

CALCULATION OF CYLINDER FORCES – METRIC BASED PRODUCTS

General Formula

The cylinder output forces are derived from the following formula:

$$F = \frac{P \times A}{10}$$

Where F = Force in N
P = Pressure at the cylinder in Bar
A = Effective area of cylinder piston in square mm.

Prior to selecting the cylinder bore size, properly size the piston rod for tension (pull) or compression (push) loading. (See the Piston Rod Selection Chart)

If the piston rod is in compression, use the 'Push Force' table below, as follows:

1. Identify the operating pressure closest to that required.
2. In the same column, identify the force required to move the load (always round up).
3. In the same row, look over to the cylinder bore required.

If the cylinder envelope dimensions are too large for the application, increase the operating pressure, if possible, & repeat the exercise.

If the piston rod is in tension, use the 'Deduction for Pull Force' table. The procedure is the same but due to the reduced area caused by the piston rod, the force available on the 'pull' stroke will be smaller. To determine the pull force:

1. Follow the procedure for 'push' force as described previously.
2. Using the 'Deduction for Pull Force' table, identify the force indicated according to the rod & pressure selected.
3. Deduct this from the original 'push' force. The resultant is the net force available to move the load.

If this force is not large enough, repeat the process & increase the system operating pressure or cylinder diameter if possible. For assistance, contact your JMC representative.

Deduction for Pull Force

Piston Rod Size (mm)	Piston Rod Area (mm ²)	Reduction in Force (N) at Various Pressures in Bar			
		1	5	7	10
4	13	1	6	9	13
6	28	3	14	20	28
8	50	5	25	35	50
10	79	8	39	55	79
12	113	11	57	79	113
16	201	20	101	141	201
20	314	31	157	220	314
25	491	49	245	344	491
32	804	80	402	563	804
40	1,257	126	628	880	1,257

Push Force

Cylinder Bore Size (mm)	Piston Area (mm ²)	Cylinder Push Force (N) at Various Pressures in Bar			
		1	5	7	10
6	28	3	14	20	28
8	50	5	25	35	50
10	79	8	39	55	79
12	113	11	57	79	113
14	154	15	77	108	154
16	201	20	101	141	201
20	314	31	157	220	314
25	491	49	245	344	491
32	804	80	402	563	804
40	1,257	126	628	880	1,257
50	1,963	196	982	1,374	1,963
63	3,117	312	1,559	2,182	3,117
80	5,027	503	2,513	3,519	5,027
100	7,854	785	3,927	5,498	7,854
125	12,272	1,227	6,136	8,590	12,272
160	20,106	2,011	10,053	14,074	20,106
200	31,416	3,142	15,708	21,991	31,416