User's Manual
Handheld Pressure-Meter
GMH 3111
as of Version 7.0

for GMSD, GMXD, MSD and MXD - Pressure Sensors

$C\epsilon$

CONTENTS

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1 General

1.1 Safety Requirements

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".
2. Device and sensors have to be handled with care (don't throw, hit, etc.). Protect plugs and sockets from soiling.
3. 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.
4. If device is to be connected to other devices (e.g. via serial interface) the circuitry has to be designed most carefully. Internal connection in third party devices (e.g. connection GND and earth) may result in not-permissible voltages impairing or destroying the device or another device connected.
   Warning: If device is operated with a defective mains power supply (e.g. short circuit from mains voltage to output voltage) this may result in hazardous voltages at the device (e.g. at sensor socket or interface).
5. 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 period of time.
   In case of doubt, please return device to manufacturer for repair or maintenance.
6. **Warning:** Do not use these product as safety or emergency stop device, 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.

1.2 Operation And Maintenance Advice

- **Battery Operation**
  If ´bAt´ is shown in the secondary display the battery has been used up and needs to be replaced. The device will, however, operate correctly for a certain amount of time. If ´bAt´ is shown in the upper display the voltage is too low to operate the device; the battery has been completely used up.
  Please note: The battery has to be taken out, when storing device above 50°C.
  We recommend to take out battery if device is not used for a longer period of time!
  The real time clock has to be set again after reconnect to the battery.

- **Mains Operation With Power Supply**
  Warning: When using a power supply please note that operating voltage has to be 10.5 to 12 V DC. Do not apply overvoltage!! Cheap 12V-power supplies often have excessive no-load voltage.
  We, therefore, recommend using regulated voltage power supplies. Trouble-free operation is guaranteed by our power supply GNG10/3000.
  Prior to connecting the power supply to the mains make sure that the operating voltage stated at the power supply is identical to the mains voltage.

- **Connecting/Changing Sensors**
  Do not use insuitable sensors. Connecting other devices/sensors as specificated may cause a damage to the instrument and device/sensor! Switch off device before changing the sensor.
  Connect sensors before switching on the device, otherwise the sensor may not be detected correctly.
  When connecting the sensor the connector may not lock correctly. In such case take the plug not at the casing but at the buckling protection at the end of the plug. If plug is entered correctly, it will slide in smoothly. To disconnect sensors do not pull at the cable but at the plug (to open locking mechanism).

1.3 Connections
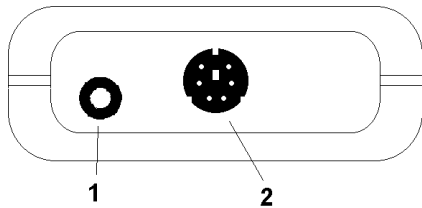
1. **Interface:** Connect to optically isolated interface adapter (accessory: GRS 3100, GRS 3105, USB 3100 or USB 3100 N)
2. **Connections** for **pressure sensors** of the GMSD, GMSD or MSD and MXD-family
3. The **mains socket** is located at the left side of the instrument

1.4 Display

Units: an arrow points to the chosen measuring unit

SL: appears if sea-level-correction is activated

Tara: appears if tara-function is activated

main display: shows measuring value

secondary display: shows min-, max- or hold value

Logg: not used

1.5 Basic Operation

When switching on the device displayed "Corr", if a Sensor with activated offset or scale correction is connected.

On-/Off-Switch

Tara: Calling of tara function
min/max: Showing the min- resp. max-memory
Store/Quit: Calling of hold function
Set/Menu: Calling of configuration

Tare Function: By pressing ´Tara´ (key 3) the displays will be set to 0. All measurings from then on will be displayed relatively to the set tare values. When the tare function is activated, the arrow "Tara" appears in the display. To deactivate tare function press ´Tara´ for >2 seconds.
Please Note: Activating/deactivating tara clears the max- & min-memories.

Max Memory: Pressing ´max´ (key 2) shows the maximum of the measured value. Pressing it again hides them. To clear the max. memory press key ´max´ for >2 seconds.

Min Memory: Pressing ´min´ (key 5) shows the minimum of the measured value. Pressing it again hides them. To clear the min. memory press key ´min´ for >2 seconds.

Hold Function: By pressing ´Store/Quit´ (key 6) the last measuring value will be held in the secondary display. Pressing it again hides it.

Zero-Point Adjustment: If there is no pressure or zero-pressure (absolute) applied to the pressure ports the device will display 0. If there is a permanent deviation (and device is operated under steady conditions), a permanent zero point adjustment can be carried out. To carry out the adjustment press button 3 for approx. 5 seconds (Auto Null will be displayed shortly).
The adjustment is done via the OFFSET-value of the sensor (referring configuration menu).
Please note: A zero-point adjustment can only be carried out if the difference between the value on display is less than 500 digits!
To recall the manufacturer's calibration press button 3 for approx. 15 seconds.
Note: If a zero-point adjustment was carried out, this will be signalled by the short displaying of „Corr" when switching on the device.

2 Configuration

To change device settings, press **Menu** (key 4) for 2 seconds. This will call the configuration menu.
Pressing key **Menu** jumps between the parameters.
The parameters can be changed with ▲ (key 2) or ▼ (key 5).
Quit (key 6) finishes the configuration and returns to standard measuring operation.

2.1 Unit: Choice Of The Display Unit

Choose the desired display unit, the referring unit is displayed by means of a functional arrow in the display. The selection is permanently stored in the sensor, therefore after reconnecting the sensor the unit will instantly reappear. The choice depends on the used sensor.

2.2 Sea Level Correction For Absolute Pressure Sensors

The device displays the absolute pressure measured at the sensor. This is not necessarily the same like the values given by weather stations! The weather stations' values are pressure at sea level. Usually the sensor is placed above sea level and therefore, if the value at sea level(zero) is to be measured, the pressure loss resulting from the actual level above zero has to be considered!

- To correct activate the „Sea-Level-Function":
  Select „on" in the menu „SL" with ▲ (key 2) or ▼ (key 5).

- Jump to the next parameter „Alti" by pressing **Menu** (key 4).
  Then enter the altitude above sea level of the sensor's location in meters and leave the configuration by pressing **Quit** (key 6)

If the sea level correction is active this will be shown by the functional arrow „SL" in the display, the device now displays the absolute pressure at sea level (zero).

2.3 P.oFF: Auto Power Off Time

The device will be automatically switched off if no key is pressed/no interface communication takes place for the time of the power off time.
The power off time can be set to values between 1 and 120 min. It can be completely deactivated by setting the parameter to ‚P.oFF = oFF".

2.4 Adr: Base Address of Interface

Up to 10 devices of the GMH3xxx- handheld-family can be connected to a serial interface at once (depending on interface converter, e.g. GRS 3105: 5 devices). To get access to each device the base addresses of the devices have to be different. For example choose 01 for the first, 11 for the second device and so on.

2.5 OFFS: Adjusting Sensor Zero Displacement

A zero displacement can be carried out for the measured value:

value displayed = value measured - offset

Standard setting: 'off' = 0.0°, i.e. no zero displacement will be carried out. Together with the scale correction (see below) this factor is mainly used to compensate for sensor deviations. Input is in the display unit.

2.6 SCAL: Adjusting Sensor Scale

The scale of the measuring can be influenced by this setting (factor is in %):
displayed value = measured value * (1+Scal/100)
Standard setting: 'off' =0.000, i.e. value is not corrected. Together with the zero displacement (see above) this factor is mainly used to compensate for sensor deviations.

3 Measuring Of Water Level – Display Unit [m]

When using suitable waterproof pressure sensors the unit [m] for meters of water can be set in the menu "Unit". 10m of water are roughly 1 bar over pressure. Measurings can be made e.g. like described below :

- <u>With one abs. pressure sensor (SL oFF!)</u>: Press ‚Tara' when sensor is at ambient air and then bring sensor to the depth to be measured. The display shows now the depth in [m].
- <u>With one rel pressure sensor</u>: bring tube connection for lower press. in contact to ambient air by means of a tube (no water contact!) and bring the sensor with its open press. connection for higher pressure to water depth to be measured (display and is compensated for pressure changes in ambient air).

4 The Serial Interface

By means of the serial interface and a suitable electrically isolated interface adapter (GRS 3100, GRS 3105 USB 3100 or USB 3100 N) the device can be connected to a computer for data transfer.

With the GRS 3105 up to 5 devices of the GMH3xxx- series can be connected to one interface (see also manual of GRS 3100, GRS 3105, USB 3100 or USB 3100 N). To avoid transmission errors, there are several security checks implemented e.g. CRC.

The following standard software packages are available:

- **EBS9M**:   9-channel software to display the measuring values
- **EASYCONTROL**: Universal multi channel software (EASYBUS-, RS485-, or GMH3000- operation possible) for real-time recording and presentation of measuring data of one GMH3xxx device in the ACCESS®-data base format

In case you want to develop your own software we offer a **GMH3000-development package** including:

- a universally applicable Windows functions library ('GMH3000.DLL') with documentation that can be used by the most programming languages.
- Programming examples Visual Basic 4.0, Testpoint (Keithley Windows measuring software)

The device has 1 channel:

- Channel 1: current measuring value (base address)

Note: ***The measuring display range values read back from the interface are always in the selected measurement unit (mbar, bar...)!***

Supported functions:

Code	Name/Function	Code	Name/Function
0	Read measurement value	200	Read min display range
3	Read system state	201	Read max display range
6	Read min value	202	Read display range - unit
7	Read max value	204	Read display range - decimal point
12	Read ID number	208	Read # of channels
176	Read min measuring range	214	Read Scale adjustment[%]
177	Read max measuring range	216	Read Offset adjustment
178	Read measuring range unit	222	Read power off time (Conf-P.oFF)
179	Read measuring range decimal point	223	Set power off time (Conf-P.oFF)
180	Read kind of measuring of sensor	240	Reset
199	Read kind of measuring of display	254	Program version

5 Pressure Connection To The Sensors

The device is designed to be connected to the sensors of the GMSD/GMXD/MSD/MXD...-series without a new calibration being necessary. Therefore a great variety of replaceable sensors of e.g. -1.999...2.500 mbar relative up to 0...1000 bar absolute pressure can be connected to the device.

Relative Pressure Sensors (types: GMSD/GMXD...MR, GMSD/GMXD...BR)

- **For measurements of over- or under pressure:**
  Connect plastic tube with internal dia of 4 mm to pressure port "B". Port "A" will not be used!
  Pressure sensors GMSD 2,5 MR, GMSD 25 MR and GMSD 350 MR allow for measurements of under pressure up to the entire over pressure measuring range by re-plugging the tube to pressure port "A". Please note that all values are displayed as positive values. No minus sign will be shown. (Example for GMSD 25 MR: For tube connection "B" the measuring range covers -19.99 to 25.00 mbar. If you replug to port "A" under pressure measurements down to -25.00 mbar could be carried out with the display showing the value 25.00 (no minus sign).
- **For measurements of pressure differences:**
  Connect both plastic tubes with an internal dia of 4 mm to pressure port "B" and "A"; make sure to apply higher pressure to port "B".
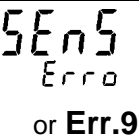
Absolute pressure sensors: (types: GMSD/GMXD...BA)

Connect plastic tube with an internal dia of 4 mm to pressure port "A". (Port "B" is not used.)

Stainless steel pressure sensors: (types: GMSD/GMXD...MRE, GMSD/GMXD...BRE, GMSD/GMXD...BAE and MSD/MXD...MRE, MSD/MXD...BRE, MSD/MXD...BAE with MSD-K31)

For measurements of over-, under- or absolute pressure screw sensor to G1/4" pressure terminal or plug plastic tube to a suitable adapter.

6 Error And System Messages

Display	Meaning	What to do?
lob -bat-	Low battery power, device will only continue operation for a short period of time	Replace battery
bAt	Battery empty	Replace battery
	Mains operation without battery: wrong voltage	Check power supply, replace it when necessary
SEnS Erro or **Err.9**	No sensor connected	Switch off device and connect sensor
	Connected sensor or device defective	If 2nd sensor available, check if device is ok. Return defective device/sensor to manufacturer for repair
	Value extremely out of measuring range	Check: pressure not within sensor range?
No display or confused characters, device does not react on keypress	Battery empty	Replace battery
	Mains operation: wrong voltage or polarity	Check power supply, replace it when necessary
	System error	Disconnect battery and power supplies, wait shortly, then reconnect
	Device defective	Return to manufacturer for repair
Err.1	Measured value above allowable range	Check: pressure not within sensor range? -> measuring value to high!
	Sensor defective	Return to manufacturer for repair
Err.2	Measured value below allowable range	Check: pressure not within sensor range? -> measuring value to low!
	Sensor defective	Return to manufacturer for repair
Err.3	Display range overflow	Check: value above 19999 -> to high to be displayed
Err.4	Display range underflow	Check: value below -19999 (Tara?) -> to low!
Er.11	Value could not be calculated	Choose different unit
	Calculation overflow happened	Choose different unit
Err.7	System error	Return to manufacturer for repair
----	Sensor not present / recognised	Connect suitable sensor
	could not calculate value	

7 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.
Only the manufacturer is capable to do efficient recalibration if necessary to get results of highest accuracy!

8 Specification

Measuring ranges:

Display range:	max. -19999...19999 digit, depending on connected sensor
Resolution:	depending on connected sensor
Pressure units:	mbar, bar, kPa, MPa, mmHg, PSI, mH_2O
	selectable depending on connected sensor
Accuracy: (typ.)	±0,1%FS (at nominal temperature)
Measuring rate:	4 meas./sec
Nominal temperature:	25°C
Sensor:	All sensors of the GMSD, GMXD, MSD and MXD..-series without recalibration can be connected.
Connection:	Mini-DIN-Socket with locking mechanism
	The sensor will automatically be detected, the measurement range settings are set referring to sensor data

Additional Functions:

Power-Off-Function:	Device will be automatically switched off if no key is pressed/no interface communication takes place for the time of the power-off delay. The power-off delay can be set to values between 1 and 120 min.; it can be completely deactivated.
Display:	2 four digit LCDs (12.4mm high and 7 mm high) for measuring values, and for min/ max memories, hold function, etc. as well as additional functional arrows.
Pushbuttons:	6 membrane keys
Interface:	Serial interface (3.5mm jack) can be connected to RS232 or USB interface of a PC via electrically isolated interface adapter GRS 3100, GRS 3105, USB 3100 or USB 3100 N (see accessories).
Power supply:	9V battery, type: IEC 6F22 (included in scope of supply)
	as well as additional d.c. connector (diameter of internal pin 1.9 mm) for external 10.5-12V direct voltage supply. (suitable power supply: GNG10/3000)
Power consumption:	< 1.6 mA
Low battery warning:	' bAt '
Housing:	impact-resistant ABS, membrane keyboard, transparent panel, Front side IP65
Dimensions:	142 x 71 x 26 mm (L x W x D)
Wight:	approx. 150 g
Working temperature:	-25...+50°C
Allowable rel. humidity:	0...95 %RH (not condensing)
Storage temperature:	-25...+70°C
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 (2004/108/EG).
	Additional fault: <1%

9 Disposal notes

This device must not be disposed as 'residual waste'. To dispose this device, please send it directly to us (adequately stamped). We will dispose it appropriately and environmentally friendly.