

**Impro**  
Fluidtek

Technical Information

# Orbital Motors Type WD, WP and WR





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## OPERATING RECOMMENDATIONS

### OIL TYPE

Hydraulic oils with anti-wear, anti-foam and demulsifiers are recommended for systems incorporating Impro Fluidtek motors. Straight oils can be used but may require VI (viscosity index) improvers depending on the operating temperature range of the system. Other water based and environmentally friendly oils may be used, but service life of the motor and other components in the system may be significantly shortened. Before using any type of fluid, consult the fluid requirements for all components in the system for compatibility. Testing under actual operating conditions is the only way to determine if acceptable service life will be achieved.

### FLUID VISCOSITY & FILTRATION

Fluids with a viscosity between 20 - 43 cSt [100 - 200 S.U.S.] at operating temperature is recommended. Fluid temperature should also be maintained below 85°C [180° F]. It is also suggested that the type of pump and its operating specifications be taken into account when choosing a fluid for the system. Fluids with high viscosity can cause cavitation at the inlet side of the pump. Systems that operate over a wide range of temperatures may require viscosity improvers to provide acceptable fluid performance.

Impro Fluidtek recommends maintaining an oil cleanliness level of ISO 17-14 or better.

### INSTALLATION & START-UP

When installing an Impro Fluidtek motor it is important that the mounting flange of the motor makes full contact with the mounting surface of the application. Mounting hardware of the appropriate grade and size must be used. Hubs, pulleys, sprockets and couplings must be properly aligned to avoid inducing excessive thrust or radial loads. Although the output device must fit the shaft snug, a hammer should never be used to install any type of output device onto the shaft. The port plugs should only be removed from the motor when the system connections are ready to be made. To avoid contamination, remove all matter from around the ports of the motor and the threads of the fittings. Once all system connections are made, it is recommended that the motor be run-in for 15-30 minutes at no load and half speed to remove air from the hydraulic system.

### MOTOR PROTECTION

Over-pressurization of a motor is one of the primary causes of motor failure. To prevent these situations, it is necessary to provide adequate relief protection for a motor based on the pressure ratings for that particular model. For systems that may experience overrunning conditions, special precautions must be taken. In an overrunning condition, the motor functions as a pump and attempts to convert kinetic energy into hydraulic energy. Unless the system is properly

configured for this condition, damage to the motor or system can occur. To protect against this condition a counterbalance valve or relief cartridge must be incorporated into the circuit to reduce the risk of over-pressurization. If a relief cartridge is used, it must be installed upline of the motor, if not in the motor, to relieve the pressure created by the over-running motor. To provide proper motor protection for an over-running load application, the pressure setting of the pressure relief valve must not exceed the intermittent rating of the motor.

### HYDRAULIC MOTOR SAFETY PRECAUTION

A hydraulic motor must not be used to hold a suspended load. Due to the necessary internal tolerances, all hydraulic motors will experience some degree of creep when a load induced torque is applied to a motor at rest. All applications that require a load to be held must use some form of mechanical brake designed for that purpose.

### MOTOR/BRAKE PRECAUTION

**Caution!** - Impro Fluidtek motor/brakes are intended to operate as static or parking brakes. System circuitry must be designed to bring the load to a stop before applying the brake.

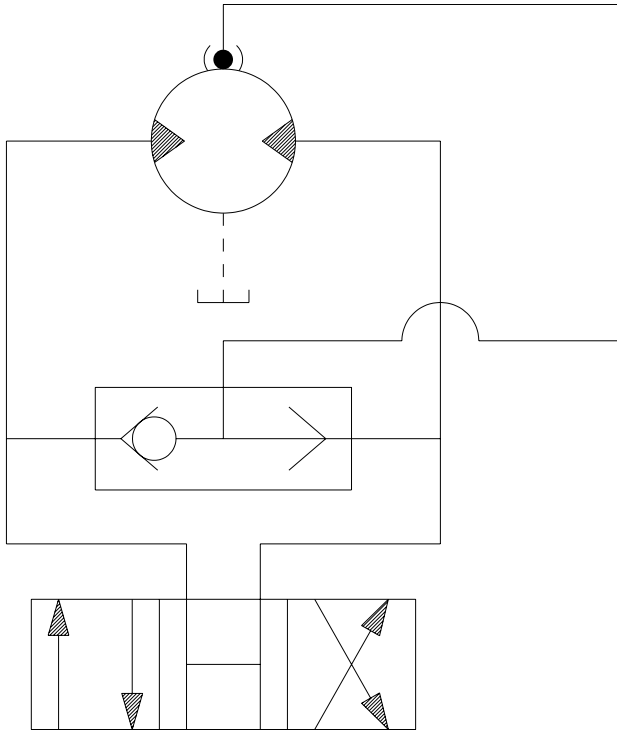
**Caution!** - Because it is possible for some large displacement motors to overpower the brake, it is critical that the maximum system pressure be limited for these applications. Failure to do so could cause serious injury or death. When choosing a motor/brake for an application, consult the performance chart for the series and displacement chosen for the application to verify that the maximum operating pressure of the system will not allow the motor to produce more torque than the maximum rating of the brake. Also, it is vital that the system relief be set low enough to insure that the motor is not able to overpower the brake.

To ensure proper operation of the brake, a separate case drain back to tank must be used. Use of the internal drain option is not recommended due to the possibility of return line pressure spikes. A simple schematic of a system utilizing a motor/brake is shown on page 5. Although maximum brake release pressure may be used for an application, a 34 bar [500 psi] pressure reducing valve is recommended to promote maximum life for the brake release piston seals. However, if a pressure reducing valve is used in a system which has case drain back pressure, the pressure reducing valve should be set to 34 bar [500 psi] over the expected case pressure to ensure full brake release. To achieve proper brake release operation, it is necessary to bleed out any trapped air and fill brake release cavity and hoses before all connections are tightened. To facilitate this operation, all motor/brakes feature two release ports. One or both of these ports may be used to release the brake in the

**OPERATING RECOMMENDATIONS & MOTOR CONNECTIONS**

**MOTOR/BRAKE PRECAUTION** (continued)

unit. Motor/brakes should be configured so that the release ports are near the top of the unit in the installed position.



TYPICAL MOTOR/BRAKE SCHEMATIC

Once all system connections are made, one release port must be opened to atmosphere and the brake release line carefully charged with fluid until all air is removed from the line and motor/brake release cavity. When this has been accomplished the port plug or secondary release line must be reinstalled. In the event of a pump or battery failure, an external pressure source may be connected to the brake release port to release the brake, allowing the machine to be moved.

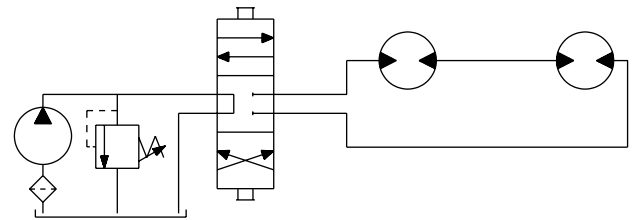
► NOTE: It is vital that all operating recommendations be followed. Failure to do so could result in injury or death.

**MOTOR CIRCUITS**

There are two common types of circuits used for connecting multiple numbers of motors – series connection and parallel connection.

**SERIES CONNECTION**

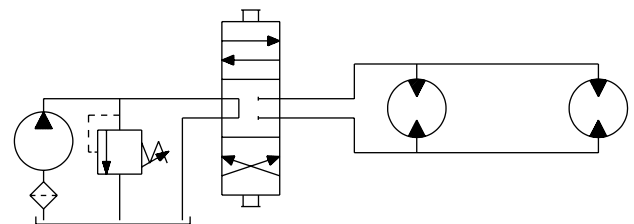
When motors are connected in series, the outlet of one motor is connected to the inlet of the next motor. This allows the full pump flow to go through each motor and provide maximum speed. Pressure and torque are distributed between the motors based on the load each motor is subjected to. The maximum system pressure must be no greater than the maximum inlet pressure of the first motor. The allowable back pressure rating for a motor must also be considered. In some series circuits the motors must have an external case drain connected. A series connection is desirable when it is important for all the motors to run the same speed such as on a long line conveyor.



SERIES CIRCUIT

**PARALLEL CONNECTION**

In a parallel connection all of the motor inlets are connected. This makes the maximum system pressure available to each motor allowing each motor to produce full torque at that pressure. The pump flow is split between the individual motors according to their loads and displacements. If one motor has no load, the oil will take the path of least resistance and all the flow will go to that one motor. The others will not turn. If this condition can occur, a flow divider is recommended to distribute the oil and act as a differential.

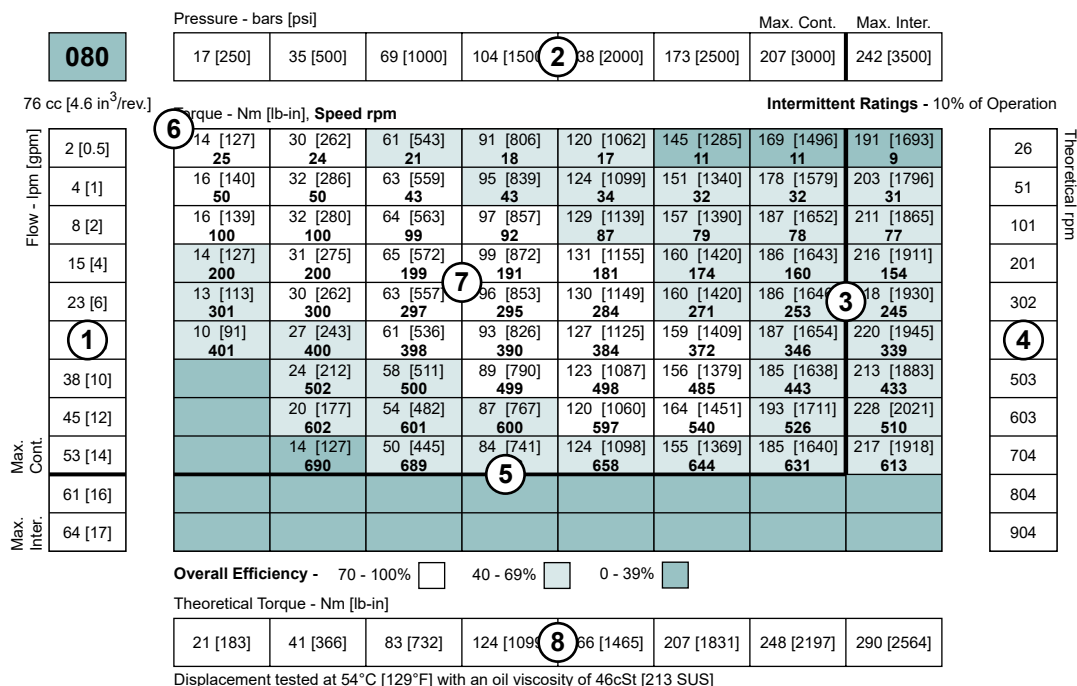


PARALLEL CIRCUIT

► NOTE: The motor circuits shown above are for illustration purposes only. Components and circuitry for actual applications may vary greatly and should be chosen based on the application.

## PRODUCT TESTING

Performance testing is the critical measure of a motor's ability to convert flow and pressure into speed and torque. All product testing is conducted using an Impro Fluidtek state of the art test facility. This facility utilizes fully automated test equipment and custom designed software to provide accurate, reliable test data. Test routines are standardized, including test stand calibration and stabilization of fluid temperature and viscosity, to provide consistent data. The example below provides an explanation of the values pertaining to each heading on the performance chart.



- Flow represents the amount of fluid passing through the motor during each minute of the test.
- Pressure refers to the measured pressure differential between the inlet and return ports of the motor during the test.
- The maximum continuous pressure rating and maximum intermittent pressure rating of the motor are separated by the dark lines on the chart.
- Theoretical RPM represents the RPM that the motor would produce if it were 100% volumetrically efficient. Measured RPM divided by the theoretical RPM give the actual volumetric efficiency of the motor.
- The maximum continuous flow rating and maximum intermittent flow rating of the motor are separated by the dark line on the chart.
- Performance numbers represent the actual torque and speed generated by the motor based on the corresponding input pressure and flow. The numbers on the top row indicate torque as measured in Nm [lb-in], while the bottom number represents the speed of the output shaft.
- Areas within the white shading represent maximum motor efficiencies.
- Theoretical Torque represents the torque that the motor would produce if it were 100% mechanically efficient. Actual torque divided by the theoretical torque gives the actual mechanical efficiency of the motor.

**ALLOWABLE BEARING & SHAFT LOADING**

This catalog provides curves showing allowable radial loads at points along the longitudinal axis of the motor. They are dimensioned from the mounting flange. Two capacity curves for the shaft and bearings are shown. A vertical line through the centerline of the load drawn to intersect the x-axis intersects the curves at the load capacity of the shaft and of the bearing.

In the example below the maximum radial load bearing rating is between the internal roller bearings illustrated with a solid line. The allowable shaft rating is shown with a dotted line.

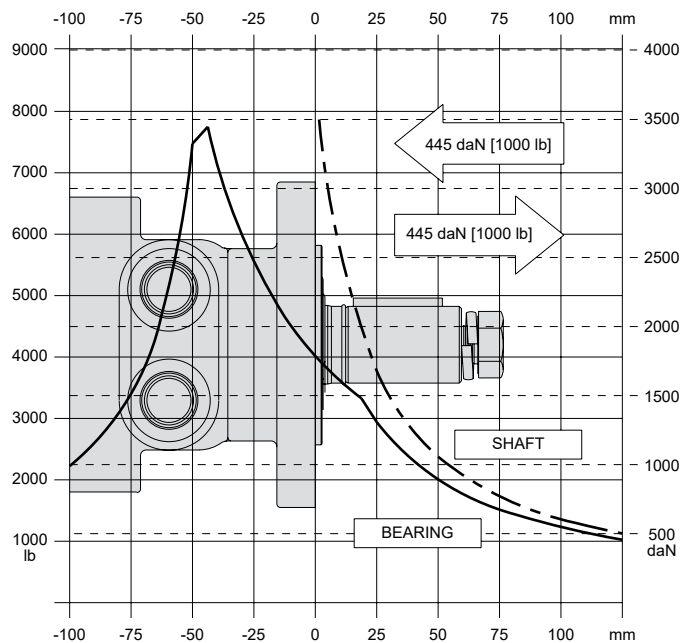
The bearing curves for each model are based on laboratory analysis and testing results constructed at Impro Fluidtek. The shaft loading is based on a 3:1 safety factor and 330 Kpsi tensile strength. The allowable load is the lower of the curves at a given point. For instance, one inch in front of the mounting flange the bearing capacity is lower than the shaft capacity. In this case, the bearing is the limiting load. The motor user needs to determine which series of motor to use based on their application knowledge.

**ISO 281 RATINGS VS. MANUFACTURERS RATINGS**

Published bearing curves can come from more than one type of analysis. The ISO 281 bearing rating is an international standard for the dynamic load rating of roller bearings. The rating is for a set load at a speed of 33 1/3 RPM for 500 hours (1 million revolutions). The standard was established to allow consistent comparisons of similar bearings between manufacturers. The ISO 281 bearing ratings are based solely on the physical characteristics of the bearings, removing any manufacturers specific safety factors or empirical data that influences the ratings.

Manufacturers' ratings are adjusted by diverse and systematic laboratory investigations, checked constantly with feedback from practical experience. Factors taken into account that affect bearing life are material, lubrication, cleanliness of the lubrication, speed, temperature, magnitude of the load and the bearing type.

The operating life of a bearing is the actual life achieved by the bearing and can be significantly different from the calculated life. Comparison with similar applications is the most accurate method for bearing life estimations.



**EXAMPLE LOAD RATING FOR MECHANICALLY RETAINED NEEDLE ROLLER BEARINGS**

- Bearing Life  $L_{10} = (C/P)^p [10^6 \text{ revolutions}]$
- $L_{10}$  = nominal rating life
- C = dynamic load rating
- P = equivalent dynamic load
- Life Exponent  $P = 10/3$  for needle bearings

BEARING LOAD MULTIPLICATION FACTOR TABLE			
RPM	FACTOR	RPM	FACTOR
50	1.23	500	0.62
100	1.00	600	0.58
200	0.81	700	0.56
300	0.72	800	0.50
400	0.66		

## VEHICLE DRIVE CALCULATIONS

When selecting a wheel drive motor for a mobile vehicle, a number of factors concerning the vehicle must be taken into consideration to determine the required maximum motor RPM, the maximum torque required and the maximum load each motor must support. The following sections contain the necessary equations to determine this criteria. An example is provided to illustrate the process.

### Sample application (vehicle design criteria)

vehicle description..... 4 wheel vehicle  
 vehicle drive.....2 wheel drive  
 GVW .....1,500lbs.  
 weight over each drive wheel ..... 425 lbs.  
 rolling radius of tires ..... 16 in.  
 desired acceleration .....0-5 mph in 10 sec.  
 top speed..... 5 mph  
 gradability.....20%  
 worst working surface..... poor asphalt

### To determine maximum motor speed

$$\text{RPM} = \frac{2.65 \times \text{KPH} \times G}{r_m} \quad \text{RPM} = \frac{168 \times \text{MPH} \times G}{r_i}$$

Where:

MPH = max. vehicle speed (miles/hr)  
 KPH = max. vehicle speed (kilometers/hr)  
 r<sub>i</sub> = rolling radius of tire (inches)  
 G = gear reduction ratio (if none, G = 1)  
 r<sub>m</sub> = rolling radius of tire (meters)

**Example**  $\text{RPM} = \frac{168 \times 5 \times 1}{16} = 52.5$

### To determine maximum torque requirement of motor

To choose a motor(s) capable of producing enough torque to propel the vehicle, it is necessary to determine the Total Tractive Effort (TE) requirement for the vehicle. To determine the total tractive effort, the following equation must be used:

$$\text{TE} = \text{RR} + \text{GR} + \text{FA} + \text{DP} \text{ (lbs or N)}$$

Where:

TE = Total tractive effort  
 RR = Force necessary to overcome rolling resistance  
 GR = Force required to climb a grade  
 FA = Force required to accelerate  
 DP = Drawbar pull required

The components for this equation may be determined using the following steps:

### Step One: Determine Rolling Resistance

Rolling Resistance (RR) is the force necessary to propel a vehicle over a particular surface. It is recommended that the worst possible surface type to be encountered by the vehicle be factored into the equation.

$$\text{RR} = \frac{\text{GVW}}{1000} \times R \text{ (lb or N)}$$

Where:

GVW = gross (loaded) vehicle weight (lb or kg)  
 R = surface friction (value from Table 1)

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**Example**  $\text{RR} = \frac{1500}{1000} \times 22 \text{ lbs} = 33 \text{ lbs}$

Table 1

Rolling Resistance	
Concrete (excellent).....	10
Concrete (good).....	15
Concrete (poor).....	20
Asphalt (good).....	12
Asphalt (fair).....	17
Asphalt (poor).....	22
Macadam (good).....	15
Macadam (fair).....	22
Macadam (poor).....	37
Cobbles (ordinary).....	55
Cobbles (poor).....	37
Snow (2 inch).....	25
Snow (4 inch).....	37
Dirt (smooth).....	25
Dirt (sandy).....	37
Mud.....	37 to 150
Sand (soft).....	60 to 150
Sand (dune).....	160 to 300

### Step Two: Determine Grade Resistance

Grade Resistance (GR) is the amount of force necessary to move a vehicle up a hill or "grade." This calculation must be made using the maximum grade the vehicle will be expected to climb in normal operation.

To convert incline degrees to % Grade:

$$\% \text{ Grade} = [\tan \text{ of angle (degrees)}] \times 100$$

$$\text{GR} = \frac{\% \text{ Grade}}{100} \times \text{GVW} \text{ (lb or N)}$$

**Example**  $\text{GR} = \frac{20}{100} \times 1500 \text{ lbs} = 300 \text{ lbs}$



**VEHICLE DRIVE CALCULATIONS**

**Step Three: Determine Acceleration Force**

Acceleration Force (FA) is the force necessary to accelerate from a stop to maximum speed in a desired time.

$$FA = \frac{MPH \times GVW \text{ (lb)}}{22 \times t} \qquad FA = \frac{KPH \times GVW \text{ (N)}}{35.32 \times t}$$

Where:

t = time to maximum speed (seconds)

**Example**  $FA = \frac{5 \times 1500 \text{ lbs}}{22 \times 10} = 34 \text{ lbs}$

**Step Four: Determine Drawbar Pull**

Drawbar Pull (DP) is the additional force, if any, the vehicle will be required to generate if it is to be used to tow other equipment. If additional towing capacity is required for the equipment, repeat steps one through three for the towable equipment and sum the totals to determine DP.

**Step Five: Determine Total Tractive Effort**

The Tractive Effort (TE) is the sum of the forces calculated in steps one through three above. On low speed vehicles, wind resistance can typically be neglected. However, friction in drive components may warrant the addition of 10% to the total tractive effort to insure acceptable vehicle performance.

$$TE = RR + GR + FA + DP \text{ (lb or N)}$$

**Example**  $TE = 33 + 300 + 34 + 0 \text{ (lbs)} = 367 \text{ lbs}$

**Step Six: Determine Motor Torque**

The Motor Torque (T) required per motor is the Total Tractive Effort divided by the number of motors used on the machine. Gear reduction is also factored into account in this equation.

$$T = \frac{TE \times ri}{M \times G} \text{ lb-in per motor} \qquad T = \frac{TE \times rm}{M \times G} \text{ Nm per motor}$$

Where:

M = number of driving motors

**Example**  $T = \frac{367 \times 16}{2 \times 1} \text{ lb-in/motor} = 2936 \text{ lb-in}$

**Step Seven: Determine Wheel Slip**

To verify that the vehicle will perform as designed in regards to tractive effort and acceleration, it is necessary to calculate wheel slip (TS) for the vehicle. In special cases, wheel slip may actually be desirable to prevent hydraulic system overheating and component breakage should the vehicle become stalled.

$$TS = \frac{W \times f \times ri}{G} \qquad TS = \frac{W \times f \times rm}{G}$$

(lb-in per motor)      (N-m per motor)

Where:

f = coefficient of friction (see table 2)

W = loaded vehicle weight over driven wheel (lb or N)

**Example**  $TS = \frac{425 \times .06 \times 16}{1} \text{ lb-in/motor} = 4080 \text{ lbs}$

Table 2

Coefficient of friction (f)	
Steel on steel.....	0.3
Rubber tire on dirt.....	0.5
Rubber tire on a hard surface .....	0.6 - 0.8
Rubber tire on cement.....	0.7

**To determine radial load capacity requirement of motor**

When a motor used to drive a vehicle has the wheel or hub attached directly to the motor shaft, it is critical that the radial load capabilities of the motor are sufficient to support the vehicle. After calculating the Total Radial Load (RL) acting on the motors, the result must be compared to the bearing/shaft load charts for the chosen motor to determine if the motor will provide acceptable load capacity and life.

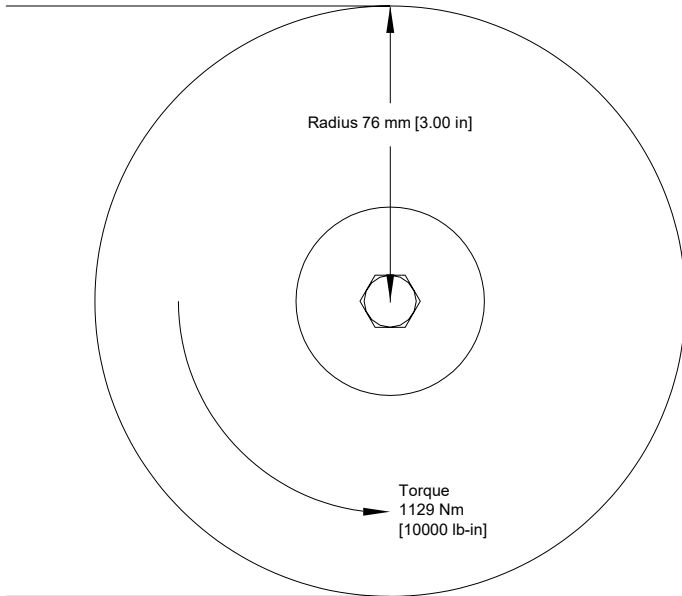
$$RL = \sqrt{W^2 + \left(\frac{T}{ri}\right)^2} \text{ lb} \qquad RL = \sqrt{W^2 + \left(\frac{T}{rm}\right)^2} \text{ kg}$$

**Example**  $RL = \sqrt{425^2 + \left(\frac{2936}{16}\right)^2} = 463 \text{ lbs}$

Once the maximum motor RPM, maximum torque requirement, and the maximum load each motor must support have been determined, these figures may then be compared to the motor performance charts and to the bearing load curves to choose a series and displacement to fulfill the motor requirements for the application.

## INDUCED SIDE LOAD

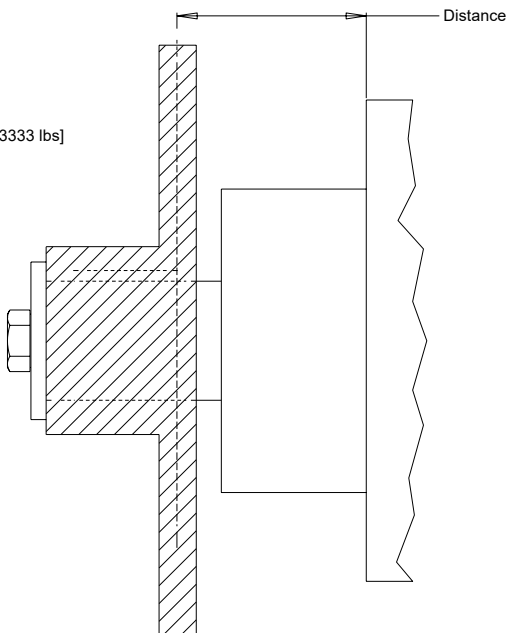
In many cases, pulleys or sprockets may be used to transmit the torque produced by the motor. Use of these components will create a torque induced side load on the motor shaft and bearings. It is important that this load be taken into consideration when choosing a motor with sufficient bearing and shaft capacity for the application.



To determine the side load, the motor torque and pulley or sprocket radius must be known. Side load may be calculated using the formula below. The distance from the pulley/sprocket centerline to the mounting flange of the motor must also be determined. These two figures may then be compared to the bearing and shaft load curve of the desired motor to determine if the side load falls within acceptable load ranges.

$$\text{Side Load} = \frac{\text{Torque}}{\text{Radius}}$$

$$\text{Side Load} = 14855 \text{ Nm [3333 lbs]}$$



## HYDRAULIC EQUATIONS

Multiplication Factor	Abbrev.	Prefix
$10^{12}$	T	tera
$10^9$	G	giga
$10^6$	M	mega
$10^3$	K	kilo
$10^2$	h	hecto
$10^1$	da	deka
$10^{-1}$	d	deci
$10^{-2}$	c	centi
$10^{-3}$	m	milli
$10^{-6}$	u	micro
$10^{-9}$	n	nano
$10^{-12}$	p	pico
$10^{-15}$	f	femto
$10^{-18}$	a	atto

Theo. Speed (RPM) =

$$\frac{1000 \times \text{LPM}}{\text{Displacement (cm}^3\text{/rev)}} \quad \text{or} \quad \frac{231 \times \text{GPM}}{\text{Displacement (in}^3\text{/rev)}}$$

Theo. Torque (lb-in) =

$$\frac{\text{Bar} \times \text{Disp. (cm}^3\text{/rev)}}{20 \pi} \quad \text{or} \quad \frac{\text{PSI} \times \text{Displacement (in}^3\text{/rev)}}{6.28}$$

Power In (HP) =

$$\frac{\text{Bar} \times \text{LPM}}{600} \quad \text{or} \quad \frac{\text{PSI} \times \text{GPM}}{1714}$$

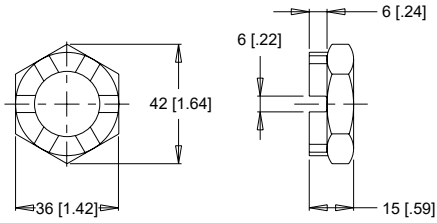
Power Out (HP) =

$$\frac{\text{Torque (Nm)} \times \text{RPM}}{9543} \quad \text{or} \quad \frac{\text{Torque (lb-in)} \times \text{RPM}}{63024}$$

**SHAFT NUT INFORMATION**

**35MM TAPERED SHAFTS**  
M24 x 1.5 Thread

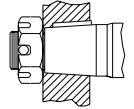
**A** Slotted Nut



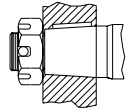
Torque Specifications: 32.5 daNm [240 ft.lb.]

**PRECAUTION**

The tightening torques listed with each nut should only be used as a guideline. Hubs may require higher or lower tightening torque depending on the material. Consult the hub manufacturer to obtain recommended tightening torque. To maximize torque transfer from the shaft to the hub, and to minimize the potential for shaft breakage, a hub with sufficient thickness must fully engage the taper length of the shaft.



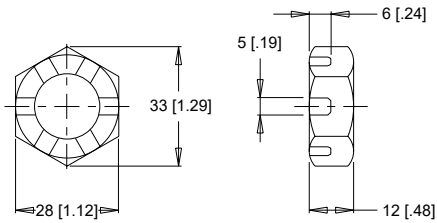
incorrect



correct

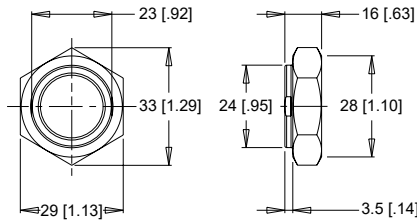
**1" TAPERED SHAFTS**  
3/4-28 Thread

**A** Slotted Nut



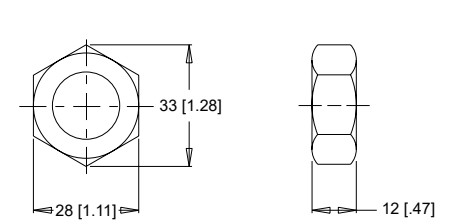
Torque Specifications: 20 - 23 daNm [150 - 170 ft.lb.]

**B** Lock Nut



Torque Specifications: 24 - 27 daNm [180 - 200 ft.lb.]

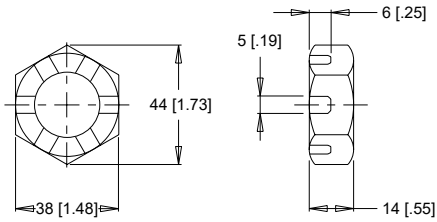
**C** Solid Nut



Torque Specifications: 20 - 23 daNm [150 - 170 ft.lb.]

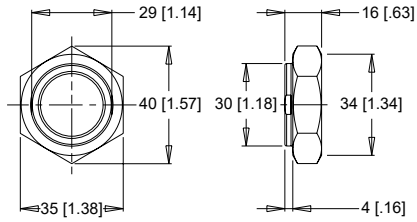
**1-1/4" TAPERED SHAFTS**  
1-20 Thread

**A** Slotted Nut



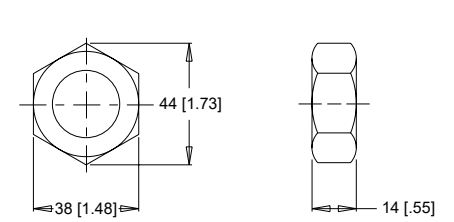
Torque Specifications: 38 daNm [280 ft.lb.] Max.

**B** Lock Nut



Torque Specifications: 33 - 42 daNm [240 - 310 ft.lb.]

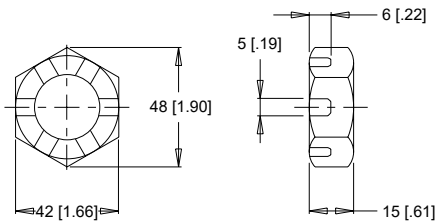
**C** Solid Nut



Torque Specifications: 38 daNm [280 ft.lb.] Max.

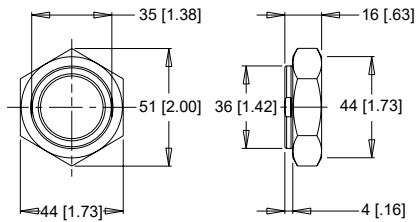
**1-3/8" & 1-1/2" TAPERED SHAFTS**  
1 1/8-18 Thread

**A** Slotted Nut



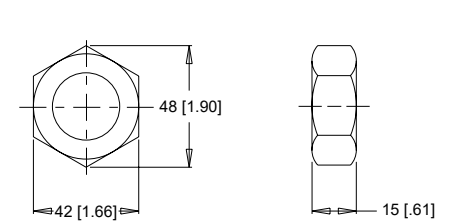
Torque Specifications: 41 - 54 daNm [300 - 400 ft.lb.]

**B** Lock Nut



Torque Specifications: 34 - 48 daNm [250 - 350 ft.lb.]

**C** Solid Nut



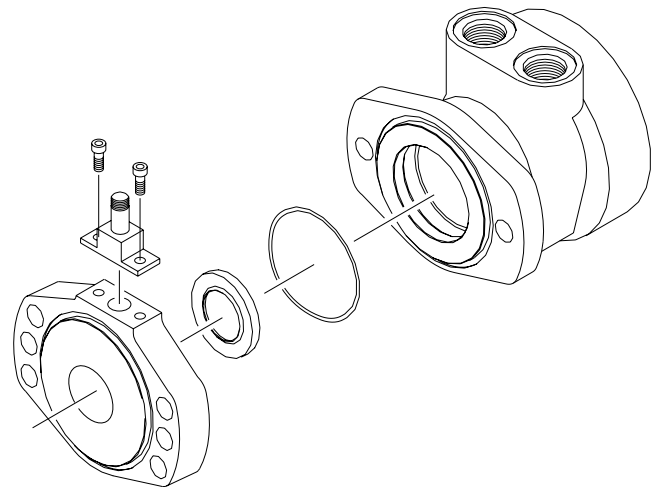
Torque Specifications: 41 - 54 daNm [300 - 400 ft.lb.]

## SPEED SENSORS

Impro Fluidtek offers both single and dual element speed sensor options providing a number of benefits to users by incorporating the latest advancements in sensing technology and materials. The single element sensors provide 50 pulses per revolution with the dual element providing 100 pulses per revolution.” Higher resolution is especially beneficial for slow speed applications, where more information is needed for smooth and accurate control. The dual sensor option also provides a direction signal allowing end-users to monitor the direction of shaft rotation.

Unlike competitive designs that breach the high pressure area of the motor to add the sensor, the Impro Fluidtek speed sensor option utilizes an add-on flange to locate all sensor components outside the high pressure operating environment. This eliminates the potential leak point common to competitive designs. Many improvements were made to the sensor flange including changing the material from cast iron to acetal resin, incorporating a Buna-N shaft seal internal to the flange, and providing a grease zerk, which allows the user to fill the sensor cavity with grease. These improvements enable the flange to withstand the rigors of harsh environments.

Another important feature of the new sensor flange is that it is self-centering, which allows it to remain concentric to the magnet rotor. This produces a consistent mounting location for the new sensor module, eliminating the need to adjust



the air gap between the sensor and magnet rotor. The o-ring sealed sensor module attaches to the sensor flange with two small screws, allowing the sensor to be serviced or upgraded in the field in under one minute. This feature is especially valuable for mobile applications where machine downtime is costly. The sensor may also be serviced without exposing the hydraulic circuit to the atmosphere. Another advantage of the self-centering flange is that it allows users to rotate the sensor to a location best suited to their application. This feature is not available on competitive designs, which fix the sensor in one location in relationship to the motor mounting flange.

## FEATURES / BENEFITS

- Grease fitting allows sensor cavity to be filled with grease for additional protection.
- Internal extruder seal protects against environmental elements.
- M12 or weatherpack connectors provide installation flexibility.
- Dual element sensor provides up to 100 pulses per revolution and directional sensing.
- Modular sensor allows quick and easy servicing.
- Acetal resin flange is resistant to moisture, chemicals, oils, solvents and greases.
- Self-centering design eliminates need to set magnet-to-sensor air gap.
- Protection circuitry

## SENSOR OPTIONS

### Z - 4-pin M12 male connector

This option has 50 pulses per revolution on all series. This option will not detect direction.

### Y - 3-pin male weatherpack connector\*

This option has 50 pulses per revolution on all series. This option will not detect direction.

### X - 4-pin M12 male connector

This option has 100 pulses per revolution on all series. This option will detect direction.

### W - 4-pin male weatherpack connector\*

This option has 100 pulses per revolution on all series. This option will detect direction.

\*These options include a 610mm [2 ft] cable.

**SPEED SENSORS**

**SINGLE ELEMENT SENSOR - Y & Z**

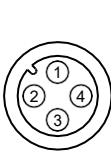
Supply voltages..... 7.5-24 Vdc  
 Maximum output off voltage..... V  
 Maximum continuous output current..... < 25 ma  
 Signal levels (low, high)..... 0.8 to supply voltage  
 Operating Temp .....-30°C to 83°C [-22°F to 181°F]

**DUAL ELEMENT SENSOR - X & W**

Supply voltages..... 7.5-18 Vdc  
 Maximum output off voltage..... V  
 Maximum continuous output current..... < 20 ma  
 Signal levels (low, high)..... 0.8 to supply voltage  
 Operating Temp .....-30°C to 83°C [-22°F to 181°F]

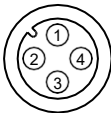
**SENSOR CONNECTORS**

Z Option



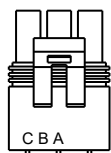
PIN		
1	positive	brown or red
2	n/a	white
3	negative	blue
4	pulse out	black

X Option



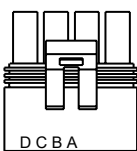
PIN		
1	positive	brown or red
2	direction out	white
3	negative	blue
4	pulse out	black

Y Option



PIN		
A	positive	brown or red
B	negative	blue
C	pulse out	black
D	n/a	white

W Option



PIN		
A	positive	brown or red
B	negative	blue
C	pulse out	black
D	direction out	white

**PROTECTION CIRCUITRY**

The single element sensor has been improved and incorporates protection circuitry to avoid electrical damage caused by:

- reverse battery protection
- overvoltage due to power supply spikes and surges (60 Vdc max.)
- power applied to the output lead

The protection circuit feature will help “save” the sensor from damage mentioned above caused by:

- faulty installation wiring or system repair
- wiring harness shorts/opens due to equipment failure or harness damage resulting from accidental conditions (i.e. severed or grounded wire, ice, etc.)
- power supply spikes and surges caused by other electrical/electronic components that may be intermittent or damaged and “loading down” the system.

While no protection circuit can guarantee against any and all fault conditions. The single element sensor from Impro Fluidtek with protection circuitry is designed to handle potential hazards commonly seen in real world applications.

Unprotected versions are also available for operation at lower voltages down to 4.5V.

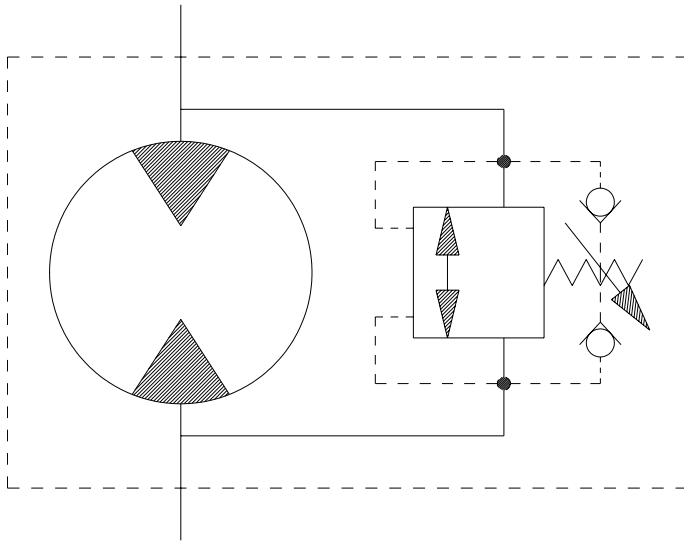
**FREE TURNING ROTOR**

The ‘AC’ option or “Free turning” option refers to a specially prepared rotor assembly. This rotor assembly has increased clearance between the rotor tips and rollers allowing it to turn more freely than a standard rotor assembly. For spool valve motors, additional clearance is also provided between the shaft and housing bore. The ‘AC’ option is available for all motor series and displacements.

There are several applications and duty cycle conditions where ‘AC’ option performance characteristics can be beneficial. In continuous duty applications that require high flow/high rpm operation, the benefits are twofold. The additional clearance helps to minimize internal pressure drop at high flows. This clearance also provides a thicker oil film at metal to metal contact areas and can help extend the life of the motor in high rpm or even over speed conditions. The ‘AC’ option should be considered for applications that require continuous operation above 57 LPM [15 GPM] and/or 300 rpm. Applications that are subject to pressure spikes due to frequent reversals or shock loads can also benefit by specifying the ‘AC’ option. The additional clearance serves to act as a buffer against spikes, allowing them to be bypassed through the motor rather than being absorbed and transmitted through the drive link to the output shaft. The trade-off for achieving these benefits is a slight loss of volumetric efficiency at high pressures.

## VALVE CAVITY

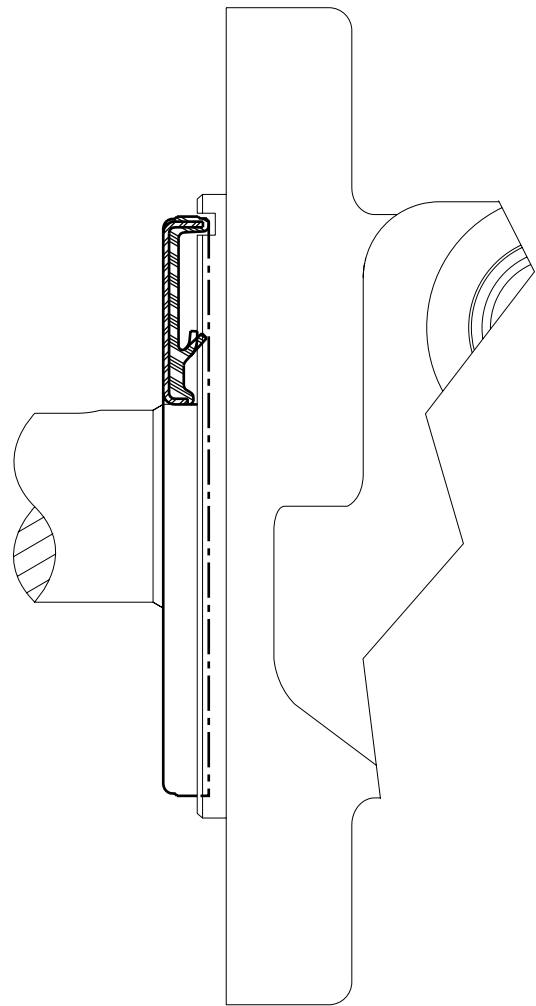
The valve cavity option provides a cost effective way to incorporate a variety of cartridge valves integral to the motor. The valve cavity is a standard 10 series 2-way cavity that accepts numerous cartridge valves, including over-running check valves, relief cartridges, flow control valves, pilot operated check fuses, and high pressure shuttle valves. Installation of a relief cartridge into the cavity provides an extra margin of safety for applications encountering frequent pressure spikes. Relief cartridges from 69 to 207 bar [1000 to 3000 psi] may also be factory installed.



For basic systems with fixed displacement pumps, either manual or motorized flow control valves may be installed into the valve cavity to provide a simple method for controlling motor speed. It is also possible to incorporate the speed sensor option and a programmable logic controller with a motorized flow control valve to create a closed loop, fully automated speed control system. For motors with internal brakes, a shuttle valve cartridge may be installed into the cavity to provide a simple, fully integrated method for supplying release pressure to the pilot line to actuate an integral brake. To discuss other alternatives for the valve cavity option, contact an authorized Impro Fluidtek distributor.

## SLINGER SEAL

Slinger seals are available on select series offered by Impro Fluidtek. Slinger seals offer extended shaft/shaft seal protection by prevented a buildup of material around the circumference of the shaft which can lead to premature shaft seal failures. The Impro Fluidtek slinger seals are designed to be larger in diameter than competitive products, providing greater surface speed and 'slinging action'.



Slinger seals are also available on 4-hole flange mounts on select series. Contact a Impro Fluidtek Customer Service Representative for additional information.

**OVERVIEW**

The WD motor series is an economical solution for light duty applications requiring high torque. It has a smaller outline yet still provides high efficiency across a wide performance range. Its integral check valves and a provision for a case drain reduce pressure on internal seals to improve product life. The compact package is suitable for industrial and mobile applications including car wash brushes, food processing equipment, conveyors, machine tools, agricultural equipment, sweepers, skid steer attachments, and more.

**FEATURES / BENEFITS**

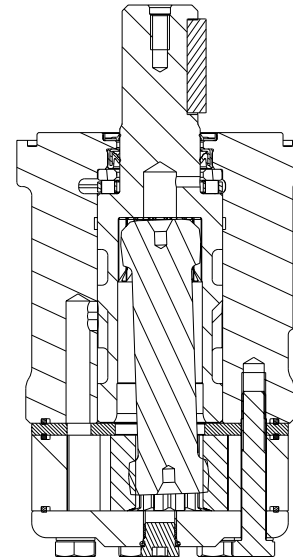
- Built-in check valves offer versatility and increased seal life.
- A variety of mounts and shafts provide flexibility in application design.
- Spool valve design gives superior performance and smooth operation over a wide speed and torque range.
- Integral rotor design provides smooth performance, compact volume and low weight.
- Low port profiling is suitable for applications with limited space.

**TYPICAL APPLICATIONS**

agriculture equipment, conveyors, carwashes, sweepers, food processing, grain augers, spreaders, feed rollers, augers, brush drives and more

**SERIES DESCRIPTIONS**

145/146 - Hydraulic Motor  
Standard



**SPECIFICATIONS**

CODE	Displacement cm <sup>3</sup> [in <sup>3</sup> /rev]	Max. Speed rpm		Max. Flow lpm [gpm]		Max. Torque Nm [lb-in]		Max. Pressure bar [psi]		
		cont.	inter.	cont.	inter.	cont.	inter.	cont.	inter.	peak
025	24.6 [1.5]	1361	1502	35 [9]	40 [11]	34 [301]	47 [416]	100 [1450]	140 [2030]	225 [3260]
032	30.8 [1.9]	1244	1388	40 [11]	45 [12]	42 [372]	57 [505]	100 [1450]	140 [2030]	225 [3260]
040	39.7 [2.4]	1124	1312	45 [12]	53 [14]	66 [584]	79 [699]	124 [1800]	155 [2250]	225 [3260]
050	48.2 [2.9]	900	1012	45 [12]	53 [14]	91 [805]	114 [1009]	138 [2000]	173 [2500]	225 [3260]
060	59.4 [3.6]	880	970	53 [14]	60 [16]	110 [974]	136 [1204]	138 [2000]	173 [2500]	225 [3260]
080	79.6 [4.9]	752	934	60 [16]	75 [20]	141 [1248]	175 [1549]	138 [2000]	173 [2500]	225 [3260]
100	96.0 [5.9]	628	786	60 [16]	75 [20]	170 [1505]	220 [1947]	138 [2000]	173 [2500]	225 [3260]
125	122.8 [7.5]	483	604	60 [16]	75 [20]	225 [1991]	274 [2425]	138 [2000]	173 [2500]	225 [3260]
160	158.0 [9.6]	383	479	60 [16]	75 [20]	284 [2513]	345 [3054]	138 [2000]	173 [2500]	225 [3260]
200	196.5 [12.0]	308	384	60 [16]	75 [20]	312 [2761]	411 [3638]	124 [1800]	166 [2400]	225 [3260]
250	240.5 [14.7]	248	312	60 [16]	75 [20]	317 [2806]	450 [3983]	103 [1500]	155 [2250]	225 [3260]
315	303.2 [18.5]	199	250	60 [16]	75 [20]	396 [3505]	576 [5098]	103 [1500]	155 [2250]	200 [2900]
400	385.8 [23.5]	150	189	60 [16]	75 [20]	480 [4248]	582 [5151]	97 [1400]	121 [1750]	180 [2610]

► Performance data is typical. Performance of production units varies slightly from one motor to another. Running at intermittent ratings should not exceed 10% of every minute of operation.

**DISPLACEMENT PERFORMANCE**

		Pressure - bar [psi]			Max. Cont.		Max. Inter.	
<b>025</b>		30 [435]	60 [870]	80 [1160]	100 [1450]	120 [1740]	140 [2030]	
25 cm <sup>3</sup> [1.5 in <sup>3</sup> ] / rev								
		Torque - Nm [lb-in], Speed rpm				Intermittent Ratings - 10% of Operation		
Flow - lpm [gpm]	5 [1.3]	9 [80] <b>186</b>	18 [159] <b>167</b>	25 [221] <b>138</b>	32 [283] <b>115</b>	35 [310] <b>106</b>		203
	10 [2.6]	9 [80] <b>388</b>	20 [177] <b>350</b>	26 [230] <b>316</b>	34 [301] <b>285</b>	37 [327] <b>255</b>	46 [407] <b>217</b>	407
	15 [4.0]	8 [71] <b>568</b>	19 [168] <b>536</b>	27 [239] <b>206</b>	33 [292] <b>485</b>	38 [336] <b>447</b>	47 [416] <b>402</b>	610
	20 [5.3]	8 [71] <b>780</b>	19 [168] <b>736</b>	26 [230] <b>688</b>	33 [292] <b>658</b>	38 [336] <b>628</b>	47 [416] <b>598</b>	813
	25 [6.6]	7 [62] <b>970</b>	18 [159] <b>922</b>	26 [230] <b>885</b>	33 [292] <b>855</b>	37 [327] <b>830</b>	46 [407] <b>780</b>	1016
	30 [7.9]	6 [53] <b>1172</b>	16 [142] <b>1120</b>	24 [212] <b>1086</b>	32 [283] <b>1046</b>	36 [319] <b>1026</b>	45 [398] <b>981</b>	1220
	35 [9.2]	5 [44] <b>1361</b>	13 [115] <b>1318</b>	22 [195] <b>1285</b>	30 [266] <b>1248</b>	36 [319] <b>1212</b>	43 [381] <b>1172</b>	1423
	40 [10.6]		11 [97] <b>1502</b>	20 [177] <b>1477</b>	28 [248] <b>1439</b>	35 [310] <b>1404</b>	42 [372] <b>1365</b>	1626
	Max. Max. Inter. Cont.							
<b>Rotor Width</b>		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input checked="" type="checkbox"/>						
4.1 [1.60] mm [in]		Theoretical Torque - Nm [lb-in]						
		12 [104]	24 [208]	31 [277]	39 [347]	47 [416]	55 [485]	
Displacement tested at 45°C [113°F] with an oil viscosity of 46cSt [213 SUS]								

		Pressure - bar [psi]			Max. Cont.		Max. Inter.	
<b>032</b>		30 [435]	60 [870]	80 [1160]	100 [1450]	120 [1740]	140 [2030]	
31 cm <sup>3</sup> [1.9 in <sup>3</sup> ] / rev								
		Torque - Nm [lb-in], Speed rpm				Intermittent Ratings - 10% of Operation		
Flow - lpm [gpm]	5 [1.3]	12 [106] <b>150</b>	24 [212] <b>133</b>	32 [283] <b>100</b>	40 [354] <b>68</b>			162
	10 [2.6]	12 [106] <b>300</b>	25 [221] <b>276</b>	33 [292] <b>253</b>	42 [372] <b>236</b>	48 [425] <b>203</b>	55 [487] <b>186</b>	325
	15 [4.0]	11 [97] <b>460</b>	24 [212] <b>433</b>	33 [292] <b>415</b>	42 [372] <b>398</b>	49 [434] <b>375</b>	57 [504] <b>346</b>	487
	20 [5.3]	9 [80] <b>616</b>	24 [212] <b>586</b>	32 [283] <b>566</b>	41 [363] <b>543</b>	49 [434] <b>520</b>	56 [496] <b>500</b>	649
	25 [6.6]	8 [71] <b>780</b>	23 [204] <b>754</b>	32 [283] <b>736</b>	40 [354] <b>712</b>	48 [425] <b>688</b>	56 [496] <b>658</b>	812
	30 [7.9]	7 [62] <b>928</b>	22 [195] <b>910</b>	31 [274] <b>882</b>	40 [354] <b>860</b>	47 [416] <b>824</b>	56 [496] <b>806</b>	974
	35 [9.2]	7 [62] <b>1090</b>	21 [186] <b>1077</b>	31 [274] <b>1057</b>	38 [336] <b>1035</b>	46 [407] <b>1008</b>	55 [487] <b>980</b>	1136
	40 [10.6]	6 [53] <b>1244</b>	19 [168] <b>1214</b>	29 [257] <b>1198</b>	37 [327] <b>1177</b>	46 [407] <b>1155</b>	54 [478] <b>1130</b>	1299
	45 [11.9]		17 [150] <b>1388</b>	28 [248] <b>1362</b>	37 [327] <b>1342</b>	45 [398] <b>1326</b>	54 [478] <b>1300</b>	1461
Max. Max. Inter. Cont.								
<b>Rotor Width</b>		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input checked="" type="checkbox"/>						
5.1 [2.00] mm [in]		Theoretical Torque - Nm [lb-in]						
		15 [130]	29 [260]	39 [347]	49 [434]	59 [521]	69 [608]	
Displacement tested at 45°C [113°F] with an oil viscosity of 46cSt [213 SUS]								

► Performance data is typical. Performance of production units varies slightly from one motor to another. Operating at maximum continuous pressure and maximum continuous flow simultaneously is not recommended. For additional information on product testing please refer to page 6.



**DISPLACEMENT PERFORMANCE**

<b>040</b>		Pressure - bar [psi]						Max. Cont.	Max. Inter.
		21 [300]	41 [600]	62 [900]	83 [1200]	103 [1500]	124 [1800]	155 [2250]	
40 cm <sup>3</sup> [2.4 in <sup>3</sup> ] / rev		Torque - Nm [lb-in], Speed rpm						Intermittent Ratings - 10% of Operation	
Flow - lpm [gpm]	8 [2]	10 [89] <b>182</b>	20 [177] <b>169</b>	29 [257] <b>128</b>	40 [354] <b>90</b>				191
	15 [4]	11 [97] <b>362</b>	21 [186] <b>344</b>	31 [274] <b>334</b>	43 [381] <b>320</b>	54 [478] <b>304</b>	65 [575] <b>284</b>	78 [690] <b>254</b>	380
	23 [6]	10 [89] <b>548</b>	20 [177] <b>535</b>	32 [283] <b>519</b>	42 [372] <b>502</b>	53 [469] <b>488</b>	66 [584] <b>468</b>	79 [699] <b>428</b>	572
	30 [8]	7 [62] <b>738</b>	19 [168] <b>729</b>	31 [274] <b>706</b>	41 [363] <b>688</b>	52 [460] <b>670</b>	64 [566] <b>648</b>	78 [690] <b>614</b>	763
	38 [10]	6 [53] <b>932</b>	16 [142] <b>914</b>	30 [266] <b>896</b>	40 [354] <b>878</b>	51 [451] <b>856</b>	62 [549] <b>834</b>	77 [681] <b>798</b>	955
	45 [12]	3 [27] <b>1124</b>	14 [124] <b>1102</b>	28 [248] <b>1084</b>	38 [336] <b>1062</b>	49 [434] <b>1043</b>	60 [531] <b>1014</b>	76 [673] <b>976</b>	1144
	53 [14]		14 [124] <b>1312</b>	25 [221] <b>1290</b>	38 [336] <b>1266</b>	48 [425] <b>1242</b>	60 [531] <b>1218</b>	76 [673] <b>1168</b>	1335
Max. Max. Inter. Cont.									
<b>Rotor Width</b>		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input type="checkbox"/>							
6.6 [260] mm [in]		Theoretical Torque - Nm [lb-in]							
		13 [117]	26 [229]	39 [347]	52 [464]	65 [576]	78 [694]	98 [867]	
		Displacement tested at 45°C [113°F] with an oil viscosity of 46cSt [213 SUS]							

<b>050</b>		Pressure - bar [psi]						Max. Cont.	Max. Inter.
		21 [300]	41 [600]	62 [900]	83 [1200]	103 [1500]	124 [1800]	138 [2000]	173 [2500]
48 cm <sup>3</sup> [2.9 in <sup>3</sup> ] / rev		Torque - Nm [lb-in], Speed rpm						Intermittent Ratings - 10% of Operation	
Flow - lpm [gpm]	8 [2]	14 [124] <b>148</b>	26 [230] <b>143</b>	40 [354] <b>130</b>	55 [354] <b>116</b>	65 [575] <b>102</b>	82 [726] <b>86</b>	88 [779] <b>75</b>	158
	15 [4]	14 [124] <b>298</b>	27 [239] <b>289</b>	42 [372] <b>276</b>	56 [381] <b>260</b>	67 [593] <b>245</b>	83 [735] <b>229</b>	89 [788] <b>214</b>	114 [1009] <b>166</b>
	23 [6]	12 [106] <b>450</b>	24 [212] <b>438</b>	41 [363] <b>423</b>	54 [372] <b>406</b>	68 [602] <b>388</b>	84 [743] <b>374</b>	91 [805] <b>352</b>	112 [991] <b>314</b>
	30 [8]	9 [80] <b>602</b>	21 [186] <b>590</b>	38 [336] <b>580</b>	52 [363] <b>555</b>	65 [575] <b>540</b>	81 [717] <b>523</b>	88 [779] <b>508</b>	110 [974] <b>475</b>
	38 [10]	2 [18] <b>750</b>	19 [168] <b>732</b>	37 [327] <b>722</b>	51 [354] <b>713</b>	63 [558] <b>693</b>	77 [681] <b>681</b>	85 [752] <b>669</b>	107 [947] <b>635</b>
	45 [12]		17 [150] <b>900</b>	33 [292] <b>885</b>	46 [336] <b>875</b>	60 [531] <b>860</b>	73 [646] <b>848</b>	83 [735] <b>830</b>	105 [929] <b>794</b>
	53 [14]			28 [248] <b>1012</b>	42 [336] <b>1000</b>	58 [513] <b>986</b>	70 [620] <b>972</b>	80 [708] <b>960</b>	100 [885] <b>924</b>
Max. Max. Inter. Cont.									
<b>Rotor Width</b>		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input type="checkbox"/>							
6.6 [260] mm [in]		Theoretical Torque - Nm [lb-in]							
		16 [143]	31 [278]	48 [422]	64 [564]	79 [700]	95 [842]	106 [937]	133 [1175]
		Displacement tested at 45°C [113°F] with an oil viscosity of 46cSt [213 SUS]							

► Performance data is typical. Performance of production units varies slightly from one motor to another. Operating at maximum continuous pressure and maximum continuous flow simultaneously is not recommended. For additional information on product testing please refer to page 6.

**DISPLACEMENT PERFORMANCE**

<b>060</b>		Pressure - bar [psi]					Max. Cont.	Max. Inter.			
		21 [300]	41 [600]	62 [900]	83 [1200]	103 [1500]	124 [1800]	138 [2000]	173 [2500]		
59 cm <sup>3</sup> [3.6 in <sup>3</sup> ] / rev											
		Torque - Nm [lb-in], Speed rpm					Intermittent Ratings - 10% of Operation				
Max. Max. Inter. Cont.	Flow - lpm [gpm]	8 [2]	17 [150] <b>122</b>	30 [266] <b>119</b>	46 [407] <b>113</b>	63 [558] <b>107</b>	82 [726] <b>94</b>	99 [876] <b>77</b>	109 [965] <b>65</b>		128
		15 [4]	16 [142] <b>247</b>	32 [283] <b>243</b>	48 [425] <b>236</b>	65 [575] <b>223</b>	82 [726] <b>209</b>	102 [903] <b>192</b>	110 [974] <b>180</b>	136 [1204] <b>142</b>	254
		23 [6]	15 [133] <b>371</b>	29 [257] <b>367</b>	47 [416] <b>360</b>	66 [584] <b>347</b>	81 [717] <b>330</b>	99 [876] <b>315</b>	107 [947] <b>304</b>	135 [1195] <b>266</b>	382
		30 [8]	12 [106] <b>496</b>	26 [230] <b>492</b>	44 [389] <b>484</b>	62 [549] <b>470</b>	79 [699] <b>457</b>	96 [850] <b>436</b>	105 [929] <b>425</b>	130 [1151] <b>386</b>	510
		38 [10]	8 [71] <b>626</b>	23 [204] <b>618</b>	40 [354] <b>608</b>	60 [531] <b>596</b>	77 [681] <b>582</b>	94 [832] <b>567</b>	104 [920] <b>558</b>	128 [1133] <b>500</b>	638
		45 [12]	2 [18] <b>752</b>	20 [177] <b>744</b>	37 [327] <b>735</b>	58 [513] <b>727</b>	75 [664] <b>716</b>	91 [805] <b>696</b>	100 [885] <b>680</b>	127 [1124] <b>628</b>	764
		53 [14]		15 [133] <b>880</b>	31 [274] <b>870</b>	48 [425] <b>862</b>	71 [628] <b>847</b>	87 [770] <b>830</b>	97 [858] <b>800</b>	121 [1071] <b>740</b>	892
		61 [16]		8 [71] <b>970</b>	27 [239] <b>958</b>	45 [398] <b>944</b>	64 [566] <b>932</b>	82 [726] <b>924</b>	93 [823] <b>902</b>	117 [1035] <b>842</b>	1020
Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input checked="" type="checkbox"/>											
<b>Rotor Width</b>		Theoretical Torque - Nm [lb-in]									
8.0 [314]		20 [176]	39 [343]	59 [520]	79 [695]	97 [862]	117 [1038]	131 [1155]	164 [1448]		
mm [in]		Displacement tested at 45°C [113°F] with an oil viscosity of 46cSt [213 SUS]									

<b>080</b>		Pressure - bar [psi]					Max. Cont.	Max. Inter.			
		21 [300]	41 [600]	62 [900]	83 [1200]	103 [1500]	124 [1800]	138 [2000]	173 [2500]		
80 cm <sup>3</sup> [4.9 in <sup>3</sup> ] / rev											
		Torque - Nm [lb-in], Speed rpm					Intermittent Ratings - 10% of Operation				
Max. Max. Inter. Cont.	Flow - lpm [gpm]	8 [2]	22 [195] <b>90</b>	42 [372] <b>85</b>	61 [540] <b>78</b>	82 [726] <b>70</b>	102 [903] <b>62</b>	124 [1097] <b>52</b>	138 [1221] <b>42</b>		95
		15 [4]	20 [177] <b>187</b>	43 [381] <b>182</b>	62 [549] <b>176</b>	84 [743] <b>167</b>	107 [947] <b>154</b>	128 [1133] <b>143</b>	141 [1248] <b>136</b>	171 [1513] <b>112</b>	190
		23 [6]	19 [168] <b>286</b>	41 [363] <b>276</b>	63 [558] <b>268</b>	83 [735] <b>257</b>	104 [920] <b>248</b>	125 [1106] <b>237</b>	139 [1230] <b>227</b>	175 [1549] <b>202</b>	285
		30 [8]	13 [115] <b>378</b>	38 [336] <b>372</b>	61 [540] <b>364</b>	82 [726] <b>354</b>	102 [903] <b>342</b>	124 [1097] <b>334</b>	137 [1212] <b>324</b>	174 [1540] <b>297</b>	381
		38 [10]	8 [71] <b>474</b>	35 [310] <b>469</b>	58 [513] <b>460</b>	80 [708] <b>448</b>	101 [894] <b>440</b>	123 [1089] <b>430</b>	135 [1195] <b>416</b>	165 [1460] <b>370</b>	476
		45 [12]	2 [18] <b>564</b>	29 [257] <b>558</b>	55 [487] <b>550</b>	75 [664] <b>540</b>	100 [885] <b>530</b>	121 [1071] <b>519</b>	133 [1177] <b>504</b>	163 [1443] <b>472</b>	570
		53 [14]		26 [230] <b>662</b>	48 [425] <b>658</b>	70 [620] <b>648</b>	96 [850] <b>637</b>	115 [1018] <b>633</b>	130 [1151] <b>609</b>	161 [1425] <b>576</b>	666
		61 [16]		20 [177] <b>752</b>	44 [389] <b>734</b>	68 [602] <b>724</b>	85 [752] <b>716</b>	105 [929] <b>700</b>	123 [1089] <b>690</b>	154 [1363] <b>663</b>	761
76 [20]		11 [97] <b>934</b>	32 [283] <b>929</b>	54 [478] <b>914</b>	74 [655] <b>904</b>	94 [832] <b>890</b>	108 [956] <b>876</b>	148 [1310] <b>814</b>	951		
Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input checked="" type="checkbox"/>											
<b>Rotor Width</b>		Theoretical Torque - Nm [lb-in]									
10.4 [410]		27 [236]	52 [460]	79 [697]	105 [931]	131 [1155]	157 [1391]	175 [1548]	219 [1941]		
mm [in]		Displacement tested at 45°C [113°F] with an oil viscosity of 46cSt [213 SUS]									

► Performance data is typical. Performance of production units varies slightly from one motor to another. Operating at maximum continuous pressure and maximum continuous flow simultaneously is not recommended. For additional information on product testing please refer to page 6.

**DISPLACEMENT PERFORMANCE**

		Pressure - bar [psi]					Max. Cont.		Max. Inter.	
<b>100</b>		21 [300]	41 [600]	62 [900]	83 [1200]	103 [1500]	124 [1800]	138 [2000]	173 [2500]	
96 cm <sup>3</sup> [5.9 in <sup>3</sup> ] / rev		Torque - Nm [lb-in], Speed rpm					Intermittent Ratings - 10% of Operation			
Flow - lpm [gpm]	8 [2]	28 [248] <b>76</b>	57 [504] <b>71</b>	82 [726] <b>65</b>	108 [956] <b>54</b>	132 [1168] <b>45</b>	158 [1398] <b>33</b>			79
	15 [4]	25 [221] <b>154</b>	56 [496] <b>147</b>	80 [708] <b>140</b>	106 [938] <b>132</b>	130 [1151] <b>122</b>	155 [1372] <b>113</b>	165 [1460] <b>104</b>	205 [1814] <b>84</b>	157
	23 [6]	23 [204] <b>235</b>	50 [443] <b>226</b>	76 [673] <b>219</b>	104 [920] <b>212</b>	128 [1133] <b>203</b>	153 [1354] <b>193</b>	170 [1505] <b>185</b>	212 [1876] <b>162</b>	236
	30 [8]	19 [168] <b>313</b>	47 [416] <b>307</b>	74 [655] <b>299</b>	104 [894] <b>291</b>	125 [1106] <b>281</b>	152 [1345] <b>270</b>	167 [1478] <b>264</b>	220 [1947] <b>240</b>	316
	38 [10]	15 [133] <b>392</b>	43 [381] <b>389</b>	71 [628] <b>384</b>	97 [858] <b>375</b>	122 [1080] <b>364</b>	149 [1319] <b>353</b>	167 [1478] <b>346</b>	218 [1929] <b>314</b>	395
	45 [12]	11 [97] <b>470</b>	37 [327] <b>465</b>	70 [620] <b>458</b>	94 [832] <b>449</b>	120 [1062] <b>437</b>	147 [1301] <b>429</b>	162 [1434] <b>426</b>	210 [1859] <b>398</b>	473
	53 [14]		33 [292] <b>550</b>	60 [531] <b>545</b>	87 [770] <b>532</b>	118 [1044] <b>518</b>	143 [1266] <b>510</b>	160 [1416] <b>500</b>	207 [1832] <b>473</b>	552
	61 [16]		27 [239] <b>628</b>	55 [487] <b>622</b>	82 [726] <b>611</b>	114 [1009] <b>598</b>	139 [1230] <b>584</b>	150 [1328] <b>575</b>	196 [1732] <b>552</b>	631
	76 [20]			37 [327] <b>786</b>	67 [593] <b>770</b>	93 [823] <b>758</b>	123 [1089] <b>732</b>	138 [1221] <b>716</b>	190 [1682] <b>670</b>	789
			<b>Overall Efficiency</b> - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input type="checkbox"/>							
		<b>Theoretical Torque</b> - Nm [lb-in]								
		32 [284]	63 [555]	95 [840]	127 [1123]	157 [1393]	190 [1678]	211 [1867]	264 [2340]	
		Displacement tested at 45°C [113°F] with an oil viscosity of 46cSt [213 SUS]								
		<b>Rotor Width</b>								
		13.0 [510]								
		mm [in]								

		Pressure - bar [psi]					Max. Cont.		Max. Inter.	
<b>125</b>		21 [300]	41 [600]	62 [900]	83 [1200]	103 [1500]	124 [1800]	138 [2000]	173 [2500]	
123 cm <sup>3</sup> [7.5 in <sup>3</sup> ] / rev		Torque - Nm [lb-in], Speed rpm					Intermittent Ratings - 10% of Operation			
Flow - lpm [gpm]	8 [2]	31 [274] <b>60</b>	64 [566] <b>57</b>	102 [903] <b>54</b>	136 [1204] <b>48</b>	161 [1425] <b>44</b>	193 [1708] <b>38</b>	220 [1947] <b>34</b>		62
	15 [4]	30 [266] <b>120</b>	63 [558] <b>118</b>	101 [894] <b>115</b>	138 [1221] <b>109</b>	168 [1487] <b>102</b>	201 [1779] <b>94</b>	225 [1991] <b>87</b>	274 [2425] <b>61</b>	123
	23 [6]	30 [266] <b>183</b>	62 [549] <b>179</b>	99 [876] <b>175</b>	137 [1212] <b>170</b>	167 [1478] <b>165</b>	202 [1788] <b>155</b>	223 [1974] <b>148</b>	272 [2407] <b>126</b>	185
	30 [8]	28 [248] <b>242</b>	59 [522] <b>240</b>	96 [850] <b>237</b>	134 [1186] <b>233</b>	165 [1460] <b>228</b>	199 [1761] <b>219</b>	220 [1947] <b>205</b>	269 [2381] <b>174</b>	247
	38 [10]	22 [195] <b>301</b>	54 [478] <b>299</b>	93 [823] <b>295</b>	130 [1151] <b>289</b>	161 [1425] <b>282</b>	191 [1690] <b>275</b>	215 [1903] <b>265</b>	263 [2328] <b>244</b>	309
	45 [12]	15 [133] <b>362</b>	48 [425] <b>360</b>	86 [761] <b>356</b>	124 [1097] <b>351</b>	156 [1381] <b>345</b>	184 [1628] <b>340</b>	209 [1850] <b>329</b>	257 [2274] <b>301</b>	370
	53 [14]	9 [80] <b>424</b>	41 [363] <b>422</b>	80 [708] <b>419</b>	117 [1035] <b>415</b>	149 [1319] <b>410</b>	176 [1558] <b>386</b>	204 [1805] <b>376</b>	243 [2151] <b>342</b>	432
	61 [16]	2 [18] <b>483</b>	32 [283] <b>477</b>	70 [620] <b>470</b>	104 [920] <b>463</b>	136 [1204] <b>454</b>	165 [1460] <b>444</b>	194 [1717] <b>437</b>	233 [2062] <b>412</b>	493
	76 [20]		15 [133] <b>604</b>	48 [425] <b>595</b>	82 [726] <b>584</b>	122 [1080] <b>573</b>	153 [1354] <b>565</b>	178 [1575] <b>556</b>	224 [1982] <b>526</b>	616
			<b>Overall Efficiency</b> - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input type="checkbox"/>							
		<b>Theoretical Torque</b> - Nm [lb-in]								
		41 [363]	80 [710]	121 [1075]	162 [1436]	201 [1782]	242 [2146]	270 [2388]	338 [2994]	
		Displacement tested at 45°C [113°F] with an oil viscosity of 46cSt [213 SUS]								
		<b>Rotor Width</b>								
		16.8 [660]								
		mm [in]								

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**DISPLACEMENT PERFORMANCE**

<b>160</b>		Pressure - bar [psi]					Max. Cont.		Max. Inter.	
		21 [300]	41 [600]	62 [900]	83 [1200]	103 [1500]	124 [1800]	138 [2000]	173 [2500]	
158 cm <sup>3</sup> [9.6 in <sup>3</sup> ] / rev										
Max. Max. Inter. Cont.		Torque - Nm [lb-in], Speed rpm					Intermittent Ratings - 10% of Operation			
		8 [2]	42 [372] 47	88 [779] 45	120 [1062] 42	168 [1487] 36	210 [1859] 28	246 [2177] 20		
Flow - lpm [gpm]	15 [4]	39 [345] 94	85 [752] 92	125 [1106] 89	170 [1505] 85	211 [1867] 79	251 [2221] 72	284 [2513] 64	345 [3053] 35	96
	23 [6]	38 [336] 143	79 [699] 140	123 [1089] 136	168 [1487] 130	209 [1850] 124	248 [2195] 116	275 [2434] 107	351 [3106] 84	144
	30 [8]	33 [292] 191	74 [655] 188	118 [1044] 184	164 [1451] 178	207 [1832] 171	245 [2168] 162	270 [2390] 154	338 [2991] 134	192
	38 [10]	25 [221] 238	68 [602] 236	113 [1000] 233	159 [1407] 229	199 [1761] 224	241 [2133] 218	262 [2319] 205	326 [2885] 183	240
	45 [12]	14 [124] 287	59 [522] 285	105 [929] 283	150 [1328] 281	192 [1699] 276	233 [2062] 270	253 [2239] 261	307 [2717] 235	287
	53 [14]	5 [44] 335	50 [443] 334	92 [814] 332	140 [1239] 329	188 [1664] 324	217 [1920] 319	242 [2142] 311	298 [2637] 281	335
	61 [16]		35 [310] 383	75 [664] 382	120 [1062] 378	160 [1416] 372	205 [1814] 363	233 [2062] 358	289 [2558] 333	384
	76 [20]		12 [106] 479	55 [487] 478	92 [814] 475	135 [1195] 469	183 [1620] 460	204 [1805] 455	276 [2443] 434	479
Rotor Width		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input checked="" type="checkbox"/>								
20.8 [820]		Theoretical Torque - Nm [lb-in]								
mm [in]		53 [468]	103 [913]	156 [1380]	209 [1848]	259 [2293]	312 [2761]	347 [3073]	435 [3852]	
Displacement tested at 45°C [113°F] with an oil viscosity of 46cSt [213 SUS]										

<b>200</b>		Pressure - bar [psi]					Max. Cont.		Max. Inter.	
		21 [300]	41 [600]	62 [900]	83 [1200]	103 [1500]	124 [1800]	166 [2400]		
197 cm <sup>3</sup> [12.0 in <sup>3</sup> ] / rev										
Max. Max. Inter. Cont.		Torque - Nm [lb-in], Speed rpm					Intermittent Ratings - 10% of Operation			
		8 [2]	52 [460] 38	109 [965] 35	164 [1451] 30	218 [1929] 23				
Flow - lpm [gpm]	15 [4]	50 [443] 76	112 [991] 74	167 [1478] 70	220 [1947] 64	270 [2390] 56	310 [2744] 48			77
	23 [6]	48 [425] 115	110 [974] 113	165 [1460] 110	218 [1929] 105	274 [2425] 98	312 [2761] 92	411 [3637] 62		116
	30 [8]	46 [407] 153	102 [903] 150	159 [1407] 146	216 [1912] 138	268 [2372] 132	303 [2682] 120	406 [3593] 86		154
	38 [10]	36 [319] 192	92 [814] 190	151 [1336] 186	206 [1823] 181	258 [2283] 174	290 [2567] 163	398 [3522] 133		193
	45 [12]	22 [195] 230	80 [708] 226	142 [1257] 223	193 [1708] 218	236 [2089] 210	282 [2496] 200	386 [3416] 167		231
	53 [14]	5 [44] 268	70 [620] 266	130 [1151] 262	176 [1558] 258	215 [1903] 250	272 [2407] 240	374 [3310] 209		270
	61 [16]		58 [513] 308	118 [1044] 305	156 [1381] 299	198 [1752] 292	253 [2239] 284	360 [3186] 256		308
	76 [20]		42 [372] 384	88 [779] 381	124 [1097] 376	173 [1531] 372	220 [1947] 358	328 [2903] 330		385
Rotor Width		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input checked="" type="checkbox"/>								
25.9 [1.020]		Theoretical Torque - Nm [lb-in]								
mm [in]		66 [582]	128 [1135]	194 [1717]	260 [2298]	322 [2852]	388 [3434]	519 [4597]		
Displacement tested at 45°C [113°F] with an oil viscosity of 46cSt [213 SUS]										

► Performance data is typical. Performance of production units varies slightly from one motor to another. Operating at maximum continuous pressure and maximum continuous flow simultaneously is not recommended. For additional information on product testing please refer to page 6.

**DISPLACEMENT PERFORMANCE**

		Pressure - bar [psi]				Max. Cont.		Max. Inter.		
<b>250</b>		21 [300]	41 [600]	62 [900]	83 [1200]	97 [1400]	103 [1500]	138 [2000]	155 [2250]	
241 cm <sup>3</sup> [14.7 in <sup>3</sup> ] / rev										
		Torque - Nm [lb-in], Speed rpm				Intermittent Ratings - 10% of Operation				
Flow - lpm [gpm]	8 [2]	58 [513] 31	118 [1044] 30	193 [1708] 28	259 [2292] 23	300 [2655] 19				32
	15 [4]	61 [540] 62	122 [1080] 61	190 [1682] 58	254 [2248] 55	302 [2673] 51	317 [2805] 47	414 [2513] 38	450 [3983] 27	63
	23 [6]	58 [513] 94	116 [1027] 93	185 [1637] 92	250 [2213] 87	295 [2611] 83	308 [2726] 81	412 [2434] 67	446 [3947] 57	94
	30 [8]	51 [451] 125	112 [991] 124	178 [1575] 121	245 [2168] 117	290 [2567] 113	304 [2690] 110	406 [2390] 97	439 [3885] 88	126
	38 [10]	40 [354] 158	98 [867] 156	169 [1496] 155	236 [2089] 151	284 [2513] 147	298 [2637] 145	390 [2319] 136	429 [3797] 121	158
	45 [12]	29 [257] 188	83 [735] 187	156 [1381] 186	230 [2036] 184	277 [2451] 180	282 [2496] 176	372 [2239] 164	414 [3664] 150	189
	53 [14]	22 [195] 220	67 [593] 219	138 [1221] 217	214 [1894] 214	262 [2319] 211	260 [2301] 209	355 [2142] 194	395 [3496] 181	220
	61 [16]		52 [460] 248	123 [1089] 244	190 [1682] 241	233 [2062] 237	244 [2159] 235	335 [2062] 223	376 [3328] 210	252
76 [20]		24 [212] 312	84 [743] 309	165 [1460] 305	202 [1788] 302	208 [1841] 300	298 [1805] 285	335 [2965] 268	315	
Max. Max. Inter. Cont.										
<b>Rotor Width</b>		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input type="checkbox"/>								
32.5 [1.280] mm [in]		Theoretical Torque - Nm [lb-in]								
		80 [712]	157 [1390]	237 [2101]	318 [2813]	371 [3288]	394 [3491]	528 [4677]	594 [5253]	
Displacement tested at 45°C [113°F] with an oil viscosity of 46cSt [213 SUS]										

		Pressure - bar [psi]				Max. Cont.		Max. Inter.		
<b>315</b>		21 [300]	41 [600]	62 [900]	90 [1300]	103 [1500]	138 [2000]	155 [2250]		
303 cm <sup>3</sup> [18.5 in <sup>3</sup> ] / rev										
		Torque - Nm [lb-in], Speed rpm				Intermittent Ratings - 10% of Operation				
Flow - lpm [gpm]	8 [2]	88 [779] 25	174 [1540] 22	255 [2257] 20						25
	15 [4]	89 [788] 49	170 [1505] 47	263 [2328] 43	352 [3115] 35	396 [3505] 30				50
	23 [6]	78 [690] 74	162 [1434] 72	246 [2177] 69	345 [3053] 59	392 [3469] 54	532 [4708] 33	576 [5098] 22		75
	30 [8]	60 [531] 101	151 [1336] 98	240 [2124] 95	339 [3000] 90	386 [3416] 84	526 [4655] 65	566 [5009] 53		100
	38 [10]	60 [531] 125	142 [1257] 123	230 [2036] 121	335 [2965] 115	380 [3363] 112	514 [4549] 90	558 [4938] 80		125
	45 [12]	37 [327] 147	128 [1133] 146	220 [1947] 143	325 [2876] 139	370 [3275] 132	500 [4425] 118	536 [4744] 105		150
	53 [14]	15 [133] 175	108 [956] 174	208 [1841] 171	318 [2814] 166	355 [3142] 160	486 [4301] 138	516 [4567] 127		175
	61 [16]		88 [779] 199	196 [1735] 197	300 [2655] 187	340 [3009] 182	465 [4115] 166	494 [4372] 152		200
76 [20]		60 [531] 250	180 [1593] 246	280 [2478] 240	326 [2885] 236	442 [3912] 217	468 [4142] 206		250	
Max. Max. Inter. Cont.										
<b>Rotor Width</b>		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input type="checkbox"/>								
40.9 [1.610] mm [in]		Theoretical Torque - Nm [lb-in]								
		101 [897]	198 [1752]	299 [2649]	435 [3846]	497 [4401]	666 [5896]	748 [6623]		
Displacement tested at 45°C [113°F] with an oil viscosity of 46cSt [213 SUS]										

► Performance data is typical. Performance of production units varies slightly from one motor to another. Operating at maximum continuous pressure and maximum continuous flow simultaneously is not recommended. For additional information on product testing please refer to page 6.

**DISPLACEMENT PERFORMANCE**

		Pressure - bar [psi]				Max. Cont.	Max. Inter.	
<b>400</b>		21 [300]	41 [600]	69 [1000]	83 [1200]	97 [1400]	121 [1750]	
386 cm <sup>3</sup> [23.5 in <sup>3</sup> ] / rev		Intermittent Ratings - 10% of Operation						
		Torque - Nm [lb-in], Speed rpm						
Flow - lpm [gpm]	8 [2]	105 [929] <b>19</b>	218 [1929] <b>18</b>	360 [3186] <b>14</b>	417 [3960] <b>11</b>		20	
	15 [4]	99 [876] <b>39</b>	207 [1832] <b>37</b>	344 [3044] <b>33</b>	411 [3637] <b>28</b>	480 [4248] <b>25</b>	39	
	23 [6]	91 [805] <b>59</b>	195 [1726] <b>57</b>	336 [2974] <b>52</b>	403 [3567] <b>43</b>	478 [4260] <b>39</b>	59	
	30 [8]	72 [637] <b>77</b>	186 [1646] <b>75</b>	325 [2876] <b>73</b>	398 [3522] <b>67</b>	466 [4124] <b>60</b>	79	
	38 [10]	62 [549] <b>100</b>	178 [1575] <b>97</b>	314 [2779] <b>93</b>	394 [3487] <b>89</b>	458 [4053] <b>81</b>	98	
	45 [12]	51 [451] <b>120</b>	164 [1451] <b>117</b>	310 [2744] <b>113</b>	378 [3345] <b>109</b>	448 [3965] <b>97</b>	118	
	53 [14]	38 [336] <b>137</b>	142 [1257] <b>134</b>	284 [2513] <b>131</b>	360 [3186] <b>129</b>	429 [3797] <b>124</b>	137	
	61 [16]	20 [177] <b>150</b>	121 [1071] <b>154</b>	260 [2301] <b>151</b>	338 [2991] <b>148</b>	410 [3629] <b>138</b>	157	
Max. Max. Inter. Cont.	76 [20]		98 [867] <b>189</b>	234 [2071] <b>187</b>	308 [2726] <b>185</b>	384 [3398] <b>182</b>	486 [4301] <b>178</b>	196
		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input checked="" type="checkbox"/>						
Rotor Width		Theoretical Torque - Nm [lb-in]						
52.1 [2.050] mm [in]		129 [1142]	252 [2229]	424 [3751]	510 [4513]	596 [5274]	743 [6579]	
Displacement tested at 45°C [113°F] with an oil viscosity of 46cSt [213 SUS]								

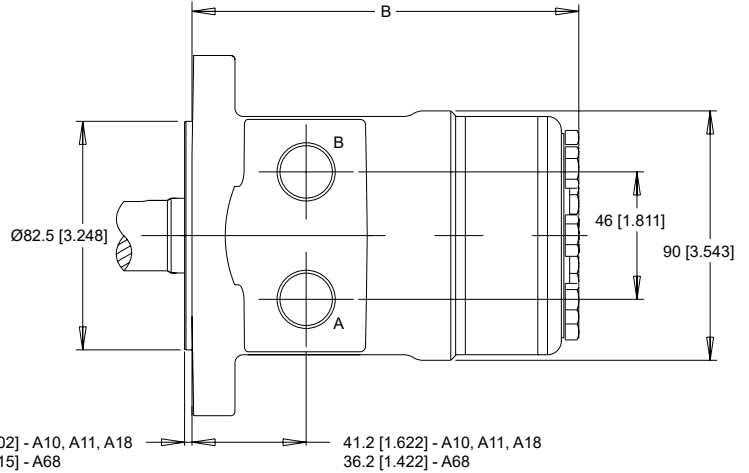
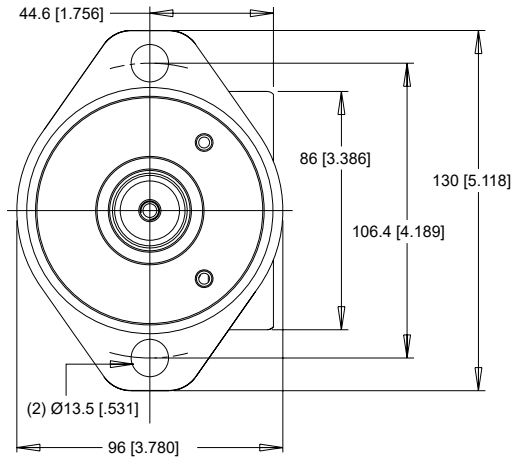
► Performance data is typical. Performance of production units varies slightly from one motor to another. Operating at maximum continuous pressure and maximum continuous flow simultaneously is not recommended. For additional information on product testing please refer to page 6.

**HOUSINGS**

► Dimensions shown are without paint. Paint thickness can be up to 0.13 [.005].

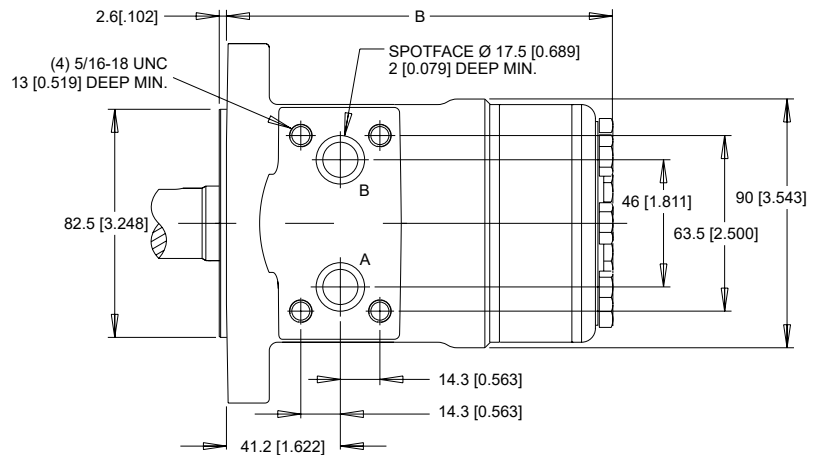
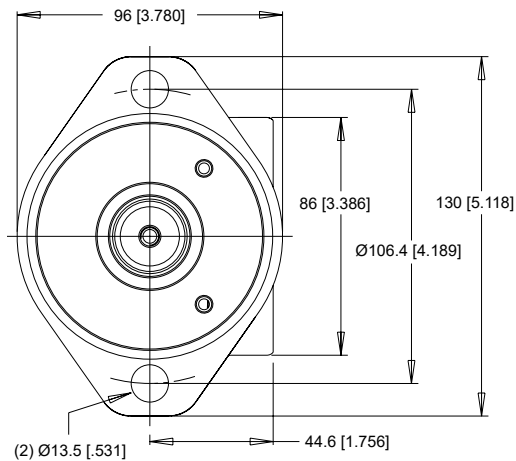
**2-HOLE, SAE A MOUNT, ALIGNED PORTS**

**A10** 1/2-14 NPT    **A11** 7/8-14 UNF    **A18** G 1/2    **A68** G 1/2 (TP)



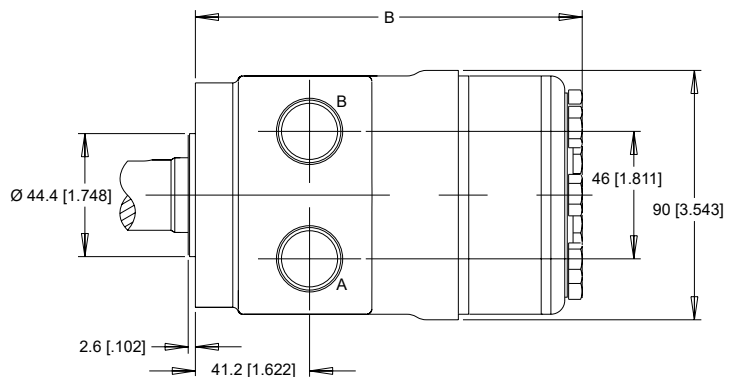
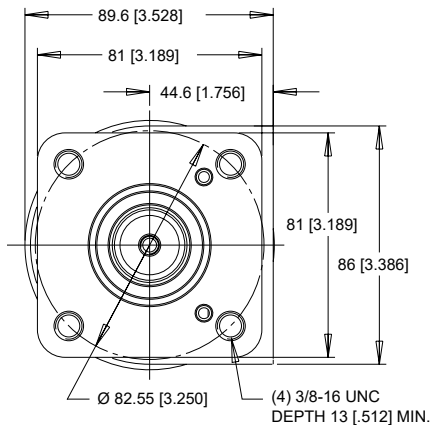
**2-HOLE, SAE A MOUNT, ALIGNED MANIFOLD PORTS**

**A17** 1/2" Drilled



**4-HOLE, SQUARE MOUNT, ALIGNED PORTS**

**F30** 1/2-14 NPT    **F31** 7/8-14 UNF

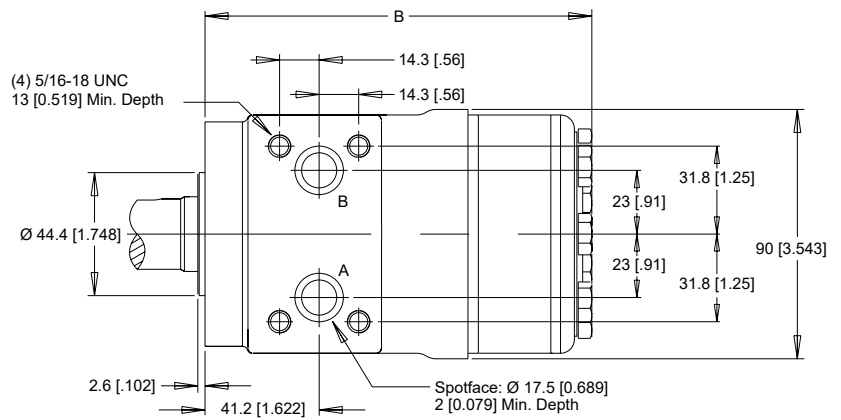
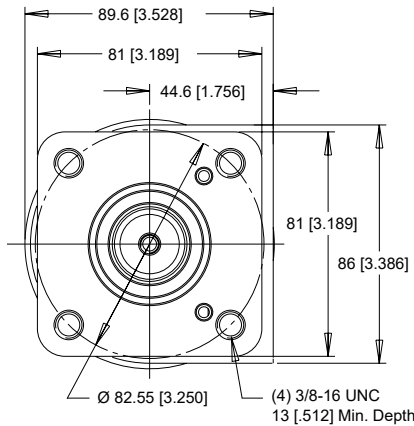


► Dimension B is charted on page 24. ► (TP) - Taller Pilot Height. Refer to detailed drawing for dimensional differences.

**HOUSINGS & TECHNICAL INFORMATION**

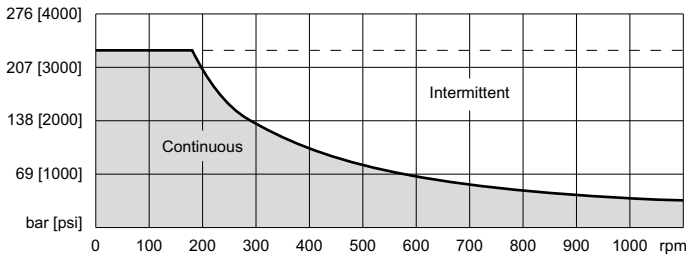
► Dimensions shown are without paint. Paint thickness can be up to 0.13 [.005].

**4-HOLE, SQUARE MOUNT, ALIGNED MANIFOLD PORTS** **F37** 1/2" Drilled

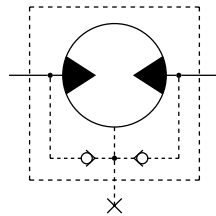


**PERMISSIBLE SHAFT SEAL PRESSURE**

The curve below represents allowable seal pressure at various speeds. Operation in the gray area results in maintaining the rated life of the shaft seal. Actual shaft seal pressure depends on motor configuration.



► With check valves and drain connection, the shaft seal pressure equals pressure in the drain line. With check valves and no drain connection, shaft seal pressure is identical to output pressure. No check valves and no drain connection, the shaft seal pressure is identical to the average value of input and output pressure.



**LENGTH & WEIGHT CHART**

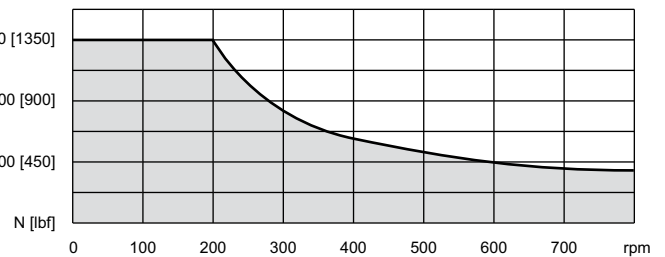
Dimension B is the overall motor length from the rear of the motor to the mounting flange surface and is referenced on detailed housing drawings listed on pages 23-24.

B	3mm Pilot	8mm Pilot	Weight
#	mm [in]	mm [in]	kg [lb]
025	119 [4.67]	114 [4.47]	5.20 [11.5]
032	120 [4.71]	115 [4.51]	5.24 [11.6]
040	121 [4.77]	116 [4.57]	5.29 [11.7]
050	121 [4.77]	116 [4.57]	5.29 [11.7]
060	123 [4.83]	118 [4.63]	5.34 [11.8]
080	125 [4.92]	120 [4.72]	5.42 [12.0]
100	128 [5.02]	123 [4.82]	5.51 [12.2]
125	131 [5.17]	126 [4.97]	5.65 [12.5]
160	135 [5.33]	130 [5.13]	5.79 [12.8]
200	141 [5.53]	136 [5.33]	5.97 [13.2]
250	147 [5.79]	142 [5.59]	6.20 [13.7]
315	156 [6.12]	151 [5.92]	6.49 [14.3]
400	167 [6.56]	162 [6.36]	6.88 [15.2]

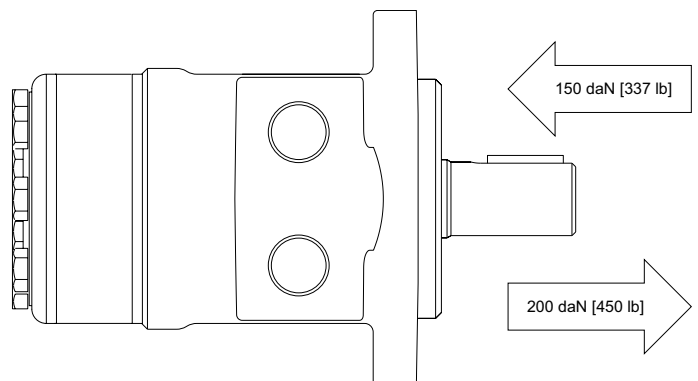
► The overall motor weights listed in this chart were calculated using the heaviest of the housing options associated with that mounting flange to end of motor dimension. 145 & 146 series motor weights can vary ± 0.5 kg [1 lb] depending on model configurations such as housing, shaft, endcover, options etc.

**ALLOWABLE SHAFT LOAD / BEARING CURVE**

The bearing curve below represents the side load capacity of the motor at the centerline of the key for various motor speeds. Operating conditions within the shaded area will maintain acceptable oil film lubrication with recommended fluids. Operating conditions outside the shaded area are susceptible to motor failure due to oil starvation and/or excessive heat generation. Fluids with low lubricity or low viscosity may require the maximum load and speed ratings to be derated to provide acceptable motor life and performance.



**THRUST LOAD**

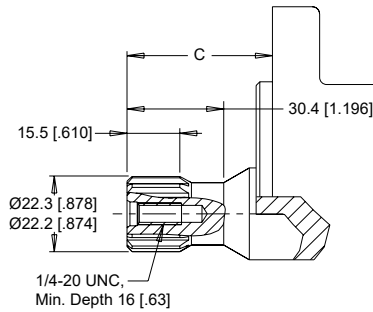




**SHAFTS**

**01** 7/8" 13 Tooth Spline

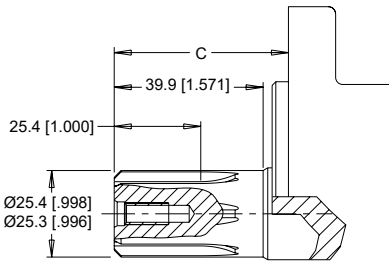
16/32 Pitch Standard  
ANSI B92.1-1996 Spline



Max. Torque: 170 Nm [1500 lb-in]

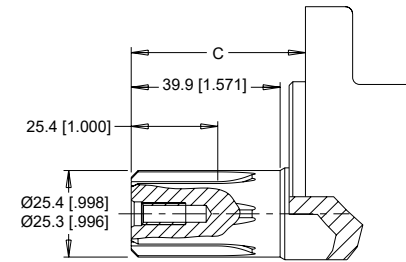
**02** 1" 6B Spline, 1/4-20 Tap

6B Spline  
SAE J499 Standard



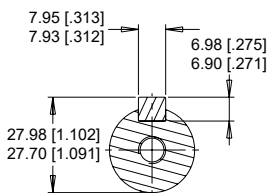
Max. Torque: 678 Nm [6000 lb-in]

**04** 1" 6B Spline, M8x1.25 Tap



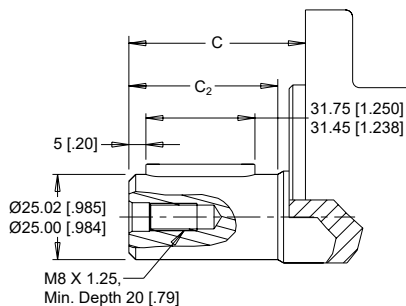
Max. Torque: 655 Nm [5800 lb-in]

**12** 25mm Straight



Max. Torque: 678 Nm [6000 lb-in]

**16** 25mm Straight Extended

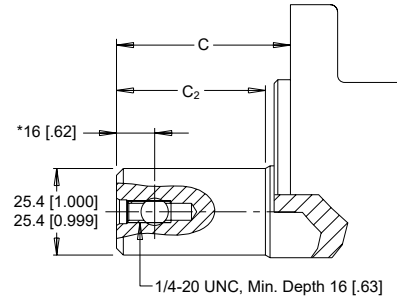


**53** 1" - 10.3 [.406] Pinhole



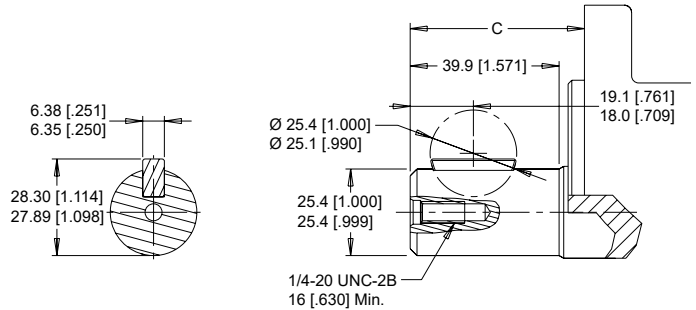
Max. Torque: 678 Nm [6000 lb-in]

**66** 1" - 8.0 [.315] Pinhole



► \* Dimension for 66 shaft is 11.2 [44]

**B1** 1" Straight, Woodruff Key



Max. Torque: 655 Nm [5800 lb-in]

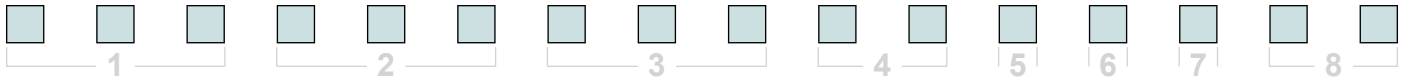
**MOUNTING / SHAFT LENGTH CHART**

Dimension C is the overall distance from the motor mounting surface to the end of the shaft.

Additional shaft length information, if necessary, is noted as C<sub>2</sub> and does not increase or decrease the listed C dimensions in this chart. The overall shaft lengths are already factored into the overall distance from the mounting surface to the end of the shaft.

C	3mm Pilot	8mm Pilot	C <sub>2</sub>
#	mm [in]	mm [in]	mm [in]
01	45.4 [1.803]	50.8 [2.000]	N/A
02	45.4 [1.803]	50.8 [2.000]	N/A
04	45.4 [1.803]	50.8 [2.000]	N/A
10	45.4 [1.803]	50.8 [2.000]	39.9 [1.571]
12	45.4 [1.803]	50.8 [2.000]	39.9 [1.571]
15	62.1 [2.445]	67.5 [2.657]	56.0 [2.205]
16	62.1 [2.445]	67.5 [2.657]	56.0 [2.205]
53	45.4 [1.803]	50.8 [2.000]	39.9 [1.571]
66	50.4 [1.984]	55.8 [2.197]	44.9 [1.768]
B1	45.4 [1.803]	50.8 [2.000]	N/A
G8	50.4 [1.984]	55.8 [2.197]	40.6 [1.599]

**ORDERING INFORMATION**



**1. CHOOSE SERIES DESIGNATION**

<b>145</b> Standard Rotation	<b>146</b> Reverse Rotation
------------------------------	-----------------------------

Standard Rotation: Port B is OUT, Port A is IN.

Reverse Rotation: Port B is OUT, Port A is IN.

► The 145 & 146 series are bi-directional.

**2. SELECT A DISPLACEMENT OPTION**

<b>025</b> 25 cm <sup>3</sup> /rev [1.5 in <sup>3</sup> /rev]	<b>125</b> 123 cm <sup>3</sup> /rev [7.5 in <sup>3</sup> /rev]
<b>032</b> 31 cm <sup>3</sup> /rev [1.9 in <sup>3</sup> /rev]	<b>160</b> 158 cm <sup>3</sup> /rev [9.6 in <sup>3</sup> /rev]
<b>040</b> 40 cm <sup>3</sup> /rev [2.4 in <sup>3</sup> /rev]	<b>200</b> 197 cm <sup>3</sup> /rev [12.0 in <sup>3</sup> /rev]
<b>050</b> 48 cm <sup>3</sup> /rev [2.9 in <sup>3</sup> /rev]	<b>250</b> 241 cm <sup>3</sup> /rev [14.7 in <sup>3</sup> /rev]
<b>060</b> 59 cm <sup>3</sup> /rev [3.6 in <sup>3</sup> /rev]	<b>315</b> 303 cm <sup>3</sup> /rev [18.5 in <sup>3</sup> /rev]
<b>080</b> 80 cm <sup>3</sup> /rev [4.9 in <sup>3</sup> /rev]	<b>400</b> 386 cm <sup>3</sup> /rev [23.5 in <sup>3</sup> /rev]
<b>100</b> 96 cm <sup>3</sup> /rev [5.9 in <sup>3</sup> /rev]	

**3. SELECT A MOUNT & PORT OPTION**

<b>A10</b> 2-Hole, SAE A Mount, Aligned Ports, 1/2-14 NPT
<b>A11</b> 2-Hole, SAE A Mount, Aligned Ports, 7/8-14 UNF
<b>A17</b> 2-Hole, SAE A Mount, Aligned Manifold Ports, 1/2" Drilled
<b>A18</b> 2-Hole, SAE A Mount, Aligned Ports, G 1/2
<b>A68</b> 2-Hole, SAE A Mount, Aligned Ports, G 1/2 (TP)
<b>F30</b> 4-Hole, Square Mount, Aligned Ports, 1/2-14 NPT
<b>F31</b> 4-Hole, Square Mount, Aligned Ports, 7/8-14 UNF
<b>F37</b> 4-Hole, Square Mount, Aligned Manifold Ports, 1/2" Drilled

► (TP) - Tall pilot. Speed sensor option is not available on tall pilot housings.

**4. SELECT A SHAFT OPTION**

<b>01</b> 7/8" 13 Tooth Spline	<b>16</b> 25mm Straight Extended
<b>02</b> 1" 6B Spline, 1/4-20 Tap	<b>53</b> 1" - 10.3 [.406] Pinhole
<b>04</b> 1" 6B Spline, M8x1.25 Tap	<b>66</b> 1" - 8.0 [.315] Pinhole
<b>10</b> 1" Straight	<b>B1</b> 1" Straight, Woodruff Key
<b>12</b> 25mm Straight	<b>G8</b> 1" Straight Nickel Plated
<b>15</b> 1" Straight Extended	

► If the BE option is selected in Step 8, the G8 shaft is recommended for added shaft protection. The 15 & 16 extended shafts are designed for use with one of the speed sensor options listed in STEP 7.

**5. SELECT A PAINT OPTION**

<b>A</b> Black
<b>B</b> Black, Unpainted Mounting Surface

**6. SELECT A VALVE CAVITY / CARTRIDGE OPTION**

<b>A</b> None
---------------

**7. SELECT AN ADD-ON OPTION**

<b>A</b> Standard
<b>W</b> Speed Sensor, Dual, 4-Pin Male Weatherpack Connector
<b>X</b> Speed Sensor, Dual, 4-Pin M12 Male Connector
<b>Y</b> Speed Sensor, Single, 3-Pin Male Weatherpack Connector
<b>Z</b> Speed Sensor, Single, 4-Pin M12 Male Connector

**8. SELECT A MISCELLANEOUS OPTION**

<b>AA</b> None
<b>AC</b> Freeturning Rotor
<b>BE</b> Slinger Seal
<b>FB</b> No Check Valves Installed

**OVERVIEW**

The WP motor series is an economical alternative to more complex roller gerotor designs and still provides high efficiency across a wide performance range. These motors are intended for light-duty applications requiring high torque in a compact package and are suitable for industrial and mobile applications including car wash brushes, food processing equipment, conveyors, machine tools, agricultural equipment, sweepers, skid steer attachments, and more.

**FEATURES / BENEFITS**

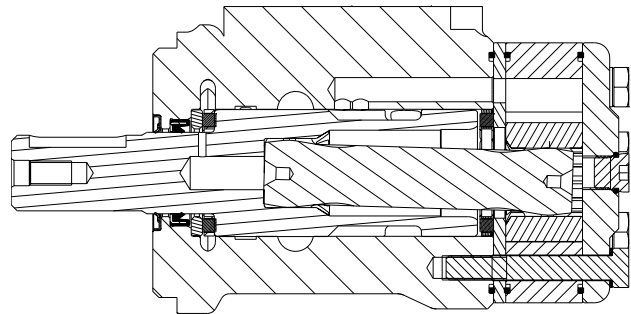
- Built-in check valves offer versatility and increased seal life.
- A variety of mounts and shafts provide flexibility in application design.
- Spool valve design gives superior performance and smooth operation over a wide speed and torque range.
- Standard high pressure shaft seals offer superior seal life and performance.

**TYPICAL APPLICATIONS**

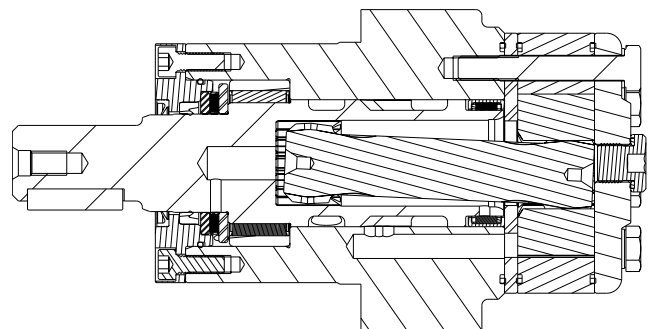
agriculture equipment, conveyors, carwashes, sweepers, food processing, grain augers, spreaders, feed rollers, augers, brush drives and more

**SERIES DESCRIPTIONS**

**155/156** - Hydraulic Motor  
*Standard*



**157/158** - Hydraulic Motor  
*With Needle Bearings*



**SPECIFICATIONS**

CODE	Displacement cm <sup>3</sup> [in <sup>3</sup> /rev]	Max. Speed rpm		Max. Flow lpm [gpm]		Max. Torque Nm [lb-in]		Max. Pressure bar [psi]		
		cont.	inter.	cont.	inter.	cont.	inter.	cont.	inter.	peak
025	25 [1.5]	1570	1687	40 [11]	45 [12]	35 [310]	48 [425]	100 [1450]	140 [2030]	225 [3260]
032	32 [2.0]	1550	1674	50 [13]	55 [15]	45 [398]	57 [504]	100 [1450]	140 [2030]	225 [3260]
040	40 [2.5]	1471	1670	60 [16]	70 [19]	65 [575]	74 [655]	100 [1450]	140 [2030]	225 [3260]
050	50 [3.0]	1208	1500	60 [16]	75 [20]	91 [805]	108 [956]	140 [2030]	175 [2540]	240 [3480]
060	59 [3.6]	1185	1271	60 [16]	75 [20]	125 [1106]	136 [1204]	160 [2320]	175 [2540]	240 [3480]
080	78 [4.8]	896	960	60 [16]	75 [20]	164 [1451]	183 [1620]	160 [2320]	175 [2540]	240 [3480]
100	96 [5.9]	728	780	60 [16]	75 [20]	195 [1726]	213 [1885]	160 [2320]	175 [2540]	240 [3480]
125	125 [7.6]	559	599	60 [16]	75 [20]	258 [2285]	278 [2460]	160 [2320]	175 [2540]	240 [3480]
160	159 [9.7]	452	483	60 [16]	75 [20]	321 [2840]	362 [3205]	160 [2320]	175 [2540]	240 [3480]
200	190 [11.6]	367	385	60 [16]	75 [20]	380 [3365]	420 [3720]	150 [2180]	175 [2540]	240 [3480]
250	240 [14.6]	291	312	60 [16]	75 [20]	445 [3940]	557 [4930]	140 [2030]	175 [2540]	240 [3480]
315	303 [18.5]	228	245	60 [16]	75 [20]	460 [4071]	602 [5330]	120 [1740]	160 [2320]	200 [2900]
400	388 [23.7]	155	189	60 [16]	75 [20]	488 [4320]	625 [5532]	95 [1380]	125 [1810]	180 [2610]

► Performance data is typical. Performance of production units varies slightly from one motor to another. Running at intermittent ratings should not exceed 10% of every minute of operation.

**DISPLACEMENT PERFORMANCE**

		Pressure - bar [psi]			Max. Cont.		Max. Inter.	
<b>025</b>		30 [435]	60 [870]	80 [1160]	100 [1450]	120 [1740]	140 [2030]	
25 cm <sup>3</sup> [1.5 in <sup>3</sup> ] / rev								
		Torque - Nm [lb-in], Speed rpm				Intermittent Ratings - 10% of Operation		
Flow - lpm [gpm]	5 [1.3]	9 [80] <b>186</b>	18 [159] <b>160</b>	25 [221] <b>134</b>	32 [283] <b>101</b>	35 [310] <b>106</b>		200
	10 [2.6]	10 [88] <b>386</b>	18 [159] <b>352</b>	26 [230] <b>323</b>	34 [301] <b>280</b>	37 [327] <b>255</b>	48 [425] <b>210</b>	400
	15 [4.0]	9 [80] <b>568</b>	19 [168] <b>537</b>	26 [230] <b>505</b>	35 [310] <b>467</b>	38 [336] <b>431</b>	44 [389] <b>390</b>	600
	20 [5.3]	8 [71] <b>777</b>	19 [168] <b>736</b>	25 [221] <b>692</b>	33 [292] <b>660</b>	39 [345] <b>608</b>	45 [398] <b>566</b>	800
	25 [6.6]	7 [62] <b>972</b>	18 [159] <b>920</b>	26 [230] <b>870</b>	32 [283] <b>840</b>	39 [345] <b>803</b>	45 [398] <b>756</b>	1000
	30 [7.9]	6 [53] <b>1167</b>	17 [150] <b>1122</b>	25 [221] <b>1088</b>	32 [283] <b>1055</b>	39 [345] <b>998</b>	44 [389] <b>976</b>	1200
	35 [9.2]	5 [44] <b>1360</b>	16 [142] <b>1318</b>	24 [212] <b>1282</b>	31 [274] <b>1258</b>	37 [327] <b>1216</b>	43 [381] <b>1160</b>	1400
	40 [10.6]	5 [44] <b>1570</b>	15 [133] <b>1503</b>	22 [195] <b>1476</b>	31 [274] <b>1432</b>	36 [319] <b>1394</b>	41 [363] <b>1359</b>	1600
	45 [11.9]		13 [115] <b>1687</b>	20 [177] <b>1636</b>	28 [248] <b>1600</b>	34 [301] <b>1558</b>	39 [345] <b>1516</b>	1800
	Max. Max. Inter. Cont.							
<b>Rotor Width</b>		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input checked="" type="checkbox"/>						
4.1 [160] mm [in]		Theoretical Torque - Nm [lb-in]						
		12 [106]	24 [211]	32 [282]	40 [352]	48 [423]	56 [493]	
Displacement tested at 45°C [113°F] with an oil viscosity of 46cSt [213 SUS]								

		Pressure - bar [psi]			Max. Cont.		Max. Inter.	
<b>032</b>		30 [435]	60 [870]	80 [1160]	100 [1450]	120 [1740]	140 [2030]	
32 cm <sup>3</sup> [2.0 in <sup>3</sup> ] / rev								
		Torque - Nm [lb-in], Speed rpm				Intermittent Ratings - 10% of Operation		
Flow - lpm [gpm]	5 [1.3]	11 [97] <b>149</b>	24 [212] <b>135</b>	35 [310] <b>114</b>	37 [327] <b>94</b>			156
	10 [2.6]	12 [106] <b>308</b>	27 [239] <b>284</b>	37 [327] <b>270</b>	43 [381] <b>250</b>	46 [407] <b>240</b>	56 [496] <b>211</b>	313
	15 [4.0]	11 [97] <b>465</b>	26 [230] <b>444</b>	36 [319] <b>429</b>	45 [398] <b>398</b>	48 [425] <b>378</b>	57 [504] <b>355</b>	469
	20 [5.3]	10 [88] <b>624</b>	25 [221] <b>589</b>	35 [310] <b>575</b>	44 [389] <b>557</b>	46 [407] <b>544</b>	56 [496] <b>524</b>	625
	25 [6.6]	9 [80] <b>780</b>	24 [212] <b>771</b>	34 [301] <b>751</b>	42 [372] <b>735</b>	45 [398] <b>719</b>	54 [478] <b>695</b>	781
	30 [7.9]	8 [71] <b>931</b>	23 [204] <b>908</b>	32 [283] <b>895</b>	40 [354] <b>876</b>	45 [398] <b>857</b>	52 [460] <b>822</b>	938
	35 [9.2]	7 [62] <b>1086</b>	20 [177] <b>1066</b>	29 [257] <b>1051</b>	39 [345] <b>1030</b>	43 [381] <b>1012</b>	51 [451] <b>981</b>	1094
	40 [10.6]	7 [62] <b>1240</b>	19 [168] <b>1212</b>	27 [239] <b>1190</b>	38 [336] <b>1178</b>	43 [381] <b>1145</b>	50 [442] <b>1121</b>	1250
	45 [11.9]	6 [53] <b>1400</b>	18 [159] <b>1382</b>	26 [230] <b>1366</b>	35 [310] <b>1340</b>	42 [372] <b>1314</b>	48 [425] <b>1280</b>	1406
	50 [13.2]	5 [44] <b>1550</b>	16 [142] <b>1526</b>	24 [212] <b>1500</b>	31 [274] <b>1478</b>	40 [354] <b>1452</b>	46 [407] <b>1418</b>	1563
55 [14.5]		12 [106] <b>1674</b>	20 [177] <b>1641</b>	28 [248] <b>1617</b>	34 [301] <b>1584</b>	39 [345] <b>1555</b>	1719	
Max. Max. Inter. Cont.								
<b>Rotor Width</b>		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input checked="" type="checkbox"/>						
5.1 [200] mm [in]		Theoretical Torque - Nm [lb-in]						
		15 [135]	31 [271]	41 [361]	51 [451]	61 [541]	71 [631]	
Displacement tested at 45°C [113°F] with an oil viscosity of 46cSt [213 SUS]								

► Performance data is typical. Performance of production units varies slightly from one motor to another. Operating at maximum continuous pressure and maximum continuous flow simultaneously is not recommended. For additional information on product testing please refer to page 6.

**DISPLACEMENT PERFORMANCE**

<b>040</b>		Pressure - bar [psi]					Max. Cont.	Max. Inter.
		30 [435]	60 [870]	80 [1160]	100 [1450]	120 [1740]	140 [2030]	
40 cm <sup>3</sup> [2.5 in <sup>3</sup> ] / rev		Torque - Nm [lb-in], Speed rpm					Intermittent Ratings - 10% of Operation	
Flow - lpm [gpm]	5 [1.3]	15 [133] <b>113</b>	31 [274] <b>98</b>	38 [336] <b>83</b>	48 [425] <b>60</b>	56 [496] <b>48</b>		125
	10 [2.6]	14 [124] <b>238</b>	31 [274] <b>222</b>	41 [363] <b>204</b>	54 [478] <b>182</b>	62 [549] <b>161</b>	70 [619] <b>114</b>	250
	20 [5.3]	13 [115] <b>482</b>	32 [283] <b>458</b>	41 [363] <b>442</b>	53 [469] <b>423</b>	65 [575] <b>402</b>	74 [655] <b>381</b>	500
	30 [7.9]	12 [106] <b>730</b>	30 [265] <b>704</b>	39 [345] <b>687</b>	51 [451] <b>668</b>	63 [558] <b>646</b>	74 [655] <b>624</b>	750
	40 [10.6]	10 [88] <b>968</b>	27 [239] <b>949</b>	39 [345] <b>928</b>	51 [451] <b>908</b>	61 [540] <b>892</b>	72 [637] <b>870</b>	1000
	50 [13.2]	7 [62] <b>1219</b>	25 [221] <b>1191</b>	37 [327] <b>1173</b>	49 [434] <b>1150</b>	59 [522] <b>1127</b>	71 [628] <b>1107</b>	1250
	60 [15.8]	4 [35] <b>1471</b>	23 [204] <b>1428</b>	34 [301] <b>1411</b>	46 [407] <b>1387</b>	56 [496] <b>1369</b>	68 [602] <b>1341</b>	1500
	70 [18.5]		16 [142] <b>1670</b>	30 [265] <b>1653</b>	41 [363] <b>1627</b>	52 [460] <b>1612</b>	64 [566] <b>1598</b>	2000
Max. Max. Inter. Cont.								
<b>Rotor Width</b>		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input type="checkbox"/>						
6.6 [260] mm [in]		Theoretical Torque - Nm [lb-in]						
		19 [168]	38 [336]	50 [442]	64 [566]	76 [673]	89 [788]	
		Displacement tested at 45°C [113°F] with an oil viscosity of 46cSt [213 SUS]						

<b>050</b>		Pressure - bar [psi]					Max. Cont.	Max. Inter.	
		30 [435]	60 [870]	80 [1160]	100 [1450]	120 [1740]	140 [2030]	160 [2320]	175 [2540]
50 cm <sup>3</sup> [3.0 in <sup>3</sup> ] / rev		Torque - Nm [lb-in], Speed rpm					Intermittent Ratings - 10% of Operation		
Flow - lpm [gpm]	5 [1.3]	19 [168] <b>100</b>	39 [345] <b>85</b>	48 [425] <b>75</b>	62 [549] <b>64</b>	75 [664] <b>48</b>		101	
	10 [2.6]	20 [177] <b>197</b>	38 [336] <b>196</b>	50 [442] <b>174</b>	63 [558] <b>159</b>	78 [690] <b>146</b>	92 [814] <b>127</b>	102 [903] <b>101</b>	107 [947] <b>97</b>
	20 [5.3]	18 [159] <b>400</b>	38 [336] <b>386</b>	52 [460] <b>371</b>	64 [566] <b>355</b>	78 [690] <b>341</b>	90 [796] <b>314</b>	104 [920] <b>292</b>	108 [956] <b>290</b>
	30 [7.9]	15 [133] <b>600</b>	37 [327] <b>585</b>	50 [442] <b>571</b>	64 [566] <b>560</b>	77 [681] <b>540</b>	89 [788] <b>516</b>	103 [912] <b>499</b>	107 [947] <b>495</b>
	40 [10.6]	12 [106] <b>808</b>	31 [274] <b>800</b>	45 [398] <b>790</b>	59 [522] <b>770</b>	73 [646] <b>766</b>	87 [770] <b>733</b>	99 [876] <b>703</b>	106 [938] <b>697</b>
	50 [13.2]	9 [80] <b>1009</b>	27 [239] <b>1006</b>	41 [363] <b>986</b>	55 [487] <b>982</b>	68 [602] <b>964</b>	84 [743] <b>956</b>	98 [867] <b>930</b>	105 [929] <b>872</b>
	60 [15.8]	6 [53] <b>1208</b>	24 [212] <b>1200</b>	37 [327] <b>1196</b>	53 [469] <b>1188</b>	64 [566] <b>1176</b>	82 [726] <b>1160</b>	95 [841] <b>1140</b>	102 [903] <b>963</b>
	70 [18.5]	3 [27] <b>1410</b>	17 [150] <b>1396</b>	32 [283] <b>1382</b>	44 [389] <b>1370</b>	58 [513] <b>1358</b>	80 [708] <b>1347</b>	93 [823] <b>1334</b>	98 [867] <b>1315</b>
Max. Inter.	75 [19.8]	15 [133] <b>1500</b>	30 [265] <b>1488</b>	40 [354] <b>1473</b>	56 [496] <b>1457</b>	77 [681] <b>1439</b>	88 [779] <b>1412</b>	93 [823] <b>1388</b>	1515
Max. Cont.									
<b>Rotor Width</b>		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input type="checkbox"/>							
6.6 [260] mm [in]		Theoretical Torque - Nm [lb-in]							
		24 [212]	47 [416]	63 [558]	79 [699]	95 [841]	110 [973]	126 [1115]	138 [1221]
		Displacement tested at 45°C [113°F] with an oil viscosity of 46cSt [213 SUS]							

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**DISPLACEMENT PERFORMANCE**

<b>060</b>		Pressure - bar [psi]						Max. Cont.	Max. Inter.	
		30 [435]	60 [870]	80 [1160]	100 [1450]	120 [1740]	140 [2030]	160 [2320]	175 [2540]	
59 cm <sup>3</sup> [3.6 in <sup>3</sup> ] / rev										
Flow - lpm [gpm]		Torque - Nm [lb-in], Speed rpm						Intermittent Ratings - 10% of Operation		
		20 [177]	46 [407]	65 [575]	80 [708]	95 [841]	112 [991]			
Max. Cont.	5 [1.3]	83	79	72	64	51	38		85	
	10 [2.6]	22 [195]	47 [416]	66 [584]	81 [717]	96 [850]	113 [1000]	125 [1106]	136 [1204]	170
	20 [5.3]	169	164	155	142	135	124	108	88	339
	30 [7.9]	20 [177]	45 [398]	64 [566]	80 [708]	93 [823]	111 [982]	123 [1088]	134 [1186]	509
	40 [10.6]	338	332	320	309	290	276	245	222	678
	50 [13.2]	17 [150]	43 [381]	62 [549]	76 [673]	89 [788]	109 [965]	121 [1071]	131 [1159]	848
	60 [15.8]	507	502	493	482	468	454	424	400	1017
	70 [18.5]	14 [124]	41 [363]	58 [513]	73 [646]	87 [770]	105 [929]	117 [1035]	127 [1124]	1186
Max. Inter.	50 [13.2]	10 [88]	37 [327]	55 [487]	70 [619]	84 [743]	102 [903]	113 [1000]	122 [1080]	1271
	60 [15.8]	7 [62]	34 [301]	52 [460]	66 [584]	82 [726]	99 [876]	109 [965]	118 [1044]	
		1014	1005	999	992	982	968	956	933	
		4 [35]	27 [239]	47 [416]	62 [549]	76 [673]	93 [823]	104 [920]	114 [1009]	
		1185	1182	1180	1175	1158	1144	1128	1112	
			22 [195]	43 [381]	58 [513]	73 [646]	86 [761]	100 [885]	110 [973]	
			1271	1265	1256	1241	1228	1212	1196	
Rotor Width		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input checked="" type="checkbox"/>								
8.0 [314] mm [in]		Theoretical Torque - Nm [lb-in]								
		28 [249]	56 [499]	75 [665]	94 [831]	113 [998]	132 [1164]	150 [1330]	164 [1455]	
Displacement tested at 45°C [113°F] with an oil viscosity of 46cSt [213 SUS]										

<b>080</b>		Pressure - bar [psi]						Max. Cont.	Max. Inter.	
		30 [435]	60 [870]	80 [1160]	100 [1450]	120 [1740]	140 [2030]	160 [2320]	175 [2540]	
78 cm <sup>3</sup> [4.8 in <sup>3</sup> ] / rev										
Flow - lpm [gpm]		Torque - Nm [lb-in], Speed rpm						Intermittent Ratings - 10% of Operation		
		32 [283]	62 [549]	80 [708]	106 [938]	125 [1106]				
Max. Cont.	5 [1.3]	60	56	50	42	30			64	
	10 [2.6]	31 [274]	64 [566]	84 [743]	104 [920]	120 [1062]	142 [1257]	162 [1434]	175 [1549]	128
	20 [5.3]	125	118	112	104	98	82	67	50	256
	30 [7.9]	26 [230]	60 [531]	84 [743]	102 [903]	125 [1106]	144 [1274]	164 [1451]	183 [1619]	385
	40 [10.6]	254	245	236	228	215	204	190	175	513
	50 [13.2]	24 [212]	56 [496]	81 [717]	100 [885]	122 [1080]	142 [1257]	160 [1416]	175 [1549]	641
	60 [15.8]	384	374	366	358	346	335	318	305	769
	70 [18.5]	19 [168]	53 [469]	75 [664]	96 [850]	118 [1044]	140 [1239]	158 [1398]	170 [1504]	897
Max. Inter.	40 [10.6]	512	505	494	483	473	462	450	438	962
	50 [13.2]	14 [124]	46 [407]	70 [619]	92 [814]	110 [973]	135 [1195]	156 [1381]	168 [1487]	
		638	630	625	615	606	593	580	568	
		10 [88]	42 [372]	66 [584]	86 [761]	106 [938]	128 [1133]	150 [1327]	164 [1451]	
		768	762	756	748	738	728	717	694	
		6 [53]	36 [319]	56 [496]	78 [690]	98 [867]	118 [1044]	140 [1239]	160 [1416]	
		896	890	882	872	860	846	830	816	
		3 [27]	27 [239]	50 [442]	74 [655]	92 [814]	113 [1000]	133 [1177]	148 [1310]	
		960	955	948	938	926	916	896	802	
Rotor Width		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input checked="" type="checkbox"/>								
10.4 [410] mm [in]		Theoretical Torque - Nm [lb-in]								
		37 [327]	75 [664]	100 [885]	125 [1106]	149 [1319]	174 [1540]	199 [1761]	218 [1929]	
Displacement tested at 45°C [113°F] with an oil viscosity of 46cSt [213 SUS]										

► Performance data is typical. Performance of production units varies slightly from one motor to another. Operating at maximum continuous pressure and maximum continuous flow simultaneously is not recommended. For additional information on product testing please refer to page 6.

**DISPLACEMENT PERFORMANCE**

		Pressure - bar [psi]						Max. Cont.	Max. Inter.			
<b>100</b>		30 [435]	60 [870]	80 [1160]	100 [1450]	120 [1740]	140 [2030]	160 [2320]	175 [2540]			
96 cm <sup>3</sup> [5.9 in <sup>3</sup> ] / rev		Torque - Nm [lb-in], Speed rpm						Intermittent Ratings - 10% of Operation				
Flow - lpm [gpm]	5 [1.3]	43 [381] 51	82 [726] 42	109 [965] 35	131 [1159] 25						52	Theoretical rpm
	10 [2.6]	43 [381] 99	84 [743] 93	108 [956] 84	133 [1177] 72	152 [1345] 62	180 [1593] 48	197 [1743] 24		104		
	20 [5.3]	41 [363] 205	79 [699] 202	107 [947] 197	127 [1124] 192	154 [1363] 182	178 [1575] 172	200 [1770] 140	212 [1876] 118	208		
	30 [7.9]	39 [345] 311	74 [655] 307	101 [894] 301	126 [1115] 294	152 [1345] 283	176 [1558] 271	198 [1752] 258	213 [1885] 240	313		
	40 [10.6]	29 [257] 413	63 [558] 410	93 [823] 406	121 [1071] 399	150 [1327] 388	172 [1522] 379	195 [1726] 368	208 [1841] 347	417		
	50 [13.2]	20 [177] 519	52 [460] 515	85 [752] 510	115 [1018] 503	148 [1310] 492	169 [1496] 480	193 [1708] 464	203 [1796] 446	521		
	60 [15.8]	17 [150] 624	53 [469] 620	83 [735] 615	111 [982] 608	138 [1221] 600	165 [1460] 582	183 [1619] 565	193 [1708] 548	625		
	70 [18.5]	11 [97] 728	42 [372] 726	73 [646] 723	93 [823] 714	126 [1115] 706	159 [1407] 684	172 [1522] 668	183 [1619] 646	729		
Max. Cont.	75 [19.8]	6 [53] 780	35 [310] 771	61 [540] 764	89 [788] 755	118 [1044] 736	145 [1283] 724	156 [1381] 712	176 [1558] 699	781	Max. Inter.	
<b>Rotor Width</b>		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input type="checkbox"/>										
13.0 [510]		Theoretical Torque - Nm [lb-in]										
mm [in]		46 [407]	92 [814]	122 [1080]	153 [1354]	183 [1623]	214 [1894]	245 [2168]	268 [2372]			
Displacement tested at 45°C [113°F] with an oil viscosity of 46cSt [213 SUS]												

		Pressure - bar [psi]						Max. Cont.	Max. Inter.			
<b>125</b>		30 [435]	60 [870]	80 [1160]	100 [1450]	120 [1740]	140 [2030]	160 [2320]	175 [2540]			
125 cm <sup>3</sup> [7.6 in <sup>3</sup> ] / rev		Torque - Nm [lb-in], Speed rpm						Intermittent Ratings - 10% of Operation				
Flow - lpm [gpm]	5 [1.3]	52 [460] 38	95 [841] 35	135 [1195] 32	168 [1487] 27						40	Theoretical rpm
	10 [2.6]	50 [442] 78	98 [867] 74	138 [1221] 69	172 [1522] 62	190 [1681] 54	234 [2071] 45	258 [2283] 35		80		
	20 [5.3]	50 [442] 158	96 [850] 152	132 [1168] 144	168 [1487] 135	202 [1788] 124	236 [2088] 110	256 [2265] 94	278 [2460] 78	160		
	30 [7.9]	44 [389] 238	92 [814] 232	126 [1115] 225	164 [1451] 215	198 [1752] 210	232 [2053] 198	262 [2319] 168	268 [2372] 155	240		
	40 [10.6]	35 [310] 319	82 [726] 316	118 [1044] 312	160 [1416] 308	193 [1708] 300	226 [2000] 288	252 [2230] 262	266 [2354] 238	320		
	50 [13.2]	31 [274] 399	77 [681] 396	108 [956] 392	155 [1372] 383	182 [1611] 368	220 [1947] 354	238 [2106] 338	262 [2319] 326	400		
	60 [15.8]	15 [133] 479	64 [566] 478	97 [858] 475	146 [1292] 470	166 [1469] 463	210 [1858] 454	224 [1982] 443	256 [2265] 434	480		
	70 [18.5]	8 [71] 559	50 [442] 555	90 [796] 548	140 [1239] 538	162 [1434] 524	204 [1805] 516	209 [1850] 500	236 [2088] 488	560		
Max. Cont.	75 [19.8]	40 [354] 599	71 [628] 594	128 [1133] 588	158 [1398] 576	192 [1699] 565	199 [1761] 536	224 [1982] 524	600	Max. Inter.		
<b>Rotor Width</b>		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input type="checkbox"/>										
16.8 [660]		Theoretical Torque - Nm [lb-in]										
mm [in]		60 [531]	119 [1053]	159 [1407]	199 [1761]	239 [2115]	279 [2469]	318 [2814]	348 [3080]			
Displacement tested at 45°C [113°F] with an oil viscosity of 46cSt [213 SUS]												

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**DISPLACEMENT PERFORMANCE**

<b>160</b>		Pressure - bar [psi]							Max. Cont.	Max. Inter.		
		30 [435]	60 [870]	80 [1160]	100 [1450]	120 [1740]	140 [2030]	160 [2320]	175 [2540]			
159 cm <sup>3</sup> [9.7 in <sup>3</sup> ] / rev		Torque - Nm [lb-in], Speed rpm							Intermittent Ratings - 10% of Operation			
Max. Cont.	Flow - lpm [gpm]	5 [1.3]	56 [496]	112 [991]	154 [1363]	201 [1779]					32	Theoretical rpm
		10 [2.6]	30	25	18	10					65	
		20 [5.3]	58 [513]	115 [1018]	156 [1381]	205 [1814]	245 [2168]	285 [2522]			130	
		30 [7.9]	60 [532]	123 [1089]	162 [1434]	202 [1788]	242 [2142]	282 [2496]	327 [2894]	360 [3186]	194	
		40 [10.6]	128	125	121	116	110	100	86	78	258	
		50 [13.2]	50 [443]	117 [1035]	157 [1389]	197 [1743]	238 [2106]	278 [2460]	322 [2850]	358 [3168]	323	
		60 [15.8]	193	190	187	183	179	173	160	144	387	
		70 [18.5]	48 [425]	113 [1000]	155 [1372]	195 [1726]	236 [2089]	273 [2416]	318 [2814]	355 [3142]	453	
Max. Inter.	75 [19.8]	32 [283]	106 [938]	149 [1319]	188 [1664]	235 [2080]	267 [2363]	313 [2770]	352 [3115]	485		
		323	320	316	312	306	299	288	275			
Rotor Width		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input checked="" type="checkbox"/>										
20.8 [820]		Theoretical Torque - Nm [lb-in]										
mm [in]		74 [651]	147 [1302]	196 [1736]	245 [2170]	282 [2496]	343 [3038]	392 [3472]	429 [3798]			
Displacement tested at 45°C [113°F] with an oil viscosity of 46cSt [213 SUS]												

<b>200</b>		Pressure - bar [psi]							Max. Cont.	Max. Inter.		
		30 [435]	60 [870]	80 [1160]	100 [1450]	115 [1670]	140 [2030]	150 [2180]	175 [2540]			
190 cm <sup>3</sup> [11.6 in <sup>3</sup> ] / rev		Torque - Nm [lb-in], Speed rpm							Intermittent Ratings - 10% of Operation			
Max. Cont.	Flow - lpm [gpm]	5 [1.3]	75 [664]	158 [1398]	200 [1770]	241 [2133]					26	Theoretical rpm
		10 [2.6]	25	22	20	10					53	
		20 [5.3]	78 [690]	160 [1416]	204 [1805]	252 [2230]	291 [2575]	348 [3080]	377 [3336]		105	
		30 [7.9]	51	49	45	39	35	29	22		158	
		40 [10.6]	74 [655]	156 [1381]	200 [1770]	246 [2177]	293 [2593]	354 [3133]	380 [3363]	416 [3681]	211	
		50 [13.2]	104	102	99	95	89	83	76	65	263	
		60 [15.8]	70 [619]	152 [1345]	196 [1735]	240 [2124]	290 [2566]	352 [3115]	378 [3345]	420 [3717]	316	
		70 [18.5]	157	155	152	148	143	137	130	118	368	
Max. Inter.	75 [19.8]	65 [575]	147 [1301]	190 [1681]	228 [2018]	286 [2531]	340 [3009]	376 [3327]	418 [3699]	395		
		210	208	205	200	193	186	178	168			
Rotor Width		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input checked="" type="checkbox"/>										
25.9 [1.020]		Theoretical Torque - Nm [lb-in]										
mm [in]		91 [803]	182 [1611]	242 [2142]	303 [2677]	348 [3079]	424 [3748]	454 [4016]	529 [4685]			
Displacement tested at 45°C [113°F] with an oil viscosity of 46cSt [213 SUS]												

► Performance data is typical. Performance of production units varies slightly from one motor to another. Operating at maximum continuous pressure and maximum continuous flow simultaneously is not recommended. For additional information on product testing please refer to page 6.



**DISPLACEMENT PERFORMANCE**

		Pressure - bar [psi]				Max. Cont.		Max. Inter.		
<b>250</b>		30 [435]	60 [870]	85 [1230]	100 [1450]	125 [1810]	140 [2030]	160 [2320]	175 [2540]	
240 cm <sup>3</sup> [14.6 in <sup>3</sup> ] / rev		Torque - Nm [lb-in], Speed rpm				Intermittent Ratings - 10% of Operation				
Flow - lpm [gpm]	5 [1.3]	89 [788] 19	194 [1717] 16	264 [2336] 10	326 [2885] 6					21
	10 [2.6]	92 [814] 40	196 [1735] 36	268 [2372] 32	329 [2912] 21	394 [3487] 10				42
Max. Cont.	20 [5.3]	90 [796] 81	192 [1699] 77	264 [2336] 72	321 [2841] 65	397 [3513] 50	445 [3938] 42	510 [4513] 36	554 [4903] 23	83
	30 [7.9]	86 [761] 124	185 [1637] 121	256 [2265] 115	314 [2779] 106	392 [3469] 94	439 [3855] 84	502 [4442] 76	557 [4929] 61	125
Max. Inter.	40 [10.6]	82 [726] 165	179 [1584] 162	248 [2195] 158	305 [2699] 153	384 [3398] 144	431 [3814] 135	486 [4301] 125	545 [4823] 113	167
	50 [13.2]	69 [611] 207	169 [1496] 203	243 [2150] 195	293 [2593] 189	378 [3345] 183	421 [3726] 170	475 [4204] 157	526 [4655] 138	208
Max. Inter.	60 [15.8]	48 [425] 250	152 [1345] 247	230 [2035] 243	282 [2496] 236	364 [3221] 222	407 [3602] 216	456 [4035] 205	508 [4496] 188	250
	70 [18.5]	37 [327] 291	139 [1230] 285	219 [1938] 278	263 [2327] 271	343 [3035] 256	386 [3416] 249	441 [3903] 234	496 [4389] 221	292
Max. Inter.	75 [19.8]	26 [230] 312	128 [1133] 310	205 [1814] 307	245 [2168] 302	328 [2903] 294	374 [3310] 270	428 [3788] 254	481 [4257] 242	313
	<b>Rotor Width</b>		Overall Efficiency - 70 - 100% <input type="checkbox"/>		40 - 69% <input type="checkbox"/>		0 - 39% <input type="checkbox"/>			
32.5 [1.280] mm [in]		Theoretical Torque - Nm [lb-in]								
		115 [1018]	229 [2027]	325 [2875]	382 [3381]	478 [4230]	535 [4735]	611 [5407]	669 [5920]	
		Displacement tested at 45°C [113°F] with an oil viscosity of 46cSt [213 SUS]								

		Pressure - bar [psi]				Max. Cont.		Max. Inter.		
<b>315</b>		30 [435]	50 [725]	70 [1015]	85 [1230]	100 [1450]	120 [1740]	140 [2030]	160 [2320]	
303 cm <sup>3</sup> [18.5 in <sup>3</sup> ] / rev		Torque - Nm [lb-in], Speed rpm				Intermittent Ratings - 10% of Operation				
Flow - lpm [gpm]	5 [1.3]	123 [1089] 16	200 [1770] 13	282 [2496] 10	344 [3044] 6					17
	10 [2.6]	117 [1035] 31	194 [1717] 29	277 [2451] 25	342 [3027] 21	399 [3531] 17				33
Max. Cont.	20 [5.3]	112 [991] 64	196 [1735] 62	275 [2434] 58	340 [3009] 54	397 [3513] 49	460 [4071] 43	526 [4655] 32	605 [5354] 23	66
	30 [7.9]	104 [920] 98	183 [1620] 94	267 [2363] 90	322 [2850] 85	390 [3452] 79	448 [3965] 70	520 [4602] 62	602 [5328] 56	99
Max. Inter.	40 [10.6]	86 [761] 129	168 [1487] 126	252 [2230] 122	304 [2690] 118	365 [3230] 113	440 [3894] 106	515 [4558] 99	588 [5204] 76	132
	50 [13.2]	73 [646] 164	156 [1381] 160	238 [2106] 155	288 [2549] 150	350 [3098] 144	424 [3752] 136	500 [4425] 127	571 [5053] 119	165
Max. Inter.	60 [15.8]	60 [531] 195	140 [1239] 192	223 [1974] 188	270 [2390] 183	325 [2876] 176	396 [3505] 170	480 [4248] 164	546 [4832] 157	198
	70 [18.5]	37 [327] 228	122 [1080] 226	186 [1646] 223	254 [2248] 218	309 [2735] 212	368 [3257] 206	455 [4027] 196	527 [4664] 188	231
Max. Inter.	75 [19.8]	23 [204] 245	100 [885] 242	174 [1540] 238	237 [2097] 233	293 [2593] 228	359 [3177] 222	444 [3929] 215	516 [4567] 206	248
	<b>Rotor Width</b>		Overall Efficiency - 60 - 100% <input type="checkbox"/>		40 - 59% <input type="checkbox"/>		0 - 39% <input type="checkbox"/>			
40.9 [1.610] mm [in]		Theoretical Torque - Nm [lb-in]								
		145 [1283]	241 [2133]	338 [2991]	410 [3628]	482 [4265]	579 [5124]	675 [5973]	772 [6832]	
		Displacement tested at 45°C [113°F] with an oil viscosity of 46cSt [213 SUS]								

► Performance data is typical. Performance of production units varies slightly from one motor to another. Operating at maximum continuous pressure and maximum continuous flow simultaneously is not recommended. For additional information on product testing please refer to page 6.

**DISPLACEMENT PERFORMANCE**

<b>400</b>		Pressure - bar [psi]						Max. Cont.		Max. Inter.			
		30 [435]	45 [650]	55 [800]	65 [940]	80 [1160]	95 [1380]	110 [1595]	125 [1810]				
388 cm <sup>3</sup> [23.7 in <sup>3</sup> ] / rev													
		Torque - Nm [lb-in], <b>Speed rpm</b>						Intermittent Ratings - 10% of Operation					
Flow - lpm [gpm]	5 [1.3]	144 [1274]	220 [1947]	270 [2389]	338 [2991]							Theoretical rpm	
		<b>11</b>	<b>10</b>	<b>7</b>	<b>5</b>						13		
	10 [2.6]	146 [1292]	223 [1973]	272 [2407]	340 [3009]	412 [3646]	488 [4319]						26
		<b>25</b>	<b>23</b>	<b>20</b>	<b>16</b>	<b>10</b>	<b>6</b>						52
	20 [5.3]	145 [1283]	219 [1938]	269 [2381]	333 [2347]	408 [3611]	484 [4283]	548 [4850]					77
		<b>51</b>	<b>50</b>	<b>48</b>	<b>45</b>	<b>40</b>	<b>35</b>	<b>27</b>					103
	30 [7.9]	138 [1221]	215 [1903]	262 [2319]	322 [2850]	402 [3558]	472 [4177]	546 [4832]	625 [5531]				129
		<b>76</b>	<b>75</b>	<b>73</b>	<b>70</b>	<b>67</b>	<b>59</b>	<b>47</b>	<b>36</b>				155
40 [10.6]	120 [1062]	204 [1805]	250 [2212]	310 [2743]	393 [3478]	458 [4053]	535 [4735]	618 [5469]			180		
	<b>103</b>	<b>102</b>	<b>100</b>	<b>96</b>	<b>89</b>	<b>82</b>	<b>73</b>	<b>62</b>			190		
50 [13.2]	100 [885]	186 [1646]	238 [2106]	295 [2611]	374 [3310]	446 [3947]	520 [4602]	600 [5310]					
	<b>129</b>	<b>128</b>	<b>125</b>	<b>123</b>	<b>119</b>	<b>112</b>	<b>102</b>	<b>91</b>					
60 [15.8]	76 [673]	166 [1469]	222 [1965]	282 [2496]	358 [3168]	427 [3779]	496 [4389]	576 [5097]					
	<b>155</b>	<b>153</b>	<b>150</b>	<b>148</b>	<b>143</b>	<b>139</b>	<b>130</b>	<b>121</b>					
70 [18.5]	50 [442]	145 [1283]	194 [1717]	250 [2212]	334 [2956]	402 [3558]	472 [4177]	540 [4779]					
	<b>179</b>	<b>177</b>	<b>174</b>	<b>170</b>	<b>165</b>	<b>158</b>	<b>152</b>	<b>144</b>					
75 [19.8]	42 [372]	135 [1195]	176 [1558]	226 [2000]	306 [2708]	373 [3301]	445 [3938]	520 [4602]					
	<b>189</b>	<b>187</b>	<b>184</b>	<b>180</b>	<b>175</b>	<b>167</b>	<b>160</b>	<b>150</b>					
<b>Rotor Width</b>		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input checked="" type="checkbox"/>											
52.1 [2.050]		Theoretical Torque - Nm [lb-in]											
mm [in]		185 [1640]	278 [2460]	340 [3007]	402 [3554]	494 [4374]	587 [5194]	680 [6014]	772 [6834]				
Displacement tested at 45°C [113°F] with an oil viscosity of 46cSt [213 SUS]													

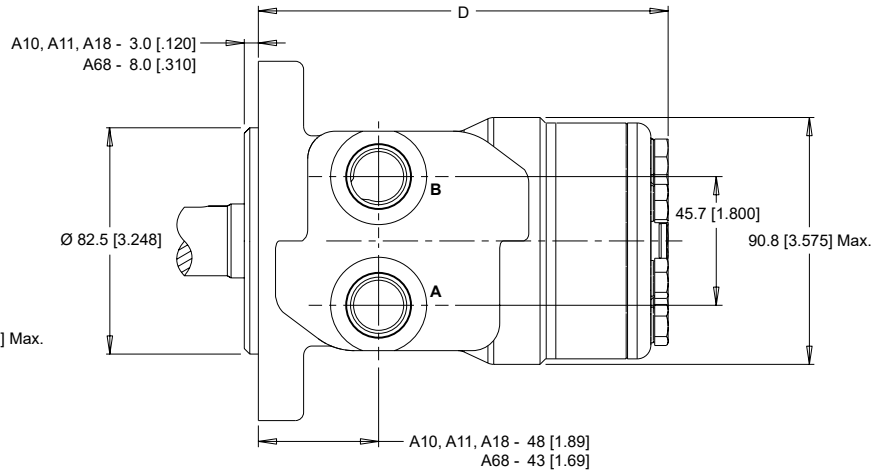
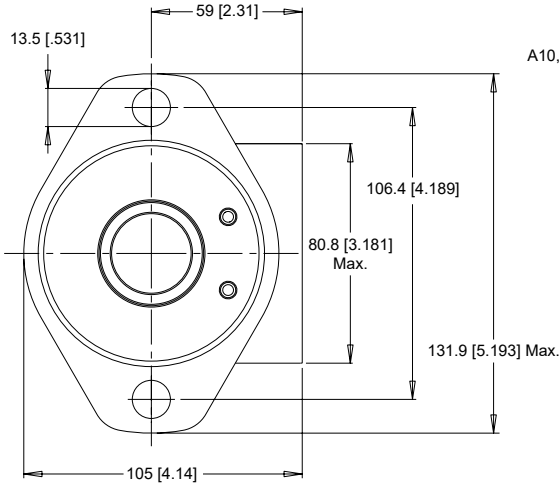
► Performance data is typical. Performance of production units varies slightly from one motor to another. Operating at maximum continuous pressure and maximum continuous flow simultaneously is not recommended. For additional information on product testing please refer to page 6.

**HOUSINGS**

► Dimensions shown are without paint. Paint thickness can be up to 0.13 [.005].

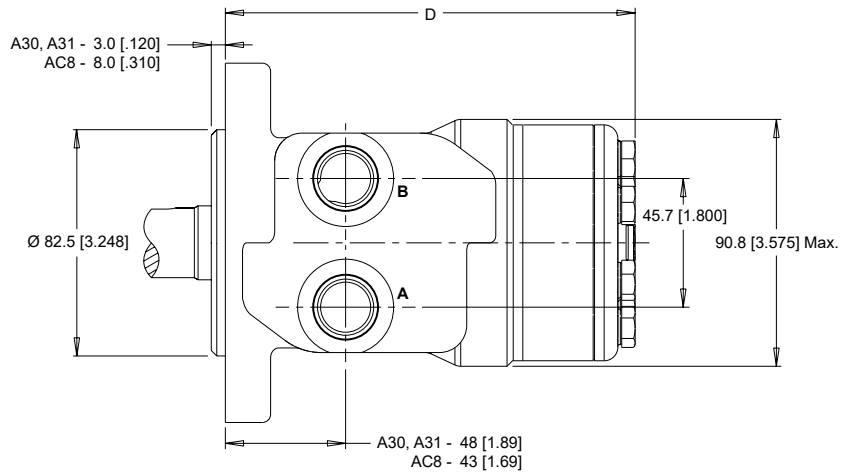
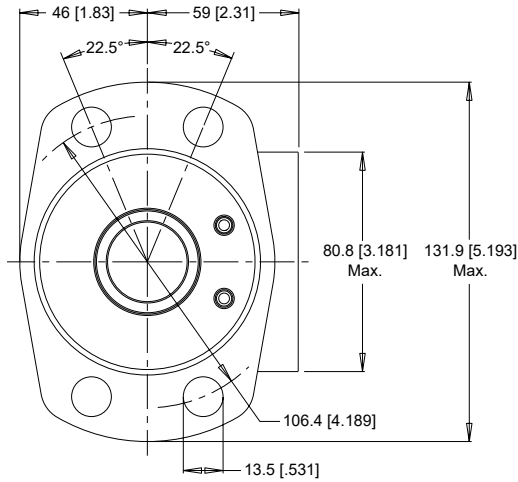
**2-HOLE, SAE A MOUNT, ALIGNED PORTS**

**A10** 1/2-14 NPT    **A11** 7/8-14 UNF    **A18** G 1/2    **A68** G 1/2 (TP)



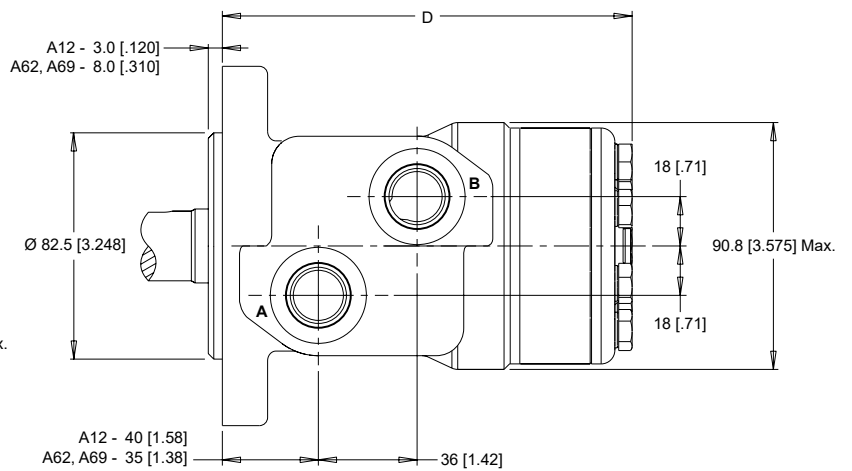
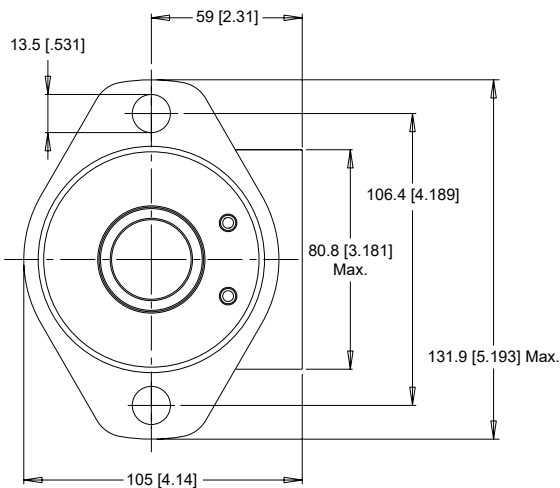
**4-HOLE, MAGNETO MOUNT, ALIGNED PORTS**

**A30** 1/2-14 NPT    **A31** 7/8-14 UNF    **AC8** G 1/2 (TP)



**2-HOLE, SAE A MOUNT, OFFSET PORTS**

**A12** G 1/2    **A62** G 1/2 (TP)    **A69** 7/8-14 UNF (TP)



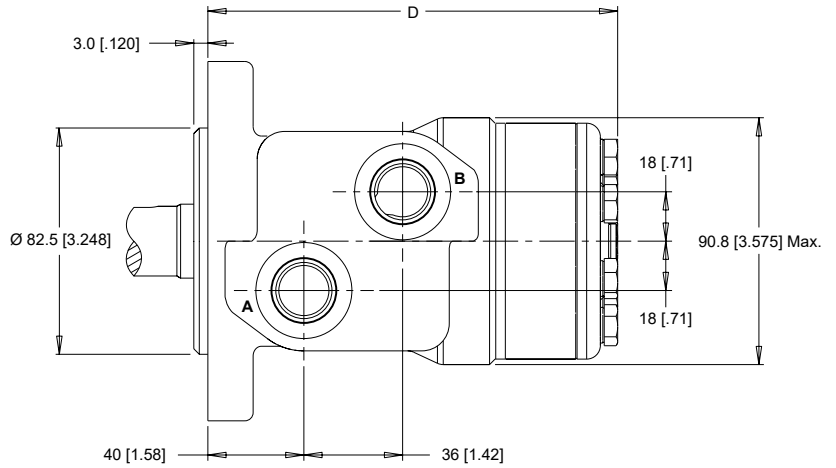
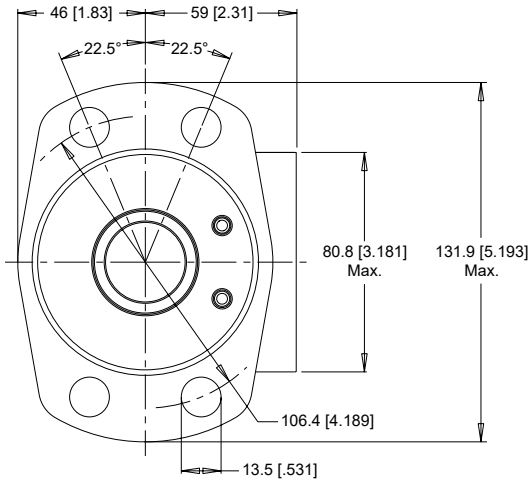
► Dimension D is charted on page 40. ► (TP) - Taller Pilot Height. Refer to detailed drawing for dimensional differences.

**HOUSINGS**

► Dimensions shown are without paint. Paint thickness can be up to 0.13 [.005].

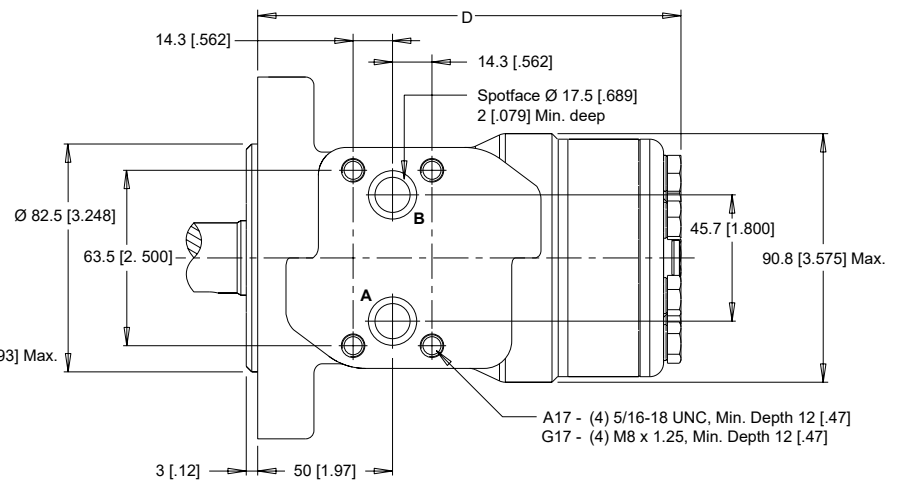
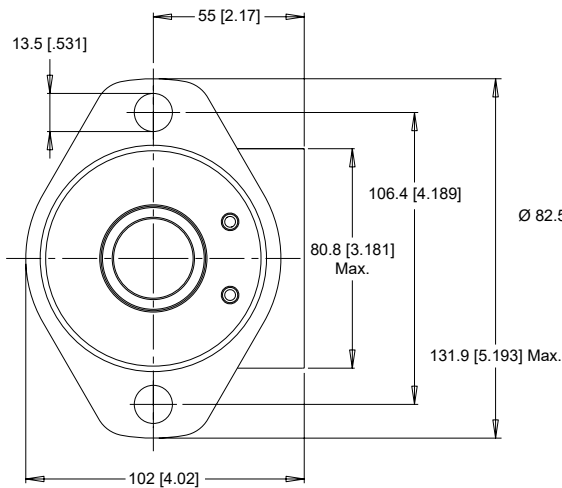
**4-HOLE, MAGNETO MOUNT, OFFSET PORTS**

**A32** G 1/2



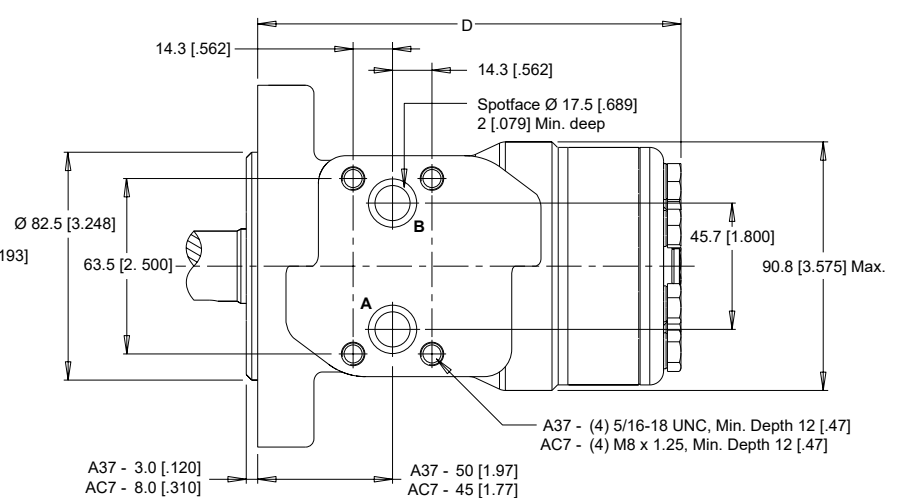
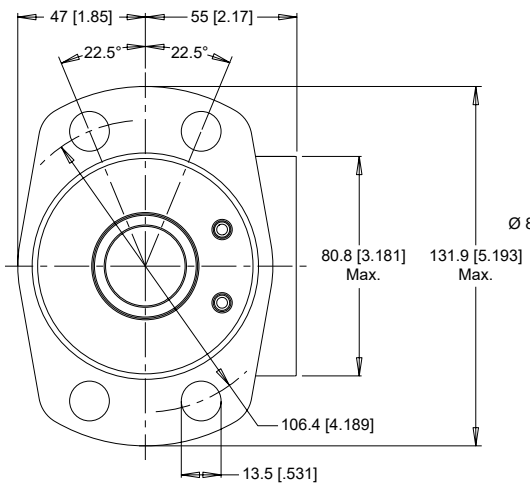
**2-HOLE, SAE A MOUNT, ALIGNED MANIFOLD PORTS**

**A17** 1/2" Drilled **G17** 1/2" Drilled



**4-HOLE, MAGNETO MOUNT, ALIGNED MANIFOLD PORTS**

**A37** 1/2" Drilled **AC7** 1/2" Drilled (TP)



► Dimension D is charted on page 40. ► (TP) - Taller Pilot Height. Refer to detailed drawing for dimensional differences.

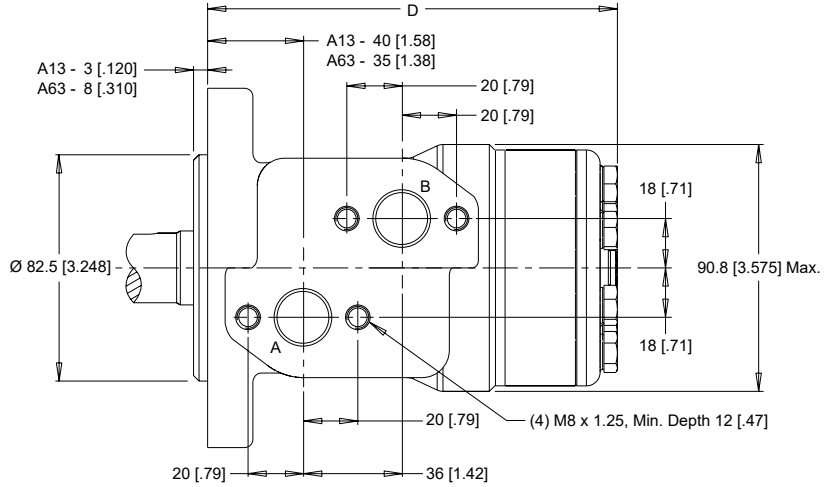
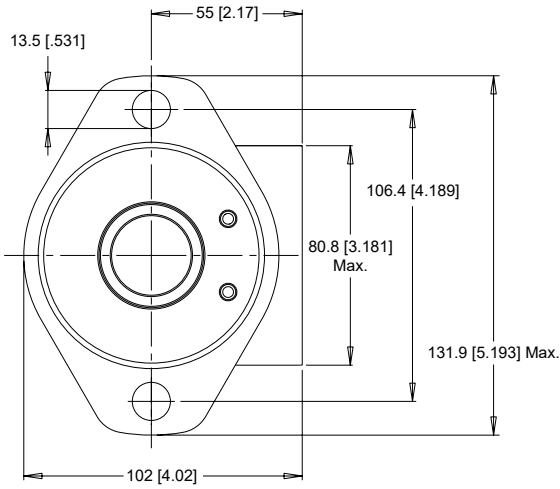
**HOUSINGS**

► Dimensions shown are without paint. Paint thickness can be up to 0.13 [.005].

**2-HOLE, SAE A MOUNT, OFFSET MANIFOLD PORTS**

**A13** G 1/2

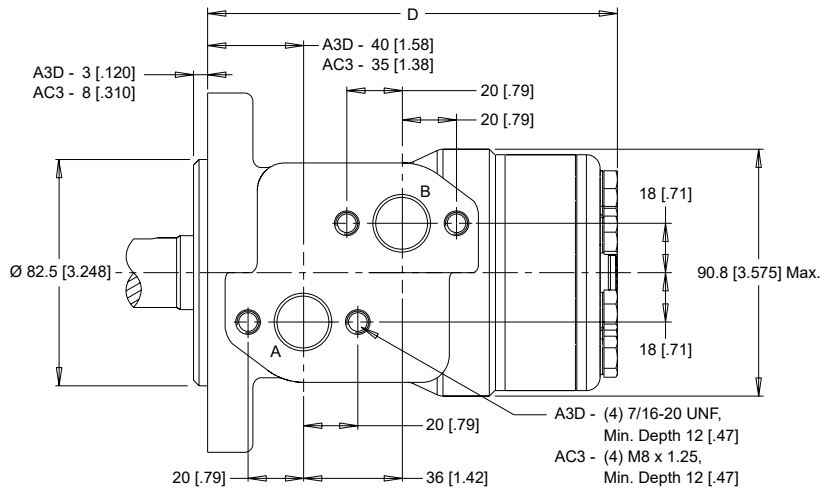
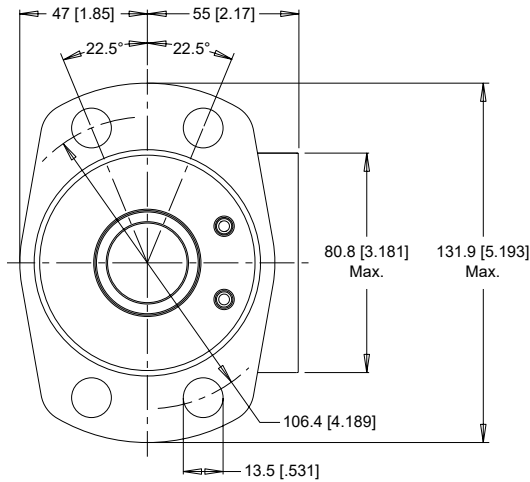
**A63** G 1/2 (TP)



**4-HOLE, MAGNETO MOUNT, OFFSET MANIFOLD PORTS**

**A3D** 7/8-14 UNF

**AC3** G 1/2 (TP)

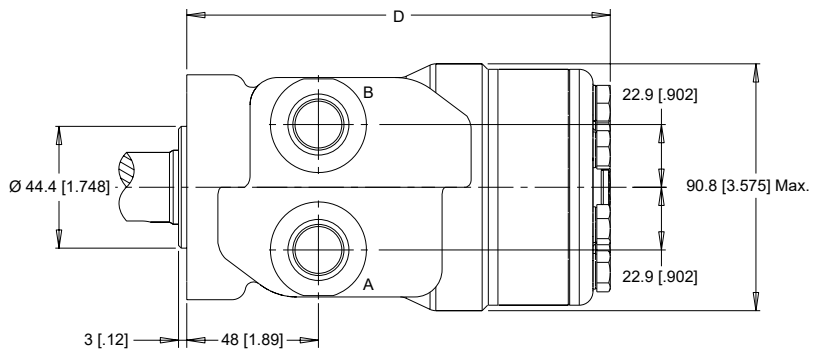
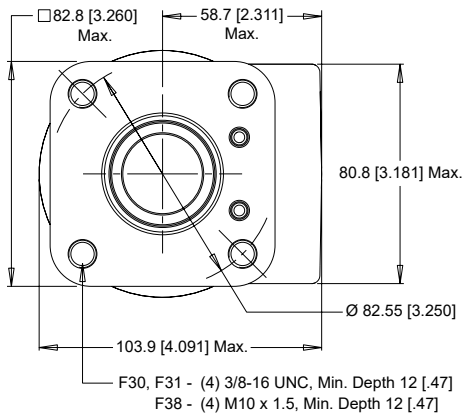


**4-HOLE, SQUARE MOUNT, ALIGNED PORTS**

**F30** 1/2-14 NPT

**F31** 7/8-14 UNF

**F38** G 1/2



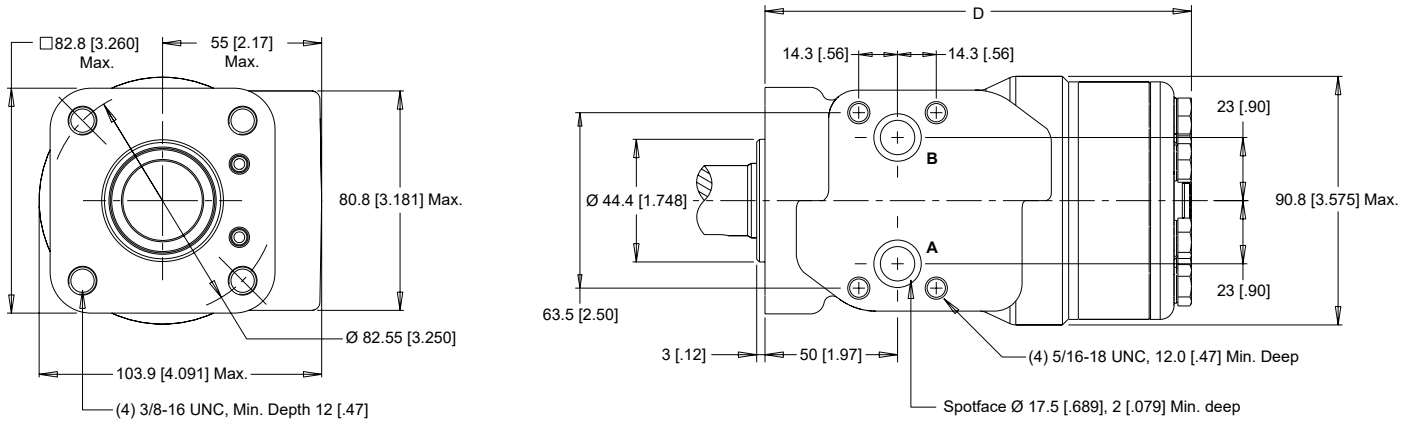
► Dimension D is charted on page 40. ► (TP) - Taller Pilot Height. Refer to detailed drawing for dimensional differences.

**WP (155/156 Series)**  
Light Duty Hydraulic Motor

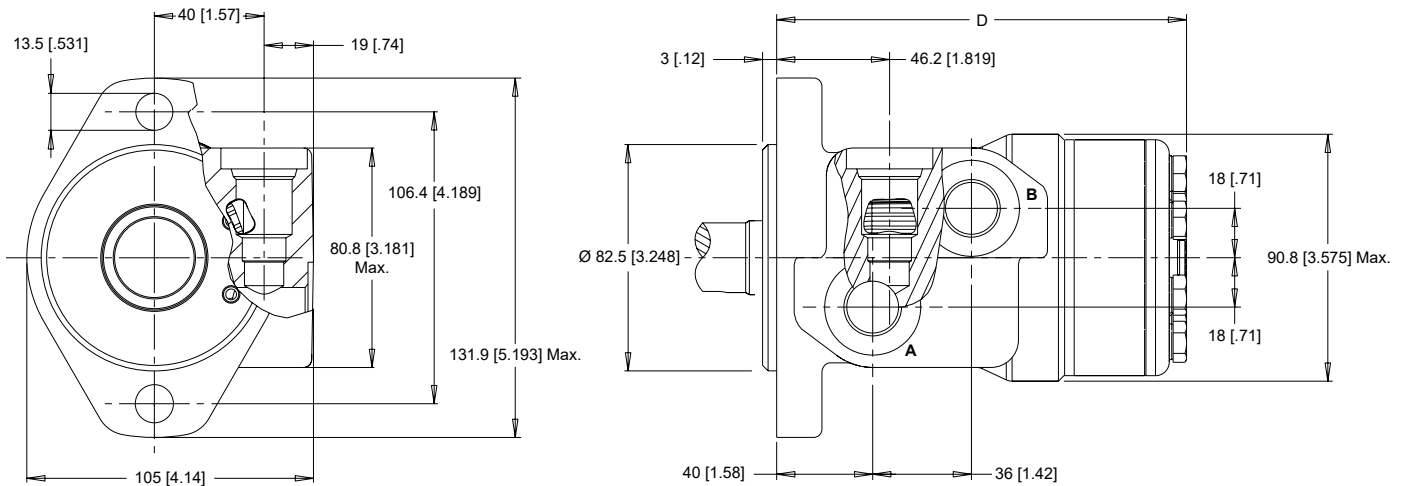
**HOUSINGS**

► Dimensions shown are without paint. Paint thickness can be up to 0.13 [.005].

**4-HOLE, SQUARE MOUNT, ALIGNED MANIFOLD PORTS** **F37** 1/2" Drilled

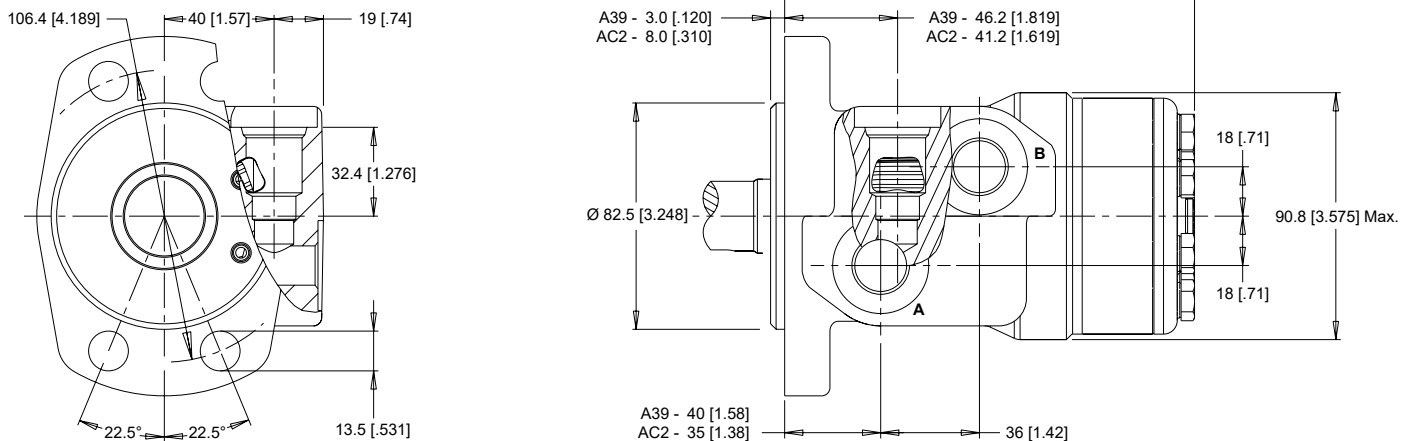


**2-HOLE, SAE A MOUNT, OFFSET PORTS, VALVE CAVITY** **A19** 7/8-14 UNF



**4-HOLE, MAGNETO MOUNT, OFFSET PORTS, VALVE CAVITY**

**A39** 7/8-14 UNF **AC2** G 1/2 (TP)



► Dimension D is charted on page 40. ► (TP) - Taller Pilot Height. Refer to detailed drawing for dimensional differences.

**HOUSINGS**

► Dimensions shown are without paint. Paint thickness can be up to 0.13 [.005].

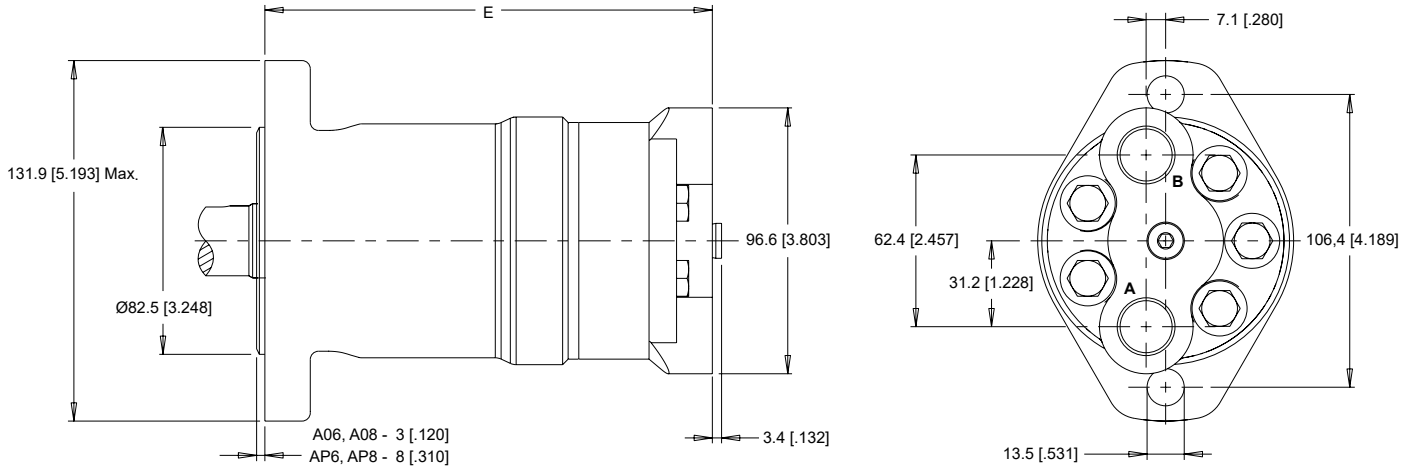
**2-HOLE, SAE A MOUNT, ALIGNED END PORTS**

**A06** 3/4-16 UNF

**A08** G 1/2

**AP6** 3/4-16 UNF (TP)

**AP8** G 1/2 (TP)



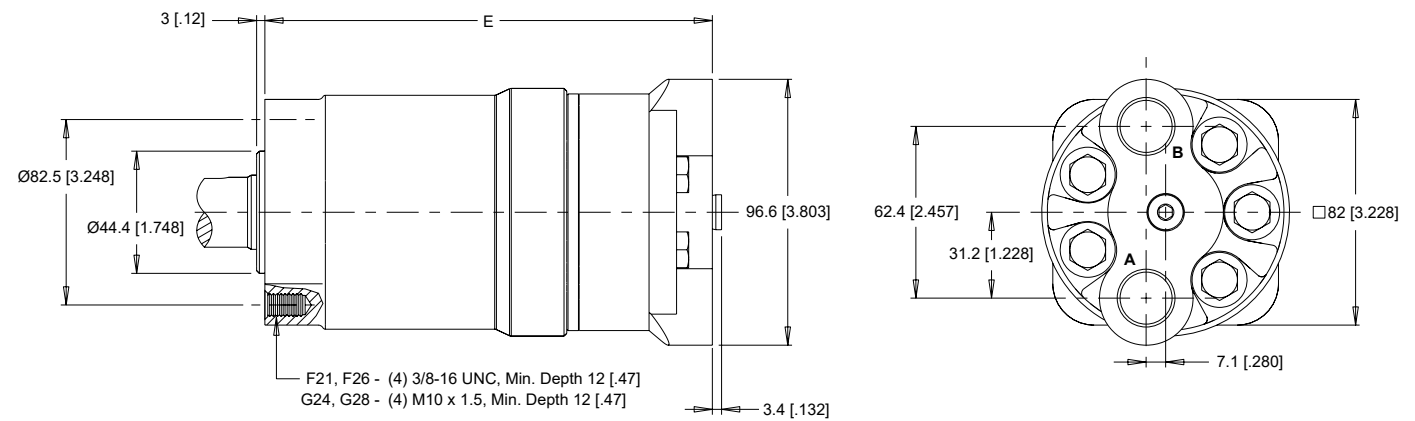
**4-HOLE, SQUARE MOUNT, ALIGNED END PORTS**

**F21** 7/8-14 UNF

**F26** 3/4-16 UNF

**G24** M22 x 1.5

**G28** G 1/2

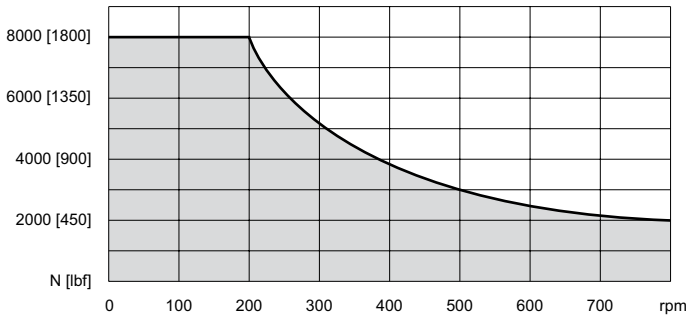


► Dimension E is charted on page 40. ► (TP) - Taller Pilot Height. Refer to detailed drawing for dimensional differences.

**TECHNICAL INFORMATION**

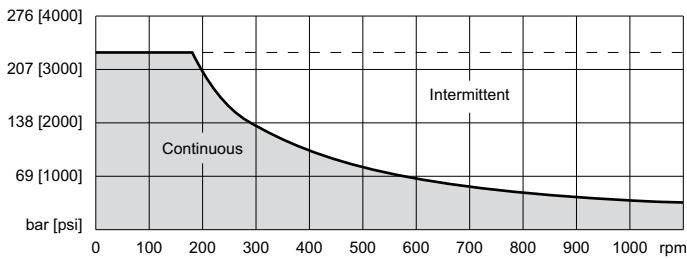
**ALLOWABLE SHAFT LOAD / BEARING CURVE**

The bearing curve below represents the side load capacity of the motor at the centerline of the key for various motor speeds. Operating conditions within the shaded area will maintain acceptable oil film lubrication with recommended fluids. Operating conditions outside the shaded area are susceptible to motor failure due to oil starvation and/or excessive heat generation. Fluids with low lubricity or low viscosity may require the maximum load and speed ratings to be derated to provide acceptable motor life and performance.

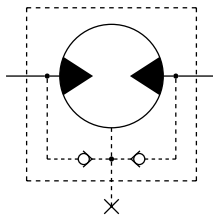


**PERMISSIBLE SHAFT SEAL PRESSURE**

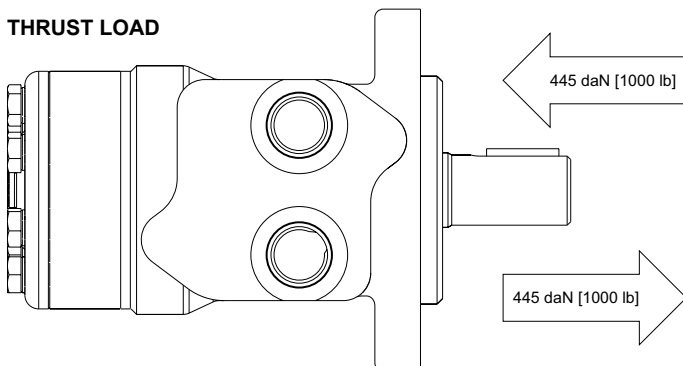
The curve below represents allowable seal pressure at various speeds. Operation in the gray area results in maintaining the rated life of the shaft seal. Actual shaft seal pressure depends on motor configuration.



▶ With check valves and drain connection, the shaft seal pressure equals pressure in the drain line. With check valves and no drain connection, shaft seal pressure is identical to output pressure. No check valves and no drain connection, the shaft seal pressure is identical to the average value of input and output pressure.



**THRUST LOAD**



**LENGTH & WEIGHT CHARTS**

Dimension D is the overall motor length from the rear of the motor to the mounting flange surface and is referenced on detailed housing drawings listed on pages 35-38.

D	3mm Pilot	8mm Pilot	Weight
#	mm [in]	mm [in]	kg [lb]
025	133 [5.24]	128 [5.04]	6.3 [13.9]
032	134 [5.28]	129 [5.08]	6.4 [14.1]
040	136 [5.34]	131 [5.16]	6.5 [14.2]
050	136 [5.34]	131 [5.16]	6.5 [14.2]
060	137 [5.40]	132 [5.20]	6.5 [14.3]
080	139 [5.49]	134 [5.28]	6.6 [14.5]
100	142 [5.59]	137 [5.39]	6.7 [14.7]
125	146 [5.74]	141 [5.55]	6.8 [14.9]
160	150 [5.90]	145 [5.71]	6.9 [15.2]
200	155 [6.10]	150 [5.91]	7.1 [15.6]
250	162 [6.36]	157 [6.18]	7.3 [16.1]
315	170 [6.69]	165 [6.50]	7.6 [16.7]
400	181 [7.13]	176 [6.93]	7.9 [17.5]

Dimension E is the overall motor length from the rear of the motor to the mounting flange surface and is referenced on detailed housing drawings listed on pages 39.

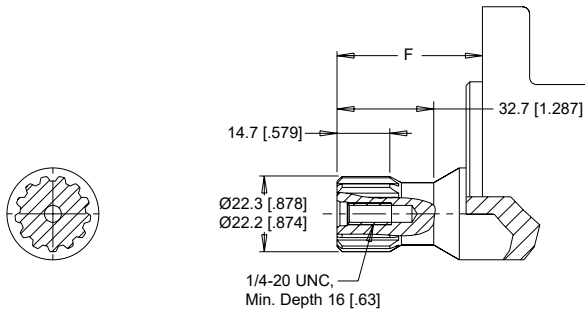
E	3mm Pilot	8mm Pilot	Weight
#	mm [in]	mm [in]	kg [lb]
025	144 [5.67]	139 [5.47]	5.9 [13.0]
032	145 [5.71]	140 [5.51]	6.0 [13.2]
040	146 [5.75]	141 [5.55]	6.1 [13.4]
050	146 [5.75]	141 [5.55]	6.1 [13.4]
060	148 [5.83]	143 [5.63]	6.1 [13.4]
080	150 [5.91]	145 [5.71]	6.2 [13.6]
100	153 [6.02]	148 [5.83]	6.3 [13.9]
125	157 [6.18]	152 [5.98]	6.4 [14.1]
160	161 [6.33]	156 [6.14]	6.5 [14.3]
200	166 [6.54]	161 [6.34]	6.7 [14.7]
250	173 [6.81]	168 [6.61]	6.9 [15.2]
315	181 [7.13]	176 [6.93]	7.2 [15.8]
400	192 [7.56]	187 [7.36]	7.5 [16.5]

▶ The overall motor weights listed in each chart above were calculated using the heaviest of the housing options associated with that mounting flange to end of motor dimension. 155 & 156 series motor weights can vary ± 0.5 kg [1 lb] depending on model configurations such as housing, shaft, endcover, options etc.



**SHAFTS**

**01** 7/8" 13 Tooth Spline



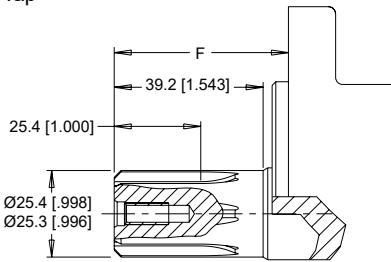
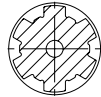
Max. Torque: 170 Nm [1500 lb-in]

**02** 1" 6B Spline, 1/4-20 Tap

**04** 1" 6B Spline, M8x1.25 Tap

**F3** 1" 6B Spline, M8x1.25 Tap

02, 04 - 6B Spline  
SAE J499 Standard  
F3 - 6B Spline  
B.S. 2059 Standard

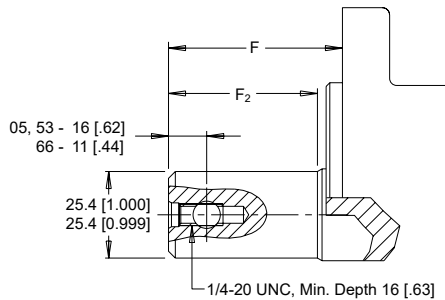
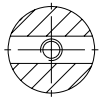


Max. Torque: 678 Nm [6000 lb-in]

**05** 1" - 9.5 [.375] Pinhole

**53** 1" - 10.3 [.406] Pinhole

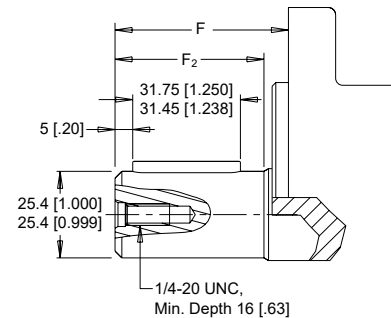
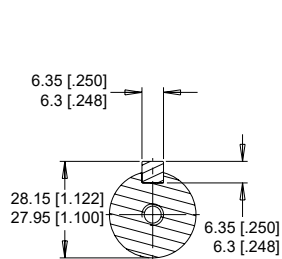
**66** 1" - 8.0 [.315] Pinhole



Max. Torque: 678 Nm [6000 lb-in]

**10** 1" Straight

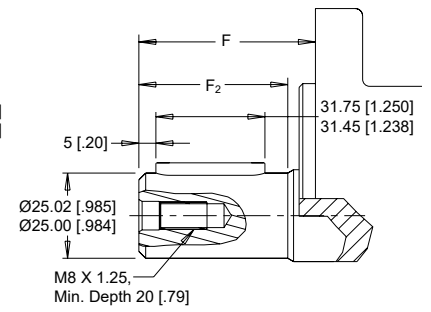
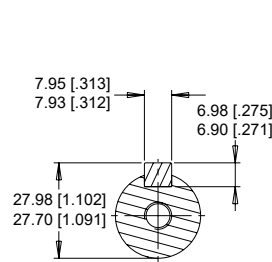
**15** 1" Straight Extended



Max. Torque: 655 Nm [5800 lb-in]

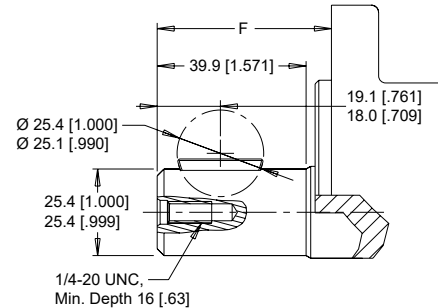
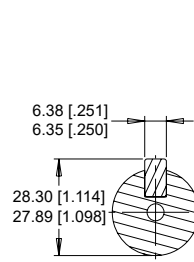
**12** 25mm Straight

**16** 25mm Straight Extended



Max. Torque: 655 Nm [5800 lb-in]

**B1** 1" Straight, Woodruff Key



Max. Torque: 655 Nm [5800 lb-in]

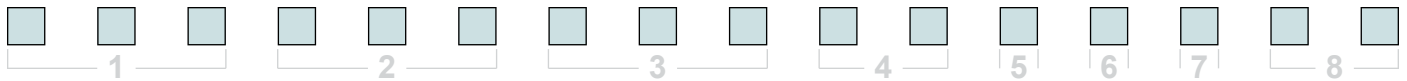
**MOUNTING / SHAFT LENGTH CHART**

Dimension F is the overall distance from the motor mounting surface to the end of the shaft.

Additional shaft length information, if necessary, is noted as F<sub>2</sub> and does not increase or decrease the listed F dimensions in this chart. The overall shaft lengths are already factored into the overall distance from the mounting surface to the end of the shaft.

F	3mm Pilot	8mm Pilot	F <sub>2</sub>
#	mm [in]	mm [in]	mm [in]
01	43.3 [1.705]	48.3 [1.902]	N/A
02	45.3 [1.783]	50.3 [1.980]	N/A
04	45.3 [1.783]	50.3 [1.980]	N/A
05	45.3 [1.783]	50.3 [1.980]	39.2 [1.543]
10	45.3 [1.783]	50.3 [1.980]	39.2 [1.543]
12	50.3 [1.980]	55.3 [2.177]	44.2 [1.740]
15	62.1 [2.445]	67.1 [2.642]	56.0 [2.205]
16	62.6 [2.464]	67.6 [2.661]	56.5 [2.225]
53	45.3 [1.783]	50.3 [1.980]	39.2 [1.543]
66	50.3 [1.980]	55.3 [2.177]	44.2 [1.740]
B1	45.3 [1.783]	50.3 [1.980]	N/A

**ORDERING INFORMATION**



**1. CHOOSE SERIES DESIGNATION**

<b>155</b> Standard Rotation	<b>156</b> Reverse Rotation
------------------------------	-----------------------------

► The 155 & 156 series are bi-directional.

**2. SELECT A DISPLACEMENT OPTION**

<b>025</b> 25 cm <sup>3</sup> /rev [1.5 in <sup>3</sup> /rev]	<b>125</b> 125 cm <sup>3</sup> /rev [7.6 in <sup>3</sup> /rev]
<b>032</b> 32 cm <sup>3</sup> /rev [2.0 in <sup>3</sup> /rev]	<b>160</b> 154 cm <sup>3</sup> /rev [9.4 in <sup>3</sup> /rev]
<b>040</b> 40 cm <sup>3</sup> /rev [2.5 in <sup>3</sup> /rev]	<b>200</b> 190 cm <sup>3</sup> /rev [11.6 in <sup>3</sup> /rev]
<b>050</b> 50 cm <sup>3</sup> /rev [3.0 in <sup>3</sup> /rev]	<b>250</b> 240 cm <sup>3</sup> /rev [14.6 in <sup>3</sup> /rev]
<b>060</b> 59 cm <sup>3</sup> /rev [3.6 in <sup>3</sup> /rev]	<b>315</b> 303 cm <sup>3</sup> /rev [18.5 in <sup>3</sup> /rev]
<b>080</b> 78 cm <sup>3</sup> /rev [4.8 in <sup>3</sup> /rev]	<b>400</b> 388 cm <sup>3</sup> /rev [23.7 in <sup>3</sup> /rev]
<b>100</b> 96 cm <sup>3</sup> /rev [5.9 in <sup>3</sup> /rev]	

**3. SELECT A MOUNT & PORT OPTION**

<b>A06</b> 2-Hole, SAE A Mount, Aligned End Ports, 3/4-16 UNF
<b>A08</b> 2-Hole, SAE A Mount, Aligned End Ports, G 1/2
<b>AP6</b> 2-Hole, SAE A Mount, Aligned End Ports, 3/4-16 UNF (TP)
<b>AP8</b> 2-Hole, SAE A Mount, Aligned End Ports, G 1/2 (TP)
<b>A10</b> 2-Hole, SAE A Mount, Aligned Ports, 1/2-14 NPT
<b>A11</b> 2-Hole, SAE A Mount, Aligned Ports, 7/8-14 UNF
<b>A12</b> 2-Hole, SAE A Mount, Offset Ports, G 1/2
<b>A13</b> 2-Hole, SAE A Mount, Offset Manifold Ports, G 1/2
<b>A17</b> 2-Hole, SAE A Mount, Aligned Manifold Ports, 1/2" Drilled
<b>A18</b> 2-Hole, SAE A Mount, Aligned Ports, G 1/2
<b>A19</b> 2-Hole, SAE A Mount, Offset Ports, Valve Cavity 7/8-14 UNF
<b>A30</b> 4-Hole, Magneto Mount, Aligned Ports, 1/2-14 NPT
<b>A31</b> 4-Hole, Magneto Mount, Aligned Ports, 7/8-14 UNF
<b>A32</b> 4-Hole, Magneto Mount, Offset Ports, G 1/2
<b>A37</b> 4-Hole, Magneto Mount, Aligned Manifold Ports, 1/2" Drilled
<b>A39</b> 4-Hole, Magneto Mount, Offset Ports, Valve Cavity 7/8-14 UNF
<b>A3D</b> 4-Hole, Magneto Mount, Offset Manifold Ports, 7/8-14 UNF
<b>A62</b> 2-Hole, SAE A Mount, Offset Ports, G 1/2 (TP)
<b>A63</b> 2-Hole, SAE A Mount, Offset Manifold Ports, G 1/2 (TP)
<b>A68</b> 2-Hole, SAE A Mount, Aligned Ports, G 1/2 (TP)
<b>A69</b> 2-Hole, SAE A Mount, Offset Ports, 7/8-14 UNF (TP)
<b>AC2</b> 4-Hole, Magneto Mount, Offset Ports, G 1/2 (TP)
<b>AC3</b> 4-Hole, Magneto Mount, Offset Manifold Ports, G 1/2 (TP)
<b>AC7</b> 4-Hole, Magneto Mount, Aligned Manifold Ports, 1/2" Drilled (TP)

► (TP) - Tall pilot. Speed sensor option is not available on tall pilot housings.

**3. SELECT A MOUNT & PORT OPTION**

<b>AC8</b> 4-Hole, Magneto Mount, Aligned Ports, G 1/2 (TP)
<b>F21</b> 4-Hole, Square Mount, Aligned End Ports, 7/8-14 UNF
<b>F26</b> 4-Hole, Square Mount, Aligned End Ports, 3/4-16 UNF
<b>F30</b> 4-Hole, Square Mount, Aligned Ports, 1/2-14 NPT
<b>F31</b> 4-Hole, Square Mount, Aligned Ports, 7/8-14 UNF
<b>F37</b> 4-Hole, Square Mount, Aligned Manifold Ports, 1/2" Drilled
<b>F38</b> 4-Hole, Square Mount, Aligned Ports, G 1/2
<b>G17</b> 2-Hole, SAE A Mount, Aligned Manifold Ports, 1/2" Drilled
<b>G24</b> 4-Hole, Square Mount, Aligned End Ports, M22 x 1.5
<b>G28</b> 4-Hole, Square Mount, Aligned End Ports, G 1/2

**4. SELECT A SHAFT OPTION**

<b>01</b> 7/8" 13 Tooth Spline	<b>15</b> 1" Straight Extended
<b>02</b> 1" 6B Spline, 1/4-20 Tap	<b>16</b> 25mm Straight Extended
<b>04</b> 1" 6B Spline, M8x1.25 Tap	<b>53</b> 1" - 10.3 [.406] Pinhole
<b>05</b> 1" - 9.5 [.375] Pinhole	<b>66</b> 1" - 8.0 [.315] Pinhole
<b>10</b> 1" Straight	<b>B1</b> 1" Straight, Woodruff Key
<b>12</b> 25mm Straight	<b>F3</b> 1" 6B Spline, M8x1.25 Tap

► The 15 & 16 extended shafts are designed for use with one of the speed sensor options listed in STEP 7.

**5. SELECT A PAINT OPTION**

<b>A</b> Black
<b>B</b> Black, Unpainted Mounting Surface

**6. SELECT A VALVE CAVITY / CARTRIDGE OPTION**

<b>A</b> None	<b>E</b> 104 bar [1500 psi] Relief
<b>B</b> Valve Cavity Only	<b>F</b> 121 bar [1750 psi] Relief
<b>C</b> 69 bar [1000 psi] Relief	<b>G</b> 138 bar [2000 psi] Relief
<b>D</b> 86 bar [1250 psi] Relief	<b>J</b> 173 bar [2500 psi] Relief

► Valve cavity is only available on the A19, A39 & AC2 housings.

**7. SELECT AN ADD-ON OPTION**

<b>A</b> Standard
<b>B</b> Lock Nut
<b>C</b> Solid Hex Nut
<b>W</b> Speed Sensor, Dual, 4-Pin Male Weatherpack Connector
<b>X</b> Speed Sensor, Dual, 4-Pin M12 Male Connector
<b>Y</b> Speed Sensor, Single, 3-Pin Male Weatherpack Connector
<b>Z</b> Speed Sensor, Single, 4-Pin M12 Male Connector

**8. SELECT A MISCELLANEOUS OPTION**

<b>AA</b> None	<b>DS</b> Groove In Mounting Flange
<b>AC</b> Freeturning Rotor	<b>FB</b> No Check Valves Installed
<b>BE</b> Slinger Seal	

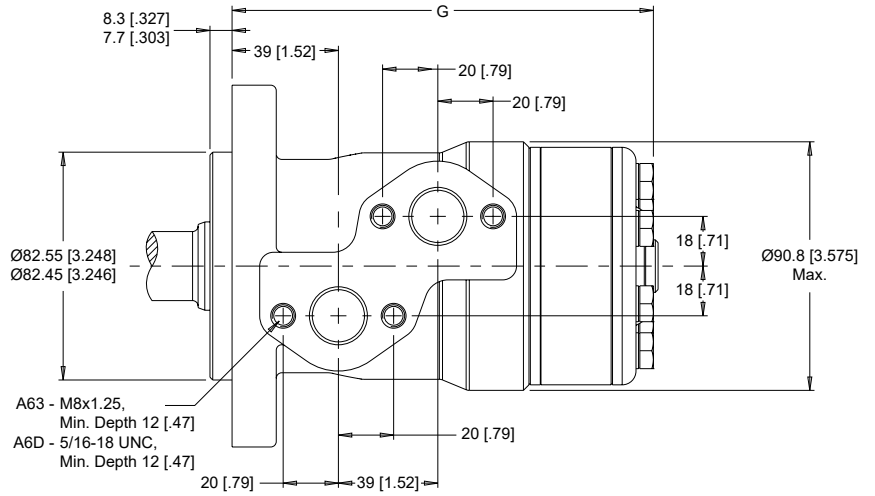
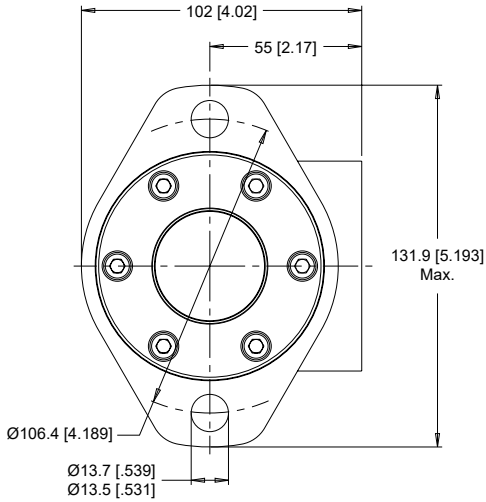
**HOUSINGS**

► Dimensions shown are without paint. Paint thickness can be up to 0.13 [.005].

**2-HOLE, SAE A MOUNT, OFFSET MANIFOLD PORTS**

**A63** G 1/2

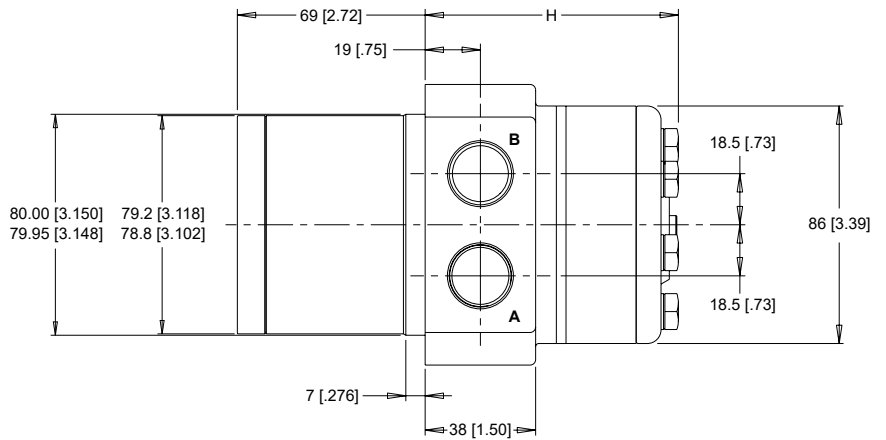
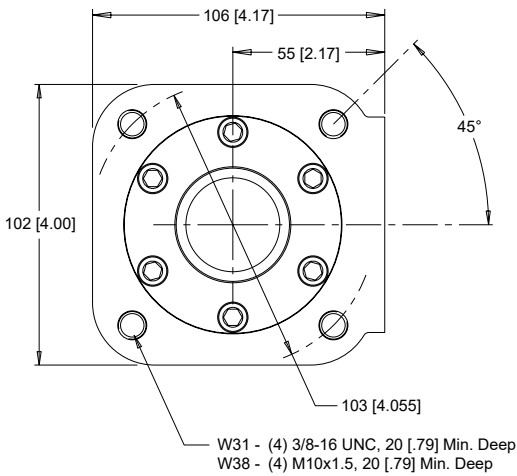
**A6D** 7/8-14 UNF



**4-HOLE, WHEEL MOUNT, ALIGNED PORTS**

**W31** 7/8-14 UNF

**W38** G 1/2



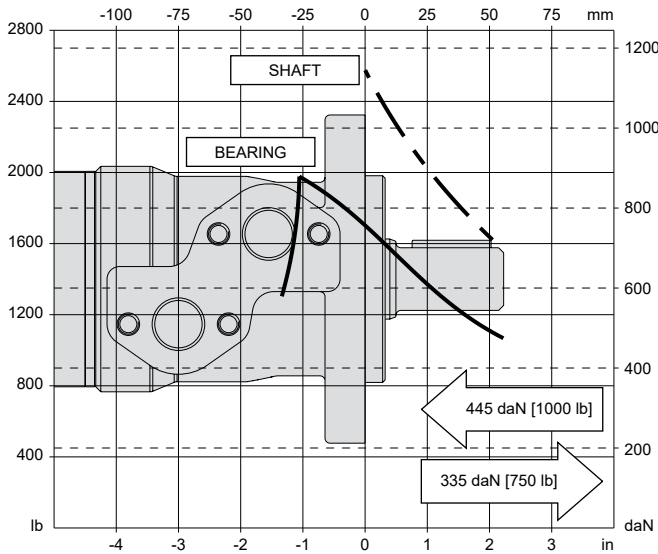
► Dimensions G & H are charted on page 44.

**TECHNICAL INFORMATION**

**ALLOWABLE SHAFT LOAD / BEARING CURVE**

The bearing curve represents allowable bearing loads based on ISO 281 bearing capacity for an  $L_{10}$  life of 2,000 hours at 100 rpm. Radial loads for speeds other than 100 rpm may be calculated using the multiplication factor table on page 7.

**SAE A MOUNT**

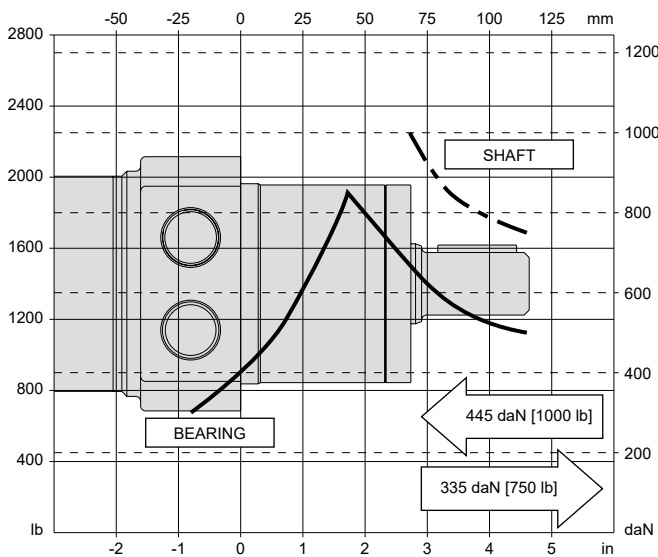


**LENGTH & WEIGHT CHART**

Dimension G is the overall motor length from the rear of the motor to the mounting flange surface.

G	Length	Weight
#	mm [in]	kg [lb]
025	133 [5.24]	6.0 [13.3]
032	134 [5.28]	6.1 [13.4]
040	136 [5.33]	6.1 [13.5]
050	136 [5.33]	6.1 [13.5]
060	137 [5.39]	6.2 [13.6]
080	139 [5.48]	6.2 [13.6]
100	142 [5.59]	6.3 [13.9]
125	146 [5.74]	6.4 [14.2]
160	150 [5.89]	6.6 [14.5]
200	155 [6.09]	6.7 [14.9]
250	161 [6.35]	7.0 [15.3]
315	170 [6.69]	7.2 [15.9]
400	181 [7.13]	7.6 [16.8]

**WHEEL MOUNT**



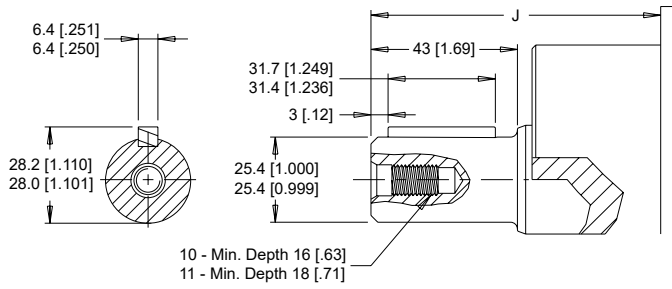
**LENGTH & WEIGHT CHART**

Dimension H is the overall motor length from the rear of the motor to the mounting flange surface.

H	Length	Weight
#	mm [in]	kg [lb]
025	72 [2.83]	6.4 [14.1]
032	73 [2.87]	6.5 [14.4]
040	75 [2.95]	6.6 [14.5]
050	75 [2.95]	6.6 [14.5]
060	76 [2.99]	6.7 [14.8]
080	78 [3.07]	6.8 [15.0]
100	81 [3.19]	6.9 [15.2]
125	85 [3.35]	7.0 [15.5]
160	89 [3.50]	7.1 [15.6]
200	94 [3.70]	7.2 [15.9]
250	100 [3.94]	7.4 [16.4]
315	109 [4.29]	7.7 [17.0]
400	120 [4.72]	8.1 [17.8]

**SHAFTS**

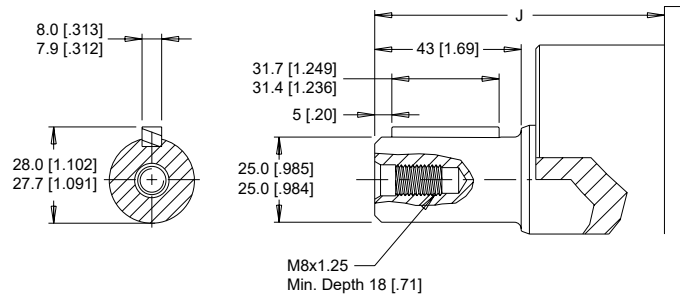
**10** 1" Straight, 1/4-20 Tap



Max. Torque: 655 Nm [5800 lb-in]

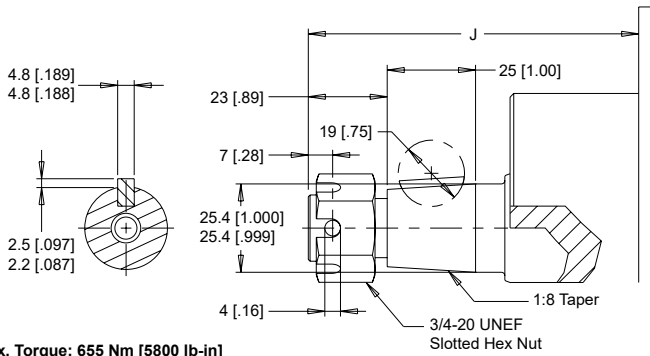
**11** 1" Straight, M8x1.25 Tap

**12** 25mm Straight



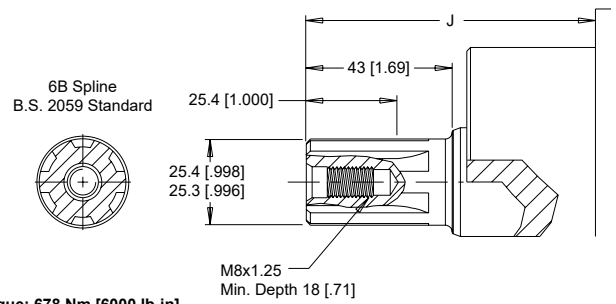
Max. Torque: 655 Nm [5800 lb-in]

**13** 1" Tapered



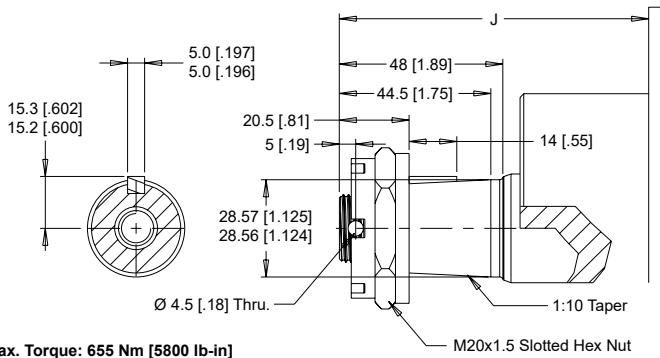
Max. Torque: 655 Nm [5800 lb-in]

**F3** 1" 6B Spline



Max. Torque: 678 Nm [6000 lb-in]

**N9** 28.5mm Tapered



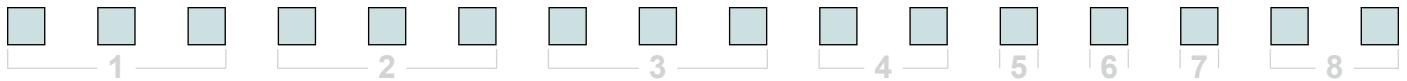
Max. Torque: 655 Nm [5800 lb-in]

**MOUNTING / SHAFT LENGTH CHART**

Dimension J is the overall distance from the motor mounting surface to the end of the shaft.

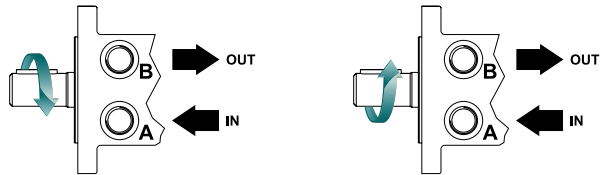
J #	SAE A Mounts mm [in]	Wheel Mounts mm [in]
10	55 [2.18]	116 [4.57]
11	55 [2.18]	116 [4.57]
12	55 [2.18]	116 [4.57]
13	66 [2.60]	127 [5.00]
F3	55 [2.18]	116 [4.57]
N9	58 [2.29]	119 [4.69]

**ORDERING INFORMATION**



**1. CHOOSE SERIES DESIGNATION**

- 157** Clockwise Rotation
- 158** Counterclockwise Rotation



► The 157 & 158 series are bi-directional. Reversing the inlet hose will reverse shaft rotation.

**2. SELECT A DISPLACEMENT OPTION**

<b>025</b>	25 cm <sup>3</sup> /rev [1.5 in <sup>3</sup> /rev]	<b>125</b>	125 cm <sup>3</sup> /rev [7.6 in <sup>3</sup> /rev]
<b>032</b>	32 cm <sup>3</sup> /rev [2.0 in <sup>3</sup> /rev]	<b>160</b>	154 cm <sup>3</sup> /rev [9.4 in <sup>3</sup> /rev]
<b>040</b>	40 cm <sup>3</sup> /rev [2.5 in <sup>3</sup> /rev]	<b>200</b>	190 cm <sup>3</sup> /rev [11.6 in <sup>3</sup> /rev]
<b>050</b>	50 cm <sup>3</sup> /rev [3.0 in <sup>3</sup> /rev]	<b>250</b>	240 cm <sup>3</sup> /rev [14.6 in <sup>3</sup> /rev]
<b>060</b>	59 cm <sup>3</sup> /rev [3.6 in <sup>3</sup> /rev]	<b>315</b>	303 cm <sup>3</sup> /rev [18.5 in <sup>3</sup> /rev]
<b>080</b>	78 cm <sup>3</sup> /rev [4.8 in <sup>3</sup> /rev]	<b>400</b>	388 cm <sup>3</sup> /rev [23.7 in <sup>3</sup> /rev]
<b>100</b>	96 cm <sup>3</sup> /rev [5.9 in <sup>3</sup> /rev]		

**3. SELECT A MOUNT & PORT OPTION**

<b>A63</b>	2-Hole, SAE A Mount, Offset Manifold Ports, G 1/2
<b>A6D</b>	2-Hole, SAE A Mount, Offset Manifold Ports, 7/8-14 UNF
<b>W31</b>	4-Hole, Wheel Mount, Aligned Ports, 7/8-14 UNF
<b>W38</b>	4-Hole, Wheel Mount, Aligned Ports, G 1/2

**4. SELECT A SHAFT OPTION**

<b>10</b>	1" Straight, 1/4-20 Tap	<b>13</b>	1" Tapered
<b>11</b>	1" Straight, M8x1.25 Tap	<b>F3</b>	1" 6B Spline
<b>12</b>	25mm Straight	<b>N9</b>	28.5mm Tapered

**5. SELECT A PAINT OPTION**

<b>A</b>	Black
<b>B</b>	Black, Unpainted Mounting Surface

**6. SELECT A VALVE CAVITY / CARTRIDGE OPTION**

<b>A</b>	None
----------	------

**7. SELECT AN ADD-ON OPTION**

<b>A</b>	Standard
----------	----------

**8. SELECT A MISCELLANEOUS OPTION**

<b>AA</b>	None
<b>AC</b>	Freeturning Rotor

**OVERVIEW**

The WR Series motors incorporate the latest advances for smooth performance, efficiency and durability. Featuring an optimized rotor geometry with seven precision rollers to eliminate sliding friction and provide rolling contact between the rotor and stator, thus increasing motor efficiency. A three-zone spool valve, integral check valves and a provision for a case drain reduce pressure on internal seals to improve product life. A wide variety of mounting, shaft, motor displacement and porting options are available to meet all application needs.

**FEATURES / BENEFITS**

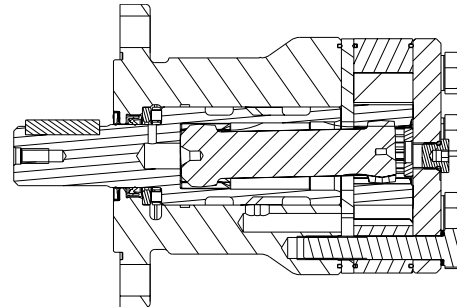
- A variety of mounts and shafts provides flexibility in application design.
- A high-pressure shaft seal offers superior seal life and performance.
- The spool valve design gives superior performance and smooth operation over a wide speed and torque range.
- Built-in check valves (not shown) in the housing offer versatility and increased seal life.
- Optimized rotor geometry provides a smooth running and highly efficient product.

**TYPICAL APPLICATIONS**

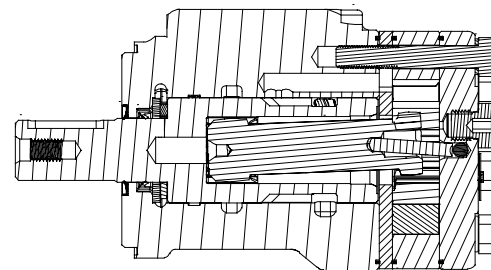
conveyors, carwashes, positioners, light-duty wheel drives, sweepers, food processing, grain augers, spreaders, feed rollers, screw drives, brush drives and more

**SERIES DESCRIPTIONS**

**251/252** - Hydraulic Motor  
Standard



**255/256** - Hydraulic Motor  
Standard



**SPECIFICATIONS**

CODE	Displacement cm <sup>3</sup> [in <sup>3</sup> /rev]	Max. Speed rpm		Max. Flow lpm [gpm]		Max. Torque Nm [lb-in]		Max. Pressure bar [psi]		
		cont.	inter.	cont.	inter.	cont.	inter.	cont.	inter.	peak
040	40 [2.5]	1116	1515	45 [12]	61 [16]	93 [823]	123 [1088]	155 [2250]	207 [3000]	224 [3250]
050	50 [3.1]	1058	1220	53 [14]	61 [16]	111 [982]	149 [1319]	155 [2250]	207 [3000]	224 [3250]
060	59 [3.6]	890	1142	53 [14]	68 [18]	138 [1221]	172 [1522]	155 [2250]	207 [3000]	224 [3250]
070	71 [4.3]	865	1078	61 [16]	76 [20]	176 [1558]	207 [1832]	172 [2500]	207 [3000]	241 [3500]
080	79 [4.9]	759	957	61 [16]	76 [20]	202 [1788]	243 [2150]	172 [2500]	207 [3000]	241 [3500]
090	88 [5.4]	691	864	61 [16]	76 [20]	222 [1965]	263 [2327]	172 [2500]	207 [3000]	241 [3500]
100	100 [6.1]	610	760	61 [16]	76 [20]	246 [2177]	289 [2558]	172 [2500]	207 [3000]	241 [3500]
115	113 [6.9]	539	672	61 [16]	76 [20]	284 [2513]	327 [2894]	172 [2500]	207 [3000]	241 [3500]
130	129 [7.9]	472	588	61 [16]	76 [20]	316 [2797]	375 [3319]	172 [2500]	207 [3000]	241 [3500]
160	160 [9.8]	379	469	61 [16]	76 [20]	400 [3540]	454 [4018]	172 [2500]	207 [3000]	241 [3500]
200	198 [12.1]	308	384	61 [16]	76 [20]	462 [4088]	544 [4814]	172 [2500]	207 [3000]	241 [3500]
240	236 [14.4]	249	315	61 [16]	76 [20]	548 [4850]	642 [5682]	172 [2500]	207 [3000]	224 [3250]
250	250 [15.3]	250	300	61 [16]	76 [20]	561 [4965]	624 [5522]	172 [2500]	207 [3000]	224 [3250]
290	291 [17.8]	210	256	61 [16]	76 [20]	526 [4655]	664 [5876]	138 [2000]	190 [2750]	207 [3000]
320	322 [19.6]	188	235	61 [16]	76 [20]	518 [4584]	690 [6106]	121 [1750]	172 [2500]	190 [2750]
400	400 [24.4]	152	190	61 [16]	76 [20]	551 [4873]	698 [6177]	104 [1500]	138 [2000]	155 [2250]

► Performance data is typical. Performance of production units varies slightly from one motor to another. Running at intermittent ratings should not exceed 10% of every minute of operation.

**DISPLACEMENT PERFORMANCE**

		Pressure - bar [psi]										Max. Cont.	Max. Inter.	
<b>040</b>		17 [250]	35 [500]	52 [750]	69 [1000]	86 [1250]	104 [1500]	121 [1750]	138 [2000]	155 [2250]	172 [2500]	207 [3000]		
40 cm <sup>3</sup> [2.5 in <sup>3</sup> ] / rev		Torque - Nm [lb-in], Speed rpm										Intermittent Ratings - 10% of Operation		
Flow - lpm [gpm]	2 [0.5]	9 [80] 43	20 [177] 40	32 [283] 35	40 [354] 29	37 [327] 24								50
	4 [1]	10 [88] 95	21 [186] 91	30 [265] 82	42 [372] 73	52 [460] 62	62 [549] 51							100
	8 [2]	9 [80] 188	19 [168] 180	28 [248] 170	41 [363] 160	51 [451] 144	64 [566] 137	72 [637] 126	79 [699] 115	89 [788] 102	99 [876] 88			199
	15 [4]	7 [62] 365	18 [159] 355	27 [239] 343	40 [354] 324	49 [434] 312	62 [549] 295	73 [646] 293	83 [735] 275	93 [823] 257	102 [903] 237	121 [1071] 198		373
	23 [6]	6 [53] 560	17 [150] 548	26 [230] 532	39 [345] 515	48 [425] 502	61 [540] 485	70 [619] 471	82 [726] 451	90 [796] 432	101 [894] 444	122 [1080] 398		572
	30 [8]	6 [53] 728	16 [142] 716	25 [221] 706	37 [327] 684	47 [416] 667	59 [522] 648	68 [602] 634	81 [717] 629	88 [779] 618	99 [876] 601	123 [1088] 545		746
	38 [10]	5 [44] 942	14 [124] 936	22 [195] 927	35 [310] 918	45 [398] 904	57 [504] 890	68 [602] 874	78 [690] 852	86 [761] 835	97 [858] 812	118 [1044] 743		945
	45 [12]	3 [27] 1116	13 [115] 1113	21 [186] 1100	34 [301] 1082	43 [381] 1056	55 [487] 1028	67 [593] 1004	77 [681] 976	84 [743] 952	95 [841] 916	116 [1027] 870		1119
	53 [14]		10 [88] 1316	20 [177] 1301	31 [274] 1278	39 [345] 1253	52 [460] 1230	63 [558] 1206	75 [664] 1184	82 [726] 1154	93 [823] 1116	115 [1018] 1078		1318
	61 [16]		8 [71] 1515	19 [168] 1497	29 [257] 1469	38 [336] 1442	49 [434] 1415	60 [531] 1399	74 [655] 1378	80 [708] 1355	90 [796] 1330	113 [1000] 1298		1517
Max. Cont.														
Max. Inter.														
<b>Rotor Width</b>		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input checked="" type="checkbox"/>												
8.1 [3.17]		Theoretical Torque - Nm [lb-in]												
mm [in]		11 [97]	22 [195]	34 [301]	45 [398]	56 [496]	67 [593]	78 [690]	90 [796]	101 [894]	112 [991]	132 [1167]		
		Displacement tested at 54°C [129°F] with an oil viscosity of 46cSt [213 SUS]												

		Pressure - bar [psi]										Max. Cont.	Max. Inter.	
<b>050</b>		17 [250]	35 [500]	52 [750]	69 [1000]	86 [1250]	104 [1500]	121 [1750]	138 [2000]	155 [2250]	172 [2500]	207 [3000]		
50 cm <sup>3</sup> [3.1 in <sup>3</sup> ] / rev		Torque - Nm [lb-in], Speed rpm										Intermittent Ratings - 10% of Operation		
Flow - lpm [gpm]	4 [1]	11 [97] 77	24 [212] 75	37 [327] 74	49 [434] 69	61 [540] 63	74 [655] 52	82 [726] 41	91 [805] 36					80
	8 [2]	11 [97] 155	24 [212] 152	36 [319] 150	49 [434] 142	62 [548] 132	75 [664] 124	88 [779] 107	99 [876] 91	107 [947] 82				160
	15 [4]	9 [80] 295	23 [204] 291	36 [319] 283	49 [434] 272	62 [548] 267	75 [664] 248	88 [779] 231	99 [876] 215	110 [973] 199	123 [1088] 182	147 [1301] 164		300
	23 [6]	7 [62] 452	22 [195] 447	35 [310] 434	47 [416] 430	61 [540] 416	74 [655] 402	87 [770] 385	99 [876] 368	111 982] 346	124 [1097] 324	149 [1319] 300		460
	30 [8]	5 [44] 594	21 [186] 589	34 [301] 577	45 [398] 566	60 [531] 546	74 [655] 528	86 [761] 509	99 [876] 489	111 [982] 468	125 [1106] 448	148 [1310] 426		600
	38 [10]	3 [27] 754	19 [168] 749	32 [283] 736	45 [398] 728	57 [504] 716	70 [619] 699	82 [726] 680	95 [841] 664	107 [947] 644	120 [1062] 624	142 [1257] 600		760
	45 [12]	2 [18] 896	17 [150] 892	30 [265] 875	43 [381] 873	55 [487] 861	68 [602] 843	80 [708] 827	92 [814] 812	105 [929] 794	116 [1027] 776	138 [1221] 752		900
	53 [14]		14 [124] 1058	27 [239] 1055	39 [345] 1052	51 [451] 1036	64 [566] 998	76 [673] 988	88 [779] 960	100 [885] 972	112 [991] 904	134 [1186] 860		1060
	61 [16]		11 [97] 1220	24 [212] 1216	35 [310] 1212	47 [416] 1210	60 [531] 1198	72 [637] 1160	84 [743] 1130	96 [850] 1112	108 [956] 1080	130 [1150] 1032		1220
	Max. Cont.													
Max. Inter.														
<b>Rotor Width</b>		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input checked="" type="checkbox"/>												
9.9 [3.89]		Theoretical Torque - Nm [lb-in]												
mm [in]		14 [122]	27 [195]	41 [301]	55 [398]	69 [496]	82 [593]	96 [690]	110 [796]	124 [894]	137 [1215]	165 [1458]		
		Displacement tested at 54°C [129°F] with an oil viscosity of 46cSt [213 SUS]												

► Performance data is typical. Performance of production units varies slightly from one motor to another. Operating at maximum continuous pressure and maximum continuous low simultaneously is not recommended. For additional information on product testing please refer to page 6.



**DISPLACEMENT PERFORMANCE**

		Pressure - bar [psi]								Max. Cont.	Max. Inter.			
<b>060</b>		17 [250]	35 [500]	52 [750]	69 [1000]	86 [1250]	104 [1500]	121 [1750]	138 [2000]	155 [2250]	172 [2500]	207 [3000]		
59 cm <sup>3</sup> [3.6 in <sup>3</sup> ] / rev												<b>Intermittent Ratings - 10% of Operation</b>		
Flow - lpm [gpm]	2 [0.5]	12 [106] 28	26 [230] 22	34 [301] 15	45 [398] 12									34
	4 [1]	13 [115] 60	29 [257] 56	42 [372] 50	56 [496] 44	62 [549] 33	68 [602] 16							67
	8 [2]	14 [124] 134	31 [274] 129	46 [407] 125	58 [513] 118	74 [655] 113	94 [832] 107	110 [974] 97	121 [1071] 87	137 [1212] 73	148 [1310] 58	168 [1487] 50		135
	15 [4]	12 [106] 250	30 [266] 245	45 [398] 240	60 [531] 232	75 [664] 225	95 [841] 217	108 [956] 208	122 [1080] 198	138 [1221] 185	150 [1328] 174	170 [1505] 168		253
	23 [6]	11 [97] 384	30 [266] 380	44 [389] 376	59 [522] 370	74 [655] 364	93 [823] 356	106 [938] 345	124 [1097] 331	138 [1221] 318	152 [1345] 307	172 [1522] 298		387
	30 [8]	10 [89] 502	29 [257] 496	43 [381] 494	58 [513] 490	72 [637] 485	92 [814] 478	104 [920] 468	123 [1089] 460	135 [1195] 450	148 [1310] 438	170 [1505] 431		505
	38 [10]	9 [80] 635	28 [248] 632	42 [372] 629	55 [487] 628	70 [620] 619	90 [797] 611	102 [903] 598	121 [1071] 589	133 [1177] 578	146 [1292] 561	168 [1487] 513		640
	45 [12]	8 [71] 755	24 [212] 748	39 [345] 745	52 [460] 741	69 [611] 735	87 [770] 729	100 [885] 718	118 [1044] 705	130 [1151] 688	145 [1283] 676	164 [1451] 659		758
	53 [14]	6 [53] 890	23 [204] 888	38 [336] 884	48 [425] 880	65 [575] 874	84 [743] 865	98 [867] 852	114 [1009] 840	127 [1124] 831	138 [1221] 820	162 [1434] 802		892
	61 [16]		17 [150] 1021	29 [257] 1018	44 [389] 1011	62 [549] 1007	78 [690] 1000	90 [797] 993	106 [938] 984	121 [1071] 974	136 [1204] 962	160 [1416] 956		1026
68 [18]		10 [89] 1142	26 [230] 1140	40 [354] 1129	57 [504] 1112	73 [646] 1097	86 [761] 1085	102 [903] 1074	115 [1018] 1060	130 [1151] 1044	158 [1398] 1020		1145	
Max. Cont.														
Max. Inter.														
<b>Rotor Width</b>		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input type="checkbox"/>												
Theoretical Torque - Nm [lb-in]		Theoretical Torque - Nm [lb-in]												
11.8 [463]		16 [142]	33 [292]	49 [434]	65 [575]	81 [717]	98 [867]	114 [1009]	131 [1150]	147 [1292]	164 [1442]	179 [1584]		
mm [in]		Displacement tested at 54°C [129°F] with an oil viscosity of 46cSt [213 SUS]												

		Pressure - bar [psi]								Max. Cont.	Max. Inter.			
<b>070</b>		17 [250]	35 [500]	69 [1000]	86 [1250]	104 [1500]	121 [1750]	138 [2000]	155 [2250]	172 [2500]	190 [2750]	207 [3000]		
71 cm <sup>3</sup> [4.3 in <sup>3</sup> ] / rev												<b>Intermittent Ratings - 10% of Operation</b>		
Flow - lpm [gpm]	2 [0.5]	13 [115] 26	30 [266] 23											28
	4 [1]	14 [124] 55	32 [283] 50	66 [584] 40	73 [646] 34									57
	8 [2]	16 [142] 112	34 [301] 106	70 [620] 94	88 [779] 89	104 [920] 81	120 [1062] 73	134 [1186] 66	149 [1319] 51					113
	15 [4]	15 [133] 211	33 [292] 206	71 [628] 194	87 [770] 186	107 [947] 178	123 [1089] 172	139 [1230] 163	158 [1398] 152	171 [1513] 143	196 [1735] 125	211 [1867] 110		213
	23 [6]	14 [124] 324	31 [274] 319	66 [584] 306	83 [735] 298	104 [920] 288	124 [1097] 280	138 [1221] 270	157 [1389] 260	176 [1558] 248	192 [1699] 232	207 [1832] 221		326
	30 [8]	13 [115] 425	30 [266] 418	67 [593] 403	84 [743] 394	104 [920] 386	123 [1089] 376	137 [1212] 364	159 [1407] 350	174 [1540] 339	193 [1708] 326	203 [1797] 312		426
	38 [10]	10 [89] 539	29 [257] 537	65 [575] 529	82 [726] 520	103 [903] 508	115 [1018] 500	135 [1195] 486	152 [1345] 474	172 [1522] 458	186 [1646] 440	204 [1805] 425		539
	45 [12]	7 [62] 638	25 [221] 634	63 [558] 622	82 [726] 614	98 [867] 604	117 [1035] 594	132 [1168] 578	152 [1345] 566	169 [1496] 552	189 [1673] 538	199 [1761] 522		638
	53 [14]	5 [44] 752	21 [186] 751	58 [513] 743	75 [664] 736	94 [832] 728	115 [1018] 718	131 [1159] 705	147 [1301] 690	167 [1478] 675	187 [1655] 650	204 [1805] 630		752
	61 [16]		17 [150] 865	54 [478] 854	73 [646] 843	91 [805] 831	107 [947] 818	128 [1133] 807	143 [1266] 795	160 [1416] 782	177 [1566] 766	194 [1717] 750		865
68 [18]		16 [142] 965	48 [425] 960	70 [620] 956	88 [779] 945	106 [938] 932	122 [1080] 920	139 [1230] 902	156 [1381] 888	173 [1531] 876	191 [1690] 850		965	
76 [20]		12 [106] 1078	47 [416] 1070	65 [575] 1062	81 [717] 1048	100 [885] 1036	118 [1044] 1014	138 [1221] 1000	152 [1345] 988	173 [1531] 960	189 [1673] 944		1078	
Max. Cont.														
Max. Inter.														
<b>Rotor Width</b>		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input type="checkbox"/>												
Theoretical Torque - Nm [lb-in]		Theoretical Torque - Nm [lb-in]												
13.8 [542]		19 [169]	39 [348]	77 [685]	97 [854]	117 [1033]	136 [1202]	155 [1371]	174 [1540]	194 [1719]	213 [1888]	232 [2056]		
mm [in]		Displacement tested at 54°C [129°F] with an oil viscosity of 46cSt [213 SUS]												

► Performance data is typical. Performance of production units varies slightly from one motor to another. Operating at maximum continuous pressure and maximum continuous low simultaneously is not recommended. For additional information on product testing please refer to page 6.

**DISPLACEMENT PERFORMANCE**

		Pressure - bar [psi]										Max. Cont.	Max. Inter.	
<b>080</b>		17 [250]	35 [500]	69 [1000]	86 [1250]	104 [1500]	121 [1750]	138 [2000]	155 [2250]	172 [2500]	190 [2750]	207 [3000]		
79 cm <sup>3</sup> [4.9 in <sup>3</sup> ] / rev		Torque - Nm [lb-in], Speed rpm										Intermittent Ratings - 10% of Operation		
Flow - lpm [gpm]	4 [1]	18 [159] 49	38 [336] 46	77 [681] 41	94 [832] 40									50
	8 [2]	18 [159] 99	39 [345] 98	76 [673] 89	98 [867] 83	120 [1062] 74	141 [1248] 68	159 [1407] 59	174 [1540] 50					100
	15 [4]	17 [150] 189	38 [336] 187	76 [673] 177	98 [867] 170	120 [1062] 161	141 [1248] 151	160 [1416] 144	180 [1593] 131	199 [1761] 122	220 [1947] 112	240 [2124] 100	190	
	23 [6]	17 [150] 290	37 [327] 286	79 [690] 274	97 [858] 268	119 [1053] 259	140 [1239] 250	160 [1416] 240	182 [1611] 227	202 [1788] 214	222 [1965] 200	243 [2150] 185	291	
	30 [8]	14 [124] 374	35 [310] 368	75 [664] 357	96 [850] 349	117 [1035] 339	138 [1221] 330	159 [1407] 321	181 [1602] 307	200 [1770] 296	220 [1947] 284	241 [2133] 268	380	
	38 [10]	11 [97] 480	34 [301] 475	73 [646] 464	94 [832] 453	116 [1027] 442	138 [1221] 433	158 [1398] 423	177 [1566] 412	199 [1761] 398	218 [1929] 383	238 [2106] 370	481	
	45 [12]	8 [71] 568	31 [274] 562	72 [637] 548	93 [823] 543	114 [1009] 532	135 [1195] 525	155 [1372] 515	176 [1558] 501	196 [1735] 486	215 [1903] 472	235 [2080] 458	570	
	53 [14]	5 [44] 668	28 [248] 663	69 [611] 649	90 [796] 642	111 [982] 632	133 [1177] 624	152 [1345] 620	172 [1522] 600	193 [1708] 585	212 [1876] 570	232 [2053] 554	671	
	61 [16]		24 [212] 759	65 [575] 752	85 [752] 747	109 [965] 731	129 [1142] 722	148 [1310] 710	168 [1487] 703	187 [1655] 689	208 [1841] 675	228 [2018] 660	772	
	68 [18]		21 [186] 855	61 [540] 848	81 [717] 842	105 [929] 828	125 [1106] 818	143 [1265] 807	164 [1451] 800	182 [1611] 789	204 [1805] 776	223 [1973] 760	861	
76 [20]		18 [159] 957	56 [496] 952	76 [673] 944	100 [885] 932	120 [1062] 923	138 [1221] 912	159 [1407] 900	178 [1575] 886	199 [1761] 872	218 [1929] 858	962		
<b>Rotor Width</b>		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input checked="" type="checkbox"/>												
<b>15.7 [617]</b>		Theoretical Torque - Nm [lb-in]												
mm [in]		22 [192]	43 [384]	87 [768]	108 [960]	130 [1152]	152 [1344]	174 [1536]	195 [1728]	217 [1920]	239 [2112]	260 [2304]		
		Displacement tested at 54°C [129°F] with an oil viscosity of 46cSt [213 SUS]												

		Pressure - bar [psi]										Max. Cont.	Max. Inter.	
<b>090</b>		17 [250]	35 [500]	69 [1000]	86 [1250]	104 [1500]	121 [1750]	138 [2000]	155 [2250]	172 [2500]	190 [2750]	207 [3000]		
88 cm <sup>3</sup> [5.4 in <sup>3</sup> ] / rev		Torque - Nm [lb-in], Speed rpm										Intermittent Ratings - 10% of Operation		
Flow - lpm [gpm]	2 [0.5]	18 [159] 23	40 [354] 22	75 [664] 17										23
	4 [1]	20 [177] 45	44 [389] 42	88 [779] 35	112 [991] 31	118 [1044] 27	128 [1133] 21							45
	8 [2]	22 [195] 91	44 [389] 88	87 [770] 81	114 [1009] 77	134 [1186] 72	158 [1398] 68	175 [1549] 60	198 [1752] 52	216 [1912] 42				91
	15 [4]	20 [177] 169	44 [389] 166	88 [779] 160	112 [991] 156	134 [1186] 152	154 [1363] 146	182 [1611] 140	204 [1805] 130	222 [1965] 122	242 [2142] 110	262 [2319] 96	170	
	23 [6]	19 [168] 260	40 [354] 257	86 [761] 250	110 [974] 245	131 [1159] 238	152 [1345] 232	176 [1558] 225	196 [1735] 215	218 [1929] 205	242 [2142] 193	263 [2327] 186	260	
	30 [8]	17 [150] 339	38 [336] 336	83 [735] 328	108 [956] 324	126 [1115] 318	150 [1327] 308	173 [1531] 300	194 [1717] 292	216 [1912] 280	238 [2106] 270	258 [2283] 258	340	
	38 [10]	14 [124] 430	33 [292] 429	77 [681] 426	106 [938] 424	122 [1080] 417	146 [1292] 411	170 [1504] 402	188 [1664] 393	210 [1858] 380	232 [2053] 366	253 [2239] 354	430	
	45 [12]	9 [80] 510	30 [265] 508	73 [646] 504	103 [912] 500	120 [1062] 496	145 [1283] 488	164 [1451] 480	184 [1628] 472	206 [1823] 462	228 [2018] 448	246 [2177] 434	510	
	53 [14]	5 [44] 601	25 [221] 600	69 [611] 596	97 [856] 594	114 [1009] 591	140 [1239] 586	160 [1416] 578	178 [1575] 566	202 [1788] 552	226 [2000] 540	244 [2159] 528	601	
	61 [16]		20 [177] 691	66 [584] 688	90 [797] 684	109 [965] 678	134 [1186] 670	156 [1381] 664	173 [1531] 654	200 [1770] 642	220 [1947] 630	242 [2142] 610	692	
68 [18]		16 [142] 772	63 [558] 770	84 [743] 768	105 [929] 766	128 [1133] 764	152 [1345] 754	168 [1487] 742	193 [1708] 722	214 [1894] 712	236 [2088] 700	772		
76 [20]		10 [88] 864	58 [513] 863	79 [699] 858	100 [885] 848	121 [1071] 844	148 [1310] 835	163 [1442] 825	186 [1646] 812	205 [1814] 800	226 [2000] 778	864		
<b>Rotor Width</b>		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input checked="" type="checkbox"/>												
<b>17.3 [682]</b>		Theoretical Torque - Nm [lb-in]												
mm [in]		24 [215]	49 [429]	97 [859]	121 [1073]	146 [1288]	170 [1502]	194 [1717]	218 [1932]	243 [2146]	267 [2361]	291 [2576]		
		Displacement tested at 54°C [129°F] with an oil viscosity of 46cSt [213 SUS]												

► Performance data is typical. Performance of production units varies slightly from one motor to another. Operating at maximum continuous pressure and maximum continuous low simultaneously is not recommended. For additional information on product testing please refer to page 6.

**DISPLACEMENT PERFORMANCE**

		Pressure - bar [psi]								Max. Cont.	Max. Inter.			
<b>100</b>		17 [250]	35 [500]	69 [1000]	86 [1250]	104 [1500]	121 [1750]	138 [2000]	155 [2250]	172 [2500]	190 [2750]	207 [3000]		
100 cm <sup>3</sup> [6.1 in <sup>3</sup> ] / rev		Torque - Nm [lb-in], Speed rpm										Intermittent Ratings - 10% of Operation		
Flow - lpm [gpm]	2 [0.5]	18 [159]	37 [327]	77 [681]	91 [805]									20
	4 [1]	26 [230]	49 [434]	84 [743]	106 [938]	120 [1062]	140 [1239]	160 [1416]						40
	8 [2]	25 [221]	50 [442]	98 [867]	125 [1106]	150 [1327]	175 [1549]	199 [1761]	189 [1673]					80
	15 [4]	26 [230]	46 [407]	97 [858]	124 [1097]	148 [1310]	175 [1549]	198 [1752]	224 [1982]	245 [2168]	267 [2363]	289 [2558]		150
	23 [6]	23 [203]	48 [425]	96 [850]	123 [1088]	148 [1310]	173 [1531]	200 [1770]	223 [1973]	246 [2177]	269 [2381]	286 [2531]		230
	30 [8]	21 [186]	45 [398]	93 [823]	121 [1071]	146 [1292]	168 [1487]	195 [1726]	221 [1956]	244 [2159]	265 [2345]	284 [2513]		300
	38 [10]	17 [150]	41 [363]	91 [805]	115 [1018]	141 [1248]	165 [1460]	189 [1673]	215 [1903]	238 [2106]	264 [2336]	282 [2496]		380
	45 [12]	14 [123]	36 [319]	89 [788]	116 [1027]	140 [1239]	162 [1434]	188 [1664]	210 [1858]	234 [2071]	258 [2283]	280 [2478]		450
	53 [14]	12 [106]	34 [301]	83 [735]	109 [965]	134 [1186]	158 [1389]	181 [1602]	205 [1814]	228 [2017]	256 [2265]	278 [2460]		530
	61 [16]	10 [88]	28 [248]	79 [699]	103 [912]	129 [1142]	152 [1345]	172 [1522]	198 [1752]	223 [1973]	254 [2248]	276 [2443]		610
Max. Inter.	68 [18]	6 [53]	21 [186]	71 [628]	94 [832]	121 [1071]	146 [1292]	169 [1496]	192 [1699]	215 [1903]	251 [2221]	272 [2407]		680
	76 [20]	680	677	666	660	653	645	635	624	610	594	574		760
		15 [133]	63 [558]	85 [752]	112 [991]	133 [1177]	160 [1416]	185 [1637]	202 [1788]	248 [2195]	267 [2363]			
Rotor Width		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input type="checkbox"/>												
Theoretical Torque - Nm [lb-in]		27 [239] 56 [496] 110 [974] 137 [1212] 166 [1469] 193 [1708] 220 [1947] 247 [2186] 275 [2434] 303 [2682] 330 [2921]												
mm [in]		Displacement tested at 54°C [129°F] with an oil viscosity of 46cSt [213 SUS]												

		Pressure - bar [psi]								Max. Cont.	Max. Inter.			
<b>115</b>		17 [250]	35 [500]	69 [1000]	86 [1250]	104 [1500]	121 [1750]	138 [2000]	155 [2250]	172 [2500]	190 [2750]	207 [3000]		
113 cm <sup>3</sup> [6.9 in <sup>3</sup> ] / rev		Torque - Nm [lb-in], Speed rpm										Intermittent Ratings - 10% of Operation		
Flow - lpm [gpm]	2 [0.5]	23 [204]	53 [469]											18
	4 [1]	25 [221]	56 [496]	95 [841]	118 [1044]									35
	8 [2]	25 [221]	59 [522]	117 [1035]	144 [1274]	172 [1522]	202 [1788]							71
	15 [4]	24 [212]	58 [513]	112 [991]	144 [1274]	173 [1531]	202 [1788]	225 [1991]	251 [2221]					133
	23 [6]	22 [195]	51 [451]	111 [982]	140 [1239]	171 [1513]	201 [1779]	224 [1982]	251 [2221]	284 [2513]	307 [2717]			204
	30 [8]	21 [186]	53 [469]	108 [956]	134 [1186]	167 [1478]	196 [1735]	222 [1965]	251 [2221]	278 [2460]	305 [2699]	327 [2894]		265
	38 [10]	16 [142]	46 [407]	105 [929]	131 [1159]	164 [1451]	191 [1690]	217 [1920]	247 [2186]	271 [2398]	299 [2646]	327 [2894]		336
	45 [12]	12 [106]	43 [381]	101 [894]	132 [1168]	161 [1425]	187 [1655]	218 [1929]	239 [2115]	269 [2381]	290 [2566]	319 [2823]		398
	53 [14]	6 [53]	35 [310]	97 [858]	125 [1106]	157 [1389]	179 [1584]	207 [1832]	237 [2097]	259 [2292]	289 [2558]	315 [2788]		469
	61 [16]		34 [301]	90 [796]	118 [1044]	149 [1319]	174 [1540]	200 [1770]	233 [2062]	254 [2248]	285 [2522]	314 [2779]		540
Max. Inter.	68 [18]	29 [257]	84 [743]	114 [1009]	140 [1239]	172 [1522]	202 [1788]	221 [1956]	253 [2239]	282 [2496]	299 [2646]		602	
	76 [20]	17 [150]	73 [646]	103 [912]	132 [1168]	161 [1425]	186 [1646]	214 [1894]	240 [2124]	266 [2354]	293 [2593]		673	
		601	596	594	589	583	572	566	557	547	544			
Rotor Width		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input type="checkbox"/>												
Theoretical Torque - Nm [lb-in]		31 [274] 62 [549] 124 [1097] 155 [1372] 186 [1646] 217 [1920] 248 [2195] 279 [2469] 310 [2743] 341 [3018] 372 [3292]												
mm [in]		Displacement tested at 54°C [129°F] with an oil viscosity of 46cSt [213 SUS]												

► Performance data is typical. Performance of production units varies slightly from one motor to another. Operating at maximum continuous pressure and maximum continuous low simultaneously is not recommended. For additional information on product testing please refer to page 6.

**DISPLACEMENT PERFORMANCE**

		Pressure - bar [psi]										Max. Cont.	Max. Inter.	
<b>130</b>		17 [250]	35 [500]	69 [1000]	86 [1250]	104 [1500]	121 [1750]	138 [2000]	155 [2250]	172 [2500]	190 [2750]	207 [3000]		
129 cm <sup>3</sup> [7.9 in <sup>3</sup> ] / rev		Torque - Nm [lb-in], Speed rpm											Intermittent Ratings - 10% of Operation	
Flow - lpm [gpm]	2 [0.5]	34 [301] 15	60 [531] 6											15
	4 [1]	32 [283] 30	64 [566] 29	124 [1097] 18	140 [1239] 10	185 [1637] 6								30
	8 [2]	31 [274] 59	65 [575] 58	126 [1115] 51	144 [1274] 46	198 [1752] 38	223 [1974] 32	248 [2195] 25						59
	15 [4]	31 [274] 115	66 [584] 112	130 [1151] 106	164 [1451] 102	195 [1726] 97	221 [1956] 92	255 [2257] 86	285 [2522] 80	312 [2761] 74	345 [3053] 66			118
	23 [6]	30 [266] 177	65 [575] 175	130 [1151] 167	162 [1434] 163	196 [1735] 157	230 [2036] 152	265 [2345] 142	289 [2558] 138	316 [2797] 132	352 [3115] 121	375 [3319] 114		177
	30 [8]	28 [248] 232	64 [566] 227	128 [1133] 218	157 [1389] 213	192 [1699] 208	223 [1974] 200	259 [2292] 189	284 [2513] 184	313 [2770] 176	343 [3036] 168	374 [3310] 162		235
	38 [10]	20 [177] 294	60 [531] 289	125 [1106] 280	157 [1389] 275	188 [1664] 268	222 [1965] 260	254 [2248] 251	282 [2496] 243	313 [2770] 234	349 [3089] 221	370 [3275] 214		294
	45 [12]	15 [133] 353	55 [487] 343	120 [1062] 343	152 [1345] 338	186 [1646] 331	216 [1912] 321	244 [2159] 311	281 [2487] 299	307 [2717] 289	341 [3018] 277	369 [3266] 264		353
	53 [14]	13 [115] 411	47 [416] 408	117 [1035] 398	150 [1328] 392	181 [1602] 386	212 [1876] 378	247 [2186] 366	273 [2416] 357	310 [2744] 347	335 [2965] 335	363 [3213] 325		411
	61 [16]	7 [62] 472	42 [372] 470	106 [938] 465	140 [1239] 462	170 [1505] 456	207 [1832] 447	239 [2115] 435	265 [2345] 426	296 [2620] 409	328 [2903] 396	361 [3195] 388		472
68 [18]		36 [319] 529	102 [903] 522	132 [1168] 517	166 [1469] 507	198 [1752] 500	224 [1982] 489	262 [2319] 482	292 [2584] 468	323 [2859] 445	351 [3106] 430		529	
76 [20]		32 [283] 588	94 [832] 585	123 [1089] 580	158 [1398] 570	190 [1682] 562	219 [1938] 550	254 [2248] 535	282 [2496] 520	308 [2726] 510	347 [3071] 490		588	
<b>Rotor Width</b>		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input type="checkbox"/>												
25.4 [1.002] mm [in]		Theoretical Torque - Nm [lb-in]												
		35 [310]	71 [628]	142 [1257]	177 [1566]	212 [1876]	248 [2195]	283 [2504]	318 [2814]	354 [3133]	389 [3442]	425 [3761]		
		Displacement tested at 54°C [129°F] with an oil viscosity of 46cSt [213 SUS]												

		Pressure - bar [psi]										Max. Cont.	Max. Inter.	
<b>160</b>		17 [250]	35 [500]	69 [1000]	86 [1250]	104 [1500]	121 [1750]	138 [2000]	155 [2250]	172 [2500]	190 [2750]	207 [3000]		
160 cm <sup>3</sup> [9.8 in <sup>3</sup> ] / rev		Torque - Nm [lb-in], Speed rpm											Intermittent Ratings - 10% of Operation	
Flow - lpm [gpm]	2 [0.5]	30 [266] 12	66 [584] 11	109 [965] 5										13
	4 [1]	32 [283] 24	70 [620] 23	136 [1204] 21	164 [1451] 20	182 [1611] 14	250 [2213] 6							25
	8 [2]	38 [336] 48	76 [673] 47	157 [1389] 42	181 [1602] 38	202 [1788] 34	265 [2345] 28	290 [2567] 22						50
	15 [4]	39 [345] 92	78 [690] 89	166 [1469] 84	205 [1814] 82	242 [2142] 77	275 [2434] 73	317 [2805] 70	358 [3169] 67	400 [3540] 62				94
	23 [6]	40 [354] 140	79 [699] 137	160 [1416] 132	203 [1797] 128	246 [2177] 123	290 [2567] 118	320 [2832] 114	354 [3133] 110	396 [3505] 106	404 [3575] 100	440 [3894] 94		144
	30 [8]	34 [301] 184	73 [646] 178	164 [1451] 172	200 [1770] 170	245 [2168] 164	288 [2549] 160	316 [2797] 152	350 [3098] 147	388 [3434] 142	428 [3788] 134	448 [3965] 129		188
	38 [10]	32 [283] 235	72 [637] 230	156 [1381] 222	196 [1735] 218	240 [2124] 212	282 [2496] 208	312 [2761] 200	347 [3071] 192	389 [3443] 184	422 [3735] 178	454 [4018] 172		238
	45 [12]	24 [212] 278	70 [620] 272	151 [1336] 264	192 [1699] 259	236 [2089] 253	278 [2460] 247	310 [2744] 242	344 [3044] 235	382 [3381] 227	419 [3708] 216	450 [3983] 210		281
	53 [14]	20 [177] 327	60 [531] 322	144 [1274] 312	186 [1646] 306	232 [2053] 300	266 [2354] 295	306 [2708] 289	338 [2991] 281	374 [3310] 276	420 [3717] 267	448 [3965] 258		331
	61 [16]	12 [106] 379	52 [460] 374	134 [1186] 360	178 [1575] 355	218 [1929] 350	254 [2248] 342	297 [2628] 338	334 [2956] 333	371 [3283] 323	401 [3549] 316	442 [3912] 308		381
68 [18]		46 [407] 420	130 [1151] 409	171 [1513] 400	215 [1903] 394	248 [2195] 387	291 [2575] 380	326 [2885] 374	361 [3195] 368	393 [3478] 358	428 [3788] 346		425	
76 [20]		38 [336] 469	120 [1062] 453	162 [1434] 448	199 [1760] 442	240 [2124] 435	278 [2460] 428	324 [2867] 421	357 [3159] 412	390 [3452] 401	425 [3761] 392		475	
<b>Rotor Width</b>		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input type="checkbox"/>												
31.8 [1.252] mm [in]		Theoretical Torque - Nm [lb-in]												
		43 [383]	89 [789]	176 [1556]	219 [1939]	265 [2345]	308 [2728]	352 [3111]	395 [3495]	441 [3901]	484 [4284]	527 [4667]		
		Displacement tested at 54°C [129°F] with an oil viscosity of 46cSt [213 SUS]												

► Performance data is typical. Performance of production units varies slightly from one motor to another. Operating at maximum continuous pressure and maximum continuous low simultaneously is not recommended. For additional information on product testing please refer to page 6.

**DISPLACEMENT PERFORMANCE**

		Pressure - bar [psi]							Max. Cont.	Max. Inter.			
<b>200</b>		17 [250]	35 [500]	69 [1000]	86 [1250]	104 [1500]	121 [1750]	138 [2000]	155 [2250]	172 [2500]	190 [2750]	207 [3000]	
198 cm <sup>3</sup> [12.1 in <sup>3</sup> ] / rev		Torque - Nm [lb-in], Speed rpm											
		Intermittent Ratings - 10% of Operation											
Flow - lpm [gpm]	2 [0.5]	38 [336] 10	87 [770] 8	172 [1522] 6	201 [1779] 5								10
	4 [1]	47 [416] 20	103 [912] 19	164 [1451] 14	201 [1779] 12	244 [2159] 9	295 [2611] 6	328 [2903] 3					20
	8 [2]	46 [407] 39	96 [850] 38	192 [1699] 36	241 [2133] 35	286 [2531] 34	330 [2920] 28	372 [3292] 25	417 [3690] 22	428 [3788] 17			40
	15 [4]	44 [389] 75	95 [841] 73	194 [1717] 70	241 [2133] 68	286 [2531] 65	333 [2947] 63	376 [3319] 59	419 [3708] 57	461 [4080] 52	498 [4407] 50	544 [4814] 40	76
	23 [6]	40 [354] 113	92 [814] 111	192 [1699] 109	240 [2124] 106	288 [2549] 103	333 [2947] 99	375 [3319] 96	421 [3726] 94	461 [4080] 89	505 [4469] 84	544 [4814] 78	116
	30 [8]	33 [292] 150	87 [770] 147	187 [1655] 142	236 [2088] 140	284 [2513] 135	330 [2920] 131	374 [3327] 126	421 [3726] 124	462 [4088] 117	504 [4460] 112	542 [4796] 106	152
	38 [10]	23 [204] 192	80 [708] 190	180 [1593] 185	230 [2035] 182	278 [2460] 177	325 [2876] 172	371 [3283] 167	415 [3673] 160	459 [4062] 154	498 [4407] 146	540 [4779] 140	192
	45 [12]	21 [186] 227	73 [646] 226	173 [1531] 219	223 [1973] 219	271 [2398] 212	318 [2814] 207	364 [3221] 201	409 [3619] 186	453 [4009] 179	491 [4345] 174	533 [4717] 174	227
	53 [14]	10 [88] 268	64 [566] 266	165 [1460] 260	214 [1894] 256	262 [2319] 251	309 [2735] 245	356 [3150] 240	400 [3540] 233	444 [3929] 227	483 [4274] 217	525 [4646] 210	268
	61 [16]		55 [487] 308	155 [1372] 300	204 [1805] 298	253 [2239] 291	300 [2655] 286	346 [3062] 279	391 [3460] 271	434 [3841] 264	472 [4177] 255	514 [4549] 248	308
	68 [18]		46 [407] 343	143 [1265] 332	191 [1690] 330	240 [2124] 322	287 [2540] 316	332 [2938] 310	377 [3336] 302	420 [3717] 296	457 [4044] 286	484 [4283] 276	343
	76 [20]		30 [265] 384	130 [1150] 374	179 [1584] 367	227 [2009] 363	275 [2434] 355	321 [2841] 349	365 [3230] 343	409 [3619] 333	430 [3805] 324	468 [4142] 314	384

**Rotor Width**

39.4 [1.553]
mm [in]

Overall Efficiency - 70 - 100%  40 - 69%  0 - 39%

Theoretical Torque - Nm [lb-in]

54 [481]	109 [963]	218 [1929]	272 [2407]	326 [2888]	381 [3369]	435 [3850]	489 [4332]	544 [4813]	598 [5294]	653 [5776]
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Displacement tested at 54°C [129°F] with an oil viscosity of 46cSt [213 SUS]

		Pressure - bar [psi]							Max. Cont.	Max. Inter.			
<b>240</b>		17 [250]	35 [500]	69 [1000]	86 [1250]	104 [1500]	121 [1750]	138 [2000]	155 [2250]	172 [2500]	190 [2750]	207 [3000]	
236 cm <sup>3</sup> [14.4 in <sup>3</sup> ] / rev		Torque - Nm [lb-in], Speed rpm											
		Intermittent Ratings - 10% of Operation											
Flow - lpm [gpm]	2 [0.5]	47 [416] 7	98 [867] 6	197 [1743] 3	247 [2186] 3								8
	4 [1]	50 [443] 14	105 [929] 13	210 [1859] 11	260 [2301] 9	310 [2717] 7	354 [3133] 4	404 [3575] 4					16
	8 [2]	53 [469] 29	111 [982] 28	224 [1982] 26	277 [2451] 24	329 [2894] 21	377 [3336] 19	424 [3752] 16	469 [4151] 11	511 [4522] 8	582 [5151] 8		32
	15 [4]	52 [460] 60	114 [1000] 59	236 [2062] 56	290 [2575] 53	346 [3062] 50	399 [3531] 47	449 [3974] 44	496 [4390] 40	541 [4788] 36	598 [5292] 33	638 [5646] 28	63
	23 [6]	47 [416] 93	109 [956] 91	227 [2009] 88	285 [2522] 85	342 [3027] 81	397 [3513] 77	449 [3974] 71	500 [4425] 66	548 [4850] 60	595 [5266] 55	642 [5682] 52	95
	30 [8]	42 [372] 125	104 [903] 123	221 [1956] 119	280 [2469] 116	336 [2974] 111	391 [3460] 106	445 [3938] 100	497 [4398] 93	547 [4841] 87	592 [5248] 79	640 [5664] 73	126
	38 [10]	35 [310] 158	95 [832] 155	213 [1885] 150	272 [2398] 147	328 [2903] 142	384 [3398] 137	437 [3867] 131	489 [4328] 123	541 [4788] 115	587 [5195] 106	635 [5620] 99	158
	45 [12]	23 [204] 189	85 [752] 186	203 [1797] 182	262 [2319] 178	319 [2823] 174	375 [3319] 168	428 [3788] 160	480 [4248] 153	531 [4699] 145	575 [5089] 134	623 [5514] 125	189
	53 [14]		75 [655] 218	192 [1699] 214	250 [2213] 210	308 [2726] 205	365 [3310] 201	418 [3699] 191	470 [4160] 183	520 [4602] 174	564 [4991] 164	611 [5407] 154	220
	61 [16]		68 [593] 249	180 [1593] 245	238 [2106] 242	295 [2611] 236	350 [3106] 230	405 [3584] 222	458 [4053] 215	510 [4496] 205	551 [4876] 195	600 [5310] 184	252
	68 [18]		56 [487] 279	165 [1460] 273	221 [1956] 270	281 [2469] 267	335 [2965] 260	388 [3434] 251	440 [3894] 241	490 [4337] 231	545 [4797] 221	590 [5222] 208	283
	76 [20]		40 [354] 315	154 [1345] 307	210 [1841] 303	264 [2336] 295	320 [2832] 290	376 [3310] 282	428 [3770] 272	480 [4221] 261	530 [4691] 250	580 [5133] 238	315

**Rotor Width**

47.4 [1.865]
mm [in]

Overall Efficiency - 70 - 100%  40 - 69%  0 - 39%

Theoretical Torque - Nm [lb-in]

66 [584]	132 [1168]	265 [2345]	331 [2929]	397 [3513]	463 [4097]	529 [4681]	595 [5265]	661 [5850]	728 [6442]	794 [7027]
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Displacement tested at 54°C [129°F] with an oil viscosity of 46cSt [213 SUS]

► Performance data is typical. Performance of production units varies slightly from one motor to another. Operating at maximum continuous pressure and maximum continuous low simultaneously is not recommended. For additional information on product testing please refer to page 6.

**DISPLACEMENT PERFORMANCE**

		Pressure - bar [psi]									Max. Cont.	Max. Inter.			
		17 [250]	35 [500]	69 [1000]	86 [1250]	104 [1500]	121 [1750]	138 [2000]	155 [2250]	172 [2500]	190 [2750]	207 [3000]			
<b>250</b>		250 cm <sup>3</sup> [15.3 in <sup>3</sup> ] / rev													
		Torque - Nm [lb-in], Speed rpm										Intermittent Ratings - 10% of Operation			
Flow - lpm [gpm]	8 [2]	49 [434] 31	112 [991] 31											32	
	15 [4]	49 [434] 59	115 [1018] 60	237 [2097] 56	295 [2611] 53	356 [3150] 48								60	
	23 [6]	45 [398] 91	112 [991] 90	233 [2062] 88	301 [2664] 85	360 [3186] 81	418 [3699] 74	471 [4168] 69	521 [4611] 64	561 [4965] 61					92
	30 [8]	41 [363] 119	107 [947] 118	235 [2080] 116	285 [2522] 113	352 [3115] 107	399 [3531] 103	441 [3903] 99	511 [4522] 92	559 [4947] 87	598 [5292] 84	624 [5522] 82			120
	38 [10]	33 [292] 151	97 [858] 150	219 [1938] 148	273 [2416] 144	330 [2920] 139	390 [3451] 134	434 [3841] 132	484 [4283] 129	529 [4681] 124	578 [5115] 119	618 [5469] 116			152
	45 [12]	22 [195] 179	81 [717] 179	198 [1752] 178	254 [2248] 177	312 [2761] 174	368 [3257] 168	410 [3628] 163	474 [4195] 158	500 [4425] 156	588 [5204] 148	605 [5354] 148			180
	53 [14]	14 [124] 211	75 [664] 210	196 [1735] 205	249 [2204] 201	307 [2717] 193	357 [3159] 188	414 [3664] 180	467 [4133] 171	512 [4531] 162	561 [4965] 158	610 [5398] 150			212
	61 [16]		62 [549] 250	178 [1575] 241	235 [2080] 234	292 [2584] 231	347 [3071] 223	400 [3540] 214	454 [4020] 211	501 [4434] 201	543 [4805] 193	602 [5327] 185			244
	68 [18]		50 [442] 271	160 [1416] 268	223 [1973] 263	276 [2442] 255	335 [2965] 244	386 [3416] 232	442 [3912] 221	490 [4336] 210	530 [4690] 200	590 [5221] 192			272
	76 [20]		38 [336] 300	142 [1257] 296	210 [1858] 290	260 [2301] 281	324 [2867] 273	372 [3292] 263	430 [3805] 252	478 [4230] 242	514 [4549] 230	580 [2133] 220			304
Max. Cont.															
Max. Inter.															
<b>Rotor Width</b>		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input checked="" type="checkbox"/>													
49.2 [1.938]		Theoretical Torque - Nm [lb-in]													
mm [in]		69 [608]	137 [1215]	275 [2431]	343 [3039]	412 [3646]	481 [4254]	549 [4862]	618 [5469]	687 [6077]	755 [6685]	824 [7292]			
Displacement tested at 54°C [129°F] with an oil viscosity of 46cSt [213 SUS]															

		Pressure - bar [psi]									Max. Cont.	Max. Inter.		
		17 [250]	35 [500]	52 [750]	69 [1000]	86 [1250]	104 [1500]	121 [1750]	138 [2000]	155 [2250]	172 [2500]	190 [2750]		
<b>290</b>		291 cm <sup>3</sup> [17.8 in <sup>3</sup> ] / rev												
		Torque - Nm [lb-in], Speed rpm										Intermittent Ratings - 10% of Operation		
Flow - lpm [gpm]	2 [0.5]	60 [531] 7	115 [1018] 6	185 [1637] 5	260 [2301] 4	292 [2584] 3								7
	4 [1]	62 [549] 13	122 [1080] 12	187 [1655] 10	265 [2345] 8	304 [2690] 6	365 [3230] 4							14
	8 [2]	60 [531] 26	128 [1133] 24	190 [1682] 22	272 [2407] 20	325 [2876] 18	372 [3292] 15	456 [4036] 12	512 [4531] 8	570 [5045] 4				27
	15 [4]	58 [513] 50	133 [1177] 49	195 [1726] 46	270 [2390] 44	328 [2903] 40	376 [3328] 36	458 [4053] 32	522 [4620] 24	574 [5080] 16	630 [5576] 9	664 [5876] 3		52
	23 [6]	56 [496] 76	124 [1097] 74	200 [1770] 71	268 [2372] 68	331 [2929] 64	396 [3505] 61	462 [4089] 57	525 [4646] 55	566 [5009] 52	625 [5531] 48	660 [5841] 40		79
	30 [8]	50 [442] 100	120 [1062] 96	197 [1743] 90	264 [2336] 85	326 [2885] 80	394 [3487] 76	465 [4115] 72	526 [4655] 70	568 [5027] 68	620 [5487] 65	655 [5797] 62		103
	38 [10]	45 [398] 129	114 [1009] 126	190 [1682] 122	258 [2283] 118	320 [2832] 116	392 [3469] 112	460 [4071] 106	521 [4611] 100	559 [4947] 92	615 [5443] 82	645 [5708] 74		130
	45 [12]	38 [336] 153	104 [920] 150	180 [1593] 146	252 [2230] 142	314 [2779] 138	390 [3452] 133	458 [4053] 127	511 [4522] 120	550 [4868] 106	610 [5399] 100	636 [5629] 95		155
	53 [14]	25 [221] 182	93 [823] 174	170 [1505] 166	236 [2089] 158	306 [2708] 150	382 [3381] 142	452 [4000] 134	500 [4425] 128	542 [4797] 122	606 [5363] 118	625 [5531] 114		182
	61 [16]	12 [106] 210	82 [726] 202	155 [1372] 193	225 [1991] 184	294 [2602] 175	375 [3319] 166	445 [3938] 160	488 [4319] 152	535 [4735] 145	595 [5266] 140	615 [5443] 136		210
68 [18]		66 [581] 230	140 [1239] 226	218 [1929] 218	280 [2478] 210	365 [3230] 202	435 [3850] 192	479 [4239] 182	526 [4655] 174	588 [5204] 164	604 [5345] 158		234	
76 [20]		55 [487] 256	128 [1133] 246	198 [1752] 237	270 [2390] 226	350 [3098] 216	426 [3770] 206	468 [4142] 198	514 [4549] 190	574 [5080] 185	588 [5204] 180		261	
Max. Cont.														
Max. Inter.														
<b>Rotor Width</b>		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input checked="" type="checkbox"/>												
57.2 [2.252]		Theoretical Torque - Nm [lb-in]												
mm [in]		80 [707]	160 [1415]	240 [2122]	320 [2829]	400 [3537]	480 [4244]	560 [4952]	639 [5659]	719 [6366]	799 [7074]	879 [7781]		
Displacement tested at 54°C [129°F] with an oil viscosity of 46cSt [213 SUS]														

► Performance data is typical. Performance of production units varies slightly from one motor to another. Operating at maximum continuous pressure and maximum continuous low simultaneously is not recommended. For additional information on product testing please refer to page 6.

**DISPLACEMENT PERFORMANCE**

		Pressure - bar [psi]						Max. Cont.		Max. Inter.		
<b>320</b>		17 [250]	35 [500]	52 [750]	69 [1000]	86 [1250]	104 [1500]	121 [1750]	138 [2000]	155 [2250]	172 [2500]	
322 cm <sup>3</sup> [19.6 in <sup>3</sup> ] / rev		Torque - Nm [lb-in], Speed rpm						Intermittent Ratings - 10% of Operation				
Flow - lpm [gpm]	2 [0.5]	60 [531]	134 [1186]	189 [1673]	238 [2106]							6
	4 [1]	70 [619]	140 [1239]	239 [2115]	276 [2442]	324 [2867]	393 [3478]	403 [3566]				12
	8 [2]	73 [646]	154 [1363]	233 [2062]	291 [2575]	333 [2947]	425 [3761]	487 [4310]	545 [4823]	621 [5496]	659 [5832]	25
	15 [4]	79 [699]	152 [1345]	235 [2080]	311 [2752]	385 [3407]	452 [4000]	518 [4584]	555 [4912]	641 [5673]	690 [6106]	47
	23 [6]	68 [602]	150 [1328]	227 [2009]	295 [2611]	378 [3345]	443 [3920]	512 [4531]	578 [5115]	621 [5496]	686 [6071]	71
	30 [8]	56 [496]	145 [1283]	218 [1929]	286 [2531]	356 [3150]	436 [3858]	506 [4478]	560 [4956]	614 [5434]	665 [5885]	93
	38 [10]	54 [478]	140 [1239]	202 [1788]	273 [2416]	348 [3080]	427 [3779]	501 [4434]	557 [4929]	604 [5345]	664 [5876]	118
	45 [12]	38 [336]	134 [1186]	192 [1681]	260 [2301]	336 [2973]	409 [3619]	476 [4212]	542 [4796]	601 [5319]	642 [5681]	140
	53 [14]	22 [195]	122 [1080]	173 [1531]	255 [2257]	323 [2858]	391 [3460]	451 [3991]	521 [4611]	582 [5150]	630 [5575]	165
	61 [16]	11 [97]	105 [930]	157 [1389]	229 [2027]	298 [2637]	376 [3327]	440 [3894]	503 [4451]	557 [4929]	618 [5469]	189
	68 [18]		88 [779]	144 [1274]	220 [1947]	285 [2522]	356 [3150]	424 [3752]	487 [4310]	549 [4858]	602 [5327]	211
	76 [20]		70 [620]	126 [1062]	190 [1681]	262 [2319]	335 [2965]	410 [3628]	463 [4097]	528 [4673]	586 [5186]	236
		235	233	230	226	218	209	202	193	185		
Rotor Width		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input type="checkbox"/>										
Theoretical Torque - Nm [lb-in]		87 [770] 177 [1566] 267 [2362] 354 [3132] 441 [3903] 533 [4717] 620 [5487] 708 [6265] 795 [7035] 887 [7850]										
63.5 [2.502] mm [in]		Displacement tested at 54°C [129°F] with an oil viscosity of 46cSt [213 SUS]										

		Pressure - bar [psi]						Max. Cont.		Max. Inter.		
<b>400</b>		17 [250]	35 [500]	52 [750]	69 [1000]	86 [1250]	104 [1500]	121 [1750]	138 [2000]			
400 cm <sup>3</sup> [24.4 in <sup>3</sup> ] / rev		Torque - Nm [lb-in], Speed rpm						Intermittent Ratings - 10% of Operation				
Flow - lpm [gpm]	2 [0.5]	82 [723]	165 [1459]	250 [2213]	329 [2912]	418 [3699]						5
	4 [1]	86 [761]	175 [1549]	262 [2317]	345 [3053]	427 [3779]	497 [4398]	577 [5106]	660 [5841]			10
	8 [2]	89 [791]	191 [1690]	284 [2513]	364 [3219]	448 [3962]	502 [4443]	606 [5363]	682 [6036]			20
	15 [4]	87 [771]	189 [1673]	277 [2451]	378 [3346]	467 [4135]	529 [4679]	629 [5569]	698 [6177]			38
	23 [6]	79 [703]	185 [1637]	271 [2398]	373 [3305]	464 [4110]	551 [4873]	631 [5584]	696 [6159]			58
	30 [8]	70 [620]	176 [1558]	260 [2301]	364 [3217]	455 [4025]	550 [4868]	623 [5515]	676 [5982]			75
	38 [10]	59 [523]	159 [1407]	239 [2115]	351 [3106]	442 [3913]	541 [4787]	611 [5410]	663 [5864]			95
	45 [12]	52 [460]	145 [1283]	233 [2062]	335 [2968]	430 [3806]	529 [4684]	595 [5269]	645 [5705]			113
	53 [14]	46 [404]	138 [1221]	215 [1903]	318 [2813]	409 [3622]	513 [4543]	578 [5115]	624 [5522]			133
	61 [16]		113 [1000]	191 [1690]	298 [2641]	390 [3448]	496 [4393]	560 [4959]	606 [5364]			153
	68 [18]		96 [850]	178 [1575]	263 [2328]	365 [3230]	478 [4228]	517 [4572]	580 [5133]			170
	76 [20]		74 [655]	150 [1327]	240 [2122]	342 [3027]	436 [3855]	493 [4365]	560 [4956]			190
		190	185	180	174	165	160	156				
Rotor Width		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input type="checkbox"/>										
Theoretical Torque - Nm [lb-in]		112 [992] 224 [1984] 336 [2976] 448 [3968] 560 [4960] 673 [5952] 785 [6944] 897 [7935]										
78.9 [3.106] mm [in]		Displacement tested at 54°C [129°F] with an oil viscosity of 46cSt [213 SUS]										

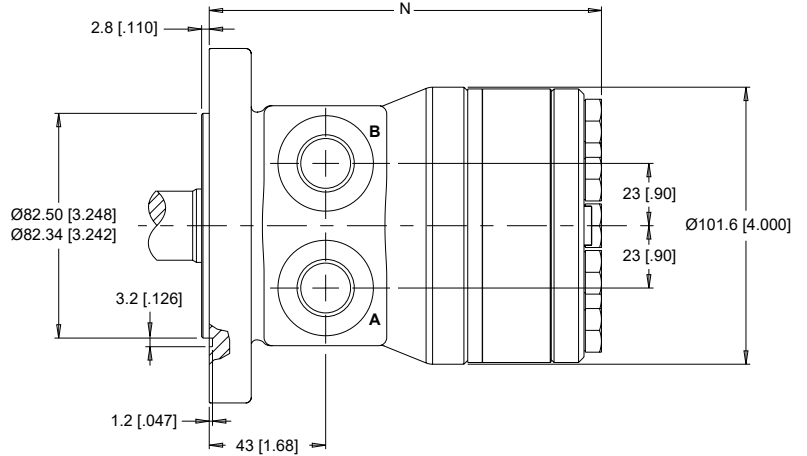
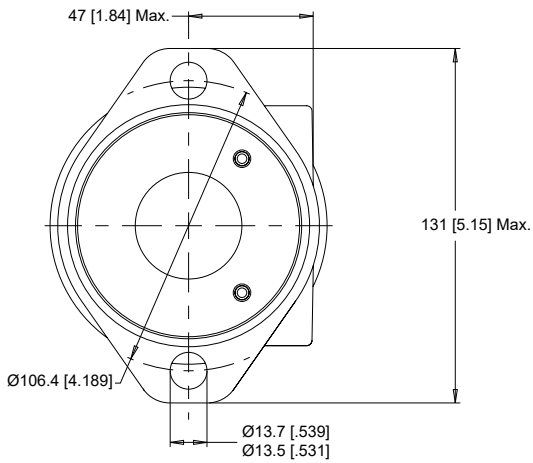
► Performance data is typical. Performance of production units varies slightly from one motor to another. Operating at maximum continuous pressure and maximum continuous low simultaneously is not recommended. For additional information on product testing please refer to page 6.

**HOUSINGS**

► Dimensions shown are without paint. Paint thickness can be up to 0.13 [.005].

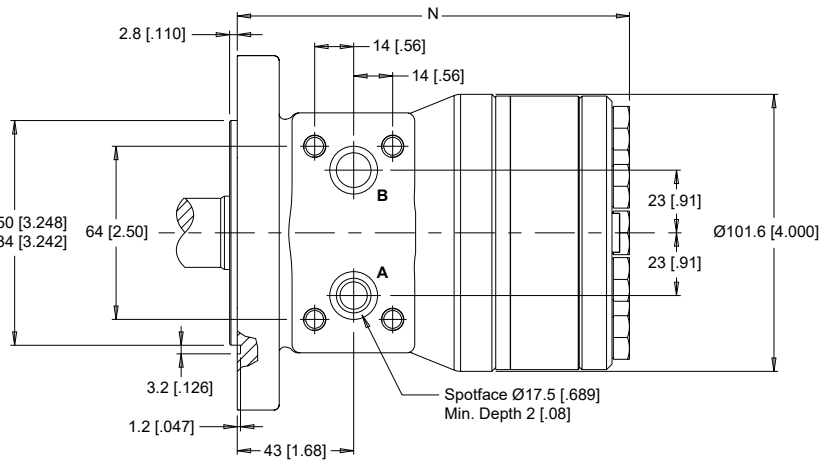
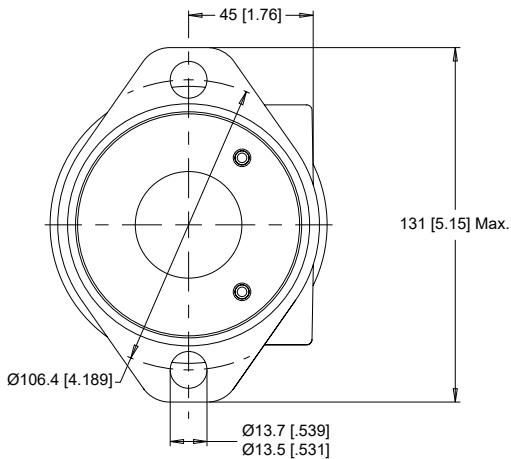
**2-HOLE, SAE A MOUNT, ALIGNED PORTS**

**A10** 1/2-14 NPT    **A11** 7/8-14 UNF    **A18** G 1/2



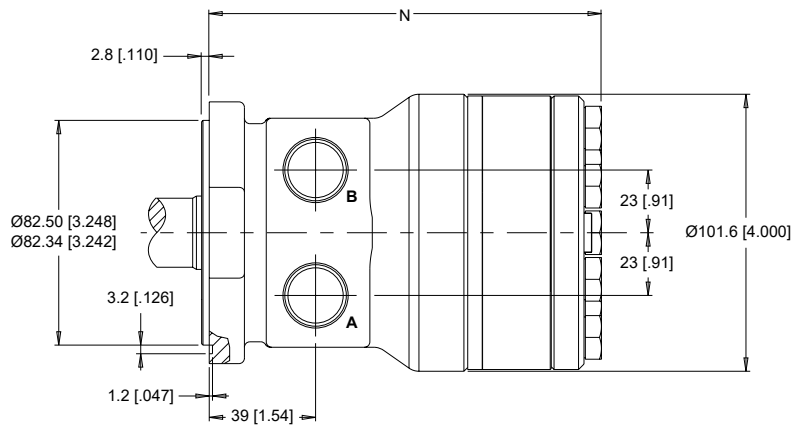
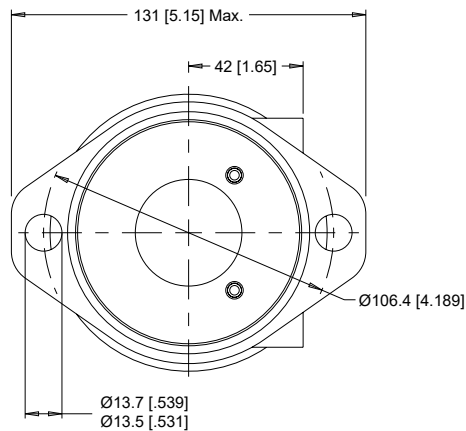
**2-HOLE, SAE A MOUNT, ALIGNED MANIFOLD PORTS**

**A17** 1/2" Drilled



**2-HOLE, SAE A MOUNT, SIDE PORTS**

**A71** 7/8-14 UNF



► Dimension N is charted on page 58.

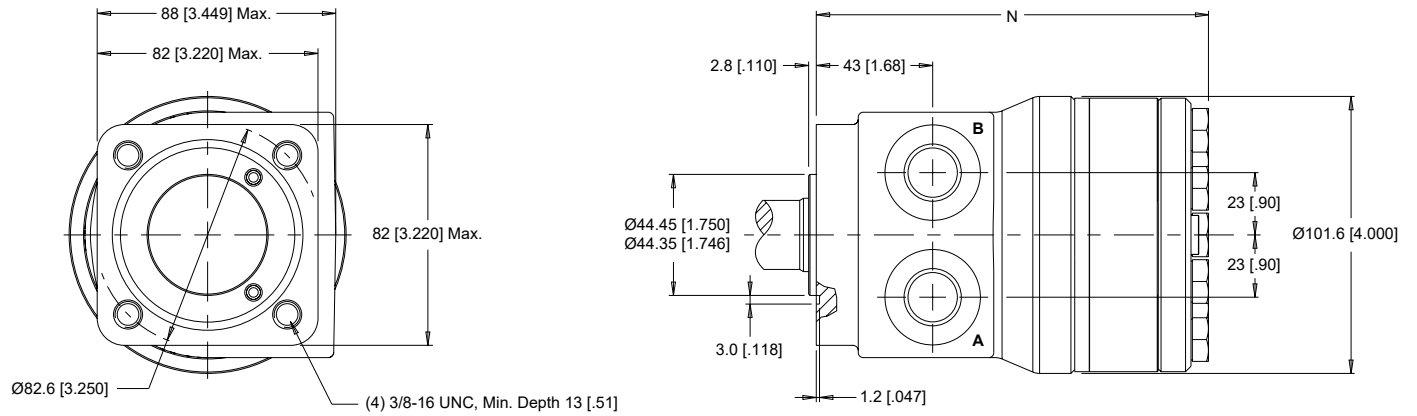


**HOUSINGS**

► Dimensions shown are without paint. Paint thickness can be up to 0.13 [.005].

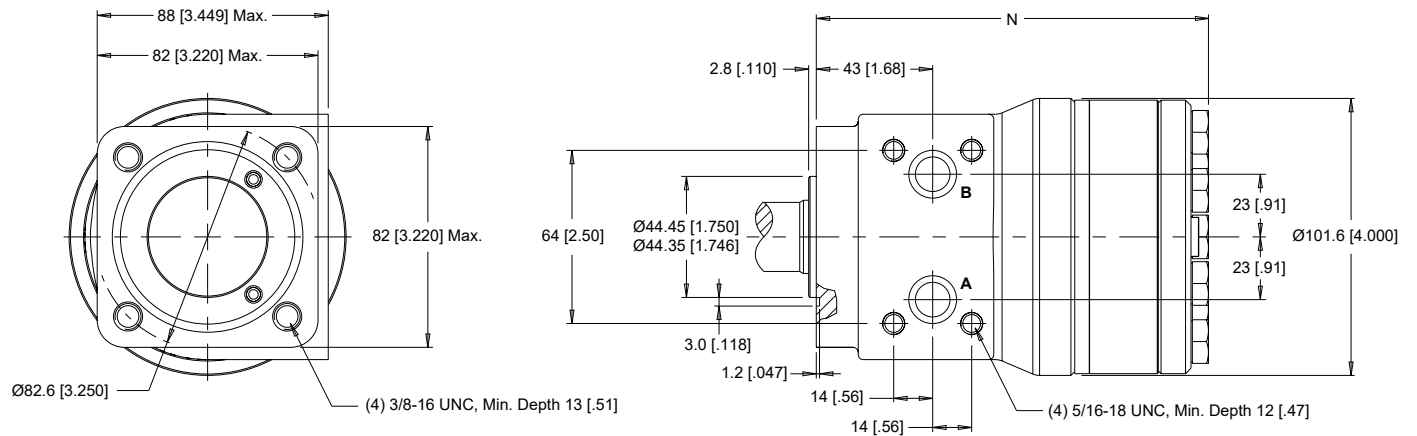
**4-HOLE, SQUARE MOUNT, ALIGNED PORTS**

**F30** 1/2-14 NPT    **F31** 7/8-14 UNF



**4-HOLE, SQUARE MOUNT, ALIGNED MANIFOLD PORTS**

**F37** 1/2" Drilled

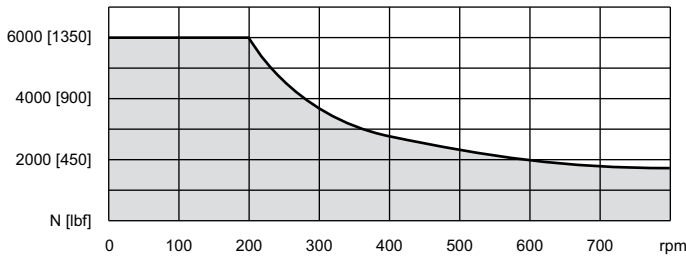


► Dimension N is charted on page 58.

**TECHNICAL INFORMATION**

**ALLOWABLE SHAFT LOAD / BEARING CURVE**

The bearing curve below represents the side load capacity of the motor at the centerline of the key for various motor speeds. Operating conditions within the shaded area will maintain acceptable oil film lubrication with recommended fluids. Operating conditions outside the shaded area are susceptible to motor failure due to oil starvation and/or excessive heat generation. Fluids with low lubricity or low viscosity may require the maximum load and speed ratings to be derated to provide acceptable motor life and performance.



**LENGTH & WEIGHT CHARTS**

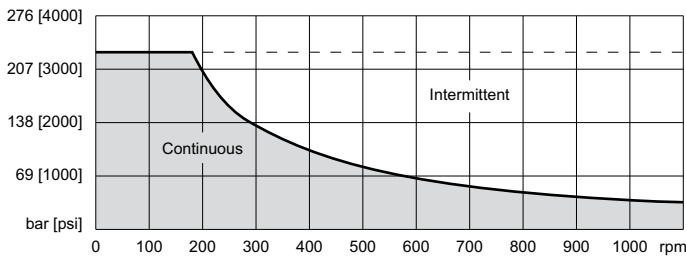
Dimension N is the overall motor length from the rear of the motor to the mounting flange surface and is referenced on detailed housing drawings listed on pages 56-57.

N	Length	Weight
#	mm [in]	kg [lb]
040	127 [4.98]	6.3 [14.0]
050	128 [5.06]	6.4 [14.2]
060	130 [5.13]	6.5 [14.3]
070	132 [5.21]	6.6 [14.5]
080	134 [5.28]	6.7 [14.8]
090	136 [5.34]	6.8 [14.9]
100	138 [5.44]	6.9 [15.1]
115	141 [5.54]	7.0 [15.3]
130	144 [5.67]	7.1 [15.6]
160	150 [5.92]	7.4 [16.2]
200	158 [6.22]	7.7 [17.0]
240	166 [6.53]	8.0 [17.7]
250	168 [6.60]	8.1 [17.9]
290	176 [6.92]	8.5 [18.7]
320	182 [7.17]	8.7 [19.2]
400	197 [7.77]	9.4 [20.7]

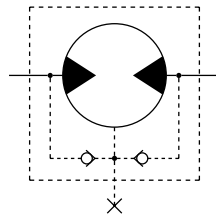
► 251 & 252 series motor weights can vary ± 0.5 kg [1 lb] depending on model configurations such as housing, shaft, endcover, options etc.

**PERMISSIBLE SHAFT SEAL PRESSURE**

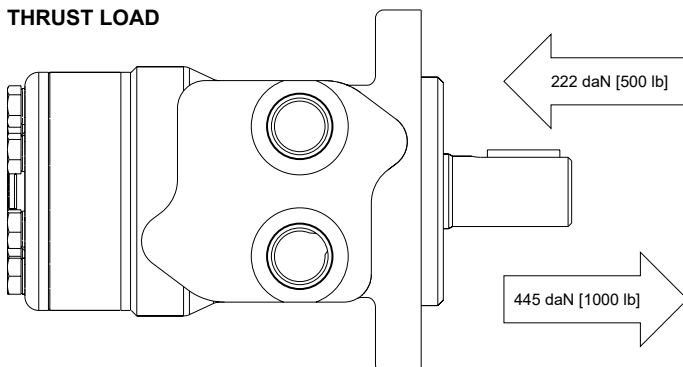
The curve below represents allowable seal pressure at various speeds. Operation in the gray area results in maintaining the rated life of the shaft seal. Actual shaft seal pressure depends on motor configuration.



► With check valves and drain connection, the shaft seal pressure equals pressure in the drain line. With check valves and no drain connection, shaft seal pressure is identical to output pressure. No check valves and no drain connection, the shaft seal pressure is identical to the average value of input and output pressure.

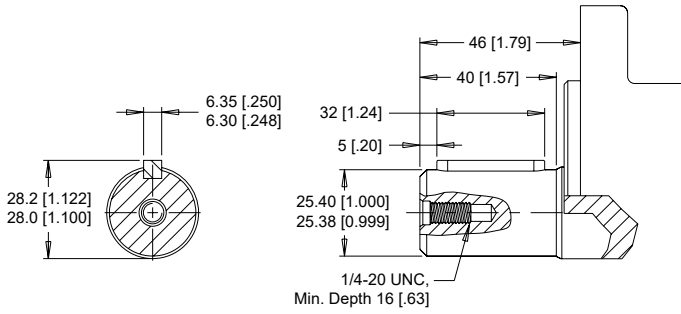


**THRUST LOAD**



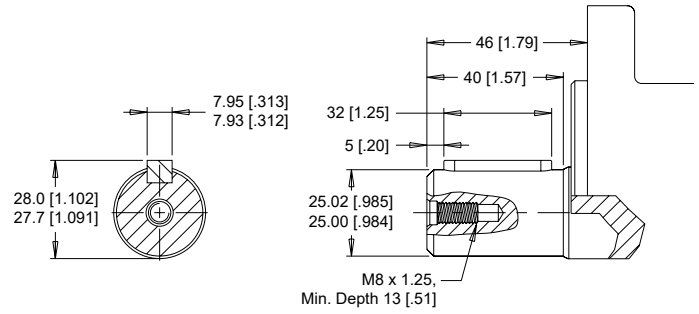
**SHAFTS**

**10** 1" Straight



Max. Torque: 655 Nm [5800 lb-in]

**12** 25mm Straight



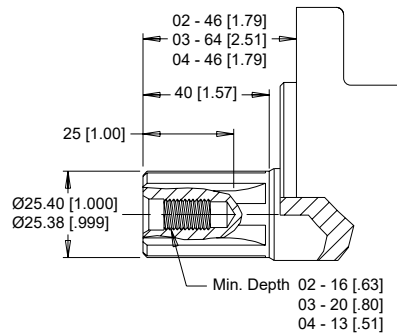
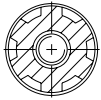
Max. Torque: 678 Nm [6000 lb-in]

**02** 1" 6B Spline, 1/4-20 Tap

**04** 1" 6B Spline, M8x1.25 Tap

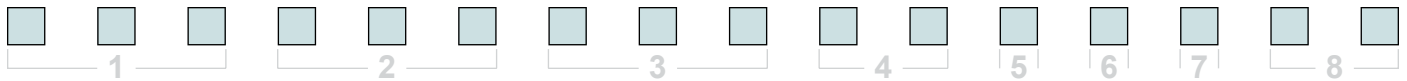
**03** 1" 6B Spline, 5/16-18 Tap

6B Spline  
SAE J499 Standard



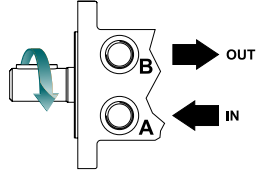
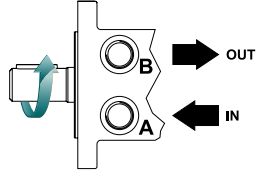
Max. Torque: 678 Nm [6000 lb-in]

**ORDERING INFORMATION**



**1. CHOOSE SERIES DESIGNATION**

<b>251</b> Standard Rotation	<b>252</b> Reverse Rotation
------------------------------	-----------------------------

► The 251 & 252 series are bi-directional.

**2. SELECT A DISPLACEMENT OPTION**

<b>040</b> 40 cm <sup>3</sup> /rev [2.5 in <sup>3</sup> /rev]	<b>130</b> 129 cm <sup>3</sup> /rev [7.9 in <sup>3</sup> /rev]
<b>050</b> 50 cm <sup>3</sup> /rev [3.1 in <sup>3</sup> /rev]	<b>160</b> 160 cm <sup>3</sup> /rev [9.8 in <sup>3</sup> /rev]
<b>060</b> 59 cm <sup>3</sup> /rev [3.6 in <sup>3</sup> /rev]	<b>200</b> 198 cm <sup>3</sup> /rev [12.1 in <sup>3</sup> /rev]
<b>070</b> 71 cm <sup>3</sup> /rev [4.3 in <sup>3</sup> /rev]	<b>240</b> 236 cm <sup>3</sup> /rev [14.4 in <sup>3</sup> /rev]
<b>080</b> 79 cm <sup>3</sup> /rev [4.9 in <sup>3</sup> /rev]	<b>250</b> 250 cm <sup>3</sup> /rev [15.3 in <sup>3</sup> /rev]
<b>090</b> 88 cm <sup>3</sup> /rev [5.4 in <sup>3</sup> /rev]	<b>290</b> 291 cm <sup>3</sup> /rev [17.8 in <sup>3</sup> /rev]
<b>100</b> 100 cm <sup>3</sup> /rev [6.1 in <sup>3</sup> /rev]	<b>320</b> 322 cm <sup>3</sup> /rev [19.6 in <sup>3</sup> /rev]
<b>115</b> 113 cm <sup>3</sup> /rev [6.9 in <sup>3</sup> /rev]	<b>400</b> 400 cm <sup>3</sup> /rev [24.4 in <sup>3</sup> /rev]

**3. SELECT A MOUNT & PORT OPTION**

<b>A10</b> 2-Hole, SAE A Mount, Aligned Ports, 1/2-14 NPT
<b>A11</b> 2-Hole, SAE A Mount, Aligned Ports, 7/8-14 UNF
<b>A17</b> 2-Hole, SAE A Mount, Aligned Manifold Ports, 1/2" Drilled
<b>A18</b> 2-Hole, SAE A Mount, Aligned Ports, G 1/2
<b>A71</b> 2-Hole, SAE A Mount, Aligned Side Ports, 7/8-14 UNF
<b>F30</b> 4-Hole, Square Mount, Aligned Ports, 1/2-14 NPT
<b>F31</b> 4-Hole, Square Mount, Aligned Ports, 7/8-14 UNF
<b>F37</b> 4-Hole, Square Mount, Aligned Manifold Ports, 1/2" Drilled

**4. SELECT A SHAFT OPTION**

<b>02</b> 6B Spline, 1/4 Tap	<b>10</b> 1" Straight
<b>03</b> 6B Spline, 5/16 Tap (Ext)	<b>12</b> 25mm Straight
<b>04</b> 6B Spline, M8 Tap	

► The 03 extended shaft is designed for use with one of the speed sensor options listed in STEP 7.

**5. SELECT A PAINT OPTION**

<b>A</b> Black
<b>B</b> Black, Unpainted Mounting Surface

**6. SELECT A VALVE CAVITY / CARTRIDGE OPTION**

<b>A</b> None
---------------

**7. SELECT AN ADD-ON OPTION**

<b>A</b> Standard
<b>W</b> Speed Sensor, Dual, 4-Pin Male Weatherpack Connector
<b>X</b> Speed Sensor, Dual, 4-Pin M12 Male Connector
<b>Y</b> Speed Sensor, Single, 3-Pin Male Weatherpack Connector
<b>Z</b> Speed Sensor, Single, 4-Pin M12 Male Connector

**8. SELECT A MISCELLANEOUS OPTION**

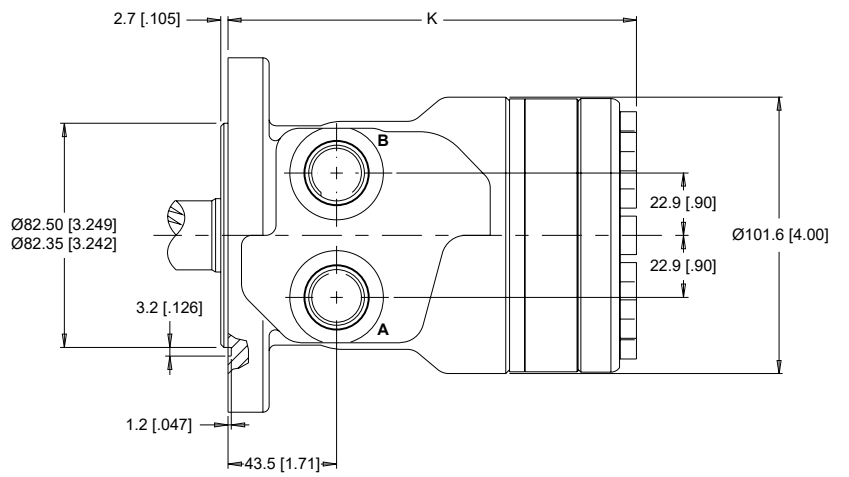
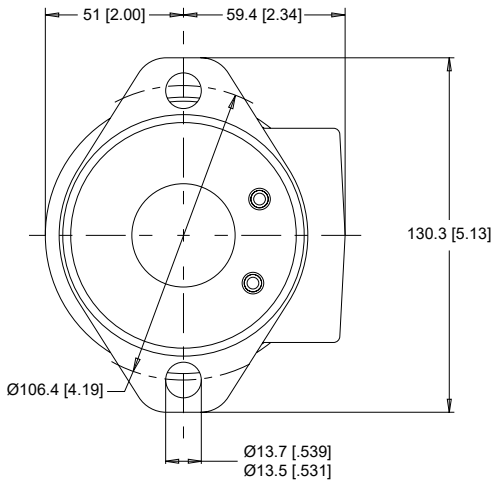
<b>AA</b> None
<b>AC</b> Freeturning Rotor

**HOUSINGS**

► Dimensions shown are without paint. Paint thickness can be up to 0.13 [0.005].

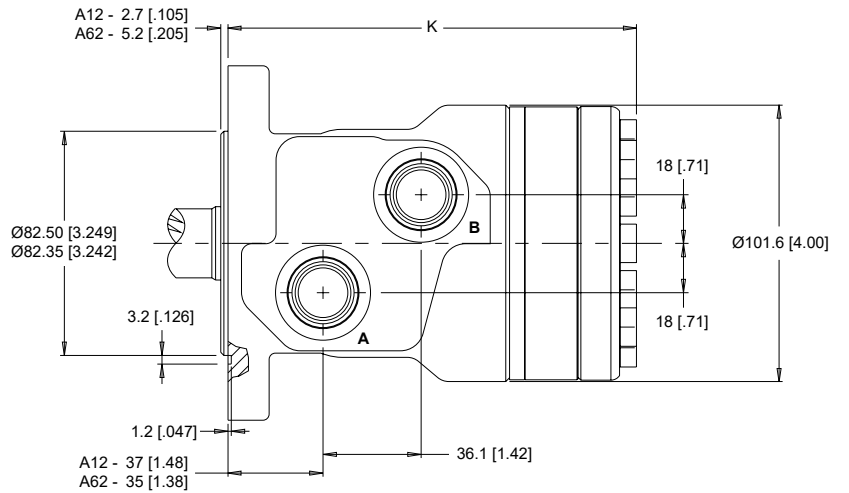
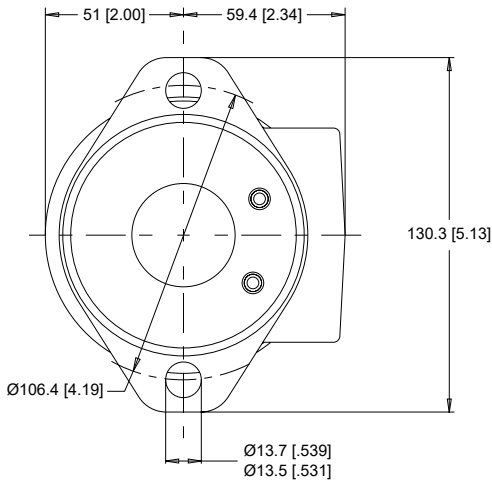
**2-HOLE, SAE A MOUNT, ALIGNED PORTS**

**A10** 1/2-14 NPT    **A11** 7/8-14 UNF



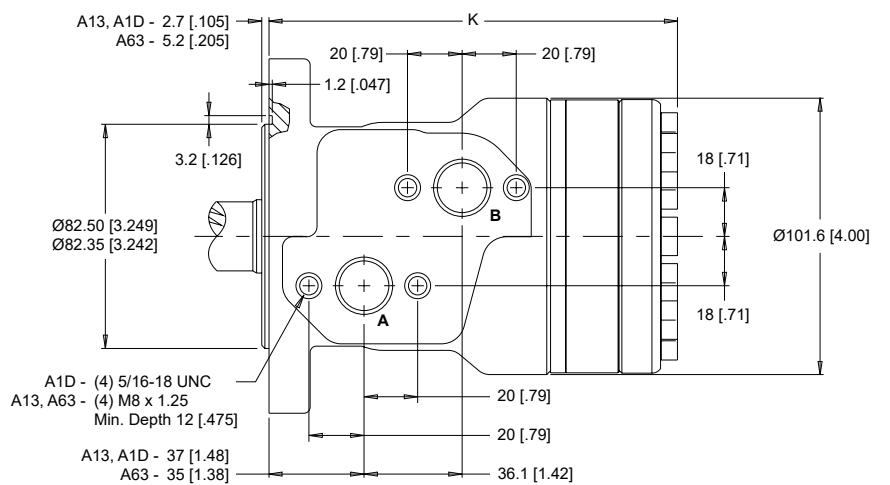
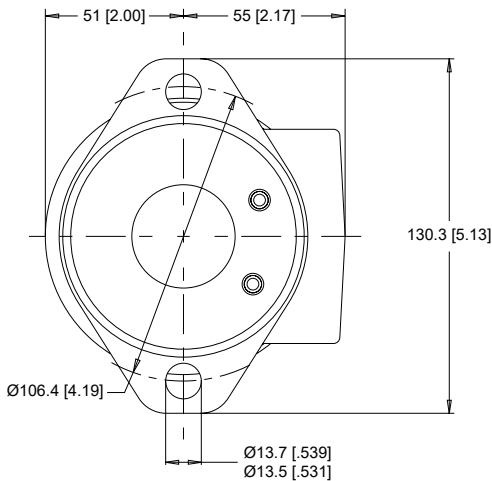
**2-HOLE, SAE A MOUNT, OFFSET PORTS**

**A12** G 1/2    **A62** G 1/2 (TP)



**2-HOLE, SAE A MOUNT, OFFSET MANIFOLD PORTS**

**A13** G 1/2    **A1D** 7/8-14 UNF    **A63** G 1/2 (TP)



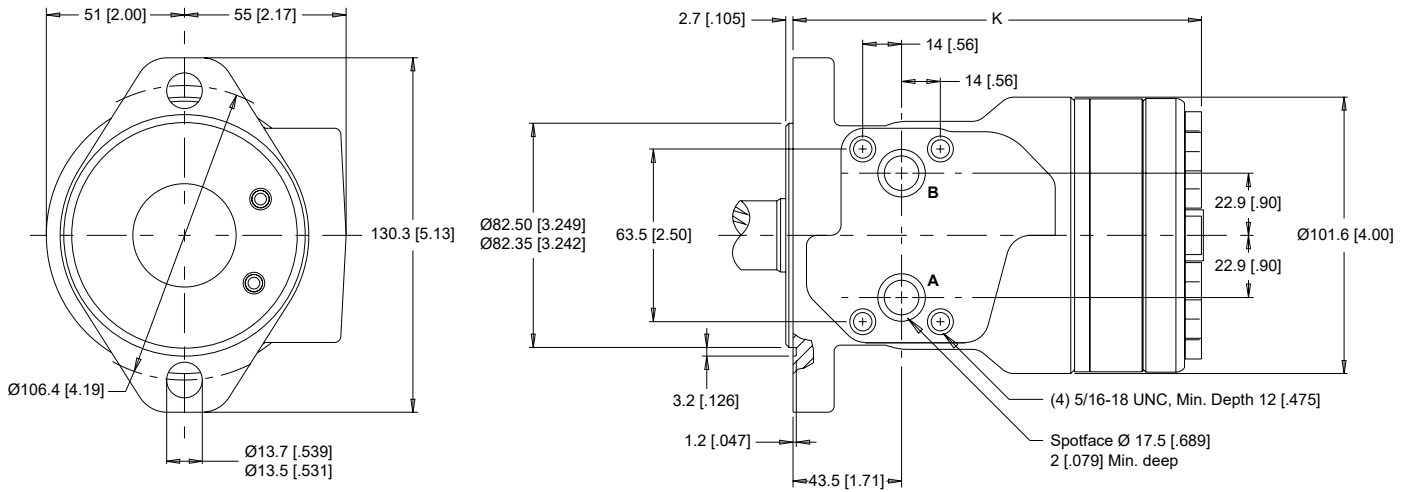
► Dimension K is charted on page 65. ► (TP) - Taller Pilot Height. Refer to detailed drawing for dimensional differences.

**HOUSINGS**

► Dimensions shown are without paint. Paint thickness can be up to 0.13 [.005].

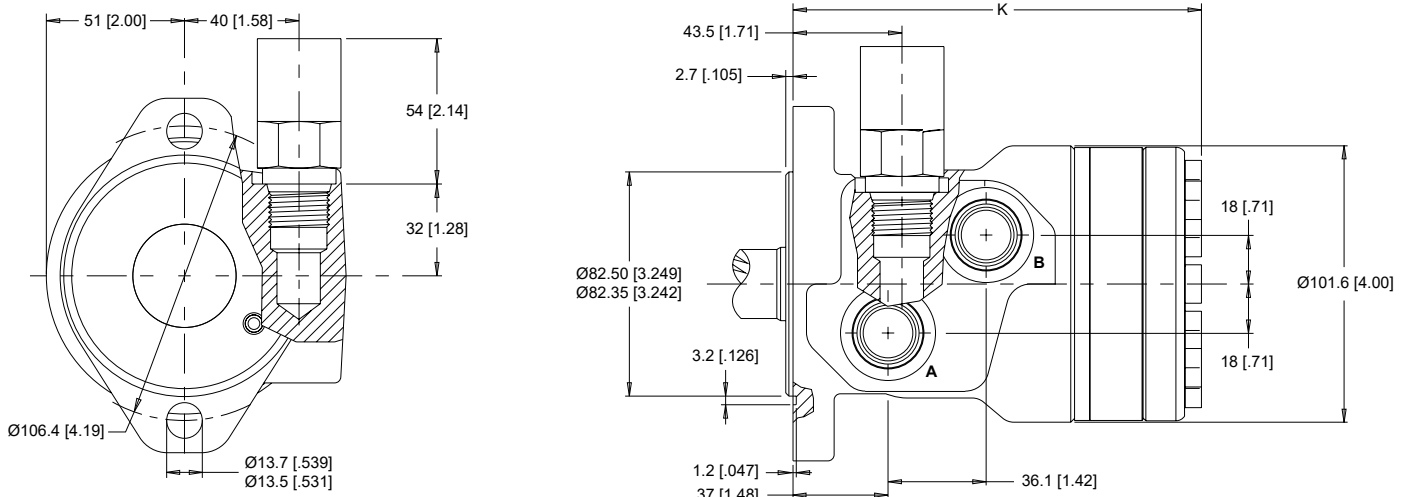
**2-HOLE, SAE A MOUNT, ALIGNED MANIFOLD PORTS**

**A17** 1/2" Drilled



**2-HOLE, SAE A MOUNT, OFFSET PORTS, VALVE CAVITY**

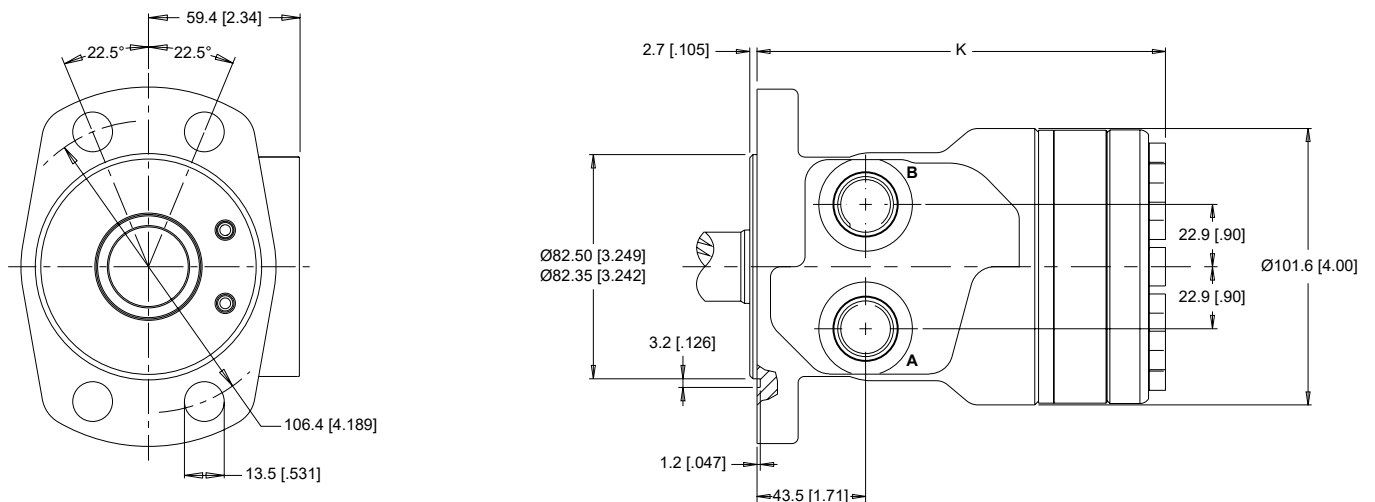
**A19** 7/8-14 UNF



**4-HOLE, MAGNETO MOUNT, ALIGNED PORTS**

**A30** 1/2-14 NPT

**A31** 7/8-14 UNF



► Dimension K is charted on page 65.

**HOUSINGS**

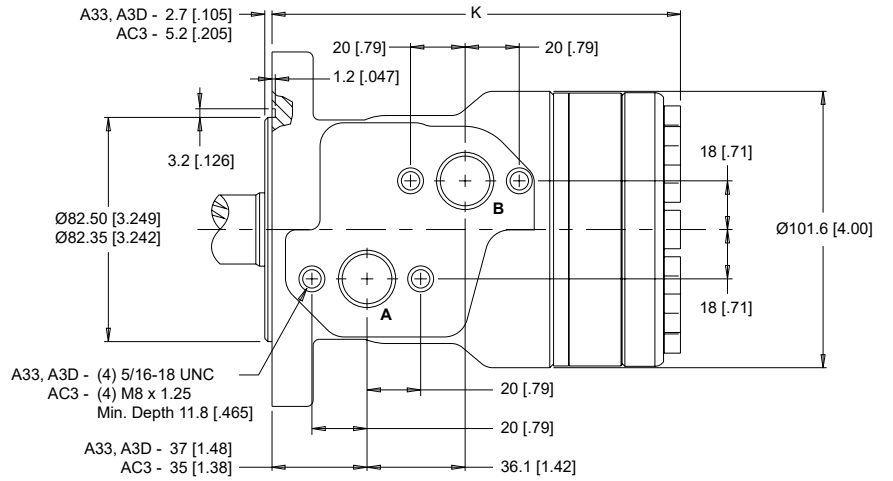
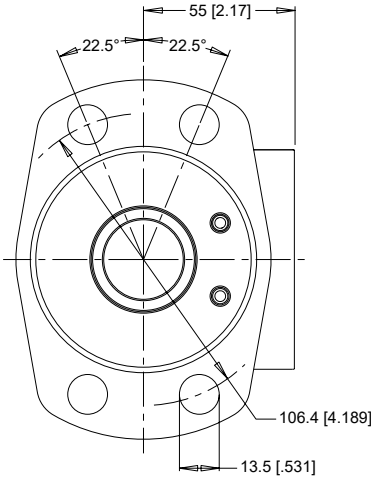
► Dimensions shown are without paint. Paint thickness can be up to 0.13 [.005].

**4-HOLE, MAGNETO MOUNT, OFFSET MANIFOLD PORTS**

**A33** G 1/2

**A3D** 7/8-14 UNF

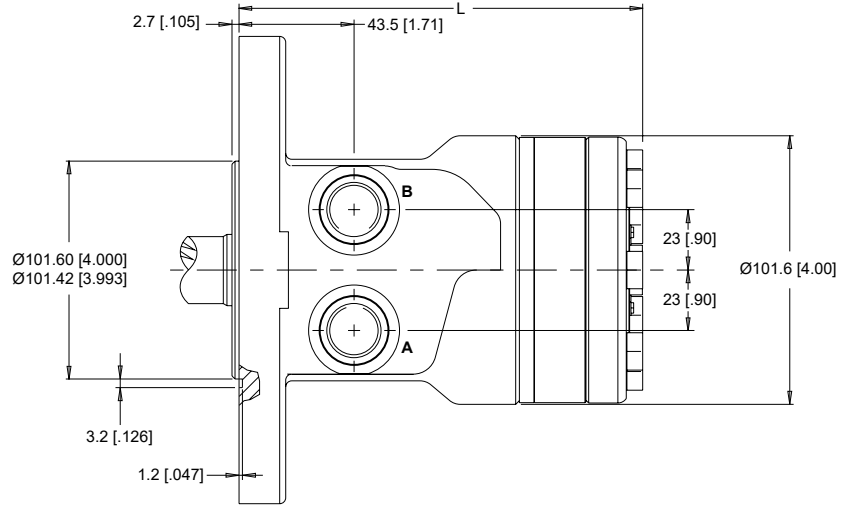
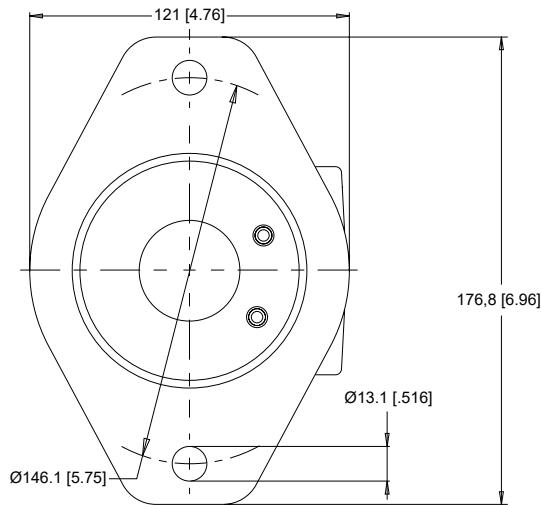
**AC3** G 1/2 (TP)



**2-HOLE, SAE B MOUNT, ALIGNED PORTS**

**B11** 7/8-14 UNF

**B18** G 1/2



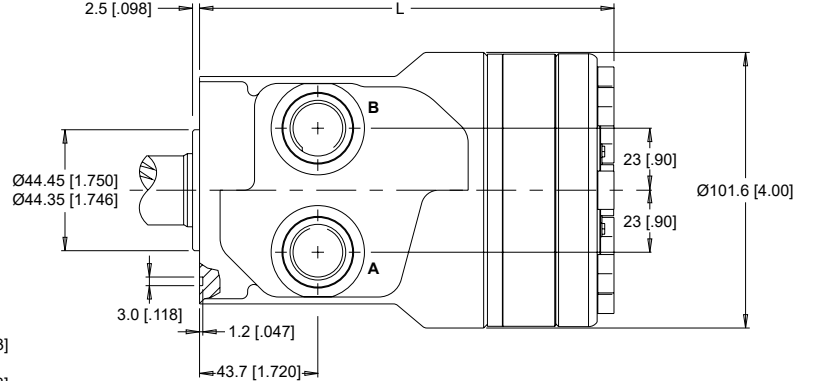
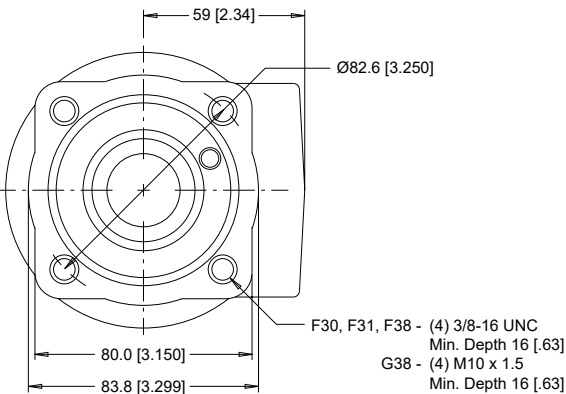
**4-HOLE, SQUARE MOUNT, ALIGNED PORTS**

**F30** 1/2-14 NPT

**F31** 7/8-14 UNF

**F38** G 1/2

**G38** G 1/2

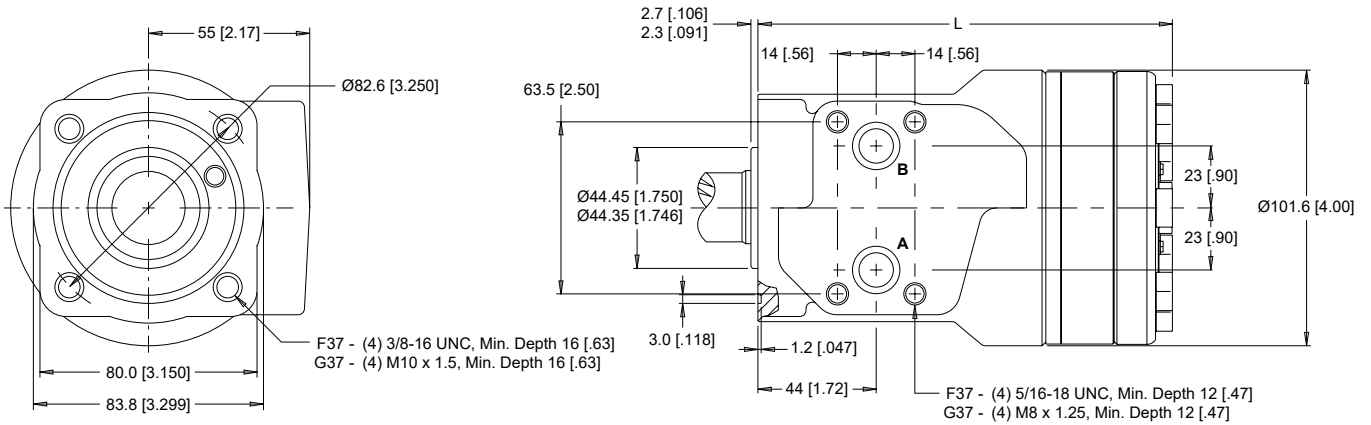


► Dimensions K & L are charted on page 65. ► (TP) - Taller Pilot Height. Refer to detailed drawing for dimensional differences.

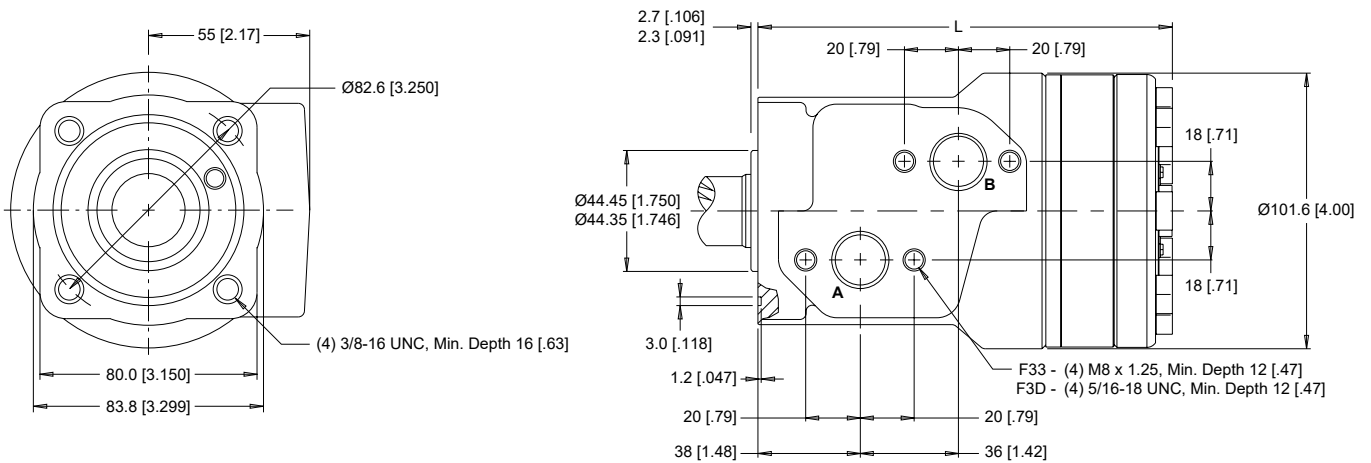
**HOUSINGS**

► Dimensions shown are without paint. Paint thickness can be up to 0.13 [.005].

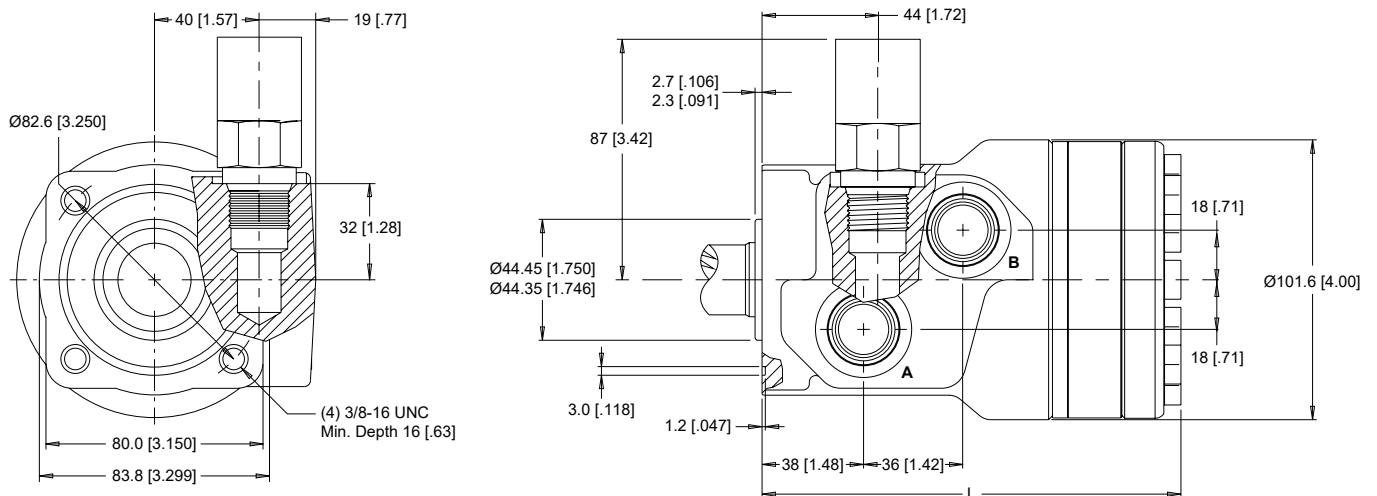
**4-HOLE, SQUARE MOUNT, ALIGNED MANIFOLD PORTS** **F37** 1/2" Drilled **G37** 1/2" Drilled



**4-HOLE, SQUARE MOUNT, OFFSET MANIFOLD PORTS** **F33** G 1/2 **F3D** 7/8-14 UNF



**4-HOLE, SQUARE MOUNT, OFFSET PORTS, VALVE CAVITY** **F39** 7/8-14 UNF



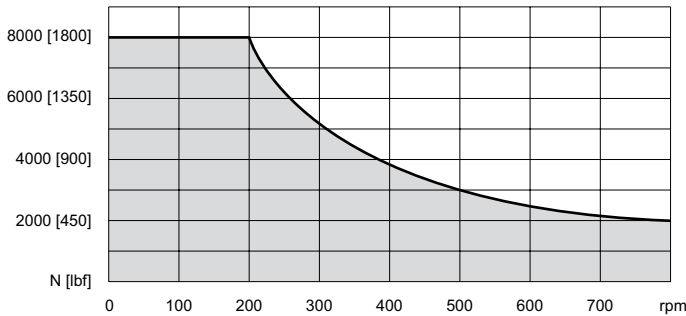
► Dimension L is charted on page 65.



**TECHNICAL INFORMATION**

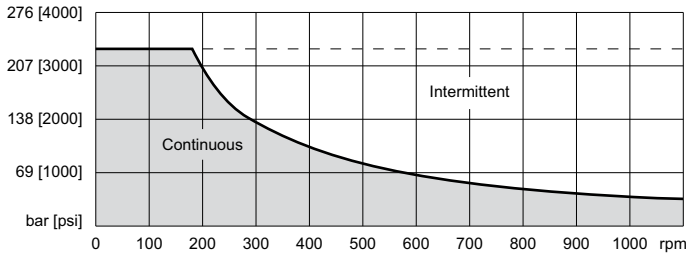
**ALLOWABLE SHAFT LOAD / BEARING CURVE**

The bearing curve below represents the side load capacity of the motor at the centerline of the key for various motor speeds. Operating conditions within the shaded area will maintain acceptable oil film lubrication with recommended fluids. Operating conditions outside the shaded area are susceptible to motor failure due to oil starvation and/or excessive heat generation. Fluids with low lubricity or low viscosity may require the maximum load and speed ratings to be derated to provide acceptable motor life and performance.

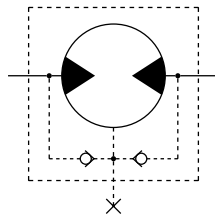


**PERMISSIBLE SHAFT SEAL PRESSURE**

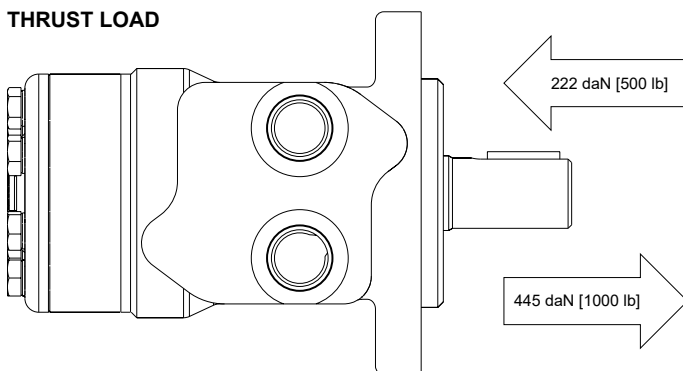
The curve below represents allowable seal pressure at various speeds. Operation in the gray area results in maintaining the rated life of the shaft seal. Actual shaft seal pressure depends on motor configuration.



- ▶ With check valves and drain connection, the shaft seal pressure equals pressure in the drain line. With check valves and no drain connection, shaft seal pressure is identical to output pressure. No check valves and no drain connection, the shaft seal pressure is identical to the average value of input and output pressure.



**THRUST LOAD**



**LENGTH & WEIGHT CHARTS**

Dimension K is the overall motor length from the rear of the motor to the mounting flange surface and is referenced on detailed housing drawings listed on pages 61-63.

<b>K</b>	<b>3mm Pilot</b>	<b>8mm Pilot</b>	<b>Weight</b>
#	mm [in]	mm [in]	kg [lb]
040	142 [5.60]	140 [5.50]	6.6 [14.5]
050	144 [5.67]	142 [5.57]	6.6 [14.5]
060	146 [5.74]	144 [5.64]	6.7 [14.7]
070	147 [5.80]	145 [5.70]	6.7 [14.7]
080	150 [5.91]	148 [5.81]	6.8 [15.0]
090	151 [5.96]	149 [5.86]	6.8 [15.0]
100	154 [6.06]	152 [5.96]	6.9 [15.2]
115	156 [6.15]	154 [6.05]	7.1 [15.6]
130	160 [6.28]	158 [6.18]	7.3 [16.0]
160	166 [6.53]	164 [6.43]	7.5 [16.5]
200	173 [6.83]	171 [6.73]	8.0 [17.6]
240	182 [7.15]	180 [7.05]	8.5 [18.7]
250	183 [7.20]	181 [7.10]	8.5 [18.7]
290	192 [7.56]	190 [7.46]	8.8 [19.4]
320	198 [7.78]	196 [7.68]	9.0 [19.8]
400	213 [8.39]	211 [8.29]	9.8 [21.6]

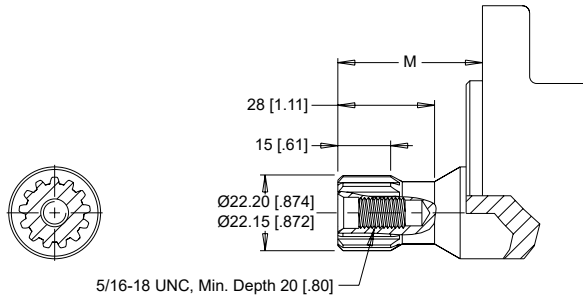
Dimension L is the overall motor length from the rear of the motor to the mounting flange surface and is referenced on detailed housing drawings listed on pages 63-64.

<b>L</b>	<b>Square &amp; B Mounts</b>	<b>B Mount Weight</b>	<b>Sq. Mount Weight</b>
#	mm [in]	kg [lb]	kg [lb]
040	142 [5.60]	7.8 [17.2]	5.3 [11.8]
050	144 [5.67]	7.8 [17.2]	5.3 [11.9]
060	146 [5.74]	7.9 [17.4]	5.4 [11.9]
070	147 [5.80]	7.9 [17.4]	5.4 [11.9]
080	150 [5.91]	8.0 [17.6]	5.5 [12.1]
090	151 [5.96]	8.0 [17.6]	5.5 [12.1]
100	154 [6.06]	8.1 [17.8]	5.6 [12.3]
115	156 [6.15]	8.3 [18.3]	5.8 [12.8]
130	160 [6.28]	8.5 [18.7]	6.0 [13.2]
160	166 [6.53]	8.7 [19.1]	6.2 [13.7]
200	173 [6.83]	9.2 [20.2]	6.7 [14.8]
240	182 [7.15]	9.7 [21.3]	7.2 [15.9]
250	183 [7.20]	9.7 [21.3]	7.2 [15.9]
290	192 [7.56]	10.0 [22.0]	7.5 [16.5]
320	198 [7.78]	10.2 [22.4]	7.7 [17.0]
400	213 [8.39]	11.0 [24.2]	8.5 [18.7]

- ▶ 255 & 256 series motor weights can vary ± 0.5 kg [1 lb] depending on model configurations such as housing, shaft, endcover, options etc.

**SHAFTS**

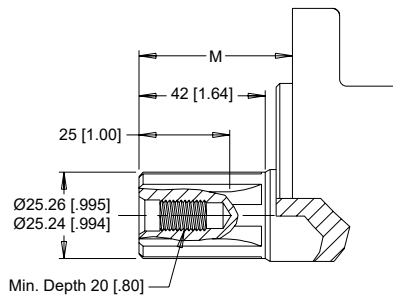
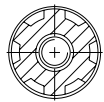
**01** 7/8" 13 Tooth Spline



Max. Torque: 170 Nm [1500 lb-in]

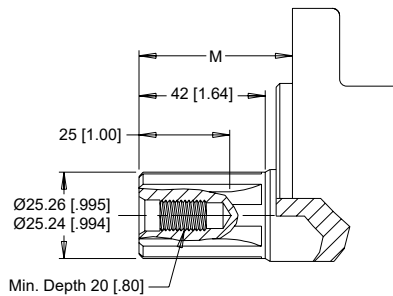
**02** 1" 6B Spline, 5/16-18 Tap

6B Spline  
SAE J499 Standard



Max. Torque: 678 Nm [6000 lb-in]

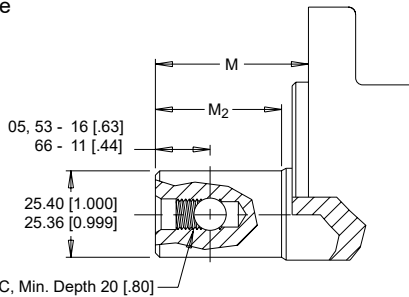
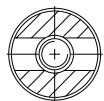
**04** 1" 6B Spline, M8x1.25 Tap



**05** 1" - 9.5 [.375] Pinhole

**53** 1" - 10.3 [.406] Pinhole

**66** 1" - 8.0 [.315] Pinhole

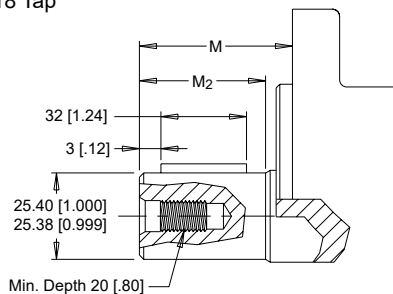
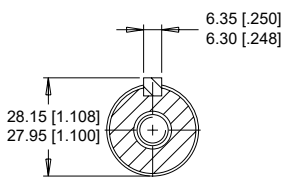


Max. Torque: 678 Nm [6000 lb-in]

**10** 1" Straight, 5/16-18 Tap

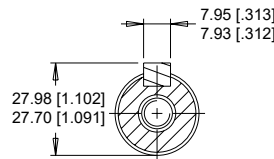
**11** 1" Straight, M8x1.25 Tap

**15** 1" Straight Ext., 5/16-18 Tap

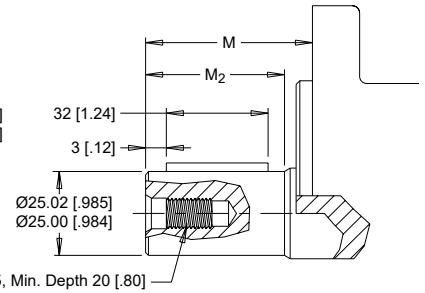


Max. Torque: 655 Nm [5800 lb-in]

**12** 25mm Straight

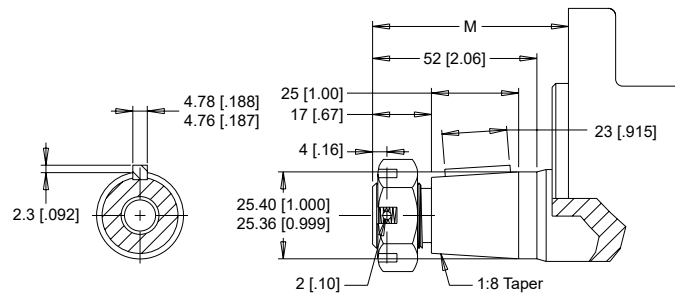


**16** 25mm Straight Extended



Max. Torque: 678 Nm [6000 lb-in]

**13** 1" Tapered



► A slotted hex nut is standard on this shaft.

Max. Torque: 655 Nm [5800 lb-in]

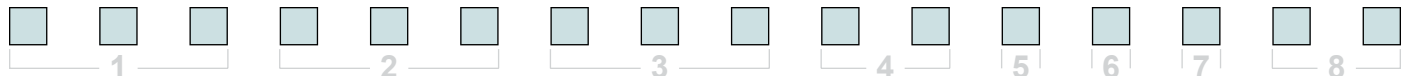
**MOUNTING / SHAFT LENGTH CHART**

Dimension M is the overall distance from the motor mounting surface to the end of the shaft.

Additional shaft length information, if necessary, is noted as M<sub>2</sub> and does not increase or decrease the listed M dimensions in this chart. The overall shaft lengths are already factored into the overall distance from the mounting surface to the end of the shaft.

M	3mm Pilot	5mm Pilot	M <sub>2</sub>
#	mm [in]	mm [in]	mm [in]
01	40 [1.59]	43 [1.69]	N/A
02	48 [1.88]	51 [1.98]	N/A
04	48 [1.88]	51 [1.98]	N/A
05	48 [1.88]	51 [1.98]	42 [1.64]
10	48 [1.88]	51 [1.98]	42 [1.64]
12	53 [2.08]	56 [2.18]	43 [1.69]
13	58 [2.29]	61 [2.39]	N/A
15	64 [2.52]	67 [2.62]	58 [2.28]
16	64 [2.52]	67 [2.62]	59 [2.34]
53	48 [1.88]	51 [1.98]	42 [1.64]
66	54 [2.13]	57 [2.23]	48 [1.89]

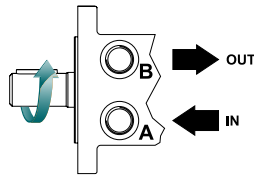
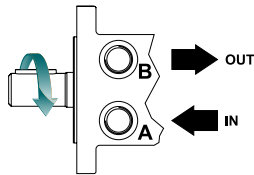
**ORDERING INFORMATION**



**1. CHOOSE SERIES DESIGNATION**

**255** Standard Rotation

**256** Reverse Rotation



► The 255 & 256 series are bi-directional.

**2. SELECT A DISPLACEMENT OPTION**

<b>040</b>	40 cm <sup>3</sup> /rev [2.5 in <sup>3</sup> /rev]	<b>130</b>	129 cm <sup>3</sup> /rev [7.9 in <sup>3</sup> /rev]
<b>050</b>	50 cm <sup>3</sup> /rev [3.1 in <sup>3</sup> /rev]	<b>160</b>	160 cm <sup>3</sup> /rev [9.8 in <sup>3</sup> /rev]
<b>060</b>	59 cm <sup>3</sup> /rev [3.6 in <sup>3</sup> /rev]	<b>200</b>	198 cm <sup>3</sup> /rev [12.1 in <sup>3</sup> /rev]
<b>070</b>	71 cm <sup>3</sup> /rev [4.3 in <sup>3</sup> /rev]	<b>240</b>	236 cm <sup>3</sup> /rev [14.4 in <sup>3</sup> /rev]
<b>080</b>	79 cm <sup>3</sup> /rev [4.9 in <sup>3</sup> /rev]	<b>250</b>	250 cm <sup>3</sup> /rev [15.3 in <sup>3</sup> /rev]
<b>090</b>	88 cm <sup>3</sup> /rev [5.4 in <sup>3</sup> /rev]	<b>290</b>	291 cm <sup>3</sup> /rev [17.8 in <sup>3</sup> /rev]
<b>100</b>	100 cm <sup>3</sup> /rev [6.1 in <sup>3</sup> /rev]	<b>320</b>	322 cm <sup>3</sup> /rev [19.6 in <sup>3</sup> /rev]
<b>115</b>	113 cm <sup>3</sup> /rev [6.9 in <sup>3</sup> /rev]	<b>400</b>	400 cm <sup>3</sup> /rev [24.4 in <sup>3</sup> /rev]

**3. SELECT A MOUNT & PORT OPTION**

<b>A10</b>	2-Hole, SAE A Mount, Aligned Ports, 1/2-14 NPT
<b>A11</b>	2-Hole, SAE A Mount, Aligned Ports, 7/8-14 UNF
<b>A12</b>	2-Hole, SAE A Mount, Offset Ports, G 1/2
<b>A13</b>	2-Hole, SAE A Mount, Offset Manifold Ports, G 1/2
<b>A1D</b>	2-Hole, SAE A Mount, Offset Manifold Ports, 7/8-14 UNF
<b>A19</b>	2-Hole, SAE A Mount, Offset Ports, Valve Cavity 7/8-14 UNF
<b>A30</b>	4-Hole, Magneto Mount, Aligned Ports, 1/2-14 NPT
<b>A31</b>	4-Hole, Magneto Mount, Aligned Ports, 7/8-14 UNF
<b>A33</b>	4-Hole, Magneto Mount, Offset Manifold Ports, G 1/2
<b>A3D</b>	4-Hole, Magneto Mount, Offset Manifold Ports, 7/8-14 UNF
<b>A62</b>	2-Hole, SAE A Mount, Offset Ports, G 1/2 (TP)
<b>A63</b>	2-Hole, SAE A Mount, Offset Manifold Ports, G 1/2 (TP)
<b>AC3</b>	4-Hole, Magneto Mount, Offset Manifold Ports, G 1/2 (TP)
<b>B11</b>	2-Hole, SAE B Mount, Aligned Ports, 7/8-14 UNF
<b>B18</b>	2-Hole, SAE B Mount, Aligned Ports, G 1/2
<b>F30</b>	4-Hole, Square Mount, Aligned Ports, 1/2-14 NPT
<b>F31</b>	4-Hole, Square Mount, Aligned Ports, 7/8-14 UNF
<b>F33</b>	4-Hole, Square Mount, Offset Manifold Ports, G 1/2
<b>F37</b>	4-Hole, Square Mount, Aligned Manifold Ports, 1/2" Drilled

► (TP) - Tall pilot. Speed sensor option is not available on tall pilot housings.

**3. SELECT A MOUNT & PORT OPTION**

<b>F38</b>	4-Hole, Square Mount, Aligned Ports, G 1/2
<b>F39</b>	4-Hole, Square Mount, Offset Ports, Valve Cavity 7/8-14 UNF
<b>F3D</b>	4-Hole, Square Mount, Offset Manifold Ports, 7/8-14 UNF
<b>G37</b>	4-Hole, Square Mount, Aligned Manifold Ports, 1/2" Drilled
<b>G38</b>	4-Hole, Square Mount, Aligned Ports, G 1/2

**4. SELECT A SHAFT OPTION**

<b>01</b>	7/8" 13 Tooth Spline	<b>12</b>	25mm Straight
<b>02</b>	1" 6B Spline, 5/16-18 Tap	<b>13</b>	1" Tapered
<b>04</b>	1" 6B Spline, M8x1.25 Tap	<b>15</b>	1" Straight Extended
<b>05</b>	1" - 9.5 [.375] Pinhole	<b>16</b>	25mm Straight Extended
<b>10</b>	1" Straight 5/16-18 Tap	<b>53</b>	1" - 10.3 [.406] Pinhole
<b>11</b>	1" Straight M8x1.25 Tap	<b>66</b>	1" - 8.0 [.315] Pinhole

► The 15 & 16 extended shafts are designed for use with one of the speed sensor options listed in STEP 7.

**5. SELECT A PAINT OPTION**

<b>A</b>	Black
<b>B</b>	Black, Unpainted Mounting Surface

**6. SELECT A VALVE CAVITY / CARTRIDGE OPTION**

<b>A</b>	None	<b>F</b>	121 bar [1750 psi] Relief
<b>B</b>	Valve Cavity Only	<b>G</b>	138 bar [2000 psi] Relief
<b>C</b>	69 bar [1000 psi] Relief	<b>J</b>	173 bar [2500 psi] Relief
<b>D</b>	86 bar [1250 psi] Relief	<b>L</b>	207 bar [3000 psi] Relief
<b>E</b>	104 bar [1500 psi] Relief		

► Valve cavity is only available on the A19 & F39 housings.

**7. SELECT AN ADD-ON OPTION**

<b>A</b>	Standard
<b>B</b>	Lock Nut
<b>C</b>	Solid Hex Nut
<b>W</b>	Speed Sensor, Dual, 4-Pin Male Weatherpack Connector
<b>X</b>	Speed Sensor, Dual, 4-Pin M12 Male Connector
<b>Y</b>	Speed Sensor, Single, 3-Pin Male Weatherpack Connector
<b>Z</b>	Speed Sensor, Single, 4-Pin M12 Male Connector

**8. SELECT A MISCELLANEOUS OPTION**

<b>AA</b>	None
<b>EG</b>	Viton Shaft Seal