User Manual
IM1

Installation size 96x48 mm (BxH)

Installation size 48x24 mm (BxH)

Installation size mm (BxH)

Installation size 72x36 mm (BxH)

Technical features:

• red display of -1999…9999 digits

• minimal installation depth: 25 mm, 26 mm, 27 mm or 40 mm without plug-in terminal

• adjustment via factory default or directly on the sensor signal

• min/max-memory

• 10 adjustable supporting points

• display flashing at threshold exceedance / undershooting

• tara function

• programming interlock via access code

• protection class IP65 at the front

• plug-in terminal

• pc-based configuration software PM-TOOL with CD and USB-adapter for devices
 without keypad for a simple adjustment of standard devices

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Identification – Current loop 4-20 mA

STANDARD TYPES	ORDER NUMBER
Housing dimension: 96x48x38 mm (incl. plug-in terminal)	**IM1-1SR4B.0001.K70xD** **IM1-1SR4B.0001.K70xD**
Housing dimension: 96x24x63 mm (incl. plug-in terminal)	**IM1-3SR4B.0001.K70xD** **IM1-3SR4B.0001.K70xD**
Housing dimension: 72x36x38 mm (incl. plug-in terminal)	**IM1-6SR4B.0001.K70xD** **IM1-6SR4B.0001.K70xD**
Housing dimension: 48x24x54 mm (incl. plug-in terminal)	**IM1-7SR4A.0001.K70xD**

Options – breakdown of order code:

IM 1- 1 S R 4 B. 0 0 0 1. K 7 0 x D

Standard type M-Line

Device range — `1`

Housing size (BxHxD)
96x48x25 mm — `1`
96x24x40 mm — `3`
72x36x25 mm — `6`
48x24x27 mm — `7`

Display type
Current loop — `S`

Display colour
Red — `R`

Number of digits
4-digit — `4`

Digit height
10 mm — `A`
14 mm — `B`

Interface
without — `0`

Dimension
`D` physical unit

Version
`x` internal version

Switching points
`0` no switching points
`2` PhotoMos outputs

Protection class
`1` without keypad, operation via PM-TOOL
`7` IP65 / plug-in terminal

Voltage supply
`K` via current loop

Measuring input
`1` Direct current 4-20 mA

Analog output
`0` without

Sensor supply
`0` without

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

Content

1. Brief description

The panel instrument **IM1-XS** is a 4-digit device fed via current loop 4-20 mA and a visual limit value monitoring via the display. The configuration happens via three front keys or via the optional PC-software PM-TOOL. An integrated programming interlock prevents unrequested changes of the parameter and can be unlocked again via an individual code.

The electrical connection happens on the rear side via plug-in terminals.

Selectable functions like e.g. the recall of the min/max-value, a zero point slowdown, a direct change of the limit value in operating mode and additional measuring supporting points for linearisation, complete the modern device concept.

2. Assembly

Please read the *Safety advice* on *page 19* before installation and keep this user manual for future reference.

The example given below shows a device in housing size 96x48mm.
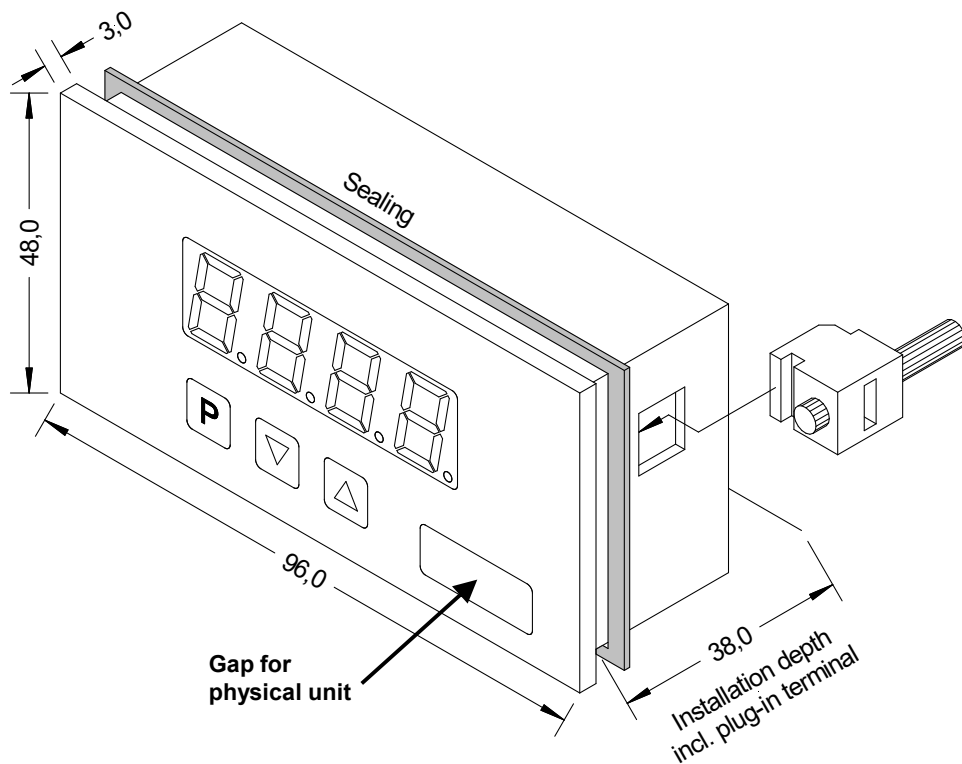
1. After removing the fixing elements, insert the device.
2. Check the seal to make sure it fits securely.
3. Click the fixing elements back into place and tighten the clamping screws by hand. Then use a screwdriver to tighten them another half a turn.
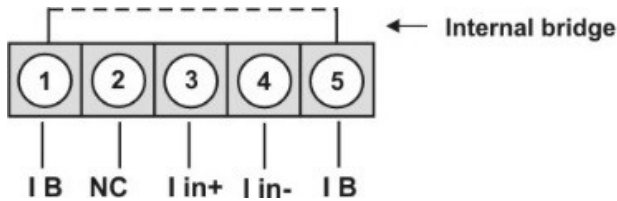
   CAUTION!   The torque should not exceed 0.1 Nm!

3. Electrical connection
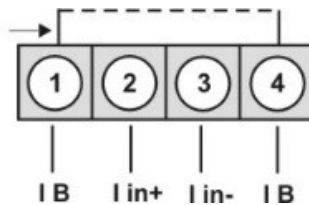
Type IM1-1SR4B.0001.K70xD (Housing 96x48 mm)
Type IM1-3SR4B.0001.K70xD (Housing 96x24 mm)
Type IM1-6SR4B.0001.K70xD (Housing 72x36 mm)

```
          ┌─────────────────────┐
          │                      │  ←─── Internal bridge
  ┌────┬────┬────┬────┬────┐
  │ 1  │ 2  │ 3  │ 4  │ 5  │
  └────┴────┴────┴────┴────┘
    │    │    │    │    │
   I B  NC  I in+ I in-  I B
```

Type IM1-7SR4B.0001.K70xD (Housing 48x24 mm)

```
Internal bridge    ──►┌──────────────┐
                      │              │
              ┌────┬────┬────┬────┐
              │ 1  │ 2  │ 3  │ 4  │
              └────┴────┴────┴────┘
                │    │    │    │
               I B  I in+ I in-  I B
```
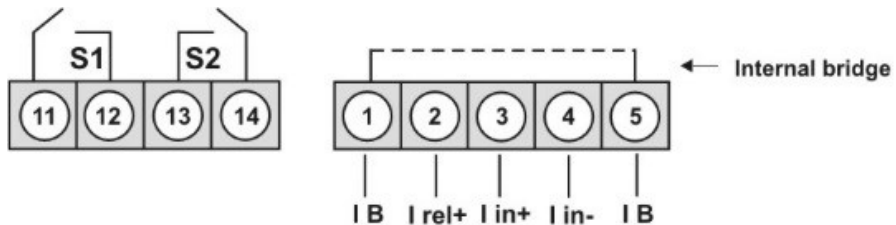
Type IM1-1SR4B.0001.K72xD (Housing 96x48 mm)   **with switching points**
Type IM1-3SR4B.0001.K72xD (Housing 96x24 mm)
Type IM1-6SR4B.0001.K72xD (Housing 72x36 mm)

```
   S1        S2                ┌───────────────────┐
                               │                   │  ←─── Internal bridge
┌────┬────┬────┬────┐   ┌────┬────┬────┬────┬────┐
│ 11 │ 12 │ 13 │ 14 │   │ 1  │ 2  │ 3  │ 4  │ 5  │
└────┴────┴────┴────┘   └────┴────┴────┴────┴────┘
                          │    │    │    │    │
                         I B I rel+ I in+ I in-  I B
```

For devices with switching outputs please use measuring input I rel+.
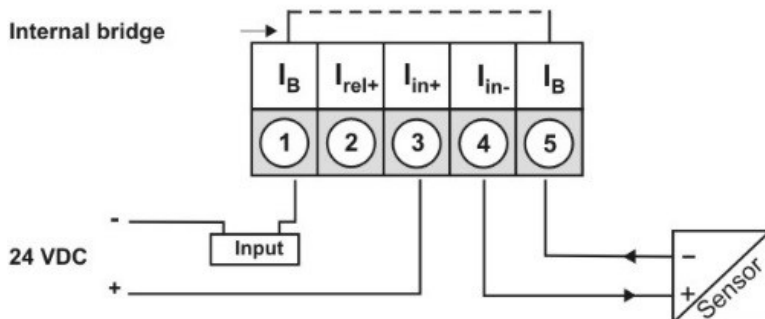
Connection examples

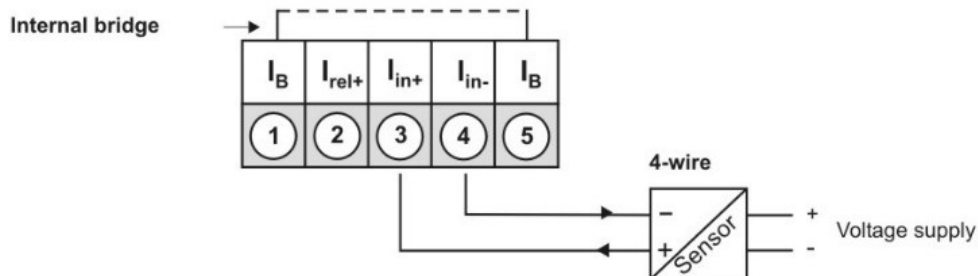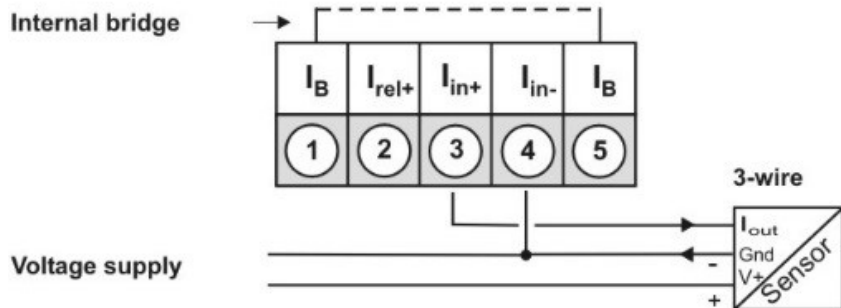Below you find some connection examples with show practical applications:

Advice: Devices in housing size 48x24 mm do not have the input Irel+. The assignment for lin+, lin- and I_B happens via terminals 2,3 and 4.

Current loop device in combination with a transmitter in current loop technique:
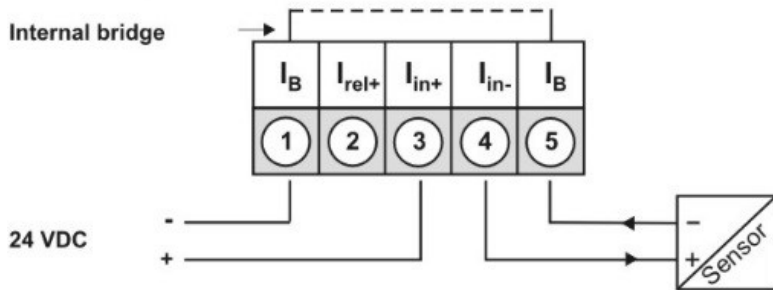

Current loop device in combination with another measuring input with low burden:

Connection examples:

Current loop device in combination with a 3-/4-wire sensor:

Internal bridge

I_B	I_{rel+}	I_{in+}	I_{in-}	I_B
1	2	3	4	5

3-wire

I_{out}
Gnd
V+
Sensor

Voltage supply

Internal bridge

I_B	I_{rel+}	I_{in+}	I_{in-}	I_B
1	2	3	4	5

4-wire

Sensor

Voltage supply

Advice:

Devices in housing size 48x24 mm do not have the input Irel+. The assignment for Iin+, Iin- and I_B happens via terminals 2,3 and 4.

Current loop device with switching outputs 24 VDC (up to 0.4 A):
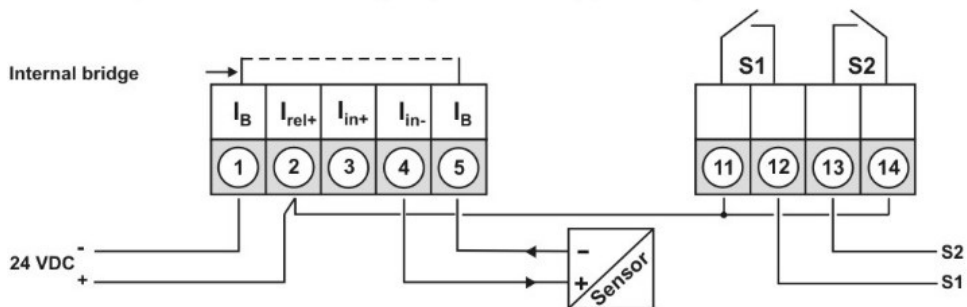
Current loop device with a 4-wire sensor and switching outputs:
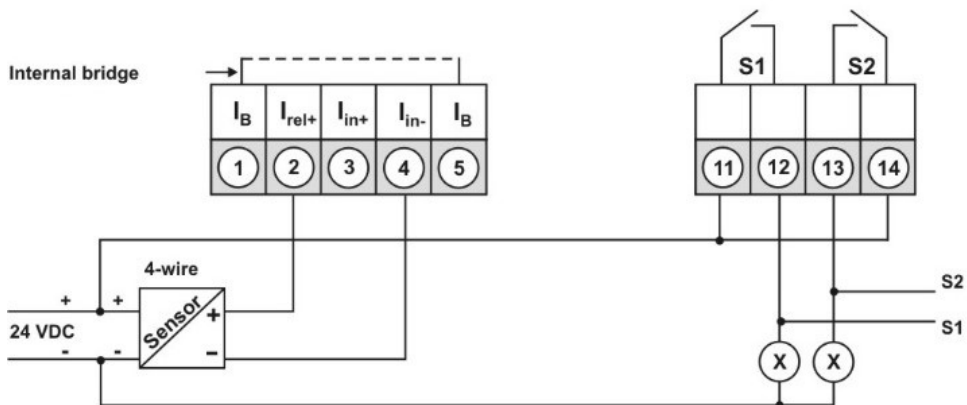
(optional available in housing sizes 96x48, 96x24 & 72x36mm)

4. Function description and operation

Operation
The operation is divided into two different levels.

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

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

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

Example:

Menu level → Parameterization level
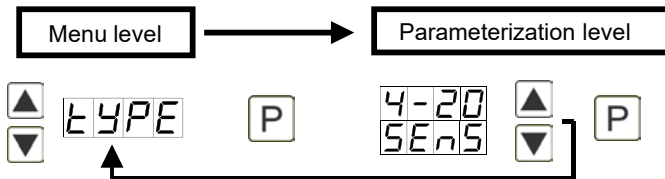
4.1. Programming via configuration software PM-TOOL-MUSB4:

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

System requirements: PC with USB interface

Software: Windows XP, Windows Vista

With this tool the device configuration can be created, skipped and safed on the PC. Via the easy to handle program surface the parameter can be changed, whereat the mode of operation and the possible selection options can be preset via the program.

CAUTION! During parameterisation with connected measuring signal, make sure that the measuring signal has no mass supply to the programming plug. The programming adapter is galvanic not isolated and directly connected with the PC. Via polarity of the input signal, a current can discharge via the adapter and destroy the device as well as other connected components!

5. Setting up the device

5.1. Switching on

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

Starting sequence

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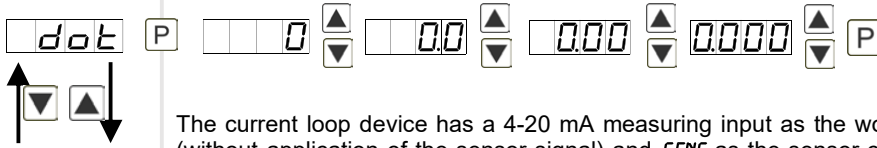
5.2. Standard parameterization:

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

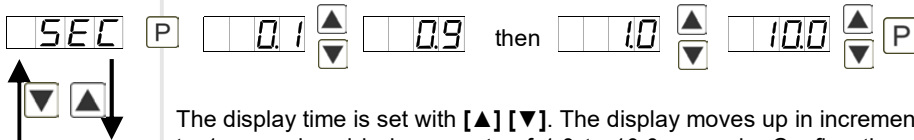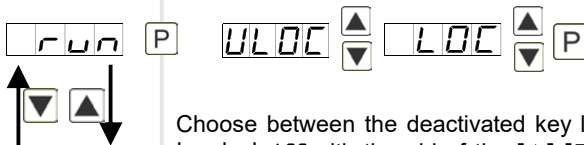| Menu level	Parameterization level
tYPE ▼ ▲	**Selection of the input signal,** *TYPE:* **Default:** *SENS* *4-20* ▲▼ *SEnS* ▲▼ [P] The current loop device has a 4-20 mA measuring input as the works calibration (without application of the sensor signal) and *SENS* as the sensor calibration (with the sensor applied). Confirm the selection with **[P]** and the display switches back to menu level.
End ▼ ▲	**Setting the measuring range end value,** *END*: **Default:** *2000* *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.
OFFS ▼ ▲	**Setting the measuring range start/offset value,** *OFFS*: **Default:** *0400* *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* 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	Parameterization level
$\fbox{d o t}$ ⬆⬇	**Selection of the input signal,** TYPE: **Default:** SENS $\fbox{0}$ ⬆⬇ $\fbox{0.0}$ ⬆⬇ $\fbox{0.00}$ ⬆⬇ $\fbox{0.000}$ ⬆⬇ $\fbox{P}$ The current loop device has a 4-20 mA measuring input as the works calibration (without application of the sensor signal) and SENS as the sensor calibration (with the sensor applied). Confirm the selection with **[P]** and the display switches back to menu level.
$\fbox{S E C}$ ⬆⬇	**Setting the display time,** SEC: **Default:** 01.0 $\fbox{0.1}$ ⬆⬇ $\fbox{0.9}$ then $\fbox{1.0}$ ⬆⬇ $\fbox{10.0}$ ⬆⬇ $\fbox{P}$ 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 to 10.0 seconds. Confirm the selection by pressing the **[P]** button. The display then switches back to the menu level again.

5.3. Programming interlock RUN

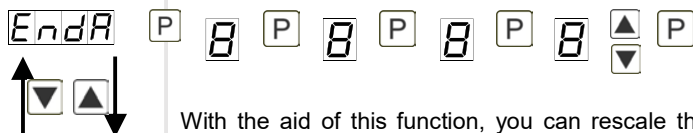|	
$\fbox{r u n}$ ⬆⬇	**Activation/deactivation of the programming lock and completion of the standard parameterization,** RUN: **Default:** ULOC $\fbox{U L O C}$ ⬆⬇ $\fbox{L O C}$ ⬆⬇ $\fbox{P}$ Choose between the deactivated key lock ULOC (works setting) and the activated key lock LOC with the aid of the **[▲] [▼]** keys. Make the selection with **[P]**. After this, the display confirms the settings with **"- - - -"**, and automatically switches to operating mode. If LOC was selected, the keyboard is locked. To get back into the menu level, press **[P]** for 3 seconds in operating mode. Now enter the CODE (works setting 1 2 3 4) that appears using the **[▲] [▼]** keys plus **[P]** to unlock the keyboard. FAIL appears if the input is wrong.

5.4. Extended parameterization

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

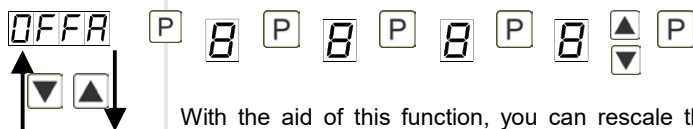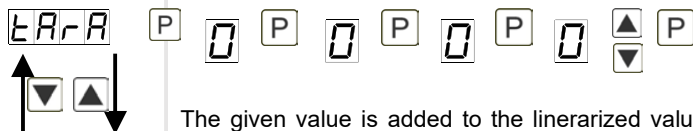| Menu level	Parameterization level
	Rescaling the measuring input values, *ENDA*: **Default:** *20.00* With the aid of this function, you can rescale the input value of **20 mA** without applying a measuring signal. If sensor calibration has been selected, these parameters are not available.
	Rescaling the measuring input values, *OFFA*: **Default:** *04.00* With the aid of this function, you can rescale the input value of **4 mA** without applying a measuring signal. If sensor calibration has been selected, these parameters are not available.
	Setting the tare/offset value, *TARA*: **Default:** *0* The given value is added to the linerarized value. In this way, the characteristic line can be shifted by the selected amount.
	Zero point slowdown, *ZERO*: **Default:** *0* With zero point slowdown, a value range around zero can be preselected at which the display shows zero. If, for example, a 10 is set, the display would show a zero in the range from -10 to +10 and continue below it with -11 and above it with +11.
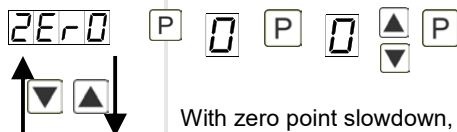
Menu level	Parameterization level
	Min/max-value inquiry - assignment of key functions, *TAST:* **Default:** *NO*

*tASt* ▼ ▲   P   *EHEr* ▲▼ *LI.12* ▲▼ *tArA* ▲▼ *no* ▲▼ P
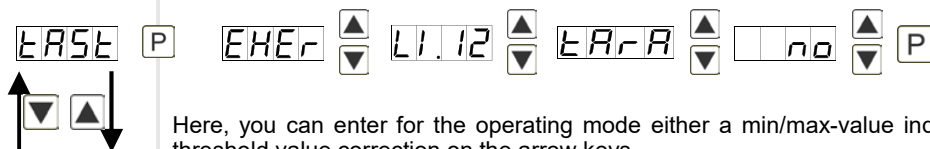
Here, you can enter for the operating mode either a min/max-value inquiry or a threshold value correction on the arrow keys.

If the min/max-memory is activated with *EHER*, the measured min/max-values will be saved during operation and can be called up via the arrow keys **[▲] [▼]**. When the device is restarted or the buttons are pressed simultaneously, the values are lost or deleted. If the threshold value correction *LI.1* is selected, the limit values can be changed during operation without hindering the operating procedure.

With *TARA* the display is tared to zero and is saved permanently as offset. The device confirms the correct taring by showing *0000* in the display. If *NO* is parameterized, the navigation keys **[▼] [▲]** have no function in operating mode.

Flashing of display, *FLAS:*
Default: *NO*

FLAS ▼ ▲   P   *LI - 1* ▲▼ *LI - 2* ▲▼ *LI.12* ▲▼ *no* ▲▼ P
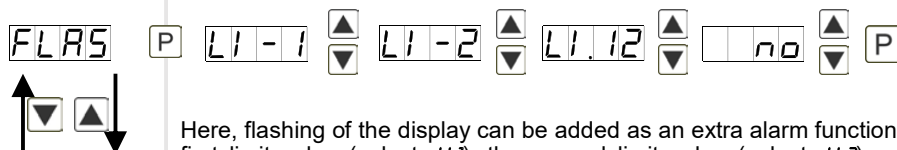
Here, flashing of the display can be added as an extra alarm function, either to the first limit value (select: *LI-1*), the second limit value (select: *LI-2*) or to both limit values (select: *LI-12*). With *NO* (works setting), no flashing is assigned at all.

Limit values / limits, *LI-1:*
Default: *0800*
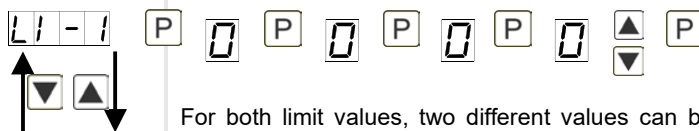
LI - 1 ▼ ▲   P   *0* P *0* P *0* P *0* ▲▼ P

For both limit values, two different values can be parameterized. With this, the parameters for each limit value are called up one after the other.

Hysteresis for limit values, *HY-1:*
Default: *0000*
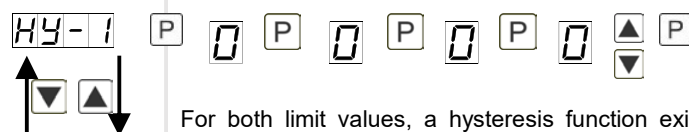
HY - 1 ▼ ▲   P   *0* P *0* P *0* P *0* ▲▼ P

For both limit values, a hysteresis function exists that reacts according to the functional principle (operating current / quiescent current).

Menu level	Parameterization level
$Fu-1$	**Function if display falls below / exceeds limit value,** $FU-1$: **Default:** $HIGH$ $HIGH$ ▲▼ $Louu$ ▲▼ P To indicate if the value falls below the lower limit value, $LOUU$ can be selected (LOW = lower limit value) and if it goes above the upper limit value, $HIGH$ can be selected (HIGH = upper limit value). LOW corresponds to the quiescent current principle and HIGH to the operating current principle.
$LI-2$	**Limit value / limits,** $LI-2$: **Default:** 1200 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 the other.
$HY-2$	**Hysteresis for limit values,** $HY-2$: **Default:** 0000 0 P 0 P 0 P 0 ▲▼ P For both limit values, a hysteresis function exists that reacts according to the functional principle (operating current / quiescent current).
$Fu-2$	**Function if display falls below / exceeds limit value,** $FU-2$: **Default:** $HIGH$ $HIGH$ ▲▼ $Louu$ ▲▼ P To indicate if the value falls below the lower limit value, $LOUU$ can be selected (LOW = lower limit value) and if it goes above the upper limit value, $HIGH$ can be selected (HIGH = upper limit value). LOW corresponds to the quiescent current principle and HIGH to the operating current principle.
$CodE$	**Setting the code,** $CODE$: **Default:** 1234 1 P 2 P 3 P 4 ▲▼ P With this setting, it is possible to select an individual code (works setting 1234) for locking the keyboard. To lock/release the key, proceed according to menu item RUN.

Menu level	Parameterization level
$\boxed{SPC\!t}$ ▲▼	**Supporting points - number of additional supporting points,** $SPCT$: **Default:** 0 $\boxed{P}$ $\boxed{0}$ ▲▼ $\boxed{P}$ In addition to the start and end value, 8 extra supporting points can be defined to linearise non-linear sensor values. Only the activated set point parameters are displayed.
$\boxed{dIS1}$ ▲▼	**Display values for supporting points,** $DIS1 ... DIS8$: $\boxed{P}$ $\boxed{8}$ $\boxed{P}$ $\boxed{8}$ $\boxed{P}$ $\boxed{8}$ $\boxed{P}$ $\boxed{8}$ ▲▼ │ $\boxed{\substack{nOCA \\ CAL}}$ ▲▼ $\boxed{P}$ Under this parameter the supporting points are defined on a value basis. At the sensor calibration one will be asked at the end (like at final value/offset, too), if a calibration shall be triggered.
$\boxed{InP1}$ ▲▼	**Analogue values for setpoints,** $INP1 ... INP8$: $\boxed{P}$ $\boxed{0}$ $\boxed{P}$ $\boxed{0}$ $\boxed{P}$ $\boxed{0}$ $\boxed{P}$ $\boxed{0}$ ▲▼ $\boxed{P}$ The set points are only displayed with the works calibration (**4-20 mA**) Here, the desired analogue values can be freely selected. The input of constantly rising analogue values must be carried out by the customer/user.

6. 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 loop current (approx. 3.8 mA) 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.

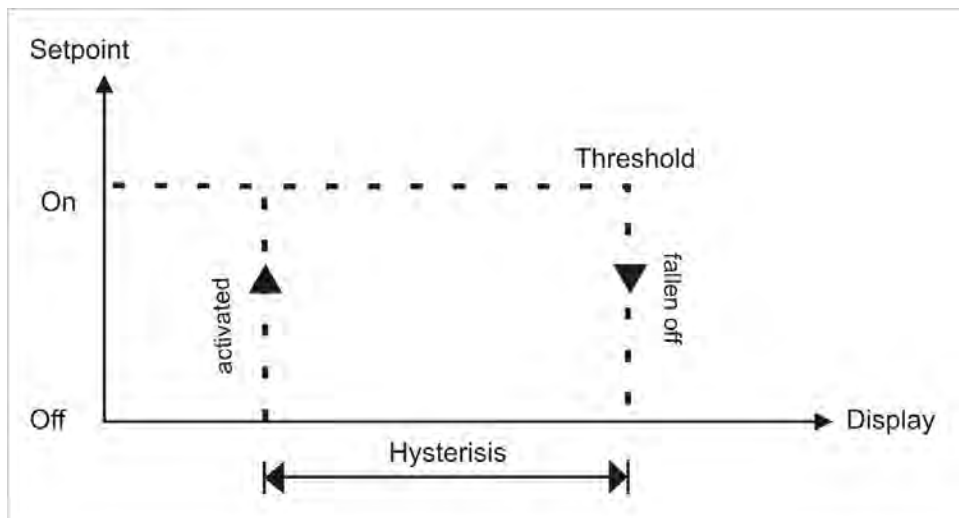## 7. Functional principle of the switching points

Limit value exceedance *HIGH*

The switching point S1-S2 is "off" below the threshold and "on" on reaching the threshold.
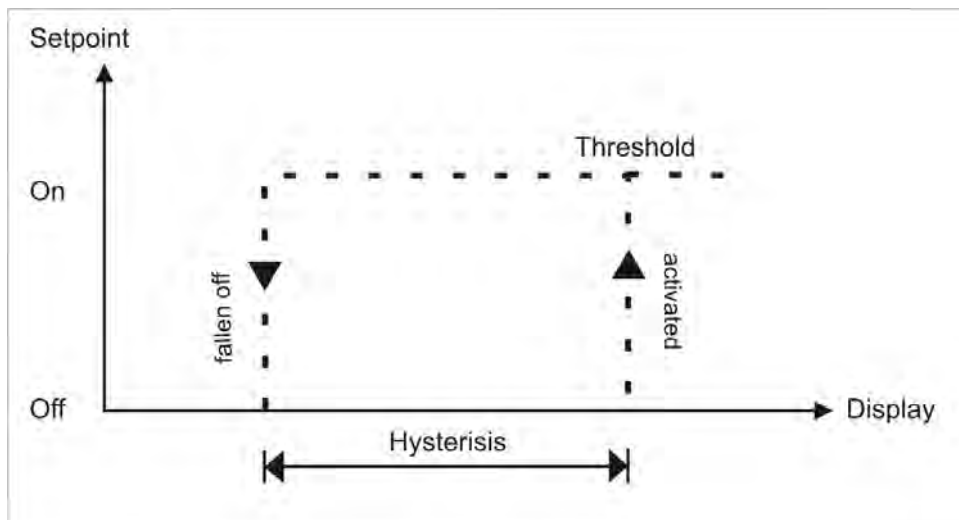
Limit value undercut *LOW*

The switching point S1-S2 is "on" below the threshold and switched "off" on reaching the threshold.

Alarms / optical switching point display

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

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

8. Technical data

Housing	
Dimensions	96x48x25 mm (BxHxD), D = 38 mm including plug-in terminal
	96x24x40 mm (BxHxD), D = 63 mm including plug-in terminal
	72x36x25 mm (BxHxD), D = 38 mm including plug-in terminal
	48x24x27 mm (BxHxD), D = 54 mm including plug-in terminal
Panel cut-out	$92.0^{+0.8}$ x $45.0^{+0.6}$ mm (Housing 96x48 mm)
	$92.0^{+0.8}$ x $22.2^{+0.3}$ mm (Housing 96x24 mm)
	$68.0^{+0.7}$ x $33.0^{+0.6}$ mm (Housing 72x36 mm)
	$45.0^{+0.6}$ x $22.2^{+0.3}$ mm (Housing 48x24 mm)
Insulation thickness	up to 3 mm
Fixing	snap-in screw element
Material	PC Polycarbonate, black, UL94V-0
Sealing material	EPDM, 65 Shore, black
Protection class	standard IP65 (front), IP00 (back side)
Weight	approx. 100 g
Connection	plug-in terminal; wire cross section up to 2.5 mm^2

Display	
Digit height	10 mm (housing 48x24 mm) 14 mm (housing 96x48 mm, 96x24 mm, 72x36 mm)
Segment colour	red
Display range	-1999 to 9999
Setpoints	optical display flashing
Overflow	horizontal bars at the top
Underflow	horizontal bars at the bottom
Display time	0.1 to 10.0 seconds

Input	Measuring range	Measuring fault	Digit
min. 3.5…max. 21 mA	4 – 20 mA	0.3 %	±1
Voltage drop	approx. 5.1 V without switching outputs approx. 8.0 V with switching outputs		

Measuring range / Input resistance / Measuring error at measuring time = 1 second	
Drift of temperature	100 ppm / K
Measuring time	0.1…10.0 seconds
Measuring principle	gradual approximation
Resolution	12 bit converter 14 bit (noiseless due to oversampling at 1s measuring time)

Output	
Switching points Only in housing sizes 96x48mm, 96x24mm and 72x36mm	potential-free PhotoMos outputs maximum switching voltage 30 VDC/AC maximum steady current 0,4 A electrical strength AC: 400 V permanent, 1800 V for 1 min
Memory	Flash memory (independently from supply)
Data life	≥ 100 years at 25°C
Ambient conditions	
Working temperature	0°C…60°C
Storing temperature	-20°C…80°C
Weathering resistance	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

9. Safety advices

Please read the following safety advice and the assembly *chapter 2* before installation and keep it for future reference.

Proper use

The **IM1-xS-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 **IM1-xS-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.
- 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 each other and do not lay them parallel with each other. Position "go" and "return lines" next to one another. Where possible use twisted pair. So, the best measuring results can be received.
- 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 isolated potentials within one complex need to be placed on an 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.

10. 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 supporting points 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 supporting points 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 to the default values and reconfigure 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.	**Err2** lights up in the 7-segment display	• Loop current <3.5 mA
7.	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 6* and set it back to its delivery status.

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