YOUR PARTNER IN SENSOR TECHNOLOGY

E+E ELEKTRONIK® Ges.m.b.H.

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EE36 Series

Transmitters for Moisture Content in Oil

E+E Transmitter Series EE36 are specially designed for the measurement of water content in oil. EE36 is ideal for online monitoring of moisture in lubrication or insulation oil, which is very important for the long-term performance and adaptive 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 an oil can be described 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 the saturated oil)

EE36 + Ball valve set

$a_w = 0$ corresponds to water-free oil, while $a_w = 1$ describes fully saturated oil. a_w measurement with EE36 transmitter series is based on the outstanding long term stability and resistance to pollution of the E+E capacitive sensor elements series HC.

Product Versions

The physical quantities measured are water activity a_w and temperature T. With these quantities EE36 calculates the water content (ppm) in mineral transformer oils. Calculation of water content in non-mineral transformer oils and lubrication oils can be accomplished by downloading specific parameters of the oil.

The measured and the calculated values are available on two free scaleable and configurable analogue outputs. In addition, an optional relay output can be used for alarms and process control.

Installation

The sensing probe is designed for inline monitoring and can be placed directly in the oil, at pressures up to 10 bar. In addition to direct mounting of the sensing probe, a ball valve installation provides mounting and removal of the probe without interrupting the process.

Easy Calibration and Adjustment of EE36

The user can easily readjust or calibrate the transmitter by using either a simple procedure with two push buttons on the printed circuit board or the configuration software.
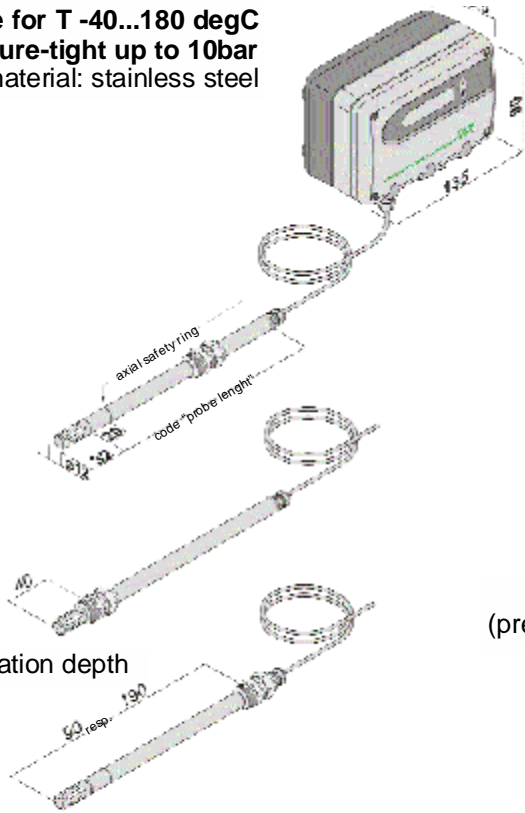
Software Tools

The configuration software is included in the scope of supply and allows an easy and fast configuration of the analogue outputs and of the alarm and control thresholds. Further features of the configuration software are adjustment and calibration of the outputs and service operations such as replacement of the sensing elements or of the entire sensing probe

Features of EE36

Measurement of a_w and T at pressure up to 10 bar	**P**
Calculation of water content in ppm for mineral transformer oil	**P**
Two free scaleable and configurable analogue outputs	**P**
Probe cable length up to 10m	**P**
Easy on site adjustment and calibration of a_w and T outputs	**P**
LED indication for operation and sensing probe status	**P**
User configuration of the instrument with PC via RS232 interface	**P**
Configuration software	**P**
Display of a_w, T and water content with MIN/MAX function	optional
Two free configurable relays outputs	optional
Replaceable sensing probe	optional
Connector for power supply and outputs	optional

Housing Dimensions (mm)

Installation Example

**Remote probe for T -40...180 degC
and pressure-tight up to 10bar**
probe material: stainless steel

ball valve installation
(pressure-tight up to 10bar)

axial safety ring

code "probe lenght"

1/2" ISO

bore diameter:
>13mm

minimum installation depth

fixed installation
(pressure-tight up to 10bar)

1/2" ISO or 1/2" NPT

maximum installation depth

bore diameter:
>13mm
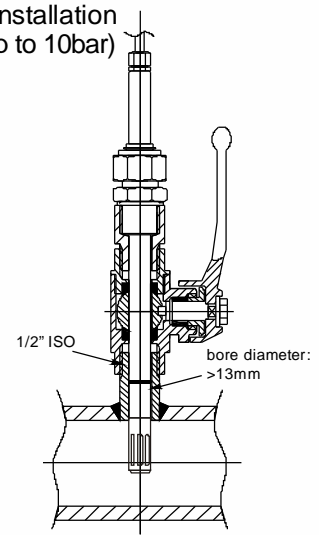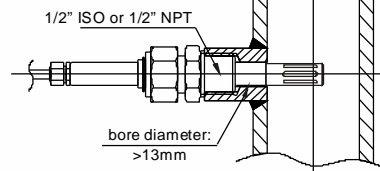
Connection Versions

Standard

M16 x 1.5
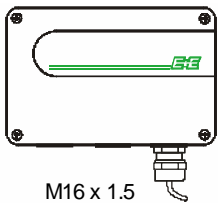
transmitter	1xM16
transmitter incl. alarm output	2xM16

Plug Option C03

Lumberg
RKC 50/11
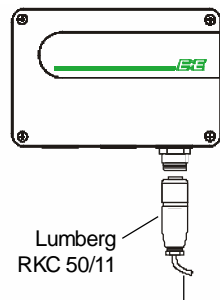
power supply +
analogue output

Plug Option C07

Lumberg
RSC 5/7

Lumberg
RKC 50/11

RS232

power supply +
analogue output
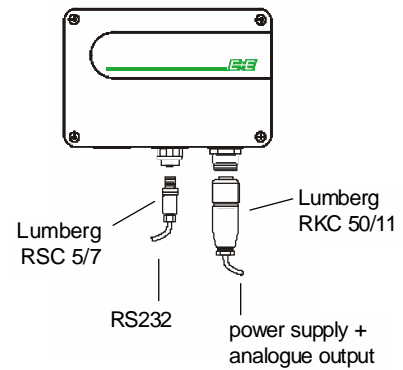
Connection Diagram
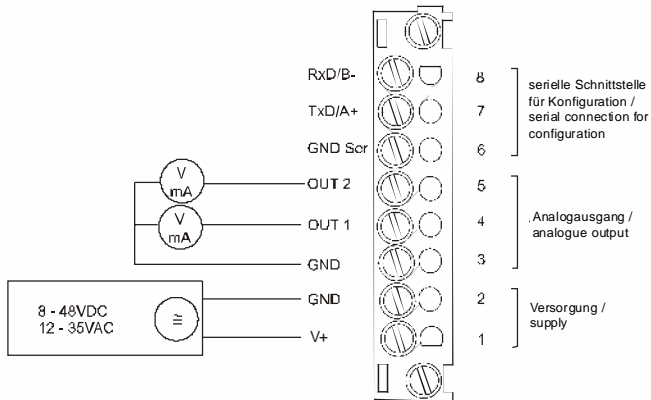
Terminal configuration - Alarm output

RxD/B-   8
TxD/A+   7   serielle Schnittstelle
                für Konfiguration /
GND Scr 6   serial connection for
                configuration

OUT 2   5
OUT 1   4   Analogausgang /
                analogue output
GND   3

GND   2   Versorgung /
V+   1   supply

8 - 48VDC
12 - 35VAC

NC   11
REL 1   C   12
NO   13

NC   14
REL 2   C   15
NO   16
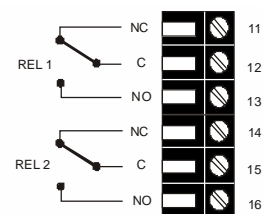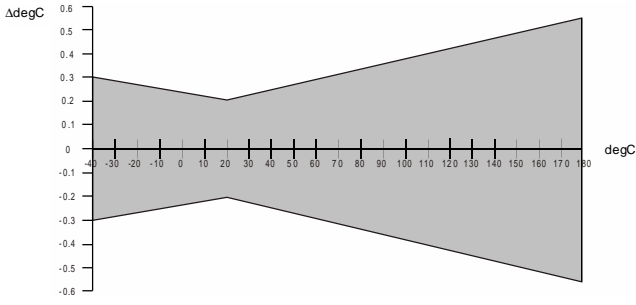
Technical Data

Measuring values

Relative Humidity

Water activity sensor [1]	HC1000-400
Measuring range [1]	0...1 a_w

Accuracy incl. hysteresis and nonlinearity in air

- Special calibration against certified standards	$\pm 0.01 a_w$ (0...0.9 a_w)	$\pm 0.02 a_w$ (0.9...1 a_w)
- Standard calibration	$\pm 0.02 a_w$ (0...0.9 a_w)	$\pm 0.03 a_w$ (0.9...1 a_w)
Temperature dependence of electronics	typ. ± 0.0001 1/degC	
Temperature dependence of sensing probe	typ. $\pm (0.00002 + 0.000002 \times a_w) \times \Delta T$ [degC]	$\Delta T = T - 20degC$
Response time with stainless steel filter at 20 degC / t_{90}	typ. 10min in still oil	

Temperature

Temperatur sensor element	Pt1000 (Tolerance class A, DIN EN 60751)
Working range sensing probe	-40...180 degC (-40...356°F)
Accuracy (typ.)	

Temperature dependence of electronics	typ. ± 0.005 degC/degC

Outputs [2]

Two freely selectable and scaleable analogue outputs		
	0 - 5V	-1mA < I_L < 1mA
	0 - 10V	-1mA < I_L < 1mA
	4 - 20mA	R_L < 500 Ohm
	0 - 20mA	R_L < 500 Ohm

Adjustable measurement range [2]

		from	up to	units
Water activity	a_w	0	1	
Temperature	T	-40	180	degC
Water content [3]	x	0	1000	ppm

General

Supply voltage	SELV 8...48V DC
	SELV 12...35V AC
Current consumption - 2x voltage output	for 24V DC/AC: typ. 40mA
- 2x current output	typ. 80mA
Pressure range sensing pobe	0.01...10bar
System requirements for software	WINDOWS 98 or later; serial interface
Serial interface for configuration [4]	RS232C
Housing / Protection class	polycarbonate / IP65
Cable gland	M16 x 1.5
Electrical connection	screw terminals up to max. 1.5mm²
Sensor protection	stainless steel filter
Operating temperature range of electronics	-40...+60 degC
Working and storage temperature range	
Housing with display	-20...+50 degC
Storage temperature	-40...+60 degC
Electromagnetic compatibility according to	EN61000-6-2 EN61010-1
	EN50081-1

$C \in$

Options

Display	graphical LCD display (128x32 pixels), with integrated push-buttons for selecting parameters and MIN/MAX function
Alarm outputs	2 x 1 switch contact: 250V AC / 6A and 28V DC / 6A threshold + hysteresis can be adjusted with configuration software
Switching parameters (freely selectable)	a_w Water activity
	T Temperature
	x Water content

[1] refer to the working range of the humidity sensor!   [2] can be easily changed by software   [3] ppm output is valid in the range 0...100 degC
[4] no data output

Ordering Guide

				EE36-PE
Hardware Configuration				
Cable length	1m		**(01)**	**01**
	2m		**(02)**	**02**
	5m		**(05)**	**05**
	10m		**(10)**	**10**
Probe length	100mm		**(3)**	**3**
	200mm		**(5)**	**5**
Pressure-tight feedthrough	1/2" male thread		**(HA03)**	**HA03**
	1/2" NPT thread		**(HA07)**	**HA07**
Display	without display		**(no Code)**	
	with display		**(D05)**	**D05**
Alarm output	without relay		**(no Code)**	
	with relay		**(SW)**	**SW**
Plug	cable thread		**(no Code)**	
	1 plug for power supply and output		**(C03)**	**C03**
	2 plugs for power supply/outputs and RS232		**(C07)**	**C07**
Sensing probe	fixed		**(no Code)**	
	interchangeable		**(P01)**	**P01**

Software Configuration						
Physical parameters of outputs	Temperature	T	[degC / °F]	**(B)**	Output 1	
	Water activity	aw	[ ]	**(K)**		
	Water content in mineral transformer oil	x	[ppm]	**(L)**	Output 2	
	Water content in lubrication or non-mineral transformer oil[1]	x	[ppm]	**(M)**		
Type of output signals	0-5V			**(2)**		
	0-10V			**(3)**		
	0-20mA			**(5)**		
	4-20mA			**(6)**		
Temperature unit	degC			**(no Code)**		
	°F			**(E01)**		**E01**
Temperature range T in degC or °F	-40...60 **(T02)**	-20...100 **(T14)**			Output T	
	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)**					
ppm Range x	0...100ppm **(X01)**				Output x	
	0...500ppm **(X02)**					
	0...1000ppm **(X03)**					

1) input of oil specific parameters necessary

Order Example

EE36-PE055HA03SWC07P01/BL3-T08-X01
Water activity / Temperature Transmitter EE36 Series

select according to
Ordering Guide
(X01 - X03)

Cable length:	5m	Output 1:	T
Probe length:	200mm	Output 2:	x (mineral transformer oil)
Pressure-tight feedthrough:	1/2" male thread	Output Signag:	0-10V
Display:	without display	Temperature unit:	degC
Alarm output:	with relay	Temperature range T:	-30...70degC (-22...158°F)
Plug:	2 plugs for power supply/outputs and RS232	Water content x:	0...100ppm
Sensing probe:	interchangeable		

Contact

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