

internormen 
filter technology



World Wide Competence



filter technology
fluid management *electronics*
system technology *contamination monitoring*
software solutions



PARTICLE COUNTING SYSTEM

MULTI-PASS TEST STAND

Contaminants larger than 1 micron circulate millions of times in the pressure liquid of hydraulic- and lubricating oil systems.

In more than 70 % of all cases, they cause untimely disturbances in the system. Permanent filtration of the pressure liquid is therefore absolutely necessary.

Optimum filtration guarantees the operating and functioning safety of hydraulic systems.

The quality of **INTERNORMEN Technology** products is guaranteed by long-term experience and modern laboratory and production facilities.

Hydraulic- and Lubricating Oil Systems

Why filtration?

- Growing performance density of systems
- Avoidance of down times caused by failure of system components due to an excessive loading of contaminated suspended solids
- Increased service life of the hydraulic- and the lubricating oil systems and of the fluid
- Attainment of the necessary cleanliness grade
- Essential increase of economic efficiency and therefor decrease of maintenance charges

Filter Efficiency Data

Multi-Pass Performance according to ISO 16889

Interpor-Glass fibre

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

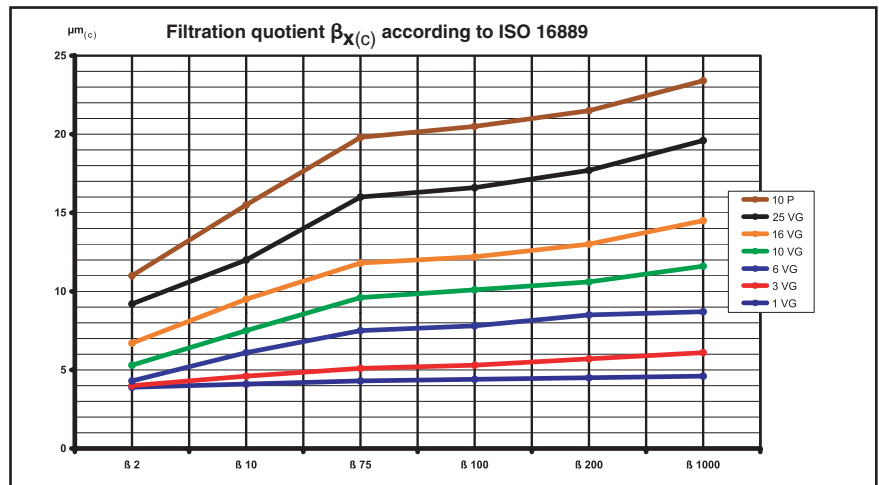
$$\beta_{x(c)} = \frac{\text{amount of particles of size } \geq x \mu\text{m}(c) \text{ before filter}}{\text{amount of particles of size } \geq x \mu\text{m}(c) \text{ after filter}}$$

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

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

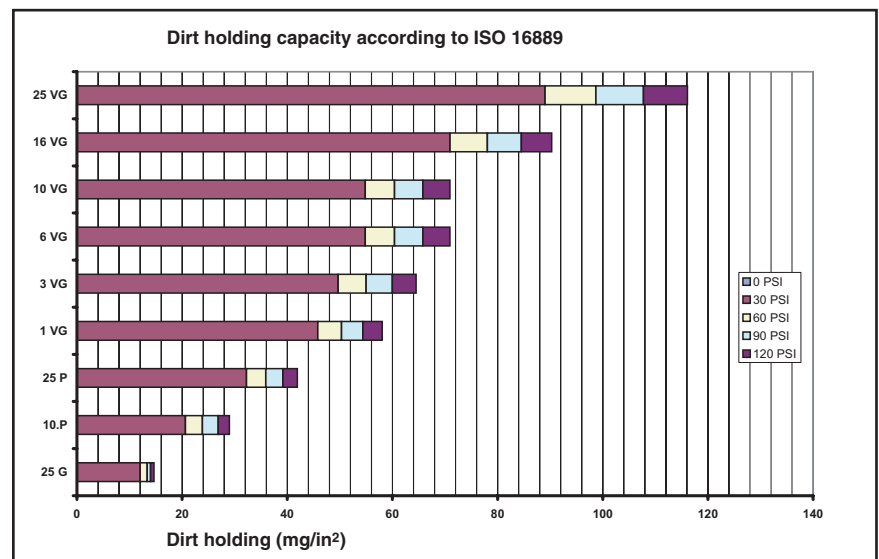
e.g.: $\beta_{10(c)} = 200 \rightarrow$

$$\frac{(200-1)}{200} \times 100 = 99,5\%$$



Dirt holding capacity according to ISO 16889

of different filter media and different filtration grades. Dirt holding capacities at 30, 60, 90, 120 PSI pressure difference. (Test dust : ISO-MTD)



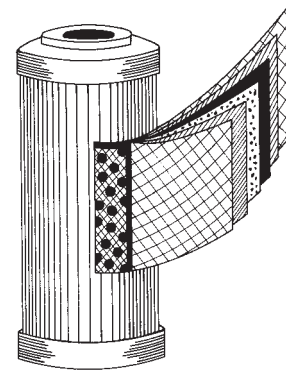
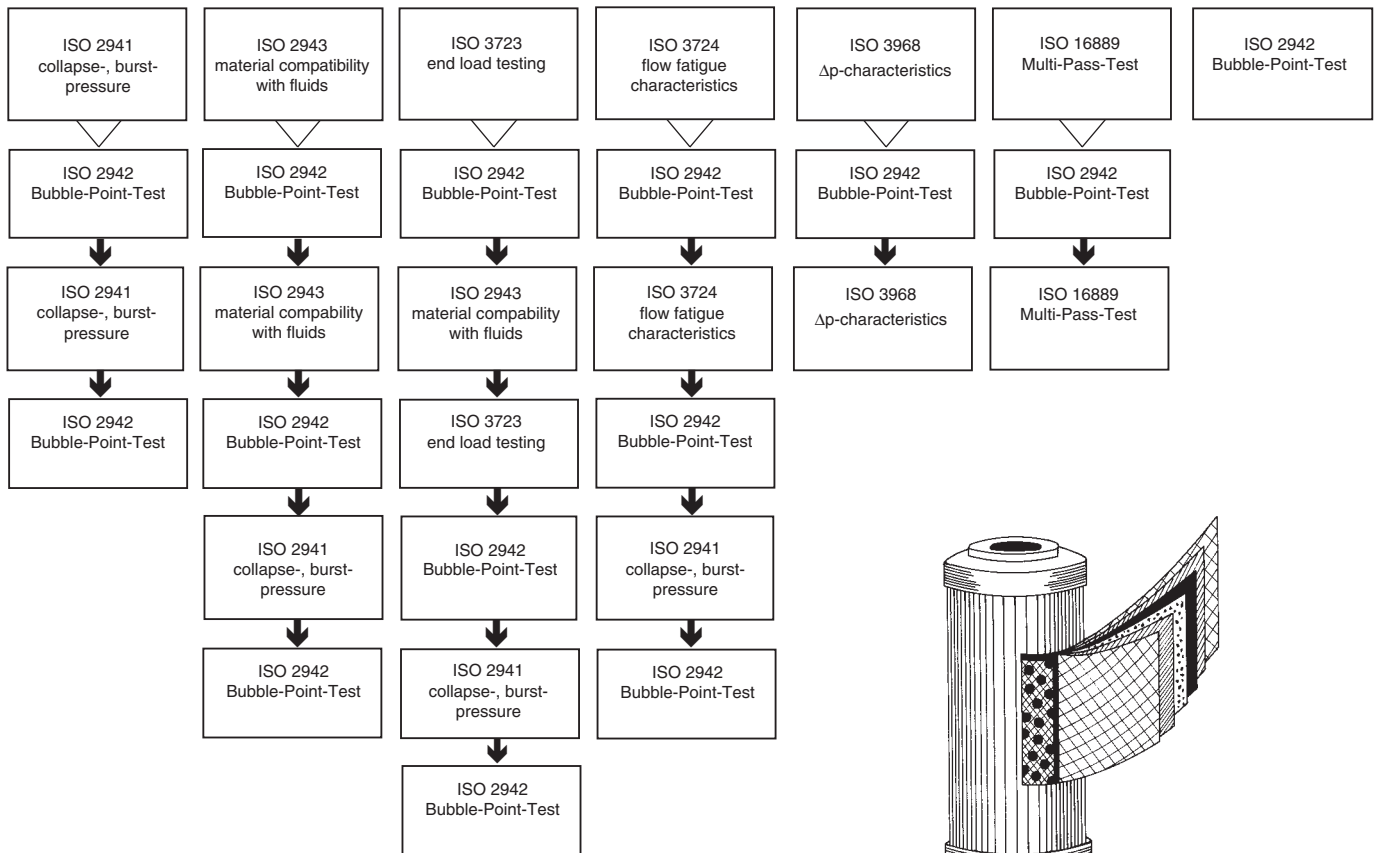
Necessary Contamination classes depending on the sensitivity of the system

The cleanliness of the oil in a hydraulic system depends 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	Required class according to ISO 4406:99	Required class according to NAS 1638	Recommended filter material by INTERNORMEN Technology
against fine soiling and mudding 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 hydraulic with high operating safety	20/16/13	7-8	10 VG
mobile hydraulic, common mechanical engineering, medium-pressure systems	22/18/14	7-9	16 VG
heavy industry low pressure systems mobile hydraulics	23/19/15	9-11	25 VG

Quality of Elements

Range of Test Procedures



The high quality of **INTERNORMEN Technology** products and the ability of solving customer-specific problems, as well as the service in lab and at site, are based on the work of qualified engineers supported by computer analysis and measurement methods, the availability of all necessary test stands according to ISO standards and continuous control of filter element and its permanent efficiency differences. Filter materials, bonding and by means of bubble-point tests on **INTERNORMEN Technology** elements tests and corresponding certificates used in filter elements for fine filtration, a stainless steel wire mesh and there- production, and later during filtration at high pressure differences. The bonding of the filter material to the end caps and the seam is executed with maximum accuracy. By using a special high quality adhesive, a homogeneous connection of the parts is achieved.



production. The beta ratio of the filter are guaranteed during high pressure processing are regularly controlled our test stand according to ISO 2942. can be supplied with 100% bubble-point on request. The glass fibre material "VG", is supported by a support fleece and by by protected against damage during

**Designed, manufactured and supplied according to the ISO 9001 Quality System.
Filter testing and quality control according to ISO standards**

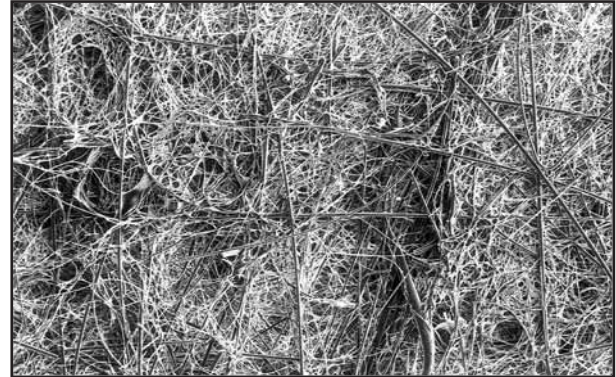
Filter Media

High Quality Filter Elements

Mainly used filter material:

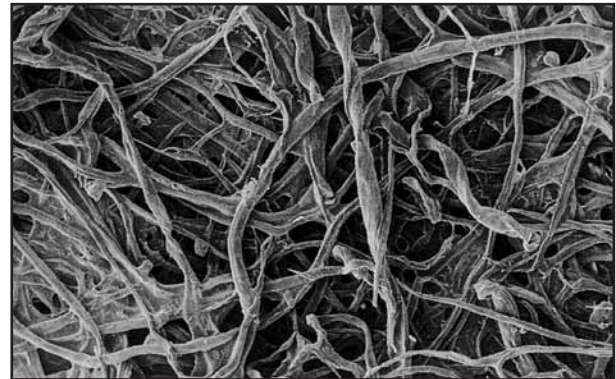
Interpor Fleece „VG“ Glass Fibre

- 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 $\beta_{x(c)} \geq 200$:
 $4\mu\text{m}_{(c)}$, $5\mu\text{m}_{(c)}$, $7\mu\text{m}_{(c)}$, $10\mu\text{m}_{(c)}$, $15\mu\text{m}_{(c)}$, $20\mu\text{m}_{(c)}$



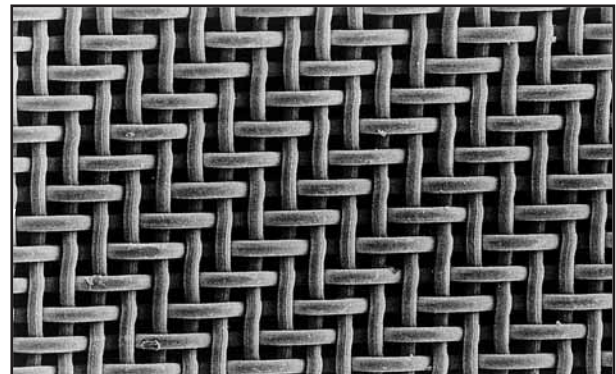
Paper Matting „P“

- deep filtration
- paper matting consisting of paper and polyester fibre
- high material stability and strenght
- available in 10 μm and 25 μm

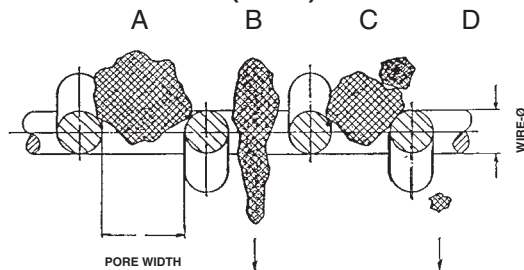


Stainless Steel Mesh „G“

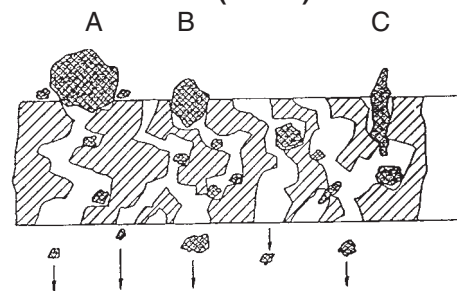
- surface filtration
- stainless steel wire mesh provides filter elements with high resistance in all kinds of hydraulic fluids
- partially cleanable
- available in 25 μm , 40 μm and 80 μm (other micron ratings on request)



Surface filtration (mesh)



Bulk filtration (fleece)



INF-Expert-System Filter

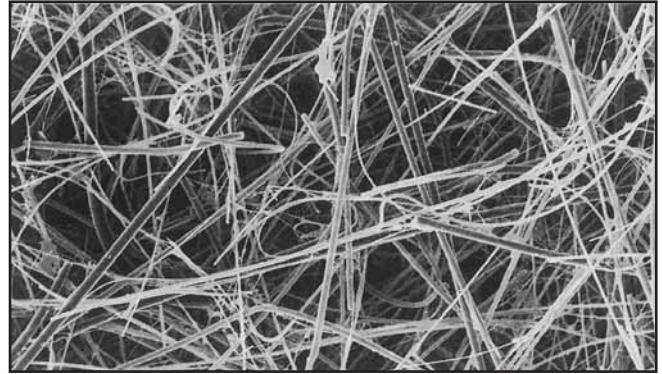
For a technical and economic intelligent filter-selection we recommend the use of the „INF-Expert-System Filter“ developed by **INTERNORMEN Technology** (CD-ROM)

Filter Media

Glass Fibre Fleece 3 VG initial State

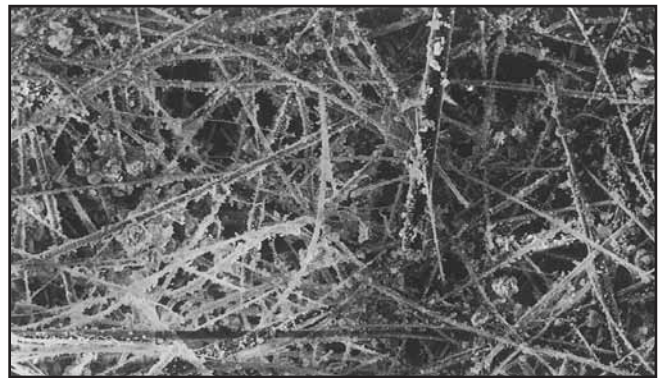


Up to 70 layers of defined fibres form a porous entanglement that - as bulk filtration - provides the typical high dirt-holding capacity.



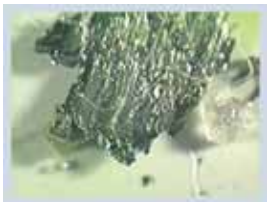
Glass Fibre Fleece 3 VG dirty

Particles, which are essentially smaller than the pore diameter, will be taken up by the fibres. Thus, the typical high dirt-holding capacity will be achieved.



Based on a most modern laboratory technology, e.g. infrared spectroscopy or emission spectroscopy (ICP), we provide our customers with full service. In addition our product range includes devices for fast and reliable online measurements, e.g.:

- Online particle counting with the **CCS 2**
- Bottle Sampling - particle counting with the **BSS 2** and the **CCS 2**
- Sampling of tank samples with the **TSS 1**
- Water analysis with the **WAS 01**



TYPICAL PARTICLES OUT OF AN OIL SAMPLE



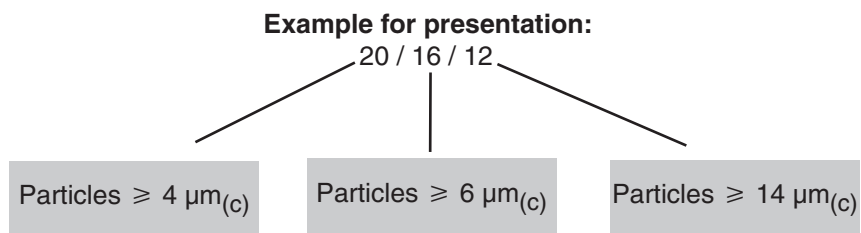
VIEW INTO THE
INTERNORMEN Technology LABORATORIES

*Confidence is good, control is better!
Modern laboratories with up-to-date test equipment guarantee highest quality.*

Laboratory Evaluation

Analysis of Contamination classes according to ISO 4406:99

For the determination of ISO-codes (contamination classes) the quantity of particles in size $4 \geq \mu\text{m}_{(c)}$, $\geq 6 \mu\text{m}_{(c)}$ and $\geq 14 \mu\text{m}_{(c)}$ according to ISO 4406 are used. The code is independent of the particle size.



Code-number	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Quantity of particles	0,3	0,6	1,3	2,5	5	10	20	40	80	160	320	640	1300	2500	5000	10000	20000	40000	80000	160000	320000
up to inclusive	0,6	1,3	2,5	5	10	20	40	80	160	320	640	1300	2500	5000	10000	20000	40000	80000	160000	320000	640000

Quantity of particles per ml

Analysis of Contamination classes according to NAS 1638

Code-number	00	0	1	2	3	4	5	6	7	8	9	10	11	12
μm	Quantity of particles x 10^3													
5-15	0,125	0,250	0,5	1	2	4	8	16	32	64	128	256	512	1024
15-25	0,022	0,044	0,089	0,178	0,356	0,712	1,425	2,85	5,7	11,4	22,8	45,6	91,2	182,4
25-50	0,004	0,008	0,016	0,032	0,063	0,126	0,253	0,506	1,012	2,025	4,05	8,1	16,2	32,4
50-100	0,001	0,002	0,003	0,006	0,011	0,022	0,045	0,09	0,18	0,36	0,72	1,44	2,88	5,76
> 100	0	0	0,001	0,001	0,002	0,004	0,008	0,016	0,032	0,064	0,128	0,256	0,512	1,024

Quantity of particles per 100 ml

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

- 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

**Modern laboratories with up-to-date test equipment guarantee best quality
Contamination determination with our Contamination Control System CCS 2**

