



## 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 analog 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 9.80", 16.20", 20.50" and 28.70".

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 analog 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  | 9.80"; 16.20"; 20.50"; 28.70"  |
| Active zone  | 6.70"; 11.4"; 15.35"; 23.2"  |
| Max. speed of change in fluid level                    | 1.57; 2.36; 3.14; 3.94 inch/s  |
| Repeatability <sup>1)</sup>                            | ≤ ± 2 % FS   |
| Switching point accuracy                               | ≤ ± 2 % FS   |
| Temperature (optional)                                 |  |
| Sensor type  | Semiconductor sensor   |
| Measuring range  | -13 .. +212 °F   |
| Accuracy   | -/+ 3.0 °F   |
| Reaction time (t <sub>90</sub> )                       | 180 s  |
| Output data  |  |
| Analog output (optional)                               |  |
| With 1 or 2 SP selectable                              | 4 .. 20 mA ohmic resistance ≤ 500 Ω<br>0 .. 10 V ohmic resistance ≥ 1 kΩ<br>corresponds to measuring range selected                                      |
| With 4 SP (only with temperature sensor)               | 0 .. 10 V ohmic resistance ≥ 1 kΩ<br>corresponds to measuring range selected   |
| Switch outputs   |  |
| Type   | PNP transistor output<br>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<br>4 SP: max. 0.25 A per output   |
| Switching cycles                                       | > 100 million  |
| Environmental conditions                               |  |
| Compensated temperature range                          | 32 .. +140 °F  |
| Operating temperature range                            | 32 .. +140 °F  |
| Storage temperature range                              | -40 .. +176 °F   |
| Fluid temperature range                                | 32 .. +140 °F  |
| CE mark  | EN 61000-6-1 / 2 / 3 / 4   |
| UL mark <sup>2)</sup>                                  | Certificate No. E318391  |
| Vibration resistance to DIN EN 60068-2-6 (0 .. 500 Hz) | ≤ 5 g  |
| Shock resistance to DIN EN 60068-2-29 (1 ms)           | ≤ 25 g   |
| Protection class to IEC 60529                          | IP 67  |
| Other data   |  |
| Max. tank pressure                                     | 7.25 psi (short-term 43.5 psi, t < 1 min)  |
| Supply voltage   | 9 .. 35 V DC without analog output<br>18 .. 35 V DC with analog output - limited energy - according to 9.3 UL 61010; Class 2; UL 1310/1585; LPS UL 60950 |
| for use acc. to UL spec.                               |  |
| Current consumption                                    | max. 2.47 A total<br>max. 90 mA with inactive switching outputs and 2 analog outputs   |
| Residual ripple of supply voltage                      | ≤ 5 %  |
| Fluids <sup>3)</sup>                                   | 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 (Full Scale) = relative to complete measuring range

<sup>1)</sup> Specified for calm, non-turbulent fluid,

<sup>2)</sup> Environmental conditions according to 1.4.2 UL 61010-1; C22.2 No. 61010-1

<sup>3)</sup> Other fluids on request

## Setting options:

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

## Setting ranges of the switching points and switch-back hysteresis:

### Fluid level switching point function

| Probe length in inches | Meas. range in inches | Switching point in inches | Hysteresis in inches |
|------------------------|-----------------------|---------------------------|----------------------|
| 9.80                   | 6.70                  | 0.10 .. 6.70              | 0.05 .. 6.60         |
| 16.20                  | 11.40                 | 0.20 .. 11.40             | 0.05 .. 11.25        |
| 20.50                  | 15.35                 | 0.25 .. 15.35             | 0.05 .. 15.15        |
| 28.70                  | 23.20                 | 0.35 .. 23.20             | 0.15 .. 22.85        |

The increment for all units is 0.05 inch.

### Fluid level window function

| Probe length in inches | Lower switch value in inches | Upper switch value in inches |
|------------------------|------------------------------|------------------------------|
| 9.80                   | 0.10 .. 6.55                 | 0.20 .. 6.60                 |
| 16.20                  | 0.20 .. 11.15                | 0.30 .. 11.25                |
| 20.50                  | 0.25 .. 15.05                | 0.35 .. 15.15                |
| 28.70                  | 0.40 .. 22.80                | 0.60 .. 23.00                |

The increment for all units is 0.05 inch.

### Fluid level offset function

| Probe length in inches | Meas. range in inches | Offset in inches |
|------------------------|-----------------------|------------------|
| 9.8                    | 6.7                   | 0 .. 26.8        |
| 16.2                   | 11.4                  | 0 .. 45.6        |
| 20.5                   | 15.35                 | 0 .. 61.4        |
| 28.7                   | 23.2                  | 0 .. 69.6        |

The increment for all units is 0.05 inch.

### Temperature switching point function

| Unit | Meas. range | Switching point | Hysteresis |
|------|-------------|-----------------|------------|
| °F   | -13 .. +212 | -9 .. +212      | 2 .. 222   |

The increment for all units is 1 °F.

### Temperature window function

| Unit | Lower switch value | Upper switch value |
|------|--------------------|--------------------|
| °F   | -10 .. 207         | -7 .. 209          |

The increment for all units is 1 °F.

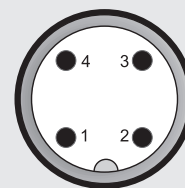
\* All ranges given in the table are adjustable by the increments shown.

## 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)
- Analog output can be assigned to fluid level or temperature as required (depending on model)

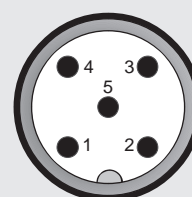
## Pin connections:

M12x1, 4 pole



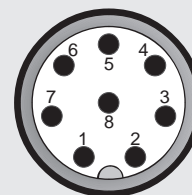
| Pin | ENS 3X16-2      | ENS 3X16-3      |
|-----|-----------------|-----------------|
| 1   | +U <sub>B</sub> | +U <sub>B</sub> |
| 2   | SP 2            | Analog          |
| 3   | 0 V             | 0 V             |
| 4   | SP 1            | SP 1            |

M12x1, 5 pole



| Pin | ENS 3X18-5      |
|-----|-----------------|
| 1   | +U <sub>B</sub> |
| 2   | Analog          |
| 3   | 0 V             |
| 4   | SP 1            |
| 5   | SP 2            |

M12x1, 8 pole



| Pin | ENS 3X1P-8         |
|-----|--------------------|
| 1   | +U <sub>B</sub>    |
| 2   | SP 2               |
| 3   | 0 V                |
| 4   | SP 1               |
| 5   | SP 3               |
| 6   | SP 4               |
| 7   | Analog fluid level |
| 8   | Analog 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 analog output only in conjunction with electrical connection type "6"
- 5 = 2 switching outputs and 1 analog output only in conjunction with electrical connection type "8"
- 8 = 4 switching outputs and 2 analog outputs only in conjunction with electrical connection type "P"

### Probe length (physical) in inches

- 0100 = 9.80"
- 0162 = 16.2"
- 0205 = 20.5"
- 0287 = 28.7"

### Modification number

- 400 = Standard in inch

### Probe material

- K = Ceramic

### Accessories:

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

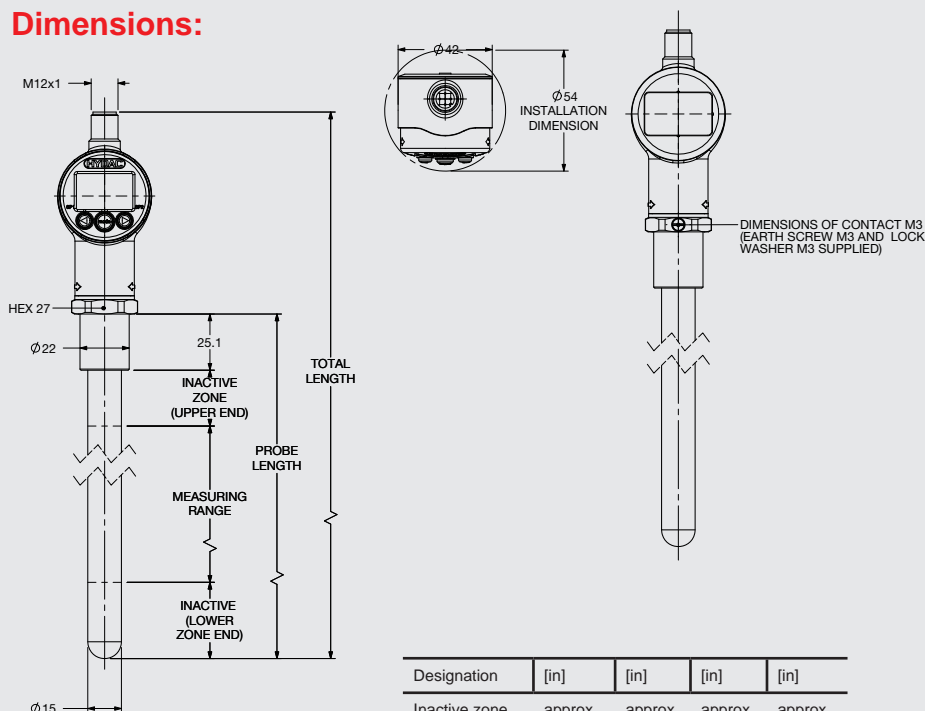
## Note:

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               | [in]         | [in]         | [in]         | [in]         |
|---------------------------|--------------|--------------|--------------|--------------|
| Inactive zone (lower end) | approx. 0.87 | approx. 1.10 | approx. 1.34 | approx. 1.97 |
| Measuring range           | 6.70         | 11.42        | 15.35        | 23.20        |
| Probe length              | 9.80         | 16.20        | 20.5         | 28.7         |
| Total length              | 13.38        | 19.68        | 24.01        | 32.28        |
| Inactive zone (upper end) | approx. 1.30 | approx. 2.64 | approx. 2.79 | approx. 2.56 |

### HYDAC ELECTRONICS

90 Southland Dr. Bethlehem, PA 18017  
 Telephone +1 (610) 266-0100  
 E-mail: electronics@hydacusa.com  
 Website: www.hydacusa.com