

PERMCO

HYDRAULIC PUMPS & MOTORS



DESIGN ENGINEER'S HANDBOOK

This catalog contains the information needed to apply and specify a Permco pump or motor for your hydraulic system. These units were developed by Permco to serve the industrial and mobile market. The performance data, presented herein, incorporates the use of the Permco patented Diverter and BiRoDiverter plate which extends bearing life. All units are manufactured from cast iron and incorporate crowned roller bearings and stackable construction.

This catalog is divided into (1) performance and (2) ordering information. Contained within one (1), flowrates, horsepower, torques, etc., can be found. Also approximate weights and overall dimensions. Part two (2) is divided into the individual components which will be combined to suit your particular application. The sections follow in the same sequence as a Permco pump or motor is coded.

This engineering catalog does not include the entire Permco pump and motor line. Other shaft end covers as well as porting arrangements are available. Please contact your local distributor, factory authorized service center or Permco's sales department for further information.

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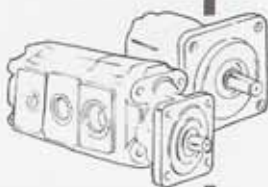
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PERMCO PUMPS AND MOTORS

Precision manufacturing and solid engineering experience are the keys to Permco's long standing reputation for quality and durability.

Here are just a few of the techniques and innovations that make Permco pumps a better buy than competitive models:



GEARS



Gears for Permco pumps are cut in our own plant to extremely close tolerances. Gear width tolerances are held to 0.0003" with backlash held to a minimum of 0.003" to 0.006". To prevent leakage caused by the common "crowning" effect, Permco "shapes gears rather than hobbing and shaving them. This gives a true involute profile for the full length of each gear tooth, assuring maximum volumetric efficiency. All this extra care means more efficiency in operation, no headaches with hand matched gear sets and longer operating time without rebuilding.

HOUSINGS

Permco uses a special iron alloy for shaft covers, gear housings, bearing carriers and port end cover castings. The added strength and bearing quality due to this extra care in metallurgy assures more hours of trouble free running for your pump or motor.

CONVENTIONAL THRUST PLATES

In pumps and motors ordered with conventional thrust plates you get the added protection of a higher density bronze alloy. The better wearing characteristics of this alloy assure more hours of pump or motor service without the need for costly rebuilding and replacement of thrust plates.

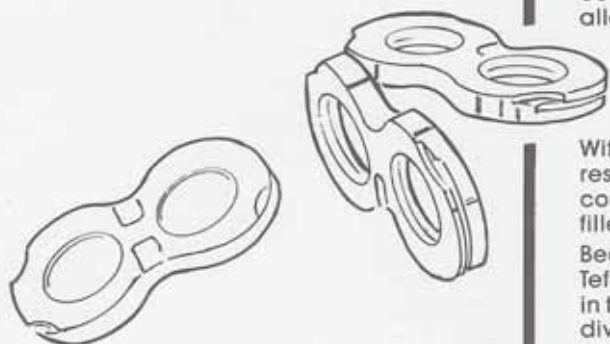
PERMCO'S PATENTED DIVERTER PLATE OPTION

Permco's revolutionary new diverter plate gives you increased working pressures of up to 3,000 p.s.i. It increases "B-10" bearing life up to 3 times, gives running speeds up to 2,400 R.P.M. This is how it works. In other gear type hydraulic pumps, pressure at the outlet side pushes internal moving parts towards the inlet. Gears flex, cutting into the housing. Bearings may overload and break down. Shafts and hubs can wear quickly. Gears wear unevenly. Constant rebuilding and downtime erode profits.

Permco's patented diverter plates reduce pump destroying wear by diverting hydraulic pressure through specially machined channels to key areas on the inlet side of the pump. This fluid pressure acts as a counter force to push gears back towards a centered position. This allows them to function properly while reducing bearing loads.

Bearings function properly with up to three times longer service under rated pressures. Wear to hubs, gears and housings is also significantly reduced. These same diverter plate channels also help to reduce the harmful effect of cavitation.

With high vacuum inlet conditions gears do not "fill" completely; the result is cavitation when the pump is subjected to high vacuum inlet conditions. Permco's diverter plate channels flow to these "partially" filled teeth and displaces cavitation from the diverter plate's surface. Because these plates are not pressure loaded they tend to retain the Teflon coating far better than conventional plates. This aids the pump in the handling of fire resistant fluids. The re-centering force of Permco diverter plates increases proportionally with increased working pressures. On-the-job experiences and in-plant testing indicate that working pressures of 3,000 p.s.i. or speeds up to 2,400 R.P.M. are now possible without unusual wear, depending upon gear width.



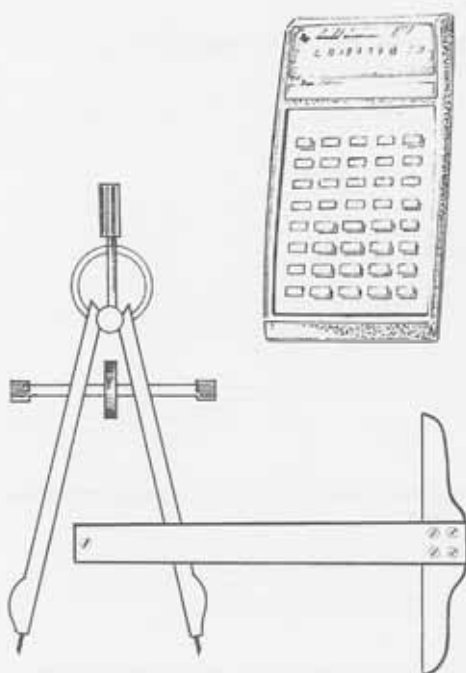
ANNOUNCING PERMCO'S NEWEST PATENTED FEATURE — BIRODIVERTERS

FLOW DIVIDERS

MULTIPLE UNITS

FIRE-RESISTANT FLUIDS

PRODUCT SPECIFICATIONS



You can now have the increased efficiency, higher working pressures and increased operating life of the diverter plate in birotational pumps, motors and flow dividers with Permco's newest invention...the patented BIRODiverter Plate.

Flow dividers are available in 3000, 5000, 7500 (or Doweled) series. Please contact Permco's factory engineering department for details.

Multiple pump and motor units are available in each series and in every size shown on the enclosed performance charts.

Permco pump and motor performance is superior to competitive cast iron, rebuildable pumps when diverter plates are used. This includes phosphate esters, water glycols (hydrolubes) and water-in-oil emulsions. Consult Permco for seal compatibility and performance characteristics when using these fluids.

Figure 1 illustrates the theoretical displacement per inch of gear per rev for each series. Pressures given are for intermittent operation for maximum life.

PL Factor

In multiple pump applications, the strength of the drive shaft will determine the maximum torque that can be delivered to the unit from the prime mover. This relationship is designated as the "PL" factor and is shown in figure 1. (page 5)

To calculate the actual "PL" factor of any given pump, the following equation should be used.

$$PL = \sum_{N=1}^{\infty} P_N L_N$$

This calculated number must be less than or equal to the stated figures in figure 1 or life rating will be lowered.

Example: A two section 7500 series pump is constructed with 2" and 1" gears, operating at 3000 and 2000 p.s.i. respectively. Will the pump shaft be able to carry the necessary torque?

Solution: Employing the Equation

$$PL = P_1 L_1 + P_2 L_2 + P_3 L_3 + \dots + P_N L_N$$

$$PL = 3000 \times 2 + 2000 \times 1$$

$$PL = 8000$$

Since the calculated PL is less than 12000 (the stated number in figure 1), the shaft will have sufficient strength to carry the torque.

LIFE (B-10)

Pump life is largely dependent on bearing life. Minimum life of bearings is dependent upon pressure and speed. Please consult factory.

FLUID RECOMMENDATIONS

Use premium quality hydraulic fluid with a viscosity range 150-300 SUS (32-65 CST) at 100°F (38°C). Normal operating viscosity range is between 80-1000 SUS. (16-220 CST) Maximum start up viscosity should not exceed 4000 SUS. Oil should have maximum anti-wear properties, rust and oxidation inhibitors.

SIDE LOADS

When a side or overhung load is imposed on the drive shaft of a pump or motor, an outboard bearing must be used (3000, 5000, 7500 series). Double outboard bearings are recommended for 2500 and 3700 series in these applications. Please consult factory.

FILTRATION (MANDATORY)

For maximum pump life, the system should be protected from contamination at a level not to exceed 250 particles greater than 10 micrometres per millilitre of fluid. A 25 micrometre return line filter with a B 10 rating of at least 2.2 should provide this level of purity. A 149 micrometre suction strainer is also suggested for added pump protection.

SHAFT ALIGNMENT

Unit shaft alignment must be within 0.007 inches total indicator reading using a standard motor coupling. Follow coupling manufacturer's installation instructions to prevent end thrust on shaft. Turn pump shaft to assure freedom of rotation. Pump and motor must be on a rigid base.

INLET CONDITIONS

Not to exceed 10 in. Hg at 1200 R.P.M., 7 in. Hg at 1800 R.P.M., or a positive pressure greater than 20 p.s.i.

MOUNTING RESTRICTIONS

Mounting position is non-restrictive.

SPEEDS

Typical operating speeds are between 400-2200 R.P.M. Consult factory should these speeds be exceeded.

TEMPERATURE

Under normal conditions of continuous operation, fluid temperature should not exceed 150°F (65°C). In no instance should the temperature exceed 185°F (85°C).

REFERENCE CHART FOR GEAR PUMPS AND MOTORS

figure 1

Series	Displacement (in. ³ /rev.)	PL FACTOR		Gear Width	Maximum Pressure (psi)	Maximum Speed (rpm)
		"C"	"I"			
1500	1.453	7,000		1/2" thru 2"	2000	2000
2500	2.573	9,000		1/2" thru 1" 1 1/4" thru 2 1/2"	2250 2000	2000 2000
3000	2.000	6,000	8,000	1/2" thru 1" 1 1/4" thru 2"	2250 2000	2000 2000
3100 (Doweled)	2.000	6,000	8,000	1/2" thru 1" 1 1/4" thru 2"	2500 2500	2000 2000
5000	2.573	9,000	14,000	1/2" thru 1" 1 1/4" thru 2 1/2"	2250 2000	2000 2000
5100 (Doweled)	2.573	9,000	14,000	1/2" thru 1" 1 1/4" thru 2 1/2"	2500 2500	2000 2000
3700	3.087	11,000		1/2" thru 1" 1 1/4" thru 2 1/2" 3"	2250 2000 2000	2000 2000 2000
7500	4.044	10,000	12,000	3/4" thru 1" 1 1/4" thru 2 1/2" 3"	2250 2000 2000	2000 2000 2000
7600 (Doweled)	4.044	10,000	12,000	3/4" thru 1" 1 1/4" thru 2 1/2" 3"	2500 2500 2500	2000 2000 2000
197 (Sleeve Bushing)	1.970	6,000	8,000	1/2" thru 1 1/4" 1 1/2" 1 3/4" 2"	4000 3750 3500 3250	2400 2400 2400 2400
257 (Sleeve Bushing)	2.560	9,000	14,000	1/2" thru 1 1/4" 1 1/2" 1 3/4" 2" 2 1/4" 2 1/2"	4500 3500 3250 3000 2750 2500	2400 2400 2400 2400 2400 2400

Note: The information shown above represents the maximum continuous operating conditions for the specified series. For applications where these values may be exceeded, please consult your Permco representative or the factory.

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1200
(D)

2,522

RECOMMENDED INLET AND DISCHARGE PORT SIZES FOR PUMPS

PUMP FLOW GPM	INLET (LOW PRESS.)		DISCHARGE (HIGH PRESS.)	
	ACTUAL INSIDE DIA (SPLIT FLANGE)	STANDARD SCHEDULE 40 PIPE SIZE	ACTUAL INSIDE DIA (SPLIT FLANGE)	HVY DUTY SCHEDULE 160 PIPE SIZE ASTM A106 GD.B
5	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
10	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{1}{2}$
15	1	1	$\frac{3}{4}$	$\frac{3}{4}$
20	$1\frac{1}{4}$	1	$\frac{3}{4}$	$\frac{3}{4}$
25	$1\frac{1}{4}$	$1\frac{1}{4}$	$\frac{3}{4}$	$\frac{3}{4}$
30	$1\frac{1}{4}$	$1\frac{1}{4}$	$\frac{7}{8}$	$\frac{3}{4}$
35	$1\frac{1}{2}$	$1\frac{1}{4}$	$\frac{7}{8}$	1
40	$1\frac{1}{2}$	$1\frac{1}{2}$	1	1
45	2	$1\frac{1}{2}$	1	$1\frac{1}{4}$
50	2	$1\frac{1}{2}$	$1\frac{1}{4}$	$1\frac{1}{4}$
60	2	2	$1\frac{1}{4}$	$1\frac{1}{4}$
70	2	2	$1\frac{1}{4}$	$1\frac{1}{4}$
80	$2\frac{1}{2}$	2	$1\frac{1}{2}$	$1\frac{1}{4}$
90	$2\frac{1}{2}$	$2\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$
100	$2\frac{1}{2}$	$2\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$
110	$2\frac{1}{2}$	$2\frac{1}{2}$	2	$1\frac{1}{2}$
120	$2\frac{1}{2}$	$2\frac{1}{2}$	2	2

- NOTE: 1) For other pipe schedules than those listed, consult factory.
 2) NPT ports are not recommended for pressures exceeding 2000 PSI
 3) JIC ports are recommended for pressures up to 2500 PSI
 4) Split flange ports are recommended for all high pressure applications.

FLUID VELOCITY FORMULAS

$$FPS = \frac{.408 \times GPM}{d^2} \quad GPM = 2.451 d^2 \times FPS$$

FPS = Feet Per Second

GPM = Gal. Per Minute

d = Inside Dia. of Hose or Pipe

"To more accurately project the actual performance of the average unit the data furnished herein is based upon typical performance after 250 hours of operation."

PERFORMANCE DATA

Performance data as shown in the following charts was obtained from and based on diverter plate equipped units, and tested with an oil viscosity of 150 SUS (32 CST).

PUMPS

P1500

AVERAGE OUTPUT—GPM at 2000 psi/138 bar

AVERAGE INPUT—Horsepower at 2000 psi/138 bar

OIL VISCOSITY—150 SUS (32 CST)

GEAR WIDTH (in.)

SPEED (RPM)	$\frac{1}{2}$	$\frac{3}{4}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{3}{4}$	2
900	1.7 4	2.5 6	3.4 7	4.2 9	5.0 11	5.8 13	6.7 14.5
1200	2.5 5	3.8 7.5	5.2 9.5	6.5 12	7.8 14.5	9.2 17	10.5 19
1500	3.4 6.5	5.1 9.5	7.0 12	8.8 15	10.7 18	12.5 21	14.3 24
1800	4.2 7.5	6.4 11	8.8 14.5	11.1 18	13.5 21.5	15.8 25	18.1 29
2100	5.1 9	7.7 13	10.7 16.5	13.4 21	16.3 25	19.0 29.5	21.7 34
2400	6.0 10	9.0 15	12.5 19	15.7 23.5	19.0 28.5	22.3 33.5	25.5 38.5

P2500

AVERAGE OUTPUT—GPM at 2000 psi/138 bar
 AVERAGE INPUT—Horsepower at 2000 psi/138 bar
 OIL VISCOSITY—150 SUS (32 CST)

GEAR WIDTH (in.)

SPEED (RPM)	1	1¼	1½	1¾	2	2¼	2½
600	5.5 10	7.0 12.5	8.5 14	10.0 16	11.0 19	12.0 20.5	13.0 23
900	8.5 15	11.0 18	13.0 21	16.0 24	17.5 27.5	19.0 31	21.0 34
1200	11.5 19.5	15.0 24	18.0 27.5	21.5 32	24.0 36.5	26.5 41	29.0 46
1500	15.0 24	19.0 29.5	23.0 34.5	27.0 40	30.5 45.5	33.5 51	37.5 57
1800	18.0 29	23.0 35	28.0 41	33.0 47.5	37.0 54	41.0 61	46.0 68.5
2100	21.0 33.5	27.0 41	32.5 47.5	38.5 55	43.5 63	48.0 71	54.0 80
2400	24.0 38	31.0 46	37.5 54.5	44.0 63	50.0 71.5	55.5 81	62.0 91.5

P3000

AVERAGE OUTPUT—GPM at 2000 psi/138 bar
 AVERAGE INPUT—Horsepower at 2000 psi/138 bar
 OIL VISCOSITY—150 SUS (32 CST)

GEAR WIDTH (in.)

SPEED (RPM)	1	1¼	1½	1¾	2
600	3.0 7	4.0 9	6.0 11	7.0 13	8.5 15
900	6.0 10.5	7.5 13.5	10.0 16.5	11.5 19	13.5 22
1200	8.5 13.5	11.0 17.5	14.0 21.5	16.0 25	19.0 29
1500	11.0 17	14.0 22	17.5 26.5	20.5 31	24.0 36
1800	13.5 20	17.5 26	21.5 31.5	25.0 37	29.0 43
2100	16.0 23.5	21.0 30	25.5 36.5	29.5 43	34.5 50
2400	18.5 27	24.0 34	29.5 42	34.0 49	39.5 57

P3700

AVERAGE OUTPUT—GPM at 2000 psi/138 bar

AVERAGE INPUT—Horsepower at 2000 psi/138 bar

OIL VISCOSITY—150 SUS (32 CST)

GEAR WIDTH (in.)

SPEED (RPM)	1	1½	1¾	2	2¼	2½	3	
600	5.5 12.0	7.5 14.5	9.5 16.5	11.5 19	13.5 21.5	15.0 24.5	17.5 27.5	21.0 34
1200	13.5 24	17.0 29	21.0 34	25.0 39	29.0 43.5	33.0 49.5	37.0 55	44.0 67.5
1500	17.5 30	22.0 36.5	27.0 43	32.0 49	37.0 54.5	42.0 62	46.5 68.5	55.0 84
1800	21.5 36	27.0 44	33.0 52	39.0 59	44.5 66	50.5 74.5	56.0 82	66.0 100.5
2100	25.5 42	32.0 51.5	39.0 61	46.0 69	52.0 77	59.5 87	65.5 96	77.5 117
2400	29.5 48	37.0 59	45.0 69.5	52.5 78.5	60.0 88	68.0 99.5	75.5 109.5	88.5 133.5

P5000

AVERAGE OUTPUT—GPM at 2000 psi/138 bar

AVERAGE INPUT—Horsepower at 2000 psi/138 bar

OIL VISCOSITY—150 SUS (32 CST)

GEAR WIDTH (in.)

SPEED (RPM)	1	1¼	1½	1¾	2	2¼	2½
600	5.5 10	7.0 12.5	8.5 14	10.0 16	11.0 19	12.0 20.5	13.0 23
900	8.5 15	11.0 18	13.0 21	16.0 24	17.5 27.5	19.0 31	21.0 34
1200	11.5 19.5	15.0 24	18.0 27.5	21.5 32	24.0 36.5	26.5 41	29.0 46
1500	15.0 24	19.0 29.5	23.0 34.5	27.0 40	30.5 45.5	33.5 51	37.5 57
1800	18.0 29	23.0 35	28.0 41	33.0 47.5	37.0 54	41.0 61	46.0 68.5
2100	21.0 33.5	27.0 41	32.5 47.5	38.5 55	43.5 63	48.0 71	54.0 80
2400	24.0 38	31.0 46	37.5 54.5	44.0 63	50.0 71.5	55.5 81	62.0 91.5

"To more accurately project the actual performance of the average unit the data furnished herein is based upon typical performance after 250 hours of operation."

PERFORMANCE DATA

Performance data as shown in the following charts was obtained from and based on diverter plate equipped units, and tested with an oil viscosity of 150 SUS (32 CST).

PUMPS

P1500

AVERAGE OUTPUT—GPM at 2000 psi/138 bar
AVERAGE INPUT—Horsepower at 2000 psi/138 bar
OIL VISCOSITY—150 SUS (32 CST)

GEAR WIDTH (in.)

SPEED (RPM)	$\frac{1}{2}$	$\frac{3}{4}$	1	1 $\frac{1}{4}$	1 $\frac{1}{2}$	1 $\frac{3}{4}$	2
900	1.7 4	2.5 6	3.4 7	4.2 9	5.0 11	5.8 13	6.7 14.5
1200	2.5 5	3.8 7.5	5.2 9.5	6.5 12	7.8 14.5	9.2 17	10.5 19
1500	3.4 6.5	5.1 9.5	7.0 12	8.8 15	10.7 18	12.5 21	14.3 24
1800	4.2 7.5	6.4 11	8.8 14.5	11.1 18	13.5 21.5	15.8 25	18.1 29
2100	5.1 9	7.7 13	10.7 16.5	13.4 21	16.3 25	19.0 29.5	21.7 34
2400	6.0 10	9.0 15	12.5 19	15.7 23.5	19.0 28.5	22.3 33.5	25.5 38.5

P7500

AVERAGE OUTPUT—GPM at 2000 psi/138 bar

AVERAGE INPUT—Horsepower at 2000 psi/138 bar

OIL VISCOSITY—150 SUS (32 CST)

GEAR WIDTH (in.)

SPEED (RPM)	1	1¼	1½	1¾	2	2¼	2½	2¾	3
600	7.5 18	10.0 21	12.5 23.5	14.5 26	17.5 29	20.0 33.5	23.5 36.5	27.0 39	29.0 42
1200	17.5 31.5	22.5 38	27.5 45	32.5 51.5	37.5 58	42.5 65	47.0 72	53.0 80	59.0 88
1500	22.5 38	28.5 47	34.5 55.5	41.0 64.5	47.5 73	53.0 81.5	59.0 90	66.0 100	73.0 111.5
1800	27.5 45	35.0 56	42.0 66.5	50.0 77	57.0 88	64.0 98	71.0 108.5	79.0 122	87.5 134
2100	32.5 52	41.0 64.5	49.0 77	59.0 90	67.0 103	74.5 114	82.5 126.5	92.0 142	101.5 157
2400	37.5 58.5	47.0 73	56.5 87.5	67.5 103	76.5 118	85.5 130	94.5 145	105.0 163	116.0 180

MOTORS

M1500

OIL VISCOSITY—150 SUS (32 CST)

AVERAGE DATA - at 2000 psi/138 bar

SPEED rpm	1" GEAR			1½" GEAR			2" GEAR		
	INPUT gpm	OUTPUT TORQUE in-lbs.	OUTPUT hp	INPUT gpm	OUTPUT TORQUE in-lbs.	OUTPUT hp	INPUT gpm	OUTPUT TORQUE in-lbs.	OUTPUT hp
800	6.0	400	5.0	8.5	660	8.5	12.0	855	11.0
1200	8.0	395	7.5	13.5	655	12.5	17.0	845	16.0
1600	11.0	385	9.5	18.0	640	15.5	22.0	830	21.0
2000	14.0	370	12.0	21.0	590	18.5	27.0	795	25.0

M2500

OIL VISCOSITY—150 SUS (32 CST)
AVERAGE DATA—at 2000 psi/138 bar

SPEED rpm	1" GEAR			1½" GEAR			2" GEAR			2½" GEAR		
	INPUT gpm	OUTPUT TORQUE in-lbs.	OUTPUT hp	INPUT gpm	OUTPUT TORQUE in-lbs.	OUTPUT hp	INPUT gpm	OUTPUT TORQUE in-lbs.	OUTPUT hp	INPUT gpm	OUTPUT TORQUE in-lbs.	OUTPUT hp
800	11.0	730	9.0	16.0	1140	14.0	21.5	1530	18.5	26.5	1900	24.0
1200	16.0	720	13.5	23.0	1120	21.0	31.0	1495	28.0	37.5	1870	35.5
1600	20.5	710	17.5	30.5	1100	27.0	40.5	1470	37.0	50.0	1820	45.0
2000	25.5	670	21.0	38.0	1040	32.5	50.0	1410	44.5	62.0	1740	55.0

M3000

OIL VISCOSITY—150 SUS (32 CST)
AVERAGE DATA—at 2000 psi/138 bar

SPEED rpm	1" GEAR			1½" GEAR			2" GEAR		
	INPUT gpm	OUTPUT TORQUE in-lbs.	OUTPUT hp	INPUT gpm	OUTPUT TORQUE in-lbs.	OUTPUT hp	INPUT gpm	OUTPUT TORQUE in-lbs.	OUTPUT hp
800	10.0	575	7.5	14.0	900	11.5	18.0	1180	15.0
1200	14.0	570	11.0	19.0	890	17.0	24.0	1170	22.5
1600	17.0	565	14.5	24.0	880	22.5	32.0	1160	29.0
2000	20.5	555	17.5	29.5	860	27.5	39.0	1130	36.0

M3700

OIL VISCOSITY—150 SUS (32 CST)

AVERAGE DATA - at 2000 psi/138 bar

SPEED rpm	1" GEAR			1½" GEAR			2" GEAR			2½" GEAR			3" GEAR		
	INPUT gpm	OUTPUT TORQUE in-lbs.	OUTPUT hp	INPUT gpm	OUTPUT TORQUE in-lbs.	OUTPUT hp	INPUT gpm	OUTPUT TORQUE in-lbs.	OUTPUT hp	INPUT gpm	OUTPUT TORQUE in-lbs.	OUTPUT hp	INPUT gpm	OUTPUT TORQUE in-lbs.	OUTPUT hp
800	13.5	800	10.0	19.5	1270	16.0	26.5	1750	22.0	32.0	2240	28.5	37.0	2800	35.5
1000	16.5	790	12.5	23.5	1250	20.0	32.0	1720	27.5	39.0	2210	34.0	45.0	2780	43.5
1400	21.5	770	17.0	31.5	1210	26.5	42.0	1675	36.0	52.0	2180	47.5	61.0	2710	58.5
1800	27.5	710	20.0	40.0	1145	32.5	53.0	1595	45.0	65.5	2100	60.0	77.0	2560	73.0

M5000

OIL VISCOSITY—150 SUS (32 CST)

AVERAGE DATA - at 2000 psi/138 bar

SPEED rpm	1" GEAR			1½" GEAR			2" GEAR			2½" GEAR		
	INPUT gpm	OUTPUT TORQUE in-lbs.	OUTPUT hp	INPUT gpm	OUTPUT TORQUE in-lbs.	OUTPUT hp	INPUT gpm	OUTPUT TORQUE in-lbs.	OUTPUT hp	INPUT gpm	OUTPUT TORQUE in-lbs.	OUTPUT hp
800	11.0	730	9.0	16.0	1140	14.0	21.5	1530	18.5	26.5	1900	24.0
1200	16.0	720	13.5	23.0	1120	21.0	31.0	1495	28.0	37.5	1870	35.5
1600	20.5	710	17.5	30.5	1100	27.0	40.5	1470	37.0	50.0	1820	45.0
2000	25.5	670	21.0	38.0	1040	32.5	50.0	1410	44.5	62.0	1740	55.0

M7500

OIL VISCOSITY—150 SUS (32 CST)
AVERAGE DATA—at 2000 psi/138 bar

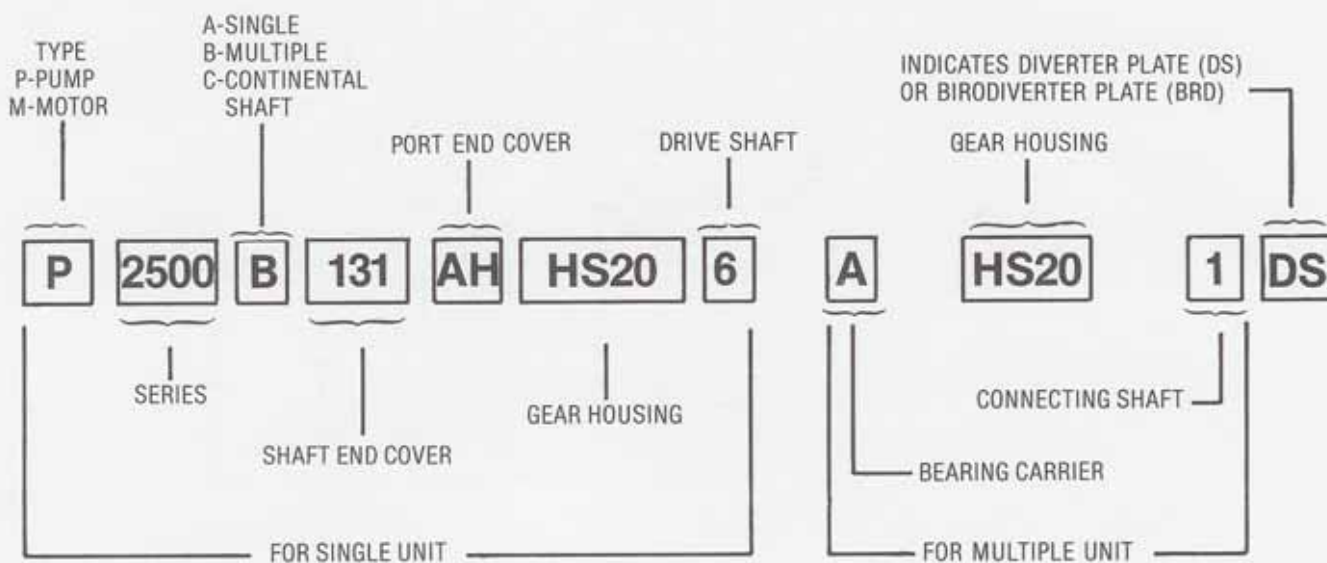
SPEED rpm	1" GEAR			1½" GEAR			2" GEAR			2½" GEAR			3" GEAR		
	INPUT gpm	OUTPUT TORQUE in-lbs.	OUTPUT hp	INPUT gpm	OUTPUT TORQUE in-lbs.	OUTPUT hp	INPUT gpm	OUTPUT TORQUE in-lbs.	OUTPUT hp	INPUT gpm	OUTPUT TORQUE in-lbs.	OUTPUT hp	INPUT gpm	OUTPUT TORQUE in-lbs.	OUTPUT hp
800	19.5	1100	14.5	28.0	1700	22.0	34.5	2270	29.0	42.0	2930	37.5	49.5	3700	47.0
1200	26.5	1090	20.0	38.0	1680	31.0	49.0	2260	42.5	60.0	2900	54.5	72.5	3680	69.0
1600	34.0	1040	26.0	49.5	1650	41.0	64.0	2220	55.5	78.0	2840	71.5	94.0	3570	89.5
2000	41.0	970	30.5	59.5	1600	50.0	78.5	2180	68.0	96.5	2760	87.0	115.0	3430	109.0

In line with our policy of continuing product improvement, specifications and information contained in this catalog are subject to change.

CODING

SINGLE AND MULTIPLE UNITS

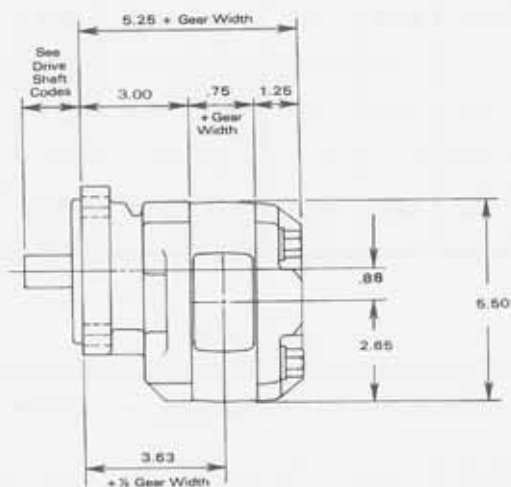
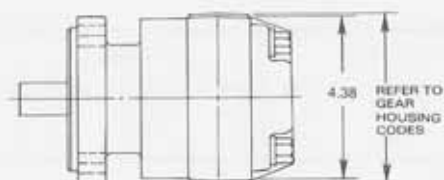
Individual components are combined to suit each particular application. Use the following guide to show proper sequence to follow.



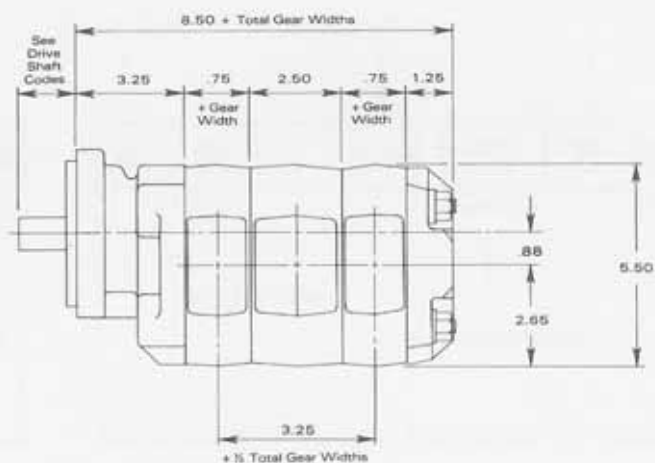
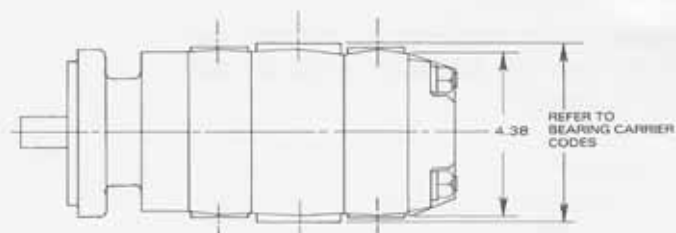
DIMENSIONAL DATA

ALL DIMENSIONS IN INCHES
UNFINISHED CASTING DIMENSIONS MAY VARY

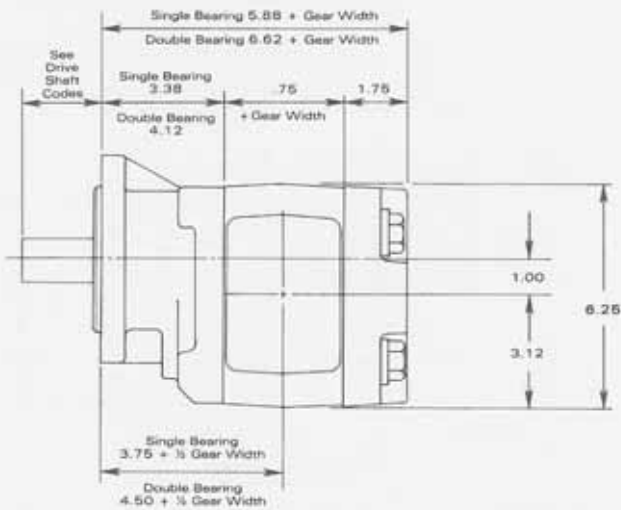
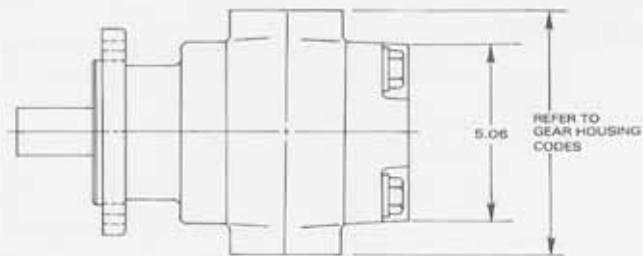
1500 SERIES SINGLE UNIT



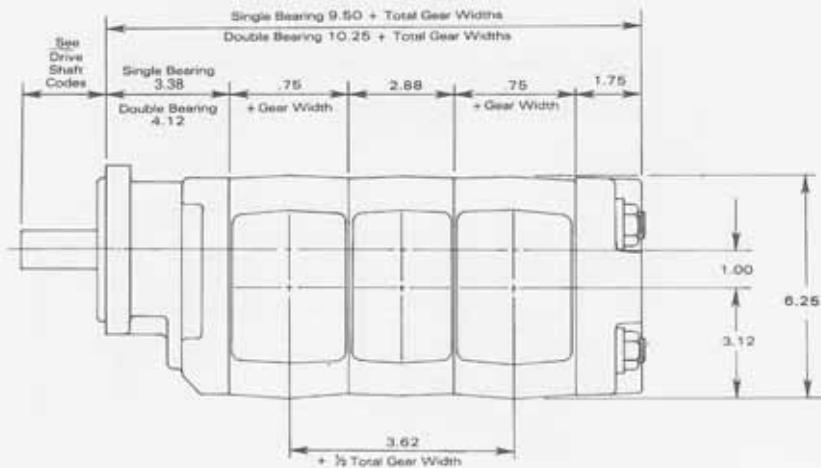
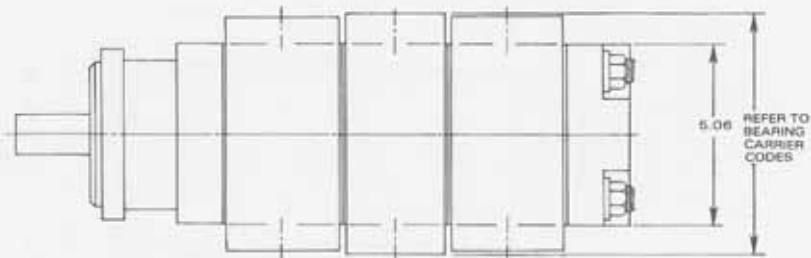
1500 SERIES MULTIPLE UNIT



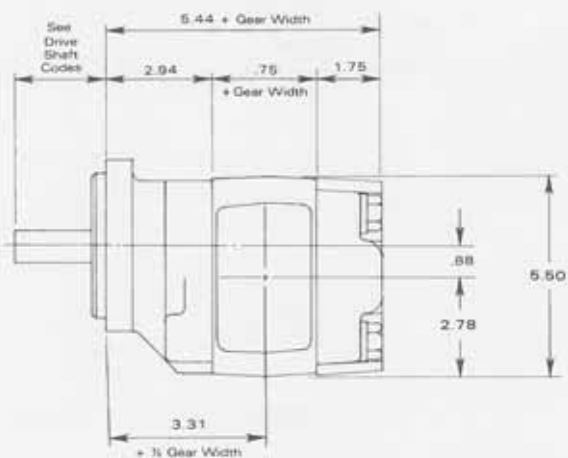
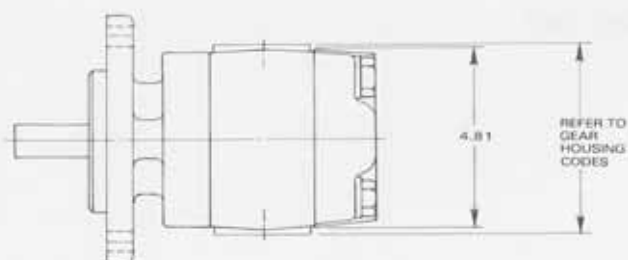
2500 SERIES SINGLE UNIT



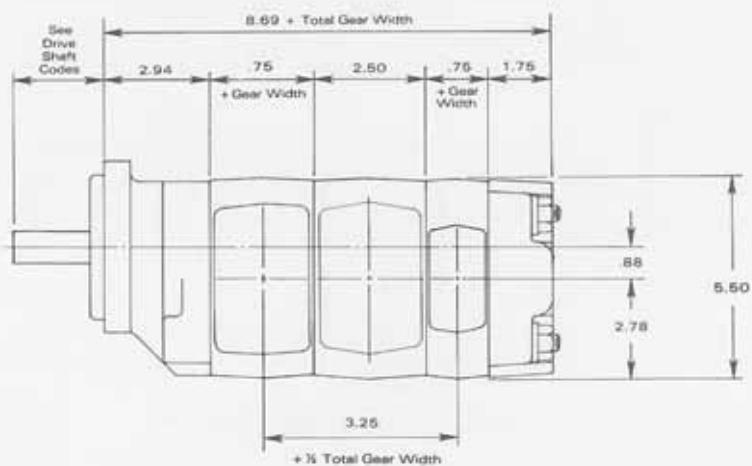
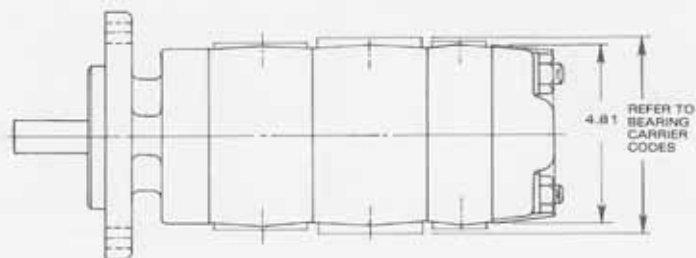
2500 SERIES MULTIPLE UNIT



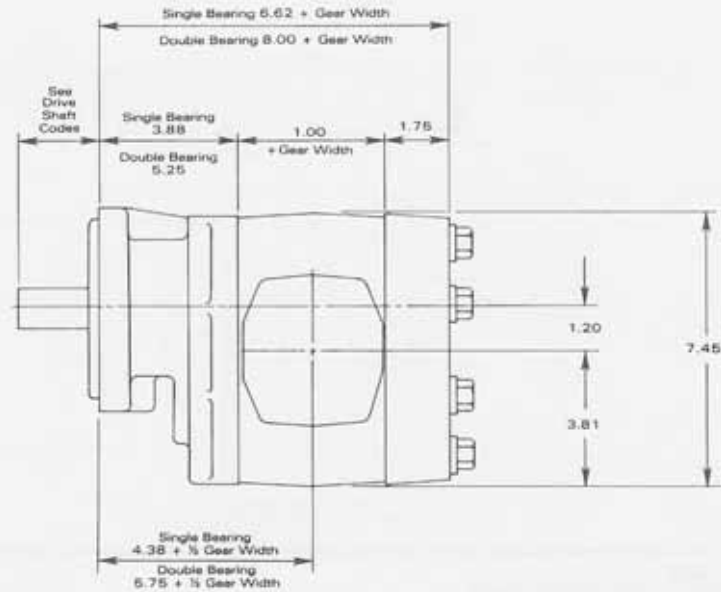
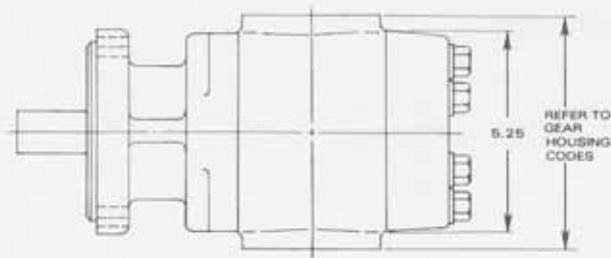
3000 SERIES SINGLE UNIT



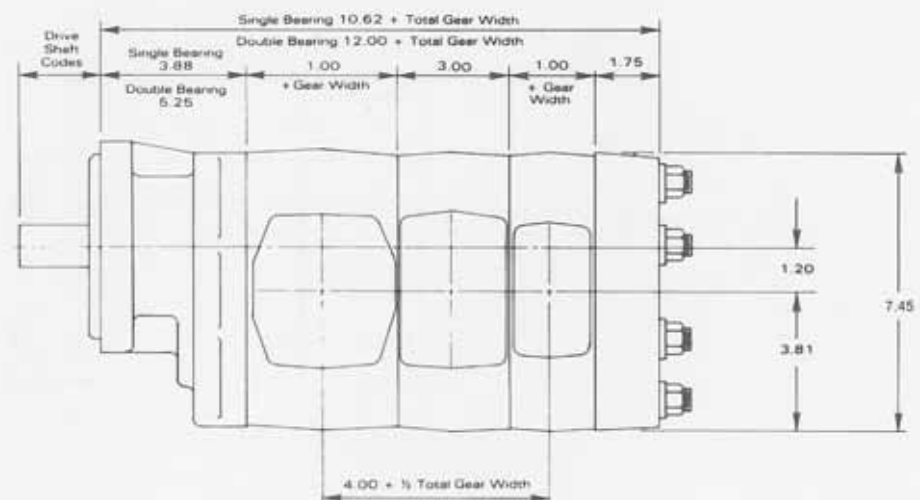
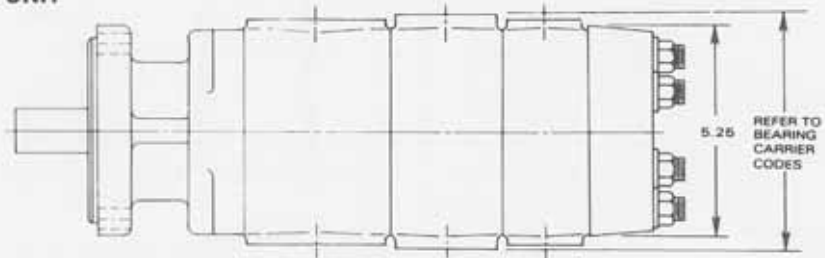
3000 SERIES MULTIPLE UNIT



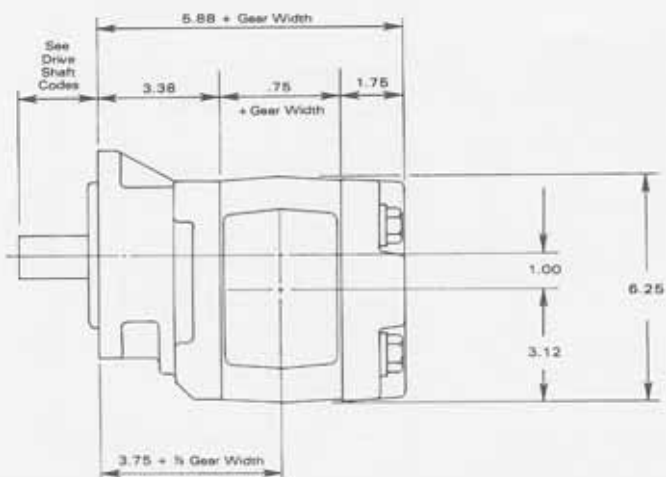
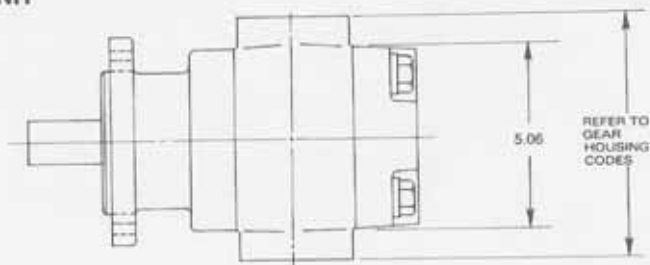
3700 SERIES SINGLE UNIT



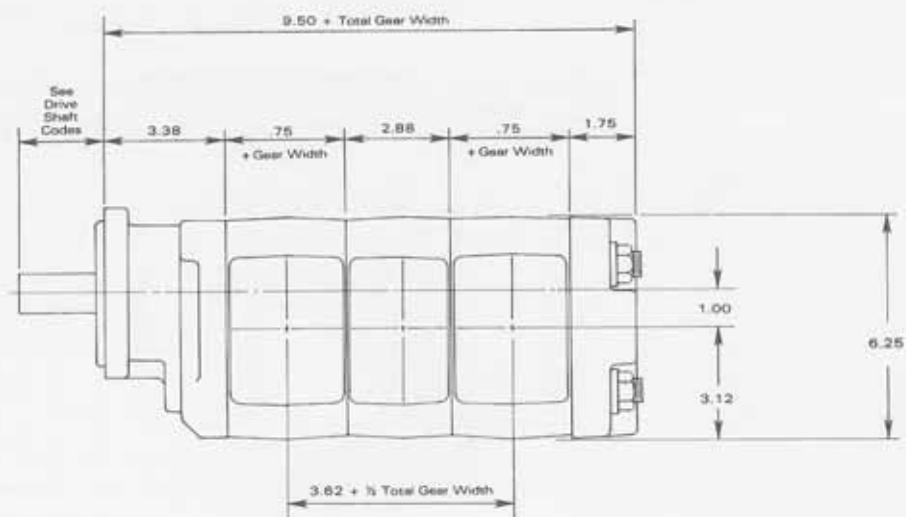
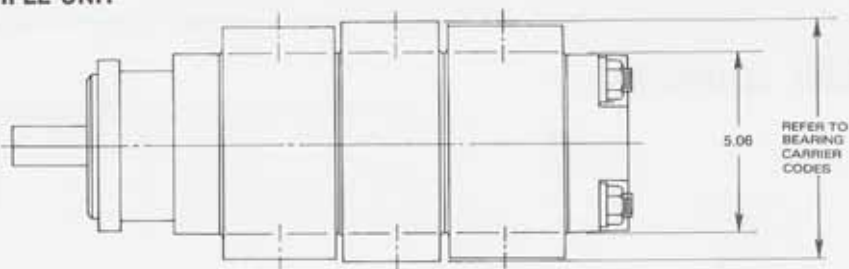
3700 SERIES MULTIPLE UNIT



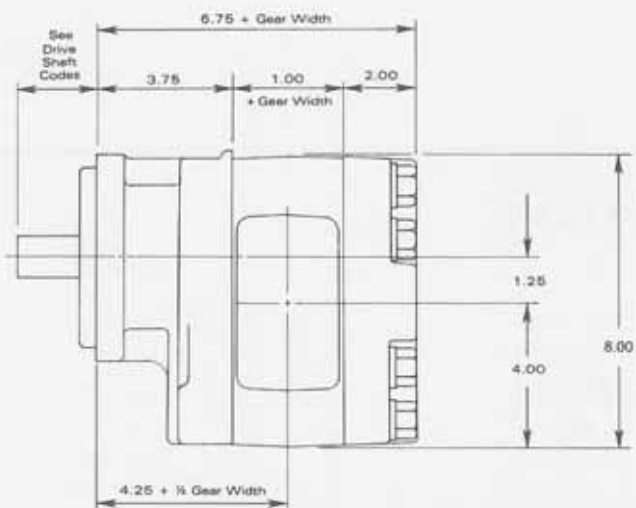
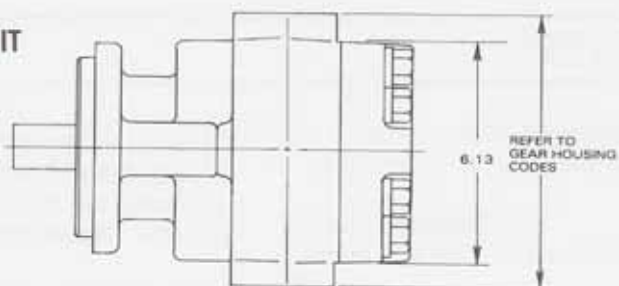
5000 SERIES SINGLE UNIT



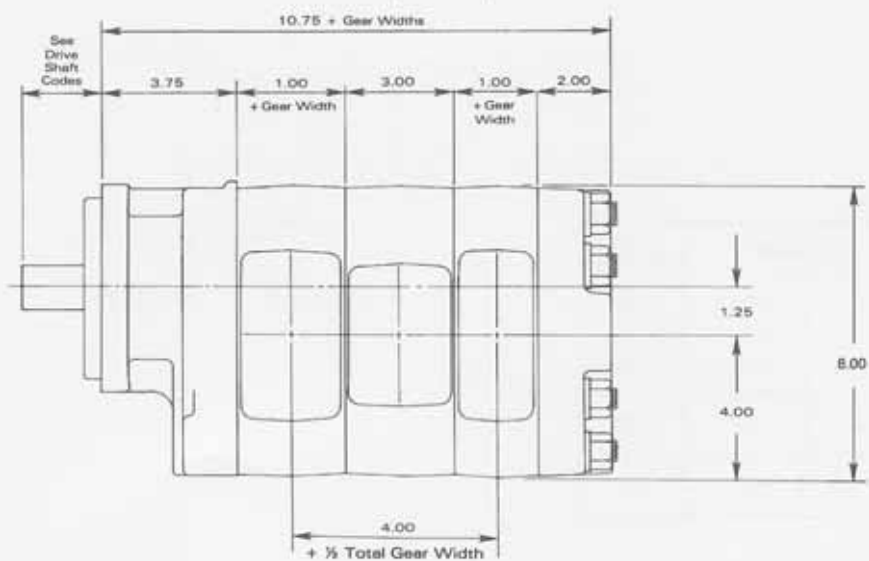
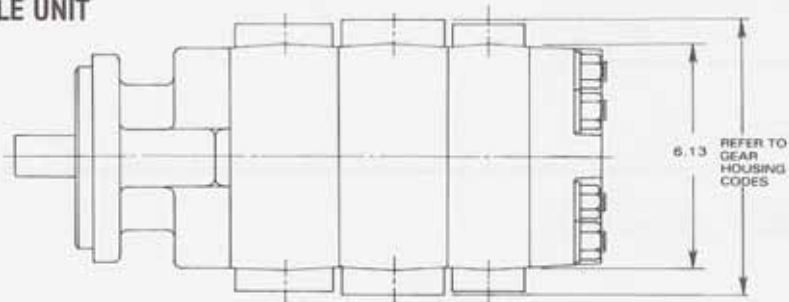
5000 SERIES MULTIPLE UNIT



7500 SERIES SINGLE UNIT



7500 SERIES MULTIPLE UNIT



SHAFT END COVERS

Shaft rotation direction is determined by facing the drive shaft with the shaft in an upper or top position.

Left to right flow..... C/W Clockwise rotation
 Right to left flow..... C/C counter clockwise rotation
 Bi-Rotational..... BR
 Double bearing , Bi-Rotational DB

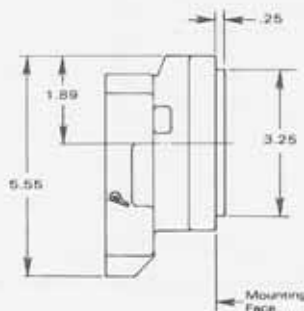
Inversion of the pump will not affect rotation. Double outboard bearings are necessary when a side or overhung load is imposed on the drive shaft of a pump or motor. **Please consult factory.**

NOTE: All motor codes contain drain ports; specify if none desired.

1500 SERIES SAE A-2 BOLT

CODES

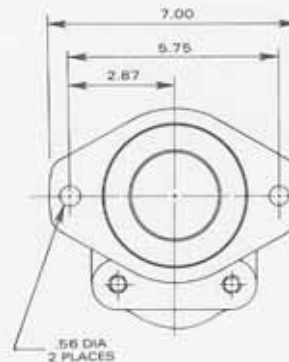
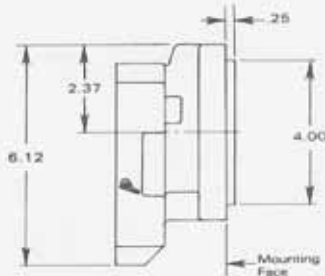
ROTATION		Shaft Bearing
Pumps	C/W	090
	C/C	190
	BR	290
Motors	BR	890



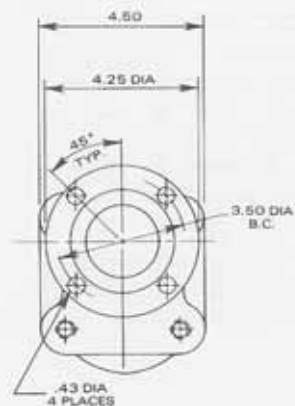
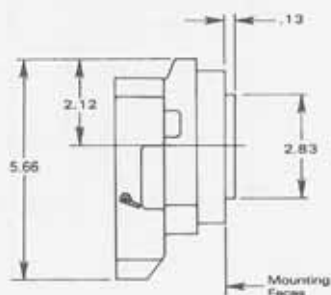
1500 SERIES SAE B-2 BOLT

CODES

ROTATION		Shaft Bearing
Pumps	C/W	096
	C/C	196
	BR	296
Motors	BR	896



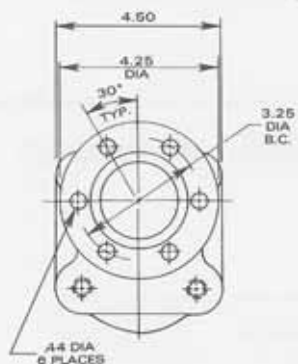
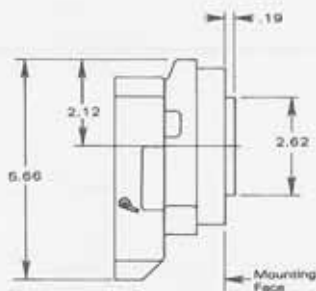
1500 SERIES ROUND FLANGE-4 BOLT ONLY



CODES

ROTATION		Shaft Bearing
Pumps	C/W	009
	C/C	109
	BR	209
Motors	BR	809

1500 SERIES ROUND FLANGE-6 BOLT



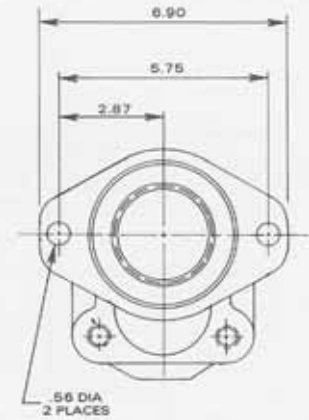
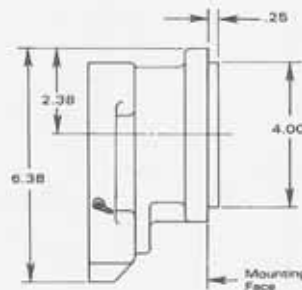
CODES

ROTATION		Shaft Bearing
Pumps	C/W	091
	C/C	191
	BR	291
Motors	BR	891

2500 SERIES SAE B-2 BOLT

CODES

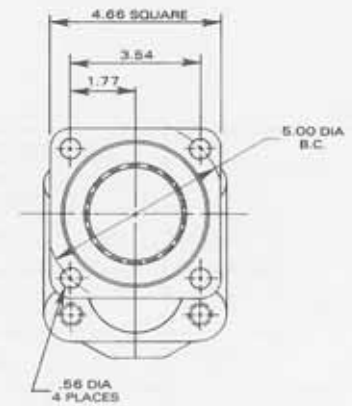
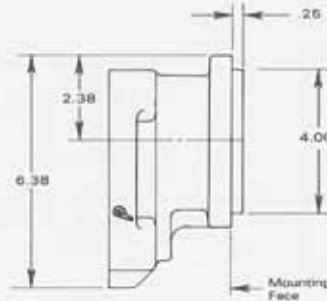
ROTATION		Shaft Bearing	
		With	Double Bearing
Pumps	C/W	086	386
	C/C	186	486
	BR	286	586
Motors	BR	686	786



2500 SERIES SAE B-4 BOLT

CODES

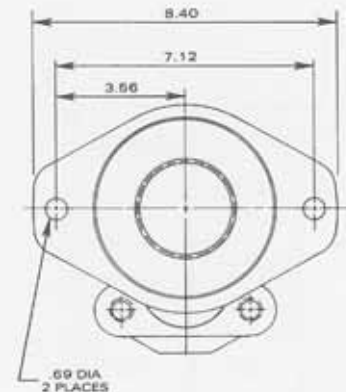
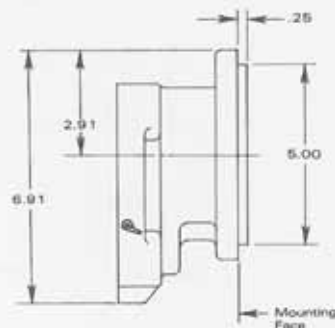
ROTATION		Shaft Bearing	
		With	Double Bearing
Pumps	C/W	031	331
	C/C	131	431
	BR	231	531
Motors	BR	631	731



2500 SERIES SAE C-2 BOLT

CODES

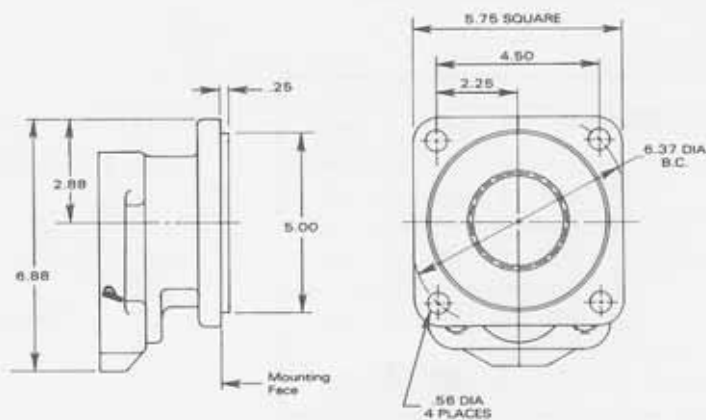
ROTATION		Shaft Bearing
Pumps	C/W	087
	C/C	187
	BR	287
Motors	BR	687



2500 SERIES SAE C-4 BOLT

CODES

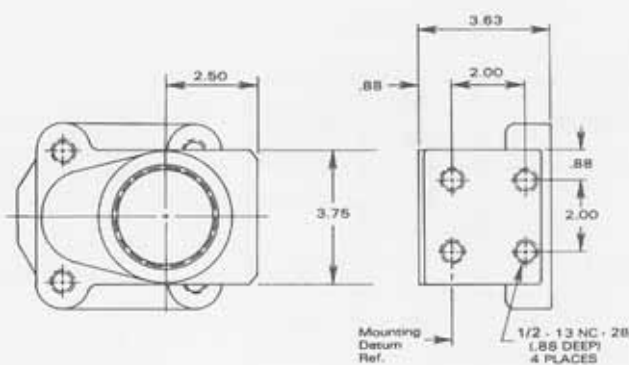
ROTATION		Shaft Bearing	
		With	Double Bearing
Pumps	C/W	067	367
	C/C	167	467
	BR	267	567
Motors	BR	667	767



2500 SERIES PAD MOUNTING

CODES

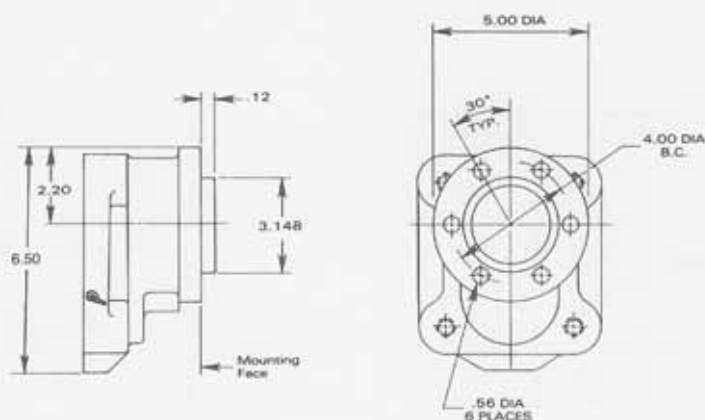
ROTATION		Shaft Bearing	
		With	Double Bearing
Pumps	C/W	099	399
	C/C	199	499
	BR	299	599
Motors	BR	699	799



2500 SERIES ROUND FLANGE-6 BOLT

CODES

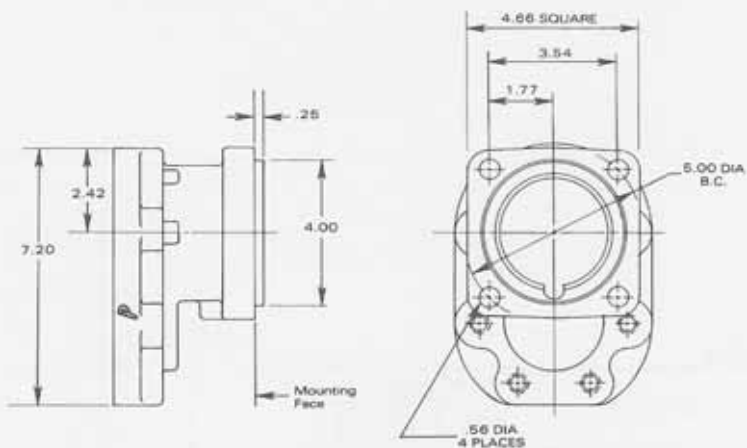
ROTATION		Shaft Bearing
Pumps	C/W	092
	C/C	192
	BR	292
Motors	BR	692



3700 SERIES SAE B-4 BOLT

CODES

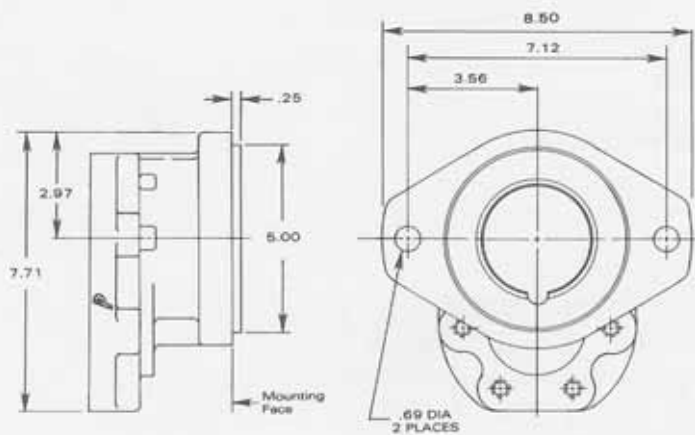
ROTATION		Shaft Bearing	
		With	Double Bearing
Pumps	C/W	031	331
	C/C	131	431
	BR	231	531
Motors	BR	631	731



3700 SERIES SAE C-2 BOLT

CODES

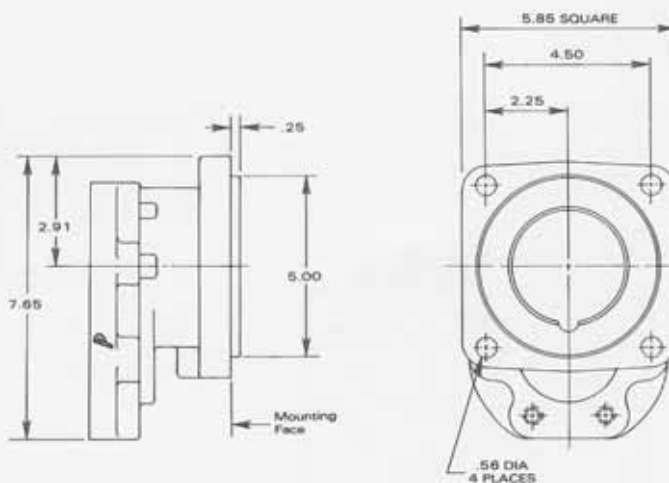
ROTATION		Shaft Bearing
Pumps	C/W	087
	C/C	187
	BR	287
Motors	BR	687



3700 SERIES SAE C-4 BOLT

CODES

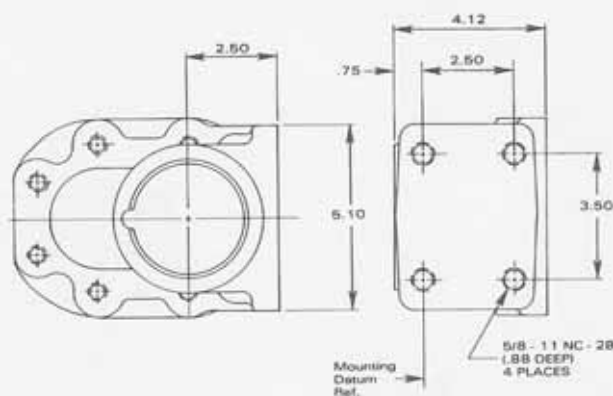
ROTATION		Shaft Bearing	
		With	Double Bearing
Pumps	C/W	067	367
	C/C	167	467
	BR	267	567
Motors	BR	667	767



3700 SERIES PAD MOUNTING

CODES

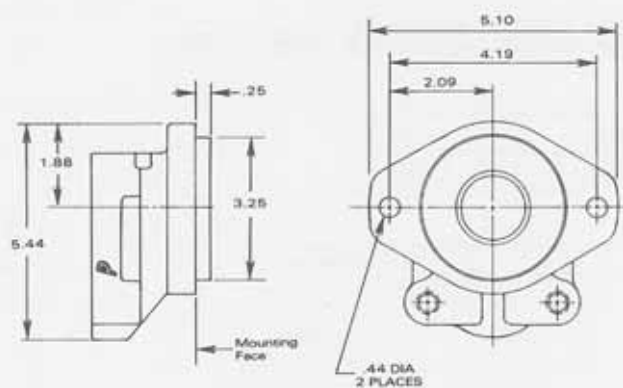
ROTATION		Shaft Bearing	
		With	Double Bearing
Pumps	C/W	000	300
	C/C	100	400
	BR	200	500
Motors	BR	600	700



3000 SERIES SAE A-2 BOLT

CODES

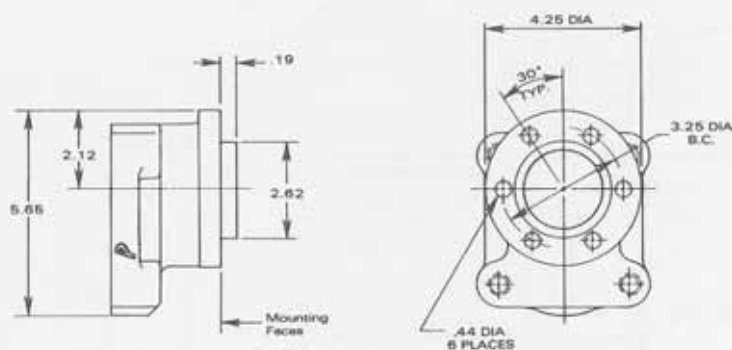
ROTATION		Shaft Bearing	
		With	Without
Pumps	C/W	383	083
	C/C	483	183
	BR	583	283
Motors	BR	783	883



3000 SERIES ROUND FLANGE-6 BOLT

CODES

ROTATION		Shaft Bearing	
		With	Without
Pumps	C/W	394	094
	C/C	494	194
	BR	594	294
Motors	BR	794	894

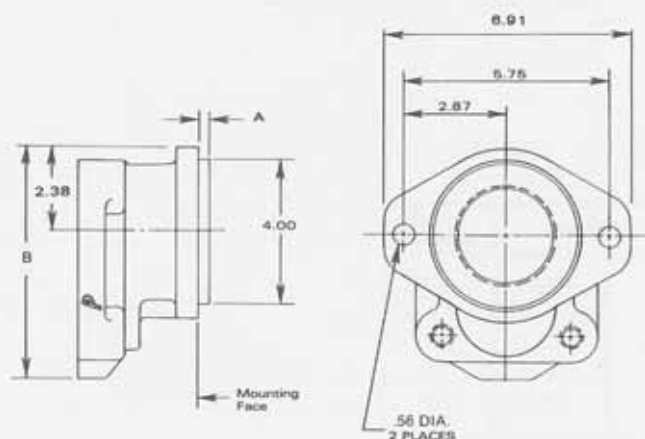


3000/5000 SERIES SAE B-2 BOLT

	A	B
3000	.38	5.94
5000	.25	6.45

CODES

ROTATION		Shaft Bearing	
		With	Without
Pumps	C/W	386	086
	C/C	486	186
	BR	586	286
Motors	BR	786	886

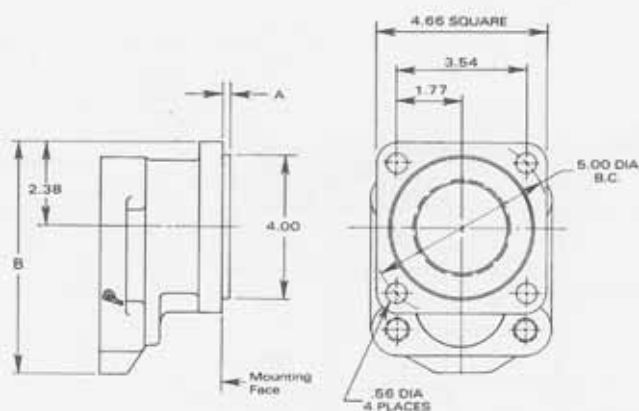


3000/5000 SERIES SAE B-4 BOLT

	A	B
3000	.38	5.94
5000	.25	6.45

CODES

ROTATION		Shaft Bearing	
		With	Without
Pumps	C/W	331	031
	C/C	431	131
	BR	531	231
Motors	BR	731	831

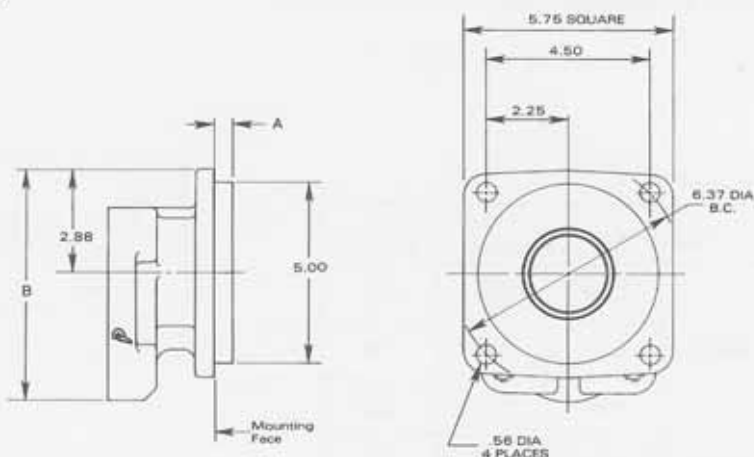


3000/5000 SERIES SAE C-4 BOLT

	A	B
3000	.50	6.45
5000	.25	6.94

CODES

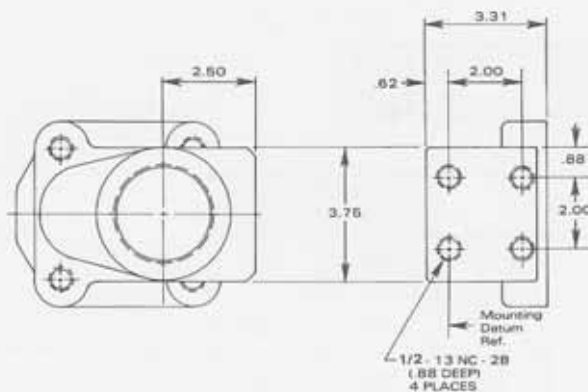
ROTATION		Shaft Bearing	
		With	Without
Pumps	C/W	367	067
	C/C	467	167
	BR	567	267
Motors	BR	767	867



3000 SERIES PAD MOUNTING

CODES

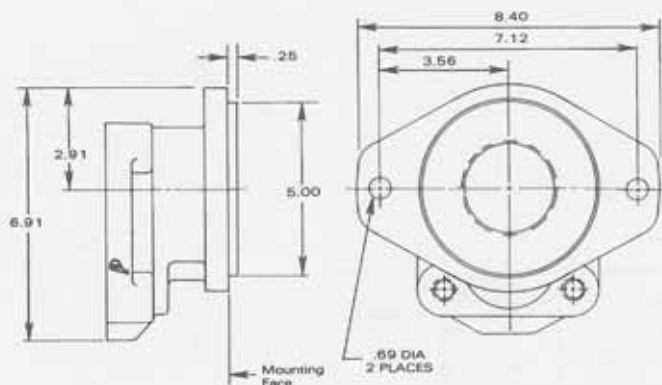
ROTATION		Shaft Bearing
Pumps	C/W	399
	C/C	499
	BR	599
Motors	BR	799



5000 SERIES SAE C-2 BOLT

CODES

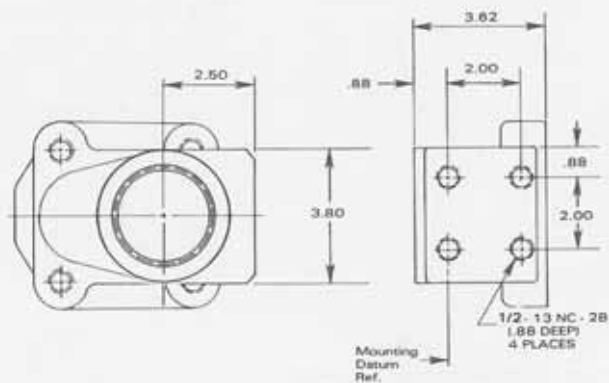
ROTATION		Shaft Bearing	
		With	Without
Pumps	C/W	387	087
	C/C	487	187
	BR	587	287
Motors	BR	787	887



5000 SERIES PAD MOUNTING

CODES

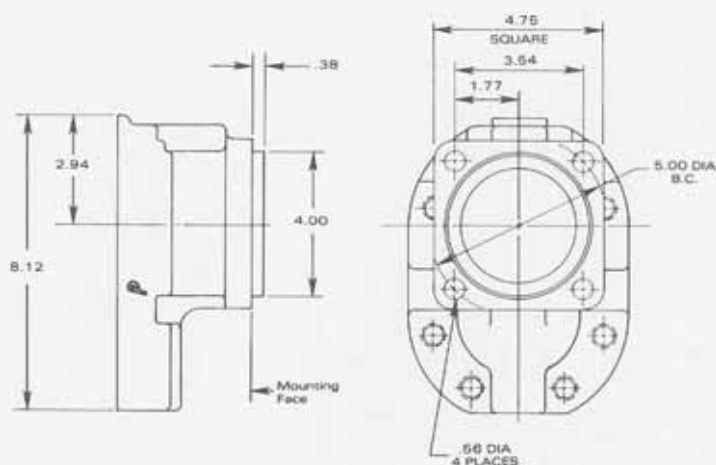
ROTATION		Shaft Bearing
Pumps	C/W	399
	C/C	499
	BR	599
Motors	BR	799



7500 SERIES SAE B-4 BOLT

CODES

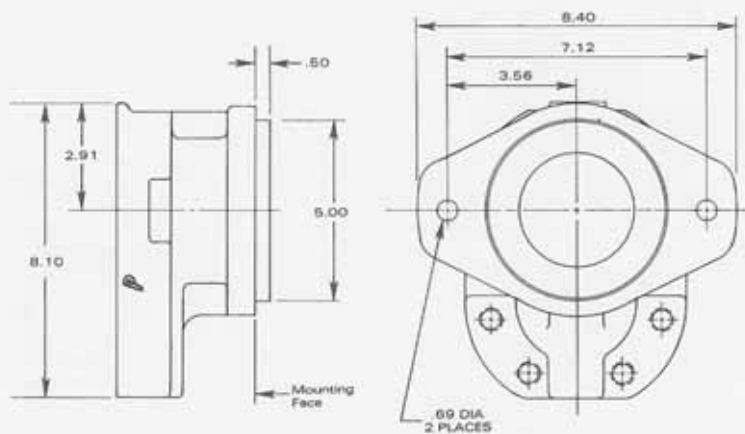
ROTATION		Shaft Bearing	
		With	Without
Pumps	C/W	331	031
	C/C	431	131
	BR	531	231
Motors	BR	731	831



7500 SERIES SAE C-2 BOLT

CODES

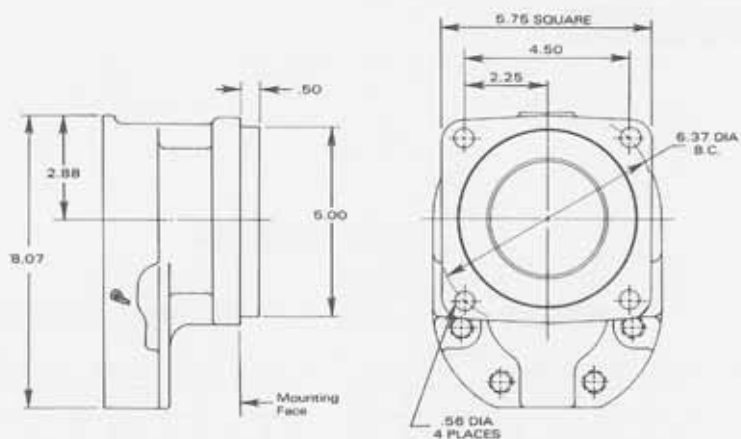
ROTATION		Shaft Bearing	
		With	Without
Pumps	C/W	387	087
	C/C	487	187
	BR	587	287
Motors	BR	787	887



7500 SERIES SAE C-4 BOLT

CODES

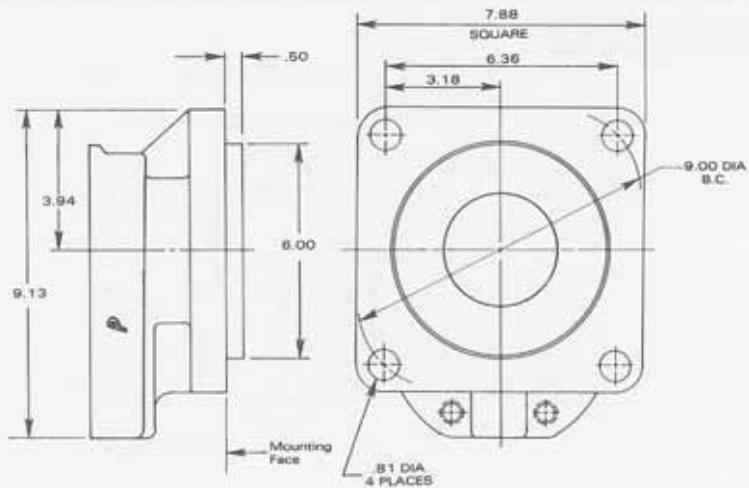
ROTATION		Shaft Bearing	
		With	Without
Pumps	C/W	367	067
	C/C	467	167
	BR	567	267
Motors	BR	767	867



7500 SERIES SAE D-4 BOLT

CODES

ROTATION		Shaft Bearing	
		With	Without
Pumps	C/W	379	079
	C/C	479	179
	BR	579	279
Motors	BR	779	879



PORT END COVERS

1500 SERIES

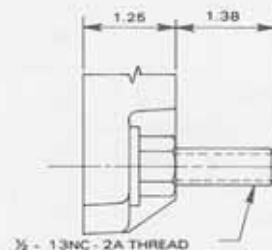
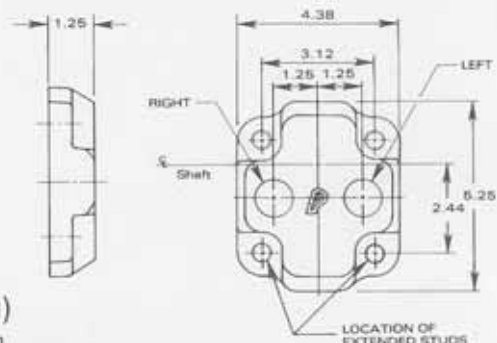
CODE SELECTION

NPT (in)

Left	Right	Single	Tandem Studs/F	Studs Ext
—	—	AD	AH	AX
—	1/2	BD	BH	BX
1/2	—	ED	EH	EX
1/2	1/2	FD	FH	FX
—	3/4	CD	CH	CX
3/4	—	ID	IH	IX
3/4	3/4	KD	KH	KX
—	1	LD	LH	LX
1	—	MD	MH	MX
1	1	OD	OH	OX
1/2	3/4	GD	GH	GX
3/4	1/2	JD	JH	JX
1/2	1	RD	RH	RX
1	1/2	QD	QH	QX
3/4	1	UD	UH	UX
1	3/4	SD	SH	SX

STRAIGHT THREADS (in)

Left	Right	Single	Tandem Studs/F	Studs Ext
—	1/2	LN	LT	LY
1/2	—	KN	KT	KY
1/2	1/2	MN	MT	MY
—	3/8	SN	ST	SY
3/8	—	RN	RT	RY
3/8	3/8	UN	UT	UY
—	7/8	CN	CT	CY
7/8	—	BN	BT	BY
7/8	7/8	EN	ET	EY
1/2	7/8	QN	QT	QY
3/8	1/2	ON	OT	OY
1/2	3/4	GN	GT	GY
3/4	1/2	JN	JT	JY



2500 SERIES

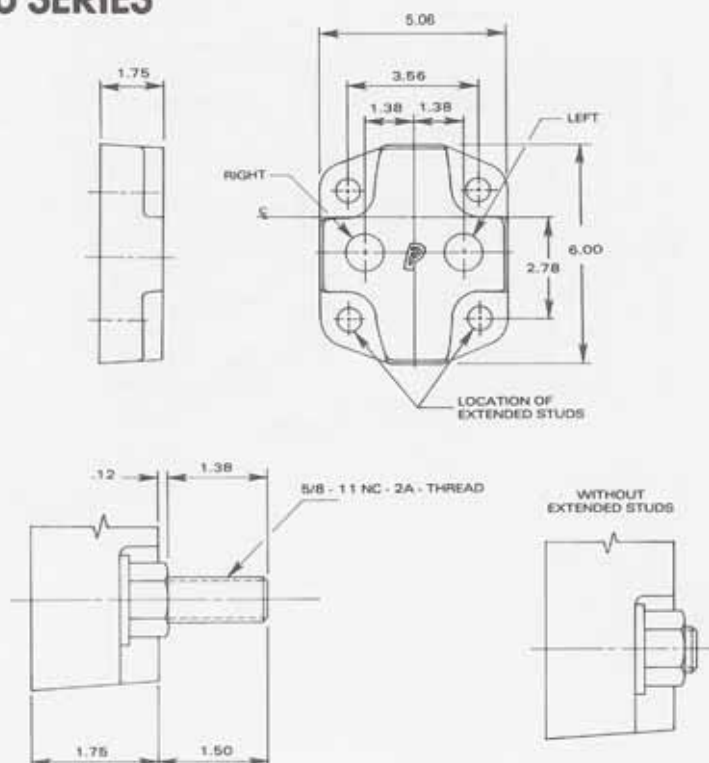
CODE SELECTION

NPT (in)

Left	Right	Single	Tandem Studs/F	Studs Ext
—	—	AD	AH	AX
3/4	—	ED	EH	EX
—	3/4	BD	BH	BX
3/4	3/4	FD	FH	FX

STRAIGHT THREADS (in)

Left	Right	Single	Tandem Studs/F	Studs Ext
1/2	—	GD	GH	GX
—	1/2	CD	CH	CX
1/2	1/2	ID	IH	IX
3/8	—	TD	TH	TX
—	3/8	MD	MH	MX
3/4	—	JD	JH	JX
—	3/4	KD	KH	KX
3/4	3/4	LD	LH	LX



3000 SERIES

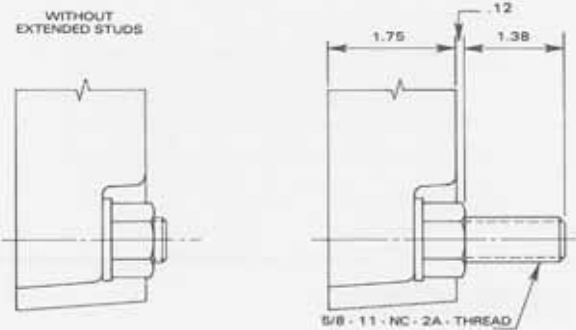
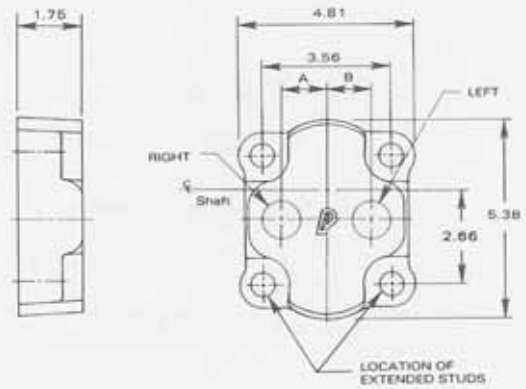
CODE SELECTION

NPT (in)

Left	B	Right	A	Single	Tandem Studs/F	Studs Ext
—	—	—	—	AD	AH	AX
$\frac{3}{4}$	$1\frac{1}{4}$	—	—	JD	JH	JX
—	—	$\frac{3}{4}$	$1\frac{1}{4}$	KD	KH	KX
$\frac{3}{4}$	$1\frac{1}{4}$	$\frac{3}{4}$	$1\frac{1}{4}$	LD	LH	LX

STRAIGHT THREADS (in)

Left	B	Right	A	Single	Tandem Studs/F	Studs Ext
$\frac{3}{4}$	$1\frac{1}{4}$	—	—	BD	BH	BX
—	—	$\frac{3}{4}$	$1\frac{1}{4}$	CD	CH	CX
$\frac{3}{4}$	$1\frac{1}{4}$	$\frac{3}{4}$	$1\frac{1}{4}$	ED	EH	EX
1	$1\frac{1}{4}$	$\frac{3}{4}$	$1\frac{1}{4}$	FD	FH	FX
$\frac{3}{4}$	$1\frac{1}{4}$	1	$1\frac{1}{4}$	GD	GH	GX
1	$1\frac{1}{4}$	1	$1\frac{1}{4}$	ID	IH	IX



3700 SERIES

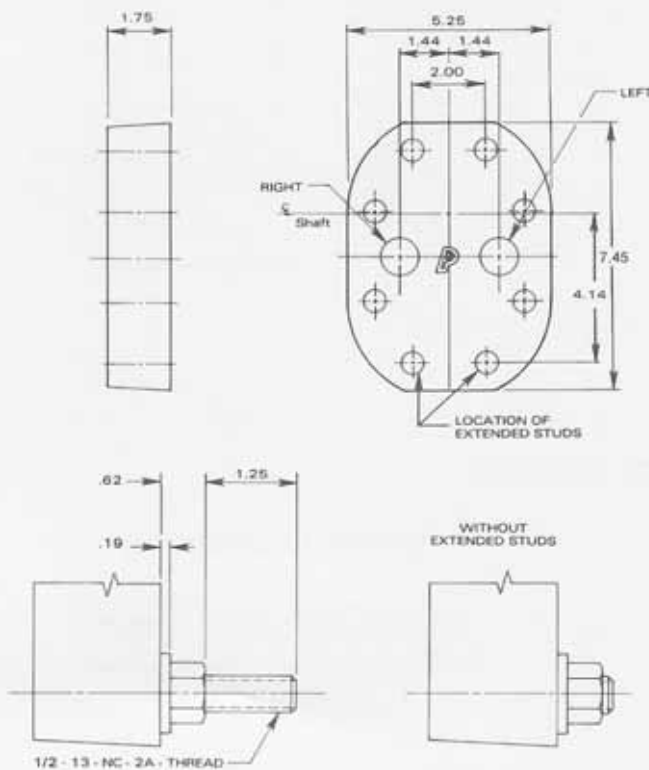
CODE SELECTION

NPT (in)

Left	Right	Single	Tandem Studs/F	Studs Ext
—	—	AZ	AT	AX
—	$\frac{3}{4}$	BZ	BT	BX
$\frac{3}{4}$	—	EZ	ET	EX
$\frac{3}{4}$	$\frac{3}{4}$	FZ	FT	FX
—	1	CZ	CT	CX
1	—	IZ	IT	IX
1	1	KZ	KT	KX
1	$\frac{3}{4}$	JZ	JT	JX
$\frac{3}{4}$	1	GZ	GT	GX

STRAIGHT THREADS (in)

Left	Right	Single	Tandem Studs/F	Studs Ext
—	$\frac{3}{4}$	MZ	MT	MX
$\frac{3}{4}$	—	OZ	OT	OX
$\frac{3}{4}$	$\frac{3}{4}$	LZ	LT	LX



5000 SERIES

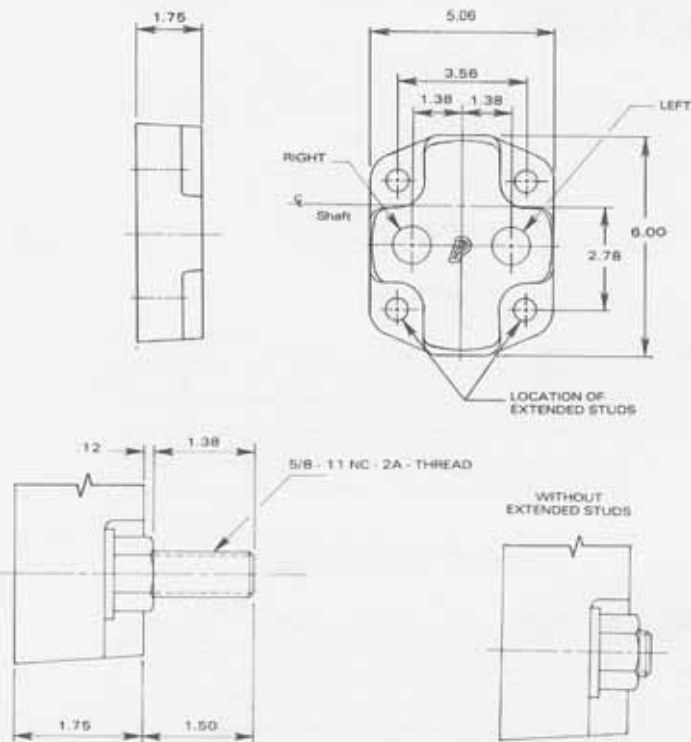
CODE SELECTION

NPT (in)

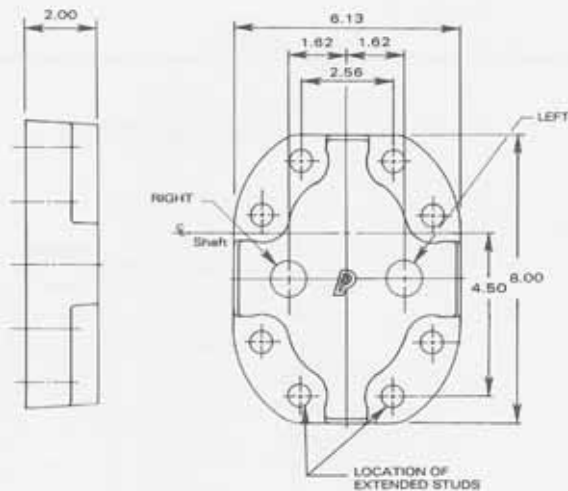
Left	Right	Single	Tandem	
			Studs/F	Studs Ext
—	—	AD	AH	AX
1/4	—	JD	JH	JX
—	1/4	KD	KH	KX
1/4	1/4	LD	LH	LX

STRAIGHT THREADS (in)

Left	Right	Single	Tandem	
			Studs/F	Studs Ext
1/4	—	BD	BH	BX
—	1/4	CD	CH	CX
1/4	1/4	ED	EH	EX



7500 SERIES



CODE SELECTION

NPT (in)

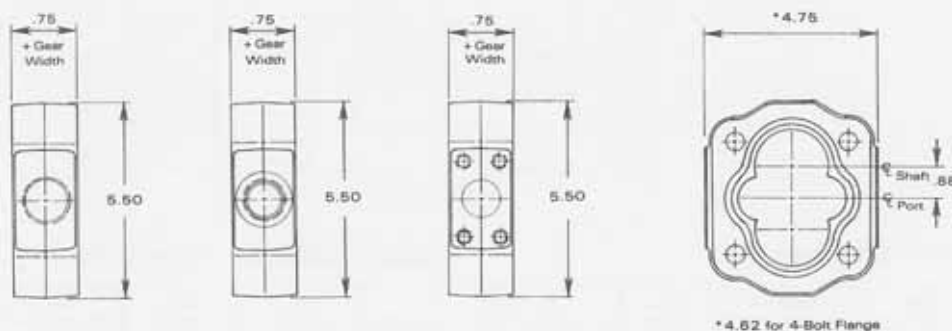
Left	Right	Single	Tandem	
			Studs/F	Studs Ext
—	—	AD	AH	AX

STRAIGHT THREADS (in)

Left	Right	Single	Tandem	
			Studs/F	Studs Ext
1	1	ID	IH	IX

GEAR HOUSINGS

1500 SERIES



N.P.T. Diam. (in.)

CODE SELECTION Gear Width (in.)

Left	Right	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2
None	None	ZA05	ZA07	ZA10	ZA12	ZA15	ZA17	ZA20
None	3/4			ZE10	ZE12	ZE15	ZE17	ZE20
1/2	1/2		DB07	DB10	DB12	DB15	DB17	
1/2	3/4			DE10	DE12	DE15		
3/4	3/4			DQ10	DQ12	DQ15	DQ17	DQ20
3/4	1				DS12	DS15	DS17	DS20
1	None				ZS12	ZS15	ZS17	ZS20
1	1				HK12	HK15	HK17	HK20
None	1 1/4						ZI17	ZI20
1	1 1/4						HL17	HL20
1 1/4	1 1/4						HS17	HS20

4-BOLT FLANGE Diam. (in.)

CODE SELECTION Gear Width (in.)

Left	Right	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2
None	None	ZA05	ZA07	ZA10	ZA12	ZA15	ZA17	ZA20
1/2	None		NO07	NO10				
1/2	1/2		YB07	YB10				
None	3/4			NE10	NE12	NE15	NE17	
3/4	1/2			YO10				
3/4	3/4			YQ10	YQ12	YQ15	YQ17	
1	3/4				QI12	QI15	QI17	
1	1				QK12	QK15	QK17	QK20
None	1 1/4							NI20
1 1/4	1							QR20
1 1/4	1 1/4							QS20

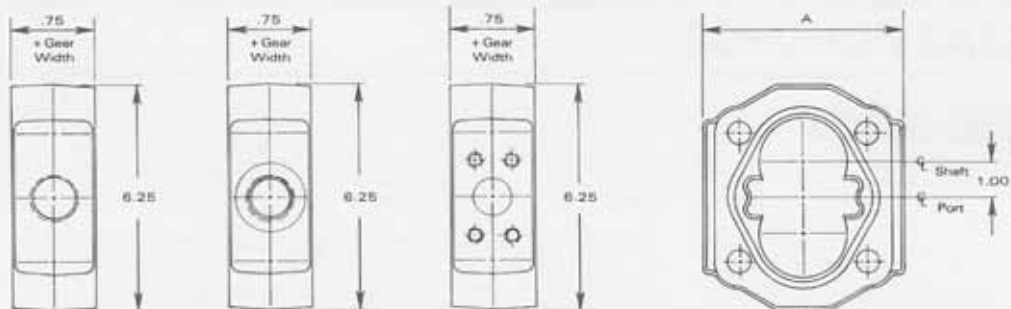
STRAIGHT THREAD Diam. (in.)

CODE SELECTION Gear Width (in.)

Left	Right	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2
None	None	ZA05	ZA07	ZA10	ZA12	ZA15	ZA17	ZA20
1/2	None		T007	T010	T012	T015		
1/2	1/2		XB07	XB10	XB12	XB15		
1/2	3/8			XC10	XC12	XC15		
3/8	3/8		XJ07	XJ10	XJ12	XJ15	XJ17	
3/8	3/4			XK10	XK12	XK15	XK17	
3/4	3/4			XQ10	XQ12	XQ15	XQ17	XQ20
7/8	7/8				XY12	XY15	XY17	XY20
None	1					TG15	TG17	TG20
1	7/8					UJ15	UJ17	UJ20
1 1/4	1 1/4						US17	US20

*Low Pressure Only

2500 SERIES



A = 5.61 for Gear Widths up to 2 1/4"
 6.94 for 2 1/2" and 2 3/4" Gear Widths
 4-Bolt Flange
 A = 5.31 for Gear Widths up to 2 1/4"
 6.62 for 2 1/2" and 2 3/4" Gear Width

N.P.T. Diam. (in.)

CODE SELECTION

Gear Width (in.)

Left	Right	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 3/4
None	None	ZA05	ZA07	ZA10	ZA12	ZA15	ZA17	ZA20	ZA22	ZA25
1/2	1/2		DB07	DB10	DB12					
3/4	3/4			DQ10	DQ12	DQ15				
3/4	1/2		DG07							
1	None				ZS12	ZS15	ZS17	ZS20		
1	1				HK12	HK15	HK17	HK20	HK22	HK25
1 1/4	1 1/4						HS17	HS20	HS22	HS25
None	1 1/2*							ZJ20	ZJ22	ZJ25
1 1/2	1 1/2								IB22	IB25
1	1 1/2*							HM20		
1 1/4	1 1/2*							HT20	HT22	HT25

4-BOLT FLANGE Diam. (in.)

CODE SELECTION

Gear Width (in.)

Left	Right	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 3/4
None	None	ZA07	ZA10	ZA12	ZA15	ZA17	ZA20	ZA22	ZA25
1/2	1/2				YB15				
3/4	3/4		YQ10						YQ25
1	1			QK12	QK15	QK17	QK20		QK25
1 1/4	1 1/4				QS15	QS17	QS20	QS22	QS25
1 1/2	1 1/2					RB17	RB20	RB22	RB25
1 1/2	3/4				YE15				
1 1/4	3/4				QP15				
1 1/2*	1 1/4				QY15	QY17	QY20	QY22	QY25
2*	1 1/2						RG20	RG22	RG25
2*	1 1/4						RF20	RF22	RF25

STRAIGHT THREAD Diam. (in.)

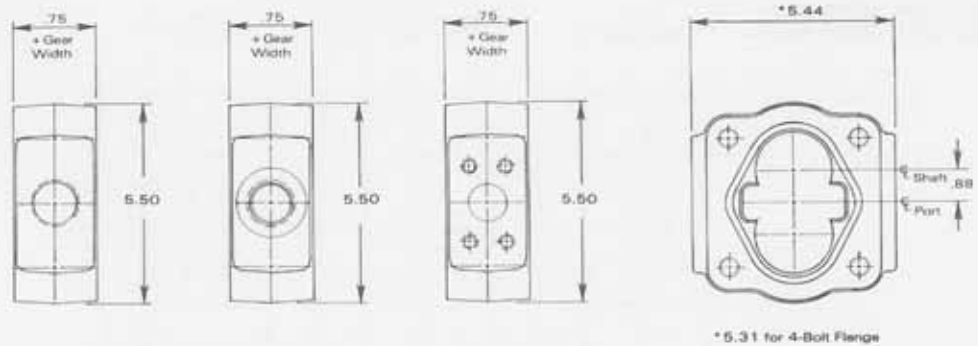
CODE SELECTION

Gear Width (in.)

Left	Right	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 3/4
None	None	ZA07	ZA10	ZA12	ZA15	ZA17	ZA20	ZA22	ZA25
1/2	1/2	XB07	XB10						
3/8	3/8		XJ10	XJ12	XJ15	XJ17	XJ20		
3/4	3/4		XQ10	XQ12	XQ15				
7/8	7/8			XY12	XY15				
1	1				UK15	UK17	UK20	UK22	UK25
1 1/4	None				TU15	TU17	TU20	TU22	TU25
1 1/4	1 1/4						US20	US22	US25
3/8	1/2		XI10						
7/8	3/4			XW12					
1	7/8			UJ12					
1 1/4	1 1/2						UT20	UT22	UT25

*Low Pressure Only

3000 SERIES



N.P.T. Diam. (in.)

CODE SELECTION

Gear Width (in.)

Left	Right	$\frac{1}{2}$	$\frac{3}{4}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{3}{4}$	2
None	None	ZA05	ZA07	ZA10	ZA12	ZA15	ZA17	ZA20
$\frac{3}{4}$	None			HB10	HB12			
$\frac{3}{4}$	$\frac{3}{4}$			HE10	HE12			
1*	$\frac{3}{4}$			HI10	HI12			
1	None			XB10	XB12	XB15	XB17	
1	1				XE12	XE15	XE17	XE20
1	$1\frac{1}{4}$ *					XF15	XF17	XF20
$1\frac{1}{4}$	$1\frac{1}{4}$							XK20
None	$1\frac{1}{4}$ *					HA15	HA17	HA20

4-BOLT FLANGE Diam. (in.)

CODE SELECTION

Gear Width (in.)

Left	Right	$\frac{1}{2}$	$\frac{3}{4}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{3}{4}$	2
None	None	ZA05	ZA07	ZA10	ZA12	ZA15	ZA17	ZA20
1	None				NB12	NB15	NB17	
1	1				NE12	NE15		
1	$1\frac{1}{4}$ *				NF12	NF15	NF17	NF20
$1\frac{1}{4}$	$1\frac{1}{4}$						NK17	NK20
$1\frac{1}{2}$ *	$1\frac{1}{4}$						NO17	NO20
$1\frac{1}{4}$	None				NZ12	NZ15		
None	$1\frac{1}{2}$						NT17	NT20
$\frac{3}{4}$	1			TF10	TF12			

STRAIGHT THREAD Diam. (in.)

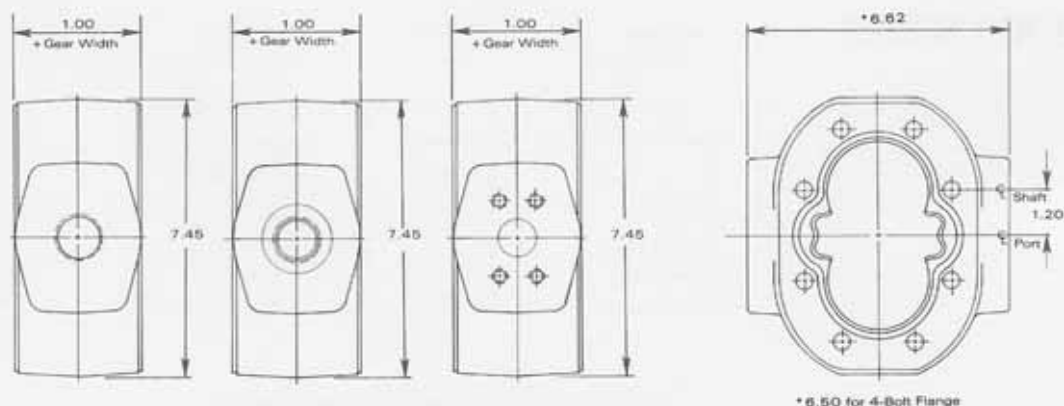
CODE SELECTION

Gear Width (in.)

Left	Right	$\frac{1}{2}$	$\frac{3}{4}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{3}{4}$	2
None	None	ZA05	ZA07	ZA10	ZA12	ZA15	ZA17	ZA20
$\frac{3}{4}$	None			DB10	DB12	DB15	DB17	DB20
$\frac{3}{4}$	$\frac{3}{4}$			DE10	DE12	DE15	DE17	
$\frac{3}{4}$	1*			DF10	DF12	DF15		
1	None			ZB10	ZB12	ZB15	ZB17	
1	1					ZE15	ZE17	ZE20
1	$1\frac{1}{4}$ *					ZF15	ZF17	ZF20
$1\frac{1}{4}$	$1\frac{1}{4}$						ZK17	ZK20
$1\frac{1}{4}$	$1\frac{1}{2}$ *						ZL17	ZL20
$1\frac{1}{4}$	None					ZZ15	ZZ17	
None	$1\frac{1}{2}$							ZT20

*Low Pressure Only

3700 SERIES



N.P.T. Diam. (in.)

CODE SELECTION Gear Width (in.)

Left	Right	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	3
None	None	ZA05	ZA07	ZA10	ZA12	ZA15	ZA17	ZA20	ZA22	ZA25	ZA30
3/4	1/2		D007								
3/4	3/4		DQ07	DQ10	DQ12	DQ15	DQ17	DQ20	DQ22	DQ25	
None	1			ZG10	ZG12	ZG15	ZG17	ZG20			
1	1			HK10	HK12	HK15	HK17	HK20	HK22	HK25	HK30
1	1 1/4*					HL15	HL17	HL20	HL22		
1 1/4	1 1/4					HS15	HS17	HS20	HS22	HS25	HS30
1 1/4	1 1/2*							HT20	HT22	HT25	HT30
1 1/2	None							ZV20	ZV22	ZV25	
1 1/2	1 1/2							IB20	IB22	IB25	IB30
3/4	1 1/4					DT15					

4-BOLT FLANGE Diam. (in.)

CODE SELECTION Gear Width (in.)

Left	Right	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	3
None	None	ZA05	ZA07	ZA10	ZA12	ZA15	ZA17	ZA20	ZA22	ZA25	ZA30
None	3/4		NE07								
1	None			NS10	NS12	NS15	NS17	NS20	NS22	NS25	NS30
1	1				QK12	QK15	QK17	QK20	QK22	QK25	QK30
1 1/4	1				QR12	QR15	QR17	QR20			
1 1/4	1 1/4					QS15	QS17	QS20	QS22	QS25	QS30
1 1/2	1 1/2							RB20	RB22	RB25	RB30
2	1 1/2									RG25	RG30
2	2									RJ25	RJ30
2 1/2	2 1/2										HP30
2 1/2	1 1/2										RM30

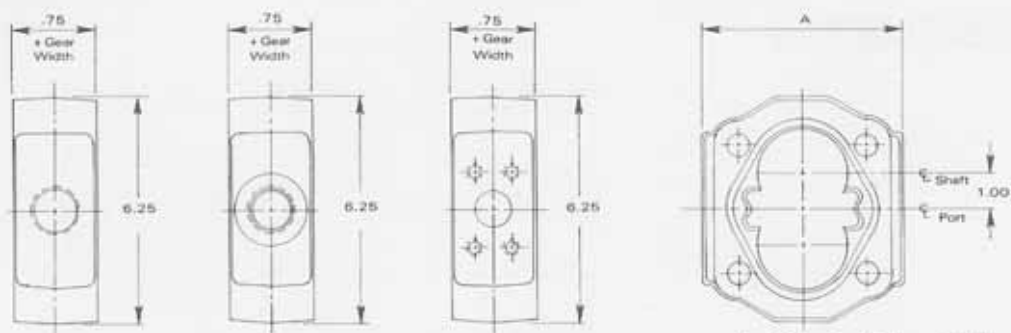
STRAIGHT THREAD Diam. (in.)

CODE SELECTION Gear Width (in.)

Left	Right	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	3
None	None	ZA07	ZA10	ZA12	ZA15	ZA17	ZA20	ZA22	ZA25	ZA30
1/2	1/2	XB07	XB10	XB12	XB15					
5/8	1/2	XI07								
5/8	3/4	XJ07	XJ10							
3/4	None		TQ10	TQ12	TQ15	TQ17				
3/4	3/4		XQ10	XQ12	XQ15	XQ17				
7/8	7/8			XY12	XY15					
1	1				UK15	UK17	UK20	UK22	UK25	
1 1/4	1 1/4					US17	US20	US22	US25	US30
1 1/2	1 1/2								VB25	VB30
2	2									VJ30
2	2 1/2									VK30

*Low Pressure Only

5000 SERIES



A = 5.61 for Gear Widths up to 2 1/4"
 6.94 for 2 1/4" and 2 1/2" Gear Widths
 4-Bolt Flange
 A = 5.31 for Gear Widths up to 2 1/4"
 6.62 for 2 1/4" and 2 1/2" Gear Width

N.P.T. Diam. (in.)

CODE SELECTION Gear Width (in.)

Left	Right	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2
None	None	ZA05	ZA07	ZA10	ZA12	ZA15	ZA17	ZA20	ZA22	ZA25
3/4	None			HB10						
3/4	3/4			HE10						
1	3/4			HI10	HI12					
None	1				XC12	XC15	XC17	XC20		
1	1				XE12	XE15	XE17	XE20		
1 1/4	1					XI15	XI17	XI20		
1 1/4	1 1/4						XK17	XK20	XK22	XK25
1 1/2	1 1/4									XO25
None	1 1/4					HA15	HA17	HA20		

4-BOLT FLANGE Diam. (in.)

CODE SELECTION Gear Width (in.)

Left	Right	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2
None	None	ZA10	ZA12	ZA15	ZA17	ZA20	ZA22	ZA25
1	3/4	TI10	TI12					
None	1		NC12	NC15	NC17	NC20		
1	1		NE12	NE15	NE17	NE20		
1 1/4	1		NI12	NI15	NI17			
1 1/4	1 1/4			NK15	NK17	NK20	NK22	
1 1/2	1 1/4			NO15	NO17	NO20	NO22	NO25
1 1/2	1 1/2				NO17	NO20	NO22	NO25
2	1 1/2					NU20	NU22	NU25
2	1 1/4					NP20	NP22	
1 1/2	1			NJ15	NJ17	NJ20	NJ22	
None	1 1/4		NA12	NA15				

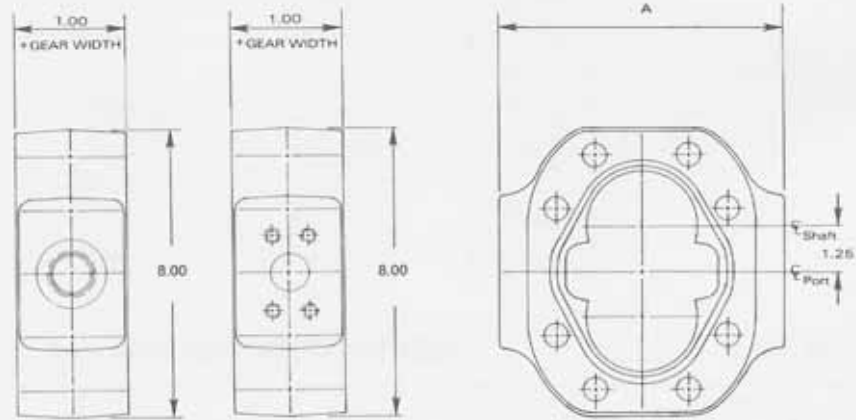
STRAIGHT THREAD Diam. (in.)

CODE SELECTION Gear Width (in.)

Left	Right	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2
None	None	ZA10	ZA12	ZA15	ZA17	ZA20	ZA22	ZA25
3/4	None	DB10	DB12	DB15				
3/4	3/4	DE10	DE12					
1	3/4	DI10	DI12					
None	1	ZC10	ZC12	ZC15	ZC17			
1	1			ZE15	ZE17	ZE20		
1	1 1/4*			ZF15	ZF17	ZF20		
1 1/4	1 1/4					ZK20	ZK22	ZK25
1 1/2*	1 1/4					ZO20	ZO22	ZO25
1 1/2	1 1/2							ZO25
1 1/4	None			ZZ15	ZZ17			
None	1 1/2					ZT20	ZT22	

*Low Pressure Only

7500 SERIES



A = 7.62 for Straight Thread
7.50 for 4-Bolt Flange

STRAIGHT THREAD Diam. (in.)

CODE SELECTION Gear Width (in.)

Left	Right	$\frac{3}{4}$	1	1 $\frac{1}{4}$	1 $\frac{1}{2}$	1 $\frac{3}{4}$	2	2 $\frac{1}{4}$	2 $\frac{1}{2}$	2 $\frac{3}{4}$	3
None	None	ZA07	ZA10	ZA12	ZA15	ZA17	ZA20	ZA22	ZA25	ZA27	ZA30
$\frac{3}{4}$	1	DF07									
1	$\frac{3}{4}$	DI07									
1	1		ZE10	ZE12	ZE15	ZE17	ZE20				
1 $\frac{1}{4}$	1 $\frac{1}{4}$					ZK17					

4-BOLT FLANGE Diam. (in.)

CODE SELECTION Gear Width (in.)

Left	Right	$\frac{3}{4}$	1	1 $\frac{1}{4}$	1 $\frac{1}{2}$	1 $\frac{3}{4}$	2	2 $\frac{1}{4}$	2 $\frac{1}{2}$	2 $\frac{3}{4}$	3
None	None	ZA07	ZA10	ZA12	ZA15	ZA17	ZA20	ZA22	ZA25	ZA27	ZA30
1	$\frac{3}{4}$	TI07	TI10								
1	1		NE10	NE12	NE15	NE17	NE20				
1 $\frac{1}{4}$ *	1		NI10	NI12							
1 $\frac{1}{4}$	1 $\frac{1}{4}$			NK12	NK15	NK17	NK20	NK22	NK25	NK27	NK30
1	1 $\frac{1}{2}$ *			NG12	NG15						
1 $\frac{1}{2}$ *	1 $\frac{1}{4}$			NO12	NO15	NO17	NO20				
1 $\frac{1}{2}$	1 $\frac{1}{2}$					NQ17	NQ20	NQ22	NQ25	NQ27	NQ30
1 $\frac{1}{4}$	2*					NM17	NM20	NM22	NM25	NM27	NM30
2*	1 $\frac{1}{2}$					NU17	NU20	NU22	NU25	NU27	NU30
2*	2*								NW25	NW27	NW30
1 $\frac{1}{2}$	2 $\frac{1}{2}$ *								NS25	NS27	NS30
None	1 $\frac{1}{2}$					NT17	NT20	NT22			

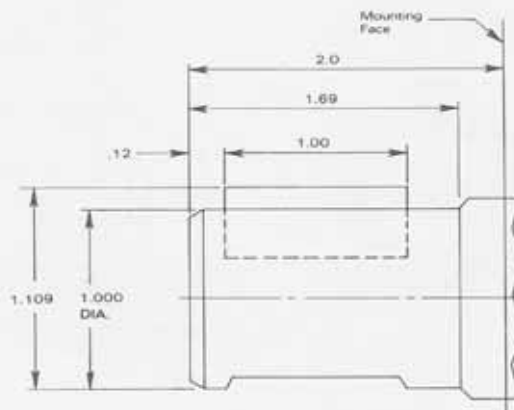
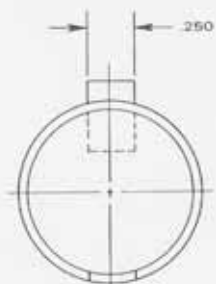
DRIVE SHAFTS

These illustrations do not necessarily portray the exact drive shaft configurations for reason of design.

Consult factory for shaft extension dimensions for pad mount applications

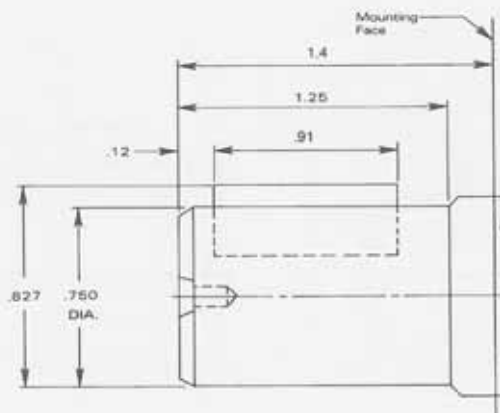
STRAIGHT KEYED 1500 SERIES

CODE 00



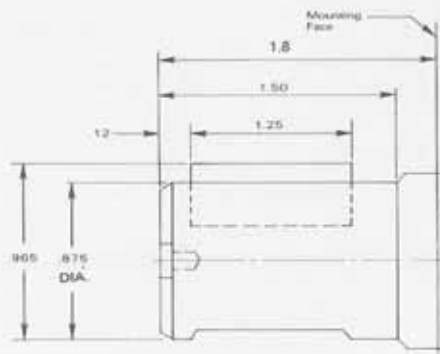
STRAIGHT KEYED 1500 SERIES

CODE 06



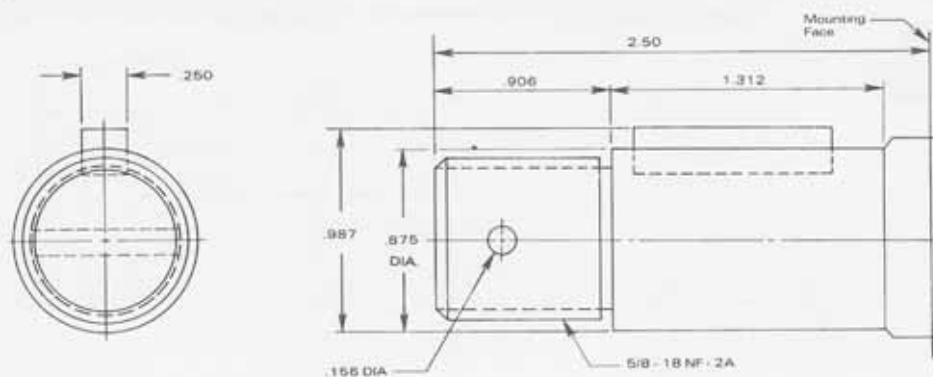
STRAIGHT KEYED 1500 SERIES

CODE 7



SAE B THREADED END
1500 SERIES

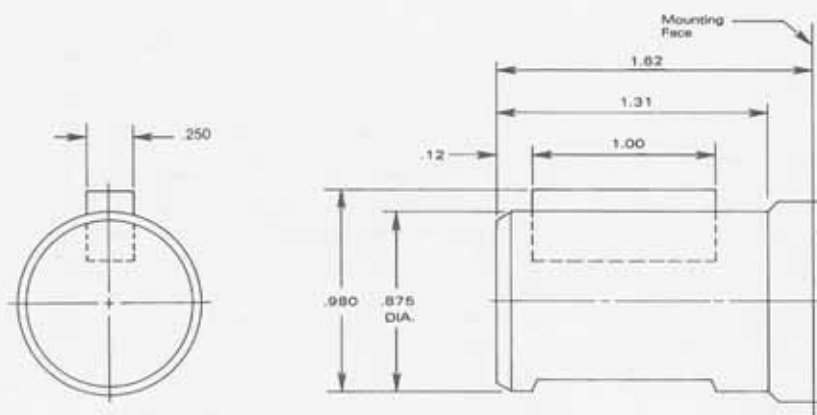
CODE 04



STRAIGHT KEYED SAE B

CODE P1500-1
P2500-29
P3000-29

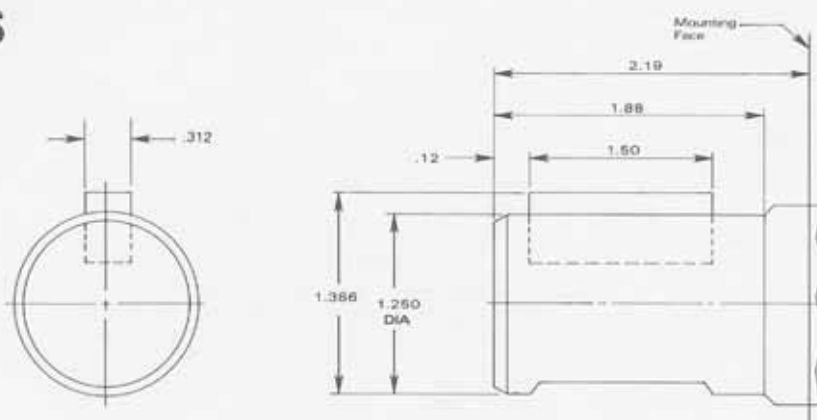
1500 SERIES
2500
3000



STRAIGHT KEYED SAE C

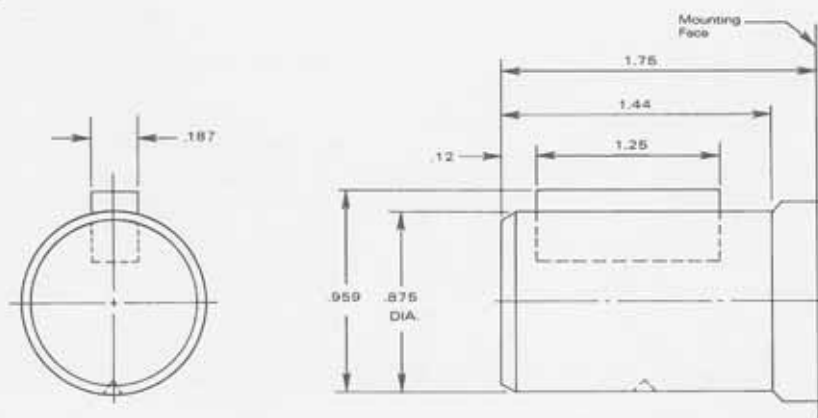
CODE 00

2500 SERIES
3700
5000
7500



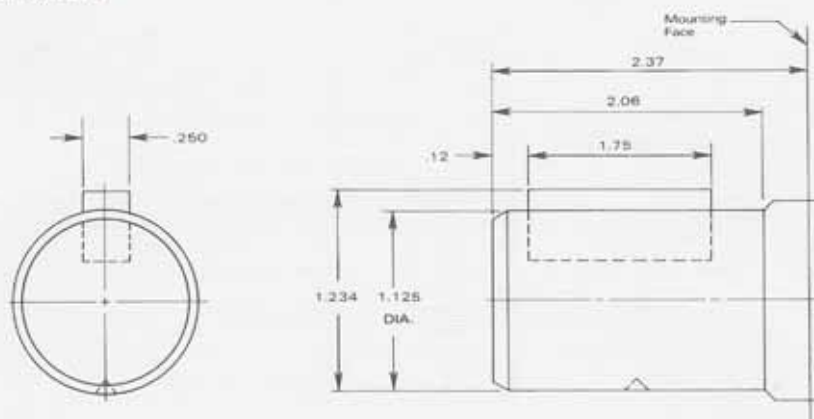
STRAIGHT KEYED
2500 SERIES

CODE 27



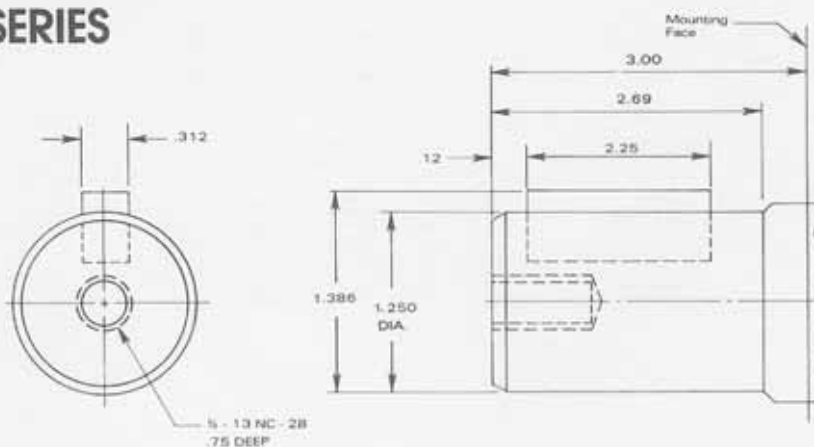
STRAIGHT KEYED
2500/3700 SERIES

CODE 1



STRAIGHT KEYED
DOUBLE BEARING FRONT END ONLY
2500/3700 SERIES

CODE 62



STRAIGHT KEYED

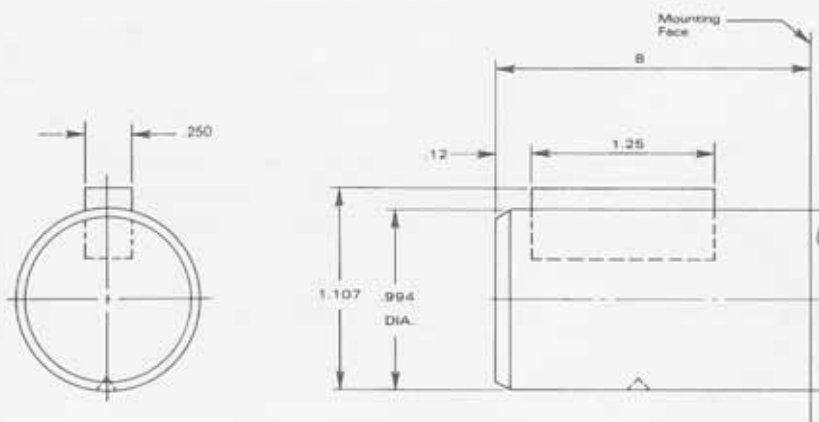
CODE 32

2500 SERIES

3000

5000

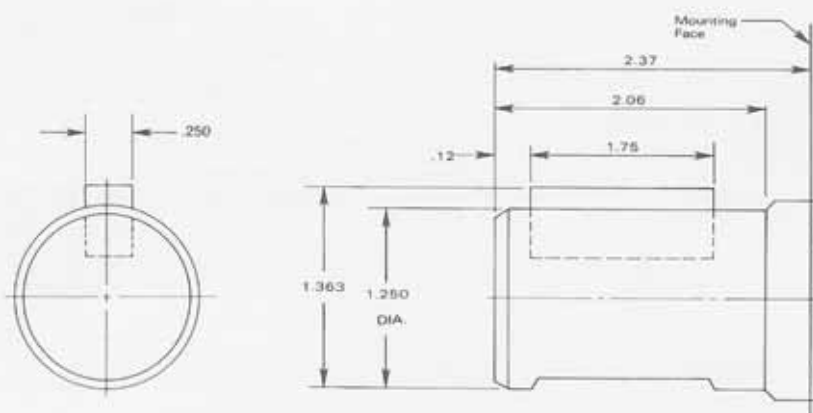
MODEL	B
P2500	1.81
P3000 P5000	1.94



STRAIGHT KEYED

CODE 7

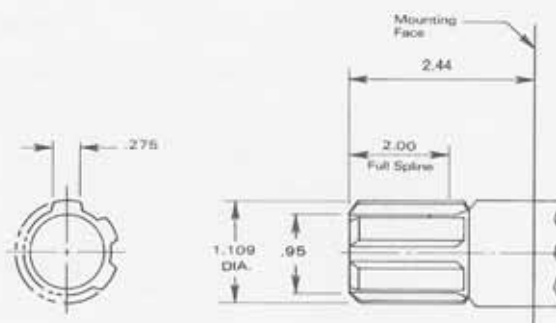
3700 SERIES



SPLINED 6 TEETH (PT0)

CODE 2

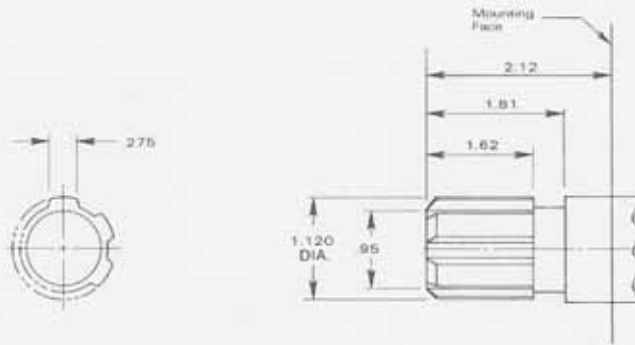
3700 SERIES



SPLINED 6 TEETH (PTO)

CODE 5

2500 SERIES

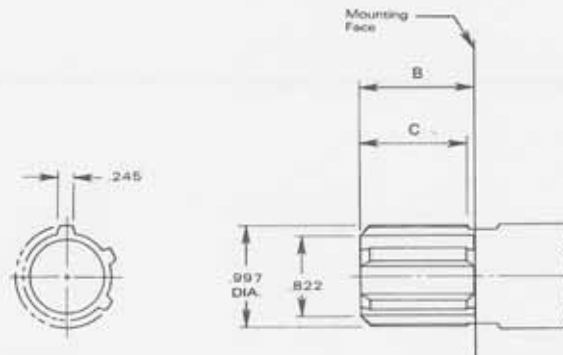


SPLINED 6 TEETH (PTO)

CODE P1500-2
P3000-57

1500/3000 SERIES

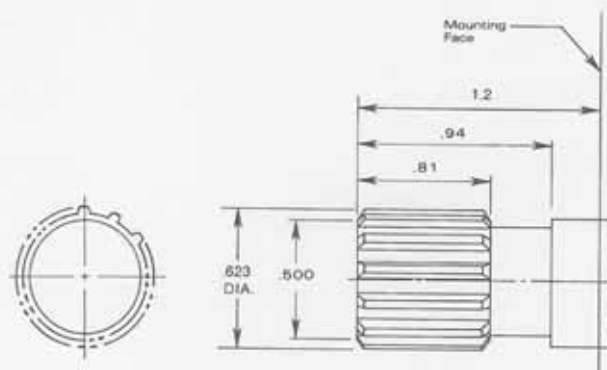
MODEL	B	C
P1500	1.75	1.46
P3000	1.62	1.62



SPLINED SAE A (9 TOOTH)

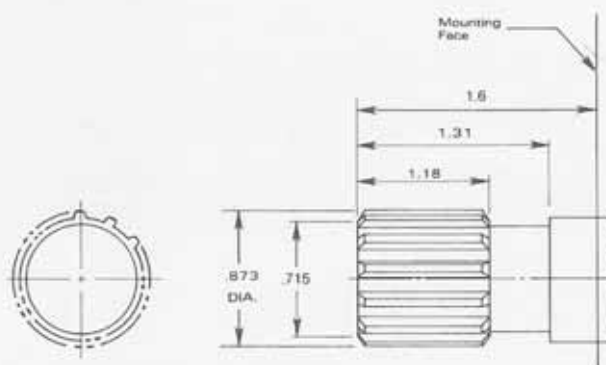
CODE 85

1500 SERIES



SPLINED SAE B (13 TOOTH)
1500 SERIES

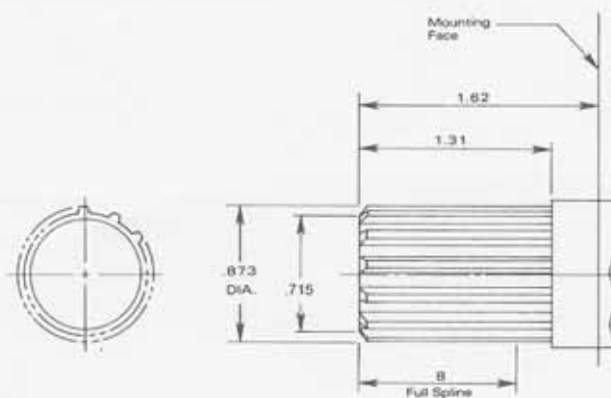
CODE 05



SPLINED SAE B (13 TOOTH)

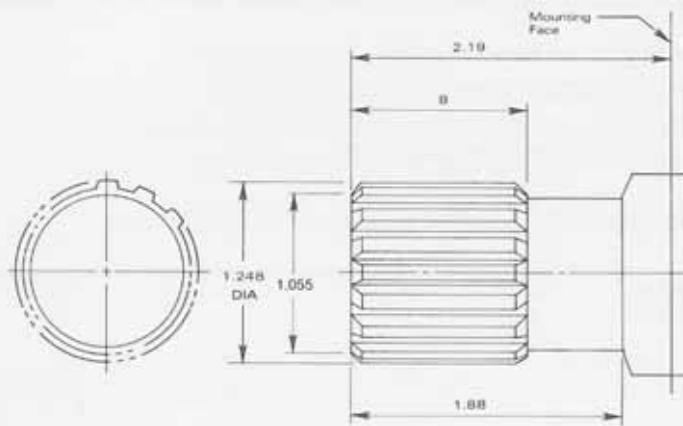
CODE 14

2500 SERIES
3000
5000



MODEL	B "I"	B "C"
P2500	—	.96
P3000	1.31	1.12
P5000	1.31	1.12

"I" = Integral Gear
 "C" = Continental Shaft

2500 SERIES**3700****5000****7500**

MODEL	B
P2500	1.50
P3700	1.62
P5000	1.38
P7500	1.75

FOR MULTIPLE UNITS ONLY ALL SERIES

CODE 1



Multiple units are connected with a shaft.
Every 2 adjacent units in multiple units
require one connecting shaft.

BEARING CARRIERS

When using a bearing carrier to provide flow to adjacent gear sections, inlet flow should not exceed 21 GPM (35 GPM for P7500) per side. When the bearing carrier is similarly used for discharge, flow should not exceed 40 GPM (60 GPM for 7500) per side.

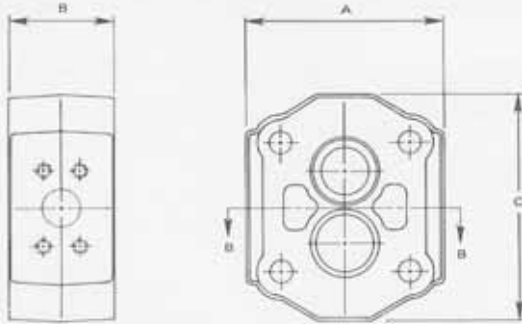
NOTE: For porting specify N.P.T., 4-Bolt Flange, or Straight Thread.

1500 SERIES

2500

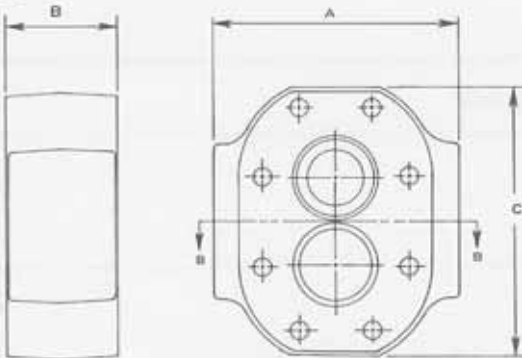
3000

5000



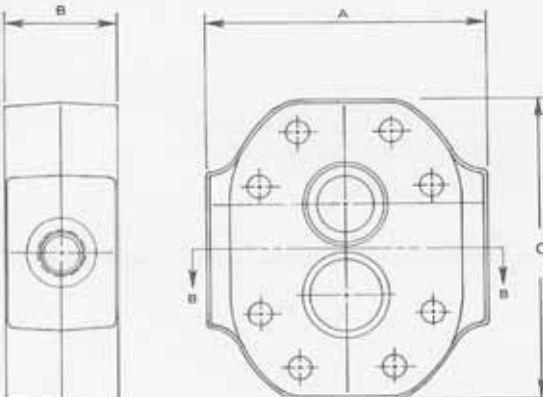
	NO PORTS	A		B	C
		NPT O.D. TUBE	FLANGE		
P1500	4.5	5.0	$\frac{4.87}{4.93}$	2.50	5.50
P2500	5.18	5.75	$\frac{5.62}{5.69}$	2.88	6.25
P3000	5.18	5.75	$\frac{5.62}{5.69}$	2.50	5.50
P5000	5.18	5.75	$\frac{5.62}{5.69}$	2.88	6.25

3700 SERIES



NO PORTS	A		B	C
	NPT O.D. TUBE	FLANGE		
6.37	6.87	$\frac{6.75}{6.81}$	3.00	7.38

7500 SERIES



NO PORTS	A		B	C
	NPT O.D. TUBE	FLANGE		
7.37	7.37	7.25	3.00	8.00

BEARING CARRIER FLOW SECTIONS

SECTION B-B

C/W Rotation Only C/C Rotation Only

	Back L.H. R.H. Front		Back L.H. R.H. Front		Back L.H. R.H. Front	
Ports	Blank	Blank	Blank	Blank	Blank	Blank
P1500	A		C		B	
P2500	A		B		G	
P3700	A		B		G	
P3000/P5000/P7500	A		B		C	

SECTION B-B

4 BOLT FLANGE

	Back L.H. R.H. Front	
Ports	1 1/2	1 1/4
P1500		
P2500	JP	
P3700	JP	
P3000/P5000/P7500		

SECTION B-B

	Back L.H. R.H. Front		Back L.H. R.H. Front		Back L.H. R.H. Front		Back L.H. R.H. Front		Back L.H. R.H. Front	
PORTS	1 1/4	Blank	1 1/2	Blank	1	1 1/2	1 1/4	1 1/4	1	1 1/2
NPT	P1500	AB					F			
	P2500	F		SK		SU		AE		WS
	P3700	F		SK		SU		AE		WS
	P3000/P5000/P7500	UA		VA		JV		UU		YV
Split Flange	P1500	GG								
	P2500	EM		EO		SW		FK		WV
	P3700	EM		EO		SW		FK		WV
	P3000/P5000/P7500	LA		MA		AM		LL		RM
O.D. Tube	P1500									
	P2500	MF		SG		SY		MU		SM
	P3700	MF		SG		SY		MU		
	P3000/P5000/P7500	CA		EA		RE		AA		JE

SECTION B-B

		Back L.H. R.H. Front		Back L.H. R.H. Front		Back L.H. R.H. Front		Back L.H. R.H. Front		Back L.H. R.H. Front	
Ports		Blank	1 1/2	1 1/2	1	1 1/4	1	1 1/4	3/4	1 1/4	1 1/4
NPT	P1500					CV				K	
	P2500	SI		WR		AM		WA		AQ	
	P3700	SI				AM		WA		AQ	
	P3000/P5000/P7500	AV		VY		UY		UW			
Split Flange	P1500					LC				FP	
	P2500	ES		WU		GA				GE	
	P3700	ES		WU		GA				GE	
	P3000/P5000/P7500	AM		MR		LR		LQ			
O.D. Tube	P1500										
	P2500	SL		SJ		WW				OC	
	P3700					WW				OC	
	P3000/P5000/P7500	AE		EJ		CJ		CI			

SECTION B-B

		Back L.H. R.H. Front		Back L.H. R.H. Front		Back L.H. R.H. Front		Back L.H. R.H. Front	
Ports		1 1/4	3/4	1 1/4	1	1	1	1 1/4	1 1/4
NPT	P1500			CQ		A0		L	
	P2500	WF		BM		CG		CI	
	P3700	WF		BM		CG		CI	
	P3000/P5000/P7500	UI		UJ					
Split Flange	P1500			KV		GS		FQ	
	P2500			JK		K0		KP	
	P3700			JK		K0		KP	
	P3000/P5000/P7500	LW		LY					
O.D. Tube	P1500					MV			
	P2500			WB		PC		PE	
	P3700			WB		PC		PE	
	P3000/P5000/P7500	CQ		CR					

WEIGHTS

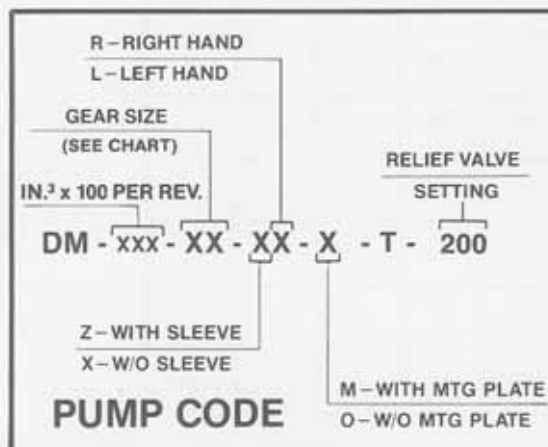
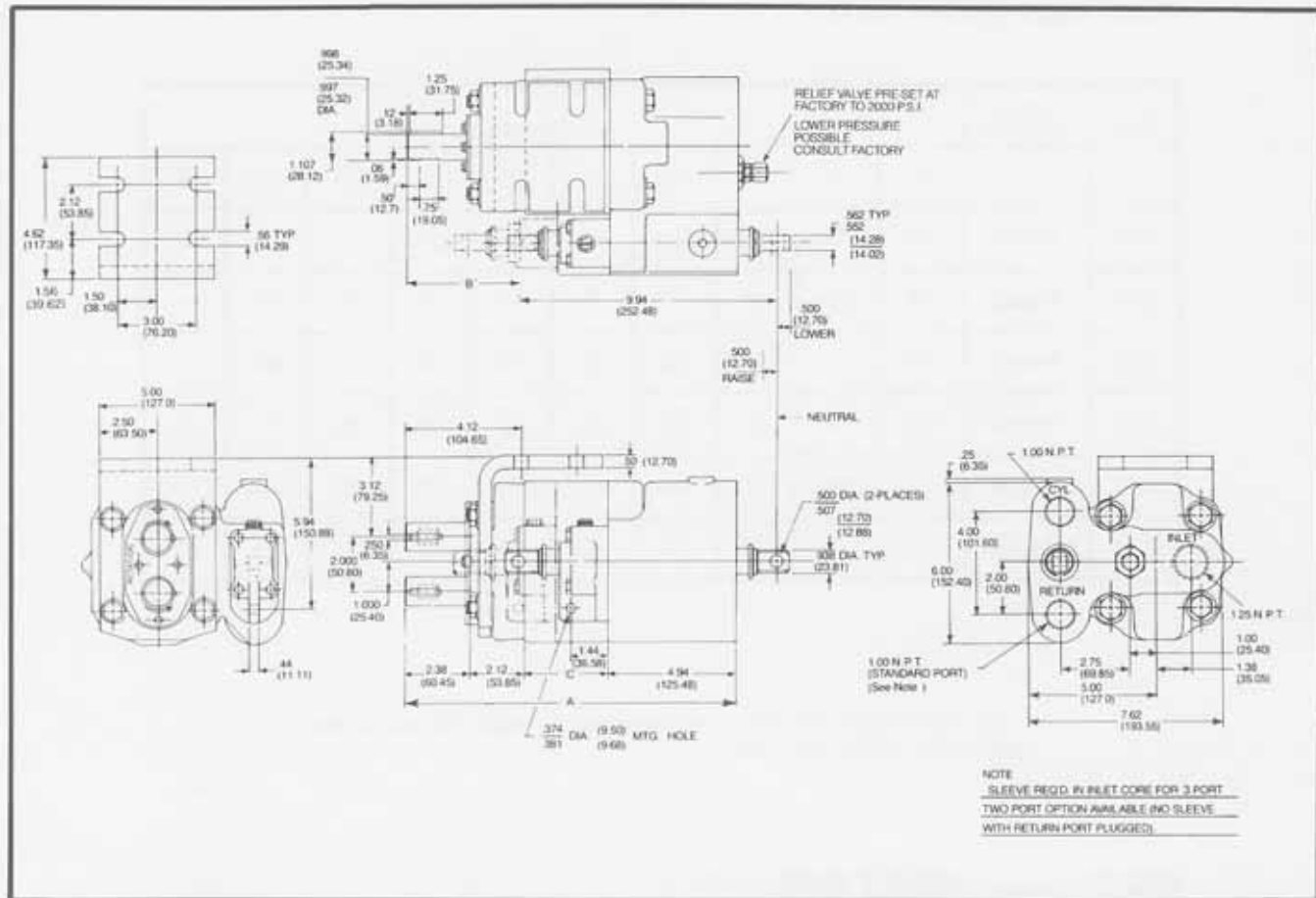
WEIGHT (approx.) SINGLE UNITS

Model	Approx. Unit Weight	Gear Width (in.)									
		½	¾	1	1¼	1½	1¾	2	2¼	2½	3
1500	Pounds	24	25	26	27½	29	30½	32½	—	—	—
2500	Pounds	36	39	42	43½	45	46½	48	50	52	—
3000	Pounds	30	31	32	33	34	35	36	—	38½	—
3700	Pounds	52	54	56	58	60	62	65	68	71	78
5000	Pounds	37	40	43	44½	46	47½	49	51	53½	—
7500	Pounds	67	70	72	74	76	79	82	85	88	92

For total multiple unit weight, add weight from single unit column and weight from multiple unit column.

WEIGHT (approx.) MULTIPLE UNITS

Model	Approx. Unit Weight	Gear Width (in.)									
		½	¾	1	1¼	1½	1¾	2	2¼	2½	3
1500	Pounds	21	22	23	24	25	26	28	—	—	—
2500	Pounds	28½	30	31½	33	34½	36	37	41	44	—
3000	Pounds	23	24	26	27	28	30	31	—	—	—
3700	Pounds	43	45	47	50	53	56	59	62	65	68
5000	Pounds	29½	31	32½	34	35½	37	38	42	45	—
7500	Pounds	54	57	60	63	65	67	69	71	73½	76



PARTIAL PUMP CODE NO.	"A" DIM. IN. (MM)	"B" DIM. IN. (MM)	"C" DIM. IN. (MM)	PERFORMANCE DATA FLOW @ 1800 RPM AND 2000 PSI
DM-512-20**	12.19 (309.63)	3.81 (96.77)	2.75 (69.85)	36.0 GPM. (136.26 LPM)
DM-640-25**	12.69 (322.33)	4.31 (109.47)	3.25 (82.55)	45.0 GPM. (170.33 LPM)

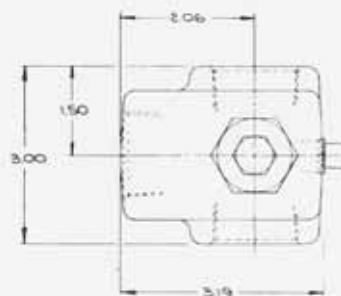
In accordance with our policy of continued product development we reserve the right to change specifications.

PERMCO'S IN-LINE RELIEF VALVE

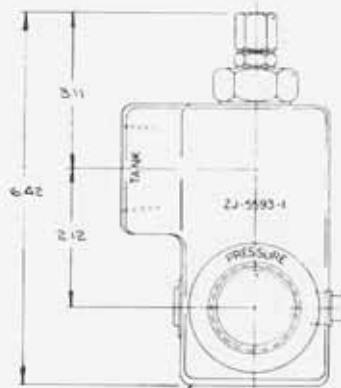
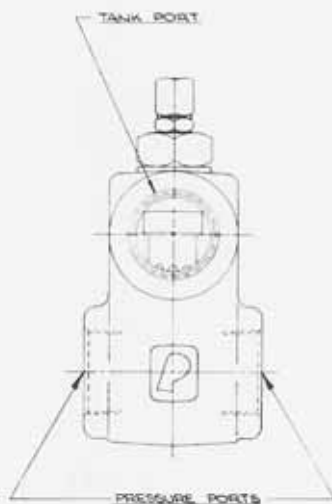
DIMENSIONAL DATA

NOTES

- 1) RELIEF VALVE IS FACTORY PRESET FOR 2500 P.S.I.
- 2) CUSTOMER CAN RESET TO SPECIFIC SYSTEM REQUIREMENTS.
- 3) PRESSURE ADJUSTMENT CAPABILITY TO 3000 P.S.I.
- 4) FLOW CAPACITY TO 50 G.P.M.



CODE
AZ-5514J-XXX-25
PART W/1
PORT SIZES
075 - 1/4" NPT
100 - 1" NPT
PRESSURE SETTING

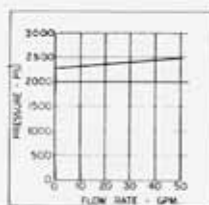


RELIEF VALVE -
PART W/1 RV-5514-250

GAGE PORT
2 NOTE

VALVE BODY
PART W/1 AZ-5514J-100 W/1 1" PORT
PART W/1 AZ-5514J-075 W/1 1/4" PORT

CODE
AZ-5514J-XXX-25



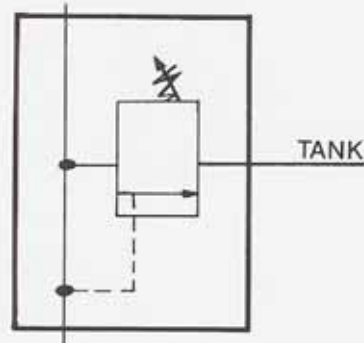
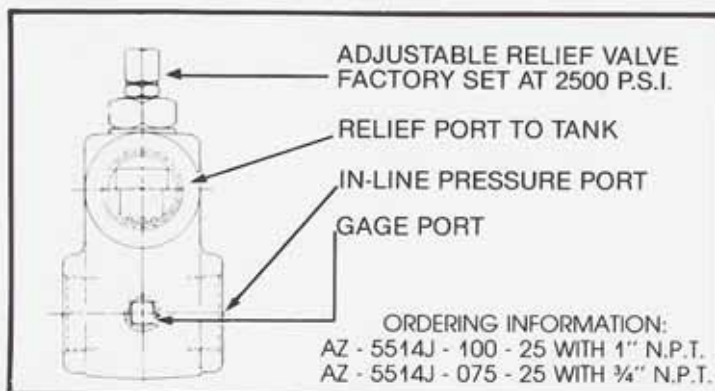
DO NOT SCALE DRAWING

MATERIAL	UNLESS OTHERWISE SPECIFIED
STEEL	1. DIMENSIONS ARE IN INCHES
WELDS	2. TOLERANCES ON DIMENSIONS
	3. FINISH
	4. TOLERANCE ON ANGLES
	5. ALL DIMENSIONS UNLESS OTHERWISE SPECIFIED
	6. FINISH ALL SURFACES
	7. ALL DIMENSIONS UNLESS OTHERWISE SPECIFIED
	8. FINISH ALL SURFACES
	9. FINISH ALL SURFACES
	10. FINISH ALL SURFACES

OUTLINE & ASS'Y.
IN-LINE RELIEF
VALVE - DIRECT
ACTING

PERMCO
1500 Frost Road
Streetsboro, Ohio 44224

Part No. C/AZ-5514J-XXX-25





Permco, Inc., P.O. Box 2068

1500 Frost Road, Streetsboro, OH 44241-0829

Phone: (330) 626-2801 Fax: (330) 626-2805



National
FLUID POWER
Association

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