LF/LFM - Low Pressure High Flow Assemblies

LF flow rate to 560 lpm, 150 gpm / LFM flow rate to 16875 lpm, 4500 gpm

APPLICATIONS

- Hydraulic and Lubrication oil
- Fuel and Fuel oil
- Rolling mill oil
- Processing liquids
- Bulk oil handling - Transfer and clean up
- Off-line systems and flushing
- Power generation
- Primary metals
- Mobile flushing systems
- Particulate and water removal
- Transfer line machining coolants
- Large gearbox filtration
- High flow Return-line filtration

PRODUCT SPECIFICATIONS & FEATURES

Max Flow Rate Visc: 150 SUS, 32 cSt	**Recommended Series**
100 gpm (375 lpm)	LF Single length
150 gpm (560 lpm)	LF Double length
300 gpm (1125 lpm)	2 x LF Double parallel mount
4500 gpm (16875 lpm)	LFM multiple element series (call for sizing assistance)
Operating Pressure	**Standard 150 psi (10 bar)**
	Available up to 3000 psi (212 bar)
Pressure Indicators	
Up to 250 psi Operating	Two visual pressure gages or differential indicator available
450 psi and higher	Differential pressure Indicator required
Maximum Temperature	**Standard 250 F**
	Call for high temperature specs

ASME U & UM CODE REQUIREMENTS

Standard vessels are manufactured to ASME code standards, but not certified. ASME U and UM code certification is available as an option. See table 9 under the Filter Assembly part number guide on page 2 for ordering detail. Please call for price adders when specifying Code certification.

- Carbon steel construction standard (304 & 316 stainless available).
- Duplexing option available for continuous filtration during filter element change-out.
- HP106 and HP107 element series have integral bypass valve (new bypass every time element is changed avoids bypass failure).
- Pressure gages are supplied standard for housings up to 250 psi operating (differential indicator is available). Differential pressure indicator is supplied standard for housings with operating pressure 450 psi and higher.
- Easy to service swing-lid design with eye nuts assures no lost hardware, hydraulic lift option available.
- Marine grade epoxy exterior finish for non-stainless steel assemblies
- Accepts coreless design with positive o-ring seals or industry standard 6 x 18 and 6 x 36 with gasket seals.
- Vent/bleed port standard in housing cover.
- 2" drain and cleanout port allows for quick draining and easy access for sump cleanout.
- Hy-Pro Dualglass filter element media technology validated per ISO16889 multipass and DFE (modified ISO16889) industry leading multipass testing.

HIGH PERFORMANCE FILTER ELEMENTS - THE HEART OF A FILTER

Dynamic Filter Efficiency (DFE) Testing

Revolutionary test methods assure that DFE rated elements perform true to rating even under demanding variable flow and vibration conditions. Today's industrial and mobile hydraulic circuits require elements that deliver specified cleanliness under ALL circumstances. Wire mesh supports the media to ensure against cyclical flow fatigue, temperature, and chemical resistance failures possible in filter elements with synthetic support mesh. Contact your distributor or Hy-Pro for more information and published articles on DFE testing.

Media Options

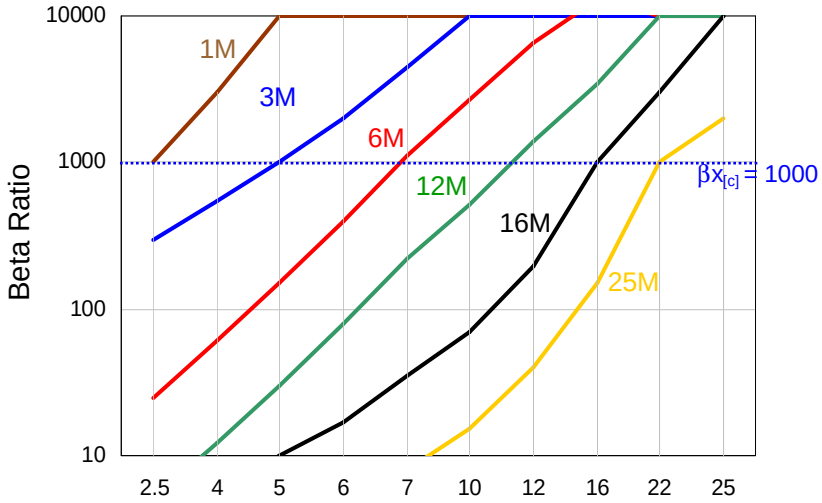
Through extensive testing we have developed media choices to handle any application. Options include G8 Dualglass, Dynafuzz (stainless fiber), and Wire mesh (stainless).

Fluid Compatibility

Petroleum based fluids, water glycol, polyol ester, phosphate ester, high water based fluids and many other synthetics. Contact us for seal material selection assistance.

FILTER MEDIA SPECIFICATIONS

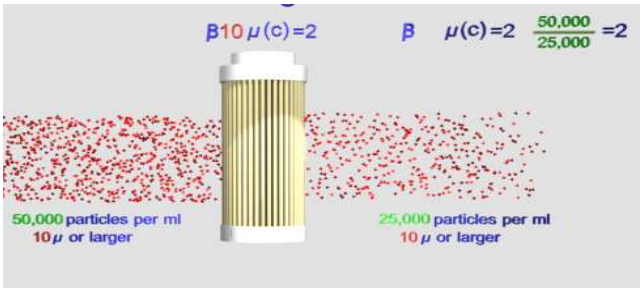
Glass Media Code Filtration Efficiency (Beta Ratio) vs Micron Size



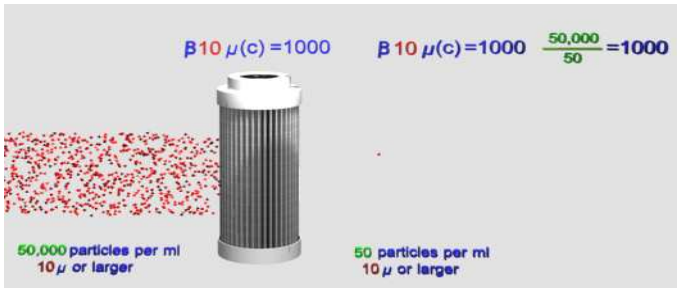
Micron size $\mu m_{[c]}$ (per ISO16889)

media code	media description
A	G8 Dualglass high performance media combined with water removal scrim. $\beta x_{[c]} = 1000$ ($\beta x = 200$)
M	G8 Dualglass our latest generation of DFE rated, high performance glass media for all hydraulic & lubrication fluids. $\beta x_{[c]} = 1000$ ($\beta x = 200$)
W	Stainless steel wire mesh media $\beta x_{[c]} = 2$ ($\beta x = 2$) nominally rated

Typical cellulose media performance



Hy-Pro G8 Dualglass media performance



FILTER ELEMENT PERFORMANCE DATA

Elements Tested to ISO quality standards

ISO 2941	Collapse and burst resistance
ISO 2942	Fabrication and Integrity test
ISO 2948	Material compatibility with fluids
ISO 3724	Flow fatigue characteristics
ISO 3968	Pressure drop vs. flow rate
ISO 16889	Multi-pass performance testing

Coreless Filter Element Technology

Hy-Pro coreless elements are featured in the FCL series. The elements are oversized to yield extended element life and handle a wide variety of high viscosity oils. Hy-Pro coreless elements utilize wire mesh pleat support which ensures that the pleats won't collapse or lose integrity.

DIFFERENTIAL PRESSURE GAGES

Differential Pressure Gauges + Switches

Differential pressure gauges with green to red display ensures proper monitoring of filter element condition. DIN connector switch can be added to any pressure gauge.

Available with terminal differential settings, visual green to red and alarm switch, at 22 psid (1.56 bar) and 45psid (3.19 bar).

Sampling Port Isolation Valves Standard

Sample port valves are located on inlet and outlet connections to which many different types of sampling connectors.

LF, LFM FILTER ASSEMBLY SELECTION AND SIZING GUIDELINES

Effective filter sizing requires consideration of flow rate, viscosity (operating and cold start), fluid type and degree of filtration. When properly sized, bypass during cold start can be avoided/minimized and optimum element efficiency and life achieved. The filter assembly differential pressure values provided for sizing differ for each media code, and assume 150 SSU (32Cts) viscosity and 0.86 fluid specific gravity. Use the following steps to identify the correct high pressure filter assembly.

1. Calculate Δp coefficient at both operating and cold start viscosity:

$$\Delta p \text{ Coefficient} = \frac{\text{Actual Operating Viscosity (SSU)}}{150} \times \frac{\text{Actual S.G.}}{0.86}$$

2. Calculate actual clean filter assembly Δp at both operating and cold start viscosity:

Actual assembly clean Δp = Flow rate x Δp Coefficient x Assembly Δp factor (from sizing table)

3. Sizing Recommendations to optimize performance and permit future flexibility:

- To avoid or minimize bypass during cold start the actual assembly clean Δp calculation should be repeated for start-up conditions if cold starts are frequent.
- Actual assembly clean Δp should not exceed 5 psid at normal operating viscosity.
- If suitable assembly size is approaching the upper limit of the recommended flow rate at the desired degree of filtration consider increasing the assembly to the next larger size if a finer degree of filtration might be preferred in the future. This practice allows the future flexibility to enhance fluid cleanliness without compromising clean Δp or filter element life.
- Once a suitable filter assembly size is determined consider increasing the assembly to the next larger size to optimize filter element life and avoid bypass during cold start.
- When using water glycol or other specified synthetics we recommend increasing the filter assembly by 1~2 sizes.
- High viscosity fluid (ie gear lube ISO 220) will typically display very high viscosity as the temperature drops below 100f. For such applications avoiding bypass during start-up might not be possible.

LF Single Element Assembly (housing + element) Differential Pressure Factors

Media code	Port size	L36, 39 Max flow gpm (lpm)	Length code	Δp factor* (psid/gpm)	Δp factor* (bar/lpm)	Length code	Δp factor* (psid/gpm)	Δp factor* (bar/lpm)
1M	2" Flange, NPT	100 (375)	16,18	0.059	0.00113	36,39	0.047	0.00090
3M		150 (560)		0.050	0.00096		0.042	0.00081
6M		150 (560)		0.048	0.00092		0.041	0.00079
10M		150 (560)		0.046	0.00087		0.040	0.00077
16M		200 (750)		0.043	0.00082		0.038	0.00073
25M		200 (750)		0.040	0.00077		0.037	0.00071
**W		300 (1125)		0.037	0.00071		0.035	0.00067
1M	3" Flange, NPT	150 (560)	16,18	0.047	0.00078	36,39	0.034	0.00065
3M		200 (750)		0.038	0.00073		0.030	0.00058
6M		200 (750)		0.036	0.00069		0.029	0.00055
10M		250 (935)		0.034	0.00066		0.028	0.00053
16M		300 (1125)		0.031	0.00060		0.026	0.00050
25M		300 (1125)		0.028	0.00054		0.024	0.00046
**W		300 (1125)		0.025	0.00048		0.022	0.00042

*Max flow rate and Δp factor assumes υ = 150 sus, 32 Centistokes. See Δp viscosity conversion formula for viscosity

LFM3 Multi-Element Assembly (housing + element) Differential Pressure Factors

Media code	Length code	Max flow gpm (lpm)	Port size	Δp factor* (psid/gpm)	Δp factor* (bar/lpm)
1M	36, 39	600 (2250)	4" Flange	0.0081	0.000154
3M		800 (3000)		0.0055	0.000105
6M		900 (3375)		0.0051	0.000098
10M		1300 (4875)		0.0045	0.000087
16M		1300 (4875)		0.0041	0.000079
25M		1500 (5625)		0.0035	0.000067
**W		1500 (5625)		0.0027	0.000052
1M	36, 39	600 (2250)	6" Flange	0.0075	0.000144
3M		800 (3000)		0.005	0.000096
6M		900 (3375)		0.0045	0.000087
10M		1300 (4875)		0.0039	0.000058
16M		1300 (4875)		0.0035	0.000067
25M		1500 (5625)		0.0029	0.000059
**W		1500 (5625)		0.0021	0.000041

*Max flow rate and Δp factor assumes υ = 150 sus, 32 Centistokes. See Δp viscosity conversion formula for viscosity

LFM4 Multi-Element Assembly (housing + element) Differential Pressure Factors

Media code	Length code	Max flow gpm (lpm)	Port size	Δp factor* (psid/gpm)	Δp factor* (bar/lpm)
1M	36, 39	600 (2250)	4" Flange	0.0067	0.000129
3M		800 (3000)		0.0048	0.000092
6M		1000 (3750)		0.0044	0.000084
10M		1300 (4500)		0.0040	0.000077
16M		1400 (5250)		0.0037	0.000071
25M		1500 (6560)		0.0032	0.000061
**W		1500 (5625)		0.0025	0.000048
1M	36, 39	600 (2250)	6" Flange	0.0062	0.000119
3M		800 (3000)		0.0043	0.000083
6M		900 (3375)		0.0039	0.000075
10M		1300 (4875)		0.0034	0.000065
16M		1300 (4875)		0.0031	0.000059
25M		1500 (5625)		0.0026	0.000050
**W		1500 (5625)		0.00207	0.000038

*Max flow rate and Δp factor assumes υ = 150 sus, 32 Centistokes. See Δp viscosity conversion formula for viscosity

LF FILTER ASSEMBLY PART NUMBER GUIDE

	table 1	table 2	table 3	table 4	table 5	table 6	table 7	table 8	table 9	table 10
LF				-	-	-				

FILTER ELEMENT PART NUMBER GUIDE

	table 4	table 5	table 6	table 7
HP10		L	-	

table 1 code	Elements per vessel
omit	1 element
M3	3 elements
M4	4 elements
M9	9 elements
M14	14 elements
M22	22 elements

table 2 code	Materials
omit	Epoxy coated steel
S	304 Stainless steel

table 3 code	Connections
B2*	2" BSPP
B3*	3" BSPP
B4*	4" BSPP
C2	2" SAE Code-61 Flange
C3	3" SAE Code-61 Flange
D2	DN50 DIN 2633 Flange
D3	DN65 DIN 2633 Flange
D4	DN100 DIN 2633 Flange
D5	DN125 DIN 2633 Flange
D6	DN150 DIN 2633 Flange
D8	DN200 DIN 2633 Flange
D10	DN250 DIN 2633 Flange
F2	2" ANSI Flange
F3	3" ANSI Flange
F4	4" ANSI Flange
F6	6" ANSI Flange
F8	8" ANSI Flange
F10	10" ANSI Flange
F12	12" ANSI Flange
N2	NPT 2"
N3	NPT 3"
N4	NPT 4"

*BSPP, DIN Flanges, and Vitolic connections options are subject to longer delivery time.

table 4 code	Element Configuration
1	HP101 series 6" OD x 2.6" ID, gasket seals. Recommended change-out 25 psid (1,8 bar), Max 45 psid (3,2 bar)
5	HP105 coreless series, positive o-ring seals. Recommended change-out 45 psid (3,2 bar)
6	HP106 element with bypass, 25 psid (1,8 bar) bypass, orings change-out 22 psid (1,5 bar)
7	HP107 element with bypass 50 psid (3,5 bar) bypass, orings change-out 45 psid (3,2 bar)
8	USE HP8314 for element P/N Interchanges with Pall HC8314, **NO BYPASS,** oring seals, max change-out 45 psid (3,2 bar)

table 5 code	Element length
18	Single (LF single element vessel only), element codes 1,5,6,7 only
36	Double, element code 1,5,6,7
39	Double, element 8 (HP8314)

table 6 code	Filtration rating
1M	β2.5[c] = 1000 (B1 = 200)
3M	β5[c] = 1000 (B3 = 200)
6M	β7[c] = 1000 (B6 = 200)
6A	β7[c] = 1000 + water removal
10M	β12[c] = 1000 (B12 = 200)
10A	β12[c] = 1000 + water removal
16M	β17[c] = 1000 (B17 = 200)
16A	β17[c] = 1000 + water removal
25M	β22[c] = 1000 (B25 = 200)
25A	β22[c] = 1000 + water removal
25W	25u nominal wire mesh
40M,W	β35[c] = 1000 (B40 = 200) or 40u nominal wire mesh
74W	74u nominal wire mesh
149W	149u nominal wire mesh
250W	250u nominal wire mesh

table 7 code	Seals
B	Buna (Nitrile)
E-WS	EPR (Skydrol fluid apps)
V	Viton (Fluoro)

table 8 code	Indicator
X	None (ported, plugged)
P	Two pressure gages
D	22 psid visual Δp gage, + electric alarm (120V AC)
E	22 psid visual Δp gage
F	45 psid visual Δp gage, + electric alarm (120V AC)
G	45 psid visual Δp gage

table 9 code	ASME code (Not required)
omit	No Code (Standard)
U	U code
M	UM code

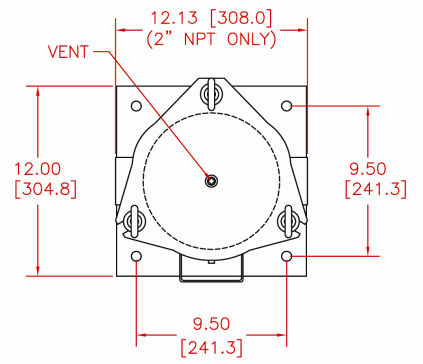
table 10 code	Max Operating Pressure
omit	150 psi (standard)
V	250 psi, 17 bar max
W*	450 psi, 30 bar max
X*	1000 psi, 66 bar max

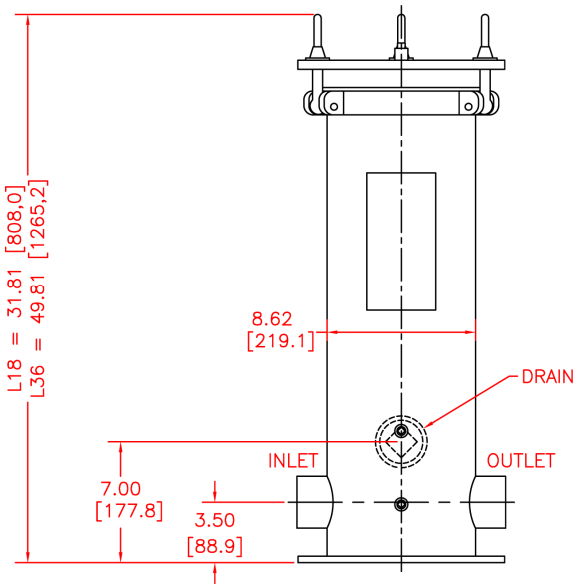
*Slip and blind flange bolt arrangement dimensions change from standard (9 bolts)

LF - 150 PSI (10 BAR) only

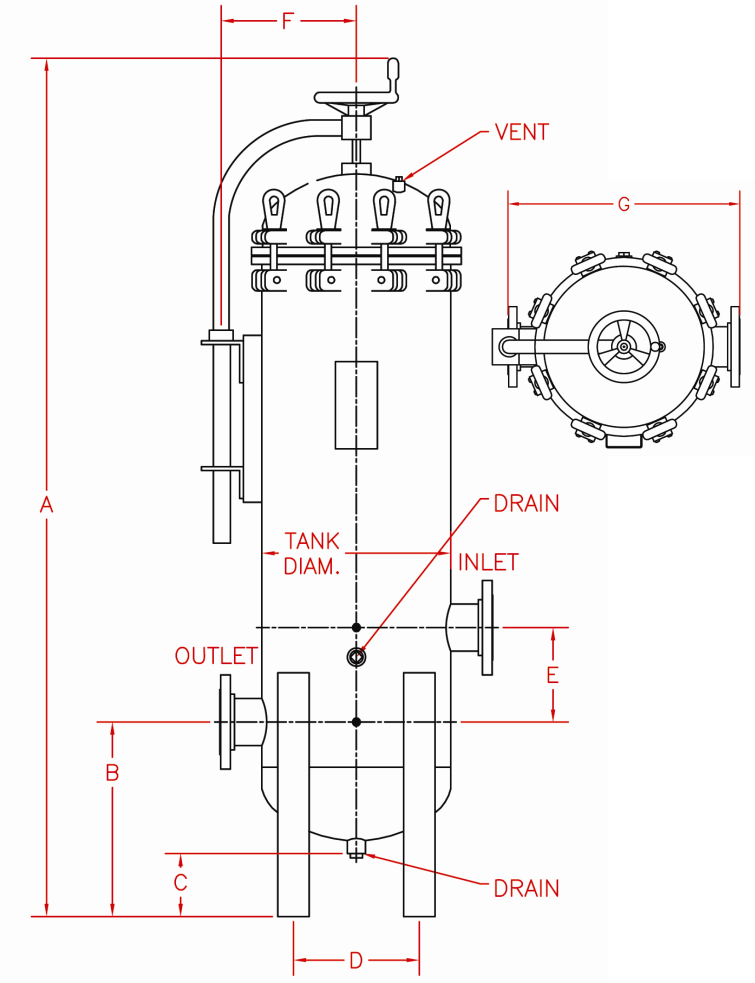
250 PSI (17 BAR), 450 PSI (30 BAR)
installation drawings next page

Length code	Weight Lb (Kg)
18	114 (52)
36	140 (64)





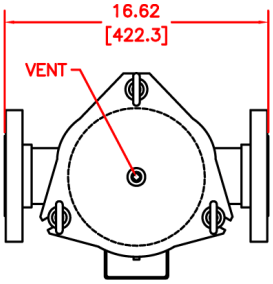
LFM* - up to 450 PSI (30 BAR)

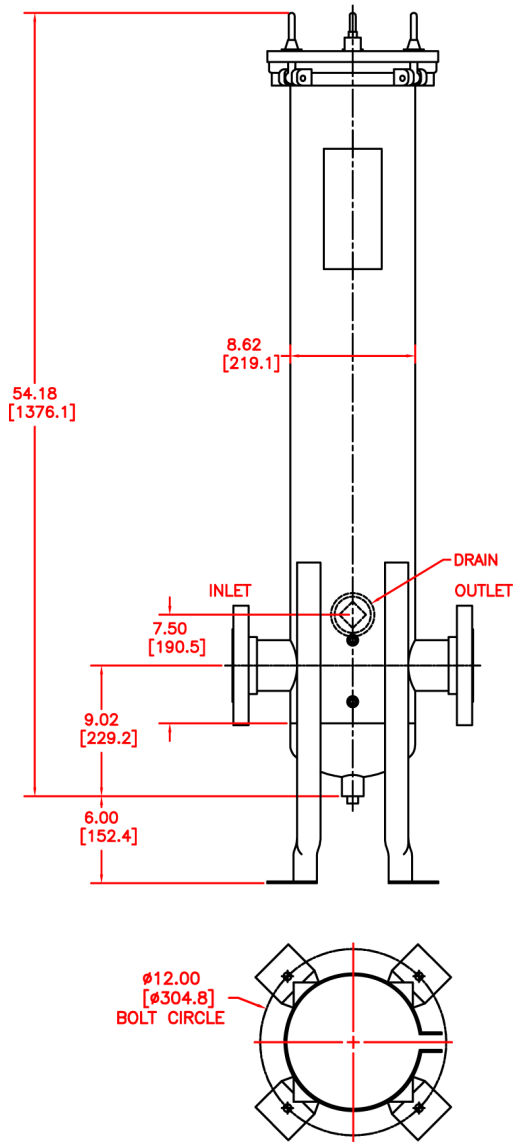


Series	Element Qty.	Tank Diam.	Port Sizes	Est. Weight	A	B	C	D*	E	F	G*
LFM3	3	16 [406,4]	2	485 Lbs 220 Kg	81.9 [2079,6]	18.5 [470,8]	6.0 [152,4]	10.0 [254,0]	9.0 [228,6]	11.9 [301,8]	24.0 [609,6]
			3		81.9 [2079,6]	18.5 [470,8]	6.0 [152,4]	10.0 [254,0]	9.0 [228,6]	11.9 [301,8]	24.0 [609,6]
			4		81.9 [2079,6]	18.5 [470,8]	6.0 [152,4]	10.0 [254,0]	9.0 [228,6]	11.9 [301,8]	24.0 [609,6]
LFM4	4	18 [457,2]	2	550 Lbs 250 Kg	81.9 [2079,6]	18.5 [470,8]	6.0 [152,4]	12.0 [304,8]	9.0 [228,6]	12.9 [327,2]	26.0 [660,4]
			3		81.9 [2079,6]	18.5 [470,8]	6.0 [152,4]	12.0 [304,8]	9.0 [228,6]	12.9 [327,2]	26.0 [660,4]
			4		81.9 [2079,6]	18.5 [470,8]	6.0 [152,4]	12.0 [304,8]	9.0 [228,6]	12.9 [327,2]	26.0 [660,4]
LFM9	9	24 [609,6]	3	645 Lbs 293 Kg	81.9 [2079,6]	18.5 [470,8]	6.0 [152,4]	18.0 [457,2]	9.0 [228,6]	15.9 [403,4]	32.0 [812,8]
			4		81.9 [2079,6]	18.5 [470,8]	6.0 [152,4]	18.0 [457,2]	9.0 [228,6]	15.9 [403,4]	32.0 [812,8]
			6		81.9 [2079,6]	18.5 [470,8]	6.0 [152,4]	18.0 [457,2]	9.0 [228,6]	15.9 [403,4]	32.0 [812,8]
LFM14	14	30 [762]	3	710 Lbs 323 Kg	81.9 [2079,6]	18.5 [470,8]	6.0 [152,4]	24.0 [609,6]	9.0 [228,6]	18.9 [479,6]	38.0 [965,2]
			4		81.9 [2079,6]	18.5 [470,8]	6.0 [152,4]	24.0 [609,6]	9.0 [228,6]	18.9 [479,6]	38.0 [965,2]
			6		81.9 [2079,6]	18.5 [470,8]	6.0 [152,4]	24.0 [609,6]	9.0 [228,6]	18.9 [479,6]	38.0 [965,2]
LFM22	22	36 [914,4]	4	900 Lbs 410 Kg	81.9 [2079,6]	24.5 [623,2]	6.0 [152,4]	30.0 [762,0]	15.0 [381,0]	21.9 [555,8]	44.0 [1117,6]
			6		81.9 [2079,6]	24.5 [623,2]	6.0 [152,4]	30.0 [762,0]	15.0 [381,0]	21.9 [555,8]	44.0 [1117,6]
			8		81.9 [2079,6]	24.5 [623,2]	6.0 [152,4]	30.0 [762,0]	15.0 [381,0]	21.9 [555,8]	44.0 [1117,6]
LFM31	31	42 [1067]	6	2080 Lbs 945 Kg	81.9 [2079,6]	24.5 [623,2]	6.0 [152,4]	36.0 [914,4]	15.0 [381,0]	24.9 [632,0]	50.0 [1270,0]
			8		81.9 [2079,6]	24.5 [623,2]	6.0 [152,4]	36.0 [914,4]	15.0 [381,0]	24.9 [632,0]	50.0 [1270,0]
			10		81.9 [2079,6]	24.5 [623,2]	6.0 [152,4]	36.0 [914,4]	15.0 [381,0]	24.9 [632,0]	50.0 [1270,0]
LFM38	38	48 [1219]	8	2450 Lbs 1115 Kg	81.9 [2079,6]	24.5 [623,2]	6.0 [152,4]	42.0 [1066,8]	15.0 [381,0]	27.9 [708,2]	56.0 [1422,4]
			10		81.9 [2079,6]	24.5 [623,2]	6.0 [152,4]	42.0 [1066,8]	15.0 [381,0]	27.9 [708,2]	56.0 [1422,4]
			12		81.9 [2079,6]	24.5 [623,2]	6.0 [152,4]	42.0 [1066,8]	15.0 [381,0]	27.9 [708,2]	56.0 [1422,4]

LF - 250 PSI (17 BAR)

Length code	Weight Lb (Kg)
18	138 (62)
36	163 (74)





LF - 450 PSI (30 BAR)

Length code	Weight Lb (Kg)
18	195 (89)
36	230 (104)