

# HMP228 Moisture and Temperature Transmitter for Oil



*The Vaisala HUMICAP® Moisture and Temperature Transmitter for Oil HMP228 enables on-line moisture monitoring in oils even in the most demanding applications.*

The Vaisala HUMICAP® Moisture and Temperature Transmitter for Oil HMP228 enables fast and reliable detection of moisture in oil. The HMP228 can be used in on-line moisture monitoring and as a control function, allowing separators and oil purifiers to be started only when needed.

## Prevents machine failures

Water contamination reduces the performance of oil. Excess moisture increases the risk of corrosion, overheating, machine malfunction and other problems. Measuring and controlling the moisture in lubrication systems is essential if costly failures are to be avoided. Careful monitoring of the moisture in oil within large lubrication systems helps to plan servicing and prevent unscheduled downtime, thus it can cut maintenance costs substantially.

## Indicates the margin to water saturation

The HMP228 measures moisture in oil in terms of the water activity ( $a_w$ ) and

temperature (T). Water activity indicates directly whether there is a risk of free water formation. The measurement is also independent of oil type and age.

## Flexible measurement concept

The HMP228 transmitter can be configured to suit each application through simple hardware and software options. The transmitter has two analog outputs, which can be scaled to any required application range.

The HMP228 transmitter can be supplied with a housing which has a local display and keypad. The display shows the measurement readings, and functions as a user interface. This feature makes the transmitter easy to use and configure with the menu-based commands through the built-in software.

## Features/Benefits

- Continuous moisture measurement in oil
- Incorporates Vaisala HUMICAP® Sensor - proven field performance since 1973
- Excellent long-term stability
- Easy-to-install, calibrate, and maintain in the field
- NIST traceable (certificate included)

## Applications

- Lubrication systems monitoring (e.g. ships, pulp and paper industry)
- Food oil processing
- Oil tank monitoring
- Non-explosive fuel oil monitoring
- Transformer oil monitoring

## Installation options

The HMP228 has two adjustable probe lengths, max. 216 mm and 435 mm. The transmitter can be ordered with a ball valve set that enables insertion and removal of the moisture probe for calibration, without the need to empty the oil system.

## Alarm relays

An alarm relay option is available for the applications where on/off control is needed. Alarm relays include two SPCO (single pole change over) type relays with 8 A/230 V contacts. They are easy to adjust with display/keypad or through RS232.

## Connectors

Several different connector options may be specified for analog output signals, power supply (24 VAC/VDC) and communications (RS232C/422/485). All connectors are EMC compliant, offer protection to IP65 (NEMA 4), and have convenient screw terminals.

## Measured Values

### Water activity

|   |                      |
|---|----------------------|
| Measurement range   | 0...1 a <sub>w</sub> |
| Accuracy (including nonlinearity, hysteresis and repeatability)                                 |                      |
| When calibrated against salt solutions (ASTM E104-85):  |                      |
| 0...0.9   | ±0.02                |
| 0.9...1.0   | ±0.03                |
| Maximum achievable accuracy when calibrated against high-quality, certified humidity standards: |                      |
| 0...0.9   | ±0.01                |
| 0.9...1.0   | ±0.02                |

|  |          |
|--|----------|
| Response time (90%) at +20 °C in still oil (with stainless steel filter) | 10 min.  |
| Sensor   | HUMICAP® |

### Temperature

|   |                              |
|---|------------------------------|
| Measurement range                             | -40...+180 °C -40...+356 °F) |
| Typical accuracy at +20 °C                    | ±0.2 °C (±0.36 °F)           |
| Typical temperature dependence of electronics | ±0.005 °C/°C (±0.005 °F/°F)  |
| Sensor  | Pt 100 IEC 751 1/3 class B   |

## Outputs

|   |  |
|---|--|
| Two analog outputs selectable and scalable      | 0...20 mA<br>4...20 mA, 0...1 V<br>0...5 V, 0...10 V |
| Typical accuracy of analog output at +20 °C     | ±0.05 %FS  |
| Typical temperature dependence of analog output | 0.005 %FS/°C (0.003 %FS/°F)                          |
| Serial output                                   | RS232C   |

## Options

|                      |  |
|----------------------|--|
| Display cover        | local display/keypad<br>2 x 16 characters LCD            |
| Cable length         | 2, 5 or 10 meters  |
| Alarm relays*        | 2 pcs 8 A/230 V SPCO<br>(single pole change over)        |
| Serial modules       | RS485/422<br>digital current loop                        |
| Power supply module* |  |
| Operating voltage    | 115 VAC (93...127 V)<br>230 VAC (187...253 V)            |
| Connections input    | screw terminal for<br>1.5 mm <sup>2</sup> wires (AWG 16) |
| output               | screw terminal for<br>0.5 mm <sup>2</sup> wires (AWG 20) |

\* Simultaneous installation with alarm outputs and internal power supply module is not possible.

## Serial Interface Modules

|                           |   |
|---------------------------|---|
| Module types              | RS485/422<br>digital current loop   |
| Connections               | screw terminals for 0.5 mm <sup>2</sup> wires (AWG 20),<br>stranded wires recommended |
| Assembly                  | plug-in module  |
| Number of devices on line |   |
| RS485/422                 | 32  |
| digital current loop      | 6 (single loop), 9 (dual loop)  |
| Network cable type        | twisted pair  |
| Network line length       | 1000 m max.   |
| Network data speed        |   |
| RS485/RS422               | 9600 baud max.  |
| digital current loop      | 4800 baud max.  |

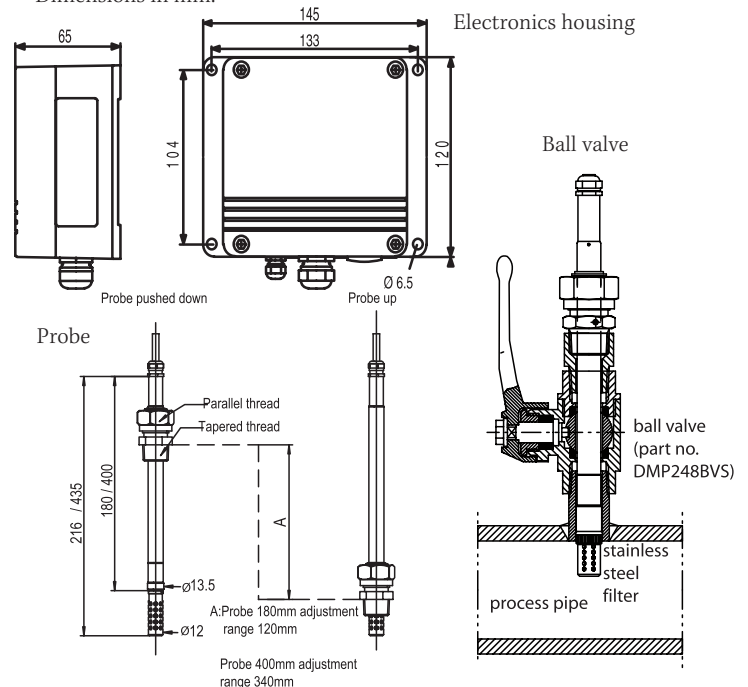
## General

|   |  |
|---|--|
| Connections                                   | screw terminals for 0.5 mm <sup>2</sup><br>wires (AWG 20), stranded<br>wires recommended |
| Operating voltage                             | 24 VDC/isolated 24 VAC, (20...28 V)  |
| option  | 115 VAC, 230 VAC   |
| Power consumption                             |  |
| without alarm relays                          | 100 mA max. (24 VDC)   |
| of the alarm relays                           | 55 mA max. (24 VDC)  |
| Recommended external load for current outputs | < 500 ohm  |
| 0...1 V output                                | > 2 kohm (to ground)   |
| 0...5 & 0...10 V outputs                      | > 10 kohm (to ground)  |
| Operating temperature range for electronics   | -40...+60 °C (-40...+140 °F)   |
| with display cover                            | 0...+50 °C (+32...+122 °F)   |
| with power supply unit                        | -40...+45 °C (-40...+113 °F)   |
| with alarm outputs up to 8 A                  | -40...+40 °C (-40...+104 °F)   |
| up to 6 A                                     | -40...+60 °C (-40...+140 °F)   |
| Storage temperature range                     | -40...+70 °C (-40...+158 °F)   |
| Pressure range                                | 0...40 bar   |
| Housing material                              | G-AlSi12 (DIN 1725)  |
| Housing classification                        | IP65 (NEMA 4)  |
| Bushing                                       | for 7...10 mm diameter cables<br>(8 x 0.5 mm <sup>2</sup> shielded cable)                |
| Sensor protection                             | stainless steel grid (Ø 12 mm)   |

Complies with EMC standard EN61326-1 (1998) + Am1:1998 + Am2:2001; Industrial Environment.

## Dimensions

Dimensions in mm.



HUMICAP® is a registered trademark of Vaisala.  
Specifications subject to change without prior notice.  
© Vaisala Oyj



# Vaisala Moisture and Temperature Meters for Transformer Oil Applications



*Vaisala's instruments provide reliable on-line measurement for moisture in transformer oil.*

The HMP228 and MMT318 transmitters and the MM70 handheld meter provide on-line measurement of moisture and temperature in transformer oil. This measurement gives continuous information and enables effective maintenance against transformer failures.

## Advanced maintenance

The determination of moisture in oil is an essential part of a comprehensive transformer maintenance program. Oil immersed transformers rely on the oil for cooling, protection from corrosion and as an important component of their insulation. Excessive moisture in oil causes accelerated ageing of the insulation materials and reduces their dielectric strength. In extreme cases this can result in arcing and short circuits within the windings. Accurate moisture measurements can also warn about leaks in the oil system, as water is absorbed from the surrounding air.

Moisture levels in oil are affected by the temperature cycling of a transformer. The water solubility of the oil is temperature-dependent: water

solubility increases as the temperature rises. Changes in temperature also affect the water desorption of the paper insulation around the transformer windings. The relative moisture saturation level in oil is a true indicator of moisture present in the paper insulation. The capacity of oil to absorb water depends both on the chemical structure of the oil and the additives included in the oil.

## ppm calculation or water activity

Traditionally ppm-units are used in transformer oil applications. The ppm-output shows the average mass concentration of water in oil.

In addition to the ppm-output, Vaisala's instruments measure water activity. Water activity indicates directly whether the oil is too moist. The measurement remains proportional to the saturation level of water in each individual oil, independent of the type, ageing or temperature of the oil.

## Technical Data

### Mass concentration of water

Typical measurement range 0...80 ppm

Upper range limited to saturation

Ppm calculation valid at temperature range 0...+100 °C

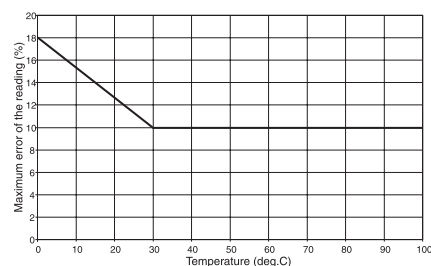
Accuracy

oil temperature > +30 °C (+86 °F)

better than 10 % of the reading

oil temperature < +30 °C (+86 °F)

see the figure below



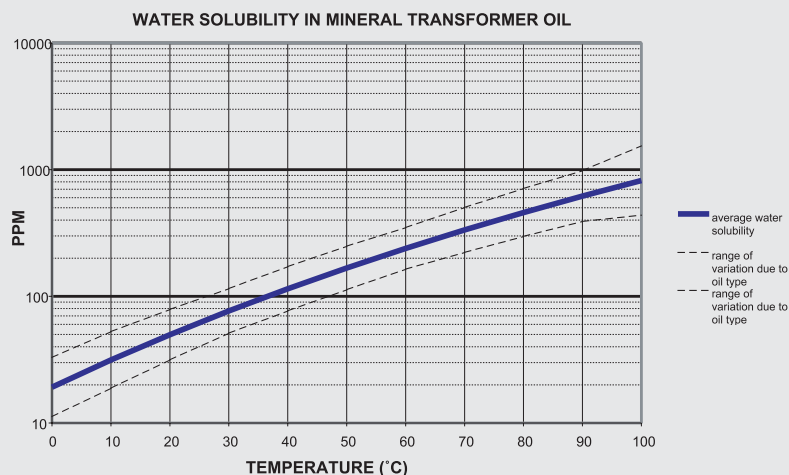
*The maximum errors caused by deviation of mineral oils using the average calculation model.*

Response time (with stainless steel filter)  
in still transformer oil (+20 °C/+68 °F)  
< 10 min

## HMP228, MMT318 and MM70 for transformer applications

Vaisala's instruments provide a direct measurement of moisture in transformer oils.

The basic model calculates the average water solubility in mineral transformer oil (see figure).



*The water solubility of transformer oils versus temperature. The marginals show the range of variation of water solubility found in actual mineral oils.*



# Get a grip on moisture in oil!



**For fast and easy detection of moisture in lubricating oil - grab the Vaisala HUMICAP® instruments and save on maintenance.**

- Real-time measurement
- Valid for most oils, age independent
- Excellent pressure and temperature tolerance
- Designed for heavy industrial use

**For more information, visit**  
**[www.vaisala.com/instruments/moisture\\_in\\_oil](http://www.vaisala.com/instruments/moisture_in_oil)**



*Vaisala HUMICAP® instruments for spot checking and on-line monitoring.*

Reptame Equipment Inc.  
[www.reptame.com](http://www.reptame.com)  
(905) 936-6979