

+ Datasheet EE381

Moisture in Oil Sensor



EE381

Compact Dew Point Sensor

The EE381 is designed for the reliable measurement of moisture in transformer, lubrication or hydraulic oil as well as in diesel fuel. It is ideal for the preventive maintenance of equipment and machinery. Besides the accurate measurement of water activity (a_w) and temperature (T), the EE381 calculates the absolute water content of the oil (x) in ppm.

Measurement Performance

The device features the high end E+E humidity sensing elements of the HC series, which stand for long term stability and high resistance to pollution.

Display and Outputs

The measured data is available on two freely configurable voltage or current outputs, as well as on the optional LC-display.

Functional Design

The compact, robust metal enclosure, the swirling front-end and various process connections and sampling options allow for easy and comfortable design-in, mounting and maintenance.

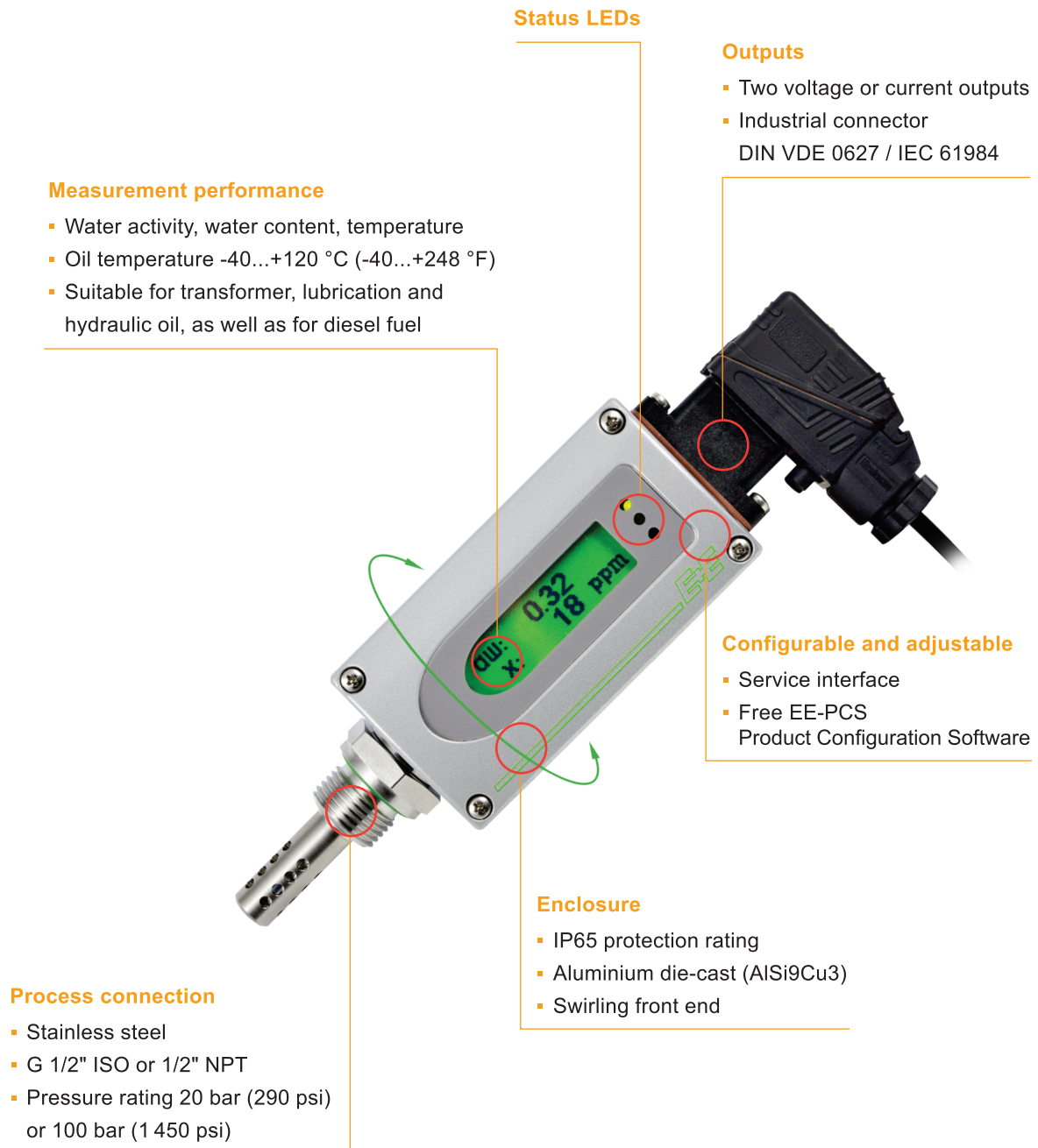
Configuration and Adjustment

An optional adapter and the free EE-PCS Product Configuration Software facilitate easy configuration and adjustment of the EE381.



EE381 moisture in oil sensor

Features



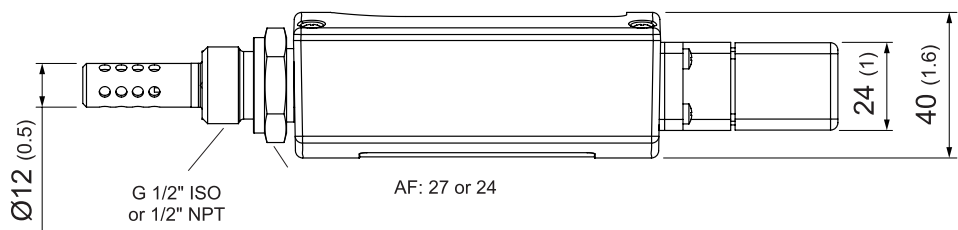
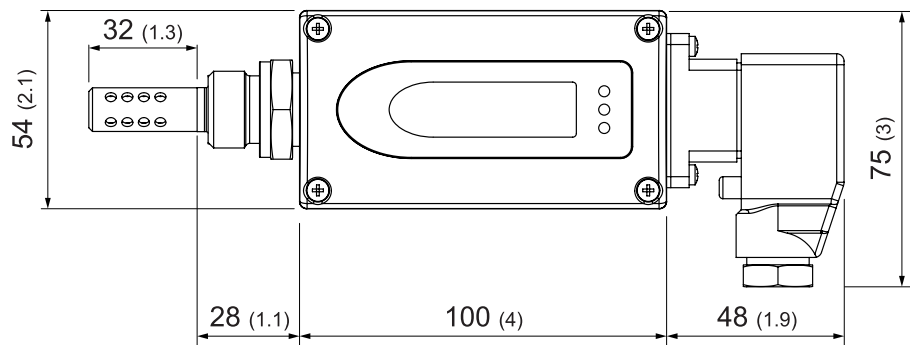
Inspection certificate

According to DIN EN 10204-3.1

Dimensions

Values in mm (inch)

Enclosure



Technical Data

Measurands

Water Activity (a_w) / Water Content (x)

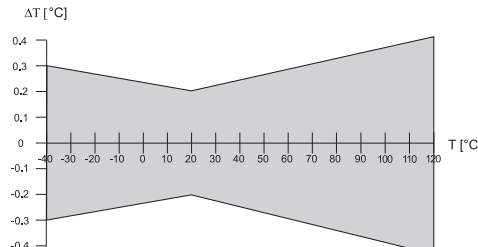
Measuring range	0...1 a_w 0...100 000 ppm; actual range depends on the oil type, for non-mineral transformer oil, specific solubility parameters are needed (ppm output is valid in the range 0...100 °C (32...212 °F))	
Accuracy ¹⁾ including hysteresis, non-linearity and repeatability (0...0,9 a_w) (0,9...1 a_w)	$\pm 0.02 a_w$ $\pm 0.03 a_w$	
Temperature dependency	a_w T	$\pm (0.00022 + 0.0002 \times a_w) \times \Delta T [^{\circ}\text{C}]$ $\pm 0.0003 ^{\circ}\text{C}/^{\circ}\text{C}$ $\Delta T = T - 20 ^{\circ}\text{C}$
Response time t_{90} , typ. @ 20 °C (68 °F) in still oil	10 min.	

1) Traceable to intern. standards, administrated by NIST, PTB, BEV,... steht nicht im alten DB
The accuracy statement includes the uncertainty of the factory calibration with an enhancement factor $k=2$ (2-times standard deviation). The accuracy was calculated in accordance with EA-4/02 and with regard to GUM (Guide to the Expression of Uncertainty in Measurement).

Technical Data

Measurands

Temperature (T)

Oil temperature	-40...120 °C (-40...+248 °F)
Accuracy ¹⁾	 The graph shows the accuracy of the temperature measurement across the range of -40 °C to 120 °C. The y-axis represents the accuracy ΔT in °C, ranging from -0.4 to 0.4. The x-axis represents the temperature T in °C, ranging from -40 to 120. The accuracy is ±0.3 °C for temperatures between -40 °C and 20 °C, ±0.2 °C for temperatures between 20 °C and 100 °C, and ±0.4 °C for temperatures between 100 °C and 120 °C.

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Outputs

Analogue

Two freely selectable and scaleable outputs aw, T or x [ppm]	0 - 5 V 4 - 20 mA (3-wire)	0 - 10 V ¹⁾ 0 - 20 mA (3-wire)	-1 mA < I _L < 1 mA R _L < 500 Ω ¹⁾ R	I _L = load current R _L = load resistance
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1) Minimum supply voltage 15 V DC

General

Power supply class III  USA & Canada: Class 2 supply necessary, max. voltage 30 V DC	10 - 30 V DC		
Current consumption , typ. @ 24 V DC	Voltage output Current output	40 mA 80 mA	
Electrical connection 7-pole industrial plug wire cross-section cable outlet	DIN VDE 0627 / IEC 61984 0.25 - 1 mm ² PG 11		
Filter	Stainless steel		
Pressure working range	0...20 bar (0...290 psi) 0...100 bar (0...1 450 psi)		
Temperature working range	Probe Electronics Display	-40...+120 °C (-40...+248 °F) -40...+80 °C (-40...+176 °F) -20...+50 °C (-4...+122 °F)	
Storage condition	-40...+60 °C (-40...+140 °F)		
Enclosure Material Protection rating	Aluminium die-cast (AlSi9Cu3) IP65		
Electromagnetic compatibility	EN 61326-1 FCC Part15 Class B	EN 61326-2-3 ICES-003 Class B	Industrial environment
Conformity	 		
Configuration and adjustment	EE-PCS Product Configuration Software (free download: www.epluse.com/configurator) and configuration adapter		

Ordering Guide

Feature	Description	Code
Hardw. Conf.		EE381-
	Process connection	G 1/2" ISO thread 1/2" NPT thread
	Pressure rating	20 bar (290 psi) 100 bar (1450 psi)
	Filter	Stainless steel, for flow <1 m/s Stainless steel, for flow >1 m/s
	Display	Display with backlight
Software Setup - Outputs	Output 1 measurand	Water activity a_w [] Water content x [ppm] Temperature T [°C] Temperature T [°F]
	Output signal 1 ¹⁾	0 - 5 V 0 - 10 V 0 - 20 mA 4 - 20 mA
	Output 1 scaling low	0 Value
	Output 1 scaling high	1 Value
	Output 2 measurand	Temperature T [°C] Temperature T [°F] Water activity a_w [] Water content x [ppm]
	Output signal 2 ¹⁾	0 - 5 V 0 - 10 V 0 - 20 mA 4 - 20 mA
	Output 2 scaling low	0 Value
	Output 2 scaling high	Value
	Oil parameterization for water content calculation	Mineral transformer oil Customer specific oil
		No code PA1 PA2 PN20 PN100 No code F18 D2 No code M70 MA1 MA2 GA2 GA3 GA5 GA6 No code SALValue No code SAHValue No code MB2 MB67 MB70 GB2 GB3 GB5 GB6 No code SBLValue SBHValue No code PPMxxx ²⁾

1) Both analogue outputs must be either voltage or current.

2) Procedure for customer specific oil (see table below).

2) Procedure for customer specific oil

Option	Description	Code
Oil number is known	Replace the xxx by the corresponding number	
Obtaining new oil parameters via oil analysis	Contact and provide E+E HQ the datasheet of the oil before sending us 2 litres of oil. After determination of the oil specific parameters, the corresponding oil number is available, insert this in place of the xxx.	Oil-ppmcal
Obtaining new oil parameters via saturation curve	Contact and provide E+E HQ the datasheet of the oil together with the saturation curve. After calculation of the oil specific parameters, the corresponding oil number is available, insert this in place of the xxx.	Oil-calc

Order Example

EE381-PA1PN20D2MA1GA2SAH100MB70GB2SBH100

Feature	Code	Description
Process connection	PA1	G 1/2" ISO thread
Pressure rating	PN20	20 bar (290 psi)
Filter	No code	Stainless steel, for flow <1 m/s
Display	D2	Display with backlight
Output 1 measurand	MA1	Temperature T [°C]
Output signal 1	GA2	0 - 5 V
Output 1 scaling low	No code	0
Output 1 scaling high	SAH100	100
Output 2 measurand	MB70	Water content x [ppm]
Output signal 2	GB2	0 - 5 V
Output 2 scaling low	No code	0
Output 2 scaling high	SBH100	100

Oil-ppmcal

Contact and provide E+E HQ the datasheet of the oil before sending us 2 litres of oil.

Accessories

For further information see datasheet [Accessories](#).

Description	Code
Product Configuration Software (free download: www.epluse.com/configurator)	EE-PCS
Product Configuration Adapter (available at www.epluse.com/ee381)	EE-PCA

