



# MM70 Handheld Moisture and Temperature Meter

for Spot-Checking in Oil



## Features

- Measurement independent of oil type, age and temperature
- In-line process checking through ball valve, no need to drain the oil
- Rugged and reliable construction
- Excellent pressure and temperature tolerance
- Data can be logged and transferred to a PC
- Proven Vaisala HUMICAP® Sensor: over 15 years in oil applications
- Compatible with Vaisala's fixed oil moisture instruments
- No reference oil needed for recalibration
- Traceable calibration (certificate included)

Vaisala HUMICAP® Handheld Moisture Meter for Oil MM70 enables reliable detection of moisture in oil. The probe can be inserted directly into the process pipe through a ball valve without draining the oil in the system.

MM70 measures moisture in oil in terms of the water activity ( $a_w$ ) and temperature (T). Water activity directly indicates whether there is a risk of free water formation. The measurement is independent of oil type, age and temperature.

### PPM Calculation Included

MM70 has an embedded model for expressing moisture as ppm in mineral transformer oil. The customer can enter up to three other oil models into the meter's memory.

### Numerical and Graphical Display

MM70 features a multilingual, menu-based user interface and a backlit LCD display. The measurement parameters can be numerically and graphically displayed and logged into the meter's memory at the same time. An analog output option is also available.

### Vaisala HUMICAP® Technology

MM70 incorporates the latest generation of the Vaisala HUMICAP® Sensor, developed for demanding moisture measurements in liquid hydrocarbons. The sensor's excellent chemical tolerance provides accurate and reliable measurement over the measurement range.

### Speedy Service - Once a Year

The meter can be recalibrated by sending the probe to Vaisala Service, or customers can calibrate the instrument themselves using a standard relative humidity calibration.

### Multi-Probe Operation

One or two probes can be connected simultaneously. Maintenance teams can use additional Vaisala dew point or relative humidity probes for other tasks. For example, a dew point probe is ideal for checking the moisture inside washed and dried oil tanks.

### Connection to PC

The optional MI70 Link Windows® software in combination with a USB connection cable is used to transfer logged data and real time measurement data from the MM70 to a PC.

# Technical Data

## Measurement Performance, MMP78 Probe

### Water Activity

Measurement range $a_w$	0 ... 1
Accuracy (including nonlinearity, hysteresis and repeatability) when calibrated against salt solutions (ASTM E104-85):	
0 ... 0.9	$\pm 0.02$
0.9 ... 1.0	$\pm 0.03$
Maximum achievable accuracy (including nonlinearity, hysteresis and repeatability) when calibrated against high-quality, certified humidity standards:	
0 ... 0.9	$\pm 0.01$
0.9 ... 1.0	$\pm 0.02$
Response time (90%) at +20 °C (+68 °F) in still oil (with stainless steel filter)	10 min
Sensor	Vaisala HUMICAP® 180L2
Recommended recalibration interval	1 year
Typical long-term stability	better than 0.01 $a_w$ / year
<b>Temperature</b>	
Measurement range	-40 ... +100 °C (-40 ... +212 °F)
Typical accuracy at +20 °C	$\pm 0.2$ °C ( $\pm 0.36$ °F)
Sensor	Pt100 RTD Class F0.1 IEC 60751

## Probe Operating Environment

Operating temperature for electronics	-40 ... +60 °C (-40 ... +140 °F)
Operating pressure range	max. 20 bar
Operating pressure range during installation through ball valve	max. 10 bar
Oil flow range	max. 1 m/s
Typical temperature dependence of electronics	$\pm 0.005$ °C/°C ( $\pm 0.005$ °F/°F)
EMC compliance	EN61326-1, Portable Equipment

## Probe Mechanical Specifications

Housing classification	IP65 (NEMA 4)
Probe material	Stainless steel (AISI316L)
Housing material	APS/PC Blend
Cable length between probe and indicator	1.9 m, 10 m extension available
Weight	506 g

## MI70 Measurement Indicator

### Operating Environment

Operating temperature	-10 ... +40 °C (+14 ... +104 °F)
Operating humidity	0 ... 100 % RH, non-condensing
Storage temperature	-40 ... +70 °C (-40 ... +158 °F)

### Inputs and Outputs

Max. no of probes	2
Power supply	Rechargeable NiMH battery pack with AC adapter or 4xAAA size alkalines, type IEC LR6
PC interface	MI70 Link software with USB or serial port cable

### Analog Output

Scale	0...1 VDC
Output resolution	0.6 mV
Accuracy	0.2 % full scale
Temperature dependence	0.002 %/°C full scale
Minimum load resistor	10 kΩ to ground

### Mechanical Specifications

Housing classification	IP54
Housing materials	ABS/PC blend
Weight	400 g

### Compatibility

EMC compliance	EN61326-1, Portable Equipment
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### Other

Menu languages	English, Chinese, Spanish, Russian, French, Japanese, German, Swedish, Finnish
Display	<ul style="list-style-type: none"> <li>LCD with backlight</li> <li>Graphic trend display of any parameter</li> <li>Character height up to 16 mm</li> </ul>
Alarm	Audible alarm function
Data logging capacity	2700 real time data points
Logging interval	1 s to 12 h
Logging duration	1 min ... memory full
Resolution	0.01 %RH, 0.01 °C/°F, 0.01 hPa, 0.01 $a_w$ , 10 ppm / 0.01 %CO <sub>2</sub>

## Battery Operation Time

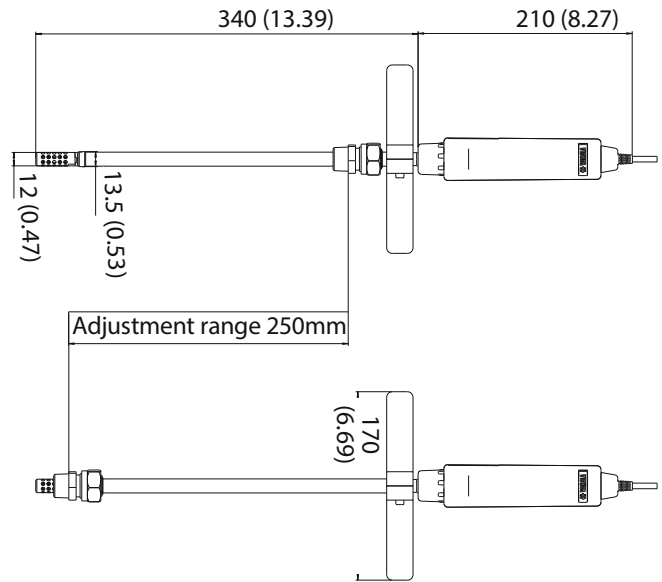
Typical charging time	4 hours
<b>Operation Times with MMP76 and MMP78</b>	
Continuous use	48 h typical at +20 °C (68 °F)
Data logging use	up to a month

## Spare Parts and Accessories

Weatherproof Carrying Case	MI70CASE4
Ball valve set (incl. fitting body & blanking plug)	HMP228BVS
Probe cable extension, 10 m	213107SP
MI70 Link software with USB cable	219687
MI70 Link software with serial port cable	MI70LINK
Analog output cable	27168ZZ
Sensor protection	HM47453SP
Dew point measurement probes	DMP74A/B
Relative humidity measurement probes	HMP75, HMP76, HMP77
<b>Transmitter Connection Cables</b>	
MMT162	219980SP
MMT310	DRW216050SP
MMT330	211339



Indicator dimensions in mm (inches)



Probe dimensions in mm (inches)

