User manual M2

Direct voltage signals: Shunt 0-60-150-300-1000 mV

Technical features:

- red display from -19999…99999 digits (optional: green, orange or blue display)
- minimal installation depth: 70 mm without plug-in terminal
- adjustment via factory default or directly on the sensor signal
- Min-/Max memory
- 30 parameter driven setpoints
- display flashing at threshold exceedance or undershooting
- zero-key for triggering of HOLD, TARA
- permanent min-/max-value recording
- volume measurement (totaliser)
- mathematical functions like reciprocal value, square root, square and rounding
- programming interlock via access code
- protection class IP65 at the front
- plug-in terminal
- two relay outputs optional
- optional analog output or sensor supply
- optional galv. insulated digital input
- accessories: pc-based configuration-kit PM-TOOL with CD & USB adapter
  for devices without keypad, for a simple adjustment of standard devices

Identification

STANDARD-TYPES	ORDER NUMBER
Direct voltage: Shunt Housing size: 96x48 mm	**M2-1VR5B.0002.570BD** **M2-1VR5B.0002.670BD**

Options – breakdown of order code:

M 2- 1 V R 5 B. 0 0 0 2. 6 7 2 B D

Basic type M-Line

Installation depth
incl. plug-in terminal 89 mm `2`

Housing size
96x48x70 mm (BxHxD) `1`

Display type
V, A `V`

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

Number of digits
5 digits `5`

Digit height
14 mm `B`

Digital input
none `0`
one `I`

Dimension
`D` physical unit

Version
`B` B

Setpoints
`0` no setpoints
`2` 2 relay outputs

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

Supply voltage
`4` 115 VAC
`5` 230 VAC
`6` 10-30 VDC galv. insulated

Measuring input
`2` Shunt 0-60-150-300-1000 mV

Analogoutput
`0` without
`X` 0-10 VDC, 0/4-20 mA

Sensor supply
`0` without

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

Contents

1. Assembly

Please read the *Safety advice* on *page 32* before installation and keep this user manual for future reference.
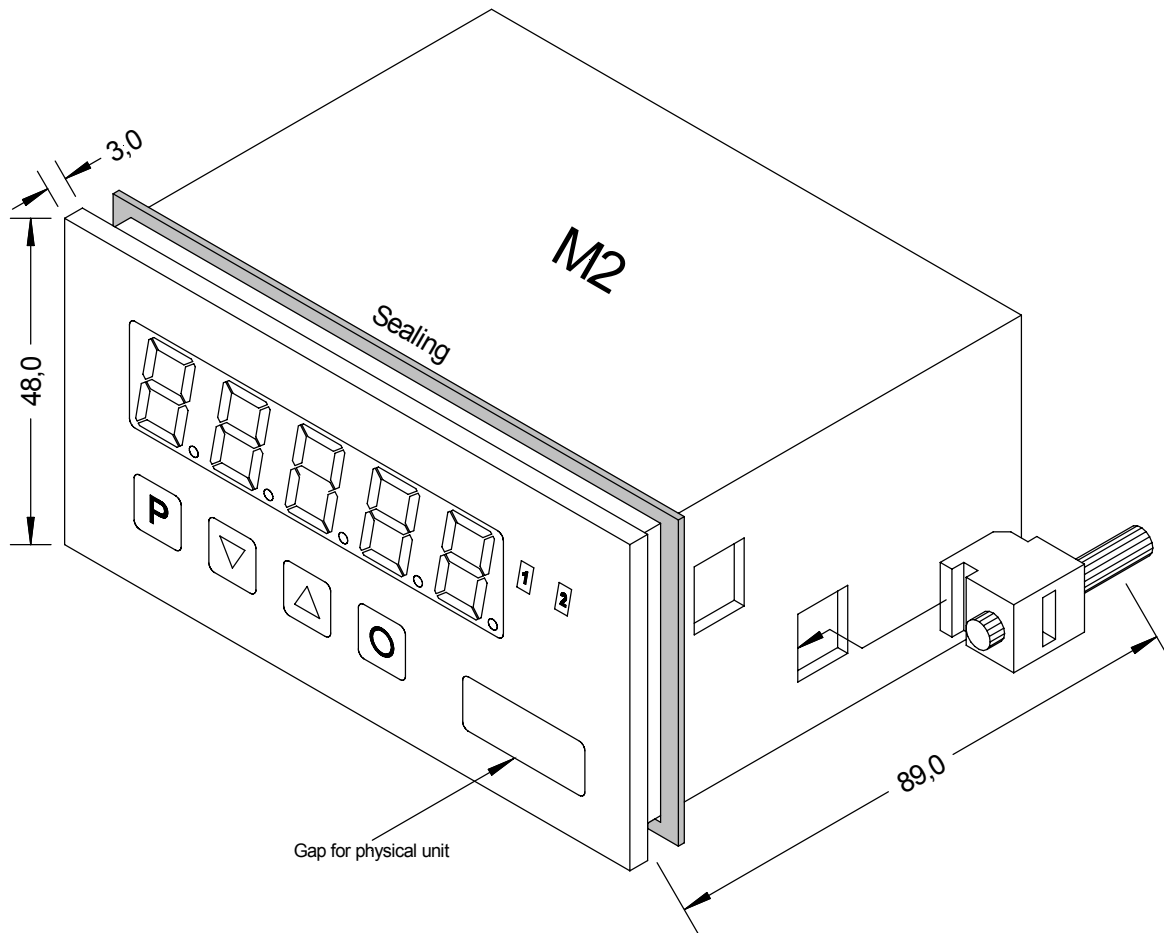

1. After removing the fixing elements, insert the device.
2. Check the seal to make sure it fits securely.
3. Click the fixing elements back into place and tighten the clamping screws by hand. Then use a screwdriver to tighten them another half a turn.

   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 M2-1VR5B.0002.470BD with a supply of 115 VAC
Type M2-1VR5B.0002.570BD with a supply of 230 VAC
Type M2-1VR5B.0002.670BD with a supply of 10-30 VDC
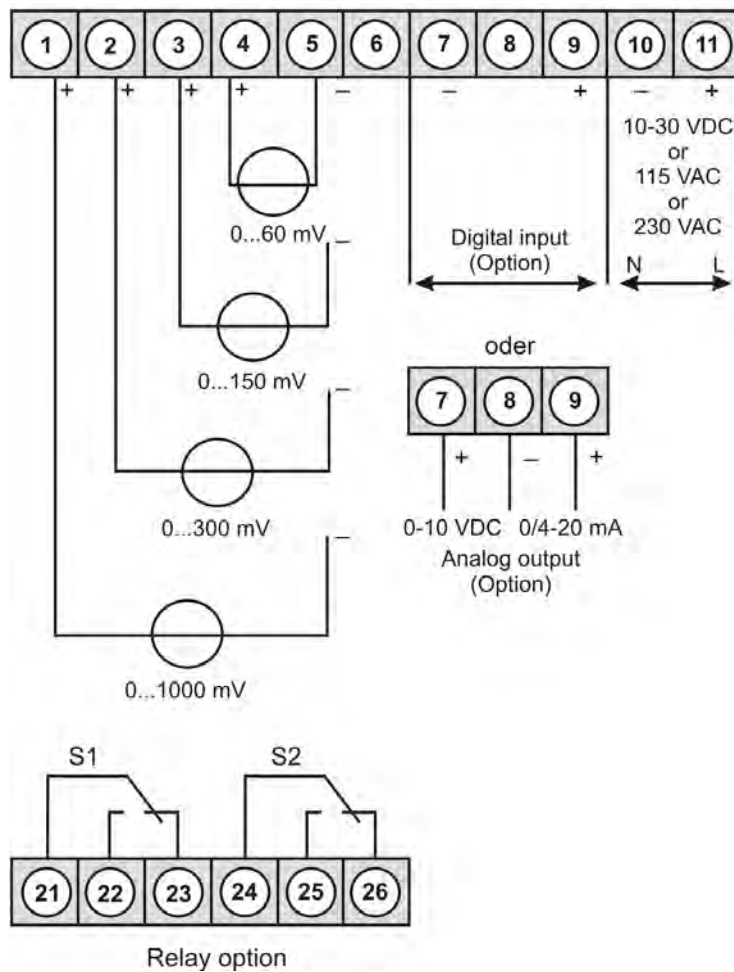
3. Function and operation description

Operation
The operation is divided into three different levels.

Menu level (delivery status)
This level is for the standard settings of the device. Only menu items which are sufficent to set the device into operation are displayed. To get into the professional level, run through the menu level and parameterise "*PROF*" under menu item *RUN*.

Menu group level (complete function volume)
Suited for complex applications as e.g. linkage of alarms, setpoint treatment, totaliser function etc. In this level function groups which allow an extended parameterisation of the standard settings are availabe. To leave the menu group level, run through this level and parameterise „*ULOC*„ under menu item *RUN*.

Parameterisation level:
Parameter deposited in the menu item can here be parameterised. Functions, that can be changed or adjusted, are always signalised by a flashing of the display. Settings that are made in the parameterisation level are confirmed with **[P]** and thus safed. By pressing the **[O]-key** it leads to a break-off of the value input and to a change into the menu level. All adjustments are safed automatically by the device and changes into operating mode, if no further key operation is done within the next 10 seconds.

Level	Key	Description
Menu level	P	Change to parameterisation level and deposited values.
	▲ ▼	Keys for up and down navigation in the menu level.
	O	Change into operation mode.
Parameterisation level	P	To confirm the changes made at the parameterization level.
	▲ ▼	Adjustment of the value / the setting.
	O	Change into menu level or break-off in value input.
Menu group level	P	Change to menu level.
	▲ ▼	Keys for up and down navigation in the menu group level.
	O	Change into operation mode or back into menu level.

Programming via the configuration software PM-TOOL MUSB4:

This configuration kit includes the software on CD, a USB-cable and a device adapter. It is connected via a 6-pole micromatch-plug on the back side of the device. The connection to the PC via an USB-plug.

System requirements: PC with USB-interface
Software: Windows XP, Windows VISTA

Function chart:
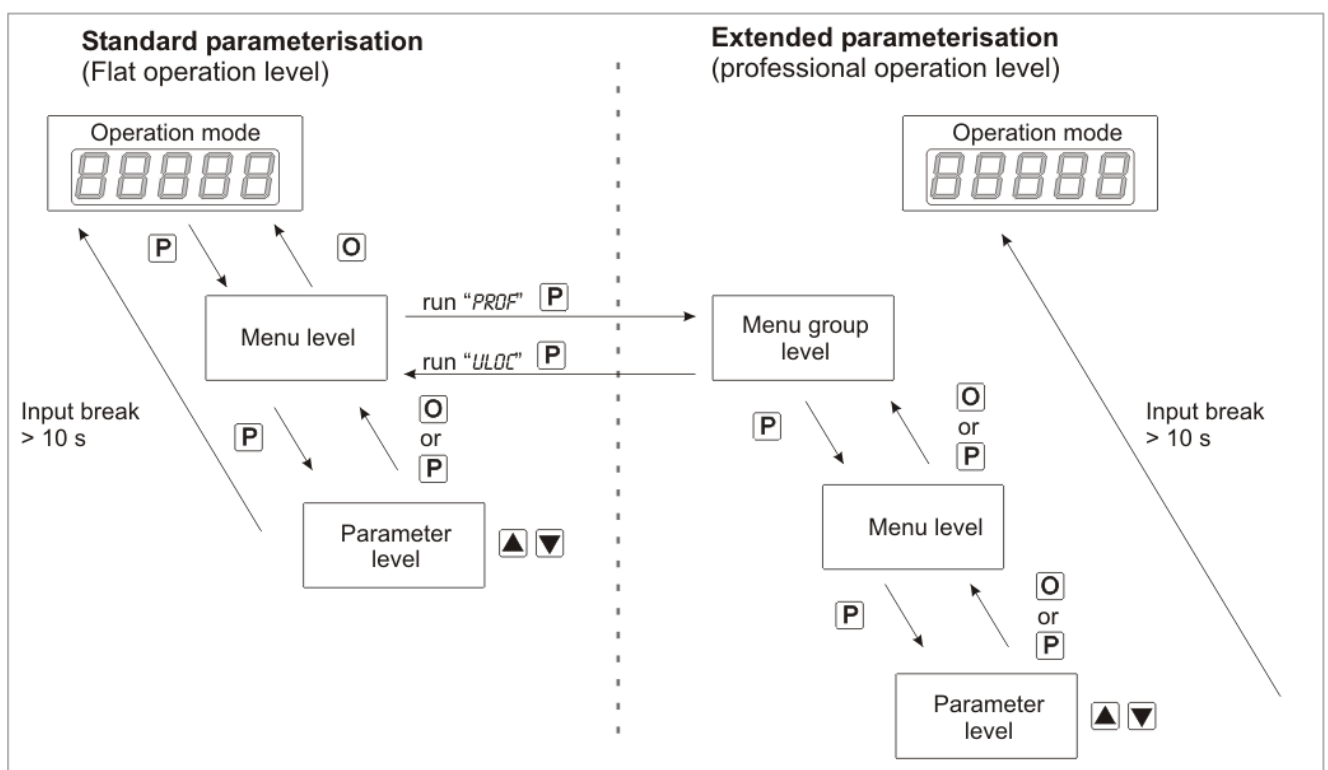
Underline:

P   Takeover

O   Stop

▲   Value selection (+)

▼   Value selection (-)
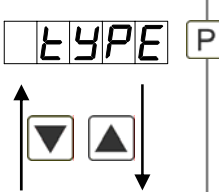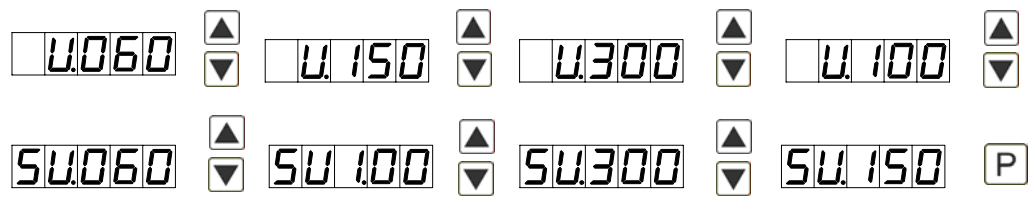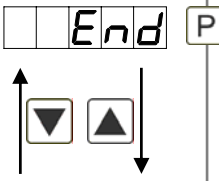
4. Setting up the device

4.1. Switching-on

Once the installation is complete, you can start the device by applying the voltage supply. Before, check once again that all electrical connections are correct.
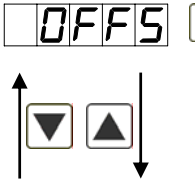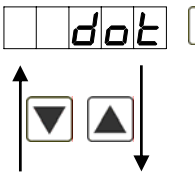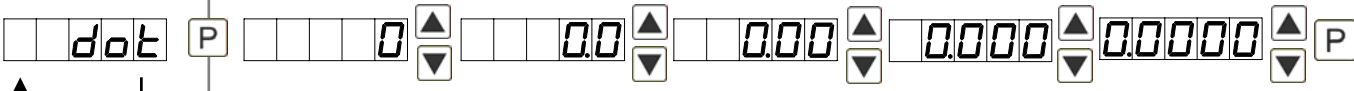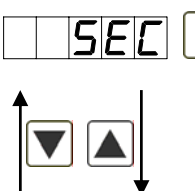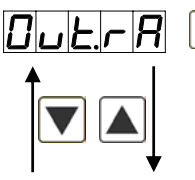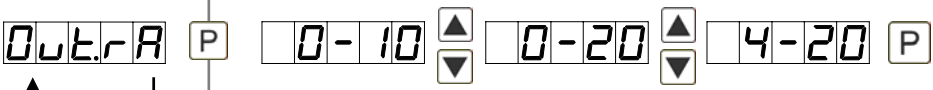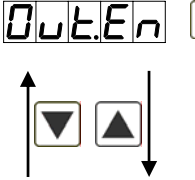
Starting sequence
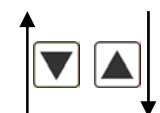
For 1 second during the switching-on process, the segment test (*8 8 8 8 8*) is displayed, followed by an indication of the software type and, after that, also for 1 second, the software version. After the starting sequence, the device switches to operation/display mode.
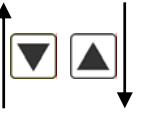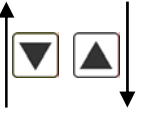
4.2. Standard parameterisation: (flat operation level)
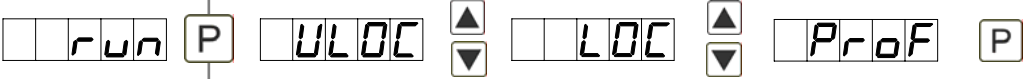
To parameterize the display, press the **[P]** key in operating mode for 1 second. The display then changes to the menu level with the first menu item *TYPE*.

Menu level	Parameterisation level
TYPE ▼▲	**Selection of the input signal, *TYPE*:** **Default:** *SU.060* *U.060* ▲▼ *U. 150* ▲▼ *U.300* ▲▼ *U. 100* ▲▼ *SU.060* ▲▼ *SU 1.00* ▲▼ *SU.300* ▲▼ *SU. 150* [P] There are several measuring input options: 60, 150, 600 or 1000 mV signals as works calibration (without application of the sensor signal) and *SU* as sensor calibration (with the sensor applied). Confirm the selection with **[P]** and the display switches back to menu level.
End ▼▲	**Setting the measuring range end value, *END*:** **Default:** *10000* *8* [P] *8* [P] *8* [P] *8* [P] *8* ▲▼ │ *nOCA* / *CAL* ▲▼ [P] 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 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
OFFS	**Setting up the measuring range start/offset value, OFFS:** **Default:** 0 Enter the start/offset value from the smallest to the highest digit with [▲] [▼] and confirm each digit with **[P]**. After the last digit the display switches back to the menu level. If *SENS* was selected as 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.
dot	**Setting the decimal point, DOT:** **Default:** 0 The decimal point on the display can be moved with [▲] [▼] and confirmed with **[P]**. The display then switches back to the menu level again.
SEC	**Setting up the display time, SEC:** **Default:** 1.0 The display time is set with [▲] [▼]. The display moves up in increments of 0.1 sec up to 1 sec and in increments of 1.0 sec up to 10.0 sec. Confirm the selection by pressing the **[P]** button. The display then switches back to the menu level again.
Out.rA	**Selection of analog output, OUT.RA:** **Default:** 4-20 Three output signals are available: 0-10 VDC, 0-20 mA and 4-20 mA, with this function, the demanded signal is selected.
Out.En	**Setting up the final value of the analog output, OUT.EN:** **Default:** 10000 The final value is adjusted from the smallest digit to the highest digit with **[▲] [▼]** and digit by digit confirmed with **[P]**. A minus sign can only be parameterised on the highest digit. After the last digit, the device changes back into menu level.

Menu level	Parameterisation level
Out.OF [P] ▼ ▲	**Setting up the initial value of the analog output, OUT.OF:** **Default:** 0 8 [P] 8 [P] 8 [P] 8 [P] 8 ▲▼ [P] The final value is adjusted from the smallest digit to the highest digit with **[▲] [▼]** and digit by digit confirmed with **[P]**. A minus sign can only be parametrised on the highest digit. After the last digit, the device changes back into menu level.
LI-1 [P] ▼ ▲	**Threshold values / limit values, LI-1:** **Default:** 2000 0 [P] 0 [P] 0 [P] 0 [P] 0 ▲▼ [P] For both limit values, two different values can be parameterized. With this, the parameters for each limit value are called up one after another.
HY-1 [P] ▼ ▲	**Hysteresis for limit values, HY-1:** **Default:** 0 0 [P] 0 [P] 0 [P] 0 [P] 0 ▲▼ [P] For all limit values exists a hysteresis function, that reacts according to the settings (threshold exceedance / threshold undercut).
Fu-1 [P] ▼ ▲	**Function if display falls below / exceeds limit value, FU-1:** **Default:** HIGH HIGH ▲▼ Louu ▲▼ [P] 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.
LI-2 [P] ▼ ▲	**Threshold values / limit values, LI-2:** **Default:** 3000 0 [P] 0 [P] 0 [P] 0 [P] 0 ▲▼ [P] For both limit values, two different values can be parameterized. With this, the parameters for each limit value are called up one after another.

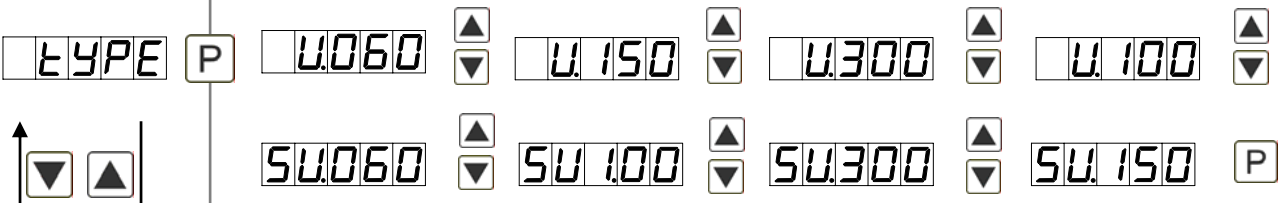| Menu level	Parameterisation level
HY-2 ▲▼	**Hysteresis for limit values, HY-2:** **Default: 0** HY-2 [P] 0 [P] 0 [P] 0 [P] 0 [P] 0 ▲▼ [P] For all limit values exists a hysteresis function, that reacts according to the settings (threshold exceedance / threshold undercut).
Fu-2 ▲▼	**Function if display falls below / exceeds limit value, FU-2:** **Default: HIGH** Fu-2 [P] HIGH ▲▼ Louu ▲▼ [P] A limit value undercut is selected with LOUU (for LOW = lower limit value), a limit value exceedance with HIGH (for HIGH = higher limit value). If e.g. limit value 1 is on a threshold level of 100 and allocated with function HIGH, an alarm is activated by reaching of the threshold level. By allocation of limit value LOUU, an alarm is activated by falling below the threshold value.
U.CodE ▲▼	**User code (4-digit number-combination, free available), U.CODE:** **Default: 0000** U.CodE [P] 8 [P] 8 [P] 8 [P] 8 ▲▼ [P] If this code is set, the user can only choose from a reduced number of parameter sets. He has e.g. no access to the scale of the measuring inputs. Still, a changing of the limit values and the allocation of the analog output are allowed. This reduced parameterisation is activated by selecting LOC in menu item RUN. The device confirms the setting with „- - - - -„ and changes into operation mode. By pressing **[P]** for 3 seconds in operation mode, the display shows CODE and thus confirms the change into the reduced parameterisation. It stays activated as long as the standard parameterisation is activated again by the input of A.CODE (master code).
A.CodE ▲▼	**Master code (4-digit number-combination free available), A.CODE:** **Default: 1234** A.CodE [P] 8 [P] 8 [P] 8 [P] 8 ▲▼ [P] No parameterisation is allowed if this code is set. This function ist activated by selecting LOC in menu item RUN. The device confirms the setting with „- - - -„ and changes into operation mode. By pressing **[P]** for 3 seconds in operation mode, the display shows CODE and thus confirms the activation of the master code. The user can only come to the parameterisation by the correct input of the number-combination. It stays activated as long as ULOC is entered in menu group RUN, this sets the device back into standard parameterisation.
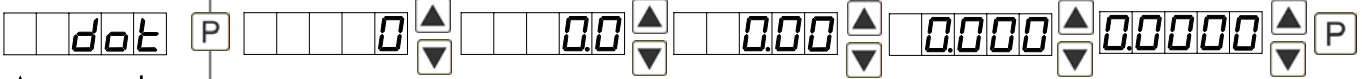
Menu level	Parameterisation level
	Activation / deactivation of the programming lock or completion of the standard parameterization with change into menu group level (complete function range), *RUN*: **Default:** *ULOC* With the navigation keys [▲] [▼], you can choose between the deactivated key lock *ULOC* (works setting) and the activated key lock *LOC*, or the menu group level *PROF*. Confirm 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, press **[P]** for 3 seconds in operating mode. Now enter the *CODE* (works setting *1 2 3 4*) that appears using [▲] [▼] plus **[P]** to unlock the keyboard. *FAIL* appears if the input is wrong. To parametrise further functions *PROF* needs to be set. The device confirms this setting with „- - - - - „ and changes automatically in operation mode. By pressing **[P]** for approx. 3 seconds in operation mode, the first menu group *INP* is shown in the display and thus confirms the change into the extended parameterisation. It stays activated as long as *ULOC* is entered in menu group *RUN* , thus the display is set back in standard parameterisation again.

4.3. Extended parameterisation (professional operation level)
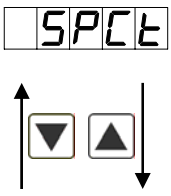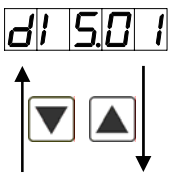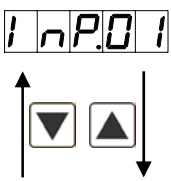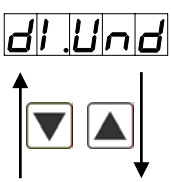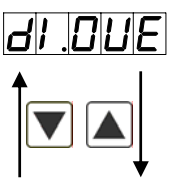
4.3.1. Signal input parameters

Menu group level

Menu level	Parameterisation level
	Selection of the input signal, *TYPE*: **Default:** *SU.060* There are several measuring input options: 60, 150, 600 or 1000 mV signals as works calibration (without application of the sensor signal) and *SU* as sensor calibration (with the sensor applied). Confirm the selection with **[P]** and the display switches back to menu level.

Menu level	Parameterisation level
End	**Setting up the measuring range end value´, *END*:** **Default:** *10000* The final value has to be adjusted from the smallest to the highest digit with [▲] [▼] and needs to be confirmed digit per digit with **[P]**. A minus sign can only be parametrised on the highest digit. After the last digit, it can then be chosen between *NOCA* and *CAL*. With *NOCA* the display value that has been adjusted bevor can now be taken over, with *CAL* the matching is done via the measuring section and the analog input value is taken over. It is always adopted to 100%. With **[P]** the selection is confirmed and the device changes back into menu level.
OFFS	**Setting up the measuring range start/offset value, *OFFS*:** **Default:** *0* Enter the start/offset value from the smallest to the highest digit with [▲] [▼] and confirm each digit with **[P]**. After the last digit the display switches back to the menu level. If *SENS* was selected as 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.
dot	**Setting the decimal point, *DOT*:** **Default:** *0* The decimal point on the display can be moved with [▲] [▼] and confirmed with **[P]**. The display then switches back to the menu level again.
SEC	**Setting up the display time, *SEC*:** **Default:** *1.0* The display time is set with [▲] [▼]. The display moves up in increments of 0.1 up to 1 second and in increments of 1.0 up to 10.0 seconds. Confirm the selection by pressing the **[P]** button. The display then switches back to the menu level again.
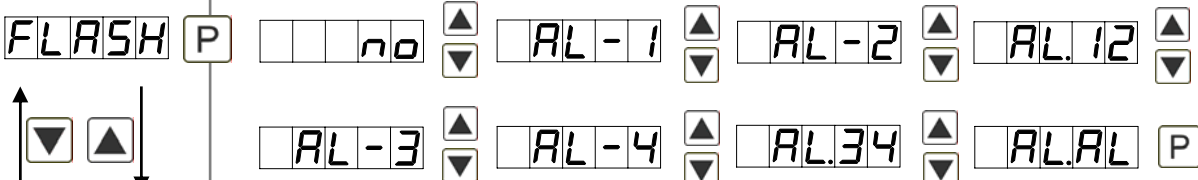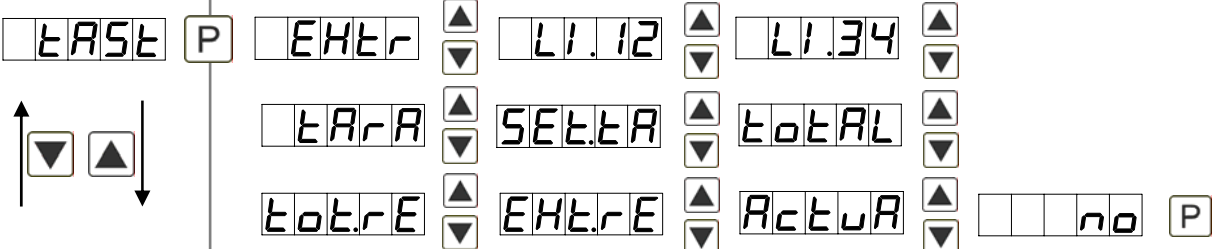
Menu level	Parameterisation level
EndA ▼ ▲	**Rescaling the measuring input values, EndA:** **Default:** 10000 8 P 8 P 8 P 8 P 8 ▲▼ P With this function, you can rescale the input value of **e.g. 19.5 mA** (works setting) without applying a measuring signal. If sensor calibration has been selected, these parameters are not available.
OFFSA ▼ ▲	**Rescaling the measuring input values, OFFA:** **Default:** 0 8 P 8 P 8 P 8 P 8 ▲▼ P With 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.
tArA ▼ ▲	**Setting up the tare/offset value, TARA:** **Default:** 0 0 P 0 P 0 P 0 P 0 ▲▼ P The given value is added to the linearized value. In this way, the characteristic line can be shifted by the selected amount.
AdJ.Pt ▼ ▲	**Setting of the balance point, ADJ.PT:** **Default:** 08000 0 P 0 P 0 P 0 P 0 ▲▼ P The balance point is preset on 80%. This means, during the semi-automatic sensor calibration a checking of the range is done for the offset and the final value. If the setting range was exceeded or undercut by +/-20 % then the failure report C.FAIL is displayed.
Unit ▼ ▲	**Setting up the physical unit, UNIT:** **Default:** NO C ▲▼ F ▲▼ L ▲▼ A ▲▼ U ▲▼ t ▲▼ no P One can choose between the above shown physical units. It will be displayed on the 5th digit of the display.
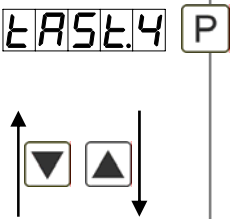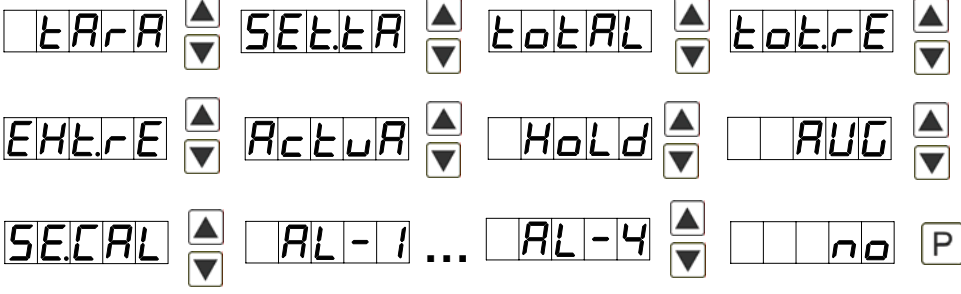
Menu level	Parameterisation level
`SPCt` [P] ▼ ▲	**Number of additional setpoints, SPCT:** **Default:** 00 `0` ▲▼ `0` ▲▼ [P] 8 additional setpoints can be defined to the initial- and final value, so linear sensor values are not linearised. Only activated setpoint parameters are displayed.
`di5.01` [P] ▼ ▲	**Display values for setpoints, DIS.01 ... DIS.30:** `8` [P] `8` [P] `8` [P] `8` [P] `8` ▲▼ | `nOCA` / `CAL` ▲▼ [P] Under this parameter setpoints are defined according to their value. At the sensor calibration, like at Endwert/Offset, one is asked at the end if a calibration shall be activated.
`InP.01` [P] ▼ ▲	**Analog values for setpoints, INP.01 ... INP.30:** `8` [P] `8` [P] `8` [P] `8` [P] `8` ▲▼ [P] These setpoints are displayed at works setting (4-20 mA) only. Here, demanded analog values can be choosen freely. The input of steadily rising analog values needs to be done self-contained.
`di.Und` [P] ▼ ▲	**Device undercut, DI.UND:** **Default:** -19999 `8` [P] `8` [P] `8` [P] `8` [P] `8` ▲▼ [P] With this function the device undercut (_ _ _ _ _) can be defined on a definite value.
`di.OUE` [P] ▼ ▲	**Display overflow, DI.OUE:** **Default:** 99999 `8` [P] `8` [P] `8` [P] `8` [P] `8` ▲▼ [P] With this function the display overflow (‾‾‾‾‾) can be defined on a definite value.
`rEt` ▼ ▲	**Back to menu group level, RET:** With **[P]** the selection is confirmed and the device changes into menu group level „-INP-".
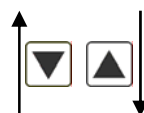
4.3.2. General device parameters

Menu group level
-FCt- ▲▼ P → Menu level

Menu level	Parameterisation level
dl.SEC	**Display time,** *DISEC:* **Default:** *01.0* 00.1 ▲▼ 00.9 then 01.0 ▲▼ 10.0 P The display is set up with [▲] [▼]. Thereby you jump until 1 second in 0.1 steps and until 10.0 seconds in 1.0-steps. With **[P]** the selection is confirmed and the device changes into menu level.
round	**Rounding of display values,** *ROUND:* **Default:** *00001* 00001 ▲▼ 00005 ▲▼ 00010 ▲▼ 00050 P This function is for instable display values, where the display value is changed in 1-, 5-, 10- or 50-steps. This does not affect the resolution of the optional outputs. With **[P]** the selection is confirmed and the device changes into menu level.
ArItH	**Arithmetic,** *ARITH:* **Default:** *NO* no ▲▼ rE2I P ▲▼ rAdI C ▲▼ SquAr P 　　　　Reciprocal　　　Root extraction　　Square With this function the calculated value, not the measuring value, is shown in the display. With *NO* , no calulation is deposited. With **[P]** the selection is confirmed and the device changes into menu level.
AUG	**Sliding average determination,** *AVG:* **Default:** *10* 01 ▲▼ 50 P Here, the number of the meterings that need to be averaged is preset. The time of averaging results of the product of measuring time *SEC* and the averaged metering *AVG*. With the selection of *AVG* in the menu level *DISPL*, the result will be shown in the display and evaluated via the alarms.
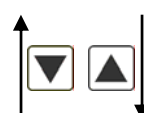
Menu level	Parameterisation level
Zero point slowdown, *ZERO:* **Default:** *00*	

Zero point slowdown, *ZERO:*

Default: *00*

ZErO [P]	*0* [P] *0* [P]
[▼] [▲]	

At the zero point slowdown, a value range around the zero point can be preset, so the display shows a zero. If e.g. a 10 is set, the display would show a zero in the value range from -10 to +10; below continue with -11 and beyond with +11.

Display, *DISPL:*

Default: *ACTUA*

di SPL [P]	*ActuA* [▲][▼] *MI n.UA* [▲][▼] *MAX.UA* [▲][▼] *totAL* [▲][▼]
[▼] [▲]	*HoLd* [▲][▼] *AUG* [P]

With this function the current measuring value, Min-/Max value, totaliser value, the process-controlled Hold-value or the sliding average value can be allocated to the display. With **[P]** the selection is confirmed and the device changes into menu level.

Display flashing, *FLASH:*

Default: *NO*

FLASH [P]	*no* [▲][▼] *AL-1* [▲][▼] *AL-2* [▲][▼] *AL.12* [▲][▼]
[▼] [▲]	*AL-3* [▲][▼] *AL-4* [▲][▼] *AL.34* [▲][▼] *AL.AL* [P]

A display flashing can be added as additional alarm function either to single or to a combination of off-limit condition. With *NO*, no flashing is allocated.

Assignment (deposit) of key functions, *TAST:*

Default: *NO*

tASt [P]	*EXtr* [▲][▼] *LI.12* [▲][▼] *LI.34* [▲][▼]
[▼] [▲]	*tArA* [▲][▼] *SEt.tA* [▲][▼] *totAL* [▲][▼]
	tot.rE [▲][▼] *EXt.rE* [▲][▼] *ActuA* [▲][▼] *no* [P]

For the operation mode, special functions can be deposited on the navigation keys [▲] [▼], in particular this function is made for devices in housing size 48x24 which do not have a 4th (**[O]** key). If the MIN-/MAX-memory is activated with *EXTR*, all measured MIN/MAX-values are safed during operation and can be recalled via the navigation keys.

Menu level	Parameterisation level
Assignment (deposit) **of key functions,** *TAST:*	The values get lost by re-start of the device. If the threshold value correction *LI.12* or *LI.34* is choosen, the values of the threshold can be changed during operation without disturbing the operating procedure. With *TARA* the device is tared to zero and safed permanently as offset. The device acknowledges the correct taring with *00000* in the display. *SET.TA* adds a defined value on to the currently displayed value. Via *TOTAL* the current value of the totaliser can be displayed for approx. 7 seconds, after this the device jumps back on the parametrised display value. If *TOT.RE* is deposited, the totaliser can be set back by pressing of the navigation keys [▲] [▼], the device acknowledges this with *00000* in the display. By allocation on *EHT.RE* the MIN/MAX-memory is deleted. At *ACTUA* the measuring value is shown for approx. 7 seconds, after this the device jumps back on the parametrised display value. If *NO* is selected, the navigation keys are without any function in the operation mode.
	Special function [O]-key, *TAST.4:* **Default:** *NO* For the operation mode, special functions can be deposited on the **[O]**-key. This function is activated by pressing the key. With *TARA* the device is tared to zero and safed permanently as offset. The device acknowledges the correct taring with *00000* in the display. *SET.TA* adds a defined value on to the currently displayed value. Via *TOTAL* the current value of the totaliser can be displayed for approx. 7 seconds, after this the device switches back on the parametrised display value. If *TOT.RE* is deposited, the totaliser can be set back by pressing of the navigation keys [▲] [▼], the device acknowledges this with *00000* in the display. *EHT.RE* deletes the MIN/MAX-memory. If *HOLD* has been selected, the moment can be hold constant by pressing the **[O]**-key, and is updated by releasing the key. Advice: *HOLD* is activated only, if *HOLD* is selected under parameter *DISPL. ACTUA* shows the measuring value for approx. 7 seconds, after this the device jumps back on the parametrised display value. The same goes for *AVG*, here the sliding average value is displayed. Via *SE.CAL* a sensor calibration is done by pushing the **[O]**-key, the sequence programm is shown in *chapter 4.5*. At *AL-1...AL-4* there can be set an output and therewith e.g. a setpoint adjustment can be done. If *NO* is selected, the **[O]**-key is without any function in the operation mode.

Menu level	Parameterisation level
	Special function digital input, *DIG.IN:* **Default:** *NO* In operation mode, the above shown parameters can be laid on the optional digital input, too. Function description see *TAST.4*.
	Back to menu group level, *RET*: With **[P]** the selection is confirmed and the device changes into menu group level „*- FCT -*".

4.3.3. Safety parameters

Menu group level
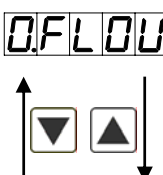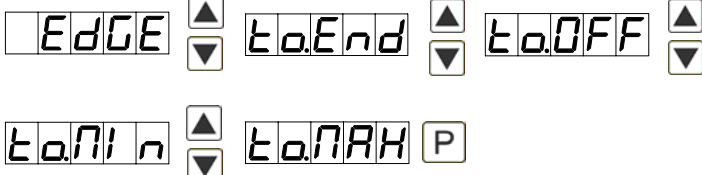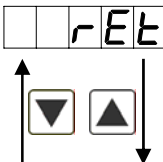
Menu level	Parameterisation level
	User code, *U.CODE:* **Default:** *0000* Via this code reduced sets of parameters can be set free. A change of the *U.CODE* can be done via the correct input of the *A.CODE* (master code).
	Master code, *A.CODE*: **Default:** *1234* By entering *A.CODE* the device will be unlocked and all parameters are released.

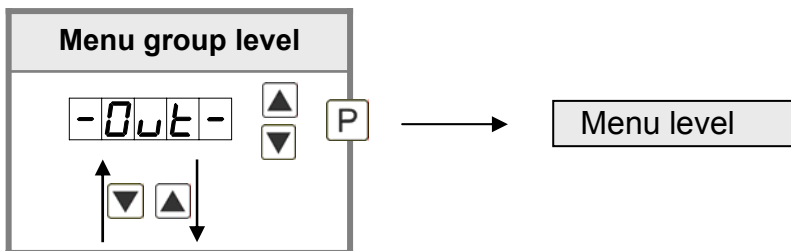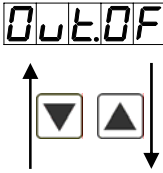| Menu level	Parameterisation level
`OutLE` [P] ▼ ▲	**Release/lock analog output parameters, `OUT.LE`:** **Default:** `ALL` `no` ▲▼ `En-OF` ▲▼ `Out.EO` ▲▼ `ALL` [P] Analog output parameters can be locked or released for the user: - At `EN-OF` the initial or final value can be changed in operation mode. - At `OUT.EO` the output signal can be changed from e.g. 0-20mA to 4-20mA or 0-10VDC. - At `ALL` analog output parameters are released. - At `NO` all analog outpout parameters are locked.
`AL.LEU` [P] ▼ ▲	**Release/lock alarm parameters, `AL.LEU`:** **Default:** `ALL` `no` ▲▼ `LIMIt` ▲▼ `ALrM.L` ▲▼ `ALL` [P] This parameter describes the user relase/user lock of the alarm. - `LIMIT`, here only the range of value of the threshold values 1-4 can be changed. - `ALRM.L`, here the range of value and the alarm trigger can be changed. - `ALL`, all alarm parameters are released. - `NO`, all alarm parameters are locked.
`rEt` ▼ ▲	**Back to menu group level, `RET`:** With **[P]** the selection is confirmed and the device changes into menu group level „`- COD -`".

4.3.4. Analog output parameters

Menu group level
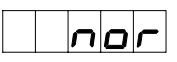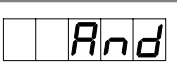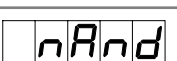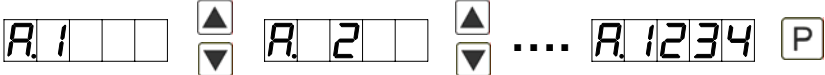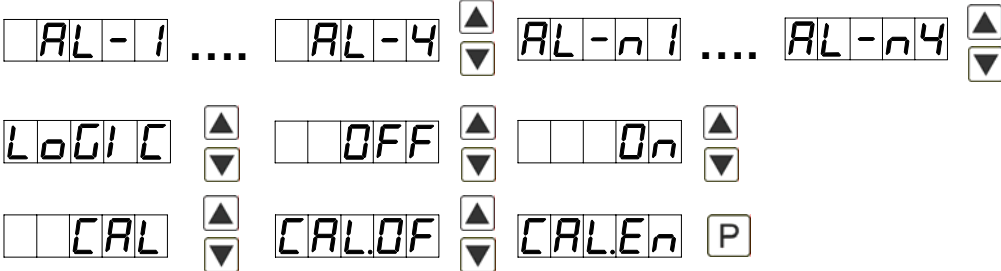
Menu level

Menu level	Parameterisation level
	Selection reference analog output, *OUTPT*: **Default:** *ACTUA* The analog output signal can refer to different functions, in detail this are the current measuring value, Min-value, Max-value, totaliser-/sum-function or the sliding average value. If *HOLD* is selected the signal of the analog output will be hold and processed just after deactivation of *HOLD*. With **[P]** the selection is confirmed and the device changes into menu level.
	Selection analog output, *OUT.RA*: **Default:** *4-20* There are 3 output signals availabe: 0-10 VDC, 0-20 mA and 4-20 mA. With this function the demanded signal can be selected.
	Setting up the final value of the analog output, *OUT.EN*: **Default:** *10000* The final value can be adjusted from the smallest to the highest digit with [▲] [▼]. 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.

Menu level	Parameterisation level
Oᴜt.OF ▼ ▲	**Setting up the initial value of the analog output, *OUT.OF:*** **Default:** *00000* *8* P *8* P *8* P *8* P *8* ▲▼ P The initial value can be adjusted from the smallest to the highest digit with [▲] [▼]. 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.
O.FLOU ▼ ▲	**Overflow behavior, *O.FLOU:*** **Default:** *EDGE* *EdGE* ▲▼ *to.End* ▲▼ *to.OFF* ▲▼ *to.MIn* ▲▼ *to.MAX* P To recognise and evaluate faulty signals, e.g. by a controller, the overflow behaviour of the analog output can be defined. As overflow can be seen either *EDGE*, that means the analog output runs on the set limits e.g. 4 and 20 mA, or *TO.OFF* (input value smaller than initial value, analog output switches on e.g. 4 mA), *TO.END* (higher than final value, analog output switches to e.g. 20 mA). If *TO.MIN* or *TO.MAX* is set, the analog output switches to the smallest or highest possible binary value. This means that values of e.g. 0 mA, 0 VDC or values higher than 20 mA or 10 VDC can be reached. With **[P]** the selection is confirmed and the device changes into menu level.
rEt ▼ ▲	**Back to menu group level, *RET*:** With **[P]** the selection is confirmed and the device changes into menu group level „*– OUT –*".

4.3.5. Relay functions

Menu group level

-ᵣEL- ▲▼ P ──────▶ Menu level

▼▲

Menu level	Parameterisation level
	Alarm relay 1, *REL-1:* **Default:** *AL-1* ᵣEL-1 P AL-1 .... AL-4 ▲▼ AL-n1 .... AL-n4 ▲▼ ▼▲ LoGIC ▲▼ OFF ▲▼ On ▲▼ CAL ▲▼ CAL.OF ▲▼ CAL.En P Each setpoint (optional) can be linked up via 4 alarms (by default). This can either be inserted at activated alarms *AL1/4* or de-activated alarms *ALN1/4*. If *LOGIC* is selected, logical links are available in the menu level *LOG-1* and *COM-1*. One can only get to these two menu levels via *LOGIC*, at all other selected functions, these two parameters are overleaped. Via *ON/OFF* the setpoints can be activated/de-activated, in this case the output and the setpoint display are set/not set on the front of the device. The parameters *CAL*, *CAL.OF* and *CAL.EN* are only used in combination with the semi-automatic calibration (chapter 4.5 sensor calibration). At *CAL*, the relay switches during sensor calibration, at *CAL.OF* during the offset calibration and at *CAL.EN* during the final value calibration. With **[P]** the selection is confirmed and the device changes into menu level.

Menu level	Parameterisation level
`LoG-1` [P] ▼▲	**Logic relay 1,** `LOG-1` **Default:** `OR` `or` ▲▼ `nor` ▲▼ `And` ▲▼ `nAnd` [P] Here, the switching behaviour of the relay is defined via a logic link, the following schema describes these functions with inclusion of `AL-1` and `AL-2`:

`or`	$A1 \lor A2$	As soon as a selected alarm is activated, the relay operates. Equates to operating current principle.
`nor`	$\overline{A1 \lor A2} = \overline{A1} \land \overline{A2}$	The relay operates only, if no selected alarm is active. Equates to quiescent current principle.
`And`	$A1 \land a2$	The relay operates only, if all selected alarms are active.
`nAnd`	$\overline{A1 \land A2} = \overline{A1} \lor \overline{A2}$	As soon as a selected alarm is not activated, the relay operates.

With **[P]** the selection is confirmed and the device changes into menu level.

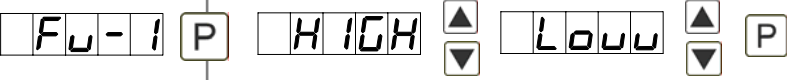| Menu level	Parameterisation level
`CoM-1` [P] ▼▲	**Alarms for relay 1,** `COM-1`: **Default:** `OR` `A.1` ▲▼ `A.2` ▲▼ …. `A.1234` [P] The allocation of the alarms to relay 1 happens via this parameter, one alarm or a group of alarms can be chosen. With **[P]** the selection is confirmed and the device changes into menu level.
`rEL-2` [P] ▼▲	**Alerting relay 2,** `REL-2`: **Default:** `AL-2` `AL-1` …. `AL-4` ▲▼ `AL-n1` …. `AL-n4` ▲▼ `LoGIC` ▲▼ `OFF` ▲▼ `On` ▲▼ `CAL` ▲▼ `CAL.OF` ▲▼ `CAL.En` [P] Each setpoint (optional) can be linked up via 4 alarms (by default). This can either be inserted at activated alarms `AL1/4` or de-activated alarms `ALN1/4`. If `LOGIC` is selected, logical links are available in the menu level `LOG-1` and `COM-1`. One can only get to these two menu levels via `LOGIC`, at all other selected functions, these two parameters are overleaped. Via `ON/OFF` the setpoints can be activated/de-activated, in this case the output and the setpoint display are set/not set on the front of the device. The parameters `CAL`, `CAL.OF` and `CAL.EN` are only used in combination with the semi-automatic calibration (see *chapter 4.5*). At `CAL`, the relay switches during sensor calibration, at `CAL.OF` during the offset calibration and at `CAL.EN` during the final value calibration. With **[P]** the selection is confirmed and the device changes into menu level.

Menu level	Parameterisation level
LoG-2 [P] ▼ ▲	**Logic relay 2, _LOG-2_:** **Default: _OR_** [ ] [ ] [ ] or ▲▼ [ ] nor ▲▼ [ ] _And_ ▲▼ _nAnd_ [P] Here, the switching behaviour of the relay is defined via a logic link, the following schema describes these functions with inclusion of _AL-1_ and _AL-2_:

or	$A1 \lor A2$	As soon as a selected alarm is activated, the relay operates. Equates to operating current principle.
nor	$\overline{A1 \lor A2} = \overline{A1} \land \overline{A2}$	The relay operates only, if no selected alarm is active. Equates to quiescent current principle.
And	$A1 \land a2$	The relay operates only, if all selected alarms are active.
nAnd	$\overline{A1 \land A2} = \overline{A1} \lor \overline{A2}$	As soon as a selected alarm is not activated, the relay operates.

With **[P]** the selection is confirmed and the device changes into menu level.

Menu level	Parameterisation level
CoN-2 [P] ▼ ▲	**Alarms for relay 2, _CON-2_:** **Default: _A. 2_** **CoN-2** [P] _A. 1_ ▲▼ _A. 2_ ▲▼ .... _A. 1234_ [P] The allocation of the alarms to relay 2 happens via this parameter, one alarm or a group of alarms can be chosen. With **[P]** the selection is confirmed and the device changes into menu level.
rEt ▼ ▲	**Back to menu group level, _RET_:** With **[P]** the selection is confirmed and the device changes into menu group level „– REL –".

4.3.6. Alarm parameters

Menu group level

-RL 1- ▲▼ P ⟶ Menu level

Menu level	Parameterisation level
AL-N.1 P	**Dependency alarm1, ALRM.1:** **Default:** ACTUR ActuA ▲▼ MInuR ▲▼ MAHuR ▲▼ totAL ▲▼ Hold ▲▼ AUG ▲▼ EHtEr P The dependency of alarm 1 can be related to special functions, in detail these are the current measuring value, the MIN-value, the MAX-value, the totaliser-/sum-value or the sliding average value. Is HOLD selected, then the alarm is hold and processed just after deactivation of HOLD. EHTER causes the dependency either by pressing the **[O]**-key on the front of the housing or by an external signal via the digital input. With **[P]** the selection is confirmed and the device changes into menu level.
L1-1 P	**Threshold values / limit values, LI-1:** **Default:** 2000 0 P 0 P 0 P 0 P 0 ▲▼ P For both limit values, two different values can be parameterized. With this, the parameters for each limit value are called up one after another.
HY-1 P	**Hysteresis for limit values, HY-1:** **Default:** 00000 0 P 0 P 0 P 0 P 0 ▲▼ P For all limit values exists a hysteresis function, that reacts according to the settings (threshold exceedance / threshold undercut).
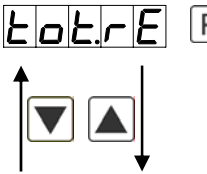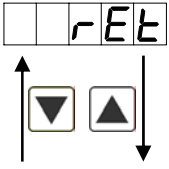
Menu level	Parameterisation level
`Fu-1` [P] [▼][▲]	**Function if display falls below / exceeds limit value, `FU-1`:** **Default: `HIGH`** `HIGH` [▲▼] `Louu` [▲▼] [P] The limit value undercut can be selected with `LOUU` (LOW = lower limit value) and limit value exceedance can be selected with `HIGH` (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.
`ton-1` [P] [▼][▲]	**Switching-on delay, `TON-1`:** **Default: `000`** `0` [P] `0` [P] `0` [▲▼] [P] For limit value 1 one can preset a delayed switching-on of 0-100 seconds.
`toF-1` [P] [▼][▲]	**Switching-off delay, `TOF-1`:** **Default: `000`** `0` [P] `0` [P] `0` [▲▼] [P] For limit value 1 one can preset a delayed switching-off of 0-100 seconds.
`rEt` [▼][▲]	**Back to menu group level, `RET`:** With **[P]** the selection is confirmed and the device changes into menu group level „`- ALI -`".

The same applies to `-AL2-` to `-AL4-`.

4.3.7. Totaliser (volume measurement)

Menu group level

$-tot-$ ▲▼ P ⟶ Menu level

▼ ▲

Menu level	Parameterisation level
$totAL$ ▼ ▲	**Totaliser state, $TOTAL$:** **Default:** OFF OFF ▲▼ $StEAd$ ▲▼ $tEMP$ ▲▼ P The totaliser makes measurements on a time base of e.g. l/h possible, at this the scaled input signal is integrated by a time and steadily (select $STEAd$) or temporarily (select $TEMP$) safed. If OFF is selected, the function is de-activated. With **[P]** the selection is confirmed and the device changes into menu level.
$t.bASE$ ▼ ▲	**Time base, $T.BASE$:** **Default:** SEC SEC ▲▼ MIn ▲▼ $hour$ ▲▼ P Under this parameter the time base of the measurement can be preset in seconds, minutes or hours.
$FActo$ ▼ ▲	**Totaliser factor, $FACTO$:** **Default:** 10^0 10^0 ▲▼ … 10^6 ▲▼ P At this the factor ($10^0…10^6$) respectively the divisor for the internal calculation of the measuring value is assigned.
$tot.dt$ ▼ ▲	**Setting up the decimal point for the totaliser, $TOT.DT$:** **Default:** 0 0 ▲▼ 0.0 ▲▼ 0.00 ▲▼ 0.000 ▲▼ 0.0000 ▲▼ P The decimal point of the device can be adjusted with the navigation keys **[▲] [▼]**. With **[P]** the selection is confirmed and the device changes into menu level.

Menu level	Parameterisation level
tot.rE P ↑ ▼ ▲ ↓	**Totaliser reset,** *TOT.RE:* **Default:** *00000* 8 P 8 P 8 P 8 P 8 ▲▼ P The reset value is adjusted from the smallest to the highest digit with the navigation keys **[▲] [▼]** and digit per digit confirmed with **[P]**. After the last digit, the display switches back to the menu level. The activator for the reset is parameter driven via the 4th key or via the optional digital input.
rEt ↑ ▼ ▲ ↓	**Back to menu group level,** *RET*: With **[P]** the selection is confirmed and the device changes into menu group level „*– TOT –*".

4.3.8. Programming lock, *RUN*:

Menu group level
–run– ▲▼ P ↑ ▼ ▲ ↓
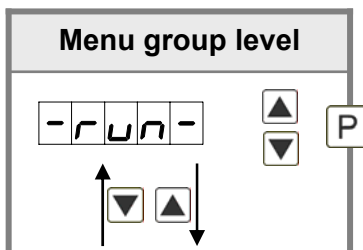
Description see page 11, menu level *RUN*

4.4. 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.

4.5. Alarms / Relays

This device has 4 virtual alarms that can monitor one limit value in regard of an undercut or exceedance. Each alarm can be allocated to an optional relay output S1-S2; furthermore alarms can be controlled by events like e.g. Hold or Min-/Max-value.

Function principle of alarms / relays	
Alarm / Relay x	De-activated, instantaneous value, Min-/Max-value, Hold-value, totaliser value
Switching threshold	Threshold / limit value of the change-over
Hysteresis	Broadness of the window between the switching thresholds
Working principle	Operating strom / Quiescent current
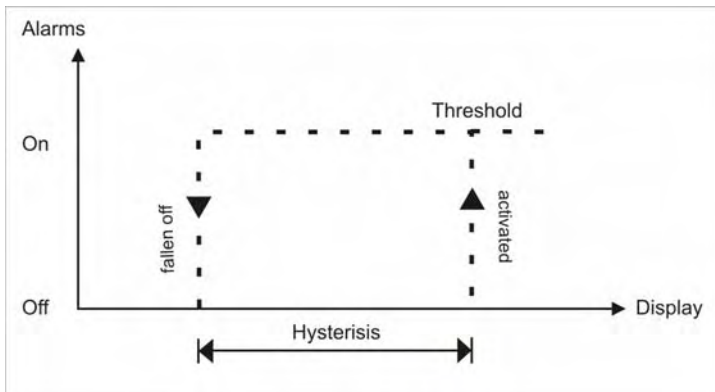
Operating current
By operating current the alarm S1-S2 is off below the threshold and on on reaching the threshold.
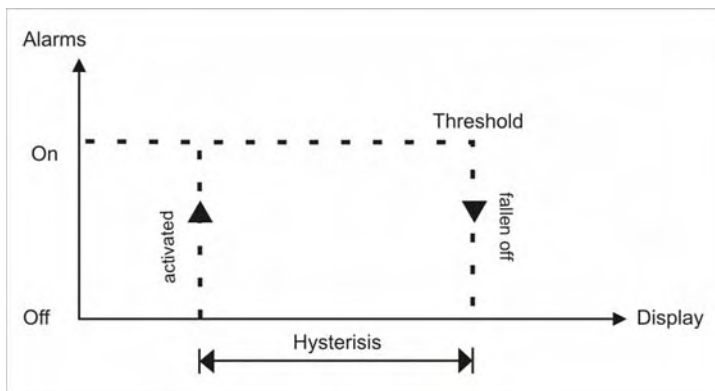
Quiescent current
By quiescent current the alarm S1-S2 is on below the threshold and switched off on reaching the threshold.
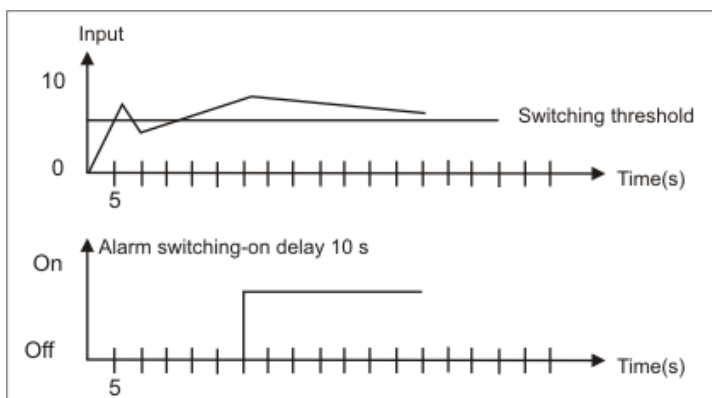
Switching-on delay
The switching-on delay is activated via an alarm and e.g. switched 10 seonds after reaching the switching threshold, a short-term exceedance of the switching value does not cause an alarm, respectively does not cause a switching operation of the relay. The switching-off delay operates in the same way, keeps the alarm / the relay switched longer for the parametrised time.

4.6. Sensor calibration offset / final value

The device has an semi-automatic sensor calibration, where a switching output operates an 80% adjustable resistors, as one finds in some sensors. Like this, offset and final value are adjusted, and the sensor can be applied directly after this. The calibration can be done via the 4th key or the digital input, depending on the parameterisation.

Push Trigger for minimum 3 seconds.

`CAL.OF`

For min. 1 measuring cycle, min. 1s or max. by trigger.

`0.61` Current measuring range value in per cent.

For min. 1 measuring cycle, min. 1s or max. by trigger.

Breached at +/- 20% range monitoring.

`CAL.En` switching output activated., e.g. 80%

For min. 1 measuring cycle, min. 1s or max. by trigger.

`71.32` Current measuring range value in per cent.

For min. 1 measuring cycle, min. 1s or max. by trigger.

Breached at +/- 20% range monitoring.

`C.SAVE` Switch-off 80%-switching ouput and display for min. 1 measuring cycle or min. 1s waiting time.

`C.FAIL`

Back to regular operation mode.

Back to regular operation mode after 1s or 1 measuring cycles.

If a special input range *SU.060*, *SU.100*, *SU.300* or *SU.150* was selected under *TYPE*, a checking of the range is done for offset and final value. At an undercut/exceedance of +/- 20% of adjustment range, an *C.FAIL* is given out.

5. Technical data

Housing	
Dimensions	96x48x70 mm (BxHxD)
	96x48x89 mm (BxHxD) incl. plug-in terminal
Panel cut-out	$92.0^{+0.8}$ x $45.0^{+0.6}$ mm
Wall thickness	up to 15 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 (optional green, yellow or blue)
Range of display	-19999 to 99999
Setpoints	one LED per setpoint
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
-5…75 mV	0…60 mV	~12 kΩ	0.2 % of measuring range	±1
-15…180 mV	0…150 mV	~60 kΩ	0.2 % of measuring range	±1
-30…360 mV	0…300 mV	~30 kΩ	0.2 % of measuring range	±1
-100…1200 mV	0…1000 mV	~200 kΩ	0.2 % of measuring range	±1
Digital input	< 24 V OFF, 10 V ON, max. 30 VDC R_I ~ 5 kΩ			
Temperature drift	100 ppm / K			
Measuring time	0.1…10.0 seconds			
Measuring principle	U/F-conversion			
Resolution	approx. 18 Bit at 1 second measuring time			

Output	
Analogausgang	0/4-20 mA or 0-10 VDC 16 Bit reversible
Switching output	
Relay Switching cycles	with change-over contacts 250 VAC / 5 AAC; 30 VDC / 5 ADC 30×10^3 at 5 AAC, 5 ADC ohm resistive load 10×10^6 mechanically Diversity according to DIN EN50178 / Characteristics according to DIN EN60255
Power supply	230 VAC +/- 10 % max. 10 VA 10-30 VDC galv. insulated, max. 4 VA
Memory	EEPROM
Data life	≥ 100 years
Ambient conditions	
Working temperature	0…50°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 60664-1

6. Safety advices

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

Proper use

The **M2-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 **M2-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.

7. 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.