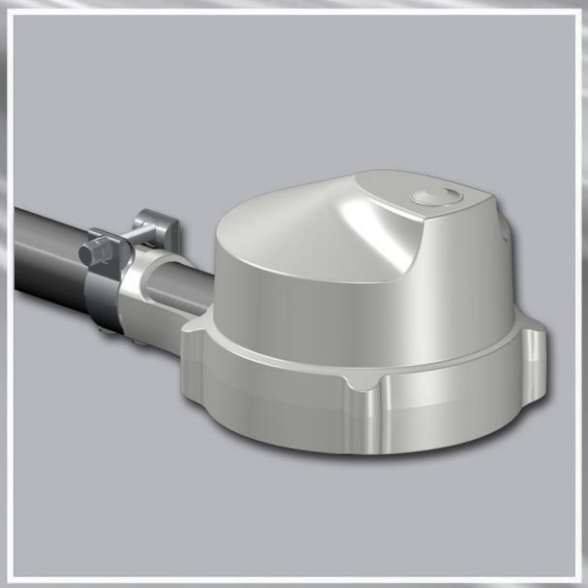
Manual
Weather Station WS10

V1.5 – 2019/09/23



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Content

Change log

Version	Date	Change
V1.0	2018/04/03	First version (pre-series)
V1.1	2018/07/23	• Manual alignment description of the WS10 • Various screenshots for device settings added • Modbus register description added and corrected • Added new UMB channel descriptions (for example, daily rainfall) • Description of configuration mode revised • Added sketch for manual wind direction • Inserting the manual setting option of the precipitation radar • Adjustable behavior of the wind direction in calm conditions documented
V1.2	2018/07/25	• Final review and minor corrections (typing and presentation)
V1.3	2019/02/20	• Wi-Fi chapter added • Chapter 7 Commissioning updated • MODBUS-Register GPS-Sensor Status moved • MODBUS-Register Wi-Fi Status moved
V1.4	2019/06/19	• List of radar admission countries added • MODBUS chapter structure reworked • MODBUS identification register description added (FW version) • Note for indoor temperature measurement added • Formatting of ASCII2.0 chapter reworked
V1.5	2019/09/23	• Note on static device installation and auxiliary variables • Note on Wifi AP-mode: Designed for easy configuration purpose • Note on wind module overheating shutdown • Note on the warm-up phase of the wind measurement • Note on the accuracy of wind measurement during operation indoors • Adjusted technical data to changed specification • Precipitation types ‘freezing rain’ and ‘sleet’ removed • Note, that the precipitation type is output even before the precipitation quantity • Azimuth and elevation explained, graph added • Note that the heating phase of the precipitation sensor is influencing the temperature measurement. • A new UMB service channel 4640 "R2S heater status" for the heating status of the precipitation sensor has been added • MODBUS register 142 Heater status added • Independent orientation recognition of the weather station by integrated compass • Chapter Commissioning updated • Chapter Guarantee added • Chapter Safety notices updated • Chapter Intended use updated • Chapter EC Certificate of Conformity added • Chapter Disposal updated

1 Read before commissioning

This manual is part of the device It must be stored close to the device, so people in need find it quickly.
This manual must be read and understood by the people installing and operating the device. This is valid especially for the chapter safety.

1.1 Used symbols

☛ Important notice for correct operation of the device

⇨ Necessary step

▶ Safety note

1.2 Guarantee

The guarantee period is 24 months from the date of delivery. The guarantee is forfeited if the designated use is violated.

2 Safety

2.1 Safety notices

- ▶ Installation and commissioning may only be carried out by adequately qualified specialists.
- ▶ Never measure or touch parts that are under voltage.
- ▶ Disconnect the power before working on the device.
- ▶ Do not open the device. Operate it only in working and undamaged condition.
- ▶ If modified or converted, operating reliability and functionality can no longer be guaranteed.
- ▶ If the device is damaged or defective, it must be returned to the manufacturer or an authorized dealer.
- ▶ The electrical cables must be checked regularly for damage. Operation of the device with defective or manipulated electrical components is prohibited.
- ▶ In addition to these operating instructions, the generally applicable legal rules and other binding guidelines for occupational safety, accident prevention and environmental protection must be observed.
- ▶ The device may only be operated within its specifications.
- ▶ The device may only be used under the conditions and for the purpose for which it was designed.
- ▶ Please observe the warnings attached to the device (→ windmeter)
- ▶ Observe technical data, storage and operating conditions.

2.2 Warning signs

Symbol	Meaning
	Important notice of possible risks to the user
	Warning of hot surfaces
	Warning of dangerous electrical voltage
	Fall hazard
	Warning of damaging the device

2.3 Warning signs on the device

Wind measurement dome:
Warning of hot surfaces

2.4 Intended use

- This device shall be used to measure and transmit meteorological data.
- This device shall be operated within the specified technical data
- This device shall be used only for the intended use
- The safety and functionality of the device may be compromised by changes or modifications
- This device uses radar radiation relevant for approval and must only be used in the countries approved for this purpose. The approved countries can be found in the appendix or under www.Lufft.com.

2.5 Incorrect use

If incorrectly installed

- the device may be operable to a limited extent or not at all
- the device may be permanently damaged
- there can be a risk of injury by the device falling from its mounting

If the device is not properly connected

- the device may fail to operate
- the device may be permanently damaged
- under some circumstances, there is a risk of electric shock

3 Scope of delivery

Weather station WS10

Connector

3.1 Further documents and software

You will find the following documents and software available to download online at www.lufft.de:

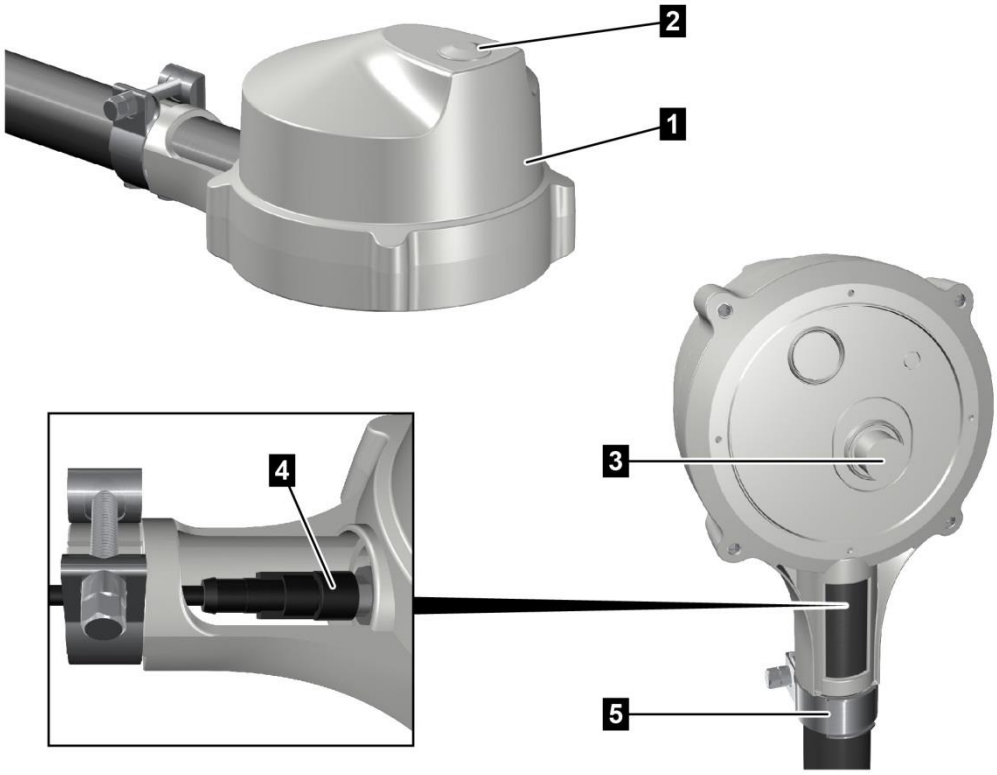
- Manual — this document
- UMB*-Protocol 1.0 — Specification and description of the UMB (Binary) protocol
- UMB-ASCII 2.0 — Communication protocol for meteorological sensors
- Firmware — latest firmware for this device
- UMB ConfigTool.Net — UMB-Configuration-Software** for UMB-Sensors
- UMB Config Tool — Manual for UMB-Configuration-Software**

* UMB = Universal-Measurement-Bus
** PC-Software for Microsoft® Windows® Operating system

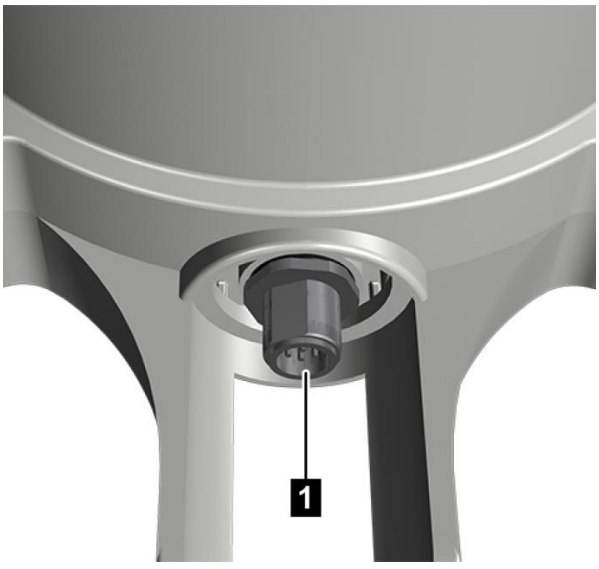
4 Device description

The WS 10 is a compact weather station to measure many different meteorological measurements to be used mainly but not exclusive for home automation.

4.1 Overview



1	Weather station WS10	4	Connector
2	Transparent glass	5	Mounting bracket
3	Wind measurement dome		



Connection

1 5-pin connector

The measurement parameters of the WS10 are optimized for stationary outdoor use. When operating in closed rooms, the accuracy may be limited (e.g. at the workplace). Auxiliary variables such as the compass and GPS position detection (lat./long., altitude) are designed for static operation. Therefore, changes in measured values are often only visible after a considerable delay!

4.2 Data security

To ensure a maximum of data security during the usage of the WS10 there are several security features implemented.

- Wi-Fi credentials are stored encrypted
- The Wi-Fi feature can be deactivated if not needed
- The reed contact to reset the device can be deactivated

4.3 Air temperature and humidity

The air temperature and humidity are measured by a high accuracy digital temperature and humidity sensor.

External influence on the measurement (like sun radiation) is eliminated by a compensation algorithm.

The WS10 needs a 30 min warm up time to measure the air temperature according to spec.

During the heating phase of the precipitation sensor (below 0°C and max. every 8 hours), there may be influences to the measurements of air temperature and humidity. To ensure measurements of the highest quality, it is recommended to query status channel 4640 in addition to the measurement channels. This service channel indicates ‘1’ when the heating is active and influencing of the measurements channels is possible. Alternatively, an error indication on the measurement channels during the heating phase may be configured, using ConfigTool.Net.

4.4 Air Pressure

The absolute air pressure is measured by an integrated sensor (MEMS) within the device. The barometric altitude formula is used to calculate the relative air pressure in relation to sea level (NN) using the GPS altitude (the altitude that can be set by the user in the device).

4.5 Precipitation

Latest radar technology is used to measure precipitation. The precipitation sensor works with a 24GHz Doppler radar, which measures the drop speed and calculates precipitation quantity and type by correlating drop size and speed.

4.6 Wind

The wind meter uses a heated thermal element. Depending on the wind speed and direction the temperature of the thermal element changes. This temperature change is used to calculate the wind speed and direction.

The WS10 needs a 30 min warm up time to measure the wind speed and direction according to spec.

WS10 features a temperature emergency shutdown to protect the heating bucket from being damaged. All wind related measurement values will report an error in this case. The values will be available again when the temperature is in safe operation conditions again.

Wind measurement is optimized for outdoor usage and depends on air ventilation. You might experience higher temperature divergences when using the device indoors (e.g. workspace).

4.7 Global Radiation

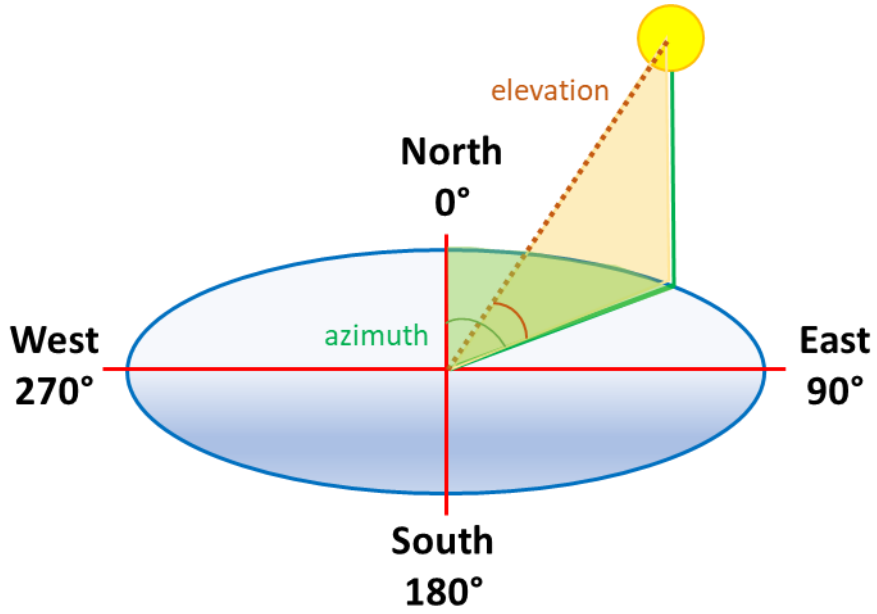
The global radiation is measured by a pyranometer mounted in the top cover of the WS10.

4.8 Position of the sun

The position of the sun (azimuth and elevation) is calculated by the geographical position of the weather station plus the current date and time.

The azimuth is the angle between the vertical plane of the sun and the median, it is given from north to east in positive direction.

The elevation is the height of the sun, that is the angle of the sun above the horizon.



4.9 Brightness

The illuminance is measured from the visible light.

4.10 Twilight

Twilight illuminance is measured by the illuminance sensor driven with a different attenuation.

4.11 Compass

The integrated electronic compass can be used to check the north – south adjustment of the sensor housing for wind direction measurement. It is also used to calculate the compass corrected wind direction. Therefore, it is not necessary to adjust the WS10 to the north.

To minimize influences of the ambient temperature, the device carries out an adaption during the first 24 hours of continuous operation. During this phase, deviations in the compass heading might occur. This is a desired behavior and will end after this timeframe.

If there is misdirection in the compass due to surrounding magnetic fields, the electronic compass can be switched off and manual alignment can be specified instead. See configuration.

4.12 UV-Index

The UV-Index is a standard measurement value of the strength of sunburn-producing ultraviolet (UV) radiation. The UV radiation is measured with an integrates sensor and the UV-Index is calculated.

The measured UV-Index must not be used for medical applications.

UV-Index	Risk	Schutz
0-2	Low	A UV Index reading of 0 to 2 means low danger from the sun's UV rays for the average person. Wear sunglasses on bright days. If you burn easily, cover up and use broad spectrum SPF 30+ sunscreen. Bright surfaces, such as sand, water and snow, will increase UV exposure.
3-5	moderate	A UV Index reading of 3 to 5 means moderate risk of harm from unprotected sun exposure. Stay in shade near midday when the sun is strongest. If outdoors, wear sun protective clothing, a wide-brimmed hat, and UV-blocking sunglasses. Generously apply broad spectrum SPF 30+ sunscreen every 2 hours, even on cloudy days, and after swimming or sweating. Bright surfaces, such as sand, water and snow, will increase UV exposure.
6-7	high	A UV Index reading of 6 to 7 means high risk of harm from unprotected sun exposure. Protection against skin and eye damage is needed. Reduce time in the sun between 10 a.m. and 4 p.m. If outdoors, seek shade and wear sun protective clothing, a wide-brimmed hat, and UV-blocking sunglasses. Generously apply broad spectrum SPF 30+ sunscreen every 2 hours, even on cloudy days, and after swimming or sweating. Bright surfaces, such sand, water and snow, will increase UV exposure.
8-10	very high	A UV Index reading of 8 to 10 means very high risk of harm from unprotected sun exposure. Take extra precautions because unprotected skin and eyes will be damaged and can burn quickly. Minimize sun exposure between 10 a.m. and 4 p.m. If outdoors, seek shade and wear sun protective clothing, a wide-brimmed hat, and UV-blocking sunglasses. Generously apply broad spectrum SPF 30+ sunscreen every 2 hours, even on cloudy days, and after swimming or sweating. Bright surfaces, such as sand, water and snow, will increase UV exposure.
≥11	extreme	A UV Index reading of 11 or more means extreme risk of harm from unprotected sun exposure. Take all precautions because unprotected skin and eyes can burn in minutes. Try to avoid sun exposure between 10 a.m. and 4 p.m. If outdoors, seek shade and wear sun protective clothing, a wide-brimmed hat, and UV-blocking sunglasses. Generously apply broad spectrum SPF 30+ sunscreen every 2 hours, even on cloudy days, and after swimming or sweating. Bright surfaces, such as sand, water and snow, will increase UV exposure

Source: Wikipedia.org

4.13 GPS (Global Positioning System)

With the build in GPS-Module the WS10 determines the geographical position as well as the date and time.

To ensure a good reception of the GPS signal the WS10 should have free sight to the sky.

The first determination of the position could take up to several minutes.

The current status of the GPS reception can be verified through several UMB channels.

UMB Channel	Name	Description
4071	gps num satellites	The number of satellites in reach. To determine the position of the WS10 it needs at least 3 satellites in reach.
4072	gps position fix	1: position locked 2: latitude and longitude determined (2D) 3: latitude, longitude and elevation determined (3D)

4.14 WLAN

The Wi-Fi of the WS10 has three different modes:

- **AP** (Access Point mode to directly connect to the WS10 for configuration)
- **STA** (Station Mode to be used in an existing Wi-Fi)
- **Wi-Fi switched off**

Please note, that AP mode is only designed for configuring the sensor. Some measurement values can be used to a limited extent.

The AP Mode is signaled by a blink signal (every 10 sec) of the green status LED.

The WS10 will stay for a maximum of 30min in the AP Mode.

The STA Mode has no additional signaling from the status LED as this is the normal operating mode.

With the config pin (see chapter 6.2) or the reed contact (Magnet) you can toggle between the AP and STA Mode.

If you activate the reed contact the WS10 will confirm this with a white status LED. After that you will see a

green status LED (if you started the AP mode) or a

blue status LED (if you started the STA mode).

For security reasons, the function of the reed contact can be deactivated (see chap 7.1.8)

After the WS10 is powered up, it will try to lock into the Wi-Fi with the configured credentials (to configure the Wi-Fi credentials (please see chap. 7.1.1)

If the configuration is wrong (e.g. wrong password), the WS10 will automatically fall back into AP mode, so you be able to re-configure the Wi-Fi credentials via direct connection.

To see a more detailed status of the Wi-Fi connection (e.g. to debug why a Wi-Fi login doesn't work), please read out the UMB channels 4060 „wifi status“ and the channel 4061 „wifi signal“.

4.14.1 Wi-Fi Statuscodes

To debug the current status of the Wi-Fi connection you can read out the UMB channel 4060 „wifi status“.

The status is coded in a 5-digit number.

. .. XX	Right two digits show connection status
. XX ..	The two digits in the middle show the last established stage of the connection. This can be used to find the possible cause of a non-functioning Wi-Fi connection. See table below
X.. ..	The left digit shows the current status summary: 1 = waiting 2 = trying to connect 3 = waiting and trying again

Common status codes	
x xx 00	Wi-Fi switched off
x xx 01	Wi-Fi switched on
x xx 02	Wi-Fi is activated SSID and password configured

Error codes	
x xx 5X	Too many error codes Too many unsuccessful connections

STA Status codes		
Status code	**Description**	**Possible errors**
x xx 03	Setting Wi-Fi operating mode STA	Wi-Fi-Modul hardware defect
x xx 04	Enabling Wi-Fi radio	
x xx 05	Wi-Fi radio switching on	
x xx 12	Start connection to SSID	SSID wrong Password wrong Signal strength too low
x xx 20	Weather Underground name resolve requested	Weather Underground credentials wrong Weather Underground not reachable
x xx 21	Weather Underground successfully resolved	

AP Mode Status codes		
Status code	**Description**	**Possible errors**
x xx 30	Setting Wi-Fi operating mode AP	Wi-Fi-Modul hardware defect
x xx 31	Enabling Wi-Fi radio	
x xx 32	Wi-Fi radio switching on	

4.14.2 Wi-Fi signal strength

Through the UMB-channel 4061 „wifi signal“ you can determine the signal strength of the Wi-Fi signal.

Signal	Quality
>-50 dBm	very good
-50…-60 dBm	good
-67…-70 dBm	OK
-70…-80 dBm	weak
< 80 dBm	very weak

5 Measurement Output

Measurements are transmitted in accordance with UMB binary protocol (Factory Settings).

It is recommended to set up and poll the station with ConfigTool.NET.

You can find an example of a measurement request in different protocols and a complete summary of the list of channels in the Appendix.

The measurement range listed in the table is used for the UMB ASCII protocol.

5.1 Air and Dewpoint Temperature

Sampling rate 1 Minute
Units °C; °F
Request channels:

UMB Channel		Measuring range		
act	**Measurement variable (float32)**	**min**	**max**	**unit**
100	Air temperature	-40	60	°C
105	Air temperature	-40	140	°F
110	Dewpoint temperature	-40	60	°C
115	Dewpoint temperature	-40	140	°F

5.2 Humidity

Sampling rate 1 Minute
Units %r.H.; g/m³
Request channels:

UMB Channel		Measuring range		
act	**Measurement variable (float32)**	**min**	**max**	**unit**
200	Relative humidity	0	100	%
205	Absolute humidity	0	1000	g/m³

5.3 Air pressure

Sampling rate 1 Minute
Units hPa
Request channels:

UMB Channel		Measuring range		
act	**Measurement variable (float32)**	**min**	**max**	**unit**
300	Absolute air pressure	500	1100	hPa
305	Relative air pressure	500	1100	hPa

5.4 Wind Speed

Sampling rate 1sec
Units m/s; km/h; mph; kts
Response threshold 0,1 m/s
Request channels:

UMB Channel		Measuring range		
act	Measurement variable (float32)	min	max	unit
400	Wind speed	0	40	m/s
405	Wind speed	0	144	km/h
410	Wind speed	0	89,4775	mph
415	Wind speed	0	77,7538	kts

5.5 Wind Direction

Sampling rate 1sec
Units °
Response threshold 0,1 m/s
Request channels:

UMB Channel		Measuring range		
act	Measurement variable (float32)	min	max	unit
500	Wind direction	0	360	°
502	Wind direction, compass	0	360	°

Ch. 500 wind direction measured by the wind sensor adjusted by the value of the manual adjustment to the north (see chapter **Manual adjustment to the north**).

Ch. 502 wind direction is calculated from the wind direction measured by the wind sensor and the heading measured by the compass.

During calm wind situations the WS10 will keep the last measured wind direction. This can be adjusted in the ConfigTool.NET (see chapter **Wind direction at calm winds**).

5.6 Compass

Sampling rate 1 sec (mean value over 16 measurements)
Units °
Request channels:

UMB Channel		Measuring range		
act	Measurement variable (float32)	min	max	unit
510	Compass heading	0	360	°

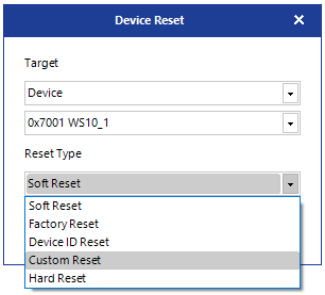
5.7 Precipitation Quantity - Absolute

Sampling rate Event-dependent on reaching the response threshold
Units l/m²; mm; in; mil
Response threshold 0,01mm (Radar)
Request channels:

UMB Channel		Measuring range		
act	Measurement variable (float64)	min	max	unit
600	Precipitation Quantity - Absolute	0	100000	l/m²
620	Precipitation Quantity - Absolute	0	100000	mm
640	Precipitation Quantity - Absolute	0	3937,008	inch
660	Precipitation Quantity - Absolute	0	3937008	mil

This measurement indicates the accumulated precipitation quantity since the last reeboot of the device. The measurement is retained for the duration of a short power failure. To reset this value, use the corresponding function in the UMB-Config-Tool or disconnect the device from the power supply for some minutes.

To reset this value, please click on the nbol in the UMB-Config-Tool.



Select Custom Reset under Reset Type. Press the Reset button to reset the precipitation values to zero.

5.8 Precipitation Quantity - Daily

Sampling rate Event-dependent on reaching the response threshold
Units l/m²; mm; in; mil
Response threshold 0,01mm (Radar)
Request channels:

UMB Channel		Measuring range		
act	Measurement variable (float64)	min	max	unit
601	Precipitation Quantity - Daily	0	200	l/m²
621	Precipitation Quantity - Daily	0	200	mm
641	Precipitation Quantity - Daily	0	7,874	in
661	Precipitation Quantity - Daily	0	7874	mil

5.9 Precipitation Quantity - Differential

Sampling rate Event-dependent on reaching the response threshold
Units l/m²; mm; in; mil
Response threshold 0,01mm (Radar)
Request channels:

UMB Channel		Measuring range		
act	Measurement variable (float32)	min	max	unit
605	Precipitation Quantity - Differential	0	100	l/m²
625	Precipitation Quantity - Differential	0	100	mm
645	Precipitation Quantity - Differential	0	3,937	in
665	Precipitation Quantity - Differential	0	3937,008	mil

Each request from a differential channel sets the accumulated quantity back to zero!

5.10 Precipitation Intensity

Sampling rate 1 Minute
Units l/m²/h; mm/h; in/h; mil/h; mm/min; in/min
Response threshold 0,01 mm/h
Request channels:

UMB Channel		Measuring range		
act	Measurement variable (float32)	min	max	unit
800	Precipitation intensity	0	30	l/m²/h
820	Precipitation intensity	0	30	mm/h
825	Precipitation intensity	0	0,5	mm/m
840	Precipitation intensity	0	1,181	in/h
845	Precipitation intensity	0	0,02	in/m
860	Precipitation intensity	0	1181	mil/h

The WS10 calculate the precipitation intensity from the averaged measurement values of the previous minute.

5.11 Precipitation Type

Sampling rate Event-dependent on reaching the response threshold
Response threshold 0,002mm (Radar)
Follow-up time 2 minutes
Request channels:

UMB Channel	Measurement Value (uint8)	Coding
700	Precipitation type	0 = no precipitation 60 = liquid precipitation, e.g. rain 70 = solid precipitation, e.g. snow 90: hail

A detected precipitation type remains valid for 2 minutes after the end of the precipitation event. In order to record precipitation types which only occur for a short period (e.g. short-term rain), the request interval should be 1 minute or shorter.

The precipitation type is already output at 0,002mm precipitation, that is even before the response threshold of the precipitation quantity (0,01mm) is reached.

5.12 Global radiation

Sampling rate 1 sec
Unit W/m²
Request channels:

UMB Channel		Measuring range		
act	Measurement variable (float32)	min	max	unit
900	Global radiation	0	1300	W/m²

5.13 UV-Index

Sampling rate 1 sec
Unit digits
Request channels:

UMB Channel		Measuring range		
act	Measurement variable (uint8)	min	max	unit
902	UV-Index	0	13	digits

5.14 Brightness

Sampling rate 5 sec
Unit klx
Request channels:

UMB Channel		Measuring range		
act	Measurement variable (float32)	min	max	unit
903	Brightness	0	120	klx

5.15 Twilight

Sampling rate 5 sec
Unit lx
Request channels:

UMB Channel		Measuring range		
act	Measurement variable (float32)	min	max	unit
904	Twilight	0	500	lx

5.16 Position of The Sun

Sampling rate 10 sec
Unit °
Request channels:

UMB Channel		Measuring range		
act	Measurement variable (float32)	min	max	unit
910	Position of the sun - azimuth	0	360	°
911	Position of the sun - elevation	0	90	°

5.17 Position

Sampling rate 10 sec
Request channels:

UMB Channel		Measuring range		
act	Measurement variable (float32)	min	max	unit
3900	Position longitude	-180	180	°
3901	Position latitude	-90	90	°
3902	Position height	-1000	10000	m
3903	UTC timestamp (uint32)	0	4294967295	s
4071	GPS number of satellites (uint8)	0	255	digits
4072	GPS Position locked (uint8)	0	255	digits

5.18 Service Channels

Request channels:

UMB Channel		Measuring range		
act	**Measurement variable (float32)**	**min**	**max**	**unit**
4060	Wi-Fi status (uint16) (refer to chapter 4.14.1 for details)	0	65535	digits
4061	Wi-Fi signal strength (sint16) (refer to chapter 4.14.2 for details)	-32767	32767	digits
4640	Heater status (refer to chapter 4.3 for details)	0	1	logic
4700	Device runtime (uint32)	0	4294967295	s
4701	Attended time (uint32)	0	4294967295	s
4702	Number boot cycles (uint32)	0	4294967295	digits
4703	UTC timestamp (uint32)	0	4294967295	s
4704	Local timestamp (uint32)	0	4294967295	s
10000	Supply voltage (float32)	0	50	V

6 Montage

⚠ Caution	
	**Fall hazard while working in heights** ⇨ For installation, only approved and tested aids (ladder, steps, etc.) may be used. ⇨ All applicable regulations for work in heights must be observed.

⚠ Caution	
	**Hazard of falling objects.** ⇨ Make sure the device is mounted correctly and safe. ⇨ During installation make sure no objects can fall.

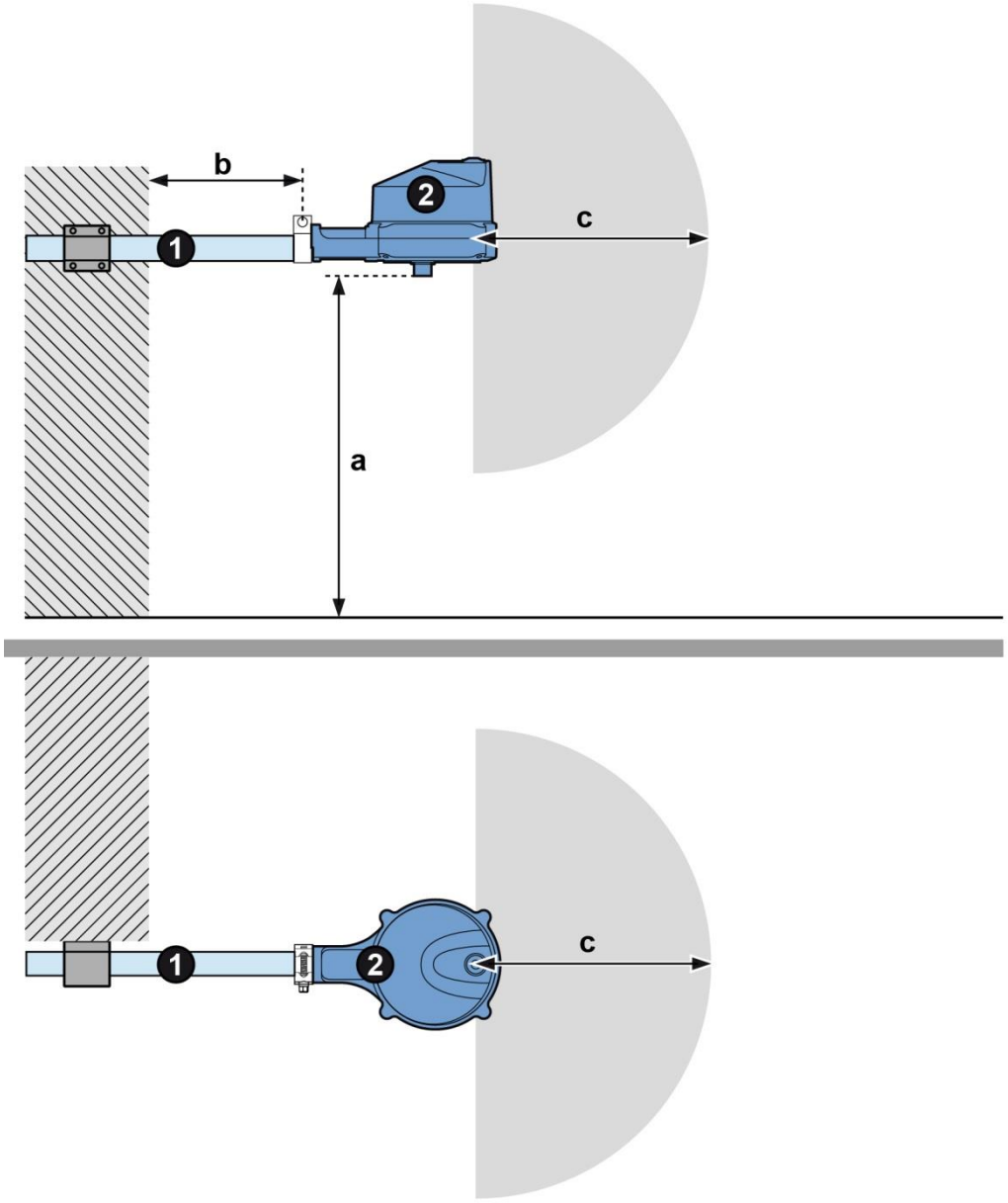
Important notices for installing

- ▶ Installation and commissioning may only be carried out by adequately qualified specialists.
- ▶ Never measure or touch parts that are under voltage.
- ▶ Observe technical data, storage and operating conditions.
- ▶ The intended location is outdoors. The device must not be operated in closed rooms.
- ▶ The building-side holding device must be sufficiently dimensioned and firmly anchored.
- ▶ The device must be secured in such a way that there are no objects, trees or other objects in the immediate vicinity that could affect the acquisition of the measured data.
- ▶ The direct measuring range in front of the device must be kept clear of all obstacles in any case.
- ▶ All work must be carried out when the device is de-energized. Only connect the power supply to the mains once all assembly work has been completed correctly.
- ▶ The cables to and from the device must be fastened in such a way that no tension is exerted on the plug connection during operation.
- ▶ Lay the cables so that they cannot be damaged.
- ▶ Lay the cables so that nobody can trip over them.
- ▶ To ensure a reliable rain radar measurement, the WS10 must be at least 8 m apart.

The following tools are required for installation:

- fork or ring spanner SW10

6.1 Installation Sketch



1	Tube (Ø 35 mm)	a	Proposed height 2000 mm
2	WS10	b	Proposed distance 500 mm
		c	Free surrounding >1000 mm

To achieve a correct measurement of global radiation, make sure the WS 10 is in all directions horizontally aligned.

To ensure the correct functionality of the WS10 the notes below concerning the place of installation must be followed:

- Free sight to the sky – for the correct function of the GPS module and the precipitation measurement the WS10 must have a free sight to the sky.
- To ensure correct measurements of any kind of sun-imposed radiation make sure that there is never shade on the WS10.
- To ensure correct wind measurements there should be no bigger obstacle (tree, building, etc.) within 5m around the WS10.

Not following the above-mentioned notes may lead to wrong measurements.

6.2 Connections

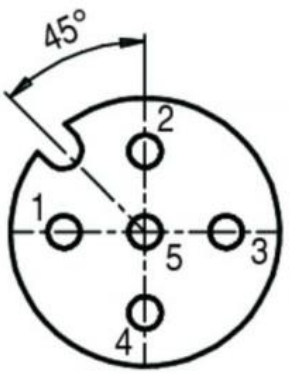
The WS 10 is to be supplied with a direct voltage of typ. 24 VDC (9-36VDC). The power supply unit used must be approved for the operation of devices with protection class III (SELV).

It is recommended to operate the WS10 at 24V DC!

The power supply must serve at least 35W @ 24V. The power connection must be fused by a 2.5A (slow-blow) fuse.

The connection cable must meet the following requirements:

- UV resistant
- external diameter of 4-6mm
- and a wire gauge of at least 0,3mm²
- Max. connection length 30m ≥ 15V DC, otherwise 15m

Pin assignment	PIN	Usage	Cable color
	1	$+V_{in}$	
	2	GND	
	3	RS 485 A (+)	
	4	RS 485 B (-)	
	5	Configuration pin (pops)	

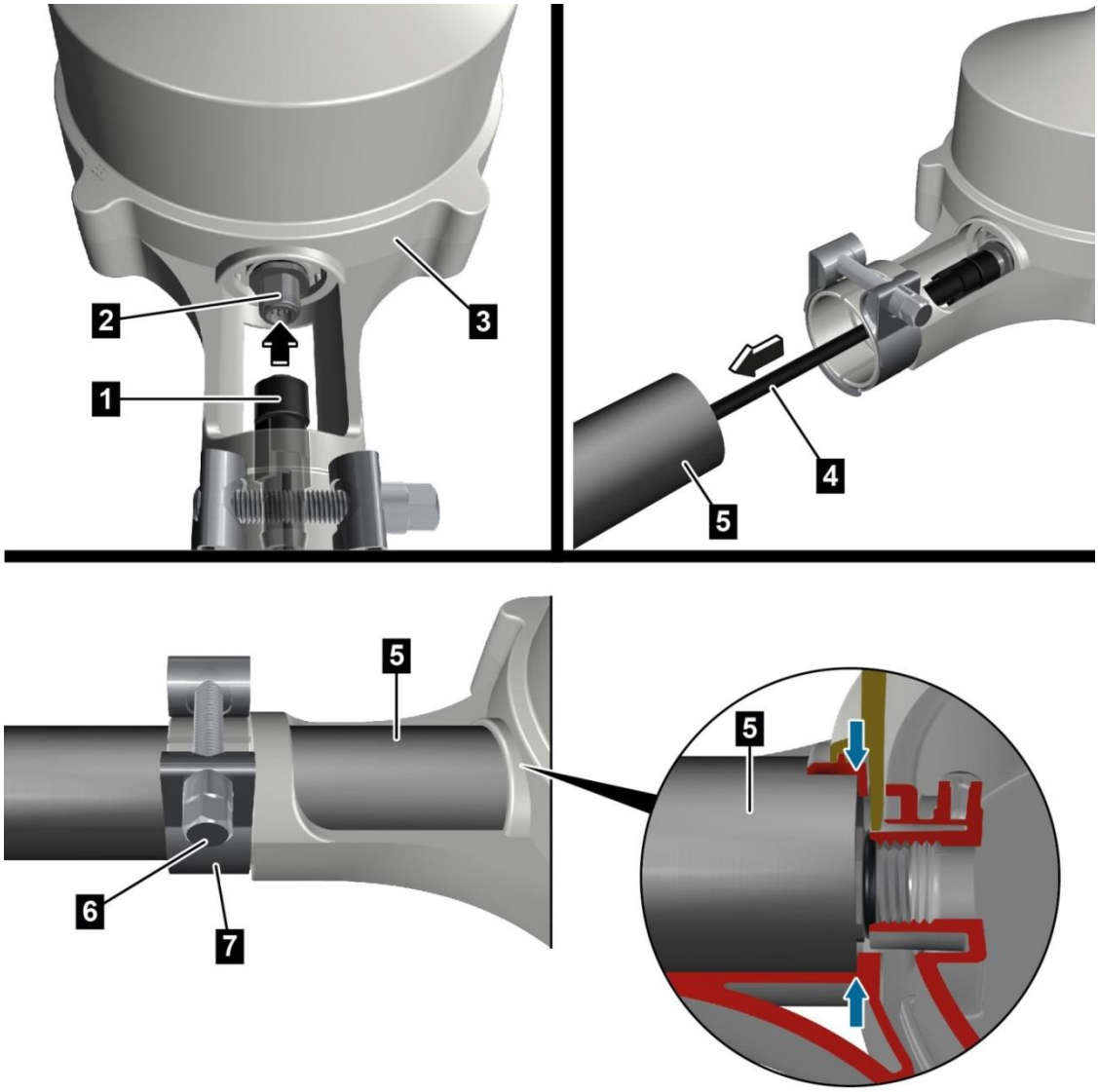
Positive voltage ($+V_{in}$ 9..36V) at the configuration pin 5 forces the WS10 into configuration mode and activates the Wi-fi access point mode.

This pin does not need to be connected, but it is recommended to connect it to GND when not in use.

The device has a half-duplex, 2-wire RS485 interface for configuration, measured value query and firmware update.

As connection cable we suggest:
Lappkabel UNITRONIC® SENSOR, 5x0,34mm² (ord.nr: **7038902**)
Or any other UV-stable cable with equal characteristics.

6.3 Fastening



1	Connector	5	Tube
2	Connection	6	Screw
3	WS10	7	Mounting bracket
4	Cable		

The WS10 is mounted on a tube in horizontal position. Make sure the tube is mounted safely at a fixed mounting point (e.g. mast, building, etc.)

- ⇨ Put the connector (**1**) of the connecting cable into the connector (**2**) of the WS10 (**3**).
- ⇨ Pull the connecting cable (**4**) through the tube (**5**).
- ⇨ Loosen the screw (**6**) at the bracket (**7**).
- ⇨ Push the tube (**5**) into the WS10 bracket until the very end.
  Make sure you do not damage the connecting cable.
- ⇨ Tighten the screw (**6**) at the bracket (**7**).

7 Commissioning

⚠ Caution	
	**Warning of hot surfaces.** ⇨ Do not touch the wind measurement dome.

7.1 Configuration

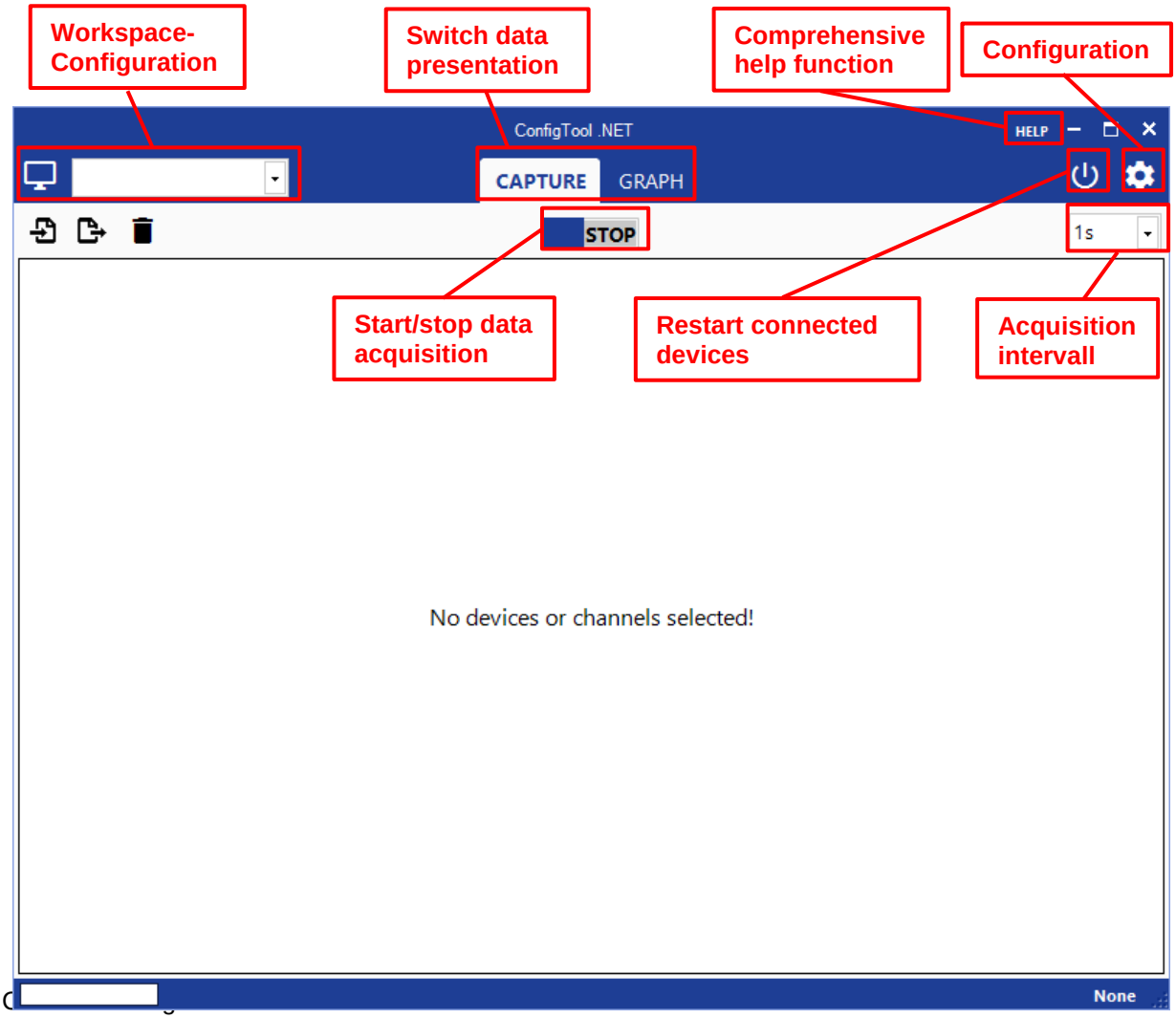
After connecting the supply voltage, the WS10 will start automatically.

If there is no Wi-Fi configured, the WS10 starts in Wi-Fi access point mode. By using the UMB-ConfigTool.NET you can now configure the WS10.

⇨ To configure the WS10 you need a Wi-Fi capable device running Windows®-PC Software or Android® operating system and the Lufft ConfigTool.NET. The Lufft ConfigTool.NET can be downloaded on the Lufft internet web site or installed directly from the Android® Playstore.

As long as no GPS position has been determined, the rain channels, the sun channels (910 "sun dir. azimuth" and 911 "sun dir. elevation") and channel 3903 "utc time" provide a BUSY error code (28h).

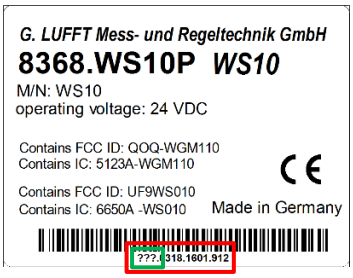
7.1.1 ConfigTool.NET



Be aware, that the configuration mode is limited to 30 min.

Configuration mode will be indicated by LED blinking green

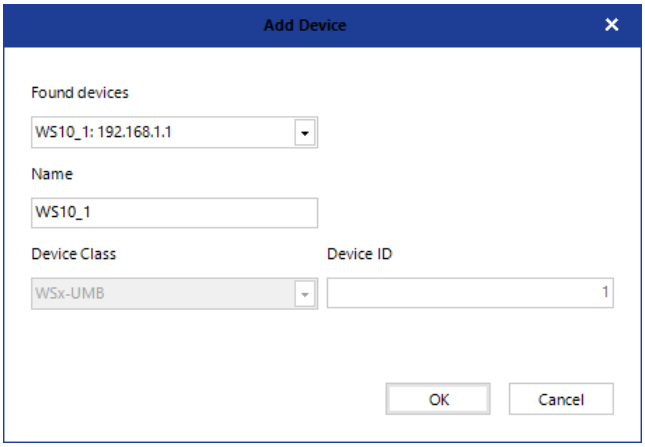
To ensure a stable Wi-Fi connection you should be within 10m around the WS10 with your device running the UMB-ConfigTool.NET.



- Connect your device with the WS10 Wi-Fi access point
- SSID: WS10_Wifi-<serial number>
- Password: <serial number> (to be found on the label)

During the connection to the WS10 there is no connection to the Internet possible.

- Start the Lufft UMB-ConfigTool.NET
- Please check the Windows® firewall configuration to allow connections to a public network.
- Click on the Button to open a new workspace.
- In the Com Channel menu, please set the Connection to Type – TCP and confirm with OK.
- Click on the Button to add a new device.
- Under Found devices you should see the WS10 with the IP-Address 192.168.1.1, you can add a name to the device and confirm with OK.



After you added the WS10 device successfully, your list of devices should look like this

⇨ To further configure the WS10 click on the device entry.

⇨ Through the ⚙ Button you get to the configuration menu.
Insert your Wi-Fi SSID and Wi-Fi key.

WiFi	
Wifi	Enabled
Mode	DHCP
IPv4 address	0.0.0.0
Subnet mask	0.0.0.0
Gateway address	0.0.0.0
DNS address	0.0.0.0
WiFi encryption	WPA2
WiFi SSID	
WiFi key	
WiFi TCP port	9750

Your Wi-Fi credentials are stored encrypted in the WS10.

⇨ Save the configuration to the WS10 with ⬆ This will automatically restart the WS10 with the new configuration.

⇨ Connect your device to the local Wi-Fi you configured the WS10 for.

⇨ Click again on the device entry to further configure the WS10.

⇨ Click on the 🔌 to change the connection details.

⇨ Delete the IP or Hostname in the TCP/IP section.

⇨ After that the new IP address of the WS10 will be shown and can be confirmed with OK.

⇨ Now you can further configure the WS10.

☞ Due to the integrated electrical compass a manually north alignment is not necessary and therefore must not be configured.

The complete functionality of the ConfigTool .NET is described in the help function.

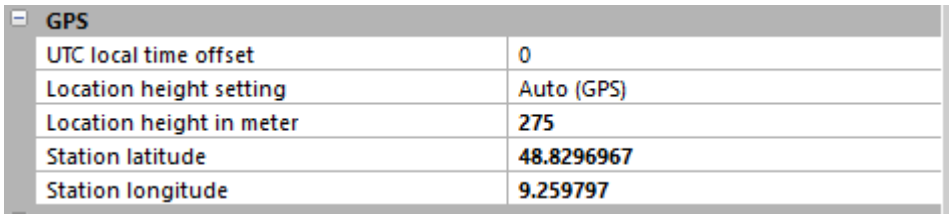
7.1.2 Adjustment to the local time zone

The system time (UTC) of the WS10 is adjusted automatically by the GPS-Modul. To adjust the WS10 to the local time zone where the WS10 is installed, you need to enter the respective offset value.

☞ Please be aware – the offset value may change with the change of summer- and wintertime (daylight saving time).

E.g. For central Europe the time zone is UTC +1h (wintertime) and UTC +2h (summertime). The respective offset would be 3600s or 7200s.

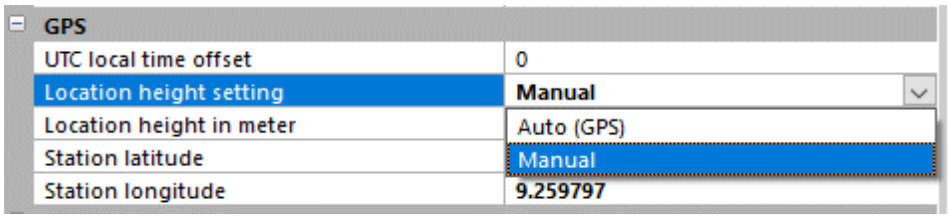
Through the ⚙ Button in the ConfigTool.NET you get to the configuration menu. Under **GPS – UTC local time offset** you may adjust your desired time offset in seconds.



7.1.3 Adjustment of location height

Through the ⚙ Button in the ConfigTool.NET you get to the configuration menu.

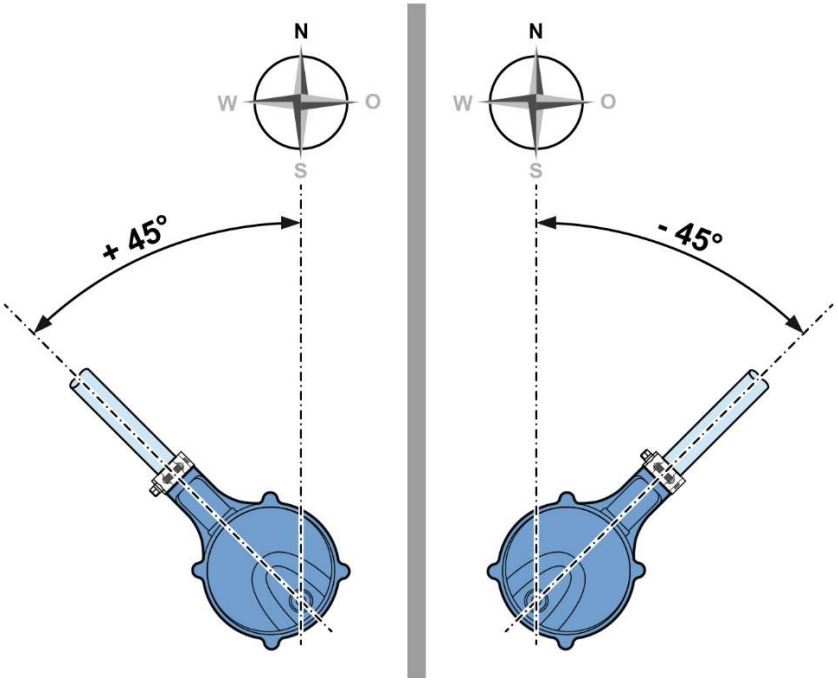
Under **GPS – Location height** you can select between Manual and Auto configuration. Using **Auto (GPS)** mode, WS10 will retrieve the altitude from its internal GPS sensor. In **Manuel** mode you can specify your location height manually.



7.1.4 Manual adjustment to the north

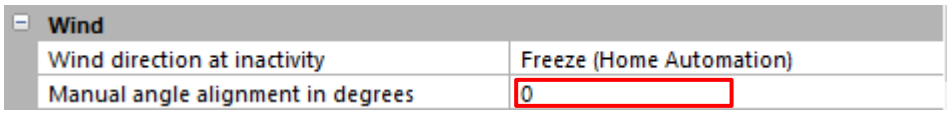
In rare occasions there is a need to manually adjust the WS10 to the north. This could be the case if the WS10 is mounted close to a strong magnetic field or large steel constructions.

To manually adjust the WS10 to the north, you must enter the difference in degree between the WS10 connector and the magnetic north.



Through the ⚙ Button in the ConfigTool.NET you get to the configuration menu.

Under **Wind – Manual angle alignment in degrees** you can enter the direction of the WS10.



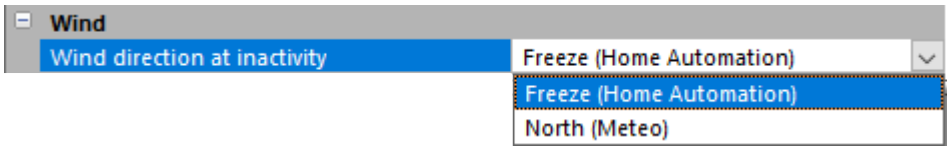
7.1.5 Wind direction at calm winds

The WS10 offers two ways to report wind direction at calm winds.

1. Freeze – means the WS10 reports the last measured wind direction
2. North – means the WS10 reports 0° as wind direction

Through the ⚙ Button in the ConfigTool.NET you get to the configuration menu.

Under **Wind – Wind direction at inactivity** you can make your choice what should be reports at calm winds.



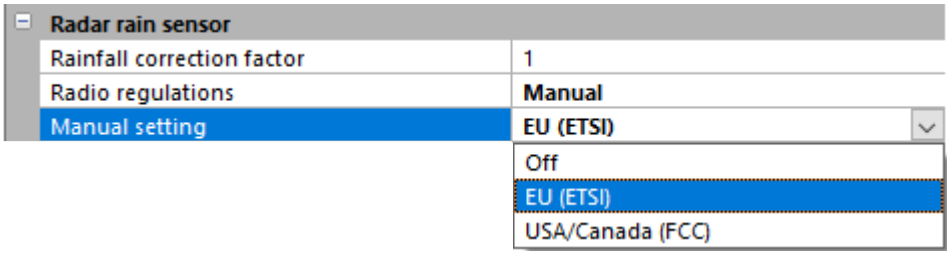
7.1.6 Manual activation of precipitation radar

Because of country individual regulation the precipitation radar is switched of automatically by a geofencing algorithm in countries where there is no approval.

If you want to manually switch on the precipitation radar, you can use the ConfigTool.NET to do so.

Through the ⚙ Button in the ConfigTool.NET you get to the configuration menu.

Under **Radar rain sensor – Radio regulations** you need to select **Manual**
and under **Manual setting** you need to choose the country standard you want to comply to.

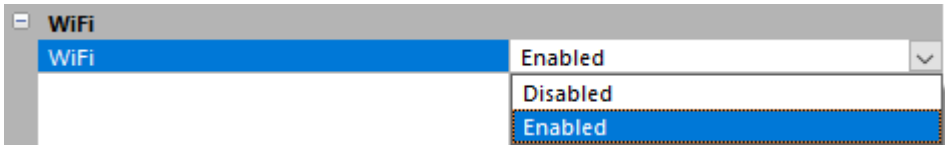


⚠ Caution

The operation of precipitation radar outside the approved countries is not permitted by law. The operator acts at his own risk and is responsible for a possible criminal liability itself. Lufft rejects any liability for the operation of precipitation radar outside the countries approved by Lufft.

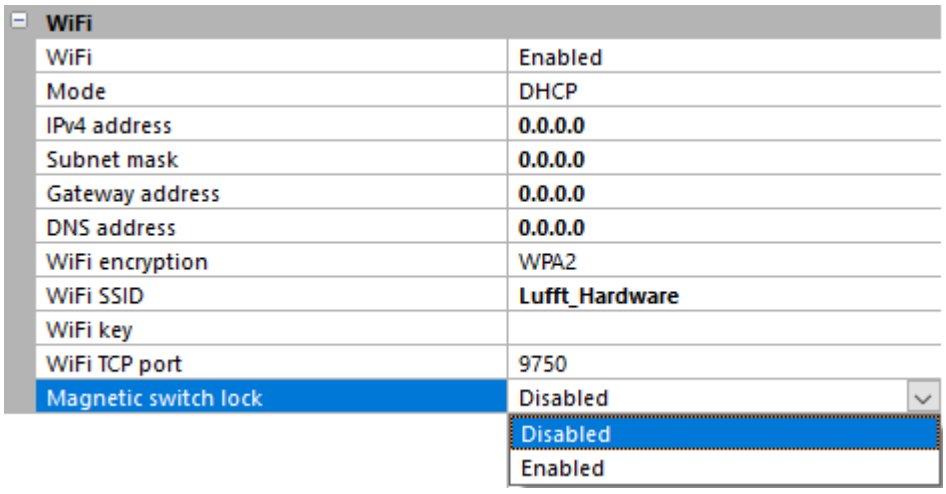
7.1.7 Deactivating the Wi-Fi

If you do not use the Wi-Fi connection, you can switch off the Wi-Fi function in the configuration menu.



7.1.8 Activating the reed contact lock

To prevent deleting the configuration accidentally you can lock the function of the reed contact in the configuration menu.



7.1.9 Reset into configuration mode

If the WS10 is due to miss configuration not accessible anymore through the WLAN, you can reset the WS10 to the configuration mode in two ways.

1. Position a magnet close to the housing where you can read ‘Reed’ on the housing.
2. Connect B+ to Pin 5 of the WS10 connector

Switching to the configuration mode is indicated by a short blue flashing of the status LED.

If the WS10 is in configuration mode, this is indicated by a green flashing every 10s of the status LED.

Please note that configuration mode is only active for 30min.

7.2 Communication with Weather Underground

To see the WS10 measurement values online in the public internet a Weather Underground connection is necessary.

- ⇨ Call the Weather Underground site https://www.wunderground.com
- ⇨ Choose “More” and “Add Weather Station”
- ⇨ Step 1: Register Your Station choose ”Join”
- ⇨ Enter your email-Address and choose a password
- ⇨ Read the ‚Terms of Service‘ and agree to them by checking the respective box
- ⇨ Click the button ‘Sign up’ to finalize the registration

After a successful registration you can register your weather station in some additional simple steps

Step 1:

- ⇨ Push the red point to the geographical location of your WS10 weather station
- ⇨ If the WS10 weather station is close to a house with a postal address, you can also find your location by adding this address
- ⇨ The coordinates and the height above sea level is automatically generated by the map

Step 2:

- ⇨ On the next page, please add additional information. The only thing necessary is an entry in ‚neighborhood‘
- ⇨ ‚Station hardware‘ has to be set to ‚other‘

After a successful registration of your WS10 weather station, Weather Underground will send you a Station ID and a Station Password.

For your convenience and later use, you can note it here:

Station ID	
Station Password	

Station ID and Station Password will be needed for the WS10 configuration.

7.3 Communication through COM1 / RS485

For the communication to the weather station WS10 you'll need the UMB-ConfigTool.Net software tool from Lufft.

The functionality and configuration of the UMB-ConfigTool.Net software tool is described in the online help of the tool. The online help can be used without internet connection.

With the UMB-ConfigTool.NET software tool you can completely configure the WS10.

7.4 Communication Protocols

The command "PRT=<value>" reads/sets the used communication protocol based on the values shown in the table below:

<value>	protocol
0*)	UMB-binary
5	MODBUS-RTU
6	MODBUS-ASCII
9	UMB-ASCII 2.0

*) factory setting

The change to another communication protocol will need a restart of the WS10 to take effect.

7.4.1 UMB binary

UMB binary is the standard protocol used for configuration of the WS10 with the ConfigTool.NET.

You'll find to documentation for download on the Lufft internet web site www.Lufft.com.

7.4.2 UMB-ASCII 2.0

The messages of the UMB-ASCII 2.0 protocol are highly customizable. Therefore, you can change your messages to fit most of the data logger hardware.

auto sending	Send a message automatically in the configured interval
interval	Time in seconds between the automated sending of messages
start character	ASCII-char used as start sequence for a message Factory setting: 2 / 02h (STX)
end character	ASCII-char used as end sequence for a message Factory setting: 4 / 04h (EOT)
decimal separator	Char used as decimal separator Factory setting: Point 46 / 2 Eh (“.”)
parameter separator	Char used as parameter separator Factory setting: Semicolon 58 / 3 Bh (“;”)
block separator	Char used as block separator Factory setting: Colon 58 / 3Ah (“:”)
line end	Char used for line end Factory setting: CRLF (0Dh, 0Ah) alternative CR (0Dh) or LF (0Ah)

In this chapter it will only described the WS10 specific command SS.

A comprehensive UMB-ASCII 2.0 documentation you find under www.lufft.com.

With the command SS you can inquire predefined standard sets:

set 1 (metric)	set 2 (imperial)	Digits before decimal point	Digits after decimal point	signed
Air temperature [°C]	Air temperature [°F]	2	1	yes
Rel. air pressure [hPa]	Rel. air pressure [hPa]	4	1	no
Rel. humidity [%]	Rel. humidity [%]	2	1	no
Dew point [°C]	Dew point [°F]	2	1	yes
Wind speed [m/s]	Wind speed [mph]	2	1	no
Corr. Wind direction [°]	Corr. Wind direction [°]	3	1	no
Precipitation type (see chap. 0)	Precipitation type (see chap. 0)	2	0	no
Precipitation intensity [mm/h]	Precipitation intensity [inch/h]	2	2	no
Global radiation [W/m²]	Global radiation [W/m²]	4	0	no
UV-Index	UV-Index	2	0	no
Brightness [kLx]	Brightness [kLx]	3	1	no

7.4.2.1 Command SS (standard-set request)

Syntax request:

```
< UMB-Address>:<RequestNr>:<SS>;<SetNum><CR><LF>
```

Syntax answer:

```
<STX>< UMB-Address>:<RequestNr>:<SS>;< SetNum>=<TelegrammNr>;<
Payload> :<Status>:<Checksum><CR><LF><EOT>
```

Example:

Request of standard-set 1:

Request:

```
7001:00:SS;1<CR><LF>
```

Anwser:

```
<STX>7001:00:SS;1=000;+23.8;0986.3;24.3;-
1.0;00.0;299.0;00;00.00;0000;00;000.1:00:0C <CR><LF><EOT>
```

Request of standard-set 2:

Request:

```
7001:00:SS;2<CR><LF>
```

Answer:

```
<STX>7001:00:SS;1=000;+74.9;0986.3;24.3;30.3;00.0;299.0;00;00.00;0000;00
;000.1:00:FD

<CR><LF><EOT>
```

7.4.3 Modbus

For a simpler integration of WS family Smart Weather Sensors into a PLC environment the Modbus communication protocol has been made available.

Measurement values are mapped to Modbus Input Registers. The range of values available is basically the same as for the UMB protocol, including different unit systems.

In the interest of simple and safe integration the use of register pairs for floating point values or 32 bit integers, which is not part of the Modbus standard, has not been applied. All measurement values are mapped to 16bit integers using suitable scaling factors.

7.4.3.1 Modbus communication parameter

The Smart Weather Sensor can be configured for MODBUS-RTU or for MODBUS-ASCII.

The base configuration must be done using the UMB Config Tool.

When selecting MODBUS RTU or MODBUS-ASCII with the UMB Config Tool, communication parameters 19200 Bd, even parity, will be preselected.

Modbus operating modes:	MODBUS-RTU, MODBUS-ASCII
Baud rate:	19200 (9600, 4800 or lower)
Interface Setting	8E1, 8N1, 8N2

The Modbus communication has been tested for a poll rate of 1 sec. The proper function of the Smart Weather Sensor with higher Modbus poll rates has not been tested.

We suggest to set the poll rate to 10 sec or slower, as, with the exception of the channels „wind speed / wind directions fast“, which are provided for special purposes, the update rate of the data is >= 10sec. However, for most of the weather data, significant changes should be expected in the range of minutes.

7.4.3.2 Addressing

The Modbus address is deducted from the UMB device ID.

A device with UMB device ID 1 also has the UMB address 1, etc.

The valid address range of Modbus from 1 to 247 is smaller than that of the UMB device IDs. If a UMB device ID > 247 has been selected, the Modbus address will be set to 247.

7.4.3.3 Modbus functions

The functions of conformance class 0 and 1 have been implemented as far as they are applicable for the Smart Weather Sensor, i.e. all functions operating on register level.

	Conformance Class 0	
0x03	Read Holding Registers	Selected configuration settings
0x16	Write Multiple Registers	Selected configuration settings
	Conformance Class 1	
0x04	Read Input Registers	Measurement values and status information
0x06	Write Single Register	Selected configuration settings
0x07	Read Exception Status	Currently not used
	Diagnostics	
0x11	Report Slave ID	(responds also to broadcast address)

7.4.3.4 Holding Register

Reg. No.	Reg. Addr	Function	Values	Scale
1	0	Local altitude	Altitude in m, for calculation of relative air pressure Value range -100 … 5000	1.0
2	1	Local altitude adjustment	0: Automatic via GPS 1: Manually	10.0
4	3	Station longitude	Value range -90…90	100.0
5	4	Station latitude	Vaue range -180 …180	100.0
6	5	UTC local time offset in min	Vaue range -720…840	1
8	7	Reset rainfall	Function only when writing to the register, reading will give 0 always	-
9	8	Device reset	Function only when writing to the register, reading will give 0 always	-

7.4.3.4.1 Function 0x03 Read Holding Registers

The functions of conformance class 0 and 1 have been implemented as far as they are applicable for the Smart Weather Sensor, i.e. all functions operating on register level.

7.4.3.4.2 Function 0x06 Write Holding Register, 0x10 Write Multiple Registers

By writing into the holding registers selected parameters of the Smart Weather Sensor can be adjusted through Modbus.

Register assignment see 7.5.3.4

Local altitude, compass deviation and averaging intervals are set by writing the new values into the related registers. Depending on the selected register the value must be scaled by the factor given in the table:

Example: for compass deviation, the table shows a scaling factor of 10.0. If the deviation is 4.8° a value of 48 shall be written into register 2 (reg.addr. 1).

The transmitted values will be checked for plausibility. Illegal values will not be accepted and cause a Modbus exception.

When writing the value 0x3247 (12871d) to register no. 8 (reg. addr. 7) the stored absolute rain amount will be set to 0. Subsequently a device reset will be initiated.

When writing the value 0x3247 (12871d) to register no. 9 (reg. addr. 8) a device reset will be initiated.

7.4.3.5 Input Register

7.4.3.5.1 Measurement values - Status

Reg. Nr.	Reg. Adr.	Value (UMB Channel)	Range	Scaling	signed/unsigned, Remarks
1	0	Identification		1	unsigned
2	1	Device status (low)	0..65535	1	unsigned
3	2	Device status (high)	0..65535	1	unsigned
Channel status (State- and error codes according to UMB-Binary-Protocol definition)					
4	3	Sensor status Temperature	0..255	1	unsigned
5	4	Sensor status Humidity	0..255	1	unsigned
6	5	Sensor status Air pressure	0..255	1	unsigned
7	6	Sensor status Wind	0..255	1	unsigned
8	7	Sensor status Precipitation	0..255	1	unsigned
9	8	Sensor status Global radiation	0..255	1	unsigned
10	9	Sensor status UV-Index	0..255	1	unsigned
11	10	Sensor status Brightness	0..255	1	unsigned
12	11	Sensor status Compass	0..255	1	unsigned
13	12	Sensor status position of the sun	0..255	1	unsigned
14	13	Sensor status GPS receiver	0..255	1	unsigned For verficiation of GPS signal please also check Reg. addr. 148.
17	16	UTC Time (low)	0..65535	1	[s], unsigned
18	17	UTC Time (high)	0..65535	1	[s*65535], unsigned
19	18	Run time	0..65535	10	[s], unsigned

The identification register is coded as follows:

Byte[0] …Software Version (e.g.: 10 -> Version 1.0)
Byte[1] …Device subclass (for internal usage only)

The device status register offers an UMB coded error status of the devices. For further information to this error codes please refer to the UMB procotol documentation.

7.4.3.5.2 Measurement values - Metric

Reg. Nr.	Reg. Adr.	Value (UMB Channel)	Range	Scaling	signed/unsigned, Remarks
20	19	Air Temperature	-40..60 °C	10	signed
24	23	Dewpoint Temperature	-40..60 °C	10	signed
30	29	Relative Humidity	0..100 %	10	unsigned
32	31	Absolute Humidity	0..100 g/m³	10	unsigned
38	37	Absolute Air Pressure	300..1100 hPa	10	unsigned
40	39	Relative Air Pressure	300..1100 hPa	10	unsigned
46	45	Wind Speed	0..40 m/s	10	unsigned
50	49	Wind Speed	0..144 km/h	10	unsigned
54	53	Wind Direction	0..360°	10	unsigned
55	54	Wind Direction (compass correction)	0..360°	10	unsigned
56	55	Compass Direction	0..360°	10	unsigned
60	59	Precipitation	0..655,3 mm	100	unsigned
61	60	Precipitation diff.	0..100 mm	100	unsigned
62	61	Precipitation Type	0..255	1	unsigned
63	62	Precipitation Intensity	0..100 mm/h	100	unsigned
64	63	Precipitation Intensity	0..1,6667 mm/min	10000	unsigned
65	64	Daily Precipication	0..655,3 mm mm	100	unsigned
69	68	Global Radiation	0..1500 W/m²	10	unsigned

Reg. Nr.	Reg. Adr.	Value (UMB Channel)	Range	Scaling	signed/unsigned, Remarks
71	70	Position of the sun Azimuth	0..360 °	10	Unsigned
72	71	Position of the sun Elevation	0..90 °	10	Unsigned
75	74	UV-Index	0..20	1	unsigned
76	75	Brightness	0..160 klx	10	unsigned
77	76	Twilight	0..500 lx	10	unsigned

7.4.3.5.3 Measurement values - Imperial

Reg. Nr.	Reg. Adr.	Value (UMB Channel)	Range	Scaling	signed/unsigned, Remarks
80	79	Air Temperature	-40..140 °F	10	signed
84	83	Dewpoint Temperature	-40..140 °F	10	signed
90	28	Relative Humidity	0..100 %	10	unsigned
92	91	Absolute Humidity	0..100 g/m³	10	unsigned
98	97	Absolute Air Pressure	300..1100 hPa	10	unsigned
100	99	Relative Air Pressure	300..1100 hPa	10	unsigned
106	105	Wind Speed	0..89,4775 mph	10	unsigned
110	109	Wind Speed	0..77,7538 kts	10	unsigned
114	113	Wind Direction	0..359°	10	unsigned
115	114	Wind Direction (compass correction)	0..359°	10	unsigned
116	115	Compass Direction	0..359°	10	unsigned

Reg. Nr.	Reg. Adr.	Value (UMB Channel)	Range	Scaling	signed/unsigned, Remarks
120	119	Precipitation	0..65,53 in	1000	unsigned
121	120	Precipitation diff.	0..3,973 in	10000	unsigned
123	122	Precipitation Intensity	0..3,973 in/h	10000	unsigned
124	123	Precipitation Intensity	0..0,06561 in/min	100000	unsigned
125	124	Daily Precipitation	0..65,53 in	1000	unsigned
129	128	Global Radiation	0..1500 W/m²	10	unsigned
131	130	Position of the sun Azimuth	0..359 °	10	Unsigned
132	131	Position of the sun Elevation	0..90 °	10	Unsigned
135	134	UV-Index	0..20	1	unsigned
136	135	Brightness	0..160 klx	10	unsigned
137	136	Twilight	0..500 lx	10	unsigned

7.4.3.5.4 Measurement values - Service

Reg. Nr.	Reg. Adr.	Value (UMB Channel)	Range	Scaling	signed/unsigned, Remarks
140	139	Supply Voltage	0..50 V	10	unsigned
141	140	Run Time (overall)	0..3931800 s	1/60	unsigned
142	141	Heater status	0..1	1	unsigned
143	142	Position Longitude	-180..180 °	100	signed
144	143	Position Latitude	-90..90 °	10	signed
145	144	Position Height Above Sea Level	-1000..10000 m	1	signed
146	145	Wifi status	0..65535	1	unsigned (see chap. 0)
147	146	Wifi signal strenth	-32768..32767	1	signed (see chap. 4.14.2)
148	147	GPS satellites received	0..255	1	unsigned
149	148	GPS Position locked	0..255	1	unsigned
150	149	Boot count	0..65535	1	unsigned
151	150	CPU load	0..65535	1	unsigned

7.4.3.6 Function 0x04 Read Input Registers

The input registers are containing the measurement values of the Smart Weather Sensor and the related status information.

The measurement values are mapped to the 16bit registers using scaling factors (0 … max. 65530 for unsigned values, -32762 … 32762 for signed values).

Values 65535 (0xffff) resp. 32767 are used for the indication of erroneous or not available measurement values. A more detailed specification of the error can be evaluated from the status registers.

The assignment of values to the available register addresses (0 … 124) has been arranged in a way so that the user can read the most frequently used data with few (ideally only one) register block requests

Following blocks have been defined:

- Status information
- Frequently used values which are independent of the unit system (met./ imp.) in use
- Frequently used values in metric units
- Frequently used values in imperial units
- Other measurement values

When using the metric unit system, the first three blocks can the supply all data usually required with one request.

There is no difference in the register assignment between the sub types of the WS family. If, dependent on the type, some value is not available, this will be indicated by setting the register to the error value.

For detailed information about measurement ranges, units etc. please refer to the related description of the UMB.

7.5 Maintanance

There is no need to regularly service the WS10.

However, if there is an accumulation of dirt on the WS10 surface, especially on the glass you should clean the surface.

To clean the glass you must only use water and dishwashing detergent. Don’t use any other detergent containing alcohol or any other acid.

8 Declaration of Conformity

8.1 EC Certificate of Conformity

Product: Smart Weather Sensor

Type: WS10 (Order No.: 8368.WS10P)

We herewith certify that the above-mentioned equipment complies in design and construction with the Directives of the European Union and specifically the EMC Directive in accordance with 2004/108/EC, the RoHS Directive 2011/65/EU and, where required, Directive 2014/53/EU.

The complete Certificate of Conformity is available for download from the Lufft website www.lufft.com.

8.2 WS10 FCC Compliance Statement (US)

Product: Smart Weather Sensor

Type: WS10 (Order No.: 8368.WS10P)

This device contains FCCID: UF9WS100.

This device complies with part 15 of the FCC Rules.
Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and

(2) this device must accept any interference received, including interference that may cause undesired operation.

Changes and modifications not expressly approved by manufacturer could void the user's authority to operate the equipment.

8.3 WS10 IC Compliance Statement (CA)

Product: Smart Weather Sensor

Type: WS10 (Order No.: 8368.WS10P)

This equipment contains equipment certified under ICID: 6650A-WS010.

This device complies with Industry Canada 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 received, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicable aux appareils radio exempts de licence.
L'exploration 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 bouillage est susceptible d'en compromettre le fonctionnement.

8.4 WS10 EN 300 440 Compliance Statement

Product: Smart Weather Sensor

Type: WS10 (Order No.: 8368.WS10**AP**)

This equipment contains equipment certified according to EN 300 440 for short range radio devices used in the 1GHz to 40GHz frequency range.

The radiation power is limited to 20mW.

9 Disposal

The disposal of this device has to be according to the European Union directive 2012/19/EU. Waste equipment must not be disposed of as household waste. The device should be recycled according to the electronic waste guidelines of the respective country.

10 Error handling and Error Codes

10.1 Error handling

Error	Action
Device does not start up	Check if you connected the device according to the specification. Check pinout and polarity of your supply voltage.
Device does not start despite existing power supply	Check whether the device supply line is connected to the correct power supply.

10.2 Status LED

LED	Meaning
Red – Green – Blue - White	Normal start up
Red slowly blinking	Hardware defect → Disconnect the device from the supply voltage for approx. 5min. and put it back into operation. → If the error is displayed again, send the device to the manufacturer
White slowly blinking	Configuration error → Check the device configuration
Green short blink every 10 sec	WS10 in Wi-Fi access mode
Blue - Green short blink every 10 sec	WS10 in Wi-Fi access mode forced through configuration pin

10.3 Error codes UMB

Status	Definition	Description
00h	OK	No Error
20h	LESE_ERR	Reading Error
23h	UNGLTG_ADRESS	Invalid Address
…	…	…

A detailed UMB documentation can be found on the internet under www.lufft.com

11 Technical Data

11.1 Electrical Data

Supply Voltage	9…36 V DC
Current Consumption	850 mA bei 9 V / 230 mA bei 24 V
Dome heating	24 VA @ 24VDC
Maximum input power	32,5 VA @ 24 VDC
Fuse supply Voltage	2,5 A (slow blow)
Protection Class	IP 66

11.2 Measurements

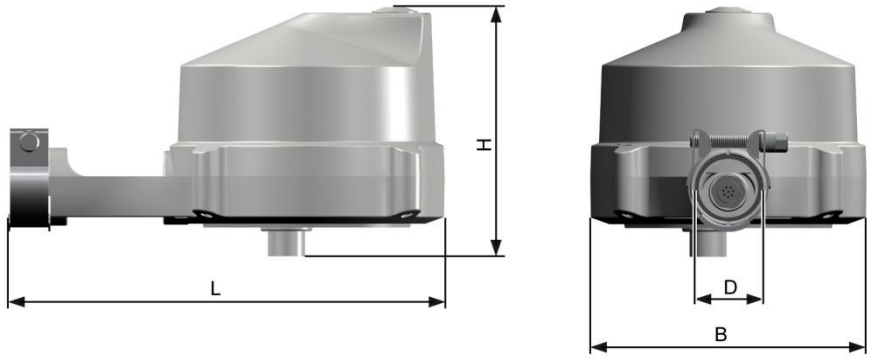
Air Temperature	Range	- 40 … 60 °C
	Accuracy	±1,0 °C (-5 … +25 °C, Wind > 2m/s), otherwise < ±2,0 °C, with inactive dome heating
Relative Humidity	Range	0 … 100 %
	Accuracy	±5% (@ 20°C and < 80% rH)
Air Pressure	Range	500 … 1100 hPa
	Accuracy	±0,5 hPa (at room temperature 25 °C)
Wind Speed	Range	0 … 40 m/s
	Accuracy	±1 m/s or 5 %, the larger value is valid
Wind Direction	Range	0 … 360°
	Accuracy	± 10°
Precipitation Amount	Range	0 … 10000 mm
	Accuracy	±2 mm or 20 % under laboratory conditions, the larger value is valid. Observation period 24h
Precipitation Intensity	Range	0 … 30 mm/h
	Accuracy	20 % under laboratory environment
Precipitation Type	Range	Rain, Snow, Sleet, Freezing Rain, Hail
Global Radiation	Range	0 … 1300 W/m^2
	Accuracy	10% or ±120 W/m^2, larger value is valid
UV-Index	Range	0 … 13
Brightness	Range	0 … 120 klx
	Accuracy	±5 % of measured value
Twilight	Range	0 … 500 lx
	Accuracy	±10 lx

11.3 Interfaces

Wired	RS485 2-wire, 5 V
Baud rate	9600…115200 Baud (Standard 19200 Baud)
WLAN	802.11:b/g/n

WLAN Security	WPA2/WPA Personal, WPA2/WPA Enterprise

11.4 Mechanical data



Dimensions (L x B x H)	227 mm x 145 mm x 130 mm
Weight	0,5 kg
Tube size (D)	35 mm

11.5 Environmental Conditions

Operating Conditions	-40 °C…+60 °C
Storage Conditions	-60 °C…+85 °C
Humidity	0…100 % rH (non condensing)

12 Appendix

12.1 Approved Countries for precipitation radar

Part.-Nr.	Countries	Frequency	Power
8368.WS10P	EU All members of the European Union	24.000 - 24.075 GHz	100mW
	Swiss	24.000 - 24.075 GHz	100mW
	Island	24.000 - 24.075 GHz	100mW
	Norway	24.000 - 24.075 GHz	100mW
	USA	24.075 - 24.175 GHz	100mW
	Canada	24.075 - 24.175 GHz	100mW
8368.WS10AP	China	24.000 – 24.250 GHz	20mW

The correct radar frequency is automatically adjusted by the position reading through the GPS module.

The use of the radar function of the WS10 in all other regions besides the above mentioned list is not allowed.

13 Contact

For warranty and repair, please contact:

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