microsonic

Operating Manual

hps+ Ultrasonic Sensors for application in overpressure with one analogue output and one switching output

hps+25/DIU/TC/E/G1
hps+35/DIU/TC/E/G1
hps+130/DIU/TC/E/G1
hps+340/DIU/TC/E/G2
hps+340/DIU/TC/G2

Product description

- The hps+ sensor measures the level in a vessel in up to 6 bar overpressure contactless. The G1 and G2 threaded pipe end permits the mounting and sealing of the sensor in a flange of the vessel. At the analogue output a signal proportional to the level is created and the pnp switching output is set according to the adjusted detect distance.
- The surfaces of the ultrasonic transducers of the hps+ sensors are protected by a PTFE-film and sealed with a FFKM-O-ring against the sensor housing. Therefore the surface of the ultrasonic transducer can be cleaned from cakings or spots.
- The sensor automatically detects the load put to the analogue output and switches to current output or voltage output respectively.
- All settings are done with two push-buttons and a three-digit LED-display (TouchControl).
- Light emitting diodes (three-colour LEDs) indicate all operation conditions.
- Choosing between rising and falling output characteristic as well as output function NOC and NCC is possible.
- The sensors are adjustable manually using the numerical LED-display or may be trained using Teach-in processes.
- Useful additional functions are set in the Add-on-menu.
- Using the LinkControl adapter (optional accessory) all TouchControl and additional sensor parameter settings can be adjusted by a Windows® Software.

Safety Notes

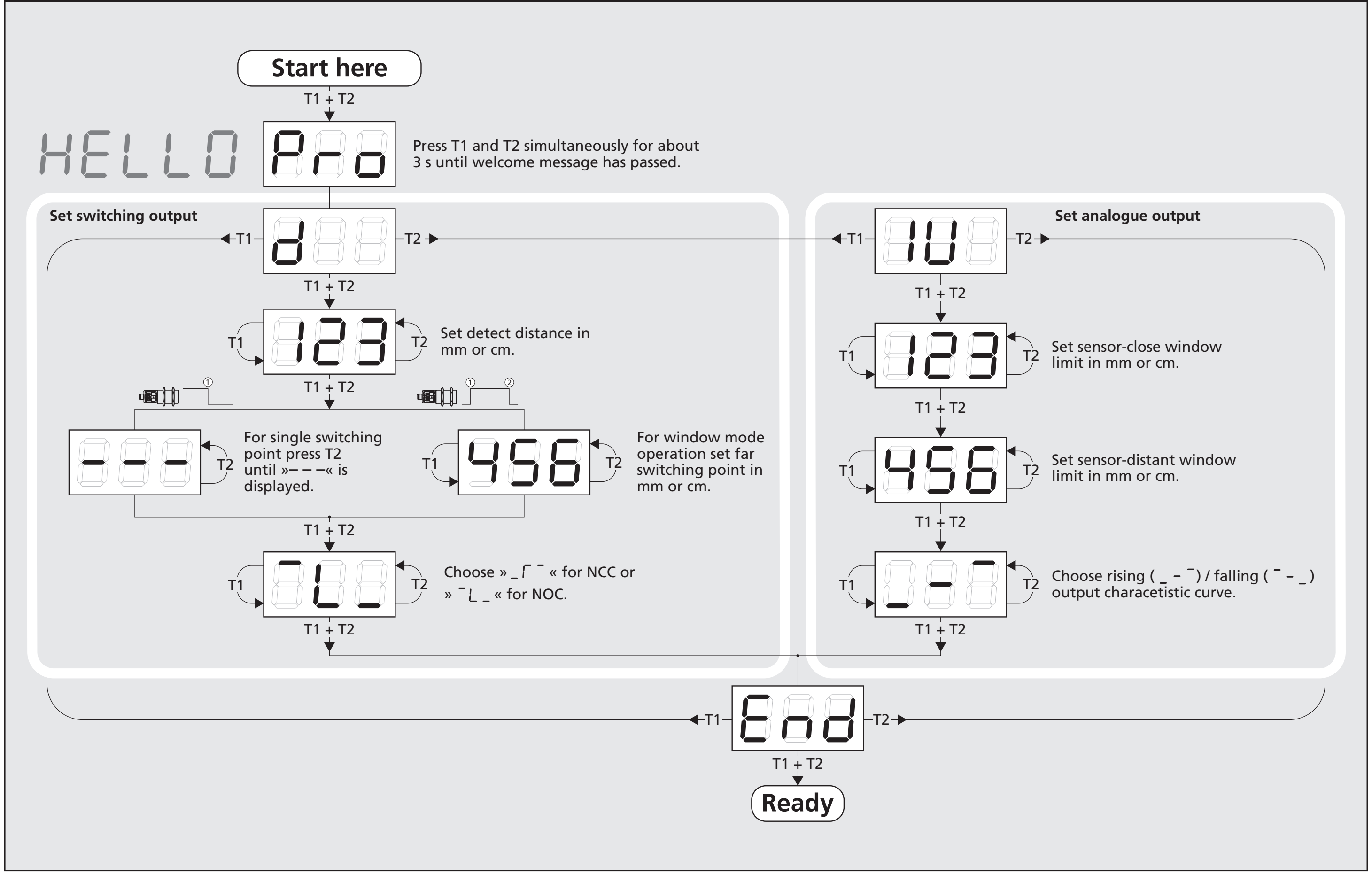
- **Read the operating instructions prior to start-up.**
- **Connection, installation and adjustment works may only be carried out by expert personnel.**
- **No safety component in accordance with the EU Machine Directive, use in the area of personal and machine protection not permitted**

Proper Use

hps+ ultrasonic sensors are used for non-contact detection of objects.

The hps+ sensors indicate a **blind zone**, in which the distance cannot be measured. The **operating range** indicates the distance of the sensor that can be applied in normal atmospheric preassure with sufficient function reserve.

Diagram 1: Set sensor parameters numerically using LED display

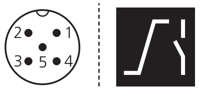


Installation

→ Assemble the sensor at the installation location.

→ If necessary seal the sensor with the enclosed Viton® O-ring (34 x 2,5 mm or 60 x 4 mm) against the flange.

→ Plug in the connector cable to the M 12 connector, see Fig. 1.



		colour
1	$+U_B$	brown
3	$-U_B$	blue
4	D	black
2	I/U	white
5	Sync/Com	grey

Fig. 1: Pin assignment with view onto sensor plug and colour coding of the microsonic connection cable

Start-up

→ Connect the power supply.

→ Set the parameters of the sensor manually via TouchControl (see Fig. 2 and Diagram 1)

→ or use the Teach-in procedure to adjust the detect points (see Diagram 2).

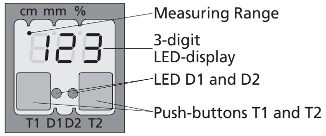


Fig. 2: TouchControl/LED display

Factory setting

hps+ sensors are delivered factory made with the following settings:

- Rising analogue characteristic
- Window limits for the analogue output set to blind zone and operating range
- Switching output on NOC
- Detecting distance at operating range
- Measurement range set to maximum range
- Sensitivity at Normal preassure

Maintenance

hps+ sensors work maintenance free. Small amounts of dirt on the surface do not influence function. Thick layers of dirt and caked-on dirt affect the sensor function and therefore must be removed.

Notes

- In operation in overpreassure it is recomended to adjust the sensitivity of the hps+ sensor: choose the parameter A14 in the Add-on menu and set it to sensitivity E2 for atmospheric preassure from 1 to 3 bar or to sensitivity E3 for atmospheric preassure >3 bar.
- hps+ sensors have internal temperature compensation. Because the sensors heat up on their own, the temperature compensation reaches its optimum working point after approx. 30 minutes of operation.
- If an object is within the set window limits of the analogue output, then LED D1 lights up green, if the object is outside the window limits, then LED D1 lights up red.
- The load put to the analogue output is detected automatically when turning supply voltage on.
- During normal operating mode, a yellow LED D2 signals that the switching output has connected.
- During normal operating mode, the measured distance value is displayed on the LED-indicator in mm. Alternatively a percentage scale may be set in the add-on menu. In this connection 0 % and 100 % correspond to the set window limits of the analogue output.
- During Teach-in mode, the hysteresis loops are set back to factory settings.
- If no objects are placed within the detection zone the LED-indicator shows »– – –«.
- If no push-buttons are pressed for 20 seconds during parameter setting mode the made changes are stored and the sensor returns to normal operating mode.
- The sensor can be reset to its factory setting, see »Key lock and factory setting«, Diagram 3.

Show parameters

→ In normal operating mode shortly push T1. The LED display shows »PAr.«

Each time you tap push-button T1 the actual settings of the analogue output are shown.

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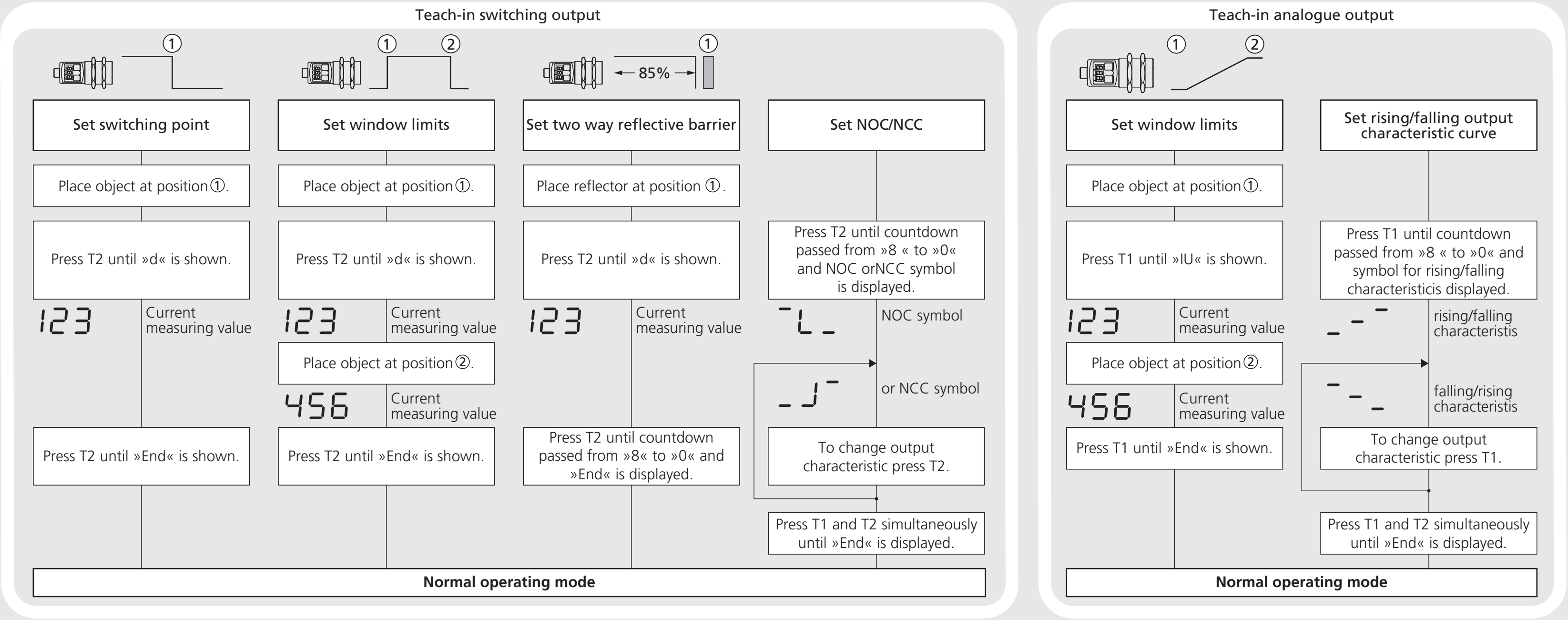
Diagram 2: Set sensor parameters via Teach-in procedure



Teach-in switching output

Set switching point
- Place object at position ①.
- Press T2 until »d« is shown.
- 123 Current measuring value
- Press T2 until »End« is shown.

Set window limits
- Place object at position ①.
- Press T2 until »d« is shown.
- 123 Current measuring value
- Place object at position ②.
- 456 Current measuring value
- Press T2 until »End« is shown.

Set two way reflective barrier
- Place reflector at position ①.
- Press T2 until »d« is shown.
- 123 Current measuring value
- Press T2 until countdown passed from »8« to »0« and »End« is displayed.

Set NOC/NCC
- Press T2 until countdown passed from »8 « to »0« and NOC orNCC symbol is displayed.
- NOC symbol
- or NCC symbol
- To change output characteristic press T2.
- Press T1 and T2 simultaneously until »End« is displayed.

Normal operating mode

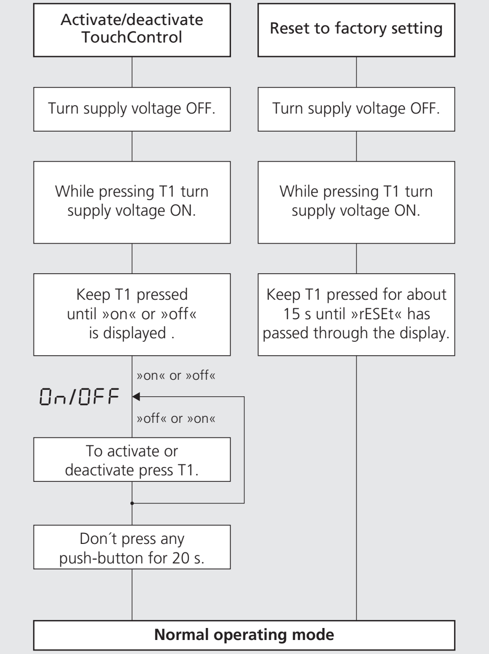
Teach-in analogue output

Set window limits
- Place object at position ①.
- Press T1 until »IU« is shown.
- 123 Current measuring value
- Place object at position ②.
- 456 Current measuring value
- Press T1 until »End« is shown.

Set rising/falling output characteristic curve
- Press T1 until countdown passed from »8 « to »0« and symbol for rising/falling characteristicis displayed.
- rising/falling characteristis
- falling/rising characteristis
- To change output characteristic press T1.
- Press T1 and T2 simultaneously until »End« is displayed.

Normal operating mode

Diagram 3: Key lock and factory setting

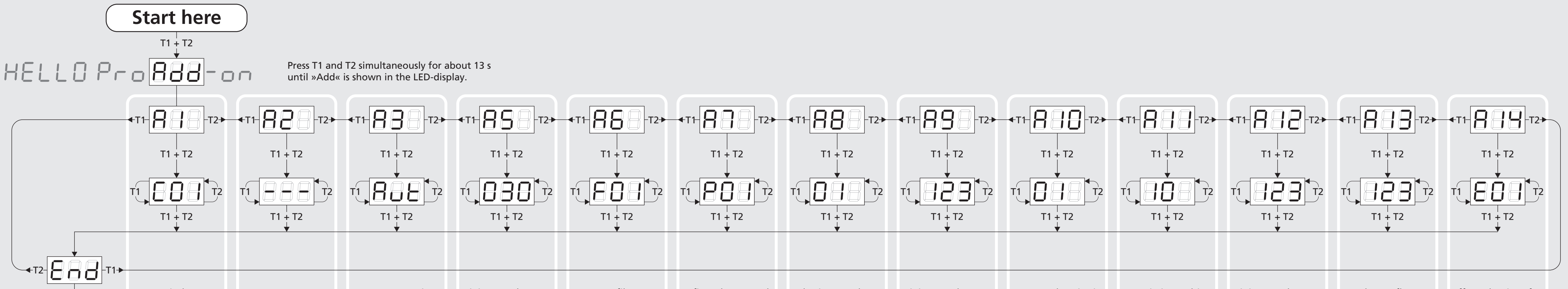


Activate/deactivate TouchControl
- Turn supply voltage OFF.
- While pressing T1 turn supply voltage ON.
- Keep T1 pressed until »on« or »off« is displayed .
- »on« or »off«
- »off« or »on«
- To activate or deactivate press T1.
- Don´t press any push-button for 20 s.

Reset to factory setting
- Turn supply voltage OFF.
- While pressing T1 turn supply voltage ON.
- Keep T1 pressed for about 15 s until »rESEt« has passed through the display.

Normal operating mode

Diagram 4: Useful additional functions in Add-on menu (for experienced users only, settings not required for standard applications)

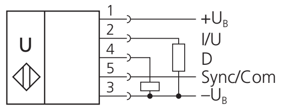


Press T1 and T2 simultaneously for about 13 s until »Add« is shown in the LED-display.

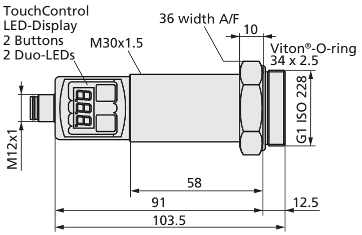
Low power mode	Display mode	Choose current/ voltage output	Hysteresis switched output	Measurement filter	Filter strength	Response time	Foreground suppression	Multiplex mode device addressing	Multiplex mode highest address	Measurement range	Calibration display	Detection zone sensitivity
»C01«: Display bright »C02«: Display dimmed »C03«: Display off	»– – –«: Display in mm or cm » ¯ – _ «: Display in %, 100 % at minimum measured value » _ – ¯«: Display in %, 100% at maximum measured value	»Aut«: automatic detection of the load »U«: voltage output »I«: current output	Minimum value: »001« Maximum value: difference between maximum range and switching point - 1 During window mode operation hysteresis influences both switching points.	»F00«: no filter »F01«: standard filter »F02«: averaging filter »F03«: foreground filter »F04«: background filter	Defines the strength of the chosen filter. »P00«: weak filter up to »P09«: strong filter	Delay in seconds between the detection of an object and the output of the measured distance in case of object approach (behaves as on-delay). "00": 0 s (no delay) up to "20": 20 s response time	Minimum value: blind zone Maximum value: nearwindow limit - 1	»00«: synchronisation »01« to »10«: sensor address for multiplex mode »oFF«: synchronisation deactivated	To optimize multiplex speed the highest sensor address may be set. Setting range »01« to »10«	Minimum value: sensor-distant window limit Maximum value: 999 mm for hps+25/..., hps+35/..., 999 cm for hps+130/..., hps+340/...	Put plane reflector vertically disposed in front of sensor: in an exact distance of 250 mm for hps+ 25... and hps+35... and 900 mm for all other types. Adjust display to 250 mm or 900 mm. Confirm calibration with T1+T2.	Affects the size of the detection zone. »E01«: high »E02«: standard »E03«: slight

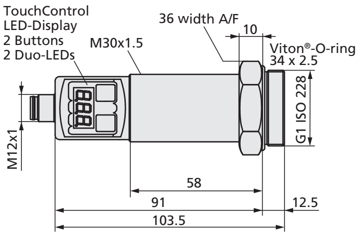
Note
Changes in the Add-on menu may impair the sensor function. A6, A7, A8, A10, A11, A12 have influence on the response time of the sensor.

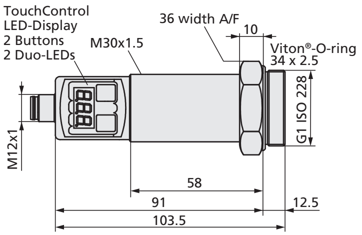
Technical data

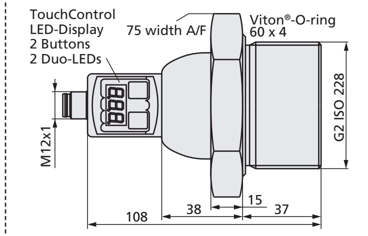


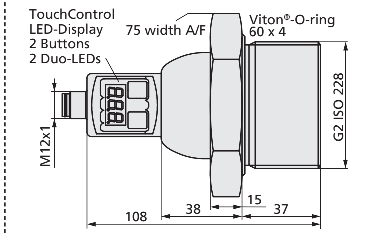
1 pnp switching output + analogue output





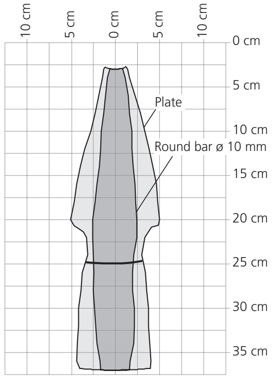


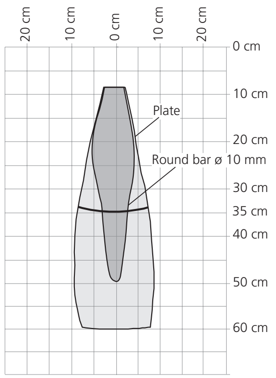


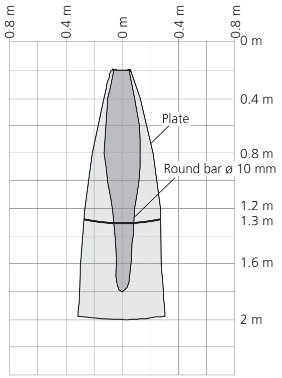


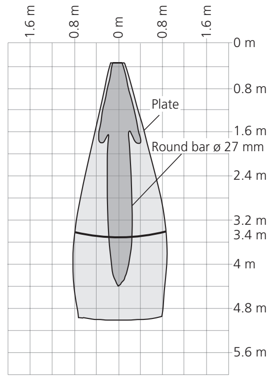
	hps+25...	hps+35...	hps+130...	hps+340...	hps+340...
Blind zone	0 to 30 mm	0 to 85 mm	0 to 200 mm	0 to 350 mm	0 to 350 mm
Operating range	250 mm	350 mm	1,300 mm	3,400 mm	3,400 mm
Maximum range	990 mm	1,500 mm	5,000 mm	8,000 mm	8,000 mm
Angle of beam spread	see detection zone	see detection zone	see detection zone	see detection zone	see detection zone
Transducer frequency	320 kHz	320 kHz	180 kHz	120 kHz	120 kHz
Resolution, sampling rate	0.025 mm	0.18 mm	0.18 mm	0.18 mm	0.18 mm
Reproducibility	±0.15 %	±0.15 %	±0.15 %	±0.15 %	±0.15 %
Accuracy	Temperature drift internal compensated, ≤2 % can be deactivated 1) (0,17 %/K without compensation)	Temperature drift internal compensated, ≤2 % can be deactivated 1) (0,17 %/K without compensation)	Temperature drift internal compensated, ≤2 % can be deactivated 1) (0,17 %/K without compensation)	Temperature drift internal compensated, ≤2 % can be deactivated 1) (0,17 %/K without compensation)	Temperature drift internal compensated, ≤2 % can be deactivated 1) (0,17 %/K without compensation)

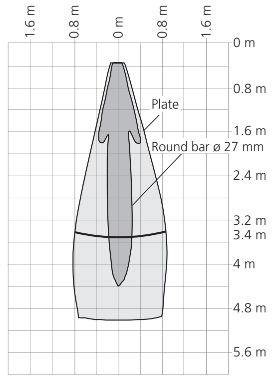
Detection zones
for different objects:
The dark grey areas are determined with a thin round bar and indicate the typical operating range of a sensor. In order to obtain the light grey areas, a plate (500 x 500 mm) is introduced into the beam spread from the side.
In doing so, the optimum angle between plate and sensor is always employed. This therefore indicates the maximum detection zone of the sensor. It is not possible to evaluate ultrasonic reflections outside this area.
Displayed is the detection zone at **standard pressure**. At 1 bar overpressure the sensitivity of the sensor will increase **5 times**.











Operating voltage U_B	9 to 30 V DC, short-circuit-proof	9 to 30 V DC, short-circuit-proof	9 to 30 V DC, short-circuit-proof	9 to 30 V DC, short-circuit-proof	9 to 30 V DC, short-circuit-proof
Voltage ripple	±10 %	±10 %	±10 %	±10 %	±10 %
No-load supply current	≤ 80 mA	≤ 80 mA	≤ 80 mA	≤ 80 mA	≤ 80 mA
Ambient pressure	up to 6.0 bar	up to 6.0 bar	up to 6.0 bar	up to 6.0 bar	up to 6.0 bar
Housing	Stainless steel 1.4571, plastic parts: PBT, TPU; Ultrasonic transducer: PTFE film, FFKM O-ring	Stainless steel 1.4571, plastic parts: PBT, TPU; Ultrasonic transducer: PTFE film, FFKM O-ring	Stainless steel 1.4571, plastic parts: PBT, TPU; Ultrasonic transducer: PTFE film, FFKM O-ring	Stainless steel 1.4571, plastic parts: PBT, TPU; Ultrasonic transducer: PTFE film, FFKM O-ring	Plastic parts: PVDF, PBT, TPU; Ultrasonic transducer: PTFE film, FFKM O-ring
Process connection	G1	G1	G1	G2	G2
Class of protection to EN 60529	IP 67	IP 67	IP 67	IP 67	IP 67
Norm conformity	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Type of connection	5-pin initiator plug, PBT	5-pin initiator plug, PBT	5-pin initiator plug, PBT	5-pin initiator plug, PBT	5-pin initiator plug, PBT
Controls	2 push-buttons (TouchControl)	2 push-buttons (TouchControl)	2 push-buttons (TouchControl)	2 push-buttons (TouchControl)	2 push-buttons (TouchControl)
Indicators	3-digit LED-display, 2 three-colour LEDs	3-digit LED-display, 2 three-colour LEDs	3-digit LED-display, 2 three-colour LEDs	3-digit LED-display, 2 three-colour LEDs	3-digit LED-display, 2 three-colour LEDs
Programmable	with TouchControl and LinkControl	with TouchControl and LinkControl	with TouchControl and LinkControl	with TouchControl and LinkControl	with TouchControl and LinkControl
Operating temperature	–25 to +70 °C	–25 to +70 °C	–25 to +70 °C	–25 to +70 °C	–25 to +70 °C
Storage temperature	–40 to +85 °C	–40 to +85 °C	–40 to +85 °C	–40 to +85 °C	–40 to +85 °C
Weight	210 g	210 g	210 g	1,200 g	350 g
Switching hysteresis 1)	3 mm	5 mm	20 mm	50 mm	50 mm
switching frequency 1)	11 Hz	9 Hz	5 Hz	3 Hz	3 Hz
Response time 1)	65 ms	84 ms	160 ms	240 ms	240 ms
Time delay before availability	<300 ms	<300 ms	<300 ms	<380 ms	<380 ms
Order No.	**hps+25/DIU/TC/E/G1**	**hps+35/DIU/TC/E/G1**	**hps+130/DIU/TC/E/G1**	**hps+340/DIU/TC/E/G2**	**hps+340/DIU/TC/G2**
Switching output	pnp, U_B – 2 V, I_{max} = 200 mA switchable NOC/NCC, short-circuit-proof	pnp, U_B – 2 V, I_{max} = 200 mA switchable NOC/NCC, short-circuit-proof	pnp, U_B – 2 V, I_{max} = 200 mA switchable NOC/NCC, short-circuit-proof	pnp, U_B – 2 V, I_{max} = 200 mA switchable NOC/NCC, short-circuit-proof	pnp, U_B – 2 V, I_{max} = 200 mA switchable NOC/NCC, short-circuit-proof
Current output 4 to 20 mA	R_L ≤ 100 Ω at 9 V ≤ U_B ≤ 20 V; R_L ≤ 500 Ω at U_B ≥ 20 V Rising/falling output characteristic	R_L ≤ 100 Ω at 9 V ≤ U_B ≤ 20 V; R_L ≤ 500 Ω at U_B ≥ 20 V Rising/falling output characteristic	R_L ≤ 100 Ω at 9 V ≤ U_B ≤ 20 V; R_L ≤ 500 Ω at U_B ≥ 20 V Rising/falling output characteristic	R_L ≤ 100 Ω at 9 V ≤ U_B ≤ 20 V; R_L ≤ 500 Ω at U_B ≥ 20 V Rising/falling output characteristic	R_L ≤ 100 Ω at 9 V ≤ U_B ≤ 20 V; R_L ≤ 500 Ω at U_B ≥ 20 V Rising/falling output characteristic
Voltage output 0 to 10 V	R_L ≥ 100 kΩ at U_B ≥ 15 V, short-circuit-proof Rising/falling output characteristic	R_L ≥ 100 kΩ at U_B ≥ 15 V, short-circuit-proof Rising/falling output characteristic	R_L ≥ 100 kΩ at U_B ≥ 15 V, short-circuit-proof Rising/falling output characteristic	R_L ≥ 100 kΩ at U_B ≥ 15 V, short-circuit-proof Rising/falling output characteristic	R_L ≥ 100 kΩ at U_B ≥ 15 V, short-circuit-proof Rising/falling output characteristic

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1) Can be programmed via TouchControl and LinkControl.

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