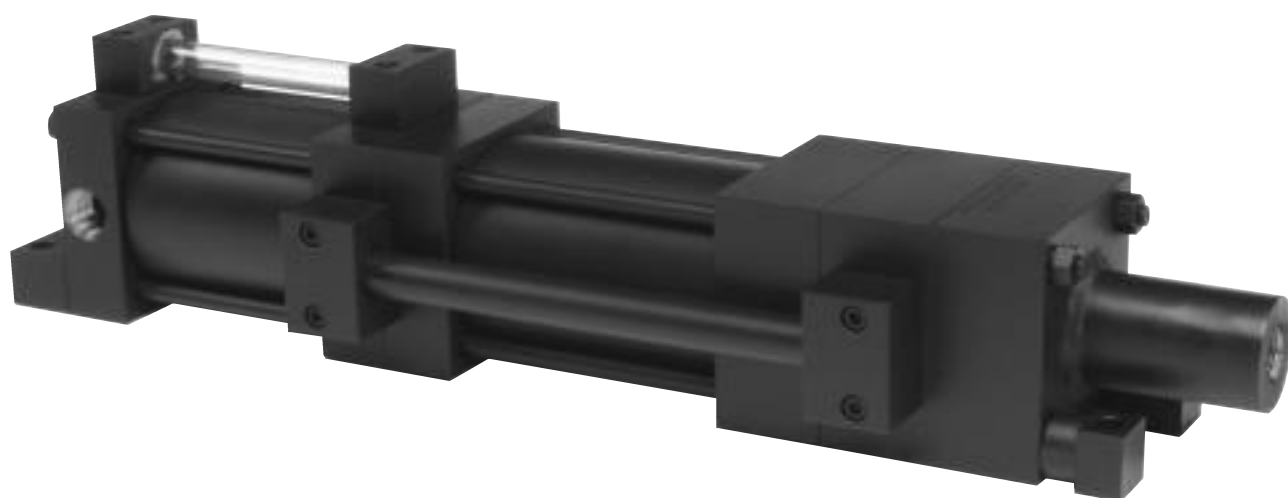
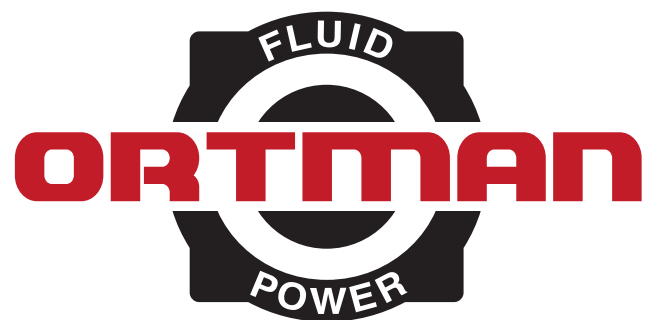
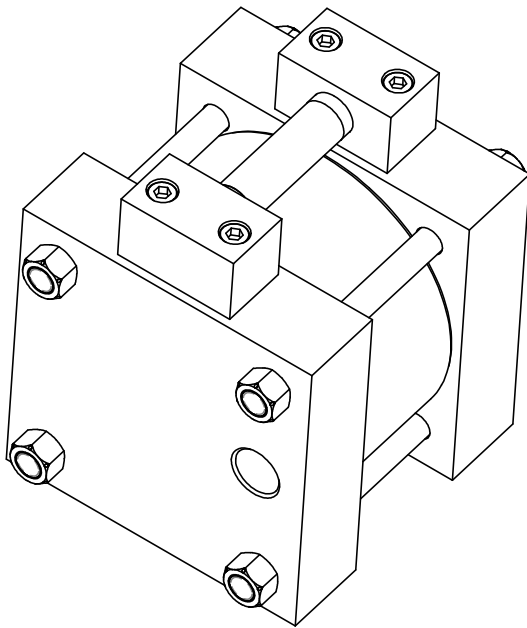




About 7R Air/Oil Tanks

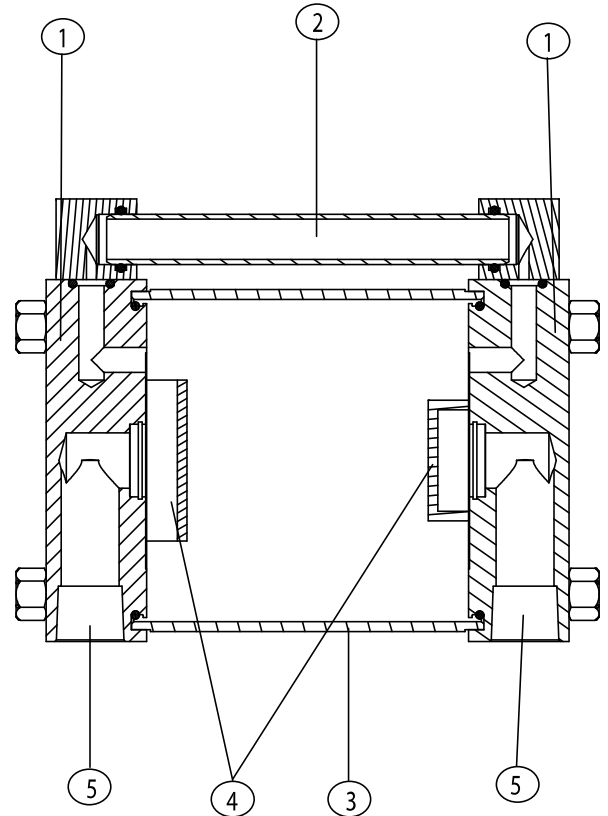
7R Tank

Series 7P1 booster is a single pressure booster consisting of a double-acting air of hydraulic cylinder driving a ram into a high pressure chamber. Circuits incorporating the Series 7P1 booster must provide for bleeding and filling.



AIR-OIL TANKS

Air-oil tanks may be used to pre-fill a booster circuit or to supply the oil for the low-pressure advance of the work cylinder. They are also used in air-over-oil circuits, resulting in ease of air operation combined with the precision of hydraulic speed control. All air-oil tanks have baffles at each end to minimize turbulence; also, they are fitted with heavy wall, sight gauge type, oil level indicators.



1. **Heads**—Rolled steel, accurately machined to assure perfect alignment of tie rods and cylinder tube.
2. **Sight Gauge**—Captured clear tubing allows oil levels to be gauged at a glance.
3. **Cylinder Tube**—Steel tubing on 3 1/4"-14" bore tanks.
4. **Hydraulic Baffles**—Eliminate air bubbles from hydraulic fluid during tank fill.
5. **Ports**—Facilitate tank filling, pneumatic pressurization, and hydraulic output.

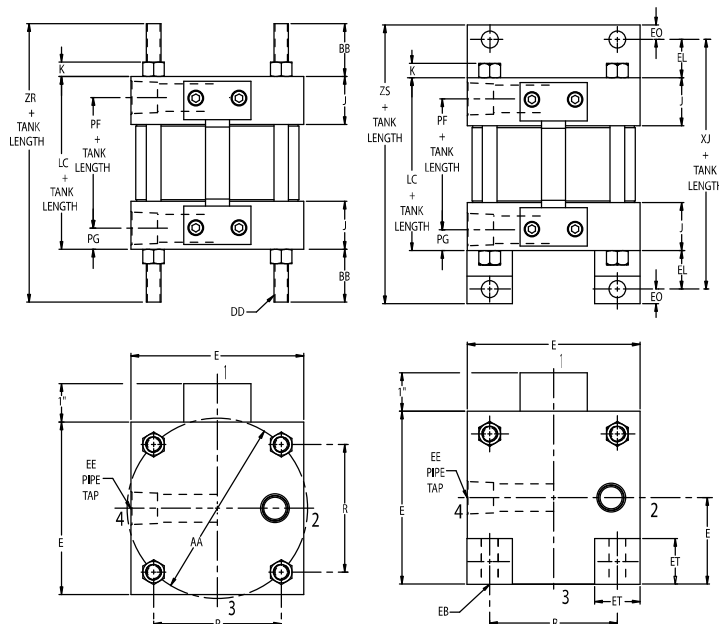
Tank Selector Chart

To determine the proper tank size:

1. Determine the cubic inches of oil required. See table on page 163 for cylinder displacement per inch of stroke (cylinder area).
2. Refer to table (at right) and find a usable volume that meets or exceeds your requirements. It is generally more economical to utilize a small bore tank with greater length rather than a larger bore, short tank.
3. If cylinder speed is a factor, it may be necessary to take the port size into consideration. For best operation, fluid velocity through pipes or tubes should not exceed 5 feet per second.

Tank Length (Inches)	Usable Tank Capacity in Cubic Inches Tank Bore Size (Inches)							
	3 1/4	4	5	6	8	10	12	14
4	12	18	29	38	69	98	141	192
5	19	29	46	63	113	166	240	327
6	26	40	63	88	157	235	339	461
7	34	51	80	113	201	304	438	596
8	41	62	98	137	245	373	537	731
9	48	73	115	162	289	441	636	865
10	55	84	132	187	332	510	735	1000
11	63	95	149	211	376	579	834	1135
12	70	106	166	236	420	647	933	1269
13	77	117	184	261	464	716	1032	1404
14	84	128	201	286	508	785	1130	1539
15	92	139	218	310	552	854	1229	1674
16	99	150	235	335	596	922	1328	1808
17	106	161	252	360	640	991	1427	1943
18	113	172	269	385	684	1060	1526	2078
19	121	183	287	409	728	1128	1625	2212
20	128	194	304	434	772	1197	1724	2347
21	135	205	321	459	816	1266	1823	2482
22	142	216	338	484	860	1335	1922	2616
23	150	227	355	508	904	1403	2021	2751
24	157	238	373	533	948	1472	2120	2886

Series 7R Air/Oil Tanks 250 PSI



- Style KL**—Tie rods extended both ends (shown).
Style KM—Tie rods extended head end.
Style KN—Tie rods extended cap end.
Style KO—No tie rods extended.
Style KCC—Foot Mount

BORE	3 1/4	4	5	6	8	10	12	14
AA	3.9	4.7	5.8	6.9	9.1	11.2	13.3	15.4
BB	1 3/8	1 3/8	1 13/16	1 13/16	2 5/16	2 11/16	2 11/16	3 3/16
DD	3/8-24	3/8-24	1/2-20	1/2-20	5/8-18	3/4-16	3/4-16	7/8-14
E	3 3/4	4 1/2	5 1/2	6 1/2	8 1/2	10 5/8	12 3/4	14 3/4
EB*	3/8	3/8	1/2	1/2	5/8	3/4	3/4	7/8
EE	1 1/2	1 1/2	1 1/2	3/4	3/4	1	1	1 1/4
EL	7/8	1	1 1/16	1	1 1/8	1 5/16	1 5/16	1 1/2
EO	3/8	3/8	1/2	1/2	5/8	5/8	5/8	3/4
ET	1	1 3/16	1 3/8	1 5/8	2 1/16	2 11/16	3 5/16	3 13/16
J	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	2	2	2 1/4
K	3/8	3/8	7/16	7/16	9/16	11/16	11/16	13/16
LC	2 1/2	2 1/2	2 1/2	3	3	4	4	4 1/2
PF	1 3/8	1 3/8	1 3/8	1 5/8	1 5/8	2	2	2 3/8
PG	9/16	9/16	9/16	11/16	11/16	1	1	1 1/16
R	2.76	3.32	4.10	4.88	6.44	7.92	9.40	10.90
SJ	4 1/4	4 1/2	4 5/8	5	5 1/4	6 5/8	6 5/8	7 1/2
ZR	5 1/4	5 1/4	6 1/8	6 5/8	7 5/8	9 3/8	9 3/8	10 7/8
ZS	5	5 1/4	5 5/8	6	6 1/2	7 1/8	7 1/8	9

*Mounting holes are 1/16" larger than screw size shown.

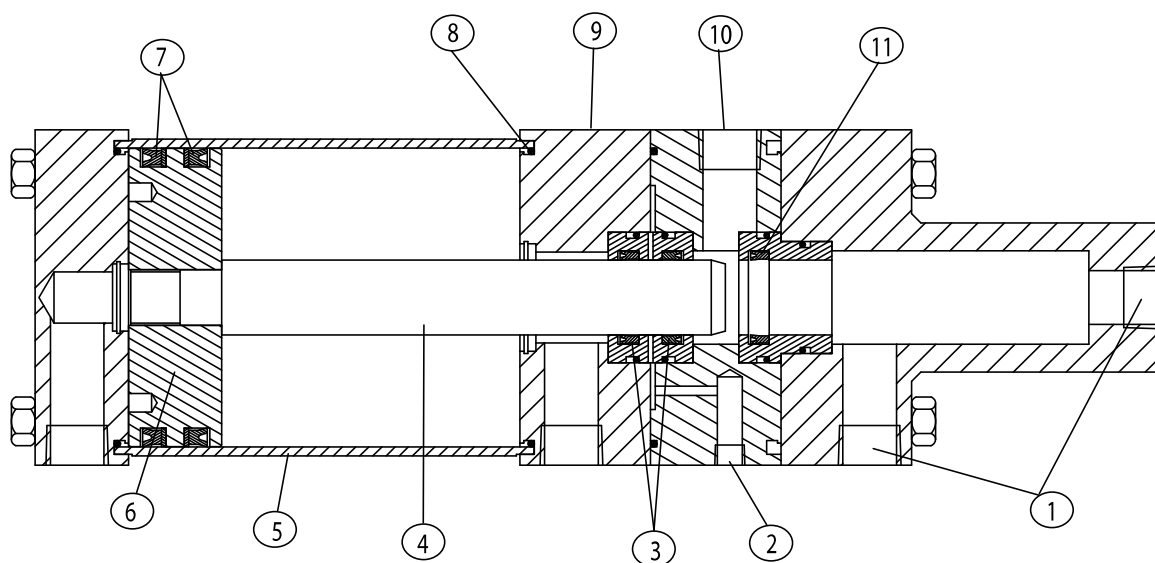
About 7P Boosters

BOOSTERS

A booster is a device normally used to convert shop air pressure to an intensified hydraulic pressure. They can also be used to convert low pressure oil to high pressure oil. Boosters are particularly well suited to applications requiring small volumes of high pressure oil. The pressure developed is inversely proportional to piston and ram areas. Basically, there are two types of boosters—7P2 and 7P1. The main difference between the two types is that the 7P1 boosters are single pressure while those of the 7P2 series are dual pressure. There is no low pressure oil inlet in the 7P1 series, and oil must be replenished through a check valve directly into the high pressure line. Sample circuits illustrating both types are shown on page 166.

Operating Pressures

1. Air driving cylinders are basically Ortman 7K Series air cylinders and are rated for 250 psi air operation in all bore sizes.
2. Oil driving cylinders are basically Ortman 7L series oil cylinders. Recommended operating pressures are as tabulated in Bulletin No. 116, 3-1/4" bore—1000 psi, 4" bore—750 psi, and 5" and 6" bore—600 psi, 8" and 10" bore—400 psi, 12" and 14" bore—350 psi.
3. Output pressures up to 5000 psi. For higher output pressures, consult your local Ortman Fluid Power representative.



1. **Alternate high pressure ports—**
Facilitate installation of high pressure lines to port most convenient to particular installation.
2. **Vent port—**
A 1/8" pipe port is provided for venting between the low pressure ram packings on all Ortman boosters.
3. **Low Pressure ram seals—**
Polyurethane U-cup seals assure minimum ram by-pass.
4. **Hydraulic ram—**
Hard chrome-plating on turned, ground and polished high-tensile steel provides smooth, wear-resistant surface that assures long bearing and packing life with minimum friction.
5. **Cylinder tube—**
Steel tubing on 3/4"—14" bore. All tubes are microhoned to assure smoother operation with minimum friction.
6. **Piston—**
One-piece, pilot-fitted to piston rod and positively locked with self-locking socket setscrew. Alloy iron pistons used on all bore sizes.
7. **Piston seals—**
Flexible-lip, block-vee type piston seals provide positive sealing, low friction and long life.
8. **Tube seals—**
Positive sealing, synthetic rubber O-ring used in extrusion-proof design.
9. **Heads—**
Rolled steel, accurately machined to assure perfect alignment of bearings, piston and cylinder tube.
10. **Low pressure inlet port—**
Provides for unrestricted flow of low pressure oil from tank.
11. **High pressure ram packing—**
Multiple lip type, non-adjustable, self-compensating, ram packing provides seal with excellent pressure sensitivity and long life. These characteristics are particularly important in boosters where high pressures must be maintained for long periods of time.

Booster Selector Chart

To determine booster ratio required:

$$\text{Booster Ratio} = \frac{P_w}{P_A}$$

Where: P_w = Work pressure (psi)

$$\text{Required} = \frac{\text{Force Req'd. (lbs.)}}{\text{Area of Cyl. (sq. in.)}}$$

Where: P_A = Available air (or hydraulic) pressure (psi)

Referring to the Booster Selector Chart, find the ratio that meets or exceeds your requirements. If more than one ratio applies, the final selection will depend on the volume of high pressure oil required.

To determine the booster stroke required for the Series 7P2 used in dual pressure circuits:

$$\text{Booster Stroke} = \frac{V_H + V_L}{A_R} + 2"$$

Where: V_H = Volume of **high pressure** oil (cu. in.) required for work cylinder. In the dual pressure circuit, this volume is only for the **high pressure portion of the stroke**.

V_L = Loss of volume (cu. in.) due to the compressibility of oil. For simplification, V_L is calculated on the basis of 1% psi for the entire high pressure circuit. (High pressure cylinder volume plus high pressure lines.)

A_R = Area of hydraulic ram (sq. in.)

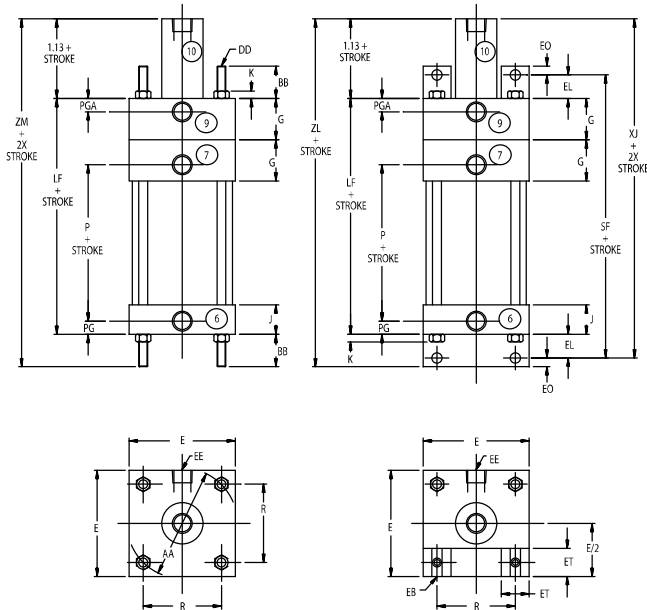
To determine the booster stroke required for the Series 7P1 used in single pressure circuits:

$$\text{Booster Stroke} = \frac{V_H + V_K}{A_R}$$

V_L = Total Volume (cu. in.) of high pressure oil required for work cylinder. In the single pressure circuit the booster must provide oil for the **entire stroke of the work cylinder**. Therefore, this volume is equal to the displacement of the work cylinder.

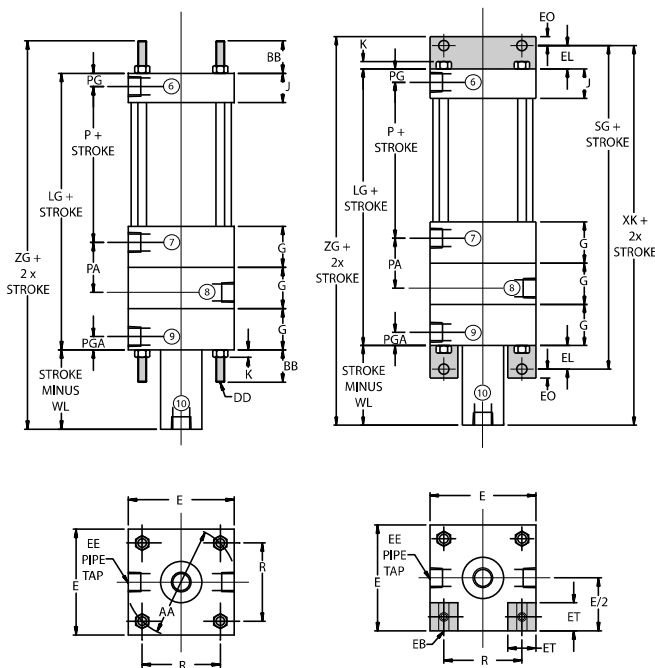
Driving Cyl.		Booster Hyd. Ram		Booster Ratio Driving Cyl. Area Hyd. Ram Area	Hydraulic Ram Pressure At Input Pressure Of:				
Cyl. Dia.	Cyl. Area	Ram Dia.	Area (Sq. In.)		60 psi	80 psi	100 psi	250 psi	500 psi
3 1/4"	8.296	1"	0.785	10.57	634	846	1057	2643	5285
		1 3/8"	1.485	5.59	335	447	559	1398	2795
		1 3/4"	2.405	3.45	207	276	345	863	1725
		2"	3.142	2.64	158	211	264	660	1320
4"	12.566	1"	0.785	16.00	960	1280	1600	4000	
		1 3/8"	1.485	8.50	508	680	850	2125	
		1 3/4"	2.405	5.20	313	416	520	1300	2600
		2"	3.142	4.00	240	320	400	1000	2000
		2 1/2"	4.900	2.60	150	208	260	650	1300
5"	19.635	1"	0.785	25.00	1501	2000	2500		
		1 3/8"	1.485	13.22	793	1058	1322	3305	
		1 3/4"	2.405	8.16	490	653	816	2040	
		2"	3.142	6.25	375	500	625	1563	
		2 1/2"	4.900	4.00	240	320	400	1000	2000
		3"	7.069	2.78	167	222	278	695	1390
		3 1/2"	9.621	2.04	122	163	204	510	1020
6"	28.274	1 3/8"	1.485	19.04	11.42	1523	1904	4760	
		1 3/4"	2.405	11.76	706	941	1176	2940	
		2"	3.142	9.00	540	720	900	2250	
		2 1/2"	4.900	5.77	346	462	577	1443	
		3"	7.069	4.00	240	320	400	1000	2000
		3 1/2"	9.621	2.94	176	235	294	735	1470
		4"	12.566	2.25	135	180	225	562	1125
8"	50.265	1 3/8"	1.485	33.85	2031	2708	3385		
		1 3/4"	2.405	20.90	1254	1672	2090	5225	
		2"	3.142	16.00	960	1280	1600	4000	
		2 1/2"	4.900	10.26	614	821	1026	2565	
		3"	7.069	7.11	427	569	711	1778	
		3 1/2"	9.621	5.22	313	418	522	1305	
		4"	12.566	4.00	240	320	400	1000	
		4 1/2"	15.904	3.16	190	253	316	790	
		5"	19.635	2.56	154	205	256	640	
		5 1/2"	23.758	2.12	127	170	212	530	
10"	78.54	1 3/4"	2.405	32.66	1960	2613	3266		
		2"	3.142	25.00	1500	2000	2500		
		2 1/2"	4.900	16.03	960	1282	1603	4008	
		3"	7.069	11.11	667	889	1111	2778	
		3 1/2"	9.621	8.16	490	653	816	2040	
		4"	12.566	6.25	375	500	625	1563	
		4 1/2"	15.904	4.94	296	395	494	1235	
		5"	19.635	4.00	240	320	400	1000	
12"	113.10	5 1/2"	23.758	3.31	199	265	331	828	
		2"	3.142	36.00	2160	2880	3600		
		2 1/2"	4.900	23.08	1382	1846	2308		
		3"	7.069	16.00	960	1280	1600	4000	
		3 1/2"	9.621	11.75	706	940	1175	2938	
		4"	12.566	9.00	540	720	900	2250	
		4 1/2"	15.904	7.11	427	569	711	1778	
		5"	19.635	5.76	346	461	576	1440	
14"	153.94	5 1/2"	23.758	4.76	286	381	476	1190	
		2 1/2"	4.900	31.42	1882	2514	3142		
		3"	7.069	21.78	1307	1742	2178		
		3 1/2"	9.621	16.00	960	1280	1600	4000	
		4"	12.566	12.25	735	980	1225	3063	
		4 1/2"	15.904	9.68	581	774	968	2420	
		5"	19.635	7.84	470	627	784	1960	
		5 1/2"	23.758	6.48	389	518	648	1620	

Series 7P1 Boosters



- Series 7P1 Style KL**—Tie rods extended both ends (shown).
- Series 7P1 Style KM**—Tie rods extended head end.
- Series 7P1 Style KN**—Tie rods extended cap end.
- Series 7P1 Style KO**—No tie rods extended.
- Series 7P1 Style KCC**—Foot Mount

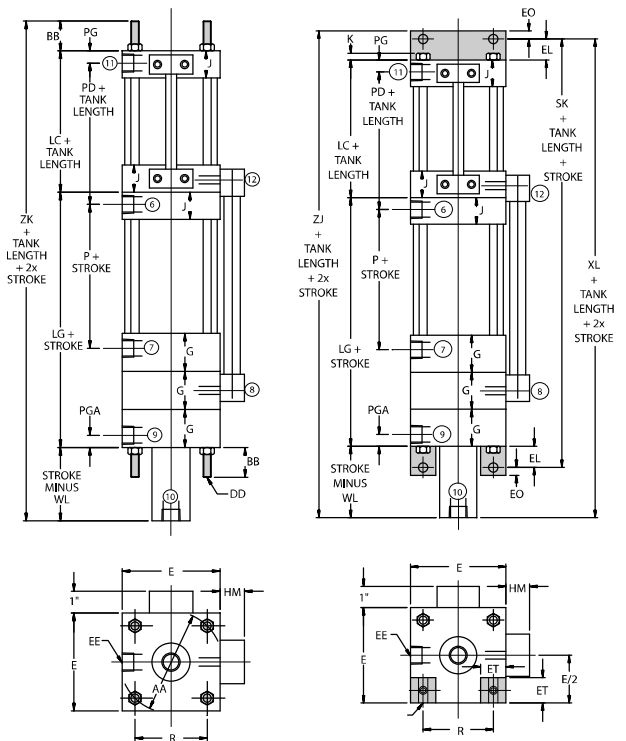
Series 7P2 Boosters



- Series 7P2 Style KL**—Tie rods extended both ends (shown).
- Series 7P2 Style KM**—Tie rods extended head end.
- Series 7P2 Style KN**—Tie rods extended cap end.
- Series 7P2 Style KO**—No tie rods extended.
- Series 7P2 Style KCC**—Foot Mount.

Series 7P3 Boosters

(Integrally mounted tanks)



- Series 7P3 Style KL**—Tie rods extended both ends (shown).
- Series 7P3 Style KM**—Tie rods extended head end.
- Series 7P3 Style KN**—Tie rods extended cap end.
- Series 7P3 Style KO**—No tie rods extended.
- Series 7P3 Style KCC**—Foot Mount.

Series 7P1 booster is a single pressure booster consisting of a double-acting pair of hydraulic cylinders driving a ram into a high pressure chamber. Circuits incorporating the Series 7P1 booster must provide for bleeding and filling.

Booster Selector Chart

The Ortman Fluid Power 7P2 booster, as illustrated on page 164, may be used in either single or dual pressure circuits. The Series 7P2 booster is self-bleeding if it is located in a position higher than that of the work cylinder, and the air-oil tank or reservoir is located in a position higher than the booster.

7P1, 7P2 and 7P3 BOOSTER DIMENSIONS

BORE	3-1/4	4	5	6	8	10	12	14
AA	3.9	4.7	5.8	6.9	9.1	11.2	13.3	15.4
BB	1 ³ / ₈	1 ³ / ₈	1 ¹³ / ₁₆	1 ¹³ / ₁₆	2 ⁵ / ₁₆	2 ¹¹ / ₁₆	2 ¹¹ / ₁₆	3 ³ / ₁₆
DD	3/8-24	3/8-24	1/2-20	1/2-20	5/8-18	3/4-16	3/4-16	7/8-14
E	3 ³ / ₄	4 ¹ / ₂	5 ¹ / ₂	6 ¹ / ₂	8 ¹ / ₂	10 ⁵ / ₈	12 ³ / ₄	14 ³ / ₄
EB*	3/8	3/8	1/2	1/2	5/8	3/4	3/4	7/8
EE	1/2	1/2	1/2	3/4	3/4	1	1	1 ¹ / ₄
EL	7/8	1	1 ¹ / ₁₆	1	1 ¹ / ₈	1 ⁵ / ₁₆	1 ⁵ / ₁₆	1 ¹ / ₂
EO	3/8	3/8	1/2	1/2	5/8	5/8	5/8	3/4
ET	1	1 ³ / ₁₆	1 ³ / ₈	1 ⁵ / ₈	2 ¹ / ₁₆	2 ¹¹ / ₁₆	3 ⁵ / ₁₆	3 ¹³ / ₁₆
F	5/8	5/8	5/8	3/4	—	—	—	—
FB*	3/8	3/8	1/2	1/2	—	—	—	—
G	1 ³ / ₄	1 ³ / ₄	1 ³ / ₄	2	2	2 ¹ / ₄	2 ¹ / ₄	2 ³ / ₄
HM	1 ¹ / ₈	1 ¹ / ₈	1 ¹ / ₈	1 ¹ / ₂	1 ¹ / ₂	1 ³ / ₄	1 ³ / ₄	2
J	1 ¹ / ₄	1 ¹ / ₄	1 ¹ / ₄	1 ¹ / ₂	1 ¹ / ₂	2	2	2 ¹ / ₄
K	3/8	3/8	7/16	7/16	9/16	11/16	11/16	13/16
LC	2 ¹ / ₂	2 ¹ / ₂	2 ¹ / ₂	3	3	4	4	4 ¹ / ₂
LF	6	6	6 ¹ / ₄	7	7 ¹ / ₈	8-5/8	9 ¹ / ₈	10 ⁷ / ₈
LG	7 ³ / ₄	7 ³ / ₄	8	9	9 ¹ / ₈	10 ⁷ / ₈	11 ³ / ₈	13 ³ / ₈
P	2 ⁵ / ₈	2 ⁵ / ₈	2 ⁷ / ₈	3 ¹ / ₈	3 ¹ / ₄	4 ¹ / ₈	4 ⁵ / ₈	5 ¹ / ₂
PA	2 ¹ / ₈	2 ¹ / ₈	2 ¹ / ₈	2 ³ / ₈	2 ³ / ₈	2 ¹ / ₂	2 ¹ / ₂	3 ¹ / ₈
PD	2 ¹ / ₂	2 ¹ / ₂	2 ¹ / ₂	3	3	4	4	4 ¹ / ₂
PG	9/16	9/16	9/16	11/16	11/16	1	1	1 ¹ / ₁₆
PGA	9/16	9/16	9/16	11/16	11/16	7/8	7/8	1 ¹ / ₁₆
R	2.76	3.32	4.10	4.88	6.44	7.92	9.40	10.90
SF	7 ³ / ₄	8	8 ³ / ₈	9	9 ³ / ₈	11 ¹ / ₄	11 ³ / ₄	13 ³ / ₈
SG	9 ¹ / ₂	9 ³ / ₄	10 ¹ / ₈	11	11 ³ / ₈	13 ¹ / ₂	14	16 ⁵ / ₈
SK	12	12 ¹ / ₄	12 ⁵ / ₈	14	14 ³ / ₈	17 ¹ / ₂	18	21 ¹ / ₈
TE	—	—	—	—	7.57	9.40	11.10	12.87
TF	4 ¹¹ / ₁₆	5 ⁷ / ₁₆	6 ⁵ / ₈	7 ⁵ / ₈	—	—	—	—
UF	5 ¹ / ₂	6 ¹ / ₄	7 ⁵ / ₈	8 ⁵ / ₈	—	—	—	—
WL	5/8	5/8	5/8	7/8	7/8	1 ¹ / ₈	1 ¹ / ₈	1 ⁵ / ₈
XJ	8	8 ¹ / ₈	8 ⁷ / ₁₆	9 ¹ / ₈	9 ³ / ₈	11 ¹ / ₁₆	11 ⁹ / ₁₆	13 ¹ / ₂
XK	8	8 ¹ / ₈	8 ⁷ / ₁₆	9 ¹ / ₈	9 ³ / ₈	11 ¹ / ₁₆	11 ⁹ / ₁₆	13 ¹ / ₂
XL	10 ¹ / ₂	10 ⁵ / ₈	10 ¹⁵ / ₁₆	12 ¹ / ₈	12 ³ / ₈	15 ¹ / ₁₆	15 ⁹ / ₁₆	18
ZG	8 ³ / ₈	8 ¹ / ₂	8 ¹⁵ / ₁₆	9 ⁵ / ₈	10	11 ¹¹ / ₁₆	12 ³ / ₁₆	14 ¹ / ₄
ZH	8 ¹ / ₂	8 ¹ / ₂	9 ³ / ₁₆	9 ¹⁵ / ₁₆	10 ⁹ / ₁₆	12 ⁷ / ₁₆	12 ¹⁵ / ₁₆	15 ¹ / ₁₆
ZJ	10 ⁷ / ₈	11	11 ¹¹ / ₁₆	12 ⁵ / ₈	13	15 ¹¹ / ₁₆	16 ³ / ₁₆	18 ³ / ₄
ZK	11	11	11 ¹¹ / ₁₆	12 ¹⁵ / ₁₆	13 ⁹ / ₁₆	16 ⁷ / ₁₆	16 ¹⁵ / ₁₆	19 ¹¹ / ₁₆
ZL	8 ³ / ₈	8 ¹ / ₂	8 ¹⁵ / ₁₆	9 ⁵ / ₈	10	11 ¹¹ / ₁₆	12 ³ / ₁₆	14 ¹ / ₄
ZM	8 ¹ / ₂	8 ¹ / ₂	9 ³ / ₁₆	9 ¹⁵ / ₁₆	10 ⁹ / ₁₆	12 ⁷ / ₁₆	12 ¹⁵ / ₁₆	15 ¹ / ₁₆
ZN	7 ³ / ₄	7 ³ / ₄	8	8 ⁷ / ₈	—	—	—	—
ZP	—	—	—	—	8 ¹ / ₄	9 ¹ / ₄	10 ¹ / ₄	12

*Mounting holes are 1/16" larger than screw size shown.

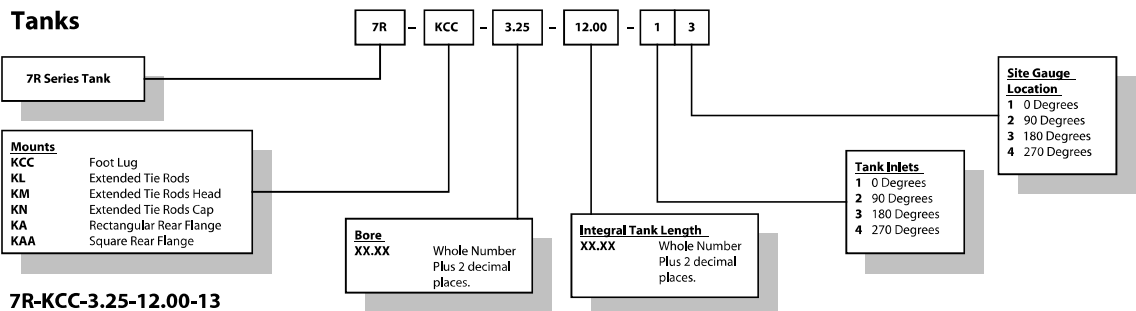
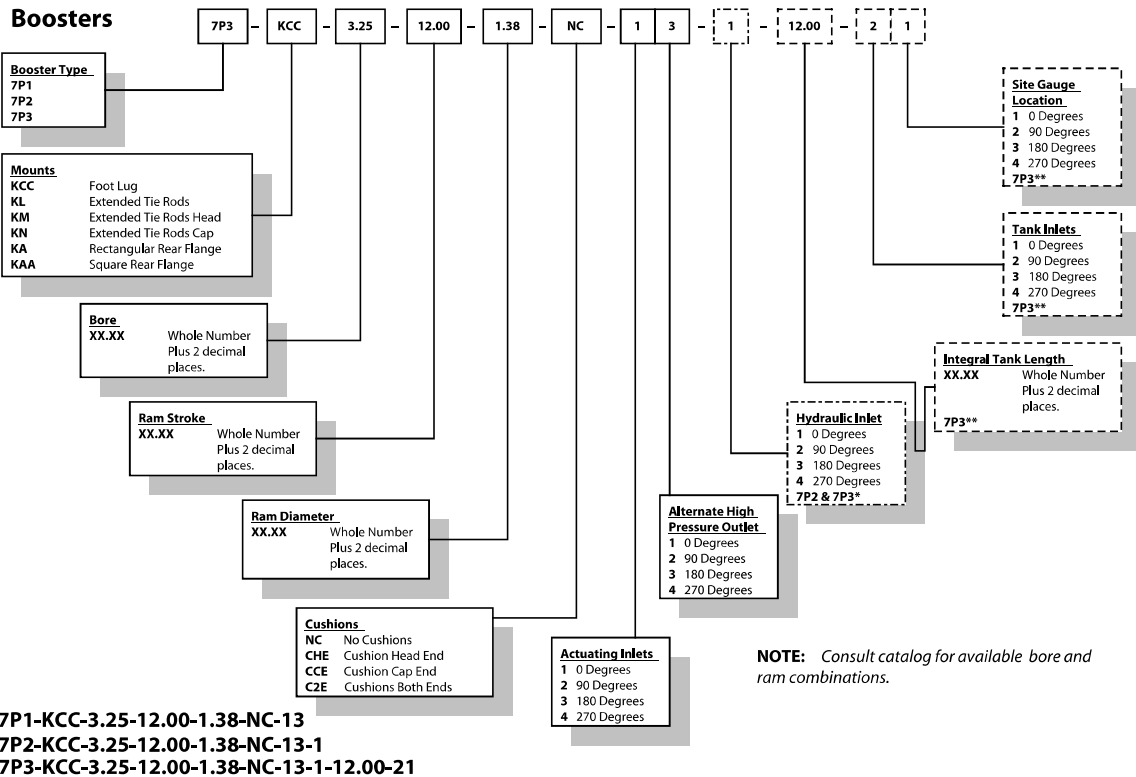
PORT IDENTIFICATION

6	Driving Cylinder Inlet (Booster Advance)
7	Driving Cylinder Inlet (Booster Return)
8	Hydraulic Inlet
9	Alternate High Pressure Hydraulic Outlet*
10	High Pressure Hydraulic Outlet
11	Tank Inlet (Air)
12	Tank Outlet (Oil)
13	Vent Port (Not Shown)**

*Port #9 not available on 3¹/₄", 4", 5" and 6" bore boosters with maximum size ram.

**1¹/₈" pipe vent port (illustrated on page 164) is normally located 180° from port #8 on Series 7P2 and 7P3 boosters unless otherwise specified. On Series 7P1 and 7P4 the vent is normally located 90° from port #9 in the #4 position, unless otherwise specified.

ORDERING INFORMATION



SAMPLE CIRCUITS

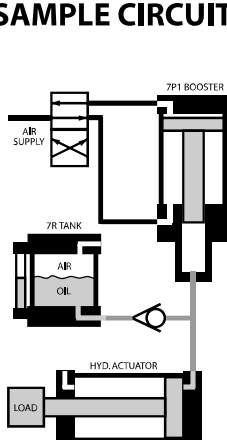


FIG. 1 SINGLE PRESSURE CIRCUIT
(AIR TO HYD. OR HYD. TO HYD.)
High pressure forward.

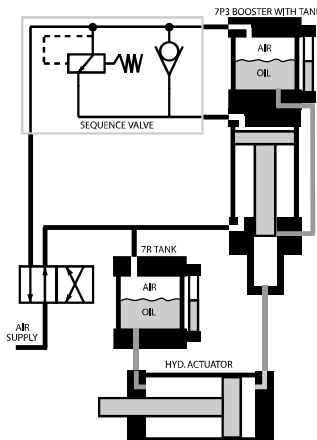


FIG. 2 DUAL PRESSURE CIRCUIT (AIR TO HYD.)
Low pressure approach and return.
High pressure at end of approach.

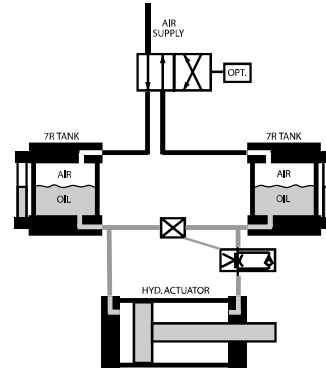


FIG. 3 AIR - OIL CIRCUITS

This type of circuit may be used to advantage where:

1. Adjustable cylinder speeds are required.
2. It is difficult to provide satisfactory lubrication to an air cylinder.
3. It would, otherwise, be necessary to have oil.

ORTMAN
STANDARD TERMS AND CONDITIONS

LEGAL EFFECT: Except as expressly otherwise agreed to in writing by an authorized representative of Seller, the following terms and conditions shall apply to and form a part of this order and any additional and/or different terms of Buyer's purchase order or other form of acceptance are rejected in advance and shall not become a part of this order.

The rights of Buyer hereunder shall neither be assignable nor transferable except with the written consent of Seller.

This order may not be canceled or altered except with the written consent of Seller and upon terms which will indemnify Seller against all loss occasioned thereby. All additional costs incurred by Seller due to changes in design or specifications, modification of this order or revision of product must be paid for by Buyer.

In addition to the rights and remedies conferred upon Seller by this order, Seller shall have all rights and remedies conferred at law and in equity and shall not be required to proceed with the performance of this order if Buyer is in default in the performance of such order or of any other contract or order with seller.

TERMS OF PAYMENT: Unless otherwise specified in this order, the terms of payment shall be net cash within thirty (30) days after shipment. These terms shall apply to partial as well as complete shipments. If any proceeding be initiated by or against Buyer under any bankruptcy or insolvency law, or in the judgement of Seller the financial condition of Buyer, at the time the equipment is ready for shipment, does not justify the terms of payment specified, Seller reserves the right to require full payment in cash prior to making shipment. If such payment is not received within fifteen (15) days after notification of readiness for shipment, Seller may cancel the order as to any unshipped item and require payment of its reasonable cancellation charges.

If Buyer delays shipment, payments based on date of shipment shall become due as of the date when ready for shipment. If Buyer delays completion of manufacture, Seller may elect to require payment according to percentage of completion. Equipment held for Buyer shall be at Buyer's risk and storage charges may be applied at the discretion of Seller.

Accounts past due shall bear interest at the highest rate lawful to contract for but if there is no limit set by law, such interest shall be eighteen percent (18%). Buyer shall pay all cost and expenses, including reasonable attorney's fees, incurred in collecting the same, and no claim, except claims within Seller's warranty of material or workmanship, as stated below, will be recognized unless delivered in writing to Seller within thirty (30) days after date of shipment.

TAXES: All prices exclude present and future sales, use, occupation, license, excise, and other taxes in respect of manufacture, sales or delivery, all of which shall be paid by Buyer unless include in the purchase price at the proper rate or a proper exemption certificate is furnished.

ACCEPTANCE: All offers to purchase, quotations and contracts of sales are subject to final acceptance by an authorized representative at Seller's plant, Quincy, Illinois.

DELIVERY: Except as otherwise specified in this quotation, delivery will be F.O.B. cars point of shipment. In the absence of exact shipping instruction, Seller will use its discretion regarding best means of insured shipment. No liability will be accepted by Seller for so doing. All transportation charges are at Buyer's expense. Time of delivery is an estimate only and is based upon the receipt of all information and necessary approvals. The shipping schedule shall not be construed to limit seller in making commitments for materials or in fabricating articles under this order in accordance with Seller's normal and reasonable production schedules.

Seller shall in no event be liable for delays caused by fires, acts of God, strikes, labor difficulties, acts of governmental or military authorities, delays in transportation or procuring materials, or causes of any kind beyond Seller's control. No provision for liquidated damages for any cause shall apply under this order. Buyer shall accept delivery within thirty (30) days after receipt of notification of readiness for shipment. Claims for shortages will be deemed to have been waived if not made in writing with ten (10) days after the receipt of the material in respect of which any such shortage is claimed. Seller is not responsible for loss or damage in transit after having received "In Good Order" receipt from the carrier. All claims for loss or damage in transit should be made to the carrier.

TITLE & LIEN RIGHTS: The equipment shall remain personal property, regardless of how affixed to any realty or structure. Until the price (including any notes given therefore) of the equipment has been fully paid in cash, Seller shall, in the event of Buyer's default, have the right to repossess such equipment.

PATENT INFRINGEMENT: If properly notified and given an opportunity to do so with friendly assistance, Seller will defend Buyer and the ultimate user of the equipment from any actual or alleged infringement of any published United States patent by the equipment or any part thereof furnished pursuant hereto (other than parts of special design, construction, or manufacture specified by and originating with Buyer), and will pay all damages and costs awarded by competent court in any suit thus defended or of which it may have had notice and opportunity to defend as aforesaid.

STANDARD WARRANTY: Seller warrants that products of its own manufacture will be free from defects in workmanship and materials under normal use and service as follows:

Hydraulic and Pneumatic Cylinders: Twenty-four (24) months from date of shipment from the factory.

Service Parts: Ninety (90) days from date of factory shipment.

Notice of the alleged defect must be given to the Seller, in writing with all identifying details including serial number, type of equipment and date of purchase within thirty (30) days of the discovery of the same during the warranty period.

Seller's sole obligation on this warranty shall be, at its option, to repair or replace or refund the purchase price of any product or part thereof which proves to be defective. If requested by Seller, such product or part thereof must be promptly returned to seller, freight prepaid, for inspection.

Seller warrants repaired or replaced parts of its own manufacture against defects in materials and workmanship under normal use and service for ninety (90) days or for the remainder of the warranty on the product being repaired.

This warranty shall not apply and Seller shall not be responsible nor liable for:

Consequential, collateral or special losses or damages;

Equipment conditions caused by fair wear and tear, abnormal conditions of use, accident, neglect or misuse of equipment, improper storage or damage resulting during shipping;

Deviation from operating instructions, specifications or other special terms of sale;

Labor charges, loss or damage resulting from improper operation, maintenance or repairs made by person(s) other than Seller or Seller's authorized service station.

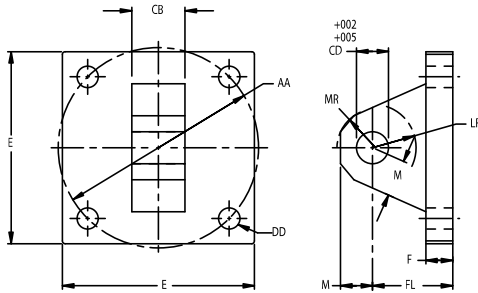
In no event shall Seller be liable for any claims whether arising from breach of contract or warranty or claims of negligence or negligent manufacture in excess of the purchase price.

THIS WARRANTY IS THE SOLE WARRANTY OF SELLERS AND ANY OTHER WARRANTIES, WHETHER EXPRESS OR IMPLIED IN LAW OR IMPLIED IN FACT, INCLUDING ANY WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR USE ARE HEREBY SPECIFICALLY EXCLUDED.

LIABILITY LIMITATIONS: Under no circumstances shall the Seller have any liability for liquidated damages or for collateral, consequential or special damages or for loss of profits, or for actual losses or for loss of production or progress of construction, whether resulting from delays in delivery or performance, breach of warranty, negligent manufacture or otherwise.

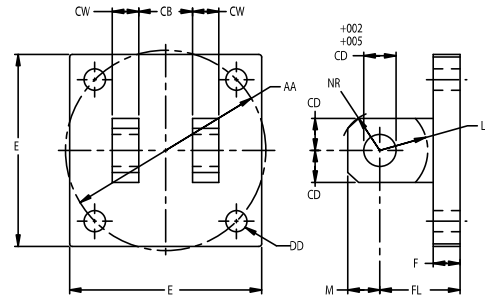
ENVIRONMENTAL AND OSHA REQUIREMENTS: At the time of shipment of the equipment from the factory, Ortman will comply with the various Federal, State and local laws and regulations concerning occupational health and safety and pollution. However, in the installation and operation of the equipment and other matters over which the seller has no control, the Seller assumes no responsibility for compliance with those laws and regulations, whether by the way of indemnity, warranty or otherwise.

NFPA Accessories



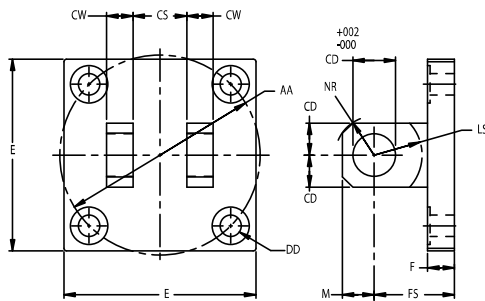
Base Pivot

Part No.	AA	CB	CD	DD	E	F	FL	LR	M	MR
Y8430	2.31	3/4	1/2	3/8	2 1/2	3/8	1 1/8	5/8	1/2	19/32
Y8431	3.61	1 1/4	3/4	1/2	3 1/2	5/8	1 7/8	15/16	3/4	29/32
Y8432	4.60	1 1/2	1	5/8	4 1/2	3/4	2 1/4	1 5/16	1	1 3/16
Y8433	5.40	2	1 3/8	5/8	5	7/8	3	1 3/4	1 3/8	1 21/32
Y8434	7.00	2 1/2	1 3/4	7/8	6 1/2	7/8	3 3/8	2	1 3/4	1 29/32
Y8435	8.10	2 1/2	2	1	7 1/2	1	3 1/2	2 1/4	2	2 3/16
Y8436	9.30	3	2 1/2	1 1/8	8 1/2	1	4	2 3/4	2 1/2	2 5/8
Y8437	10.60	3	3	1 1/4	9 1/2	1	4 1/4	3 1/16	2 3/4	2 7/8



Base Clevis

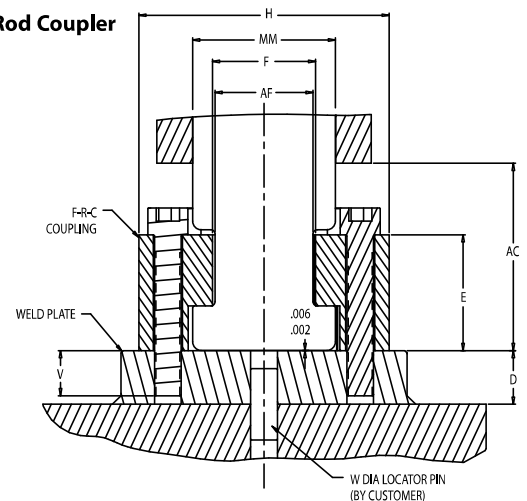
Part No.	AA	CB	CD	CW	DD	E	F	FL	LR	M	NR
77500	2.31	3/4	1/2	1/2	3/8	2 1/2	3/8	1 1/8	5/8	1/2	9/16
77501	3.61	1 1/4	3/4	5/8	1/2	3 1/2	5/8	1 7/8	15/16	3/4	27/32
77502	4.60	1 1/2	1	3/4	5/8	4 1/2	3/4	2 1/4	1 5/16	1	1 1/8
77503	5.40	2	1 3/8	1	5/8	5	7/8	3	1 3/4	1 3/8	1 1/2
77504	7.00	2 1/2	1 3/4	1 1/4	7/8	6 1/2	7/8	3 3/8	2	1 3/4	1 15/16
77505	8.10	2 1/2	2	1 1/4	1	7 1/2	1	3 1/2	2 1/4	2	2 3/16
88770	9.30	3	2 1/2	1 1/2	1 1/8	8 1/2	1	4	2 3/4	2 1/2	2 11/16
88771	10.60	3	3	1 1/2	1 1/4	9 1/2	1	4 1/4	3 1/16	2 3/4	3
88772	13.60	4	3 1/2	2	1 3/4	12 5/8	1 11/16	5 11/16	3 5/8	3 1/2	3 1/2
88773	16.20	4 1/2	4	2 1/4	2	14 7/8	1 15/16	6 7/16	4 1/8	4	4



Base Clevis for Spherical Bearing

Part No.	AA	CS	CD	CW	DD	E	F	FS	LS	M	NR
79788	2.31	11/16	1/2	1/2	3/8	2 1/2	3/8	1 3/8	7/8	1/2	9/16
79789	3.61	15/16	3/4	5/8	1/2	3 1/2	5/8	2 1/16	1 7/16	3/4	15/16
79790	4.60	1 1/16	1	3/4	5/8	4 1/2	3/4	2 1/2	1 15/16	1	13/16

Flanged Rod Coupler



Flanged Rod Coupler

Part No.	Rod Dia.	AF	E	F	H	M	N	P	R	S	V
85650	5/8	3/8	9/16	13/32	1 1/2	10-24	4	1 1/8	45	90	3/8
85651	1	11/16	7/8	3/4	2	1/4-20	6	1 1/2	30	60	3/8
85652	1 3/8	7/8	1	15/16	2 1/2	5/16-18	6	2	30	60	1/2
85653	1 3/4	1 1/8	1 1/4	1 3/16	3	5/16-18	8	2 3/8	22 1/2	45	1/2
85654	2	1 3/8	1 5/8	1 7/16	3 1/2	3/8-16	12	2 11/16	15	30	5/8
85655	2 1/2	1 3/4	1 7/8	1 7/8	4	3/8-16	12	3 3/16	15	30	5/8
85656	3	2 1/4	2 3/8	2 3/8	5	1/2-13	12	4	15	30	7/8
85657	3 1/2	2 1/2	2 3/8	2 3/8	5 1/8	5/8-11	12	4 11/16	15	30	7/8
85658	4	3	2 3/8	3 3/8	6 3/8	5/8-11	12	5 3/16	15	30	7/8
85659	4 1/2	3 1/2	3 3/8	3 3/8	6 3/8	5/8-11	12	5 11/16	15	30	7/8
85660	5	3 3/8	3 3/8	4	7 3/8	5/8-11	12	6 3/16	15	30	7/8
85661	5 1/2	4 3/8	3 3/8	4 1/2	8 1/4	3/4-10	12	6 7/8	15	30	1 1/8

Weld Plate

Part No.	D	G	W	Bolt Torque FT. LBS.
85670	1/2	2	1/4	5
85671	1/2	2 1/2	1/4	12
85672	5/8	3	1/4	25
85673	5/8	4	1/4	25
85674	3/4	4	3/8	50
85675	3/4	4 1/2	3/8	50
85676	1	5 1/2	3/8	125
85677	1	7	3/8	245
85678	1	7	3/8	245
85679	1	8	3/8	245
85680	1	8	3/8	245
85681	1 1/4	9	3/8	425

Weld Plate

