Filter element

Element description

M - Wire Mesh	Δp 20 bar
P - Paper	Δp 20 bar
A - Microfibre	Δp 20 bar

Characteristics of filter elements with nominal filtration, M series

For wire mesh filter elements, filtration degree is defined as the maximum diameter of a sphere corresponding to the mesh size, in microns.

Characteristics of filter elements with nominal filtration, P series

For cellulose filter elements, filtration efficiency expressed in micron is to be construed as nominal $\beta_{X©} > 2$.

Characteristics of filter elements with absolute filtration, A series

For microfibre filter elements, filtration degree is defined by the test bench MULTIPASS ISO 16889.

Reference standards

All filter elements comply with the following **ISO** standards.

ISO	**2941**	- Collapse and burst resistance.
ISO	**2942**	- Bubble point test resistance.
ISO	**2943**	- Compatibility with fluids.
ISO	**3723**	- Resistance to axial deformation.
ISO	**23181**	- Fatigue test with flow.
ISO	**3968**	- Pressure drop.
ISO	**16889**	- Filtration efficiency by means of Multipass.

N.B. P series cellulose cartridges are compatible only with mineral oils in according to ISO 2943 - 4.

Multipass test in compliance new ISO 16889
Contaminant ISO MTD

Filtration	$\beta_{X©} \geq 1000$
Filter element	
A01*	<4
A03	5
A06	7
A10	10
A16	15
A25	20

* On request

International standards for fluid contamination control

Components	**Recommended filtrations**								
Servo valves			●	●	●				
Proportional Valves				●	●	●			
Variable displacement pumps.					●	●	●		
Cartridge valves						●	●	●	
Piston pumps						●	●	●	
Vane pumps							●	●	●
Pressure - flow rate control valves							●	●	●
Solenoid valves							●	●	●
ISO code	12/10/7	13/11/8	14/12/9	15/13/10	16/14/11	17/15/12	18/16/13	19/17/14	20/18/15
NAS code	1	2	3	4	5	6	7	8	9
Absolute filtration recommended	$\beta_{<4©} \geq 1000$	$\beta_{5©} \geq 1000$			$\beta_{7©} \geq 1000$		$\beta_{10©} \geq 1000$	$\beta_{15©} \geq 1000$	$\beta_{20©} \geq 1000$

Correct sizing of the filter must be based on a variable pressure drop depending on the application:

• return filter	Δp from 0,4 to 0,6 bar
• filter on lubrication lines	Δp from 0,3 to 0,5 bar
• off-line fluid power plants	Δp from 0,3 to 0,4 bar
• off-line filter test benches	Δp from 0,1 to 0,3 bar
• over-boost filte	Δp from 0,4 to 0,6 bar

The pressure drop calculation is performed by adding together the value for the housing and the value for the filter element. The pressure drop in the housing is proportional to the fluid density kg/dm³; all the graphs in the catalogue are referred to mineral oil with density of 0,86 kg/dm³.
The filter element pressure drop value is proportional to viscosity mm²/s, the Y values in the catalogue are referred to viscosity of 30 mm²/s.

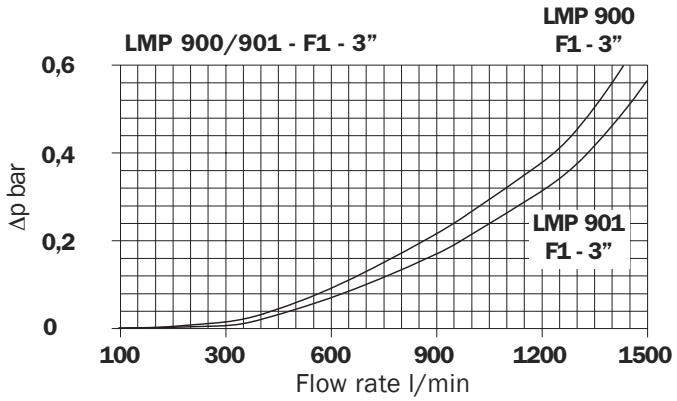
Number of working cartridges installed in LMP manifold - LMD filters

LMD 400-401 (length 4)	2 cartridges CU 400 4
LMD 400-401 (length 5)	2 cartridges CU 400 5
LMD 400-401 (length 6)	2 cartridges CU 400 6
LMD 431 (length 5)	2 cartridges CU 400 5
LMD 431 (length 6)	2 cartridges CU 400 6
LMP 900 2	2 cartridges CU 900
LMP 902 2	4 cartridges CU 900
LMP 903 2	6 cartridges CU 900
LMP 952 3	2 cartridges CU 950 3
LMP 953 3	3 cartridges CU 950 3
LMP 954 3	4 cartridges CU 950 3
LMD 951 3	2 cartridges CU 950 3

Filter housings Δp pressure drop

The curves are plotted utilising mineral oil with density of 0.86 kg/dm³ to ISO 3968.

Δp varies proportionally with density.



For Y values see next page:

Sizing data for single cartridge, head at top

Δp Tot.
Δpc Filter housing
Δpe Filter element
Y Multiplication factor (see page 196)
Q l/min = flow rate
V1 = reference viscosity 30 mm²/s (cSt)
V2 = operating viscosity in mm²/s (cSt)
Δp Tot. = Δpc + Δpe
Δpe = Y : 1000 x Q x (V2/V1)

Calculation example with HLP Mineral Oil Variation in viscosity

Data:
Filter with in-line connections
Pressure = 15 bar
Flow rate = 700 l/min
Viscosity = 46 mm²/s (cSt)
Density = 0,86 Kg/dm³
Filtration = 10 μm absolute
With bypass valve

Filter type - LMP 900 1 (see housings pressure drop graphs on page 230)

Practical example

Q = 700 l/min
V_2 = 46 mm²/s (cSt)
Pmax = 15 bar
Filtration = 10 μm absolute
Δp Tot. max = **0,6 bar** (max. recommended value)
Filter element series N, Δp max 20 bar
Δpc = 0,13 bar (* see diagram)
Δpe = (0,3166 : 1000) x 700 x (46/30) = 0,34 bar
Δp Tot. = 0,13 + 0,34 = 0,47 bar

Sized filter type:
LMP 900 1 B A F1 A10 N P01

Calculation examples with HFD fluid Variations in viscosity and density

Data:
Filter with in-line connections
Pressure = 15 bar
Flow rate = 700 l/min
Viscosity = 46 mm²/s (cSt)
Density = 1,1 Kg/dm³
Filtration = 10 μm absolute
With bypass valve

Filter type - LMP 900 1 (see housings pressure drop graphs on page 230)

Practical example

Q = 700 l/min
V_2 = 46 mm²/s (cSt)
Pmax = 15 bar
Filtration = 10 μm absolute
Δp Tot. max = **0,6 bar** (max. recommended value)
Filter element series N, Δp max 20 bar
Δpc = 0,13 x (1,1/0,86)= 0,17
Δpe = (0,3166 : 1000) x 700 x (46/30) = 0,34 bar
Δp Tot. = 0,17 + 0,34 = 0,51 bar

Filter type:
LMP 900 1 B V F1 A10 N P01

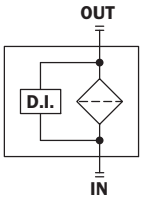
Multiplication factor “Y” for definition of the pressure drop of filter elements.

Reference viscosity 30 mm²/s

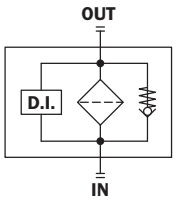
Filter Element		Absolute Filtration N - W Series					Nominal Filtration N Series		Nominal Filtration N Series
Type		**A 0 3**	**A 0 6**	**A 1 0**	**A 1 6**	**A 2 5**	**P 1 0**	**P 2 5**	**M 2 5**
CU 110	1	16,25	15,16	8,754	8,142	5,875	2,862	2,651	0,1431
	2	12,62	10,44	6,111	6,024	4,155	1,598	1,486	0,1253
	3	8,571	7,951	5,066	4,066	2,397	1,242	1,153	0,1067
	4	5,759	4,051	2,798	2,358	1,142	0,9072	0,8491	0,0558
CU 210	1	5,3	4,8	2,0	1,66	1,32	0,56	0,43	0,12
	2	3,44	2,95	1,24	1,09	0,7	0,42	0,35	0,09
	3	2,4	1,7	0,94	0,84	0,54	0,33	0,23	0,05
DN	016	7,95	7,20	3,00	2,49	1,98	0,84	0,65	0,18
	025	5,00	4,53	1,89	1,57	1,25	0,53	0,41	0,11
	040	3,13	2,66	1,12	0,98	0,63	0,38	0,32	0,08
CU 400	2	3,133	2,550	1,457	1,225	0,780	0,750	0,640	0,192
	3	2,150	1,700	0,940	0,781	0,500	0,400	0,340	0,102
	4	1,600	1,285	0,709	0,615	0,400	0,340	0,270	0,084
	5	1,000	0,833	0,475	0,340	0,200	0,240	0,190	0,057
	6	0,822	0,580	0,300	0,267	0,175	0,220	0,177	0,053
CU 900	1	0,860	0,6333	0,3166	0,300	0,2142	-	-	0,050
CU 950	2	1,030	0,8	0,5875	0,4	0,2571	-	-	0,050
	3	0,443	0,4	0,2625	0,1833	0,152			0,020

Filter Element		Absolute Filtration					Nominal Filtration N Series		Nominal Filtration N Series
Type		**A 0 3**	**A 0 6**	**A 1 0**	**A 1 6**	**A 2 5**	**P 1 0**	**P 2 5**	**M 2 5**
MR 630	7	0,888	0,780	0,360	0,336	0,156	0,121	0,960	0,468

Style **S**

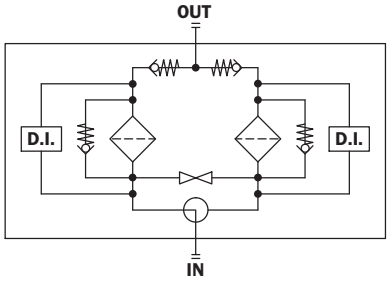


Style **B**

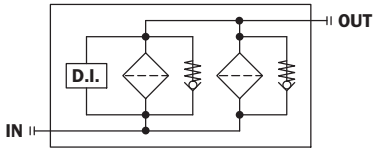


Filter series	Hydraulic symbols Style S	Style B
LMP 110-120	●	●
LMP 210-211	●	●
LDP	●	●
LMP 400	●	●
LMP 900	●	●
LMP 950	●	●

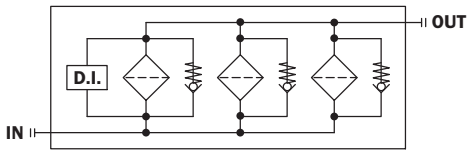
Style - Double filter
LMD 400 - 401 - 431 - 951



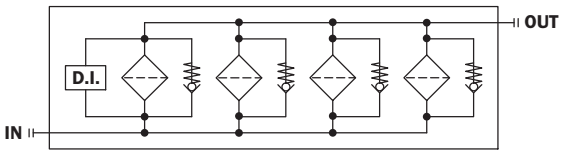
Style - Mounting on manifold
LMP 902 - 952



Style - Mounting on manifold
LMP 903 - 953



Style - Mounting on manifold
LMP 954



Compatibility (to ISO 2943)

- * Housings compatible with:
  Mineral oils, synthetic fluids.
- * The filter elements are compatible with:
  Mineral oils, synthetic fluids.
- NBR seals series A, compatible with:
  Mineral oils, synthetic fluids, aqueous emulsions and water and glycol.
- FPM seals series V, compatible with:
  Mineral oils, synthetic fluids aqueous emulsions, water and glycol.

* Compatibility with aqueous emulsions, water and glycol see ordering code.

Oil velocity

Recommended maximum flow rate

Recommended maximum flow rate for filters installed on lubrication lines, return or in-line filters is defined by the maximum oil velocity in the connections.
For filters mounted on Off-Line lines the maximum recommended flow rate is defined by the pressure drop of the filter element.

Filter for pressurised lubrication, max. oil velocity 2,5 m/sec.
Return or in-line filter, max oil velocity 5 m/sec.

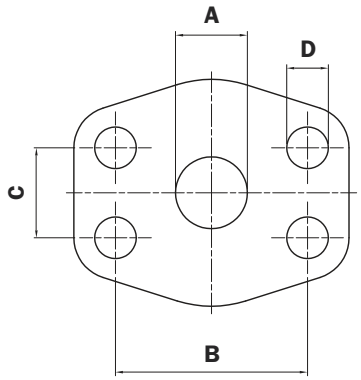
		Connections							
Filter	**Oil velocity**	**3/4”**	**1”**	**1 1/4”**	**1 1/2”**	**2”**	**2 1/2”**	**3”**	**4”**
LMP 110	2,5 m/sec.	48	74	-	-	-	-	-	-
	5 m/sec.	95	148	-	-	-	-	-	-
LMP 210-211	2,5 m/sec.	-	74	121	188	-	-	-	-
	5 m/sec.	-	148	245	380	-	-	-	-
LMP 400	2,5 m/sec.	-	-	-	188	295	500	-	-
	5 m/sec.	-	-	-	380	600	980	-	-
LMP 900	2,5 m/sec.	-	-	-	-	-	-	755	1180
	5 m/sec.	-	-	-	-	-	-	1535	2400
LMP 950	2,5 m/sec.	-	-	-	-	-	-	755	1180
	5 m/sec.	-	-	-	-	-	-	1535	2400

Flow rate l/min

Connection to 3000 psi SAE flange

Dimension	1" SAE 3000 PSI **M**	1" SAE 3000 PSI **UNC**	1 1/4" SAE 3000 PSI **M**	1 1/4" SAE 3000 PSI **UNC**	1 1/2" SAE 3000 PSI **M**	1 1/2" SAE 3000 PSI **UNC**
A	25	25	32	32	38	38
B	52,4	52,4	58,7	58,7	70	70
C	26,2	26,2	30,2	30,2	35,7	35,7
D	M10	3/8" UNC	M10	7/16"UNC	M12	1/2" UNC

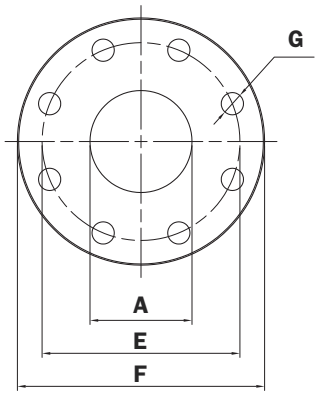
FLANGE SAE 3000 PSI



Connection to 3000 psi SAE flange

Dimension	2" SAE 3000 PSI **M**	2" SAE 3000 PSI **UNC**	2 1/2" SAE 3000 PSI **M**	2 1/2" SAE 3000 PSI **UNC**	3" SAE 3000 PSI **M**	3" SAE 3000 PSI **UNC**	4" SAE 3000 PSI **M**	4" SAE 3000 PSI **UNC**
A	51	51	63	63	73	73	99	99
B	77,8	77,8	88,9	88,9	106,4	106,4	130,2	130,2
C	42,9	42,9	50,8	50,8	62	62	77,8	77,8
D	M12	1/2" UNC	M12	1/2" UNC	M16	5/8" UNC	M16	5/8" UNC

FLANGE DN 100 PN 10/16



Connection Flange IN-OUT	DN 80 PN 16	DN 100 PN 16
A	73	99
E	160	180
F	200	220
G	18	18

SAE flange connections available on In-Line filters

Filter Type	Connections: SAE 3000 psi 1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"	DN 80 PN 16	DN 100 PN 16
LMP 210	X	X	X						
LMP 400-1				X	X				
LMP 430-1				X	X				
LMP 400-1-31					X				
LMP 900-1						X	X		
LMP 902-3							X		
LMP 950-1						X	X		
LMP 952-3-4-5-6							X		
LMD 951 1-2-3						X	X	X	X