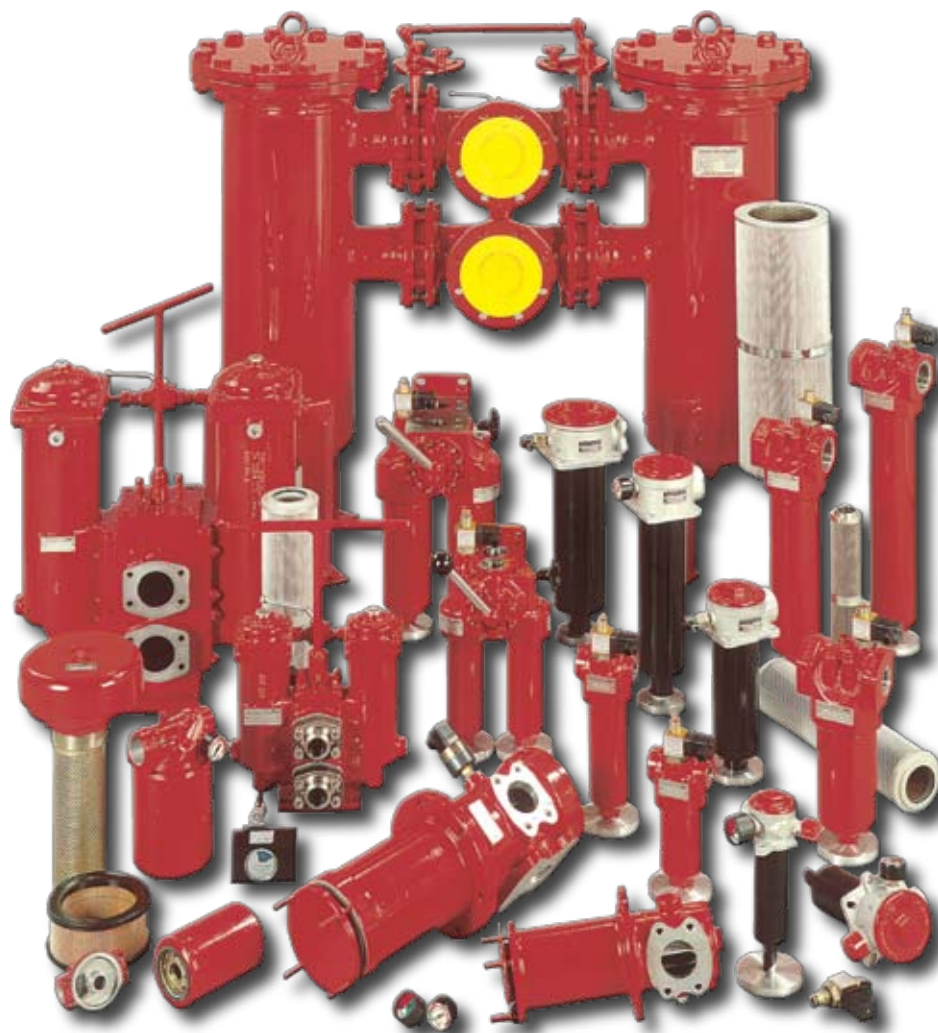


Hydraulic and Lubrication Filters



internormen 
filter technology



The name **INTERNORMEN** stands for competence and more than four decades of experience, in developing products and solutions in the fields of filter technology, measurement, diagnostic and analysis technology and modern filtration software.

Following a path of continuous development, we have maintained quality, a common hallmark of all our products and services, as a fundamental element of the **INTERNORMEN** corporate strategy. In the field of hydraulic and lubrication filters, **INTERNORMEN** currently offers a product selection with more than 4000 different filter elements, including corresponding filter housings.

Our wide range knowledge, our ability to expeditiously implement new technologies, the consistent orientation towards our customers' needs – have all resulted in seven product families:

filter technology

system technology

fluid management

contamination monitoring

electronics

software solutions

process technology

WHY FILTRATION ?

What is Hydraulic System Cleanliness?

Cleanliness is a term used to describe the level of solid and liquid contamination found in hydraulic systems. *Contamination* may be defined as any substance that is not part of the hydraulic system's working fluid.



Why is cleanliness important to you?



Efficient production for clean systems provide maximum productivity.

Improved control of spare parts through preventive maintenance and monitoring contamination.

Reduced equipment downtime through scheduled inspections.

Safety hazards minimized through preventing contamination related failure.

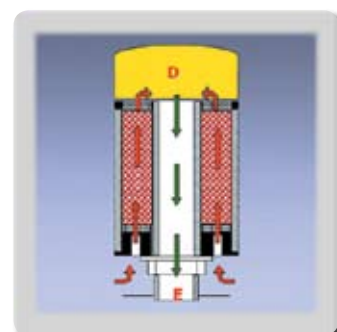
Increased life expectancy of system components, essentially increased economies of operation and therefore decreased maintenance charges.

Reduced repair costs due to fewer breakdowns.

How does contamination get in there?

There are three principal means through which contamination can occur in a typical hydraulic system. It can be:

1. Built in during system assembly
2. Generated during system operation
3. Ingested by the system during operation



FILTER MEDIA

Mainly used filter material:

- deep filtration
- high particle-holding capacity
- best micron rating at high delta p
- usable for mineral oils, emulsions and for most synthetic hydraulic fluids and lubrication oils
- filter fineness based on filtration quotient $\beta_{x(c)} \geq 200$:
 $4\mu_{(c)}$, $5\mu_{(c)}$, $7\mu_{(c)}$, $10\mu_{(c)}$,
 $15\mu_{(c)}$, $20\mu_{(c)}$



INTERPOR FLEECE "VG" GLASS FIBRE



PAPER MATTING "P"

- deep filtration
- paper matting consisting of paper and polyester fibre
- high material stability and strength
- available in 10 μ m and 25 μ m

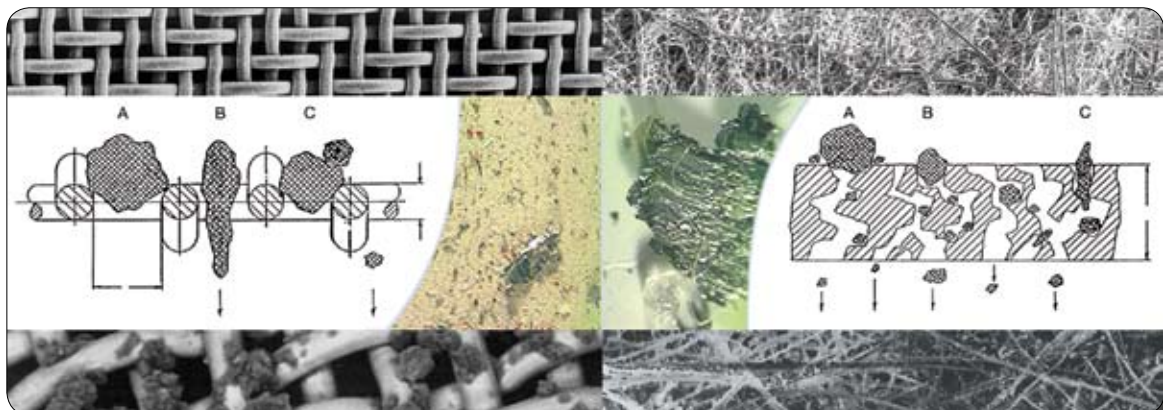
- surface filtration
- a stainless steel wire mesh provides high resistance filter elements (irrespective of the hydraulic fluid being used)
- partially cleanable
- available in 25 μ m, 40 μ m and 80 μ m (other micron ratings on request)



STAINLESS STEEL MESH "G"

SURFACE FILTRATION (MESH)

BULK FILTRATION (FLEECE)



TANK MOUNTED RETURN-LINE FILTERS

SERIES TEF - DTEF - TEFB - RF - TRW

Application: Mounting is on the top of the reservoir with the outlet port returning to the reservoir.

Port size: up to G 1 ½, up to SAE 5", up to DN 200.

Working pressure: 10 bar

Flow rates: up to 7200 l/min, TEFB, TRW up to 300 l/min

Filtration materials: Paper, interpor fleece or stainless steel wire mesh

User benefits: Lightweight, easy to change, reduced possibility of oil spillage during element change (environmental concern)

TEF - filters have a removable bowl which prevents contamination from entering the reservoir during filter element change, multiple inlet ports are possible

TEFB - no additional breather port in the tank needed

TRW - horizontal tank mounted return-line filters



RETURN-LINE FILTERS WITH SUCTION CONNECTION

SERIES TRS - TNRS

Application: Tank mounted return-line filters with suction connection for mobile hydraulic applications with minimum two independent hydraulic circuits

Port size: up to G 1 ¼, up to SAE 2"

Working pressure: 10 bar

Flow rates: up to 450 l/min

Filtration materials: Paper, interpor fleece or stainless steel wire mesh

User benefits: Tank-top mounted in-line filters supply clean suction flow and prevent cavitation, custom designs possible



STAINLESS STEEL PRESSURE FILTERS

SERIES EH

Application: For mounting in pressure lines.

Port size: up to SAE 2", up to G 1 ½

Working pressure: up to 420 bar

SERIES BEHD

Application: Stainless Steel Filter-Battery, high filter efficiency at high volume flows

Port size: up to Avit 3"

Working pressure: up to 315 bar

SERIES EHD – EDU – EDA – EDSF

Application: Can be mounted in suction, pressure or return lines. The flow path through the filter can be changed to either of the two chambers.

Port size: up to SAE 4", up to G 1, DN 250

Working pressure: up to 315 bar

User benefits: Change-over ball valve which, integrated in the middle of the housing, makes it possible to switch from the dirty to the clean filter side without interrupting the operation. The dirty element can be serviced/changed while in the "off" position also without interrupting the operation

EDA-Filters according to ASME



SERIES ELF

Application: For mounting in suction, pressure and return lines

Port size: up to DN 250

Working pressure: 16 bar

PRESSURE FILTERS, CHANGE OVER

SERIES MDD - HDD

Application: Can be mounted in suction, pressure or return lines.

Port size: up to G 1, up to SAE 2" Avit 2"

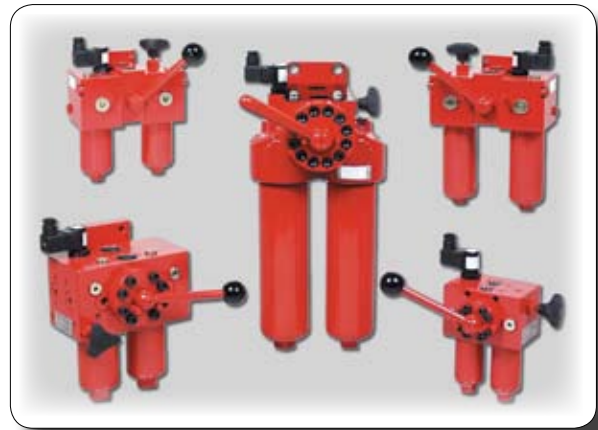
Working pressure: up to 315 bar

Flow rates: MDD up to 95 l/min, HDD up to 1350 l/min

Filtration materials: Paper, interpor fleece or stainless steel wire mesh.

User benefits: Duplex filters can be maintained without interruption of the operation.

The upper part has a three-way-change-over valve which allows to change-over the flow from the dirty filter side to the clean filter side without interruption.



SERIES DU - DUV

Application: The flow path through the filter can be changed to either of the two chambers.

For mounting in suction, pressure or return lines.

Port size: up to G 3/4, up to SAE 5"

Working pressure: 32 bar

Flow rates: DU up to 4000 l/min, DUV up to 2000 l/min

Filtration materials: Paper, interpor fleece or stainless steel wire mesh

User benefits: Rotary slide- or ball valve, which is integrated in the middle of the housing, makes it possible to switch from the dirty filter side to the clean filter side without interrupting the operation. The dirty element can be serviced or changed while in the "off" position.



SERIES DSF - DNR

Application: The flow path through the filter can be changed to either of the two chambers.

For mounting in suction, pressure or return lines.

Port size: in DIN or ANSI flanges up to 10"

Working pressure: 25 bar, 16 bar

Flow rates: DSF up to 10 000 l/min,

DNR up to 8000 l/min

Filtration materials: Paper, interpor fleece or stainless steel wire mesh

User benefits: A three-way change-over valve which is integrated in the middle of the housing makes it possible to switch from the dirty filter side to the clean filter side without interrupting the operation



SERIES DA - DNA

Filters according to ASME

Application: The flow path through the filter can be changed to either of the two chambers.

For mounting in suction, pressure or return lines.

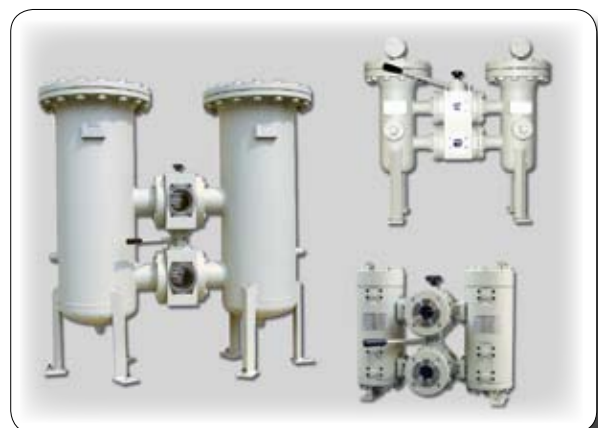
Port size: up to flange DN 250, up to SAE 2", up to ANSI 4"

Working pressure: 16 bar, 40 bar

Flow rates: DA up to 1000 l/min, DNA up to 2050 l/min

Filtration materials: Paper, interpor fleece or stainless steel wire mesh

User benefits: Change-over ball valve which, integrated in the middle of the housing, makes it possible to switch from the dirty filter side to the clean filter side without interrupting the operation



Learn more about our different filter series at:
<http://www.internormen.com/cms/en/products/filtertechnology>

PRESSURE FILTERS

SERIES LF - RF

Application: For mounting in suction, pressure and return lines.

Port size: from G ¾ up to DIN/ANSI flange 10"

Working pressure: 10 bar, 16 bar, 25 bar, 32 bar

Flow rates: up to 10 000 l/min

Filtration materials: Paper, interpor fleece or stainless steel wire mesh

User benefits: The filter is mounted in such a way that the inlet and the outlet are on the same level. It can be used as a suction filter, pressure filter and return-line filter. RF-filter series have inlets on the side and outlets to the bottom.



PRESSURE FILTERS, PN > 100 bar

SERIES ML - MNL

Application: Mounting in pressure lines with threaded design.

Port size: up to G 1

Working pressure: up to 160 bar

Flow rates: up to 450 l/min

Filtration materials: Interpor fleece or stainless steel wire mesh.

User benefits: Economical, lightweighted filter range for low to medium pressure applications. Requires only minimal clearance during element change and therefore saves valuable space.



SERIES HP 31 - 450

Application: Mounting in pressure lines with threaded design.

Port size: up to G 1 ½, up to SAE 2"

Working pressure: up to 420 bar

Flow rates: up to 1350 l/min

Filtration materials: Paper, interpor fleece or stainless steel wire mesh.

User benefits: In-line or flange mounting possible with various different port and Δp indicator options. Very high flow rates with a single housing possible.



SERIES HP 170 - 1351

Application: Mounting in pressure lines with flange mounting.

Port size: up to SAE 1 1/2"

Working pressure: up to 420 bar

Flow rates: up to 1350 l/min

Filtration materials: Paper, interpor fleece or stainless steel wire mesh.

User benefits: In-line or flange mounting possible with various different port and Δp indicator options. Very high flow rates with a single housing possible.



SERIES HPW

Application: Pressure filters for reversible filtration, mounting in pressure lines with flange or threaded mounting.

Port size: up to G 1 1/2, up to flange DN 50, up to G 2

Working pressure: up to 315 bar

Flow rates: up to 400 l/min

Filtration materials: Paper, interpor fleece or stainless steel wire mesh.

User benefits: HPW filters are to be applied where the medium that should be filtered flows through the filter in two directions, and the filter effect for both directions of the flow exists.



SERIES HPV - MDV

Application: In-line pressure filters with differential pressure (cold start) valve.

Port size: HPV - up to G 1 1/2, MDV - up to G 3/4

Working pressure: HPV - 420 bar, MDV - 200 bar

Flow rates: HPV up to 450 l/min, MDV up to 150 l/min

Filtration materials: Paper, interpor fleece or stainless steel wire mesh.

User benefits: Permanent supply of clean oil is guaranteed. If the element is clogged, change is forced, which means that no damage is possible to the downstream components.

Forced (third port) return to the reservoir.



PRESSURE FILTERS, MANIFOLD MOUNTED, PN > 100 bar

SERIES MNU - HNU - HPU - HPP

Application: Mounting in pressure lines with flange or manifold mounting.

Port size: DN 32

Working pressure: 160 bar, 315 bar

Flow rates: HPP - up to 1350 l/min

Filtration materials: Paper, interpor fleece or stainless steel wire mesh.

User benefits: Simplified mounting, which saves valuable space. Provides filtration directly at the point needed. Prevents dirty fluid from passing downstream during the element change.



SERIES HPF - HPX - HPY

Application: Mounting in pressure lines with manifold mounting.

Port size: up to DN 36

Working pressure: up to 315 bar

Flow rates: HPF - up to 1350 l/min

Filtration materials: Paper, interpor fleece or stainless steel wire mesh.

User benefits: Simplified mounting, which saves valuable space. Provides filtration directly at the point needed. Prevents dirty fluid from passing downstream during the element change.



TANK MOUNTED SUCTION FILTERS

SERIES AS - TS - TSW - ASF

Application: Mount into the side of the reservoir below oil levels, directly mounted to the reservoir vertically (TS-series) or horizontally (TSW-series).

Suction side is in the reservoir with a check valve to stop oil draining from the reservoir when being serviced.

Port size: up to SAE 3 1/2", up to G 1 1/2

Flow rates: up to 700 l/min

Filtration materials: Paper, interpor fleece or stainless steel wire mesh.

User benefits: Suction filters which can be serviced from the outside of the reservoir with no additional check valve needed.



OFF-LINE FILTERS

SERIES NF

Application: The partial flow filter NF is foreseen for fine filtration of hydraulic and lubrication circuits additionally to the main filter.

Port size: up to SAE 2 1/2"

Working pressure: 16 bar

Flow rates: up to 1000 l/min

Filtration materials: Paper, interpor fleece or stainless steel wire mesh. NF-filters can be provided with filter elements for water absorption.

User benefits: The large filtration area in comparison to the nominal size is the premise for a high dirt-retaining capacity even in a case of small filter fineness. Element change without tools is possible. After release of the straining screw and removal of the cover, the elements are accessible and can be changed.



Please request separate data sheets for our **FILTER SERIES**

TANK BREATHERS

SERIES NBF - EBF - BFD - BF

Application: Air breathers assure no contamination reaches the tank through air exchange and condensation of water in reservoirs.

Port size: up to G 3

Flow rates: up to 3500 l/min

Filtration materials: NBF - Interpor fleece, paper

EBF - Paper

TBF - Paper

BF - WP - Interpor fleece, paper

BFD - Silica gel, interpor fleece

User benefits: Protect systems from airborne debris and / or moisture.



SPIN ON FILTERS

SERIES WPL

Application: In-line filter series, mounted into pressure and return lines for all hydraulic systems.

Port size: up to G 1 ½

Flow rates: up to 260 l/min

Filtration materials: Paper or interpor fleece

User benefits: Easy maintenance. Die-cast aluminum construction saves overall weight. Can be used as suction or return filters.



CLOGGING INDICATORS

SERIES AE - OE - O - E - VS

Application: Wide range of clogging indicators for hydraulic and lubricating systems.

User benefits: Easy integration into automatic control systems, continuous contamination control, continuous pressure difference measuring, early identification of increased contamination, optimal utilization of filter elements.

Types: optical, electrical, optical-electrical, electronical, available in the following variations - block execution, explosion-proof, thread execution, with reset function, with control function.

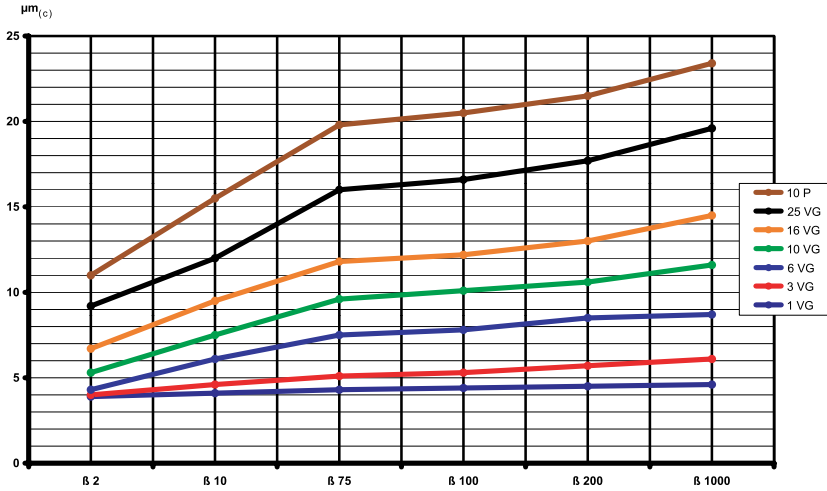


or download them from our website www.internormen.com

FILTER EFFICIENCY DATA

MULTI-PASS PERFORMANCE ACCORDING TO ISO 16889

FILTRATION QUOTIENT $\beta_{x(c)}$ INTERPOR GLASS FIBRE



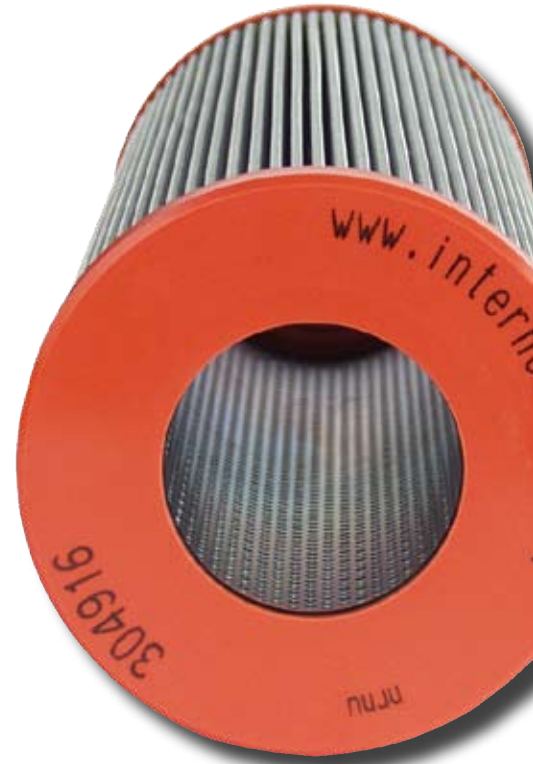
Calculation of the filtration quotient $\beta_{x(c)}$

$$\beta_{x(c)} = \frac{\text{amount of particles of the size } \geq x \mu\text{m}_{(c)} \text{ before the filter}}{\text{amount of particles of the size } \geq x \mu\text{m}_{(c)} \text{ after the filter}}$$

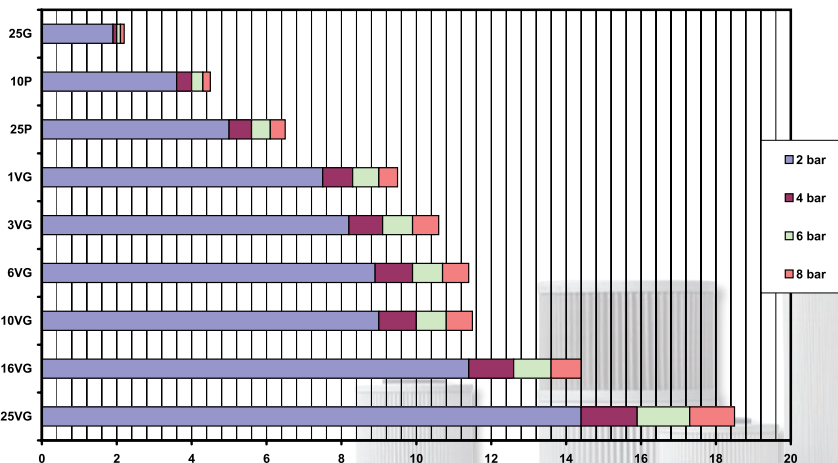
Conversion of filtration quotient $\beta_{x(c)}$ into filtration efficiency in %

$$\frac{\text{filtration quotient} - 1}{\text{filtration quotient}} \times 100 = \%$$

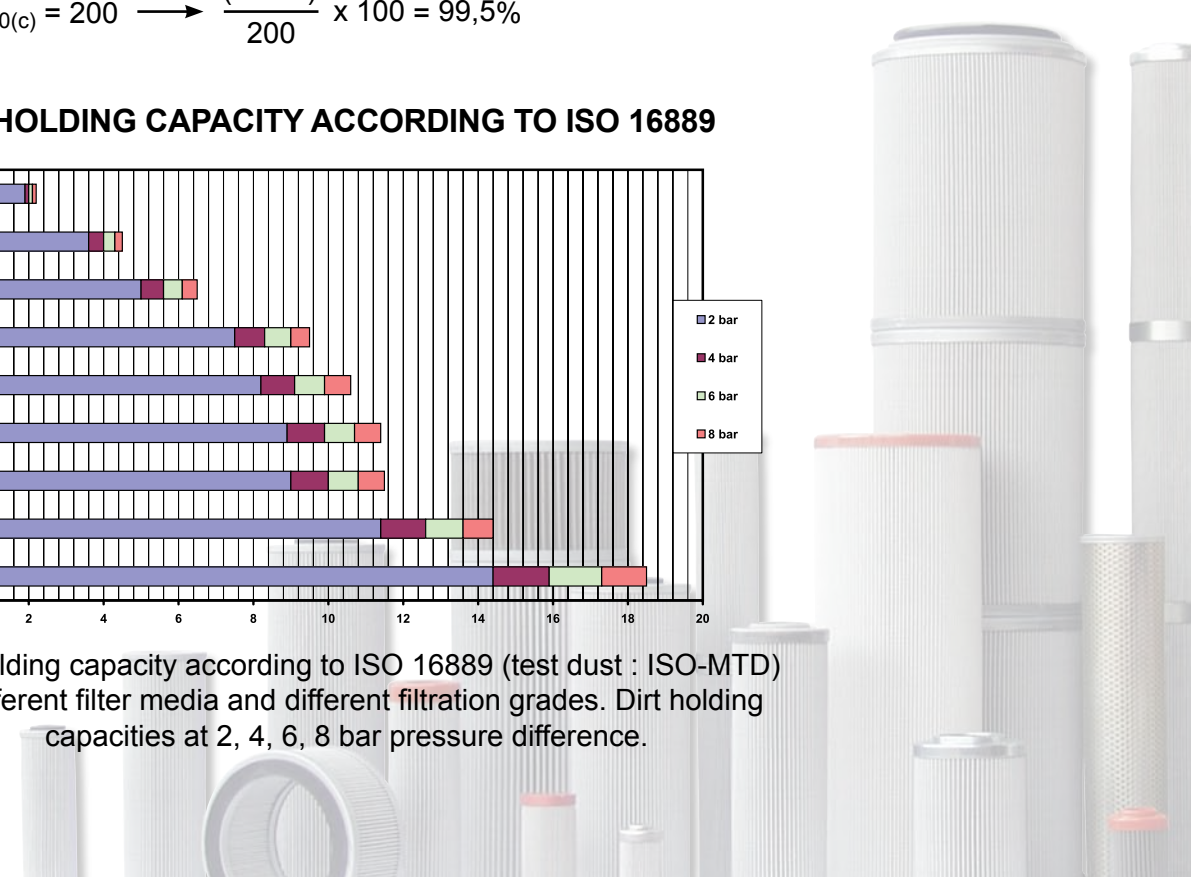
e.g. $\beta_{10(c)} = 200 \rightarrow \frac{(200-1)}{200} \times 100 = 99,5\%$



DIRT HOLDING CAPACITY ACCORDING TO ISO 16889



Dirt holding capacity according to ISO 16889 (test dust : ISO-MTD) of different filter media and different filtration grades. Dirt holding capacities at 2, 4, 6, 8 bar pressure difference.



NECESSARY CLEANLINESS CLASSES IN DEPENDANCY OF A SYSTEMS SENSITIVITY

The cleanliness of the oil in a hydraulic system is dependent on the micron rating of the element, the specific dirt entry as well as the size distribution of the particles in the fluid. The data in the table are standard values. To ascertain the quality of an oil, it has to be analysed.

Kind of system Case of application	Req. class acc. to ISO 4406:99	Req. class acc. to NAS 1638	Recommended <i>INTERNORMEN</i> filter material
Against fine soiling and mud- ding up of sensitive systems	16/12/8	2-3	1 VG
	17/13/9	3-4	3 VG
Heavy-duty servo systems, high pressure systems with long service life	19/15/11	4-6	6 VG
Proportional valves, industrial hydraulics with high operating safety	20/16/13	7-8	10 VG
Mobile hydraulics, common mechanical engineering, medium pressure systems	22/18/14	7-9	16 VG
Heavy industries, low pressure systems, mobile hydraulics	23/19/15	9-11	25 VG

In addition to tests developed by *INTERNORMEN Technology*, testing of our filter elements is done according to the following ISO-Standards:

- ISO 2941** Verification of collapse/burst resistance
- ISO 2942** Verification of fabrication integrity
- ISO 2943** Verification of material compatibility with fluids
- ISO 3723** Method for end load testing
- ISO 3724** Verification of flow fatigue characteristics
- ISO 3968** Evaluation of pressure drop versus flow characteristics
- ISO 16889** Multi-Pass method for evaluating filtration performance



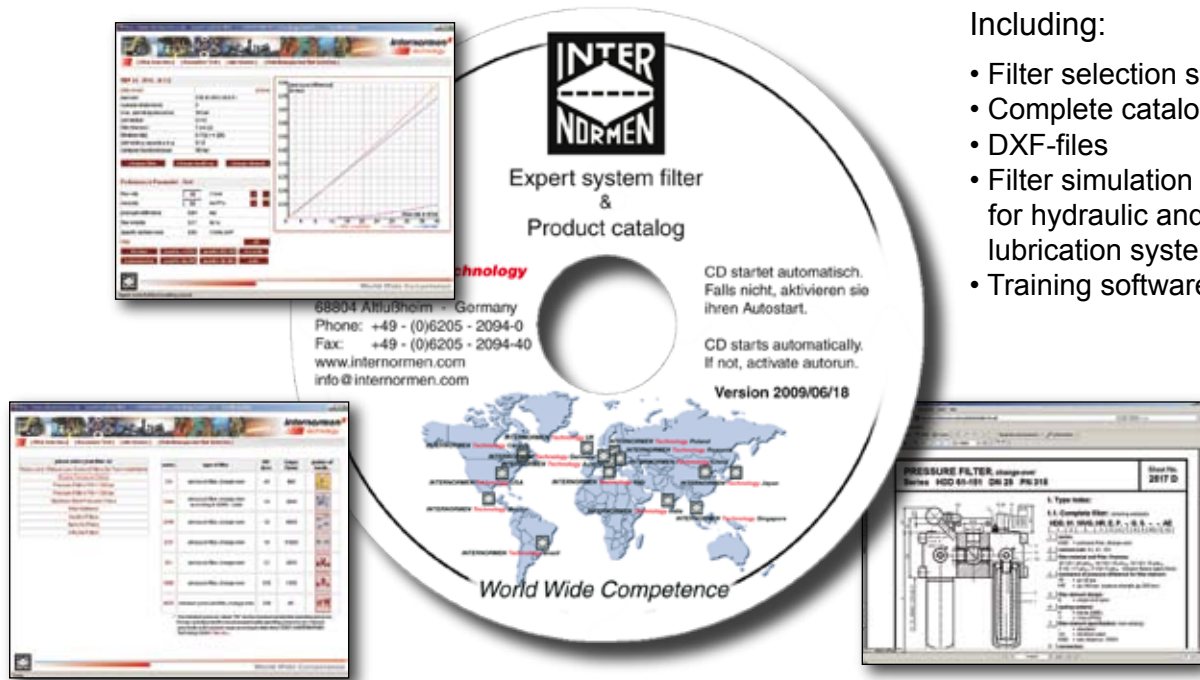
Solution of customer specific filter problems, service in lab and at site are based on the work of our research and development and design teams, supported by computer analysis and measurement methods, and the availability of all necessary test stands according to ISO standards, and continuous production control of filter elements.

The beta ratio of the filter element and its permanent efficiency are guaranteed for high pressure differences. Filter materials, bonding and processing are regularly controlled by means of bubble-point tests, on our test stand, according to ISO 2942.

INTERNORMEN Technology elements can be supplied with 100 % bubble-point tests and corresponding certificates on request.

Become a filtration expert!

Design and explore the filter you need using our CD-ROM



Including:

- Filter selection software
- Complete catalogue
- DXF-files
- Filter simulation software for hydraulic and lubrication systems
- Training software

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