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World Wide Competence

Contamination Monitoring

NEW
CCT 01 + PFS 01

Measuring systems for inline, offline and online monitoring of hydraulic and lubricating fluids

Competence through Experience

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INTERNORMEN Technology

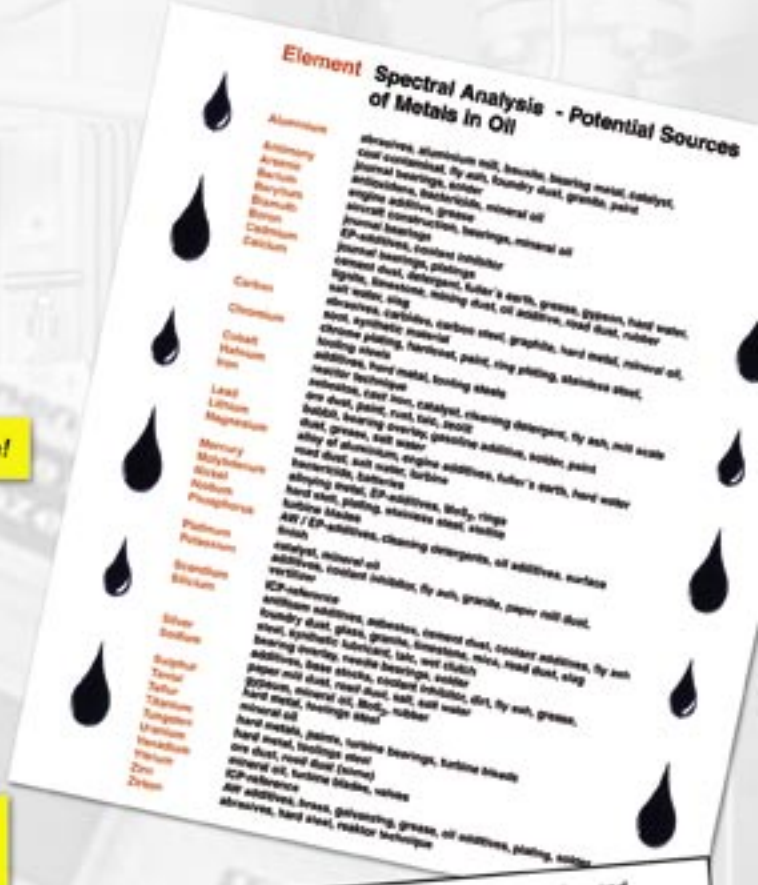
Particulate Contamination

Particulate contamination is the most frequent reason for failure and downtime of hydraulic and lubricating systems.

Therefore it is of crucial importance for the functionality and efficiency of a system to know the precise level of contamination at any time.

This knowledge enables the operator to influence the situation with appropriate counteractive actions. This way best possible equipment availability is ensured.

Your advantage!



Effects of Particulate Contamination

- Accelerated oil aging
- Shortened fluid lifetime
- Failure of additives
- Corrosion, cavitation, abrasion, erosion
- Increased wear

Particle

Please also ask for information regarding our wide range of filter products!

Applications of *INTERNORMEN* Contamination Monitoring Systems

- Immediate and precise diagnosis of a hydraulic system's condition
- Monitoring filter performance with respect to the standard required by certain system components
- Accurate determination of the optimal date for filter element changes
- Reliable monitoring of running-in periods of new systems
- Diagnosis of hydraulic components, such as pumps, bearings or sealings
- Definition of the condition of new fluids when introducing them to a system
- Verification of effective offline filtration
- Evidence for the influence of changed external conditions on the particulate level in a hydraulic system

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Guidelines for Determining, Achieving, and Maintaining Target Cleanliness Levels with High Performance Filtration (Beta Ratio ≥ 200)

Most Sensitive System Component	Low Pressure Under 2000 psi (moderate conditions)		Medium Pressure 2000 to 2999 psi (or low pressure plus severe conditions)[1]		High Pressure 3000 psi and Over (or medium pressure plus severe conditions)[1]	
	ISO Target Levels	Filter Media Ratings[2]	ISO Target Levels	Filter Media Ratings[2]	ISO Target Levels	Filter Media Ratings[2]
PUMPS						
Fixed External Gear	22/18/14	25VQ	20/16/13	10VQ	20/16/13	10VQ
Vane	23/18/14	25VQ	20/16/13	10VQ	20/16/13	6VQ
Fixed Piston	20/15/13	10VQ	20/16/13	6VQ	19/15/11	3VQ
Variable Piston	20/16/13	6VQ	19/15/11	3VQ	18/14/10	3VQ
VALVES						
Check Valve	22/18/14	25VQ	20/16/13	10VQ	20/16/13	10VQ
Directional (solenoid)	22/18/14	25VQ	20/16/13	10VQ	20/16/13	10VQ
Standard Flow Control	22/18/14	25VQ	20/16/13	10VQ	20/16/13	10VQ
Cartridge Valve	20/16/13	10VQ	20/15/13	6VQ	19/15/11	3VQ
Proportional Valve	19/15/11	3VQ	18/14/10	3VQ	17/13/9	3VQ
Servo Valve	18/14/10	3VQ	17/13/9	3VQ	16/13/8	3VQ
ACTUATORS						
Cylinders, Vane Motors, Gear Motors	23/19/15	25VQ	22/18/14	10VQ	20/16/13	6VQ
Piston Motors, Swash Plate Motors	20/16/13	10VQ	20/16/13	6VQ	19/15/11	6VQ
Hydrostatic Drives	19/15/11	6VQ	18/14/10	3VQ	17/13/9	3VQ
TEST STANDS	15/11/7	1VQ	15/11/7	1VQ	15/11/7	1VQ
LUBRICATING OILS						
Paper Machine Oils	20/16/13	10VQ	not applicable	not applicable	not applicable	not applicable
Steam Turbine Oils	19/15/11	6VQ	not applicable	not applicable	not applicable	not applicable
Diesel Engine	20/16/13	10VQ	not applicable	not applicable	not applicable	not applicable
Mobile Gear Box	20/16/13	10VQ	not applicable	not applicable	not applicable	not applicable
Industrial Gear Box	19/15/11	6VQ	not applicable	not applicable	not applicable	not applicable
Journal Bearing	19/15/11	6VQ	not applicable	not applicable	not applicable	not applicable
Roller Bearing	18/14/10	3VQ	not applicable	not applicable	not applicable	not applicable
Ball Bearing	17/13/9	3VQ	not applicable	not applicable	not applicable	not applicable

Notes: [1] Severe conditions may include high flow surges, pressure spikes, frequent cold starts, extremely heavy duty use or the presence of water.

[2] Two or more systems filters of the recommended rating may be required to achieve and maintain the desired Target Cleanliness Level, for more details and accuracy use our filter simulation software.

INTERNORMEN Technology

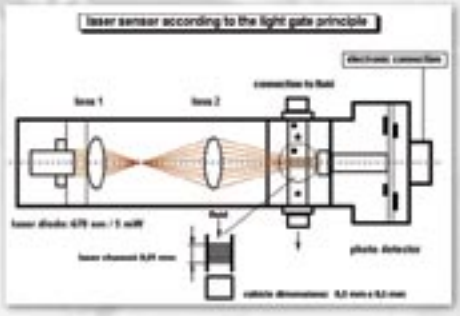
INTERNORMEN monitoring systems provide the opportunity of mobile and stationary fluid monitoring and particle counting. All diagnoses are made immediately and accurately according to effective standards.

Benefit from the advantages of immediate diagnosis compared to external lab analysis

Our wide range of products for particulate contamination measurements are an essential part of any broad maintenance concept. The systems are not only intended for inline and offline operation, in addition many online applications are also available.

Connecting all systems to external PCs in order to control operations and manage measurement-data using an MS-Excel-based Data-Manager are not the only possibilities. With help of the MWS 02, the CCS 2 can also be accessed over the Ethernet or the Internet.

The new MPM 01 and CCM 01 devices are inexpensive Inline-monitoring systems for permanent and stationary operations based on the successful CCS 2 technology.

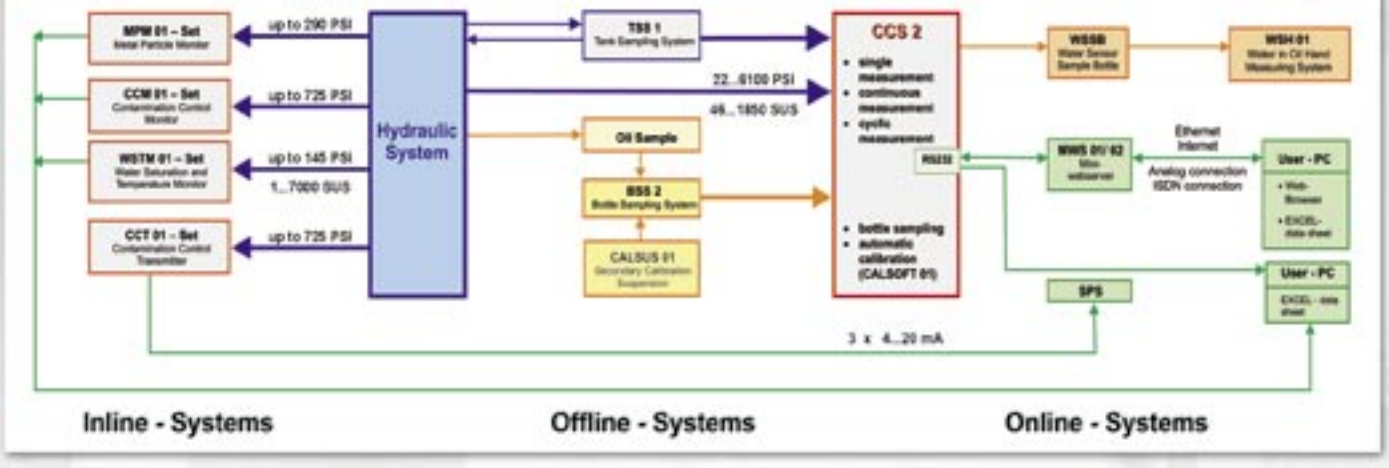


Technology

The *INTERNORMEN* particle counters operate with different sensors. Both the CCS 2 and the CCM 01 are equipped with a laser sensor, which detects particles in a fluid based on the light gate principle. These particles are counted in different counting channels. For example, the sensor of the CCS 2 determines the current particulate level of the pressure- or lubricating fluid in combination with an integrated dosing unit which automatically adapts the pressure of the connected system. Instead, the CCM 01 also measures the flow velocity of the fluid to generate results. The MPM 01 detects coarse metal particles using an inductive measuring technique.

Please ask about our water-in-oil monitoring solutions!

Contamination Controlling



CCS 2 - Contamination Control System

- Particle counter with laser sensor for hydraulic and lubricating fluids
- Precise determination of contamination classes according to ISO 4406:99, ISO 4406:87 and NAS 1638
- High precision measuring system for mobile and stationary applications
- Makes measurements at different points of a system possible, even at points with dynamic conditions
- Many specific measuring programs
- Results are displayed immediately
- Internal storage and management of measurements
- Automatic monitoring function with control signal output if set thresholds are exceeded
- RS 232 interface to control system operations using an external PC or the internet
- Data-transfer to an external PC or the Internet
- Data management using an MS-Excel based Data-Manager software
- Comfortable and user-friendly software
- Storage capacity 4 x 100 data sets
- Mains or battery operation
- 6.5" TFT colored display

Satisfied customers worldwide
Online measurements with lab-quality results

Wide range of accessories

Integrated printer

Case in carry-on standard-size

CCS 2 with bottle sample

Technical Data

Fluid compatibility	Mineral oil based hydraulic and lubricating fluids as well as synthetic ester
Laser	650nm
Counting channels	8; sizes ≥4µm(c), ≥4.6µm(c), ≥6µm(c), ≥6.4µm(c), ≥10µm(c), ≥14µm(c), ≥21µm(c), ≥37µm(c).
Accuracy	<2%
Max. particle concentration	24000 particles/ml
Calibration	ISO-MTD in oil (ISO 11171)
Supply pressure	22...6100 PSI
Viscosity	46...1850 SUS
Connections	Miniature measuring connection with screw coupling M16x2, connector coupling for hose 0.24"
Power supply	90...250 V AC 50/60 Hz, 12 V DC
Internal accumulator	12 V DC

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The new Inline Monitoring Solutions

CCM 01 - Contamination Control Monitor

- Particle counter with laser sensor for hydraulic and lubricating fluids
- Reliable determination of contamination classes according to ISO 4406:99
- Designed as an inexpensive inline monitoring solution for stationary and permanent operations
- Displays contamination classes according to NAS 1638
- For the installation in new or existing systems
- Results displayed immediately
- Internal storage of measurements
- Automatic monitoring function with control signal output if set thresholds are exceeded
- RS 232 interface
- Data-transfer to an external PC
- Data management using a MS-Excel based Data-Manager software
- Comfortable and user-friendly software
- Numeric 4-line display
- Robust case

Technical Data

Fluid compatibility	Hydraulic and lubricating fluids as well as synthetic ester
Laser	650 nm
Counting channels	4; sizes (switchable): $\geq 4\mu m_{(c)}$, $\geq 6\mu m_{(c)}$, $\geq 14\mu m_{(c)}$, $\geq 21\mu m_{(c)}$; *or* $\geq 6.4\mu m_{(c)}$, $\geq 14\mu m_{(c)}$, $\geq 21\mu m_{(c)}$, $\geq 37\mu m_{(c)}$
Pressure	up to 725 PSI
Temperature range	32...158 °F
Calibration	ISO MTD in oil
Connection	1" or 3/4" pipes
Power Supply	24V DC

MPM 01- Metal Particle Monitor

- Metal particle sensor MPS 01 with inductive measuring technique including the control unit MPM 01 for direct measurement survey
- Detection and counting of metal particles >200µm
- Designed as an inexpensive inline monitoring solution for stationary and permanent operation
- For installation in new or existing systems
- Internal storage of measurements
- Automatic monitoring function with control signal output if set thresholds are exceeded
- RS 232 interface
- Data-transfer to an external PC
- Data management using a MS-Excel based Data-Manager software
- Comfortable and user-friendly software
- Numeric 4-line display
- Robust case

Technical Data

Fluid compatibility	Hydraulic and lubricating fluids, as well as synthetic ester
Measuring	Inductive method
Metal particles	>200µm
Detection rate	max. 100 particles/sec
Pressure	up to 290 PSI
Temperature range	-40...+176 °F
Flow velocity	26 gal/min
Connections	Hose or flange
Electronic	M12, 4 poles
Power supply	24V DC

MPS 01 - Metal Particle Sensor

- Metal particle sensor operating with inductive measuring concept for hydraulic and lubricating fluids
- Detection of metal particles >200µm
- Designed as an inexpensive inline monitoring solution for stationary and permanent operations
- For installation in new or existing systems
- Two output signals; counting impulses (24V, 5ms) as well as a diagnostic signal

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The new Inline Monitoring Solutions

CCT 01 - Contamination Class Transmitter

- Particle counter with Laser sensor PFS 01 for hydraulic and lubricating fluids
- Contamination monitoring at different test stands for hydraulic components, filter service devices, wind energy plants and mobile and stationary hydraulic systems in general
- Inexpensive and reliable inline system to control contamination classes. It consists of the actual contamination class transmitter CCT 01 with integrated three-channel particle counter in combination with the particle flow sensor PFS 01
- Applicable for hydraulic and lubricating oils.
- When using the CCT 01 as contamination class transmitter, the measurement signals received from the laser sensor are transformed into contamination classes and passed on as analogue output (4...20 mA)
- The signals emitted accord to the contamination classes based on ISO 4406:99 (≥ 4 $\mu m_{(c)}$, ≥ 6 $\mu m_{(c)}$, ≥ 14 $\mu m_{(c)}$)
- The CCT 01 does not have keys, but using the USB-interface and a PC, it is possible to configure the device, set calibration values or transmit current or saved particle numbers. The data can be processed further from external computers.

Technical Data

Serial Interface	USB (for configuration) M 12 - connector, CAN - option
Dimensions	7.9 x 3.3 x 1.4 in. x in. x in.
Mass	0.85 lbs
Output signals	3 x 4....20 mA

PFS 01- Laser Sensor

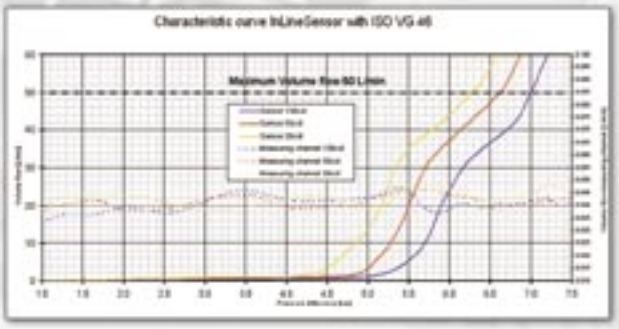
The PFS 01 laser sensor consists of two sensor elements, a laser sensor for particle counting and a thermal flow sensor for measuring the volume flow. It operates based on the offline flow principle. Advantages of a thermical flow sensor: no moved parts, no abrasion, insensitive to contamination, easy electronical evaluation. The partial flow leads through the flow sensor and the laser sensor is created with a counter balance valve. The laser sensor integrated in the PFS operates based on the light cover principle. Differences to precision sensors: more compact, cost reduction, designed for permanent / trend monitoring

- The laser sensor PFS 01 is calibrated according to ISO 11171:99. Calibration values are preset for each CCT 01
- It is possible to save measurements in user-defined intervals (up to 1000 measurements)
- Suitable for installation in new or existing systems

Technical Data

Calibration of particle size	ISO MTD in oil (ISO 11171:2000)
Max. acceptable operating pressure	≤ 725 PSI
Max. oil temperature (short term)	158 °F
Viscosity range	46.....1850 SUS
Ambient temperature	32....+ 113 °F
Max. acceptable volume flow	13.3 gal/min
Connections	Pipes, 1" or ¾"
Protection class	IP 65
Weight	3.3 lbs

Operating fluids:
- Hydraulic oils H, HL, HLP and HV
- Gear oils C, CL, CLP
- Motor oils, gas oils
- MIL-H-5606 E
- Vegetable oils (HTG, Triglyceride)
- Synthetic ester (HEES)



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The new standard in modern Fluid Management and Contamination Control

UMFC 41/81 - Mobile Oil Service with Fluid Control Function

The UMFC is a mobile off-line-filter unit with a "Fluid-Control"-function, simplifying off-line-filtration and filling of reservoirs, selectively equipped with the "Interporvlies"-filter elements or with our well proven "Watersorp"-filter elements.
For a representative conclusion about the prevailing condition of a fluid, a continuous measurement of the contamination classes and the saturation of the oil with water is provided between pump and filter unit. This is achieved by the PFS 01 laser sensor in combination with the contamination class transmitter CCT 01.
The output is displayed in contamination classes according to ISO 4406:99 and in percent (%) of saturation of the oil with water, additionally data may be read out and transfered to a standard PC via USB interface.
The unit UMFC is equipped with 4 separate operating modes. By entering of desired contamination classes and/or desired water saturation an automated shutdown of the UMFC is effected when reaching threshold for contamination classes, for water saturation or for contamination classes and water saturation.
As for protection of the particle sensor, the unit is equipped with a temperature control function. For avoiding any damages, the sensor of the particle counter set CCT 01 is switched off, when reaching an oil temperature of over 122°F. The maximum allowable oil temperature of the system is up to 158°F, reaching this value causes an automated shutdown. All conditions are displayed via pilot lamps on the LCD-monitor.

	Technical Data UMFC 41 single phase AC motor	Technical Data UMFC 81 three phase AC motor / pole changing	
Volume flow	11.3 GPM	11.3 GPM	22.5 GPM
Max. working pressure	87 PSI	145 PSI	
Viscosity	46 - 1850 SUS	46 - 3680 SUS	46 - 1850 SUS
Electrical connection	110 V - 60 Hz (1 phase)	460 V - 60 Hz (3 phase)	460 V - 60 Hz (3 phase)
Max. oil temperature	32...158 °F particle measuring possible up to 122 °F	32...158 °F particle measuring possible up to 122 °F	

UMCC 40 - Mobile Oil Service and Contamination Control

The UMCC is a mobile off-line-filter unit with Contamination Control-function. In combination with our particle counter system CCS 2, contamination classes can be determined online or via bottle samples with our optional BSS 2 system according to ISO 4406:99 and NAS 1638 standards.
This way, equipped with Contamination control monitor CCM 01-Set, WSTM 01-Set with WSPS 03 sensor and visual clogging indicator controlled flushing can be achieved with the integrated software and relais output.

The integrated Y-Filter protects the laser sensor of the CCS 2 from particles larger than 200 µm and prolongs service life of the integrated low noise pump, that enables the using of the unit in tough and dirty cleaning jobs. By continous Δp monitoring of the filter elements the user will be informed about the true state of the contamination of the element. Because of the large filtration area element, the user can realize cost savings over time through not so many element changes.
The particle counter CCS 2 can also be used seperate from the flushing system with this handy, lightweighted carrying case, which is included in this package as well as our user-friendly data manager software.

	Technical Data UMCC 40 single phase AC motor
Volume flow	11.3 GPM
Max. working pressure	116 PSI
Viscosity	46 - 1850 SUS
Electrical connection	110 V - 60 Hz (1 phase)

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Accessories

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BSS 2 - Bottle Sampling System

This optional auxiliary unit for the CCS 2 measuring system ensures optimal bottle sampling processing and sample preparation and therefore lab-quality results. Essential degasification is performed by the generated vacuum. A variable adjustable pressure can be applied as well to feed the fluid to the CCS 2 system.

Also available with compressor

Technical Data

Pressure range	0...58 PSI
Vacuum range	0...28 in. Hg
External supply pressure	min. 72 PSI, max. 145 PSI Air volume Q_{min} = 10.5 GPM
Supply pressure connection	Quick coupling NW 7.2
Hose connection	Miniature measuring connection with screw coupling M16x2
Power supply	110...230 V AC, 12 V DC

MWS 02 - Mini Web Server

The Mini Web Server enables online measurements with the CCS 2 measuring system and therefore immediate remote diagnosis of hydraulic systems using the Ethernet or the Internet. In order to control the CCS 2, display and download data, a very comfortable website is provided.

TSS 1 - Tank Sampling System

The TSS 1 is a user- friendly, mobile oil sampling system. It can supply fluid to the CCS 2 system or it can extract bottle samples.

CALSUS 01 + CALSOFT 01

This set allows -in combination with the BSS 2- the secondary calibration of the CCS 2 laser sensor according to ISO 11171:99. All necessary solutions and certificates are included. Using the Software CALSOFT 01 this secondary calibration can be performed automatically.

WSH 01 - Set with WSSB

Sensor and display unit for quick, mobile, easy and reliable monitoring of the saturation of oil with water. The WSSB sampling bottle makes it possible to measure in combination with the CCS 2.

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