



Side Load for Bimba Flat-I® Series Cylinders

1.0 Side Load Chart

As a supplement to our Flat catalog, this service bulletin gives the relationship between side load and stroke length for each bore size. With the chart included, one can also size a cylinder based on the desired side load. As a guideline, the side load of a cylinder increases as the bore size increases and the stroke length decreases.

To find the maximum recommended side load, the parameters needed are:

- o Style (FO, FOD, ...)
- o Bore size (02, 04,...)
- o Stroke length
- o Extra extension (EE)

To size the cylinder based on the side load consideration, the parameters needed are:

- o Side load
- o Stroke length

2.0 The Relationship Between Stroke Length & Extra Extension

Stroke length and extra extension (EE) have a unique relationship in term of side load. Example:

- o Maximum side load for FO-025 = Maximum side load for FO-023-EE2
- o Maximum side load for FO-1258 = Maximum side load for FO-1254-EE4
- o And so on

With the above example we can use the chart attached to determined all of the recommended side load for all FLAT-I® series cylinder.

Example:

Question: What is the side load for FO-704-EE2 ?

Answer: Since we know the side load for FO-704-EE2 = FO-706

So all we need to do is to look at the chart (Figure 3) and look for:

Bore size = 70

Stroke length = 6 in.

And, we get the maximum recommended side load of about 1.4 lbs.

Conversion factor: 1 kg = 2.2 lbs; 1 in. = 25.4 mm

3.0 Recommendation for a higher side load application

There are several ways to increase side load capabilities within Flat-I® products. The two common methods are to include magnetic (-M) option (Ref. Figure 4) or to change the series to FOD & FSD style cylinder (Ref. Table 1).

FOD & FSD Maximum Side Load (lbs)			FOD & FSD Maximum Side Load (lbs) With Magnet Option		
	Stroke Length			Stroke Length	
Bore	.25 in.	16 in.	Bore	.25 in.	16 in.
02	0.47	0.48	02	0.68	0.49
04	0.59	0.60	04	0.85	0.61
09	1.89	1.79	09	2.56	1.83
17	2.26	2.18	17	3.09	2.24
31	3.00	2.87	31	4.05	2.94
50	4.48	4.17	50	5.84	4.28
70	5.49	5.13	70	7.14	5.26
125	7.28	6.56	125	9.12	6.73

Table 1. Side load for FOD & FSD with and without magnetic option

As shown in Table 1, for a given bore, the side load capability decreases by a small amount from 0.25" to 16" of stroke. These are because the load is supported and spread out further by the bearing in the end caps, making FOD & FSD better alternatives for a higher side load application.

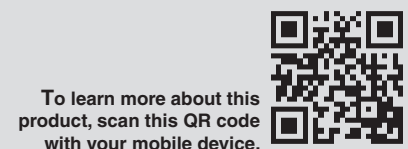
4.0 Recommendation for a long life cylinder design

One of the criteria for a long life cylinder design is not to over side-load the cylinder. Table 1, Figure 3 & 4 show us the maximum recommended side load for a vertical application (Figure 1). For a horizontal application (Figure 2), we need to take into consideration the rod weight (Table 2).

The information presented is in Bimba's best engineering opinion and should be used for reference only. Recommendations derived should be verified under actual operating conditions. Bimba reserves the right to change specifications without prior notice.

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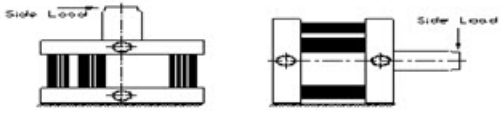


Figure 1. Vertical application

Figure 2. Horizontal application

The design guideline for the side load in horizontal application is:

Desire Side Load + Rod weight < Maximum recommended side load for vertical application (Figure 3 or 4)

Notes:

- The higher the side load of the cylinder, the higher the wear of the cylinder, making the life of the cylinder shorter.
- Stroke limitation for FOP product line is the total combined stroke length

	Rod Weight																
	Stroke (in.)																
Bore	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
02	0.00	0.01	0.02	0.02	0.03	0.04	0.05	0.05	0.06	0.07	0.07						
04	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.11						
09	0.02	0.05	0.07	0.10	0.13	0.16	0.19	0.22	0.25	0.27	0.30	0.33	0.36	0.39	0.42	0.44	0.47
17	0.03	0.07	0.12	0.16	0.21	0.25	0.29	0.34	0.38	0.43	0.47	0.52	0.56	0.61	0.65	0.69	0.74
31	0.07	0.13	0.20	0.26	0.32	0.39	0.45	0.52	0.58	0.64	0.71	0.77	0.84	0.90	0.96	1.03	1.09
50	0.08	0.15	0.21	0.28	0.34	0.40	0.47	0.53	0.60	0.66	0.72	0.79	0.85	0.92	0.98	1.04	1.11
70	0.09	0.15	0.22	0.28	0.34	0.41	0.47	0.54	0.60	0.66	0.73	0.79	0.86	0.92	0.98	1.05	1.11
125	0.19	0.31	0.42	0.53	0.65	0.76	0.87	0.99	1.10	1.22	1.33	1.44	1.56	1.67	1.78	1.90	2.01

Table 2. Rod Weight

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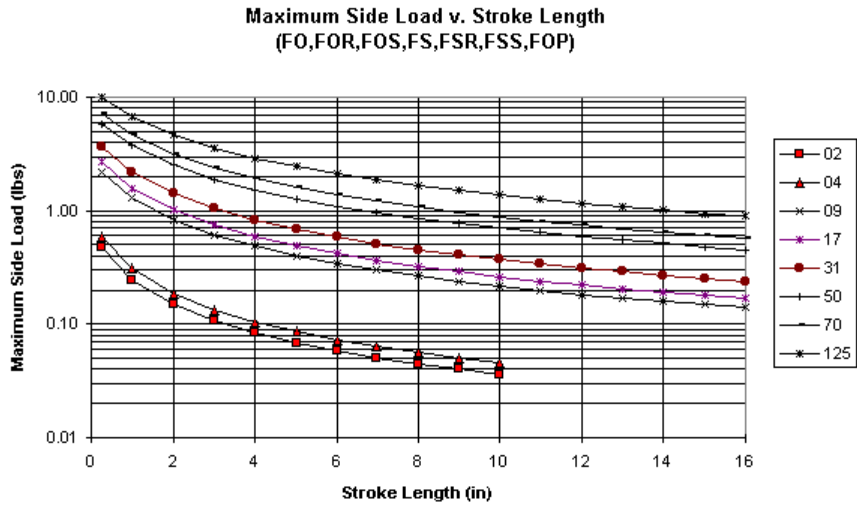


Figure 3. Flat-I® maximum side load on vertical application

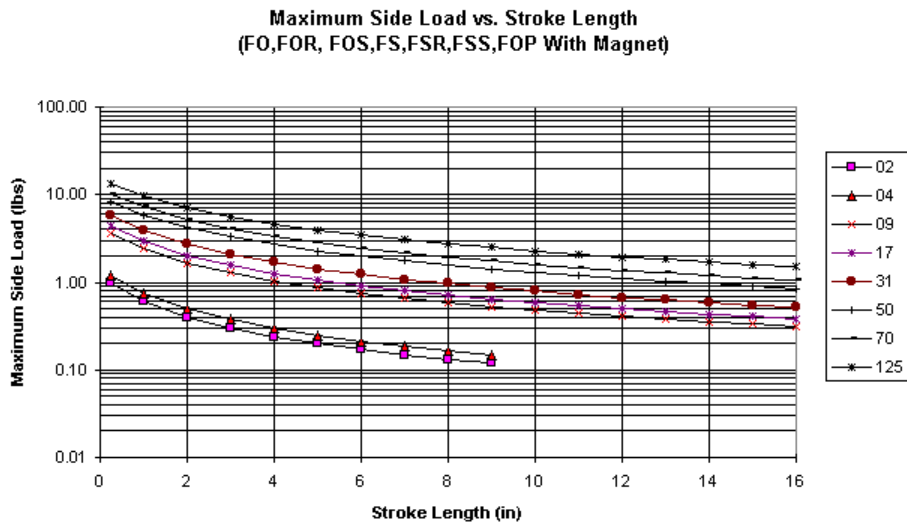


Figure 4. Flat-I® Maximum side load with magnetic option on a vertical application

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