

internormen

technology

**INTER
NORMEN**

NORMEN
**FLUID
SERVICE
CONCEPT**





In addition to our standard program of hydraulic and lubrication filters in the range of **INTERNORMEN** *filter technology* there are the following **INTERNORMEN** divisions:

 *fluid management*

 *electronics*

 *system technology*

 *contamination
monitoring*

 *software solutions*

For our “Fluid-Service-Centers” which are established for certain territories **INTERNORMEN** offers a comprehensive Service Consulting - including the appropriate products - which requires the following basic proceeding:



INTERNORMEN's Fluid

Solutions contain:

➔ **Setting of targets for contamination classes in regards to particle and moisture contamination**

➔ **Fixing of critical values and alarm settings**



➔ **Preparation of complete interpretations of analyses:**

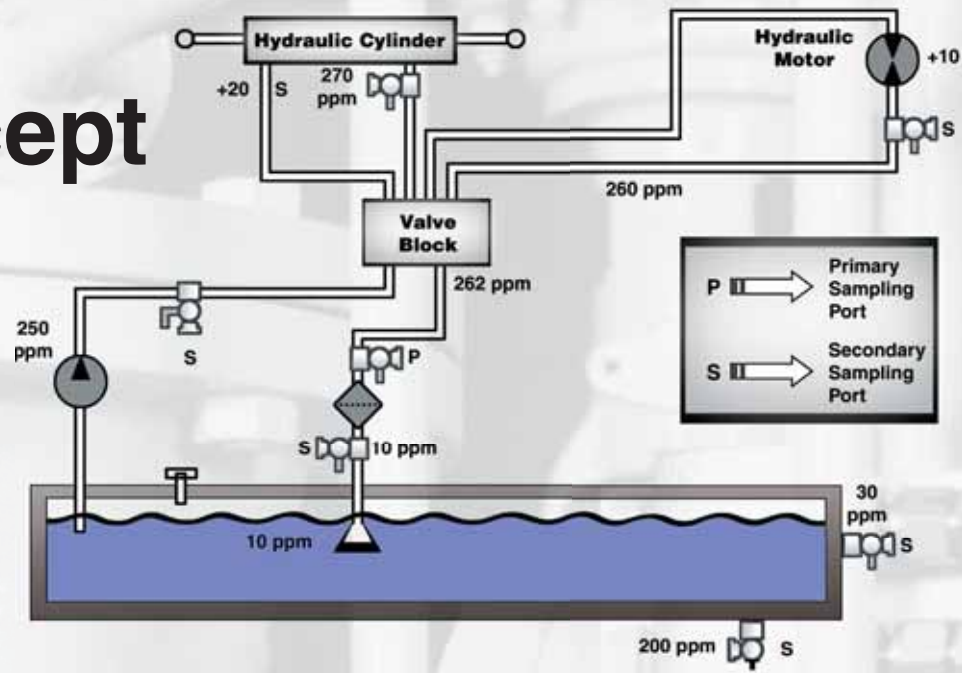
internormen filter technology	Guidelines for Determining, Achieving, and Maintaining Target Cleanliness Levels with High Performance Filtration (Beta Ratio ≥ 200)					
	Most Sensitive System Component		Medium Pressure 2000 to 2999 psi (or low pressure plus severe conditions) ¹		High Pressure 3000 psi and Over (or medium pressure plus severe conditions) ¹	
	ISO Target Levels	Filter Micron Ratings ⁽²⁾	ISO Target Levels	Filter Micron Ratings ⁽²⁾	ISO Target Levels	Filter Micron Ratings ⁽²⁾
PUMPS	22/18/14	25VG	20/16/13	10VG	20/16/13	10VG
Fixed External Gear	22/18/14	25VG	20/16/13	10VG	20/16/13	6VG
Vane	20/16/13	10VG	20/16/13	6VG	19/15/11	3VG
Fixed Piston	20/16/13	6VG	19/15/11	3VG	18/14/10	3VG
Variable Piston						
VALVES	22/18/14	25VG	20/16/13	10VG	20/16/13	10VG
Check Valve	22/18/14	25VG	20/16/13	10VG	20/16/13	10VG
Directional (solenoid)	22/18/14	25VG	20/16/13	10VG	20/16/13	3VG
Standard Flow Control	20/16/13	10VG	20/16/13	6VG	19/15/11	3VG
Cartridge Valve	19/15/11	3VG	18/14/10	3VG	17/13/9	3VG
Proportional Valve	18/14/10	3VG	17/13/9	3VG	16/12/8	3VG
Servo Valve						
ACTUATORS	23/19/15	25VG	22/18/14	16VG	20/16/13	6VG
Cylinders, Vane Motors, Gear Motors	20/16/13	10VG	18/14/10	3VG	19/15/11	6VG
Piston Motors, Swash Plate Motors	19/15/11	6VG	15/11/7	1VG	17/13/9	3VG
Hydrostatic Drives	15/11/7	1VG			15/11/7	3VG
TEST STANDS						
LUBRICATING OILS	20/16/13	10VG		not applicable	not applicable	not applicable
Paper Machine Oils	19/15/11	6VG		not applicable	not applicable	not applicable
Steam Turbine Oils	20/16/13	10VG		not applicable	not applicable	not applicable
Diesel Engine	20/16/13	10VG		not applicable	not applicable	not applicable
Mobile Gear Box	19/15/11	6VG		not applicable	not applicable	not applicable
Industrial Gear Box	19/15/11	6VG		not applicable	not applicable	not applicable
Journal Bearing	18/14/10	3VG		not applicable	not applicable	not applicable
Roller Bearing	17/13/9	3VG		not applicable	not applicable	not applicable
Ball Bearing						

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.

Element	Spectral Analysis of Metals in Oil	Potential Sources
Aluminum		abrasives, aluminum mill, bauxite, bearing metal, catalyst, journal bearings, fly ash, laundry dust, granite, paint
Antimony		antioxidants, solder
Arsenic		engine additive, grease
Barium		aircraft construction, bearings, mineral oil
Beryllium		EP-additives
Bismuth		journal bearings, coolant inhibitor
Boron		carment dust, platings
Cadmium		ligands, limestone, mining dust, oil additive, road dust, rubber
Calcium		salt water, slag
Carbon		abrasives, carbides, carbon steel, graphite, hard metal, mineral oil, reactor technique
Chromium		ore dust, paint, rust, talc, zeolite
Cobalt		additives, hard metal, tooling steels
Hafnium		reactor technique
Iron		abrasives, cast iron, catalyst, cleaning detergent, fly ash, mill scale
Lead		additives, hard metal, tooling steels
Lithium		ore dust, paint, rust, talc, zeolite
Magnesium		babbit, bearing overlay, gasoline additive, solder, paint
Mercury		slit of aluminum, engine additives, fuller's earth, hard water
Molybdenum		road dust, salt water, turbine
Nickel		bactericide, batteries
Niobium		sliding metal, EP-additives, MoS ₂ , rings
Phosphorus		hard steel, plating, stainless steel, stable
Platinum		turbine blades
Potassium		AW / EP-additives, cleaning detergents, oil additives, surface finish
Scandium		catalyst, mineral oil
Silicon		additives, coolant inhibitor, fly ash, granite, paper mill dust, veritizer
Silver		ICP-reference
Sodium		anti-foam additives, asbestos, cement dust, coolant additives, fly ash, laundry dust, glass, granite, limestone, mica, road dust, slag
Sulphur		steel, synthetic lubricant, talc, wet clutch
Tantalum		bearing overlay, needle bearings, solder
Tellurium		additives, base stocks, coolant inhibitor, dirt, fly ash, grease
Titanium		paper mill dust, stocks, coolant inhibitor, dirt, fly ash, grease
Tungsten		gypsum, mineral oil, MoS ₂ , salt, salt water
Uranium		hard metal, toolings steel
Vanadium		mineral oil
Zirconium		hard metal, paints, turbine bearings, turbine blades
Zinc		ore dust, road dust (some)
Zircon		mineral oil, turbine blades, valves
		ICP-reference
		AW additives, brass, galvanizing, grease, oil additives, plating, solder
		abrasives, hard steel, reactor technique

Service Concept

➔ **Selection of possible measuring points in the system**



➔ **Installation of possible measuring valves and access points**

Do	Don't
- Sample from live fluid zones	- Sample from dead pipe legs or hose ends
- Sample from turbulent zones such as elbows	- Sample from laminar zones
- Sample downstream of bearing, gears, pumps, cylinders, and actuators	- Sample after filters or from sumps
- Sample machine during typical work conditions	- Sample when machine is cold or not operating

Good **Not Good If:**

- Laminar flow - large particles in boundaries
- High flow velocity - particle fly-by

Don't

➔ **Supply of corrective customer specific solutions**

The image displays several screenshots of the INTER NORMEN software interface. One window shows a table with columns for 'Parameter' and 'Test'. Another window shows a graph with a linear trendline. A third window shows a list of parameters and their values. A CD-ROM is shown with the INTER NORMEN logo and text: 'system filter • Filterexpertsystem', 'uct-catalogue • Produktkatalog', 'Version 3.2 - 02 / 2004'. The CD-ROM also features the 'internormen technology' logo and a world map. Installation instructions are provided: 'Installation: CD-Rom startet automatisch. Falls nicht, CD-Rom mit "inf1.exe" starten. CD-Rom starts automatically. If not, start CD-Rom with "inf1.exe".'

INTERNORMEN offers service devices for sale, leasing or rent

INTERNORMEN service devices - application and benefits:

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CCS 2 + BSS 2 / Particle Counter and Bottle Sampling System

- Online determination of contamination classes according to ISO 4406:1999, NAS 1638 and ISO 4406:1987
- Verifies the filter performance
- Permits "on-condition" laboratory oil analysis
- Confirms improved maintenance
- Verifies pump condition
- Determines the cleanliness of stored hydraulic and lubrication fluids
- Identifies changing atmospheric conditions
- Troubleshoots and isolates problems and problematic components
- Identifies the necessity of spectral analysis
- Determines the benefit of offline filter units
- Determines the optimal time/frequency for the change of elements
- Identifies filter failures
- Verifies centrifuge performance
- Detects high-corrosive wear
- Monitors new system start-up time
- Verifies bearing condition
- Confirms target contamination classes are achieved
- Verifies breather condition
- Verifies the effectiveness of the filters selected
- Identifies abnormal gear wear
- Determines new oil cleanliness



BSS 2 - Bottle Sampling System

- Serves as bottle sampling device for the CCS 2
- Deaerates the processed oil sample before feeding it into the CCS 2
- Serves as calibration device for the CCS 2, using **INTERNORMEN's** software CALSOFT 01 and **INTERNORMEN's** certified test fluid CALSUS 01



TSS 1 - Tank Sampling System

- Serves as a device for feeding oil samples from reservoirs to the CCS 2
- Also serves for bottle sampling device from reservoirs





INTERNORMEN's Fluid



WAS01 - Water-in-Oil Analyse Set

- Determines the water content in oils
- Determines condensation in the reservoir
- Identifies damages/leaks of watercooled heat exchangers
- Determines the saturation of water absorbing breather filters
- Demonstrates the effectiveness of water extracting devices
- Identifies the effectiveness of cylinder wiper seals



PAS01 - Sampling and Oil Analyse Set

- Serves for receiving inspection of hydraulic and lubrication fluids
- Includes mini-measuring connections for simple sampling
- Determines the condition of operating fluids on site
- Identifies the type of contamination
- Visual appraisal of fluids and their contamination
- Serves for static or dynamic bottle sampling
- Serves for particle analyse by means of membrane sample
- Serves for optical particle counting by means of membrane sample under a microscope
- Serves for gravimetric analysis of solid contamination



UM/US - Mobile and Stationary Off-line Filter Units

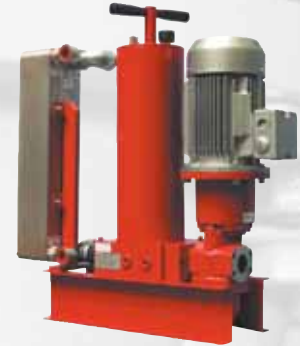
- Serve for improvement of the contamination classes in fluid systems
- Extend the service life of system components
- Reduce the down times of machines
- Usable for filling of reservoirs and sumps with new fluid
- Flushing of fluid systems after machine repairs and maintenance
- Extend the service life of „In-Line“-Filters
- Improve the general cleanliness classes of fluid systems
- Extend the service life of the oil, respectively change intervals
- Reduce the fine contamination / polishes the fluid
- Reduce the oil ageing and extend the oil service life
- Serve as flushing unit for new systems and machine break-ins

Service Concept

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USP/UST - Off-Line Filter with additional Heat Exchanger

- Serves for filtration and cooling of fluids
- Improves the oil service life
- Increases the lubricating properties of operation fluids



Watersorp - Water Absorbing Filter Elements

- Serve for absorption of free and emulsified water from oils
- Additionally reduce solid contamination
- Reduce the oil ageing and deadditivation of fluids



IFPM/IFPS - Fluid Purifier Systems

- Remove free, solved and emulsified water from operation fluids
- Remove free and dissolved gases
- Remove particle contamination down to 1 μm
- Extend the oil service times and prevent oil ageing
- Improve the reliability and productivity of plants
- Reduce the down times of machine equipment / systems
- Extend the service life of system components



WSH 01 - Water Analysis Sensor

- Measures percent water saturation level of fluids
- Determines proactive a water problem, before water turns into an emulsified or even free state
- Serves to avoid deadditivation, corrosion, loss of dielectric strength in transformer oils and a reduction of lubrication film thickness



BFD - Desiccant Breather Filter

- Reduces the coefficient of high ambient humidity
- Removes particle and moisture contamination from the ambient air before tank inlet
- Extends oil service life
- Reduces machine down times
- Reduces repairs and replacement of system components





INTERNORMEN's „In-house Laboratory Services“

has state of the art equipment and with special expert knowledge to immediately analyse the problems and present solutions in teaming up with the experts from the Fluid Management.

INTERNORMEN's equipment in the oil analyse laboratory (abstract):

Atomic Emission Spectroscopy

The ICP-OES (Inductive coupled plasma-optical emission spectrum) serves for the analyse of chemical elements. In the range of hydraulics and lubrication oil area the OES analysis is mainly applied for the determination of wear, respectively contamination particles. The ICP technology enables a determination of up to 72 chemical elements relating to quality and quantity.

Infrared Spectroscopy

The FTIR-method (Fourier-Transformation-Infrared spectroscopy) is the most advanced method of infrared spectroscopy and provides the concurrent analysis over a wide range of the electromagnetic spectrum (7500-370 cm^{-1}). The infrared spectroscopy serves for the determination of chemical compounds (molecules) and indicates the chemical changes, polymerisation and impurities in comparison with known samples.

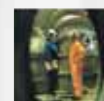
Wet chemical method of analysis

1. Testing of mineral and hydrocarbons; determination of water content according to Karl Fischer, ASTM.D 1744-64

The determination of the water content is based on the oxidation of sulphur dioxide through iodine in the presence of water as described by Bunsen. The water content is determined by end point titration.

2. Determination of total base or strong acid number (TAN/TBN)

The acid number indicates the amount of acid or base in mg that has to be added until the colour changes. The TAN (Total Acid Number), respectively the TBN (Total Base Number) indicates the ageing state of the oils. A practical assessment is only possible by a comparison with new oil.





Oil Sample Analysis



Contamination analysis according to NAS 1638 and ISO 4406:1999



Microscopic particle counting according to ISO 4407



Gravimetric analysis according to ISO 4405

Microscopic contamination analysis



Center viscosity (105F)

Viscosity - temperature diagram

pH-value measurement

(only aqueous fluids)

Examination of Filter Elements



Bubble Point Test according to ISO 2942

Collapse pressure resistance according to ISO 2941

Multi Pass test according to ISO 16889 (new element)



p/Q-characteristic according to ISO 3968 (new element)

Compatibility with hydraulic fluids according to ISO 2943

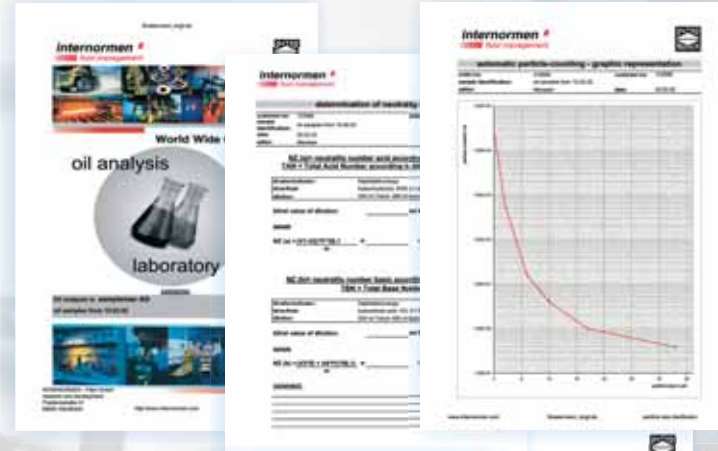
Analysis of the element structure



Pore size + spectrum of the filter material

Type of contamination, microscopic analysis

Determination of contamination, manometric



How you benefit from the "Fluid-Service-Center" :



INTERNORMEN Fluid Management has invested in highly talented and well-trained people, highest product technology, research and development equipment as well as a „top-of-the-line“ laboratory for oil analysis in order to get the best for our customers. We are proud of being able to lead our customers and partners to the next level in the range of Fluid Management. You may rely on our team of specialists to:



- Optimise your oil analysis program
- Obtain analyses and solutions for reaching your targets from one supplier
- Get the newest products in the range of oil analysis and filter technology and to get trained how to benefit from them
- Reduce unscheduled downtime of your systems, machinery and equipment
- Increase the reliability of your systems and thus improve your product quality
- Minimize the chance of a catastrophic failure
- Reduce the number of fluid changes, lubricant consumption cost and save substantial cost for their disposal
- Reduce environmental impact by minimizing lubricant consumption (integral part of ISO 14001)
- On base of our training material which is always updated and kept at the best state of the art, you and your personnel are regularly trained to get a know-how which enables you to achieve an active cost-saving maintenance. These training sessions can take place either in our Training Center in Altlußheim or world-wide at any requested site and in different languages.





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