aerospace
climate control
electromechanical
filtration
fluid & gas handling
hydraulics
pneumatics
process control
sealing & shielding

PGP/PGM 500 Series

Gear Pumps and Motors In Single And Multiple Configurations

Parker

ENGINEERING YOUR SUCCESS.

The Parker Hannifin Gear Pump Division Assures:

- Consistent quality
- Technical innovation
- Premier customer service

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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.

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

- Material Handling
- Construction
- Turf Care
- Forestry
- Agriculture
- Industrial

⚠ WARNING

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from Parker Hannifin Corporation, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application and review the information concerning the product or system in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by Parker Hannifin Corporation and its subsidiaries at any time without notice.

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Table of Contents

Pump/Motor Products

PGP/PGM 505

- Flows to 8 gpm
- Continuous pressures to 4000 psi
- Speeds to 4000 rpm
- Wide variety of integral valve options
- Single and bi-rotational motors

PGP/PGM 511

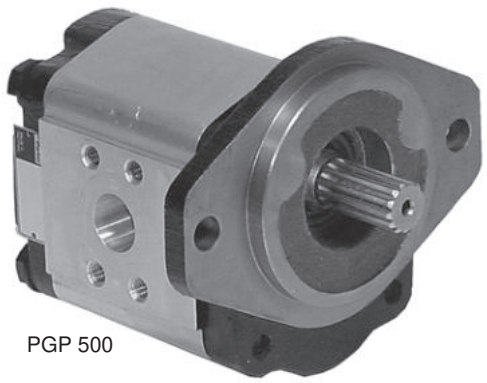
- Flows to 19 gpm
- Continuous pressures to 3625 psi
- Speeds to 4000 rpm
- Wide variety of integral valve options
- Single and bi-rotational motors

Parker Hannifin Corporation
Gear Pump Division
Kings Mountain, North Carolina USA

PGP/PGM 500 Series

- **High Performance**
- **High Efficiency**
- **High Pressure Operation**

PGP/PGM 500 series gear pumps/motors are an advanced performance version of the international "bushing block" style pumps. PGP/PGM 500 series pumps/motors offer superior performance, high efficiency and low noise operation at high operating pressures. They are produced in three frame sizes (PGP/PGM 505, PGP/PGM 511) with displacements ranging from 2 to 52 cm^3 (.12 to 3.17 in^3/rev). A wide variety of standard options are available to meet specific application requirements worldwide.


PGP 500

Advantages

- **Up to 275 bar (4000 psi) continuous operation**
  High strength materials and large journal diameters provide low bearing loads for high pressure operation.
- **Low noise**
  PGP/PGM 505 - 13 tooth gear profile,
  PGP/PGM 511 – 12 tooth gear profile and
  optimized flow metering provide reduced pressure pulsation and exceptionally quiet operation.
- **High efficiency**
  Pressure balanced bearing blocks assure maximum efficiency under all operating conditions.
- **Application flexibility**
  International mounts and connections, integrated valve capabilities and common inlet multiple pump configurations provide unmatched design and application versatility.

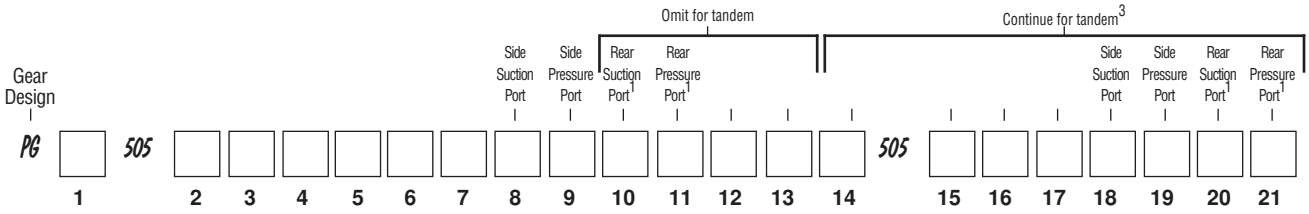
Characteristics

Product Features	Description
Pump Type	Heavy-duty, aluminum, external gear
Mounting	SAE, rectangular, thru-bolt, and application specific
Ports	SAE/metric split flange, metric and others
Shaft Style	SAE splined, keyed, tapered, tang and specials.
Speed	500 - 4000 rpm, see tables on pages 6, 14 and 21.
Theoretical Displ.	See tables on pages 6, 14 and 18.
Drive	Drive direct with flexible coupling is recommended.
Axial / Radial Load	Units subject to axial or radial loads should be specified with an outboard bearing. Please contact Product Support for assistance.
Inlet Pressure	Operating range - 0.8 to 2 bar abs (12-29 psia).Minimum inlet pressure -0.25 bar abs (-3.6 psia). Short time w/o load. Max. pressure not to exceed 20 psig.
Outlet Pressure	See tables on pages 6, 14 and18.
Fluids	Mineral oil, fire resistant fluids: - water-oil emulsions 60/40, HFB - water-glycol, HFC - phosphate-esters, HFD
Fluid Temperature	Range of operating temperature -15 to +80°C (5 to 176° F). Max. permissible operating pressure dependent on fluid temperature. Temperature for cold start -20 to -15°C (-4 to 5° F) at speed ≤ 1500 rpm.

Product Features	Description
Fluid Viscosity	Range of operating viscosity 8 to 1000 mm^2/s max. Permissible operating pressure dependent on viscosity. Viscosity range for cold start 1000 to 2000 centistokes at operating pressure ≤10 bar (145 psi) and speed ≤1500 rpm.
Range of Ambient Temperature	-40°C to +70°C (-40°F to 158°F)
Filtration	According to ISO 4406 Cl. 16/13
Flow Velocity	See table on page 19.
Direction of Rotation (looking at the driveshaft)	Clockwise, counter-clockwise or birotational. Note: Drive pump or motor only in indicated direction of rotation.
Multiple Pump Assemblies	- Available in two, three or four section configurations. - Max. shaft loading must conform to the limitations shown in the shaft loading rating tables on pages 9 and 17 in this catalog. - 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 gear sets share a common inlet. - Inlet port can be in either section.

Parker Hannifin Corporation
Gear Pump Division
Kings Mountain, North Carolina USA

PGP/PGM 505 How to Specify



1 Pump/Motor

P	***Pump***
M	***Motor***

2,15 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)
D	—	Motor w/check valve and restrictor

3,16 Displacement

0020	***2.0 ccm (0.12 cir)***
0030	***3.0 ccm (0.18 cir)***
0040	***4.0 ccm (0.24 cir)***
0050	***5.0 ccm (0.31 cir)***
0060	***6.0 ccm (0.37 cir)***
0070	7.0 ccm (0.43 cir)
0080	8.0 ccm (0.49 cir)
0100	10.0 ccm (0.61 cir)
0110	11.0 ccm (0.67 cir)
0120	12.0 ccm (0.73 cir)

4 Rotation

C	***Clockwise***
A	***Counter clockwise***
B	***Bi-directional motors only***

Please note the bold, italicized items reflect Parker preferred product options.

5 Shaft

A1	9T, 16/32 Pitch, 32L, SAE "A" spline
A2	***9T, 20/40 Pitch, 27L, SAE "AA" spline***
J1	***Ø12.7, 3.2 Key, no thread, 38L, parallel***
K1	Ø15.88, 4.0 Key, no thread, 32L, SAE "A", parallel

6 Shaft End Covers

A1	50.8x50.8 - Ø45.25 4bolt square flange
H1	***82.5 - Ø50.8 SAE "A-A" 2bolt flange***
H2	106.4 - Ø82.55 SAE "A" 2bolt flange

7,17 Shaft Seal

X	No seal
N	***NBR***
V	FPM, FKM

NOTES:

1 Only coded for the last section.

2 Only for motors

3 For further "B" triple unit repeat displacement, shaft seal between sections, side suction port, side pressure port, rear suction port,rear pressure port.

4. Dimensions are in millimeters except where noted.

5. Distributor unit contains shaft with add on capability for multiples.

8,9,10,11,18,19,20,21 Port Options

B1	No ports
D2	***9/16" - 18 UNF thread***
D3	***3/4" - 16 UNF thread***
D4	7/8" - 14 UNF thread
D5*	1 1/16" - 12UN thread
*Not usable for rear ports	

12 Motor Drain Option[2]

B1	No drain
A	***7/16"-20 UNF thread***
C	9/16"-18 UNF thread

13 Drain Position[2]

2	Drain on bottom
3	Drain on top
4	***Rear drain***

14 Section Connection

S	Separate inlets
C	Common inlets

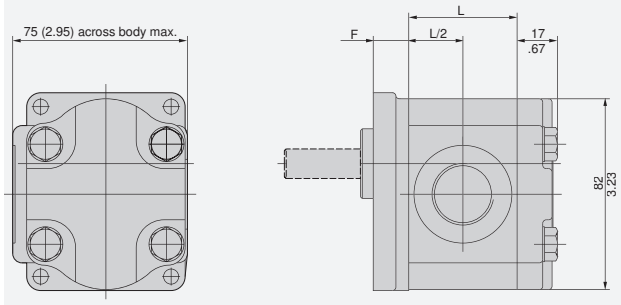
PGP/PGM 505 Specifications

Description	Code	*0020*	*0030*	*0040*	*0050*	0060	0070	0080	0090	0100	0110	0120
Displacements	cm^3/rev in^3/rev	***2*** ***0.12***	***3*** ***0.18***	***4*** ***0.24***	***5*** ***0.31***	6 0.37	7 0.43	8 0.49	9 0.55	10 0.61	11 0.67	12 0.73
Continuous Pressure	bar psi	***275*** ***3988***	***275*** ***3988***	***275*** ***3988***	***275*** ***3988***	275 3988	275 3988	275 3988	250 3625	250 3625	250 3625	220 3190
Intermittent Pressure	bar psi	***300*** ***4350***	***300*** ***4350***	***300*** ***4350***	***300*** ***4350***	300 4350	300 4350	300 4350	275 3988	275 3988	275 3988	220 3190
Minimum Speed @ Max. Outlet Pressure	rpm	***500***	***500***	***500***	***500***	500	500	500	500	500	500	500
Maximum Speed @ 0 Inlet & Max. Outlet Pressure	rpm	***4000***	***4000***	***4000***	***4000***	3600	3300	3000	2900	2800	2400	2400
Pump Input Power @ Max. Pressure and 1500 rpm	kW HP	***2*** ***2.68***	***2.3*** ***3.08***	***3*** ***4.02***	***3.8*** ***5.10***	4.5 6.03	5.3 7.11	6 8.05	6.5 8.72	6.9 9.25	7.6 10.19	8.4 11.26
Dimension "L"	mm in	***38.4*** ***1.51***	***41.1*** ***1.62***	***43.8*** ***1.72***	***46.5*** ***1.83***	49.1 1.93	51.8 2.04	54.5 2.15	57 2.24	59.8 2.35	62.5 2.46	65.2 2.57
Approximate Weight [1]	kg LB	***1.72*** ***3.80***	***2.22*** ***4.91***	***2.27*** ***5.02***	***2.32*** ***5.13***	2.38 5.26	2.43 5.37	2.48 5.48	2.53 5.59	2.58 5.70	2.63 5.81	2.68 5.92

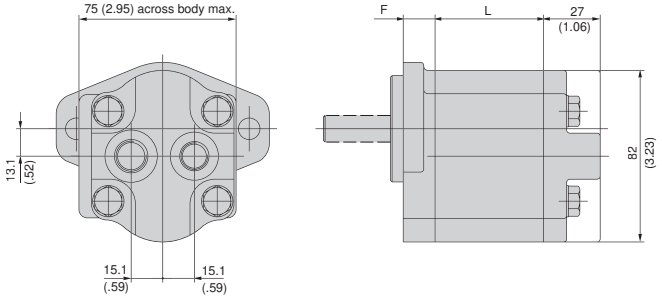
[1] Single pump with Shaft End Cover D3 and non ported Port End Cover.

PGP/PGM 505 Dimensions

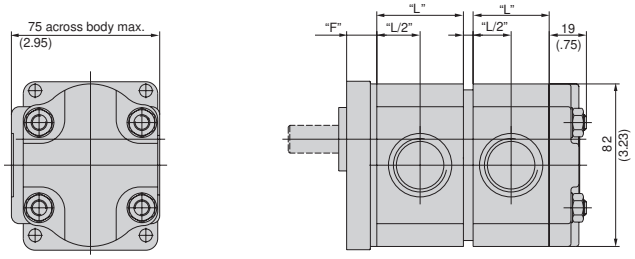
Single Unit PGP/PGM 505



Single Unit PGP/PGM 505 with rear ports



Tandem Unit PGP/PGM 505



NOTE:
Dimension "F" see shaft end covers on page 7
Dimension "L" see table above

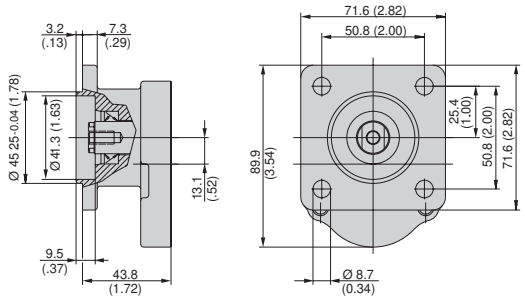
Notes: 1. Dimensions are in millimeters (inches).
2. Dimensions are nominal except where noted.
3. Subscript and/or superscript numbers are tolerances.

Please note the bold, italicized items reflect Parker preferred product options.

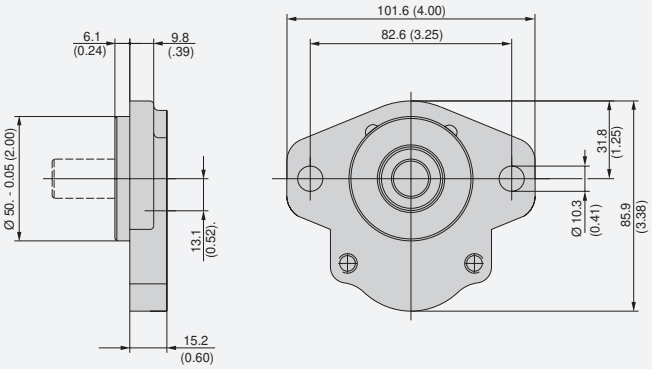
Parker Hannifin Corporation
Gear Pump Division
Kings Mountain, North Carolina USA

PGP/PGM 505 Shaft End Covers

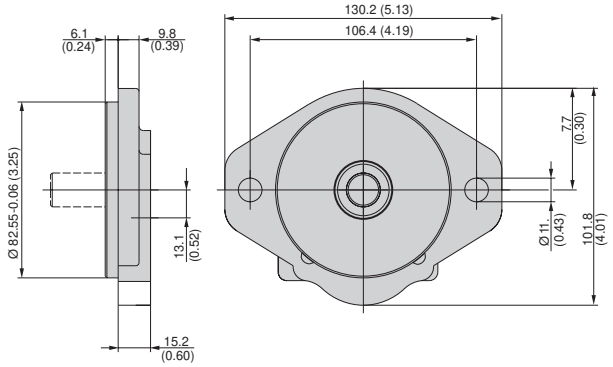
Code A1



Code H1



Code H2

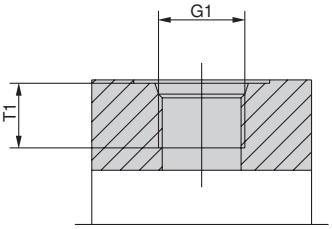


Notes: 1. Dimensions are in millimeters (inches).
2. Dimensions are nominal except where noted.
3. Subscript and/or superscript numbers are tolerances.

Please note the bold, italicized items reflect Parker preferred product options.

PGP/PGM 505 Porting

Code D2, D3, D4, D5
SAE straight thread
See table below for specific port dimensions.



PGP/PGM 505

Code	G1	T1
Thread	Thread	Dimensions
D2	***9/16"-18 UNF***	***12.7***
D3	***3/4"-16 UNF***	***14.3***
D4	7/8"-14 UNF	16.7
D5	1 1/16"-12 UN	19.0

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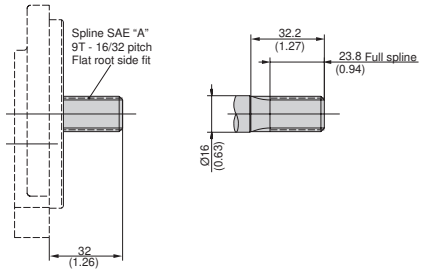
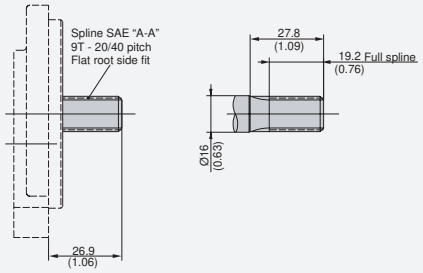
PGP/PGM 505 Drive Shaft

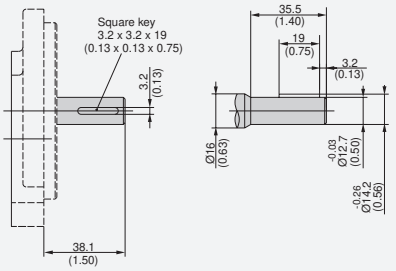
Code A1



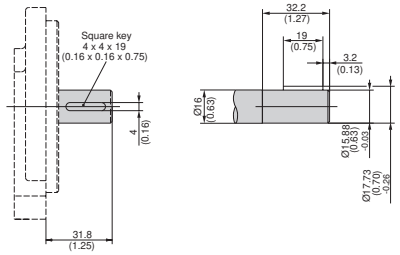
Code A2



Code J1



Code K1



Notes: 1. Dimensions are in millimeters (inches).
2. Dimensions are nominal except where noted.
3. Subscript and/or superscript numbers are tolerances.

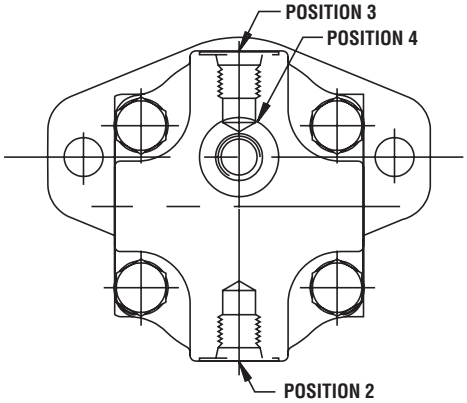
When applying a multiple section pump, the maximum drive shaft load is determined by adding the torque values for each pumping section that will be simultaneously loaded.

PGP/PGM 505 - Shaft Load Capacity

Code	Description	Style	Torque Rating
A1	9T, 16/32 Pitch, SAE "A"	Spline	108Nm/954 in-lb
A2	***9T, 20/40 Pitch, SAE "A-A"***	***Spline***	***108Nm/954 in-lb***
J1	***Ø 12.7,3.2 Key, No thread, 38L***	***Parallel***	***43Nm/380in-lb***
K1	Ø 15.88, 4.0 Key. No Thread, 32L, SAE "A"	Parallel	85Nm/751in-lb
	Tandem Pump/Connecting Shaft	Spline	36Nm/318in-lb

$$\text{Torque [in-lb]} = \frac{\text{Displacement [in}^3\text{/rev]} \times \text{Pressure [psi]}}{5.72} \qquad \text{Torque [Nm]} = \frac{\text{Displacement [cc/rev]} \times \text{Pressure [bar]}}{57.2}$$

PGP/PGM 505 Drain Positions



Please note the bold, italicized items reflect Parker preferred product options.

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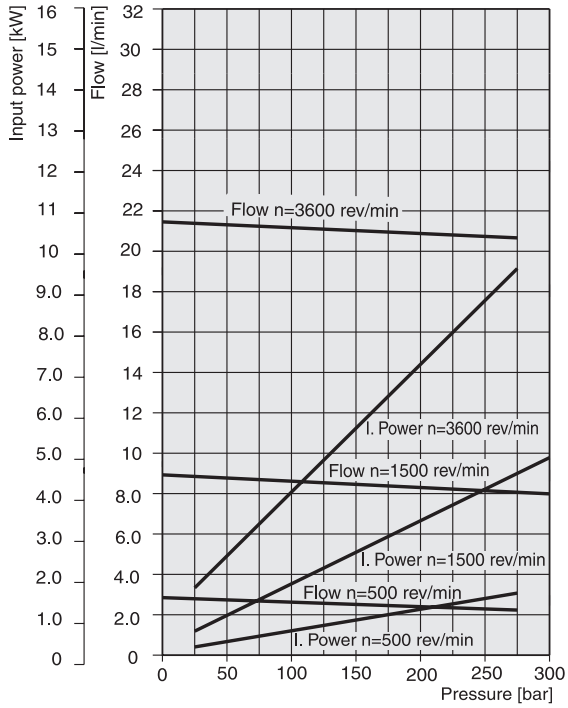
Gear Pump Division
Kings Mountain, North Carolina USA

PGP 505 - 6.0 CC

Fluid Temperature = 45± 2°C
Viscosity = 36mm^2/s

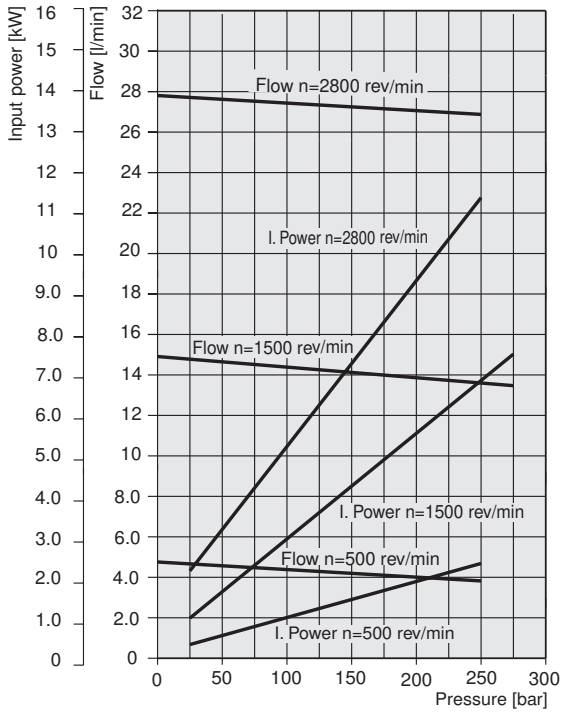
Inlet Pressure = 0.9 + 0.1 bar absolute



PGP 505 - 10.0 CC

Fluid Temperature = 45± 2°C
Viscosity = 36mm^2/s

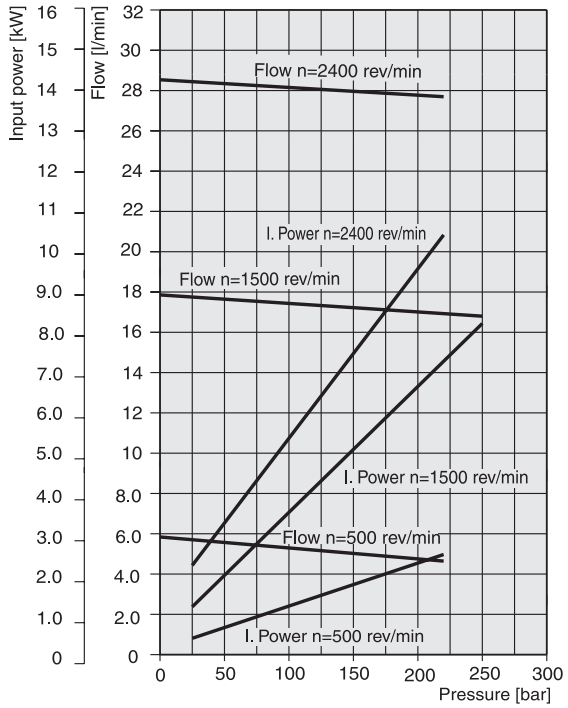
Inlet Pressure = 0.9 + 0.1 bar absolute



PGP 505 - 12.0 CC

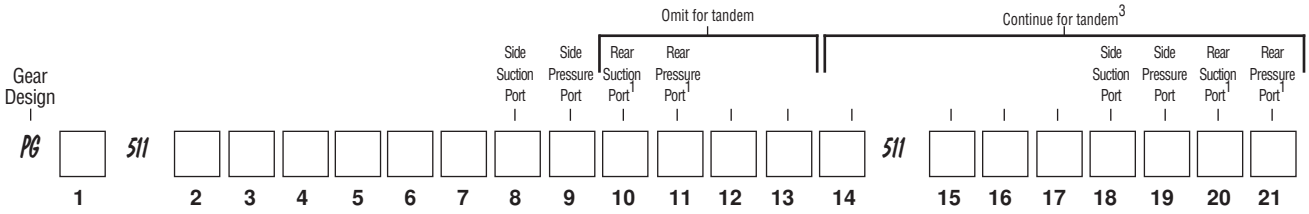
Fluid Temperature = 45± 2°C
Viscosity = 36mm^2/s

Inlet Pressure = 0.9 + 0.1 bar absolute



Performance data shown is based upon a series of laboratory tests and is not representative of any one unit.

PGP/PGM 511 How to Specify



1 Pump/Motor

P	***Pump***
M	***Motor***

2,15 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)
D	—	Standard Motor w. one ACC + restrictor

***** Only for displacement codes 0060 to 0280

3,16 Displacement

0060	6.0 ccm (0.37 cir)
0070	***7.0 ccm (0.43 cir)***
0080	8.0 ccm (0.49 cir)
0100	***10.0 ccm (0.61 cir)***
0110	***11.0 ccm (0.67 cir)***
0140	***14.0 ccm (0.85 cir)***
0160	16.0 ccm (0.98 cir)
0180	***18.0 ccm (1.10 cir)***
0190	19.0 ccm (1.16 cir)
0210	***21.0 ccm (1.28 cir)***
0230	23.0 ccm (1.40 cir)
0270	27.0 ccm (1.65 cir)
0280	***28.0 ccm (1.71 cir)***
0310	31.0 ccm (1.89 cir)

4 Rotation

C	***Clockwise***
A	***Counter clockwise***
B	***Bi-directional motors only***

5 Shaft

A1	***9T, 16/32 Pitch, 32L, SAE "A" spline***
B1	10T, 16/32 Pitch, 32L spline
B2	10T, 16/32 Pitch, 38.2L spline
C1	11T, 16/32 Pitch, 38.2L, SAE 19-4 spline
C2	11T, 16/32 Pitch, 32.2L, SAE 19-4 spline
K1	***Ø15.88, 4.0 Key, no thread, 32L, SAE "A", parallel***
K4	Ø15.88, 4.0 Key, no thread, 58.7L, parallel
L1	Ø17.46, 4.8 Key, 7/16" UNF ext., 44.7L, parallel
L6	Ø19.05, 4.8 Key, no thread, 32L, parallel

6 Shaft End Covers

D4	72.0x100.0 - Ø80 rectangular
H2	***106.4 - Ø82.55 SAE "A" 2bolt flange***
H3	146.1 - Ø101.6 SAE "B" 2bolt flange
Q2	60.0x60.0 - Ø50.0 w. shaft seal, O' 'thrubolt flange
Q4	60.0x60.0 - Ø50.0 w. shaft seal, O',thrubolt flange
J5	H2 with slots, spec 2bolt
L2	106.4 - Ø82.55 SAE "A" 2bolt, w. OBB + cont. drive shaft

7,17 Shaft Seal

X	No seal
N	***NBR***
V	FPM, FKM
M	Double NBR
W	Double FPM

8,9,10,11,18,19,20,21 Port Options

B1	No ports
D2	9/16" - 18 UNF thread
D3	3/4" - 16 UNF thread
D4	***7/8" - 14 UNF thread***
D5	***1 1/16" - 12UN thread***
D6[1]	***1 5/16" - 12 UN thread***
D7[2]	1 5/8" - 12 UN thread
D8[2]	1 7/8" - 12 UN thread

[1]Not usable for rear ports.
[2]Inlet port only. For 19cc and larger.

12 Motor Drain Option[2]

B1	No drain
C	***9/16-18 UNF thread***

13 Drain Position[2]

2	Drain on bottom
3	Drain on top
4	***Rear drain***
5	Drain right view on drive shaft
6	Drain left view on drive shaft

14 Section Connection

S	Separate inlets
C	Common inlets

NOTES:

1 Only coded for the last section.

2 Only for motors

3 For further "B" triple unit repeat displacement, shaft seal between sections, side suction port, side pressure port, rear suction port, rear pressure port.

4. Dimensions are in millimeters except where noted.

Please note the bold, italicized items reflect Parker preferred product options.

Parker Hannifin Corporation
Gear Pump Division
Kings Mountain, North Carolina USA

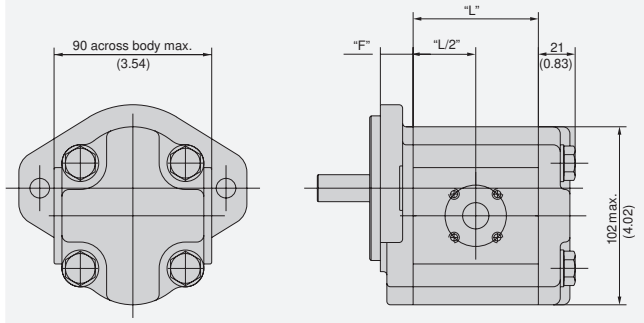
PGP/PGM 511 Specifications

Description	Code	0060	*0070*	0080	*0100*	*0110*	*0140*	0160	*0180*	0190	*0210*	0230	0270	*0280*	0310
Displacements	cm^3/rev in^3/rev	6 0.37	***7*** ***0.43***	8 0.49	***10*** ***0.61***	***11*** ***0.67***	***14*** ***0.85***	16 0.98	***18*** ***1.10***	19 1.16	***21*** ***1.28***	23 1.40	27 1.65	***28*** ***1.71***	31 1.89
Continuous Pressure	bar psi	250 3625	***250*** ***3625***	250 3625	***250*** ***3625***	***250*** ***3625***	***250*** ***3625***	250 3625	***250*** ***3625***	250 3625	***235*** ***3410***	225 3265	190 2755	***185*** ***2685***	165 2395
Intermittent Pressure	bar psi	275 3988	***275*** ***3988***	275 3988	***275*** ***3988***	***275*** ***3988***	***275*** ***3988***	275 3988	***260*** ***3770***	260 3770	***240*** ***3480***	235 3408	200 2900	***190*** ***2755***	170 2465
Minimum Speed @ Max. Outlet Pressure	rpm	500	***500***	500	***500***	***500***	***500***	500	***500***	500	***500***	500	500	***500***	500
Maximum Speed @ 0 Inlet & Max. Outlet Pressure	rpm	4000	***4000***	4000	***3600***	***3600***	***3300***	3000	***3000***	3000	***2800***	2800	2400	***2300***	2300
Pump Input Power @ Max. Pressure and 1500 rpm	kW HP	4.5 6.03	***5.25*** ***7.04***	6 8.05	***7.5*** ***10.06***	***8.3*** ***11.1***	***10.5*** ***14.0***	12 16.0	***13.5*** ***18.1***	14.3 19.1	***14.4*** ***19.3***	14.7 19.7	14.9 19.9	***15.8*** ***21.1***	16.7 22.4
Dimension "L"	mm in	51.8 2.04	***53.3*** ***2.10***	54.9 2.16	***57.9*** ***2.28***	***59.4*** ***2.34***	***64*** ***2.52***	67 2.64	***70.1*** ***2.76***	71.6 2.82	***76.6*** ***3.02***	77.6 3.06	83.7 3.30	***84.2*** ***3.31***	89.8 3.54
Approximate Weight [1]	kg LB	3.5 7.70	***3.5*** ***7.70***	3.6 7.90	***3.6*** ***7.90***	***3.7*** ***8.10***	***3.8*** ***8.40***	3.9 8.60	***4.0*** ***8.80***	4.0 8.80	***4.1*** ***9.00***	4.2 9.20	4.3 9.50	***4.4*** ***9.70***	4.5 9.9

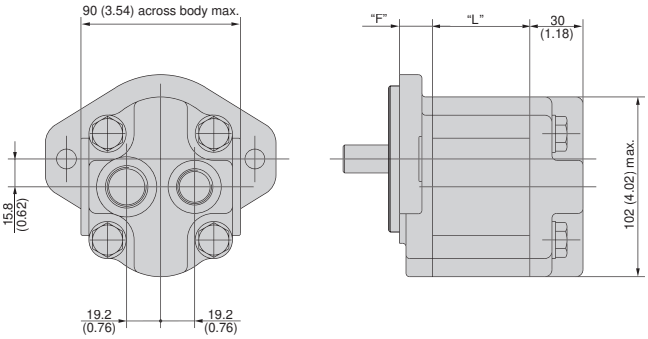
[1] Single pump with Shaft End Cover Q1 and non ported Port End Cover.

PGP/PGM 511 Dimensions

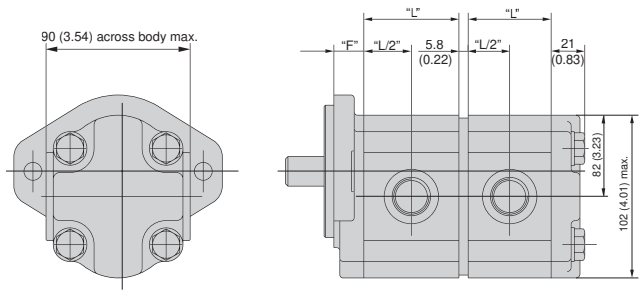
Single Unit PGP/PGM 511



Single Unit PGP/PGM 511 with rear ports



Tandem Unit PGP/PGM 511



NOTE:
Dimension "F" see shaft end covers on page 15
Dimension "L" see table above

Notes: 1. Dimensions are in millimeters (inches).
2. Dimensions are nominal except where noted.
3. Subscript and/or superscript numbers are tolerances.

Please note the bold, italicized items reflect Parker preferred product options.

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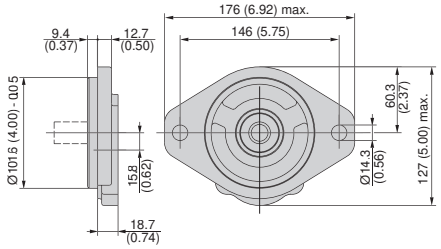
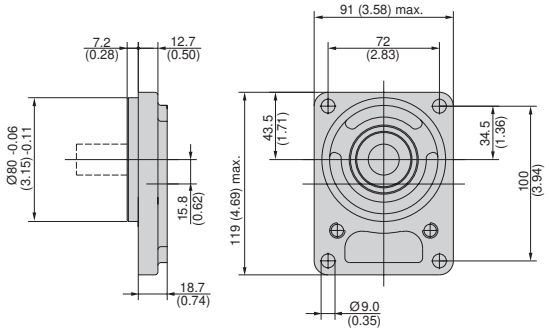
Gear Pump Division
Kings Mountain, North Carolina USA

PGP/PGM 511 Shaft End Covers

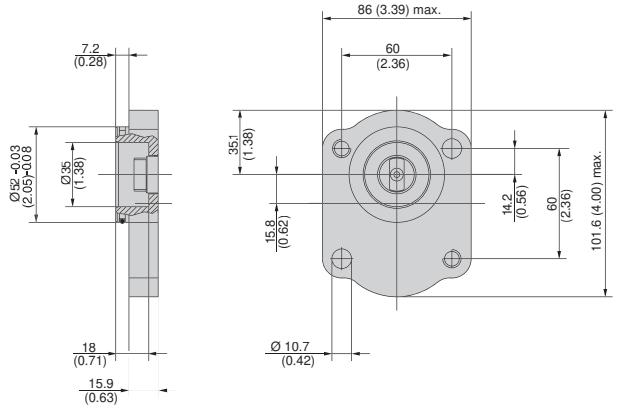
Code H3



Code D4



Code Q2



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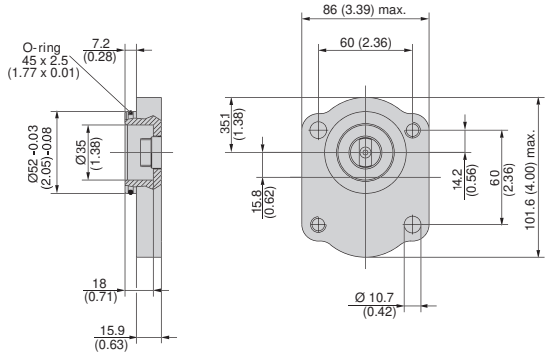
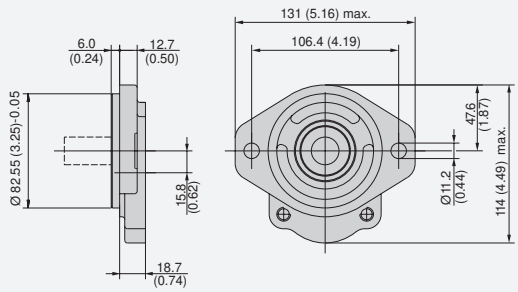


Code H2



Notes: 1. Dimensions are in millimeters (inches).
2. Dimensions are nominal except where noted.
3. Subscript and/or superscript numbers are tolerances.

Please note the bold, italicized items reflect Parker preferred product options.

Parker Hannifin Corporation
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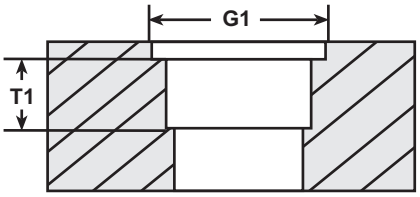
Kings Mountain, North Carolina USA

PGP/PGM 511 Porting

Code D
SAE straight thread
See table at right for specific port dimensions.



Code	G1 Thread	T1 Dimensions
D2	9/16"-18 UNF	12.7
D3	3/4"-16 UNF	14.3
D4	***7/8"-14 UNF***	***16.7***
D5	***1 1/16"-12 UN***	***19.0***
D6	***1 5/16"-12 UN***	***19.0***
D7	1 5/8"-12 UN	19.0
D8	1 7/8"-12 UN	19.0

Please note the bold, italicized items reflect Parker preferred product options.

Notes: 1. Dimensions are in millimeters (inches).
2. Dimensions are nominal except where noted.
3. Subscript and/or superscript numbers are tolerances.

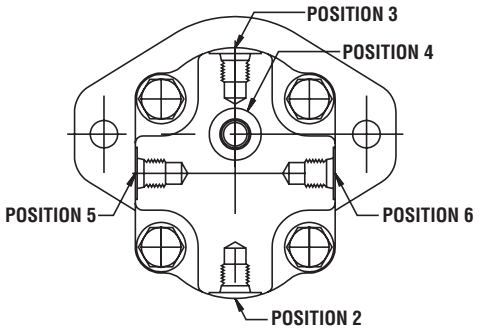
PGP/PGM 511 - Shaft Load Capacity

Code	Description	Style	Torque Rating
A1	***9T, 16/32 Pitch, 32L, SAE "A"***	***Spline***	***86Nm/759in-lb***
C1	11T, 16/32 Pitch, 38.2L, SAE 19-4	Spline	184Nm/1625in-lb
C2	11T, 16/32 Pitch, 32.2L, SAE 19-4	Spline	184Nm/1625in-lb
K1	***Ø 15.88 4.0 Key, no thread, 32L, SAE "A"***	***Parallel***	***75Nm/662in-lb***
K4	Ø 15.88, 3.95 Key, no thread, 58.7L	Parallel	75Nm/662in-lb
L1	Ø 17.46, 4.8 Key, 7/16UNF ext., 44.2L	Parallel	112Nm/989in-lb
L6	Ø 19.05, 4.8 Key, no thread, 32L, SAE 19-1	Parallel	145Nm/1280in-lb
	Tandem pump Connecting Shaft	Spline	110Nm/971in-lb

When applying a multiple section pump, the maximum drive shaft load is determined by adding the torque values for each pumping section that will be simultaneously loaded.

$$\text{Torque [in-lb]} = \frac{\text{Displacement [in}^3\text{/rev] x Pressure [psi]}}{5.72} \qquad \text{Torque [Nm]} = \frac{\text{Displacement [cc/rev] x Pressure [bar]}}{57.2}$$

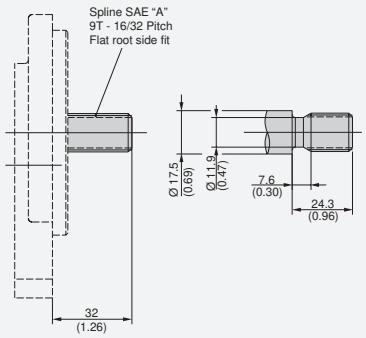
PGP/PGM 511 Drain Positions



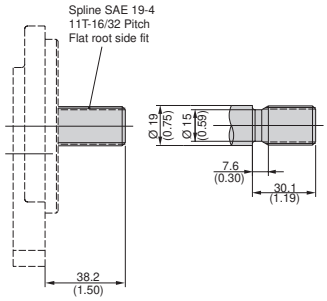
Please note the bold, italicized items reflect Parker preferred product options.

PGP/PGM 511 Drive Shaft

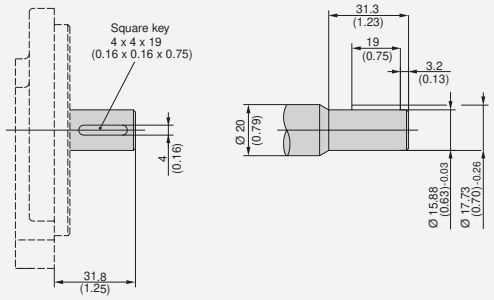
Code A1



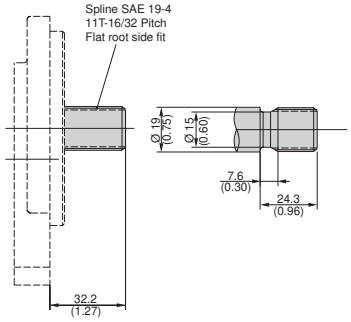
Code C1



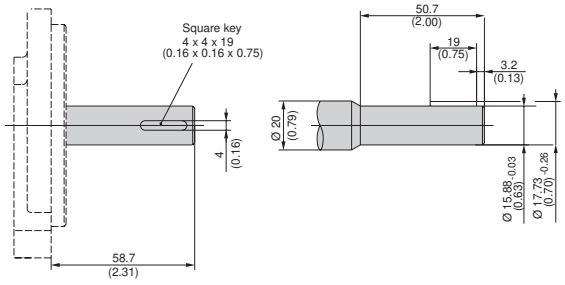
Code K1



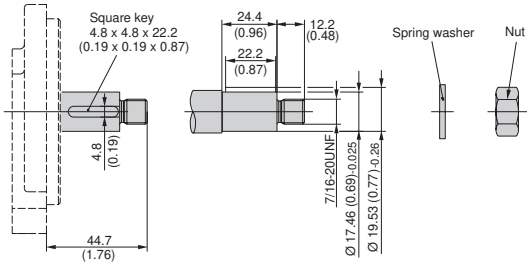
Code C2



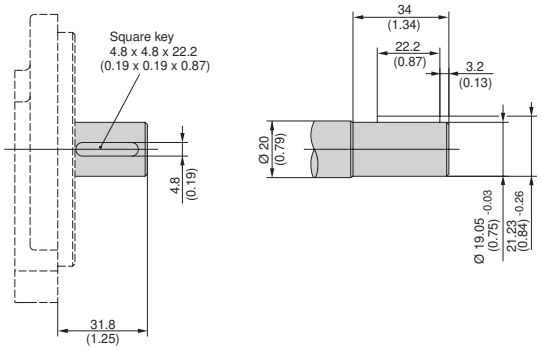
Code K4



Code L1



Code L6



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Notes: 1. Dimensions are in millimeters (inches).
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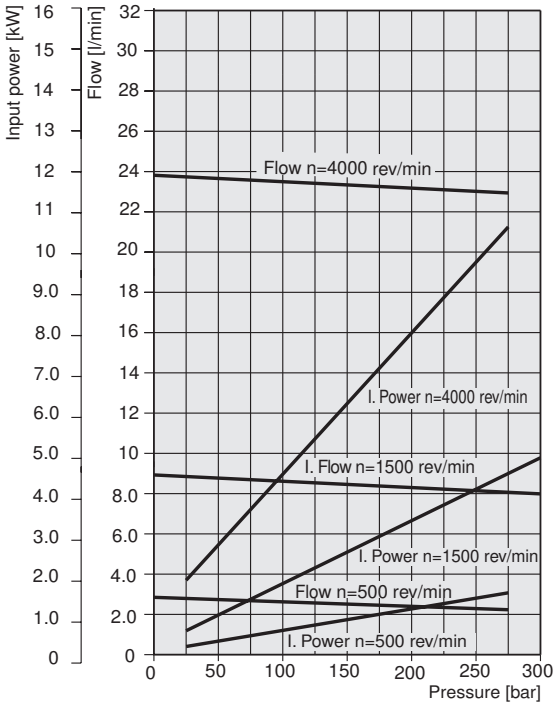
Parker Hannifin Corporation
Gear Pump Division
Kings Mountain, North Carolina USA

PGP511 - 6.0 CC

Fluid Temperature = 45± 2°C
Viscosity = 36mm^2/s

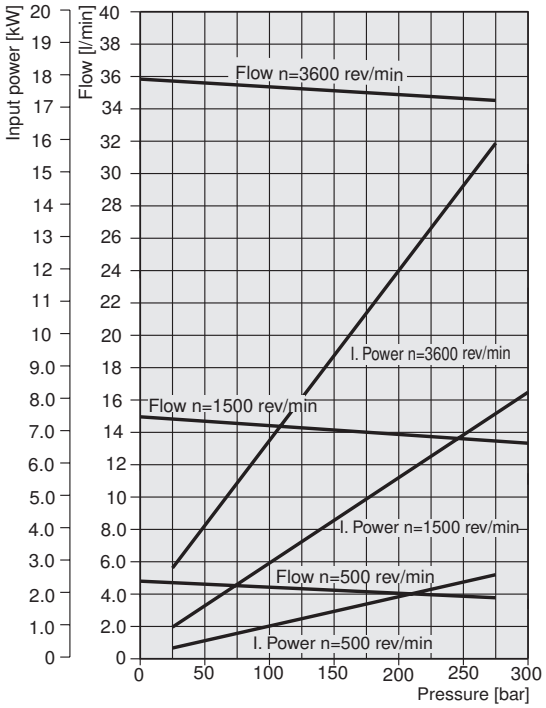
Inlet Pressure = 0.9 + 0.1 bar absolute



PGP511 - 10.0 CC

Fluid Temperature = 45± 2°C
Viscosity = 36mm^2/s

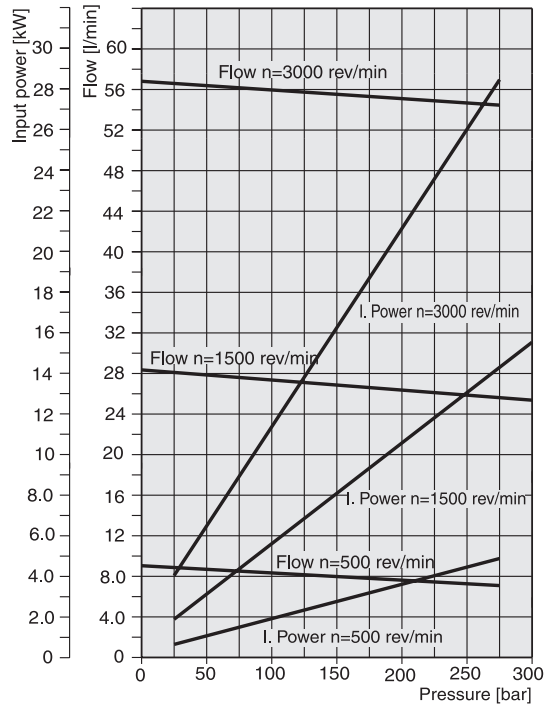
Inlet Pressure = 0.9 + 0.1 bar absolute



PGP511 - 19.0 CC

Fluid Temperature = 45± 2°C
Viscosity = 36mm^2/s

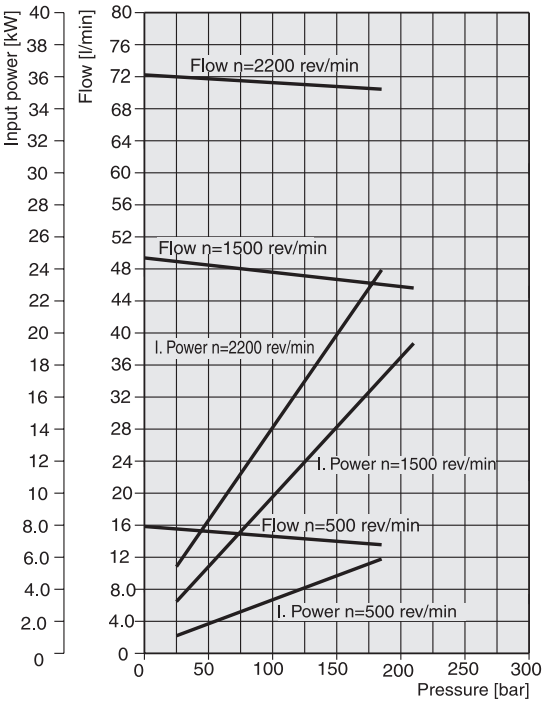
Inlet Pressure = 0.9 + 0.1 bar absolute



PGP511 - 33.0 CC

Fluid Temperature = 45± 2°C
Viscosity = 36mm^2/s

Inlet Pressure = 0.9 + 0.1 bar absolute



Performance data shown is based upon a series of laboratory tests and is not representative of any one unit.

Parker Hannifin Corporation
Gear Pump Division
Kings Mountain, North Carolina USA

Integral Valve Options and Market Experience

This appendix provides overviews of the valves currently offered as well as options that are available from the wide range of Parker gear pumps and motors. Many valves are already in production for OEM customers on specific pumps or motors, while others have been supplied for prototype evaluation. A few valves are derivatives of valves already in production and can be produced for OEM customers. Parker's integral valve program was developed in response to requests from our OEM customers to reduce the number and total cost of components on their machines. We addressed this challenge by integrating the valves required for machine functions into our hydraulic pumps and motors. This integration has reduced the number of purchased components, eliminated many of the hydraulic hoses and associated fittings (and potential leak points), and reduced assembly labor costs on the production line.

Applications:	Implement Pumps (Single)	Implement Pumps (Tandem)	Triple and Quad Pumps	Two Stage Pumps	Power Steering Pumps	Power Steering/Fan Drive Pumps	Fan Drive Pumps	Direct Acting Relief Valves	Pilot Operated Relief Valves	Load Sensing Relief Valves	Solenoid Unloading Relief Valves	Unloaders for Tandem Pumps	Priority Flow Dividers	Load Sense Priority Valves	Single Accumulator Charge Pumps	Dual Accumulator Charge Pumps	Single Accumulator Charge Valves	Dual Accumulator Charge Valves	Load Sense Charge Valves	Modulating Brake Valves	Hydraulic Motors	Motors with Integral Relief Valves	Motors with Cross Port Relief Valves	Motors with Integral By-Pass Valves	Steering & Accumulator Charge Valve (STAC)	Custom Valve Manifolds	Brake Valve	Check Valve & Restrictor
Materials Handling																												
Electric Lift Trucks	•	•		•				•	•				•	•	•		•									•		
I.C. Powered Lift Trucks	•	•		•					•	•			•	•												•		
Rough Terrain Lift Trucks	•	•		•						•			•	•	•	•	•	•	•	•						•		
Turf Care and Grasscutting																												
Reel Commercial Mowers	•	•	•	•	•	•	•	•	•		•		•	•								•	•	•		•		•
Rotary Commercial Mowers	•	•	•	•	•	•	•	•	•		•		•	•								•	•	•		•		
Heavy Duty Industrial Mowers	•	•	•	•	•	•	•	•	•		•		•	•							•	•	•	•		•	•	•
Construction Equipment																												
Road Construction	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•			•	•	•
Wheel Loaders		•		•	•	•	•		•			•	•	•	•	•	•	•	•	•					•	•		
Backhoe-Loaders		•	•	•	•	•	•		•			•	•	•	•	•	•	•	•	•					•	•		
Cranes and Winches	•	•	•	•	•	•	•		•		•		•	•					•	•	•	•	•			•	•	
Haul Trucks			•	•	•									•	•	•	•	•								•		
Truck, Bus & Rec. Vehicles				•	•	•	•	•					•	•		•		•	•	•	•	•				•		
Municipal, Street Sweepers	•	•	•	•	•	•	•	•	•		•		•	•	•	•	•	•	•	•	•	•	•	•		•		

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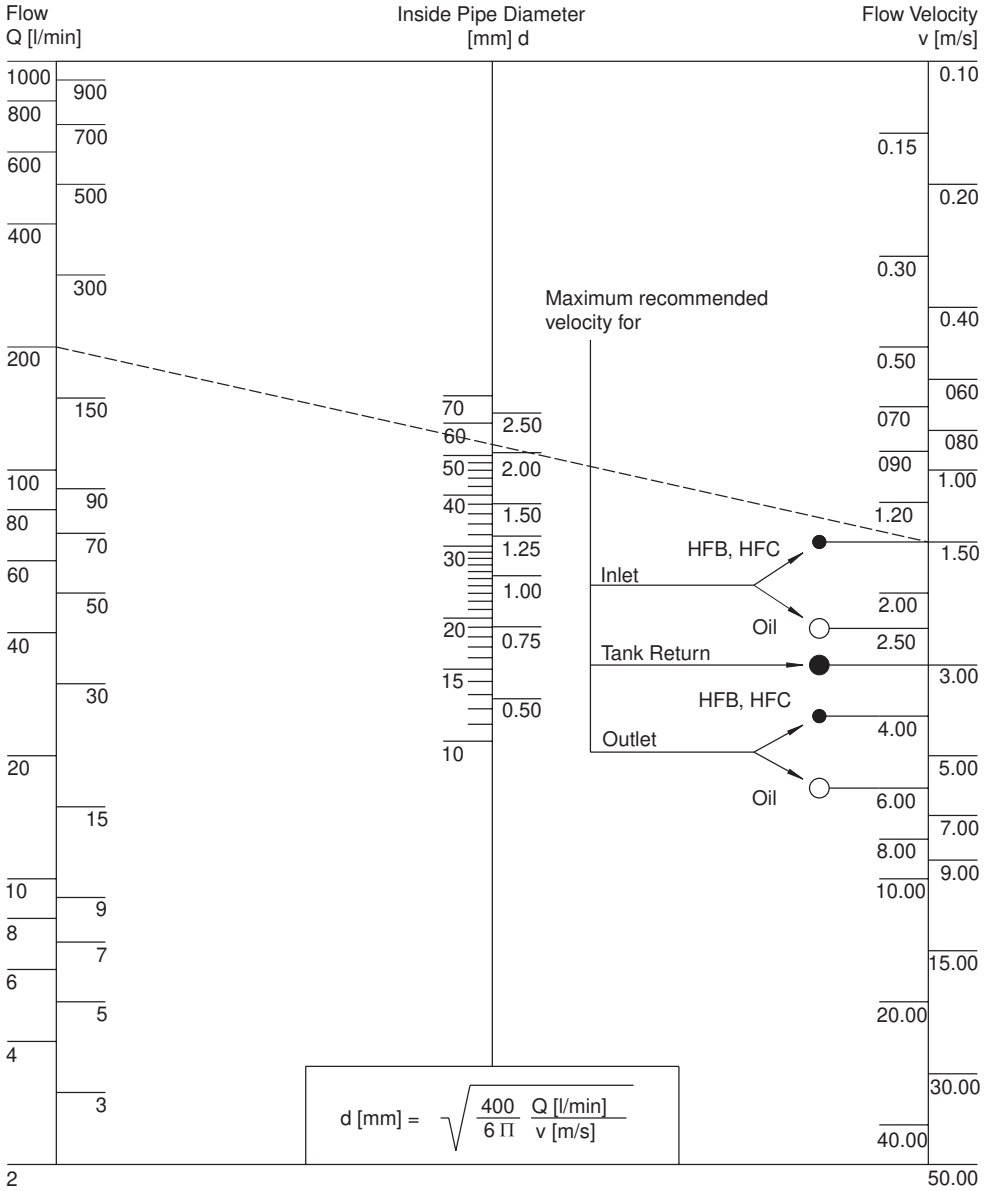
Gear Pump Division
Kings Mountain, North Carolina USA

List of Available Pump Combinations - PGP 505 and PGP 511

First pump	Second pump	
	PGP 505	**PGP 511**
PGP 505	X	
PGP 511		X

Nomograph for Pipe Velocity



Parker Hannifin Corporation
Gear Pump Division
Kings Mountain, North Carolina USA

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2. Payment: Payment shall be made by Buyer net 30 days from the date of delivery of the items purchased hereunder. Amounts not timely paid shall bear interest at the maximum rate permitted by law for each month or portion thereof that the Buyer is late in making payment. Any claims by Buyer for omissions or shortages in a shipment shall be waived unless Seller receives notice thereof within 30 days after Buyer's receipt of the shipment.

3. Delivery: Unless otherwise provided on the face hereof, delivery shall be made F.O.B. Seller's plant. Regardless of the method of delivery, however, risk of loss shall pass to Buyer upon Seller's delivery to a carrier. Any delivery dates shown are approximate only and Seller shall have no liability for any delays in delivery.

4. Warranty: Seller warrants that the items sold hereunder shall be free from defects in material or workmanship for a period of 18 months from date of shipment from Parker Hannifin Corporation. **THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO ITEMS PROVIDED HEREUNDER. SELLER MAKES NO OTHER WARRANTY, GUARANTEE, OR REPRESENTATION OF ANY KIND WHATSOEVER. ALL OTHER WARRANTIES, INCLUDING BUT NOT LIMITED TO, MERCHANTABILITY AND FITNESS FOR PURPOSE, WHETHER EXPRESS, IMPLIED, OR ARISING BY OPERATION OF LAW, TRADE USAGE, OR COURSE OF DEALING ARE HEREBY DISCLAIMED. NOTWITHSTANDING THE FOREGOING, THERE ARE NO WARRANTIES WHATSOEVER ON ITEMS BUILT OR ACQUIRED WHOLLY OR PARTIALLY, TO BUYER'S DESIGNS OR SPECIFICATIONS.**

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6. Changes, Reschedules and Cancellations: Buyer may request to modify the designs or specifications for the items sold hereunder as well as the quantities and delivery dates thereof, or may request to cancel all or part of this order, however, no such requested modification or cancellation shall become part of the contract between Buyer and Seller unless accepted by Seller in a written amendment to this Agreement. Acceptance of any such requested modification or cancellation shall be at Seller's discretion, and shall be upon such terms and conditions as Seller may require.

7. Special Tooling: A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture items sold pursuant to this contract. Such special tooling shall be and remain Seller's property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in apparatus belonging to Seller which is utilized in the notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller shall have the right to alter, discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.

8. Buyer's Property: Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer or any other items which become Buyer's property, may be considered obsolete and may be destroyed by Seller after two (2) consecutive years have elapsed without Buyer placing an order for the items which are 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. Taxes: Unless otherwise indicated on the face hereof, all prices and charges are exclusive of excise, sales, use, property, occupational or like taxes which may be imposed by any taxing authority upon the manufacture, sale or delivery of the items sold hereunder. If any such taxes must be paid by Seller or if Seller is liable for the collection of such tax, the amount thereof shall be in addition to the amounts for the items sold. Buyer agrees to pay all such taxes or to reimburse Seller therefore upon receipt of its invoice. If Buyer claims exemption from any sales, use or other tax imposed by any taxing authority, Buyer shall save Seller harmless from and against any such tax, together with any interest or penalties thereon which may be assessed if the items are held to be taxable.

10. Indemnity For Infringement of Intellectual Property Rights: Seller shall have no liability for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights except as provided in this Part 10. Seller will defend and indemnify Buyer against allegations of infringement of U.S. Patents, U.S. Trademarks, copyrights, trade dress and trade secrets (hereinafter 'Intellectual Property Rights'). 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 an allegation that an item sold pursuant to this contract infringes the Intellectual Property Rights of a third party. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of such allegations of infringement, and Seller having sole control over the defense of any allegations or actions including all negotiations for settlement or compromise. If an item sold hereunder is subject to a claim that it infringes the Intellectual Property Rights of a third party, Seller may, at its sole expense and option, procure for Buyer the right to continue using said item, replace or modify said item so as to make it noninfringing, or offer to accept return of said item and return the purchase price less a reasonable allowance for depreciation. Notwithstanding the foregoing, Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to items delivered hereunder for which the designs are specified in whole or part by Buyer, or infringements resulting from the modification, combination or use in a system of any item sold hereunder. The foregoing provisions of this Part 10 shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights.

If a claim is based on information provided by Buyer or if the design for an item delivered hereunder is specified in whole or in part by Buyer, Buyer shall defend and indemnify Seller for all costs, expenses or judgments resulting from any claim that such item infringes any patent, trademark, copyright, trade dress, trade secret or any similar right.

11. Force Majeure: Seller does not assume the risk of and shall not be liable for delay or failure to perform any of Seller's obligations by reason of circumstances beyond the reasonable control of Seller (hereinafter 'Events of Force Majeure'). Events of Force Majeure shall include without limitation, accidents, acts of God, strikes or labor disputes, acts, laws, rules or regulations of any government or government agency, fires, floods, delays or failures in delivery of carriers or suppliers, shortages of materials and any other cause beyond Seller's control.

12. Entire Agreement/Governing Law: The terms and conditions set forth herein, together with any amendments, modifications and any different terms or conditions expressly accepted by Seller in writing, shall constitute the entire Agreement concerning the items sold, and there are no oral or other representations or agreements which pertain thereto. This Agreement shall be governed in all respects by the law of the State of Ohio. No actions arising out of the sale of the items sold hereunder or this Agreement may be brought by either party more than two (2) years after the cause of action accrues.

9/91P

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Web site: www.parker.com

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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