Oil Condition Sensor
HYDACLAB®
HLB 1400

Oil condition monitoring	4 measured variables

Sequential analogue and switching output

Description:

The HYDACLAB® HLB 1400 is a multifunctional sensor for online condition monitoring of standard and biodecradable oils in stationary and mobile applications.

The user is kept informed of changes in fluid condition as they occur and can take immediate action in the case of deteriorating operating conditions.

Assertions can be made about the condition of an oil, e.g. ageing or mixing with other fluids, based upon the measured values of dielectric constant and its change, electric conductivity and its change, saturation level, and temperatur.

These measurements are available as sequential analogue signals and/or switching signals at the electrical output of the HYDACLAB® (e.g. for activating warning devices or alarms).

The measurement values can be displayed and configured on various HYDAC display and measurement devices.

Technical data:

Input data	
Saturation level	0 .. 100 % saturation
Temperature	-25 .. +100 °C
Dielectric constant	1 .. 10
Change in the dielectric constant	-30 .. +30 %
electrical conductivity	0 .. 100 nS/m
Change of electric conductivity	-100 .. 200 %
Operating pressure	< 50 bar
Pressure resistance	< 600 bar
Flow velocity	< 5 m/s
Parts in contact with fluid	Stainless steel / ceramic with vacuum-metallised seal Glass with thin-film metallic coating / FKM
Output variable saturation level	
Output signal (0 .. 100 %)	4 .. 20 mA / 0 .. 10 V
Calibration accuracy	≤ ± 2 % FS max.
Accuracy[1]	≤ ± 3 % FS typ. [1]
Output variable temperature	
Output signal (-25 .. +100 °C)	4 .. 20 mA / 0 .. 10 V
Accuracy	≤ ± 3 % FS max.
Output variable dielectric constant	
Output signal (1 .. 10)	4 .. 20 mA / 0 .. 10 V
Accuracy	≤ ± 5 % FS max.
Output variable change of dielectric constant	
Output signal (± 30 % of IV)	12 mA ± 8 mA / 5 ± 5 V
Accuracy	See below [2]
Output variable electric conductivity (not for Mod 001)	
Output signal (0 .. 100 nS/m)	4 .. 20 mA / 0 .. 10 V
Accuracy	≤ ± 5 % FS max.
Output variable change of electric conductivity (not for Mod 001)	
Output signal (-100 .. 200 %)	12 mA ± 8 mA / 5 ± 5 V
Accuracy	See below [2]
Switching output (default settings)	
Signal 1 (N/C)	PNP switching output 0.5 A max., switching level ≥ U_B - 4 V
Default alert SP1 relative humidity	≥ 85 %
Default alert level SP1 temperature	≥ 80 °C
Default alert level SP1 rel. change in dielectric constant	± 15 %
Default alert SP1 rel. change in conductivity	± 15 % (not for Mod 001)
Environmental conditions	
Nominal temperature range	+20 .. +80 °C
Storage temperature	-30 .. +90 °C
Fluid compatibility	Suited for hydraulic and lubrication oils
$C \epsilon$ mark	EN 61000-6-1 / 2 / 3 / 4
Viscosity range	1 .. 5000 cSt
Shock resistance acc. to DIN EN 60068-2-27	50 g / 11 ms / half sine
Vibration resistance acc. to DIN EN 60068-2-6 at 5 .. 2000 Hz	10 g / sine
Protection class acc. to DIN EN 60529 [3]	IP 67
Other data	
Supply voltage U_B	10 .. 36 V DC
Residual ripple of supply voltage	≤ 5 %
Current consumption without outputs	max. 100 mA
Mechanical connection	G ¾ A ISO 1179-2
Tightening torque, recommended	30 Nm
Electrical connection	M12x1, 5 pole / 8 pole
Housing	Stainless steel
Weight	~ 215 g

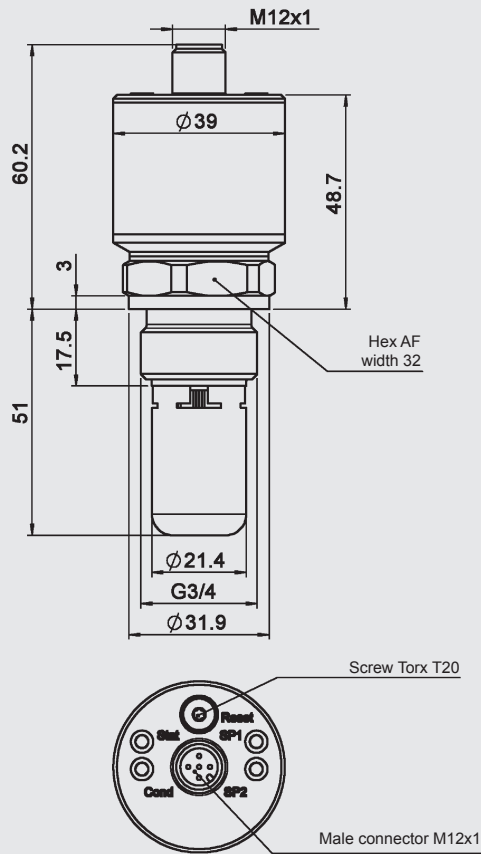Note: reverse polarity protection, short circuit protection provided.
FS (**F**ull **S**cale) = relative to complete measuring range, **IV** (**I**nitial **V**alue)

[1] The max. accuracy achievable when measuring relative humidity is heavily dependent on the type of fluid or fluid additive. More precise information on this is available on request.

[2] The accuracies when measuring the change of dielectric constant and the electric conductivity depend on the application, the oil type and the auto-calibration of the sensor. Detailed information available on request.

[3] With mounted mating connector in corresponding protection class

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Dimensions:

M12x1

60.2

Ø 39

48.7

3

17.5

51

Hex AF
width 32

Ø 21.4
G3/4
Ø 31.9

Screw Torx T20

Reset
Sat   SP1
Cond   SP2

Male connector M12x1

Model code:

HLB 1 4 J X – XXXXX – 000

Measured variables
4 = 4 measured variables:
   - saturation (rel. humidity)
   - temperature
   - electric conductivity (not for Mod 001)
   - dielectric constant (DC)

Mechanical connection
J = G 3/4 A ISO 1179-2

Electrical connection
8 = male M12x1, 5 pole (mating connector not supplied)
P = male M12x1, 8 pole (mating connector not supplied)

Signal technology
5 pole:
1C000 = 1 switching output / analogue output
00S12 = RS 485
CANopen (only available on request)
IO-Link (only available on request)
8 pole:
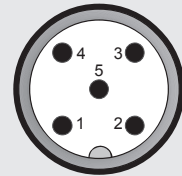1CS12 = switching output / analogue output / RS 485

Modification number
000 = standard
001 = modification; replaces HLB 1308

Accessories:
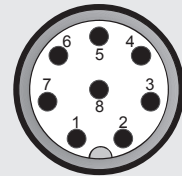Appropriate accessories, such as mating connectors, can be found in the Accessories brochure.

Pin connections:

M12x1, 5 pole

Pin	1C000	00S12
1	$+U_B$	$+U_B$
2	SP1/AA1	RS485B
3	GND	GND
4	SP2/AA2	RS485A
5	HSI	HSI

M12x1, 8 pole

Pin	1CS12
1	$+U_B$
2	SP1/AA1
3	GND
4	PE
5	HSI
6	RS 485A
7	RS 485B
8	SP2/AA2

HSI = **H**YDAC **S**ensor **I**nterface (HYDAC's own communication interface)

SP = Switch point

AA = Analogue output (sequence)

Display and read-out options:

HMG 510
Portable 2-channel measuring instrument, specially designed for use with HSI and SMART sensors.
Order no.: 909889

HMG 2500 / HMG 3010 / HMG 4000
Portable data recorders with fully graphics-capable colour display for displaying, recording and processing measured values as well as for configuring of HSI and SMART sensors.

CMU 1000
Electronic evaluation unit for online monitoring of measured values as well as for configuration of HSI and SMART sensors.
Order no.: 920718

CSI-B-2
Interface module, enables configuration of HSI and SMART sensors using HYDAC PC software CMWIN.
Order no.: 920134

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.

HYDAC ELECTRONIC GMBH
Hauptstraße 27, 66128 Saarbrücken
Germany
Telephone +49 (0)6897 509-01
Fax +49 (0)6897 509-1726
E-mail: electronic@hydac.com
Internet: www.hydac.com