



## Water in oil measurement ( $a_w$ ) presentation

# Company founded by Theodor Horn, 1854 - 1925



**Patent specification in 1885  
for the first  
Eddy current speed indicator**



beginning



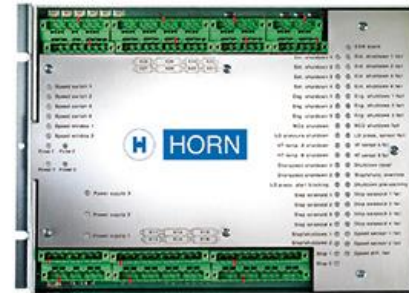
today



Monitoring Systems



Bearing distance monitoring Systems



Double channel Safetysystems



Oil Mist Detectors



Sensors for distance rpm, temperature, pressure



Water in Oil Sensor



360° Encoders



CAN Encoders and Indicators



Flexible mounting Indicators



Multifunctional Indicators

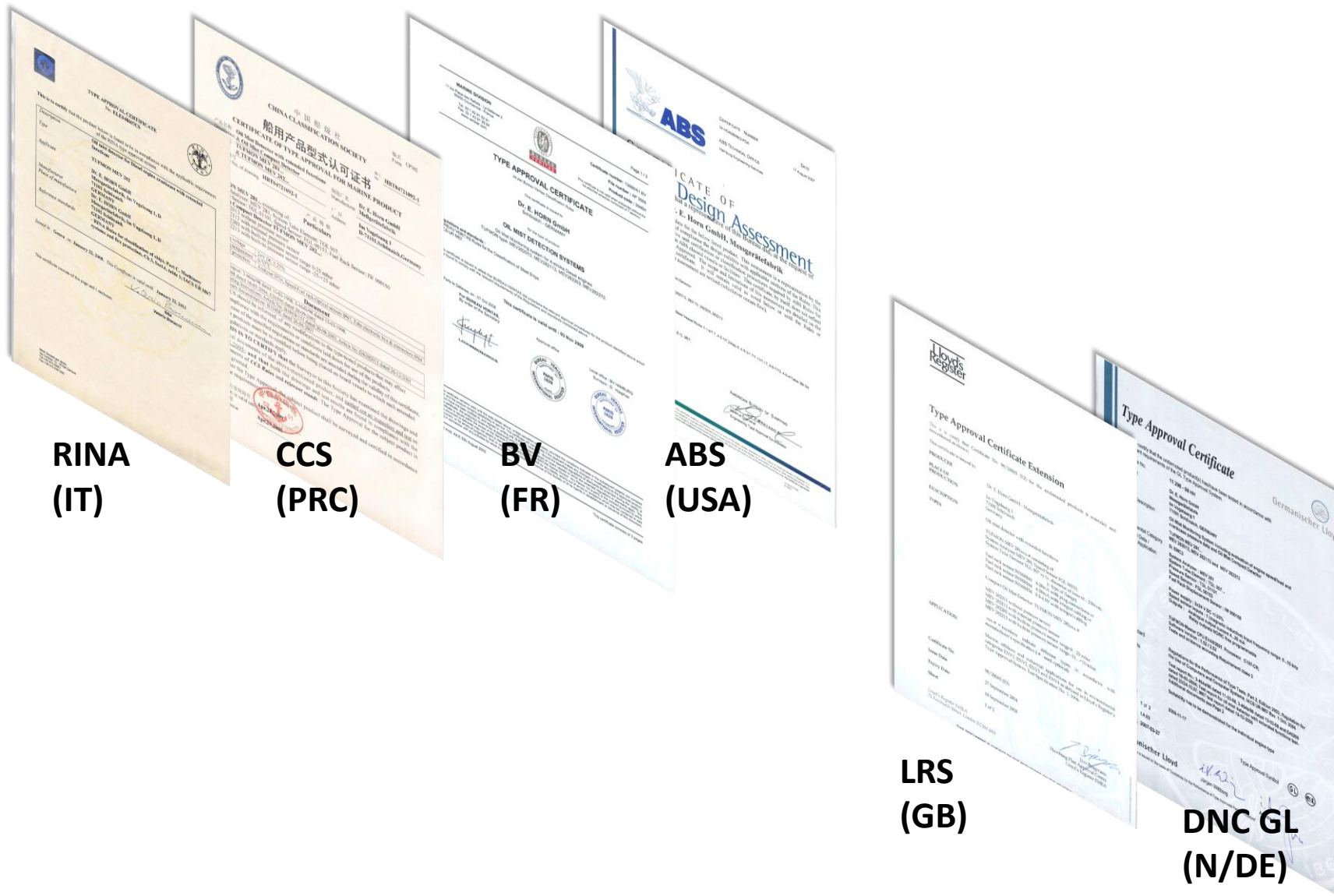


Ceiling mounting Indicators



Cylinder Pressure Monitoring

# Worldwide certified & approved



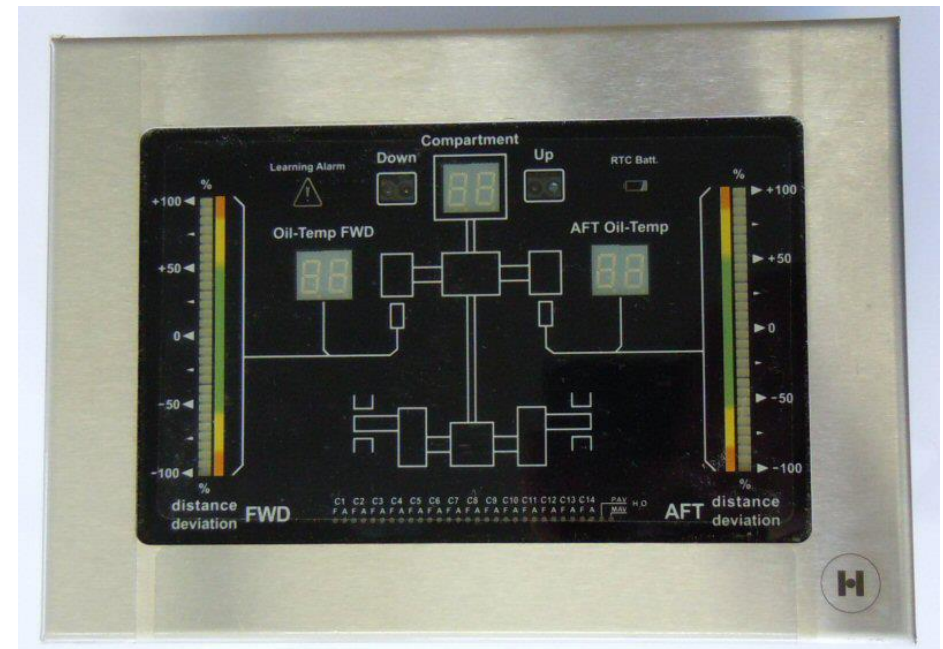
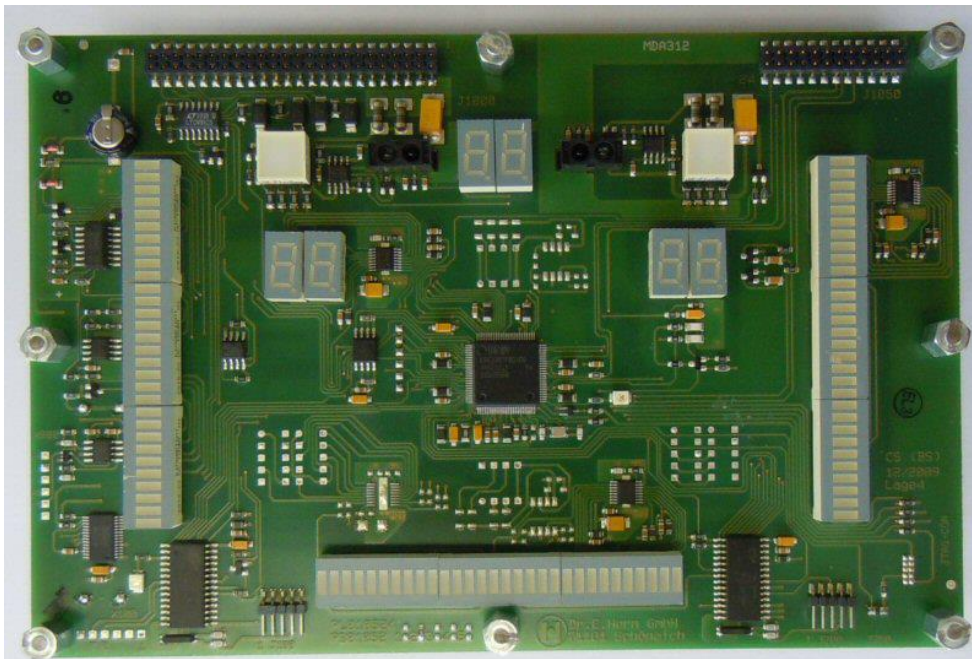
# Electronic Safety Monitoring System

- Multi  $\mu$ Controller and multi I/Qs
- CanOpen communication; redundant
- digital & analogue inputs / outputs
- designed for rough environment (vibration, shock, temperature, oil)



# Electronic Monitoring Systems with enhanced control

- CANopen communication
- digital & analogue inputs / outputs
- designed for rough environment



- simultaneous analysis of distance and temperature
- up to 72 sensors within 13ms
- long term memory with >10 Mio.event logs
- traceable & manipulation protected

# Competencies

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- Mechanics: design and construction
  
- Electronics: Hardware
- Electronics: Firmware (Hardware based Software)
- Electronics: Windows based Application Software
  
- Manufacturing and Production of mechanical components
- Manufacturing and Production of picked & placed Printed Circuit Boards
  
- Assembling of Mechanics and Electronics
- Flashing / Programming of  $\mu$ Controllers / CPUs
- Configuration and Setup (default & customized values)
  
- Quality: Track and Traceability
- Functionality: Software upgrading and re-programming

## What is water activity $a_w$

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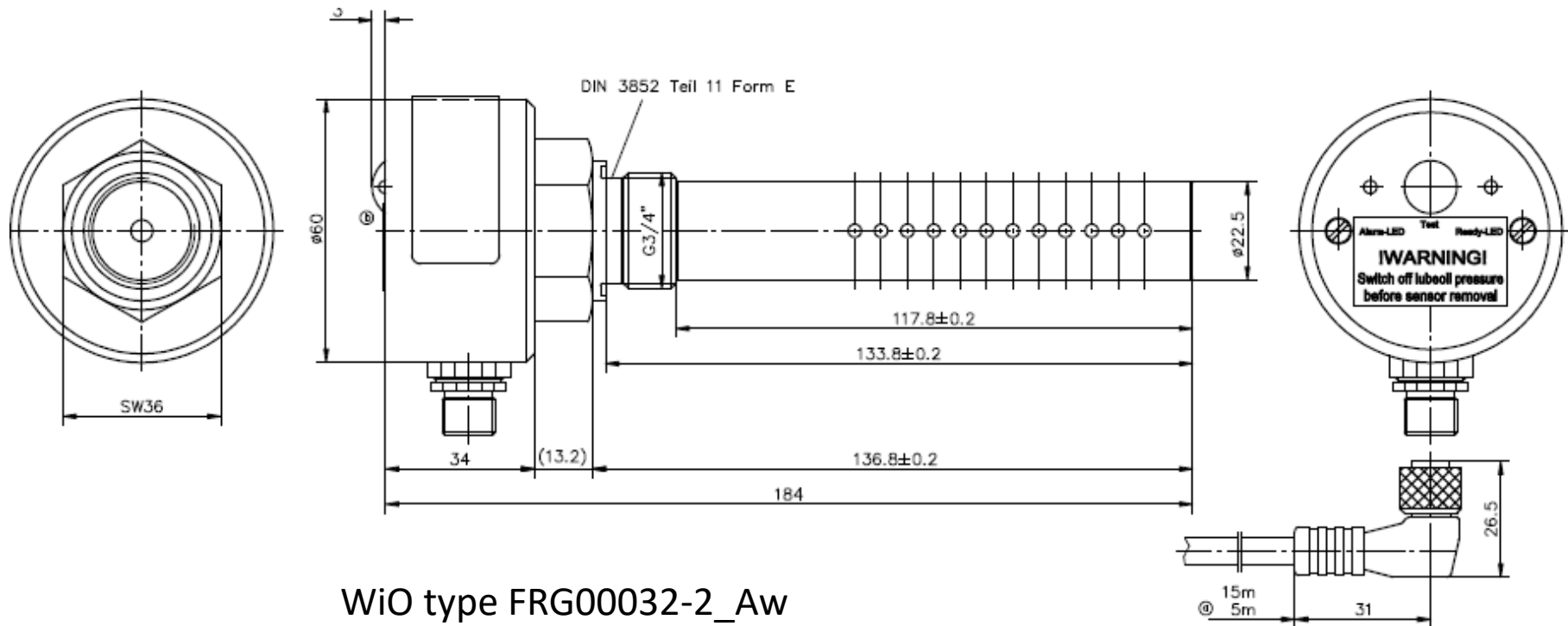
**Water in oil can build up a critical situation at moving parts as the lubrication film will be influenced in a negative way and besides that the risk of corrosion increases dramatically.**

**There are different methods in order to check the water in oil content:**

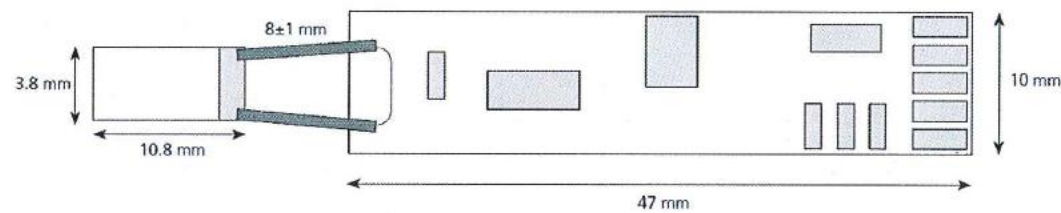
- **Karl-Fischer-Titration (KFT) : off line, expensive, oil must be send to laboratory problematic is the preparation of the sample, different laboratories may measure different water contents**
- **Crackle test: Not exact, no information about oil saturation by water**
- **calcium hydride test: Measures in %, no information about oil saturation by water**
- **water activity measurement ( $a_w$ ): takes temperature into consideration works nearly independent from the age of the oil and the oil type itself.**



# Water in oil sensor stand alone version measuring $a_w$

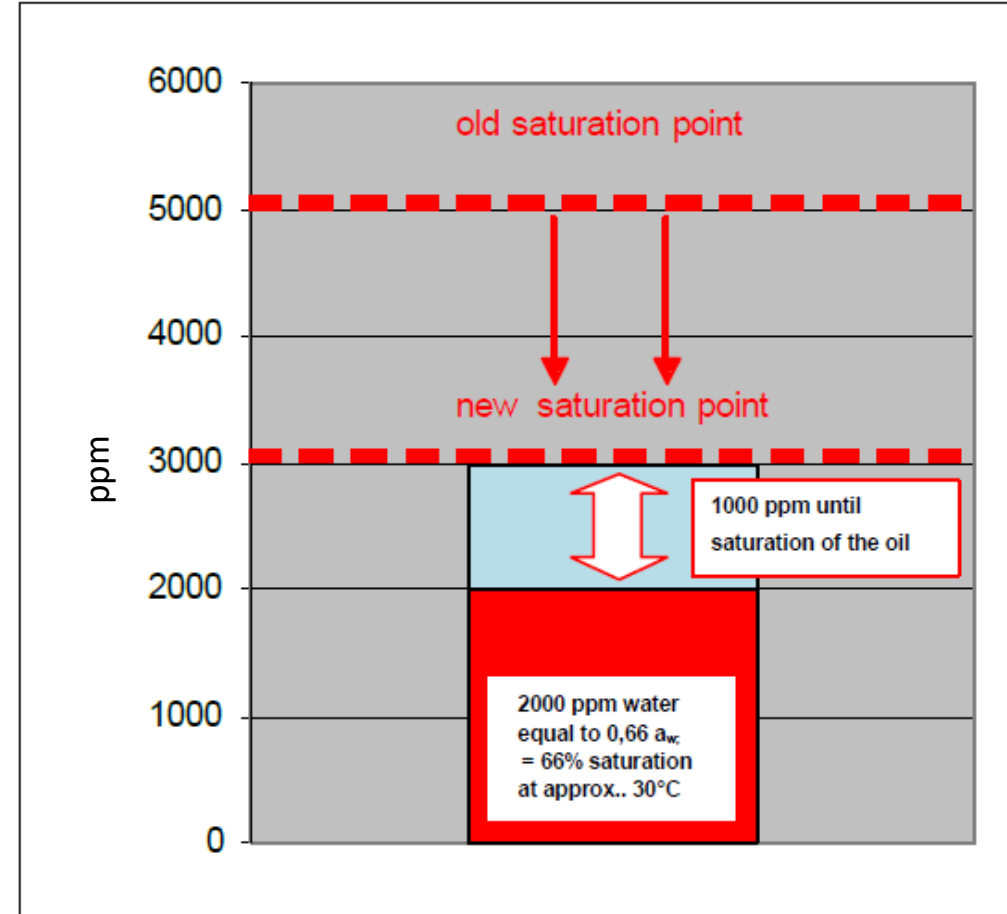
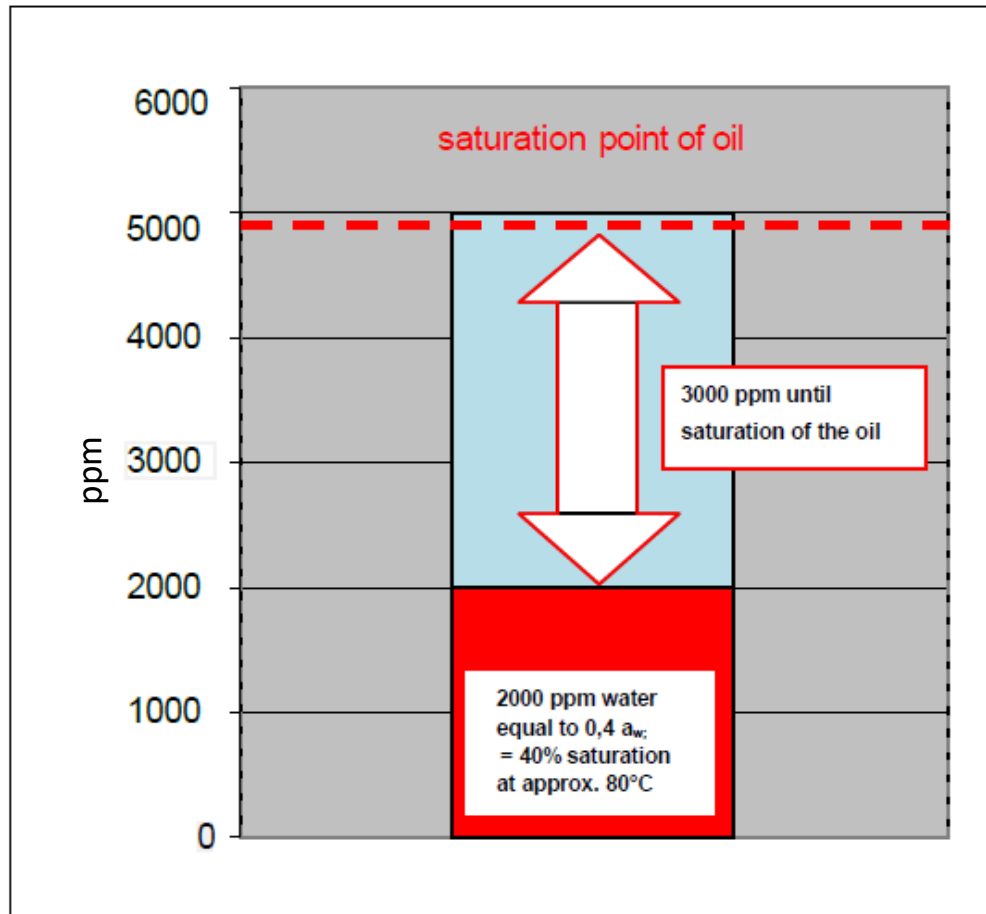


WiO type FRG00032-2\_Aw



WiO sensor element with conversion circuit

# What is water activity $a_w$



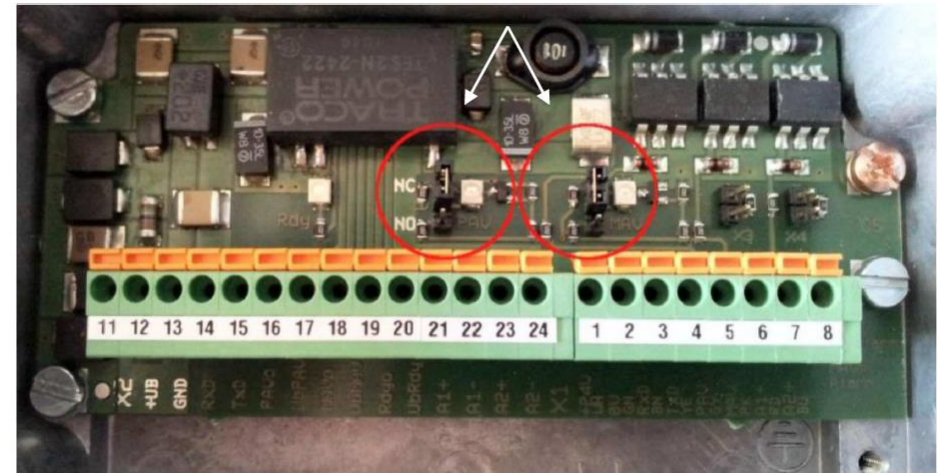
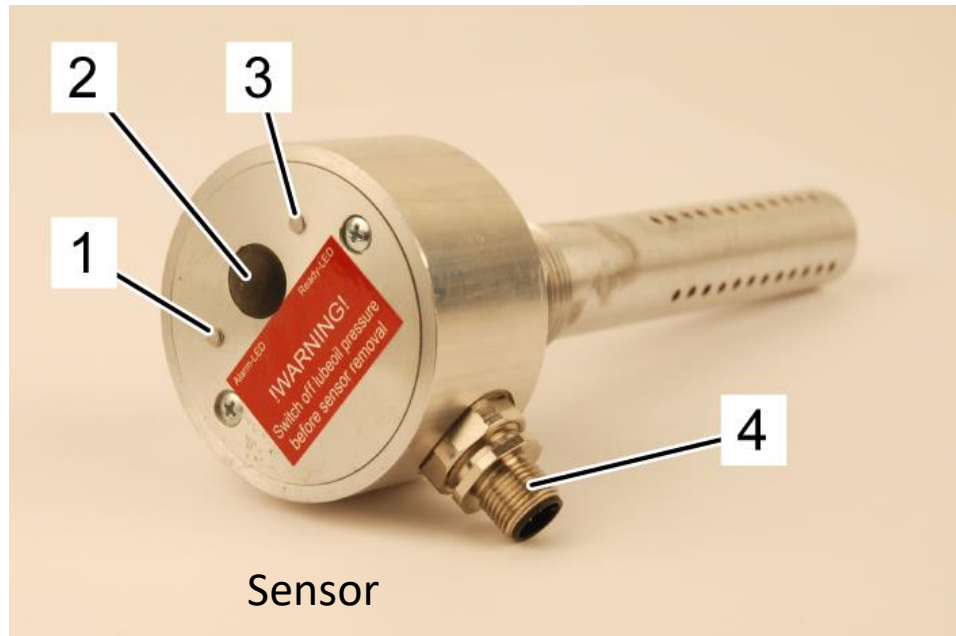
The two diagrams are showing the influence of the temperature for the saturation by water. Left side oil with 80°C and right side oil with 30°C. Saturation of oil with water is reached at lower temperatures much earlier.

## Advantages of the water activity $a_w$ measurement

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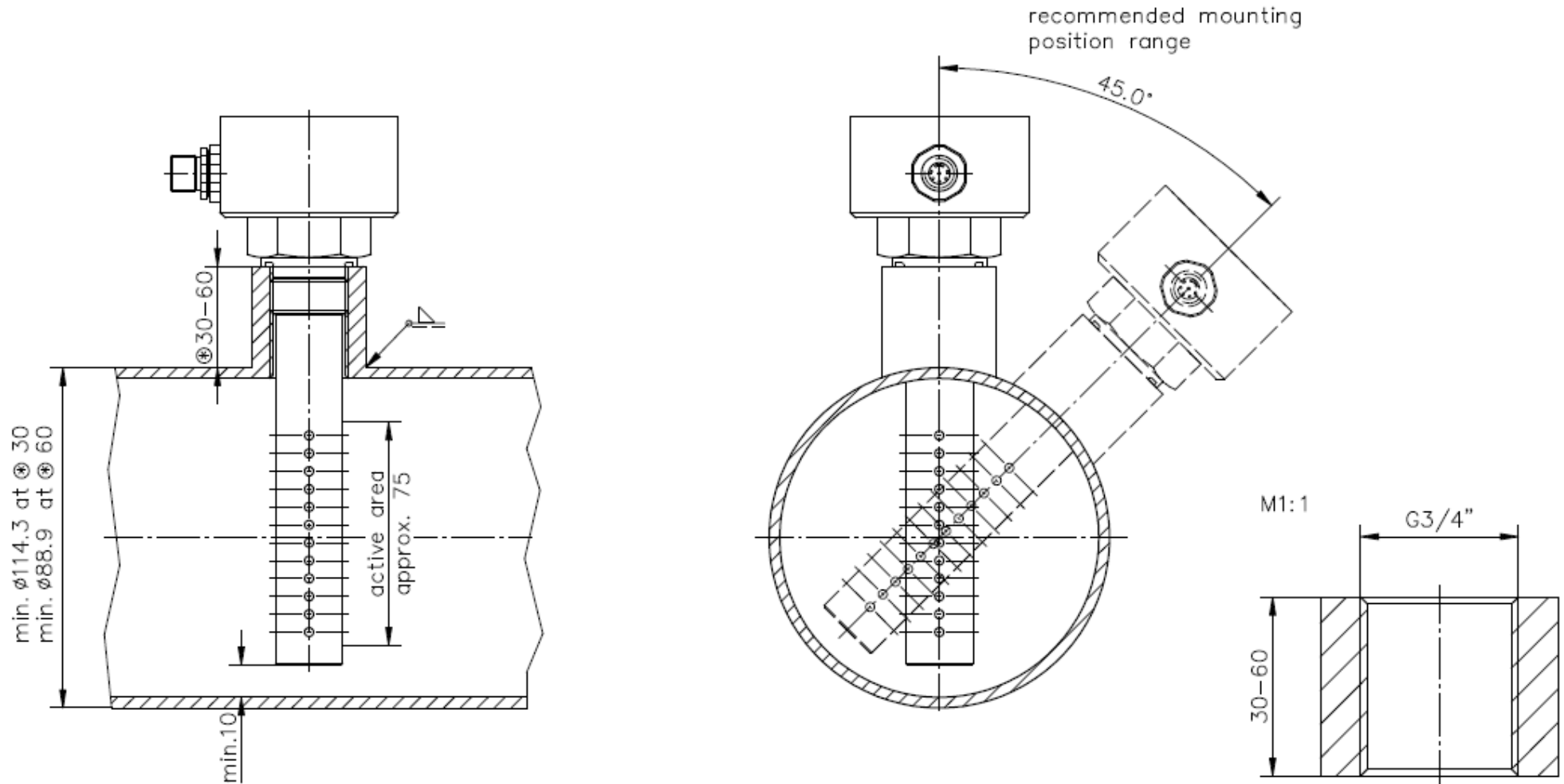
- **measures the saturation of the oil nearly independent from the oil type and oil age**
- **take the oil temperature into consideration in order to measure the saturation**
- **easy to use sensors are available for the measurement**
- **early warning by using pre alarm and alarm contacts are available**
- **cost effective online measurement**

## $a_w$ measurement sensor FRG00032-2\_AW



- 1 Alarm LED
- 2 Function test button
- 3 Ready LED
- 4 Connection plug

# Installation of the water activity $a_w$ sensor



## Where can the water activity $a_w$ sensor be used?

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- **lubrication oil measurements:**
  - **2 and 4-stroke engines**
  - **compressors**
  - **pumps**
  - **gear boxes**
  - **turbines**
  
- **hydraulic oil measurements:**
  - **at all machines using hydraulic up to 10 bar**

Thank you !