User manual M3

Frequency input: 0,01 Hz to 999,99 Hz

Connection for Namur-, NPN-, PNP- and TTL-sensors

Technical features:

- red display of -19999…99999 digits (optional: green, orange or blue display)
- minimal installation depth: 120 mm without plug-in terminal
- min-/max memory
- 30 parameter driven setpoints
- optical threshold value indication
- Schmitt-trigger-input
- zero-key for triggering of HOLD, TARA
- permanent min-/max-value recording
- volume measurement (totaliser)
- arithmetic function
- zero point tranquilization
- programming interlock via access code
- protection class IP65 at the front
- plug-in terminal
- digital input
- option: 2 or 4 relay outputs or 8 PhotoMos-outputs
- option: 1 or 2 analog outputs
- option: RS232 or RS485 interface

Identification

STANDARD TYPES	ORDER NUMBER
Frequency Housing size: 96x48 mm	**M3-1FR5B.0307.570AD** **M3-1FR5B.0307.670AD**

Options – breakdown of order code:

M3-1FR5B.0307.672AD

Basic type M3

Installation depth
139 mm, incl.plug-in terminal [3]

Housing size
B96xH48xT120 mm [1]

Type of display
Frequency [F]

Display colour
Blue [B]
Green [G]
Red [R]
Yellow [Y]

Number of digits
5-digit [5]

Digit height
14 mm [B]

Interface
RS232 [3]
RS485 [4]

Dimension
[D] physical unit

Version
[A] A

Setpoints
[0] no setpoints
[2] 2 relay outputs
[4] 4 relay outputs
[8] 8 PhotoMos outputs

Protection class
[7] IP65 / plug-in terminal

Voltage supply
[4] 115 VAC
[5] 230 VAC
[6] 10-30 VDC galv.insulated

Measuring input
[7] 0.01 Hz to 999.99 Hz

Analog output
[0] without
[X] 0-10 VDC, 0/4-20 mA

Sensor supply
[2] 10 VDC / 20 mA
incl. digital input
[3] 24 VDC / 50 mA
incl. digital input
[K] 24 VDC / 50 mA
incl. digital input and
pulse out put (10 kHz only
with frequency measuring)
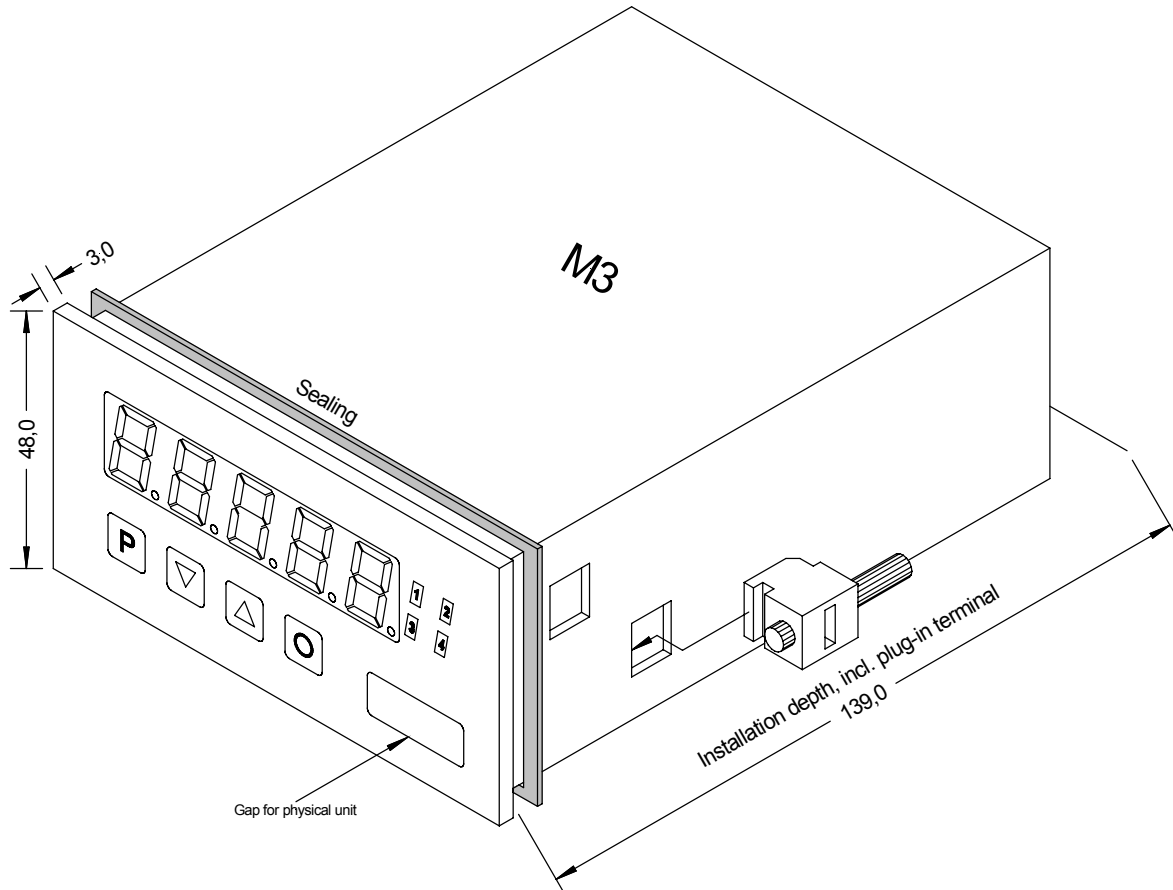
Please state physical unit by order, e.g. m/min.

Contents

1. Assembly

Please read the *Safety advice* on *page 49* 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!
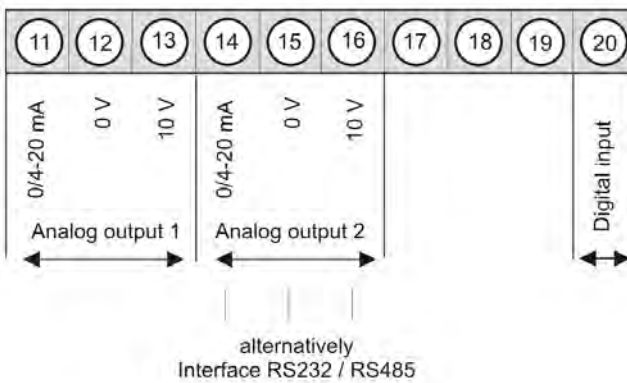

The dimension symbols can be exchanged before installation via a channel on the side!

2. Electrical connection

Type M3-1FR5B.0007.570AD with a supply of 230 VAC
Type M3-1FR5B.0307.670AD with a supply of 10-30 VDC
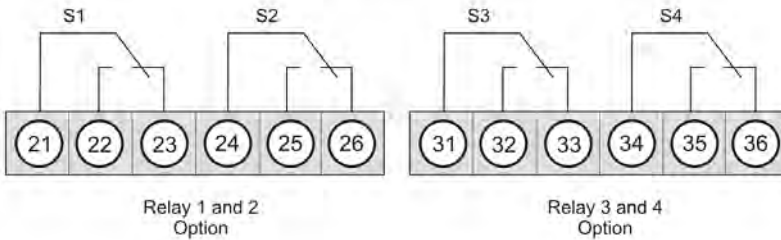

Options:

alternatively
Interface RS232 / RS485
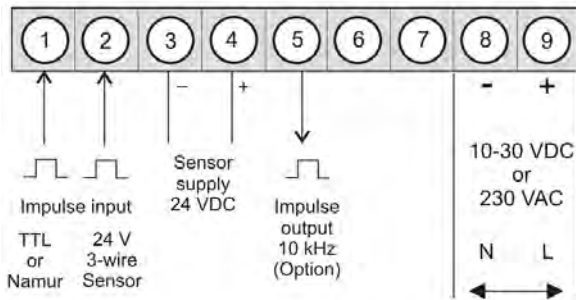
Attention!

For devices with sensor supply, terminal clamps 4 and 18, aswell as 3 and 19 are connected galvanically in the device.

Relay 1 and 2
Option

Relay 3 and 4
Option

Alternative to relay

8 PhotoMos outputs
Option
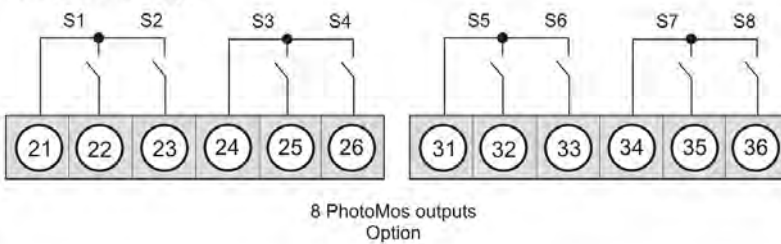
Alternative to analog output 2

Interface RS232

Interface RS485
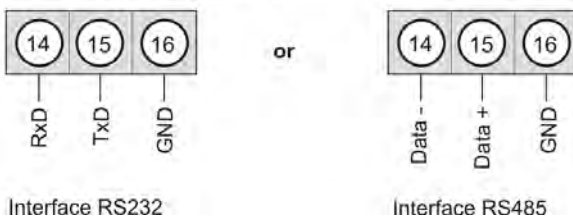
M3-devices with frequency respectively impulse input

Namur

10-30 VDC

Namur

N   L
230 VAC

3-wire NPN

Pull-up
(extern)
2,7 kΩ
0,5 W

10-304 VDC

3-wire NPN

Pull-up
(extern)
2,7 kΩ
0,5 W

N   L
230 VAC

3-wire PNP

10-30 VDC

3-wire PNP

N   L
230 VAC
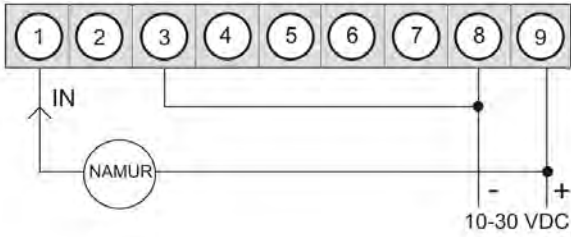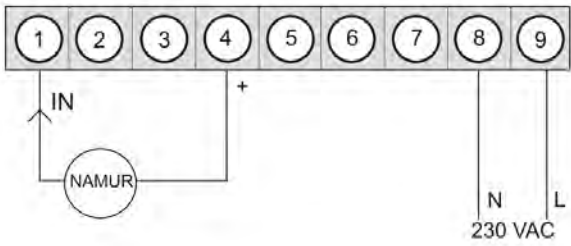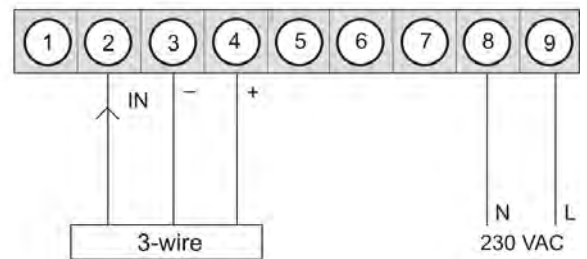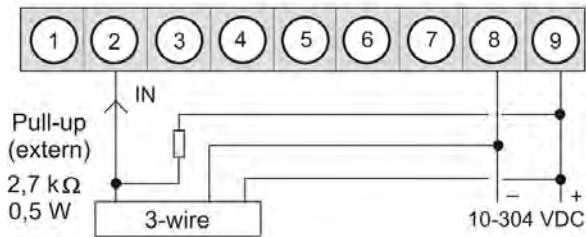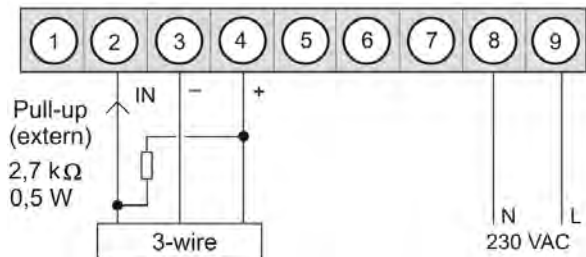
3. Function- and operation description

Operation
The operation is divided into three different levels.

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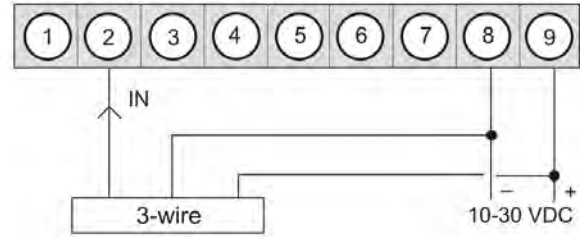This level is for the standard settings of the device. Only menu items which are sufficent to set the device into operation are displayed. To get into the professional level, run through the menu level and parameterise **"prof"** under menu item *RUN*.

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 „zero-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.

Function chart:

Standard parameterisation
(Flat operation level)

Extended parameterisation
(professional operation level)

Operation mode

88888

Operation mode

88888

[P]   [O]

run "*PROF*" [P]

run "*ULOC*" [P]

Menu level

Menu group level

Input break > 10 s

[P]

[O] or [P]

[P]

[O] Or [P]

Input break > 10 s

Parameter level   [▲][▼]

Menu level

[P]

[O] or [P]

Parameter level   [▲][▼]
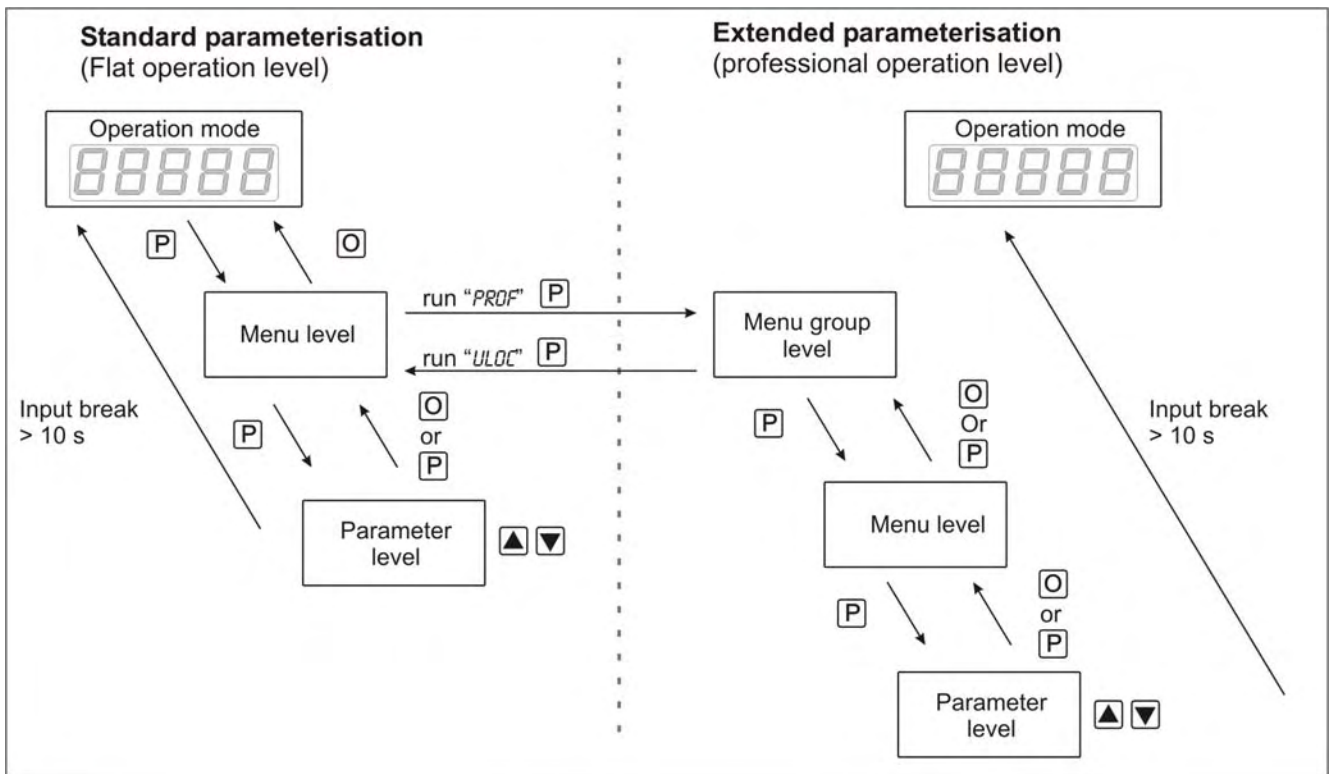
Underline:

[P] Takeover   [▲] Value selection (+)

[O] Stop   [▼] 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
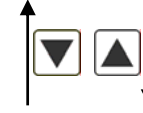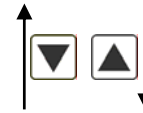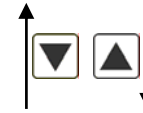
For 1 second during the switching-on process, the segment test ($8\ 8\ 8\ 8\ 8$) is displayed, followed by an indication of the software type and, after that, also for 1 second, the software version. After the starting sequence, the device switches to operation/display mode.

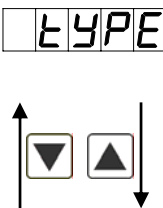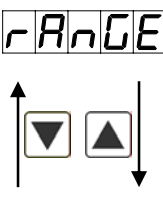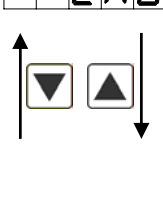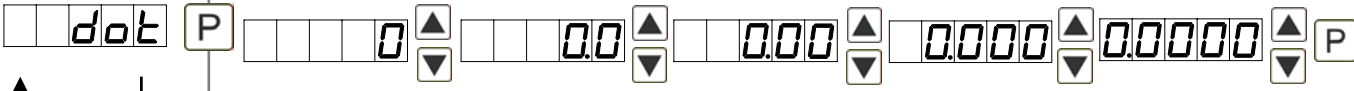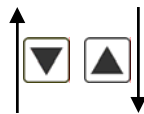## 4.2. Standard parameterisation: (flat operation level)

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
	Selection of the input signal, *TYPE*: [*tYPE*] [P] [*SEnS.F*] [▲▼] [*FrEQU*] [P] [▼][▲] If the scaling of the device is done via *SENS.F* (Sensor calibration), the frequency range needs to be preset under *RANGE* and is adjusted by application of the final value /initial value. If *FREQU* (Factory calibration) is preferred, the final value needs to be entered under *END* and the final frequency needs to be entered under *ENDA*. Under *OFFS* the initial value needs to be entered and under *OFFSA* the initial frequency. There is no application of the measuring signal. Confirm the selection with **[P]** and the display switches back to menu level.
	Setting the measuring range end value, *END*: [*rAnGE*] [P] [*1E0*] [▲▼] [*10E0*] [▲▼] [*100E0*] [▲▼] [*1E3*] [▲▼] 9.9999 Hz 99.999 Hz 999.99 Hz 9.9999 kHz [▼][▲] [*10E3*] [▲▼] [*100E3*] [P] 99.999 kHz 999.99 kHz Choose between six different frequency ranges. Confirm the selection with **[P]** and the display switches back to menu level.
	Setting the measuring range final value, *END*: [*End*] [P] [8] [P] [8] [P] [8] [P] [8] [P] [8] [▲▼] [*nOCA* / *CAL*] [▲▼] [P] [▼][▲] Set the final value from the smallest to the highest digit with [▲] [▼] and confirm each digit with **[P]**. A minus sign can only be parametrized 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
Setting the measuring range start/offset value, *OFFS*: `OFFS` [P] `8` [P] `8` [P] `8` [P] `8` [P] `8` [▲][▼] | `nOCA` / `CAL` [▲][▼] [P]	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.F* 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 decimal point, *DOT*: `dot` [P] `0` [▲][▼] `0.0` [▲][▼] `0.00` [▲][▼] `0.000` [▲][▼] `0.0000` [▲][▼] [P]	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 up the display time, *SEC*: `SEC` [P] `00.1` [▲][▼] `00.9` then `01.0` [▲][▼] `10.0` [P]	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.
Rescaling the measuring input values, *ENDA*: `EndA` [P] `8` [P] `8` [P] `8` [P] `8` [P] `8` [▲][▼] [P]	With this function, you can rescale the input value of **e.g. 8.000 Hz** (works setting) without applying a measuring signal. If sensor calibration has been selected, these parameters are not available.
Rescaling the measuring input values, *OFFA*: `OFFSA` [P] `8` [P] `8` [P] `8` [P] `8` [P] `8` [▲][▼] [P]	With this function, you can rescale the input value of **e.g. 100 Hz** (works setting) without applying a measuring signal. If sensor calibration has been selected, these parameters are not available.

Menu level	Parameterisation level
`dELAY` [P] ▼▲	**Setting of the impulse delay, `DELAY`:** [ ] [ ] [ ] [ ] [0] ▲▼ [ ] [ ] [250] [P] With the impulse delay of 0 – 250 ms (max), frequencies can be collected, which are even smaller than by the predetermined measuring time of the device. If e.g. a delay of 250 seconds is set, this means that the device waits up to 250 seconds for an edge, before it assumes a 0 Hz-frequency. Thus frequencies up to 0.004 Hz can be collected.
`Out.rA` [P] ▼▲	**Selection of analog output, `OUT.RA`:** [0-10] ▲▼ [0-20] ▲▼ [4-20] [P] 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` [P] ▼▲	**Setting up the final value of the analog output, `OUT.EN`:** [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.
`Out.OF` [P] ▼▲	**Setting up the initial value of the analog output, `OUT.OF`:** [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.
`L1-1` [P] ▼▲	**Threshold values / limit values, `LI-1`:** [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
Hysteresis for limit values, HY-1:	
`HY-1` 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).
Function if display falls below / exceeds limit value, FU-1:	
`FU-1` P `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. See page 29.
	This applies for LI-1 to LI-4!
User code (4-digit number-combination, free available), U.CODE:	
`U.CodE` P `8` P `8` P `8` P `8` ▲▼ P	If this code is set (>0000), all parameters are locked, if *LOC* has been selected before under menu item *RUN*. By pushing **[P]** during operation mode for approx. 3 seconds, *CODE* appears in the display. To get to the unlocked reduced parameter, the user needs to enter the preset *U.CODE*. This code has to be entered before each parametrisation, until the *A.CODE* (Master code) unlocks all parameters again.
Master code (4-digit number-combination free available), A.CODE:	
`A.CodE` P `8` P `8` P `8` P `8` ▲▼ P	With this code, all parameters can be unlocked, if *LOC* has been activated before under menu item *RUN*. By pushing **[P]** during operation mode for approx. 3 seconds, *CODE* appears in the display. The user can now reach all parameters by entering *A.CODE*. Leaving the parametrisation, under menu item *RUN*, the user can unlock them permanently by choosing *ULOC* or *PROF*. So, there is no need for anew code entering, even by pushing **[P]** during operation mode again.
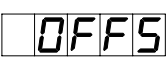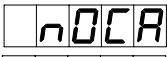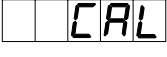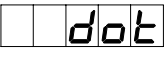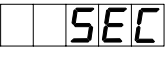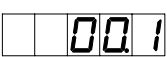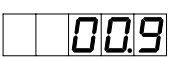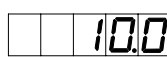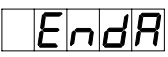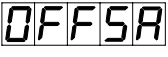
Menu level	Parameterisation level
	Activation / deactivation of the programming lock or completion of the standard parameterization with change into menu group level (complete function range), _RUN_:
	⬚⬚ r u n [P] ⬚ UL OC [▲/▼] ⬚⬚ L OC [▲/▼] ⬚ P r o F [P]
[▼] [▲]	With the navigation keys [▲] [▼], you 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 parametrisation** (Professional operation level)

4.3.1. Signal input parameters

Menu group level
- InP -   ▲/▼ P   →   Menu level

Menu level	Parameterisation level
tYPE ▼▲	**Selection of the input signal, *TYPE*:** tYPE P SEnS.F ▲/▼ FrEQU P If the scaling of the device is done via *SENS.F* (Sensor calibration), the frequency range needs to be preset under *RANGE* and is adjusted by application of the final value /initial value. If *FREQU* (Factory calibration) is preferred, the final value needs to be entered under *END* and the final frequency needs to be entered under *ENDA*. Under *OFFS* the initial value needs to be entered and under *OFFSA* the initial frequency. There is no application of the measuring signal. Confirm the selection with **[P]** and the display switches back to menu level.
rAnGE ▼▲	**Setting the measuring range end value, *END*:** rAnGE P 1E0 ▲/▼ 10E0 ▲/▼ 100E0 ▲/▼ 1E3 ▲/▼ 　　　　　9.9999 Hz　　99.999 Hz　　999.99 Hz　　9.9999 kHz 10E3 ▲/▼ 100E3 P 99.999 kHz　999.99 kHz Choose between six different frequency ranges. Confirm the selection with **[P]** and the display switches back to menu level.
End ▼▲	**Setting the measuring range final value, *END*:** End P 8 P 8 P 8 P 8 P 8 ▲/▼ │ nOCA / CAL ▲/▼ P Set the final value from the smallest to the largest digit with [▲] [▼] and confirm each digit with **[P]**. A minus sign can only be parametrized 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` [P] ▼ ▲	**Setting the measuring range start/offset value, `OFFS`:** `8` [P] `8` [P] `8` [P] `8` [P] `8` ▲▼ │ `nOCA` / `CAL` ▲▼ [P] 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.F` 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.
`dot` [P] ▼ ▲	**Setting the decimal point, `DOT`:** `0` ▲▼ `0.0` ▲▼ `0.00` ▲▼ `0.000` ▲▼ `0.0000` ▲▼ [P] 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` [P] ▼ ▲	**Setting up the display time, `SEC`:** `00.1` ▲▼ `00.9` then `01.0` ▲▼ `10.0` [P] 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.
`EndA` [P] ▼ ▲	**Rescaling the measuring input values, `ENDA`:** `8` [P] `8` [P] `8` [P] `8` [P] `8` ▲▼ [P] With this function, you can rescale the input value of **e.g. 8.000 Hz** (works setting) without applying a measuring signal. If sensor calibration has been selected, these parameters are not available.
`OFFSA` [P] ▼ ▲	**Rescaling the measuring input values, `OFFA`:** `8` [P] `8` [P] `8` [P] `8` [P] `8` ▲▼ [P] With this function, you can rescale the input value of **e.g. 100 Hz** (works setting) without applying a measuring signal. If sensor calibration has been selected, these parameters are not available.

Menu level	Parameterisation level
dELAY ⯆⯅	**Setting of the impulse delay, DELAY:** `0` ⯅⯆ `250` P With the impulse delay of 0 – 250 ms (max), frequencies can be collected, which are even smaller than by the predetermined measuring time of the device. If e.g. a delay of 250 seconds is set, this means that the device waits up to 250 seconds for an edge, before it assumes a 0 Hz-frequency. Thus frequencies up to 0.004 Hz can be collected.
tArA ⯆⯅	**Setting up the tare/offset value, TARA:** `0` `0` `0` `0` `0` ⯅⯆ P The given value is added to the linerarized value. In this way, the characteristic line can be shifted by the selected amount.
SPCt ⯆⯅	**Number of additional setpoints, SPCT:** `0` ⯅⯆ P 30 additional setpoints can be defined to the initial- and final value, so linear sensor values are not linearised. Only activated setpoint parameters are displayed.
di S.01 ⯆⯅	**Display values for setpoints, DIS.01 ... DIS.30:** `8` `8` `8` `8` `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 ⯆⯅	**Analog values for setpoints, INP.01 ... INP.30:** `8` `8` `8` `8` `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.

Menu level	Parameterisation level
dI.Und	**Device undercut, *DI.UND:*** With this function the device undercut (_ _ _ _ _) can be defined on a definite value. Exception is input type **4-20 mA**, it already shows undercut at a signal <1 mA, so a sensor failure is marked.
dI.OUE	**Display overflow, *DI.OUE:*** 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
$di.SEC$ [▼][▲]	**Display time, $DISEC$:** $di.SEC$ [P] 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, $ROUND$:** $round$ [P] 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, $ARITH$:** $ArITH$ [P] no [▲]/[▼] $rE2IP$ [▲]/[▼] $rAdIC$ [▲]/[▼] $SQUAr$ [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.
$ZErO$ [▼][▲]	**Zero point tranquilisation, $ZERO$:** $ZErO$ [P] 0 [P] 0 [▲]/[▼] [P] At the zero point tranquilisation, 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.

Menu level	Parameterisation level
`di SPL` [P] ▼▲	**Display, DISPL:** `ActuA` ▲▼ `MI n.UA` ▲▼ `MAX.UA` ▲▼ `totAL` ▲▼ `HoLd` [P] With this function the current measuring value, Min-/Max value, totaliser value or the process-controlled Hold-value can be allocated to the display. With **[P]** the selection is confirmed and the device changes into menu level.
`FLASH` [P] ▼▲	**Display flashing, FLASH:** `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.
`tASt` [P] ▼▲	**Assignment (deposit) of key functions, TAST:** `EHtr` ▲▼ `LI.12` ▲▼ `LI.34` ▲▼ `tArA` ▲▼ `SEt.tA` ▲▼ `totAL` ▲▼ `tot.rE` ▲▼ `EHt.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 key (**[O]** key). If the MIN-/MAX-memory is activated with *EHTR*, all measured MIN/MAX-values are safed during operation and can be recalled via the navigation keys. 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 set temporarily on a parametrised value. 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.

Menu level	Parameterisation level
Special function [O]-key, *TAST.4:*	
`tASt.4` P ▼▲	`tArA` ▲▼ `SEt.tA` ▲▼ `totAL` ▲▼ `tot.rE` ▲▼ `EHt.rE` ▲▼ `ActuA` ▲▼ `HoLd` ▲▼ `AL-1` ... `AL-4` ▲▼ `no` P For the operation mode, special functions can be deposited on the **[O]**-Taste. This function is activated by pressing the key. With *TARA* the device is set temporarily on a parametrised value. 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. *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. 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.
Special function digital input, *DIG.IN:*	
`di G.i n` P ▼▲	`tArA` ▲▼ `SEt.tA` ▲▼ `totAL` ▲▼ `tot.rE` ▲▼ `EHt.rE` ▲▼ `ActuA` ▲▼ `HoLd` ▲▼ `AL-1` ... `AL-4` ▲▼ `no` P In operation mode, the above shown parameter can be laid on the optional digital input, too. Function description see *TAST.4*.
`rEt` ▼▲	**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
-𝐂𝐨𝐝- ▲▼ P ⟶ Menu level
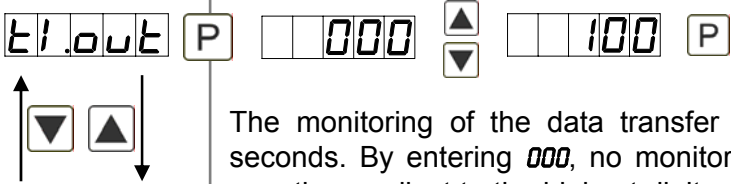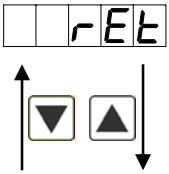
Menu level	Parameterisation level
𝐔.𝐂𝐨𝐝𝐄	**User code** $U.CODE$: 𝟎 P 𝟎 P 𝟎 P 𝟎 ▲▼ P Via this code reduced sets of parameters can be set free. A change of the $U.CODE$ can be done via the correct input of the $A.CODE$ (master code).
𝐀.𝐂𝐨𝐝𝐄	**Master code,** $A.CODE$: 𝟏 P 𝟐 P 𝟑 P 𝟒 ▲▼ P By entering $A.CODE$ the device will be unlocked and all parameters are released.
𝐎𝐮𝐭.𝐋𝐄 P	**Release/lock analog output parameters,** $OUT.LE$: no ▲▼ En-OF ▲▼ Out.EO ▲▼ ALL P Analog output parameter 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.

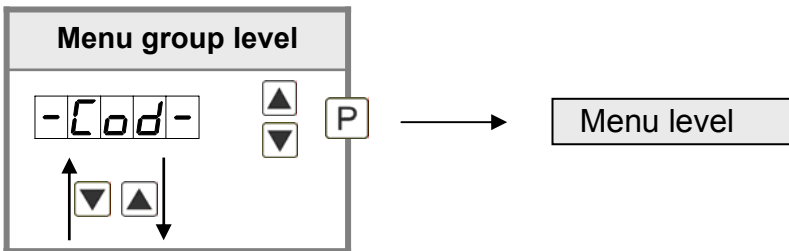| Menu level	Parameterisation level
RL.LEU [P] ▲▼	**Release/lock alarm parameters, *AL.LEU*:** `no` ▲▼ `LIПIt` ▲▼ `ALгП.L` ▲▼ `ALL` [P] This parameter describes the user relase/user lock of the alarm. - *LIMIT*, here only the range of value of the threshold values 1-4 can be changed. - *ALRM.L*, here 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 „*- FCT -*" .

4.3.4. Serial parameters

Menu group level

`-5Eг-` ▲▼ [P] ──────▶ Menu level
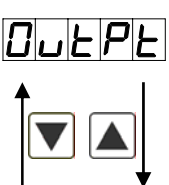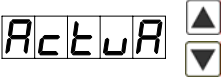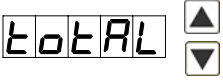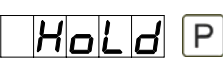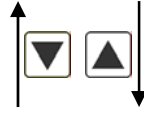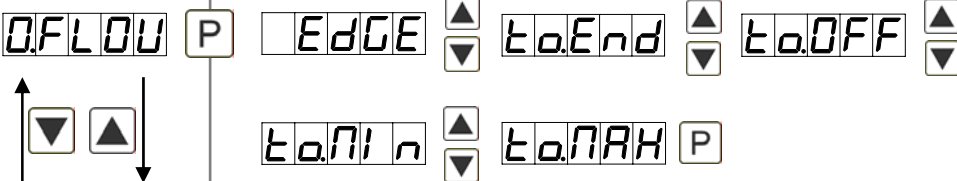
Menu level	Parameterisation level
Addr [P] ▲▼	**Device address, *ADDR*:** `001` ▲▼ `250` [P] The address of the device can be adjusted from the smallest to the highest digit with the up and down keys [▲] [▼] and needs to be approved digit per digit with **[P]**. An address up to max.250 is available.
b.ПOdE [P] ▲▼	**ModBus operation type, *B.MODE*:** `ASCII` ▲▼ `гtu` [P] **In preparation.**

Menu level	Parameterisation level
ᄐᛁ.ᴑᴜᴛ [P] ▼▲	**Timeout, ᴛᴵᴏᴜᴛ:** ☐☐☐ ▲▼ ☐☐☐ [P] The monitoring of the data transfer is parametrised in seconds, up to max. 100 seconds. By entering *000*, no monitoring takes place. The timeout can be adjusted vom the smallest to the highest digit with the up and down keys [▲] [▼] and needs to be approved digit per digit with **[P]**. After the last digit, the display changes back into menu level.
ᴿᴇᴛ ▼▲	**Back to menu group level, *RET*:** With **[P]** the selection is confirmed and the device changes into menu group level „- *FCT* -".

4.3.5. Analog output parameters 1

Menu group level
-ᴏᴜᴛ- ▲▼ [P] ⟶ Menu level ▼▲

Menu level	Parameterisation level
ᴏᴜᴛᴘᴛ [P] ▼▲	**Selection reference analog output, *OUTPT*:** ᴀᴄᴛᴜᴀ ▲▼ ᴍᴵ ᴺ.ᴜᴀ ▲▼ ᴍᴀᴴᴜᴀ ▲▼ ᴛᴏᴛᴀʟ ▲▼ ʜᴏʟᴅ [P] The analog output signal can refer to different functions, in detail this are the current measuring value, Min-value, Max-value or totaliser-/sum-function. 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.

Menu level	Parameterisation level
Out.rA [P] [▼] [▲]	**Selection analog output, OUT.RA:** [0-10][▲▼] [0-20][▲▼] [4-20] [P] 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.
Out.En [P] [▼] [▲]	**Setting up the final value of the analog output, OUT.EN:** [8] [P] [8] [P] [8] [P] [8] [P] [8][▲▼] [P] 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 parametrized on the highest value digit. After the last digit, the display switches back to the menu level.
Out.OF [P] [▼] [▲]	**Setting up the initial value of the analog output, OUT.OF:** [P] [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 parametrized on the highest value digit. After the last digit, the display switches back to the menu level.
O.FLOU [P] [▼] [▲]	**Overflow behaviour, O.FLOU:** [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 jumps on e.g. 4 mA), TO.END (higher than final value, analog output jumps on e.g. 20 mA). If TO.MIN or TO.MAX is set, the analog output jumps on 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 -" .

4.3.6. Analog output parameters 2

Menu group level
-Ou2- ▲▼ P ⟶ Menu level   ▼▲

Menu level	Parameterisation level
Ou2.Pt P ▼▲	**Selection reference analog output, *OU2.PT*:** *ActuA* ▲▼ *MI n.UA* ▲▼ *MAX.UA* ▲▼ *HoLd* ▲▼ *AbS.UA* P The analog output signal can refer to different functions, in detail this are the current measuring value, Min-value, Max-value or totaliser-/sum-function. 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.
Ou2.rA P ▼▲	**Selection analog output, *OU2.RA*:** *0-10* ▲▼ *0-20* ▲▼ *4-20* P 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.
Ou2.En P ▼▲	**Setting up the final value of the analog output, *OU2.EN*:** *8* P *8* P *8* P *8* P *8* ▲▼ P 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 parametrized on the highest value digit. After the last digit, the display switches back to the menu level.
Ou2.0F P ▼▲	**Setting up the initial value of the analog output, *OU2.0F*:** *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 parametrized on the highest value digit. After the last digit, the display switches back to the menu level.

Menu level	Parameterisation level
Ou2.FL ▼ ▲	**Overflow behaviour, *OU2.FL*:** *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 jumps on e.g. 4 mA), *TO.END* (higher than final value, analog output jumps on e.g. 20 mA). If *TO.MIN* or *TO.MAX* is set, the analog output jumps on 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 „- *OU2*-" .

4.3.7. Relay functions

Menu group level

$- r E L -$ ▲▼ P ⟶ Menu level

▼▲

Menu level	Parameterisation level
$r E L - 1$ P ▼▲	**Alarm relay 1, REL-1:** **Applies for relay 2-4, too** $AL-1$ …. $AL-4$ ▲▼ $AL-n1$ …. $AL-n4$ ▲▼ $LoGIC$ ▲▼ OFF ▲▼ On 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. With **[P]** the selection is confirmed and the device changes into menu level.
$LoG-1$ P ▼▲	**Logic relay 1, LOG-1** 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*: <table><tr><td>or</td><td>$A1 \vee A2$</td><td>As soon as a selected alarm is activated, the relay operates. Equates to operating current principle.</td></tr><tr><td>nor</td><td>$\overline{A1 \vee A2} = \overline{A1} \wedge \overline{A2}$</td><td>The relay operates only, if no selected alarm is active. Equates to quiescent current principle.</td></tr><tr><td>And</td><td>$A1 \wedge a2$</td><td>The relay operates only, if all selected alarms are active.</td></tr><tr><td>$nAnd$</td><td>$\underline{A1 \wedge A2} = \underline{A1} \vee \underline{A2}$</td><td>As soon as a selected alarm is not activated, the relay operates.</td></tr></table> With **[P]** the selection is confirmed and the device changes into menu level.

Menu level	Parameterisation level
Alarms for relay 1, _COM-1_: `CoN-1` [P] `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.	

Menu level	Parameterisation level
`rEL-5` [P] ▼▲	**Alarm relay 5, _REL-5_:** **Applies for relays 6-8, too** `AL-5` .... `AL-8` ▲▼ `AL-n5` .... `AL-n8` ▲▼ `LoGIC` ▲▼ `OFF` ▲▼ `On` [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-2_ and _COM-2_. 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. With **[P]** the selection is confirmed and the device changes into menu level.

Menu level	Parameterisation level
`LoG-5` [P] ▼▲	**Logic relay 5, _LOG-5_:** `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
Alarms for relay 5, *COM-5*: $\boxed{CoΠ-5}$ $\boxed{P}$ $\boxed{A.1}$ ▲▼ $\boxed{A.2}$ ▲▼ .... $\boxed{A.1234}$ $\boxed{P}$ ▼▲	The allocation of the alarms for relay 5 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.
Back to menu group level, *RET*: $\boxed{rEt}$ ▼▲	With **[P]** the selection is confirmed and the device changes into menu group level „– REL –".

4.3.8. Alarm parameters

Menu group level

$\boxed{-AL1-}$ ▲▼ $\boxed{P}$ → Menu level
▼▲

Menu level	Parameterisation level
Dependency alarm1, *ALRM.1*: $\boxed{AL r Π.1}$ $\boxed{P}$ $\boxed{ActuA}$ ▲▼ $\boxed{ΠInuA}$ ▲▼ $\boxed{ΠAKuA}$ ▲▼ ▼▲ $\boxed{totAL}$ ▲▼ $\boxed{HoLd}$ ▲▼ $\boxed{EHtEr}$ $\boxed{P}$	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 or the totaliser-/sum-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.

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Menu level	Parameterisation level
L I-1 [P] ▼▲	**Threshold values / limit values, *LI-1*:** [P] *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*:** [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-1 [P] ▼▲	**Function if display falls below / exceeds limit value, *FU-1*:** [P] **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*:** [P] *0* [P] *0* [P] *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*:** [P] *0* [P] *0* [P] *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-*.

4.3.9. Totaliser (Volume measurement)

Menu group level
$-tot-$ ▲▼ P ⟶ Menu level
▼ ▲

Menu level	Parameterisation level
$totAL$ P ▼ ▲	**Totaliser state, $TOTAL$:** 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.
$t.bASE$ P ▼ ▲	**Time base, $T.BASE$:** SEC ▲▼ MIn ▲▼ $hour$ ▲▼ P Under this parameter the time base of the measurement can be preset in seconds, minutes or hours.
$FActo$ P ▼ ▲	**Totaliser factor, $FACTO$:** 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.
$tot.dt$ P ▼ ▲	**Setting up the decimal point for the totaliser, $TOT.DT$:** 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
Totaliser reset, *TOT.RE:*	
ᵗᵒᵗ.ʳᴱ [P] ▼ ▲	🔳 [P] 🔳 [P] 🔳 [P] 🔳 [P] 🔳 ▲▼ [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.
Back to menu group level, *RET*:	
ʳᴱᵗ ▼ ▲	With **[P]** the selection is confirmed and the device changes into menu group level „– TOT –" .

4.3.10. Programming lock, *RUN*:

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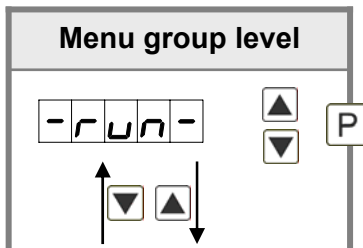
Description see page 11, menu level *RUN*

Rotation speed of a machine shaft

There are 4 sprockets on one machine shaft. Applied in an angle of 90° to each other and to the rotation speed measurement. The sprockets are collected via a proximity switch and evaluated by the frequency device, which shall display the rotation speed in U/min. 0…3600 U/min is preset as rotaion speed range of the machine.

Calculation of the input frequency

Number of sprockets = 4
Final rotation speed = 3600 U/min

$$\textit{Final frequency [Hz]} = \frac{\textit{Final frequency } [\frac{U}{min}]}{60 \; [\frac{s}{min}] \times 1U} \times \textit{Number of sprockets}$$

$$\textit{Final frequency [Hz]} = \frac{3600 \; \frac{U}{min}}{60 \; \frac{s}{min} \times 1U} \times 4 = 240 \; Hz$$

Setting up the device

Based on the default settings of the device, following parameters need to be changed:

Parameter	Settings	Description
tYPE	FrE9U	As the input frequency is known, the device does not need to be applied to the measuring section.
rAnGE	100E0	The final frequency is in the range of 100.00 to 999.99 Hz.
End	3600	3600 shall be displayed as final value.
EndA	240.00	The final frequency for display value 3600 is 24.00 Hz.

4.4. 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 current / Quiescent current
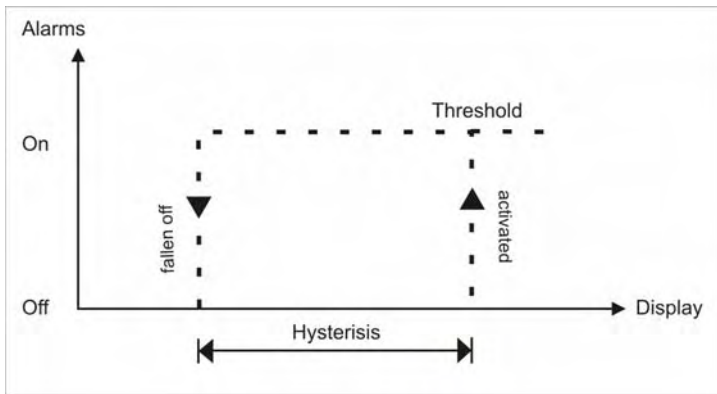
Operating current
By operating current the alarm S1-S2 is off below the threshold and on on reaching the threshold.
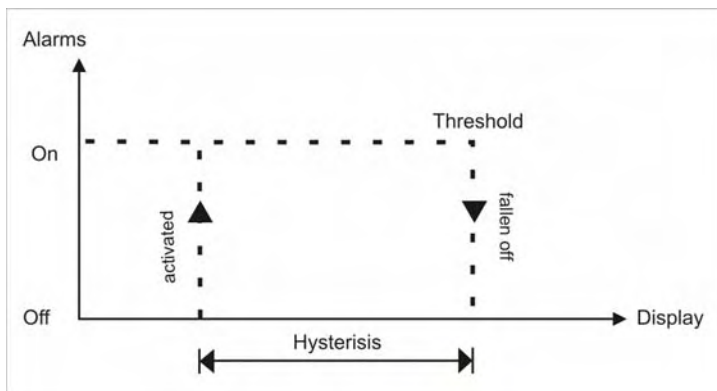
Quiescent current
By quiescent current the alarm S1-S2 is on below the threshold and switched off on reaching the threshold.
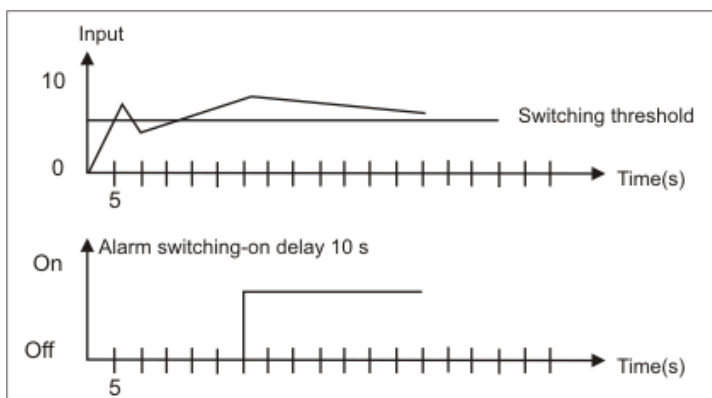
Switching-on delay
The switching-on delay is activated via an alarm and e.g. switched 10 seonds after reaching the switching threshold, a short-term exceedance of the switching value does not cause an alarm, respectively does not cause a switching operation of the relay. The switching-off delay operates in the same way, keeps the alarm / the relay switched longer for the parametrised time.

5. Factory settings

5.1. Default values

Standard parametrisation (flat operation level)

Parameter	Menu items					Default value
`ЕУРЕ` Type of scale	`SEnS.F` Sensor calibration	`FrE9U` Factory calibration				`FrE9U` Factory calibration

`rAnGE`
Range of frequency
	`IE0`
	0.0000…
	9.9999 Hz
		`I0E0`
		00.000…
		99.999 Hz
			`I00E0`
			000.00…
			999.99 Hz
				`IE3`
				0.0000…
				9.9999 KHz
					`I0E3`
					00.000…
					99.999 KHz
					
					`I00E3`
					000.00…
					999.99 KHz
						`I00E3`
						000.00…
						999.99 KHz

`End` Final value	`-I9999`	to	`99999`			`I0000`
`OFFS` Offset	`-I9999`	to	`99999`			`0`
`dot` Display of decimal point	`0`	to	`0.0000`			`0`
`SEC` Measuring time	`0.I` 0.1 seconds	to	`I0.0` 10.0 seconds			`I.0` 1.0 seconds
`EndA` Analog final value	`-I9999`	to	`99999`			`I0000`
`OFFSA` Analog initial value	`-I9999`	to	`99999`			`0`
`dELAY` Impulse delay	`0` 0 s	to	`250` 250 s			`0` 0 s
`Out.rA` Analog output range	`0-I0` 0…10 V	`0-20` 0…20 mA	`4-20` 4…20 mA			`4-20` 4…20 mA

Parameter	Menu items					Default value
`Out.En` Analog output final value	`-19999`	to	`99999`			`10000`
`Out.OF` Analog output initial value	`-19999`	to	`99999`			`00000`
`L1-1` Limit value 1	`-19999`	to	`99999`			`2000`
`HY-1` Hysteresis 1	`00000`	to	`99999`			`00000`
`Fu-1` Operation type 1	`Low` Undercut	`HIGH` Exceedance				`HIGH` Exceedance
`L1-2` Limit value 2	`-19999`	to	`99999`			`3000`
`HY-2` Hysteresis 2	`00000`	to	`99999`			`00000`
`Fu-2` Operation type 2	`Low` Undercut	`HIGH` Exceedance				`HIGH` Exceedance
`L1-3` Limit value 3	`-19999`	to	`99999`			`4000`
`HY-3` Hysteresis 3	`00000`	to	`99999`			`00000`
`Fu-3` Operation type 3	`Low` Undercut	`HIGH` Exceedance				`HIGH` Exceedance
`L1-4` Limit value 4	`-19999`	to	`99999`			`5000`
`HY-4` Hysteresis 4	`00000`	to	`99999`			`00000`
`Fu-4` Operation type 4	`Low` Undercut	`HIGH` Exceedance				`HIGH` Exceedance

Parameter	Menu items					Default value
`U.CodE` Usercode	`0000`	to	`9999`			`0000`
`A.CodE` Master code	`0000`	to	`9999`			`1234`
`run` run	`ULOC` Standard operation	`LOC` Parameter lock	`ProF` Professional operation			`ULOC` Standard operation

Extended parameterisation (professional operation level)

Signal input parameters

`- InP -`

Parameter	Menu items					Default value
`tYPE` Type of scale	`SEnS.F` Sensor calibration	`FrEQU` Factory calibration				`FrEQU` Factory calibration

`rAnGE`
 	
Frequency
range
	`1E0`
	
	0.0000…
	9.9999 Hz
		`10E0`
		
		00.000…
		99.999 Hz
			`100E0`
			
			000.00…
			999.99 Hz
				`1E3`
				
				0.0000…
				9.9999 KHz
					`10E3`
					
					00.000…
					99.999 KHz
					
					`100E3`
					
					000.00…
					999.99 KHz
						`100E3`
						
						000.00…
						999.99 KHz

`End` Final value	`-19999`	to	`99999`			`10000`
`OFFS` Offset	`-19999`	to	`99999`			`0`
`dot` Display of decimal point	`0`	to	`0.0000`			`0`
`SEC` Measuring time	`0.1` 0.1 seconds	to	`10.0` 10.0 seconds			`1.0` 1.0 seconds
`EndA` Analog final value	`-19999`	to	`99999`			`10000`

Parameter	Menu items					Default value
OFFSA Analog initial value	-19999	to	99999			0
dELAY Impulse delay	0 0 s	to	250 250 s			0 0 s
tArA Device offset	-19999	to	99999			0 Exceedance
SPCt Number of setpoints	00	to	30			00
dIS.01 Display value 1	-19999	to	99999			
InP.01 Analog value 1	-19999	to	99999			
...						
dIS.30 Display value 30	-19999	to	99999			
InP.30 Analog value 30	-19999	to	99999			
dI.Und Display underflow	-19999	to	99999			-19999
dI.OVE Display overflow	-19999	to	99999			99999
rEt						

General device parameters

`-Fct-`

Parameter	Menu items					Default value
`dI.SEC` Display time	`00.1` 0,1 second	`10.0` to	`10.0` 10 seconds			`0 1.0` 1 second
`round` To round a value	`00001` no rounding	`00005` In powers of 5	`000 10` In powers of 10	`00050` In powers of 50		`00001` no rounding
`ArI tH` Arithmetic	`no` no	`rE2I P` Reciprocal	`rAdI E` Root extraction	`SQUAr` Squaring		`no` no
`2ErO` Zero-point slow-down	`00` no slow-down	`to` to	`99` at x-digit display = zero			`00` no slow-down
`dI SPL` Default display	`ActuA` Current measurand	`MI n.UA` Minimum	`MAXUA` Maximum	`totAL` Totaliser	`HoLd` Hold	`ActuA` Current measurand

`FLASH`
Flashing at
	`no`
	no
	
	`AL-4`
	Alarm 4
		`AL- 1`
		Alarm 1
		
		`AL.34`
		Alarm 3 + 4
			`AL-2`
			Alarm 2
			
			`AL.AL`
			Alarm 1…4
				`AL. 12`
				Alarm 1 + 2
					`AL-3`
					Alarm 3
						`no`
						no

`tASt`
Up-/Down-Key function
	`no`
	no
	
	`SEt.tA`
	Set Tara value
		`EHtr`
		Extremum (min/max)
		
		`totAL`
		Totaliser value
			`LI.12`
			Alarm limit 1+2
			
			`tot.rE`
			Totaliser reset
				`LI.34`
				Alarm limit 3+4
				
				`EHt.rE`
				Extremum reset
					`tArA`
					Tara function
					
					`ActuA`
					Display measuring value
						`no`
						no

`tASt.4`
Special function 4th key
	`no`
	no
	
	`EHt.rE`
	Extremum reset
	
	`AL-3`
	Alarm 3
		`tArA`
		Tara function
		
		`ActuA`
		Display measurand
		
		`AL-4`
		Alarm 4
			`SEt.tA`
			Set Tara value
			
			`HoLd`
			Hold
				`totAL`
				Totaliser value
				
				`AL- 1`
				Alarm 1
					`tot.rE`
					Totaliser reset
					
					`AL-2`
					Alarm 2
						`no`
						no

Parameter	Menu items					Default value
$d\ IG.In$ Digital input	no no	$tArA$ Tara function	$SEt.tA$ Set Tara value	$totAL$ Totaliser value	$tot.rE$ Totaliser reset	no no
	$EHt.rE$ Extremum reset	$ActuA$ Display measurand	$HoLd$ Hold	$AL-1$ Alarm 1	$AL-2$ Alarm 2	
	$AL-3$ Alarm 3	$AL-4$ Alarm 4				
rEt						

Safety parameters

$-Cod-$

Parameter	Menu items					Default value
$U.CodE$ User code	0000	to	9999			0000
$A.CodE$ Administrator code	0000	to	9999			1234
$Out.LE$ Analog output level	no not changeable	$En-OF$ Range of value	$Out.EO$ Range of value & source	ALL all parameters		ALL all parameters
$ALLEU$ Alarm level	no not changeable	$LIMIt$ Limit value	$ALrML$ Range of value & source	ALL all parameters		ALL all parameters
rEt						

Serial parameters

`-SEr-`

Parameter	Menu items					Default value
Addr Device address	`001`	to	`250`			`001`
b.NOdE Communi-cation mode	`ASC11` ASCII	`rtu` rtu				`ASC11` ASCII
t1.out Timeout	`000` no monitoring	to	`100` X seconds no traffic			`000` no monitoring
`rEt`						

Analog output parameters 1

`-Out-`

Parameter	Menu items					Default value
OutPt Source	`ActuA` Current measurand	`MinUA` Minimum	`MAXUA` Maximum	`totAL` Totaliser	`HoLd` Hold	`ActuA` Current measurand
Out.rA Output range	`0-10` 0...10 mA	`0-20` 0...20 mA	`4-20` 4...20 mA	x seconds no traffic		`4-20` 4...20 mA
Out.En Final value	`-19999`	to	`99999`			`10000`
Out.OF Initial value	`-19999`	to	`99999`			`00000`
O.FLOU Overflow behaviour	`EdGE` Run to limit value	`to.End` Jump to final value	`to.OFF` Jump to start	`to.MIn` Jump to smallest value	`to.MAX` Jump to biggest highest value	`EdGE` Jump to limit value
`rEt`						

Analog output parameters 2

`-0u2-`

Parameter	Menu items					Default value
`0u2.Pt` Source	`ActuA` Current measurand	`MInuA` Minimum	`MAXuA` Maximum	`totAL` Totaliser	`Hold` Hold	`ActuA` Current measurand
`0u2.rA` Output range	`0-10` 0...10 mA	`0-20` 0...20 mA	`4-20` 4...20 mA	x seconds no traffic		`4-20` 4...20 mA
`0u2.En` Final value	`-19999`	to	`99999`			`10000`
`0u2.0F` Initial value	`-19999`	to	`99999`			`00000`
`0u2.FL` Overflow behaviour	`EdGE` Run to limit value	`to.End` Jump to final value	`to.0FF` Jump to start	`to.MIn` Jump to smallest value	`to.MAX` Jump to biggest highest value	`EdGE` Jump to limit value
`rEt`						

Relay functions

`-rEL-`

Parameter	Menu items					Default value

`rEL-1`
 	
Relay function1
	`AL-1`
	
	at Alarm 1
	
	`AL-n1`
	
	not Alarm 1
	
	`LoGIC`
	
	via Logic
		to
		
		to
		
		`0FF`
		
		released
			`AL-4`
			
			at Alarm 4
			
			`AL-n4`
			
			not Alarm 4
			
			`on`
			
			acrivated
						`AL-1`
						
						at Alarm 1

`LoG-1` Logic relay 1	`or` active if at least 1 alarm	`nor` active if no alarm	`And` active if all alarms are	`nAnd` active if at least 1 alarm is not		`or` active if at least 1 alarm

Parameter	Menu items					Default value
CoM-1 Alarm combination relay 1	**A.1** Alarm 1 and so on to	**A.2** Alarm 2 **A.1234** Alarm 1+2+3+4	**A.12** Alarm 1 + 2	**A.3** Alarm 3	Alarm 1 + 3	**A.1** Alarm 1
rEL-2 Relay function 2	**AL-1** at Alarm 1 **AL-n1** not Alarm 1 **LoGIC** via Logic	to to **OFF** released	**AL-4** at Alarm 4 **AL-n4** not Alarm 4 **on** activated			**AL-2** at Alarm 2
LoG-2 Logic relay 2	**or** active if at least 1 alarm	**nor** active if no alarm	**And** active if all alarms are	**nAnd** active if at least 1 alarm is not		**or** active if at least 1 alarm
CoM-2 Alarm combination relay 2	**A.1** Alarm 1 to	**A.2** Alarm 2 **A.1234** Alarm 1+2+3+4	**A.12** Alarm 1+2	**A.3** Alarm 3	**A.13** Alarm 1+3	**A.2** active if at least 1 alarm
rEL-3 Relay function 3	**AL-1** at Alarm 1 **AL-n1** not Alarm 1 **LoGIC** via Logic	to to **OFF** released	**AL-4** at Alarm 4 **AL-n4** not Alarm 4 **on** activated			**AL-3** at Alarm 3
LoG-3 Logic relay 3	**or** active if at least 1 alarm	**nor** active if no alarm	**And** active if all alarms are	**nAnd** active if at least 1 alarm is not		**or** active if at least 1 alarm

5. Factory settings

Parameter	Menu items					Default value
CoN-3 Alarm combination relay 3	**A.1** Alarm 1 to	**A.2** Alarm 2 / **A.1234** Alarm 1+2+3+4	**A.12** Alarm 1+2	**A.3** Alarm 3	**A.13** Alarm 1+3	**A.3** active if at least 1 alarm
rEL-4 Relay function 4	**AL-1** at Alarm 1 / **AL-n1** not Alarm 1 / **LoGIC** via Logic	to / to / **OFF** released	**AL-4** at Alarm 4 / **AL-n4** not Alarm 4 / **on** activated			**AL-4** at Alarm 4
LoG-4 Logic relay 4	**or** active if at least 1 alarm	**nor** active if no alarm	**And** active if all alarms are	**nAnd** active if at least 1 alarm is not		**or** active if at least 1 alarm
CoN-4 Alarm combination relay 4	**A.1** Alarm 1 to	**A.2** Alarm 2 / **A.1234** Alarm 1+2+3+4	**A.12** Alarm 1+2	**A.3** Alarm 3	**A.13** Alarm 1+3	**A.4** active if at least 1 alarm
rEt						

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Alarm parameters

`- AL 1 -`

Parameter	Menu items					Default value

`ALr.N.1`
Alarm source 1
	`Act.uA`
	Current measurand
	
	`EHtEr`
	External input (DigIn/Tast4)
		`NI n.uA`
		Minimum measurand
			`NAH.uA`
			Maximum measurand
				`totAL`
				Totaliser
					`Hold`
					Hold
						`Act.uA`
						Current measurand

`L 1- 1` Limit value 1	`-19999`	to	`99999`			`2000`
`HY- 1` Hysteresis 1	`00000`	to	`99999`			`00000`
`Fu- 1` Function 1	`Lou` Undercut	`H IGH` Exceedance				`H IGH` Exceedance
`ton- 1` Activation delay 1	`000` no	to	`100` 100 seconds			`000` no
`toF- 1` De-activation delay 1	`000` no	to	`100` 100 seconds			`000` no
`rEt`						

`- AL 2 -`

Parameter	Menu items					Default value

`ALr.N.2`
Alarm source 2
	`Act.uA`
	Current measurand
	
	`EHtEr`
	External input (DigIn/Tast4)
		`NI n.uA`
		Min. measurand
			`NAH.uA`
			Max. measurand
				`totAL`
				Totaliser
					`Hold`
					Hold
						`Act.uA`
						Current measurand

`L 1-2` Limit value 2	`-19999`	to	`99999`			`3000`

Parameter	Menu items					Default value
`HY-2` Hysteresis 2	`00000`	to	`99999`			`00000`
`Fu-2` Function 2	`Louu` Undercut	`HIGH` Exceedance				`HIGH` Exceedance
`ton-2` Activation delay 2	`000` no	to	`100` 100 seconds			`000` no
`toF-2` De-activation delay 2	`000` no	to	`100` 100 seconds			`000` no
`rEt`						

`-AL3-`

Parameter	Menu items					Default value
`ALrN3` Alarm source 3	`ActuA` Current measurand `EHtEr` External input (DigIn/Tast4)	`NInuA` Minimum measurand	`NAHuA` Maximum measurand	`totAL` Totaliser	`HoLd` Hold	`ActuA` Current measurand
`LI-3` Limit value 3	`-19999`	to	`99999`			`4000`
`HY-3` Hysteresis 3	`00000`	to	`99999`			`00000`
`Fu-3` Function 3	`Louu` Undercut	`HIGH` Exceedance				`HIGH` Exceedance
`ton-3` Activation delay 3	`000` no	to	`100` 100 seconds			`000` no
`toF-3` De-activation delay 3	`000` no	to	`100` 100 seconds			`000` no
`rEt`						

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`-AL4-`

Parameter	Menu items					Default value
ALrN.4 Alarm source 4	**ActuA** Current measurand **EHtEr** External input (DigIn/Tast4)	**MinUA** Minimum measurand	**MAHUA** Maximum measurand	**totAL** Totaliser	**HoLd** Hold	**ActuA** Current measurand
LI-4 Limit value 4	**-19999**	to	**99999**			**5000**
HY-4 Hysteresis 4	**00000**	to	**99999**			**00000**
Fu-4 Function 4	**Louu** Undercut	**HIGH** Exceedance				**HIGH** Exceedance
ton-4 Activation delay 4	**000** no	to	**100** 100 seconds			**000** no
toF-4 De-activation delay 4	**000** no	to	**100** 100 seconds			**000** no
rEt						

Totaliser (Volume measuring)

| ‑tot‑ |

Parameter	Menu items					Default value
totAL Totaliser state	OFF Off	StEAd Permanent saving	tEMP Quick saving			OFF Off
t.bASE Time base	SEC Seconds	MIn Minutes	hour Hours			SEC Seconds
FACto Divisor	10^0 10^0=1	to	10^6 10^6			10^0 10^0=1
tot.dt Decimal places	0	to	0.0000			0
tot.rE Totaliser reset	00000	to	99999			00000
rEt						

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	96x48x120 mm (BxHxT)
	96x48x139 mm (BxHxT) incl. plug-in terminal
Panel cut-out	$92.0^{+0,8}$ x $45.0^{+0,6}$ mm
Wall thickness	to 15 mm
Fixing	screw elements
Material	PC Polycarbonate, black, UL94V-0
Sealing material	EPDM, 65 Shore, black
Protection class	sandard IP65 (Front), IP00 (Back side)
Weight	approx. 300 g
Connection	plug-in terminal; wire cross section up to 2.5 mm^2
Display	
Digit height	14 mm
Segment colour	red (optional blue/green/orange)
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	
Sensing device	Namur, 3-wire initiator, impulse input, TTL
High/Low level TTL level	> 10 V / < 6 V – U_{in} max. 30 V > 4.6 V / < 1.9 V
Input frequency	0.0001 – 9.9999 Hz, 0.001 – 99.999 HZ, 0.01 – 999.99 Hz 0.0001 – 9.9999 kHz, 0.001 – 99.999 kHZ, 0.01 – 999.99 kHz
Input resistance	R_I at 24 V / 4 kΩ / R_I at Namur 1.8 kΩ
Digital input	< 2.4 V OFF, 10 V ON, max. 30 VDC R_I ~ 5 kΩ
Accuracy	
Temperature drift	50 ppm / K
Measuring time	0.1…10.0 seconds
Measuring principle	Frequency measuring / pulse width modulation
Resolution	500,000 points
Measuring error	0.0005% of measuring range

Output		
Sensor supply	24 VDC / 50 mA; 10 VDC / 20 mA	
Pulse output	max. 10 kHz (only for frequency measurement)	
Analog output	0/4-20 mA or 0-10 VDC 16 Bit reversible	
Switching outputs	Relay with change-over contacts Switching cycles 8 normally open contacts	250 VAC / 2 AAC; 30 VDC / 2 ADC 0.5×10^5 at contact load 0.5×10^6 mechanically PhotoMos / 30 VDC/AC 0,4 A
Power supply	230 VAC +/- 10 % max. 10 VA 10-30 VDC +/- 10 % 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	DIN 61326	
CE-sign	Conformity to 89/336/EWG	
Safety standard	DIN 61010	

7. Safety advices

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

Proper use

The **M3-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 **M3-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.	"*ERRT*" lights up in the 7-segment display	• Please contact the manufaturer 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.