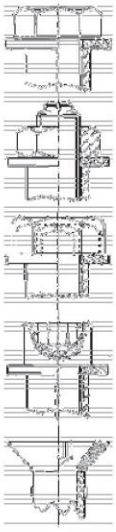
Tabla A: Valores medios de resistencia para diferentes materiales para la construcción de estructuras y elementos de máquinas.

Material	RESISTENCIA (N/mm²) σ_B	σ_{tF} σ_F τ_{tF}	HB	tracc.-comp. σ_{Pul}	tracc.-comp. σ_{Alt}	flexión $\sigma_{f\,Pul}$	flexión $\sigma_{f\,Alt}$	torsión $\tau_{t\,Pul}$	torsión $\tau_{t\,Alt}$	E	G	Propiedades y ejemplos de aplicación
1. Aceros de construcción según DIN 17 100												
St 34	340 a 420	300 220 130	950 a 1200	220	160	280	170	130	100	$2{,}1\cdot10^5$	$8\cdot10^4$	Piezas de construcción no muy importantes sometidas a cargas bajas
St 37	370 a 450	340 240 140	1050 a 1250	240	170	320	190	140	110	$2{,}1\cdot10^5$	$8\cdot10^4$	Acero de común uso en estructuras y elementos de máquinas sometidos a cargas medianas. Fácilmente maquinable y soldable. (AISI/SAE: A570 Gr.36) [1]
St 42	420 a 500	380 270 150	1200 a 1400	270	190	380	220	150	130	$2{,}1\cdot10^5$	$8\cdot10^4$	Piezas sometidas a cargas medianas como clavijas, manivelas, palancas. Fácilmente maquinable, soldable, cementable.
St 50	500 a 600	450 320 180	1400 a 1700	320	220	400	250	180	150	$2{,}1\cdot10^5$	$8\cdot10^4$	Ejes, árboles, pernos y espárragos con cargas medianas. Maquinables, soldables bajo ciertas condiciones, apenas endurecibles, utilizables para piezas sometidas a deslizamiento. (AISI/SAE: A570 Gr.50)
St 52	520 a 620	450 340 180	1450 a 1750	340	240	400	210	190	160	$2{,}1\cdot10^5$	$8\cdot10^4$	Acero de calidad para la construcción de estructuras. Fácilmente soldable.
St 60	600 a 720	540 380 180	1700 a 1950	380	260	540	320	220	180	$2{,}1\cdot10^5$	$8\cdot10^4$	Piezas bastante cargadas. Para piezas resistentes al desgaste, pasadores, chavetas, cuñas, engranajes, piñones y tornillos sin fin. Endurecible y bonificable. Soldable bajo ciertas condiciones. Maquinado caro.
St70	700 a 850	620 450 260	1950 a 2400	450	320	620	370	260	200	$2{,}1\cdot10^5$	$8\cdot10^4$	Piezas sometidas a cargas considerables. Para piezas resistentes al desgaste. Ejm.: Herramientas, matrices, rodillos de laminación, levas y piezas motrices. Fácilmente endurecibles y bonificables. Arranque de viruta difícil y no soldables.
2. Aceros bonificables según DIN 17 200												
C22	500 a 600	410 300 170	1550	280	210	350	250	160	140	$2{,}1\cdot10^5$	$8\cdot10^4$	Elementos de construcción pequeños resistentes al desgaste. (AISI/SAE: 1020)
C35 Ck35	600 a 720	450 330 190	hasta 1720	350	250	450	300	190	160	$2{,}1\cdot10^5$	$8\cdot10^4$	Acero para tornillos según DIN 1050. También utilizado como acero para la construcción de estructuras. (AISI/SAE: 1035)
C45 Ck45	650 a 800	530 390 210	hasta 2060	390	290	530	350	210	170	$2{,}1\cdot10^5$	$8\cdot10^4$	Ejes y árboles con cargas altas y resistentes al desgaste, pernos, gorrones o pasadores de eje. (AISI/SAE: 1045)

[1] Entre paréntesis los equivalentes según normas americanas AISI (American Iron and Steel Institute) y SAE (Society of Automotive Engineers)

Fuente: Reitor - Hohmann, Grundlagen des Konstruierens, Girardet Verlag, 1977

HSL-3 carbon steel, heavy duty anchor

	Anchor version	Benefits
	 HSL-3 Bolt version HSL-3-G Threaded rod version HSL-3-B Safety cap version HSL-3-SH Hexagonal socked head screws HSL-3-SK Countersunk version	- suitable for non-cracked and cracked concrete C 20/25 to C 50/60 - high loading capacity - force-controlled expansion - reliable pull-down of the part fastened - no rotation in hole when tightening bolt


Concrete


Tensile zone


Fire resistance


Fatigue


Shock


Seismic


European Technical Approval


CE conformity


PROFIS Anchor design software

Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European technical approval [a)]	CSTB, Paris	ETA-02/0042 / 2008-01-10
ICC-ES report incl. seismic	ICC evaluation service	ESR 1545 / 2012-03-01
Shockproof fastenings in civil defence installations	Federal Office for Cicil Protection, Bern	BZS D 08-601 / 2008-06-30
Fire test report	IBMB, Braunschweig	UB 3041/1663-CM / 2004-03-22
Assessment report (fire)	warringtonfire	WF 166402 / 2007-10-26

a) All data given in this section according ETA-02/0042, issue 2008-01-10.

Basic loading data (for a single anchor)

All data in this section applies to

For details see Simplified design method

- Correct setting (See setting instruction)
- No edge distance and spacing influence
- Concrete as specified in the table
- *Steel* failure
- Minimum base material thickness
- Concrete C 20/25, $f_{ck,cube}$ = 25 N/mm²

Mean ultimate resistance

		Non-cracked concrete						Cracked concrete					
Anchor size		**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Tensile $N_{Ru,m}$	[kN]	31,1	39,2	47,9	66,9	93,5	122,9	15,9	21,2	34,2	47,8	66,8	87,8
Shear $V_{Ru,m}$													
HSL-3, HSL-3-B, HSL-3-SK[a], HSL-3-SH[a]	[kN]	*43,0*	*68,0*	95,8	133,8	187,0	*245,3*	40,0	56,0	68,4	95,6	133,6	175,6
HSL-3-G[b]	[kN]	*36,1*	*48,1*	*75,1*	*118,5*	187,0	-	*36,1*	*48,1*	68,4	95,6	133,6	-

Characteristic resistance

		Non-cracked concrete						Cracked concrete					
Anchor size		**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Tensile N_{Rk}	[kN]	23,4	29,5	36,1	50,4	70,4	92,6	12,0	16,0	25,8	36,0	50,3	66,1
Shear V_{Rk}													
HSL-3, HSL-3-B, HSL-3-SK[a], HSL-3-SH[a]	[kN]	*31,1*	*49,2*	*71,7*	100,8	140,9	*177,4*	30,1	42,2	51,5	72,0	100,6	132,3
HSL-3-G[b]	[kN]	*26,1*	*34,8*	*54,3*	*85,7*	140,9	-	*26,1*	*34,8*	51,5	72,0	100,6	-

Design resistance

		Non-cracked concrete						Cracked concrete					
Anchor size		**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Tensile N_{Rd}	[kN]	15,6	19,7	24,0	33,6	47,0	61,7	6,7	10,7	17,2	24,0	33,5	44,1
Shear V_{Rd}													
HSL-3, HSL-3-B, HSL-3-SK[a], HSL-3-SH[a]	[kN]	24,9	39,4	48,1	67,2	93,9	123,5	20,1	28,1	34,3	48,0	67,1	88,2
HSL-3-G[b]	[kN]	20,9	27,8	43,4	67,2	93,9	-	20,1	27,8	34,3	48,0	67,1	-

Recommended loads

		Non-cracked concrete						Cracked concrete					
Anchor size		**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Tensile N_{rec}[c]	[kN]	11,2	14,1	17,2	24,0	33,5	44,1	4,8	7,6	12,3	17,1	24,0	31,5
Shear V_{rec}[c]													
HSL-3, HSL-3-B, HSL-3-SK[a], HSL-3-SH[a]	[kN]	17,8	28,1	34,3	48,0	67,1	88,2	14,3	20,1	24,5	34,3	47,9	63,0
HSL-3-G[b]	[kN]	14,9	19,9	31,0	48,0	67,1	-	14,3	19,9	24,5	34,3	47,9	-

a) HSL-3-SK and HSL-3-SH is only available up to M12
b) HSL-3-G is only available up to M20
c) With overall partial safety factor for action γ = 1,4. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

Materials

Mechanical properties of HSL-3, HSL-3-G, HSL-3-B, HSL-3-SH, HSL-3-SK

Anchor size		M8	M10	M12	M16	M20	M24
Nominal tensile strength f_{uk}	[N/mm²]	800	800	800	800	830	830
Yield strength f_{yk}	[N/mm²]	640	640	640	640	640	640
Stressed cross-section A_s	[mm²]	36,6	58,0	84,3	157	245	353
Moment of resistance W	[mm³]	31,3	62,5	109,4	277,1	540,6	935,4
Design bending resistance without sleeve $M_{Rd,s}$	[Nm]	24,0	48,0	84,0	212,8	415,2	718,4

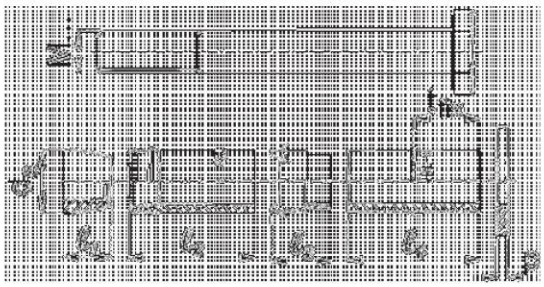
Material quality

Part	Material
Bolt, threaded rod	steel strength 8.8, galvanised to min. 5 µm

Anchor dimensions

Dimensions of HSL-3, HSL-3-G, HSL-3-B, HSL-3-SH, HSL-3-SK

Anchor version	Thread size	t_{fix} [mm]		d_s [mm]	ℓ_1 [mm]	ℓ_2 [mm]	ℓ_3 [mm]	ℓ_4 [mm]		p [mm]
		min	max					min	max	
HSL-3 HSL-3-G	M8	5	200	11,9	12	32	15,2	19	214	2
	M10	5	200	14,8	14	36	17,2	23	218	3
HSL-3 HSL-3-G HSL-3-B	M12	5	200	17,6	17	40	20	28	223	3
	M16	10	200	23,6	20	54,4	24,4	34,5	224,5	4
	M20	10	200	27,6	20	57	31,5	51	241	4
HSL-3 HSL-3-B	M24	10	200	31,6	22	65	39	57	247	4
HSL-3-SH	M8	5		11,9	12	32	15,2	19		2
	M10	20		14,8	14	36	17,2	38		3
	M12	25		17,6	17	40	20	48		3
HSL-3-SK	M8	10	20	11,9	12	32	15,2	18,2	28,2	2
	M10	20		14,8	14	36	17,2	32,2		3
	M12	25		17,6	17	40	20	40		3

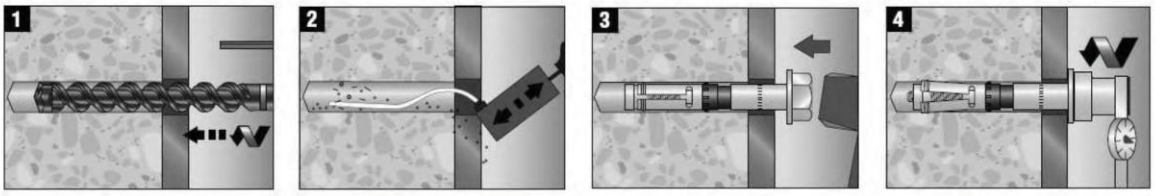


Setting

installation equipment

Anchor size	M8	M10	M12	M16	M20	M24
Rotary hammer	TE2 – TE16			TE40 – TE70		
Other tools	hammer, torque wrench, blow out pump					

Setting instruction

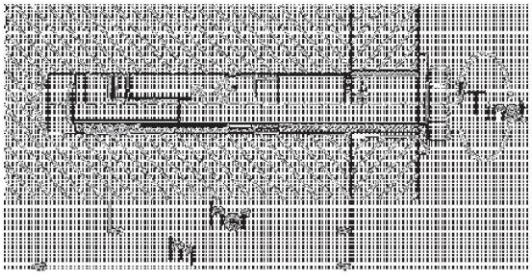


Drill hole. | Blow out dust and fragments. | Install anchor. | Apply tightening torque (for HSL-3-B: no torque wrench is needed)

For detailed information on installation see instruction for use given with the package of the product.

For technical data for anchors in diamond drilled holes please contact the Hilti Technical advisory service.

Setting details: depth of drill hole h_1 and effective anchorage depth h_{ef}



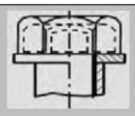
Setting details HSL-3

Anchor version HSL-3			M8	M10	M12	M16	M20	M24
Nominal diameter of drill bit	d_o	[mm]	12	15	18	24	28	32
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	12,5	15,5	18,5	24,55	28,55	32,7
Depth of drill hole	$h_1 \geq$	[mm]	80	90	105	125	155	180
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	14	17	20	26	31	35
Effective anchorage depth	h_{ef}	[mm]	60	70	80	100	125	150
Torque moment	T_{inst}	[Nm]	25	50	80	120	200	250
Width across	SW	[mm]	13	17	19	24	30	36

Setting details HSL-3-G

Anchor version HSL-3-G			M8	M10	M12	M16	M20
Nominal diameter of drill bit	d_o	[mm]	12	15	18	24	28
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	12,5	15,5	18,5	24,55	28,55
Depth of drill hole	$h_1 \geq$	[mm]	80	90	105	125	155
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	14	17	20	26	31
Effective anchorage depth	h_{ef}	[mm]	60	70	80	100	125
Torque moment	T_{inst}	[Nm]	20	35	60	80	160
Width across	SW	[mm]	13	17	19	24	30

Setting details HSL-3-B

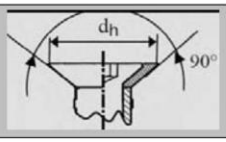
Anchor version HSL-3-B			M12	M16	M20	M24
Nominal diameter of drill bit	d_o	[mm]	18	24	28	32
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	18,5	24,55	28,55	32,7
Depth of drill hole	$h_1 \geq$	[mm]	105	125	155	180
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	20	26	31	35
Effective anchorage depth	h_{ef}	[mm]	80	100	125	150
Width across	SW	[mm]	24	30	36	41

The torque moment is controlled by the safety cap

Setting details HSL-3-SH

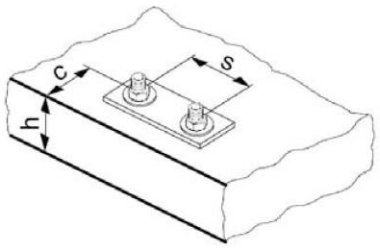
Anchor version HSL-3-SH			M8	M10	M12
Nominal diameter of drill bit	d_o	[mm]	12	15	18
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	12,5	15,5	18,5
Depth of drill hole	$h_1 \geq$	[mm]	85	95	110
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	14	17	20
Effective anchorage Depth	h_{ef}	[mm]	60	70	80
Torque moment	T_{inst}	[Nm]	25	35	60
Width across	SW	[mm]	6	8	10

Setting details HSL-3-SK

Anchor version HSL-3-SK			M8	M10	M12
Nominal diameter of drill bit	d_o	[mm]	12	15	18
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	12,5	15,5	18,5
Depth of drill hole	$h_1 \geq$	[mm]	80	90	105
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	14	17	20
Diameter of countersunk hole in the fixture	$d_h =$	[mm]	22,5	25,5	32,9
Effective anchorage Depth	h_{ef}	[mm]	60	70	80
Torque moment	T_{inst}	[Nm]	25	50	80
Size of hexagon socket screw key	SW	[mm]	5	6	8

Setting parameters

Anchor size			M8	M10	M12	M16	M20	M24
Minimum base material thickness	h_{min}	[mm]	120	140	160	200	250	300
Minimum spacing	s_{min}	[mm]	60	70	80	100	125	150
	for c ≥	[mm]	100	100	160	240	300	300
Minimum edge distance	c_{min}	[mm]	60	70	80	100	150	150
	for s ≥	[mm]	100	160	240	240	300	300
Critical spacing for splitting failure	$s_{cr,sp}$	[mm]	230	270	300	380	480	570
Critical edge distance for splitting failure	$c_{cr,sp}$	[mm]	115	135	150	190	240	285
Critical spacing for concrete cone failure	$s_{cr,N}$	[mm]	180	210	240	300	375	450
Critical edge distance for concrete cone failure	$c_{cr,N}$	[mm]	90	105	120	150	187,5	225



For spacing (edge distance) smaller than critical spacing (critical edge distance) the design loads have to be reduced.

Critical spacing and critical edge distance for splitting failure apply only for non-cracked concrete. For cracked concrete only the critical spacing and critical edge distance for concrete cone failure are decisive.

Simplified design method

Simplified version of the design method according ETAG 001, Annex C. Design resistance according data given in ETA-02/0042, issue 2008-01-10.

- Influence of concrete strength
- Influence of edge distance
- Influence of spacing
- Valid for a group of two anchors. (The method may also be applied for anchor groups with more than two anchors or more than one edge. The influencing factors must then be considered for each edge distance and spacing. The calculated design loads are then on the save side: They will be lower than the exact values according ETAG 001, Annex C. To avoid this, it is recommended to use the anchor design software PROFIS anchor)

The design method is based on the following simplification:

- No different loads are acting on individual anchors (no eccentricity)

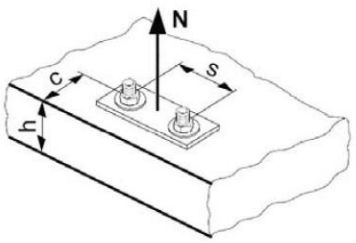
The values are valid for one anchor.

For more complex fastening applications please use the anchor design software PROFIS Anchor.

Tension loading

The design tensile resistance is the lower value of

- Steel resistance: $N_{Rd,s}$
- Concrete pull-out resistance: $N_{Rd,p} = N^0_{Rd,p} \cdot f_B$
- Concrete cone resistance: $N_{Rd,c} = N^0_{Rd,c} \cdot f_B \cdot f_{1,N} \cdot f_{2,N} \cdot f_{3,N} \cdot f_{re,N}$
- Concrete splitting resistance (only non-cracked concrete):
  $N_{Rd,sp} = N^0_{Rd,c} \cdot f_B \cdot f_{1,sp} \cdot f_{2,sp} \cdot f_{3,sp} \cdot f_{h,sp} \cdot f_{re,N}$



Basic design tensile resistance

Design steel resistance $N_{Rd,s}$

Anchor size		M8	M10	M12	M16	M20	M24
$N_{Rd,s}$	[kN]	19,5	30,9	44,9	83,7	130,7	188,3

Design pull-out resistance $N_{Rd,p} = N^0_{Rd,p} \cdot f_B$ (only M8, M10 in cracked concrete)

		Non-cracked concrete						Cracked concrete					
Anchor size		M8	M10	M12	M16	M20	M24	M8	M10	M12	M16	M20	M24
$N^0_{Rd,p}$	[kN]	No pull-out failure						6,7	10,7	No pull-out failure			

Design concrete cone resistance $N_{Rd,c} = N^0_{Rd,c} \cdot f_B \cdot f_{1,N} \cdot f_{2,N} \cdot f_{3,N} \cdot f_{re,N}$
Design splitting resistance [a] $N_{Rd,sp} = N^0_{Rd,c} \cdot f_B \cdot f_{1,sp} \cdot f_{2,sp} \cdot f_{3,sp} \cdot f_{h,sp} \cdot f_{re,N}$

		Non-cracked concrete						Cracked concrete					
Anchor size		M8	M10	M12	M16	M20	M24	M8	M10	M12	M16	M20	M24
$N^0_{Rd,c}$	[kN]	15,6	19,7	24,0	33,6	47,0	61,7	11,2	14,1	17,2	24,0	33,5	44,1

a) Splitting resistance must only be considered for non-cracked concrete

Influencing factors

Influence of concrete strength

Concrete strength designation (ENV 206)	C 20/25	C 25/30	C 30/37	C 35/45	C 40/50	C 45/55	C 50/60
$f_B = (f_{ck,cube}/25N/mm^2)^{1/2}$ a)	1	1,1	1,22	1,34	1,41	1,48	1,55

a) $f_{ck,cube}$ = concrete compressive strength, measured on cubes with 150 mm side length

Influence of edge distance a)

$c/c_{cr,N}$ / $c/c_{cr,sp}$	0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9	1
$f_{1,N} = 0,7 + 0,3 \cdot c/c_{cr,N} \le 1$	0,73	0,76	0,79	0,82	0,85	0,88	0,91	0,94	0,97	1
$f_{1,sp} = 0,7 + 0,3 \cdot c/c_{cr,sp} \le 1$										
$f_{2,N} = 0,5 \cdot (1 + c/c_{cr,N}) \le 1$	0,55	0,60	0,65	0,70	0,75	0,80	0,85	0,90	0,95	1
$f_{2,sp} = 0,5 \cdot (1 + c/c_{cr,sp}) \le 1$										

a) The edge distance shall not be smaller than the minimum edge distance c_{min} given in the table with the setting details. These influencing factors must be considered for every edge distance.

Influence of anchor spacing a)

$s/s_{cr,N}$ / $s/s_{cr,sp}$	0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9	1
$f_{3,N} = 0,5 \cdot (1 + s/s_{cr,N}) \le 1$	0,55	0,60	0,65	0,70	0,75	0,80	0,85	0,90	0,95	1
$f_{3,sp} = 0,5 \cdot (1 + s/s_{cr,sp}) \le 1$										

a) The anchor spacing shall not be smaller than the minimum anchor spacing s_{min} given in the table with the setting details. This influencing factor must be considered for every anchor spacing.

Influence of base material thickness

h/h_{ef}	2,0	2,2	2,4	2,6	2,8	3,0	3,2	3,4	3,6	≥ 3,68
$f_{h,sp} = [h/(2 \cdot h_{ef})]^{2/3}$	1	1,07	1,13	1,19	1,25	1,31	1,37	1,42	1,48	1,5

Influence of reinforcement

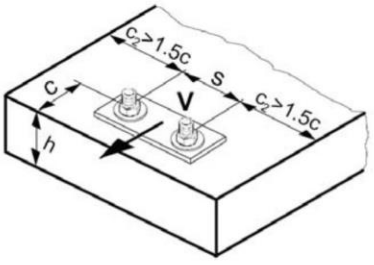
Anchor size	M8	M10	M12	M16	M20	M24
$f_{re,N} = 0,5 + h_{ef}/200mm \le 1$	0,8 a)	0,85 a)	0,9 a)	1	1	1

a) This factor applies only for dense reinforcement. If in the area of anchorage there is reinforcement with a spacing ≥ 150 mm (any diameter) or with a diameter ≤ 10 mm and a spacing ≥ 100 mm, then a factor $f_{re,N} = 1$ may be applied.

Shear loading

The design shear resistance is the lower value of

- Steel resistance: $V_{Rd,s}$
- Concrete pryout resistance: $V_{Rd,cp} = k \cdot N_{Rd,c}$
- Concrete edge resistance: $V_{Rd,c} = V^0_{Rd,c} \cdot f_B \cdot f_{ß} \cdot f_h \cdot f_4 \cdot f_{hef} \cdot f_c$



Basic design shear resistance

Design steel resistance $V_{Rd,s}$

Anchor size		M8	M10	M12	M16	M20	M24
$V_{Rd,s}$	HSL-3, HSL-3-B, HSL-3-SK[a], HSL-3-SH[a] [kN]	24,9	39,4	57,4	80,9	113,5	141,9
	HSL-3-G [kN]	20,9	27,8	43,4	68,6	113,5	-

a) HSL-3-SK and HSL-3-SH is only available up to M12

Design concrete pryout resistance $V_{Rd,cp} = k \cdot N_{Rd,c}$ [a)]

Anchor size	M8	M10	M12	M16	M20	M24
k	1,8			2,0		

a) $N_{Rd,c}$: Design concrete cone resistance

Design concrete edge resistance [a)] $V_{Rd,c} = V^0_{Rd,c} \cdot f_B \cdot f_{ß} \cdot f_h \cdot f_4 \cdot f_{hef} \cdot f_c$

	Non-cracked concrete						Cracked concrete					
Anchor size	M8	M10	M12	M16	M20	M24	M8	M10	M12	M16	M20	M24
$V^0_{Rd,c}$ [kN]	11,7	16,9	22,9	36,8	47,7	59,7	8,3	12,0	16,2	26,1	33,8	42,3

a) For anchor groups only the anchors close to the edge must be considered.

Influencing factors

Influence of concrete strength

Concrete strength designation (ENV 206)	C 20/25	C 25/30	C 30/37	C 35/45	C 40/50	C 45/55	C 50/60
$f_B = (f_{ck,cube}/25N/mm^2)^{1/2}$ a)	1	1,1	1,22	1,34	1,41	1,48	1,55

a) $f_{ck,cube}$ = concrete compressive strength, measured on cubes with 150 mm side length

Influence of angle between load applied and the direction perpendicular to the free edge

Angle ß	0°	10°	20°	30°	40°	50°	60°	70°	80°	≥ 90°
$f_\beta = \frac{1}{\sqrt{(\cos\alpha_V)^2 + \left(\frac{\sin\alpha_V}{2,5}\right)^2}}$ 	1	1,01	1,05	1,13	1,24	1,40	1,64	1,97	2,32	2,50

Influence of base material thickness

h/c	0,15	0,3	0,45	0,6	0,75	0,9	1,05	1,2	1,35	≥ 1,5
$f_h = \{h/(1,5 \cdot c)\}^{1/2} \le 1$	0,32	0,45	0,55	0,63	0,71	0,77	0,84	0,89	0,95	1,00

Influence of anchor spacing and edge distance [a] for concrete edge resistance: f_4

$f_4 = (c/h_{ef})^{1,5} \cdot (1 + s / [3 \cdot c]) \cdot 0,5$

c/h_{ef}	Single anchor	Group of two anchors s/h_{ef}														
		0,75	1,50	2,25	3,00	3,75	4,50	5,25	6,00	6,75	7,50	8,25	9,00	9,75	10,50	11,25
0,50	0,35	0,27	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35
0,75	0,65	0,43	0,54	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65
1,00	1,00	0,63	0,75	0,88	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
1,25	1,40	0,84	0,98	1,12	1,26	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40
1,50	1,84	1,07	1,22	1,38	1,53	1,68	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84
1,75	2,32	1,32	1,49	1,65	1,82	1,98	2,15	2,32	2,32	2,32	2,32	2,32	2,32	2,32	2,32	2,32
2,00	2,83	1,59	1,77	1,94	2,12	2,30	2,47	2,65	2,83	2,83	2,83	2,83	2,83	2,83	2,83	2,83
2,25	3,38	1,88	2,06	2,25	2,44	2,63	2,81	3,00	3,19	3,38	3,38	3,38	3,38	3,38	3,38	3,38
2,50	3,95	2,17	2,37	2,57	2,77	2,96	3,16	3,36	3,56	3,76	3,95	3,95	3,95	3,95	3,95	3,95
2,75	4,56	2,49	2,69	2,90	3,11	3,32	3,52	3,73	3,94	4,15	4,35	4,56	4,56	4,56	4,56	4,56
3,00	5,20	2,81	3,03	3,25	3,46	3,68	3,90	4,11	4,33	4,55	4,76	4,98	5,20	5,20	5,20	5,20
3,25	5,86	3,15	3,38	3,61	3,83	4,06	4,28	4,51	4,73	4,96	5,18	5,41	5,63	5,86	5,86	5,86
3,50	6,55	3,51	3,74	3,98	4,21	4,44	4,68	4,91	5,14	5,38	5,61	5,85	6,08	6,31	6,55	6,55
3,75	7,26	3,87	4,12	4,36	4,60	4,84	5,08	5,33	5,57	5,81	6,05	6,29	6,54	6,78	7,02	7,26
4,00	8,00	4,25	4,50	4,75	5,00	5,25	5,50	5,75	6,00	6,25	6,50	6,75	7,00	7,25	7,50	7,75
4,25	8,76	4,64	4,90	5,15	5,41	5,67	5,93	6,18	6,44	6,70	6,96	7,22	7,47	7,73	7,99	8,25
4,50	9,55	5,04	5,30	5,57	5,83	6,10	6,36	6,63	6,89	7,16	7,42	7,69	7,95	8,22	8,49	8,75
4,75	10,35	5,45	5,72	5,99	6,27	6,54	6,81	7,08	7,36	7,63	7,90	8,17	8,45	8,72	8,99	9,26
5,00	11,18	5,87	6,15	6,43	6,71	6,99	7,27	7,55	7,83	8,11	8,39	8,66	8,94	9,22	9,50	9,78
5,25	12,03	6,30	6,59	6,87	7,16	7,45	7,73	8,02	8,31	8,59	8,88	9,17	9,45	9,74	10,02	10,31
5,50	12,90	6,74	7,04	7,33	7,62	7,92	8,21	8,50	8,79	9,09	9,38	9,67	9,97	10,26	10,55	10,85

a) The anchor spacing and the edge distance shall not be smaller than the minimum anchor spacing s_{min} and the minimum edge distance c_{min}.

Influence of embedment depth

Anchor size	M8	M10	M12	M16	M20	M24
$f_{hef} = 0,05 \cdot (h_{ef} / d)^{1,68}$	0,75	0,67	0,61	0,55	0,62	0,67

Influence of edge distance [a]

c/d	4	6	8	10	15	20	30	40
$f_c = (d / c)^{0,19}$	0,77	0,71	0,67	0,65	0,60	0,57	0,52	0,50

a) The edge distance shall not be smaller than the minimum edge distance c_{min}.

Combined tension and shear loading

For combined tension and shear loading see section “Anchor Design”.

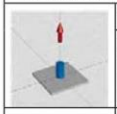
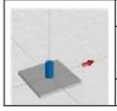
Precalculated values

Design resistance calculated according ETAG 001, Annex C and data given in ETA-02/0042, issue 2008-01-10. All data applies to concrete C 20/25 – $f_{ck,cube}$ =25 N/mm². HSL-3-SK and HSL-3-SH is only available up to M12.

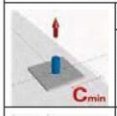
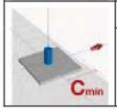
Recommended loads can be calculated by dividing the design resistance by an overall partial safety factor for action γ = 1,4. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

Design resistance

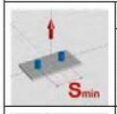
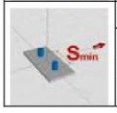
Single anchor, no edge effects

			Non-cracked concrete						Cracked concrete					
Anchor size			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Min. base material thickness h_{min} [mm]			120	140	160	200	250	300	120	140	160	200	250	300
	**Tensile N_{Rd}**													
	HSL-3, HSL-3-B, HSL-3-S), HSL-3-SH HSL-3-G	[kN]	15,6	19,7	24,0	33,6	47,0	61,7	6,7	10,7	17,2	24,0	33,5	44,1
	**Shear V_{Rd}, without lever arm**													
	HSL-3, HSL-3-B, HSL-3-SK, HSL-3-SH	[kN]	24,9	39,4	48,1	67,2	93,9	123,5	20,1	28,1	34,3	48,0	67,1	88,2
	HSL-3-G	[kN]	20,9	27,8	43,4	67,2	93,9	-	20,1	27,8	34,3	48,0	67,1	-

Single anchor, min. edge distance ($c = c_{min}$)

			Non-cracked concrete						Cracked concrete					
Anchor size			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Min. base material thickness h_{min} [mm]			120	140	160	200	250	300	120	140	160	200	250	300
Min. edge distance c_{min} [mm]			60	70	80	100	125	150	60	70	80	100	125	150
	**Tensile N_{Rd}**													
	HSL-3, HSL-3-B, HSL-3-SK, HSL-3-SH HSL-3-G	[kN]	10,2	12,8	15,9	22,0	33,9	40,4	6,7	10,5	12,9	18,0	28,4	33,1
	**Shear V_{Rd}, without lever arm**													
	HSL-3, HSL-3-B, HSL-3-SK, HSL-3-SH HSL-3-G	[kN]	6,4	8,4	10,6	15,5	28,1	30,0	4,5	5,9	7,5	11,0	19,9	21,3

Double anchor, no edge effects, min. spacing ($s = s_{min}$), (load values are valid for one anchor)

			Non-cracked concrete						Cracked concrete					
Anchor size			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Min. base material thickness h_{min} [mm]			120	140	160	200	250	300	120	140	160	200	250	300
Min. spacing s_{min} [mm]			60	70	80	100	125	150	60	70	80	100	125	150
	**Tensile N_{Rd}**													
	HSL-3, HSL-3-B, HSL-3-SK, HSL-3-SH HSL-3-G	[kN]	9,8	12,4	15,2	21,2	29,6	39,0	6,7	9,4	11,4	16,0	22,4	29,4
	**Shear V_{Rd}, without lever arm**													
	HSL-3, HSL-3-B, HSL-3-SK, HSL-3-SH HSL-3-G	[kN]	18,7	26,2	32,1	44,8	62,6	82,3	13,4	18,7	22,9	32,0	44,7	58,8

PL30 01 R A

POLARIS 30 SERIES

Hydraulic Gear Pumps and Motors

Replaces edition: 10.1995

PRESSURE

Max. continuous	3625 psi (250 bar)
Max. intermittent	3900 psi (270 bar)
Max. peak	4060 psi (280 bar)

DISPLACEMENT

From	1.33 in^3/rev (21,89 cm^3/rev)
To	5.53 in^3/rev (90,66 cm^3/rev)

BSI REGISTERED FIRM
ISO 9001
FM 27654
SINCE MARCH 1994

SPEED

Min. speed	350 rpm
Max. speed	3000 rpm

POLARIS 30 gear pumps and motors meet a wide range of mobile and industrial applications. SAE and EUROPEAN mounting flanges and cast iron covers with extruded aluminum body houses single piece gear, journal, shaft assemblies with a pressure balancing system that provides the highest volumetric and overall efficiencies available. Exceptionally large bearings make possible longer life at high pressure. A complete range of drive shafts in spline, parallel keyed, and tapered versions to meet all SAE and EUROPEAN standards.

Edition: 02.1998

	POLARIS pump size	POLARIS motor size	Theoretical displacement		Min. (1) speed	Max. (1) speed	Max. (2) continuous pressure p_1		Pump flow (3) @ 1800 rpm @ p1	Motor torque (4) @ 100 psi	Approx. weight	
			in^3/rev	cm^3/rev	rpm	rpm	psi	bar	US gpm	lbf in	kg	lb
POLARIS 30	**PLP 30-22**	**PLM 30-22**	1.33	21.89	350	3000	3625	250	9.83	18.36	11.00	24.26
	PLP 30-27	**PLM 30-27**	1.62	26.58	350	3000	3625	250	11.94	22.30	11.10	24.47
	PLP 30-34	**PLM 30-34**	2.09	34.39	350	3000	3480	240	15.45	28.84	11.20	24.70
	PLP 30-38	**PLM 30-38**	2.35	38.53	350	3000	3480	240	17.31	32.31	11.30	24.92
	PLP 30-43	**PLM 30-43**	2.67	43.77	350	3000	3300	230	19.66	36.71	11.55	25.47
	PLP 30-51	**PLM 30-51**	3.15	51.59	350	2500	3040	210	23.42	43.26	11.80	26.02
	PLP 30-61	**PLM 30-61**	3.72	60.97	350	2500	2755	190	27.97	51.13	12.00	26.46
	PLP 30-73	**PLM 30-73**	4.48	73.47	350	2500	2465	170	33.35	61.61	12.50	27.56
	PLP 30-82	**PLM 30-82**	4.96	81.29	350	2200	2320	160	36.90	68.17	12.70	28.00
	PLP 30-90	**PLM 30-90**	5.53	90.66	350	2200	2175	150	42.02	76.03	13.00	28.66

(1) Minimum speeds can be reduced, maximum speeds can be increased. For specific operating conditions consult CASAPPA technical dept. for recommendations and approval.
(2) Significantly higher intermittent pressures are allowed. Consult catalog or contact CASAPPA technical dept.
(3) Flow shown is minimum allowed for production pump at rated pressure with 10 wt oil at 110° Fahrenheit and can be used to calculate minimum volumetric efficiency under these conditions.
(4) Indicated torque is obtained by considering the average mechanical efficiency.
Please contact your CASAPPA distributor for further assistance.

CASAPPA®
FLUID POWER DESIGN

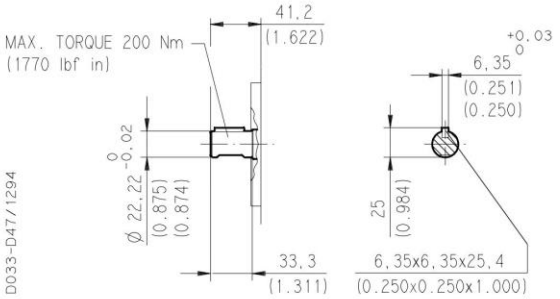
SHAFT OPTIONS

SAE "B" STRAIGHT — 32

Mounting flange availability:

S5						

Dimensions refer to flange code **S5**

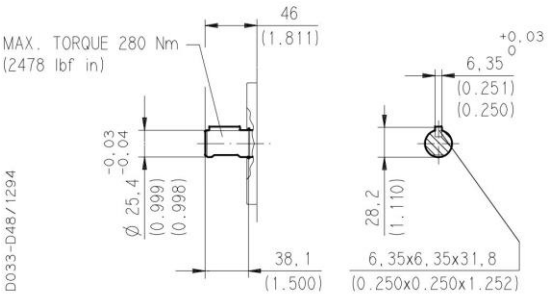


SAE "B-B" STRAIGHT — 33

Mounting flange availability:

S5						

Dimensions refer to flange code **S5**

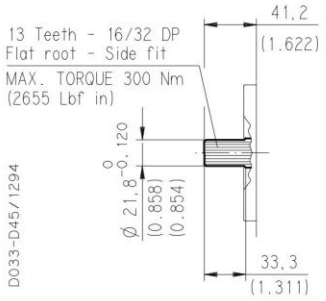


SAE "B" SPLINE — 04

Mounting flange availability:

S5						

Dimensions refer to flange code **S5**

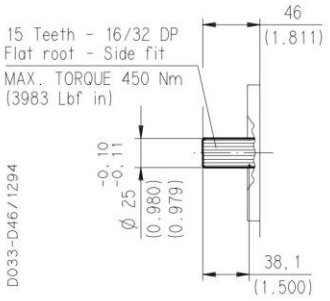


SAE "B-B" SPLINE — 05

Mounting flange availability:

S5						

Dimensions refer to flange code **S5**



SAE "B" SPLINE (Special) — A8

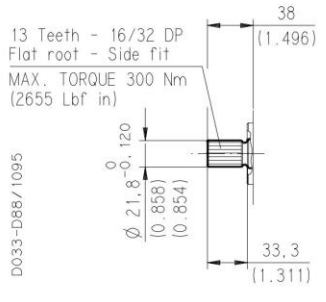
Not available with size:

30-82	30-90					

Mounting flange availability:

E3						

Dimensions refer to flange code **E3**



STRAIGHT — 41

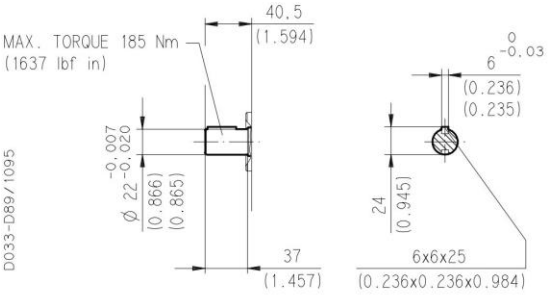
Not available with size:

30-82	30-90					

Mounting flange availability:

E3	E4					

Dimensions refer to flange code **E3**



Replaces: D033-001/10.95

D033-001/02.98

SHAFT OPTIONS

EUROPEAN TAPERED 1:8 — 83

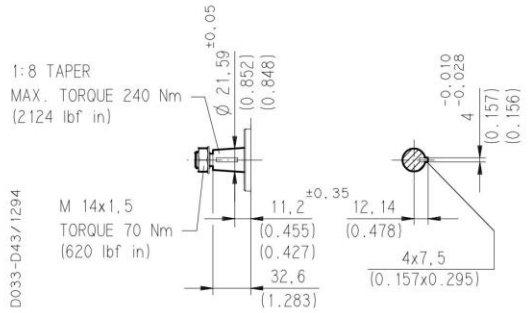
Not available with size:

30-82	30-90					

Mounting flange availability:

E3						

Dimensions refer to flange code **E3**



GERMAN TAPERED 1:5 — 56

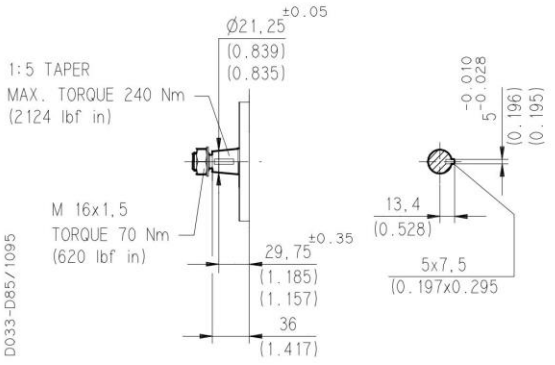
Not available with size:

30-61	30-73	30-82	30-90			

Mounting flange availability:

B3						

Dimensions refer to flange code **B3**



EUROPEAN TAPERED 1:8 — 84

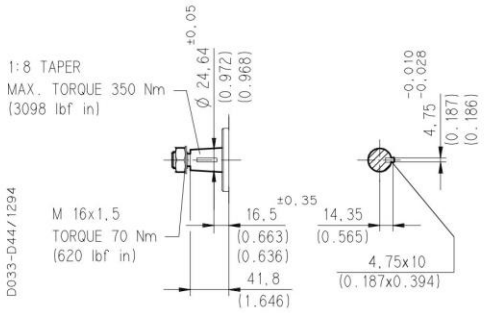
Not available with size:

30-22	30-27	30-34	30-38			

Mounting flange availability:

E4						

Dimensions refer to flange code **E4**

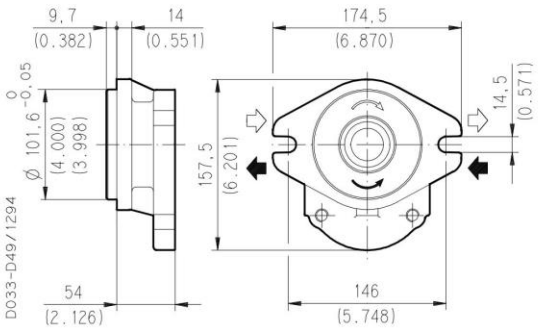


Replaces: D033-001/10.95

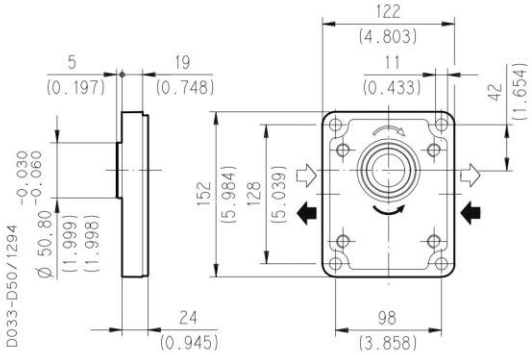
D033-001/02.98

MOUNTING FLANGE OPTIONS

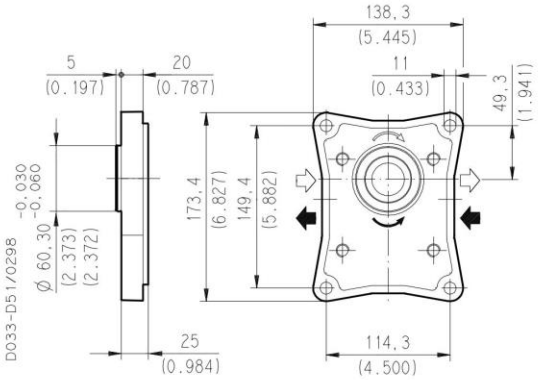
SAE "B" 2 BOLT — S5



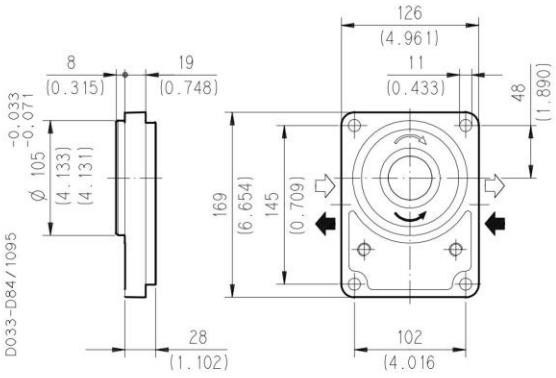
EUROPEAN RECTANGULAR — E3



EUROPEAN RECTANGULAR — E4



GERMAN RECTANGULAR — B3



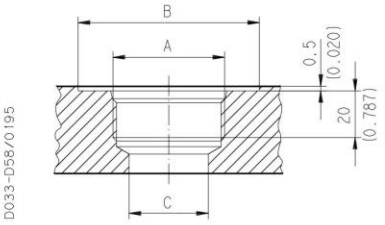
Replaces: D033-001/10.95

D033-001/02.98

PORT OPTIONS

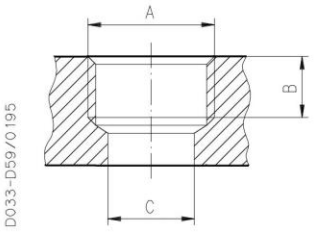
SAE STRAIGHT THREAD PORTS O-RING BOSS

CODE	NOMINAL SIZE	A	B	C
			mm (in)	mm (in)
OD	5/8	1-1/16-12 UN-2B	41 (1.614)	19 (0.748)
OF	1	1-5/16-12 UN-2B	49 (1.929)	27 (1.063)
OG	1-1/4	1-5/8-12 UN-2B	58 (2.283)	32 (1.260)
OH	1-1/2	1-7/8-12 UN-2B	65 (2.559)	32 (1.260)



BSPP STRAIGHT THREAD PORTS

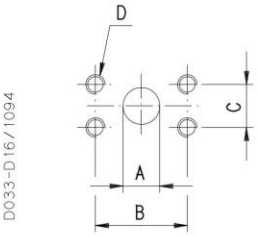
CODE	NOMINAL SIZE	A	B	C
			mm (in)	mm (in)
GF	1	G 1	22 (0.866)	27 (1.063)
GG	1-1/4	G 1-1/4	22 (0.866)	33 (1.299)
GH	1-1/2	G 1-1/2	24 (0.945)	38 (1.496)



METRIC SAE SPLIT PORTS SAE J518 C (STANDARD PRESSURE SERIES)

D033-001/10.95

CODE	NOMINAL SIZE	A	B	C	D
		mm (in)	mm (in)	mm (in)	Thread Depth mm (in)
MA	1/2	12,5 (0.492)	38,1 (1.500)	17,5 (0.689)	M 8 22 (0.866)
MB	3/4	19 (0.748)	47,6 (1.874)	22,2 (0.874)	M 10 22 (0.866)
MC	1	25,4 (1.000)	52,4 (2.063)	26,2 (1.031)	
MD	1 1/4	30,5 (1.201)	58,7 (2.311)	30,2 (1.189)	
ME	1 1/2	39,3 (1.547)	69,8 (2.748)	35,7 (1.406)	M 12 22 (0.866)
MF	2	51 (2.008)	77,8 (3.063)	42,9 (1.689)	

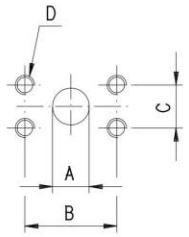


PORT OPTIONS

SAE SPLIT PORTS SAE J518 C (STANDARD PRESSURE SERIES)

CODE	NOMINAL SIZE	A	B	C	D
		mm (in)	mm (in)	mm (in)	Thread Depth mm (in)
SA	1/2	12,5 (0.492)	38,1 (1.500)	17,5 (0.689)	5/16-18 UNC-2B 22 (0.866)
SB	3/4	19 (0.748)	47,6 (1.874)	22,2 (0.874)	3/8-16 UNC-2B 22 (0.866)
SC	1	25,4 (1.000)	52,4 (2.063)	26,2 (1.031)	
SD	1 1/4	30,5 (1.201)	58,7 (2.311)	30,2 (1.189)	7/16-14 UNC-2B 22 (0.866)
SE	1 1/2	39,3 (1.547)	69,8 (2.748)	35,7 (1.406)	1/2-13 UNC-2B 22 (0.866)
SF	2	51 (2.008)	77,8 (3.063)	42,9 (1.689)	

D033-D16/1094

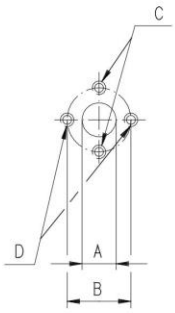


Replaces: D033-001/10.95

EUROPEAN 4 BOLT FLANGE

CODE	A	B	C	D
	mm (in)	mm (in)	Thread Depth mm (in)	Thread Depth mm (in)
EB	19 (0.748)	40 (1.575)	M 8 18 (0.709)	M 8 18 (0.709)
ED	27 (1.063)	51 (2.008)	M 10 18 (0.709)	M 10 18 (0.709)
EF	33 (1.299)	62 (2.441)	M12 10 (0.394)	M12 18 (0.709)

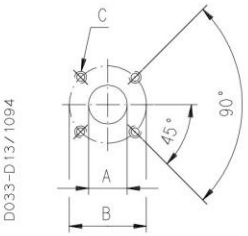
D033-D96/0298



EUROPEAN 4 BOLT FLANGE

CODE	A	B	C
	mm (in)	mm (in)	Thread Depth mm (in)
BL	19 (0.748)	55 (2.165)	M 8 18 (0.709)
BM	27 (1.063)	55 (2.165)	M 8 18 (0.709)

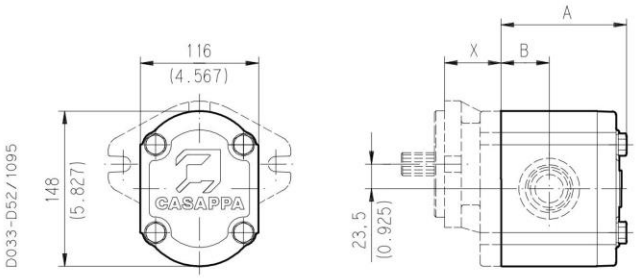
D033-D13/1094



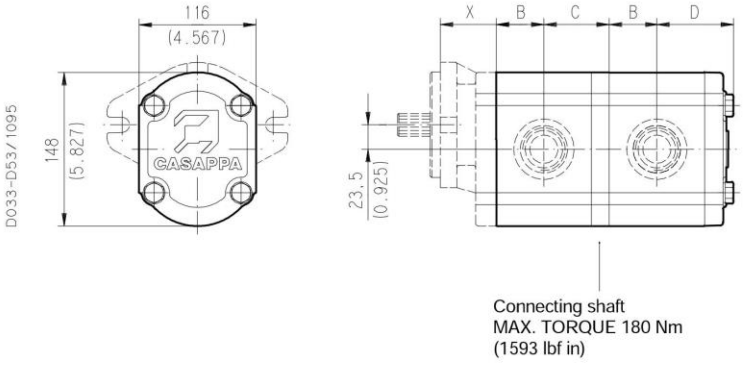
D033-001/02.98

DIMENSIONS

Single pumps and motors



Multiple pumps same groups PLP 30/30



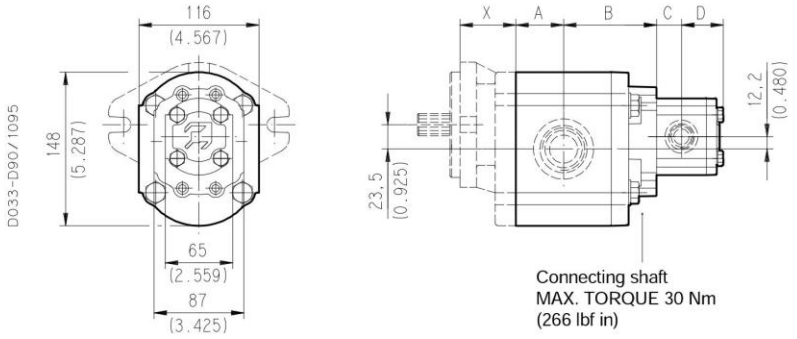
Note: For **X** dimension see mounting flanges at page 4.

D033-001/10.95

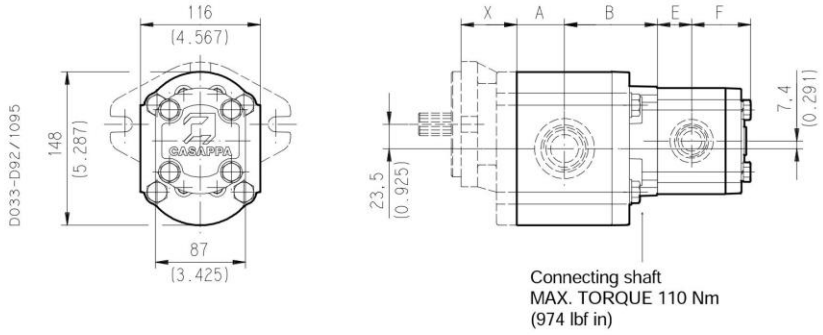
Pump size	Motor size	A		B		C		D	
		mm	(in)	mm	(in)	mm	(in)	mm	(in)
PLP 30-22	**PLM 30-22**	106	(4.173)	39	(1.535)	56	(2.205)	67	(2.638)
PLP 30-27	**PLM 30-27**	109	(4.291)	40,5	(1.594)	57,5	(2.264)	68,5	(2.697)
PLP 30-34	**PLM 30-34**	114	(4.488)	43	(1.693)	60	(2.362)	71	(2.795)
PLP 30-38	**PLM 30-38**	117	(4.606)	44,5	(1.752)	61,5	(2.421)	72,5	(2.854)
PLP 30-43	**PLM 30-43**	120	(4.724)	46	(1.811)	63	(2.480)	74	(2.913)
PLP 30-51	**PLM 30-51**	125	(4.921)	48,5	(1.909)	65,5	(2.579)	76,5	(3.012)
PLP 30-61	**PLM 30-61**	131	(5.157)	51,5	(2.028)	68,5	(2.697)	79,5	(3.130)
PLP 30-73	**PLM 30-73**	139	(5.472)	55,5	(2.185)	72,5	(2.854)	83,5	(3.287)
PLP 30-82	**PLM 30-82**	144	(5.669)	58	(2.283)	75	(2.953)	86	(3.386)
PLP 30-90	**PLM 30-90**	150	(5.906)	61	(2.402)	78	(3.071)	89	(3.504)

MULTIPLE PUMPS DIFFERENT GROUPS DIMENSIONS

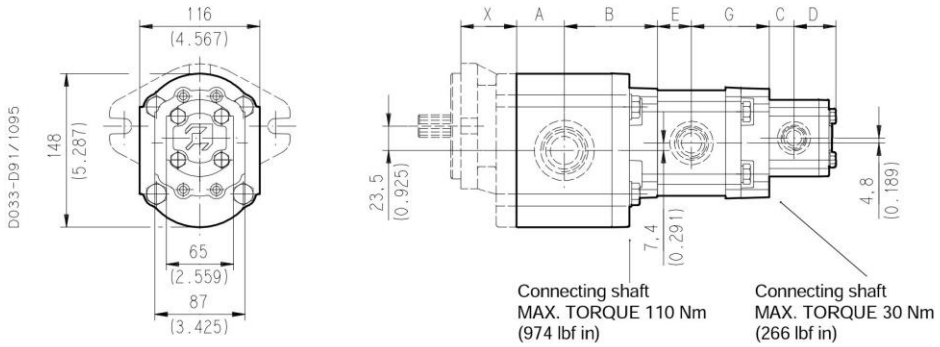
PLP 30/10



PLP 30/20



PLP 30/20/10



D033-001/10.95

MULTIPLE PUMPS DIFFERENT GROUPS DIMENSIONS

Polaris 30

Pump size	A		B	
	mm	(in)	mm	(in)
PLP 30-22	39	(1.535)	83	(3.268)
PLP 30-27	40,5	(1.594)	84,5	(3.327)
PLP 30-34	43	(1.693)	87	(3.425)
PLP 30-38	44,5	(1.752)	88,5	(3.484)
PLP 30-43	46	(1.811)	90	(3.543)
PLP 30-51	48,5	(1.909)	92,5	(3.642)
PLP 30-61	51,5	(2.028)	95,5	(3.760)
PLP 30-73	55,5	(2.185)	99,5	(3.917)
PLP 30-82	58	(2.283)	102	(4.016)
PLP 30-90	61	(2.402)	105	(4.134)

Polaris 10

Pump size (1)	C		D	
	mm	(in)	mm	(in)
PLP 10-1	17,6	(0.693)	34,1	(1.343)
PLP 10-2	19,2	(0.756)	35,7	(1.406)
PLP 10-3,15	21	(0.827)	37,5	(1.476)
PLP 10-4	22,4	(0.882)	38,9	(1.531)
PLP 10-5	24	(0.945)	40,5	(1.594)
PLP 10-6,3	26	(1.024)	42,5	(1.673)
PLP 10-8	28,8	(1.134)	45,3	(1.783)
PLP 10-10	32	(1.260)	48,5	(1.909)

Polaris 20

Pump size (1)	E		F		G	
	mm	(in)	mm	(in)	mm	(in)
PLP 20-4	25,8	(1.016)	49,3	(1.941)	67,8	(2.669)
PLP 20-6,3	27	(1.063)	50,5	(1.988)	69	(2.717)
PLP 20-8	28,3	(1.114)	51,8	(2.039)	70,3	(2.768)
PLP 20-9	28,9	(1.138)	52,4	(2.063)	70,9	(2.791)
PLP 20-11,2	30,5	(1.201)	54	(2.126)	72.5	(2.854)
PLP 20-14	33	(1.299)	56,5	(2.224)	75	(2.953)
PLP 20-16	34,8	(1.370)	58,3	(2.295)	76,8	(3.024)
PLP 20-20	38	(1.496)	61,5	(2.421)	80	(3.150)
PLP 20-25	42	(1.654)	65,5	(2.579)	84	(3.307)
PLP 20-31,5	47	(1.850)	70,5	(2.776)	89	(3.504)

(1) Technical data of POLARIS 10 and 20 are shown in the respective catalogues.

D033-001/10.95

HOW TO ORDER SINGLE PUMPS AND MOTORS

1	2	3		4	5		6	7		8		9
PLP 30-34	S	0	–	04	S5	–	L	OF/OD	–	N	–	H

1 Size		PUMP CODE	MOTOR CODE
in^3/rev	cm^3/rev		
1.33	21.89	PLP 30-22	PLM 30-22
1.62	26.58	PLP 30-27	PLM 30-27
2.09	34.39	PLP 30-34	PLM 30-34
2.35	38.53	PLP 30-38	PLM 30-38
2.67	43.77	PLP 30-43	PLM 30-43
3.15	51.59	PLP 30-51	PLM 30-51
3.72	60.97	PLP 30-61	PLM 30-61
4.48	73.47	PLP 30-73	PLM 30-73
4.96	81.29	PLP 30-82	PLM 30-82
5.53	90.66	PLP 30-90	PLM 30-90

2 Rotation	CODE
Left	S
Right	D

3 Version	CODE
No outboard bearing	0

4 Drive shaft	CODE
SAE "B" straight	32
SAE "B-B" straight	33
SAE "B" spline	04
SAE "B-B" spline	05
SAE "B" spline (special)	08
Straight	41
European tapered 1:8	83
European tapered 1:8	84
German tapered 1:5	56

5 Mounting flange	CODE
SAE "B" 2 bolt	S5
European rectangular (50,8 mm pilot, 98x128 mm bolt pattern)	E3
European rectangular (60,3 mm pilot, 114,3x149,4 mm bolt pattern)	E4
German rectangular (105 mm pilot, 102x145 mm bolt pattern)	B3

6 Ports position	CODE
Side	L

7 Inlet/outlet ports		CODE
SAE STRAIGHT THREAD PORTS O-RING BOSS		
Series and size		Side ports
PLP 30 / PLM 30	22 - 27 - 34	OF/OD
		OD/OF
PLP 30 / PLM 30	38 - 43 - 51	OG/OF
		OF/OG
PLP 30 / PLM 30	61 - 73 - 82 - 90	OH/OG
		OG/OH

CODE	7 Inlet/outlet ports	
BSPP STRAIGHT THREAD PORTS		
Side ports	Series and size	
GF/GF	PLP 30 / PLM 30	22 - 27 - 34 - 38 - 43 - 51
GG/GF	PLP 30	61 - 73
GF/GG	PLM 30	
GH/GG	PLP 30	82 - 90
GG/GH	PLM 30	
METRIC SAE SPLIT PORTS SAE J518 C		
Side ports	Series and size	
MB/MA	PLP 30 / PLM 30	22
MA/MB		
MC/MB	PLP 30	27 - 34
MB/MC	PLM 30	
MD/MC	PLP 30	38 - 43 - 51
MC/MD	PLM 30	
ME/MD	PLP 30	61 - 73 - 82
MD/ME	PLM 30	
MF/ME	PLP 30	90
ME/MF	PLM 30	
SAE SPLIT PORTS SAE J518 C		
Side ports	Series and size	
SB/SA	PLP 30 / PLM 30	22
SA/SB		
SC/SB	PLP 30	27 - 34
SB/SC	PLM 30	
SD/SC	PLP 30	38 - 43 - 51
SC/SD	PLM 30	
SE/SD	PLP 30	61 - 73 - 82
SD/SE	PLM 30	
SF/SE	PLP 30	90
SE/SF	PLM 30	
EUROPEAN 4 BOLT FLANGE		
Side ports	Series and size	
ED/EB	PLP 30	22 - 27 - 34 - 38 - 43 - 51 - 61 (mounting flange E3)
EB/ED	PLM 30	
ED/ED	PLP 30	43 - 51 (mounting flange E4)
ED/ED	PLM 30	
EF/ED	PLP 30	73 (mounting flange E3 - E4)
ED/EF	PLM 30	61 - 82 - 90 (mounting flange E4)
GERMAN 4 BOLT FLANGE		
Side ports	Series and size	
BM/BL	PLP 30 / PLM 30	22 - 27 - 34 - 38 - 43 - 51
BL/BM		

CODE	8 Seals
N	Buna (standard)
V	Viton

CODE	9 Shaft seal options
C	High back pressure seal with wiper seal
D	Standard seal with wiper seal
H	High back pressure seal

Replaces: D033-001/10.95
D033-001/02.98

HOW TO ORDER MULTIPLE PUMPS

DOUBLE PUMPS

1		2	3		4	5		1		4	5		6		7		8
PLP 30-34	–	04	S5	–	L	OF/OD	/	30-34	–	L	OF/OD	–	S	–	N	–	
Front section								Rear section									

Replaces: D033-001/10.95

1 Pump size		CODE
in^3/rev	cm^3/rev	
1.33	21.89	PLP 30-22
1.62	26.58	PLP 30-27
2.09	34.39	PLP 30-34
2.35	38.53	PLP 30-38
2.67	43.77	PLP 30-43
3.15	51.59	PLP 30-51
3.72	60.97	PLP 30-61
4.48	73.47	PLP 30-73
4.96	81.29	PLP 30-82
5.53	90.66	PLP 30-90

2 Drive shaft	CODE
SAE "B" straight	32
SAE "B-B" straight	33
SAE "B" spline	04
SAE "B-B" spline	05
SAE "B" spline (special)	08
Straight	41
European tapered 1:8	83
European tapered 1:8	84
German tapered 1:5	56

3 Mounting flange	CODE
SAE "B" 2 bolt	S5
European rectangular (50,8 mm pilot, 98x128 mm bolt pattern)	E3
European rectangular (60,3 mm pilot, 114,3x149,4 mm bolt pattern)	E4
German rectangular (105 mm pilot, 102x145 mm bolt pattern)	B3

4 Ports position	CODE
Side	L

D033-001/02.98

5 Inlet/outlet ports		CODE
SAE STRAIGHT THREAD PORTS O-RING BOSS		
Series and size		Side ports
PLP 30	22 - 27 - 34	OF/OD
PLP 30	38 - 43 - 51	OG/OF
PLP 30	61 - 73 - 82 - 90	OH/OG

CODE	5 Inlet/outlet ports	
BSPP STRAIGHT THREAD PORTS		
Side ports	Series and size	
GF/GF	PLP 30	22 - 27 - 34 - 38 - 43 - 51
GG/GF	PLP 30	61 - 73
GH/GG	PLP 30	82 - 90
METRIC SAE SPLIT PORTS SAE J518 C		
Side ports	Series and size	
MB/MA	PLP 30	22
MC/MB	PLP 30	22 - 27 - 34
MD/MC	PLP 30	38 - 46 - 51
ME/MD	PLP 30	61 - 73 - 82
MF/ME	PLP 30	90
SAE SPLIT PORTS SAE J518 C		
Side ports	Series and size	
SB/SA	PLP 30	22
SC/SB	PLP 30	27 - 34
SD/SC	PLP 30	38 - 46 - 51
SE/SD	PLP 30	61 - 73 - 82
SF/SE	PLP 30	90
EUROPEAN 4 BOLT FLANGE		
Side ports	Series and size	
ED/EB	PLP 30	22 - 27 - 34 - 38 - 43 - 51 - 61 (mounting flange E3)
ED/ED	PLP 30	43 - 51 (mounting flange E4)
EF/ED	PLP 30	73 (mounting flange E3 and E4) 61 - 82 - 90 (mounting flange E4)
GERMAN 4 BOLT FLANGE		
Side ports	Series and size	
BM/BL	PLP 30	22 - 27 - 34 - 38 - 43 - 51

CODE	6 Rotation
S	Left
D	Right

CODE	7 Seals
N	Buna (standard)
V	Viton

CODE	8 Special covers
L	Cast iron mounting flange and aluminum rear cover **(b)**

(a) Technical data of POLARIS 10 and 20 are shown in the respective catalogue.

(b) Only for multiple pumps different groups.

TRIPLE PUMPS

1		2	3		4	5		1		4	5		1		4	5		6		7		8
PLP30-34	–	04	S5	–	L	OF/OD	/	30-34	–	L	OF/OD	/	30-34	–	L	OF/OD	–	S	–	N	–	
Front section								Intermediate section					Rear sections									

ORDER EXAMPLE

SINGLE PUMPS AND MOTORS

Standard pump	PLP 30-34 S 0-04 S5-L OF/OD-N
Standard motor	PLM 30-34 S 0-04 S5-L OD/OF-N
Pump with special features	PLM 30-34 S 0-04 S5-L OD/OF-N-C

DOUBLE PUMPS

Standard double pump same groups	PLP 30-34 04 S5-LOF/OD / 30-34 L OF/OD-S-N
Standard double pump different groups	PLP 30-34 04 S5-LOF/OD / 10-2 L OB/OA-S-N
Double pump with special features	PLP 30-34 04 S5-LOF/OD / 10-2 L OB/OA-S-N-L

TRIPLE PUMPS

Standard triple pump same groups	PLP 30-34 04 S5-L OF/OD / 30-34 L OF/OD / 30-34 L OF/OD-S-N
Standard triple pump different groups	PLP 30-34 04 S5-L OF/OD / 20-8 L OC/OC / 10-2 L OB/OA-S-N
Triple pump with special features	PLP 30-34 04 S5-L OF/OD / 20-8 L OC/OC / 10-2 L OB/OA-S-N-L

Replaces: D033-001/10.95

D033-001/02.98

CASAPPA®
FLUID POWER DESIGN

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e-mail: info@casappa.com

PL10 01 R A

POLARIS 10 SERIES

Hydraulic Gear Pumps and Motors

Replaces edition: 10.1995

PRESSURE

Max. continuous	3770 psi (260 bar)
Max. intermittent	4060 psi (280 bar)
Max. peak	4350 psi (300 bar)

BSI REGISTERED FIRM
ISO 9001
FM 27654
SINCE MARCH 1994

DISPLACEMENT

From	0.06 in^3/rev (1 cm^3/rev)
To	0.60 in^3/rev (9,9 cm^3/rev)

SPEED

Min. speed	650 rpm
Max. speed	4000 rpm

POLARIS 10 gear pumps and motors meet a wide range of mobile and industrial applications. SAE and EUROPEAN mounting flanges and rear covers are available in both cast iron and aluminum for reduced weight. The extruded aluminum body houses single piece gear, journal, shaft assemblies with a pressure balancing system that provides the highest volumetric and overall efficiencies available. Exceptionally large bearings make possible longer life at high pressure. A complete range of drive shafts in spline, parallel keyed, and tapered versions to meet all SAE, and EUROPEAN standards.

	POLARIS pump size	POLARIS motor size	Theoretical displacement		Min. (1) speed	Max. (1) speed	Max. (2) continuous pressure p_1		Pump flow (3) @ 1800 rpm @ p1	Motor torque (4) @ 100 psi	Approx. (5) weight	
			in^3/rev	cm^3/rev	rpm	rpm	psi	bar	US gpm	lbf in	kg	lb
POLARIS 10	**PLP 10-1**	**PLM 10-1**	0.06	1	650	4000	3770	260	0.46	0.84	1.40	3.09
	PLP 10-1,5 (6)	**PLM 10-1,5 (6)**	0.09	1.5	650	4000	3770	260	0.69	1.26	1.45	3.20
	PLP 10-2	**PLM 10-2**	0.12	2	650	4000	3770	260	0.92	1.68	1.50	3.31
	PLP 10-2,5 (6)	**PLM 10-2,5 (6)**	0.15	2.5	650	4000	3770	260	1.15	2.10	1.52	3.35
	PLP 10-3,15	**PLM 10-3,15**	0.19	3.1	650	4000	3770	260	1.42	2.60	1.54	3.40
	PLP 10-4	**PLM 10-4**	0.24	4	650	4000	3625	250	1.84	3.35	1.58	3.48
	PLP 10-5	**PLM 10-5**	0.30	4.9	650	4000	3625	250	2.25	4.10	1.65	3.64
	PLP 10-5,8 (7)	**PLM 10-5,8 (7)**	0.35	5.8	650	3500	3300	230	2.67	4.86	1.70	3.75
	PLP 10-6,3	**PLM 10-6,3**	0.38	6.2	650	3500	3300	230	2.85	5.20	1.73	3.81
	PLP 10-8	**PLM 10-8**	0.48	7.9	650	3500	2610	180	3.69	6.62	1.80	3.97
	PLP 10-10	**PLM 10-10**	0.60	9.9	650	3500	2030	140	4.64	8.30	1.90	4.19

Edition: 01.1998

(1) Minimum speeds can be reduced, maximum speeds can be increased. For specific operating conditions consult CASAPPA technical dept. for recommendations and approval.
(2) Significantly higher intermittent pressures are allowed. Consult catalog or contact CASAPPA technical dept.
(3) Flow shown is minimum allowed for production pump at rated pressure with 10 wt oil at 110° Fahrenheit and can be used to calculate minimum volumetric efficiency under these conditions.
(4) Indicated torque is obtained by considering the average mechanical efficiency.
(5) Weight shown is for pump and motor with cast iron end-covers. There is a weight reduction for aluminum covers.
(6) Available only for single units with shaft code 81.
(7) Available only for single units with shafts code 81 and 86.
Please contact your CASAPPA distributor for further assistance.

CASAPPA®
FLUID POWER DESIGN

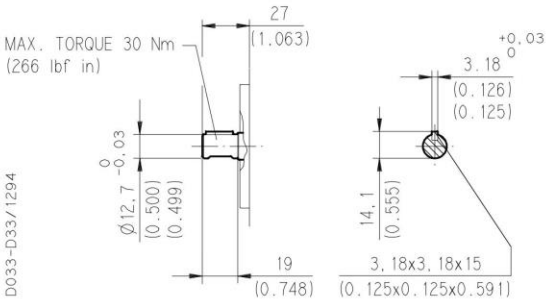
SHAFT OPTIONS

SAE "A-A" STRAIGHT — 30

Mounting flange availability:

S0	R9	R8	B1	K2		

Dimensions refer to flange code **S0**

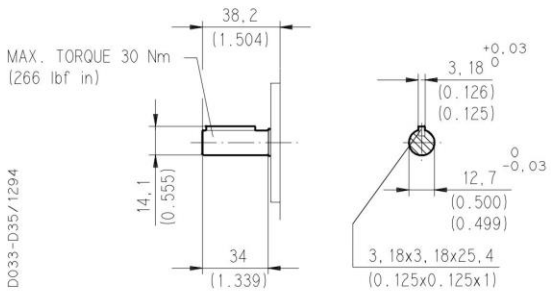


SAE STRAIGHT — 36

Mounting flange availability:

R8	R9	W9				

Dimensions refer to flange code **R8**

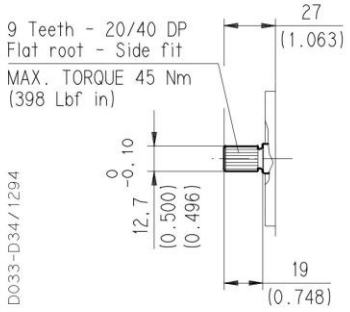


SAE "A-A" SPLINE — 02

Mounting flange availability:

R9	R8	B1	K2			

Dimensions refer to flange code **R9**

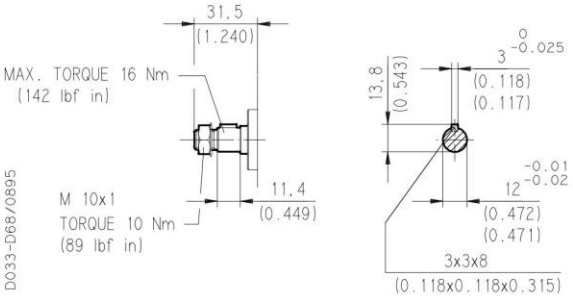


STRAIGHT — 29

Mounting flange availability:

E8	E1	E7				

Dimensions refer to flange code **E8**

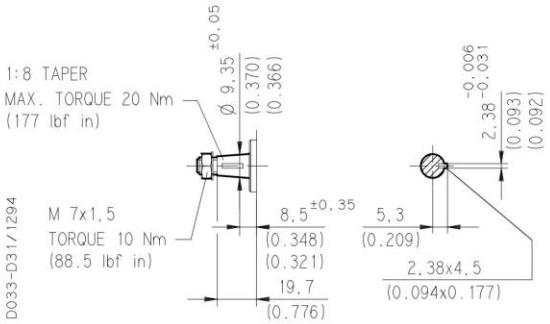


EUROPEAN TAPERED 1:8 — 81

Mounting flange availability:

E1						

Dimensions refer to flange code **E1**

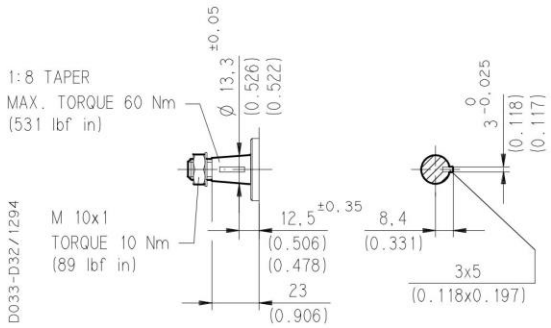


EUROPEAN TAPERED 1:8 — 86

Mounting flange availability:

E7	E1	E8				

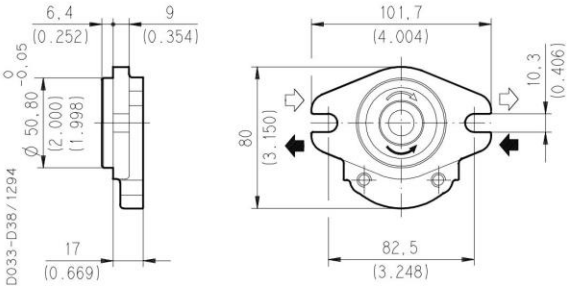
Dimensions refer to flange code **E7**



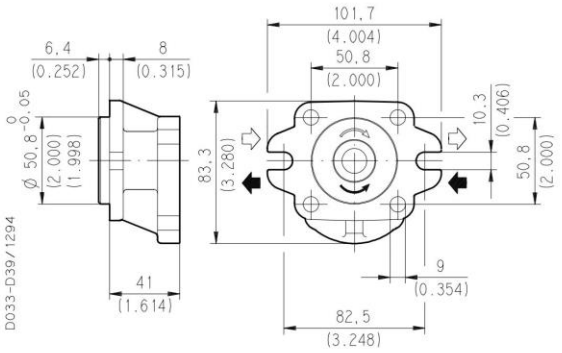
D033-001/10.95

MOUNTING FLANGE OPTIONS

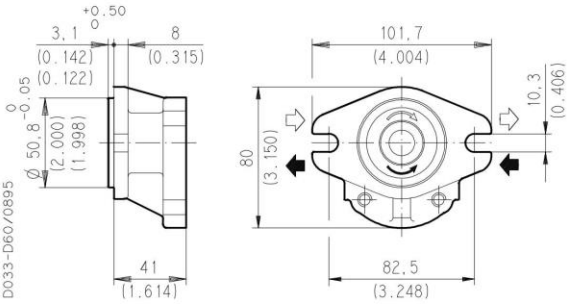
SAE "A-A" 2 BOLT — S0



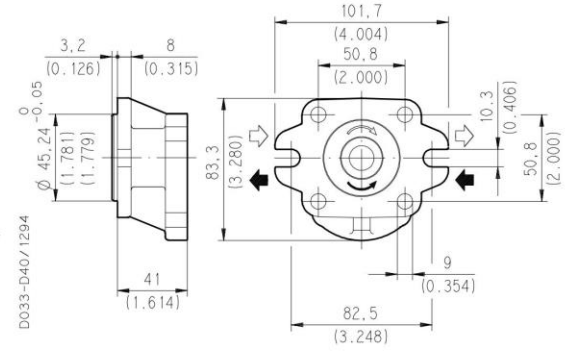
SAE "A-A" 2-4 BOLT — R9



SAE 2 BOLT — W9



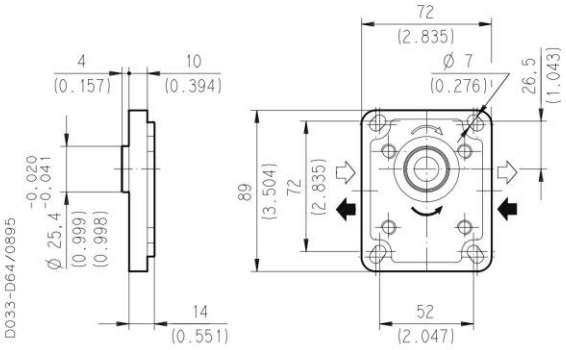
SAE 2-4 BOLT — R8



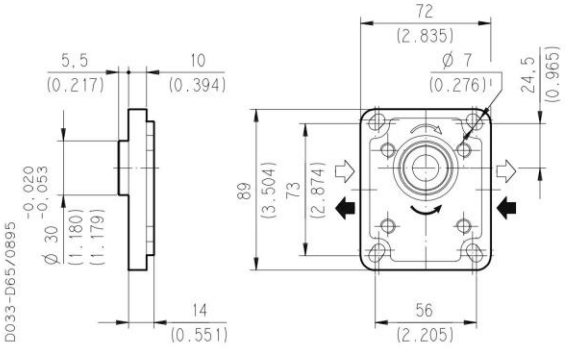
D033-001/10.95

MOUNTING FLANGE OPTIONS

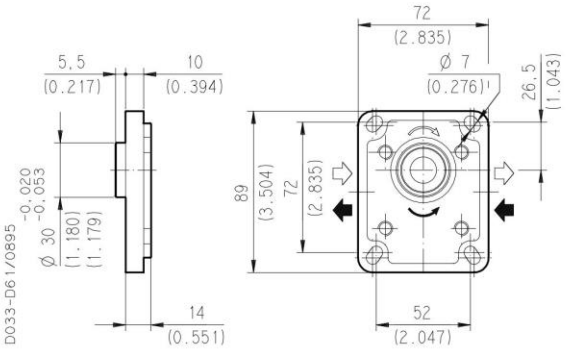
EUROPEAN RECTANGULAR — E1



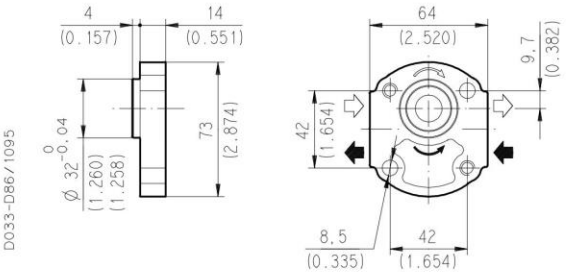
EUROPEAN RECTANGULAR — E7



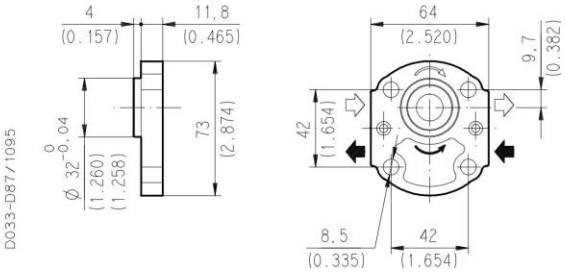
EUROPEAN RECTANGULAR — E8



THROUGH 2 BOLTS (32 mm pilot) — B1



THROUGH 4 BOLTS (32 mm pilot) — K2



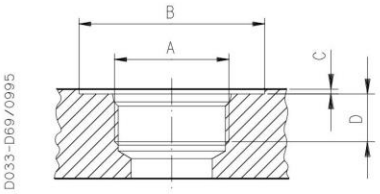
D033-001/10.95

PORT OPTIONS

Replaces: D033-001/10.95

SAE STRAIGHT THREAD PORTS O-RING BOSS

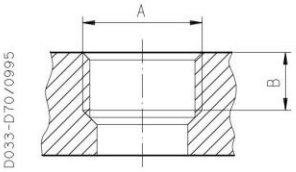
CODE	NOMINAL SIZE	A	B	C	D
			mm (in)	mm (in)	mm (in)
03 (·)	1/4	7/16-20 UNF-2B	21 (0.827)	0,5 (0.020)	14 (0.551)
OA (·)	3/8	9/16-18 UNF-2B	26 (1.024)	0,5 (0.020)	15 (0.591)
OB	1/2	3/4-16 UNF-2B	32 (1.260)	0,5 (0.020)	15 (0.591)
OC	5/8	7/8-14 UNF-2B	35 (1.378)	0,5 (0.020)	17 (0.669)



D033-D69/0995

BSPP STRAIGHT THREAD PORTS

CODE	NOMINAL SIZE	A	B
			mm (in)
GA (·)	1/8	G 1/8	11 (0.433)
GC	3/8	G 3/8	14 (0.551)
GD	1/2	G 1/2	14 (0.551)

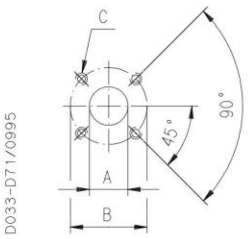


D033-D70/0995

GERMAN 4 BOLT FLANGE

D033-001/01.98

CODE	A	B	C
	mm (in)	mm (in)	Thread Depth mm (in)
BA	8 (0.315)	30 (1.181)	M 6 12 (0.472)
BB	13 (0.512)	30 (1.181)	M 6 12 (0.472)

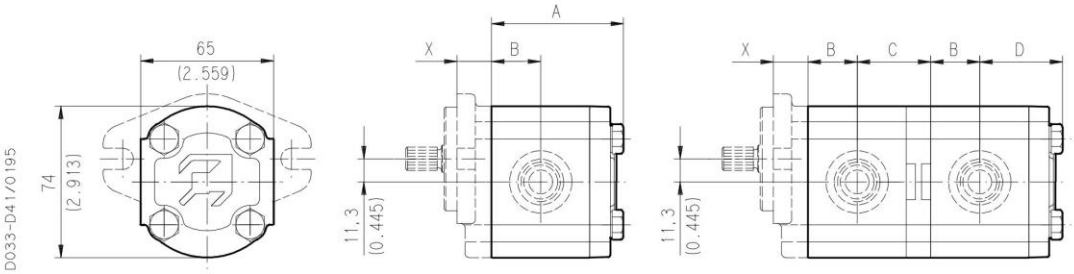


D033-D71/0995

(·): Drain ports options.

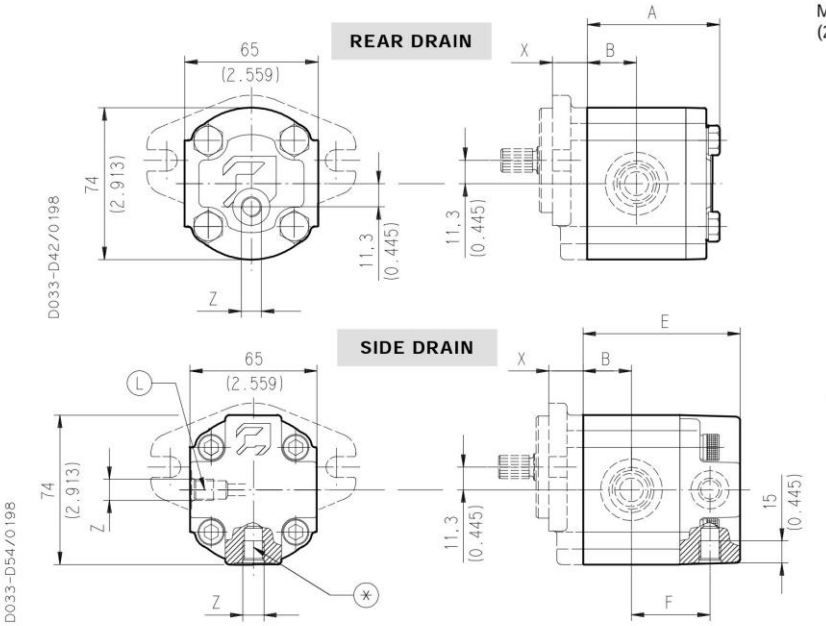
SIDE PORTS PUMPS AND MOTORS DIMENSIONS

Unidirectional and bidirectional rotation with internal drain



Connecting shaft
MAX. TORQUE 30 Nm
(266 lbf in)

Bidirectional rotation with external drain



Drain port position
L= Side
✶= Bottom

Note:
X Dimension: see mounting flanges at pages 3 and 4.
Z Dimension: see ports options at page 5.

Pump size	Motor size	A (*)		B		C		D		E		F	
		mm	(in)	mm	(in)	mm	(in)	mm	(in)	mm	(in)	mm	(in)
PLP 10-1	**PLM 10-1**	51,7	(2.035)	17,6	(0.693)	29,6	(1.165)	34,1	(1.343)	65,2	(2.567)	32,6	(1.283)
PLP 10-1,5	**PLM 10-1,5**	53,3	(2.098)	18,4	(0.724)					66,8	(2.630)	33,4	(1.315)
PLP 10-2	**PLM 10-2**	54,9	(2.161)	19,2	(0.756)	31,2	(1.228)	35,7	(1.406)	68,4	(2.693)	34,2	(1.346)
PLP 10-2,5	**PLM 10-2,5**	56,5	(2.224)	20	(0.787)					70	(2.756)	35	(1.378)
PLP 10-3,15	**PLM 10-3,15**	58,5	(2.303)	21	(0.827)	33	(1.299)	37,5	(1.476)	72	(2.835)	36	(1.417)
PLP 10-4	**PLM 10-4**	61,3	(2.413)	22,4	(0.882)	34,4	(1.354)	38,9	(1.531)	74,8	(2.945)	37,4	(1.472)
PLP 10-5	**PLM 10-5**	64,5	(2.539)	24	(0.945)	36	(1.417)	40,5	(1.594)	78	(3.071)	39	(1.535)
PLP 10-5,8	**PLM 10-5,8**	67,1	(2.642)	25,3	(0.996)					80,6	(3.173)	40,3	(1.587)
PLP 10-6,3	**PLM 10-6,3**	68,5	(2.697)	26	(1.024)	38	(1.496)	42,5	(1.673)	82	(3.228)	41	(1.614)
PLP 10-8	**PLM 10-8**	74	(2.913)	28,8	(1.134)	40,8	(1.606)	45,2	(1.780)	87,5	(3.445)	43,8	(1.724)
PLP 10-10	**PLM 10-10**	80,5	(3.169)	32	(1.260)	44	(1.732)	48,5	(1.909)	94	(3.701)	47	(1.850)

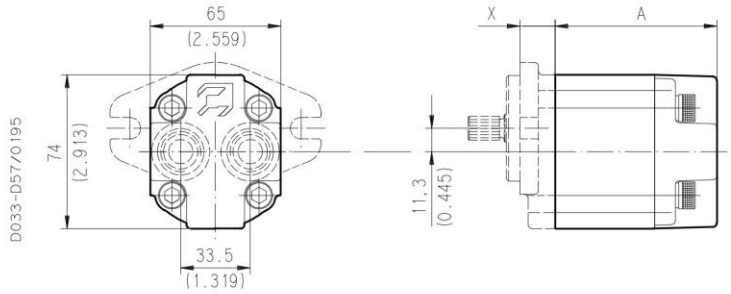
(*) For bidirectional rotation with internal drain pumps and motors, A dimension is replaced by E dimension.

Replaces: D033-001/10.95
D033-001/01.98

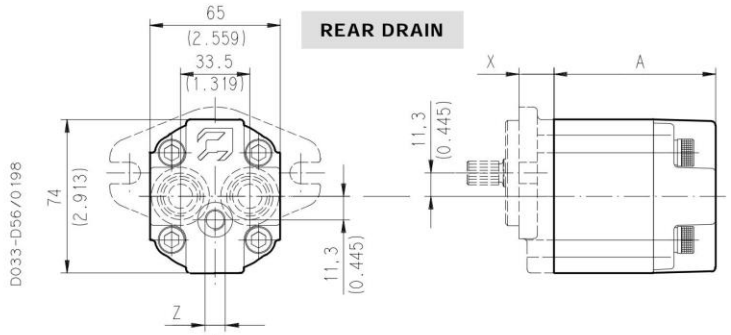
REAR PORTS PUMPS AND MOTORS DIMENSIONS

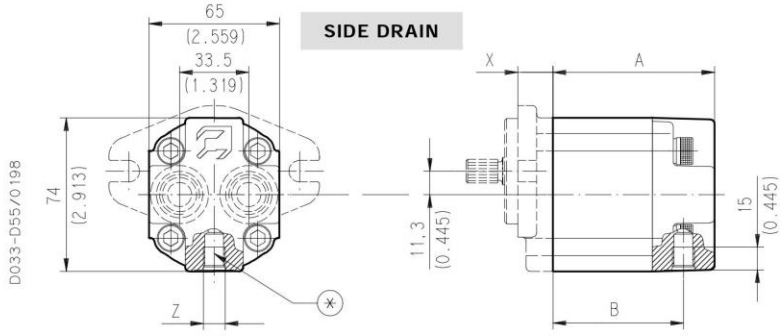
Replaces: D033-001/10.95

Unidirectional and bidirectional rotation with internal drain



Bidirectional rotation with external drain





Drain port position

✶= Bottom

Note:

X Dimension: see mounting flanges at pages 3 and 4.

Z Dimension: see ports options at page 5.

Pump size	Motor size	A		B	
		mm	(in)	mm	(in)
PLP 10-1	**PLM 10-1**	65,2	(2.567)	50,2	(1.976)
PLP 10-1,5	**PLM 10-1,5**	66,8	(2.630)	51,8	(2.039)
PLP 10-2	**PLM 10-2**	68,4	(2.693)	53,4	(2.102)
PLP 10-2,5	**PLM 10-2,5**	70	(2.756)	55	(2.165)
PLP 10-3,15	**PLM 10-3,15**	72	(2.835)	57	(2.244)
PLP 10-4	**PLM 10-4**	74,8	(2.945)	59,8	(2.354)
PLP 10-5	**PLM 10-5**	78	(3.071)	63	(2.480)
PLP 10-5,8	**PLM 10-5,8**	80,6	(3.173)	65,6	(2.583)
PLP 10-6,3	**PLM 10-6,3**	82	(3.228)	67	(2.638)
PLP 10-8	**PLM 10-8**	87,5	(3.445)	72,5	(2.854)
PLP 10-10	**PLM 10-10**	94	(3.701)	79	(3.110)

D033-001/01.98

MAX. PRESSURE RELIEF VALVE FIXED SETTING

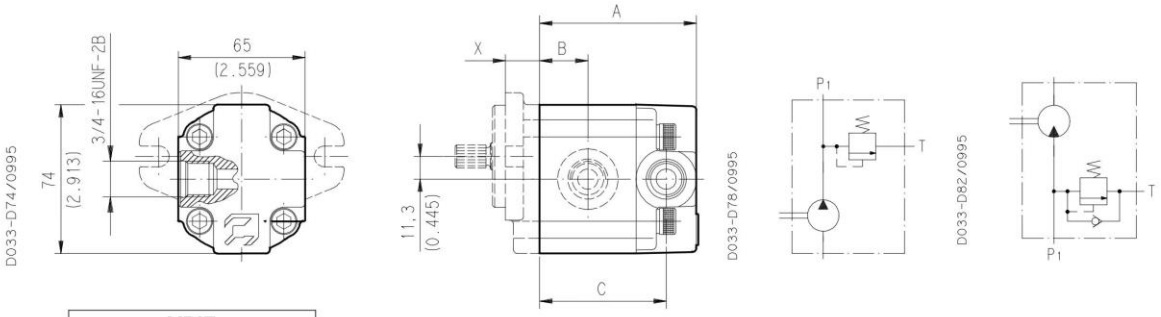
VPEF | **35**

Valve type:
VPEF:Fixed setting valve with external drain
VPIF:Fixed setting valve with internal drain

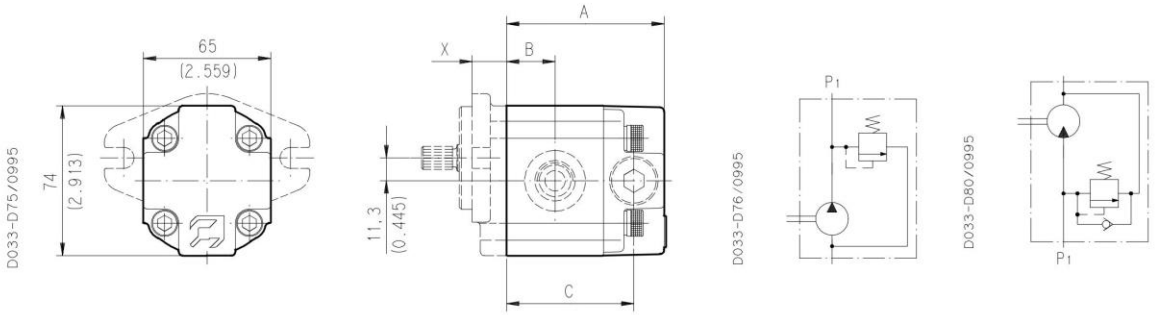
Fixed setting pressure value [bar]:
(see table below)

	FIXED SETTING PRESSURE VALUE																		
bar	17	35	44	50	80	100	120	125	140	150	160	175	190	210	250	280	300	330	350
psi	247	508	638	725	1160	1450	1740	1813	2030	2175	2320	2538	2755	3045	3625	4060	4350	4785	5075

VPEF



VPIF



Pump size	Motor size	A		B		C	
		mm	(in)	mm	(in)	mm	(in)
PLP 10-1	**PLM 10-1**	65,2	(2.567)	17,6	(0.693)	50,2	(1.976)
PLP 10-1,5	**PLM 10-1,5**	66,8	(2.630)	18,4	(0.724)	51,8	(2.039)
PLP 10-2	**PLM 10-2**	68,4	(2.693)	19,2	(0.756)	53,4	(2.102)
PLP 10-2,5	**PLM 10-2,5**	70	(2.756)	20	(0.787)	55	(2.165)
PLP 10-3,15	**PLM 10-3,15**	72	(2.835)	21	(0.827)	57	(2.244)
PLP 10-4	**PLM 10-4**	74,8	(2.945)	22,4	(0.882)	59,8	(2.354)
PLP 10-5	**PLM 10-5**	78	(3.071)	24	(0.945)	63	(2.480)
PLP 10-5,8	**PLM 10-5,8**	80,6	(3.173)	25,3	(0.996)	65,6	(2.583)
PLP 10-6,3	**PLM 10-6,3**	82	(3.228)	26	(1.024)	67	(2.638)
PLP 10-8	**PLM 10-8**	87,5	(3.445)	28,8	(1.134)	72,5	(2.854)
PLP 10-10	**PLM 10-10**	94	(3.701)	32	(1.260)	79	(3.110)

Note:
X Dimension: see mounting flanges at page 3 and 4.

D033-001/10.95

MAX. PRESSURE RELIEF VALVE ADJUSTABLE SETTING

VPER / **TS**

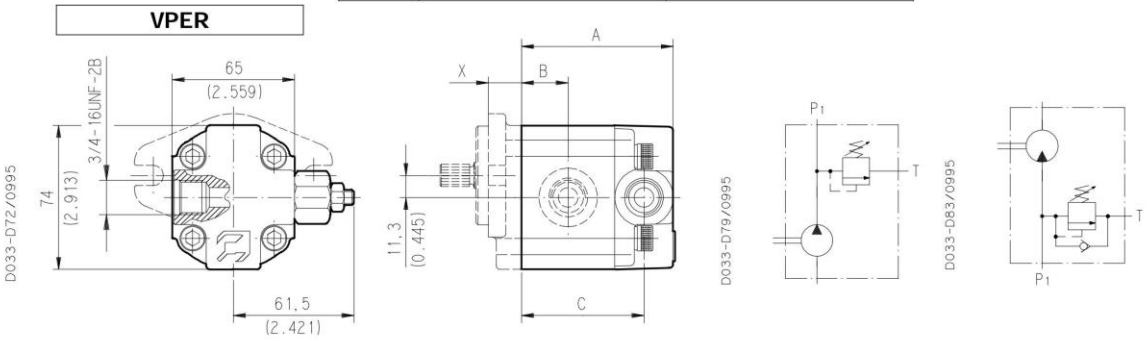
Valve type:
VPER:Adjustable setting valve with external drain
VPIR:Adjustable setting valve with internal drain

Pressure range code:
(see table below)

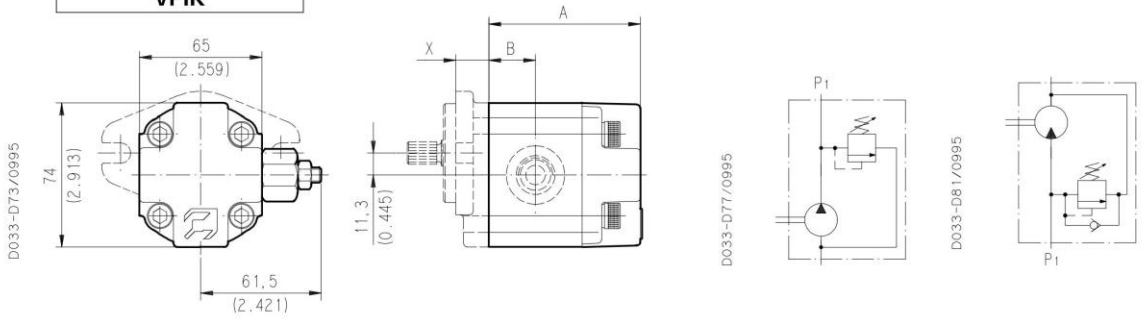
	SETTING PRESSURE RANGE	
Code	bar	psi
TV	20 ÷ 75	290 ÷ 1090
TS	75 ÷ 220	1090 ÷ 3190

Replaces: D033-001/10.95

VPER



VPIR



D033-001/01.98

Pump size	Motor size	A		B		C	
		mm	(in)	mm	(in)	mm	(in)
PLP 10-1	**PLM 10-1**	65,2	(2.567)	17,6	(0.693)	50,2	(1.976)
PLP 10-1,5	**PLM 10-1,5**	66,8	(2.630)	18,4	(0.724)	51,8	(2.039)
PLP 10-2	**PLM 10-2**	68,4	(2.693)	19,2	(0.756)	53,4	(2.102)
PLP 10-2,5	**PLM 10-2,5**	70	(2.756)	20	(0.787)	55	(2.165)
PLP 10-3,15	**PLM 10-3,15**	72	(2.835)	21	(0.827)	57	(2.244)
PLP 10-4	**PLM 10-4**	74,8	(2.945)	22,4	(0.882)	59,8	(2.354)
PLP 10-5	**PLM 10-5**	78	(3.071)	24	(0.945)	63	(2.480)
PLP 10-5,8	**PLM 10-5,8**	80,6	(3.173)	25,3	(0.996)	65,6	(2.583)
PLP 10-6,3	**PLM 10-6,3**	82	(3.228)	26	(1.024)	67	(2.638)
PLP 10-8	**PLM 10-8**	87,5	(3.445)	28,8	(1.134)	72,5	(2.854)
PLP 10-10	**PLM 10-10**	94	(3.701)	32	(1.260)	79	(3.110)

Note: For **X** dimension see mounting flanges at page 3 and 4.

HOW TO ORDER SINGLE PUMPS AND MOTORS

1	2	3		4	5		6	7		8		9		10	11	
PLP 10-2	S	0	–	30	S0	–	L	OB/OA	–	N	–	EL	–	L	OA	–

12		13
H	–	VPER ...

1 Size		PUMP CODE	MOTOR CODE
in^3/rev	cm^3/rev		
0.06	1	PLP 10-1	PLM 10-1
0.09	1.5	PLP 10-1,5	PLM 10-1,5
0.12	2	PLP 10-2	PLM 10-2
0.15	2.5	PLP 10-2,5	PLM 10-2,5
0.19	3.1	PLP 10-3,15	PLM 10-3,15
0.24	4	PLP 10-4	PLM 10-4
0.30	4.9	PLP 10-5	PLM 10-5
0.35	5.8	PLP 10-5,8	PLM 10-5,8
0.38	6.2	PLP 10-6,3	PLM 10-6,3
0.48	7.9	PLP 10-8	PLM 10-8
0.60	9.9	PLP 10-10	PLM 10-10

2 Rotation	CODE
Left	S
Right	D
Reversible rear external drain	R
Reversible side external drain	L
Reversible internal drain	B

3 Version	CODE
No outboard bearing	0
With outboard bearing (only W9 flange)	1

4 Drive shaft	CODE
SAE "A-A" straight	30
SAE straight	36
SAE "A-A" spline	02
Straight	29
European tapered 1:8	81
European tapered 1:8	86

5 Mounting flange	CODE
SAE "A-A" 2 bolt	S0
SAE "A-A" 2-4 bolt	R9
SAE 2 bolt	W9
SAE 2-4 bolt	R8
European rectangular (25,4 mm pilot, 52x72 mm bolt pattern)	E1
European rectangular (30 mm pilot, 56x73 mm bolt pattern)	E7
European rectangular (30 mm pilot, 52x72 mm bolt pattern)	E8
Through 2 bolt (32 mm pilot, 42x42 mm bolt pattern)	B1
Through 4 bolt (32 mm pilot, 42x42 mm bolt pattern)	K2

6 Ports position	CODE
Side	L
Rear	P

CODE	7 Inlet/outlet ports		
SAE STRAIGHT THREAD PORTS O-RING BOSS			
Side ports	Rear ports	Series and size	
OB/OA	OB/OA	PLP 10	1 - 1,5 - 2 - 2,5 - 3,15
OA/OB	OA/OB	PLM 10	4 - 5 - 5,8 - 6,3
OC/OB	OB/OB	PLP 10	8 - 10
OB/OC	OB/OB	PLM 10	
BSPP STRAIGHT THREAD PORTS			
Side ports	Rear ports	Series and size	
GC/GC	GC/GC	PLP 10	1 - 1,5 - 2 - 2,5
		PLM 10	3,15 - 4
GD/GD	GD/GD	PLP 10	5 - 5,8 - 6,3 - 8 - 10
		PLM 10	
GERMAN 4 BOLT FLANGE			
Side ports	Rear ports	Series and size	
BB/BA		PLP 10	1 - 1,5 - 2 - 2,5 - 3,15
BA/BB		PLM 10	4 - 5 - 5,8 - 6,3 - 8 - 10

CODE	8 Seals
N	Buna (standard)
V	Viton

CODE	9 Cover options
EL	Aluminum mounting flange and rear cover
L	Cast iron mounting flange and aluminum rear cover

CODE	10 Drain port positions
L	Side
*	Bottom

CODE	11 Drain ports
SAE STRAIGHT THREAD PORTS O-RING BOSS	
03	7/16-20 UNF-2B
OA	9/16-18 UNF-2B
BSPP STRAIGHT THREAD PORTS	
GA	G 1/8

CODE	12 Shaft seal options
C	High back pressure seal with wiper seal
D	Standard seal with wiper seal
H	High back pressure seal

CODE	13 Max. pressure relief valve
VPEF ...	Fixed setting with external drain
VPIF ...	Fixed setting with internal drain
VPER ...	Adjustable setting with external drain
VPIR ...	Adjustable setting with internal drain

Replaces: D033-001/10.95
D033-001/01.98

HOW TO ORDER MULTIPLE PUMPS

DOUBLE PUMPS

1		2	3		4	5		1		4	5		6		7		8
PLP 10-2	–	30	S0	–	L	OB/OA	/	10-2	–	L	OB/OA	–	S	–	N	–	EL
Front section								Rear section									

1 Pump size		CODE
in³/rev	cm³/rev	
0.06	1	PLP 10-1
0.09	1.5	PLP 10-1,5
0.12	2	PLP 10-2
0.15	2.5	PLP 10-2,5
0.19	3.1	PLP 10-3,15
0.24	4	PLP 10-4
0.30	4.9	PLP 10-5
0.35	5.8	PLP 10-5,8
0.38	6.2	PLP 10-6,3
0.48	7.9	PLP 10-8
0.60	9.9	PLP 10-10

2 Drive shaft	CODE
SAE "A-A" straight	30
SAE straight	36
SAE "A-A" spline	02
Straight	29
European tapered 1:8	81
European tapered 1:8	86

3 Mounting flange	CODE
SAE "A-A" 2 bolt	S0
SAE "A-A" 2-4 bolt	R9
SAE 2 bolt	W9
SAE 2-4 bolt	R8
European rectangular (25,4 mm pilot, 52x72 mm bolt pattern)	E1
European rectangular (30 mm pilot, 56x73 mm bolt pattern)	E7
European rectangular (30 mm pilot, 52x72 mm bolt pattern)	E8
Through 2 bolt (32 mm pilot, 42x42 mm bolt pattern)	B1
Through 4 bolt (32 mm pilot, 42x42 mm bolt pattern)	K2

4 Ports position	CODE
Side	L
Rear	P

CODE	5 Inlet/outlet ports	
SAE STRAIGHT THREAD PORTS O-RING BOSS		
Side ports	Pump size	
OB/OA	PLP 10	1 - 1,5 - 2 - 2,5 - 3,15 4 - 5 - 5,8 - 6,3
OC/OB	PLP 10	8 - 10
BSPP STRAIGHT THREAD PORTS		
Side ports	Series and size	
GC/GC	PLP 10	1 - 1,5 - 2 - 2,5 - 3,15 - 4
GD/GD	PLP 10	5 - 5,8 - 6,3 - 8 - 10
GERMAN 4 BOLT FLANGE		
Side ports	Pump size	
BB/BA	PLP 10	1 - 1,5 - 2 - 2,5 - 3,15 4 - 5 - 5,8 - 6,3 - 8 - 10

CODE	6 Rotation
S	Left
D	Right

CODE	7 Seals
N	Buna (standard)
V	Viton

CODE	8 Cover options
EL	Aluminum mounting flange and rear cover
L	Cast iron mounting flange and aluminum rear cover

TRIPLE PUMPS

1		2	3		4	5		1		4	5		1		4	5		6		7		8
PLP10-2	–	30	S0	–	L	OB/OA	/	10-2	–	L	OB/OA	/	10-2	–	L	OB/OA	–	S	–	N	–	EL
Front section								Intermediate section					Rear sections									

D033-001/10.95

ORDER EXAMPLE

SINGLE PUMPS AND MOTORS

Standard pump	PLP 10-2 S 0-30 S0-L OB/OA-N
Standard motor	PLM10-2 S 0-30 S0-L OA/OB-N
Pump with special features	PLP 10-2 S 0-30 S0-L OB/OA-N-EL-VPER/TS

MULTIPLE PUMPS

Standard double pump	PLP 10-2 02 S0-L OB/OA / 10-2 L OB/OA-S-N

TRIPLE PUMPS

Standard triple pump	PLP 10-2 02 S0-L OB/OA / 10-2 L OB/OA / 10-2 L OB/OA-S-N
Triple pump with special features	PLP 10-2 02 S0-L OB/OA / 10-2 L OB/OA / 10-2 L OB/OA-S-N-EL

Replaces: D033-001/10.95

D033-001/01.98

CASAPPA®
FLUID POWER DESIGN

CASAPPA S.p.A. - Parma - Italy - Tel.: + 39 521 304111 - Fax: + 39 521 804600
CASAPPA Corp. *- Batavia, IL 60510 U.S.A. - Phone: 630 761-0041 - Fax: 630 761-0048*
CASAPPA GmbH - Stuttgart - Germany - Tel.: + 49 711 7811770 - Fax: + 49 711 7811771
CASAPPA SARL *- Janneyrias - France - Tel.: + 33 4 78767617 - Fax: + 33 4 78767629*
www.casappa.com
e-mail: info@casappa.com

Free flow nose to side check valve

Capacity:
10 gpm (40 L/min.)

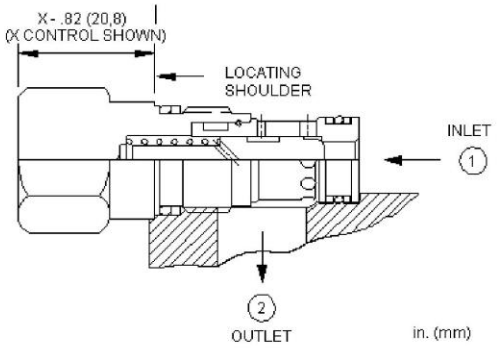
Functional Group:
Products : Cartridges : Check : 2-Port : Free Flow Nose to Side

Model:
CXBA

Product Description

Free-flow, nose-to-side check valves are on/off circuit components that allow free flow from the inlet (port 1) to the outlet (port 2) and block flow in the opposite direction.

Download

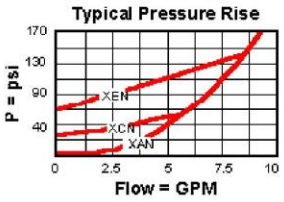


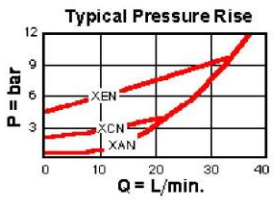
Technical Features

- Two-port check valves share the same cavity for a given frame size, however, pay close attention as flow paths may be in opposite directions.
- Check valves offer extremely low leakage rates with a maximum leakage of less than 1 drop per minute (0,07 cc/min).
- Will accept 5000 psi (350 bar) at ports 1 and 2.
- Incorporates the Sun floating style construction to minimize the possibility of internal parts binding due to excessive installation torque and/or cavity/cartridge machining variations.

Technical Data

	U.S. Units	Metric Units
Cavity	T-162A	
Capacity	10 gpm	40 L/min.
Maximum Operating Pressure	5000 psi	350 bar
Maximum Valve Leakage at 110 SUS (24 cSt)	1 drops/min.	0,07 cc/min.
Series (from Cavity)	Series 0	
Valve Hex Size	3/4 in.	19,1 mm
Valve Installation Torque	20 - 25 lbf ft	27 - 33 Nm
Seal Kits - Cartridge	Buna: 990-162-007	
Seal Kits - Cartridge	Viton: 990-162-006	
Model Weight	0.17 lb.	0.08 kg.





CXBA-XCN

Control	Cracking Pressure	Seal Material	Material/Coating Modifier
Preferred Options	Preferred Options	Preferred Options	Preferred Options
X Not Adjustable	**A** 4 psi (0,3 bar) **C** 30 psi (2 bar) Standard Options **B** 15 psi (1 bar) **D** 50 psi (3,5 bar) **E** 75 psi (5 bar) **F** 100 psi (7 bar)	**N** Buna-N Standard Options **V** Viton	**No modifier** (standard material with no special coating) Special Options **/AP** Stainless Steel, Passivated Control: X *Our corrosion resistant product line is growing! If you are interested in a corrosion resistant option for this model, please contact Sun.*

When the modifier is /AP, the control must be X

Contamination Control Fundamentals

Why Filter?

70% - 90% of all hydraulic system failures are caused by contaminants in the fluid. Even when no immediate failures occur, high contamination levels can sharply decrease operating efficiency.

Contamination is defined as any substance which is foreign to a fluid system and damaging to its performance. Contamination can exist as a gas, liquid or solid. Solid contamination, generally referred to as particulate contamination, comes in all sizes and shapes and is normally abrasive.

High contaminant levels accelerate component wear and decrease service life. Worn components, in turn, contribute to inefficient system operation, seizure of parts, higher fluid temperatures, leakage, and loss of control. All of these phenomena are the result of direct mechanical action between the contaminants and the system components. Contamination can also act as a catalyst to accelerate oxidation of the fluid and spur the chemical breakdown of its constituents.

Filtering a system's fluid can remove many of these contaminants and extend the life of system components.
Filtration = System Protection

How a System Gets Contaminated

Contaminants come from two basic sources: they either enter the system from outside (ingression) or are generated from within. New systems often have contaminants left behind from manufacturing and assembly operations. Unless they are filtered as they enter the circuit, both the original fluid and make-up fluid are likely to contain more contaminants than the system can tolerate. Most systems ingest contaminants through such components as inefficient air breathers and worn cylinder rod seals during normal operation. Airborne contaminants are likely to gain admittance during routine servicing or maintenance. Also, friction and heat can produce internally generated contamination.

Size of Solid Contaminants

The size of solid particle contaminants is commonly measured in micrometers, µm, (usually referred to as microns, µm). A micron is a unit of length equal to one millionth of a meter or about 0.00004 inch. Particles that are less than 40 µm cannot be detected by the human eye.

Figure 2 shows the sizes of some common substances. To gain some perspective, consider the diameters of the following substances:

Substance	Microns	Inches
Grain of table salt	100 µm	0.0039"
Human hair	80 µm	0.0027"
Talcum powder	10 µm	0.00039"
Bacteria (average)	2 µm	0.000078"

A micron rating identifies the size of particles that a particular filtration media is designed to remove. For instance, HYDAC 3µm Betamicron® filter media is rated at ß3 ≥200, meaning that it can remove particles of 3 µm and greater at 99.5% efficiency.

Figure 1. Typical Examples of Wear Due to Contamination

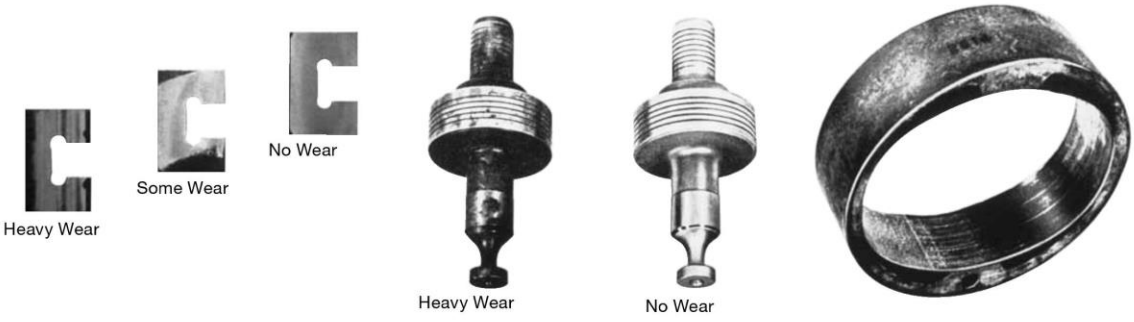
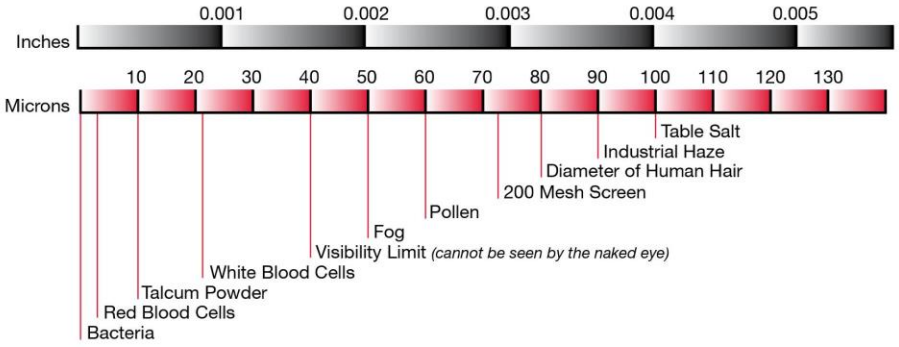


Figure 2. Sizes of known Particles in Inches and Microns



How Contaminants are Measured and Reported - Changes in the Industry

In hydraulic fluid power systems, power is transmitted and contained through a liquid under pressure within an enclosed circuit. These fluids all contain a certain amount of solid particle contaminants. The amount of particulate contaminants present in a hydraulic or lubrication system's fluid is commonly referred to as its cleanliness level.

Recent changes in measuring and defining the cleanliness of fluid systems have created a shift in the way the size and amount of solid contaminants are reported. In 1999, the International Standards Organization (ISO) introduced a series of new fluid cleanliness standards that reflect these changes. These standards are summarized in Table 1.

Table 1. Changes in Industry Standards

Previous	Current 1999	Description
ISO 4406	ISO 4406:1999	ISO Range Code
ISO 4402	ISO 11171	Automatic Particle Counter *(APC)* calibration procedures *(ACFTD to ISO MTD)*
ISO 4572	ISO 16889	Multi-pass test reports

The change in calibration procedures (ISO 4402 to ISO 11171) occurred for two reasons. First, the industry developed a new standard test dust for calibration fluid. This new ISO Medium Test Dust (ISO MTD) replaced the previously used AC Fine Test Dust (ACFTD), which is no longer available. Secondly, there has been a change in how particle sizes are measured. By way of newer technologies, particles are now measured in two dimensions, whereas in the past they had been measured using the largest dimension (chord). Older technology was not as precise as it is today, and particle sizes reported were less accurate. Table 2 shows that what used to be classified as a 2 µ particle is now classified as a 4.6 µ(c) particle. The (c) denotes that particle size measurements are certified using an Automatic Particle Counter (APC) which has been calibrated in accordance with ISO 11171.

ISO 11171 calls for the use of ISO MTD dust and changes the way we report the number of particles based on the new distribution of particles in the new standard reference material (SRM2806). Today, the ISO Medium Test Dust and the new calibration standard (11171) are used to synchronize all APC's. This change was made in an effort to reduce variability in tests conducted in different laboratories around the world.

How will these changes affect you?

In comparing the old standards to the new, the following have not changed:

- The amount and the size of solid contamination in your system is still the same!
- The filters still work the same way!

What has changed:

- The way particle size is specified has changed.

The new standards and reporting methods "move the measuring stick" to correct for the inaccurate calibration assumptions made over the past 40 years.

Particle Size Definitions - ISO 4402 vs. ISO 11171

This change in the way contaminants are measured had the net effect of changing the classification of the size of the particle.

Table 2. A Comparison of Particle Size Classification

ISO 4402 (ACFTD)	ISO 11171 (ISO MTD)
< 1.0 µm	4.0 µm(c)
1.0 µm	4.2 µm(c)
2 µm	4.6 µm(c)
3 µm	5.1 µm(c)
5 µm	6.4 µm(c)
10 µm	9.8 µm(c)
15 µm	13.6 µm(c)
20 µm	17.5 µm(c)
25 µm	21.2 µm(c)
Previous Size per ISO 4402	Current Size per ISO 11171

Note that the size of the particles is reported differently; i.e., a particle 1.0 µm in size under ISO 4402 is now considered to be 4.2 µm(c) in size. **Keep in mind that the particles are actually the same size they have always been; we are just using a different ruler.**

ISO Scale Numbers - ISO 4406 vs. ISO 4406:1999

ISO 4406:1999 provides guidelines for defining the level of contamination present in a fluid sample in terms of an ISO rating. Due to the change in the specification of particle sizes shown in Table 2, the definition of the ISO scale (or range) numbers needed to be redefined. Tables 3(a) and 3(b) provide a comparison of ISO scale numbers under ISO 4406 and 4406:1999, respectively.

Another change involved the addition of a third scale number to define an ISO rating. Under the old ISO 4406, the ISO scale numbers represented the number of particles greater than or equal to 5 µm and 15 µm in size. The new ISO 4406:1999 uses three scale numbers, representing the number of particles greater than or equal to 4 µm(c), 6 µm(c), and 14 µm(c) in size.

Figure 3(a) shows the graph used to plot particle counts per ISO 4406. When the count of particles ≥5 µm and ≥15 µm in size are plotted, the corresponding ISO rating can be determined graphically. Two micron (2 µm) levels are optional, as they are not a required part of the old ISO 4406 standard.

Similarly, Figure 3(b) shows the graph used to plot particle counts per ISO 4406:1999. This figure shows how 4406:1999 is different from the old ISO 4406 in that it plots the cleanliness level based on the number of particles at the 4 µm(c)/6 µm(c)/14 µm(c) sizes per 1 mL of fluid.

Also, filter companies previously measured the number of particles per 100 mL of sample fluid. Under ISO 4406:1999, we now report the number of particles per 1 mL of sample fluid.

It is important to note that net effect of all these changes keeps the ISO rating relatively unchanged.

Figure 3(a). Graphing Particle Counts per ISO 4406

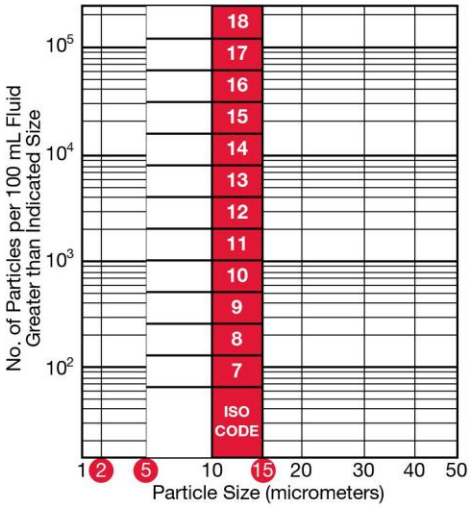


Figure 3(b). Graphing Particle Counts per ISO 4406:1999

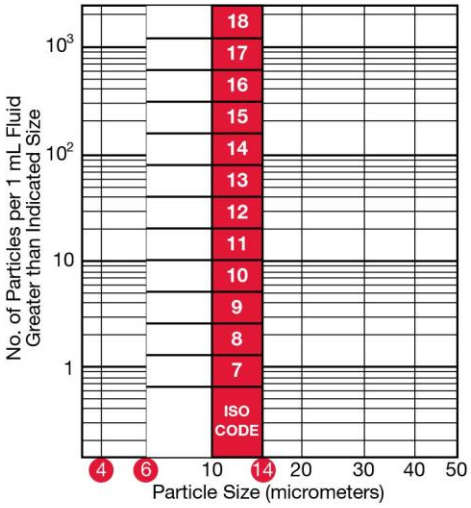


Table 3(a). ISO Code 4406 Hydraulic Fluid Power–Solid Contamination Code

Number of Particles per 100 mL of Fluid		Scale Number
More Than	Up to and Including	
8,000,000	16,000,000	24
4,000,000	8,000,000	23
2,000,000	4,000,000	22
1,000,000	2,000,000	21
500,000	1,000,000	20
250,000	500,000	19
130,000	250,000	18
64,000	130,000	17
32,000	64,000	16
16,000	32,000	15
8,000	16,000	14
4,000	8,000	13
2,000	4,000	12
1,000	2,000	11
500	1,000	10
250	500	9
130	250	8
64	130	7
32	64	6
16	32	5
8	16	4
4	8	3
2	4	2
1	2	1

Previous ISO codes are commonly made up of 2 scale numbers representing the number of particles ≥5 µm and ≥15 µm. Showing a third scale number, ≥2 µm is optional. The left number will always be larger. The scale numbers are defined such that each successive scale is generally a doubling of the previous scale. The particle count can be expressed as the number of particles per mL or per 100 mL, but the ISO range numbers and the ISO codes do not change.

Table 3(b). ISO 4406:1999 Hydraulic Fluid Power–Solid Contamination Code (New)

Number of Particles per 1 mL of Fluid		Scale Number
More Than	Up to and Including	
1,300,000	2,500,000	28
640,000	1,300,000	27
320,000	640,000	26
160,000	320,000	25
80,000	160,000	24
40,000	80,000	23
20,000	40,000	22
10,000	20,000	21
5,000	10,000	20
2,500	5,000	19
1,300	2,500	18
640	1,300	17
320	640	16
160	320	15
80	160	14
40	80	13
20	40	12
10	20	11
5	10	10
2.5	5	9
1.3	2.5	8
0.64	1.3	7
0.32	0.64	6
0.16	0.32	5
0.08	0.16	4
0.04	0.08	3
0.02	0.04	2
0.01	0.02	1
0.00	0.01	0

Current ISO codes are made up of 3 numbers representing the number of particles ≥4 µm(c), ≥6 µm(c) and ≥14 µm(c). The particle count is expressed as the number of particles per mL.

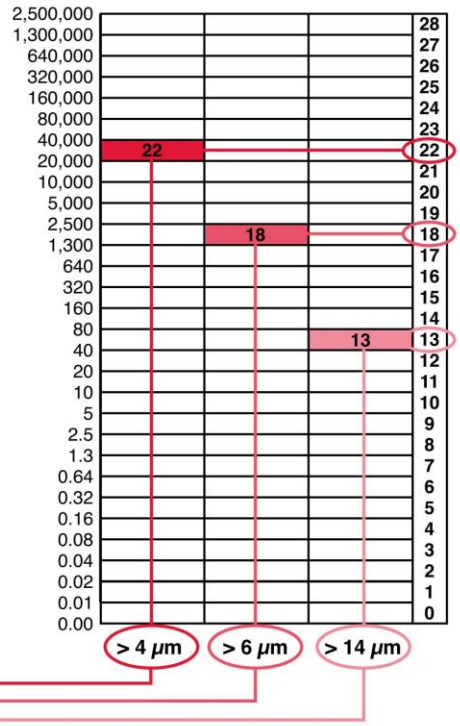
ISO 4406 Code

Cleanliness levels are defined by three numbers divided by slashes (/.) These numbers correspond to 4, 6, and 14 micron, in that order. Each number refers to an ISO Range Code, which is determined by the number of particles for that size (4,6, & 14µm) and larger present in 1 ml of fluid. Each range is double the range below. Refer to the chart below to see the actual ranges.

Example:

larger than 4µm = 22,340
larger than 6µm = 1,950
larger than 14µm = 43

ISO Code = 22 / 18 / 13



Achieving the appropriate cleanliness level in a system

The only way to achieve and maintain the appropriate cleanliness level in a hydraulic or lubrication system, is to implement a comprehensive filtration program. HYDAC offers all of the products that are needed to do just that! - They include:

Solid Contamination

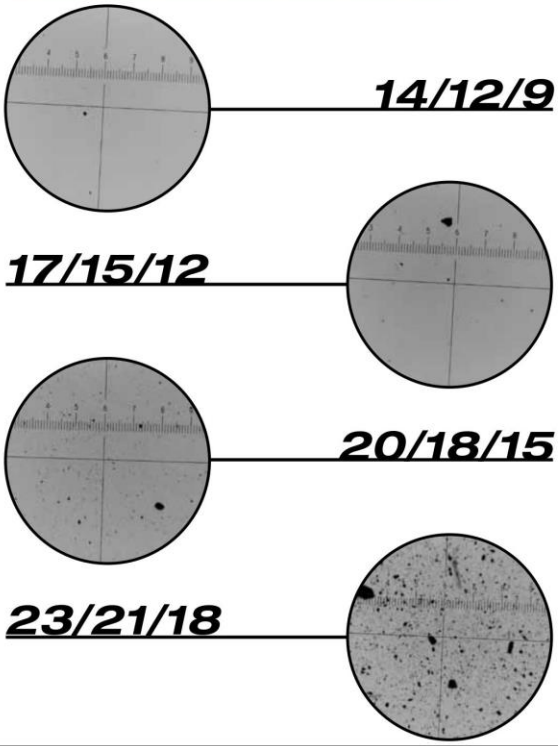
- pressure filters
- return line filters
- offline filtration loops
- oil transfer units for precleaning of new oil
- portable and online contamination monitors
- reservoir breathers and filler/breathers

Water Content

- water content sensors
- reservoir breathers with silica gel desiccant
- vacuum dehydration water removal units
- water removal elements

Fluid Analysis

- bottle sampling kits
- complete analysis kits



Cleanliness Levels - ISO 4406 vs. ISO 4406:1999

The following example shown in Figures 4(a) and 4(b) compares the cleanliness level, or ISO rating, of a typical petroleum-based fluid sample using both the previous ISO Code 4406 and the current ISO Code 4406:1999 rating systems.

The fluid sample contains a certain amount of solid particle contaminants, in various shapes and sizes. Figure 4(a) shows a 100 mL sample that contains 300,000 particles greater than 2 µm in size, 20,000 particles greater than 5 µm in size, and 1,500 particles greater than 15 µm in size.

Since the particle count for contaminants size 2 µm and greater falls between 250,000 and 500,000, the first *(optional)* ISO range *(or scale)* number is 19 using Table 3(a). The particle count falls between 16,000 and 32,000 for particles greater than 5 µm, so the second ISO range number is 15. The particle count falls between 1,000 and 2,000 for particles greater than 15 µm, so the third ISO range number is 11. Thus, the cleanliness level for the fluid sample shown in Figure 4(a) per ISO 4406 is ISO 19/15/11.

In Figure 4(b), note that 1 mL of fluid (not per 100 mL) is measured per ISO 4406:1999. Also, the amount of particles at the 4 µm(c)/6 µm(c)/14 µm(c) levels are measured instead of at the 2 µm/5 µm/15 µm levels.

The number of 4 µm(c) particles falls between 2500 and 5000, so the first ISO range number is 19 using Table 3(b). The count for 6 µm(c) particles falls between 160 and 320 particles, so the second ISO range number is 15. The 14 µm(c) particle counts falls between 10 and 20, so the third range number is 11. Therefore, the cleanliness level for the fluid sample shown in Figure 4(b) per ISO 4406:1999 is 19/15/11.

Although the ranges for the scale numbers have changed, the resulting ISO Code has not changed.

Figure 4(a). Determining the ISO Rating of a Fluid Using ISO 4406 **Previous**

Sample Fluid **100 mL**

Particle Size	Number of Particles
≥ 2 µm	300,000
≥ 5 µm	20,000
≥ 10 µm	4,000
≥ 15 µm	1,500
≥ 20 µm	1,000
≥ 30 µm	0.3

If Particle Count Falls Between	Scale Number is*
250,000-500,000	19
16,000-32,000	15
1,000-2,000	11

*Source: ISO/DIS 4406

The Sample Fluid is ISO 19/15/11.

↑optional

Figure 4(b). Determining the ISO Rating of a Fluid Using ISO 4406:1999 **Current 1999**

Sample Fluid **1 mL**

Particle Size	Number of Particles
≥ 4 µm(c)	3,000
≥ 5 µm(c)	700
≥ 6 µm(c)	200
≥ 10 µm(c)	
≥ 14 µm(c)	15
≥ 15 µm(c)	
≥ 20 µm(c)	10
≥ 30 µm(c)	3

If Particle Count Falls Between	Scale Number is*
250,000-500,000	19
16,000-32,000	15
1,000-2,000	11

*Source: ISO 4406:1999

The Sample Fluid is ISO 19/15/11.

Required Cleanliness Levels

The pressure of a hydraulic system provides the starting point for determining the cleanliness level required for efficient operation. Table 4 provides general guidelines for recommended cleanliness levels based on pressure.

Low pressure: 0-500 psi (35 bar)
Medium pressure: 500-1500 psi (35-100 bar)
High pressure: 1500 psi (100 bar) and above

Table 4. Cleanliness Level Guidelines Based on Pressure

System Type	Recommended Cleanliness Levels (ISO Code)
Low pressure – manual control	20/18/15 or better
Low to medium pressure – electro-hydraulic controls	19/17/14 or better
High pressure – servo controlled	16/14/11 or better

A second consideration is the type of components present in the hydraulic system. The amount of contamination that any given component can tolerate is a function of many factors, such as clearance between moving parts, frequency and speed of operation, operating pressure, and materials of construction. Tolerances for contamination range from that of low pressure gear pumps, which normally will give satisfactory performance with cleanliness levels typically found in new fluid (ISO 19/17/14), to the more stringent requirements for servo-control valves, which need oil that is eight times cleaner (ISO 16/14/11).

For your convenience, Table 5 provides a cross reference showing the approximate correlation between several different scales or levels used in the marketplace to quantify contamination. The table shows the code levels used for military standards 1638 and 1246A, as well as the new SAE AS4059 standard.

Table 5. ISO Cleanliness Level Correlation

ISO Code 4 µ(c)/6 µ(c)/14 µ(c)	Mil Std. 1638 (1967)	Mil Std. 1246A (1967)	ACFTD Gravimetric Level–mg/L	SAE AS4059 Standard
21/19/16	10			11
20/18/15	9			10
19/17/14	8	300		9
18/16/13	7		1	8
17/15/12	6			7
16/14/12		200		6
16/14/11	5			5
15/13/10	4		0.1	4
14/12/9	3			3
13/11/8	2			2
12/10/8		100		1
11/10/7	1			1
10/9/6			0.01	0
9/8/5				00

Finding the cleanliness level required by a system

Today, many fluid power component manufacturers are providing cleanliness level *(ISO code)* recommendations for their components. They are often listed in the manufacturer's component product catalog or can be obtained by contacting the manufacturer directly. Their recommendations may be expressed in desired filter element ratings or in system cleanliness levels *(ISO codes or other codes)*. Some typically recommended cleanliness levels for components are provided in table below.

1. Starting at the left hand column, select the most sensitive component used in the system.
2. Move to the right to the column that describes the system pressure and conditions.
3. Here you will find the recommended ISO class level, and recommended element micron rating.

	Low/Medium Pressure Under 2000 psi (moderate conditions)		High Pressure 2000 to 2999 psi (low/medium with severe conditions[1])		Very High Pressure 3000 psi and over (high pressure with severe conditions[1])	
	ISO Target Levels	Micron Ratings	ISO Target Levels	Micron Ratings	ISO Target Levels	Micron Ratings
Pumps						
Fixed Gear or Fixed Vane	20/18/15	20	19/17/14	10	18/16/13	5
Fixed Piston	19/17/14	10	18/16/13	5	17/15/12	3
Variable Vane	18/16/13	5	17/15/12	3	not applicable	not applicable
Variable Piston	18/16/13	5	17/15/12	3	16/14/11	3[2]
Valves						
Check Valve	20/18/15	20	20/18/15	20	19/17/14	10
Directional (solenoid)	20/18/15	20	19/17/14	10	18/16/13	5
Standard Flow Control	20/18/15	20	19/17/14	10	18/16/13	5
Cartridge Valve	19/17/14	10	18/16/13	5	17/15/12	3
Proportional Valve	17/15/12	3	17/15/12	3	16/14/11	3[2]
Servo Valve	16/14/11	3[2]	16/14/11	3[2]	15/13/10	3[2]
Actuators						
Cylinders, Vane Motors, Gear Motors	20/18/15	20	19/17/14	10	18/16/13	5
Piston Motors, Swash Plate Motors	19/17/14	10	18/16/13	5	17/15/12	3
Hydrostatic Drives	16/15/12	3	16/14/11	3[2]	15/13/10	3[2]
Test Stands	15/13/10	3[2]	15/13/10	3[2]	15/13/10	3[2]
Bearings						
Journal Bearings	17/15/12	3	not applicable	not applicable	not applicable	not applicable
Industrial Gearboxes	17/15/12	3	not applicable	not applicable	not applicable	not applicable
Ball Bearings	15/13/10	3[2]	not applicable	not applicable	not applicable	not applicable
Roller Bearings	16/14/11	3[2]	not applicable	not applicable	not applicable	not applicable

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 system filters of the recommended rating may be required to achieve and maintain the desired Target Cleanliness Level.

Element Technical Data

Performance Specifications / Filtration Rating

HYDAC filter elements meet a wide variety of requirements in today's workplace, from the simplest to the most sophisticated fluid power systems. Established industry standards enable users to select the optimal filter element for any application.

Filter elements are rated on the basis of their ability to remove contaminants of specific targeted sizes from a fluid, under specific operating conditions. Filtration ratings can be measured by analyzing three areas of performance:

(1) efficiency or absolute rating and percent efficiency,

(2) dirt holding capacity (DHC), and

(3) the pressure drop across the element at a specific absolute efficiency.

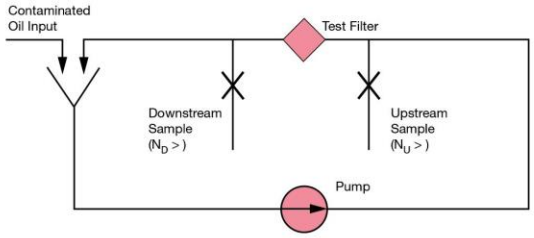
The Multi-Pass Test

Filter element efficiency ratings and capacities are determined by conducting a multi-pass test under controlled laboratory conditions. This is a standard industry test with procedure published by the International Standards Organization (ISO), the American National Standards Institute (ANSI), and the National Fluid Power Association (NFPA). The multi-pass test yields reproducible test data for appraising the filtration performance of a filter element including its particle removal efficiency under ideal conditions. These test results enable the user to: (1) compare the dirt removal efficiency, dirt holding capacity, and Beta stability characteristics of elements offered by various filter element suppliers and (2) helps one to select the proper filter element when also evaluating the structural integrity and pleat support system designed to obtain the optimal contamination control level for any particular system under dynamic operating conditions.

Hydraulic fluid *(Mil. Spec. 5606)* is circulated through a system containing the filter element to be tested. Additional fluid contaminated with ISO MTD Test Dust is introduced upstream of the element being tested. Fluid samples are then extracted upstream and downstream of the test element.

Dirt holding capacity is defined as the total grams of ISO MTD Test Dust added to the system to bring the test filter element to terminal pressure drop. *(Alarm Trip Point)*

Figure 5. Multi-Pass Test Schematic



Filtration Ratio (Beta) ISO 4572 vs. ISO 16889

Due to the changes in the way particles are measured and the fact that a new test dust (ISO MTD) is now utilized, a new standard for multi-pass testing was necessary. This now current standard, ISO 16889, replaces the old Multi-Pass Test Standard, ISO 4572.

The filtration ratio *(more commonly referred to as the Beta ratio)* is, in fact, a measure of the particle capture efficiency of a filter element.

ISO 4572 (Old)

$$\beta_x = \frac{\text{number of particles upstream} \geq x \text{ microns}}{\text{number of particles downstream} \geq x \text{ microns}}$$

where x is a specified particle size.

ISO 16889 (Current 1999)

$$\beta_{x(c)} = \frac{\text{number of particles upstream} \geq x(c) \text{ microns}}{\text{number of particles downstream} \geq x(c) \text{ microns}}$$

where x(c) is a specified particle size.

$$\text{Example: } \beta_{10(c)} = \frac{7500}{100} = 75$$

This particle capture efficiency can also be expressed as a percent by subtracting the number 1 from the Beta (in this case 4), dividing by Beta and multiplying it by 100:

$$\text{Beta}_{10(c)} \text{ efficiency} = 75 = \frac{(\beta - 1)}{\beta} \times 100$$

$$\text{Beta}_{10(c)} \text{ efficiency} = \frac{(75 - 1)}{75} \times 100 = 98.667\%$$

The example is read as "Beta ten is equal to 75, where 7500 particles, 10 microns and larger, were counted upstream of the test filter *(before)* and 100 particles, 10 microns and larger, were counted downstream of the test filter *(after)*."

The filter element tested was 98.667% efficient in removing particles 10 microns and larger.

Percent Efficiency

To calculate a filter element's percent efficiency, subtract 1 from the Beta, divide that answer by the Beta, then multiply by 100.

Example Per ISO 4572 (old):		Example Per ISO 16889 (new):
Step 1:	$\beta_{10} \geq 75$	$\beta_{10(c)} \geq 75$
Step 2:	75 -1 = 74	75 -1 = 74
Step 3:	74 ÷ 75 = 0.987	74 ÷ 75 = 0.987
Step 4:	0.987 x 100 = 98.7%	0.987 x 100 = 98.7%

Using a calculator with a % key, you can use the shortcut version.

Example Per ISO 4572 (old):		Example Per ISO 16889 (new):
Step 1:	$\beta_{10} \geq 200$	$\beta_{10(c)} \geq 200$
Step 2:	200 -1 = 199	200 -1 = 199
Step 3:	199 ÷ 200 = 99.5%	199 ÷ 200 = 99.5%

Filter Beta Rating

ISO 16889 replaces ISO 4572 as the International Standard for Multi-pass Testing. It provides a common testing format for filter manufacturers to rate filter element performance. For convenience, Betas are shown in this catalog for both old and new Multi-pass standards *(ISO 4572 and 16889, respectively.)*

According to ISO 16889, each filter manufacturer can test a given filter element at a variety of flow rates and terminal pressure drop ratings that fit the application, system configuration and filter element size. Results may vary depending on the configuration of the filter element tested and the test conditions.

Currently, there is no accepted ISO, ANSI, or NFPA standard regarding "absolute" ratings. Filter manufacturers have generally adopted an industry standard using $\beta_{x(c)} \geq 75$ (98.7% efficiency) as a minimum efficiency to rate an element as an high efficiency depth filter media. Filter manufacturers generally rate their high efficiency elements as $\beta_{x(c)} \geq 100$ (99.0% efficiency), $\beta_{x(c)} \geq 200$ (99.5% efficiency), or $\beta_{x(c)} \geq 1000$ (99.9% efficiency). Performance of HYDAC elements is typically a minimum rating of $\beta_{x(c)} \geq 1000$, with high dirt holding capacities and lower pressure drops in optimum balance to meet the dynamics and stresses of all applications.

Dirt Holding Capacity

Dirt holding capacity (DHC) is the amount of contaminant *(expressed in grams)* the element will retain before it goes into alarm *(terminal pressure)*. All other factors being equal, an element's DHC can provide indication of how long the element will last until full. This characteristic, taken into context with a structural and pleat support evaluation will provide good indication of what element should last longer in system operation.

Dirt holding capacity, sometimes called "apparent capacity," is a very important and often overlooked factor in selecting the right element for the application. The dirt holding capacity of an element is measured in grams of ISO medium test dust contaminant as determined from the multi-pass test *(ISO 16889)*, and measured at the terminal ΔP *(alarm point)*. When selecting filter elements, it is beneficial to compare the dirt holding capacities of elements with similar particle removal efficiencies and good structural and pleat support characteristics.

Pressure Drop

When sizing a filter, it is important to consider the initial differential pressure (ΔP) across the element and the housing. Elements offering a lower pressure drop at a high Beta efficiency are better than elements with a high ΔP at the same efficiency. At every level of filtration, HYDAC Betamicron® media elements offer a superior combination of high efficiency, high dirt holding capacity, and low pressure drop with the media support design that provides the highest levels of performance under dynamic fluid conditions.

Collapse Rating

The collapse rating of a filter *(determined by ISO 2941/ANSI B93.25)* represents the differential pressure across the element that causes the media to fail. The collapse rating of a filter element installed in a filter housing, with a bypass valve, should be at least two times greater than the full flow bypass valve pressure drop. The collapse rating for filter elements used in filter housings with no bypass valve should be at least the same as the setting of the system relief valve upstream of the high collapse element. When a collapsed element becomes clogged with contamination all functions downstream of the filter will become inoperative due to the release of high levels of contamination to the critical hydraulic components - **Loss of Protection**.

Element Selection

The Right Media for the Right Application = Job Matched Filtration

Filtration Application Guidelines

Selecting the proper HYDAC media for your application is easy if you follow these simple guidelines.

Step 1. Remember that the key to cost effective contamination control is to maintain the system's cleanliness at the tolerance level of the system's most sensitive component. So, the first step is to identify the most sensitive component.

Step 2. Determine the desired cleanliness level (ISO Code) for that component by referring to Table 5 on page 8 or by contacting the component manufacturer directly.

Step 3. Referring to Table 8 identify the HYDAC filter medium that will meet or exceed the desired cleanliness level.

Step 4. Remember to regularly check the effectiveness of the selected media through the use of contamination monitoring equipment.

Table 8. HYDAC Element Media Recommendations

Desired Cleanliness Levels (ISO Code)	HYDAC Media
20/18/15	20 µm
19/17/14	10 µm
18/16/13	5 µm
17/15/12	3 µm

Effect of Dirt Ingression

Filter element life varies with the true dirt holding capacity of the element under dynamic flow conditions and the amount of dirt introduced into the circuit. The rate of this dirt ingression in combination with the desired cleanliness level should be considered when selecting the media to be used for a particular application. Table 9 provides recommendations accordingly.

The amount of dirt introduced can vary from day to day and hour to hour, generally making it difficult to predict when an element will become fully loaded. This is why we recommend specifying a filter indicator.

Filter indicators provide a vital measure of protection for your system by indicating when the filter element needs to be changed or cleaned. HYDAC filters are available with visual, electrical and electrical-visual combination filter indicators. These indicators may also be purchased as separate items.

Table 9. Recommended HYDAC Media to Achieve Desired Cleanliness Levels

Desired Cleanliness Levels (ISO Code)	HYDAC Element Micron Rating
20/18/15	20 µm
19/17/14	10 µm
18/16/13	5 µm
17/15/12	3 µm

Amount of Fluid Filtered

To obtain the desired cleanliness level (ISO Code) using the suggested HYDAC filter medium, it is recommended that a minimum of one-third of the total fluid volume in the system pass through the filter per minute. If fluid is filtered at a higher flow rate, better results may be achieved. If only a lesser flow rate can be filtered, a more efficient media may be required.

Systems operating in a clean environment, with efficient air-breather filters and effective cylinder rod wiper seals, may achieve the desired results at a lower turnover rate. Systems operating in a severe environment or under minimal maintenance conditions should have a higher turnover. Turnover must be considered when selecting the location of the system's filter(s).

Sizing a Filter Element

Since the pressure drop versus flow data contained in our filter catalog is for fluids with a viscosity of 141 SUS (30 cSt), and a specific gravity of .86, we are often asked how to size a filter with a viscosity other than 141 SUS (30 cSt) or a specific gravity other than .86. In those instances where the viscosity or specific gravity is significantly higher, it may be necessary to use a larger element. To make this determination, we need to calculate the life of the element, using the following equation:

EL = IA – (H + E)

Where:

EL	=	Element Life (expressed in psi)
H	=	Housing pressure drop
IA	=	Indicator Alarm trip point
E	=	Element pressure drop

1. The housing pressure drop can be read directly from a graph. This value is not significantly affected by viscosity or the number of elements in the housing, since housing flow is turbulent.
2. The element pressure drop is directly proportional to viscosity, influenced by high pressure since element flow is laminar.

A "rule of thumb" for element life, as calculated from the above equation, is to work towards a filter assembly differential pressure drop that is typically no greater than 20% of alarm trip setting.

Typical targets are:

- ≤ 15 psid for pressure
- ≤ 6 psid for return
- 3 to 4 psid for lube systems

Filter assembly differential pressure should never exceed 50% alarm trip point even in most demanding applications.

The interval between element change-outs can be extended by increasing the total filter element area. Many HYDAC filters can be furnished with one, two, or three elements or with larger elements. By selecting a filter with additional element area, the time between servicing can be extended for minimal additional cost.

Fluid Compatability: Fire Resistant Fluids

HYDAC filters have been used successfully to filter a variety of fire resistant fluids. Filtering these fluids requires careful attention to filter selection and application. Your fluid supplier should be the final source of information when using these fluids. The supplier should be consulted for recommendations regarding limits of operating conditions, material and seal compatibility, and other requirements peculiar to the fluid being used within the conditions specified by the fluid supplier.

High Water Content Fluids

High water content fluids consist primarily of two types: water and soluble mineral base oil, and water with soluble synthetic oil. The oil proportion is usually 5%, but may vary from as low as 2% to as high as 10%.

Standard HYDAC Betamicron® elements are compatible with both types of high water content fluids. Filter sizing is accomplished the same as it is done with other mineral based hydraulic fluids. Some special factors that need to be considered in the selection process include the following:

- All aluminum in the filter housing should be high water based tolerant or anodized.
- Buna N or Viton seals are recommended.
- The high specific gravity and low vapor pressure of these fluids create a potential for severe cavitation problems. Suction filters or strainers should not be used with these fluids.

Invert Emulsions

Invert emulsions consist of a mixture of petroleum based oil and water. Typical proportions are 60% oil to 40% water. Standard HYDAC filters with 10 µm and 25 µm media elements are satisfactory for use with these fluids. Filters should be sized conservatively for invert emulsions. These fluids are non-Newtonian - their viscosity is a function of shear. We recommend up to twice the normal element area be used as space and other conditions permit.

Some special factors that need to be considered in the selection process include the following:

- Potential exists for cavitation problems with invert emulsions similar to high water based fluids.
- Buna N or Viton seals are recommended.

Water Glycols

Water glycols consist of a mixture of water, glycol, and various additives. HYDAC Betamicron® filter elements are compatible for use with these fluids. Some special factors that need to be considered in the selection process include the following:

- All aluminum in the filter should be water tolerant or anodized.
- Potential exists for cavitation problems with water glycols similar to high water based fluids.
- Buna N or Viton seals are recommended.

Phosphate Esters

Phosphate esters are classified as synthetic fluids. All HYDAC filters and elements can be used with most of these fluids. Sizing should be the same as with mineral based oils of similar viscosity. Some special factors that need to be considered in the selection process include the following:

- Use any Betamicron® media with EPR or Viton seals if required by fluid manufacturer for phosphate esters.
- Use S0103H *(low collapse)* or S0155H *(high collapse)*.

Pressure Drop Correction for Specific Gravity (filter housing)

Filter housing pressure drop curves shown in this catalog are predicated on the use of petroleum based fluid with a specific gravity of 0.860. The various fire resistant fluids discussed in this section have a specific gravity higher than 0.860, which affects pressure drop. Use the following formula to compute the correct pressure drop for the higher specific gravity:

Corrected pressure drop =

$$\frac{\text{Fluid specific gravity}}{0.860} \times \text{Catalog pressure drop}$$

Filter Selection Considerations

Filter Location

Pressure filtration: Pressure filters usually produce the lowest system contamination levels to assure clean fluid for sensitive high-pressure components and provide protection of downstream components in the event of catastrophic failures. Systems with high intermittent return line flows may need only be sized to match the output of the pump, where the return line may require a much larger filter for the higher intermittent flows. See Figure 6(a).

Return line filtration: Return line filters are often considered when initial cost is a major concern. A special concern in applying return line filters is sizing for flow. Large rod cylinders and other components can cause return line flows to be much greater than pump output. Return lines can have substantial pressure surges, which need to be taken into consideration when selecting filters and their locations. See Figure 6(b).

Re-circulating filtration: While usually not recommended as a system's primary filtration *(due to the high cost of obtaining adequate flow rates)* re-circulating, or off-line, filtration is often used to supplement on-line filters when adequate turnover cannot be obtained with the inline filter. It is also often an ideal location in which to use a water removal filter. Off-line re-circulating continuous depth filters normally do not provide adequate turnover flow rates to handle the high contamination loading resulting from component failures and/or inefficient maintenance practices. See Figure 6(c).

Suction filtration: High efficiency suction filters are not recommended for open-loop circuits. The cavitation these filters can cause far outweighs any advantage obtained by attempting to clean the fluid in this part of the system.

Breather filtration: Efficient filter breathers are required for effective contamination control on nonpressurized reservoirs and should complement the liquid filtration component.

Multiple filtration: For systems incorporating large total fluid volumes, it may be necessary to employ filters in more than one location. Multiple pressure filters, pressure and return line filters, and recirculating filters are examples of multiple filtration applications.

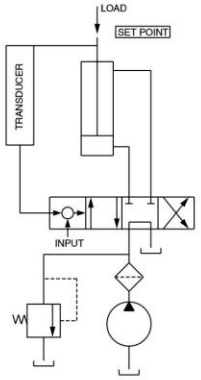


Figure 6(a). Pressure Filtration Circuit

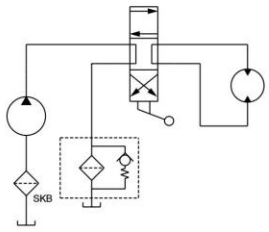


Figure 6(b). Return Line Filtration Circuit

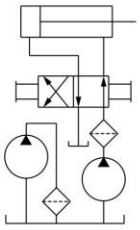
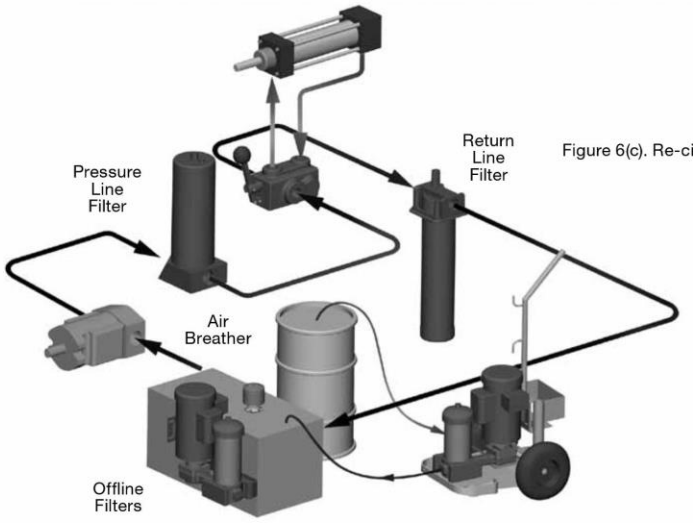


Figure 6(c). Re-circulating Filtration Circuit



Seven Steps to Selecting a Filter

It is important to keep in mind that all system components have some tolerance for contamination. The key to cost effective contamination control is to maintain the system's cleanliness level at the tolerance level of the most sensitive component. Once the desired cleanliness level (ISO code) is determined, selecting a cost effective filtration system can be readily accomplished.

1. Determining desired cleanliness level	Step 1. Determine the most sensitive component in the system. Then, determine the desired cleanliness level *(ISO code)* by using Tables 4 and 5 *(page 8)* or by contacting the manufacturer directly. Operating pressure levels also have a bearing on cleanliness requirements.
2. Selecting correct medium	Step 2. Using Table 9 *(on page 11, respectively)*, identify the proper HYDAC filter media to employ.
3. Where to filter	Step 3. Determine where to locate the filters, using the information on the previous page, "Filter Location."
4. Selecting filter housing	Step 4. Refer to Filter Products in the Table of Contents and the individual filter catalog pages to select the specific filter housing that will meet the requirements set forth in Steps 2 and 3 above, as well as the pressure and flow parameters at the particular filter's location. Consideration should also be given to installation convenience for your particular application. Use the selection charts shown on the catalog page to determine the specific filter model number for the desired media at the required flow rate.
5. Selecting filter breather	Step 5. For nonpressurized reservoirs, refer to the HYDAC Accessories Catalog to select the appropriate filter breather.
6. Contamination control practices	Step 6. Implement the appropriate manufacturing, assembly, and maintenance contamination control procedures. Effective contamination control is achieved through the conscientious use of sound manufacturing and maintenance practices. Some examples are: filtering make-up oil; controlling contamination ingestion during manufacturing, assembly, maintenance, and repair processes; and properly maintaining cylinder wiper seals.
7. Verifying results	Step 7. Check all filtration systems to determine if the results expected are obtained and maintained during system operation, as operating conditions and maintenance practices may not remain constant. HYDAC distributors and field representatives have access to contamination monitoring equipment that can determine the exact cleanliness level *(ISO code)* of your system on the spot. Contact your HYDAC distributor or phone us for complete details.

Rated Fatigue Pressure

The application of individual filters should take fatigue ratings into consideration when there are flow or pressure variations creating pressure peaks and shock loads.

Typical hydraulic systems that use highly repetitive operations include plastic injection molding machines, die-cast machines, and forging and stamping press systems. In these and other similar applications, rated fatigue pressure should be considered when selecting a filter.

It has been common practice in the fluid power industry to establish component ratings for maximum operating pressure based on the minimum yield pressure, which is usually one third of the minimum yield pressure for higher-pressure components and one fourth of the minimum yield pressure for lower-pressure components. This rating method has proved satisfactory for many years, but it does not directly address the subject of fatigue.

The National Fluid Power Association has introduced a method *(NFPA T2.6.1)* for verifying the fatigue pressure rating of the pressure-containing envelope of a metal fluid power component. In this method, components are cycled from 0 to test pressure for 1 million cycles *(10 million cycles is optional)*. The rated fatigue pressure *(RFP)* is verified by testing. We establish the desired RFP from design, then we calculate the cycle testing pressure *(CTP)*, and then conduct tests at CTP per 1,000,000 cycles.

The T2.6.1 Pressure Rating document is available from the National Fluid Power Association, 3333 N. Mayfair Road, Milwaukee, WI 53222-3219.

Sizing HYDAC Filter Assemblies

To properly size and calculate the pressure drop across a filter for a particular application the following procedures should be strictly followed:

Assembly pressure drop (ΔP) is the sum of the ΔP across the filter housing plus the ΔP across the filter element.
This simple formula is shown below:

ΔP Filter Assembly = ΔP Housing + ΔP Clean Element

To calculate a filter assembly ΔP we must first know the specifics of the application.

To calculate the ΔP across the housing we must know the flow rate and specific gravity of the fluid we wish to filter. A chart is provided in each of the product brochures that provides a curve outlining the pressure drop across the housing based upon the flow in GPM *(gallons per minute)*. This data must then be adjusted if the specific gravity is at a lower or higher point than standard Hydraulic Fluid (0.86). The formula for calculation of the housing ΔP is shown as follows:

$$\Delta P \text{ Housing} = \Delta P \text{ (From Curve on Literature)} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

To calculate the ΔP across the element additional information is required. This will include the **viscosity** of the fluid *(at operating temperature)*, required **filtration rating in µm** *(microns)*, **type of element** *(High collapse -BH or Low collapse -BN)*, and **K** *(coefficient)* factor from the attached conversion tables. With this information the following formula is used to calculate ΔP across the element. Again the specific gravity and viscosity *(standard hydraulic fluid figured at a viscosity of 141 SSU - Saybolt Universal Seconds - 30 centistrokes)* will change the ΔP.

$$\Delta P \text{ Clean Element} = \frac{\text{Flow Rate GPM X Element K factor}}{\text{or } (\Delta P \text{ from element curve})} \times \frac{\text{Actual Specific Gravity}}{0.86} \times \frac{\text{Actual Viscosity in SSU}}{141}$$

EXAMPLE - an application with the following criteria would be sized as shown.

Conditions:	**Fluid** – Hydraulic Oil	**Flow Rate** – 30 GPM
	Specific Gravity – 0.86	**Max. Operating Pressure** – 4,500 psi
	Viscosity – 141 SSU	**Normal Operating Pressure** – 4,000 psi
	Micron Rating - 10µm	**Bypass** - YES *(Low collapse element)*

Filter Type Selected

HYDAC Model No. DF BN/HC 240 G 10 D 1.1 / 12 V -B6

HOUSING

$$\Delta P \text{ Housing} = \Delta P \text{ Calculation (From Curve on Literature)} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

$$\Delta P \text{ Housing} = 1.0 \text{ psid} \times \frac{0.86}{0.86} = 1.0 \text{ psid}$$

ELEMENT

$$\Delta P \text{ Clean Element} = \Delta P \text{ Calculation} \times \frac{\text{Actual Specific Gravity}}{0.86} \times \frac{\text{Actual Viscosity}}{141 \text{ SSU}}$$

$$\Delta P \text{ Clean Element} = 30 \text{ GPM} \times 0.196 \times \frac{0.86}{0.86} \times \frac{141 \text{ SSU}}{141 \text{ SSU}}$$

$$\Delta P \text{ Clean Element} = 5.88 \times 1 \times 1 = 5.88 \text{ psid}$$

FILTER ASSEMBLY

$$\Delta P \text{ Filter Assembly} = \Delta P \text{ Housing} + \Delta P \text{ Clean Element}$$
$$1.0 \text{ psid} + 5.88 \text{ psid} = 6.88 \text{ psid}$$

NOTE:
A change in the fluid can make a significant difference in the pressure drop across a filter assembly. A second calculation for the element (ΔP) should be done at the lowest temperature condition *(cold start)* to determine how the filter will operate under these sevear conditions with significantly higher viscosity.

EXAMPLE - an application with the following criteria would be sized as shown. *(Cold Start Condition)*

Conditions:

Fluid – Hydraulic Oil
Specific Gravity – 0.86
Viscosity – 400 SSU
Micron Rating - 10µm
Flow Rate – 30 GPM
Max. Operating Pressure – 4,500 psi
Normal Operating Pressure – 4,000 psi
Bypass - YES *(Low collapse element)*

Filter Type Selected
HYDAC Model No. DF BN/HC 240 G 10 D 1.1 / 12 V - B6

HOUSING

$$\Delta P \text{ Housing} = \Delta P \text{ Calculation } \textit{(From Curve on Literature)} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

$$\Delta P \text{ Housing} = 1.0 \text{ psid} \times \frac{0.86}{0.86} \text{ or } (1.0) = 1.0 \text{ psid}$$

ELEMENT

$$\Delta P \text{ Clean Element} = \Delta P \text{ Calculation} \times \frac{\text{Actual Specific Gravity}}{0.86} \times \frac{\text{Actual Viscosity}}{141 \text{ SSU}}$$

$$\Delta P \text{ Clean Element} = 30 \text{ GPM} \times 0.296 \times \frac{0.86}{0.86} \times \frac{400 \text{ SSU}}{141 \text{ SSU}}$$

$$\Delta P \text{ Clean Element} = 5.9 \times 1.0 \times 2.84 = 9.72 \text{ psid}$$

FILTER ASSEMBLY

ΔP Filter Assembly = ΔP Housing + ΔP Clean Element
1.0 psid + 9.72 psid = 10.72 psid *(More than 2 times normal clean assembly ΔP)*

Filter Applications Worksheet

*Name: _____ *Title: _____

*Company: _____ *Email: _____

*Address: _____ State: _____ Zip: _____

*Phone: _____ Mobile: _____ Fax: _____

End User System Application

***System Critical Components** (i.e. Servo's, Proportional Valves)*

***System Operating Temperature Range**	
From:	°F
To:	°F

***Ingested Dirt Levels** (check one)*

☐ Heavy ☐ Medium ☐ Light

***Clean Filter Differential Pressure Limit**	
	psid *(typically 40%-50% Indicator trip setting)*

***ISO/NAS Cleanliness Target Level**

***Maximum Operating Pressure**	
	psi

***Nominal Operating Pressure**	
	psi

***Filter Flow Rate Nominal / Maximum**	
	gpm nominal
	gpm maximum

***Hydraulic Fluid**		
Manufacturer		Type
Designation		
Viscosity	SUS	CS
Specific Gravity		

***Special Operating Requirements** (reverse flow, bidirectional flow duplex, or other special requirements)

***Mounting Orientation & Port Configuration**
Inlet
Outlet

***Inlet/Outlet Configuration** (i.e. inline, side inlet/bottom outlet)

***Filter Changeout Access** (i.e. top or bottom)

Bypass Requirements

☐ 87 ☐ 43 ☐ 25 ☐ 15 ☐ 3 (psid) ☐ Non Bypass KB

***Indicator Requirements** (check one)*

☐ B ☐ BM ☐ C ☐ D ☐ E/ES ☐ F ☐ G ☐ GC
☐ GW ☐ H ☐ J ☐ J4 ☐ K ☐ LE ☐ LZ ☐ UE
☐ UF ☐ UG ☐ V

Supply Voltage *(LED for D Indicators)*:

☐ Diff. Pressure ☐ Static ☐ Vacuum Indication
(check one)

***Filtration Rating Requirements**
Micron Rating
Depth / Surface
Element Media
ISO Cleanliness Target

***System Maintenance Comments** (Sampling/changeout frequency, maintenance practices)

*Required Information to properly quote.

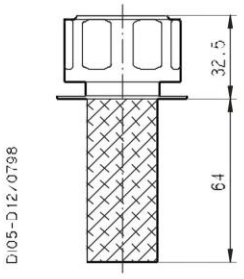
FILLER BREATHER FILTERS SERIES HB

IKRON®
Fluid Filtration

Replaces: HB 01 T E / 07.1998

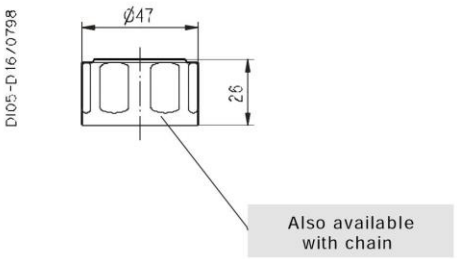
The filler breather filters HB series are built in steel and are protected with special treatments allowing utilization and exposure to the atmospheric agents.
The range includes particular options like the pressurization valve and the air filtration.

HB 50

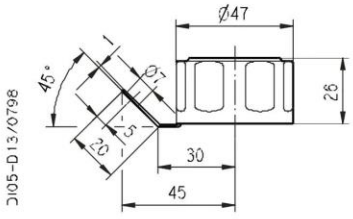


TECHNICAL DATA		
Degree of filtration air		10 [mm] - 40 [mm]
Air flow	10 [mm]	250 [l/min]
	40 [mm]	285 [l/min]
Operatingtemperature		- 30 + 90 [°C]
Fluid compatibility		Mineral oils
		Synthetic fluids
Seals		Buna
Weight		0,070 , 0,090 [Kg]

CAP



CAP WITH LOCKING LUG

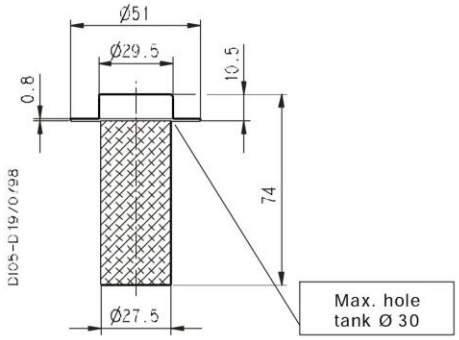


Edition: 02/04.2000

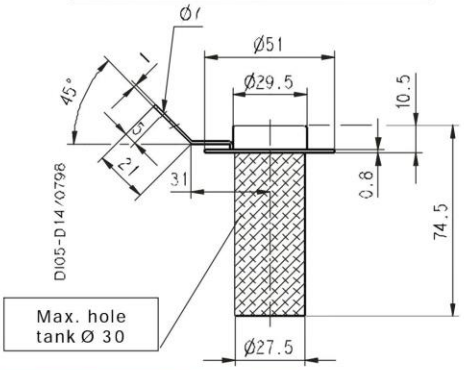
IKRON S.r.l.
43044 Lemignano di Collecchio (PR) - Italy Via C.Prampolini , 2
Telephone: nat. 0521 304911 -internat. + 39 0521 304911 - Fax + 39 0521 304900

IKRON

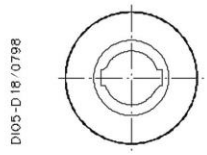
MOUNTING FLANGE WITH BASKET



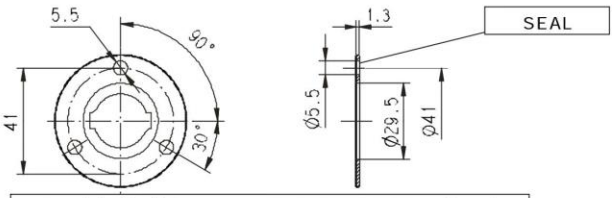
MOUNTING FLANGE WITH BASKET AND LOCKING LUG



WELD-ON MOUNTING

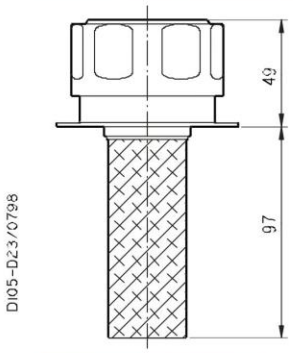


MOUNTING WITH SCREWS



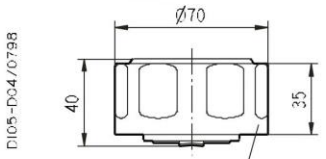
Furnished with 3 screws M5x12 UNI 6107 and seal

HB 70



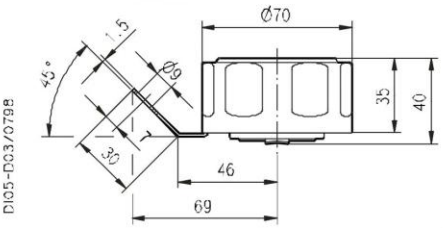
TECHNICAL DATA		
Degree of filtration air		10 [mm] - 40 [mm]
Air flow	10 [mm]	450 [l/min]
	40 [mm]	480 [l/min]
Operating temperature		- 30 + 90 [°C]
Fluid compatibility		Mineral oils
		Synthetic fluids
Seals		Buna
Weight		0,230 ÷ 0,570 [Kg]

CAP



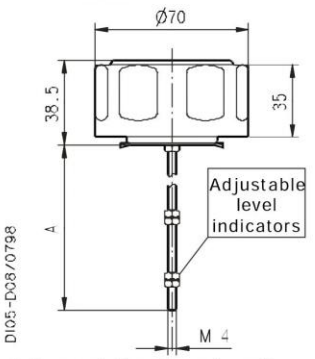
Version with chain available

CAP WITH LOCKING LUG



Cap with dipstick code	A mm
M	200
N	400
P	630

CAP WITH DIPSTICK



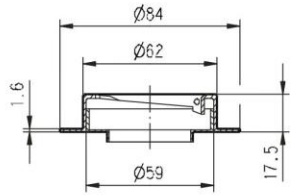
It does not allow the using with the filtering basket.

DI05-002/07.98

IKRON

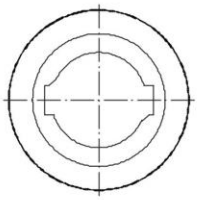
Replaces: 07.98

MOUNTING FLANGE



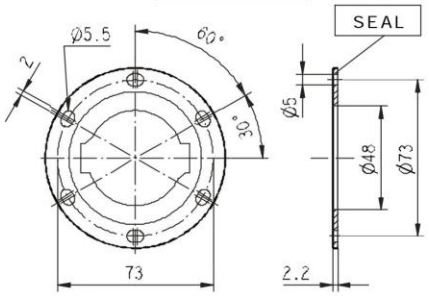
WELD-ON MOUNTING

Hole tank Ø 42



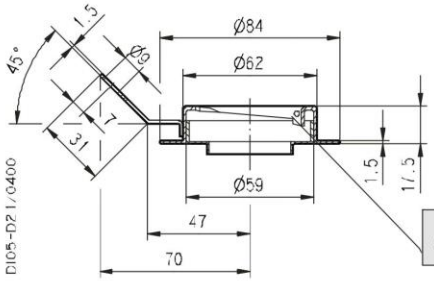
MOUNTING WITH SCREWS

Hole tank Ø 42



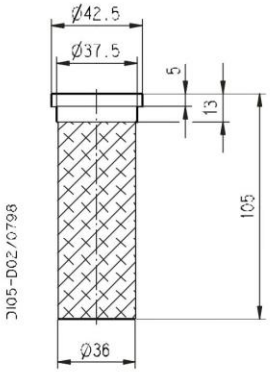
Furnished with 6 screws
M5x12 UNI 6107 and seal

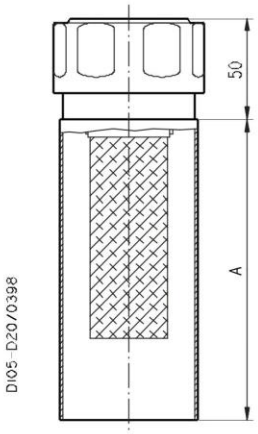
MOUNTING FLANGE WITH LOCKING LUG



Arranged for chain

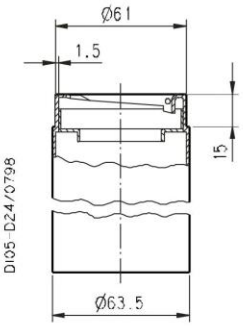
FILTERING BASKET



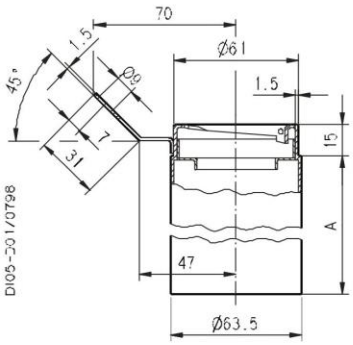


Extension code	A
	mm
15	40
20	65
25	80
30	135

FLANGE WITH EXTENSION *WELD-ON MOUNTING*



FLANGE WITH EXTENSION AND LOCKING LUG *WELD-ON MOUNTING*



Hole tank Ø 64

DI05-002 - 02/04.00

IKRON

HOW TO ORDER

1	2	3	4	5	6	7	8	9
HB 70	– A	– 8	– L	– 2	– 15	– G	– 2	– R

1 Type	CODE
Filler breather filters	HB 50
Filler breather filters	HB 70

2 Cap features	CODE
10 [mm] Air filter	A
40 [mm] Air filter	B

3 Pressurization valve	CODE
None	8
With pressurization valve: 0,4 bar ①	9

4 Dipstick	CODE
None	L
With dipstick height (200 mm) ① - ②	M
With dipstick height (400 mm) ① - ②	N
With dipstick height (630 mm) ① - ②	P

5 Arrangements	CODE
None	1
Arranged for chain	2
Arranged for safety locking	3

6 Mounting flange	CODE
Mounting with screws	05
Weld-on mounting	10
Extension to weld h= 40 mm ①	15
Extension to weld h= 65 mm ①	20
Extension to weld h= 80 mm ①	25
Extension to weld h= 135 mm ①	30

7 Filtering basket	CODE
None ①	G
With basket (obligatory for HB 50)	H

8 Flange arrangements	CODE
None	1
Arranged for chain	2
Arranged for locking	3

9 Safety elements	CODE
None	R
With safety element	S

① **ONLY FOR HB 70 ONLY**

② **VERSIONS M -N - P DO NOT ALLOW THE MOUNTING WITH THE FILTERING BASKET**

DI05-002/07.98

Overview of Elements

Wire Mesh Element

- Corrosion protection due to stainless steel filter material and tin-plated or nickel-plated steel parts
- Cleanable
- Filtration ratings: 25µm, 50µm, 74µm, 100µm, 149µm, and 200µm nominal

Metal Fiber Element

- Safeguards high filtration efficiency even at extreme dynamic loads
- High contamination retention capacity due to deep filtering which results in a longer service life
- Low flow resistance
- Corrosion protection due to stainless steel filter material and tin-plated steel parts
- High differential pressure tolerance
- Economical due to cleanability
- High temperature range
- Filtration ratings: 3µm, 5µm, 10µm, and 20µm nominal / or absolute ratings - *Consult Factory*

Disposable Polyester (paper) Element

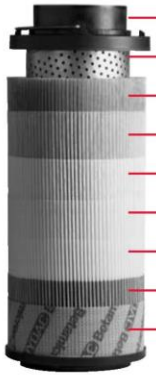
- Higher contamination retention capacity then cellulose due to deep filtration
- Low flow resistance
- Media supported on both sides with wire mesh
- Good fluid compatability due to media being free of bonding agent
- Filtration ratings: 10µm, and 20µm nominal
- Non cellulose media *(polyester)*- plastic coating eliminates swelling

Mobilemicron Element

- Extremely low ΔP across elements when utilized with high viscosity fluids or cold start conditions
- Melt blown fiberglass media construction
- Good dirt holding capacity
- High filtration efficiencies $\beta_{x(c)} \geq 200$
- Good beta stability
- Filtration Ratings: 10µm and 15µm absolute

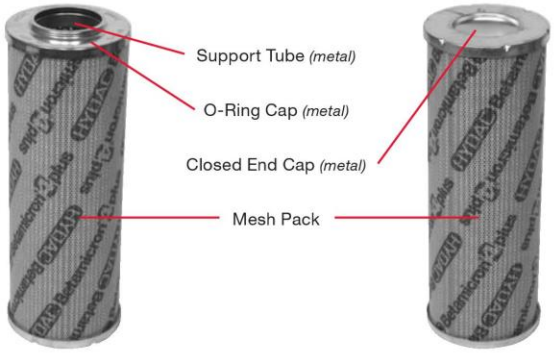
Element Construction

Betamicron®



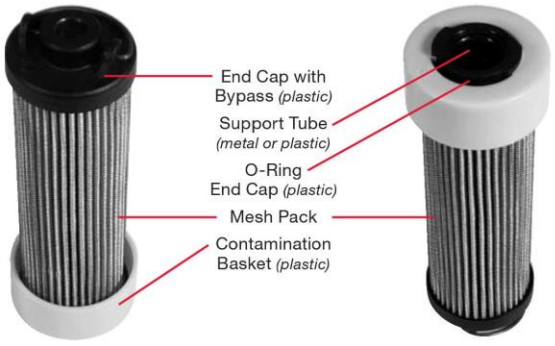
1 Conductive plastics end caps
2 Seam support tube
3 Inner screen to stabilize deep pleats
4 Support layer to back up active media layers
5 Final active depth layer to remove fine particles
6 Pre-filter depth layer to remove course articles
7 Diffusion layer to equalize flow across surface
8 Outer screen to stabilize pleats *(under cover)*
9 Multi-Protection cover *(for high pressure elements)*

Betamicron® Pressure



Betamicron® Return Element

Return filters include Bypass in the endcap - insures proper bypass operation at all times.



Betamicron® Absolute Elements

- BN4HC - Low Collapse (290 psid)
- BH4HC - High Collapse (3045 psid)
- Fiberglass
- Depth Filtration
- 3, 5, 10, & 20 micron
- Disposable
- Absolute Filtration Rating $\beta_{x(c)} \geq 1000$
- Structurally Designed for Dynamic Flow Conditions

Betamicron / Aquamicron Combination Elements

- BN/AM - code designation
- Collapse Rating - 145 psid
- Undissolved (free) Water Removal ONLY!
- 3 & 10 micron
- Absolute Filtration Rating ßx(c) > 100
- Disposable

Mobilemicron Elements

- Low Clean Element ΔP Per Flow Rate for Cold Start
- Absolute Filtration Rating ßx(c) ≥ 200
- Good Beta Stability
- Good Dirt Holding Capacity
- Collapse Rating - 145 psid
- Disposable
- Depth Filtration

Polyester (paper) Nominal Elements

- P/HC - code designation
- Polyester
- Collapse Rating - 250 psid
- 10 & 20 micron, Nominal
- Disposable
- Surface Filtration

ECOmicron® Element

- ECO/N - code designation
- All Plastic Construction
- Collapse Rating - 145 psid
- 3, 5, 10, & 20 micron
- Absolute Filtration Rating ßx(c) ≥ 1000
- Disposable
- Depth Filtration

Wire Screen Ecominal Elements

- W/HC - code designation
- Collapse Rating - 250 psid
- Wire Mesh
- 25, 74, & 149 micron, Nominal
- Cleanable
- Surface Filtration

Aquamicron® Elements

- AM - code designation
- Collapse Rating - 145 psid
- Undissolved (free) Water Removal ONLY!
- 40 micron
- ß40(c) ≥ 100
- Disposable

Metal Fiber Nominal Elements

- V - code designation
- Collapse Rating - 3000 psid
- Stainless Steel Media
- 5, 10, & 20 micron, Nominal
- Cleanable
- Depth Filtration
- Absolute Rated Available on Request
- 1, 3, 5, 10, & 20 Micron Absolute for Process Applications

Element K Factors

"D" Pressure Elements

Size	...D...BN4HC (Betamicron® Low Collapse)				
	3 µm	5 µm	10 µm	20 µm	Wgt. (lbs.)
0030	3.504	2.374	1.251	0.618	0.176
0035	1.294	1.041	0.811	0.510	N/A*
0055	0.751	0.603	0.444	0.263	N/A*
0060	1.582	1.116	0.723	0.433	0.243
0075	0.510	0.411	0.290	0.170	N/A*
0095	0.411	0.329	0.225	0.132	N/A*
0110	0.819	0.585	0.361	0.205	0.397
0140	0.701	0.450	0.261	0.157	0.485
0160	0.718	0.480	0.252	0.193	0.595
0240	0.450	0.333	0.196	0.128	0.881
0280	0.220	0.171	0.092	0.071	1.631
0330	0.294	0.215	0.163	0.095	1.389
0500	0.181	0.132	0.081	0.058	2.183
0660	0.136	0.099	0.061	0.044	2.712
0990	0.090	0.066	0.040	0.029	3.285
1320	0.068	0.048	0.030	0.021	9.700
1500	0.069	0.058	0.032	0.018	N/A*

Size	...D...BH4HC (Betamicron® High Collapse)				
	3 µm	5 µm	10 µm	20 µm	Wgt. (lbs.)
0030	5.000	2.780	1.989	1.042	0.287
0035	–	–	–	–	–
0055	–	–	–	–	–
0060	3.210	1.785	0.993	0.669	0.507
0110	1.394	0.819	0.488	0.307	0.816
0140	1.088	0.622	0.445	0.233	0.992
0160	0.919	0.569	0.322	0.240	0.992
0240	0.578	0.374	0.214	0.158	1.764
0280	0.313	0.184	0.097	0.090	2.932
0330	0.422	0.244	0.154	0.108	2.645
0500	0.232	0.143	0.083	0.065	3.814
0660	0.179	0.106	0.055	0.049	4.740
0990	0.119	0.072	0.043	0.033	N/A*
1320	0.089	0.054	0.031	0.024	9.700
1500	0.958	0.675	0.410	0.215	N/A*

Size	...D...V Elements				
	3 µm	5 µm	10 µm	20 µm	Wgt. (lbs.)
0030	1.011	0.740	0.411	0.200	0.331
0060	0.877	0.511	0.296	0.183	0.485
0110	0.452	0.304	0.182	0.118	0.793
0140	0.320	0.261	0.172	0.126	1.080
0160	0.251	0.177	0.123	0.079	1.146
0240	0.169	0.137	0.093	0.062	1.653
0280	0.126	0.093	0.064	0.041	3.064
0330	0.121	0.097	0.065	0.043	2.579
0500	0.081	0.065	0.044	0.028	3.858
0660	0.063	0.050	0.034	0.021	4.564
0990	0.043	0.034	0.023	0.015	N/A*
1320	0.032	0.026	0.018	0.012	N/A*

Size	...D...W/HC Elements 25, 50, 74, 100, 149, 200 µm	Wgt. (lbs.)
0030	0.185	N/A*
0060	0.092	2.624
0110	0.050	0.661
0140	0.040	0.838
0160	0.035	1.102
0240	0.023	1.455
0280	0.020	2.425
0330	0.020	2.138
0500	0.011	N/A*
0660	0.008	3.748
0990	0.006	7.496
1320	0.004	9.700

* Not Available at the time of publication. Please contact HYDAC for latest information.

All Element K Factors in psi / gpm.

"DN" Pressure Elements

Size	...DN...BN/HC				
	3 µm	5 µm	10 µm	25 µm	Wgt. (lbs.)
0040	1.315	0.899	0.475	0.365	2.161
0063	0.819	0.541	0.330	0.256	0.331
0100	0.651	0.363	0.219	0.174	0.507
0160	0.439	0.306	0.202	0.143	N/A*
0250	0.275	0.178	0.111	0.091	1.411
0400	0.178	0.110	0.073	0.055	2.161

Size	...DN...BH/HC				
	3 µm	5 µm	10 µm	25 µm	Wgt. (lbs.)
0040	2.211	1.361	0.904	0.594	2.161
0063	1.590	1.359	0.895	0.452	0.838
0100	1.050	0.644	0.422	0.285	2.161
0160	0.439	0.274	0.219	0.143	N/A*
0250	0.292	0.183	0.151	0.107	0.705
0400	0.256	0.162	0.146	0.092	2.161

Pressure Elements for the Automotive Industry

Size	5.03.XXDBN				
	3 µm	5 µm	10 µm	20 µm	Wgt. (lbs.)
09	0.1680	0.1405	0.0788	0.0443	1.67
18	0.0800	0.0669	0.0375	0.0211	3.03
27	0.0517	0.0432	0.0242	0.0136	4.50

Size	5.03.XXDBH				
	3 µm	5 µm	10 µm	20 µm	Wgt. (lbs.)
09	0.2068	0.1457	0.0886	0.0465	10.450
18	0.0967	0.0681	0.0414	0.0217	19.026
27	0.0630	0.0444	0.0270	0.0142	27.139

Size	5.03.XXD W/HC	
	25, 50, 74, 100, 149, 200 µm	Wgt. (lbs.)
09	0.0073	1.71
18	0.0035	3.29
27	0.0023	N/A*

Size	1.11.XXDBN				
	3 µm	5 µm	10 µm	20 µm	Wgt. (lbs.)
04	0.5895	0.4999	0.2664	0.1531	0.69
08	0.2886	0.2413	0.1354	0.0761	1.02
13	0.1751	0.1464	0.0821	0.0462	1.51
16	0.1322	0.1105	0.0620	0.0348	1.89

Size	1.11.XXDBH				
	3 µm	5 µm	10 µm	20 µm	Wgt. (lbs.)
04	0.9366	0.6598	0.4012	0.2104	4.365
08	0.4553	0.3208	0.1951	0.1023	6.504
13	0.2738	0.1929	0.1173	0.0615	9.546
16	0.2060	0.1452	0.0883	0.0463	11.530

Size	1.07.XXDBN				
	3 µm	5 µm	10 µm	20 µm	Wgt. (lbs.)
04	2.0461	1.7350	0.9248	0.5313	0.26
08	0.9751	0.8152	0.4574	0.2571	0.39

Size	1.07.XXDBH				
	3 µm	5 µm	10 µm	20 µm	Wgt. (lbs.)
04	2.3965	1.6883	1.0266	0.5384	0.52
08	1.1652	0.8208	0.4991	0.2618	0.82

* Not Available at the time of publication. Please contact HYDAC for latest information.

All Element K Factors in psi / gpm.

"R" Return Elements

Size	...R...BN4HC (Betamicron® Low Collapse)				
	3 µm	5 µm	10 µm	20 µm	Wgt.
0030	3.749	2.407	1.470	0.808	0.070
0060	1.470	1.005	0.598	0.376	0.110
0075	1.209	0.780	0.445	0.241	0.240
0110	0.817	0.517	0.329	0.178	0.190
0140	N/A*	N/A*	N/A*	N/A*	N/A*
0160	0.522	0.323	0.208	0.159	0.320
0165	0.616	0.430	0.245	0.133	0.380
0185	0.485	0.334	0.179	0.097	N/A*
0210	0.214	0.145	0.096	0.060	N/A*
0240	0.338	0.208	0.142	0.096	0.380
0270	0.138	0.094	0.062	0.039	N/A*
0280	0.168	0.118	0.090	0.055	N/A*
0330	0.232	0.150	0.093	0.066	0.760
0500	0.162	0.104	0.069	0.044	1.040
0660	0.105	0.066	0.042	0.029	1.710
0850	0.082	0.055	0.036	0.023	2.364
0950	0.064	0.043	0.030	0.020	3.450
1300	0.045	0.032	0.024	0.014	4.050
1700	0.040	0.029	0.018	0.011	4.450
1800	0.036	0.030	0.016	0.009	N/A*
2600	0.023	0.016	0.011	0.007	6.500

Size	...R...ECO/N				
	3 µm	5 µm	10 µm	20 µm	Wgt.
0090	0.515	0.343	0.464	0.317	N/A*
0110	–	–	0.464	0.317	N/A*
0150	0.467	0.319	0.277	0.189	N/A*
0160	0.553	0.378	0.329	0.225	N/A*
0165	0.674	0.369	0.321	0.220	N/A*
0170	–	–	–	0.189	N/A*
0185	–	–	0.272	0.162	N/A*
0210	0.150	0.103	0.089	0.061	N/A*
0240	–	–	0.209	–	N/A*
0280	0.166	–	–	–	N/A*
0330	0.228	0.156	0.135	–	N/A*
0660	0.200	0.068	0.059	0.041	N/A*
0850	0.078	0.053	0.046	0.032	N/A*
0950	0.068	0.047	0.041	0.028	N/A*
1300	0.049	0.034	0.029	0.020	N/A*
1700	0.038	0.026	0.023	–	N/A*
2600	0.024	0.017	0.014	0.010	N/A*

Size	...R...BN/AM		
	3 µm	10 µm	Wgt.
0330	0.477	0.164	0.960
0660	0.192	0.066	1.991
0850	0.132	0.045	N/A*
1300	0.088	0.033	4.450
2600	0.052	0.019	8.100

Size	...R...MM		
	10 µm	15 µm	Wgt.
0060	0.420	0.263	0.110
0075	0.265	0.166	0.240
0090	0.252	0.118	N/A*
0110	0.199	0.124	0.190
0150	0.114	0.071	N/A*
0160	0.149	0.097	0.320
0165	0.146	0.091	0.380
0185	0.108	0.067	N/A*
0210	0.052	0.032	N/A*
0240	0.095	0.062	0.380
0270	0.032	0.020	N/A
0330	0.078	0.049	0.760
0500	0.052	0.032	1.040
0660	0.030	0.019	1.710
0850	0.023	0.015	2.364
0950	0.023	0.014	3.450
1300	0.016	0.010	4.050
1700	0.010	0.006	4.450
2600	0.008	0.005	6.500

Size	...R...P/HC (Paper)	
	10, 20 µm	Wgt.
0030	0.458	N/A*
0060	0.255	0.170
0075	0.156	0.320
0110	0.128	0.280
0160	0.077	0.290
0165	0.086	0.460
0240	0.049	0.627
0330	0.037	0.900
0500	0.024	0.805
0660	0.016	1.980
0850	0.012	2.500
0950	0.010	3.710
1300	0.007	4.450
1700	0.006	N/A*
2600	0.003	8.300

Size	...R...W/HC (Wire Screen)	
	25, 50, 74, 100, 149, 200 µm	Wgt.
0030	0.110	0.080
0060	0.055	0.175
0075	0.043	N/A
0110	0.030	0.290
0160	0.021	0.410
0165	0.020	0.520
0240	0.015	0.610
0330	0.010	0.960
0500	0.007	0.362
0660	0.005	1.980
0850	0.004	2.535
0950	0.003	3.520
1300	0.003	4.610
1700	0.002	N/A*
2600	0.001	8.300

* Not Available at the time of publication. Please contact HYDAC for latest information.

All Element K Factors in psi / gpm.

"RN" Return Elements

Size	...RN...BN/HC				
	3 µm	5 µm	10 µm	25 µm	Wgt.
0040	0.777	0.420	0.265	0.146	N/A*
0063	0.530	0.292	0.183	0.101	N/A*
0100	0.369	0.219	0.132	0.069	0.320
0160	0.184	0.137	0.095	0.055	0.810
0250	0.154	0.088	0.066	0.050	0.810
0400	0.119	0.076	0.056	0.047	0.980
0630	0.113	0.066	0.050	0.038	1.920
1000	0.038	0.027	0.022	0.014	N/A*

"AM"

Size	...AM...A	
	040A	Wgt.
0330	0.216	0.740
0500	0.138	1.023
0660	0.095	1.580
0850	0.074	1.990
0950	0.067	2.900
1300	0.048	3.550
2600	0.024	6.210

"RK"

Size	...RK...MM		
	10 µm	15 µm	Wgt.
0100	0.0964	0.0544	0.310
0201	0.0398	0.0268	0.650
0251	0.0379	0.0248	0.397
0300	0.0324	0.0161	1.220
0400	0.0299	0.0195	N/A*
0800	0.0207	0.0162	N/A*

Spin-Ons

Size	...MA...BN				
	3 µm	5 µm	10 µm	20 µm	Wgt.
0040	1.3914	1.1799	0.6289	0.3613	0.73
0080	0.5216	0.4423	0.2357	0.1354	1.35
0085	–	–	–	–	N/A*
0090	0.5409	0.4586	0.2445	0.1404	1.50
0095	0.3086	0.2616	0.1395	0.0801	2.04
0160	0.2372	0.1983	0.1113	0.0625	2.56
0180	0.1231	0.1029	0.0577	0.0325	3.69

Size	...MA...P			
	3 µm	10 µm	25 µm	Wgt.
0040	7.763	2.348	1.516	0.60
0080	1.606	0.486	0.314	1.08
0085	1.161	0.351	0.227	1.42
0090	1.594	0.482	0.311	1.29
0095	0.894	0.270	0.174	1.47
0160	0.839	0.192	0.145	2.15
0180	0.443	0.134	0.087	2.68

Size	...MA...A	
	010 µm	Wgt.
0080	0.513	1.35
0085	–	N/A
0090	0.507	1.50
0095	0.284	2.00
0160	0.233	2.50
0180	0.136	3.60

* Not Available at the time of publication. Please contact HYDAC for latest information.

All Element K Factors in psi / gpm.

SUCTION FILTERS HF 410 SERIES

IKRON®
Fluid Filtration

Replaces: HF 410 01 T E

The tank submerged suction filters HF 410 series are designed to be fitted directly on pump intake and provide versatility to safeguard the hydraulic components from contaminating particles.

- ARRANGED FOR CLOGGING INDICATOR
- BY-PASS VALVE (Standard setting - 20 [kPa]; - 0,2 [bar])
- MAGNETIC SET

MATERIALS	Connecting head	Reinforced nylon
	End cap	Zinc plated steel
	Inner tube	Zinc plated steel
	Filter media	Phosphor bronze
		Steel wire mesh
		Stainless steel wire mesh
	Seals	Buna
FLUID COMPATIBILITY CONFORMING TO ISO 2943	With reference to ISO 6743/4	With mineral oil (HH-HM-HR-HV-HG) and synthetic fluid (HS-HFDR-HFDU-HFDS)
ELEMENT COLLAPSE PRESSURE RATING	Conforming to ISO 2941	100 [kPa] 1 [bar]
FLOW RANGE	min.	10 [l/min]
	max.	300 [l/min]
DEGREE OF FILTRATION	Phosphor bronze	60 - 125 [µm]
	Steel wire mesh	90 [µm]
	Stainless steel wire mesh	25 - 60 - 250 [µm]
OPERATING TEMPERATURE		- 30 + 90 [°C]

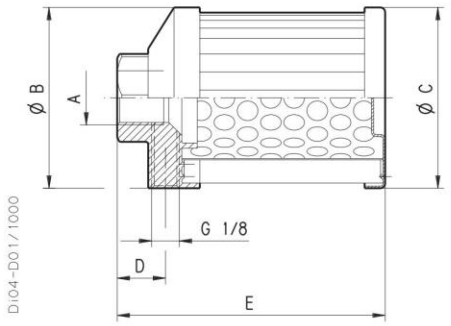
Edition: 02/07.20011

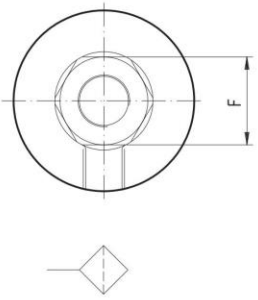
IKRON S.r.l.
43044 Lemignano di Collecchio (PR) - Italy Via C. Prampolini, 2
Telephone: (+ 39) 0521 304911 - Fax (+ 39) 0521 304900 - http://www.casappa.com - e-mail: ikron@casappa.com

IKRON

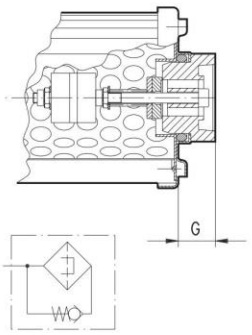
TECHNICAL DATA

VERSION A01





VERSION A06



Filter type	A (Thread GAS - BSPP)		Ø B	Ø C	D	E	F	G	Standard filtering surface	Oversized filtering surface
	Standard (✱)	On request (✱)	mm	mm	mm	mm	mm	mm	cm^2	cm^2
HF410-10.060	G 3/8	G 1/2	54	52	15,2	83	27	12	290	370
HF410-20.077	G 1/2	G 3/4 - G 1 - G 1 1/4	72,5	70	18,2	103	34 (■)	15	370	490
HF410-20.122	G 3/4	G 1/2 - G 1 - G 1 1/4				148			585	780
HF410-30.077	G 1	G 1 1/4 - G 1 1/2 - G 2	102	99	23,7 (●)	109	60 (□)	14,6	525	680
HF410-30.122						154			830	1075
HF410-30.162	G 1 1/4	G 1 - G 1 1/2 - G 2				194			1295	1425
HF410-30.195	G 1 1/2	G 1 - G 1 1/4 - G 2				227			1560	1870
HF410-40.122	G 2	G 2 1/2 - G 3	132,5	130	27	162	100	14,6	1515	2000
HF410-40.162						202			2010	2655
HF410-40.195						235			2420	3200
HF410-40.239						279			3970	5260

(✱) NPT and metric threads are available (consult our technical department).

(●) D= 28 mm only with A= G 2 (■) F= 50 mm only with A= G 1 - G 1 1/4 (□) F= 70 mm only with A= G 2

HOW TO ORDER

1		2		3		4		5		6
HF 410-10.060	-	AS	-	FB060	-	GC	-	A01	-	B1

1 Filter type	CODE
See table above	HF 410-..

2 Filtering surface	CODE
Standard	AS
Oversized (on request)	FS

3 Degree of filtration	CODE
60 [µm] Phosphor bronze	FB060
125 [µm] Phosphor bronze	FB125
90 [µm] Steel wire mesh	MS090
25 [µm] Stainless steel wire mesh	MI025
60 [µm] Stainless steel wire mesh	MI060
250 [µm] Stainless steel wire mesh	MI250

4 Inlet port	CODE
Thread GAS (BSPP)	
G 3/8	GC
G 1/2	GD
G 3/4	GE
G 1	GF
G 1 1/4	GG
G 1 1/2	GH
G 2	GL
G 2 1/2	GM
G 3	GN

5 Optionals	CODE
None (standard)	A01
With By-pass	A02
With By-pass and magnetic set	A06

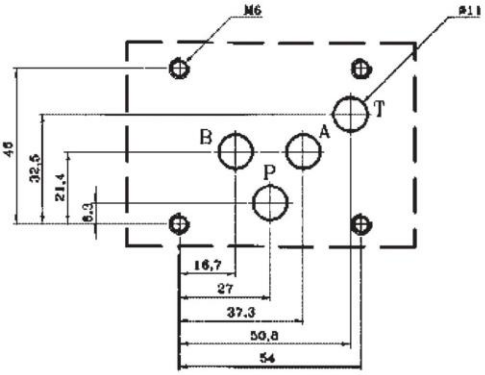
6 Arrangement	CODE
None	B1
Hole for indicator	B2
Plugged hole for indicator	B3

Standard

On request

Replaces: 06.98

Di04-002 - 02/07.2001



Le ns. Elettrovalvole CETOP 5

si caratterizzano per una progettazione

globale particolarmente accurata.

Infatti le caratteristiche tecniche c

he le rendono molto affidabili

e con performance molto elevate

si possono riassumere in:

- configurazione a doppia molla;
- magnete molto potente;
- fusione ottimizzata anche

  nei minimi particolari;
- portata molto elevata;
- limite idraulico molto alto.

1 LETTURA DEL CODICE DI DESIGNAZIONE DELLE VALVOLE FT5 - ES - *

FT5 - ES - (1) (C) - * - (024C) / 20

1 2 3 4 5 6 7

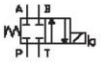
1	FT5	elettrovalvola di controllo direzione a 4 vie - Cetop 05 - pressione 32 Mpa (320 bar)
2	ES	comando elettrico standard
3	(1)	tipo di cursore (Vedi 7)
4	(C)	combinazione degli elettromagneti e delle molle, vedi anche simboli funzionali 2 C 2 magneti e cursore al centro (3 posizioni) N 2 magneti e cursore al centro (3 posizioni) LL 1 magnete (a) e molla (2 posizioni estreme) ML 1 magnete (a) e molla (2 posizioni, centrale ed estrema) LM 1 magnete (a) e molla (2 posizioni, estrema e centrale)
5	*	Codice riservato per opzioni e varianti b solo per versioni LL, ML, LM magnete “b” anziché magnete “a” T* dispositivo per commutazione temporizzata, vedi 14 e 15 K protezione antispruzzo e spintori manuali, vedi 16 Z* opzioni anticorrosione, vedi 18 DR drenaggio esterno della camera solenoide, vedi 17
6	(024C)	Tensione di alimentazione e bobine, vedi 10, 11 e 12
7	Numero di disegno (progressivo) della valvola	

2 SIMBOLI FUNZIONALI

1C 

1ML 

1N 

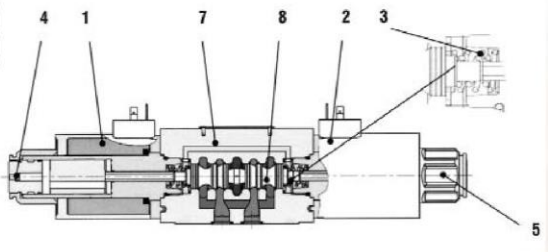
1MLb 

1LL 

1LM 

1LLb 

1LMb 

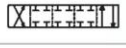


3 DESCRIZIONE

ELETTROVALVOLE DI CONTROLLO DIREZIONE 4 VIE CETOP 05 FT5 - ES - *

Il cursore⑧si sposta nel corpo della valvola⑦soggetto all'azione della molla③e dei magneti①e②.
Il cursore⑧ in funzione della sua forma e della sua posizione all'interno del corpo valvola⑦ apre e/o chiude i passaggi tra le bocche P, A, B, T controllando la direzione del flusso idraulico. In caso di mancanza di corrente, il cursore può essere spostato manualmente azionando lo spintore di emergenza④posizionato alla fine del magnete e accessibile attraverso la ghiera di bloccaggio⑤

4 IDENTIFICAZIONE DEL CURSORE E DEI TRANSITORI

0C			0LL		
1C			1LL		
3C			1LLb		
4C			2LL		
55C			0ML		
7C			1ML		
8C			3ML		
1N			4ML		
2N			8ML		

5 CARATTERISTICHE E PRESTAZIONI

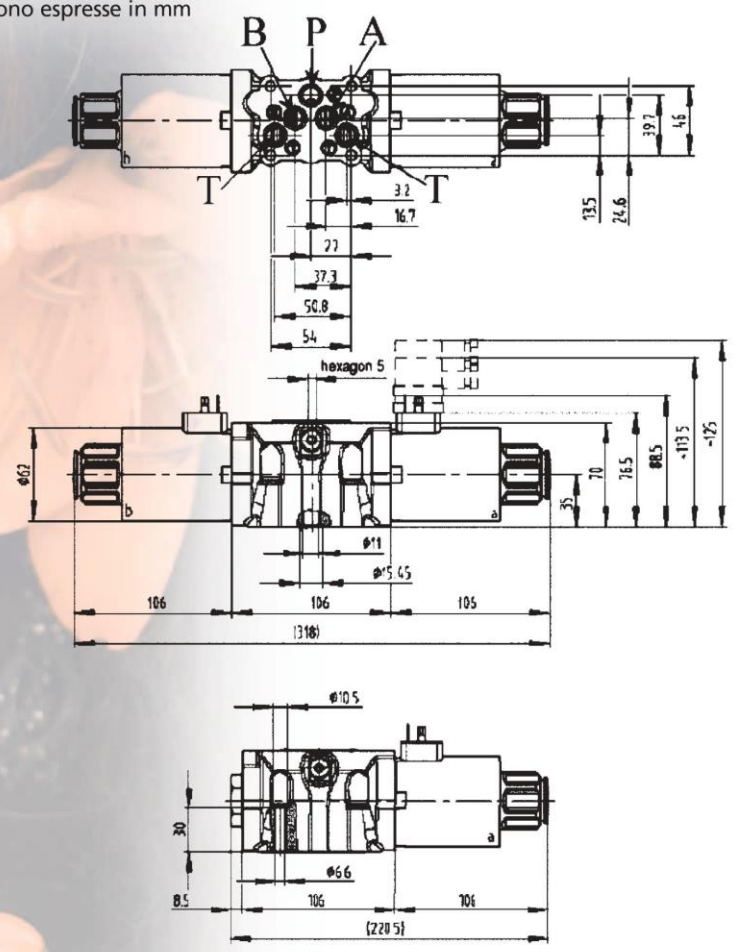
portata massima nominale	120 l/min
portata massima raccomandata	vedi 8
pressione massima nominale (P, A, B)	32 Mpa (320 bar)
pressione massima raccomandata (P, A, B)	35 Mpa (350 bar)
pressione massima alla bocca T	21 Mpa (210 bar)
perdite di carico	vedi 9
protezione DIN 40050	IP 65
ciclo di servizio	100%
vita di lavoro	>107 cycles
massa	1 sol. 3,9 kg
	2 sol. 5,4 kg
	2 sol. 5,4 kg

6 INSTALLAZIONE

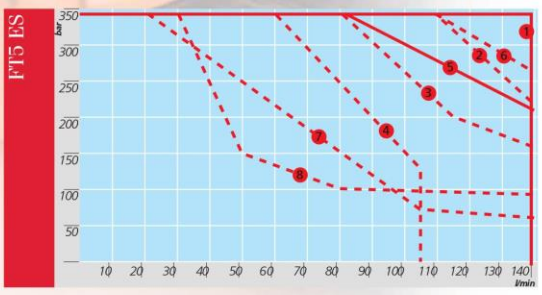
Le valvole FT5 - ES - * sono conformi a quanto prescritto dalle norme ISO e CETOP per superficie di montaggio. Quando vengono montate sulla piastra di collegamento le valvole FT5 - ES - * vengono fissate con 4 viti M6 x 40 mm (oppure M6 x ** a secondo dell'altezza dei vari moduli associati) strette con momento torcente di circa 12 Nm.
I trafilamenti tra la valvola e la sua superficie di montaggio sono impediti dalla compressione di opportune guarnizioni a sezione quadrata tipo QUAD - Ring 12,42 x 1,68 x 1,68.

7 DIMENSIONI DI MONTAGGIO

Tutte le dimensioni sono espresse in mm



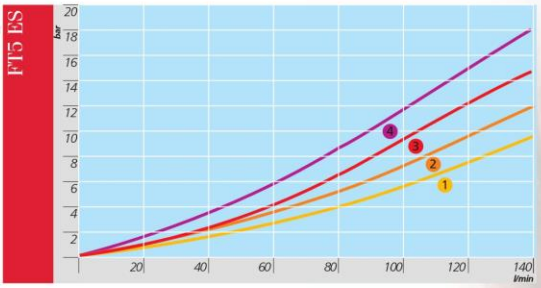
8 LIMITE IDRAULICO DI UTILIZZO



Curve di limite dei valori p/Q per un uso sicuro entro il campo di funzionamento delle elettrovalvole FT5 - ES - *.
Queste curve sono ottenute con valvole eccitate a tensione nominale - 5% e operanti con fluido idraulico con caratteristiche secondo ISO 4406 classe 19/17/14. Queste curve sono valide per un utilizzo a 4 vie della valvola.

Tipo	Curva
OC	1
1C	
8C	
0ML	
1ML	
8ML	
3C	5
3ML	
4C	3
55C	7
7C	4
1N	6
2N	8
0LL	2
1LL	2
1LLb	2
2LL	8
4ML	3

9 DIAGRAMMI TIPICI



Curve ΔpQ tipiche per valvole FT5 - ES - * in configurazione standard con fluido idraulico avente _ = 32 mm_/s a t = 40° C, per flussi P→A/B, A/B→T and P→T

Tipo	P-A	P-B	A-T	B-T	P-T
OC	1	1	2	2	1
1C	1	1	2	2	-
3C	1	1	2	2	-
4C	3	3	4	4	1
55C	1	1	1	2	2
7C	1	1	2	2	-
8C	1	1	2	2	-
1N	1	1	2	3	-
2N	1	1	-	-	-
OLL	1	1	1	3	-
1LL	1	1	2	2	-
1LLb	1	1	2	2	-
2LL	1	1	-	-	-
0ML	-	1	2	-	1
1ML	-	1	2	-	-
3ML	-	1	2	-	-
4ML	3	-	-	4	1
8ML	-	1	2	-	-

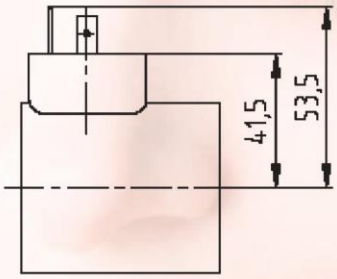
10 BOBINE, CON CONNESSIONE ELETTRICA STANDARD SECONDO ISO 440/DIN 43650, PER ALIMENTAZIONE DC

Le valvole tipo FT5 - ES - * sono messe in funzione da magneti che sono eccitati direttamente da corrente continua. Le valvole possono essere fornite senza bobine con codice FT5 - ES - * - 0000 e le bobine possono essere fornite separatamente con codice B05 - ***C

ALIMENTAZIONE IN CORRENTE CONTINUA

Tensione	*Codice valvola*	*Codice bobina*	*Corrente nominale (A)*
V12 DC	**FT5 - ES - * - * - 012C**	**B05-012C**	3,17
V24 DC	**FT5 - ES - * - * - 024C**	**B05- 024C**	1,73

Variazione permessa di voltaggio: +5% -10%
Altre tensioni disponibili: V 48 DC, V 106 DC, V 205 DC



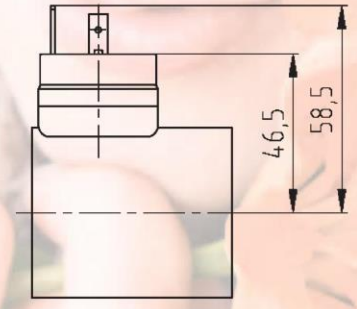
11 BOBINE, CON CONNESSIONE ELETTRICA STANDARD SECONDO ISO 4400/DIN 43650, PER ALIMENTAZIONE AC

Le valvole tipo FT5 - ES - * sono messe in funzione con l'uso di bobine che incorporano un ponte di raddrizzamento. Le bobine con ponte di raddrizzamento incorporato possono essere fornite separatamente con codice B05 - ***A.

ALIMENTAZIONE IN CORRENTE ALTERNATA

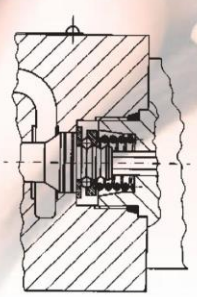
Tensione	*Codice valvola*	*Cod. bobina*	*Nominal Current (A)*
V115 AC/50(60) Hz	**FT5-ES-*-*-115A**	**B05-115A**	0,40
V230 AC/50(60) Hz	**FT5-ES-*-*-230A**	**B05- 230A**	0,20

Variazione permessa di voltaggio: +5% -10%



12 VERSIONE "N": AGGANCIO MECCANICO DEL CURSORE

Le elettrovalvole in questa versione sono tipicamente a 2 posizioni estreme, azionate da due elettromagneti e non hanno molle di centraggio agenti sul cursore. Il cursore viene agganciato, nelle posizioni estreme della sua corsa, da un dispositivo meccanico che lo tiene in posizione anche quando viene a cessare l'azione di spinta dei magneti di comando. Questo dispositivo consente infatti di comandare l'elettrovalvola con eccitazione di corrente di breve durata e garantisce la stabilità della posizione del cursore anche contro l'eventuale presenza di forze idrodinamiche, gravitazionali o inerziali (vibrazioni).

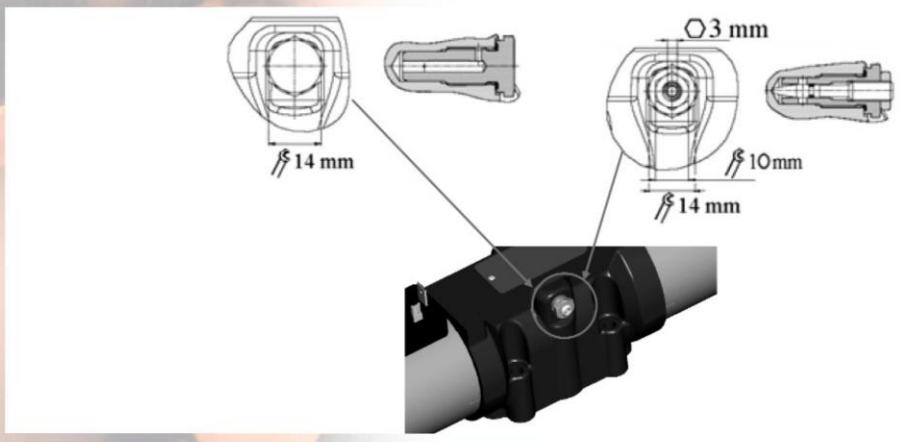


13 VERSIONE "T": COMMUTAZIONE TEMPORIZZATA

Le elettrovalvole in questa versione possono essere a 2 o 3 posizioni. Il corpo della valvola incorpora un orifizio ((0,6 mm) che provoca una strozzatura sul canale che collega idraulicamente le due camere estreme dell'elettrovalvola. L'effetto di strozzatura limita la velocità di spostamento del cursore e riduce eventuali picchi di pressione.

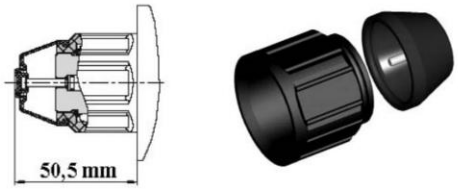
14 VERSIONE "TR": COMMUTAZIONE REGOLARE

Nelle valvole in versione "TR" l'orifizio fisso è sostituito da un dispositivo di strozzatura regolabile, che permette di ottimizzare il tempo di commutazione. Per aumentare la strozzatura (e quindi il tempo di commutazione) avvitare in senso orario la vite di regolazione (Ch. 3 mm), dopo aver svitato il suo dado di fissaggio (Ch. 10 mm).



15 VERSIONE "K": SPINTORE MANUALE

Le valvole in versione "K" presentano all'estremità del magnete degli spintori incorporati in un cappuccio di gomma morbida. Tali spintori hanno la funzione di consentire l'azionamento manuale delle valvole senza l'ausilio di utensili. Il cappuccio in gomma agevola l'intervento manuale e protegge lo spintore e la parte terminale del magnete da umidità, spruzzi d'acqua, etc...



16 OPZIONI DI PROTEZIONE DALLA CORROSIONE

Le valvole FT5 - ES - * standard presentano il corpo fosfatato, i tubi dei solenoidi non trattati e le bobine protette da zincatura trivalente. Per aumentare la resistenza della valvola in presenza di agenti aggressivi sono disponibili diverse ozioni:

ZT Corpo, tubi e bobine presentano zincatura trivalente

ZL Il corpo è protetto con vernice allo zinco tipo TEMADUR 40
Solenoidi presentano una zincatura con spessore di 8-12 µm

ZK Il corpo è protetto con vernice allo zinco tipo TEMADUR 40
I tubi dei solenoidi e le bobine sono sottoposte a trattamento di zinco-nickelatura

Esempio di valvola in versione ZK: FT5 - ES - 1LLb - ZK - 024C/20

IKRON®

Fluid Filtration

FILTER SELECTION GUIDE

LEITFADEN ZUR AUSWAHL EINES FILTERS

GUIDA PER LA SCELTA DI UN FILTRO

GUIDE POUR CHOISIR UN FILTRE

GUIA PARA LA SELECCION DE UN FILTRO

INDEX

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PRINCIPLES OF HYDRAULIC FILTRATION

INTRODUCTION

Contamination level of the hydraulic system fluid should never damage all components such as pumps, motors, valves, cylinders and servovalves.

The biggest quantity of failures in hydraulic systems is due to contamination which causes high maintenance costs, plus extra costs for the replacement and overhaul of damaged parts and high costs for machine downtime.

Standards about solid contamination have now been changed so that also some definitions of filtration have to be updated.
It has to be clear that these changes in standards are not going to modify filters performance, but have to be respected to avoid an incorrect use.

We explain all new provisions about solid contamination in the following pages; we also show the different steps for the correct choose of the filter for the hydraulic circuit.

CONTAMINANTS

Contaminant powders are utilized in tests to establish filters technical features.

The procedure ISO 11171 replaces ISO 4402 regarding particle sizes measurements.

ISO 4402 referred to the dimension of the circle diameter to include the whole particle. ISO 11171 refers to the diameter of the circle with the same particle area.
It becomes clear that a particle can have two different dimensions depending on the standard used to measure it, so that two different units of measure have been adopted to avoid glaring mistakes.
Classification "µm" refers to ISO 4402, while "µm(c)" is utilized for ISO 11171.

	OLD ISO 4402	*NEW ISO 11171*
Particle type	***ACFTD (Aircleaner Fine Dust Test)***	***ISO MTD (ISO Medium Dust Test)***
Unit of measure	**[µm]**	**[µm (c)]**
Dimension	***Diameter of the circle including the whole particle***	***Diameter of the circle with the same particle area***

The table on the right shows the comparison between the two particle size classifications, ISO 4402 and ISO 11171.

COMPARISON OF PARTICLE SIZE	
ISO 4402 (ACFTD) [µm]	*ISO 11171 (ISO-MTD) [µm (c)]*
1	4,2
2	4,6
3	5,1
4	5,8
5	6,4
6	7,1
7	7,7
8	8,4
9	9,1
10	9,8
15	13,6
20	17,5
25	21,2
30	24,9
40	31,7
50	38,2

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"ISO" SCALE NUMBER

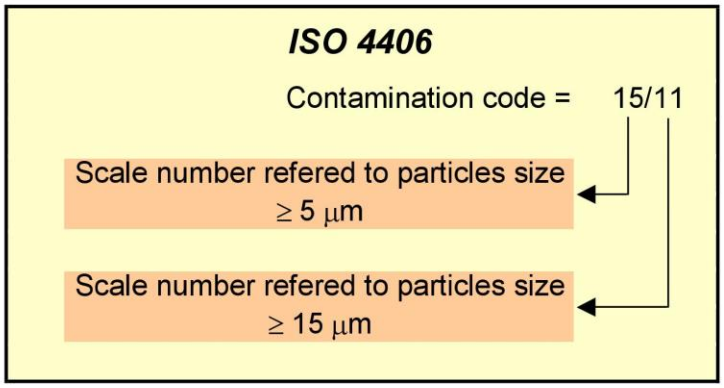
Another important change is ISO 4406:1999 replacing old ISO 4406.
ISO 4406 measures the number of particles with dimension ≥ 5 μm and ≥ 15μm per 100 mL of fluid.
New ISO 4406:1999 measures the number of particles with dimension ≥ 4 μm(c), ≥ 6μm(c) and ≥ 16μm(c) per 1 mL of fluid.

Here are the tables of contamination code for ISO 4406 and ISO 4406:1999

ISO 4406 CONTAMINATION CODE (Old)		
Number of particles per 100 mL of fluid		*Scale number*
More than	Up to/Including	
8.000.000	16.000.000	24
4.000.000	8.000.000	23
2.000.000	4.000.000	22
1.000.000	2.000.000	21
500.000	1.000.000	20
250.000	500.000	19
130.000	250.000	18
64.000	130.000	17
32.000	64.000	16
16.000	32.000	15
8.000	16.000	14
4.000	8.000	13
2.000	4.000	12
1.000	2.000	11
500	1.000	10
250	500	9
130	250	8
64	130	7
32	64	6
16	32	5
8	16	4
4	8	3
2	4	2
1	2	1

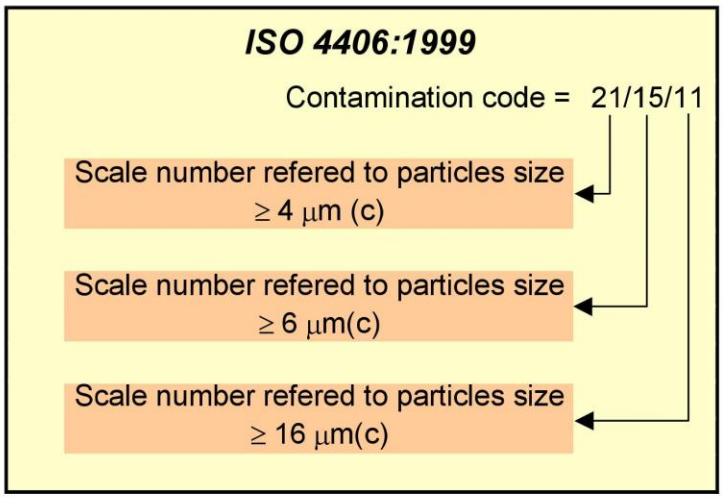
ISO 4406:1999 CONTAMINATION CODE (New)		
Number of particles per 1 mL of fluid		*Scale number*
More than	Up to/Including	
1.300.000	2.500.000	28
640.000	1.300.000	27
320.000	640.000	26
160.000	320.000	25
80.000	160.000	24
40.000	80.000	23
20.000	40.000	22
10.000	20.000	21
5.000	10.000	20
2.500	5.000	19
1.300	2.500	18
640	1.300	17
320	640	16
160	320	15
80	160	14
40	80	13
20	40	12
10	20	11
5	10	10
2.5	5	9
1.3	2.5	8
0.64	1.3	7
0.32	0.64	6
0.16	0.32	5
0.08	0.16	4
0.04	0.08	3
0.02	0.04	2
0.01	0.02	1
0.00	0.00	0

Following figures are meant to help in determining the ISO 4406 and ISO 4406:1999 rating.



With reference to the table of page 4, ISO 4406 code 15/11 refers to the presence per 100mL of fluid of the following particles quantities:

More than 16.000 and up to and including 32.000 with dimension ≥ 5 μm;
More than 1.000 and up to and including 2.000 with dimension ≥ 15 μm.



With reference to the table of page 4, ISO 4406:1999 code 21/15/11 refers to the presence per 1 mL of fluid of the following particles quantities:

More than 10.000 and up to and including 20.000 with dimension ≥ 4 μm(c);
More than 160 and up to and including 320 with dimension ≥ 6 μm(c);
More than 10 and up to and including 20 with dimension ≥ 16 μm(c).

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FILTRATION RATIO "β_x" AND "$\beta_{x(c)}$"

The "β" ratio is the value that expresses the particle capture efficiency of a filter and is based on the particle dimension.

The "β" ratio is determined by conducting a laboratory test called MULTI-PASS TEST. It consists in making a particular number of particles having different dimensions circulate through the filter and then to keep count of the particles downstream.
After replacing ISO 4402 with ISO 11171, it has been establish to update the standard for MULTI-PASS TEST too, so that old ISO 4572 has been modified into new ISO 16889.

"β_x" ratio following ISO 4572:

$$\beta_x \geq \frac{\text{Upstream particles with dimension "x"µm}}{\text{Downstream particles with dimension "x"µm}}$$

where "x" stands for particle size in [µm]

"$\beta_{x(c)}$" ratio following ISO 16889:

$$\beta_{x(c)} \geq \frac{\text{Upstream particles with dimension "x"µm(c)}}{\text{Downstream particles with dimension "x"µm(c)}}$$

where "x" stands for particle size in [µm(c)]

For instance, to establish "$\beta_{x(c)}$", referred to particles size 10 µm(c), for a filter with 1.000 particles upstream and 5 downstream, we write as following:

$$\beta_{10(c)} \geq \frac{1.000\ \mu m(c)}{5\ \mu m(c)}$$

$$\beta_{10(c)} \geq 200$$

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FILTRATION EFFICIENCY

Filtration efficiency is directly proportional to the "β" ratio and shows by a certain percentage the reduction of particles in a filter element from upstream to downstream.

Filtration efficiency can be obtained out of the following formula:

$$\text{Filtration Efficiency \%} = \frac{(\text{Ratio } \beta - 1)}{\text{Ratio } \beta} \times 100$$

In a filter with $\beta_{10(c)} \geq 200$ efficiency will be obtained as following:

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

Efficiency at 99,5% means downstream contaminats at 0,5%.

"β" *Value*	% *of Efficiency*
≥2	50
≥20	95
≥50	98
≥75	98,7
≥100	99
≥200	99,5

"β" < 75 expresses nominal rating, while with "β" ≥ 75 an absolute rating is obtained.

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SELECTION OF DEGREE OF FILTRATION

Selecting the proper degree of filtration is the first step in the final choice of filter for your application.

The following table will help you in your search.

SELECTION OF DEGREE OF FILTRATION					
COMPONENT	USE	PRESSURE LEVEL (bar)	NAS 1638	ISO 4406:1999	DEGREE OF FILTRATION IKRON
GEAR PUMPS AND MOTORS	OCCASIONAL	X<140	11	22/20/17	RP/SP025 - FB060
		140<X<210	10	21/19/16	RP/SP010 - FG025
		X>210	10	21/19/16	RP/SP010 - FG025
	CONTINUOUS	X<140	10	21/19/16	RP/SP010 - FG025
		140<X<210	9	20/18/15	FG010
		X>210	8	19/17/14	FG010
FIXED AND VARIABLE DISPLACEMENT PISTON PUMPS AND MOTORS	OCCASIONAL	X<140	9	20/18/15	RP/SP010 - FG025
		140<X<210	9	20/18/15	RP/SP010 - FG025
		X>210	8	19/17/14	FG010
	CONTINUOUS	X<140	8	19/17/14	FG010
		140<X<210	8	19/17/14	FG010
		X>210	7	18/16/13	FG006 - FG010
FIXED AND VARIABLE DISPLACEMENT VANE PUMPS AND MOTORS	OCCASIONAL	X<140	11	22/20/17	RP/SP025 - FB060
		140<X<210	10	21/19/16	RP/SP010 - FG025
		X>210	10	21/19/16	RP/SP010 - FG025
	CONTINUOUS	X<140	10	21/19/16	RP/SP010 - FG025
		140<X<210	9	20/18/15	FG010
		X>210	8	19/17/14	FG010
HIGH TORQUE LOW SPEED ORBIT MOTORS	OCCASIONAL	X<140	11	22/20/17	RP/SP025 - FB060
		140<X<210	10	21/19/16	RP/SP010 - FG025
		X>210	10	21/19/16	RP/SP010 - FG025
	CONTINUOUS	X<140	10	21/19/16	RP/SP010 - FG025
		140<X<210	9	20/18/15	FG010
		X>210	9	20/18/15	FG010
RELIEF AND FLOW CONTROL VALVES		X<210	11	22/20/17	RP/SP025 - FB060
		X>210	10	21/19/16	RP/SP010 - FG025
	ELECTRIC CONTROL	0<X<420	9	20/18/15	FG010
LOADSENSING VALVES		X<210	6	17/15/12	FG006
		X>210	5	16/14/11	FG003
SERVO VALVES		X<210	6	17/15/12	FG006
		X>210	5	16/14/11	FG003
DIRECTIONAL CONTROL VALVES		X<140	11	22/20/17	RP/SP025 - FB060
		140<X<210	10	21/19/16	RP/SP010 - FG025
		X>210	10	21/19/16	RP/SP010 - FG025
	ELECTRIC CONTROL	0<X<420	9	20/18/15	FG010
CYLINDERS		X<210	11	22/20/17	RP/SP025 - FB060
		X>210	10	21/19/16	RP/SP010
PILOT CONTROL VALVES		0<X<50	9	20/18/15	FG010

TO PROTECT COMPONENTS WITH DIFFERENT NEEDS, E.G. PUMPS-MOTORS AND SERVOVALVES, PLEASE SELECT THE FINEST DEGREE OF FILTRATION.

ALL INSTRUCTIONS ARE RELATED TO POLLUTED ENVIRONMENTAL CONDITIONS ON AVERAGE.
IN CASE OF HIGH CONTAMINATION, WE SUGGEST TO SELECT THE FINER DEGREE OF FILTRATION.

FILTERING MEDIA

Most popular IKRON filtering media are:

IKRON DEGREE OF FILTRATION	FILTERING MEDIA	"β" RATIO	PERCENTAGE OF EFFICIENCY
FG003	Microfibre glass	$\beta_3 \geq 200$	99,5%
FG006	Microfibre glass	$\beta_6 \geq 200$	99,5%
FG010	Microfibre glass	$\beta_{10} \geq 200$	99,5%
FG025	Microfibre glass	$\beta_{25} \geq 200$	99,5%
FB060	Phosphor bronze	$\beta_{60} \geq 75$	98,7%
FB125	Phosphor bronze	$\beta_{125} \geq 75$	98,7%
SP010	Cellulose	$\beta 10 \geq 2$	50%
SP025	Cellulose	$\beta_{25} \geq 2$	50%
RP010	Reinforced cellulose	$\beta_{10} \geq 2$	50%
RP025	Reinforced cellulose	$\beta_{25} \geq 2$	50%

Filtering media can have a standard surface (IKRON code “AS”), or an oversize surface (IKRON code “FS”).

Microfibre glass get reinforced by carbon steel mesh, while cellulose media and phosphore bronze get reinforced by zinc-plated steel mesh.

DIRT HOLDING CAPACITY

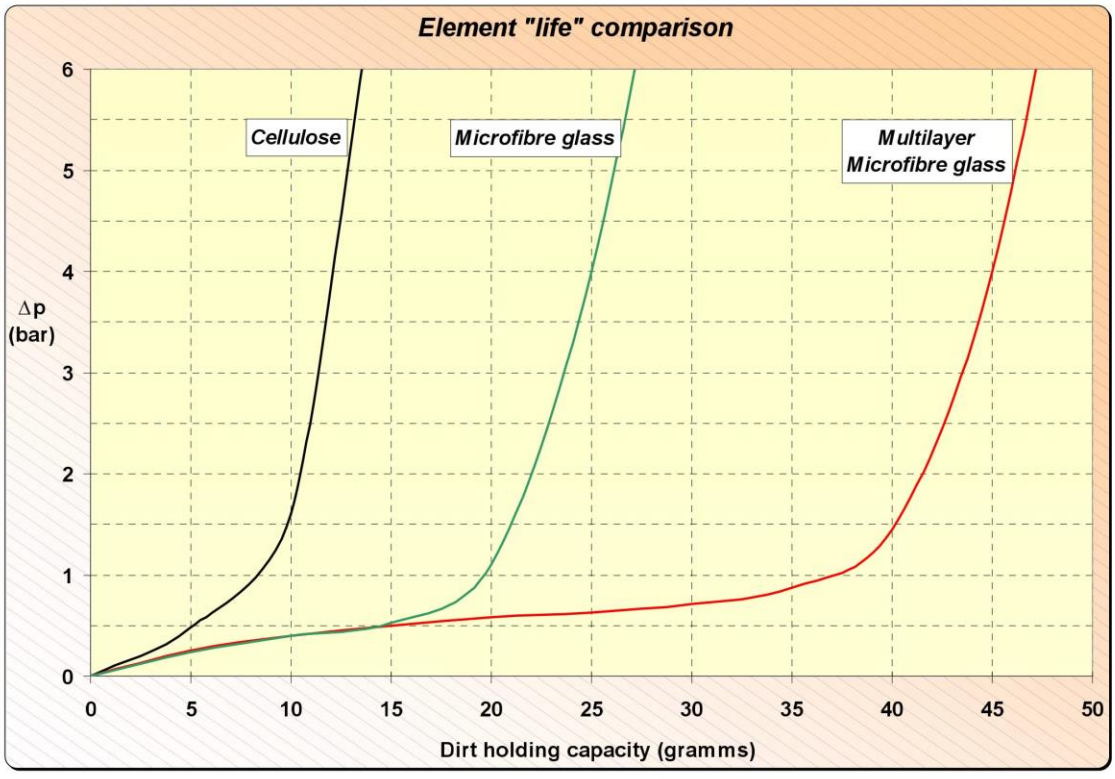
The main feature in element media's "life" is dirt holding capacity.

The dirt holding capacity expresses in grams the amount of contaminant which can be retained by the element, on the basis of specified pressure drop readings.

There are many types of filtering media, the best that can show a high dirt holding capacity with the same surface area is microfibre glass.

Microfibre glass is available on request with a multilayer surface, consisting of a prefiltering media plus main filtering media.
Multilayer microfibre glass media presents the best solution for a high dirt holding capacity and therefore a longer "life" for the element.

The following graph compares element "life" with the same filtering surface area but different types of media.



FILTER SIZE SELECTION

1. The hydraulic plant's maximum flow is obtained by the sum of the deliveries of all the pumps. The delivery of each pump is calculated as following:

$$Q_{max} = n_{max} \cdot V_{max} / 1000$$

n = [rpm]

V = [cm^3/rev]

Q = [l/min]

2. The pressure drop of a complete filter is obtained adding housing's pressure drop to element's pressure drop.

3. Complete filter's pressure drop has to follow indications reported in the following table.

FILTER TYPE	*Accepted pressure drop*
HF410	Less / Up to 0,02 bar
HF502	Less / Up to 0,40 bar
HF550	Less / Up to 0,40 bar
HF554	Less / Up to 0,40 bar
HF570	Less / Up to 0,40 bar
HF595 (suction)	Less / Up to 0,20 bar
HF595 (return)	Less / Up to 0,40 bar
HF620 (suction)	Less / Up to 0,20 bar
HF620 (return)	Less / Up to 0,40 bar
HF625	Less / Up to 0,40 bar
HF650	Less / Up to 0,75 bar (*)
HF690	Less / Up to 1,20 bar
HF705	Less / Up to 5,00 bar
HF745	Less / Up to 0,75 bar (*)
HF760	Less / Up to 0,75 bar (*)

(*)
In hard working situations pressure drop is acceptable to reach 1,50 bar.

4. Once the degree of filtration has been identified, you need to select the correct size of the filter. Please refer to attached pressure drop curves to choose inlet port and element's length in accordance with the suggested parameters.

5. The attached curves have been obtained using mineral oil fluids SAE 10 at 30 mm^2/sec (cSt) viscosity and flux density 0.856 Kg/dm^3.

With different viscosity and density degrees, you need to determine special curves.

The housing's pressure drop is related to oil density, so that in oils with density different from 0.856 Kg/dm^3, housing's Δp is:

Housing Δp = Δp curve x (Oil density / 0,856)

Element's pressure drop is related to oil viscosity and kinematics density. With features resulting different from the ones at point "5", element's pressure drop has to be determined as following:

Element Δp = Δp curve x (Oil density / 0,856) x (Kinematics viscosity / 30)

At this point, housing's Δp has to be added together with element's Δp, always make sure that total Δp value is not more that the one reported at point "3".

Total Δp = Housing Δp + Element Δp

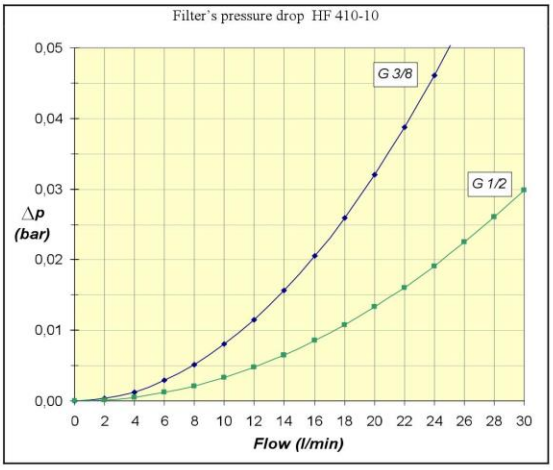
PRESSURE DROP CURVES

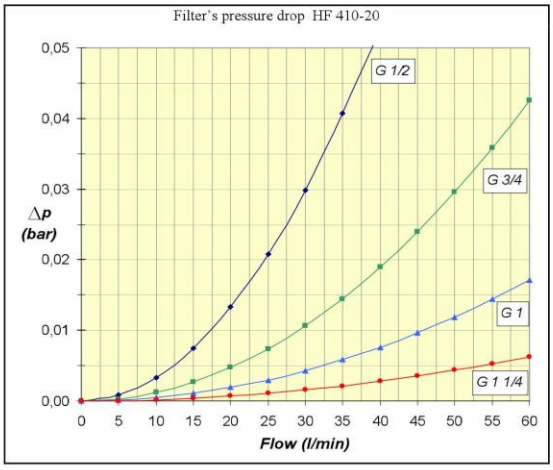
SUCTION FILTERS SERIES HF 410

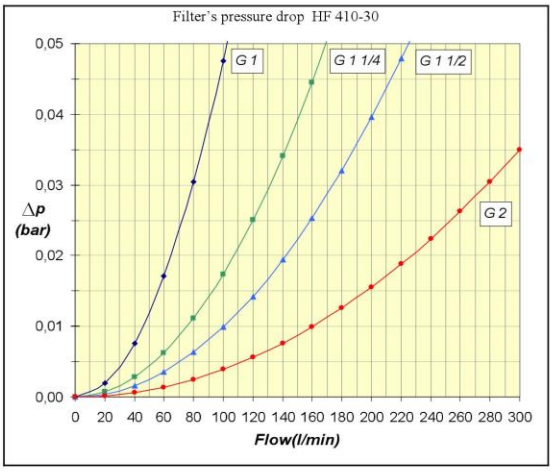
PRESSURE DROP CURVES

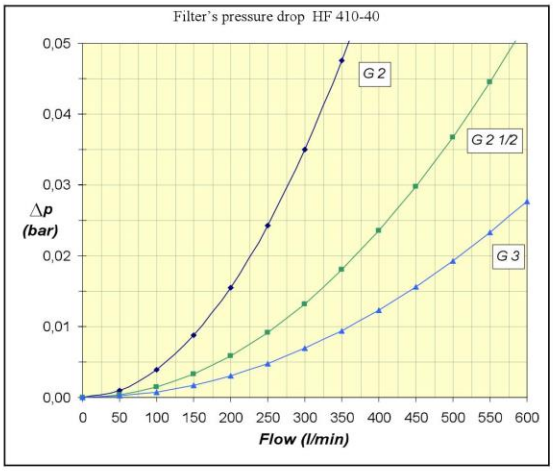
The pressure drop for filters HF 410 is 0,02 bar max.

1) Filter's **pressure drop** is determined by the inlet port's dimension.









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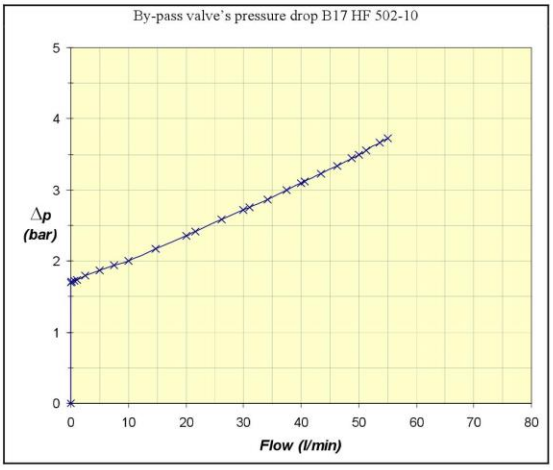
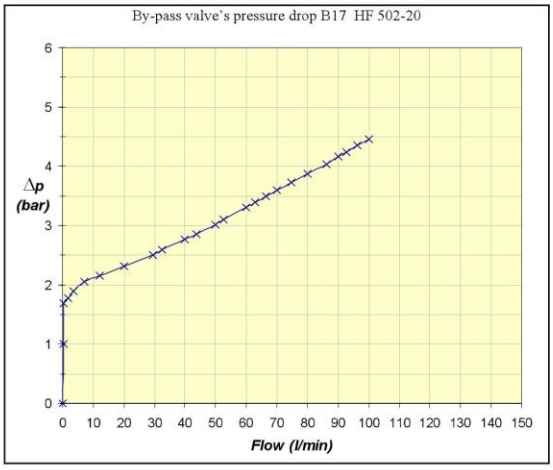
TANK MOUNTED RETURN LINE FILTERS SERIES HF 502

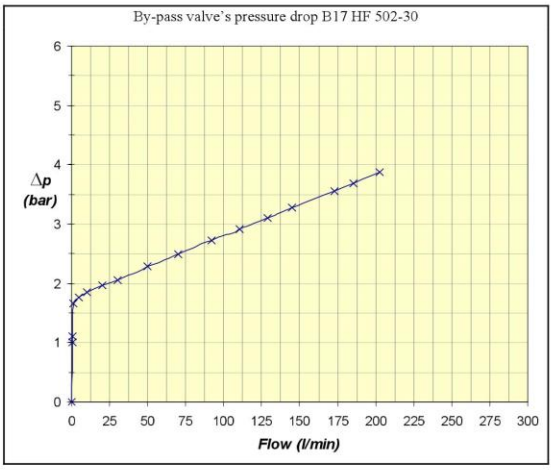
PRESSURE DROP CURVES

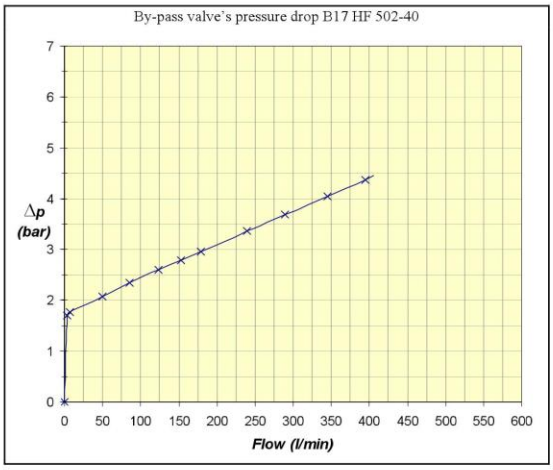
The pressure drop for return filters series HF 502 has to be between 0,2 and 0,4 bar.

1) The **by-pass pressure** drop is directly proportional to fluid specific gravity and it's irrelevant to determine the total pressure drop.

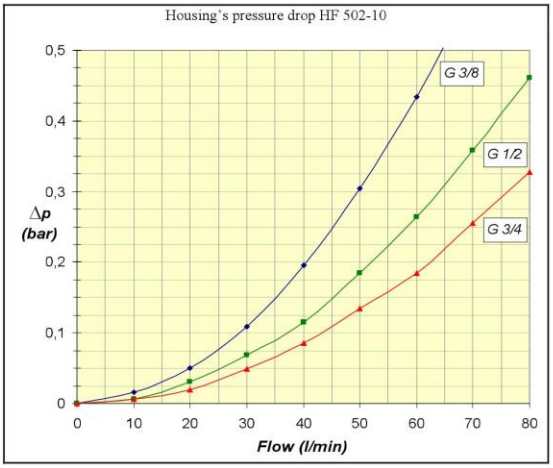


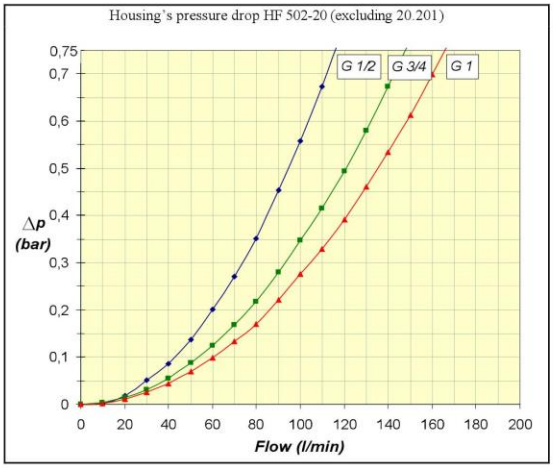


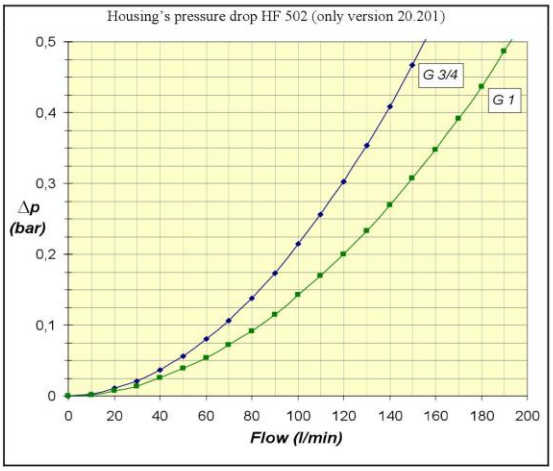


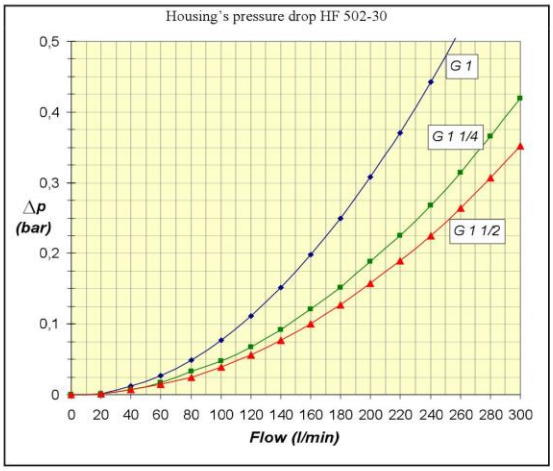


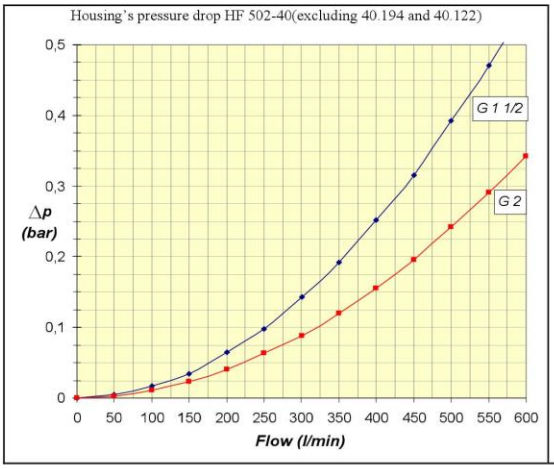
2) The **housing's pressure drop** is determined by the sum of the inlet and outlet port dimension.

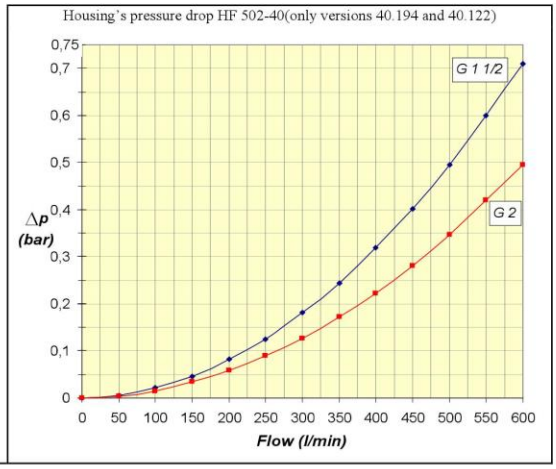




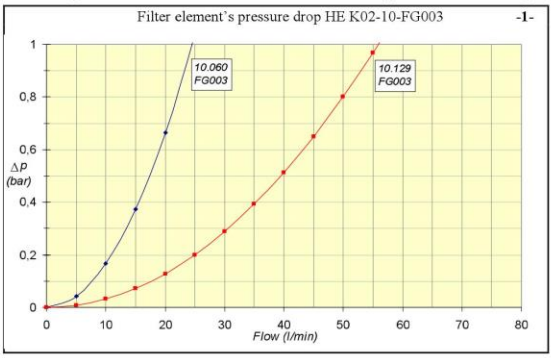


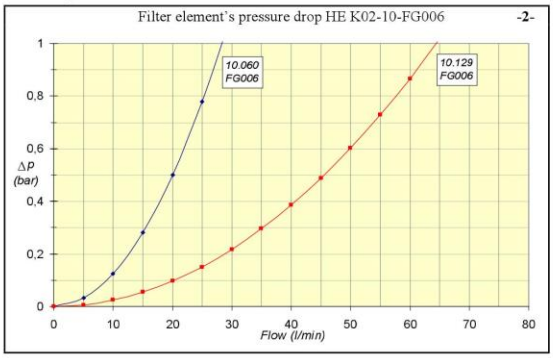


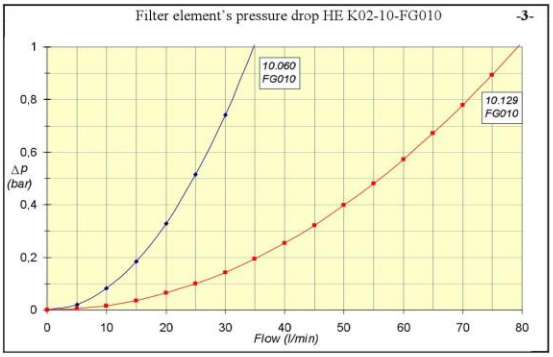


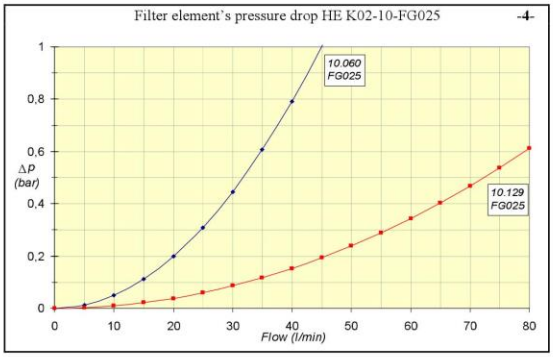


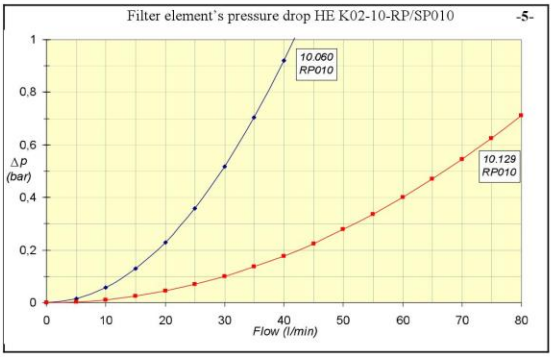
3) The **filter element's pressure drop** is determined by standard media and AS surface, they have been calculated experimentally and thy are valid for clean elements.

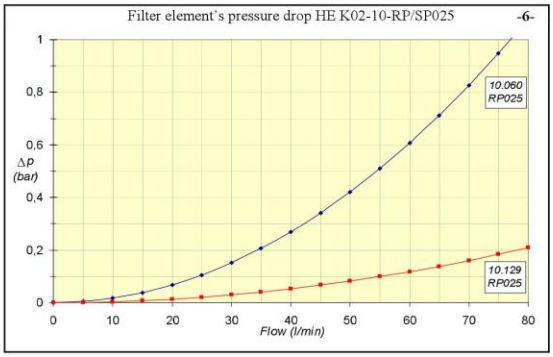


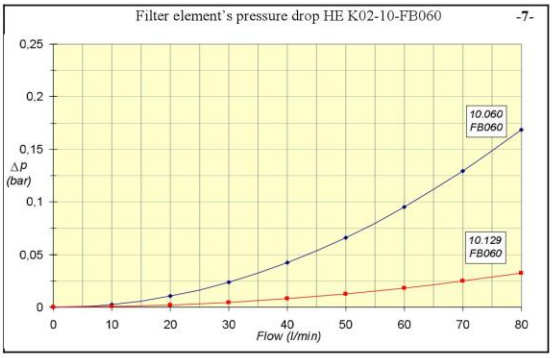


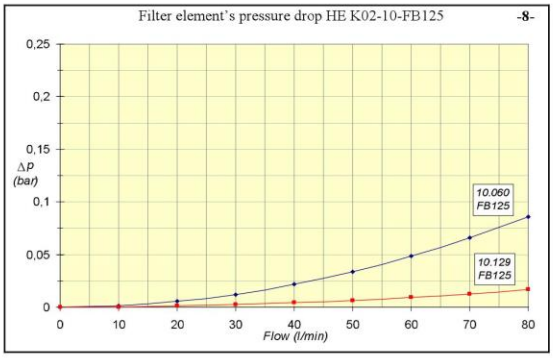












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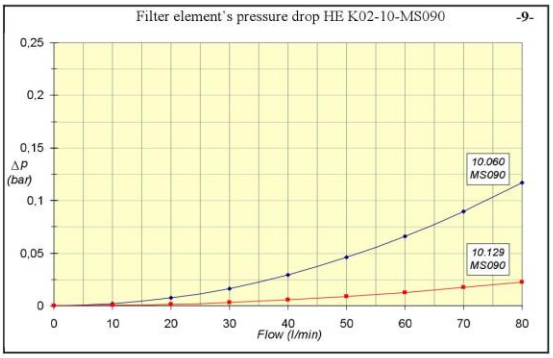
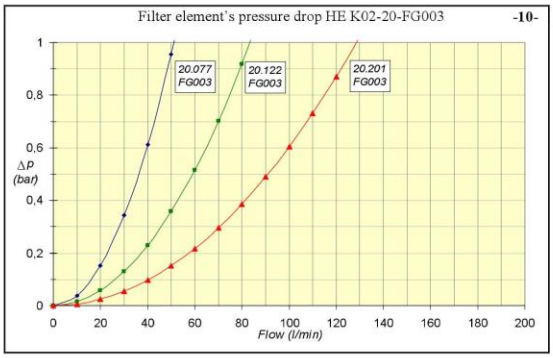
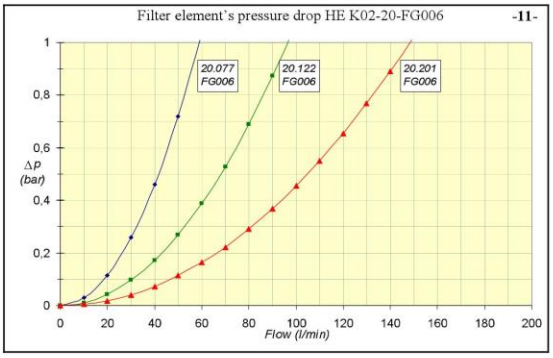
Filter element's pressure drop HE K02-10-MS090 -9-



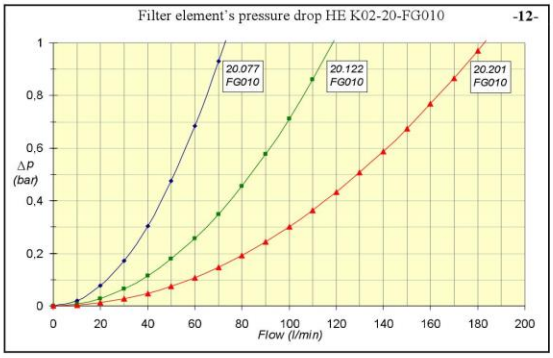
Filter element's pressure drop HE K02-20-FG003 -10-



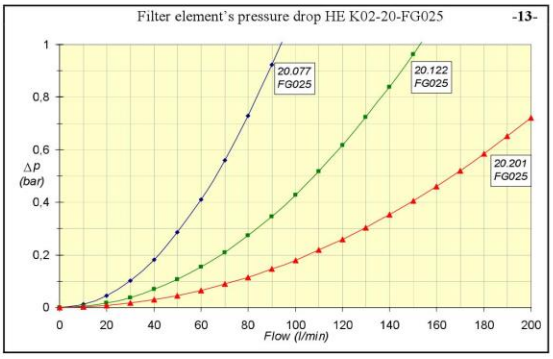
Filter element's pressure drop HE K02-20-FG006 -11-



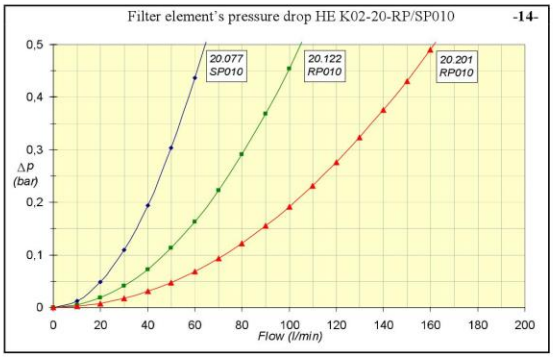
Filter element's pressure drop HE K02-20-FG010 -12-



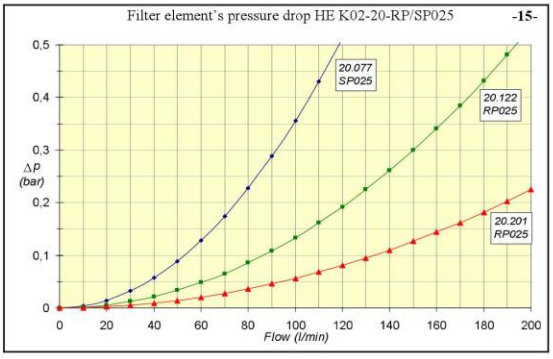
Filter element's pressure drop HE K02-20-FG025 -13-



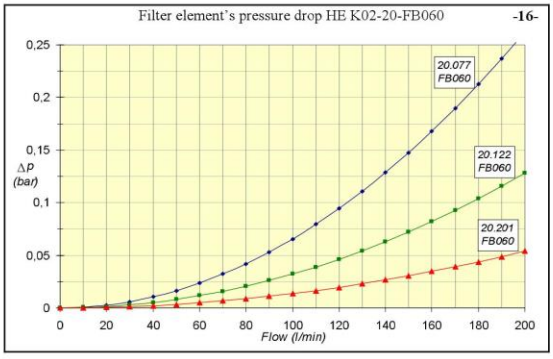
Filter element's pressure drop HE K02-20-RP/SP010 -14-



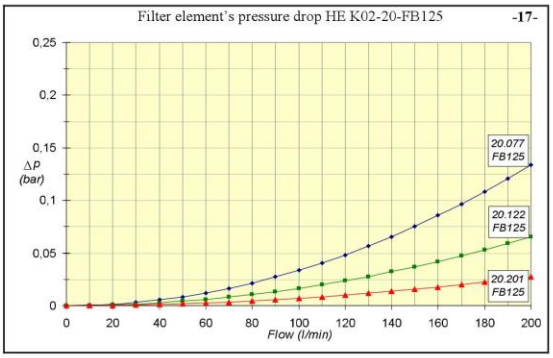
Filter element's pressure drop HE K02-20-RP/SP025 -15-



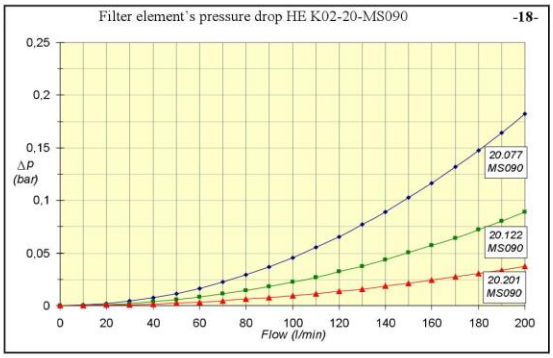
Filter element's pressure drop HE K02-20-FB060 -16-



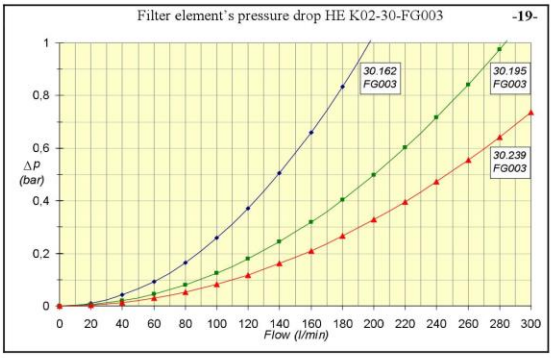
Filter element's pressure drop HE K02-20-FB125 -17-



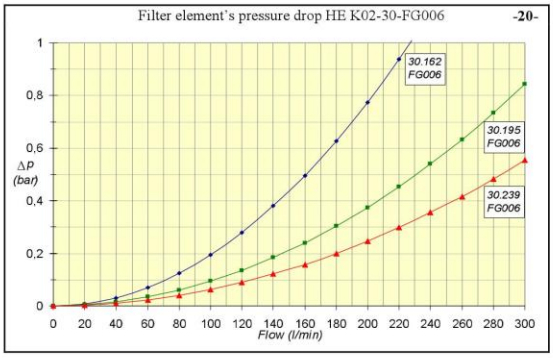
Filter element's pressure drop HE K02-20-MS090 -18-



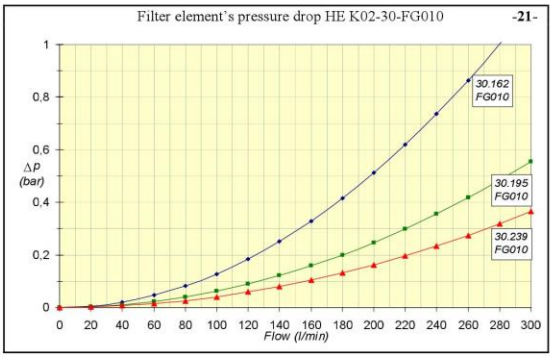
Filter element's pressure drop HE K02-30-FG003 -19-



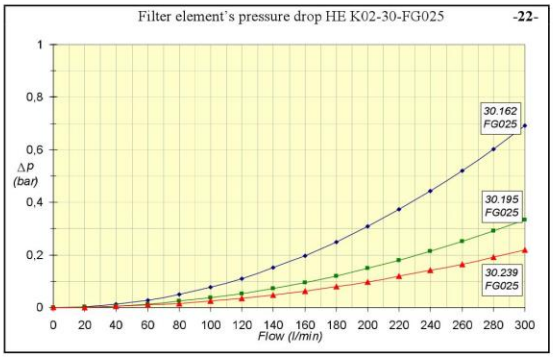
Filter element's pressure drop HE K02-30-FG006 -20-



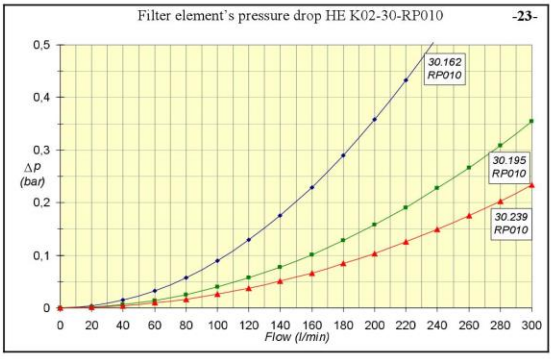
Filter element's pressure drop HE K02-30-FG010 -21-



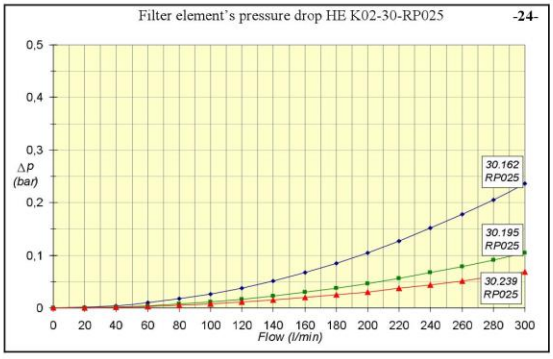
Filter element's pressure drop HE K02-30-FG025 -22-



Filter element's pressure drop HE K02-30-RP010 -23-



Filter element's pressure drop HE K02-30-RP025 -24-



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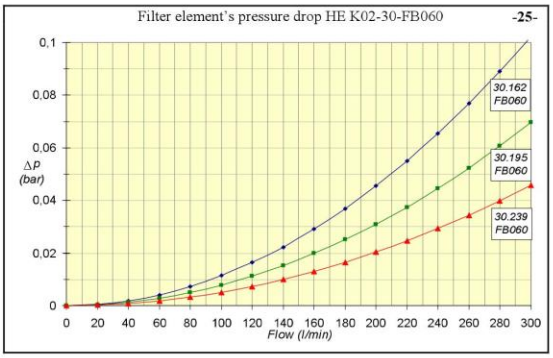
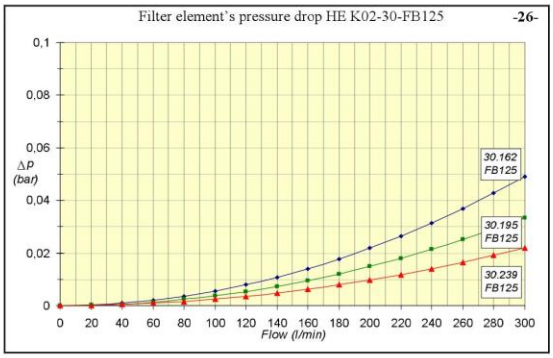
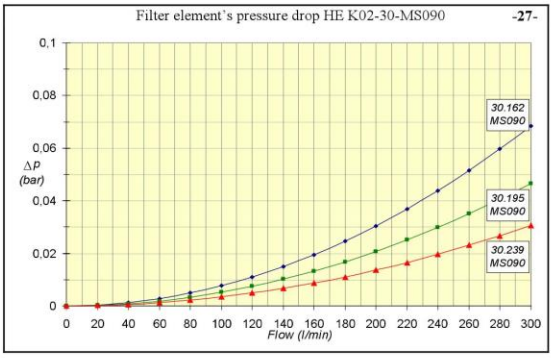
Filter element's pressure drop HE K02-30-FB060 -25-



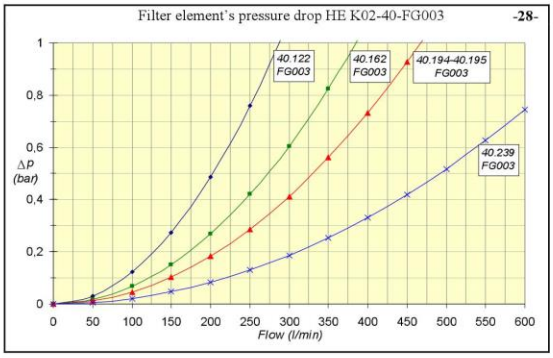
Filter element's pressure drop HE K02-30-FB125 -26-



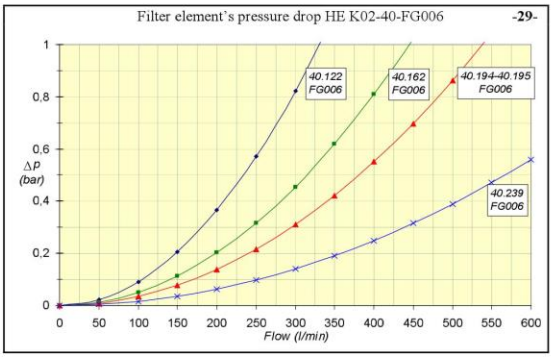
Filter element's pressure drop HE K02-30-MS090 -27-



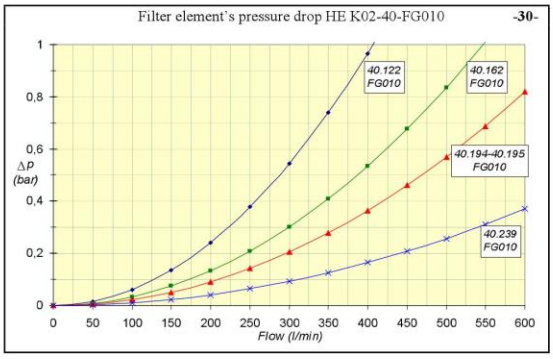
Filter element's pressure drop HE K02-40-FG003 -28-



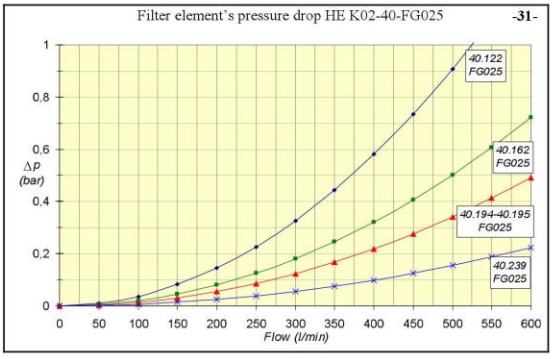
Filter element's pressure drop HE K02-40-FG006 -29-



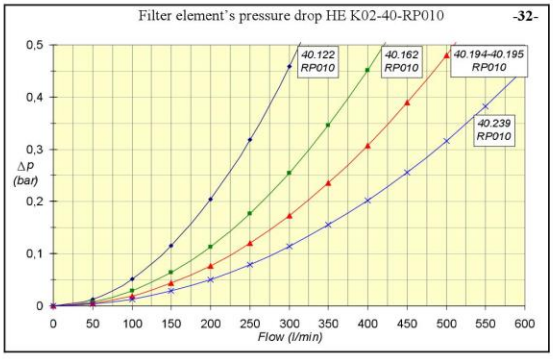
Filter element's pressure drop HE K02-40-FG010 -30-

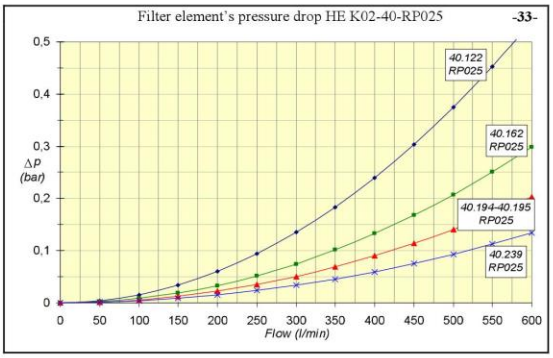


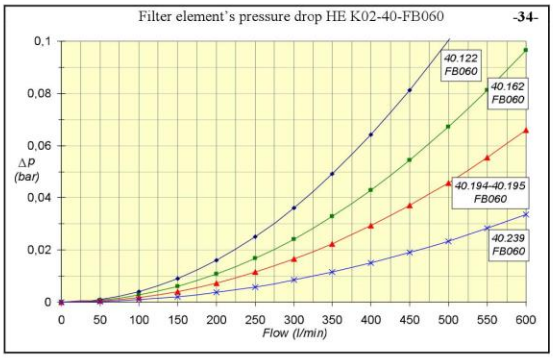
Filter element's pressure drop HE K02-40-FG025 -31-

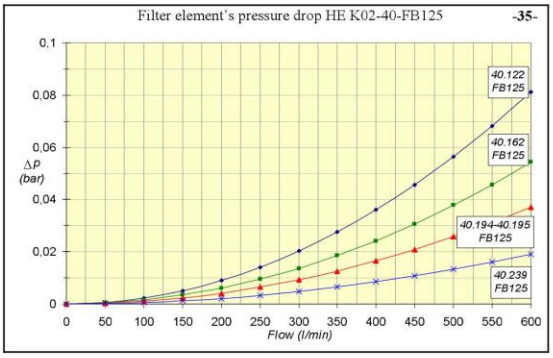


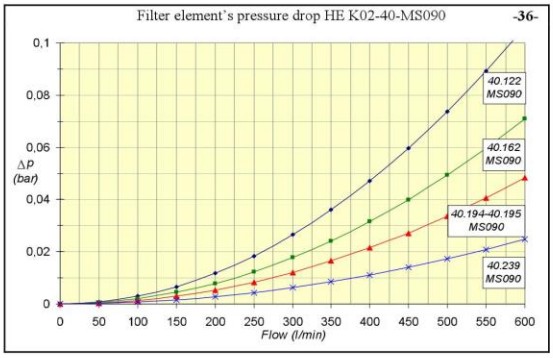
Filter element's pressure drop HE K02-40-RP010 -32-




Filter element's pressure drop HE K02-40-RP025 -33-
0,5
0,4
0,3
ΔP (bar)
0,2
0,1
0
0 50 100 150 200 250 300 350 400 450 500 550 600
Flow (l/min)
40.122 RP025
40.162 RP025
40.194-40.195 RP025
40.239 RP025


Filter element's pressure drop HE K02-40-FB060 -34-
0,1
0,08
0,06
ΔP (bar)
0,04
0,02
0
0 50 100 150 200 250 300 350 400 450 500 550 600
Flow (l/min)
40.122 FB060
40.162 FB060
40.194-40.195 FB060
40.239 FB060


Filter element's pressure drop HE K02-40-FB125 -35-
0,1
0,08
0,06
ΔP (bar)
0,04
0,02
0
0 50 100 150 200 250 300 350 400 450 500 550 600
Flow (l/min)
40.122 FB125
40.162 FB125
40.194-40.195 FB125
40.239 FB125


Filter element's pressure drop HE K02-40-MS090 -36-
0,1
0,08
0,06
ΔP (bar)
0,04
0,02
0
0 50 100 150 200 250 300 350 400 450 500 550 600
Flow (l/min)
40.122 MS090
40.162 MS090
40.194-40.195 MS090
40.239 MS090

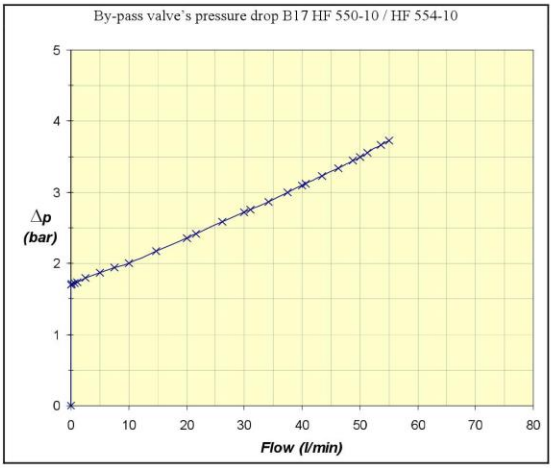
IKRON

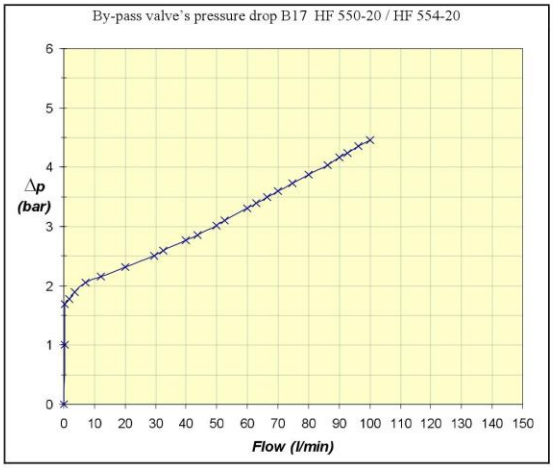
TANK MOUNTED RETURN LINE FILTERS
SERIES HF 550 - 554

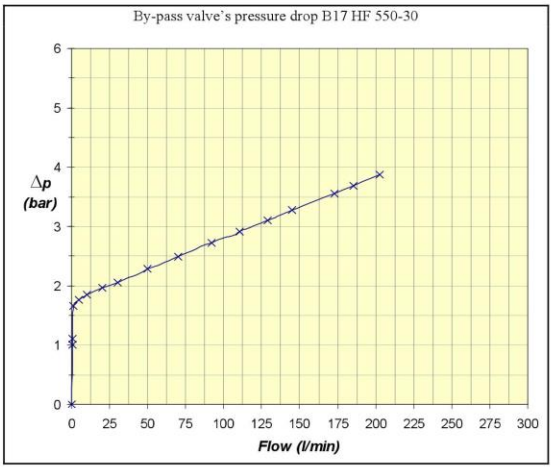
PRESSURE DROP CURVES

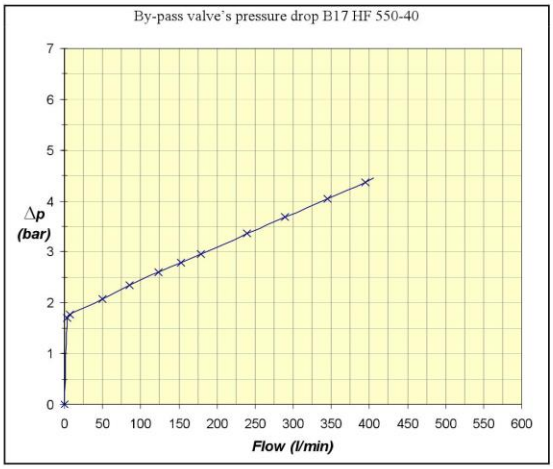
The pressure drop for return filters series HF 550 and HF554 has to be between 0,2 and 0,4 bar.

1) The **by-pass pressure drop** is directly proportional to fluid specific gravity and it's irrelevant to determine the total pressure drop.

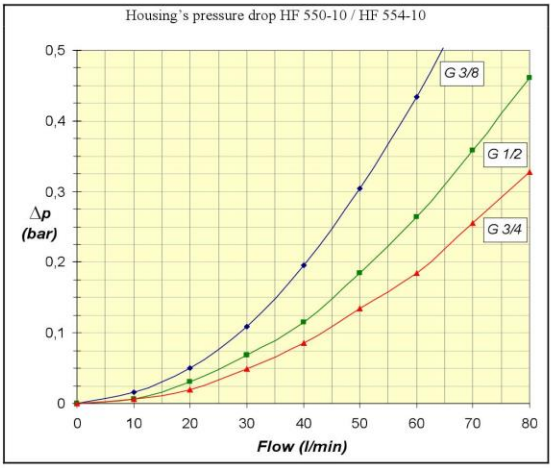


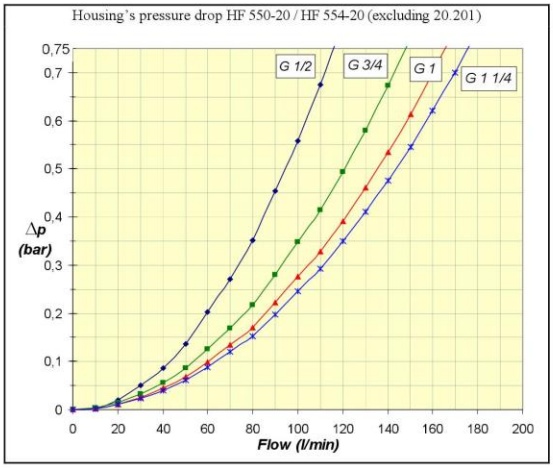


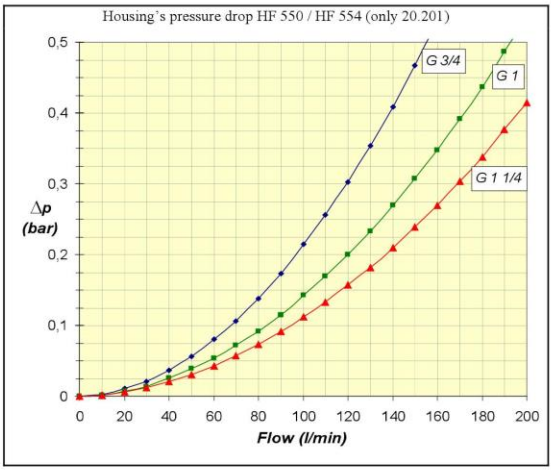


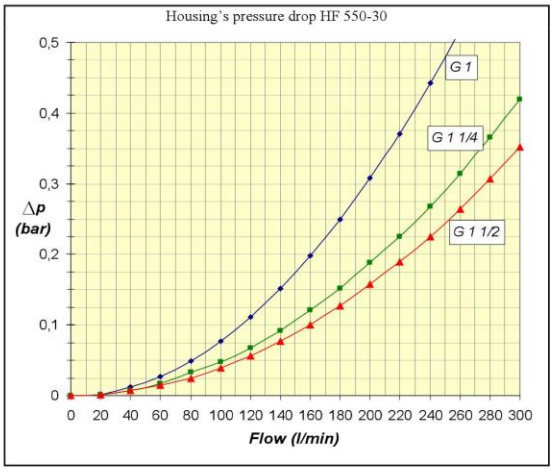


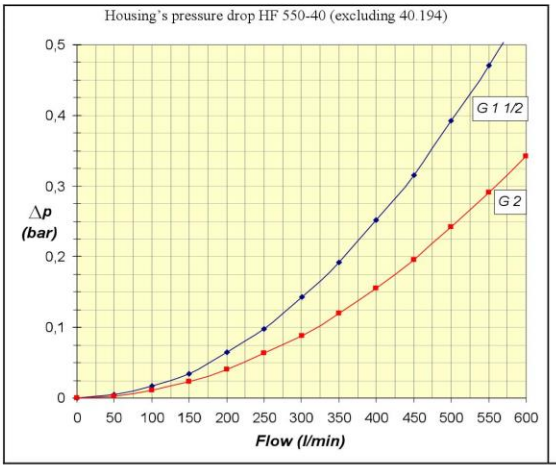
2) The **housing's pressure drop** is determined by the sum of the inlet and outlet port dimension.

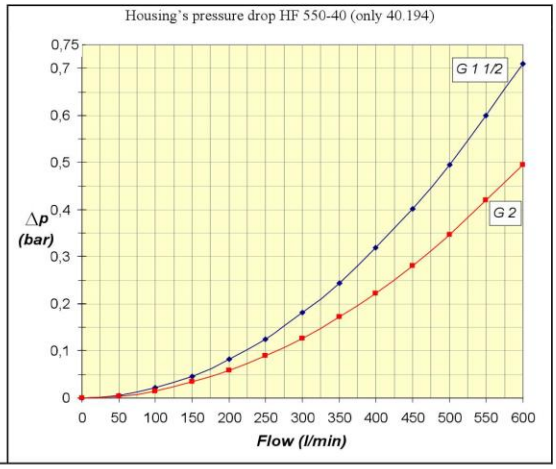




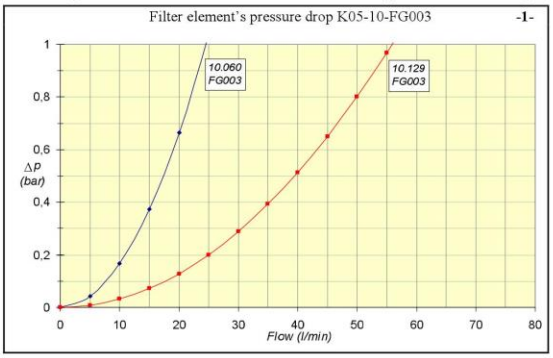


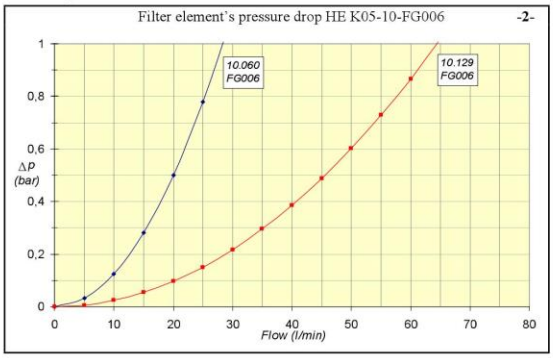


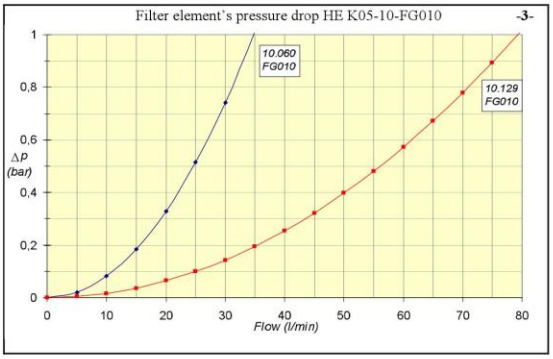


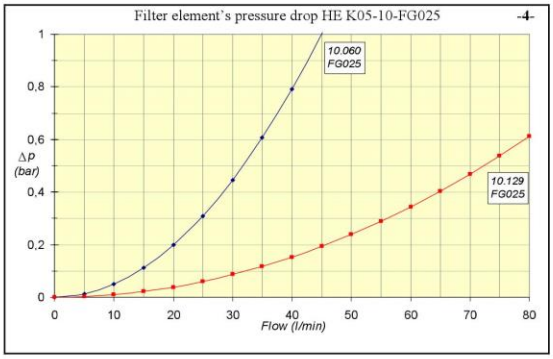


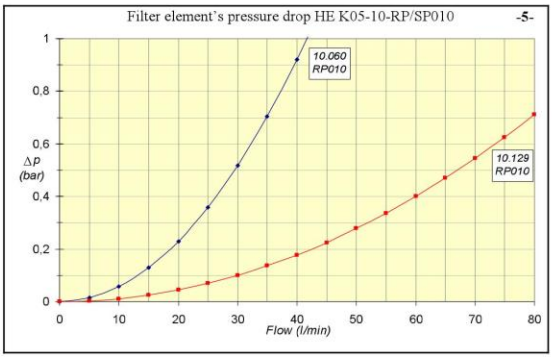
3) The **filter element's pressure drop** is determined by standard media and AS surface, they have been calculated experimentally and thy are valid for clean elements.

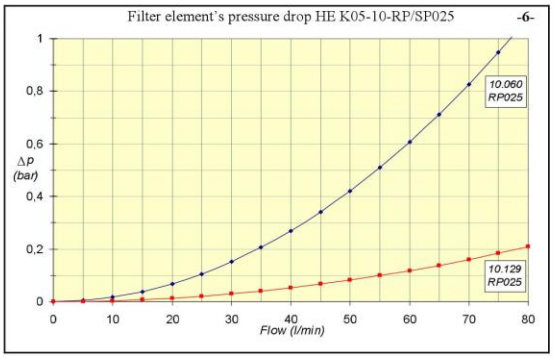


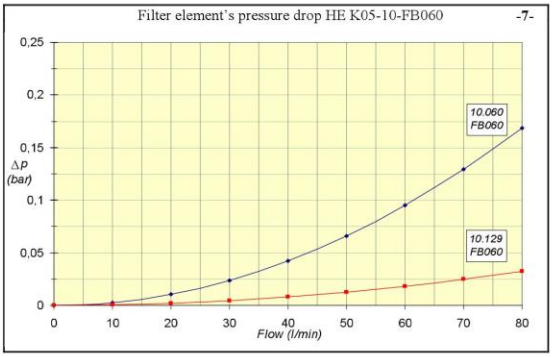


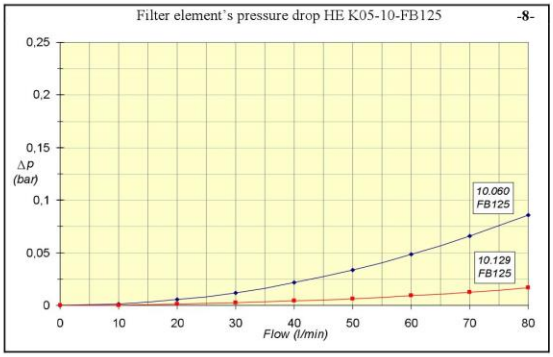


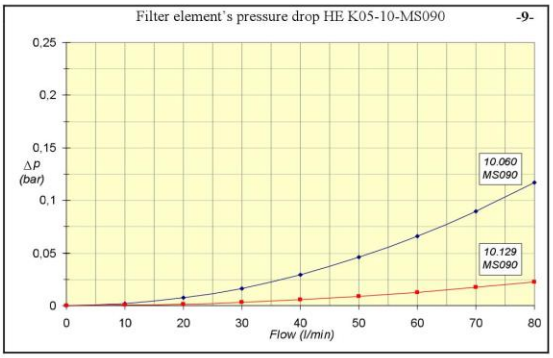


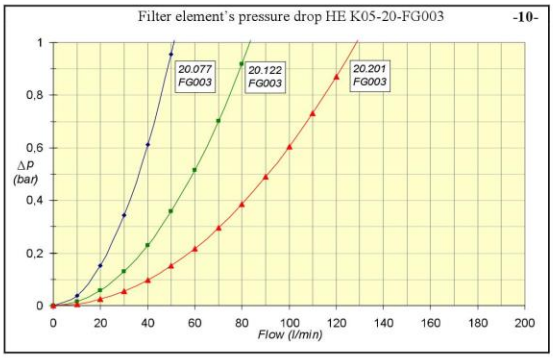


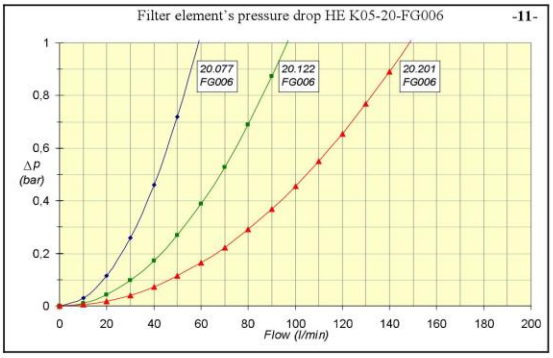


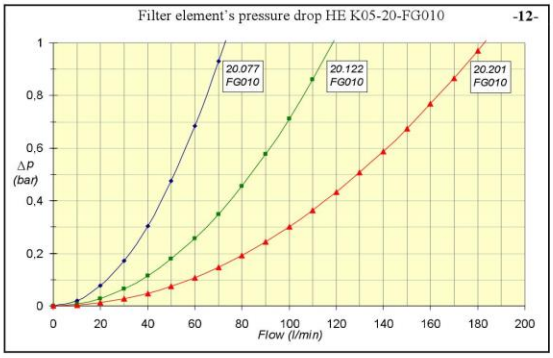


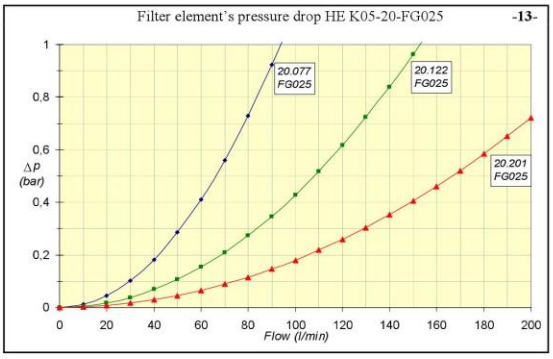


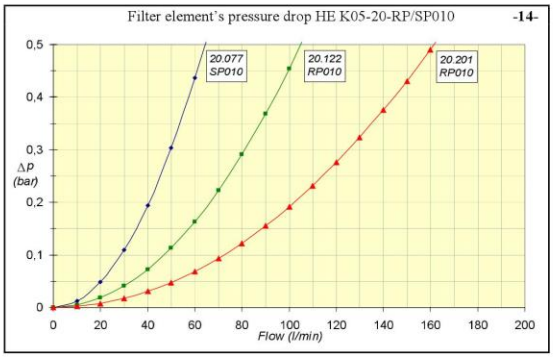

Filter element's pressure drop HE K05-10-MS090
-9-
ΔP (bar)
Flow (l/min)
10.060 MS090
10.129 MS090

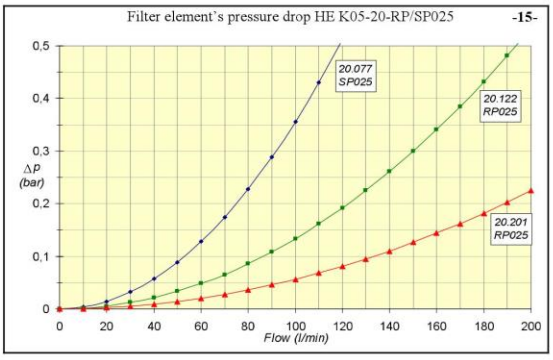

Filter element's pressure drop HE K05-20-FG003
-10-
ΔP (bar)
Flow (l/min)
20.077 FG003
20.122 FG003
20.201 FG003

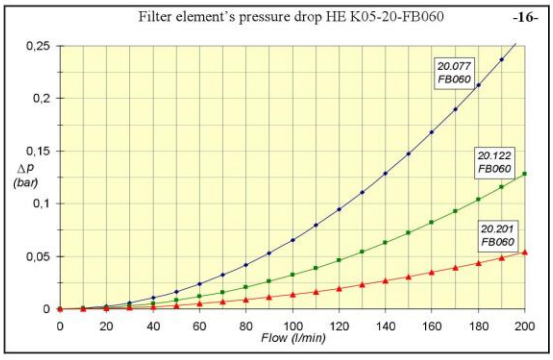

Filter element's pressure drop HE K05-20-FG006
-11-
ΔP (bar)
Flow (l/min)
20.077 FG006
20.122 FG006
20.201 FG006

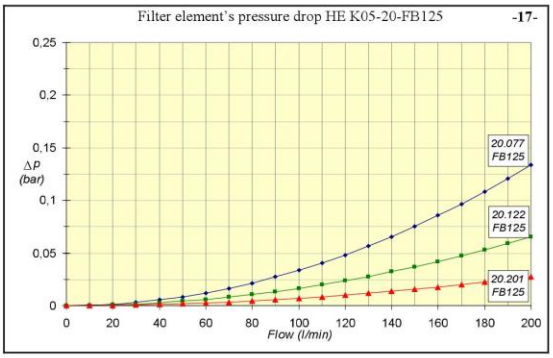

Filter element's pressure drop HE K05-20-FG010
-12-
ΔP (bar)
Flow (l/min)
20.077 FG010
20.122 FG010
20.201 FG010

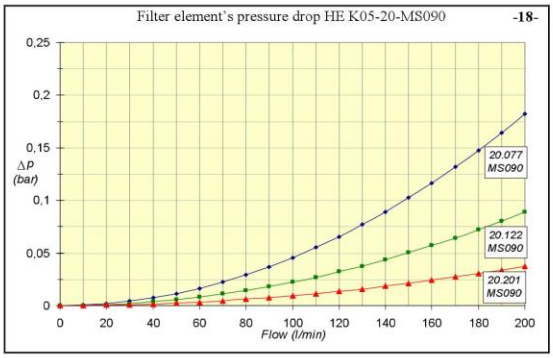

Filter element's pressure drop HE K05-20-FG025
-13-
ΔP (bar)
Flow (l/min)
20.077 FG025
20.122 FG025
20.201 FG025

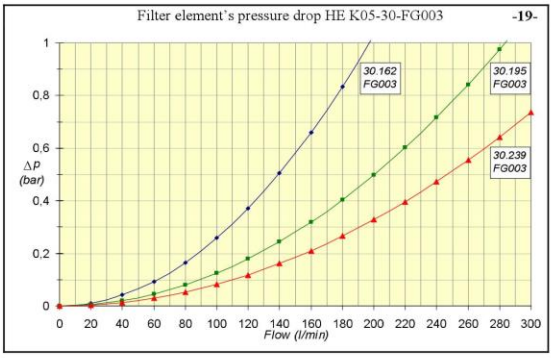

Filter element's pressure drop HE K05-20-RP/SP010
-14-
ΔP (bar)
Flow (l/min)
20.077 SP010
20.122 RP010
20.201 RP010

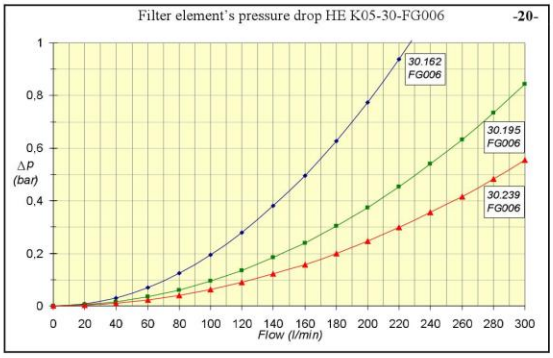

Filter element's pressure drop HE K05-20-RP/SP025
-15-
ΔP (bar)
Flow (l/min)
20.077 SP025
20.122 RP025
20.201 RP025

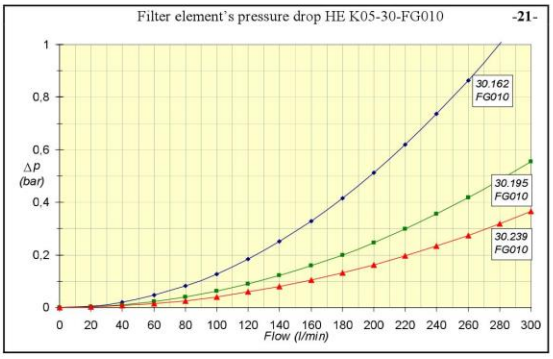

Filter element's pressure drop HE K05-20-FB060
-16-
ΔP (bar)
Flow (l/min)
20.077 FB060
20.122 FB060
20.201 FB060

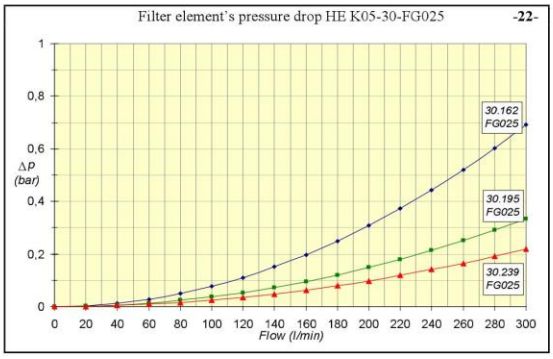

Filter element's pressure drop HE K05-20-FB125 -17-
ΔP (bar)
Flow (l/min)
20.077 FB125
20.122 FB125
20.201 FB125

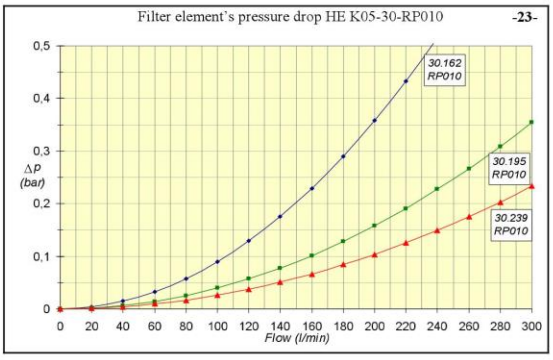

Filter element's pressure drop HE K05-20-MS090 -18-
ΔP (bar)
Flow (l/min)
20.077 MS090
20.122 MS090
20.201 MS090

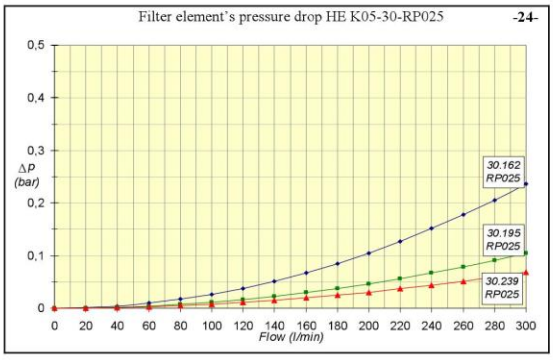

Filter element's pressure drop HE K05-30-FG003 -19-
ΔP (bar)
Flow (l/min)
30.162 FG003
30.195 FG003
30.239 FG003

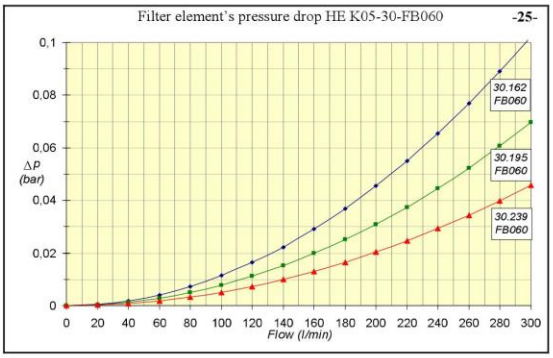

Filter element's pressure drop HE K05-30-FG006 -20-
ΔP (bar)
Flow (l/min)
30.162 FG006
30.195 FG006
30.239 FG006

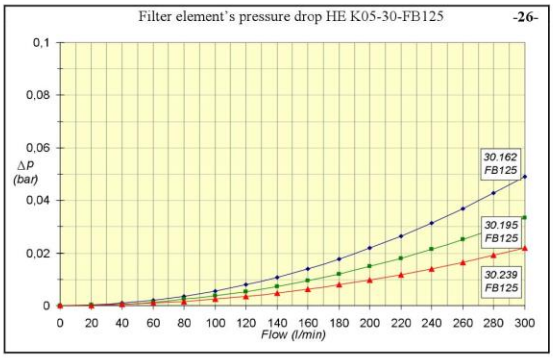

Filter element's pressure drop HE K05-30-FG010 -21-
ΔP (bar)
Flow (l/min)
30.162 FG010
30.195 FG010
30.239 FG010

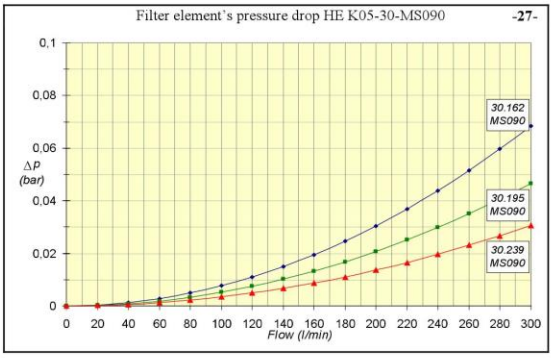

Filter element's pressure drop HE K05-30-FG025 -22-
ΔP (bar)
Flow (l/min)
30.162 FG025
30.195 FG025
30.239 FG025

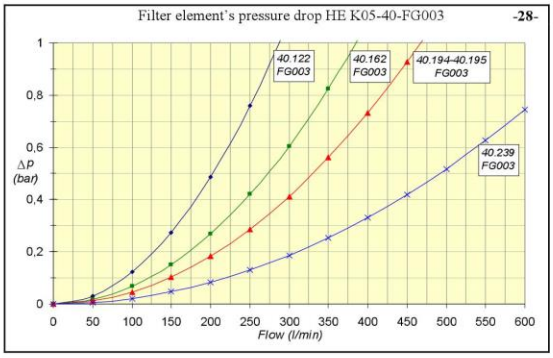

Filter element's pressure drop HE K05-30-RP010 -23-
ΔP (bar)
Flow (l/min)
30.162 RP010
30.195 RP010
30.239 RP010

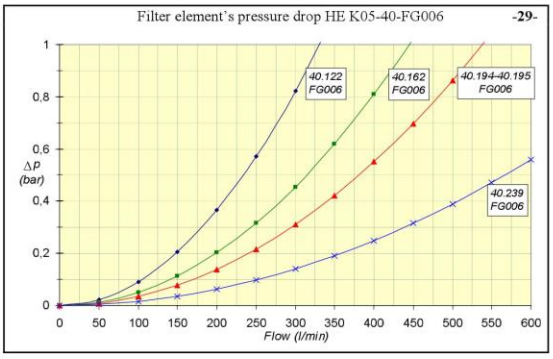

Filter element's pressure drop HE K05-30-RP025 -24-
ΔP (bar)
Flow (l/min)
30.162 RP025
30.195 RP025
30.239 RP025

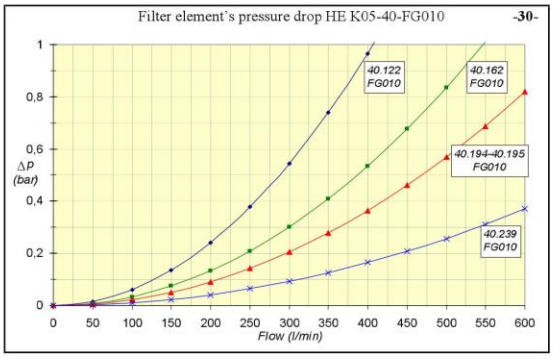

Filter element's pressure drop HE K05-30-FB060 -25-
ΔP (bar)
Flow (l/min)
30.162 FB060
30.195 FB060
30.239 FB060

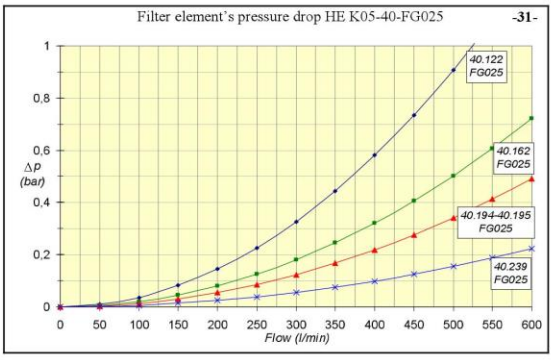

Filter element's pressure drop HE K05-30-FB125 -26-
ΔP (bar)
Flow (l/min)
30.162 FB125
30.195 FB125
30.239 FB125

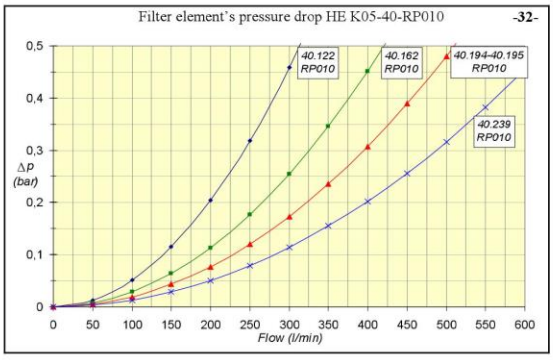

Filter element's pressure drop HE K05-30-MS090 -27-
ΔP (bar)
Flow (l/min)
30.162 MS090
30.195 MS090
30.239 MS090


Filter element's pressure drop HE K05-40-FG003 -28-
ΔP (bar)
Flow (l/min)
40.122 FG003
40.162 FG003
40.194-40.195 FG003
40.239 FG003

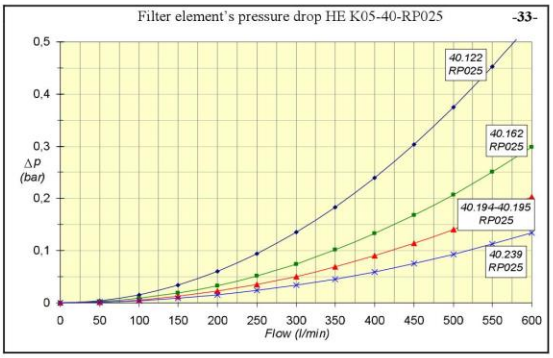

Filter element's pressure drop HE K05-40-FG006 -29-
ΔP (bar)
Flow (l/min)
40.122 FG006
40.162 FG006
40.194-40.195 FG006
40.239 FG006


Filter element's pressure drop HE K05-40-FG010 -30-
ΔP (bar)
Flow (l/min)
40.122 FG010
40.162 FG010
40.194-40.195 FG010
40.239 FG010

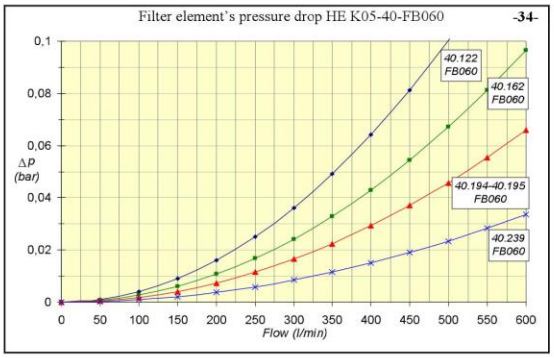

Filter element's pressure drop HE K05-40-FG025 -31-
ΔP (bar)
Flow (l/min)
40.122 FG025
40.162 FG025
40.194-40.195 FG025
40.239 FG025


Filter element's pressure drop HE K05-40-RP010 -32-
ΔP (bar)
Flow (l/min)
40.122 RP010
40.162 RP010
40.194-40.195 RP010
40.239 RP010

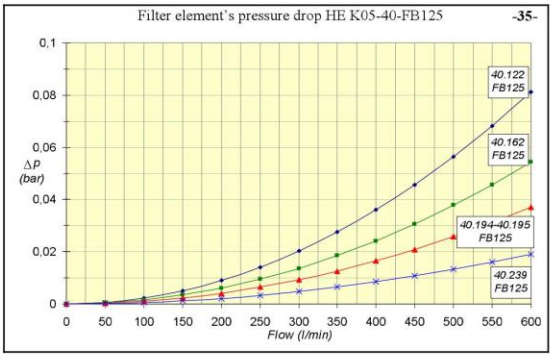
Filter element's pressure drop HE K05-40-RP025 -33-



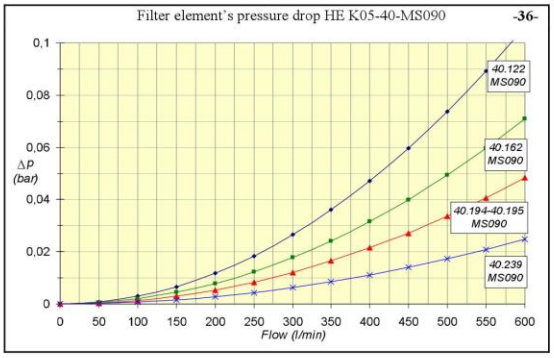
Filter element's pressure drop HE K05-40-FB060 -34-



Filter element's pressure drop HE K05-40-FB125 -35-



Filter element's pressure drop HE K05-40-MS090 -36-



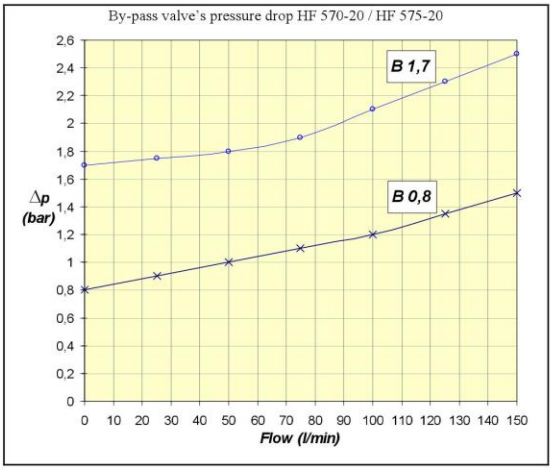
IKRON

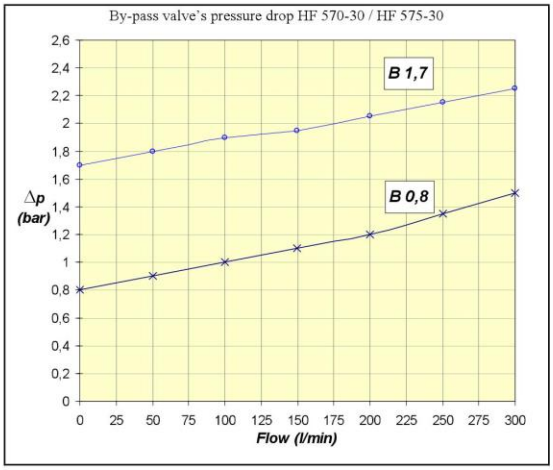
TANK MOUNTED RETURN LINE FILTERS
SERIES HF 570 - 575

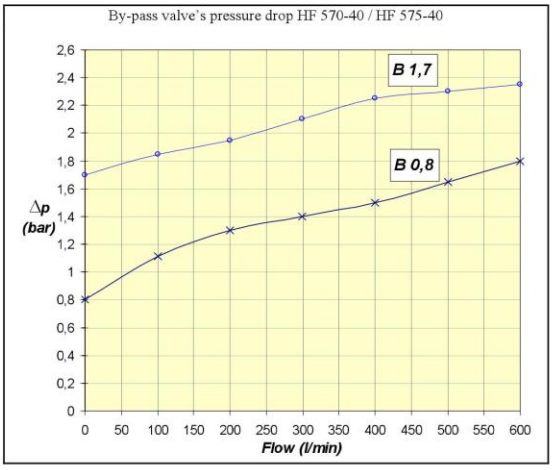
PRESSURE DROP CURVES

The pressure drop for return filters series HF 570 and HF 575 has to be between 0,2 and 0,4 bar.

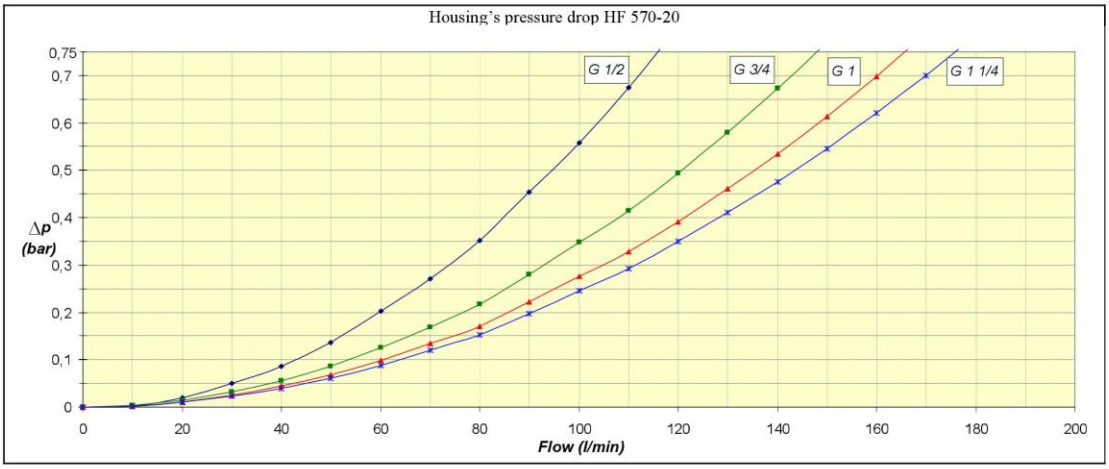
1) The **by-pass pressure drop** is directly proportional to fluid specific gravity and it's irrelevant to determine the total pressure drop.

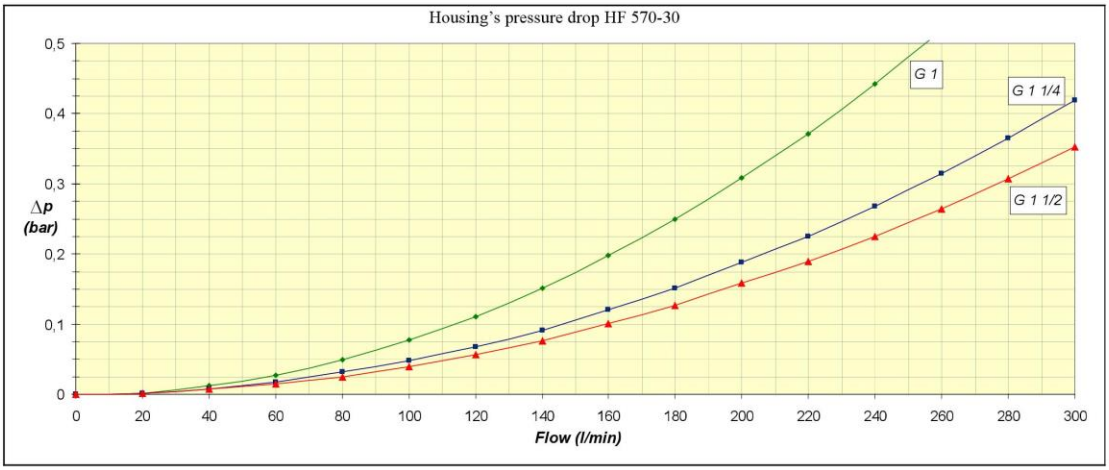


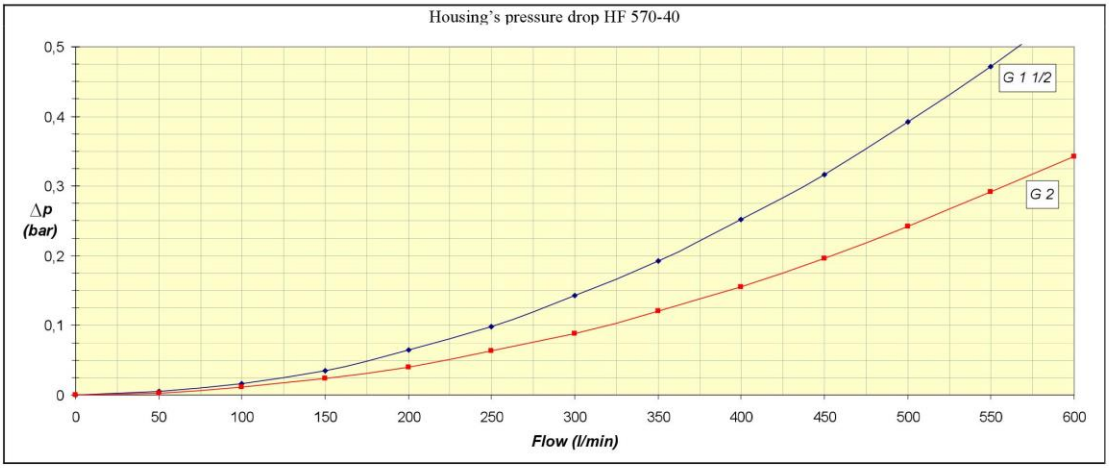




2) The **housing's pressure drop** is determined by the sum of the inlet port's dimension.







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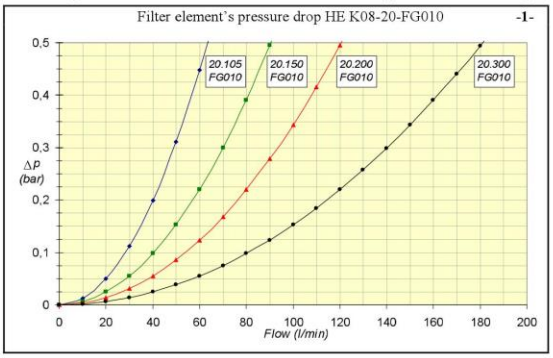
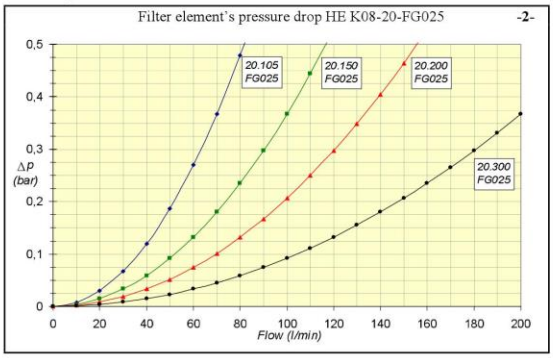
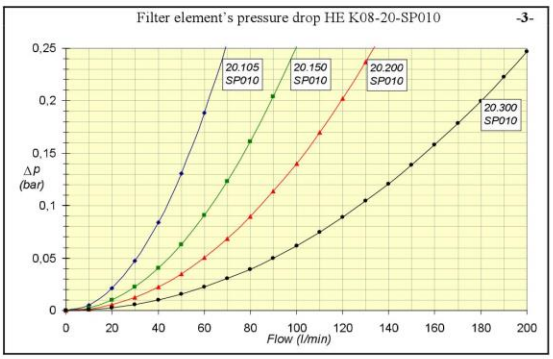
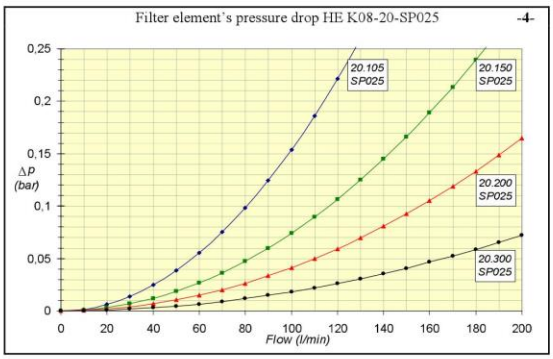
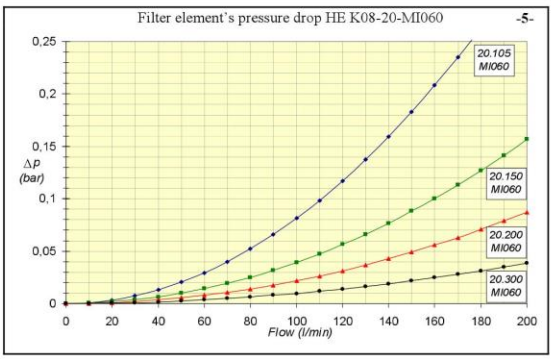
3) The **filter element's pressure drop** is determined by standard media and AS surface, they have been calculated experimentally and thy are valid for clean elements.

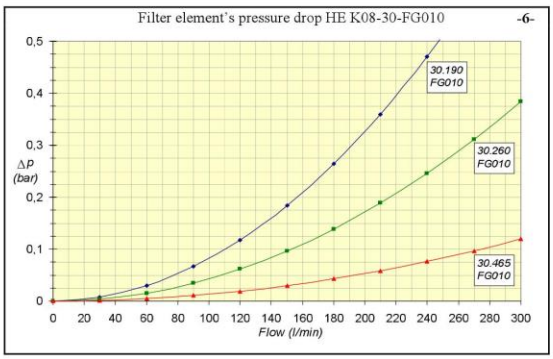


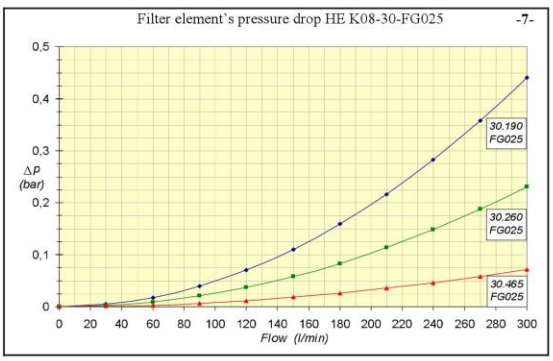


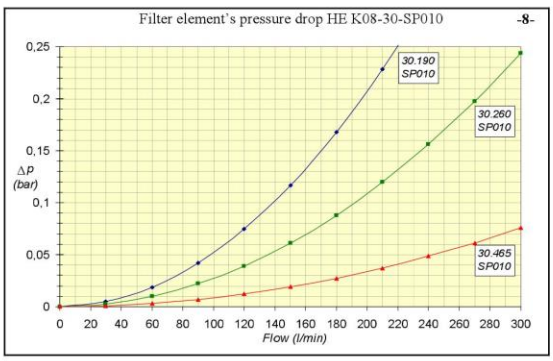




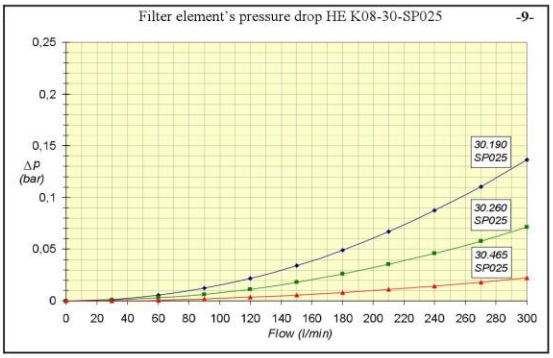




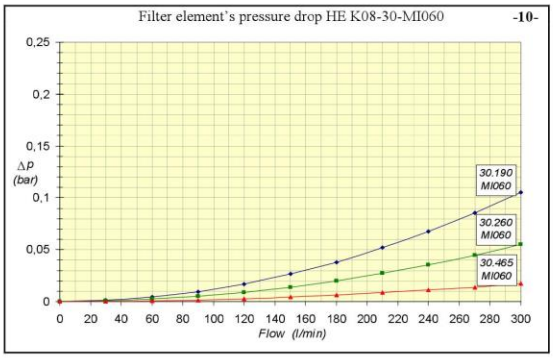




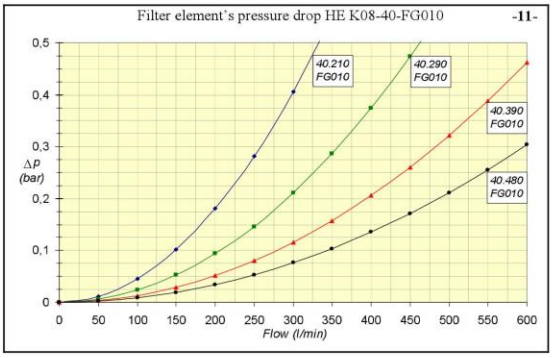
Filter element's pressure drop HE K08-30-SP025 -9-



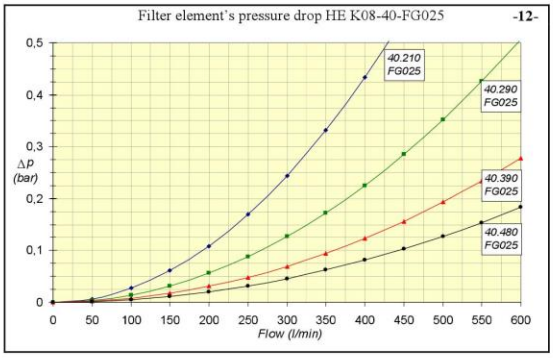
Filter element's pressure drop HE K08-30-MI060 -10-



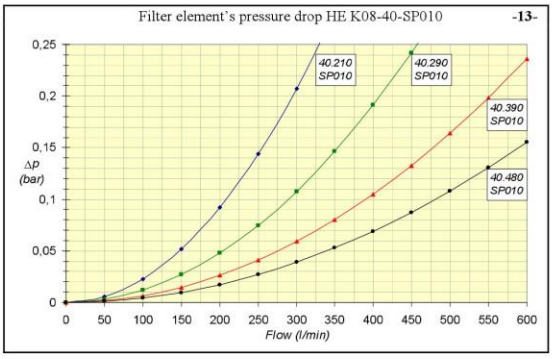
Filter element's pressure drop HE K08-40-FG010 -11-



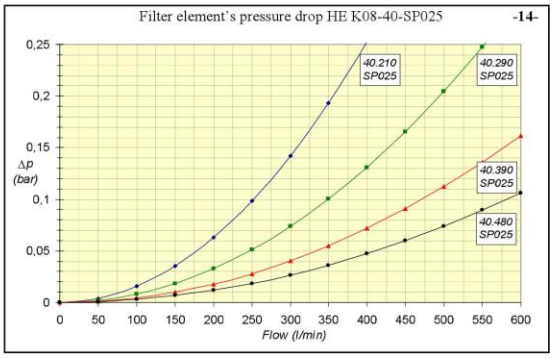
Filter element's pressure drop HE K08-40-FG025 -12-



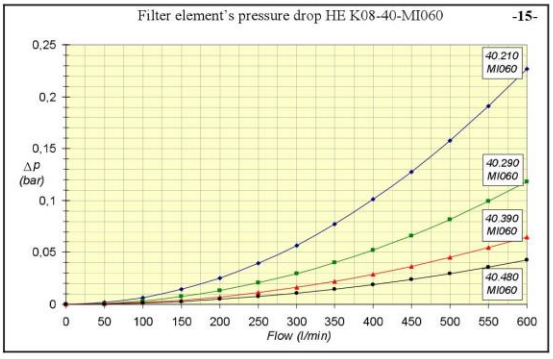
Filter element's pressure drop HE K08-40-SP010 -13-



Filter element's pressure drop HE K08-40-SP025 -14-



Filter element's pressure drop HE K08-40-MI060 -15-



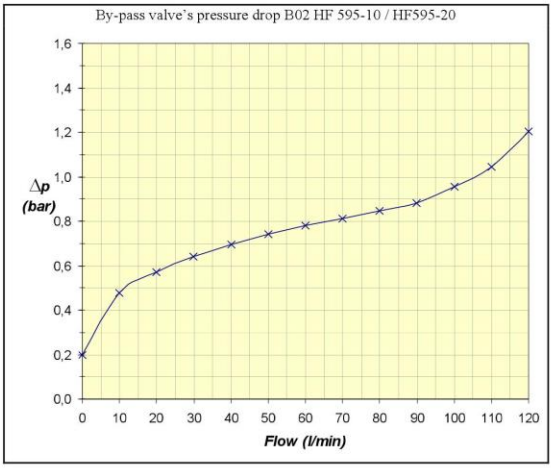
IKRON

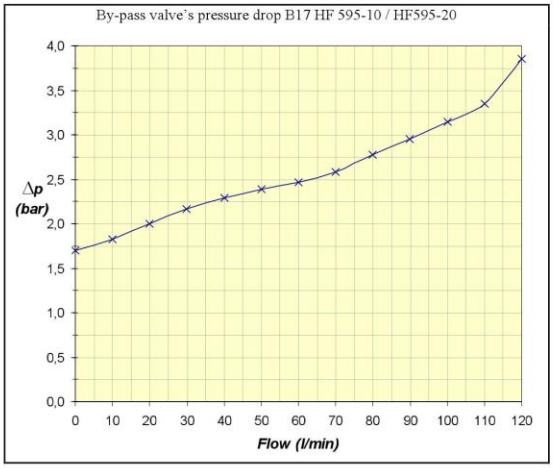
SUCTION AND RETURN FILTERS SERIES HF 595

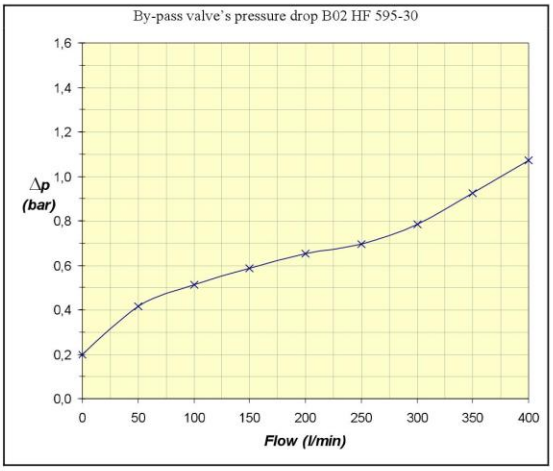
PRESSURE DROP CURVES

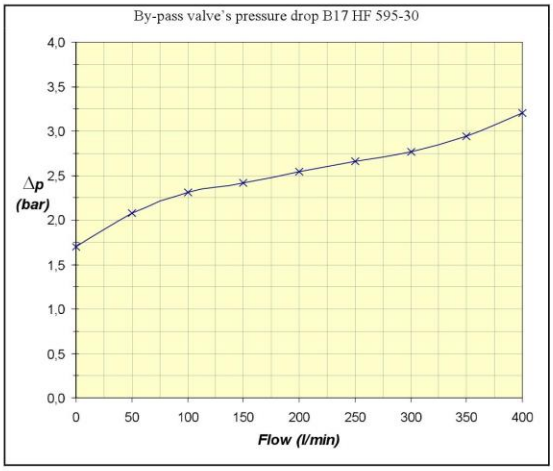
The pressure drop for filters series HF 595 on suction line is 0,2 bar max; the pressure drop for filters series HF 595 on return has to be between 0,2 and 0,4 bar.

1) The **by-pass pressure drop** is directly proportional to fluid specific gravity and it's irrelevant to determine the total pressure drop.

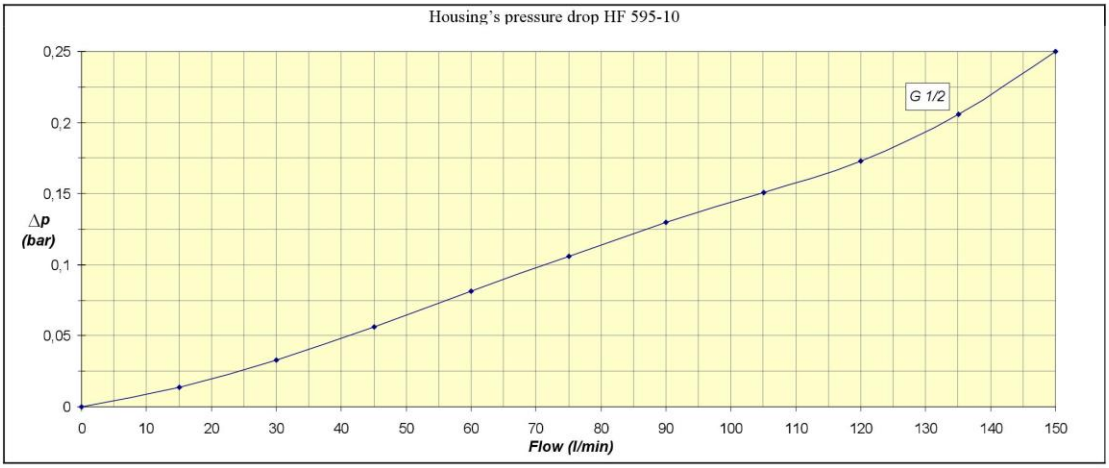


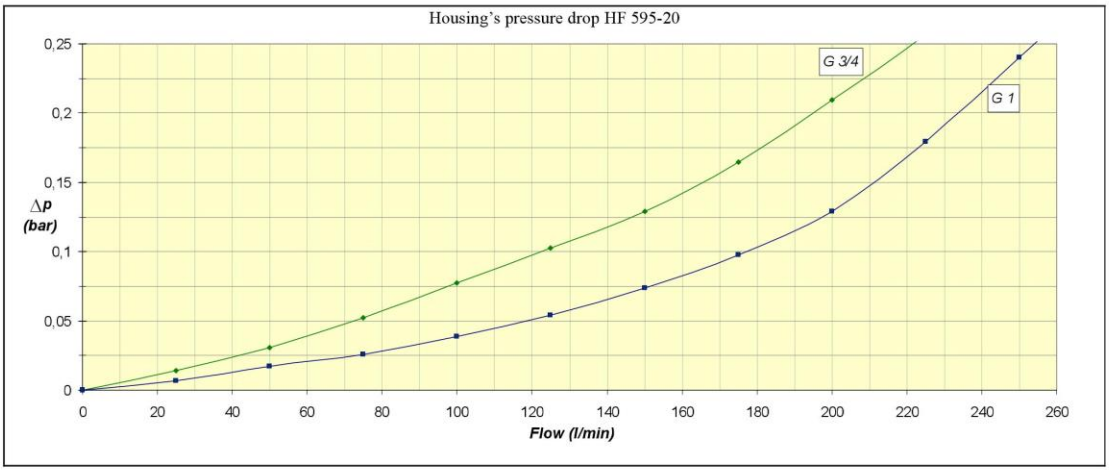


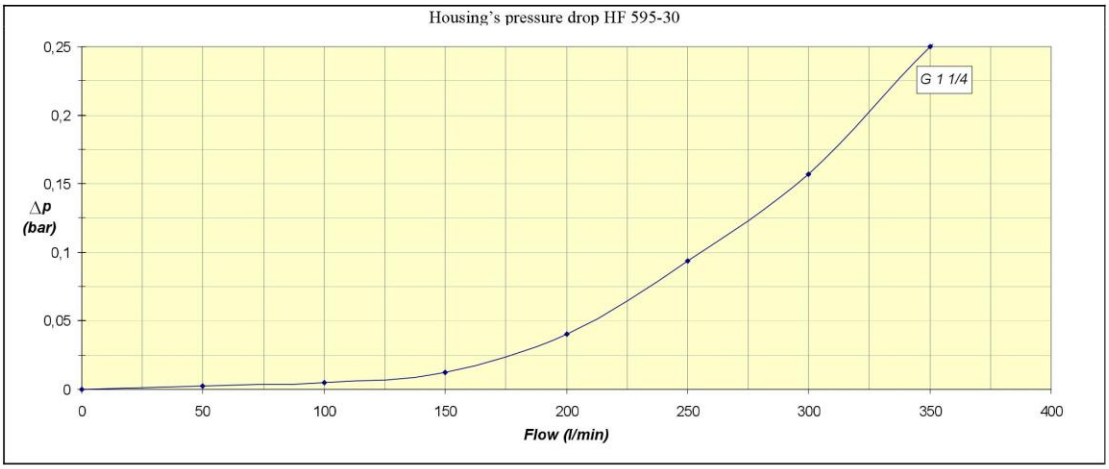




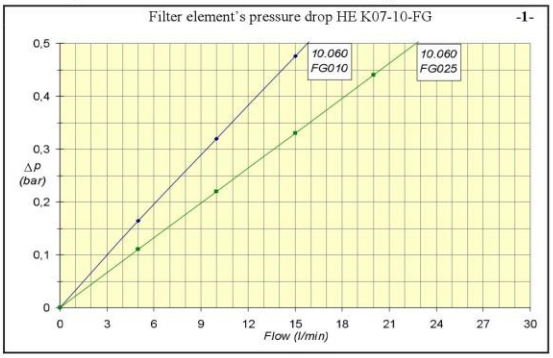
2) The **housing's pressure drop** is determined by the sum of the inlet and outlet port dimension.

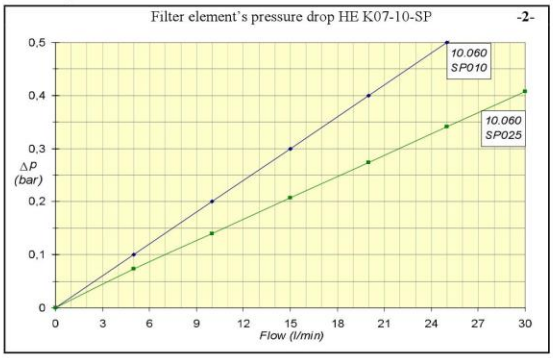


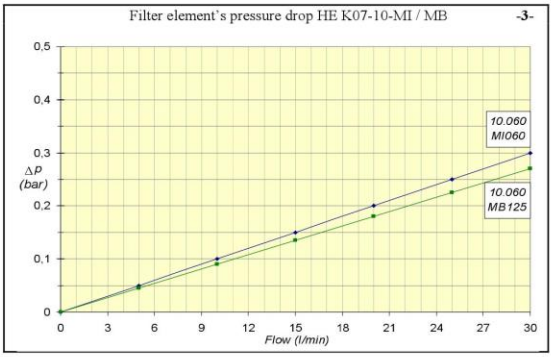


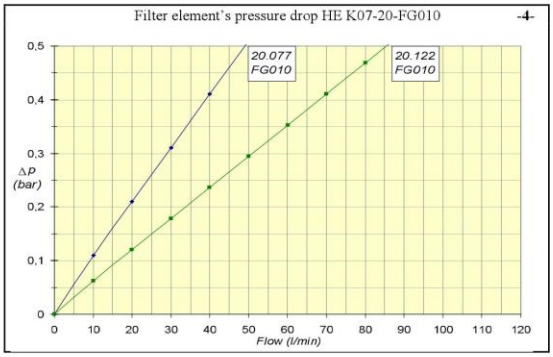


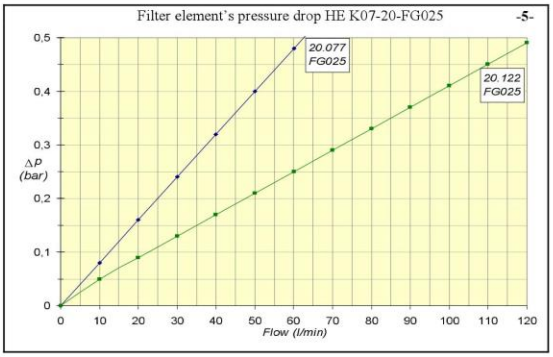
3) The **filter element's pressure drop** is determined by standard media and AS surface, they have been calculated experimentally and thy are valid for clean elements.

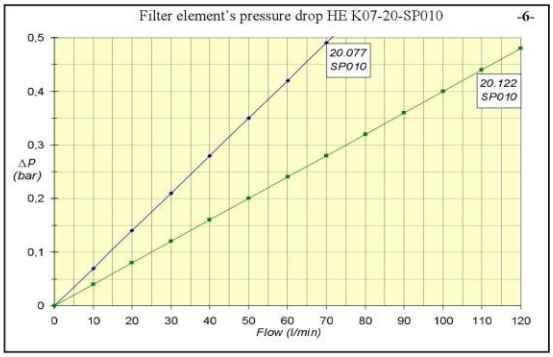


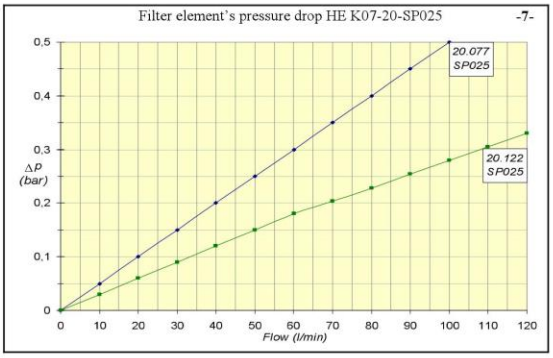


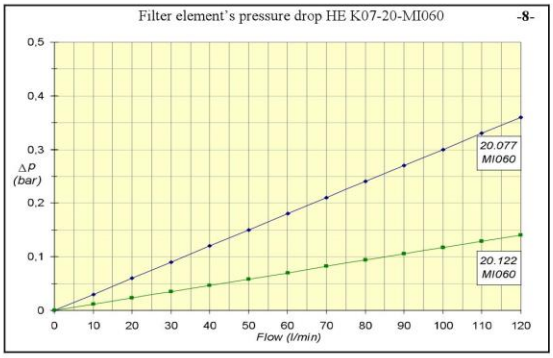


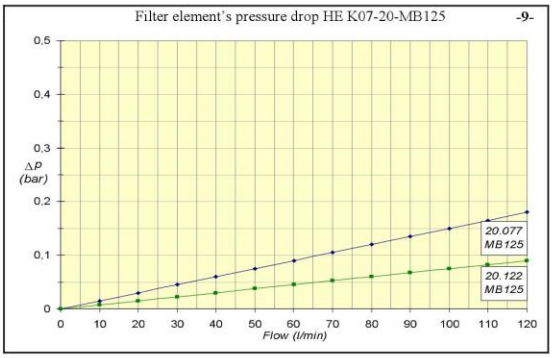


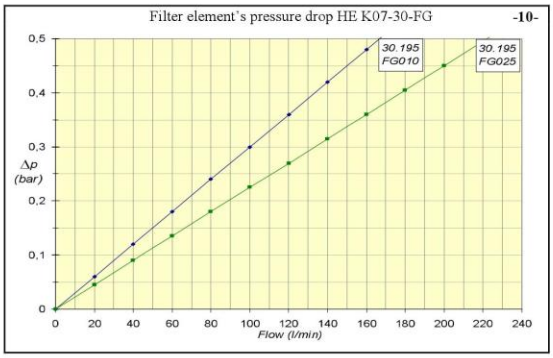


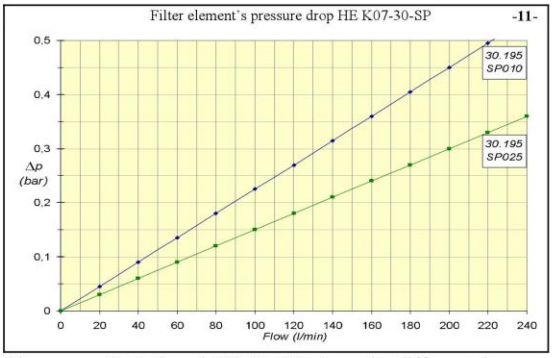


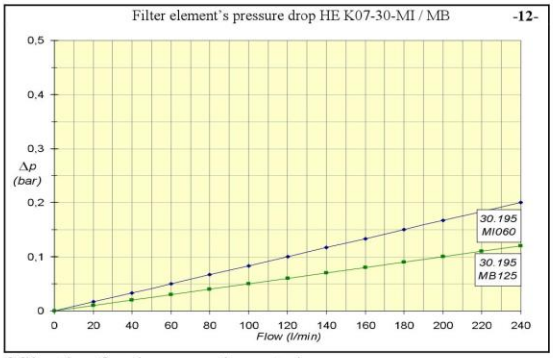












The curves (1-2-3) and (10-11-12) show the different degrees of filtration for the same element size.

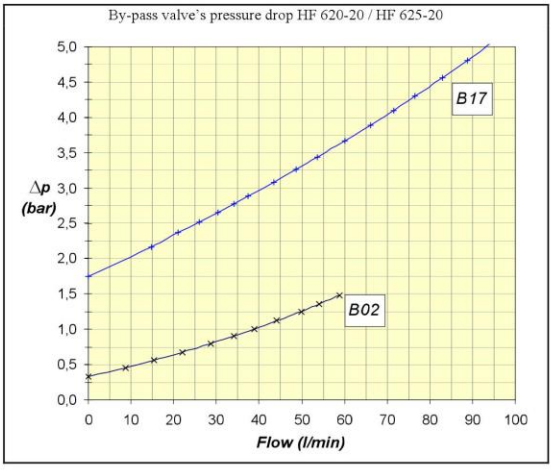
IKRON

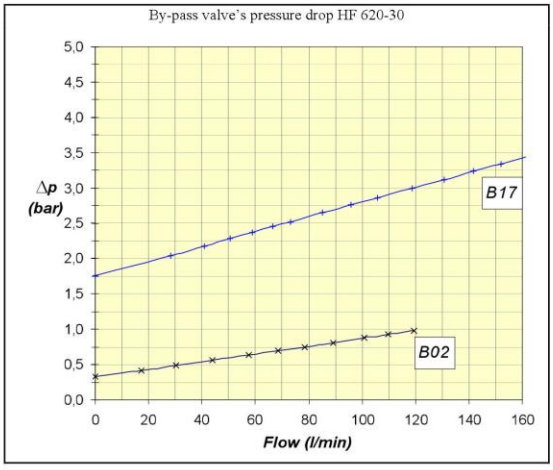
SUCTION AND RETURN FILTERS SERIES HF 620 - 625

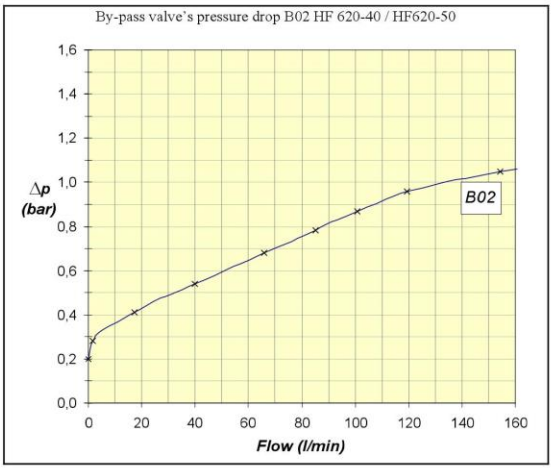
PRESSURE DROP CURVES

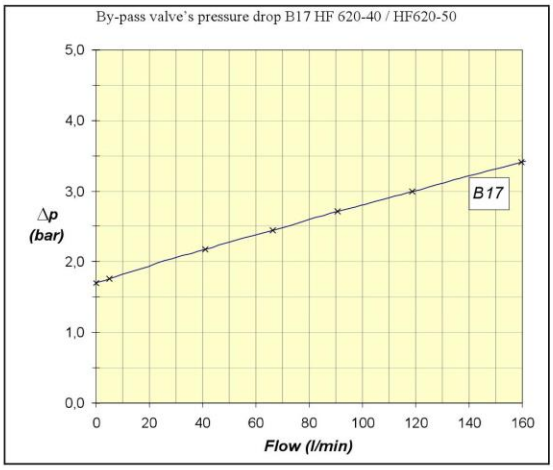
The pressure drop for filters series HF 620 on suction line is 0,2 bar max; the pressure drop for filters series HF 620 and HF 625 on return has to be between 0,2 and 0,4 bar.

1) The **by-pass pressure drop** is directly proportional to fluid specific gravity and it's irrelevant to determine the total pressure drop.

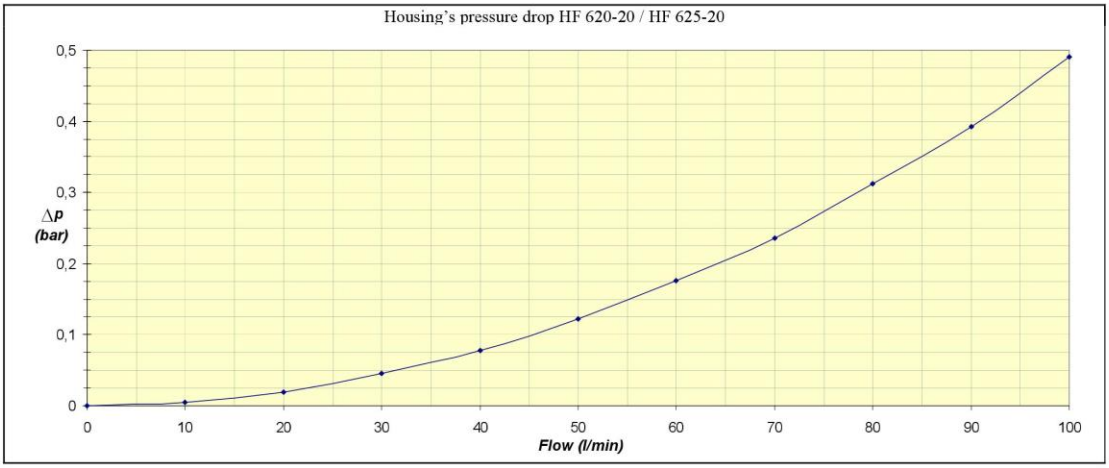


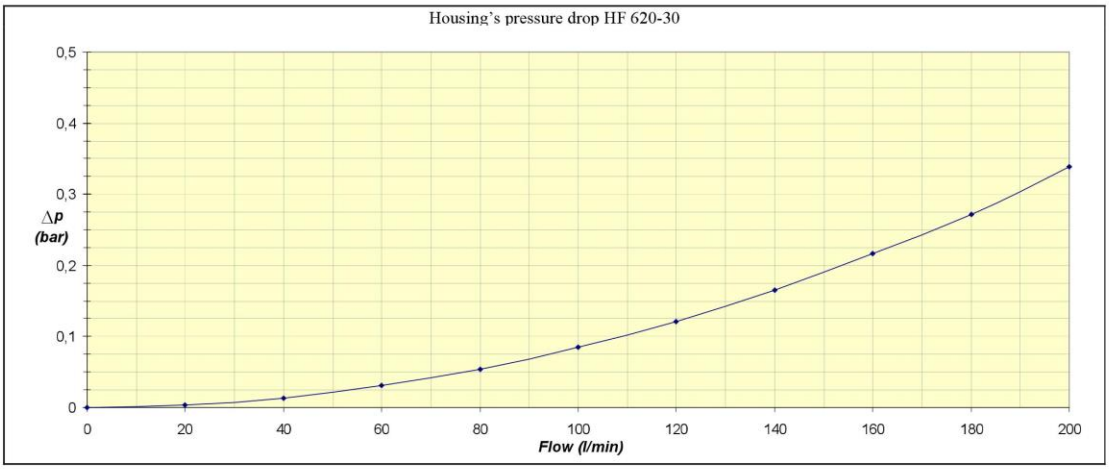


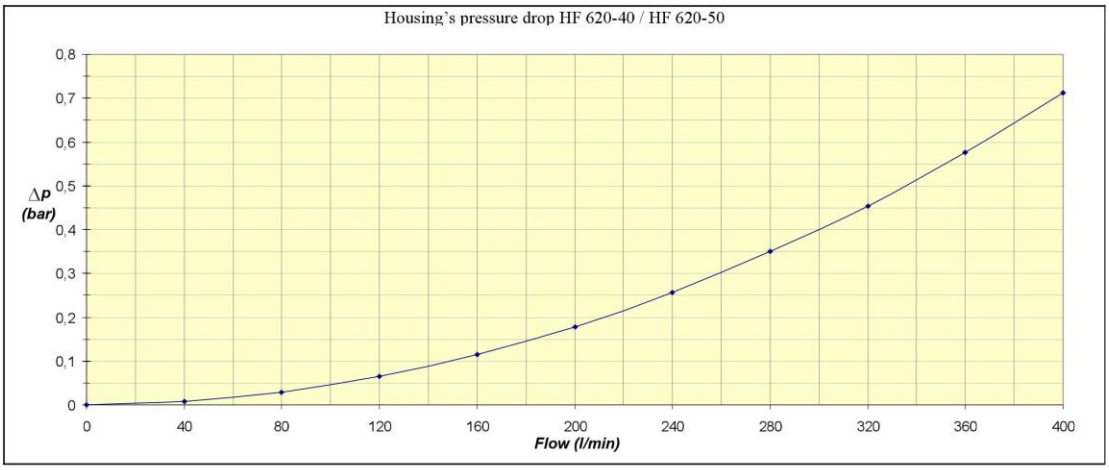




2) The **housing's pressure drop** is determined by the sum of the inlet and outlet port dimension.

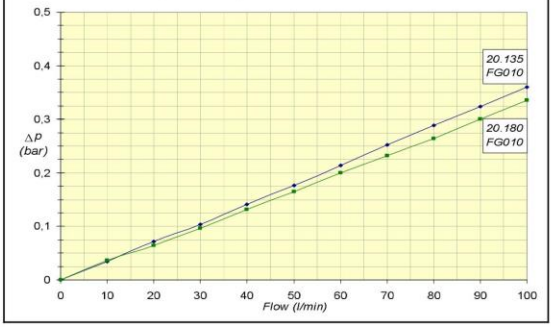




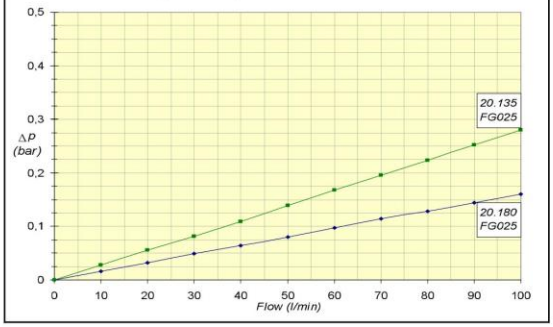


3) The **filter element's pressure drop** is determined by standard media and AS surface, they have been calculated experimentally and thy are valid for clean elements.

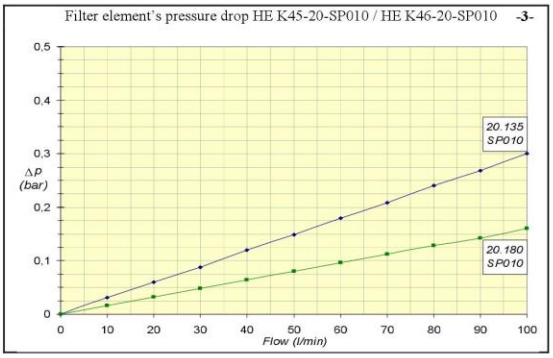
Filter element's pressure drop HE K45-20-FG010 / HE K46-20-FG010 -1-



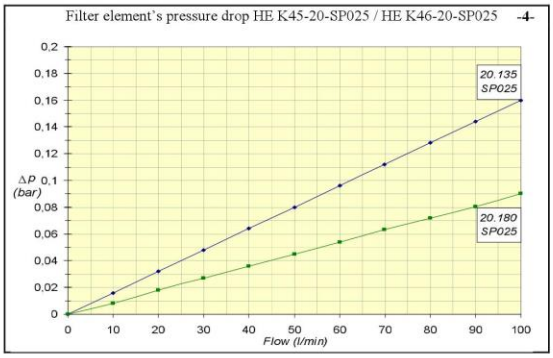
Filter element's pressure drop HE K45-20-FG025 / HE K46-20-FG025 -2-



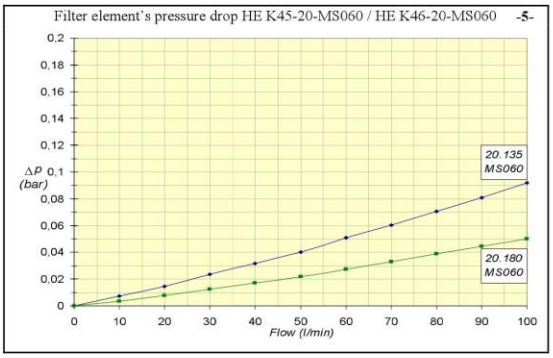
Filter element's pressure drop HE K45-20-SP010 / HE K46-20-SP010 -3-



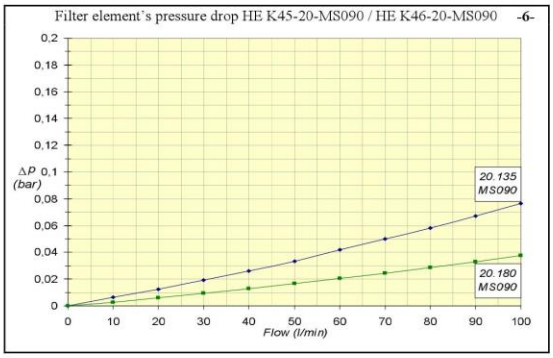
Filter element's pressure drop HE K45-20-SP025 / HE K46-20-SP025 -4-



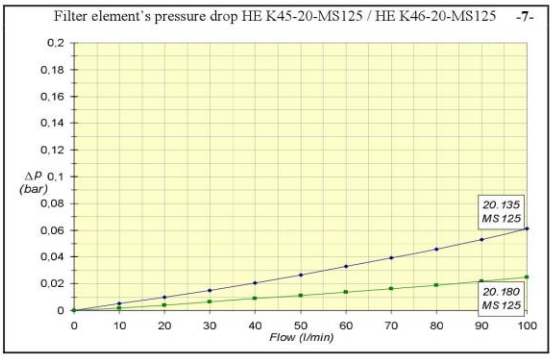
Filter element's pressure drop HE K45-20-MS060 / HE K46-20-MS060 -5-



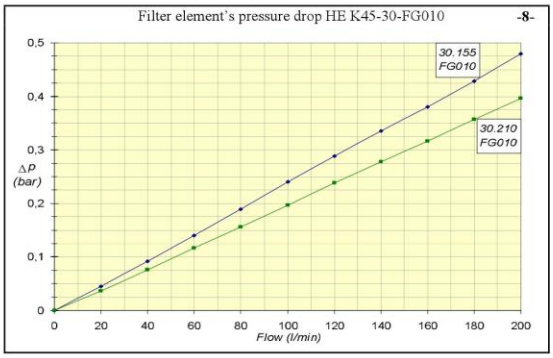
Filter element's pressure drop HE K45-20-MS090 / HE K46-20-MS090 -6-



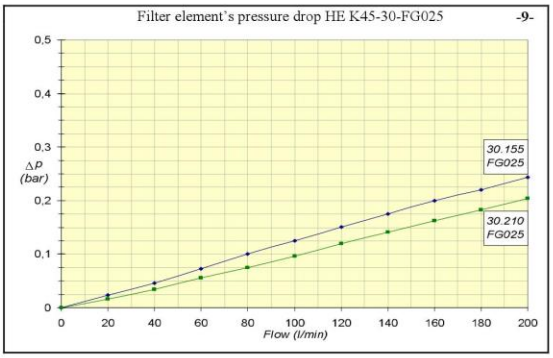
Filter element's pressure drop HE K45-20-MS125 / HE K46-20-MS125 -7-



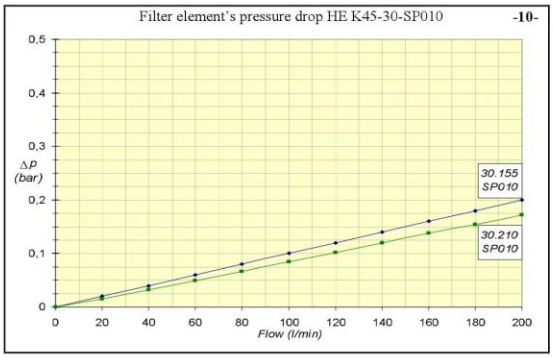
Filter element's pressure drop HE K45-30-FG010 -8-



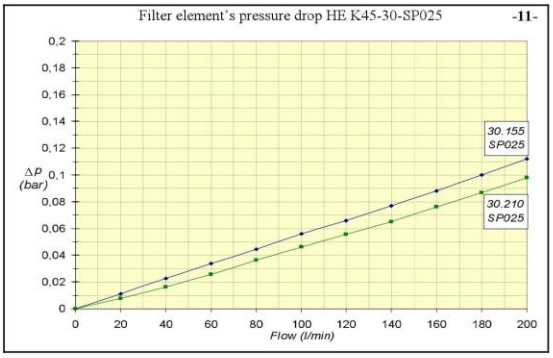
Filter element's pressure drop HE K45-30-FG025 -9-



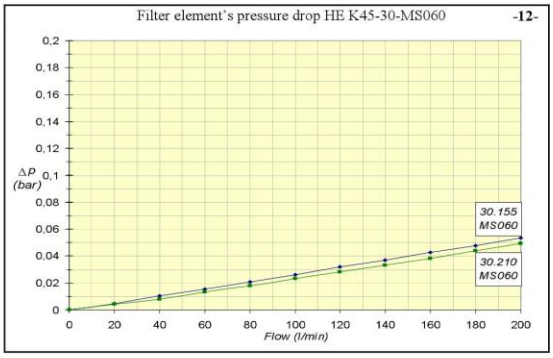
Filter element's pressure drop HE K45-30-SP010 -10-



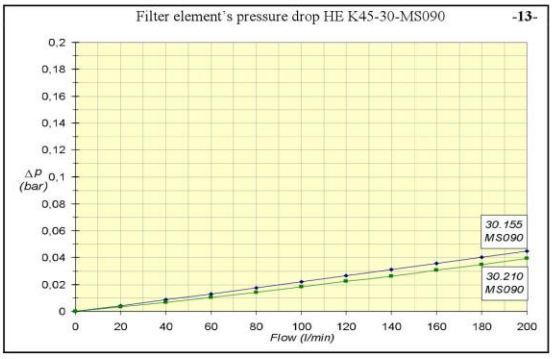
Filter element's pressure drop HE K45-30-SP025 -11-



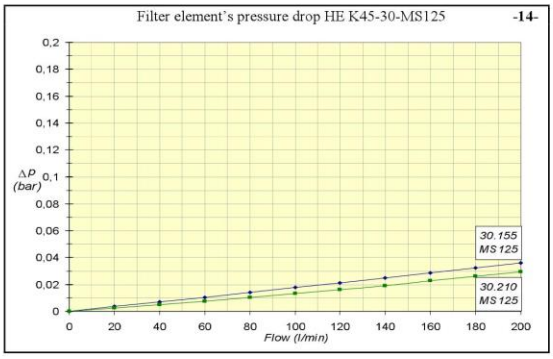
Filter element's pressure drop HE K45-30-MS060 -12-



Filter element's pressure drop HE K45-30-MS090 -13-



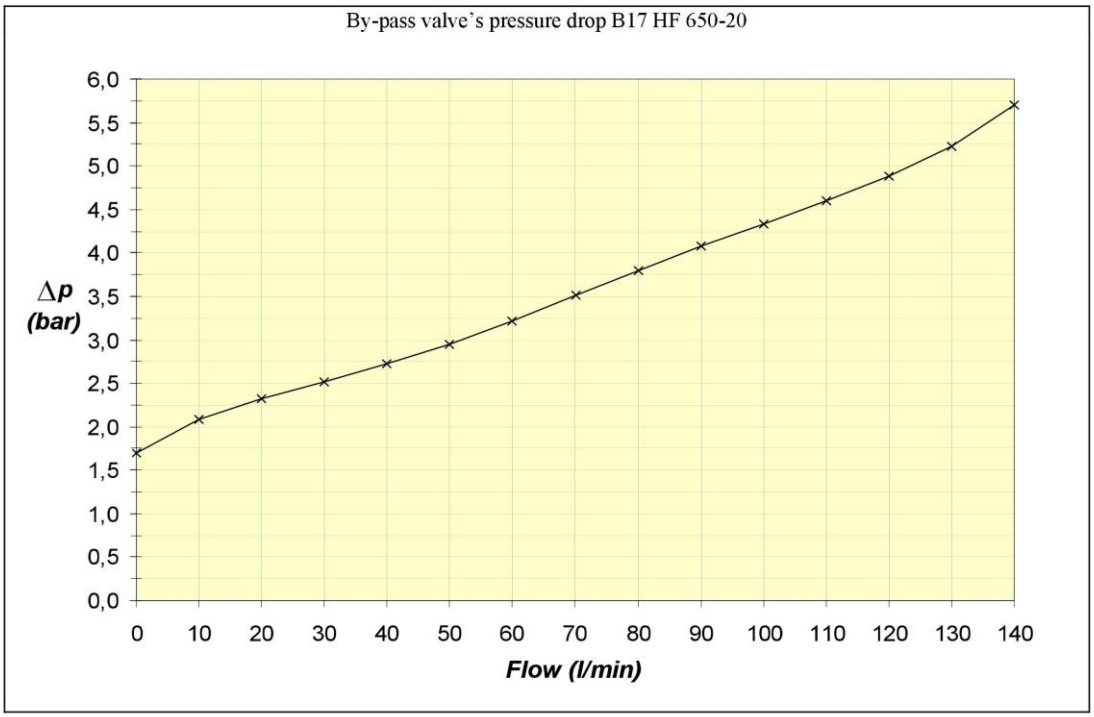
Filter element's pressure drop HE K45-30-MS125 -14-



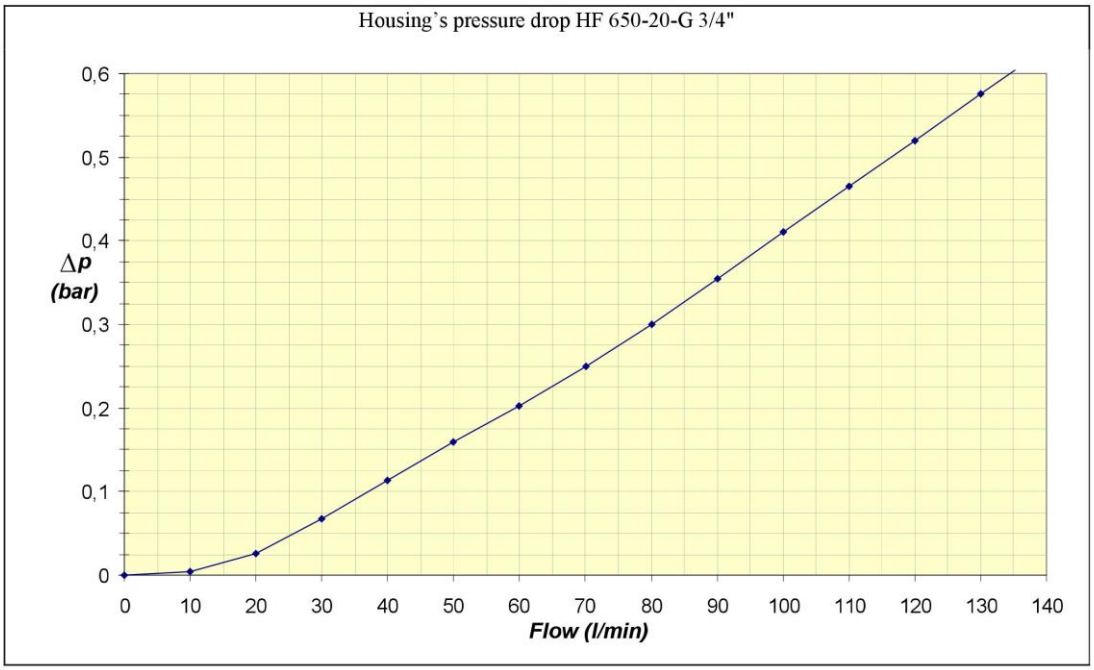
PRESSURE DROP CURVES

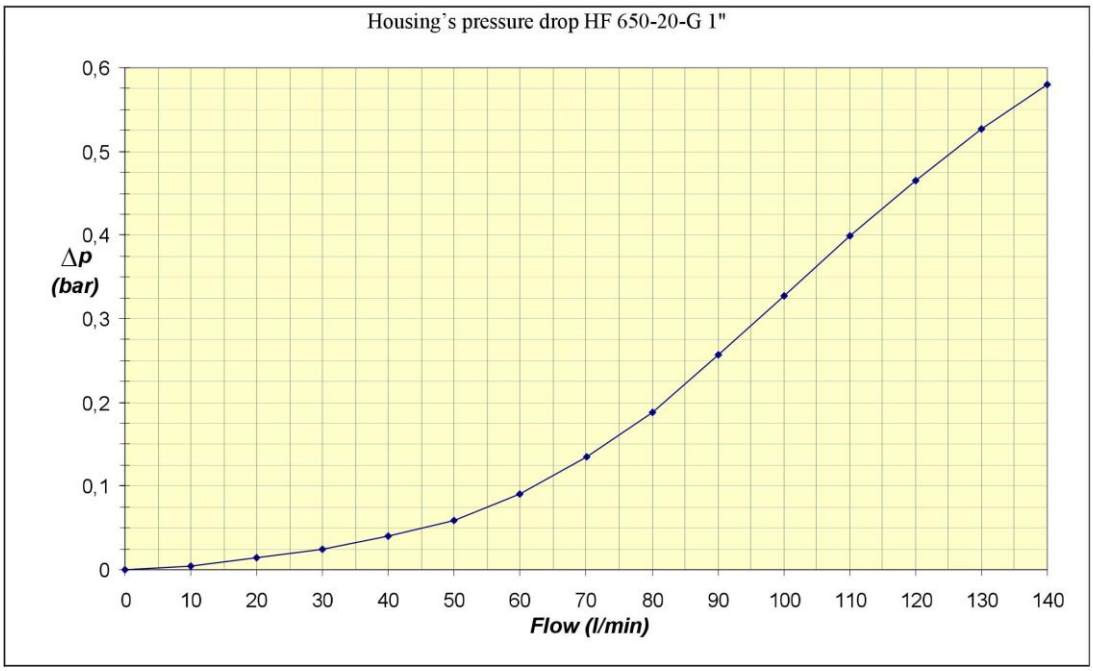
The pressure drop for medium pressure filters series HF 650 on equipments with regular use is 0,75 bar max, while the pressure drop has to be between 1 and 1,5 bar on equipments with heavy working.

1) The **by-pass pressure drop** is directly proportional to fluid specific gravity and it's irrelevant to determine the total pressure drop.



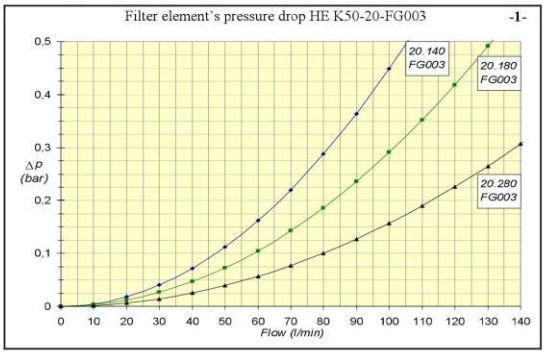
2) The **housing's pressure drop** is determined by the sum of the inlet and outlet port dimension.



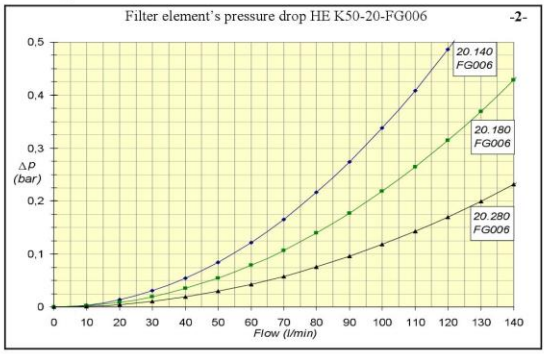


3) The **filter element's pressure drop** is determined by standard media and AS surface, they have been calculated experimentally and thy are valid for clean elements.

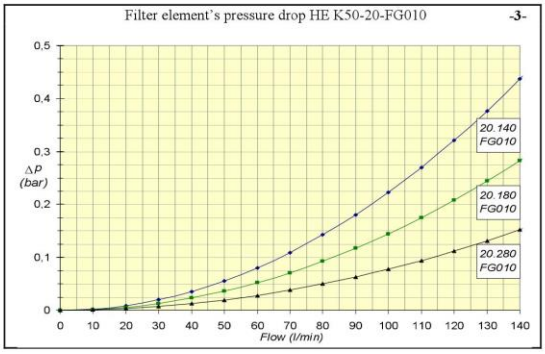
Filter element's pressure drop HE K50-20-FG003 -1-



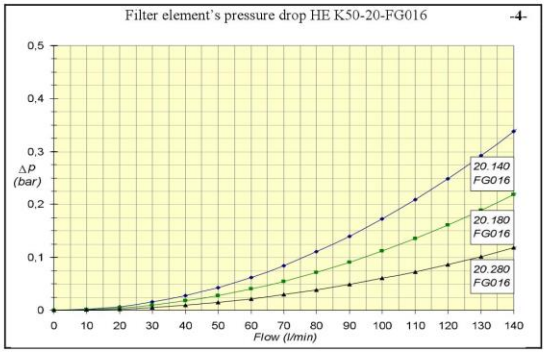
Filter element's pressure drop HE K50-20-FG006 -2-



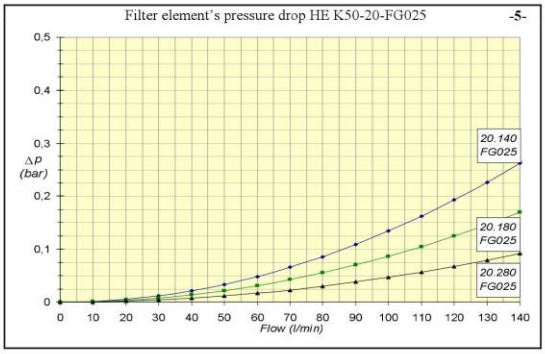
Filter element's pressure drop HE K50-20-FG010 -3-



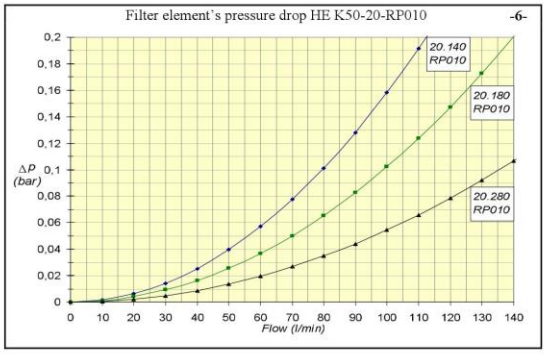
Filter element's pressure drop HE K50-20-FG016 -4-



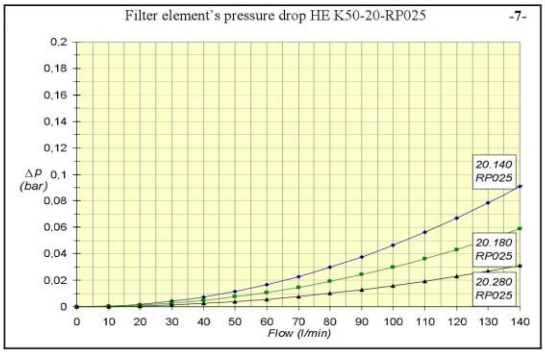
Filter element's pressure drop HE K50-20-FG025 -5-



Filter element's pressure drop HE K50-20-RP010 -6-



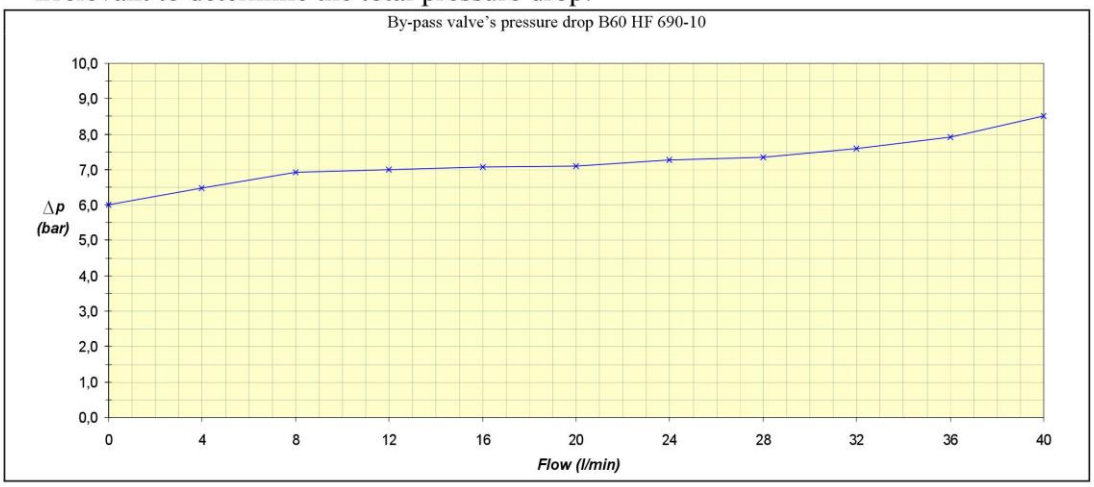
Filter element's pressure drop HE K50-20-RP025 -7-



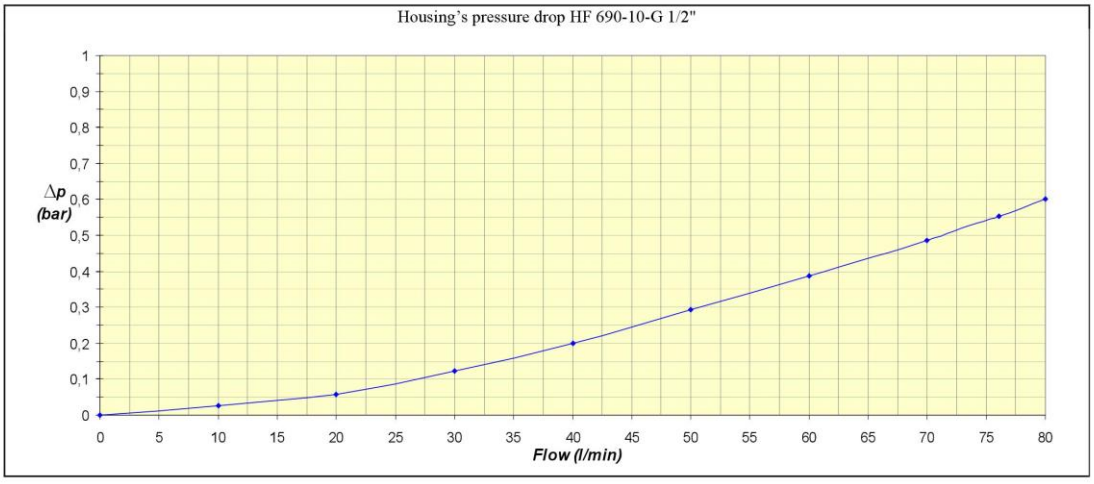
PRESSURE DROP CURVES

The pressure drop for medium pressure filters series HF 690 on equipments with regular use is 1,2 bar max.

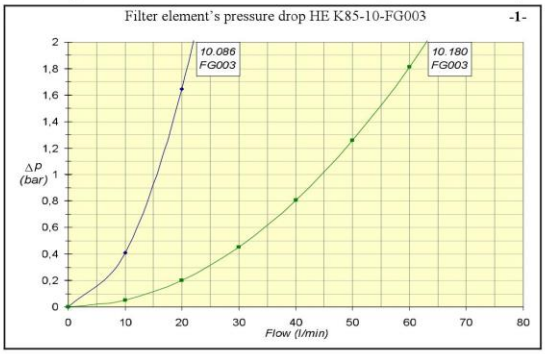
1) The **by-pass pressure drop** is directly proportional to fluid specific gravity and it's irrelevant to determine the total pressure drop.

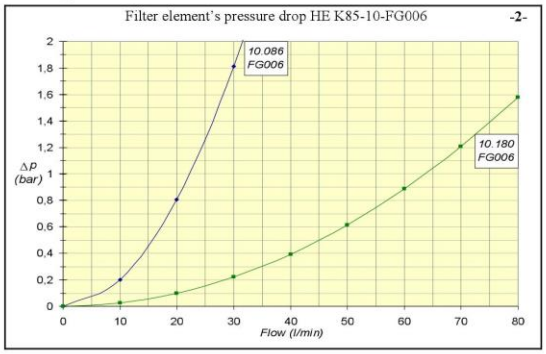


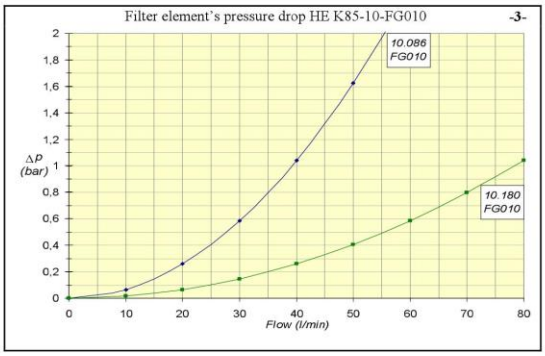
2) The **housing's pressure drop** is determined by the sum of the inlet and outlet port dimension.

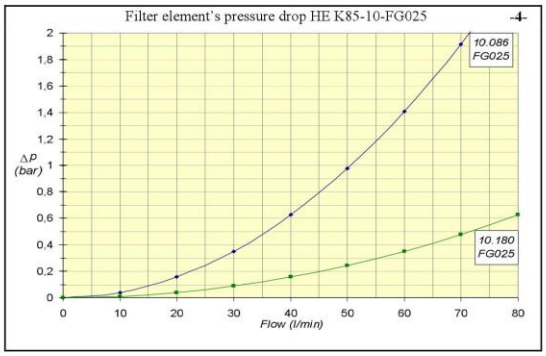


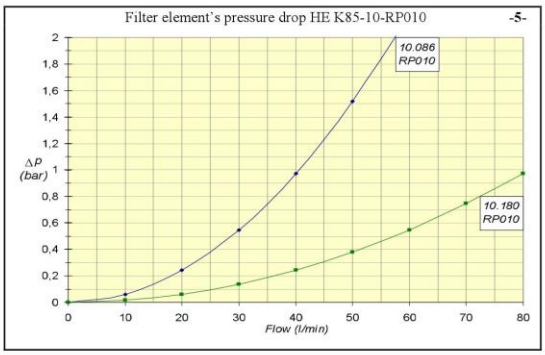
3) The **filter element's pressure drop** is determined by standard media and AS surface, they have been calculated experimentally and thy are valid for clean elements.

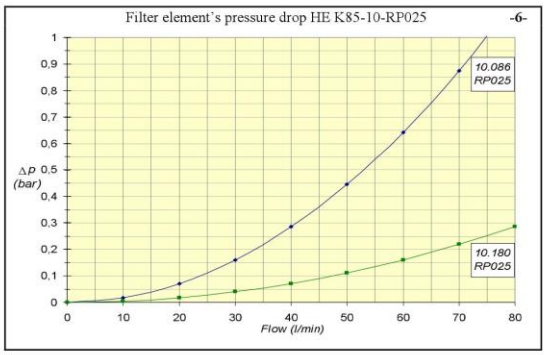


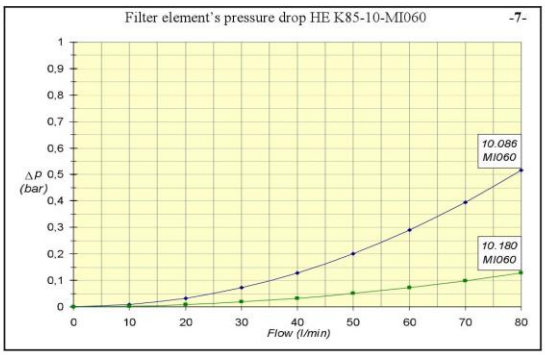












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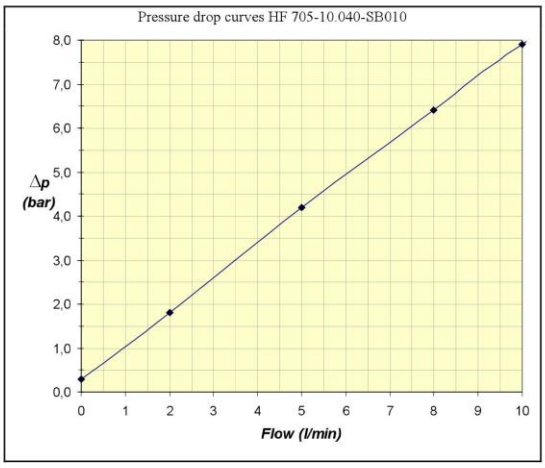
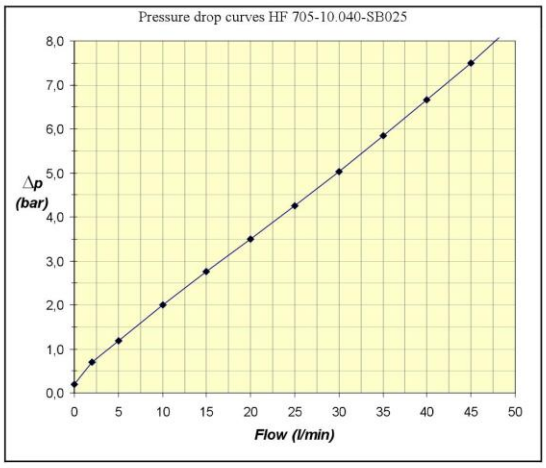
HIGH PRESSURE LINE FILTERS SERIES HF 705

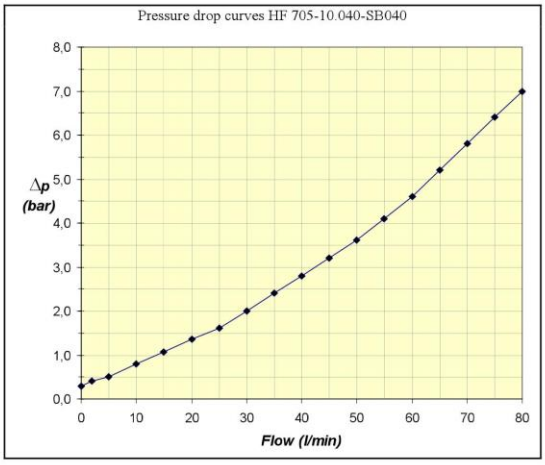
PRESSURE DROP CURVES

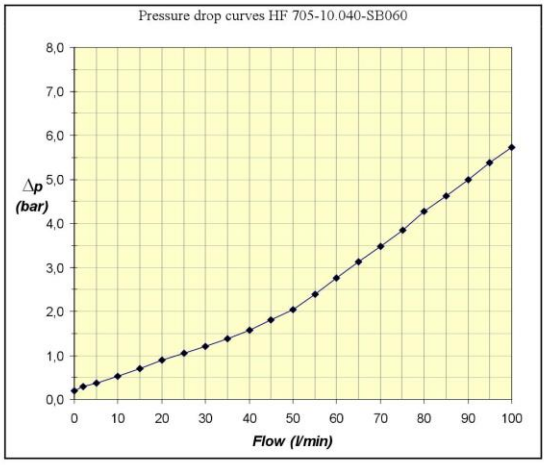
The pressure drop for filters series HF 705 is 5 bar max.

1) The **filter's pressure drop** is determined by four different type of filtering surface.







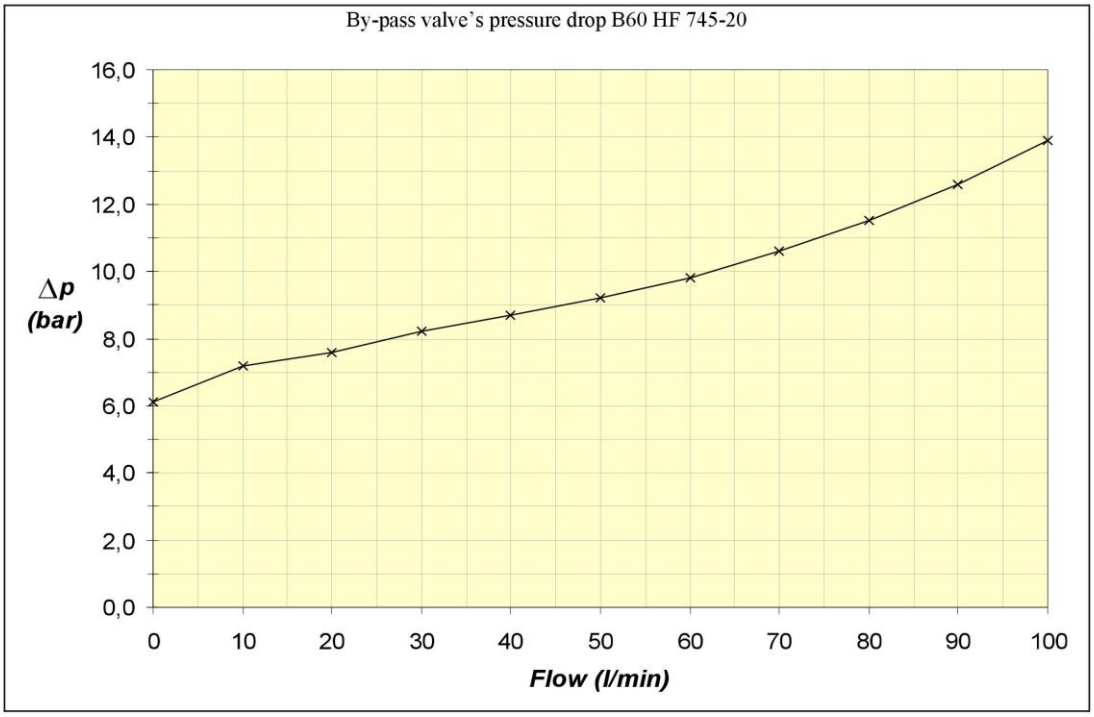


PRESSURE DROP CURVES

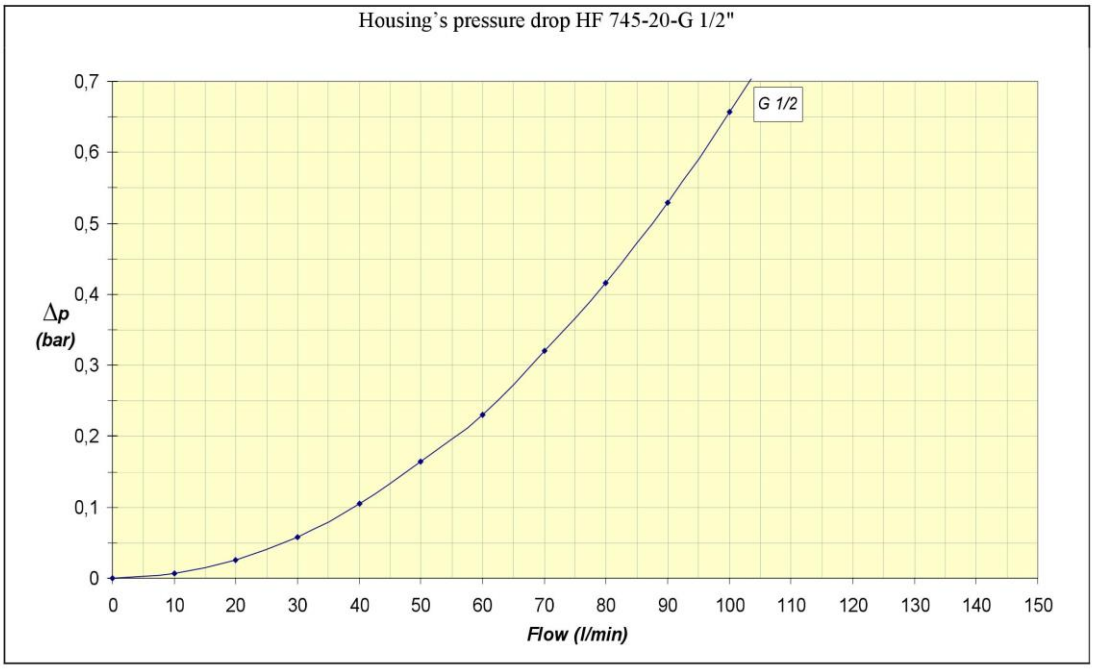
The pressure drop for medium pressure filters series HF 745 on equipments with regular use is 0,75 bar max, while the pressure drop has to be between 1 and 1,5 bar on equipments with heavy working.

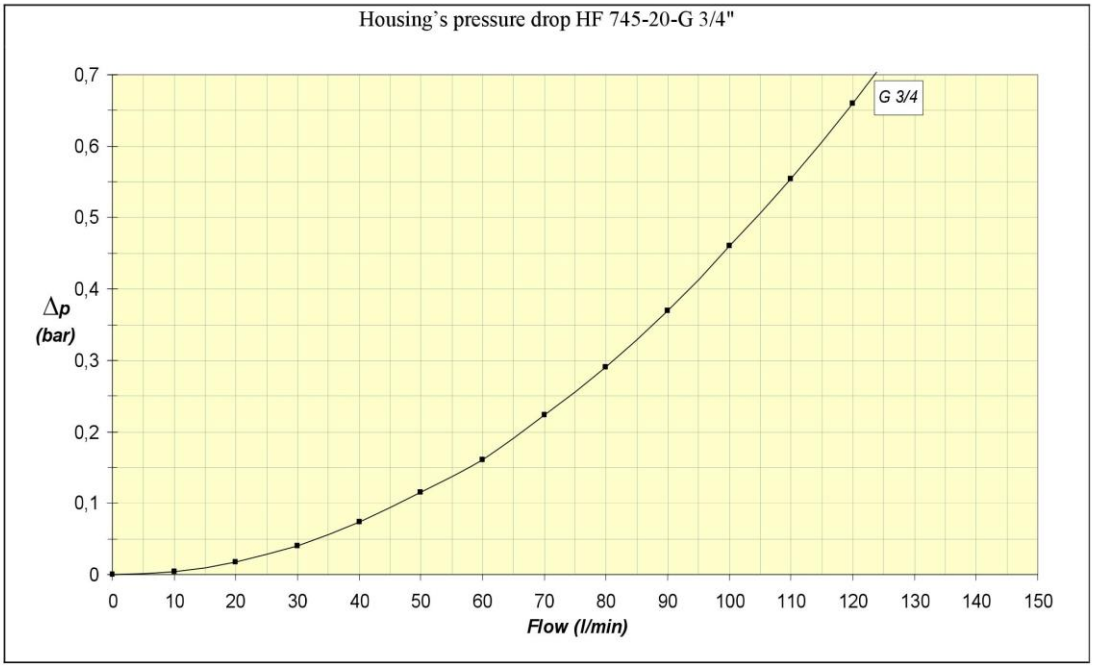
The filters series HF 745 grants a ratio $\beta x \geq 200$.

1) The **by-pass pressure drop** is directly proportional to fluid specific gravity and it's irrelevant to determine the total pressure drop.



2) The **housing's pressure drop** is determined by the sum of the inlet and outlet port dimension.





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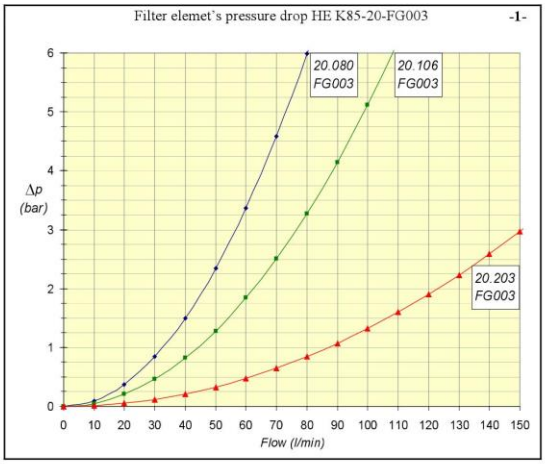
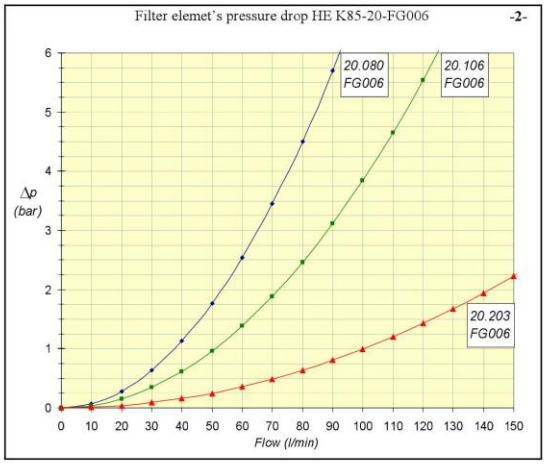
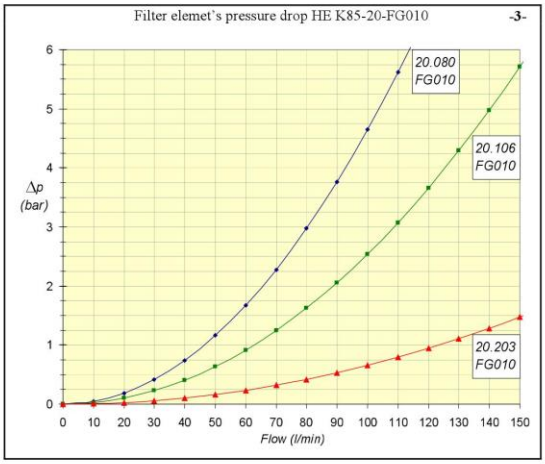
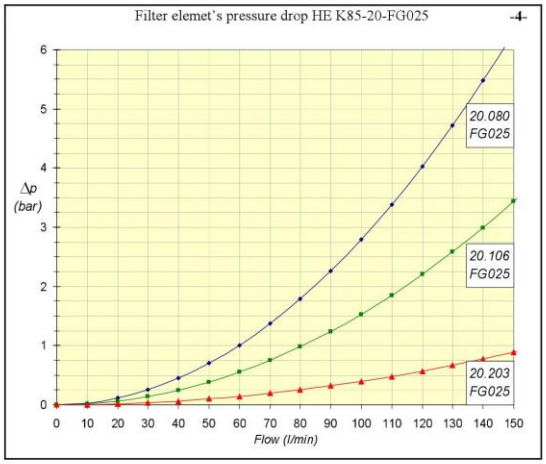
3) The **filter element's pressure drop** is determined by standard media and AS surface, they have been calculated experimentally and thy are valid for clean elements.









IKRON

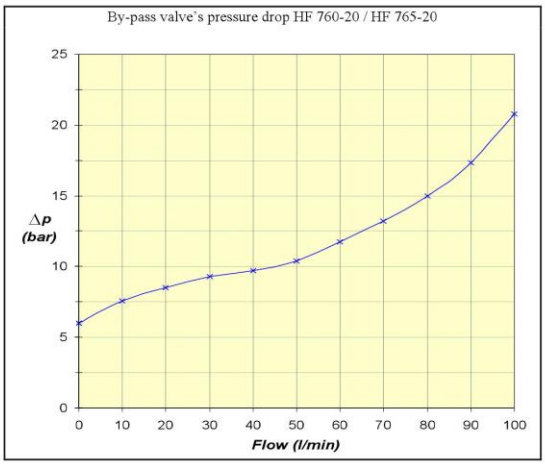
HIGH PRESSURE LINE FILTERS SERIES HF 760 - 765

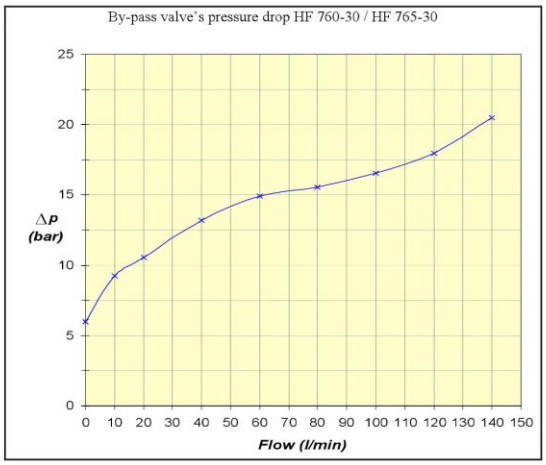
PRESSURE DROP CURVES

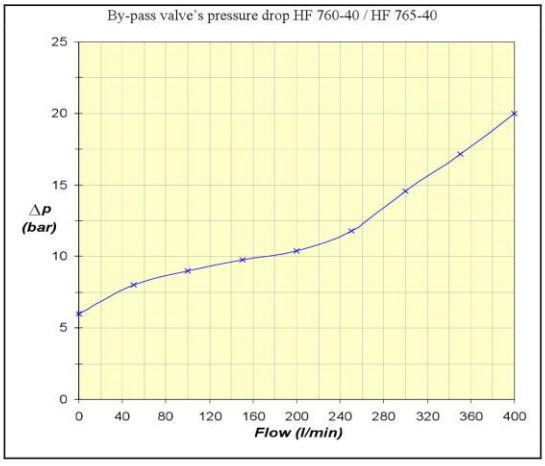
The pressure drop for medium pressure filters series HF 745 on equipments with regular use is 0,75 bar max, while the pressure drop has to be between 1 and 1,5 bar on equipments with heavy working.

The filters series HF 745 grants a ratio **βx≥200.**

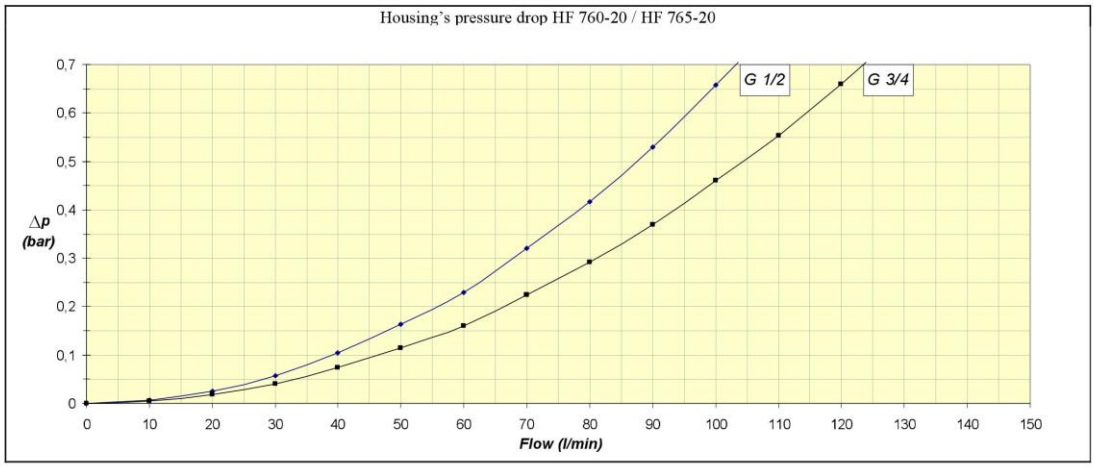
1) The **by-pass pressure drop** is directly proportional to fluid specific gravity and it's irrelevant to determine the total pressure drop.

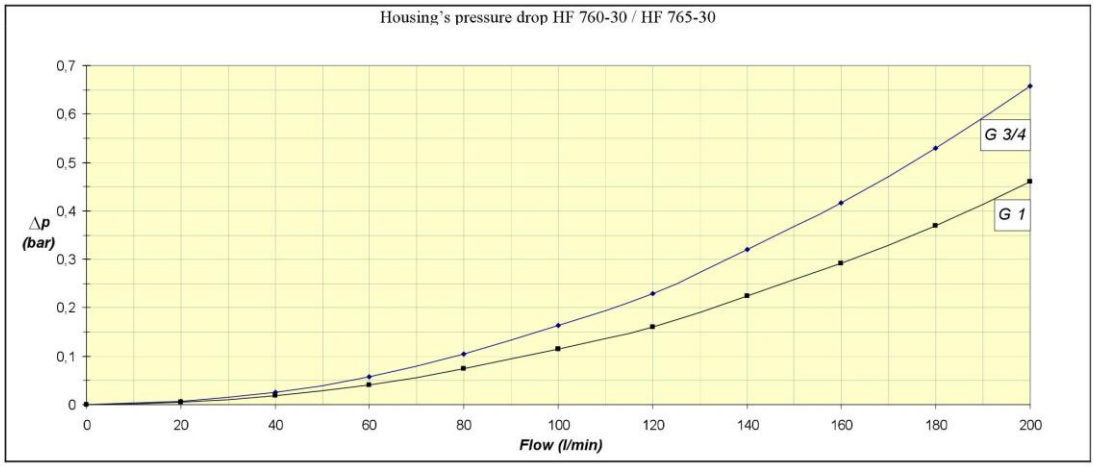


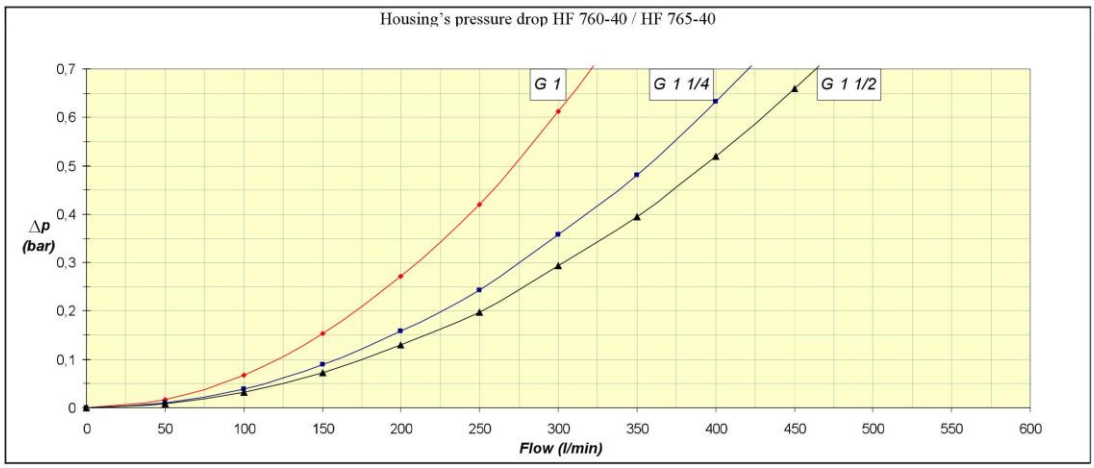




2) The **housing's pressure drop** is determined by the sum of the inlet and outlet port dimension.







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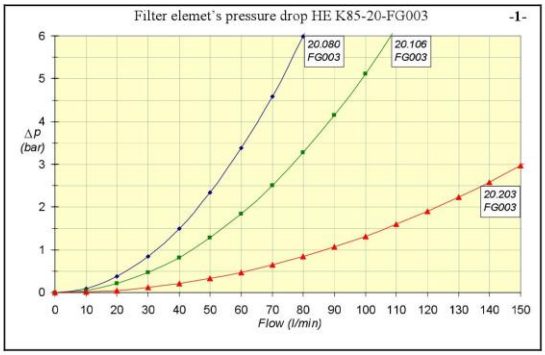
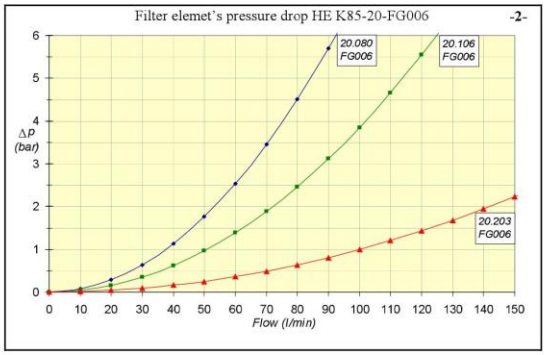
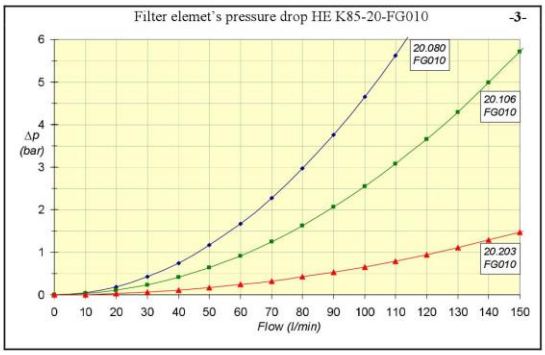
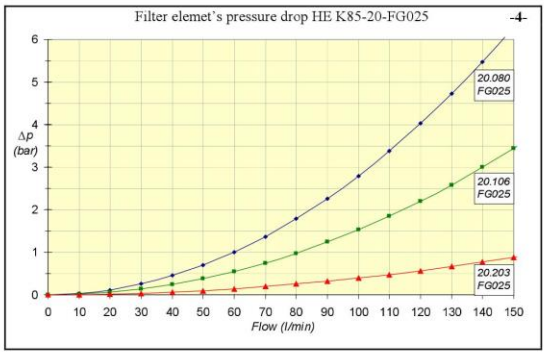
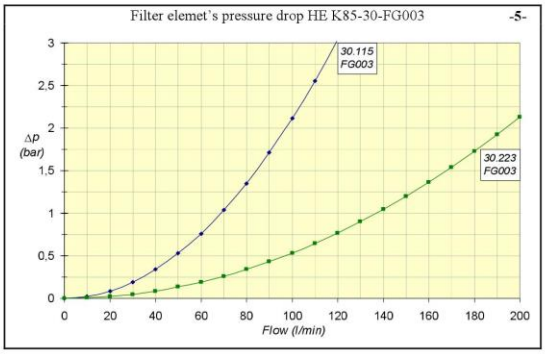
3) The **filter element's pressure drop** is determined by standard media and AS surface, they have been calculated experimentally and thy are valid for clean elements.

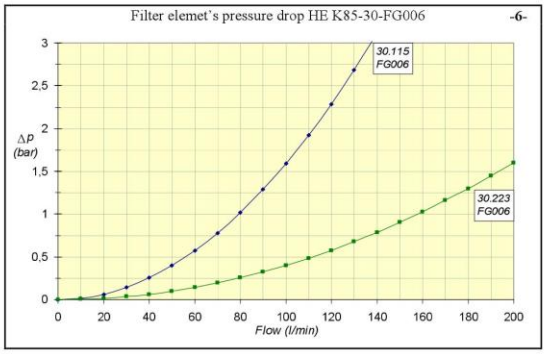


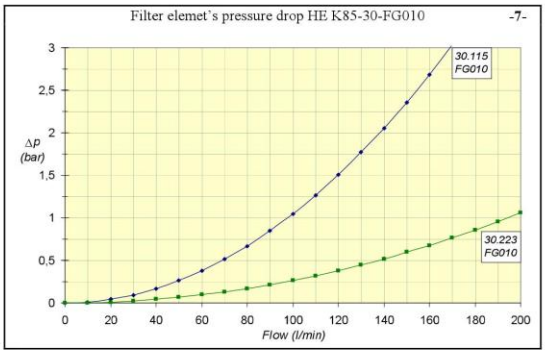


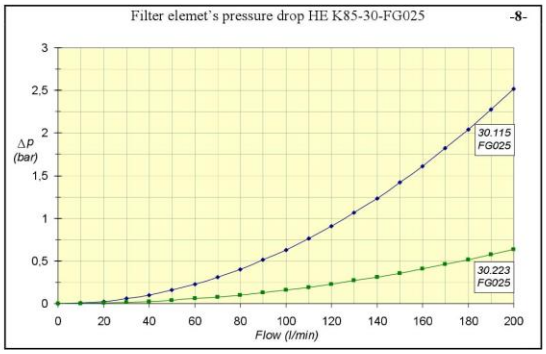


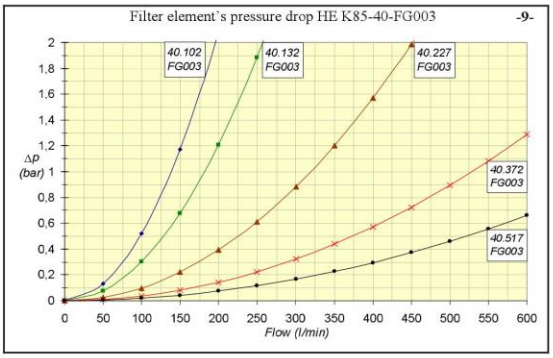


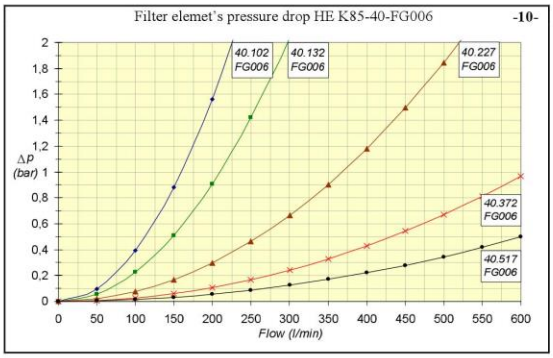


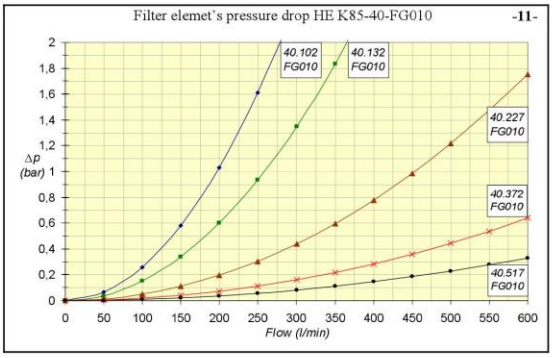


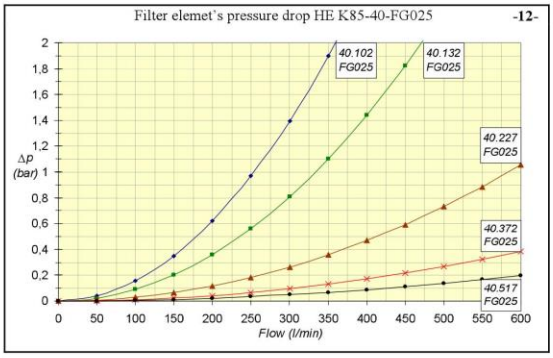





Filter element's pressure drop HE K85-40-FG003
-9-
40.102 FG003
40.132 FG003
40.227 FG003
40.372 FG003
40.517 FG003
Δp (bar)
Flow (l/min)


Filter elemet's pressure drop HE K85-40-FG006
-10-
40.102 FG006
40.132 FG006
40.227 FG006
40.372 FG006
40.517 FG006
Δp (bar)
Flow (l/min)


Filter elemet's pressure drop HE K85-40-FG010
-11-
40.102 FG010
40.132 FG010
40.227 FG010
40.372 FG010
40.517 FG010
Δp (bar)
Flow (l/min)


Filter elemet's pressure drop HE K85-40-FG025
-12-
40.102 FG025
40.132 FG025
40.227 FG025
40.372 FG025
40.517 FG025
Δp (bar)
Flow (l/min)

NOMINAL FLOW RATES

IKRON

FILTRI HF 410 / FILTERS HF 410

Bocca Ingresso Inlet Port	25 MICRON		60 MICRON		90 MICRON		Peso Filtro Filter Weight (Kg)
	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	
G 3/8"	5	HF410-10.060 MI025	15	HF410-10.060 FB060-MI060	15	HF410-10.060 MS090	0,1
G 1/2"	8		20		20		
G 1/2"	10	HF410-20.077 MI025	20	HF410-20.077 FB060-MI060	20	HF410-20.077 MS090	0,15
G 3/4"	15		30		30		
G 1"	20		45		45		
G 1"1/4	25		55		55		
G 1/2"	15	HF410-20.122 MI025	25	HF410-20.122 FB060-MI060	25	HF410-20.122 MS090	0,2
G 3/4"	20		40		40		
G 1"	25		55		55		
G 1"1/4	30		60		60		
G 1"	15	HF410-30.077 MI025	25	HF410-30.077 FB060-MI060	25	HF410-30.077 MS090	0,3
G 1"1/4	20		40		40		
G 1"1/2	25		55		55		
G 2"	30		60		60		
G 1"	30	HF410-30.122 MI025	60	HF410-30.122 FB060-MI060	60	HF410-30.122 MS090	0,35
G 1"1/4	35		80		80		
G 1"1/2	40		90		90		
G 2"	45		100		100		
G 1"	35	HF410-30.162 MI025	60	HF410-30.162 FB060-MI060	60	HF410-30.162 MS090	0,4
G 1"1/4	40		90		90		
G 1"1/2	45		120		120		
G 2"	50		130		130		
G 1"	40	HF410-30.195 MI025	65	HF410-30.195 FB060-MI060	65	HF410-30.195 MS090	0,45
G 1"1/4	45		110		110		
G 1"1/2	50		130		130		
G 2"	55		140		140		
G 2"	50	HF410-40.122 MI025	130	HF410-40.122 FB060-MI060	130	HF410-40.122 MS090	0,65
G 2"1/2	60		150		150		
G 3"	70		190		190		
G 2"	60	HF410-40.162 MI025	140	HF410-40.162 FB060-MI060	140	HF410-40.162 MS090	0,7
G 2"1/2	70		160		160		
G 3"	80		200		200		
G 2"	90	HF410-40.195 MI025	200	HF410-40.195 FB060-MI060	200	HF410-40.195 MS090	0,8
G 2"1/2	100		220		220		
G 3"	110		240		240		
G 2"	130	HF410-40.239 MI025	250	HF410-40.239 FB060-MI060	250	HF410-40.239 MS090	0,85
G 2"1/2	150		270		270		
G 3"	300		300		300		

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FILTRI HF 410 / FILTERS HF 410

Bocca Ingresso Inlet Port	125 MICRON		250 MICRON		Peso Filtro Filter Weight (Kg)
	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	
G 3/8"	15	HF410-10.060 FB125	15	HF410-10.060 MS250	0,1
G 1/2"	20		20		
G 1/2"	20	HF410-20.077 FB125	20	HF410-20.077 MS250	0,15
G 3/4"	30		30		
G 1"	45		45		
G 1"1/4	55		55		
G 1/2"	25	HF410-20.122 FB125	25	HF410-20.122 MS250	0,2
G 3/4"	40		40		
G 1"	55		55		
G 1"1/4	60		60		
G 1"	25	HF410-30.077 FB125	25	HF410-30.077 MS250	0,3
G 1"1/4	40		40		
G 1"1/2	55		55		
G 2"	60		60		
G 1"	60	HF410-30.122 FB125	60	HF410-30.122 MS250	0,35
G 1"1/4	80		80		
G 1"1/2	90		90		
G 2"	100		100		
G 1"	60	HF410-30.162 FB125	60	HF410-30.162 MS250	0,4
G 1"1/4	90		90		
G 1"1/2	120		120		
G 2"	130		130		
G 1"	65	HF410-30.195 FB125	65	HF410-30.195 MS250	0,45
G 1"1/4	110		110		
G 1"1/2	130		130		
G 2"	140		140		
G 2"	130	HF410-40.122 FB125	130	HF410-40.122 MS250	0,65
G 2"1/2	150		150		
G 3"	190		190		
G 2"	140	HF410-40.162 FB125	140	HF410-40.162 MS250	0,7
G 2"1/2	160		160		
G 3"	200		200		
G 2"	200	HF410-40.195 FB125	200	HF410-40.195 MS250	0,8
G 2"1/2	220		220		
G 3"	240		240		
G 2"	250	HF410-40.239 FB125	250	HF410-40.239 MS250	0,85
G 2"1/2	270		270		
G 3"	300		300		

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FILTRI HF 502 / FILTERS HF 502

Bocca Ingresso Inlet Port	3 MICRON ASS./ABS.		6 MICRON ASS./ABS.		10 MICRON ASS./ABS.		Peso Filtro Filter Weight (Kg)
	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	
G 3/8"	7	HF502-10.060 FG003	8	HF502-10.060 FG006	10	HF502-10.060 FG010	0,4
G 1/2"	10		12		15		
G 3/4"	12		15		20		
G 3/8"	15	HF502-10.129 FG003	17	HF502-10.129 FG006	20	HF502-10.129 FG010	0,5
G 1/2"	20		22		25		
G 3/4"	25		27		30		
G 1/2"	20	HF502-20.077 FG003	22	HF502-20.077 FG006	25	HF502-20.077 FG010	0,9
G 3/4"	25		27		30		
G 1"	28		30		35		
G 1/2"	30	HF502-20.122 FG003	32	HF502-20.122 FG006	37	HF502-20.122 FG010	1
G 3/4"	35		40		45		
G 1"	45		50		55		
G 3/4"	55	HF502-20.201 FG003	60	HF502-20.201 FG006	65	HF502-20.201 FG010	1,2
G 1"	60		65		70		
G 1"	60	HF502-30.162 FG003	65	HF502-30.162 FG006	70	HF502-30.162 FG010	2
G 1"1/4	65		75		85		
G 1"1/2	75		85		95		
G 1"	70	HF502-30.195 FG003	80	HF502-30.195 FG006	85	HF502-30.195 FG010	2,1
G 1"1/4	80		95		105		
G 1"1/2	90		105		115		
G 1"	80	HF502-30.239 FG003	85	HF502-30.239 FG006	90	HF502-30.239 FG010	2,2
G 1"1/4	90		100		110		
G 1"1/2	100		110		120		
G 1"1/2	100	HF502-40.122 FG003	110	HF502-40.122 FG006	120	HF502-40.122 FG010	3,1
G 2"	130		145		160		
G 1"1/2	110	HF502-40.162 FG003	120	HF502-40.162 FG006	130	HF502-40.162 FG010	3,2
G 2"	150		165		180		
G 1"1/2	150	HF502-40.194 FG003	165	HF502-40.194 FG006	180	HF502-40.194 FG010	3,4
G 2"	210		225		250		
G 1"1/2	155	HF502-40.195 FG003	170	HF502-40.195 FG006	185	HF502-40.195 FG010	3,4
G 2"	215		230		255		
G 1"1/2	210	HF502-40.239 FG003	230	HF502-40.239 FG006	260	HF502-40.239 FG010	3,5
G 2"	270		300		340		

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FILTRI HF 502 / FILTERS HF 502

Bocca Ingresso Inlet Port	25 MICRON ASS./ABS.		10 MICRON NOM.		25 MICRON NOM.		Peso Filtro Filter Weight (Kg)
	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	
G 3/8"	13	HF502-10.060 FG025	15	HF502-10.060 SP010-RP010	20	HF502-10.060 SP025-RP025	0,4
G 1/2"	18		20		25		
G 3/4"	23		25		30		
G 3/8"	25	HF502-10.129 FG025	30	HF502-10.129 SP010-RP010	35	HF502-10.129 SP025-RP025	0,5
G 1/2"	30		35		40		
G 3/4"	35		40		45		
G 1/2"	30	HF502-20.077 FG025	35	HF502-20.077 SP010-RP010	40	HF502-20.077 SP025-RP025	0,9
G 3/4"	35		40		45		
G 1"	40		45		50		
G 1/2"	40	HF502-20.122 FG025	45	HF502-20.122 RP010	50	HF502-20.122 RP025	1
G 3/4"	50		55		60		
G 1"	60		65		70		
G 3/4"	75	HF502-20.201 FG025	90	HF502-20.201 RP010	100	HF502-20.201 RP025	1,2
G 1"	80		100		110		
G 1"	75	HF502-30.162 FG025	85	HF502-30.162 RP010	95	HF502-30.162 RP025	2
G 1"1/4	90		95		105		
G 1"1/2	100		105		115		
G 1"	95	HF502-30.195 FG025	100	HF502-30.195 RP010	120	HF502-30.195 RP025	2,1
G 1"1/4	115		120		130		
G 1"1/2	125		130		140		
G 1"	100	HF502-30.239 FG025	110	HF502-30.239 RP010	130	HF502-30.239 RP025	2,2
G 1"1/4	120		130		140		
G 1"1/2	130		140		150		
G 1"1/2	130	HF502-40.122 FG025	140	HF502-40.122 RP010	150	HF502-40.122 RP025	3,1
G 2"	180		210		230		
G 1"1/2	140	HF502-40.162 FG025	150	HF502-40.162 RP010	160	HF502-40.162 RP025	3,2
G 2"	200		220		240		
G 1"1/2	190	HF502-40.194 FG025	200	HF502-40.194 RP010	220	HF502-40.194 RP025	3,4
G 2"	270		300		320		
G 1"1/2	195	HF502-40.195 FG025	205	HF502-40.195 RP010	225	HF502-40.195 RP025	3,4
G 2"	275		305		325		
G 1"1/2	280	HF502-40.239 FG025	320	HF502-40.239 RP010	410	HF502-40.239 RP025	3,5
G 2"	360		400		500		

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FILTRI HF 502 / FILTERS HF 502

Bocca Ingresso Inlet Port	60 MICRON		90 MICRON		125 MICRON		Peso Filtro Filter Weight (Kg)
	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	
G 3/8"	25	HF502-10.060 FB060	25	HF502-10.060 MS090	25	HF502-10.060 FB125	0,4
G 1/2"	30		30		30		
G 3/4"	35		35		35		
G 3/8"	45	HF502-10.129 FB060	50	HF502-10.129 MS090	50	HF502-10.129 FB125	0,5
G 1/2"	50		55		55		
G 3/4"	55		60		60		
G 1/2"	50	HF502-20.077 FB060	55	HF502-20.077 MS090	55	HF502-20.077 FB125	0,9
G 3/4"	55		60		60		
G 1"	60		65		65		
G 1/2"	70	HF502-20.122 FB060	75	HF502-20.122 MS090	75	HF502-20.122 FB125	1
G 3/4"	80		85		85		
G 1"	95		100		100		
G 3/4"	120	HF502-20.201 FB060	130	HF502-20.201 MS090	130	HF502-20.201 FB125	1,2
G 1"	130		140		140		
G 1"	130	HF502-30.162 FB060	135	HF502-30.162 MS090	135	HF502-30.162 FB125	2
G 1"1/4	140		150		150		
G 1"1/2	150		160		160		
G 1"	160	HF502-30.195 FB060	170	HF502-30.195 MS090	170	HF502-30.195 FB125	2,1
G 1"1/4	170		180		180		
G 1"1/2	190		200		200		
G 1"	180	HF502-30.239 FB060	190	HF502-30.239 MS090	190	HF502-30.239 FB125	2,2
G 1"1/4	190		200		200		
G 1"1/2	210		220		220		
G 1"1/2	250	HF502-40.122 FB060	260	HF502-40.122 MS090	260	HF502-40.122 FB125	3,1
G 2"	340		350		350		
G 1"1/2	260	HF502-40.162 FB060	270	HF502-40.162 MS090	270	HF502-40.162 FB125	3,2
G 2"	350		360		360		
G 1"1/2	310	HF502-40.194 FB060	325	HF502-40.194 MS090	325	HF502-40.194 FB125	3,4
G 2"	410		425		425		
G 1"1/2	315	HF502-40.195 FB060	330	HF502-40.195 MS090	330	HF502-40.195 FB125	3,4
G 2"	415		430		430		
G 1"1/2	460	HF502-40.239 FB060	490	HF502-40.239 MS090	500	HF502-40.239 FB125	3,5
G 2"	560		590		600		

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FILTRI HF 550 / FILTERS HF 550

Bocca Ingresso Inlet Port	3 MICRON ASS./ABS.		6 MICRON ASS./ABS.		10 MICRON ASS./ABS.		Peso Filtro Filter Weight (Kg)
	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	
G 3/8"	7	HF550-10.060 FG003	8	HF550-10.060 FG006	10	HF550-10.060 FG010	0,5
G 1/2"	10		12		15		
G 3/4"	12		15		20		
G 3/8"	15	HF550-10.129 FG003	17	HF550-10.129 FG006	20	HF550-10.129 FG010	0,6
G 1/2"	20		22		25		
G 3/4"	25		27		30		
G 1/2"	20	HF550-20.077 FG003	22	HF550-20.077 FG006	25	HF550-20.077 FG010	1
G 3/4"	25		27		30		
G 1"	28		30		35		
G 1"1/4	30		35		40		
G 1/2"	30	HF550-20.122 FG003	32	HF550-20.122 FG006	37	HF550-20.122 FG010	1,1
G 3/4"	35		40		45		
G 1"	45		50		55		
G 1"1/4	50		55		60		
G 3/4"	55	HF550-20.201 FG003	60	HF550-20.201 FG006	65	HF550-20.201 FG010	1,3
G 1"	60		65		70		
G 1"1/4	70		75		80		
G 1"	60	HF550-30.162 FG003	65	HF550-30.162 FG006	70	HF550-30.162 FG010	3,3
G 1"1/4	65		75		85		
G 1"1/2	75		85		95		
G 1"	70	HF550-30.195 FG003	80	HF550-30.195 FG006	85	HF550-30.195 FG010	3,4
G 1"1/4	80		95		105		
G 1"1/2	90		105		115		
G 1"	80	HF550-30.239 FG003	85	HF550-30.239 FG006	90	HF550-30.239 FG010	3,5
G 1"1/4	90		100		110		
G 1"1/2	100		110		120		
G 1"1/2	110	HF550-40.162 FG003	120	HF550-40.162 FG006	130	HF550-40.162 FG010	4,6
G 2"	150		165		180		
G 1"1/2	150	HF550-40.194 FG003	165	HF550-40.194 FG006	180	HF550-40.194 FG010	4,8
G 2"	210		225		250		
G 1"1/2	155	HF550-40.195 FG003	170	HF550-40.195 FG006	185	HF550-40.195 FG010	4,8
G 2"	215		230		255		
G 1"1/2	210	HF550-40.239 FG003	230	HF550-40.239 FG006	260	HF550-40.239 FG010	4,9
G 2"	270		300		340		

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FILTRI HF 550 / FILTERS HF 550

Bocca Ingresso Inlet Port	25 MICRON ASS./ABS.		10 MICRON NOM.		25 MICRON NOM.		Peso Filtro Filter Weight (Kg)
	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	
G 3/8"	13	HF550-10.060 FG025	15	HF550-10.060 SP010-RP010	20	HF550-10.060 SP025-RP025	0,5
G 1/2"	18		20		25		
G 3/4"	23		25		30		
G 3/8"	25	HF550-10.129 FG025	30	HF550-10.129 SP010-RP010	35	HF550-10.129 SP025-RP025	0,6
G 1/2"	30		35		40		
G 3/4"	35		40		45		
G 1/2"	30	HF550-20.077 FG025	35	HF550-20.077 SP010-RP010	40	HF550-20.077 SP025-RP025	1
G 3/4"	35		40		45		
G 1"	40		45		50		
G 1"1/4	45		50		55		
G 1/2"	40	HF550-20.122 FG025	45	HF550-20.122 RP010	50	HF550-20.122 RP025	1,1
G 3/4"	50		55		60		
G 1"	60		65		70		
G 1"1/4	70		75		80		
G 3/4"	75	HF550-20.201 FG025	90	HF550-20.201 RP010	100	HF550-20.201 RP025	1,3
G 1"	80		100		110		
G 1"1/4	90		110		120		
G 1"	75	HF550-30.162 FG025	85	HF550-30.162 RP010	95	HF550-30.162 RP025	3,3
G 1"1/4	90		95		105		
G 1"1/2	100		105		115		
G 1"	95	HF550-30.195 FG025	100	HF550-30.195 RP010	120	HF550-30.195 RP025	3,4
G 1"1/4	115		120		130		
G 1"1/2	125		130		140		
G 1"	100	HF550-30.239 FG025	110	HF550-30.239 RP010	130	HF550-30.239 RP025	3,5
G 1"1/4	120		130		140		
G 1"1/2	130		140		150		
G 1"1/2	140	HF550-40.162 FG025	150	HF550-40.162 RP010	160	HF550-40.162 RP025	4,6
G 2"	200		220		240		
G 1"1/2	190	HF550-40.194 FG025	200	HF550-40.194 RP010	220	HF550-40.194 RP025	4,8
G 2"	270		300		320		
G 1"1/2	195	HF550-40.195 FG025	205	HF550-40.195 RP010	225	HF550-40.195 RP025	4,8
G 2"	275		305		325		
G 1"1/2	280	HF550-40.239 FG025	320	HF550-40.239 RP010	410	HF550-40.239 RP025	4,9
G 2"	360		400		500		

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FILTRI HF 550 / FILTERS HF 550

Bocca Ingresso Inlet Port	60 MICRON		90 MICRON		125 MICRON		Peso Filtro Filter Weight (Kg)
	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	
G 3/8"	25	HF550-10.060 FB060	25	HF550-10.060 MS090	25	HF550-10.060 FB125	0,5
G 1/2"	30		30		30		
G 3/4"	35		35		35		
G 3/8"	45	HF550-10.129 FB060	50	HF550-10.129 MS090	50	HF550-10.129 FB125	0,6
G 1/2"	50		55		55		
G 3/4"	55		60		60		
G 1/2"	50	HF550-20.077 FB060	55	HF550-20.077 MS090	55	HF550-20.077 FB125	1
G 3/4"	55		60		60		
G 1"	60		65		65		
G 1"1/4	65		70		70		
G 1/2"	70	HF550-20.122 FB060	75	HF550-20.122 MS090	75	HF550-20.122 FB125	1,1
G 3/4"	80		85		85		
G 1"	95		100		100		
G 1"1/4	105		110		110		
G 3/4"	120	HF550-20.201 FB060	130	HF550-20.201 MS090	130	HF550-20.201 FB125	1,3
G 1"	130		140		140		
G 1"1/4	140		150		150		
G 1"	130	HF550-30.162 FB060	135	HF550-30.162 MS090	135	HF550-30.162 FB125	3,3
G 1"1/4	140		150		150		
G 1"1/2	150		160		160		
G 1"	160	HF550-30.195 FB060	170	HF550-30.195 MS090	170	HF550-30.195 FB125	3,4
G 1"1/4	170		180		180		
G 1"1/2	190		200		200		
G 1"	180	HF550-30.239 FB060	190	HF550-30.239 MS090	190	HF550-30.239 FB125	3,5
G 1"1/4	190		200		200		
G 1"1/2	210		220		220		
G 1"1/2	260	HF550-40.162 FB060	270	HF550-40.162 MS090	270	HF550-40.162 FB125	4,6
G 2"	350		360		360		
G 1"1/2	310	HF550-40.194 FB060	325	HF550-40.194 MS090	325	HF550-40.194 FB125	4,8
G 2"	410		425		425		
G 1"1/2	315	HF550-40.195 FB060	330	HF550-40.195 MS090	330	HF550-40.195 FB125	4,8
G 2"	415		430		430		
G 1"1/2	460	HF550-40.239 FB060	490	HF550-40.239 MS090	500	HF550-40.239 FB125	4,9
G 2"	560		590		600		

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FILTRI HF 554 / FILTERS HF 554

Bocca Ingresso Inlet Port	3 MICRON ASS./ABS.		6 MICRON ASS./ABS.		10 MICRON ASS./ABS.		Peso Filtro Filter Weight (Kg)
	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	
G 3/8"	7	HF554-10.060 FG003	8	HF554-10.060 FG006	10	HF554-10.060 FG010	0,5
G 1/2"	10		12		15		
G 3/4"	12		15		20		
G 3/8"	15	HF554-10.129 FG003	17	HF554-10.129 FG006	20	HF554-10.129 FG010	0,6
G 1/2"	20		22		25		
G 3/4"	25		27		30		
G 1/2"	20	HF554-20.077 FG003	22	HF554-20.077 FG006	25	HF554-20.077 FG010	1,1
G 3/4"	25		27		30		
G 1"	28		30		35		
G 1"1/4	30		35		40		
G 1/2"	30	HF554-20.122 FG003	32	HF554-20.122 FG006	37	HF554-20.122 FG010	1,2
G 3/4"	35		40		45		
G 1"	45		50		55		
G 1"1/4	50		55		60		
G 3/4"	55	HF554-20.201 FG003	60	HF554-20.201 FG006	65	HF554-20.201 FG010	1,4
G 1"	60		65		70		
G 1"1/4	70		75		80		

Bocca Ingresso Inlet Port	25 MICRON ASS./ABS.		10 MICRON NOM.		25 MICRON NOM.		Peso Filtro Filter Weight (Kg)
	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	
G 3/8"	13	HF554-10.060 FG025	15	HF554-10.060 SP010-RP010	20	HF554-10.060 SP025-RP025	0,5
G 1/2"	18		20		25		
G 3/4"	23		25		30		
G 3/8"	25	HF554-10.129 FG025	30	HF554-10.129 SP010-RP010	35	HF554-10.129 SP025-RP025	0,6
G 1/2"	30		35		40		
G 3/4"	35		40		45		
G 1/2"	30	HF554-20.077 FG025	35	HF554-20.077 SP010-RP010	40	HF554-20.077 SP025-RP025	1,1
G 3/4"	35		40		45		
G 1"	40		45		50		
G 1"1/4	45		50		55		
G 1/2"	40	HF554-20.122 FG025	45	HF554-20.122 RP010	50	HF554-20.122 RP025	1,2
G 3/4"	50		55		60		
G 1"	60		65		70		
G 1"1/4	70		75		80		
G 3/4"	75	HF554-20.201 FG025	90	HF554-20.201 RP010	100	HF554-20.201 RP025	1,4
G 1"	80		100		110		
G 1"1/4	90		110		120		

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FILTRI HF 554 / FILTERS HF 554

Bocca Ingresso Inlet Port	60 MICRON		90 MICRON		125 MICRON		Peso Filtro Filter Weight (Kg)
	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	
G 3/8"	25	HF554-10.060 FB060	25	HF554-10.060 MS090	25	HF554-10.060 FB125	0,5
G 1/2"	30		30		30		
G 3/4"	35		35		35		
G 3/8"	45	HF554-10.129 FB060	50	HF554-10.129 MS090	50	HF554-10.129 FB125	0,6
G 1/2"	50		55		55		
G 3/4"	55		60		60		
G 1/2"	50	HF554-20.077 FB060	55	HF554-20.077 MS090	55	HF554-20.077 FB125	1,1
G 3/4"	55		60		60		
G 1"	60		65		65		
G 1"1/4	65		70		70		
G 1/2"	70	HF554-20.122 FB060	75	HF554-20.122 MS090	75	HF554-20.122 FB125	1,2
G 3/4"	80		85		85		
G 1"	95		100		100		
G 1"1/4	105		110		110		
G 3/4"	120	HF554-20.201 FB060	130	HF554-20.201 MS090	130	HF554-20.201 FB125	1,4
G 1"	130		140		140		
G 1"1/4	140		150		150		

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FILTRI HF 570 - 575 / FILTERS HF 570 - 575

Bocca Ingresso Inlet Port	10 MICRON ASS./ABS.		25 MICRON ASS./ABS		10 MICRON NOM.		HF570 Peso Filtro Filter Weight (Kg)	HF575 Peso Filtro Filter Weight (Kg)
	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type		
G 1/2"	30	HF570-20.106 HF575-20.106 FG010	40	HF570-20.106 HF575-20.106 FG025	50	HF570-20.106 HF575-20.106 SP010	1,2	0,9
G 3/4"	40		50		60			
G 1"	45		55		65			
G 1"1/4	50		60		70			
G 1/2"	40	HF570-20.150 HF575-20.150 FG010	50	HF570-20.150 HF575-20.150 FG025	60	HF570-20.150 HF575-20.150 SP010	1,4	1,1
G 3/4"	50		60		70			
G 1"	60		70		80			
G 1"1/4	65		75		85			
G 1/2"	50	HF570-20.200 HF575-20.200 FG010	55	HF570-20.200 HF575-20.200 FG025	60	HF570-20.200 HF575-20.200 SP010	1,5	1,2
G 3/4"	60		70		80			
G 1"	70		80		90			
G 1"1/4	75		85		100			
G 1/2"	65	HF570-20.300 HF575-20.300 FG010	70	HF570-20.300 HF575-20.300 FG025	90	HF570-20.300 HF575-20.300 SP010	1,8	1,5
G 3/4"	80		90		110			
G 1"	90		100		120			
G 1"1/4	95		110		130			
G 1"	95	HF570-30.190 HF575-30.190 FG010	100	HF570-30.190 HF575-30.190 FG025	110	HF570-30.190 HF575-30.190 SP010	4	3
G 1"1/4	120		130		140			
G 1"1/2	135		140		160			
G 1"	120	HF570-30.260 HF575-30.260 FG010	130	HF570-30.260 HF575-30.260 FG025	140	HF570-30.260 HF575-30.260 SP010	4,4	3,4
G 1"1/4	150		160		180			
G 1"1/2	170		180		200			
G 1"	140	HF570-30.465 HF575-30.465 FG010	155	HF570-30.465 HF575-30.465 FG025	170	HF570-30.465 HF575-30.465 SP010	4,8	3,8
G 1"1/4	180		200		220			
G 1"1/2	200		220		230			
G 1"1/2	200	HF570-40.210 HF575-40.210 FG010	220	HF570-40.210 HF575-40.210 FG025	250	HF570-40.210 HF575-40.210 SP010	8,2	3,2
G 2"	220		250		260			
G 1"1/2	300	HF570-40.290 HF575-40.290 FG010	320	HF570-40.290 HF575-40.290 FG025	340	HF570-40.290 HF575-40.290 SP010	8,5	3,5
G 2"	320		340		360			
G 1"1/2	320	HF570-40.390 HF575-40.390 FG010	340	HF570-40.390 HF575-40.390 FG025	360	HF570-40.390 HF575-40.390 SP010	9	4
G 2"	340		360		380			
G 1"1/2	380	HF570-40.480 HF575-40.480 FG010	400	HF570-40.480 HF575-40.480 FG025	420	HF570-40.480 HF575-40.480 SP010	9,8	4,8
G 2"	400		420		440			

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FILTRI HF 570 - 575 / FILTERS HF 570 - 575

Bocca Ingresso Inlet Port	25 MICRON NOM.		60 MICRON		HF570 Peso Filtro Filter Weight (Kg)	HF575 Peso Filtro Filter Weight (Kg)
	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type		
G 1/2"	60	HF570-20.106 HF575-20.106 SP025	80	HF570-20.106 HF575-20.106 MI060	1,2	0,9
G 3/4"	70		90			
G 1"	75		95			
G 1"1/4	80		100			
G 1/2"	70	HF570-20.150 HF575-20.150 SP025	90	HF570-20.150 HF575-20.150 MI060	1,4	1,1
G 3/4"	80		100			
G 1"	90		110			
G 1"1/4	95		115			
G 1/2"	70	HF570-20.200 HF575-20.200 SP025	90	HF570-20.200 HF575-20.200 MI060	1,5	1,2
G 3/4"	90		110			
G 1"	100		120			
G 1"1/4	110		130			
G 1/2"	100	HF570-20.300 HF575-20.300 SP025	120	HF570-20.300 HF575-20.300 MI060	1,8	1,5
G 3/4"	120		140			
G 1"	130		150			
G 1"1/4	140		160			
G 1"	130	HF570-30.190 HF575-30.190 SP025	150	HF570-30.190 HF575-30.190 MI060	4	3
G 1"1/4	160		180			
G 1"1/2	180		200			
G 1"	160	HF570-30.260 HF575-30.260 SP025	180	HF570-30.260 HF575-30.260 MI060	4,4	3,4
G 1"1/4	200		220			
G 1"1/2	220		240			
G 1"	190	HF570-30.465 HF575-30.465 SP025	210	HF570-30.465 HF575-30.465 MI060	4,8	3,8
G 1"1/4	240		260			
G 1"1/2	250		270			
G 1"1/2	260	HF570-40.210 HF575-40.210 SP025	290	HF570-40.210 HF575-40.210 MI060	8,2	3,2
G 2"	290		320			
G 1"1/2	360	HF570-40.290 HF575-40.290 SP025	390	HF570-40.290 HF575-40.290 MI060	8,5	3,5
G 2"	390		420			
G 1"1/2	380	HF570-40.390 HF575-40.390 SP025	410	HF570-40.390 HF575-40.390 MI060	9	4
G 2"	410		440			
G 1"1/2	440	HF570-40.480 HF575-40.480 SP025	460	HF570-40.480 HF575-40.480 MI060	9,8	4,8
G 2"	460		500			

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FILTRI HF 595 / FILTERS HF 595
LINEA DI ASPIRAZIONE / SUCTION LINE

Bocca Ingresso Inlet Port	10 MICRON ASS./ABS.		25 MICRON ASS./ABS.		10 MICRON NOM.		Peso Filtro Filter Weight (Kg)
	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	
G 1/2"	5	HF595-10.060 FG010	8	HF595-10.060 FG025	10	HF595-10.060 SP010	0,7
G 3/4"	20	HF595-20.077 FG010	30	HF595-20.077 FG025	35	HF595-20.077 SP010	1,2
G 1"	40	HF595-20.122 FG010	45	HF595-20.122 FG025	55	HF595-20.122 SP010	1,5
G 1"1/4	70	HF595-30.195 FG010	90	HF595-30.195 FG025	115	HF595-30.195 SP010	3,5

Bocca Ingresso Inlet Port	25 MICRON NOM.		60 MICRON		125 MICRON		Peso Filtro Filter Weight (Kg)
	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	
G 1/2"	15	HF595-10.060 SP025	25	HF595-10.060 MI060	30	HF595-10.060 MB125	0,7
G 3/4"	45	HF595-20.077 SP025	60	HF595-20.077 MI060	70	HF595-20.077 MB125	1,2
G 1"	65	HF595-20.122 SP025	90	HF595-20.122 MI060	120	HF595-20.122 MB125	1,5
G 1"1/4	135	HF595-30.195 SP025	160	HF595-30.195 MI060	180	HF595-30.195 MB125	3,5

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FILTRI HF 595 / FILTERS HF 595
LINEA AL RITORNO / RETURN LINE

Bocca Ingresso Inlet Port	10 MICRON ASS./ABS.		25 MICRON ASS./ABS.		10 MICRON NOM.		Peso Filtro Filter Weight (Kg)
	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	
G 1/2"	10	HF595-10.060 FG010	15	HF595-10.060 FG025	20	HF595-10.060 SP010	0,7
G 3/4"	35	HF595-20.077 FG010	45	HF595-20.077 FG025	50	HF595-20.077 SP010	1,2
G 1"	60	HF595-20.122 FG010	75	HF595-20.122 FG025	90	HF595-20.122 SP010	1,5
G 1"1/4	100	HF595-30.195 FG010	120	HF595-30.195 FG025	160	HF595-30.195 SP010	3,5

Bocca Ingresso Inlet Port	25 MICRON NOM.		60 MICRON		125 MICRON		Peso Filtro Filter Weight (Kg)
	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	
G 1/2"	25	HF595-10.060 SP025	35	HF595-10.060 MI060	40	HF595-10.060 MB125	0,7
G 3/4"	60	HF595-20.077 SP025	130	HF595-20.077 MI060	150	HF595-20.077 MB125	1,2
G 1"	120	HF595-20.122 SP025	160	HF595-20.122 MI060	180	HF595-20.122 MB125	1,5
G 1"1/4	190	HF595-30.195 SP025	220	HF595-30.195 MI060	240	HF595-30.195 MB125	3,5

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FILTRI HF 620 - 625 / FILTERS HF 620 - 625
LINEA DI ASPIRAZIONE / SUCTION LINE

Bocca Ingresso Inlet Port	10 MICRON ASS./ABS.		25 MICRON ASS./ABS.		10 MICRON NOM.		Peso Filtro Filter Weight (Kg)
	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	
G 3/4"	15	HF620-20.135 HF625-20.135 FG010	15	HF620-20.135 HF625-20.135 FG025	20	HF620-20.135 HF625-20.135 SP010	1
G 3/4"	20	HF620-20.180 HF625-20.180 FG010	20	HF620-20.180 HF625-20.180 FG025	25	HF620-20.180 HF625-20.180 SP010	1,2
G 1"1/4	60	HF620-30.155 FG010	60	HF620-30.155 FG025	70	HF620-30.155 SP010	1,9
G 1"1/4	80	HF620-30.210 FG010	80	HF620-30.210 FG025	90	HF620-30.210 SP010	2
G 1"1/2	150	HF620-40.155 FG010	150	HF620-40.155 FG025	170	HF620-40.155 SP010	3,4
G 1"1/2	160	HF620-40.210 FG010	160	HF620-40.210 FG025	180	HF620-40.210 SP010	3,5
G 1"1/2	150	HF620-50.155 FG010	150	HF620-50.155 FG025	170	HF620-50.155 SP010	5,3
G 1"1/2	160	HF620-50.210 FG010	160	HF620-50.210 FG025	180	HF620-50.210 SP010	5,4

Bocca Ingresso Inlet Port	25 MICRON NOM.		60 MICRON		90 - 125 MICRON		Peso Filtro Filter Weight (Kg)
	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	
G 3/4"	25	HF620-20.135 HF625-20.135 SP025	30	HF620-20.135 HF625-20.135 MS060	35	HF620-20.135 HF625-20.135 MS090-MS125	1
G 3/4"	30	HF620-20.180 HF625-20.180 SP025	35	HF620-20.180 HF625-20.180 MS060	40	HF620-20.180 HF625-20.180 MS090-MS125	1,2
G 1"1/4	85	HF620-30.155 SP025	110	HF620-30.155 MS060	120	HF620-30.155 MS090-MS125	1,9
G 1"1/4	100	HF620-30.210 SP025	115	HF620-30.210 MS060	125	HF620-30.210 MS090-MS125	2
G 1"1/2	190	HF620-40.155 SP025	220	HF620-40.155 MS060	240	HF620-40.155 MS090-MS125	3,4
G 1"1/2	210	HF620-40.210 SP025	230	HF620-40.210 MS060	250	HF620-40.210 MS090-MS125	3,5
G 1"1/2	190	HF620-50.155 SP025	220	HF620-50.155 MS060	240	HF620-50.155 MS090-MS125	5,3
G 1"1/2	210	HF620-50.210 SP025	230	HF620-50.210 MS060	250	HF620-50.210 MS090-MS125	5,4

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FILTRI HF 620 - 625 / FILTERS HF 620 - 625
LINEA AL RITORNO / RETURN LINE

Bocca Ingresso Inlet Port	10 MICRON ASS./ABS.		25 MICRON ASS./ABS.		10 MICRON NOM.		Peso Filtro Filter Weight (Kg)
	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	
G 3/4"	40	HF620-20.135 HF625-20.135 FG010	40	HF620-20.135 HF625-20.135 FG025	50	HF620-20.135 HF625-20.135 SP010	1
G 3/4"	50	HF620-20.180 HF625-20.180 FG010	50	HF620-20.180 HF625-20.180 FG025	60	HF620-20.180 HF625-20.180 SP010	1,2
G 1"1/4	120	HF620-30.155 FG010	120	HF620-30.155 FG025	140	HF620-30.155 SP010	1,9
G 1"1/4	140	HF620-30.210 FG010	140	HF620-30.210 FG025	160	HF620-30.210 SP010	2
G 1"1/2	280	HF620-40.155 FG010	280	HF620-40.155 FG025	300	HF620-40.155 SP010	3,4
G 1"1/2	300	HF620-40.210 FG010	300	HF620-40.210 FG025	320	HF620-40.210 SP010	3,5
G 1"1/2	280	HF620-50.155 FG010	280	HF620-50.155 FG025	300	HF620-50.155 SP010	5,3
G 1"1/2	300	HF620-50.210 FG010	300	HF620-50.210 FG025	320	HF620-50.210 SP010	5,4

Bocca Ingresso Inlet Port	25 MICRON NOM.		60 MICRON		90 - 125 MICRON		Peso Filtro Filter Weight (Kg)
	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	
G 3/4"	60	HF620-20.135 HF625-20.135 SP025	70	HF620-20.135 HF625-20.135 MS060	75	HF620-20.135 HF625-20.135 MS090-MS125	1
G 3/4"	70	HF620-20.180 HF625-20.180 SP025	80	HF620-20.180 HF625-20.180 MS060	85	HF620-20.180 HF625-20.180 MS090-MS125	1,2
G 1"1/4	180	HF620-30.155 SP025	190	HF620-30.155 MS060	200	HF620-30.155 MS090-MS125	1,9
G 1"1/4	190	HF620-30.210 SP025	200	HF620-30.210 MS060	210	HF620-30.210 MS090-MS125	2
G 1"1/2	340	HF620-40.155 SP025	380	HF620-40.155 MS060	390	HF620-40.155 MS090-MS125	3,4
G 1"1/2	360	HF620-40.210 SP025	390	HF620-40.210 MS060	400	HF620-40.210 MS090-MS125	3,5
G 1"1/2	340	HF620-50.155 SP025	380	HF620-50.155 MS060	390	HF620-50.155 MS090-MS125	5,3
G 1"1/2	360	HF620-50.210 SP025	390	HF620-50.210 MS060	400	HF620-50.210 MS090-MS125	5,4

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FILTRI HF 650 / FILTERS HF 650

Bocca Ingresso Inlet Port	3 MICRON ASS./ABS.		6 MICRON ASS./ABS.		10 MICRON ASS./ABS.		Peso Filtro Filter Weight (Kg)
	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	
G 3/4"	50	HF650-20.140 FG003	60	HF650-20.140 FG006	70	HF650-20.140 FG010	1,3
G 1"	70	HF650-20.140 FG003	80	HF650-20.140 FG006	90	HF650-20.140 FG010	1,3
G 3/4"	85	HF650-20.180 FG003	95	HF650-20.180 FG006	100	HF650-20.180 FG010	1,5
G 1"	95	HF650-20.180 FG003	105	HF650-20.180 FG006	110	HF650-20.180 FG010	1,5
G 3/4"	100	HF650-20.230 FG003	110	HF650-20.230 FG006	120	HF650-20.230 FG010	2
G 1"	110	HF650-20.230 FG003	120	HF650-20.230 FG006	130	HF650-20.230 FG010	2

Bocca Ingresso Inlet Port	16 MICRON ASS./ABS.		25 MICRON ASS./ABS.		10 MICRON NOM.		Peso Filtro Filter Weight (Kg)
	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	
G 3/4"	75	HF650-20.140 FG016	80	HF650-20.140 FG025	65	HF650-20.140 RP010	1,3
G 1"	95	HF650-20.140 FG016	100	HF650-20.140 FG025	85	HF650-20.140 RP010	1,3
G 3/4"	105	HF650-20.180 FG016	110	HF650-20.180 FG025	100	HF650-20.180 RP010	1,5
G 1"	115	HF650-20.180 FG016	120	HF650-20.180 FG025	105	HF650-20.180 RP010	1,5
G 3/4"	125	HF650-20.230 FG016	130	HF650-20.230 FG025	105	HF650-20.230 RP010	2
G 1"	135	HF650-20.230 FG016	140	HF650-20.230 FG025	110	HF650-20.230 RP010	2

Bocca Ingresso Inlet Port	25 MICRON NOM.		Peso Filtro Filter Weight (Kg)
	Portata Flow (lt/min)	Filtro Tipo Filter Type	
G 3/4"	80	HF650-20.140 RP025	1,3
G 1"	100	HF650-20.140 RP025	1,3
G 3/4"	110	HF650-20.180 RP025	1,5
G 1"	120	HF650-20.180 RP025	1,5
G 3/4"	130	HF650-20.230 RP025	2
G 1"	140	HF650-20.230 RP025	2

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FILTRI HF 690 / FILTERS HF 690

Bocca Ingresso Inlet Port	3 MICRON ASS./ABS.		6 MICRON ASS./ABS.		10 MICRON ASS./ABS.		Peso Filtro Filter Weight (Kg)
	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	
G 1/2"	10	HF690-10.086 FG003	15	HF690-10.086 FG006	25	HF690-10.086 FG010	0,9
G 1/2"	30	HF690-10.180 FG003	45	HF690-10.180 FG006	60	HF690-10.180 FG010	1,2

Bocca Ingresso Inlet Port	25 MICRON ASS./ABS.		10 MICRON NOM.		25 MICRON NOM.		Peso Filtro Filter Weight (Kg)
	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	
G 1/2"	40	HF690-10.086 FG025	30	HF690-10.086 RP010	40	HF690-10.086 RP025	0,9
G 1/2"	75	HF690-10.180 FG025	65	HF690-10.180 RP010	75	HF690-10.180 RP025	1,2

Bocca Ingresso Inlet Port	60 MICRON		Peso Filtro Filter Weight (Kg)
	Portata Flow (lt/min)	Filtro Tipo Filter Type	
G 1/2"	45	HF690-10.086 MI060	0,9
G 1/2"	80	HF690-10.180 MI060	1,2

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FILTRI HF 745 / FILTERS HF 745

Bocca Ingresso Inlet Port	3 MICRON ASS./ABS.		6 MICRON ASS./ABS.		Peso Filtro Filter Weight (Kg)
	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	
G 1/2"	25	HF745-20.080 FG003	30	HF745-20.080 FG006	3,8
G 3/4"	25		35		
G 1/2"	30	HF745-20.106 FG003	40	HF745-20.106 FG006	4,2
G 3/4"	30		40		
G 1/2"	50	HF745-20.203 FG003	55	HF745-20.203 FG006	5,7
G 3/4"	55		60		

Bocca Ingresso Inlet Port	10 MICRON ASS./ABS.		25 MICRON ASS./ABS.		Peso Filtro Filter Weight (Kg)
	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	
G 1/2"	35	HF745-20.080 FG010	45	HF745-20.080 FG025	3,8
G 3/4"	40		50		
G 1/2"	45	HF745-20.106 FG010	60	HF745-20.106 FG025	4,2
G 3/4"	50		70		
G 1/2"	60	HF745-20.203 FG010	80	HF745-20.203 FG025	5,7
G 3/4"	70		90		

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FILTRI HF 760 -765 / FILTERS HF 760 - 765

Bocca Ingresso Inlet Port	3 MICRON ASS./ABS.		6 MICRON ASS./ABS.		Peso Filtro Filter Weight (Kg)
	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	
G 1/2"	25	HF760-20.080 HF765-20.080 FG003	30	HF760-20.080 HF765-20.080 FG006	5,3
G 3/4"	25		35		
G 1/2"	30	HF760-20.106 HF765-20.106 FG003	40	HF760-20.106 HF765-20.106 FG006	5,7
G 3/4"	30		40		
G 1/2"	50	HF760-20.203 HF765-20.203 FG003	55	HF760-20.203 HF765-20.203 FG006	7,2
G 3/4"	55		60		
G3/4"	55	HF760-30.115 HF765-30.115 FG003	60	HF760-30.115 HF765-30.115 FG006	8,2
G 1"	60		65		
G 3/4"	90	HF760-30.223 HF765-30.223 FG003	100	HF760-30.223 HF765-30.223 FG006	10
G 1"	100		110		
G1"	105	HF760-40.102 HF765-40.102 FG003	120	HF760-40.102 HF765-40.102 FG006	14,3
G1"1/4	105		120		
G1"1/2	110		125		
G1"	125	HF760-40.132 HF765-40.132 FG003	140	HF760-40.132 HF765-40.132 FG006	15,2
G1"1/4	140		160		
G1"1/2	140		160		
G1"	200	HF760-40.227 HF765-40.227 FG003	210	HF760-40.227 HF765-40.227 FG006	18
G1"1/4	210		225		
G1"1/2	225		250		
G1"	250	HF760-40.372 HF765-40.372 FG003	260	HF760-40.372 HF765-40.372 FG006	22
G1"1/4	260		275		
G1"1/2	270		290		
G1"	260	HF760-40.517 HF765-40.517 FG003	270	HF760-40.517 HF765-40.517 FG006	28,5
G1"1/4	290		300		
G1"1/2	330		350		

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FILTRI HF 760 - 765 / FILTERS HF 760 - 765

Bocca Ingresso Inlet Port	10 MICRON ASS./ABS.		25 MICRON ASS./ABS.		Peso Filtro Filter Weight (Kg)
	Portata Flow (lt/min)	Filtro Tipo Filter Type	Portata Flow (lt/min)	Filtro Tipo Filter Type	
G 1/2"	35	HF760-20.080 HF765-20.080 FG010	45	HF760-20.080 HF765-20.080 FG025	5,3
G 3/4"	40		50		
G 1/2"	45	HF760-20.106 HF765-20.106 FG010	60	HF760-20.106 HF765-20.106 FG025	5,7
G 3/4"	50		70		
G 1/2"	60	HF760-20.203 HF765-20.203 FG010	80	HF760-20.203 HF765-20.203 FG025	7,2
G 3/4"	70		90		
G3/4"	70	HF760-30.115 HF765-30.115 FG010	90	HF760-30.115 HF765-30.115 FG025	8,2
G 1"	75		100		
G 3/4"	120	HF760-30.223 HF765-30.223 FG010	130	HF760-30.223 HF765-30.223 FG025	10
G 1"	130		150		
G1"	140	HF760-40.102 HF765-40.102 FG010	170	HF760-40.102 HF765-40.102 FG025	14,3
G1"1/4	150		190		
G1"1/2	150		200		
G1"	170	HF760-40.132 HF765-40.132 FG010	210	HF760-40.132 HF765-40.132 FG025	15,2
G1"1/4	190		225		
G1"1/2	200		240		
G1"	240	HF760-40.227 HF765-40.227 FG010	250	HF760-40.227 HF765-40.227 FG025	18
G1"1/4	260		280		
G1"1/2	280		300		
G1"	280	HF760-40.372 HF765-40.372 FG010	300	HF760-40.372 HF765-40.372 FG025	22
G1"1/4	310		330		
G1"1/2	320		350		
G1"	300	HF760-40.517 HF765-40.517 FG010	320	HF760-40.517 HF765-40.517 FG025	28,5
G1"1/4	350		370		
G1"1/2	380		400		

HF 410

Suction filters
Saugfilter
Filtri immersi in aspirazione
Filtres immergés à l'aspiration
Filtros de aspiracion

HF 502 - HF 550 - HF 554 - HF 570 HF 575 - HF 595

Return filters
Rücklauffilter für den tankeinbau
Filtri semimmersi in ritorno
Filtres semi-immergés en retour
Filtros de retorno

HF 620 - HF 625 - HF 650

In line filters "Spin-On" type
Nebenstromfilter typ "Spin-On"
Filtri in linea tipo "Spin-On"
Filtres en ligne type "Spin-On"
Filtros en linea tipo "Spin-On"

HF 690 - HF 705 - HF 745 - HF 760

Medium and high pressure filters
Mittel - und Hochdruckfilter
Filtri per media e alta pressione
Filtres pour moyenne et haute pression
Filtros de media y alta presión

IKRON®
Fluid Filtration

IKRON S.r.l.
43044 Lemignano di Collecchio (PR) - Italy Via C. Prampolini, 2
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1.5:1 pilot ratio, load reactive load control valve

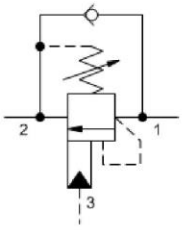
Capacity:
30 gpm (120 L/min.)

Functional Group:
Products : Cartridges : Load Control Valve, Load Reactive : 3 Port, Non-Vented : 1.5:1 Pilot Ratio

Model:
MBEB

Product Description

Load reactive, load control valves with pilot assist combine two valves; a check valve and a relief valve. The check valve allows free flow from the directional valve (port 2) to the load (port 1) while a direct-acting, pilot-assisted relief valve controls flow from port 1 to port 2. Pilot assist at port 3 lowers the effective setting of the relief valve at a rate determined by the pilot ratio.



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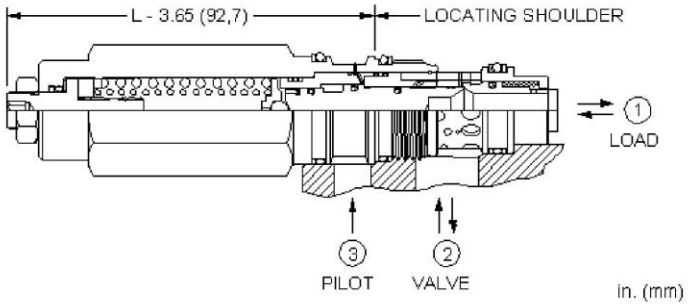


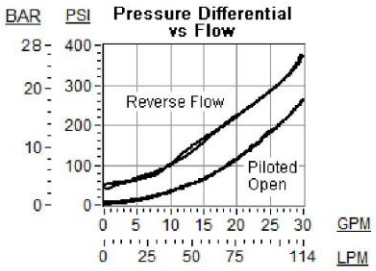
Technical Features

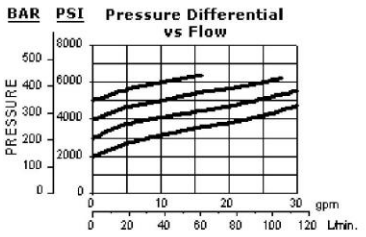
- Load reactive load control valves should be set at least 1.3 times the maximum load induced pressure.
- Turn adjustment clockwise to decrease setting and release load.
- Full clockwise setting is 1000 psi (70 bar) for the H range and 2000 psi (140 bar) for the J range.
- All 3-port counterbalance, load control, and pilot-to-open check cartridges are physically interchangeable (i.e. same flow path, same cavity for a given frame size).
- This valve has positive seals between all ports.
- Backpressure at port 2 adds to the effective relief setting at a ratio of 1 plus the pilot ratio times the backpressure.
- This valve is functionally a 3 port counterbalance valve. It seats as a poppet valve and modulates as a spool valve offering the best of both worlds.
- These valves are capable of modulating over a broader range of flows than the pure poppet designs. The longer stroke allows us to incorporate a uni-directional damping device that smooths the opening and lets the valve close quickly.
- This valve has full relief capacity.
- Sun load control cartridges can be installed directly into a cavity machined in an actuator housing for added protection and improved stiffness in the circuit.
- Incorporates the Sun floating style construction to minimize the possibility of internal parts binding due to excessive installation torque and/or cavity/cartridge machining variations.

Technical Data

	U.S. Units	Metric Units
Cavity	T-2A	
Capacity	30 gpm	120 L/min.

Pilot Ratio	1.5:1	
Maximum Recommended Load Pressure at Maximum Setting	3760 psi	260 bar
Maximum Setting	5000 psi	350 bar
Adjustment - Number of Counterclockwise Turns to Increase Setting	5	
Check Cracking Pressure	25 psi	1,7 bar
Factory Pressure Settings Established at	2 in³/min.	30 cc/min.
Maximum Valve Leakage at Reseat	5 drops/min.	0,3 cc/min.
Series (from Cavity)	Series 2	
Reseat	>85% of Set Pressure	
Valve Hex Size	1 1/8 in.	28,6 mm
Valve Installation Torque	45 - 50 lbf ft	60 - 70 Nm
Adjustment Screw Internal Hex Size	5/32 in.	4 mm
Adjustment Locknut/Cap Hex Size	9/16 in.	15 mm
Adjustment Nut Torque	80 - 90 lbf in.	9 - 10 Nm
Seal Kits - Cartridge	Buna: 990-202-007	
Seal Kits - Cartridge	Viton: 990-202-006	
Model Weight	1.01 lb.	0.46 kg.





MBEB-LHN

Control	Functional Setting Range	Seal Material
Standard Options	Standard Options	Standard Options
C* Tamper Resistant - Factory Set	**H** 1000 - 4000 psi (70 - 280 bar), 3000 psi (210 bar) Standard Setting	**N** Buna-N
L Standard Screw Adjustment	**J** 2000 - 5000 psi (140 - 350 bar), 3000 psi (210 bar) Standard Setting	**V** Viton

* Special Setting required, specify at time of order
Customer specified setting stamped on hex $ 2.00

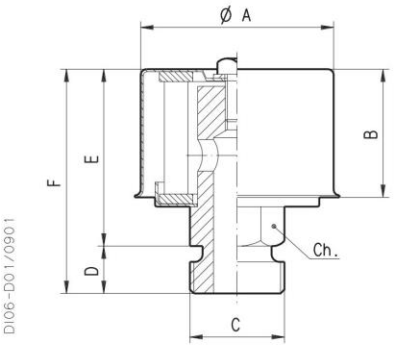
Related Models
MBEBX

AIR FILTERS SERIES AF 105

IKRON®
Fluid Filtration

Replaces: AF-HL 02 T E

The air filters AF 105 series are built in steel and are protected with special treatments to be used on circuit exposed to atmospheric agents.



DI06-D01/0901

TECHNICAL DATA		
Filter type	Degree of filtration air	Air flow
AF 105-10	5 [µm] 10 [µm]	200 [l/min]
AF 105-20	5 [µm] 10 [µm]	500 [l/min]

Filter type	ØA	B	C	D	E	F	Ch	Weight
	mm	mm		mm	mm	mm		[kg]
AF 105-10	48	32	M 12X1,5	9	45	54	14	0,09
			M 18x1,5	9	45	54	19	0,13
			M 22x1,5	10	45	55	24	0,17
			G 1/4	9	45	54	14	0,11
			G 3/8	9	45	54	19	0,13
AF 105-20	67	50	G ½	10	64	74	22	0,27

HOW TO ORDER

1		2		3		4
AF 105-10	-	GB	-	SP010	-	P1

1 Filter type	CODE
Air filter	AF 105-10
Air filter	AF-105-20

2 Thread connection	CODE
METRIC	
M 12X1,5 ①	TB
M 18X1,5 ①	TE
M 22X1,5 ①	TG
GAS (BSPP)	
G 1/4 ①	GB
G 3/8 ①	GC
G 1/2 ②	GD

3 Degree of filtration	CODE
5 [µm] Cellulose	SP005
10 [µm] Cellulose	SP010

4 Pressurization	CODE
None	P1

① **FOR 105-10 ONLY**

② **FOR 105-20 ONLY**

Edition: 03/04.2003

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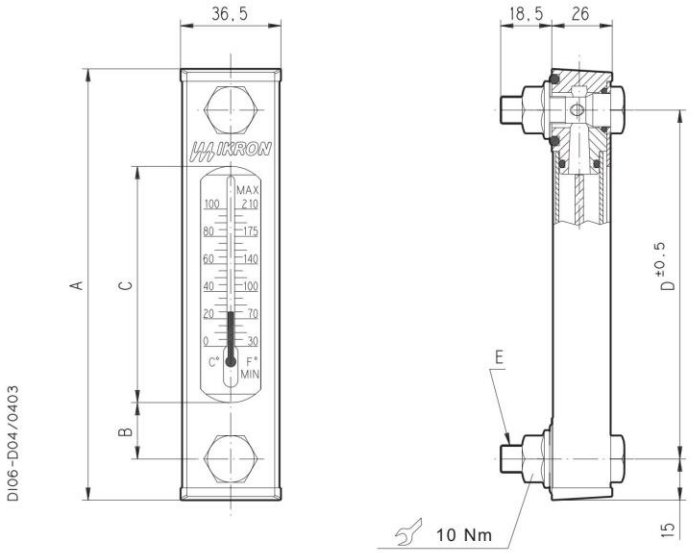
IKRON

LEVEL AND TEMPERATURE GAUGES HL 91 SERIES

The indicators HL 91 series are applied on reservoirs containing oil based fluids and they allow the survey of the level, and eventually of the temperature. The HL 91 series products are made of plastic material mounted on a aluminium frame.



Replaces: 02/09.01

TECHNICAL DATA						
Max. operating pressure	Operating temperature	Fluid compatibility		Seals		Thermometer scale
1 bar	- 30 + 90 [°C]	Mineral oil	Petroleum based fluids	Buna	Viton	0 + 100 [°C]

Gauge type	A	B	C	D	E	Drilling tank	E	Drilling tank	F	G	H	Weight
	mm	mm	mm	mm		mm		mm	mm	mm	mm	[kg]
HL 91-10	106	17,5	41	76	M10X1,5	11	M12x1,75	13	-	-	-	0,15
HL 91-20	157	20,5	86	127	M10x1,5	11	M12X1,75	13	-	-	-	0,19
HL 91-30	284	20,5	213	254	M10X1,5	11	M12X1,75	13	-	-	-	0,23

HOW TO ORDER

1		2		3		4
HL 91-10	-	T1	-	T	-	B

Di06-002 - 03/04.03

1	Gauge type	CODE
Centre 76 mm		HL 91-10
Centre 127 mm		HL 91-20
Centre 254 mm		HL 91-30

2	Screw fixing	CODE
M10X1,5		T1
M12X1,75		T2

3	Thermometer	CODE
None		N
With thermometer		T

4	Seals	CODE
Buna		B
Viton		V

ARGO HYTOS

Program Summary

Filtration & Fluid Management
Sensors & Measurement
Fluid & Motion Control


ARGO HYTOS
ARGO HYTOS

Content

Filtration

ARGO-HYTOS manufactures sophisticated filter solutions, mainly applied in hydraulic and lubrication systems as well as in transmissions. The range of solutions that have been implemented extend from stationary industrial plants to mobile applications.

Next to customized developments, that are precisely tailored to customer individual requirements, ARGO-HYTOS offers a comprehensive range of innovative standard solutions for a wide variety of sectors:

- **suction filters**
- **return and return-suction filters**
- **pressure and high-pressure filters**
- **filling and ventilating filters**
- **filter accessories**

Suction Strainers

Nominal flow rate [l/min]	up to 350
Fineness [µm (c)]	100
Connection	$G1/2...G2 1/2$

Screen elements with female thread to be installed in the suction line of the pump.

Suction Filters

Nominal flow rate [l/min]	up to 130
Fineness [µm (c)]	30, 60
Connection	$G3/4...G1 1/4$
	SAE $1 1/2...$SAE 2

Tank top mounting, optionally with foot valve for horizontal mounting.

Return-Suction Filters

Nominal flow rate [l/min]	up to 600
Pressure [bar]	up to 10
Fineness [µm (c)]	12, 16
Connection	$G3/4...G1 1/2$, SAE $1 1/2$, SAE 2

Tank top mounting, with boost pump connection (0.5 bar charge pressure) for hydrostatic drives.

Return Filters

Nominal flow rate [l/min]	up to 650
Pressure [bar]	up to 16
Fineness [µm (c)]	5...100
Connection	Ø 17.5...Ø 20.5 (hose connection)
	$G1/2...G1 1/2$
	SAE 2...SAE $2 1/2$

Tank top mounting or for mounting in a separate return flow tank section, optionally with integrated replaceable ventilating filter (2 µm(c)), resp. extension pipe and diffuser.

Pressure Filters

Nominal flow rate [l/min]	up to 370
Pressure [bar]	up to 100
Fineness [µm (c)]	5...30
Connection	$G1/2$... $G1 1/2$, SAE $2 1/2$

Tank top mounting, clogging indicator electrical and/or optical on request.

High Pressure Filters

Nominal flow rate [l/min]	up to 1000
Pressure [bar]	up to 600
Fineness [µm (c)]	5...30
Connection	2 x Ø 15, 2 x Ø 31 (Flange Connection) $G1/2$...$G1 1/2$ SAE $1 1/4$...SAE 2

In-line mounting / Flange connection, optionally reverse flow function, clogging indicator electrical and/or optical on request.

High Pressure Safety Filters

Nominal flow rate [l/min]	up to 100
Pressure [bar]	up to 315
Fineness [µm (c)]	60, 100
Connection	M22 x 1.5...M26 x 1.5 $G3/4$

Filling and Ventilating Filters

Air flow [l/min]	up to 850
Oil flow [l/min]	up to 90
Fineness [µm (c)]	2
Connection	$G3/4$ M18 x 1.5...M60 x 2

Regulation of pressure changes in the reservoir and oil level indication.
Option: Double check valve, dipstick, "Vandalism proof"-types.

Manometers

Optical
Green/red area [bar] -0.25
1.0 / 2.0

Pressure Switches

Electrical
Switching pressure [bar] -0.15, -0.25
1.2...2.5

Monitors the clogging condition of Suction, Return and Return-Suction Filters.

Differential Pressure Indicators

Optical
Response pressure [bar] 2...5

Differential Pressure Switches

electrical/optical
Switching Pressure [bar] 1.2...5

Monitors the clogging condition of Pressure and High Pressure Filters.
Option: temperature suppression, with 2 switching points.

Oil Level Gauges with Thermometer

Level range [mm] 33...194
Temperature scale [°C] -10...+80

Indicates the oil level and the oil temperature in hydraulic oil or lubricant reservoirs.

Dipsticks

Level range [mm] 25...540
Bolt thread up to $G^1/_2$
up to M16 x 1.5

Checks the oil level in hydraulic oil or lubricant reservoirs.

Customized Filter Solutions

Customized filter and system solutions for special applications developed and designed in cooperation with our customers.

Fluid Management

As well as reducing maintenance and servicing costs, efficient fluid management is also a key factor in boosting the reliability, productivity and cost-effectiveness of the operation.
ARGO-HYTOS supplies application-oriented products for manual and automatic cleaning of hydraulic fluids:

- **off-line filters**
- **off-line filter units**
- **oil service units**
- **dewatering units**

Off-line Filters

Nominal flow rate [l/min]	up to 60 (with flow control valve: up to 12 l/min)
Operating pressure [bar]	up to 12 (with flow control valve: up to 350 bar)
Fineness [µm (c)]	3, 5, 12
Connection	up to G1

Off-line filters for application in low pressure circuits or with flow control valve for connection to the high pressure line.

Off-line Filter Units

Nominal flow rate [l/min]	up to 45
Operating pressure [bar]	up to 6
Fineness [µm (c)]	3, 5
Electro Motor Types	1~110 V (50...60 Hz) 1~230 V (50...60 Hz) 3~400 V / 460 V (50...60 Hz) 24 V DC
Connection	up to G1

Filter Units for first fit or for retrofitting in existing systems.

Oil Service Units

Nominal flow rate [l/min]	up to 45
Operating pressure [bar]	up to 6
Fineness [µm (c)]	3, 5
Electro Motor Types	1~110 V (50...60 Hz) 1~230 V (50...60 Hz) 3~400 V / 460 V (50...60 Hz) 24 V DC

Filter Units for cleaning in off-line filtration or filling systems by using ultra-fine filter elements. Optionally with oil cleanliness monitoring.

Dewatering Units

Nominal flow rate [l/min]	up to 45
Operating pressure [bar]	up to 6
Electro Motor Types	3~400 V / 460 V (50...60 Hz)

With dewatering units, large water quantities are efficiently withdrawn from the oil.

Water Absorbing Filter Elements

Small quantities of remaining water can be withdrawn by water absorbing filter elements. Water absorbing filter elements fit in standard versions of off-line filters and filter units.

Sensors & Measurement

Systems that provide reliable assessment of the condition of hydraulic fluids are the key feature of continuous fluid monitoring. Sensors and measurement technology from ARGO-HYTOS precisely target this range of tasks. Our fluid monitoring products comprise equipment and system solutions to enable online monitoring during continuous operation as well as analysis of bottled samples under laboratory conditions.

- **portable oil diagnostic system**
- **stationary particle monitor**
- **software to evaluate data and analyze trends**

Portable Oil Diagnostic Systems

Sensitivity [µm (c)]	4
ISO-MTD-sizes [µm (c)]	4; 4.6; 6; 9.8; 14; 21.2; 38; 68
Classification	ISO 4406 NAS 1638 MIL-STD-1246C NAVAIR 01-1A-17
Pressure [bar]	0.5...420
Temperature [°C]	Pressure fluids: 0...+90 Ambient: +5...+50
Operating modes	Bottle sample analysis, online-analysis
Data transmission	RS 232

Stationary Particle Monitor

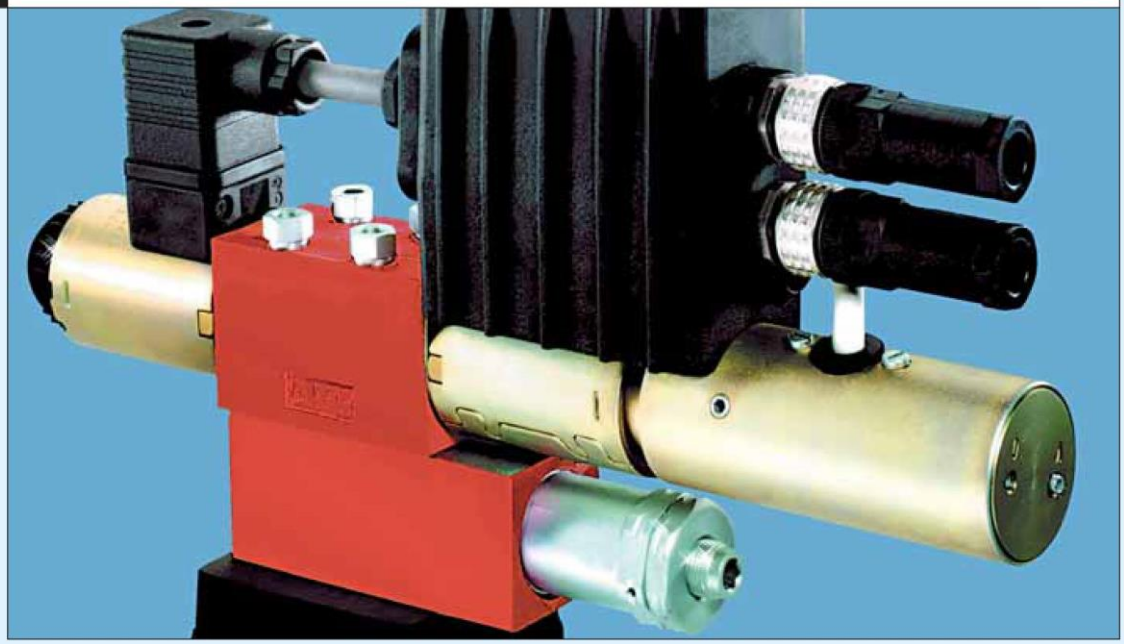
Sensitivity [µm (c)]	4
ISO-MTD-sizes [µm (c)]	4; 6; 14; 21
Classification	ISO 4406
Pressure [bar]	0.5...500
Temperature [°C]	Pressure fluids: -20...+60 Ambient: -20...+60
Data transmission	RS 232, RS 485, analogue, 0.5 V, IrDa

Software for Portable Oil Diagnostic System

For complete control of the Portable Oil Diagnostic System from the control window of the software. Structure of a data bank according to any criteria. Issue of certificates. Report of chronological measuring processes.

Software for Stationary Particle Monitor

DDE-Server to record data and as interface driver for other software packets.



Fluid & Motion Control

ARGO-HYTOS' expertise in control technology is gained from more than 50 years' experience. We focus here on a wide range of valves, power units and integrated manifolds featuring all commonly used design features and functions, together with proportional valves and the associated control electronics:

- **direct operated directional valves in CETOP 02 to CETOP 05 and pilot operated valves in CETOP 07 and CETOP 08**
- **valves subplate and sandwich type – flow control, pressure and check valves in CETOP 02 to CETOP 05**
- **cartridge valves**
- **direct operated proportional valves with compensator sandwich valve, in CETOP 02 to CETOP 05**
- **analog and digital electronic control units – on-board, or for installation in control cabinets**
- **power pack assembly kits**
- **customized control blocks**

We especially focus on developing customised solutions based on tried-and-tested fundamental technologies, specifically adapted to the requirement profiles in each individual case.

Directional Control Valves, solenoid operated

Size	NG04 to NG25
Pressure [bar]	up to 350
Flow [l/min]	up to 600

Directional Control Valves, other operations

Size	NG04 to NG10
Pressure [bar]	up to 320
Flow [l/min]	up to 140

Directional Control Valves

Size	NG03
Pressure [bar]	up to 250
Flow [l/min]	up to 20

Screw-in Cartridge Valves

Size	NG04 to NG06
Pressure [bar]	up to 350
Flow [l/min]	up to 60

Proportional Directional Control Valves / Electronics / Pressure Compensators

Size	NG04 to NG10
Pressure [bar]	up to 320
Flow [l/min]	up to 60

Pressure Valves

Size	NG04 to NG10
Pressure [bar]	up to 320
Flow [l/min]	up to 150

Check Valves

Size	NG04 to NG30
Pressure [bar]	up to 320
Flow [l/min]	up to 400

Flow Control Valves

Size	NG04 to NG10
Pressure [bar]	up to 320
Flow [l/min]	up to 100

Connection Plates, Manifold Plates

Size	NG04 to NG10
Pressure [bar]	up to 350
Flow [l/min]	up to 140

Assembly Kits for Compact Hydraulic Power Packs

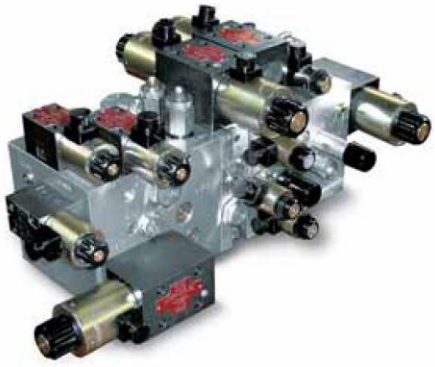
Motor output [kW]	up to 3
Pressure [bar]	up to 250
Flow [l/min]	up to 17

Customized Power Packs

Motor output [kW]	up to 7.5
Pressure [bar]	up to 320

Power Units with Oil Immersed Electric Motor

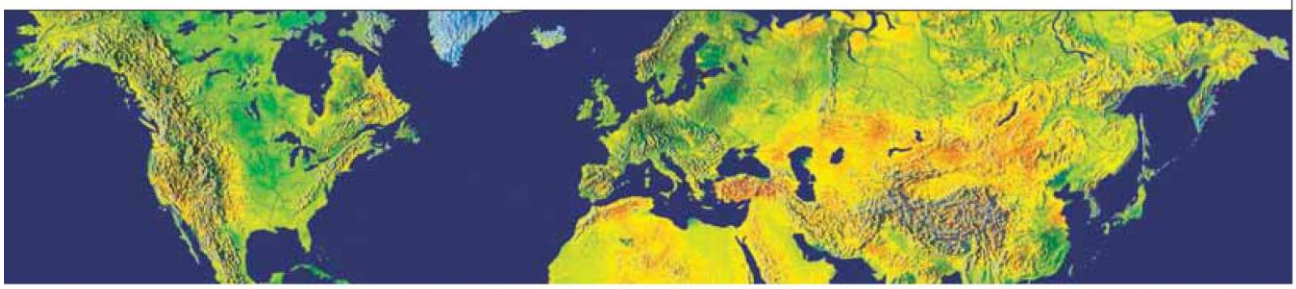
Motor output [kW]	up to 1.5
Pressure [bar]	up to 250
Flow [l/min]	up to 17



Customized Control Blocks

Pressure [bar]	up to 320
Flow [l/min]	up to 140

ARGO-HYTOS worldwide



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Distribution partners

Further distribution partners worldwide you will find in the Internet at **www.argo-hytos.com**

ARGO HYTOS

9107152-e / 0706

Direct-acting relief valve

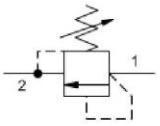
Capacity:
12 gpm (45 L/min.)

Functional Group:
Products : Cartridges : Relief : 2 Port : Direct Acting

Model:
RDBA

Product Description

Direct-acting relief cartridges are normally closed, pressure-limiting valves used to protect hydraulic components from pressure transients. When the pressure at the inlet (port 1) reaches the valve setting, the valve starts to open to tank (port 2), throttling flow to limit the pressure rise. These valves are smooth and quiet, essentially zero leak, dirt tolerant, immune to silting and are very fast.



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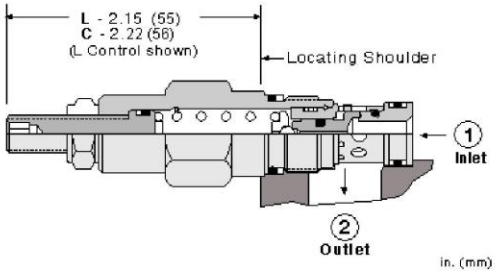


in. (mm)

Technical Features

- All 2-port relief cartridges (except pilot reliefs) are physically and functionally interchangeable (same flow path, same cavity for a given frame size).
- Will accept maximum pressure at port 2; suitable for use in cross port relief circuits.
- The seals on the adjust screw are exposed to system pressure which means this valve can only be adjusted when the pressure is removed. The setting procedure is; check the setting, remove the pressure, adjust the valve, check the new setting.
- Valve is relatively insensitive to varying oil temperatures and oil borne contamination.
- Select a spring range where the desired relief setting is approximately mid-range to high between the minimum and maximum pressure to ensure maximum valve repeatability.
- Suitable for use in load holding applications.
- Back pressure on the tank port (port 2) is directly additive to the valve setting at a 1:1 ratio.
- Incorporates the Sun floating style construction to minimize the possibility of internal parts binding due to excessive installation torque and/or cavity/cartridge machining variations.

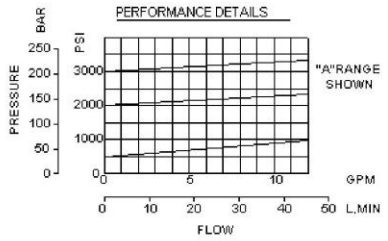
Special Notes

- U.S. Patent #4,742,846; European Patent Pending

Technical Data

	U.S. Units	Metric Units
Cavity	T-162A	
Capacity	12 gpm	45 L/min.
Factory Pressure Settings Established at	4 gpm	15 L/min.
Maximum Operating Pressure	5000 psi	350 bar
Maximum Valve Leakage at Reseat	10 drops/min.	0,7 cc/min.
Response Time - Typical	2 ms	
Series (from Cavity)	Series 0	
U.S. Patent #	4,742,846	
Reseat	>90 % of Set Pressure	
Adjustment - Number of Clockwise Turns to Increase Setting	5	
Valve Hex Size	3/4 in.	19,1 mm
Valve Installation Torque	20 - 25 lbf ft	27 - 33 Nm
Adjustment Screw Internal Hex Size	5/32 in.	4 mm

Adjustment Locknut/Cap Hex Size	9/16 in.	15 mm
Adjustment Nut Torque	80 - 90 lbf in.	9 - 10 Nm
Seal Kits - Cartridge	Buna: 990-162-007	
Seal Kits - Cartridge	Viton: 990-162-006	
Model Weight	0.22 lb.	0.10 kg.



RDBA-LAN

Control

Preferred Options

L Standard Screw Adjustment

Standard Options

C* Tamper Resistant - Factory Set

K Handknob

Adjustment Range

Preferred Options

A 500 - 3000 psi (35 - 210 bar), 1000 psi (70 bar) Standard Setting

W 800 - 4500 psi (55 - 315 bar), 1000 psi (70 bar) Standard Setting

Standard Options

B 300 - 1500 psi (20 - 105 bar), 1000 psi (70 bar) Standard Setting

C 1000 - 6000 psi (70 - 420 bar), 1000 psi (70 bar) Standard Setting

D 200 - 800 psi (14 - 55 bar), 400 psi (28 bar) Standard Setting

E 150 - 400 psi (10 - 28 bar), 200 psi (14 bar) Standard Setting

S 50 - 200 psi (3,5 - 14 bar), 100 psi (7 bar) Standard Setting

Seal Material

Preferred Options

N Buna-N

Standard Options

V Viton

Material/Coating Modifier

Preferred Options

No modifier (standard material with no special coating)

Special Options

/AP Stainless Steel, Passivated

Control: C

Control: L

Our corrosion resistant product line is growing! If you are interested in a corrosion resistant option for this model, please contact Sun.

When the control is F, the range must be A,B,E or W
When the modifier is /AP, the control must be C or L

* Special Setting required, specify at time of order
Customer specified setting stamped on hex $ 2.00

Related Documents (opens in new window):

- Explanation of Sun cartridge control options - US units.
- Explanation of Sun cartridge control options - metric units.

- Two-piece, floating cartridge construction.

Free flow side to nose check valve with port 3 blocked

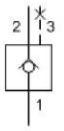
Capacity:
30 gpm (120 L/min.)

Functional Group:
Products : Cartridges : Check : 3-Port : Free Flow Side to Nose, Port 3 Blocked

Model:
CXEE

Product Description

Free-flow, side-to-nose cheater check valves function as a standard 2-port check valve in a 3-port cavity with port 3 of the cartridge blocked off. These valves are useful in circuits where a check valve is required in an existing three port cavity.



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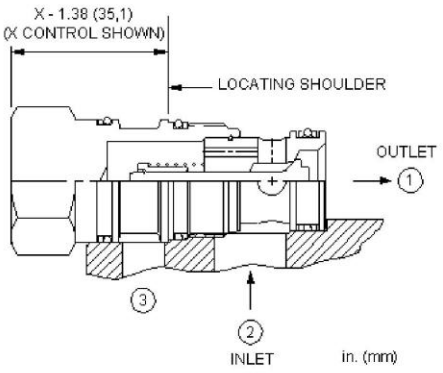
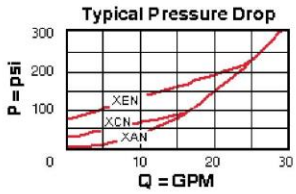


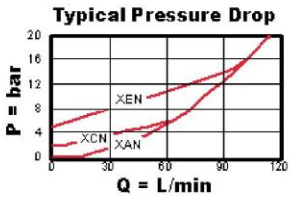
Technical Features

- Two-port check valves share the same cavity for a given frame size, however, pay close attention as flow paths may be in opposite directions.
- Check valves offer extremely low leakage rates with a maximum leakage of less than 1 drop per minute (0,07 cc/min).
- Will accept 5000 psi (350 bar) at ports 1 and 2.
- Corrosion resistant cartridge valves are intended for use in corrosive environments and are identified by the model code suffix /AP (see Option Selection below). External parts are made from stainless steel with titanium or brass components, where applicable. Internal parts are made from carbon steel leaded alloy, the same as standard valves. For further details, please see the Materials of Construction page.
- Incorporates the Sun floating style construction to minimize the possibility of internal parts binding due to excessive installation torque and/or cavity/cartridge machining variations.

Technical Data

	U.S. Units	Metric Units
Cavity	T-2A	
Capacity	30 gpm	120 L/min.
Maximum Operating Pressure	5000 psi	350 bar
Maximum Valve Leakage at 110 SUS (24 cSt)	1 drops/min.	0,07 cc/min.
Series (from Cavity)	Series 2	
Valve Hex Size	1 1/8 in.	28,6 mm
Valve Installation Torque	45 - 50 lbf ft	60 - 70 Nm
Seal Kits - Cartridge	Buna: 990-202-007	
Seal Kits - Cartridge	Viton: 990-202-006	
Model Weight	0.48 lb.	0.22 kg.





CXEE-XCN

Control	Cracking Pressure	Seal Material	Material/Coating Modifier
Standard Options	Standard Options	Standard Options	Preferred Options
X Not Adjustable	**A** 4 psi (0,3 bar) **B** 15 psi (1 bar) **C** 30 psi (2 bar) **D** 50 psi (3,5 bar) **E** 75 psi (5 bar) **F** 100 psi (7 bar)	**N** Buna-N **V** Viton	**No modifier** (standard material with no special coating) Special Options **/AP** Stainless Steel, Passivated Control: X *Our corrosion resistant product line is growing! If you are interested in a corrosion resistant option for this model, please contact Sun.*

When the modifier is /AP, the control must be X