

Operating manual
Digital microprocessor controlled pressure transducer
with selectable output signal (4 ... 20 mA or 0 ... 10 V)

as of version 1.9

GMUD MP



Please carefully read these instructions before use!



Please consider the safety instructions!



Please keep for future reference!



Made in Germany

WEEE-Reg.-Nr. DE 93889386

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1 General Note

Read this document carefully and get used to the operation of the device before you use it. Keep this document within easy reach near the device for consulting in case of doubt.

Mounting, start-up, operating, maintenance and removing from operation must be done by qualified, specially trained staff that have carefully read and understood this manual before starting any work.

The manufacturer will assume no liability or warranty in case of usage for other purpose than the intended one, ignoring this manual, operating by unqualified staff as well as unauthorized modifications to the device. The manufacturer is not liable for any costs or damages incurred at the user or third parties because of the usage or application of this device, in particular in case of improper use of the device, misuse or malfunction of the connection or of the device.

The manufacturer is not liable for misprints.

2 Safety

2.1 Intended Use

The Device measures differential, relative or absolute pressure of non corrosive, non ionizing gases. An analogue output can be used for a 4 ... 20 mA or a 0 ... 10 V signal.

The safety requirements (see below) have to be observed.

The device must be used only according to its intended purpose and under suitable conditions.

Use the device carefully and according to its technical data (do not throw it, strike it, etc.)

Protect the device from dirt.

The sensor must not be used in an environment containing aggressive gasses (e.g. ammonia).

Beware of condensation, as any residues that can originate from drying can influence the accuracy.

2.2 Safety signs and symbols

Warnings are labeled in this document with the followings signs:



Caution! This symbol warns of imminent danger, death, serious injuries and significant damage to property at non-observance.








Attention! This symbol warns of possible dangers or dangerous situations which can provoke damage to the device or environment at non-observance.



Note! This symbol point out processes which can indirectly influence operation or provoke unforeseen reactions at non-observance.

2.3 Safety guidelines

This device has been designed and tested in accordance with the safety regulations for electronic devices. However, its trouble-free operation and reliability cannot be guaranteed unless the standard safety measures and special safety advises given in this manual will be adhered to when using the device.

1.  Trouble-free operation and reliability of the device can only be guaranteed if the device is not subjected to any other climatic conditions than those stated under "Specification". If the device is transported from a cold to a warm environment condensation may cause in a failure of the function. In such a case make sure the device temperature has adjusted to the ambient temperature before trying a new start-up.
2.  If there is a risk whatsoever involved in running it, the device has to be switched off immediately and to be marked accordingly to avoid re-starting. Operator safety may be a risk if:
 - there is visible damage to the device
 - the device is not working as specified
 - the device has been stored under unsuitable conditions for a longer time
 In case of doubt, please return device to manufacturer for repair or maintenance.
3.  When connecting the device to other devices the connection has to be designed most thoroughly as internal connections in third-party devices (e.g. connection GND with protective earth) may lead to undesired voltage potentials that can lead to malfunctions or destroying of the connected devices. This device must not be run with a defective or damaged power supply unit. Danger to life due to electrical shock!
4.  Do not use these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury or material damage. Failure to comply with these instructions could result in death or serious injury and material damage.
5.  This device must not be used at potentially explosive areas! The usage of this device at potentially explosive areas increases danger of deflagration, explosion or fire due to sparking.

3 Disposal notes



The device must not be disposed in the regular domestic waste.

Send the device directly to us (sufficiently stamped), if it should be disposed. We will dispose the device appropriate and environmentally sound.



4 Product specification

4.1 Scope of supply

The scope of supply includes:

- GMUD MP
- Operating manual
- Elbow-Type Plug (2 with option OUT)

4.2 Operation and maintenance advice

1.  Treat device and sensor carefully. Use only in accordance with above specification. (do not throw, hit against etc.). Protect plug and socket from soiling.
2.  Supply connection / Mains operation:
When connecting a mains cable, please take care to connect only allowed components. Carefully check the polarity and the correct connection.
Don't apply overvoltage!

5 Notes to the calibration services

Calibration certificates - DKD-certificates - other certificates:

If device should be certificated for its accuracy, it is the best solution to return it with the referring sensors to the manufacturer. (please state desired test values, e.g. 70 %RH)

Only the manufacturer is capable to do efficient recalibration if necessary to get results of highest accuracy!

Humidity transmitters are subject to ageing. For optimum measuring precision we recommend a regular adjusting at the manufacturer (e.g. every 2nd year). Cleaning and checking of the device is part of the service.

6 General installation instructions

Release the screw of the elbow-type plug.

Unplug the elbow-type plug.

Release the connection sealing.

Release the PG fitting and sealing.

Pull out the connection socket.

Slide the PG fitting and then the sealing over the cable.

Insert wires into the elbow-type plug.

Connect the cable to the numbered screw-contacts.

(Refer to wiring diagram).

Reattach the connection socket inside the elbow-type plug. (4 different positions can be chosen depending on mounting situation).

Tighten PG fitting carefully to seal the elbow-type plug.

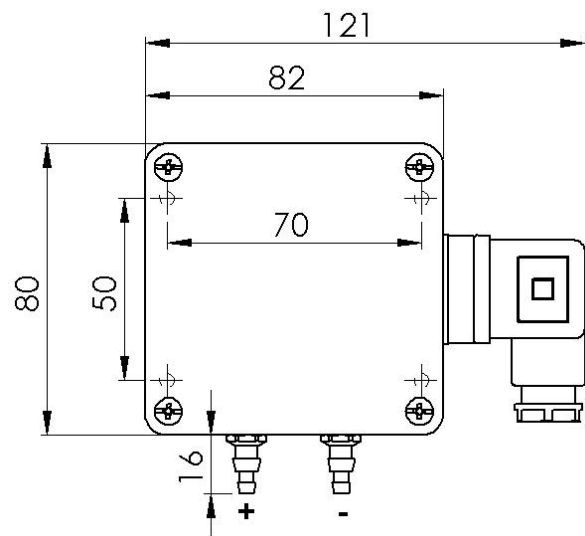
Re-attach the connection sealing.

Replug the elbow-type plug.

Carefully tighten the screw of the angel-type plug.

Left Pressure Port: Higher Pressure

Right Pressure Port: Lower Pressure (if available)



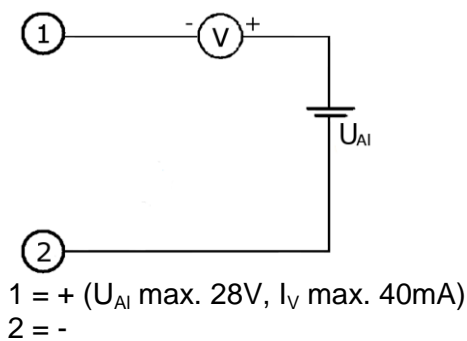
7 Assignment of elbow-type plug (depending on output setting)

Only with option /OUT
Elbow-type plug left side
 DC-isolated switching output, switching to GND. Setting of min and max-value via menu

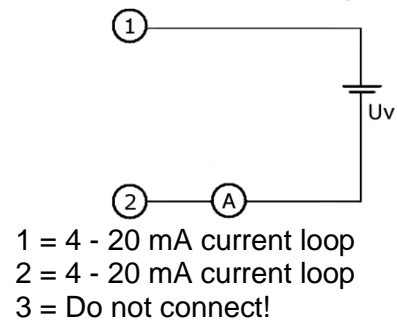
Elbow-type plug right side Supply and signal output Current- or voltage signal selectable via menu



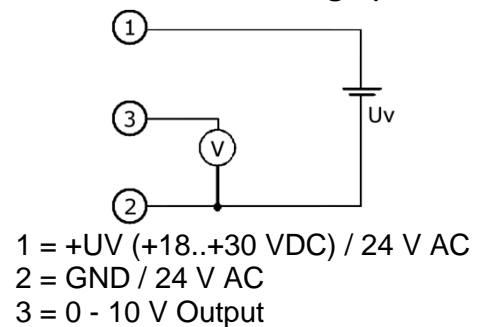
Switching output



Current (4 – 20 mA)



Voltage (0 – 10 V)



Hint for option -OD:
 Open front cover for having access to display and buttons

8 Details for pressure measurement

8.1 Absolute pressure

Absolute pressure is the pressure referenced to vacuum (zero pressure).
 With no pressure charged (pressure port left open), the atmospheric pressure is measured.
 Application field: meteorological measuring (e.g. 1013 hPa abs), vacuum processes

8.2 Differential pressure

The differential pressure is the difference between 2 pressure levels.
 Commonly both pressure levels are charged to one side of the sensor membrane, the sensor then needs two pressure ports.
 Application field: HVAC, filter/air filter, velocity pressure

8.3 Relative pressure

Relative pressure is the differential pressure between a pressure level (over or under pressure) and the atmospheric pressure. For measuring relative pressure with a differential pressure sensor (2 pressure ports) one of the ports has to be left open.
 Application field: Pneumatic or hydraulic systems, tire pressure

9 Display functions

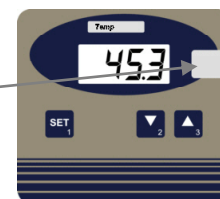
9.1 Usage of unit labels

As the transmitter is a multiple purpose device, many different display units are possible. Therefore unit-labels (within scope of supply) can be shoved between the case cover and the front foil behind the **transparent unit-window**.

To replace a label, unscrew the cover, pull out the old label (if present) and shove in the new one.

The unit depends on the configuration settings "Unit"!

Please refer to table in chapter "0" "Configuration of the device"



9.2 Measuring display

During normal operation the measured pressure value corresponding to the selected measuring unit is displayed. Whenever a correction is active (offset-, scale- or sea-level-correction) a small arrow will be shown in the upper left of the display.

9.3 Min- and max-value memory

View Min-Value (Lo): Press button ▼ shortly once
View Max-value (Hi): Press button ▲ shortly once
Restore current value: Press button Set shortly once
Delete min- and max-value: Press and hold button ▼ or ▲

display changes between 'Lo' and Min values
display changes between 'Hi' and Min values
current measured value is displayed
Display shows ,CLr' (Clear) and then switching to
measuring display, min.- and max.-values are cleared

After 15 seconds the display will automatically switch back to the measuring display.

10 Error and system messages

Display	Description	Possible fault cause	Remedy
Err.1	Above measuring range	Wrong signal	Keep pressure within measuring range
Err.2	Below measuring range	Wrong signal	Keep pressure within measuring range
Err.3	Above display range	Value >9999	Check settings: Offset and scale. Also check sea level correction on absolute devices
Err.4	Below display range	Value < -1999	Check settings: Offset and scale. Also check sea level correction on absolute devices
Err.7	System error	Error in device	Disconnect from supply and reconnect. If error remains: return to manufacturer
Err.9	Sensor error	Sensor defective	Check sensors, cable and connections, damages visible? Disconnect from supply and reconnect. If error remains: return to manufacturer
Er.11	Calculation not possible	Calculation variable missing or invalid	Check settings: Unit, offset and scale. Also check sea level correction on absolute devices
Er.12	Value is invalid	Restart	Disconnect from supply and reconnect. If error remains: return to manufacturer
8.8.8.8	Segment test	The transducer performs a display test for 2 seconds after power up. After that it will change to the display of the measuring.	

11 Configuration of the device

Follow these instructions to configure the functions of the device:

- Press button **SET** until the first parameter becomes visible in the.
- Switch to the desired parameter by pressing the button **SET**.
- Use the button ▲ or ▼ to change a value and use button **SET** to validate the value.



If there is no key pressed within the menu mode within 2 minutes, the configuration will be cancelled.

All changed settings will be lost!



Changing the device parameters is password protected by factory default. The password must be set correctly to 185 for entering the menu. The last menu point gives the option to disable the password protection.



Hint for option -OD:

Open front cover for having access to display and buttons

11.1 Password lock

Anzeige	Werte	Bedeutung
SET	Button ▼ and ▲	
Code	Passwort	
	185	For entering the configuration menu the password has to be set to 185.

11.2 Output configuration

Display	Values	Information
SET	Button ▼ and ▲	
unit	Unit and range of the pressure display <i>The unit defines the decimal point position as well as the display range. Depending on the sensor range some units may not be visible.</i>	
	bAr	bar
	mbar	mbar
	PA	Pascal
	hPA	hecto Pascal
	PSI	PSI
	torr	Torr (= mmHg)
dA.ov	Output type	
	v i	Voltage output (0 ... 10 V) Current output (4 ... 20 mA, factory default)
dA.Lo	Output zero point (low value)	
	8.8.8.8	Display value for an output value of 4 mA (or 0V) (Factory default: <i>Lower measuring range</i>)
dA.hi	Output scale (high value)	
	8.8.8.8	Display value for an output value of 20 mA (or 10V) (Factory default: <i>Upper measuring range</i>)
dA.Er	Output in case of an error	
	Lo hi	Output is <= 3,6 mA / 0V (factory default) Output is >= 21 mA / 10,5 V

11.3 Correction

Display	Values	Information
SET	Button ▼ and ▲	
oFF5	Offset correction of the measuring	
	oFF	Not active (factory <i>default</i>)
	^-500 ... ^500	Offset correction depending on display unit
5cAL	Offset correction of the measuring	
	oFF	Not active (factory <i>default</i>)
	^-2.00 ... ^2.00	Scale correction in %
P.dEt	Peak detection of the measuring	
	oFF	Not active (factory <i>default</i>)
	on	Active: Min.- and max.-value from non-averaged measuring value

If higher values are needed, please check sensor, if necessary return to manufacturer for inspection.

Calculation: corrected value = (measured value – oFF5) * (1+ 5cAL /100)

11.4 Sea level correction (only for absolute devices)

Display	Values	Information
SET	Button ▼ and ▲	
5.L	Sea level correction	
	oFF	Not active (factory <i>default</i>)
	^on	Active
ALt	Altitude of sea level (only when 5.L on)	
	-1999 ... 9999	Altitude deviation to sea level in meters

Calculation formula for the sea level correction

$$p(h_{Alt}) = p_{gemessen} [hPa] \cdot \left(1 - \frac{0,0065 \left[\frac{K}{m} \right] \cdot h_{Alt} [m]}{288,15 [K]} \right)^{5,255} [hPa]$$

Atmospheric conditions: international standard atmosphere

11.5 Alarm (only available with option –OUT)

Display	Values	Information
SET	Button ▼ and ▲	
ALLo	Lower alarm value (alarm when below value)	
	oFF	Not active (factory <i>default</i>)
	-1999 ... 9999	Output is active when measuring is below or equal this value
	on	Always on
ALHi	Upper alarm value (alarm when above value)	
	oFF	Not active (factory <i>default</i>)
	-1999 ... 9999	Output is active when measuring is above or equal this value
	on	Always on

11.6 Filter settings

Display	Values	Information
SET	Button ▼ and ▲	
FILT	Filter	
	oFF	No filtering
	0.1 ... 10	Filtering cycle in seconds (factory default: 0,5 s)
FAST	Fast measuring (only for output: voltage and filter: oFF)	
	oFF	Not active (factory default) <i>Averaging over 32 measurings</i>
	oN	Active: averaging 2 measurings

The filter uses the last calculated value and the average over the set period of time. In 100 ms there will be 16 measurements. The new value will then be calculated as average over the 16 measurements and the last value. When the filter is not active and the fast measuring is active there will be no averaging, each sensor value is displayed and the output will be set to the corresponding signal. This might lead to a turbulent output signal and display value.

11.7 Lock settings

Anzeige	Werte	Bedeutung
SET	Button ▼ and ▲	
Loc.5	Lock settings	
	oN	Active (factory default) To enter the settings menu the password 185 must be set under Code .
	oFF	Not active, the password protection Code is not checked.

12 Specification

Display range	-1999 ... 9999 Digit
Optimal measuring range	25 ... 75 % full scale from sensor range
Accuracy	(at nominal temperature of 0 ... 70 °C) Type-specific refer to chapter 13 Sensor accuracies on page 12. Best case: Typical (hysteresis and temperature effects) $\pm 0,15$ % full scale Typical (linearity) $\pm 0,6$ % full scale Maximum $\pm 0,9$ % full scale
Pressure media	Suitable for air, non corrosive, non-oxidising and non-reducing gases
Sensor	Silicon MEMS
Temperature compensation	Integrated in sensor element from 0 ... 70 °C
Measuring rate	Up to 1000 measurings per second
Justierung	Digital offset and scale correction
Min- and max value memory	Memory function for min and max value
Output signals	Arbitrary scale from 0 ... 10 V and 4 ... 20 mA
Scaling	Via selection in settings menu setting the output value for 4 mA (or 0 V) and 20 mA (or 10 V)
Connection	elbow-type plug
Auxiliary energy	4 ... 20 mA: From 4 ... 20 mA current loop $U_v = 18 - 30$ V DC / 24 V AC, max. 6 mA
Permissible impedance	4 .. 20 mA: $R_A(\text{Ohm}) < ((U_v - 12V) / 0,02 \text{ A})$ <i>Example: for $U_v = 18V$: $R_A < (18V .. 12V) / 0,02A \Rightarrow R_A < 300 \text{ Ohm}$</i>
Permissible load	0 .. 10 V: $R_L(\text{Ohm}) > 3000 \text{ Ohm}$
Switching output	Max. 28 V, 40 mA
Display	4-Digit 7-Segment LCD-Display Displayrange from -1999 ... 9999 Digit
Operational controls	3 Switches
Ambient conditions	
Nominal temperature	25 °C
Operating temperature	Electronics: -20 .. 70 °C,
Relative humidity	Electronics: 0 .. 95 % r.F. (non-condensing)
Storage temperature	-40 .. 70°C
Housing	ABS (IP65, außer Sensor)
Dimension	82 x 80 x 55 mm (without elbow-type plug and pressure connection)
Mounting	By means of screw thread or mounting holes in housing (accessible after cover has been removed).
Mounting position	50 x 70mm, max. shaft diameter of mounting screws is 4mm.
Electrical connection	elbow-type plug conforming to DIN 43650 (IP65), max. wire cross section: 1.5 mm ² , wire/cable diameter from 4.5 to 7 mm
EMC	The device corresponds to the essential protection ratings established in the Regulations of the Council for the Approximation of Legislation for the member countries regarding electromagnetic compatibility (89/336/EWG). In accordance with EN50081-1 and EN50082-1.

13 Sensor accuracies

13.1 Accuracies with standard measuring ranges

Order code	Measuring range	Overload	Burst pres.	Accuracy typical 0...+70 °C lin., hysteresis and temp. (max.)
GMUD-MP low differential pressure				
GMUD-MP-F-MD0	0,000..+1,000 mbar	150 mbar	200 mbar	± 0,35 %, ± 1,5 % (± 6,0 %)
GMUD-MP-F-MD1	0.00..+10,00 mbar	150 mbar	200 mbar	± 0,15 %, ± 0,6 % (± 1,5 %)
GMUD-MP-F-MD2	0,00..+20,00 mbar	150 mbar	200 mbar	± 0,15 %, ± 0,6 % (± 1,5 %)
GMUD-MP-F-MD3	-1,999..+2,500 mbar	250 mbar	500 mbar	± 0,10 %, ± 0,9 % (± 1,5 %)
GMUD-MP-F-MD4	-19,99..+20,00 mbar	150 mbar	200 mbar	± 0,15 %, ± 0,6 % (± 0,9 %)
GMUD-MP differential pressure				
GMUD-MP-S-MD0	0,0..+100,0 mbar	1000 mbar	1500 mbar	± 0,15 %, ± 0,6 % (± 1,5 %)
GMUD-MP-S-MD1	0,0..+500,0 mbar	1000 mbar	1500 mbar	± 0,15 %, ± 0,6 % (± 1,5 %)
GMUD-MP-S-MD2	0..+1000 mbar	2000 mbar	3000 mbar	± 0,15 %, ± 0,6 % (± 1,5 %)
GMUD-MP-S-MD3	0..+2000 mbar	4000 mbar	6000 mbar	± 0,15 %, ± 0,6 % (± 1,5 %)
GMUD-MP-S-MD4	0..+5000 mbar	7000 mbar	7000 mbar	± 0,15 %, ± 0,6 % (± 1,5 %)
GMUD-MP-S-MD5	-100,0..+100,0 mbar	1000 mbar	1500 mbar	± 0,15 %, ± 0,6 % (± 0,9 %)
GMUD-MP-S-MD6	-500..+500 mbar	1000 mbar	1500 mbar	± 0,15 %, ± 0,6 % (± 0,9 %)
GMUD-MP-S-MD7	-1000..+1000 mbar	2000 mbar	3000 mbar	± 0,15 %, ± 0,6 % (± 0,9 %)
GMUD-MP absolute pressure				
GMUD-MP-S-MA0	0..+1100 mbar	4000 mbar	6000 mbar	± 0,2 %, ± 1,0 % (± 3,0 %)
GMUD-MP-S-MA1	0..+2000 mbar	4000 mbar	6000 mbar	± 0,15 %, ± 0,6 % (± 1,5 %)
GMUD-MP for atmospheric pressure				
GMUD-MP-S-MBS:+600..+1100abs	+600..+1100 mbar	2000 mbar	3000 mbar	± 0,15 %, ± 0,6 % (± 1,3 %)

13.2 Accuracies with specific measuring ranges

Can be ordered by option -MBS or -MBF.

From the respective range limits any range can be selected.

The accuracy of the sensor specifies the system accuracy. The ranges highlighted in the table above show the highest possible accuracy.

The minimum display value is -1999 because of the 7-segment display. A +- 500,0 mbar sensor can be ordered as -199.9 .. 500.0 mbar or -500 .. 500 mbar.

With intermediate ranges the accuracy will change. The expected accuracy can be calculated as follows:

Sensor range / measuring range * accuracy

e.g. desired range -10..+600 mbar -> measuring range e: 10 + 600 = 610

Next sensor -1000...+1000 mbar -> sensor range: 1000 + 1000 = 2000, accuracy = 0.9%

Accuracy GMUD MP-S-10...+600 = 2000 / 610 * 0.9 % = 2.95 %