E+E

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in sensor
technology.

Datasheet EE381

Moisture in Oil Sensor

www.epluse.com

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

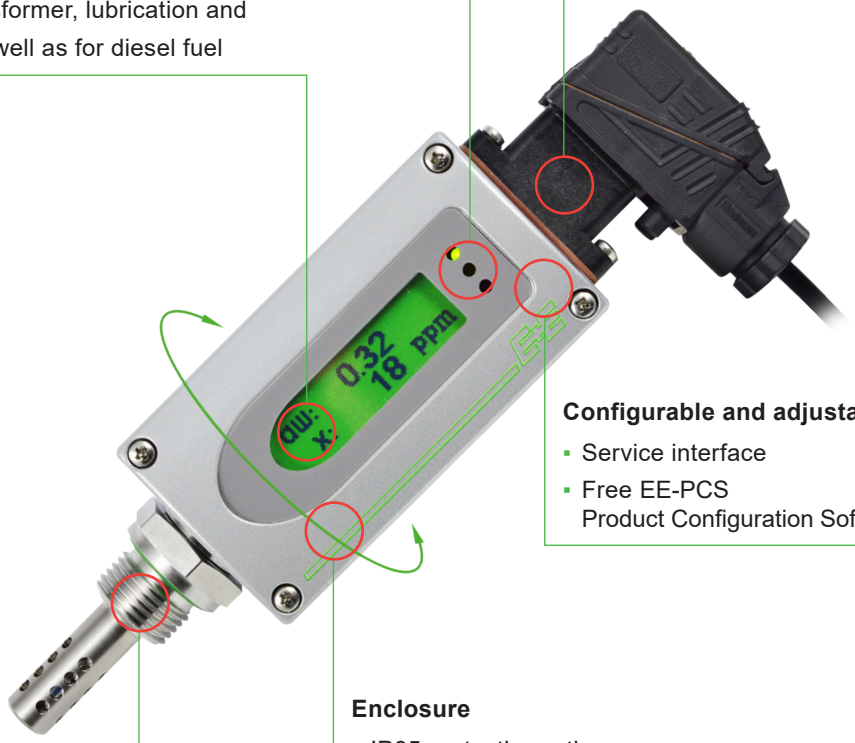
Status LEDs

Outputs

- Two voltage or current outputs
- Industrial connector
  DIN VDE 0627 / IEC 61984

Measurement performance

- Water activity, water content, temperature
- Oil temperature -40...+120 °C (-40...+248 °F)
- Suitable for transformer, lubrication and hydraulic oil, as well as for diesel fuel



Configurable and adjustable

- Service interface
- Free EE-PCS
  Product Configuration Software

Enclosure

- IP65 protection rating
- Aluminium die-cast (AlSi9Cu3)
- Swirling front end

Process connection

- Stainless steel
- G 1/2" ISO or 1/2" NPT
- Pressure rating 20 bar (290 psi) or 100 bar (1 450 psi)

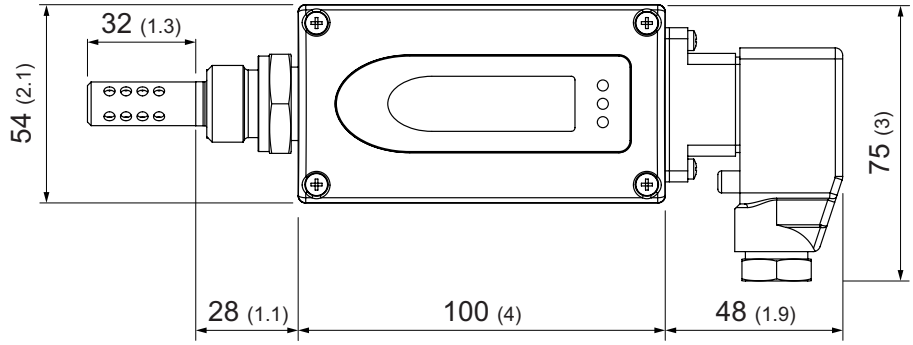
Inspection certificate

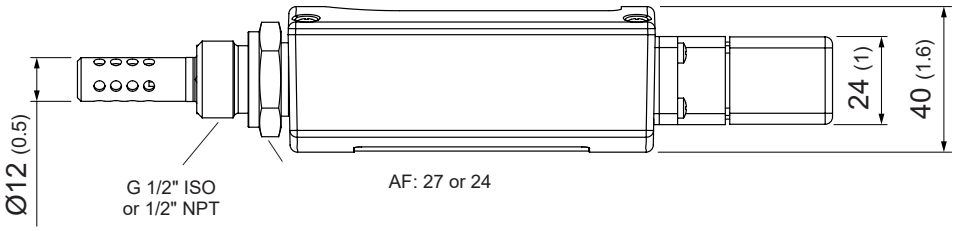
According to DIN EN 10204-3.1

Dimensions

Values in mm (inch)

Enclosure





Technical Data

Measurands

Water Activity (a_w) / Water Content (x)

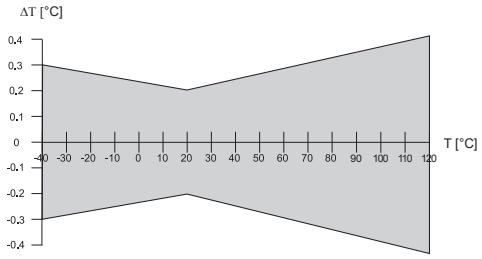
Measuring range		0...1 aw 0...100 000 ppm; actual range depends on the oil type, for non-mineral transformer oil, specific solubility parameters are needed (ppm output is valid in the range 0...100 °C (32...212 °F))
Accuracy[1)] including hysteresis, non-linearity and repeatability		
	(0...0,9 a_w)	±0.02 a_w
	(0,9...1 a_w)	±0.03 a_w
Temperature dependency	**a_w**	±(0.00022 + 0.0002 x aw) x ΔT [°C] ΔT = T - 20 °C
	T	±0.0003 °C/°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)]	

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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)]	I_L = load current R_L = load resistance

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 mm² 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 EN 61326-2-3 Industrial environment FCC Part15 Class B ICES-003 Class B
Conformity		CE UKCA
Configuration and adjustment		EE-PCS Product Configuration Software (free download: www.epluse.com/configurator) and configuration adapter

Ordering Guide

	Feature	Description	Code
			EE381-
Hardw. Conf.	Process connection	G 1/2" ISO thread	PA1
		1/2" NPT thread	PA2
	Pressure rating	20 bar (290 psi)	PN20
		100 bar (1 450 psi)	PN100
	Filter	Stainless steel, for flow <1 m/s	No code
		Stainless steel, for flow >1 m/s	F18
	Display	Display with backlight	D2
Software Setup - Outputs	Output 1 measurand	Water activity a_w [ ]	No code
		Water content x [ppm]	M70
		Temperature T [°C]	MA1
		Temperature T [°F]	MA2
	Output signal 1[1)]	0 - 5 V	GA2
		0 - 10 V	GA3
		0 - 20 mA	GA5
		4 - 20 mA	GA6
	Output 1 scaling low	0	No code
		Value	SAL*Value*
	Output 1 scaling high	1	No code
		Value	SAH*Value*
	Output 2 measurand	Temperature T [°C]	No code
		Temperature T [°F]	MB2
		Water activity a_w [ ]	MB67
		Water content x [ppm]	MB70
	Output signal 2[1)]	0 - 5 V	GB2
		0 - 10 V	GB3
		0 - 20 mA	GB5
		4 - 20 mA	GB6
	Output 2 scaling low	0	No code
		Value	SBL*Value*
	Output 2 scaling high	Value	SBH*Value*
	Oil parameterization for water content calculation	Mineral transformer oil	No code
		Customer specific oil	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**

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