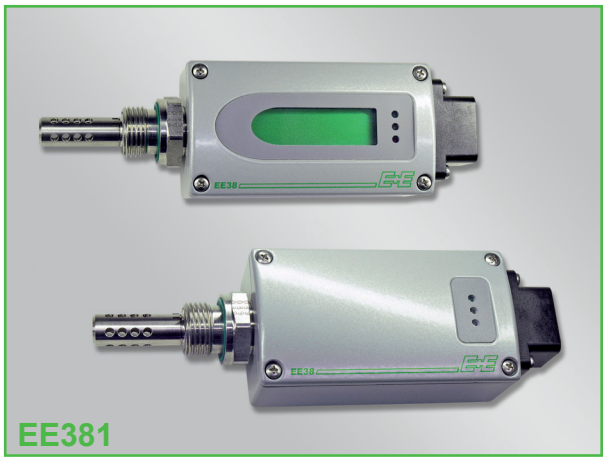
EE381 Series

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

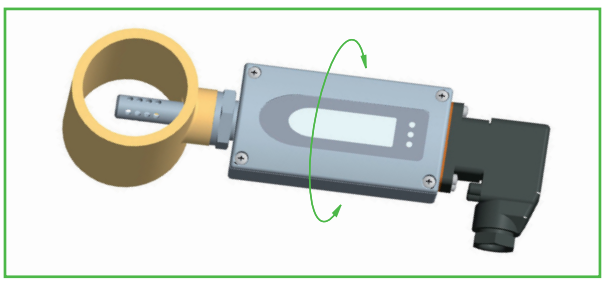
The EE381 transmitter has two freely selectable and scaleable outputs for water activity, water content or temperature.
The EE381 switch with two relay outputs is designed for control and alarm purposes. The status for early warning and main alarm is indicated by LED's.
Adjustment of the a_w/T/ppm set 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.



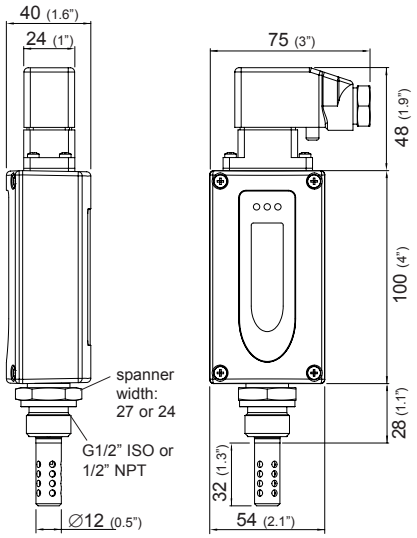
Typical Applications

monitoring of
- transformer oil
- hydraulic oil
- ship engines

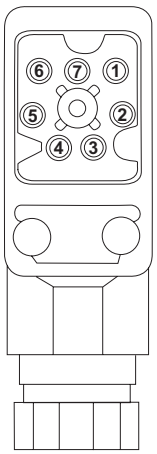
Features

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

1	V+	10...30V DC
2	GND	
3	GND	
4	OUT1	V / mA
5	OUT2	V / mA
6	NC	
7	NC	

relay output

1	V+	10...30V DC
2	GND	
3	NC11	
4	NC12	
5	NC21	
6	NC22	
7	not connected	

Technical Data

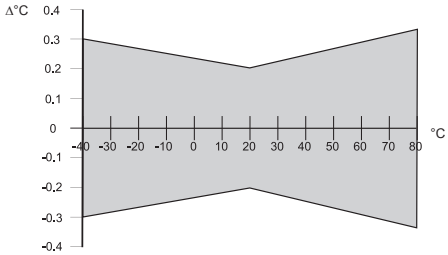
Measuring values

Water activity

Humidity sensor	HMC01
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 / t_{90}	typ. 10min in still oil

Temperature

Temperatur sensor element	HMC01
Working range sensing probe	-40...80°C (-40...176°F)
Accuracy	



Outputs

EE381-Tx two freely selectable and scaleable analogue outputs for a_w, T, ppm	0 - 1V / 0 - 5V / 0 - 10V[1)]	-1mA < I_L < 1mA
	4 - 20mA / 0 - 20mA	R_L < 500 Ohm[1)]
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 / during autocalibration: 100mA current output: typ. 80mA / during autocalibration: 140mA
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
Sensor protection	stainless steel filter (punched)
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	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						T	
	switch							S
Pressure range	up to 20bar (290psi)						E	E
	up to 100bar (1450psi)						I	I
Pressure tight feedthrough	G1/2" male thread						HA03	HA03
	1/2" NPT thread						HA07	HA07
Display	without display							
	with display						D08	D08
Software Configuration								
Physical parameters of outputs	Temperature		T	[°C / °F]	(B)	output/relay 1	select according to Ordering Guide (B,K,L,M)	
	Water activity		a_w	[ ]	(K)			
	Water content in mineral transformer oil		x	[ppm]	(L)	output/relay 2	select according to Ordering Guide (B,K,L,M)	
	Water content in lubrication or non-mineral transformer oil 1)		x	[ppm]	(M)			
Type of output signals (only for model T)	0-1V						1	
	0-5V						2	
	0-10V						3	
	0-20mA						5	
	4-20mA						6	
Temperature unit	°C							
	°F						E01	E01
Scaling of T-output (in °C or °F)	-40...60 (T02)	-20...100 (T14)	-40...140 (T83)			output/relay T	select according to Ordering Guide (Txx) other T-Scaling refer data sheet "T-Scalings"	
	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)					
ppm Range x	0...100ppm (X01)						select according to Ordering Guide	
	0...500ppm (X02)	other measuring range: _____				output/relay x		
	0...1000ppm (X03)							
Setting of alarm output	standard for conficuration KK:	R1: 0.8 [ ]	R2: 0.9 [ ]					
		H1: 0.05 [ ]	H2: 0.05 [ ]					
	other set points:	relay 1: _____	relay 2: _____					SP
		hysteresis 1: _____	hysteresis 2: _____					

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