Lorenz® messtechnik gmbh

Strain Gauge Hand-Held Measuring Amplifier GM78

Operating Instructions

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1 Imprint / Copyright

2 Important Notes / Keeping

Before installing and commissioning the device, these operating instructions, and in particular the corresponding safety instructions, must be read. The device may only be used as described in this manual to prevent injury or damage.

The operating instructions have been drawn up in accordance with EN 82079-1 and must be kept in a safe place.

2.1 General Informations

These operating instructions are intended for technically qualified personnel who have appropriate knowledge in the field of measurement and control technology. Qualified personnel are persons who are familiar with the installation, operation, maintenance and repair of the device and have the appropriate qualifications. The personnel must have knowledge of the legal and safety regulations and be able to apply them.

The device may only be used by qualified personnel in accordance with the technical data in connection with the safety regulations and rules set out below. During operation, the legal and safety regulations required for the respective application must also be observed. This also applies analogously to the use of accessories.

The exact information about all safety instructions and warnings contained in these operating instructions as well as their correct technical implementation are prerequisites for the safe installation, commissioning, safe operation and maintenance of Lorenz Messtechnik GmbH devices. All measures must only be carried out by qualified personnel. All persons involved in the project planning, installation and operation of Lorenz Messtechnik GmbH devices must be familiar with the safety concepts in the automation technology and be qualified in the above-mentioned sense.

For reasons of clarity, these operating instructions cannot cover all details and information and not all applications for the handling of devices from Lorenz Messtechnik GmbH. Nor can all conceivable types of installation, operation and maintenance must be taken into account.

If further information is desired or required, or if special problems occur which are not described in detail in these operating instructions, please contact Lorenz Messtechnik GmbH.

The devices of Lorenz Messtechnik GmbH may only be operated in accordance with the applications described in these operating instructions. Built-in devices may only be operated if they are properly installed.

By connecting and commissioning the device, the purchaser accepts the General Terms and Conditions of Sale and Delivery of Lorenz Messtechnik GmbH. Furthermore, the buyer accepts the possible incompleteness of this operating manual and that the information contained therein may not be complete and informations are without guarantee. Errors, misprints and changes excepted.

2.1.1 Intended Use, not intended Use

A device from Lorenz Messtechnik GmbH is used for display, processing and control of processes. It must not be used as the sole means of averting dangerous conditions on machines and systems.

Machines and systems must be designed in such a way that faulty states cannot lead to a dangerous situation for the operating personnel (e. g. through independent limit value-switches or mechanical interlocks).

In particular, it must be ensured that a the device, its malfunction or its failure does not lead to damage to property or a loss of that can lead to danger to people. It is also important to prevent the precautions that are taken from being cannot be circumvented for the safety of a plant. Emergency stop devices must remain effective at all times.

2.1.2 Installation Instructions

Devices from Lorenz Messtechnik GmbH must be installed and connected in compliance with the relevant DIN and VDE standards.

They must be installed in such a way that unintentional operation is sufficiently excluded. To prevent an interruption of the supply and signal lines from leading to an undefined or dangerous state, appropriate hardware and software safety precautions must be observed.

Supply and signal lines must be installed in such a way that they do not interfere with the function of the Lorenz Messtechnik GmbH by interfering signals (such as inductive or capacitive interferences).

2.1.3 Notes on Malfunctions, Maintenance and Repair

The devices do not contain any parts that require or can be serviced by the user. Repairs may only be carried out by Lorenz Messtechnik GmbH.

If it can be assumed that safe operation of the device is no longer possible, it must be put out of operation immediately and secured against unintentional operation. This applies in particular if:

... the device is visibly damaged.

... the device is no longer functional.

... parts of the appliance are loose.

... the connecting lines are visibly damaged.

In addition, we would like to point out that all obligations of Lorenz Messtechnik GmbH arise exclusively from the respective purchase contract in which the warranty is conclusively stated.

2.2 Intended Use

Devices from Lorenz Messtechnik GmbH are to be used exclusively for measuring tasks and the directly associated control tasks. Any use beyond this is considered to be improper.

The valid legal and safety regulations must be observed during measurement. The instrument is not a safety component in the sense of its intended use and it is transported and stored properly. The installation and commissioning, the operation and the disassembly must be carried out professionally.

2.3 General Hazards in the Event of non-compliance with the Safety Instructions

The device complies with the current safety requirements. Residual dangers can emanate from the device if it is improperly used and operated by untrained personnel. Any person entrusted with the installation, operation, maintenance and repair of the device must read and understand the operating instructions and, in particular, the safety instructions.

Incorrect use (e. g. by untrained personnel) may result in residual hazards. The operating instructions must be read and understood by all persons involved in the installation, commissioning, maintenance, repair, operation and dismantling of the device is trusted. The device must not be used if visible damage is visible.

2.4 Residual Hazards

The system planner, equipment supplier and operator must plan, implement and be responsible for the safety of the equipment. Other hazards must be minimized. The residual dangers of the measurement technology must be pointed out and human error must be taken into account. The design of the system must be suitable for avoiding hazards - a hazard analysis must be carried out for the system The applicable regulations and laws are as follows to note.

2.5 Safety and Warning Notices

If residual dangers should occur when working with the device, these are indicated in these instructions with the following symbols:

Caution: indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury. The accident prevention regulations of the employer‘s liability insurance association must be observed..

Notice: Indicates a possible hazardous situation that will result in property damage if not avoided

Annotation: Additional information or reference to other important detailed information.

2.6 Health Protection and Safety

To ensure that our products are safe and do not pose a health hazard, the following points must be observed:

1. Read all relevant sections of this manual carefully before starting work.
2. All warning signs on containers and packaging must be observed.
3. Installation, operation, maintenance and repair work may only be carried out by appropriately trained personnel in compliance with the instructions given for this purpose. If any of these instructions are not followed, the user of the product bears full responsibility for any consequences that may occur.
4. Disconnect the appliance from any power supply before opening it.
5. The safety instructions must be strictly observed in order to avoid damage to property and bodily injury - possibly even fatal ones.

2.7 Qualified Personnel

Qualified personnel are persons who are familiar with the installation, operation and the maintenance of the device and have appropriate qualifications. The device shall only be used by qualified personnel according to the technical data in connection with the following safety regulations and rules. During the operation, legal and safety rules for the respective application case must be noted. The same applies for the use of accessories.

2.8 Conversions and Changes

The device may not be modified in terms of design or safety without our express consent. Any modification excludes liability on our part for any resulting damage. Repairs as well as modifications to the printed circuit boards are prohibited.

2.9 CE Marking

With the CE marking, Lorenz Messtechnik GmbH guarantees that its product meets the requirements of the relevant EC directives.

3 Related documents

The following documents contain reference information about the strain gauge measuring amplifier GM 40: 081003_GM40_en.pdf, DIN Mounting Rail SG Measuring Amplifier GM 40 data sheet

4 Introduction

4.1 Product Description

The GM 78 is a hand-held measuring instrument with a freely scalable, high-contrast OLED display for strain gauge signals with -3.5mV/V...+3.5mV/V. The physical units are freely selectable and scalable.

The compact hand-held measuring device can be used flexibly. It can be operated either with standard externally accessible Li-Ion batteries or a USB-C plug-in power supply with an integrated battery charging function. The energy-saving mode with an adjustable timer automatically switches the device off.

A 100% control signal (if available, see sensor data sheet) can be connected to the sensor. This makes it very easy to calibrate 4 sensors to the GM 78 and to check the calibration at any time. The maximum value is also shown on the display. 4/6- wire measurement can be switched via menu function

4.2 Safe and Proper Use

Notice:

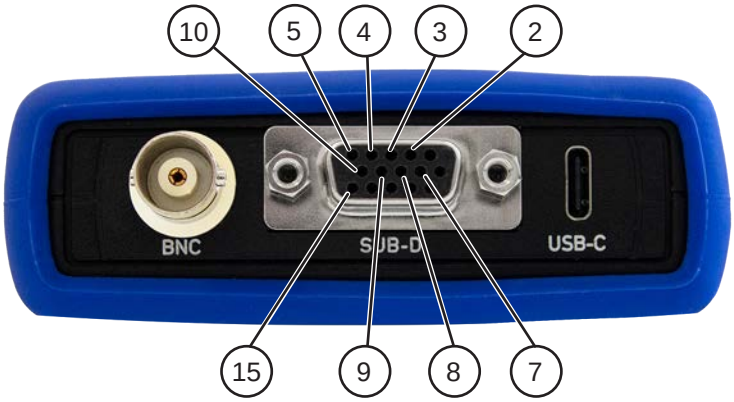
- Protect the device against moisture, condensation, rain, snow....
- Protect the device against direct solar radiation
- Protect the device against dust and pollution
- Protect the device against excessive ambient temperature
- Protect the device against excessive vibration

4.3 Dimensions – Weight

Device dimensions in mm: LxBxH: ca.180 x 90 x 30 Weight: 0,25kg

5 Instruction / Description of the Operating Mode

5.1 Connection description



USB-C
Connecting the plug-in power supply

BNC
Analog output

Sensor socket
Type 15-pin, SUB-D HD (High Density)

Occupancy
Pin2: Excitation (-)
Pin3: Excitation (+)
Pin4: Connection detection (connect with Pin9)
Pin5: Signal (+)
Pin7: Sensing (-)
Pin8: Sensing (+)
Pin9: Measuring mass
Pin10: Signal (-)
Pin15: Control signal

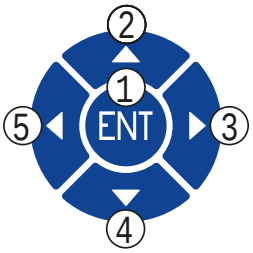
ENT
Enter, switch on device, confirm selection

◄▲▼►
Menu navigation

Display
Display range is 7 digits. Display and decimal point freely scalable.

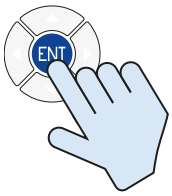
5.2 Description of control panel

1.	ENT:	Switch on, confirm selection
2.	Arrow key (AK) up:	Navigate to the top of the menu
3.	Arrow key (AK) right:	manual entry select digit
4.	Arrow key (AK) down	Navigate down in the menu
5.	Arrow key (AK) left:	Return to previous menu item



The CON (control), TARE, MIN and MAX functions (see “5.13 Setting examples” on page 12) only at the home screen level.

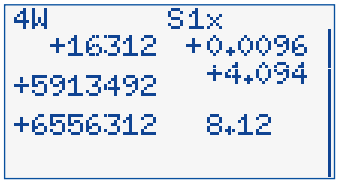
5.3 Switching on the device



Press the ENT key to turn on the device. To save energy, the device automatically turns off depending on the setting (see „5.9 Menu item AutoOff Config“ page 10).

To access the menu from the start screen, press and **hold** the ENT key (at least 1 second). Press the left AK to return to the start screen.

5.4 Start screen



Screen display as delivered or when no electrical and physical value is set. Setting via „5.7.2 Shown Value“ page 7 oder „5.8.2 Display“ page 9.

The three left columns of numbers show the integer value of the three AD converters. The three right values are, from bottom to top, battery voltage (8.12), supply voltage (+4.094) and sensor voltage (+0.0096). Since no sensor is connected, there is no voltage. The blue bar on the right represents the charge state of the batteries.

Screen display after setting electrical value (see „5.7.2 Shown Value“ page 7).

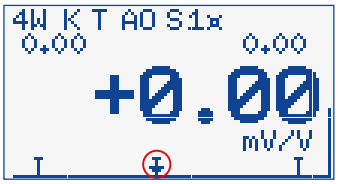
4W: 4 Wire, 4-wire technology, switchable to 6W. (see „4 / 6 wire“ page 9)

K: Push AK up (CON) Control is activated. Press again to deactivate.

T: Push AK down (Tare) Tare is activated. Press again to deactivate.

A0: Analog Out. (see „5.8.6 Analog-Out“ page 10)

S1x: Storage location sensor 1 selected. (see „Choose Sensor“ page 7)

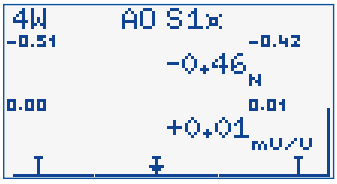


S1: After connecting a sensor, S1x changes to S1¤ and indicates that the sensor is connected.

+0.00: Two decimal places out of a possible four (see „Display“ page 9).

The triangle (red circle) is centered in the measuring range. The Ts on the right and left are the measuring range.

mV/V: Electrical value (see „Shown Value“ page 7, can also be set under Display.)



Display set for simultaneous electrical and physical value.

The upper line with -0.46 is the physical value defined as N. (see „5.8.1 Sensor settings“ page 8 under physical unit).

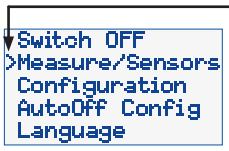
The lower line with +0.01 shows the electrical value with the non-changeable unit mV/V.

5.5 Main menu

Press and hold the ENT button again (for at least 1 second) to access the main menu:

Use the arrow key (AK) up or  down to  select the menu items.

Press the arrow key (AK) to the left to  return to the start screen.

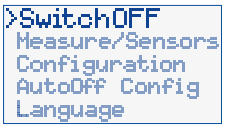


The > arrow on the display is used to select menu items.

The ENT key is used to access the menu item.

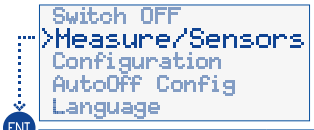
Press the left AB to return to the home screen.

5.6 Menu item Switch off



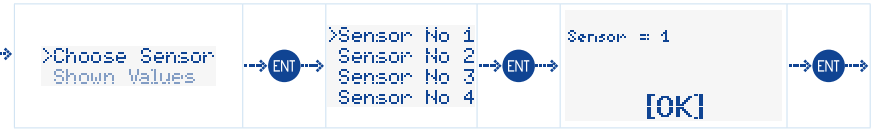
This menu item offers one option: turn off device.

5.7 Menu item Measure / Sensors



This menu item offers two options: select sensor or select the physical quantity to be displayed.

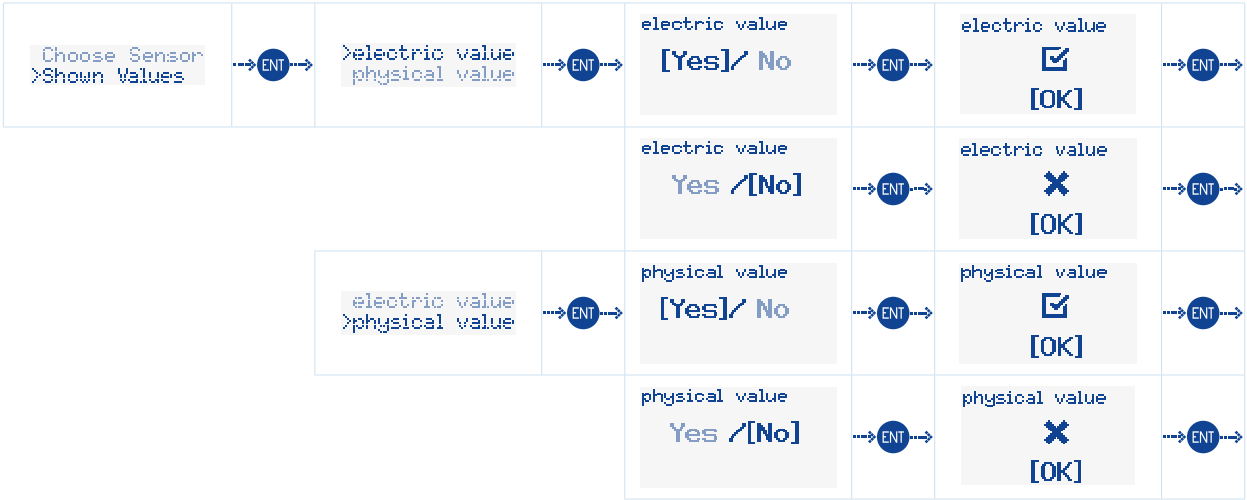
5.7.1 Choose Sensor



back to main menu, press AK left to go to start screen.

A total of four memory locations are available for the values (physical and electrical with 4- or 6-wire technology, averaging) from four different sensors to choose from.

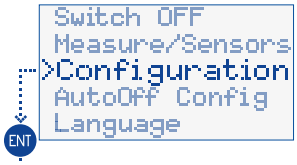
5.7.2 Shown Value



If required, the electrical and physical values can be displayed simultaneously.

Note: the electrical and physical values can also be switched on and off under Display (see “5.8.2 Display” on page 10).

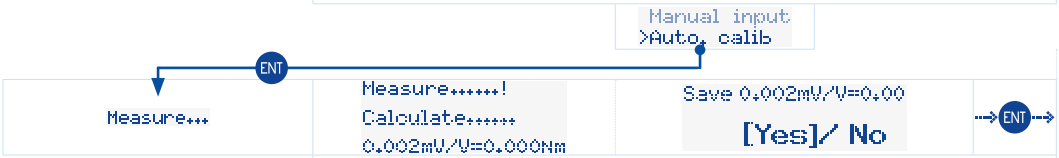
5.8 Menu item Configuration



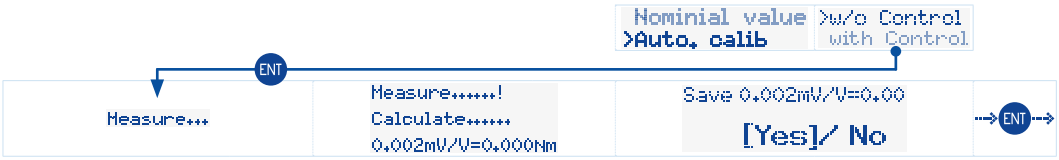
This menu item offers six options: sensor settings, display, factory settings, 4/6-wire measurement, averaging and analog output.

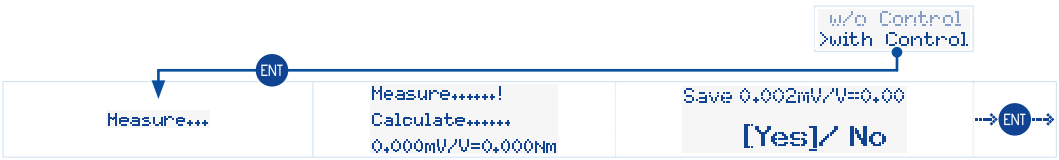
5.8.1 Sensor settings

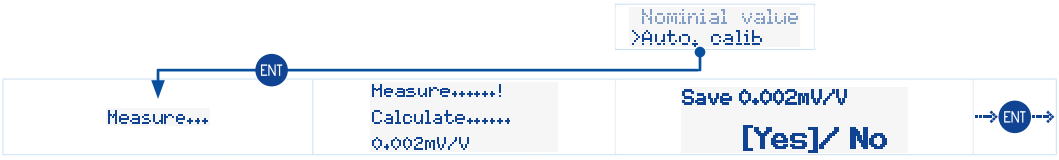
The positions with the blue triangle (red circle) can be selected using the arrow key (AK) left/right, and the value can be changed using AK up/down. With ENT back to submenu.

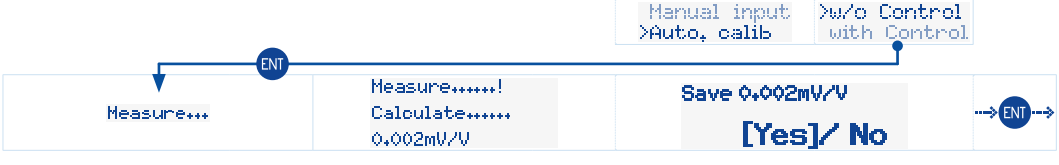


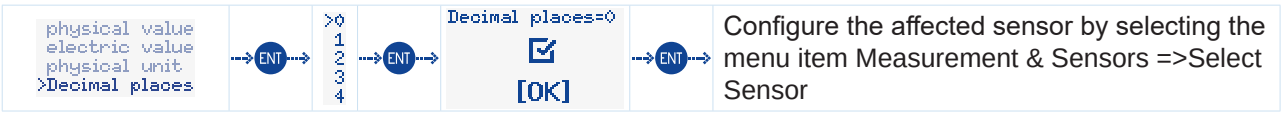
The value determined by Auto. calib is stored under manual input.





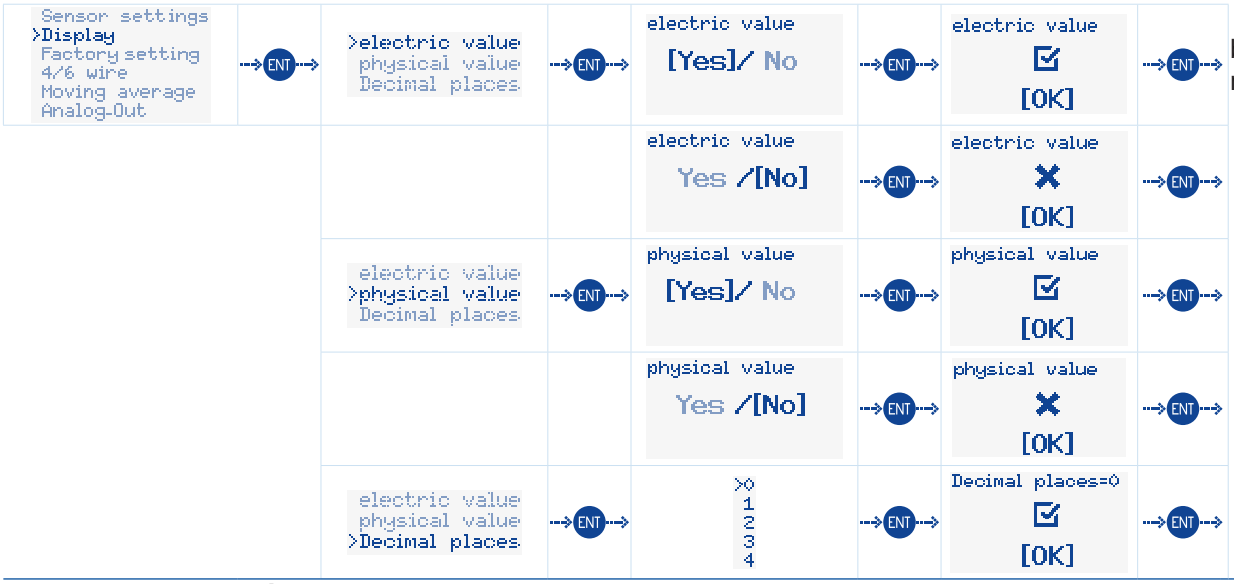






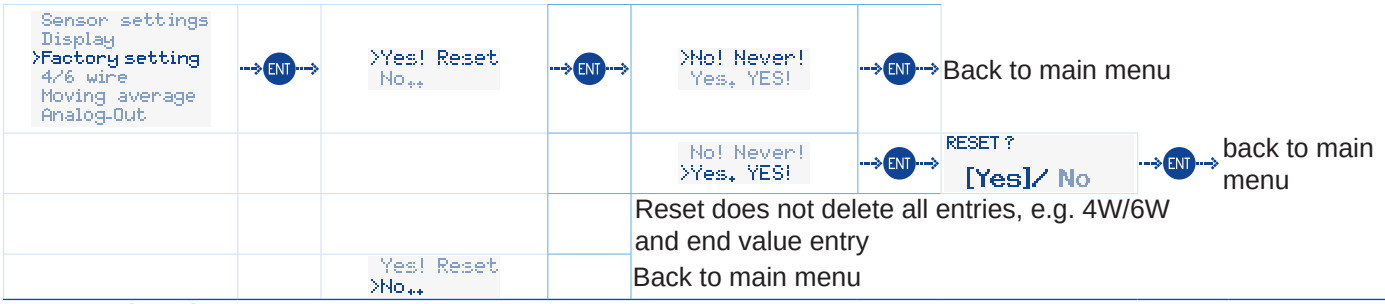
Configure the affected sensor by selecting the menu item Measurement & Sensors =>Select Sensor

5.8.2 Display



back to sub-menu

5.8.3 Factory setting



Back to main menu

back to main menu

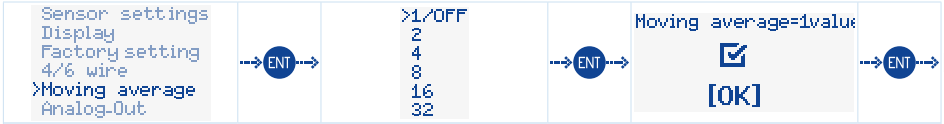
Reset does not delete all entries, e.g. 4W/6W and end value entry

Back to main menu

5.8.4 4 / 6 wire

back to submenu

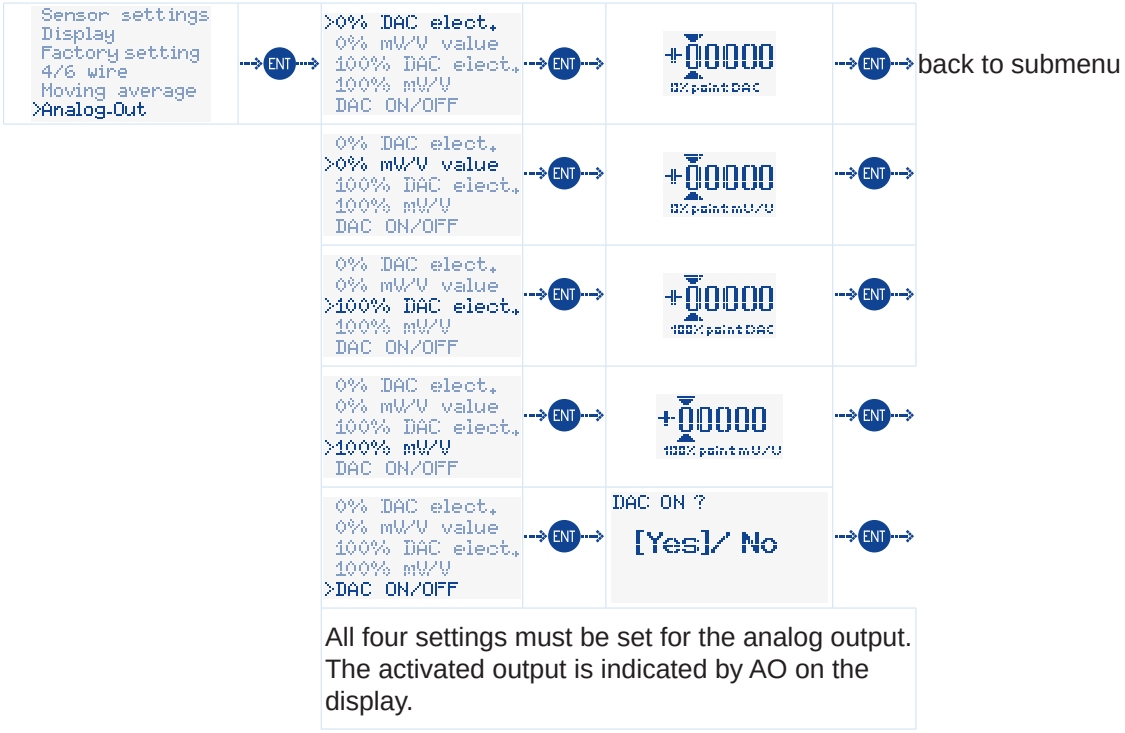
5.8.5 Moving average



back to submenu

The measurement curve is smoothed by calculating the mean value from several measured values.

5.8.6 Analog-Out



All four settings must be set for the analog output. The activated output is indicated by AO on the display.

5.9 Menu item AutoOff Config

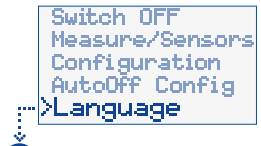
There are two options to choose from under this menu item:

AutoOFF Timer und AutoOFF 1 / 0

5.9.1 AutoOFF Timer

5.9.2 AutoOFF 1 / 0

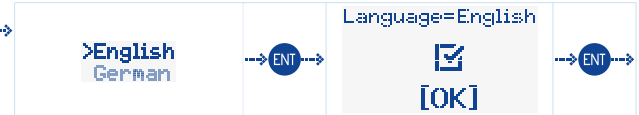
5.10 Menu item Language



There are two options to choose from under this menu item:

English and German.

5.10.1 English



5.10.2 German

5.11 Battery voltage

Successful connection of the charger/power supply unit is indicated by the USB C display. After charging, only USB is displayed.

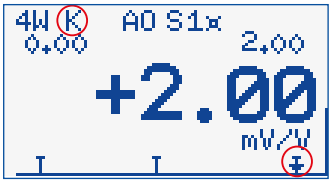
The vertical bar on the right visualizes the battery charge level. To display the battery voltage, the electrical and physical value must be switched off. Operating time at 50% duty cycle with batteries > 10h. The charging time of GM 78 is approx. 1.5h.

5.12 Settings

5.12.1 Sensitivity preset

The sensitivity of the sensor is given in the data sheet or on the type plate. It is given in mV/V. For the setting, see “5.8.1 Sensor settings” on page 9 >electrical value>100% lift elec>manual input

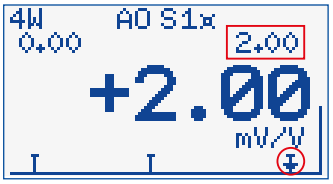
5.12.2 Control signal connection



Pressing the AK up button (CON) activates the 100% control in the sensor (if available; see sensor data sheet) – this enables a simple system control. When the button is pressed, the characteristic value of the sensor must appear on the display. See “5.8.1 Sensor settings” on page 9 >electrical value>100% lift elec>Auto. calib>with Control

5.13 Setting examples

GM 78 is therefore designed for strain gauge-based measurements, i.e. mV/V measurements, and thus enables comparative measurements of mechanical quantities with the highest precision. The mobile device has one measuring channel.



Sensor at 100% load, the triangle (red circle) moves to the right and then stands at the upper limit of the measuring range.

The maximum value is displayed at the top right (red rectangle). The maximum value can be reset by pressing the AK right (MAX).

Sensor loaded with -100%, the triangle (red circle) moves to the left side and then stands on the lower limit of the measuring range.

The minimum value is displayed in the top left corner (red rectangle). The minimum value can be reset to zero with the AK left (MIN).

Sensor loaded over 110%, the triangle (red circle) turns 90° and stops on the bar on the right.

5.14 Interfaces and Connections

5.14.1 Connection for SG-Sensors

Excitation via GM 78:	4.096V, max. 17 mA
Bridge resistance:	min. 240 until 4000 Ohm, only full bridge, 4- or 6-wire
Sensitivity:	from -3.5 mV/V - 3.5 mV/V
100% control:	Activate with the up arrow key (CON).

The excitation voltage should be as high as possible. It must not exceed the excitation voltage specified for the sensor (see sensor data sheet).

5.15 Terms Definition

Nominal load:	z.E. g. 100 kN, 63 Nm, ... is indicated on the sensor and on the test certificate. The nominal load is the upper limit of the measuring range.
Sensitivity:	Is the sensor signal at 100 % nominal load of a SG sensor. Indicated in mV/V. See sensor type label or test certificate.
6-wire connection:	Some sensors have two additional sensing lines, which are connected to the respective SG excitation.
100% control signal:	By a control resistance, a signal is simulated in the sensor which produces the exact same value as at 100 % nominal load.
Nominal Impedance:	Max. resistance load at current measurement.
SG excitation:	The SG excitation is the supply of a SG sensor and must be of highest quality.
Bridge resistance:	The bridge resistance is the ohmic resistance of the complete measurement bridge.

5.16 Troubleshooting

No output signal available:

- ➪ No power supply
- ➪ Sensor not connected, or open circuit in the sensor line?

Voltage output or current output at the control limit:

- ➪ Signal input not connected or connected incorrectly?
- ➪ Open circuit in the sensor line
- ➪ Has the sensor been overloaded?

Output signal does not return to 0:

- ➪ Was the sensor overloaded?
- ➪ Is the sensor installed in a distorted manner?
- ➪ Was the sensor connected correctly?
- ➪ Is there a break in the sensor line?

Measured values are unstable:

- ➪ Interference is induced via the sensor cable – connect the cable shield to ground!
- ➪ The switching power supply has no ground reference – connect 0V to ground (also possible via

100 kΩ / 100 nF)!

➪ Is the sensor cable too close to the power electronics?

➪ Is the sensor grounded?

6 Product Phases

6.1 Transportation

Annotation:

- Please pack the equipment suitable for transportation
- The equipment may not be able to move back and forth in the package
- Please protect the equipment against moisture

6.2 Commissioning and Installation

··· Safety measures before the installation

Notice:

- The device may only be charged using the supplied plug-in power supply (100... 240VAC / 5VDC, 3A).

··· Cable connections

Notice:

- Never connect voltage levels to unoccupied pins!

6.3 Standard Operation

··· EMC

Notice:

- The device must not be exposed to higher EMC levels than those specified in the standard.

··· Cable

Notice:

- Never disconnect the connectors by pulling the cables. Always separate the connector at the plug directly.

··· Storage

Annotation:

- Store the device in dry and dust-free spaces only.

6.4 Maintenance and Cleaning

... Cleaning

Caution:

- Please disconnect the device from the power supply before cleaning.

Notice:

- Clean the housing with a soft and slightly moisturized cloth. Never use solvents, as they may damage the front panel labeling and the display panel.
- While cleaning, ensure that no liquids enter the device or the connections

... Preventive maintenance and inspection

Annotation:

- Check the plug connections.

... Repair

Annotation:

- The device does not contain any parts which must or can be serviced by the user. Repairs may be carried out by Lorenz Messtechnik GmbH, exclusively. If assuming that safe operation of the device is no longer possible, it must be taken out of service and secured against inadvertent operation, immediately. This applies in particular, if:

  ... the device shows visible damage

  ... the device is no longer functional

  ... parts of the device are loose

  ... the connection lines show visible damage.

6.5 Safe Disposal

Equipment disposal:

- Please dispose obsolete equipment in accordance with the applicable statutory provisions. By this, you meet the legal obligations and also contribute to the environmental protection!

Battery disposal

- The end user is legally (Battery Regulation) obliged to return all used batteries and rechargeable batteries – disposal in the normal trash is prohibited. The used batteries/ rechargeable batteries can be disposed of free of charge at the collection points in the community, at our company or wherever batteries/rechargeable batteries are sold.