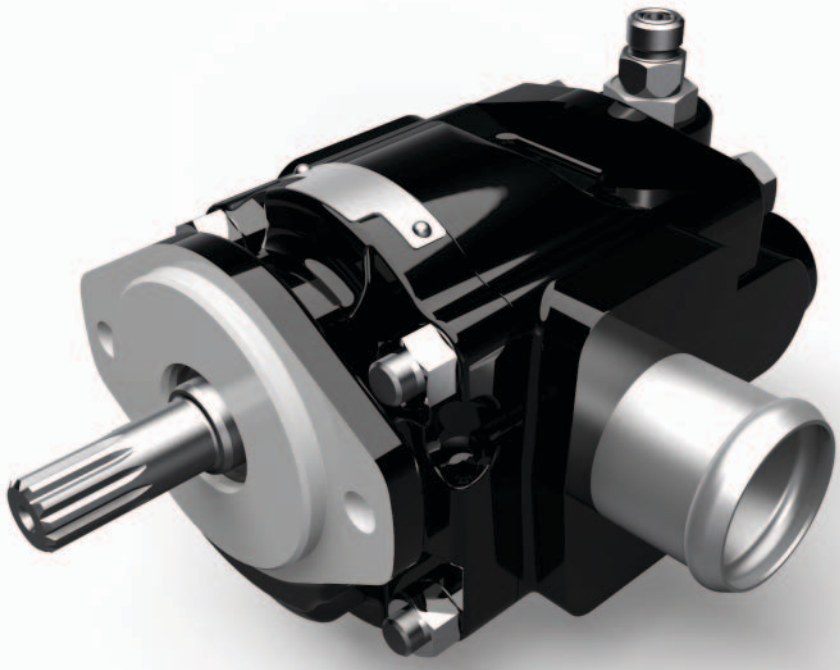


Pump & Motor Division

PGP/PGM 600 Series in Single and Multiple Configurations

ENGINEERING YOUR SUCCESS.

The Parker Hannifin Gear Pump Division Assures:

- Consistent quality
- Technical innovation
- Premier customer service

Worldwide Sales and Service

Parker operates sales and service centers in major industrial areas worldwide. Call 1-800-C-PARKER for more information, or for a synopsis of the Gear Pump Division, contact a Parker representative.

The Gear Pump Division's ability to engineer specialty products for unique applications has kept us at the forefront of technology, and ensured our position as the industry leader. Our success has come from providing a quality product with excellent sales and service support.

We manufacture hydraulic components for a wide range of industries including:

- Construction
- Truck/Bus
- Material handling
- Forestry
- Agriculture
- Industrial
- Turf care

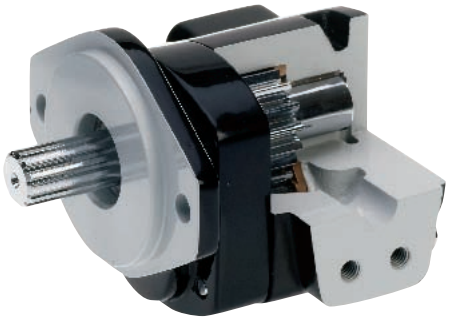
Table of Contents

Pump/Motor Products

PGP/PGM 610

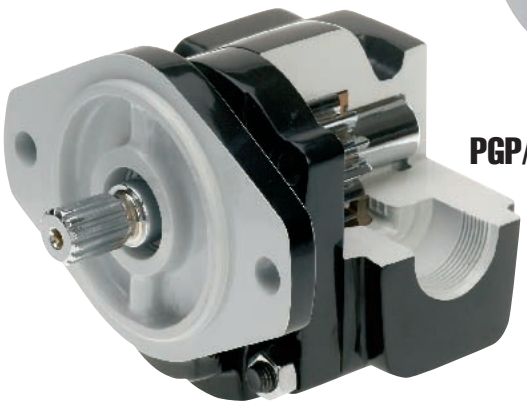
- ***Continuous pressures to 275 bar / 4000 psi***
- ***Displacements from 7 to 32 cc/rev (.43 to 1.95 cir)***
- ***SAE B 13-tooth spline available***
- ***Integral valve options***

PGP/PGM610



PGP/PGM 620

- ***Continuous pressures to 275 bar / 4000 psi***
- ***Displacements from 19 to 50 cc/rev (1.16 to 3.05 cir)***
- ***Multiple sections and cross frames with common inlet***
- ***Integral valve options***



PGP/PGM620

PGP/PGM 640

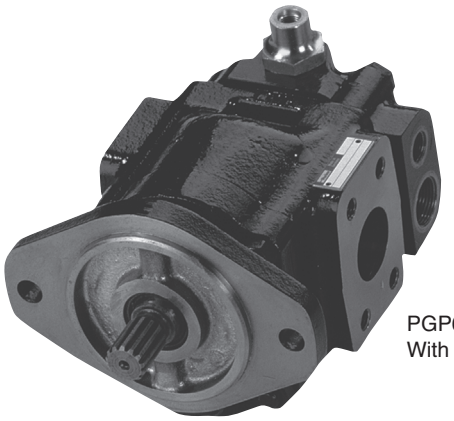
- ***Continuous pressures to 275 bar / 4000 psi***
- ***Displacements from 30 to 80 cc/rev (1.83 to 4.88 cir)***
- ***Multiple sections and cross frames with common inlet***
- ***Integral valve options***

PGP/PGM640

PGP/PGM 600

Parker Hydraulics has supplied gear pumps and motors to worldwide mobile and industrial markets for many years, especially for material handling, turf care, agricultural, and construction equipment applications. Many Parker pumps and motors have been developed and tested for the specific needs of these industries.

Parker's defined strategy to provide engineered solutions, coupled with an award-winning flexible manufacturing system has resulted in the availability of a wide range of special options.



PGP620
With LS Priority

Features of PGP/PGM 600

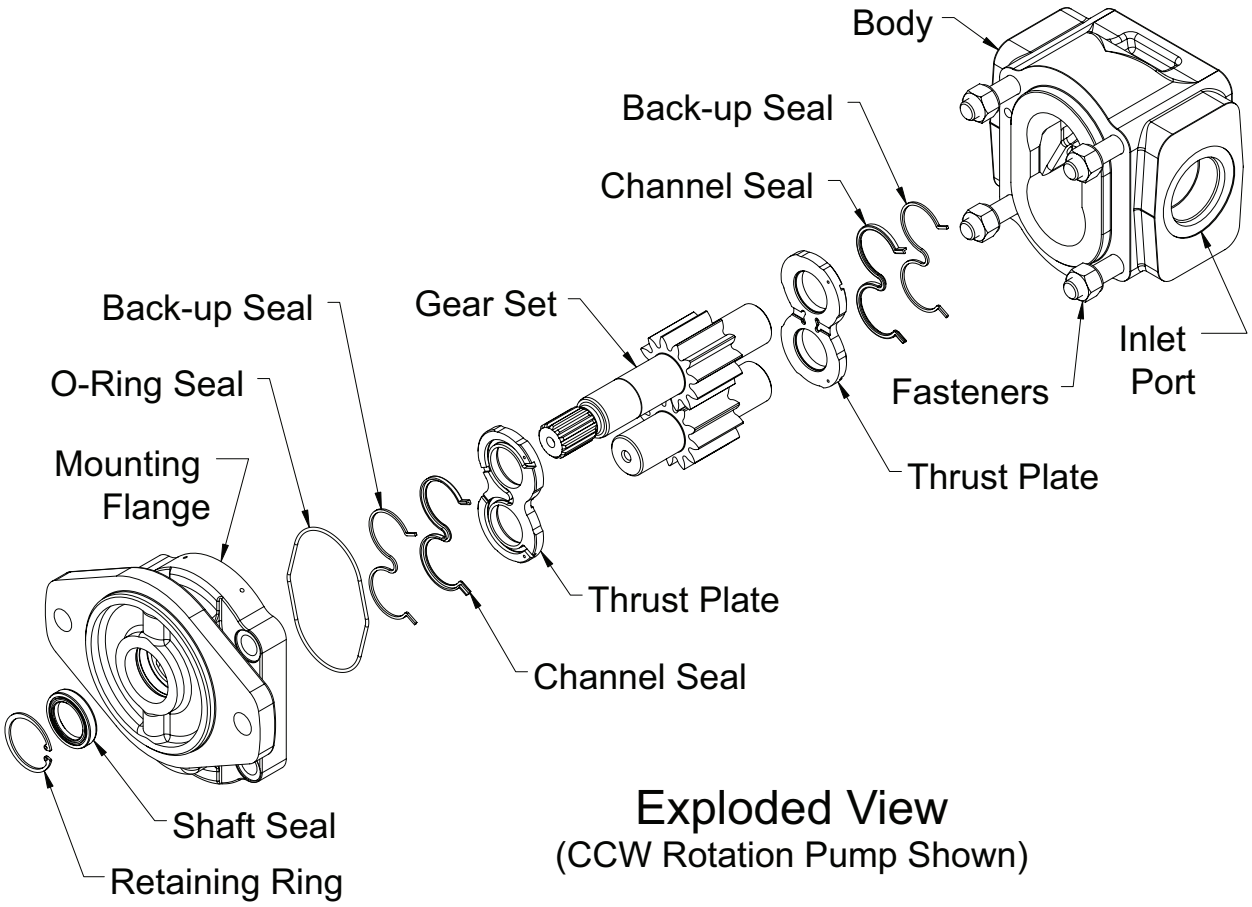
- Interlocking body design
- Multiple section and cross-frame pumps available
- Common inlets available for multiple section pumps
- Continuous operating pressures up to 275 bar (4000 psi)
- Pressure balanced thrust plate design for high efficiency
- Reduced system noise levels compared to earlier models and competitors' pumps
- High power through-drive capability
- Wide range of integral valves for power steering, power brakes, fan drives and implement hydraulics

Characteristics

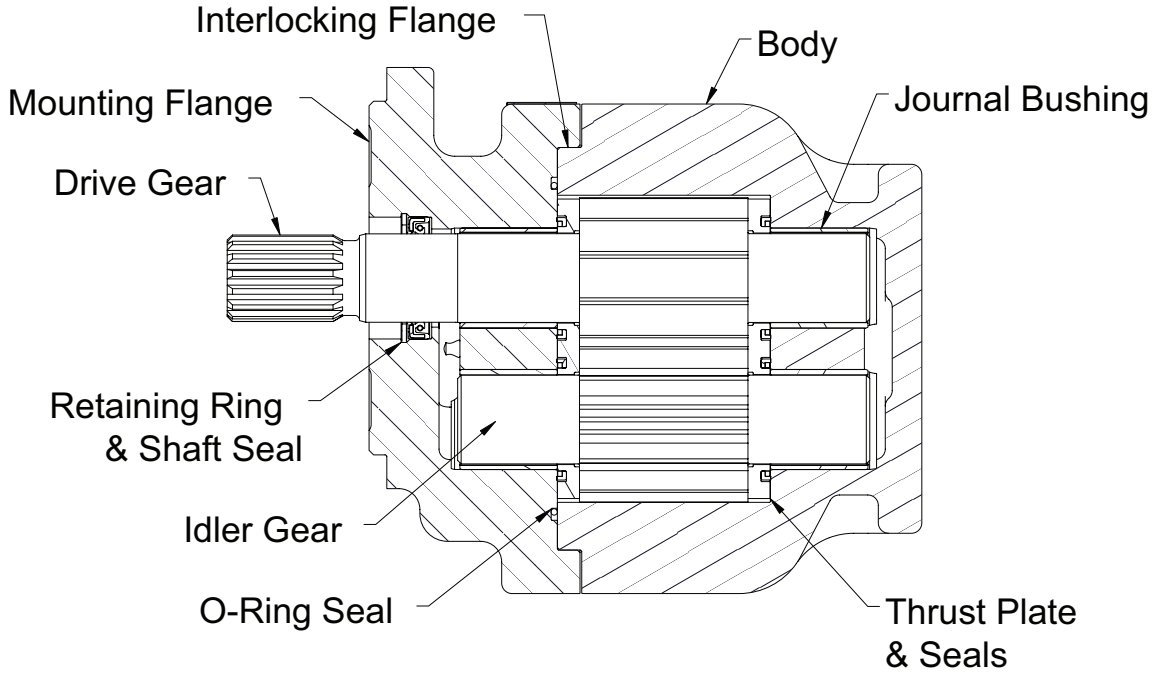
Product Features	Description
Pump/motor type	Heavy-duty, cast iron, external gear.
Mounting	SAE, 2-bolt and 4-bolt
Ports	SAE split flange, straight thread o-ring
Shaft style	SAE splined, keyed, tapered.
Speed range	See tables, pages 17-19
Displacement	See codes pages 6,8,10
Rotation	Clockwise, counterclockwise or birotational.
Pump inlet pressure	1.0 bar (15 psig) Maximum 13 cm (5 in) Hg Maximum Vacuum at operating temperature
Inlet flow velocity	3.0 mps (10 fps) Max Pump
Outlet pressure	See pages 7, 9, 11
Axial / radial shaft loads	Call product support, call 1-888-700-7411
Hydraulic fluids	Petroleum oil (mineral base) Biodegradable oil Fire resistant fluids such as: - water-oil emulsions 60/40, HFB - water-glycol, HFC - phosphate-esters, HFD Note: Pressure ratings are reduced by 35 bar (500 psi) when using water-oil emulsions or water glycol, see pages 20-21 for details.
Fluid temperature	Range of operating temperature -15 to +80°C (5 to 176°F). Temperature for cold start -20 to -15°C (-4 to +5°F) at speed ≤ 1500 rpm. Maximum permissible operating pressure is dependent on fluid temperature.

Product Features	Description
Recommended fluid viscosity (petroleum oil)	Range of operating viscosity 15 to 75 cSt. Max. operating viscosity should not exceed 1600 cSt. Recommended min. viscosity 8 cSt. See pages 20-21 for more details.
Recommended filtration	According to ISO 4406 code. 20/18/15 at 140 bar (2000psi) 19/17/14 at 210 bar (3000psi) 17/15/12 at 275 bar (4000psi)
Multiple pump assemblies	- Available in two or three section configurations. - Max. shaft loading must conform to the limitations shown in the Shaft Load Capacity table, see page 14. - The max. load is determined by adding the torque values for each pumping section that will be simultaneously loaded.
Separate or common inlet capability	Separate Inlet configuration: - Each gear housing has individual inlet and outlet ports. Common Inlet configuration: - Two or more gear sets share a common inlet.
Valve options	-Load sensing priority -Constant primary flow priority -Relief valves -Anti-cav checks (motor)

PGP/PGM 600 Series Construction



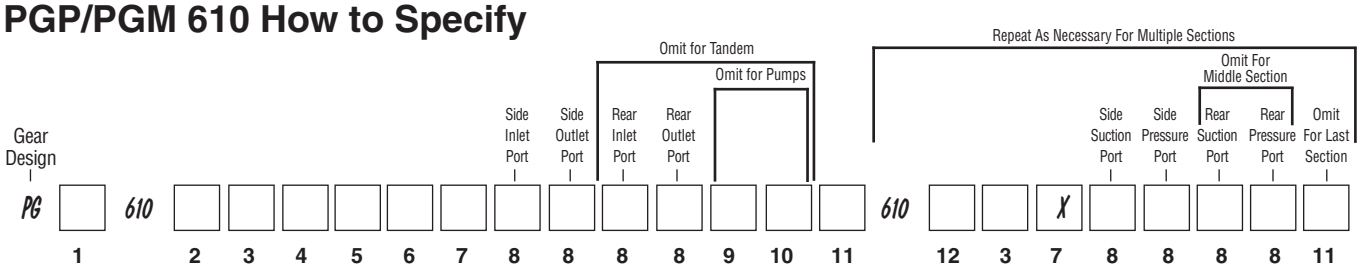
Exploded View
(CCW Rotation Pump Shown)



Cross-Section View

Parker Hannifin Corporation
Pump & Motor Division
Kings Mountain, North Carolina USA

PGP/PGM 610 How to Specify



1 Pump/Motor

P	Pump
M	Motor

2 Unit

	Pump	Motor
A	Single unit	Standard Motor w/o checks
B	Multiple unit	Standard Motor w/ two checks
C	—	Standard Motor w/one anti cavitation check (ACC)

3 Displacement

0070	7 cc/rev (0.43 in³/rev)
0100	10 cc/rev (0.61 in³/rev)
0140	14 cc/rev (0.85 in³/rev)
0160	16 cc/rev (0.98 in³/rev)
0180	18 cc/rev (1.10 in³/rev)
0210	21 cc/rev (1.28 in³/rev)
0230	23 cc/rev (1.40 in³/rev)
0260	26 cc/rev (1.59 in³/rev)
0280	28 cc/rev (1.71 in³/rev)
0320	32 cc/rev (1.95 in³/rev)

4 Rotation

C	Clockwise
A	Counter clockwise
B	Bi-directional (Motor Only)

5 Shaft*

A1	9T, SAE "A" spline
C1	11T, SAE 19-4 spline
D1	13T, SAE "B" spline
K1	32L, SAE "A" parrallel
L6	32L, SAE "19-1" parrallel

***See Note 1**

6 Flange

H2	SAE "A" 2-bolt
H3	SAE "B" 2-bolt

7 Shaft Seal*

X	No seal
N	NBR (Buna-N) (pump only)
V	FPM, FKM (Fluorocarbon) (pump only)
M	Double NBR (Buna-N) (pump only)
W	Double FPM (Fluorocarbon) (pump only)
H	High Pres.(7bar) (motor only)

***See Note 2**

8 Port Options*

Code	Description	Rear Ports	Available Displacements for Side Ports
B1	No ports	n/a	7 thru 32 cc
D3	SAE-8 straight thread o-ring	Yes	7 thru 32 cc
D4	SAE-10 straight thread o-ring	Yes	7 thru 32 cc
D5	SAE-12 straight thread o-ring	Yes	7 thru 32 cc
D6	SAE-16 straight thread o-ring	No	7 thru 32 cc
D7	SAE-20 straight thread o-ring	No	14 thru 32 cc
S1	½" Split Flange, SAE Code 61	No	7 thru 32 cc
S2	¾" Split Flange, SAE Code 61	No	7 thru 32 cc
S3	1" Split Flange, SAE Code 61	No	14 thru 32 cc
S4	1¼" Split Flange, SAE Code 61	No	14 thru 32 cc

***See Note 3**

9 Motor Drain Option

B1	No drain
A	SAE-4, straight thread o-ring
C	SAE-6, straight thread o-ring

10 Motor Drain Position

4	Rear drain

11 Inlet Options (Multi Section Units Only)

C	Common
S	Separate

12 Multiple Unit

A	Last section
B	Middle section

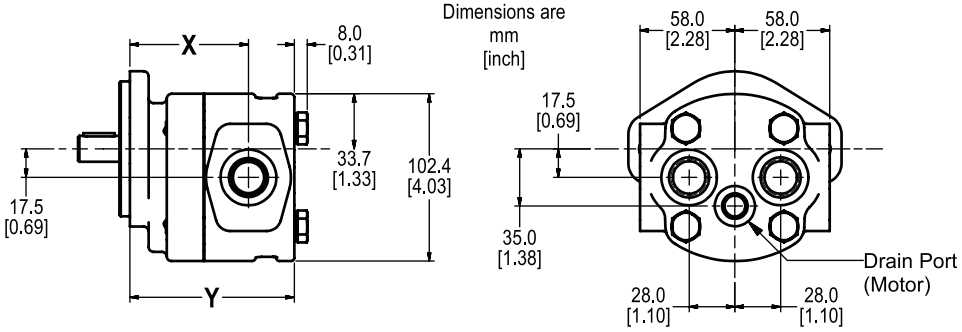
Notes:

1. See shaft load capacity table, page 14, to check shaft strength.
2. Specify “V” or “W” code if phosphate ester fluid is used or if operating temperatures exceed 80°C (176°F).
3. See page 16 for recommended maximum flows.

Parker Hannifin Corporation
Pump & Motor Division
Kings Mountain, North Carolina USA

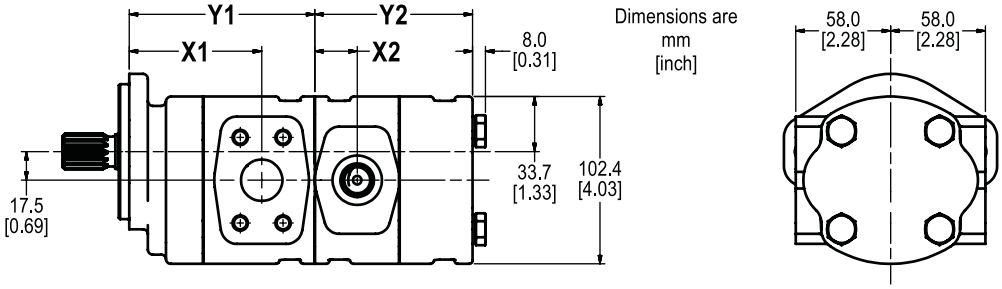
PGP/PGM 610 Specification - Standard Displacements - Single Unit

Pump Displacement	Code	0070	0100	0140	0160	0180	0210	0230	0260	0280	0320
	cc/rev	7.0	10.0	14.0	16.0	18.0	21.0	23.0	26.0	28.0	32.0
	in^3/rev	0.43	0.61	0.85	0.98	1.10	1.28	1.40	1.59	1.71	1.95
Continuous Pressure	bar	275	275	275	275	265	245	235	215	200	175
	psi	3989	3989	3989	3989	3843	3553	3408	3118	2901	2538
Intermittent Pressure	bar	300	300	300	300	290	270	260	240	220	175
	psi	4351	4351	4351	4351	4206	3916	3771	3480	3190	2538
Port Location "X"	mm	71.0	75.5	75.0	78.0	81.0	81.5	83.5	81.0	84.0	90.5
	inch	2.80	2.97	2.95	3.07	3.19	3.21	3.29	3.19	3.31	3.56
Overall Length "Y"	mm	99.0	103.5	109.5	112.5	115.5	120.0	122.0	123.5	126.5	135.0
	inch	3.90	4.07	4.31	4.43	4.55	4.72	4.80	4.86	4.98	5.31
Weight*	kg	5.9	6.2	6.5	6.8	6.8	7.1	7.2	7.3	7.5	8.0
	lb	13.1	13.6	14.4	14.9	15.0	15.6	15.9	16.2	16.5	17.6



PGP/PGM 610 Specification - Standard Displacements - Tandem Unit

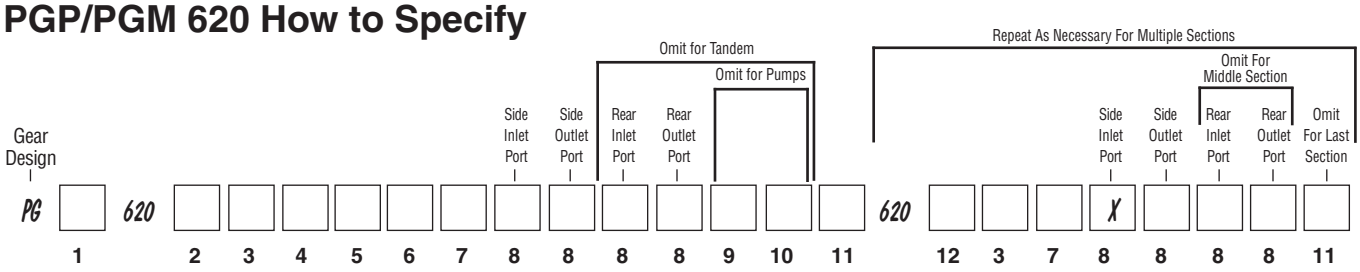
Pump Displacement	Code	0070	0100	0140	0160	0180	0210	0230	0260	0280	0320
	cc/rev	7.0	10.0	14.0	16.0	18.0	21.0	23.0	26.0	28.0	32.0
	in^3/rev	0.43	0.61	0.85	0.98	1.10	1.28	1.40	1.59	1.71	1.95
Front Port Location "X1"	mm	71.0	75.5	75.0	78.0	81.0	81.5	83.5	81.0	84.0	90.5
	inch	2.80	2.97	2.95	3.07	3.19	3.21	3.29	3.19	3.31	3.56
Front Overall Length "Y1"	mm	96.0	100.5	106.5	109.5	112.5	117.0	119.0	120.5	123.5	132.5
	inch	3.78	3.96	4.19	4.31	4.43	4.61	4.69	4.74	4.86	5.22
Rear Port Location "X2"	mm	25.0	25.0	31.5	31.5	31.5	35.5	35.5	39.5	39.5	42.0
	inch	0.98	0.98	1.24	1.24	1.24	1.40	1.40	1.56	1.56	1.65
Rear Overall Length "Y2"	mm	95.5	100.0	106.0	109.0	112.0	116.5	118.5	120.0	123.0	132.0
	inch	3.76	3.94	4.17	4.29	4.41	4.59	4.67	4.72	4.84	5.20
Weight - Front Section*	kg	5.6	5.9	6.2	6.4	6.5	6.8	6.9	7.0	7.2	7.7
	lb	12.4	12.9	13.7	14.2	14.3	14.9	15.2	15.5	15.8	17.0
Weight - Rear Section*	kg	5.7	5.9	6.3	6.5	6.5	6.8	7.0	7.1	7.2	7.8
	lb	12.5	13.0	13.8	14.3	14.4	15.0	15.3	15.6	15.9	17.2



*All weights are approximate. The actual weight of an assembly will depend upon the porting and the type of shaft and mounting specified. The weight of a tandem pump will be the sum of the weights of each section.

Parker Hannifin Corporation
Pump & Motor Division
Kings Mountain, North Carolina USA

PGP/PGM 620 How to Specify



1 Pump/Motor

P	Pump
M	Motor

2 Unit

	Pump	Motor
A	Single unit	Standard Motor w/o checks
B	Multiple unit	Standard Motor w/ two checks
C	—	Standard Motor w/one anti cavitation check (ACC)

3 Displacement

0190	19 cc/rev (1.16 in³/rev)
0230	23 cc/rev (1.40 in³/rev)
0260	26 cc/rev (1.59 in³/rev)
0290	29 cc/rev (1.77 in³/rev)
0330	33 cc/rev (2.01 in³/rev)
0370	37 cc/rev (2.26 in³/rev)
0410	41 cc/rev (2.50 in³/rev)
0440	44 cc/rev (2.69 in³/rev)
0500	50 cc/rev (3.05 in³/rev)

4 Rotation

C	Clockwise
A	Counter clockwise
B	Bi-directional (Motor Only)

5 Shaft

C1	SAE 19-4 spline, 11T
D1	SAE "B" spline, 13T
E1	SAE "B-B" spline, 15T
M1	SAE "B" parallel key
M2	SAE "B-B", parallel key
L6	SAE 19-1 parallel key
R3	SAE "B" taper 8:1

***See Note 1**

6 Flange

A3	SAE "B" 4-bolt square
A4	SAE "C" 4-bolt square
H2	SAE "A" 2-bolt
H3	SAE "B" 2-bolt

7 Shaft Seal

X	No seal
N	NBR (Buna-N) (pump only)
V	FPM, FKM (Fluorocarbon) (pump only)
M	Double NBR (Buna-N) (pump only)
W	Double FPM (Fluorocarbon) (pump only)
H	High Pres.(5bar) (motor only)

***See Note 2**

8 Port Options*

Code	Description	Rear Ports	Available Displacements for Side Ports
B1	No ports	n/a	19 thru 50 cc
D3	SAE-8 straight thread o-ring	Yes	19 thru 50 cc
D4	SAE-10 straight thread o-ring	Yes	19 thru 50 cc
D5	SAE-12 straight thread o-ring	Yes	19 thru 50 cc
D6	SAE-16 straight thread o-ring	Yes	19 thru 50 cc
D7	SAE-20 straight thread o-ring	No	19 thru 50 cc
D8	SAE-24 straight thread o-ring	No	29 thru 50 cc
S1	½" Split Flange, SAE Code 61	No	19 thru 50 cc
S2	¾" Split Flange, SAE Code 61	No	19 thru 50 cc
S3	1" Split Flange, SAE Code 61	No	19 thru 50 cc
S4	1¼" Split Flange, SAE Code 61	No	19 thru 50 cc
S5	1½" Split Flange, SAE Code 61	No	29 thru 50 cc
S6	2" Split Flange, SAE Code 61	No	29 thru 50 cc

***See Note 3**

9 Motor Drain Option

B1	No drain
C	SAE-6, straight thread o-ring

10 Motor Drain Position

4	Rear drain

11 Inlet Options (Multi Section Units Only)

C	Common
S	Separate

12 Multiple Unit

A	Last section
B	Middle section

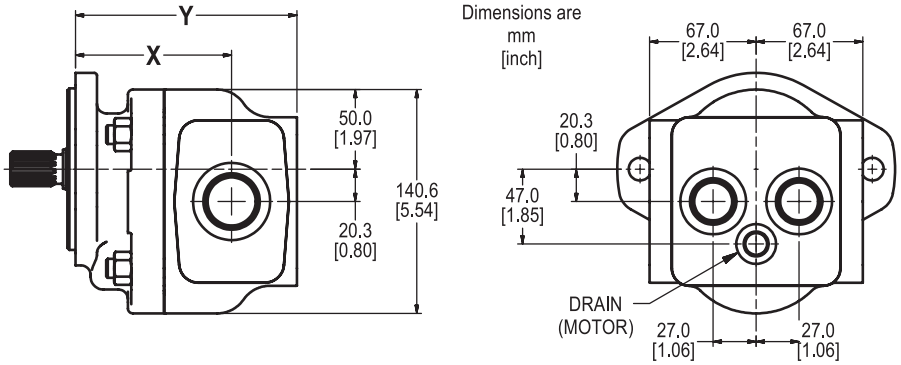
Notes:

1. See shaft load capacity table, page 14, to check shaft strength.
2. Specify "V" or "W" code if phosphate ester fluid is used or if operating temperatures exceed 80°C (176°F).
3. See page 16 for recommended maximum flows.

Parker Hannifin Corporation
Pump & Motor Division
Kings Mountain, North Carolina USA

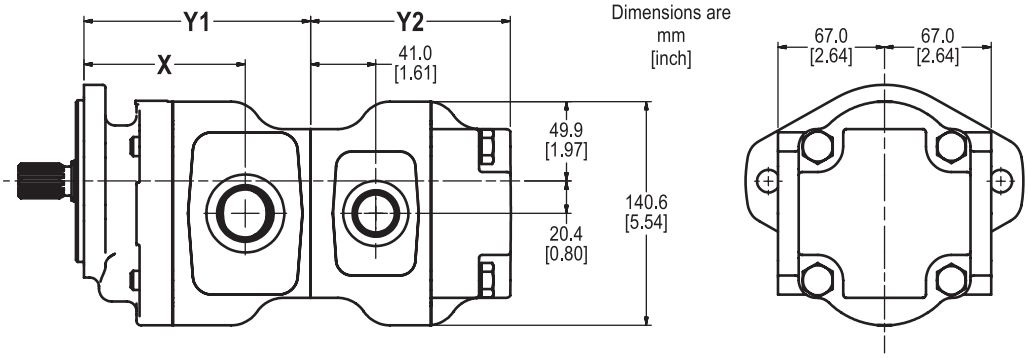
PGP/PGM 620 Specification - Standard Displacements - Single Unit

Pump	Code	0190	0230	0260	0290	0330	0370	0410	0440	0500
Displacement	cc/rev	19.0	23.0	26.0	29.0	33.0	37.0	41.0	44.0	50.0
	in^3/rev	1.16	1.40	1.59	1.77	2.01	2.26	2.50	2.68	3.05
Continuous	bar	275	275	275	275	275	250	220	210	210
Pressure	psi	3989	3989	3989	3989	3989	3626	3191	3046	3046
Intermittent	bar	300	300	300	300	300	275	245	230	210
Pressure	psi	4351	4351	4351	4351	4351	3989	3553	3336	3046
Port Location	mm	82.5	86.9	90.2	93.5	97.9	102.3	106.7	110.0	116.6
"X"	inch	3.25	3.42	3.55	3.68	3.85	4.03	4.20	4.33	4.59
Overall Length	mm	123.5	127.9	131.2	134.5	138.9	143.3	147.7	151.0	157.6
"Y"	inch	4.86	5.04	5.17	5.30	5.47	5.64	5.81	5.94	6.20
*Weight	kg	12.1	12.2	12.3	12.6	12.7	12.9	13.0	13.1	13.3
	lb	26.7	26.9	27.1	27.8	28.0	28.4	28.7	28.9	29.3



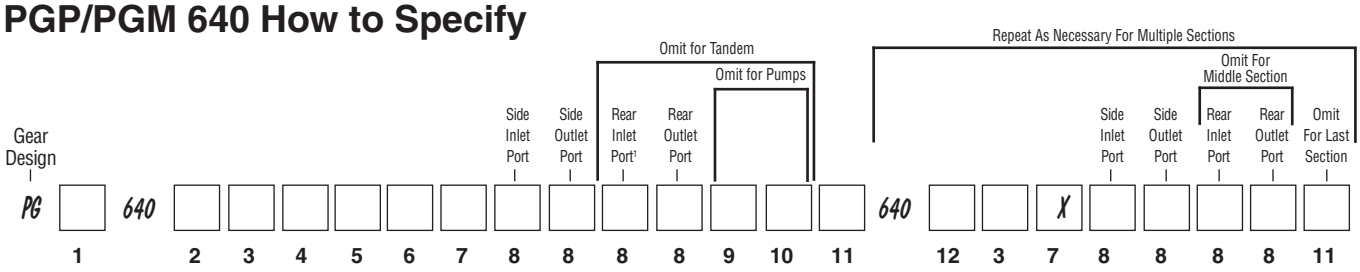
PGP/PGM 620 Specification - Standard Displacements - Tandem Unit

Pump	Code	0190	0230	0260	0290	0330	0370	0410	0440	0500
Displacement	cc/rev	19.0	23.0	26.0	29.0	33.0	37.0	41.0	44.0	50.0
	in^3/rev	1.16	1.40	1.59	1.77	2.01	2.26	2.50	2.68	3.05
Front Port	mm	82.5	86.9	90.2	93.5	97.9	102.3	106.7	110.0	116.6
Location "X"	inch	3.25	3.42	3.55	3.68	3.85	4.03	4.20	4.33	4.59
Front Overall	mm	123.5	127.9	131.2	134.5	138.9	143.3	147.7	151.0	157.6
Length "Y"	inch	4.86	5.04	5.17	5.30	5.47	5.64	5.81	5.94	6.20
Rear Overall	mm	123.5	127.9	131.2	134.5	138.9	143.3	147.7	146.0	157.6
Length "Y"	inch	4.86	5.04	5.17	5.30	5.47	5.64	5.81	5.75	6.20
*Weight Front	kg	12.1	12.2	12.3	12.6	12.7	12.9	13.0	13.1	13.3
Section	lb	26.7	26.9	27.1	27.8	28.0	28.4	28.7	28.9	29.3
*Weight Rear	kg	12.1	12.2	12.3	12.6	12.7	12.9	13.0	11.5	13.3
Section	lb	26.7	26.9	27.1	27.8	28.0	28.4	28.7	25.4	29.3



*All weights are approximate. The actual weight of an assembly will depend upon the porting and the type of shaft and mounting specified. The weight of a tandem pump will be the sum of the weights of each section.

PGP/PGM 640 How to Specify



1 Pump/Motor	
P	Pump
M	Motor

2 Unit		
	Pump	**Motor**
A	Single unit	Standard Motor w/o checks
B	Multiple unit	Standard Motor w/ two checks
C	—	Standard Motor w/one anti cavitation check (ACC)

3 Displacement	
0300	30 cc/rev (1.83 in³/rev)
0350	37 cc/rev (2.14 in³/rev)
0450	45 cc/rev (2.75 in³/rev)
0550	55 cc/rev (3.36 in³/rev)
0650	65 cc/rev (4.00 in³/rev)
0750	75 cc/rev (4.58 in³/rev)
0800	80 cc/rev (4.88 in³/rev)

4 Rotation	
C	Clockwise
A	Counter clockwise
B	Bi-directional (Motor Only)

5 Shaft	
D1	SAE "B" spline, 13T
E1	SAE "B-B" spline, 15T
E4	SAE "C" spline, 14T
M2	SAE "B-B" parallel key
N1	SAE "C" parallel key

***See Note 1**

6 Flange	
A3	SAE "B" 4-bolt square
A4	SAE "C" 4-bolt square
H3	SAE "B" 2-bolt flange
K3	SAE "C" 2-bolt flange

7 Shaft Seal	
X	No seal
N	NBR (Buna-N) (pump only)
V	FPM, FKM (Fluorocarbon) (pump only)
M	Double NBR (Buna-N) (pump only)
W	Double FPM (Fluorocarbon) (pump only)
H	High Pres.(5bar) (motor only)

***See Note 2**

8 Port Options*			
Code	**Description**	**Rear Ports**	**Available Displacements for Side Ports**
B1	No ports	n/a	30 thru 80 cc
D5	SAE-12 straight thread o-ring	Yes	30 thru 80 cc
D6	SAE-16 straight thread o-ring	Yes	30 thru 80 cc
D7	SAE-20 straight thread o-ring	Yes	30 thru 80 cc
D8	SAE-24 straight thread o-ring	Yes	30 thru 80 cc
D9	SAE-32 straight thread o-ring	No	30 thru 80 cc
S2	¾" Split Flange, SAE Code 61	No	30 thru 80 cc
S3	1" Split Flange, SAE Code 61	No	30 thru 80 cc
S4	1¼" Split Flange, SAE Code 61	No	30 thru 80 cc
S5	1½" Split Flange, SAE Code 61	No	30 thru 80 cc
S6	2" Split Flange, SAE Code 61	No	40 thru 80 cc

***See Note 3**

9 Motor Drain Option	
B1	No drain
C	SAE-6, Straight thread o-ring

10 Motor Drain Position	
4	Rear drain

11 Inlet Options (Multi Section Units Only)	
C	Common inlet (passage)
S	Separate

12 Multiple Unit	
A	Last section
B	Middle section

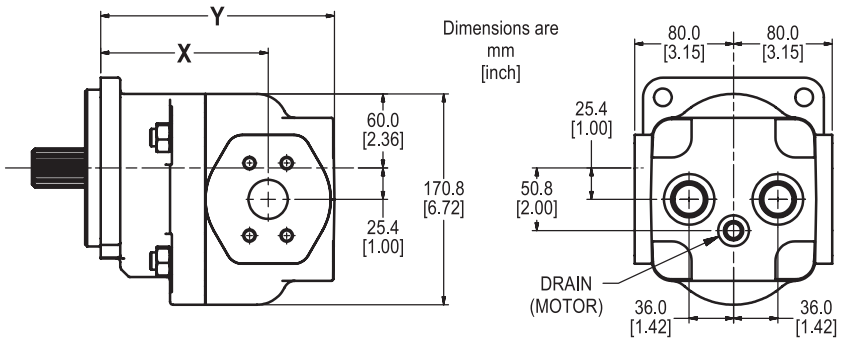
Notes:

1. See shaft load capacity table, page 14, to check shaft strength.
2. Specify “V” or “W” code if phosphate ester fluid is used or if operating temperatures exceed 80°C (176°F).
3. See page 16 for recommended maximum flows.

Parker Hannifin Corporation
Pump & Motor Division
Kings Mountain, North Carolina USA

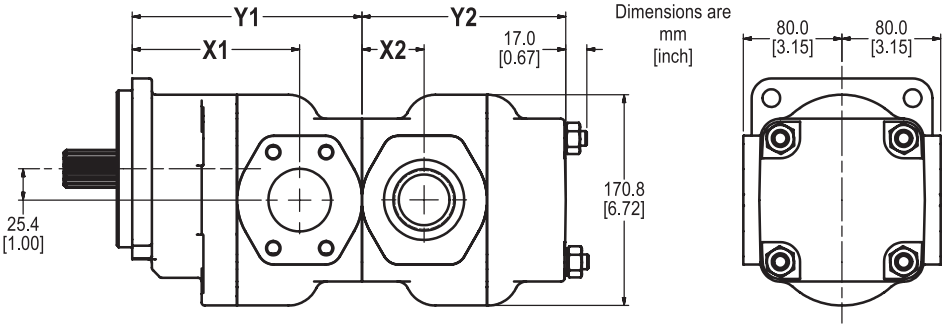
PGP/PGM 640 Specification - Standard Displacements - Single Unit

Pump Displacement	Code	0300	0350	0450	0550	0650	0750	0800
	cc/rev	30.0	35.0	45.0	55.0	65.0	75.0	80.0
	in³/rev	1.83	2.14	2.75	3.36	3.97	4.58	4.88
Continuous Pressure	bar	275	275	275	275	275	235	215
	psi	3989	3989	3989	3989	3843	3408	3118
Intermittent Pressure	bar	300	300	300	300	300	260	240
	psi	4351	4351	4351	4351	4206	3771	3481
Port Location "X"	mm	128.6	128.6	131.8	135.6	138.4	142.2	142.2
	inch	5.07	5.07	5.19	5.34	5.45	5.60	5.60
Overall Length "Y"	mm	176	176	183	189	196	203	203
	inch	6.90	6.93	7.19	7.45	7.71	7.99	7.99
*Weight	kg	20.6	20.6	21.2	22.0	22.6	23.3	24.0
	lb	42.2	45.4	46.7	48.5	49.8	51.4	53.0



PGP/PGM 640 Specification - Standard Displacements - Tandem Unit

Pump Displacement	Code	0300	0350	0450	0550	0650	0750	0800
	cc/rev	30.0	35.0	45.0	55.0	65.0	75.0	80.0
	in³/rev	1.83	2.14	2.75	3.36	3.97	4.58	4.88
Front Port Location "X1"	mm	128.6	128.6	131.8	135.6	138.4	142.2	142.2
	inch	5.06	5.06	5.19	5.34	5.45	5.60	5.60
Rear Port Location "X2"	mm	44.5	44.5	47.9	50.7	54.5	58.0	58.0
	inch	1.75	1.75	1.89	2.00	2.15	2.28	2.28
Front Overall Length "Y"	mm	173.1	173.1	179.7	186.3	192.9	200.2	200.2
	inch	6.81	6.81	7.07	7.33	7.59	7.88	7.88
Rear Overall Length "Y"	mm	150.9	150.9	157.5	164.1	170.7	178.0	178.0
	inch	5.94	5.94	6.20	6.46	6.72	7.01	7.01
*Weight Front Section	kg	20.3	20.3	20.9	21.7	22.3	23.0	23.0
	lb	44.8	44.8	46.1	47.8	49.2	50.7	50.7
*Weight Rear Section	kg	19.3	19.3	19.9	20.7	21.3	22.0	22.0
	lb	42.5	42.5	43.9	45.6	47.0	48.5	48.5

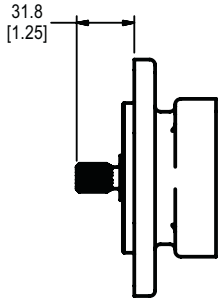


*All weights are approximate. The actual weight of an assembly will depend upon the porting and the type of shaft and mounting specified. The weight of a tandem pump will be the sum of the weights of each section.

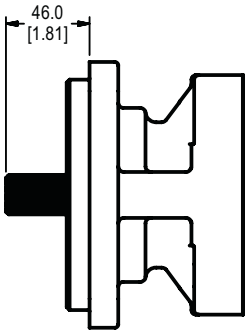
PGP/PGM 600 Spline Shaft

Dimensions are shown as $\frac{mm}{[in]}$

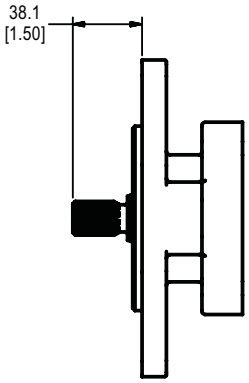
Code A1 (610 only)
9T, 16/32 PITCH, 32L S.A.E. "A" SPLINE
FLAT ROOT SIDE FIT



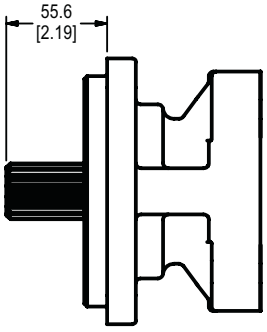
Code E1 (620 & 640 only)
15T, 16/32 PITCH, 46L S.A.E. "B-B" SPLINE
FLAT ROOT SIDE FIT



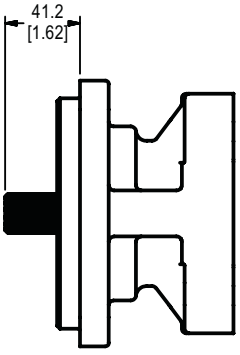
Code C1 (610 & 620 only)
11T, 16/32 PITCH, 38.1L S.A.E. "19-4" SPLINE
FLAT ROOT SIDE FIT



Code E4 (640 only)
14T, 12/24 PITCH, 55.6L S.A.E. "C" SPLINE
FLAT ROOT SIDE FIT



Code D1 (610, 620 & 640)
13T, 16/32 PITCH, 41.2L S.A.E. "B" SPLINE
FLAT ROOT SIDE FIT

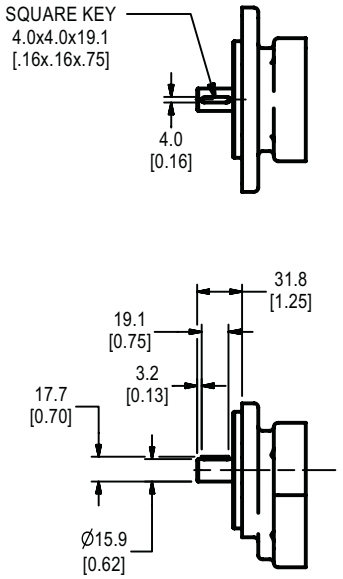


Parker Hannifin Corporation
Pump & Motor Division
Kings Mountain, North Carolina USA

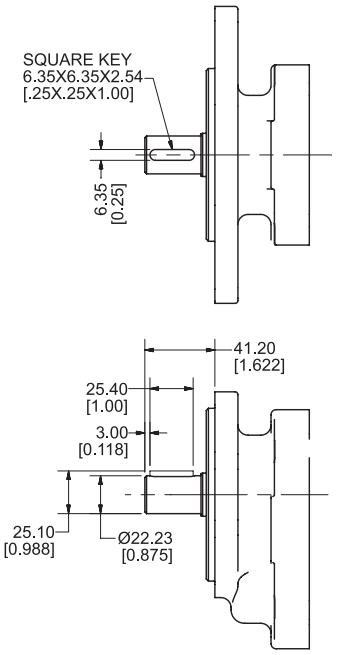
PGP/PGM 600 Drive Shaft

Dimensions are shown as mm [in]

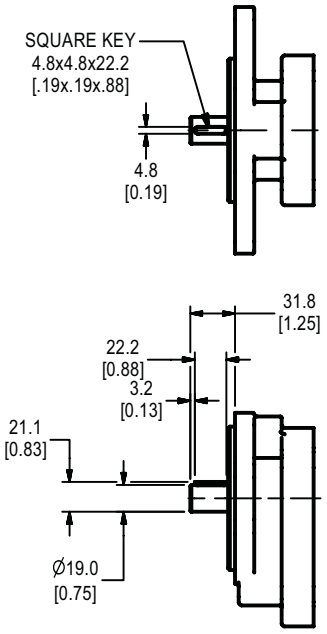
Code K1 (610 only)
Ø15.88, 4.0 KEY,
NO THREAD, 32L
S.A.E. "A" PARALLEL



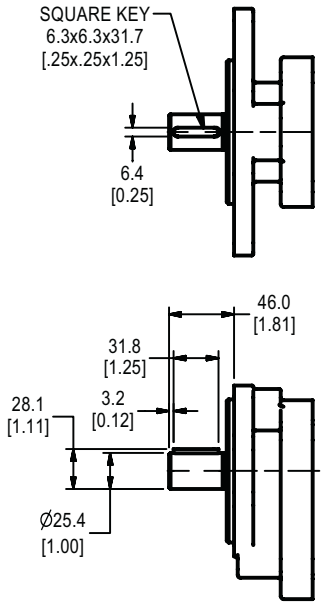
Code M1
(620 only)
Ø22.22, 6.3 KEY,
NO THREAD, 41.2L
S.A.E. "B" PARALLEL



Code L6
(610 & 620 only)
Ø19.05, 4.8 KEY,
NO THREAD, 32L
S.A.E. "19-1" PARALLEL



Code M2
(620 & 640 only)
Ø25.4, 6.3 KEY,
NO THREAD, 46L
S.A.E. "B-B" PARALLEL

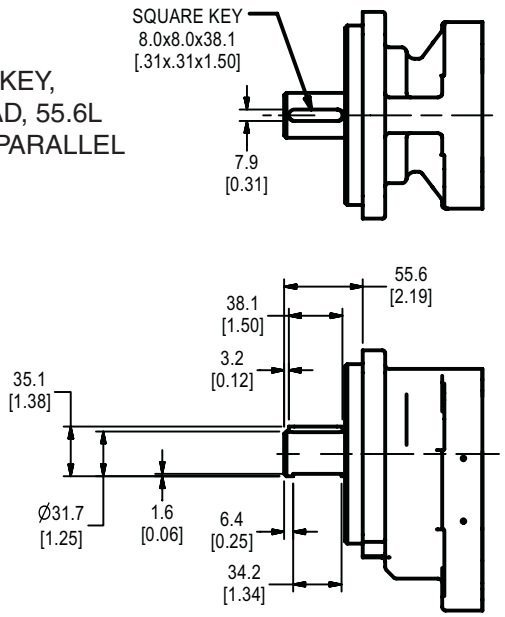


Parker Hannifin Corporation
Pump & Motor Division
Kings Mountain, North Carolina USA

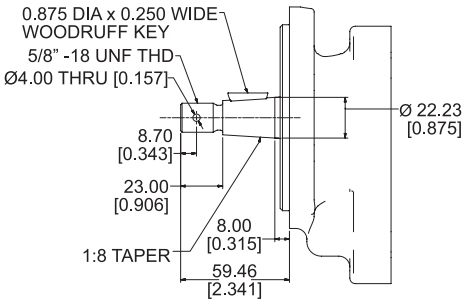
PGP/PGM 600 Drive Shaft

Dimensions are shown as mm [in]

Code N1
(640 only)
Ø31.7, 8.0 KEY,
NO THREAD, 55.6L
S.A.E. "C" PARALLEL



Code R3 (620 only)
SAE "B" TAPER w/Key



PGP/PGM 600- Shaft Load Capacity - Continuous Rating

Code	Type	Shaft Description	Maximum Allowable Torque					
			PGP610		PGP620		PGP640	
			Nm	lb-ft	Nm	lb-ft	Nm	lb-ft
A1	spline	SAE A, 9 tooth, 16/32 pitch	85	62	N/A	N/A	N/A	N/A
C1	spline	SAE 19-4,11 tooth, 16/32 pitch	125	92	125	92	N/A	N/A
D1	spline	SAE B, 13 tooth, 16/32 pitch	245	181	245	181	350	258
E1	spline	SAE B-B, 15 tooth, 16/32 pitch	N/A	N/A	390	288	535	395
E4	spline	SAE C, 14 tooth, 12/24 pitch	N/A	N/A	N/A	N/A	1040	767
n/a	spline	Connecting Shaft-Tandem Units	130	96	225	166	435	321
K1	key	SAE A, 0.625" dia, 0.156" key	85	63	N/A	N/A	N/A	N/A
L6	key	SAE 19-1, 0.750" dia, 0.188" key	170	125	170	125	N/A	N/A
M1	key	SAE B, 0.875" dia, 0.250" key	200	148	200	148	N/A	N/A
M2	key	SAE BB, 1.000" dia, 0.250" key	N/A	N/A	320	236	320	236
N1	key	SAE C, 1.250" dia, 0.312" key	N/A	N/A	N/A	N/A	630	465
R3	taper	SAE B, 1:8 taper, 5/8" - 18 thd	N/A	N/A	190	140	N/A	N/A

To calculate the theoretical torque of a pump or motor:

$$\text{Torque (Nm)} = \frac{\text{Pressure (bar)} \times \text{Displacement (cc/rev)}}{62.8}$$

$$\text{Torque (lb-ft)} = \frac{\text{Pressure (psi)} \times \text{Displacement (cuin/rev)}}{75.4}$$

Approximate actual torque to drive a pump = 1.1 x theoretical torque.

Approximate actual torque from a motor = .9 x theoretical torque.

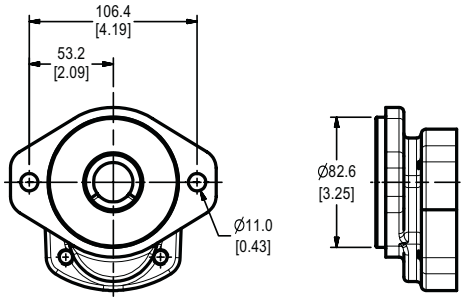
The total shaft torque for a multiple section unit will be the sum of the values for each section.
Each connecting shaft should also be checked for torque load capacity.

Parker Hannifin Corporation
Pump & Motor Division
Kings Mountain, North Carolina USA

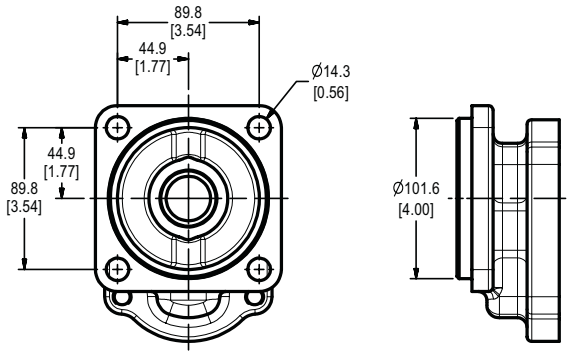
PGP/PGM 600 Mounting Flange

Dimensions are shown as mm [in]

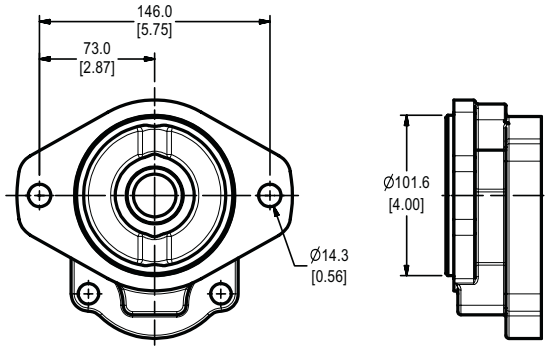
Code H2 (610 & 620 only)
S.A.E. "A" 2-BOLT



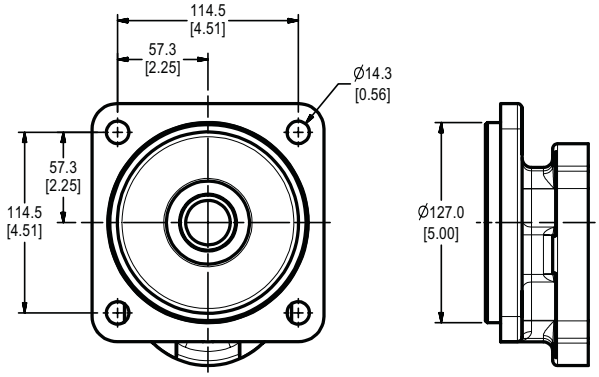
Code A3 (620 & 640 only)
S.A.E. "B" 4-BOLT



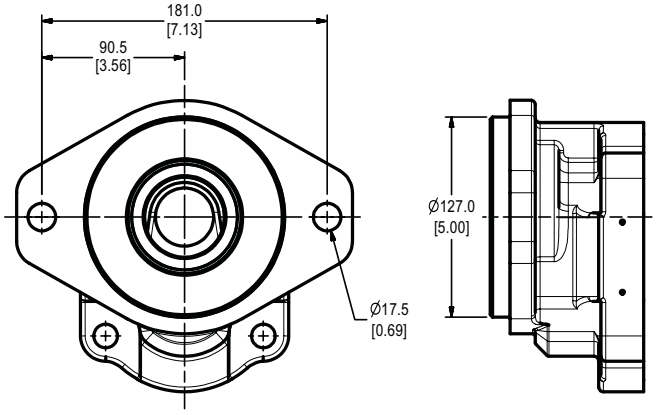
Code H3 (610, 620 & 640)
S.A.E. "B" 2-BOLT



Code A4 (620 & 640 only)
S.A.E. "C" 4-BOLT



Code K3 (640 only)
S.A.E. "C" 2-BOLT

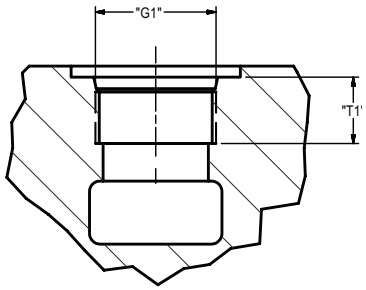


PGP/PGM 600 Porting

Dimensions are shown as mm [in]

Porting Code D

SAE J1926 STRAIGHT THREAD O-RING

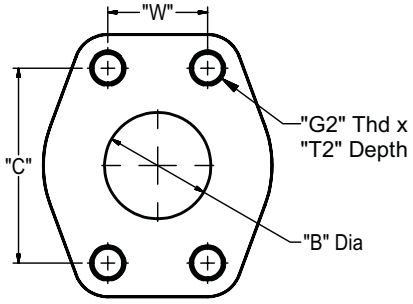


*Note: The pump inlet flow velocity should not exceed 3.0 m/s (10 fps). Pump outlet and motor inlet or outlet flow velocities should not exceed 6.1 m/s (20 fps).

Code	Dash Size	Nominal Tube OD	"G1" Thd Size inch	"T1" Full Thd Min mm (inch)	Recommended Max Flow* lpm (gpm)	
					Pump Inlet	Pump Outlet & Motor
D3	-8	1/2"	3/4"-16	14.3 (.56)	14 (3.8)	28 (7.5)
D4	-10	5/8"	7/8"-14	16.7 (.66)	22 (5.7)	44 (11.5)
D5	-12	3/4"	1-1/16"-12	19.0 (.75)	34 (9.1)	69 (18.2)
D6	-16	1"	1-5/16"-12	19.0 (.75)	66 (17.4)	132 (34.9)
D7	-20	1 1/4"	1-5/8"-12	19.0 (.75)	108 (28.5)	215 (56.9)
D8	-24	1 1/2"	1-7/8"-12	19.0 (.75)	160 (42.2)	319 (84.3)
D9	-32	2"	2-1/2"-12	19.0 (.75)	294 (77.7)	588 (155.3)

Porting Code S

FOUR BOLT SPLIT FLANGE TYP SAE J518 CODE 61



*Note: The pump inlet flow velocity should not exceed 3.0 m/s (10 fps). Pump outlet and motor inlet or outlet flow velocities should not exceed 6.1 m/s (20 fps).

Code	Dash Size	Nominal ID	"G2" Thd Size inch	"T2" Full Thd Min mm (inch)	"B" Dia mm (inch)	"C" mm (inch)	"W" mm (inch)	Recommended Max Flow* lpm (gpm)	
								Pump Inlet	Pump Outlet & Motor
S1	-8	1/2"	5/16"-18	15.0 (0.59)	12.7 (0.50)	38.10 (1.500)	17.48 (0.688)	23 (6.1)	46 (12.2)
S2	-12	3/4"	3/8"-16	14.0 (0.56)	19.0 (0.75)	47.63 (1.875)	22.23 (0.875)	52 (13.8)	104 (27.5)
S3	-16	1"	3/8"-16	20.6 (0.81)	25.4 (1.00)	52.37 (2.062)	26.19 (1.031)	93 (24.5)	185 (49.0)
S4	-20	1 1/4"	7/16"-14	20.6 (0.81)	31.8 (1.25)	58.72 (2.312)	30.17 (1.188)	145 (38.3)	290 (76.5)
S5	-24	1 1/2"	1/2"-13	27.0 (1.06)	38.1 (1.50)	69.85 (2.750)	35.71 (1.406)	208 (55.1)	417 (110.2)
S6	-32	2"	1/2"-13	27.0 (1.06)	50.8 (2.00)	77.77 (3.062)	42.88 (1.688)	370 (97.9)	742 (195.9)

PGP610 Typical Outlet Flow and Input Power
120°F (50°C), ISO VG32 Fluid

Speed rpm	units	Displacement / Maximum Allowable Continuous Pressure									
	cc	7	10	14	16	18	21	23	26	28	32
	in^3	0.43	0.61	0.85	0.98	1.10	1.28	1.40	1.59	1.71	1.95
	bar	275	275	275	275	265	245	235	215	200	175
	psi	3989	3989	3989	3989	3843	3553	3408	3118	2901	2538
900	lpm	6.0	8.5	11.9	13.6	15.3	17.9	19.6	22.1	23.8	27.2
	gpm	1.6	2.2	3.1	3.6	4.0	4.7	5.2	5.8	6.3	7.2
	kw	3.1	4.4	6.2	7.1	7.4	7.8	7.8	7.8	7.7	9.0
	hp	4.2	5.9	8.3	9.5	9.9	10.4	10.4	10.4	10.3	12.1
1200	lpm	8.0	11.3	15.9	18.1	20.4	23.8	26.1	29.5	31.8	36.3
	gpm	2.1	3.0	4.2	4.8	5.4	6.3	6.9	7.8	8.4	9.6
	kw	4.1	5.9	8.3	9.5	9.9	10.4	10.4	10.3	10.2	12.0
	hp	5.6	7.9	11.1	12.7	13.2	13.9	13.9	13.9	13.7	16.1
1500	lpm	10.0	14.3	20.1	22.9	25.8	30.1	32.9	37.2	40.1	45.8
	gpm	2.6	3.8	5.3	6.1	6.8	7.9	8.7	9.8	10.6	12.1
	kw	5.2	7.5	10.5	12.0	12.5	13.1	13.1	13.1	12.9	15.2
	hp	7.0	10.0	14.0	16.0	16.7	17.6	17.6	17.5	17.3	20.4
1800	lpm	12.1	17.3	24.2	27.6	31.1	36.3	39.7	44.9	48.4	55.3
	gpm	3.2	4.6	6.4	7.3	8.2	9.6	10.5	11.9	12.8	14.6
	kw	6.3	9.0	12.6	14.3	15.0	15.8	15.8	15.7	15.5	18.3
	hp	8.4	12.0	16.8	19.2	20.1	21.1	21.1	21.0	20.8	24.5
2100	lpm	14.2	20.3	28.4	32.4	36.5	42.6	46.6	52.7	56.7	64.8
	gpm	3.7	5.4	7.5	8.6	9.6	11.2	12.3	13.9	15.0	17.1
	kw	7.4	10.6	14.8	16.9	17.7	18.6	18.6	18.5	18.3	21.5
	hp	9.9	14.2	19.9	22.7	23.7	24.9	24.9	24.8	24.6	28.9
2400	lpm	16.3	23.3	32.6	37.2	41.9	48.9	53.5	60.5	65.2	74.5
	gpm	4.3	6.1	8.6	9.8	11.1	12.9	14.1	16.0	17.2	19.7
	kw	8.6	12.2	17.1	19.6	20.4	21.5	21.5	21.4	21.2	24.9
	hp	11.5	16.4	22.9	26.2	27.4	28.8	28.8	28.7	28.42	33.4
2700	lpm	18.3	26.2	36.7	41.9	47.1	55.0	60.2	68.1	73.3	83.8
	gpm	4.8	6.9	9.7	11.1	12.5	14.5	15.9	18.0	19.4	22.1
	kw	9.7	13.9	19.5	22.2	23.2	24.4	24.4	24.3	24.1	28.3
	hp	13.1	18.6	26.1	29.8	31.1	32.7	32.7	32.6	32.3	38.0
3000	lpm	20.4	29.1	40.7	46.6	52.4	61.1	66.9	75.7	81.5	93.1
	gpm	5.4	7.7	10.8	12.3	13.8	16.1	17.7	20.0	21.5	24.6
	kw	10.9	15.6	21.9	25.0	26.1	27.4	27.4	27.3	27.0	31.8
	hp	14.7	21.0	29.3	33.5	35.0	36.8	36.8	36.6	36.3	42.7
3300	lpm	22.3	31.8	44.6	51.0	57.3	66.9	73.2	82.8	89.2	101.9
	gpm	5.9	8.4	11.8	13.5	15.1	17.7	19.3	21.9	23.6	26.9
	kw	12.2	17.4	24.3	27.8	29.0	30.5	30.5	30.4	30.1	35.4
	hp	16.3	23.3	32.6	37.3	38.9	40.9	40.9	40.8	40.4	47.5

PGP620 Typical Outlet Flow and Input Power
120°F (50°C), ISO VG32 Fluid

Speed rpm	units	Displacement / Maximum Allowable Continuous Pressure								
	cc	19	23	26	29	33	37	41	44	50
	in^3	1.16	1.40	1.59	1.77	2.01	2.26	2.50	2.75	3.05
	bar	275	275	275	275	275	250	220	210	210
	psi	3989	3989	3989	3989	3989	3626	3191	3046	3046
900	lpm	16.2	19.6	22.1	24.7	28.1	31.5	34.9	37.4	42.5
	gpm	4.3	5.2	5.8	6.5	7.4	8.3	9.2	9.9	11.2
	kw	8.4	10.2	11.5	12.9	14.6	14.9	14.5	14.9	16.9
	hp	11.3	13.7	15.5	17.2	19.6	20.0	19.5	20.0	22.7
1200	lpm	21.7	26.1	29.5	32.9	37.4	42.0	46.5	49.9	56.7
	gpm	5.7	6.9	7.8	8.7	9.9	11.1	12.3	13.2	15.0
	kw	11.2	13.6	15.4	17.2	19.5	19.9	19.4	19.9	22.6
	hp	15.1	18.2	20.6	23.0	26.2	26.7	26.0	26.6	30.3
1500	lpm	27.2	32.9	37.2	41.5	47.3	53.0	58.7	63.0	71.6
	gpm	7.2	8.7	9.8	11.0	12.5	14.0	15.5	16.7	18.9
	kw	14.2	17.2	19.4	21.7	24.7	25.1	24.5	25.1	28.5
	hp	19.0	23.0	26.1	29.1	33.1	33.7	32.9	33.7	38.3
1800	lpm	32.8	39.7	44.9	50.1	57.0	63.9	70.8	76.0	86.4
	gpm	8.7	10.5	11.9	13.2	15.1	16.9	18.7	20.1	22.8
	kw	17.0	20.6	23.3	26.0	29.6	30.2	29.4	30.1	34.2
	hp	22.8	27.7	31.3	34.9	39.7	40.4	39.4	40.4	45.9
2100	lpm	38.5	46.6	52.7	58.8	66.9	75.0	83.1	89.2	101.3
	gpm	10.2	12.3	13.9	15.5	17.7	19.8	21.9	23.6	26.8
	kw	20.1	24.3	27.5	30.7	34.9	35.6	34.7	35.5	40.4
	hp	26.9	32.6	36.9	41.1	46.8	47.7	46.5	47.7	54.2
2400	lpm	44.2	53.5	60.5	67.5	76.8	86.1	95.4	102.4	116.4
	gpm	11.7	14.1	16.0	17.8	20.3	22.8	25.2	27.1	30.7
	kw	23.2	28.1	31.8	35.4	40.3	41.1	40.1	41.1	46.7
	hp	31.1	37.7	42.6	47.5	54.1	55.1	53.8	55.1	62.6
2700	lpm	49.8	60.2	68.1	76.0	86.4	96.9	107.4	115.2	131.0
	gpm	13.1	15.9	18.0	20.1	22.8	25.6	28.4	30.4	34.6
	kw	26.4	32.0	36.2	40.3	45.9	46.8	45.6	46.7	53.1
	hp	35.4	42.9	48.5	54.1	61.5	62.7	61.2	62.7	71.2
3000	lpm	55.3	66.9	75.7	84.4	96.0	107.7	119.3	128.0	145.5
	gpm	14.6	17.7	20.0	22.3	25.4	28.4	31.5	33.8	38.4
	kw	29.7	35.9	40.6	45.3	51.6	52.6	51.3	52.5	59.7
	hp	39.8	48.2	54.5	60.8	69.1	70.5	68.7	70.4	80.0

PGP640 Typical Outlet Flow and Input Power
120°F (50°C), ISO VG32 Fluid

Speed rpm	units	Displacement / Maximum Allowable Continuous Pressure						
	cc	30	35	45	55	65	75	80
	in^3	1.83	2.26	2.75	3.36	3.97	4.58	4.88
	bar	275	275	275	275	265	225	210
	psi	3989	3989	3989	3989	3843	3263	3046
900	lpm	25.5	31.5	38.3	46.8	55.3	63.8	68.0
	gpm	6.7	8.3	10.1	12.4	14.6	16.9	18.0
	kw	13.3	16.4	20.0	24.4	27.8	27.2	27.1
	hp	17.8	22.0	26.8	32.7	37.3	36.5	36.3
1200	lpm	34.2	42.0	51.0	62.4	73.7	85.1	90.7
	gpm	9.0	11.1	13.5	16.5	19.5	22.5	24.0
	kw	17.7	21.9	26.6	32.5	37.0	36.3	36.1
	hp	23.8	29.3	35.7	43.6	49.7	48.7	48.4
1500	lpm	43.0	53.0	64.5	78.8	93.1	107.4	114.6
	gpm	11.4	14.0	17.0	20.8	24.6	28.4	30.3
	kw	22.4	27.6	33.6	41.1	46.8	45.9	45.7
	hp	30.1	37.1	45.1	55.1	62.8	61.5	61.2
1800	lpm	51.8	63.9	77.8	95.0	112.3	129.6	138.2
	gpm	13.7	16.9	20.5	25.1	29.7	34.2	36.5
	kw	26.9	33.2	40.4	49.3	56.2	55.0	54.8
	hp	36.1	44.5	54.1	66.1	75.3	73.8	73.5
2100	lpm	60.8	75.0	91.2	111.5	131.7	152.0	162.1
	gpm	16.1	19.8	24.1	29.4	34.8	40.2	42.8
	kw	31.7	39.1	47.6	58.2	66.3	64.9	64.6
	hp	42.6	52.5	63.8	78.0	88.8	87.0	86.7
2400	lpm	69.8	86.1	104.8	128.0	151.3	174.6	186.2
	gpm	18.4	22.8	27.7	33.8	40.0	46.1	49.2
	kw	36.7	45.2	55.0	67.2	76.6	75.0	74.7
	hp	49.2	60.6	73.8	90.1	102.7	100.6	100.1
2700	lpm	78.6	96.9	117.9	144.0	170.2	196.4	209.5
	gpm	20.8	25.6	31.1	38.1	45.0	51.9	55.3
	kw	41.7	51.4	62.6	76.5	87.1	85.3	84.9
	hp	55.9	69.0	83.9	102.6	116.8	114.4	113.9
3000	lpm	87.3	107.7	131.0	160.1	189.2	218.3	232.8
	gpm	23.1	28.4	34.6	42.3	50.0	57.7	61.5
	kw	46.9	57.8	70.3	85.9	97.9	95.9	95.5
	hp	62.9	77.5	94.3	115.2	131.2	128.6	128.0

GEAR PUMP FLUID RECOMMENDATIONS

PETROLEUM OILS (Mineral-based)

Viscosity Recommendations

Optimum operating viscosity is considered to be about 20 cSt (100 SUS).

Minimum: approximately 7.5 - 10 cSt (50 - 60 SUS)
Maximum at start up: approximately 1600 cSt (7500 SUS)

Recommended Viscosity Grades

Grade	Viscosity at 40°C (100°F)	Viscosity at 100°C (210°F)
SAE 10	32 cSt (150 SUS)	4 cSt (41 SUS)
SAE 20	71 cSt (300 SUS)	7 cSt (51 SUS)
ISO 32	32 cSt (165 SUS)	5 cSt (44 SUS)
ISO 46	46 cSt (240 SUS)	7 cSt (49 SUS)

Other Desirable Properties

Viscosity Index: 90 minimum
Aniline Point: 175 minimum

Additives Usually Recommended

Rust and Oxidation Inhibitors
Foam Depressant

Note: Antiwear (AW) additives are not recommended. In some instances the presence of zinc compounds can actually be harmful to copper, bronze, or brass components used in the system. The use of AW oil is optional with our gear units.

General Recommendations

High quality hydraulic oils are essential for satisfactory performance and long life of any hydraulic system. Such oils are usually prepared from highly refined, turbine oil stocks with which select additives are compounded. We suggest following the manufacturer's specifications or the recommendations of a reputable oil supplier for the specific oil requirements on your machine.

A high viscosity oil will generally give better performance and longer life than a thin oil. Oil of around 20 cSt (100 SUS) viscosity will give optimum performance. Your selection should be as near to optimum as possible at operating temperature but not so heavy at start-up as to cause cavitation. Cold start-up procedures which allow the use of heavier oils should prove worthwhile by increasing pump life.

Inlet Vacuum

Vacuum measured at the inlet port of the pump generally should not exceed 13 cm (5 in) Hg. Higher vacuum can result in cavitation which may severely damage the pump. A usually acceptable rule of thumb is that the inlet line flow velocity should not exceed 3.0 mps (10 fps). A long inlet line or the use of several fittings may necessitate increasing the line size. We suggest that each inlet port of a tandem pump have its own line from the reservoir. If possible, the fluid level in the reservoir should be higher than the pump inlet.

Operating Temperature

The optimum oil operating temperature is in the range of 50 to 60°C (120-140°F). If the oil temperature will be above 82°C (180°F) for significant periods of time, then FPM or FKM (Viton) seals should be used. The oil temperature should not exceed 93°C (200°F), even if FPM or FKM seals are used. High temperatures result in rapid oil deterioration and indicate the need for an oil cooler or a larger reservoir. The nearer to optimum temperature, the longer the service life of the oil, pump and other components.

Reservoir

Reservoir capacity in gallons should at least equal total pump output in GPM. When filling the reservoir, oil should pass through a 100-mesh screen. Pour only **clean oil** from **clean containers** into the reservoir. The reservoir should have a breather to allow air in or out. The filler cap and breather should be sealed to prevent moisture from entering. A hydraulic oil water content of as little as 0.1% can cause damage to hydraulic components.

Filtration

Good filtration assures improved service life at today's high operating pressures. System filtration is recommended that will maintain a contamination level according to ISO 4406: 20/18/15 for 140 bar (2000 psi), 19/17/14 for 210 bar (3000 psi) and 17/15/12 for 275 bar (4000 psi). The specific filter recommendation should come from your equipment manufacturer or filter supplier.

A 100 mesh screen should be used in the suction line leading to the pump. It should be of sufficient size to handle twice the pump capacity. The screen must be cleaned and checked regularly to avoid pump and system damage.

Oil and filters should be changed on a regular schedule and the system flushed in accordance with the original equipment manufacturer's recommendations. Reservoir air breather filters should be cleaned periodically.

FILTRATION IS NOT A SUBSTITUTE FOR PRACTICING CLEANLINESS AND PROPER PREVENTIVE MAINTENANCE.

Cold Weather Operation

Oils for use in cold weather should have a viscosity not exceeding 7500 SUS (1620 cSt) at the minimum start up temperature and a pour point of at least 20°F (11°C) below that temperature. Experience in cold climates has been satisfactory without using special oils or fluids. Start-up procedures must allow for a gradual warm-up and equipment should not be operated at full pressure until the oil reaches a reasonably fluid state.

Comments On The Use Of Other Oils And Fluids.

Biodegradable Oils (Vegetable-Based)

Oils of this type with properties similar to recommended petroleum oils may be used with the PGP600 series pumps and motors. Performance, pressure ratings, and durability are not adversely affected.

Automatic Transmission Fluid (ATF)

In general these oils have low viscosity and may be used only at reduced operating pressures and oil temperatures.

Diesel Fuel, Kerosene, Coal Oil

Although sometimes used as a dilutant for cold weather operations, their use is not recommended because they are insufficiently refined products.

Transformer Oil

Sometimes used for extremely cold weather operation. It is not generally recommended as it becomes too thin at normal operating temperatures. Oil to U.S. Military Spec MIL-H-5606 is in this category.

WATER BASE FIRE RESISTANT FLUIDS

Two types of water base fluids (WBF) may be used with our gear pumps and motors.

Both types of WBF come in various viscosity grades. Select the grade best suited to the equipment and its operation in terms of pressure, speed, temperature, duty cycle, etc. The fluid used should be recommended by the O.E.M. or a reputable fluid supplier.

Water-in Oil (60/40) Invert Emulsions

Invert emulsions are approved for use with PGP600 series pumps but at pressures up to 3000 psi or 500 psi below rated pressures, whichever is lower.

Water Glycol Solutions

Water glycol solutions of the types normally used in hydrostatic systems may be used with PGP600 series pumps. These consist of about 60% glycol and about 40% water with additives to improve lubricity and other characteristics. Pressures up to 3000 psi are approved, depending on the displacement.

OPERATING LIMITS GENERALLY RECOMMENDED WITH VARIOUS FLUIDS

FLUID:	MAX. OPER. TEMP.	MAX. INLET LINE VELOCITY	MAX. INLET VACUUM AT PUMP
Petroleum Oil	82°C (180°F)	3.0m/s (10fps)	13cm (5”) Hg
WIO Emulsion	65°C (150°F)	1.2m/s (4fps)	0cm (0”) Hg
Waler Glycol Solution	65°C (150°F)	1.2m/s (4fps)	0cm (0”) Hg

Note: These figures represent generally accepted maximums and will not prove satisfactory in all installations. For very severe duty cycles, it will likely be advantageous to design and operate the system at something less than these maximum limits.

WBF Filtration

Filtration that seems to give the best results consists of a 100-mesh inlet screen and a return line filter. For water base fluids, the inlet screen should be sized up three to four times the pump capacity. The return line filter should have a rating and size recommended by the fluid and filter manufacturers to achieve the recommended ISO contamination level.

Note: Finer filtration may be required by other components in the system.

High Water Base Fluids (HWBF)

The use or 95/5 emulsion is not recommended.

Phosphate Ester

Phosphate ester does not appear to effect pump performance or service life, but FPM or FKM (Viton) seals should be used with this fluid. Viscosity characteristics of phosphate ester fluid limit the recommended ranges of operating and ambient temperatures.

- DO NOT USE ANY TYPE OF FLUID NOT RECOMMENDED IN THIS BULLETIN WITHOUT FIRST CONSULTING OUR PRODUCT SUPPORT.
- OBTAIN YOUR FINAL FLUID RECOMMENDATION FROM YOUR FLUID SUPPLIER.

Parker Hannifin Gear Pump Division
101 Canterbury Road, Kings Mountain, NC
Telephone: 1-888-700-7411

Notes

Parker Hannifin Corporation
Pump & Motor Division
Kings Mountain, NC 28086

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Offer of Sale

1. Definitions. As used herein, the following terms have the meanings indicated.

Buyer: means any customer receiving a Quote for Products from Seller.

Goods: means any tangible part, system or component to be supplied by the Seller.

Products: means the Goods, Services and/or Software as described in a Quote provided by the Seller.

Quote: means the offer or proposal made by Seller to Buyer for the supply of Products.

Seller: means Parker Hannifin Corporation, including all divisions and businesses thereof.

Services: means any services to be supplied by the Seller.

Software: means any software related to the Products, whether embedded or separately downloaded.

Terms: means the terms and conditions of this Offer of Sale or any newer version of the same as published by Seller electronically at www.parker.com/saleterms.

2. Terms. All sales of Products by Seller are contingent upon, and will be governed by, these Terms and, these Terms are incorporated into any Quote provided by Seller to any Buyer. Buyer's order for any Products whether communicated to Seller verbally, in writing, by electronic date interface or other electronic commerce, shall constitute acceptance of these Terms. Seller objects to any contrary or additional terms or conditions of Buyer. Reference in Seller's order acknowledgement to Buyer's purchase order or purchase order number shall in no way constitute an acceptance of any of Buyer's terms of purchase. No modification to these Terms will be binding on Seller unless agreed to in writing and signed by an authorized representative of Seller.

3. Price; Payment. The Products set forth in Seller's Quote are offered for sale at the prices indicated in Seller's Quote. Unless otherwise specifically stated in Seller's Quote, prices are valid for thirty (30) days and do not include any sales, use,or other taxes or duties. Seller reserves the right to modify prices at any time to adjust for any raw material price fluctuations. Unless otherwise specified by Seller, all prices are F.C.A. Seller's facility (INCOTERMS2010). All sales are contingent upon credit approval and payment for all purchases is due thirty (30) days from the date of invoice (or such date as may be specified in the Quote). Unpaid invoices beyond the specified payment date incur interest at the rate of 1.5% per month or the maximum allowable rate under applicable law.

4. Shipment; Delivery; Title and Risk of Loss. All delivery dates are approximate. Seller is not responsible for damages resulting from any delay. Regardless of the manner of shipment, delivery occurs and title and risk of loss or damage pass to Buyer, upon placement of the Products with the shipment carrier at Seller's facility. Unless otherwise agreed, Seller may exercise its judgment in choosing the carrier and means of delivery. No deferment of shipment at Buyers' request beyond the respective indicated shipping date will be made except on terms that will indemnify, defend and hold Seller harmless against all loss and additional expense. Buyer shall be responsible for any additional shipping charges incurred by Seller due to Buyer's acts or omissions.

5. Warranty. The warranty related to the Products is as follows: (i) Goods are warranted against defects in material or workmanship for a period of twelve (12) months from the date of delivery or 2,000 hours of use, whichever occurs first; (ii) Services shall be performed in accordance with generally accepted practices and using the degree of care and skill that is ordinarily exercised and customary in the field to which the Services pertain and are warranted for a period of six (6) months from the completion of the Services by Seller; and (iii) Software is only warranted to perform in accordance with applicable specifications provided by Seller to Buyer for ninety (90) days from the date of delivery or, when downloaded by a Buyer or end user, from the date of the initial download. All prices are based upon the exclusive limited warranty stated above, and upon the following disclaimer: DISCLAIMER OF WARRANTY: **THIS WARRANTY IS THE SOLE AND ENTIRE WARRANTY PERTAINING TO PRODUCTS. SELLER DISCLAIMS ALL OTHER WARRANTIES, EXPRESS AND IMPLIED, INCLUDING DESIGN, NON INFRINGEMENT, MERCHANTABILITY, AND FITNESS FOR A PARTICULAR PURPOSE. SELLER DOES NOT WARRANT THAT THE SOFTWARE IS ERROR-FREE OR FAULT-TOLERANT, OR THAT BUYER'S USE THEREOF WILL BE SECURE OR UNINTERRUPTED. BUYER AGREES AND ACKNOWLEDGES THAT UNLESS OTHERWISE AUTHORIZED IN WRITING BY SELLER THE SOFTWARE SHALL NOT BE USED IN CONNECTION WITH HAZARDOUS OR HIGH RISK ACTIVITIES OR ENVIRONMENTS. EXCEPT AS EXPRESSLY STATED HEREIN, ALL PRODUCTS ARE PROVIDED "AS IS".**

6. Claims; Commencement of Actions. Buyer shall promptly inspect all Products upon receipt. No claims for shortages will be allowed unless reported to the Seller within ten (10) days of delivery. Buyer shall notify Seller of any alleged breach of warranty within thirty (30) days after the date the non-conformance is or should have been discovered by Buyer. Any claim or action against Seller based upon breach of contract or any other theory, including tort, negligence, or otherwise must be commenced within twelve (12) months from the date of the alleged breach or other alleged event, without regard to the date of discovery.

7. LIMITATION OF LIABILITY. IN THE EVENT OF A BREACH OF WARRANTY, SELLER WILL, AT ITS OPTION, REPAIR OR REPLACE THE NON-CONFORMING PRODUCT, RE-PERFORM THE SERVICES, OR REFUND THE PURCHASE PRICE PAID WITHIN A REASONABLE PERIOD OF TIME. IN NO EVENT IS SELLER LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF, OR AS THE RESULT OF, THE SALE, DELIVERY, NON-DELIVERY, SERVICING, NON-COMPLETION OF SERVICES, USE, LOSS OF USE OF, OR INABILITY TO USE THE PRODUCTS OR ANY PART THERE OF, LOSS OF DATA, IDENTITY, PRIVACY, OR CONFIDENTIALITY, OR FOR ANY CHARGES OR EXPENSES OF ANY NATURE INCURRED WITHOUT SELLER'S WRITTEN CONSENT, WHETHER BASED IN CONTRACT, TORT OR OTHER LEGAL THEORY. IN NO EVENT SHALL SELLER'S LIABILITY UNDER ANY CLAIM MADE BY BUYER EXCEED THE PURCHASE PRICE PAID FOR THE PRODUCTS.

8. Loss to Buyer's Property. Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer or any other items which are or become Buyer's property, will be considered obsolete and maybe destroyed by Seller after two (2) consecutive years have elapsed without Buyer ordering the Products manufactured using such property. Seller shall not be responsible for any loss or damage to such property while it is in Seller's possession or control.

9. Special Tooling. Special Tooling includes but is not limited to tooling, jigs, fixtures and associated manufacturing equipment acquired or necessary to manufacture Products. A tooling charge may be imposed for any Special Tooling. Such Special Tooling shall be and remain Seller's property not withstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in Special Tooling belonging to Seller that is utilized in the manufacture of the Products, even if such Special Tooling has been specially converted or adapted for such manufacture and not withstanding any charges paid by Buyer. Unless otherwise agreed, Seller has the right to alter, discard or otherwise dispose of any Special Tooling or other property in its sole discretion at any time.

10. Security Interest. To secure payment of all sums due, Seller retains a security interest in all Products delivered to Buyer and, Buyer's acceptance of these Terms is deemed to be a Security Agreement under the Uniform Commercial Code. Buyer authorizes Seller as its attorney to execute and file on Buyer's behalf all documents Seller deems necessary to perfect its security interest.

11. User Responsibility. The Buyer through its own analysis and testing, is solely responsible for making the final selection of the Products and assuring that all performance, endurance, maintenance, safety and warning requirements of the application of the Products are met. The Buyer must analyze all aspects of the application and follow applicable industry standards, specifications, and other technical information provided with the Product. If Seller provides Product options based upon data or specifications provided by the Buyer, the Buyer is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the Products. In the event the Buyer is not the end-user, Buyer will ensure such end-user complies with this paragraph.

12. Use of Products, Indemnity by Buyer. Buyer shall comply with all instructions, guides and specifications provided by Seller with the Products. Unauthorized Uses. If Buyer uses or resells the Products for any uses prohibited in Seller's instructions, guides or specifications, or Buyer otherwise fails to comply with Seller's instructions, guides and specifications, Buyer acknowledges that any such use, resale, or non-compliance is at Buyer's sole risk. Buyer shall indemnify, defend, and hold Seller harmless from any losses, claims, liabilities,damages,lawsuits,judgments and costs (including attorney fees and defense costs), whether for personal injury, property damage, intellectual property infringement or any other claim, brought by or incurred by Buyer, Buyer's employees, or any other person, arising out of: (a) improper selection, application, design, specification or other misuse of Products provided by Seller; (b) any act or omission, negligent or otherwise, of Buyer; (c) Seller's use of patterns, tooling, equipment, plans, drawings, designs or specifications or other information or things furnished by Buyer; (d) damage to the Products from an external cause, repair or attempted repair by anyone other than Seller, failure to follow instructions, guides and specifications provided by Seller, use with goods not provided by Seller, or opening, modifying, deconstructing or tampering with the Products for any reason; or (e) Buyer's failure to comply with these Terms. Seller shall not indemnify Buyer under any circumstance except as otherwise provided in these Terms.

13. Cancellations and Changes. Buyer may not cancel or modify any order for any reason, except with Seller's written consent and upon terms that will indemnify, defend and hold Seller harmless against all direct, incidental and consequential loss or damage. Seller, at any time, may change Product features, specifications, designs and availability.

14. Limitation on Assignment. Buyer may not assign its rights or obligations without the prior written consent of Seller.

15. Force Majeure. Seller does not assume the risk and is not liable for delay or failure to perform any of Seller's obligations by reason of events or circumstances beyond its reasonable control ("Events of Force Majeure"). Events of Force Majeure shall include without limitation: accidents,strikes or labor disputes, acts of any government or government agency, acts of nature, delays or failures in delivery from carriers or suppliers, shortages of materials, or any other cause beyond Seller's reasonable control.

16. Waiver and Severability. Failure to enforce any provision of these Terms will not invalidate that provision; nor will any such failure prejudice Seller's right to enforce that provision in the future. Invalidation of any provision of these Terms by legislation or other rule of law shall not invalidate any other provision herein and, the remaining provisions will remain in full force and effect.

17. Termination. Seller may terminate any agreement governed by or arising from these Terms for any reason and at anytime by giving Buyer thirty (30) days prior written notice. Seller may immediately terminate, in writing, if Buyer: (a) breaches any provision of these Terms (b) appoints a trustee, receiver or custodian for all or any part of Buyer's property (c) files a petition for relief in bankruptcy on its own behalf, or one if filed by a third party(d) makes an assignment for the benefit of creditors; or (e) dissolves its business or liquidates all or a majority of its assets.

18. Ownership of Software. Seller retains ownership of all Software supplied to Buyer hereunder. In no event shall Buyer obtain any greater right in and to the Software than a right in the nature of a license limited to the use thereof and subject to compliance with any other terms provided with the Software.

19. Indemnity for Infringement of Intellectual Property Rights. Seller is not liable for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights ("Intellectual Property Rights") except as provided in this Section. Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on a third party claim that one or more of the Products sold hereunder infringes the Intellectual Property Rights of a third party in the country of delivery of the Products by the Seller to the Buyer. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of any such claim, and Seller having sole control over the defense of the claim including all negotiations for settlement or compromise. If one or more Products sold hereunder is subject to "such a claim, Seller may, at its sole expense and option, procure for Buyer the right to continue using the Products, replace or modify the Products so as to render them non-infringing, or offer to accept return of the Products and refund the purchase price less a reasonable allowance for depreciation. Seller has no obligation or liability for any claim of infringement: (i) a rising from information provided by Buyer; or (ii) directed to any Products provided hereunder for which the designs are specified in whole or part by Buyer; or (iii) resulting from the modification, combination or use in a system of any Products provided hereunder. The foregoing provisions of this Section constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for such claims of infringement of Intellectual Property Rights.

20. Governing Law. These Terms and the sale and delivery of all Products are deemed to have taken place in, and shall be governed and construed in accordance with, the laws of the State of Ohio, as applicable to contracts executed and wholly performed therein and without regard to conflicts of laws principles. Buyer irrevocably agrees and consents to the exclusive jurisdiction and venue of the courts of Cuyahoga County, Ohio with respect to any dispute, controversy or claim arising out of or relating to the sale and delivery of the Products.

21. Entire Agreement. These Terms, along with the terms set forth in the main body of any Quote, forms the entire agreement between the Buyer and Seller and constitutes the final, complete and exclusive expression of the terms of sale. In the event of a conflict between any term set forth in the main body of a Quote and these Terms, the terms set forth in the main body of the Quote shall prevail. All prior or contemporaneous written or oral agreements or negotiations with respect to the subject matter shall have no effect. These Terms may not be modified unless in writing and signed by an authorized representative of Seller.

22. Compliance with Laws. Buyer agrees to comply with all applicable laws, regulations,and industry and professional standards, including those of the United States of America, and the country or countries in which Buyer may operate,including without limitation the U.S. Foreign Corrupt Practices Act ("FCPA"), the U.S. Anti-Kickback Act ("Anti-Kickback Act"), U.S. and E.U. export control and sanctions laws ("Export Laws"), the U.S. Food Drug and Cosmetic Act ("FDCA"), and the rules and regulations promulgated by the U.S. Food and Drug Administration ("FDA"), each as currently amended. Buyer agrees to indemnify, defend, and hold harmless Seller from the consequences of any violation of such laws, regulations and standards by Buyer, its employees or agents. Buyer acknowledges that it is familiar with all applicable provisions of the FCPA, the Anti-Kickback Act, Export Laws, the FDCA and the FDA and certifies that Buyer will adhere to the requirements thereof and not take any action that would make Seller violate such requirements. Buyer represents and agrees that Buyer will not make any payment or give anything of value, directly or indirectly, to any governmental official, foreign political party or official thereof, candidate for foreign political office, or commercial entity or person, for any improper purpose, including the purpose of influencing such person to purchase Products or otherwise benefit the business of Seller. Buyer further represents and agrees that it will not receive, use, service, transfer or ship any Product from Seller in a manner or for a purpose that violates Export Laws or would cause Seller to be in violation of Export Laws."

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Parker Hannifin Corporation

About Parker Hannifin Corporation

Parker Hannifin is a leading global motion-control company dedicated to delivering premier customer service. A Fortune 500 corporation listed on the New York Stock Exchange (PH), our components and systems comprise over 1,400 product lines that control motion in some 1,000 industrial and aerospace markets. Parker is the only manufacturer to offer its customers a choice of hydraulic, pneumatic, and electro-mechanical motion-control solutions. Our Company has the largest distribution network in its field, with over 7,500 distributors serving more than 350,000 customers worldwide.

Parker's Charter

To be a leading worldwide manufacturer of components and systems for the builders and users of durable goods. More specifically, we will design, market and manufacture products controlling motion, flow and pressure. We will achieve profitable growth through premier customer service.

Product Information

North American customers seeking product information, the location of a nearby distributor, or repair services will receive prompt attention by calling the Parker Product Information Center at our toll-free number: 1-800-C-PARKER (1-800-272-7537). In the UK, a similar service is available by calling 0500-103-203.

The Aerospace Group is a leader in the development, design, manufacture and servicing of control systems and components for aerospace and related high-technology markets, while achieving growth through premier customer service.

The Climate & Industrial Controls Group designs, manufactures and markets system-control and fluid-handling components and systems to refrigeration, air-conditioning and industrial customers worldwide.

The Fluid Connectors Group designs, manufactures and markets rigid and flexible connectors, and associated products used in pneumatic and fluid systems.

The Seal Group designs, manufactures and distributes industrial and commercial sealing devices and related products by providing superior quality and total customer satisfaction.

The Hydraulics Group designs, produces and markets a full spectrum of hydraulic compnents and systems to builders and users of industrial and mobile machinery and equipment.

The Filtration Group designs, manufactures and markets quality filtration and clarification products, providing customers with the best value, quality, technical support, and global availability.

The Automation Group is a leading supplier of pneu-matic and electro-mechanical components and systems to automation customers worldwide.

The Instrumentation Group is a global leader in the design, manufacture and distribution of high-quality critical flow components for worldwide processinstrumentation, ultra-high-purity, medical and analytical applications.

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