Instructions for Use

MEC 500

Electronic Volume Converter

living gas

metreg
Metreg Technologies GmbH

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Content

1 General information

This operating manual explains how to install, configure, monitor and maintain the MEC 500.

Compliance with all safety specifications and instructions for use in this operating manual is a prerequisite for safe work processes and the intended use of this device. Furthermore, the applicable directives, standards, local accident prevention regulations and general safety regulations for the respective area of application of this device must be observed.

This manual is an integral part of the product and must be kept in the immediate vicinity of the device. It must be accessible at all times to the employees responsible for installation, service, maintenance and cleaning. The figures contained in this manual are pictorial representations of the operations described and are therefore not necessarily to scale; consequently, they may differ from the actual appearance of the device.

⚠WARNING **Risk of serious injury or even death!**

Failure to observe this warning may result in death or serious injury!

NOTICE

This symbol indicates information related to the use of the product or important technical issues.

1.1 Customer service

For technical assistance with the installation or use of this product, please contact the manufacturer's technical support.

1.2 Definitions

Designation	Description
Three-way valve	Used to safely transfer pressure from the pressure input point in the gas meter to the pressure sensor input of the MEC 500, minimizing the risk of burst pressure on the sensor
EM-1, EM-2 or EM-2Ex	Expansion modules to extend the functionality of the MEC 500
Firmware	Software uploaded to the MEC 500
Installation kit	Mounting plate designed for the installation of the MEC 500 for use on the gas line
INT-S3 barrier	Opto-electrical barrier for signal separation between the normal zone and the Ex zone
Metreg 500	Software application installed on a PC with Windows operating system for reading out and configuring the MEC 500
Optical interface	This allows the MEC 500 to be read out via infrared communication in accordance with IEC 62056
RS485 interface	Transmission interface for communication between PC and MEC 500

1.3 Safety regulations

- Always use the latest version of this documentation.
  Ensure that the documentation matches the hardware and firmware version of the configured device.
  The current version is available from the manufacturer.
- The MEC 500 is an explosion-proof device of the intrinsically safe variant “i”.
  The device may be installed in explosion risk zones 0, 1 and 2 for gas, and dust in groups IIA and IIB.
- Internal safety circuits, including integrated pressure and temperature sensors, fail to meet the 500 V test required by EN 60079-11 for grounded or insulated metal parts inside. The protection class does not depend on the respective free spaces. Metal cable lugs are galvanically connected and can be installed completely grounded or completely not grounded. This must be weighed up during installation.
- The person installing the device is responsible for verifying the continuity of safety connections.
- Avoid impact or scratching the housing, as there is a risk of ignition.
- The housing must not be opened if there is a situational risk of moisture or dust entering the connection compartment – be it due to rain, snow or strong wind.
- The IP protection class specified by the manufacturer is fulfilled if the rubber seal is correctly inserted into the housing. The cables must be firmly connected to the cable entries, with the front panel firmly tightened. Unused cable entries must be plugged and the antenna connection (if provided) must be closed with a cap or antenna.

- In exceptional cases, all or part of the polycarbonate housing can become electrostatically charged, which can cause it to ignite. Do not install the product in an atmosphere/weather condition that is conducive to electrostatic charging. Clean the product with a damp cloth only.
- Intrinsically safe circuits in the MEC 500 comply with all intrinsic safety regulations set out in EN 60079-14; see below for details:
  - Cables must be designed with separate strands or as multicore cables of types A or B, in accordance with item 12.2.2.8 of EN 60079-14.
  - Cables and wires of non-intrinsically safe circuits must be routed separately from intrinsically safe cables and wires.
  - Cables and wires must be securely fastened to prevent them hanging loose and to prevent mechanical damage.
  - The cables of intrinsically safe circuits must be insulated in blue.

  The cable shield must be connected to the cable entry. This grounds the MEC 500 in the device environment. If transmitters are used, their shielding must be insulated.
- Cables used for connection must have a round cross-section which fits the outer diameter of the cable glands used.
- The device functions and options may differ depending on the variant.
- In view of the technical conditions, safety and other regulations, this measuring device may only be serviced by trained and experienced persons. All conditions for the use of special equipment must be taken into account. Similar conditions apply to all related accessories.
- The device approved for installation must have the same serial number on the physical nameplate, on the certificate of metrological characteristics and on the digital nameplate on the LCD display.
- One device variant is designed in accordance with the Measuring Instruments Directive (MID) 2014/32/EU of the European Parliament and of the Council of February 26, 2014, on the harmonization of the laws of the Member States relating to the making available on the market of measuring instruments (as amended); these are volume correctors used in domestic, commercial and industrial applications.
- A device designed in conformity with the MID is marked accordingly on the nameplate. The CE marking has an additional “M”, the last two digits of which indicate the year of manufacture.
- According to the MID regulation, junction boxes, surge protectors and Zener barriers may be used. These components must be suitable for operation in housing.
- To install the MEC 500 on the gas meter, cables must be used that correspond with those used in the gas meter. Before installation, familiarize yourself with the technical documentation of the gas meter; there you will find detailed information on installation conditions and cable types.
- This device must not be installed in the vicinity of strong magnetic fields.

All products marked with this symbol are electrical and electronic equipment (Directive 2012/19/EU of the European Parliament and of the Council of July 4, 2012, on the prevention of waste electrical and electronic equipment (WEEE)) and must not be mixed with unsorted household waste. Instead, to protect human health and the environment, you must take your waste equipment to an officially designated collection point for the recycling of waste electrical and electronic equipment. Proper disposal and recycling help to avert potentially harmful consequences for the environment and people.

For further information on the location and conditions of such collection points, please contact the installer or local authorities.

2 Safety

2.1 Safety regulations for radio equipment

- The device can be equipped with a GSM modem. In this type variant, the device becomes a radio device according to Directive 2014/53/EU of the European Parliament and of the Council of April 16, 2014, on the harmonization of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC (RED).
- The use of a device with a built-in modem is only permitted in locations where the operation of a GSM modem does not interfere with the operation of other equipment and installations, whether industrial or medical.
- The RED compliance test was performed using an HSA-0918-TCQ5 antenna from Hongsense Technology. Co, Ltd.
- Unauthorized access to the inside of the device, installation disregarding the information in this document, unauthorized changes and modifications to the device structure can result in the loss of the intrinsically safe, metrological properties as well as the radio safety properties of the device. The removal of seals or gaskets may result in the loss of metrological, intrinsic safety and radio properties and the warranty.

MID Directive 2014/32/EU of the European Parliament and of the Council of February 26, 2014, on the harmonization of the laws of the Member States relating to the making available on the market of measuring instruments (recast)

ATEX Directive 2014/34/EU of the European Parliament and of the Council of February 26, 2014, on the harmonization of the laws of Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres (recast)

RED Directive 2014/53/EU of the European Parliament and of the Council of April 16, 2014, on the harmonization of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC

3 Technical Data

3.1 Basic principles

MEC 500

- is an electronic volume corrector and is designed to work via pulse connection or encoder in combination with bellows, rotary piston, turbine wheel and ultrasonic gas meters.
- is an explosion-protected device and can be operated in potentially explosive atmospheres of ATEX class 0.
- acquires natural gas volume values from gas meters, stores them in the internal memory and processes the volume calculation according to certain standard conditions of the respective gas volume.
- offers different menu languages – German, English, Spanish, and Polish.

In addition to measuring and converting gas volumes, the functions of the MEC 500 are as follows: The flow of gas in measurement and standard conditions is recorded and can be read in the **Registered Data** field. In addition to the actual gas flow, MEC 500 can also monitor and supervise the entire gas system by means of the integrated input and output circuits; this makes MEC 500 a fully functional control unit with the functions of a measured value recorder.

Communication with the device takes place via the optional internal modem with 4G / 3G / 2G technology as well as NB-IoT and LTE Cat M. Serial communication takes place via serial interfaces, optionally 2 x RS485 or 1 x RS485 and optionally 1 x RS232. Furthermore, the device has an optical interface.

The MEC 500 is configured using the PC Windows application Metreg 500.

Connection options

- LS33600 batteries (3 pieces) for powering the MEC 500 (1 piece) and the optional internal modem (2 pieces)
- Antenna with FME connector
- INT-S3 power supply interface, separate from the communication interface
- EM-1, EM-2 and EM-2Ex expansion modules, via the INT-S3 interface
- External industrial modem IK-401, via the INT-S3 interface

3.2 Device types and accessories

MEC 500 can be assembled in two types of housings with various types of pressure sensors, and with or without MID Declaration of Conformity:

Polycarbonate housing

- MID Declaration of Conformity
- Up to 2 pressure sensors – internal or external
- Pt1000 temperature sensor, 50 mm fixed or adjustable 140–180 mm
- Optional internal modem
- Special mounting plate

Aluminum housing

- MID Declaration of Conformity
- Up to 2 pressure sensors – internal or external
- Pt1000 temperature sensor, 50 mm fixed or adjustable 140–180 mm
- Optional internal modem
- Special mounting plate
- Full numeric keypad
- Backlight for interior compartment
- Piano black details

NOTICE

Not every combination of pressure sensors is also available as a version with MID Declaration of Conformity. For example, external P1 & P2 sensors are not possible in this case.

3.3 General data

Approvals and certifications	
ATEX certification EN IEC 60079-0:2018, EN 60079-11:2012	FTZU 20 ATEX 0030X, from April 6, 2020 Ex classification: Ⓔx II 1G Ex ia IIB T4 Ga
Metrology approval EN 12405-1:2005 + A2:2010 EN 12405-1:2018 EN 12405-2:2012	EU type test, report no.: PTB-1.42-4097513 and issued certificates no.: DE-19-MI002-PTB005 – PTZ converter DE-19-MI002-PTB005 – T values In operation, MEC 500 complies with the System 2 specification of EN 12405-2:2012.

Dimensions	**Polycarbonate**	**Aluminum**
Width	196 mm / 207 mm with pressure sensor thread	180 mm / 202 mm with pressure sensor thread
Height	170 mm / 194 mm with cable entries	150 mm / 167 mm with cable entries
Depth	77 mm	93 mm
Weight	1.3 kg	3.5 kg

Environmental conditions	
Housing seal	IP66 for outdoor installation
Ambient temperature	-25°C to +70°C with SAFT LS33600 or TADIRAN SL2780 batteries Or -25°C to +70°C with EVE 34165 batteries
Resistance to electrical and magnetic conditions	M2 – device can be mounted in areas with vibrations and flickering. E2 – device can be mounted in industrial areas exposed to electrical interferences.
Relative humidity	Maximum 95% at temperature 70°C

General information	
Display	4-inch display with backlight, resolution 128 x 64. Display resistant to critically low temperatures, range from -20°C to +70°C
Keypad	6 push buttons for polycarbonate device 18 push buttons for aluminum device
Cable connections	1 x M16 cable entry (cable diameter 4–8 mm) 8 x M14 cable entries (cable diameter 3–6.5 mm) Antenna connector (optional)—FME-M socket – suitable for connecting an FME-F antenna
Extras	Backlight for connection compartment in version with aluminum housing

3.4 Technical specifications

Communication with the device	
Serial interfaces	2 x RS485 ext. communication interfaces (COM1, COM2) Transmission speed – from 2,400 b/s to 256,000 b/s Option 1 x RS232 communication interface (COM1 instead of RS485), transmission speed up to 115,200 b/s
Optical interface	Optical interface IEC 62056-21 (COM3) Transmission speed 9,600–38,400 b/s
Internal modem	Internal modem as an option: 3G / 2G modem 4G /3G / 2G modem NB-IoT / LTE Cat M1 / 2G modem Power supply from built-in batteries
Transmission protocols	MODBUS RTU, MODBUS TCP (in version with internal modem), MODBUS RTU (MASTER MODE), GAZMODEM, GAZMODEM (MASTER MODE). Other protocols available on request.

Device power supply	
MEC 500 battery (B1)	**1 battery to supply the MEC 500** Voltage: 3.6 V General output: 17 Ah Type: SAFT LS33600, ambient temperature: -25°C to +70°C Type: EVE ER34615, ambient temperature: -25°C to +50°C Estimated run time: 5 years under the following conditions: • Recording interval set to 60 min • All outputs, signal inputs and transmission interfaces (wire without terminating resistors) are inactive. • LCD display remains off, keypad is not used. • Operating temperature: Minimum value for ambient temperature, i.e. 25°C • Maximum pulse frequency provided at the LF input (2 Hz) • Measured gas pressure $p1=p1_{max}$ • Measured gas temperature $t=t_{min}$

Device power supply	
Modem batteries (B2, B3)	**2 batteries to power the optional internal modem** Voltage: 3.6 V General output: 17 Ah Type: SAFT LS33600 ambient temperature range: -25°C to +70°C Type: EVE ER34615 ambient temperature range: -25°C to +50°C Estimated run time: 5 years on 2 batteries under the following conditions: • 3 x daily communication for 5 min each • GSM signal level CSQ=20 • Ambient temperature 21°C
Backup battery	**1 backup battery** (see also section 8.1 “Backup battery”, page 80) Voltage: 3.6 V General output: 1.2 Ah Type: SAFT LS14250, ½ AA format Estimated run time: 2 weeks
External power source	Special safety barrier INT-S3 with the following features: • Ex-classification ⟨Ex⟩ II (2) G [Ex ib Gb] IIA • Power supply for MEC 500: U_{in} = 5.7 V • Activation of MEC 500 functions requiring an external power supply: Frequency mode of the digital output, 1 s measuring cycle, RF pulse inputs • Safety barrier for signals outside the danger zone – RS485 interface separation: Activates the transmission of devices located outside the Ex zone – Digital output isolation: Transmission of signals from digital outputs to automatic systems outside the Ex zone • Power supply of the INT-S3 interface: 10.5–30 V DC

Inputs and outputs	
Digital inputs	• 6 Ex digital inputs – cooperation with potential-free connection points, shared with: – 2 LF inputs, frequency 0–60 Hz, reed contact, Wiegand – 1 TS tamper-proof switch (closed in default setting) • 2 Ex digital inputs, NAMUR type, shared with: – 2 HF inputs, frequency 0–5,000 Hz EN 60947-5-6, can run on battery for a short time. – 1 encoder (NAMUR type) • 1 SCR encoder
Digital outputs	• 4 Ex digital outputs – 1 output with possible use as frequency output, max. output frequency 5,000 Hz – frequency depends on values of flow rate, base flow rate, pressure, etc. Mode with external power supply is available. – 4 outputs with the option to output pulses based on meter progress: Vb, Vm, E, etc. – Binary outputs configurable in NO / NC mode to release pulses on alarm conditions

Pressure and temperature measurement	
Primary pressure sensor P1	**Sensor types** • Internal – thread available on right side of housing • External – sensor installed on cable, length up to 10 m **Thread** • Metric thread M12 x 1.5 • Inch thread ¼" NPT on request **Sensor ranges [bar A (absolute)]** 0.8–6 / 0.8–10 / 2–10 / 4–20 /7–35 / 4–70 / 10–70 / 10–100 / 20–100
Secondary pressure sensor P2	Sensor types and thread like P1 Sensor ranges [bar G (gage)]: 0–0.1 / 0–0.3 / 0–1 / 0–6 / 0–10 / 4–20 / 7–35 / 10–70 / 10–100 / 5–55
Temperature sensor	**Temperature sensor Pt1000 class A in 2 versions** • 50 mm length, Ø 5.7 mm: Insertion into the temperature pocket on the gas meter • 140–180 mm adjustable length, 6 mm housing diameter: Insertion into the temperature pocket in the pipeline Sensor range: -30°C to +70°C

Storage capacity	
Data recording	Periodic recording: Interval adjustable from 1–60 min. Storage capacity: 36,000 logs (over 4 years with 60 min intervals) Measuring cycle: Every 6–60 s with battery supply; every 1–60 s with power supply via INT-S3 Hourly values: 11,500 logs (over 16 months) Daily readings: 1,400 logs (about 4 years) Monthly values: About 450 logs Period values 2 (adjustable; default on the tenth, twentieth and last gas day of the month): Approx. 800 logs
Events and alarms	• **AlarmLOG**: Exceeding pressure range, flow rate. Alarms must be constantly checked and acknowledged. If the memory is more than 95% full, the device will count to error counter. Capacity: Approx. 3,000 logs. • **FullLOG**: Events occurring during normal device operation – status change of digital inputs, opening of the inner compartment, connection of the power supply. Memory sector is overwritten – oldest events are deleted when new ones occur. Storage capacity: Approx. 3,000 logs.

3.5 Metrological data

Pressure and temperature measurement			
Standard conditions	Can be set by authorized service personnel, possible options: • Standard pressure (absolute) pb: 1.00–1.02 bar, default 1.01325 bar • Standard temperature Tb: 270–300 K, default 273.15 K (0°C) • Reference temperature for combustion process T1: 270–300 K, default 298.15 K (25°C)		
Algorithms for the calculation of the gas composition	SGERG-88, AGA8-92 exact composition, AGA8-G1, AGA8-G2, AGA NX-19 mod Constant compression factor K=1		
Temperature range for algorithms	**Pressure measuring range [bar]**	**Calculation method**	
		SGERG-88 AGA8-G1 AGA8-G2	AGA8-92DC	AGA NX19 mod
		T_{min}, T, T_{max} [°C]	T_{min}, T, T_{max} [°C]	T_{min}, T, T_{max} [°C]
	0.8–6			-30, 17.5, 65
	0.8–10			
	2–10	-25, 20, 65		
	4–20		-30, 20, 70	
	7–35			
	4–70			
	10–70	-10, 27.5, 65		
	10–100			

Pressure and temperature measurement			
	20–100		

Maximum permissible errors	
Maximum permissible errors (MPE) according to EN 12405-1	0.5% for reference conditions 1% for nominal operating conditions Typical error <0.15
Maximum permissible errors (MPE) according to EN 12405-2	ECD class A

Accuracy of pressure and temperature input values		
Accuracy of primary pressure sensor p1	20°C ± 3°C ± 0.2% of measured value	-25°C to +70°C ± 0.5% of measured value
Accuracy of secondary pressure sensor p2	± 0.4% of measuring range	
Accuracy of temperature sensor T	20°C ± 3°C ± 0.1% of measured value	-25°C to +70°C ± 0.2% of measured value

3.6 Intrinsically safe parameters

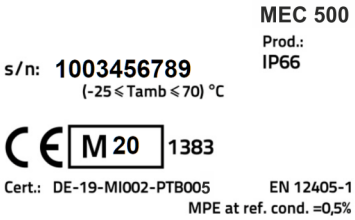
- External power supply (POWER SUPPLY): Connections 2 ($_{Vin}$) to 1 (GND)
  Ui=6.51 V; Pi=3.5 W; Ii=1.1 A; Li=0; Ci=12 °µF
- External power supply of the communication interfaces (COM SUPPLY): Connections 4 (VIN) to 3 (GND)
  Ui=6.51 V; Pi=0.8 W; Ii=0.4A; Li=0; Ci=2.64 µF
- COM1: Connections 5 (D-), 6 (D+) to GND
- COM2: Connections 7 (D-, Rx), 8 (D+, Tx) to GND
  Uo=6.51 V; Io=0.8A; Po=1.1 W; Pi=0.66 W; Li=0; Ci=0
  Gas group IIA Lo=800 µH; Co=500 µF
  Gas group IIB Lo=200 µH; Co=25 µF
- External DIGITAL SENSOR: Connections 10 (V_{out}) to 9 (GND)
  Uo=6.51 V; Io=0.29A; Po=0.47 W; Li=0; Ci=0
  Gas group IIA Lo=2 mH; Co=500 µF
  Gas group IIB Lo=1 mH; Co=25 µF
- Output signals DIGITAL OUTPUTS: Connections 11 (DO1+), 12 (DO2+), 13 (DO3+), 14 (DO4+)
  Ui=15 V; Ii=0.123 A; Pi=0.33 W; Li=0; Ci=0; Uo=6.51 V
  Gas group IIA Lo=18 mH; Co=7 µF
  Gas group IIB Lo=10 mH; Co=1.7 µF
- Contact inputs: Connections 16 (DI1+), 18 (DI2+), 20 (DI3+), 22 (DI4+), 24 (DI5+) to GND and 26 (DI6+), 28 (DI7+), 30 (DI8+), 29 (DI8-) to GND
  Ui=6.51 V; Li=0; Ci=120 nF
  Gas group IIA Lo=800 mH; Co=500 µF
  Gas group IIB Lo=400 mH; Co=25 µF
  Additionally only for contact input: Connection 24 (DI5+) to GND
  Po=27 mW; Uo=6.51 V; Io=16.5 mA
- NAMUR inputs (HF1, HF2): connections 26 (DI6+) to 25 (DI6-), 28 (DI7+) to 27 (DI7-)
  Uo=9.6 V; Io=33 mA; Po=78 mW; Li=0; Ci=0
  Gas group IIA Lo=800 mH; Co=100 µF
  Gas group IIB Lo=400 mH; Co=13 µF
- Input SCR ENCODER: Connections 30 (DI8+), 29 (DI8-) to GND
  Uo=9.6 V; Io=0.021 A; Po=0.48 W; Li=0; Ci=0
  Gas group IIA Lo=2 mH; Co=500 µF
  Gas group IIB Lo=1 mH; Co=25 µF
- Sensor Pt1000: Connections 32 (I+), 31 (I-), 34 (U+), 33 (U-) to GND
  Ui=6.51 V; Li=0; Ci=250 nF;
- External pressure sensor: Connection 36 (PS1), 38 (PS2), 40 (PS3), 37 (PS4), 39 (PS5) to 35 (GND)
  Ui=6.51 V; Li=0; Ci=200 nF;

3.7 Device identification

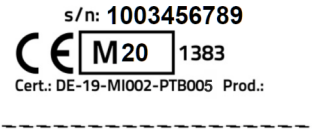
The device is identified by several nameplates. The nameplates shown below are located on the front of the device.

If the device does not have an MID certificate, the nameplates are different.

Marking for devices conforming with the MID Directive



Marking for aluminum housing



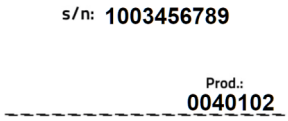
Marking for polycarbonate housing

The marking prescribed by MID includes the following data:

- Serial number of the device
- CE marking
- MID marking with year of recognition of conformity
- Specification of device number
- MID certificate name
- Production number/date

The information missing here is on the front of the MEC 500.

Marking for other devices

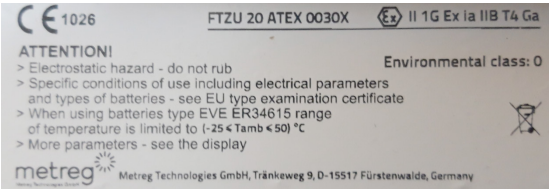


Information on the nameplate:

- Serial number of the device
- Production number/date

ATEX conformity also includes easily accessible, contamination-proof markings. The following nameplates are located on the top of the device.

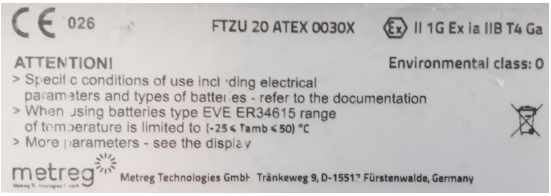
Nameplate with ATEX marking



ATEX marking for polycarbonate housings, including instruction that rubbing the housing is prohibited.

ATEX requires information such as:

- No. of the **ATEX** certificate
- **Ex** classification
- Special terms of use
- Name and address of the manufacturer



ATEX marking for aluminum housing

3.8 Device sealing

A properly sealed device maintains the integrity, quality and warranty of the device. Any damaged seal may give cause to suspect that the integrity of the device has been compromised.

There are 2 types of sealing in a MEC 500:

Sealing according to MID

Hologram seal indicating the EN 12405-1 standard to which it refers. If this seal is damaged or missing, the device loses its conformity to MID.

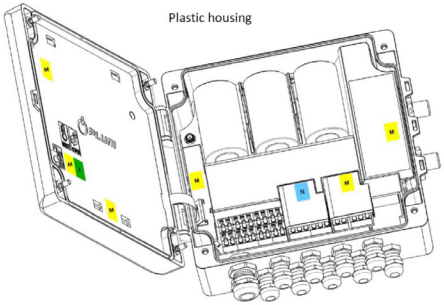
Manufacturer's seal

This seal ensures that the device has not been tampered with. The warranty becomes void if this sticker is removed.

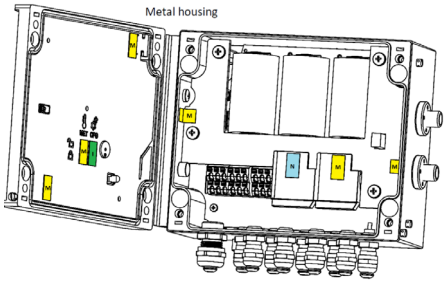
- If the device has not been assembled and certified with MID conformity confirmation, check that all the above seals have been replaced by manufacturer seals.

Positions of the seals in the MEC 500:

Polycarbonate housing

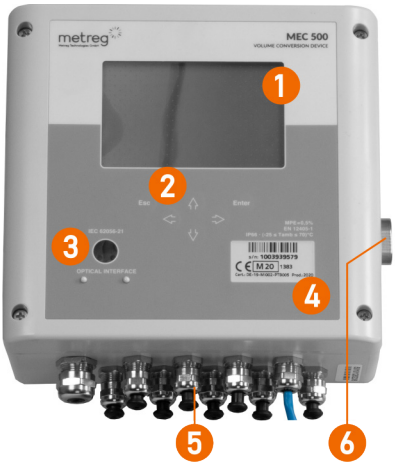


Aluminum housing

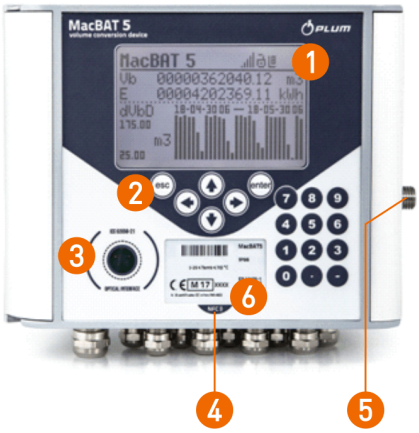


3.9 Overview of the device

Polycarbonate housing



Aluminum housing

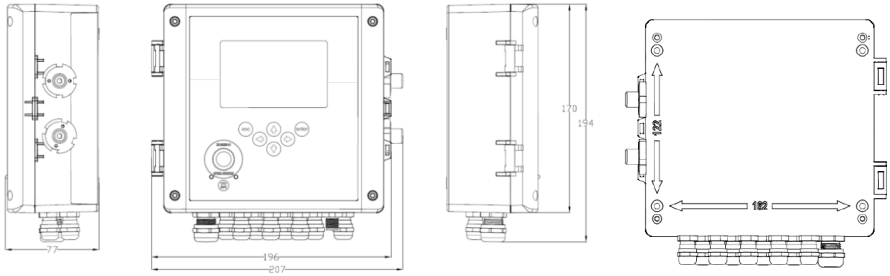


1 Display
2 Keypad
3 Optical interface
4 MID nameplate
5 Cable entries and antenna connection – if equipped with modem
6 Pressure sensor connection – if present inside

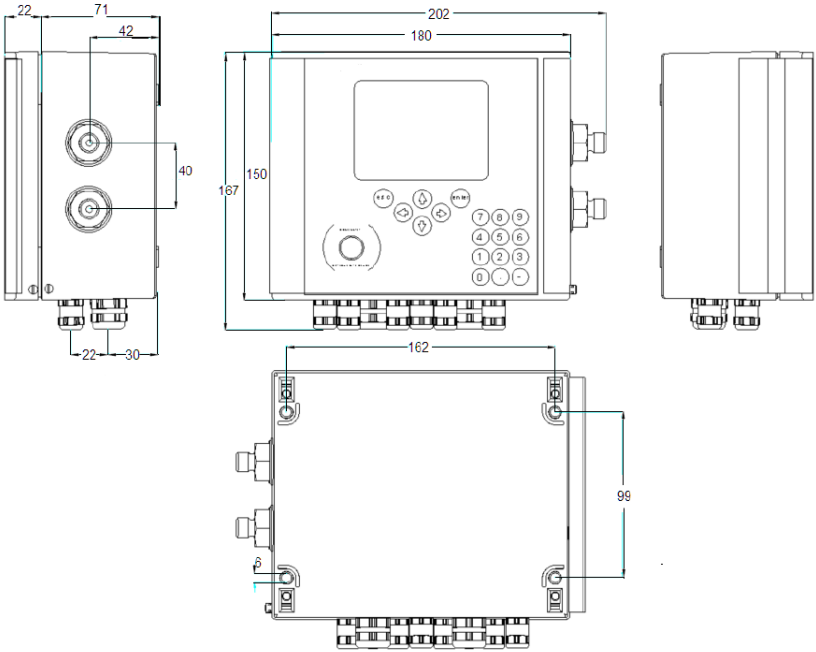
4 Installation

4.1 Device dimensions

Polycarbonate housing



Aluminum housing



4.2 Tool list

Various tools are required to properly install the device.

Tool	Purpose in the installation process
Open-end wrench	Fixing the cable entries, pressure sensor connection • Have various wrench sizes and an adjustable open-end wrench ready.
Phillips screwdriver	Opening and closing the device housing
Slotted screwdriver	Loosening the terminals to fix the cable Tightening the screws on the INT-S3 to secure the cables well
Allen key, 5 mm	Fastening the device and the three-way valve to the mounting plate
Crimping pliers	Firm connection of the insulating sleeves to the cable ends

⚠WARNING **Risk of injury from gas explosion!**

If tools are used that are not EX-safe, explosions may occur.

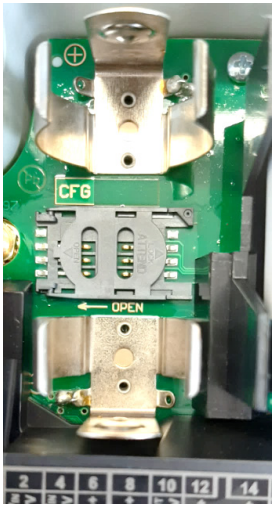
- When installing in the vicinity of gases, only use EX-safe tools.

4.3 Insert SIM card (optional, for modem)

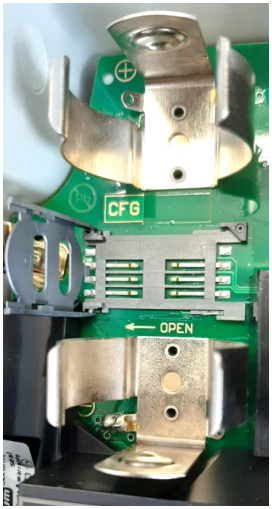
If the device is equipped with a modem, we recommend inserting the SIM card right at the beginning of work. However, you can also do that later.

NOTICE

- For the MEC 500, use a mini SIM card that conforms to the ETSI TS 102221 V.9.0.0 or embedded SIM standards.

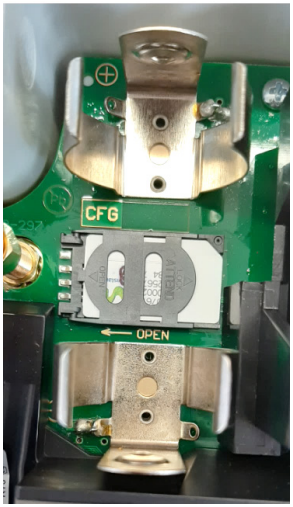


1. Remove the modem battery (B3) – the first one on the left; see also section 5.1.



2. Slide the cover of the SIM compartment to the left to open it.

3. Insert the mini SIM card and align it correctly.



4. Close the cover, slide it to the right and replace the battery.

4.4 Installation on the mounting plate

NOTICE

- Contact the manufacturer for instructions on how to install on the mounting plate!

4.5 MEC 500 with external pressure sensor

Installing the external sensor

If the MEC 500 is equipped with an external pressure sensor, there are two options:

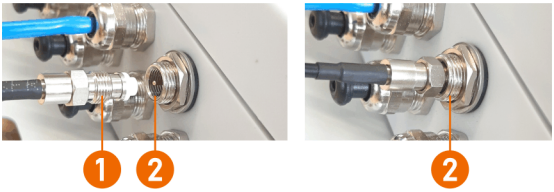
- Attach the valve so that the center port is facing right. The valve can be firmly attached to the plate directly.
- Attach the pressure sensor to the connection of the three-way valve with an M12 x 1.5 double socket or use the short attached pipe.

or

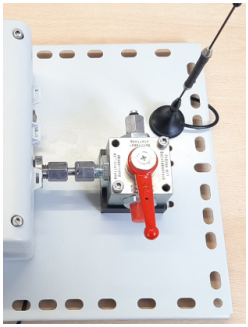
- Attach the three-way valve directly to the pressure pick-up point, eliminating the need to mount it on the plate.

Inserting the antenna into the FME socket

If the device has an internal modem:



- Secure the plug (1) of the antenna cable to prevent it falling out by screwing it into the socket (2).



Finished assembly

The connected antenna has a magnetic base and can be attached to any metal part.

The pressure and measuring circuits can now be connected to the device.

4.6 Cable preparation

⚠WARNING **Risk of injury from gas explosion!**

A faulty connection can lead to life-threatening situations or cause considerable material damage.

- The appliance may only be connected by well-trained gas specialists.

⚠WARNING **Risk of injury from gas explosion!**

Equipment that does not comply with the installation conditions and values specified in the ATEX certificate may incur an explosion risk.

- Ensure that the device is only connected to intrinsically safe devices when operating in zone 0.

⚠WARNING **Risk of injury from electric shock!**

Electrical circuits are live.

- Disconnect the power supply before starting work.

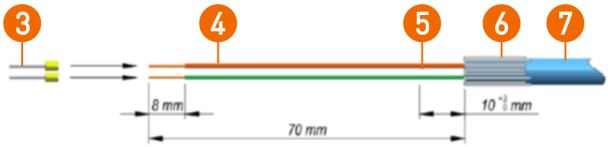
⚠WARNING **Risk of injury from gas explosion!**

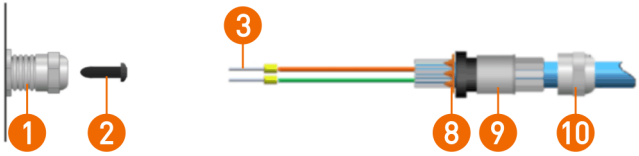
Cables used for intrinsically safe circuits must be routed separately from non-intrinsically safe cables.

- Lay intrinsically safe cables firmly and protect them from mechanical damage.
- Use cables with blue insulation.

The required cable dimensions are between 0.25 mm^2 and 0.75 mm^2 for multicore cables. This derives from the diameters of the cable entries and cable clamp types used.

Unused cable entries must be screwed tight and closed with black plugs to ensure that the IP66 protection class is maintained.





1 Cable entry
2 Plug
3 Ferrules
4 Single cores
5 Insulation
6 Cable shield
7 Cable with insulation
8 Shaped crown
9 Strain relief with rubber seal
10 Gland nut

Fig. 1: Position of the black plugs

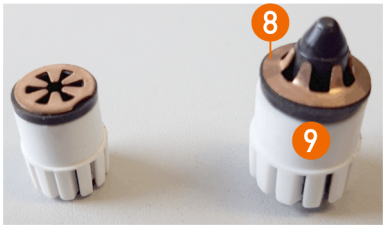


Fig. 2: Black plug shapes a crown (8).

- Push the black plug (2) into the cable entry (1) as far as it will go. This deforms the crown (8) inside, as required later, see Fig. 1 and *Fig.* 2.
- Unscrew the gland nut (10).
- Remove the strain relief (9) from the gland.
- Strip about 70 mm of the insulation from the cables.
- Cut the cable shield (6) about 10 mm long and roll it backwards over the insulation of the cable (7).
- Slide the gland nut (10) over the cable.
- Slide the strain relief together with the crown over the shield so that the shield still protrudes approx. 6 mm from the crown.
- Remove the insulation from the individual cores over a length of about 8 mm.
- Pull the wire end sleeves (3) onto the cores and securely fasten them to the individual cores using the crimping pliers.

- Push the cores and the cable into the cable entry (1) as far as it will go.
- Screw the gland nut (10) onto the cable entry. This closes the strain relief.
- Secure the cable entry with a second open-end wrench so that it does not rotate when the gland screw is tightened.
- Tighten the gland nut with the open-end wrench.

Technical parameters of the cables

CT6 temperature sensor and EPS external pressure sensor
factory-mounted cable, maximum length 10 m.

Digital inputs; DI, LF, NAMUR, SCR
LIYCY 2 x 0.25 – 0.5 mm^2 or
LIYCY 4 x 0.25 – 0.5 mm^2.

Communication interfaces COM1, COM2, device power supply, DO outputs
LIYCY 2...10 x 0.50 mm^2 – max. 150 m
LIYCY 6...10 x 0.75 mm^2 – max. 200 m

Or pair-stranded cables
IYCY-P 2...5 x 2 x 0.34 mm^2 – max. 100 m
LIYCY-P 2...5 x 2 x 0.50 mm^2 – max. 150 m
LIYCY-P 2...5 x 2 x 0.75 mm^2 – max. 200 m.

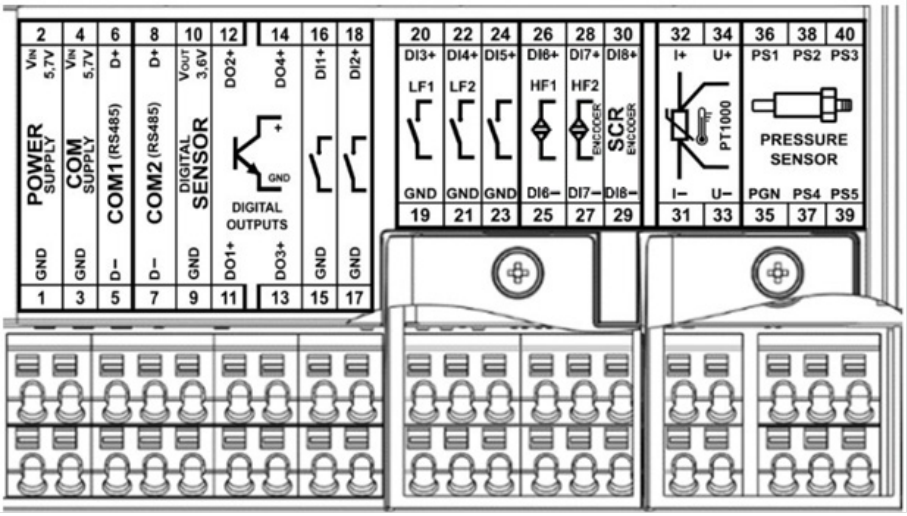
Number of cables required for the connection
cores: power supply of the MEC 500 and internal modem only
4 cores: Power supply of the MEC 500 and transmission on single RS485 channel
6 cores: Power supply of the MEC 500 and transmission on both RS485 channels
7–10 cores: Power supply of the MEC 500, transmission inputs and DO outputs

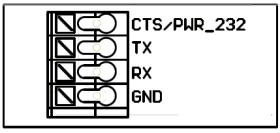
4.7 Connecting external cabling

External wiring is done using the Terminals (see page 31) so that cables are prevented from being torn out by the glands; see section 4.6 “Cable preparation”, page 28.

- After clamping each cable core into the terminal, make sure each core is firmly clamped by carefully pulling on the core.

Terminals





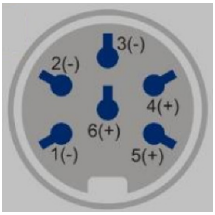
Optional RS232 board

1–2 External power supply, INT-S3 only
3–4 Power supply for external COM ports
5–8 Connections for transmission via serial interfaces
9–10 Power supply for digital sensors – currently not available
11–14 DO – connection for digital outputs
15–18 DI – binary inputs 1 and 2
19–22 Pulse input LF1 and LF2, shared with binary inputs 3 and 4
23–24 Anti-tampering contact, shared with binary input 5
25–26 Pulse input HF1 from gas meter, shared with NAMUR digital input
27–28 Pulse input HF2 from gas meter, shared with NAMUR digital input and encoder input
29–30 SCR encoder input
31–34 PT1000 input, 4-wire
35–40 Input EPS pressure sensor

NOTICE

The HF1 and HF2 modes of DI6 and DI7 are only available if the power supply of MEC 500 is external.

4.8 Connecting a gas meter



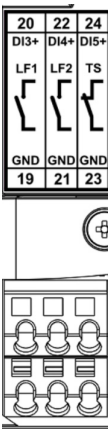
Example of a gas meter output socket

To connect the signal line of the gas meter, first check the nameplate for the pin assignment and then connect the wires to the correct terminal in each case.

NOTICE

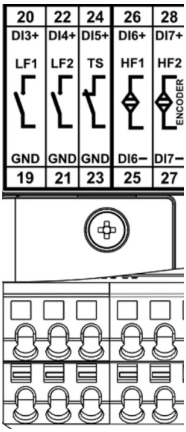
- After connection, correctly configure the type of input signal and pulse value of the inputs used; see section 6.2 “Configuring pulse inputs”, page 43.

Example 1



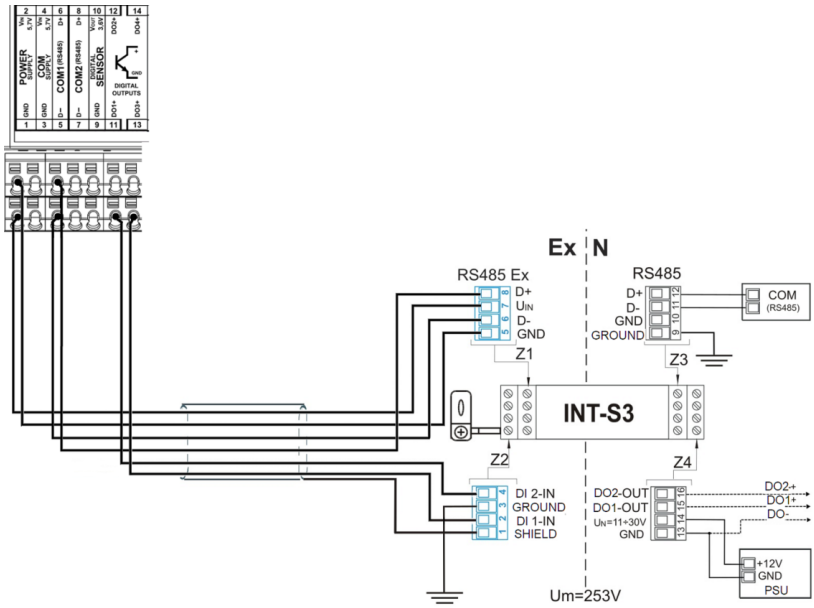
Signal	Pins	MEC 500
LF1	1–4	19–20
LF2	2–5	21–22
TS	3–6	23–24

Example 2



Signal	Pins	MEC 500
LF1	1–4	19–20
HF1	2–5	25–26
TS	3–6	23–24

4.9 INT-S3 connection – external power source and other circuits



A single cable connects INT-S3 to MEC 500.
In order to use a transmission on the second COM output (connection 7, 8) and/or to realize 2 additional digital outputs DO, another INT-S3 module must be used.

⚠WARNING **Risk of injury from explosion!**

If the MEC 500 is operated in an Ex zone, only INT-S3 may be connected directly to its own terminals.

- Connect all other devices to the side of the INT-S3 marked N (black terminals).

⚠WARNING **Risk of injury from electric shock!**

INT-S3 requires a supply voltage of 10.5–30 V DC.

- Never connect the 230 V mains current directly to the terminals!

NOTICE

Even when connected to the external power supply, the MEC 500 battery (B1) must always remain in the MEC 500, as it is not possible to start it up without the MEC 500 battery.

4.10 Connecting external modules

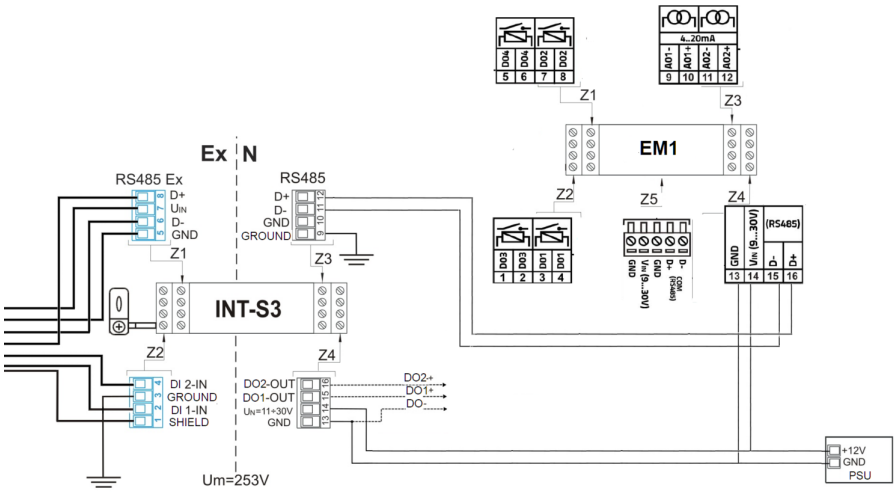


Fig. 3: Example: Connection of external module 1, additional relay and current outputs, EM1

EM1 is connected to the safe side of INT-S3.

INT-S3 is transparent here. MEC 500 communicates directly with the module.

Connections Z4 and Z5 in EM1 are connected.

Connection of EM-2 expansion module

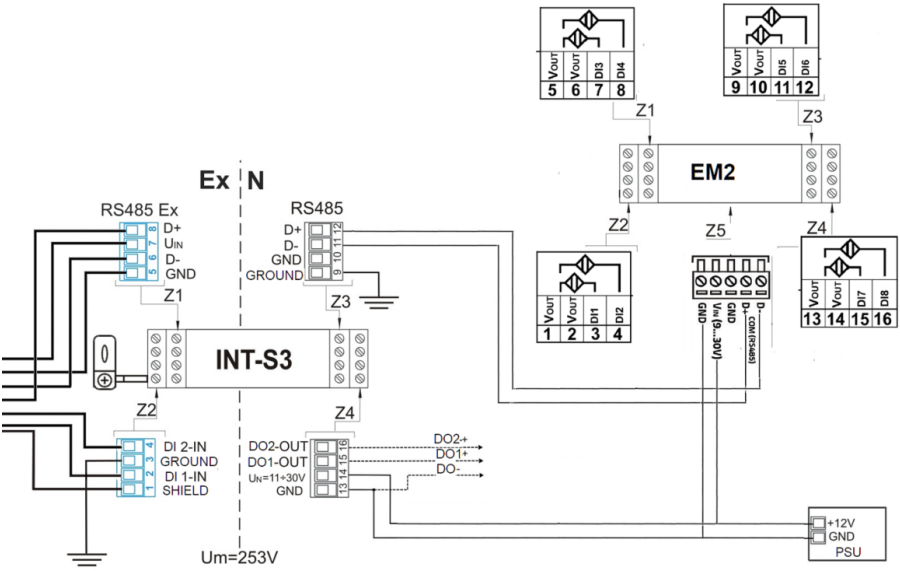


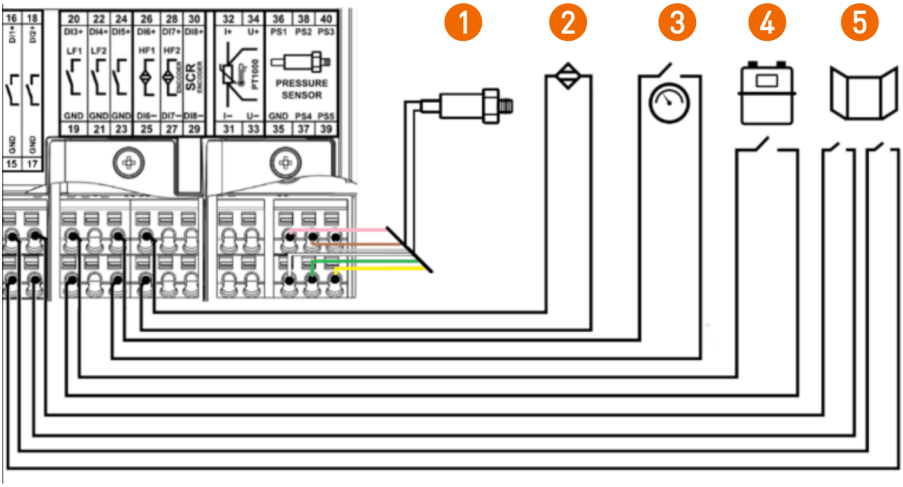
Fig. 4: Example: Connection of external module 2, additional NAMUR inputs, EM2

EM2 is connected to the safe side of INT-S3.

INT-S3 is transparent here. MEC 500 communicates directly with the module.

Connections 1, 2, 5, 6, 9, 10, 13, 14 are internally connected.

4.11 Connecting binary inputs and other devices



1 External pressure sensor
2 Inductive sensor
3 Differential pressure gage
4 Gas meter
5 Control cabinet door

This example for connecting peripheral devices may vary in individual cases due to the large number of configuration options available.

5 Use

5.1 Starting up the MEC 500

On receipt of goods, the MEC 500 may be fitted with a release tab which must be removed before the device can be powered by battery:

1 Modem battery (B3)
2 Modem battery (B2)
3 MEC 500 battery (B1)

A release tab (5) insulates the backup battery; see section 8.1 “Backup battery”, page 80.

- Pull out all release tabs (4, 5).

The batteries are now active.

- After removing the release tabs, set the time and date of the device, see section 7.4.1.1 “Configuration after Installation”, page 60.

5.2 User accounts

The account system consists of levels 0 to 9 with increasing access rights.

Preset passwords should be changed during initial configuration for security reasons.

Login details (L0 to L9) are shown on the display in the header, see section 5.5 “Display”, page 40. The user remains logged in until he switches off the display.

- **Logout level 0**
  Default setting after starting the device.
- **Basic – Level 1**
  Penalty access. Automatically set for 15 min if higher level login fails 5 times by entering the wrong password.
- **Reader – Level 2**
  Account number 201
  Login with preset password (4096) for read-only access.
- **Customer – Level 3**
  Account number 301
  Login with preset password (4096) for customer access.
  Additional rights: Changing time settings, transmission parameters, flow limits.

- **Administrator – Level 4**
  Default, account number 401 (available as default) to 406.
  Log in with preset password (4096) for administrator.
  Additional rights: Configuration of the device, pulse factor, pulse input, Vm change, limit values for pressure and temperature, changing configuration of the digital inputs and outputs.
  A permanent login in level 4 is possible when the CFG lock is open.
- **Metrologist – Level 7**
  Full user access. Protected by MID seal. If the user operates at this level, the device loses MID conformity.
  Additional rights: Access to parameters protected by MID, change of base conditions, calibration of pressure and temperature inputs, interruption and disconnection of pressure and temperature inputs.
  A permanent login in level 7 is possible when the MET lock is open.
- **Producer – Level 9**
  Highest privilege level; individuals at the manufacturer's site have access to this account. Full, unlimited access to MEC 500 parameters.

5.3 Permitted changes to parameters

Option 1 via predefined accounts

Each configurable parameter is listed in the *MEC 500 Data Structure* document, along with the authorization level required to change the parameter.

You must authenticate yourself by password for each change request:

- Log in with password entry via the keypad.

Option 2 via locking switch inside the device

- Operate the locking switch inside the device.

There are 2 locks there:

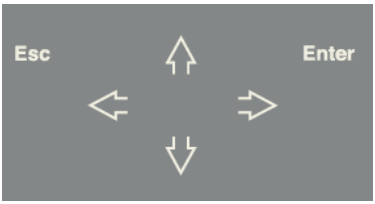
- **CFG lock**
  When unlocked, the administrator (level 4) has permanent access to the device. After the initial configuration, we recommend changing the preset access passwords, locking the lock and sealing it with user security, see section.
- **MET lock**
  Metrological lock allowing full access to MEC 500. In devices without an MID conformity check, this lock is used to protect the MEC 500 against the modification of advanced parameters. When unlocked, there is unrestricted access to all parameters (except pressure and temperature sensors). This lock may only be opened by people who fully understand the consequences of the action.

NOTICE

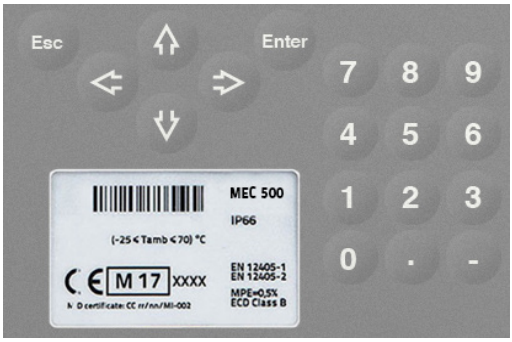
In the case of MID devices, removal of the seal and opening of the MET lock will lead to the premature end of the verification period for this device. Subsequently, the device in question must be calibrated again by a weights and measures office or a state-approved testing laboratory.

5.4 Keypad

MEC 500 can be operated and programmed using the controls on the front panel of the device.



Polycarbonate housing: 6 keys

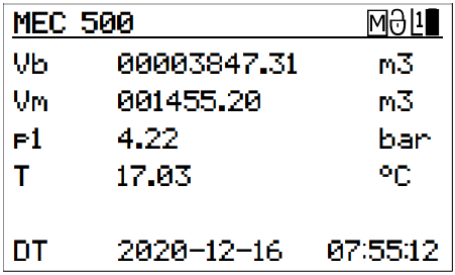


Aluminum housing: 18 keys

- **Enter**
  For switching on the display, moving forward in the menu and confirming changes
- **Esc**
  For switching off the display, moving backwards in the menu and discarding changes
- **Arrow keys**
  For moving around the menu
- **Number keys** (only with aluminum housing)
  For entering numerical values (alternatively to navigation via arrow keys)

Each key input appears immediately on the display.

5.5 Display



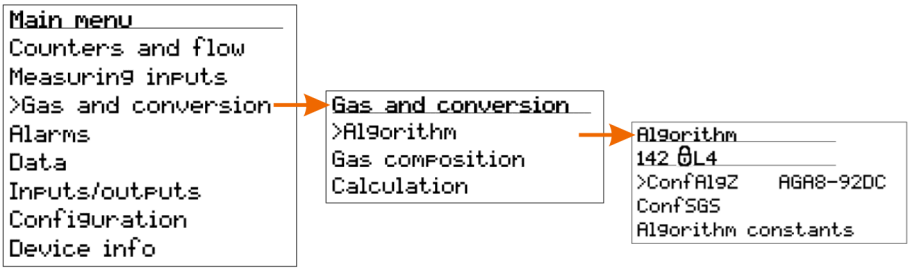
The display is divided into 7 lines, 6 of which can be freely configured. The first line is the header with the status icons. By default, the remaining lines display **Vb**, **Vm**, **p**, **T** and **DT** (current date with time).

Icon on display	Description
	MID conformity This icon indicates that the metrological lock is closed. If the field remains empty, the MET lock has been opened. This icon does not exist in a non-MID device.
	Modem range The more bars, the greater the range. This icon means that the modem is online, but no transmission is taking place.
	Modem switched off No transmission, the modem is not active.
	Modem online The transmission path via modem channel is established, data transmission is currently in progress.
	Status of the CFG lock The icon can be displayed locked or unlocked, which directly corresponds to the status of the physical lock.
	Currently logged-on access level (L1–L9) See also section 5.2 User accounts, page 37.
	Device alarm status If the ER icon is flashing, an important error has occurred. The WR icon means warning. The OK icon indicates that no alarms are active.
	Battery status If the device is connected via the external power supply, the “plug” symbol appears.

5.6 Navigating the menu

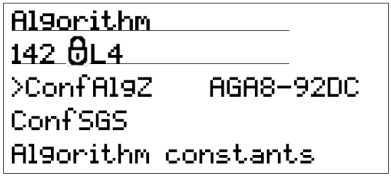
The MEC 500 has a graphic test menu accessible to users for configuration and registration of data. This is also the preferred way to input the initial configuration of the device. Configurable parameters are: Gas meter reading, limit value for flow rate, limit values for pressure and temperature, transmission parameters, gas composition.

The menu is structured in several levels:



Menu with editable parameters – without further submenus

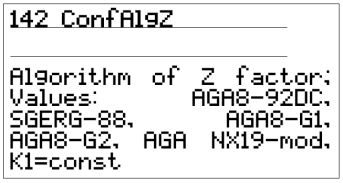
The menu consists of several information items about the respective parameter.



142 Number of parameters in the parameter table

Processing locked for current authorization level.

If the meaning of a particular parameter is unclear, notes on the parameter can be called up using the key (arrow on the right of the keypad):



6 Settings

6.1 Power supply

The first thing to do is to set one of the 2 modes of power supply for the device.

- **BATT** – battery mode, without telemetry equipment, stand-alone device, no connection to power supply, local readout or by integrated modem in Schedules mode. The features of this mode are:
  - RS485 outputs not active; temporary operation of COM1 is possible via battery if the housing of the device is open; active alarm **Case open**; purpose here is configuration on site
  - Digital outputs only run in binary mode; status is updated every 60 s.
  - HF counter not available, DI6 and DI7 only work as inputs for NAMUR status.
  - Device measuring cycle can be set from 6–60 s.
  - Modem only operational in **Schedules** mode.
- **FULL** – mode external power supply, connection to INT-S3 or complete telemetry cabinet, unlimited readout from device and configuration via modem or serial transmission interfaces
  - RS485 outputs permanently active
  - Digital outputs run in any mode, frame rate up to 1 s.
  - HF counter available at any time
  - Device measuring cycle can be set from 1–60 s.
  - Modem operational in any mode

Set current source mode

- Call up the main menu with **Enter**.
- Select **Configuration** → **Power source** → **External**.
- Select **EPwrSMode** and press **Enter**; select **BATT** or **FULL**.

NOTICE

You can also operate in battery mode in **FULL** mode when the external power supply temporarily fails. In the same menu you will find the parameter for this: **EPwrSSupp**, adjustable to 0–180 min. This is a temporary mode due to significant power consumption when the device is running at full capacity. The battery discharges by 0.3% per hour.

6.2 Configuring pulse inputs

The MEC 500 offers several options for connecting the gas meter.

- Call up the main menu with **Enter**.
- Select **Measuring inputs** → **Flowmeter**.
- Select **ConfImp** and press **Enter** to select the appropriate option for the gas meter type.

Available input options

- **STOP** – meter stopped; this mode is used to replace gas meters or for initial configuration when the meter is already connected.
- **LF** – low frequency input for frequencies up to 60 Hz, cooperation with Wiegand signal transmitters
- **HF** – high frequency input for frequencies up to 5,000 Hz
- **EN** – NAMUR encoder input, digital communication with gas meter
- **SCR** – absolute encoder input

Principles

- A single position like LF1 means that only this one input is used to increment the Vm counter, without a control input.
- Two positions such as HF1/HF2 mean that the first value increases the Vm counter and the second value controls the control counter V2.
- Two positions such as D-LF1/LF2 and D-HF1/HF2 mean that the volume increases or decreases depending on the flow direction.

NOTICE

The RF pulse inputs only work when the MEC 500 is connected to an external power supply. A battery-powered MEC 500 can only provide values for LF and SCR inputs.

6.3 Configuring the encoder

The encoder input is used to establish uninterrupted communication with the gas meter by means of digital data transmission between gas meters and volume correctors. The transmission takes place by regularly sending the absolute status of the gas meter. The volume corrector stores the value received from the encoder in the Vo counter and then transfers it to the Vm counter. Certain steps must be performed to properly configure the input.

NOTICE

A properly configured gas meter equipped with an encoder should have a synchronized counter between MEC 500 (meaning counter Vo) and the value read by the encoder.

If the primary gas volume input is set in EN/SCR mode, further modifications of the Vm meter are not possible.

- First make the configuration.
- Then connect the encoder output to the volume corrector.

  If this is reversed, this can lead to an unwanted increase in the main meter.

Configuration procedure

- Set parameter **ConfImp** to **STOP**.
- Set the Vm and V2 meters to the values corresponding to the gas totalizer.
- Connect the cable for encoder communication.
- Change the **ConfImp** parameter to **EN/SCR**.
- Wait until the communication link is established.

NOTICE

The use of the encoder affects the battery life.
Communication with the encoder is preset to 1x/30 s; its frequency can be increased up to 1x/5 s. An externally powered device communicates with the encoder every 5 s.

In the device it is possible to change the registration period of the samples in the memory – the available range is from 1 to 60 min.

If data is saved more frequently, the data memory fills up faster.

Other important parameters are the start of the gas day and the gas month.

Changing settings for data logging

- Call up the main menu with **Enter**.
- Select **Data** → **Configuration** → **Basic**.
- Press **Enter** to change the value.

Options

- **Dtau** – sample logging period in the device memory, from 1 to 60 min
- **BillingHour** – hour at which the gas day begins; default 6:00 a.m.
- **BillingDay** – day on which the gas month starts; default 1 (first day of the calendar month).

Gas composition and algorithm settings can be uploaded to the MEC 500 via the keypad.

Changing the calculation algorithm of the compressibility factor

- Call up the main menu with **Enter**.
- Select **Gas and conversion** → **Algorithm**.
- Select **ConfAlgZ** and press **Enter** to select an available algorithm.

Available options

- SGERG-88
- AGA8-G1
- AGA8-G2
- AGA NX19-mod
- AGA8-92DC
- K1=const.

For each algorithm, the next step is to set the gas composition. All except AGA8-92DC require a simplified gas composition on principle. If a simplified gas composition is not available for each algorithm, you can also use the full gas composition if available.

Changing the gas composition from simplified to complete

- Call up the main menu with **Enter**.
- Select **Gas and conversion** → **Algorithm**.
- Select **ConfSGS** and press **Enter** to change the value.

Options

- **Simpl.** – the MEC 500 uses a simplified gas composition for the calculation.
- **Full comp.** – the MEC 500 uses the complete gas composition for the calculation.

Application of the algorithms for a simplified gas composition

Parameter	Algorithm				
	SGERG-88	**AGA8-G1**	**AGA8-G2**	**AGA NX-19mod**	**K1=const**
XCO2 [%]		0–30		0.15	
XH2 [%]		0–10			
d	0.55–0.9	0.554–0.87		0.554–0.75	0.07–2
Hs [MJ/m³]	20–48	18.7–45.1			0–66
XN2 [%]			0–50	0.15	
K1					0–2

If these algorithms are used, parameter values such as the calorific value **Hs** and the relative density **d** must be programmed in the device so that they match the currently set standard conditions(**Tb** and **pb)** for volume calculation and reference conditions for combustion(**T1** and **P1**, here always **P1**=**pb**).
In many European countries, the usual combination of standard conditions is: **pb**=1.01325 bar; **Tb**=273.15 K; **T1**=298.15 K. When working with a complete gas composition, no further recalculations are necessary.

The calorific value **Hs** must be entered, as it is required for the correct calculation of the energy.

Ranges of molar fractions for complete gas composition

Para-meter	Name	Unit	Base area	Extended range*
Hs	Calorific value	MJ/m³	30–45	20–48
d	Relative density	-	0.55–0.8	0.55–0.9
C1	Methane, CH_4	%	70–100	50–100
C2	Ethane, C_2H_6	%	0–10	0–20
C3	Propane, C_3H_8	%	0–3.5	0–5
nC4	n-butane, n-C_4H_{10}	%	Partial sum of nC_4+iC_4 0–1.5	Subtotal of nC_4 + iC_4 0–1.5
iC4	i-butane, i-C_4H_{10}	%		
nC5	n-pentane, n-C_5H_{12}	%	Subtotal of nC_5 + iC_5 + $neoC_5$ 0–0.5	Subtotal of nC_5 + iC_5 + $neoC_5$ 0–0.5
iC5	i-pentane, n-C_5H_{12}	%		
neoC5	neo-pentane, neo-C_5H_{12}	%		
C6H14	n-hexane, n-C_6H_{14}	%	0–0.1	0–0.1

Para-meter	Name	Unit	Base area	Extended range*
C7H16	n-heptane, n-C_7H_{16}	%	0–0.05	0–0.05
C8H18	n-octane, n-C_8H_{18}	%	Subtotal of C_8H_{18} + C_9H_{20} + $C_{10}H_{22}$ 0–0.05	Subtotal of C_8H_{18} + C_9H_{20} + $C_{10}H_{22}$ 0–0.05
C9H20	n-nonane, n-C_9H_{20}	%		
C10H22	n-decane, n-$C_{10}H_{22}$	%		
H_2	Hydrogen	%	0–10	0–10
N_2	Nitrogen	%	0–20	0–50
CO_2	Carbon dioxide	%	0–20	0–30
H_2O	Water	%	0–0.015	0–0.015
H_2S	Hydrogen sulfide	%	0–100	0–100
CO	Carbon monoxide	%	0–3	0–3
He	Helium	%	0–0.5	0–0.5
Ar	Argon	%	0–100	0–100
O_2	Oxygen	%	0–100	0–100
C6+	Hexane & higher hydrocarbons	%	0–0.2	0–0.2

With the extended range of the complete gas composition, the measurement uncertainty doubles in the calculation of the compressibility factor. In the basic range, the uncertainty is estimated at 0.1% of the value, in the extended range at 0.2%.

6.4 Adjusting the gas composition

- Call up the main menu with **Enter**.
- Select **Gas and conversion** → **Algorithm**.
- Select **Simpl** or **Full comp.**:

Simpl. (simplified gas composition)

- Select each parameter and press **Enter** to change its value.

Full comp. (complete gas composition)

- Select each parameter and press **Enter** to change the value.

GasProc refers to the unnormalized sum of the new gas composition.

When new gas parameters are uploaded, **GasProc** must be 100% ± *deviation* , with *deviation* as set in **Gas and conversion** → **Gas composition** → **Advanced** → **GasNorm**.

We recommend setting the gas composition via software, as configuration via the keypad of the MEC 500 is very time-consuming.

6.5 Adjusting the measurement counter

Adjusting the Vm value

- Call up the main menu with **Enter**.
- Select **Counters and flow** → **Volume** → **Current**.
- Select **Vm** and press **Enter** to change the gas meter value.

Setting the pulse factor for the gas meter

- Call up the main menu with **Enter**.
- Select **Measuring inputs** → **Flowmeter** → **Pulse factor**.
- Select each parameter for pulse factors and press **Enter** to input **LF** and **HF**, if used.
- Set the gas meter connection; see section 6.2 “Configuring pulse inputs”, page 43.

NOTICE

When using the encoder function: **ConfImp** = **SCR** or **EN**, **Vm** is automatically adjusted.

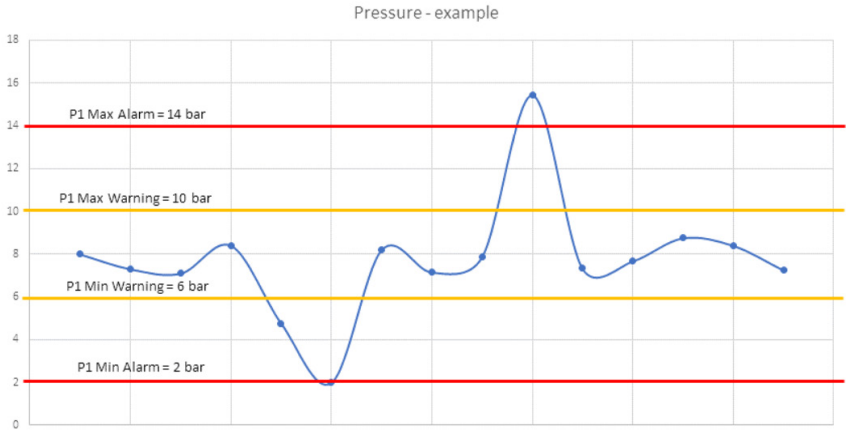
6.6 Setting limit values

- Call up the main menu with **Enter**.
- Select **Configuration** → **Limits**.
- Select the value to be set.

Available limit values

- **Pressure 1** – pressure used for PTZ calculation
- **Pressure 2** – secondary pressure, used for monitoring the pressure regulator
- **Temperature** – temperature used for PTZ calculation
- **Flowmeter** – nominal and base flow limits
- **C factor** – limits for conversion factor
- **Peak limits** – limits for hourly growth rate of volume and energy
- **User conf. limits** – user definable parameters for parameters not included in the above list; see section 5.3 “Permitted changes to parameters”, page 38.

Each value, except **Pressure 1** (**2**), has a lower and upper limit.



Pressure 1 has warning and alarm limits:

- **Warning** – values exceeded, but still no significant effects on the function of the gas station. Monitor, do not react.
- **Alarm** – if this limit is exceeded, the gas station supervisors must take immediate action.

6.7 Setting substitute values

Substitute values for pressure and temperature are used for the PTZ calculation when the device is operating under error conditions (e.g. pressure or temperature out of range).

For the **temperature corrector** variant of the MEC 500, the substitute pressure value is a fixed value that is permanently used for calculation.

Setting the substitute pressure value

- Call up the main menu with **Enter**.
- Select **Measuring inputs** → **Pressure 1** → **Advanced**.
- Select **tSubst** and press **Enter** to make changes.

Setting the substitute temperature value

- Call up the main menu with **Enter**.
- Select **Measuring inputs** → **Temperature** → **Advanced**.
- Select **tSubst** and press **Enter** to make changes.

6.8 Configuring digital inputs

The device has up to 8 digital inputs that can be used as counter inputs or binary inputs for monitoring the gas station. Some inputs are assigned with the following counter options, which mean they cannot be used as digital inputs.

	DI1 binary	DI2 binary	DI3 binary	DI4 binary	DI5 binary	DI6 Namur	DI7 Namur	DI8 binary
LF			X	X				
HF						X	X	
SCR								X
EN							X	
TS					X			

NOTICE

The default setting for anti-tamper contact is DI5.

Setting digital inputs

- Call up the main menu with **Enter**.
- Select **Inputs/outputs** → **Digital inputs** → **Configuration**.
- Select **p1subst** and press **Enter** to make changes.

Available parameters

- **DIOn**—status of currently available digital inputs (read only).
- **ConfDI** – switching the DI on/off.
  Slide to the left: Input switched off.
  Slide to the right: Input switched on.
- **DIPol** – polarity of the input.
  Slide to the left: DI is closed in the idle state.
  Slide to the right: DI is open in the idle state.

6.9 Configuring digital outputs

Up to 4 digital device outputs can be used in binary mode. The MEC 500 emits individual pulses via these outputs when certain alarms or alarm groups are triggered.

	DO1	DO2	DO3	DO4
Binary/event	X	X	X	X
Pulse	Vb, Vm, E	Vb, Vm, E	Vb, Vm, E	Vb, Vm, E
Frequency		P1, P2, t, Qb, Qm, QE, QM, AtmPress		

Setting digital outputs

- Call up the main menu with **Enter**.
- Select **Inputs/outputs** → **Digital outputs** → **DO1/DO2/DO3/DO4**.
- Select parameter and press **Enter** to change a value.

Options using the example of DO2

- **DO2Mode** – refers to binary/event, counter, and frequency mode. Determines the output working mode.
- **DO2Idx** – refers to counter mode. The selection of the counter corresponds to the pulses in the output.
- **DO2Evt** – refers to binary/event mode.
  - Select event code from the event table—see additional document Data structure.
- **DO2EvtTm** – refers to binary/event mode. Duration of the pulse.
- **DO2PulseLen** – refers to binary/event, counter mode. Pulse duration in ms.
- **DO2PulsePer** – refers to binary/event, counter mode. Time interval between pulses in ms.
- **DO2Factor** – refers to counter mode. Pulse output factor, e.g. value = 1 means 1 pulse/1m³.
- **DO2Fidx** – refers to frequency mode. Determination of the parameters corresponding to the output frequency.
- **DO2Fmin/Fmax** – refers to frequency mode. Setting of the frequency range in the output.
- **Fmin/Fmax** – refers to frequency mode. Setting of the frequency value corresponding to the minimum and maximum values of the parameters in DO2Fidx.

6.10 Setting the transmission interfaces

The device has up to 3 transmission interfaces:

- COM1: RS485 or RS232
- COM2: RS485
- COM3: Optical interface

- Call up the main menu with **Enter**.
- Select **Configuration** → **Transmission** → **COM1/COM2/Optical**.
- Select parameter and press **Enter** to change a value.

Options for COM1

- **COM1Bps** – baud rate of the serial interface (up to 256,000 b/s, for optical interface up to 38,400 b/s)
- **COM1Adr** – address of the serial interface

NOTICE

The COM1 and COM2 interfaces only function as long as an external power supply is connected to the connections 1 and 2 or 3 and 4, which only supplies the COM interfaces.

The optical interface operates continuously.

COM1 can be used for 15 min in battery mode if the device housing is open and the **Case Open** alarm is active.

6.11 Setting the modem

NOTICE

We recommend configuring the modem via software, as this also allows schedules and advanced parameters to be configured. This is not possible via the keypad.

- Call up the main menu with **Enter**.
- Select **Configuration** → **Transmission** → **Modem** → **Configuration**.
- Select parameter and press **Enter** to change a value.

Options

- **MPin** – PIN code of the SIM card
- **MApn** – APN of the SIM card used
- **MOPort** – port for connecting the device via TCP/IP
- **MMode** – modem operating mode. Schedules, online mode, online mode with schedules
- **Advanced**
  - **MOBattTm** – maintenance time in online mode via battery in case of mains power failure
  - **MOApnUser** – private APN user name
  - **MOApnPwd** – private APN password

7 Data output and configuration

7.1 Viewing recorded data

- Call up the main menu with **Enter**.
- Select **Data**.
- Select submenu and press **Enter** to access different data records.

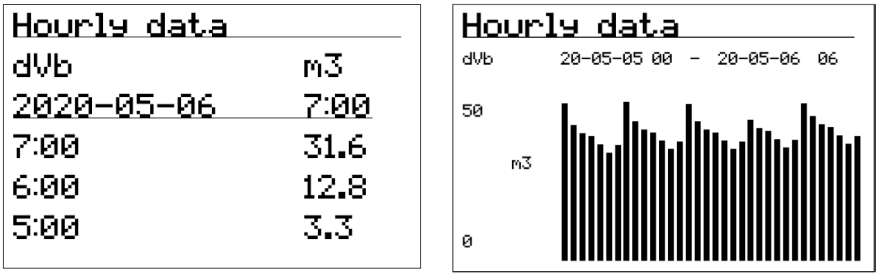


Fig. 5: Example of recorded data; right: Diagram view

Options

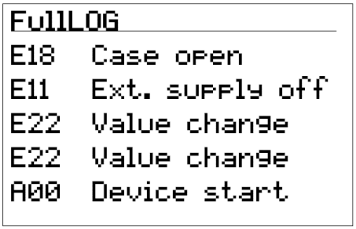
- **Peak data** – peak values with time and date of their occurrence
- **Periodic data** – stored data with recording period
- **Hourly data** – data stored in the last full hour
- **Daily data** – data stored on the last full day
- **Monthly data** – data stored in the last full month
- **Momentary data** – data stored during a fault status in momentary storage mode

Navigating the data

↓↑	For moving back and forth in time in the data samples
→←	For moving through the data types, switching between values, moving the bar chart in the chart view
Enter	Display options for the diagram view of recorded data
Esc	Back to previous menu

7.2 Alarms and other events

- Call up the main menu with **Enter**.
- Select **Alarms**.



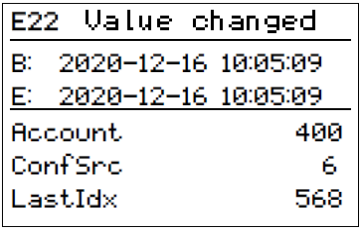


Fig. 6: Example of other events

Options

- **AlarmLOG (active)** – list of active alarms at the time of the menu call up
- **FullLOG** – complete list of all alarms and events that are still in progress or have already been completed.
- **AlarmLOG** – alarm list for important alarms regarding measuring technology. If one of these alarms is active, the **ER** icon flashes in the display header.
- **FullLOG (active)** – event list for technically important binary inputs and limit values. If one of these alarms is active, the **WR** icon flashes in the display header.
- **SetupLOG** – alarm list reserved for the manufacturer
- **System status** – vector of alarms
- **Configuration** – for clearing the event log

Navigating the alarms

↓↑	For moving back and forth in time in the alarms
→←	For scrolling through alarm names and start times
Enter	Shows details of the alarm
Esc	Back to previous menu

The memory in the device intended for alarms is divided into 3 sectors:

AlarmLOG

Storage capacity: 3,000 logs

If the alarm memory becomes too full, this generates an **AlarmLOG full** alarm. The main effect of a full alarm memory is that the **Vb** main counters stop counting under standard conditions. The configuration of the device is then blocked. This memory sector must be regularly cleared. Confirmation of completed alarms is performed by authorized personnel – these persons know the list of alarms stored in the device memory.

Clearing an alarm memory

- Call up the main menu with **Enter**.
- Select **Alarms** → **Configuration**.
- Select **AlarmLOG** and press **Enter**.
- Set the value of the parameter to 0 and confirm with **Enter**.

FullLOG

Storage capacity: 3,000 logs

If this memory sector becomes full, this does not result in an alarm. The oldest logs are replaced by the most recent ones. This memory sector has no influence on measurement and device operation.

SetupLOG

Storage capacity: 1,000 logs

If this memory sector becomes full, this does not result in an alarm. Important interventions are stored in this memory sector. The names of events in this memory sector are not displayed.

Clearing setup memory:

- Unlock MET lock.
- Call up the main menu with **Enter**.
- Select **Alarms** → **Configuration**.
- Select **SetupLOG** and press **Enter**.
- Set the value of the parameter to 0 and confirm with **Enter**.

7.3 Configuration via PC/Windows software

The Metreg 500 program is used to configure and diagnose MEC 500 devices. The user-friendly graphic interface allows configuration of basic and advanced functions. The Metreg 500 supports a local firmware update in MEC 500 devices, without additional interfaces or surfaces. It also stores a list of previously connected devices that can be easily navigated between.

The Metreg 500 software can be downloaded here:
https://www.metreg-technologies.de/ (srcollen to **downloads MEC 500**)

Connect to the device via serial RS485 interface or via optical interface with optical head.

⚠WARNING

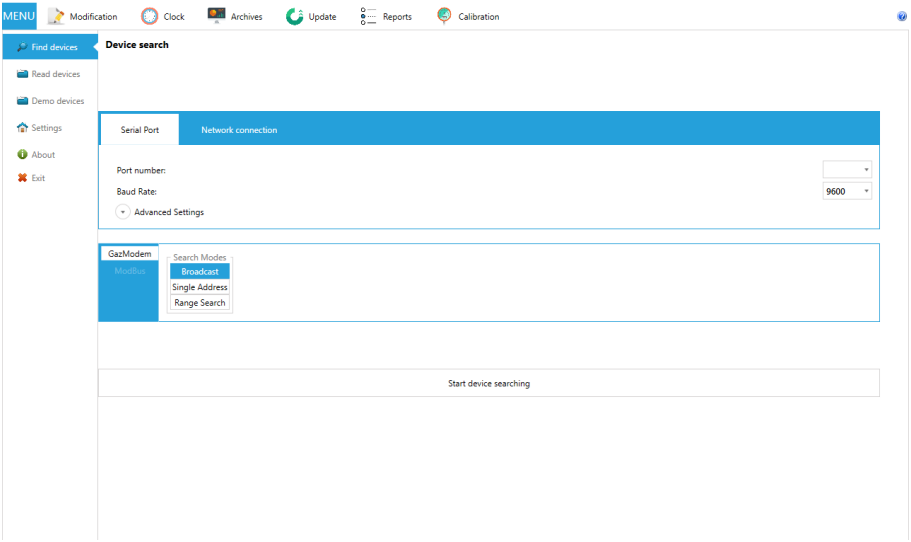
- If the device is running in an Ex zone, do not connect the RS485 communication interface directly to the device, but via a safety barrier, e.g. INT-S3 interface.

If the device is not configured in an Ex zone, a USB RS485 interface can be connected directly to the device, for example:

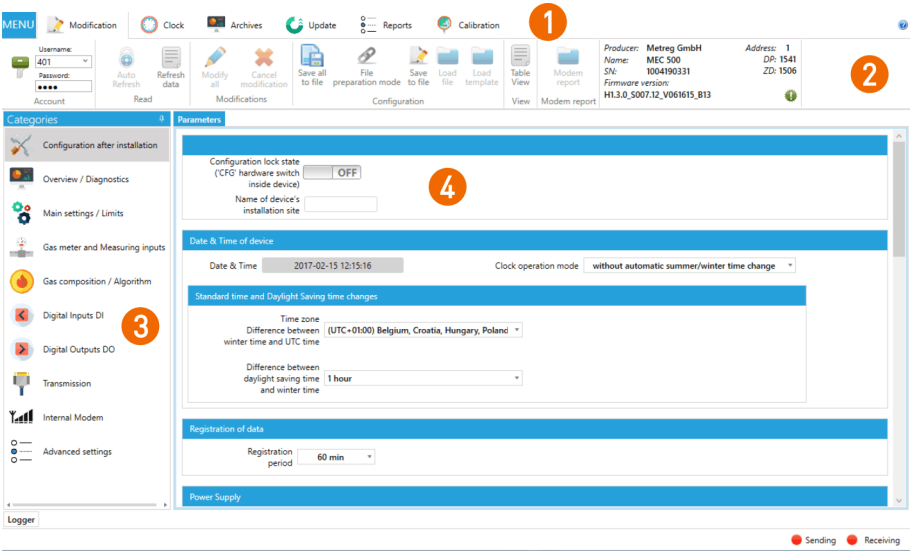
- Connect the 5 V power connector of the interface to inputs 3–4 (COM SUPPLY) to supply power to the interfaces.

Find devices

- Select the COM input of the computer according to the connected interface.
- Set the baud rate that is already set in the device configuration.
- Use the **Find devices** function to search for the device.



7.4 Metreg 500 software interface



1 **MENU** – main menu with the functions:
- **Modification**, refer to chapter 7.4.1 “Modification”, page 60
- **Clock**, refer to chapter 7.4.2 “Clock”, page 77
- **Archives**, refer to chapter 7.4.3 “Archive”, page 78
- **Update**, refer to chapter 7.4.4 “Update”, page 79
- **Reports**
- **Calibration**

2 Toolbar

3 **Categories** – parameter categories

4 **Parameters** – parameter view of the selected category

NOTICE

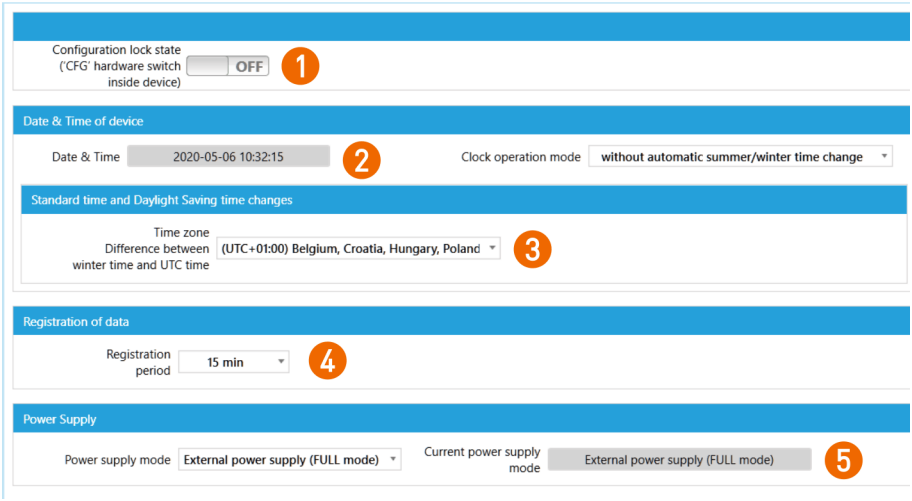
- If the software does not display the profile of the device, but only a list of parameters, please contact the engineering department of the manufacturer.

7.4.1 Modification

7.4.1.1 Configuration after Installation

Configuration after installation — Configuring limit values after installation

These are the basic parameters of the device. The configuration is described in section 6 “Settings”, page 42.



1 Status of the CFG lock, read only

2 Setting the date, time and time change

Only winter time

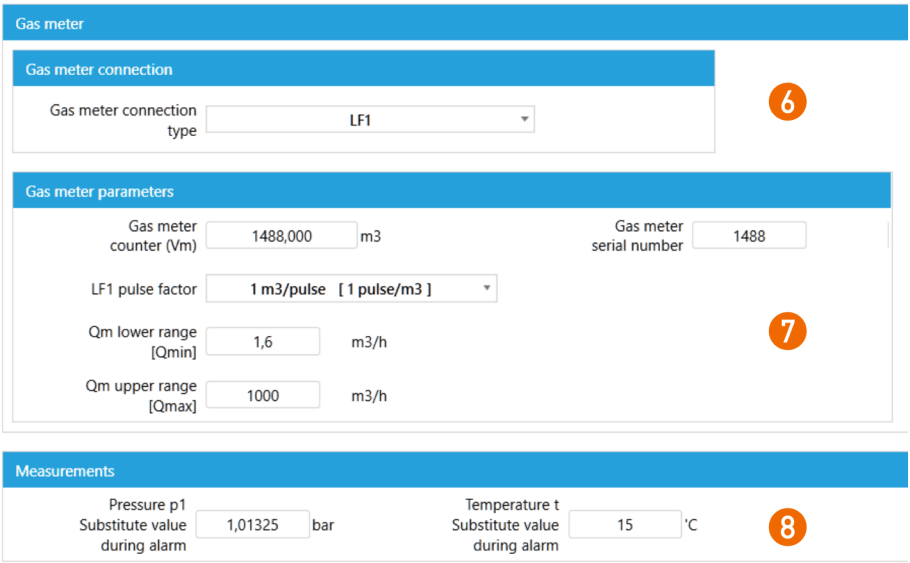
Only summer time

Automatic time change

3 Setting the time zone

4 Setting the recording period for values in the device memory: 1–60 min

5 Type of power source
Battery mode – battery supply only, without connection of an external power source, independent device
External mode – operation set with telemetry, can work with RF input data from gas meters



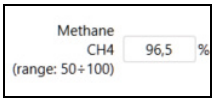
6 Gas meter connection type – determination of the input type of gas meter pulses and increase of Vm meter values.
- Select the required variant from the list.

7 Gas meter parameters – see the nameplate of the gas meter. Depending on the input type, only the information relevant for this type is displayed, e.g. no RF pulse factor if LF1 is selected.

8 Substitute values – values for calculation in alarm situations, see section 6.7 “Setting substitute values”, page 49.

9 Gas composition and algorithm setting

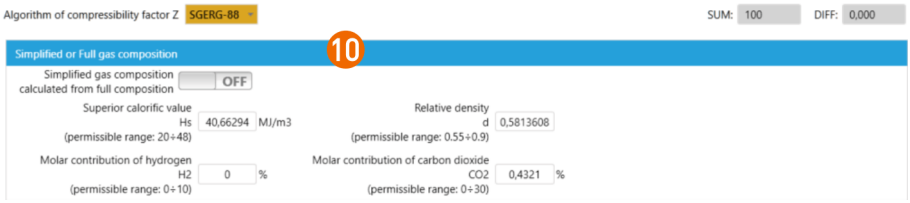
- Select the algorithm for the calculation.
  Depending on the setting, the corresponding gas parameters appear. For AGA8-92DC the complete gas composition is displayed.



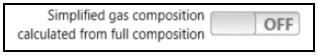
Parameter range

Correct composition = 100%, displayed in the percentage counter in the top right corner

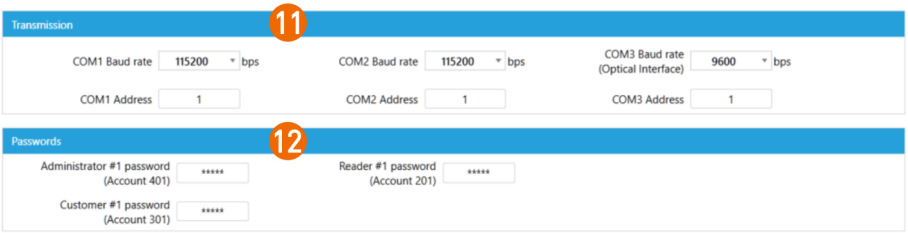
If a deviation exceeds the programmed value, a red frame appears around the window.



10 Simplified or Full gas composition

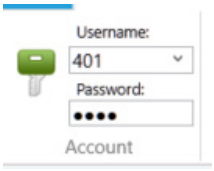


Simplified gas composition algorithms can also use the full gas composition.



11 Transmission parameters
Setting of the baud rate for the COM interfaces and transmission address. COM3 is specified as the optical interface.

12 For the security of the device, the passwords of accounts 201/301/401 must be changed.



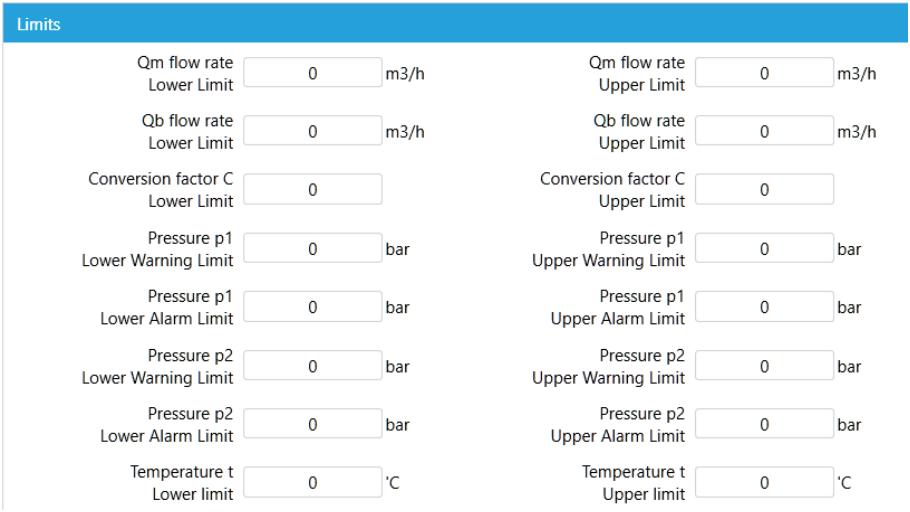
After changing the account passwords, the new password must be used during configuration.

After 5 failed attempts, the configuration access to the device is blocked for 15 min.

7.4.1.2 Main settings / Limits

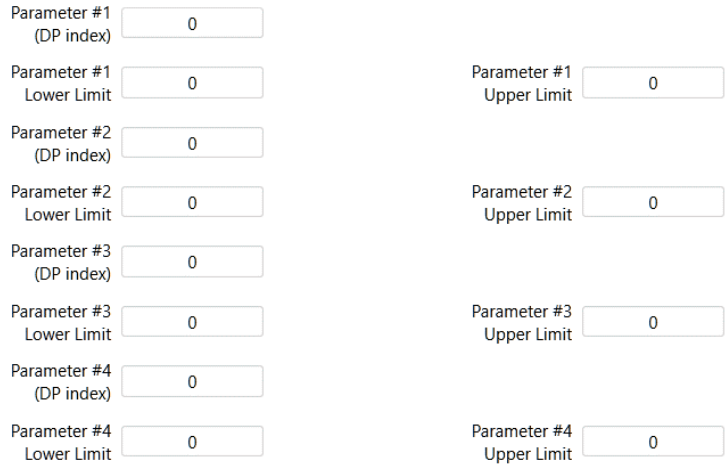
Main settings / Limits — Setting limit values

The limit values can also be set via the keypad; see section 6.6 “Setting limit values”, page 48.



Preset limit values

- **Qm flow rate**: Limit values for measured flow rate
- **Qb flow rate**: Limits for normalized flow rate
- **Conversion factor C**: Limit values for state number
- **Pressure p1** and **p2:** Upper and lower thresholds for warning and alarm
- Limit values for temperature **t**

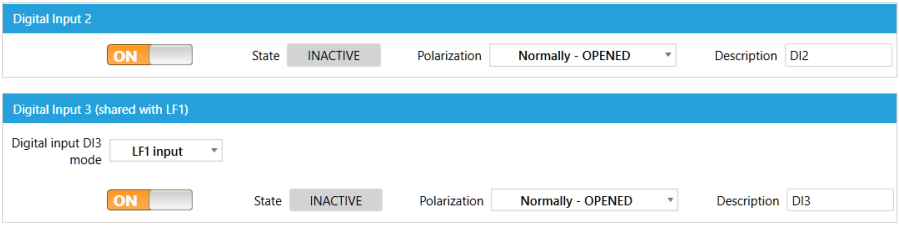


Additional limit values for user-defined parameters

- DP index – device parameter index from the data structure – the index of parameters from the whole list of changeable parameters

7.4.1.3 Digital Inputs DI

Digital Inputs DI Changing the function of the digital inputs



The following parameters can be changed:

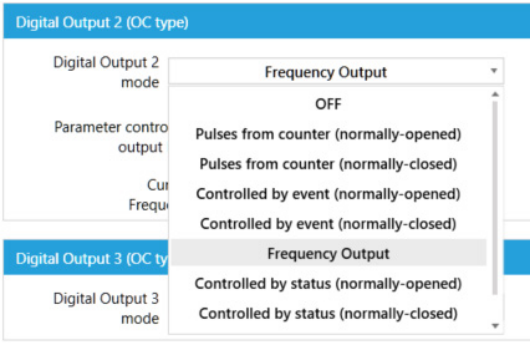
- Input polarity – normally open – alarm is triggered when DI+/GND pins are shorted. Normally closed – alarm is triggered as soon as the DI+/GND pins are open.
- **Description of DI** – 14 settings are possible, e.g. “Door open”.
- Input to the system is activated.

NOTICE

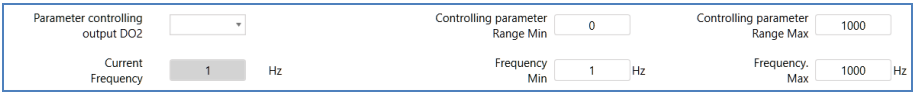
DI3 and DI4 are shared with the LF inputs. DI6 and DI7 are shared with the HF inputs. Once an input is reserved for the gas meter, it cannot be used in binary mode. The corresponding information appears above the respective input; see example DI3.

7.4.1.4 Digital Outputs DO

Digital Outputs DO Changing the function of the digital outputs



- Click **Digital Output mode** to select the type of output:



Frequency mode – the parameter controls the frequency value of the output signal.

Counter mode – counters control the output signal from which pulses are generated.

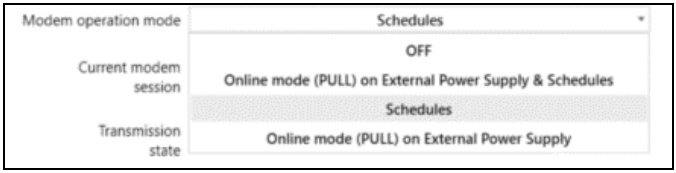
Event mode – the event code controls the output signal to trigger a pulse. The event code is selected according to the Data Structure document.

7.4.1.5 Internal Modem

 Internal Modem Modem configuration

- Check if an internal modem is present, recognizable by the FME antenna connection:

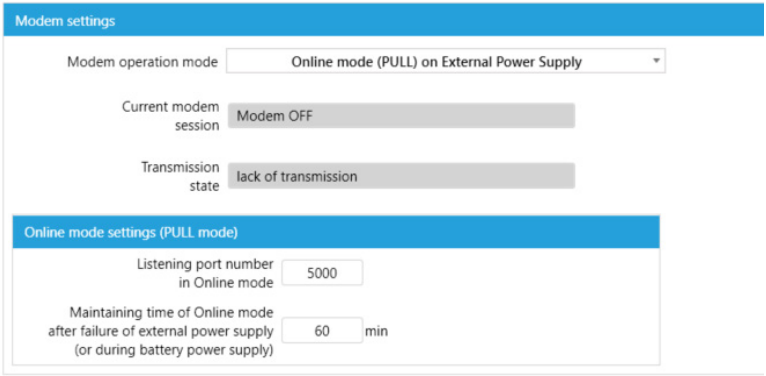
- Select **Modem operation mode**:



Options

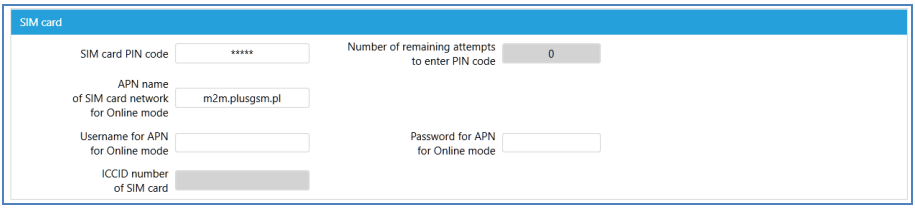
- **OFF** – modem switched off or not installed
- **Online mode (PUSH) on external Power Supply & Schedules** – the device remains permanently online and available via a fixed IP address of the SIM card, i.e. in PULL mode. At certain moments, it initiates the schedules and sends data independently via the permanently established connection. Note: While the schedule is running, online access to the device remains disabled.
- **Schedules** – by default the modem status is offline. The modem starts transmission at the set date and time and carries out processes such as: Sending data to the http server, connecting to the FTP server, time synchronization with the NTP server, setting up a call window – PULL mode in a limited time period.
- **Online mode (PULL) on External Power Supply** – the device remains permanently online and available via a fixed IP address of the SIM card, i.e. in PULL mode. Unlike the first mode, the device will not respond to set schedules, but to external requests.

PULL mode: General settings without a schedule



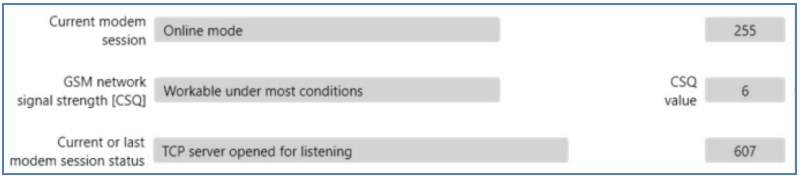
If **Online mode (PULL) on External Power Supply** is selected, further parameters appear.

- **Listening port number in Online mode** – the device "listens" to this port number in online mode.
- **Maintaining time of Online mode after failure of external power supply** – duration in which online mode is maintained in battery mode in the event of a mains power failure (max. 240 min). Note that this mode consumes a lot of battery power.



In PULL mode only some specific parameters have to be set:

- PIN for the SIM card
- APN for the SIM card
- Username and password for APN – if available



Once the settings are modified and confirmed, the modem goes into operation. Establishing the connection takes about 1 min. For details see **Current modem session** and **Transmission state**.

Schedules

NOTICE

The MID and non-MID variants may have different firmware versions. Due to these differences, some functions may not be available or may have been changed in your device. Newly added features will be explained in future versions of this document.

Up to nine schedules can be configured on the device, which can be activated or deactivated. Configured schedules do not necessarily have to be used.

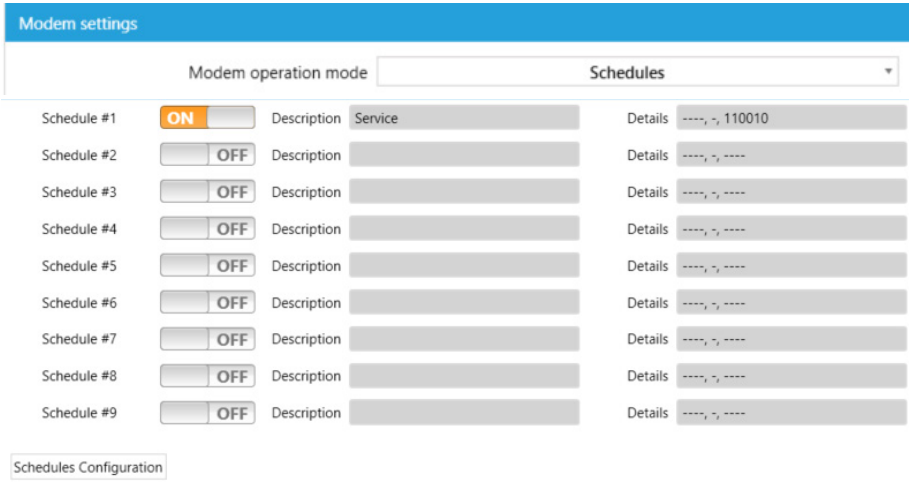


Fig. 7: Modem settings

- Set the **Modem operation mode** to **Schedules** or **Online mode with Schedules**; the parameters required for configuration then appear.
- Switch the required schedule on or off by clicking the **ON|OFF** switch.

Schedules Configuration

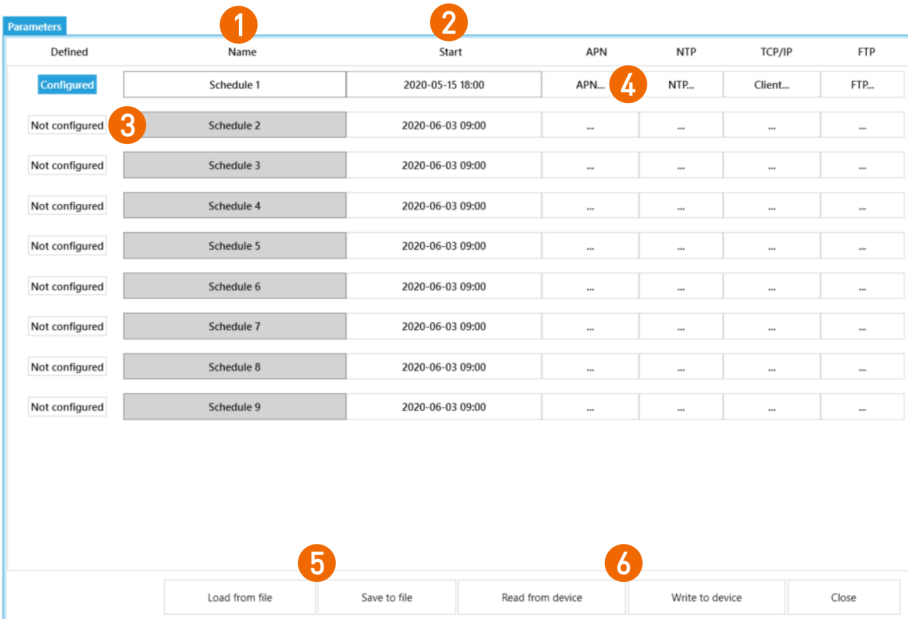


Fig. 8: Interface for configuring schedules

1 Schedule name up to 24 characters

2 Date and time of execution of the schedule; see also “Example of schedule configuration”, page 71.

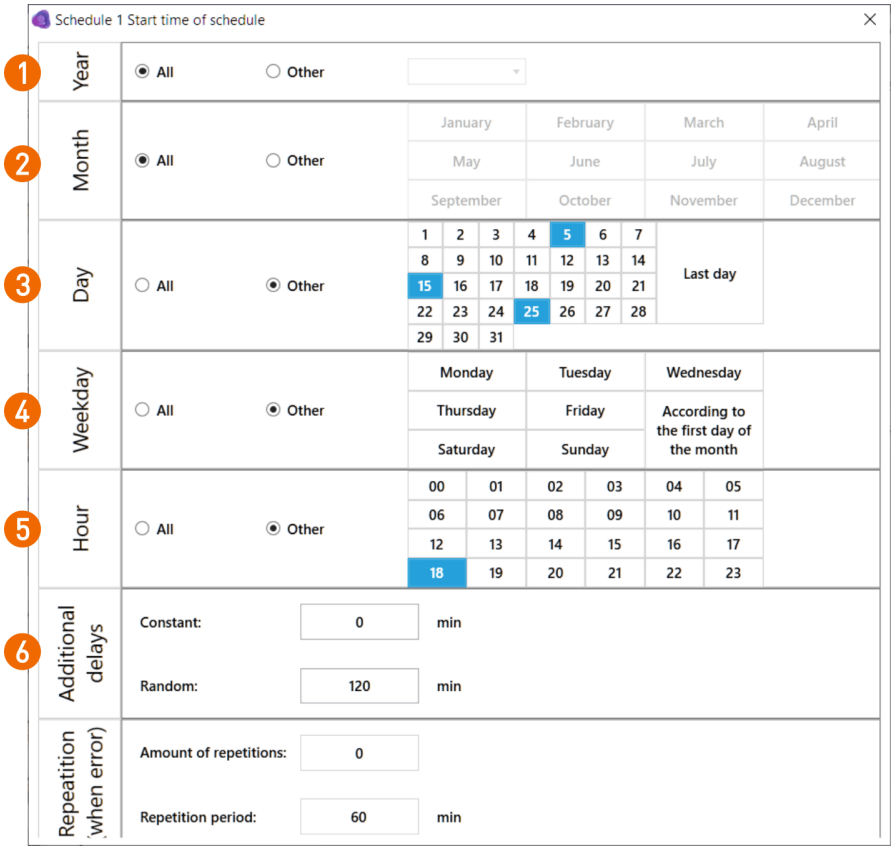
3 Click **Not configured** to activate a schedule.

4 Click the box to make further settings; see also “Other settings”, page 72.
The settings are saved when the window is closed.

5 Click **Load from file** or **Save to file** to load a schedule or save it for use in the next device.

6 Click **Read from device** or **Write to device** to load a schedule for editing or to save it to the device.

Example of schedule configuration



1 The year in which the schedule is activated. **All**: Schedule is turned on every year, meaning current status. The schedule can also be set for next year.

2 Month in which the schedule is activated. **All**: Schedule is used every month.

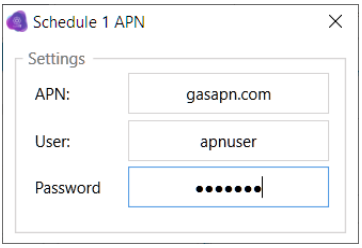
3 Day (of the month) – setting the days on which the schedule is activated. Important if the user does not want to have a device connection every day, but only on selected days.

4 Weekday supplements Day (3). For example, if the day is set to the 5th, 15th and 25th of the month and also set to **Wednesday** which falls on the 7th, 14th, 21st and 28th day of the month, then the device will start that schedule on those days as well.

5 Hour defines how often during the day the device connects to the network; here it is 18:00 hrs.

6 Constant and random delay
Constant – e.g. at 24 the modem always switches on at 18:24.
Random – e.g. at 36 the modem switches on at a random time between 18:00 and 18:36.

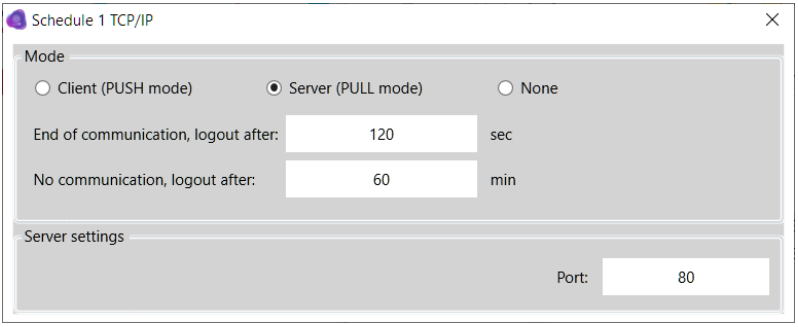
Other settings



For schedules, the **APN** authorization data must be set separately. The general settings for APN are meaningless while a schedule is running. Various SIM cards can work with separate APN, for example, with separate settings for private charging systems and FTP in public networks.

APN must always be programmed correctly. Without the correct APN settings, a schedule will work incorrectly or not at all.

On: Request to synchronize the time with the NTP server. The NTP address must work within the frame programmed for APN in the previous step. Can be switched off if NTP is not needed.



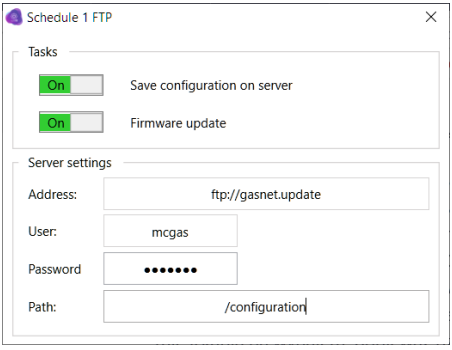
NOTICE

The description applies to devices with firmware version S007.12. With this firmware version only PULL mode is available for schedules.

Similar configuration to “PULL mode: General settings without a schedule”, page 68.

The schedule must be notified of conditions for terminating the connection:

- **End of communication, logout after** – after the end of the transmission, the device waits for further requests for the set period of time. Without inquiries, the schedule ends.
- **No communication, logout after** – if the device goes into online mode and no request is received, it disconnects from the network after the pause set there.
- **Port** – the device "listens" to this port number during communication.



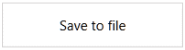
The report can be sent to the FTP server via the FTP settings. The server address, user name and password can be entered in the marked fields.

The report is generated in .txt file format and lists all parameters with their current values.

Summary of configured schedule

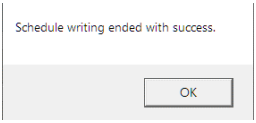
- The device runs the schedule on the 5th, 15th, and 25th of the month.
- Time of execution of the schedule = 18:00
- Random delay 120 min. While the schedule is set for 18:00, it will start at a different time between 18:00 and 20:00 on each of the days.
- The SIM card must be running in the APN "gasapn.com".
- The device will synchronize the time with the NTP server.
- The device will establish the TCP connection in PULL mode during the schedule and wait for requests.

When all settings have been made:



Save the schedule to use it for other devices.

Upload the schedule onto the device.



As soon as the device accepts the set schedule, this message appears on the screen.

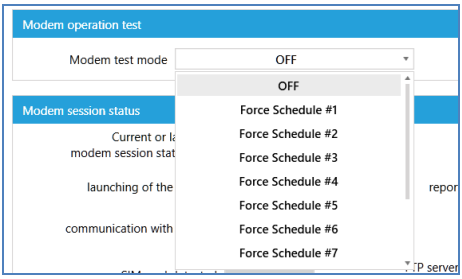
Close the window and return to "Modem settings", page 69.

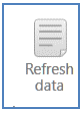
Testing a schedule

NOTICE

Schedules can be tested when the **Advanced** profile is used in the program. How to activate the **Advanced** profile is described in the additional software documentation.

First, the schedule should be checked to see if it has been configured appropriately. When the schedule is configured properly, the schedule details show the next execution time of the schedule.

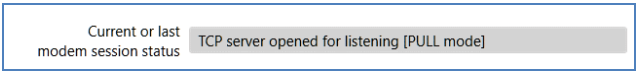




- Select **Modem test mode** and click the required test plan to execute it.
- Refresh data several times with **Refresh data** to verify the behavior of the modem.

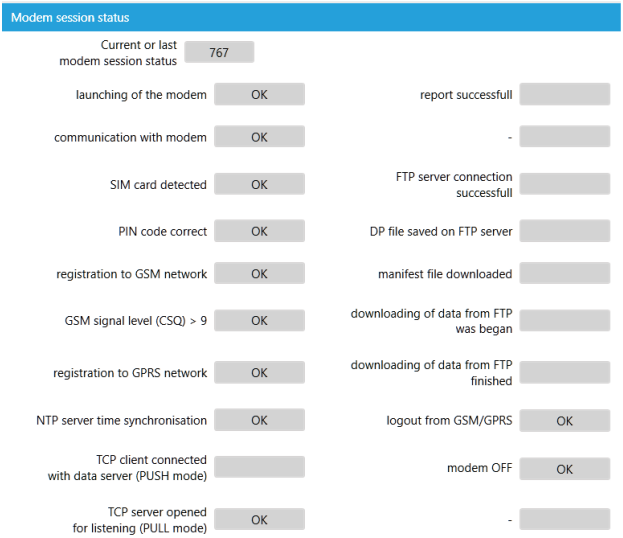
  The modem needs about 1 min to establish the connection.

As soon as the modem is online, the current modem session can be seen under **Diagnostics**:

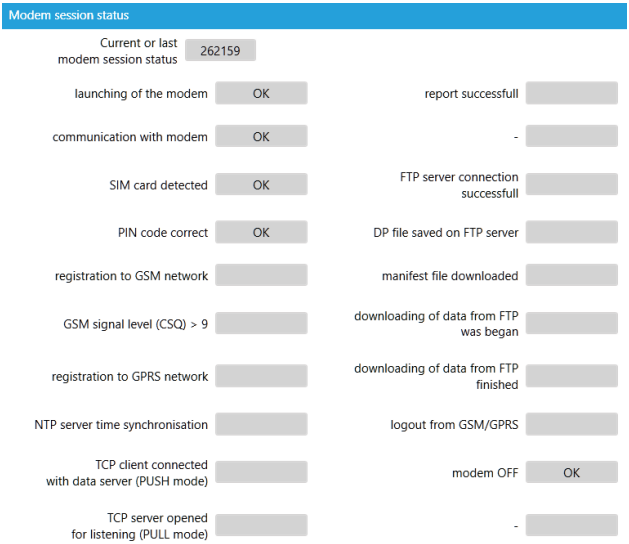


Modem session status

During the connection, the modem displays all the operations performed.



Correct connection – modem performed all steps, including logout and modem OFF.



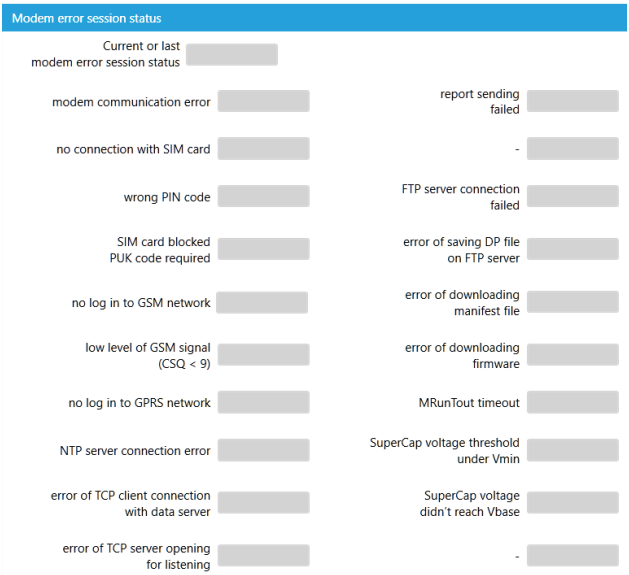
Faulty connection – modem stopped at intermediate step and switched off without logging off from GPRS.

NOTICE

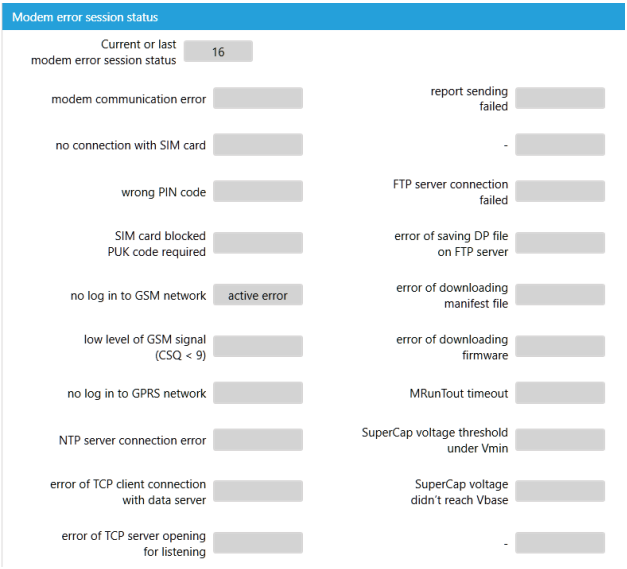
Within a schedule, not every operation has to show **OK**. If, for example, no FTP connection has been configured, the corresponding steps in the protocol are missing.

Modem error session status

If the modem fails to complete its schedule, it keeps a log of the errors that occurred while connected to the network.



No errors displayed – since the previous modem connection protocol, no errors have occurred during the connection.



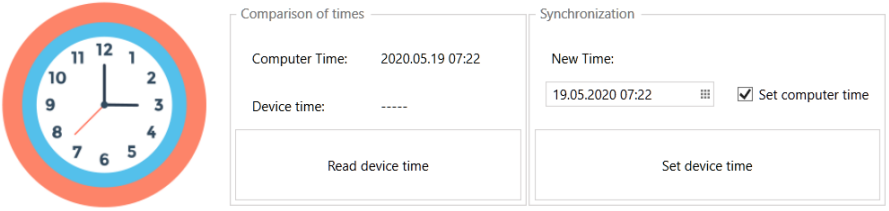
Active error – the device has not logged into the GSM network. Possible causes: wrong APN, wrong server name, no antenna, no GSM area available nearby.

If there are no errors in the modem error log, the schedule is configured correctly and the device is ready for operation.

Exception: The modem error log says “low level of GSM signal”. In this case, the device can transmit data despite the error.

7.4.2 Clock

Making changes to the time settings in the device:



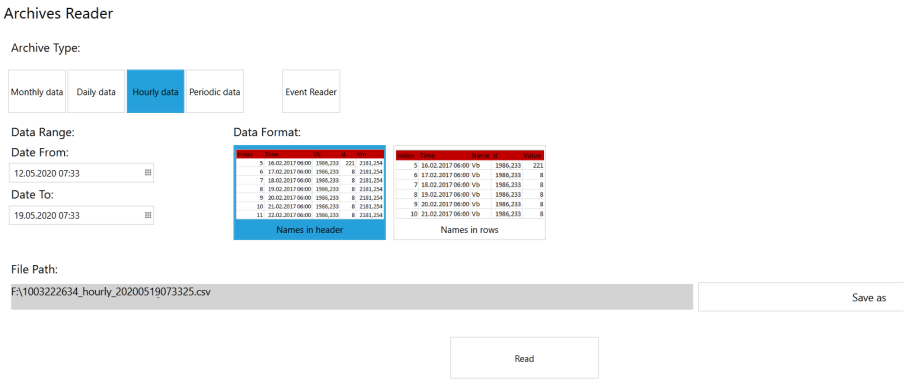
- Click **Read device time**.

Set computer time and **Set device time** are required if the time is to be synchronized with the local time.

- Check the **Set computer time** box until the time is displayed. Uncheck to set the time manually.
- Click **Set device time** to automatically adjust the device time.

7.4.3 Archives

Read data by period, hour and month and also events.



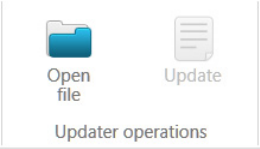
Reading data

- Select data type **periodic**, **hourly**, **daily** or **monthly**.
- Set data range: To read the data from the beginning, set the start date before the date of manufacture of the device, for example, to 2016.
- Select **Save as** to enter the file path for saving the report.
- Click **Read** and wait until the reading of the data is completed.

7.4.4 Update

Upload files to the device:

- New firmware version
- New Modbus map
- New menu map



- Click **Open file**.
- Navigate to the required file.
- Click **Update** and wait for the message that the process has been successful.

NOTICE

Be aware of the consequences of making changes in this tab.

The file extension accepted by the program is ".pfp".

- Only use files from the technical service of the device manufacturer.
- Do not combine files from different devices, otherwise there is a high risk of device malfunction or failure.

8 Service

8.1 Backup battery

The device can be equipped by the manufacturer with a backup battery with the following features:

Voltage	3.6 V
Capacity	1.2 Ah
Type	SAFT LS14250, size ½ AA

Its main function is to keep the device operational when the MEC 500 battery (B1) is so depleted that its charge is insufficient to maintain stable device functions. The backup battery supplies power to the memory to maintain settings and the clock. It is not used while the main batteries are running.

NOTICE

The backup battery is replaced in one of the manufacturer's workshop.
If you replace the backup battery yourself, this will void any warranty claim or MID conformity.

8.2 Main batteries (B1–B3)

The device can be equipped with up to 3 main batteries with the following features:

Voltage	3.6 V
Capacity	17 Ah
Types	SAFT LS33600 permissible ambient temperature range: -25°C to +70°C EVE ER34615 permissible ambient temperature range: -25°C to +50°C
Main batteries	B1 to supply the MEC 500 B2, B3 to supply the internal modem (optional)
Estimated service life	5 years

NOTICE

- Always use new ones when replacing batteries.
- Never combine batteries with different states of charge.

The modem can be powered by 1 or 2 batteries.

NOTICE

- When replacing the battery, insert it with the positive (+) terminal first. As soon as it touches the holder, push the negative terminal (-) of the battery in firmly.

8.3 Acknowledging an alarm

A device with MID compliance is designed so that when the list of unacknowledged alarms reaches a storage capacity of 97%, it counts to the error counter and initiates the corresponding event.

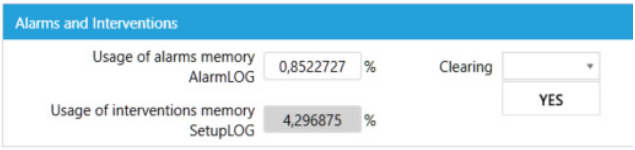
It is strongly recommended to acknowledge the alarms regularly.

Alarm acknowledgment via keypad

- Call up the main menu with **Enter**.
- Select **Alarms** → **Configuration**.
- Select **AlarmLOG**, press **Enter** and set the parameter to 0.

Alarm acknowledgment via software

- Call up Metreg 500.
- Read out MEC 500; see section 7.3 “Configuration via PC/Windows software”, page 57.
- Select **Main Settings** → **Limits**.
- Scroll down to the parameters for **Alarms and Events**:



- Select **Clearing** and confirm the change.

9 Maintenance

9.1 Troubleshooting

After installation, the device does not require any special measures and monitoring. Proper installation will ensure uninterrupted operation of the device throughout its life.

The device only needs to be inspected regularly in accordance with standard EN 60079-17:

- Frequency of regular inspection: at least once a year.
  A detailed visual inspection is mandatory.
- Frequency of unannounced inspections: to be adjusted to the prevailing environmental conditions.
  Detailed, accurate visual inspection is mandatory.

Under certain conditions, the device may malfunction if alarms are constantly triggered or if errors occurred during configuration.

Frequently occurring malfunctions with cause and solution

Error	Cause	Solution
Device not booting up	No power supply Battery release tabs still in place	• Re-insert battery into device. • Ensure that the release tabs have been removed.
Device not measuring pressure/temperature	Pressure or temperature outside the permissible range	• Install the device in an area where sensor ranges are sufficient. • Replace the device with one which has sensors for the appropriate range.
Despite connected power supply, device still in battery mode	Insufficient power source	• Ensure that the power source is compatible with the device. If the message **Insufficient power source** appears in the event list: • Replace power source with a working and compatible one.
Device not communicating via optical interface	Optical input in device deactivated Optical interface deactivated Malfunction of the optical interface Incorrect baud rate set	• Switch on the display. • Activate the optical interface. • Replace the optical interface. • Make sure that the baud rate is set correctly.
Device not communicating via serial interfaces	Incorrect baud rate Attempt to use the device without external power supply with closed housing.	• Check the baud rate. • Open the housing and connect to COM1.
Modification failure	CFG switch locked Wrong password	• Check CFG lock. • Ensure that the correct password is

Error	Cause	Solution
	Shutdown due to 5 attempts to make changes with wrong password Insufficient authorization	entered for the account. • Use account with proper authorization to modify the parameters in question.
Vb counter not running	**AlarmLOG** memory sector full Pressure or temperature outside the permissible range	• Acknowledge alarms in the **AlarmLOG** section. • Ensure correct measurement of pressure and temperature and correct connection.
Vm counter not running	Incorrect gas meter input connected Damaged cable between gas meter and corrector	• Check configuration of **ConfImp** with the used output values of the gas meter. • Make sure that the connection between the device and the gas meter is correct.
Display not working	Battery empty Display defective	• Check battery level. If the device can be connected with the COM interface, the display is defective.
Battery discharging too quickly	When supplied with mains power: Frequent mains power failure, then the battery maintains the full mode functions. Scheduled opening time too long	• Check **EPwrSSupp** time and the events for corresponding event entries. • Check schedule time. The device may remain in online mode for too long for no reason.

9.2 Alarms

NOTICE

Events in **bold** are stored in the Alarm LOG memory sector.

Code	Name	Description
0	Engine startup	Device is switched on – initial startup, battery replacement, firmware update or malfunction
1	**System error**	Device detects missing P1 or T sensor.
2	**Calculation error**	PTZ conversion incorrect – plausible, since pressure is outside the permissible range.
3	**AlgZ range**	Gas composition parameter out of range
4	**P1 range**	Pressure out of range – primary sensor
5	P2 range	Pressure outside permissible range
6	**T range**	Temperature outside permissible range
7	**Qm range**	Measured flow rate outside permissible range
8	Tamb error	Ambient temperature sensor failed
9	**Tamb range**	Ambient temperature outside permissible range
10	Batterie low	Battery level below 10%
11	Ext. supply off	External power source disconnected
12	Ext. supply low	Fluctuation in the connected power source – possibly incompatible device was connected – neither INT-S3 nor with power supply via USB 5 V or other common power supply
13	Keyboard error	Keypad malfunction – device periodically checks keypad status.
14	Software update	Device firmware updated
15	Data update	Device data changed – Modbus maps
16	Data erased	Device deleted
17	**AlarmLOG full**	AlarmLOG 97% full – alarms must be acknowledged.
18	Case open	Device housing open
19	Intrusion attempt	5 unsuccessful login attempts with wrong password The device COM inputs are now blocked for 15 min.
20	Login	User logged in via keypad
21	Configuration changed	Device configuration parameters changed
22	Value changed	Changed numerical parameter value, e.g. Vm counter
23	Text changed	Changed TEXT parameter value, e.g. description of digital input
24	Time changed	Time changed in the device
25	Counter overrun	Counter value exceeds the max. capacity of this counter.
26	Gas composition	Gas composition changed

Code	Name	Description
27	C limit	State number outside the programmed limit value
28	P1 limit W min	P1 minimum warning limit exceeded
29	P1 limit W max	P1 maximum warning limit exceeded
30	P1 limit A min	P1 minimum alarm limit exceeded
31	P1 limit A max	P1 maximum alarm limit exceeded
32	P2 limit W min	P2 minimum warning limit exceeded
33	P2 limit W max	P2 maximum warning limit exceeded
34	P2 limit A min	P2 minimum alarm limit exceeded
35	P2 limit A max	P2 maximum alarm limit exceeded
36	T limit	Temperature outside the programmed limit
37	Qb limit	Flow rate at base conditions outside the programmed limit value
38	Qm limit	Flow rate at measuring conditions outside the programmed limit value
39	dVbh1 limit	Hourly increment 1 outside the programmed limit value
40	dVbh2 limit	Hourly increment 2 outside the programmed limit value
41	dVbh3 limit	Hourly increment 3 outside the programmed limit value
42	Vm-V2 limit	Permissible difference between Vm and V2 counter exceeded
43	dEh1 limit	Current increase 1 outside the programmed limit value
44	dEh2 limit	Current increase 2 outside the programmed limit value
45	dEh3 limit	Current increase 3 outside the programmed limit value
46	dVb.eph1 limit	Estimated hourly volume increase 1 outside the programmed limit – event remains active until the end of the current hour
47	dVb.eph2 limit	Estimated hourly volume increase 2 outside the programmed limit – event remains active until the end of the current hour
48	Param1 limit	Additional recorded parameter 1 outside the programmed limit value
49	Param2 limit	Additional recorded parameter 2 outside the programmed limit value
50	Param3 limit	Additional recorded parameter 3 outside the programmed limit value
51	Param4 limit	Additional recorded parameter 4 outside the programmed limit value
52	Collective alarm A	One or more alarms from the common alarms A group triggered
53	Collective alarm B	One or more alarms from the common alarms B group triggered
54	**Calibration mode**	Calibration of the pressure or temperature sensor still ongoing
55	DI1: Name des Ereignisses	Digital input 1 status change
56	DI2	Digital input 2 status change

Code	Name	Description
57	DI3	Digital input 3 status change
58	DI4	Digital input 4 status change
59	DI5	Digital input 5 status change
61	DI7	Digital input 7 status change
62	DI8	Digital input 8 status change
63	Reverse flow	Reverse flow detection active – when using D-LF1/LF2 or D-HF1/HF2 input configuration

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