



USER MANUAL

Weather Backpack

Mobile weather station



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1 Warranty

Please note the loss of warranty and non-liability by unauthorized manipulation of the system. You need a written permission of the LAMBRECHT meteo GmbH for changes of system components. These activities must be operated by a qualified technician.

The warranty does not cover:

1. Mechanical damages caused by external impacts (e. g. icefall, rockfall, vandalism).
2. Impacts or damages caused by over-voltages or electromagnetic fields which are beyond the standards and specifications in the technical data.
3. Damages caused by improper handling, e. g. by wrong tools, incorrect installation, incorrect electrical installation (false polarity) etc.
4. Damages which are caused by using the device beyond the specified operation conditions.

2 Introduction



WEATHER BACKPACK (ID 30.00852.000001)

Weather Backpack was developed and designed for smooth operation also in challenging climatic conditions. This complete system is weatherproof and can be set up within minutes. The u[sonic]WS7 sensor is connected with just one plug-and-play cable to determine and monitor the measurement data.

In battery operation, the Weather Backpack is operational for up to eight days; alternatively, a solar module can be connected. (While a solar module is connectable, it is **not** available as an option in our product range.) When the station is connected to the power grid, the heater automatically switches on and off based on the temperature. In both solar and grid operation, the battery is automatically charged.



STANDARD WITH U[SONIC]WS7

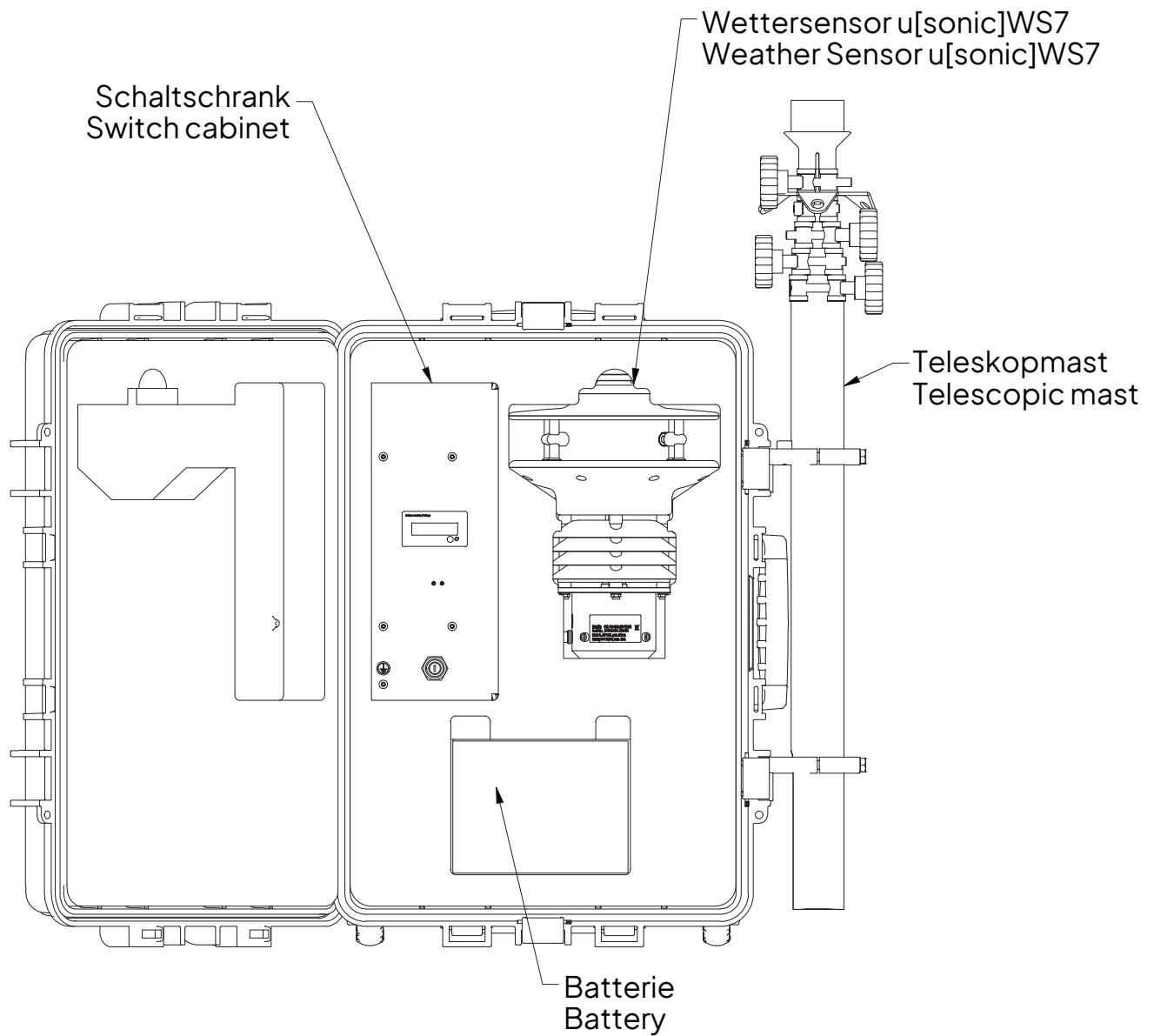
The u[sonic]WS7 records seven weather parameters. Wind direction and wind speed are measured by ultrasonic measurement, furthermore global radiation, air temperature, humidity, and air pressure are output; the dew point is calculated.

The lamella hut of the humidity-temperature sensor eliminates unwanted weather influences and enables even more accurate measurements. The intelligent heater (only available with fixed power supply) operates in dependence of the two wind parameters and allows the use in a wide temperature application range. The u[sonic]WS7 is both easy to install and very service-friendly.



3 Included components

The station Weather Backpack comes with all the components shown in the picture below.



4 Hardware that is also included

ID 32.00852.000051	Special cable WS7
ID 32.00852.000053	Mains cable 230 V (charging and mains operation)
ID 32.05908.100200	Ethernet cable, RJ45 Cat. 5e, 2 m, bayonet lock
	3 Tension ropes
	3 Ground pegs

Please check the delivery for completeness immediately after receipt of the incoming goods. If any of the hardware components are missing, please contact customer service for a replacement: Telephone : +49 551 49580

5 Tools needed for installation

No special tools are required for the pending assembly and maintenance work. All work can be performed with the listed, commercially available tools.

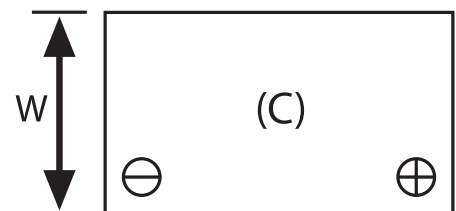
- ✓ Hammer 5 kg
- ✓ Folding ruler or measuring tape
- ✓ External hexagonal wrench size 4
- ✓ Compass or compass app

6 Rechargeable battery (Banner SBV 12-26)

Banner Stand by Bull Bloc fleece batteries are sealed, valve-regulated lead-acid batteries with the electrolyte fixed in the fleece. These block batteries are called AGM batteries. They are characterized by a very universally applicable and absolutely maintenance-free design. Long service life and high energy density are further advantages.

CHARACTERISTICS

- Block battery, nominal voltage 12 volts
- 100 % maintenance-free over the entire service life
- Float charge voltage 2.27 V/cell
- Recommended temperature range 20 °C (maximum -10 °C to 40 °C)
- FAA and IATA non-dangerous goods (in accordance with Packaging Regulation 806)
- Corrosion-proof pole bushing
- Good voltage level in the high-current sector
- Constructive life 10 - 12 years (Long Life in accordance with EUROBAT)
- Dimensions (L x W x H): 166 x 175 x 125 mm
- Weight: approx. 8.1 kg



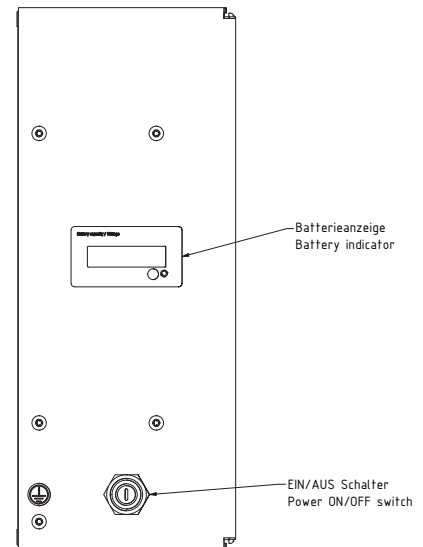


The lead acid battery (Banner SBV 12–26, 12 V, 26 Ah) should be checked before installation. The battery's state of charge can be read in percent (%) or volts (V) after pressing the display button.

6.1 Battery safety instructions



For this, observe the operating instructions for sealed, stationary lead–acid batteries from the battery manufacturer in the appendix.



6.2 Charging the battery

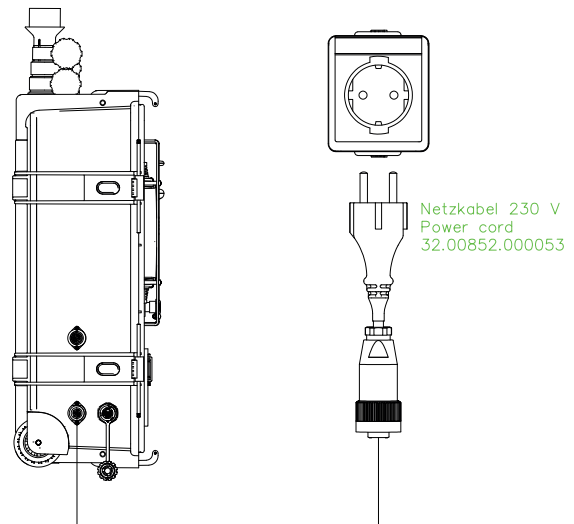
The portable weather station is equipped with an integrated charging management. The 12V lead–gel battery can be charged with:

- Solar panel; up to 100 W panel power
(A solar panel can be connected, but it is **not** available as an option in our product range.)
- Mains supply 110/230 VAC

6.2.1 Charging via mains supply

Simply connect the power cord supplied with the Weather Backpack to the case and plug the other end into the wall outlet to charge the battery.

The station can be operated normally while the battery is charging. If the supply is via mains (110/230 VAC), the heating of the u[sonic]WS7 weather sensor is automatically activated and regulated depending on the ambient temperature.



6.2.2 Charging via solar module

A portable solar panel can be connected to the Weather Backpack, but it is **not** available as an option in our product range. It can be connected via a separate port (see Chapter 14) to the weather station.

The solar module can fully charge the battery or extend the runtime of the station, depending on the module size (maximum 100 W) and solar condition. A 100 W solar module allows year-round operation (under non-icing conditions) in Germany without an external power supply, if optimally installed.



In winter, please note that battery life may be shortened due to low temperatures.

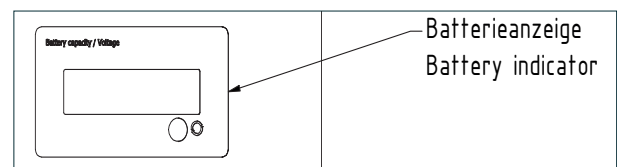
If the portable weather station is supplied (charged) by solar module or battery, the heating of the u[sonic]WS7 is deactivated automatically. **Heated operation is only possible under fixed network supply.**



An external solar charge controller must not be switched in between, as the portable weather station already has a built-in solar charge controller.

6.3 Battery indicator

The battery charge status can be checked on the battery display inside the suitcase. To activate the display, press the key on the display for 10 seconds. The battery charge status can be displayed in "%" (percentage) or the battery voltage in "V" (volts). You can switch between the displays by repeatedly pressing the display key.



The deep discharge protection of the portable weather station switches off the station when the remaining capacity is approx. 30 %. A fully charged battery (99–100 %) can operate the weather station for approx. 8 days before the 30 % is reached and the portable weather station is switched off.

6.4 Storage of the battery / portable weather station

If the portable weather station is not operated for a longer period of time (> 3 months), it is recommended to disconnect the positive terminal of the battery to reduce the self-discharge of the system to a minimum.

Tip: When starting up after a longer break period (> 3 months), check the time and date of the data logger and update them before the next measurement campaign. If the data logger clock has jumped back to the initial date, it is recommended to operate the station on the landline network for 8–24 hours while it is switched on in order to recharge the backup battery of the data logger clock.

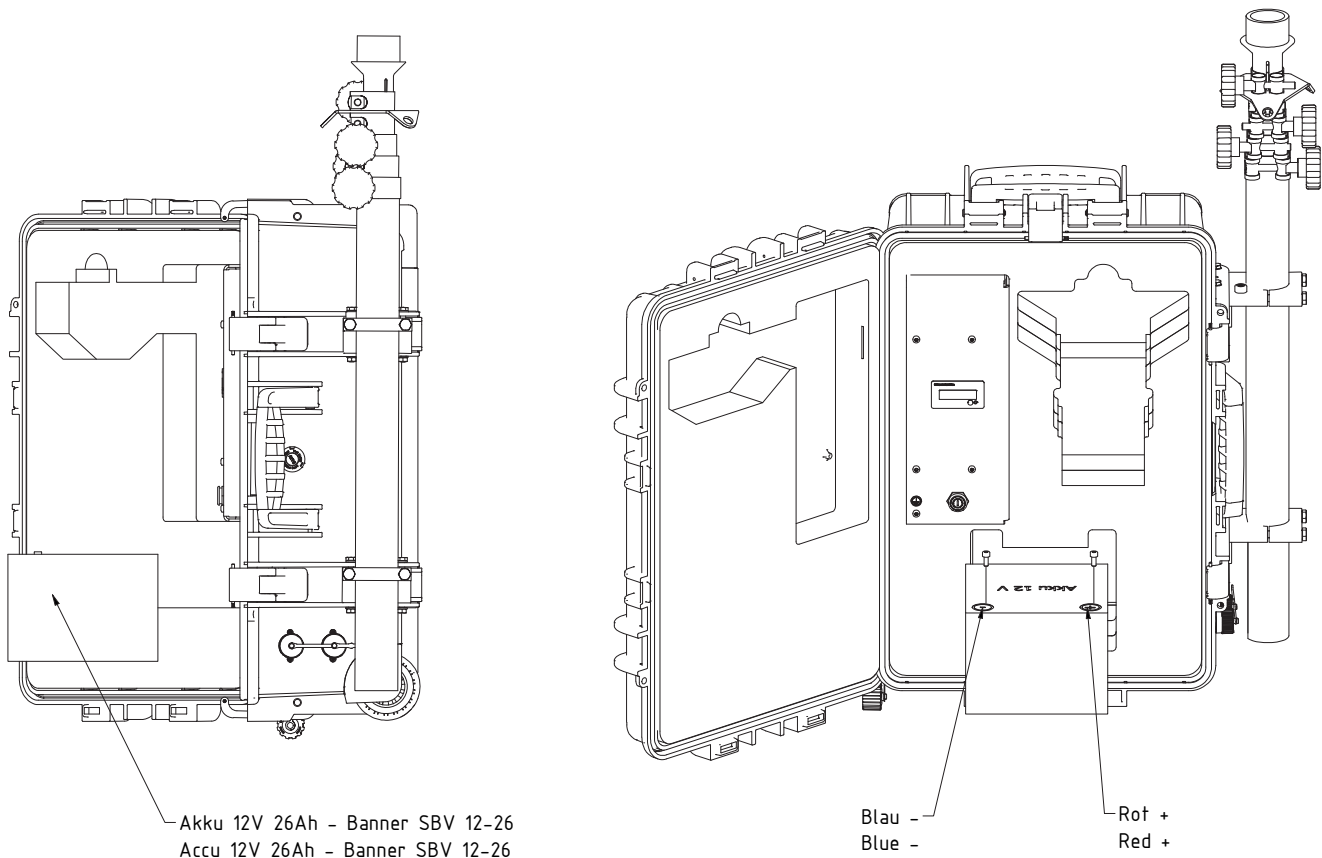


6.5 Changing the battery

The fitted rechargeable battery has a long service life. Should a battery change nevertheless be necessary, proceed as described in the drawings below.



Assembly, electrical connection, and wiring of the weather station may only be carried out by qualified personnel who are familiar with and comply with the generally applicable rules of technology and the relevant laws, regulations, and standards.



7 Installation conditions

7.1 General information to wind measurements

When measuring wind in accordance with meteorological standards (e.g. VDI 3786, sheet 2), measurement height and measurement location are decisive criteria for representative and error-free measurements. The portable weather station is particularly suitable for measuring wind conditions in a confined area. If wind conditions in a larger area are to be extrapolated, a measuring height of 10 m above the ground is generally considered ideal. The distance from obstacles to the weather station should then be at least 10 times the height of the obstacle. The installation site must **not** be in the shadow of larger obstacles.

The above-mentioned conditions cannot be achieved in every situation, e.g. in the case of mobile measurements on vehicles or on measuring containers. Therefore, reasonable compromises have to be found and documented where necessary. When installing the sensor on a roof, the installation site should be in the center of the roof to avoid preferred directions.

7.2 Choice of installation site

For optimal functioning of the weather station, you should consider the following guidelines in selecting the optimal installation location.

- The station must be set up on as level a surface as possible. The ground should be such that you can hammer in the pegs without any problems (no rocky or asphalted ground). Basically: A ground nail only has holding power on the portion that is in the ground.
- The installation location of the sensor must be such that it is not in the operating field of radar systems (radar scanners or radar transmitters), generators or antennas. We therefore recommend a distance of at least 2m from such systems. Furthermore, a minimum distance of 5 m must be maintained from MF/ RF and Satcom (e.g. Inmarsat, VSat) antennas. The maximum interference radiation is allowed 10 V/m not exceed (tested in accordance with the EMC standard). If necessary, a larger distance must be observed.
- Avoid placing the weather station near heat sources such as chimneys, heaters, air conditioners and exhaust vents.
- Position the weather station at least 30 m away from asphalt or concrete roads that readily absorb and radiate heat from the sun. Avoid installations near fences or sides of buildings that get a lot of sun during the day.
- Never install the weather station where it will be directly sprayed by a sprinkler system, as this will affect the readings.
- Do not place the weather station under trees or near buildings. In heavily wooded areas you should set up the weather station in a clearing or meadow.
- Place the weather station in a location that receives good sun exposure throughout the day.

8 Installation of the weather station



The weather station can be set up by a single person. However, we recommend that two people set up the weather station, depending on the terrain (difficult terrain). The second person can help to anchor the mast.



Try not to touch the small dome on top of the radiation sensor. The skin's oil reduces its sensitivity. If you are afraid that you may have touched the dome during installation, clean the dome with a soft, damp cloth (not microfiber).



8.1 General installation guidelines

- Install the weather station as vertically as possible to ensure accurate measurements. Use the spirit level on the mast or a spirit level to ensure the mast is vertical.

FOR SOLAR PANEL OPERATION ONLY:

- In the northern hemisphere, the solar panel should face south to get the maximum insolation. The u[sonic]WS7 should face north for proper calibration of wind direction.
- In the southern hemisphere, the solar panel should face north to achieve maximum solar radiation. The u[sonic]WS7 should face north for proper calibration of wind direction.

8.2 Aligning the u[sonic]WS7 weather sensor

To measure the wind direction, the sensor must be aligned to the north. For the alignment, a point in the terrain is determined which is located as far as possible in the direction of north in relation to the final position of the wind direction sensor. The location of the reference point can first be selected using a topographic map. The exact location of the reference point is determined with a bearing compass, which can be adjusted horizontally on a tripod for convenience.



Watch out for compass declinations!

8.3 Preparation and verification before installation

- ✓ Is the installation material complete?
- ✓ Is the sensor working correctly? (Call up the webpage with the logger and read the time off on the page **General**.)
- ✓ Is the battery fully charged? (The charging indicator is visible on the display. If the battery is discharged, connect the supply cable to the portable weather station for charging.)
- ✓ Are the date and time on the data logger correct? *)
- ✓ Does the logger record data?

***) Note:**

If the weather station was out of operation for a long time, it may happen that the backup battery of the data logger clock is empty and the date and time will change. If the clock of the data logger has jumped back to the initial date, it is recommended to operate the station in the switched-on state for 8-24 hours on the fixed network to recharge the backup battery of the data logger clock.

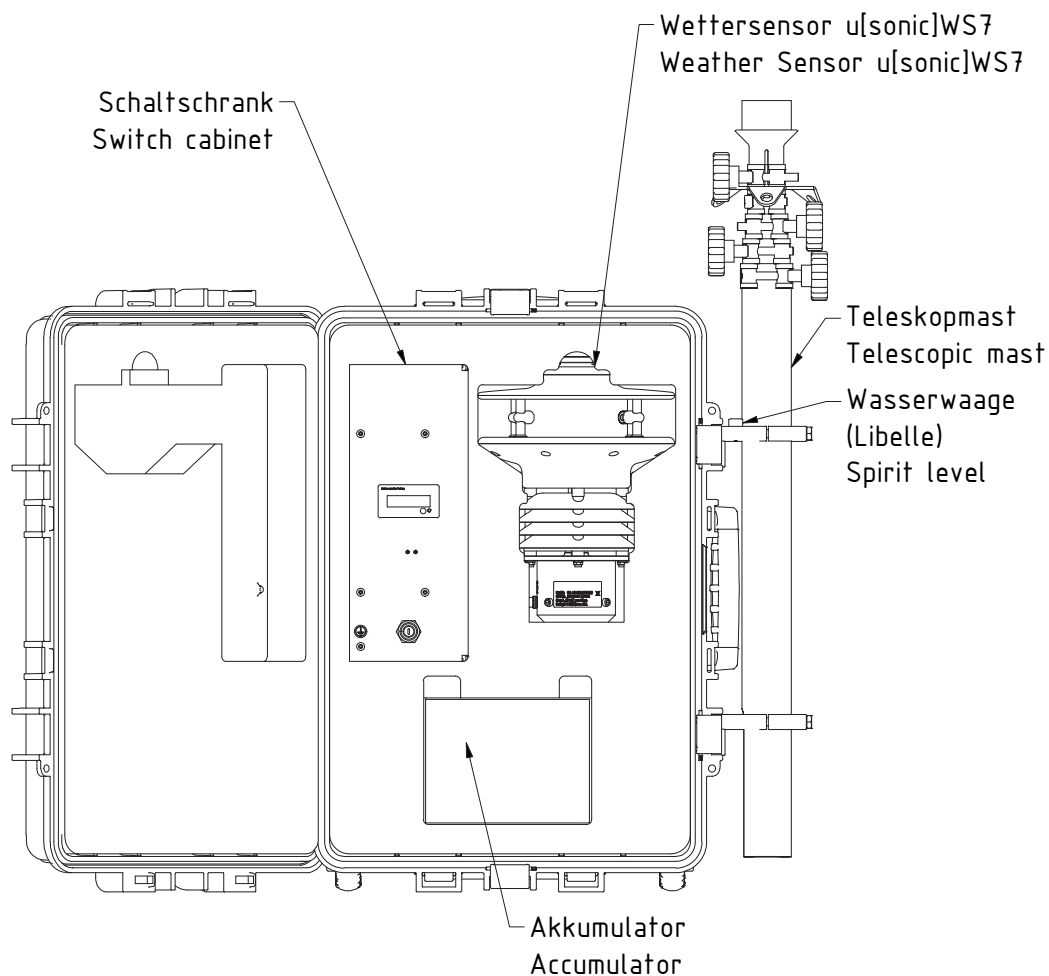
9 Assembly instructions

CHECK BATTERY

- Make sure the battery is charged (visible via the display)
- If the battery is discharged, connect the supply cable to the portable weather station

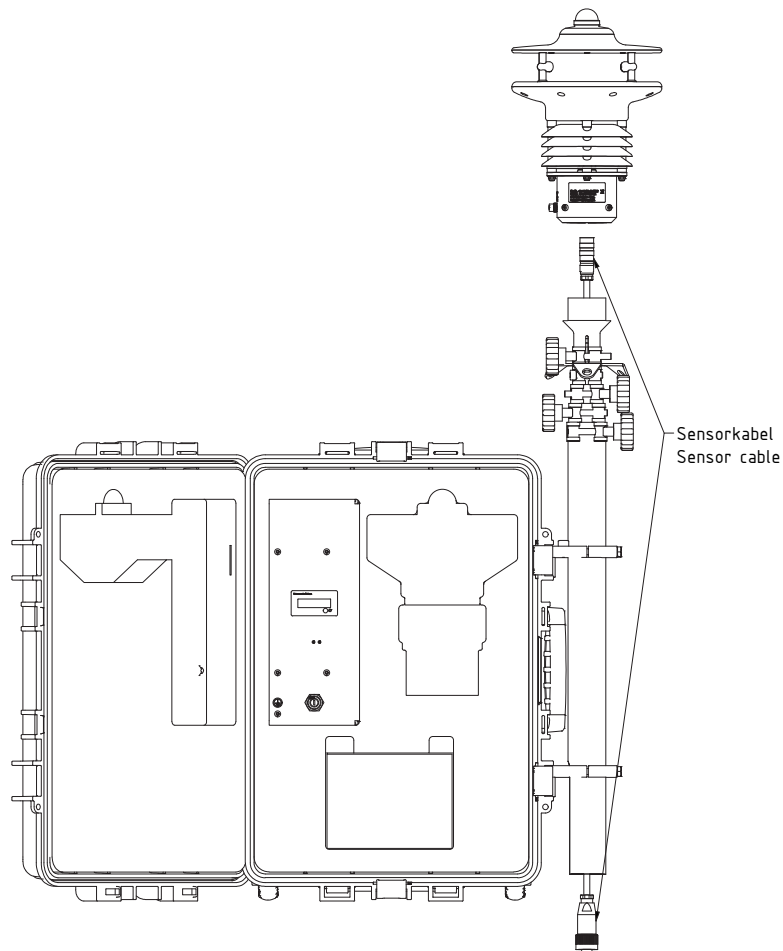
PREPARE TOOLS AND INSTALLATION MATERIAL

- Remove accessories (cables, grounding pegs) from case and set aside
- Have the required tools handy:
 - ✓ Hammer 5 kg
 - ✓ Folding ruler or measuring tape
 - ✓ External hexagonal wrench size 4
 - ✓ Compass or compass app
- Open suitcase
- Take the u[sonic]WS7 weather sensor out of the case and lay it down carefully



LAYING THE SENSOR CABLE

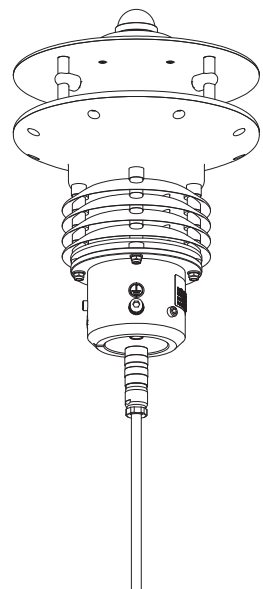
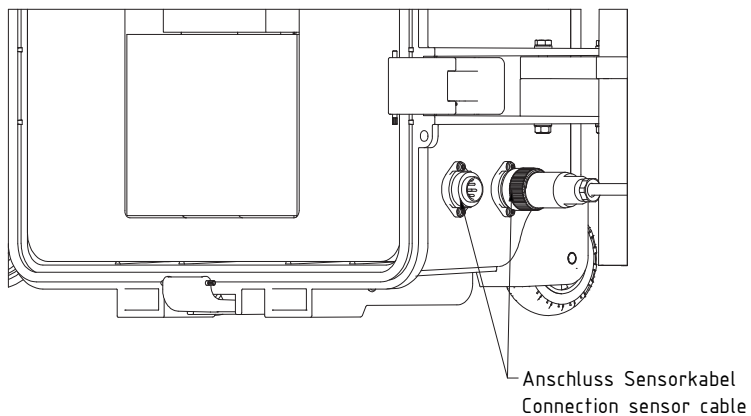
- Run the sensor cable of the u[sonic]WS7 through the mast



- Connect the sensor cable to the connector on the suitcase and the u[sonic]WS7

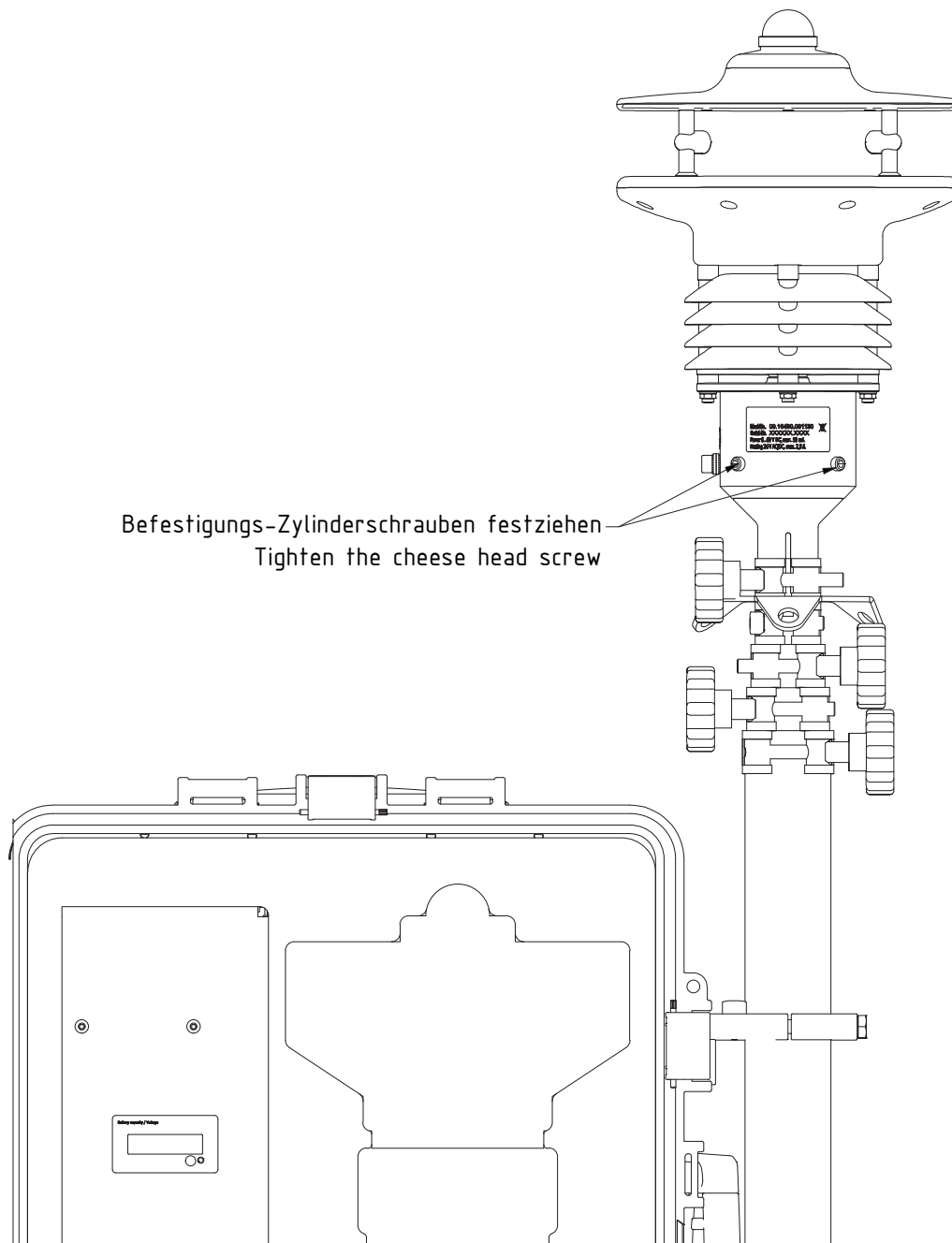


There are two equal sensor ports on the case to which sensors can be connected. If several sensors are connected, then they must have different Modbus addresses (sensor IDs).



SENSOR INSTALLATION

- Place the weather sensor u[sonic]WS7 on the mast and tighten all fastening cylinder screws with the external hexagonal wrench size 4

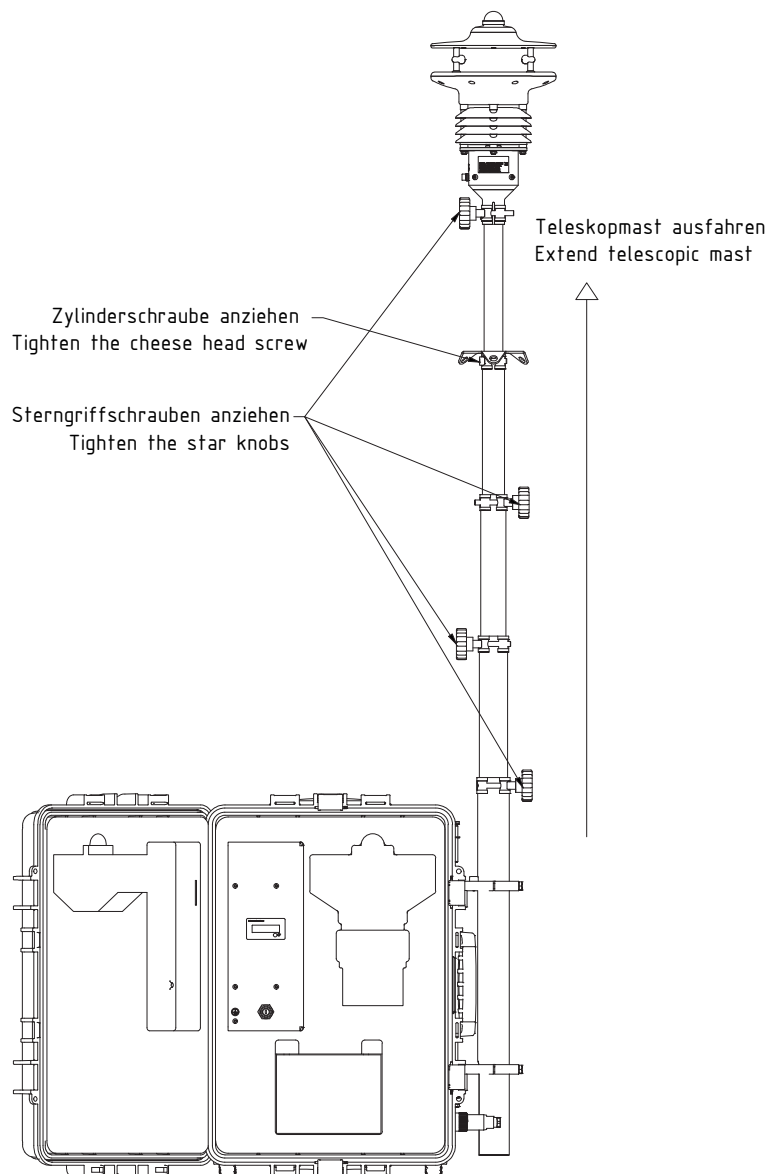
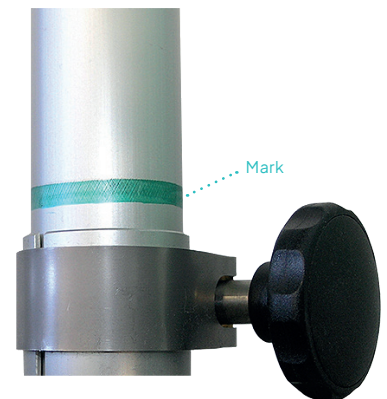


EXTEND THE MAST AND PREPARE THE TENSIONING CABLES



Extend the mast segments to a maximum of the markings.

- Loosen the star knob screw and extend the mast, starting with the upper (= thinnest) tube segment, extend this to the maximum marking; retighten the star grip screw
- Then pull out the pipe segments underneath, in each case up to the maximum marking
- Prepare the tensioning ropes, including the three carabiner hooks of the tensioning ropes hang in the eyelets on the mast
- Extend mast to final position



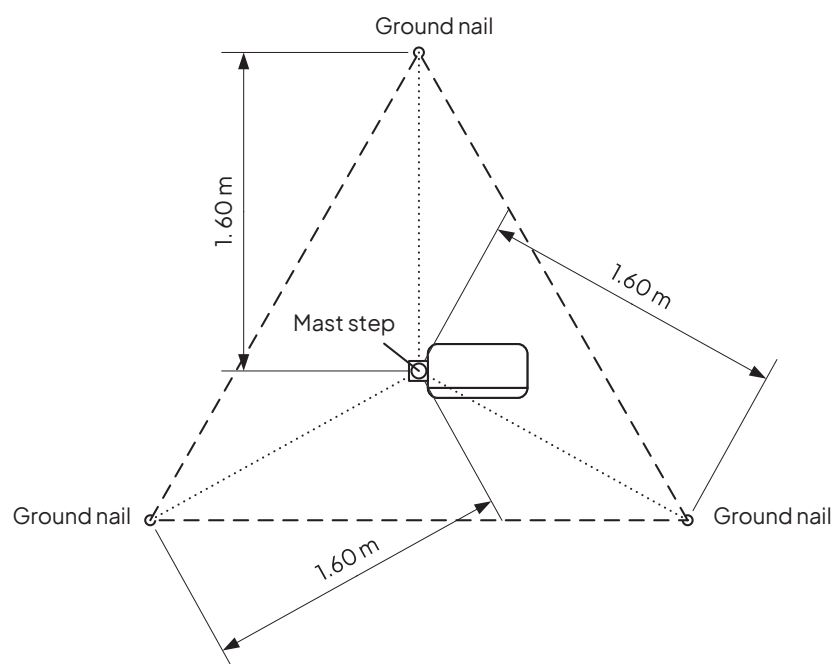
LAY DOWN THE MAST



Lay down the mast and case carefully.
In doing so, pay careful attention to the sensor so that it is not damaged.

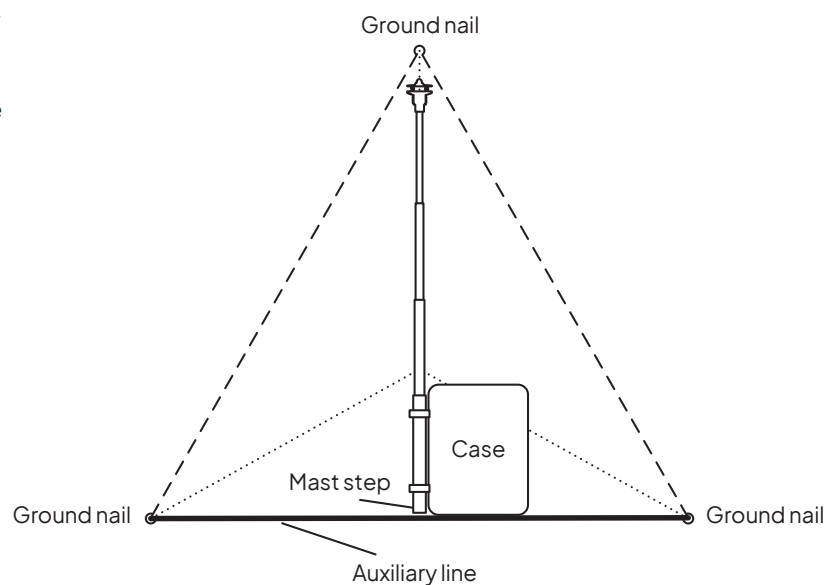
DRIVE IN THE PEGS

- Using a folding rule or tape measure, measure 1.60 m in each case in an imaginary equilateral triangle to the center of the mast (mast foot) (see drawing)
- Drive the three pegs into the ground with a hammer at a distance of 1.60 m from the base of the mast (middle of the triangle)



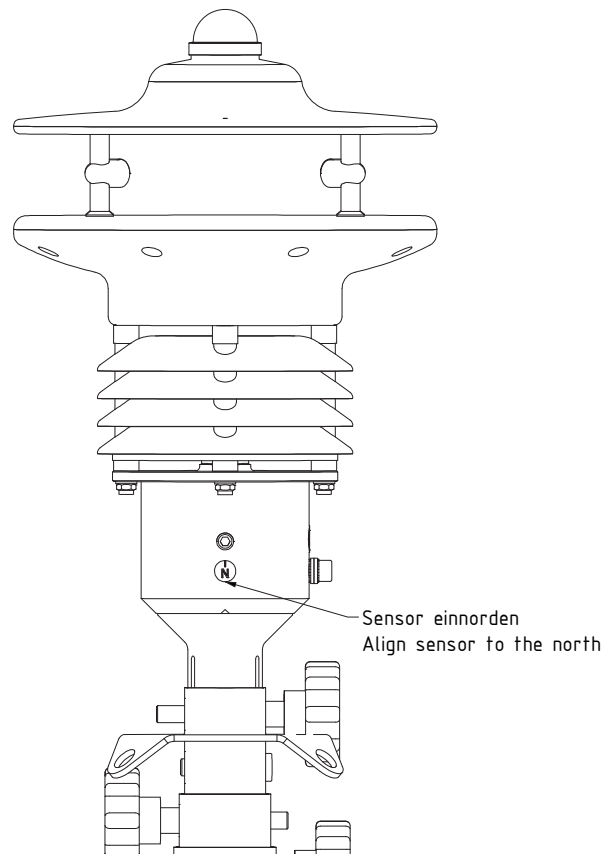
ERECT MAST

- Roll the suitcase with the mast centrally to one side of the imaginary triangle
- Carefully lay down the suitcase with the mast again
- Hook the tensioning ropes into the ground pegs
- Lift up the suitcase with the mast and roll it to the center of the triangle
- Position the mast in the center of the triangle
- Pre-tension the tensioning ropes to approx. 2.5 m
- Ensure a secure footing



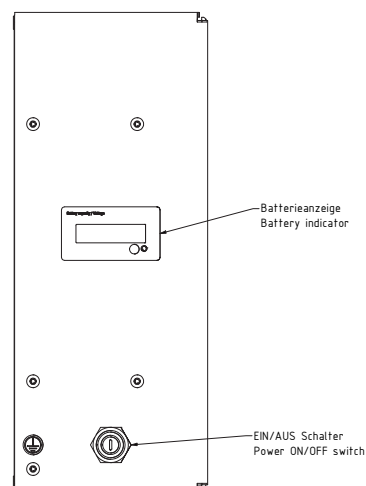
ALIGN SENSOR TO THE NORTH

- For general information on this, see the chapter "Calibrating the u[sonic]WS7 weather sensor"
- Align the u[sonic]WS7 to the north using a compass or a compass app based on the north marker
- Tighten the ropes until the portable weather station is secure, aligning it vertically using the level on the mast



SWITCH ON THE SYSTEM

- Switch on the system with the on/off switch
- Start measuring



10 Connect data logger met[log] to the PC

In the following description it is assumed that the data logger met[LOG] already been assigned a fixed IP address. If the IP address has been changed and the address is no longer known, see chapter 13.

DATA LOGGER MET[LOG] WITH FIXED IP

The picture in this example shows the default setting in the delivery state of the logger.

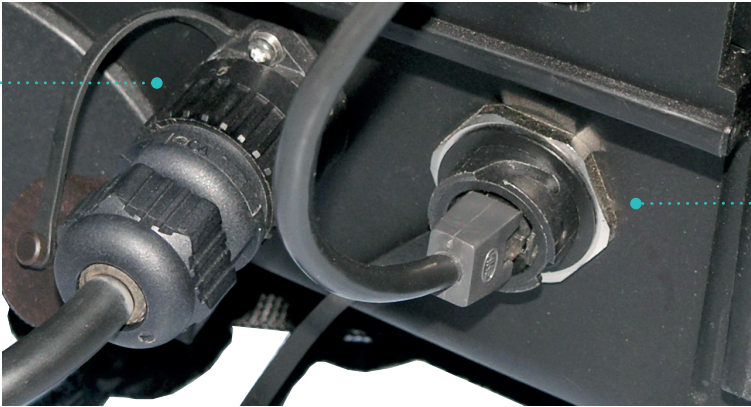
Settings				
General	Unit	Login	Email settings	Network
Time	Export	Get file	Update	FTP
Network				
DHCP		No		
IP		192.168.243.100		
Mask		255.255.255.0		
Gateway		192.168.243.0		
DNS		8.8.8.8		

CONNECTION OF THE MET[LOG] TO A PC WITH USB TO ETHERNET ADAPTER

Connect a commercially available USB/Ethernet adapter to the PC or laptop.

Connect a suitable Ethernet cable to the Weather Backpack and the USB/Ethernet adapter. The RJ45 interface is on the side of the transport suitcase.

AC power connection
to charge the battery



RJ45 interface

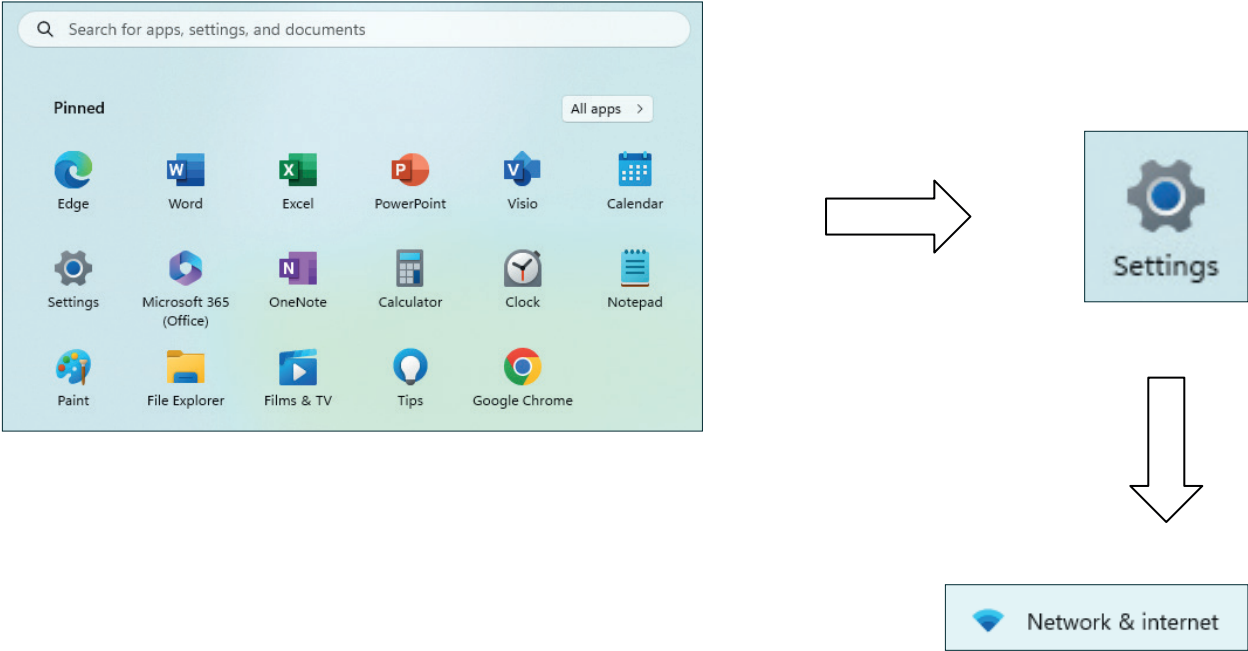
Switch on by pressing the system switch on the control cabinet inside the suitcase. The system starts automatically. After 30 seconds a connection to met[LOG] can be established.

If the system is operating correctly, the on switch lights up with a green ring.



11 Setting up the network connection on a PC or laptop

Execute the **Settings** command (reference to a Windows 11™ system)



Change to the entry of the USB network adapter
Click on **Edit**:

Ethernet 3
Not connected

Authentication settings

Edit

Metered connection

Some apps might work differently to reduce data usage when you're connected to this network

Off

Set a data limit to help control data usage on this network

IP assignment: Manual

IPv4 address: 192.168.243.102

IPv4 mask: 255.255.255.0

IPv4 gateway: 192.168.243.0

Edit

DNS server assignment: Manual

IPv4 DNS servers: 8.8.8.8 (Unencrypted)

Edit

Manufacturer: ASIX

Description: ASIX AX88179A USB 3.2 Gen1 to Gigabit Ethernet Adapter

Driver version: 2.20.8.0

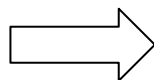
Physical address (MAC): C0-18-03-2A-67-1D

Copy

The required network information can be entered in the following context menu.

RECOMMENDED SETTINGS

IP Address: 192.168.243.102
 Subnet mask: 255.255.255.0
 Gateway: 192.168.243.0
 DNS: 8.8.8.8



End the step with **Save** and accept data.

Edit IP settings

Manual

IPv4

On

IP address

192.168.243.102

Subnet mask

255.255.255.0

Gateway

192.168.243.0

Preferred DNS

8.8.8.8

DNS over HTTPS

Off

Alternative DNS

Save

Cancel

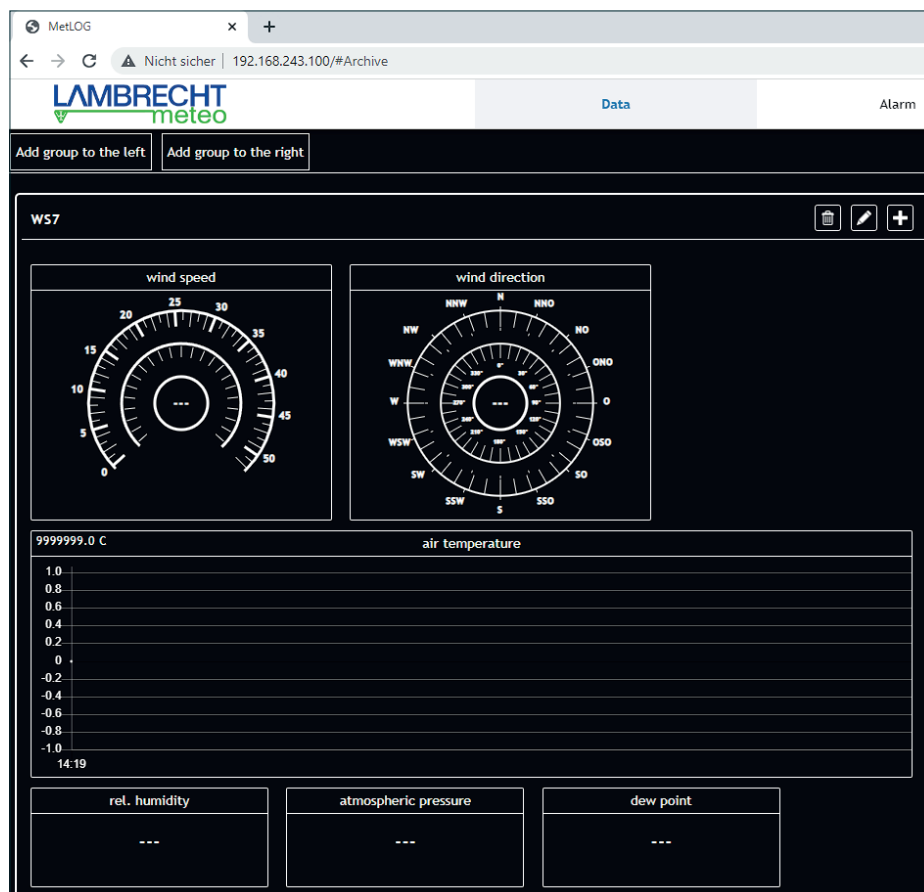
12 Accessing the browser

Type the defined IP of the met[LOG] data logger into the address line of the browser and send it by pressing **Input/ Enter**.

In this example it is the IP 192.168.243.100



The met[LOG] data logger is already preconfigured at the factory for the operation of the Weather Backpack. We refer to this user manual for further information on the met[LOG].



13 IP address of the Weather Backpack

CHANGING THE IP ADDRESS OF THE WEATHER BACKPACK

The IP address of the Weather Backpack can be changed. In this case, please note that the PC and data logger must not have the same IP address and must match the entered subnet mask.

ASSIGNING A FIXED IP ADDRESS VIA THE MET[LOG] SD CARD

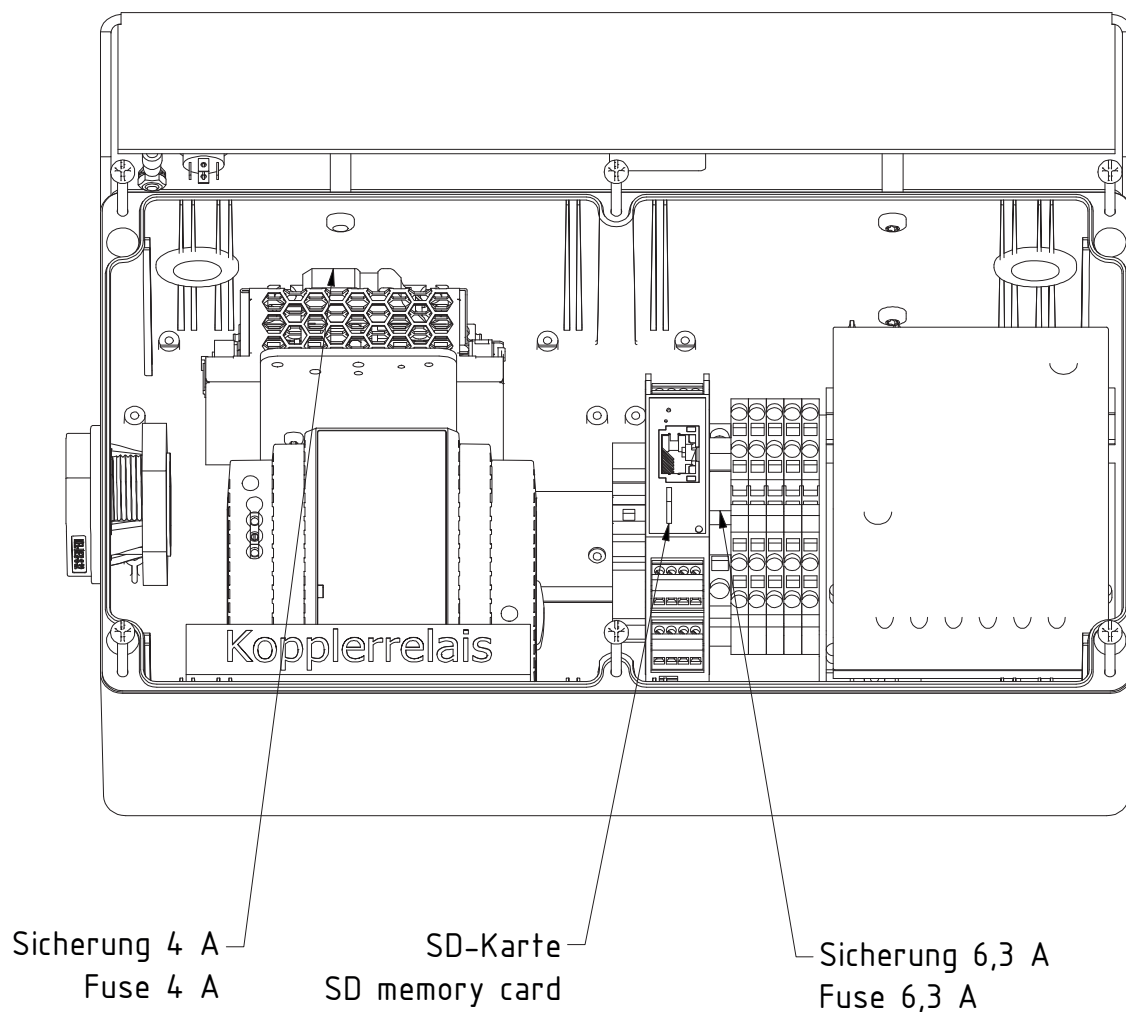
Another fixed IP address can be assigned to the data logger met[LOG] via the SD card if the preset IP address does not work. For this purpose, a file with the name:

\$config.cfg must be created.



This requires the inner case of the case to be opened.
See the exploded view and the warnings in Chapter 11.

LOCATIONS OF SD CARD AND FUSES IN ELECTRICAL CABINET



Enter the following command lines in the file:

```
{ "method": "POST", "path": "/config/net", "data": { "dhcpEnabled": 0, "ipAddr": "192.168.243.100",  
"maskAddr": "255.255.255.0", "gwAddr": "192.168.1.1", "DNS": "192.168.243.100" } }  
  
{ "method": "POST", "path": "/config/saveconfig" }
```



It is important that the file always ends with a new line (<CR> and/or <LF>)!

This command sets:

fixed IP address “ipAddr”:	192.168.243.100
Subnet	“maskAddr”: 255.255.255.0
Gateway	“gwAddr”: 192.168.243.100
DNS	“DNS”: 192.168.243.100

Any other fixed IP address can also be assigned in this way.



If IP addresses are assigned manually in a network, it must always be ensured that only one device with this IP address may exist in a network branch.



Make sure when creating the file that the file is saved with the correct file extension. (File type when saving "All Files (*.*)"). Under Windows, if the known file extensions are hidden, it can happen that Windows automatically adds a non-visible file extension to the file name. In this case, the configuration file is not read!

14 Data export as CSV

There is the possibility to export the stored data as a CSV file. The export is done on a daily basis or also manually via the **Export** function in the **General** menu, and creates a CSV file on the SD card of the met[LOG]. This file can be downloaded to a PC via the **Load file** function in the **General** menu.

You can select for the CSV export whether the fields are separated with comma (English) or with semicolon (German) (default). If the fields are separated with comma, then the decimal place of the values is separated with a dot ".". If the fields are separated with a semicolon, then the decimal place of the values is separated with a comma ",".

15 Exploded view to access the inside of the electronics housing

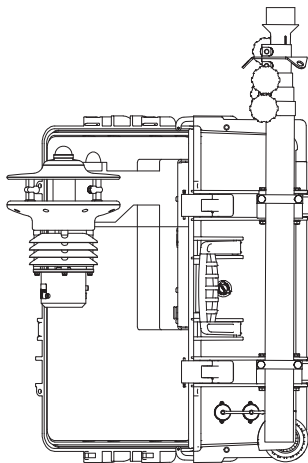


Electric shock hazard to life! The operator has to make sure that only authorized electricians, who know and observe the generally valid rules of technology and the respectively valid laws, regulations, and standards, open the electronic housing of the Weather Backpack.

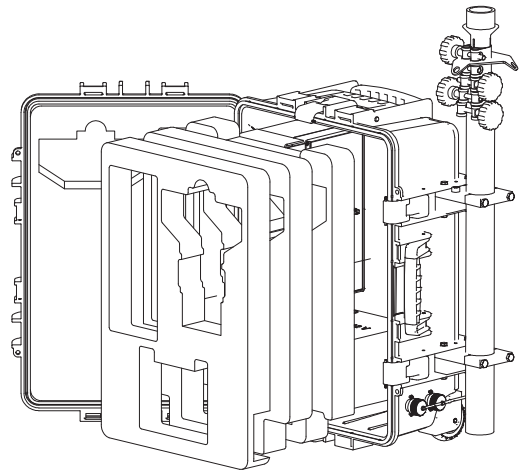


All external power supplies must be deactivated before the electronics housing is opened! Switch off the device for this purpose, disconnect it from the mains and battery and secure it against accidental switching on again.

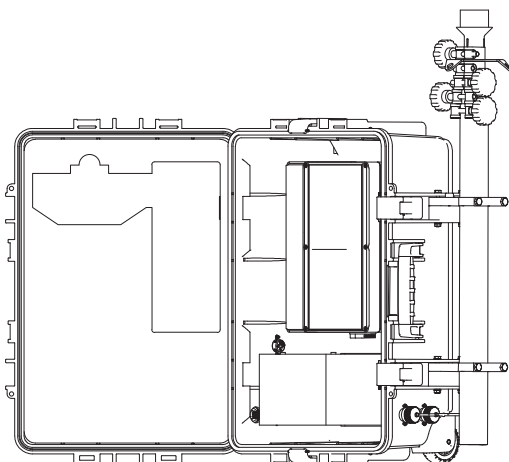
1



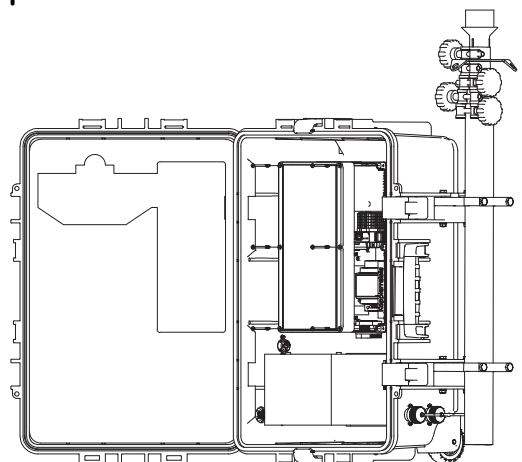
2



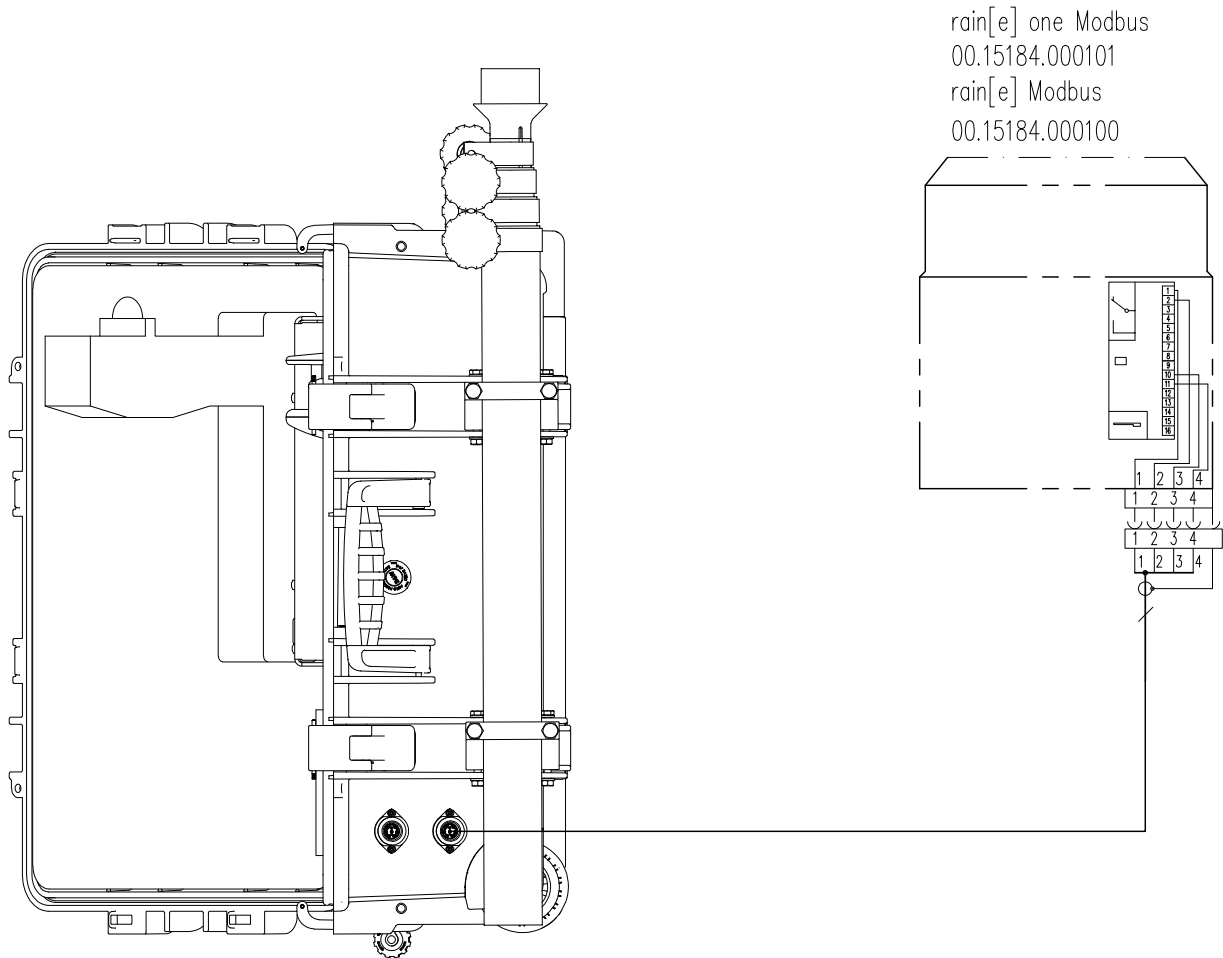
3



4



16 Connecting rain gauge

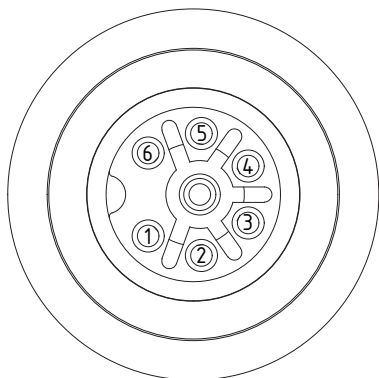


Note: The connector required for the electrical connection of the rain[e] Modbus is **not included in the scope of delivery** and must be provided by the customer.

Required connector:

Binder coupling, 6-pin + PE, screw termination, screw locking, straight

Manufacturer part number: **99 4218 14 07**

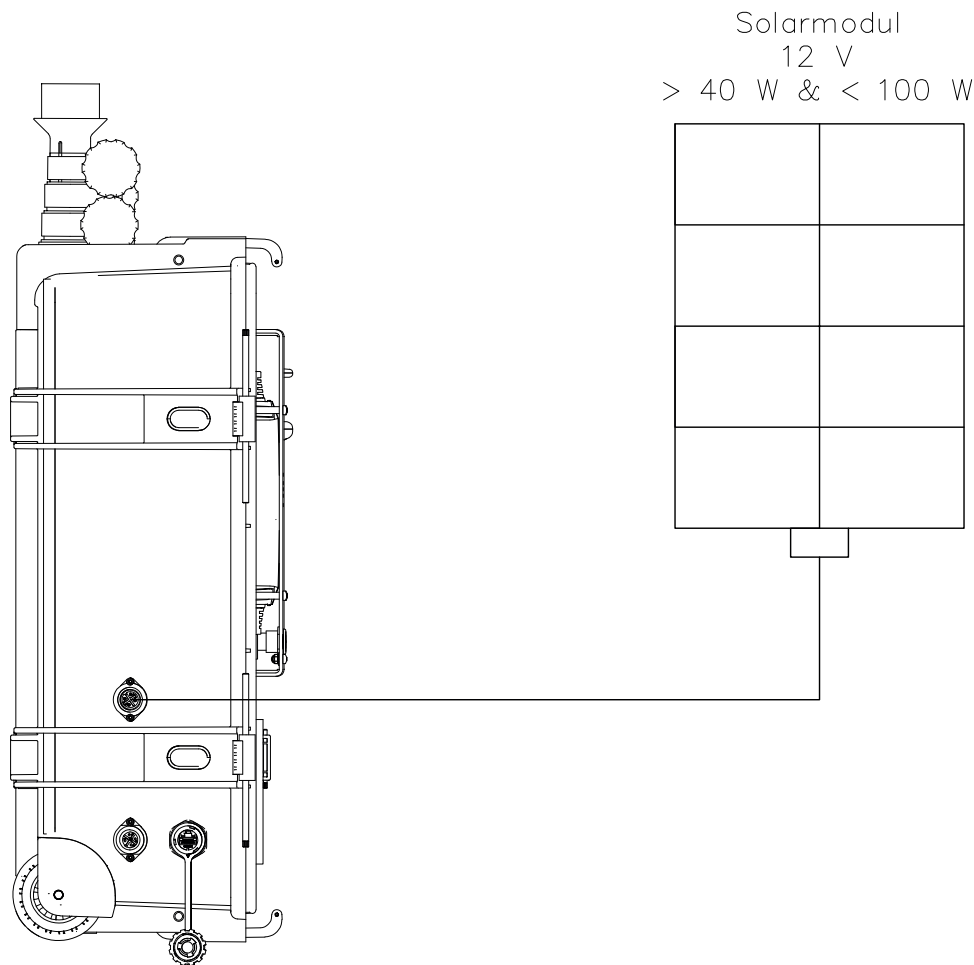


Anschluss WS7 / Regenmesser Connection WS7 / rain gauge

Rundstecker 7-pol. Binder 09-4219-00-07	
Pin	Pinbelegung
1	VCC +
2	VCC -
3	Data +
4	Data -
5	Konfig.
6	Analog Masse

Round plug 7-pol. Binder 09-4219-00-07	
Pin	Pin assignment
1	VCC +
2	VCC -
3	Data +
4	Data -
5	config.
6	Analog ground

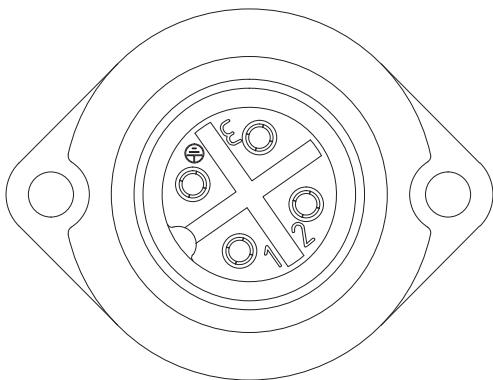
17 Solar supply connection



Note: The connector required for connecting the solar module is **not included in the scope of delivery** and must be provided by the customer.

Required connector:

Binder connector, 3-pin + PE, screw termination, screw locking, straight
Manufacturer part number: **99 4221 00 04**



Anschluss Solarpanel Connection solarpanel

Buchse, 4-pol. Binder 09-4224-00-04	
Pin	Pinbelegung
1	VCC +
2	VCC -

Rifle, 4-pol. Binder 09-4224-00-04	
Pin	Pin assigment
1	VCC +
2	VCC -

18 Technical data

Key features	Weather Backpack	ID 30.00852.000001
Area of application	Outdoor	
Environmental conditions	Sensor: -40...+70 °C; 0...100 % r. h. Battery: -10...+40 °C; 0...100 % r. h.	
Ethernet	10/100 BaseT; connector RJ45 shielded	
Battery life	Approx. 8 days	
Protection class	IP 65	
Material	Case: polypropylene; mast: Aluminum	
Weight	Approx. 27 kg	
Mast height	Approx. 3 m	
Specifications in detail		
Wind direction	Measurement range: 0...359.9° Accuracy: < 2° (> 1 m/s) RMSE Resolution: 0.1°	
Wind speed	Measurement range: 0...65 m/s Accuracy: ± 0.2 m/s RMSE (v < 10 m/s); ± 2 % RMSE (10 < v < 65 m/s) Resolution: 0.1 m/s	
Air temperature	Measurement range: -40...+70 °C Accuracy: ± 0.1 K (0...60 °C); ± 0.2 K (-40...0 °C) > 2 m/s Resolution: 0.1 °C	
Relative humidity	Measurement range: 0...100 % r. h. Accuracy: typically ± 1.5 % (0...80 %); ± 2 % (> 80 %) Resolution: 0.1 %	
Air pressure	Measurement range: 300...1100 mbar Accuracy: ± 0.5 mbar Resolution: 0.1 mbar	
Global radiation ("Second class")	Measurement range: 0...2000 W/m ² Global radiation in the range of 285...3000 nm Resolution: 0.2 W/m ²	
Dew point	Calculated value	
Charger technical specifications		
Operating temperature range battery charger	-10... +40 °C (full rated output up to 30 °C)	
Charger standards		
Safety	EN 60335-1, EN 60335-2-29	
Emission	EN 55014, EN 61000-6-3, EN 61000-3-2	
Interference immunity	EN 55014-2, EN 61000-6-1, EN 61000-6-2, EN 61000-3-3	
Technical information Battery SBV 12-26		
Nominal voltage	12 V	
Rated capacity	26 Ah	
Weight	Approx. 8.1 kg	

19 Disposal

LAMBRECHT meteo GmbH is recorded and registered at the Stiftung Elektro-Altgeräte Register under:

WEEE reg. no. DE 45445814

In the monitoring and control instrument category, type of device: "Monitoring and control instruments for exclusively commercial use."

Within the EU



The device must be disposed of in accordance with European directives 2002/96/EC and 2003/108/EC (waste electrical and electronic devices). Waste devices must not be disposed of with household garbage! For environmentally friendly recycling and disposal of your waste device, please contact a certified disposal company for electronic waste.

Outside the EU

Please observe the regulations applicable to the proper disposal of waste electronic devices in each country.

STAND BY BULL

Banner
THE POWER COMPANY

Operating instructions

for valve regulated lead acid

1. Commissioning

Prior to commissioning, all cells/blocks must be checked with regard to mechanical damage, correct connection of the terminals and the solid fit of the connector. If necessary, the terminal caps are to be mounted. DIN EN 50272-1 and EN 50272-2 apply to the installation and operation of fix-mounted batteries. The battery is to be installed in a manner that an ambient related temperature difference of $>3^{\circ}\text{C}$ between the individual cells and blocks cannot occur.

The charger should be turned off and consumers separated from the battery prior to it being connected to the d.c. current supply (positive pole to positive terminal). The charger should then be switched on and charged according to Section 2.2.

1.1 Open circuit voltage

Before mounting, the open circuit voltage of each simple cell/bloc has to be controlled.

The minimum guidelines at 20°C are as following

2 volt cell:	$u \geq 2,10 \text{ v}$
6 volt bloc:	$u \geq 6,30 \text{ v}$
12 volt bloc:	$u \geq 12,60 \text{ v}$

Any higher values for freshly produced batteries are normal, but lower values are not. In case of lower values the cells/blocs have to be recharged.

1.2 Stud torque

The following torque values apply for blocks and cells with inserted screw poles:

M5	2.0 - 3.0 Nm
M6	3.9 - 5.4 Nm
M8	11.0 - 14.7 Nm

2. Operation

Sealed batteries are ready for operation when dispatched. Full capacity is attained through charging at a constant voltage of 2.27 - 2.30 V/cell (continuous battery power supply) within 4-5 weeks.

If the batteries are used for charging/discharging operations immediately after receipt, prior to the first discharge, they require initial charging with max. 2.35V/cell at 20°C for 24 hours, or with constant current of 1A per 100 Ah for 24 hours. GEL-batteries are in standby parallel operation and buffer operations without cycles partially operational only.

2.1 Discharging

The end point voltage of the discharge current of the battery may not be undercut. Unless otherwise stipulated by the manufacturer, the discharge may not exceed the rated capacity. Charging must take place

immediately after both full and partial discharging, or within a period of max. 24 hours.

2.2 Charging

A charging process with limits according to DIN 41 773 (IU-characteristic) may be used.

Depending on the design of the charger and the charging curve, alternating currents flow through the battery, which are superimposed on the d.c. charge. These superimposed alternating currents and the effects of consumers lead to additional warming of the battery and loads on the electrodes, which can cause subsequent damage (see Section 2.4). Depending on the equipment involved (pursuant to DIN/VDE 0510 Part 1 draft), charging can take place during the following types of operation:

a.) Stand by parallel operation and floating operation

In this case, the consumers, the d.c. current source and the battery are subject to constant, simultaneous switching. The charge voltage represents both the operational and the equipment voltage.

With Stand by parallel operation, the a.c. current source is permanently able to supply both the maximum consumer and the battery charge currents. The battery only supplies current should the d.c. current source (charger) fail. The charge voltage setting amounts to $2.25\text{--}2.3 \text{ V} \pm 1\% \text{ per } ^{\circ}\text{C} \times \text{cell number}$.

In order to reduce the amount of recharging time, a charging stage can be employed with a charging voltage of 2.35 V (in exceptional cases 2.40V) x cell number. The charging current is to be limited to 0.25 x C10 until the charged voltage is attained. Once the maximum charged voltage is achieved, automatic switching to retentive charging at $2.25\text{--}2.3 \text{ V} \pm 1\% \text{ per } ^{\circ}\text{C} \times \text{cell number}$ occurs.

Buffer operation

In the case of buffer operation, the d.c. current source is not always able to supply the maximum consumer current, when this temporarily exceeds the rated current of the d.c. current source. During this period, the battery supplies power and is therefore not fully charged at all times. Accordingly, depending on the consumers, the charging voltage should be set at approx. $2.27\text{--}2.30 \text{ V} \times \text{cell number}$.

b.) Switch mode

During charging with max. 2.35 V/cell, the battery is separated from the consumers. Charging is to be

monitored. If at 2.35 V/cell the charging current falls to 1.5 A/100 Ah rated capacity, a switch to retentive charging is made, or switching occurs once 2.35V/cell is reached.

c.) Battery operation (charging/discharging)

The consumer will only be fed from the battery. The charging process must be agreed with Banner in line with the application.

2.3 Equalisation charging

Following a deep discharge and/or insufficient charging, charging must take place at a constant voltage of max. 2.35 V/cell for up to 48 hours. The charging current may not exceed 10A per 100 Ah of rated capacity. Should a maximum temperature of 45°C be reached, charging is to be interrupted, or a switch to retentive charging be made, in order that the temperature falls.

2.4. Superimposed alternating current leff

Maximal 1 A per 100 Ah C10 in sealed batteries, like ZVEI information leaflet no. 19.

2.5 Charging currents

Charging currents are not subject to any limits during continuous battery power supply and buffer operation without a recharging stage. Instead the specific battery-related information our data sheets applies.

2.6 Permitted deviations from the float voltages

This deviation is somewhat larger within the first 6 months after installation than later.

This is due to the different internal conditions each single cell/bloc in terms of recombination and polarization. (following values refer to 20°C and $2,27\text{V}/^{\circ}\text{C}$ in

	2 v cells	6 v cells	12 v cells
< 6 months	2,20 - 2,32 V	6,60 - 6,96 V	13,20 - 13,92 V
> 6 months	2,22 - 2,30 V	6,66 - 6,90 V	13,32 - 13,80 V

standby parallel and buffer operations)

The ideal temperature range amounts to $20^{\circ}\text{C} \pm 5^{\circ}\text{C}$ (the technical data are based on this temperature). High temperatures cut battery service life, while low temperatures reduce the capacity available. Exceeding the temperature limit of 55°C is not permitted and ongoing operating temperatures $<45^{\circ}\text{C}$ are to be avoided. The temperature differences between the blocks in a plant should not exceed 5°C .

Within an operating temperature range of $15^{\circ}\text{--}25^{\circ}\text{C}$, a temperature-dependent adjustment of the charging

voltage is not required. If the operating temperature is constantly outside this temperature range, the voltage should be adjusted accordingly. The corrective temperature factor amounts to $-0.005\text{V/cell per }^{\circ}\text{C}$.

3. Electrolyte

The electrolyte either consists of very pure diluted sulphuric acid, which is fixed in a web, or in gel form. Accordingly, even in the case of mechanical damage, liquid escapes are either impossible, or only occur to a very limited extent.

4. Ventilation

Battery compartments, shelves or cupboards are to have sufficient ventilation pursuant to ÖVE C 10 T" or DIN EN 50272-2. There are no gas emissions under normal charging conditions. Never install batteries in airtight, sealed rooms or containers!

5. Battery care and checks

The battery must be kept clean and dry, in order to prevent creepage current. Battery cleaning should take place in accordance with the ZVEI directive „Cleaning of batteries“.

The plastic parts of the battery, particularly the cell containers may only be cleaned with water without any additives.

The following should be measured and noted at least every six months:

- Battery voltage
- The voltage of various cells/block batteries
- The surface temperature of various cells/block batteries
- Battery room temperature

If the cell voltage deviates by $+0.2\text{ V/cell}$ or 0.1V/cell

from the average retentive charging voltage and /or the surface temperature of various cells/blocks by more than 5K , then customer service support should be sought.

The following should be measured and noted annually:

- Voltage of all cells/block batteries
- The surface temperature of various cells/block batteries
- Battery room temperature

Annual visual controls:

- The screw connections. The solid fit of unsecured screw connections is to be checked
- The battery installation and surroundings
- Ventilation and air extraction

6. Testing

Testing should be completed according to EN 60896-2. Special testing instructions, e.g. pursuant to DIN VDE 0107 and DIN VDE 0108 should also be observed.

a.) Operational safety of the battery system

In general, the functionality of the battery must be regularly checked using a capacity test in order to guarantee the operational safety of the system. Care must be taken that the capacity test is carried out with the maximum current for which the battery is designed in its highest loading condition. Regular checks of the battery can markedly reduce the risk of unexpected failures. It is thus recommended to carry out professional capacity tests at regular intervals, at least once a year.

7. Defects

If defects in the battery or the charger are identified,

customer service support should be requested immediately. Measurement data in line with Section 6 simplifies the search for the defect and its repair. A service contract with Banner also facilitates the timely identification of defects.

8. Storage and mothballing

If cells/batteries are to be stored for a long time or mothballed, they should be kept fully charged in a dry, frost-free room. Direct sunlight is to be avoided. In order to prevent damage, a choice can be made from the following charging measures:

1. Half-yearly equalisation charging in accordance with Section 2.3. In the case of mean room temperatures of over 20°C , shorter intervals may be necessary.

2. Retentive charging in line with Section 2.2. The period of use begins with the ex-works delivery of the filled and charged battery. Storage times are to be included in the period of use in full. In addition, batteries require recharging.

9. Technical data

The rated voltage, the number of cells, the rated capacity and the battery type are all to be read on the rating plate of the equipment.

Installation/Dealer stamp

on/by:

Warnings and safety instructions for lead-acid batteries



- Adhere to the information printed on the batteries, in the instructions for use and the vehicle operating manual.



- Wear eye protection.



- Keep children away from acid and batteries.



Danger of explosions:

- A highly explosive oxyhydrogen gas mixture is created during battery charging.



Open flames, sparks, open lights and smoking are prohibited:

- Avoid sparks when handling cables and electrical devices! Avoid short circuits!



Danger of chemical burns:

- Battery acid can cause severe burns therefore.
- Wear gloves and eye protection!
- Do not tip the battery, as acid can escape from the degassing valves.



First aid:

- In the case of acid splashes in the eyes, immediately rinse out with clean water for several minutes! Then consult a doctor without delay!
- Treat acid splashes on the skin or clothing with an acid neutralizer or soap and rinse with large amounts of water.
- Should acid be swallowed, consult a doctor immediately!



Warning:

- Do not subject batteries to direct daylight.
- Discharged batteries can freeze; therefore use frost-free storage.



Disposal:

- Used batteries should be handed in at a collection point. The information provided under Item 1 should be taken into account during transport. Never dispose of batteries with household waste!

Any warranty claims are null and void should the instructions for use be ignored, non-original spare parts be used for repairs, unauthorised tampering with the battery occur, or additives be introduced into the electrolyte (alleged improvement agents).

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