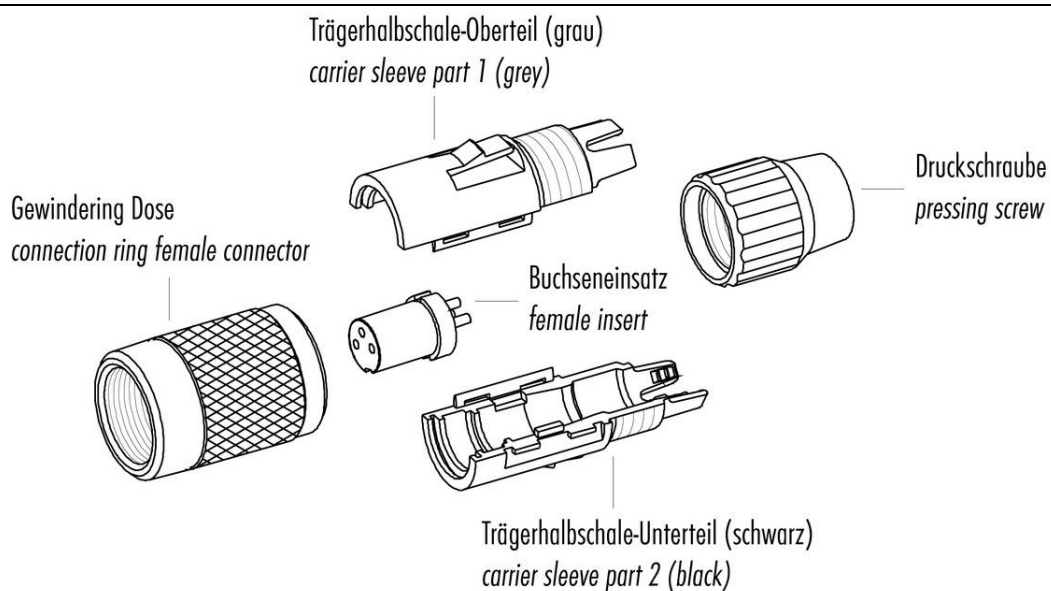
4.3.1 Cable, cable preparation, connector installation

The cable to be used for connection should have the following properties:
5 cores, core cross-section max. 0.14mm², cable diameter max. 5.0mm, resistant to ultraviolet rays, overall shielding.

Note:

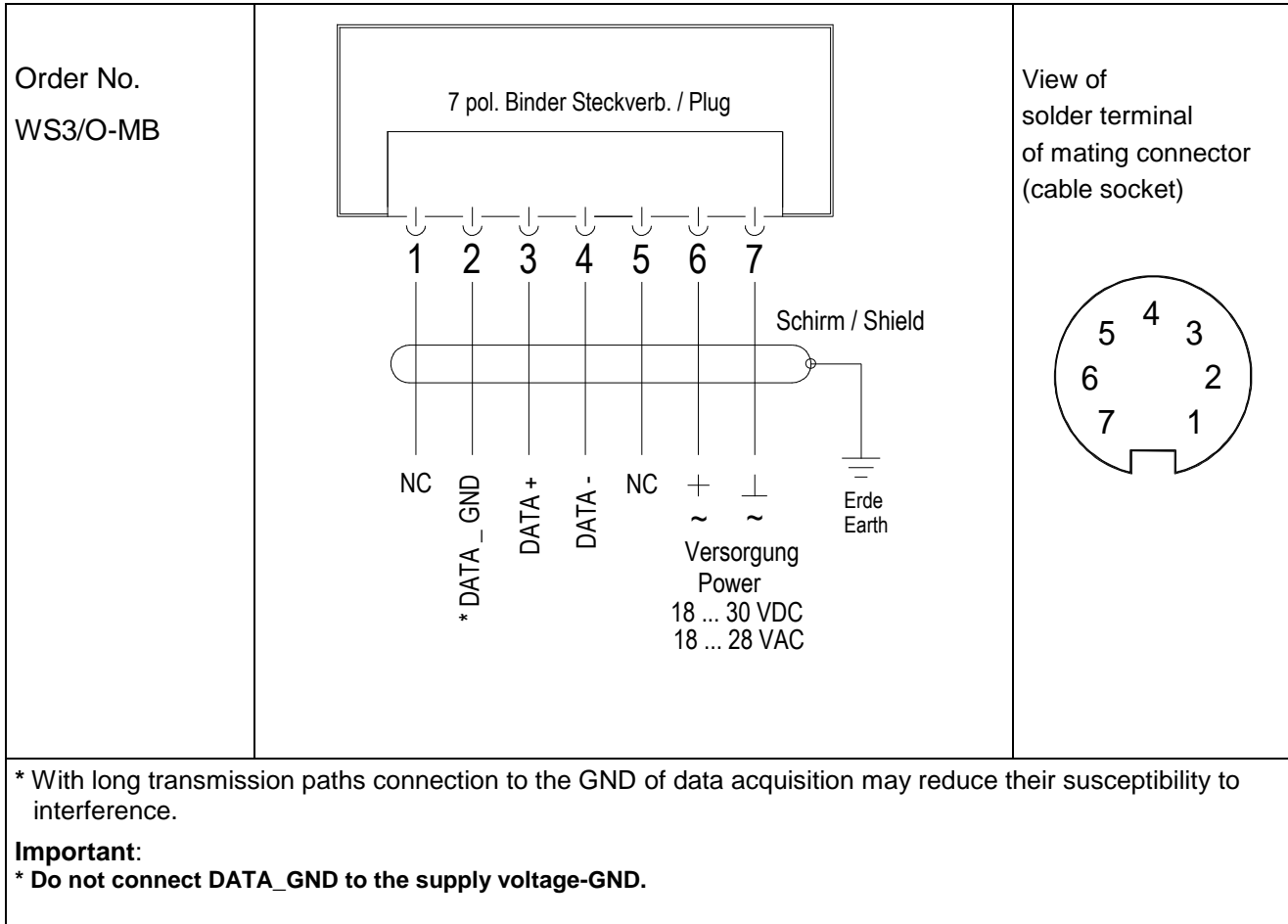
A prepared connecting cable is available for the COMPACT WS3/O Weather Station as an optional accessory.

Cable socket, type: Binder, series 711



Achtung: max. Drehmoment des Gewinderings im Flanschsteckverbinder: 50cNm (handfest)
Attention: max. torque of ring nut in socket connector: 50cNm (manual adjustment)

4.3.2 Diagram of connections



4.3.3 Connection using cable

PIN	Core colour	Function
1	WHITE	NC
2	BROWN	* DATA _ GND
3	GREEN	DATA +
4	YELLOW	DATA -
5	GREY	NC
6	PINK	+ power 18...30V DC / 18...28V AC
7	BLUE	- power 18...30V DC / 18...28V AC

* With long transmission paths connection to the GND of data acquisition may reduce their susceptibility to interference.

Important:
* Do not connect DATA_GND to the supply voltage-GND.

5 Maintenance

As the device does not have any moving parts, i.e. is not subject to wear during operation, only minimal servicing is required.

Depending on the location the instrument might pollute. The cleaning should be carried out by means of water and a soft cloth. Aggressive cleaning agents must not be used.

Please note:

During storage, installation, de-installation, transport or maintenance of the COMPACT WS3/O Weather Station make sure that no water gets into the device or connector.

6 Interface

The interface to the Weather Station consists of a RS485 link (half-duplex mode), with the following data format:

- 9600baud (the baud rate can be selected with the **Command BR**).
- 8data bits.
- No parity.
- 1stop bit.
- Data in binary format (command interpreter: MODBUS RTU).

The behavior (configuration) of the Weather Station can be changed using the available commands (see **Commands and description**).

When the Weather Station starts up, the character string "Weather Station", software version, hardware version and serial number is output:

```
Weather Station
v03.04
508990 v11-11
12030123
```

6.1 Command interpreter MODBUS RTU

Once the command interpreter is selected the transmitted bytes are interpreted according to the MODBUS specification (<http://www.modbus.org/>). Here, the weather station WS3/O is representing a MODBUS Slave.

The data transmission is carried out in packages, so-called frames, of maximum 256 bytes. Each package contains a 16bit CRC checksum (initial value: 0xffff).

Slave-Address	Function code	Data	CRC	
1byte	1byte	0...252byte(s)	2bytes	
			CRC low-byte	CRC high-byte

Table 1 : MODBUS Frame

The following MODBUS functions are supported:

- 0x04 (Read Input Register).
- 0x03 (Read Holding Registers).
- 0x06 (Write Single Register).
- 0x10 (Write Multiple Registers).

The weather station WS3/O supports a write access for the slave-address 0 ("Broadcast").

All received MODBUS request are checked for validity before carrying out. In error case the weather station responds with one of the following exceptions (→MODBUS Exception Responses).

Code	Name	Signification
0x01	ILLEGAL FUNCTION	The function code in the request is not allowed for the register address.
0x02	ILLEGAL DATA ADDRESS	The register address in the request is not valid.
0x03	ILLEGAL DATA VALUE	The stated data in the request are not allowed.

Table 2: MODBUS Exceptions

6.1.1 Measuring values (Input Register)

All measuring values of the weather station WS3/O consume 32Bit, i.e. 2 MODBUS register addresses. The following table shows the allocation of measuring value to register address, while the measuring values are sorted as follows:

- By measuring value type (30001 to 34999).
- In unbroken sequence (35001 to 39999).

Register address	Parameter Name	Unit	Multiplicator	Explanation	Data type
30001	Wind speed	m/s	10	value / 10 (1 decimal place, e.g. 101=10.1m/s)	U32
30003	Mean value Wind speed	m/s	10	value / 10 (1 decimal place, e.g.. 101=10.1m/s)	U32
<hr/>					
30201	Wind direction	°	10	value/ 10 (1 decimal place, e.g. 1010=101.0°)	U32
30203	Mean value Wind direction	°	10	value / 10 (1 decimal place, e.g. 1010=101.0°)	U32
<hr/>					
30401	Air temperature	°C	10	value / 10 (1 decimal place, e.g. 255=25.5°C)	S32
30403	Interior temperature of housing	°C	10	value / 10 (1 decimal place, e.g. 355=35.5°C)	S32
<hr/>					
30601	relative humidity	%r.h.	10	value/ 10 (1 decimal place, e.g. 355=35.5°r.F.)	U32
30603	absolute humidity	g/m ³	100	value / 100 (2 decimal places, e.g. 923=9.23g/m ³)	U32
30605	Dew point temperature	°C	10	value / 10 (1 decimal place, e.g. 115=11.5°C)	S32
<hr/>					
30801	Absolute air pressure	hPa	100	value / 100 (2 decimal places, e.g.	U32

				105000=1050.00hPa)	
30803	Relative air pressure relating to NHN	hPa	100	value / 100 (2 decimal places, e.g. 105000=1050.00hPa)	U32
31001	Global radiation	W/m ²	10	value / 10 (1 decimal place, e.g. 10000=1000.0W/m ²)	S32
31201	Brightness north	kLux	10	value / 10 (1 decimal place, e.g. 1200=120.0kLux)	U32
31203	Brightness east	kLux	10	value / 10 (1 decimal place, e.g. 1200=120.0kLux)	U32
31205	Brightness south	kLux	10	value / 10 (1 decimal place, e.g. 1200=120.0kLux)	U32
31207	Brightness west	kLux	10	value / 10 (1 decimal place, e.g. 1200=120.0kLux)	U32
31209	Twilight	Lux	1	value (no decimal place, e.g. 500=500Lux)	U32
31401	Precipitation status		1	value (no decimal place, (0=no precipitation, 1=precipitation))	U32
34601	Date		1	value (no decimal place, JJJJMMTT, e.g. 20121210=10.12.2012)	U32
34603	Time		1	value (no decimal place, HHMMSS, e.g. 121035=12:10:35)	U32
34605	Time format	h	1	value (no decimal place, offset to UTC in hours, e.g. 60=UTC+1h)	S32
34801	Longitude	°	1000000	value / 1000000 (6 decimal places, e.g.)	S32
34803	Latitude	°	1000000	value/ 1000000 (6 decimal places, e.g.)	S32
34805	Sun position Elevation	°	10	value / 10 (1 decimal place, e.g. 900=90.0°)	S32
34807	Sun position Azimuth	°	10	value / 10 (1 decimal place, e.g. 1800=180.0° / 0°=north, 180°=south, clockwise 0...360°)	S32
34809	Height above sea level	m	1	value (no decimal place, e.g. 240=240m above sea level)	U32
34811	Sensor status		1	value (no decimal place, bit coded, dep. of sensor)	U32
34813	Main loop cycles per 1s	1/s	1	Value (no decimal place, for ex.	U32

				2550=2550 1/s)	
34815	Operating time	s	1	Value (no decimal place, for ex. 255=255s)	U32
34817	Mean value of the height over MSL, received via GPS.	m	10	Value (1 decimal place, e.g. 240=24.0m above MSL)	U32
35001	Wind speed (30001) ¹	m/s	10	value / 10 (1 decimal place, e.g. 101=10.1m/s)	U32
35003	Mean value Wind speed (30003) ¹	m/s	10	value / 10 (1 decimal place, e.g. 101=10.1m/s)	U32
35005	Wind direction (30201) ¹	°	10	value/ 10 (1 decimal place, e.g. 1010=101.0°)	U32
35007	Mean value wind direction (30203) ¹	°	10	value / 10 (1 decimal place, e.g. 1010=101.0°)	U32
35009	Air temperature (30401) ¹	°C	10	value / 10 (1 decimal place, e.g. 255=25.5°C)	S32
35011	Interior temperature of housing (30403) ¹	°C	10	Value / 10 (1 decimal place, e.g. 355=35.5°C)	S32
35013	Dew point temperature (30605) ¹	°C	10	value/ 10 (1 decimal place, e.g. 115=11.5°C)	S32
35015	Rel. humidity (30601) ¹	%r.h.	10	value / 10 (1 decimal place, e.g. 355=35.5°r.h.)	U32
35017	Abs. humidity (30603) ¹	g/m ³	100	value / 100 (2 decimal places, e.g. 923=9.23g/m ³)	U32
35019	Absolute air pressure (30801) ¹	hPa	100	value / 100 (2 decimal places, e.g. 105000=1050.00hPa)	U32
35021	Rel. air pressure relating to sea level (30803) ¹	hPa	100	value / 100 (2 decimal places, e.g. 105000=1050.00hPa)	U32
35023	Global radiation (31001) ¹	W/m ²	10	value / 10 (1 decimal place, e.g. 10000=1000.0W/m ²)	S32
35025	Brightness north (31201) ¹	kLux	10	value / 10 (1 decimal place, e.g. 1200=120.0kLux)	U32
35027	Brightness east (31203) ¹	kLux	10	value / 10 (1 decimal place, e.g. 1200=120.0kLux)	U32
35029	Brightness south (31205) ¹	kLux	10	value / 10 (1 decimal place, e.g. 1200=120.0kLux)	U32
35031	Brightness west (31207) ¹	kLux	10	value / 10 (1 decimal place, e.g. 1200=120.0kLux)	U32
35033	Twilight (31209) ¹	Lux	1	value (no decimal place, e.g. 500=500Lux)	U32
35035	Precipitation status		1	value (no decimal place, (0=no	U32

	(31401) ¹			precipitation, 1=precipitation)	
35037	Date (34601) ¹		1	value (no decimal place, JJJJMMTT, e.g. 20121210=10.12.2012)	U32
35039	Time (34603) ¹		1	value (no decimal place, HHMMSS, e.g. 121035=12:10:35)	U32
35041	Time format (34605) ¹	h	1	value (no decimal place, Offset to UTC in hours, e.g. 60=UTC+1h)	S32
35043	Longitude (34801) ¹	°	1000000	value / 1000000 (6 decimal places, e.g.)	S32
35045	Latitude (34803) ¹	°	1000000	value / 1000000 (6 decimal place, e.g.)	S32
35047	Sun position Elevation (34805) ¹	°	10	value / 10 (1 decimal place, e.g. 900=90.0°)	S32
35049	Sun position Azimuth (34807) ¹	°	10	value / 10 (1 decimal place, e.g. 1800=180.0° / 0°=north, 180°=south, clockwise 0...360°)	S32
35051	Height above sea level (34809) ¹	m	1	Wert (no decimal place, e.g. 240=240m above sea level)	U32
35053	Sensor status (34811) ¹		1	value (no decimal place, bit coded, dep. of sensor)	U32
35055	Main loop cycles	1/s	1	value (no decimal place, number cycles per 1s)	U32
35057	SHT2x temperature	°C	10	value / 10 (1 decimal place, e.g. 255=25.5°C)	S32
35059	NTC temperature	°C	10	value / 10 (1 decimal place, e.g. 255=25.5°C)	S32
35061	Operating time	s	1	Value (no decimal place, for ex. 24000=24000s since last reset)	U32
35063	Mean value of the height over MSL (34817) ¹ , received via GPS.	m	10	Value (1 decimal place, e.g. 240=24.0m above MSL)	U32

Table 3 : MODBUS Input Register

¹: The numbers in parentheses describe the register addresses, which mean the same measuring value. Thus, the wind speed for ex. is situated at address 30001 and at address 35001.

Remark:

Due to the unbroken sequence of the measuring values, starting from address 35001, the MODBUS master can read-out all measuring values by one request!

6.1.2 Commands (Holding Register)

All commands of the weather station WS3/O consume 32Bit, i.e. 2 MODBUS register addresses, and are representing unsigned integral numbers. The following example shows the changing of the baud rate to 19200baud.

1. Set password for the user level (KY=234)

Slave address	Function code	Starting address	Number Registers	Number byte(s)	Data	CRC	
0x01	0x10	0x9C 49	0x00 02	0x04	0x00 00 00 EA	0x4F 7C	
						CRC low-Byte	CRC high-Byte

2. Set command baud rate to 19200 baud (BR=6)

Slave address	Function code	Starting address	Number Registers	Number byte(s)	Data	CRC	
0x01	0x10	0x9C 45	0x00 02	0x04	0x00 00 00 06	0x4E A4	
						CRC low-Byte	CRC high-Byte

6.2 Commands and description

The following table lists the available commands and the associated passwords for read / write:

Command	Initial value factory setting	MODBUS register- address	Description	Password	
				Read ¹	Write ²
Command AI	10	40069	Averaging interval for wind speed and wind direction.	None	User
Command BR	96	40005	Select baud rate.	None	User
Command DC	0	40081	Mode of calculation for twilight.	None	User
Command DO	0	40037	North correction of wind direction.	None	User
Command FB	1	40001	Quick-start mode.	None	User
Command HP	5	40035	Heating capacity anti-condensation	None	User
Command ID	0 (INTERNET BUS) 1 (MODBUS)	40003	Identification number resp. slave address.	None	User
Command KY	0	40009	Set key / password.	None	None
Command LC	0	40045	LED control.	None	None
Command RS	-	40029	Reset.	None	User
Command SH	0	40071	Station height.	None	User
Command SV	-	45005	SW-Version.	None	-
Command TR	-	-	Telegram output.	None	None
Command TT	0	-	Automatic telegram output.	None	None
Command TZ	0	40073	Time zone.	None	User

Table 4 : List of commands

¹: Command without parameter (used to read selected parameter).

²: Command with parameter (used to write a new parameter).

6.2.1 Command AI

<id>AI<parameter><CR> Averaging interval for wind speed and wind direction

Access: Read / write.

Description: The command AI is used to specify the averaging interval for the wind speed and wind direction in minutes.
The averaging of the wind velocity is scalar, and the averaging of the wind direction vectorial.

If the parameter is 0, the averaging is deactivated, and the mean values correspond to the instantaneous values. Here, the wind direction is reset (to 0°) during calm (< 0.6m/s).

Wind from the North is displayed with 360°.

Parameter description: AI = 0 → averaging disabled
AI = 1 → averaging interval = 1 minute

Value range: 0...10

Initial value:

10

6.2.2 Command BR

<id>BR<parameter><CR> Select baud rate

Access: Read / write.

Description: The command BR is used to select the required baud rate.

Parameter description:

Parameter	Description
12	1200baud (8n1)
24	2400baud (8n1)
48	4800baud (8n1)
96	9600baud (8n1)
192	19200baud (8n1)
384	38400baud (8n1)
576	57600baud (8n1)
1152	115200baud (8n1)

Value range: 12 / 24 / 48 / 96 / 192 / 384 / 576 / 1152

Initial value: 96

6.2.3 Command DC

<id>DC<parameter><CR> Mode of calculation for twilight

Access: Read/ write.

Description: The mode of calculation for twilight is stated by command DC. The twilight is calculated from the 4 brightness values, depending on direction. Here, one can select between sum and mean value.

Parameter description: 0: Twilight corresponds to the sum of the 4 brightness values
1: Twilight corresponds to the mean value of the 4 brightness values

value rang: 0...1

Initial value: 0

6.2.4 Command DO

<id>DO<parameter><CR> North correction of wind direction

Access: Read / write.

Description: The command DO is used to specify an offset for the wind direction in °. This brings about correction to the north for the Weather Station.

Value range: 0...360

Initial value: 0

6.2.5 Command FB

<id>FB<parameter><CR>	Quick-start mode
Access:	Read / write.
Description:	The command FB is used to select quick-start mode.
Parameter description:	0: quick-start mode disabled 1: quick-start mode enabled
Value range:	0...1
Initial value:	1

6.2.6 Command HP

<id>HP<parameter><CR>	Heating power Condensation protection
Access:	Read / write.
Description:	The heating capacity for the condensation protection of the precipitation monitor is set by command "HP". The indication is stated in percent.
Parameter description:	5...8: Maximum responsivity of the precipitation monitor for detection of the lowest precipitation intensities. 9...17: High responsivity, and at the same time reduction of the responsivity for fog, mist and condensation. 18...22: Maximum insensibility against fog, mist and condensation
Value range:	0...100
Initial value:	5

6.2.7 Command ID

<id>ID<parameter><CR>	Identification number
Access:	Read / write.
Description:	This command is used to specify the identification number (INTERNER BUS interpreter) resp. the slave address (MODBUS RTU Interpreter). A response telegram will only be transmitted if the 'id' in the command matches the one set in the Weather Station. An exception here is the generic 'id' that causes all weather stations to respond. Once the 'id' has been changed, the device will immediately respond with the new 'id'.
Parameter description:	99 generic 'id' (INTERNER BUS interpreter) 0 Broadcast slave address (MODBUS RTU Interpreter)
Value range:	0 to 99 (INTERNER BUS interpreter) 1 to 247 (MODBUS RTU interpreter)
Initial value:	0 (INTERNER BUS Interpreter) 1 (MODBUS RTU Interpreter)

6.2.8 Command KY

<id>KY<parameter><CR>	Key/password
Access:	Read / write.
Description:	Through of the command "KY" the value for the key (password) is set. For the change of parameters the required password must be used.
Parameter description:	0 no password 234 password for user level
Value range:	0 / 234
Initial value:	0

6.2.9 Command LC

<id>LC<parameter><CR> LED control

Access: Read / write.

Description: The command LC is used to specify the mode for control of the blue LED.

Parameter description:

Parameter	Description
0	LED (blue) indicates wind speed
1	LED (blue) is dark

Examples:

LED dark blue: "00LC1\r"

LED blue indicates wind speed: "00LC0\r"

Value range: 0 / 1

Initial value: 0

6.2.10 Command RS

<id>RS<parameter><CR> Reset

Access: Read / write.

Description: Through the command RS a reset of the microcontroller is carried out. The cause for the last reset is output without stating a parameter. Here, the output occurs in the form of strings (see the following table), which are lined up in a row, separated by spaces.

String	Description
PORF	Power On Reset Flag.
EXTRF	External Reset Flag.
BORF	Brownout Reset Flag.
WDRF	Watchdog Reset Flag.
PDIRF	Programming/Debug Interface Reset Flag.
SRF	Software Reset Flag.
SDRF	Spike Detector Reset Flag.

Parameter description: 1 Watchdog reset

2 Software reset

Value range: 1 / 2

Initial value: -

6.2.11 Command SH

<id>SH<parameter><CR> Station height

Access: Read / write.

Description: The command is used to select the altitude at the location where the Weather Station is installed.
This value is used to calculate the relative air pressure.
Height is specified in metres.
If the set parameter is 3001, the relative air pressure with elevation is calculated from the GPS data.

Parameter description: Height above MSL in metres

0...3000: Station height in metres (the basis for calculation of the relative air pressure)

3001: The parameter SH is disregarded (calculation of the relative air pressure is based on the height from the GPS data)

Value range: 0...3001

Initial value: 0

Remark: GPS determines ellipsoidal heights above the reference ellipsoid (==> World Geodetic System WGS84). From 36m (in Western Pomerania) up to 50m (in the Black Forest and in the Alps) the ellipsoidal heights in Germany are higher than the heavy-related heights (NN, HN, NHN).
That means, there are regional elevation errors which can be avoided by manual entry.
Moreover, it must be considered that the GPS altitude values can be subject to a change of up to 30m (referred to the WGS8 ellipsoid).

6.2.12 Command SV

<id>SV<CR> SW-Version

Access: Read.

Description: The software version can be read by means of command SV.

Parameter description: -

Response telegram: -

Value range: -

Initial value: -

6.2.13 Command TR

<id>TR<parameter><CR>	Telegram output
Access:	Read / write.
Description:	This command initiates one-off transmission of a telegram. The parameter specifies the type of telegram.
Parameter description:	1 Measured value telegram. 2 Sensor data telegram.
Response telegram:	See section Fehler! Verweisquelle konnte nicht gefunden werden.
Value range:	1...2
Initial value:	-

6.2.14 Command TT

<id>TT<parameter><CR>	Automatic telegram output
Access:	Read / write.
Description:	The command TT is used to select the automatic output of telegrams (interval = 1 second). Automatic telegram output remains switched off for the first 10 seconds after start-up of the Weather Station. During this time the user has the opportunity of changing the parameter TT.
Parameter description:	0 Automatic telegram output switched off. 1 Measured value telegram. 2 Sensor data telegram.
Response telegram:	See section Fehler! Verweisquelle konnte nicht gefunden werden.
Value range:	0...2
Initial value:	0

6.2.15 Command TZ

<id>TZ<parameter><CR> Time zone

Access: Read / write.

Description: The command TZ is used to change the output of date/time.

Parameter description::

0	UTC
23:	UTC-Zeit – 1 hours
24:	UTC-Zeit
25:	UTC-Zeit + 1 hours
48:	CEST or CET

The change between summer- and winter time occurs independently.

TZ	Signification
0	UTC
1	UTC – 23 hours
...	...
24	UTC
...	-1
47	UTC + 23 hours
48	CEST or CET

Response telegram: -

Value range: 0...48

Initial value: 0

7 LED signals

On the underside of the COMPACT WS3/O Weather Station there are 2 LEDs which are externally visible through the housing.

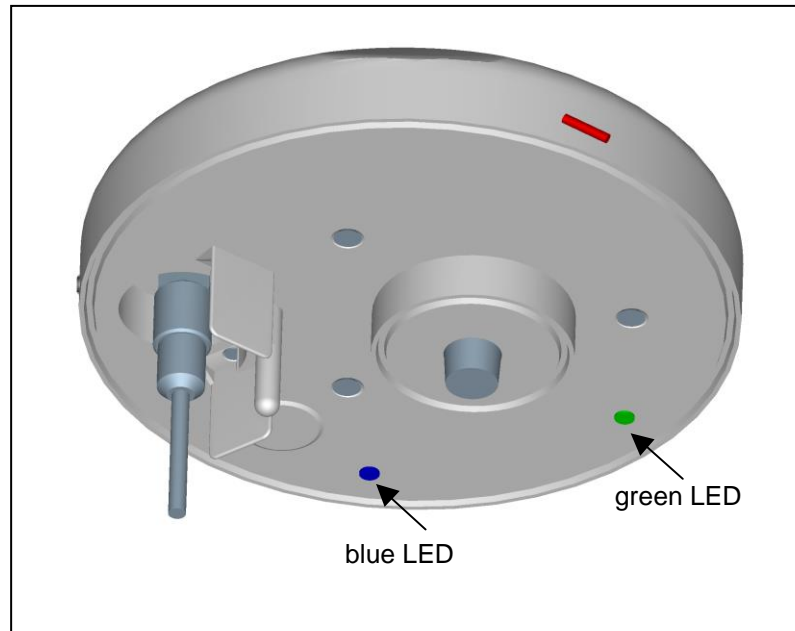
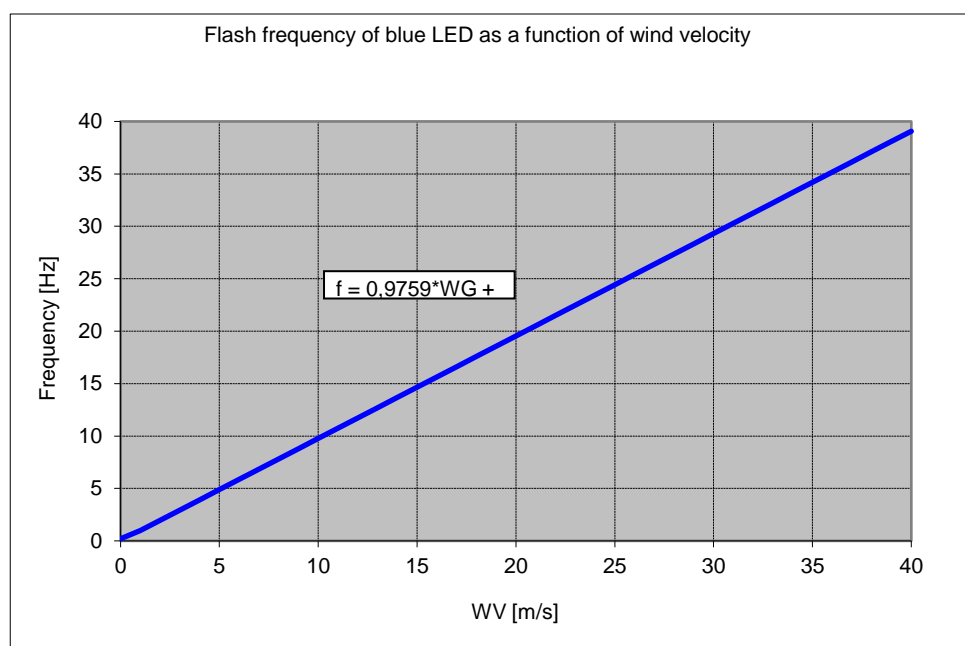


Figure 1 : LEDs

If the Weather Station does not receive a command to query measured values for 3 seconds or longer, the green LED flashes at a frequency of 1Hz and signals its readiness for operation. If automatic telegram output is enabled (see **Command TT**), the green LED remains dark.

The flash frequency of the blue LED indicates the current wind speed (see **Command LC**). The correlation between the flash frequency and wind speed is shown in the following figure:



8 Technical data

Wind speed		
	Type	Thermal anemometer.
	Measuring range	0...40m/s
	Resolution	0.1m/s
	Accuracy	To 10m/s: ± 1m/s (rms - mean over 360°). From 10m/s: ± 5 % (rms - mean over 360°).
Wind direction		
	Type	Thermal anemometer.
	Measuring range	1 ... 360°
	Resolution	1°
	Accuracy with laminar incident flow	± 10°
Brightness		
	Type	Silicon sensor.
(north, east, south, west)	Measuring range	0...150kLux
	Resolution	0.1kLux
	Accuracy	± 3% (± 4.5kLux)
	Spectral range	475...650nm
Twilight		
	Type	Silicon sensor.
	Measuring range	0...999Lux
	Resolution	1Lux
	Accuracy	± 10Lux
Global irradiance		
	Type	Silicon sensor.
	Measuring range	0...1300W/m ²
	Resolution	1W/m ²
	Accuracy	± 10% (± 130W/m ²)
	Spectral range	350...1100nm
Precipitation		
	Type	Ceramics, capacitive value measurement, sensor area heated.
	Measuring range	1 / 0 (precipitation yes/no)
	Thermal output, sensor dry, bedewing protection	0.1W
	Thermal output, sensor wet drying phase	1.1W
Temperature		
	Type	PT1000
	Measuring range	-30 ... +60°C
	Resolution	0.1°C
	Accuracy with wind speed >2m/s	± 1°C (-5°C...+25°C)

Air pressure sensor		
	Type	Piezoresistive.
	Measuring range	300...1100hPa
	Resolution	0.01hPa
	Accuracy	± 0.5hPa at 20°C
	Long-term stability	± 0.1hPa / year
Humidity sensor		
	Type	CMOS capacitive.
Relative humidity		
	Measuring range	0...100% rel. humidity
	Resolution	0.1% rel. humidity
	Accuracy with wind speed >2m/s	± 10% rel. humidity at 20°C
Absolute humidity		
	measuring range	0...400g/m ³
	Resolution	0.01g/m ³
Dew-point temperature		
	Measuring range	-30...+60°C
	Resolution	0.1°C
Inside temperature of housing		
	Type	Silicon sensor
	Measuring range	-30 ... +60°C
	Resolution	0.1°C
	Accuracy	± 2°C
Digital interface		
	Type	RS485
	Mode	Half-duplex mode
	Baud rate	1200, 2400, 4800, 9600 , 19200, 38400, 57600, 115200
	Data format	- Binary (command interpreter: MODBUS RTU)
General		
Operating voltage		18...30VDC, 18...28VAC
	Power consumption	< 300mA at 24VDC
Ambient conditions	Temperature range	-30... +60 °C
	Humidity range	Non-condensing
GPS reception	GPS receiver with low power consumption, built-in RTC and antenna	
	Holding time of RTC (without voltage supply)	Approx. 3 days
Housing		
	Material	Polycarbonate
	Dimensions	See Dimension drawing
	Weight	0.22kg
	Type of protection	IP65 in working position
	Type of connection	7-pin plug connector

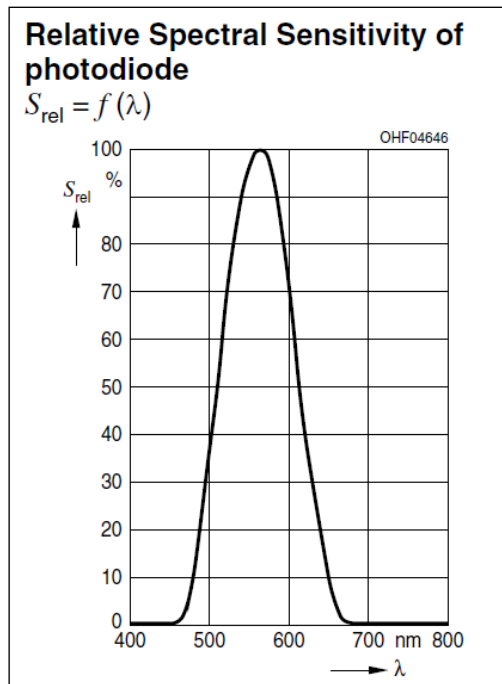


Figure 2 : Spectrum of brightness sensors
 (Source: data sheet for component SFH5711 / OSRAM)

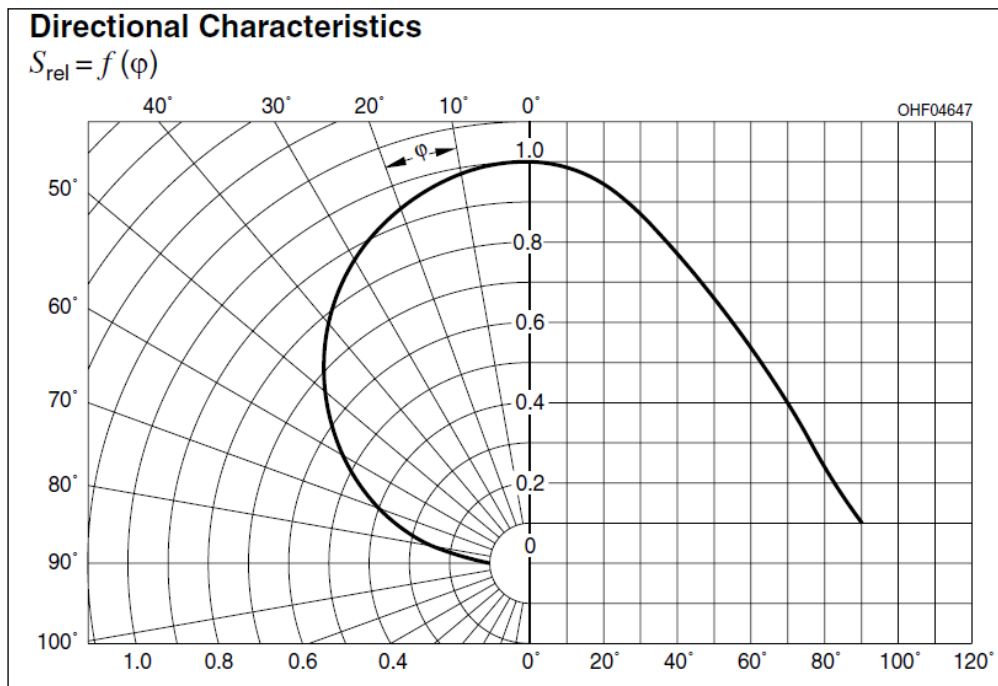


Figure 3 : Directional characteristics of brightness sensors
 (Source: data sheet for component SFH5711 / OSRAM)

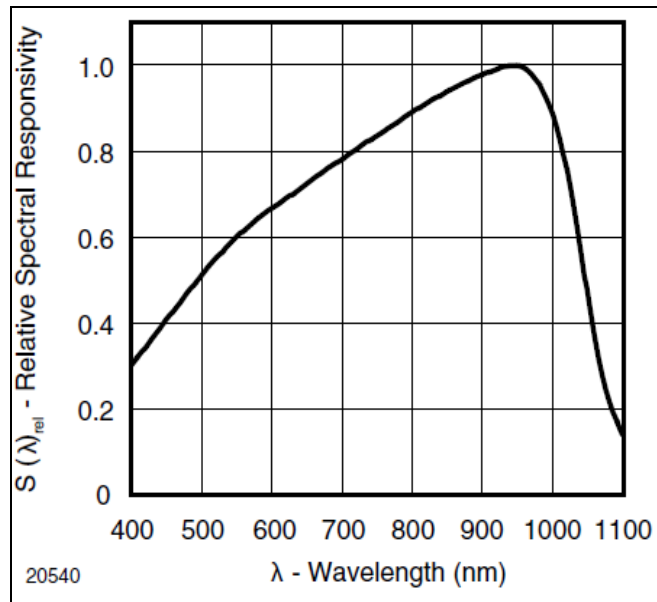
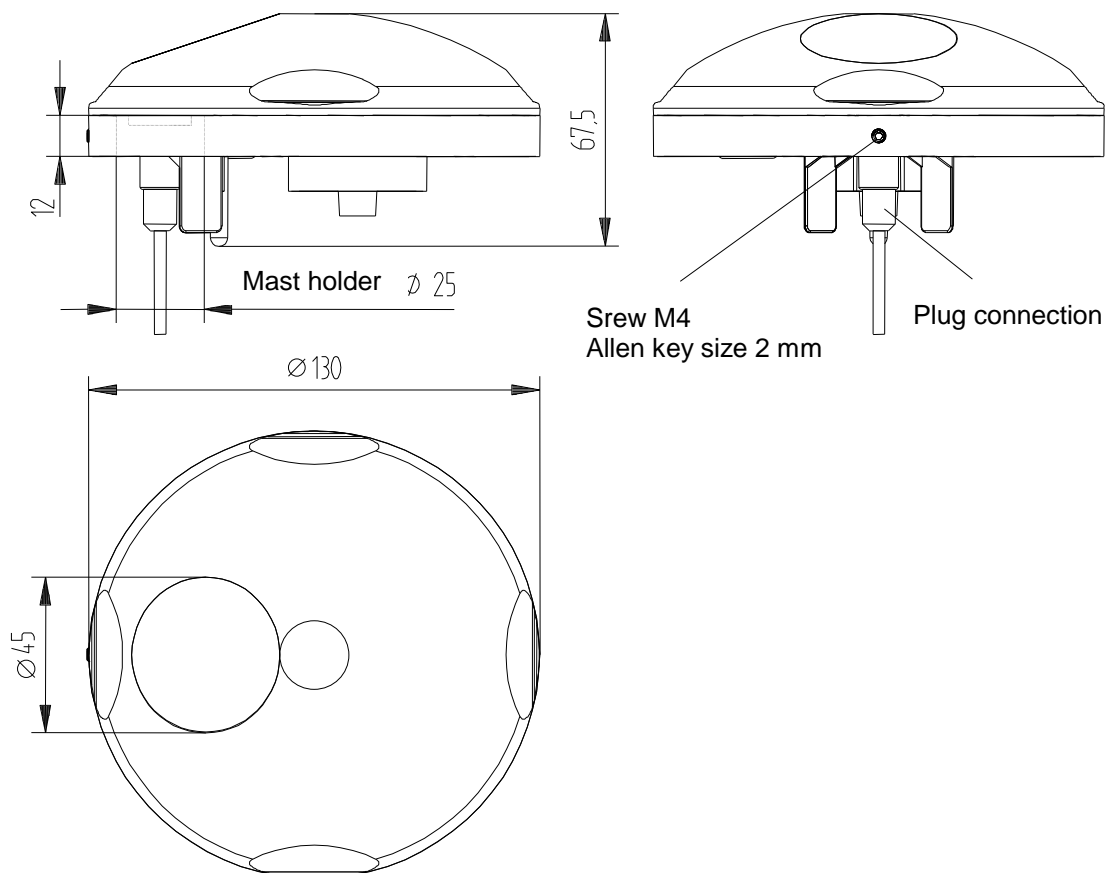


Figure 4 : Spectrum for global irradiance sensor
 (Source: data sheet for component TEMD5080X01 / VISHAY)

9 Dimension drawing [in mm]



10 Accessories (optional)

Cable Prepared connecting cable for COMPACT WS3/O Weather Station. Features: Cable with cable socket on device side and open ends on reception side.		Length: 5m Length: 10m
Installation support Used for lateral attachment of COMPACT WS3/O Weather Station to a vertical surface.		Length: 250mm Width: 60mm Material: Stainless steel 1.4301

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- Subject to technical modifications -