Rineer High Torque Vane Motor
MV057 Series
Technical Data Sheet

- Maximum operating pressure:
  - 3000 psi (207 bar) – Code 61
  - 4500 psi (310 bar) – Code 62

Features

- Ideal for medium speed, high torque applications requiring reliability in a small size
- 2-port, single rotary group motors available in displacements of 48 in³ or 55.5 in³ (787 cc or 909 cc)
- 4-port, double rotary group motors available with displacements ranging from 96 in³ to 111 in³ (1573 cm³ to 1819 cm³)
- High torque at start and stall, up to 94% of the theoretical value
- Continuous operating speeds of up to 500 RPM
- Available with up to 574 HP (428 kW)
- Available with optional through-hole shaft
- Customizable for direct drive applications
- High power to weight ratio
- High reliability in demanding applications
- Long service life

Overview of contents

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Ordering code

01		02		03		04		05		06		07	08	09		10	
MV057	**–**	**A2**	**–**	**1S**	**–**	**048**	**–**	**30**	**–**	**B1**	**–**	**T**	**B**	**B**	**–**	**000**	

01	**Motor Series**	**MV057**

Port Options – Rear port orientation can be specified. Consult your Rineer representative.

02	***Code 61***	
	1-1/2" 4 – bolt flange, 2-port	**A2**
	1-1/2" 4 – bolt flange, 4-port	**A4**
	SAE 24	
	O-ring boss, 2-port	**C2**
	Code 62	
	1-1/4" 4 – bolt flange, 2-port	**D2**
	1-1/4" 4 – bolt flange, 4-port	**D4**

Rotary Group Designation

03	Code 61 – standard speed	**1S**
	Code 62 – standard speed	**2S**

Displacement Options

04	***2-port, single rotating group***	
	48 in^3 (787 cm^3)	**048**
	55.5 in^3 (909 cm^3)	**055**
	4-port, double rotating group	
	96 in^3 (1573 cm^3) – 48/48 suitable for series/parallel circuit	**096**
	103.5 in^3 (1696 cm^3) – 48/55.5 requires logic circuit for operation as a two speed	**103**
	111 in^3 (1819 cm^3) – 55.5/55.5 suitable for series/parallel circuit	**111**

Motors assembled with largest displacement rotating group closest to front housing

Shaft Selection

05	Keyed	**30**
	Splined	**31**
	Keyed shaft out front & rear	**34**
	Shaft with internal key	**35**
	Shaft with internal spline	**36**
	Tapered key thrust - code 61 only	**41**
	Keyed front with rear shaft – configured to customer specifications	**42**
	Splined front with rear shaft – configured to customer specifications	**43**
	Smooth shaft - configured to customer specifications	**52**
	Hollow drill shaft with API NC26 (2-3/8") or API NC31 (2-7/8") internal flush threads	**53**
	Hollow drill shaft with API NC31 (2-7/8") internal flush threads (T5 bearing configuration only)	**63**

Bearing Selection

06	*See Code 61 & 62 shaft and bearing combinations for availability (Page 3)*	

Ordering code

01		02		03		04		05		06		07	08	09		10	
MV057	**–**	**A2**	**–**	**1S**	**–**	**048**	**–**	**30**	**–**	**B1**	**–**	**T**	**B**	**B**	**–**	**000**	

Shaft Seal (see page 9)

07	TCN (radial lip seal)	**T**
	Quad ring	**Q**
	No shaft seal	**0**

Main Body O-rings (see page 8 for seal material specifications)

08	NBR (Buna) – not available in Code 62	**B**
	FKM (Viton) – Code 61 optional, Code 62 only	**V**

Pedestal O-rings (see page 8 for seal material specifications)

09	NBR (Buna) – Code 61 standard, not available in Code 62	**B**
	FKM (Viton) – Code 61 optional, not available in Code 62	**V**
	Disogrin – Code 62 only	**D**

Special Index Number

10	Standard design – special features are designated with a three-digit code (consult your Rineer representative)	**000**

Shaft and bearing combinations
Code 61

	30	31	34	41	42	43	52
B1	●	●	●	—	●	●	●
B3	—	—	—	●	—	—	—

Code 62

	30	31	35	36	43	53	63
B1	●	●	—	—	●	—	—
T1	—	●	—	—	—	—	—
T2	—	—	○	●	—	—	—
T4	—	—	—	—	—	●	—
T5	—	—	—	—	—	●	●

● = available ○ = upon request — = not available

Note: Other shaft and bearing combinations may be available. Consult your Rineer representative.

Weights (approximate)

Type of motor	lbs.	kg
Code 61, 2-port	119	54.0
Code 61, 2-port, 41 shaft	124	56.3
Code 61, 4-port	200	90.8
Code 62, 2-port	127	57.7
Code 62, 2-port, 53 shaft	146	66.3
Code 62, 4-port	206	93.5
Code 62, 4-port, 53 shaft	323	146.6
Code 62, 4-port, 63 shaft	323	146.6

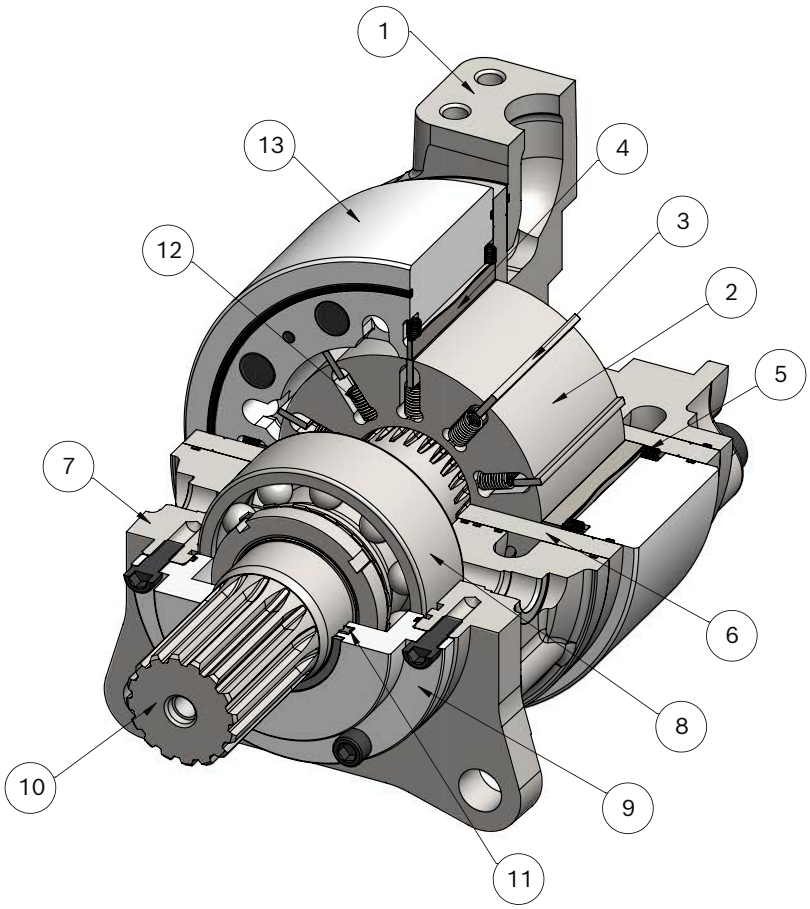
Technical data

The MV057 series motors are internally balanced. No significant radial loads are self-induced on the motor bearings, contributing to a long service life and the ability to run at maximum speed and torque simultaneously. The motor can be configured with various bearing options to accommodate external radial and axial loading. This data sheet details standard configuration (see Figure 1), but custom, application-specific solutions may be available. Please consult your Rineer representative.

Oil supply lines are connected to ports A and B on 2-port, single rotating group motors (Figure 2), and to A1, A2, B1and B2 on 4-port, double rotating group motors (Figure 3). Case drain lines should be installed on the C1 port. Reference motor unit drawings beginning on page 12 for additional case line locations and Case Drain section on page 8 for details.

Using the “A” port(s) as the inlet will provide clockwise shaft rotation as seen from the front of the shaft. Using the “B” port(s) will provide counterclockwise shaft rotation also seen from the front of the shaft (see Figure 2 & Figure 3).

The 4-port, double rotating group configuration can be used as a two-speed motor with appropriate external valving.



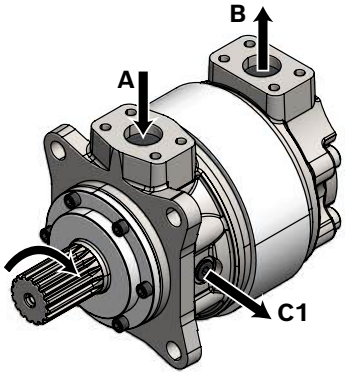
Item No.	Description
1	Rear Housing
2	Rotor
3	Rotor Vane
4	Stator Vane
5	Stator Vane Spring
6	Timing Plate
7	Front Housing
8	Bearing
9	Seal Plate
10	Shaft
11	Shaft Seal
12	Rotor Vane Springs
13	Stator

Figure 1. Basic parts list

Technical data

2-port motor

Clockwise rotation



Counter-clockwise rotation

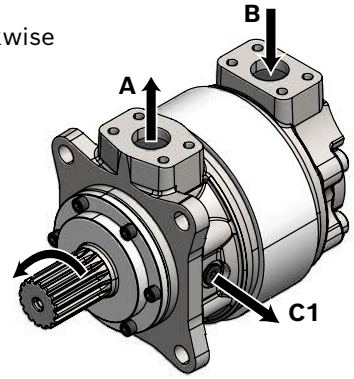
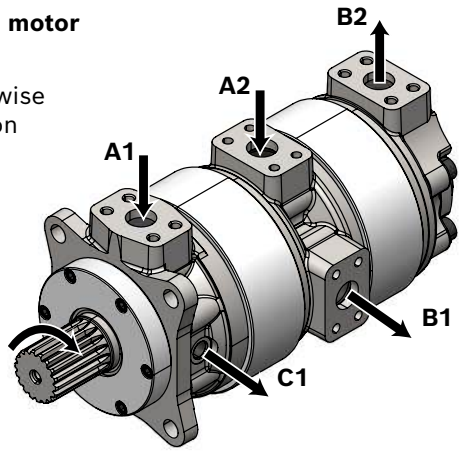


Figure 2. Oil flow direction to establish clockwise and counter-clockwise rotation on 2-port configuration motors.

4-port motor

Clockwise rotation



Counter-clockwise rotation

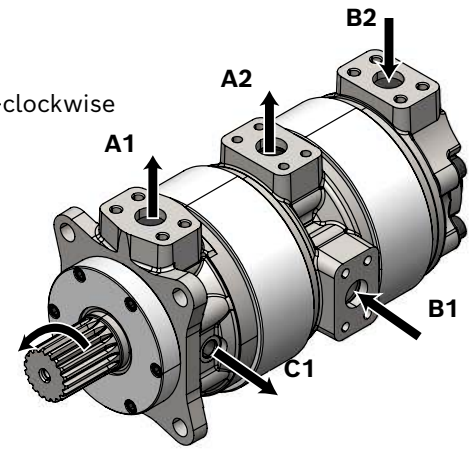


Figure 3. Oil flow direction to establish clockwise and counter-clockwise rotation on 4-port configuration motors.

Technical Data

Motor specifications

Standard Series Code 61	Displacement		Pressure				Speed		Torque @ 3000 psid (207 bar)*	
	(in^3/rev)	(cm^3/rev)	Continuous		Intermittent		Continuous	Intermittent	Continuous	
			(psid)	(bar)	(psid)	(bar)	(rpm)	(rpm)	(lb-ft)	(Nm)
MV057-A,C	48	787	3000	207	3500	241	500	600	1702	2308
	55.5	909					500	600	1976	2679

High Performance Series Code 62	Displacement		Pressure				Speed		Torque @ 4500 psid (310 bar)*	
	(in^3/rev)	(cm^3/rev)	Continuous		Intermittent		Continuous	Intermittent	Continuous	
			(psid)	(bar)	(psid)	(bar)	(rpm)	(rpm)	(lb-ft)	(Nm)
MV057-D	48	787	4500	310	5000	345	500	600	2553	3461
	55.5	909					500	600	3016	4089

* Torque values are average performance data measured at maximum speeds with 100 SUS (20 cSt) and standard rotating group.

Note:

1. When considering a 4-port motors, any two displacements can be combined. The resultant torque is the sum of the corresponding torque values from the two (2) displacements.
2. Maximum speed is limited by the highest displacement selected.
3. Intermittent duty cycle is six (6) seconds per minute.
4. Higher speeds or pressure may be permissible under certain conditions. Consult your Rineer representative.

Technical data

Choice of hydraulic fluid
Bosch Rexroth Rineer high torque vane motors are primarily designed to operate on conventional petroleum based hydraulic oils. The hydraulic oil can be chosen in consultation with the oil supplier or your local sales office, bearing the following requirements in mind:

General
The oil shall have FZG (90) fail stage minimum 11 described in IP 334 (DIN 51354). The oil must also contain inhibitors to prevent oxidation, corrosion and foaming. The viscosity of mineral oil is highly dependent on the temperature. The final choice of oil must depend on the operating temperature that can be expected at the motor or that has been established in the system and not in the hydraulic tank.

High temperatures in the system greatly reduce the service life of oil and rubber seals, as well as resulting in low viscosity, which in turn provides poor lubrication. Content of water shall be less than 0.1%.

Oil used in the system should be filtered by a minimum of 25 micron filter.

Fluid Cleanliness

System Pressure	
< 3000 psi / 207 bar	> = 3000 psi / 207 bar
19/17/14*	18/16/13

* ISO 4406 Standard

Viscosity

Minimum Operating Viscosity	100 SSU / 20 cSt
Maximum Operating Viscosity	250 SSU / 54 cSt

Minimum operating viscosities must be met even at maximum temperature. Operating below 20 cSt will result in reduced life expectancy.

Maximum fluid temperature should not exceed 180 °F (82 °C).

Please consult with a Bosch Rexroth Rineer Applications Engineer when using fire resistant fluid, water glycols, biodegradable fluids, or viscosities outside above recommendations.

Seals
Buna N (NBR)
Temperature Range:
–65 °F to +250 °F (–54 °C to +121 °C)

Buna N is a copolymer of butadiene and acrylonitrile with excellent compatibility with petroleum products. For exposure in low temperatures it is necessary to sacrifice some high temperature resistance. The product is superior in compression set, cold flow, tear, and abrasion resistance. Inferior in resistance to ozone, sunlight or weather. It is generally recommended for petroleum, water, diester, and water-glycol. Not recommended for use with halogenated hydrocarbons, phosphate ester, ketones, acids, and brake fluids.

Fluorocarbon (FKM) (Viton)
Temperature Range:
–20 °F to +350 °F (–29 °C to +177 °C)

Viton is a linear copolymer of vinylidene fluoride and hexafluoro propylene which offers the widest temperature range and chemical resistance. The product is compatible and recommended for use with most fluids and gases such as petroleum, silicate ester, diester, halogenated hydrocarbons, and most phosphate esters. Viton has very good ozone, weather and aging resistance. It is not recommended for ketones, glycol based brake fluids, superheated steam, formic and acetic acids.

Disogrin (TODI/Polyurethane)
Temperature Range:
–54 °F to +230 °F (–48 °C to +110 °C)

Disogrin is a high performance polyurethane. This compound is primarily used on O-rings for heavy duty applications and possesses extremely high mechanical properties, offering outstanding resistance to abrasion, tear and extrusion over a large range of temperatures. It has high temperature stability resulting in very low compression set required for sealing ensuring maximum service life. It is suitable for use with petroleum based fluids and some biodegradable (synthetic and natural Ester) fluids.

Technical data

Bosch Rexroth Rineer offers radial lip seals and quad ring seals for MV057 motors in both NBR and FKM materials. Radial lip seals accomodate external radial loads imposed on the shaft at higher speeds and to a greater degree than quad ring seals. Both seal designs will accomodate axial loading on the shaft.

Heat failure of the material is the most common failure mode for a rotary seal. Reducing the friction at the shaft / seal interface is the most effective method of reducing heat buildup on the seal. The higher the pressure to be sealed combined with high shaft speeds results in increased friction (heat buildup), decreasing seal life. Properly performing rotary seals offer unique challenges. Our seals operate with an oil film under the seal / shaft contact area that separates the two surfaces reducing surface wear and providing cooling to the contact area. Slippage oil which by-passes the vanes, rotor and timing plate interface accumulates in the case and lubricates the bearings and seals.

Shaft seal options

Seal Type	Maximum Case Pressure	External Loading
Radial Lip Seal	35 psig (2.4 bar)	Radial / Axial
Quad Seal	100 psig (6.9 bar)	Low Radial / Axial
No Shaft Seal	500 psig (35 bar)	N/A

When the motor is mated to a gearbox, bearing box, or overhung load adapter, it is possible to specify the motor to have no shaft seal which would allow motor case flow to flush the companion component. In this instance, the driven component must have a case connection to allow flow back to tank at a pressure low enough for the rating of its shaft seal.

Case Drain

The 57 Series motors **REQUIRE** an external case drain of sufficient size to prevent back pressure in excess of 35 psi (2.4 bar) for radial lip seals or 100 psi (6.9 bar) for quad seals. A case drain line must be run to the reservoir with minimum restriction as to not exceed the rated capacity of the seals; any unused case drain ports must be plugged. Never plug all case drain ports as this will cause build up of pressure in the motor case and blow out the shaft seal. The case drain line should return directly to the reservoir below the surface of the oil, and as far away as possible from the pump suction line. Refer to the unit drawings for case drain port locations. Use of the case drain port at the highest elevation is recommended.

Thermal Shock

Consideration to cold temperature environments must be provided in the event that a temperature differential exists between the motor and the system in excess of 50 °F (28 °C). Contact a Bosch Rexroth Rineer representative if this is a possibility. In cold temperature environments it may be necessary to warm up the oil in the hydraulic system before the system is used. Typically the warm up is limited to the oil, the pump and directional control valve; leaving other components in the circuit such as the motor cold. When a directional control valve is shifted, the warm oil in the hydraulic system flows through a cold motor resulting in a non-uniform expansion of the internal parts of the motor which may lead to galling and component failure. Low pressure oil can be circulated through the motor case at a maximum flow rate of 3 gpm (11 lpm) or idled at low speed of 20 rpm maximum until the motor temperature is within 50 °F (28 °C) or less than system oil temperature.

Technical data

Selecting / Sizing a Motor

Motor selection is dependent on the application and generally the required horsepower, motor speed range, and available supply pressure are to be defined. Alternatively desired output torque and speed for a given application can be used. Motor speed (shaft speed) is a function of flow delivered to the motor and displacement. Torque output is a function of differential pressure and motor displacement. The charts illustrated are based on actual performance data and account for losses in a given motor.

For example:
An application requirement is 75 hp (56 kW) at 200 rpm with an available supply pressure of 3200 psi (221 bar) and a return line pressure of 200 psi (14 bar). The pressure differential is 3000 psi (207 bar).

Calculations:

Theoretical torque (ideal no losses):

Metric:

$$T = \frac{P \times 9549.09}{n} = \frac{56 \times 9549.09}{200} = \sim 2674 \text{ N-m}$$

U.S.:

$$T = \frac{P \times 5252}{n} = \frac{75 \times 5252}{200} = \sim 1970 \text{ lb-ft}$$

Theoretical displacement (ideal no losses):
for condition T = 2674 N-m (T = 1970 lb-ft)

Metric:

$$d = \frac{T \times 62.81}{p} = \frac{2674 \times 62.81}{207} = \sim 811 \text{ cm}^3$$

U.S.:

$$d = \frac{T \times 75.4}{p} = \frac{1970 \times 75.4}{3000} = \sim 50 \text{ in}^3$$

Referencing the chart *"Torque 55.5 in³ / 909 cm³,"* a 55.5 in³ (909 cm³) displacement motor at a pressure 3000 psid (207 bar) will develop torque of approximately 1970 lb-ft (2674 N-m).

Referencing the chart *"Total Required Flow 55 in³ / 909 cm³,"* a 55.5 in³ (909 cm³) displacement motor at a pressure of 3000 psid (207 bar) operating at 200 rpm will require a total flow of approximately 55 gpm (208 lpm).

Nomenclature

Symbol	Measureable Quantity	U.S.	Metric
d	Displacement	cir or $\frac{in^3}{rev}$	cc or $\frac{cm^3}{rev}$
Q	Flow	gpm or $\frac{gal}{min}$	lpm or $\frac{liters}{min}$
n	Shaft Speed	rpm or $\frac{revolutions}{min}$	rpm or $\frac{revolutions}{min}$
P	Power	hp	kW
Δp	Differential pressure	psid	bar
T	Torque	lb-ft	N-m

Calculation Fundamentals

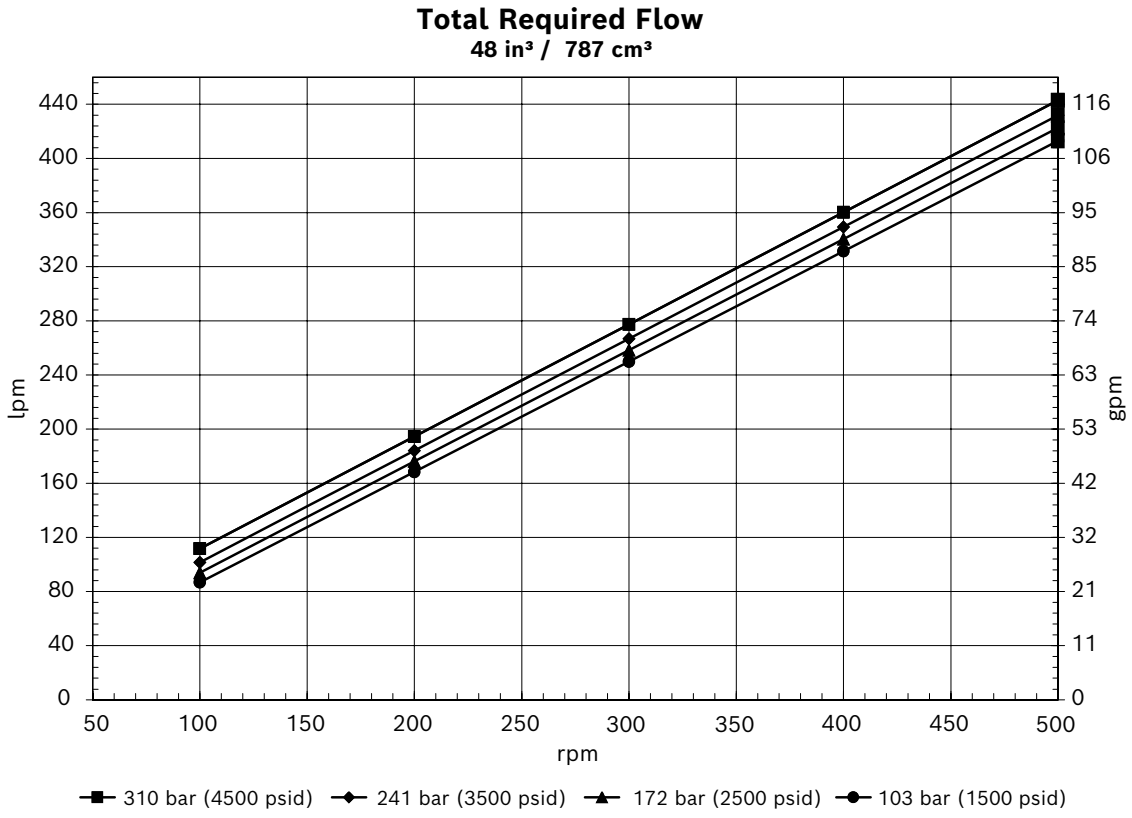
U.S.	Metric
$T = \frac{P \times 5252}{n}$	$T = \frac{P \times 9549.09}{n}$
$T = \frac{d \times \Delta p}{75.4}$	$T = \frac{d \times \Delta p}{62.81}$
$P_{shaft} = \frac{T \times n}{5252}$	$P_{shaft} = \frac{T \times n}{9549.09}$
$P_{shaft} = \frac{Q \times \Delta p}{1714}$	$P_{shaft} = \frac{Q \times \Delta p}{599.29}$
$Q = \frac{d \times n}{231}$	$Q = \frac{d \times n}{1000}$
$n = \frac{P \times 5252}{T}$	$n = \frac{P \times 9549.09}{T}$
$d = \frac{T \times 75.4}{\Delta p}$	$d = \frac{T \times 62.81}{\Delta p}$

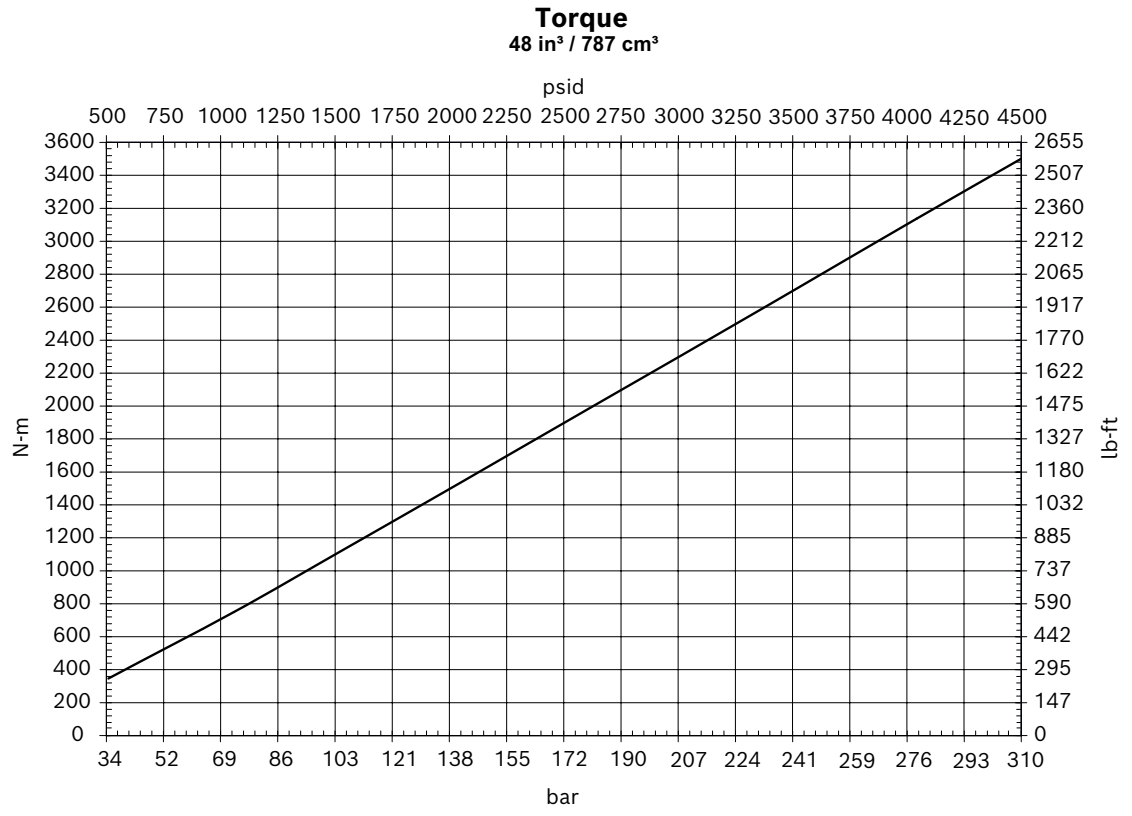
Unit Conversions

Quantity	Symbol	Metric	Convert	U.S.
Torque	T	N-m	÷ 1.356	lb-ft
Power	P	kW	x 1.341	hp
Displacement	d	cm^3/rev	÷ 16.385	in^3/rev
Flow Rate	Q	lpm	÷ 3.78	gpm
Rotational Speed	n	rpm	=	rpm
Pressure	p	bar	x 14.504	psi

Technical data

Flow & output torque* – 48 in³

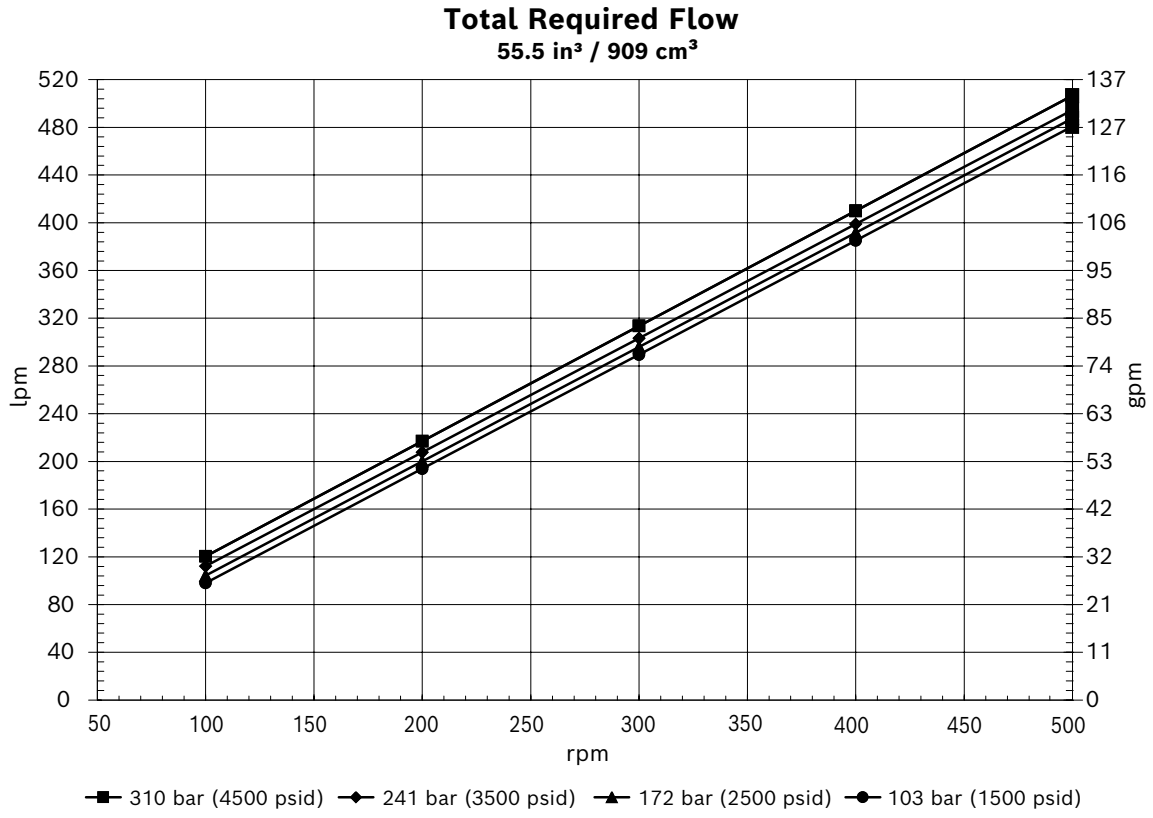


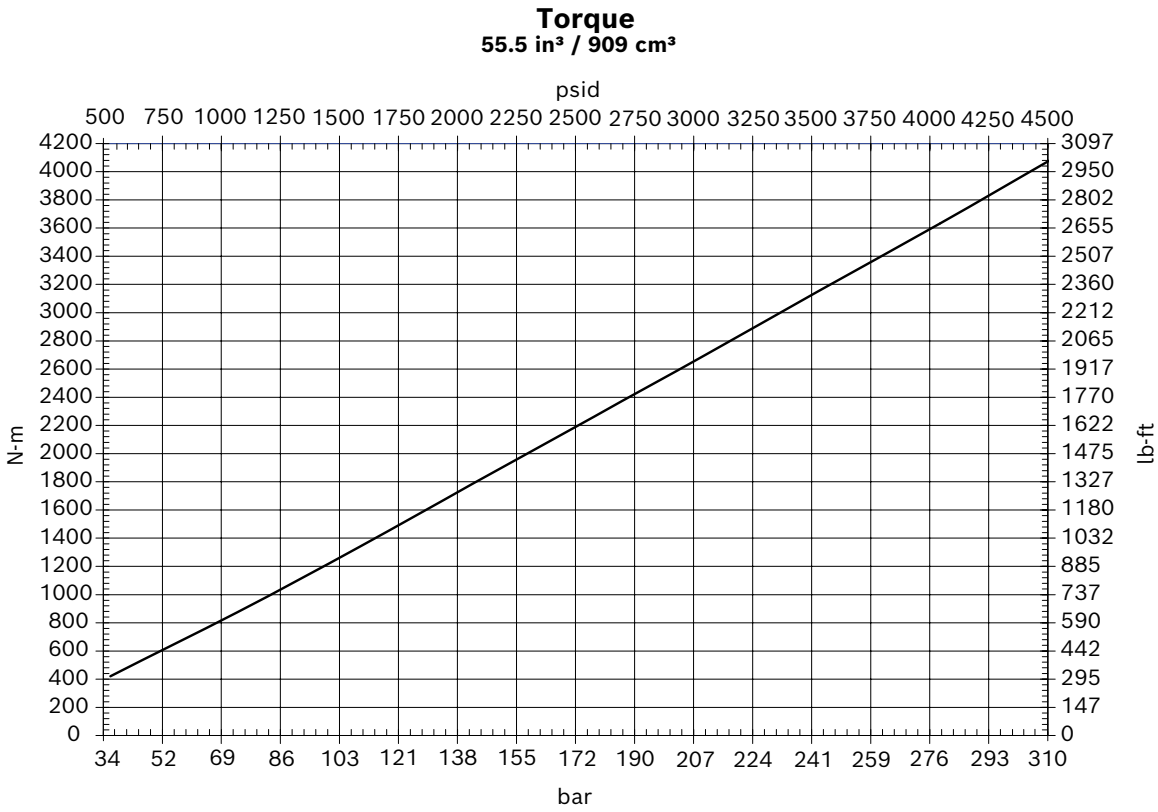


*Values are average performance data measured at maximum speeds with 100 SUS (20 cSt) viscosity and standard rotating group.

Technical data

Flow & output torque* – 55.5 in³

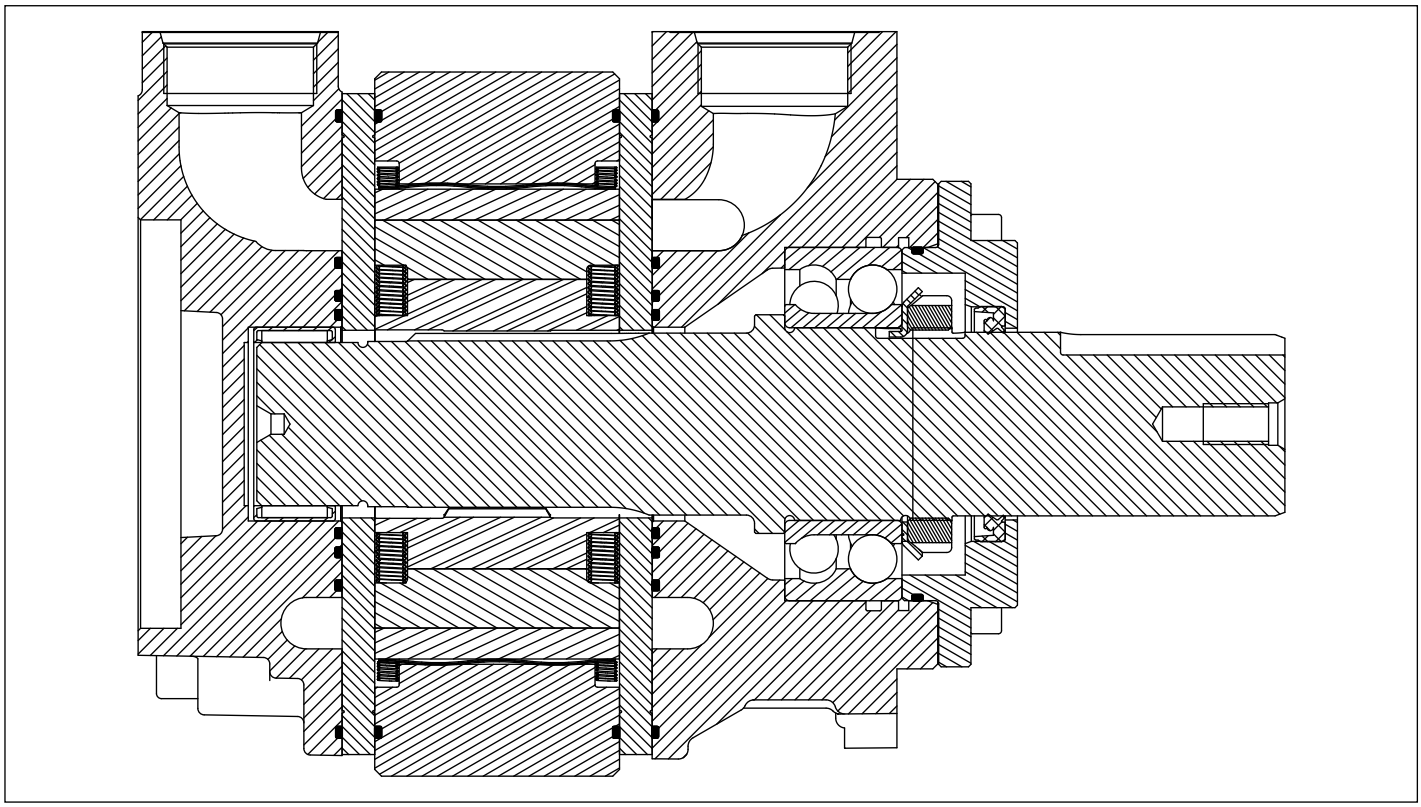


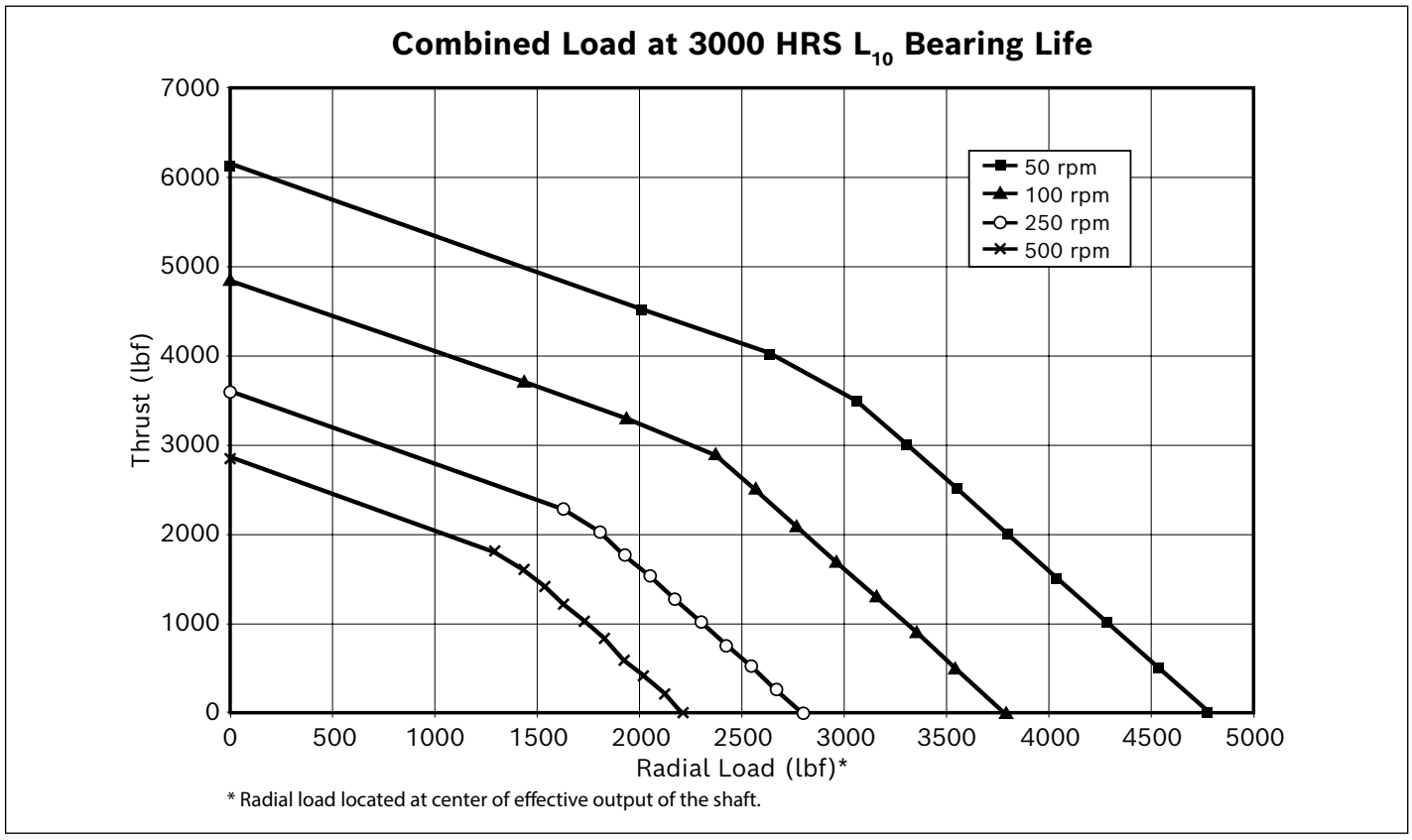


*Values are average performance data measured at maximum speeds with 100 SUS (20 cSt) viscosity and standard rotating group.

Technical data

Bearing data – Code 61 Motor (B1 bearing)

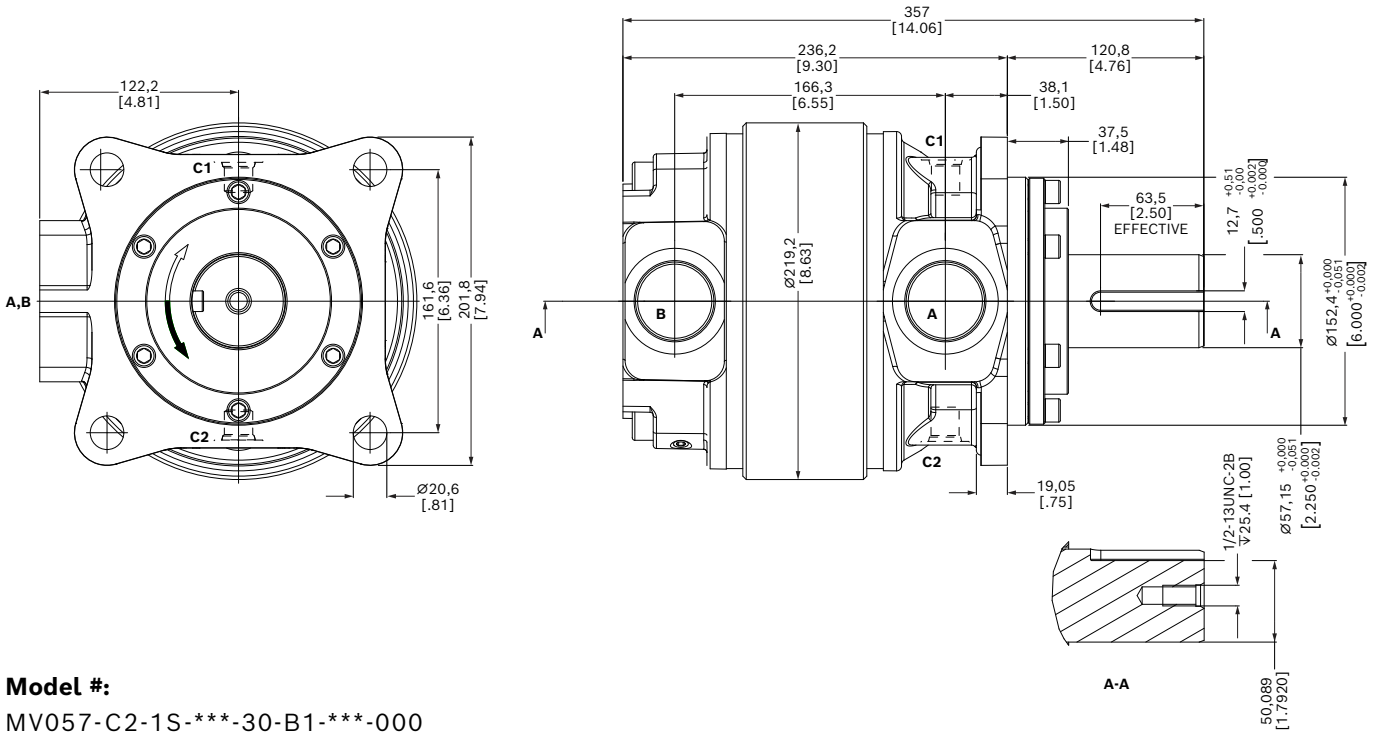




* Radial load located at center of effective output of the shaft.

Technical data

Unit dimensions – Code 61 Motor (B1 bearing)

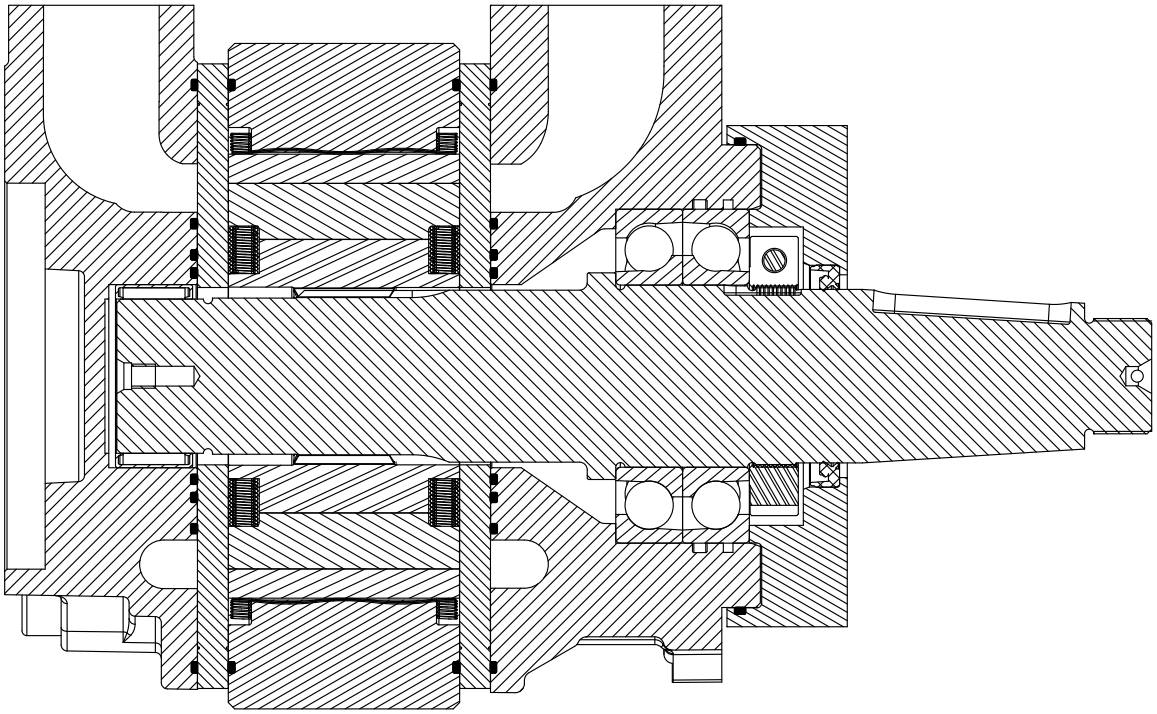


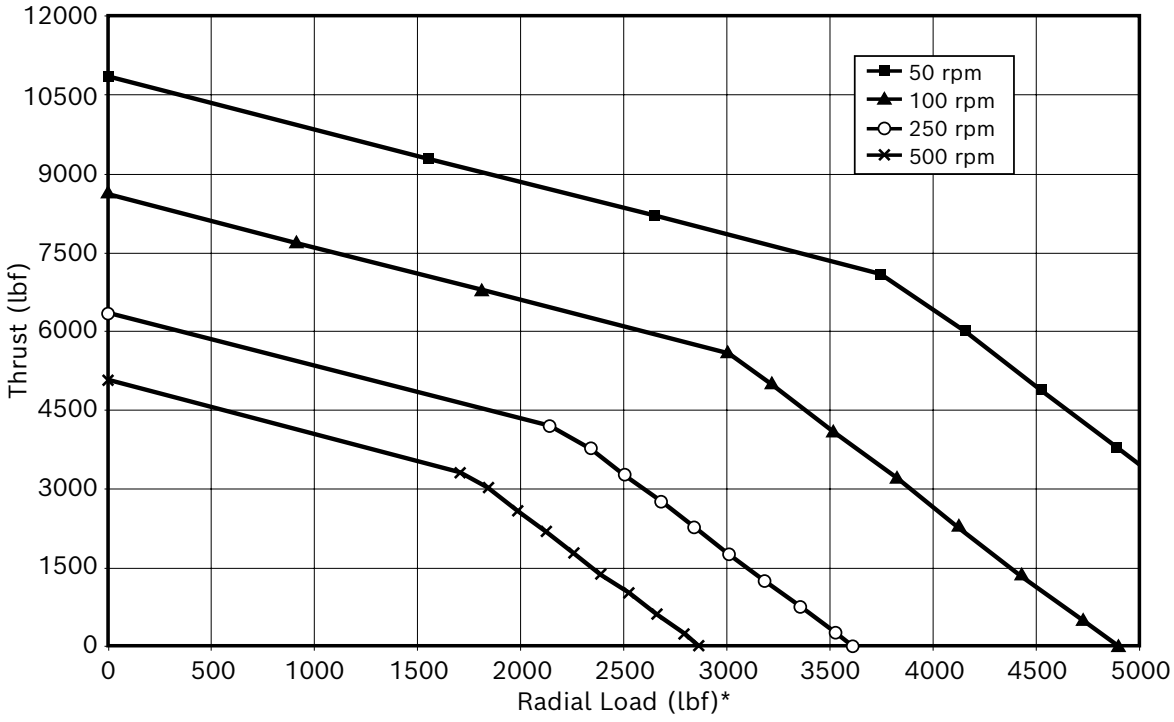
Model #:

MV057-C2-1S-***-30-B1-***-000

Technical data

Bearing data – Code 61 Motor (B3 bearing)

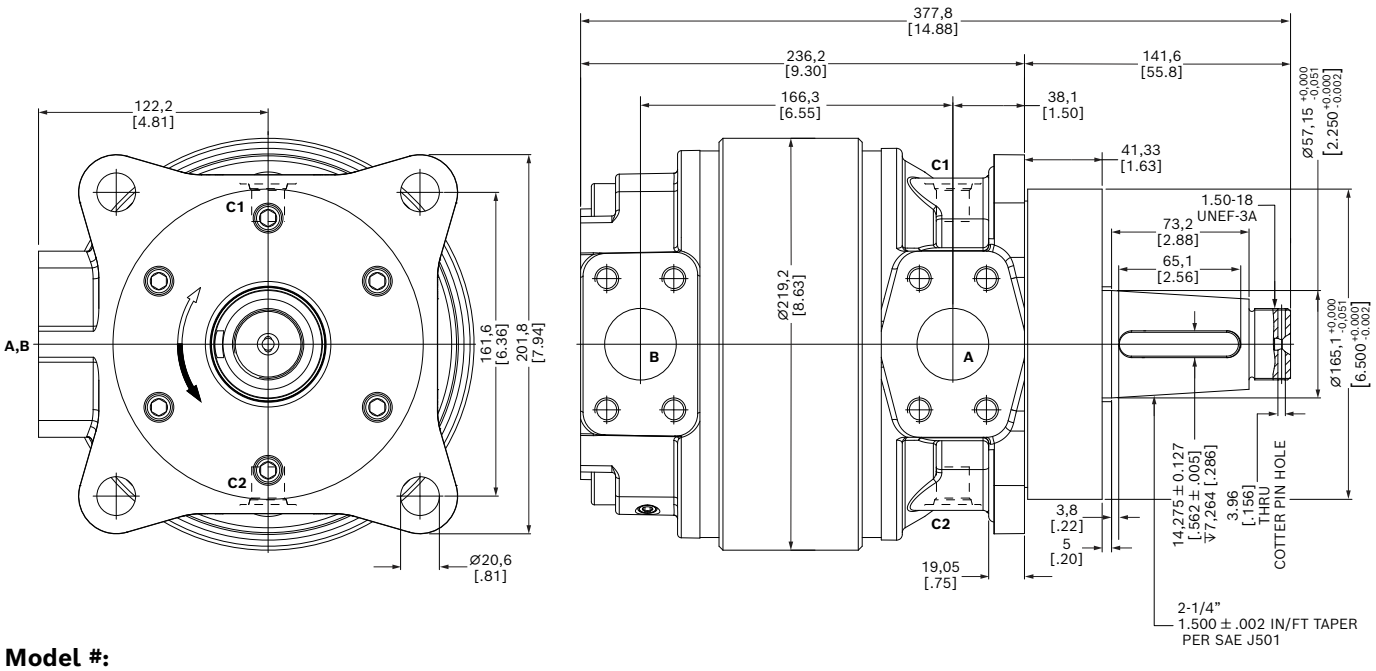




* Radial load located at center of effective output of the shaft.

Technical data

Unit dimensions – Code 61 Motor (B3 bearing)

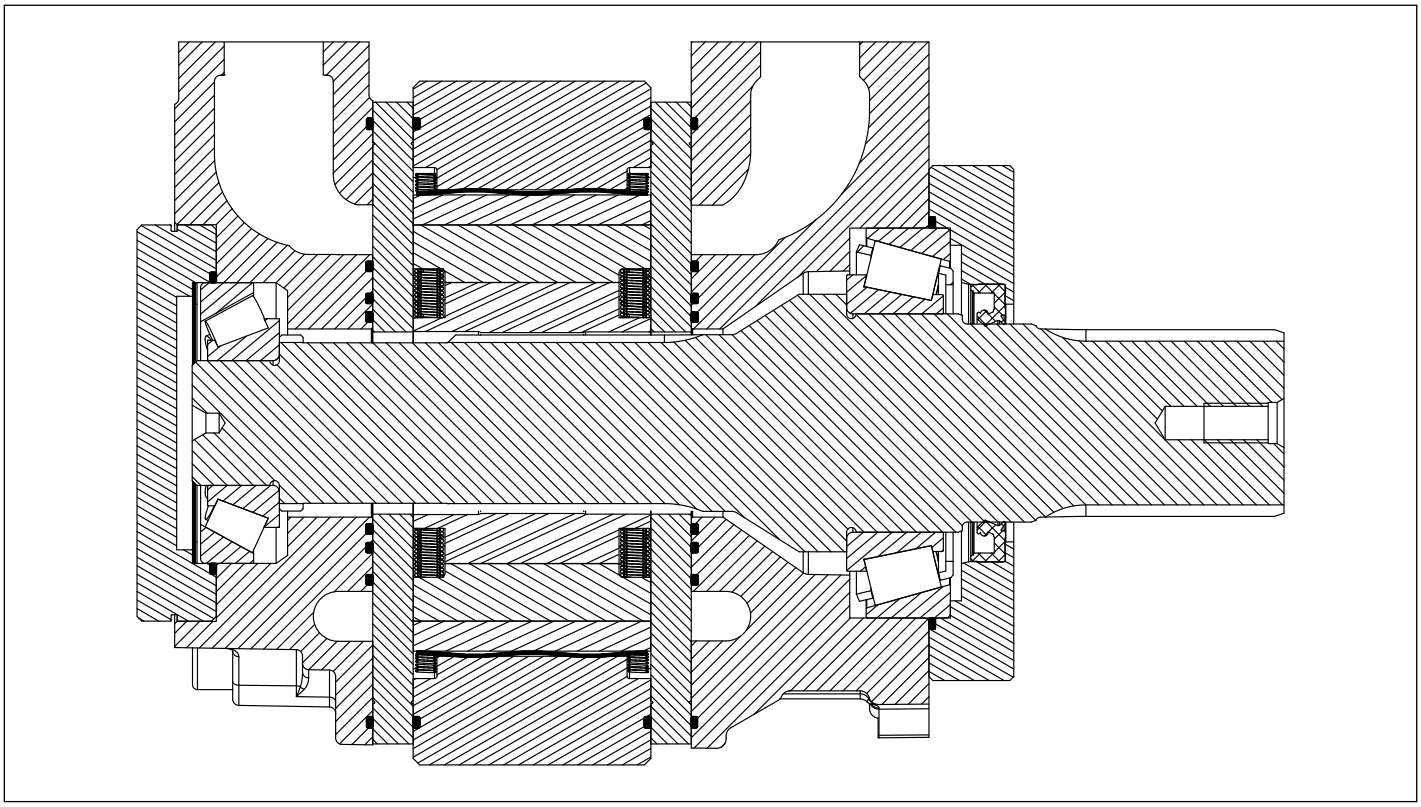


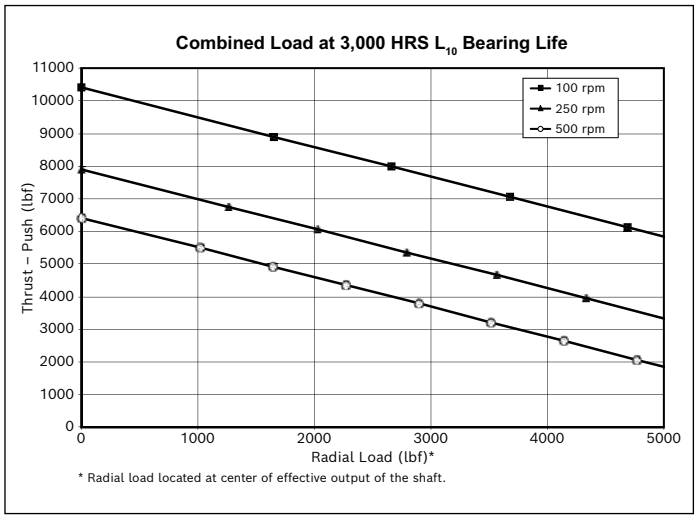
Model #:

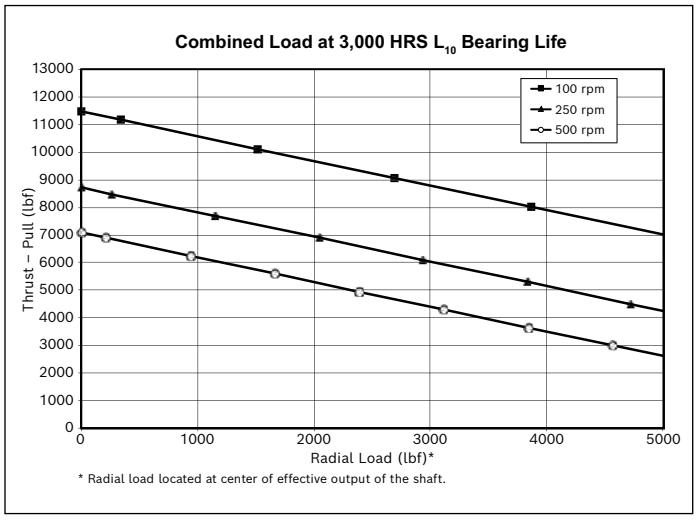
MV057-A2-1S-***-41-B3-***-000

Technical data

Bearing data – Code 62 (T1 bearing)

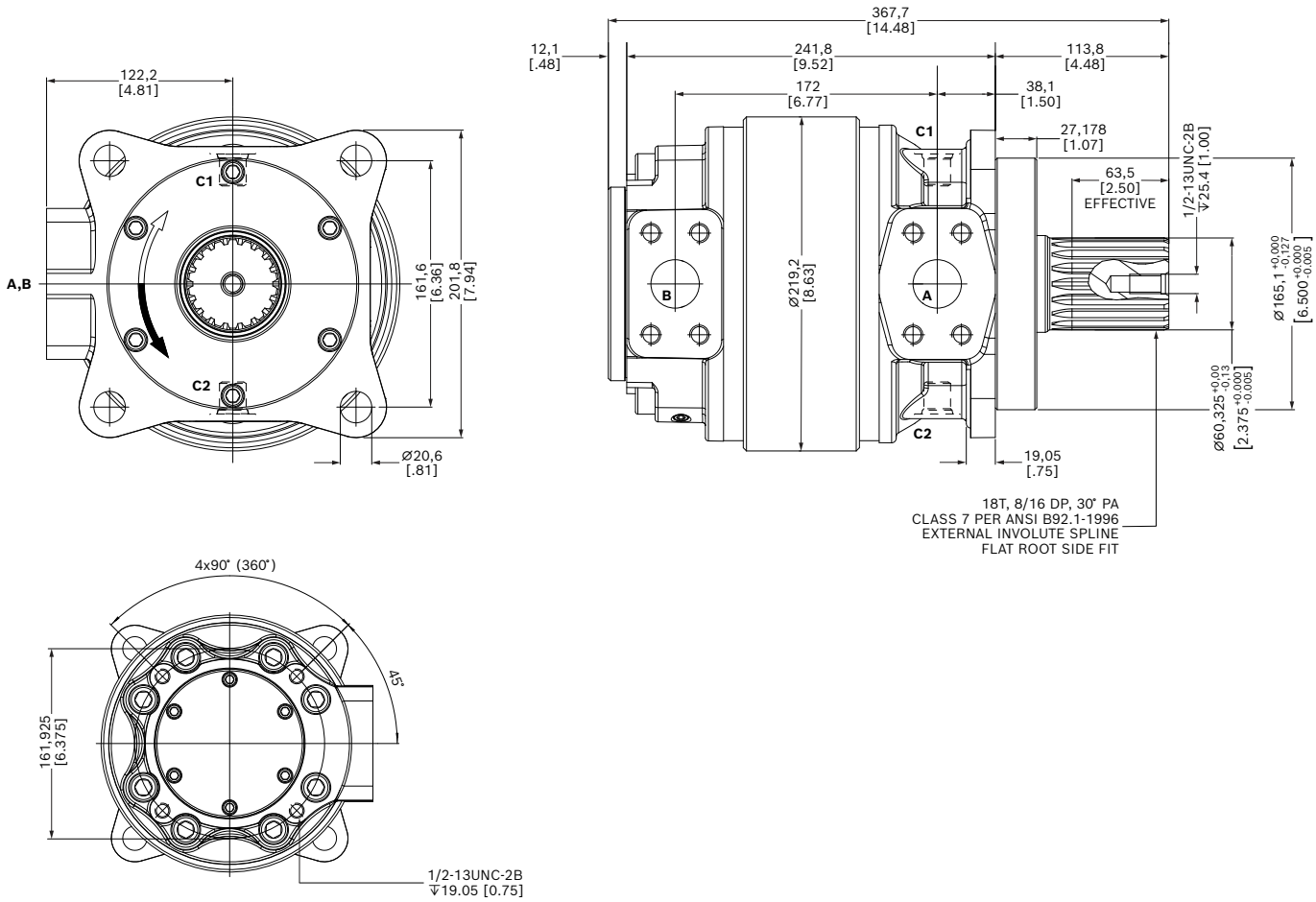






Technical data

Unit dimensions – Code 62 (T1 bearing)

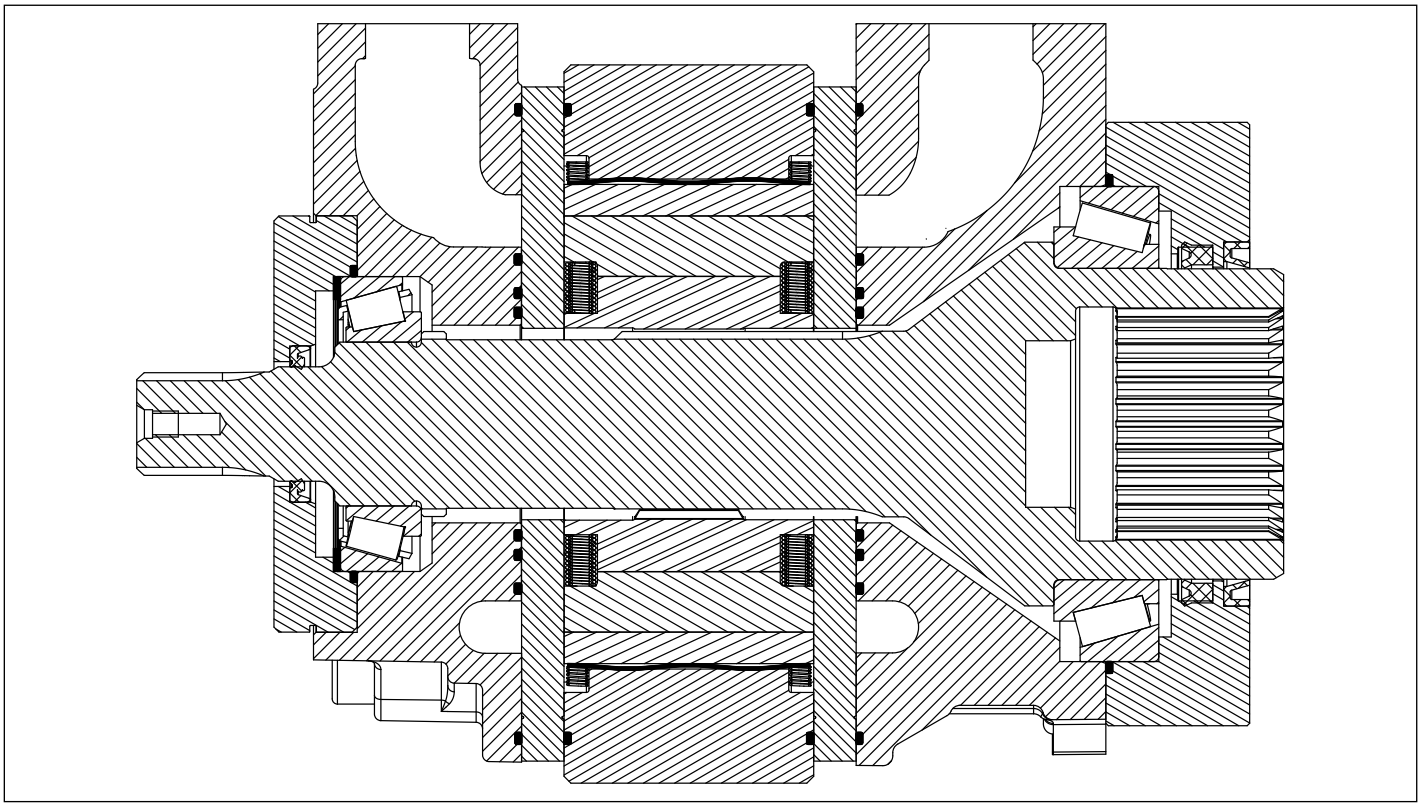


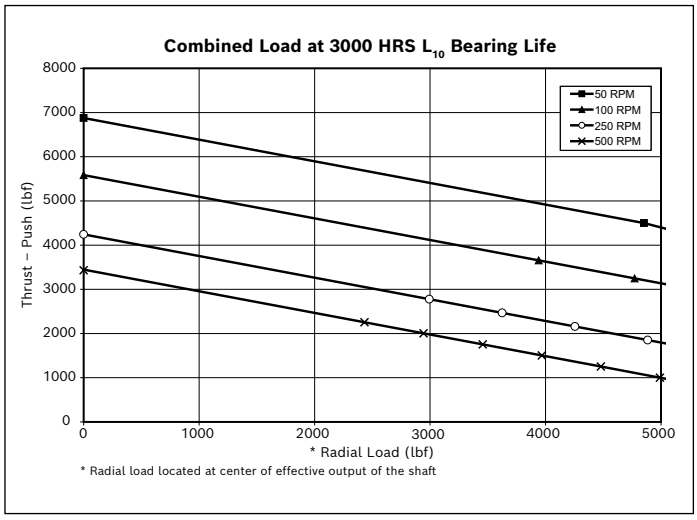
Model #:

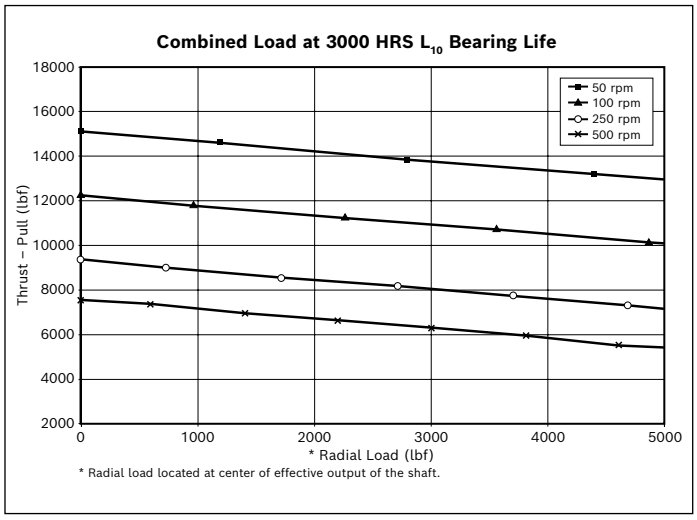
MV057-D2-2S-***-31-T1-*VD-000

Technical data

Bearing data – Code 62 (T2 bearing)

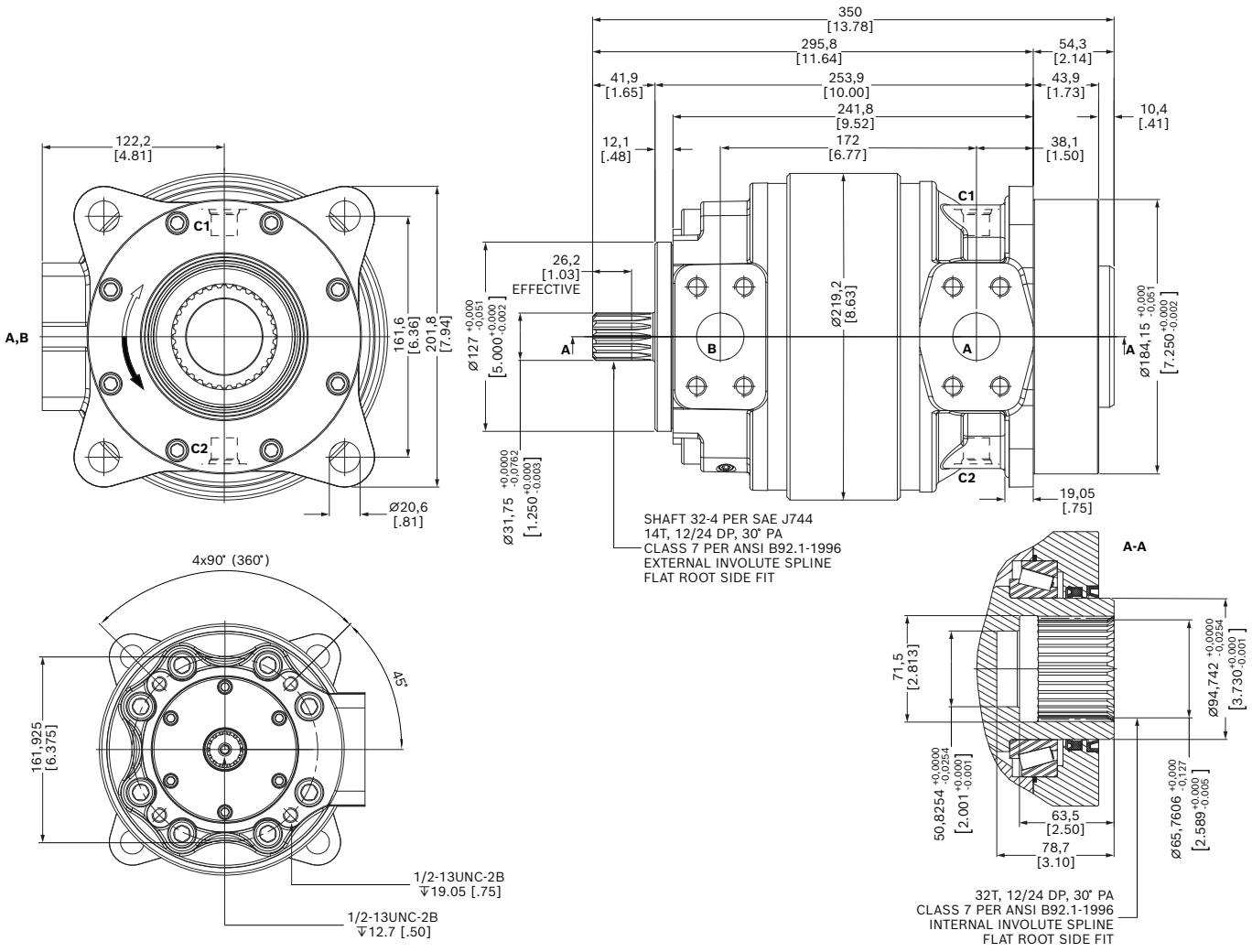






Technical data

Unit dimensions – Code 62 (T2 bearing)

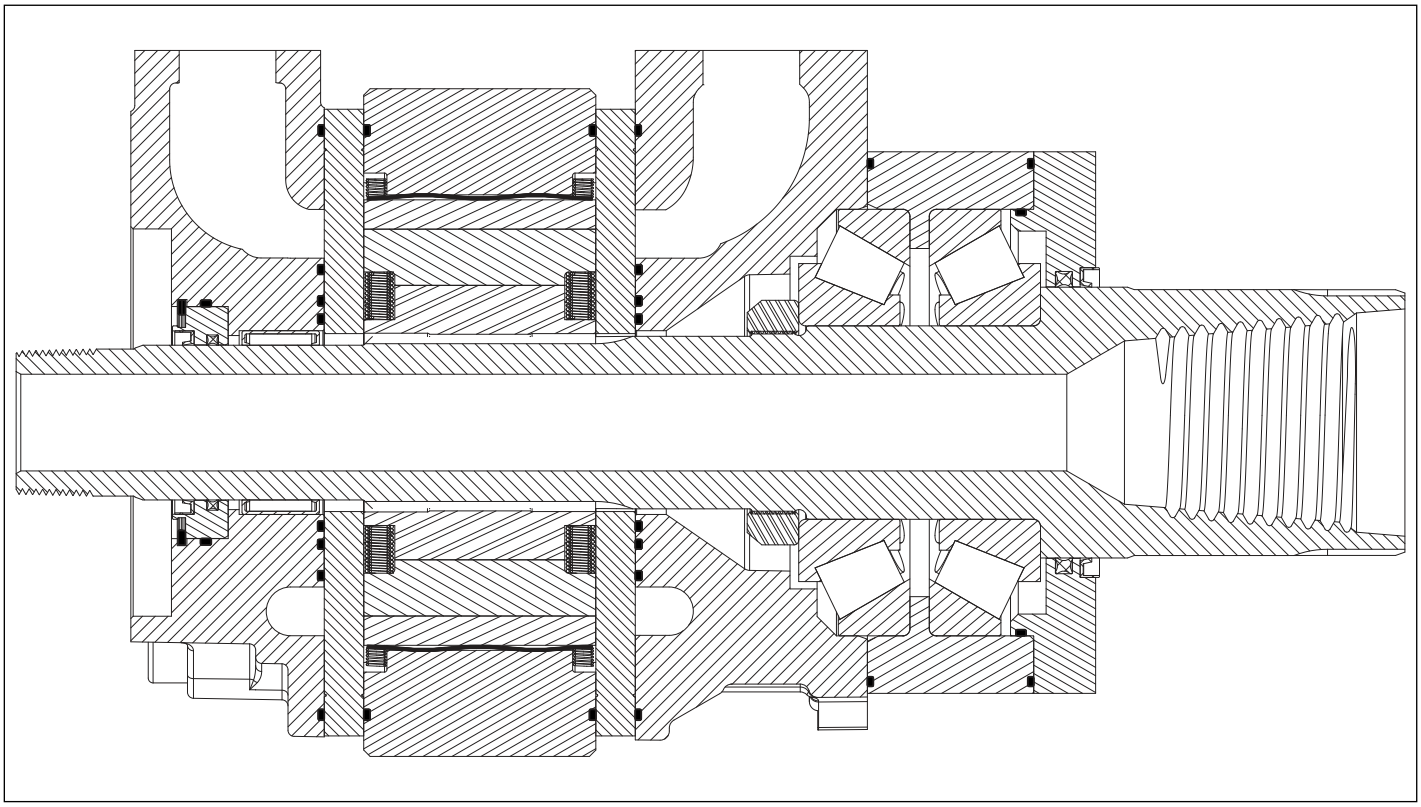


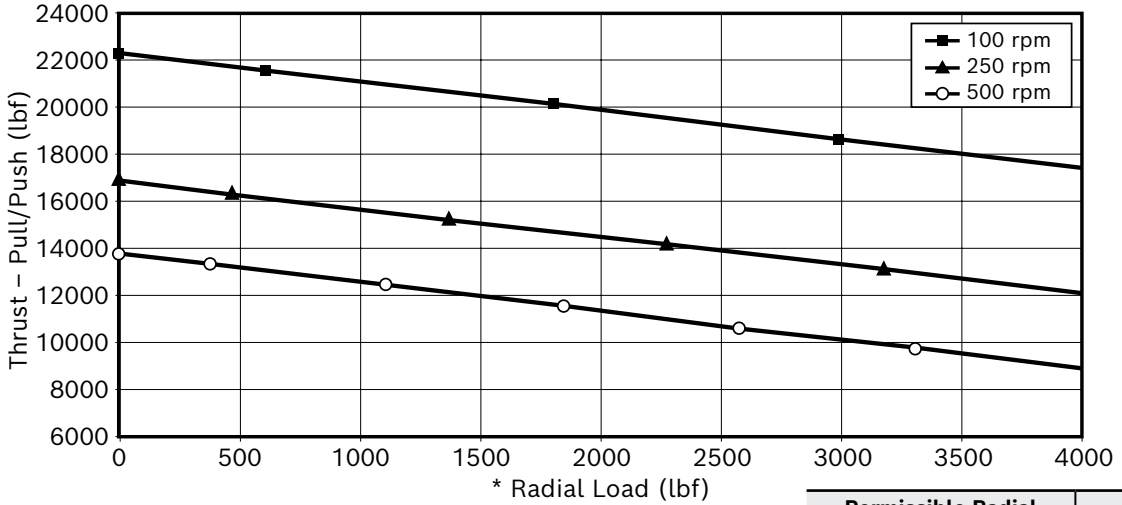
Model #:

MV057-D2-2S-***-36-T2-*VD-060

Technical data

Bearing data – Code 62 (T4 bearing)





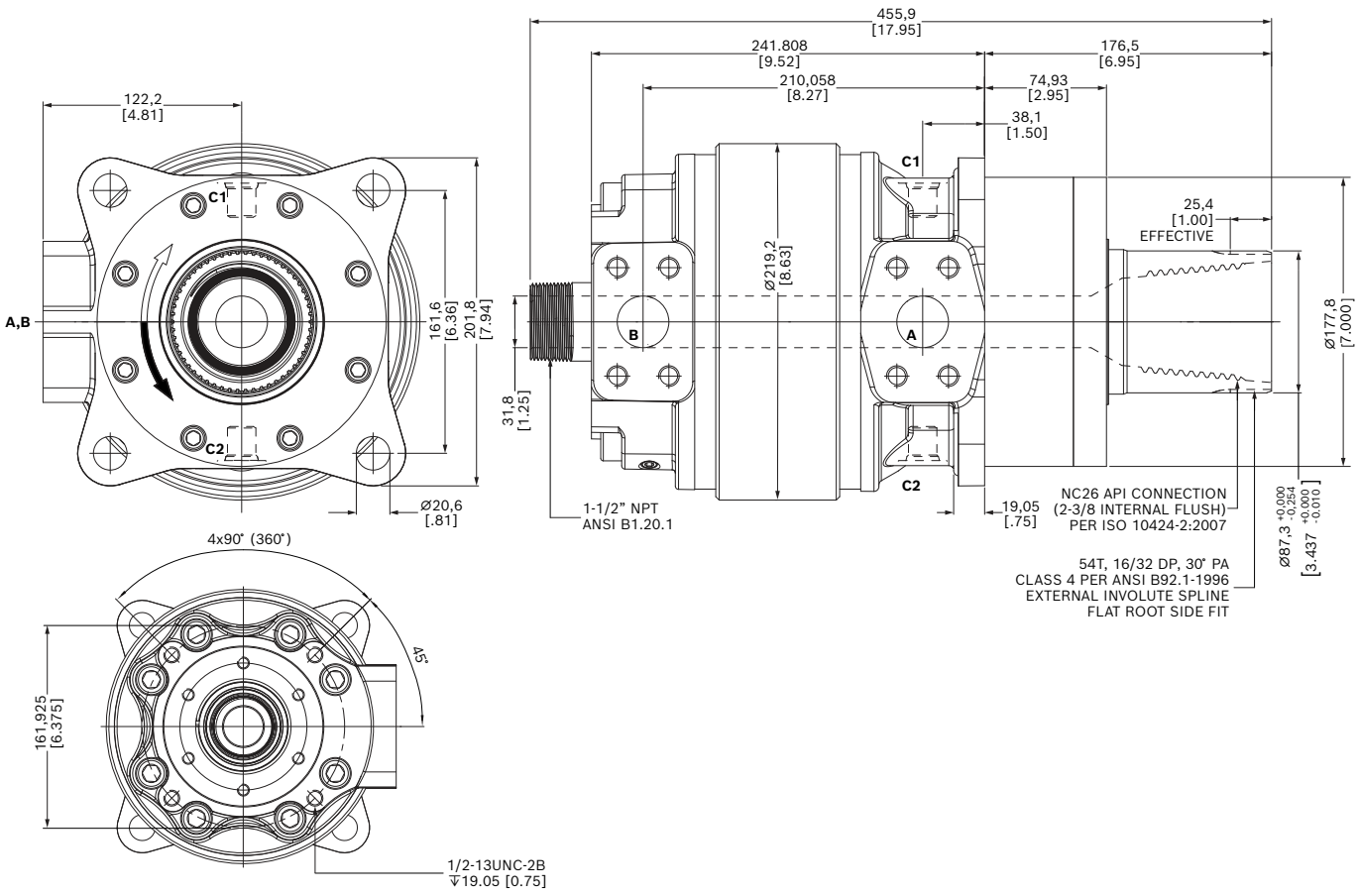
* Radial load located at center of effective output of the shaft.

Permissible Radial Load		Operating Torque	
(lbf)	(N)	(ft-lbf)	(N-m)
3500	15569	3062–3115	4151–4224
3000	13345	3384–3438	4588–4661
2500	11121	3706	5025
2000	8896	3975	5389

For additional information, consult your Rineer representative.

Technical data

Unit dimensions – Code 62 (T4 bearing)

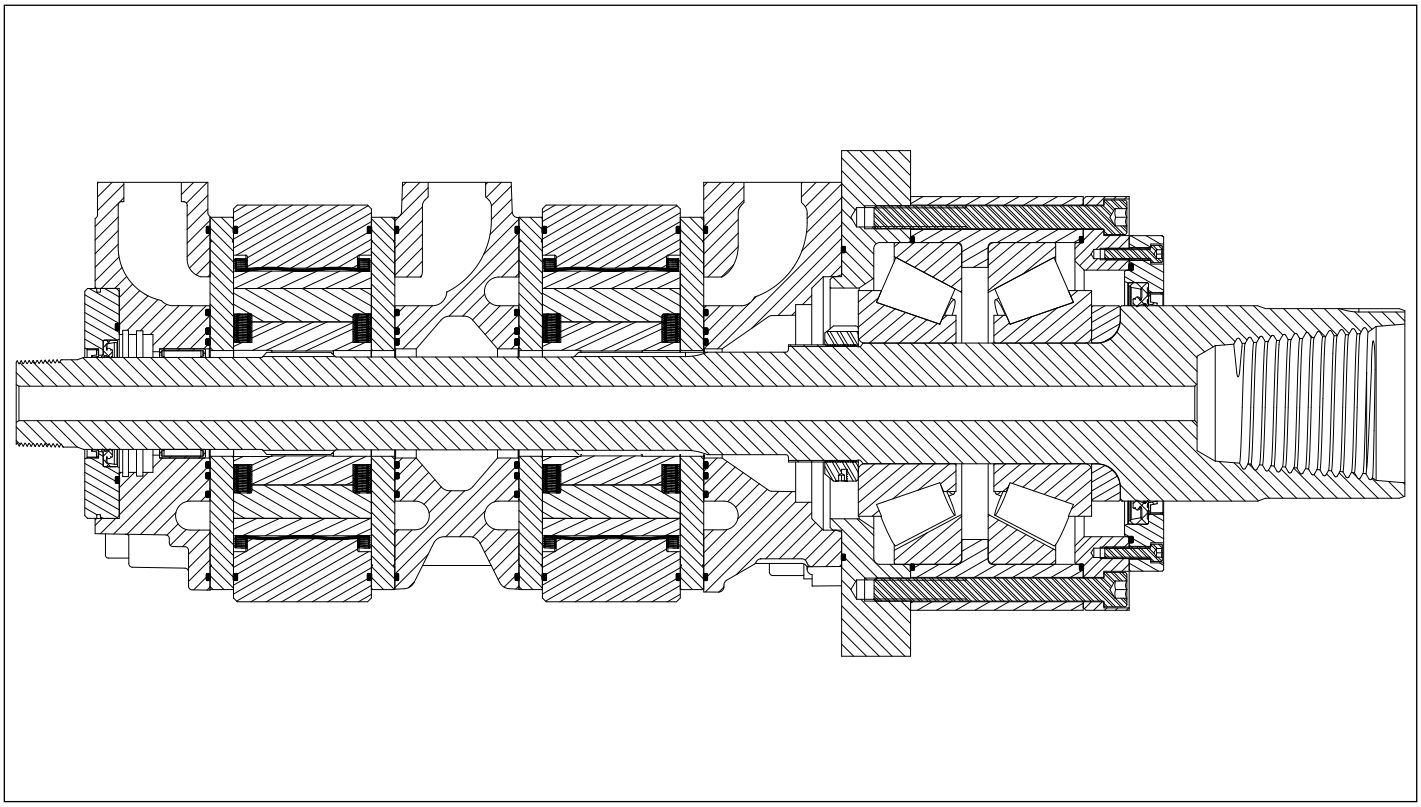


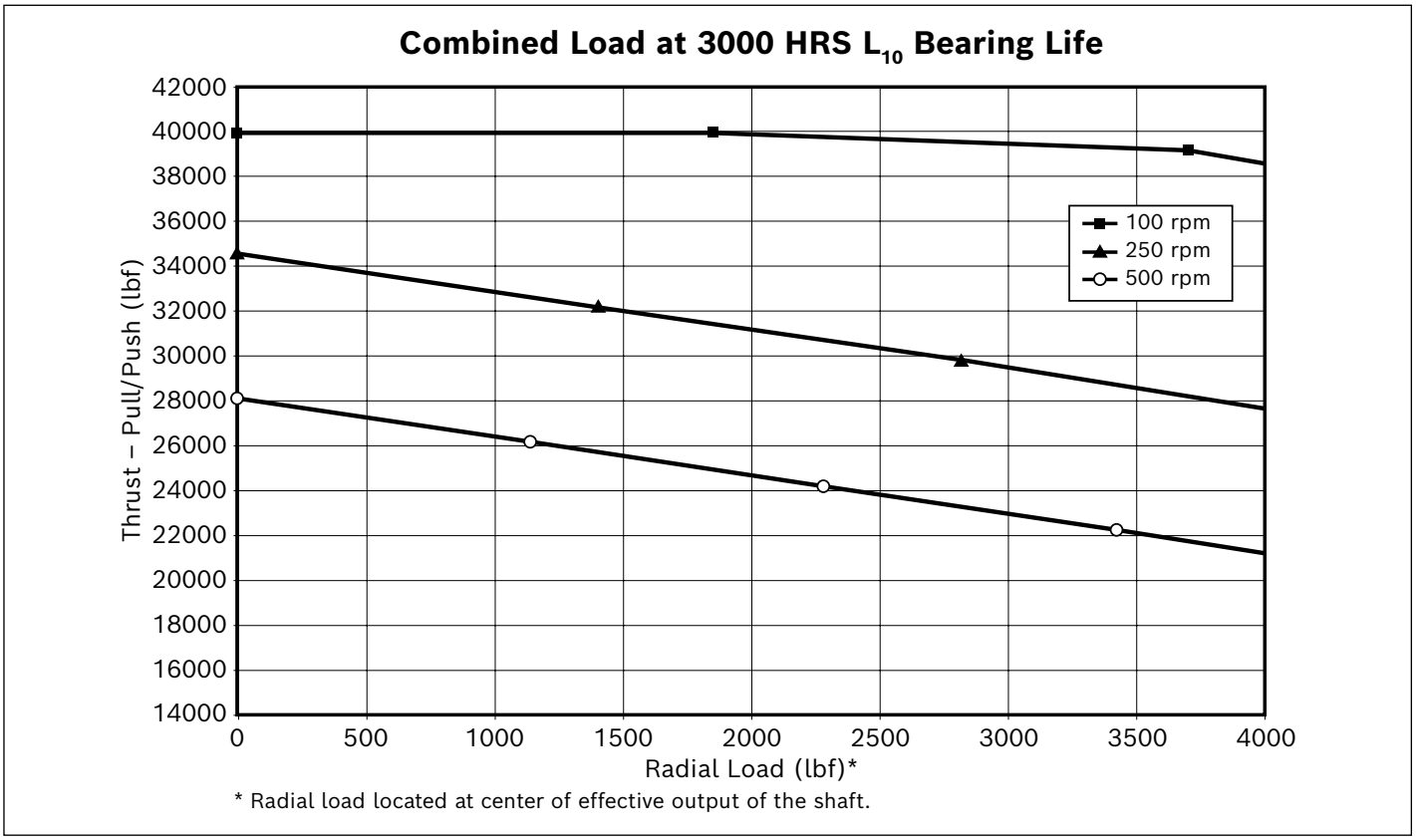
Model #:

MV057-D2-2S-***-53-T4-*VD-000

Technical data

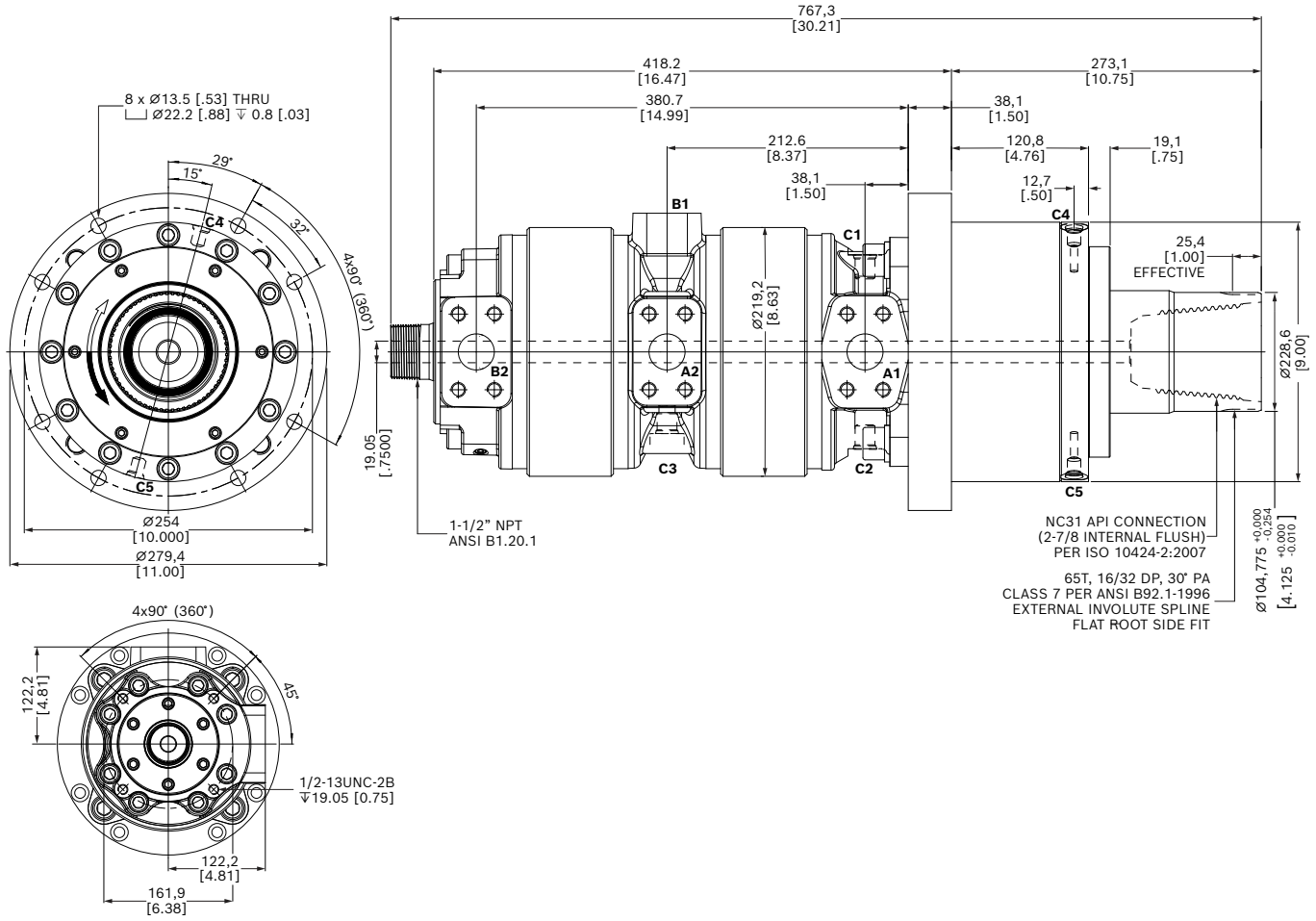
Bearing data – Code 62 (T5 bearing)





Technical data

Unit dimensions – Code 62 (T5 bearing)



Model #:

MV057-D4-2S-***-63-T5-TVD-000

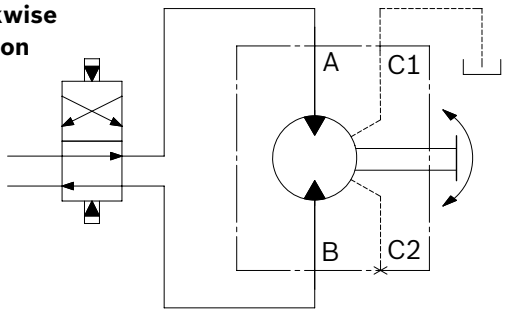
Engineering guidelines

Circuit design

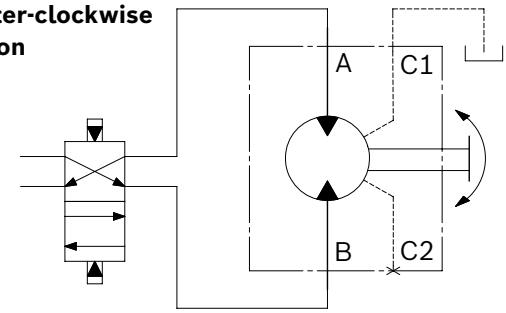
2-port motor circuit

When fluid flow is provided to the “A” port, the rotation of the shaft, as seen from its end, will be clockwise. The “B” port will be the return line flow. Using the “B” port for inlet flow will reverse the direction of the shaft rotation, and the “A” port will become the return line port.

Clockwise rotation



Counter-clockwise rotation



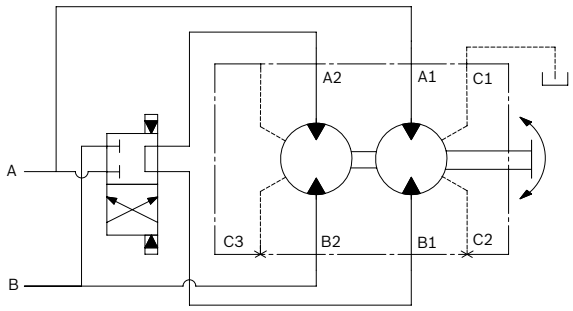
4-port motor circuit

The front housing has a port designated “A1.” The center housing has 2 ports, designated “A2” and “B1”. Port “A2” is on the same plane as port “A1”. Port “B1” is offset from “A2” by 90 degrees. The rear housing has a port designated “B2”, located on the same plane as “A1” and “A2.” The 4-port motor is capable of single speed operation, and with external valving, two speed operation. Two-speed operation with the 4-port motor can be accomplished using either series, parallel, or logic circuits.

Series/parallel circuit

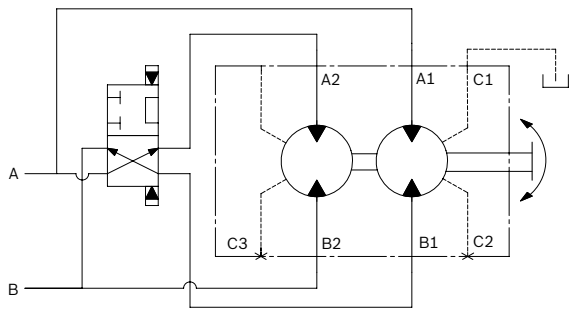
When using a series/parallel circuit with the 4-port motor, equal displacement rotating groups must be used. See the circuit diagram below for reference only.

Series Circuit



Note: Circuit between A2 and B2 port must be rated for full system pressure.

Parallel Circuit



Note: Circuit between A2 and B2 port must be rated for full system pressure.

Notes

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