

## Water in Oil sensor FRG00035-xx



### Working principle

The sensor is based on using a capacitor to measure the absorption of water in oil. The physical measured value is the so called “Water activity” value „AW”.


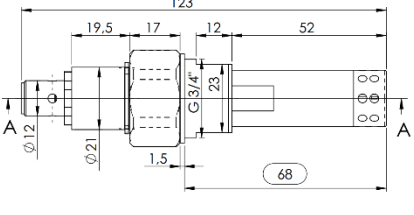
Oil has the ability to hold a certain amount of dissolved water. The maximum water amount oil can hold is called “saturation point”. Above the “saturation point” free water will fall out which can cause corrosion inside of the engine. The “saturation point” is influenced by temperature and other different factors like the composition of oil mineral or synthetic, formulation of additives and will change during the lifetime of the oil.

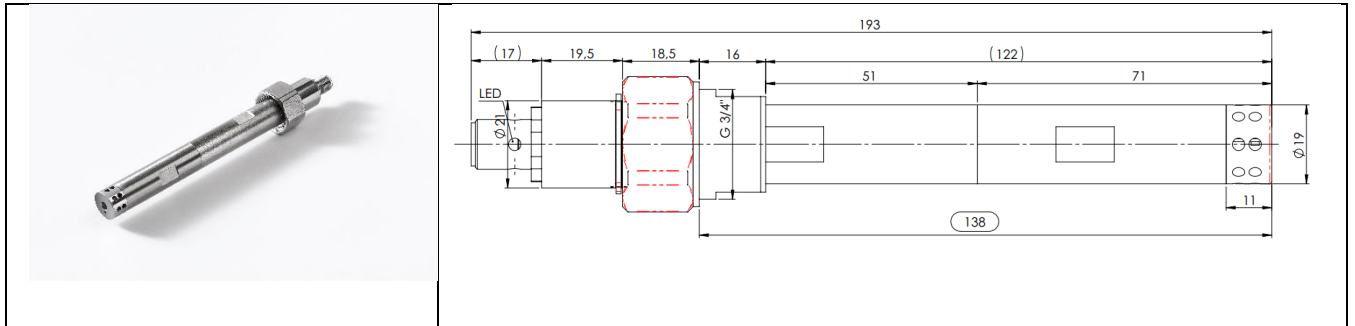
Normally, at site, the water in oil content is measured by a Water in Oil test kit. These kits can only measure the percentage of oil in water normally based on room temperature which supplies no information of the saturation of the oil by water!

The Water in Oil Sensor (WiO) is not measuring free water or emulsion, which is detectable by regular Water in Oil test kits, it measures the absolute water content in oil. The context between humidity and „AW” is  $x \text{ AW} * 100 = x \% \text{ humidity}$ . The PAV (Pre-Alarm-Value) of 0.5 AW means 50 % of humidity, while the MAV (Main-Alarm-Value) of 0.9 AW means 90 % of humidity. More than 100 % (or 1.0 AW) means free water, from this point regular Water-in-Oil-test kits begin to measure. If the WiO shows main alarm, the value is higher than 90 % (oil is saturated to 90 % by water).

## Technical data sensor:

	<b>RS232</b>  FRG00035-R-68-85 FRG00035-R-138-85	<b>I<sup>2</sup>C</b>  FRG00035-I-68-125 FRG00035-I-138-125	<b>Compact</b>  FRG00035-C-68-85 FRG00035-C-138-85	<b>Analogue</b> <b>(available 12/20)</b> FRG00035-AC-68-85 FRG00035-AC-138-85 FRG00035-AV-68-85 FRG00035-AV-138-85
<b>Temperature range</b>	-25...+85 °C	-25...+125 °C	-25...+85 °C	-25...+85 °C
<b>Accuracy of humidity measurement</b>	±3 % within -25...+85 °C			
<b>Pressure resistance against medium</b>	10 bar			
<b>Protection degree</b>	IP67			
<b>operating voltage</b>	18...32 VDC	5 VDC	18...32 VDC, max. permissible ripple ≤ 5 %	18...32 VDC, max. permissible ripple ≤ 5 %
<b>Current consumption</b>	< 30 mA	< 10 mA	< 60 mA	< 60 mA
<b>Wrong polarity protection</b>	Yes	Yes	Yes	Yes
<b>Cable length</b>	Max. 15 m	Max. 50 m	Max. 50 m	Max. 50 m
<b>Output</b>			2 relay outputs for 2 alarm levels (0.5 AW and 0.9 AW), output max. 200 mA	2 analogue outputs (4-20 mA or 0-10 V, see ordering scheme) Burden for 4-20 mA < 500 Ω
<b>Other</b>	Length: from nut to end of sensor 68 mm or 138 mm (others on request) Nut with inner or outer thread G 3/4" (through adapter)			

<b>Picture</b>	<b>Drawing with length</b>
	



## Ordering structure FRG00035-xx

### FRG00035-X-YY-ZZ

FRG00035 -> Basic type information

X -> Interface

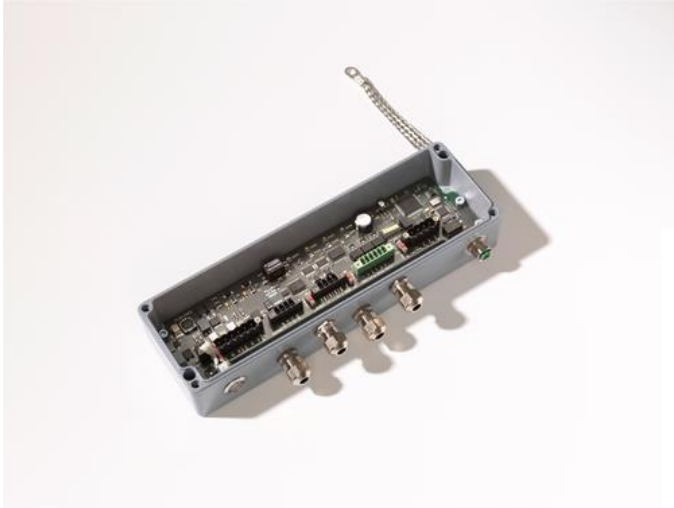
YY -> Sensor length

ZZ -> Temperature range

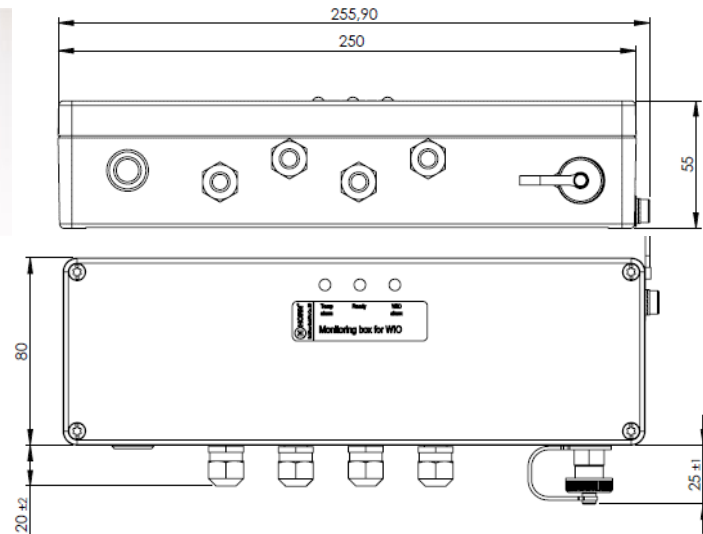
	Interface	Length [mm]	Max. temperature
FRG00035-R-68-85	RS232, SCP	68	85 °C
FRG00035-R-138-85	RS232, SCP	138	85 °C
FRG00035-N-68-85	RS232, non-SCP	68	85 °C
FRG00035-N-138-85	RS232, non-SCP	138	85 °C
FRG00035-I-68-125	I <sup>2</sup> C	68	125 °C
FRG00035-I-138-125	I <sup>2</sup> C	138	125 °C
FRG00035-C-68-85	Compact-version, only relay output	68	85 °C
FRG00035-C-138-85	Compact-version, only relay output	138	85 °C
FRG00035-AC-68-85	Analogue version, 4-20 mA-output	68	85 °C
FRG00035-AC-138-85	Analogue version, 4-20 mA-output	138	85 °C
FRG00035-AV-68-85	Analogue version, 0-10 V-output	68	85 °C
FRG00035-AV-138-85	Analogue version, 0-10 V-output	138	85 °C

## Monitoring box

	<b>small cable glands</b> <b>MPU010-R-S (RS232)</b> <b>MPU010-I-S (I<sup>2</sup>C)</b>	<b>large cable glands</b> <b>MPU010-R-L (RS232)</b> <b>MPU010-I-L (I<sup>2</sup>C)</b>
Power supply	18...32 VDC, max. permissible ripple ≤ 5 %, Protected by automatic fuse	
Power consumption	~10 W	
Polarity protection	yes	
Operating temperature	-25...+85 °C	
Storage temperature	-25...+90 °C	
Relative humidity	< 90 %, non-condensing	
Weight	Monitoring box: ~700 g	
EMC-standard	generics no. 55016 and 55022, safety rules acc. EN 61000-4, -6 rules for type approval test acc. GL	
Connection to PE	Copper mesh band	
Cable glands	M12 for sensor, cable dia. 5-6,5 mm M12 for relays, cable dia. 5-6,5 mm M12 for analogue outputs, cable dia. 5-6,5 mm M12 for power supply, cable dia. 5-6,5 mm	M12 for sensor, cable dia. 5-6,5 mm M25 for power, cable dia. 12,5-20,5 mm M25 for relays and analogue output, cable dia. 12,5-20,5 mm
Sensor interface	I <sup>2</sup> C or RS232	
Alarm relays	PAV, MAV, Ready	
Photo-MOS outputs	< 60 VDC, 500 mA (Short Circuit Protected, free configurable)	
User interface	3 LED, analogue output, web page over ethernet, CAN	
Configuration	web page over ethernet	
Analog output	current output or voltage output (details configurable: 0-20 mA or 0-24 mA), galvanic isolated, user selectable	
Water in oil	burden max. 500 Ω	
Temperature	burden max. 500 Ω	
Resolution	PWM / 4096 steps	
Linearity	≤ ±0,25 % of final value	
Reaction time	approx. 300 ms	
Ethernet	Transmission rate max. 100Mbit/s for parameter settings and display, galvanic isolated, IP-Address adjustable	
CAN	Transmission rate 20kBaud...1MBaud; Node ID adjustable 1...127 CANopen-protocol for parameter settings and display, galvanic isolated	



Picture: MPU010-x-S with small cable glands



## Ordering structure MPU010-xx

### MPU010-X-Y

MPU010 -> Basic type information

X -> Interface

Y -> Cable gland

	Interface	Cable glands
MPU010-R-S (RS232)	RS232	Small (M12)
MPU010-I-S (I <sup>2</sup> C)	I <sup>2</sup> C	Small (M12)
MPU010-R-L (RS232)	RS232	Large (M25)
MPU010-I-L (I <sup>2</sup> C)	I <sup>2</sup> C	Large (M25)