

Impro
Fluidtek

Technical Information

Orbital Motors

Type WD, WP and WR



TABLE OF CONTENTS

TECHNICAL INFORMATION

Operating Recommendations.....	4-5
Motor Connections	5
Product Testing (Understanding the Performance Charts).....	6
Allowable Bearing & Shaft Loads	7
Vehicle Drive Calculations	8-9
Induced Side Loading.....	10
Hydraulic Equations.....	10
Shaft Nut Dimensions & Torque Specifications	11

OPTIONAL MOTOR FEATURES

Speed Sensor Options	12-13
Freeturning Rotor Option.....	13
Valve Cavity Option	14
Slinger Seal Option.....	14

LIGHT DUTY HYDRAULIC MOTORS

WD Product Line Introduction.....	15
WD Displacement Performance Charts.....	16-22
145 & 146 Series Housings.....	23-24
145 & 146 Series Technical Information.....	24
145 & 146 Series Shafts.....	25
145 & 146 Series Ordering Information.....	26
WP Product Line Introduction.....	27
WP Displacement Performance Charts.....	28-34
155 & 156 Series Housings.....	35-39
155 & 156 Series Technical Information.....	40
155 & 156 Series Shafts.....	41
155 & 156 Series Ordering Information.....	42
157 & 158 Series Housings.....	43
157 & 158 Series Technical Information.....	44
157 & 158 Series Shafts.....	45
157 & 158 Series Ordering Information.....	46
WR Product Line Introduction.....	47
WR Displacement Performance Charts.....	48-55
251 & 252 Series Housings.....	56-57
251 & 252 Series Technical Information.....	58
251 & 252 Series Shafts.....	59
251 & 252 Series Ordering Information.....	60
255 & 256 Series Housings.....	61-64
255 & 256 Series Technical Information.....	65
255 & 256 Series Shafts.....	66
255 & 256 Series Ordering Information.....	67

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.

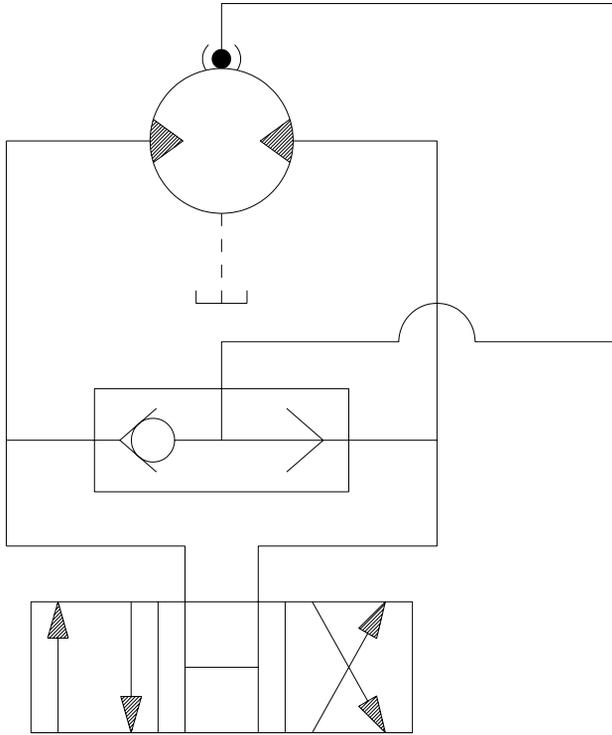
Caution! - Because it is possible for some large displacement motors to overpower the brake, it is critical that the maximum system pressure be limited for these applications. Failure to do so could cause serious injury or death. When choosing a motor/brake for an application, consult the performance 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.

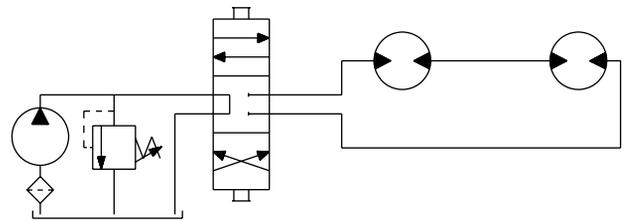
► NOTE: It is vital that all operating recommendations be followed. Failure to do so could result in injury or death.

MOTOR CIRCUITS

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

SERIES CONNECTION

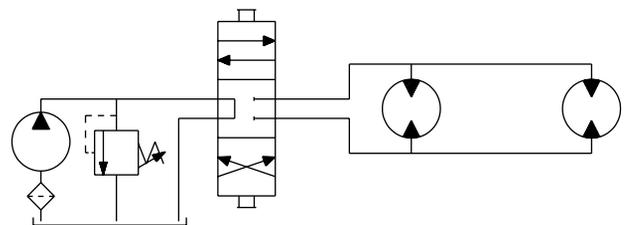
When motors are connected in series, the outlet of one motor is connected to the inlet of the next motor. This allows the full pump flow to go through each motor and provide maximum speed. Pressure and torque are distributed between the motors based on the load each motor is subjected to. The maximum 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.

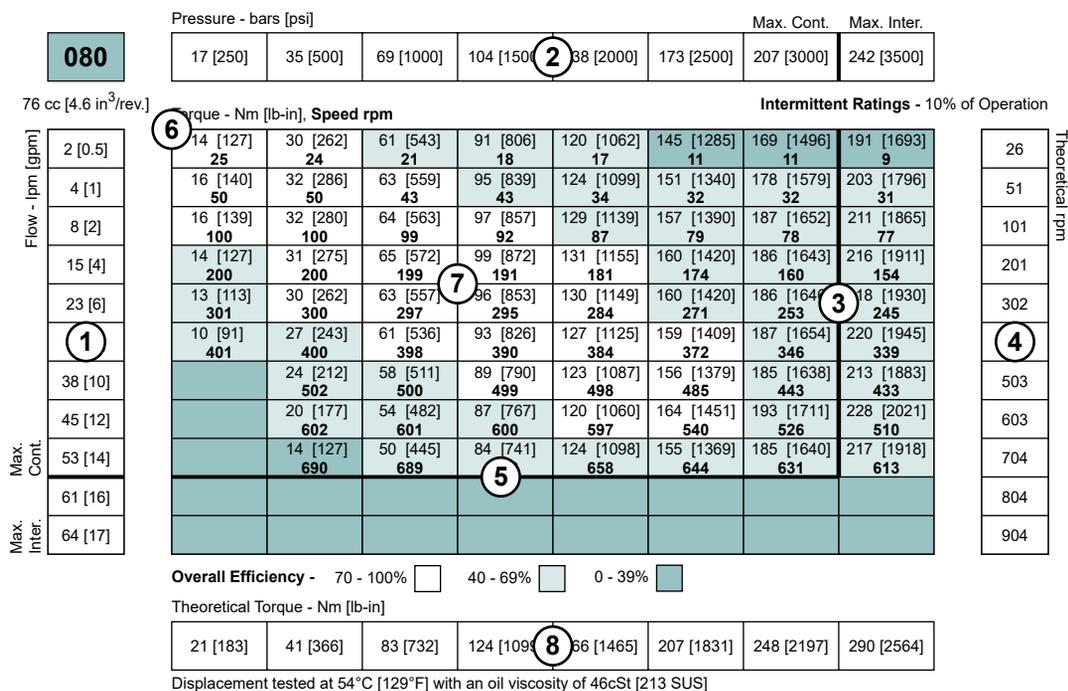


PARALLEL CIRCUIT

► 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.

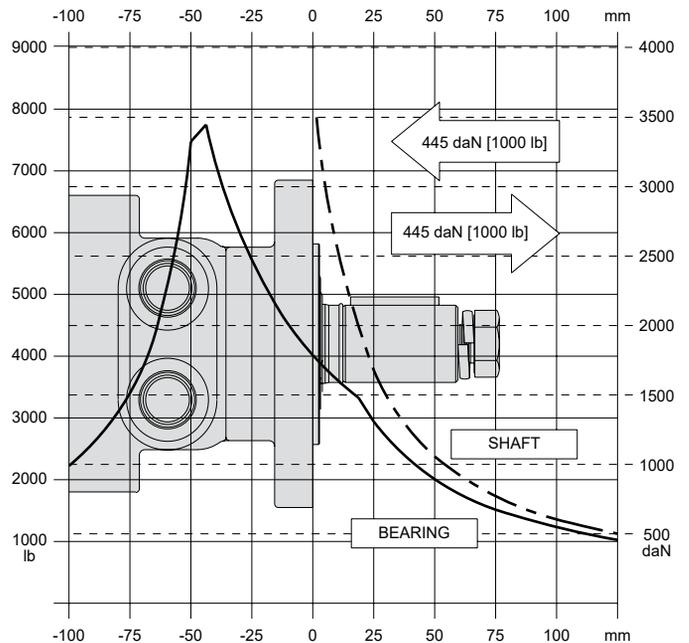
The bearing curves for each model are based on laboratory analysis and testing results constructed at Impro Fluidtek. The shaft loading is based on a 3:1 safety factor and 330 Kpsi tensile strength. The allowable load is the lower of the curves at a given point. For instance, one inch in front of the 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
 GVW1,500lbs.
 weight over each drive wheel 425 lbs.
 rolling radius of tires 16 in.
 desired acceleration0-5 mph in 10 sec.
 top speed..... 5 mph
 gradability.....20%
 worst working surface..... poor asphalt

To determine maximum motor speed

$$RPM = \frac{2.65 \times KPH \times G}{rm} \qquad RPM = \frac{168 \times MPH \times G}{ri}$$

Where:

MPH = max. vehicle speed (miles/hr)
 KPH = max. vehicle speed (kilometers/hr)
 ri = rolling radius of tire (inches)
 G = gear reduction ratio (if none, G = 1)
 rm = rolling radius of tire (meters)

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

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:

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

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.

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

Where:

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

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

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:

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

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

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

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.

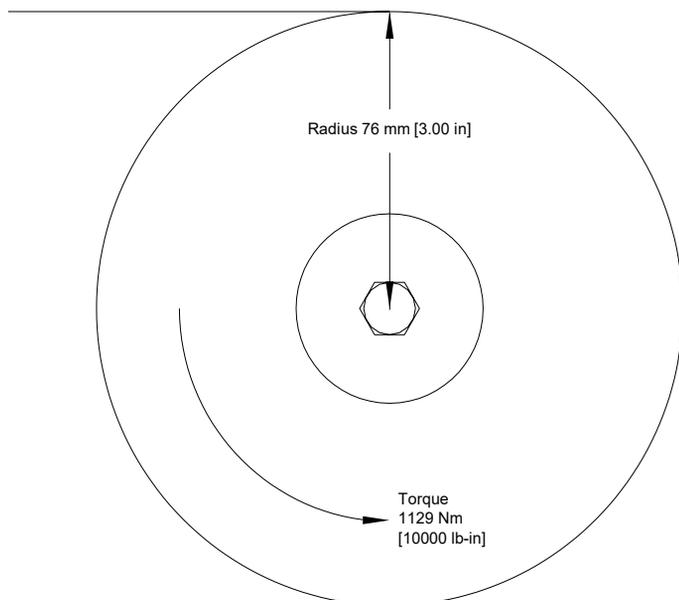
$$RL = \sqrt{W^2 + \left(\frac{T}{ri}\right)^2} \text{ lb} \qquad RL = \sqrt{W^2 + \left(\frac{T}{rm}\right)^2} \text{ kg}$$

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

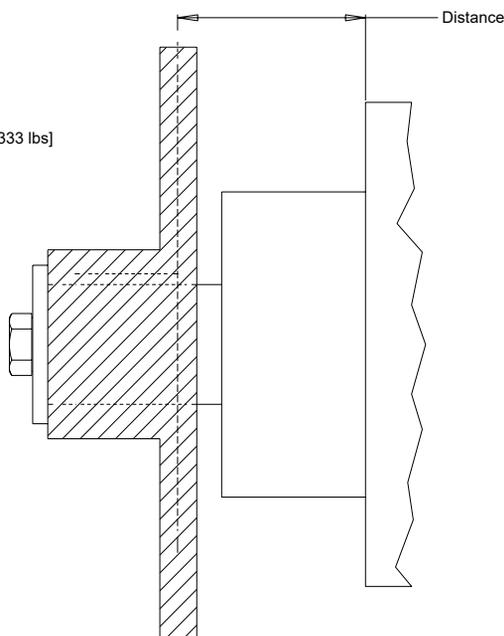
In many cases, pulleys or sprockets may be used to transmit the torque produced by the motor. Use of these components will create a torque induced side load on the motor shaft and bearings. It is important that this load be taken into consideration when choosing a motor with sufficient bearing and shaft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

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

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



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) =

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

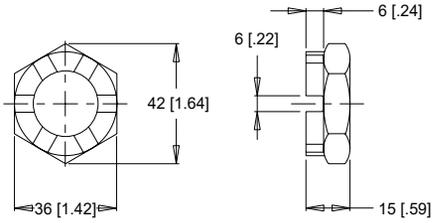
Power Out (HP) =

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

SHAFT NUT INFORMATION

35MM TAPERED SHAFTS
M24 x 1.5 Thread

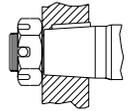
A Slotted Nut



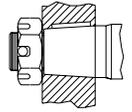
Torque Specifications: 32.5 daNm [240 ft.lb.]

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.



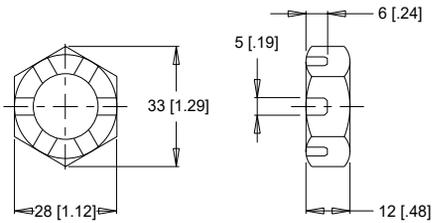
incorrect



correct

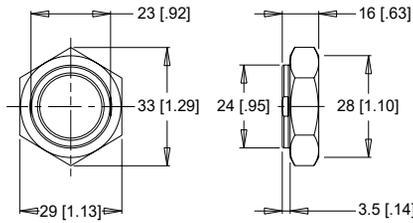
1" TAPERED SHAFTS
3/4-28 Thread

A Slotted Nut



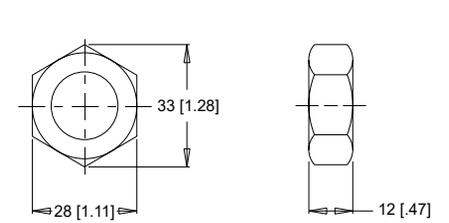
Torque Specifications: 20 - 23 daNm [150 - 170 ft.lb.]

B Lock Nut



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

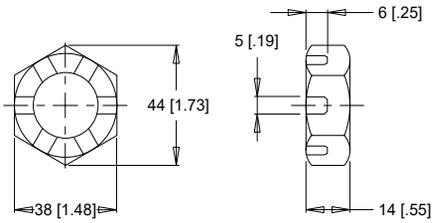
C Solid Nut



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

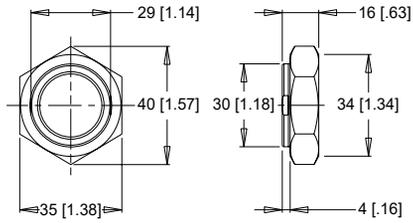
1-1/4" TAPERED SHAFTS
1-20 Thread

A Slotted Nut



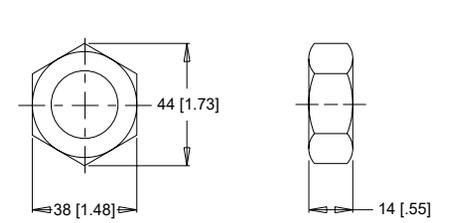
Torque Specifications: 38 daNm [280 ft.lb.] Max.

B Lock Nut



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

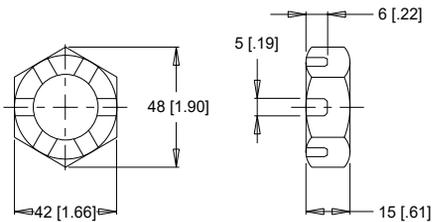
C Solid Nut



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

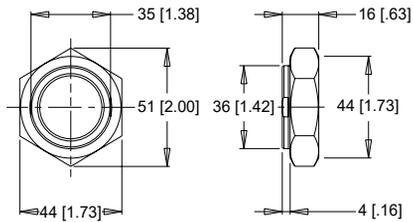
1-3/8" & 1-1/2" TAPERED SHAFTS
1 1/8-18 Thread

A Slotted Nut



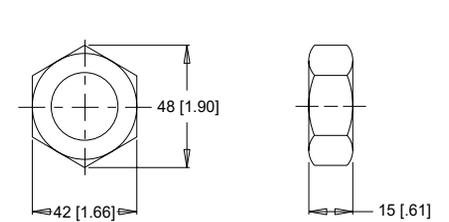
Torque Specifications: 41 - 54 daNm [300 - 400 ft.lb.]

B Lock Nut



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

C Solid Nut



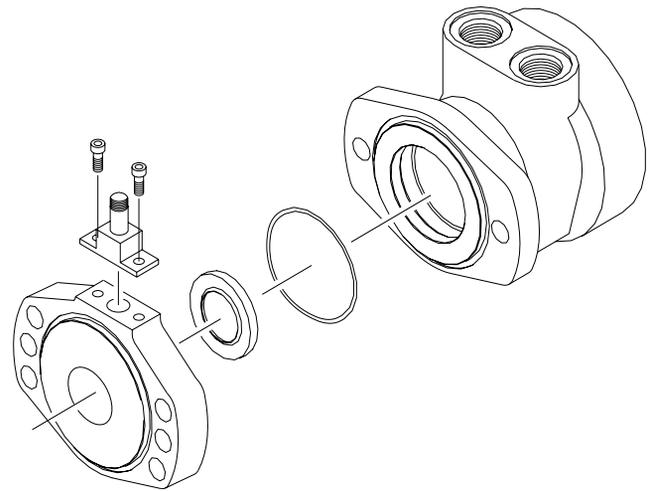
Torque Specifications: 41 - 54 daNm [300 - 400 ft.lb.]

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 24V
 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]

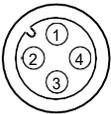
DUAL ELEMENT SENSOR - X & W

Supply voltages 7.5-18 Vdc
 Maximum output off voltage 18V
 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

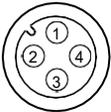
PIN



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

X Option

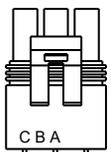
PIN



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

Y Option

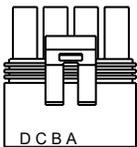
PIN



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.

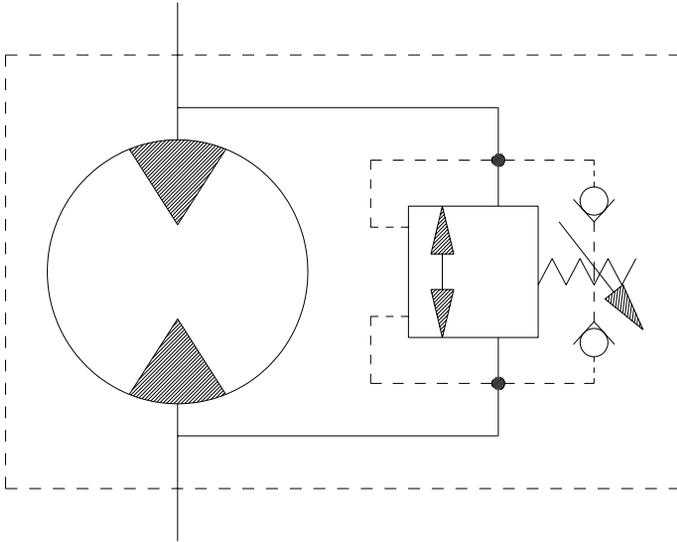
FREE TURNING ROTOR

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

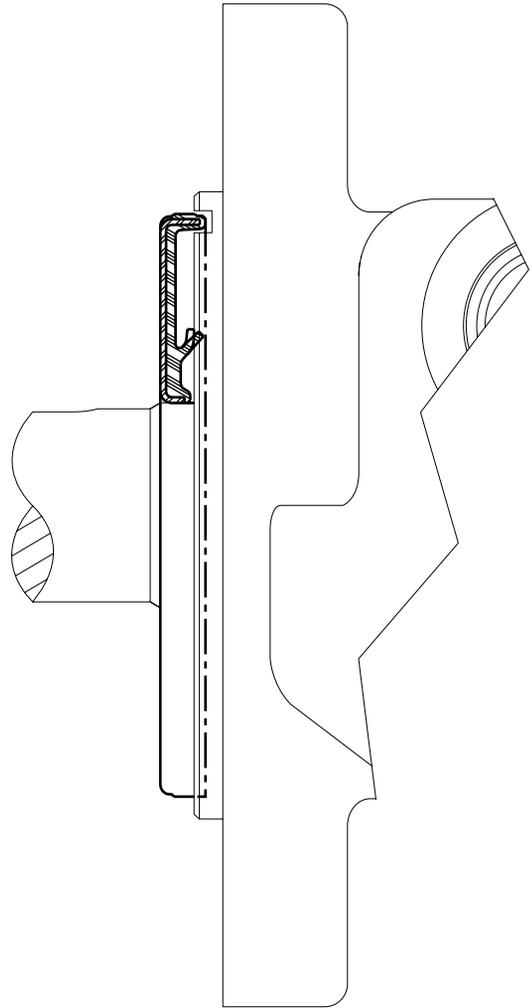
The valve cavity option provides a cost effective way to incorporate a variety of cartridge valves integral to the motor. The valve cavity is a standard 10 series 2-way cavity that accepts numerous cartridge valves, including over-running check valves, relief cartridges, flow control valves, pilot operated 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

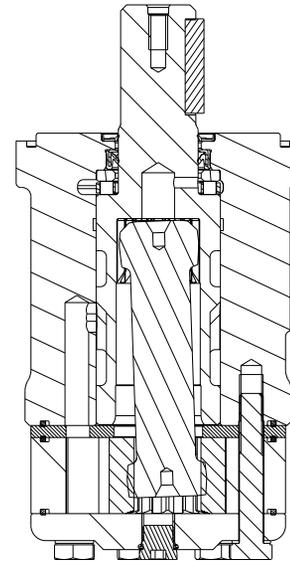
- Built-in check valves offer versatility and increased seal life.
- A variety of mounts and shafts provide flexibility in application design.
- Spool valve design gives superior performance and smooth operation over a wide speed and torque range.
- Integral rotor design provides smooth performance, 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 ³ [in ³ /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]	84 [743]	114 [1009]	124 [1800]	173 [2500]	225 [3260]
060	59.4 [3.6]	880	970	53 [14]	61 [16]	102 [903]	136 [1204]	124 [1800]	173 [2500]	225 [3260]
080	79.6 [4.9]	752	934	61 [16]	76 [20]	128 [1133]	175 [1549]	124 [1800]	173 [2500]	225 [3260]
100	96.0 [5.9]	628	786	61 [16]	76 [20]	158 [1398]	220 [1947]	124 [1800]	173 [2500]	225 [3260]
125	122.8 [7.5]	483	604	61 [16]	76 [20]	202 [1788]	274 [2425]	124 [1800]	173 [2500]	225 [3260]
160	158.0 [9.6]	383	479	61 [16]	76 [20]	248 [2195]	351 [3106]	138 [2000]	173 [2500]	225 [3260]
200	196.5 [12.0]	308	384	61 [16]	76 [20]	274 [2761]	411 [3638]	103 [1500]	166 [2400]	225 [3260]
250	240.5 [14.7]	248	312	61 [16]	76 [20]	317 [2806]	450 [3983]	103 [1500]	155 [2250]	225 [3260]
315	303.2 [18.5]	199	250	61 [16]	76 [20]	396 [3505]	576 [5098]	103 [1500]	155 [2250]	200 [2900]
400	385.8 [23.5]	154	189	61 [16]	76 [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

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

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

		Pressure - bar [psi]					Max. Cont.	Max. Inter.			
040		21 [300]	41 [600]	62 [900]	83 [1200]	103 [1500]	124 [1800]	155 [2250]			
40 cm ³ [2.4 in ³] / rev		Torque - Nm [lb-in], Speed rpm					Intermittent Ratings - 10% of Operation				
Flow - lpm [gpm]	8 [2]	10 [89] 182	20 [177] 169	29 [257] 128	40 [354] 90					191	
	15 [4]	11 [97] 362	21 [186] 344	31 [274] 334	43 [381] 320	54 [478] 304	65 [575] 284	78 [690] 254	380		
	23 [6]	10 [89] 548	20 [177] 535	32 [283] 519	42 [372] 502	53 [469] 488	66 [584] 468	79 [699] 428	572		
	30 [8]	7 [62] 738	19 [168] 729	31 [274] 706	41 [363] 688	52 [460] 670	64 [566] 648	78 [690] 614	763		
	38 [10]	6 [53] 932	16 [142] 914	30 [266] 896	40 [354] 878	51 [451] 856	62 [549] 834	77 [681] 798	955		
	45 [12]	3 [27] 1124	14 [124] 1102	28 [248] 1084	38 [336] 1062	49 [434] 1043	60 [531] 1014	76 [673] 976	1144		
	53 [14]		14 [124] 1312	25 [221] 1290	38 [336] 1266	48 [425] 1242	60 [531] 1218	76 [673] 1168	1335		
Max. Max. Inter. Cont.											
Rotor Width		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]									

		Pressure - bar [psi]					Max. Cont.	Max. Inter.			
050		21 [300]	41 [600]	62 [900]	83 [1200]	103 [1500]	124 [1800]	138 [2000]	173 [2500]		
48 cm ³ [2.9 in ³] / rev		Torque - Nm [lb-in], Speed rpm					Intermittent Ratings - 10% of Operation				
Flow - lpm [gpm]	8 [2]	14 [124] 148	26 [230] 143	40 [354] 130	55 [354] 116	65 [575] 102	82 [726] 86	88 [779] 75		158	
	15 [4]	14 [124] 298	27 [239] 289	42 [372] 276	56 [381] 260	67 [593] 245	83 [735] 229	89 [788] 214	114 [1009] 166	313	
	23 [6]	12 [106] 450	24 [212] 438	41 [363] 423	54 [372] 406	68 [602] 388	84 [743] 374	91 [805] 352	112 [991] 314	471	
	30 [8]	9 [80] 602	21 [186] 590	38 [336] 580	52 [363] 555	65 [575] 540	81 [717] 523	88 [779] 508	110 [974] 475	629	
	38 [10]	2 [18] 750	19 [168] 732	37 [327] 722	51 [354] 713	63 [558] 693	77 [681] 681	85 [752] 669	107 [947] 635	786	
	45 [12]		17 [150] 900	33 [292] 885	46 [336] 875	60 [531] 860	73 [646] 848	83 [735] 830	105 [929] 794	942	
	53 [14]			28 [248] 1012	42 [336] 1000	58 [513] 986	70 [620] 972	80 [708] 960	100 [885] 924	1100	
Max. Max. Inter. Cont.											
Rotor Width		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

060		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 ³ [3.6 in ³] / rev											
		Torque - Nm [lb-in], Speed rpm					Intermittent Ratings - 10% of Operation				
Max. Max. Inter. Cont.	Flow - lpm [gpm]	8 [2]	17 [150] 122	30 [266] 119	46 [407] 113	63 [558] 107	82 [726] 94	99 [876] 77	109 [965] 65		128
		15 [4]	16 [142] 247	32 [283] 243	48 [425] 236	65 [575] 223	82 [726] 209	102 [903] 192	110 [974] 180	136 [1204] 142	254
		23 [6]	15 [133] 371	29 [257] 367	47 [416] 360	66 [584] 347	81 [717] 330	99 [876] 315	107 [947] 304	135 [1195] 266	382
		30 [8]	12 [106] 496	26 [230] 492	44 [389] 484	62 [549] 470	79 [699] 457	96 [850] 436	105 [929] 425	130 [1151] 386	510
		38 [10]	8 [71] 626	23 [204] 618	40 [354] 608	60 [531] 596	77 [681] 582	94 [832] 567	104 [920] 558	128 [1133] 500	638
		45 [12]	2 [18] 752	20 [177] 744	37 [327] 735	58 [513] 727	75 [664] 716	91 [805] 696	100 [885] 680	127 [1124] 628	764
		53 [14]		15 [133] 880	31 [274] 870	48 [425] 862	71 [628] 847	87 [770] 830	97 [858] 800	121 [1071] 740	892
		61 [16]		8 [71] 970	27 [239] 958	45 [398] 944	64 [566] 932	82 [726] 924	93 [823] 902	117 [1035] 842	1020
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]									
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]									

080		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 ³ [4.9 in ³] / rev											
		Torque - Nm [lb-in], Speed rpm					Intermittent Ratings - 10% of Operation				
Max. Max. Inter. Cont.	Flow - lpm [gpm]	8 [2]	22 [195] 90	42 [372] 85	61 [540] 78	82 [726] 70	102 [903] 62	124 [1097] 52	138 [1221] 42		95
		15 [4]	20 [177] 187	43 [381] 182	62 [549] 176	84 [743] 167	107 [947] 154	128 [1133] 143	141 [1248] 136	171 [1513] 112	190
		23 [6]	19 [168] 286	41 [363] 276	63 [558] 268	83 [735] 257	104 [920] 248	125 [1106] 237	139 [1230] 227	175 [1549] 202	285
		30 [8]	13 [115] 378	38 [336] 372	61 [540] 364	82 [726] 354	102 [903] 342	124 [1097] 334	137 [1212] 324	174 [1540] 297	381
		38 [10]	8 [71] 474	35 [310] 469	58 [513] 460	80 [708] 448	101 [894] 440	123 [1089] 430	135 [1195] 416	165 [1460] 370	476
		45 [12]	2 [18] 564	29 [257] 558	55 [487] 550	75 [664] 540	100 [885] 530	121 [1071] 519	133 [1177] 504	163 [1443] 472	570
		53 [14]		26 [230] 662	48 [425] 658	70 [620] 648	96 [850] 637	115 [1018] 633	130 [1151] 609	161 [1425] 576	666
		61 [16]		20 [177] 752	44 [389] 734	68 [602] 724	85 [752] 716	105 [929] 700	123 [1089] 690	154 [1363] 663	761
76 [20]		11 [97] 934	32 [283] 929	54 [478] 914	74 [655] 904	94 [832] 890	108 [956] 876	148 [1310] 814	951		
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]									
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.		
100		21 [300]	41 [600]	62 [900]	83 [1200]	103 [1500]	124 [1800]	138 [2000]	173 [2500]		
96 cm ³ [5.9 in ³] / rev		Torque - Nm [lb-in], Speed rpm					Intermittent Ratings - 10% of Operation				
Flow - lpm [gpm]	8 [2]	28 [248] 76	57 [504] 71	82 [726] 65	108 [956] 54	132 [1168] 45	158 [1398] 33			79	
	15 [4]	25 [221] 154	56 [496] 147	80 [708] 140	106 [938] 132	130 [1151] 122	155 [1372] 113	165 [1460] 104	205 [1814] 84	157	
	23 [6]	23 [204] 235	50 [443] 226	76 [673] 219	104 [920] 212	128 [1133] 203	153 [1354] 193	170 [1505] 185	212 [1876] 162	236	
	30 [8]	19 [168] 313	47 [416] 307	74 [655] 299	104 [894] 291	125 [1106] 281	152 [1345] 270	167 [1478] 264	220 [1947] 240	316	
	38 [10]	15 [133] 392	43 [381] 389	71 [628] 384	97 [858] 375	122 [1080] 364	149 [1319] 353	167 [1478] 346	218 [1929] 314	395	
	45 [12]	11 [97] 470	37 [327] 465	70 [620] 458	94 [832] 449	120 [1062] 437	147 [1301] 429	162 [1434] 426	210 [1859] 398	473	
	53 [14]		33 [292] 550	60 [531] 545	87 [770] 532	118 [1044] 518	143 [1266] 510	160 [1416] 500	207 [1832] 473	552	
	61 [16]		27 [239] 628	55 [487] 622	82 [726] 611	114 [1009] 598	139 [1230] 584	150 [1328] 575	196 [1732] 552	631	
	76 [20]			37 [327] 786	67 [593] 770	93 [823] 758	123 [1089] 732	138 [1221] 716	190 [1682] 670	789	
			Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input type="checkbox"/>								
		Theoretical Torque - 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]									
		Rotor Width									
		13.0 [510]									
		mm [in]									

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

► 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

160		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 ³ [9.6 in ³] / rev										
Max. Max. Inter. Cont.		Torque - Nm [lb-in], Speed rpm					Intermittent Ratings - 10% of Operation			
		42 [372]	88 [779]	120 [1062]	168 [1487]	210 [1859]	246 [2177]			
Flow - lpm [gpm]	8 [2]	47	45	42	36	28	20			48
	15 [4]	39 [345]	85 [752]	125 [1106]	170 [1505]	211 [1867]	251 [2221]	284 [2513]	345 [3053]	96
	23 [6]	38 [336]	79 [699]	123 [1089]	168 [1487]	209 [1850]	248 [2195]	275 [2434]	351 [3106]	144
	30 [8]	33 [292]	74 [655]	118 [1044]	164 [1451]	207 [1832]	245 [2168]	270 [2390]	338 [2991]	192
	38 [10]	14 [124]	59 [522]	105 [929]	150 [1328]	192 [1699]	233 [2062]	253 [2239]	307 [2717]	240
	45 [12]	287	285	283	281	276	270	261	235	287
	53 [14]	5 [44]	50 [443]	92 [814]	140 [1239]	188 [1664]	217 [1920]	242 [2142]	298 [2637]	335
	61 [16]	335	334	332	329	324	319	311	281	384
76 [20]		35 [310]	75 [664]	120 [1062]	160 [1416]	205 [1814]	233 [2062]	289 [2558]	479	
		383	382	378	372	363	358	333		
		12 [106]	55 [487]	92 [814]	135 [1195]	183 [1620]	204 [1805]	276 [2443]		
		479	478	475	469	460	455	434		
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]								
		53 [468]	103 [913]	156 [1380]	209 [1848]	259 [2293]	312 [2761]	347 [3073]	435 [3852]	
20.8 [820]		Displacement tested at 45°C [113°F] with an oil viscosity of 46cSt [213 SUS]								
mm [in]										

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

► 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.			
250		21 [300]	41 [600]	62 [900]	83 [1200]	97 [1400]	103 [1500]	138 [2000]	155 [2250]	
241 cm ³ [14.7 in ³] / 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.										
Rotor Width		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.			
315		21 [300]	41 [600]	62 [900]	90 [1300]	103 [1500]	138 [2000]	155 [2250]		
303 cm ³ [18.5 in ³] / 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.										
Rotor Width		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.
400		21 [300]	41 [600]	69 [1000]	83 [1200]	97 [1400]	121 [1750]
386 cm ³ [23.5 in ³] / rev							
		Torque - Nm [lb-in], Speed rpm				Intermittent Ratings - 10% of Operation	
Flow - lpm [gpm]	Max. Max. Inter. Cont.	8 [2]	19	18	14	11	20
		15 [4]	99 [876]	207 [1832]	344 [3044]	411 [3637]	480 [4248]
23 [6]	59	57	52	43	39	32	39
30 [8]	77	75	73	67	60	49	59
38 [10]	100	97	93	89	81	70	79
45 [12]	120	117	113	109	97	84	98
53 [14]	137	134	131	129	124	113	118
61 [16]	150	154	151	148	138	130	137
76 [20]	189	187	185	182	178	178	157
		98 [867]	234 [2071]	308 [2726]	384 [3398]	486 [4301]	196
		189	187	185	182	178	
Rotor Width		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]		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]

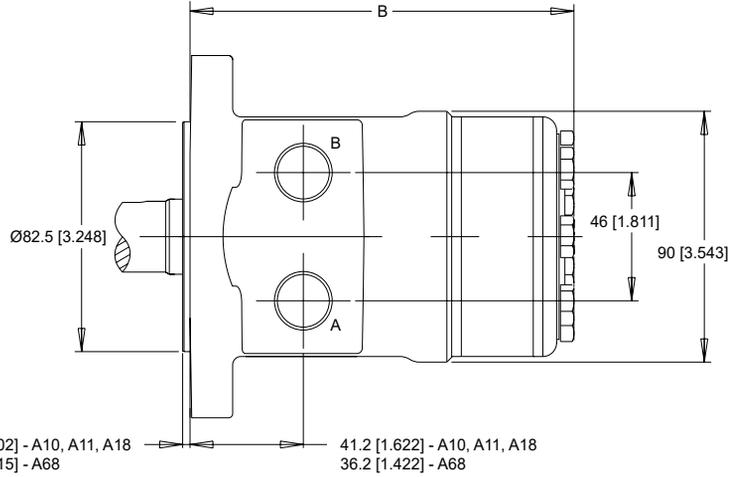
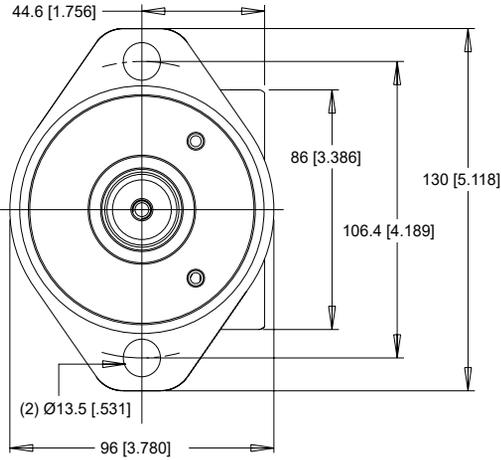
► Performance data is typical. Performance of production units varies slightly from one motor to another. Operating at maximum continuous pressure and maximum continuous flow simultaneously is not recommended. For additional information on product testing please refer to page 6.

HOUSINGS

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

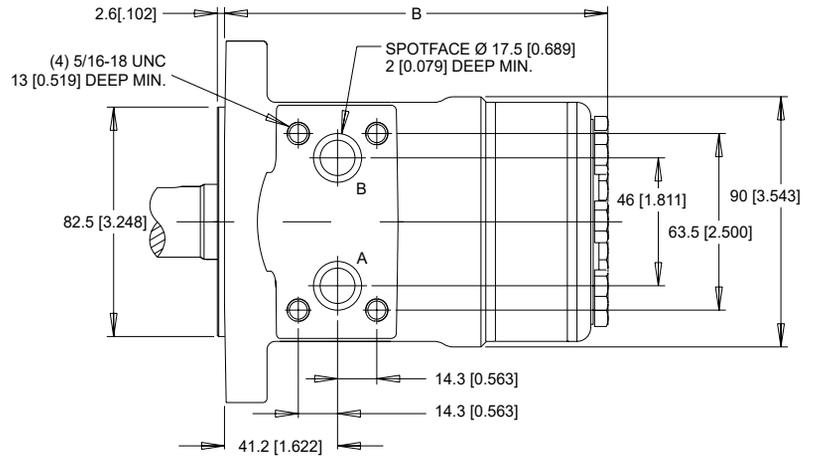
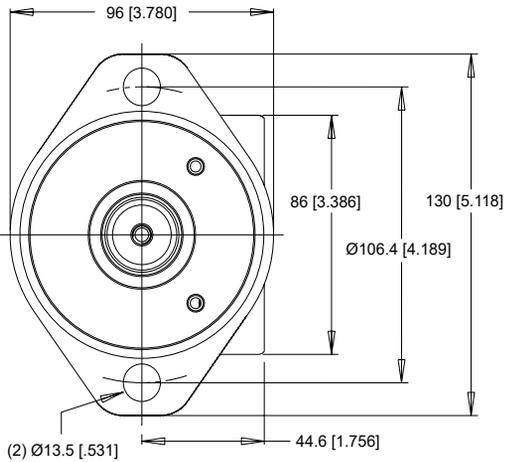
2-HOLE, SAE A MOUNT, ALIGNED PORTS

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



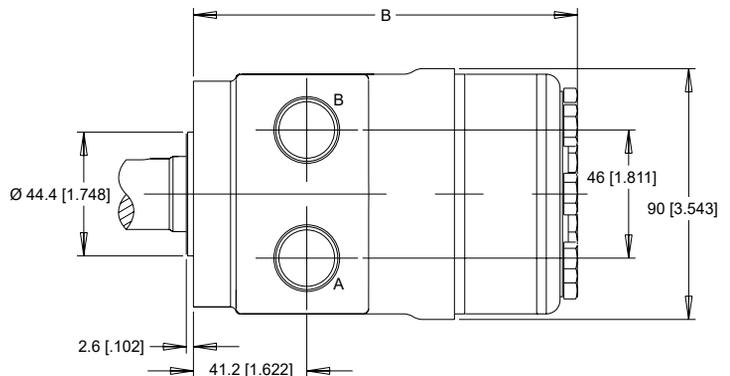
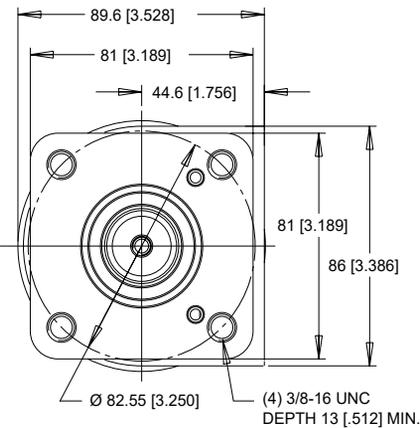
2-HOLE, SAE A MOUNT, ALIGNED MANIFOLD PORTS

A17 1/2" Drilled



4-HOLE, SQUARE MOUNT, ALIGNED PORTS

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

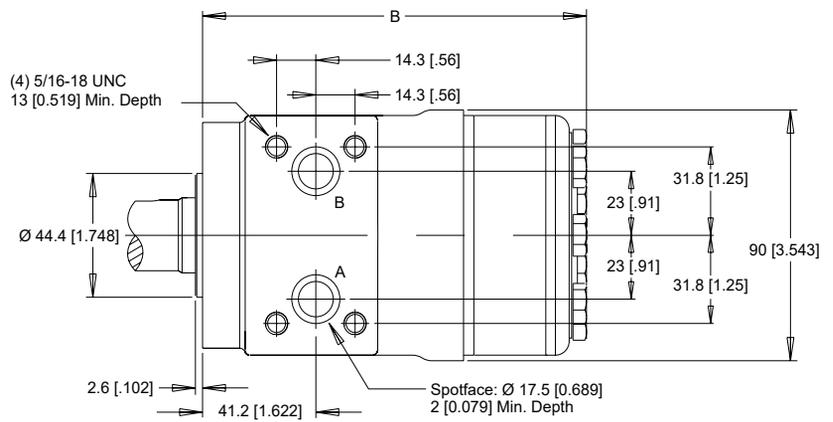
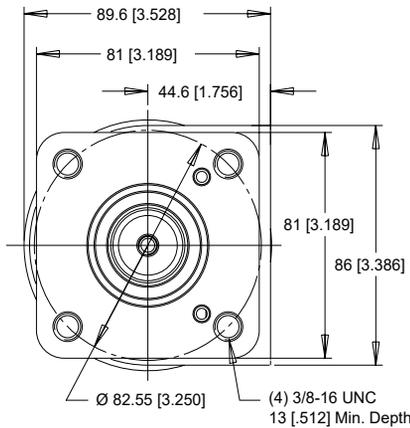


► Dimension B is charted on page 24. ► (TP) - Taller Pilot Height. Refer to detailed drawing for dimensional differences.

HOUSINGS & TECHNICAL INFORMATION

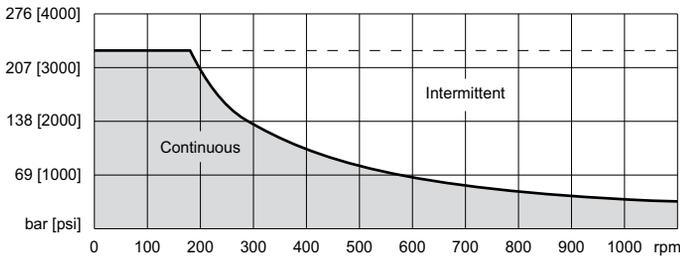
► Dimensions shown are without paint. Paint thickness can be up to 0.13 [.005].

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

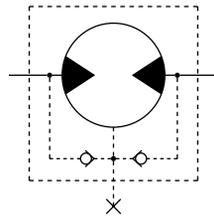


PERMISSIBLE SHAFT SEAL PRESSURE

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

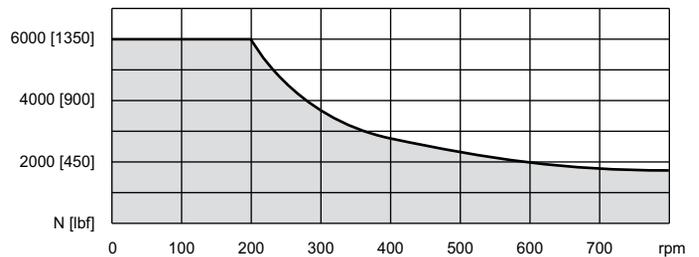
Dimension B is the overall motor length from the rear of the motor to the mounting flange surface and is referenced on detailed housing drawings listed on pages 23-24.

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]

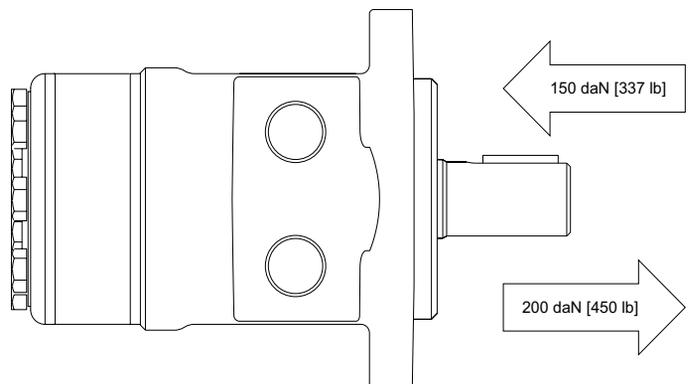
► The overall motor weights listed in this chart were calculated using the heaviest of the housing options associated with that mounting flange to end of motor dimension. 145 & 146 series motor weights can vary ± 0.5 kg [1 lb] depending on model configurations such as housing, shaft, endcover, options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



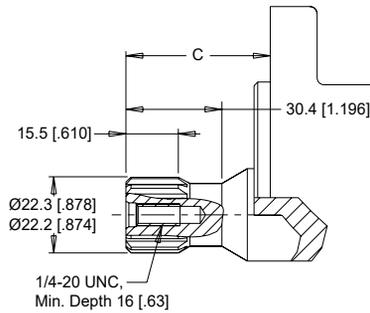
THRUST LOAD



SHAFTS

01 7/8" 13 Tooth Spline

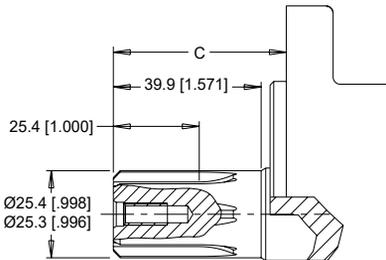
16/32 Pitch Standard
ANSI B92.1-1996 Spline



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

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

6B Spline
SAE J499 Standard

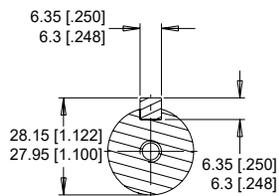


Max. Torque: 678 Nm [6000 lb-in]

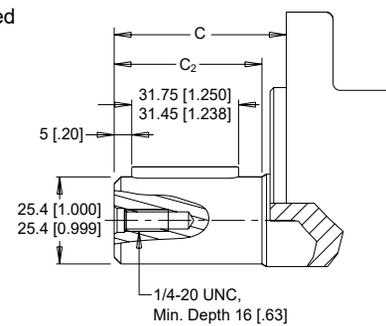
04 1" 6B Spline, M8x1.25 Tap

10 1" Straight

G8 1" Straight Nickel Plated

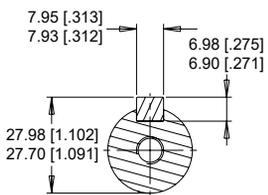


15 1" Straight Extended



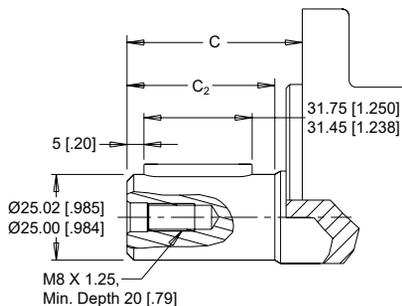
Max. Torque: 655 Nm [5800 lb-in]

12 25mm Straight



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

16 25mm Straight Extended

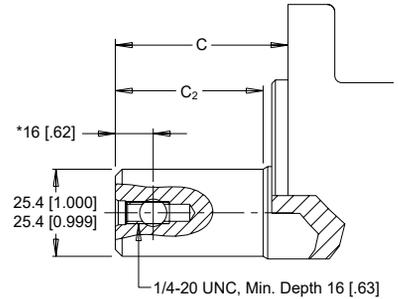


53 1" - 10.3 [.406] Pinhole



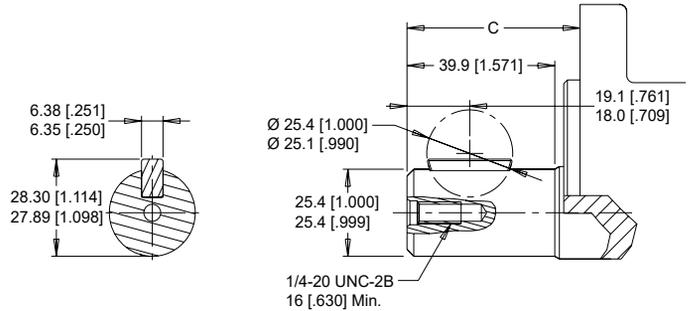
Max. Torque: 678 Nm [6000 lb-in]

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]

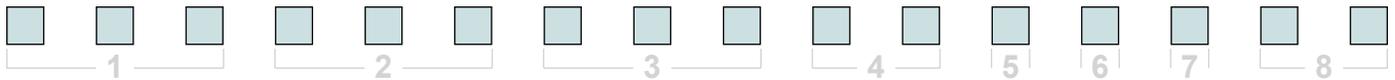
MOUNTING / SHAFT LENGTH CHART

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 C₂ 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.

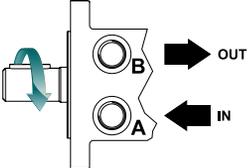
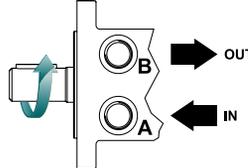
C	3mm Pilot	8mm Pilot	C ₂
#	mm [in]	mm [in]	mm [in]
01	45.4 [1.803]	50.8 [2.000]	N/A
02	45.4 [1.803]	50.8 [2.000]	N/A
04	45.4 [1.803]	50.8 [2.000]	N/A
10	45.4 [1.803]	50.8 [2.000]	39.9 [1.571]
12	45.4 [1.803]	50.8 [2.000]	39.9 [1.571]
15	62.1 [2.445]	67.5 [2.657]	56.0 [2.205]
16	62.1 [2.445]	67.5 [2.657]	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

145 Standard Rotation	146 Reverse Rotation
------------------------------	-----------------------------

► The 145 & 146 series are bi-directional.

2. SELECT A DISPLACEMENT OPTION

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

3. SELECT A MOUNT & PORT OPTION

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

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

A Black
B Black, Unpainted Mounting Surface

6. SELECT A VALVE CAVITY / CARTRIDGE OPTION

A None

7. SELECT AN ADD-ON OPTION

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

8. SELECT A MISCELLANEOUS OPTION

AA None
AC Freeturning Rotor
BE Slinger Seal
FB 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

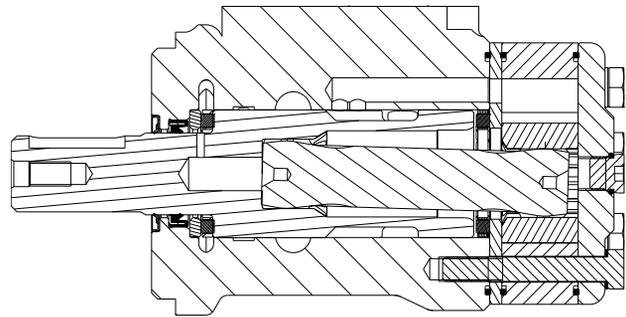
- Built-in check valves offer versatility and increased seal life.
- A variety of mounts and shafts provide flexibility in application design.
- Spool valve design gives superior performance and smooth operation over a wide speed and torque range.
- Standard high pressure shaft seals offer superior seal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

TYPICAL APPLICATIONS

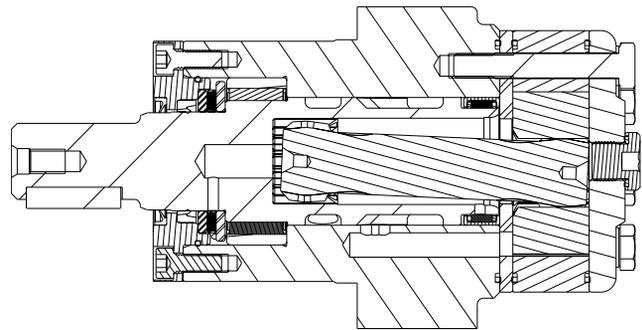
agriculture equipment, conveyors, carwashes, sweepers, food processing, grain augers, spreaders, feed rollers, augers, brush drives and more

SERIES DESCRIPTIONS

155/156 - Hydraulic Motor
Standard



157/158 - Hydraulic Motor
With Needle Bearings



SPECIFICATIONS

CODE	Displacement cm ³ [in ³ /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]	92 [814]	108 [956]	140 [2030]	175 [2540]	240 [3480]
060	59 [3.6]	1014	1271	60 [16]	75 [20]	125 [1106]	136 [1204]	160 [2320]	175 [2540]	240 [3480]
080	78 [4.8]	768	960	60 [16]	75 [20]	164 [1451]	183 [1620]	160 [2320]	175 [2540]	240 [3480]
100	96 [5.9]	624	780	60 [16]	75 [20]	200 [1770]	213 [1885]	160 [2320]	175 [2540]	240 [3480]
125	125 [7.6]	479	599	60 [16]	75 [20]	262 [2319]	278 [2460]	160 [2320]	175 [2540]	240 [3480]
160	159 [9.7]	387	483	60 [16]	75 [20]	327 [2894]	360 [3186]	160 [2320]	175 [2540]	240 [3480]
200	190 [11.6]	315	394	60 [16]	75 [20]	380 [3365]	420 [3720]	150 [2180]	175 [2540]	240 [3480]
250	240 [14.6]	250	312	60 [16]	75 [20]	445 [3940]	557 [4930]	140 [2030]	175 [2540]	240 [3480]
315	303 [18.5]	195	245	60 [16]	75 [20]	460 [4071]	605 [5354]	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.	
025		30 [435]	60 [870]	80 [1160]	100 [1450]	120 [1740]	140 [2030]	
25 cm ³ [1.5 in ³] / rev								
		Torque - Nm [lb-in], Speed rpm				Intermittent Ratings - 10% of Operation		
Flow - lpm [gpm]	5 [1.3]	9 [80] 186	18 [159] 160	25 [221] 134	32 [283] 101	35 [310] 106		200
	10 [2.6]	10 [88] 386	18 [159] 352	26 [230] 323	34 [301] 280	37 [327] 255	48 [425] 210	400
	15 [4.0]	9 [80] 568	19 [168] 537	26 [230] 505	35 [310] 467	38 [336] 431	44 [389] 390	600
	20 [5.3]	8 [71] 777	19 [168] 736	25 [221] 692	33 [292] 660	39 [345] 608	45 [398] 566	800
	25 [6.6]	7 [62] 972	18 [159] 920	26 [230] 870	32 [283] 840	39 [345] 803	45 [398] 756	1000
	30 [7.9]	6 [53] 1167	17 [150] 1122	25 [221] 1088	32 [283] 1055	39 [345] 998	44 [389] 976	1200
	35 [9.2]	5 [44] 1360	16 [142] 1318	24 [212] 1282	31 [274] 1258	37 [327] 1216	43 [381] 1160	1400
	40 [10.6]	5 [44] 1570	15 [133] 1503	22 [195] 1476	31 [274] 1432	36 [319] 1394	41 [363] 1359	1600
	45 [11.9]		13 [115] 1687	20 [177] 1636	28 [248] 1600	34 [301] 1558	39 [345] 1516	1800
	Max. Max. Inter. Cont.							
Rotor Width		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.	
032		30 [435]	60 [870]	80 [1160]	100 [1450]	120 [1740]	140 [2030]	
32 cm ³ [2.0 in ³] / rev								
		Torque - Nm [lb-in], Speed rpm				Intermittent Ratings - 10% of Operation		
Flow - lpm [gpm]	5 [1.3]	11 [97] 149	24 [212] 135	35 [310] 114	37 [327] 94			156
	10 [2.6]	12 [106] 308	27 [239] 284	37 [327] 270	43 [381] 250	46 [407] 240	56 [496] 211	313
	15 [4.0]	11 [97] 465	26 [230] 444	36 [319] 429	45 [398] 398	48 [425] 378	57 [504] 355	469
	20 [5.3]	10 [88] 624	25 [221] 589	35 [310] 575	44 [389] 557	46 [407] 544	56 [496] 524	625
	25 [6.6]	9 [80] 780	24 [212] 771	34 [301] 751	42 [372] 735	45 [398] 719	54 [478] 695	781
	30 [7.9]	8 [71] 931	23 [204] 908	32 [283] 895	40 [354] 876	45 [398] 857	52 [460] 822	938
	35 [9.2]	7 [62] 1086	20 [177] 1066	29 [257] 1051	39 [345] 1030	43 [381] 1012	51 [451] 981	1094
	40 [10.6]	7 [62] 1240	19 [168] 1212	27 [239] 1190	38 [336] 1178	43 [381] 1145	50 [442] 1121	1250
	45 [11.9]	6 [53] 1400	18 [159] 1382	26 [230] 1366	35 [310] 1340	42 [372] 1314	48 [425] 1280	1406
	50 [13.2]	5 [44] 1550	16 [142] 1526	24 [212] 1500	31 [274] 1478	40 [354] 1452	46 [407] 1418	1563
55 [14.5]		12 [106] 1674	20 [177] 1641	28 [248] 1617	34 [301] 1584	39 [345] 1555	1719	
Max. Max. Inter. Cont.								
Rotor Width		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

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

050		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 ³ [3.0 in ³] / rev		Torque - Nm [lb-in], Speed rpm					Intermittent Ratings - 10% of Operation		
Flow - lpm [gpm]	5 [1.3]	19 [168] 100	39 [345] 85	48 [425] 75	62 [549] 64	75 [664] 48		101	
	10 [2.6]	20 [177] 197	38 [336] 196	50 [442] 174	63 [558] 159	78 [690] 146	92 [814] 127	102 [903] 101	107 [947] 97
	20 [5.3]	18 [159] 400	38 [336] 386	52 [460] 371	64 [566] 355	78 [690] 341	90 [796] 314	104 [920] 292	108 [956] 290
	30 [7.9]	15 [133] 600	37 [327] 585	50 [442] 571	64 [566] 560	77 [681] 540	89 [788] 516	103 [912] 499	107 [947] 495
	40 [10.6]	12 [106] 808	31 [274] 800	45 [398] 790	59 [522] 770	73 [646] 766	87 [770] 733	99 [876] 703	106 [938] 697
	50 [13.2]	9 [80] 1009	27 [239] 1006	41 [363] 986	55 [487] 982	68 [602] 964	84 [743] 956	98 [867] 930	105 [929] 872
	60 [15.8]	6 [53] 1208	24 [212] 1200	37 [327] 1196	53 [469] 1188	64 [566] 1176	82 [726] 1160	95 [841] 1140	102 [903] 963
	70 [18.5]	3 [27] 1410	17 [150] 1396	32 [283] 1382	44 [389] 1370	58 [513] 1358	80 [708] 1347	93 [823] 1334	98 [867] 1315
Max. Inter.	75 [19.8]	15 [133] 1500	30 [265] 1488	40 [354] 1473	56 [496] 1457	77 [681] 1439	88 [779] 1412	93 [823] 1388	1515
Rotor Width		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]							

► 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

060		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 ³ [3.6 in ³] / rev										
Max. Cont.		Torque - Nm [lb-in], Speed rpm						Intermittent Ratings - 10% of Operation		
		20 [177]	46 [407]	65 [575]	80 [708]	95 [841]	112 [991]			
Max. Inter.	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
75 [19.8]	678	669	660	645	630	616	594	582	1271	
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]										

080		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 ³ [4.8 in ³] / rev										
Max. Cont.		Torque - Nm [lb-in], Speed rpm						Intermittent Ratings - 10% of Operation		
		32 [283]	62 [549]	80 [708]	106 [938]	125 [1106]				
Max. Inter.	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
75 [19.8]	512	505	494	483	473	462	450	438	962	
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.			
100		30 [435]	60 [870]	80 [1160]	100 [1450]	120 [1740]	140 [2030]	160 [2320]	175 [2540]			
96 cm ³ [5.9 in ³] / 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.		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input type="checkbox"/>										
Rotor Width		Theoretical Torque - Nm [lb-in]										
13.0 [510]		46 [407]	92 [814]	122 [1080]	153 [1354]	183 [1623]	214 [1894]	245 [2168]	268 [2372]			
mm [in]		Displacement tested at 45°C [113°F] with an oil viscosity of 46cSt [213 SUS]										

		Pressure - bar [psi]						Max. Cont.	Max. Inter.			
125		30 [435]	60 [870]	80 [1160]	100 [1450]	120 [1740]	140 [2030]	160 [2320]	175 [2540]			
125 cm ³ [7.6 in ³] / 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.		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input type="checkbox"/>										
Rotor Width		Theoretical Torque - Nm [lb-in]										
16.8 [660]		60 [531]	119 [1053]	159 [1407]	199 [1761]	239 [2115]	279 [2469]	318 [2814]	348 [3080]			
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

160		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 ³ [9.7 in ³] / rev		Torque - Nm [lb-in], Speed rpm						Intermittent Ratings - 10% of Operation			
Max. Cont.	Flow - lpm [gpm]	5 [1.3]	10 [2.6]	20 [5.3]	30 [7.9]	40 [10.6]	50 [13.2]	60 [15.8]	70 [18.5]	75 [19.8]	Theoretical rpm
	56 [496]	112 [991]	154 [1363]	201 [1779]						32	
	30	25	18	10						65	
	58 [513]	115 [1018]	156 [1381]	205 [1814]	245 [2168]	285 [2522]				130	
	63	60	56	52	48	37				194	
	60 [532]	123 [1089]	162 [1434]	202 [1788]	242 [2142]	282 [2496]	327 [2894]	360 [3186]		258	
	128	125	121	116	110	100	86	78		323	
	50 [443]	117 [1035]	157 [1389]	197 [1743]	238 [2106]	278 [2460]	322 [2850]	358 [3168]		387	
193	190	187	183	179	173	160	144		453		
48 [425]	113 [1000]	155 [1372]	195 [1726]	236 [2089]	273 [2416]	318 [2814]	355 [3142]		485		
257	255	252	248	244	239	224	211				
32 [283]	106 [938]	149 [1319]	188 [1664]	235 [2080]	267 [2363]	313 [2770]	352 [3115]				
323	320	316	312	306	299	288	275				
23 [204]	88 [779]	133 [1177]	178 [1575]	212 [1876]	260 [2301]	308 [2726]	342 [3027]				
387	384	380	375	371	366	358	346				
16 [142]	82 [726]	128 [1133]	170 [1505]	206 [1823]	255 [2257]	302 [2673]	331 [2929]				
452	451	448	444	436	430	423	412				
10 [89]	79 [699]	124 [1097]	164 [1451]	201 [1779]	248 [2195]	296 [2620]	319 [2823]				
483	481	477	472	466	460	450	436				
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]									

200		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 ³ [11.6 in ³] / rev		Torque - Nm [lb-in], Speed rpm						Intermittent Ratings - 10% of Operation			
Max. Cont.	Flow - lpm [gpm]	5 [1.3]	10 [2.6]	20 [5.3]	30 [7.9]	40 [10.6]	50 [13.2]	60 [15.8]	70 [18.5]	75 [19.8]	Theoretical rpm
	75 [664]	158 [1398]	200 [1770]	241 [2133]						26	
	25	22	20	10						53	
	78 [690]	160 [1416]	204 [1805]	252 [2230]	291 [2575]	348 [3080]	377 [3336]			105	
	51	49	45	39	35	29	22			158	
	74 [655]	156 [1381]	200 [1770]	246 [2177]	293 [2593]	354 [3133]	380 [3363]	416 [3681]		211	
	104	102	99	95	89	83	76	65		263	
	70 [619]	152 [1345]	196 [1735]	240 [2124]	290 [2566]	352 [3115]	378 [3345]	420 [3717]		316	
157	155	152	148	143	137	130	118		368		
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				
54 [478]	142 [1257]	180 [1593]	222 [1965]	277 [2451]	333 [2947]	356 [3150]	402 [3558]				
262	260	258	254	249	243	235	223				
36 [319]	128 [1133]	166 [1469]	210 [1858]	266 [2354]	322 [2850]	350 [3097]	400 [3540]				
315	313	309	305	299	293	284	268				
15 [133]	102 [903]	158 [1398]	202 [1788]	254 [2248]	302 [2673]	327 [2894]	376 [3327]				
367	365	362	358	352	336	330	316				
	94 [832]	146 [1292]	194 [1717]	230 [2035]	290 [2566]	317 [2805]	364 [3221]				
	394	390	385	380	374	365	352				
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

250		Pressure - bar [psi]					Max. Cont.		Max. Inter.	
		30 [435]	60 [870]	85 [1230]	100 [1450]	125 [1810]	140 [2030]	160 [2320]	175 [2540]	
240 cm ³ [14.6 in ³] / 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
	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
	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
	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
Rotor Width 32.5 [1.280] mm [in]										
Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input type="checkbox"/>										
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]										

315		Pressure - bar [psi]					Max. Cont.		Max. Inter.	
		30 [435]	50 [725]	70 [1015]	85 [1230]	100 [1450]	120 [1740]	140 [2030]	160 [2320]	
303 cm ³ [18.5 in ³] / 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
	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
	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
	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
Rotor Width 40.9 [1.610] mm [in]										
Overall Efficiency - 60 - 100% <input type="checkbox"/> 40 - 59% <input type="checkbox"/> 0 - 39% <input type="checkbox"/>										
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

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

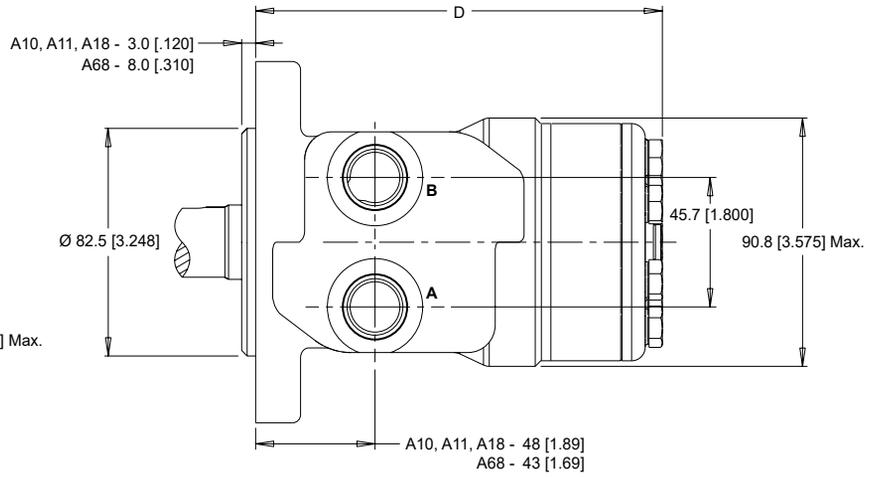
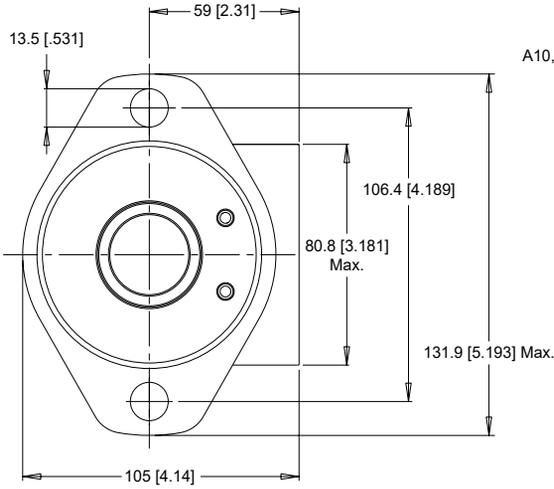
► Performance data is typical. Performance of production units varies slightly from one motor to another. Operating at maximum continuous pressure and maximum continuous flow simultaneously is not recommended. For additional information on product testing please refer to page 6.

HOUSINGS

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

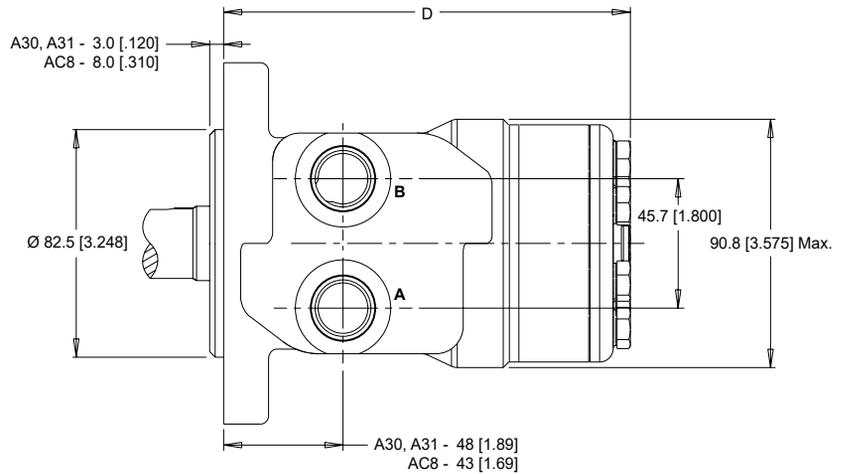
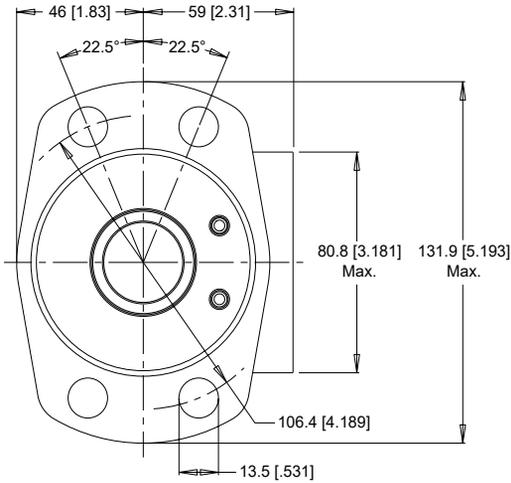
2-HOLE, SAE A MOUNT, ALIGNED PORTS

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



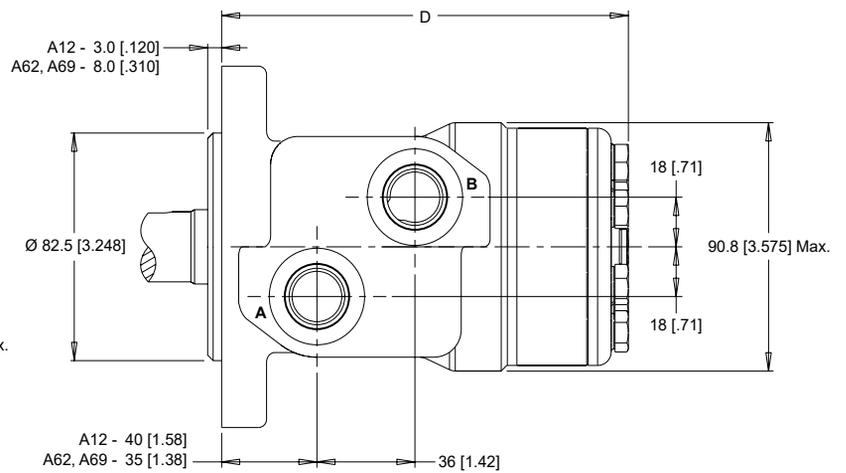
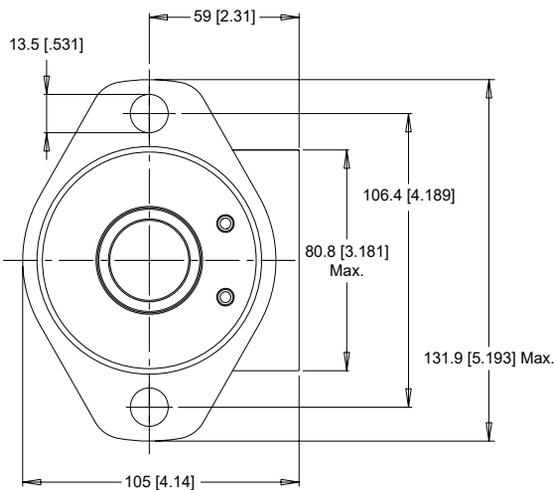
4-HOLE, MAGNETO MOUNT, ALIGNED PORTS

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)



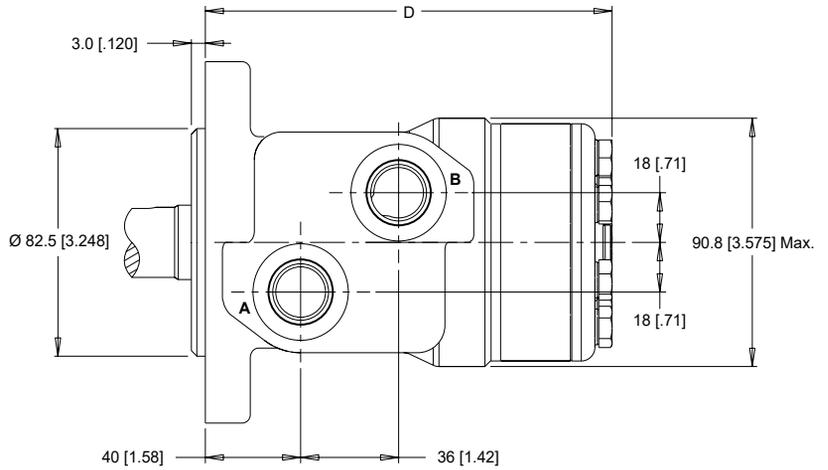
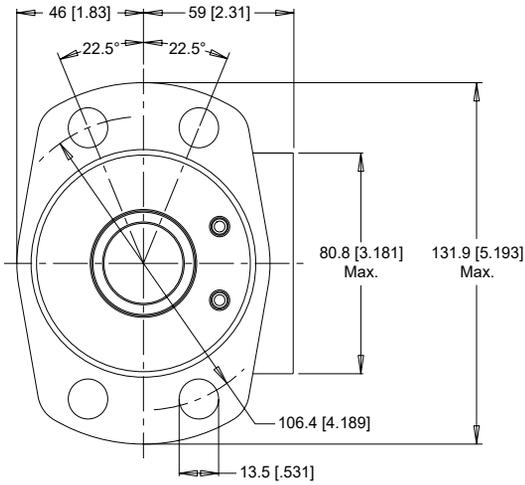
► Dimension D is charted on page 40. ► (TP) - Taller Pilot Height. Refer to detailed drawing for dimensional differences.

HOUSINGS

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

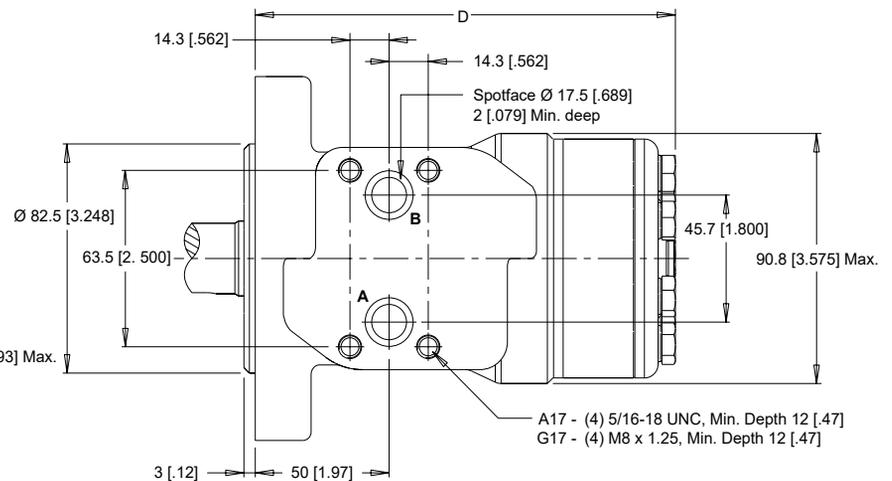
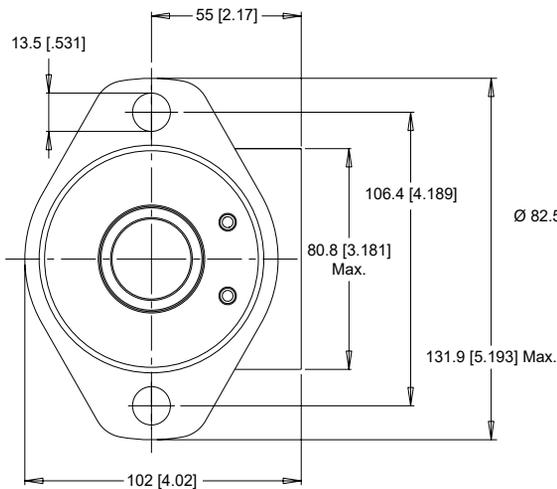
4-HOLE, MAGNETO MOUNT, OFFSET PORTS

A32 G 1/2



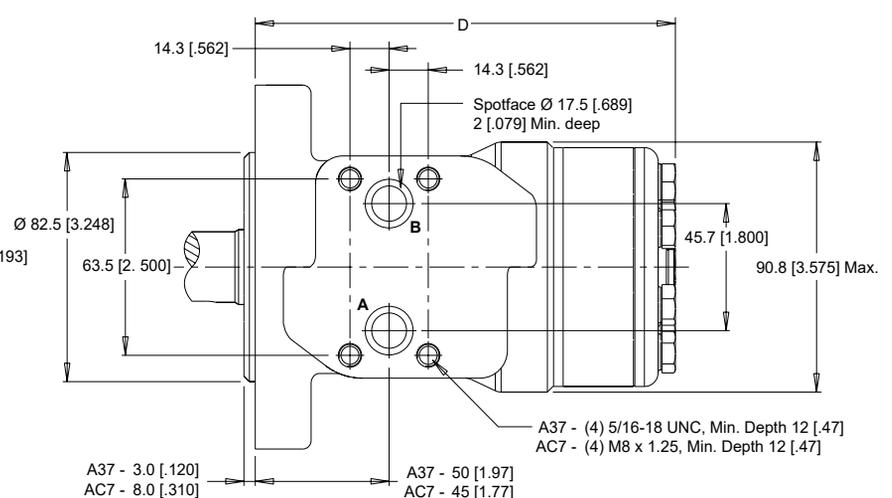
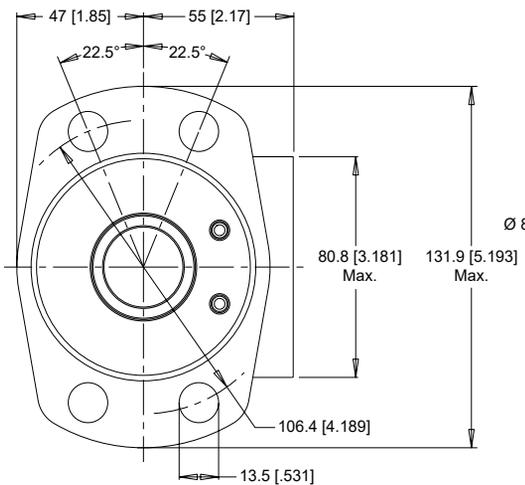
2-HOLE, SAE A MOUNT, ALIGNED MANIFOLD PORTS

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



4-HOLE, MAGNETO MOUNT, ALIGNED MANIFOLD PORTS

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



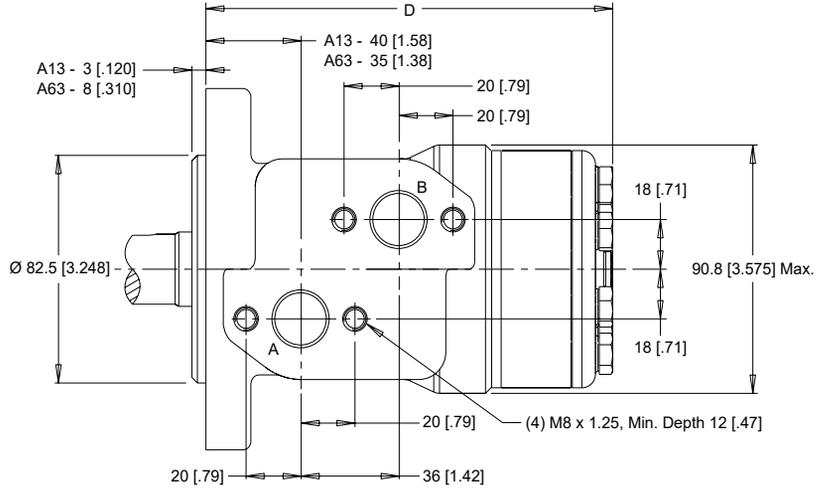
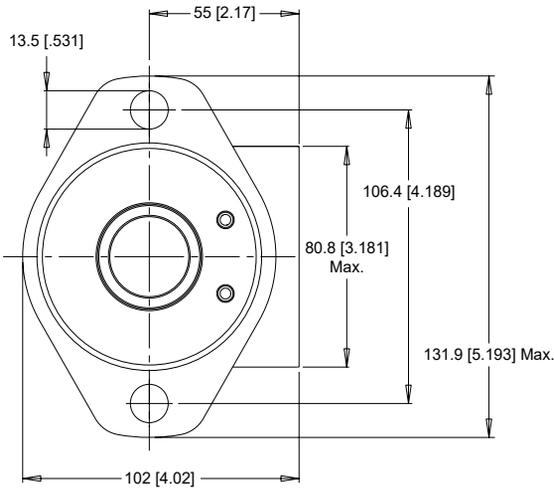
► Dimension D is charted on page 40. ► (TP) - Taller Pilot Height. Refer to detailed drawing for dimensional differences.

HOUSINGS

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

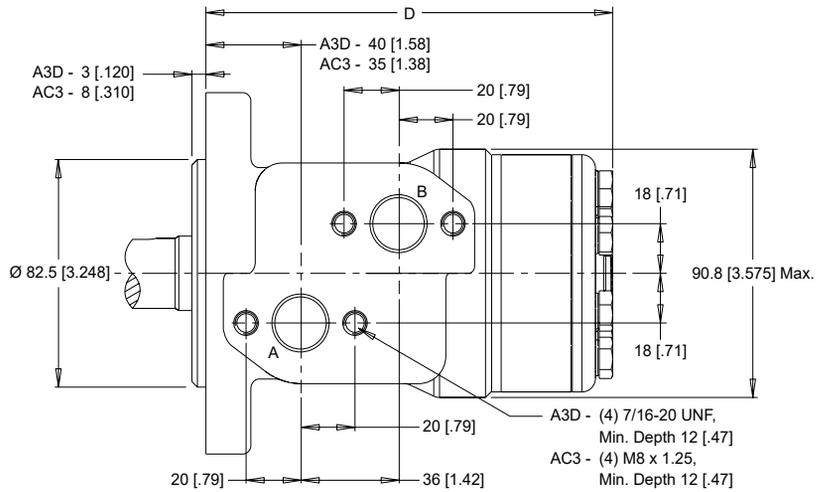
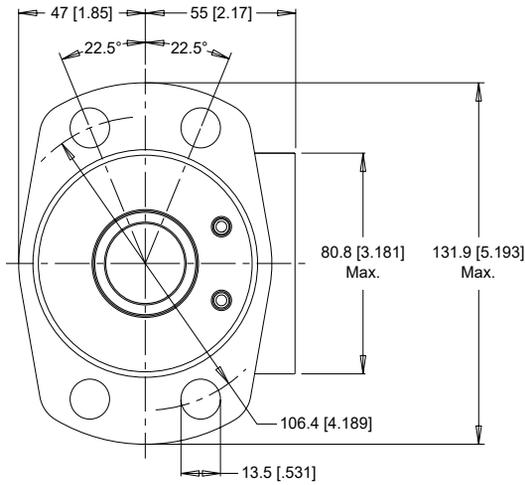
2-HOLE, SAE A MOUNT, OFFSET MANIFOLD PORTS

A13 G 1/2 **A63** G 1/2 (TP)



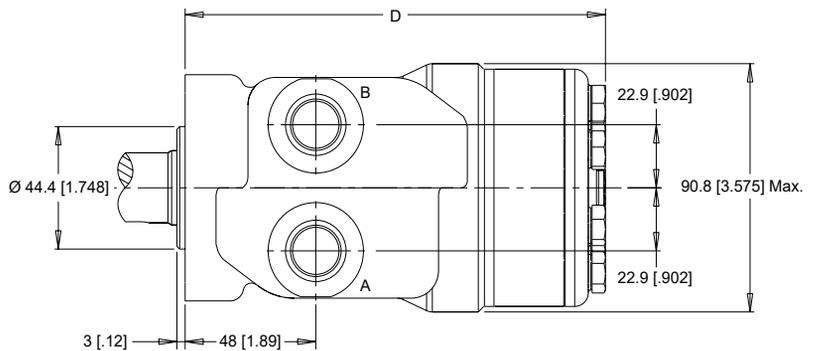
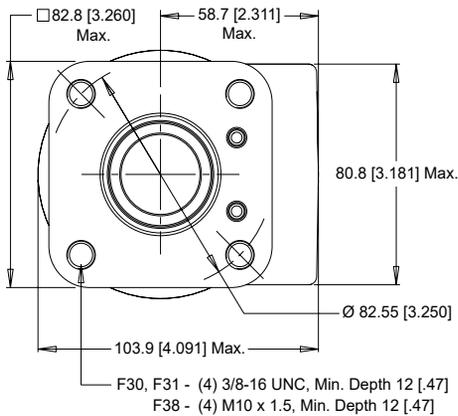
4-HOLE, MAGNETO MOUNT, OFFSET MANIFOLD PORTS

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



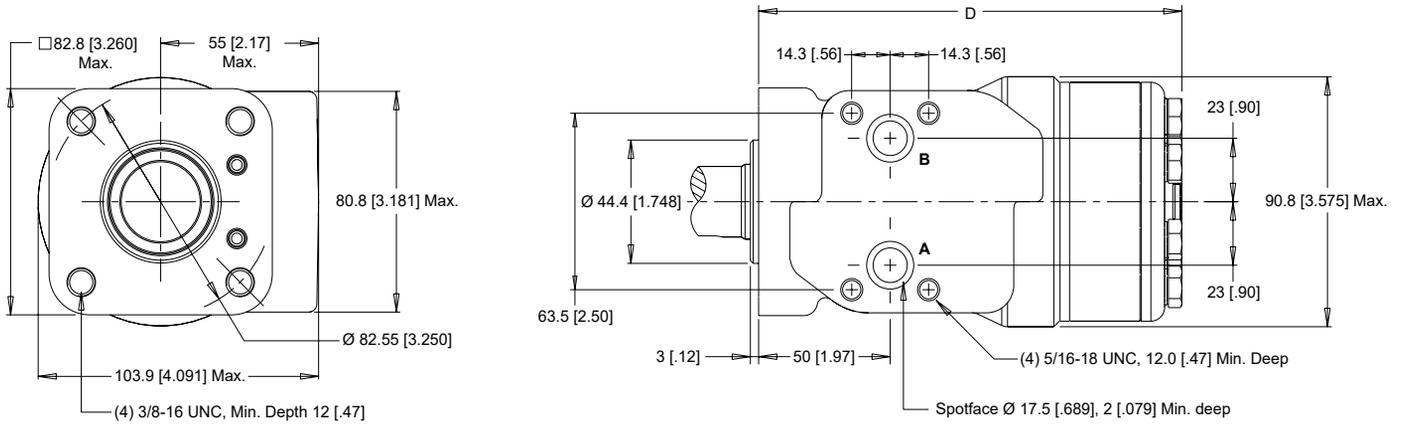
► Dimension D is charted on page 40. ► (TP) - Taller Pilot Height. Refer to detailed drawing for dimensional differences.

WP (155/156 Series)
Light Duty Hydraulic Motor

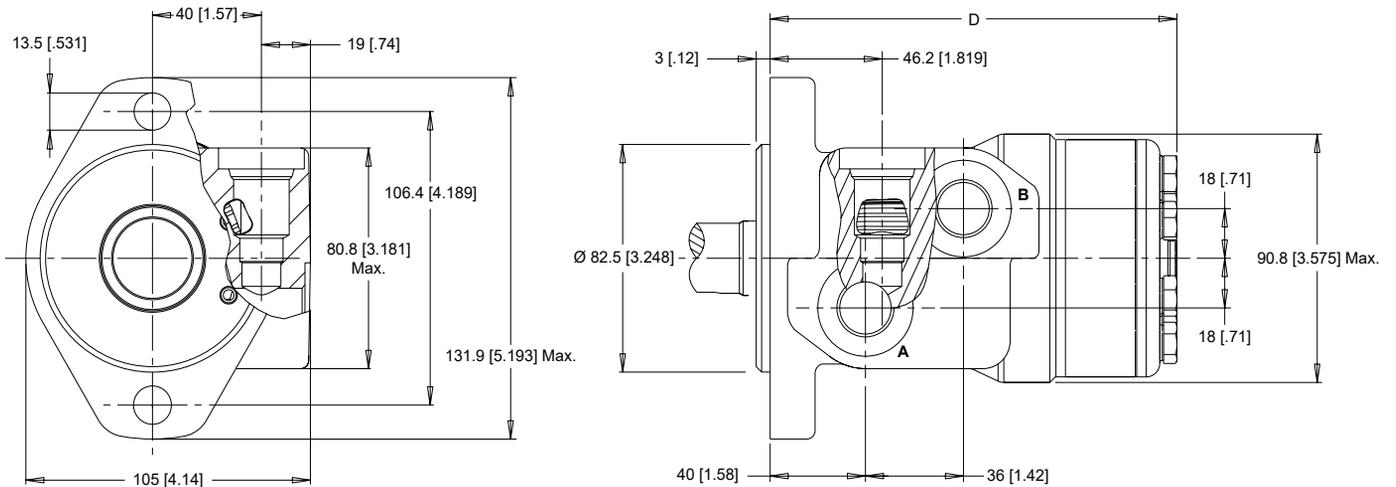
HOUSINGS

► 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

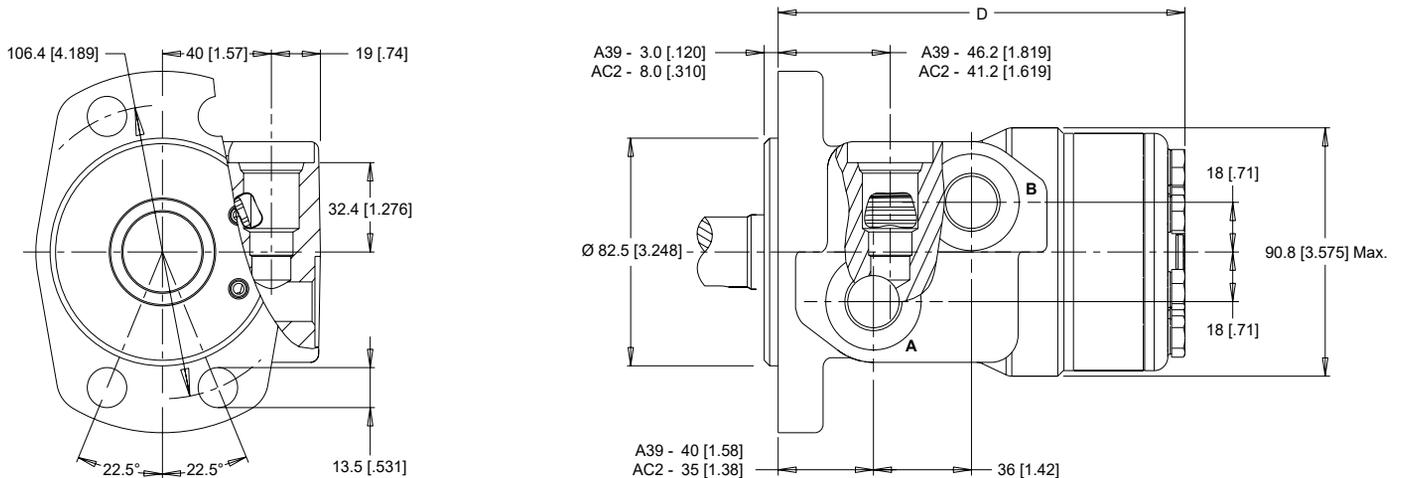


2-HOLE, SAE A MOUNT, OFFSET PORTS, VALVE CAVITY **A19** 7/8-14 UNF



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].

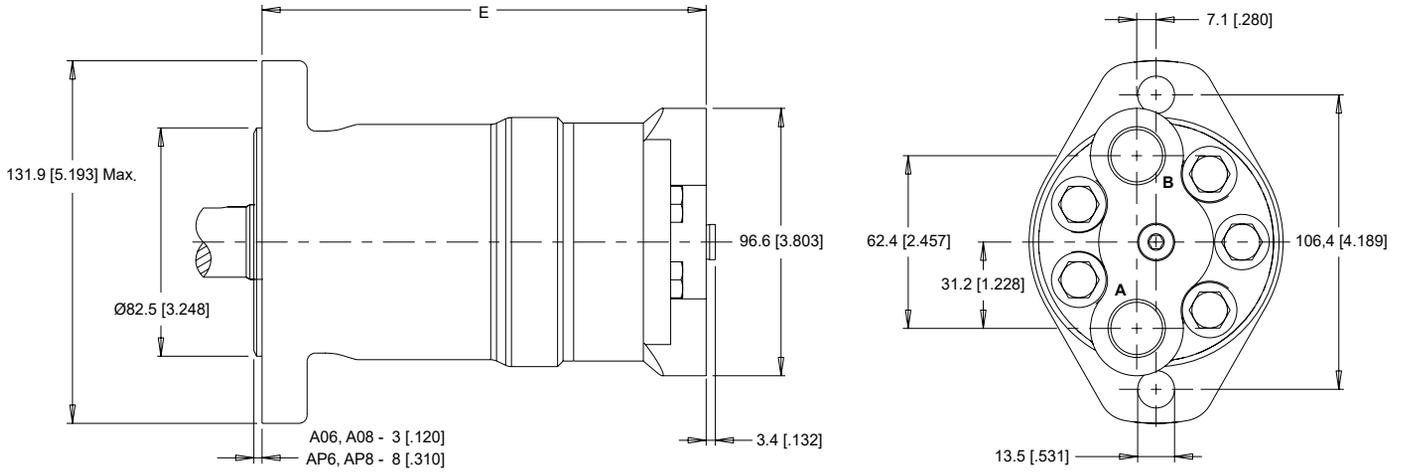
2-HOLE, SAE A MOUNT, ALIGNED END PORTS

A06 3/4-16 UNF

A08 G 1/2

AP6 3/4-16 UNF (TP)

AP8 G 1/2 (TP)



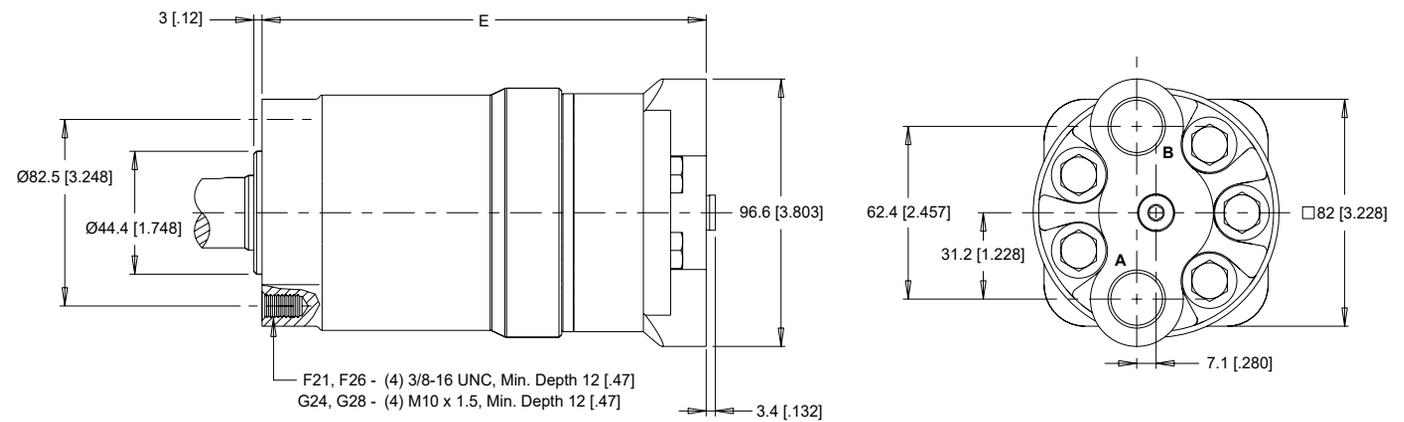
4-HOLE, SQUARE MOUNT, ALIGNED END PORTS

F21 7/8-14 UNF

F26 3/4-16 UNF

G24 M22 x 1.5

G28 G 1/2

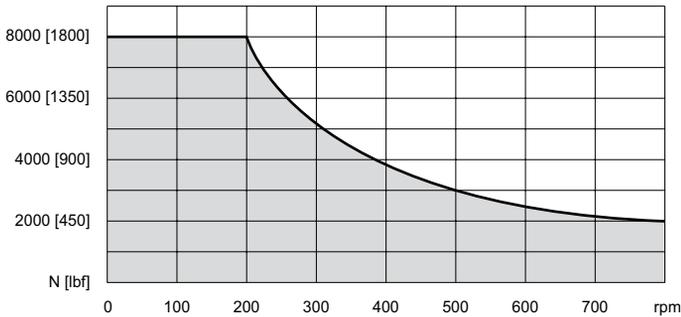


► Dimension E is charted on page 40. ► (TP) - Taller Pilot Height. Refer to detailed drawing for dimensional differences.

TECHNICAL INFORMATION

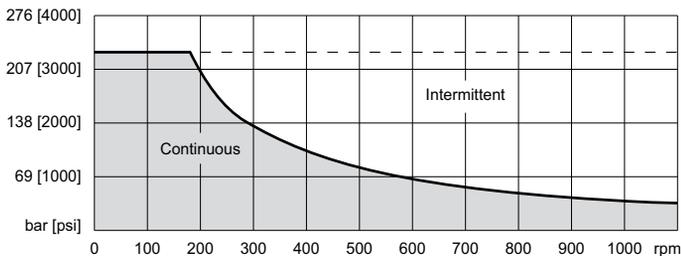
ALLOWABLE SHAFT LOAD / BEARING CURVE

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.

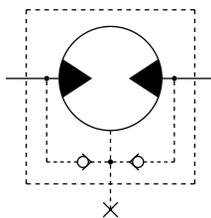


PERMISSIBLE SHAFT SEAL PRESSURE

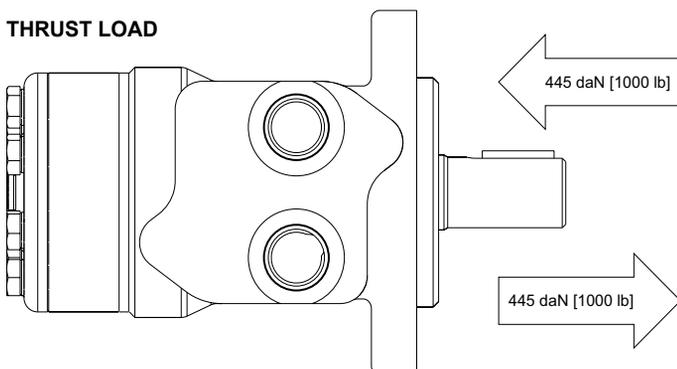
The curve below represents allowable seal pressure at various speeds. Operation in the gray area results in maintaining the rated life of the shaft seal. Actual shaft seal pressure depends on motor configuration.



▶ 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]

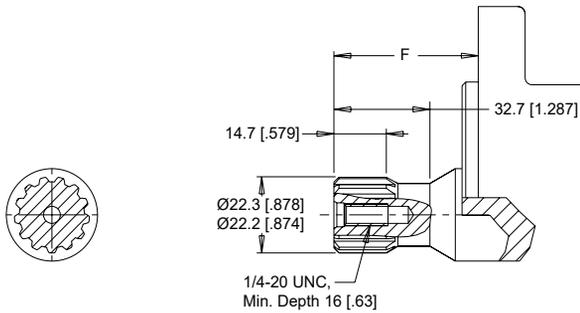
Dimension E is the overall motor length from the rear of the motor to the mounting flange surface and is referenced on detailed housing drawings listed on pages 39.

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



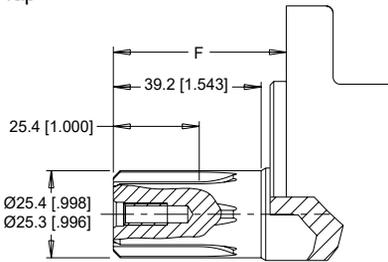
Max. Torque: 170 Nm [1500 lb-in]

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

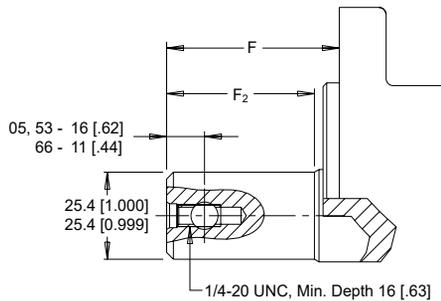


Max. Torque: 678 Nm [6000 lb-in]

05 1" - 9.5 [.375] Pinhole

53 1" - 10.3 [.406] Pinhole

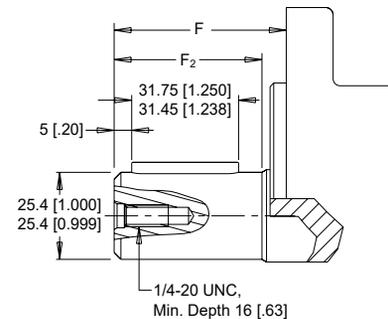
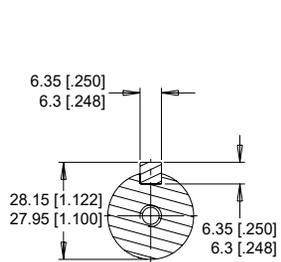
66 1" - 8.0 [.315] Pinhole



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

10 1" Straight

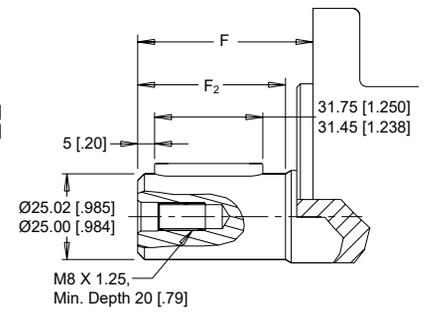
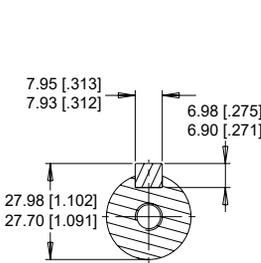
15 1" Straight Extended



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

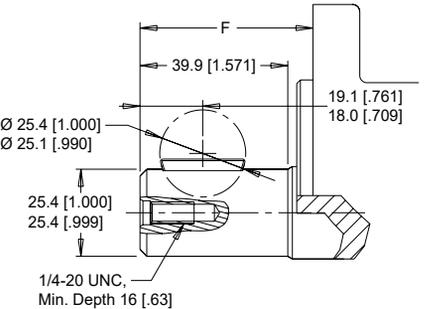
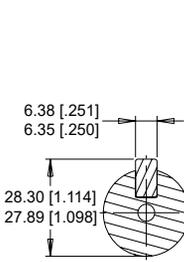
12 25mm Straight

16 25mm Straight Extended



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

B1 1" Straight, Woodruff Key



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

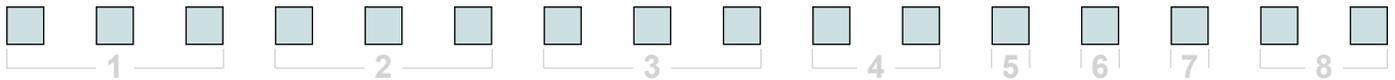
MOUNTING / SHAFT LENGTH CHART

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 F₂ 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 ₂
#	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

155 Standard Rotation	156 Reverse Rotation
------------------------------	-----------------------------

► The 155 & 156 series are bi-directional.

2. SELECT A DISPLACEMENT OPTION

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

3. SELECT A MOUNT & PORT OPTION

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

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

4. SELECT A SHAFT OPTION

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

A Black
B Black, Unpainted Mounting Surface

6. SELECT A VALVE CAVITY / CARTRIDGE OPTION

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

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

7. SELECT AN ADD-ON OPTION

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

8. SELECT A MISCELLANEOUS OPTION

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

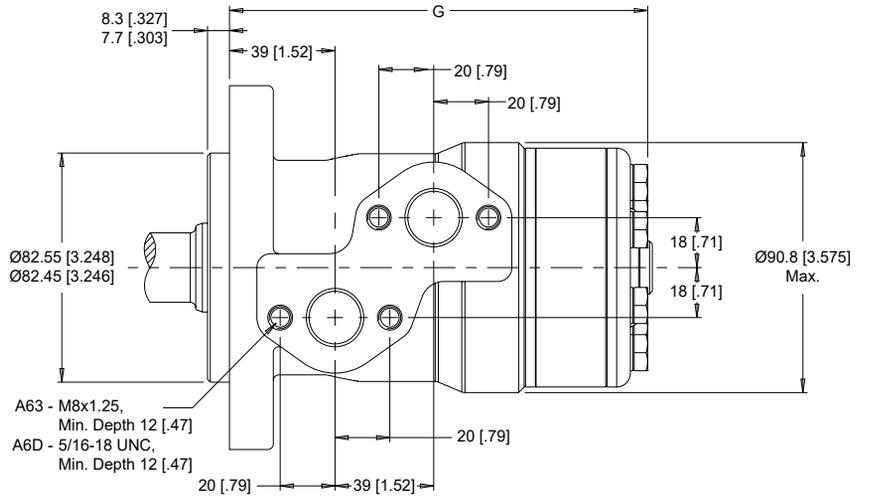
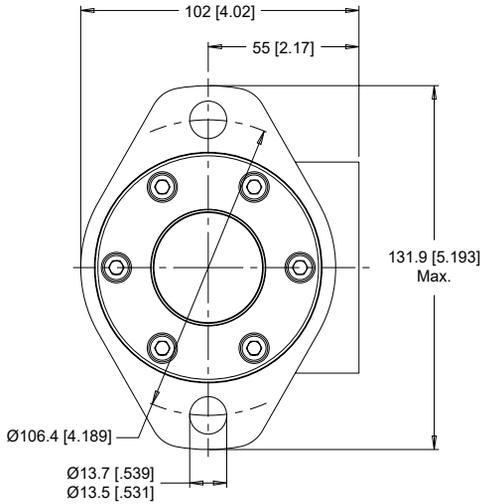
HOUSINGS

► 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

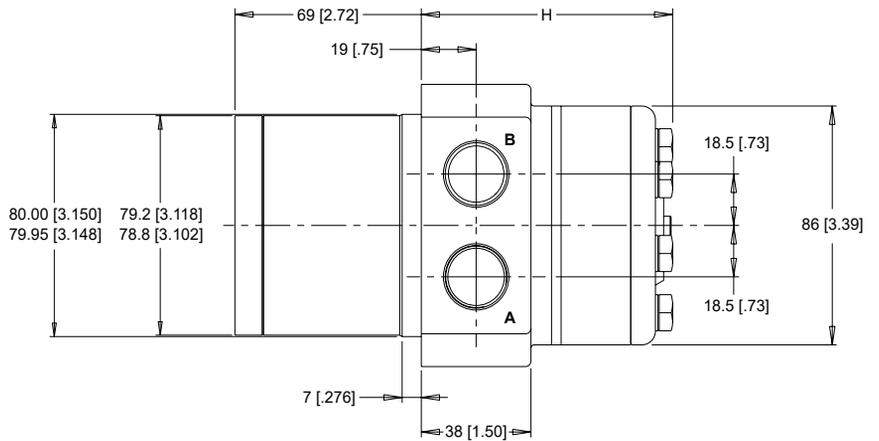
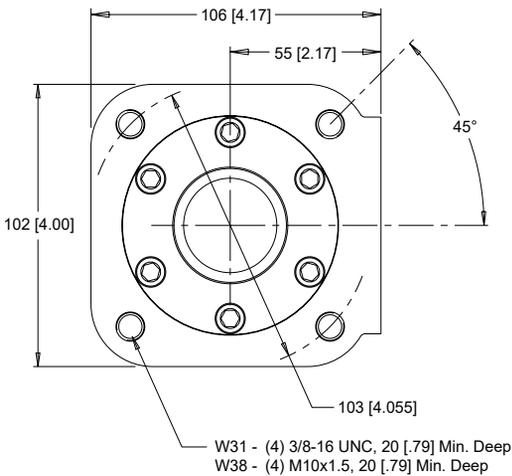
A6D 7/8-14 UNF



4-HOLE, WHEEL MOUNT, ALIGNED PORTS

W31 7/8-14 UNF

W38 G 1/2



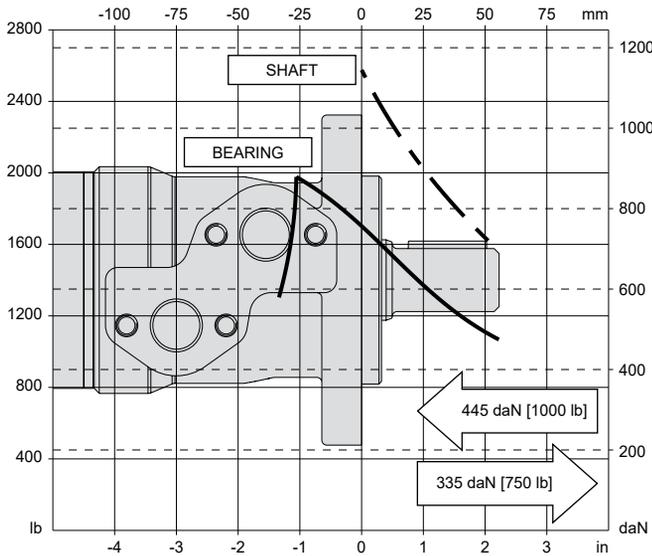
► Dimensions G & H are charted on page 44.

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

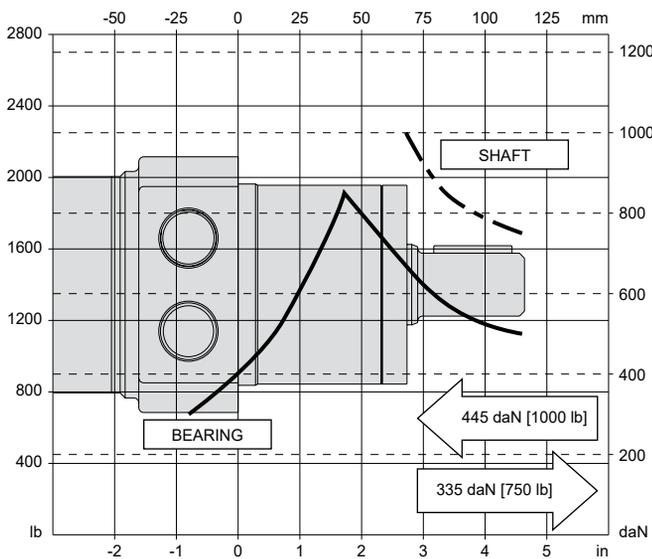


LENGTH & WEIGHT CHART

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



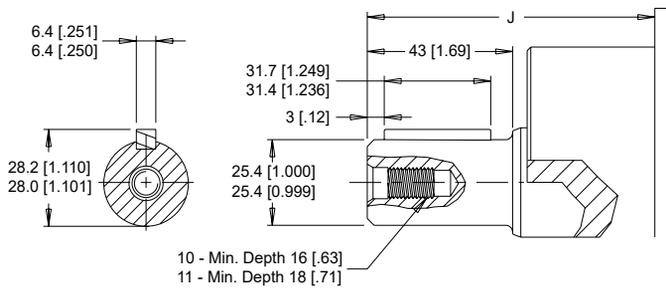
LENGTH & WEIGHT CHART

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

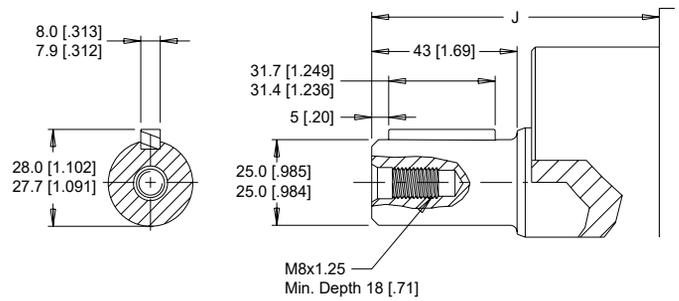
10 1" Straight, 1/4-20 Tap



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

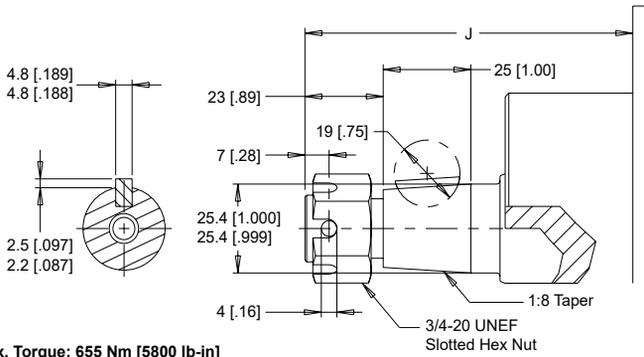
11 1" Straight, M8x1.25 Tap

12 25mm Straight



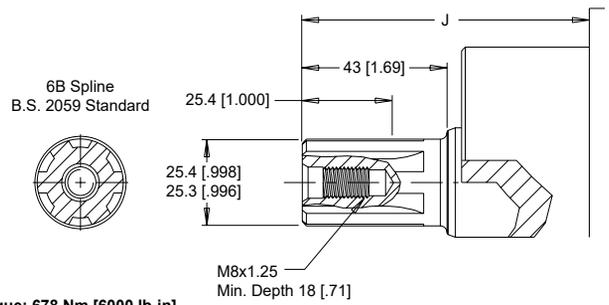
Max. Torque: 655 Nm [5800 lb-in]

13 1" Tapered



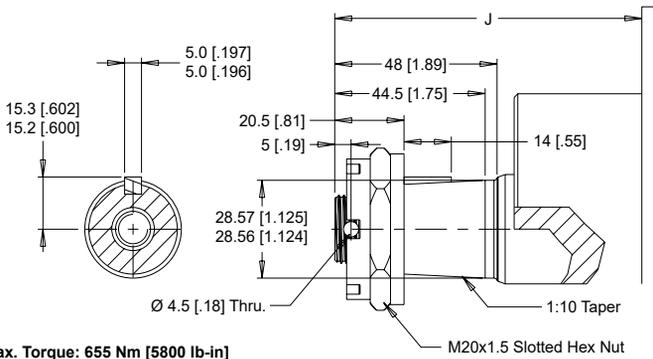
Max. Torque: 655 Nm [5800 lb-in]

F3 1" 6B Spline



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

N9 28.5mm Tapered



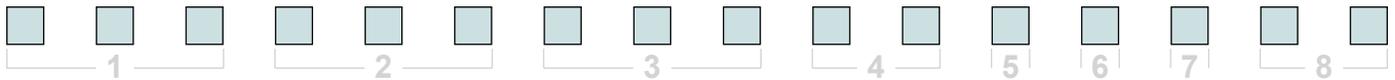
Max. Torque: 655 Nm [5800 lb-in]

MOUNTING / SHAFT LENGTH CHART

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

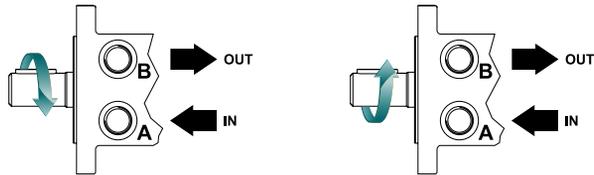
J #	SAE A Mounts mm [in]	Wheel Mounts mm [in]
10	55 [2.18]	116 [4.57]
11	55 [2.18]	116 [4.57]
12	55 [2.18]	116 [4.57]
13	66 [2.60]	127 [5.00]
F3	55 [2.18]	116 [4.57]
N9	58 [2.29]	119 [4.69]

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

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

3. SELECT A MOUNT & PORT OPTION

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

4. SELECT A SHAFT OPTION

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

5. SELECT A PAINT OPTION

A	Black
B	Black, Unpainted Mounting Surface

6. SELECT A VALVE CAVITY / CARTRIDGE OPTION

A	None
----------	------

7. SELECT AN ADD-ON OPTION

A	Standard
----------	----------

8. SELECT A MISCELLANEOUS OPTION

AA	None
AC	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

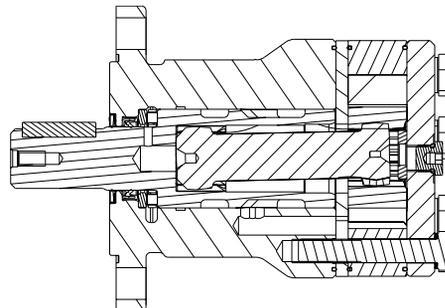
- A variety of mounts and shafts provides flexibility in application design.
- A high-pressure shaft seal offers superior seal life and performance.
- The spool valve design gives superior performance and smooth operation over a wide speed and torque range.
- Built-in check valves (not shown) in the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

TYPICAL APPLICATIONS

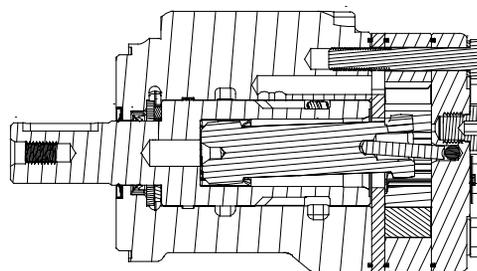
conveyors, carwashes, positioners, light-duty wheel drives, sweepers, food processing, grain augers, spreaders, feed rollers, screw drives, brush drives and more

SERIES DESCRIPTIONS

251/252 - Hydraulic Motor
Standard



255/256 - Hydraulic Motor
Standard



SPECIFICATIONS

CODE	Displacement cm ³ [in ³ /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.	
040		17 [250]	35 [500]	52 [750]	69 [1000]	86 [1250]	104 [1500]	121 [1750]	138 [2000]	155 [2250]	172 [2500]	207 [3000]		
40 cm ³ [2.5 in ³] / 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.														
Rotor Width		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input checked="" type="checkbox"/>												
8.1 [317]		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.	
050		17 [250]	35 [500]	52 [750]	69 [1000]	86 [1250]	104 [1500]	121 [1750]	138 [2000]	155 [2250]	172 [2500]	207 [3000]		
50 cm ³ [3.1 in ³] / 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.														
Rotor Width		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input checked="" type="checkbox"/>												
9.9 [389]		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.			
060		17 [250]	35 [500]	52 [750]	69 [1000]	86 [1250]	104 [1500]	121 [1750]	138 [2000]	155 [2250]	172 [2500]	207 [3000]		
59 cm ³ [3.6 in ³] / rev												Intermittent Ratings - 10% of Operation		
		Torque - Nm [lb-in], Speed rpm												
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.														
Rotor Width		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.			
070		17 [250]	35 [500]	69 [1000]	86 [1250]	104 [1500]	121 [1750]	138 [2000]	155 [2250]	172 [2500]	190 [2750]	207 [3000]		
71 cm ³ [4.3 in ³] / rev												Intermittent Ratings - 10% of Operation		
		Torque - Nm [lb-in], Speed rpm												
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.														
Rotor Width		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.	
080		17 [250]	35 [500]	69 [1000]	86 [1250]	104 [1500]	121 [1750]	138 [2000]	155 [2250]	172 [2500]	190 [2750]	207 [3000]		
79 cm ³ [4.9 in ³] / 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	
Rotor Width		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input checked="" type="checkbox"/>												
15.7 [617] mm [in]		Theoretical Torque - Nm [lb-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.	
090		17 [250]	35 [500]	69 [1000]	86 [1250]	104 [1500]	121 [1750]	138 [2000]	155 [2250]	172 [2500]	190 [2750]	207 [3000]		
88 cm ³ [5.4 in ³] / 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	
Rotor Width		Overall Efficiency - 70 - 100% <input type="checkbox"/> 40 - 69% <input type="checkbox"/> 0 - 39% <input checked="" type="checkbox"/>												
17.3 [682] mm [in]		Theoretical Torque - Nm [lb-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.			
100		17 [250]	35 [500]	69 [1000]	86 [1250]	104 [1500]	121 [1750]	138 [2000]	155 [2250]	172 [2500]	190 [2750]	207 [3000]		
100 cm ³ [6.1 in ³] / rev		Torque - Nm [lb-in], Speed rpm										Intermittent Ratings - 10% of Operation		
Flow - lpm [gpm]	2 [0.5]	18 [159] 17	37 [327] 13	77 [681] 12	91 [805] 11									20
	4 [1]	26 [230] 38	49 [434] 37	84 [743] 33	106 [938] 31	120 [1062] 29	140 [1239] 15	160 [1416] 7						40
	8 [2]	25 [221] 80	50 [442] 78	98 [867] 75	125 [1106] 70	150 [1327] 68	175 [1549] 65	199 [1761] 61	189 [1673] 20					80
	15 [4]	26 [230] 150	46 [407] 148	97 [858] 142	124 [1097] 139	148 [1310] 136	175 [1549] 131	198 [1752] 128	224 [1982] 122	245 [2168] 118	267 [2363] 111	289 [2558] 85		150
	23 [6]	23 [203] 229	48 [425] 226	96 [850] 221	123 [1088] 218	148 [1310] 215	173 [1531] 212	200 [1770] 208	223 [1973] 201	246 [2177] 197	269 [2381] 189	286 [2531] 162		230
	30 [8]	21 [186] 296	45 [398] 292	93 [823] 285	121 [1071] 282	146 [1292] 280	168 [1487] 280	195 [1726] 274	221 [1956] 270	244 [2159] 265	265 [2345] 255	284 [2513] 208		300
	38 [10]	17 [150] 378	41 [363] 375	91 [805] 367	115 [1018] 370	141 [1248] 367	165 [1460] 364	189 [1673] 363	215 [1903] 361	238 [2106] 353	264 [2336] 338	282 [2496] 310		380
	45 [12]	14 [123] 450	36 [319] 448	89 [788] 442	116 [1027] 438	140 [1239] 433	162 [1434] 426	188 [1664] 420	210 [1858] 412	234 [2071] 404	258 [2283] 390	280 [2478] 355		450
	53 [14]	12 [106] 528	34 [301] 526	83 [735] 520	109 [965] 518	134 [1186] 514	158 [1389] 508	181 [1602] 500	205 [1814] 490	228 [2017] 480	256 [2265] 468	278 [2460] 440		530
	61 [16]	10 [88] 610	28 [248] 608	79 [699] 600	103 [912] 596	129 [1142] 590	152 [1345] 582	172 [1522] 576	198 [1752] 568	223 [1973] 556	254 [2248] 542	276 [2443] 525		610
68 [18]	6 [53] 680	21 [186] 677	71 [628] 666	94 [832] 660	121 [1071] 653	146 [1292] 645	169 [1496] 635	192 [1699] 624	215 [1903] 610	251 [2221] 594	272 [2407] 574		680	
76 [20]		15 [133] 760	63 [558] 754	85 [752] 750	112 [991] 742	133 [1177] 730	160 [1416] 715	185 [1637] 702	202 [1788] 688	248 [2195] 666	267 [2363] 636		760	
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.			
115		17 [250]	35 [500]	69 [1000]	86 [1250]	104 [1500]	121 [1750]	138 [2000]	155 [2250]	172 [2500]	190 [2750]	207 [3000]		
113 cm ³ [6.9 in ³] / rev		Torque - Nm [lb-in], Speed rpm										Intermittent Ratings - 10% of Operation		
Flow - lpm [gpm]	2 [0.5]	23 [204] 17	53 [469] 12											18
	4 [1]	25 [221] 35	56 [496] 34	95 [841] 30	118 [1044] 19									35
	8 [2]	25 [221] 70	59 [522] 69	117 [1035] 65	144 [1274] 62	172 [1522] 60	202 [1788] 56							71
	15 [4]	24 [212] 130	58 [513] 129	112 [991] 127	144 [1274] 125	173 [1531] 122	202 [1788] 117	225 [1991] 114	251 [2221] 108					133
	23 [6]	22 [195] 200	51 [451] 199	111 [982] 197	140 [1239] 194	171 [1513] 191	201 [1779] 186	224 [1982] 183	251 [2221] 176	284 [2513] 170	307 [2717] 153			204
	30 [8]	21 [186] 264	53 [469] 262	108 [956] 258	134 [1186] 256	167 [1478] 254	196 [1735] 251	222 [1965] 248	251 [2221] 240	278 [2460] 232	305 [2699] 226	327 [2894] 210		265
	38 [10]	16 [142] 336	46 [407] 334	105 [929] 330	131 [1159] 326	164 [1451] 323	191 [1690] 318	217 [1920] 312	247 [2186] 306	271 [2398] 300	299 [2646] 292	327 [2894] 281		336
	45 [12]	12 [106] 397	43 [381] 396	101 [894] 390	132 [1168] 387	161 [1425] 382	187 [1655] 379	218 [1929] 371	239 [2115] 363	269 [2381] 355	290 [2566] 344	319 [2823] 339		398
	53 [14]	6 [53] 468	35 [310] 464	97 [858] 456	125 [1106] 452	157 [1389] 448	179 [1584] 444	207 [1832] 442	237 [2097] 436	259 [2292] 430	289 [2558] 422	315 [2788] 415		469
	61 [16]		34 [301] 539	90 [796] 534	118 [1044] 531	149 [1319] 524	174 [1540] 521	200 [1770] 518	233 [2062] 506	254 [2248] 498	285 [2522] 495	314 [2779] 479		540
68 [18]		29 [257] 601	84 [743] 596	114 [1009] 594	140 [1239] 589	172 [1522] 583	202 [1788] 572	221 [1956] 566	253 [2239] 557	282 [2496] 547	299 [2646] 544		602	
76 [20]		17 [150] 672	73 [646] 668	103 [912] 664	132 [1168] 658	161 [1425] 655	186 [1646] 648	214 [1894] 638	240 [2124] 627	266 [2354] 621	293 [2593] 607		673	
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.	
130		17 [250]	35 [500]	69 [1000]	86 [1250]	104 [1500]	121 [1750]	138 [2000]	155 [2250]	172 [2500]	190 [2750]	207 [3000]		
129 cm ³ [7.9 in ³] / 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	
Rotor Width		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.	
160		17 [250]	35 [500]	69 [1000]	86 [1250]	104 [1500]	121 [1750]	138 [2000]	155 [2250]	172 [2500]	190 [2750]	207 [3000]		
160 cm ³ [9.8 in ³] / 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	
Rotor Width		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.			
200		17 [250]	35 [500]	69 [1000]	86 [1250]	104 [1500]	121 [1750]	138 [2000]	155 [2250]	172 [2500]	190 [2750]	207 [3000]	
198 cm ³ [12.1 in ³] / 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]
----------	-----------	------------	------------	------------	------------	------------	------------	------------	------------	------------

Displacement tested at 54°C [129°F] with an oil viscosity of 46cSt [213 SUS]

		Pressure - bar [psi]							Max. Cont.	Max. Inter.			
240		17 [250]	35 [500]	69 [1000]	86 [1250]	104 [1500]	121 [1750]	138 [2000]	155 [2250]	172 [2500]	190 [2750]	207 [3000]	
236 cm ³ [14.4 in ³] / 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]
----------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------

Displacement tested at 54°C [129°F] with an oil viscosity of 46cSt [213 SUS]

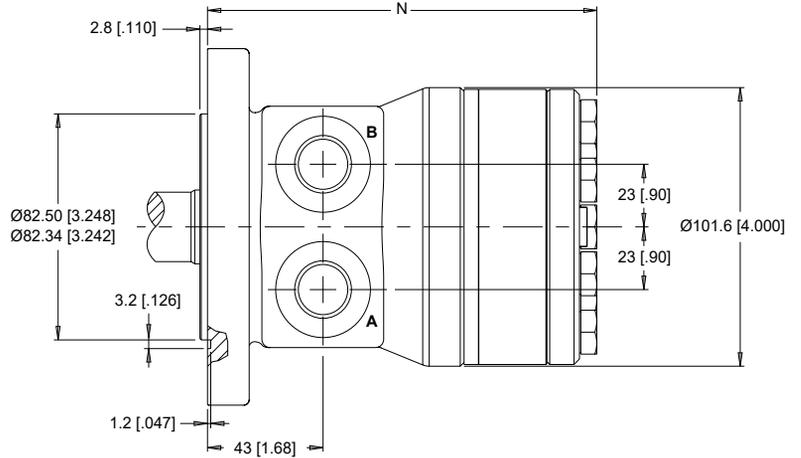
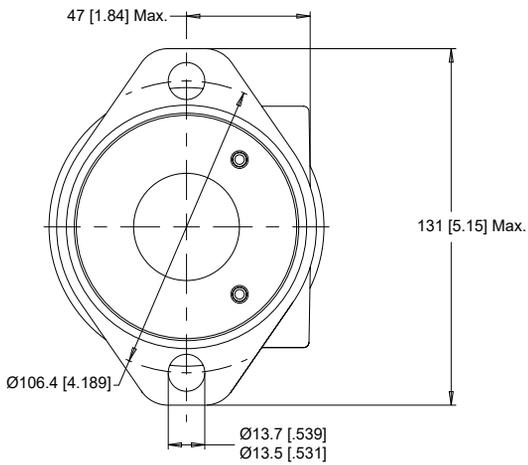
► Performance data is typical. Performance of production units varies slightly from one motor to another. Operating at maximum continuous pressure and maximum continuous low simultaneously is not recommended. For additional information on product testing please refer to page 6.

HOUSINGS

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

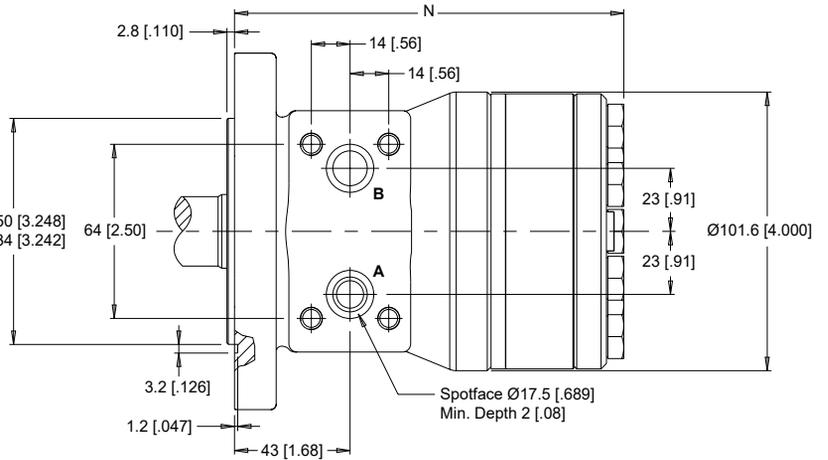
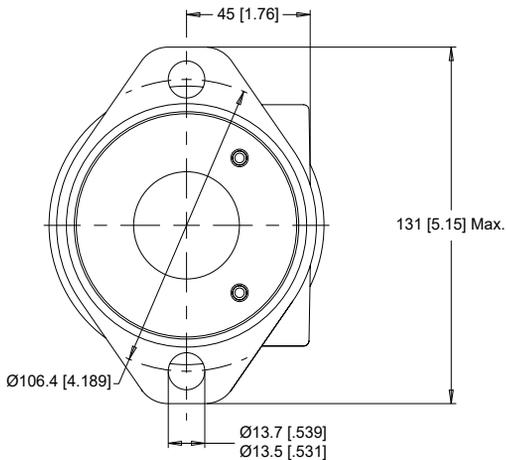
2-HOLE, SAE A MOUNT, ALIGNED PORTS

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



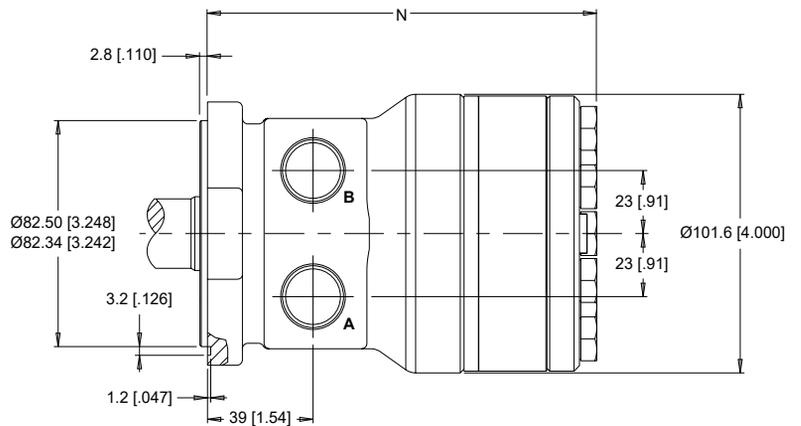
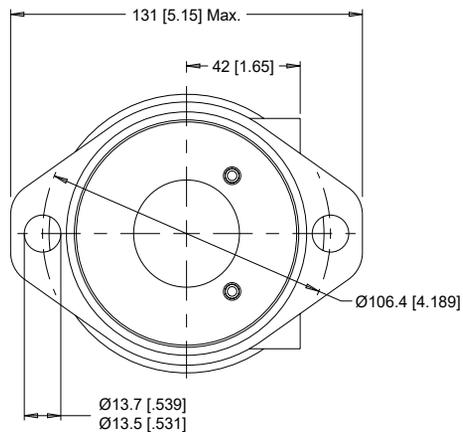
2-HOLE, SAE A MOUNT, ALIGNED MANIFOLD PORTS

A17 1/2" Drilled



2-HOLE, SAE A MOUNT, SIDE PORTS

A71 7/8-14 UNF



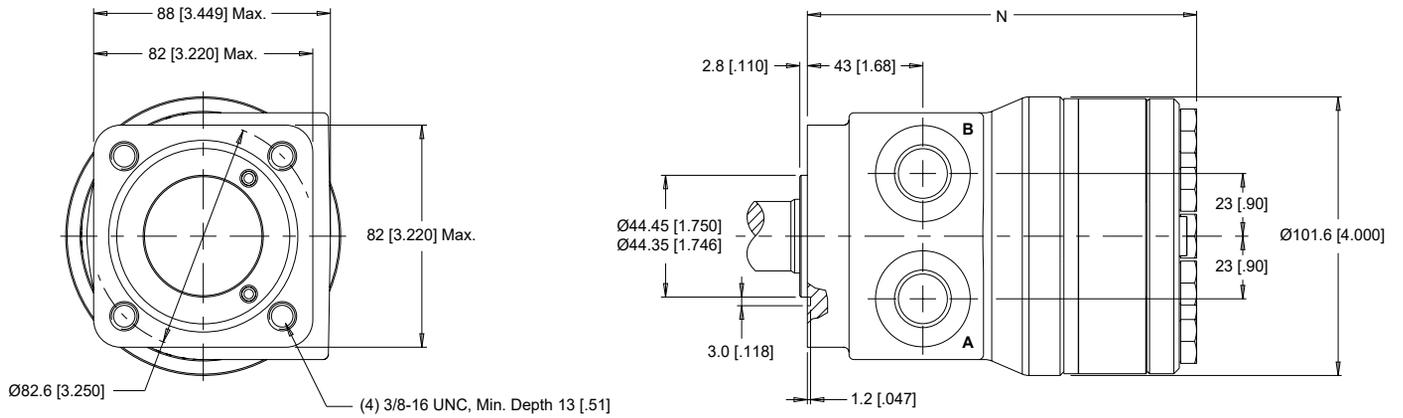
► Dimension N is charted on page 58.

HOUSINGS

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

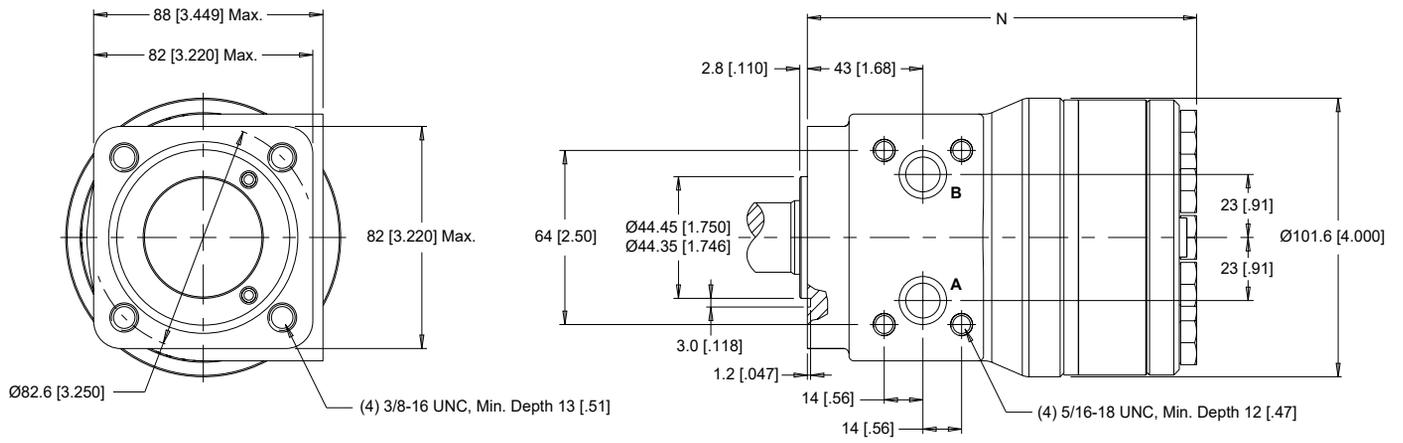
4-HOLE, SQUARE MOUNT, ALIGNED PORTS

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



4-HOLE, SQUARE MOUNT, ALIGNED MANIFOLD PORTS

F37 1/2" Drilled

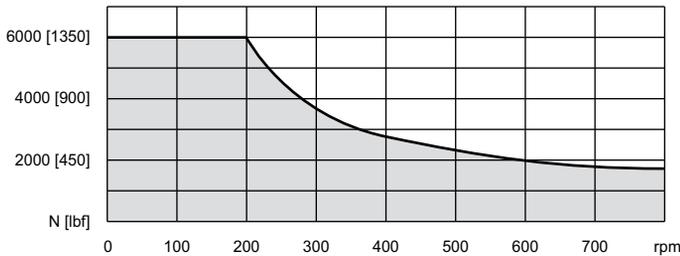


► Dimension N is charted on page 58.

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

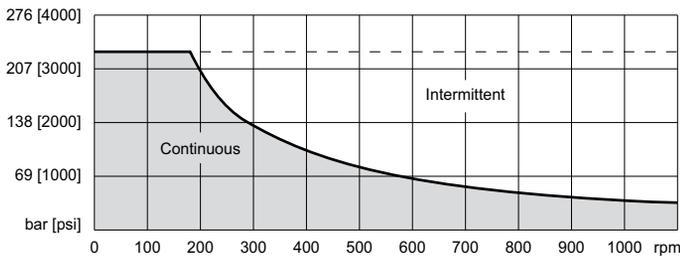
Dimension N is the overall motor length from the rear of the motor to the mounting flange surface and is referenced on detailed housing drawings listed on pages 56-57.

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]

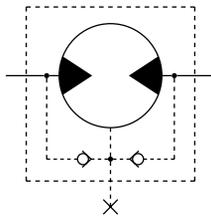
► 251 & 252 series motor weights can vary ± 0.5 kg [1 lb] depending on model configurations such as housing, shaft, endcover, options etc.

PERMISSIBLE SHAFT SEAL PRESSURE

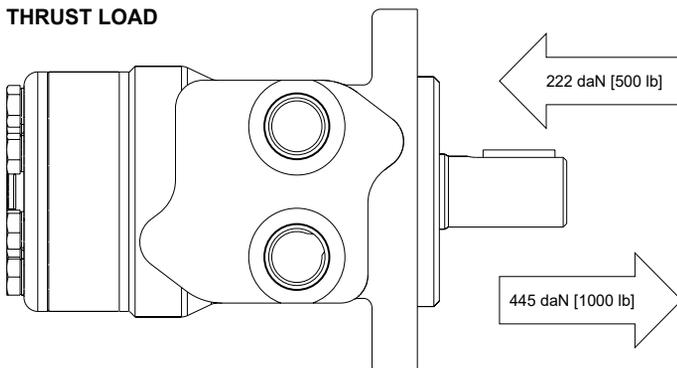
The curve below represents allowable seal pressure at various speeds. Operation in the gray area results in maintaining the rated life of the shaft seal. Actual shaft seal pressure depends on motor configuration.



► 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.

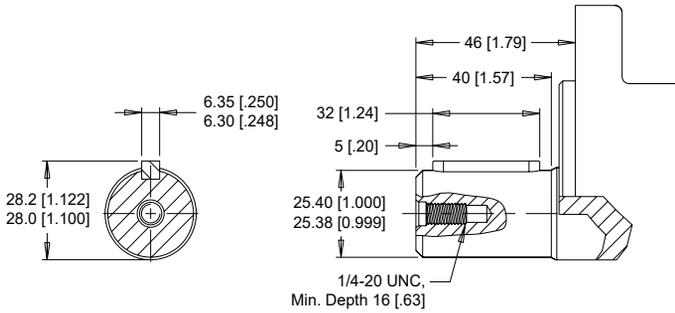


THRUST LOAD



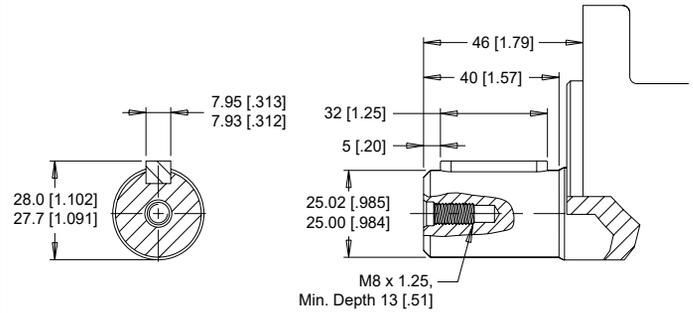
SHAFTS

10 1" Straight



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

12 25mm Straight



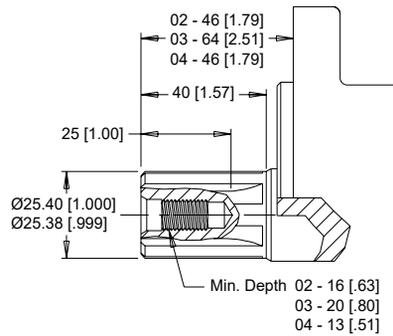
Max. Torque: 678 Nm [6000 lb-in]

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

04 1" 6B Spline, M8x1.25 Tap

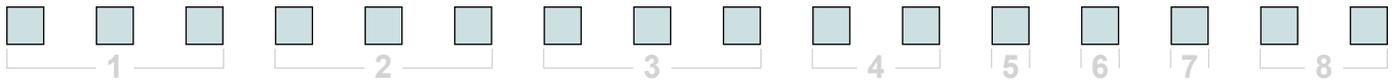
03 1" 6B Spline, 5/16-18 Tap

6B Spline
SAE J499 Standard



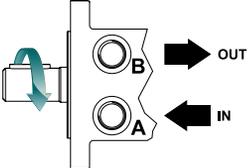
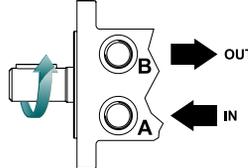
Max. Torque: 678 Nm [6000 lb-in]

ORDERING INFORMATION



1. CHOOSE SERIES DESIGNATION

251 Standard Rotation	252 Reverse Rotation
------------------------------	-----------------------------

► The 251 & 252 series are bi-directional.

2. SELECT A DISPLACEMENT OPTION

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

3. SELECT A MOUNT & PORT OPTION

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

4. SELECT A SHAFT OPTION

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

A Black
B Black, Unpainted Mounting Surface

6. SELECT A VALVE CAVITY / CARTRIDGE OPTION

A None

7. SELECT AN ADD-ON OPTION

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

8. SELECT A MISCELLANEOUS OPTION

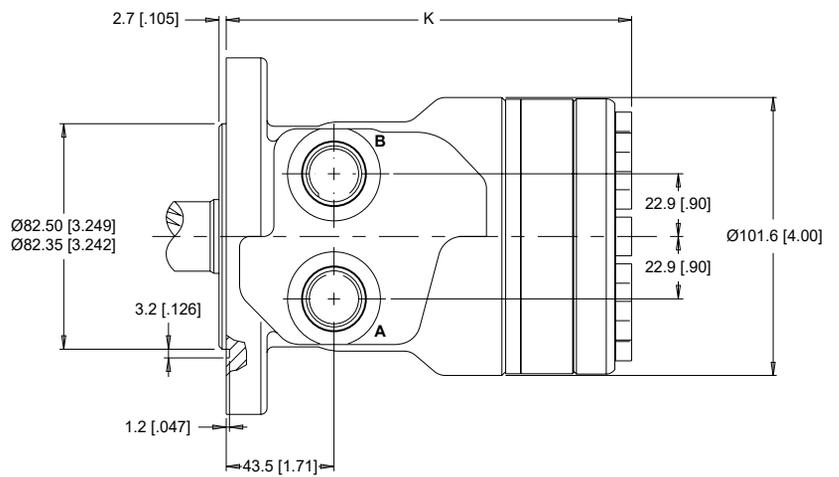
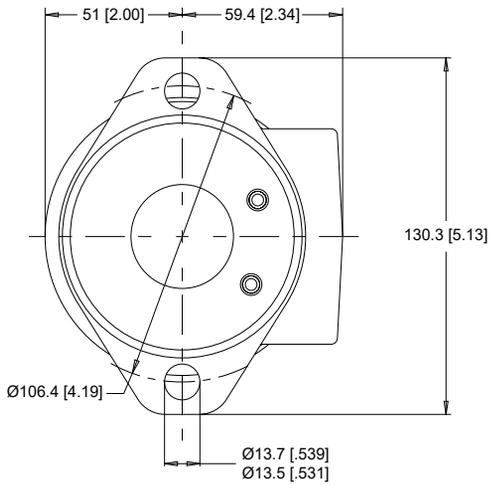
AA None
AC Freeturning Rotor

HOUSINGS

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

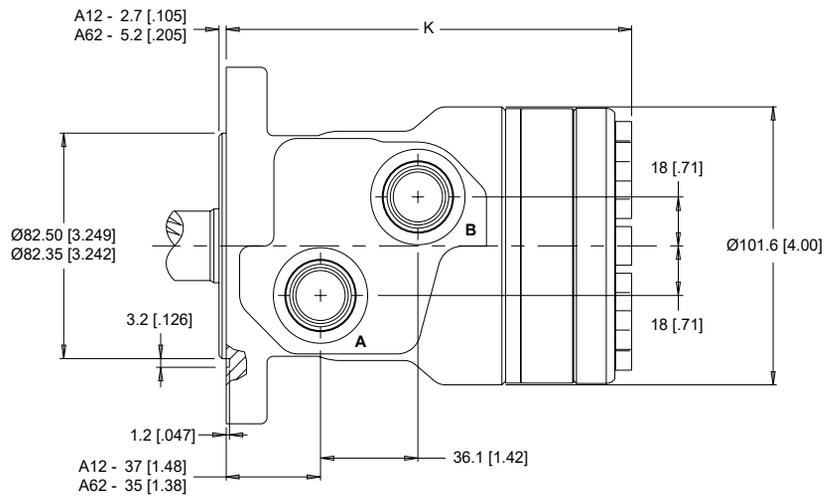
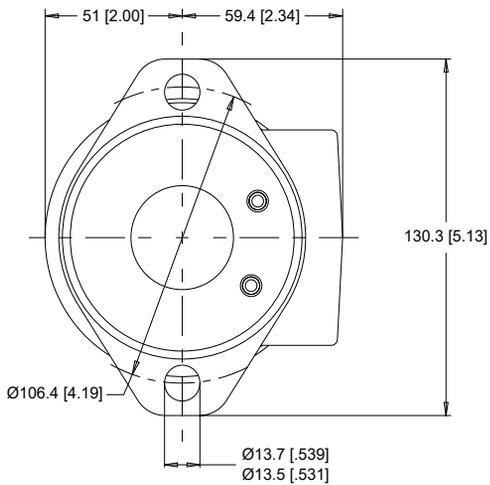
2-HOLE, SAE A MOUNT, ALIGNED PORTS

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



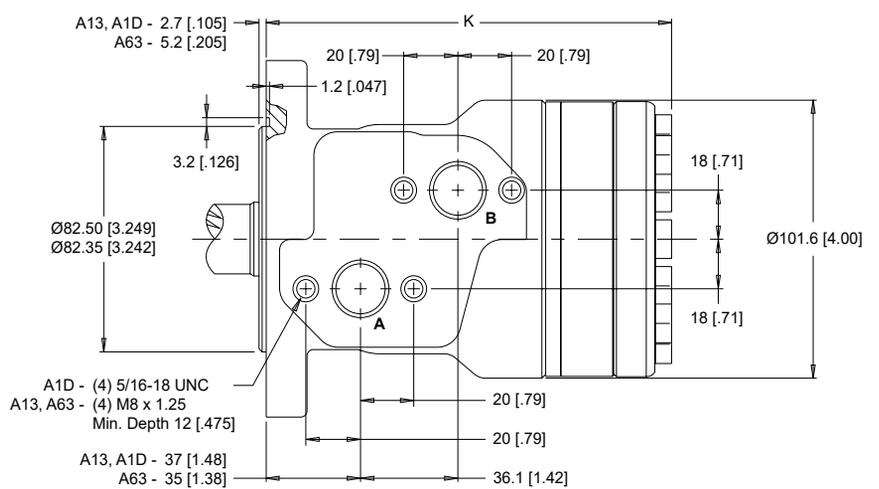
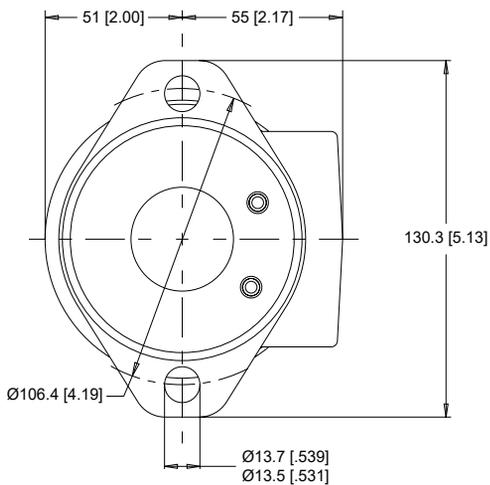
2-HOLE, SAE A MOUNT, OFFSET PORTS

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

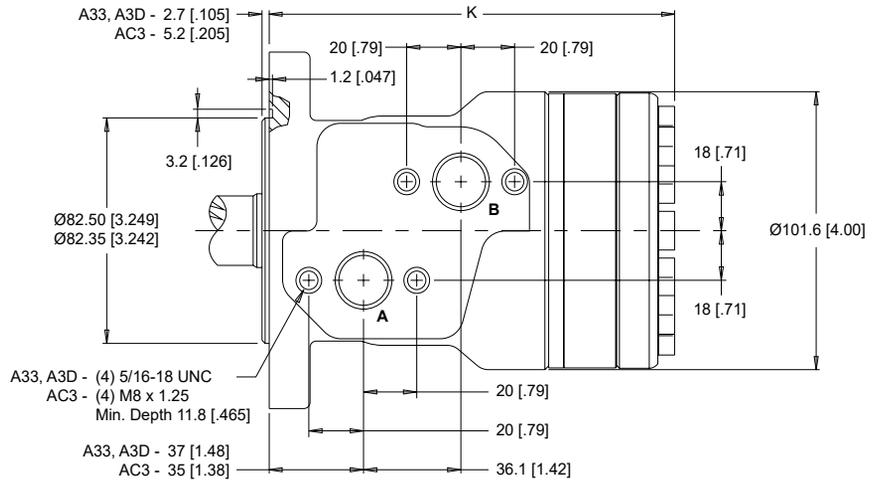
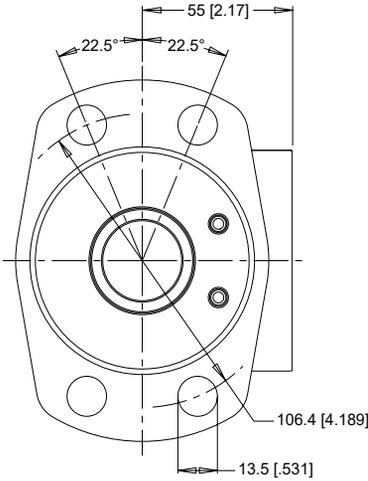
► Dimensions shown are without paint. Paint thickness can be up to 0.13 [.005].

4-HOLE, MAGNETO MOUNT, OFFSET MANIFOLD PORTS

A33 G 1/2

A3D 7/8-14 UNF

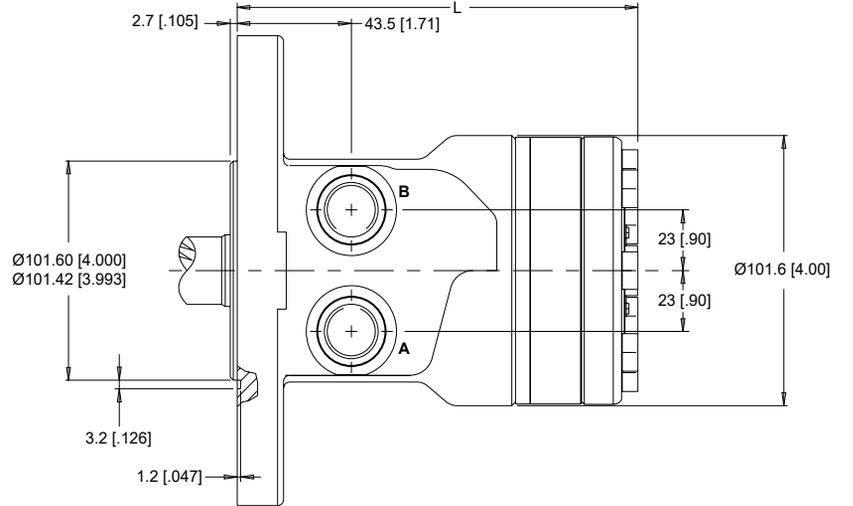
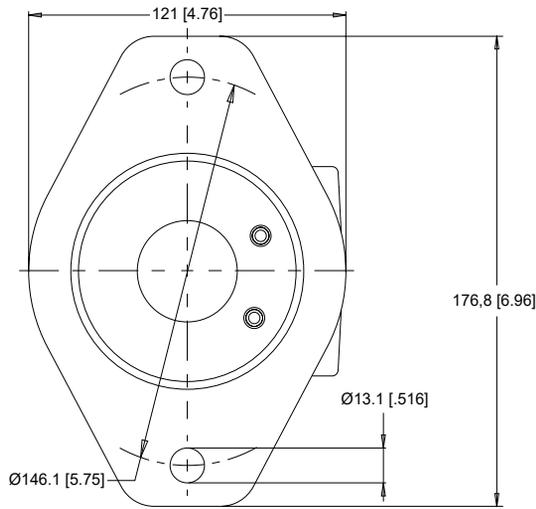
AC3 G 1/2 (TP)



2-HOLE, SAE B MOUNT, ALIGNED PORTS

B11 7/8-14 UNF

B18 G 1/2



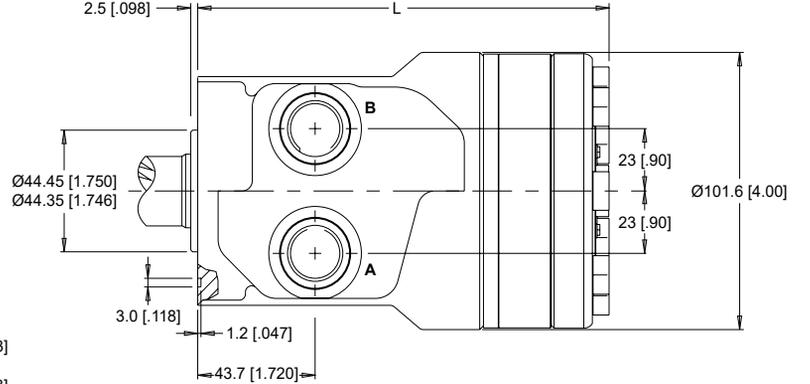
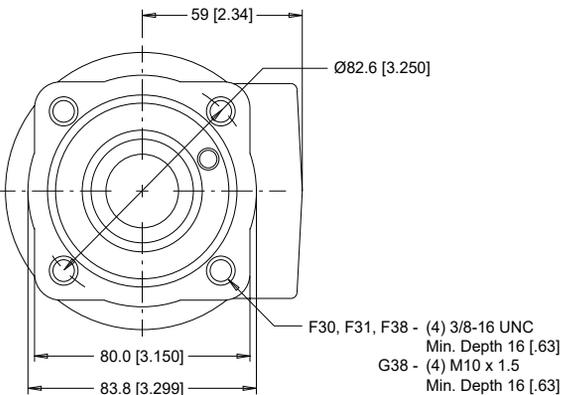
4-HOLE, SQUARE MOUNT, ALIGNED PORTS

F30 1/2-14 NPT

F31 7/8-14 UNF

F38 G 1/2

G38 G 1/2



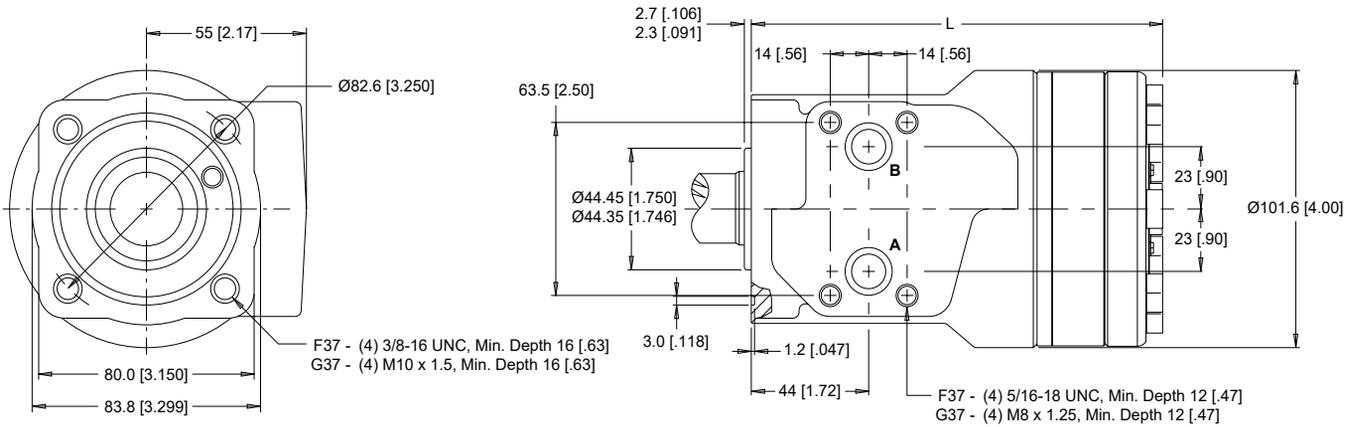
► Dimensions K & L are charted on page 65. ► (TP) - Taller Pilot Height. Refer to detailed drawing for dimensional differences.

HOUSINGS

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

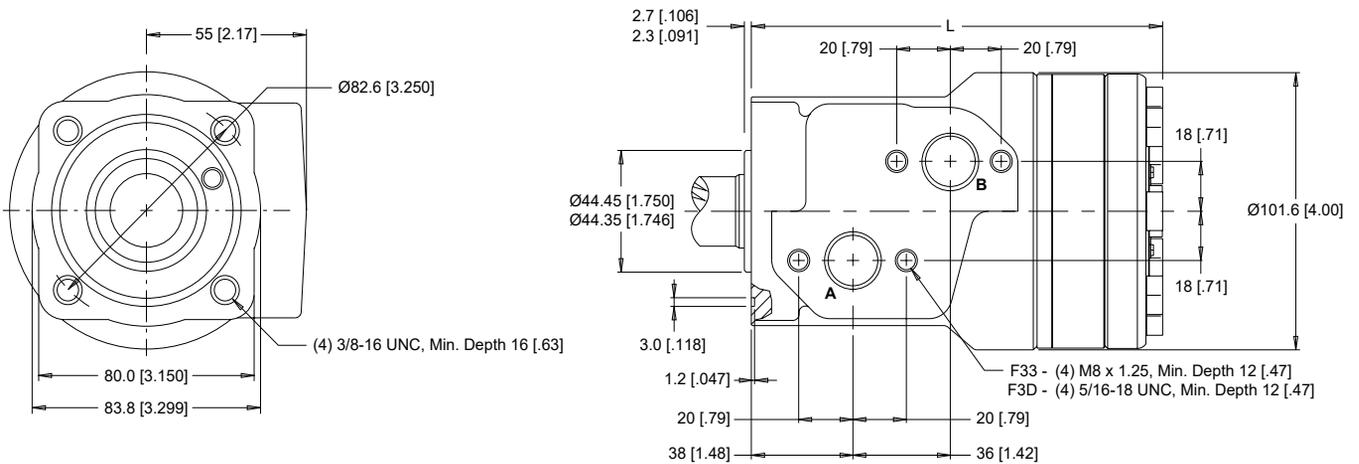
4-HOLE, SQUARE MOUNT, ALIGNED MANIFOLD PORTS

F37 1/2" Drilled **G37** 1/2" Drilled



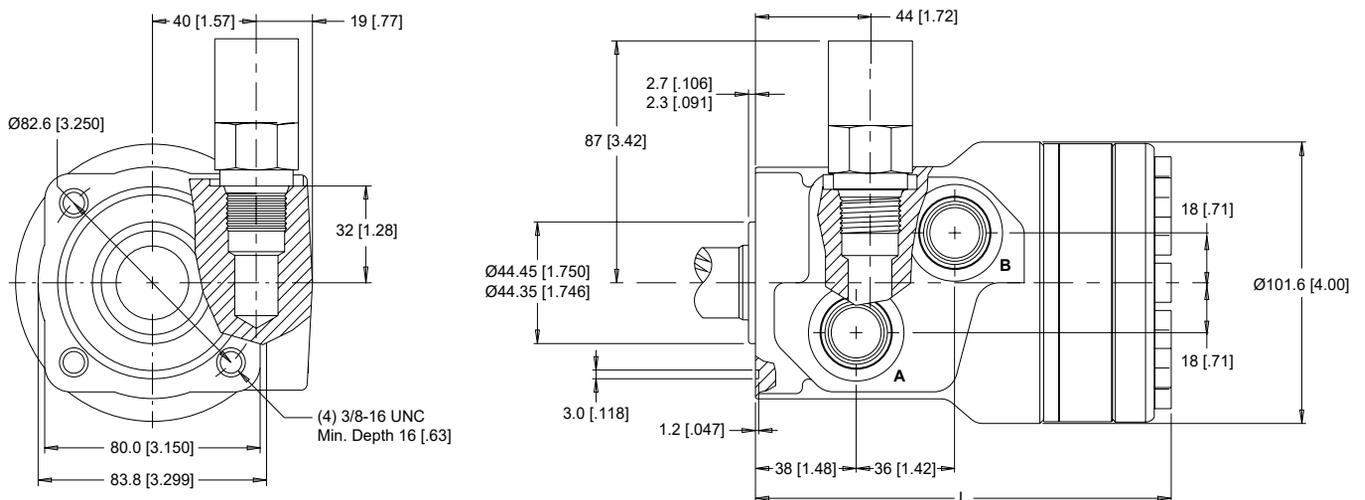
4-HOLE, SQUARE MOUNT, OFFSET MANIFOLD PORTS

F33 G 1/2 **F3D** 7/8-14 UNF



4-HOLE, SQUARE MOUNT, OFFSET PORTS, VALVE CAVITY

F39 7/8-14 UNF

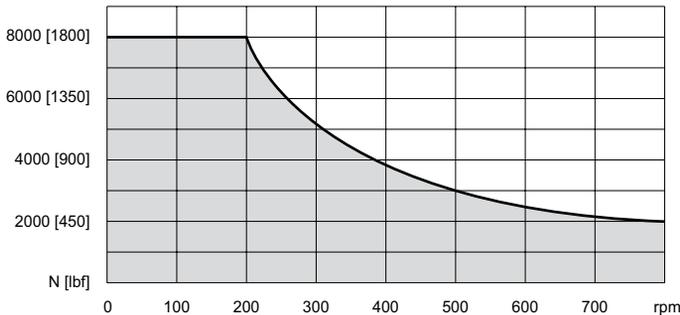


► Dimension L is charted on page 65.

TECHNICAL INFORMATION

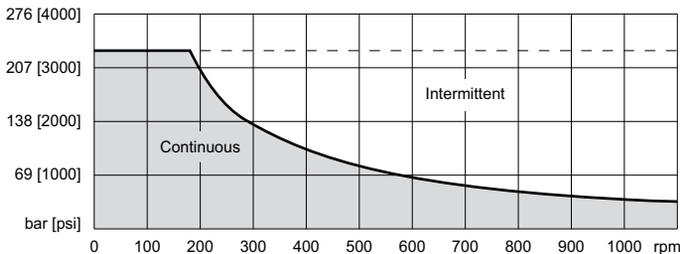
ALLOWABLE SHAFT LOAD / BEARING CURVE

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.

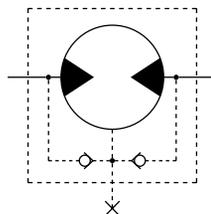


PERMISSIBLE SHAFT SEAL PRESSURE

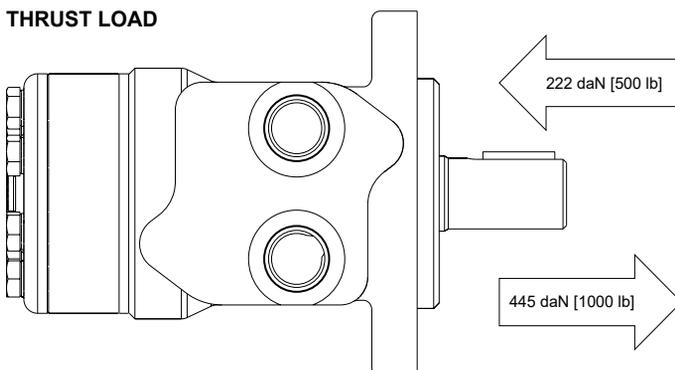
The curve below represents allowable seal pressure at various speeds. Operation in the gray area results in maintaining the rated life of the shaft seal. Actual shaft seal pressure depends on motor configuration.



- ▶ 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.

K	3mm Pilot	8mm Pilot	Weight
#	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]

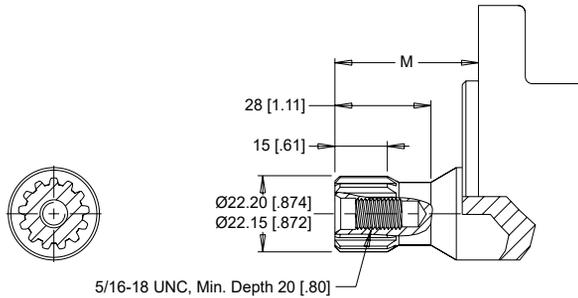
Dimension L is the overall motor length from the rear of the motor to the mounting flange surface and is referenced on detailed housing drawings listed on pages 63-64.

L	Square & B Mounts	B Mount Weight	Sq. Mount Weight
#	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.

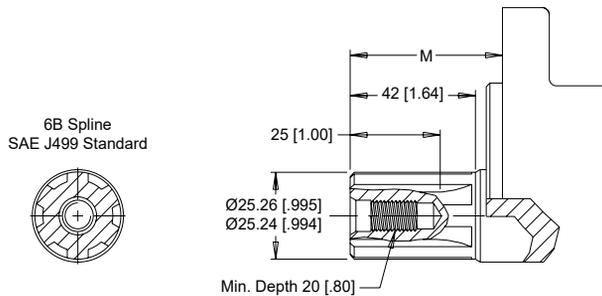
SHAFTS

01 7/8" 13 Tooth Spline



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

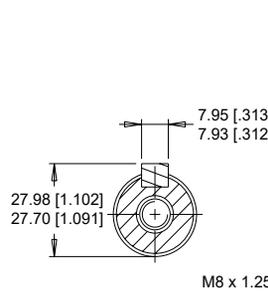
02 1" 6B Spline, 5/16-18 Tap



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

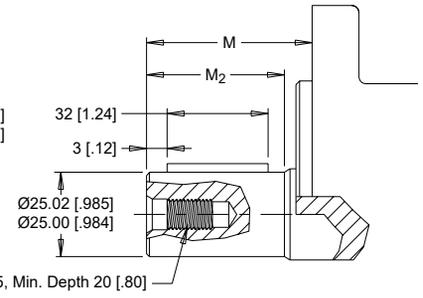
04 1" 6B Spline, M8x1.25 Tap

12 25mm Straight

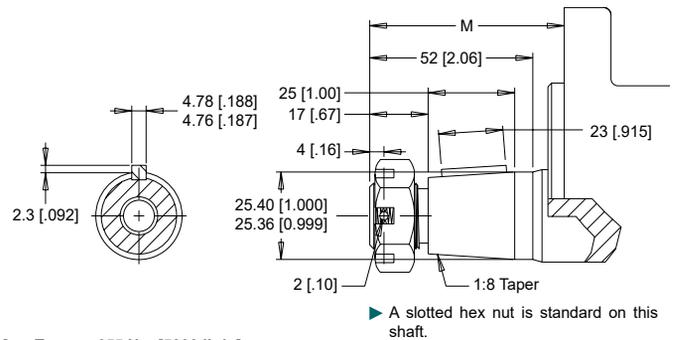


Max. Torque: 678 Nm [6000 lb-in]

16 25mm Straight Extended



13 1" Tapered

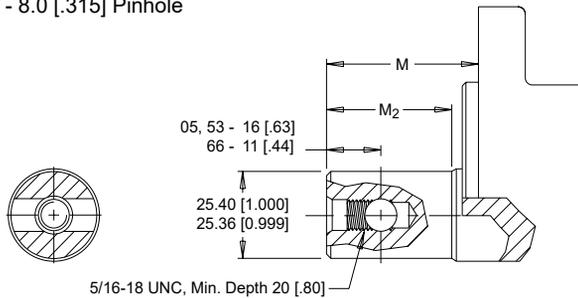


Max. Torque: 655 Nm [5800 lb-in]

05 1" - 9.5 [.375] Pinhole

53 1" - 10.3 [.406] Pinhole

66 1" - 8.0 [.315] Pinhole

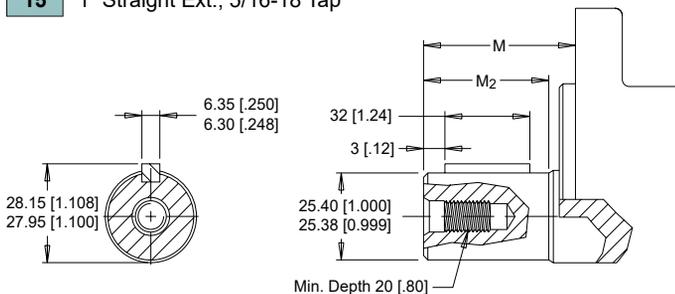


Max. Torque: 678 Nm [6000 lb-in]

10 1" Straight, 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]

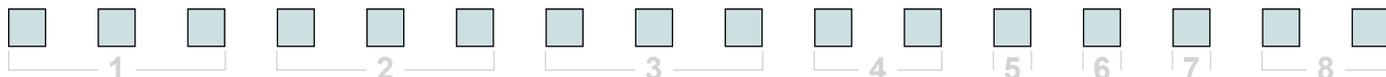
MOUNTING / SHAFT LENGTH CHART

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 M₂ 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 ₂
#	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]

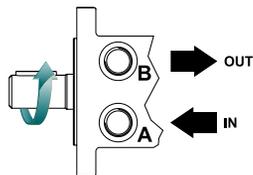
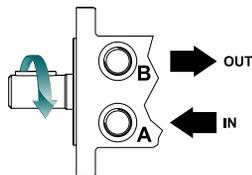
ORDERING INFORMATION



1. CHOOSE SERIES DESIGNATION

255 Standard Rotation

256 Reverse Rotation



► The 255 & 256 series are bi-directional.

2. SELECT A DISPLACEMENT OPTION

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

3. SELECT A MOUNT & PORT OPTION

A10	2-Hole, SAE A Mount, Aligned Ports, 1/2-14 NPT
A11	2-Hole, SAE A Mount, Aligned Ports, 7/8-14 UNF
A12	2-Hole, SAE A Mount, Offset Ports, G 1/2
A13	2-Hole, SAE A Mount, Offset Manifold Ports, G 1/2
A1D	2-Hole, SAE A Mount, Offset Manifold Ports, 7/8-14 UNF
A19	2-Hole, SAE A Mount, Offset Ports, Valve Cavity 7/8-14 UNF
A30	4-Hole, Magneto Mount, Aligned Ports, 1/2-14 NPT
A31	4-Hole, Magneto Mount, Aligned Ports, 7/8-14 UNF
A33	4-Hole, Magneto Mount, Offset Manifold Ports, G 1/2
A3D	4-Hole, Magneto Mount, Offset Manifold Ports, 7/8-14 UNF
A62	2-Hole, SAE A Mount, Offset Ports, G 1/2 (TP)
A63	2-Hole, SAE A Mount, Offset Manifold Ports, G 1/2 (TP)
AC3	4-Hole, Magneto Mount, Offset Manifold Ports, G 1/2 (TP)
B11	2-Hole, SAE B Mount, Aligned Ports, 7/8-14 UNF
B18	2-Hole, SAE B Mount, Aligned Ports, G 1/2
F30	4-Hole, Square Mount, Aligned Ports, 1/2-14 NPT
F31	4-Hole, Square Mount, Aligned Ports, 7/8-14 UNF
F33	4-Hole, Square Mount, Offset Manifold Ports, G 1/2
F37	4-Hole, 3/8-16 UNC, 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

F38	4-Hole, Square Mount, Aligned Ports, G 1/2
F39	4-Hole, Square Mount, Offset Ports, Valve Cavity 7/8-14 UNF
F3D	4-Hole, Square Mount, Offset Manifold Ports, 7/8-14 UNF
G37	4-Hole, M10x1.5, Square Mount, Aligned Manifold Ports, 1/2" Drilled
G38	4-Hole, Square Mount, Aligned Ports, G 1/2

4. SELECT A SHAFT OPTION

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

A	Black
B	Black, Unpainted Mounting Surface

6. SELECT A VALVE CAVITY / CARTRIDGE OPTION

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

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

7. SELECT AN ADD-ON OPTION

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

8. SELECT A MISCELLANEOUS OPTION

AA	None
EG	Viton Shaft Seal