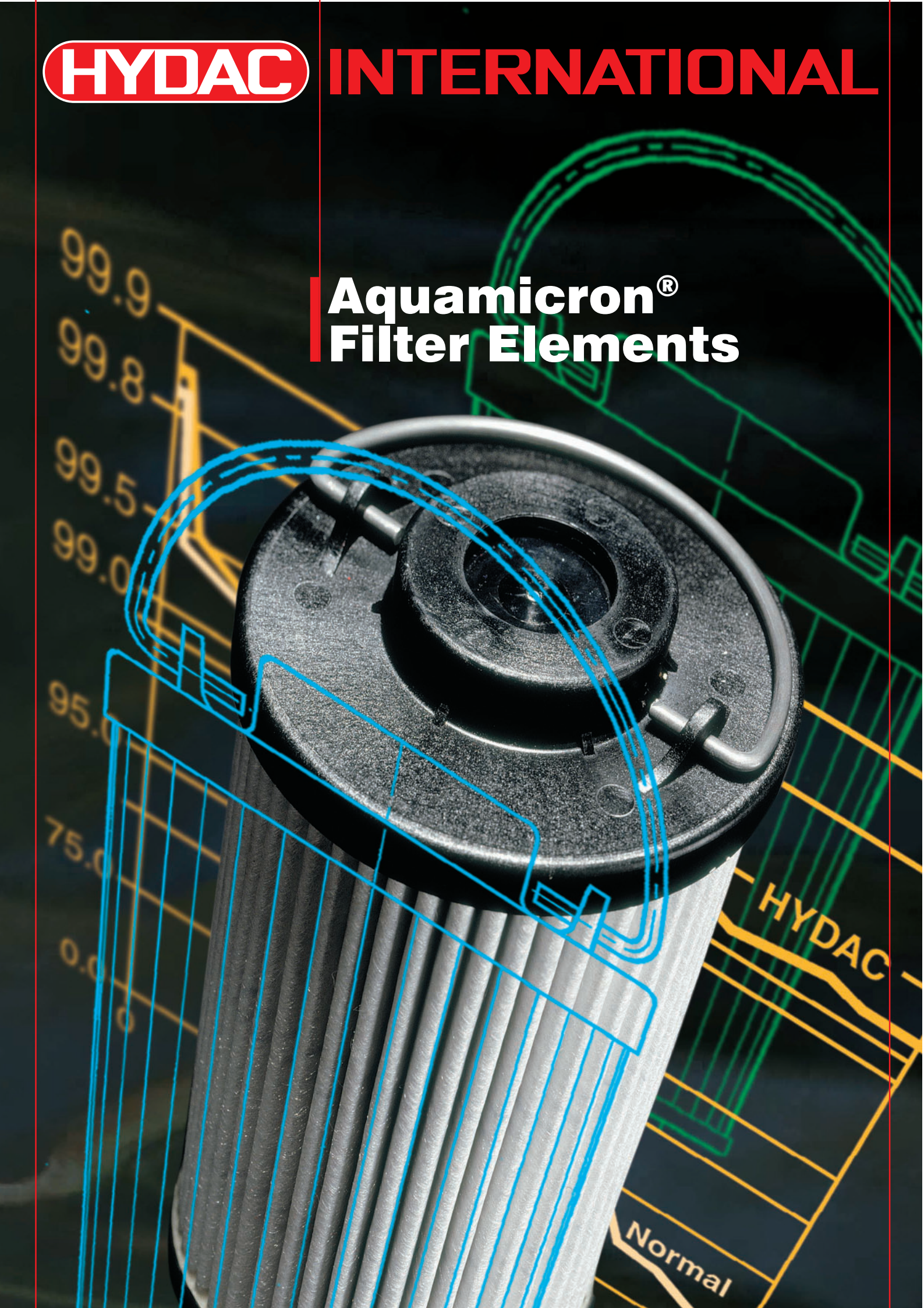
HYDAC INTERNATIONAL

Aquamicron® Filter Elements



1. DESCRIPTION

The presence of water in hydraulic media causes many problems, for example, the saturation of very fine filters or jamming of valves, and these problems are often wrongly attributed to excessive levels of solid particle contamination.
In addition to this the build-up of rust and the reduction in lubrication on bearings and slides can lead to considerable impairment in the functioning of a system. In other words, water is a serious "contaminant" of a hydraulic medium.

Since methods usually employed up to now to extract water have, on the whole, proved to be uneconomical compared to the purchase price of a system, HYDAC Aquamicron® technology offers an economically sound, yet effective, method of separating water from hydraulic media.

Aquamicron® filter elements are specially designed to separate water from mineral oils, HFD-R oils and biodegradable oils. They are only available in the dimensions of the HYDAC HC return line filter elements from size 330 upwards. This means that they can be installed in all HYDAC filter housings from size 330/331 upwards, which are fitted with return line filter elements.

The increasing pressure loss in a filter element which is being saturated with water indicates, by means of standard clogging indicators, that it is time to change the element. When Aquamicron® technology is employed, solid particle contaminants are also separated from the hydraulic medium as a side-effect.
This means that the Aquamicron® element doubles as a safety filter. The "filtration rating" is 40 µm absolute ($\beta_{40} \geq 100$ to Δp = 3 bar). In order to guarantee greatest efficiency it is recommended that they are installed off-line.

Note:

The Aquamicron® elements are disposable items.

1.1. PRINCIPLES OF AQUAMICRON® TECHNOLOGY

The separation of water from hydraulic fluids with the aid of the super absorber embedded in the filter material is based on a physical-chemical reaction. The super absorber reacts with the water present in the medium and expands to form a gel, from which the water present in the medium can no longer be extracted even by increasing the pressure.

The Aquamicron® technology is capable of absorbing circulating water, be it emulsified or free. These filter elements cannot remove dissolved water from the system, i.e. water below the saturation level of the hydraulic medium.

The following principles apply to Aquamicron® technology:

High water content	⇒	High absorption rate	
Low water content	⇒	Low absorption rate	
Unsaturated filter element	⇒	High absorption rate	
Saturated filter element	⇒	Low absorption rate	
Hydraulic filter area load (l/min cm²)	↘	Absorption rate Water retention capacity Residual water content	↗ ↗ ↘
Static pressure	↘	Absorption rate Water retention capacity Residual water content	= = ↘
Pressure and flow-rate fluctuations present		Absorption rate Water retention capacity Residual water content	↘ ↘ ↗
Dispersion/detergent additive present		Absorption rate Water retention capacity Residual water content	↘ = ↗

Key to symbols: ↗ increases ↘ decreases = constant

2. GENERAL

Max. permissible operating pressure

25 bar

Max. permissible Δp across element

10 bar

Temperature range

0 °C to +100 °C

Compatibility with hydraulic media

Mineral oils:
test criteria to ISO 2943

Lubricating oils:
test criteria to ISO 2943

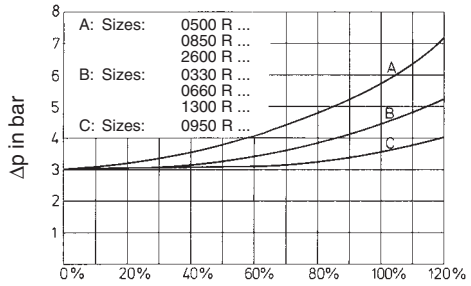
Other media on request

Cracking pressure of the bypass valve

Δp_o = 3 bar +10%

Bypass valve curves

The bypass valve curves apply to mineral oils with a density of 0.86 kg/dm³. The differential pressure of the valve changes proportionally to the density.



Q in l/min as a percentage of the size

3. MODEL CODE

(also order example)

0660 R 040 AM /-V

Size
0330
0500
0660
0850
0950
1300
2600

Type
R

Filtration rating in µm
040 absolute

Filter material
Aquamicron®

Supplementary details
–V FPM (-Viton) seal

4. ELEMENT SPECIFICATIONS

4.1. FILTRATION AREA

Size	cm²
0330	2785
0500	4259
0660	6174
0850	7949
0950	8667
1300	12111
2600	24711

5. DETERMINATION OF THE WATER CONTENT G_W PRESENT IN THE SYSTEM

Two methods can be employed to determine the water content G_W present in the system:

– the hydrogen gas method

– the Karl Fischer method to DIN 51777

The hydrogen gas method can be carried out using portable test equipment, e.g. the HYDAC Water Test Kit WTK; however, reading accuracy at water contents below 500 ppm is limited.

The Karl Fischer method, on the other hand, can only be conducted in the laboratory. It is available from HYDAC Filtration Technology as a laboratory service.

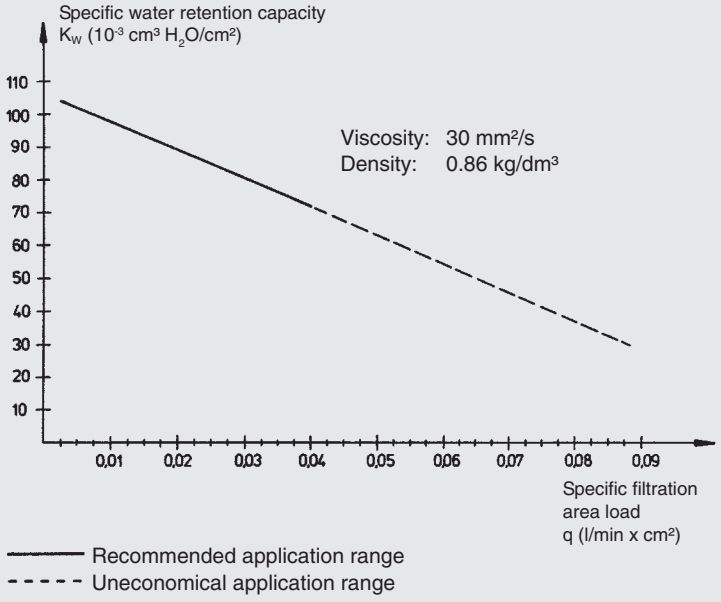
The water content G_W is usually given in ppm (parts per million) or in percent (100 ppm corresponds to 0.01 %).

6. CALCULATION

6.1. DETERMINATION OF THE WATER RETENTION CAPACITY C_W (cm³)

$$q = \frac{Q}{A}$$ **(Recommendation: $q_{max} \leq 0.04$ l/min cm²)**

q = specific filtration area load of a filter element in l/min cm²
Q = flow rate in l/min
A = filtration area in cm² (point 4.1)



$C_W = K_W \times A$ (cm³)

C_W = water retention capacity of a filter element in cm³
K_W = specific water retention capacity dependent on the specific filtration area load q in (10^{-3} cm³ H_2O/cm²)
A = filtration area in cm² (see point 4.1.)
q = specific filtration area load of a filter element in l/min cm²

6.2. AQUAMICRON® ELEMENT SIZE RECOMMENDATIONS

Size	Recommended flow rate in l/min	Water retention capacity C_W in cm³ at Δp = 2.5 bar and an oil viscosity of 30 mm²/s	Part no.
0330	13 advised 100 maximum	260 180	315268
0500	19 advised 155 maximum	400 280	315355
0660	28 advised 255 maximum	570 400	315356
0850	35 advised 286 maximum	730 520	315357
0950	39 advised 314 maximum	800 570	315358
1300	54 advised 437 maximum	1120 790	315269
2600	109 advised 870 maximum	2230 1570	316102

6.3. CALCULATION OF THE WATER QUANTITY m_W TO BE ABSORBED BY THE FILTER ELEMENT

$$\mathbf{m_W = \Delta G_W \times 10^{-3} \times V_T\ (cm^3)}$$

m_W = water quantity to be absorbed by the filter element in cm³

ΔG_W = difference between the initial and required final water content in ppm

Please note:
It is impossible to achieve a final water content below the saturation level of the hydraulic medium!

V_T = tank volume in litres x 1000

6.4. CALCULATION OF THE NUMBER OF ELEMENTS REQUIRED

$$\mathbf{n = \frac{m_W}{C_W}}$$

n = number of filter elements required

The economical use of Aquamicron® technology depends on the cost of filter elements compared to the cost of buying and disposing of the oil.

m_W = water quantity to be absorbed by the filter element in cm³ (see point 6.3.)

C_W = water-retention capacity of a filter element in cm³ (see point 6.1.)

7. NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.