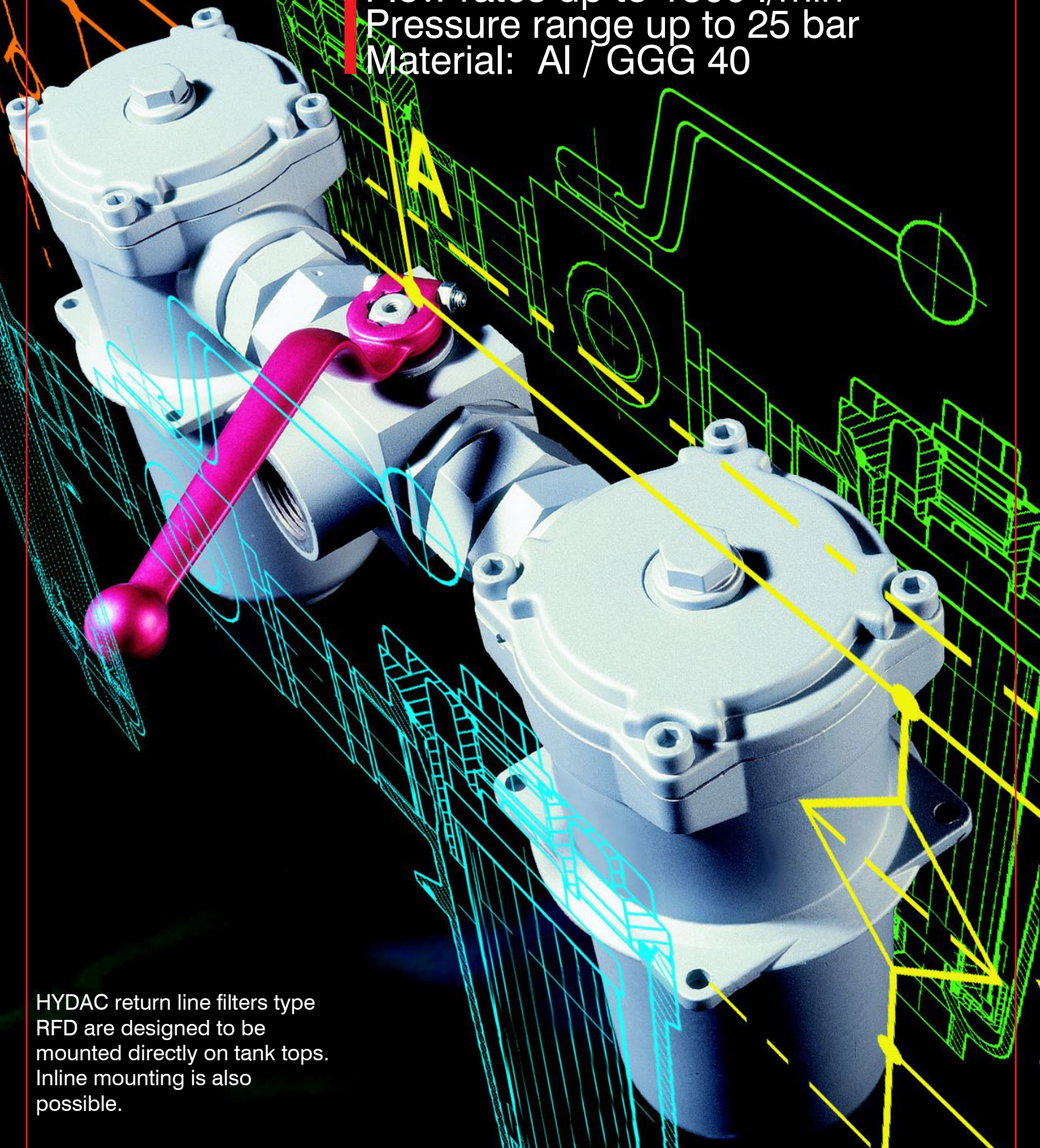


**HYDAC**

**INTERNATIONAL**

**Change-Over  
Return Line Filter RFD**

Flow rates up to 1300 l/min  
Pressure range up to 25 bar  
Material: Al / GGG 40



HYDAC return line filters type RFD are designed to be mounted directly on tank tops. Inline mounting is also possible.

# 1. TECHNICAL SPECIFICATIONS

## 1.1. FILTER HOUSING

### Construction

The return line filters consist of one-piece housings with bolt-on cover plates.

The two housings are connected by a ball change-over valve with negative overlap and single-lever operation.

Connections for clogging indicators are standard (1 indicator per filter side).

## 1.2. FILTER ELEMENTS

Hydac filter elements are tested according to the following ISO test standards:

- ISO 3724 Verification of flow fatigue characteristics
- ISO 4572 Contamination retention capacity
- ISO 4572 Multi-pass method for evaluating filtration performance
- ISO 3968 Evaluation of pressure drop versus flow characteristics
- ISO 2942 Bubble point test
- ISO 2941 Verification of collapse / burst resistance

### Reliable filter operation is only guaranteed with original HYDAC filter elements!

The filter elements are also suitable for use in dynamic applications due to their high differential pressure stability; max. permiss.  $\Delta p$  across the element:

|                                |           |
|--------------------------------|-----------|
| Betamicon®(BN3HC)              | : 25 bar  |
| Paper (P/HC)                   | : 10 bar  |
| Wire mesh (W/HC)               | : 30 bar  |
| Stainless steel fibre (V)      | : 210 bar |
| Betamicon®/Aquamicron® (BN/AM) | : 10 bar  |
| Aquamicron®(AM)                | : 10 bar  |

For further details on filter elements, please see:

**brochure no.: E 7.200../..**

### Fluid compatibility

Suitable for mineral oils, lubrication oils, non-flam fluids, synthetic and rapidly biodegradable oils. For use with water, please contact our technical sales department.

## 1.3. CLOGGING INDICATORS (example)

**VR 2 D.0 /-L220**

**Type of indicator** \_\_\_\_\_  
 VR return line indicator

**Pressure setting** \_\_\_\_\_  
 2 2 bar

**Indicator type code** \_\_\_\_\_  
 B. visual  
 C. electrical  
 D. visual/electrical

**Modification number** \_\_\_\_\_  
 0 = the latest version is always supplied

**Supplementary details** \_\_\_\_\_  
 -V Viton  
 -Lxx voltage for type "D"

For further details on clogging indicators, please see:  
**Brochure no.: E 7.050../..**

## 1.4. SEALS

Choice of Perbunan (= NBR) or Viton (= FPM) for HFD fluids

## 1.5. SPECIAL MODELS AND ACCESSORIES

- Filter housings size 330 in GGG 40 (SG iron)
- Filter housing surface electro-less nickel-plated (only possible on GGG 40)
- Mating flanges available for filters from size 330 and above

## 1.6. SPARE PARTS

See Original Spare Parts List and Maintenance Instructions

# 2. GENERAL

### Mounting

Tank-top filter or inline filter

### Direction of flow

Inlet: via ball valve between the housings

Outlet: vertically down

### Temperature range

-10 °C ... +100 °C

### Pressure setting of clogging indicator

$\Delta p_a = 2 \text{ bar} -0.2 \text{ bar}$

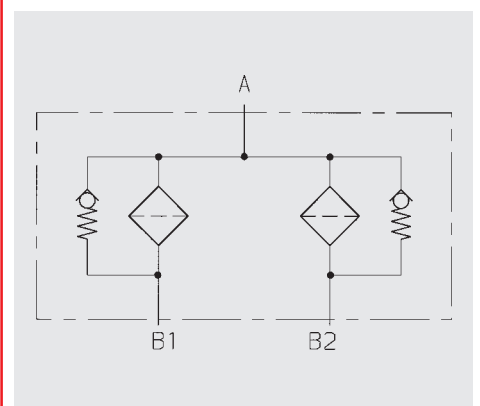
Other pressure settings on request

### Cracking pressure of bypass valve

$\Delta p_o = 3 \text{ bar} +0.5 \text{ bar}$

Other cracking pressures on request

### Hydraulic symbol



### 3. MODEL CODE

(also order example)

#### 3.1. COMPLETE FILTER

RFD BN/HC 660 D A N 10 D 1 . X /-L24

#### Filter type

RFD

#### Filter material of element

BN/HC Betamicon® (BN3HC)  
 AM Aquamicon®  
 BN/AM Betamicon®/Aquamicon®  
 P/HC paper  
 W/HC stainless steel wire mesh  
 V stainless steel fibre

#### Size / Housing material

Al: 60, 110, 160, 240, 330  
 SG iron (GGG40): 660, 950, 1300

#### Operating pressure

D = 25 bar

#### Type of change-over

A = ball

#### Type of connection / Connection size

| Code | Type of connection                  | Filter size |     |     |     |     |     |     |      |
|------|-------------------------------------|-------------|-----|-----|-----|-----|-----|-----|------|
|      |                                     | 60          | 110 | 160 | 240 | 330 | 660 | 950 | 1300 |
| C    | G 3/4                               | •           | •   |     |     |     |     |     |      |
| D    | G1                                  |             |     | •   | •   |     |     |     |      |
| G    | G2                                  |             |     |     |     | •   |     |     |      |
| L    | SAE DN 50                           |             |     |     |     | •   |     |     |      |
| N    | SAE DN 80                           |             |     |     |     |     | •   |     |      |
| P    | SAE DN 100                          |             |     |     |     |     |     | •   | •    |
| Z    | According to customer specification |             |     |     |     |     |     |     |      |

#### Filtration rating in µm

BN3HC, V : 3, 5, 10, 20  
 BN/AM : 3, 10  
 P/HC : 10, 20  
 W/HC : 25, 50, 100, 200  
 AM : 40

#### Type of clogging indicator

Y with plastic blanking plug in indicator port  
 A with steel blanking plug in indicator port  
 B with visual indicator  
 C with electrical indicator  
 D with combined visual/electrical indicator

for other clogging indicators, see brochure no. E 7.050../..

#### Type code

1 standard connection

#### Modification number

X the latest version is always supplied

#### Supplementary details

V FPM seals, filter suitable for rapidly biodegradable oils and phosphate ester (HFD-R)  
 L... light with corresponding voltage (24V, 48V, 110V, 220V) ] only on clogging  
 LED 2 light-emitting diodes up to 24 volt ] indicators type D  
 KB without bypass valve  
 B. special cracking pressure of the bypass valve (B1 = 1 bar, B6 = 6 bar)

3.2. REPLACEMENT ELEMENT  
(also order example)

0330 R 010 BN3HC /-KB

**Size** \_\_\_\_\_  
0060, 0110, 0160, 0240, 0330, 0660, 0950, 1300

**Type** \_\_\_\_\_  
R

**Filtration rating in µm** \_\_\_\_\_  
BN3HC, V : 3, 5, 10, 20  
BN/AM : 3, 10  
P/HC : 10, 20  
W/HC : 25, 50, 100, 200  
AM : 40

**Filter material** \_\_\_\_\_  
BN3HC, V, BN/AM, P/HC, W/HC, AM

**Supplementary details** \_\_\_\_\_  
V = FPM seals, filter suitable for rapidly biodegradable oils and phosphate ester (HFD-R)  
W = only for V and W/HC elements: NBR seals, filter suitable for oil-water emulsions (HFA, HFC)  
KB = without bypass valve  
B. = special bypass cracking pressure (B1 = 1 bar, B6 = 6 bar)

4. FILTER SPECIFICATIONS

| Filter type | Connection (inlet) | Element size | Number of elements per filter side | Weight [kg] with element |
|-------------|--------------------|--------------|------------------------------------|--------------------------|
| 60          | G 3/4              | 0060 R...    | 1                                  | 3.2                      |
| 110         | G 3/4              | 0110 R...    | 1                                  | 3.7                      |
| 160         | G1                 | 0160 R...    | 1                                  | 7.0                      |
| 240         | G1                 | 0240 R...    | 1                                  | 7.8                      |
| 330         | G2                 | 0330 R...    | 1                                  | 13.4                     |
|             | SAE DN 50          |              |                                    |                          |
| 660         | SAE DN 80          | 0660 R...    | 1                                  | 50.9                     |
| 950         | SAE DN 100         | 0950 R...    | 1                                  | 97.5                     |
| 1300        | SAE DN 100         | 1300 R...    | 1                                  | 108.0                    |

## 5. FILTER CALCULATION / SIZING

The total pressure drop of a filter at a certain flow rate is the sum of the housing  $\Delta p$  and the element  $\Delta p$ .

The pressure drop can either be determined with the aid of our FSP Filter Sizing Program, which is available free of charge, or by using the following graphs.

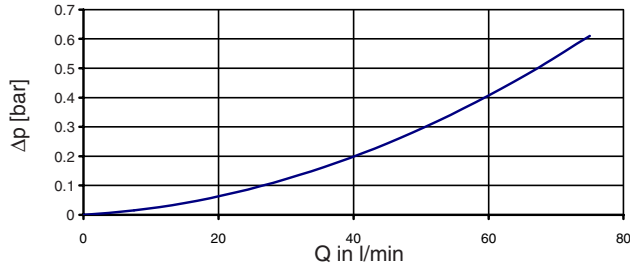
### 5.1. $\Delta P$ -Q HOUSING GRAPHS TO ISO 3968

The housing graphs apply to mineral oil with a density of  $0.86 \text{ kg/dm}^3$  and a kinematic viscosity of  $30 \text{ mm}^2/\text{s}$  for, in each case, the largest nominal width per size.

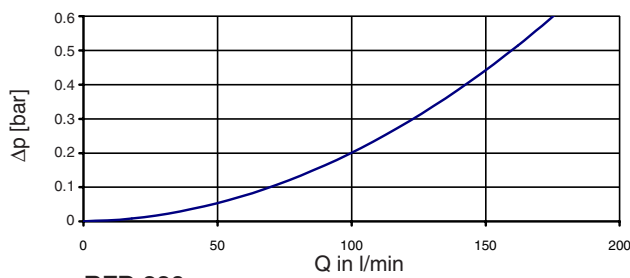
For turbulent flows, the differential pressure changes proportionally to the density.

For laminar flows it changes proportionally to the density and the viscosity.

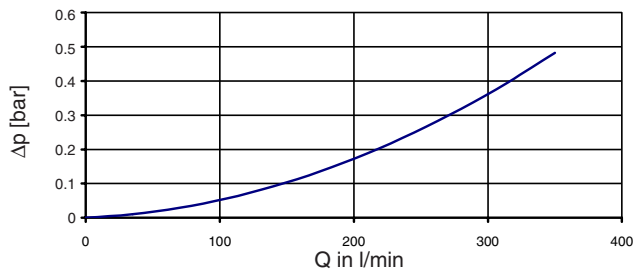
**RFD 60/110**



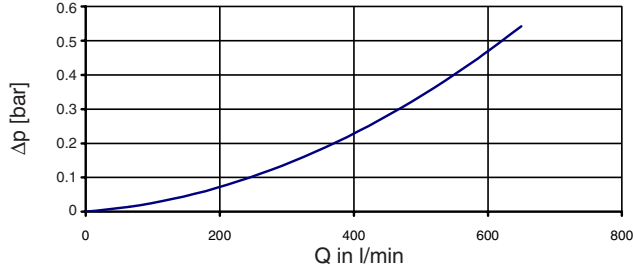
**RFD 160/240**



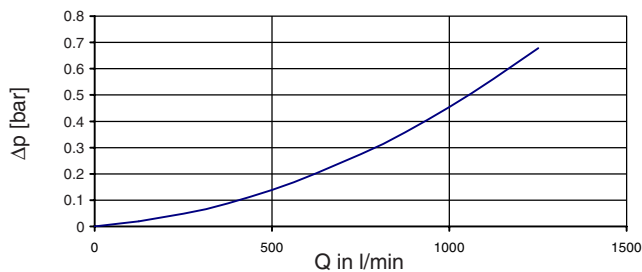
**RFD 330**



**RFD 660**



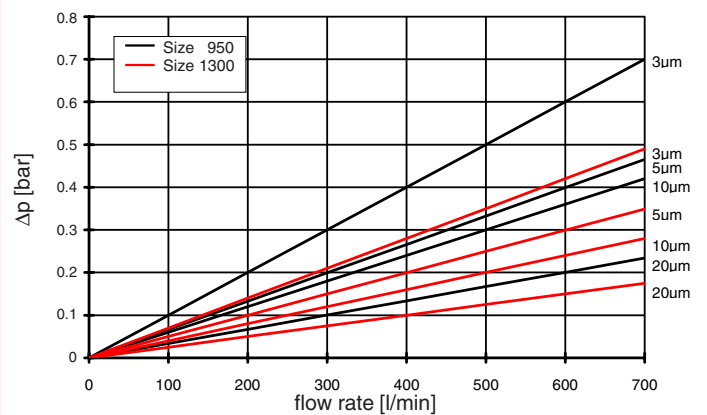
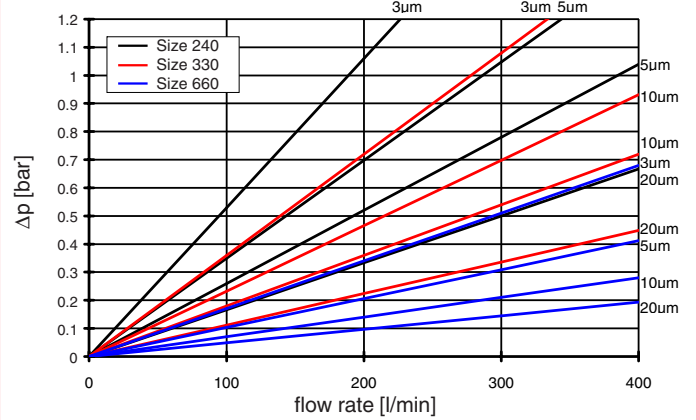
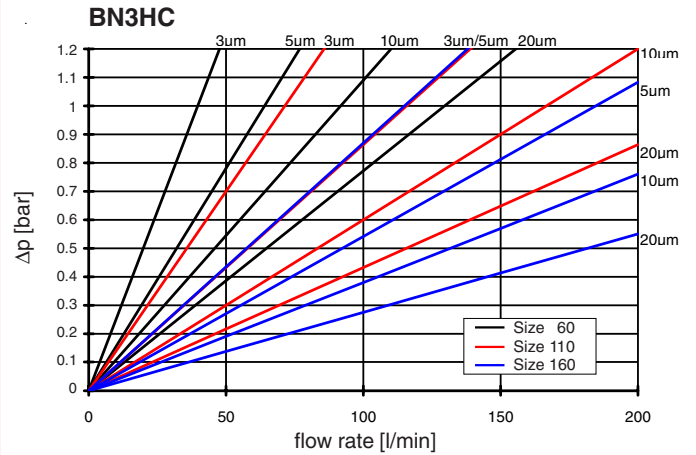
**RFD 950/1300**



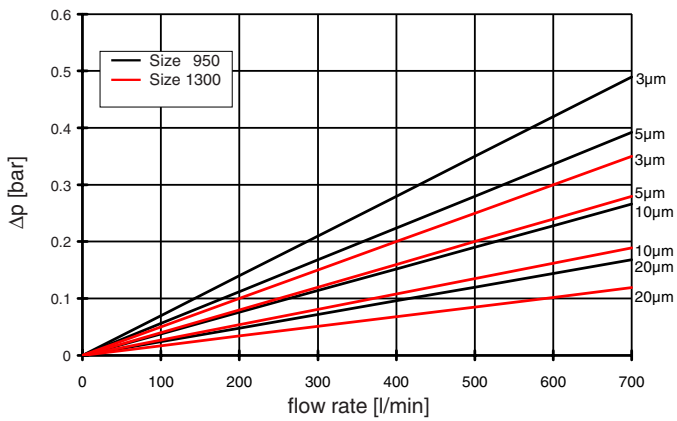
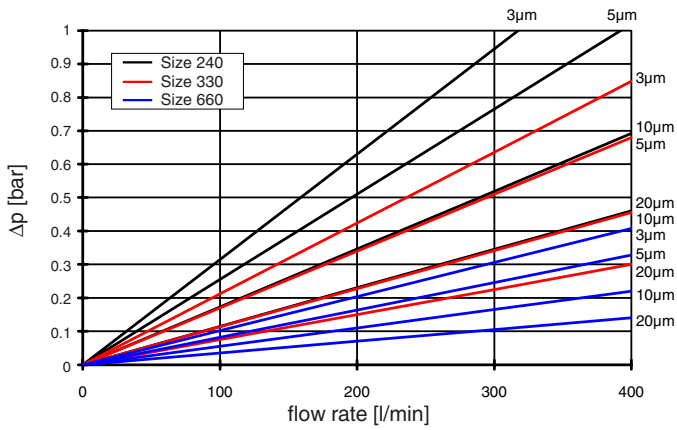
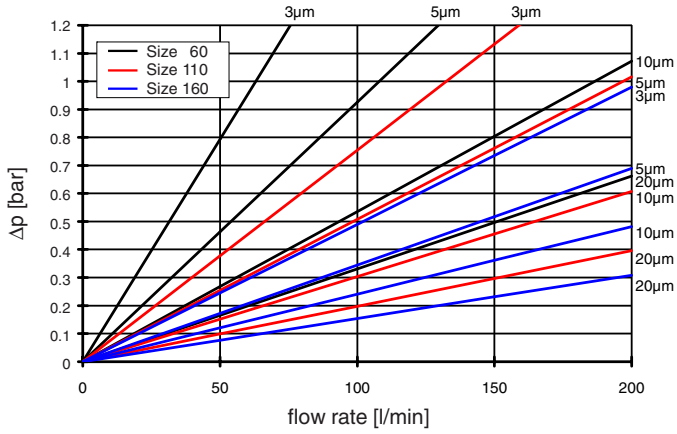
### 5.2. $\Delta P$ -Q GRAPHS - FILTER ELEMENTS

The element graphs apply to mineral oil with a kinematic viscosity of  $30 \text{ mm}^2/\text{s}$ .

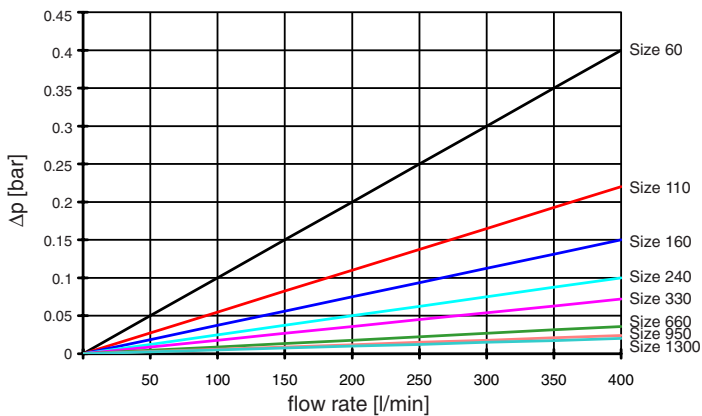
The pressure drop changes proportionally to the change in viscosity (see Example 5.3.).



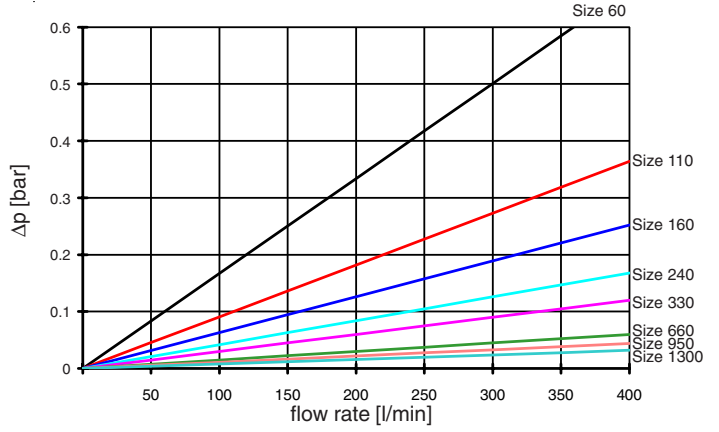
**V**



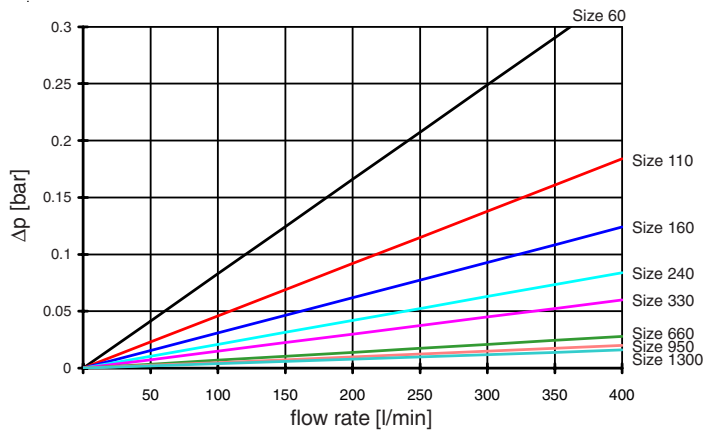
**W/HC**



**P/HC (10 µm)**



**P/HC (20 µm)**



**5.3. EXAMPLE**

**General:**

$$\Delta p_{\text{total}} = \Delta p_{\text{housing}} + \Delta p_{\text{element}} \times \frac{\text{viscosity (mm}^2\text{/s)}}{30 \text{ mm}^2\text{/s}}$$

$\Delta p_{\text{housing}}$  = to be determined from point 5.1.

$\Delta p_{\text{element}}$  = element pressure drop at flow rate Q/n and viscosity 30 mm<sup>2</sup>/s according to point 5.2.

**Example:**

System data: RFD 110 with BN3HC element (10 µm)  
viscosity = 46 mm<sup>2</sup>/s  
(ISO VG 46 at 40 °C)  
Q = 40 l/min

$$\Rightarrow \Delta p_{\text{housing}} = 0.2 \text{ bar (at Q)}$$

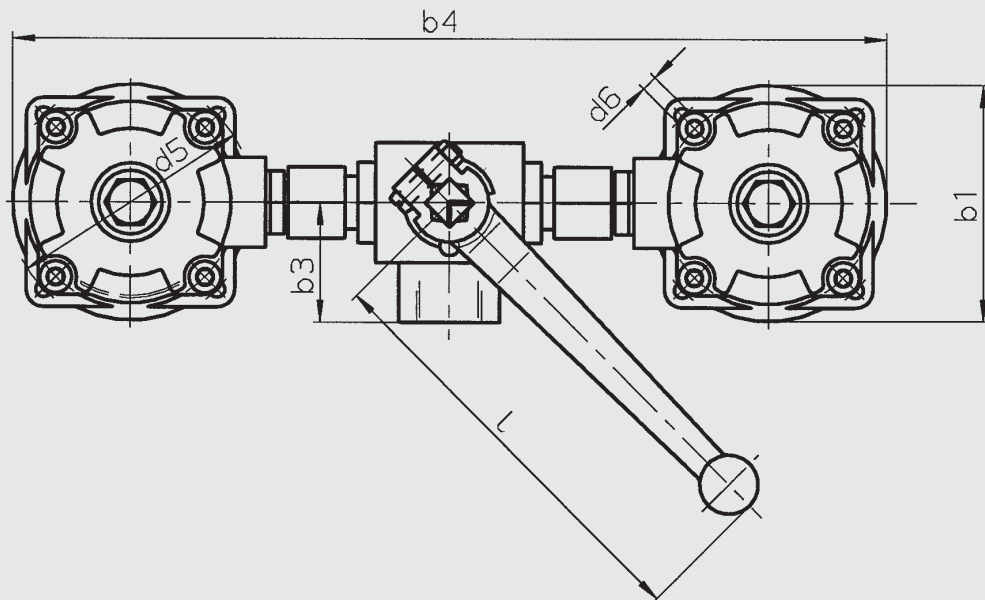
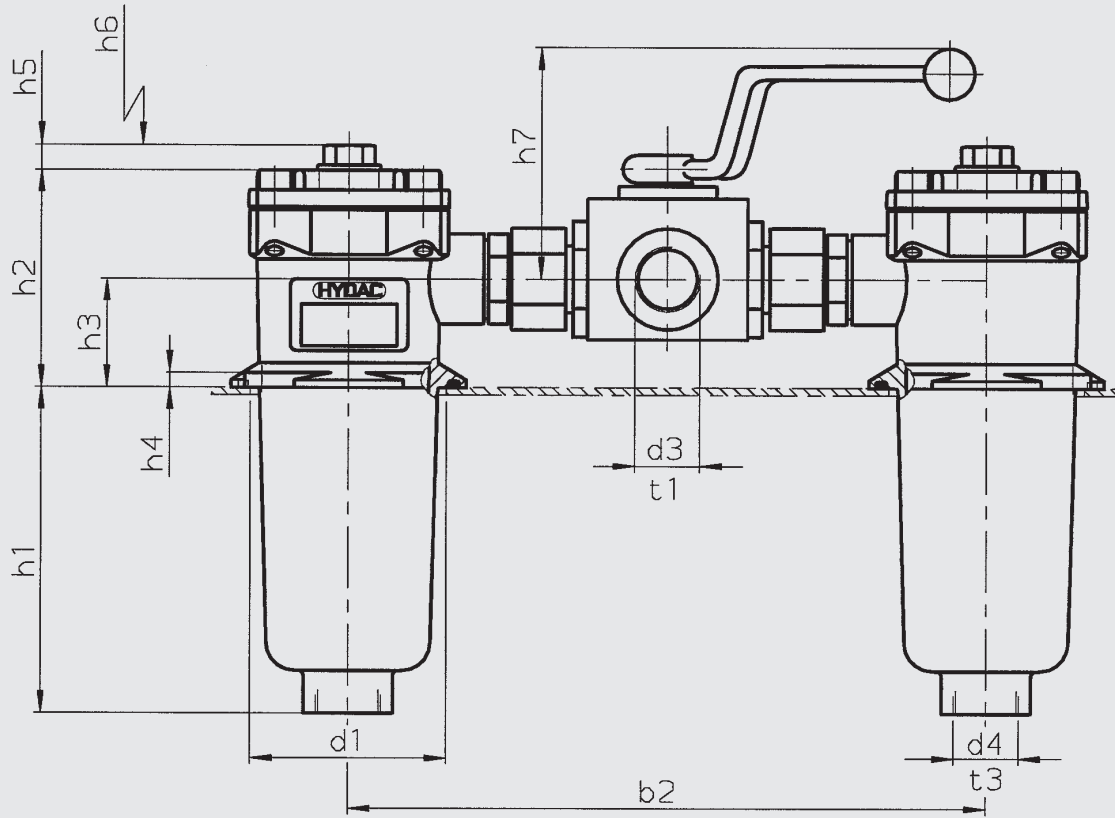
$$\Delta p_{\text{element}} = 0.24 \times \frac{46}{30} = 0.37 \text{ bar}$$

$$\Delta p_{\text{total}} = \underline{0.57 \text{ bar}}$$

**For ease of calculation, our FSP Filter Sizing Program can be downloaded from our website [www.hydac.com](http://www.hydac.com)**

## 6. DIMENSIONS

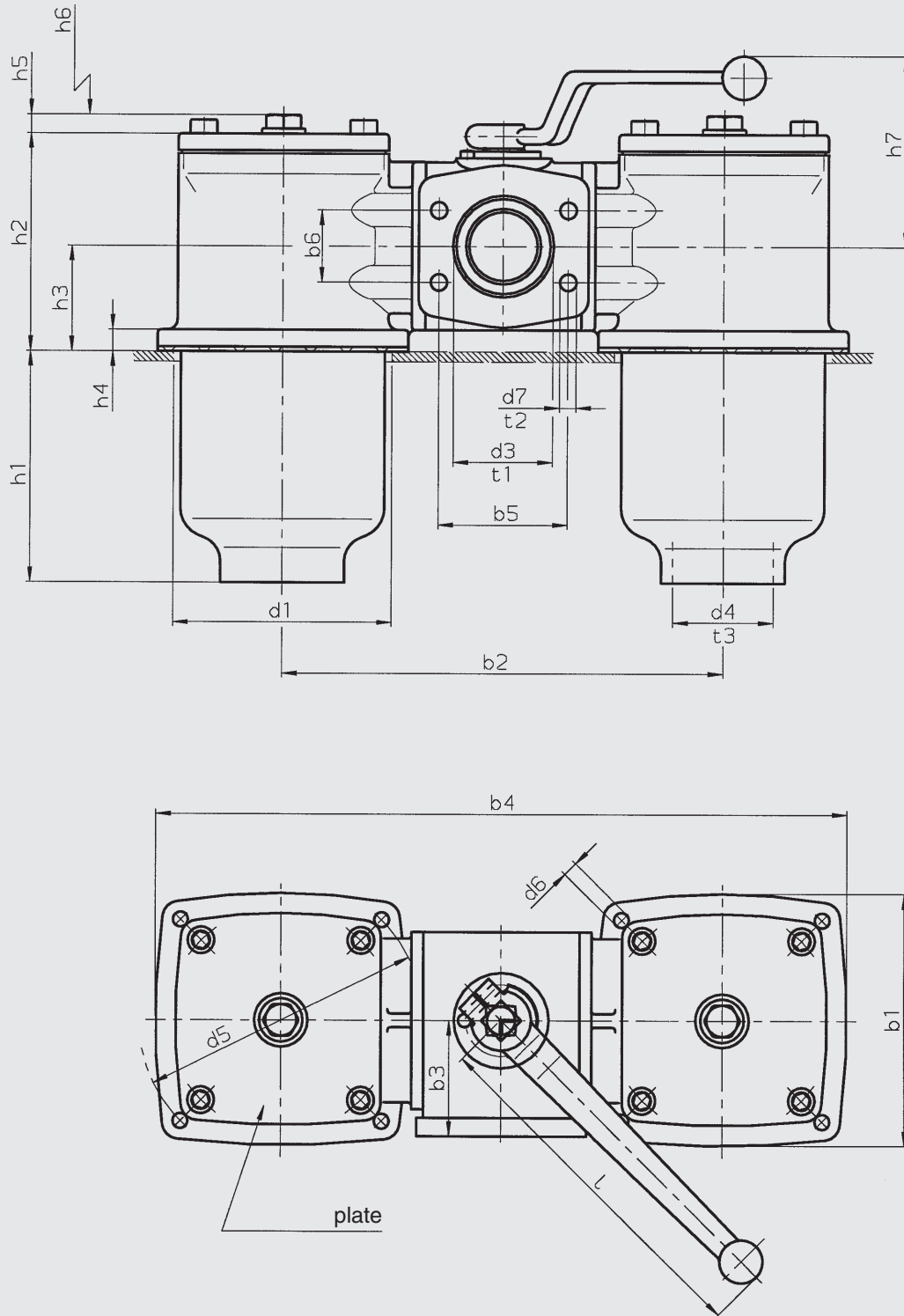
### 6.1. RFD 60 - 240



| Type    | b1  | b2±1.5 | b3   | b4  | d1  | d3    | d4     | d5  | d6 <sup>1)</sup> | h1  | h2  | h3 | h4 | h5 | h6  | h7 | l   | t1 | t3 |
|---------|-----|--------|------|-----|-----|-------|--------|-----|------------------|-----|-----|----|----|----|-----|----|-----|----|----|
| RFD 60  | 96  | 260.5  | 47.5 | 357 | 80  | G 3/4 | G 3/4  | 100 | M5               | 66  | 88  | 44 | 6  | 11 | 80  | 92 | 173 | 16 | 17 |
| RFD 110 | 96  | 260.5  | 47.5 | 357 | 80  | G 3/4 | G 3/4  | 100 | M5               | 133 | 88  | 44 | 6  | 11 | 145 | 92 | 173 | 16 | 17 |
| RFD 160 | 126 | 335.5  | 56.5 | 461 | 106 | G1    | G1 1/4 | 135 | M6               | 89  | 108 | 54 | 6  | 11 | 120 | 95 | 173 | 24 | 20 |
| RFD 240 | 126 | 335.5  | 56.5 | 461 | 106 | G1    | G1 1/4 | 135 | M6               | 150 | 108 | 54 | 6  | 11 | 180 | 95 | 173 | 24 | 20 |

<sup>1)</sup> mounting hole for screw

6.2. RFD 330-1300



| Type     | b1  | b2±1.3 | b3  | b4  | b5    | b6   | d1  | d3                   | d4              | d5  | d6 <sup>1)</sup> | d7       | h1  | h2  | h3  | h4 | h5 | h6  | h7  | l   | t1      | t2      | t3 |
|----------|-----|--------|-----|-----|-------|------|-----|----------------------|-----------------|-----|------------------|----------|-----|-----|-----|----|----|-----|-----|-----|---------|---------|----|
| RFD 330  | 150 | 254    | 69  | 404 | 77.8  | 42.9 | 135 | G2<br>SAE DN 50 (2") | G2              | 170 | M8               | —<br>M12 | 138 | 131 | 63  | 13 | 11 | 180 | 120 | 216 | 24<br>— | —<br>17 | 27 |
| RFD 660  | 195 | 330    | 100 | 525 | 106.5 | 61.9 | 180 | SAE DN 80 (3")       | G3              | 220 | M12              | M16      | 243 | 167 | 83  | 13 | 11 | 320 | 130 | 216 | —       | 20      | 32 |
| RFD 950  | 250 | 390    | 140 | 640 | 130.2 | 77.8 | 208 | SAE DN 100 (4")      | SAE DN 90 (3½") | 290 | M16              | M16      | 251 | 198 | 93  | 13 | 11 | 350 | 180 | 301 | —       | 25      | —  |
| RFD 1300 | 250 | 410    | 140 | 660 | 130.2 | 77.8 | 208 | SAE DN 100 (4")      | SAE DN 100 (4") | 290 | M16              | M16      | 332 | 241 | 121 | 13 | 11 | 460 | 180 | 301 | —       | 25      | —  |

Filter connection for SAE flanges to SAE-J 518c / 3000 psi

<sup>1)</sup> mounting hole for screw

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.

