



# **P03/3-Mod bus and P03/3-Mod bus-GPS Weather Stations for Mod bus**

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**Technical specifications and installation instructions**  
from version 2.0



# 1. Description

The **P03/3-Modbus and P03/3-Modbus-GPS Weather Stations** measure temperature, wind speed and brightness (eastern, southern and western sun) and recognize precipitation.

The **P03/3-Modbus-GPS** additionally receives the UTC signals (Universal Time Coordinated) as well as the site coordinates via an integrated GPS receiver. The direction of the sun (azimuth) as well as its height (elevation) are calculated and indicated, too.

Data are usually output after a request made by the Modbus master via a 2-wire RS485 connection. Furthermore, the weather station can communicate with a PC, an SPS or an MC.

The weather station has four ports; the data output is made via the terminals A and B. Here, an IC is used that can operate with up to 128 participants on one bus (TI SN65LBC184D).

Terminals 1 and 2 are provided for the power supply (24 V DC). The ports are not protected against reverse polarity. If they are wrongly connected, the interface modules will be destroyed.

## Functions:

- **Brightness measurement** with three separate sensors for east, south and west. Recognition of twilight/dawn with special filters
- **Wind measurement:** The wind strength measurement takes place electronically and thus noiselessly and reliably, even during hail, snow and sub-zero temperatures. Even turbulent air and anabatic winds in the vicinity of the weather station are recorded
- **Temperature measurement**
- Heated precipitation sensor (1.2 watts): No false reports as a result of fog or dew. Dries quickly after precipitation has stopped
- **P03/3-Modbus-GPS only:** Integrated GPS receiver. Output of UTC (Universal Time Coordinated), position (degree of longitude and latitude) and position of the sun (azimuth, elevation)

## 1.1. Technical specifications

Housing	Plastic material
Colour	White / translucent
Mounting	On-wall
Protection category	IP 44
Dimensions	approx. 96 × 77 × 118 (W × H × D, mm)
Weight	approx. 160 g
Ambient temperature	Operation -30...+50°C, Storage -30...+70°C
Operating voltage	12...40 V DC (12...28 V AC). An appropriate 20 V AC power supply unit can be obtained from Elsner Elektronik.

Cable cross-section	Massive conductors of up to 0.8 mm <sup>2</sup>
Current	max. 80 mA, residual ripple 10%
Data output	RS485 2-wire
Protocol	Modbus RTU
Heating rain sensor	approx. 1.2 W
Measurement range temperature	-40...+80°C
Resolution (temperature)	0.1°C
Accuracy (temperature)	±1.5°C at -25...+80°C
Measurement range wind	0...35 m/s
Resolution (wind)	0,1 m/s
Accuracy (wind)	at ambient temperature -20...+50°C: ±22% of the measurement value when incident flow is from 45...315° ±15% of the measurement value when incident flow is from 90...270° (Frontal incident flow corresponds to 180°)
Measurement range brightness	0...99 000 lux
Resolution (brightness)	1 lux at 0...120 lux 2 lux at 121...1 046 lux 63 lux at 1 047...52 363 lux 423 lux at 52 364...99 000 lux
Accuracy (brightness)	±35%

The following standards have been considered for the evaluation of the product in terms of electro magnetic compatibility:

- EN 60730-1:2000-11 + A11:2002

The product has been tested for the above mentioned standards by an accredited EMV laboratory.

## 2. Installation and commissioning

### 2.1. Notes on installation



**Installation, inspection, commissioning and troubleshooting of the device must only be carried out by a competent electrician.**

Disconnect all lines to be assembled, and take safety precautions against accidental switch-on.

The device is exclusively intended for appropriate use. With each inappropriate change or non-observance of the instructions for use, any warranty or guarantee claim will be void.

After unpacking the device, check immediately for any mechanical damages. In case of transport damage, this must immediately notified to the supplier.



**If damaged, the device must not be put into operation.**

If an operation without risk may supposedly not be guaranteed, the device must be put out of operation and be secured against accidental operation.

The device must only be operated as stationary system, i.e. only in a fitted state and after completion of all installation and start-up works, and only in the environment intended for this purpose.

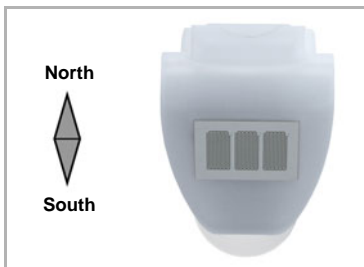
Elsner Elektronik does not assume any liability for changes in standards after publication of this instruction manual.

### 2.1.1. Installation position

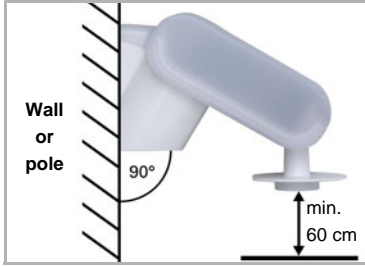
Choose an installation position in the building where wind, rain and sun can be measured unhindered by the sensors. The weather station must not be installed underneath any structural parts from which water can still drip onto the rain sensor after it has stopped raining or snowing. The weather station must not be shaded by anything, such as building structures or trees. There must be at least 60 cm of free space underneath the weather station to allow it to measure the wind correctly and to prevent it from being snowed in when it snows. Please ensure that the extended awning does not cast shade on the unit, and that this is not protected from the wind.

Temperature measurements can also be affected by external influences such as by warming or cooling of the building structure on which the sensor is mounted, (sunlight, heating or cold water pipes).

Magnetic fields, transmitters and interfering fields from electricity consumers (e.g. fluorescent lamps, neon signs, switched-mode power supplies etc.) can interfere with or even cut out reception of the GPS signal.



*Fig. 1  
Align the weather station in a southward direction.*



*Fig. 2*  
The weather station must be mounted on a vertical wall (or a pole).



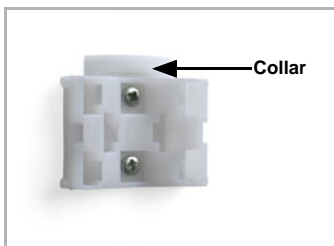
*Fig. 3*  
The weather station must be mounted in the horizontal transverse direction (horizontally).

### 2.1.2. Mounting the sensor

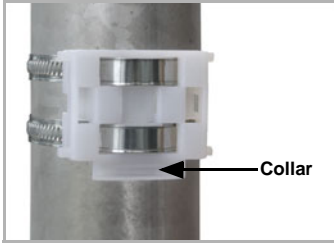
### 2.1.3. Attaching the mount

The sensor comes with a combination wall/pole mount. The mount comes adhered by adhesive strips to the rear side of the housing.

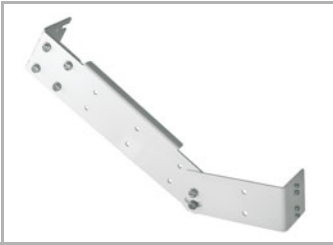
Fasten the mount vertically onto the wall or pole.



*Fig. 4*  
When wall mounting: flat side on wall, crescent-shaped collar upward.



*Fig. 5*  
*When pole mounting: curved side on pole, collar downward.*



*Fig. 6*  
*An additional, optional accessory available from Elsner Elektronik is an articulated arm for flexible wall, pole or beam mounting of the sensor.*



*Fig. 7*  
*Example uses of the hinge arm mounting: With the hinge arm mounting, the sensor peeps out from beneath the roof overhang.*

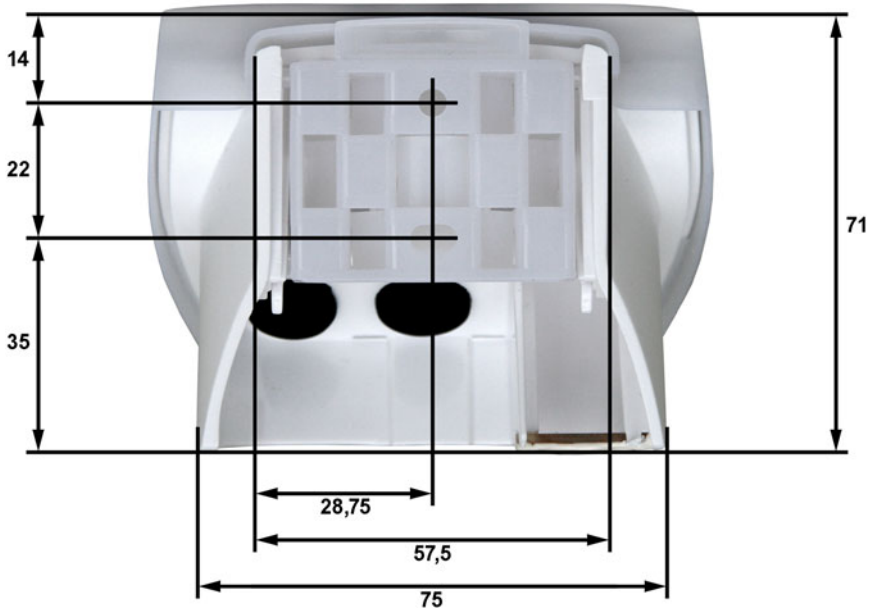
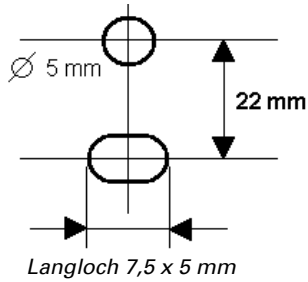


*Fig. 8*  
*Example uses of the hinge arm mounting: Fitting to a pole with worm drive hose clips*

## 2.1.4. View of rear side and drill hole plan

Fig. 9 a+b  
Drill hole plan

Dimensions of rear side of housing with bracket. Subject to change for technical enhancement.



### 2.1.5. Preparing the sensor

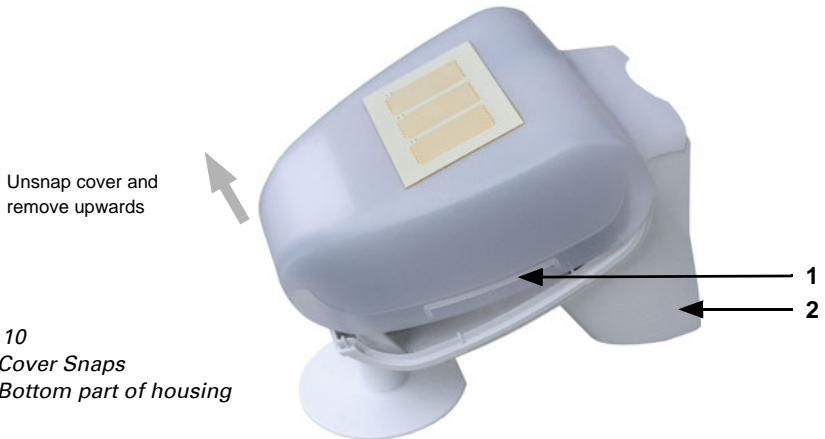


Fig. 10

1) Cover Snaps

2 Bottom part of housing

The weather station cover with the rain sensor snaps in on the left and right along the bottom edge (see figure). Remove the weather station cover. Proceed carefully, so as **not to pull off the wire** connecting the PCB in the bottom part with the rain sensor in the cover (wire with push-connector).

Push the connecting cable through the rubber seal on the bottom of the weather station and connect the power and bus cables to the terminals provided for this purpose. The connection is by typical telephone cable (J-Y(ST)Y 2 × 2 × 0.8).

The connection cable must be plugged in between the cover and circuit board.



## 2.1.6. PCB Layout

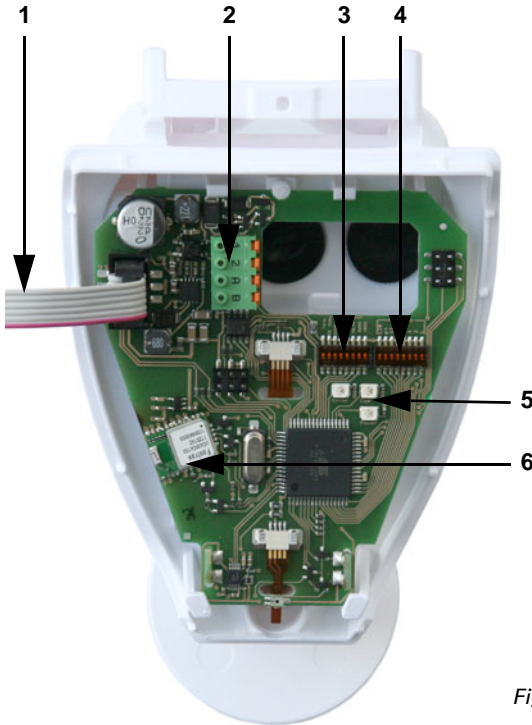
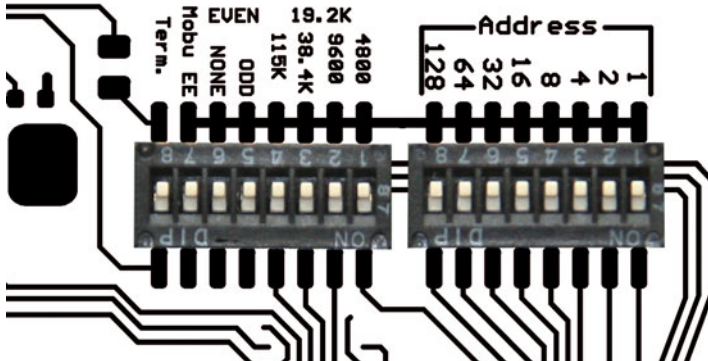


Fig. 11: Overview PCB

- 1) Connection to the rain sensor in the housing cover
- 2) Connecting plug, suitable for massive conductors of up to 0.8 mm<sup>2</sup>  
1: +24 V DC | 2: GND | A: data | B: data
- 3) DIP switch for interface parameters (see detailed view)
- 4) DIP switch for slave address (see detailed view)
- 5) LED "Com", "Error" and "Power"  
„Power“: operating voltage  
„Error“: sensor error or erroneous data  
„Com“: bus communication
- 6) GPS module (only P03/3-Modbus-GPS)

Fig. 12: detailed view DIP switches



If all DIP switches are in the OFF position (default setting), the following parameters are active:

Address: 1  
 Baud rate: 19,200  
 Parity: Even  
 Termination: Disabled

#### **Setting of the slave's address:**

The slave address is set with the help of the 8-bit DIP switch "Address". If all switches are in the OFF position, Address 1 is active. Address 0 is reserved for broadcast messages; addresses greater than 247 are not valid.

The coding of the address is binary. For the address 47, you must e.g. set the switches 1, 2, 3, 4 and 6 to ON.

#### **Interface parameters:**

The interface parameters are set with the help of the second 8-bit DIP switch. If the first 4 switches are in the OFF position, the transfer rate amounts to 19,200 bauds. If one of these switches is set to ON, the corresponding baud rate is applicable.

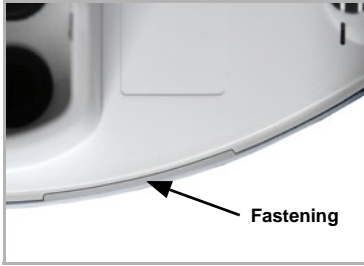
**Parity:** If the two switches "ODD" and "NONE" are set to OFF, the parity is EVEN. Only "ODD" or "NONE" activates the corresponding parity control.

**Switch "Mobu EE":** no function.

**Switch "Term.":** bus termination 124 ohms

### **2.1.7. Mounting the weather station**

Close the housing by putting the cover back over the bottom part. The cover must snap in on the left and right with a definite "click".



*Fig. 13*  
Make sure the cover and bottom part are properly snapped together! This picture is looking at the closed sensor from underneath.



*Fig. 14*  
Push the housing from above into the fastened mount. The bumps on the mount must snap into the rails in the housing.

To remove it, the weather station can be simply pulled upwards out of the mount, against the resistance of the fastening.

## 2.2. Notes on mounting and commissioning

Do not open weather station if water (rain) might ingress: even some drops might damage the electronic system.

Observe the correct connections. Incorrect connections may destroy the weather station or connected electronic devices.

Please take care not to damage the temperature sensor (small blank at the bottom part of the housing.) when mounting the weather station. Please also take care not to break away or bend the cable connection between the blank and the rain sensor when connecting the weather station.

Remove all existing protection labels after installation.

The correct wind value may only be supplied approximately 60 seconds after the supply voltage has been connected.

### 2.2.1. Maintenance of the weather station

The weather station must be checked for dirt on a regular, twice-yearly basis and cleaned if necessary. A dirty weather station can lead to strange results, such as the wind sensor failing to work, the station constantly announcing rain, or failure to detect sunlight.

## 2.2.2. Transfer protocol

## 2.3. P03-Modbus request string from the master

Byte No.	Variable		Meaning
0	Slave address	xx	
1	Command	04H	Read Input Registers
2	Start address High Byte	xx	
3	Start address Low Byte	xx	
4	Number of words High Byte	xx	
5	Number of words Low Byte	xx	
6	CRC Low Byte	xx	
7	CRC High Byte	xx	

## 2.4. P03-Modbus output string to the master

Byte No.	Start address	Variable		Meaning
0		Slave address	xx	
1		Command	04H	Read Input Registers
2		Number of bytes	xx	Master request * 2
3	0	Outdoor temperature	H	with sign, value/10 =
4	1	Outdoor temperature	L	temperature xx.x °C
5	2	Sun sensor, south	H	
6	3	Sun sensor, south	L	1...99 Kilolux
7	4	Sun sensor, west	H	
8	5	Sun sensor, west	L	1...99 Kilolux
9	6	Sun sensor, east	H	
10	7	Sun sensor, east	L	1...99 Kilolux
11	8	Light	H	0...999 Lux
12	9	Light	L	0...999 Lux
13	10	Wind	H	Value/10 gives wind speed in m/ s (metres per second)
14	11	Wind	L	
15	12	GPS / RTC	H	1 = GPS; 0 = quartz clock 50 ppm (*)
16	13	Rain	L	1 = rain; 0 = no rain
17	14	Day	H	
18	15	Day	L	Date Day (*)
19	16	Month	H	
20	17	Month	L	Date Month (*)
21	18	Year	H	

Byte No.	Start address	Variable		Meaning
22	19	Year	L	Date Year (*)
23	20	Hour	H	
24	21	Hour	H	Time Hour (*)
25	22	Minute	L	
26	23	Minute	L	Time Minute (*)
27	24	Second	H	
28	25	Second	L	Time Second (*)
29	26	Azimuth	H	Value/10 = sun position; angle 0.0 ... 359.9 degrees (*)
30	27	Azimuth	L	
31	28	Elevation	H	Value/10 = sun position; height range +/-90.0 degrees (*)
32	29	Elevation	L	
33	30	Degree of longitude	H	Value/100 +/- xxx.xx°; + = east / - = west (*)
34	31	Degree of longitude	L	
35	32	Degree of latitude	H	Value/100 +/- xxx.xx°; + = north / - = south (*)
36	33	Degree of latitude	L	
37	CRC		L	
38	CRC		H	

**(\*) Only available with version P03/3-Modbus-GPS (with GPS module)**

Negative values are represented in the two's complement notation.

Time indicated as: UTC (Coordinated Universal Time).