

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.



How can water get in a system?

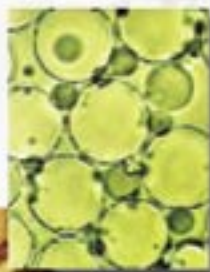
- Inappropriate storage
- Residue from cleaning
- Humidity/condensation
- Bearings
- Permeable spots (hairline cracks, caps, defective sealings, etc.)

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



Filtered rust particles



Microscopic photo of water in oil



Oil sample with 100 ppm



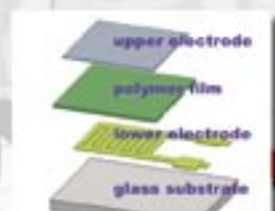
Oil sample with 600 ppm

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.

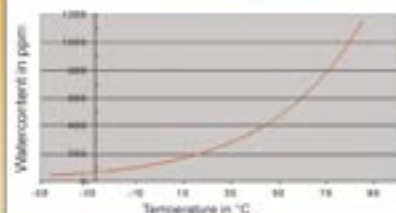
What is being measured?

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 monitor 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



Additional Products

from our product range, which - if you have problems with water - might be of great interest to you:

internormen 
fluid management

IFPM/IFPS Fluid Purifier Systems

- Remove free, dissolved and emulsified water from operating fluids
- Remove free and dissolved gases
- Remove particulate contamination down to 1 micron
- Extend fluid life and prevent oil aging
- Improve reliability and productivity of your systems
- Reduce down-time of machinery
- Extend life of system components



internormen 
filter technology

Watersorp - water-absorbing filter elements

- Absorb free and emulsified water from oil
- Particulate contamination is also filtered
- Reduce oil aging and deadditivation of fluids



BFD - Desiccant Breather Filters

- Reduce the influence of humidity
- Remove particulate contamination and humidity of air entering a system or a tank
- Extend fluid life
- Reduce down time of machinery
- Reduce system component repairs and replacements



INTERNORMEN Technology GmbH

Friedensstrasse 41 • D-68804 Altlussheim - GERMANY
Phone: +49 - (0) 6205-2094-0 • Fax: +49 - (0) 6205-2094-40
Internet: www.internormen.com • e-mail: info@internormen.com

internormen 
technology