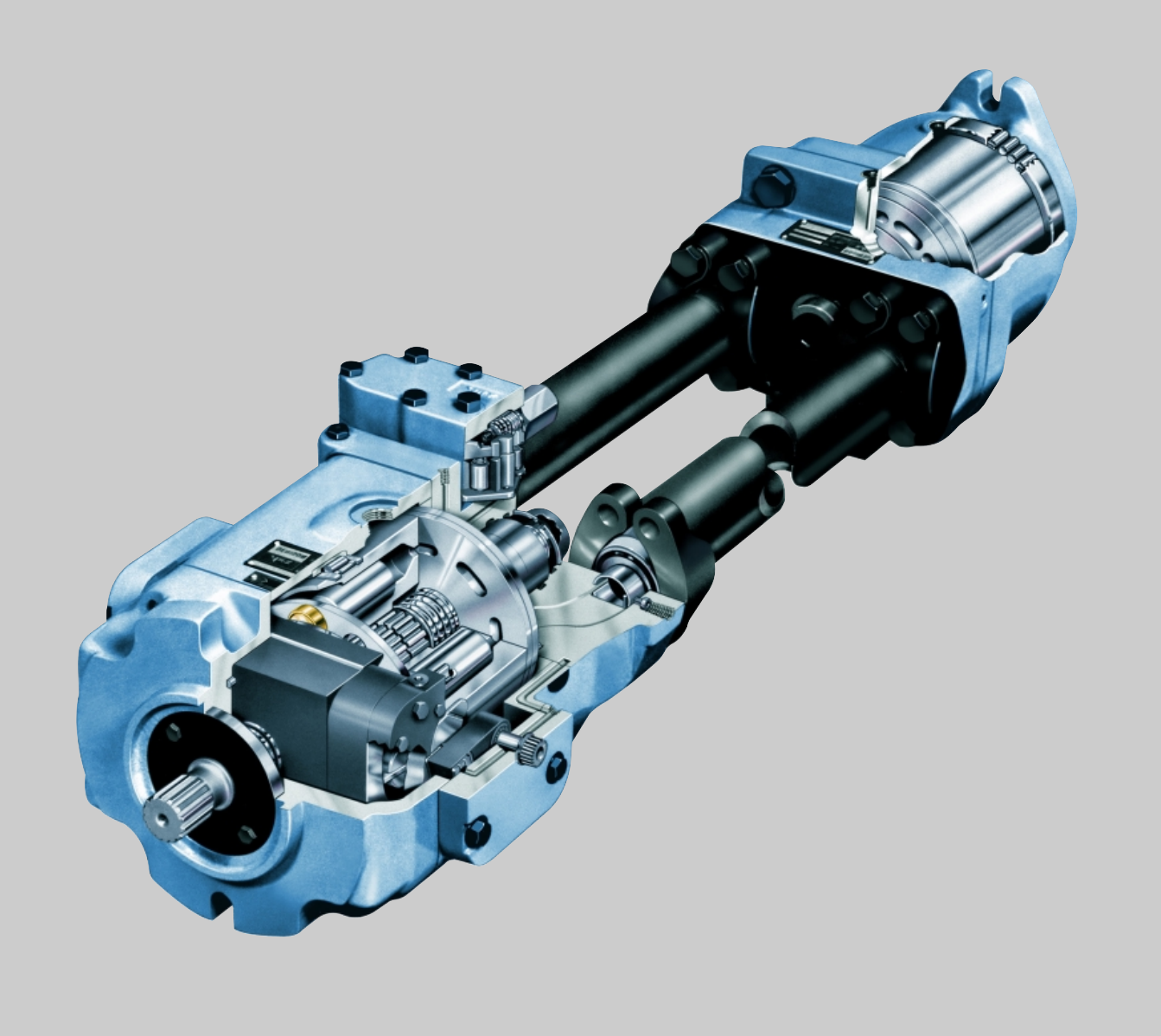
DENISON HYDRAULICS

Gold Cup Series

piston pumps for open & closed circuits



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DENISON Hydraulics

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Series		Terms	P6	P7	P8	P11	P14	P24	P30
Displacement	*Max. displacement*	in^3/rev.	6.00	7.25	8.00	11.00	14.00	24.60	30.60
		cm^3/rev.	98,3	118,8	131,1	180,3	229,5	403,2	501,5
Pressure	*Continuous*	psi	5000	5000	3600	5000	5000	5000[1)]	5000[1)]
		bar	350	350	250	350	350	350[1)]	350[1)]
	Intermittent	psi	6000	6000	4500	6000	6000	5000[1)]	5000[1)]
		bar	420	420	310	420	420	350[1)]	350[1)]
Speed (*Pump)*	*max. @ full stroke*	rpm	3000	3000	2100	2400	2400	2100[2)]	1800
(Motor)	*max. @ full stroke*	rpm	3000	3000	NA	2400	2400	2100[2)]	1800
(Motor)	*max. @ 50% stroke*	rpm	3600	3600	NA	2800	2800	2100[2)]	1800
Mounting	*Flange -2 bolt*	SAE	127-2 (C)	127-2 (C)	127-2 (C)	-	-	-	-
Flange -4 bolt (opt. on 6,7 & 8)		SAE	152-4 (D)	152-4 (D)	152-4 (D)	165-4 (E)	165-4 (E)	177-4 (F)	177-4 (F)
	Shaft - keyed	SAE	32-1 (C)	32-1 (C)	32-1 (C)	44-1 (E)	44-1 (E)	50-1 (F)	50-1 (F)
	keyed	SAE	44-1 (D)	44-1 (D)	44-1 (D)	-	-	-	-
	Shaft - splined	SAE	32-4 (C)	32-4 (C)	32-4 (C)	44-4 (E)	44-4 (E)	50-4(F)	50-4 (F)
	splined	SAE	44-4 (D)	44-4 (D)	44-4 (D)	-	-	-	-
Weight (*Pump) less controls*		lbs	175-300	175-300	175-300	325-530	325-530	750-835	750-835
	Mass	kg.	80-135	80-135	80-135	145-240	145-240	340-375	340-375
Weight *(Motor Fixed)*		lbs	110	110	N/A	250	250	510	600
	Mass	kg.	50	50	N/A	110	110	230	270
Weight *(Motor Variable) less controls*		lbs	110	110	N/A	300	300	650	670
	Mass	kg.	50	50	N/A	135	135	290	300
Rotating inertia		$lbs\text{-}in^2$	92	92	92	290	290	821	977
		$kg.m^2$	0,027	0,027	0,027	0,085	0,085	0,240	0,286
Torque *(Motor) theo. max.*	*per 100 psi*	lbs-in	95.5	115.4	NA	175	222	392	487
	per 100 bar	Nm	157	189	NA	287	362	623	797
	at 5000 psi	lbs-in	4774	5769	NA	8750	11100	19576	24351
	at 350 bar	Nm	539,5	651,9	NA	990	1250	2158	2752
Power *(Motor) theo. max.at 5000 psi, 350 bar*									
	per 100 rpm	hp	7.6	9.2	NA	13.8	17.6	31.1	38.6
		kW	5,7	6,8	NA	10,3	13,1	23,1	28,8
	at 2000 rpm	hp	151.5	183.1	NA	277.8	353.5	621.3	695
		kW	113,0	136,6	NA	207,0	263,7	463,5	518,2
Torque *(Motor) efficiency*	*- approx. stalled*	% theo.	81	81	NA	81	81	81	81
	running	% theo.	93	93	NA	93	93	93	93
Case pressure:	*max. allowable continuous*	psi	75	75	75	75	75	75	75
		bar	5,2	5,2	5,2	5,2	5,2	5,2	5,2
	intermittent	psi	125	125	125	125	125	125	125
		bar	8,6	8,6	8,6	8,6	8,6	8,6	8,6
(Not to exceed 25 psi,1,7 bar above inlet in open circuit units)									
Flow *(Pump) theo.at max.displ.@1500 rpm*		gpm	39	47	52	71	91	160	199
		lpm	148	178	197	269	344	606	753
	@1800 rpm	gpm	47	57	62	86	109	192	238
		lpm	178	216	235	326	413	727	901
Displacement	*(Internal aux. pump)*		**P6,7,8P,S,V**	**P11,14P,S**	**P11,14V**	**P24P**	**P24S[3)]**	**P30P**	**P30S[3)]**
		in^3/rev.	1.07	(2) 1.07[4)]	1.07[5)]	2.81[6)]	2.81[6)]	2.81[6)]	2.81[6)]
		cm^3/rev.	17,5	(2) 17,5	17,5	46,1	46,1	46,1	46,1
Flow *(Internal aux. pump)*	*@1500 rpm*	gpm	6.9	(2) 6.9	6.9	18.2	6.5	18.2	6.5
		lpm	26,1	(2) 26,1	26,1	68,9	24,6	69,1	24,6
	@1800 rpm	gpm	8.3	(2) 8.3	8.3	21.9	7.8	21.9	7.8
		lpm	31,4	(2) 31,4	31,4	82,9	29,5	82,9	29,5

1) Max. pressure 4000 psi, (275 bar) for M24 and 30 series variable motors. Consult Denison for higher pressure applications.

2) On HF-1 fluids, 1800 RPM Max. on HF-0 fluids.

3) Internal cartridge provides servo flow and must be supercharged from external replenishing flow, from external auxiliary pump.

4) One servo cartridge and one replenishing cartridge.

5) Servo cartridge only.

6) Standard, other sizes available, see ordering code.

		P6,7,8,11,14,24P	P6,7,8,11,14,24S	P30P	P30S
Replenishing pressure *(Internal aux. pump)*					
Replenish pressure minus case pressure	psi	180-220	330-370	180-220	420-460
	bar	12,4-15,2	22,8-25,5	12,4-15,2	29,0-31,7
Servo pressure *(Internal aux. pump)*	psi	400-520	590-690	440-540	670-770
Servo pressure minus case pressure	bar	27,6-35,9	40,7-47,6	30,3-37,2	46,2-53,1
at 0 psi, 0 bar discharge pressure					
Servo pressure *(Internal aux. pump)*	psi	600-720	790-890	740-840	970-1070
Servo pressure minus case pressure	bar	41,4-49,7	54,5-61,4	51,0-57,9	66,9-73,8
at 5000 psi, 350 bar discharge pressure					
Servo pressure *(Internal aux. pump)*	psi	500-600	500-600	500-600	500-600
for HI-IQ control units. Servo pressure minus	bar	37,2-44,1	37,2-44,1	37,2-44,1	37,2-44,1
case pressure at 5000 psi, 350 bar discharge pressure - at system pressure range 0 to 5000 psi, 350 bar.					

Series		**Terms**	**P6**	**P7**	**P8**	**P11**	**P14**	**P24**	**P30**
Controls									
Compensator response	off-stroke	sec.	0.05	0.05	0.05	0.07	0.07	0.10	0.10
(per SAE J497 @ **5000 psi**, 350 bar)	on-stroke	sec.	0.9	0.9	0.9	1.5	1.5	1.8	1.8
Compensator adjustment		**psi/turn**	**2000**	**2000**	**2000**	**2000**	**2000**	**2000**	**2000**
		bar/turn	138	138	138	138	138	138	138
Min. comp. override pressure at above listed min.		**psi**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
servo. (servo, electric & hydraulic stroker)		bar	6.7	6.7	6.7	6.7	6.7	6.7	6.7
Servo shaft rotation, 0 to full stroke		degrees	19°	19°	19°	19°	19°	19°	19°
Torque to turn rotary servo shaft		**in.-lbs**	**20**	**20**	**20**	**20**	**20**	**20**	**20**
		Nm	2,3	2,3	2,3	2,3	2,3	2,3	2,3

The maximum inlet at the auxiliary pump inlet is 200 psi. (13,8 bar)

Any inlet pressures above atmospheric will increase noise levels and decrease efficiencies noted in this literature. Exact measurements depend on each application and operating conditions. Please consult your nearest Denison Office for further details.

Minimum compensating pressure is 100 psi (6.9 bar) over servo.

For recommended fluids, temperature and fluid cleanliness, see Denison Hydraulics bulletin SPO-AM305 for more details.

REAR DRIVE TORQUE CAPACITY

SERIES	FRONT INPUT SHAFT TYPE	FRONT INPUT SHAFT TORQUE CAPACITY	REAR MOUNTINGS SAE A	B	C	D	E	F	REAR OUTPUT SHAFT TORQUE CAPACITY
P6,7,8 P,S,V	Keyed SAE 32-1(C) Spline SAE 32-4(C)	6920 in-lbs. (780 Nm)	● ●	● ●					1750 in-lbs. (195 Nm)
P6,7,8 P,S,V	Keyed SAE 44-1(D) Spline SAE 44-4(D)	6920 in-lbs. (780 Nm)	● ●	● ●					1750 in-lbs. (195 Nm)
P6,7,8 R,L only	Keyed SAE 32-1(C)* Spline SAE 32-4C	13,845 in-lbs. (1565 Nm)			● ●				6920 in-lbs. (780 Nm)
P11,14 P,S,V	Keyed SAE 44-1(E) Spline SAE 44-4(E)	13,370 in-lbs. (1510 Nm)	● ●	● ●					2400 in-lbs. (270 Nm)
P11,14 R,L only	Keyed SAE 44-1(E)* Spline SAE 44-4(E)	26735 in-lbs. (3020 Nm)			● ●	● ●	● ●		13,370 in-lbs. (1510 Nm)
P24,30 P,S,	Keyed SAE 50-1(F) Spline SAE 50-4(F)	24350 in-lbs. (2750 Nm)		● ●	● ●				2700 in-lbs. (305 Nm)
P24,30 R,L only	Keyed SAE 50-1(F) Spline SAE 50-4(F)	48,700* in-lbs. (5,500 Nm)				● ●	● ●	● ●	24,350 in-lbs (2750 Nm)

* Coupling for keyed shaft must be pressed fit.

P6/7/8 SAE 127-2 Mtg., 32-1, 4 Shaft Bearing 230-82140 (6007)

Speed (rpm)	1000	1000	1000	1000	1200	1200	1200	1200	1500	1500	1500	1500	1800	1800	1800	1800
Shaft Load (lbs)	1	1	1000	1000	1	1	1000	1000	1	1	1000	1000	1	1	1000	1000
Shaft Load (N)	4	4	4448	4448	4	4	4448	4448	4	4	4448	4448	4	4	4448	4448
Case Pressure (psi)	0	25	0	25	0	25	0	25	0	25	0	25	0	25	0	25
Case Pressure (bar)	0.0	1.7	0.0	1.7	0.0	1.7	0.0	1.7	0.0	1.7	0.0	1.7	0.0	1.7	0.0	1.7
B-10 Life (hours x 1000)	**8E+08**	**1833**	**0.778**	**0.778**	**6E+08**	**1528**	**0.648**	**0.648**	**5E+08**	**1222**	**0.518**	**0.518**	**4E+08**	**1018**	**0.432**	**0.432**

P6/7/8 SAE 152-4 Mtg., 44-1, 4 Shaft Bearing 230-00207-0 (6207)

Speed (rpm)	1000	1000	1000	1000	1200	1200	1200	1200	1500	1500	1500	1500	1800	1800	1800	1800
Shaft Load (lbs)	1	1	1000	1000	1	1	1000	1000	1	1	1000	1000	1	1	1000	1000
Shaft Load (N)	4	4	4448	4448	4	4	4448	4448	4	4	4448	4448	4	4	4448	4448
Case Pressure (psi)	0	25	0	25	0	25	0	25	0	25	0	25	0	25	0	25
Case Pressure (bar)	0.0	1.7	0.0	1.7	0.0	1.7	0.0	1.7	0.0	1.7	0.0	1.7	0.0	1.7	0.0	1.7
B-10 Life (hours x 1000)	**3E+09**	**7394**	**3.136**	**3.136**	**3E+09**	**6161**	**2.613**	**2.613**	**2E+09**	**4929**	**2.09**	**2.09**	**2E+09**	**4170**	**1.742**	**1.742**

P11/14 SAE 165-4 Mtg., 44-1, 4 Shaft Bearing 230-82148-0 (6010)

Speed (rpm)	1000	1000	1000	1000	1200	1200	1200	1200	1500	1500	1500	1500	1800	1800	1800	1800
Shaft Load (lbs)	0	0	1000	1000	0	0	1000	1000	0	0	1000	1000	0	0	1000	1000
Shaft Load (N)	0	0	4448	4448	0	0	4448	4448	0	0	4448	4448	0	0	4448	4448
Case Pressure (psi)	0	25	0	25	0	25	0	25	0	25	0	25	0	25	0	25
Case Pressure (bar)	0.0	1.7	0.0	1.7	0.0	1.7	0.0	1.7	0.0	1.7	0.0	1.7	0.0	1.7	0.0	1.7
B-10 Life (hours x 1000)	**2E+09**	**535**	**1.907**	**1.907**	**2E+09**	**446**	**1.589**	**1.589**	**1E+09**	**356**	**1.272**	**1.272**	**1E+09**	**297**	**1.06**	**1.06**

P11/14 SAE 165-4 Mtg., 44-1, 4 Shaft Bearing 230-82214-0 (22208)

Speed (rpm)	1000	1000	1000	1000	1200	1200	1200	1200	1500	1500	1500	1500	1800	1800	1800	1800
Shaft Load (lbs)	0	0	1000	1000	0	0	1000	1000	0	0	1000	1000	0	0	1000	1000
Shaft Load (N)	0	0	4448	4448	0	0	4448	4448	0	0	4448	4448	0	0	4448	4448
Case Pressure (psi)	0	25	0	25	0	25	0	25	0	25	0	25	0	25	0	25
Case Pressure (bar)	0.0	1.7	0.0	1.7	0.0	1.7	0.0	1.7	0.0	1.7	0.0	1.7	0.0	1.7	0.0	1.7
B-10 Life (hours x 1000)	**16856**	**2452**	**275**	**172**	**14046**	**2043**	**230**	**143**	**11237**	**1635**	**184**	**114.8**	**9364**	**1363**	**153**	**95.7**

P24 SAE 177-4 Mtg., 50-1, 4 Shaft Bearing 230-82213-0 (22311)

Speed (rpm)	1000	1000	1000	1000	1200	1200	1200	1200	1500	1500	1500	1500	1800	1800	1800	1800
Shaft Load (lbs)	0	0	1000	1000	0	0	1000	1000	0	0	1000	1000	0	0	1000	1000
Shaft Load (N)	0	0	4448	4448	0	0	4448	4448	0	0	4448	4448	0	0	4448	4448
Case Pressure (psi)	0	25	0	25	0	25	0	25	0	25	0	25	0	25	0	25
Case Pressure (bar)	0.0	1.7	0.0	1.7	0.0	1.7	0.0	1.7	0.0	1.7	0.0	1.7	0.0	1.7	0.0	1.7
B-10 Life (hours x 1000)	**591.6**	**428.5**	**276.7**	**213.5**	**493**	**357**	**230.5**	**178**	**394.4**	**991.6**	**184.4**	**142.3**	**328.7**	**238**	**153.7**	**118.6**

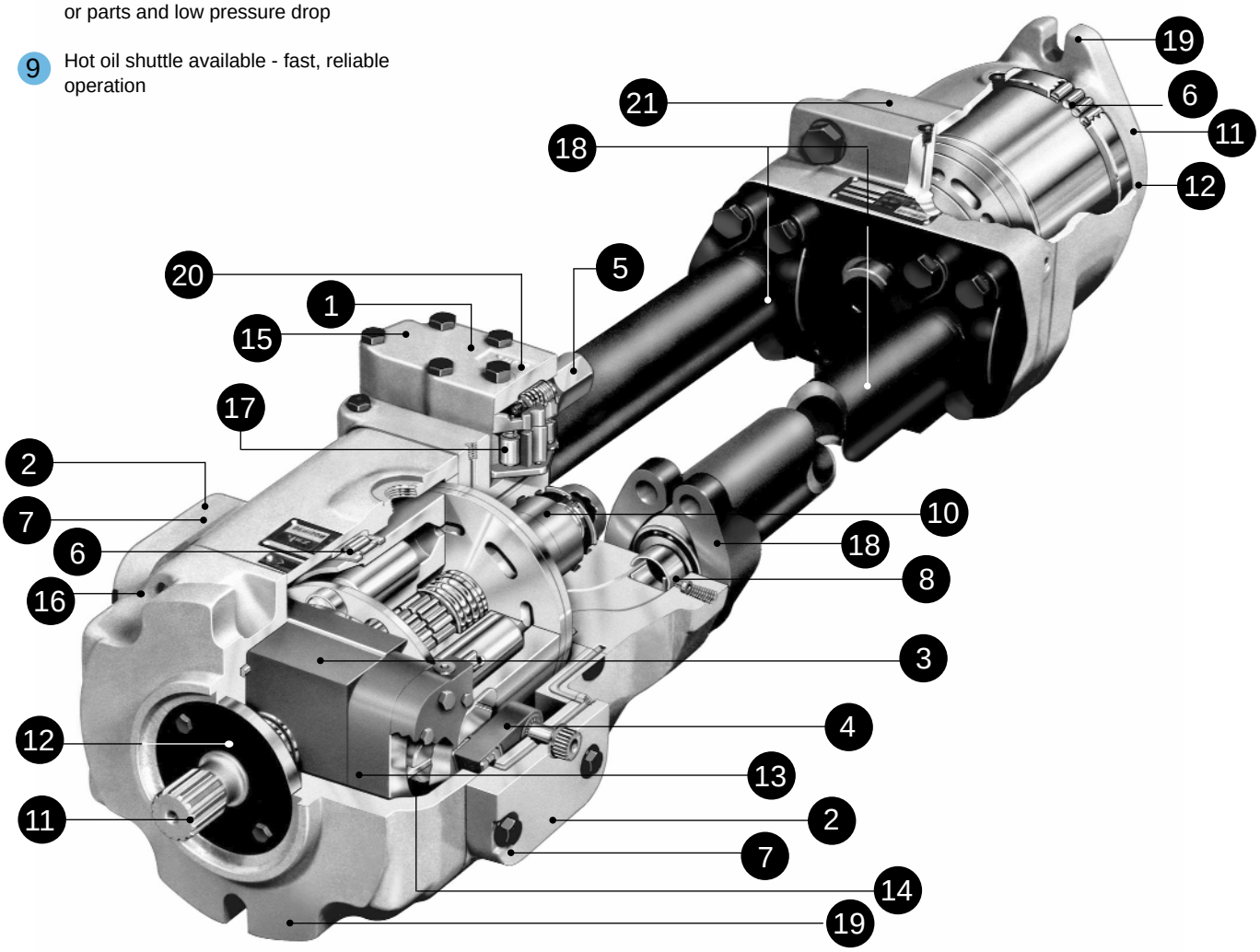
P30 SAE 177-4 Mtg., 50-1, 4 Shaft Bearing 230-82213-0 (22311)

Speed (rpm)	1000	1000	1000	1000	1200	1200	1200	1200	1500	1500	1500	1500	1800	1800	1800	1800
Shaft Load (lbs)	0	0	1000	1000	0	0	1000	1000	0	0	1000	1000	0	0	1000	1000
Shaft Load (N)	0	0	4448	4448	0	0	4448	4448	0	0	4448	4448	0	0	4448	4448
Case Pressure (psi)	0	25	0	25	0	25	0	25	0	25	0	25	0	25	0	25
Case Pressure (bar)	0.0	1.7	0.0	1.7	0.0	1.7	0.0	1.7	0.0	1.7	0.0	1.7	0.0	1.7	0.0	1.7
B-10 Life (hours x 1000)	**227**	**177.7**	**126.4**	**102.8**	**189.2**	**148**	**105.3**	**85.6**	**151.3**	**118.4**	**84.2**	**68.5**	**126.1**	**98.7**	**70.2**	**57.1**

*radial load at center of key

Note: Variation in life is due to variations in tolerances within the pump.
Contact DENISON Hydraulics for B-10 with other operating conditions and with other case pressure values.
Consult Denison Hydraulics for shaft side loads of P*R units.

1. Quick change valve block - easy to service or replace
2. Quick change controls - easy to service and change
3. Dampened low inertia rocker cam - more stable, quieter and faster than other designs
4. Exclusive zero-backlash rotary servo design - lifetime accuracy
5. Field adjustable compensator override - easily adjusted without removing from machinery
6. Precision barrel bearing, a distinctive Denison Hydraulics feature for over 30 years - permits high speeds, high pressure and provides long life
7. Versatile controls - can be located on either side of pump or motor for maximum freedom of design
8. Patented ring style replenishing checks fastest operation with no sliding poppets or parts and low pressure drop
9. Hot oil shuttle available - fast, reliable operation
10. Auxiliary pump can be changed without disassembling the transmission
11. Standard SAE keyed or splined drive shafts are available
12. High pressure mechanical shaft seals can be changed without disassembling the transmission. Double lip seals are also available
13. One piece stroking vane/cam means no lost motion, zero backlash, better control, and no linkages to wear out
14. Stroking vane seals are pressure loaded for longer life
15. Standard compensator vent ports allow for a wide variety of controls (See Controls Manual)
16. Rocker cam displacement indicator helps troubleshoot the system
17. Modulated servo pressure saves power
18. Standard Code 62 SAE split flange connections
19. Conforms to SAE mounting standards. These products are qualified to meet Military specifications MIL-P-17869A and MIL-S-901-C Grade A
20. Fastest compensator response: Gives maximum of 10% pressure overshoot at rated conditions (guaranteed times under all conditions faster response times possible depending upon application)
- Variable motors available for multiple speed ranges or constant power



CLOSED HYDRAULIC CIRCUIT

Variable Pump/Fixed Motor. This combination provides for a constant torque output at a fixed maximum pressure over the full speed range. Speed and direction are controlled with a variable displacement over-center pump. Power from overhauling loads is regenerated back into the pump prime mover. Motor speed is limited to the maximum speed permitted by full pump displacement. System is capable of full power only at maximum pump displacement.

POWER CHARACTERISTICS OF HYDROSTATIC TRANSMISSIONS

Variable Pump/Variable Motor. This combination provides for an extended range of motor speeds. The motor, at full displacement, delivers maximum torque while its speed and direction respond to displacement changes of the crossover center pump. Power is proportional to motor speed.

This transmission system has the capability of constant torque and rising power until the pump reaches full displacement and full power at elevated speeds as motor displacement and torque are reduced.

PACKAGE PUMP

The package pump contains the circuit elements shown in the hydraulic schematic on pgs. 56-58. These include the axial piston over-center variable displacement pump which controls the speed and direction of the motor, the auxiliary pump which supplies servo pressure (for controlling the displacement of the variable pump) and replenishment pressure, the servo pressure relief valve, the replenishment pressure relief valve and the replenishment check valves for ports A and B. The pump package also includes the displacement control valves as well as an external arm which shows actual displacement. The various control features are described below.

PACKAGE MOTOR

The package motor, shown in schematic pgs. 56-58, contains the axial piston fluid motor, the shuttle valve that continuously removes hot oil from the low pressure side of the loop and a relief valve to establish minimum hydraulic loop pressure at the motor. The fluid motor is available with fixed displacement or with the variable displacement option. The standard variable motors include an external indicator which shows displacement.

OPEN CIRCUIT PUMP

The open circuit pump contains the circuit elements shown on pages 59,60. These include a cross-center variable displacement pump which is normally limited to one side of center. The auxiliary pump supplies only servo pressure to control the main pump displacement and inlet porting is enlarged to improve the pump's inlet characteristics. As the open loop pump operates on one side of center only, not all controls are available.

AUXILIARY REAR DRIVE

Additional auxiliary flow is available with the rear drive pump option. The rear drive may also be utilized for servo and other purposes.
See ordering code for additional detail.

"R" & "L" style pumps have no rear shaft seal, so any pump driven must be able to withstand case pressure of the pump driving it.

AUXILIARY PUMP

Integral to the package pump's envelope is the gerotor auxiliary pump. (P24P, P24S, P30P & P30S have vane integral pump). It provides servo and replenishing pressure. See page 5 for factory settings.
NOTE: Auxiliary pump inlet must be connected directly to the reservoir. Customer must supply external line from integral auxiliary pump back into main pump for filtering servo and/or replenishing oil. (see installation drawings starting on pg 10.)

MOUNTING

The pump or motor is designed to operate in any position. For vertical mounting it is recommended that the shaft bearing be drained via the drain port provided. The mounting hub and mounting flange are in full conformance with SAE standard. The shaft must be in alignment with the shaft of the driven load and should be checked with a dial indicator. The mounting pad or adapter into which the fluid pump pilots be concentric with the pump shaft within 0.006 in., 0,152 mm to prevent bearing failure. This concentricity is particularly important if the shaft is rigidly connected to the driving load without a flexible coupling. The shaft-coupling interface must be lubricated with lithium molydisulfide or similar grease.

INLET PRESSURES, PORTS A & B

In a closed hydraulic loop the pump inlet or the fluid motor inlet (during dynamic braking) are supercharged by the integral replenishment system. Consult Denison in cases where fluid viscosity or dynamics or line size may cause inlet pressure at either port A or B to be less than the 150 psi, 10,3 bar maintained by the integral replenishment system. For operation in open loop or combination open-closed loops, consult Denison.

DRAIN PORT

Drain the package pump from the higher drain port. If drain port is above the fluid level in the tank install a 5 psi, 0,3 bar relief of suitable size in the drain line to tank. For vertical mounting it is recommended that the shaft bearing be drained via the drain port provided.

For pump speeds intermittently below 1000 rpm, install a back pressure relief 40 psi, 2,8 bar of suitable size in the drain line from the higher port to tank. Motor case drain must be connected to pump case.

Motor: Drain the motor from the higher drain ports into the lower pump drain port or tank. Make provision that the motor drain port pressure will not exceed the maximum limits specified above.

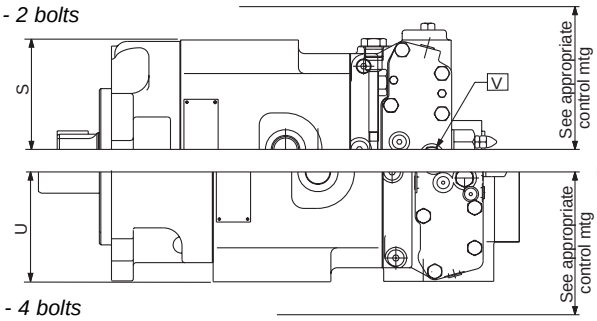
RETURN LINE FILTER

Relatively inexpensive low pressure filters are recommended for installation in the return lines and drain lines from circuits using these pumps or motors. Consider the possibility of decompression surges and intensified flow in cylinder circuits as well as the factors above in selecting return line filters.

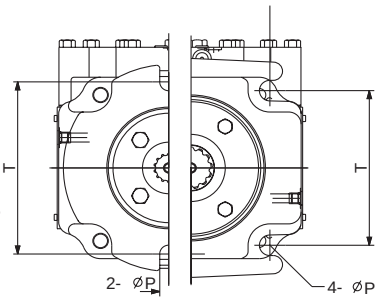
AUXILIARY FLOW FILTERS

It is recommended the auxiliary pump fluid be fully filtered to aid in maintaining acceptable cleanliness levels. For good filtration and reasonable maintenance intervals the filter capacity must be at least twice the auxiliary pump flow. To use this feature, install the isolation plug and connect the filter between ports G&H, (P6,P7,P8,P24,P30), or J&K (P11,P14). See detailed schematics and drawings pages 10-19 for location of these ports.
NOTE: Auxiliary and return filters **must** use bypass valves.

SAE-C - 2 bolts

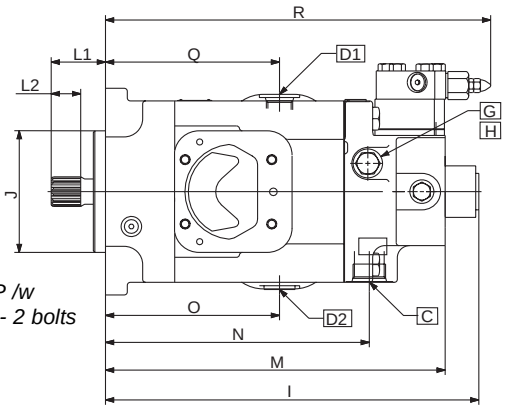


SAE-D - 4 bolts

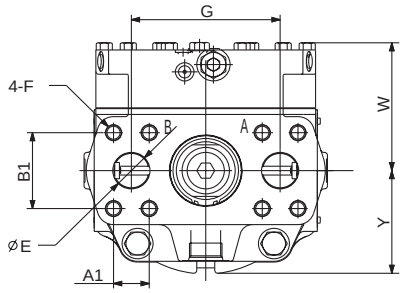


SAE-C - 2 bolts *SAE-D - 4 bolts*

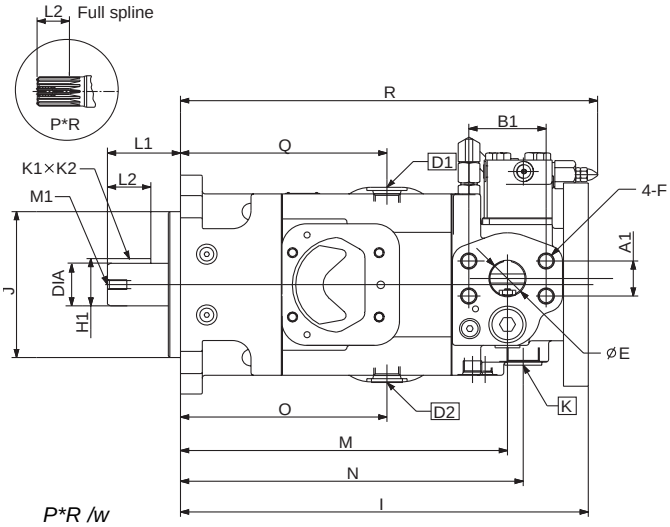
Shaft end view



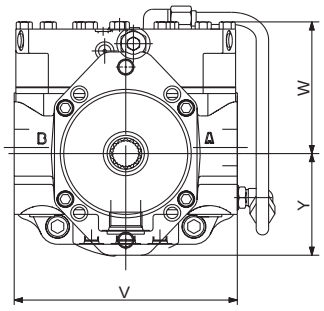
*P*P /w*
SAE-C - 2 bolts



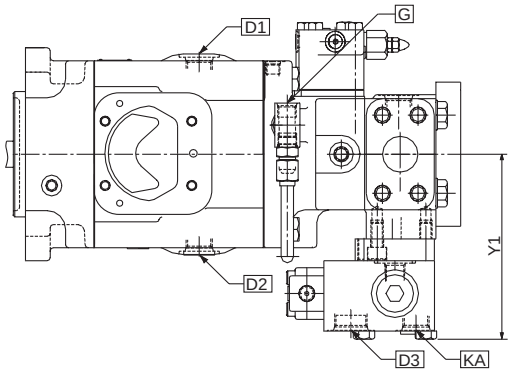
*P*P, rear view*



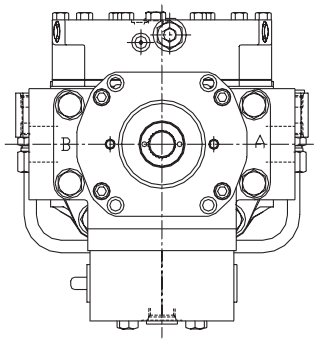
*P*R /w*
SAE-D - 4 bolts



*P*R, rear view*



*P*L/w*
SAE-C - 2 bolts



*P*L, rear view*

NOTE: See page 20 for shaft, porting and rear drive information.
See appropriate controls mounting starting on page 21.

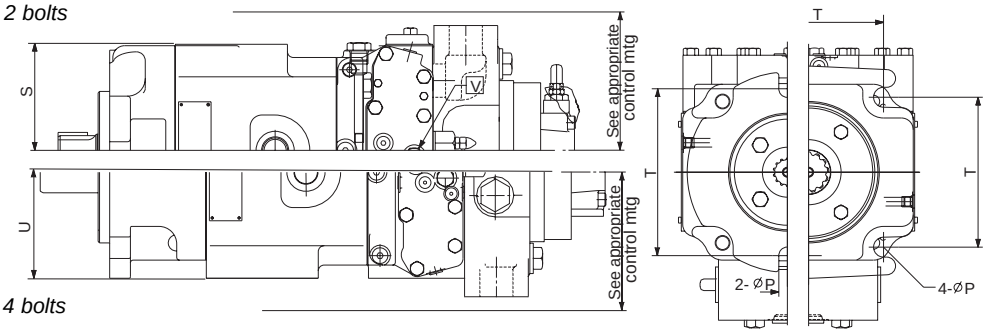
P*L

	P6P P7P P8P	P6R,L P7R,L P8R,L
SAE-C, 2 bolts		
G	6.00 (152,4)	
I	15.06 (382,5)	15.14 (384,6)
J	5.000 4.998 (126,95) (127,00)	5.000 4.998 (126,95) (127,00)
M	13.70 (348,0)	11.88 (301,8)
N	10.64 (270,3)	12.52 (317,9)
O	7.02 (178,3)	7.02 (178,3)
P	Ø.73 Ø(18,4)	Ø.73 Ø(18,4)
Q	7.02 (178,3)	7.02 (178,3)
R	15.51 (393,9)	15.55 (394,9)
U/S	4.50 (114,3)	4.50 (114,3)
T	7.12 (180,8)	7.12 (180,8)
V		9.00 (228.6)
W	5.27 (133,9)	5.27 (133,9)
Y	4.22 (107,2)	4.22 107,2)
Y1		7.38 (187,6)

P*L

	P6P P7P P8P	P6R,L P7R,L P8R,L
SAE-D, 4 bolts		
G	6.00 (152,4)	
I	16.40 (416,6)	16.48 (418,6)
J	6.000 5.998 (152,40) (152,35)	6.000 5.998 (152,40) 152,35)
M	15.04 (382,1)	13.22 (335,9)
N	11.98 (304,3)	13.85 (352,0)
O	8.36 (212,3)	8.36 (212,3)
P	Ø.83 Ø(21,1)	Ø.83 Ø(21,1)
Q	8.36 (212,3)	8.36 (212,3)
R	16.85 (427,9)	16.89 (429,0)
U/S	4.50 (114,3)	4.44 (112,8)
T	6.36 (161,6)	6.36 (161,6)
V		8.88 (725,6)
W	5.27 (133,9)	5.27 (133,9)
Y	4.22 (107,2)	4.22 (107,2)
Y1		7.38 (187.66)

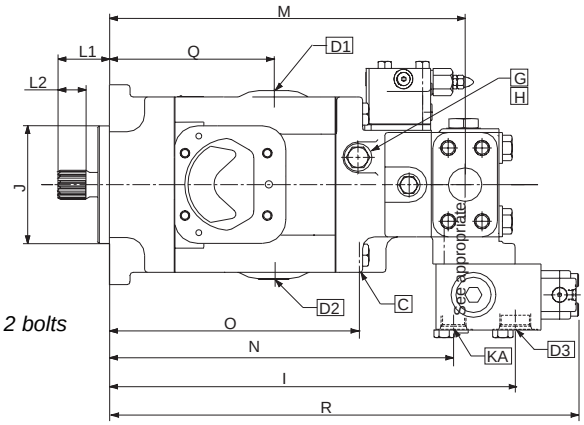
SAE-C - 2 bolts



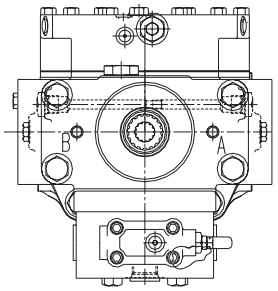
SAE-D - 4 bolts

SAE-C - 2 bolts *SAE-D - 4 bolts*

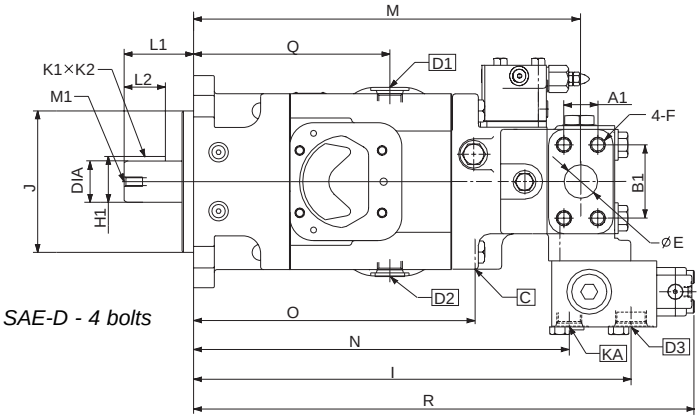
Shaft end view



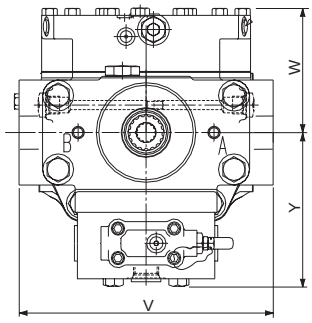
SAE-C - 2 bolts



rear view



SAE-D - 4 bolts



Fluid Connections

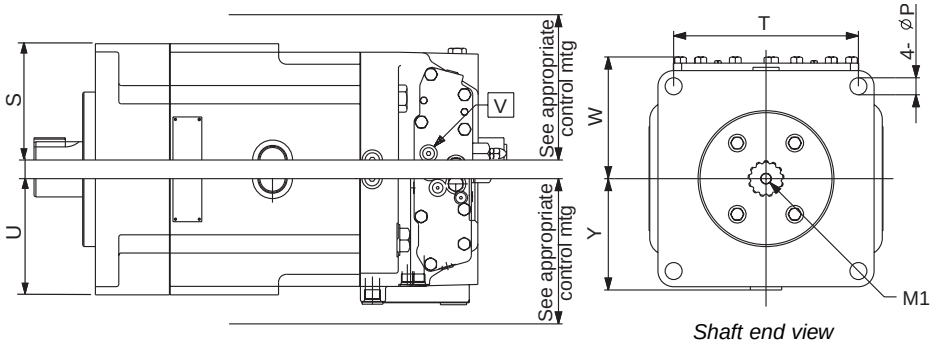
Ports	Remarks
A& B	Main lines
C	Auxiliary pump inlet port
D1 & D2	Drain ports
D3	Shuttle drain
G	Auxiliary pump outlet to filter
H	Auxiliary pump filter return
J	Auxiliary pump outlet
K	External replenish inlet
KA	Shuttle relief inlet
V	Common vent ports

NOTE: See page 20 for shaft, porting and rear drive information.
See appropriate controls mounting starting on page 21.

	P6S P7S P8S
SAE-C, 2 bolts	
I	17.28 (438,9)
J	5.000 4.998 (126,95) (127,00)
M	15.14 (384,6)
N	14.65 (372,1)
O	10.64 (270,3)
P	Ø.73 Ø(18,4)
Q	7.02 (178,3)
R	19.72 (502,0)
U/S	4.50 (114,3)
T	7.12 (180,8)
V	10.72 (173,0)
W	5.26 (133,5)
Y	6.51 (165,4)

	P6S P7S P8S
SAE-D, 4 bolts	
I	18.62 (472,9)
J	6.000 5.998 152,40 (152,35)
M	16.48 (418.6)
N	15.99 (406,1)
O	11.98 (304,3)
P	Ø.83 Ø(21,1)
Q	21.06 (535,0)
R	21.06 (536,9)
U/S	4.50 (114,3)
T	6.36 (161,6)
V	8.88 (225,6)
W	5.27 (133,9)
Y	6.51 (165,4)

P*P

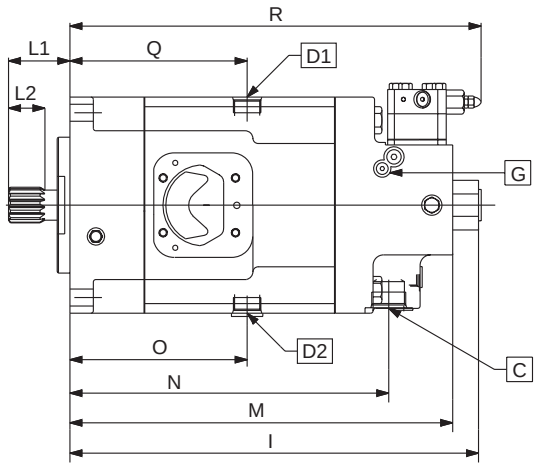


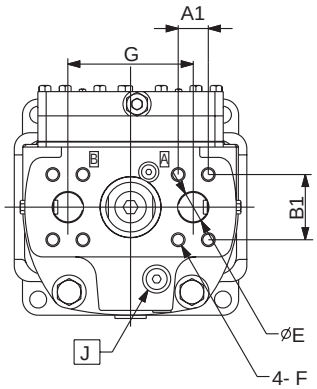
P*R,L

Shaft end view

	P11P P14P	P11R,L P14R,L
G	6.00 (152,4)	
I	19.55 (496,5)	18.31 (465.2)
J	6.500 6.498 (165,05) (165,10)	6.500 6.498 (165,05) (165,10)
M	18.31 (465,2)	15.64 (397,1)
N	15.25 (387,4)	
O	8.48 (215,3)	8.48 (215,3)
P	Ø.81 Ø(20,6)	Ø.81 Ø(20,6)
Q	8.48 (215,3)	8.48 (215,3)
R	19.83 (503.8)	20.00 (508,1)
R1		20.28 (515,1)
S/U	5.56 (141,3)	5.94 (150,9)
T	8.84 (224,5)	8.84 (224,5)
V		11.88 (301,8)
W	5.82 (147,9)	5.82 (147,9)
Y	5.33 (135,3)	5.33 135,3)
Y1		5.91 (150,0)
Y2		8.08 (205,1)

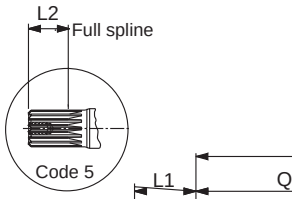
P*P

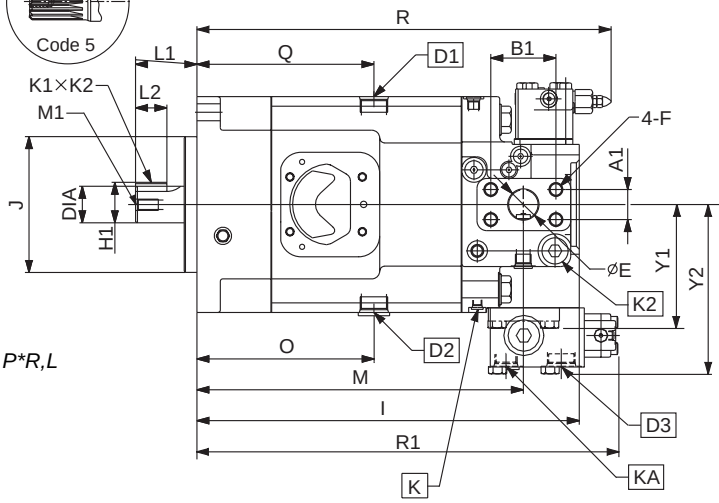




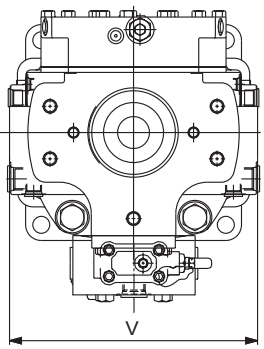
P*P, rear view

P*R
P*L





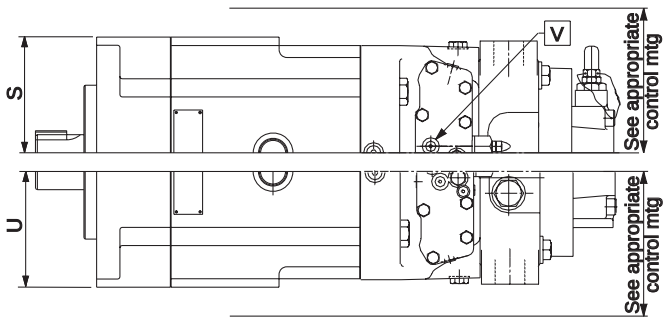
P*R,L

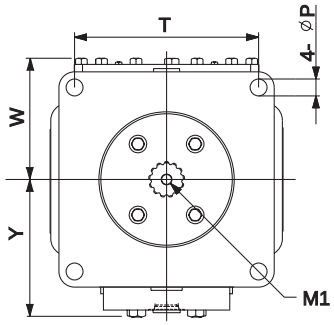


P*R,L, rear view

NOTE: See page 20 for shaft, porting and rear drive information.
See appropriate controls mounting starting on page 21.

P*S

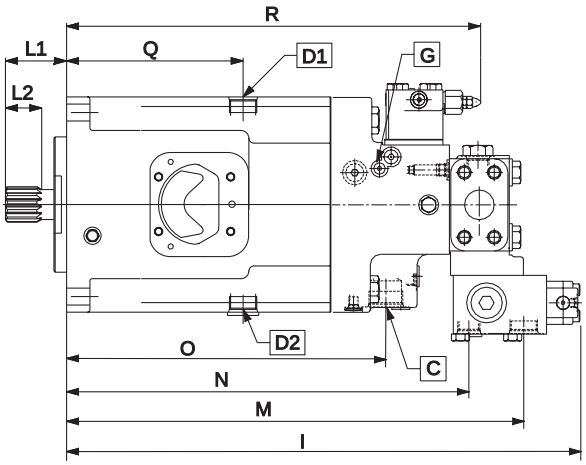


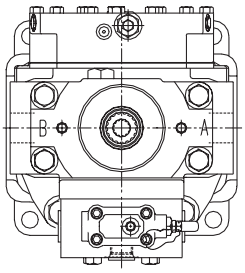


Shaft end view

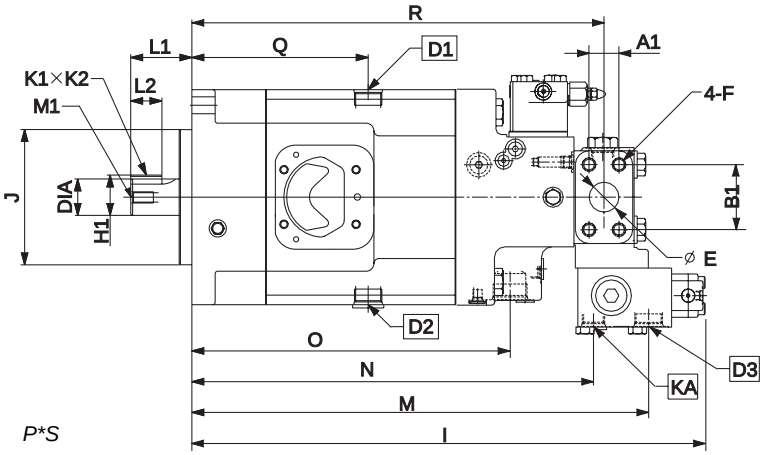
	P11S P14S
G	10.76 (273,0)
I	24.45 (621,0)
J	6.500 6.498 (165,05) (165,10)
M	21.89 (556,0)
N	19.26 (489,2)
O	15.25 (387,4)
P	Ø.81 Ø(20,6)
Q	8.48 (215,3)
R	19.69 (500.1)
S/U	5.36 (136,5)
T	8.84 (224,5)
W	5.82 (147,9)
Y	6.51

P*S

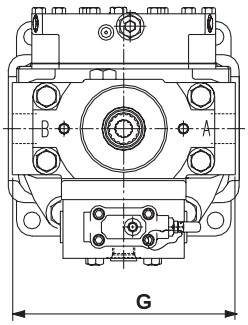




rear view



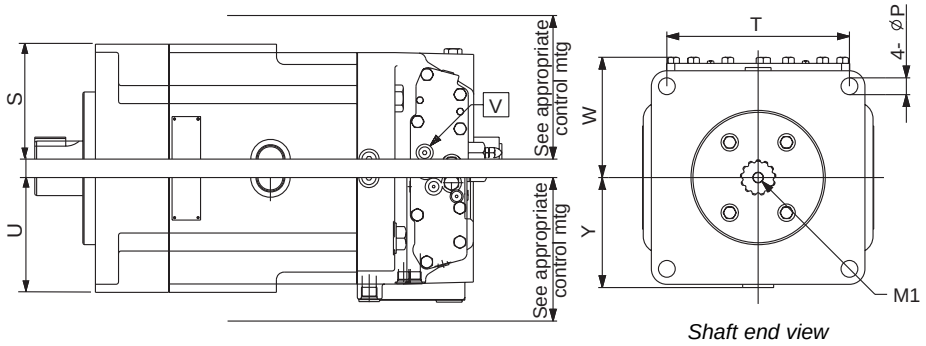
P*S



rear view

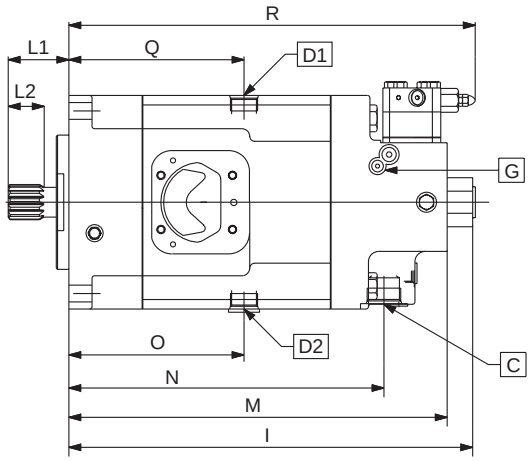
NOTE: See page 20 for shaft, porting and rear drive information.
See appropriate controls mounting starting on page 21.

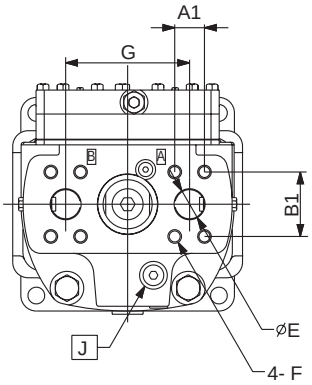
*P*P*



Shaft end view

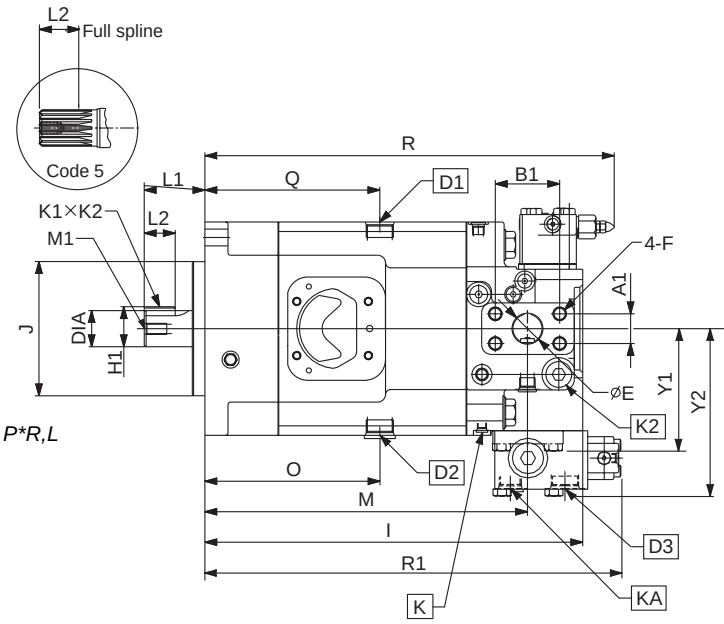
*P*R,L*

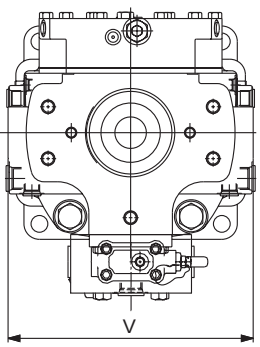




*P*P, rear view*

*P*R,L*





*P*R,L rear view*

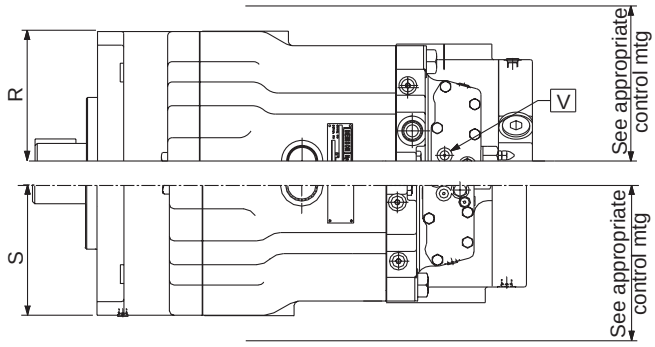
	P24P	P30P
G	12.44 (316,0)	12.44 (316,0)
I	10.92 (277,5)	10.92 (277,5)
J	7.000 6.998 (177,80) (177,75)	7.000 6.998 (177,80) (177,75)
M	23.70 (602,1)	24.70 (627,5)
N	18.80 (477,4)	19.80 (502,8)
O	18.08 (459,4)	19.08 (484,7)
P	Ø1.06 Ø(26,9)	Ø.81 Ø(26,9)
Q	10.92 (277,5)	10.92 (277,5)
R	7.15 (190,5)	7.15 (190,5)
S	7.15 (190,5)	7.15 (190,5)
T	9.75 (247,6)	9.75 (247,6)
U	7.31 (185,7)	7.31 (185,7)
V	7.31 (185,7)	7.31 (185,7)

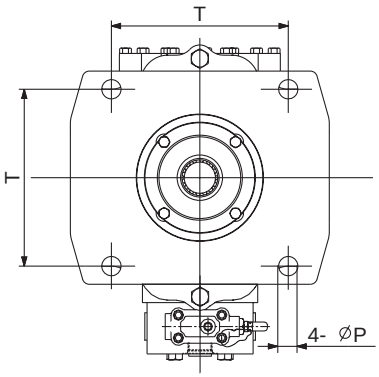
	P24R,L	P30R,L
G	12.44 (316,0)	12.44 (316,0)
I	10.92 (277,5)	10.92 (277,5)
J	7.000 6.998 (177,80) (177,75)	7.000 6.998 (177,80) (177,75)
M	23.33 (592,6)	24.33 (618,0)
N	22.08 (560,8)	23.08 (587,2)
O	18.08 (459,4)	19.08 (484,7)
P	Ø1.06 Ø(26,9)	Ø.81 Ø(26,9)
Q	10.92 (277,5)	10.92 (277,5)
R	7.15 (190,5)	7.15 (190,5)
S	7.15 (190,5)	7.15 (190,5)
T	9.75 (247,6)	9.75 (247,6)
U	7.31 (185,7)	7.31 (185,7)
V1	7.72 (196,2)	7.72 (196,2)
V2	9.89 (251,3)	9.89 (251,3)

P*R
P*L

NOTE: See page 20 for shaft, porting and rear drive information.
See appropriate controls mounting starting on page 21.

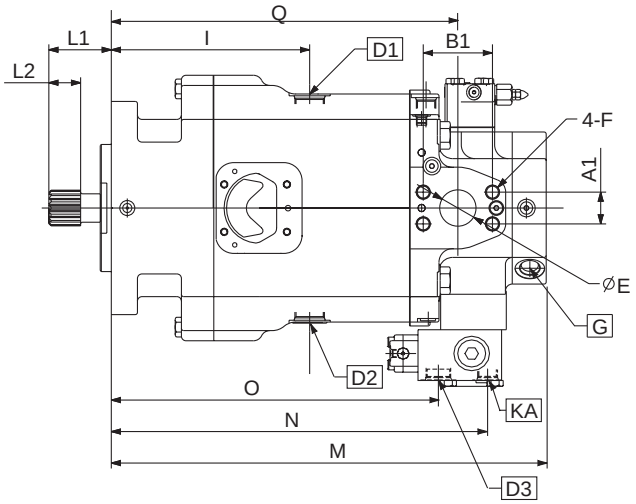
*P*S*



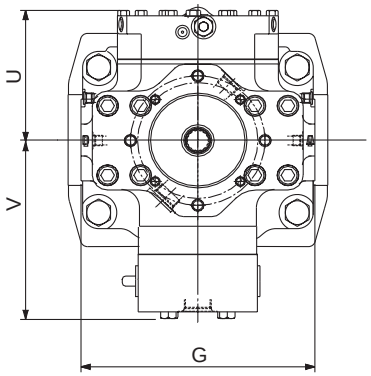


Shaft end view

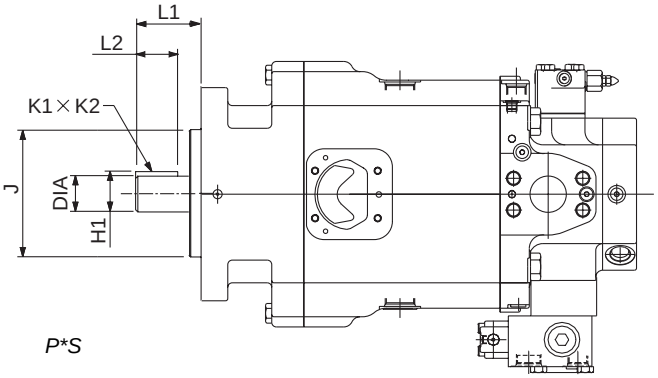
	P24S	P30S
G	12.44 (316,0)	12.44 (316,0)
I	10.92 (277,5)	10.92 (277,5)
J	7.000 6.998 (177,80) (177,75)	7.000 6.998 (177,80) (177,75)
M	22.83 (579,9)	23.83 (605,3)
N	20.68 (525,3)	20.68 (525,3)
O	17.05 (433,2)	18.05 (458,5)
P	Ø1.06 Ø(26,9)	Ø1.06 Ø(26,9)
Q	27,58 (700,6)	28.58 (725,9)
R	7.15 (190,5)	7.15 (190,5)
S	7.15 (190,5)	7.15 (190,5)
T	9.75 (247,6)	9.75 (247,6)
U	7.13 (181,1)	7.13 (181,1)
V	10.01 (254,3)	10.01 (254,3)



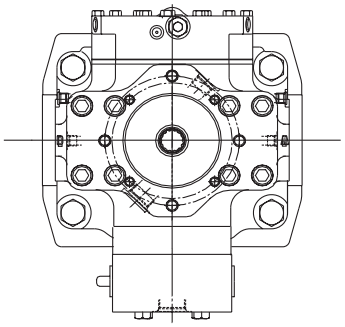
*P*S*



rear view



*P*S*



rear view

NOTE: See page 20 for shaft, porting and rear drive information.
See appropriate controls mounting starting on page 21.

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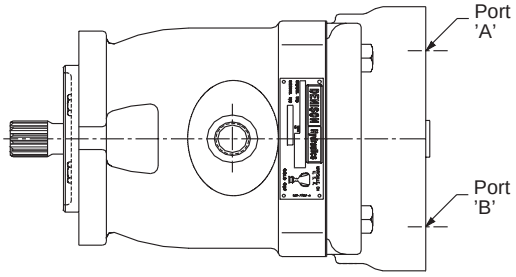
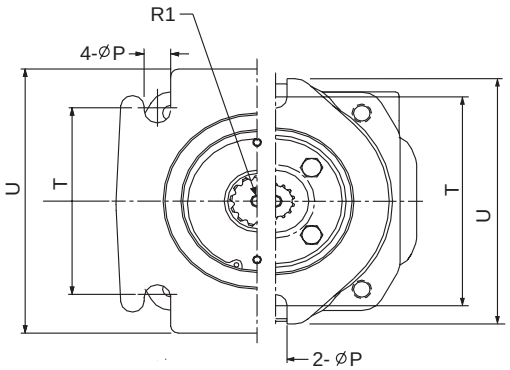
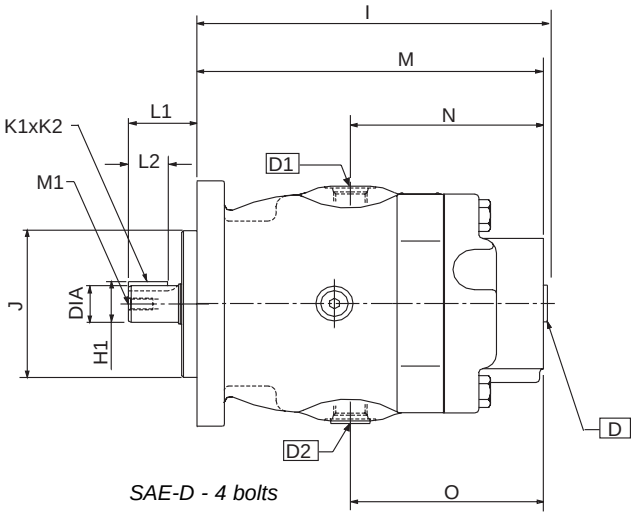


SAE-C - 2 bolts

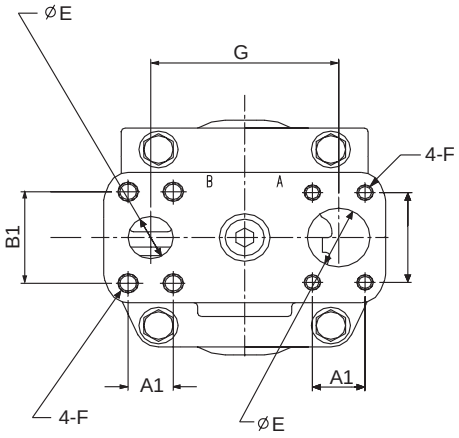


SAE-D - 4 bolts *SAE-C - 2 bolts*

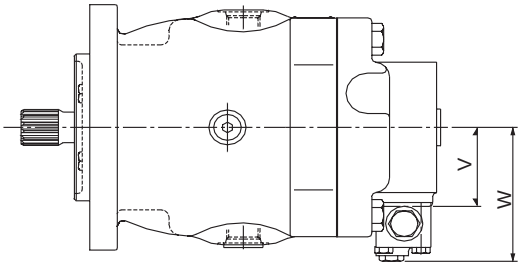
Shaft end view



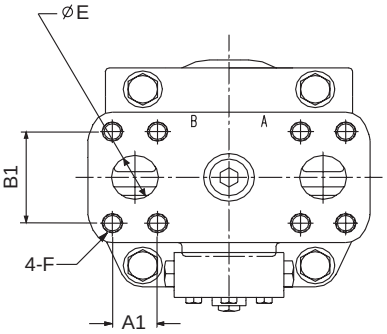
SAE-D - 4 bolts



*P*F, rear view*



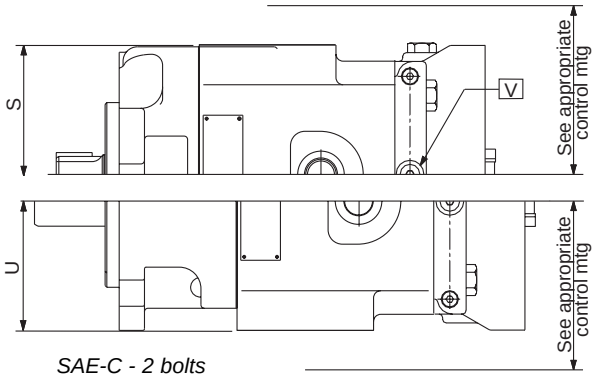
*M*G*



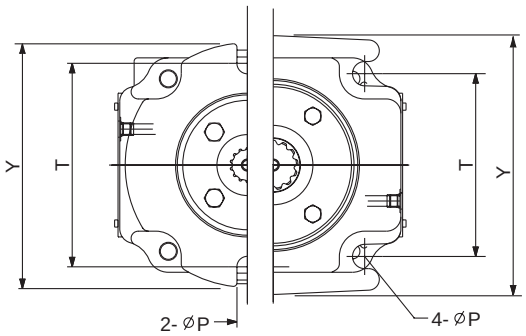
*M*F/G, rear view*

	P6F P7F P8F	M6F/G M7F/G
	SAE-C, 2 bolts	
G	6.00 (152,4)	6.00 (152,4)
I	11.20 (284,4)	11.20 (284,4)
J	5.000 4.998 (126,95) (127,00)	5.000 4.998 (126,95) (127,00)
M	11.06 (280,9)	11.06 (280,9)
N	6.16 (156,5)	6.16 (156,5)
O	6.16 (156,5)	6.16 (156,5)
P	Ø.73 Ø(18,4)	Ø.73 Ø(18,4)
T	7.12 (180,8)	7.12 (180,8)
U	8.36 (212,4)	8.36 (212,4)
V	w/o shuttle	2.69 (68,3)
W	w/ shuttle	4.56 (115,8)
	P6F P7F P8F	**M6F/G M7F/G**
	SAE-D, 4 bolts	
G	6.00 (152,4)	6.00 (152,4)
I	11.60 (294,6)	11.60 (294,6)
J	6.000 5.998 (152,40) (152,35)	6.000 5.998 (152,40) 152,35)
M	11.46 (291,1)	11.46 (291,1)
N	6.16 (156,5)	6.16 (156,5)
O	6.16 (156,5)	6.16 (156,5)
P	Ø.83 Ø(21,1)	Ø.83 Ø(21,1)
T	6.36 (161,6)	6.36 (161,6)
U	9.00 (228,6)	9.00 (228,6)
V	w/o shuttle	2.69 (68,3)
W	w/ shuttle	4.56 (115,8)

NOTE: See page 20 for shaft, porting and rear drive information.
See appropriate controls mounting starting on page 21

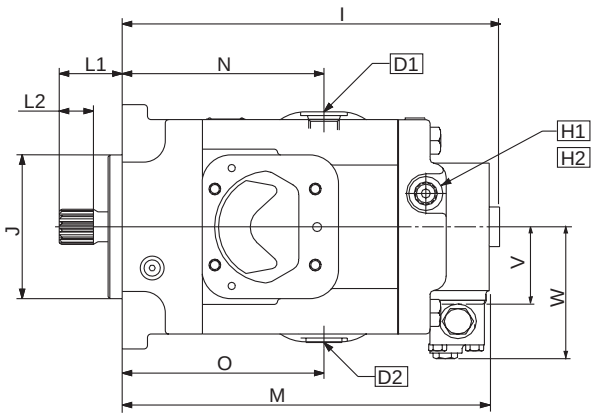


SAE-C - 2 bolts

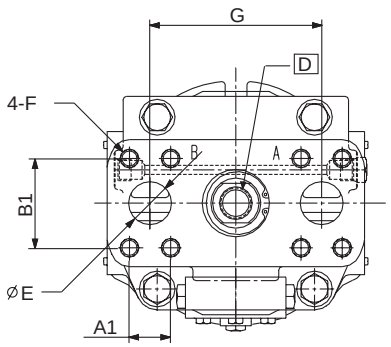


SAE-C - 2 bolts *SAE-D - 4 bolts*

Shaft end view



SAE-D - 4 bolts



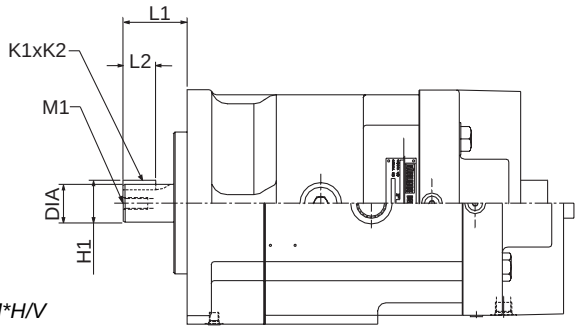
rear view

	M6,7H/V
	SAE-C, 2 bolts
G	6.00 (152,4)
I	13.16 (334,3)
J	5.000 4.998 (126,95) (127,00)
M	12.80 (325,1)
N	7.02 (178,3)
O	7.02 (178,3)
P	Ø.73 Ø(18,4)
U/S	4.50 (114,3)
T	7.12 (180,8)
V	2.84 (72,1)
W	4.56 (115,8)
Y	8.44 (214,4)

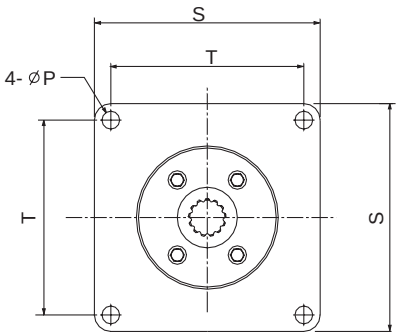
	M6,7H/V
	SAE-D, 4 bolts
G	6.00 (152,4)
I	14.50 (368,3)
J	6.000 5.998 (152,40) (152,35)
M	14.14 (359,2)
N	8.36 (212,3)
O	8.36 (212,3)
P	Ø.83 Ø(21,1)
U/S	4.50 (114,3)
T	6.36 (161,6)
V	2.84 (72,1)
W	4.56 (115,8)
Y	9.00 (228,6)

NOTE: See page 20 for shaft, porting and rear drive information.
See appropriate controls mounting starting on page 21.

*M*F/G*

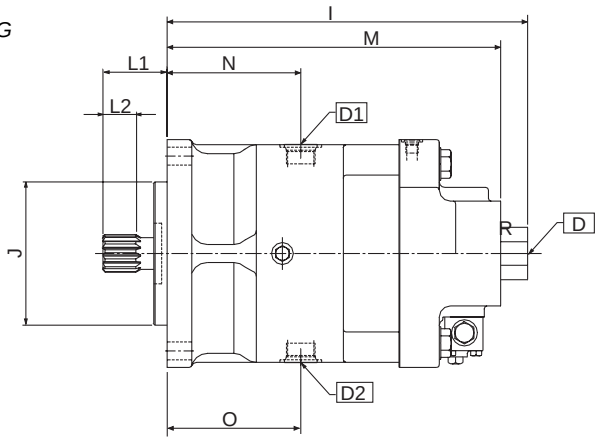


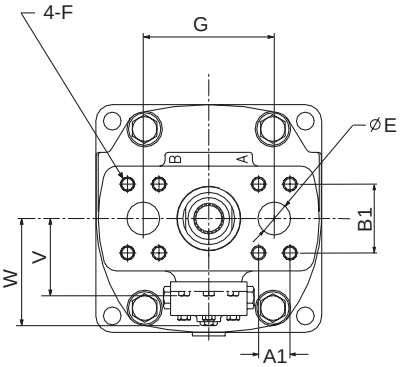
*M*H/V*



*M*F/G,H/V*
Shaft end view

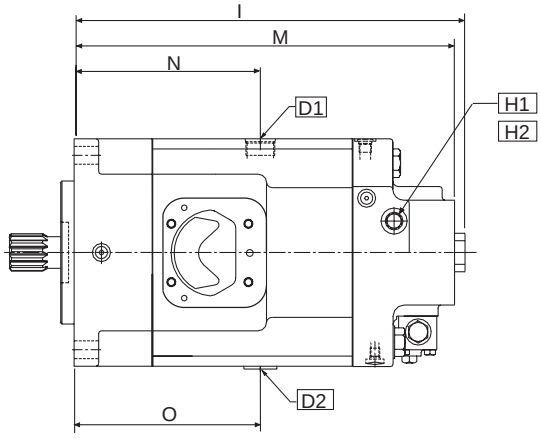
*M*F/G*

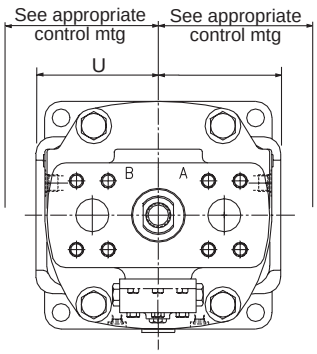




*M*F/G, rear view*

*M*H/V*





*M*H/V, rear view*

M11F/G
M14F/G

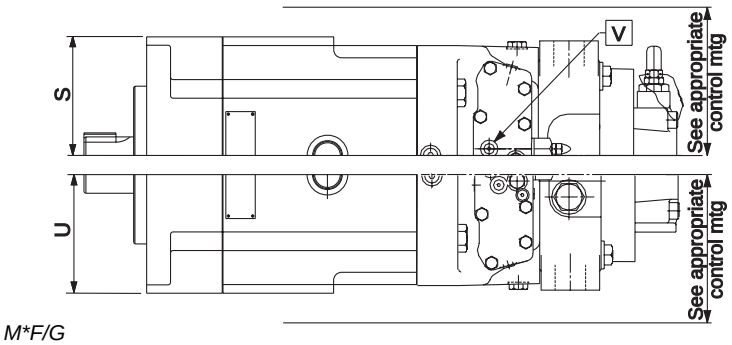
	SAE-C, 4 bolts
G	6.00 (152,4)
I	16.51 (419,4)
J	6.500 6.498 (165,1) (165,0)
M	15.28 (388,0)
N	6.12 (155,4)
O	6.12 (155,4)
S	10.34 (262,6)
T	8.84 (224,5)
V	w/o 3.51 shuttle (89,1)
W	w/ 4.86 shuttle (123,5)
R	5.17

M11H/V
M14H/V

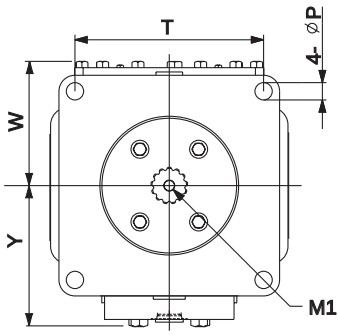
	SAE-C, 4 bolts
G	6.00 (152,4)
I	17.79 (451,9)
J	6.500 6.498 (165,1) (165,0)
M	17.32 (439,9)
N	8.48 (215,4)
O	8.48 (215,4)
P	Ø.81 Ø(20,6)
R	5.17 (131,3)
S	10.34 (262,6)
T	8.84 (224,5)
U	5.17 (131,3)
V	w/o 3.51 shuttle (89,1)

NOTE: See page 20 for shaft, porting and rear drive information.
See appropriate controls mounting starting on page 21.

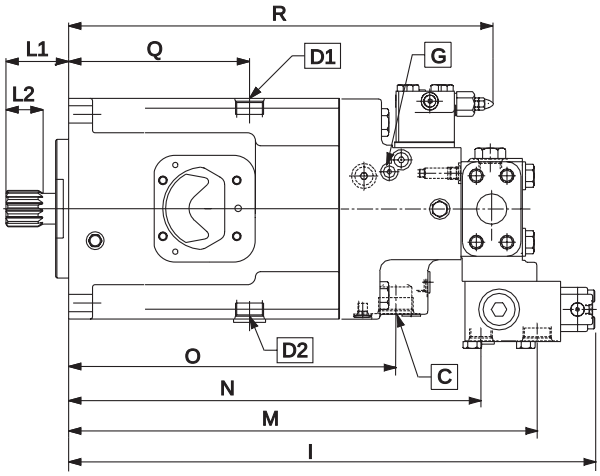
Ordering Code | Back to Content



M*F/G

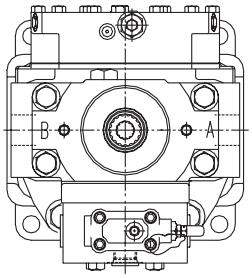


Shaft end view



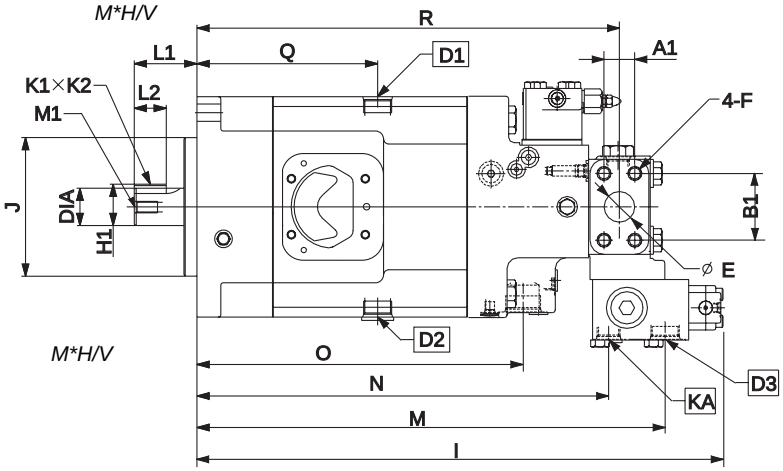
M*F/G

rear view

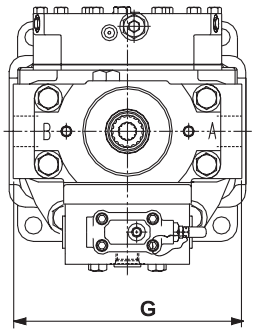


Shaft end view

M*H/V



M*H/V



rear view

M24F/G M30F/G

	SAE-F, 4 Bolts	
G	8.76 (222,4)	8.76 (222,4)
I	21.61 (548,8)	22.61 (574,2)
J	7.000 6.998 (177,80) (177,75)	7.000 6.998 (177,80) (177,75)
M	20.46 (519,6)	21.46 (545,0)
N	10.92 (277,5)	10.92 (277,5)
Q	14.62 (371,4)	14.62 (371,4)
R	7.15 (190,5)	8.51 (225,0)
S	7.51 (190,5)	8.51 (225,0)
T	9.75 (247,6)	9.75 (247,6)
V	5.52 (140.1)	5.52 (140.1)
W	6.81 (173,0)	6.81 (173,0)

M24H/V M30H/V

	SAE-F, 4 Bolts	
G	12.88 (327,2)	12.88 (327,2)
I	21.61 (548,8)	10.92 (277,5)
J	7.000 6.998 (177,80) (177,75)	7.000 6.998 (177,80) (177,75)
M	20.46 (519,6)	24.33 (618,0)
N	10.92 (277,5)	23.08 (587,2)
Q	14.62 (371,4)	10.92 (277,5)
R	7.15 (190,5)	7.15 (190,5)
S	7.15 (190,5)	7.15 (190,5)
T	9.75 (247,6)	9.75 (247,6)
V	5.52 (140,08)	5.52 (140,08)
W	6.81 (172,97)	6.81 (172,97)

NOTE: See page 20 for shaft, porting and rear drive information.
See appropriate controls mounting starting on page 21.

Shafts	Pumps/Motors	6	7	8	11	14	24	30	L1	L2	DIA	K1 x K2	H1	R
	Keyed SAE 32-1 (C)	●	●	●					2.23	1.25	1.2500-1.2494	.312-.310	1.366	M10 x 25,4
									(56,6)	(31,8)	(31,750-31,735)	(7,92-7,87)	(34,7)	
02	Keyed SAE 44-1 (E)				●	●			2.97	1.50	1.750-1.748	.437-.435	1.941	M12 x 25,4
07									*(75,4)*	*(38,1)*	*(44,45-44,40)*	*(11,10-11,05)*	*(49,30)*	
	Keyed SAE 50-1 (F)						●	●	3.47	2.25	2.0000-1.9994	.500-498	2.218	M16 x 50,8
									(88,1)	*(57,2)*	*(50,80-50,78)*	*(12,70-12,65)*	*(56,34)*	
	Splined SAE 32-4 (C)	●	●	●					2.23	1.20	side fit, 30º, class 1, 12/24p, 14 teeth			M10 x 25,4
									(56,6)	***(30,5)***				
	Splined SAE 32-4 (C) **P*R**	●	●	●					2.23	1.75	side fit, 30º, class 1, 12/24p, 14 teeth			M10 x 25,4
03									*(56,6)*	*(44,4)*				
08	Splined SAE 44-4 (E)				●	●			2.97	1.50	side fit, 30º, class 1, 8/16p, 13 teeth			M12 x 25,4
									(75,4)	*(38,1)*				
	Splined SAE 50-4 (F)						●	●	3.47	1.75	side fit, 30º, class 1, 8/16p, 13 teeth			M16 x 50,8
									(88,1)	*(44,4)*				
04	Keyed SAE 44-1 (D)	●	●	●					2.97	1.75	1.750-1.749	.437-.438	1.943	M10 x 25,4
									(75,4)	*(44,4)*	*(44,45-44,40)*	*(11,10-11,13)*	*(49,35)*	
	Splined SAE 44-4 (D)	●	●	●					2.97	1.70	side fit, 30º, class 1, 8/16p, 13 teeth			M10 x 25,4

PORTS		DIMENSIONS			THREADS	PORTS								
		E	A1	B1	F	V	D1,D2	D3	C	K	KA	G	H	J
P6,7,8V	A	2.00 (50,8)	1.44 (36,6)	3.12 (79,2)	1/2-13 X 1.05	SAE-4	SAE-12	NA	SAE-16	SAE-16	NA	SAE-8	SAE-8	NA
	B	1.50 (38,1)	3.06 (77,7)	1.68 (42.7)	5/8-11 X 1.38									
P6,7,8*	A&B	1.50 (38,1)	1.44 (36,6)	3.12 (79,2)	5/8-11 X 1.38	SAE-4	SAE-12	SAE-16	SAE-16	NA	SAE-12	SAE-8	SAE-8	NA
P11,14V	A	2.50 (63,5)	2.00 (50,8)	3.50 (88,9)	1/2-13 X 1.19	SAE-8	SAE-16	NA	SAE-20	SAE-16	NA	SAE-4	NA	NA
P11,14*	A&B	1.50 (38,1)	1.44 (36,6)	3.12 (79,2)	5/8-11 X 1.31	SAE-4	SAE-16	SAE-16	SAE-20	SAE-12(P*R)	SAE-12	SAE-4	NA	SAE-10(P*P)
P24,30*	A&B	2.00 (50,8)	1.75 (44,5)	3.82 (97,0)	3/4-10 X 1.50	SAE-4	SAE-20	SAE-16	See Below	SAE-16	SAE-12	SAE-12	NA	NA
	C	2.00 (50,8)	1.68 (42,7)	3.06 (77,7)	1/2-13 X 1.06									
P6,7,8F	A	2.00 (50,8)	1.44 (36,6)	3.12 (79,2)	1/2-13 X 1.06	NA	SAE-12	NA	NA	NA	NA	NA	NA	NA
	B	1.50 (38,1)	1.44 (36,6)	3.12 (79,2)	5/8-11 X 1.31									
P6,7,8L	A&B	1.50 (38,1)	3.12 (79,2)	1.44 (36,6)	5/8-11 X 1.31	SAE-4	SAE-12	NA	NA	SAE-12	SAE-12	SAE-8	SAE-8	NA
M6,7,8F,G,H,V	A	2.00 (50,8)	1.44 (36.6)	3.12 (79.2)	5/8-11 X 1.38	NA	SAE-12	NA	NA	NA	NA	NA	NA	NA
M11,14F,G,H,V	A&B	1.50 (38,1)	1.44 (36,6)	3.12 (79,2)	5/8-13 X 1.31	NA	SAE-16	NA	NA	NA	NA	NA	NA	NA
M24,30F,G,H,V	A&B	2.00 (50,8)	1.75 (44,5)	3.81 (96,8)	3/4-10 X 1.50	NA	SAE-20	NA	NA	NA	NA	NA	NA	NA
P6,7,8R	A&B	1.50 (38,1)	3.12 (79,2)	1.44 (36,6)	5/8-11 X 1.31	SAE-4	SAE-12	SAE-16	NA	SAE-16	SAE-12	SAE-8	SAE-4	NA

Rear drives .....(P6P-02R1C-8A2-A00-0**B**1-M2

		SAE Mounting & Coupling							
Mounting	**None / plugged**	**82-2 (A)**	**101-2 (B)**	**101-4 (B)**	**127-2 (C)**	**127-4 (C)**	**152-4 (D)**	**165-4 (E)**	**177-4 (F)**
coupling		**16-4 (A)**	**22-4 (B)**	**22-4 (B)**	**32-4 (C)**	**32-4 (C)**	**44-4 (D)**	**44-4 (E)**	**50-4 (F)**
P6,7,8	0	A	B	-	-	-	-	-	-
P6,7,8 R,L	0	A	B	-	C	-	-	-	-
P11,14	0	A	B	-	-	-	-	-	-
P11,14 R,L	0	A	B	-	C	C	D	E	-
P24,30	0	-	B	-	C	-	-	-	-
P24,30 R,L	0	-	B	B	C	C	D	E	F

NOTE: For more detail information refer to the individual pump installation drawings.
These are available on CD contact your nearest sales representative or distributor.

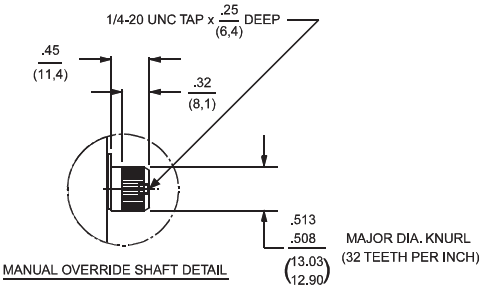
102 CONTROL

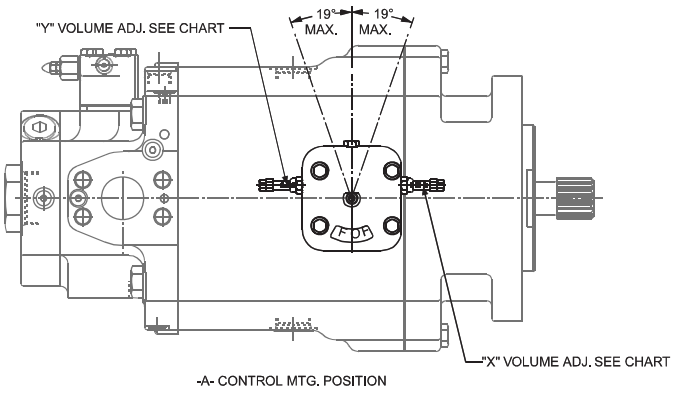
CONTROL MOUNTING POSITION
SHOWN ON P24 PUMP
REF. DWG. 23-9933

NOTES
PUMP ROTATION IS VIEWED FROM SHAFT END

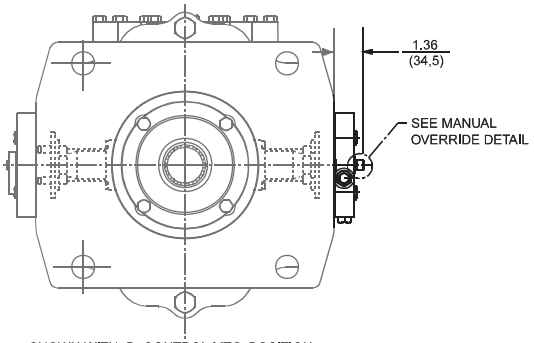
-A- CONTROL MTG.						
CONTROL OPTION	PUMP ROT.	ROTARY SERVO SPRG. OFF-SET TO	PORT 'A'	PORT 'B'	'X' VOLUME	'Y' VOLUME
"102"	C	CCW ROT. FULL TO	INLET	OUTLET	MAX. VOLUME	MIN. VOLUME
	CC	CW ROT. FULL TO	INLET	OUTLET	MIN. VOLUME	MAX. VOLUME

-B- CONTROL MTG.						
CONTROL OPTION	PUMP ROT.	ROTARY SERVO SPRG. OFF-SET TO	PORT 'A'	PORT 'B'	'X' VOLUME	'Y' VOLUME
"102"	C	CW ROT. FULL TO	INLET	OUTLET	MIN. VOLUME	MAX. VOLUME
	CC	CCW ROT. FULL TO	INLET	OUTLET	MAX. VOLUME	MIN. VOLUME





-A- CONTROL MTG. POSITION



SHOWN WITH -B- CONTROL MTG. POSITION

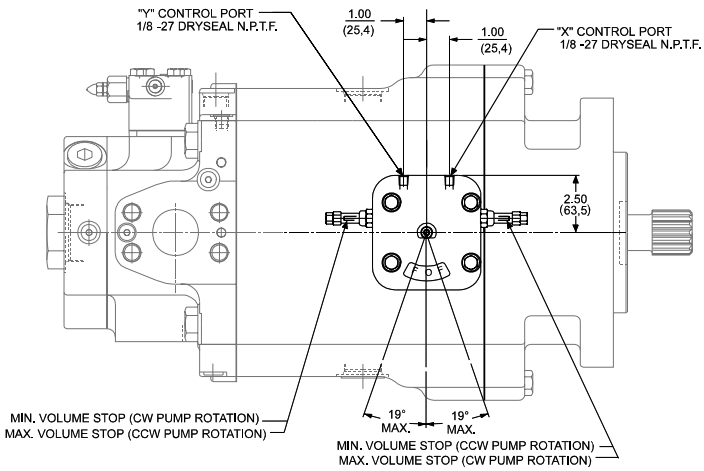
2A2 CONTROL

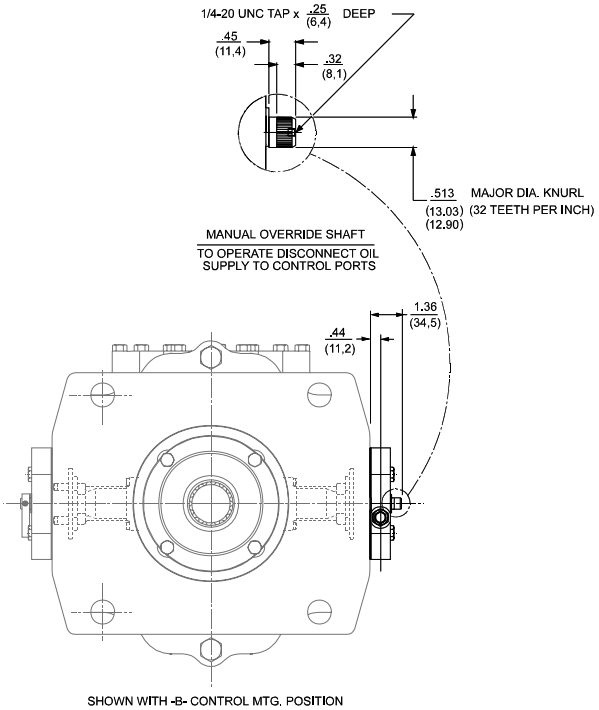
CONTROL MOUNTING POSITION
SHOWN ON P24 PUMP
REF. DWG. 23-9934

NOTES
PUMP ROTATION IS AS VIEWED FROM SHAFT END.

-A- CONTROL MTG. POSITION						
CONTROL OPTION	PUMP ROT.	CONTROL PRESSURE TO: PORT "X"	CONTROL PRESSURE TO: PORT "Y"	MANUAL OVERRIDE SHAFT ROTATION	PORT "A"	PORT "B"
"2A2" (SPRING OFFSET TO ZERO)	CW	MIN. VOLUME	MAX. VOLUME	CCW	INLET	OUTLET
	CCW	MAX. VOLUME	MIN. VOLUME	CW	INLET	OUTLET

-B- CONTROL MTG. POSITION						
CONTROL OPTION	PUMP ROT.	CONTROL PRESSURE TO: PORT "X"	CONTROL PRESSURE TO: PORT "Y"	MANUAL OVERRIDE SHAFT ROTATION	PORT "A"	PORT "B"
"2A2" (SPRING OFFSET TO ZERO)	CW	MAX. VOLUME	MIN. VOLUME	CCW	INLET	OUTLET
	CCW	MIN. VOLUME	MAX. VOLUME	CW	INLET	OUTLET





SHOWN WITH -B- CONTROL MTG. POSITION

NOTE: For dimensions & port identifications not shown see the appropriate basic pump installation starting on page 10.

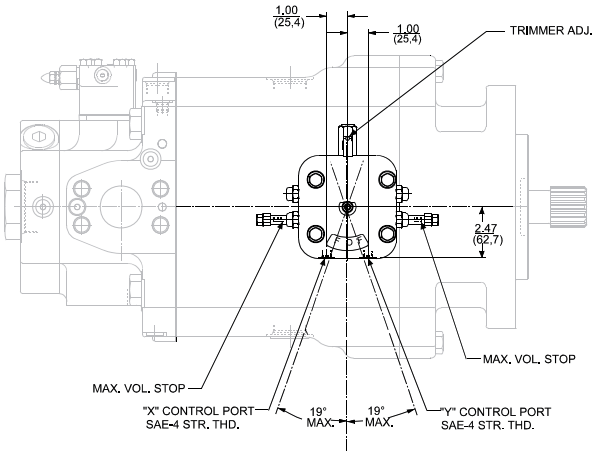
2H2 CONTROL

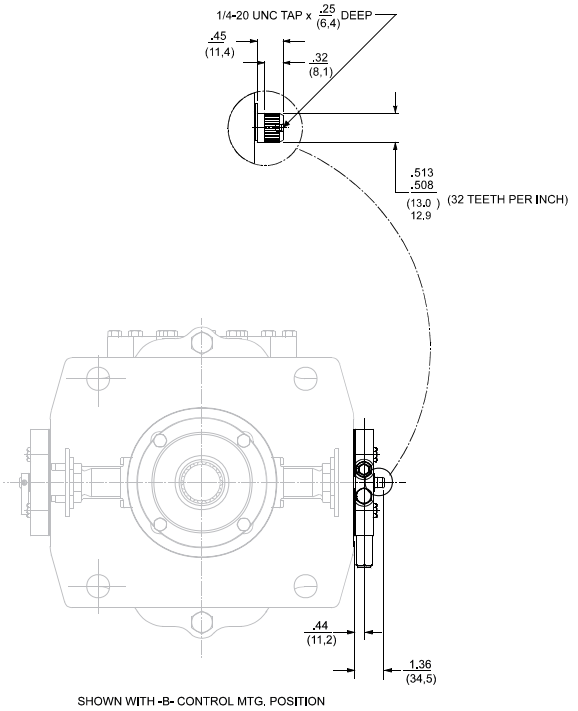
CONTROL MOUNTING POSITION
SHOWN ON P24 PUMP
REF. DWG. 23-9926

NOTES
PUMP ROTATION IS AS VIEWED FROM SHAFT END.

-A- CONTROL MTG.					
CONTROL OPTION	PUMP ROT.	CONTROL PRESSURE CONTROL	MANUAL SHAFT	PORT 'A'	PORT 'B'
"2H2"	CW	'X'	CCW	OUTLET	INLET
	CCW	'Y'	CW	OUTLET	INLET
	CW	'Y'	CW	INLET	OUTLET
	CCW	'X'	CCW	INLET	OUTLET

-B- CONTROL MTG.					
CONTROL OPTION	PUMP ROT.	CONTROL PRESSURE CONTROL	MANUAL SHAFT	PORT 'A'	PORT 'B'
"2H2"	CW	'X'	CCW	INLET	OUTLET
	CCW	'Y'	CW	INLET	OUTLET
	CW	'Y'	CW	OUTLET	INLET
	CCW	'X'	CCW	OUTLET	INLET





SHOWN WITH -B- CONTROL MTG. POSITION

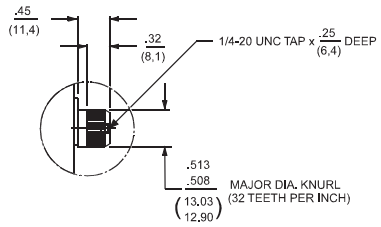
4A2 CONTROL

CONTROL MOUNTING POSITION
SHOWN ON P24 PUMP
REF. DWG. 23-9927

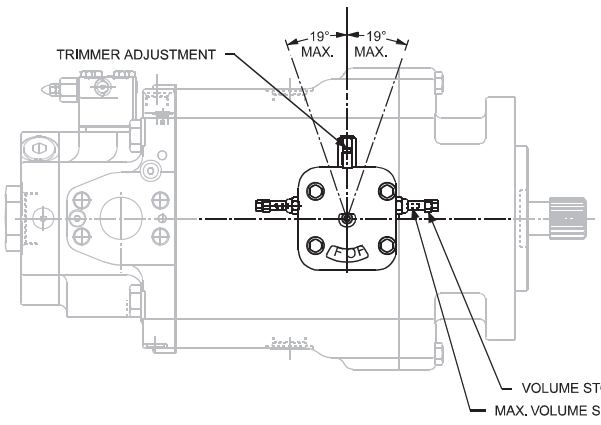
NOTES
PUMP ROTATION IS AS VIEWED FROM SHAFT END.

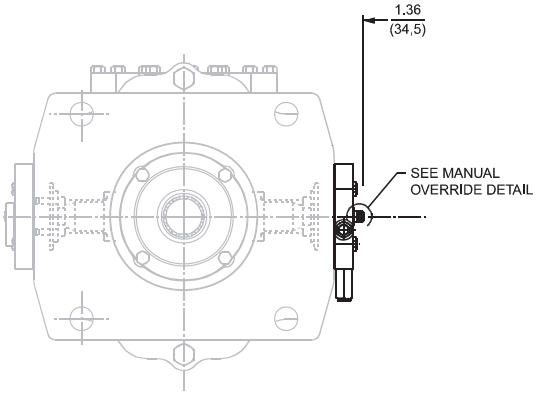
-A- CONTROL MTG. POSITION				
CONTROL OPTION	PUMP ROT.	ROTARY SERVO INPUT SHAFT ROTATION	PORT 'A'	PORT 'B'
"4A2"	CW	CW	INLET	OUTLET
	CCW	CCW	INLET	OUTLET
	CW	CCW	OUTLET	INLET
	CCW	CW	OUTLET	INLET

-B- CONTROL MTG. POSITION				
CONTROL OPTION	PUMP ROT.	ROTARY SERVO INPUT SHAFT ROTATION	PORT 'A'	PORT 'B'
"4A2"	CW	CCW	INLET	OUTLET
	CCW	CW	INLET	OUTLET
	CW	CW	OUTLET	INLET
	CCW	CCW	OUTLET	INLET



MANUAL OVERRIDE SHAFT DETAIL





SHOWN WITH -B- CONTROL MTG. POSITION

NOTE: For dimensions & port identifications not shown see the appropriate basic pump installation starting on page 10.

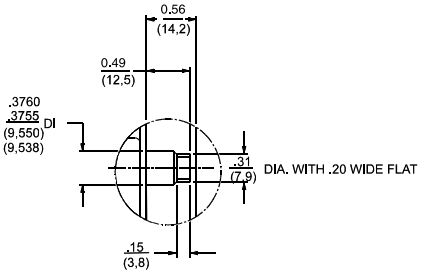
5A2 CONTROL

CONTROL MOUNTING POSITION
SHOWN ON P24 PUMP
REF. DWG. 23-9914

-A- CONTROL MTG. POSITION				
CONTROL OPTION	PUMP ROT.	ROTARY SERVO INPUT SHAFT ROTATION	PORT 'A'	PORT 'B'
"5A2"	CW	CW	INLET	OUTLET
	CCW	CCW	INLET	OUTLET
	CW	CCW	OUTLET	INLET
	CCW	CW	OUTLET	INLET

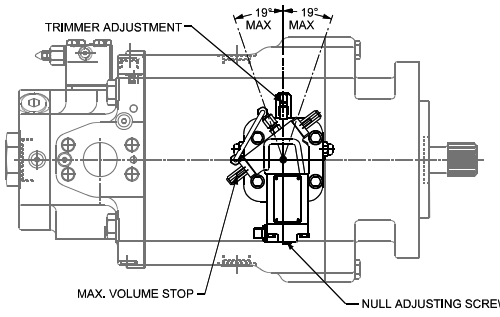
-B- CONTROL MTG. POSITION				
CONTROL OPTION	PUMP ROT.	ROTARY SERVO INPUT SHAFT ROTATION	PORT 'A'	PORT 'B'
"5A2"	CW	CCW	INLET	OUTLET
	CCW	CW	INLET	OUTLET
	CW	CW	OUTLET	INLET
	CCW	CCW	OUTLET	INLET

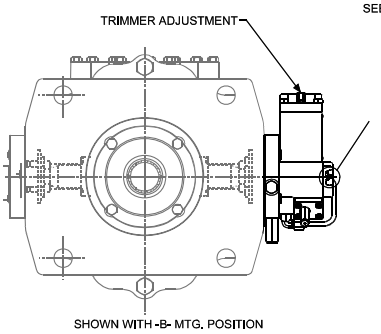
NOTES
PUMP ROTATION IS AS VIEWED FROM SHAFT END

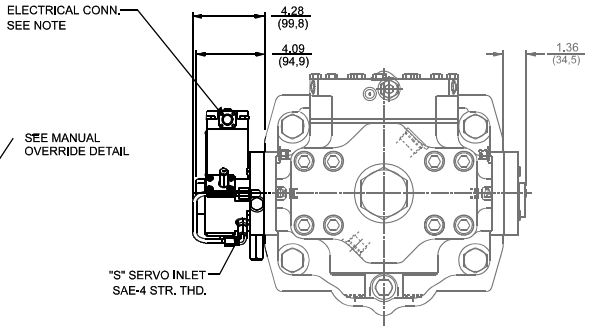


NOTE:
ELECT. RECEPTACLE CONN. 5/8-24 UNEF x .390 (9,91)
MATING CONNECTOR HALF, MS3106E-10SL-4S

MANUAL OVERRIDE DETAIL
TO OPERATE, DISCONNECT OIL SUPPLY TO SERVO, "S", INLET PORT.
DO NOT EXCEED 50in/lbs (6 N.m) TORQUE.







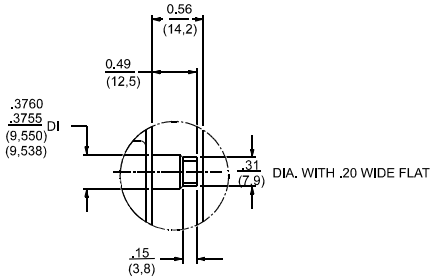
5C2 CONTROL

CONTROL MOUNTING POSITION
SHOWN ON P24 PUMP
REF. DWG. 23-9936

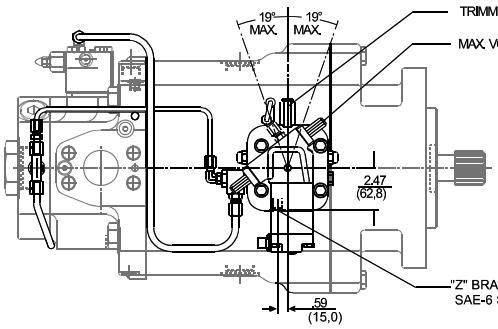
-A- CONTROL MTG. POSITION				
CONTROL OPTION	PUMP ROT.	ROTARY SERVO INPUT SHAFT ROTATION	PORT 'A'	PORT 'B'
"5C2"	CW	CW	INLET	OUTLET
	CCW	CCW	INLET	OUTLET
	CW	CCW	OUTLET	INLET
	CCW	CW	OUTLET	INLET

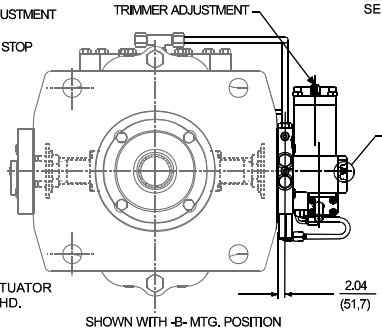
-B- CONTROL MTG. POSITION				
CONTROL OPTION	PUMP ROT.	ROTARY SERVO INPUT SHAFT ROTATION	PORT 'A'	PORT 'B'
"5C2"	CW	CCW	INLET	OUTLET
	CCW	CW	INLET	OUTLET
	CW	CW	OUTLET	INLET
	CCW	CCW	OUTLET	INLET

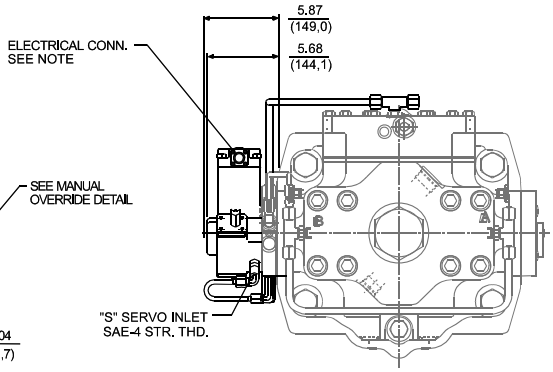
NOTES
PUMP ROTATION IS AS VIEWED FROM SHAFT END



MANUAL OVERRIDE DETAIL
TO OPERATE, DISCONNECT OIL SUPPLY TO SERVO, "S", INLET PORT.
DO NOT EXCEED 50in/lbs (6 N.m) TORQUE.







NOTE: For dimensions & port identifications not shown see the appropriate basic pump installation starting on page 10.

7D2, 7E2 CONTROL

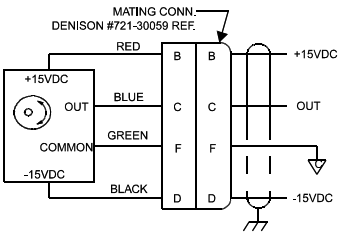
CONTROL MOUNTING POSITION
SHOWN ON P24 PUMP
7D2 REF. DWG. 23-9928
7E2 REF. DWG. 23-9923

-A- CONTROL MTG. POSITION				
CONTROL OPTION	PUMP ROT.	VOLUME INDICATOR SHAFT ROTATION	PORT 'A'	PORT 'B'
"7D2" "7E2"	CW	CW	INLET	OUTLET
	CCW	CCW	INLET	OUTLET
	CW	CCW	OUTLET	INLET
	CCW	CW	OUTLET	INLET

-B- CONTROL MTG. POSITION				
CONTROL OPTION	PUMP ROT.	VOLUME INDICATOR SHAFT ROTATION	PORT 'A'	PORT 'B'
"7D2" "7E2"	CW	CCW	INLET	OUTLET
	CCW	CW	INLET	OUTLET
	CW	CW	OUTLET	INLET
	CCW	CCW	OUTLET	INLET

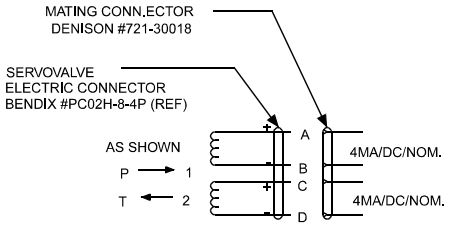
NOTE:
ELECT. RECEPTACLE CONN. 5/8-24 UNEF x .390 (9,91)
MATING CONNECTOR HALF, MS3106E-10SL-4S

NOTES
PUMP ROTATION IS AS VIEWED FROM SHAFT END.



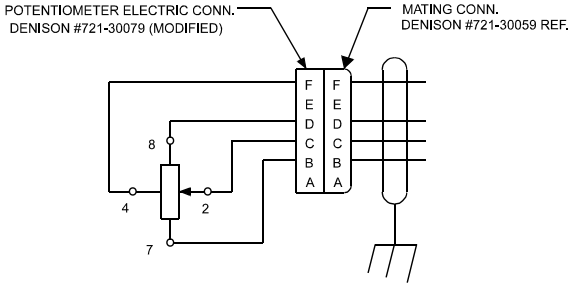
RVDT WIRING SCHEMATIC

DENISON #788-20002
2.4VDC OUT AT 19° CAM ANGLE



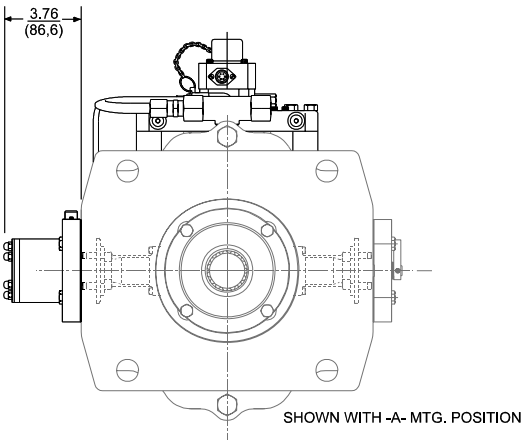
SERVOVALVE WIRING SCHEMATIC

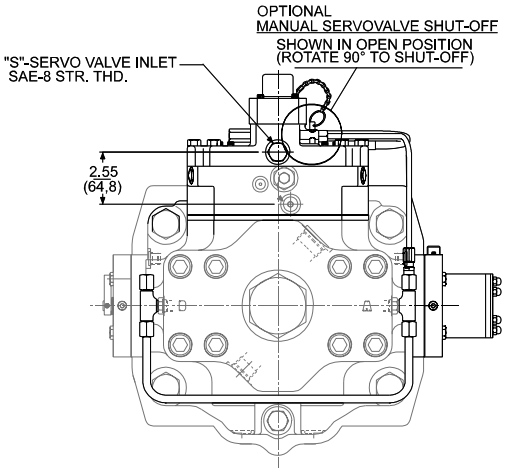
DENISON #099-13142

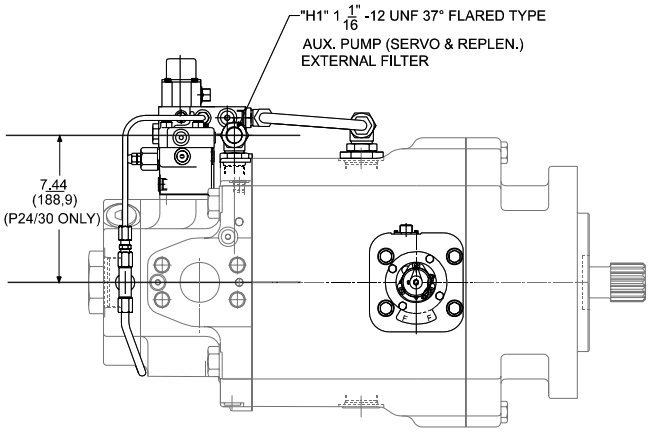


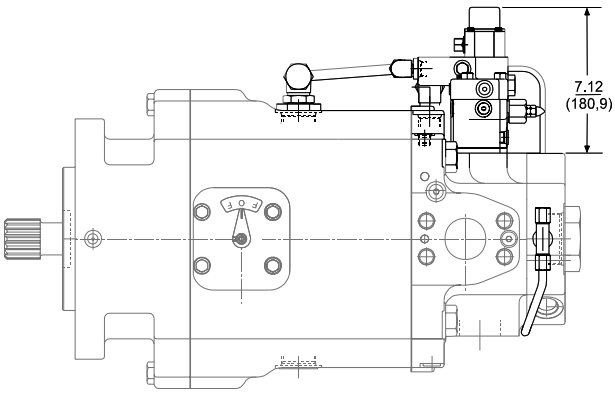
POTENTIOMETER WIRING SCHEMATIC

DENISON #037-44092









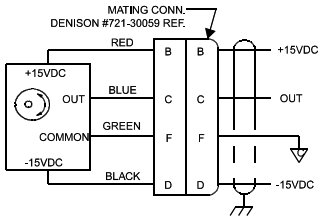
NOTE: For dimensions & port identifications not shown see the appropriate basic pump installation starting on page 10.

7P2 CONTROL

HI-IQ & 4DC01
"B" CONTROL MOUNTING POSITION
CW/CCW, SHOWN ON P6 PUMP
REF. DWG. 23-10132

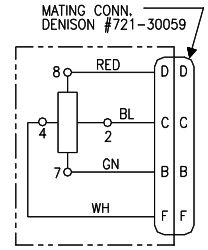
NOTES
PUMP ROTATION IS AS VIEWED FROM SHAFT END.

-B- SIDE INPUT CONTROL					
CONTROL OPTION	PUMP ROT.	ENERGIZE SOLENOID	VOL. INDICATOR ROTATION	PORT 'A'	PORT 'B'
SPECIAL "7P2"	CW	B	CCW	INLET	OUTLET
	CCW	A	CW	INLET	OUTLET
	CW	A	CW	OUTLET	INLET
	CCW	B	CCW	OUTLET	INLET

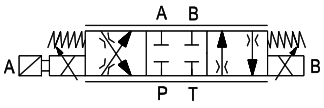


RVDT WIRING SCHEMATIC

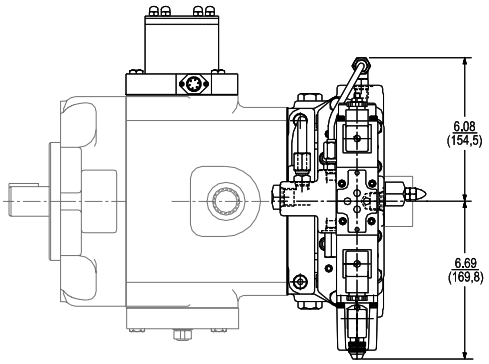
DENISON #788-20002
2.4VDC OUT AT 19° CAM ANGLE

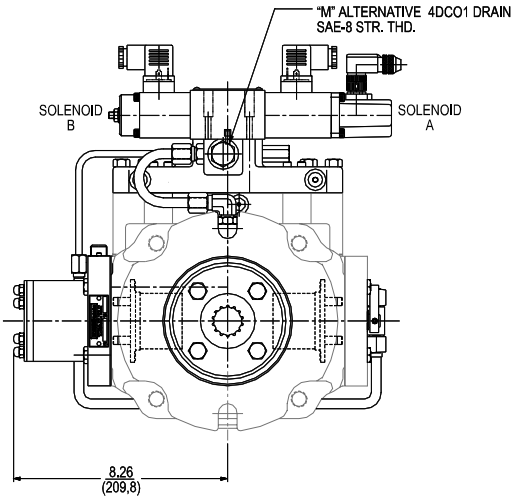


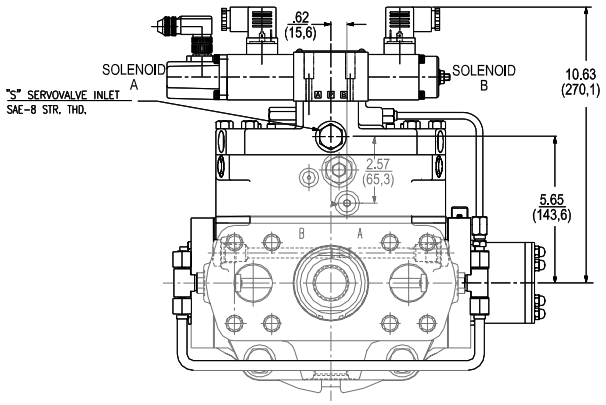
POTENTIOMETER DIAGRAM

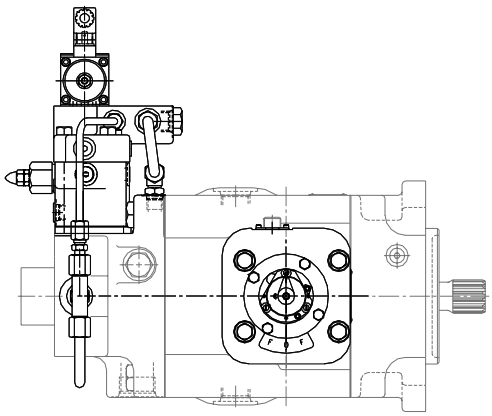


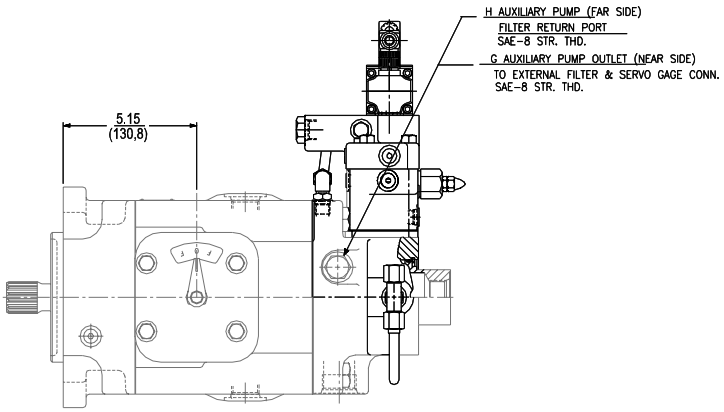
4DC01 HYDRAULIC DIAGRAM











NOTE: For dimensions & port identifications not shown see the appropriate basic pump installation starting on page 10.

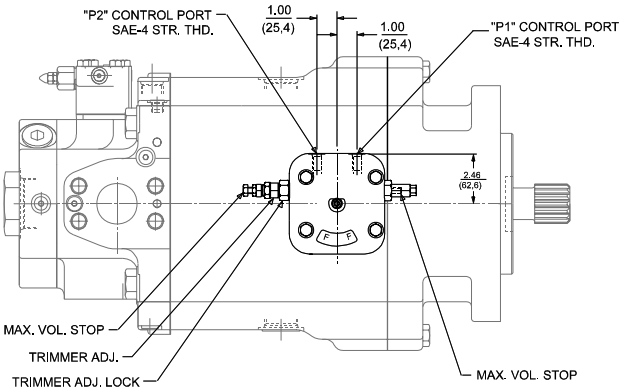
8A2 CONTROL

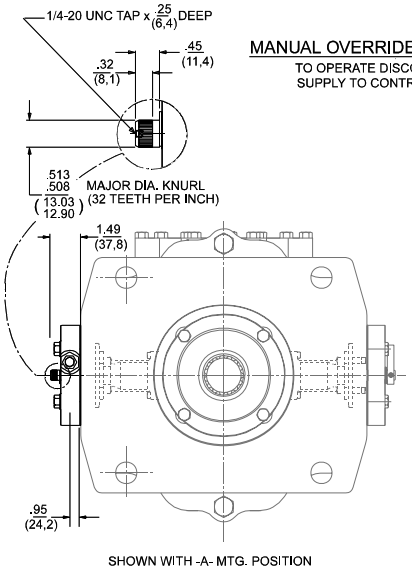
CONTROL MOUNTING POSITION
SHOWN ON P24 PUMP
REF. DWG. 23-9915

NOTES
PUMP ROTATION IS AS VIEWED FROM SHAFT END.

-A- CONTROL MTG. POSITION					
CONTROL OPTION	PUMP ROT.	CONTROL PRESSURE TO SAE-4 STR THD CONTROL PORT	MANUAL OVERRIDE SHAFT ROTATION	PORT "A"	PORT "B"
"8A2"	CW	"PI"	CCW	OUTLET	INLET
	CCW	"P2"	CW	OUTLET	INLET
	CW	"P2"	CW	INLET	OUTLET
	CCW	"P1"	CCW	INLET	OUTLET

-B- CONTROL MTG. POSITION					
CONTROL OPTION	PUMP ROT.	CONTROL PRESSURE TO SAE-4 STR THD CONTROL PORT	MANUAL OVERRIDE SHAFT ROTATION	PORT "A"	PORT "B"
"8A2"	CW	"PI"	CCW	INLET	OUTLET
	CCW	"P2"	CW	INLET	OUTLET
	CW	"P2"	CW	OUTLET	INLET
	CCW	"P1"	CCW	OUTLET	INLET





MANUAL OVERRIDE SHAFT DETAIL
TO OPERATE DISCONNECT OIL SUPPLY TO CONTROL PORTS

SHOWN WITH -A- MTG. POSITION

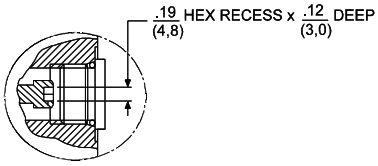
9A2 CONTROL

CONTROL MOUNTING POSITION
SHOWN ON P24 PUMP
REF. DWG. 23-9920

NOTES
PUMP ROTATION IS AS VIEWED FROM SHAFT END.

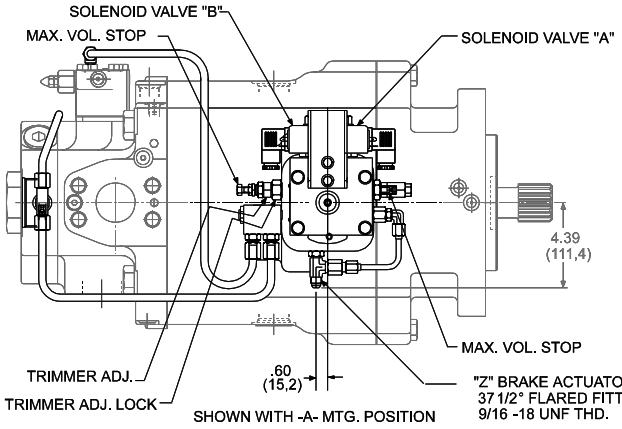
-B- CONTROL MTG POSITION					
CONTROL OPTION	PUMP ROT.	ENERGIZE SOLENOID	MANUAL OVERIDE SHAFT ROTATION	PORT "A"	PORT "B"
"9A2"	CW	"A"	CCW	INLET	OUTLET
	CCW	"B"	CW	INLET	OUTLET
	CW	"A"	CW	OUTLET	INLET
	CCW	"B"	CCW	OUTLET	INLET

-A- CONTROL MTG POSITION					
CONTROL OPTION	PUMP ROT.	ENERGIZE SOLENOID	MANUAL OVERIDE SHAFT ROTATION	PORT "A"	PORT "B"
"9A2"	CW	"B"	CCW	OUTLET	INLET
	CCW	"A"	CW	OUTLET	INLET
	CW	"A"	CW	INLET	OUTLET
	CCW	"B"	CCW	INLET	OUTLET

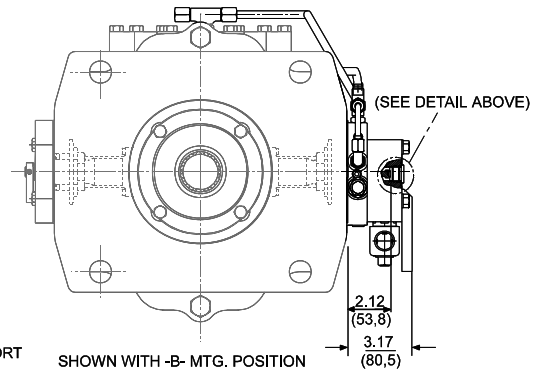


MANUAL OVERRIDE SHAFT

MATING CONNECTOR DIN 43650 TYPE AF
TWO (2) SUPPLIED WITH CONNECTORS



SHOWN WITH -A- MTG. POSITION



SHOWN WITH -B- MTG. POSITION

NOTE: For dimensions & port identifications not shown see the appropriate basic pump installation starting on page 10.

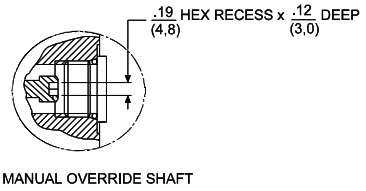
9C2 CONTROL

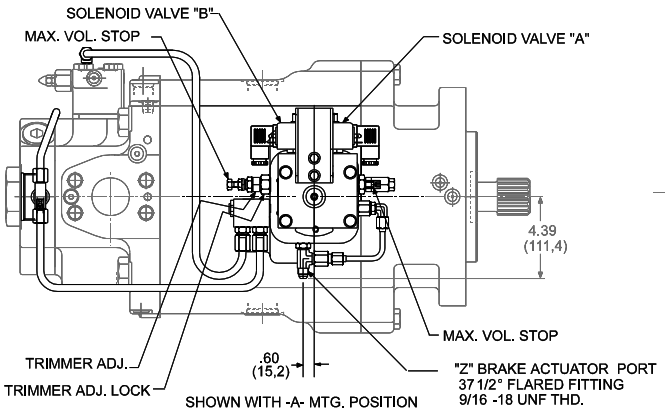
CONTROL MOUNTING POSITION
SHOWN ON P24 PUMP
REF. DWG. 23-10005

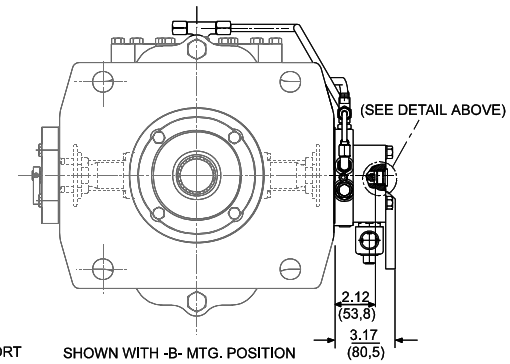
NOTES
PUMP ROTATION IS AS VIEWED FROM SHAFT END.

-A- CONTROL MTG POITION					
CONTROL OPTION	PUMP ROT.	ENERGIZE SLOENOID:	MANUAL OVERIDE SHAFT ROTATION	PORT "A"	PORT "B"
"9C2"	CW	"B"	CCW	OUTLET	INLET
	CCW	"A"	CW	OUTLET	INLET
	CW	"A"	CW	INLET	OUTLET
	CCW	"B"	CCW	INLET	OUTLET

-B- CONTROL MTG POITION					
CONTROL OPTION	PUMP ROT.	ENERGIZE SLOENOID:	MANUAL OVERIDE SHAFT ROTATION	PORT "A"	PORT "B"
"9C2"	CW	"A"	CCW	INLET	OUTLET
	CCW	"B"	CW	INLET	OUTLET
	CW	"B"	CW	OUTLET	INLET
	CCW	"A"	CCW	OUTLET	INLET







MATING CONNECTOR DIN 43650 TYPE AF
TWO (2) SUPPLIED WITH CONNECTORS

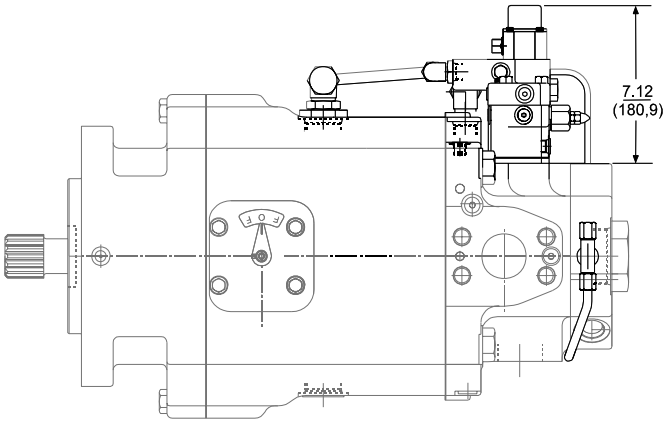
**2 CONTROL

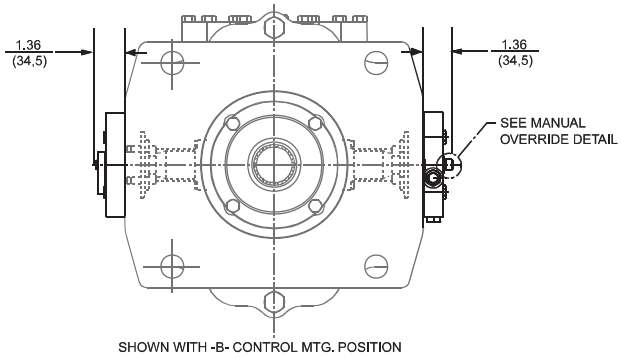
TYPICAL INDICATOR
CONTROL MOUNTING POSITION
SHOWN ON P24 PUMP
REF. DWG. 23-9933

NOTES
PUMP ROTATION IS AS VIEWED FROM SHAFT END.

-A- CONTROL MTG.						
CONTROL OPTION	PUMP ROT.	ROTARY SERVO SPRG. OFF-SET TO	PORT 'A'	PORT 'B'	'X' VOLUME	'Y' VOLUME
**2	C	CCW ROT. FULL TO	INLET	OUTLET	MAX. VOLUME	MIN. VOLUME
	CC	CW ROT. FULL TO	INLET	OUTLET	MIN. VOLUME	MAX. VOLUME

-B- CONTROL MTG.						
CONTROL OPTION	PUMP ROT.	ROTARY SERVO SPRG. OFF-SET TO	PORT 'A'	PORT 'B'	'X' VOLUME	'Y' VOLUME
**2	C	CW ROT. FULL TO	INLET	OUTLET	MIN. VOLUME	MAX. VOLUME
	CC	CCW ROT. FULL TO	INLET	OUTLET	MAX. VOLUME	MIN. VOLUME





NOTE: For dimensions & port identifications not shown see the appropriate basic pump installation starting on page 10.

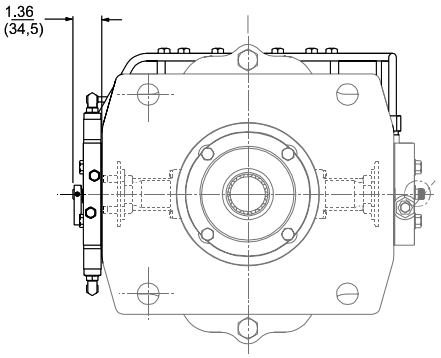
**4 CONTROL

TYPICAL TORQUE LIMITER
CONTROL MOUNTING POSITION
SHOWN ON P24 PUMP WITH 18A CONTROL
REF. DWG. 23-9921

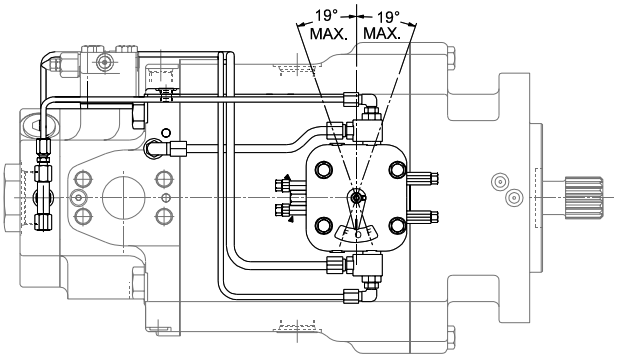
NOTES
PUMP ROTATION IS AS VIEWED FROM SHAFT END.

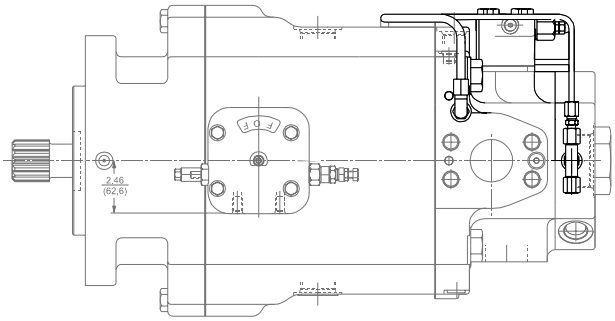
-A- CONTROL MTG. POSITION						
CONTROL OPTION	PUMP ROT.	CONTROL PRESSURE TO SAE-4 STR. THD. CONTROL PORT	MANUAL OVERRIDE SHAFT ROTATION	PORT 'A'	PORT 'B'	TORQUE LIMITER ADJUSTMENT
**4	CW	"P1"	CCW	OUTLET	INLET	F
	CW	"P2"	CW	INLET	OUTLET	E

-B- CONTROL MTG. POSITION						
CONTROL OPTION	PUMP ROT.	CONTROL PRESSURE TO SAE-4 STR. THD. CONTROL PORT	MANUAL OVERRIDE SHAFT ROTATION	PORT 'A'	PORT 'B'	TORQUE LIMITER ADJUSTMENT
**4	CW	"P1"	CCW	INLET	OUTLET	F
	CW	"P2"	CW	OUTLET	INLET	E



SHOWN WITH -B- MTG. POSITION & CW ROTATION





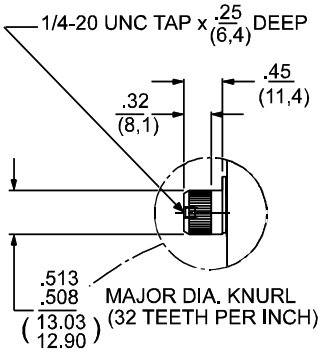
2A0 CONTROL

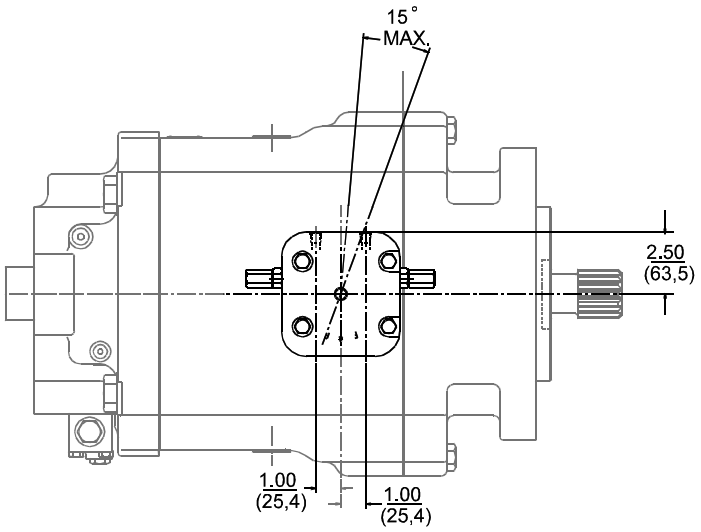
ROTARY SERVO,
SPG. OFFSET TO FULL, 1-SIDE CTR.
CONTROL MOUNTING POSITION
SHOWN ON M24 MOTOR
REF. DWG. 23-9752

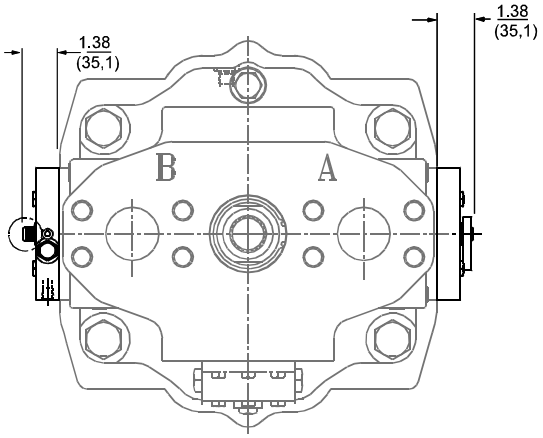
NOTES
PUMP ROTATION IS AS VIEWED FROM SHAFT END.

-A- CONTROL MTG. POSITION				
SPRING OFF SET TO FULL DISPLACEMENT (REDUCED SPEED)				
MOTOR ROT.	PORT "A"	PORT "B"	PRESSURE TO PORT "X" (1/8-27 DRYSEAL NPTF)	PRESSURE TO PORT "Y" (1/8-27 DRYSEAL NPTF)
CW	INLET	OUTLET	FULL SPEED	REDUCED SPEED
CCW	OUTLET	INLET		

-B- CONTROL MTG. POSITION				
SPRING OFF SET TO FULL DISPLACEMENT (REDUCED SPEED)				
MOTOR ROT.	PORT "A"	PORT "B"	PRESSURE TO PORT "Y" (1/8-27 DRYSEAL NPTF)	PRESSURE TO PORT "X" (1/8-27 DRYSEAL NPTF)
CW	INLET	OUTLET	REDUCED SPEED	FULL SPEED
CCW	OUTLET	INLET		







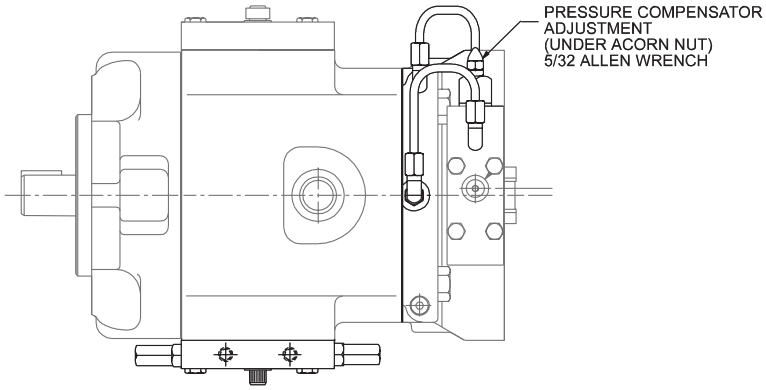
SHOWN WITH -B- MTG. POSITION

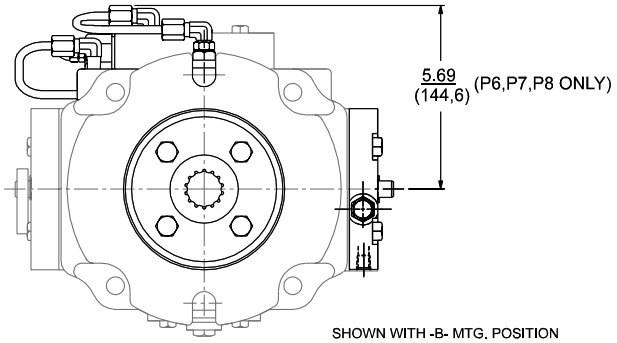
NOTE: For dimensions & port identifications not shown see the appropriate basic pump installation starting on page 10.

****5 CONTROL**
REVERSE COMPENSATOR,
A OR B INLET, CCW/CW ROTATION
CONTROL MOUNTING POSITION
SHOWN ON M6 MOTOR
REF. DWG. 23-9784

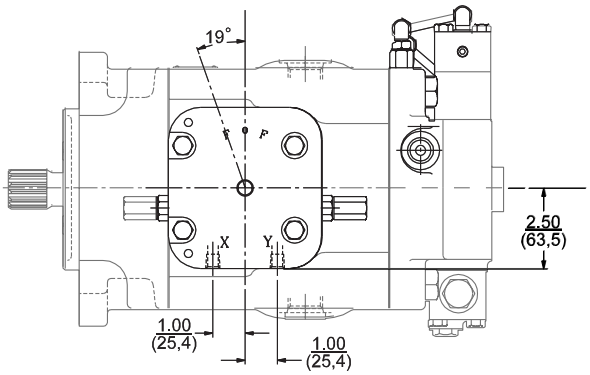
NOTES
PUMP ROTATION IS AS VIEWED FROM SHAFT END.

-B- CONTROL MTG. POSITION					
SPRING OFF SET TO FULL DISPLACEMENT (MIN. SPEED)					ROTARY SHAFT ROT. FOR MIN. DISPL. (MAX SPEED)
MOTOR ROT.	PORT "A"	PORT "B"	PRESSURE TO PORT "X"	PRESSURE TO PORT "Y"	
CW	INLET	OUTLET	REDUCED SPEED	FULL SPEED	CW
CCW	OUTLET	INLET	REDUCED SPEED	FULL SPEED	CW



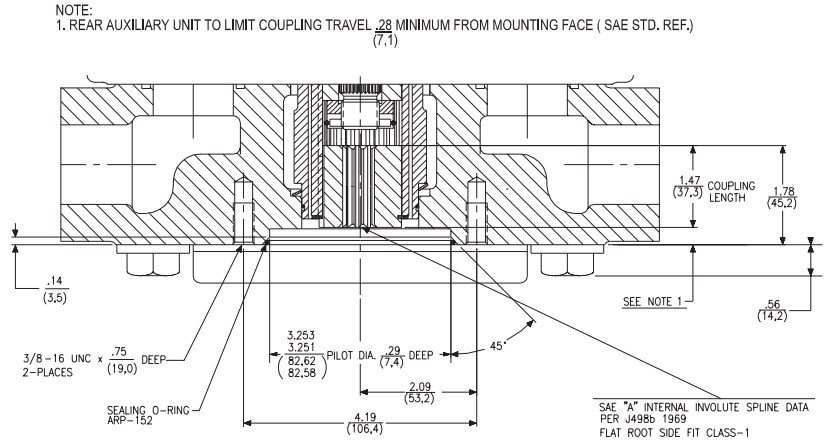


SHOWN WITH -B- MTG. POSITION

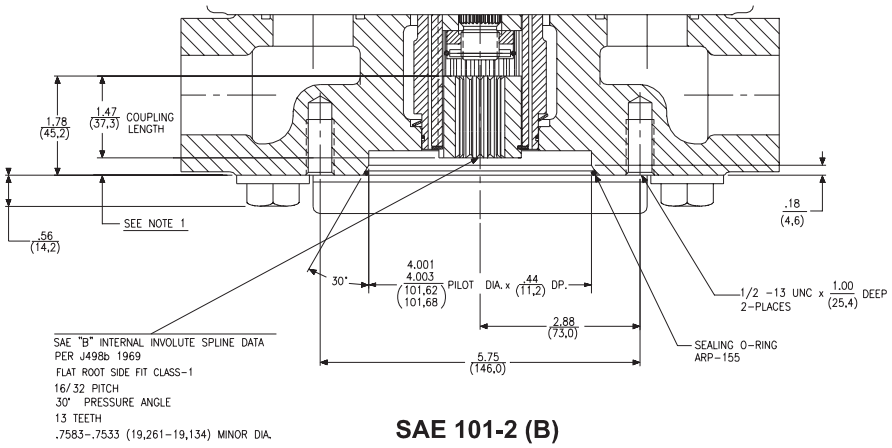


NOTE: For dimensions & port identifications not shown see the appropriate basic pump installation starting on page 10.

P6-8, R,L
P6-14 P,S,
SAE 82-2 (A) WITH COUPLING 16-4
SAE 101-2 (B) WITH COUPLING 22-4

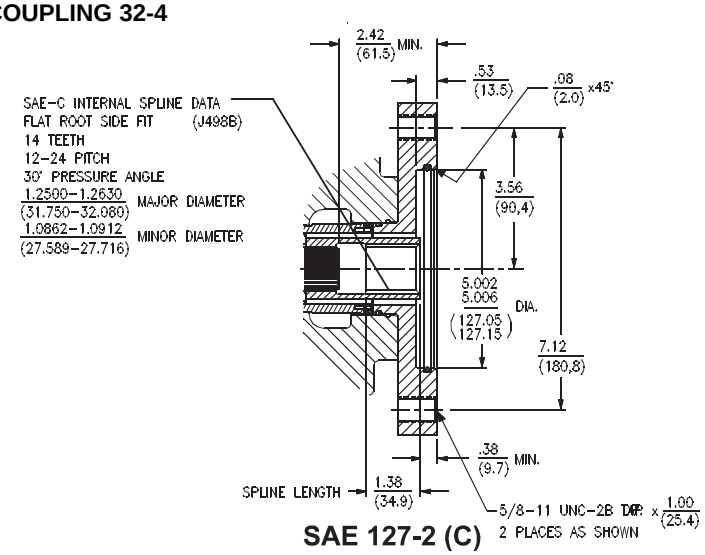


SAE 82-2 (A)



SAE 101-2 (B)

P6,7,8, R,L
SAE 127-2 (C) WITH COUPLING 32-4



SAE 127-2 (C)

P11,14 R,L
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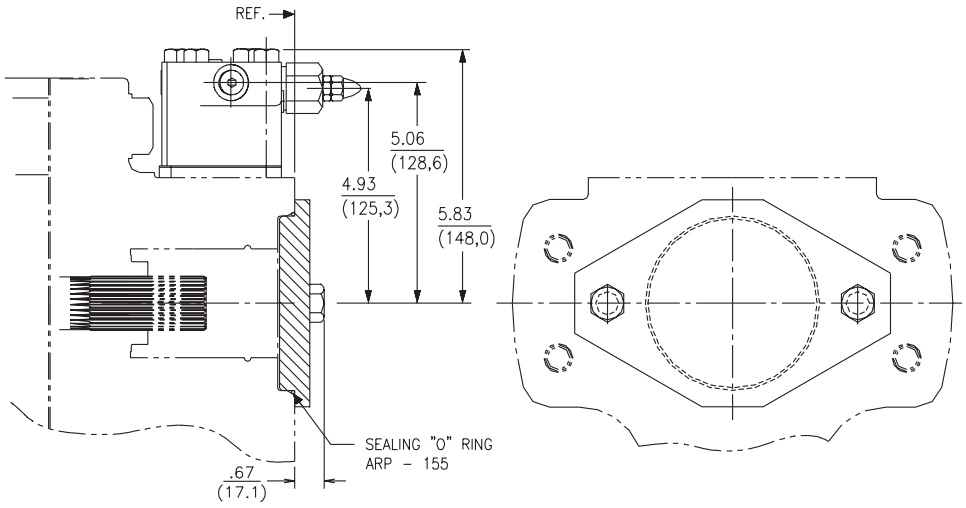
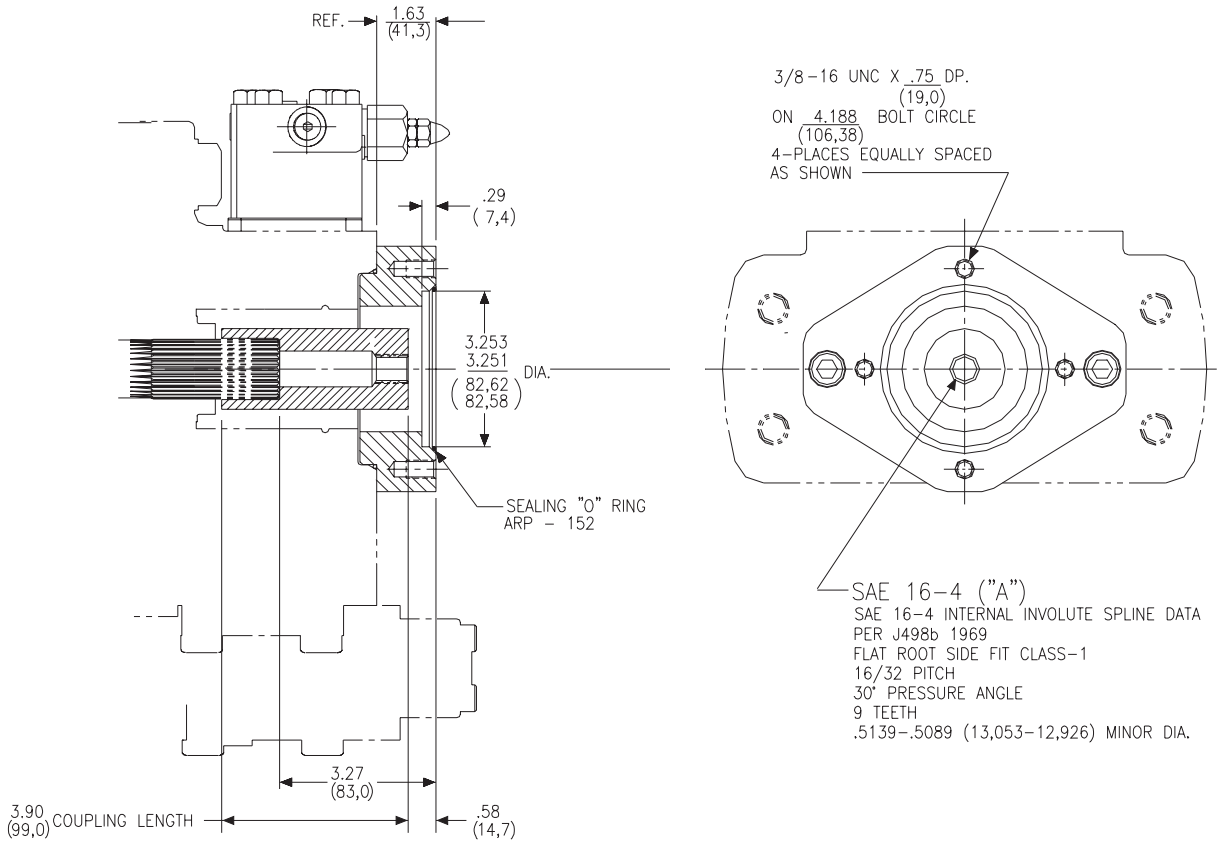
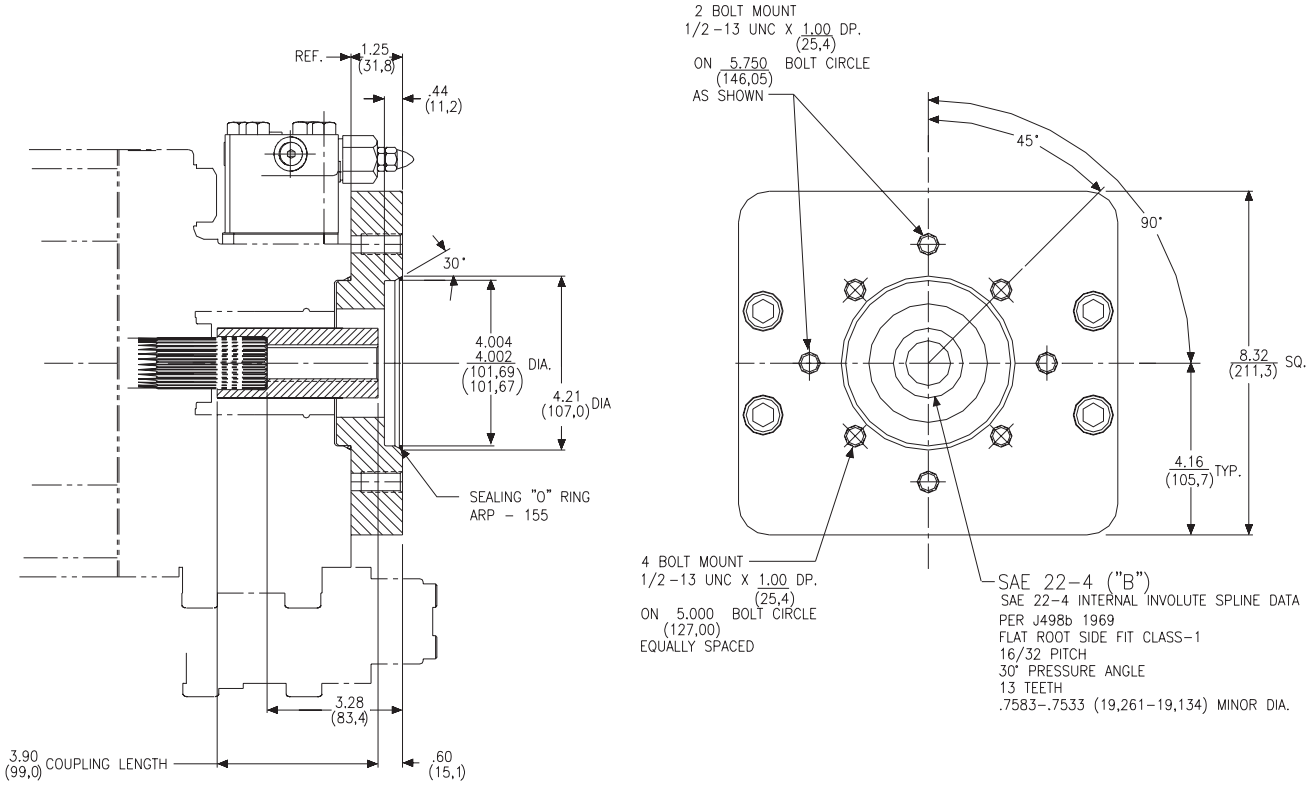


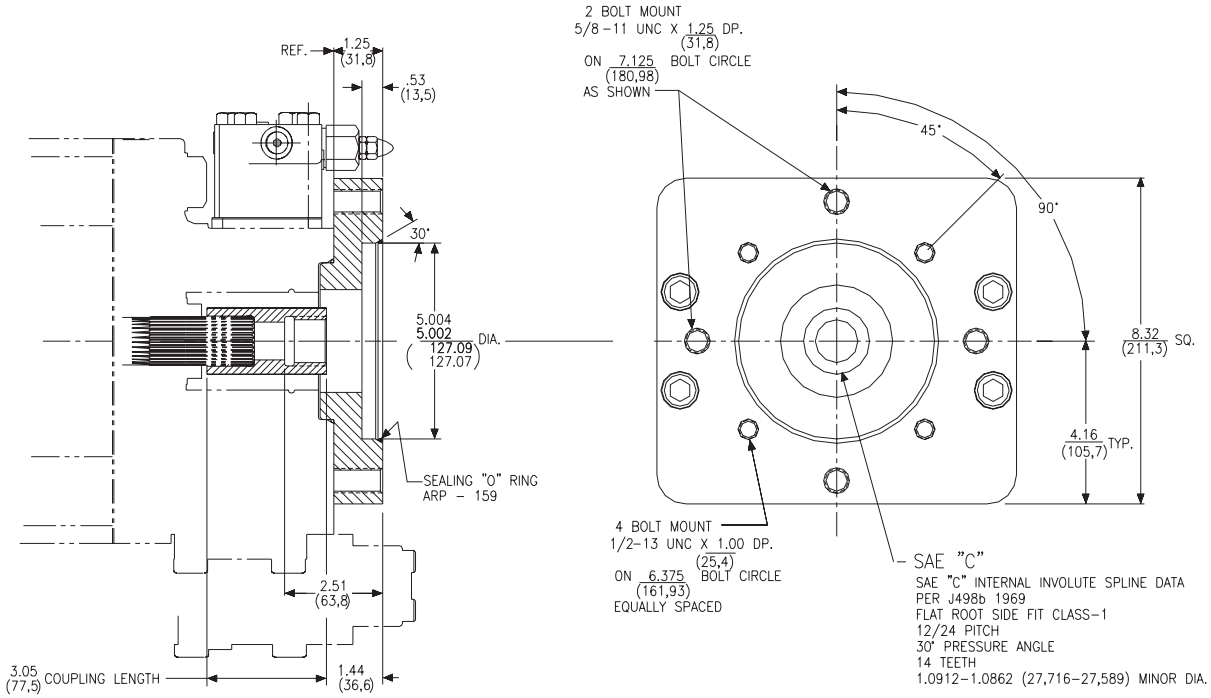
P11,14 R,L
SAE 82-2 (A) WITH COUPLING 16-4



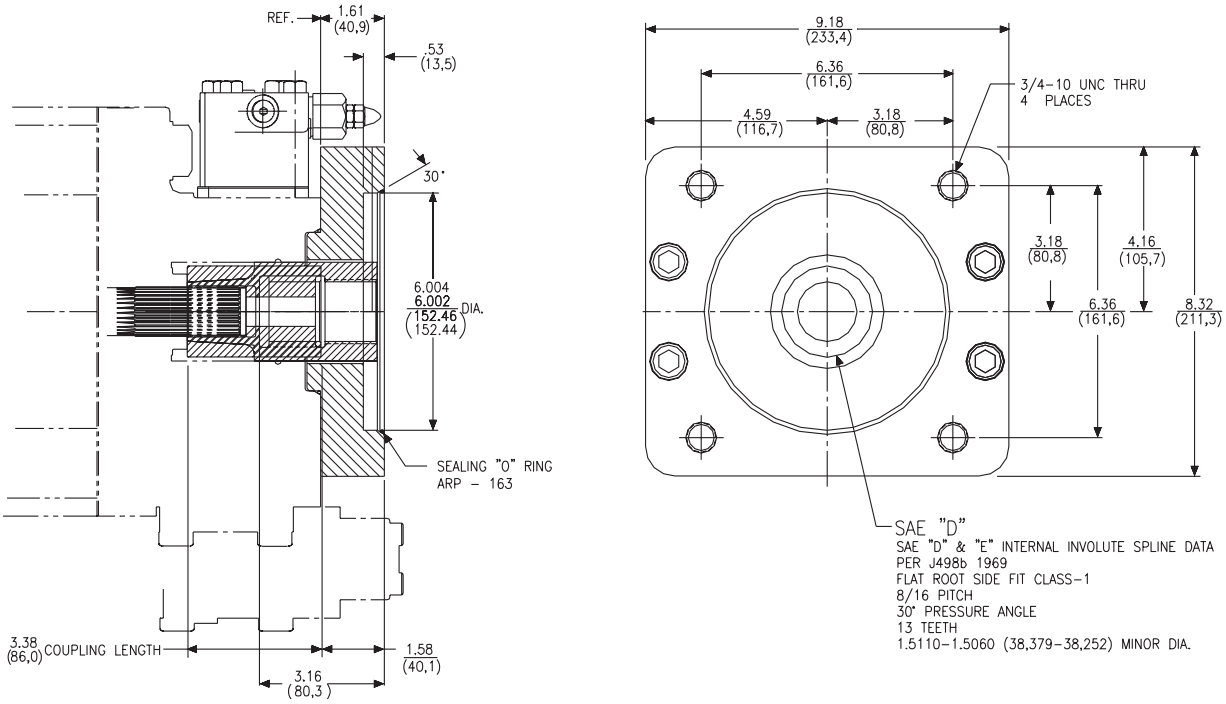
P11,14 R,L
SAE 101-2 (B) WITH COUPLING 22-4



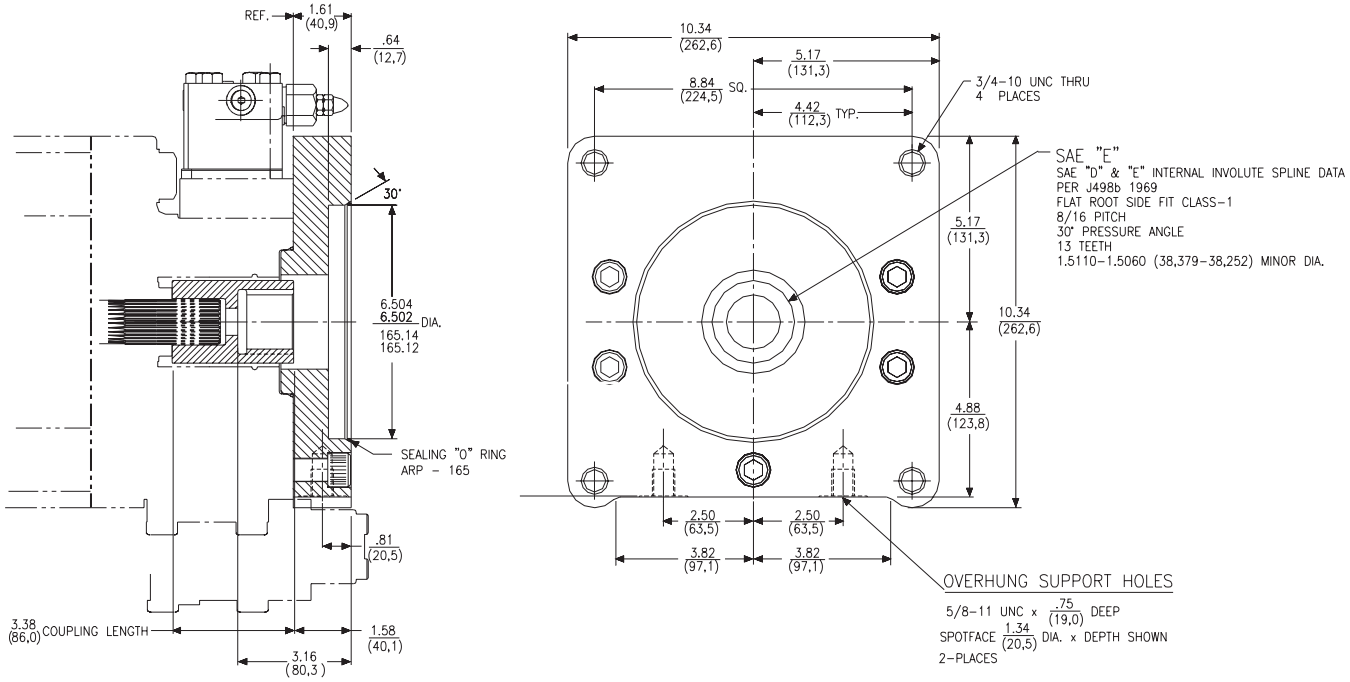
P11,14 R,L
SAE 127-2 (C) WITH COUPLING 32-4
SAE 127-4 (C) WITH COUPLING 32-4



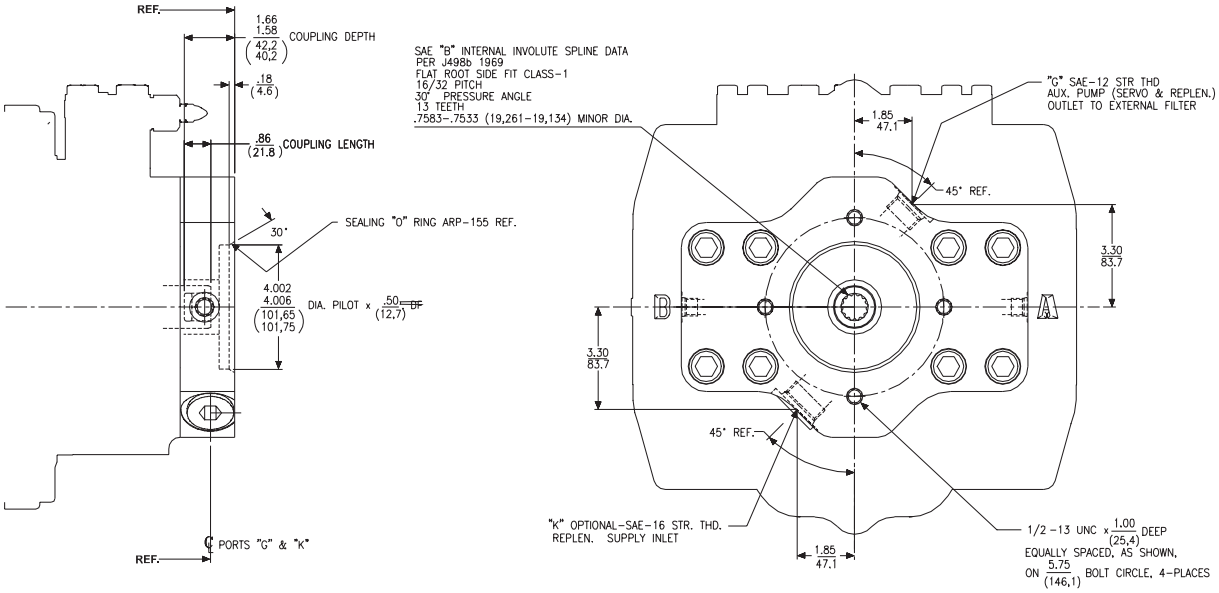
P11,14 R,L
SAE 152-4 (D) WITH COUPLING 44-4



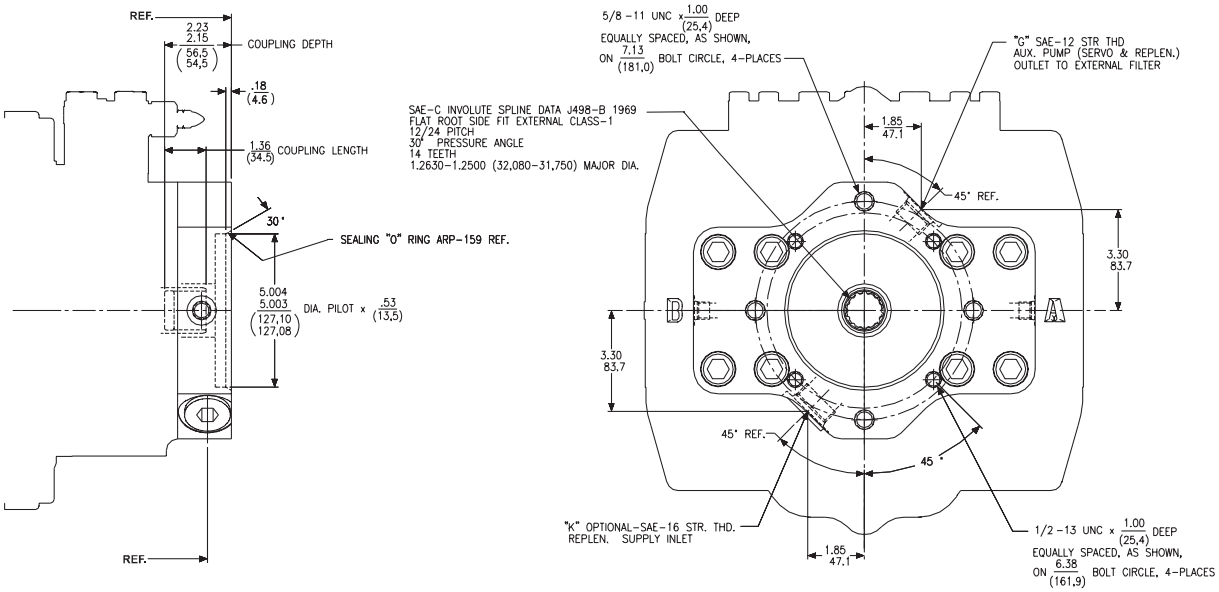
P11,14 R,L
SAE 165-4 (E) WITH COUPLING 44-4



P24,30 P,S
SAE 101-2 (B) WITH COUPLING 22-4

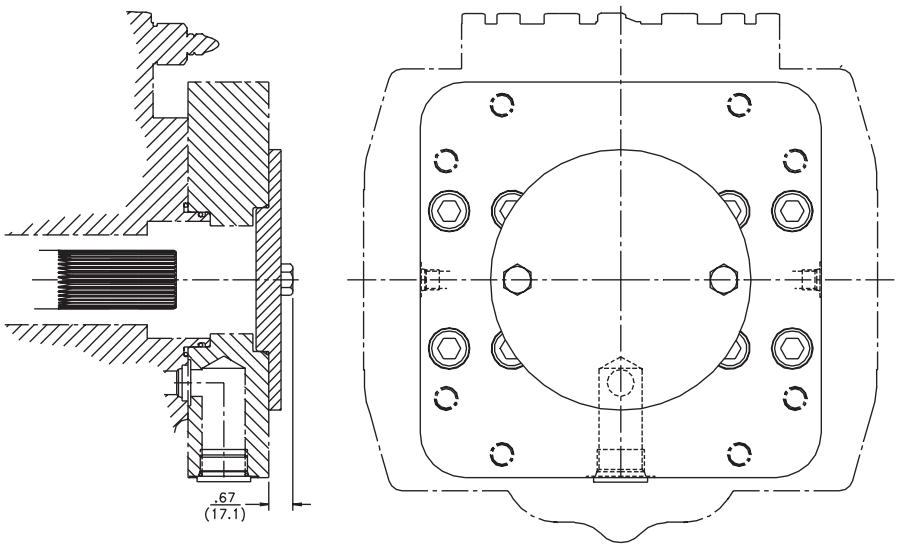


P24,30 P,S
SAE 127-2 (C) WITH COUPLING 32-4
SAE 127-4 (C) WITH COUPLING 32-4

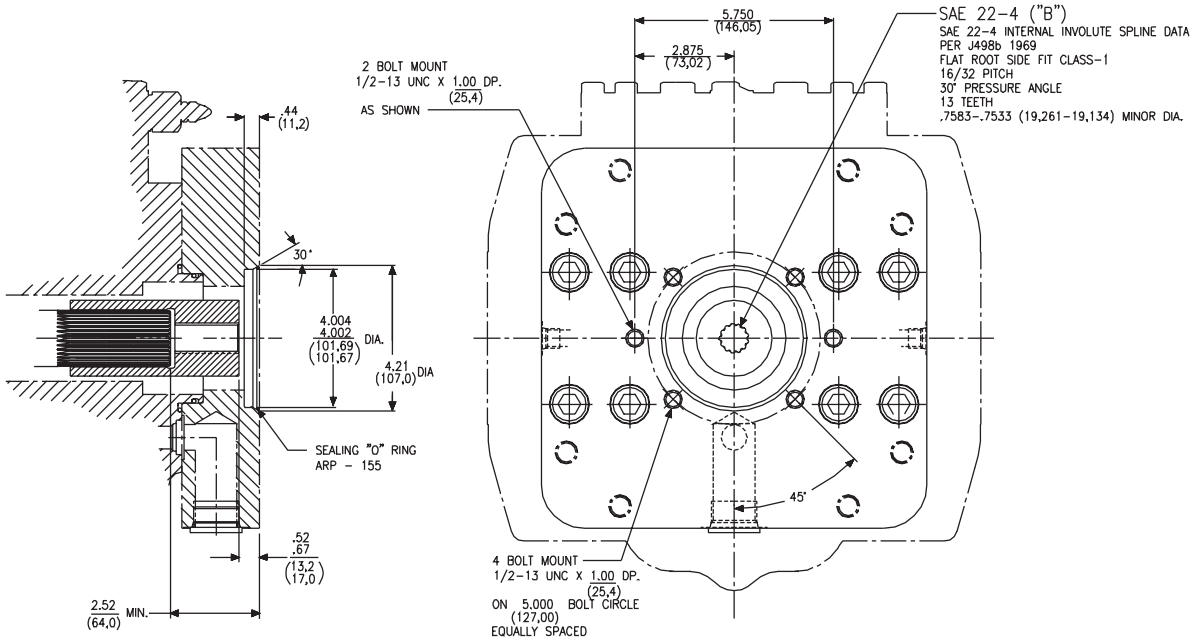


Ordering Code | Back to Content

P24,30 R,L
BLANKING PLATE

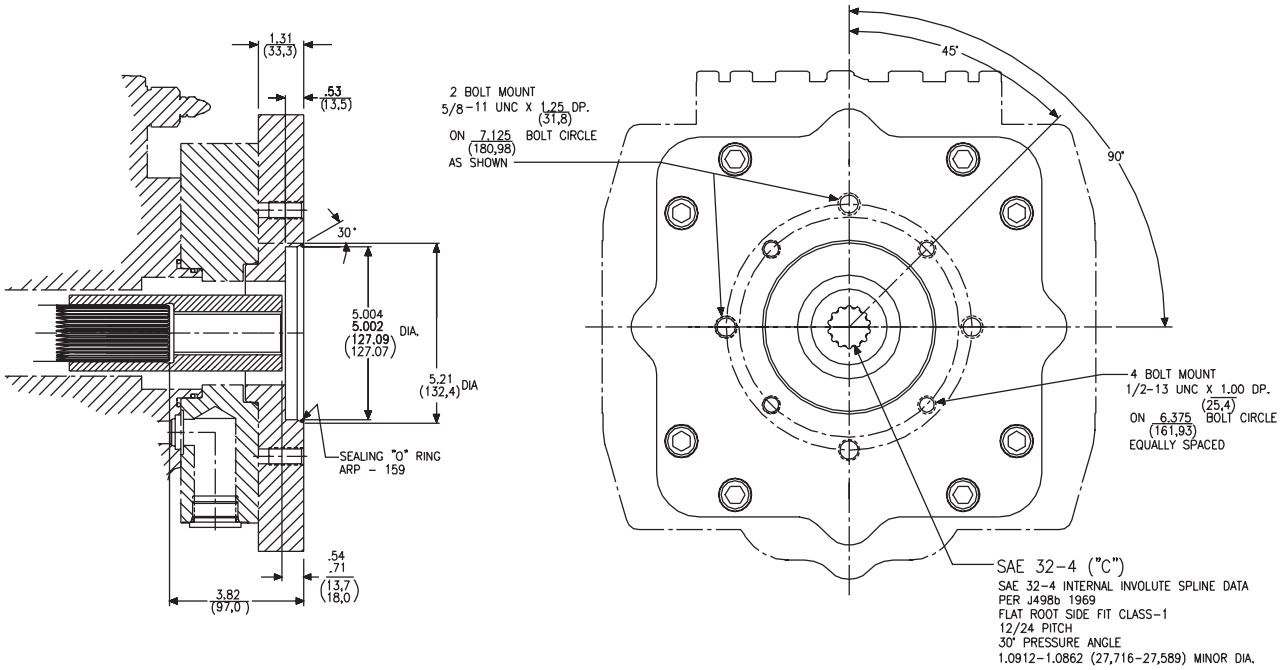


P24,30 R,L
SAE 101-2 (B) WITH COUPLING 22-4
SAE 101-4 (B) WITH COUPLING 22-4

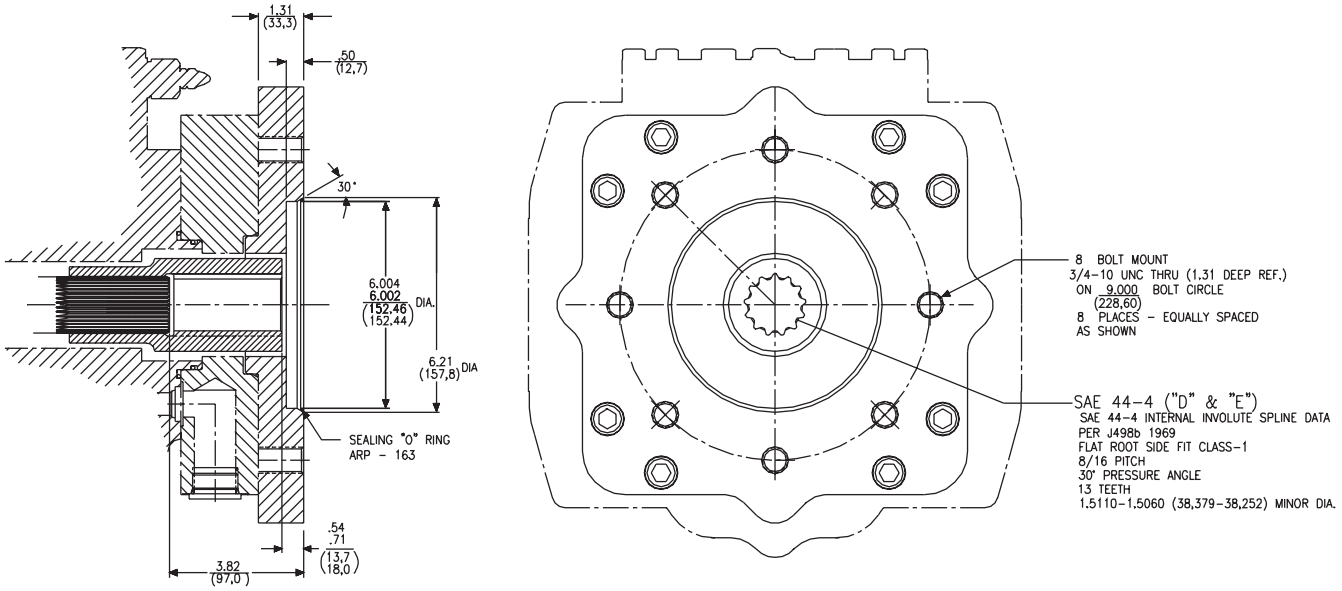


Ordering Code | Back to Content

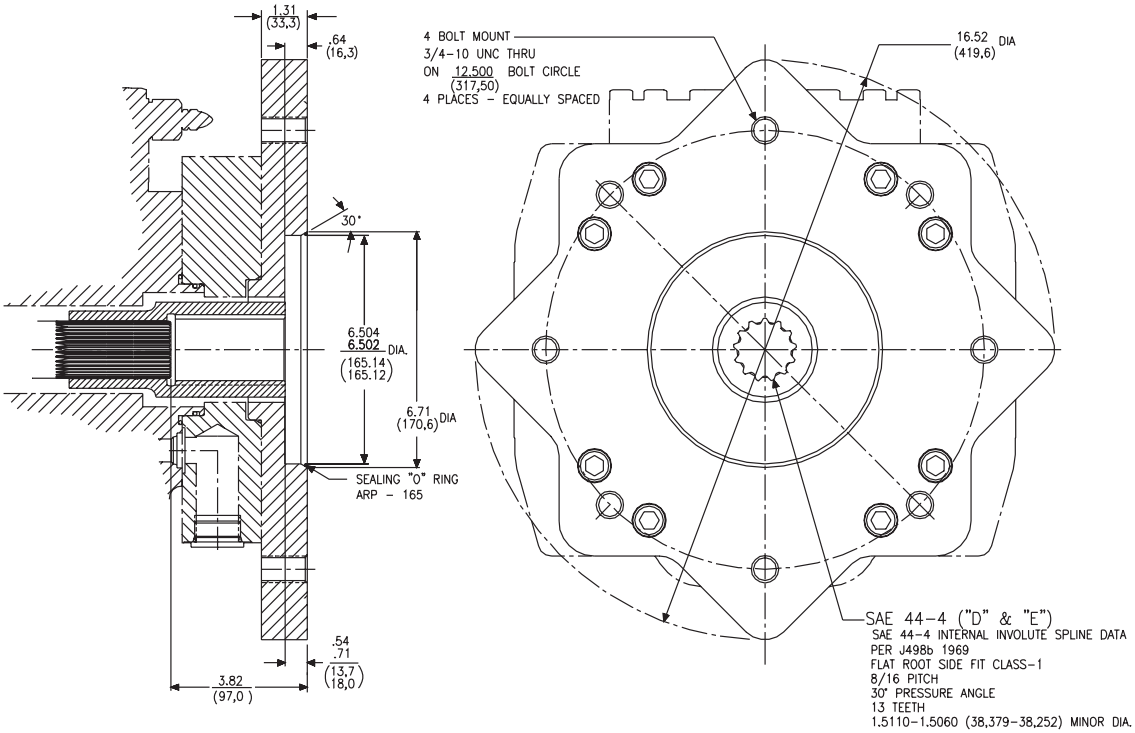
P24,30 R,L
SAE 127-2 (C) WITH COUPLING 32-4
SAE 127-4 (C) WITH COUPLING 32-4



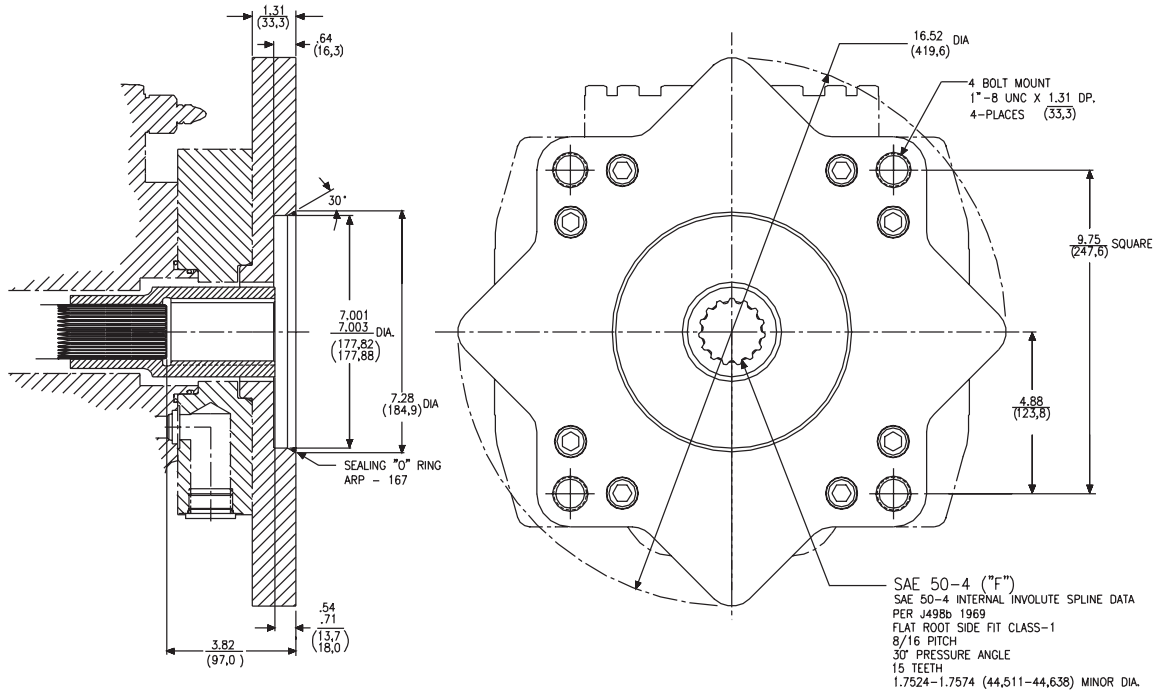
P24,30 R,L
SAE 152-4 (D) WITH COUPLING 44-4

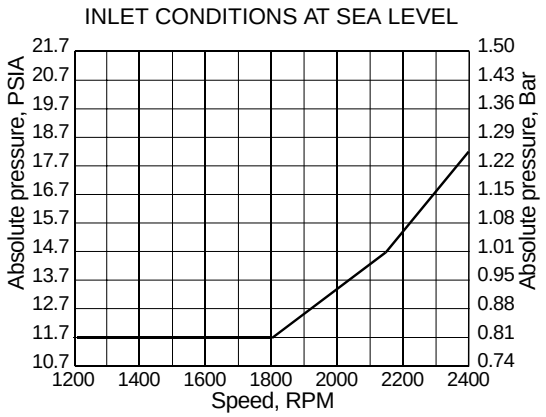


P24,30 R,L
SAE 165-4 (E) WITH COUPLING 44-4

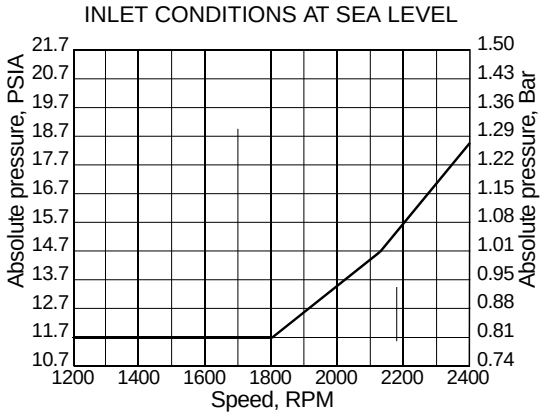


P24,30 R,L
SAE 177-4 (F) WITH COUPLING 50-4

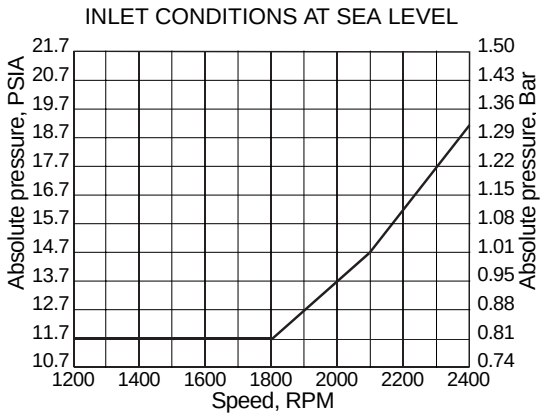




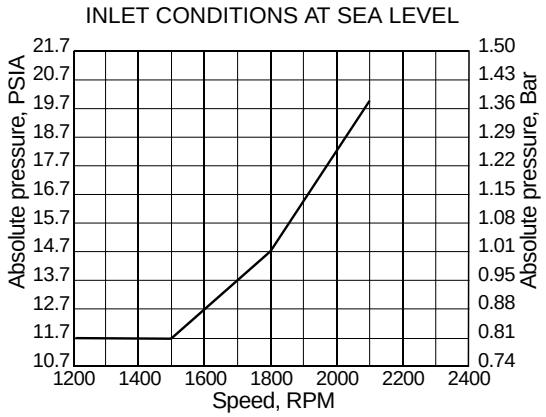
P6V & P6F



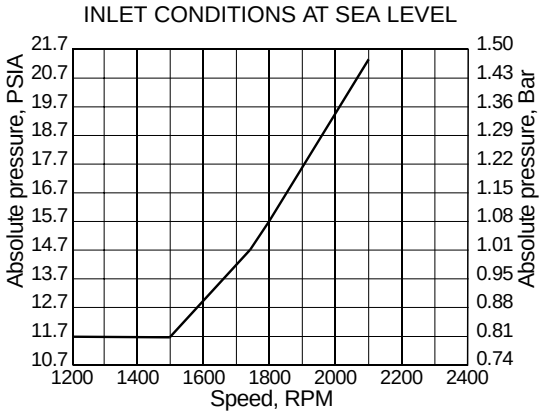
P7V & P7F



P8V & P8F



P11V



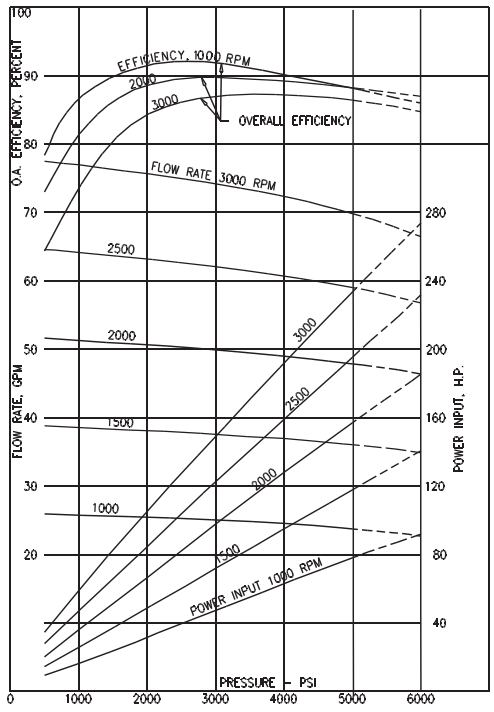
P14V

Note: The absolute inlet pressure is the pressure required to fill the pump with petroleum based fluids. The maximum pressure in the inlet port is 200 psi, 14 bar. For unboosted systems, the diameter of the suction line must be sized to allow a maximum velocity not higher than 4 ft/sec. A coarse screen may be considered in the suction line, no filter. For water in oil invert emulsions and water glycols increase the inlet absolute pressure by 25%, for phosphate ester increase the absolute inlet pressure by 35%. Any inlet pressures above atmospheric may increase noise levels and decrease efficiencies noted in this literature. Please consult your nearest Denison Office for further details.

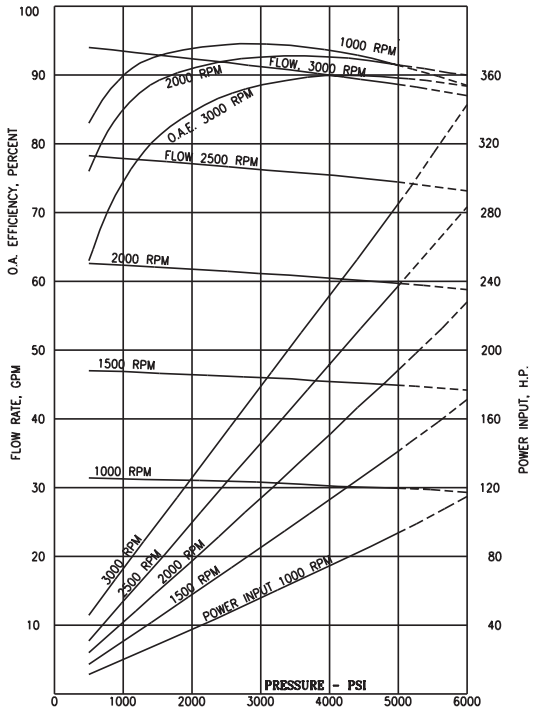
Inlet characteristics-auxiliary pump, port C

Series	Speed	Displacement		Pressure absolute	
	rpm	in^3/rev	cm^3/rev	psi	bar
6, 7, 8, 11, 14	1200	1.07	17,5	9.5	0,66
6, 7, 8, 11, 14	1800	1.07	17,5	9.5	0,66
6, 7, 8, 11, 14	2400	1.07	17,5	10.5	0,72
24, 30	1200	4.84	79,3	9.5	0,66
24, 30	1800	4.84	79,3	10.5	0,72

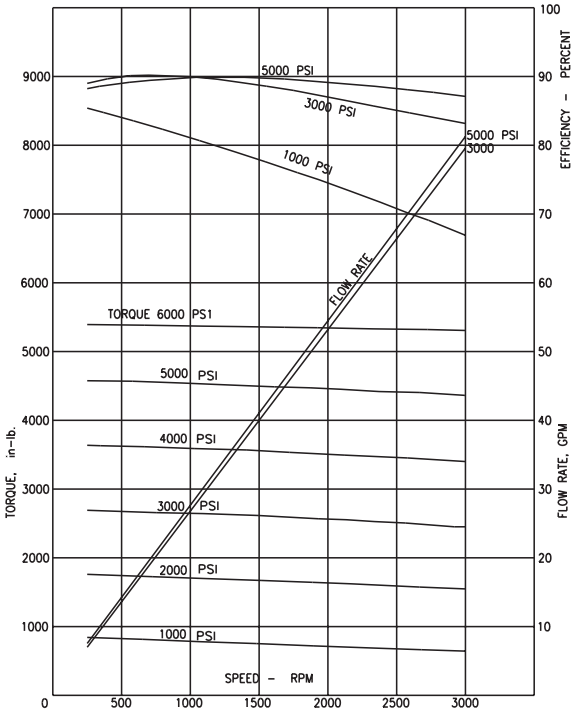
Note: Maximum pressure on inlet port C is 200 psi, 14 bar.



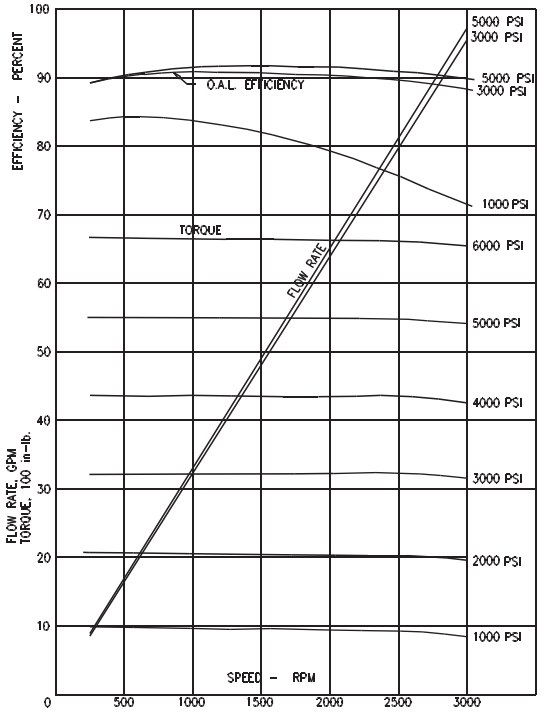
Performance curves Series 6
Pump at full displacement



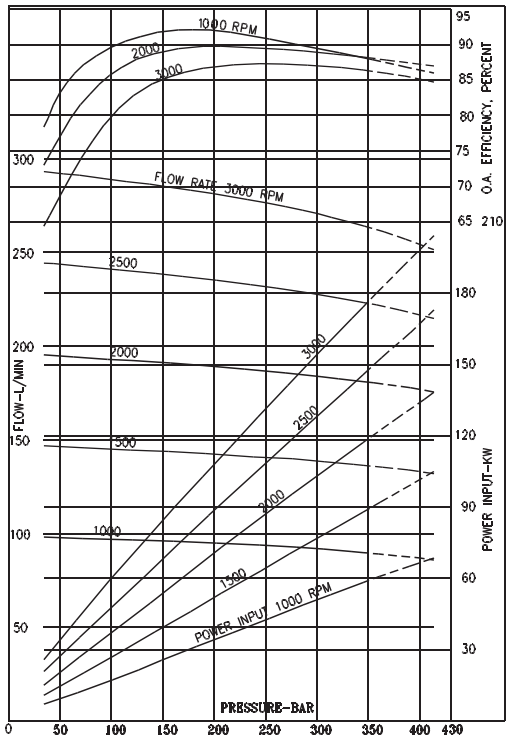
Performance curves Series 7
Pump at full displacement



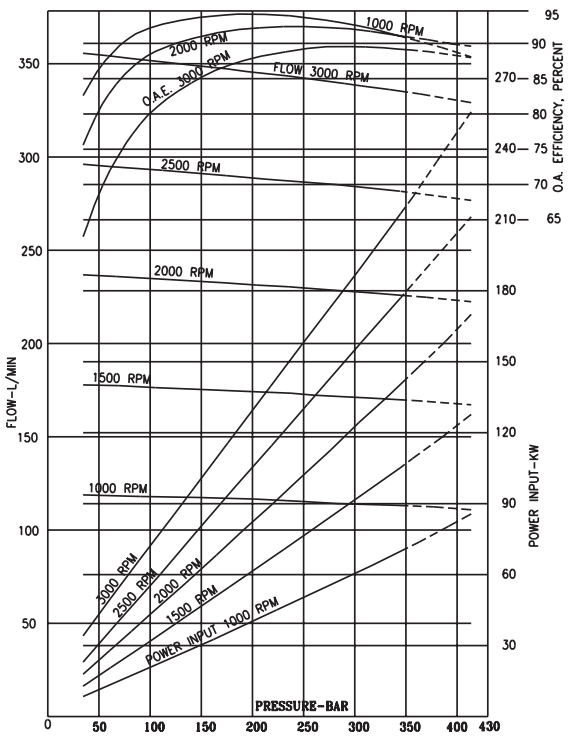
Performance curves Series 6
Motor at full displacement



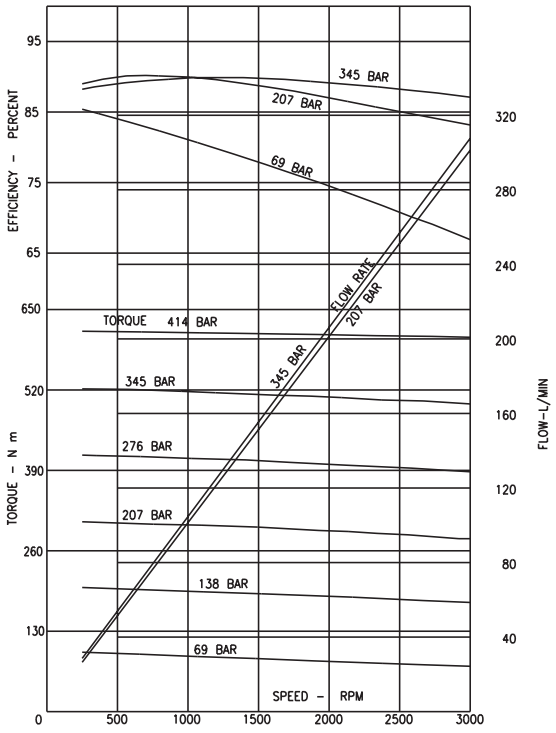
Performance curves Series 7
Motor at full displacement



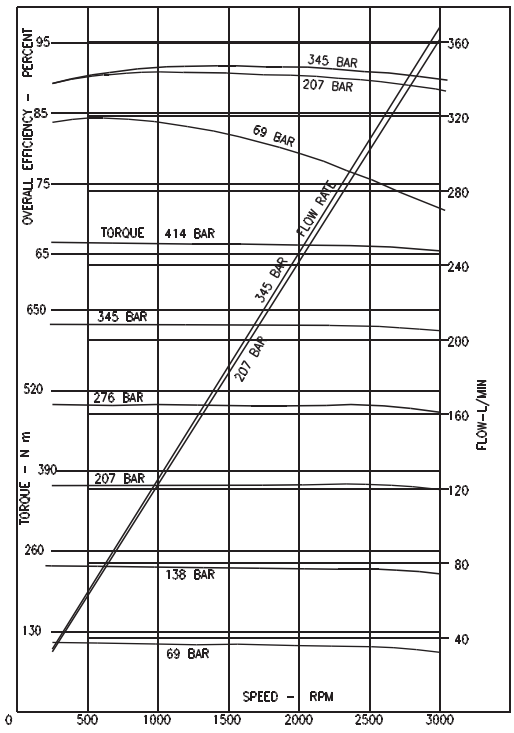
Performance curves Series 6
Pump at full displacement



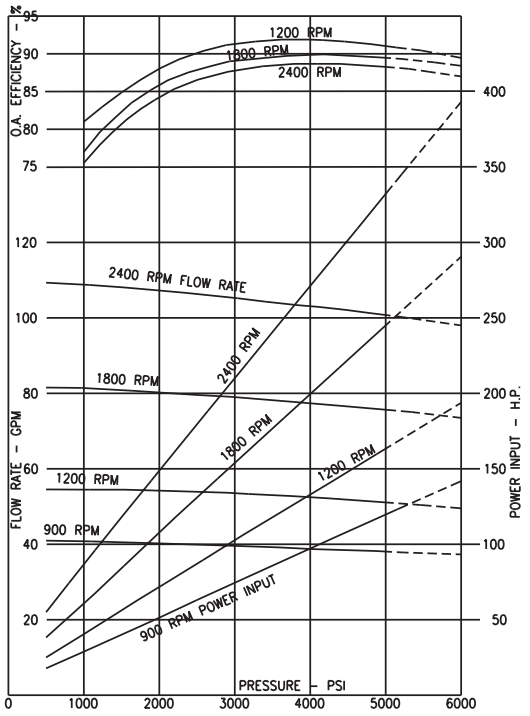
Performance curves Series 7
Pump at full displacement



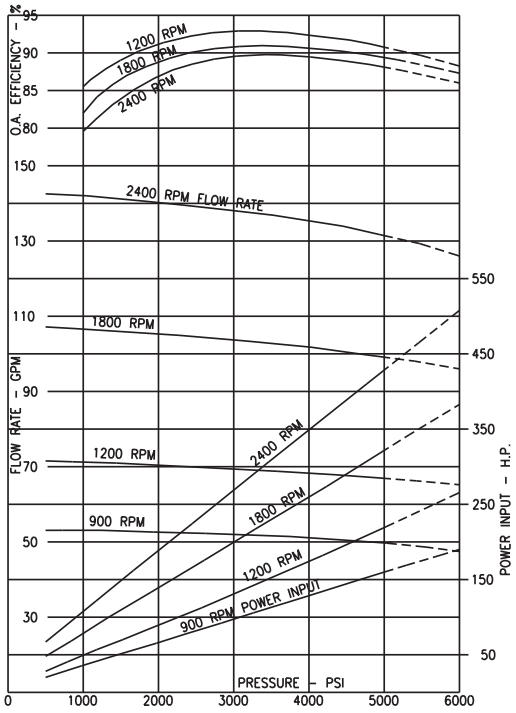
Performance curves Series 6
Motor at full displacement



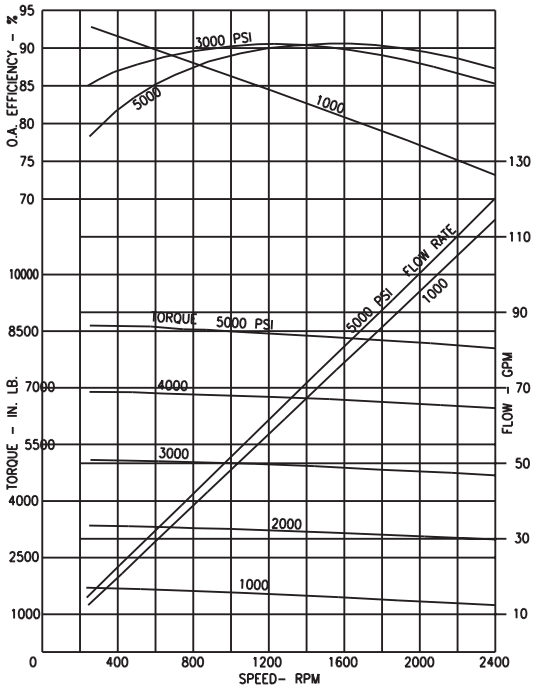
Performance curves Series 7
Motor at full displacement



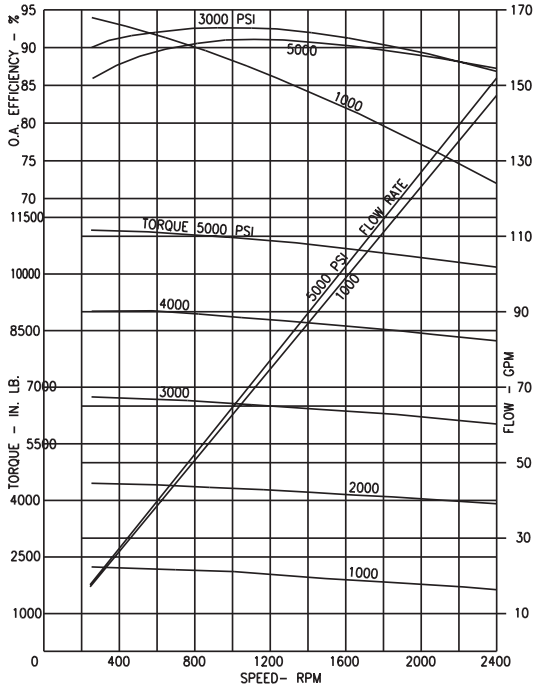
Performance curves Series 11
Pump at full displacement



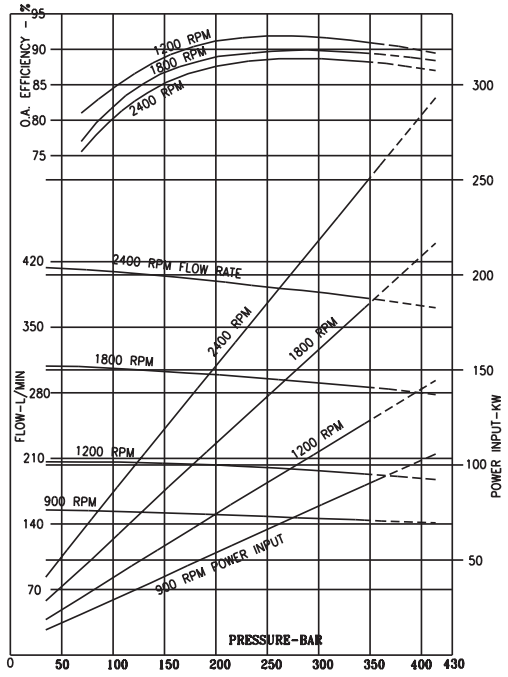
Performance curves Series 14
Pump at full displacement



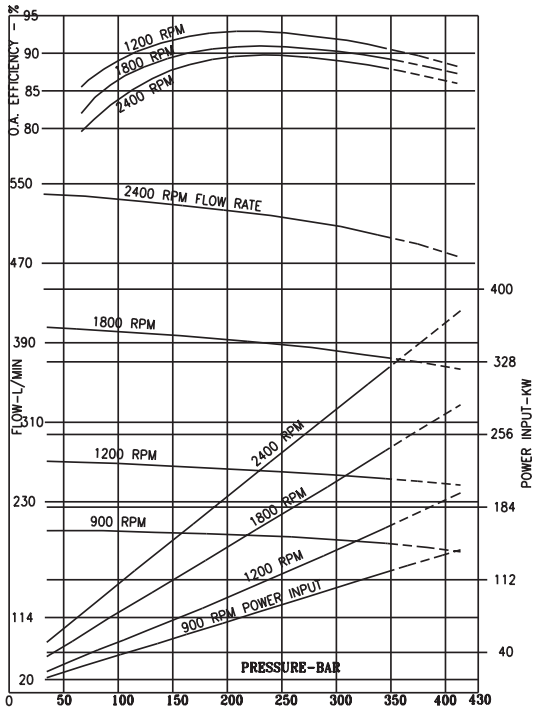
Performance curves Series 11
Motor at full displacement



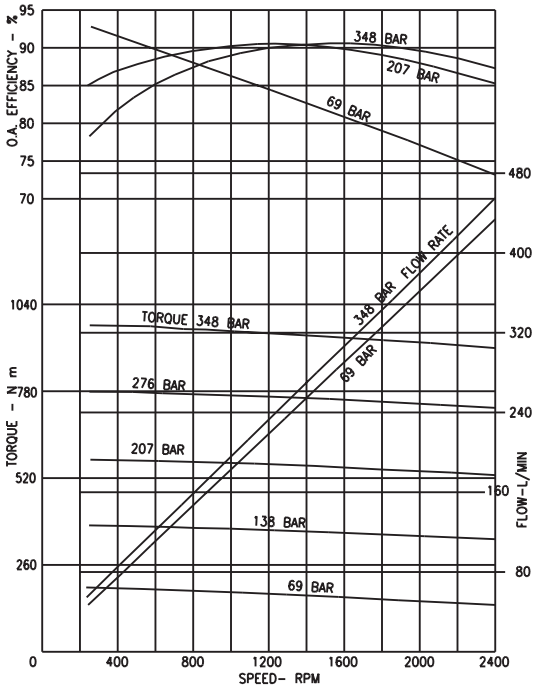
Performance curves Series 14
Motor at full displacement



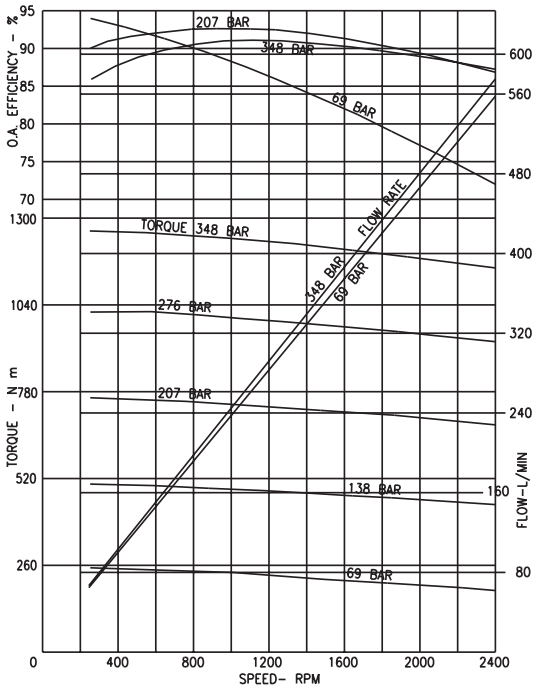
Performance curves Series 11
Pump at full displacement



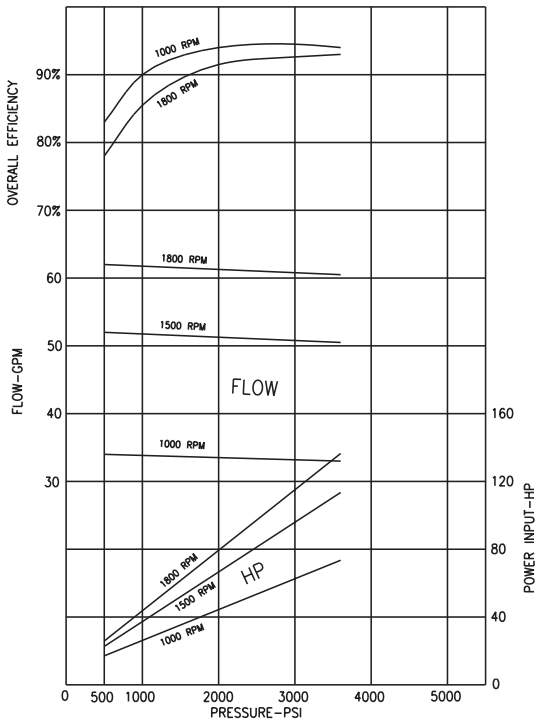
Performance curves Series 14
Pump at full displacement



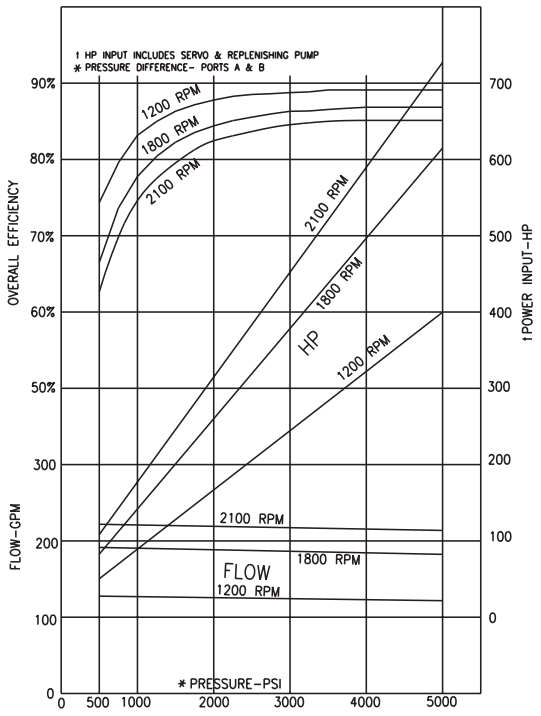
Performance curves Series 11
Motor at full displacement



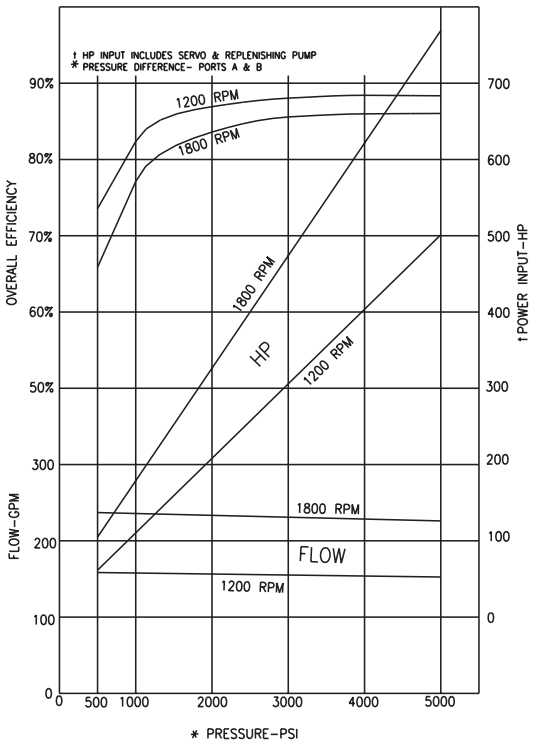
Performance curves Series 14
Motor at full displacement



Performance curves Series 8
Pump at full displacement



Performance curves Series 24
Pump at full displacement



Performance curves Series 30
Pump at full displacement

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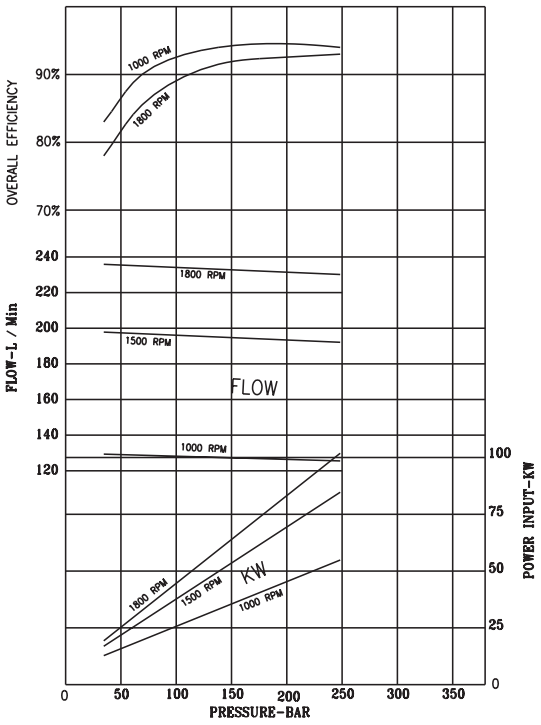
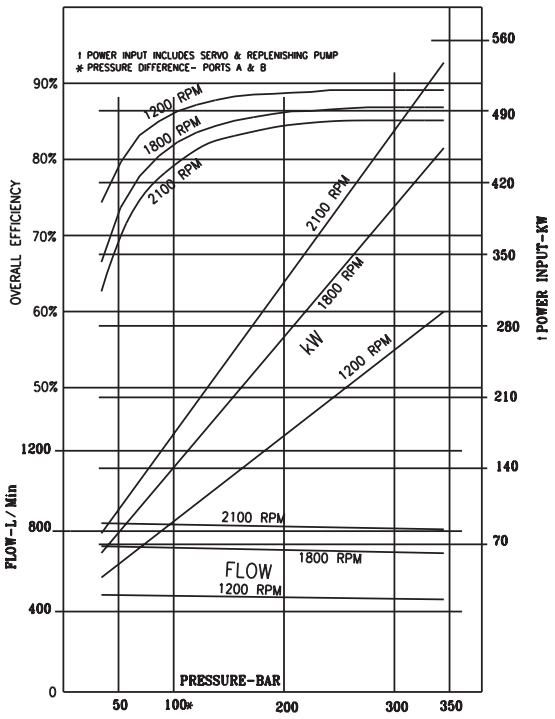
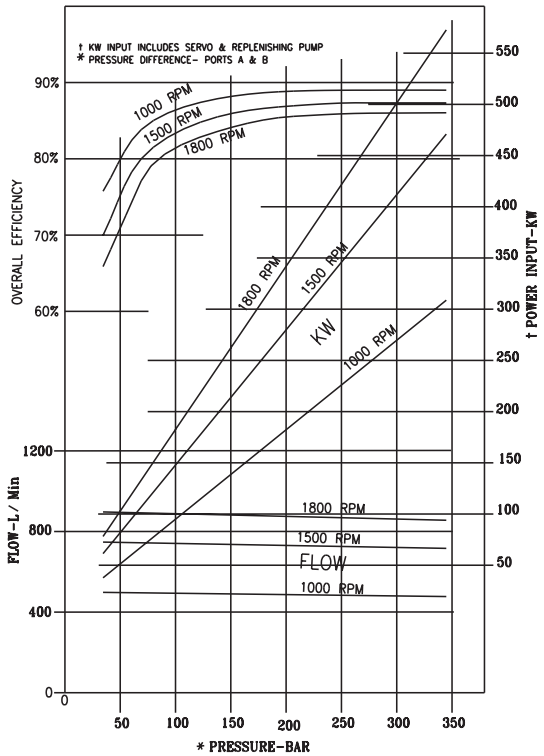


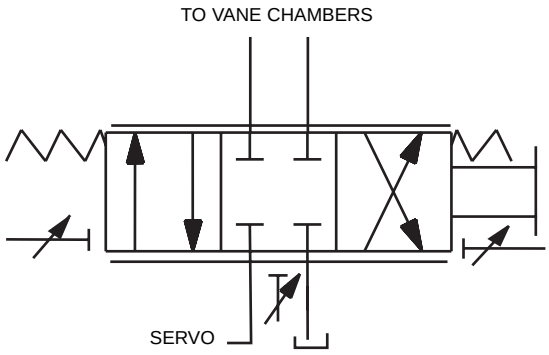
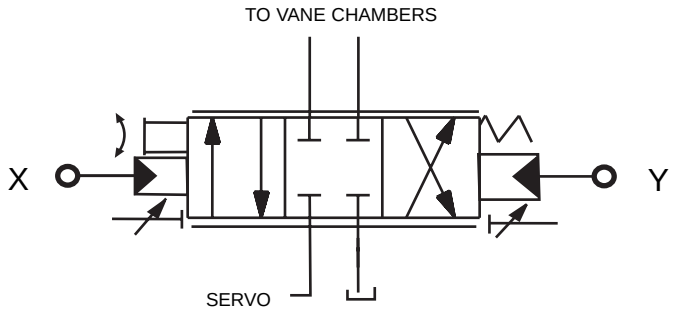
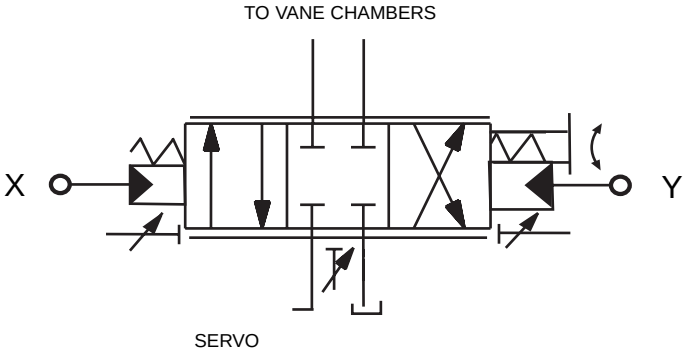
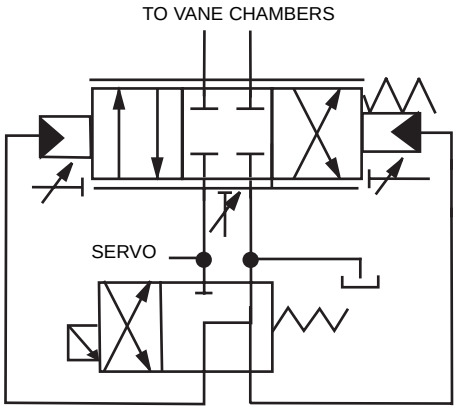
Performance curves Series 8
Pump at full displacement

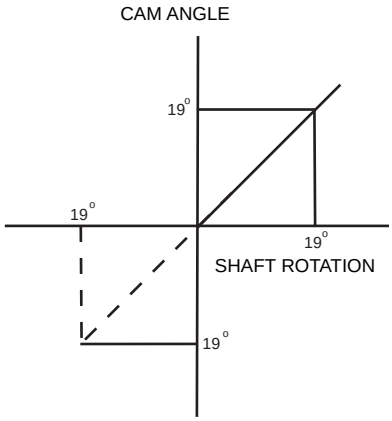
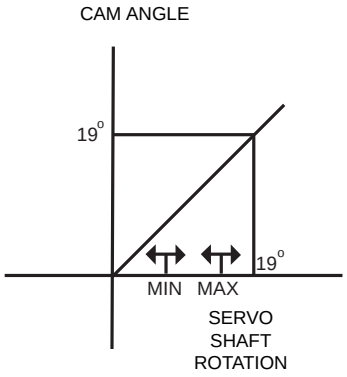
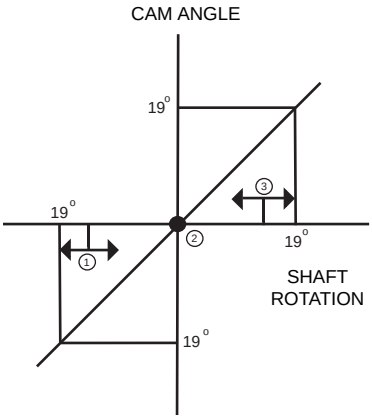
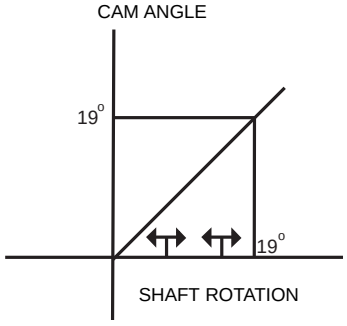


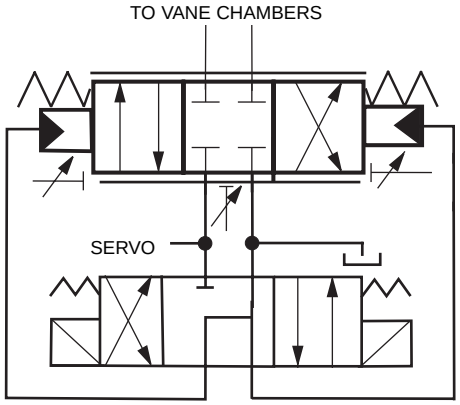
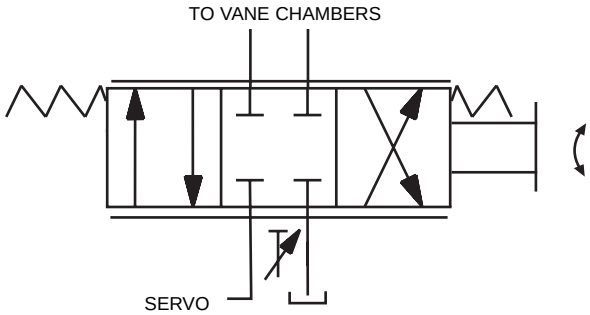
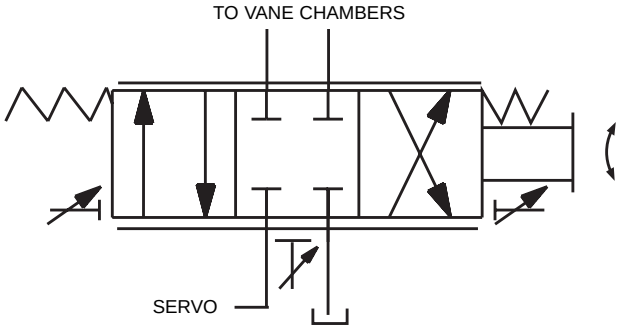
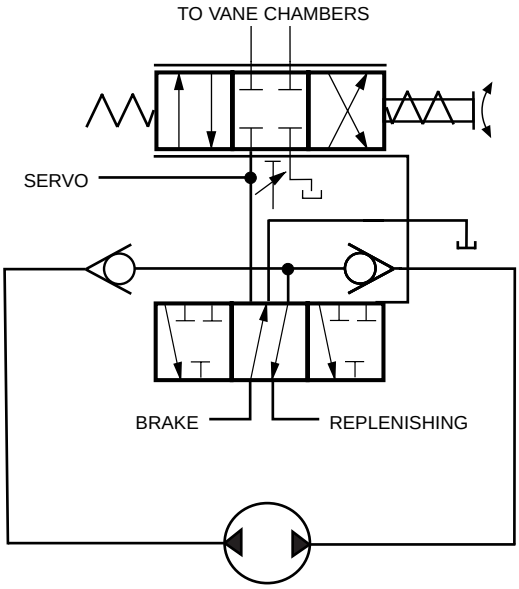
Performance curves Series 24
Pump at full displacement

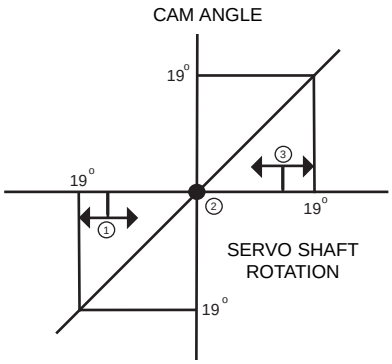
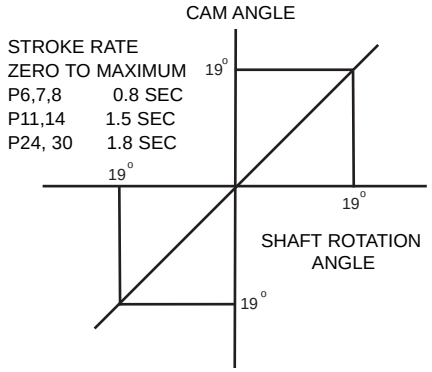
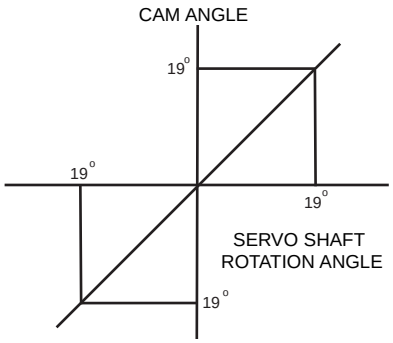


Performance curves Series 30
Pump at full displacement

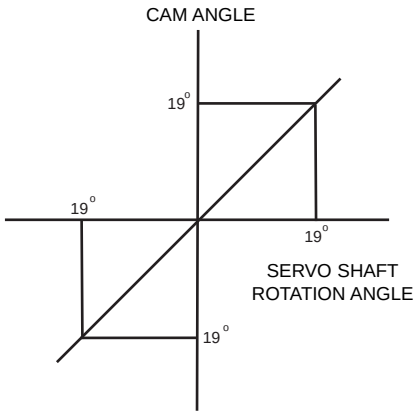
CODE	DESCRIPTION	HYDRAULIC CIRCUIT
102	MANUAL SCREW ADJUST	
2A2	TWO POSITION CONTROL	
2H2	3 POSITION CONTROL	
2M2	2 POSITION CONTROL WITH 4DO1 VALVE	

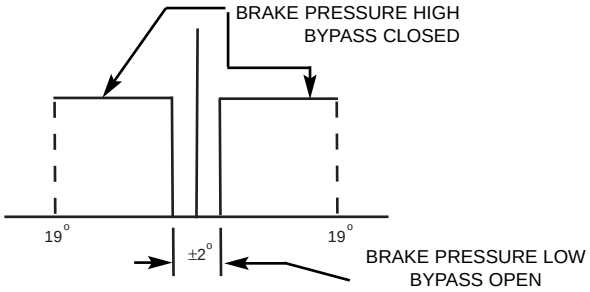
TYPICAL PERFORMANCE	DESCRIPTION OF OPERATION
	Spring loaded toward maximum displacement, with an adjustment screw to limit the displacement anywhere between 0% and 100%. A minimum volume stop is also supplied so that when the rotary servo shaft is turned, the displacement can be varied only between the minimum and maximum settings. Torque required to rotate servo shaft: 20 lb-in, 2.56 Nm.
	Hydraulically piloted non-proportionally between adjustable minimum and maximum displacements. The control is spring loaded toward minimum when used on pumps, to maximum on motors. Servo pressure is switched by an external valve to drive the control in either direction. When used on motors, the minimum setting can be set no lower than 30% of maximum.
	Hydraulically piloted non-proportionally between an adjustable minimum displacement of 0±5% and two fully adjustable maximum displacements, one in either direction, and spring loaded toward minimum. Servo pressure is switched by an external valve to drive the control in either direction.
	Same as 2A2 except a 4D01 two position directional valve is mounted to the control. With the solenoid de-energized, the control is spring loaded to zero for pumps and to maximum displacement for motors. Energizing the solenoid drives the control toward maximum displacement on pumps, minimum on motors. When used on motors, the minimum settings can be no less than 30% of maximum.

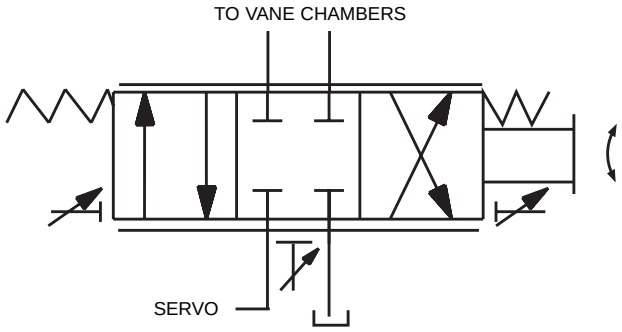
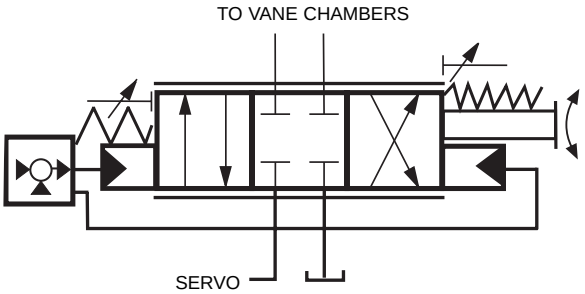
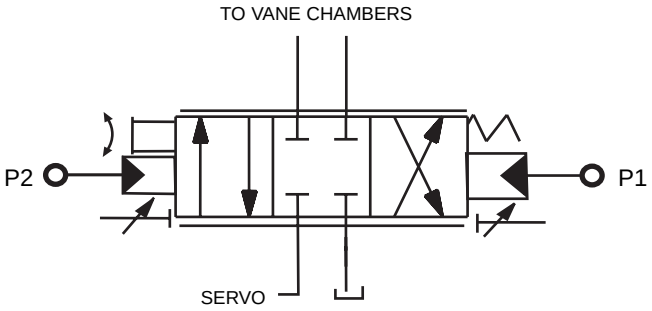
CODE	DESCRIPTION	HYDRAULIC CIRCUIT
2N2	3 POSITION CONTROL WITH 4DO1 VALVE	
402	SPRING CENTERED ROTARY SERVO	
4A2	SPRING CENTERED ROTARY SERVO WITH ADJUSTABLE STOPS	
4B2	SPRING CENTERED ROTARY SERVO WITH AUTOMATIC BRAKE AND BYPASS CONTROL	

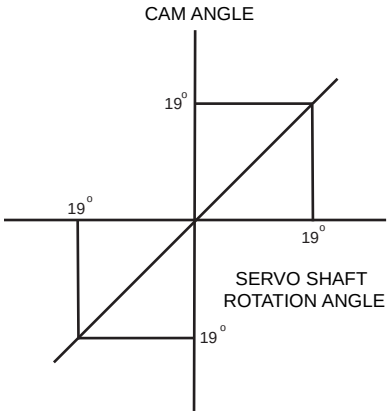
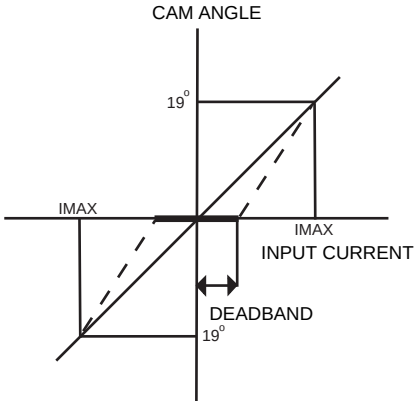
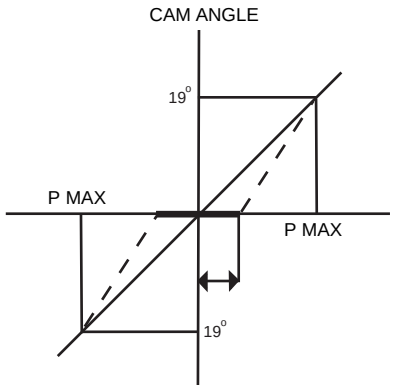
TYPICAL PERFORMANCE	DESCRIPTION OF OPERATION
	Same as 2H2 except a 4D01 three position directional valve is mounted to the control. With the solenoids de-energized, the control is spring loaded to zero. Energizing a solenoid drives the control toward maximum displacement in one of the two directions.
	The 402 is the basic displacement control for all Goldcup. It is actuated by a servo shaft that is rotated from 0º - 19º, either side of center. This action opens a unique slide valve to port servo oil to and from the vane chambers that actuate the rocker cam. Vanes, integral to the cam, move the cam so that it follows the rotary servo input shaft motion exactly. When the cam reaches the position equal to that of the input shaft, the slide valve closes. Any cam motion due to pumping forces immediately opens the slide valve to correct the cam position. Springs cause the control to return to zero stroke when no external force is applied to the servo shaft. An adjustment is provided to locate the exact zero position, to prevent machine creep.
	The 4A2 control is the same as the 402, with addition of adjustable maximum volume stop screws, with locking caps, to limit the control to less than 100% displacement. Stops are present on both sides of center and may be set independently to different settings.

The 4B2 control is the same as the 4A2 control, with the addition of an output port that will provide servo pressure to control a spring applied, pressure released parking brake. The control contains anticoincidence functions that cause the brake to release immediately upon application of an on-stroke motion at the rotary servo shaft, and that cause the brake to remain released even after the rotary servo shaft is recentered, until the pump rocker cam actually returns to zero, at which time the brake will set. Additionally, a small bypass is opened between the pump A & B ports to bypass any flow that is generated if the pump is not exactly zeroed. The bypass closes whenever the brake is released.





CODE	DESCRIPTION	HYDRAULIC CIRCUIT
4C2	SPRING CENTERED BRAKE AND ADJUSTABLE BYPASS CONTROL (AUTOMATIC BRAKE CONTROL)	
5A2	ELECTRO HYDRAULIC CONTROL	
8A2	HYDRAULIC STROKER	

TYPICAL PERFORMANCE	DESCRIPTION OF OPERATION
	This control combines the features of the 4A2 and 4B2 controls. See above descriptions.
	The 5A2 control controls displacement in proportion to an electric current between zero and 350 milliamps. The control is available with or without a 10% deadband. Positive polarity drives the control in one direction, and negative polarity in the other. Adjustable maximum displacement stops are included. The 5C2 option, with automatic brake control, is also available.
	The 8A2 control controls displacement in proportion to a hydraulic pressure, values listed below. The control is available with or without a 10% deadband. Pressure applied in the P1 port drives the pump on stroke in one direction, P2 port in the other. Adjustable maximum displacement stops are included. The 8C2 option, with automatic brake control, is also available.

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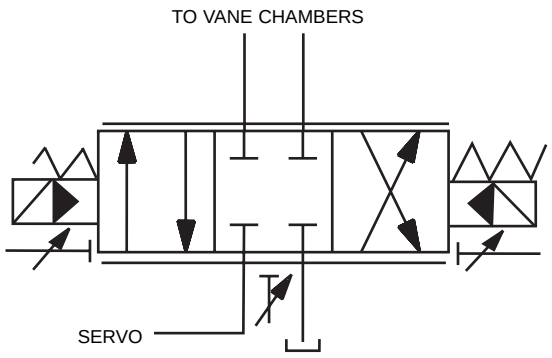
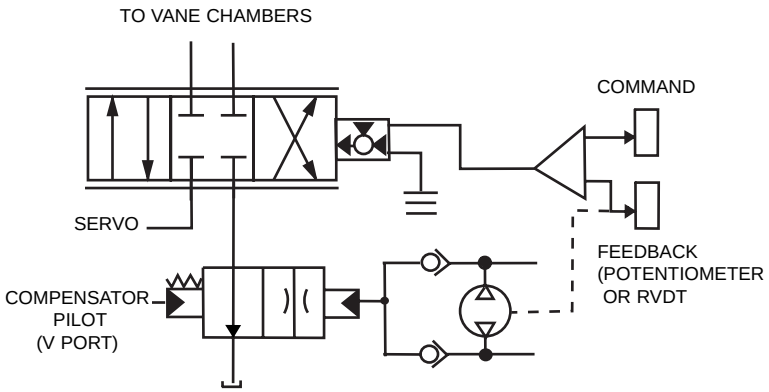
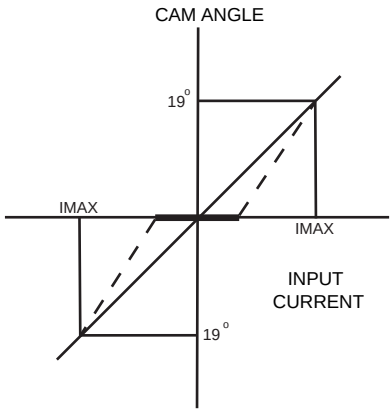
CODE	DESCRIPTION	HYDRAULIC CIRCUIT
9A2	ELECTRIC STROKER	
7D2 **7E2** **7F2** **7G2**	HIGH IQ SERVOVALVE CONTROL	

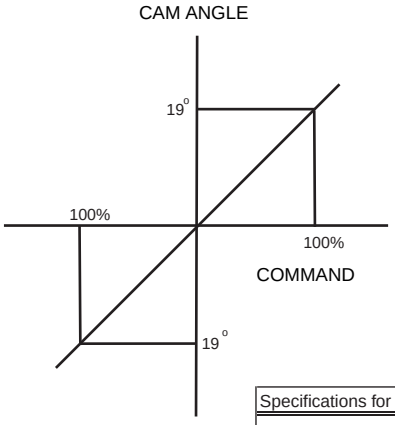
TYPICAL PERFORMANCE



DESCRIPTION OF OPERATION

The 9A2 control controls displacement in proportion to an electric current between zero and 350 milliamps for the 24 volt version, and up to 650 milliamps for the 12 volt version. The control is available with or without a 10% deadband. The control signal is a Pulse Width Modulated signal. Current signal to one coil drives the pump in one direction, and to the other coil in the opposite. Adjustable maximum displacement stops are included. The 9C2 option, with automatic brake control, is also available.

Specifications:		
Hysteresis	5% typical, 8% maximum	
Linearity	8%	
Response	P6,7,8	0.9 seconds, zero to full stroke or back
	P11,14	1.5 seconds, zero to full stroke or back
	P24, 30	1.8 seconds, zero to full stroke or back
Repeatability	2%	
Temperature null shift	<2% per 100ºF (38º C)	
Servo pressure required	200-1000 psi (14-70 bar), 400 nominal (28 bar)	
Coil resistance	41 ohms	
Electrical input	270 ma minimum, 325 ma nominal, 350 ma maximum	
Neutral deadband	150 ma minimum, 180 ma nominal, 210 ma maximum	
Manual override	3/16" Allen wrench, 30 in-lb (3.4Nm) with zero signal	
Fluid types	All	
Fluid cleanliness	Contains a 75 micron filter, NAS 1638, class 8 or ISO 17/14	
Available drivers	5A Driver	020-14078-0
	5A options card	S20-11716-0
	Power supply	762-30026-0
	Euro card holder	701-00007-8
Electrical connector	DIN 43650 type AF, 16-01008-8	
Fluid cleanliness	NAS 1638, class 8 or ISO 17/14	

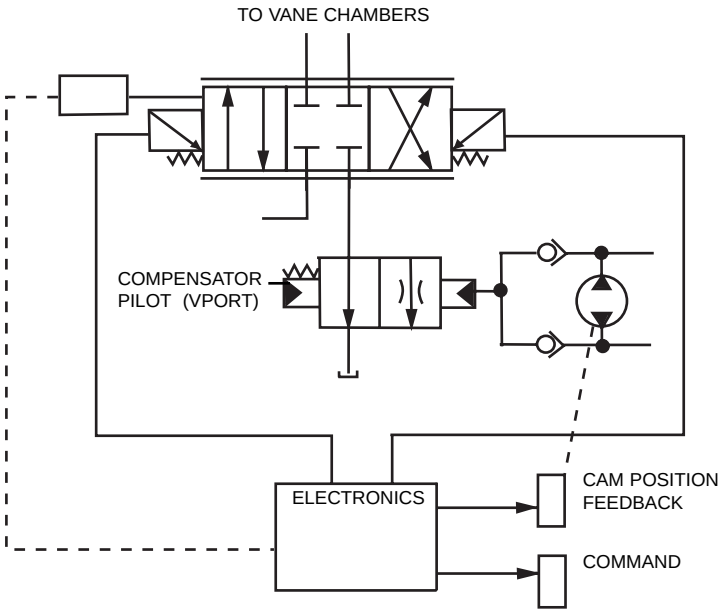
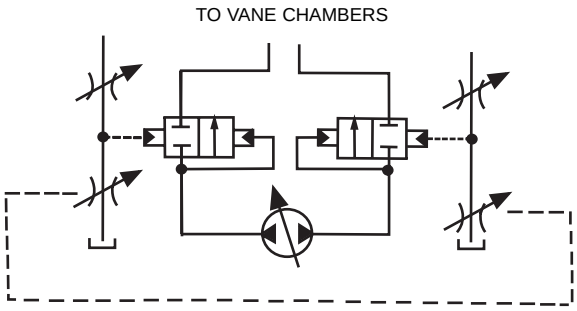


The 7** control is a high response displacement control that uses a servovalve to direct high flow levels to and from the vane chambers, in order to achieve high stroke rates on the pump. A feedback potentiometer or RVDT (Rotary Variable Differential Transformer) is used to feed back the rocker cam position to the controlling electronics to achieve stable operation.

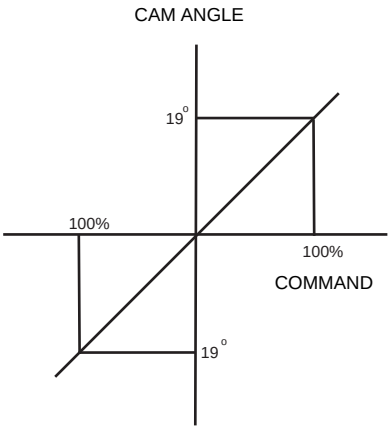
The 7D2 control uses a servovalve and a feedback potentiometer for feedback, the 7E2 uses an RVDT.

The 7F2 control uses servovalve and a the feedback potentiometer, but also has a special valve block with a valve in it to shut off the servovalve, so that control may be taken over by a 4A2 control also mounted to the pump as a manual override. The 7G2 is the same, except using an RVDT.

Specifications for 7D, 7E,7F, 7G:			
	P6,7,8	P11,14	P24/30
Hysteresis	<±1%	<±1%	±1%
Linearity	<±0.5%	<±0.5%	±0.5%
Step Response	180ms	300 Ms	360 Ms
Small Signal Frequency Response	10 Hz, 400 psi (28 bar)	8.2 Hz,, 440 psi (30 bar)	6 Hz,, 500 psi (35 bar)
	17 Hz,, 1000psi (70 bar)	13 Hz,, 1000 psi (70 bar)	9 Hz,, 1000 psi (70 bar)
Servo Pressure	1000 psi (70 bar) nominal		
Coil Resistance	1000 ohms		
Electrical Input	0-10 ma		
Feedback Pot Output,	±3 VDC		
19", 15 VDC excitation			
Feedback RVDT Output,	±2.4 VDC		
19", 15 VDC excitation			
Fluid Types	All		
Fluid Cleanliness	NAS 1638, class8 or ISO 17/14		
Available Drivers	Jupiter High IQ S20-11958		
Electrical Connector			

CODE	DESCRIPTION	HYDRAULIC CIRCUIT
7P2 **7J2** **7K2** **7I2**	HIGH IQ 4DCO1 CONTROL PROPORTIONAL VALVE	
--4	TORQUE LIMITER OVERRIDE	

TYPICAL PERFORMANCE



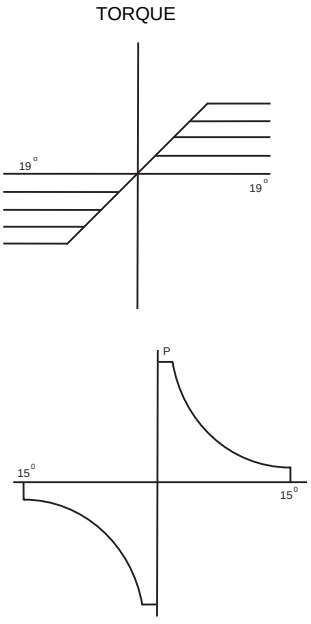
DESCRIPTION OF OPERATION

The 700 controls are high response displacement controls that use proportional directional flow control valves to direct high flow levels to and from the vane chambers, in order to achieve high stroke rates on the pump A feedback potentiometer or RVDT (Rotary Variable Differential Transformer) is used to feed back the rocker cam position to the controlling electronics to achieve stable operation.

The 7P2 control uses a proportional directional control valve and a feedback potentiometer for feedback, the 7J2 uses an RVDT.

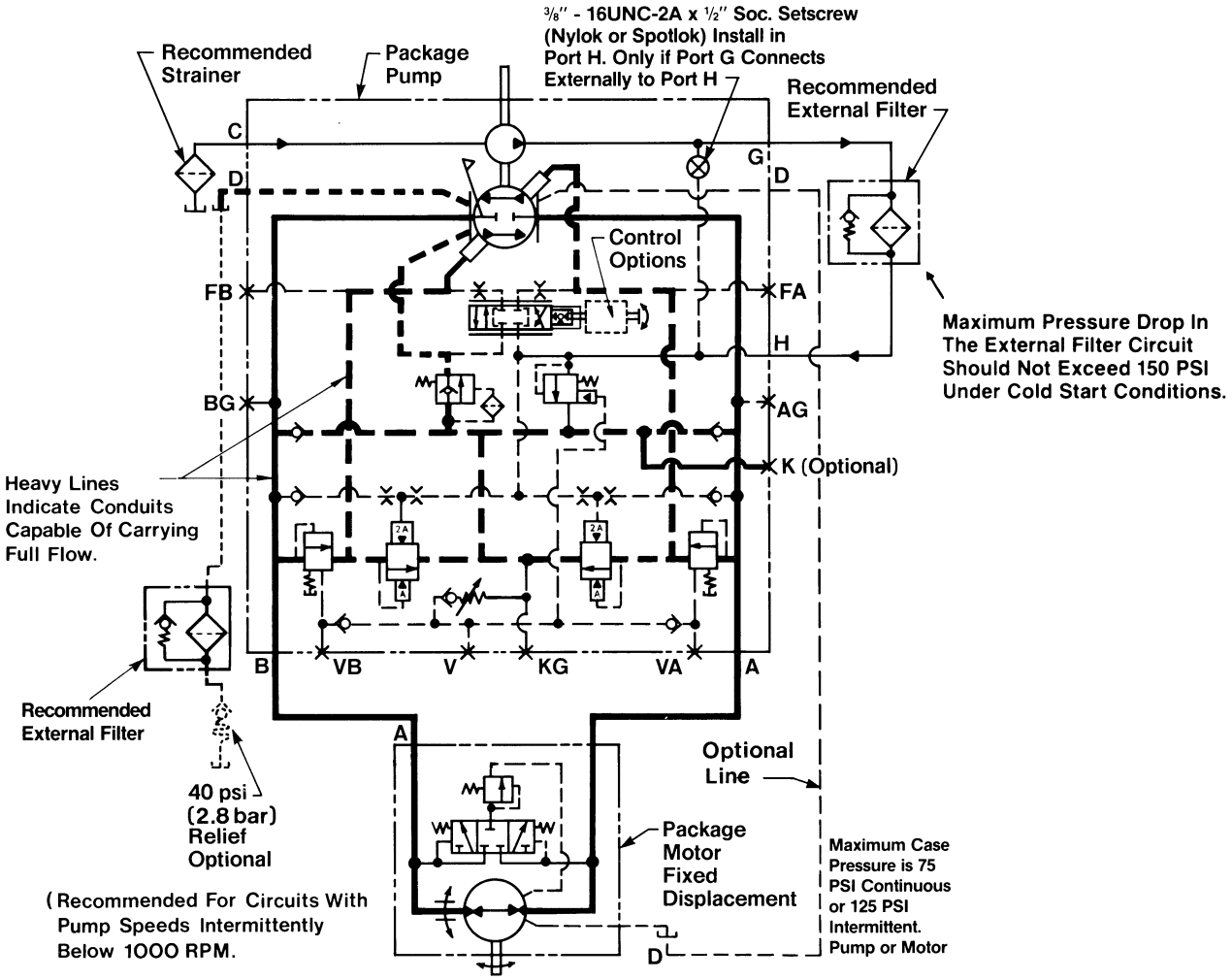
The 7K2 control uses proportional directional control valve and a the feedback potentiometer, but also has a special valve block with a valve in it to shut off the servovalve, so that control may be taken over by a 4A2 control also mounted to the pump as a manual override. The 7L2 is the same, except using an RVDT.

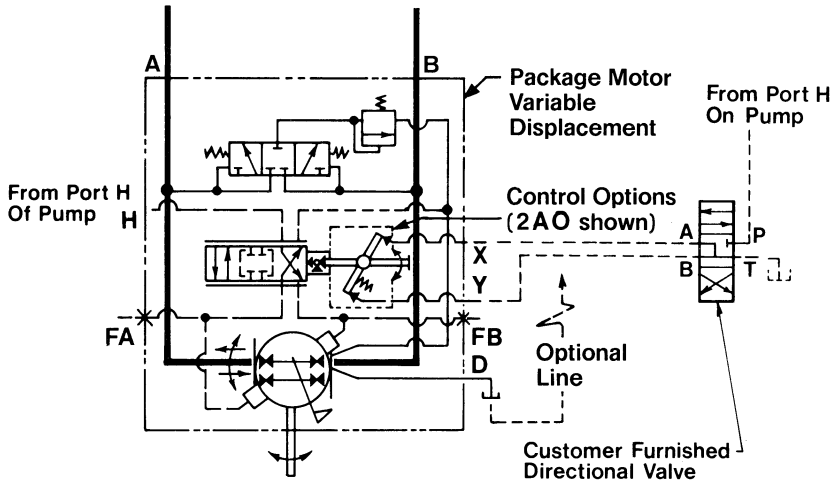
Specifications for 7P, 7J, 7K, 7L			
	P6,7,8	P11,14	P24/30
Hysteresis	<±1%	<±1%	<±1%
Linearity	<±0.9%	<±0.9%	±0.9%
Step Response	180 ms	300 ms	300 ms
Small Signal Frequency Response	16 Hz, 400 psi (28 bar)	12 Hz,, 440 psi (30 bar)	8Hz,, 500 psi (35 bar)
	25 Hz,, 1000 psi (70 bar)	20 Hz,, 1000 psi (70 bar)	10 Hz,, 1000 psi (70 bar)
Servo Pressure	1000 psi (70 bar) nominal		
Coil Resistance	1000 ohms		
Electrical Input	0-10 ma		
Feedback Pot Output	±3 VDC at 19º, 15 VDC excitation		
Feedback RVDT Output,	±2.4 VDC at 19º, 15 VDC excitation		
Fluid Types	All		
Fluid Cleanliness	NAS 1638, class 8 or ISO 17/14		
Available Drivers	Jupiter High IQ driver 020-14133		
Electrical Connector			



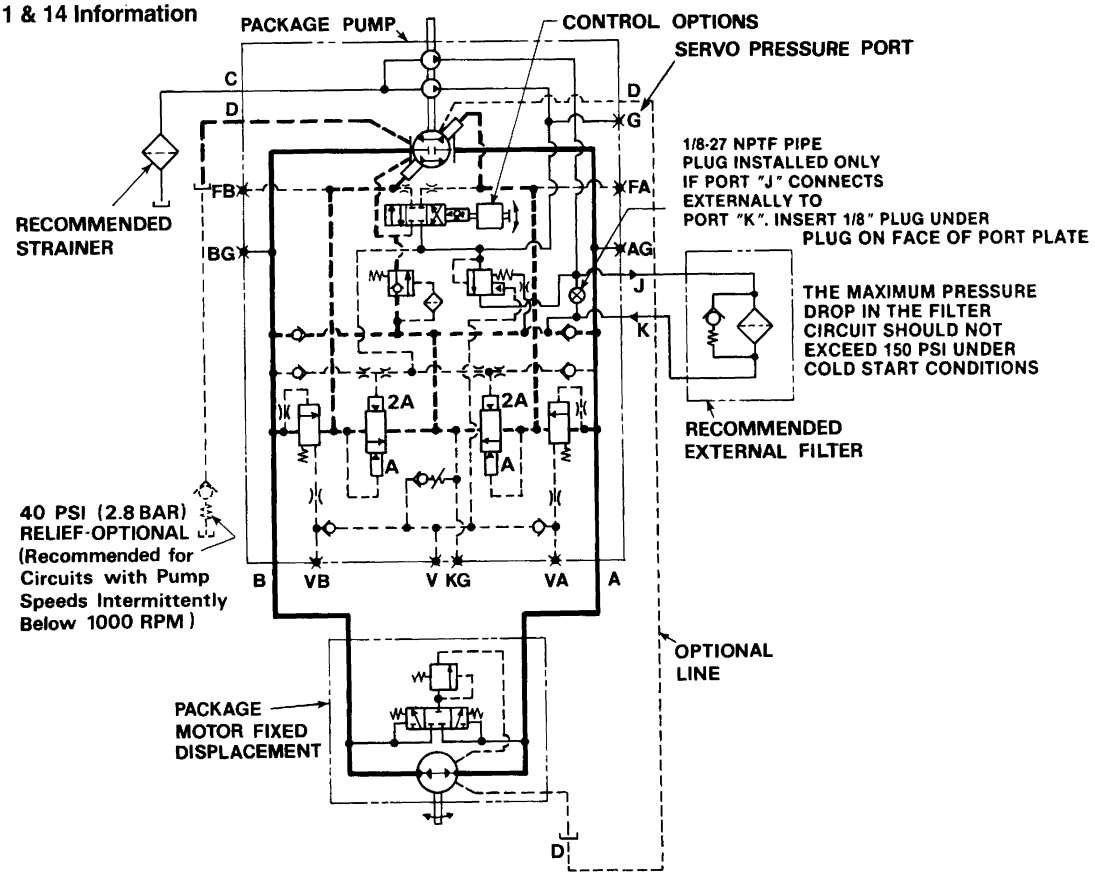
The **4 control option can be added to any other control, except the 7**, and will limit the amount of torque accepted by the drive shaft on the pump by reducing displacement if the product of pressure and flow (displacement) exceed a preset value. This will allow the pump to go to full stroke, but not at maximum pressure, and it will allow the pump to go to full pressure, but not at maximum flow. When the condition causing the overload disappears, the pump control reverts to the main displacement control. The pressure compensator override is always in effect, at all times, and its function is not effected by this control in any way.

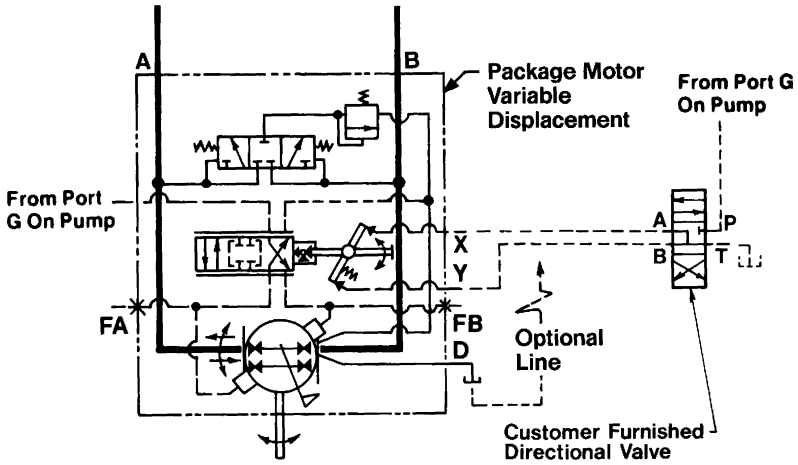
Series 6, 7 & 8 Information





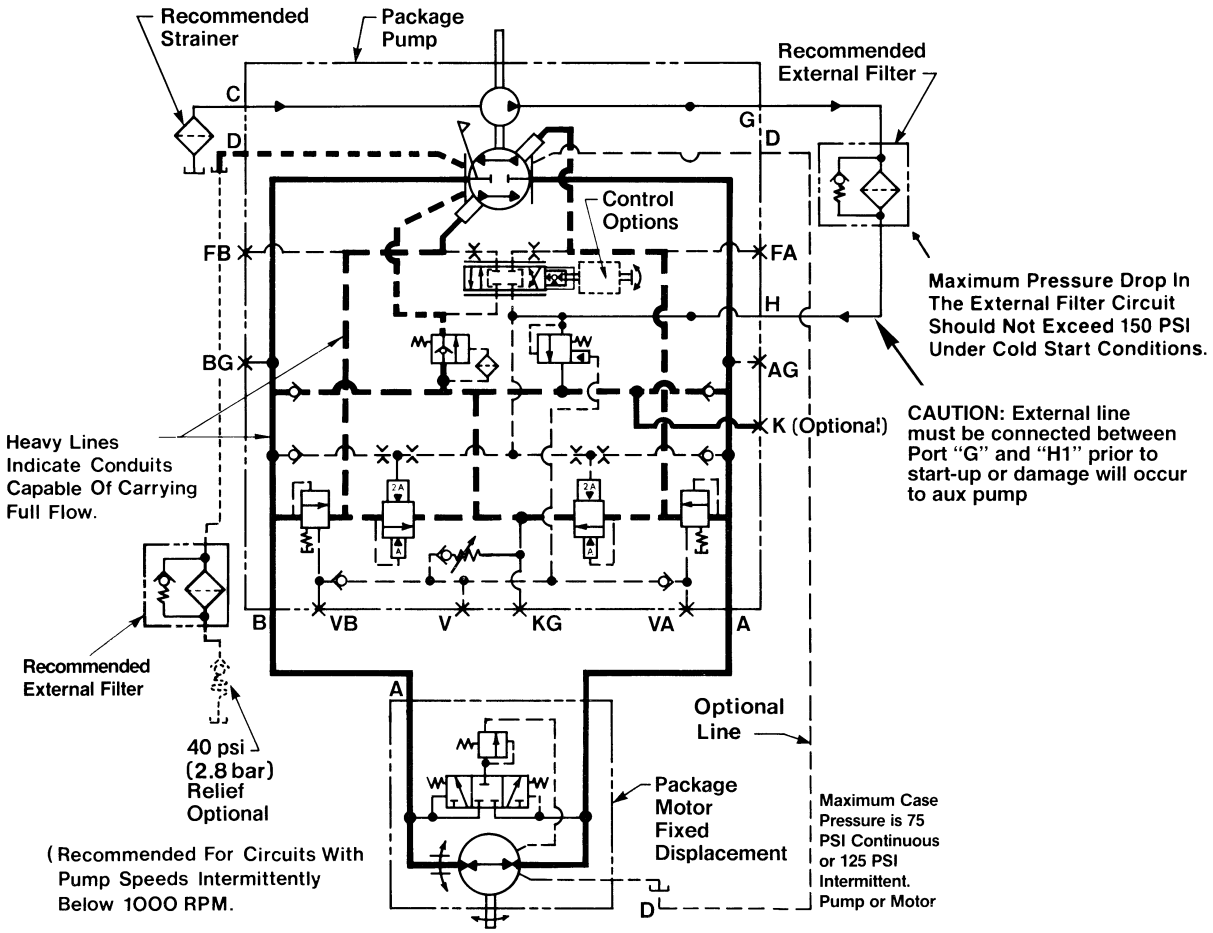
Series 11 & 14 Information

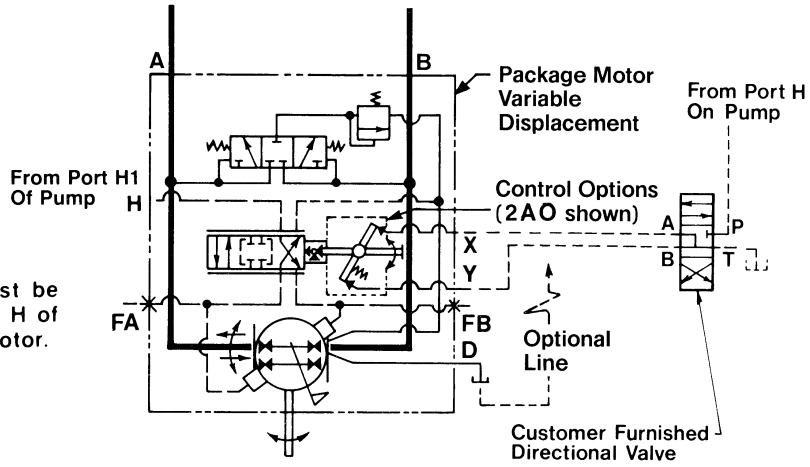




NOTE:
Servo pressure must be furnished from Port G of pump to Port H1 or H2 of motor.

Series 24 & 30 Information



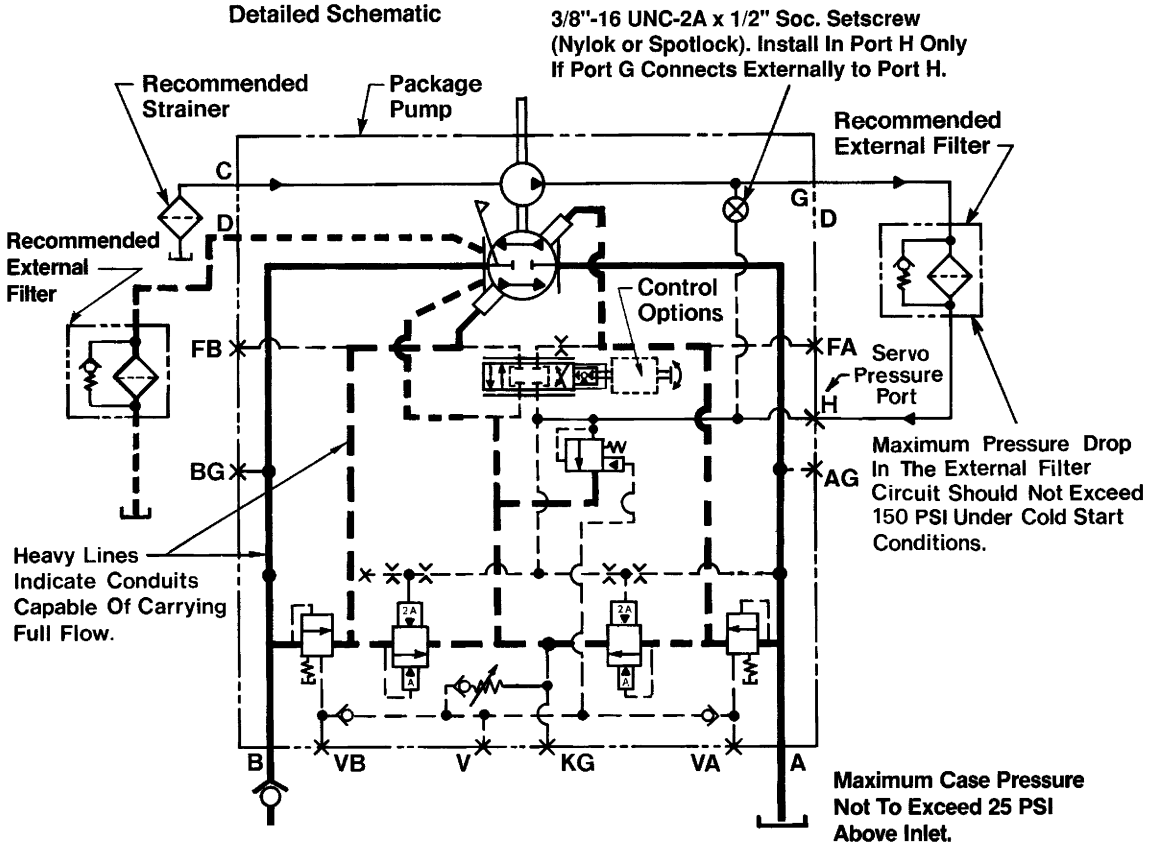


NOTE: Servo pressure must be furnished from Port H of pump to Port H of motor.

Filters must use bypass valves.

Series 6 & 7 Information

Open Loop Pump
Detailed Schematic



SERIES 6, 7, 8 OPEN CIRCUIT PUMP

	pump rotation	rotary servo input shaft rotation	port "A"	port "B"
input command "A" side	R	CW	inlet	outlet
	L	CCW	inlet	outlet
input command "B" side	R	CCW	inlet	outlet
	L	CW	inlet	outlet

NOTES:

1. The auxiliary pump inlet must be connected directly to the reservoir. See page 39 for main pump and auxiliary pump inlet requirements.

2. Case pressure must not exceed inlet pressure by more than 25 psi, 1,7 bar.

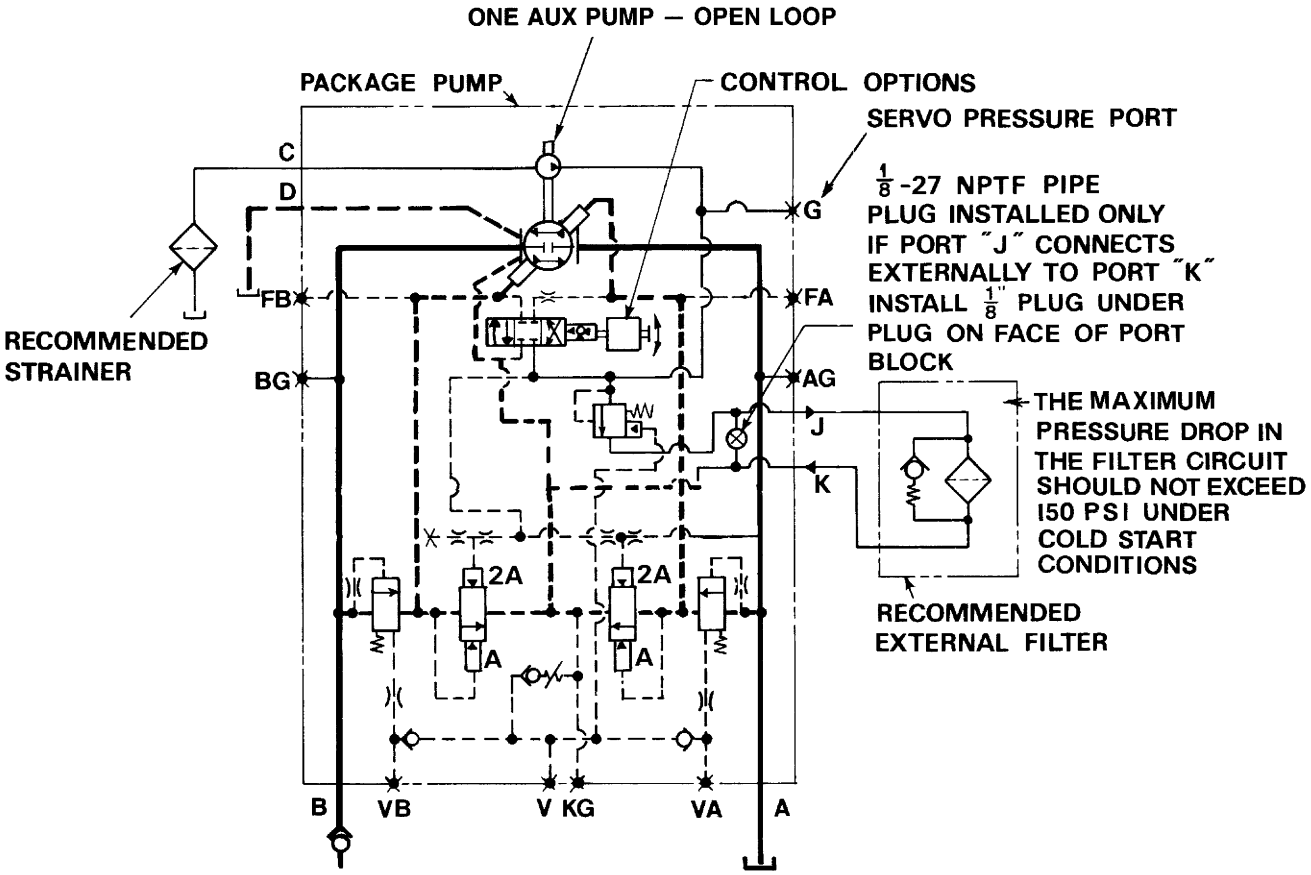
3. Maximum allowable inlet (port C) pressure: 200 psi, 13,8 bar.

4. Filters must use bypass valves.

5. Absolute inlet pressure must be increased for the following fluids:
   a. 25% for water glycols
   b. 35% for phosphate esters

6. A check valve in the outlet line between the pump and load is highly recommended where hoses, accumulators or other components may decompress when pump is vented by the compensator.

Series 11 & 14 Information



SERIES 11, 14 OPEN CIRCUIT PUMP

	pump rotation	rotary servo input shaft rotation	port "A"	port "B"
input command "A" side	R	CW	inlet	outlet
	L	CCW	inlet	outlet
input command "B" side	R	CCW	inlet	outlet
	L	CW	inlet	outlet

NOTE:

A check valve in the outlet line between the pump and load is highly recommended where hoses, accumulators or other components may decompress when pump is vented by the compensator.

Pump Ordering Code

									P	24	P-	2	R	1	E-	9	A	2-	A	0 0-	0	B	0
Pump																							
Series/displacement		**6**	**7**	**8**	**11**	**14**	**24**	**25**	**30**														
in^3/rev.		6.00	7.25	8.00	11.00	14.00	24.60	30.60	30.60														
cc/rev.		98.3	118.8	131.1	180.3	229.4	403.1	501.4	501.4														
Type																							
Fixed displacement		●	●	●	●	●				F													
Closed circuit		●	●	●	●	●	●	●		P													
Through drive		●	●	●	●	●	●	●		R													
Through drive with shuttle valve		●	●	●	●	●	●	●		L													
Limited through drive with shuttle valve		●	●	●	●	●	●	●		S													
Open circuit		●	●	●	●	●				V													

Shaft/mounting

P6,P7,P8		P11,P14		P24,P30				
SAE Shaft	SAE Mount	SAE Shaft	SAE Mount	SAE Shaft	SAE Mount			
(C) 32-1	(C) 127-2	(E) 44-1	(E) 165-4	(F) 50-1	(F) 177-4	Keyed, mechanical shaft seal	02	
(C) 32-4	(C) 127-2	(E) 44-4	(E) 165-4	(F) 50-4	(F) 177-4	Splined, mechanical shaft seal	03	
(D) 44-1	(D) 152-4					Keyed, mechanical shaft seal	04	
(D) 44-4	(D) 152-4					Splined, mechanical shaft seal	05	
(C) 32-1	(C) 127-2	(E) 44-1	(E) 165-4	(F) 50-1	(F) 177-4	Keyed, double lip shaft seal	07	
(C) 32-4	(C) 127-2	(E) 44-4	(E) 165-4	(F) 50-4	(F) 177-4	Splined, double lip shaft seal	08	

Shaft rotation																								
Clockwise viewed from shaft end												R												
Counterclockwise viewed from shaft end												L												
Seal type																								
Buna													1											
Viton													4											
Ethylene Propylene (EPR)													5											
Design letter	**Assigned by manufacturer, and may change without notice**																							
Primary controls																								
None (fixed units only)														0										
Screw adjustment														1										
Cylinder control														2										
Rotary servo														4										
High IQ														7										
Hydraulic stroker														8										
Electric stroker														9										

Primary control options	1●●	2●●	4●●	7●●	8●●	9●●	
None (fixed units only)							0
Adjustable maximum volume stops	●	●	●		●	●	A
Automatic brake control			●				B
A + B above			●		●	●	C
Servovalve with feedback potentiometer				●			D
Servovalve with feedback RVDT				●			E
Servovalve with feedback potentiometer and manual override				●			F
Servovalve with feedback RVDT and manual override				●			G
3 position spring centered		●					H
4DC01 with feedback potentiometer				●			J
4DC01 with feedback RVDT				●			K
4DC01 with feedback RVDT and manual override				●			L
With 2 position 4D01 valve mounted		●					M
With 3 position 4D01 valve mounted		●					N
4DC01 with feedback potentiometer and manual override				●			P

Ordering Code
Back to Content

Secondary controls	1●●	1●●	4●●	7●●	8●●	9●●	
Mechanical volume indicator	●	●	●	●	●	●	2
Torque limiter override	●	●	●		●	●	4
Electrical volume indicator - potentiometer	●	●	●		●	●	6
Electrical volume indicator - RVDT	●	●	●		●	●	7

Control location	
Primary control on A port side.	A
Primary control on B port side.	B

Control features	2M● /2N●	7● ●	8● ●		9● ●	
			psi	bar		
	110VAC/60Hz/Hirshmann connector	No manual override	75-350	5-24	24VDC	00
	12VDC/Hirshmann connector	With manual override	75-435	5-30	12VDC	01
	240VAC/50Hz/Hirshmann connector		100-380	7-26		02
	110VAC/60Hz/Wiring box		150-400	10-28		03
	12VDC/Wiring box		75-250	5-17		04
	Less directional valve					05
	24VDC/Hirshmann connector					06
	110VAC/50Hz/Hirshmann connector					07

Internal pump	P6,P7,P8		P11,P14		P24,P30			
	in^3/rev. X	cc/rev. X	in^3/rev. X	cc/rev.. X	in^3/rev. X	cc/rev.. X		X
	1.07	17.5	2 x 1.07	2 x 35.1	2.81	46.0		0
					1.61	26.4	Additional replenishing flow required from other source	1
					1.05	17.2	Additional replenishing flow required from other source	2
					3.56	58.3		3
					4.84	79.3		4
					5.42	88.8		5
					6.10	100.0		6

External drive	P6,P7,P8 - P, S		P11,P14 - P, S		P24,P30 - P, S		P6,P7,P8 - R, L		P11,P14 - R, L		P24,P30 - R, L		
	SAE Mount	SAE Coupling	SAE Mount	SAE Coupling	SAE Mount	SAE Coupling	SAE Mount	SAE Coupling	SAE Mount	SAE Coupling	SAE Mount	SAE Coupling	
	None	None	None	None	None	None	None	None	None	None	None	None	0
A/2	82-2	16-4	82-2	16-4	82-2	82-2	82-2	16-4	82-2	16-4			A
B/2-4	101-2	22-4	101-2	22-4	101-2	101-2	101-2	22-4	101-2	22-4	101-4	22-4	B
C/2-4					127-2	32-4	127-2	32-4	127-4	32-4	127-4	32-4	C
D/4									152-4	44-4	152-4	44-4	D
E/4									165-4	44-4	165-4	44-4	E
F/4											177- 4	50-4	F

External mounting	
No external pump mounted	0
External pump mounted	1

Ordering Code
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Motor Ordering Code

												M	6	H	2	N	1	C	2	A	0	A	0	0-	0
Motor																									
Series/displacement		**6**	**7**	**8**	**11**	**14**	**24**	**30**																	
	in³/rev.	6.00	7.25	8.00	11.00	14.00	24.60	30.60																	
	cc/rev.	98.3	118.8	131.1	180.3	229.4	403.1	501.4																	
Type																									
Fixed displacement without hot oil shuttle		●	●	●	●	●							F												
Fixed displacement with hot oil shuttle		●	●	●	●	●	●	●					G												
Variable displacement with hot oil shuttle		●	●	●	●	●	●	●					H												
Variable displacement without hot oil shuttle		●	●	●	●	●							V												

Shaft/mounting

M6, M7, M8		M11, M14		M24, M30			
SAE Shaft	SAE Mount	SAE Shaft	SAE Mount	SAE Shaft	SAE Mount		
(C) 32-1	(C) 127-2	(E) 44-1	(E) 165-4	(F) 50-1	(F) 177-4	Keyed, mechanical shaft seal	02
(C) 32-4	(C) 127-2	(E) 44-4	(E) 165-4	(F) 50-4	(F) 177-4	Splined, mechanical shaft seal	03
(D) 44-1	(D) 152-4					Keyed, mechanical shaft seal	04
(D) 44-4	(D) 152-4					Splined, mechanical shaft seal	05

Shaft rotation

Clockwise viewed from shaft end	R
Counterclockwise viewed from shaft end	L
Bidirectional	N

Seal type

Buna	1
Viton	4
Ethylene Propylene (EPR)	5

Design letter — Assigned by manufacturer, and may change without notice — A, B, C, D

Primary controls

None (fixed units only)	0
Cylinder control	2
Hydraulic stroker	8
Electric stroker	9

Primary control options

	2●●	8●●	9●●	
None (fixed units only)				0
Adjustable maximum volume stops	●	●	●	A
With 2 position 4D01 valve mounted	●			M

Secondary controls

	2●●	8●●	9●●	
None (fixed units only)				0
Reverse compensator	●	●	●	5

Control location

Primary control on A port side.	A
Primary control on B port side.	B

Control features

2M● /2N●	8●●		9●●	
	psi	bar		
110VAC/60Hz/Hirshmann connector	75-250	5-17	24VDC	00
12VDC/Hirshmann connector	250-450	17-31	12VDC	01
240VAC/50Hz/Hirshmann connector				02
110VAC/60Hz/Wiring box				03
12VDC/Wiring box				04
Less directional valve				05

Shuttle valve features

Without orifices	0
With orifices	1

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