

- Compact weather station to measure the most important meteorological parameters
- Implemented GPS receiver
- RS485
- Modbus protocol



Description

The CLIMA SENSOR US is used for acquisition of the most important meteorological parameters. Depending on the development level the device supplies measured data for:

- wind speed and direction, averaging acc. to WMO-recommendations
- air temperature
- relative humidity
- barometric air pressure
- precipitation
- brightness

The compact design, simple mounting and different options for data output permit operation with numerous applications.

Wind speed and **wind direction** are determined by acquiring 2-dimensional horizontal components of ultrasonic measurement paths positioned at right angles in relation to each other. The speed of sound can be additionally used to calculate and output the acoustic virtual temperature. The ultrasonic measurement principle allows inertia-free measurement of gusts and peak values.

Air temperature and **relative humidity** are measured via a built-in precision combination sensor, which is equipped with a weather and radiation shield. **Barometric air pressure** is measured with a MEMs (micro-electro-mechanical system) sensor, based on piezoresistive technology.

Measurement of the **precipitation intensity** are contactless using a signal reflected with a Doppler radar. When calculating, the intensity captured for the last minute is extrapolated to an output for one hour. The **type of precipitation** can roughly be determined from the measured values of rainfall speed, intensity, temperature and humidity.

Brightness is captured by 4 photo sensors with spectral sensitivity curve. The direction of the light source is calculated using the prevailing intensity conditions. The logarithmic intensity characteristic of the photo sensors allows light intensities to be measured and output in a wide range between 1 – 150,000 lux.

A **GPS receiver** is used for the determination of position and as a real-time source. Additionally, it is used to calculate the current position of the sun. Position, time and position of the sun are provided via the RS485 / RS422 interfaces.

A **RS485/422 interface** is available for serial communication. It can be operated in full or half duplex mode. Predefined data telegrams are available for outputting measured values (e.g., VD, VDT, NMEA, etc.). A Modbus RTU protocol is additionally implemented for extended standardised communication. The device can be switched to Modbus RTU mode with the relevant command.

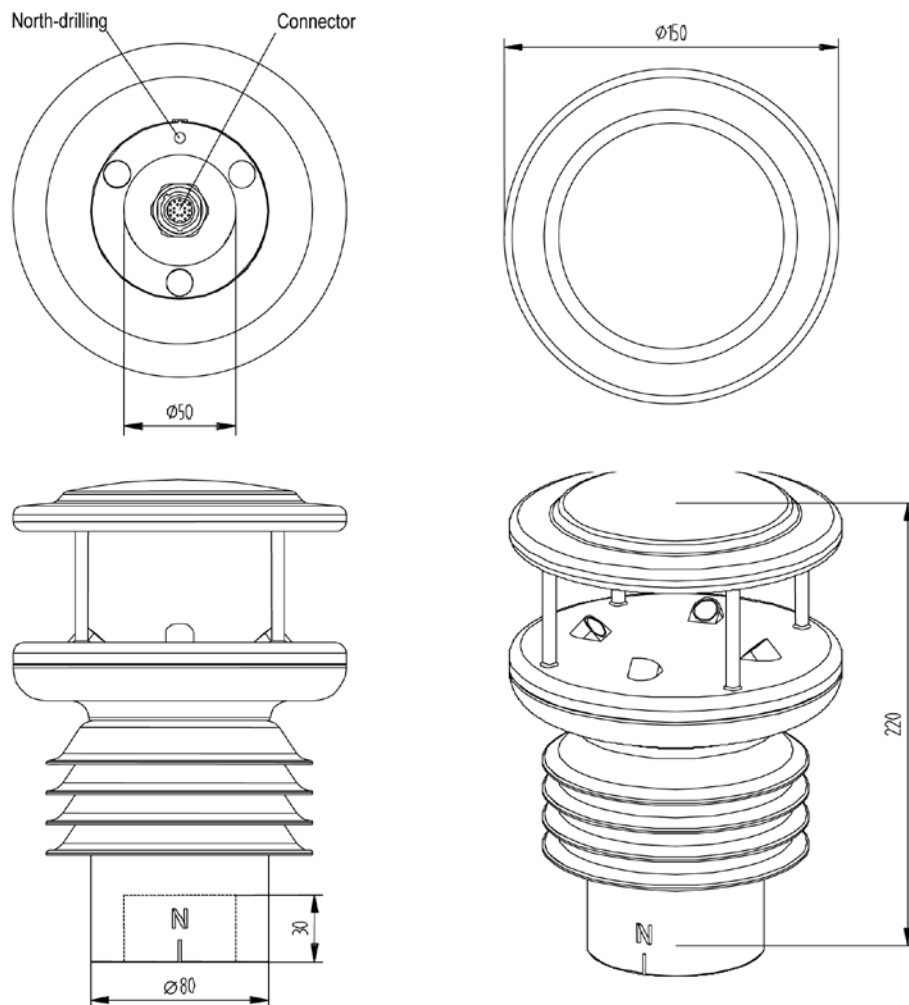
The CLIMA SENSOR US is equipped with a built-in heating system.

Specifications (1/2)

Wind speed	
Measuring range	0.01 ... 60 m/s (Scaling of analog output freely selectable)
Accuracy	≤ 5 m/s: ± 0.3 m/s (rms - mean over 360°) 5 ... 60 m/s: $\pm 3\%$ of measured value (rms - mean over 360°)
Resolution	0.1 m/s: in telegrams 1, 2, 3, 5, 6 0.01 m/s: in telegram 14
Wind direction	
Measuring range	0 ... 360°
Accuracy	$\pm 2.0^\circ$ @ wind speed > 2 m/s
Resolution	1°: in telegrams 1, 2, 3, 4, 6 0.1°: in telegrams 5, 14
Virtual temperature	
Measuring range	-40 ... +80°C
Accuracy	± 0.5 K
Resolution	0.1 K
Air temperature	
Measuring range	-40 ... +80°C
Accuracy	± 0.3 K @ 25°C, ± 1.0 K above -40 ... +80°C
Resolution	0.1 K
Long-term stability	< 0.04 K per year
Air humidity, relative	
Measuring range	0 ... 100% relative humidity
Accuracy	$\pm 1.8\%$ of 10 ... 90%, $\pm 3.0\%$ of 0 ... 100%
Resolution	0.1%
Long-term stability	< 0.5% per year
Air pressure	
Measurement range	300 ... 1100 hPa
Accuracy	± 0.25 hPa @ +10 ... +35°C ± 1 hPa @ -20 ... +60°C
Resolution	0.1 hPa
Long-term stability	< ± 1 hPa per year
Brightness	
Measuring range	1 lux ... 150 klux
Accuracy	0.3% of relative measured value
Resolution	approx. 0.3% of measuring value
Precipitation	
Measuring range	Intensity: 0.001 ... 999 mm/h (Resolution intensity: 0.001 mm/h) Daily total: 0.01 ... 999 mm (Resolution daily total: 0.01 mm)
Droplet size	0.25 ... 5.0 mm (large as hail)
Accuracy with precipitation	with 95% of the precipitations deviations less than 15% compared with Thies Laser Precipitation Monitor (Reference)
Type of precipitation	Rain, snow, sleet, ice crystals, hail

Specifications (2/2)

Digital output digital	
Interface	RS485 / RS422 (Electrically isolated from supply)
Baud rate	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600 selectable
Output	Instantaneous values, sliding means from 100 msec to 2 min in increments of 100 msec freely selectable
Output rate	One per 10 msec to one per 60 seconds in increments of 1 msec freely selectable
Protocol	ASCII Thies / Modbus RTU
Data output analog	
Electrical outputs	0 ... 10 V (Electrically isolated from supply)
	Permissible burden on voltage output: $\geq 2000 \Omega$
Output	Instantaneous values, sliding means from 100 msec to 2 min in increments of 100 msec freely selectable
Output rate	Update rate 10 msec
Resolution	16 bit
General information	
Internal measuring rate	Wind: up to 500 propagation time measurements per second, up to 125 complete measuring sequences/second incl. calculations Temperature, humidity, air pressure, precipitation, brightness: updated 1x per second
Bus mode	Bus mode with up to 99 devices possible
Firmware update	Via RS422 / RS485 in full-duplex and half-duplex mode
Operating voltage	Supply <u>without</u> cover heating: 6 ... 40 V DC or 10 ... 28 V AC 50Hz / 60 Hz typ. 50 mA @ 24 V Supply <u>with</u> cover heating: 24 V AC/DC $\pm 15\%$, typ. 25 W @ 24 V nominal
Operating temperature	-30 ... +70 °C (Storage temperature: -55 ... +80°C)
Dimension / Weight	150 mm (diameter) x 220mm (height) / approx. 900g
Connection	19-pin plug connection
Protection	IP 67
Housing	Plastic: LEXAN (polycarbonate, UV-stabilised) impact and weather-resistant
Mounting	on mast tube R1½" ($\varnothing 48.3$ mm)
Manufacturer	Thies
Accessories	Module set M83555 (incl. isolated repeater) or M83575 (incl. isolated repeater)

Dimensional drawing

Mechanical installation

Proper installation of the CLIMA SENSOR US is carried out using a tube socket R1½" (Ø 48.3 mm) and at least 30 mm in length. The inside diameter of the tube socket must be at least 30 mm as the electrical connection of the CLIMA SENSOR US is carried out at the bottom of the device. After connection the CLIMA SENSOR US is then mounted on the tube or mast socket. The marking for north on the device must be aligned to north. The device is fixed to the shaft with the two Allen screws (AF 4 mm).


Maintenance

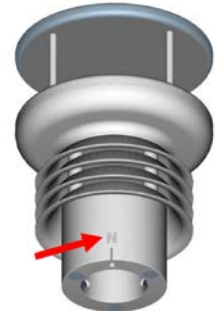
The CLIMA SENSOR US does not have moving parts. Thus it is not subject to wear during operation, only minimal servicing is required. It is recommended cleaning the device from soil using water.

Alignment to north

For exact determination of the wind and brightness direction the CLIMA SENSOR US must be installed aligned to north (true north). When aligning the device, the marking for north (N) must point to north (true north). To do so, select a conspicuous feature of the landscape to the north or south with a compass and turn the mast or sensor until the marking for north points to true north.

When aligning the device to north using a compass, bear in mind the magnetic variation (= deviation in the direction of the compass needle from true north) and possible interference from magnetic fields (e.g., iron parts, electric cables).

The lower edge of the sensor base is equipped with a bore for north aligned to the marking for north. This bore allows a mast adapter with a pin for north to be used here. The mast adapter is not included in the scope of supply.



Sensor connection to Ammonit Meteo-40 data logger

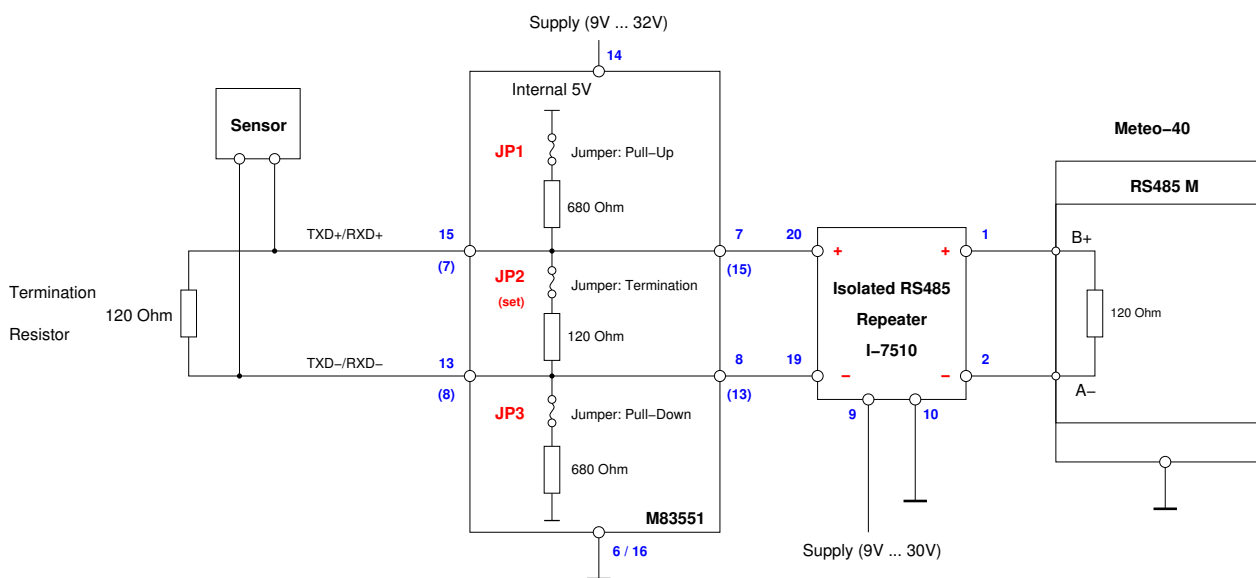
Sensor	Plug Pin No.	Ammonit Cable Wire Colour	Meteo-40 RS485M	Supply Sensor
Data	K	brown	Tx-	
Data	L	white	Tx+	
Ground	I	green, yellow		Signal Ground
Supply	E, F	red, pink		(+)24V AC/DC
Supply	D, G	grey, blue		(-)24V AC/DC

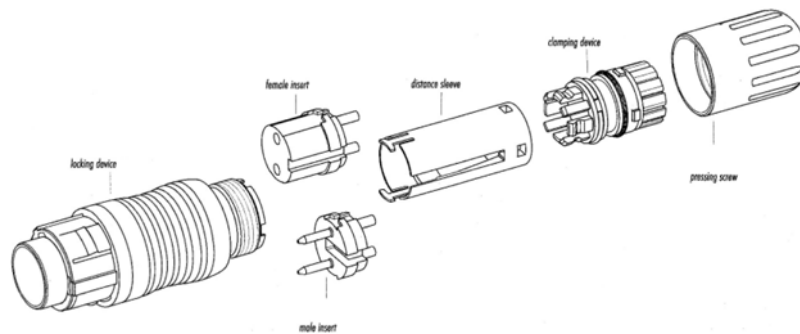
Connect the shield logger-sided to Ground (GND)
Cable type: LiYCY (TP) 4 x 2 x 0.25mm²

Note:
Cable is subject to change depending on the required cable length.

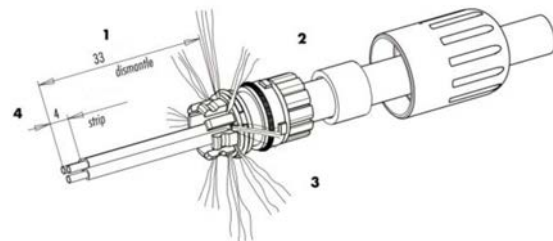
Sensor connection diagram to Ammonit Meteo-40 data logger

In order to connect the sensor to the Ammonit Meteo-40 data logger, an additional module set (M83555 or M83575) has to be implemented between sensor and data logger.

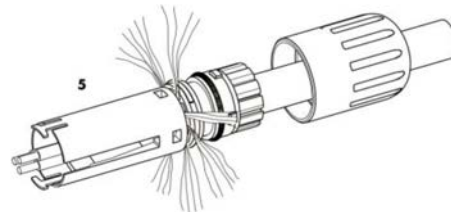


Plug and cable assembly
Socket outlet 212812, 19-pin, Type: Binder, Serial 440, EMC


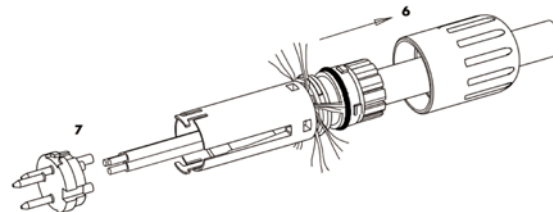
1. Strip over L = 33mm
Do not remove sheath.
2. Slip on pressing screw and clamping device.
Remove sheath.
3. Strip wire strands and tin-coat.
4. Fan / comb out shielding. Thread shields wires into crown all round.



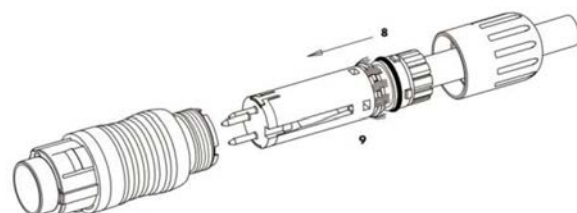
5. Engage distance sleeve and clamping device.



6. Slide assembled unit backwards over cable (approx. 10mm).
7. Solder inserts in place.



8. Slide assembled unit forwards until it engages in the contact insert.
9. Draw shield wires towards shielding ring and shorten.
Too long: wires on packing ring - no seal
Too short: no contact with shaft ring



10. Insert assembled unit in carrier sleeve.

