User's Manual
Handheld Double-Pressure-Meter
GMH3156
as of Version 6.4
for 2 GMSD or GMXD – Pressure Sensors

$$C\mkern-6mu\epsilon$$

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. <u>**Warning:**</u> 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.
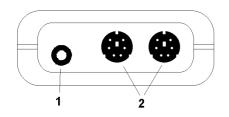 Connect sensors before switching on the device, otherwise the sensor may not be detected correctly.
  When connecting the sensor the connector may not lock correctly. In such case take the plug not at the casing but at the buckling protection at the end of the plug. If plug is entered correctly, it will slide in smoothly. To disconnect sensors do not pull at the cable but at the plug (to open locking mechanism).

1.3 Connections

1. **Output:** Operation as interface: Connect to optically isolated interface adapter (accessory: GRS 3100, GRS3105 or USB3100) Operation as analogue output: Connection via suitable cable. Attention: The output mode has to be configured (p.r.t. 2.8) and influences battery life!
2. **Connections** for **pressure sensors** of the GMSD and GMXD-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: measuring value of **sensor 1**

secondary display: measuring value of **sensor 2** or **difference sensor 1 – sensor 2** (selection with key ‚Set')

Logg: appears, if a logger function is chosen

1.5 Basic Operation

When switching on the device and the logger function is not off the time of the integrated clock will shortly be displayed. Furthermore the kind of measuring is displayed (Slo/Fast/P.det, p.r.t 2.1) and "Corr", if a Sensor with activated offset or scale correction is connected.

After changing the battery the clock-setting menu is activated automatically (‚CLOC'). Check the clock and adjust, if necessary (p.r.t chapter 2).

On-/Off-Switch

Tara: Calling of tara function

min/max: Showing the min- resp. max-memory

Store/Quit: Calling of hold function resp. calling of logger functions (p.r.t. chapter 3)

Set/Menu: Choose secondary display: **Sensor2** or **difference sensor1 – sensor2** or 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 maximums of the measured values. Pressing it again hides them. To clear the max memories press key ´max´ for >2 seconds.

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

Hold Function: By pressing ´Store/Quit´ (key 6) the last measuring values will be held in the display. Pressing it again hides them. (only when logger = ‚off').

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 activate the configuration menu (main display: „SEt").

Pressing key *Menu* changes between the menus, pressing ▸ (key 3) jumps to the referring parameters, which can be selected with key ▸ (key 3).

The parameters can be changed with ▲ (key 2) or ▼ (key 5).

Pressing *Menu* again jumps back to the main configuration menu and saves the settings.

Quit (key 6) finishes the configuration and returns to standard measuring operation.

Menu	Parameter	Values	Meaning	
KEY **Menu**	KEY ▸	KEY ▲ or ▼		
SEt ConF	**Set Configuration: Generic Configurations**			
	Unit	mbar,bar..	**Unit**: Unit of display (given by sensor 1 when using 2 sensors)	*, **
	SL	oFF/on	**Sea level correction**: on or off (only for Sensor 1)	*, **
	Alti	-2000..9999	**Altitude** above sea level [m] (only for Sensor1 and if SL)	*,**
	rAtE		**Rate**: Measuring rate (p.r.t. chapter 2.1)	*
		Slo	**Slow** measuring rate (4Hz filtered, low power consumption)	*
		FASt	**Fast** measuring rate, filtered (>1000Hz)	*
		P.dEt	**Peak detection**: fast measuring rate, unfiltered (>1000Hz)	*
	t.AVG	1-120	Averaging period in seconds, used by the averaging function	
		oFF	Averaging function deactivated	
	P.oFF	1-120	**Auto Power Off** time in minutes	
		oFF	Auto Power Off deactivated	
	Out	oFF	Function of the output: No output function, lowest power consumption	
		SEr	Output is serial interface	
		dAC	Output is analogue output 0...1V	
	Adr.	01,11..91	Base **address** of interface (if Out = SEr)	
	dAC.	CH1, CH2 or CH DIF	Choice of the input to be the source for the analogue output (if Out = dAC)	
	dAC.0	eg. -5.00..5.00 mbar	Enter desired value at which the analogue output potential should be 0V (if Out = dAC)	
	dAC.1	eg. -5.00..5.00 mbar	Enter desired value at which the analogue output potential should be 1V (if Out = dAC)	
SEt CAL	**Set Calibration: Adjustment of Sensors**			
	OFS.1	Sensordep., e.g. -5.00..5.00 mbar	The **offset of sensor 1** will be displaced by this value to compensate for deviations in the probe or in the measuring device	
		OFF	Zero displacement inactive (=0.0°)	
	SCL.1	-2.000...2.000	The measuring **scale of sensor 1** will be changed by this factor [%] to compensate deviations of temperature probe or measuring device	
		OFF	Scale correction factor inactive (=0.000)	
	OFS.2	Sensordep., e.g. -5.00..5.00 mbar	The **offset of sensor 2** will be displaced by this value to compensate for deviations in the probe or in the measuring device	
		oFF	Zero displacement inactive (=0.0°)	
	SCL.2	-2.000...2.000	The measuring **scale of sensor 2** will be changed by this factor [%] to compensate deviations of temperature probe or measuring device	
		oFF	Scale correction factor inactive (=0.000)	
SEt AL.	**Set Alarm: Settings Of Alarm Function**			
	AL. 1	On	**Alarm sensor 1** on, with buzzer sound	
		no.So	Alarm sensor 1 on, without buzzer sound	
		oFF	no alarm function for sensor 1	
	AL.Lo/AL.1	Sensor1-Min... AL.1-Hi	Min alarm rail Sensor 1 (not when AL.1 = oFF) Sensor1-Min is the lower display range of sensor 1	
	AL.Hi/AL.1	AL.1-Lo... Sensor1-Max	Max alarm rail Sensor 1 (not when AL.1 = oFF) Sensor1-Max is the upper display range of sensor 1	
	AL. 2	On	**Alarm sensor 2** on, with buzzer sound	
		no.So	Alarm sensor 2 on, without buzzer sound	
		oFF	no alarm function for sensor 2	
	AL.Lo/AL.2	Sensor2-Min... AL.2-Hi	Min alarm rail Sensor 2 (not when AL.2 = oFF) Sensor2-Min is the lower display range of sensor 2	

	AL.Hi/AL.2	`AL.2-Lo...` `Sensor2-Max`	Max alarm rail Sensor 2 (not when AL.2 = oFF) Sensor2-Max is the upper display range of sensor 2	
	AL. DIF	`On`	**Alarm sensor difference** on, with buzzer sound	
		`no.So`	Alarm sensor difference on, without buzzer sound	
		`oFF`	no alarm function for sensor difference	
	AL.Lo DIF	`-19999..AL.DIF-Hi`	Min alarm rail of difference (not when AL.DIF = oFF)	
	AL.Hi DIF	`AL.DIF-Lo..19999`	Max alarm rail of difference (not when AL.DIF = oFF)	
SEt **LoGG**	**Set Logger: Configuration Of Logger Function**			*
	Func	`CYCL`	**Cyclic**: logger function ‚cyclic logger'	*
		`Stor`	**Store**: logger function ‚individual value logger'	*
		`oFF`	no logger function	*
	CYCL	`1..3600`	Cycle time of cyclic logger [seconds]	*
	Lo.Po	`on/oFF`	**Low-power logger** with very low power consumption (only for cyclic logger and slow measuring rate)	*
SEt **CLOC**	**Set Clock: Setting Of Real Time Clock**			
	CLOC	`HH:MM`	**Clock**: Setting of time hours:minutes	
	dAtE	`TT.MM`	**Date**: day.month	
	YEAr	`YYYY`	**Year**	

(*) *This menu can only be invoked if the logger memory contains no data! If parameter should be changed the logger memory has to be cleared before! (key 6, p.r.t. chapter 3)*

(**) *This menu can only be invoked if a referring sensor is connected to connection 1. When using a second sensor at connection 2 then changes are taken over.*

2.1 Different Kinds Of Measuring: „rAtE-Slo, -P.dEt, -FASt"

Three different kinds of measuring pressure are supported. Two of them (P.dEt and FASt) are working with high measuring frequency of more than 1000 measurings per second.

2.1.1 rAtE-Slo: Standard Measuring

Measuring rate 4Hz, averaging and filter functions are active.
Application: Measuring of slowly changing or static pressures, e.g. measuring of leakproofness, athmospheric pressure...
Highest accuracy, high noise immunity (EMI and unstable measuring signals), low power consumption.

2.1.2 rAtE-P.dEt: Peak detection

Measuring rate >1000Hz, the value is displayed unfiltered.
Application with logger function: Measuring of short pressure peaks or fast changing pressures with a resolution of < 1ms. The cyclic logger function records the arithmetic mean value, the highest and the lowest peak of the refering time interval.
Attention: higher power consumption, measuring is sensitive to noise (EMI,..).

2.1.3 rAtE-FASt: Fast filtered measuring

Measuring rate >1000Hz, the value is filtered slightly (higher noise immunity than P.dEt, small peaks will be filtered out), apart from that identical behaviour like P.dEt.

2.2 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 two abs. pressure sensors (SL oFF!)</u>: Sensor 2 at ambient air (does not have to be waterproof), waterproof sensor 1 at water depth to be measured. Don't press ‚Tara', the depth can already read from the DIF-display and is compensated for pressure changes in ambient air.
- <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).

2.3 Sea Level Correction For Absolute Pressure Sensors

The device displays the absolute pressure. This is not necessarily the same like the values given by weather stations! The weather stations' values are giving the 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 sea level has to be considered! To correct the measuring display activate the „Sea-Level-Function" (SL, p.r.t. chapter 2, setting is only possible, if the abs. pressure sensor is connected to sensor socket 1). Then enter the altitude above sea level of the sensor's location in meters (Alti, p.r.t. chapter 2). When activated, the display shows the SL-arrow and the device displays the pressure value at sea level.

Please note: When two absolute pressure sensors are connected, the sea level function for both is corresponding to the setting of sensor 1

2.4 Averaging Function

The averaging function concerns the display values (LCD and interface). It is completely independent from the averaging of the logger function, please don't mix them up!
The averaging integrates the measuring values during a selectable period of time and then calculates the average display value. It is independent from the selected kind of measuring (slow, fast, peak detect).
As long as not enough values are collected (selected averaging time) to calculate a average value, the upper display shows "----", the lower display a 'countdown'.
During an active low-power-logging procedure the averring is always deactivated

Function of min/max-value memory during averaging:
- If averaging is activated and slow measuring is selected (rAtE-Slo), the min-/max-value memory refers to the average display value.
- If averaging is activated and fast measuring is selected (rAtE-FASt or P.dEt) , the min-/max-value memory refers to the internal measured values (fast peaks can be detected).

2.5 Zero Displacement Sensor 1 ('OFS.1') and Sensor 2 ('OFS.2')

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 Scale Correction Sensor 1 ('SCL.1') and Sensor 2 ('SCL.2')

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.

2.7 Power Off Time

If there won't be pressed any key and no interface communication takes place for the time of the power off time setting (P.Off), the device will be switched off automatically to save battery power.
If P.oFF = oFF then the automatic switch off is deactivated.

2.8 Output

The output can be used as serial interface (for GRS3100, GRS3105 or USB3100 interface adapters) or as analogue output (0-1V).

2.8.1 Interface - Base Address ('Adr.')

Up to 10 devices of the GMH3xxx- handheld-family can be connected to a serial interface at once (depending on interface converter, e.g. GRS3105: 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. See also chapter 4.

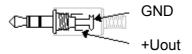### 2.8.2 Analogue Output – Scaling with DAC.0 and DAC.1

Note: Analogue output can not be used during logger recordings

With the DAC.0 and DAC.1 values the output can be rapidly scaled to Your efforts.

Keep in mind not to connect low-resistive loads to the output, otherwise the output value will be wrong and battery life is decreased. Loads above ca 10kOhm are uncritical.

If the display exceeds the value set by DAC.1, then the device will apply 1V to the output

If the display falls below the value set by DAC.0, then the device will apply 0V to the output

In case of an error (Err.1, Err.2, no sensor, etc.) the device will apply slightly above 1V to the output.

plug wiring:

GND

+Uout

Attention!
The 3rd contact has to be left floating!
Only stereo plugs are allowed!

2.9 Alarm

3 possible settings per channel: Alarm off (AL.oFF), on with horn sound (AL.on), on without horn (AL.no.So).

Following conditions will display an alarm, when the function is activated (on or no.So):

- Value is below lower (AL. Lo) or above upper alarm rail (AL.Hi).
- Sensor error (Sens Erro)
- Low battery (bAt)
- Fe 7: System error (always with sound)

In case of an alarm, and when polling the interface the prio-flag is set in the returned interface message.

If the horn sound of one channel will be switched on/off (on or no.So), then this horn sound setting will automatically be copied to the other activated channels.

2.10 Real Time Clock

The real time clock is used for the logger function: Recorded values are also containing the point of time, when they were measured. Please check the settings when necessary.

If the battery was replaced the referring menu ‚CLOC' will automatically be started.

3 Operation Of Logger

The device supports two different logger functions:

„Func-Stor":   each time when „store" (key 6) is pressed a measurement will be recorded.

„Func-CYCL":   measurements will automatically be recorded each interval, which was set in the logger menu ‚CYCL' until the logger will be stopped or the logger memory is full. The recording is started by pressing „Store" 2 seconds.

The logger records 3 measurement results each time:

current or mean value (depending on logger setting, see below), min peak and max peak of sensor 1
current or mean value (depending on logger setting, see below), min peak and max peak of sensor 2
current or mean value (dep. on logger setting), min peak and max peak of sensor 1 - sensor 2

Min and max peak are the minimum resp. the maximum of the measured values since the last recording. Using them allows f.e. analysis of fluctuating pressures. For the evaluation of the data the software GSOFT3050 has to be used. The software also allows easy configuration and starting of the logger.

When the logger is activated (Func Stor or Func CYCL) the hold function is no more available, the key 6 is solely used for the operation of the logger functions.

3.1 „Func-Stor": Storing Single Measurements

Each time when „store" (key 6) is pressed a measurement and its time stamp will be recorded.
The recorded data can be viewed either in the display (when calling the configuration an additional menu „REAd LoGG" is displayed, see below) or by means of the interface and a PC with GSOFT3050-software.

Please note: *For the Func-Stor-logging function it is not allowed to change the pressure sensor after values are stored, otherwise invalid data could be read out.*
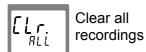*For the read out of the logger the sensor has to be kept connected!*

Max. number of measurings: 99
A measuring contains:
- sensor 1, current measuring value at the time of recording
- sensor 1, min peak since the last recording
- sensor 1, max peak since the last recording
- sensor 2, current measuring value at the time of recording
- sensor 2, min peak since the last recording
- sensor 2, max peak since the last recording
- difference sensor 1 - sensor 2, current measuring value at time of recording
- difference sensor 1 - sensor 2, min peak since the last recording
- difference sensor 1 - sensor 2, max peak since the last recording
- time and date of the recording

After each recording „St. XX" will be displayed for a short time. XX represents the number of the recording.
If logger memory contains recordings already:
When „Store" is pressed for 2 seconds, the choice for clearing the logger memory will be displayed:

CLr ALL	CLr LASt	CLr. no
Clear all recordings	Clear the last recording	Clear nothing (cancel menu)

The selection can be made by ▲ (key 2) and ▼ (key 5). "Quit" (key 6) enters the choice.
If the logger memory is full, the display will show: LoGG Full

Viewing Recorded Measurings

Within the „LoGG Stor" function the measurings can be viewed directly in the display not only by means of a computer (like at „Func CYCL"): press 2 seconds „Set" (key 4): The first menu displayed now is „rEAd LoGG" (read logger data). After pressing ▸ (key 3) the measurement recorded last will be displayed, changing between the different values referring to the measurement also is done by pressing ▸ .
Changing the measurement is done by pressing the keys ▲ or ▼ .

3.2 „Func-CYCL": Automatic Recording With Selectable Logger-Cycle-Time

The Logger-Cycle-Time is settable (p.r.t. Configuration). For example „CYCL" = 60: A measuring is recorded after each 60 seconds.
When the slow measurement "rAtE-Slo" is chosen, additionally a low power function is available: „Lo.Po".
If „Lo.Po" is on, the device only will take a measurement at the point of time of the recording. In between the recordings the measuring shuts down. This decreases the power consumption enormously and therefore is recommended e.g. for long time recordings where no mains adapter is available.

Max. number of measurings: 4000 (at max. 64 recording sequences)
Cycle time: 1...3600 seconds (=1h), selectable in the configuration

A measuring contains:
▪ slow measuring rate (rAtE Slo):
- sensor 1, current measuring value at the time of recording
- sensor 1, min peak, max peak since the last recording
- sensor 2, current measuring value at the time of recording
- sensor 2, min peak, max peak since the last recording
- difference sensor 1 – sensor 2, current measuring value at time of recording
- difference sensor 1 – sensor 2, min peak, max peak since the last recording

- fast measuring rates (rAtE FASt,P.dEt):
  - sensor 1, arithmetic mean value since the last recording
  - sensor 1 min peak, max peak since the last recording
  - sensor 2, arithmetic mean value since the last recording
  - sensor 2 min peak, max peak since the last recording
  - difference sensor 1 – sensor 2, arithmetic mean value since the last recording
  - difference sensor 1 – sensor 2, min peak, max peak since the last recording

Starting a recording:

By pressing "Store" (key 6) for 2 seconds the logger operation will be called. The display will show: `Lo66 run`

By pressing "Store" again the recording will be initiated.

After that the display shows 'St.XXXX' for a short time whenever a measuring is recorded. XXXX is the number of the measuring 1..4000.

If the logger memory is full, the display will show: `Lo66 FuLL` The recording automatically will be stopped.

If Low-Power-Logger-Function „Lo.Po = on" the device switches itself off as soon as the memory gets filled.

Stopping the recording manually:
By pressing "Store" (key 6) the recording can be stopped manually. Then the following choice appears:

`StoP YES` Stop the recording   `StoP no` Do not stop the recording

The selection can be made by ▲ (key 2) and ▼ (key 5). "Quit" (key 6) enters the choice.

Note: *If you try to switch off the instrument in the cyclic recording operation You will be asked once again if the recording is to be stopped.*
The device can only be switched off after the recording has been stopped!
The Auto-Power-Off-function is deactivated during recording!

Clear Recordings:
By pressing "Store" (key 6) for 2 seconds the logger operation will be called.

The display will show: `Lo66 run` By pressing the keys ▲ (key 2) or ▼ (key 5) the display will change to `Lo66 CLr`.

When „Store" is pressed, the choice for clearing the logger memory will be displayed:

`CLr. ALL` Clear all recordings   `CLr. LASt` Clear the last recording sequence   `CLr. no` Clear nothing (cancel menu)

The selection can be made by ▲ (key 2) and ▼ (key 5). "Quit" (key 6) enters the choice.

4 The Serial Interface

By means of the serial interface and a suitable electrically isolated interface adapter (GRS3100, GRS3105 or USB3100) the device can be connected to a computer for data transfer. With the GRS3105 up to 5 devices of the GMH3xxx- series can be connected to one interface (see also manual of GRS3105)
To avoid transmission errors, there are several security checks implemented e.g. CRC.
The following standard software packages are available:

- **GSOFT3050**:   Operation and read out of logger function, data display in diagrams and tables
- **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)

In addition to the operation at a PC the device can be operated with the **GAM3000-device**, to use the alarm function for simple supervision and controlling applications. Just connect a GAM3000 to the interface, activate the alarm function of the GMH and the relays output is operating.

The device has 9 channels:

- Channel 1: sensor 1 current measuring value (base address)
- Channel 2: sensor 1 min peak (p.r.t. chapter 3)
- Channel 3: sensor 1 max peak (p.r.t. chapter 3)
- Channel 4: sensor 2 current measuring value (base address)
- Channel 5: sensor 2 min peak (p.r.t. chapter 3)
- Channel 6: sensor 2 max peak (p.r.t. chapter 3)
- Channel 7: difference sensor 1 – sensor 2 current measuring value (base address)
- Channel 8: difference sensor 1 – sensor 2 min peak (p.r.t. chapter 3)
- Channel 9: difference sensor 1 – sensor 2 sensor 1 max peak (p.r.t. chapter 3)

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

Supported functions:

Channel 1	4, 7	2,3,5 6,8,9	Code	Name/Function	Channel 1	4, 7	2,3,5 6,8,9	Code	Name/Function
x	x	x	0	Read measurement value	x			208	Read # of channels
x	x	x	3	Read system state	x			222	Read power off time (Conf-P.oFF)
x			12	Read ID number	x			223	Set power off time (Conf-P.oFF)
x			22	Read min alarm rail (AL. - AL.Lo)	x	x	x	224	Logger: Read data of CYCL- Logger
x			23	Read max alarm rail (AL. - AL.Hi)	x			225	Logger: Read cycle time (LoGG - CYCL)
x			32	Read configuration flag BitAlarmOn: 1, BitAlarmSound:3; BitLoggerOn:50; BitCyclicLogger:51; BitLowPowerLogger:52	x			226	Logger: set cycle time (LoGG - CYCL)
					x			227	Logger: start recording
					x			228	Logger: Read # of recordings made
x			160	Set configuration flag (refer to 32)	x			229	Logger: Read state
x	x	x	176	Read min measuring range	x			231	Logger: Read stop time
x	x	x	177	Read max measuring range	x			233	Read real time clock (CLOC)
x	x	x	178	Read measuring range unit	x			234	Set real time clock (CLOC)
x	x	x	179	Read measuring range decimal point	x			236	Read logger memory size
x	x	x	180	Read kind of measuring of sensor	x			237	Read logger filecount
					x			238	Read logger filepointer
x	x	x	199	Read kind of measuring of display	x			239	Read logger file info
x	x	x	200	Read min display range	x			240	Reset
x	x	x	201	Read max display range	x			254	Program version
x	x	x	202	Read display range - unit	x			260	Logger: read data of STOR Logger
x	x	x	204	Read display range - decimal point	x	x	x	263	Read logger channel info

5 Pressure Connection To The Sensors

The device is designed to be connected to the sensors of the GMSD/GMXD...-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...400.0 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)

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

Measurements of pressure differences with two sensors

By means of the calculation sensor 1 – sensor 2 (DIF) press. differences of any sensor combinations can be measured.

6 Error And System Messages

Display	Meaning	What to do?
10B -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	reconnect sensor, during logging: stop the logger and restart it
	could not calculate value	suitable sensor / unit combination necessary

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 connnected sensor
Accuracy: (typ.)	±0,1%FS (at nominal temperature)
	(FASt and P.dET: ±0.5%FS)
Measuring rate:	slow: 4 meas./sec (ConF-Rate = Slow)
	fast: >1000 meas./sec (ConF-Rate = FASt and P.dEt)
Nominal temperature:	25°C
Sensor:	All sensors of the GMSD and GMXD..-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.
Min/Max-Alarm:	The measuring values can be monitored constantly for the min. and max. rails set Alarming is done by integrated horn, display and interface
Real time clock:	Integrated clock with date and year
Logger:	2 Functions: individual value logger („Func–Stor") and cyclic logger („Func–CYCL")
Memory:	Stor: 99 data sets; CYCL: 4000 data sets
Cycle time CYCL:	1...3600 seconds (= 1h)
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 GRS3100, GRS3105 or USB3100.
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:	Slow measuring rate: < 1.6 mA
	Fast measuring rate: < 7.0 mA
	Low-Power-Logger: < 0.3 mA (for cycle time>30s, without interface communication active and no alarm horn sounding) up to 0.8 mA (at cycle time 1s)
Housing:	impact-resistant ABS, membrane keyboard, transparent panel, Front side IP65
Dimensions:	142 x 71 x 26 mm (L x W x D)
Working conditions:	-25 ... +50°C, 0 ... 95 %RH (non 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.