MOTORS

Technical Information

Motor Brakes Type HB, HK, CE, RE and DT

WHITE

together in motion

White is a leading global provider of motor and steering solutions that power the evolution of mobile and industrial applications around the world.

Contents

Chapter 1

Technical Information

Topics:

- *Operating recommendations*
- *Motor Connections*
- *Product Testing (Understanding the Performance Charts)*
- *Allowable Bearing & Shaft Loads*
- *Vehicle Drive Calculations*
- *Induced Side Loading*
- *Hydraulic Equations*
- *Shaft Nut Dimensions & Torque Specifications*

Operating Recommendations

Oil type

Hydraulic oils with anti-wear, anti-foam and demulsifiers are recommended for systems incorporating these 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 the 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.

We recommend maintaining an oil cleanliness level of ISO 17-14 or better.

Installation & start-up

When installing a 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 ap- propriate 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! - The motors/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 ensure 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. 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 unit. Motor/brakes should be configured so that the release ports are near the top of the unit in the installed position.

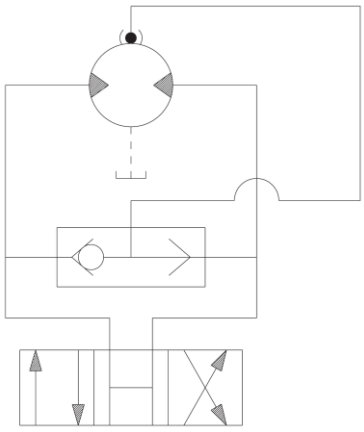


Figure 1: Typical motor/brake schematic

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 Connections

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 at the same speed such as on a long line conveyor.

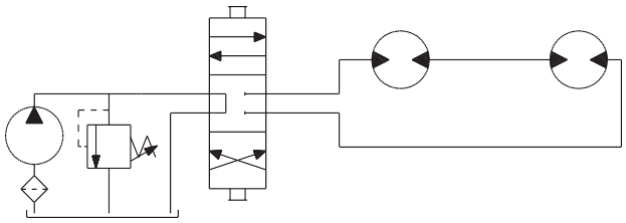


Figure 2: Series circuit

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.

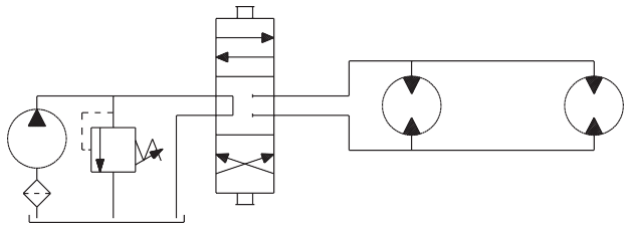
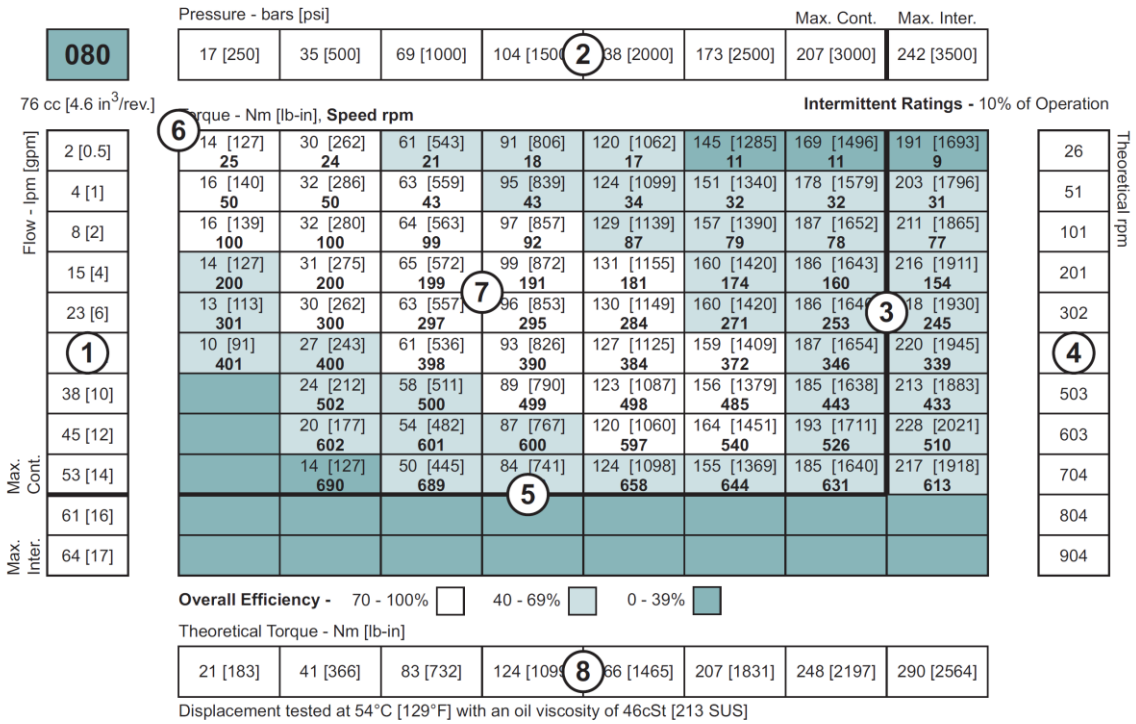


Figure 3: Series circuit

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 a 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.



1. Flow represents the amount of fluid passing through the motor during each minute of the test.
2. Pressure refers to the measured pressure differential between the inlet and return ports of the motor during the test.
3. The maximum continuous pressure rating and maxi- mum intermittent pressure rating of the motor are separated by the dark lines on the chart.
4. Theoretical RPM represents the RPM that the motor would produce if it were 100% volumetrically efficient. Measured RPM divided by the theoretical RPM gives the actual volumetric efficiency of the motor.
5. The maximum continuous flow rating and maximum intermittent flow rating of the motor are separated by the dark line on the chart.
6. 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.
7. Areas within the white shading represent maximum motor efficiencies.
8. 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

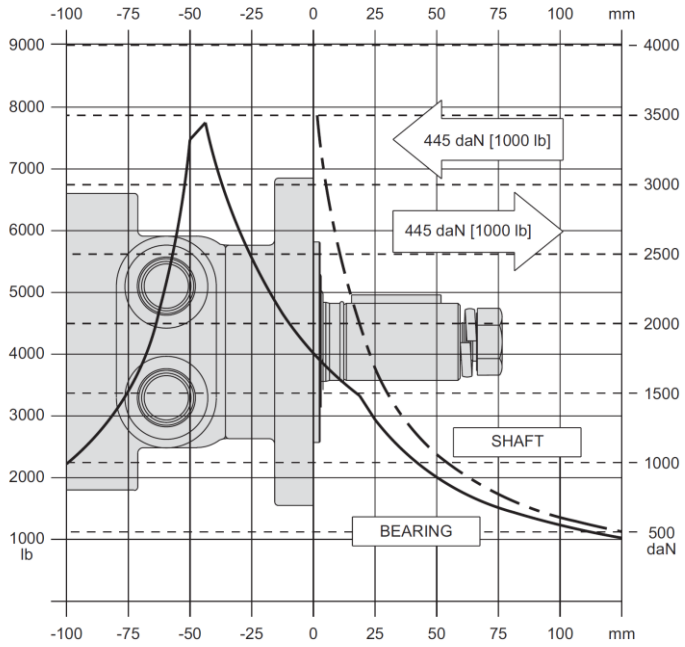
This catalog provides curves showing allowable radial loads at points along the longitudinal axis of the motor. They are dimensioned from the mounting flange. Two capacity curves for the shaft and bearings are shown. A vertical line through the centerline of the load drawn to intersect the x-axis intersects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

Sample application (vehicle design criteria)

Vehicle description……..4-wheel vehicle
Vehicle drive……...2-wheel drive
GVW……..…….1,500 lbs.
Weight over each drive wheel…….……..425 lbs.
Rolling radius of tires…….……...16 in.
Desired acceleration…….……0-5 mph in 10 sec.
Top speed…….……5 mph
Gradeability…….……...20%
Worst working surface…….……..poor asphalt

To determine maximum motor speed

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

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

Table 1: Rolling Resistance

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:

% Grade = [tan of angle (degrees)] x 100

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

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

Step Three: Determine Acceleration Force

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

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

Where:

t = time to maximum speed (seconds)

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

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 (lb or N)

Example TE = 33 + 300 + 34 + 0 (lbs) = 367 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.

$$T = \frac{\text{TE x ri}}{\text{M x G}} \text{ lb} - \text{in per motor}$$

$$T = \frac{\text{TE x rm}}{\text{M x G}} \text{ Nm per motor}$$

Where:

M = number of driving motors

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

Step Seven: Determine Wheel Slip

To verify that the vehicle will perform as designed in regard 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.

$$TS = \frac{\text{W x f x ri}}{\text{G}} (\text{lb} - \text{in per motor})$$

$$TS = \frac{\text{W x f x rm}}{\text{G}} (\text{N} - \text{m per motor})$$

Where:

f = coefficient of friction (see table 2)

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

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

Table 2: Coefficient of friction (f)

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 Ra- dial 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.

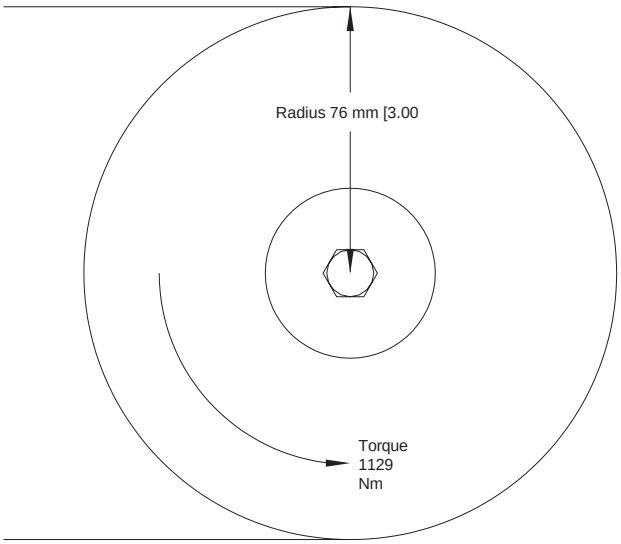
$$RL = \sqrt{W^2 + \left(\frac{T}{ri}\right)^2} \; lb \qquad RL = \sqrt{W^2 + \left(\frac{T}{rm}\right)^2} \text{ kg}$$

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

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

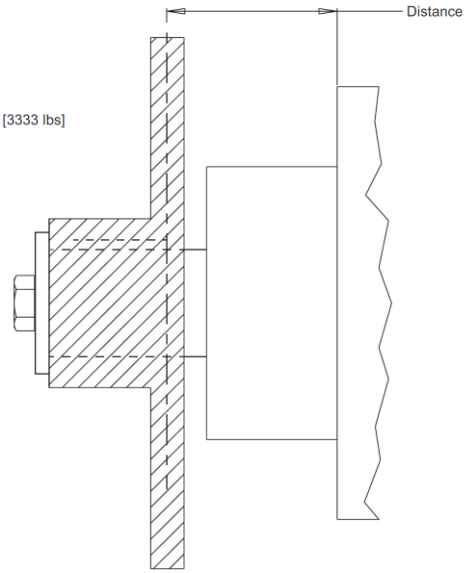
In many cases, pulleys or sprockets may be used to transmit the torque produced by the motor. Use of these components will create a torque induced side load on the motor shaft and bearings. It is important that this load be taken into consideration when choosing a motor with sufficient bearing and shaft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

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

Side Load = 14855 Nm [3333 lbs]



Hydraulic Equations

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

$$\text{Theo. Speed (RPM)} = \frac{1000 \text{ x LPM}}{\text{Displacement } (\text{cm}^3/\text{rev})} \quad \text{or} \quad \frac{231 \text{ x GPM}}{\text{Displacement } (\text{in}^3/\text{rev})}$$

$$\text{Theo. Torque (lb} - \text{in)} = \frac{\text{Bar x Disp. } (cm^3/\text{rev})}{20 \text{ pi}} \quad \text{or} \quad \frac{\text{PSI x Displacement } (\text{in}^3/\text{rev})}{6.28}$$

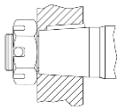
$$\text{Power in (HP)} = \frac{\text{Bar x LPM}}{600} \quad \text{or} \quad \frac{\text{PSI x GPM}}{1714}$$

$$\text{Power out (HP)} = \frac{\text{Torque (Nm)x RPM}}{9543} \quad \text{or} \quad \frac{\text{Torque (lb} - \text{in)x RPM}}{63024}$$

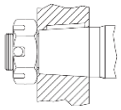
Shaft nut information

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.



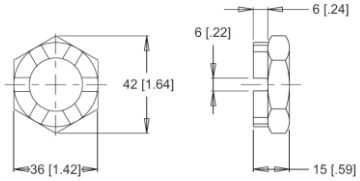
incorrect



correct

35MM TAPERED SHAFTS
M24 x 1.5 Thread

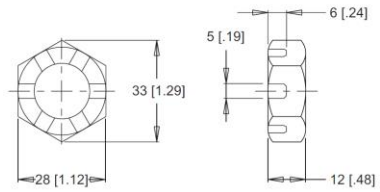
A Slotted Nut



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

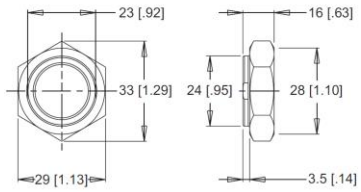
1" TAPERED SHAFTS
3/4-28 Thread

A Slotted Nut



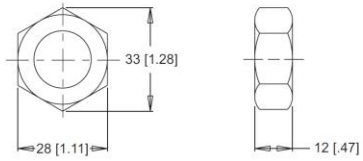
Torque Specifications: 20 - 23 daNm [150 - 170 ft.lb.]

B Lock Nut



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

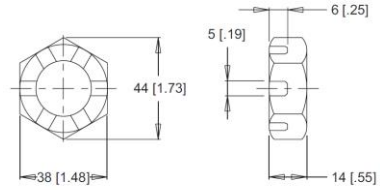
C Solid Nut



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

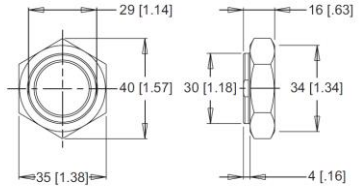
1-1/4" TAPERED SHAFTS
1-20 Thread

A Slotted Nut



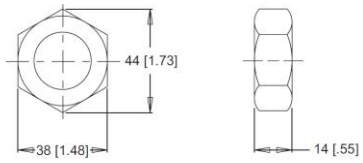
Torque Specifications: 38 daNm [280 ft.lb.] Max.

B Lock Nut



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

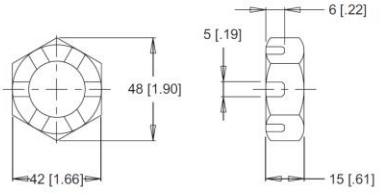
C Solid Nut



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

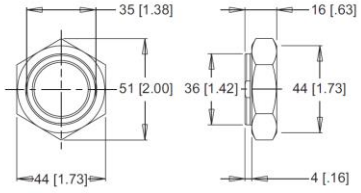
1-3/8" & 1-1/2" TAPERED SHAFTS
1 1/8-18 Thread

A Slotted Nut



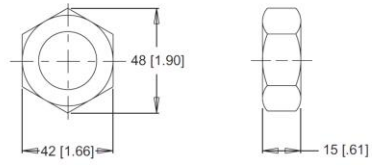
Torque Specifications: 41 - 54 daNm [300 - 400 ft.lb.]

B Lock Nut



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

C Solid Nut



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

Chapter 2

Optional Motor Features

Topics:

- *Internal Drain*
- *Valve Cavity Option*
- *Free Turning Rotor*

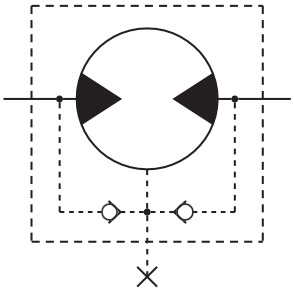
Internal drain

The internal drain is an option available on all HB, DR, and DT Series motors, and is standard on all WP, WR, WS, and D9 series motors. Typically, a separate drain line must be installed to direct case leakage of the motor back to the reservoir when using a HB, DR, or DT Series motor. However, the internal drain option eliminates the need for a separate drain line through the installation of two check valves in the motor end cover. This simplifies plumbing requirements for the motor.

The two check valves connect the case area of the motor to each port of the end cover. During normal motor operation, pressure in the input and return lines of the motor close the check valves. However, when the pressure in the case of the motor is greater than that of the return line, the check valve between the case and low-pressure line opens, allowing the case leakage to flow into the return line. Since the operation of the check valves is dependent upon a pressure differential, the internal drain option operates in either direction of motor rotation.

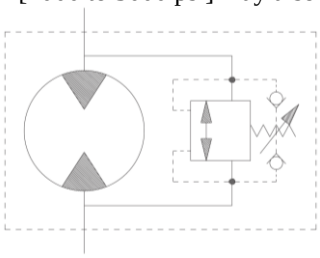
Although this option can simplify many motor installations, precautions must be taken to insure that return line pressure remains below allowable levels (see table below) to insure proper motor operation and life. If return line pressure is higher than allowable, or experiences pressure spikes, this pressure may feed back into the motor, possibly causing catastrophic seal failure. Installing motors with internal drains in series is not recommended unless overall pressure drop over all motors is below the maximum allowable backpressure as listed in the chart below. If in doubt, contact your authorized representative.

Maximum allowable back pressure		
Series	**Cont. bar [psi]**	**Inter. bar [psi]**
HB	69 [1000]	103 [1500]
DR	69 [1000]	103 [1500]
DT	21 [300]	34 [500]
D9	21 [300]	21 [300]
Brakes	34 [500]	34 [500]



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 (12 series on the 800 series motor) 2-way cavity that accepts numerous cartridge valves, including overrunning 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 con- trolling 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 distributor.

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.

Chapter 3

Hydraulic motors/brakes – HB & HK

Topics:

HB/HK Product Line Introduction

Overview

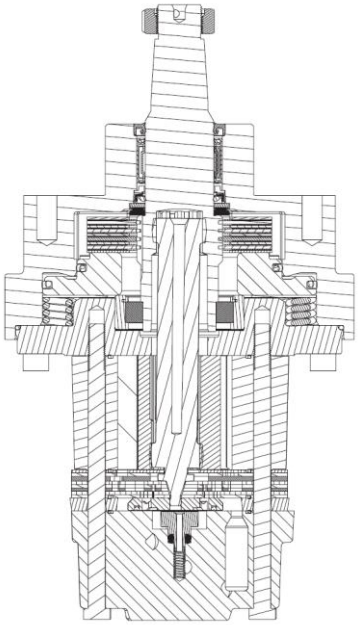
The HB Series motor is the leader in its class, offering high efficiency and durability. The three-zone orbiting valve, laminated manifold and Roller Stator motor work harmoniously to produce high overall efficiencies over a wide range of operating conditions. The standard case drain increases shaft seal life by reducing internal pressures experienced by the seal. Case oil leakage is also directed across all driveline components, increasing motor life. An internal drain option is also available. At the heart of the motor is a heavy-duty drive link, offering 30% more torque capacity than competitive designs. These features make the HB Series motor the preferred choice for applications requiring peak efficiency for continuous operation.

Features / Benefits

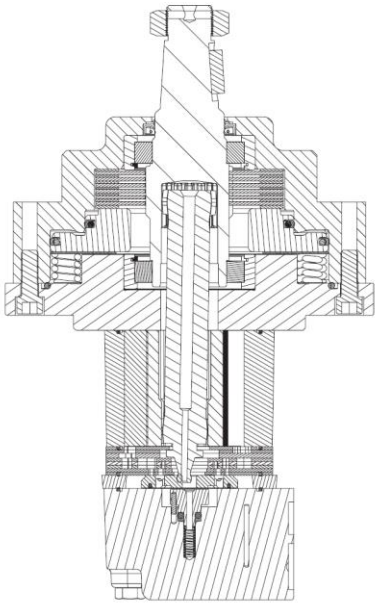
- Forced Drive Link Lubrication reduces wear and pro- motes longer life from motor.
- Heavy-Duty Drive Link is up to 30% stronger than competitive designs for longer life.
- Three-Zone Orbiting Valve precisely meters oil to produce exceptional volumetric efficiency.
- Rubber Energized Steel Face Seal does not extrude or melt under high pressure or high temperature.
- Standard Case Drain increases shaft seal life by reducing pressure on seal.

Series Descriptions

310 - Hydraulic Motor/Brake
Standard



315 - Hydraulic Motor
With Greater Holding Torque



Typical Applications

Medium-duty wheel drives, augers, mixers, winch drives, swing drives, grapple heads, feed rollers, broom drives, chippers, mining equipment, forestry equipment and more

Specifications

Code	Displacement cm³ [in³/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
050	52 [3.2]	680	830	38 [10]	45 [12]	135 [1200]	158 [1400]	207 [3000]	242 [3500]	276 [4000]
080	76 [4.6]	800	950	53 [14]	64 [17]	191 [1700]	222 [1975]	207 [3000]	242 [3500]	276 [4000]
090	89 [5.4]	680	840	61 [16]	76 [20]	225 [2000]	270 [2400]	207 [3000]	242 [3500]	276 [4000]
110	111 [6.8]	680	850	76 [20]	95 [25]	298 [2650]	349 [3100]	207 [3000]	242 [3500]	276 [4000]
125	127 [7.7]	580	740	76 [20]	95 [25]	338 [3000]	394 [3500]	207 [3000]	242 [3500]	276 [4000]
160	164 [10.0]	460	580	76 [20]	95 [25]	448 [3975]	512 [4550]	207 [3000]	242 [3500]	276 [4000]
200	205 [12.5]	370	460	76 [20]	95 [25]	569 [5050]	653 [5800]	207 [3000]	242 [3500]	276 [4000]
250	254 [15.5]	290	370	76 [20]	95 [25]	704 [6250]	799 [7100]	207 [3000]	242 [3500]	276 [4000]
300	293 [17.9]	250	320	76 [20]	95 [25]	811 [7200]	929 [8250]	207 [3000]	242 [3500]	276 [4000]
400	409 [24.9]	180	230	76 [20]	95 [25]	946 [8400]	1019 [9050]	173 [2500]	189 [2750]	207 [3000]

- 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.

HB/HK Displacement Performance

050

52 cm³ [3.2 in³] / rev

Pressure - bar [psi]

17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	207 [3000] Max. Cont.	242 [3500] Max. Inter.

Torque - Nm [lb-in], **Speed rpm**

Intermittent Ratings - 10% of Operation

Flow - lpm [gpm]									Theoretical rpm
Max. Inter. / Max. Cont.									
	2 [0.5]	7 [66] **36**	18 [158] **31**	38 [314] **26**	51 [447] **21**	66 [587] **9**			37
	4 [1]	9 [77] **72**	19 [164] **69**	38 [335] **65**	57 [505] **63**	71 [631] **33**	87 [772] **32**	98 [866] **9**	73
	8 [2]	9 [75] **142**	19 [164] **140**	39 [342] **135**	59 [521] **133**	78 [690] **122**	95 [840] **102**	109 [964] **77**	123 [1086] **57**	145
	15 [4]	8 [68] **288**	19 [164] **286**	38 [340] **285**	57 [507] **284**	78 [688] **265**	99 [872] **245**	112 [993] **211**	129 [1145] **189**	289
	23 [6]			36 [319] **431**	56 [492] **427**	76 [669] **416**	97 [859] **396**	114 [1009] **347**	134 [1182] **321**	434
	30 [8]			34 [304] **577**	53 [467] **572**	73 [646] **568**	95 [841] **543**	113 [1001] **488**	134 [1183] **463**	578
	38 [10]				51 [451] **699**	71 [628] **683**	92 [810] **665**	111 [978] **634**	133 [1174] **604**	722
	45 [12]				48 [427] **847**	68 [606] **825**	88 [781] **798**	111 [980] **770**		867

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

Rotor Width	Theoretical Torque - Nm [lb-in]						
8.0 [.316]	14 [127]	29 [255]	58 [510]	86 [764]	115 [1019]	144 [1274]	173 [1529]	202 [1783]

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 flow simultaneously is not recommended..

080

76 cm³ [4.6 in³] / rev

Flow - lpm [gpm]	Pressure - bar [psi] 17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	207 [3000] Max. Cont.	242 [3500] Max. Inter.	Theoretical rpm
	Torque - Nm [lb-in], **Speed rpm**						**Intermittent Ratings -** 10% of Operation		
2 [0.5]	14 [127] **25**	30 [262] **24**	61 [543] **21**	91 [806] **18**	120 [1062] **17**	145 [1285] **11**	169 [1496] **11**	191 [1693] **9**	26
4 [1]	16 [140] **50**	32 [286] **50**	63 [559] **43**	95 [839] **43**	124 [1099] **34**	151 [1340] **32**	178 [1579] **32**	203 [1796] **31**	51
8 [2]	16 [139] **100**	32 [280] **100**	64 [563] **99**	97 [857] **92**	129 [1139] **87**	157 [1390] **79**	187 [1652] **78**	211 [1865] **77**	101
15 [4]	14 [127] **200**	31 [275] **200**	65 [572] **199**	99 [872] **191**	131 [1155] **181**	160 [1420] **174**	186 [1643] **160**	216 [1911] **154**	201
23 [6]	13 [113] **301**	30 [262] **300**	63 [557] **297**	96 [853] **295**	130 [1149] **284**	160 [1420] **271**	186 [1646] **253**	218 [1930] **245**	302
30 [8]	10 [91] **401**	27 [243] **400**	61 [536] **398**	93 [826] **390**	127 [1125] **384**	159 [1409] **372**	187 [1654] **346**	220 [1945] **339**	402
38 [10]		24 [212] **502**	58 [511] **500**	89 [790] **499**	123 [1087] **498**	156 [1379] **485**	185 [1638] **443**	213 [1883] **433**	503
45 [12]		20 [177] **602**	54 [482] **601**	87 [767] **600**	120 [1060] **597**	164 [1451] **540**	193 [1711] **526**	228 [2021] **510**	603
53 [14] Max. Cont.		14 [127] **690**	50 [445] **689**	84 [741] **688**	124 [1098] **658**	155 [1369] **644**	185 [1640] **631**	217 [1918] **613**	704
61 [16]									804
64 [17] Max. Inter.									904

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

Rotor Width	Theoretical Torque - Nm [lb-in]							
11.7 [.462] mm [in]	21 [183]	41 [366]	83 [732]	124 [1099]	166 [1465]	207 [1831]	248 [2197]	290 [2564]

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

090

89 cm³ [5.4 in³] / rev

Flow - lpm [gpm]	Pressure - bar [psi] 17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	207 [3000] Max. Cont.	242 [3500] Max. Inter.	Theoretical rpm
	Torque - Nm [lb-in], **Speed rpm**						**Intermittent Ratings -** 10% of Operation		
2 [0.5]	12 [106] **21**	26 [231] **19**	69 [609] **17**	100 [889] **15**	142 [1259] **13**	174 [1537] **10**	206 [1826] **7**	232 [2049] **5**	22
4 [1]		30 [264] **41**	68 [605] **38**	107 [947] **34**	146 [1296] **30**	180 [1596] **27**	212 [1875] **26**	242 [2142] **23**	43
8 [2]		33 [291] **84**	71 [629] **79**	108 [958] **73**	149 [1323] **67**	183 [1620] **66**	221 [1956] **60**	251 [2223] **59**	86
15 [4]			72 [636] **167**	113 [1003] **158**	153 [1351] **149**	188 [1664] **143**	225 [1990] **141**	260 [2300] **135**	172
23 [6]			72 [633] **252**	112 [995] **243**	151 [1340] **233**	187 [1654] **227**	226 [1996] **222**	260 [2304] **218**	257
30 [8]			68 [598] **339**	109 [960] **331**	151 [1340] **317**	188 [1660] **309**	227 [2012] **301**	263 [2326] **300**	343
38 [10]				108 [959] **416**	150 [1328] **403**	188 [1667] **391**	229 [2024] **381**	270 [2393] **370**	428
45 [12]				109 [961] **505**	153 [1356] **490**	195 [1728] **475**	232 [2049] **462**	271 [2398] **448**	514
53 [14]				145 [1287] **590**	190 [1678] **578**	213 [1886] **558**	241 [2135] **544**	282 [2495] **530**	599
61 [16] Max. Cont.				134 [1190] **677**	187 [1654] **660**	192 [1701] **644**	227 [2007] **629**	269 [2384] **610**	685
68 [18]					136 [1201] **748**	189 [1675] **729**	240 [2122] **719**		770
76 [20] Max. Inter.					136 [1205] **835**	174 [1536] **819**	216 [1916] **806**		856

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

Rotor Width	Theoretical Torque - Nm [lb-in]							
13.7 [.541] mm [in]	24 [215]	49 [430]	97 [860]	146 [1290]	194 [1720]	243 [2150]	291 [2580]	340 [3010]

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

110

111 cm³ [6.8 in³] / rev

Pressure - bar [psi]

17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	207 [3000] Max. Cont.	242 [3500] Max. Inter.

Torque - Nm [lb-in], **Speed rpm**

Intermittent Ratings - 10% of Operation

Flow - lpm [gpm]									Theoretical rpm
	2 [0.5]	12 [106] **16**	39 [347] **16**	88 [777] **14**	135 [1199] **11**	182 [1609] **9**	223 [1977] **8**	273 [2420] **6**	304 [2690] **5**	17
	4 [1]	16 [142] **33**	42 [374] **33**	97 [857] **31**	146 [1290] **27**	199 [1763] **21**	246 [2179] **19**	293 [2592] **18**	329 [2916] **16**	34
	8 [2]		42 [372] **67**	98 [866] **64**	148 [1313] **59**	201 [1782] **49**	249 [2204] **46**	297 [2629] **44**	345 [3050] **43**	68
	15 [4]			94 [835] **134**	149 [1320] **126**	201 [1777] **117**	251 [2223] **110**	302 [2674] **104**	348 [3083] **104**	136
	23 [6]			93 [819] **202**	148 [1312] **196**	201 [1775] **186**	250 [2215] **177**	302 [2671] **167**	348 [3078] **163**	204
	30 [8]			89 [785] **269**	145 [1287] **267**	199 [1760] **258**	249 [2204] **247**	299 [2648] **267**	352 [3114] **229**	272
	38 [10]			83 [738] **339**	139 [1232] **336**	194 [1718] **327**	244 [2163] **315**	296 [2617] **304**	349 [3086] **292**	340
	45 [12]			82 [723] **407**	145 [1281] **406**	209 [1853] **397**	291 [2578] **386**	315 [2786] **368**	343 [3031] **360**	408
	53 [14]			74 [654] **475**	129 [1143] **473**	183 [1621] **466**	238 [2103] **451**	287 [2539] **441**	349 [3085] **426**	476
	61 [16]				143 [1261] **542**	199 [1763] **536**	251 [2224] **523**	301 [2666] **510**	363 [3213] **492**	544
	68 [18]				120 [1059] **609**	179 [1586] **603**	233 [2058] **593**	284 [2510] **580**	347 [3071] **561**	612
Max. Cont.	76 [20]				107 [944] **678**	160 [1419] **677**	217 [1918] **661**	268 [2374] **645**	327 [2896] **627**	680
	83 [22]				93 [824] **746**	157 [1393] **743**	206 [1823] **735**	257 [2271] **714**		748
	91 [24]				86 [762] **813**	139 [1234] **810**	197 [1744] **803**	250 [2214] **783**		816
Max. Inter.	95 [25]				77 [678] **847**	132 [1171] **844**	191 [1694] **835**	243 [2154] **828**		850

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

Rotor Width

17.3 [.681] mm [in]

Theoretical Torque - Nm [lb-in]

31 [271]	61 [541]	122 [1083]	184 [1624]	245 [2166]	306 [2707]	367 [3248]	428 [3790]

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

125

127 cm³ [7.7 in³] / rev

Pressure - bar [psi]

17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	207 [3000] Max. Cont.	242 [3500] Max. Inter.

Torque - Nm [lb-in], **Speed rpm**

Intermittent Ratings - 10% of Operation

Flow - lpm [gpm]									Theoretical rpm
	2 [0.5]	14 [127] **14**	44 [394] **14**	109 [961] **13**	159 [1408] **13**	217 [1922] **12**	267 [2364] **10**	313 [2766] **9**	355 [3146] **7**	15
	4 [1]	16 [138] **29**	45 [401] **29**	108 [952] **29**	167 [1475] **27**	226 [2004] **25**	278 [2459] **23**	332 [2936] **21**	367 [3245] **19**	30
	8 [2]		49 [432] **59**	108 [953] **59**	165 [1462] **57**	231 [2046] **54**	286 [2528] **48**	332 [2941] **48**	387 [3421] **45**	60
	15 [4]		49 [430] **119**	107 [949] **119**	167 [1479] **118**	229 [2024] **113**	284 [2513] **108**	342 [3023] **102**	392 [3467] **98**	120
	23 [6]			102 [902] **179**	166 [1473] **177**	223 [1973] **173**	279 [2473] **169**	337 [2985] **163**	393 [3477] **157**	180
	30 [8]			100 [888] **239**	160 [1420] **239**	222 [1968] **235**	287 [2541] **235**	337 [2987] **221**	391 [3459] **214**	240
	38 [10]			95 [841] **299**	154 [1359] **298**	217 [1919] **298**	273 [2413] **292**	332 [2940] **281**	387 [3428] **273**	300
	45 [12]			83 [738] **359**	147 [1304] **358**	207 [1831] **357**	267 [2361] **350**	329 [2914] **342**	406 [3590] **308**	360
	53 [14]			82 [727] **419**	146 [1293] **418**	204 [1801] **417**	268 [2375] **413**	332 [2935] **402**	419 [3704] **340**	420
	61 [16]			69 [608] **473**	168 [1484] **463**	198 [1756] **440**	258 [2287] **415**	327 [2895] **384**	386 [3419] **341**	480
	68 [18]				193 [1704] **517**	214 [1894] **498**	278 [2460] **472**	360 [3188] **438**	386 [3412] **384**	540
Max. Cont.	76 [20]				205 [1815] **577**	245 [2164] **561**	290 [2567] **537**	344 [3040] **505**	408 [3606] **453**	600
	83 [22]				151 [1336] **640**	201 [1781] **623**	260 [2298] **597**	320 [2832] **563**		660
	91 [24]				85 [751] **705**	151 [1334] **686**	218 [1930] **662**	284 [2516] **621**		720
Max. Inter.	95 [25]				79 [697] **736**	139 [1227] **723**	209 [1853] **694**	270 [2387] **669**		750

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

Rotor Width

19.7 [.776] mm [in]

Theoretical Torque - Nm [lb-in]

35 [307]	69 [613]	139 [1226]	208 [1839]	277 [2452]	346 [3065]	416 [3678]	485 [4291]

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

160

164 cm³ [10.0 in³] / rev

Pressure - bar [psi] | Max. Cont. | Max. Inter.

Torque - Nm [lb-in], **Speed rpm**

Intermittent Ratings - 10% of Operation

Flow - lpm [gpm]	17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	207 [3000]	242 [3500]	Theoretical rpm
2 [0.5]	24 [216] **11**	61 [538] **11**	143 [1267] **10**	213 [1881] **9**	287 [2536] **8**	351 [3106] **7**	411 [3640] **5**	470 [4159] **4**	12
4 [1]	28 [244] **23**	67 [596] **22**	145 [1287] **21**	215 [1899] **18**	291 [2578] **16**	355 [3145] **14**	425 [3758] **13**	493 [4366] **11**	24
8 [2]		66 [588] **46**	148 [1306] **44**	224 [1983] **39**	301 [2666] **34**	366 [3241] **32**	441 [3904] **30**	508 [4493] **28**	47
15 [4]		66 [584] **92**	146 [1291] **91**	226 [2002] **87**	313 [2769] **80**	375 [3318] **71**	451 [3990] **67**	516 [4569] **66**	93
23 [6]		62 [551] **137**	146 [1295] **136**	224 [1986] **134**	307 [2718] **125**	379 [3358] **119**	449 [3975] **108**	515 [4553] **106**	139
30 [8]			142 [1258] **184**	221 [1954] **182**	299 [2644] **172**	376 [3329] **161**	447 [3952] **152**	520 [4603] **146**	185
38 [10]			132 [1169] **230**	216 [1909] **229**	289 [2558] **222**	371 [3282] **211**	448 [3961] **195**	520 [4598] **190**	231
45 [12]			129 [1144] **277**	208 [1842] **275**	284 [2510] **270**	357 [3161] **261**	436 [3862] **239**	512 [4529] **228**	278
53 [14]			117 [1040] **323**	202 [1788] **320**	275 [2438] **316**	353 [3124] **305**	427 [3781] **291**	509 [4508] **279**	324
61 [16]			103 [913] **369**	187 [1659] **367**	275 [2431] **364**	338 [2994] **356**	418 [3698] **341**	496 [4392] **325**	370
68 [18]			91 [803] **415**	175 [1553] **413**	257 [2278] **4110**	325 [2874] **403**	405 [3587] **389**	480 [4246] **376**	416
Max. Cont. 76 [20]				169 [1499] **461**	246 [2176] **459**	328 [2906] **447**	397 [3514] **438**	477 [4223] **422**	462
83 [22]				147 [1297] **507**	232 [2049] **504**	315 [2792] **498**	385 [3411] **487**		509
91 [24]				131 [1157] **553**	218 [1928] **550**	300 [2655] **546**	378 [3344] **531**		555
Max. Inter. 95 [25]				121 [1073] **577**	208 [1844] **573**	291 [2577] **571**	365 [3229] **557**		578

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

Rotor Width	Theoretical Torque - Nm [lb-in]							
25.4 [1.000]	45 [398]	90 [796]	180 [1592]	270 [2389]	360 [3185]	450 [3981]	540 [4777]	630 [5573]

mm [in]

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

200

205 cm³ [12.5 in³] / rev

Pressure - bar [psi] | Max. Cont. | Max. Inter.

Torque - Nm [lb-in], **Speed rpm**

Intermittent Ratings - 10% of Operation

Flow - lpm [gpm]	17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	207 [3000]	242 [3500]	Theoretical rpm
2 [0.5]	35 [314] **9**	83 [734] **9**	179 [1581] **8**	267 [2365] **7**	353 [3121] **6**	443 [3921] **5**	505 [4469] **4**	579 [5120] **3**	10
4 [1]	37 [325] **18**	81 [721] **18**	186 [1642] **17**	287 [2536] **14**	301 [2665] **13**	452 [4004] **11**	540 [4777] **9**	611 [5406] **8**	19
8 [2]	39 [349] **36**	89 [790] **36**	199 [1759] **35**	295 [2610] **31**	386 [3412] **27**	473 [4185] **24**	554 [4904] **21**	643 [5687] **20**	37
15 [4]	38 [338] **73**	87 [766] **73**	191 [1689] **72**	292 [2586] **68**	386 [3417] **61**	480 [4252] **53**	574 [5077] **49**	661 [5849] **46**	74
23 [6]		84 [742] **110**	185 [1635] **109**	287 [2542] **106**	382 [3380] **98**	480 [4247] **89**	570 [5046] **81**	657 [5817] **74**	111
30 [8]			176 [1556] **147**	279 [2468] **144**	376 [3327] **136**	479 [4243] **123**	571 [5051] **112**	658 [5827] **104**	148
38 [10]			166 [1471] **184**	268 [2374] **182**	368 [3256] **173**	467 [4131] **162**	556 [4923] **151**	651 [5761] **141**	185
45 [12]			154 [1361] **221**	257 [2275] **219**	360 [3185] **214**	460 [4069] **200**	558 [4939] **187**	650 [5751] **176**	222
53 [14]			147 [1304] **258**	245 [2165] **256**	355 [3141] **250**	441 [3906] **238**	539 [4773] **224**	640 [5666] **213**	259
61 [16]			123 [1089] **295**	235 [2083] **290**	333 [2949] **286**	429 [3797] **277**	523 [4628] **264**	624 [5519] **242**	296
68 [18]			112 [993] **331**	220 [1943] **327**	302 [2669] **323**	414 [3665] **319**	527 [4659] **303**	616 [5451] **289**	333
Max. Cont. 76 [20]				197 [1745] **369**	310 [2740] **365**	395 [3499] **360**	492 [4353] **343**	596 [5273] **331**	370
83 [22]				172 [1525] **405**	282 [2496] **401**	386 [3420] **395**	480 [4252] **382**		407
91 [24]				157 [1390] **442**	265 [2341] **441**	369 [3269] **438**	453 [4005] **425**		444
Max. Inter. 95 [25]				139 [1229] **460**	252 [2234] **458**	349 [3087] **456**	447 [3955] **444**		462

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

Rotor Width	Theoretical Torque - Nm [lb-in]							
31.8 [1.251]	56 [498]	112 [995]	225 [1990]	337 [2986]	450 [3981]	562 [4976]	675 [5971]	787 [6967]

mm [in]

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

250

254 cm³ [15.5 in³] / rev

Pressure - bar [psi]

17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	207 [3000] Max. Cont.	242 [3500] Max. Inter.

Torque - Nm [lb-in], **Speed rpm**

Intermittent Ratings - 10% of Operation

Flow - lpm [gpm]									Theoretical rpm
	2 [0.5]	43 [381] **7**	104 [924] **6**	221 [1955] **6**	339 [3001] **5**	449 [3974] **3**	551 [4872] **1**			8
	4 [1]	50 [439] **14**	115 [1014] **14**	240 [2128] **13**	361 [3196] **11**	466 [4128] **9**	574 [5080] **7**	668 [5907] **4**		15
	8 [2]	51 [455] **29**	115 [1014] **29**	245 [2167] **28**	369 [3262] **26**	479 [4236] **22**	604 [5342] **17**	712 [6303] **13**	800 [7082] **9**	30
	15 [4]	48 [428] **59**	105 [930] **58**	242 [2145] **57**	371 [3286] **56**	493 [4363] **51**	619 [5480] **41**	741 [6555] **33**	847 [7496] **25**	60
	23 [6]	42 [368] **89**	110 [969] **88**	234 [2069] **88**	367 [3252] **87**	487 [4313] **82**	626 [5542] **69**	747 [6611] **58**	847 [7492] **48**	90
	30 [8]		92 [818] **119**	223 [1978] **118**	357 [3159] **117**	490 [4332] **115**	622 [5508] **101**	744 [6587] **87**	846 [7490] **76**	120
	38 [10]		80 [712] **149**	209 [1849] **148**	342 [3025] **147**	472 [4176] **141**	605 [5353] **129**	717 [6345] **114**	844 [7472] **104**	150
	45 [12]			199 [1757] **178**	329 [2915] **176**	455 [4022] **174**	581 [5142] **165**	703 [6225] **147**	833 [7375] **127**	179
	53 [14]			182 [1640] **208**	310 [2743] **206**	443 [3919] **205**	567 [5017] **197**	711 [6296] **176**	817 [7227] **158**	209
	61 [16]			164 [1456] **238**	294 [2603] **235**	438 [3873] **233**	552 [4886] **227**	674 [5960] **205**	804 [7114] **191**	239
	68 [18]			145 [1285] **268**	270 [2393] **266**	402 [3560] **263**	530 [4694] **259**	661 [5846] **245**	784 [6939] **222**	269
Max. Cont.	76 [20]			122 [1083] **298**	255 [2256] **295**	380 [3359] **292**	511 [4519] **289**	627 [5547] **277**	757 [6697] **252**	299
	83 [22]				221 [1955] **326**	353 [3124] **323**	484 [4279] **319**	607 [5368] **307**		328
	91 [24]				201 [1775] **357**	336 [2973] **355**	461 [4082] **353**	599 [5297] **342**		358
Max. Inter.	95 [25]				184 [1627] **371**	313 [2768] **368**	442 [3915] **365**	575 [5088] **360**		373

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

Rotor Width	Theoretical Torque - Nm [lb-in]							
39.4 [1.551] mm [in]	70 [617]	139 [1234]	279 [2468]	418 [3702]	558 [4936]	697 [6170]	837 [7404]	976 [8639]

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

300

293 cm³ [17.9 in³] / rev

Pressure - bar [psi]

17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	207 [3000] Max. Cont.	242 [3500] Max. Inter.

Torque - Nm [lb-in], **Speed rpm**

Intermittent Ratings - 10% of Operation

Flow - lpm [gpm]									Theoretical rpm
	2 [0.5]	61 [543] **6**	118 [1044] **5**	261 [2311] **5**	388 [3433] **4**					7
	4 [1]	59 [521] **12**	140 [1237] **12**	271 [2397] **11**	414 [3666] **11**	546 [4833] **8**	681 [6025] **5**			13
	8 [2]	61 [541] **25**	128 [1134] **25**	281 [2490] **24**	425 [3761] **23**	562 [4970] **19**	693 [6128] **14**	820 [7259] **10**	915 [8095] **4**	26
	15 [4]	52 [461] **51**	128 [1130] **51**	275 [2436] **50**	427 [3782] **50**	578 [5119] **44**	715 [6327] **32**	827 [7317] **25**	956 [8457] **19**	52
	23 [6]		115 [1017] **77**	266 [2351] **76**	406 [3592] **75**	557 [4931] **70**	706 [6250] **55**	840 [7435] **43**	945 [8361] **37**	78
	30 [8]		107 [951] **103**	251 [2223] **102**	407 [3598] **101**	538 [4759] **96**	691 [6117] **82**	832 [7359] **66**	948 [8393] **52**	104
	38 [10]		88 [779] **129**	229 [2026] **127**	393 [3475] **126**	528 [4672] **122**	672 [5950] **109**	826 [7307] **90**	959 [8487] **74**	130
	45 [12]			217 [1923] **154**	368 [3256] **153**	504 [4457] **150**	663 [5864] **133**	800 [7076] **112**	931 [8239] **97**	155
	53 [14]			201 [1782] **180**	347 [3067] **178**	510 [4513] **173**	646 [5713] **161**	798 [7060] **140**	921 [8149] **114**	181
	61 [16]			168 [1491] **206**	324 [2865] **204**	472 [4180] **201**	621 [5492] **188**	764 [6765] **171**	917 [8112] **142**	207
	68 [18]			143 [1266] **232**	298 [2638] **230**	427 [3783] **227**	591 [5234] **220**	745 [6591] **198**	878 [7773] **176**	233
Max. Cont.	76 [20]			114 [1013] **258**	283 [2501] **256**	443 [3916] **254**	597 [5284] **247**	717 [6344] **227**	849 [7512] **206**	259
	83 [22]				246 [2179] **282**	397 [3512] **280**	559 [4943] **274**	681 [6023] **257**		284
	91 [24]				181 [1601] **309**	357 [3159] **306**	502 [4442] **304**	642 [5684] **294**		310
Max. Inter.	95 [25]				166 [1466] **321**	323 [2858] **319**	491 [4347] **318**	630 [5577] **300**		323

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

Rotor Width	Theoretical Torque - Nm [lb-in]							
45.5 [1.790] mm [in]	81 [713]	161 [1425]	322 [2850]	483 [4275]	644 [5701]	805 [7126]	966 [8551]	1127 [9976]

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

400

409 cm³ [24.9 in³] / rev

Pressure - bar [psi]					Max. Cont.	Peak
17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	207 [3000]

Torque - Nm [lb-in], **Speed rpm** — **Intermittent Ratings -** 10% of Operation

Flow - lpm [gpm]								Theoretical rpm
	2 [0.5]	85 [757] **4**	193 [1710] **4**	367 [3248] **3**	534 [4721] **2**			5
	4 [1]	88 [776] **9**	185 [1640] **8**	383 [3386] **8**	580 [5129] **6**	745 [6590] **4**	899 [7954] **1**	10
	8 [2]	86 [762] **18**	196 [1734] **18**	394 [3487] **17**	586 [5184] **15**	764 [6763] **11**	927 [8204] **5**	19
	15 [4]	85 [749] **37**	188 [1661] **36**	404 [3571] **35**	602 [5325] **32**	796 [7047] **24**	962 [8517] **18**	1108 [9804] **9**	38
	23 [6]	71 [629] **55**	180 [1593] **55**	387 [3428] **54**	596 [5274] **49**	787 [6969] **39**	978 [8653] **28**	1141 [10094] **20**	56
	30 [8]		165 [1462] **74**	373 [3299] **73**	595 [5264] **69**	792 [7010] **58**	966 [8552] **44**	1149 [10167] **31**	75
	38 [10]		143 [1269] **92**	356 [3150] **90**	581 [5144] **88**	782 [6923] **79**	974 [8617] **62**	1156 [10231] **45**	93
	45 [12]		122 [1076] **111**	333 [2950] **109**	545 [4823] **107**	749 [6624] **98**	957 [8470] **83**	1143 [10116] **61**	112
	53 [14]		95 [842] **129**	313 [2774] **128**	521 [4607] **126**	717 [6344] **117**	931 [8235] **103**	1131 [10007] **78**	130
	61 [16]			282 [2493] **147**	496 [4385] **145**	685 [6063] **141**	919 [8131] **121**	1100 [9733] **100**	149
	68 [18]			244 [2156] **166**	453 [4009] **165**	681 [6023] **158**	871 [7708] **142**	1071 [9478] **121**	167
Max. Cont.	76 [20]			197 [1741] **185**	420 [3713] **183**	650 [5756] **179**	838 [7417] **166**	1051 [9302] **145**	186
	83 [22]			164 [1448] **203**	378 [3344] **201**	588 [5200] **198**	810 [7171] **186**		205
	91 [24]				333 [2947] **222**	559 [4945] **220**	750 [6640] **211**		223
Max. Inter.	95 [25]				303 [2682] **231**	539 [4773] **228**	764 [6760] **221**		232

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

Rotor Width

63.5 [2.500] mm [in]

Theoretical Torque - Nm [lb-in]

112 [991]	224 [1982]	448 [3965]	672 [5947]	896 [7930]	1120 [9912]	1344 [11895]

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 flow simultaneously is not recommended.

HB/HK All Series Housing

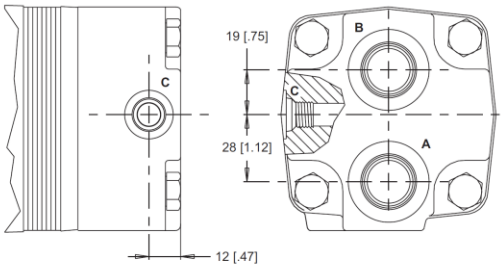
- The dimensions shown are without paint. Paint thickness can be up to 0.13 [.005].

END PORTED - ALIGNED

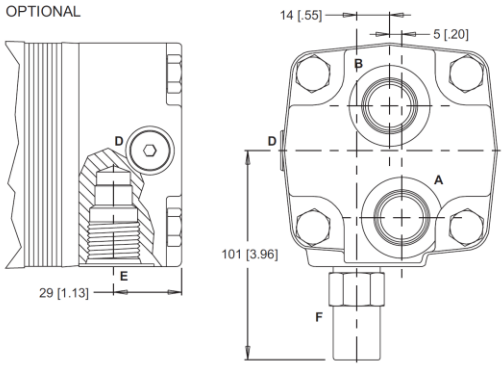
1 Main Ports **A, B**: 7/8-14 UNF Drain Port **C**: 7/16-20 UNF

2 Main Ports **A, B**: G 1/2 Drain Port **C**: G 1/4

STANDARD



OPTIONAL



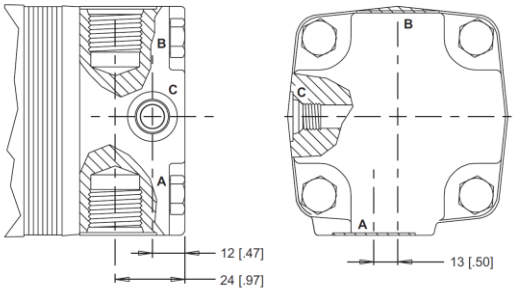
D: Internal Drain **E**: 10 Series/2-Way Valve Cavity 7/8-14 UNF **F**: Valve Cartridge Installed

SIDE PORTED - 180° OPPOSED

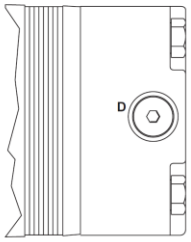
6 Main Ports **A, B**: 1 1/16-12 UN
Drain Port **C**: 7/16-20 UNF

7 Main Ports **A, B**: G 1/2
Drain Port **C**: G 1/4

STANDARD



OPTIONAL

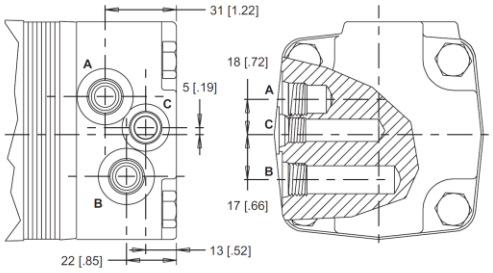


D: Internal Drain

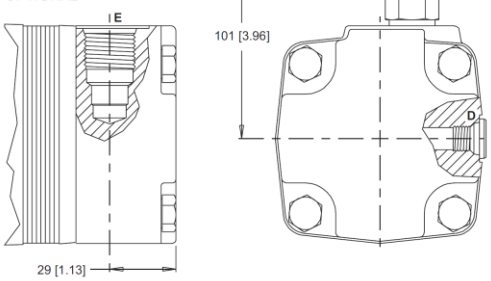
SIDE PORTED - OFFSET

5 Main Ports **A, B**: 9/16-18 UNF
Drain Port **C**: 7/16-20 UNF

STANDARD



OPTIONAL



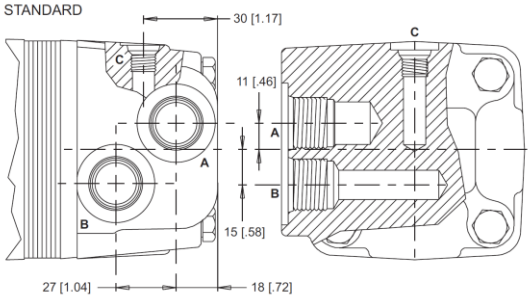
D: Internal Drain **E**: 10 Series/2-Way Valve Cavity 7/8-14 UNF **F**: Valve Cartridge Installed

SIDE PORTED - OFFSET

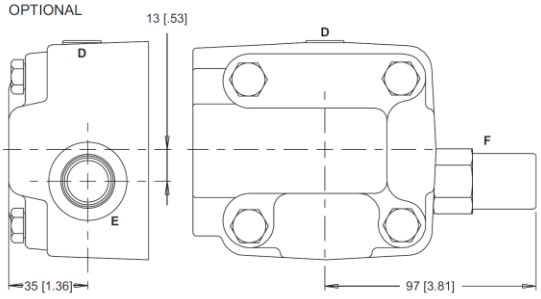
1 Main Ports **A, B**: 7/8-14 UNF
Drain Port **C**: 7/16-20 UNF

2 Main Ports **A, B**: G 1/2
Drain Port **C**: G 1/4

STANDARD



OPTIONAL

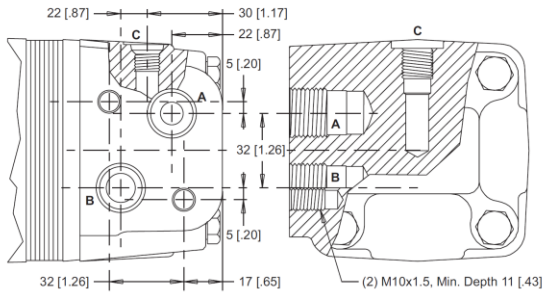


D: Internal Drain **E**: 10 Series/2-Way Valve Cavity 7/8-14 UNF **F**: Valve Cartridge Installed

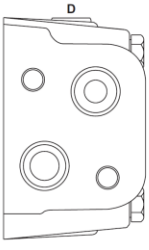
SIDE PORTED - OFFSET MANIFOLD

3 Main Ports **A, B**: G 1/2
Drain Port **C**: G 1/4

STANDARD



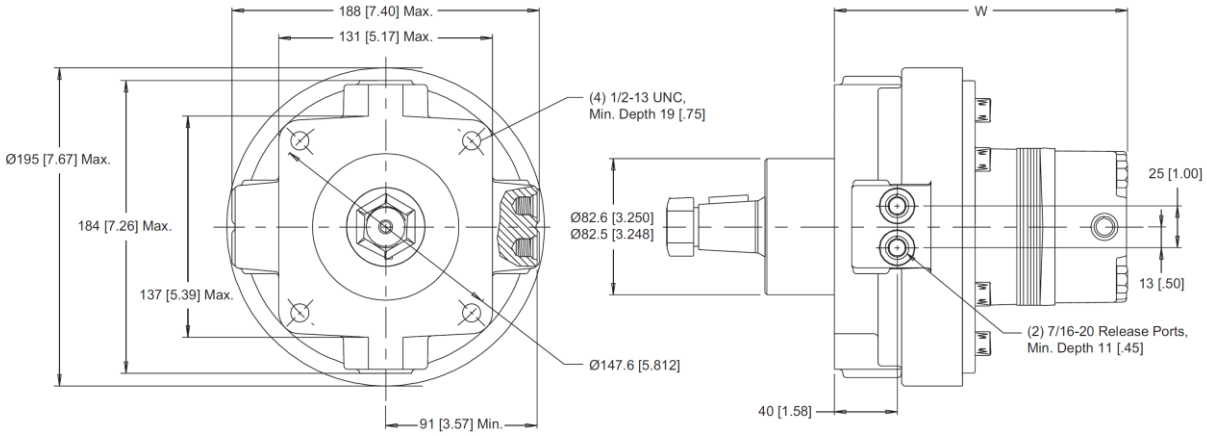
OPTIONAL



D: Internal Drain

HB 310 Series Housing

4-HOLE, MOTOR BRAKE W2 End Ports W8 Side Ports

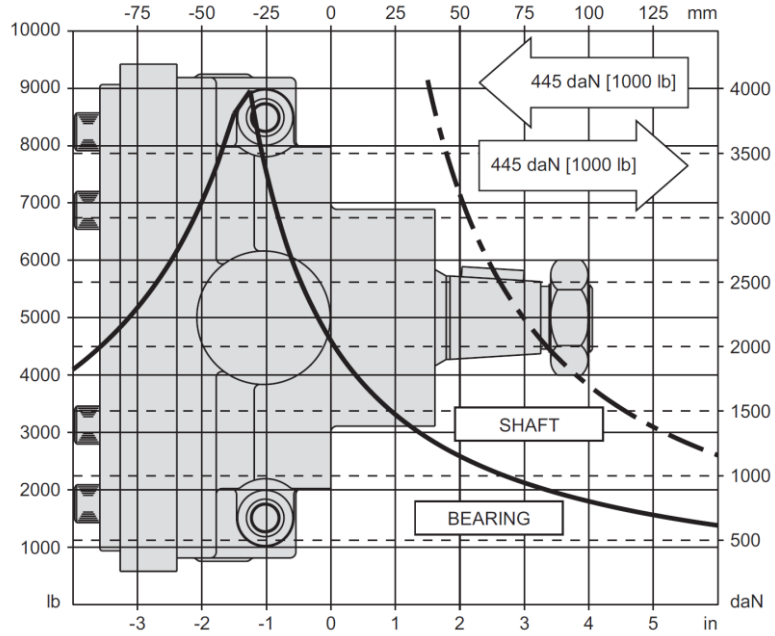


HB 310 Series Technical Information

Allowable Shaft Load / Bearing Curve Length & Weight Chart

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.

Motor Brake



Specifications

Rated brake torque …….904 Nm [8000 lb-in]

Initial release pressure…….....21 bar [300 psi]

Full release pressure……...31 bar [450 psi]

Maximum release pressure…….207 bar [3000 psi]

Release volume……..…13-16 cm3 [0.8 - 1.0 in3]

Length & Weight Chart

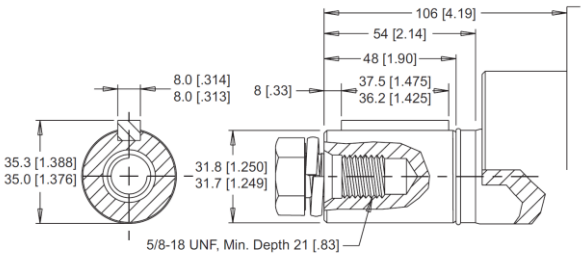
Dimensions WW are the overall motor lengths from the rear of the motor to the mounting flange sur- face and are referenced on detailed housing drawings

W	Endcovers	Endcovers	Weight
#	mm [in]	mm [in]	kg [lb]
050	163 [6.41]	181 [7.12]	19.1 [42.2]
080	167 [6.56]	185 [7.27]	19.4 [42.7]
090	169 [6.64]	187 [7.35]	19.5 [42.9]
110	172 [6.78]	190 [7.49]	19.7 [43.4]
125	175 [6.87]	193 [7.58]	19.8 [43.7]
160	180 [7.10]	198 [7.81]	20.1 [44.4]
200	187 [7.35]	205 [8.06]	20.5 [45.3]
250	194 [7.32]	212 [8.36]	20.9 [46.1]
300	200 [7.65]	218 [8.59]	21.3 [47.0]
400	218 [8.60]	236 [9.31]	22.3 [49.1]

- All RE series motor weights can vary ± 0.5 kg [1 lb] depending on model configurations such as housing, shaft, end cover, options etc.

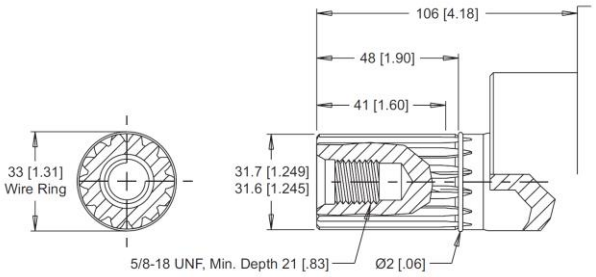
HB 310 Series Shaft

20 1-1/4" Straight



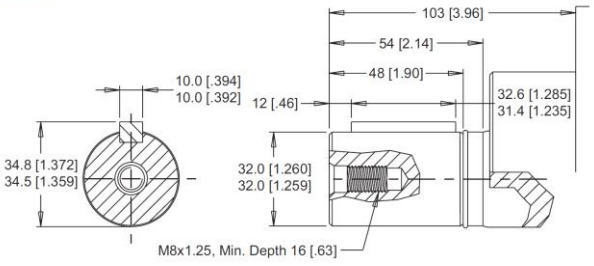
Max. Torque: 882 Nm [7804 lb-in]

23 14 Tooth Spline



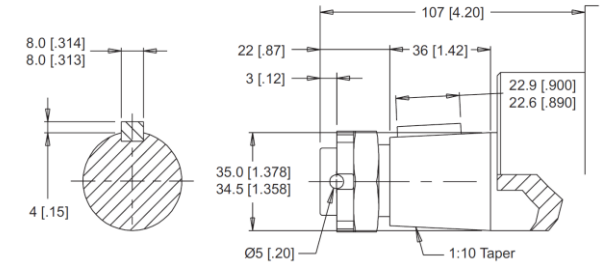
Max. Torque: 882 Nm [7804 lb-in]

21 32mm Straight



Max. Torque: 882 Nm [7804 lb-in]

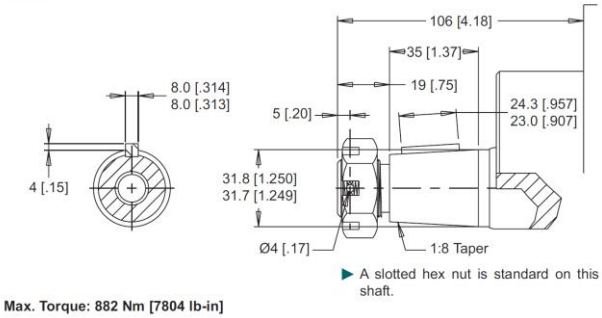
28 35mm Tapered



- A slotted hex nut is standard on this shaft.

Max. Torque: 882 Nm [7804 lb-in]

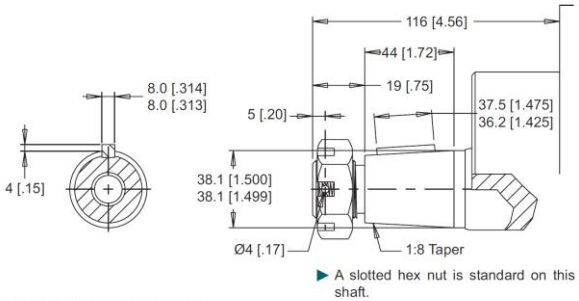
22 1-1/4" Tapered



▶ A slotted hex nut is standard on this shaft.

Max. Torque: 882 Nm [7804 lb-in]

31 1-1/2" Tapered



▶ A slotted hex nut is standard on this shaft.

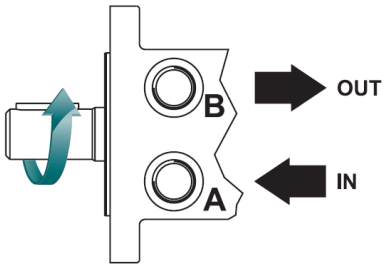
Max. Torque: 882 Nm [7804 lb-in]

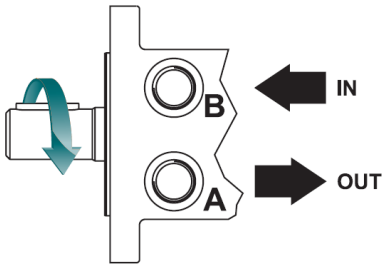
HB 310 Series Ordering Information

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
1 2 3a 3b 4 5 6 7 8

1. CHOOSE SERIES DESIGNATION

310 HB Series Motor/Brake





▶ The 310 series is bi-directional.

2. SELECT A DISPLACEMENT OPTION

050	52 cm^3/rev [3.2 in^3/rev]	**160**	164 cm^3/rev [10.0 in^3/rev]
080	76 cm^3/rev [4.6 in^3/rev]	**200**	205 cm^3/rev [12.5 in^3/rev]
090	89 cm^3/rev [5.4 in^3/rev]	**250**	254 cm^3/rev [15.5 in^3/rev]
110	111 cm^3/rev [6.8 in^3/rev]	**300**	293 cm^3/rev [17.9 in^3/rev]
125	127 cm^3/rev [7.7 in^3/rev]	**400**	409 cm^3/rev [24.9 in^3/rev]

3a. SELECT MOUNT TYPE

END MOUNTS

W2 4-Hole, Motor/ Brake

SIDE MOUNTS

W8 4-Hole, Motor/Brake

3b. SELECT PORT SIZE

END PORT OPTIONS

1	7/8-14 UNF Offset
2	G ½ Aligned

SIDE PORT OPTIONS

1	7/8-14 UNF, Aligned
2	G 1/2, Aligned
3	G ½, Offset Manifold
5	9/16-18 UNF Offset
6	1 1/16-12 UN, 180° Opposed
7	G 1/2, 180° Opposed

4. SELECT A SHAFT OPTION

20	1-1/4” Straight	**23**	14 Tooth Spline
21	32mm Straight	**28**	35mm Tapered
22	1-1/4” Tapered	**31**	1-1/2” Tapered

5. SELECT A PAINT OPTION

A	Black
B	Black, Unpainted Mounting Surface
Z	No Paint

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 side porta 1,2 & 5 and end ports 1 & 2.

7. SELECT AN ADD-ON OPTION

A	Standard
B	Lock Nut
C	Solid Hex Nut

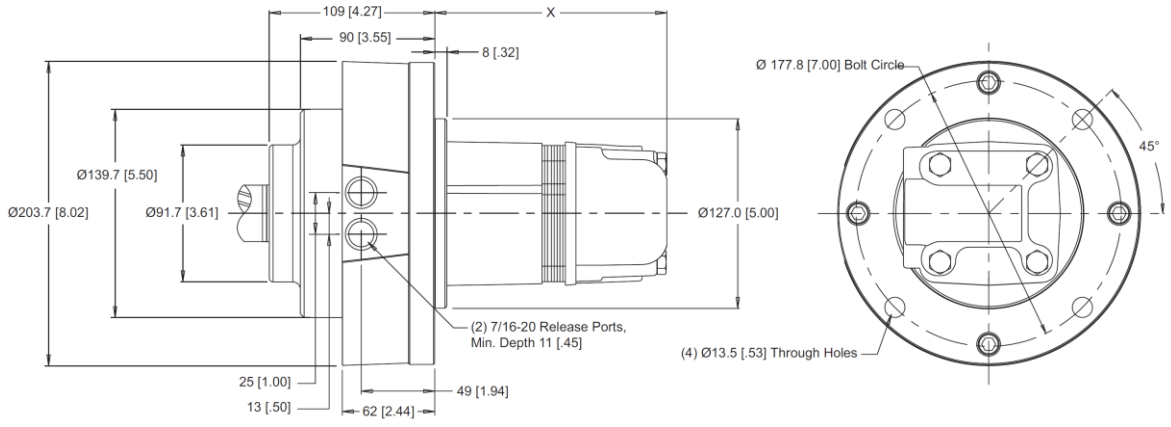
8. SELECT A MISCELLANEOUS OPTION

AA	None
AC	Freeturning Rotor

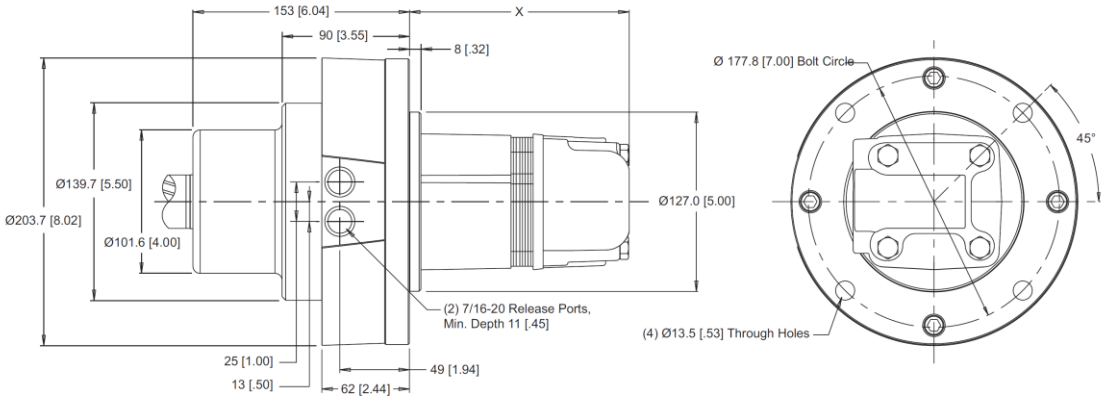
HK 315 Series Housing

- The dimensions shown are without paint. Paint thickness can be up to 0.13 [.005].

4-HOLE, MOTOR BRAKE **W2** End Ports **W8** Side Ports



4-HOLE, MOTOR BRAKE, TALL PILOT WB End Ports WC Side Ports

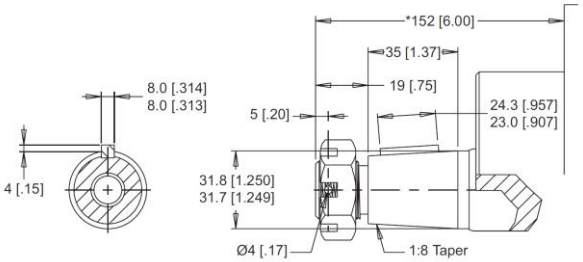


► Dimension X is charted on page 26. Porting options listed on pages 20-21.

HK 315 Series Shaft

* Dimension from end of shaft to mounting flange shown is for the W2 and W8. When using the WB or WC mount add 45 [1.77] from this dimension.

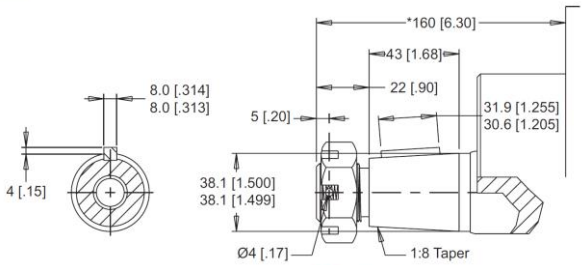
22 1-1/4" Tapered



► A slotted hex nut is standard on this shaft.

Max. Torque: 882 Nm [7804 lb-in]

31 1-1/2" Tapered



► A slotted hex nut is standard on this shaft.

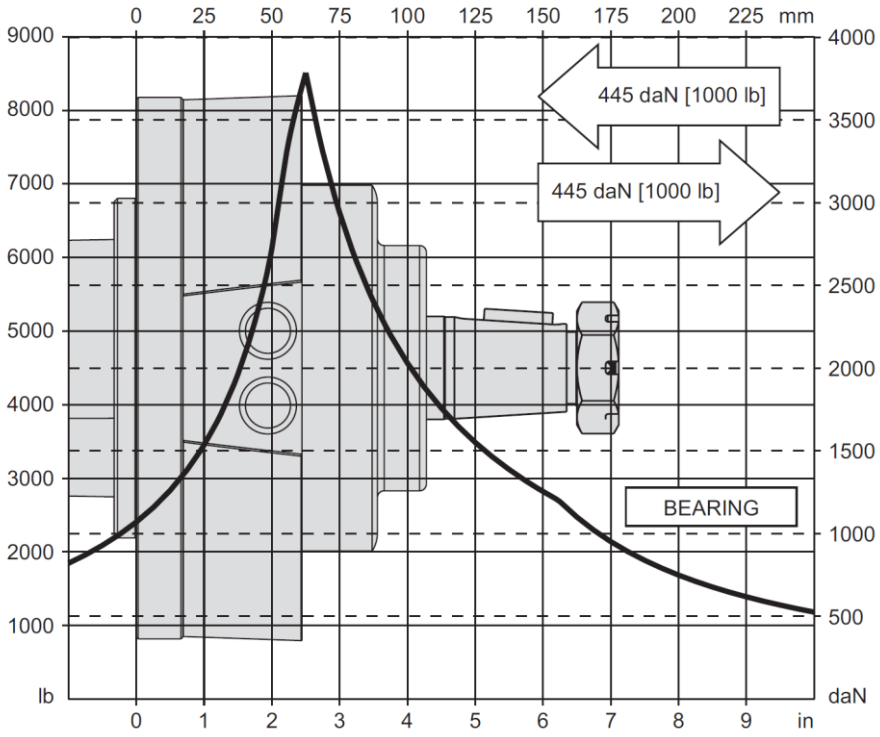
Max. Torque: 882 Nm [7804 lb-in]

HK 315 Series Technical Information

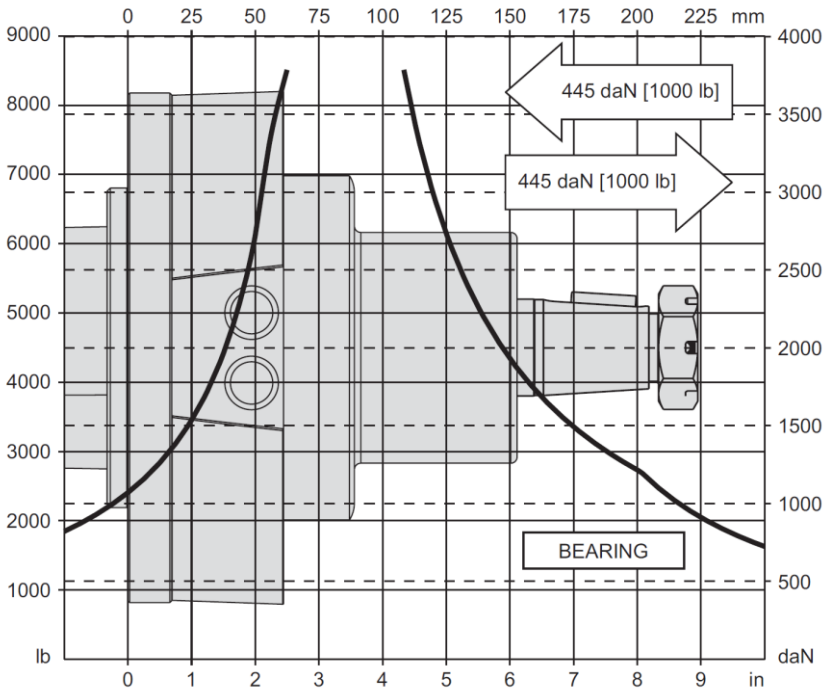
Allowable Shaft Load / Bearing Curve Length & Weight Chart

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.

Motor Brake (Short Pilot)



Motor Brake (Tall Pilot)



Specifications

Rated brake torque..... 1130 Nm [10000 lb-in]
Initial release pressure ..... 28 bar [400 psi]
Maximum release pressure ..... 207 bar [3000 psi]
Release volume..... 16 cm3 [1.0 in3]

LENGTH & WEIGHT CHART

Dimension X is the overall motor length from the rear of the motor to the mounting flange surface and are referenced on detailed housing drawings listed above.

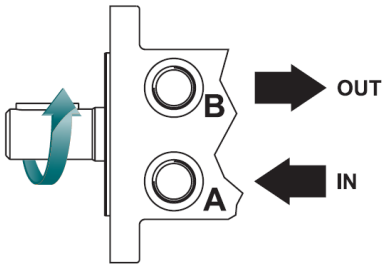
X	Endcovers on pg. 20	Endcovers on pg. 21	Weight
#	mm [in]	mm [in]	kg [lb]
050	83 [3.26]	101 [3.97]	21.9 [48.2]
080	86 [3.40]	104 [4.11]	22.1 [48.7]
090	88 [3.45]	106 [4.16]	22.2 [48.9]
110	91 [3.59]	109 [4.30]	22.5 [49.4]
125	94 [3.68]	112 [4.39]	22.6 [49.7]
160	99 [3.91]	117 [4.62]	22.9 [50.4]
200	106 [4.16]	124 [4.87]	23.3 [51.3]
250	113 [4.46]	131 [5.17]	23.7 [52.1]
300	119 [4.70]	137 [5.41]	24.1 [53.0]
400	137 [5.41]	155 [6.12]	25.0 [55.1]

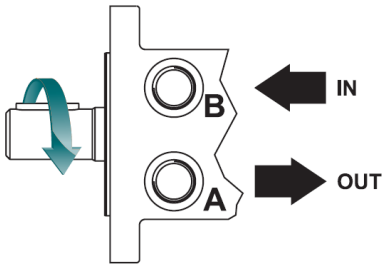
▶ 315 series motor/brake weights can vary ± 1 kg [2 lb] depending on model configurations such as housing, shaft, endcover, options etc. Add 1.4 kg [3 lb] to weight listed for the Tall Pilot mount housing.

HK 315 Series Ordering Information

1. CHOOSE SERIES DESIGNATION

315 HK Series Motor/Brake





▶ The 315 series is bi-directional.

2. SELECT A DISPLACEMENT OPTION

050	52 cm^3/rev [3.2 in^3/rev]	**160**	164 cm^3/rev [10.0 in^3/rev]
080	76 cm^3/rev [4.6 in^3/rev]	**200**	205 cm^3/rev [12.5 in^3/rev]
090	89 cm^3/rev [5.4 in^3/rev]	**250**	254 cm^3/rev [15.5 in^3/rev]
110	111 cm^3/rev [6.8 in^3/rev]	**300**	293 cm^3/rev [17.9 in^3/rev]
125	127 cm^3/rev [7.7 in^3/rev]	**400**	409 cm^3/rev [24.9 in^3/rev]

3a. SELECT MOUNT TYPE

END MOUNTS

W2	4-Hole, Motor/ Brake
W8	4-Hole, Motor/Brake (TP)

SIDE MOUNTS

W8	4-Hole, Motor/Brake
WC	4-Hole, Motor/Brake (TP)

3b. SELECT PORT SIZE

END PORT OPTIONS

1	7/8-14 UNF Offset
2	G ½ Aligned

SIDE PORT OPTIONS

1	7/8-14 UNF, Aligned
2	G 1/2, Aligned
3	G ½, Offset Manifold
5	9/16-18 UNF Offset
6	1 1/16-12 UN, 180° Opposed
7	G 1/2, 180° Opposed

4. SELECT A SHAFT OPTION

22	1-1/4" Tapered
31	1-1/2" Tapered

5. SELECT A PAINT OPTION

A	Black
B	Black, Unpainted Mounting Surface
Z	No Paint

6. SELECT A VALVE CAVITY/CARTRIDGE OPTION

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

► Valve cavity is only available on side porta 1,2 & 5 and end ports 1 & 2.

7. SELECT AN ADD-ON OPTION

A	Standard
B	Lock Nut
C	Solid Hex Nut

8. SELECT A MISCELLANEOUS OPTION

AA	None
AC	Freeturning Rotor

Chapter 4

Hydraulic motors/brakes - CE

Topics:

CE 410/411 Series Product Line Introduction

Overview

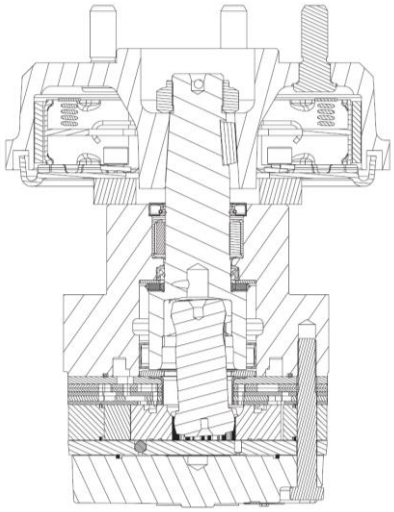
The combination of compact size, light weight and low speed efficiency make the CE motor the best wheel drive motor available. To reduce overall motor length and weight, all unnecessary material was removed from the housing and the valve was placed in the face of the rotor. The pressure- compensated balance plate allows the motor to maintain high volumetric efficiencies at startup and high mechanical efficiencies during running conditions. All of these features unite to make the CE Series motor 10-25% lighter and more compact than competitive designs, making it perfect for applications with strict weight and size requirements.

Features / Benefits

- Needle Roller Bearing is in optimum location to allow load to be placed as close to center line of bearing as possible.
- Three Bearing Options allow load carrying capability of motor to be matched to application.
- Valve-In-Rotor Design provides cost effective, efficient distribution of oil and reduces overall motor length.
- Pressure-Compensated Balance Plate improves volumetric efficiency at low flows and high pressure.

Series Descriptions

410/411 - Hydraulic Motor
With Integral Drum Brake



Typical Applications

Medium-duty wheel drives, grapple heads, feed rollers, broom drives and more

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
120	121 [7.4]	360	490	45 [12]	61 [16]	322 [2850]	356 [3150]	207 [3000]	224 [3250]	241 [3500]
160	162 [9.9]	370	470	61 [16]	76 [20]	424 [3750]	501 [4430]	207 [3000]	224 [3250]	241 [3500]
200	204 [12.4]	300	370	61 [16]	76 [20]	525 [4650]	593 [5250]	207 [3000]	224 [3250]	241 [3500]
230	232 [14.2]	260	320	61 [16]	76 [20]	559 [4950]	646 [5720]	207 [3000]	224 [3250]	241 [3500]
260	261 [15.9]	260	350	68 [18]	91 [24]	706 [6250]	760 [6730]	207 [3000]	224 [3250]	241 [3500]
300	300 [18.3]	250	320	76 [20]	95 [25]	802 [7100]	862 [7630]	207 [3000]	224 [3250]	241 [3500]
350	348 [21.2]	220	270	76 [20]	95 [25]	904 [8000]	1017 [9000]	207 [3000]	224 [3250]	241 [3500]
375	375 [22.8]	200	250	76 [20]	95 [25]	972 [8600]	1040 [9200]	207 [3000]	224 [3250]	241 [3500]
470	465 [28.3]	160	200	76 [20]	95 [25]	1040 [9200]	1153 [10200]	172 [2500]	189 [2750]	207 [3000]
540	536 [32.7]	140	170	76 [20]	95 [25]	1003 [8875]	1209 [10700]	138 [2000]	172 [2500]	207 [3000]
750	748 [45.6]	100	130	76 [20]	95 [25]	1082 [9575]	1237 [10950]	103 [1500]	121 [1750]	138 [2000]

- 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.

CE 410/411 Series Displacement Performance

► 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.

120

121 cm³ [7.4 in³] / rev

Flow - lpm [gpm]	Pressure - bar [psi]: 17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	207 [3000] Max. Cont.	241 [3500] Peak	Theoretical rpm
	Torque - Nm [lb-in], **Speed rpm**						**Intermittent Ratings -** 10% of Operation		
2 [0.5]	21 [184] **14**	47 [418] **13**	84 [745] **10**	114 [1008] **7**					16
4 [1]	26 [226] **26**	52 [459] **26**	109 [969] **23**	157 [1387] **21**	203 [1793] **18**	260 [2305] **13**	290 [2566] **10**	281 [2490] **7**	32
8 [2]		52 [456] **58**	110 [977] **56**	161 [1424] **51**	208 [1845] **47**	269 [2382] **33**	310 [2746] **29**	347 [3066] **25**	63
15 [4]		48 [422] **119**	110 [975] **112**	169 [1497] **103**	225 [1992] **95**	271 [2399] **91**	327 [2896] **83**	369 [3269] **82**	125
23 [6]		46 [409] **187**	106 [934] **182**	158 [1402] **177**	204 [1803] **173**	248 [2199] **168**	297 [2630] **160**	372 [3290] **143**	188
30 [8]			99 [876] **248**	157 [1389] **244**	207 [1829] **240**	253 [2241] **233**	323 [2857] **205**	371 [3282] **201**	250
38 [10]			96 [853] **306**	156 [1379] **298**	207 [1834] **293**	257 [2278] **286**	297 [2633] **279**	359 [3178] **269**	313
Max. Cont. 45 [12]			85 [749] **371**	151 [1337] **360**	206 [1823] **352**	256 [2267] **345**	305 [2695] **341**	344 [3042] **335**	375
53 [14]			77 [684] **437**	137 [1215] **428**	197 [1745] **418**	251 [2222] **409**	296 [2618] **404**		438
Max. Inter. 61 [16]			71 [633] **499**	135 [1191] **490**	194 [1717] **482**	244 [2163] **467**	304 [2687] **454**		500

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

Rotor Width 13.8 [.542] mm [in]

Theoretical Torque - Nm [lb-in]: 33 [295] | 67 [589] | 133 [1178] | 200 [1768] | 266 [2357] | 333 [2946] | 399 [3535] | 466 [4124]

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

160

162 cm³ [9.9 in³] / rev

Flow - lpm [gpm]	Pressure - bar [psi]: 17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	207 [3000] Max. Cont.	241 [3500] Peak	Theoretical rpm
	Torque - Nm [lb-in], **Speed rpm**						**Intermittent Ratings -** 10% of Operation		
2 [0.5]	32 [287] **11**	72 [634] **11**	152 [1341] **10**	215 [1906] **9**	282 [2493] **8**	326 [2888] **6**	366 [3238] **4**	412 [3643] **1**	12
4 [1]	36 [318] **22**	78 [690] **21**	145 [1287] **20**	225 [1991] **19**	290 [2567] **16**	346 [3060] **14**	366 [3236] **8**	416 [3680] **7**	24
8 [2]	33 [296] **45**	73 [649] **44**	145 [1287] **43**	227 [2010] **40**	292 [2586] **36**	357 [3156] **33**	413 [3654] **31**	464 [4108] **28**	47
15 [4]	44 [386] **92**	71 [630] **91**	146 [1296] **88**	226 [2000] **86**	299 [2646] **79**	364 [3226] **74**	426 [3768] **71**	485 [4289] **66**	94
23 [6]		70 [623] **133**	146 [1294] **131**	225 [1991] **128**	296 [2617] **122**	365 [3232] **117**	428 [3786] **115**	492 [4352] **111**	140
30 [8]		66 [583] **181**	141 [1251] **177**	216 [1916] **175**	286 [2533] **171**	350 [3102] **165**	414 [3663] **159**	476 [4210] **152**	187
38 [10]		61 [537] **224**	138 [1224] **223**	212 [1873] **219**	282 [2497] **213**	347 [3072] **211**	411 [3641] **204**	473 [4183] **196**	234
45 [12]		56 [495] **272**	130 [1150] **265**	207 [1829] **264**	279 [2465] **262**	344 [3046] **256**	407 [3603] **249**	470 [4157] **242**	280
53 [14]			123 [1088] **318**	196 [1737] **313**	269 [2384] **306**	332 [2939] **297**	400 [3540] **295**	464 [4111] **284**	327
Max. Cont. 61 [16]			114 [1010] **362**	187 [1659] **356**	263 [2327] **351**	329 [2910] **344**	395 [3499] **334**	458 [4053] **330**	374
68 [18]			102 [903] **410**	180 [1593] **407**	250 [2209] **401**	319 [2822] **385**	389 [3438] **382**		420
Max. Inter. 76 [20]			96 [846] **455**	174 [1536] **448**	248 [2193] **438**	316 [2798] **430**	379 [3353] **423**		467

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

Rotor Width 13.8 [.542] mm [in]

Theoretical Torque - Nm [lb-in]: 45 [394] | 89 [788] | 178 [1576] | 267 [2365] | 356 [3153] | 445 [3941] | 534 [4729] | 623 [5518]

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

200

204 cm³ [12.4 in³] / rev

Pressure - bar [psi]

17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	207 [3000] Max. Cont.	241 [3500] Peak

Torque - Nm [lb-in], **Speed rpm**

Intermittent Ratings - 10% of Operation

Flow - lpm [gpm]	Torque - Nm [lb-in], Speed rpm							Theoretical rpm
2 [0.5]	40 [358] **8**	92 [817] **8**	180 [1596] **8**	269 [2378] **7**	348 [3083] **6**			10
4 [1]	46 [409] **17**	89 [787] **15**	180 [1597] **15**	276 [2440] **12**	359 [3177] **11**	427 [3782] **9**	489 [4328] **8**	19
8 [2]	45 [395] **36**	91 [807] **34**	190 [1684] **32**	284 [2509] **31**	369 [3268] **28**	451 [3989] **25**	523 [4630] **23**	586 [5189] **19**	38
15 [4]	40 [358] **73**	92 [817] **72**	188 [1662] **69**	284 [2492] **67**	373 [3303] **63**	453 [4006] **60**	530 [4693] **56**	607 [5371] **51**	75
23 [6]		86 [760] **111**	181 [1600] **107**	278 [2457] **104**	365 [3228] **100**	451 [3989] **95**	524 [4636] **90**	605 [5353] **85**	112
30 [8]		75 [663] **148**	174 [1539] **145**	267 [2363] **142**	359 [3176] **137**	441 [3905] **132**	518 [4584] **125**	597 [5286] **120**	150
38 [10]		62 [549] **185**	162 [1430] **184**	257 [2272] **181**	347 [3072] **177**	429 [3798] **171**	507 [4488] **164**	587 [5198] **157**	187
45 [12]			146 [1290] **222**	244 [2159] **217**	339 [2996] **213**	429 [3798] **204**	506 [4476] **198**	583 [5161] **193**	224
53 [14]			129 [1145] **259**	227 [2005] **256**	328 [2905] **250**	410 [3628] **244**	492 [4354] **236**	571 [5049] **226**	261
Max. Cont. 61 [16]			112 [994] **298**	208 [1842] **297**	316 [2795] **284**	399 [3534] **281**	484 [4285] **273**	562 [4971] **266**	299
68 [18]			90 [799] **334**	207 [1833] **330**	304 [2689] **327**	395 [3493] **320**	481 [4260] **316**		336
Max. Inter. 76 [20]			75 [665] **366**	178 [1576] **365**	282 [2495] **361**	372 [3288] **361**	465 [4115] **351**		373

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

Rotor Width

17.3 [.682] mm [in]

Theoretical Torque - Nm [lb-in]

56 [494]	112 [987]	223 [1975]	335 [2962]	446 [3949]	558 [4936]	669 [5924]	781 [6911]

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

230

233 cm³ [14.2 in³] / rev

Pressure - bar [psi]

17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	207 [3000] Max. Cont.	241 [3500] Peak

Torque - Nm [lb-in], **Speed rpm**

Intermittent Ratings - 10% of Operation

Flow - lpm [gpm]	Torque - Nm [lb-in], Speed rpm							Theoretical rpm
2 [0.5]	46 [406] **7**	98 [866] **7**	209 [1849] **6**	300 [2659] **5**	380 [3367] **2**			9
4 [1]	49 [435] **14**	105 [925] **13**	215 [1903] **12**	321 [2839] **11**	413 [3651] **8**	488 [4315] **6**	543 [4808] **3**	17
8 [2]	50 [438] **30**	107 [945] **28**	221 [1954] **26**	329 [2909] **26**	430 [3803] **22**	520 [4599] **18**	594 [5260] **13**	662 [5856] **9**	33
15 [4]	45 [401] **62**	102 [900] **61**	214 [1895] **59**	325 [2872] **57**	426 [3773] **53**	522 [4623] **47**	610 [5395] **41**	683 [6045] **34**	66
23 [6]	39 [342] **96**	92 [812] **96**	203 [1801] **93**	317 [2808] **91**	412 [3645] **87**	486 [4304] **80**	560 [4953] **72**	642 [5678] **66**	98
30 [8]		84 [743] **128**	197 [1739] **125**	304 [2691] **122**	410 [3627] **119**	506 [4479] **112**	600 [5313] **103**	647 [5728] **95**	131
38 [10]		72 [634] **162**	186 [1650] **159**	292 [2585] **156**	402 [3556] **153**	493 [4363] **146**	584 [5169] **136**	634 [5613] **126**	163
45 [12]			167 [1477] **192**	282 [2494] **191**	393 [3479] **185**	491 [4349] **178**	576 [5094] **167**	658 [5822] **155**	196
53 [14]			152 [1343] **225**	260 [2301] **225**	374 [3310] **220**	470 [4160] **208**	555 [4910] **201**	657 [5818] **186**	228
Max. Cont. 61 [16]			135 [1198] **259**	250 [2209] **259**	362 [3207] **253**	464 [4110] **244**	553 [4895] **232**	637 [5637] **220**	261
68 [18]			115 [1021] **291**	231 [2044] **289**	344 [3042] **286**	447 [3956] **279**	540 [4777] **266**		293
Max. Inter. 76 [20]			93 [822] **325**	210 [1859] **323**	327 [2898] **319**	432 [3825] **311**	529 [4677] **299**		326

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

Rotor Width

19.7 [.777] mm [in]

Theoretical Torque - Nm [lb-in]

64 [565]	128 [1131]	256 [2261]	383 [3392]	511 [4522]	639 [5653]	767 [6783]	894 [7914]

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

260

261 cm³ [15.9 in³] / rev

Pressure - bar [psi]

17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	Max. Cont. 207 [3000]	Peak 241 [3500]

Torque - Nm [lb-in], **Speed rpm**

Intermittent Ratings - 10% of Operation

Flow - lpm [gpm]	17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	207 [3000]	241 [3500]	Theoretical rpm
2 [0.5]	58 [514] **6**	127 [1120] **5**	242 [2140] **4**	347 [3068] **3**	425 [3759] **1**				8
4 [1]	62 [547] **12**	124 [1097] **10**	248 [2191] **9**	354 [3133] **8**	446 [3950] **6**	495 [4377] **2**			15
8 [2]	61 [543] **26**	130 [1150] **23**	249 [2200] **20**	372 [3295] **20**	478 [4234] **17**	562 [4972] **13**	633 [5599] **7**		30
15 [4]	61 [536] **54**	125 [1109] **51**	258 [2284] **48**	377 [3339] **46**	501 [4436] **42**	600 [5306] **36**	700 [6192] **30**	781 [6915] **21**	59
23 [6]	57 [500] **84**	121 [1067] **81**	245 [2169] **74**	376 [3326] **74**	498 [4406] **69**	609 [5391] **60**	713 [6309] **53**	815 [7214] **45**	88
30 [8]		111 [981] **113**	242 [2143] **107**	369 [3268] **105**	489 [4327] **100**	607 [5374] **89**	711 [6290] **81**	810 [7167] **71**	117
38 [10]		103 [909] **142**	230 [2034] **137**	357 [3161] **134**	483 [4273] **128**	595 [5267] **119**	700 [6198] **109**	762 [6740] **98**	146
45 [12]		87 [771] **173**	216 [1915] **169**	345 [3057] **166**	452 [4002] **161**	578 [5111] **152**	645 [5708] **143**	741 [6557] **129**	175
53 [14]		75 [664] **203**	202 [1786] **201**	331 [2928] **195**	434 [3841] **191**	553 [4897] **183**	657 [5811] **170**	759 [6718] **157**	204
61 [16]		61 [538] **232**	191 [1687] **131**	313 [2769] **226**	435 [3847] **220**	553 [4892] **210**	656 [5803] **199**	746 [6601] **189**	233
Max. Cont. 68 [18]			168 [1486] **258**	295 [2614] **255**	414 [3664] **248**	526 [4652] **242**	638 [5642] **229**	742 [6567] **215**	262
76 [20]			152 [1345] **287**	277 [1455] **286**	403 [3570] **281**	520 [4598] **271**	631 [5585] **257**		291
83 [22]			129 [1143] **319**	249 [2208] **319**	381 [3372] **312**	493 [4365] **299**	620 [5489] **287**		320
Max. Inter. 91 [24]			104 [924] **348**	233 [2063] **346**	358 [3166] **335**	471 [4168] **333**	551 [4875] **332**		349

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

Rotor Width

22.1 [.872] mm [in]

Theoretical Torque - Nm [lb-in]

72 [633]	143 [1266]	286 [2532]	429 [3798]	572 [5064]	715 [6330]	858 [7596]	1001 [8861]

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

300

300 cm³ [18.3 in³] / rev

Pressure - bar [psi]

17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	Max. Cont. 207 [3000]	Peak 241 [3500]

Torque - Nm [lb-in], **Speed rpm**

Intermittent Ratings - 10% of Operation

Flow - lpm [gpm]	17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	207 [3000]	241 [3500]	Theoretical rpm
2 [0.5]	63 [559] **5**	136 [1202] **4**	285 [2518] **3**	413 [3656] **3**	513 [4537] **2**	580 [5129] **1**			7
4 [1]	56 [493] **12**	139 [1230] **10**	272 [2410] **10**	386 [3418] **8**	483 [4272] **6**	546 [4834] **4**			13
8 [2]	59 [522] **23**	134 [1185] **21**	302 [2676] **19**	427 [3781] **19**	521 [4611] **16**	587 [5196] **14**	673 [5952] **10**	743 [6572] **5**	26
15 [4]	57 [503] **47**	134 [1189] **44**	296 [2620] **40**	407 [3602] **38**	497 [4398] **37**	602 [5324] **34**	696 [6161] **29**	774 [6852] **23**	51
23 [6]	50 [447] **73**	125 [1109] **70**	286 [2534] **64**	439 [3886] **62**	559 [4946] **61**	677 [5992] **55**	789 [6978] **48**	877 [7762] **43**	76
30 [8]		111 [986] **97**	279 [2468] **93**	424 [3752] **92**	567 [5020] **86**	685 [6059] **77**	807 [7142] **72**	920 [8139] **64**	101
38 [10]		96 [853] **126**	261 [2306] **121**	417 [3687] **118**	532 [4712] **112**	659 [5832] **104**	805 [7121] **95**	903 [7994] **86**	127
45 [12]		78 [689] **150**	228 [2013] **149**	367 [3252] **146**	501 [4434] **140**	643 [5694] **130**	766 [6781] **121**	890 [7875] **109**	152
53 [14]		59 [525] **176**	213 [1889] **174**	385 [3410] **171**	495 [4383] **166**	623 [5509] **155**	748 [6618] **143**	812 [7186] **136**	177
61 [16]			181 [1603] **200**	349 [3085] **196**	474 [4195] **194**	620 [5484] **181**	731 [6471] **172**	850 [7519] **157**	202
68 [18]			159 [1405] **227**	319 [2823] **225**	479 [4241] **219**	578 [5112] **212**	718 [6356] **196**	830 [7348] **186**	228
Max. Cont. 76 [20]			126 [1115] **252**	289 [2560] **251**	418 [3703] **248**	561 [4962] **240**	703 [6221] **225**	811 [7180] **207**	253
83 [22]			104 [919] **277**	261 [2309] **276**	390 [3454] **274**	555 [4907] **263**	679 [6011] **252**		278
91 [24]			67 [590] **302**	218 [1925] **301**	389 [3441] **299**	530 [4686] **293**	652 [5766] **282**		303
Max. Inter. 95 [25]			56 [496] **314**	197 [1740] **313**	364 [3225] **310**	484 [4281] **309**	632 [5594] **298**		316

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

Rotor Width

25.4 [1.000] mm [in]

Theoretical Torque - Nm [lb-in]

82 [729]	165 [1457]	329 [2914]	494 [4371]	659 [5828]	823 [7285]	988 [8742]	1152 [10199]

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

350

348 cm³ [21.2 in³] / rev

Pressure - bar [psi]

17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	207 [3000] Max. Cont.	241 [3500] Peak

Torque - Nm [lb-in], **Speed rpm**

Intermittent Ratings - 10% of Operation

Flow - lpm [gpm]	17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	207 [3000]	241 [3500]	Theoretical rpm
2 [0.5]	70 [617] **5**	147 [1297] **5**	269 [2383] **4**						6
4 [1]	73 [649] **10**	149 [1318] **10**	291 [2580] **10**	412 [3647] **9**					11
8 [2]	76 [670] **21**	159 [1403] **21**	313 [2767] **21**	453 [4007] **20**	557 [4927] **18**	668 [5915] **16**	782 [6919] **13**		22
15 [4]	69 [609] **43**	159 [1409] **42**	324 [2868] **42**	463 [4101] **40**	596 [5273] **37**	714 [6316] **36**	820 [7261] **32**	927 [8204] **25**	44
23 [6]	62 [544] **65**	149 [1319] **65**	321 [2837] **64**	478 [4228] **31**	606 [5363] **57**	736 [6514] **53**	845 [7475] **52**	950 [8410] **43**	66
30 [8]	45 [395] **87**	128 [1134] **86**	304 [2693] **85**	467 [4134] **84**	622 [5502] **80**	776 [6870] **75**	906 [8022] **67**	987 [8734] **61**	88
38 [10]		109 [962] **108**	288 [2550] **107**	455 [4027] **106**	621 [5500] **100**	754 [6670] **94**	907 [8028] **85**	1029 [9105] **77**	109
45 [12]		94 [833] **130**	268 [2376] **129**	439 [3889] **128**	588 [5205] **124**	758 [6712] **115**	901 [7970] **104**	1031 [9120] **94**	131
53 [14]		65 [575] **152**	244 [2162] **151**	409 [3619] **150**	572 [5059] **148**	727 [6433] **137**	879 [7777] **127**	1025 [9070] **117**	153
61 [16]			220 [1947] **174**	385 [3406] **173**	549 [4855] **171**	697 [6172] **163**	855 [7570] **152**	1000 [8853] **139**	175
68 [18]			186 [1644] **196**	361 [3195] **194**	520 [4599] **192**	685 [6062] **187**	825 [7297] **177**	967 [8555] **165**	197
76 [20] Max. Cont.			147 [1301] **216**	324 [2863] **213**	483 [4275] **212**	637 [5634] **209**	790 [6993] **194**	944 [8357] **183**	218
83 [22]			109 [960] **239**	289 [2560] **237**	443 [3921] **234**	605 [5357] **232**	770 [6814] **223**		240
91 [24]			77 [684] **261**	251 [2225] **258**	431 [3814] **257**	588 [5207] **256**	733 [6488] **248**		262
95 [25] Max. Inter.			56 [493] **272**	226 [2004] **270**	409 [3621] **264**	570 [5048] **261**	727 [6435] **259**		273

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

Rotor Width

39.4 [1.553] mm [in]

Theoretical Torque - Nm [lb-in]

95 [844]	191 [1688]	381 [3376]	572 [5064]	763 [6752]	954 [8439]	1144 [10127]	1335 [11815]

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

375

375 cm³ [22.8 in³] / rev

Pressure - bar [psi]

17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	207 [3000] Max. Cont.	241 [3500] Peak

Torque - Nm [lb-in], **Speed rpm**

Intermittent Ratings - 10% of Operation

Flow - lpm [gpm]	17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	207 [3000]	241 [3500]	Theoretical rpm
2 [0.5]	78 [687] **4**	162 [1438] **4**	321 [2840] **4**	447 [3958] **3**	592 [5237] **2**				6
4 [1]	78 [694] **9**	163 [1443] **8**	333 [2951] **8**	474 [4193] **7**	606 [5366] **6**	730 [6457] **4**			11
8 [2]	81 [721] **19**	169 [1495] **18**	339 [3001] **17**	485 [4288] **16**	625 [5533] **15**	756 [6692] **13**	851 [7532] **9**		21
15 [4]	74 [651] **39**	166 [1470] **38**	321 [2837] **36**	465 [4117] **36**	611 [5404] **33**	748 [6624] **29**	876 [7754] **26**	991 [8766] **25**	41
23 [6]	62 [547] **60**	155 [1372] **59**	341 [3015] **58**	515 [4557] **56**	670 [5931] **51**	785 [6946] **44**	884 [7825] **40**	1005 [8896] **43**	61
30 [8]	47 [412] **81**	138 [1223] **80**	320 [2836] **77**	503 [4453] **76**	664 [5880] **71**	834 [7385] **63**	976 [8633] **55**	1067 [9442] **61**	82
38 [10]		118 [1048] **101**	303 [2684] **99**	495 [4382] **97**	647 [5726] **92**	801 [7090] **83**	922 [8161] **74**	1058 [9364] **77**	102
45 [12]		98 [870] **121**	288 [2547] **119**	469 [4147] **117**	635 [5620] **112**	804 [7115] **107**	972 [8605] **93**	1121 [9920] **94**	122
53 [14]		71 [625] **141**	261 [2308] **140**	435 [3849] **139**	603 [5337] **135**	786 [6953] **126**	938 [8298] **114**	1104 [9771] **117**	142
61 [16]		55 [487] **162**	241 [2134] **161**	423 [3744] **160**	593 [5248] **155**	758 [6706] **147**	922 [8160] **135**	1086 [9614] **139**	163
68 [18]			204 [1805] **182**	391 [3461] **181**	564 [4988] **177**	723 [6402] **168**	893 [7899] **164**	1053 [9320] **165**	183
76 [20] Max. Cont.			219 [1942] **201**	365 [3231] **200**	533 [4714] **198**	662 [5860] **193**	864 [7643] **178**	1030 [9112] **183**	203
83 [22]			132 [1173] **222**	316 [2795] **220**	514 [4552] **219**	675 [5970] **210**	807 [7141] **203**		223
91 [24]			100 [881] **243**	290 [2567] **242**	475 [4202] **241**	640 [5667] **232**	792 [7012] **220**		244
95 [25] Max. Inter.			80 [711] **253**	261 [2313] **251**	465 [4113] **250**	616 [5454] **242**	779 [6891] **235**		254

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

Rotor Width

31.8 [1.252] mm [in]

Theoretical Torque - Nm [lb-in]

103 [908]	205 [1815]	410 [3631]	615 [5446]	821 [7261]	1026 [9076]	1231 [10892]	1436 [12707]

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

470

465 cm³ [28.3 in³] / rev

Pressure - bar [psi]					Max. Cont.	Peak
17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	207 [3000]

Intermittent Ratings - 10% of Operation

Torque - Nm [lb-in], **Speed rpm**

Flow - lpm [gpm]	17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	207 [3000]	Theoretical rpm
2 [0.5]	99 [878] **4**	210 [1862] **3**	420 [3713] **3**					5
4 [1]	102 [899] **8**	210 [1856] **7**	424 [3748] **7**	597 [5285] **7**	774 [6847] **6**			9
8 [2]	102 [906] **16**	222 [1968] **15**	438 [3875] **15**	620 [5488] **14**	782 [6922] **13**	957 [8470] **11**	1106 [9788] **9**	17
15 [4]	95 [836] **32**	208 [1837] **31**	407 [3600] **30**	605 [5351] **28**	782 [6922] **25**	961 [8504] **23**	1143 [10118] **20**	33
23 [6]	79 [700] **48**	196 [1736] **48**	426 [3772] **46**	620 [5483] **44**	814 [7204] **41**	969 [8580] **36**	1149 [10172] **31**	49
30 [8]	61 [544] **65**	179 [1588] **65**	411 [3638] **63**	630 [5578] **61**	847 [7498] **57**	1046 [9253] **48**	1191 [10541] **44**	66
38 [10]	40 [352] **81**	159 [1405] **80**	387 [3429] **80**	618 [5471] **77**	825 [7301] **73**	1036 [9167] **67**	1245 [11019] **55**	82
45 [12]		125 [1105] **97**	367 [3245] **96**	587 [5197] **94**	800 [7076] **90**	1005 [8891] **82**	1232 [10898] **72**	98
53 [14]		103 [912] **113**	340 [3007] **113**	572 [5066] **111**	767 [6787] **106**	985 [8720] **100**	1208 [10688] **91**	115
61 [16]		63 [557] **130**	306 [2712] **129**	527 [4662] **128**	744 [6581] **124**	955 [8451] **116**	1162 [10285] **105**	131
68 [18]			260 [2298] **146**	494 [4370] **145**	708 [6262] **142**	921 [8148] **135**	1149 [10169] **126**	147
Max. Cont. 76 [20]			219 [1941] **163**	456 [4035] **163**	673 [5954] **158**	883 [7815] **151**	1090 [9647] **140**	164
83 [22]			174 [1542] **179**	417 [3687] **178**	634 [5612] **176**	847 [7496] **168**		180
91 [24]			138 [1225] **195**	373 [3302] **194**	605 [5354] **193**	808 [7147] **186**		196
Max. Inter. 95 [25]				348 [3079] **204**	552 [4885] **203**	769 [6808] **197**		205

Overall Efficiency - 70 - 100% ☐ 40 - 69% ▒ 0 - 39% ■

Rotor Width	Theoretical Torque - Nm [lb-in]						
39.4 [1.553]	127 [1127]	255 [2253]	509 [4506]	764 [6760]	1018 [9013]	1273 [11266]	1528 [13519]

mm [in]

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

540

536 cm³ [32.7 in³] / rev

Pressure - bar [psi]					Max. Cont.	Max. Inter
17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	172 [2500]	

Intermittent Ratings - 10% of Operation

Torque - Nm [lb-in], **Speed rpm**

Flow - lpm [gpm]	17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	172 [2500]	Theoretical rpm
2 [0.5]	106 [940] **3**	230 [2035] **2**					4
4 [1]	105 [927] **6**	223 [1975] **6**	455 [4023] **6**	655 [5797] **5**	868 [7684] **3**		8
8 [2]	112 [991] **13**	237 [2100] **13**	488 [4321] **12**	719 [6358] **10**	911 [8065] **8**	1087 [9617] **3**	15
15 [4]	107 [944] **27**	246 [2174] **26**	503 [4455] **25**	745 [6593] **24**	952 [8426] **21**	1131 [10005] **16**	29
23 [6]	96 [854] **42**	230 [2033] **41**	516 [4571] **40**	756 [6686] **40**	1007 [8911] **36**	1233 [10911] **30**	43
30 [8]	69 [613] **56**	208 [1843] **56**	476 [4214] **54**	760 [6724] **54**	993 [8787] **49**	1206 [10676] **42**	57
38 [10]	59 [521] **70**	184 [1631] **70**	456 [4035] **69**	720 [6367] **67**	968 [8568] **64**	1223 [10821] **56**	71
45 [12]	30 [264] **84**	155 [1376] **83**	418 [3702] **83**	688 [6089] **83**	926 [8195] **78**	1205 [10668] **69**	85
53 [14]		123 [1089] **98**	391 [3456] **98**	630 [5576] **97**	892 [7896] **95**	1149 [10165] **88**	99
61 [16]		90 [793] **113**	361 [3197] **113**	635 [5622] **112**	896 [7925] **109**	1137 [10061] **106**	114
68 [18]		51 [452] **127**	328 [2901] **126**	592 [5238] **125**	862 [7632] **124**	1116 [9873] **118**	128
Max. Cont. 76 [20]			278 [2460] **141**	550 [4869] **140**	816 [7222] **140**	1076 [9526] **132**	142
83 [22]			224 [1980] **154**	447 [3954] **153**	720 [6369] **151**		156
91 [24]			180 [1590] **169**	449 [3971] **168**	754 [6673] **167**		170
Max. Inter. 95 [25]			153 [1358] **176**	426 [3768] **174**	689 [6095] **173**		177

Overall Efficiency - 70 - 100% ☐ 40 - 69% ▒ 0 - 39% ■

Rotor Width	Theoretical Torque - Nm [lb-in]					
45.5 [1.791]	147 [1302]	294 [2604]	588 [5207]	883 [7811]	1177 [10414]	1471 [13018]

mm [in]

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

750

748 cm³ [45.6 in³] / rev

Flow - lpm [gpm]	Pressure - bar [psi] Torque - Nm [lb-in], **Speed rpm**			Max. Cont.	Peak	Theoretical rpm
	17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	
	Intermittent Ratings - 10% of Operation					
2 [0.5]	108 [957] **2**	231 [2041] **1**				3
4 [1]	174 [1540] **4**	340 [3010] **4**	651 [5760] **4**	950 [8408] **4**	1233 [10916] **3**	6
8 [2]	166 [1467] **9**	367 [3246] **9**	695 [6154] **9**	1020 [9024] **9**	1302 [11518] **7**	11
15 [4]	170 [1501] **19**	359 [3181] **19**	719 [6366] **19**	1086 [9607] **18**	1325 [11729] **16**	21
23 [6]	167 [1477] **29**	344 [3048] **29**	699 [6190] **28**	1015 [8979] **27**	1346 [11916] **25**	31
30 [8]	129 [1142] **40**	324 [2866] **39**	700 [6191] **38**	1053 [9316] **37**	1345 [11898] **35**	41
38 [10]	111 [979] **50**	295 [2606] **49**	656 [5809] **48**	1039 [9191] **47**	1390 [12305] **44**	51
45 [12]	69 [614] **60**	254 [2246] **59**	631 [5586] **58**	987 [8736] **57**	1365 [12079] **56**	61
53 [14]	47 [413] **69**	227 [2009] **68**	591 [5232] **66**	957 [8469] **65**	1346 [11913] **64**	71
61 [16]		198 [1756] **80**	555 [4909] **79**	931 [8243] **77**	1294 [11455] **74**	82
68 [18]		136 [1203] **91**	517 [4571] **90**	879 [7778] **90**	1230 [10884] **87**	92
Max. Cont. 76 [20]		93 [827] **100**	453 [4010] **99**	820 [7257] **98**	1191 [10540] **97**	102
83 [22]			409 [3620] **109**	786 [6958] **108**		112
91 [24]			340 [3010] **120**	747 [6609] **119**		122
Max. Inter. 95 [25]			318 [2810] **126**	693 [6130] **125**		127

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

Rotor Width	Theoretical Torque - Nm [lb-in]				
63.5 [2.501]	205 [1815]	410 [3631]	821 [7261]	1231 [10892]	1641 [14522]

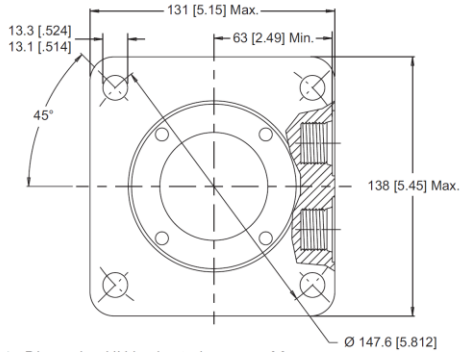
mm [in]

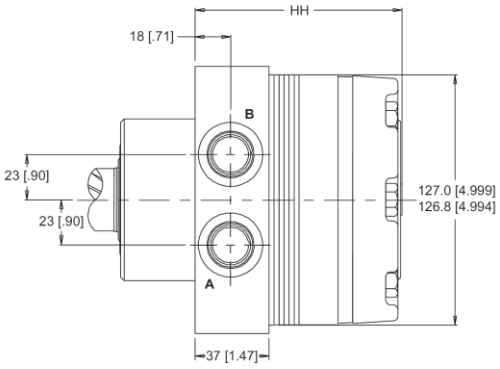
Displacement tested at 54°C [129°F] with an oil viscosity of 46cSt [213 SUS]

CE 410/411 Series Housing

- The dimensions shown are without paint. Paint thickness can be up to 0.13 [.005].

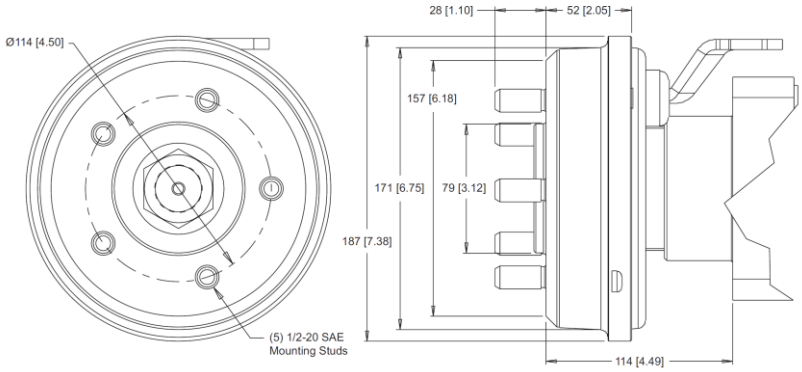
4-HOLE, WHEEL BRAKE MOUNT, ALIGNED PORTS **K31** 7/8-14 UNF **K35** 9/16-18 UNF **K38** G 1/2



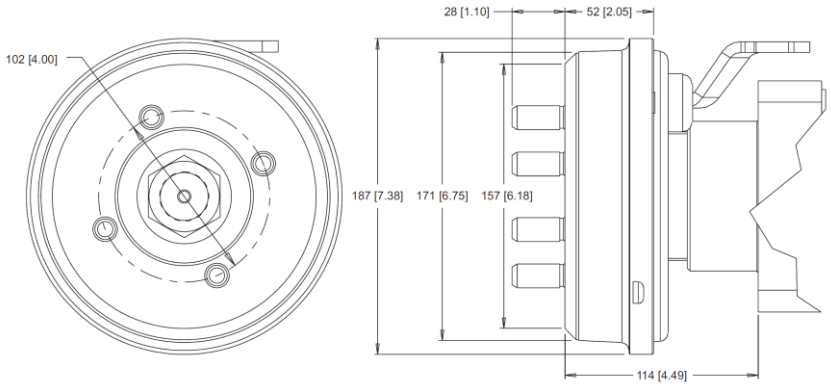


Hub option details

5-BOLT, WHEEL HUB

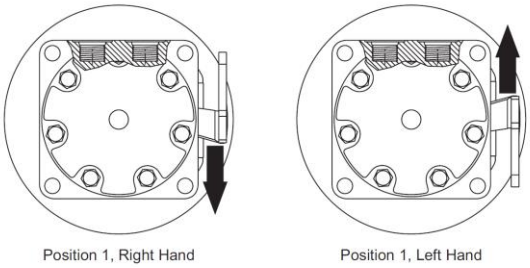


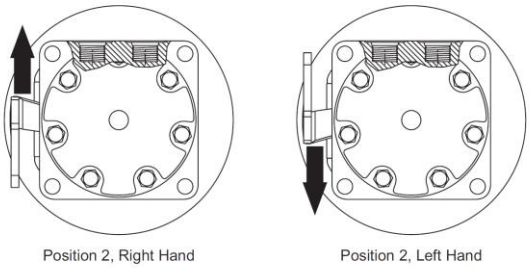
4-BOLT, WHEEL HUB



CE 410/411 Series Technical Information

Brake Lever Position & Pull Direction

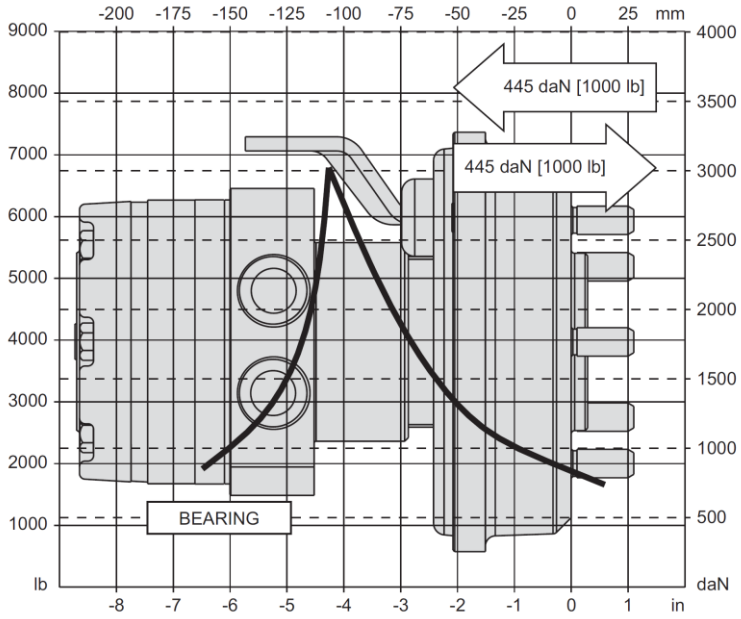




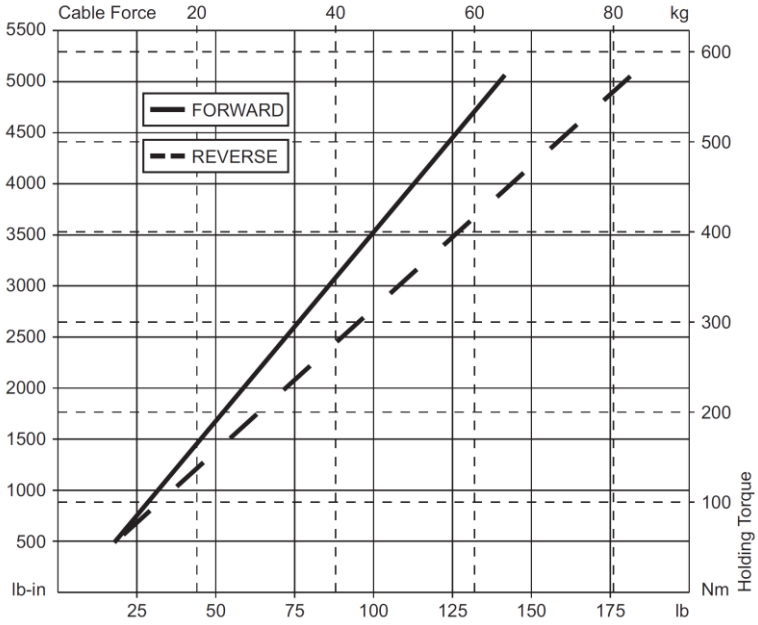
Allowable Shaft Load / Bearing Curve

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

Motor Brake



Brake Holding Torque



LENGTH & WEIGHT CHART

Dimension HH is the overall motor length from the rear of the motor to the mounting flange surface and are referenced on detailed housing drawings listed above.

HH	Length	Weight
#	mm [in]	kg [lb]
120	99 [3.91]	16.0 [35.2]
160	99 [3.91]	16.0 [35.2]
200	103 [4.05]	16.3 [35.9]
230	105 [4.15]	16.5 [36.3]
260	108 [4.24]	16.7 [36.7]
300	111 [4.37]	17.0 [37.4]
350	125 [4.92]	18.1 [39.9]
375	117 [4.62]	17.5 [38.5]
470	125 [4.92]	18.1 [39.9]
540	131 [5.16]	18.7 [41.1]
750	149 [5.87]	20.1 [44.2]

- 410/411 motor.brake series motor weights can vary ± 0.5 kg [1 lb] depending on model configurations such as housing, shaft, endcover, options etc.

CE 410/411 Series Ordering Information

1. CHOOSE SERIES DESIGNATION

410 Standard Motor **411** Reverse Rotation

- The 410 & 411 series is bi-directional. For applications requiring the motor to rotate in only one direction, shaft seal life may be prolonged by pressurizing the A port of the motor.

2. SELECT A DISPLACEMENT OPTION

120	121 cm^3/rev [7.4 in^3/rev]	**350**	348 cm^3/rev [21.1 in^3/rev]
160	162 cm^3/rev [9.9 in^3/rev]	**375**	375 cm^3/rev [22.8 in^3/rev]
200	204 cm^3/rev [12.4 in^3/rev]	**470**	465 cm^3/rev [28.3 in^3/rev]
230	232 cm^3/rev [14.2 in^3/rev]	**540**	536 cm^3/rev [32.7 in^3/rev]
260	261 cm^3/rev [15.9 in^3/rev]	**750**	748 cm^3/rev [45.6 in^3/rev]
300	300 cm^3/rev [18.3 in^3/rev]		

3. SELECT MOUNT & PORT OPTION

K31	4-Hole, Wheel Brake Mount, Aligned Ports, 7/8-14 UNF
K35	4-Hole, Wheel Brake Mount, Aligned Ports, 9/16-18 UNF
K38	4-Hole, Wheel Mount, Aligned Ports, G 1/2

4. SELECT A SHAFT OPTION

22	1-1/4” Tapered

5. SELECT A PAINT OPTION

A	Black
Z	No Paint

6. SELECT A VALVE CAVITY/CARTRIDGE OPTION

A	None

7. SELECT AN ADD-ON OPTION

A	Standard

8. SELECT A MISCELLANEOUS OPTION

YA	5 Bolt Hub, Position 2, Right Hand
YB	5 Bolt Hub, Position 2, Left Hand
YE	4 Bolt Hub, Position 2, Right Hand
YF	4 Bolt Hub, Position 2, Left Hand
ZA	5 Bolt Hub, Position 1, Left Hand
ZB	5 Bolt Hub, Position 1, Right Hand
ZE	4 Bolt Hub, Position 1, Left Hand
ZF	4 Bolt Hub, Position 1, Right Hand

Chapter 5

Hydraulic motors/brakes - RE

Topics:

RE 510/511 Series Product Line Introduction

Overview

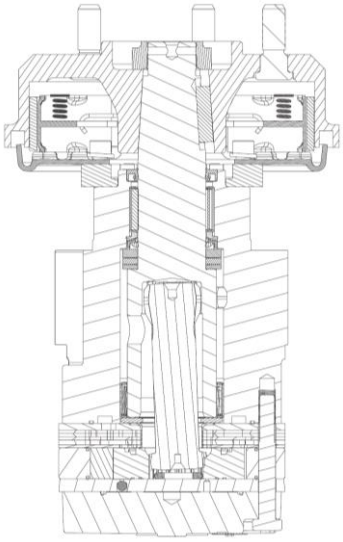
RE Series motors offer the perfect compromise between price and performance by producing work horse power at a reasonable cost. Although these motors perform well in a wide range of applications, they are especially suited for low flow, high pressure applications. During startup, pressure causes the balance plate to flex toward the rotor, vastly improving volumetric efficiency. As the motor reaches operating pressure, the balance plate relaxes, allowing the rotor to turn freely which translates into higher mechanical efficiencies. Transmitting this power to the output shaft is the most durable drive link in its class. Four bearing options, combined with standard mounting flanges and output shafts, allow the motor to be configured to suit nearly any application.

Features / Benefits

- High Pressure Shaft Seal offers superior seal life and performance and eliminates need for case drain.
- Three Bearing Options allow load carrying capability of motor to be matched to application.
- Heavy-Duty Drive Link is the most durable in its class and receives full flow lubrication to provide long life.
- Valve-In-Rotor Design provides cost effective, efficient distribution of oil and reduces overall motor length.
- Pressure-Compensated Balance Plate improves volumetric efficiency at low flows and high pressure.

Series Descriptions

510/511 - Hydraulic Motor
With Integral Drum Brake



Typical Applications

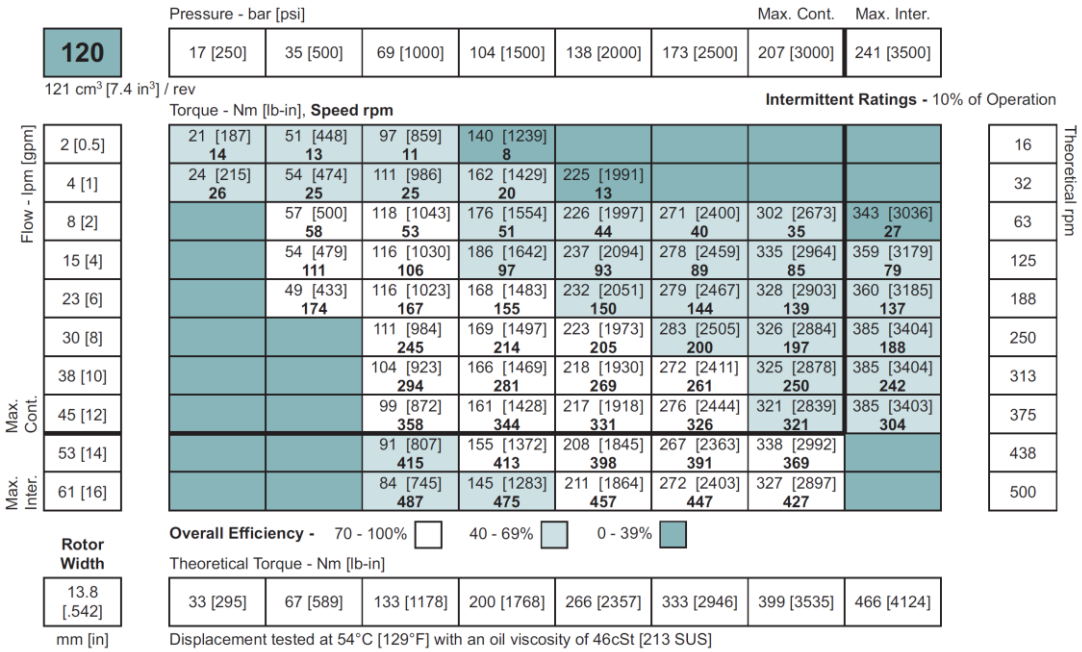
Medium-duty wheel drives, augers, mixers, winch drives, swing drives, grapple heads, feed rollers, broom drives, chippers, mining equipment, forestry equipment and more

Specifications

Code	Displacement cm³ [in³/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
120	121 [7.4]	360	490	45 [12]	61 [16]	327 [2900]	383 [3400]	207 [3000]	241 [3500]	276 [4000]
160	162 [9.9]	370	470	61 [16]	76 [20]	475 [4200]	542 [4800]	207 [3000]	241 [3500]	276 [4000]
200	204 [12.4]	300	370	68 [18]	83 [22]	542 [4800]	633 [5600]	207 [3000]	241 [3500]	276 [4000]
230	232 [14.2]	260	320	68 [18]	83 [22]	644 [5700]	712 [6300]	207 [3000]	241 [3500]	276 [4000]
260	261 [15.9]	260	350	76 [20]	91 [24]	712 [6300]	791 [7000]	207 [3000]	241 [3500]	276 [4000]
300	300 [18.3]	250	320	83 [22]	95 [25]	825 [7300]	938 [8300]	207 [3000]	241 [3500]	276 [4000]
350	348 [21.2]	220	270	83 [22]	95 [25]	921 [8150]	1045 [9250]	207 [3000]	241 [3500]	276 [4000]
375	375 [22.8]	200	250	76 [20]	91 [24]	1006 [8900]	1158 [10250]	207 [3000]	241 [3500]	276 [4000]
470	465 [28.3]	160	200	76 [20]	91 [24]	1096 [9700]	1184 [10475]	172 [2500]	189 [2750]	207 [3000]
540	536 [32.7]	140	170	76 [20]	91 [24]	983 [8700]	1243 [11000]	138 [2000]	173 [2500]	207 [3000]
620	631 [38.5]	120	150	76 [20]	91 [24]	1014 [8976]	1291 [11421]	121 [1750]	155 [2250]	173 [2500]
750	748 [45.6]	100	130	76 [20]	91 [24]	1062 [9400]	1237 [10950]	103 [1500]	121 [1750]	138 [2000]

- 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.

RE 510/511 Series Displacement Performance



160

Pressure - bar [psi]

17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	Max. Cont. 207 [3000]	Max. Inter. 241 [3500]

162 cm³ [9.9 in³] / rev

Torque - Nm [lb-in], **Speed rpm**

Intermittent Ratings - 10% of Operation

Flow - lpm [gpm]									Theoretical rpm
	2 [0.5]	37 [326] **7**	77 [685] **3**	149 [1323] **3**	223 [1977] **3**	310 [2741] **2**	349 [3088] **1**			12
	4 [1]	30 [264] **21**	80 [704] **18**	164 [1448] **17**	244 [2158] **16**	324 [2865] **14**	378 [3344] **13**	442 [3909] **9**		24
	8 [2]	36 [317] **45**	80 [711] **43**	161 [1423] **41**	242 [2143] **39**	316 [2792] **37**	379 [3350] **35**	481 [4258] **32**	551 [4880] **28**	47
	15 [4]	39 [342] **92**	75 [664] **90**	171 [1510] **86**	253 [2241] **84**	321 [2838] **82**	379 [3351] **80**	451 [3992] **76**	516 [4569] **72**	94
	23 [6]		71 [631] **138**	158 [1395] **134**	235 [2078] **131**	317 [2806] **127**	389 [3447] **122**	462 [4088] **121**	518 [4586] **118**	140
	30 [8]		67 [596] **186**	164 [1449] **182**	236 [2090] **179**	312 [2760] **173**	385 [3411] **170**	456 [4033] **167**	513 [4537] **163**	187
	38 [10]		72 [640] **232**	149 [1323] **230**	234 [2074] **229**	309 [2736] **222**	376 [3329] **220**	455 [4022] **213**	522 [4623] **207**	234
	45 [12]		67 [596] **279**	144 [1275] **279**	226 [1998] **272**	304 [2689] **270**	369 [3270] **264**	440 [3890] **255**	497 [4397] **247**	280
	53 [14]			135 [1190] **326**	228 [2022] **323**	310 [2739] **317**	375 [3317] **311**	457 [4040] **304**	541 [4789] **299**	327
Max. Cont.	61 [16]			123 [1087] **372**	213 [1889] **372**	298 [2634] **364**	368 [3253] **361**	435 [3847] **357**	502 [4439] **350**	374
	68 [18]			108 [952] **419**	199 [1764] **417**	283 [2501] **416**	362 [3201] **407**	419 [3708] **401**		420
Max. Inter.	76 [20]			105 [929] **466**	195 [1726] **465**	280 [2476] **462**	349 [3092] **453**	453 [4008] **443**		467

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

Rotor Width

13.8 [.542] mm [in]

Theoretical Torque - Nm [lb-in]

45 [394]	89 [788]	178 [1576]	267 [2365]	356 [3153]	445 [3941]	534 [4729]	623 [5518]

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 flow simultaneously is not recommended..

200

Pressure - bar [psi]

17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	Max. Cont. 207 [3000]	Max. Inter. 241 [3500]

204 cm³ [12.4 in³] / rev

Torque - Nm [lb-in], **Speed rpm**

Intermittent Ratings - 10% of Operation

Flow - lpm [gpm]									Theoretical rpm
	2 [0.5]	40 [358] **7**	91 [808] **4**	133 [1181] **4**	294 [2602] **4**	375 [3323] **3**				10
	4 [1]	43 [376] **16**	85 [753] **13**	200 [1769] **12**	276 [2442] **11**	373 [3304] **10**	442 [3915] **9**	526 [4656] **6**		19
	8 [2]	44 [385] **34**	93 [851] **31**	195 [1727] **29**	299 [2646] **27**	374 [3311] **27**	461 [4079] **25**	542 [4792] **23**	616 [5451] **20**	38
	15 [4]	39 [347] **72**	94 [834] **69**	198 [1752] **67**	305 [2701] **63**	401 [3549] **60**	477 [4222] **58**	544 [4818] **55**	629 [5568] **51**	75
	23 [6]		82 [724] **111**	191 [1694] **109**	284 [2518] **107**	389 [3446] **103**	463 [4098] **100**	553 [4894] **99**	636 [5628] **90**	112
	30 [8]		80 [704] **148**	188 [1661] **145**	285 [2518] **141**	402 [3556] **136**	458 [4053] **134**	543 [4802] **130**	628 [5554] **124**	150
	38 [10]		66 [581] **185**	180 [1592] **181**	276 [2445] **176**	364 [3224] **173**	458 [4051] **170**	535 [4737] **164**	615 [5441] **160**	187
	45 [12]			165 [1462] **221**	261 [2312] **214**	362 [3200] **210**	450 [3982] **207**	535 [4731] **198**	618 [5471] **196**	224
	53 [14]			150 [1328] **257**	273 [2413] **256**	368 [3253] **247**	449 [3975] **244**	558 [4936] **241**	602 [5328] **235**	261
	61 [16]			134 [1183] **296**	253 [2242] **292**	335 [2969] **284**	435 [3850] **277**	524 [4639] **273**	598 [5292] **269**	299
Max. Cont.	68 [18]			121 [1068] **334**	232 [2056] **330**	339 [3003] **327**	416 [3686] **320**	512 [4532] **313**	599 [5299] **308**	336
	76 [20]			110 [970] **372**	206 [1823] **372**	308 [2725] **365**	401 [3552] **357**	507 [4484] **352**		373
Max. Inter.	83 [22]				191 [1689] **407**	285 [2520] **403**	379 [3353] **397**	486 [4303] **388**		410

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

Rotor Width

17.3 [.682] mm [in]

Theoretical Torque - Nm [lb-in]

56 [494]	112 [987]	223 [1975]	335 [2962]	446 [3949]	558 [4936]	669 [5924]	781 [6911]

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

230

233 cm³ [14.2 in³] / rev

Pressure - bar [psi]

17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	207 [3000] Max. Cont.	241 [3500] Max. Inter.

Torque - Nm [lb-in], **Speed rpm**

Intermittent Ratings - 10% of Operation

Flow - lpm [gpm]	17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	207 [3000] Max. Cont.	241 [3500] Max. Inter.	Theoretical rpm
2 [0.5]	45 [397] **6**	92 [813] **4**	184 [1628] **3**	293 [2590] **2**	375 [3323] **1**				9
4 [1]	48 [429] **14**	101 [890] **12**	223 [1972] **11**	316 [2793] **11**	414 [3660] **9**	493 [4366] **7**	560 [4955] **4**		17
8 [2]	51 [453] **30**	105 [926] **27**	215 [1899] **25**	329 [2911] **25**	425 [3760] **23**	524 [4637] **20**	618 [5468] **17**	710 [6286] **12**	33
15 [4]	43 [384] **63**	108 [960] **59**	209 [1851] **55**	326 [2884] **54**	435 [3846] **52**	539 [4771] **47**	655 [5799] **42**	721 [6381] **39**	66
23 [6]		102 [603] **93**	213 [1889] **88**	339 [3001] **85**	428 [3789] **82**	536 [4747] **77**	628 [5559] **73**	718 [6355] **69**	98
30 [8]		89 [789] **127**	207 [1830] **122**	316 [2793] **120**	425 [3762] **115**	521 [4612] **110**	639 [5653] **107**	717 [6341] **98**	131
38 [10]		78 [690] **161**	198 [1750] **157**	311 [2752] **151**	436 [3856] **148**	527 [4660] **143**	612 [5420] **140**	703 [6218] **132**	163
45 [12]			189 [1669] **191**	296 [2624] **186**	425 [3764] **182**	510 [4517] **176**	599 [5304] **170**	689 [6098] **163**	196
53 [14]			177 [1565] **224**	293 [2596] **216**	388 [3434] **214**	495 [4384] **208**	587 [5197] **205**	680 [6017] **198**	228
61 [16]			150 [1326] **256**	272 [2408] **255**	397 [3509] **249**	484 [4280] **245**	574 [5077] **237**	669 [5925] **227**	261
68 [18] Max. Cont.			142 [1261] **292**	264 [2333] **286**	355 [3140] **282**	493 [4366] **276**	569 [5032] **274**	655 [5799] **259**	293
76 [20]			122 [1083] **324**	237 [2096] **321**	347 [3068] **316**	453 [4009] **309**	571 [5057] **305**		326
83 [22] Max. Inter.				210 [1855] **357**	338 [2987] **351**	464 [4104] **345**	550 [4864] **339**		358

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

Rotor Width

19.7 [.777] mm [in]	Theoretical Torque - Nm [lb-in]							
	64 [565]	128 [1131]	256 [2261]	383 [3392]	511 [4522]	639 [5653]	767 [6783]	894 [7914]

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

260

261 cm³ [15.9 in³] / rev

Pressure - bar [psi]

17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	207 [3000] Max. Cont.	241 [3500] Max. Inter.

Torque - Nm [lb-in], **Speed rpm**

Intermittent Ratings - 10% of Operation

Flow - lpm [gpm]	17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	207 [3000] Max. Cont.	241 [3500] Max. Inter.	Theoretical rpm
2 [0.5]	49 [432] **5**	112 [989] **2**							8
4 [1]	54 [475] **12**	113 [998] **11**	240 [2125] **10**	365 [3230] **9**	478 [4227] **8**	578 [5112] **7**	648 [5736] **5**		15
8 [2]	54 [474] **27**	115 [1021] **25**	247 [2184] **24**	367 [3244] **22**	488 [4318] **21**	591 [5230] **19**	703 [6223] **16**		30
15 [4]	49 [429] **57**	114 [1010] **55**	261 [2307] **51**	363 [3214] **51**	486 [4300] **48**	595 [5268] **46**	697 [6171] **43**	807 [7143] **39**	59
23 [6]	45 [397] **86**	115 [1016] **83**	236 [2090] **80**	364 [3221] **78**	497 [4398] **76**	590 [5225] **71**	721 [6379] **68**	802 [7096] **63**	88
30 [8]		94 [833] **114**	227 [2008] **109**	348 [3078] **109**	477 [4224] **105**	592 [5239] **101**	692 [6128] **96**	794 [7027] **88**	117
38 [10]		85 [752] **145**	231 [2044] **144**	340 [3013] **141**	470 [4155] **138**	585 [5180] **133**	685 [6063] **127**	796 [7048] **119**	146
45 [12]		78 [692] **173**	217 [1919] **173**	354 [3135] **168**	464 [4108] **166**	567 [5018] **161**	672 [5945] **153**	802 [7095] **144**	175
53 [14]		64 [563] **202**	198 [1754] **202**	326 [2886] **200**	445 [3941] **196**	568 [5026] **184**	668 [5908] **181**	765 [6771] **176**	204
61 [16]			182 [1608] **231**	299 [2644] **229**	448 [3965] **221**	552 [4884] **219**	651 [5763] **216**	752 [6659] **209**	233
68 [18]			160 [1417] **261**	304 [2693] **261**	417 [3690] **256**	550 [4870] **247**	643 [5689] **240**	740 [6551] **232**	262
76 [20] Max. Cont.			136 [1204] **290**	278 [2460] **289**	391 [3464] **285**	521 [4614] **277**	636 [5628] **274**	736 [6516] **263**	291
83 [22]			132 [1168] **319**	263 [2325] **319**	374 [3314] **315**	512 [4535] **311**	615 [5442] **301**		320
91 [24] Max. Inter.			82 [722] **348**	227 [2009] **347**	361 [3190] **345**	496 [4386] **340**			349

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

Rotor Width

22.1 [.872] mm [in]	Theoretical Torque - Nm [lb-in]							
	72 [633]	143 [1266]	286 [2532]	429 [3798]	572 [5064]	715 [6330]	858 [7596]	1001 [8861]

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

300

300 cm³ [18.3 in³] / rev

Pressure - bar [psi]

17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	207 [3000] Max. Cont.	241 [3500] Max. Inter.

Torque - Nm [lb-in], **Speed rpm**

Intermittent Ratings - 10% of Operation

Flow - lpm [gpm]	17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	207 [3000] Max. Cont.	241 [3500] Max. Inter.	Theoretical rpm
2 [0.5]	51 [452] **3**	95 [839] **1**							7
4 [1]	63 [557] **11**	145 [1282] **10**	302 [2675] **9**	433 [3829] **8**	510 [4513] **7**	627 [5552] **4**			13
8 [2]	62 [551] **22**	158 [1400] **20**	308 [2722] **19**	437 [3866] **19**	571 [5056] **16**	679 [6011] **13**	768 [6796] **9**	830 [7346] **5**	26
15 [4]	66 [588] **48**	145 [1281] **47**	316 [2793] **45**	430 [3805] **43**	577 [5107] **38**	680 [6015] **33**	820 [7258] **28**	908 [8040] **21**	51
23 [6]	58 [511] **75**	140 [1241] **75**	290 [2566] **72**	424 [3755] **69**	546 [4830] **65**	690 [6105] **57**	801 [7088] **49**	946 [8372] **40**	76
30 [8]	46 [405] **100**	128 [1136] **100**	305 [2699] **99**	391 [3460] **96**	571 [5056] **87**	700 [6199] **82**	826 [7313] **71**	930 [8233] **62**	101
38 [10]		111 [981] **125**	282 [2493] **124**	409 [3623] **121**	503 [4447] **115**	683 [6043] **106**	794 [7028] **98**	919 [8131] **88**	127
45 [12]		92 [814] **150**	261 [2313] **150**	388 [3435] **148**	472 [4177] **143**	641 [5676] **133**	783 [6927] **122**	881 [7794] **113**	152
53 [14]		77 [684] **176**	245 [2165] **175**	391 [3464] **175**	530 [4687] **173**	661 [5848] **163**	809 [7157] **151**	949 [8398] **138**	177
61 [16]		63 [553] **201**	224 [1983] **201**	366 [3243] **199**	508 [4498] **192**	633 [5599] **187**	796 [7044] **173**	916 [8103] **163**	202
68 [18]			201 [1780] **225**	339 [2999] **225**	467 [4135] **222**	666 [5898] **211**	804 [7115] **199**	899 [7955] **194**	228
76 [20]			172 [1522] **251**	327 [2895] **251**	480 [4247] **247**	611 [5410] **240**	745 [6596] **232**	910 [8051] **217**	253
83 [22]			144 [1276] **277**	321 [2836] **276**	466 [4127] **269**	575 [5084] **263**	732 [6474] **254**		278
91 [24]			119 [1049] **302**	281 [2483] **301**	435 [3853] **300**	559 [4943] **291**	703 [6223] **280**		303
95 [25]			105 [928] **315**	262 [2319] **314**	434 [3838] **311**	553 [4894] **307**	707 [6257] **294**		316

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

Rotor Width	Theoretical Torque - Nm [lb-in]							
25.4 [1.000] mm [in]	82 [729]	165 [1457]	329 [2914]	494 [4371]	659 [5828]	823 [7285]	988 [8742]	1152 [10199]

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

350

348 cm³ [21.2 in³] / rev

Pressure - bar [psi]

17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	207 [3000] Max. Cont.	241 [3500] Max. Inter.

Torque - Nm [lb-in], **Speed rpm**

Intermittent Ratings - 10% of Operation

Flow - lpm [gpm]	17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	207 [3000] Max. Cont.	241 [3500] Max. Inter.	Theoretical rpm
2 [0.5]	64 [566] **4**	134 [1183] **4**	272 [2404] **3**	399 [3532] **2**					6
4 [1]	64 [570] **10**	134 [1189] **9**	296 [2619] **8**	437 [3869] **8**					11
8 [2]	69 [607] **21**	145 [1285] **20**	312 [2764] **19**	462 [4092] **18**	600 [5308] **18**	742 [6571] **17**	855 [7569] **14**		22
15 [4]	71 [627] **42**	151 [1340] **41**	313 [2767] **40**	471 [4169] **39**	630 [5577] **37**	772 [6834] **35**	889 [7869] **34**	993 [8785] **28**	44
23 [6]	62 [549] **64**	149 [1618] **63**	315 [2788] **62**	474 [4191] **60**	630 [5577] **57**	768 [6796] **54**	925 [8182] **51**	1032 [9137] **45**	66
30 [8]	53 [472] **86**	139 [1233] **85**	307 [2713] **84**	459 [4058] **82**	626 [5537] **79**	768 [6793] **75**	928 [8210] **69**	1051 [9300] **65**	88
38 [10]		113 [1004] **108**	298 [2639] **108**	431 [3814] **108**	601 [5317] **102**	745 [6593] **100**	910 [8056] **93**	1062 [9399] **87**	109
45 [12]		98 [869] **130**	265 [2346] **129**	445 [3936] **128**	581 [5144] **125**	740 [6552] **117**	891 [7889] **109**	1044 [9237] **104**	131
53 [14]		86 [758] **152**	252 [2226] **151**	422 [3738] **150**	570 [5044] **147**	723 [6398] **139**	881 [7794] **133**	1031 [9126] **120**	153
61 [16]		63 [560] **173**	235 [2079] **173**	409 [3619] **172**	549 [4859] **170**	720 [6375] **163**	850 [7522] **155**	1012 [8952] **147**	175
68 [18]			220 [1948] **195**	394 [3490] **194**	571 [5054] **190**	693 [6134] **187**	839 [7428] **175**	986 [8727] **164**	197
76 [20]			208 [1843] **217**	375 [3320] **216**	513 [4544] **214**	683 [6044] **213**	835 [7385] **195**	975 [8632] **188**	218
83 [22]			179 [1583] **239**	352 [3112] **239**	554 [4906] **238**	685 [6064] **233**	813 [7198] **221**	958 [8482] **215**	240
91 [24]			172 [1526] **261**	360 [3186] **261**	534 [4724] **260**	666 [5890] **256**			262
95 [25]				369 [3264] **271**	529 [4682] **270**	647 [5730] **265**			273

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

Rotor Width	Theoretical Torque - Nm [lb-in]							
39.4 [1.553] mm [in]	95 [844]	191 [1688]	381 [3376]	572 [5064]	763 [6752]	954 [8439]	1144 [10127]	1335 [11815]

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

375

375 cm³ [22.8 in³] / rev

Pressure - bar [psi]

17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	Max. Cont. 207 [3000]	Max. Inter. 241 [3500]

Intermittent Ratings - 10% of Operation

Torque - Nm [lb-in], **Speed rpm**

Flow - lpm [gpm]									Theoretical rpm
	2 [0.5]	76 [674] **3**							6
	4 [1]	84 [745] **8**	162 [1432] **7**	329 [2911] **6**	490 [4337] **6**	639 [5652] **5**	763 [6756] **3**		11
	8 [2]	82 [724] **18**	171 [1510] **17**	361 [[3196] **16**	537 [4754] **16**	689 [6095] **14**	836 [7399] **12**	955 [8449] **9**	21
	15 [4]	77 [680] **39**	163 [1439] **37**	358 [3164] **37**	537 [4756] **36**	695 [6151] **32**	857 [7587] **29**	989 [8750] **25**	1121 [9923] **20**	41
	23 [6]	67 [595] **60**	158 [1398] **59**	354 [3130] **56**	527 [4661] **56**	695 [6155] **52**	864 [7642] **47**	1011 [8951] **40**	1168 [10334] **36**	61
	30 [8]	57 [508] **80**	149 [1321] **80**	340 [3010] **78**	510 [4512] **77**	695 [6154] **71**	845 [7476] **65**	1009 [8930] **60**	1156 [10229] **51**	82
	38 [10]		134 [1187] **100**	322 [2849] **99**	495 [4383] **96**	681 [6024] **93**	836 [7399] **87**	1007 [8913] **80**	1157 [10235] **71**	102
	45 [12]		115 [1013] **121**	301 [2661] **120**	480 [4249] **118**	645 [5711] **113**	809 [7159] **108**	980 [8674] **98**	1141 [10098] **92**	122
	53 [14]		93 [819] **141**	280 [2475] **140**	477 [4218] **138**	633 [5602] **134**	795 [7036] **128**	949 [8402] **120**	1117 [9887] **105**	142
	61 [16]		73 [646] **161**	261 [2314] **161**	429 [3797] **160**	598 [5296] **155**	770 [6817] **151**	934 [8267] **141**	1085 [9605] **130**	163
	68 [18]			236 [2091] **181**	434 [3843] **181**	597 [5282] **177**	765 [6771] **168**	907 [8026] **161**	1080 [9554] **150**	183
Max. Cont.	76 [20]			209 [1851] **202**	384 [3396] **201**	561 [4969] **198**	740 [6549] **191**	877 [7764] **183**	1027 [9091] **168**	203
	83 [22]			178 [1576] **222**	374 [3309] **221**	530 [4694] **218**	696 [6160] **213**	840 [7431] **205**		223
Max. Inter.	91 [24]			141 [1246] **242**	319 [2822] **241**	511 [4523] **239**	662 [5860] **233**			244

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

Rotor Width mm [in]	Theoretical Torque - Nm [lb-in]							
31.8 [1.252]	103 [908]	205 [1815]	410 [3631]	615 [5446]	821 [7261]	1026 [9076]	1231 [10892]	1436 [12707]

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

470

465 cm³ [28.3 in³] / rev

Pressure - bar [psi]

17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	Max. Cont. 173 [2500]	Peak 207 [3000]

Intermittent Ratings - 10% of Operation

Torque - Nm [lb-in], **Speed rpm**

Flow - lpm [gpm]								Theoretical rpm
	2 [0.5]	93 [823] **2**	185 [1635] **1**					5
	4 [1]	97 [857] **7**	203 [1794] **5**	409 [3618] **5**	610 [5402] **5**	815 [7209] **4**		9
	8 [2]	98 [865] **15**	209 [1845] **14**	435 [3851] **13**	659 [5836] **13**	855 [7563] **12**	1025 [9071] **11**	1196 [10586] **9**	17
	15 [4]	94 [834] **31**	200 [1774] **30**	444 [3932] **28**	659 [5829] **28**	886 [7836] **26**	1066 [9434] **23**	1250 [11062] **21**	33
	23 [6]	86 [759] **48**	193 [1704] **47**	438 [3880] **44**	673 [5955] **44**	872 [7715] **41**	1073 [9499] **37**	1258 [11128] **32**	49
	30 [8]	73 [643] **64**	179 [1587] **63**	424 [3752] **60**	663 [5863] **60**	857 [7586] **57**	1098 [9718] **50**	1279 [11317] **43**	66
	38 [10]	52 [464] **81**	164 [1455] **80**	407 [3597] **78**	627 [5550] **78**	851 [7533] **75**	1067 [9444] **68**	1276 [11288] **61**	82
	45 [12]		141 [1248] **97**	379 [3350] **94**	630 [5575] **93**	832 [7363] **90**	1067 [9441] **83**	1273 [11264] **76**	98
	53 [14]		114 [1006] **113**	350 [3094] **112**	580 [5133] **111**	802 [7101] **108**	1013 [8964] **102**	1222 [10817] **94**	115
	61 [16]		83 [736] **130**	322 [2846] **129**	545 [4819] **127**	796 [7040] **123**	965 [8538] **119**	1190 [10528] **113**	131
	68 [18]		56 [497] **146**	275 [2434] **145**	526 [4657] **145**	737 [6519] **142**	956 [8464] **138**	1166 [10317] **128**	147
Max. Cont.	76 [20]			235 [2078] **162**	479 [4239] **161**	706 [6249] **158**	917 [8117] **154**	1122 [9933] **143**	164
	83 [22]			202 [1790] **179**	460 [4075] **178**	669 [5920] **176**	883 [7811] **170**		180
Max. Inter.	91 [24]			157 [1392] **195**	385 [3410] **194**	620 [5484] **190**	843 [7464] **186**		196

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

Rotor Width mm [in]	Theoretical Torque - Nm [lb-in]						
39.4 [1.553]	127 [1127]	255 [2253]	509 [4506]	764 [6760]	1018 [9013]	1273 [11266]	1528 [13519]

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

540

536 cm³ [32.7 in³] / rev

Pressure - bar [psi]	17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]
					Max. Cont.	Max. Inter.

Intermittent Ratings - 10% of Operation

Torque - Nm [lb-in], **Speed rpm**

Flow - lpm [gpm]	17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	Theoretical rpm
2 [0.5]	104 [921] **2**	197 [1748] **2**					4
4 [1]	126 [1111] **6**	230 [2031] **5**	467 [4136] **5**	699 [6183] **5**	939 [8310] **5**	1149 [10165] **4**	8
8 [2]	134 [1189] **13**	240 [2120] **13**	501 [4436] **12**	755 [6679] **12**	977 [8646] **11**	1185 [10484] **10**	15
15 [4]	120 [1058] **27**	232 [2055] **27**	510 [4510] **26**	757 [6697] **26**	988 [8740] **24**	1223 [10827] **23**	29
23 [6]	97 [859] **41**	224 [1984] **41**	505 [4469] **40**	783 [6930] **40**	993 [8787] **38**	1225 [10838] **34**	43
30 [8]	78 [692] **56**	213 [1887] **56**	484 [4285] **55**	750 [6635] **54**	983 [8698] **53**	1251 [11075] **48**	57
38 [10]	59 [523] **70**	190 [1678] **70**	455 [4026] **69**	728 [6445] **69**	959 [8487] **67**	1244 [11008] **62**	71
45 [12]		176 [1554] **84**	438 [3879] **83**	719 [6360] **83**	945 [8360] **80**	1203 [10646] **77**	85
53 [14]		139 [1233] **98**	418 [3703] **97**	682 [6035] **96**	952 [8421] **94**	1183 [10467] **91**	99
61 [16]		109 [963] **112**	385 [3407] **111**	668 [5908] **111**	899 [7957] **110**	1163 [10290] **105**	114
68 [18]		83 [736] **126**	356 [3154] **126**	612 [5417] **125**	869 [7694] **124**	1116 [9876] **123**	128
Max. Cont. 76 [20]			323 [2861] **140**	603 [5333] **139**	829 [7335] **138**	1109 [9816] **134**	142
83 [22]			297 [2629] **154**	537 [4753] **153**	792 [7011] **152**		156
Max. Inter. 91 [24]			215 [1905] **169**	491 [4349] **168**	750 [6639] **168**		170

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

Rotor Width	Theoretical Torque - Nm [lb-in]					
45.5 [1.791]	147 [1302]	294 [2604]	588 [5207]	883 [7811]	1177 [10414]	1471 [13018]

mm [in]

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

620

631 cm³ [38.5 in³] / rev

Pressure - bar [psi]	17 [250]	35 [500]	69 [1000]	104 [1500]	121 [1750]	155 [2250]
					Max. Cont.	Max. Inter.

Intermittent Ratings - 10% of Operation

Torque - Nm [lb-in], **Speed rpm**

Flow - lpm [gpm]	17 [250]	35 [500]	69 [1000]	104 [1500]	121 [1750]	155 [2250]	Theoretical rpm
2 [0.5]	120 [1060] **2**	228 [2021] **1**					3
4 [1]	136 [1202] **5**	264 [2332] **5**	535 [4733] **5**	796 [7048] **4**	935 [8275] **3**		6
8 [2]	142 [1256] **11**	276 [2445] **11**	571 [5055] **11**	853 [7550] **10**	985 [8717] **9**	1256 [11117] **7**	12
15 [4]	131 [1159] **23**	269 [2379] **23**	581 [5141] **23**	870 [7696] **22**	1008 [8920] **21**	1279 [11320] **17**	24
23 [6]	111 [982] **35**	260 [2300] **35**	575 [5087] **34**	883 [7811] **34**	1014 [8976] **33**	1285 [11368] **29**	36
30 [8]	91 [809] **47**	247 [2184] **47**	555 [4914] **46**	855 [7570] **45**	1000 [8853] **44**	1291 [11421] **40**	48
38 [10]	67 [595] **59**	220 [1943] **58**	526 [4655] **58**	833 [7372] **57**	972 [8602] **56**	1268 [11225] **52**	60
45 [12]		203 [1794] **71**	504 [4456] **70**	815 [7208] **70**	953 [8437] **69**	1240 [10977] **65**	72
53 [14]		160 [1419] **83**	476 [4213] **81**	778 [6888] **80**	930 [8233] **79**	1225 [10843] **78**	84
61 [16]		124 [1095] **95**	439 [3885] **94**	753 [6666] **93**	895 [7917] **92**	1187 [10509] **90**	96
68 [18]		91 [801] **107**	407 [3599] **107**	703 [6223] **106**	852 [7537] **105**	1147 [10147] **104**	108
Max. Cont. 76 [20]			358 [3172] **119**	675 [5974] **118**	815 [7215] **117**	1100 [9736] **115**	120
83 [22]			328 [2901] **131**	614 [5431] **131**	759 [6715] **130**		132
Max. Inter. 91 [24]			247 [2185] **143**	556 [4922] **142**	706 [6249] **141**		144

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

Rotor Width	Theoretical Torque - Nm [lb-in]					
54.0 [2.125]	173 [1532]	346 [3064]	692 [6127]	1039 [9191]	1212 [10729]	1559 [13794]

mm [in]

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

750	Pressure - bar [psi]			Max. Cont.	Peak
748 cm³ [45.6 in³] / rev	17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]

Torque - Nm [lb-in], **Speed rpm** — **Intermittent Ratings -** 10% of Operation

Flow - lpm [gpm]	17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	Theoretical rpm
2 [0.5]	147 [1299] **2**	281 [2487] **1**				3
4 [1]	156 [1379] **4**	322 [2852] **4**	652 [5768] **4**	967 [8554] **3**	1308 [11571] **3**	6
8 [2]	158 [1403] **9**	339 [3003] **9**	693 [6134] **9**	1027 [9088] **8**	1360 [12033] **7**	11
15 [4]	153 [1350] **19**	331 [2933] **19**	705 [6241] **19**	1064 [9419] **18**	1416 [12534] **16**	21
23 [6]	135 [1194] **29**	321 [2840] **29**	697 [6166] **28**	1059 [9373] **28**	1408 [12462] **26**	31
30 [8]	114 [1008] **40**	304 [2690] **40**	678 [6002] **39**	1039 [9197] **38**	1421 [12573] **34**	41
38 [10]	82 [722] **50**	271 [2395] **49**	648 [5733] **49**	1015 [8980] **48**	1371 [12130] **47**	51
45 [12]	54 [477] **60**	249 [2207] **60**	616 [5452] **59**	983 [8699] **59**	1345 [11902] **56**	61
53 [14]		197 [1739] **70**	577 [5104] **69**	946 [8372] **68**	1311 [11600] **67**	71
61 [16]		150 [1325] **80**	533 [4718] **79**	905 [8008] **78**	1271 [11249] **76**	82
68 [18]		105 [927] **90**	494 [4374] **90**	860 [7614] **89**	1225 [10843] **88**	92
Max. Cont. 76 [20]		62 [552] **100**	423 [3741] **100**	805 [7123] **99**	1173 [10385] **98**	102
83 [22]			385 [3404] **110**	747 [6608] **110**		112
Max. Inter. 91 [24]			302 [2669] **121**	670 [5932] **120**		122

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

Rotor Width	Theoretical Torque - Nm [lb-in]				
63.5 [2.501]	205 [1815]	410 [3631]	821 [7261]	1231 [10892]	1641 [14522]

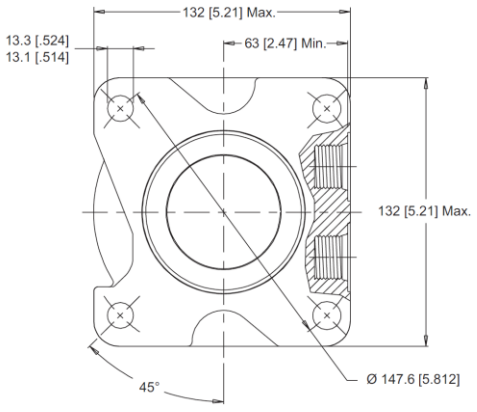
mm [in] — Displacement tested at 54°C [129°F] with an oil viscosity of 46cSt [213 SUS]

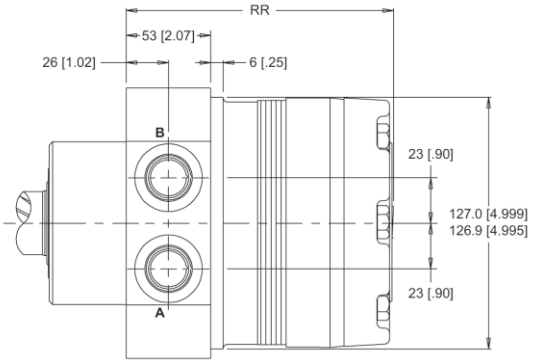
- Performance data is typical. Performance of production units varies slightly from one motor to another. Operating at maximum continuous pressure and maximum continuous flow simultaneously is not recommended.

RE 510/511 Series Housing

- The dimensions shown are without paint. Paint thickness can be up to 0.13 [.005].

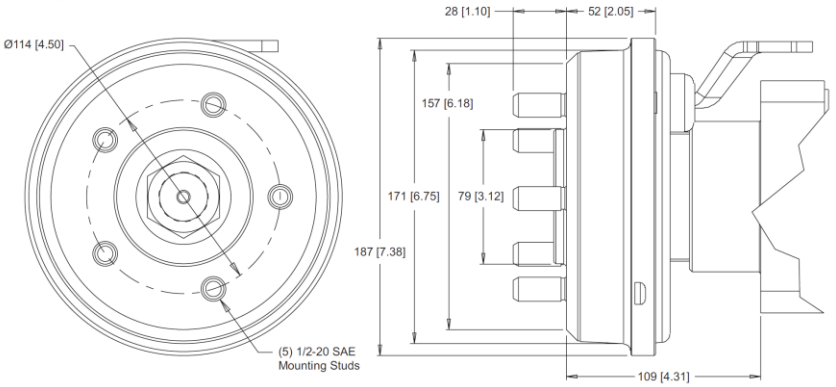
4-HOLE, WHEEL BRAKE MOUNT, ALIGNED PORTS — **X31** 7/8-14 UNF **X38** G 1/2



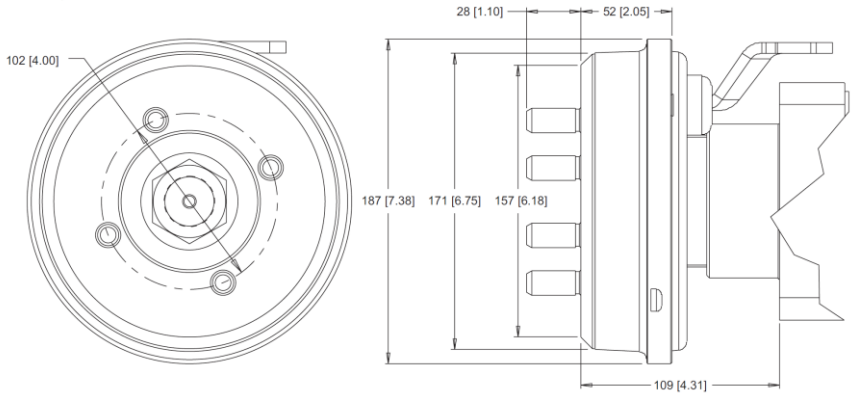


Hub Option Details

5-BOLT, WHEEL HUB

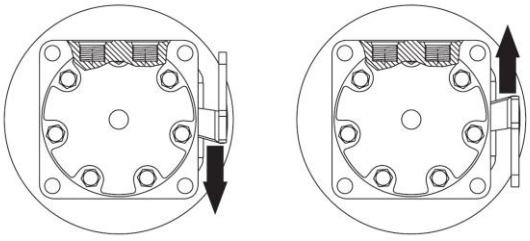


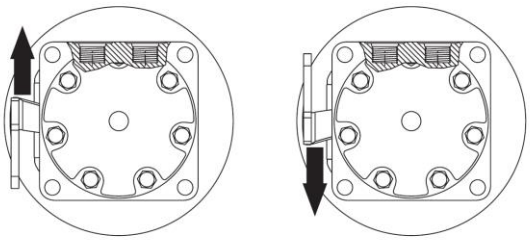
4-BOLT, WHEEL HUB



RE 510/511 Series Technical Information

Brake Lever Position & Pull Direction

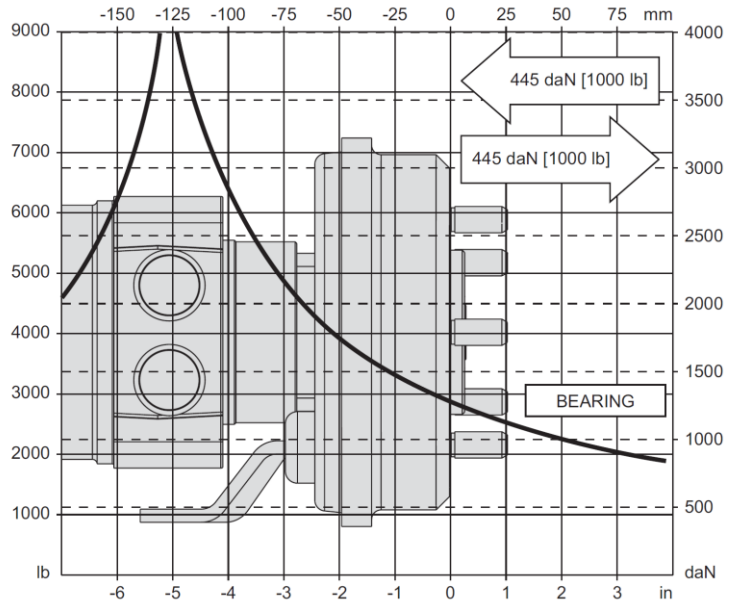




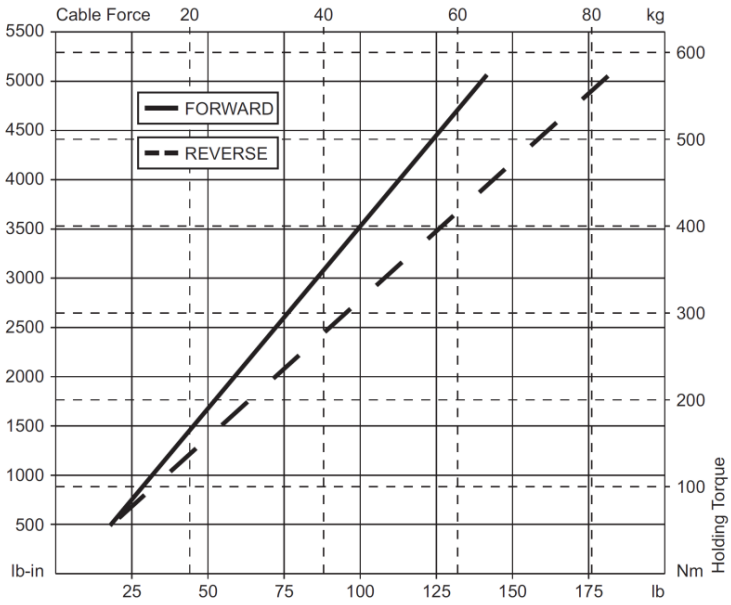
Allowable Shaft Load / Bearing Curve

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.

Motor Brake



Brake Holding Torque



LENGTH & WEIGHT CHART

Dimension RR is the overall motor length from the rear of the motor to the mounting flange surface and are referenced on detailed housing drawings listed above.

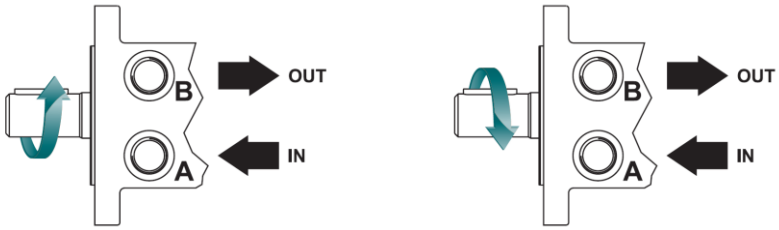
RR	Length	Weight
#	mm [in]	kg [lb]
120	156 [6.15]	14.9 [42.9]
160	156 [6.15]	14.9 [42.9]
200	159 [6.29]	15.2 [43.7]
230	162 [6.38]	15.3 [43.9]
260	165 [6.48]	15.6 [44.5]
300	168 [6.61]	16.0 [45.3]
350	182 [7.16]	17.1 [47.7]
375	174 [6.86]	16.5 [46.5]
470	182 [7.16]	17.1 [47.7]
540	188 [7.40]	17.6 [49.0]
620	196 [7.77]	18.4 [50.5]
750	206 [8.11]	19.0 [52.0]

- 510/511 motor.brake series motor weights can vary ± 0.5 kg [1 lb] depending on model configurations such as housing, shaft, endcover, options etc.

RE 510/511 Series Ordering Information

1. CHOOSE SERIES DESIGNATION

510 Standard Motor **511** Reverse Rotation



- The 510 & 511 series is bi-directional. For applications requiring the motor to rotate in only one direction, shaft seal life may be prolonged by pressurizing the A port of the motor.

2. SELECT A DISPLACEMENT OPTION

120	121 cm^3/rev [7.4 in^3/rev]	**350**	348 cm^3/rev [21.1 in^3/rev]
160	162 cm^3/rev [9.9 in^3/rev]	**375**	375 cm^3/rev [22.8 in^3/rev]
200	204 cm^3/rev [12.4 in^3/rev]	**470**	465 cm^3/rev [28.3 in^3/rev]
230	232 cm^3/rev [14.2 in^3/rev]	**540**	536 cm^3/rev [32.7 in^3/rev]
260	261 cm^3/rev [15.9 in^3/rev]	**750**	748 cm^3/rev [45.6 in^3/rev]
300	300 cm^3/rev [18.3 in^3/rev]		

3. SELECT MOUNT & PORT OPTION

X31 4-Hole, Wheel Brake Mount, Aligned Ports, 7/8-14 UNF

X38 4-Hole, Wheel Brake Mount, Aligned Ports, G 1/2

4. SELECT A SHAFT OPTION

31	1-1/4" Tapered

5. SELECT A PAINT OPTION

A	Black
Z	No Paint

6. SELECT A VALVE CAVITY/CARTRIDGE OPTION

A	None

7. SELECT AN ADD-ON OPTION

A	Standard

8. SELECT A MISCELLANEOUS OPTION

YA	5 Bolt Hub, Position 2, Right Hand
YB	5 Bolt Hub, Position 2, Left Hand
YE	4 Bolt Hub, Position 2, Right Hand
YF	4 Bolt Hub, Position 2, Left Hand
ZA	5 Bolt Hub, Position 1, Left Hand
ZB	5 Bolt Hub, Position 1, Right Hand
ZE	4 Bolt Hub, Position 1, Left Hand
ZF	4 Bolt Hub, Position 1, Right Hand

Chapter 6

Hydraulic Motor/Brakes - DT

Topics:

DT Product Line information

Overview

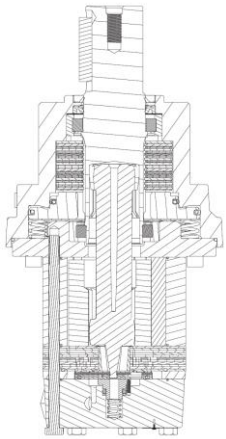
The most amazing aspect of the DT Series motor is its huge torque potential from its relatively small size. The DT Series motor is capable of producing output torque comparable to competitive designs, but from a package that is both shorter and lighter. The savings in space and weight in no way compromises durability, as the motor uses massive shafts, bearings and drive links to transmit the torque produced by this powerful package. The use of a case drain allows reduced pressure on the shaft seal while maintaining driveline lubrication for maximum motor life. Standard mounting and shaft options offer interchangeability with competitive designs. An internal drain option is also available.

Features / Benefits

- Heavy-Duty Roller Bearing supports high side loads and receives forced lubrication for cooling and increased life.
- Compact Housing contributes to high power-to-weight ratio of motor and offers front and rear mounting flanges.
- Heavy-Duty Drive Link receives forced lubrication for long life and is capable of extreme duty cycles.
- Roller Stator® Motor available in displacements up to 2093 cm3 [127.7 in3] for high torque output.
- Three-Zone Orbiting Valve precisely meters oil to produce exceptional volumetric efficiencies.

Series Descriptions

710 - Hydraulic Motor
With Integral Hydraulic Brake



Typical Applications

Heavy-duty wheel drives, augers, mixers, pumping units, conveyors, boring machines, rotators, mining equipment, forestry equipment and more and more.

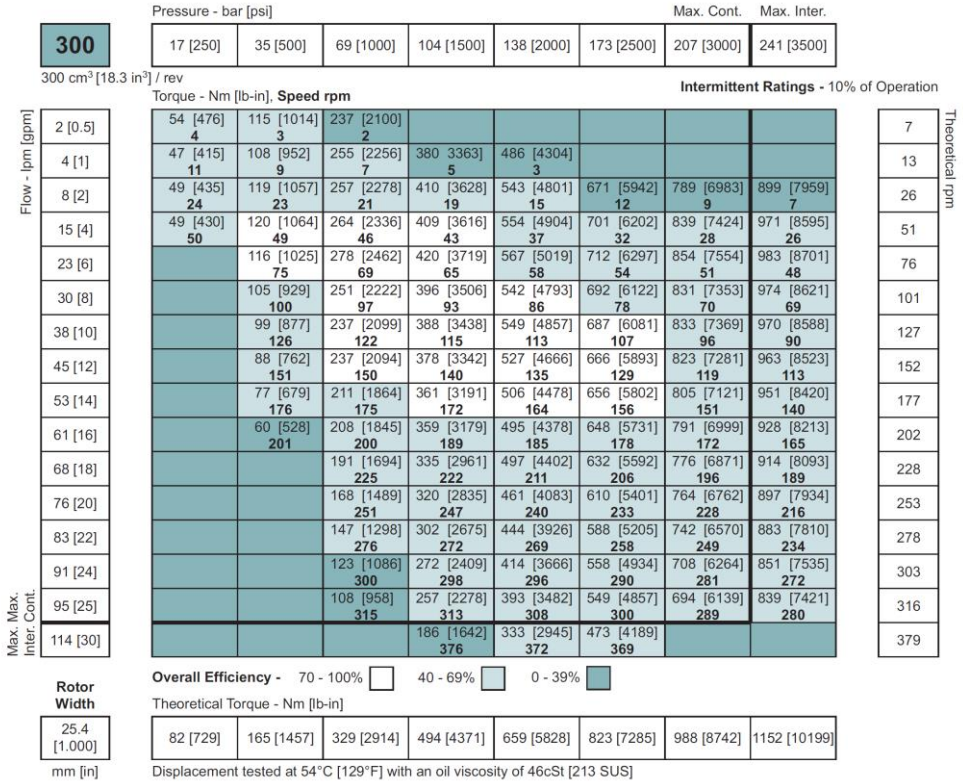
Specifications

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
300	300 [18.3]	320	380	95 [25]	114 [30]	819 [7250]	955 [8450]	207 [3000]	241 [3500]	259 [3750]
375	374 [22.8]	250	300	95 [25]	114 [30]	1045 [9250]	1127 [9975]	207 [3000]	224 [3250]	241 [3500]
470	464 [28.3]	200	240	95 [25]	114 [30]	1071 [9475]	1390 [12300]	172 [2500]	224 [3250]	241 [3500]
540	536 [32.7]	180	210	95 [25]	114 [30]	1277 [11300]	1525 [13500]	172 [2500]	207 [3000]	241 [3500]
750	747 [45.6]	130	150	95 [25]	114 [30]	1780 [15750]	2090 [18500]	172 [2500]	207 [3000]	241 [3500]
930	929 [56.7]	100	120	95 [25]	114 [30]	1780 [15750]	2141 [18950]	138 [2000]	172 [2500]	207 [3000]
1K1	1047 [63.9]	90	110	95 [25]	114 [30]	1915 [16950]	2316 [20500]	138 [2000]	172 [2500]	207 [3000]
1K5	1495 [91.2]	60	70	95 [25]	114 [30]	2090 [18500]	2316 [20500]	103 [1500]	121 [1750]	138 [2000]
2K1	2093 [127.7]	40	50	95 [25]	114 [30]	2661 [23550]	3342 [29580]	103 [1500]	121 [1750]	138 [2000]

- 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.

DT Displacement Performance

- 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.



375

375 cm³ [22.8 in³] / rev

Pressure - bar [psi]

17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	Max. Cont. 207 [3000]	Max. Inter. 224 [3250]

Torque - Nm [lb-in], **Speed rpm**

Intermittent Ratings - 10% of Operation

Flow - lpm [gpm]									Theoretical rpm
2 [0.5]	65 [574] **4**	144 [1272] **3**	302 [2670] **2**	449 [3970] **1**					6
4 [1]	66 [583] **9**	152 [1345] **8**	312 [2757] **7**	475 [4208] **5**	625 [5535] **4**				11
8 [2]	67 [596] **19**	154 [1365] **18**	329 [2907] **17**	496 [4388] **14**	644 [5695] **12**	805 [7122] **10**	963 [8524] **8**	1050 [9288] **7**	21
15 [4]	71 [627] **40**	158 [1400] **39**	337 [2982] **37**	513 [4536] **34**	680 [6020] **30**	858 [7596] **27**	1013 [8962] **25**	1099 [9723] **23**	41
23 [6]	64 [570] **60**	151 [1334] **60**	336 [2969] **58**	520 [4598] **54**	694 [6141] **49**	871 [7704] **45**	1048 [9275] **41**	1115 [9867] **41**	61
30 [8]	53 [467] **81**	151 [1337] **80**	325 [2876] **78**	512 [4532] **73**	691 [6113] **69**	873 [7724] **63**	1051 [9304] **60**	1126 [9964] **59**	82
38 [10]		131 [1161] **101**	313 [2768] **99**	502 [4439] **95**	686 [6075] **89**	884 [7824] **82**	1049 [9281] **79**	1131 [10011] **77**	102
45 [12]		112 [995] **121**	308 [2725] **120**	494 [4375] **116**	685 [6059] **109**	862 [7626] **103**	1053 [9321] **98**	1137 [10066] **97**	122
53 [14]		99 [878] **141**	283 [2508] **140**	469 [4149] **136**	645 [5705] **131**	844 [7467] **125**	1013 [8965] **117**	1116 [9877] **115**	142
61 [16]		75 [662] **162**	262 [2319] **161**	443 [3923] **160**	631 [5587] **155**	823 [7283] **148**	1009 [8930] **143**	1114 [9859] **136**	163
68 [18]			248 [2198] **181**	427 [3779] **178**	612 [5416] **175**	804 [7119] **167**	1005 [8895] **160**	1091 [9653] **156**	183
76 [20]			218 [1925] **202**	403 [3568] **200**	583 [5161] **195**	778 [6886] **189**	966 [8549] **178**	1071 [9474] **173**	203
83 [22]			189 [1676] **222**	375 [3318] **221**	561 [4967] **217**	754 [6669] **211**	942 [8335] **201**	1036 [9171] **196**	223
91 [24]			155 [1374] **242**	344 [3041] **240**	535 [4732] **237**	724 [6410] **229**			244
95 [25]				321 [2839] **252**	519 [4596] **249**	710 [6283] **241**			254
Max. Max. Inter. Cont. 114 [30]				238 [2110] **303**	432 [3820] **301**	622 [5503] **296**			304

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

Rotor Width

31.8 [1.252]

mm [in]

Theoretical Torque - Nm [lb-in]

103 [908]	205 [1815]	410 [3631]	615 [5446]	821 [7261]	1026 [9076]	1231 [10892]	1333 [11799]

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

470

465 cm³ [28.3 in³] / rev

Pressure - bar [psi]

17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	Max. Cont. 173 [2500]	207 [3000]	Max. Inter. 224 [3250]

Torque - Nm [lb-in], **Speed rpm**

Intermittent Ratings - 10% of Operation

Flow - lpm [gpm]									Theoretical rpm
2 [0.5]	86 [762] **3**	201 [1780] **2**	401 [3553] **2**						5
4 [1]	92 [817] **7**	195 [1728] **7**	406 [3597] **6**	610 [5395] **5**	806 [7137] **4**				9
8 [2]	94 [835] **15**	199 [1761] **15**	418 [3702] **14**	631 [5580] **13**	832 [7365] **11**	1042 [9226] **9**	1239 [10961] **8**		17
15 [4]	92 [815] **32**	202 [1784] **32**	426 [3769] **60**	646 [5717] **28**	849 [7513] **24**	1066 [9430] **23**	1272 [11256] **21**	1381 [12217] **19**	33
23 [6]	82 [729] **48**	203 [1799] **47**	423 [3744] **46**	647 [5725] **43**	855 [7565] **39**	1070 [9473] **36**	1275 [11287] **34**	1365 [12083] **32**	49
30 [8]	67 [595] **65**	185 [1641] **64**	414 [3663] **63**	642 [5683] **60**	867 [7671] **54**	1078 [9538] **47**	1300 [11508] **46**	1398 [12367] **44**	66
38 [10]	52 [459] **81**	170 [1503] **80**	399 [3532] **79**	630 [5573] **78**	857 [7584] **69**	1077 [9531] **63**	1283 [11352] **61**	1393 [12323] **58**	82
45 [12]		153 [1354] **97**	380 [3366] **96**	613 [5422] **93**	842 [7454] **88**	1072 [9488] **77**	1302 [11523] **74**	1394 [12334] **68**	98
53 [14]		127 [1121] **114**	359 [3173] **113**	591 [5229] **110**	823 [7282] **104**	1057 [9350] **97**	1270 [11242] **89**	1392 [12318] **85**	115
61 [16]		100 [888] **160**	335 [2964] **129**	564 [4993] **127**	798 [7061] **119**	1030 [9118] **114**	1254 [11101] **108**	1369 [12118] **102**	131
68 [18]		67 [595] **146**	304 [2689] **145**	535 [4734] **143**	765 [6772] **137**	1003 [8875] **132**	1229 [10877] **120**	1348 [11926] **114**	147
76 [20]			274 [2428] **162**	504 [4458] **160**	733 [6485] **155**	965 [8536] **148**	1197 [10592] **139**	1318 [11668] **136**	164
83 [22]			226 [2003] **178**	458 [4050] **175**	691 [6118] **172**	928 [8215] **165**	1150 [10181] **156**	1266 [11200] **154**	180
91 [24]			176 [1554] **194**	415 [3670] **192**	669 [5917] **190**	885 [7833] **183**			196
95 [25]				389 [3442] **203**	632 [5589] **198**	867 [7676] **190**			205
Max. Max. Inter. Cont. 114 [30]				277 [2451] **243**	514 [4549] **240**	755 [6684] **235**			245

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

Rotor Width

39.4 [1.553]

mm [in]

Theoretical Torque - Nm [lb-in]

127 [1127]	255 [2253]	509 [4506]	764 [6760]	1018 [9013]	1273 [1126]	1528 [13519]	1655 [14646]

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

540

536 cm³ [32.7 in³] / rev

Pressure - bar [psi]

17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500] Max. Cont.	207 [3000] Max. Inter.

Torque - Nm [lb-in], **Speed rpm**

Intermittent Ratings - 10% of Operation

Flow - lpm [gpm]	17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	207 [3000]	Theoretical rpm
2 [0.5]	103 [908] **2**	215 [1607] **2**	421 [3722] **1**					4
4 [1]	104 [917] **6**	228 [2016] **5**	454 [4015] **4**	666 [5897] **3**	874 [7730] **1**			8
8 [2]	108 [954] **13**	231 [2043] **12**	474 [4191] **11**	704 [6231] **9**	925 [8190] **5**	1153 [10201] **4**		15
15 [4]	102 [906] **27**	232 [2052] **26**	503 [4448] **24**	756 [6692] **21**	994 [8799] **18**	1221 [10806] **15**	1461 [12930] **13**	29
23 [6]	98 [866] **42**	230 [2038] **41**	498 [4404] **39**	766 [6774] **36**	1023 [9049] **30**	1268 [11225] **27**	1494 [13219] **24**	43
30 [8]	84 [744] **56**	213 [1883] **55**	484 [4280] **53**	754 [6669] **49**	1032 [9130] **42**	1273 [11262] **38**	1524 [13486] **34**	57
38 [10]	63 [561] **70**	195 [1727] **69**	466 [4122] **68**	737 [6519] **64**	1006 [8903] **57**	1285 [11374] **49**	1532 [13556] **46**	71
45 [12]	42 [373] **84**	179 [1586] **83**	444 [3928] **82**	717 [6349] **76**	984 [8710] **72**	1274 [11277] **65**	1518 [13436] **57**	85
53 [14]		146 [1295] **97**	421 [3722] **95**	694 [6139] **93**	964 [8529] **87**	1253 [11091] **80**	1512 [13381] **70**	99
61 [16]		116 [1025] **113**	391 [3460] **111**	663 [5865] **108**	930 [8230] **103**	1206 [10675] **97**	1479 [13086] **84**	114
68 [18]		90 [798] **127**	356 [3153] **125**	629 [5563] **123**	900 [7969] **116**	1192 [10550] **107**	1451 [12841] **100**	128
76 [20]		56 [498] **141**	330 [2923] **139**	595 [5265] **137**	887 [7850] **133**	1158 [10250] **123**	1421 [12578] **114**	142
83 [22]			278 [2464] **155**	549 [4859] **153**	822 [7271] **148**	1121 [9919] **136**	1388 [12283] **133**	156
91 [24]			243 [2154] **169**	508 [4494] **166**	794 [7024] **164**	1054 [9325] **156**		170
95 [25]			220 [1948] **176**	486 [4299] **174**	762 [6741] **169**	1025 [9075] **163**		177
Max. Max. Inter. Cont. 114 [30]			90 [800] **211**	366 [3237] **210**	638 [5649] **207**	920 [8144] **203**		212

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

Rotor Width	Theoretical Torque - Nm [lb-in]						
45.5 [1.791] mm [in]	147 [1302]	294 [2604]	588 [5207]	883 [7811]	1177 [10414]	1471 [13018]	1765 [15621]

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

750

748 cm³ [45.6 in³] / rev

Pressure - bar [psi]

17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500] Max. Cont.	207 [3000] Max. Inter.

Torque - Nm [lb-in], **Speed rpm**

Intermittent Ratings - 10% of Operation

Flow - lpm [gpm]	17 [250]	35 [500]	69 [1000]	104 [1500]	138 [2000]	173 [2500]	207 [3000]	Theoretical rpm
2 [0.5]	144 [1276] **1**	290 [2566] **1**						3
4 [1]	154 [1367] **4**	323 [2863] **3**	669 [5917] **2**	931 [8242] **2**				6
8 [2]	162 [1435] **9**	341 [3015] **9**	712 [6302] **7**	1021 [9038] **6**	1305 [11550] **3**			11
15 [4]	158 [1400] **19**	348 [3080] **19**	723 [6399] **17**	1082 [9578] **15**	1402 [12410] **11**			21
23 [6]	144 [1273] **30**	331 [2927] **29**	714 [6317] **27**	1083 [9583] **24**	1433 [12678] **20**	1744 [15430] **16**		31
30 [8]	126 [1116] **40**	328 [2900] **39**	697 [6167] **37**	1072 [9486] **34**	1451 [12843] **25**	1769 [15658] **20**		41
38 [10]	104 [922] **50**	291 [2574] **50**	675 [5976] **47**	1055 [9334] **44**	1445 [12785] **36**	1786 [15805] **28**	2076[18373] **19**	51
45 [12]	77 [682] **60**	269 [2382] **59**	655 [5792] **58**	1032 [9136] **54**	1431 [12668] **49**	1786 [15801] **36**	2094[18528] **30**	61
53 [14]	46 [410] **70**	239 [2116] **69**	627 [5545] **68**	1003 [8880] **65**	1407 [12451] **59**	1767 [15634] **45**	2099[18578] **37**	71
61 [16]		201 [1780] **81**	584 [5164] **79**	971 [8592] **76**	1345 [11907] **70**	1743 [15422] **57**	2065[18271] **44**	82
68 [18]		161 [1421] **91**	545 [4819] **90**	928 [8209] **86**	1306 [11556] **80**	1709 [15120] **69**		92
76 [20]		120 [1058] **101**	497 [4395] **100**	863 [7635] **97**	1260 [11154] **90**			102
83 [22]			444 [3926] **110**	831 [7351] **108**	1213 [10737] **101**			112
91 [24]			389 [3447] **121**	785 [6947] **117**	1196 [10581] **111**			122
95 [25]			368 [3255] **126**	757 [6697] **124**	1144 [10126] **120**			127
Max. Max. Inter. Cont. 114 [30]			205 [1813] **151**	613 [5428] **149**	979 [8665] **146**			152

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

Rotor Width	Theoretical Torque - Nm [lb-in]						
63.5 [2.501] mm [in]	205 [1815]	410 [3631]	821 [7261]	1231 [10892]	1641 [14522]	2051 [18153]	2462 [21783]

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

930

929 cm³ [56.7 in³] / rev

Pressure - bar [psi]

17 [250]	35 [500]	52 [750]	69 [1000]	86 [1250]	104 [1500]	121 [1750]	138 [2000] Max. Cont.	155 [2250]	173 [2500] Max. Inter.

Torque - Nm [lb-in], **Speed rpm**

Intermittent Ratings - 10% of Operation

Flow - lpm [gpm]	17 [250]	35 [500]	52 [750]	69 [1000]	86 [1250]	104 [1500]	121 [1750]	138 [2000]	155 [2250]	173 [2500]	Theoretical rpm
2 [0.5]	180 [1590] **1**	387 [3423] **1**	607 [5368] **1**	801 [7089] **1**							3
4 [1]	196 [1734] **4**	418 [3696] **3**	653 [5780] **3**	864 [7649] **3**	1067 [9447] **3**	1294 [11451] **3**					5
8 [2]	205 [1816] **8**	442 [3907] **7**	680 [6015] **7**	877 [7764] **7**	1117 [9886] **7**	1300 [11501] **6**	1510 [13365] **5**				9
15 [4]	198 [1753] **16**	432 [3825] **16**	664 [5878] **15**	906 [8021] **15**	1121 [9924] **15**	1338 [11840] **14**	1556 [13769] **13**	1730 [15306] **11**			17
23 [6]	185 [1633] **24**	420 [3719] **24**	651 [5765] **24**	908 [8034] **24**	1123 [9935] **23**	1355 [11991] **22**	1543 [13651] **20**	1794 [15873] **18**	1981 [17532] **16**		25
30 [8]	162 [1438] **32**	404 [3576] **31**	636 [5624] **30**	893 [7900] **30**	1107 [9800] **29**	1340 [11854] **28**	1581 [13988] **27**	1776 [15716] **24**	1985 [17570] **22**	2105 [18632] **17**	33
38 [10]	125 [1109] **40**	368 [3253] **40**	626 [5536] **39**	845 [7476] **38**	1087 [9620] **38**	1314 [11625] **36**	1497 [13251] **34**	1736 [15364] **31**	1956 [17306] **28**	2153 [19054] **24**	41
45 [12]	91 [807] **48**	341 [3018] **47**	578 [5111] **46**	815 [7213] **45**	1072 [9487] **44**	1314 [11630] **42**	1525 [13492] **41**	1713 [15159] **36**	1946 [17222] **33**	2133 [18873] **32**	49
53 [14]	35 [310] **57**	290 [2565] **56**	533 [4715] **55**	765 [6772] **54**	1024 [9059] **52**	1240 [10974] **50**	1487 [13155] **49**	1727 [15287] **45**	1945 [17216] **43**	2168 [19188] **36**	58
61 [16]		239 [2118] **64**	484 [4281] **63**	726 [6429] **62**	959 [8488] **61**	1210 [10708] **59**	1450 [12830] **57**	1696 [15008] **54**	1925 [17039] **50**	2140 [18934] **46**	66
68 [18]		205 [1811] **72**	440 [3891] **72**	701 [6202] **70**	920 [8143] **69**	1177 [10418] **67**	1422 [12580] **65**	1643 [14538] **64**	1893 [16741] **58**	2105 [18625] **55**	74
76 [20]		150 [1325] **81**	409 [3616] **80**	632 [5590] **79**	801 [7091] **78**	1100 [9733] **76**	1505 [12135] **75**	1599 [14148] **72**	1859 [16454] **67**	2060 [18230] **63**	82
83 [22]		99 [875] **89**	336 [2977] **88**	581 [5139] **87**	837 [7403] **86**	1056 [9342] **83**	1305 [11553] **83**	1561 [13816] **80**	1799 [15918] **77**	2025 [17925] **71**	90
91 [24]			282 [2497] **97**	501 [4438] **96**	766 [6778] **94**	1021 [9038] **93**	1266 [11201] **92**	1489 [13179] **89**	1752 [15505] **86**	1969 [17427] **82**	98
95 [25] Max. Inter. Cont.			241 [2137] **101**	496 [4389] **100**	722 [6390] **100**	974 [8621] **97**	1214 [10743] **96**	1454 [12863] **93**	1727 [15286] **89**	1956 [17309] **84**	102
114 [30] Max.			66 [582] **122**	300 [2652] **121**	532 [4711] **120**	781 [6914] **118**	1044 [9235] **118**	1271 [11248] **116**			123

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

Rotor Width	Theoretical Torque - Nm [lb-in]									
78.9 [3.106] mm [in]	255 [2257]	510 [4514]	765 [6771]	1020 [9029]	1275 [11286]	1530 [13543]	1785 [15800]	2040 [18057]	2296 [20314]	2551 [22572]

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

1K1

1047 cm³ [63.9 in³] / rev

Pressure - bar [psi]

17 [250]	35 [500]	52 [750]	69 [1000]	86 [1250]	104 [1500]	121 [1750]	138 [2000] Max. Cont.	155 [2250]	173 [2500] Max. Inter.

Torque - Nm [lb-in], **Speed rpm**

Intermittent Ratings - 10% of Operation

Flow - lpm [gpm]	17 [250]	35 [500]	52 [750]	69 [1000]	86 [1250]	104 [1500]	121 [1750]	138 [2000]	155 [2250]	173 [2500]	Theoretical rpm
2 [0.5]	217 [1918] **1**	455 [4026] **1**	671 [5940] **0.9**	890 [7879] **0.6**							2
4 [1]	206 [1821] **3**	498 [4410] **2**	706 [6251] **2**	935 [8273] **2**	1189 [10518] **2**						4
8 [2]	224 [1985] **6**	498 [4407] **6**	754 [6672] **6**	983 [8700] **5**	1222 [10810] **5**	1428 [12635] **4**					8
15 [4]	224 [1980] **14**	472 [4180] **13**	754 [6669] **13**	1011 [8946] **13**	1262 [11169] **11**	1486 [13147] **10**	1697 [15014] **9**				15
23 [6]	170 [1500] **21**	487 [4314] **21**	739 [6538] **20**	1020 [9023] **19**	1238 [10956] **18**	1501 [13286] **16**	1695 [14998] **14**	1914 [16936] **12**			22
30 [8]	164 [1451] **28**	431 [3814] **28**	709 [6270] **28**	970 [8580] **27**	1241 [10986] **26**	1481 [13106] **23**	1727 [15280] **20**	1942 [17185] **16**	2144 [18971] **9**		29
38 [10]	129 [1143] **36**	401 [3546] **36**	675 [5975] **35**	944 [8356] **34**	1208 [10688] **32**	1455 [12879] **29**	1714 [15168] **26**	1919 [16982] **26**	2145 [18983] **17**		37
45 [12]	98 [871] **43**	359 [3176] **43**	624 [5526] **42**	894 [7915] **41**	1148 [10163] **40**	1420 [12569] **37**	1693 [14981] **31**	1893 [16756] **25**	2133 [18879] **22**	2311 [20456] **19**	44
53 [14]	44 [390] **50**	312 [2761] **50**	580 [5129] **49**	851 [7535] **49**	1122 [9933] **47**	1383 [12237] **44**	1612 [14263] **40**	1856 [16424] **33**	2098 [18569] **29**	2327 [20596] **25**	51
61 [16]		251 [2220] **57**	516 [4569] **56**	776 [6871] **56**	1062 [9402] **55**	1320 [11678] **52**	1587 [14045] **50**	1837 [16261] **38**	2082 [18426] **30**	2291 [20275] **29**	58
68 [18]		190 [1678] **65**	458 [4053] **65**	706 [6252] **64**	1002 [8869] **62**	1272 [11252] **60**	1552 [13738] **59**	1794 [15877] **52**	2051 [18147] **41**	2275 [20130] **33**	66
76 [20]		117 [1033] **72**	390 [3453] **71**	652 [5774] **71**	930 [8227] **70**	1187 [10502] **69**	1596 [12874] **64**	1723 [15246] **58**	2001 [17705] **57**	2228 [19716] **45**	73
83 [22]		50 [444] **79**	310 [2741] **79**	569 [5034] **78**	847 [7493] **77**	1113 [9846] **76**	1380 [12214] **74**	1650 [14599] **67**	1927 [17055] **62**	2138 [18924] **51**	80
91 [24]			210 [1862] **86**	491 [4346] **85**	755 [6677] **84**	1018 [9007] **83**	1288 [11398] **81**	1557 [13777] **76**	1827 [16164] **71**	2101 [18591] **61**	87
95 [25] Max. Inter. Cont.			185 [1635] **90**	463 [4096] **90**	710 [6281] **89**	963 [8519] **88**	1232 [10901] **85**	1497 [13247] **82**	1790 [15844] **76**	2028 [17950] **71**	91
114 [30] Max.				202 [1789] **108**	477 [4217] **107**	730 [6460] **106**	1013 [8962] **105**	1237 [10947] **104**			109

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

Rotor Width	Theoretical Torque - Nm [lb-in]									
88.9 [3.502] mm [in]	287 [2544]	575 [5088]	862 [7631]	1150 [10175]	1437 [12719]	1725 [15263]	2012 [17807]	2300 [20350]	2587 [22894]	2874 [25438]

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

1K5

1495 cm³ [91.2 in³] / rev

Pressure - bar [psi] | Max. Cont. | Max. Inter.

17 [250]	35 [500]	52 [750]	69 [1000]	86 [1250]	104 [1500]	121 [1750]

Torque - Nm [lb-in], **Speed rpm** — **Intermittent Ratings -** 10% of Operation

Flow - lpm [gpm]	17 [250]	35 [500]	52 [750]	69 [1000]	86 [1250]	104 [1500]	121 [1750]	Theoretical rpm
2 [0.5]	305 [2703] **0.9**	648 [5736] **0.6**						2
4 [1]	336 [2978] **2**	693 [6128] **1**	1011 [8942] **1**					3
8 [2]	351 [3106] **4**	729 [6454] **4**	1085 [9597] **3**	1364 [12072] **3**				6
15 [4]	331 [2925] **9**	712 [6304] **9**	1116 [9879] **8**	1491 [13191] **7**	1771 [15668] **7**			11
23 [6]	297 [2629] **15**	681 [3023] **14**	1088 [9632] **13**	1464 [12952] **12**	1770 [15662] **10**			16
30 [8]	247 [2183] **20**	640 [5662] **19**	1038 [9188] **18**	1430 [12655] **17**	1793 [15864] **15**	2123 [18786] **9**		21
38 [10]	197 [1740] **25**	583 [5159] **24**	1001 [8860] **23**	1377 [12189] **22**	1749 [15479] **19**	2090 [18498] **14**		26
45 [12]	131 [1157] **30**	531 [4695] **29**	940 [8315] **28**	1330 [11770] **27**	1702 [15066] **24**	2041 [18059] **19**	2329 [20613] **14**	31
53 [14]	67 [594] **36**	484 [4282] **35**	869 [7689] **33**	1267 [11217] **32**	1642 [14532] **30**	1990 [17612] **24**	2300 [20353] **15**	36
61 [16]		391 [3457] **40**	769 [6805] **39**	1172 [10374] **37**	1567 [13866] **36**	1914 [16941] **32**	2258 [19986] **21**	41
68 [18]		294 [2602] **45**	686 [6072] **44**	1076 [9523] **43**	1489 [13177] **40**	1846 [16334] **38**	2188 [19366] **27**	46
76 [20]		182 [1607] **50**	614 [5435] **49**	988 [8746] **48**	1392 [12320] **47**	1743 [15429] **44**	2301 [18553] **37**	51
83 [22]		87 [770] **55**	487 [4310] **54**	872 [7720] **53**	1283 [11356] **52**	1632 [14442] **48**	2021 [17883] **46**	56
91 [24]			456 [4032] **60**	749 [6632] **60**	1146 [10143] **58**	1533 [13570] **58**	1872 [16568] **50**	61
95 [25]			293 [2589] **63**	704 [6232] **62**	1052 [9313] **62**	1465 [12961] **59**	1843 [16306] **53**	64
Max. Max. Inter. Cont. 114 [30]				246 [2174] **75**	645 [5711] **74**	1047 [9265] **73**		76

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

Rotor Width

127.1 [5.003]

mm [in]

Theoretical Torque - Nm [lb-in]

410 [3631]	821 [7261]	1231 [10892]	1641 [14522]	2051 [18153]	2462 [21783]	2872 [25414]

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

2K1

2094 cm³ [127.7 in³] / rev

Pressure - bar [psi] | Max. Cont. | Max. Inter.

17 [250]	35 [500]	52 [750]	69 [1000]	86 [1250]	104 [1500]	121 [1750]

Torque - Nm [lb-in], **Speed rpm** — **Intermittent Ratings -** 10% of Operation

Flow - lpm [gpm]	17 [250]	35 [500]	52 [750]	69 [1000]	86 [1250]	104 [1500]	121 [1750]	Theoretical rpm
2 [0.5]	438 [3878] **0.8**	892 [7894] **0.8**						1
4 [1]	440 [3891] **1**	922 [8162] **1**	1398 [12375] **1**					2
8 [2]	460 [4073] **3**	956 [8458] **3**	1460 [12923] **3**					4
15 [4]	443 [3920] **7**	963 [8525] **7**	1491 [13192] **6**	1980 [17520] **6**				8
23 [6]	402 [3560] **10**	924 [8179] **10**	1470 [13012] **10**	1963 [17370] **9**				11
30 [8]	337 [2985] **14**	884 [7824] **14**	1425 [12613] **14**	1920 [16995] **13**	2390 [21152] **9**	2668 [23613] **8**		15
38 [10]	275 [2431] **17**	814 [7205] **17**	1350 [11944] **16**	1869 [16538] **16**	2343 [20733] **13**	2663 [23564] **9**		19
45 [12]	173 [1535] **21**	723 [6398] **21**	1262 [11171] **21**	1795 [15886] **20**	2286 [20232] **17**	2665 [23588] **12**		22
53 [14]	66 [587] **25**	619 [5479] **24**	1155 [10221] **24**	1702 [15063] **23**	2206 [19519] **21**	2637 [23333] **13**		26
61 [16]		496 [4391] **28**	1018 [9009] **28**	1587 [14046] **27**	2107 [18645] **26**	2574 [22777] **20**		29
68 [18]		368 [3257] **32**	910 [8052] **32**	1466 [12973] **31**	1980 [17527] **30**	2471 [21866] **26**		33
76 [20]		225 [1991] **36**	755 [6686] **36**	1304 [11537] **36**	1859 [16449] **35**	2359 [20878] **30**		37
83 [22]		71 [628] **39**	622 [5507] **39**	1171 [10367] **39**	1682 [14885] **38**	2212 [19575] **36**		40
91 [24]			429 [3794] **43**	984 [8704] **43**	1544 [13665] **42**	2067 [18291] **40**		44
95 [25]			354 [3129] **45**	891 [7883] **45**	1428 [12636] **45**	1971 [17445] **43**		46
Max. Max. Inter. Cont. 114 [30]				430 [3803] **54**	959 [8485] **54**	1492 [13207] **53**		55

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

Rotor Width

177.9 [7.003]

mm [in]

Theoretical Torque - Nm [lb-in]

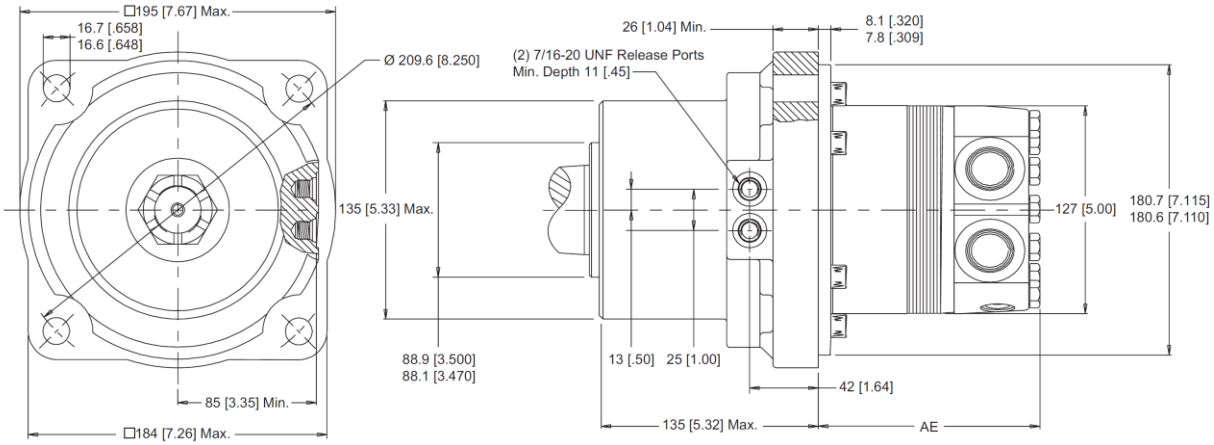
574 [5084]	1149 [10167]	1723 [15251]	2298 [20334]	2872 [25418]	3447 [30502]	4021 [35585]

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

DT 710 Series Housing

- The dimensions shown are without paint. Paint thickness can be up to 0.13 [.005].

4-HOLE, WHEEL BRAKE MOUNT W2 End Ports W8 Side Ports

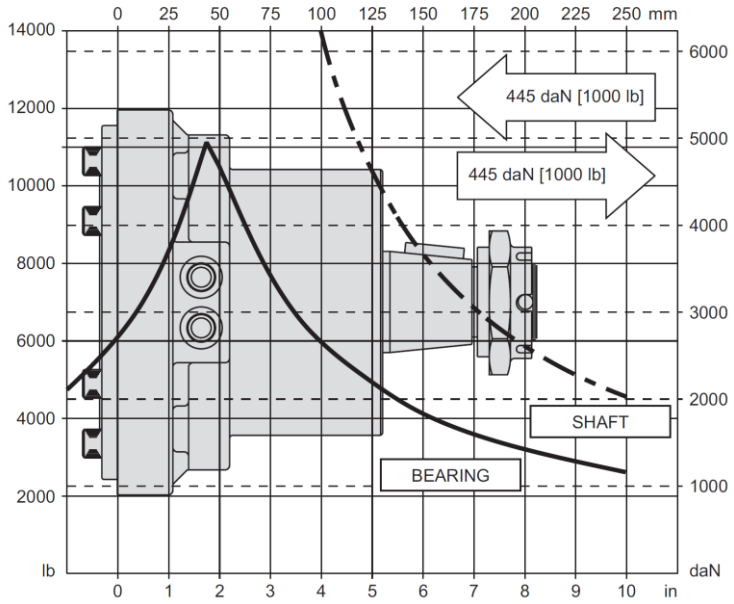


DT 710 Series Technical Information

Allowable Shaft Load / Bearing Curve

The bearing curve represents allowable bearing loads based on ISO 281 bearing capacity for an L10 life of 2,000 hours at 100 rpm. Radial loads for speeds other than 100 rpm may be calculated using the multiplication factor table.

Wheel Brake Mounts



Specification

Rated brake torque..... 1582 Nm [14000 lb-in]
Initial release pressure ..... 19 bar [275 psi]
Full release pressure ..... 33 bar [475 psi]
Maximum release pressure .....207 bar [3000 psi]
Release volume..... 13-16 cm3 [0.8 - 1.0 in3]

- The DT 710 series motor/brakes are available with different holding torque specifications. For additional information please contact Customer Service & Technical Support or your local distributor.

Length & Weight Chart

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

AB	Endcovers on pg. 55	Endcovers on pg. 56	Weight
#	mm [in]	mm [in]	kg [lb]
300	112 [4.43]	115 [4.54]	27.2 [60.0]
375	119 [4.68]	122 [4.79]	27.8 [61.2]
470	126 [4.98]	129 [5.09]	28.3 [62.5]
540	132 [5.22]	135 [5.33]	28.8 [63.6]
750	150 [5.93]	153 [6.04]	30.3 [66.7]
930	166 [6.53]	169 [6.64]	31.4 [69.2]
1K1	176 [6.93]	179 [7.04]	32.2 [71.1]
1K5	214 [8.43]	217 [8.54]	35.3 [77.9]
2K1	265 [10.43]	268 [10.54]	39.3 [86.7]

- All DT series motor weights can vary ± 1.4 kg [3 lb] depending on model configurations such as housing, shaft, endcover, options etc.

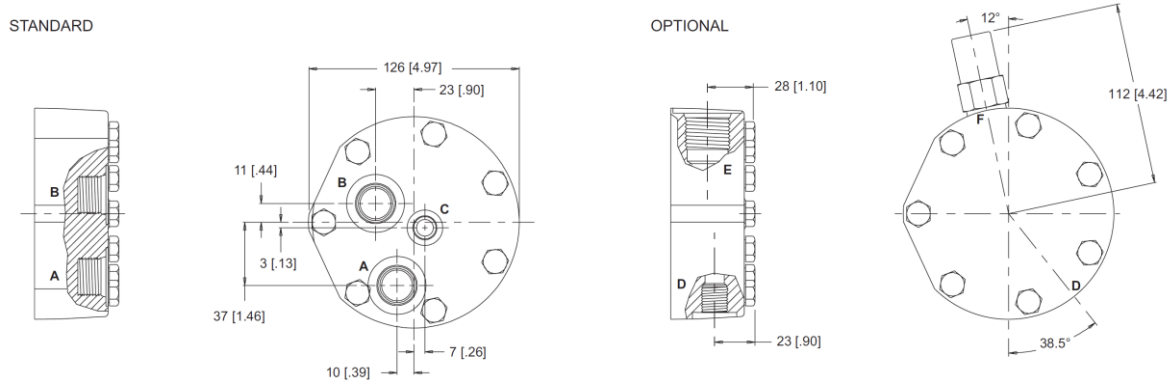
DT 710 Series Porting Options

- The dimensions shown are without paint. Paint thickness can be up to 0.13 [.005].

End Ported – Offset

1 Main Ports **A, B**: 7/8-14 UNF

Drain Port **C**: 7/16-20 UNF



D: Internal Drain **E**: 10 Series/2-Way Valve Cavity 7/8-14 UNF **F**: Valve Cartridge Installed

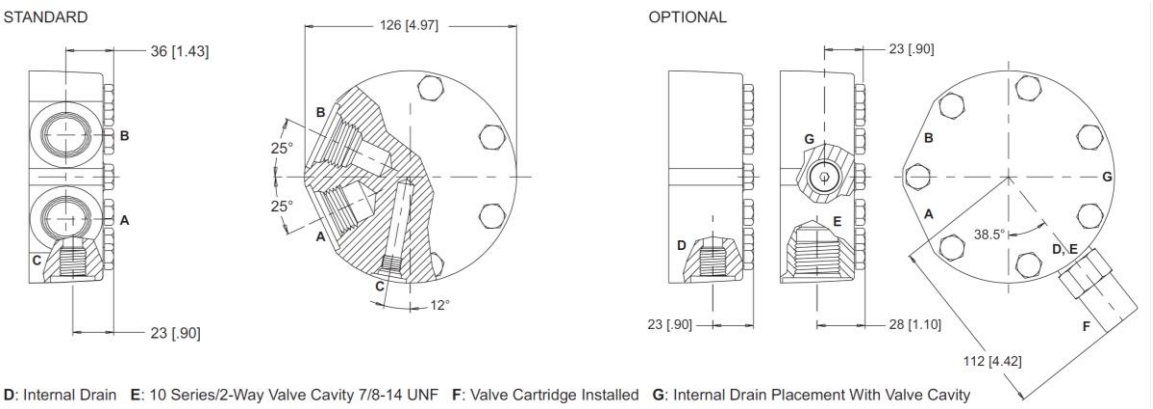
Side Ported - Radial

2 Main Ports **A, B**: G 3/4

Drain Port **C**: G ¼

5 Main Ports **A, B**: 1 1/16-12 UN

Drain Port **C**: 7/16-20 UNF

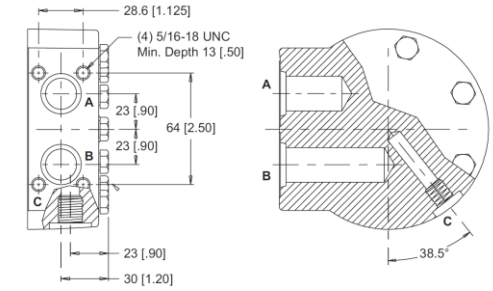


D: Internal Drain **E**: 10 Series/2-Way Valve Cavity 7/8-14 UNF **F**: Valve Cartridge Installed **G**: Internal Drain Placement With Valve Cavity

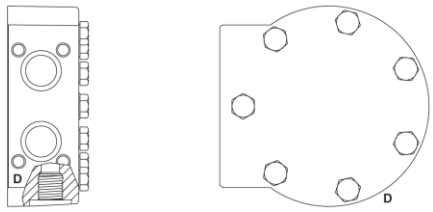
Side Ported - Manifold Aligned

3 Main Ports **A, B**: 11/16" Drilled
Drain Port **C**: 7/16-20 UNF

STANDARD



OPTIONAL



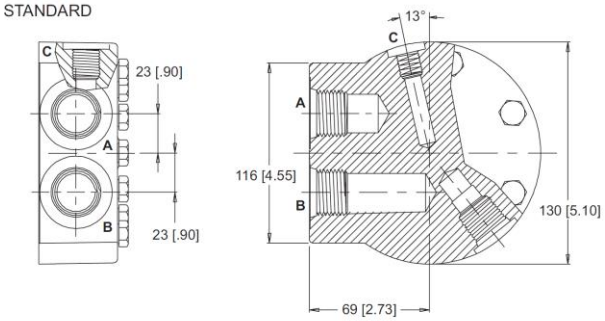
D: Internal Drain

Side Ported - Aligned

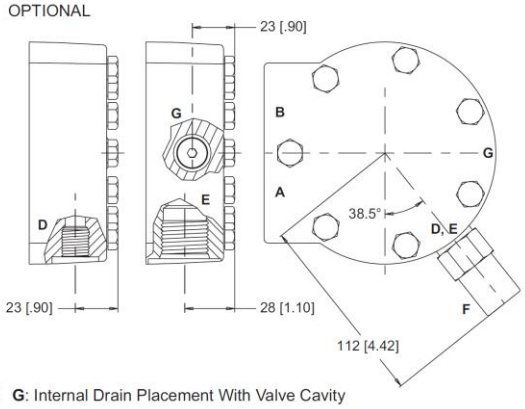
6 Main Ports **A, B**: 1 1/16-12 UN
Drain Port **C**: 7/16-20 UNF

7 Main Ports **A, B**: G 3/4
Drain Port **C**: G 1/4

STANDARD



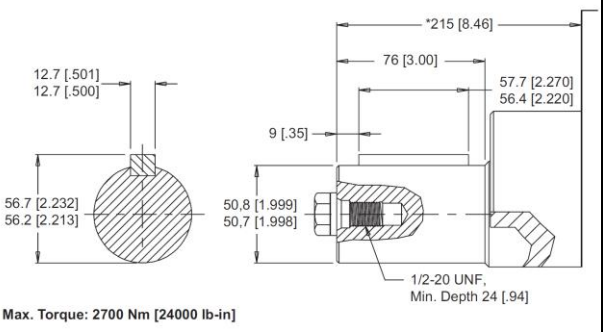
OPTIONAL



D: Internal Drain **E**: 10 Series/2-Way Valve Cavity 7/8-14 UNF **F**: Valve Cartridge Installed **G**: Internal Drain Placement With Valve Cavity

DT 710 Series Shaft

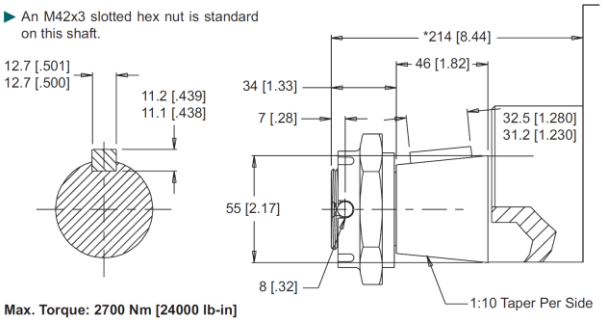
50 2" Straight



Max. Torque: 2700 Nm [24000 lb-in]

51 55mm Tapered

▶ An M42x3 slotted hex nut is standard on this shaft.

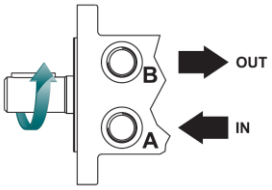


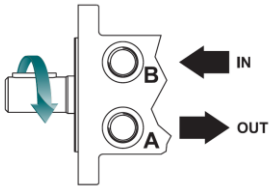
Max. Torque: 2700 Nm [24000 lb-in]

DT 710 Series Ordering Information

1. CHOOSE SERIES DESIGNATION

710 Hydraulic Motor with Integral Brake





- The 710 series is bi-directional.

2. SELECT A DISPLACEMENT OPTION

300	300 cm^3/rev [18.3 in^3/rev]	**930**	929 cm^3/rev [56.7 in^3/rev]
375	374 cm^3/rev [22.8 in^3/rev]	**1K1**	1047 cm^3/rev [63.9 in^3/rev]
470	464 cm^3/rev [28.3 in^3/rev]	**1K1**	1495 cm^3/rev [91.2 in^3/rev]
540	536 cm^3/rev [32.7 in^3/rev]	**2K1**	2093 cm^3/rev [127.7 in^3/rev]
750	747 cm^3/rev [45.6 in^3/rev]		

3a. SELECT MOUNT TYPE

END MOUNTS

W2 Wheel Brake Mount

SIDE MOUNTS

W8 Wheel Brake Mount

3b. SELECT PORT SIZE

END PORT OPTIONS

1 7/8-14 UNF Offset

SIDE PORT OPTIONS

2	G 3/4, Radial
3	11/16" Hole, Aligned Manifold
5	1 1/16-12 UN, Radial
6	1 1/16-12 UN, Aligned
7	G 3/4, Radial

4. SELECT A SHAFT OPTION

50	2" Straight
51	55mm Tapered

5. SELECT A PAINT OPTION

A	Black
Z	No Paint

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 not available on port option 3.

7. SELECT AN ADD-ON OPTION

A Standard

8. SELECT A MISCELLANEOUS OPTION

AA	None
AC	Freeturning Rotor

White Drive Motors & Steering, LLC
110 Bill Bryan Blvd, Hopkinsville, Kentucky, 42240

White Drive Motors and Steering sp. z o.o.
ul. Logistyczna 1, Bielany Wrocławskie, 55-040 Kobierzyce

whitedriveproducts.com