

# TECHNICAL DATA

## How to determine the right size Cylinder for the job

To determine what size cylinder 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 4 in/sec) require 25% more force than the load, moderate speeds (4 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. So, 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

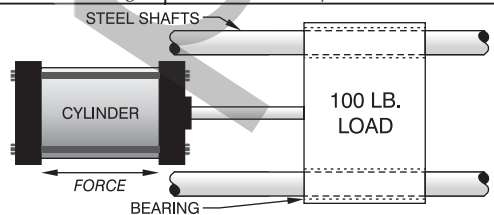
Once you've determined the force you need to move the load at the desired velocity and allow for friction, here's how to find the cylinder bore that meets your specifications.

The force generated by a cylinder is determined by the effective piston area times the air pressure. The force chart on page 117 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 4 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 117 shows that at 60 psi, the 2" bore with 5/8" 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)*

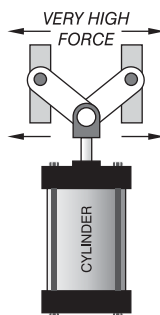
Plain Bearing Material	Cylinder Force	
	Dry Bearing	Oiled Bearing
PTFE	10 lbs.	10 lbs.
UHMW	20 lbs.	20 lbs.
Hardened Steel	25 lbs.	20 lbs.
Brass	40 lbs.	25 lbs.
Cast Iron	45 lbs.	25 lbs.
Steel (soft)	85 lbs.	25 lbs.
Ball Bearing	5-10 lb. Cylinder Force	



### General Mechanics

#### TOGGLE

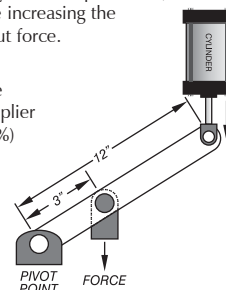
Toggles are complex mechanisms that can achieve very high force.



#### FORCE MULTIPLYING LEVER

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

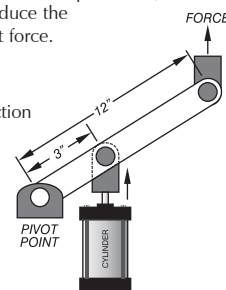
4:1 Force Multiplier (400%)



#### FORCE REDUCING LEVER

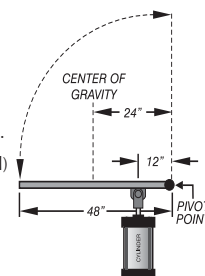
Force Reducing Levers increase the cylinder output stroke, but reduce the output force.

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 (assume 25%).



LOAD CENTER OF GRAVITY =  $\frac{48"}{2} = 24"$   
 LEVER =  $\frac{24"}{12"} = 2:1$   
 FORCE =  $2 \times 2,000 \text{ LBS.} = 4,000 \text{ LBS.}$   
 FORCE (INCLUDING =  $4,000 \times 1.25 = 5,000 \text{ LBS.}$  FRICTION)  
 AT 100 PSI AIR PRESSURE, THE FORCE CHART (ON PAGE 117) SHOWS THAT AN 8" BORE HAS 5,026 LBS. FORCE.

# 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	
1½	ALL	PUSH	1.767	106	142	177	353	442	706	.00102
	¾	PULL	1.460	88	117	146	292	365	584	.00084
	1	PULL	.982	59	79	98	196	246	392	.00057
2	ALL	PUSH	3.142	188	251	314	628	785	1256	.00182
	¾	PULL	2.835	170	227	284	567	708	1134	.00164
	1	PULL	2.357	141	189	236	471	589	942	.00136
2½	ALL	PUSH	4.909	295	393	491	981	1227	1962	.00284
	¾	PULL	4.602	276	368	460	920	1150	1840	.00266
	1	PULL	4.124	247	330	412	825	1031	1650	.00239
3¼	ALL	PUSH	8.296	498	664	830	1659	2074	3318	.00480
	1	PULL	7.511	451	601	751	1502	1877	3004	.00435
	1½	PULL	6.811	409	545	681	1362	1702	2724	.00394
4	ALL	PUSH	12.566	754	1005	1257	2513	3141	5026	.00727
	1	PULL	11.781	707	942	1178	2356	2945	4712	.00682
	1½	PULL	11.081	665	886	1108	2216	2770	4432	.00641
5	ALL	PUSH	19.635	1178	1571	1964	3927	4908	7854	.01136
	1	PULL	18.850	1131	1508	1885	3770	4712	7540	.01090
	1½	PULL	18.150	1089	1452	1815	3630	4537	7260	.01050
6	ALL	PUSH	28.274	1696	2262	2827	5655	7068	11310	.01636
	1½	PULL	26.789	1607	2144	2679	5358	6697	10716	.01550
	1¾	PULL	25.869	1552	2070	2587	5174	6467	10348	.01497
8	ALL	PUSH	50.265	3016	4021	5026	10053	12566	20106	.02908
	1½	PULL	48.780	2927	3902	4878	9756	12195	19512	.02832
	1¾	PULL	47.860	2872	3829	4786	9572	11965	19144	.02770
10	ALL	PUSH	78.540	4712	6283	7854	15708	19635	31416	.04545
	1¾	PULL	76.130	4568	6090	7613	15226	19032	30452	.04406
	2	PULL	75.400	4524	6032	7540	15080	18850	30160	.04363
12	ALL	PUSH	113.098	6786	9048	11310	22620	28275	45239	.06545
	2	PULL	109.956	6597	8796	10996	21992	27489	43982	.06363
	2½	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	ALL	¼	PUSH	3.044	182	243	304	609	761	1217	.00176
	¾		PULL	2.737	164	218	273	547	684	1094	.00158
2½	ALL	⅜	PUSH	4.755	285	380	475	951	1188	1902	.00275
	¾		PULL	4.448	266	355	444	889	1112	1779	.00257
	1		PULL	3.970	238	317	397	794	992	1588	.00229
3¼	ALL	½	PUSH	8.076	484	646	807	1613	2016	3226	.00466
	1		PULL	7.291	437	583	729	1458	1822	2916	.00422
	1½		PULL	6.591	395	527	659	1318	1647	2636	.00381
4	ALL	⅝	PUSH	11.952	717	956	1195	2390	2988	4780	.00692
	1		PULL	11.167	670	893	1116	2233	2791	4466	.00646
	1½		PULL	11.467	628	837	1046	2093	2616	4186	.00606
5	ALL	¾	PUSH	19.021	1141	1521	1902	3804	4755	7608	.01100
	1		PULL	18.236	1094	1458	1823	3647	4559	7294	.01050
	1½		PULL	17.536	1052	1402	1753	3507	4384	7014	.01010
6	ALL	¾	PUSH	27.660	1659	2212	2766	5532	6915	11064	.01600
	1½		PULL	26.175	1570	2094	2617	5235	6543	10470	.01510
	1¾		PULL	25.255	1515	2020	2525	5051	6313	10102	.01460
8	ALL	1	PUSH	48.694	2921	3895	4869	9738	12173	19477	.02810
	1½		PULL	47.209	2832	3776	4720	9441	11802	18883	.02730
	1¾		PULL	46.289	2777	3703	4628	9257	11572	18515	.02670
10	ALL	1	PUSH	76.969	4618	6157	7696	15393	19242	30787	.04450
	1¾		PULL	74.564	4473	5965	7456	14912	18641	29825	.04310
	2		PULL	73.829	4429	5906	7382	14765	18457	29531	.04270
12	ALL	1	PUSH	111.527	6691	8922	11152	22305	27881	44610	.06450
	2		PULL	108.385	6503	8670	10838	21677	27096	43354	.06270
	2½		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 69.  
For MSE multi-stage force chart, see page 79.

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

# TECHNICAL DATA

## How the right mounting and careful installation help prevent premature cylinder wear

Choosing the right style of mounting for your cylinder's size, force and function has a direct effect on its 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.

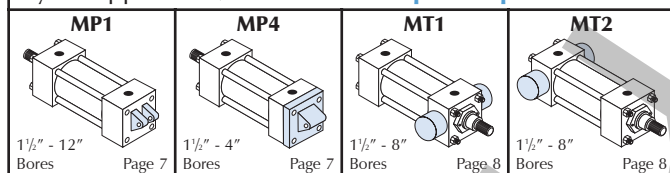
There are cylinder mounts and options to suit virtually every application.

### 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 89 to determine if a stop tube is needed for your application).

#### Samples of pivot mounts.

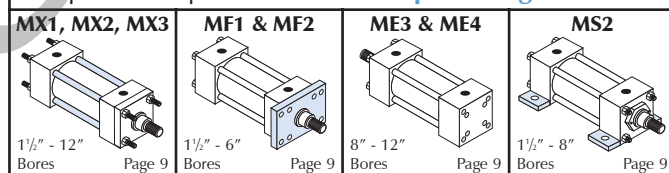


### Rigid Mount Cylinders

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 104 for details). 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 advice 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 1/16" thick X 3/8" wide (for 1 1/2" to 8" 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.** 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.** 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 105-115 for more details.

# TECHNICAL DATA

## WEIGHT CHARTS

### BASIC CYLINDERS (TA, TD, FM 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	
1½	1.6	2.0	1.6	2.1	2.2	2.2	2.2	2.5	.20
2	2.4	2.9	2.4	3.2	3.3	3.2	3.2	3.6	.25
2½	3.3	3.9	3.3	4.3	4.5	4.5	4.5	4.7	.27
3¼	6.5	7.9	6.5	9.2	10.1	10.0	10.0	9.0	.51
4	8.8	10.5	8.8	12.1	13.3	13.2	13.2	11.1	.55
5	13.2	14.3	13.2	17.8	19.9	N/A	20.0	17.5	.59
6	21.5	25.2	21.5	29.7	32.2	N/A	32.2	27.2	.84
8	35.4	36.5	35.4	43.5	N/A	N/A	35.4	N/A	1.25
10	70.3	N/A	70.0	72.0	N/A	N/A	70.3	N/A	1.60
12	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.

### ACCESSORIES

WEIGHT IN POUNDS

ROD CLEVIS		ROD EYES		EYE BRACKETS		CLEVIS BRACKETS		CLEVIS PINS	
PART NO.	WEIGHT	PART NO.	WEIGHT	PART NO.	WEIGHT	PART NO.	WEIGHT	PART NO.	WEIGHT
RC437	.40	RE750	1.10	EB500	.86	CB500	.90	CP500C	.12
RC500	.40	RE1000	2.40	EB750	3.00	CB750	3.10	CP750C	.38
RC750	1.22	RE1375	5.58	EB1000	6.36	CB1000	6.20	CP1000C	.80
RC1000	2.58	RE1500	10.52	EB1375	11.22	CB1375	9.70	CP1375C	1.22
RC1250	6.28	—	—	—	—	—	—	—	—
RC1500	11.60	—	—	—	—	—	—	—	—

### ALIGNMENT COUPLERS

WEIGHT IN POUNDS

PART NO.	WEIGHT	PART NO.	WEIGHT	PART NO.	WEIGHT
AC250	.30	AC625	.40	AC1375	7.50
AC312	.30	AC750	1.10	AC1500	7.60
AC375	.30	AC875	1.10	AC1750	7.60
AC437	.30	AC1000	2.90	—	—
AC500	.30	AC1250	2.90	—	—

## TORQUE CHARTS

### CYLINDER TIE RODS

(Aluminum, Stainless Steel & Steel Tubing)

CYLINDER BORE	TIE ROD THREAD SIZE	TORQUE IN FT.-LBS.
1½	¼-28	7
2	⅜-24	12
2½	½-24	14
3¼	⅝-24	30
4	¾-24	35
5	1½-20	45
6	1½-20	50
8	¾-18	125
10	¾-16	125
12	¾-16	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.
2½	⅜-24	10-12
3¼	⅜-24	20
4	⅜-24	25
5	½-20	35
8	¾-18	75

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

### RETAINER SCREWS

CYLINDER BORE	SIZE	TORQUE IN FT.-LBS.
2 & 2½	#10-32 S.H.C.S.	5
3¼ TO 12	¼-28 S.H.C.S.	12

# 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 NO.	WITH CUSHIONS			PART NO.	WITH CUSHIONS	
		H	C	HC		H	HC
1½	SK 625-150	SK 625-150H	SK 625-150C	SK 625-150HC	SKD 625-150	SKD 625-150H	SKD 625-150HC
2	SK 625-200	SK 625-200H	SK 625-200C	SK 625-200HC	SKD 625-200	SKD 625-200H	SKD 625-200HC
2½	SK 625-250	SK 625-250H	SK 625-250C	SK 625-250HC	SKD 625-250	SKD 625-250H	SKD 625-250HC
3¼	SK 100-325	SK 100-325H	SK 100-325C	SK 100-325HC	SKD 100-325	SKD 100-325H	SKD 100-325HC
4	SK 100-400	SK 100-400H	SK 100-400C	SK 100-400HC	SKD 100-400	SKD 100-400H	SKD 100-400HC
5	SK 100-500	SK 100-500H	SK 100-500C	SK 100-500HC	SKD 100-500	SKD 100-500H	SKD 100-500HC
6	SK 137-600	SK 137-600H	SK 137-600C	SK 137-600HC	SKD 137-600	SKD 137-600H	SKD 137-600HC
8	SK 137-800	SK 137-800H	SK 137-800C	SK 137-800HC	SKD 137-800	SKD 137-800H	SKD 137-800HC
10	SK 175-1000	SK 175-1000H	SK 175-1000C	SK 175-1000HC	SKD 175-1000	SKD 175-1000H	SKD 175-1000HC
12	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 NO.	WITH CUSHIONS			PART NO.	WITH CUSHIONS	
		H	C	HC		H	HC
1½	SK 100-150	N/A	SK 100-150C	N/A	SKD 100-150	N/A	N/A
2	SK 100-200	SK 100-200H	SK 100-200C	SK 100-200HC	SKD 100-200	SKD 100-200H	SKD 100-200HC
2½	SK 100-250	SK 100-250H	SK 100-250C	SK 100-250HC	SKD 100-250	SKD 100-250H	SKD 100-250HC
3¼	SK 137-325	SK 137-325H	SK 137-325C	SK 137-325HC	SKD 137-325	SKD 137-325H	SKD 137-325HC
4	SK 137-400	SK 137-400H	SK 137-400C	SK 137-400HC	SKD 137-400	SKD 137-400H	SKD 137-400HC
5	SK 137-500	SK 137-500H	SK 137-500C	SK 137-500HC	SKD 137-500	SKD 137-500H	SKD 137-500HC
6	SK 175-600	SK 175-600H	SK 175-600C	SK 175-600HC	SKD 175-600	SKD 175-600H	SKD 175-600HC
8	SK 175-800	SK 175-800H	SK 175-800C	SK 175-800HC	SKD 175-800	SKD 175-800H	SKD 175-800HC
10	SK 200-1000	SK 200-1000H	SK 200-1000C	SK 200-1000HC	SKD 200-1000	SKD 200-1000H	SKD 200-1000HC
12	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 (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 NO.	WITH CUSHIONS			PART NO.	WITH CUSHIONS	
		H	C	HC		H	HC
1½	THSK 625-150	THSK 625-150H	THSK 625-150C	THSK 625-150HC	THSKD 625-150	THSKD 625-150H	THSKD 625-150HC
2	THSK 625-200	THSK 625-200H	THSK 625-200C	THSK 625-200HC	THSKD 625-200	THSKD 625-200H	THSKD 625-200HC
2½	THSK 625-250	THSK 625-250H	THSK 625-250C	THSK 625-250HC	THSKD 625-250	THSKD 625-250H	THSKD 625-250HC
3¼	THSK 100-325	THSK 100-325H	THSK 100-325C	THSK 100-325HC	THSKD 100-325	THSKD 100-325H	THSKD 100-325HC
4	THSK 100-400	THSK 100-400H	THSK 100-400C	THSK 100-400HC	THSKD 100-400	THSKD 100-400H	THSKD 100-400HC
5	THSK 100-500	THSK 100-500H	THSK 100-500C	THSK 100-500HC	THSKD 100-500	THSKD 100-500H	THSKD 100-500HC
6	THSK 137-600	THSK 137-600H	THSK 137-600C	THSK 137-600HC	THSKD 137-600	THSKD 137-600H	THSKD 137-600HC
8	THSK 137-800	THSK 137-800H	THSK 137-800C	THSK 137-800HC	THSKD 137-800	THSKD 137-800H	THSKD 137-800HC
10	THSK 175-1000	THSK 175-1000H	THSK 175-1000C	THSK 175-1000HC	THSKD 175-1000	THSKD 175-1000H	THSKD 175-1000HC
12	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 NO.	WITH CUSHIONS			PART NO.	WITH CUSHIONS	
		H	C	HC		H	HC
1½	THSK 100-150	N/A	THSK 100-150C	N/A	THSKD 100-150	N/A	N/A
2	THSK 100-200	THSK 100-200H	THSK 100-200C	THSK 100-200HC	THSKD 100-200	THSKD 100-200H	THSKD 100-200HC
2½	THSK 100-250	THSK 100-250H	THSK 100-250C	THSK 100-250HC	THSKD 100-250	THSKD 100-250H	THSKD 100-250HC
3¼	THSK 137-325	THSK 137-325H	THSK 137-325C	THSK 137-325HC	THSKD 137-325	THSKD 137-325H	THSKD 137-325HC
4	THSK 137-400	THSK 137-400H	THSK 137-400C	THSK 137-400HC	THSKD 137-400	THSKD 137-400H	THSKD 137-400HC
5	THSK 137-500	THSK 137-500H	THSK 137-500C	THSK 137-500HC	THSKD 137-500	THSKD 137-500H	THSKD 137-500HC
6	THSK 175-600	THSK 175-600H	THSK 175-600C	THSK 175-600HC	THSKD 175-600	THSKD 175-600H	THSKD 175-600HC
8	THSK 175-800	THSK 175-800H	THSK 175-800C	THSK 175-800HC	THSKD 175-800	THSKD 175-800H	THSKD 175-800HC
10	THSK 200-1000	THSK 200-1000H	THSK 200-1000C	THSK 200-1000HC	THSKD 200-1000	THSKD 200-1000H	THSKD 200-1000HC
12	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 (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 NO.	WITH CUSHIONS		
		H	C	HC
1½	TSK 625-150	TSK 625-150H	TSK 625-150C	TSK 625-150HC
2	TSK 625-200	TSK 625-200H	TSK 625-200C	TSK 625-200HC
2½	TSK 625-250	TSK 625-250H	TSK 625-250C	TSK 625-250HC
3¼	TSK 100-325	TSK 100-325H	TSK 100-325C	TSK 100-325HC
4	TSK 100-400	TSK 100-400H	TSK 100-400C	TSK 100-400HC
5	TSK 100-500	TSK 100-500H	TSK 100-500C	TSK 100-500HC
6	TSK 137-600	TSK 137-600H	TSK 137-600C	TSK 137-600HC
8	TSK 137-800	TSK 137-800H	TSK 137-800C	TSK 137-800HC

BORE	STANDARD SINGLE ROD END		KITS INCLUDE CUSHION SEALS AND WEAR BAND
	PART NO.		
2	BPSK 625-200		
2½	BPSK 625-250		
3¼	BPSK 100-325		
4	BPSK 100-400		
5	BPSK 100-500		
6	BPSK 137-600		
8	BPSK 137-800		

BORE	OVERSIZE SINGLE ROD END			
	PART NO.	WITH CUSHIONS		
		H	C	HC
1½	TSK 100-150	N/A	TSK 100-150C	N/A
2	TSK 100-200	TSK 100-200H	TSK 100-200C	TSK 100-200HC
2½	TSK 100-250	TSK 100-250H	TSK 100-250C	TSK 100-250HC
3¼	TSK 137-325	TSK 137-325H	TSK 137-325C	TSK 137-325HC
4	TSK 137-400	TSK 137-400H	TSK 137-400C	TSK 137-400HC
5	TSK 137-500	TSK 137-500H	TSK 137-500C	TSK 137-500HC
6	TSK 175-600	TSK 175-600H	TSK 175-600C	TSK 175-600HC
8	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 NO.		
2	BPSK 100-200		
2½	BPSK 100-250		
3¼	BPSK 137-325		
4	BPSK 137-400		
5	BPSK 137-500		
6	BPSK 175-600		
8	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	5/8	NRSK 625-200
2½	5/8	NRSK 625-250
	1	NRSK 100-250
3¼	1	NRSK 100-325
	1 1/8	NRSK 137-325
4	1	NRSK 100-400
	1 1/8	NRSK 137-400
5	1	NRSK 100-500
	1 1/8	NRSK 137-500
6	1 1/8	NRSK 137-600
	1 1/4	NRSK 175-600
8	1 3/8	NRSK 137-800
	1 3/4	NRSK 175-800
10	1 3/4	NRSK 175-1000
	2	NRSK 200-1000
12	2	NRSK 200-1200
	2 1/2	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)

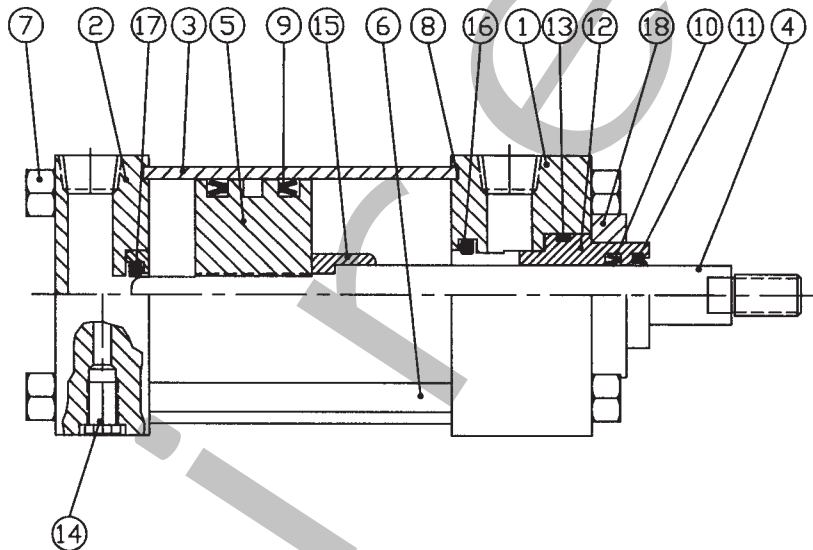
Seal Kits same for 'MSE' or 'MSR'

STANDARD ROD DIAMETER		OVERSIZE ROD DIAMETER	
BORE	PART NUMBER	BORE	PART NUMBER
1½	SK-MSE-625-150-2S	1½	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	SK-MSE-625-200-2S	2	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
2½	SK-MSE-625-250-2S	2½	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
3¼	SK-MSE-100-325-2S	3¼	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	SK-MSE-100-400-2S	4	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	SK-MSE-100-500-2S	5	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	SK-MSE-137-600-2S	6	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	SK-MSE-137-800-2S	8	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

# SERIES 'TA' CYLINDER PARTS LIST: STANDARD ROD DIAMETER

(Below listed parts can also be used for Back To Back Cylinders)

**NOTE:**  
When ordering any part,  
please supply TRD Serial  
Number to insure proper  
parts are supplied.



ITEM	QTY.	PART NAME	BORE SIZE									
			1½	2	2½	3¼	4	5	6	8	10	12
1	1	HEAD	A-10-15	A-10-20	A-10-25	A-10-32	A-10-40	A-10-50	A-10-60	A-10-80	A-10-100	A-10-120
2	1	CAP	A-25-15	A-25-20	A-25-25	A-25-32	A-25-40	A-25-50	A-25-60	A-25-80	A-25-100	A-25-120
3	1	TUBE	A-40-15 1¼ + STK	A-40-20 1¼ + STK	A-40-25 1½ + STK	A-40-32 1⅞ + STK	A-40-40 1⅞ + STK	A-40-50 1⅞ + STK	A-40-60 1⅞ + STK	A-40-80 1⅞ + STK	A-40-100 2⅞ + STK	A-40-120 2⅞ + STK
4	1	PISTON ROD 	Consult Factory with Serial Number									
5	1	*PISTON	A-15-15	A-15-20	A-15-25	A-15-32	A-15-40	A-15-50	A-15-60	A-15-80	A-15-100	A-15-120
6	4	†TIE ROD	A-50-15	A-50-20	A-50-25	A-50-32	A-50-32	A-50-50	A-50-60	A-50-80	A-50-100	A-50-120
7	8	TIE ROD NUTS	¼-28	⅝-24	⅝-24	¾-24	¾-24	½-20	½-20	⅝-18	¾-16	¾-16
8	2	TUBE SEAL	TS-15	TS-20	TS-25	TS-32	TS-40	TS-50	TS-60	TS-80	TS-100	TS-120
9	2	PISTON SEAL	PS-15	PS-20	PS-25	PS-32	PS-40	PS-50	PS-60	PS-80	PS-100	PS-120
10	1	ROD SEAL	RS-625	RS-625	RS-625	RS-1000	RS-1000	RS-1000	RS-1375	RS-1375	RS-1750	RS-2000
11	1	ROD WIPER	RW-625	RW-625	RW-625	RW-1000	RW-1000	RW-1000	RW-1375	RW-1375	RW-1750	RW-2000
12	1	ROD BUSHING	A-30-1	A-30-1	A-30-1	A-30-2	A-30-2	A-30-2	A-30-3	A-30-3	A-30-4	A-30-5
13	1	BUSHING "O" RING	BO-1	BO-1	BO-1	BO-2	BO-2	BO-2	BO-3	BO-3	BO-4	BO-5
14	1 or 2	ADJ. NEEDLE (incl) SEAL	A-66-1	A-66-1	A-66-1	A-66-2	A-66-2	A-66-2	A-66-2	A-66-2	A-66-2	A-66-2
15	1	CUSHION SPUD	A-65-1	A-65-1	A-65-1	A-65-2	A-65-2	A-65-2	A-65-3	A-65-3	A-65-4	A-65-5
16	1	CUSHION SEAL-H	CS-3	CS-3	CS-3	CS-4	CS-4	CS-4	CS-5	CS-5	CS-6	CS-6
17	1	CUSHION SEAL-C	CS-1	CS-1	CS-1	CS-2	CS-2	CS-2	CS-3	CS-3	CS-3	CS-3
18	1	RETAINER PLATE	A-36-15	A-35-1	A-35-1	A-35-2	A-35-2	A-35-2	A-35-3	A-35-3	A-35-4	A-35-5
	1	ROD BUSH SEALS INSTALLED	A-30-1A	A-30-1A	A-30-1A	A-30-2A	A-30-2A	A-30-2A	A-30-3A	A-30-3A	A-30-4A	A-30-5A

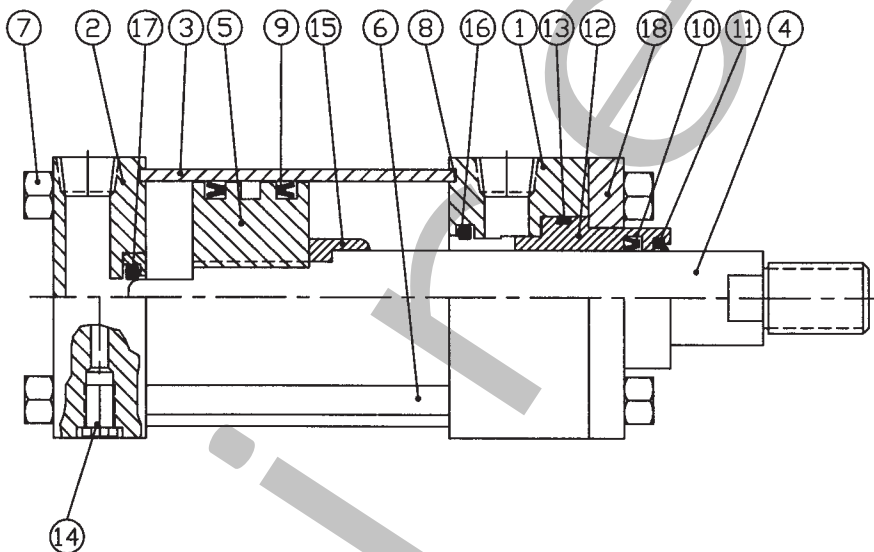
When ordering piston rod it is recommended to order both piston rod & piston (parts 4 & 5). Please specify TRD serial number.

\* Specify if air/oil seal is required - standard piston will accept magnetic strip only for center groove.

† Must supply serial number to insure proper tie rods are supplied.

# SERIES 'TA' CYLINDER PARTS LIST: OVERSIZE ROD DIAMETER

(Below listed parts can also be used for Back To Back Cylinders)



**NOTE:**  
When ordering any part,  
please supply TRD Serial  
Number to insure proper  
parts are supplied.

ITEM	QTY.	PART NAME	BORE SIZE									
			1½	2	2½	3¼	4	5	6	8	10	12
1	1	HEAD	A-110-15	A-110-20	A-110-25	A-110-32	A-110-40	A-110-50	A-110-60	A-110-80	A-110-100	A-110-120
2	1	CAP	A-25-15	A-25-20	A-25-25	A-25-32	A-25-40	A-25-50	A-25-60	A-25-80	A-25-100	A-25-120
3	1	TUBE	A-40-15 1¼ + STK	A-40-20 1¼ + STK	A-40-25 1½ + STK	A-40-32 1⅞ + STK	A-40-40 1⅞ + STK	A-40-50 1⅞ + STK	A-40-60 1⅞ + STK	A-40-80 1⅞ + STK	A-40-100 2⅞ + STK	A-40-120 2⅞ + STK
4	1	PISTON ROD ▲	Consult Factory with Serial Number									
5	1	*PISTON	A-15-15-1	A-15-20-1	A-15-25-1	A-15-32-1	A-15-40-1	A-15-50-1	A-15-60-1	A-15-80-1	A-15-100-1	A-15-120-1
6	4	†TIE ROD	A-50-15	A-50-20	A-50-25	A-50-32	A-50-32	A-50-50	A-50-60	A-50-80	A-50-100	A-50-120
7	8	TIE ROD NUTS	¼-28	⅜-24	⅜-24	⅜-24	⅜-24	½-20	½-20	⅝-18	¾-16	¾-16
8	2	TUBE SEAL	TS-15	TS-20	TS-25	TS-32	TS-40	TS-50	TS-60	TS-80	TS-100	TS-120
9	2	PISTON SEAL	PS-15	PS-20	PS-25	PS-32	PS-40	PS-50	PS-60	PS-80	PS-100	PS-120
10	1	ROD SEAL	RS-1000	RS-1000	RS-1000	RS-1375	RS-1375	RS-1375	RS-1750	RS-1750	RS-2000	RS-2500
11	1	ROD WIPER	RW-1000	RW-1000	RW-1000	RW-1375	RW-1375	RW-1375	RW-1750	RW-1750	RW-2000	RW-2500
12	1	ROD BUSHING	A-30-2-OS	A-30-2	A-30-2	A-30-3	A-30-3	A-30-3	A-30-4	A-30-4	A-30-5	A-30-6
13	1	BUSHING "O" RING	BO-2-OS	BO-2	BO-2	BO-3	BO-3	BO-3	BO-4	BO-4	BO-5	BO-6
14	1 or 2	ADJ. NEEDLE (incl) SEAL	A-66-1	A-66-1	A-66-1	A-66-2	A-66-2	A-66-2	A-66-2	A-66-2	A-66-2	A-66-2
15	1	CUSHION SPUD	N/A	A-65-2	A-65-2	A-65-3	A-65-3	A-65-3	A-65-4	A-65-4	A-65-5	A-65-6
16	1	CUSHION SEAL-H	N/A	CS-4	CS-4	CS-5	CS-5	CS-5	CS-6	CS-6	CS-6	CS-10
17	1	CUSHION SEAL-C	CS-1	CS-1	CS-1	CS-2	CS-2	CS-2	CS-3	CS-3	CS-3	CS-3
18	1	RETAINER PLATE	A-36-15-OS	A-36-20-OS	A-36-25-OS	A-36-32-OS	A-35-3	A-35-3	A-35-4	A-35-4	A-35-5	A-35-6
	1	ROD BUSH SEALS INSTALLED	A-30-2A-OS	A-30-2A	A-30-2A	A-30-3A	A-30-3A	A-30-3A	A-30-4A	A-30-4A	A-30-5A	A-30-6A

▲ When ordering piston rod it is recommended to order both piston rod & piston (parts 4 & 5). Please specify TRD serial number.

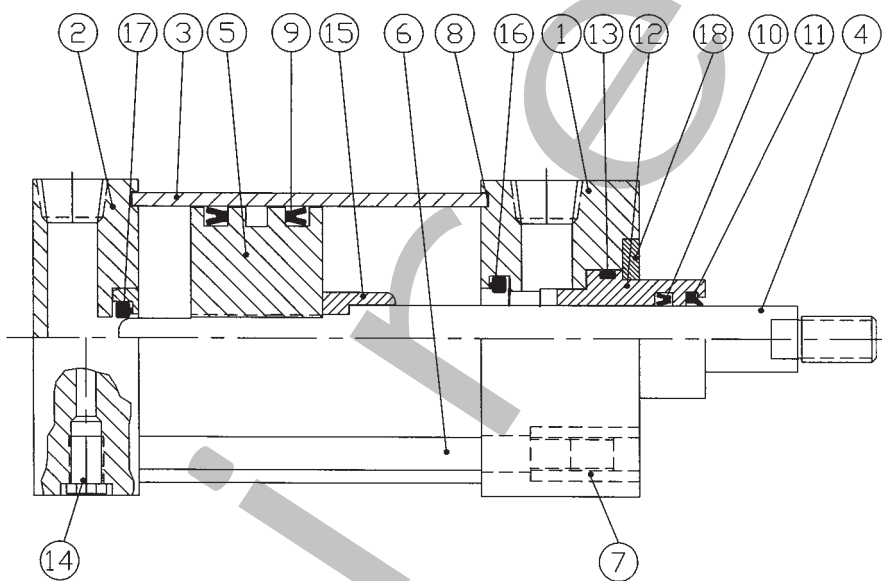
\* Specify if air/oil seal is required - standard piston will accept magnetic strip only for center groove.

† Must supply serial number to insure proper tie rods are supplied.



# SERIES 'FM' CYLINDER PARTS LIST: STANDARD ROD DIAMETER

**NOTE:**  
When ordering any part,  
please supply TRD Serial  
Number to insure proper  
parts are supplied.



ITEM	QTY.	PART NAME	BORE SIZE						
			1½	2	2½	3¼	4	5	6
1	1	HEAD	FM-10-15	FM-10-20	FM-10-25	FM-10-32	FM-10-40	FM-10-50	FM-10-60
2	1	CAP	FM-25-15	FM-25-20	FM-25-25	FM-25-32	FM-25-40	FM-25-50	FM-25-60
3	1	TUBE	A-40-15 1¼ + STK	A-40-20 1¼ + STK	A-40-25 1½ + STK	A-40-32 1⅞ + STK	A-40-40 1⅞ + STK	A-40-50 1⅞ + STK	A-40-60 1⅞ + STK
4	1	PISTON ROD <small>⚠</small>	Consult Factory with Serial Number						
5	1	*PISTON	A-15-15	A-15-20	A-15-25	A-15-32	A-15-40	A-15-50	A-15-60
6	4	†TIE ROD	A-50-15	A-50-20	A-50-25	A-50-32	A-50-32	A-50-50	A-50-60
7	4	SLEEVE NUTS	SN-100-250	SN-100-312	SN-100-312	SN-100-375	SN-100-375	SN-100-500	SN-100-500
8	2	TUBE SEAL	TS-15	TS-20	TS-25	TS-32	TS-40	TS-50	TS-60
9	2	PISTON SEAL	PS-15	PS-20	PS-25	PS-32	PS-40	PS-50	PS-60
10	1	ROD SEAL	RS-625	RS-625	RS-625	RS-1000	RS-1000	RS-1000	RS-1375
11	1	ROD WIPER	RW-625	RW-625	RW-625	RW-1000	RW-1000	RW-1000	RW-1375
12	1	ROD BUSHING	FM-30-1	FM-30-1	FM-30-1	FM-30-2	FM-30-2	FM-30-2	FM-30-3
13	1	BUSHING "O" RING	BO-1	BO-1	BO-1	BO-2	BO-2	BO-2	BO-3
14	1 or 2	ADJ. NEEDLE (incl) SEAL	A-66-1	A-66-1	A-66-1	A-66-2	A-66-2	A-66-2	A-66-2
15	1	CUSHION SPUD	A-65-1	A-65-1	A-65-1	A-65-2	A-65-2	A-65-2	A-65-3
16	1	CUSHION SEAL-H	CS-3	CS-3	CS-3	CS-4	CS-4	CS-4	CS-5
17	1	CUSHION SEAL-C	CS-1	CS-1	CS-1	CS-2	CS-2	CS-2	CS-3
18	1	RETAINER PLATE	FM-35-1	FM-35-1A	FM-35-1A	FM-35-2	FM-35-2	FM-35-2	FM-35-3
	1	ROD BUSH SEALS INSTALLED	A-30-1A	A-30-1A	A-30-1A	A-30-2A	A-30-2A	A-30-2A	A-30-3A

⚠ When ordering piston rod it is recommended to order both piston rod & piston (parts 4 & 5). Please specify TRD serial number.  
 \* Specify if air/oil seal is required - standard piston will accept magnetic strip only for center groove.  
 † Must supply serial number to insure proper tie rods are supplied.

# SERIES 'FM' CYLINDER PARTS LIST: OVERSIZE ROD DIAMETER

Basic Cylinders

Triple-Rod

Multi-Stage

Cylinder Options

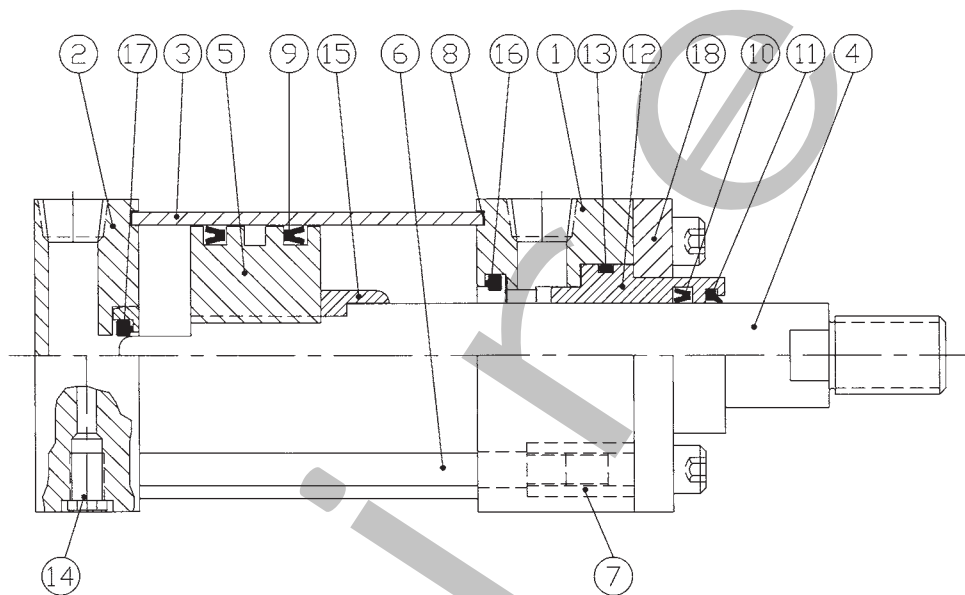
Air Boosters

Air/Oil Tanks

Accessories

Technical Data

**NOTE:**  
When ordering any part,  
please supply TRD Serial  
Number to insure proper  
parts are supplied.



ITEM	QTY.	PART NAME	BORE SIZE						
			1½	2	2½	3¼	4	5	6
1	1	HEAD	FM-110-15	FM-110-20	FM-110-25	FM-110-32	FM-110-40	FM-110-50	FM-110-60
2	1	CAP	FM-25-15	FM-25-20	FM-25-25	FM-25-32	FM-25-40	FM-25-50	FM-25-60
3	1	TUBE	A-40-15 1¼ + STK	A-40-20 1¼ + STK	A-40-25 1½ + STK	A-40-32 1⅞ + STK	A-40-40 1⅞ + STK	A-40-50 1⅞ + STK	A-40-60 1⅞ + STK
4	1	PISTON ROD ▲	Consult Factory with Serial Number						
5	1	*PISTON	A-15-15-OS-1	A-15-20-OS-1	A-15-25-OS-1	A-15-32-OS-1	A-15-40-OS-1	A-15-50-OS-1	A-15-60-OS-1
6	4	†TIE ROD	A-50-15	A-50-20	A-50-25	A-50-32	A-50-32	A-50-50	A-50-60
7	4	SLEEVE NUTS	SN-100-250	SN-100-312	SN-100-312	SN-100-375	SN-100-375	SN-100-500	SN-100-500
8	2	TUBE SEAL	TS-15	TS-20	TS-25	TS-32	TS-40	TS-50	TS-60
9	2	PISTON SEAL	PS-15	PS-20	PS-25	PS-32	PS-40	PS-50	PS-60
10	1	ROD SEAL	RS-1000	RS-1000	RS-1000	RS-1375	RS-1375	RS-1375	RS-1750
11	1	ROD WIPER	RW-1000	RW-1000	RW-1000	RW-1375	RW-1375	RW-1375	RW-1750
12	1	ROD BUSHING	FM-30-2-OS	FM-30-2	FM-30-2	FM-30-3	FM-30-3	FM-30-3	FM-30-4
13	1	BUSHING "O" RING	BO-2-OS	BO-2	BO-2	BO-3	BO-3	BO-3	BO-4
14	1 or 2	ADJ. NEEDLE (incl) SEAL	A-66-1	A-66-1	A-66-1	A-66-2	A-66-2	A-66-2	A-66-2
15	1	CUSHION SPUD	N/A	A-65-2	A-65-2	A-65-3	A-65-3	A-65-3	A-65-4
16	1	CUSHION SEAL-H	N/A	CS-4	CS-4	CS-5	CS-5	CS-5	CS-6
17	1	CUSHION SEAL-C	CS-1	CS-1	CS-1	CS-2	CS-2	CS-2	CS-3
18	1	RETAINER PLATE	FM-35-15-OS	FM-36-20-OS	FM-36-25-OS	FM-36-32-OS	FM-36-40-OS	FM-36-50-OS	FM-36-60-OS
	1	ROD BUSH SEALS INSTALLED	FM-30-2A-OS	FM-30-2A	FM-30-2A	FM-30-3A	FM-30-3A	FM-30-3A	FM-30-4A

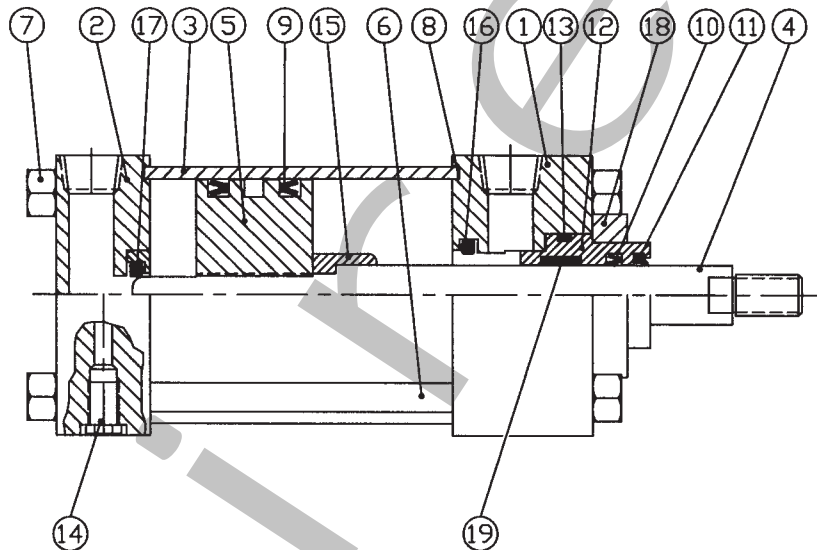
▲ When ordering piston rod it is recommended to order both piston rod & piston (parts 4 & 5). Please specify TRD serial number.

\* Specify if air/oil seal is required - standard piston will accept magnetic strip only for center groove.

† Must supply serial number to insure proper tie rods are supplied.

# SERIES 'TA' CYLINDER WITH 'EN' OPTION PARTS LIST: STANDARD ROD DIAMETER

**NOTE:**  
When ordering any part,  
please supply TRD Serial  
Number to insure proper  
parts are supplied.



ITEM	QTY.	PART NAME	BORE SIZE									
			1½	2	2½	3¼	4	5	6	8	10	12
1	1	HEAD	EN-10-15	EN-10-20	EN-10-25	EN-10-32	EN-10-40	EN-10-50	EN-10-60	EN-10-80	EN-10-100	EN-10-120
2	1	CAP	EN-25-15	EN-25-20	EN-25-25	EN-25-32	EN-25-40	EN-25-50	EN-25-60	EN-25-80	EN-25-100	EN-25-120
3	1	TUBE	EN-40-15 1¼ + STK	EN-40-20 1¼ + STK	EN-40-25 1½ + STK	EN-40-32 1⅞ + STK	EN-40-40 1⅞ + STK	EN-40-50 1⅞ + STK	EN-40-60 1⅞ + STK	EN-40-80 1⅞ + STK	EN-40-100 2⅞ + STK	EN-40-120 2⅞ + STK
4	1	PISTON ROD <small>▲</small>	Consult Factory with Serial Number									
5	1	*PISTON	A-15-15	A-15-20	A-15-25	A-15-32	A-15-40	A-15-50	A-15-60	A-15-80	A-15-100	A-15-120
6	4	+TIE ROD	SS-50-15	SS-50-20	SS-50-25	SS-50-32	SS-50-32	SS-50-50	SS-50-60	SS-50-80	SS-50-100	SS-50-120
7	8	TIE ROD NUTS (SS)	¼-28	⅝-24	⅝-24	¾-24	¾-24	½-20	½-20	⅝-18	¾-16	¾-16
8	2	TUBE SEAL	TS-15	TS-20	TS-25	TS-32	TS-40	TS-50	TS-60	TS-80	TS-100	TS-120
9	2	PISTON SEAL	PS-15	PS-20	PS-25	PS-32	PS-40	PS-50	PS-60	PS-80	PS-100	PS-120
10	1	ROD SEAL	RS-625	RS-625	RS-625	RS-1000	RS-1000	RS-1000	RS-1375	RS-1375	RS-1750	RS-2000
11	1	PTFE ROD WIPER	TRW-625	TRW-625	TRW-625	TRW-1000	TRW-1000	TRW-1000	TRW-1375	TRW-1375	TRW-1750	TRW-2000
12	1	ROD BUSHING	SS-30-1	SS-30-1	SS-30-1	SS-30-2	SS-30-2	SS-30-2	SS-30-3	SS-30-3	SS-30-4	SS-30-5
13	1	BUSHING "O" RING	BO-1	BO-1	BO-1	BO-2	BO-2	BO-2	BO-3	BO-3	BO-4	BO-5
14	1 or 2	ADJ. NEEDLE (incl) SEAL	SS-66-1	SS-66-1	SS-66-1	SS-66-2	SS-66-2	SS-66-2	SS-66-2	SS-66-2	SS-66-2	SS-66-2
15	1	CUSHION SPUD	A-65-1	A-65-1	A-65-1	A-65-2	A-65-2	A-65-2	A-65-3	A-65-3	A-65-4	A-65-5
16	1	CUSHION SEAL-H	CS-3	CS-3	CS-3	CS-4	CS-4	CS-4	CS-5	CS-5	CS-6	CS-6
17	1	CUSHION SEAL-C	CS-1	CS-1	CS-1	CS-2	CS-2	CS-2	CS-3	CS-3	CS-3	CS-3
18	1	RETAINER PLATE	EN-36-15	EN-35-1	EN-35-1	EN-35-2	EN-35-2	EN-35-2	EN-35-3	EN-35-3	EN-35-4	EN-35-5
19	1	PTFE ROD WEARBAND	TWB-625	TWB-625	TWB-625	TWB-1000	TWB-1000	TWB-1000	TWB-1375	TWB-1375	TWB-1750	TWB-2000
	1	ROD BUSH SEALS INSTALLED	SS-30-1A	SS-30-1A	SS-30-1A	SS-30-2A	SS-30-2A	SS-30-2A	SS-30-3A	SS-30-3A	SS-30-4A	SS-30-5A

▲ When ordering piston rod it is recommended to order both piston rod & piston (parts 4 & 5). Please specify TRD serial number.  
 \* Specify if air/oil seal is required - standard piston will accept magnetic strip only for center groove.  
 † Must supply serial number to insure proper tie rods are supplied.

Basic Cylinders  
Triple-Rod  
Multi-Stage  
Cylinder Options  
Air Boosters  
Air/Oil Tanks  
Accessories  
Technical Data

# SERIES 'TA' CYLINDER WITH 'EN' OPTION PARTS LIST: OVERSIZE ROD DIAMETER

Basic Cylinders

Triple-Rod

Multi-Stage

Cylinder Options

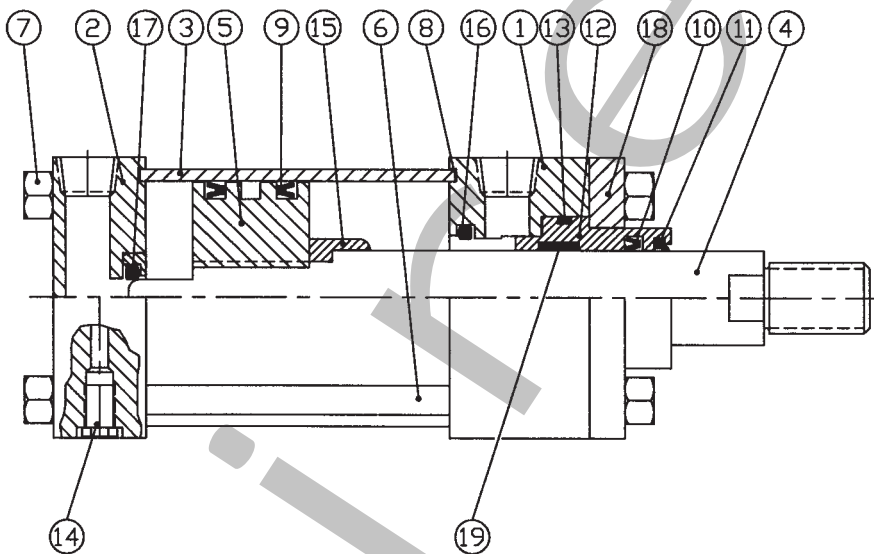
Air Boosters

Air/Oil Tanks

Accessories

Technical Data

**NOTE:**  
When ordering any part,  
please supply TRD Serial  
Number to insure proper  
parts are supplied.



ITEM	QTY.	PART NAME	BORE SIZE									
			1½	2	2½	3¼	4	5	6	8	10	12
1	1	HEAD	EN-110-15	EN-110-20	EN-110-25	EN-110-32	EN-110-40	EN-110-50	EN-110-60	EN-110-80	EN-110-100	EN-110-120
2	1	CAP	EN-25-15	EN-25-20	EN-25-25	EN-25-32	EN-25-40	EN-25-50	EN-25-60	EN-25-80	EN-25-100	EN-25-120
3	1	TUBE	EN-40-15 1¼ + STK	EN-40-20 1¼ + STK	EN-40-25 1½ + STK	EN-40-32 1⅞ + STK	EN-40-40 1⅞ + STK	EN-40-50 1⅞ + STK	EN-40-60 1⅞ + STK	EN-40-80 1⅞ + STK	EN-40-100 2⅞ + STK	EN-40-120 2⅞ + STK
4	1	PISTON ROD ⚠	Consult Factory with Serial Number									
5	1	*PISTON	A-15-15-OS-1	A-15-20-OS-1	A-15-25-OS-1	A-15-32-OS-1	A-15-40-OS-1	A-15-50-OS-1	A-15-60-OS-1	A-15-80-OS-1	A-15-100-OS-1	A-15-120-OS-1
6	4	+TIE ROD	SS-50-15	SS-50-20	SS-50-25	SS-50-32	SS-50-32	SS-50-50	SS-50-60	SS-50-80	SS-50-100	SS-50-120
7	8	TIE ROD NUTS (SS)	¼-28	⅜-24	⅜-24	⅜-24	⅜-24	½-20	½-20	⅝-18	¾-16	¾-16
8	2	TUBE SEAL	TS-15	TS-20	TS-25	TS-32	TS-40	TS-50	TS-60	TS-80	TS-100	TS-120
9	2	PISTON SEAL	PS-15	PS-20	PS-25	PS-32	PS-40	PS-50	PS-60	PS-80	PS-100	PS-120
10	1	ROD SEAL	RS-1000	RS-1000	RS-1000	RS-1375	RS-1375	RS-1375	RS-1750	RS-1750	RS-2000	RS-2500
11	1	PTFE ROD WIPER	TRW-1000	TRW-1000	TRW-1000	TRW-1375	TRW-1375	TRW-1375	TRW-1750	TRW-1750	TRW-2000	TRW-2500
12	1	ROD BUSHING	SS-30-2-OS	SS-30-2	SS-30-2	SS-30-3	SS-30-3	SS-30-3	SS-30-4	SS-30-4	SS-30-5	SS-30-6
13	1	BUSHING "O" RING	BO-2-OS	BO-2	BO-2	BO-3	BO-3	BO-3	BO-4	BO-4	BO-5	BO-6
14	1 or 2	ADJ. NEEDLE (incl) SEAL	SS-66-1	SS-66-1	SS-66-1	SS-66-2	SS-66-2	SS-66-2	SS-66-2	SS-66-2	SS-66-2	SS-66-2
15	1	CUSHION SPUD	N/A	A-65-2	A-65-2	A-65-3	A-65-3	A-65-3	A-65-4	A-65-4	A-65-5	A-65-6
16	1	CUSHION SEAL-H	N/A	CS-4	CS-4	CS-5	CS-5	CS-5	CS-6	CS-6	CS-6	CS-10
17	1	CUSHION SEAL-C	CS-1	CS-1	CS-1	CS-2	CS-2	CS-2	CS-3	CS-3	CS-3	CS-3
18	1	RETAINER PLATE	EN-36-15-OS	EN-36-20-OS	EN-36-25-OS	EN-36-32-OS	EN-35-3	EN-35-3	EN-35-4	EN-35-4	EN-35-5	EN-35-6
19	1	PTFE ROD WEARBAND	TWB-1000	TWB-1000	TWB-1000	TWB-1375	TWB-1375	TWB-1375	TWB-1750	TWB-1750	TWB-2000	TWB-2500
	1	ROD BUSH SEALS INSTALLED	SS-30-2A-OS	SS-30-2A	SS-30-2A	SS-30-3A	SS-30-3A	SS-30-3A	SS-30-4A	SS-30-4A	SS-30-5A	SS-30-6A

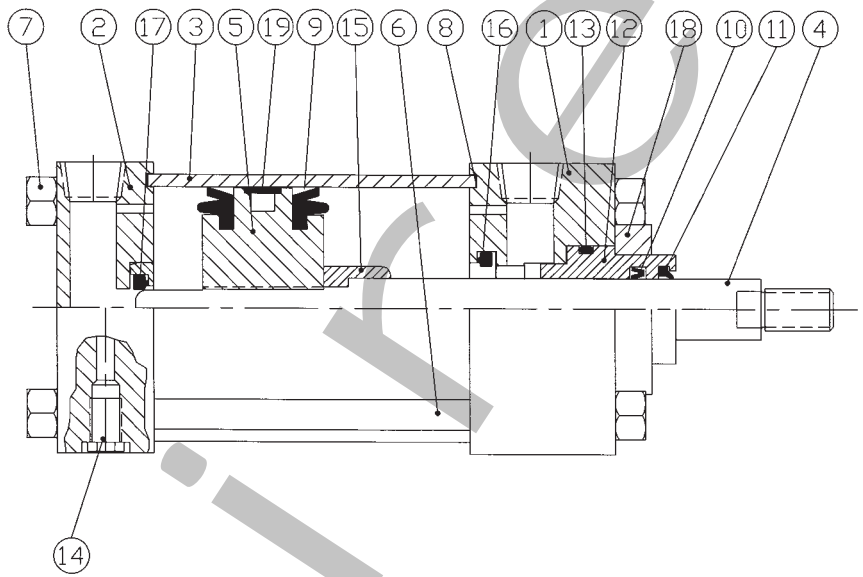
⚠ When ordering piston rod it is recommended to order both piston rod & piston (parts 4 & 5). Please specify TRD serial number.

\* Specify if air/oil seal is required - standard piston will accept magnetic strip only for center groove.

+ Must supply serial number to insure proper tie rods are supplied.

# SERIES 'TD' CYLINDER PARTS LIST: STANDARD ROD DIAMETER

**NOTE:**  
When ordering any part,  
please supply TRD Serial  
Number to insure proper  
parts are supplied.



ITEM	QTY.	PART NAME	BORE SIZE							
			1½	2	2½	3¼	4	5	6	8
1	1	HEAD	A-10-15-FC	A-10-20-FC	A-10-25-FC	A-10-32-FC	A-10-40-FC	A-10-50-FC	A-10-60-FC	A-10-80-FC
2	1	CAP	A-25-15-FC	A-25-20-FC	A-25-25-FC	A-25-32-FC	A-25-40-FC	A-25-50-FC	A-25-60-FC	A-25-80-FC
3	1	TUBE	A-40-15 1¼ + STK	A-40-20 1¼ + STK	A-40-25 1½ + STK	A-40-32 1⅞ + STK	A-40-40 1⅞ + STK	A-40-50 1⅞ + STK	A-40-60 1⅞ + STK	A-40-80 1⅞ + STK
4	1	PISTON ROD ▲	Consult Factory with Serial Number							
5	1	*PISTON	BP-15-15	BP-15-20	BP-15-25	BP-15-32	BP-15-40	BP-15-50	BP-15-60	BP-15-80
6	4	+TIE ROD	A-50-15	A-50-20	A-50-25	A-50-32	A-50-32	A-50-50	A-50-60	A-50-80
7	8	TIE ROD NUTS	¼-28	⅜-24	⅜-24	⅜-24	⅜-24	½-20	½-20	⅝-18
8	2	TUBE SEAL	TS-15	TS-20	TS-25	TS-32	TS-40	TS-50	TS-60	TS-80
9	2	PISTON SEAL	BPS-15	BPS-20	BPS-25	BPS-32	BPS-40	BPS-50	BPS-60	BPS-80
10	1	ROD SEAL	RS-625	RS-625	RS-625	RS-1000	RS-1000	RS-1000	RS-1375	RS-1375
11	1	ROD WIPER	RW-625	RW-625	RW-625	RW-1000	RW-1000	RW-1000	RW-1375	RW-1375
12	1	ROD BUSHING	A-30-1	A-30-1	A-30-1	A-30-2	A-30-2	A-30-2	A-30-3	A-30-3
13	1	BUSHING "O" RING	BO-1	BO-1	BO-1	BO-2	BO-2	BO-2	BO-3	BO-3
14	1 or 2	ADJ. NEEDLE OPTIONAL	A-66-1	A-66-1	A-66-1	A-66-2	A-66-2	A-66-2	A-66-2	A-66-2
15	1	CUSHION SPUD	A-65-1	A-65-1	A-65-1	A-65-2	A-65-2	A-65-2	A-65-3	A-65-3
16	1	CUSHION SEAL-H	CS-3	CS-3	CS-3	CS-4	CS-4	CS-4	CS-5	CS-5
17	1	CUSHION SEAL-C	CS-1	CS-1	CS-1	CS-2	CS-2	CS-2	CS-3	CS-3
18	1	RETAINER PLATE	A-36-15	A-35-1	A-35-1	A-35-2	A-35-2	A-35-2	A-35-3	A-35-3
19	1	PISTON WEARBAND	TWB-15	TWB-20	TWB-25	TWB-32	TWB-40	TWB-50	TWB-60	TWB-80
	1	ROD BUSH SEALS INSTALLED	A-30-1A	A-30-1A	A-30-1A	A-30-2A	A-30-2A	A-30-2A	A-30-3A	A-30-3A

▲ When ordering piston rod it is recommended to order both piston rod & piston (parts 4 & 5). Please specify TRD serial number.  
 \* Specify if air/oil seal is required - standard piston will accept magnetic strip only for center groove.  
 † Must supply serial number to insure proper tie rods are supplied.

# SERIES 'TD' CYLINDER PARTS LIST: OVERSIZE ROD DIAMETER

Basic Cylinders

Triple-Rod

Multi-Stage

Cylinder Options

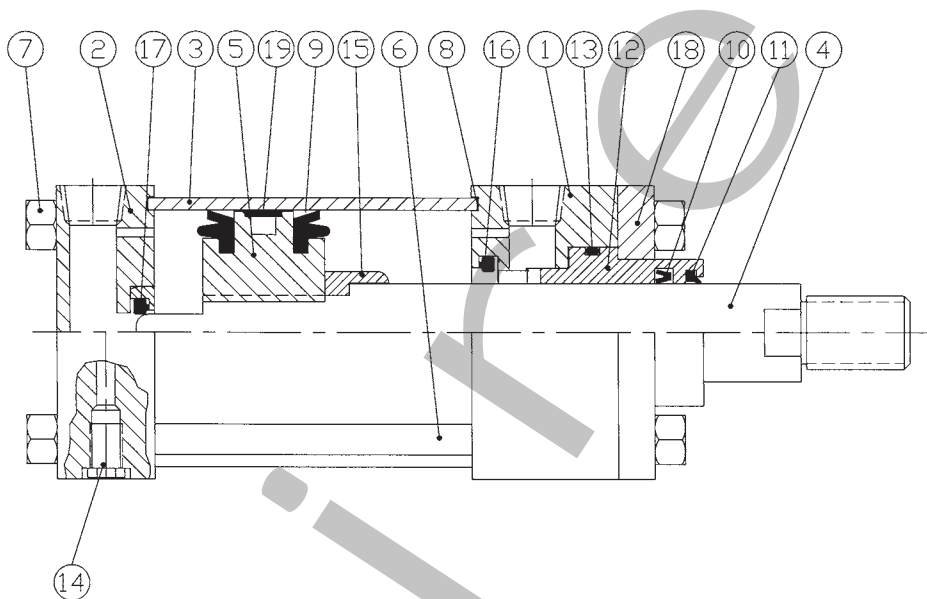
Air Boosters

Air/Oil Tanks

Accessories

Technical Data

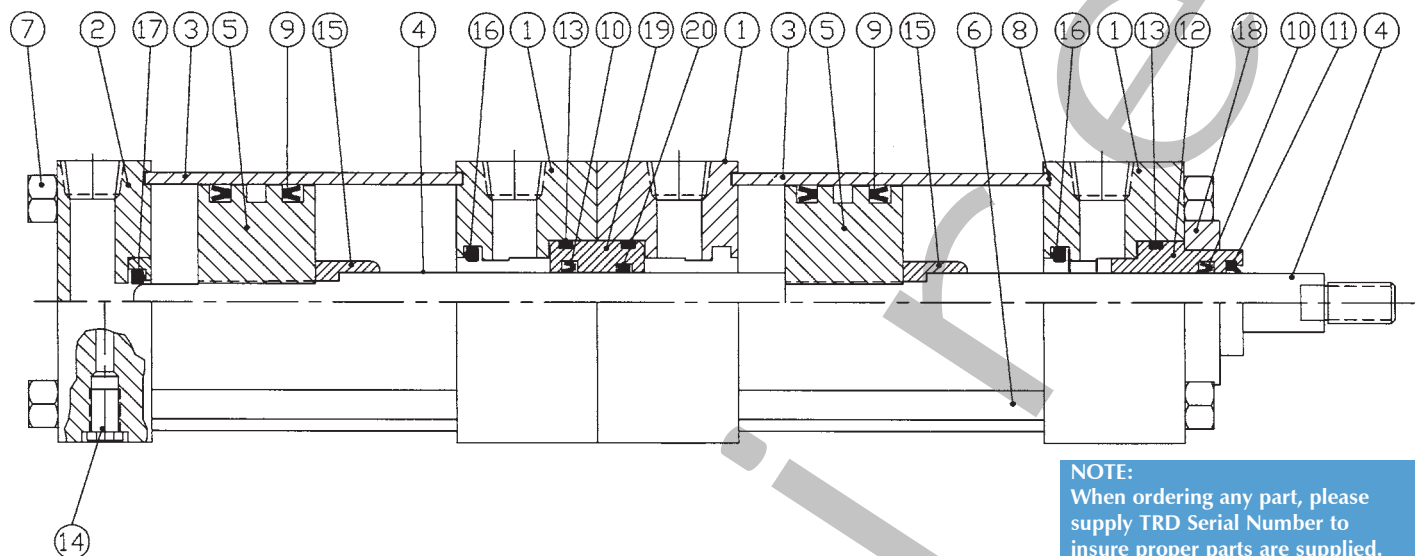
**NOTE:**  
When ordering any part,  
please supply TRD Serial  
Number to insure proper  
parts are supplied.



ITEM	QTY.	PART NAME	BORE SIZE							
			1½	2	2½	3¼	4	5	6	8
1	1	HEAD	A-110-15-FC	A-110-20-FC	A-110-25-FC	A-110-32-FC	A-110-40-FC	A-110-50-FC	A-110-60-FC	A-110-80-FC
2	1	CAP	A-25-15-FC	A-25-20-FC	A-25-25-FC	A-25-32-FC	A-25-40-FC	A-25-50-FC	A-25-60-FC	A-25-80-FC
3	1	TUBE	A-40-15 1¼ + STK	A-40-20 1¼ + STK	A-40-25 1½ + STK	A-40-32 1⅞ + STK	A-40-40 1⅞ + STK	A-40-50 1⅞ + STK	A-40-60 1⅞ + STK	A-40-80 1⅞ + STK
4	1	PISTON ROD ⚠	Consult Factory with Serial Number							
5	1	*PISTON	BP-15-15-OS	BP-15-20-OS	BP-15-25-OS	BP-15-32-OS	BP-15-40-OS	BP-15-50-OS	BP-15-60-OS	BP-15-80-OS
6	4	†TIE ROD	A-50-15	A-50-20	A-50-25	A-50-32	A-50-32	A-50-50	A-50-60	A-50-80
7	8	TIE ROD NUTS	¼-28	⅝-24	⅝-24	¾-24	¾-24	½-20	½-20	⅝-18
8	2	TUBE SEAL	TS-15	TS-20	TS-25	TS-32	TS-40	TS-50	TS-60	TS-80
9	2	PISTON SEAL	BPS-15	BPS-20	BPS-25	BPS-32	BPS-40	BPS-50	BPS-60	BPS-80
10	1	ROD SEAL	RS-1000	RS-1000	RS-1000	RS-1375	RS-1375	RS-1375	RS-1750	RS-1750
11	1	ROD WIPER	RW-1000	RW-1000	RW-1000	RW-1375	RW-1375	RW-1375	RW-1750	RW-1750
12	1	ROD BUSHING	A-30-2-OS	A-30-2	A-30-2	A-30-3	A-30-3	A-30-3	A-30-4	A-30-4
13	1	BUSHING "O" RING	BO-2-OS	BO-2	BO-2	BO-3	BO-3	BO-3	BO-4	BO-4
14	1 or 2	ADJ. NEEDLE OPTIONAL	A-66-1	A-66-1	A-66-1	A-66-2	A-66-2	A-66-2	A-66-2	A-66-2
15	1	CUSHION SPUD	N/A	A-65-2	A-65-2	A-65-3	A-65-3	A-65-3	A-65-4	A-65-4
16	1	CUSHION SEAL-H	N/A	CS-4	CS-4	CS-5	CS-5	CS-5	CS-6	CS-6
17	1	CUSHION SEAL-C	CS-1	CS-1	CS-1	CS-2	CS-2	CS-2	CS-3	CS-3
18	1	RETAINER PLATE	A-36-15-OS	A-36-20-OS	A-36-25-OS	A-36-32-OS	A-36-40-OS	A-36-50-OS	A-36-60-OS	A-35-4
19	1	PISTON WEARBAND	TWB-15	TWB-20	TWB-25	TWB-32	TWB-40	TWB-50	TWB-60	TWB-80
	1	ROD BUSH SEALS INSTALLED	A-30-2A-OS	A-30-2A	A-30-2A	A-30-3A	A-30-3A	A-30-3A	A-30-4A	A-30-4A

⚠ When ordering piston rod it is recommended to order both piston rod & piston (parts 4 & 5). Please specify TRD serial number.  
\* Specify if air/oil seal is required - standard piston will accept magnetic strip only for center groove.  
† Must supply serial number to insure proper tie rods are supplied.

# TANDEM AND 3 POSITION CYLINDER PARTS LIST: STANDARD ROD DIAMETER



**NOTE:**  
When ordering any part, please supply TRD Serial Number to insure proper parts are supplied.

ITEM	QTY.	PART NAME	BORE SIZE									
			1½	2	2½	3¼	4	5	6	8	10	12
1	3	HEAD	A-10-15	A-10-20	A-10-25	A-10-32	A-10-40	A-10-50	A-10-60	A-10-80	A-10-100	A-10-120
2	1	CAP	A-25-15	A-25-20	A-25-25	A-25-32	A-25-40	A-25-50	A-25-60	A-25-80	A-25-100	A-25-120
3	2	TUBE	A-40-15 1¼ + STK	A-40-20 1¼ + STK	A-40-25 1½ + STK	A-40-32 1⅞ + STK	A-40-40 1⅞ + STK	A-40-50 1⅞ + STK	A-40-60 1⅞ + STK	A-40-80 1⅞ + STK	A-40-100 2⅞ + STK	A-40-120 2⅞ + STK
4	1	PISTON ROD	Consult Factory with Serial Number									
5	2	*PISTON	A-15-15	A-15-20	A-15-25	A-15-32	A-15-40	A-15-50	A-15-60	A-15-80	A-15-100	A-15-120
6	4	†TIE ROD	A-50-15	A-50-20	A-50-25	A-50-32	A-50-32	A-50-50	A-50-60	A-50-80	A-50-100	A-50-120
7	8	TIE ROD NUTS	¼-28	⅝-24	⅝-24	¾-24	¾-24	½-20	½-20	⅝-18	¾-16	¾-16
8	4	TUBE SEAL	TS-15	TS-20	TS-25	TS-32	TS-40	TS-50	TS-60	TS-80	TS-100	TS-120
9	4	PISTON SEAL	PS-15	PS-20	PS-25	PS-32	PS-40	PS-50	PS-60	PS-80	PS-100	PS-120
10	2	ROD SEAL	RS-625	RS-625	RS-625	RS-1000	RS-1000	RS-1000	RS-1375	RS-1375	RS-1750	RS-2000
11	1	ROD WIPER	RW-625	RW-625	RW-625	RW-1000	RW-1000	RW-1000	RW-1375	RW-1375	RW-1750	RW-2000
12	1	ROD BUSHING	A-30-1	A-30-1	A-30-1	A-30-2	A-30-2	A-30-2	A-30-3	A-30-3	A-30-4	A-30-5
13	3	BUSHING "O" RING	BO-1	BO-1	BO-1	BO-2	BO-2	BO-2	BO-3	BO-3	BO-4	BO-5
14	1 to 3	ADJ. NEEDLE (incl) SEAL	A-66-1	A-66-1	A-66-1	A-66-2	A-66-2	A-66-2	A-66-2	A-66-2	A-66-2	A-66-2
15	1	CUSHION SPUD	A-65-1	A-65-1	A-65-1	A-65-2	A-65-2	A-65-2	A-65-3	A-65-3	A-65-4	A-65-5
16	1	CUSHION SEAL-H	CS-3	CS-3	CS-3	CS-4	CS-4	CS-4	CS-5	CS-5	CS-6	CS-6
17	1	CUSHION SEAL-C	CS-1	CS-1	CS-1	CS-2	CS-2	CS-2	CS-3	CS-3	CS-3	CS-3
18	1	RETAINER PLATE	A-36-15	A-35-1	A-35-1	A-35-2	A-35-2	A-35-2	A-35-3	A-35-3	A-35-4	A-35-5
19	1	△ TANDEM ROD BUSH	A-30-1-T	A-30-1-T	A-30-1-T	A-30-2-T	A-30-2-T	A-30-2-T	A-30-3-T	A-30-3-T	A-30-4-T	A-30-5-T
20	1	QUAD ROD SEAL	TH-625	TH-625	TH-625	TH-1000	TH-1000	TH-1000	TH-1375	TH-1375	TH-1750	TH-2000

△ Bushing replaceable on 3-Position cylinder only.

Note: The above can be used when ordering parts for a 3-Position cylinder if order-

\* Specify if air/oil seal is required - standard piston will accept magnetic strip only for center groove.

† Must supply serial number to insure proper tie rods are supplied.

# SERIES 'TRA' CYLINDER PARTS LIST

Basic Cylinders

Triple-Rod

Multi-Stage

Cylinder Options

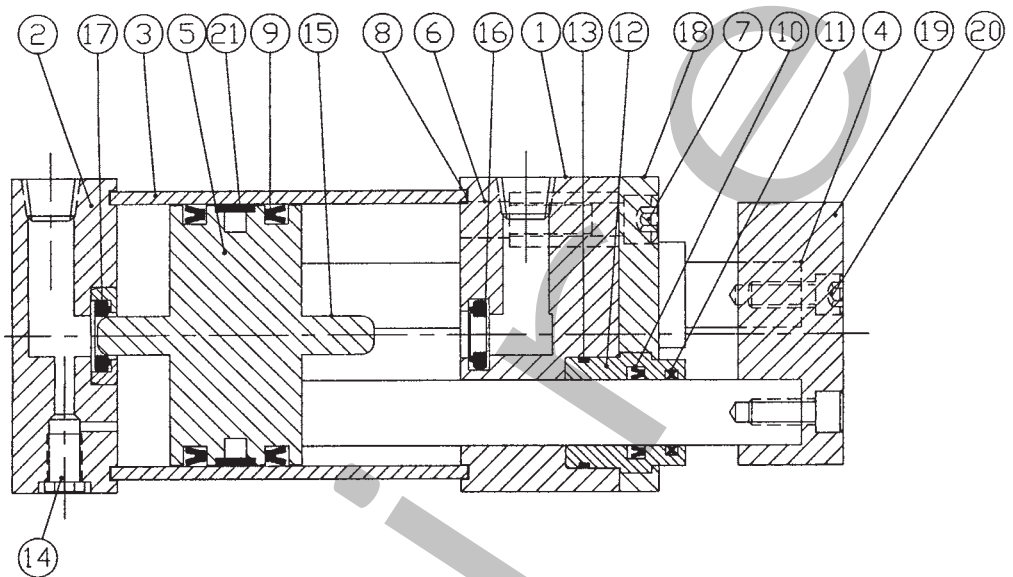
Air Boosters

Air/Oil Tanks

Accessories

Technical Data

**NOTE:**  
When ordering any part,  
please supply TRD Serial  
Number to insure proper  
parts are supplied.



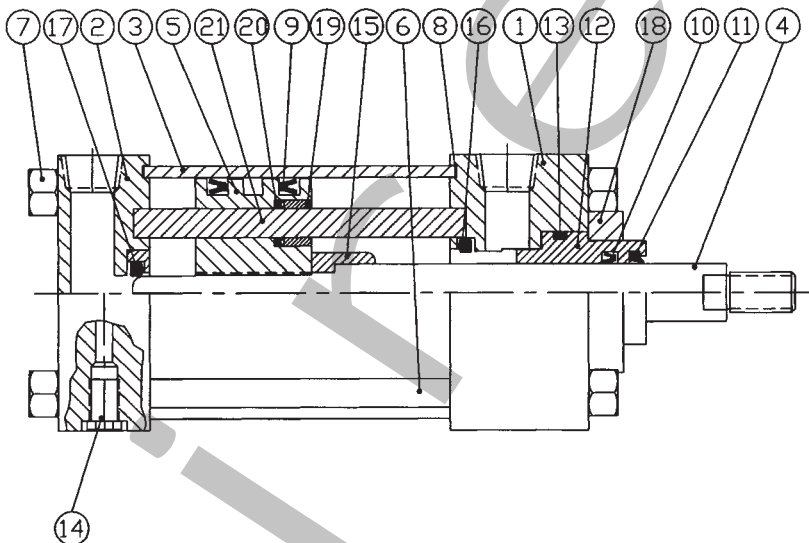
ITEM	QTY.	PART NAME	BORE SIZE							
			1½	2	2½	3¼	4	5	6	8
1	1	HEAD	TR-10-15	TR-10-20	TR-10-25	TR-10-32	TR-10-40	TR-10-50	TR-10-60	TR-10-80
2	1	CAP	FM-25-15	FM-25-20	FM-25-25	FM-25-32	FM-25-40	FM-25-50	FM-25-60	FM-25-80
3	1	TUBE	A-40-15 1¼ + STK	A-40-20 1¼ + STK	A-40-25 1¾ + STK	A-40-32 1⅞ + STK	A-40-40 1⅞ + STK	A-40-50 1⅞ + STK	A-40-60 1⅞ + STK	A-40-80 1⅞ + STK
4	1	PISTON ROD	Consult Factory with Serial Number							
5	1	*PISTON	TR-15-15	TR-15-20	TR-15-25	TR-15-32	TR-15-40	TR-15-50	TR-15-60	TR-15-80
6	4	TIE ROD	TR-50-15	TR-50-20	TR-50-25	TR-50-32	TR-50-32	TR-50-50	TR-50-60	TR-50-80
7	4	SLEEVE NUTS	SN-100-250	SN-100-312	SN-100-312	SN-100-375	SN-100-375	SN-100-500	SN-100-500	5/8-18 Hex Nuts
8	2	TUBE SEAL	TS-15	TS-20	TS-25	TS-32	TS-40	TS-50	TS-60	TS-80
9	2	PISTON SEAL	PS-15	PS-20	PS-25	PS-32	PS-40	PS-50	PS-60	PS-80
10	3	ROD SEAL	RS-312	RS-500	RS-625	RS-625	RS-625	RS-1000	RS-1000	RS-1000
11	3	ROD WIPER	RW-312	RW-500	RW-625	RW-625	RW-625	RW-1000	RW-1000	RW-1000
12	3	ROD BUSHING	TR-110-30-1	TR-110-30-2	TR-110-30-3	TR-110-30-3	TR-110-30-3	TR-110-30-4	TR-110-30-4	A-30-2
13	3	BUSHING "O" RING	TR-BO-1	TR-BO-2	TR-BO-3	TR-BO-3	TR-BO-3	TR-BO-4	TR-BO-4	BO-2
14	1 or 2	ADJ. NEEDLE OPTIONAL	A-66-1	A-66-1	A-66-1	A-66-2	A-66-2	A-66-2	A-66-2	A-66-2
15	2	CUSHION SPUD	PART OF PISTON			TR-CS-32-5-11	TR-CS-32-5-H	TR-CS-32-5-11	TR-CS-6-8-1	TR-CS-6-8-1
16	1	CUSHION SEAL-H	CS-8	CS-9	CS-1	CS-2	CS-2	CS-2	CS-3	CS-3
17	1	CUSHION SEAL-C	CS-1	CS-1	CS-1	CS-2	CS-2	CS-2	CS-3	CS-3
18	1	RETAINER PLATE	TR-36-15	TR-36-20	TR-36-25	TR-36-32	TR-36-40	TR-36-50	TR-36-60	(3) A-35-2
19	1	TOOLING PLATE	TR-39-15	TR-39-20	TR-39-25	TR-39-32	TR-39-40	TR-39-50	TR-39-60	TR-39-80
20	3	TOOLING PLATE SCREWS	#10-32X½	¼-28X½	5/16-24X1⅓	⅜-24X1	⅜-24X1	½-20X1	½-20X1	½-20X1
21	1	PISTON WEARBAND	PWB-15	PWB-20	PWB-25	PWB-32	PWB-40	PWB-50	PWB-60	PWB-80

△ 2½", 5", 6" & 8" bores use low head socket cap screws.

\* Specify if air/oil seal is required - standard piston will accept magnetic strip only for



# SERIES 'TA' CYLINDER WITH 'NR' OPTION PARTS LIST: STANDARD ROD DIAMETER

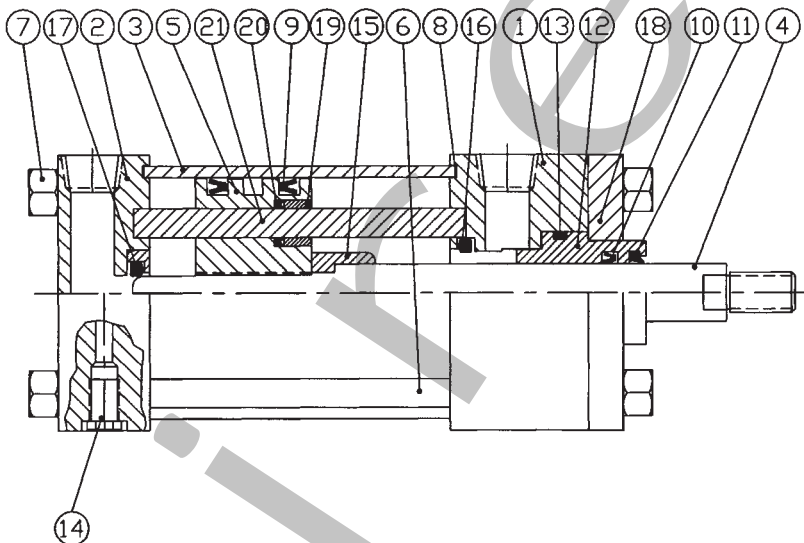


**NOTE:**  
When ordering any part,  
please supply TRD Serial  
Number to insure proper  
parts are supplied.

ITEM	QTY.	PART NAME	BORE SIZE								
			2	2½	3¼	4	5	6	8	10	12
1	1	HEAD	NR-A-10-20	NR-A-10-25	NR-A-10-32	NR-A-10-40	NR-A-10-50	NR-A-10-60	NR-A-10-80	NR-A-10-100	NR-A-10-120
2	1	CAP	NR-A-25-20	NR-A-25-25	NR-A-25-32	NR-A-25-40	NR-A-25-50	NR-A-25-60	NR-A-25-80	NR-A-25-100	NR-A-25-120
3	1	TUBE	A-40-20 1¼ + STK	A-40-25 1⅜ + STK	A-40-32 1⅞ + STK	A-40-40 1⅞ + STK	A-40-50 1⅞ + STK	A-40-60 1⅞ + STK	A-40-80 1⅞ + STK	A-40-100 2⅝ + STK	A-40-120 2⅞ + STK
4	1	PISTON ROD ▲	Consult Factory with Serial Number								
5	1	*PISTON	NR-A-15-20	NR-A-15-25	NR-A-15-32	NR-A-15-40	NR-A-15-50	NR-A-15-60	NR-A-15-80	NR-A-15-100	NR-A-15-120
6	4	†TIE ROD	A-50-20	A-50-25	A-50-32	A-50-32	A-50-50	A-50-60	A-50-80	A-50-100	A-50-120
7	8	TIE ROD NUTS	⅝-24	⅝-24	⅜-24	⅜-24	½-20	½-20	⅝-18	¾-16	¾-16
8	2	TUBE SEAL	TS-20	TS-25	TS-32	TS-40	TS-50	TS-60	TS-80	TS-100	TS-120
9	2	PISTON SEAL	PS-20	PS-25	PS-32	PS-40	PS-50	PS-60	PS-80	PS-100	PS-120
10	1	ROD SEAL	RS-625	RS-625	RS-1000	RS-1000	RS-1000	RS-1375	RS-1375	RS-1750	RS-2000
11	1	ROD WIPER	RW-625	RW-625	RW-1000	RW-1000	RW-1000	RW-1375	RW-1375	RW-1750	RW-2000
12	1	ROD BUSHING	A-30-1	A-30-1	A-30-2	A-30-2	A-30-2	A-30-3	A-30-3	A-30-4	A-30-5
13	1	BUSHING "O" RING	BO-1	BO-1	BO-2	BO-2	BO-2	BO-3	BO-3	BO-4	BO-5
14	1 or 2	ADJ. NEEDLE (incl) SEAL	A-66-1	A-66-1	A-66-2	A-66-2	A-66-2	A-66-2	A-66-2	A-66-2	A-66-2
15	1	CUSHION SPUD	N/A	N/A	A-65-2	A-65-2	A-65-2	A-65-3	A-65-3	A-65-4	A-65-5
16	1	CUSHION SEAL-H	N/A	N/A	CS-4	CS-4	CS-4	CS-5	CS-5	CS-6	CS-6
17	1	CUSHION SEAL-C	CS-1	CS-1	CS-2	CS-2	CS-2	CS-3	CS-3	CS-3	CS-3
18	1	RETAINER PLATE	A-35-1	A-35-1	A-35-2	A-35-2	A-35-2	A-35-3	A-35-3	A-35-4	A-35-5
19	2	GUIDE ROD BEARING	GRB-1	GRB-2	GRB-3	GRB-4	GRB-4	GRB-4	GRB-5	GRB-5	GRB-5
20	2	GUIDE ROD SEAL	2-010	2-109	Q4012	Q4114	Q4114	Q4114	TH-1000	TH-1000	TH-1000
21	2	GUIDE RODS ▲	GR-72-20	GR-72-25	GR-72-32	GR-72-40	GR-72-50	GR-72-60	GR-72-80	GR-72-100	GR-72-120

▲ Serial number required to insure proper parts supplied.  
\* Order as piston & piston rod assembly - serial number required.  
† Must supply serial number to insure proper tie rods are supplied.

# SERIES 'TA' CYLINDER WITH 'NR' OPTION PARTS LIST: OVERSIZE ROD DIAMETER

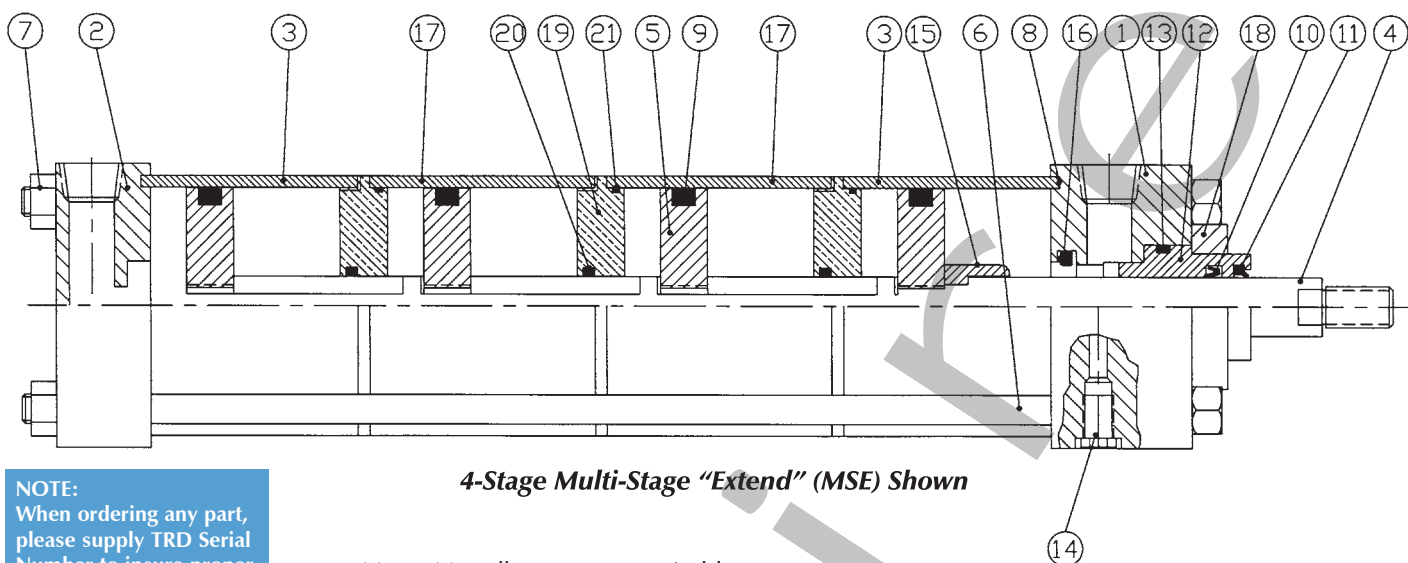


**NOTE:**  
When ordering any part,  
please supply TRD Serial  
Number to insure proper  
parts are supplied.

ITEM	QTY.	PART NAME	BORE SIZE							
			2½	3¼	4	5	6	8	10	12
1	1	HEAD	NR-110-25	NR-110-32	NR-110-40	NR-110-50	NR-110-60	NR-110-80	NR-110-100	NR-110-120
2	1	CAP	NR-25-25	NR-25-32	NR-25-40	NR-25-50	NR-25-60	NR-25-80	NR-25-100	NR-25-120
3	1	TUBE	A-40-25 1¾ + STK	A-40-32 1⅞ + STK	A-40-40 1⅞ + STK	A-40-50 1⅞ + STK	A-40-60 1⅞ + STK	A-40-80 1⅞ + STK	A-40-100 2⅝ + STK	A-40-120 2⅞ + STK
4	1	PISTON ROD ▲	Consult Factory with Serial Number							
5	1	*PISTON	NR-15-25-OS-1	NR-15-32-OS-1	NR-15-40-OS-1	NR-15-50-OS-1	NR-15-60-OS-1	NR-15-80-OS-1	NR-15-100-OS-1	NR-15-120-OS-1
6	4	†TIE ROD	A-50-25	A-50-32	A-50-32	A-50-50	A-50-60	A-50-80	A-50-100	A-50-120
7	8	TIE ROD NUTS	⅝-24	¾-24	¾-24	½-20	½-20	⅝-18	¾-16	¾-16
8	2	TUBE SEAL	TS-25	TS-32	TS-40	TS-50	TS-60	TS-80	TS-100	TS-120
9	2	PISTON SEAL	PS-25	PS-32	PS-40	PS-50	PS-60	PS-80	PS-100	PS-120
10	1	ROD SEAL	RS-1000	RS-1375	RS-1375	RS-1375	RS-1750	RS-1750	RS-2000	RS-2500
11	1	ROD WIPER	RW-1000	RW-1375	RW-1375	RW-1375	RW-1750	RW-1750	RW-2000	RW-2500
12	1	ROD BUSHING	A-30-2	A-30-3	A-30-3	A-30-3	A-30-4	A-30-4	A-30-5	A-30-6
13	1	BUSHING "O" RING	BO-2	BO-3	BO-3	BO-3	BO-4	BO-4	BO-5	BO-6
14	1 or 2	ADJ. NEEDLE (incl) SEAL	A-66-1	A-66-2	A-66-2	A-66-2	A-66-2	A-66-2	A-66-2	A-66-2
15	1	CUSHION SPUD	N/A	A-65-3	A-65-3	A-65-3	A-65-4	A-65-4	A-65-5	A-65-6
16	1	CUSHION SEAL-H	N/A	CS-5	CS-5	CS-5	CS-6	CS-6	CS-6	CS-10
17	1	CUSHION SEAL-C	CS-1	CS-2	CS-2	CS-2	CS-3	CS-3	CS-3	CS-3
18	1	RETAINER PLATE	A-36-25-OS	A-36-32-OS	A-36-40-OS	A-36-50-OS	A-36-60-OS	A-35-4	A-35-5	A-35-6
19	2	GUIDE ROD BEARING	GRB-2	GRB-3	GRB-4	GRB-4	GRB-4	GRB-5	GRB-5	GRB-5
20	2	GUIDE ROD SEAL	2-109	Q4012	Q4114	Q4114	Q4114	TH-1000	TH-1000	TH-1000
21	2	GUIDE RODS ▲	GR-72-25	GR-72-32	GR-72-40	GR-72-50	GR-72-60	GR-72-80	GR-72-100	GR-72-120

▲ Serial number required to insure proper parts supplied.  
\* Order as piston & piston rod assembly - serial number required.  
† Must supply serial number to insure proper tie rods are supplied.

# SERIES 'MSE' CYLINDER PARTS LIST: STANDARD ROD DIAMETER



**NOTE:**  
When ordering any part, please supply TRD Serial Number to insure proper parts are supplied.

4-Stage Multi-Stage "Extend" (MSE) Shown

Note: Not all parts are repairable.  
(MSR - consult factory)

ITEM	QTY.	PART NAME	BORE SIZE							
			1½	2	2½	3¼	4	5	6	8
1	1	HEAD	A-10-15	A-10-20	A-10-25	A-10-32	A-10-40	A-10-50	A-10-60	A-10-80
2	1	CAP	A-25-15	A-25-20	A-25-25	A-25-32	A-25-40	A-25-50	A-25-60	A-25-80
3	1	FRONT/REAR TUBE	A-40-15	A-40-20	A-40-25	A-40-32	A-40-40	A-40-50	A-40-60	A-40-80
4	1, 2 3 or 4	PISTON ROD ▲	Consult Factory with Serial Number							
5	1	*PISTON	MS-15-15	MS-15-20	MS-15-25	MS-15-32	MS-15-40	MS-15-50	MS-15-60	MS-15-80
6	4	+TIE ROD	A-50-15	A-50-20	A-50-25	A-50-32	A-50-40	A-50-50	A-50-60	A-50-80
7	4	TIE ROD NUTS	¼-28	⅜-24	⅜-24	⅜-24	⅜-24	½-20	½-20	⅝-18
8	2	TUBE SEAL	TS-15	TS-20	TS-25	TS-32	TS-40	TS-50	TS-60	TS-80
9	2 3 or 4	PISTON SEAL	QPS-15	QPS-20	QPS-25	QPS-32	QPS-40	QPS-50	QPS-60	QPS-80
10	1	ROD SEAL	RS-625	RS-625	RS-625	RS-1000	RS-1000	RS-1000	RS-1375	RS-1375
11	1	ROD WIPER	RW-625	RW-625	RW-625	RW-1000	RW-1000	RW-1000	RW-1375	RW-1375
12	3	ROD BUSHING	A-30-1	A-30-1	A-30-1	A-30-2	A-30-2	A-30-2	A-30-3	A-30-3
13	3	BUSHING "O" RING	BO-1	BO-1	BO-1	BO-2	BO-2	BO-2	BO-3	BO-3
14	1	ADJ. NEEDLE OPTIONAL	A-66-1	A-66-1	A-66-1	A-66-2	A-66-2	A-66-2	A-66-2	A-66-2
15	1	CUSHION SPUD	A-65-1	A-65-1	A-65-2	A-65-2	A-65-2	A-65-3	A-65-3	A-65-3
16	1	CUSHION SEAL-H	CS-3	CS-3	CS-3	CS-4	CS-4	CS-4	CS-5	CS-5
17	1 or 2	CENTER TUBE ▲	A-40-15	A-40-20	A-40-25	A-40-32	A-40-40	A-40-50	A-40-60	A-40-80
18	1	RETAINER PLATE	A-36-15	A-35-1	A-35-1	A-35-2	A-35-2	A-35-2	A-35-3	A-35-3
19	1, 2 or 3	INTENSIFIER HEAD	MS-10-15	MS-10-20	MS-10-25	MS-10-32	MS-10-40	MS-10-50	MS-10-60	MS-10-80
20	1, 2 or 3	INTENSIFIER ROD SEAL	TH-625	TH-625	TH-625	TH-1000	TH-1000	TH-1000	TH-1375	TH-1375
21	1, 2 or 3	INTENSIFIER TUBE SEAL	MS-15	MS-20	MS-25	MS-32	MS-40	MS-50	MS-60	MS-80

▲ Serial number required to insure proper parts supplied.  
\* Order as piston & piston rod assembly - serial number required.