

FLUID POWER Design Data Sheet



Revised Sheet 75 - Womack Design Data File

WORKING WITH SI (System International) CYLINDERS- PART 2

Piston Velocity - Metric Hydraulic Cylinders - For Pump Flows of 3 to 75 Liters per Minute

Piston Diameter mm.	Rod Diameter mm.	3 l/min.	5 l/min.	10 l/min.	15 l/min.	20 l/min.	25 l/min.	30 l/min.	40 l/min.	50 l/min.	75 l/min.
25	None*	6.111	10.19	20.37	----	----	----	----	----	----	----
	12	7.938	13.23	26.46	----	----	----	----	----	----	----
	18	12.68	21.14	42.27	----	----	----	----	----	----	----
32	None*	3.732	6.220	12.44	18.66	Figures in the body of this chart are piston speeds in meters per minute (m/min).					----
	14	4.614	7.690	15.38	23.07						----
	22	7.077	11.80	23.59	35.39	----	----	----	----	----	----
40	None*	2.387	3.978	7.955	11.93	15.91	19.89	----	----	----	----
	18	2.992	4.987	9.974	14.96	19.95	24.94	----	----	----	----
	28	4.677	7.795	15.59	23.39	31.18	38.98	----	----	----	----
50	None*	1.528	2.547	5.094	7.641	10.19	12.74	15.28	20.39	----	----
	22	1.895	3.159	6.316	9.476	12.63	15.79	18.95	25.28	----	----
	36	3.174	5.290	10.58	15.87	21.16	26.45	31.74	42.34	----	----
63	None*	0.9624	1.604	3.208	4.812	6.415	8.020	9.624	12.84	16.03	----
	28	1.199	1.999	3.998	5.997	7.995	9.995	11.99	15.00	19.82	----
	45	1.965	3.275	6.550	9.824	13.10	16.37	19.65	26.21	32.74	----
80	None*	0.5968	0.9947	1.989	2.984	3.978	4.973	5.968	7.961	9.943	14.82
	36	0.7483	1.247	2.494	3.742	4.988	6.236	7.483	9.982	12.47	18.71
	56	1.170	1.950	3.900	5.850	7.800	9.751	11.70	15.61	19.49	29.25
100	None*	0.3820	0.6366	1.273	1.910	2.546	3.183	3.820	5.095	6.364	9.549
	45	0.4790	0.7983	1.597	2.395	3.193	3.991	4.790	6.389	7.979	11.97
	70	0.7490	1.248	2.497	3.745	4.993	6.241	7.490	9.991	12.49	18.72
125	None*	0.2445	0.4074	0.8149	1.222	1.630	2.037	2.445	3.261	4.073	6.112
	56	0.3060	0.5100	1.020	1.529	2.039	2.549	3.059	4.080	5.096	7.646
	90	0.5076	0.8460	1.692	2.538	3.384	4.230	5.076	6.771	8.457	12.69
160	None*	0.1492	0.2487	0.4974	0.7460	0.9946	1.243	1.492	1.990	2.486	3.730
	70	0.1845	0.3080	0.6151	0.9227	1.230	1.538	1.845	2.462	3.074	4.613
	110	0.2830	0.4716	0.9432	1.415	1.887	1.358	2.830	3.776	4.714	7.074
200	None*	0.0955	0.1592	0.3183	0.4775	0.6366	0.7958	0.9549	1.284	1.591	2.387
	90	0.1197	0.1996	0.3991	0.5987	0.7982	0.9978	1.197	1.597	1.995	2.994
	140	0.1872	0.3121	0.6241	0.9362	1.248	1.560	1.872	2.498	3.119	4.681

Piston Velocity - Metric Hydraulic Cylinders - For Pump Flows of 100 to 450 Liters per Minute

Piston Diameter mm.	Rod Diameter mm.	100 l/min.	125 l/min.	150 l/min.	175 l/min.	200 l/min.	250 l/min.	300 l/min.	350 l/min.	400 l/min.	450 l/min.
80	None*	19.89	24.87	----	----	----	----	----	----	----	----
	36	24.94	31.18	----	----	Figures in the body of this chart are piston speeds in meters per minute (m/min.).					----
	56	39.00	48.75	----	----						----
100	None*	12.73	15.92	19.10	22.28	25.46	----	----	----	----	----
	45	15.97	19.96	23.95	27.94	31.93	----	----	----	----	----
	70	24.97	31.21	37.45	43.69	49.93	----	----	----	----	----

(This chart is continued on the back side of this sheet)

(This chart is continued from the front side of this sheet)

Piston Diameter mm.	Rod Diameter mm.	100 l/min.	125 l/min.	150 l/min.	175 l/min.	200 l/min.	250 l/min.	300 l/min.	350 l/min.	400 l/min.	450 l/min.
		Figures in the body of this chart are piston speeds in meters per minute									
125	None	8.149	10.19	12.22	14.26	16.30	20.37	24.44	28.52	----	----
	56	10.20	12.74	15.29	17.84	20.39	25.49	30.59	35.68	----	----
	90	16.92	21.15	25.38	29.61	33.84	42.30	50.76	59.22	----	----
160	None	4.974	6.217	7.460	8.704	9.947	12.43	14.92	17.41	19.89	22.38
	70	6.151	7.689	9.227	10.76	12.30	15.38	18.45	21.53	24.60	27.68
	110	9.432	11.79	14.15	16.51	18.86	23.58	28.29	33.01	37.73	42.44
200	None	3.183	3.979	4.775	5.570	6.366	7.958	9.549	11.14	12.73	14.32
	90	3.991	4.989	5.987	6.985	7.983	9.978	11.97	13.97	15.97	17.96
	140	6.241	7.802	9.362	10.92	12.48	15.60	18.72	21.84	24.97	28.09

U. S. AND METRIC SI PRESSURE AND FLOW CONVERSIONS for Operation of Air and Hydraulic Cylinders

PRESSURE				HYDRAULIC FLOW				AIR FLOW			
PSI (lbs/sq. inch) and Bars				GPM and Liters per Minute				CFM and Cubic Decimeters per Second			
1 PSI = 0.0689655 Bar				1 GPM = 3.785 Liters per Minute				1 CFM = 0.47195 dm ³ /sec			
1 Bar = 14.5 PSI				1 Liter per Minute = 0.2642 GPM				1 dm ³ /sec = 2.1187 CFM			
PSI	Bars	Bars	PSI	GPM	l/min	l/min	GPM	CFM	dm ³ /sec	dm ³ /sec	CFM
20	1.379	1	14.5	1	3.785	5	1.32	1	0.472	5	10.59
30	2.069	2	29.0	2	7.570	10	2.64	2	0.944	10	21.19
40	2.759	3	43.5	3	11.36	15	3.96	3	1.416	15	31.78
50	3.448	4	58.0	4	15.14	20	5.28	4	1.888	20	42.37
60	4.138	5	72.5	5	18.93	30	7.93	5	2.360	30	63.56
70	4.828	6	87.0	10	37.85	40	10.6	10	4.720	40	84.75
80	5.517	7	102	15	56.78	50	13.2	15	7.079	50	105.9
90	6.207	8	116	20	75.70	75	19.8	20	9.439	75	158.9
100	6.897	9	131	25	94.63	100	26.4	25	11.80	100	211.9
120	8.276	10	145	30	113.6	125	33.0	30	14.16	125	264.8
140	9.655	15	218	35	132.5	150	39.6	35	16.52	150	317.8
500	34.48	20	290	40	151.4	175	46.2	40	18.88	175	370.7
600	41.38	25	363	45	170.3	200	52.8	45	21.24	200	423.7
700	48.28	30	435	50	189.3	225	59.4	50	23.60	225	476.7
800	55.17	35	508	60	227.1	250	66.1	60	28.32	250	529.7
900	62.07	40	580	70	265.0	300	79.3	70	33.04	300	635.6
1,000	68.97	45	653	80	302.8	350	92.8	80	37.76	350	741.5
1,200	82.76	50	725	90	340.7	400	106	90	42.48	400	847.5
1,400	96.55	55	798	100	378.5	450	119	100	47.20	450	953.4
1,600	110.3	60	870	125	473.1	500	132	125	58.99	500	1,059
1,800	124.1	65	943	150	567.8	550	145	150	70.79	550	1,165
2,000	137.9	70	1,015	175	662.4	600	159	175	82.59	600	1,271
2,250	155.2	80	1,160	200	757.0	700	185	200	94.39	700	1,483
2,500	172.4	100	1,450	225	851.6	800	211	225	106.2	800	1,695
2,750	189.7	125	1,813	250	946.3	900	238	250	118.0	900	1,907
3,000	206.9	150	2,175	275	1,041	1,000	264	275	129.8	1,000	2,119
3,250	224.1	175	2,538	300	1,136	1,100	291	300	141.6	1,100	2,331
3,500	241.4	200	2,900	325	1,230	1,200	317	325	153.4	1,200	2,542
4,000	275.9	250	3,625	350	1,325	1,300	343	350	165.2	1,300	2,754
4,500	310.3	300	4,350	375	1,420	1,400	370	375	177.0	1,400	2,966
5,000	344.8	350	5,075	400	1,514	1,500	396	400	188.8	1,500	3,178

Note that a "liter" is equal to a "cubic decimeter (dm³)" but the liter is used for liquid measure while the dm³ is used for air and gas volume measurement.

Note also that a "bar" is used widely in fluid power for pressure measurement, but the standard SI unit for pressure is the pascal (Pa) or the kilopascal (kPa). One kPa is equal to 0.00145 PSI, a unit which is difficult to work with in most fluid power systems.

Published by:
WOMACK EDUCATIONAL PUBLICATIONS
Womack Machine Supply Co.
 13835 Senlac Dr.
 Farmers Branch, TX 75234
 Tel: 800-859-9801
 Fax: 214-630-5314
www.womack-educational.com