



World Wide Competence

Water-in-Oil Monitoring Solutions

**Mobile and
stationary
electronic
sensor systems**

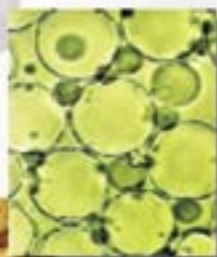
for
inline and offline
applications





Water in hydraulic fluids -

Water is a type of contamination and has negative effects on the characteristics of a fluid. After particulate contamination, water is the second most common reason for breakdowns and failures of hydraulic and lubricating systems.



Microscopic photo of water in oil



Filtered rust particles

How can water get in a system?

- Inappropriate storage
- Residue from cleaning
- Humidity/condensation
- Bearings
- Permeable spots (hairline cracks, caps, defective sealings, etc.)

Types of water

These types of water can be present:

- dissolved water
up to the saturation limit of a fluid
- emulsified and free water
above the saturation limit of a fluid



Oil sample with 100 ppm



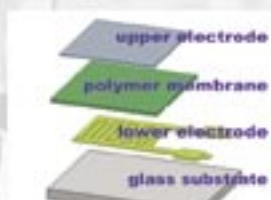
Oil sample with 600 ppm

Effects and consequences of water in hydraulic fluids

- Accelerates oil aging
- Shortens fluid life
- Worsens ability of air segregation
- Worsens lubricating performance
- Worsening of control characteristics
- Increases wear
- Noise
- Failure of polarizing additives
- Increased acid numbers
- Worsened filterability
- Rust
- Higher contamination levels



About the WSPS Sensors



Measuring principle

The WSPS 01/03 are capacitive sensors and utilize a polymer foil as dielectric between two electrodes. This foil is capable of absorbing water molecules due to its microporous structure. The absorption causes the capacity of the sensor element to change. This change of capacity changes the frequency of the resonant circuit and is detected and converted into an output.

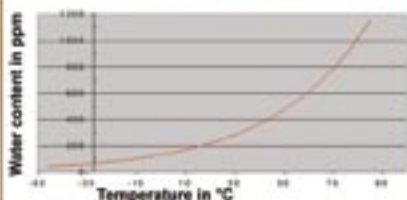
What is being measured?

These sensors measure the relative humidity of a fluid, unlike the water content determination using the Karl-Fischer-Method (total water of the fluid - free and dissolved). The result of a measurement is the saturation level of the fluid with water in percent.

| | |
|------------|-----------------------------|
| 0% - 60% | No free water |
| 60% - 80% | Small amounts of free water |
| 80% - 100% | Free water |

The indication of 100% means the total saturation of a fluid and therefore the presence of dangerous free water in the fluid.

A theoretic relation to the ppm (mg/kg) water content (determined by the Karl-Fischer method) can be made for values between 0% and 100%. For this purpose it is necessary to know the characteristic curve of the saturation level and the temperature of the fluid.



Characteristic curves for different fluids are pre-programmed in the WSTM 01 display unit. Operating with the WSPS 03, results can be displayed in ppm.



With WSPS 01
and WSH 01



With WSPS 03
and WSTM 01



Technical Data

WSPS 01

| | |
|----------------------------|----------------|
| Measuring water saturation | ✓ |
| Measuring range | 0%...100 % |
| Accuracy | +/- 2% |
| Ambient temperature | -40°C...+110°C |
| Flow velocity | maximum 2 m/s |
| Power supply | 9 V...30 V DC |
| Analogue outputs | 0 V...1 V |
| Clean with | Isopropanol |
| Protective cap | Plastic |
| Cable length | 1.5 m |
| Protection class sensor | IP 67 |
| display unit | IP 40 |

Offline Sensor

Recommended Display Unit

WSH 01

- with colored LED display
- for mobile offline applications

WSPS 03

| | |
|-----------------------------|--------------------|
| Measuring water saturation | ✓ |
| Measuring range | 0%...100 % |
| Accuracy | +/- 2% |
| Pressure resistance | 16 bars |
| Flow velocity | maximum 2 m/s |
| Measuring fluid temperature | ✓ |
| Temperature range | -20°C...+80°C |
| Connection thread | G 3/4 |
| Power supply | 12 V...30 V |
| Ohmic resistance | 600 Ohm at 24 V DC |
| Analogue output saturation | 4 mA...20 mA |
| Analogue output temperature | 4 mA...20 mA |
| Protective cap | Stainless steel |
| Cable length | 5 m |
| Protection class sensor | IP 67 |
| display unit | IP 65 |

Inline Sensor

Recommended Display Unit

WSTM 01

- with numeric 4-row display
- for stationary online applications
- results for certain fluids can be displayed in ppm

Fluid compatibility

Mineral oil based fluids as well as synthetic fluids such as hydraulic oils, lubricating oils, transformer oils, and ester based synthetic oils.

Tested and for the WSTM 01 pre-programmed fluids

- | | |
|----------------------|------------------------|
| ✓ HLP 22 (Shell) | ✓ CLP 220 (Shell) |
| ✓ HLP 46 (Shell) | ✓ HEES 46 (Fuchs) |
| ✓ HLP 68 (Shell) | ✓ Red Army Oil (China) |
| ✓ MIL-H 5606 (Shell) | ✓ ... |

Additional fluids are being tested constantly and added to the program. Research on special fluids is available (upon request).

Product Overview

WSPS 01 Sensor

- Sensor to monitoring and diagnose hydraulic and lubricating fluids
- For quick, simple and reliable offline measurements of saturated water in oil
- Analogue output of water saturation in volts
- Simple cleaning



WSPS 03 Sensor

- Sensor for monitoring and diagnosing hydraulic and lubricating fluids
- For reliable online measurements of saturated water in oil
- Also measures temperature
- Analogue output of water saturation and temperature both in milliamps
- Simple cleaning



WSH 01 - Set

- WSPS 01 Sensor with the WSH 01 display unit
- For quick, simple and reliable mobile offline measurements of saturated water in oil
- Small and comfortable handheld measuring device
- Multiple applications
- Battery powered
- Simple cleaning
- Colored LED display



Separate display units available

WSTM 01 - Set

- WSPS 03 sensor with the WSTM 01 display unit
- For reliable, stationary inline measurements of water saturation of an oil
- Also measures temperature
- Results can be displayed in either saturation level or theoretical ppm
- Simple cleaning
- 4-row, numeric display
- Simple menu navigation
- Saves up to 100 measurements
- Serial bus (RS 232)



Including Data Manager software for PCs

MSS 01

Enables the operation of up to 8 separate WSPS 03 sensors with only one WSTM 01 display unit



WSSB

Bottle sampling glass for direct measurements when using the CCS 2

