

Air Cylinder Force

Extension and Retraction – 60 to 130 PSI Pressure Range

Cylinder forces are shown in pounds for both extension and retraction. Lines in bold type show extension forces, using the full piston area. Lines in italic type show retraction forces with various size piston rods. Remember that force values are *theoretical*, derived by calculation.

Pressures along the top of the chart do not represent air supply pressure; they are differential pressures across the two cylinder ports. In practice, the air supply line must supply another 5% of pressure to make up for cylinder loss, and must supply an estimated 25 to 50% additional pressure to make up for flow losses in lines and valving so the cylinder will have sufficient travel speed.

For good design and highest circuit efficiency, open the cylinder speed control valves as wide as practical and reduce the pressure regulator setting to as low a pressure as will give satisfactory cylinder force and speed.

For pressures not shown, use the effective areas in the third column as power factors. Multiply effective area times differential pressure to obtain theoretical cylinder force.

Piston Rod Dia., Ins.	Dia., Ins.	Effec. Area, Sq.Ins.	Pressure Differential Across Cylinder Ports								
			60 PSI	70 PSI	80 PSI	90 PSI	100 PSI	110 PSI	120 PSI	130 PSI	
1-1/2	None	1.77	106	124	142	159	177	195	212	230	
	5/8	<i>1.46</i>	<i>88</i>	<i>102</i>	<i>117</i>	<i>132</i>	<i>146</i>	<i>161</i>	<i>176</i>	<i>190</i>	
	1	<i>.985</i>	<i>59</i>	<i>69</i>	<i>79</i>	<i>89</i>	<i>98</i>	<i>108</i>	<i>118</i>	<i>128</i>	
1-3/4	None	2.41	144	168	192	216	241	265	289	313	
	5/8	<i>2.10</i>	<i>126</i>	<i>147</i>	<i>168</i>	<i>189</i>	<i>210</i>	<i>231</i>	<i>252</i>	<i>273</i>	
	1-1/4	<i>1.18</i>	<i>71</i>	<i>83</i>	<i>95</i>	<i>106</i>	<i>118</i>	<i>130</i>	<i>142</i>	<i>154</i>	
2	None	3.14	188	220	251	283	314	345	377	408	
	5/8	<i>2.83</i>	<i>170</i>	<i>198</i>	<i>227</i>	<i>255</i>	<i>283</i>	<i>312</i>	<i>340</i>	<i>368</i>	
	1	<i>2.35</i>	<i>141</i>	<i>165</i>	<i>188</i>	<i>212</i>	<i>235</i>	<i>259</i>	<i>283</i>	<i>306</i>	
2-1/2	None	4.91	295	344	393	442	491	540	589	638	
	5/8	<i>4.60</i>	<i>276</i>	<i>322</i>	<i>368</i>	<i>414</i>	<i>460</i>	<i>506</i>	<i>552</i>	<i>598</i>	
	1	<i>4.12</i>	<i>247</i>	<i>289</i>	<i>330</i>	<i>371</i>	<i>412</i>	<i>454</i>	<i>495</i>	<i>536</i>	
3	None	7.07	424	495	565	636	707	778	848	919	
	1	<i>6.28</i>	<i>377</i>	<i>440</i>	<i>503</i>	<i>565</i>	<i>628</i>	<i>691</i>	<i>754</i>	<i>817</i>	
	1-3/4	<i>4.66</i>	<i>280</i>	<i>326</i>	<i>373</i>	<i>420</i>	<i>466</i>	<i>513</i>	<i>560</i>	<i>606</i>	
3-1/4	None	8.30	498	581	664	747	830	913	996	1079	
	1	<i>7.51</i>	<i>451</i>	<i>526</i>	<i>601</i>	<i>676</i>	<i>751</i>	<i>827</i>	<i>902</i>	<i>977</i>	
	1-3/8	<i>6.82</i>	<i>409</i>	<i>477</i>	<i>545</i>	<i>613</i>	<i>681</i>	<i>750</i>	<i>818</i>	<i>886</i>	
3-1/2	None	9.62	577	674	770	866	962	1058	1155	1251	
	1	<i>8.84</i>	<i>530</i>	<i>618</i>	<i>707</i>	<i>795</i>	<i>884</i>	<i>972</i>	<i>1060</i>	<i>1149</i>	
	4	None	12.57	754	880	1006	1131	1257	1283	1508	1634
1		<i>11.78</i>	<i>707</i>	<i>825</i>	<i>943</i>	<i>1061</i>	<i>1178</i>	<i>1296</i>	<i>1415</i>	<i>1532</i>	
1-3/8		<i>11.09</i>	<i>665</i>	<i>776</i>	<i>887</i>	<i>998</i>	<i>1109</i>	<i>1219</i>	<i>1330</i>	<i>1441</i>	
5	None	19.64	1178	1375	1571	1768	1964	2160	2357	2553	
	1	<i>18.85</i>	<i>1131</i>	<i>1320</i>	<i>1508</i>	<i>1697</i>	<i>1885</i>	<i>2074</i>	<i>2263</i>	<i>2451</i>	
	1-3/8	<i>18.16</i>	<i>1089</i>	<i>1271</i>	<i>1452</i>	<i>1634</i>	<i>1816</i>	<i>1997</i>	<i>2179</i>	<i>2360</i>	
6	None	28.27	1696	1979	2262	2544	2827	3110	3392	3675	
	1-3/8	<i>26.79</i>	<i>1607</i>	<i>1875</i>	<i>2143</i>	<i>2411</i>	<i>2679</i>	<i>2946</i>	<i>3214</i>	<i>3482</i>	
	1-3/4	<i>25.90</i>	<i>1552</i>	<i>1811</i>	<i>2069</i>	<i>2328</i>	<i>2586</i>	<i>2845</i>	<i>3104</i>	<i>3362</i>	
7	None	38.49	2309	2694	3079	3464	3849	4234	4619	5004	
	1-3/8	<i>37.01</i>	<i>2220</i>	<i>2590</i>	<i>2960</i>	<i>3331</i>	<i>3701</i>	<i>4071</i>	<i>4441</i>	<i>4811</i>	
	8	None	50.27	3016	3519	4022	4524	5027	5530	6032	6535
1-3/8		<i>48.79</i>	<i>2927</i>	<i>3415</i>	<i>3903</i>	<i>4391</i>	<i>4879</i>	<i>5366</i>	<i>5854</i>	<i>6342</i>	
1-3/4		<i>47.90</i>	<i>2872</i>	<i>3351</i>	<i>3829</i>	<i>4308</i>	<i>4786</i>	<i>5265</i>	<i>5744</i>	<i>6222</i>	
10	None	78.54	4712	5498	6283	7069	7854	8639	9425	10210	
	1-3/4	<i>76.14</i>	<i>4568</i>	<i>5329</i>	<i>6091</i>	<i>6852</i>	<i>7614</i>	<i>8375</i>	<i>9136</i>	<i>9898</i>	
	2	<i>75.40</i>	<i>4524</i>	<i>5278</i>	<i>6032</i>	<i>6786</i>	<i>7540</i>	<i>8294</i>	<i>9048</i>	<i>9802</i>	
12	None	113.1	6786	7917	9048	10179	11310	12441	13572	14703	
	2	<i>110.0</i>	<i>6598</i>	<i>7697</i>	<i>8797</i>	<i>9896</i>	<i>10996</i>	<i>12095</i>	<i>13195</i>	<i>14295</i>	
	2-1/2	<i>108.2</i>	<i>6491</i>	<i>7573</i>	<i>8655</i>	<i>9737</i>	<i>10819</i>	<i>11901</i>	<i>12983</i>	<i>14075</i>	
14	None	153.9	9234	10773	12312	13851	15390	16929	18468	20007	
	2-1/2	<i>149.0</i>	<i>8939</i>	<i>10429</i>	<i>11919</i>	<i>13409</i>	<i>14899</i>	<i>16389</i>	<i>17879</i>	<i>19369</i>	
	3	<i>146.8</i>	<i>8810</i>	<i>10278</i>	<i>11747</i>	<i>13215</i>	<i>14683</i>	<i>16151</i>	<i>17620</i>	<i>19088</i>	