User manual M1

Standard signal 0/4-20 mA, 0-10 VDC

Technical features:

- red display of -1999…9999 digits (optional: green, orange or blue display)
- minimal installation depth: from 97 mm with plug-in terminal
- adjustment via factory default or directly on the sensor signal
- min-/max-value recording
- 10 adjustable setpoints
- display flashing at threshold value exceedance / undercut
- tara function
- programming interlock via access code
- protection class IP65 at the front
- plug-in terminal
- optional: 2 relay outputs
- accessories: pc-based configuration software PM-TOOL for devices without keypad, for a simple adjustment of standard devices via PC

Identification

STANDARD TYPES	ORDER NUMBER
Direct current, direct voltage Housing size: 72x36 mm	**M1-6VR4B.0001.570AD** **M1-6VR4B.0001.770AD**

Options – breakdown of order code:

M	1-	6	V	R	4	B.	0	0	0	1.	7	7	0	A	D

Standard type M line

Installation depth
113 mm incl. plug-in terminal: 1

Housing-size
B72xH36xT97 mm (without plug-in terminal): 1

Type of display
Current, voltage: V

Display colour
Blue: B
Green: G
Red: R
Orange: Y

Number of digits
4-digit: 4

Digit height
14 mm: B

Interface
without: 0

Dimension
D physical unit

Version
A A

Setpoints
0 no setpoint
2 2 relay outputs

Protection class
1 without keypad, operation at the back
7 IP65 / plug-in terminal

Supply voltage
4 115 VAC + 10,25€
5 230 VAC
7 24 VDC galv. insulated

Measuring input
1 Standard signal 0/4-20 mA, 0-10 VDC

Analog output
0 without

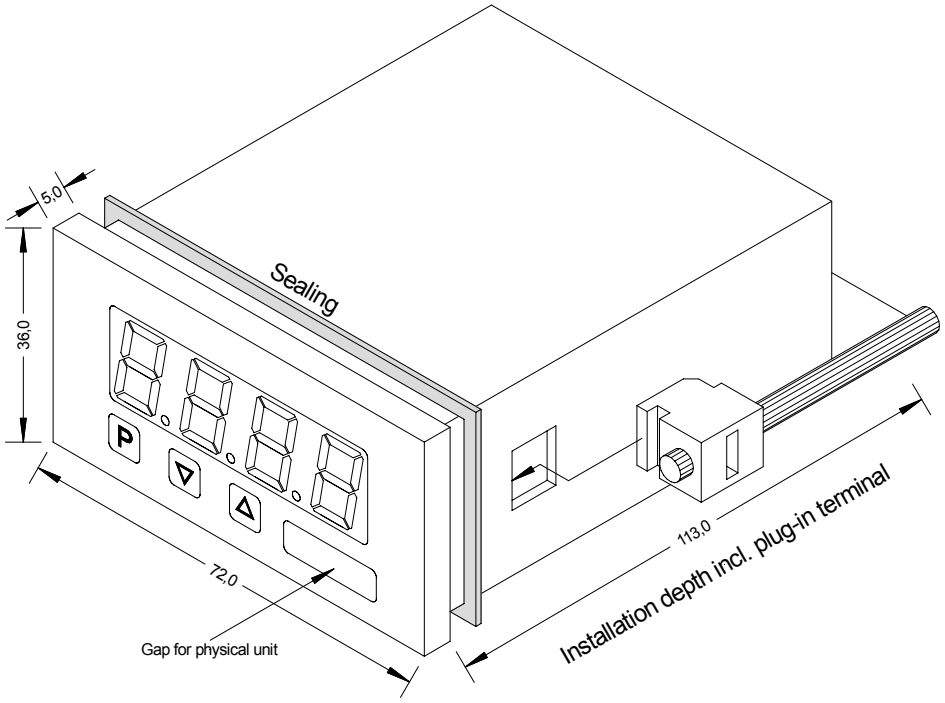
Sensor supply
0 without

Please state physical unit by order, e.g. m/min.

Contents

1. Assembly

Please read the *Safety advice* on *page 16* before installation and keep this user manual for future reference.



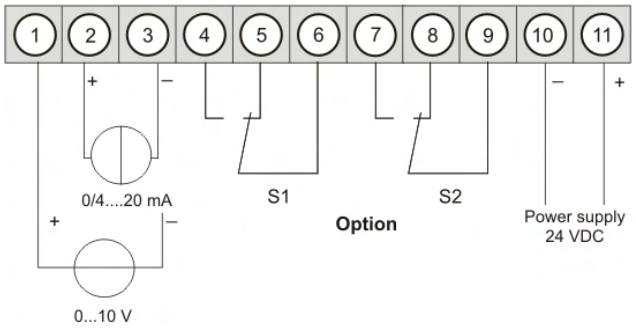
1. After removing the fixing elements, insert the device.
2. Check the seal to make sure it fits securely.
3. Click the fixing elements back into place and tighten the clamping screws by hand. Then use a screwdriver to tighten them another half a turn.

CAUTION! The torque should not exceed 0.1 Nm!

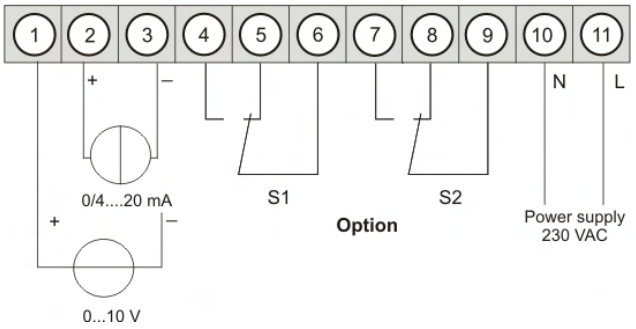
The dimension symbols can be exchanged before installation via a channel on the side!

2. Electrical connection

Type M1-6VR4B.0001.770AD
with a supply of 24 VDC



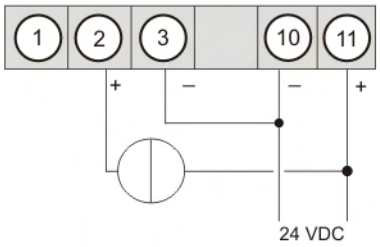
Type M1-6VR4B.0001.570AD
with a supply of 230 VAC



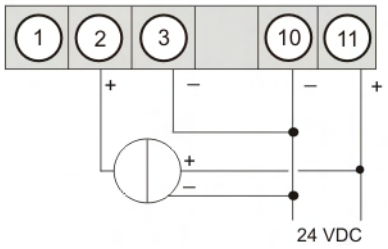
Connection examples:

Below you find some connection examples, which demonstrate some practical applications:

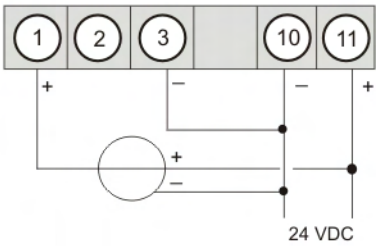
M1 in combination with a
2-wire sensor 4-20 mA



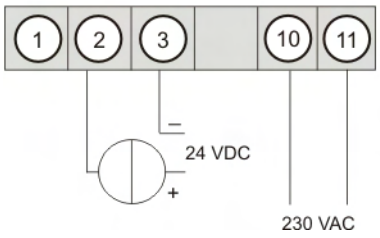
M1 in combination with a
3-wire sensor 0/4-20 mA



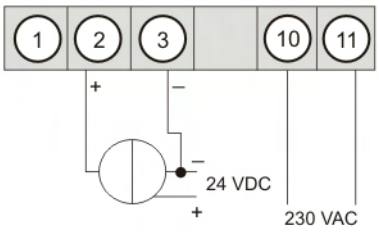
M1 in combination with a
3-wire sensor 0-10 V



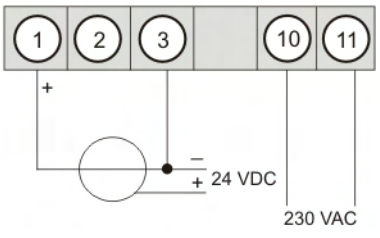
2-wire sensor 0/4-20 mA



3-wire sensor 0/4-20 mA



3-wire sensor 0-10 V



3. Function and operation description

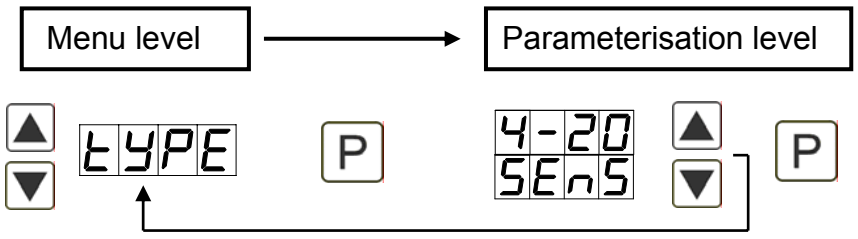
Operation
The operation is divided into two different levels.

Menu Level
Here it is possible to navigate between the individual menu items.

Parameterisation level:
The parameters stored in the menu item can be parameterised here.
Functions that can be adjusted or changed are always indicated with a flashing of the display. Adjustments made at the parameterisation level should be allways confirmed by pressing the **[P]**-key to save them.
However, the display automatically saves all adjustments and then switches into operation mode, if no further keys are pressed within 10 seconds.

Level	Button	Description
Menu level	P	Change to parameterisation level with the relevant parameters
	▲ ▼	For navigation at the menu level
Parameterisation level	P	To confirm the changes made at the parameterisation level
	▲ ▼	To change the value or setting

Example:



Programming via configuration software PM-TOOL-MUSB4

You receive the software on CD incl. an USB-cable with a device adaptor. The connection is done via a 4-pole micromatch connector plug on the back and the PC is connected via an USB connector plug.

System requirements: PC with USB interface

Software: Windows XP, Windows Vista

4. Setting up the device

4.1. Switching on

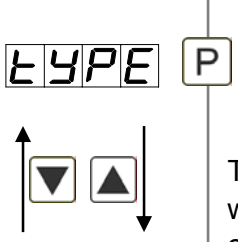
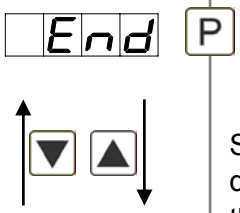
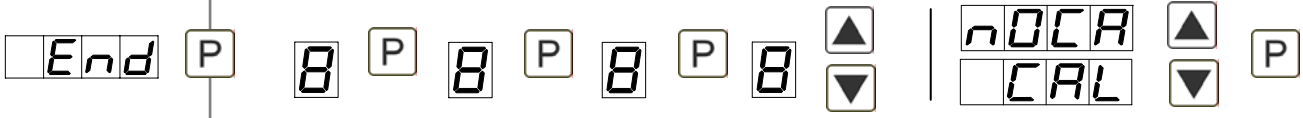
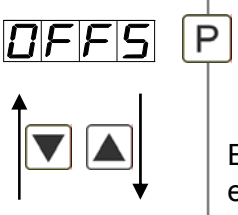
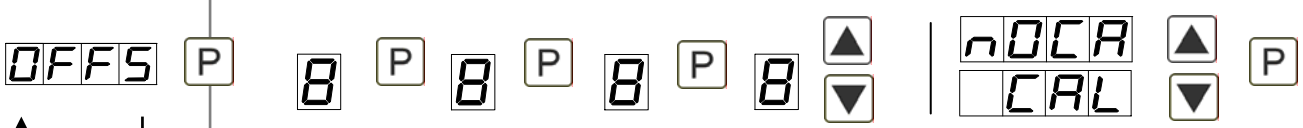
Once the installation is complete, you can start the device by applying the current loop. Check beforehand once again that all the electrical connections are correct.

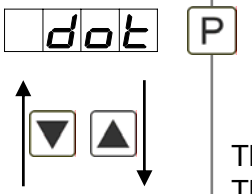
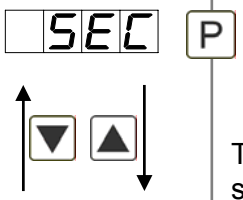
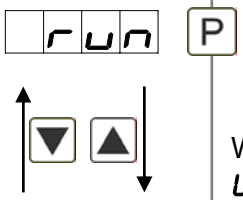
Starting sequence

For 1 second during the switching-on process, the segment test (*8 8 8 8*) is displayed, followed by an indication of the software type and, after that, also for 1 second, the software version. After the start-up sequence, the device switches to operation/display mode.

4.2. Standard parameterisation:

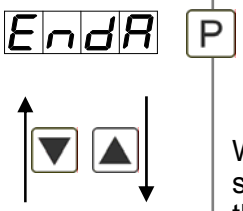
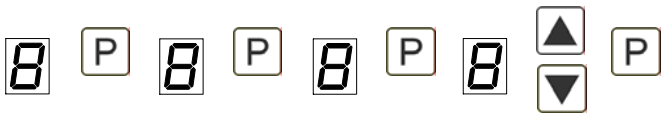
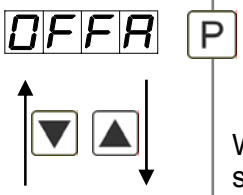
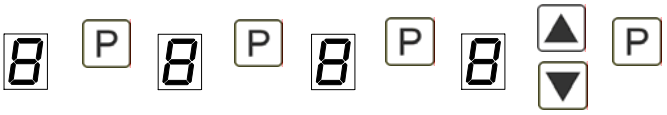
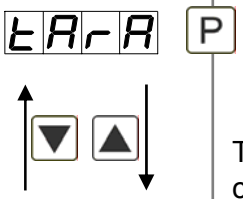
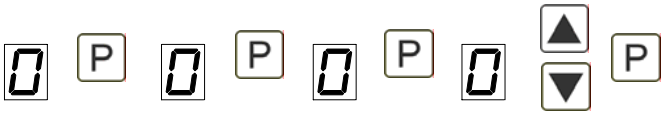
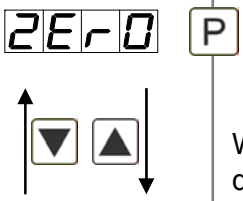
To be able to parameterize the display, press the **[P]** key in operating mode for 1 second. The display then changes to the menu level with the first menu item *TYPE*.

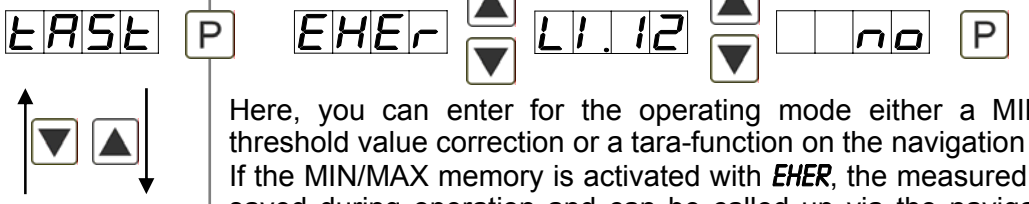
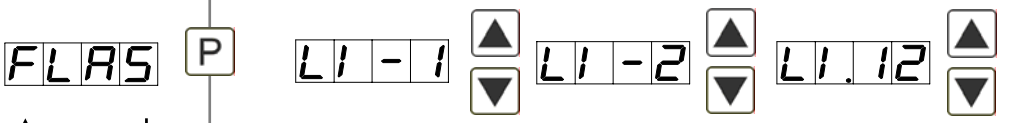
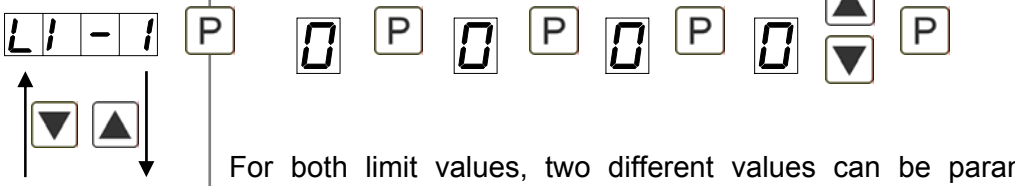
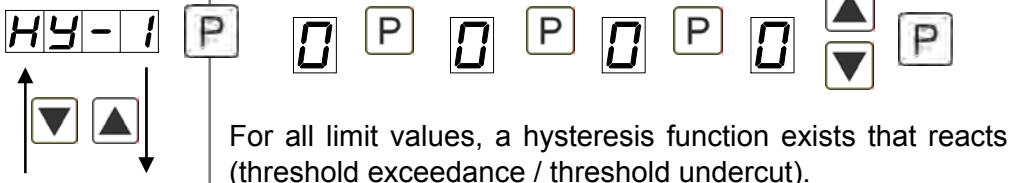
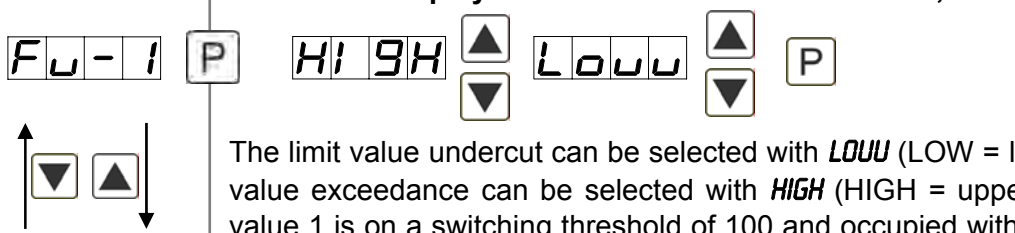
Menu level	Parameterisation level
	**Selection of the input signal, *TYPE*:** There are several measuring input options: 0/4-20 mA or 0-10 VDC signals as the works calibration (without application of the sensor signal) and *SENS* as the sensor calibration (with the sensor applied). Confirm the selection with **[P]** and the display switches back to menu level.
	**Setting the measuring range end value, *END*:**  Set the end value from the smallest to the highest digit with [▲] [▼] and confirm each digit with **[P]**. A minus sign can only be parameterized on the highest value digit. After the last digit, the display switches back to the menu level. If *SENS* was selected as the input option, you can only select between *NOCA* and *CAL*. With *NOCA*, only the previously set display value is taken over, and with *CAL*, the device takes over both the display value and the analogue input value.
	**Setting the measuring range start/offset value, *OFFS*:**  Enter the start/offset value from the smallest to the highest digit [▲] [▼] and confirm each digit with **[P]**. After the last digit the display switches back to the menu level. If *SENS* was selected as the input option, you can only select between *NOCA* and *CAL*. With *NOCA*, only the previously set display value is taken over, and with *CAL*, the device takes over both the display value and the analogue input value.

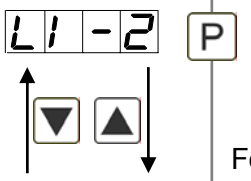
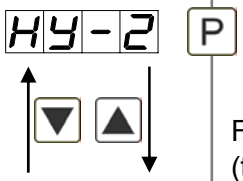
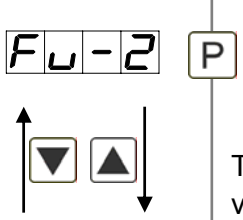
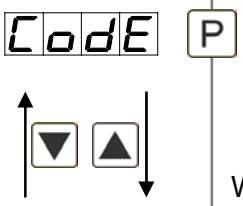
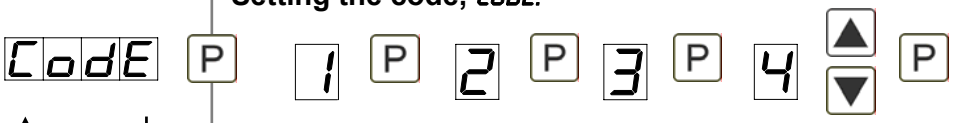
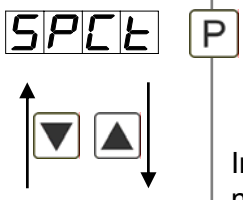
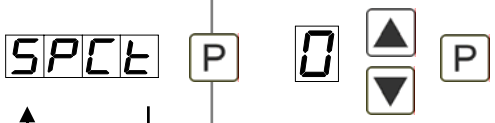
Menu level	Parameterisation level
	**Setting the decimal point, *DOT*:** The decimal point on the display can be moved with [▲] [▼] and confirmed with **[P]**. The display then switches back to the menu level again.
	**Setting the display time, *SEC*:**  The display time is set with [▲] [▼]. The display moves up in increments of 0.1 second up to 1 second and in increments of 1.0 second to 10.0 seconds. Confirm the selection by pressing the **[P]** button. The display then switches back to the menu level again.
	**Activation / deactivation of the programming lock and completion of the standard parameterization, *RUN*:**  With the aid of the [▲] [▼] keys, you can choose between the deactivated key lock *ULOC* (works setting) and the activated key lock *LOC*. Make the selection with **[P]**. After this, the display confirms the settings with **"- - - -"**, and automatically switches to operating mode. If *LOC* was selected, the keyboard is locked. To get back into the menu level, you must press **[P]** for 3 seconds in operating mode. You must now enter the *CODE* (works setting *1 2 3 4*) that appears using the [▲] [▼] keys plus **[P]** to unlock the keyboard. *FAIL* appears if the input is wrong.

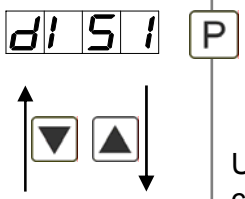
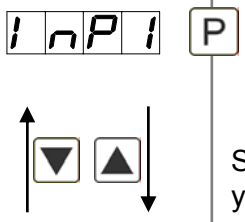
4.3. Extended parameterisation

By pressing the [▲] & [▼] keys during standard parameterisation for one second, the display switches to the extended parameterisation mode.
Operation is the same as in standard parameterisation.

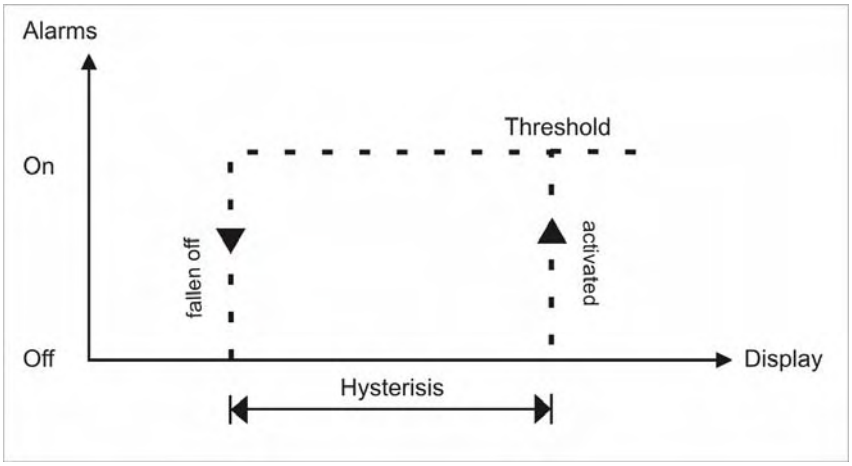
Menu level	Parameterisation level
	**Rescaling the measuring input values, *ENDA:***  With the aid of this function, you can rescale the input value of **e.g. 19,5 mA** (works setting) without applying a measuring signal. If sensor calibration has been selected, these parameters are not available.
	**Rescaling the measuring input values, *OFFA:***  With the aid of this function, you can rescale the input value of **e.g. 3,5 mA** (works setting) without applying a measuring signal. If sensor calibration has been selected, these parameters are not available.
	**Setting the tare/offset value, *TARA:***  The given value is added to the linerarized value. In this way, the characteristic line can be shifted by the selected amount.
	. **Zero point slowdown, *ZERO:***  With zero point slowdown, a value range around zero can be preselected at which the display shows zero. If, for example, a 10 is set, the display would show a zero in the range from -10 to +10 and continue below it with -11 and above it with +11.

Menu level	Parameterisation level
	**4.3.1. Assignment (deposit) of key functions, *TAST:*** Here, you can enter for the operating mode either a MIN/MAX value inquiry, a threshold value correction or a tara-function on the navigation keys. If the MIN/MAX memory is activated with ***EHER***, the measured MIN/MAX values will be saved during operation and can be called up via the navigation keys **[▲] [▼]**. The values are lost if the device is restarted. If the threshold value correction ***LI.1*** is selected, the limit values can be changed during operation without hindering the operating procedure. With the tara-function the device can be set on a temporarily parameterized value. This function is activated by pushing the two navigation keys **[▼] [▲]** simultaneously. The device receipts the correct taring by showing “0000” in the display. If ***NO*** is parameterized, the navigation keys **[▼] [▲]** have no function in operating mode.
	**4.3.2. Flashing of display, *FLAS:*** Here, flashing of the display can be added as an extra alarm function, either to the first limit value (select: ***LI-1***), the second limit value (select: ***LI-2***) or to both limit values (select: ***LI-12***). With ***NO*** (works setting), no flashing is assigned at all.
	**4.3.3. Limit values / Limits, *LI-1:*** For both limit values, two different values can be parameterised. With this, the parameters for each limit value are called up one after the other.
	**Hysteresis for limit values, *HY-1:*** For all limit values, a hysteresis function exists that reacts according to the settings (threshold exceedance / threshold undercut).
	**Function if display falls below / exceeds limit value, *FU-1:*** The limit value undercut can be selected with ***LOUU*** (LOW = lower limit value) and limit value exceedance can be selected with ***HIGH*** (HIGH = upper limit value). If e.g. limit value 1 is on a switching threshold of 100 and occupied with function „*HIGH*“, the alarm will be activated by reaching the threshold. If the limit value is allocated to „*LOW*“, an alarm will be activated by undercut of the threshold.

Menu level	Parameterisation level
	**Limit value /Limits,** *LI-2:* For both limit values, two different values can be parameterised. With this, the parameters for each limit value are called up one after the other.
	**Hysteresis for limit values,** *HY-2:*  For all limit values, a hysteresis function exists that reacts according to the settings (threshold exceedance / threshold undercut).
	**Function if display falls below / exceeds limit value,** *FU-2:*  The limit value undercut can be selected with ***LOUU*** (LOW = lower limit value) and limit value exceedance can be selected with ***HIGH*** (HIGH = upper limit value). If e.g. limit value 1 is on a switching threshold of 100 and occupied with function „*HIGH*“, the alarm will be activated by reaching the threshold. If the limit value is allocated to „*LOW*“, an alarm will be activated by undercut of the threshold.
	**Setting the code,** *CODE:*  With this setting, it is possible to select an individual code (works setting ***1 2 3 4***) for locking the keyboard. To lock/release the key, proceed according to menu item ***RUN***.
	**4.3.4. Setpoints - Number of additional setpoints,** *SPCT:*  In addition to the start and end value, 8 extra setpoints can be defined to linearise non-linear sensor values. Only the activated setpoint parameters are displayed.

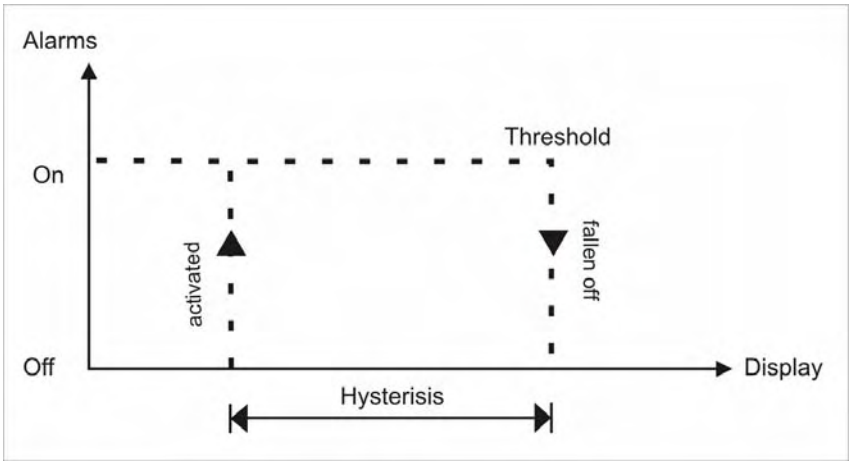
Menu level	Parameterisation level
	**Display values for setpoints** *DIS1 ... DIS5:*  Under this parameter the setpoints are defined on a value basis. At the sensor calibration one will be asked at the end (like at Endwert/Offset, too), if a calibration shall be triggered.
	**Analogue values for setpoints** *INP1 ... INP8:*  Setpoints are only displayed under works calibration (4-20 mA). Here you can choose your analog values. The entry of constantly rising values need to be done self-contained.

Functional principle of the set points



Limit value exceedance "HIGH"

By limit value exceedance the alarm S1-S2 is off below the threshold and on on reaching the threshold.



Limit value undercut "LOW"

By limit value undercut the alarm S1-S2 is on below the threshold and switched off on reaching the threshold.

Alarms / optical setpoint display

An activated set point can be optically indicated by flashing of the 7-segment display.

Functional principle of the alarms	
Alarm	Deactivated, display value
Threshold	Threshold/limit value for switch over
Hysteresis	Width of the window between the thresholds
Function	Limit value exceedance / limit value undercut

5. Factory settings

5.1. Default values

Parameter	Menu items				Default
tYPE	0-10	SEnS	0-20	4-20	SEnS
End	-999	to	9999		1000
OFFS	-999	to	9999		0000
dot	0000	to	0.000		0
SEC	0.1	to	10.0		01.0
run	ULOC	LOC			ULOC
OFFA	-9.99	to	99.99		
EndA	-9.99	to	99.99		
tArA	-999	to	9999		0
2Er0	00	to	99		0
tASt	no	EHtr	LI.12	tArA	no
FLAS	no	LI-1	LI-2	LI 12	no
LI-1	-999	to	9999		0200
HY-1	0000	to	9999		0000
Fu-1	Louu	HI 9H			HI 9H
LI-2	-999	to	9999		0300
HY-2	0000	to	9999		0000
Fu-2	Louu	HI 9H			HI 9H
CodE	0000	to	9999		1234
SPCt	0	to	8		0
dI S1	-999	to	9999		
InP1	-999	to	9999		
dI S2	-999	to	9999		
InP2	-999	to	9999		
dI S3	-999	to	9999		
InP3	-999	to	9999		
dI S4	-999	to	9999		
InP4	-999	to	9999		
dI S5	-999	to	9999		
InP5	-999	to	9999		
dI S6	-999	to	9999		
InP6	-999	to	9999		

Parameter	Menu items				Default
dI S7	-999	to	9999		
I nP7	-999	to	9999		
dI S8	-999	to	9999		
I nP8	-999	to	9999		

5.2. Reset to default values

To return the unit to a **defined basic state**, a reset can be carried out to the default values.

The following procedure should be used:

- Switch off the power supply
- Press button [**P**]
- Switch on voltage supply and press **[P]**-button until **„- - - -“** is shown in the display.

With reset, the default values of the program table are loaded and used for subsequent operation. This puts the unit back to the state in which it was supplied.

Caution! All application-related data are lost.

6. Technical data

Housing				
Dimensions				
72x36	72x36x97 mm (BxHxD)			
	72x36x113 mm (BxHxD) including plug-in terminal			
Panel cut-out				
72x36	$68.0^{+0.7}$ x $33.0^{+0.6}$ mm			
Wall thickness	up to 3 mm			
Fixing	Screw elements			
Material	PC Polycarbonate, black, UL94V-0			
Sealing material	EPDM, 65 Shore, black			
Protection class	Standard IP65 (Front), IP00 (Back side)			
Weight	approx. 200 g			
Connection	plug-in terminal; wire cross section up to 2.5 mm^2			
Display				
Digit height	14 mm			
Segment colour	red (Standard), optional available in green, blue and orange			
Range of display	-1999 to 9999			
Setpoints	optical display flashing			
Overflow	horizontal bars at the top			
Underflow	horizontal bars at the bottom			
Display time	0.1 to 10.0 seconds			
Input	**Measuring range**	**Ri**	**Measuring fault**	**Digit**
min. -22…max. 24 mA	0/4 – 20 mA	~ 100 Ω	0.1 % of measuring range	±1
min. -12…max. 12 VDC	0-10 VDC	~ 200 kΩ	0.1 % of measuring range	±1
Temperature drift	100 ppm / K			
Measuring time	0.1…10.0 seconds			
Measuring principle	U/F-converter			
Resolution	approx. 18 Bit at 1 second measuring time			
Switching output	**Switching contact**			
Relay Switching cycle	with change-over contact 250 V / 5 AAC, 30 V/ 5 ADC 30 * 10^3 at 5 AAC, 5 ADC ohm resitive burden 10 * 10^6 mechanically			
	Diversity according to DIN EN50178 / Characteristics according to DIN EN60255			
Power pack	24 VDC +/- 10 % (max. 1 VA), 230 VAC +/- 10 % (max. 6 VA)			
Memory	EEPROM			
Data life	≥ 100 years			

Ambient conditions	
Working temperature	0…60°C
Storing temperature	-20…80°C
Climatic density	relative humidity 0-80% on years average without dew
EMV	EN 61326
CE-sign	Conformity to directive 2004/108/EG
Safety standard	According to low voltage directive 2006/95/EG EN 61010; EN 69664-1

7. Safety advice

Please read the following safety advice and the assembly *chapter 1* before installation and keep it for future reference.

Proper use

The **M1-device** is designed for the evaluation and display of sensor signals.

Danger! Careless use or improper operation can result in personal injury and/or damage to the equipment.

Control of the device

The panel meters are checked before dispatch and sent out in perfect condition. Should there be any visible damage, we recommend close examination of the packaging. Please inform the supplier immediately of any damage.

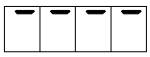
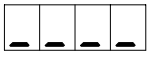
Installation

The **M1-device** must be installed by a suitably **qualified specialist** (e.g. with a qualification in industrial electronics).

Notes on installation

- There must be no magnetic or electric fields in the vicinity of the device, e.g. due to transformers, mobile phones or electrostatic discharge.
- The **fuse rating** of the supply voltage should not exceed a value of **6A N.B. fuse**.
- Do not install **inductive consumers** (relays, solenoid valves etc.) near the device and **suppress** any interference with the aid of RC spark extinguishing combinations or free-wheeling diodes.
- Keep input, output and supply lines separate from one another and do not lay them parallel with each other. Position “go” and “return lines” next to one another. Where possible use twisted pair. So, you receive best measuring results.
- Screen off and twist sensor lines. Do not lay current-carrying lines in the vicinity. Connect the **screening on one side** on a suitable potential equaliser (normally signal ground).
- The device is not suitable for installation in areas where there is a risk of explosion.
- Any electrical connection deviating from the connection diagram can endanger human life and/or can destroy the equipment.
- The terminal area of the devices is part of the service. Here electrostatic discharge needs to be avoided. Attention! High voltages can cause dangerous body currents.
- Galvanic insulated potentials within one complex need to be placed on a appropriate point (normally earth or machines ground). So, a lower disturbance sensibility against impacted energy can be reached and dangerous potentials, that can occur on long lines or due to faulty wiring, can be avoided.

8. Error elimination

	Error description	Measures
1.	The unit permanently indicates overflow. 	• The input has a very high measurement, check the measuring circuit. • With a selected input with a low voltage signal, it is only connected on one side or the input is open. • Not all of the activated setpoints are parameterised. Check if the relevant parameters are adjusted correctly.
2.	The unit permanently shows underflow. 	• The input has a very low measurement, check the measuring circuit . • With a selected input with a low voltage signal, it is only connected on one side or the input is open. • Not all of the activated setpoints are parameterised. Check if the relevant parameters are adjusted correctly.
3.	The word "*HELP*" lights up in the 7-segment display.	• The unit has found an error in the configuration memory. Perform a reset on the default values and re-configure the unit according to your application.
4.	Program numbers for parameterising of the input are not accessible.	• Programming lock is activated • Enter correct code
5.	"*ERR1*" lights up in the 7-segment display	• Please contact the manufacturer if errors of this kind occur.
6.	The device does not react as expected.	• If you are not sure if the device has been parameterised before, then follow the steps as written in *chapter 5.2.* and set it back to its delivery status.