GREISINGER

EN

Operating Manual

**Handheld Pressure-Meter
water-proof, with data logger**

as of version 1.0

GMH 5150

CE

☞ Please carefully read these instructions before use!

☞ Please consider the safety instructions!

☞ Please keep for future reference!

Made in Germany

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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

This device must only be used with one "GMSD… - K51" or "MSD … ..E" pressure sensors.
Other usages are not intended.

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, …)
Protect the device from dirt.

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. **DANGER**
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 device and the connected devices.

DANGER
This device must not be run with a defective or damaged power supply unit.
Danger to life due to electrical shock!

4. **DANGER**
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. **DANGER**
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   Product Specification

3.1   Scope of supply

The scope of supply includes:

- GMH 5150 with 2 AAA batteries
- Operation manual
- Short form manual

3.2   Operation and maintenance advice

1. Battery operation:
If 'bAt' is shown in the lower display the battery has been used up and needs to be replaced. However, the device will operate correctly for a certain 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. Battery change: p.r.t. chapter 15.

     The battery has to be taken out, when storing device above 50 °C.
     We recommend taking out battery if device is not used for a longer period of time.
     After recommissioning the real-time clock has to be set again.

2. Mains operation
     The output voltage of a connected power supply unit has to be between 4.5 and 5.5 V DC.
     Don't apply overvoltage!

3. Treat device and sensor carefully. Use only in accordance with above specification. (do not throw, hit against etc.). Protect plug and socket from soiling.

4. Connecting/changing sensors
     Use only sensors of GMSD ... - K51 or MSD - series!
     Other sensors may lead to damage to the device and the sensor.
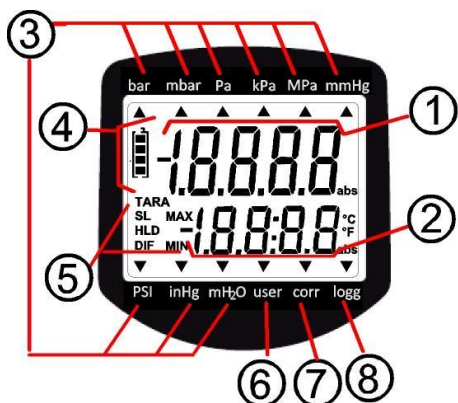Switch off device before changing the sensor.
The sensors are coupled to the instrument via bayonet connectors
To connect a sensor, plug in the connector in the right position and then rotate the ribbed ring ½ turn.
To disconnect rotate the ribbed ring ½ turn and then pull out the connector.

4 Handling

4.1 Display elements

1	**Main display**:	measuring value
2	**Secondary display**:	display of minimum / maximum / memorized measuring value / "CALC"
3	Arrows for selected **measuring unit**	
4	Rating of battery status	
5	Display elements to show minimum / maximum / memorized measuring value as well as tare-function and sea-level-correction	
6	**user arrow**:	measuring value is shown in freely adjustable user-unit (please refer to chapter 7.1)
7	**corr arrow**:	zero-point or slope correction is active
8	**logg arrow:** logger is ready arrow flashing: automatic recording (Logg CYCL) is active	

4.2 Pushbuttons
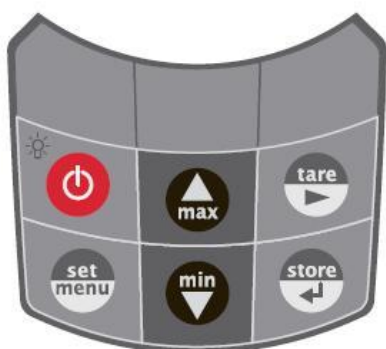
On / off key, backlight press shortly: activate backlight or switch on instrument press longer: switch off instrument	
set / menu: press shortly: display change: show calculated value ("CALC", please refer to chapter 7.6 and 0 press for 2 sec. (menu): invoke configuration menu	
min / max: press shortly: min. or max. value is displayed press for 2 sec: the corresponding value is deleted	
press shortly: tare-function: display is set to 0. All measuring values are displayed relatively to this set tare-value from now on. press for 2 sec: deactivate tare-function	
store / enter: Logger off: hold and save current measuring value ('HLD' is displayed) (Logger on: Operation of data logger - chapter 8) (Set/Menu: confirm settings, return to measuring)	

4.3 Connections

Universal output: interface, supply, analog output
(p.r.t. chapter 9 "Universal Input")

7-pole bayonet connector: connection for sensor

4.4 Pop-up clip

Handling:

- Pull at label "open" in order to swing open the pop-up clip.
- Pull at label "open" again to swing open the pop-up clip further.

Pop-up clip closed	Pop-up clip at position 90°	Pop-up clip at position 180°
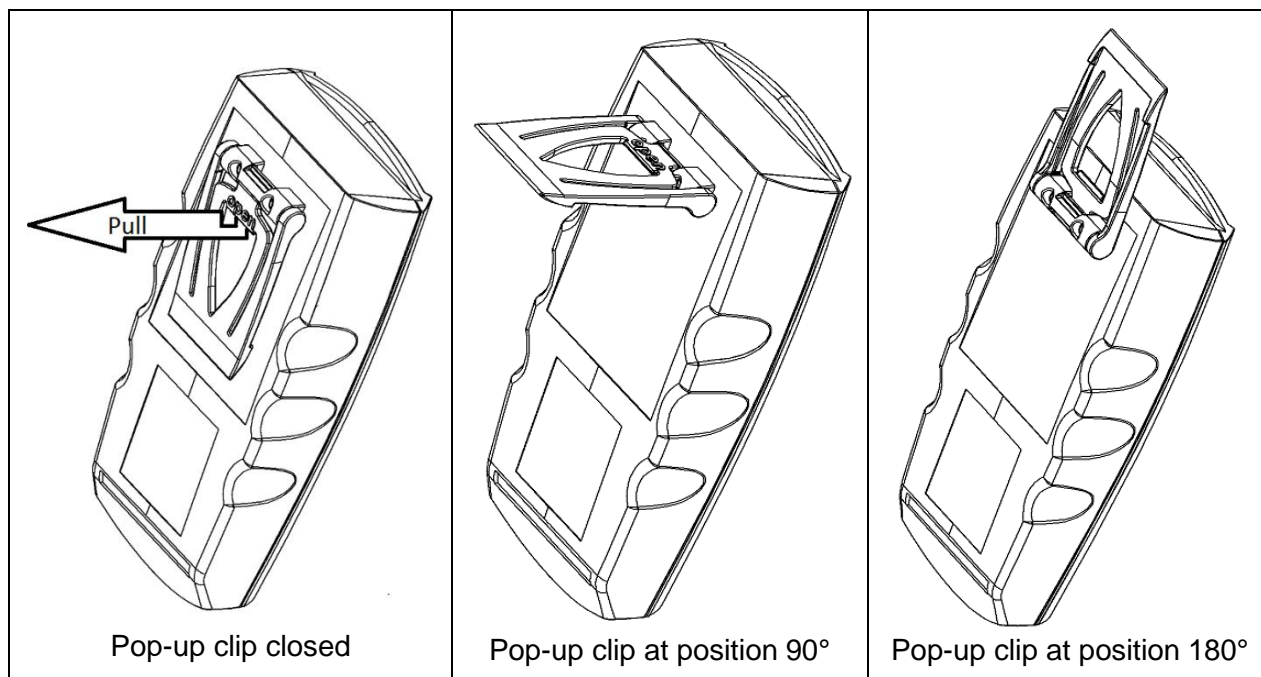
Function:

- The device with a closed pop-up clip can be plainly laid onto a table or attached to a belt, etc.
- The device with pop-up clip at position 90° can be set up on a table, etc.
- The device with pop-up clip at position 180° can be suspended from a screw or the magnetic holder GMH 1300.

Device attached to a belt	Device set up on a table	Device suspended from magnetic holder GMH 1300
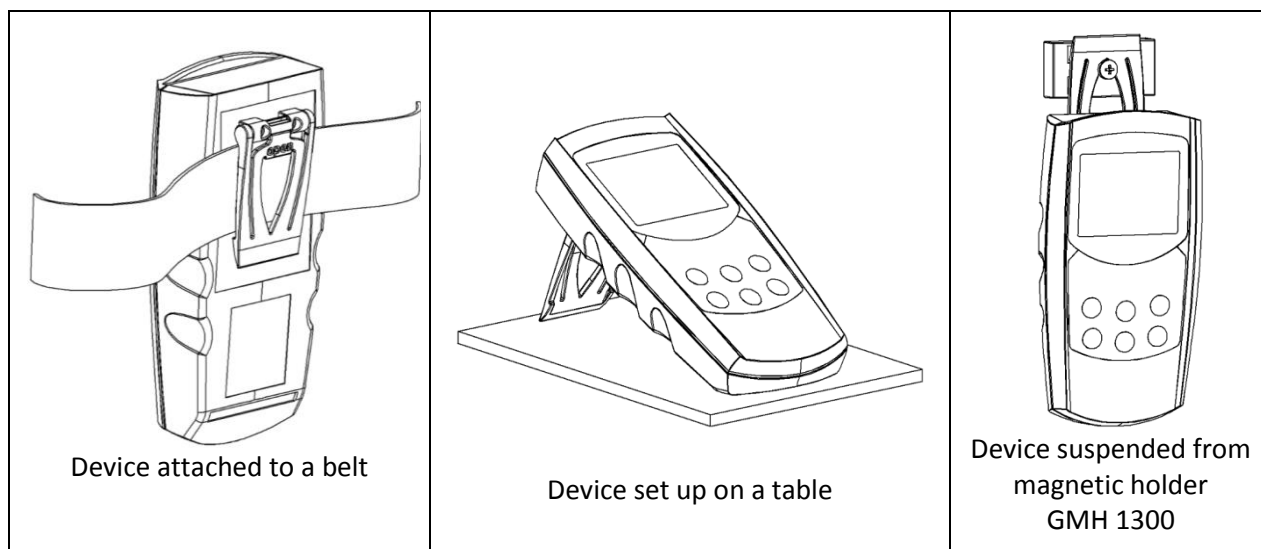
5   Start Operation

Connect sensors, turn device on via 🔴 key.

After segment test 🔲 the device displays some configuration:

rAtE
SLo   if standard measurement is selected

rAtE
FASt   if fast measurement is selected

rAtE
P.dEt   if peak value detection is selected

After that the device is ready for measuring.

6   Configuration

ⓘ   Some menu points depend on current device settings (e.g. some points are locked if logger memory contains data sets).

To change device settings, press **"menu"** 🔘 for 2 seconds. This will activate the configuration menu (main display: "SEt"). Pressing **"menu"** 🔘 changes between the menus points, pressing ▶ jumps to the referring parameters, which can be selected with key ▶.

The parameters can be changed with ▲max or ▼min.

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

"enter" ↵ finishes the configuration and returns to standard measuring operation.

ⓘ   Pressing "menu" and "store" at the same time for more than 2 seconds will reset the device to factory defaults.
If there are data sets stored and logger is set to "manual recording" ("Func Stor") the first menu point displayed is "rEAd Logg" (p.r.t. chapter 8 "Data Logger")
If no key is pressed for more than 2 minutes the configuration will be aborted. All changes will not be saved!

Menu	Parameter	Value	Description		
set menu	tare ▶	▲max or ▼min			
SEt ConF		**Set Configuration: General configurations**			
	Unit	**Unit: Select measuring unit**		*, **	
		Arrow to **bar, mbar …**	Measuring value is displayed in corresponding unit, the selectable units depend on connected sensor		
		Arrow to **"user"**	Measuring value is displayed in freely adjustable user-unit		
	bASE user	**bar, mbar**	Unit "user": base unit		
	dP user	**0000, 000.0, … .0000"**	Unit "user": decimal point setting (only if user-unit selected)		
	FACt user	**-19999...19999**	Unit "user": multiplication factor		
	SL	**Sea Level: Sea-level correction**		*, **	
		oFF	Sea-level correction off		
		on	Sea-level correction on *(p.r.t. 7.4)*		
	ALti	**-2000 ... 9999**	Sea-level in [m]	*, **	
	rAtE	**Rate: Measuring rate**		*	
		Slo	**Slow** measuring rate (4 Hz filtered, low power consumption)		
		FASt	**Fast** measuring rate, filtered (1000 Hz)		
		P.dEt	**Peak detection**: fast measuring rate, unfiltered (1000 Hz)		

		Averaging Filter		*	
	t.AUG	**1 … 120**	Averaging period in seconds		
		oFF	Averaging function is deactivated		
	P.oFF	**Auto Power-Off: Select power-off delay**			
		1 ... 120	Power-off delay in minutes. Device will be automatically switched off as soon as this time has elapsed if no key is pressed/no interface communication takes place.		
		oFF	Automatic power-off function deactivated (continuous operation)		
	LitE	**Background illumination**			
		oFF	Illumination deactivated		
		5 … 120	Turn off illumination after 5 … 120s (factory settings: 5 s)		
		on	Illumination always on		

			Set Calculation: Calculated display values		*	
SEt CALC		**CALC**	**Choice of function**			
			oFF	No calculated display		
			dP:dt	Pressure change per time (leak rate measurements, ...)		
			SPEd	Flow speed measurement with pitot tube etc.		
			FLo	Volumetric flow rate measurement with pitot tube etc.		
			"dP:dt": Settings			
		bASE	**Time unit of pressure change rate**			
			Per.S	Pressure change rate unit per second, e.g. mbar/s		
			Per.n	Pressure change rate unit per minute, e.g. mbar/min		
			Per.h	Pressure change rate unit per hour, e.g. mbar/h		
		t.int	**Test period, for which the pressure change rate is calculated**			
			0:01... 1:00	Period in [minutes:seconds], ex works: 1s		
			"SPEd" or "Flo": Settings			
		Unit	**SPEd: speed unit**			
			n:S	meter per second, m/s		
			kn:h	kilometer per hour, km/h		
			nPh	miles per hour, mph		
			knot	knots		
			FLo: Volumetric flow unit			
			n3:s	cubic meter per second, m^3/s		
			n3:n	cubic meter per minute, m^3/min		
			n3:h	cubic meter per hour, m^3/h		
			L:S	liter per second, l/s		
			L:n	liter per minute, l/min		
		A	**FLo: Volumetric flow - cross section**			
			10.0 … 1999.9, 2000 … 14000	cross section in cm^2		
		COEF	**0.1000 ... 1.9999**	coefficient,(Prandtl pitot tube = 1.0000 please refer to chapter 7.7)		
		t	**-100.0 ... 1000.0 °C**	air flow temperature		
		P.AbS	**100.0 ... 1999.9 mbar**	ambient pressure		
		dP	**0000, 000.0 … 00.00**	decimal point setting		
		Strt	**oFF, 1 … 1000**	minimum display, below always display 0		

Menu	Parameter	Value	Description		
set menu	**tare ▶**	**▲max** or **▼min**			
SEt OUt	**Out**	**Set Output: Universal output adjustments**			
		oFF	Interface and analog output off		
		SEr:	Serial interface activated		
		dAC:	Analog output activated		
	Adr.	**01, 11..91**	Base address for serial interface communication (only at Out = SEr)		
	dAC.0	**sensor dep.** e.g.-5.00..5.00 mbar	Zero-point setting for Out = dAC: Measuring value which should correspond to output 0 V		
	dAC.1	**sensor dep.** e.g.-5.00..5.00 mbar	Slope setting for Out = dAC: Measuring value which should correspond to output 1 V		
SEt Corr		**Set Corr: Input adjustment**		*	
	OFFS	**Zero adjustment/offset of sensors**		*	
		oFF	No zero adjustment of sensors		
		Sensor dep. e.g.-5.00..5.00 mbar	The offset of sensor will be displaced by this value to compensate for deviations of the probe or of the measuring device.		
	SCAL	**Slope adjustment of sensors**		*	
		oFF	No slope adjustment of sensor		
		-2.000 … 2.000	The slope of sensor will be changed by this factor [%] to compensate deviations of probe or measuring device		
SEt AL.		**Set Alarm: Settings for alarm function**			
	AL.	**On/No.So**	Alarm on, with/without buzzer		
		OFF	No alarm function		
	AL.Lo	**Sensor-Min ... AL.Hi**	Min-alarm-limit sensor (not if AL. = oFF) Sensor-Min is lower display range limit of sensor		
	AL.Hi	**AL.Lo ... Sensor-Max**	Max-alarm-limit sensor (not if AL. = oFF) Sensor-Max is upper display range limit of sensor		
SEt LoGG		**Set Logger: Settings for logger function**		*	
	Func	**Selection of logger function**		*	
		CYCL	Cyclic: cyclic logger		
		Stor	Store: manual recording		
		oFF	No logger activated		
	CYCL	**0:01 .. 60:00**	Cycle time in [minutes: seconds] (for cyclic logger)	*	
	Lo.Po	**on/oFF**	Low-power-logger with low power consumption (only for cyclic logger and slow measuring rate)	*	
SEt CLOC		**Set Clock: Settings for real time clock**			
	CLOC	**HH:MM**	Clock: set time hours: minutes		
	YEAr	**YYYY**	Year: set year		
	dAtE	**TT.MM**	Date: set date day. month		
rEAd LoGG		**rEAd Logg: Read calibration data:** **p.r.t. chapter 8.1 Manual Recording ("Func-Stor")**			

(*) *If logger memory contains data sets parameters marked with (*) cannot be called. You have to clear memory to change these parameters! (button 6, p.r.t. chapter 8)*

(**) *Parameter can only be called if corresponding sensor is plugged.*

7 Remarks to Special Features

7.1 Different Pressure Units

Depending on the connected sensors different units can be selected via menu (Unit). The measuring range of the sensors may restrict the choice!

User-Unit

For pressure units, which are not covered by the ones printed on the display, there can be done a manual setting for a "user-defined" unit.

Example:

To enable a GMSD 2 BR - K51 (-1000 … 2000 mbar) to display the unit kg/cm^2, following settings (bold) have to be entered:

	kg/cm^2	Torr	atm	at	
bASE user:	**bar**	mbar	bar	bar	
DP user:	**.0000**	.0000	.0000	.0000	
FACt user:	**1.0197**	.7433	0.9869	1.0197	

7.2 Different kinds of measuring

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

7.2.1 Standard measuring (slow)

`rAtE`
`SLo`　Measuring rate 4 Hz, averaging and filter functions are active.
Application: Measuring of slowly changing or static pressures, e.g. measuring of leakproofness, atmospheric pressure...
Highest accuracy, high noise immunity, low power consumption.

7.2.2 Peak detection (Peak detection)

`rAtE`
`P.dEt`　Measuring rate >1000 Hz, the value is displayed unfiltered.
Application with logger function: Measuring of short pressure peaks or fast changing pressures with a resolution of <1 ms. The cyclic logger function records the arithmetic mean value, the highest and the lowest peak of the referring time interval.

Attention: higher power consumption, measuring is sensitive to noise (EMI, ...).

(i)　Measuring is sensitive to noise (EMI, ...)
and higher power consumption.

7.2.3 Fast filtered measuring (fast)

`rAtE`
`FASt`　Measuring rate >1000 Hz, but the value is filtered (higher noise immunity than P.dEt, small peaks will be filtered out), apart from that identical behavior like rAtE-P.dEt.

7.3 Water depth / level measurement

☞　Water-proof sensors have to be used for water depth / level measurement.

Select the unit [m] for meters water column (selection mH2O) in menu "Unit".10 m water column (=water depth) corresponds roughly 1 bar overpressure.

Measurings can be made e.g. like described below: (for abs. pressure sensors SL has to be deactivated)
- With an abs. pressure sensor: 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].
- With a rel. pressure sensor: 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 pressure connection for higher pressure to water depth to be measured (display and is compensated for pressure changes in ambient air).

7.4 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 are displaying the pressure at sea level. Usually the sensor is placed above sea level and therefore the pressure loss resulting from the actual level above sea level has to be considered, if the value at sea level (zero) should be measured! To correct the measuring display, activate the "Sea-Level-Function" (SL, p.r.t. chapter 6, setting is only possible, if an abs. pressure sensor is connected). Then enter the altitude above sea level of the sensor's location in meters (Alti, p.r.t. chapter 6). When activated, the display shows the SL-arrow and the device displays the pressure value at sea level.

7.5 Averaging function

(i) The averaging function concerns the display values (LCD and interface). It is completely independent from the averaging of the logger function FASt and P.dEt!

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 have been collected (i. e. for the selected averaging time) to calculate an 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).

7.6 CALC: Pressure change per time dP/dt

The CALC function "dPdt" allows displaying pressure changes per time directly. The corresponding measuring intervals (t.int) can be freely chosen. The device automatically saves pressure values during this period and calculates the pressure change rate "pressure change / time" from the current measuring value and historical data.

Tare button: Historical data is deleted, calculation restarts.

> **Example:** **Tightness testing for sewage ducts according to EN 1610** with requirements less than -3 mbar/min in a 5 minutes test duration at a test pressure of 250 mbar
>
> **Equipment/presetting:**
> • Sealing bladder and pressure pump
> • Sensor: GMSD 2 BR - K51 (measuring range -1000 … +2000 mbar)
> • bASE= Pet.n (minutes) time unit for pressure change rate
> • t.int = 1:00 (1 minutes) test duration, for which the pressure change rate is calculated
> • Logger: Cycl, 5 sek
> **Procedure:**
> • Connect all parts, arrange all necessary sealings
> • Start logger
> • Charge with pressure, wait for sufficient time
> • Restart calculation with "tare" button
> • Current pressure value is displayed, button "set" changes to dP:dt display
> • The display can give some preliminary information about the test result (will it fail the test?)
> • Release pressure after 5 minutes
> • Stop logger
> **Evaluation:**
> Read out data logger with GSOFT3050, input at register "comment":
> Client, place of inspection, date, time, address / duct number, as-built data (duct type, nominal size, etc), test instructions, pressures, tolerances, etc. as well as test result.
> Therefore a comment sample can be prepared as file, company logo etc. can be added for printing.

👉 t.int- setting: If there are set high values the displayed values can be easily misinterpreted, because the displayed value responds very slowly.

The pressure change is monitored during the selected time interval t.Int and calculated referring to the time base („bASE"). It is assumed, that the pressure continues to change the same way in the following.
Example.: t.int = 10 sec; „bASE" = Per.n (minutes) ; pressure change in 10 seconds = -2mbar
Resulting display CALC = -12 mbar

The displayed value is calculated: $P(T_{current}) - P(T_{current} -t.int) / T.int$

If there are not data for the whole t.int-period yet the values are extrapolated with the already available data.

7.7 CALC: Pitot measuring of Velocity and Flow

7.7.1 Velocity measurement in air: "CALC SPEd"

The air velocity is calculated by means of the pressure difference at a Prandtl pitot tube or comparable measuring setup.

—— with ——

v   = velocity (m/s)

Δp = dynamic pressure (Pa) => p(A)-p(B)   = *measured pressure difference*

s   = pitot tube factor (= 1.0 for Prandtl pitot tube) *value input at "COEF" in the CALC menue*

    = air density (kg/m³)

p_a = air pressure (Pa)   *value input at "P.abs" in the CALC menue*

R_i = gas constant (at air = 287 (J / kg • K))

T   = absolute temperature (K)   *value input in °C at "t" in the CALC menue*
                                                 (0 °C = 231.15K)

Generally the pressure differences evaluated are very small, therefore it is recommended to use pressure sensors with high resolution.

Recommended sensors for use with a Prandtl pitot tube:

Sensor	Meas. range Pmax	Vmin		Vmax		CALC-Menu „dP"	CALC-Menu „Strt"	ConF-Menu „t.AVG"
GMSD 2,5 MR - K51	2.500 mbar	1 m/s	4 km/h	20 m/s	72 km/h	000.0	1.0	1
GMSD 25 MR - K51	25.00 mbar	5 m/s	18 km/h	64 m/s	230 km/h	0000	5	1

It is not recommended to measure velocities below Vmin, because therefore the resolution of the sensors is too low.

👉 Display value "-1 digit":

If -1 digit is displayed at velocity of flow measurement the connected sensor gives a negative pressure value -> check offset!
Velocity or flow calculation cannot be done with negative values.

7.7.2 Volumetric flow measurement in air: "CALC FLo"

The flow measurement is based on the velocity measurement (see above). Velocity multiplied with the cross-section area (input in CALC menu by "A") offers the volumetric flow at the selected display.

8　Data Logger

The device supports two different logger functions:

"Func-Stor":　　Manual recording by keypress "store"
　　　　　　　　　　Additional input of measuring point (L-Id) is needed

"Func-CYCL":　　Automatic recording at intervals of set cycle time

The logger stores 3 measuring values per data set:

- -"CALC off"*): measuring or average (depends on function), min-peak and max-peak
- -"CALC active" *): measuring or average (depends on function), Calculated value and dummy value

Min- and max-peak are the minimum and the maximum of the measured values since the last recording. This allows precise analysis of the current pressure as well as pressure fluctuations.

For the evaluation of the data the software GSOFT3050 (version V3.0 or higher) 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 "store" is solely used for the operation of the logger functions.

8.1　Manual Recording ("Func-Stor")

a) Save measurements manually:

Up to 1000 measurements can be saved if logger function "Func store" is selected (p.r.t. "Configuration"):

Press "store" shortly:　data set is saved ("St. XX" is displayed shortly,
　　　　　　　　　　　　　　where XX is the number of the data set)

Input of measuring point "L-Id": Selection of measuring point via keys 🔼 or 🔽.
Number 0 … 19999 or text assigned to number 1 … 40 (comfortable assignment of texts can be done with gratis software GMHKonfig)

Confirm input with 🔘.

ⓘ　One data set contains:
　　- **measuring value** at the time of the recording
　　- CALC off *)　**min-peak**, **max-peak** since the last recording
　　- CALC active *) **Calculated value** at the time of the recording and dummy value
　　- time and date of the recording

𝐿𝑜𝐺𝐺 𝐹𝑈𝐿𝐿 is displayed if logger storage is full.

*) CALC-Function: see chapter 7.6, 7.7

b) Read manual recordings:

Saved data sets can be viewed both with PC-software GSOFT3050 and directly on the device display.

Do not change the pressure sensor if manual recording is selected and values are already stored, because otherwise invalid data may be read-out. The pressure sensor used during the recording has to be connected!

Press "menu" for 2 seconds: $r E A d$ $LoGG$ is displayed

"rEAd LoGG" is only displayed if data sets have been already stored. Otherwise the configuration menu is displayed: SEt $ConF$

Press shortly:	Change between measuring values, measuring point and date+time of the data set
or	Change between different data sets
	End display of recordings

c) Clear manual recordings:

If data sets have been stored, they can be deleted with the "store" key:

Press for 2 seconds: Call menu "Clear"

Select with or :

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

Confirm selection and quit menu "Clear"

8.2 Automatic Recording with Selectable Cycle Time ("Func CYCL")

If logger function "Func CYCL" is selected (p.r.t. "Configuration") the device will automatically record measuring values at intervals of the set cycle time.

The logger's cycle time can be set from 1s to 60min (p.r.t. "Configuration").

Storable data sets: 10000

A data set contains at slow measuring rate (**rAtE SLo**):
- **measuring value** at the time of the recording
- CALC off *): **min-peak**, **max-peak** since the last recording
- CALC active *):   Calculated value at the time of the recording and dummy value

At data set contains at fast measuring rate (**rAtE FASt** and **rAtE P.dEt**):
- **arithmetic average** since the last recording
- CALC off *): **min-peak**, **max-peak** since the last recording
- CALC active *): Calculated value at the time of the recording and dummy value

*) CALC-Function: see chapter 7.6, 7.7

(i) At measuring kind "rAtE-Slo" a power saving function is selectable: "Lo.Po". If activated a measurement is only done if it is also logged (i.e. no additional measurements between the saved values). This seriously reduces the power consumption and is therefore especially appropriate for long-term measurements (e.g. leak test) without an external power supply.

a) Start recording:

store **Press "store" for 2 seconds:** Start Menu, press **store** again: automatic recording will be started.

Each storage process is signaled by the short display of 'St.XXXXX', where XXXXX is the number of the saved data set.

If the logger memory is full, the recording stops automatically and the display shows

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

b) Stop recording:

store **Press "store" for 2 seconds:** If recording is running the "stop" menu is displayed

Select with **max** or **min**.

$StoP$ no	Do not stop recording (cancel menu)
$StoP$ YES	Stop recording

store Confirm selection and quit "stop" menu

(i) If you try to switch off the device while cyclic recording is active you will be asked whether the recording should really be stopped.
The device can only be switched off if the recording is stopped.
Auto-off function is deactivated as long as cyclic recording is active.

c) Clear recordings:

store **Press "store" for 2 seconds:** If there are data sets stored and recording is already stopped
$LoGG$ run is displayed

Select $LoGG$ Clr with **max** or **min** to call the clear-menu

Select with **max** or **min**.

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

store Confirm selection and quit menu "Clear"

9   Universal Output

The output can be used either as serial interface (for USB 5100 interface converter) or as analog output (0-1V). If the output is not needed, it is strongly recommended to deactivate it (Out oFF) to lower power consumption. This increases battery life time.
If the device is used together with interface adapter USB 5100 the device is supplied from the interface.

Pin assignment:

1: external supply +5V, 50 mA

2: GND

3: TxD/RxD (3.3V Logic)

4: +U_{DAC}, analog output

☞   Only suitable adaptor cables are permitted (accessories)!

9.1 Interface

The device can be connected to a USB interface of a PC by the electrically isolated interface converter USB 5100 (accessory). The data is transmitted binary-coded and protected against transmission errors by complex safety mechanism (CRC).

The following standard software packages are available:
- **GSOFT3050**:   Operating and evaluation software for the integrated logger function
- **EBS20M / -60M**:   20-/60-channel software for measuring value display
- **GMHKonfig**:   Configuration Software (for free on internet)

In case you want to develop your own software we offer a **GMH3000-development package** including:
- a universally applicable Windows functions library ('GMH3x32e.DLL') with documentation, can be used by all 'established' programming languages, suitable for:
  Windows XP™, Windows Vista™, Windows 7™
- Programming examples Visual Basic 4.0™, Delphi 1.0™, Testpoint™ etc.

The device has 3 channels:
-        Channel 1: current measuring value (sensor 1) and base address
-        Channel 2: "CALC off"*): min peak   "CALC active"*): calculated value
-        Channel 3: "CALC off"*): max peak   "CALC active"*): dummy value

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

*) CALC-Function: see chapter 7.6, 7.7

9.2 Analog output

An analog voltage 0-1V can be tapped at the universal output connector (mode: "Out dAC").

The analog output can be easily scaled with DAC.0 and DAC.1.

Please take care not to load the analog output too heavily, otherwise the output value will be distorted and the power consumption will rise. Loads up to approx. 100 kOhm are unproblematic.

If the displayed value goes beyond DAC.1 the output voltage will be 1V.
If the displayed value falls below DAC.0 the output voltage will be 0V.
In error case (Err.1, Err.2, ----, etc.) the output voltage will be slightly higher than 1V.
The interface converter USB 5100 has a screw/plug connection; therefore no further cable is necessary if USB 5100 is used.

10 Input Adjustment

The zero point and slope of each measuring inputs can be adjusted with the parameters offset ("OFFS") and scale ("SCAL").
A reasonable adjustment presumes reliable references (e.g. ice water, controlled precision water bath, etc.).

If the inputs are adjusted (i.e. offset and scale are different from default settings) the device will shortly display "Corr" after turned on.

Default setting for offset and scale are 'off' = 0.0, i.e. inputs are not changed.

Zero point correction:

> ***Displayed value = measured value – OFFS***

Zero point and slope correction:

> ***Displayed value = (measured value – OFFS) * (1 + SCAL / 100)***

11 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 ... 1000 bar absolute pressure can be connected to the device.

Relative pressure sensors (types: GMSD ... MR - K51, GMSD ... BR - K51)

- **For measurements of over- or under pressure:**
  Pressure sensors GMSD 2,5 MR - K51, GMSD 25 MR - K51 and GMSD 350 MR - K51 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 - K51: 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 diameter of 4 mm to pressure port "B" and "A"; make sure to apply higher pressure to port "B".

Absolute pressure sensors (types: GMSD ... BA - K51)
Connect plastic tube with an inner diameter of 4 mm to pressure port "A". (Port "B" is not used.)

Stainless steel sensors (types: MSD ... MRE, MSD ... BRE, MSD ... BAE)
For measurements of over-, under- or absolute pressure screw sensor to G1/2" pressure terminal or plug plastic tube to a suitable adapter. Connection to instrument: Use cable MSD-K51.

12 Alarm ("AL.")

There are 3 possible settings:

off (AL.oFF), on with buzzer (AL.on), on without buzzer (AL.no.So).

Alarm is given in the following cases (if alarm active, AL.on or AL.no.So):
- Lower alarm boundary (AL. Lo) under-run
- Upper alarm boundary (AL. Hi) over-rum
- Sensor error
- Low battery (bAt)
- Err.7: system error (always with buzzer!)

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

13 Real Time Clock ("CLOC")

The real time clock is used for chronological assignment of the logger data and calibration points. Please check the settings when necessary.

14 Accuracy Check / Adjustment Service

You can send the device to the manufacturer for adjustment and inspection.

Calibration certificate - DKD certificate - official certifications:

If the measuring instrument is supposed to receive a calibration certificate, it has to be sent to the manufacturer (declare test points).

If the device is certificated together with a suitable sensor very high overall accuracies are possible.

Basic settings can only be checked and – if necessary – corrected by the manufacturer.

A calibration protocol is enclosed to the device ex works. This documents the precision reached by the production process.

15 Replacing Batteries

Before changing batteries, please read the following instruction and follow it step by step.

Not following the instruction may cause harm to the instrument or the protection against ingress of water and dust may be lost!
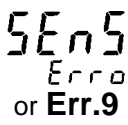
Avoid unnecessary opening of the instrument!

1. Open the 3 Phillips screws at the backside of the instrument.
2. Lay down the still closed instrument, so that the display side points upwards.
   The lower half of the housing incl. the electronics should be kept lying down during battery change.
   This avoids loss of the sealing rings of the screw holes..
3. Lift upper half of housing. Keep an eye on the six function keys, to be sure not to damage them.
4. Change carefully the two batteries (Type: AAA).
5. Check: Are the 3 sealing rings placed in the housing?
   Is the circumference seal of the upper half sound and clean?
6. Close the housing, taking care that it is positioned correctly, otherwise the sealing may be damaged. Afterwards press the two halves together, lay the instrument with display pointing downwards and screw it together again
   Take care to screw only until you feel increasing resistance, higher screwing force does not result in higher water protection!
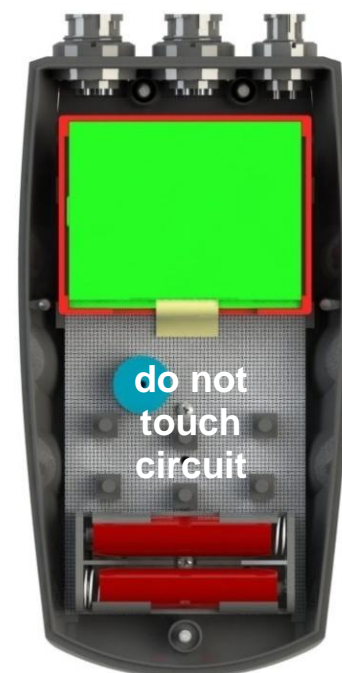
16 Error and System Messages

Display	Description	What to do?
5En5 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

If **"bAt"** is flashing, the battery will be exhausted soon. Further measurements are possible for short time. If "bAt" is displayed continuously the battery is ultimately exhausted and has to be replaced. Further measurements aren't possible any more.

17 Reshipment und Disposal

17.1 Reshipment

_DANGER
All devices returned to the manufacturer have to be free of any residual of measuring media and/or other hazardous substances. Measuring residuals at housing or sensor may be a risk for persons or environment

Use a adequate transport package for reshipment, especially for fully functional devices. Please make sure that the device is protected in the package by enough packing materials.

17.2 Disposal instructions

Batteries must not be disposed in the regular domestic waste but at the designated collecting points.

The device must not be disposed in the unsorted municipal waste! Send the device directly to us (sufficiently stamped), if it should be disposed. We will dispose the device appropriate and environmentally sound.

18 Specifications

Display range		maximal -19999...19999 digit, depends on used sensor
Number of channels		1
Suitable probes		GMSD … - K51 and MSD … sensors with connection cable MSD-K51
Available ranges/resolutions		ranging from -1.999 … 2,500 mbar / 0.001 mbar to 0 … 1000 bar / 1 bar
Connections	sensor	7-pole bayonet connector
	output / ext. supply	4-pole connector for serial interface and supply (USB Adapter USB 5100) analog output 0-1V, adjustable
Display units		depends on meas. range selection (depends on connected sensor): mbar, bar, Pa, kPa, MPa, mmHg, inHg, PSI, mH$_2$O
User unit		freely adjustable
Measuring frequency		4 / s or 1000 / s
Accuracy		± 0.1 % FS ± 1 digit
Working conditions		-25 ... 50 °C; 0 ... 95 %RH (non condensing)
Storage conditions		-25 ... 70 °C
Display		4 ½ digit 7-segment display, illuminated (white)
Correction function		offset / slope (via menu), if offset/slope value not equal zero: "corr" is displayed
Leakage test function		Pressure change rate display, configurable time base
Air velocity / volume flow		measuring with pitot tube
Real-time clock		integrated clock with date and year
Data logger	cyclic	10000 data sets
	manual	1000 data sets (with measuring point input, 40 adjustable measuring point text numbers)
Alarm	channels	1 with individual alarm boundaries
	types	buzzer/visual/interface
Additional functions		min- / max- / hold- function
Averaging		adjustable, 1 … 120 seconds
Housing	protection class	IP65 and IP67
	dimensions L*W*H [mm]	160 * 86 * 37 incl. protective covering, approx. 250 g incl. batteries and protective covering
Power supply		2*AAA-batteries (included in delivery)
	current consumption	2.0 mA (at Out = Off, equivalent to 500 h), illumination ~10mA (turns off automatically)
Battery-change indicator		automatically if battery exhausted "bAt", warning "bAt" flashing
Auto-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 1and 120 min.; it can be completely deactivated.
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%

CE

EC - Declaration of Conformity

It is hereby confirmed, that the products

GMH 5130, GMH 5150, GMH 5155

comply with protection requirements that are set out in the guidelines of the council for the unification of legal regulations of the member states concerning EC Directive on EMC 2004/108/EC and the Low Voltage Directive 2006/95/EC.
It is further ensured that the restriction of pollutants complies with the directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment (2011/65/EU - RoHS).

The conformity to EMC is verified under observance of following harmonised standards:

EN 61326-1 : 2013 (table 3, class B),
EN 61326-1 : 2013 (addendum A, class B)

The conformity to the exclusion of harmful substances is verified under observance of following harmonised standard:

EN 50581 : 2012

The following manufacturer is responsible for the declaration:

GHM Messtechnik GmbH
Standort Greisinger
Hans-Sachs-Straße 26
D - 93128 Regenstauf

released by

Hinreiner, Alois
Director BU

Regenstauf	09.04.2015	
place	date	signature