

CYLINDER FORCE

The output force, or thrust developed by a cylinder is a product of the operating pressure acting upon the square inch surface area of its inner piston.

Cylinder thrust on the forward stroke utilizes the full piston area to develop maximum power. The piston surface subject to pressure on the retract stroke is reduced by the area of the piston rod to give the "net effective area" for force development in the "pull" direction.

The chart below shows output force measured in "pounds" produced at various input pressure levels. Figures given are theoretical values and do not include losses due to friction.

When selecting a cylinder for air service, it should be sized to overpower the work load by at least 25% for moderate cycle speed, to 100% for rapid speed applications.

Hydraulic cylinders should be considered to operate at 95% efficiency for sizing purposes with allowance given for pressure losses in the system between the pump and cylinder.

CYL. BORE DIA.	ROD DIA.	WORK AREA SQ.IN.	OPERATING PRESSURE													
			60	80	100	120	150	200	250	500	750	1000	1500	2000	2500	3000
1 1/2	NONE	1.767	106	141	177	212	265	354	442	884	1326	1767	2650	3534	4418	5301
	5/8	1.460	88	117	146	176	219	292	365	730	1095	1460	2190	2920	3650	4380
	1	.982	59	79	98	118	147	196	246	491	737	982	1473	1964	2455	2946
2	NONE	3.141	188	251	314	377	471	628	785	1571	2356	3141	4712	6282	7853	9423
	5/8	2.834	170	227	283	340	425	566	709	1417	2126	2834	4251	---	---	---
	1	2.356	141	188	236	283	353	471	589	1178	1767	2356	3534	4712	5890	7068
2 1/2	NONE	4.909	295	393	491	589	736	982	1227	2455	3682	4909	7364	9818	12273	14727
	5/8	4.601	276	368	460	552	690	920	1150	2301	3451	4601	---	---	---	---
	1	4.123	247	330	412	495	618	825	1031	2062	3092	4123	6185	8246	10308	12369
3 1/4	NONE	8.295	498	666	830	995	1244	1660	2074	4148	6221	8295	12443	16590	20738	24885
	1	7.510	451	601	751	901	1127	1502	1878	3755	4230	7510	11265	---	---	---
	1 3/8	6.810	409	545	681	817	1022	1362	1703	3405	5108	6810	10215	13620	17025	20430
4	NONE	12.566	754	1005	1257	1508	1885	2514	3142	6283	9425	12566	18849	25132	31415	37698
	1	11.781	707	942	1178	1414	1767	2356	2945	5891	8836	11781	---	---	---	---
	1 3/4	10.161	610	813	1016	1219	1524	2032	2540	5081	7621	10161	15242	20322	25403	30483
5	NONE	19.635	1178	1571	1964	2356	2945	3928	4909	9818	14726	19635	29453	39270	49088	58905
	1	18.850	1131	1508	1885	2262	2828	3770	4713	9425	14138	---	---	---	---	---
	2	16.494	990	1320	1649	1979	2474	3299	4124	8247	12371	16494	24741	32988	41235	49482
6	NONE	28.274	1696	2262	2827	3392	4241	5654	7096	14137	21206	28274	42411	56548	70685	84822
	1 3/8	26.789	1607	2143	2679	3215	4018	5358	6697	13395	20092	---	---	---	---	---
	2 1/2	23.366	1402	1869	2337	2804	3505	4673	5842	11683	17525	23366	35049	46732	58415	70098
7	NONE	38.485	2309	3079	3849	4618	5773	7697	9621	19243	28864	38485	57728	76970	96213	115455
	3	31.416	1885	2513	3142	3770	4712	6283	7854	15708	23562	31416	47125	62832	78540	94248
	5	18.850	1131	1508	1885	2262	2828	3770	4713	9425	14138	18850	28275	37700	47125	56550
8	NONE	50.265	3016	4021	5027	6032	7540	10054	12566	25133	37689	50265	75398	100530	125663	150795
	1 3/8	48.780	2927	3902	4878	5854	7317	9756	12195	24390	---	---	---	---	---	---
	3 1/2	40.644	2439	3252	4064	4877	6097	8129	10161	20322	30483	40644	60966	81288	101610	121932
10	NONE	78.540	4712	6283	7854	9424	11781	15708	19637	39270	58905	78540	117810	157080	196350	235620
	1 3/4	76.135	4568	6091	7614	9136	11420	15228	19034	38068	---	---	---	---	---	---
	4 1/2	62.636	3758	5011	6264	7516	9395	12527	15659	31318	46977	62636	93954	125272	156590	187908
12	NONE	113.10	6786	9048	11310	13572	16965	22620	28275	56550	84825	113100	169650	226200	282750	339300
	2	109.96	6598	8797	10996	13196	16494	21992	27490	54980	---	---	---	---	---	---
	5 1/2	89.34	5360	7147	8934	10720	13401	17868	22335	44670	67005	89340	134010	178680	223350	268020
14	NONE	153.94	9236	12315	15394	18473	23091	30788	38485	76970	115455	153940	230910	307880	384850	461820
	2 1/2	149.03	8942	11922	14903	17884	22355	29806	37258	74515	---	---	---	---	---	---
	5	130.18	7811	10414	13018	15622	19527	26036	32545	65090	97635	130180	195270	260360	325450	390540
7	115.45	6927	9236	11545	13854	17318	23090	28863	57725	86588	115450	173175	230900	288625	346350	

To determine force developed in "pull" direction with rod diameters other than those shown above, deduct the area of selected piston rod given in table below from full bore area and multiply this "net effective area" by the system operating pressure.

ROD DIA.	1	1 3/8	1 3/4	2	2 1/2	3	3 1/2	4	4 1/4	4 1/2	5	5 1/2	5 3/4	7	8	9
AREA SQ.IN.	.785	1.485	2.405	3.141	4.909	7.069	9.621	12.566	14.186	15.904	19.635	23.758	25.967	38.485	50.265	63.617