

Technical Data

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**95% OF OUR CYLINDERS SHIP IN 2-3 DAYS!
ONE DAY RUSH SERVICE AVAILABLE ON ALL CATALOGED CYLINDER MODELS!**

TECHNICAL DATA

How to determine the right cylinder size for the job.

To determine what cylinder size the task requires, you need to answer a few questions about three main points: load, velocity and air pressure.

How heavy (in pounds) is the load to be moved?

The answer to this is usually given, set by the machine design. However, unless you are lifting a load vertically, with no external friction, it can be difficult to determine the true load. If the load cannot be calculated, try to physically measure the load. The closer the true load is known, the better the results. In order to move the load, you need to choose a cylinder that provides force greater than the load. So, if the load is 100 lbs., it will take of force greater than 100 lbs. to move it. In fact, it's a good idea to allow an additional factor of 25% force to allow for friction.

What's the required velocity?

Although velocity may also be set by machine design, often you have some latitude within a range. Whenever possible, for best results, we recommend using moderate speed because the greater the velocity required, the greater the *additional* force needed to achieve it. Slow speeds (up to four in/sec) require 25% more force than the load, moderate speeds (four to 16 in/sec) about 50% more and high speeds (greater than 16 in/sec) about 100% more force. So, for that 100 lb. load, you need 125 lbs. of force to move it slowly, 150 lbs. of force to move it at moderate speeds and 200 lbs. of force to move it quickly. *Don't forget to add 25 lbs. (25% of 100 lbs.) for friction!*

What's the minimum effective air pressure you can use and is your pressure source constant?

This is important because high pressures can accelerate seal wear and create stress on the cylinder and inconsistent pressures can cause system malfunctions or failures. To maximize cylinder life and performance, you need to provide consistent airflow at the minimum effective pressure to maintain the desired velocity. The idea then, is for the cylinder to be able to move the maximum load, at the minimum acceptable velocity and at the minimum available pressure.

About bore sizes.

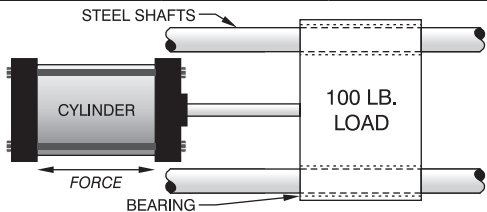
Once you've determined the force you need to move the load at the desired velocity and allow for friction, here's how to find the cylinder bore that meets your specifications.

The force generated by a cylinder is determined by the effective piston area times the air pressure. The force chart on page 280 lists the effective piston area for each bore size, the "Push" (extend) and "Pull" (retract) stroke, at various air pressures. If you assume a maximum load of 100 lbs., a minimum velocity of four in/sec, and a minimum pressure of 60 psi, here's how to select the right cylinder bore. Since the velocity is slow, the force should be 25% greater than the load or 125 lbs. After adding 25 lbs. for friction (25% of 100 lbs.), the total force needed is 150 lbs. The chart on page 263 shows that at 60 PSI, the 2" bore with .625" rod extend force is 188 lbs. and retract force is 170 lbs.; the right cylinder for the application.

Horizontal Applications

Cylinder force is reduced by the coefficient of friction between the bearing surface and guide shafts. Bearing materials and bearing types (plain or ball) all perform differently. With hardened steel shafts, the following information lists how much cylinder force is required to move a 100 lb. load, on various bearing materials (*for reference purposes only*).

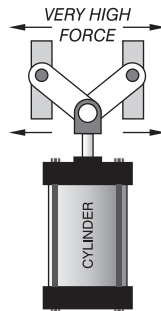
Plain Bearing Material	Cylinder Force	
	Dry Bearing	Oiled Bearing
PTFE	10 lbs.	10 lbs.
UHMW	20 lbs.	20 lbs.
Hardened Steel	25 lbs.	20 lbs.
Brass	40 lbs.	25 lbs.
Cast Iron	45 lbs.	25 lbs.
Steel (soft)	85 lbs.	25 lbs.
Ball Bearing	5-10 lb. Cylinder Force	



General Mechanics

TOGGLE

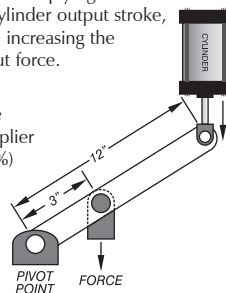
Toggles are complex mechanisms that can achieve very high force.



FORCE MULTIPLYING LEVER

Force Multiplying Levers reduce the cylinder output stroke, while increasing the output force.

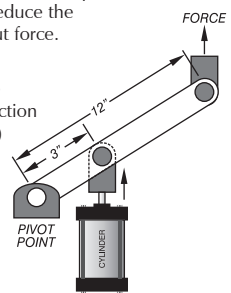
4:1 Force Multiplier (400%)



FORCE REDUCING LEVER

Force Reducing Levers increase the cylinder output stroke but reduce the output force.

1:4 Force Reduction (25%)



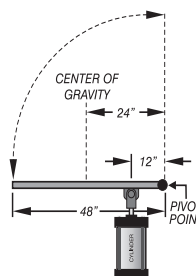
EXAMPLE

A 2000 lb. steel plate needs to be raised from horizontal, 90° vertical.

The highest force required will be at the horizontal position. As the plate nears the vertical position, less force will be required.

The example assumes that the weight (load) is evenly distributed over the plate length. For uneven loads, estimate the center of gravity of the load.

Additional force must be added for friction.



$$\text{LOAD CENTER OF GRAVITY} = \frac{48''}{2} = 24''$$

$$\text{LEVER} = \frac{24''}{12''} = 2:1$$

$$\text{FORCE} = 2 \times 2,000 \text{ LBS.} = 4,000 \text{ LBS.}$$

$$\text{FORCE (INCLUDING} = 4,000 \times 1.25 = 5,000 \text{ LBS. FRICTION)}$$

AT 100 PSI AIR PRESSURE, THE FORCE CHART (ON PAGE 119) SHOWS THAT AN 8" BORE HAS 5,026 LBS. FORCE.

TECHNICAL DATA

How the right mounting and careful installation helps prevent premature cylinder wear.

Choosing the right style of mounting for your cylinder's size, force and function has a direct effect on it's service life. The wrong mounting or incorrect installation, can result in side load, which creates excessive wear on the piston, piston rod, rod bearing and seals. When wear occurs, leakage usually follows and that's how cylinders fail.

Side load occurs when a load is placed on the piston rod without guidance or support, or when the mounting and piston rod connection are misaligned. It can also occur in pivot type mounts when the weight of the cylinder places load on the piston and rod bearing points.

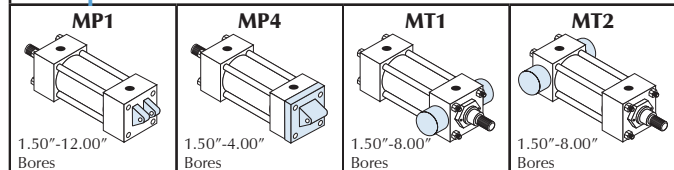
There are cylinder mounts and options to suit virtually every application.

Pivot Type Mountings: Clevis & Trunnion

Pivot type of mounts can eliminate side load in one plane, but careful alignment in the other plane is crucial. Since TRD uses a floating rod bushing design, side loading caused by misalignment is minimized but not totally eliminated.

Long stroke pivot mount cylinders will have high side loads just because of the weight of the cylinder components. In these applications, a stop tube is usually essential for proper cylinder operation (see page 185 to determine if a stop tube is needed).

Samples of Pivot Mounts:

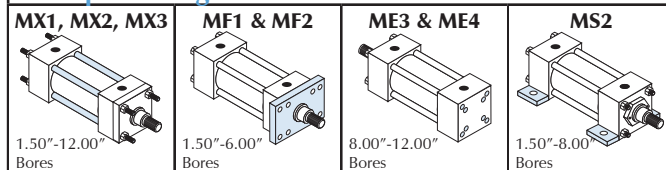


Rigid Mount Cylinders

Base mounted, flange mounted and tie-rod mounted cylinders must be carefully aligned with the direction of load travel to avoid side loads.

If for some reason, proper alignment cannot be maintained throughout the entire cylinder stroke, a rod end connection that allows for some lateral misalignment should be used. TRD offers a full line of Rod Alignment Couplers to solve misalignment issues (refer to page 218). Keep in mind, the rod alignment couplers do not provide any rod end support. Always check to see if your application requires a stop tube.

Samples of Rigid Mounts:



Choose options that enhance and extend the working life of your cylinders.

Cushions can be designed into either one or both ends of the cylinder to provide controlled deceleration. This option prevents excessive end-of-stroke impact, reducing vibration and noise. Cushions are designed to stop light loads at moderate speeds. Heavy loads or higher speed applications may require shock absorbers. Your local distributor representative is qualified to provide expert advise on what options are best suited for your application.

Bumper Piston Seals. Whether used by themselves or with cushions, bumper piston seals provide additional controlled deceleration at end of stroke.

Wear band. A .063" thick x 0.375" wide (for 1.50" to 8.00" bore, larger strips for bigger bores) PTFE composite material strip is added to the piston diameter to eliminate metal to metal contact between the piston and the tube. Since wear band materials are compressive in nature, they can provide some cylinder side load protection. As side load pressure is applied, the wear band contact area with the tube increases, enabling a higher transfer of load due to the high amount of contact area.

Even though wear bands contain a high percentage of PTFE, they do add additional internal drag in the cylinder. Additional drag can effect cycle rates and

at times, lower overall production in high speed applications.

Fluorocarbon Seals are usually associated with higher temperature applications, fluorocarbon can provide additional chemical resistance. Consult factory for additional information.

"SSP" Solid Stainless Steel Piston with wear band. When cylinder bores are used to measure or dispense food products, it is essential to eliminate non-FDA approved materials from the cylinder internal construction. Specify "FDA approved materials only" at time of order.

FDA Lubricant is typically used with stainless steel cylinders for food dispensing applications. Can also be specified when there is concern for possible contamination from petroleum based, air-borne particles associated with the normal cylinder operation.

Switches. Position sensing switches give you the potential for expanding the capabilities of your cylinder functions to include accurate piston sensing, event timing, sequencing and more. Magnetically operated, the switches are mounted to the exterior of the cylinder where they are actuated by a magnet contained on the piston. Refer to pages 242-252 for more details.

TECHNICAL DATA: FORCE CHART

BASIC CYLINDER FORCE CHART* (TA, TD, FM)

BORE	ROD DIA.	STROKE TYPE	EFFECTIVE PISTON AREA	POUNDS OF FORCE AT PSI						CU. FT. DISPLACEMENT PER IN. OF STROKE
				60	80	100	200	250	400	
1.50	ALL	PUSH	1.767	106	142	177	353	442	706	.00102
	0.625	PULL	1.460	88	117	146	292	365	584	.00084
	1.000	PULL	0.982	59	79	98	196	246	392	.00057
2.00	ALL	PUSH	3.142	188	251	314	628	785	1256	.00182
	0.625	PULL	2.835	170	227	284	567	708	1134	.00164
	1.000	PULL	2.357	141	189	236	471	589	942	.00136
2.50	ALL	PUSH	4.909	295	393	491	981	1227	1962	.00284
	0.625	PULL	4.602	276	368	460	920	1150	1840	.00266
	1.000	PULL	4.124	247	330	412	825	1031	1650	.00239
3.25	ALL	PUSH	8.296	498	664	830	1659	2074	3318	.00480
	1.000	PULL	7.511	451	601	751	1502	1877	3004	.00435
	1.375	PULL	6.811	409	545	681	1362	1702	2724	.00394
4.00	ALL	PUSH	12.566	754	1005	1257	2513	3141	5026	.00727
	1.000	PULL	11.781	707	942	1178	2356	2945	4712	.00682
	1.375	PULL	11.081	665	886	1108	2216	2770	4432	.00641
5.00	ALL	PUSH	19.635	1178	1571	1964	3927	4908	7854	.01136
	1.000	PULL	18.850	1131	1508	1885	3770	4712	7540	.01090
	1.375	PULL	18.150	1089	1452	1815	3630	4537	7260	.01050
6.00	ALL	PUSH	28.274	1696	2262	2827	5655	7068	11310	.01636
	1.375	PULL	26.789	1607	2144	2679	5358	6697	10716	.01550
	1.750	PULL	25.869	1552	2070	2587	5174	6467	10348	.01497
8.00	ALL	PUSH	50.265	3016	4021	5026	10053	12566	20106	.02908
	1.375	PULL	48.780	2927	3902	4878	9756	12195	19512	.02832
	1.750	PULL	47.860	2872	3829	4786	9572	11965	19144	.02770
10.00	ALL	PUSH	78.540	4712	6283	7854	15708	19635	31416	.04545
	1.750	PULL	76.130	4568	6090	7613	15226	19032	30452	.04406
	2.000	PULL	75.400	4524	6032	7540	15080	18850	30160	.04363
12.00	ALL	PUSH	113.098	6786	9048	11310	22620	28275	45239	.06545
	2.000	PULL	109.956	6597	8796	10996	21992	27489	43982	.06363
	2.500	PULL	108.189	6491	8655	10819	21638	27047	43276	.06261

*Theoretical force. Actual force will be reduced by friction.

'NR' NON-ROTATING CYLINDER FORCE CHART*

BORE	ROD DIA.	GUIDE RODS DIA.	STROKE TYPE	EFFECTIVE PISTON AREA	POUNDS OF FORCE AT PSI						CU. FT. DISPLACEMENT PER IN. OF STROKE
					60	80	100	200	250	400	
2.00	ALL	0.250	PUSH	3.044	182	243	304	609	761	1217	.00176
	0.625		PULL	2.737	164	218	273	547	684	1094	.00158
2.50	ALL	0.313	PUSH	4.755	285	380	475	951	1188	1902	.00275
	0.625		PULL	4.448	266	355	444	889	1112	1779	.00257
	1.000		PULL	3.970	238	317	397	794	992	1588	.00229
3.25	ALL	0.375	PUSH	8.076	484	646	807	1613	2016	3226	.00466
	1.000		PULL	7.291	437	583	729	1458	1822	2916	.00422
	1.375		PULL	6.591	395	527	659	1318	1647	2636	.00381
4.00	ALL	0.625	PUSH	11.952	717	956	1195	2390	2988	4780	.00692
	1.000		PULL	11.167	670	893	1116	2233	2791	4466	.00646
	1.375		PULL	11.467	628	837	1046	2093	2616	4186	.00606
5.00	ALL	0.625	PUSH	19.021	1141	1521	1902	3804	4755	7608	.01100
	1.000		PULL	18.236	1094	1458	1823	3647	4559	7294	.01050
	1.375		PULL	17.536	1052	1402	1753	3507	4384	7014	.01010
6.00	ALL	0.625	PUSH	27.660	1659	2212	2766	5532	6915	11064	.01600
	1.375		PULL	26.175	1570	2094	2617	5235	6543	10470	.01510
	1.750		PULL	25.255	1515	2020	2525	5051	6313	10102	.01460
8.00	ALL	1.000	PUSH	48.694	2921	3895	4869	9738	12173	19477	.02810
	1.375		PULL	47.209	2832	3776	4720	9441	11802	18883	.02730
	1.750		PULL	46.289	2777	3703	4628	9257	11572	18515	.02670
10.00	ALL	1.000	PUSH	76.969	4618	6157	7696	15393	19242	30787	.04450
	1.750		PULL	74.564	4473	5965	7456	14912	18641	29825	.04310
	2.000		PULL	73.829	4429	5906	7382	14765	18457	29531	.04270
12.00	ALL	1.000	PUSH	111.527	6691	8922	11152	22305	27881	44610	.06450
	2.000		PULL	108.385	6503	8670	10838	21677	27096	43354	.06270
	2.500		PULL	106.618	6397	8529	10661	21323	26654	42647	.06170

Note: Use the pull force/volume numbers for both ends of a double end cylinder. For TRA triple rod force chart, see page 102.

*Theoretical force. Actual force will be reduced by friction.

TECHNICAL DATA: FORCE & TORQUE CHART

SERIES 'MS' EFFECTIVE PISTON AREA/FORCE CHART*

BORE	STAGES	EFF. PISTON AREA (SQ. IN.)				FORCE IN LBS. AT 60 PSI				FORCE IN LBS. AT 100 PSI			
		EXTEND (MSE)		RETRACT (MSR)		EXTEND (MSE)		RETRACT (MSR)		EXTEND (MSE)		RETRACT (MSR)	
		STD. ROD Ø	O' SIZE Ø	STD. ROD Ø	O' SIZE Ø	STD. ROD Ø	O' SIZE Ø	STD. ROD Ø	O' SIZE Ø	STD. ROD Ø	O' SIZE Ø	STD. ROD Ø	O' SIZE Ø
1.50	2	3.228	2.749	2.922	1.964	193	164	175	117	322	274	292	196
	3	4.687	3.731	4.383	2.946	281	223	262	176	468	373	438	294
	4	6.150	4.713	5.844	3.928	369	282	350	235	615	471	584	392
	5	7.607	5.695	N/A	N/A	456	342	N/A	N/A	761	570	N/A	N/A
2.00	2	5.974	5.499	5.668	4.714	358	329	340	282	597	549	566	471
	3	8.808	7.856	8.502	7.071	528	471	510	424	880	785	850	707
	4	11.642	10.213	11.336	9.428	698	612	680	565	1164	1021	1133	942
	5	14.482	12.568	N/A	N/A	869	754	N/A	N/A	1448	1257	N/A	N/A
2.50	2	9.490	9.033	9.188	8.248	569	541	551	494	949	903	918	824
	3	14.080	13.157	13.782	12.372	844	789	826	742	1408	1315	1378	1237
	4	18.680	17.281	18.376	16.496	1120	1036	1102	989	1868	1728	1837	1649
	5	23.312	21.405	N/A	N/A	1398	1284	N/A	N/A	2330	2140	N/A	N/A
3.25	2	15.807	15.107	15.022	13.622	948	906	901	817	1580	1510	1502	1362
	3	23.317	21.918	22.532	20.433	1399	1315	1351	1225	2331	2191	2253	2043
	4	30.828	28.729	30.043	27.244	1849	1723	1802	1634	3082	2872	3004	2724
	5	38.340	35.540	N/A	N/A	2300	2132	N/A	N/A	3834	3554	N/A	N/A
4.00	2	24.347	23.647	23.562	22.166	1460	1418	1413	1329	2434	2364	2356	2216
	3	36.127	34.728	35.342	33.243	2167	2083	2120	1994	3612	3472	3534	3324
	4	47.908	45.809	47.123	44.324	2874	2748	2827	2659	4790	4580	4712	4432
	5	59.690	56.890	N/A	N/A	3581	3413	N/A	N/A	5969	5689	N/A	N/A
5.00	2	38.485	37.785	37.700	36.3	2309	2267	2262	2178	3848	3778	3770	3630
	3	57.334	55.935	56.549	54.45	3440	3356	3392	3267	5733	5593	5654	5445
	4	76.184	74.085	75.399	72.6	4571	4445	4523	4356	7618	7408	7539	7260
	5	95.035	92.235	N/A	N/A	5701	5534	N/A	N/A	9503	9223	N/A	N/A
6.00	2	55.065	54.143	53.582	51.736	3303	3248	3214	3104	5506	5414	5358	5136
	3	81.854	80.012	80.370	77.607	4911	4800	4822	4656	8185	8001	8037	7760
	4	108.644	105.881	107.16	103.476	6518	6352	6429	6208	10864	10588	10716	10347
8.00	2	99.047	98.125	97.564	95.72	5942	5887	5853	5743	9904	9812	9756	9572
	3	147.834	145.985	146.35	143.58	8870	8759	8781	8614	14783	14598	14635	14358
	4	196.611	193.845	195.13	191.44	11796	11630	11707	11486	19661	19384	19513	19144

*Theoretical force - actual force will be reduced due to seal friction.

TORQUE CHARTS: CYLINDER TIE RODS

(Aluminum, Stainless Steel & Steel Tubing)

CYLINDER BORE	TIE ROD THREAD SIZE	TORQUE IN FT.-LBS.
1.50	1/4-28	7
2.00	5/16-24	12
2.50	5/16-24	14
3.25	3/8-24	30
4.00	3/8-24	35
5.00	1/2-20	45
6.00	1/2-20	50
8.00	5/8-18	125
10.00	3/4-16	125
12.00	3/4-16	125

Tighten cylinders using an "X" tightening pattern on tie rods.

(Fiberglass AIR/OIL TANK Tubing Only)

CYLINDER BORE	TIE ROD THREAD SIZE	TORQUE IN FT.-LBS.
2.50	5/16-24	10-12
3.25	3/8-24	20
4.00	3/8-24	25
5.00	1/2-20	35
8.00	5/8-18	75

Tighten cylinders using an "X" tightening pattern on tie rods.

RETAINER SCREWS

CYLINDER BORE	SIZE	TORQUE IN FT.-LBS.
2.00 & 2.50	#10-32 S.H.C.S.	5
3.25 TO 12.00	1/4-28 S.H.C.S.	12

TECHNICAL DATA: WEIGHT CHARTS

TA, TD, FM BASIC CYLINDERS (with standard rod size) WEIGHT IN POUNDS

CYLINDER BORE	MODEL								ADD PER IN. OF STROKE
	MXO	MS1 MT1/MT2	MS4	MP1	MP2	MP4	MF1/MF2 ME3/ME4	MS2	
1.50	1.6	2.0	1.6	2.1	2.2	2.2	2.2	2.5	.20
2.00	2.4	2.9	2.4	3.2	3.3	3.2	3.2	3.6	.25
2.50	3.3	3.9	3.3	4.3	4.5	4.5	4.5	4.7	.27
3.25	6.5	7.9	6.5	9.2	10.1	10.0	10.0	9.0	.51
4.00	8.8	10.5	8.8	12.1	13.3	13.2	13.2	11.1	.55
5.00	13.2	14.3	13.2	17.8	19.9	N/A	20.0	17.5	.59
6.00	21.5	25.2	21.5	29.7	32.2	N/A	32.2	27.2	.84
8.00	35.4	36.5	35.4	43.5	N/A	N/A	35.4	N/A	1.25
10.00	70.3	N/A	70.0	72.0	N/A	N/A	70.3	N/A	1.60
12.00	107.9	N/A	N/A	109.9	N/A	N/A	107.5	N/A	2.30

All weights are in pounds. For oversize rod series add 10%.

*Weight includes clevis pins.

FM CYLINDERS WITH ROD LOCK MOUNTED

WEIGHT IN POUNDS

BORE	ROD DIA.	CYLINDER WITH ROD LOCK									ROD LOCK UNIT ONLY
		MXO	MS1 MT1/MT2	MS4	MP1	MP2	MP4	MF1 MF2	MS2 BASEBAR	ADD PER IN. OF STROKE	
1.50	0.625	3.3	3.7	3.3	3.8	3.9	3.9	3.9	4.2	0.20	1.23
	1.000	6.3	6.8	6.8	7.5	7.6	7.5	7.5	7.9	0.28	2.40
2.00	0.625	5.1	5.6	5.1	5.9	6.0	5.9	5.9	6.3	0.25	2.12
	1.000	6.3	6.8	6.8	7.5	7.6	7.5	7.5	7.9	0.28	2.40
2.50	0.625	7.0	7.6	7.0	8.0	8.2	8.2	8.2	8.4	0.27	3.04
	1.000	8.5	9.1	8.5	9.5	9.7	9.7	9.7	9.9	0.30	3.64
3.25	1.000	13.9	15.3	13.9	16.6	17.5	17.5	17.5	16.5	0.51	5.88
	1.375	15.4	16.8	15.4	18.1	19.0	19.0	19.0	18.0	0.56	5.81
4.00	1.000	19.6	21.3	19.6	22.9	24.1	24.0	24.0	21.9	0.55	9.28
	1.375	21.2	22.9	21.2	24.5	25.7	25.6	25.6	23.5	0.61	9.01
5.00	1.000	28.0	28.9	28.0	32.6	34.8	-	34.9	32.3	0.59	12.70
	1.375	31.2	32.1	31.2	35.8	38.0	-	38.1	35.5	0.65	13.86
6.00	1.375	45.6	49.3	45.6	53.8	56.3	-	56.3	51.3	0.84	20.83
	1.750	49.4	53.1	49.4	57.6	60.1	-	60.1	55.1	0.93	21.25

PFLF BASIC CYLINDERS

WEIGHT IN POUNDS

CYLINDER BORE	MODEL									ADD PER IN. OF STROKE
	MXO	MS1 MT1/MT2	MS4	MP1	MP2	MP4	MF1 ME3	MF2	MS2	
1.50	2.4	2.8	2.4	2.9	2.7	2.7	3.0	2.7	3.3	.19
2.00	3.6	4.1	3.6	4.4	3.9	3.9	4.4	3.8	4.8	.24
2.50	4.9	5.5	4.9	5.9	5.2	5.2	6.1	5.2	6.3	.26
3.25	9.0	10.4	9.0	11.7	11.1	11.1	12.5	11.0	11.5	.49
4.00	12.3	14.0	12.3	15.6	14.5	14.5	16.7	14.4	14.6	.53
5.00	18.6	19.7	18.6	23.2	21.8	N/A	25.4	21.9	22.9	.57
6.00	29.7	33.4	29.7	37.9	34.6	N/A	40.4	34.6	35.4	.81
8.00	49.6	50.7	49.6	57.7	N/A	N/A	49.6	N/A	N/A	1.22

All weights are in pounds. For oversize rod series add 10%.

*Weight includes clevis pins.

'SS' SERIES BASIC CYLINDERS

WEIGHT IN POUNDS

BORE	ROD DIAMETER	MODEL				ADD PER INCH OF STROKE
		MX0/MS4 ME3/ME4	MF1 MF2	MT1 MT2	MP1*	
1.50	0.625	3.3	4	3.8	3.8	0.3
	1.000	4.1	4.8	4.6	4.6	0.4
2.00	0.625	5.8	7	6.4	6.4	0.5
	1.000	6.2	7.4	6.8	6.8	0.6
2.50	0.625	8	9.5	8.5	8.7	0.6
	1.000	8.5	10	9	9.2	0.7
3.25	1.000	15	18.7	15.5	16	0.8
	1.375	15.4	19.2	16	16.5	1.0

BORE	ROD DIAMETER	MODEL				ADD PER INCH OF STROKE
		MX0/MS4 ME3/ME4	MF1 MF2	MT1 MT2	MP1*	
4.00	1.000	23	28	23.5	27	1.0
	1.375	23.4	28.5	24	27.5	1.2
5.00	1.000	34.4	42	35	41	1.1
	1.375	34.9	42.5	35.5	41.5	1.3
6.00	1.375	60	71.9	61.5	69	1.5
	1.750	62	73.9	63.2	71	1.7
8.00	1.375	79	N/A	80.2	88	2.0
	1.750	82	N/A	83.2	91	2.3

TECHNICAL DATA: WEIGHT CHARTS

'TAS' SERIES BASIC CYLINDERS

WEIGHT IN POUNDS

BORE	ROD DIA. (MM)	MOUNT													ADD PER INCH OF STROKE
		MS4 MXO	MX1 MX2 MX3	MF1	MF2	MF5	MF6	MP1	MP2	MS2 MS3 MS7	MT1 MT2	MT4	ME3 ME4	SB	
1.50	0.625	3.9	4.3	4.6	4.6	5.0	4.2	4.8	4.4	4.4	5.8	N/A	4.1	0.6	
	1.000	4.7	5.0	5.4	5.4	5.8	5.0	5.6	5.2	5.2	6.6	N/A	4.9	0.8	
2.00	0.625	6.4	6.9	7.3	7.4	8.0	6.7	7.3	6.9	7.0	8.7	N/A	6.6	1.0	
	1.000	6.9	7.3	7.8	7.9	8.5	7.2	7.8	7.4	7.5	9.2	N/A	7.1	1.3	
2.50	0.625	8.9	9.6	10.2	10.0	11.0	9.3	9.8	9.4	9.6	11.7	N/A	9.2	1.2	
	1.000	9.4	10.0	10.7	10.5	11.5	9.8	10.3	9.9	10.1	12.2	N/A	9.7	1.4	
3.25	1.000	16.4	18.4	19.9	19.1	21.6	17.8	19.5	17.7	17.8	20.0	N/A	17.2	1.6	
	1.375	16.9	18.8	20.4	19.5	22.1	18.3	20.0	18.2	18.3	20.5	N/A	17.7	1.8	
4.00	1.000	25.9	28.7	30.7	29.0	32.6	27.3	29.0	27.2	27.3	29.8	N/A	26.7	2.0	
	1.375	26.3	28.9	31.1	29.1	33.0	27.7	29.4	27.6	27.7	30.2	N/A	27.1	2.2	
5.00	1.000	38.8	42.8	45.8	43.4	48.7	40.5	41.9	41.9	40.2	44.5	N/A	39.7	2.2	
	1.375	39.3	42.9	46.3	43.7	49.2	41.0	42.4	42.4	40.7	45.0	N/A	40.2	2.4	
6.00	1.375	67.8	74.8	79.3	74.2	83.2	69.9	74.0	70.9	69.5	78.3	N/A	68.9	3.0	
	1.750	72.0	78.6	83.5	78.2	87.4	74.1	78.2	75.1	73.7	82.5	N/A	73.1	3.3	
8.00	1.375	96.0	N/A	N/A	N/A	N/A	99.0	N/A	99.5	98.0	113.0	95.0	97.7	4.0	
	1.750	103.0	N/A	N/A	N/A	N/A	106.0	N/A	106.5	105.0	120.0	102.0	104.7	4.3	

ACCESSORIES WEIGHT CHART

WEIGHT IN POUNDS

ROD CLEVIS		ROD EYES		EYE BRACKETS		CLEVIS BRACKETS		CLEVIS PINS				WELD PLATE		FLANGE END COUPLER	
PART NO.	WEIGHT	PART NO.	WEIGHT	PART NO.	WEIGHT	PART NO.	WEIGHT	PART NO.	WEIGHT	PART NO.	WEIGHT	PART NO.	WEIGHT	PART NO.	WEIGHT
RC437	.40	RE437	.30	EB500	.86	CB500	.90	CP500C	.12	CP500E	.12	WP625	.45	FEC625	.41
RC500	.40	RE500	.30	EB750	3.00	CB750	3.10	CP750C	.38	CP750E	.38	WP1000	.69	FEC1000	.65
RC750	1.22	RE625	.30	EB1000	6.36	CB1000	6.20	CP1000C	.80	CP1000E	.80	WP1375	1.26	FEC1375	1.22
RC1000	2.58	RE750	1.10	EB1375	11.22	CB1375	9.70	CP1375C	1.22	CP1375E	1.22	WP1750	2.25	FEC1750	2.25
RC1250	6.28	RE1000	2.40	EB1750	17.5	CB1750	17	CP1750C	4.1	CP1750E	3.78	WP2000	2.67	FEC2000	2.59
RC1375	6.28	RE1250	5.58	EB2000	25	CB2000	26	CP2000C	5.36	CP2000E	4.93	WP2500	3.38	FEC2500	3.30
RC1500	11.6	RE1375	5.58	EB2500	39	CB2500	37	CP2500C	9.42	CP2500E	9.22	—	—	—	—
RC1750	12.7	RE1500	10.52	—	—	—	—	—	—	—	—	—	—	—	—
RC1875	18	RE1875	11.5	—	—	—	—	—	—	—	—	—	—	—	—
RC2250	27	RE2250	23	—	—	—	—	—	—	—	—	—	—	—	—
RC2500	36	RE2500	32	—	—	—	—	—	—	—	—	—	—	—	—

ALIGNMENT COUPLERS WEIGHT CHART

WEIGHT IN POUNDS

PART NO.	WEIGHT	PART NO.	WEIGHT	PART NO.	WEIGHT	PART NO.	WEIGHT	PART NO.	WEIGHT	STAINLESS STEEL			
										PART NO.	WEIGHT	PART NO.	WEIGHT
AC250	.30	AC625	.40	AC1375	7.50	AC2250	8.50	AC3500	39.5	SS-AC250	.30	SS-AC750	1.10
AC312	.30	AC750	1.10	AC1500	7.60	AC2500	28	AC3750	40.2	SS-AC312	.32	SS-AC875	1.30
AC375	.30	AC875	1.10	AC1750	7.60	AC2750	29.2	AC4000	55	SS-AC375	.34	SS-AC1000	2.90
AC437	.30	AC1000	2.90	AC1875	8.00	AC3000	30.4	AC4500	60	SS-AC437	.36	SS-AC1250	3.10
AC500	.30	AC1250	2.90	AC2000	8.30	AC3250	38	AC5000	66	SS-AC500	.38	SS-AC1500	8.00
										SS-AC625	.40	-	-

STAINLESS STEEL ACCESSORIES WEIGHT CHART

WEIGHT IN POUNDS

ROD CLEVIS		ROD EYES		EYE BRACKETS & CLEVIS BRACKETS		CLEVIS PINS	
PART NUMBER	WEIGHT	PART NUMBER	WEIGHT	PART NUMBER	WEIGHT	PART NUMBER	WEIGHT
SS-RC437	.28	SS-RE750	.32	SS-EB500	1.2	SS-CP500-1	.12
SS-RC500	.28	SS-RE1000	.30	SS-EB750	3.8	SS-CP750-1	.38
SS-RC750	.78	SS-RE1375	1.10	SS-EB1000	6.9	SS-CP1000-1	.80
SS-RC1000	2.13	SS-RE1500	2.40	SS-CB500	1.5	SS-CP1375-1	1.22
SS-RC1250	5.8	-	-	SS-CB750	4.5	SS-CP1750-1	4.7
SS-RC1500	11.1	-	-	SS-CB1000	7.6	-	-

TECHNICAL DATA: SEAL KITS

SERIES 'TA', 'EN' & 'FM'

NOTE: To insure proper seals are supplied for all models, **ALWAYS** supply TRD serial number.

BORE	STANDARD SINGLE ROD END				STANDARD DOUBLE ROD END		
	PART NUMBER	WITH CUSHIONS			PART NUMBER	WITH CUSHIONS	
		H	C	HC		H	HC
1.50	SK 625-150	SK 625-150H	SK 625-150C	SK 625-150HC	SKD 625-150	SKD 625-150H	SKD 625-150HC
2.00	SK 625-200	SK 625-200H	SK 625-200C	SK 625-200HC	SKD 625-200	SKD 625-200H	SKD 625-200HC
2.50	SK 625-250	SK 625-250H	SK 625-250C	SK 625-250HC	SKD 625-250	SKD 625-250H	SKD 625-250HC
3.25	SK 100-325	SK 100-325H	SK 100-325C	SK 100-325HC	SKD 100-325	SKD 100-325H	SKD 100-325HC
4.00	SK 100-400	SK 100-400H	SK 100-400C	SK 100-400HC	SKD 100-400	SKD 100-400H	SKD 100-400HC
5.00	SK 100-500	SK 100-500H	SK 100-500C	SK 100-500HC	SKD 100-500	SKD 100-500H	SKD 100-500HC
6.00	SK 137-600	SK 137-600H	SK 137-600C	SK 137-600HC	SKD 137-600	SKD 137-600H	SKD 137-600HC
8.00	SK 137-800	SK 137-800H	SK 137-800C	SK 137-800HC	SKD 137-800	SKD 137-800H	SKD 137-800HC
10.00	SK 175-1000	SK 175-1000H	SK 175-1000C	SK 175-1000HC	SKD 175-1000	SKD 175-1000H	SKD 175-1000HC
12.00	SK 200-1200	SK 200-1200H	SK 200-1200C	SK 200-1200HC	SKD 200-1200	SKD 200-1200H	SKD 200-1200HC

BORE	OVERSIZE SINGLE ROD END				OVERSIZE DOUBLE ROD END		
	PART NUMBER	WITH CUSHIONS			PART NUMBER	WITH CUSHIONS	
		H	C	HC		H	HC
1.50	SK 100-150	N/A	SK 100-150C	N/A	SKD 100-150	N/A	N/A
2.00	SK 100-200	SK 100-200H	SK 100-200C	SK 100-200HC	SKD 100-200	SKD 100-200H	SKD 100-200HC
2.50	SK 100-250	SK 100-250H	SK 100-250C	SK 100-250HC	SKD 100-250	SKD 100-250H	SKD 100-250HC
3.25	SK 137-325	SK 137-325H	SK 137-325C	SK 137-325HC	SKD 137-325	SKD 137-325H	SKD 137-325HC
4.00	SK 137-400	SK 137-400H	SK 137-400C	SK 137-400HC	SKD 137-400	SKD 137-400H	SKD 137-400HC
5.00	SK 137-500	SK 137-500H	SK 137-500C	SK 137-500HC	SKD 137-500	SKD 137-500H	SKD 137-500HC
6.00	SK 175-600	SK 175-600H	SK 175-600C	SK 175-600HC	SKD 175-600	SKD 175-600H	SKD 175-600HC
8.00	SK 175-800	SK 175-800H	SK 175-800C	SK 175-800HC	SKD 175-800	SKD 175-800H	SKD 175-800HC
10.00	SK 200-1000	SK 200-1000H	SK 200-1000C	SK 200-1000HC	SKD 200-1000	SKD 200-1000H	SKD 200-1000HC
12.00	SK 250-1200	SK 250-1200H	SK 250-1200C	SK 250-1200HC	SKD 250-1200	SKD 250-1200H	SKD 250-1200HC

Single rod end seal kit includes: 2 Piston Seals, 2 Tube End Seals, Rod Wiper, Rod Seal & Bushing "O" Ring.

Note: Back-to-Back cylinders would require two (2) of the above kits.

SERIES 'TA', 'EN' & 'FM' (WITH 'TH' OPTION)

NOTE: To insure proper seals are supplied for all models, **ALWAYS** supply TRD serial number.

BORE	STANDARD SINGLE ROD END				STANDARD DOUBLE ROD END		
	PART NUMBER	WITH CUSHIONS			PART NUMBER	WITH CUSHIONS	
		H	C	HC		H	HC
1.50	THSK 625-150	THSK 625-150H	THSK 625-150C	THSK 625-150HC	THSKD 625-150	THSKD 625-150H	THSKD 625-150HC
2.00	THSK 625-200	THSK 625-200H	THSK 625-200C	THSK 625-200HC	THSKD 625-200	THSKD 625-200H	THSKD 625-200HC
2.50	THSK 625-250	THSK 625-250H	THSK 625-250C	THSK 625-250HC	THSKD 625-250	THSKD 625-250H	THSKD 625-250HC
3.25	THSK 100-325	THSK 100-325H	THSK 100-325C	THSK 100-325HC	THSKD 100-325	THSKD 100-325H	THSKD 100-325HC
4.00	THSK 100-400	THSK 100-400H	THSK 100-400C	THSK 100-400HC	THSKD 100-400	THSKD 100-400H	THSKD 100-400HC
5.00	THSK 100-500	THSK 100-500H	THSK 100-500C	THSK 100-500HC	THSKD 100-500	THSKD 100-500H	THSKD 100-500HC
6.00	THSK 137-600	THSK 137-600H	THSK 137-600C	THSK 137-600HC	THSKD 137-600	THSKD 137-600H	THSKD 137-600HC
8.00	THSK 137-800	THSK 137-800H	THSK 137-800C	THSK 137-800HC	THSKD 137-800	THSKD 137-800H	THSKD 137-800HC
10.00	THSK 175-1000	THSK 175-1000H	THSK 175-1000C	THSK 175-1000HC	THSKD 175-1000	THSKD 175-1000H	THSKD 175-1000HC
12.00	THSK 200-1200	THSK 200-1200H	THSK 200-1200C	THSK 200-1200HC	THSKD 200-1200	THSKD 200-1200H	THSKD 200-1200HC

BORE	OVERSIZE SINGLE ROD END				OVERSIZE DOUBLE ROD END		
	PART NUMBER	WITH CUSHIONS			PART NUMBER	WITH CUSHIONS	
		H	C	HC		H	HC
1.50	THSK 100-150	N/A	THSK 100-150C	N/A	THSKD 100-150	N/A	N/A
2.00	THSK 100-200	THSK 100-200H	THSK 100-200C	THSK 100-200HC	THSKD 100-200	THSKD 100-200H	THSKD 100-200HC
2.50	THSK 100-250	THSK 100-250H	THSK 100-250C	THSK 100-250HC	THSKD 100-250	THSKD 100-250H	THSKD 100-250HC
3.25	THSK 137-325	THSK 137-325H	THSK 137-325C	THSK 137-325HC	THSKD 137-325	THSKD 137-325H	THSKD 137-325HC
4.00	THSK 137-400	THSK 137-400H	THSK 137-400C	THSK 137-400HC	THSKD 137-400	THSKD 137-400H	THSKD 137-400HC
5.00	THSK 137-500	THSK 137-500H	THSK 137-500C	THSK 137-500HC	THSKD 137-500	THSKD 137-500H	THSKD 137-500HC
6.00	THSK 175-600	THSK 175-600H	THSK 175-600C	THSK 175-600HC	THSKD 175-600	THSKD 175-600H	THSKD 175-600HC
8.00	THSK 175-800	THSK 175-800H	THSK 175-800C	THSK 175-800HC	THSKD 175-800	THSKD 175-800H	THSKD 175-800HC
10.00	THSK 200-1000	THSK 200-1000H	THSK 200-1000C	THSK 200-1000HC	THSKD 200-1000	THSKD 200-1000H	THSKD 200-1000HC
12.00	THSK 250-1200	THSK 250-1200H	THSK 250-1200C	THSK 250-1200HC	THSKD 250-1200	THSKD 250-1200H	THSKD 250-1200HC

Single rod end Seal Kit includes: 2 Piston Seals, 2 Tube End Seals, Rod Wiper, Rod Seal & Bushing "O" Ring.

Note: Back-to-Back cylinders would require two (2) of the above kits.

TECHNICAL DATA: SEAL KITS

NOTE: To insure proper seals are supplied for all models, ALWAYS supply TRD serial number.

3-POSITION & TANDEM

BORE	STANDARD SINGLE ROD END			
	PART NUMBER	WITH CUSHIONS		
		H	C	HC
1.50	TSK 625-150	TSK 625-150H	TSK 625-150C	TSK 625-150HC
2.00	TSK 625-200	TSK 625-200H	TSK 625-200C	TSK 625-200HC
2.50	TSK 625-250	TSK 625-250H	TSK 625-250C	TSK 625-250HC
3.25	TSK 100-325	TSK 100-325H	TSK 100-325C	TSK 100-325HC
4.00	TSK 100-400	TSK 100-400H	TSK 100-400C	TSK 100-400HC
5.00	TSK 100-500	TSK 100-500H	TSK 100-500C	TSK 100-500HC
6.00	TSK 137-600	TSK 137-600H	TSK 137-600C	TSK 137-600HC
8.00	TSK 137-800	TSK 137-800H	TSK 137-800C	TSK 137-800HC

SERIES 'TD'

BORE	STANDARD SINGLE ROD END		KITS INCLUDE CUSHION SEALS AND WEAR BAND
	PART NUMBER		
1.50	BPSK 625-150		
2.00	BPSK 625-200		
2.50	BPSK 625-250		
3.25	BPSK 100-325		
4.00	BPSK 100-400		
5.00	BPSK 100-500		
6.00	BPSK 137-600		
8.00	BPSK 137-800		

BORE	OVERSIZE SINGLE ROD END			
	PART NUMBER	WITH CUSHIONS		
		H	C	HC
1.50	TSK 100-150	N/A	TSK 100-150C	N/A
2.00	TSK 100-200	TSK 100-200H	TSK 100-200C	TSK 100-200HC
2.50	TSK 100-250	TSK 100-250H	TSK 100-250C	TSK 100-250HC
3.25	TSK 137-325	TSK 137-325H	TSK 137-325C	TSK 137-325HC
4.00	TSK 137-400	TSK 137-400H	TSK 137-400C	TSK 137-400HC
5.00	TSK 137-500	TSK 137-500H	TSK 137-500C	TSK 137-500HC
6.00	TSK 175-600	TSK 175-600H	TSK 175-600C	TSK 175-600HC
8.00	TSK 175-800	TSK 175-800H	TSK 175-800C	TSK 175-800HC

BORE	OVERSIZE SINGLE ROD END		KITS INCLUDE CUSHION SEALS AND WEAR BAND
	PART NUMBER		
1.50	BPSK 100-150		
2.00	BPSK 100-200		
2.50	BPSK 100-250		
3.25	BPSK 137-325		
4.00	BPSK 137-400		
5.00	BPSK 137-500		
6.00	BPSK 175-600		
8.00	BPSK 175-800		

NOTE: To insure proper seals are supplied for all models, ALWAYS supply TRD serial number.

SERIES 'NR' (Internally Guided Non-Rotating)

BORE	PISTON ROD DIA.	PART NUMBER
2.00	0.625	NRSK 625-200
	0.625	NRSK 625-250
2.50	1.000	NRSK 100-250
	1.000	NRSK 100-325
3.25	1.375	NRSK 137-325
	1.000	NRSK 100-400
4.00	1.375	NRSK 137-400
	1.000	NRSK 100-500
5.00	1.375	NRSK 137-500
	1.375	NRSK 137-600
6.00	1.750	NRSK 175-600
	1.375	NRSK 137-800
8.00	1.750	NRSK 175-800
	1.750	NRSK 175-1000
10.00	2.000	NRSK 200-1000
	2.000	NRSK 200-1200
12.00	2.500	NRSK 250-1200

NOTE: Add suffix H and/or C to indicate if cushion seals are required on Head and/or Cap.

Example: NRSK 625-200HC

SERIES 'MS' (Multi-Stage)

Seal Kits same for 'MSE' or 'MSR'

STANDARD ROD DIAMETER		OVERSIZE ROD DIAMETER	
BORE	PART NUMBER	BORE	PART NUMBER
1.50	SK-MSE-625-150-2S	1.50	SK-MSE-100-150-2S
	SK-MSE-625-150-3S		SK-MSE-100-150-3S
	SK-MSE-625-150-4S		SK-MSE-100-150-4S
2.00	SK-MSE-625-200-2S	2.00	SK-MSE-100-200-2S
	SK-MSE-625-200-3S		SK-MSE-100-200-3S
	SK-MSE-625-200-4S		SK-MSE-100-200-4S
2.50	SK-MSE-625-250-2S	2.50	SK-MSE-100-250-2S
	SK-MSE-625-250-3S		SK-MSE-100-250-3S
	SK-MSE-625-250-4S		SK-MSE-100-250-4S
3.25	SK-MSE-100-325-2S	3.25	SK-MSE-137-325-2S
	SK-MSE-100-325-3S		SK-MSE-137-325-3S
	SK-MSE-100-325-4S		SK-MSE-137-325-4S
4.00	SK-MSE-100-400-2S	4.00	SK-MSE-137-400-2S
	SK-MSE-100-400-3S		SK-MSE-137-400-3S
	SK-MSE-100-400-4S		SK-MSE-137-400-4S
5.00	SK-MSE-100-500-2S	5.00	SK-MSE-137-500-2S
	SK-MSE-100-500-3S		SK-MSE-137-500-3S
	SK-MSE-100-500-4S		SK-MSE-137-500-4S
6.00	SK-MSE-137-600-2S	6.00	SK-MSE-175-600-2S
	SK-MSE-137-600-3S		SK-MSE-175-600-3S
	SK-MSE-137-600-4S		SK-MSE-175-600-4S
8.00	SK-MSE-137-800-2S	8.00	SK-MSE-175-800-2S
	SK-MSE-137-800-3S		SK-MSE-175-800-3S
	SK-MSE-137-800-4S		SK-MSE-175-800-4S

TECHNICAL DATA: SEAL KITS

SERIES 'TAS'

NOTE: To insure proper seals are supplied for all models, **ALWAYS** supply TRD serial number.

BORE	STANDARD SINGLE ROD END				STANDARD DOUBLE ROD END		
	PART NO.	WITH CUSHIONS			PART NO.	WITH CUSHIONS	
		H	C	HC		H	HC
1.50	SK 625-150-OTS	SK 625-150-OTS-H	SK 625-150-OTS-C	SK 625-150-OTS-HC	SKD 625-150-OTS	SKD 625-150-OTS-H	SKD 625-150-OTS-HC
2.00	SK 625-200-OTS	SK 625-200-OTS-H	SK 625-200-OTS-C	SK 625-200-OTS-HC	SKD 625-200-OTS	SKD 625-200-OTS-H	SKD 625-200-OTS-HC
2.50	SK 625-250-OTS	SK 625-250-OTS-H	SK 625-250-OTS-C	SK 625-250-OTS-HC	SKD 625-250-OTS	SKD 625-250-OTS-H	SKD 625-250-OTS-HC
3.25	SK 100-325-OTS	SK 100-325-OTS-H	SK 100-325-OTS-C	SK 100-325-OTS-HC	SKD 100-325-OTS	SKD 100-325-OTS-H	SKD 100-325-OTS-HC
4.00	SK 100-400-OTS	SK 100-400-OTS-H	SK 100-400-OTS-C	SK 100-400-OTS-HC	SKD 100-400-OTS	SKD 100-400-OTS-H	SKD 100-400-OTS-HC
5.00	SK 100-500-OTS	SK 100-500-OTS-H	SK 100-500-OTS-C	SK 100-500-OTS-HC	SKD 100-500-OTS	SKD 100-500-OTS-H	SKD 100-500-OTS-HC
6.00	SK 137-600-OTS	SK 137-600-OTS-H	SK 137-600-OTS-C	SK 137-600-OTS-HC	SKD 137-600-OTS	SKD 137-600-OTS-H	SKD 137-600-OTS-HC
8.00	SK 137-800-OTS	SK 137-800-OTS-H	SK 137-800-OTS-C	SK 137-800-OTS-HC	SKD 137-800-OTS	SKD 137-800-OTS-H	SKD 137-800-OTS-HC

BORE	OVERSIZE SINGLE ROD END				OVERSIZE DOUBLE ROD END		
	PART NO.	WITH CUSHIONS			PART NO.	WITH CUSHIONS	
		H	C	HC		H	HC
1.50	SK 100-150-OTS	N/A	SK 100-150-OTS-C	N/A	SKD 100-150-OTS	N/A	N/A
2.00	SK 100-200-OTS	SK 100-200-OTS-H	SK 100-200-OTS-C	SK 100-200-OTS-HC	SKD 100-200-OTS	SKD 100-200-OTS-H	SKD 100-200-OTS-HC
2.50	SK 100-250-OTS	SK 100-250-OTS-H	SK 100-250-OTS-C	SK 100-250-OTS-HC	SKD 100-250-OTS	SKD 100-250-OTS-H	SKD 100-250-OTS-HC
3.25	SK 137-325-OTS	SK 137-325-OTS-H	SK 137-325-OTS-C	SK 137-325-OTS-HC	SKD 137-325-OTS	SKD 137-325-OTS-H	SKD 137-325-OTS-HC
4.00	SK 137-400-OTS	SK 137-400-OTS-H	SK 137-400-OTS-C	SK 137-400-OTS-HC	SKD 137-400-OTS	SKD 137-400-OTS-H	SKD 137-400-OTS-HC
5.00	SK 137-500-OTS	SK 137-500-OTS-H	SK 137-500-OTS-C	SK 137-500-OTS-HC	SKD 137-500-OTS	SKD 137-500-OTS-H	SKD 137-500-OTS-HC
6.00	SK 175-600-OTS	SK 175-600-OTS-H	SK 175-600-OTS-C	SK 175-600-OTS-HC	SKD 175-600-OTS	SKD 175-600-OTS-H	SKD 175-600-OTS-HC
8.00	SK 175-800-OTS	SK 175-800-OTS-H	SK 175-800-OTS-C	SK 175-800-OTS-HC	SKD 175-800-OTS	SKD 175-800-OTS-H	SKD 175-800-OTS-HC

Single rod end Seal Kit includes: 2 Piston Seals, 2 Tube End Seals, Rod Wiper, Rod Seal & Bushing "O" Ring.

Note: Back-to-Back cylinders would require two (2) of the above kits.

SERIES 'SS'

NOTE: To insure proper seals are supplied for all models, **ALWAYS** supply TRD serial number.

BORE	STANDARD SINGLE ROD END				STANDARD DOUBLE ROD END		
	PART NO.	WITH CUSHIONS			PART NO.	WITH CUSHIONS	
		H	C	HC		H	HC
1.50	SSSK 625-150	SSSK 625-150H	SSSK 625-150C	SSSK 625-150HC	SSSKD 625-150	SSSKD 625-150H	SSSKD 625-150HC
2.00	SSSK 625-200	SSSK 625-200H	SSSK 625-200C	SSSK 625-200HC	SSSKD 625-200	SSSKD 625-200H	SSSKD 625-200HC
2.50	SSSK 625-250	SSSK 625-250H	SSSK 625-250C	SSSK 625-250HC	SSSKD 625-250	SSSKD 625-250H	SSSKD 625-250HC
3.25	SSSK 100-325	SSSK 100-325H	SSSK 100-325C	SSSK 100-325HC	SSSKD 100-325	SSSKD 100-325H	SSSKD 100-325HC
4.00	SSSK 100-400	SSSK 100-400H	SSSK 100-400C	SSSK 100-400HC	SSSKD 100-400	SSSKD 100-400H	SSSKD 100-400HC
5.00	SSSK 100-500	SSSK 100-500H	SSSK 100-500C	SSSK 100-500HC	SSSKD 100-500	SSSKD 100-500H	SSSKD 100-500HC
6.00	SSSK 137-600	SSSK 137-600H	SSSK 137-600C	SSSK 137-600HC	SSSKD 137-600	SSSKD 137-600H	SSSKD 137-600HC
8.00	SSSK 137-800	SSSK 137-800H	SSSK 137-800C	SSSK 137-800HC	SSSKD 137-800	SSSKD 137-800H	SSSKD 137-800HC

BORE	OVERSIZE SINGLE ROD END				OVERSIZE DOUBLE ROD END		
	PART NO.	WITH CUSHIONS			PART NO.	WITH CUSHIONS	
		H	C	HC		H	HC
1.50	SSSK 100-150	N/A	SSSK 100-150C	N/A	SSSKD 100-150	N/A	N/A
2.00	SSSK 100-200	SSSK 100-200H	SSSK 100-200C	SSSK 100-200HC	SSSKD 100-200	SSSKD 100-200H	SSSKD 100-200HC
2.50	SSSK 100-250	SSSK 100-250H	SSSK 100-250C	SSSK 100-250HC	SSSKD 100-250	SSSKD 100-250H	SSSKD 100-250HC
3.25	SSSK 137-325	SSSK 137-325H	SSSK 137-325C	SSSK 137-325HC	SSSKD 137-325	SSSKD 137-325H	SSSKD 137-325HC
4.00	SSSK 137-400	SSSK 137-400H	SSSK 137-400C	SSSK 137-400HC	SSSKD 137-400	SSSKD 137-400H	SSSKD 137-400HC
5.00	SSSK 137-500	SSSK 137-500H	SSSK 137-500C	SSSK 137-500HC	SSSKD 137-500	SSSKD 137-500H	SSSKD 137-500HC
6.00	SSSK 175-600	SSSK 175-600H	SSSK 175-600C	SSSK 175-600HC	SSSKD 175-600	SSSKD 175-600H	SSSKD 175-600HC
8.00	SSSK 175-800	SSSK 175-800H	SSSK 175-800C	SSSK 175-800HC	SSSKD 175-800	SSSKD 175-800H	SSSKD 175-800HC

Single rod end Seal Kit includes: 2 Piston Seals, 2 Tube End Seals, Rod Wiper, Rod Seal & Bushing "O" Ring.

Note: Back-to-Back cylinders would require two (2) of the above kits.

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CONVERSION CHARTS

FRACTION EQUIVALENTS											
FRACTION (INCHES)	DECIMAL (INCHES)	METRIC (MM) (x 25.4)	FRACTION (INCHES)	DECIMAL (INCHES)	METRIC (MM) (x 25.4)	FRACTION (INCHES)	DECIMAL (INCHES)	METRIC (MM) (x 25.4)	FRACTION (INCHES)	DECIMAL (INCHES)	METRIC (MM) (x 25.4)
1/64	.016	.4	17/64	.266	6.8	33/64	.516	13.1	49/64	.766	19.5
1/32	.031	.8	9/32	.281	7.1	17/32	.531	13.5	25/32	.781	19.8
3/64	.047	1.2	19/64	.297	7.5	35/64	.547	13.9	51/64	.797	20.2
1/16	.062	1.6	5/16	.312	7.9	9/16	.562	14.3	13/16	.812	20.6
5/64	.078	2.0	21/64	.328	8.3	37/64	.578	14.7	53/64	.828	21.0
3/32	.094	2.4	11/32	.344	8.7	19/32	.594	15.1	27/32	.844	21.4
7/64	.109	2.8	23/64	.359	9.1	39/64	.609	15.5	55/64	.859	21.8
1/8	.125	3.2	3/8	.375	9.5	5/8	.625	15.9	7/8	.875	22.2
9/64	.141	3.6	25/64	.391	9.9	41/64	.641	16.3	57/64	.891	22.6
5/32	.156	4.0	13/32	.406	10.3	21/32	.656	16.7	29/32	.906	23.0
11/64	.172	4.4	27/64	.422	10.7	43/64	.672	17.1	59/64	.922	23.4
3/16	.187	4.7	7/16	.437	11.1	11/16	.687	17.4	15/16	.937	23.8
13/64	.203	5.2	29/64	.453	11.5	45/64	.703	17.9	61/64	.953	24.2
7/32	.219	5.6	15/32	.469	11.9	23/32	.719	18.3	31/32	.969	24.6
15/64	.234	5.9	31/64	.484	12.3	47/64	.734	18.6	63/64	.984	25.0
1/4	.250	6.3	1/2	.500	12.7	3/4	.750	19.0	1	1.000	25.4

TEMPERATURE EQUIVALENTS							
FAHRENHEIT TO CELSIUS CONVERSION				CELSIUS TO FAHRENHEIT CONVERSION			
F°	C°	F°	C°	C°	F°	C°	F°
-30	-34.4	130	54.4	-30	-22	65	149
-20	-28.9	140	60.0	-20	-4	70	158
-10	-23.3	150	65.6	-10	14	75	167
0	-17.8	160	71.1	0	32	80	176
10	-12.2	170	76.7	5	41	85	185
20	-6.7	180	82.2	10	50	90	194
30	-1.1	190	87.8	15	59	95	203
40	4.4	200	93.3	20	68	100	212
50	10.0	210	98.9	25	77	105	221
60	15.6	220	104.4	30	86	110	230
70	21.1	230	110.0	35	95	115	239
80	26.7	240	115.6	40	104	120	248
90	32.2	250	121.1	45	113	125	257
100	37.8	300	148.9	50	122	130	266
110	43.3	350	176.7	55	131	150	302
120	48.9	400	204.4	60	140	200	392

C° = (F° - 32) ÷ 1.8

F° = C° x 1.8 + 32

PRESSURE CONVERSIONS					
PSI	KG/CM²	BARS	KG/CM²	PSI	BARS
60	4.2	4.1	4	56.9	3.9
70	4.9	4.8	5	71.1	4.9
80	5.6	5.5	6	85.3	5.9
90	6.3	6.2	7	99.5	6.9
100	7.0	6.9	8	113.8	7.8
150	10.5	10.3	9	128.0	8.8
200	14.0	13.8	10	142.2	9.8
250	17.6	17.2	20	284.4	19.6
300	21.1	20.7	30	426.6	29.4
350	24.6	24.1	40	568.8	39.2
400	28.1	27.6	50	711.0	49.0
450	31.6	31.0	60	853.2	58.8
500	35.1	34.4	70	995.4	68.6
550	38.7	37.9	80	1137.6	78.4
600	42.2	41.3	90	1279.8	88.2
650	45.7	44.8	100	1422.0	98.0
700	49.2	48.2	150	2133.0	147.0
750	52.7	51.7	200	2844.0	196.0
800	56.2	55.1	250	3555.0	245.0
850	59.8	58.6	300	4266.0	294.0
900	63.3	62.0	350	4977.0	343.0
950	66.8	65.5	—	—	—
1000	70.3	68.9	—	—	—
1500	105.5	103.4	—	—	—
2000	140.6	137.8	—	—	—
2500	175.8	172.3	—	—	—
3000	210.9	206.7	—	—	—
3500	246.1	241.2	—	—	—
4000	281.2	275.6	—	—	—
4500	316.4	310.1	—	—	—
5000	351.5	344.5	—	—	—

Kg/cm² = PSI x .0703
Bars = PSI x .0689

PSI = Kg/cm² x 14.22
Bars = Kg/cm² x .98

MEASUREMENT CONVERSIONS					
INCHES	CM	MM	CM	INCHES	
1	2.5	25.4	1	.4	
2	5.1	50.8	2	.8	
3	7.6	76.2	3	1.2	
4	10.2	101.6	4	1.6	
5	12.7	127.0	5	2.0	
6	15.2	152.4	6	2.4	
7	17.8	177.8	7	2.8	
8	20.3	203.2	8	3.1	
9	22.9	228.6	9	3.5	
10	25.4	254.0	10	3.9	
15	38.1	381.0	20	7.9	
20	50.8	508.0	30	11.8	
25	63.5	635.0	40	15.8	
30	76.2	762.0	50	19.7	
35	88.9	889.0	60	23.6	
40	101.6	1016.0	70	27.6	
45	114.3	1143.0	80	31.5	
50	127.0	1270.0	90	35.5	
55	139.7	1397.0	100	39.4	
60	152.4	1524.0	110	43.3	
65	165.1	1651.0	120	47.3	
70	177.8	1778.00	130	51.2	
75	190.5	1905.0	140	55.2	
80	203.2	2032.0	150	59.1	
85	215.9	2159.0	160	63.0	
90	228.6	2286.0	170	67.0	
95	241.3	2413.0	180	70.9	
100	254.0	2540.0	190	74.9	
—	—	—	200	78.8	
—	—	—	210	82.7	
—	—	—	220	86.7	
—	—	—	230	90.6	
—	—	—	240	94.6	
—	—	—	250	98.5	
—	—	—	260	102.4	

cm = in. x 2.54 mm = in. x 25.4 in. = cm x .394

TECHNICAL DATA

COMMON FLUID POWER FORMULAS

PROPERTY	WORD FORMULA	MATHEMATIC EQUATION
FLUID PRESSURE psi (Pounds per Square Inch)	Pressure = $\frac{\text{Force (lbs)}}{\text{Area (in}^2\text{)}}$	$P = \frac{F}{A}$
CYLINDER AREA EXTEND in ² (Square Inches)	Area = $\frac{\pi}{4} \times \text{Diameter}^2$ (inches)	$A = .7854 D^2$
CYLINDER AREA RETRACT in ² (Square Inches)	Area = $(\frac{\pi}{4} \times \text{Bore Diameter}^2) - (\frac{\pi}{4} \times \text{Rod Diameter}^2)$	$A = (.7854 D_b^2) - (.7854 D_r^2)$
CYLINDER FORCE lbs. (Pounds of Force)	Force = Pressure (psi) x Net Area (in ²)	$F = PA$
CYLINDER VELOCITY ft/s (Feet per Second)	Velocity = $\frac{231 \times \text{Flow Rate (GPM)}}{12 \times 60 \times \text{Net Area (in}^2\text{)}}$	$v = \frac{.3208 Q}{A}$
CYLINDER VOLUME G (Gallons of Fluid)	Volume = $\frac{\text{Net Area (in}^2\text{)} \times \text{Stroke (in)}}{231}$	$V = \frac{A L}{231}$
CYLINDER FLOW RATE GPM (Gallons per Minute)	Flow Rate = $\frac{12 \times 60 \times \text{Velocity (ft/s)} \times \text{Net Area (in}^2\text{)}}{231}$	$Q = 3.117 v A$
CYLINDER POWER hp (Horsepower)	Horsepower = $\frac{\text{Pressure (psi)} \times \text{Flow Rate (GPM)}}{1714}$	$hp = \frac{P Q}{1714}$
FLUID MOTOR TORQUE lb-in (Inch Pounds)	Torque = $\frac{\text{Pressure (psi)} \times \text{F.M. Displacement (in}^3\text{/rev.)}}{2\pi}$	$T = \frac{P d}{2\pi}$
	Torque = $\frac{\text{Horsepower} \times 63025}{\text{RPM}}$	$T = \frac{63025 \text{ hp}}{n}$
	Torque = $\frac{\text{Flow Rate (GPM)} \times \text{Pressure (psi)} \times 36.77}{\text{RPM}}$	$T = \frac{36.77 Q P}{N}$
FLUID MOTOR SPEED RPM (Revolutions per Minute)	Speed = $\frac{231 \times \text{Flow Rate (GPM)}}{\text{F.M. Displacement (in}^3\text{/rev.)}}$	$n = \frac{231 Q}{d}$
FLUID MOTOR POWER hp (Horsepower)	Horsepower = $\frac{\text{Torque (lbs-in)} \times \text{RPM}}{63025}$	$hp = \frac{T n}{63025}$
PUMP OUTLET FLOW GPM (Gallons per Minute)	Flow = $\frac{\text{RPM} \times \text{Pump Displacement (in}^3\text{/rev.)}}{231}$	$Q = \frac{n d}{231}$
FLOW RATE THROUGH PIPING ft/s Velocity (Feet per Second)	Velocity = $\frac{.3208 \times \text{Flow Rate Through I.D. (GPM)}}{\text{Internal Area (in}^2\text{)}}$	$v = \frac{.3208 Q}{A}$
TORQUE REQUIREMENT lb-in (Inch Pounds)	Torque = Lever Length (in.) x Pull (lbs.)	$T = L \times F$

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TECHNICAL DATA: TRD APPLICATION CHECK LIST

Date / /

Need help selecting the right cylinder for your application? Just fill out as much information about your application and contact your local distributor or TRD. (TRD Customer Service fax: 815-654-0690. E-mail: techsupport@trdmfg.com)

DISTRIBUTOR INFORMATION		
Distributor: _____	Branch Office: _____	Contact: _____
<i>How do you want to be contacted?</i>		
Phone: _____	Fax: _____	E-Mail: _____

CUSTOMER INFORMATION		
Customer: _____	Contact: _____	
<i>How do you want to be contacted?</i>		
Phone: _____	Fax: _____	E-Mail: _____

APPLICATION INFORMATION		
<i>Do you have a basic cylinder description?</i>		
Bore: _____	Stroke: _____	Mount: _____ Options: _____
Modification: _____		
Cylinder Operating Pressure: <input type="checkbox"/> Pneumatic _____ PSI <input type="checkbox"/> Hydraulic _____ PSI (Non-Shock)		
Ambient Temperature: <input type="checkbox"/> Normal Indoor Industrial <input type="checkbox"/> Cold: _____ °F <input type="checkbox"/> Hot: _____ °F		
Cylinder Velocity: _____ inches/second Cycles per Minute: _____		
Cylinder Orientation: <input type="checkbox"/> Horizontal <input type="checkbox"/> Vertical: <input type="checkbox"/> Rod Up <input type="checkbox"/> Rod Down <input type="checkbox"/> Angle: _____ (Degrees)		
Describe the load (including weight). Is the load guided? How is the cylinder rod attached to the load? Any side load?		

Application: _____		

<p>Sketch: (include dimensions)</p>	
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