



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 cakings or spots.
  - All settings are done with two push-buttons and a three-digit LED display (TouchControl).
  - Light emitting diodes (three-colour LEDs) indicate the switching status.
  - The output functions are changeable from NOC to NCC.
  - The sensors are adjustable manually using the numerical LED display or 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 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 pressure with sufficient function reserve.

- 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 M12 connector, see Fig. 1.

		<b>colour</b>
1	+U <sub>B</sub>	brown
3	-U <sub>B</sub>	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**
- 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).

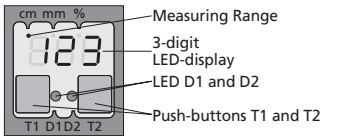


Fig. 2: TouchControl/LED display

- Factory setting**
- hps+ sensors are delivered factory made with the following settings:
- 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

**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 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.
- 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.

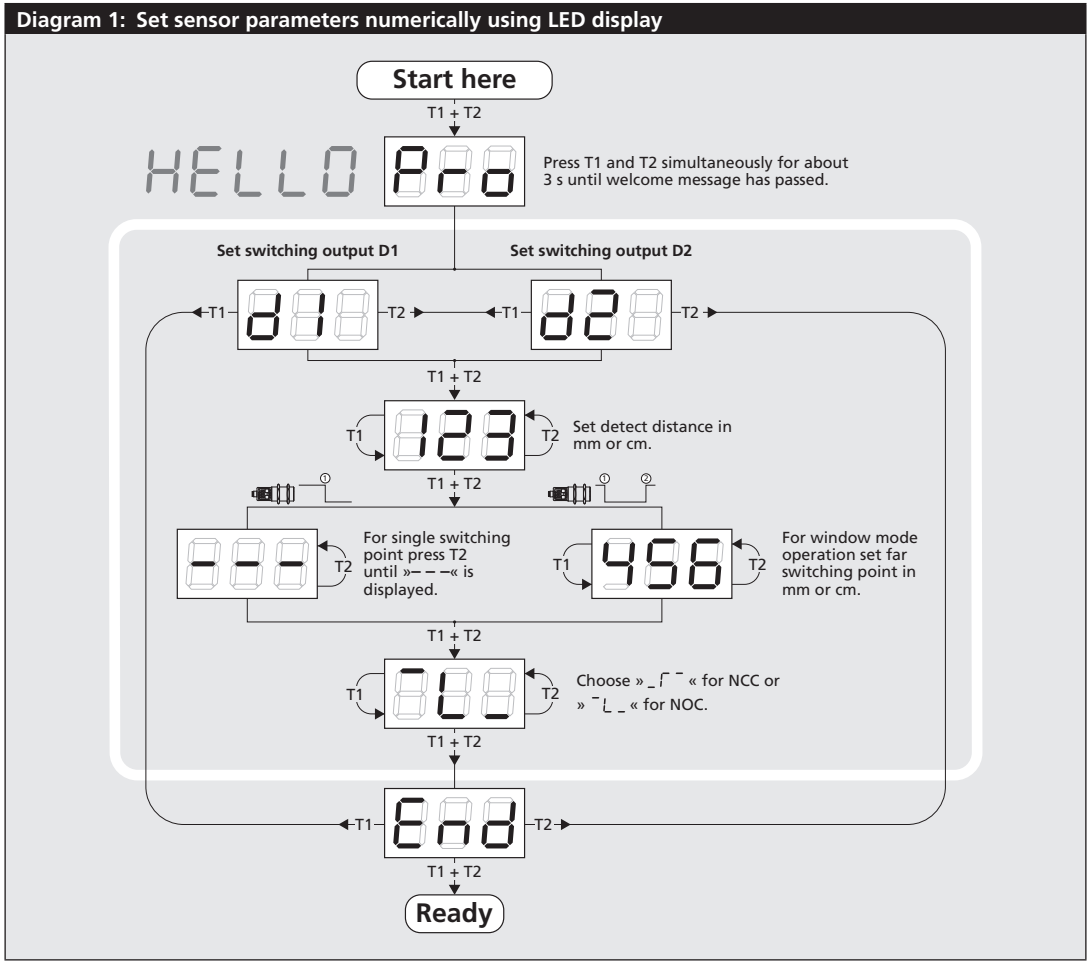


Diagram 2: Set sensor parameters via Teach-in procedure

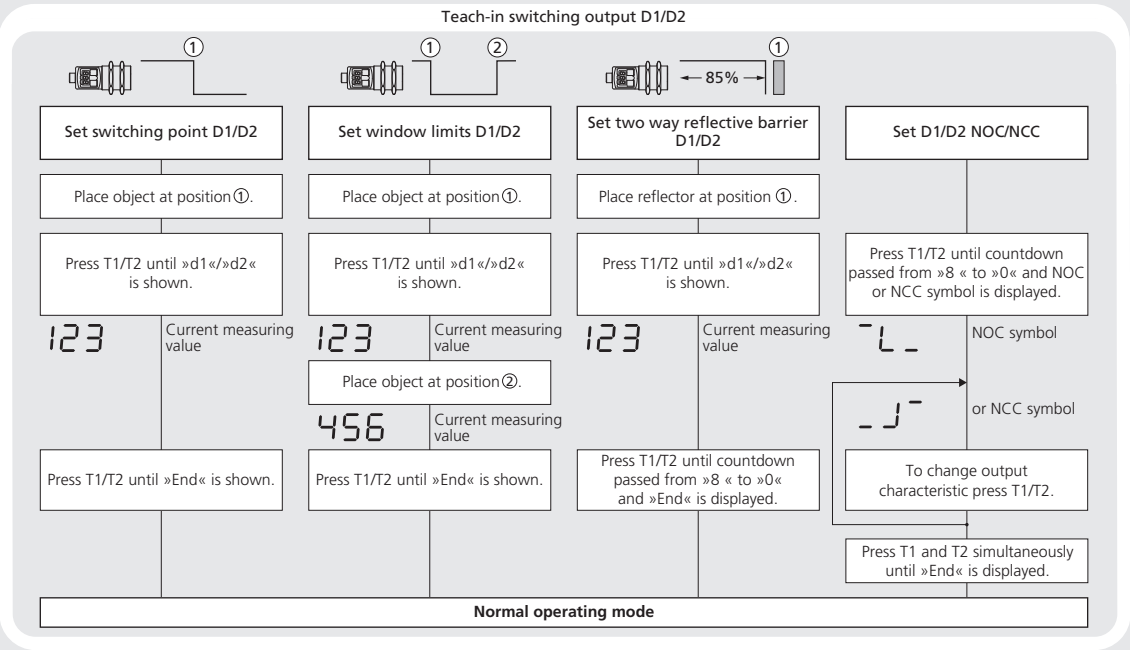


Diagram 3: Key lock and factory setting

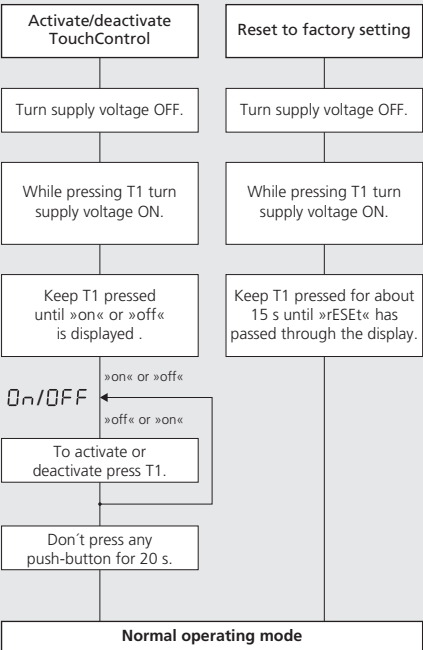
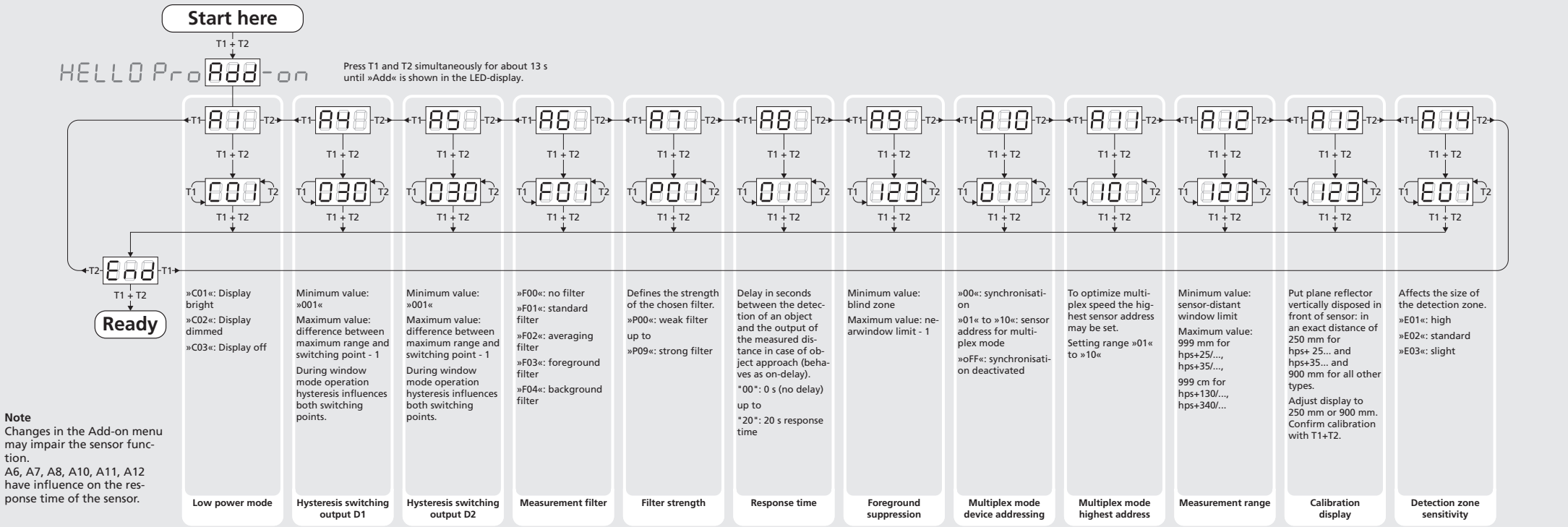
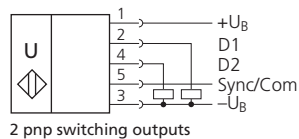


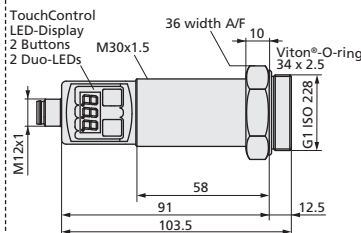
Diagram 4: Useful additional functions in Add-on menu (for experienced users only, settings not required for standard applications)



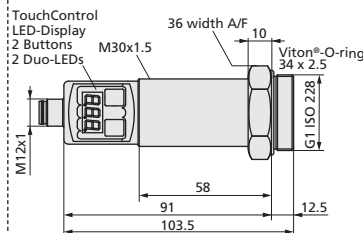
# Technical data



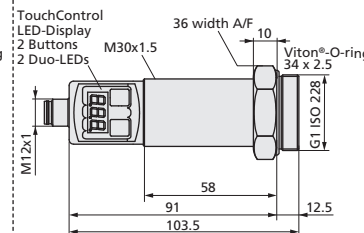
hps+25...



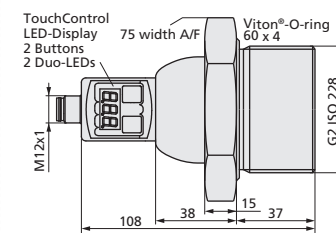
hps+35...



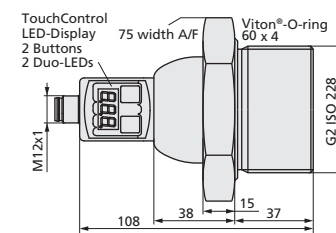
hps+130...



hps+340...

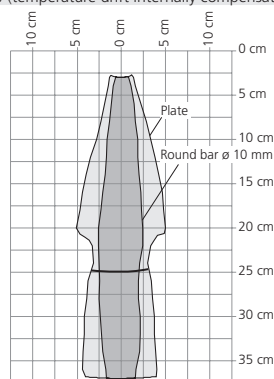


hps+340...

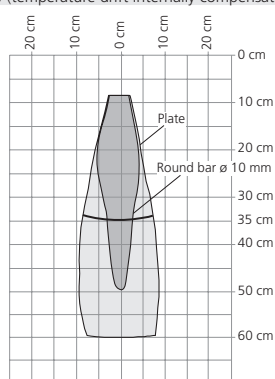


<b>blind zone</b>	0 to 30 mm
<b>operating range</b>	250 mm
<b>maximum range at normal pressure</b>	350 mm
<b>maximum range at <math>\geq 2</math> bar overpressure</b>	990 mm
<b>angle of beam spread</b>	see detection zone
<b>transducer frequency</b>	320 kHz
<b>resolution</b>	0.025 mm
<b>reproducibility</b>	$\pm 0.15$ %
<b>accuracy</b>	$\pm 1$ % (temperature drift internally compensated)

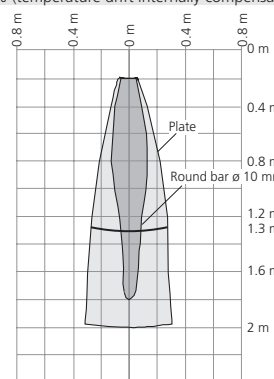
**Detection zones**  
for different objects:  
The dark grey areas are determined with a thin round bar and indicate the typical operating range of a sensor. In order to obtain the light grey areas, a plate (500 x 500 mm) is introduced into the beam spread from the side. In doing so, the optimum angle 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.



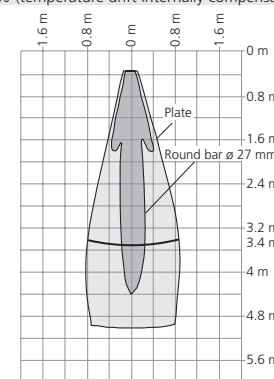
<b>blind zone</b>	0 to 85 mm
<b>operating range</b>	350 mm
<b>maximum range at normal pressure</b>	600 mm
<b>maximum range at <math>\geq 2</math> bar overpressure</b>	1,500 mm
<b>angle of beam spread</b>	see detection zone
<b>transducer frequency</b>	320 kHz
<b>resolution</b>	0.18 mm
<b>reproducibility</b>	$\pm 0.15$ %
<b>accuracy</b>	$\pm 1$ % (temperature drift internally compensated)



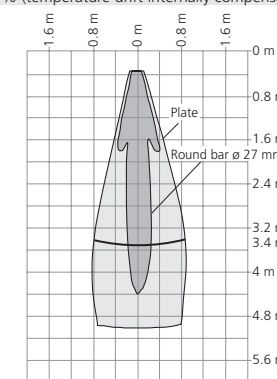
<b>blind zone</b>	0 to 200 mm
<b>operating range</b>	1,300 mm
<b>maximum range at normal pressure</b>	2,000 mm
<b>maximum range at <math>\geq 2</math> bar overpressure</b>	5,000 mm
<b>angle of beam spread</b>	see detection zone
<b>transducer frequency</b>	180 kHz
<b>resolution</b>	0.18 mm
<b>reproducibility</b>	$\pm 0.15$ %
<b>accuracy</b>	$\pm 1$ % (temperature drift internally compensated)



<b>blind zone</b>	0 to 350 mm
<b>operating range</b>	3,400 mm
<b>maximum range at normal pressure</b>	5,000 mm
<b>maximum range at <math>\geq 2</math> bar overpressure</b>	8,000 mm
<b>angle of beam spread</b>	see detection zone
<b>transducer frequency</b>	120 kHz
<b>resolution</b>	0.18 mm
<b>reproducibility</b>	$\pm 0.15$ %
<b>accuracy</b>	$\pm 1$ % (temperature drift internally compensated)



<b>blind zone</b>	0 to 350 mm
<b>operating range</b>	3,400 mm
<b>maximum range at normal pressure</b>	5,000 mm
<b>maximum range at <math>\geq 2</math> bar overpressure</b>	8,000 mm
<b>angle of beam spread</b>	see detection zone
<b>transducer frequency</b>	120 kHz
<b>resolution</b>	0.18 mm
<b>reproducibility</b>	$\pm 0.15$ %
<b>accuracy</b>	$\pm 1$ % (temperature drift internally compensated)



<b>operating voltage <math>U_B</math></b>	9 to 30 V DC, short-circuit-proof
<b>voltage ripple</b>	$\pm 10$ %
<b>no-load supply current</b>	$\leq 80$ mA
<b>ambient pressure</b>	up to 6.0 bar
<b>housing</b>	Stainless steel 1.4571, plastic parts: PBT, TPU; Ultrasonic transducer: PTFE film, FFKM O-ring
<b>process connection</b>	G1
<b>class of protection to EN 60529</b>	IP 67
<b>norm conformity</b>	EN 60947-5-2
<b>type of connection</b>	5-pin initiator plug, PBT
<b>controls</b>	2 push-buttons (TouchControl)
<b>indicators</b>	3-digit LED display, 2 three-colour LEDs
<b>programmable</b>	TouchControl and LinkControl
<b>operating temperature</b>	-25 to +70 °C
<b>storage temperature</b>	-40 to +85 °C
<b>weight</b>	210 g
<b>switching hysteresis</b> <sup>1)</sup>	3 mm
<b>switching frequency</b> <sup>2)</sup>	11 Hz
<b>response time</b> <sup>2)</sup>	68 ms
<b>time delay before availability</b>	<300 ms

**order no.** hps+25/DD/TC/E/G1

**switching outputs** 2 x pnp,  $U_B - 2$  V,  $I_{max} = 2$  x 200 mA  
switchable NOC/NCC, short-circuit-proof

<b>operating voltage <math>U_B</math></b>	9 to 30 V DC, short-circuit-proof
<b>voltage ripple</b>	$\pm 10$ %
<b>no-load supply current</b>	$\leq 80$ mA
<b>ambient pressure</b>	up to 6.0 bar
<b>housing</b>	Stainless steel 1.4571, plastic parts: PBT, TPU; Ultrasonic transducer: PTFE film, FFKM O-ring
<b>process connection</b>	G1
<b>class of protection to EN 60529</b>	IP 67
<b>norm conformity</b>	EN 60947-5-2
<b>type of connection</b>	5-pin initiator plug, PBT
<b>controls</b>	2 push-buttons (TouchControl)
<b>indicators</b>	3-digit LED display, 2 three-colour LEDs
<b>programmable</b>	TouchControl and LinkControl
<b>operating temperature</b>	-25 to +70 °C
<b>storage temperature</b>	-40 to +85 °C
<b>weight</b>	210 g
<b>switching hysteresis</b> <sup>1)</sup>	5 mm
<b>switching frequency</b> <sup>2)</sup>	9 Hz
<b>response time</b> <sup>2)</sup>	84 ms
<b>time delay before availability</b>	<300 ms

**order no.** hps+35/DD/TC/E/G1

**switching outputs** 2 x pnp,  $U_B - 2$  V,  $I_{max} = 2$  x 200 mA  
switchable NOC/NCC, short-circuit-proof

<b>operating voltage <math>U_B</math></b>	9 to 30 V DC, short-circuit-proof
<b>voltage ripple</b>	$\pm 10$ %
<b>no-load supply current</b>	$\leq 80$ mA
<b>ambient pressure</b>	up to 6.0 bar
<b>housing</b>	Stainless steel 1.4571, plastic parts: PBT, TPU; Ultrasonic transducer: PTFE film, FFKM O-ring
<b>process connection</b>	G1
<b>class of protection to EN 60529</b>	IP 67
<b>norm conformity</b>	EN 60947-5-2
<b>type of connection</b>	5-pin initiator plug, PBT
<b>controls</b>	2 push-buttons (TouchControl)
<b>indicators</b>	3-digit LED display, 2 three-colour LEDs
<b>programmable</b>	TouchControl and LinkControl
<b>operating temperature</b>	-25 to +70 °C
<b>storage temperature</b>	-40 to +85 °C
<b>weight</b>	210 g
<b>switching hysteresis</b> <sup>1)</sup>	20 mm
<b>switching frequency</b> <sup>2)</sup>	5 Hz
<b>response time</b> <sup>2)</sup>	160 ms
<b>time delay before availability</b>	<300 ms

**order no.** hps+130/DD/TC/E/G1

**switching outputs** 2 x pnp,  $U_B - 2$  V,  $I_{max} = 2$  x 200 mA  
switchable NOC/NCC, short-circuit-proof

<b>operating voltage <math>U_B</math></b>	9 to 30 V DC, short-circuit-proof
<b>voltage ripple</b>	$\pm 10$ %
<b>no-load supply current</b>	$\leq 80$ mA
<b>ambient pressure</b>	up to 6.0 bar
<b>housing</b>	Stainless steel 1.4571, plastic parts: PBT, TPU; Ultrasonic transducer: PTFE film, FFKM O-ring
<b>process connection</b>	G2
<b>class of protection to EN 60529</b>	IP 67
<b>norm conformity</b>	EN 60947-5-2
<b>type of connection</b>	5-pin initiator plug, PBT
<b>controls</b>	2 push-buttons (TouchControl)
<b>indicators</b>	3-digit LED display, 2 three-colour LEDs
<b>programmable</b>	TouchControl and LinkControl
<b>operating temperature</b>	-25 to +70 °C
<b>storage temperature</b>	-40 to +85 °C
<b>weight</b>	1,200 g
<b>switching hysteresis</b> <sup>1)</sup>	50 mm
<b>switching frequency</b> <sup>2)</sup>	3 Hz
<b>response time</b> <sup>2)</sup>	240 ms
<b>time delay before availability</b>	<380 ms

**order no.** hps+340/DD/TC/E/G2

**switching outputs** 2 x pnp,  $U_B - 2$  V,  $I_{max} = 2$  x 200 mA  
switchable NOC/NCC, short-circuit-proof

<b>operating voltage <math>U_B</math></b>	9 to 30 V DC, short-circuit-proof
<b>voltage ripple</b>	$\pm 10$ %
<b>no-load supply current</b>	$\leq 80$ mA
<b>ambient pressure</b>	up to 6.0 bar
<b>housing</b>	Plastic parts: PVDF, PBT, TPU; Ultrasonic transducer: PTFE film, FFKM O-ring
<b>process connection</b>	G2
<b>class of protection to EN 60529</b>	IP 67
<b>norm conformity</b>	EN 60947-5-2
<b>type of connection</b>	5-pin initiator plug, PBT
<b>controls</b>	2 push-buttons (TouchControl)
<b>indicators</b>	3-digit LED display, 2 three-colour LEDs
<b>programmable</b>	TouchControl and LinkControl
<b>operating temperature</b>	-25 to +70 °C
<b>storage temperature</b>	-40 to +85 °C
<b>weight</b>	350 g
<b>switching hysteresis</b> <sup>1)</sup>	50 mm
<b>switching frequency</b> <sup>2)</sup>	3 Hz
<b>response time</b> <sup>2)</sup>	240 ms
<b>time delay before availability</b>	<380 ms

**order no.** 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

<sup>1)</sup> Can be programmed via TouchControl and LinkControl.

<sup>2)</sup> With TouchControl and LinkControl, the selected filter setting and the maximum range influence the switching frequency and the response time.