

EE381

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

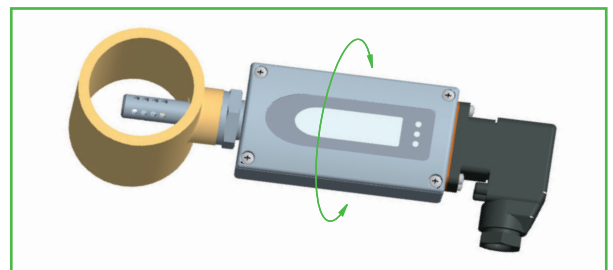
The optional configuration software allows flexible and easy adjustment of the analogue resp. relay outputs to the respective requirements.

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.



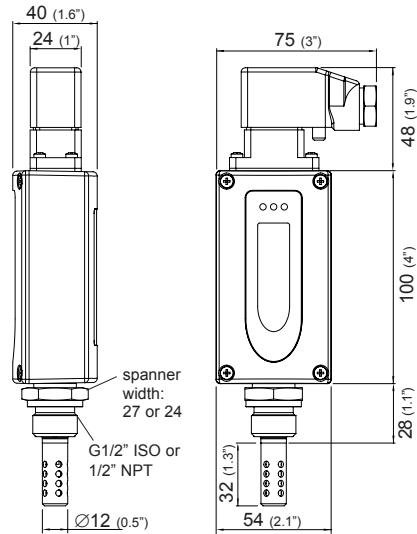
Typical Applications

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

Features

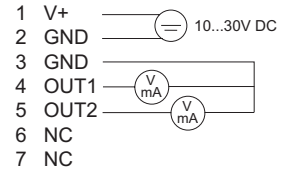
- measuring range 0...1 a_w
- measurement of water content in ppm
- medium temperature -40...80°C (-40...176°F)
- two relay outputs for $a_w/ppm/T$

Dimensions in mm

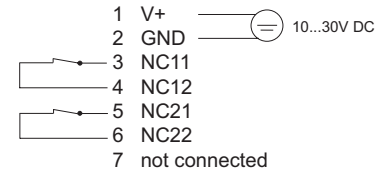


Connection Diagram

analogue output



relay output



Technical Data

Measuring values

Water activity

Humidity sensor

HC1000-400K

Measuring range

0...1a_w

Accuracy incl. hysteresis and nonlinearity in air

±0.02a_w (0...0.9a_w) ±0.03a_w (0.9...1a_w)
Traceable to intern. standards, administrated by NIST, PTB, BEV...

Temperature dependence

a_w: ±(0.00022 + 0.0002 x a_w) x ΔT [°C] ΔT = T - 20°C
T: ±(0.0003°C/°C)

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

typ. 10min in still oil

Temperature

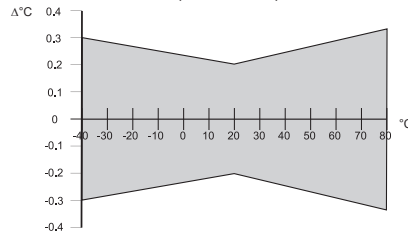
Temperatur sensor element

Pt 100 DIN A

Working range sensing probe

-40...120°C (-40...248°F)

Accuracy



Outputs

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

0 - 1V / 0 - 5V / 0 - 10V¹⁾
4 - 20mA / 0 - 20mA

-1mA < I_L < 1mA
R_L < 500 Ohm¹⁾

EE381-Sx alarm output

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

General

Supply voltage

10...30V DC

Current consumption at 24V DC

voltage output: typ. 40mA
current output: typ. 80mA

Pressure range

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

System requirements for software

WINDOWS 2000 or later; serial interface

Serial interface for configuration

RS232C

Housing / Protection class

Al Si 9 Cu 3 / IP65

Electrical connection

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

stainless steel filter (punched)

Working temperature range

probe: -40...120°C (-40...248°F)
electronic: -40...80°C (-40...176°F)
with LC display: -20...50°C (-4...122°F)

Storage temperature range

-40...60°C (-40...140°F)

Electromagnetic compatibility according to

EN 61326-1 EN61326-2-3 ICES-003 ClassB
Industrial Environment FCC Part15 ClassB



1) minimum supply voltage 15V DC

Ordering Guide

| | | EE381- | EE381- |
|-----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Hardware Configuration | | | |
| Model | transmitter switch | T | S |
| Pressure range | up to 20bar (290psi) up to 100bar (1450psi) | E I | E I |
| Pressure tight feedthrough | G1/2" male thread 1/2" NPT thread | HA03 HA07 | HA03 HA07 |
| Display | without display with display | D08 | D08 |
| Software Configuration | | | |
| Physical parameters of | Temperature Water activity | T a _w | [°C / °F] (B) [] (K) |
| outputs | Water conten in mineral transformer oil Water content in lubrication or no mineral transformer oil 1) | x x | [ppm] (L) [ppm] (M) |
| Type of output signals (only for model T) | 0-1V 0-5V 0-10V 0-20mA 4-20mA | | 1 2 3 5 6 |
| Temperature unit | °C °F | | E01 E01 |
| Scaling of T-ouput (in °C oder °F) | -40...60 (T02) -20...100 (T14) 0...50 (T04) 0...120 (T16) 0...100 (T05) 0...80 (T21) -30...70 (T08) -20...80 (T24) -20...120 (T10) -40...160 (T33) -40...120 (T12) -40...250 (T81) | -40...140 (T83) 0...250 (T88) 32...120 (T90) 32...140 (T91) 32...250 (T94) 32...132 (T96) | output/relay T select according to Ordering Guide (B,K,L,M) select according to Ordering Guide (B,K,L,M) other T-Scaling refer to data sheet „T-Scalings“ |
| ppm Range x | 0...100ppm (X01) 0...500ppm (X02) other measuring range: _____ 0...1000ppm (X03) | | output/relay x select according to Ordering Guide |
| Setting of alarm Schaltausgänge | standard for connfiguration KK: other set points: | R1: 0,8 [] H1: 0,05 [] relay 1: _____ hysteresiss 1: _____ | R2: 0,9 [] H2: 0,05 [] relay 2: _____ hysteresiss 2: _____ SP |

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 | Output 1: | T |
| Pressure range: | up to 20bar (290psi) | Output 2: | x |
| Pressure tight feedthrough: | G1/2" male thread | Output signal: | 0-5V |
| Display: | with display | Temperature unit: | °C |
| | | Scaling of T-output: | 0...100°C |
| | | ppm Range: | 0...100ppm |

EE381-SEHA03/KK

| | | | |
|-----------------------------|----------------------|--------------------------|----------------|
| Model: | switch | Relay 1: | a _w |
| Pressure range: | up to 20bar (290psi) | Relay 2: | a _w |
| Pressure tight feedthrough: | G1/2" male thread | Temperature unit: | °C |
| Display: | without display | Setting of alarm output: | standard |