Electronic Level Switch
ENS 3000

Description:

The ENS 3000 is an electronic level switch with integrated display. The instrument has 1, 2 or 4 switching outputs and an analogue output signal is available as an option.

In addition to the standard minimum and maximum switching signals, with the 4 switching output version it is possible to set additional warning signals to prevent problems such as tank overflow or aeration of the pump. The ENS 3000 can be used for oil as well as water. The fluid type can be selected for specific applications via the menu.

The main applications of the ENS 3000 are primarily in hydraulics, e.g. for fluid level monitoring of a tank.

The ENS 3000 is available in standard probe lengths of 250 mm, 410 mm, 520 mm and 730 mm.

The instrument is also available with or without an integrated temperature sensor.

Special features:

- 1, 2 or 4 independent PNP transistor switching outputs
- Selectable for use with oil or water
- User-selectable switch outputs based on the measured value
- Switching and switch-back points can be adjusted independently
- Selectable analogue output (optional)
- 4-digit display
- Simple to operate due to menu-based key operation

Technical data:

Input data	
Sensor type	Capacitive fluid level sensor
Probe lengths	250; 410; 520; 730 mm
Active zone	170; 290; 390; 590 mm
Max. speed of change in fluid level	40; 60; 80; 100 mm/s
Repeatability[1]	$\leq \pm 2 \%$ FS
Switching point accuracy	$\leq \pm 2 \%$ FS
Temperature (optional)	
Sensor type	Semiconductor sensor
Measuring range	-25 .. +100 °C
Accuracy	± 1.5 °C
Reaction time (t_{90})	180 s
Output data	
Analogue output (optional)	
With 1 or 2 SP selectable	4 .. 20 mA ohmic resistance $\leq$ 500 Ω
	0 .. 10 V ohmic resistance $\geq$ 1 kΩ
	corresponds to measuring range selected
With 4 SP (only with temperature sensor)	0 .. 10 V ohmic resistance $\geq$ 1 kΩ
	corresponds to measuring range selected
Switch outputs	
Type	PNP transistor output programmable as N/O / N/C
Assignment	On version with temperature measurement, user can select temperature or fluid level
Switching current	1 or 2 SP: max. 1.2 A per output
	4 SP: max. 0.25 A per output
Switching cycles	> 100 million
Environmental conditions	
Compensated temperature range	0 .. +60 °C
Operating temperature range	0 .. +60 °C
Storage temperature range	-40 .. +80 °C
Fluid temperature range	0 .. +60 °C
CE mark	EN 61000-6-1 / 2 / 3 / 4
cULus mark[2]	Certificate No. E318391
Vibration resistance to DIN EN 60068-2-6 (0 .. 500 Hz)	$\leq$ 5 g
Shock resistance to DIN EN 60068-2-29 (1 ms)	$\leq$ 25 g
Protection class to IEC 60529	IP 67
Other data	
Max. tank pressure	0.5 bar (short-term 3 bar, t < 1 min)
Supply voltage	9 .. 35 V DC without analogue output
	18 .. 35 V DC with analogue output
for use acc. to UL spec.	- limited energy - according to 9.3 UL 61010; Class 2; UL 1310/1585; LPS UL 60950
Current consumption	max. 2.47 A total max. 90 mA with inactive switching outputs and 2 analogue outputs
Residual ripple of supply voltage	$\leq$ 5 %
Fluids[3]	Hydraulic oils (mineral based), synth. oils, fluids containing water
Parts in contact with medium	Ceramic
Display	4-digit, LED, 7 segment, red, height of digits 7 mm
Weight	~ 180; 220; 250; 300 g

Note: Reverse polarity protection of the supply voltage, excess voltage, override and short circuit protection are provided.

FS (**F**ull **S**cale) = relative to complete measuring range

[1] Specified for calm, non-turbulent fluid,

[2] Environmental conditions according to 1.4.2 UL 61010-1; C22.2 No. 61010-1

[3] Other fluids on request

Setting options:

All settings available on the ENS 3000 are combined in 2 easy-to-navigate menus. To prevent unauthorised adjustment of the instrument, a programming lock can be set.

Setting ranges of the switching points and switch-back hystereses:

Fluid level switching point function

Probe length in cm	Meas. range in cm	Switching point in cm *	Hysteresis in cm *
25.0	17.0	0.3 .. 17.0	0.1 .. 16.8
41.0	29.0	0.5 .. 29.0	0.2 .. 28.7
52.0	39.0	0.6 .. 39.0	0.2 .. 38.6
73.0	59.0	0.9 .. 59.0	0.3 .. 58.4

The increment for all units is 0.1 cm.

Fluid level window function

Probe length in cm	Lower switch value in cm *	Upper switch value in cm *
25.0	0.3 .. 16.7	0.4 .. 16.8
41.0	0.5 .. 28.4	0.7 .. 28.7
52.0	0.6 . 38.3	0.9 .. 38.6
73.0	0.9 .. 57.9	1.4 .. 58.4

The increment for all units is 0.1 cm.

Fluid level offset function

Probe length in cm	Meas. range in cm *	Offset in cm *
25.0	17.0	0 .. 68.0
41.0	29.0	0 .. 116.0
52.0	39.0	0 .. 156.0
73.0	59.0	0 .. 177.0

The increment for all units is 0.1 cm.

Temperature switching point function

Unit	Meas. range	Switching point	Hysteresis
°C	-25 .. +100	-23.0 .. +100.0	1.0 .. 123.5

The increment for all units is 0.5 °C.

Temperature window function

| Unit	Lower switch value	Upper switch value
°C	-23.5 .. +97.5	-22.0 .. +98.5

The increment for all units is 0.5 °C.

* All ranges given in the table are adjustable by the increments shown.

Additional functions:

- Switching mode of the switching outputs adjustable (switching point function or window function)
- Switching direction of the switching outputs adjustable (N/C or N/O function)
- Switching outputs can be assigned to fluid level or temperature, as required
- Switch-on and switch-off delay adjustable from 0.00 .. 9999 seconds
- Display can be adjusted (actual fluid level, actual temperature, peak values, switching point 1, 2, 3, 4 or display off)
- Analogue output can be assigned to fluid level or temperature as required (depending on model)
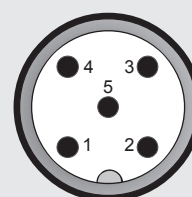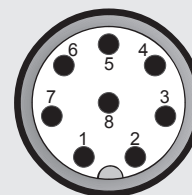
Pin connections:

M12x1, 4 pole
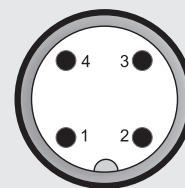
Pin	ENS 3X16-2	ENS 3X16-3
1	+U_B	+U_B
2	SP 2	Analogue
3	0 V	0 V
4	SP 1	SP 1

M12x1, 5 pole

Pin	ENS 3X18-5
1	+U_B
2	Analogue
3	0 V
4	SP 1
5	SP 2

M12x1, 8 pole

Pin	ENS 3X1P-8
1	+U_B
2	SP 2
3	0 V
4	SP 1
5	SP 3
6	SP 4
7	Analogue fluid level
8	Analogue temperature

Model code:

$$ENS\ 3\ X\ 1\ X\ -\ X\ -\ XXXX\ -\ 000\ -\ K$$

Temperature sensor
1 = With temperature sensor
2 = Without temperature sensor

Mechanical connection
1 = 22 mm collar
 to fit cutting ring coupling G22L

Electrical connection
6 = Male M12x1, 4 pole
 only possible on output models "2" and "3"
8 = Male M12x1, 5 pole
 only possible on output model "5"
P = Male M12x1, 8 pole
 only possible on output model "8"

Output
2 = 2 switching outputs
 only in conjunction with electrical connection type "6"
3 = 1 switching output and 1 analogue output
 only in conjunction with electrical connection type "6"
5 = 2 switching outputs and 1 analogue output
 only in conjunction with electrical connection type "8"
8 = 4 switching outputs and 2 analogue outputs
 only in conjunction with electrical connection type "P"

Probe length (physical) in mm
0250; 0410; 0520; 0730

Modification number
000 = Standard

Probe material
K = Ceramic

Note:
On instruments with a different modification number, please read the label or the technical amendment details supplied with the instrument.

Accessories:
Appropriate accessories, such as electrical connectors, splash guards, etc. can be found in the Accessories brochure.
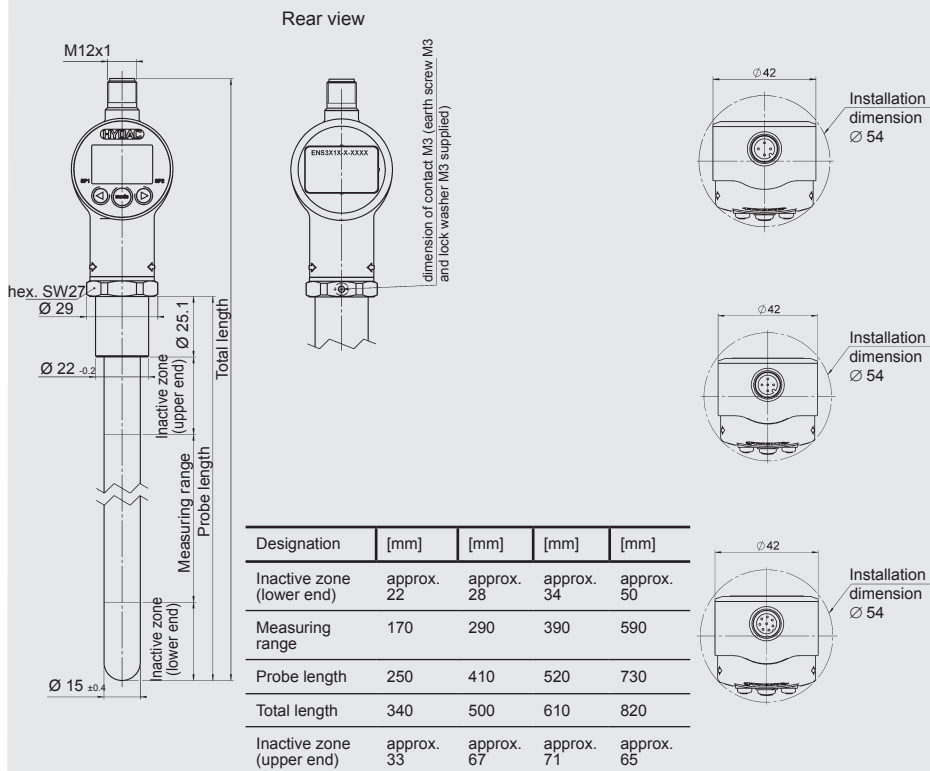
Note:

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

Dimensions:

Designation	[mm]	[mm]	[mm]	[mm]
Inactive zone (lower end)	approx. 22	approx. 28	approx. 34	approx. 50
Measuring range	170	290	390	590
Probe length	250	410	520	730
Total length	340	500	610	820
Inactive zone (upper end)	approx. 33	approx. 67	approx. 71	approx. 65