



Operating manual

hps+ Ultrasonic Sensors for application in overpressure with two switching outputs

- hps+25/DD/TC/E/G1
- hps+35/DD/TC/E/G1
- hps+130/DD/TC/E/G1
- hps+340/DD/TC/E/G2
- hps+340/DD/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. The pnp switching outputs are set according to the adjusted detect distances.
- 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 cavings or spots.
- 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.
- The output functions are changeable from NOC to NCC.
- The sensors are adjustable manually using the numerical LED display and may be trained via 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 may be made by a Windows software.

Important instructions for assembly and application

All employee and plant safety-relevant measures must be taken prior to assembly, start-up or maintenance work (see operating manual for the entire plant and the operator instruction of the plant).

The sensors are not considered as safety equipment and may not be used to ensure human or machine safety!

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 pressure with sufficient function reserve.

Assembly instructions

- 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 M12 connector.

		colour
1	+U _B	brown
3	-U _B	blue
4	D2	black
2	D1	white
5	Sync/Com	grey

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

Start-up

- hps+ sensors are delivered factory made with the following settings:
- Switching outputs on NOC.
- Detecting distances at operating range and half operating range.

- Measurement range set to maximum range at ≥ 2 bar overpressure.
- Sensitivity at normal pressure.

Set the parameters of the sensor manually or use the Teach-in procedure to adjust the detect points.

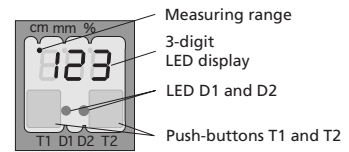


Fig. 2: TouchControl

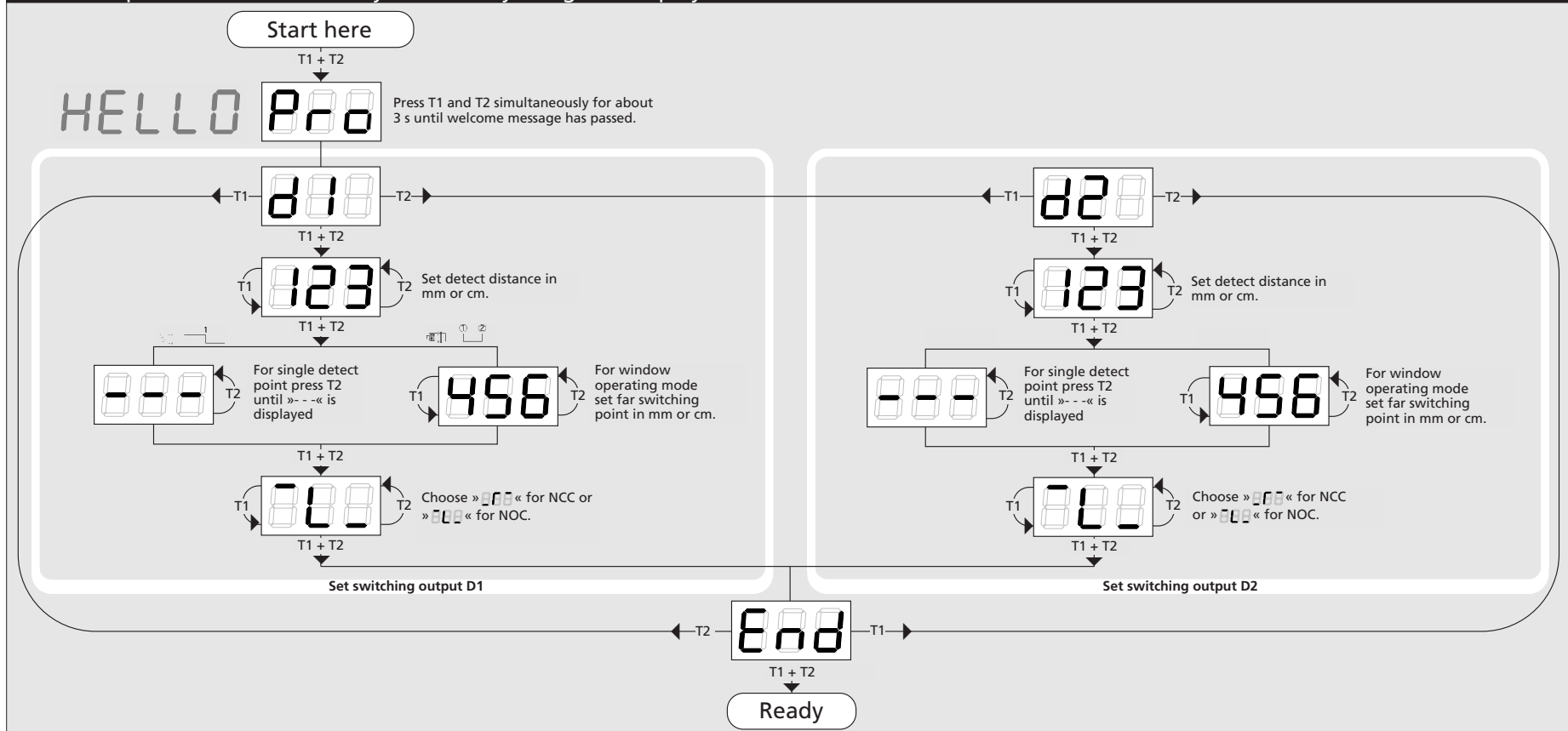
Maintenance

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.

Note

- In operation in overpressure it is recommended 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 pressure from 1 to 3 bar or to sensitivity E3 for atmospheric pressure > 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.
- During normal operating mode, a yellow LED signals that the corresponding switching output is set.
- During normal operating mode, the measured distance value is displayed on the LED display in mm (up to 999 mm) or cm (from 100 cm). Scale switches automatically and is indicated by a point on top of the digits.
- During Teach-in mode, the hysteresis value is set back to factory settings.
- If no objects are placed within the detection zone the LED display shows »- -«.
- If no push-buttons are pressed for 20 seconds during parameter setting mode, the parameter changes are saved and the sensor returns to normal operating mode.

Set sensor parameters alternatively numerically using LED display...



Show parameters

Tapping push-button T1 shortly during normal operating mode shows »PAr« on the LED display. Each time you tap push-button T1 the actual settings of the switching outputs are displayed.

...or via the Teach-in procedure

Teach-in switching output D1

1. Set switching point D1. 2. Set window mode D1. 3. Set two-way reflective barrier D1. 4. Set NOC/NCC D1.

Place object at position ①.

Press T1 until »d« is displayed.

Current measuring value: 123

Place object at position ②.

Current measuring value: 456

Press T1 until »End« is displayed.

Press T1 until »End« is displayed.

Press T1 until countdown passed from »-8« to »-0« and »End« is displayed.

To change output function press T1.

Symbol NOC or NCC.

Press T1 and T2 simultaneously until »End« is displayed.

Normal operating mode

Teach-in switching output D1

Teach-in switching output D2

1. Set switching point D2. 2. Set window mode D2. 3. Set two-way reflective barrier D2. 4. Set NOC/NCC D2.

Place object at position ①.

Press T2 until »d2« is displayed.

Current measuring value: 123

Place object at position ②.

Current measuring value: 456

Press T2 until »End« is shown.

Press T2 until »End« is shown.

Press T2 until countdown passed from »-8« to »-0« and »End« is displayed.

To change output function press T2.

Symbol NOC or NCC.

Press T1 and T2 simultaneously until »End« is displayed.

Normal operating mode

Teach-in switching output D2

Key lock and factory setting

Activate/deactivate TouchControl. Reset to factory settings.

Turn supply voltage OFF. Turn supply voltage ON.

While pressing T1 turn supply voltage ON until »on« or »off« is displayed. Turn supply voltage ON while pressing T1 and keep it pressed for ca. 15 s until »rESE« has passed through the display.

000 »on« or »off«

To activate or deactivate press T1.

OFF »off« or »on«

Wait for 20 s.

Normal operating mode

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

Start here

HELLO Pro Add-on

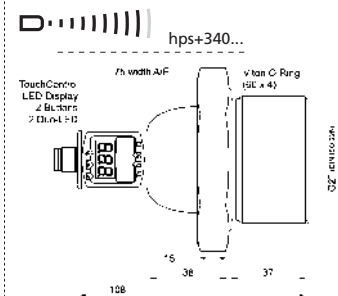
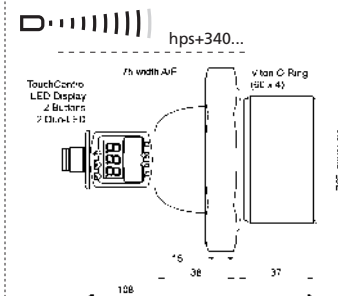
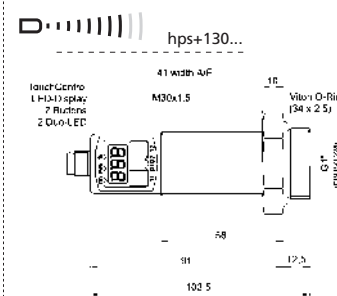
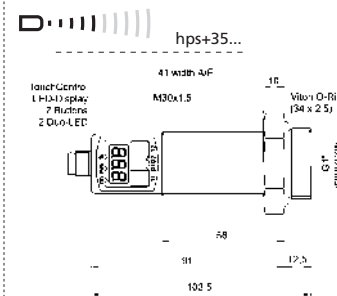
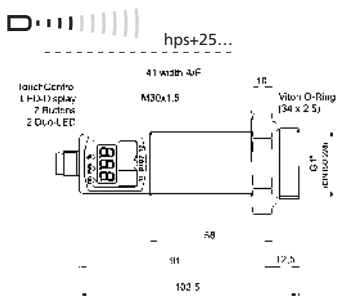
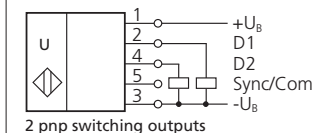
Press T1 and T2 simultaneously for about 13 s until »Add« is shown in the LED display

Ready

<p>»C01«: Display bright</p> <p>»C02«: Display dimmed</p> <p>»C03«: Display off</p> <p>Low power mode</p>	<p>Minimum value: »001«</p> <p>Maximum value: difference between maximum range and switching point - 1</p> <p>During window operating mode hysteresis influences both switching points.</p> <p>Hysteresis switching output D1</p>	<p>Minimum value: »001«</p> <p>Maximum value: difference between maximum range and switching point - 1</p> <p>During window operating mode hysteresis influences both switching points.</p> <p>Hysteresis switching output D2</p>	<p>»F00«: no filter</p> <p>»F01«: standard filter</p> <p>»F02«: averaging filter</p> <p>»F03«: foreground filter</p> <p>»F04«: background filter</p> <p>Measurement filter</p>	<p>Defines the strength of the chosen filter.</p> <p>»P00«: weak filter up to</p> <p>»P09«: strong filter</p> <p>Filter strength</p>	<p>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).</p> <p>"00": 0 s (no delay) up to</p> <p>"20": 20 s response time</p> <p>Response time</p>	<p>Minimum value: blind zone</p> <p>Maximum value: nearwindow limit - 1</p> <p>Foreground suppression</p>	<p>»00«: synchronisation</p> <p>»01« to »10«: sensor address for multiplex mode</p> <p>»FF«: synchronisation deactivated</p> <p>Multiplex mode device addressing</p>	<p>To optimize multiplex speed the highest sensor address may be set.</p> <p>Setting range »01« to »10«</p> <p>Multiplex mode highest address</p>	<p>Minimum value: sensor-distant window margin</p> <p>Maximum value: 999 mm for hps+25/..., hps+35/..., 999 cm for hps+130/..., hps+340/...</p> <p>Measurement range</p>	<p>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.</p> <p>Calibration display</p>	<p>Affects the sensitivity for operation in overpressure.</p> <p>»E01«: normal pressure</p> <p>»E02«: 1-3 bar overpressure</p> <p>»E03«: > 3 bar overpressure</p> <p>Sensitivity</p>
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Note
Changes in the Add-on menu may affect the sensor function.
A6, A7, A8, A10, A11, A12 have influence on the response time of the sensor.

Technical data



	<p>blind zone 0 to 30 mm</p> <p>operating range 250 mm</p> <p>maximum range at normal pressure 350 mm</p> <p>maximum range at ≥ 2 bar overpressure 990 mm</p> <p>angle of beam spread Please see detection zone</p> <p>transducer frequency 320 kHz</p> <p>resolution 0.025 mm</p> <p>reproducibility $\pm 0,15\%$</p> <p>accuracy $\pm 1\%$ (temperature drift internally compensated)</p> <p>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.</p> <p>Displayed is the detection zone at standard pressure. At 1 bar overpressure the sensitivity of the sensor will increase 5 times.</p>	<p>blind zone 0 to 85 mm</p> <p>operating range 350 mm</p> <p>maximum range at normal pressure 600 mm</p> <p>maximum range at ≥ 2 bar overpressure 1,500 mm</p> <p>angle of beam spread Please see detection zone</p> <p>transducer frequency 320 kHz</p> <p>resolution 0.18 mm</p> <p>reproducibility $\pm 0,15\%$</p> <p>accuracy $\pm 1\%$ (temperature drift internally compensated)</p>	<p>blind zone 0 to 200 mm</p> <p>operating range 1,300 mm</p> <p>maximum range at normal pressure 2,000 mm</p> <p>maximum range at ≥ 2 bar overpressure 5,000 mm</p> <p>angle of beam spread Please see detection zone</p> <p>transducer frequency 180 kHz</p> <p>resolution 0.18 mm</p> <p>reproducibility $\pm 0,15\%$</p> <p>accuracy $\pm 1\%$ (temperature drift internally compensated)</p>	<p>blind zone 0 to 350 mm</p> <p>operating range 3,400 mm</p> <p>maximum range at normal pressure 5,000 mm</p> <p>maximum range at ≥ 2 bar overpressure 8,000 mm</p> <p>angle of beam spread Please see detection zone</p> <p>transducer frequency 120 kHz</p> <p>resolution 0.18 mm</p> <p>reproducibility $\pm 0,15\%$</p> <p>accuracy $\pm 1\%$ (temperature drift internally compensated)</p>	<p>blind zone 0 to 350 mm</p> <p>operating range 3,400 mm</p> <p>maximum range at normal pressure 5,000 mm</p> <p>maximum range at ≥ 2 bar overpressure 8,000 mm</p> <p>angle of beam spread Please see detection zone</p> <p>transducer frequency 120 kHz</p> <p>resolution 0.18 mm</p> <p>reproducibility $\pm 0,15\%$</p> <p>accuracy $\pm 1\%$ (temperature drift internally compensated)</p>
operating voltage U_B	9 V to 30 V DC, short-circuit-proof	9 V to 30 V DC, short-circuit-proof	9 V to 30 V DC, short-circuit-proof	9 V to 30 V DC, short-circuit-proof	9 V to 30 V DC, short-circuit-proof
voltage ripple	$\pm 10\%$	$\pm 10\%$	$\pm 10\%$	$\pm 10\%$	$\pm 10\%$
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	Stainless steel 1.4571, plastic parts: 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	TouchControl and LinkControl	TouchControl and LinkControl	TouchControl and LinkControl	TouchControl and LinkControl	TouchControl and LinkControl
operating temperature	-25°C to +70°C	-25°C to +70°C	-25°C to +70°C	-25°C to +70°C	-25°C to +70°C
storage temperature	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C
weight	210 g	210 g	210 g	1,200 g	350 g
switching hysteresis¹⁾	3 mm	5 mm	20 mm	50 mm	50 mm
switching frequency²⁾	11 Hz	9 Hz	5 Hz	3 Hz	3 Hz
response time²⁾	68 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/DD/TC/E/G1	hps+35/DD/TC/E/G1	hps+130/DD/TC/E/G1	hps+340/DD/TC/E/G2	hps+340/DD/TC/G2
switching outputs	2 x pnp, $U_B=2$ V, $I_{max} = 2$ x 200 mA switchable NOC/NCC, short-circuit-proof	2 x pnp, $U_B=2$ V, $I_{max} = 2$ x 200 mA switchable NOC/NCC, short-circuit-proof	2 x pnp, $U_B=2$ V, $I_{max} = 2$ x 200 mA switchable NOC/NCC, short-circuit-proof	2 x pnp, $U_B=2$ V, $I_{max} = 2$ x 200 mA switchable NOC/NCC, short-circuit-proof	2 x pnp, $U_B=2$ V, $I_{max} = 2$ x 200 mA switchable NOC/NCC, short-circuit-proof

1) Can be programmed with TouchControl and LinkControl 2) With TouchControl and LinkControl, the selected filter setting and the maximum range influence the switching frequency and response time.