

EE381 Series

Compact Transmitter / Switch for Moisture Content in Oil

E+E Transmitter Series EE381 are specially designed for the measurement of water content in oil. EE381 is ideal for online monitoring of moisture in lubrication or insulation oil, which is very important for the long-term performance and preventive maintenance of plant and machinery.

For instance, moisture affects dramatically the insulation characteristics of electrical transformer oil and therefore continuous monitoring is extremely important.

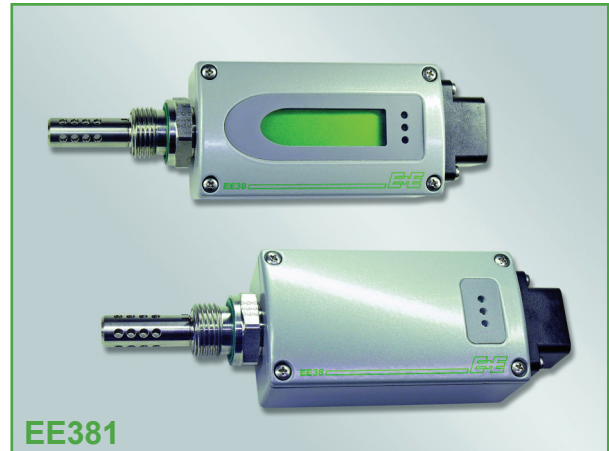
Humidity measurement in oil

Similar to the humidity in the air, the water content in oil can be indicated by the absolute value in ppm or by the relative value a_w :

- ppm (mass of water / mass of oil)
- a_w (actual water content as fraction of the water content in saturated oil)

$a_w = 0$ corresponds to water-free oil, while $a_w = 1$ indicates saturated oil. a_w measurement with the EE381 transmitter is based on the outstanding long term stability and resistance to pollution of the E+E capacitive sensor elements series HC.

The measured physical quantities are water activity a_w and temperature T. With these quantities EE381 calculates the water content x (ppm) in mineral transformer oils. Calculation of water content (ppm) in non-mineral oils and lubrication oils can be achieved by programming the specific parameters of the oil into the EE381.



Outputs

The EE381 transmitter has two freely selectable and scaleable outputs for water activity, water content or temperature.

The EE381 switch with two relay outputs is designed for control and alarm purposes. The status for early warning and main alarm is indicated by LED's.

Adjustment of the a_w /T/ppm set point and hysteresis can be achieved with the optional configuration software.

Configuration Software

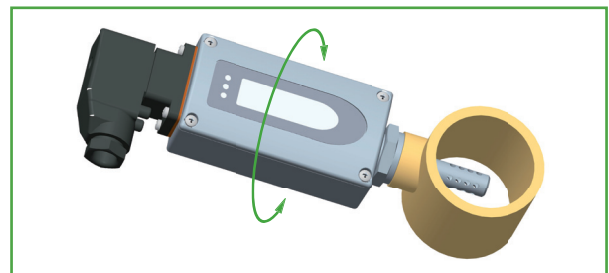
The optional configuration software allows flexible and easy adjustment of the analogue resp. relay outputs to the respective requirements.

The adjustment / calibration of the transmitters can easily be performed.

Screw Connection for Mounting - 360° positionable

The construction of this screw connection enables any position / rotation of the mounted transmitter.

So an optimal position of the display resp. the cable outlet is guaranteed.



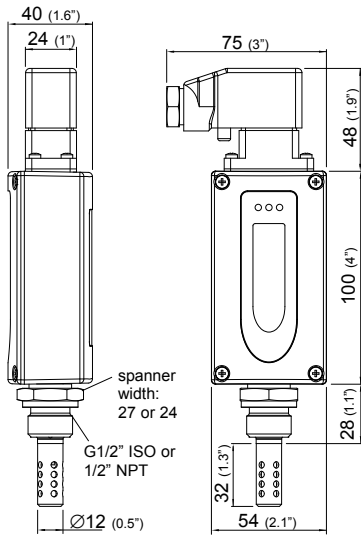
Typical Applications

- monitoring of
- transformer oil
- hydraulic oil
- ship engines

Features

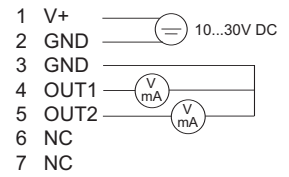
- measuring range 0...1 a_w
- measurement of water content in ppm
- medium temperature -40...80°C (-40...176°F)
- two relay outputs for a_w /ppm/T

Dimensions in mm

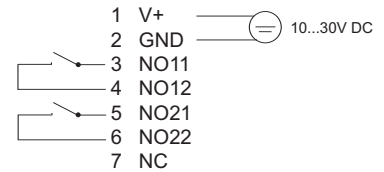


Connection Diagram

analogue output



relay output



Technical Data

Measuring values

Water activity

Humidity sensor

Measuring range

Accuracy incl. hysteresis and nonlinearity in air

Temperature dependence

Response time with stainless steel filter at 20°C / t₉₀

HMC01

0...1a_w

±0.02a_w (0...0.9a_w) ±0.03a_w (0.9...1a_w)

Traceable to intern. standards, administrated by NIST, PTB, BEV...

a_w: ±(0.00022 + 0.0002 x a_w) x ΔT [°C] ΔT = T - 20°C

T: ±(0.0003°C/°C)

typ. 10min in still oil

Temperature

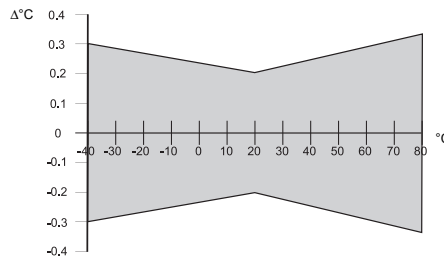
Temperatur sensor element

Working range sensing probe

Accuracy

HMC01

-40...80°C (-40...176°F)



Outputs

EE381-Tx two freely selectable and scaleable analogue outputs for a_w, T, ppm

0 - 1V / 0 - 5V / 0 - 10V¹⁾

-1mA < I_L < 1mA

EE381-Sx alarm output

4 - 20mA / 0 - 20mA

R_L < 500 Ohm¹⁾

Standard setting of alarm outputs

2 potential-free relays (normally open)
30V DC 0.6A / 35V AC 0.3A (resistive)

pre-alarm: 0.8 a_w

main alarm: 0.9 a_w

hysteresis: 0.05 a_w

General

Supply voltage

Current consumption at 24V DC

Pressure range

System requirements for software

Serial interface for configuration

Housing / Protection class

Electrical connection

10...30V DC

voltage output: typ. 40mA / during autocalibration: 100mA

current output: typ. 80mA / during autocalibration: 140mA

0...20bar (0...290psi) / 0...100bar (0...1450psi)

WINDOWS 2000 or later; serial interface

RS232C

Al Si 9 Cu 3 / IP65; Nema 4

7-pole industrial plug: DIN VDE 0627 / IEC 61984

cable cross-section: 0.25 - 1 mm² / cable connection: PG 11

stainless steel filter (punched)

Sensor protection

Working temperature range

probe: -40...80°C (-40...176°F)

electronic: -40...60°C (-40...140°F)

with LC display: -20...50°C (-4...122°F)

Storage temperature range

-40...60°C (-40...140°F)

Electromagnetic compatibility according to

EN61000-6-3

EN61000-6-2

FCC Part15 ClassB

EN61326-2-3

EN61326-1

ICES-003 ClassB



1) minimum supply voltage 15V DC

Ordering Guide

		EE381-	
Hardware Configuration			
Model	transmitter switch		T S
Pressure range	up to 20bar (290psi) up to 100bar (1450psi)		E I
Pressure tight feedthrough	G1/2" male thread 1/2" NPT thread		HA03 HA07
Display	without display with display		D08
Software Configuration			
Physical parameters of outputs	Temperature Water activity Water content in mineral transformer oil Water content in lubrication or non-mineral transformer oil ¹⁾	T [°C / °F] (B) aw [] (K) x [ppm] (L) x [ppm] (M)	output/relay 1 output/relay 2
Type of output signals	0-1V 0-5V 0-10V 0-20mA 4-20mA	(1) (2) (3) (5) (6)	select according to Ordering Guide (B,K,L,M) select according to Ordering Guide (B,K,L,M) select according to Ordering Guide (1,2,3,5,6)
Temperature unit	°C °F		E01
Scaling of T-output (in °C or °F)	-40...60 (T02) -20...100 (T14) -40...140 (T83) 0...50 (T04) 0...120 (T16) 0...250 (T88) 0...100 (T05) 0...80 (T21) 32...120 (T90) -30...70 (T08) -20...80 (T24) 32...140 (T91) -20...120 (T10) -40...160 (T33) 32...250 (T94) -40...120 (T12) -40...250 (T81) 32...132 (T96)		output/relay T select according to Ordering Guide (Txx) other T-scaling refer to page 134
ppm Range x	0...100ppm (X01) 0...500ppm (X02) 0...1000ppm (X03)		output/relay x select according to Ordering Guide (X01 - X03)

1) Input of oil specific parameters necessary

Accessories

- Stainless steel grid (HA010110)
- Display (D08)
- Configuration software + interface cable (HA010604)

Order Example

EE381-TEHA03D08/BL2-T05-X01

Model: transmitter
 Pressure range: up to 20bar (290psi)
 Pressure tight feedthrough: G1/2" male thread
 Display: with display

Output/relay 1: T
 Output/relay 2: x
 Output signal: 0-5V
 Measured value unit: metric
 Scaling of T-output: 0...100°C
 ppm Range: 0...100ppm