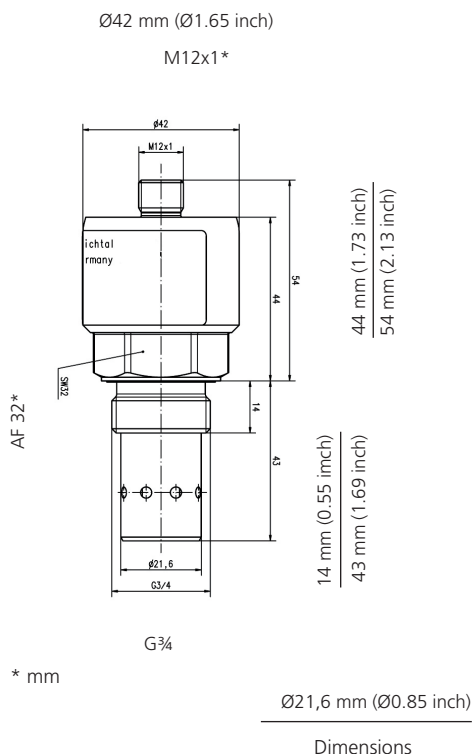## Humidity Sensor

Continuous Oil Condition Monitoring

Description

Application area

Water is not desired in hydraulic fluids and lubricants. High concentration of water can cause severe disturbance in operation and damage.

Performance features

The sensor measures the relative humidity of the oil and thus directly displays the saturation degree in the water:

› 0 %: Absolutely dry oil.

› 100 %: The oil is completely saturated with water. Additional water will not be dissolved anymore and will present itself as free water.

In contrast to the humidity analysis from laboratories, where the absolute water content is defined in ppm (parts per million), the saturation limit of the oil can be determined by relative humidity measurement. The advantage of the relative humidity over the absolute water content is, that it is not necessary to know the oil or its saturation limit in order to determine if there is free or dissolved water.

Example:

› Mineral oils (e.g. HLP) have a comparatively low water absorption capacity. 500 ppm may signify that the oil is over-saturated and that free water exists.

› Ester oils (e.g. HEES) have a relatively high water capacity. 500 ppm may show that the oil is just saturated by 15 %.

Please also note the characteristics of the relative humidity with different temperatures: Warm oil can dissolve more water than cold oil. Therefore, the relative humidity of the oil increases in case of no further water supply. Hot, relatively dry oil, may suddenly keep free water if the ambient temperature cools down.

It points out the current saturation of the oil with water, independent from oil type and temperature and additionally assures operation of systems by direct warning.

Measuring principle

The sensor records the relative oil humidity and oil temperature. Through an oil specific calibration it is possible to calculate the absolute humidity up to the saturation limit.

The measuring values are given by RS 232 and the analogue outputs.

Ø42 mm (Ø1.65 inch)

M12x1*

* mm

44 mm (1.73 inch) / 54 mm (2.13 inch)

14 mm (0.55 imch) / 43 mm (1.69 inch)

Ø21,6 mm (Ø0.85 inch)

Dimensions

Design characteristics

The sensor is provided with a G¾ thread and can be integrated in the tank or via adapter in lines.
Communication with the sensor either takes place over a serial interface or over two analog outputs (4 ... 20 mA).

Technical data

Sensor data	Size	Unit
Max. operating pressure	50 (725)	bar (psi)
Operating conditions		
Temperature[1]	-20 ... +85	°C
	(-4 ... +185)	°F
Rel. humidity[1]	0 ... 100	% r.H. (non-condensing)
Compatible fluids	mineral oils (H, HL, HLP, HLPD, HVLP), synthetic esters (HETG, HEPG, HEES, HEPR), polyalkylenglycols (PAG), zinc and ash-free oils (ZAF), polyalphaolefins (PAO)	
Wetted materials	aluminum, HNBR, polyurethane resin, epoxy resin, chemical nickel/gold (ENIG), soldering tin (Sn60Pb40, Sn96, 5Ag-3CuO, 5NiGe), aluminum oxide, glass (DuPont QQ550)	
Protection class[2]	IP67	
Power supply[3])	9 ... 33	V
Power input	max. 60	mA
Output		
Power output (2x)[4]	4 ... 20	mA
Accuracy power output[5]	± 2	%
Interface	RS 232	-
Connections		
Threaded connection	G¾	inch
Tightening torque of threaded connection	45 ±4.5	Nm
Electrical connection	M12x1, 8-pole	-
Tightening torque M12-connector	0.1	Nm

Measuring range		
Rel. humidity	0 ... 100	%
Temperature	-20 ... +85	°C
	(-4 ... +185	°F)
Measuring accuracy		
Rel. humidity	1	% r.H.
Temperature	0.1	K
Measuring accuracy[6]		
Rel. humidity (10 ... 90%)[7]	±3	% r.H.
Rel. humidity (<10 %, >90 %)[7]	±5	% r.H.
Temperature	±2	K
Response time humidity measurement (0 to 100 %)	<1	min
Weight	115	g

[1] Outside the specified measuring range, there are possibly no plausible measuring values to be expected
[2] With screwed on connector
[3] Automatic switch off at U <8 V and U >36 V, with load-dump impulses over 50V an external protection must be provided
[4] Outputs IOut1 and IOut2 are freely configurable (see interfaces and communication commands)
[5] In relation to the analogue current signal (4 ... 20 mA)
[6] Works calibration
[7] Calibrated to air at room temperature