Rineer High Torque Vane Motor MV015 Series Technical Data Sheet

- Maximum operating pressure:
  - Code 61: 3000 psi (207 bar)

Features

- Ideal for medium speed, high torque applications requiring reliability in a small size
- High power to weight ratio
- Eight fixed displacement rotary groups ranging from 6 in^3 to 15 in^3 (98 cc to 246 cc)
- High torque at start and stall, up to 94% of the theoretical value
- Continuous operating speeds of up to 2000 RPM
- Available with up to 150 HP (112 kW)
- Able to conform to SAE ‘C’ mounting specification
- Available with optional through-hole shaft
- Customizable for direct drive applications
- High reliability in demanding applications
- Long service life
- Support and spare parts available for repairs

Overview of contents

Ordering code

01		02		03		04		05		06		07	08		09	
MV015	**–**	**61**	**–**	**1S**	**–**	**015**	**–**	**30**	**–**	**B1**	**–**	**T**	**B**	**–**	**000**	

01	**Motor Series**	**MV015**

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

02	***Code 61, single speed***	
	Standard cast rear housing with 1-1/4” 4-bolt flanges	**61**
	Code 61, 2-speed (consult your Rineer representative)	
	Standard cast rear housing with 1-1/4” 4-bolt flanges, single pilot, open during crossover	**62**
	Standard cast rear housing with 1-1/4” 4-bolt flanges, single pilot, closed during crossover	**63**
	Standard cast rear housing with 1-1/4” 4-bolt flanges, double pilot, open during crossover	**65**
	Standard cast rear housing with 1-1/4” 4-bolt flanges, single pilot, closed during crossover	**67**
	Continuous cast rear housing with 1-1/4” 4-bolt flanges, single pilot, open during crossover	**72**
	Continuous cast rear housing with 1-1/4” 4-bolt flanges, single pilot, closed during crossover	**73**
	Continuous cast rear housing with 1-1/4” 4-bolt flanges, double pilot, open during crossover	**75**
	Continuous cast rear housing with 1-1/4” 4-bolt flanges, single pilot, closed during crossover	**77**

Rotary Group Designation

03	Code 61 – standard speed	**1S**

Displacement Options

04	***2-port, single rotating group***	
	6 in^3 (98 cc)/rev.	**006**
	7 in^3 (115 cc)/rev.	**007**
	8 in^3 (131 cc)/rev.	**008**
	9.5 in^3 (156 cc)/rev.	**009**
	10.5 in^3 (172 cc)/rev.	**010**
	11.5 in^3 (188 cc)/rev.	**011**
	13 in^3 (213 cc)/rev.	**013**
	15 in^3 (246 cc)/rev.	**015**

Shaft Selection

05	Keyed	**30**
	Splined	**31**
	Wheel motor with tapered shaft according to SAE J501	**32**
	Shaftless for direct mount	**33**
	Shaftless for use with customer supplied shaft	**37**
	Splined shaft out front and rear	**49**
	Manually retractable splined shaft	**50**
	Smooth shaft – configured to customer specifications	**52**
	Hollow shaft with CA21-1 male drill rod threads	**53**

01		02		03		04		05		06		07	08		09	
MV015	**–**	**61**	**–**	**1S**	**–**	**015**	**–**	**30**	**–**	**B1**	**–**	**T**	**B**	**–**	**000**	

Bearing Selection

06	*See shaft and bearing combinations for availability*	

Shaft Seal (see page 7)

07	TCN (radial lip seal) – In FKM (Viton) only, required for 53 shaft	**T**
	Quad ring	**Q**

Main Body O-rings (see page 6 for seal material specifications)

08	NBR (Buna) – standard, required for 53 shaft	**B**
	FKM (Viton) – optional	**V**

Special Index Number

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

Shaft and bearing combinations

Code 61

	30	**31**	**32**	**33**	**49**	**50**	**52**	**53**
B1	●	●	—	●	●	●	○	—
B2	●	—	—		—	—	—	—
B4	●	●	—	—	—	—	—	
T1	—	—	●	—	—	—	—	●

● = available ○ = upon request — = not available

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

Weights (approximate)

Motor type	**lbs.**	**kg**
30, 31 shaft	47	21
32 shaft	57	26
33 shaft	45	20
49 shaft	46	21
50 shaft	64	29
53 shaft	60	27

Technical data

The MV015 series motors are hydraulically balanced internally. 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 configurations (see Figure 1), but custom, application-specific solutions may be available. Please consult your Rineer representative.

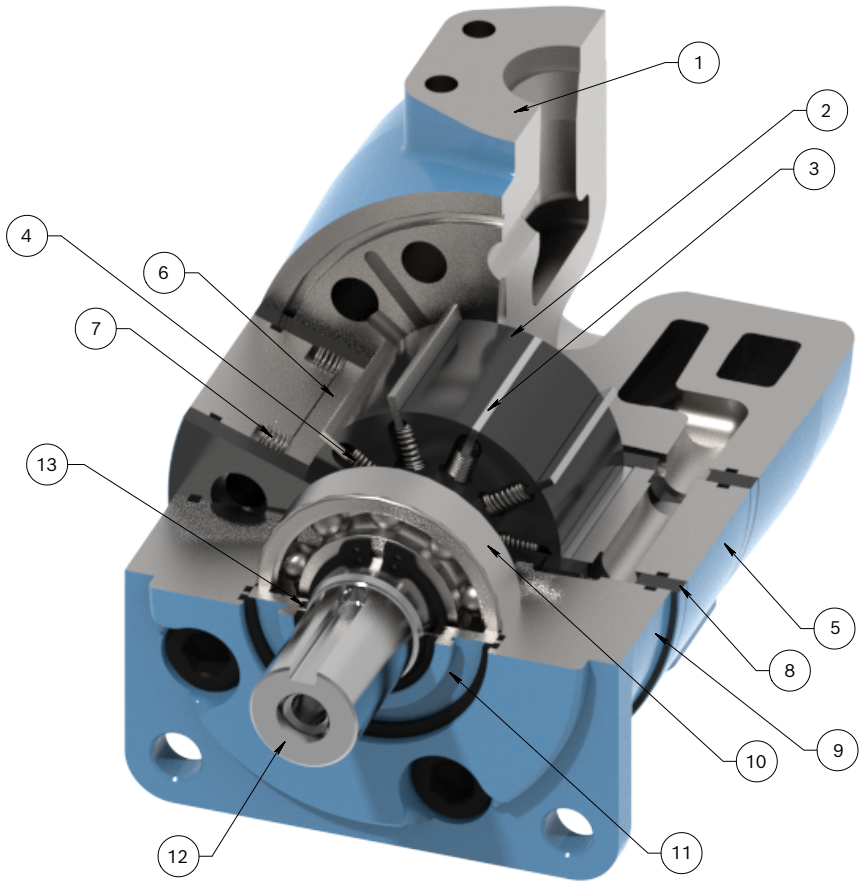


Figure 1. Basic parts list

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

Technical data

Oil supply lines are connected to ports A and B. Case drain lines can be installed on the C1 port. Reference motor unit drawings beginning on page 18 for additional case line locations and Case Drain section on page 7 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).

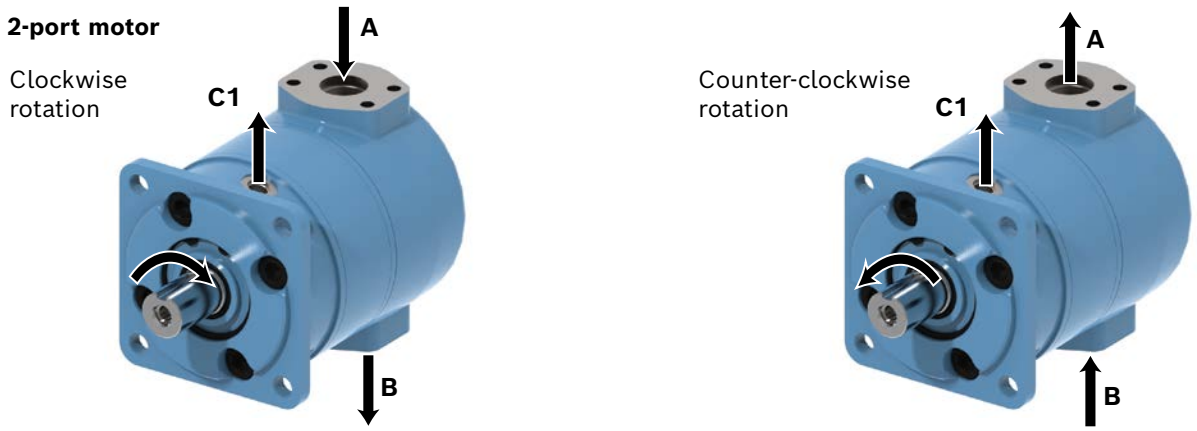


Figure 2. Oil flow direction to establish clockwise and counter-clockwise rotation.

Motor specifications

Standard Series Code 61	Displacement		Pressure				Speed		Torque @ 3000 psid (207 bar)*	
			Continuous		Intermittent		Continuous	Intermittent	Continuous	
	(in^3/rev)	(cm^3/rev)	(psi)	(bar)	(psi)	(bar)	(rpm)	(rpm)	(lb-ft)	(Nm)
MV015	6	98	3000	207	3500	241	2000	2600	183	248
	7	115					1900	2600	230	312
	8	131					1800	2600	274	372
	9.5	156					1700	2300	308	418
	10.5	172					1600	2300	352	477
	11.5	188					1600	2300	395	536
	13	213					1500	2000	428	580
	15	246					1500	2000	509	690

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

Note:

1. Intermittent duty cycle is six (6) seconds per minute.
2. 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
19/17/14*

* 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 your Rineer representative 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.

Technical data

Bosch Rexroth Rineer offers two types of rotary seals, namely a lip seal and quad ring seal designs in FKM. Radial lip seals accommodate external radial loads imposed on the shaft and higher speeds to a greater degree than quad seal designs. Both designs will accommodate 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

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 15 Series motors are designed for either internal or external case drainage. If operating in an open loop circuit, the use of an external case drain is optional and unused case drain ports should be plugged. If operating in a closed loop circuit, the 15 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. When used, this case drain line must be run to the reservoir with minimum restriction as to not exceed the rated capacity of the seals, and any unused case drain ports must be plugged. In this case, never plug all case drain ports as this will cause buildup 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 theoil, 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 1 gpm (4 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 50 hp (37.28 kW) at 1000 rpm with an available supply pressure of 2700 psi (186 bar) and a return line pressure of 200 psi (14 bar). The pressure differential is 2500 psi (172 bar).

Calculations:

Theoretical torque (ideal no losses):

Metric:

$$T = \frac{P \times 9549.09}{n} = \frac{37.28 \times 9549.09}{1000} = \sim 356 \text{ N-m}$$

U.S.:

$$T = \frac{P \times 5252}{n} = \frac{50 \times 5252}{1000} = \sim 263 \text{ lb-ft}$$

Theoretical displacement (ideal no losses):
for condition T = 356 N-m (T = 263 lb-ft)

Metric:

$$d = \frac{T \times 62.81}{p} = \frac{356 \times 62.81}{172} = \sim 130 \text{ cc}$$

U.S.:

$$d = \frac{T \times 75.4}{p} = \frac{263 \times 75.4}{2500} = \sim 8 \text{ in}^3$$

Referencing the chart “Torque 8 in^3 (131 cc),” an 8 in^3 (131 cc) displacement motor at a pressure 2500 psid (172 bar) will develop torque of approximately 230 lb-ft (312 N-m).

Referencing the chart “Total Required Flow 8 in^3 (131 cc),” a 8 in^3 (131 cc) displacement motor at a pressure of 2500 psid (172 bar) operating at 1000 rpm will require a total flow of approximately 44 gpm (167 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

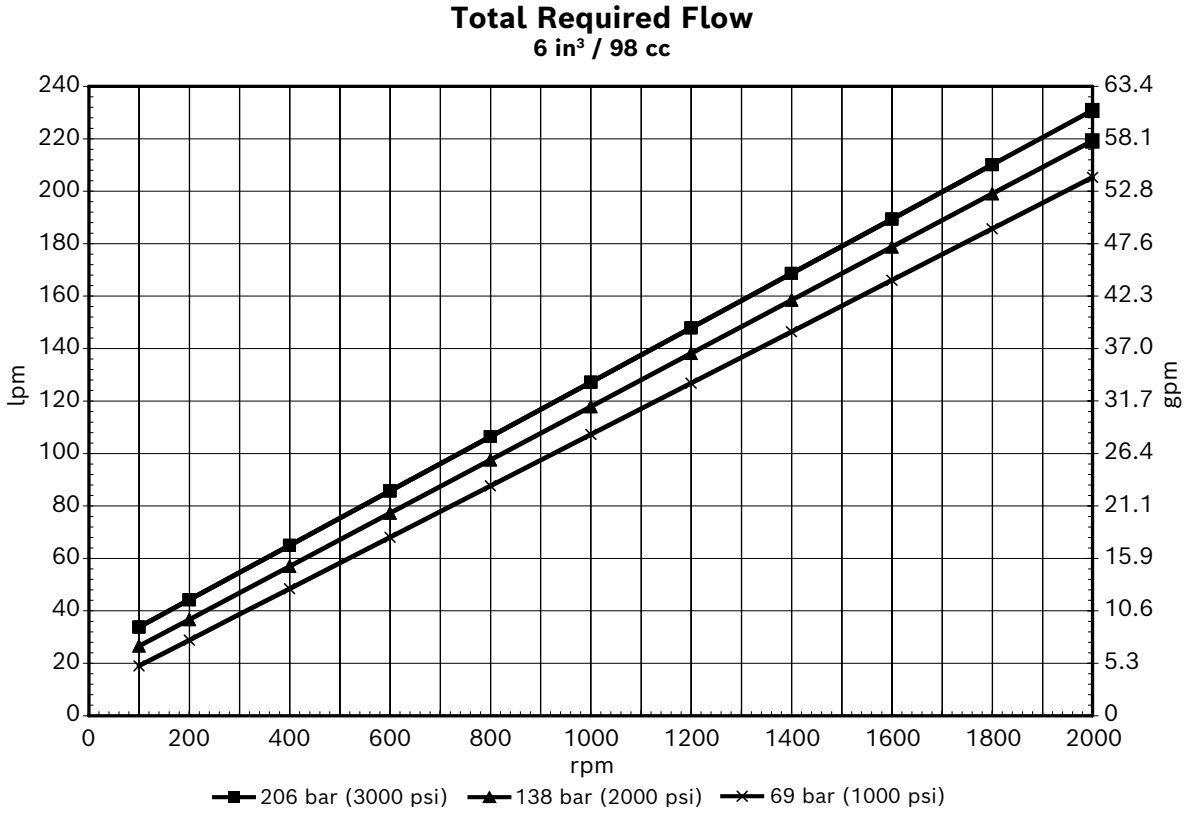
U.S.	Metric
$T = \frac{P \times 5252}{n}$	$T = \frac{P \times 9549.09}{n}$
$T = \frac{d \times \Delta p}{75.4}$	$T = \frac{d \times \Delta p}{62.81}$
$P_{shaft} = \frac{T \times n}{5252}$	$P_{shaft} = \frac{T \times n}{9549.09}$
$P_{shaft} = \frac{Q \times \Delta p}{1714}$	$P_{shaft} = \frac{Q \times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

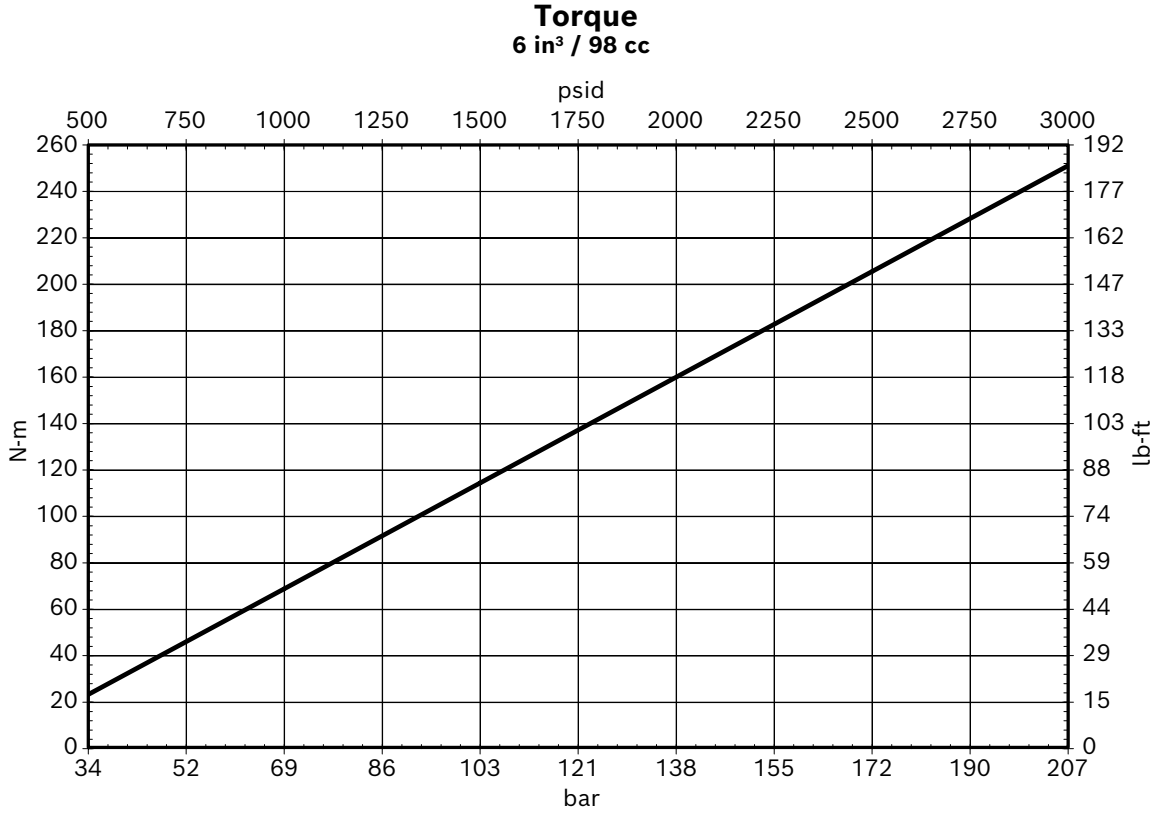
Unit Conversions

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

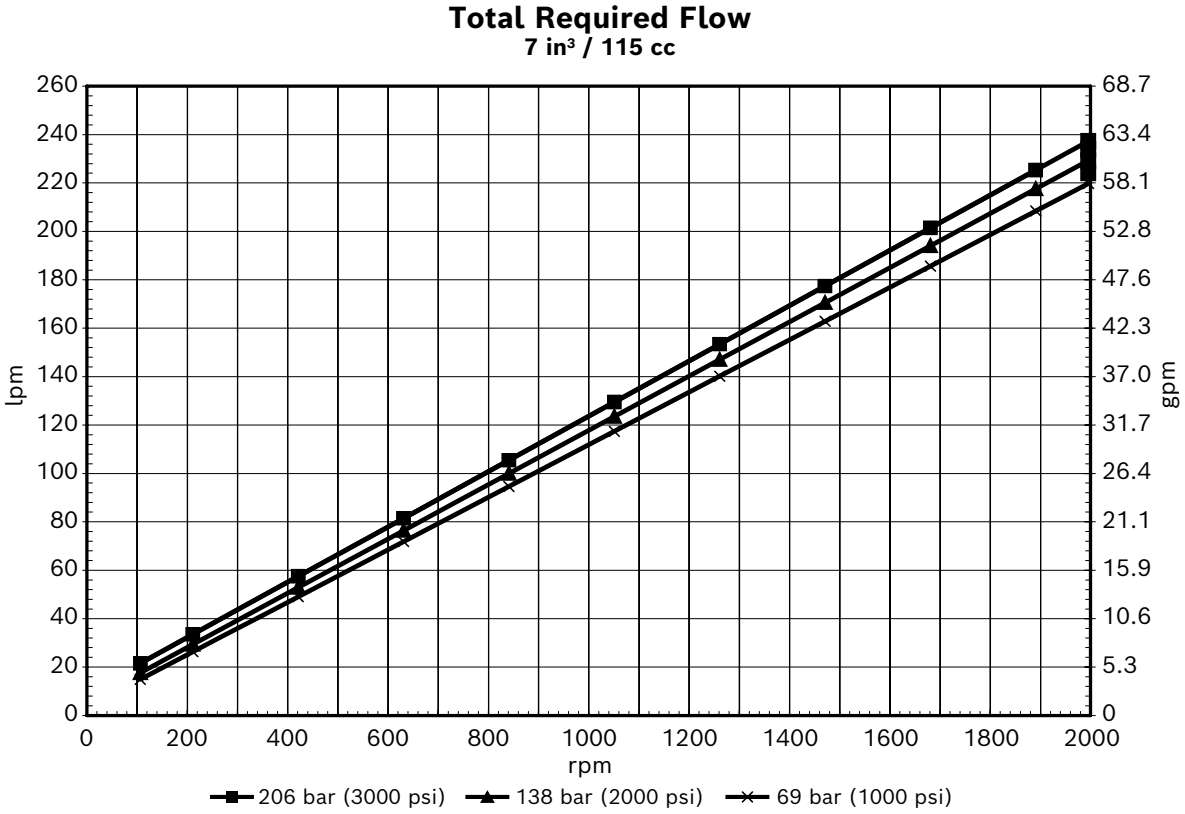
Flow and output torque – 6 in³

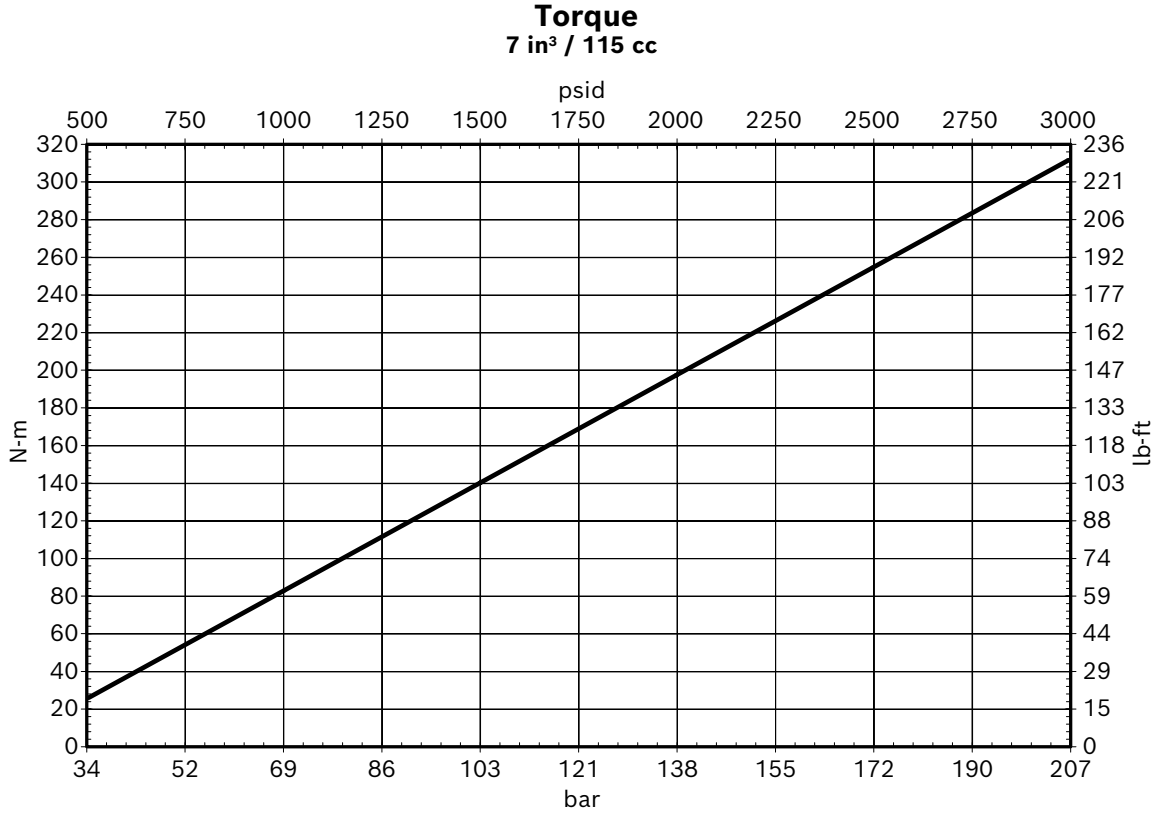




Technical data

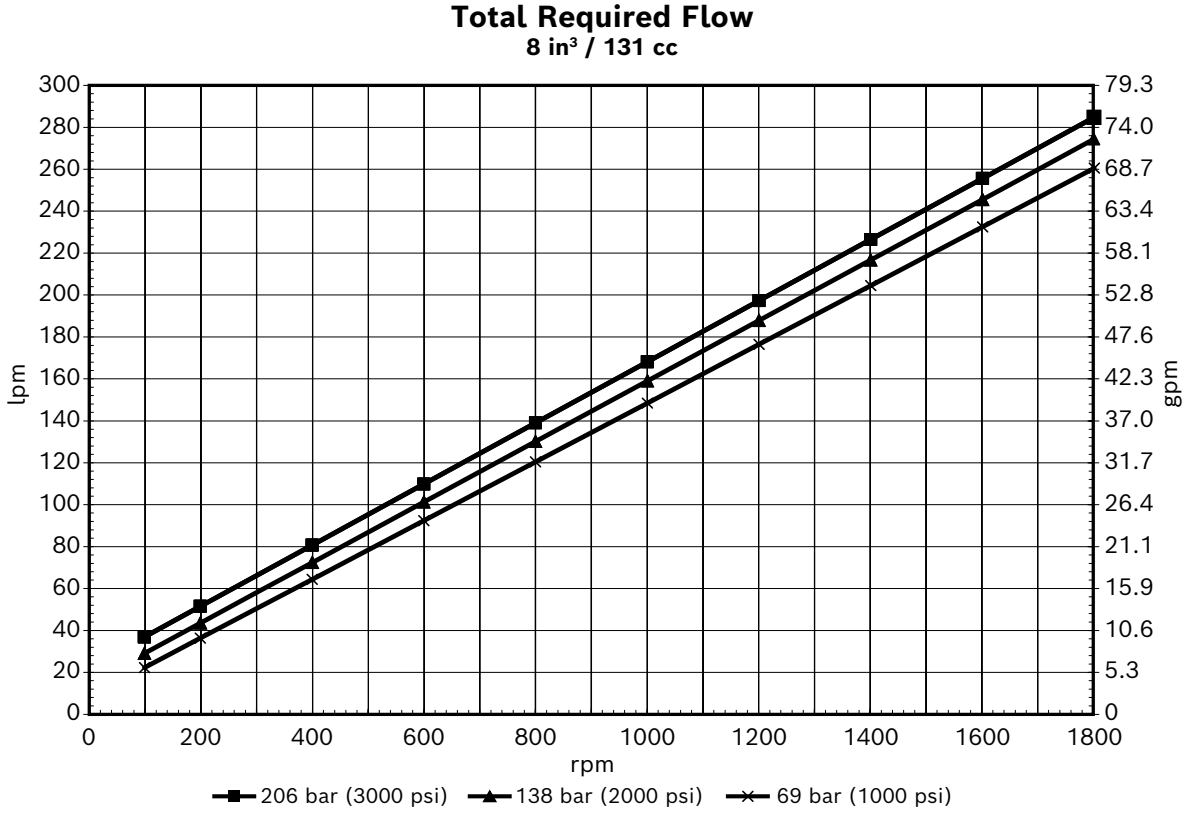
Flow and output torque – 7 in³

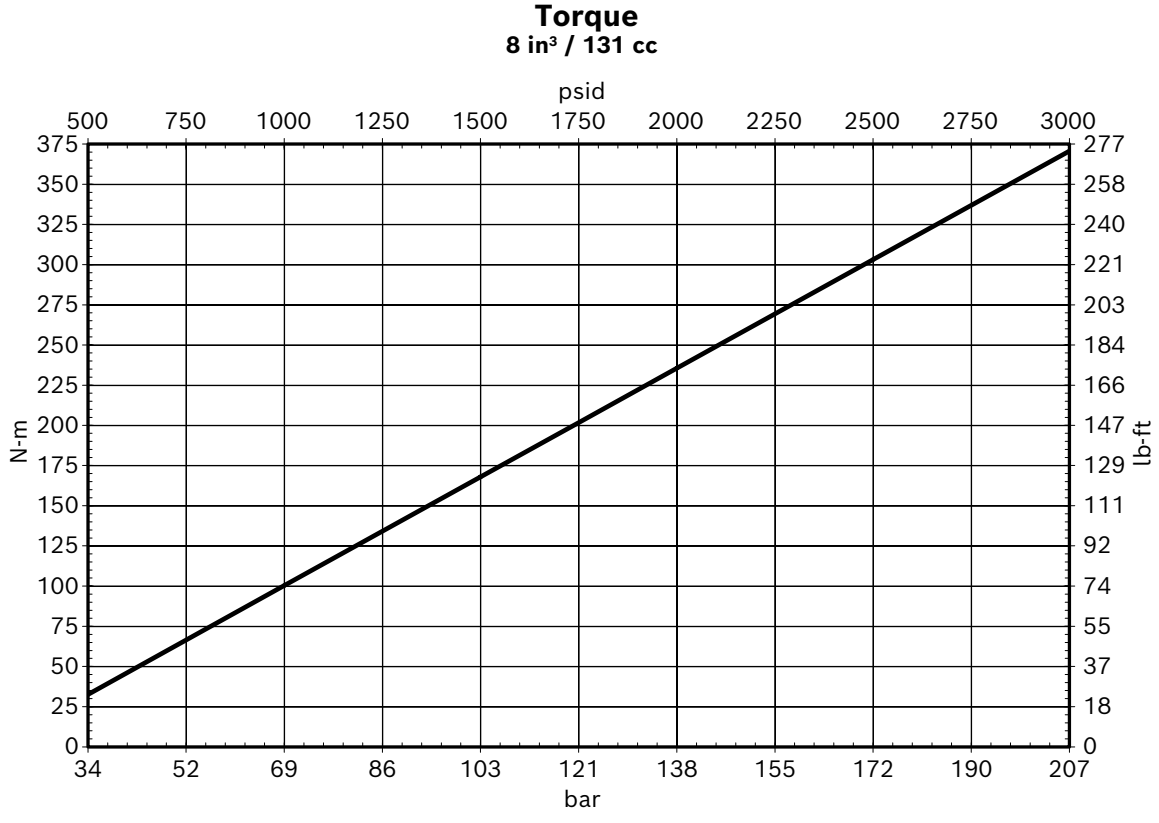




Technical data

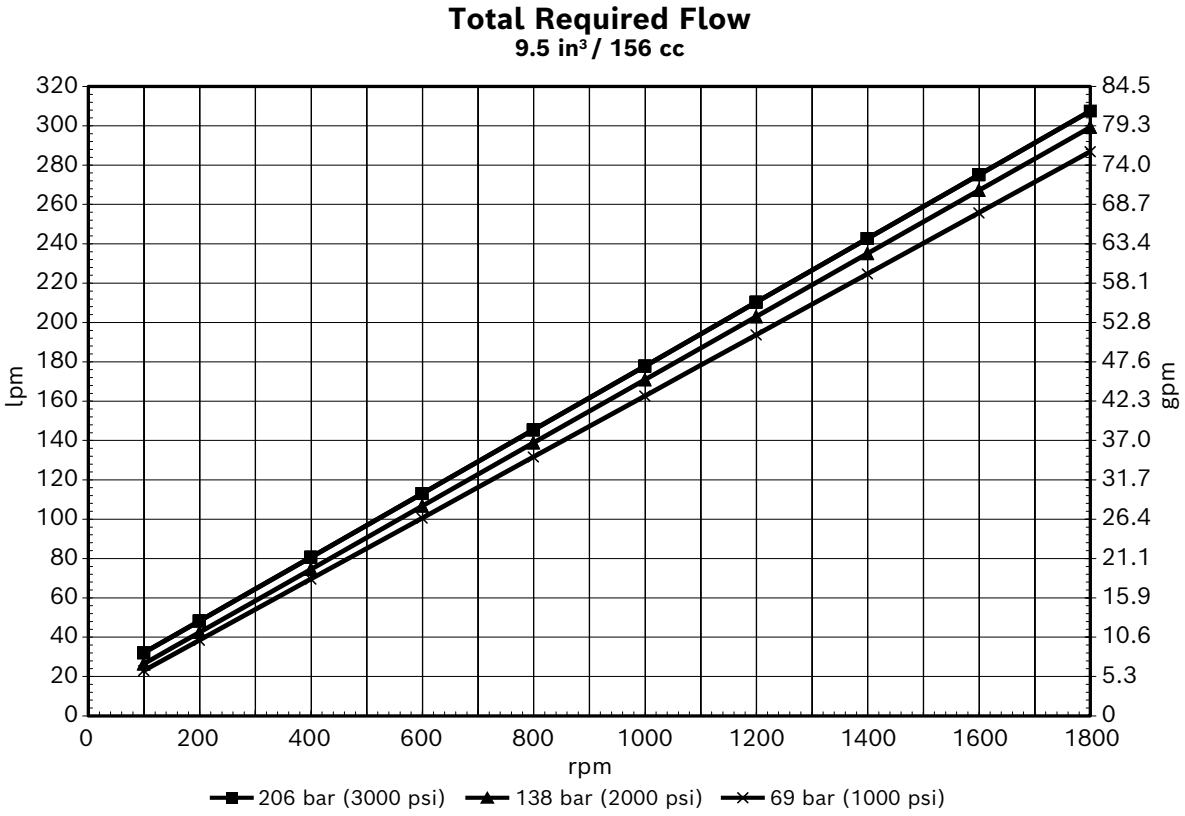
Flow and output torque – 8 in³

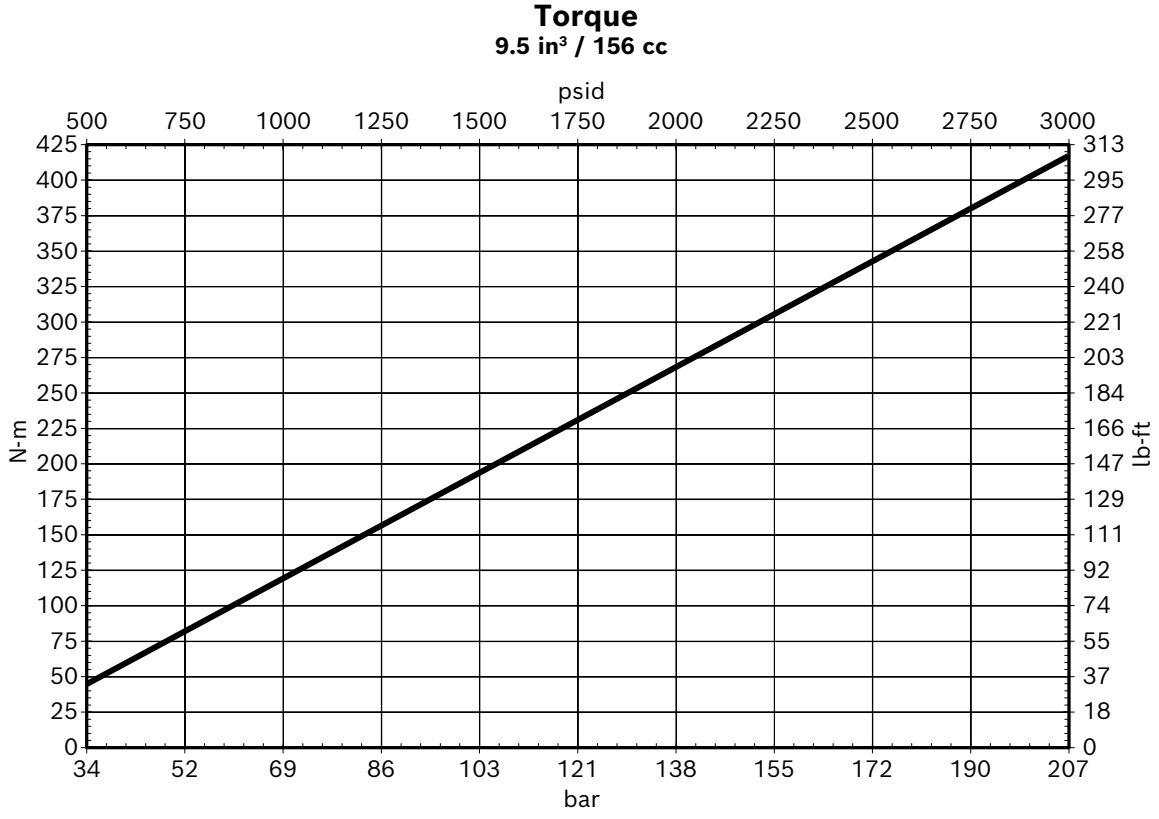




Technical data

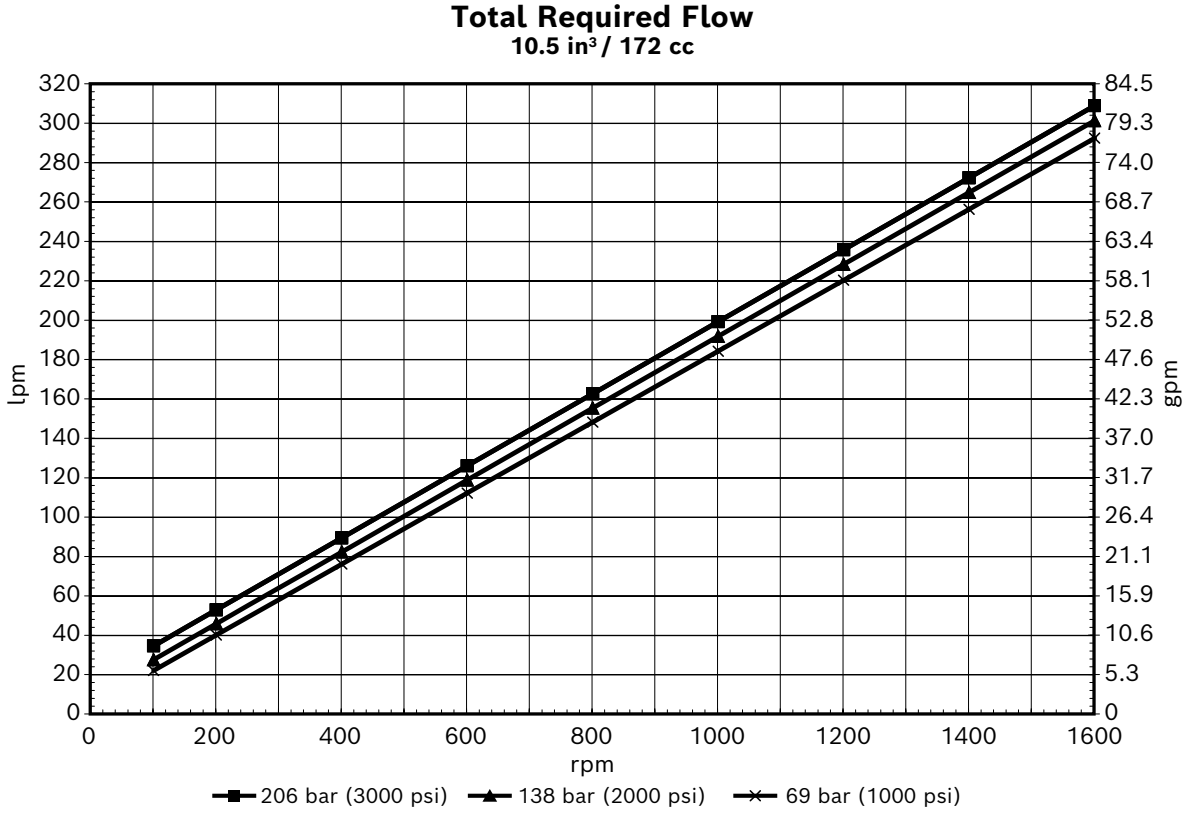
Flow and output torque – 9.5 in³

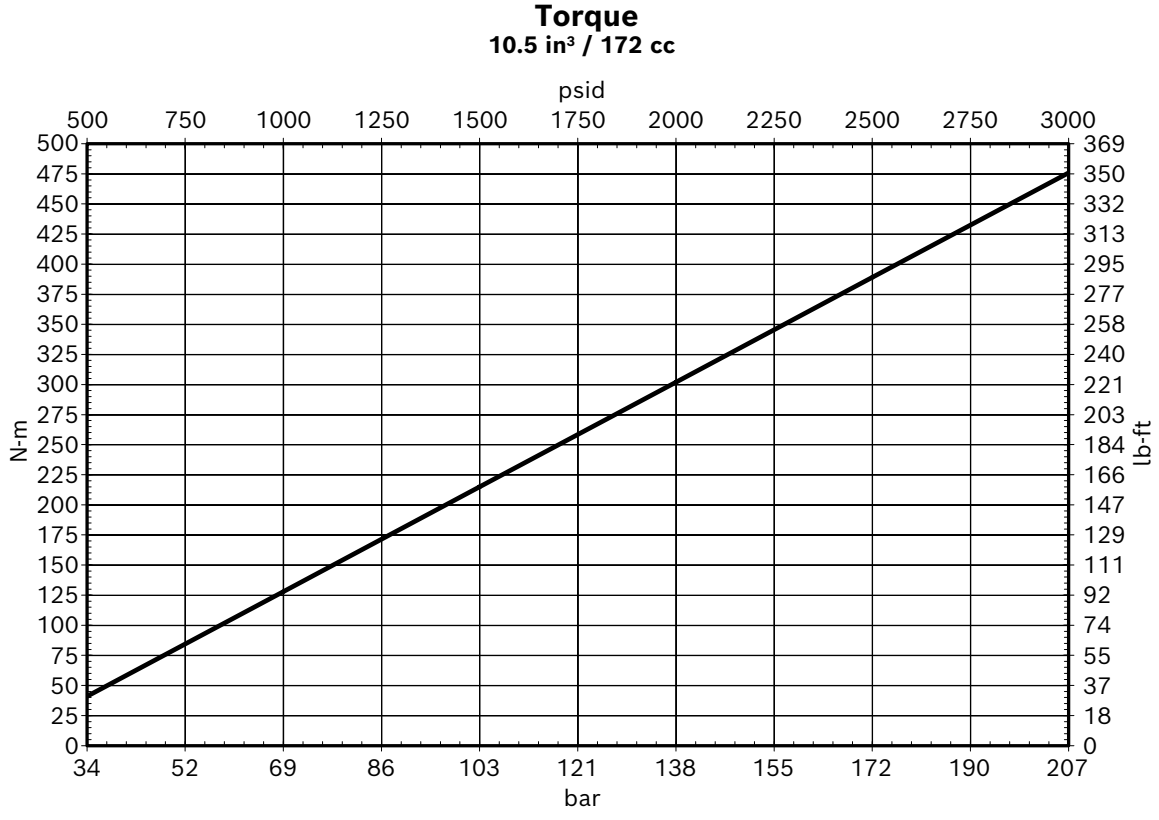




Technical data

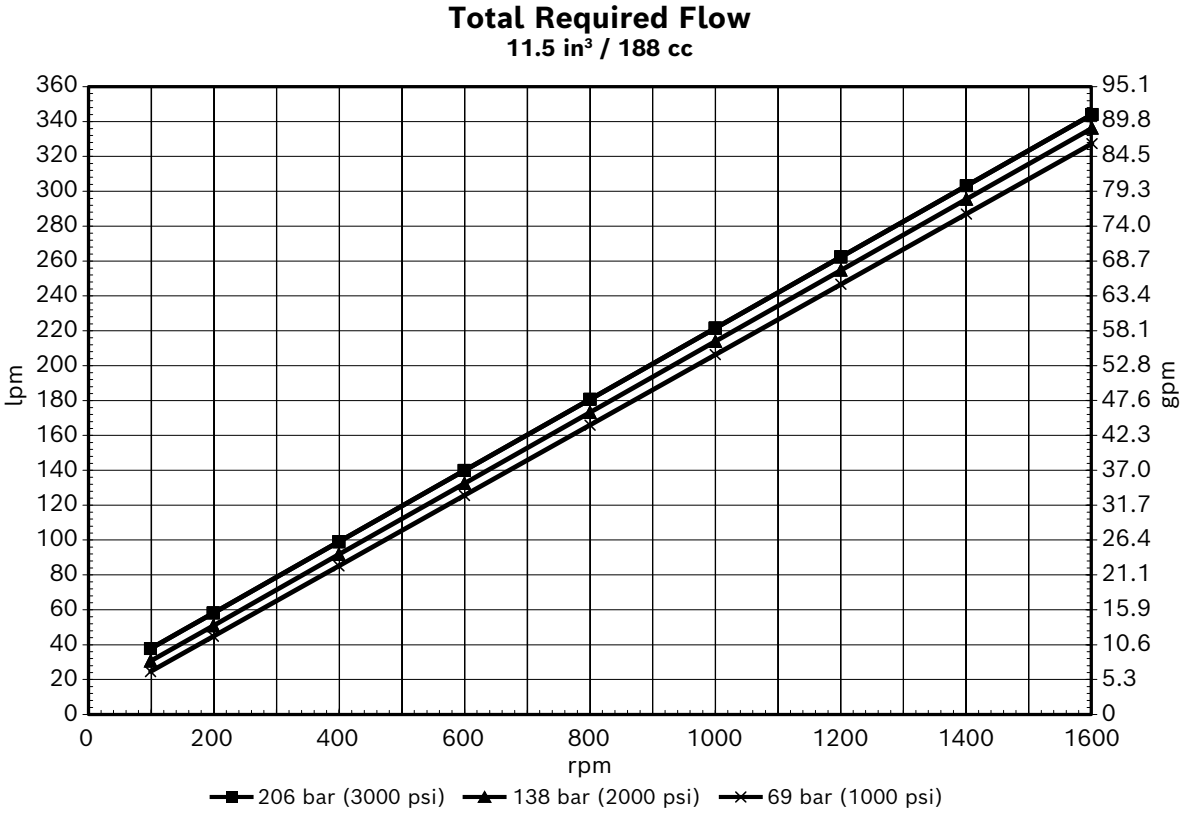
Flow and output torque – 10.5 in³

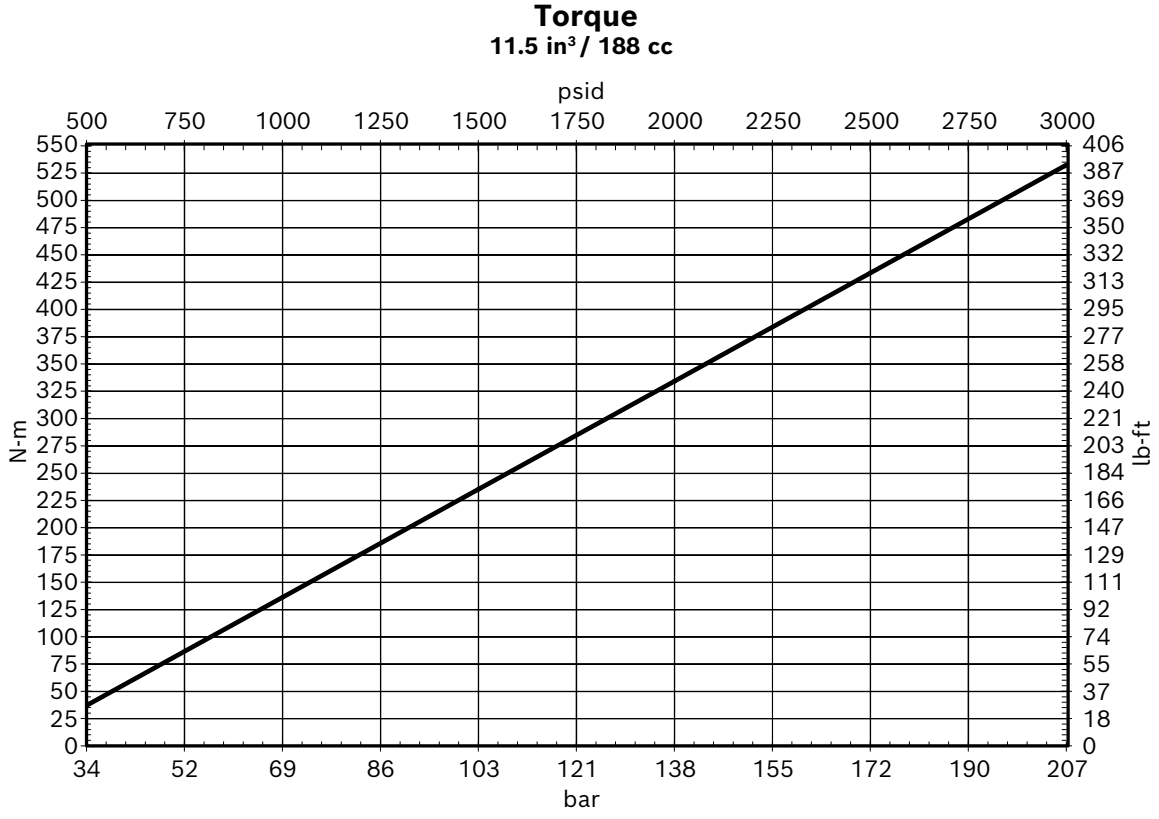




Technical data

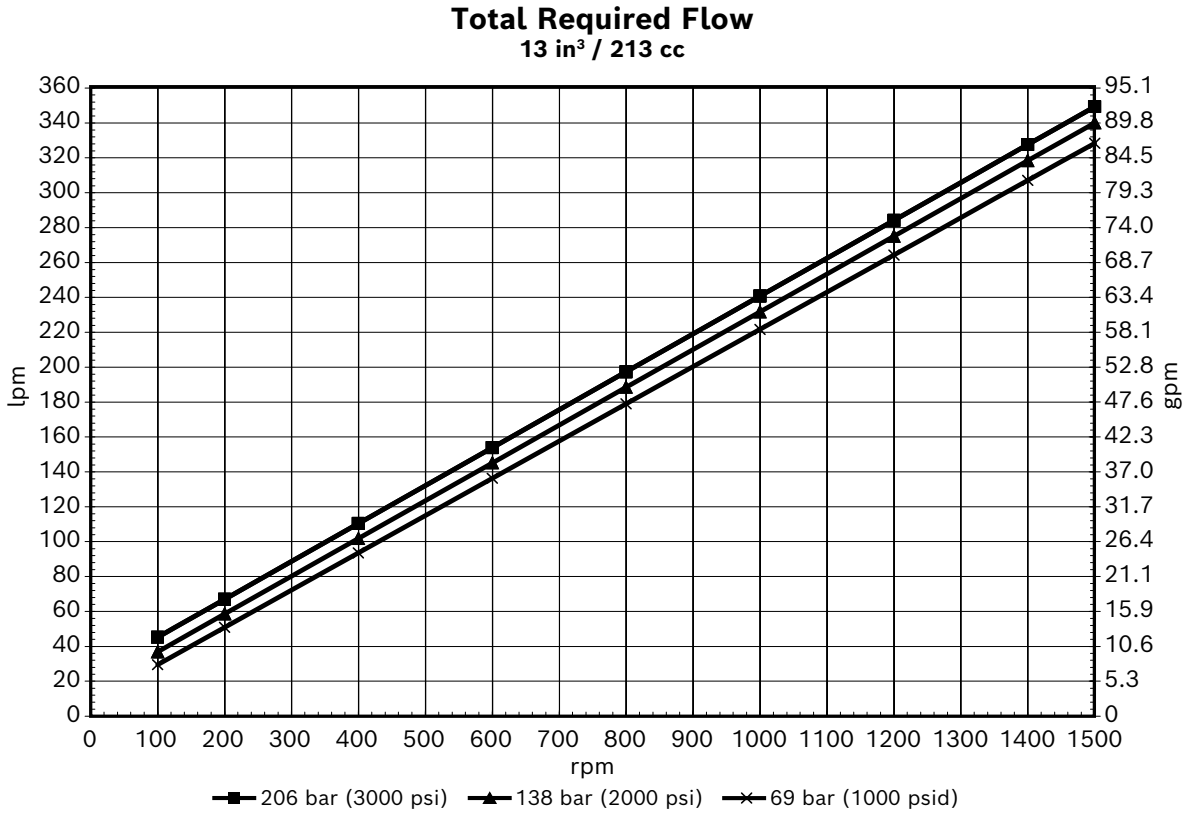
Flow and output torque – 11.5 in³

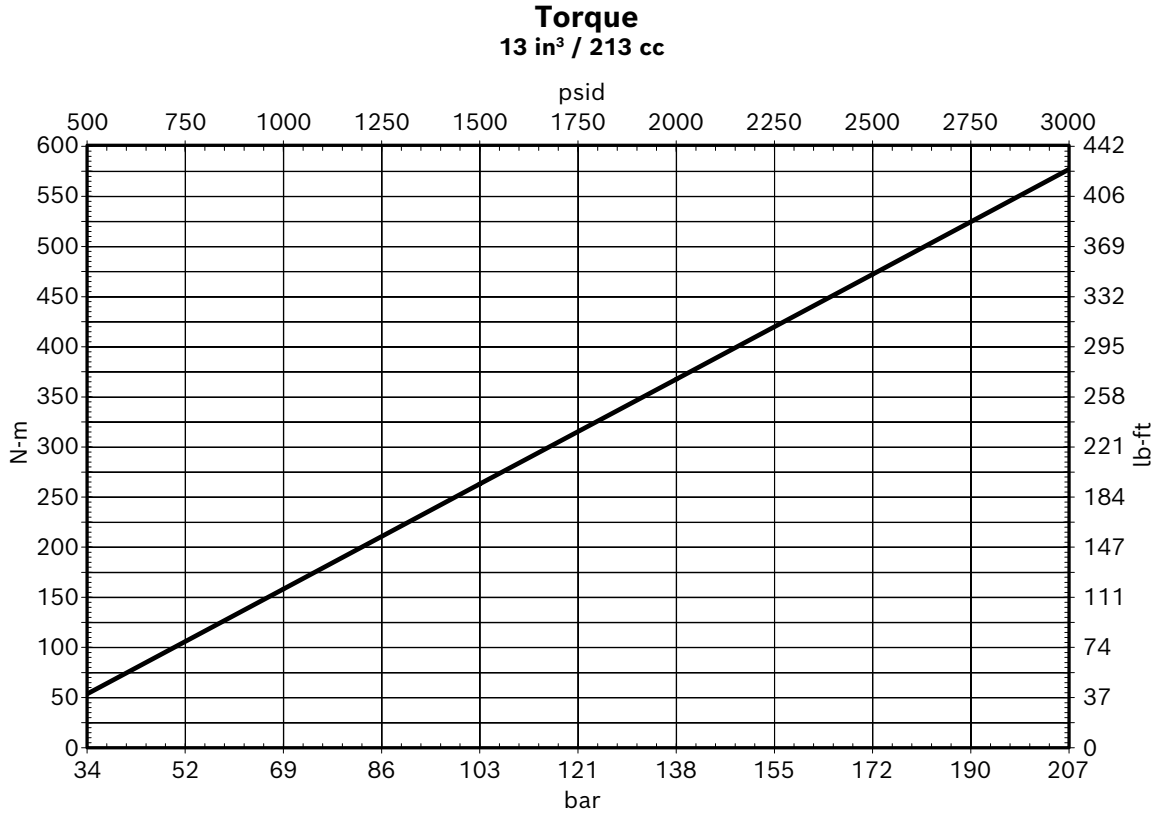




Technical data

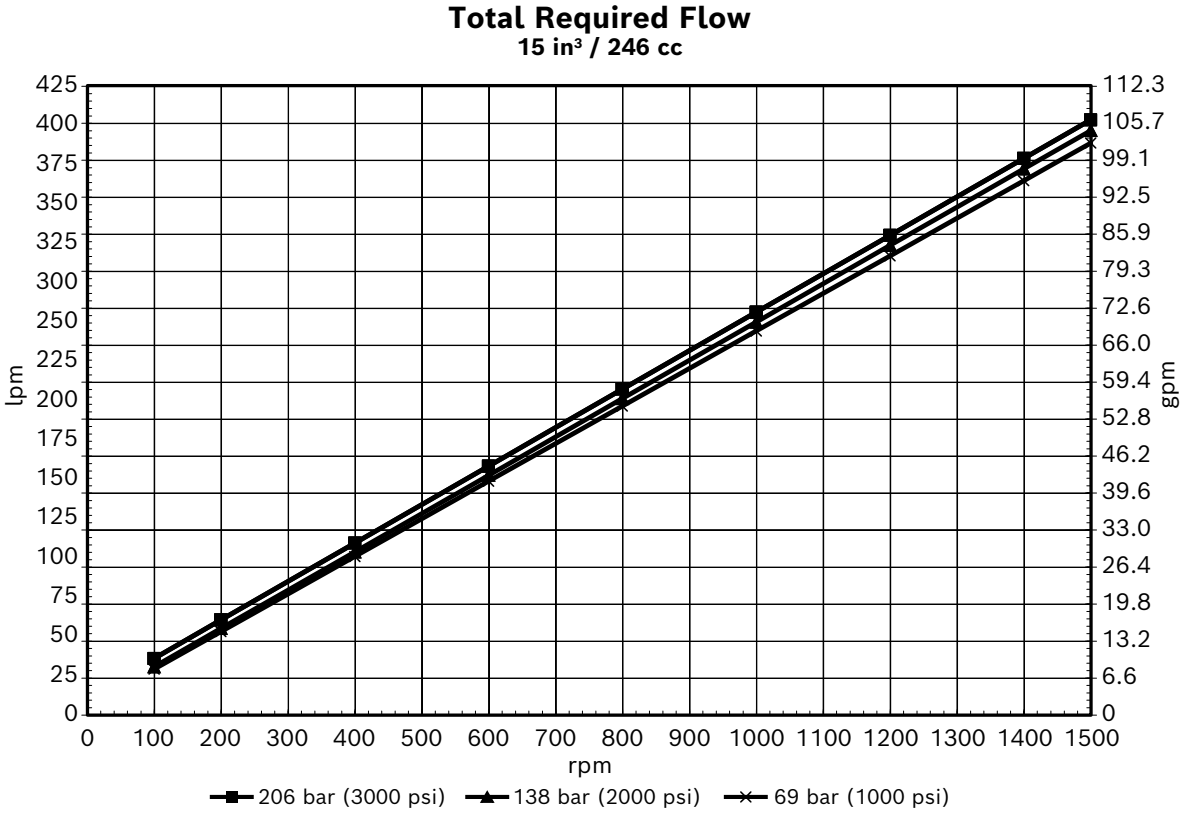
Flow and output torque – 13 in³

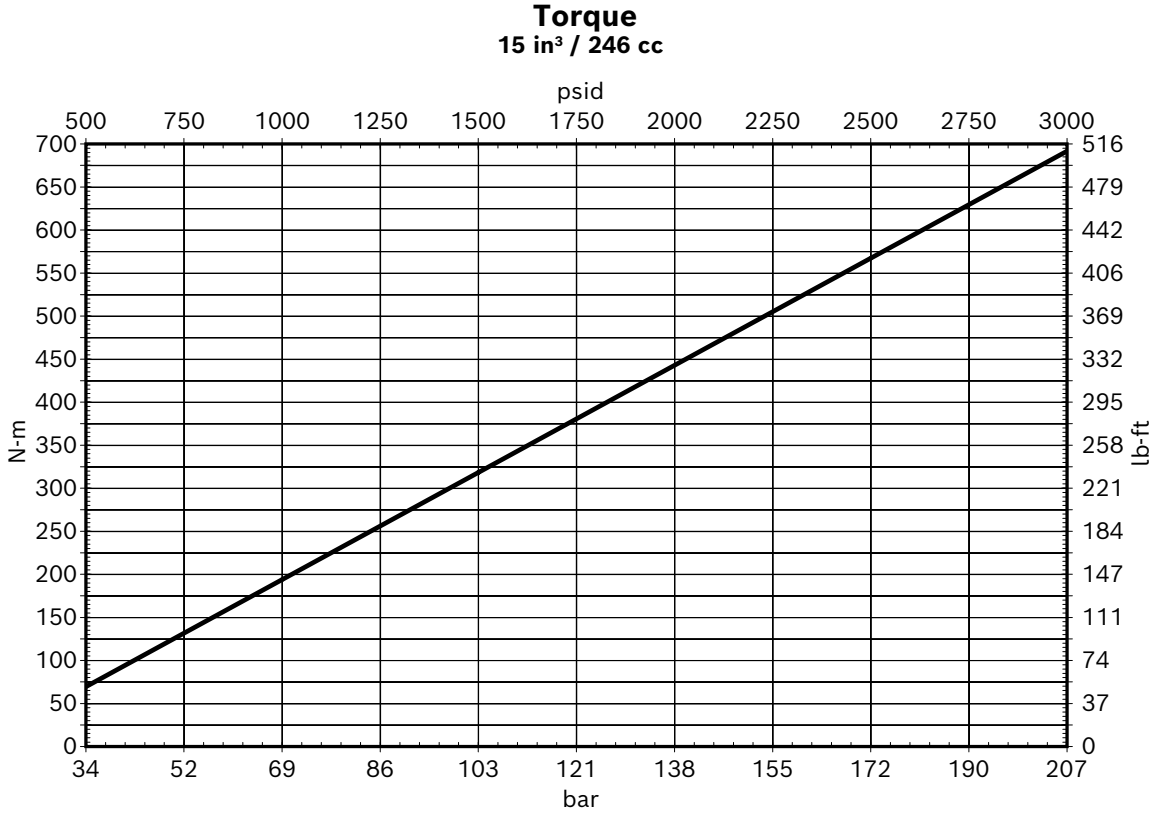




Technical data

Flow and output torque – 15 in³





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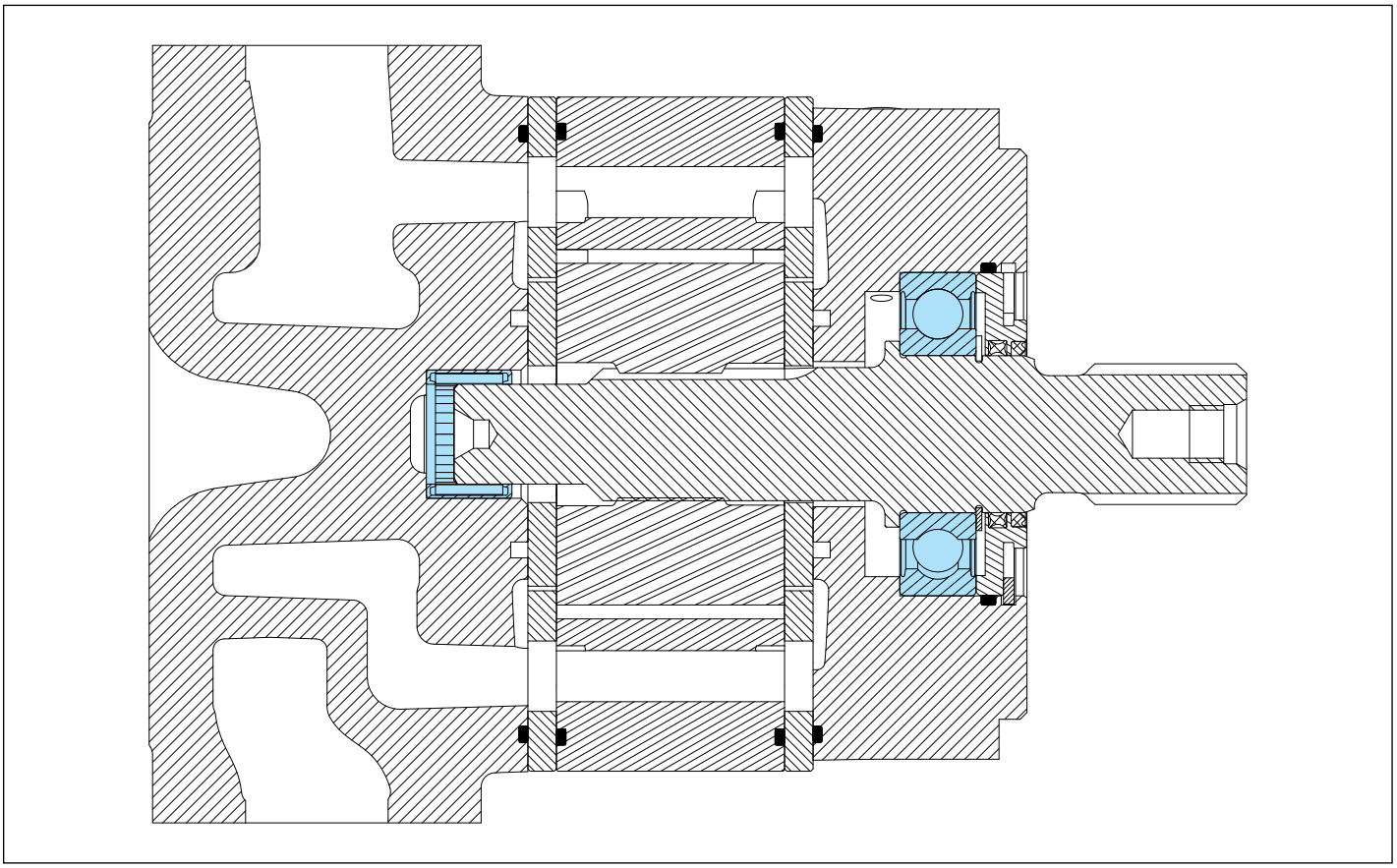
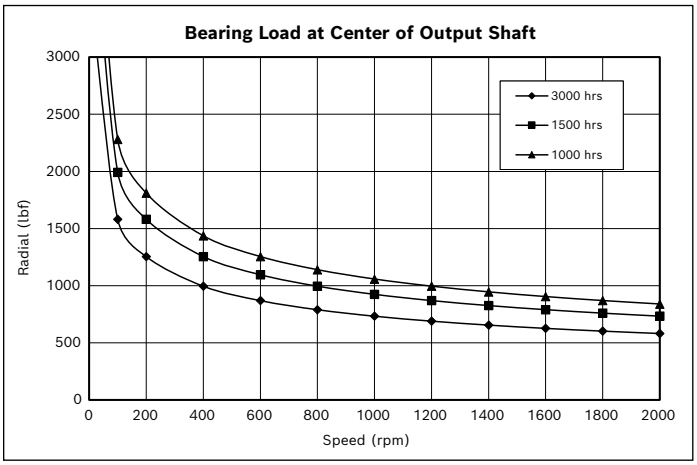
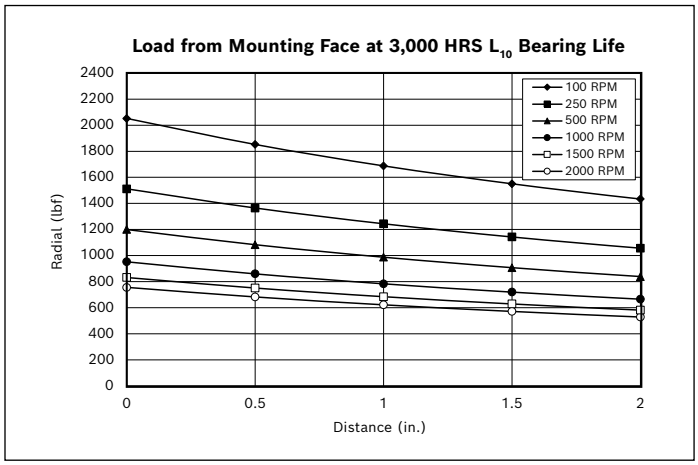
Technical data

Bearing data – Code 61 Motor (B1 Bearing)

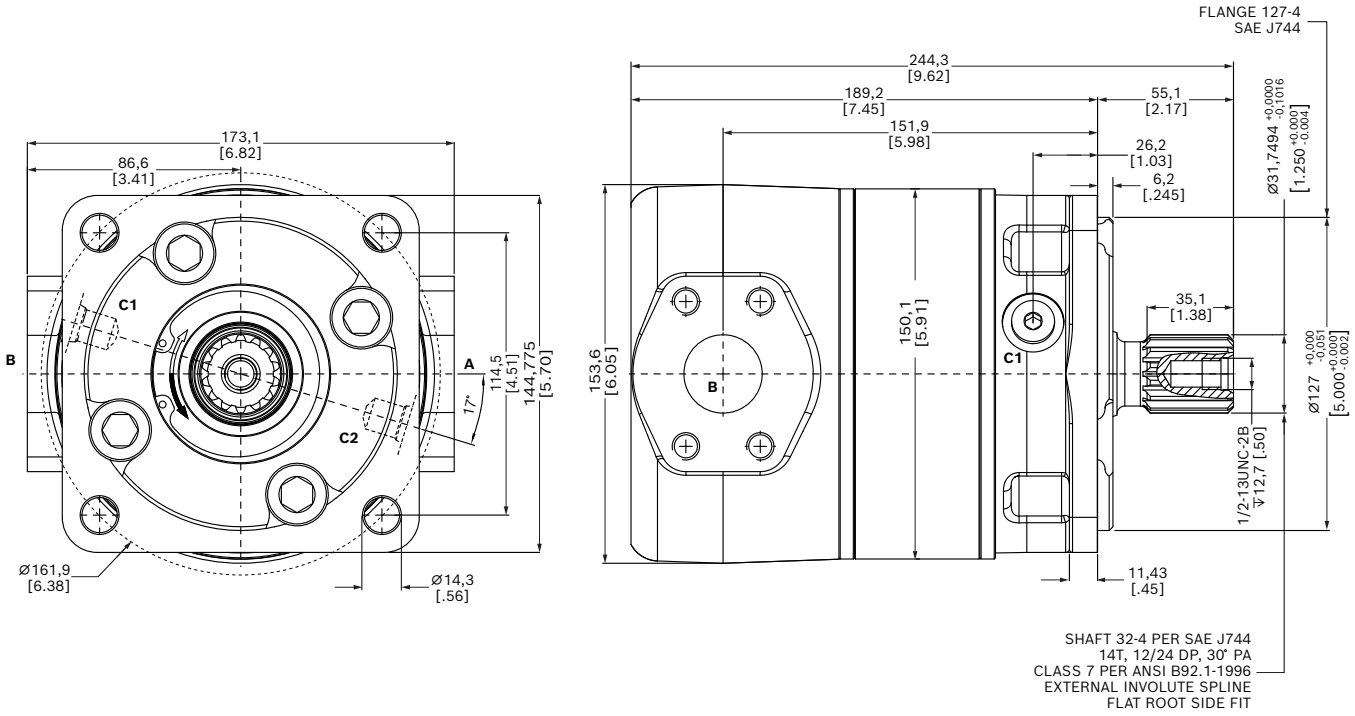






Technical data

Unit dimensions – Code 61 Motor (B1 Bearing)

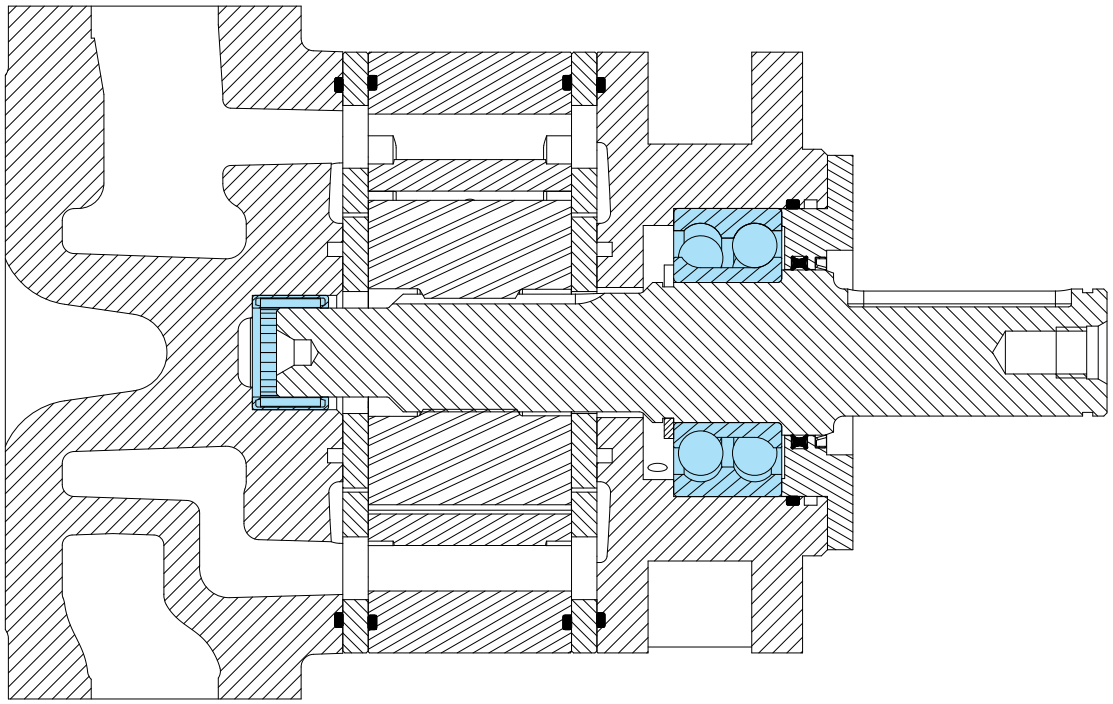


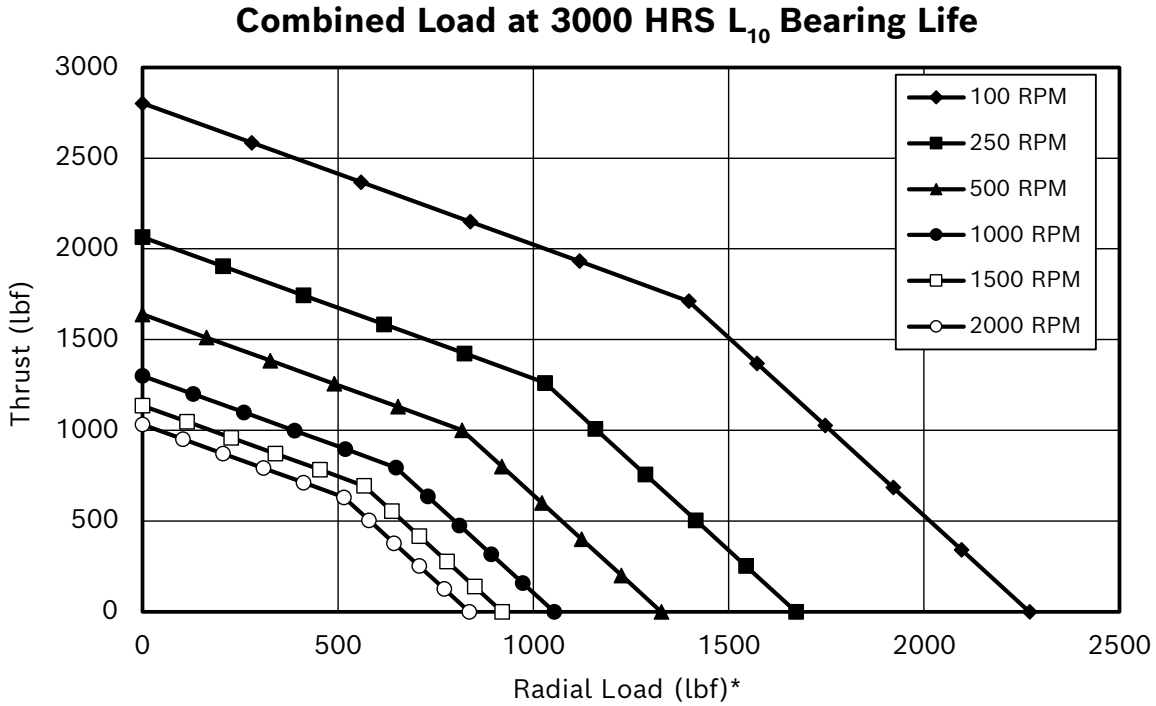
Model #:

MV015-61-1S-***-31-B1-**-000

Technical data

Bearing data – Code 61 Motor (B2 Bearing)

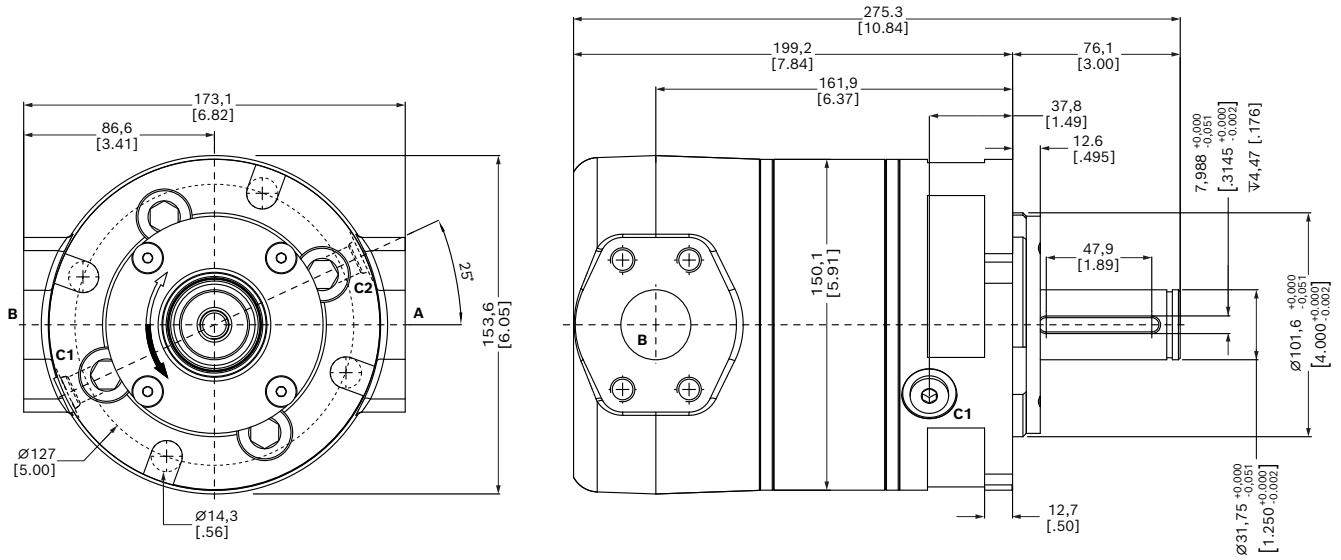




* Radial load located at center of effective output of the shaft.

Technical data

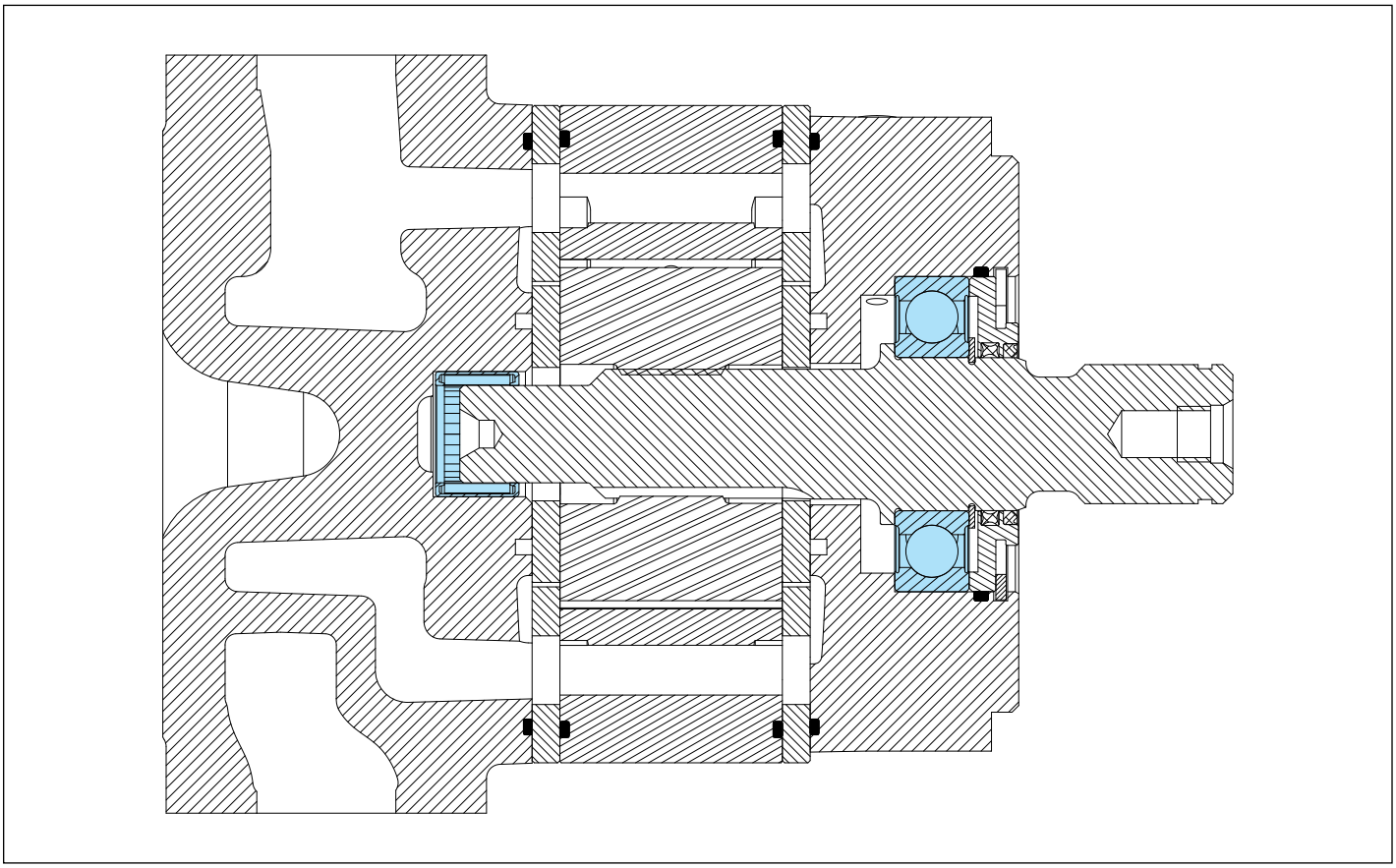
Unit dimensions – Code 61 Motor (B2 Bearing)

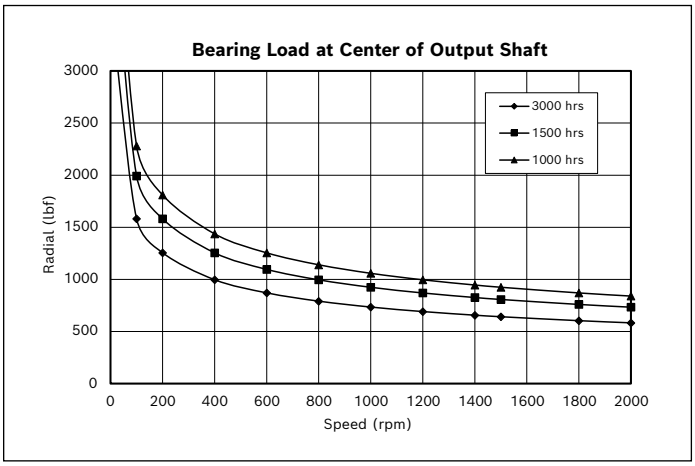


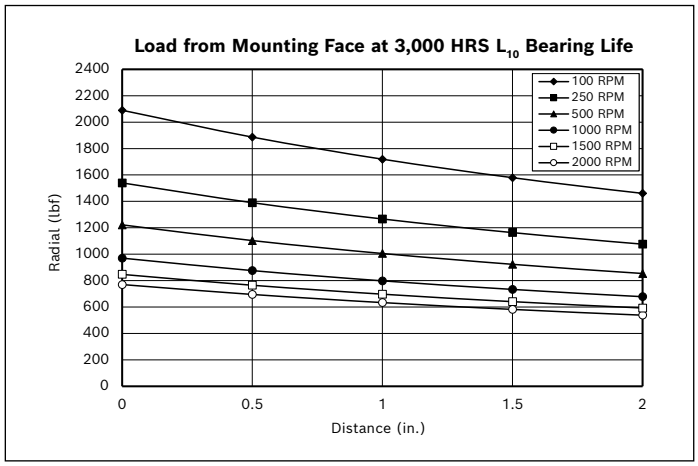
Model #:
MV015-61-1S-***-30-B2-**-099

Technical data

Bearing data – Code 61 Motor (B4 Bearing)

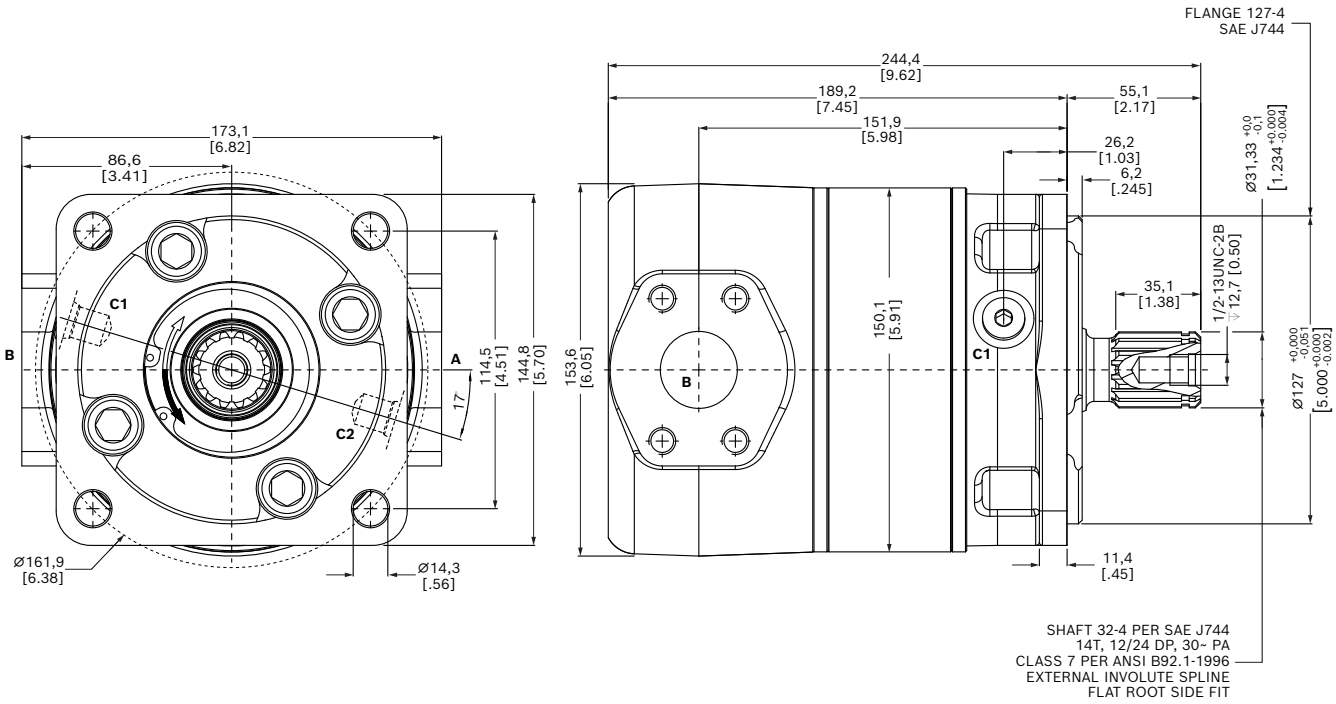






Technical data

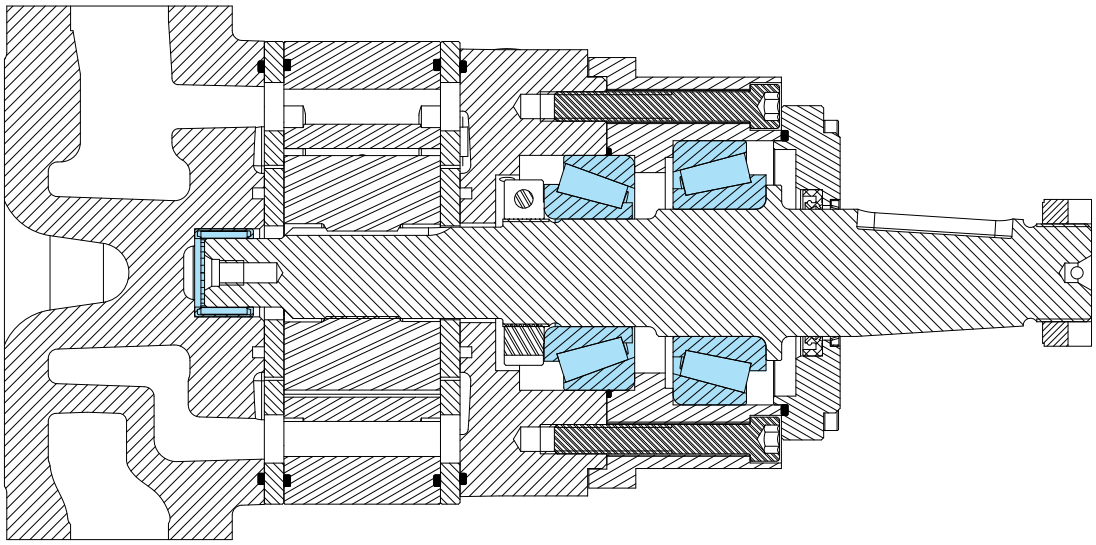
Unit dimensions – Code 61 Motor (B4 Bearing)

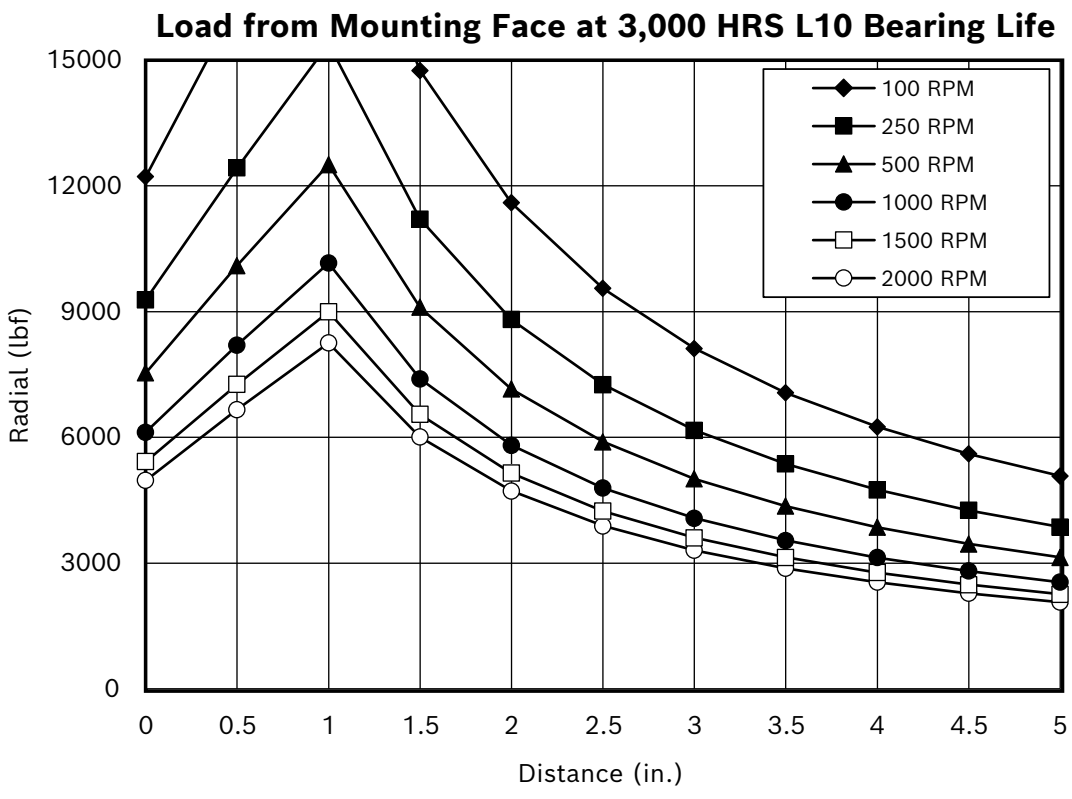


Model #:
MV015-61-1S-***-31-B4-**-075

Technical data

Bearing data – Code 61 Motor (T1 Bearing)

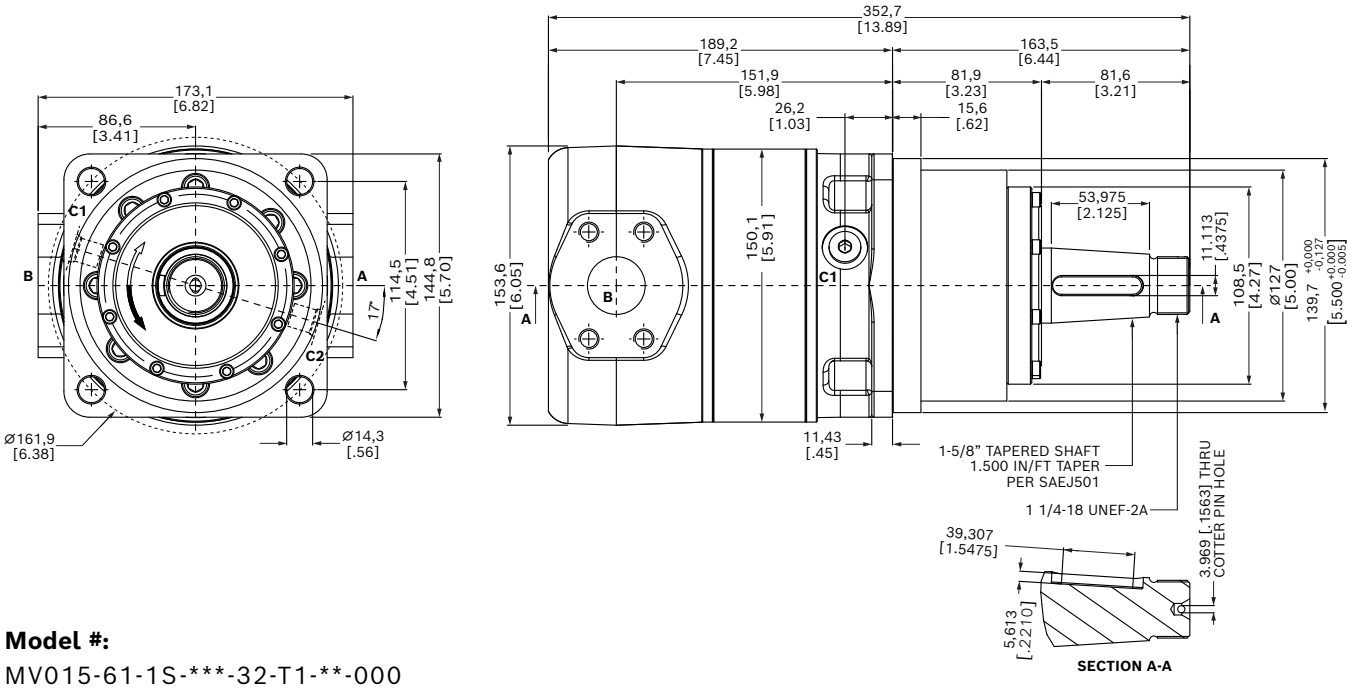




For combined loading, refer to chart on page 26.

Technical data

Unit dimensions – Code 61 Motor (T1 Bearing)

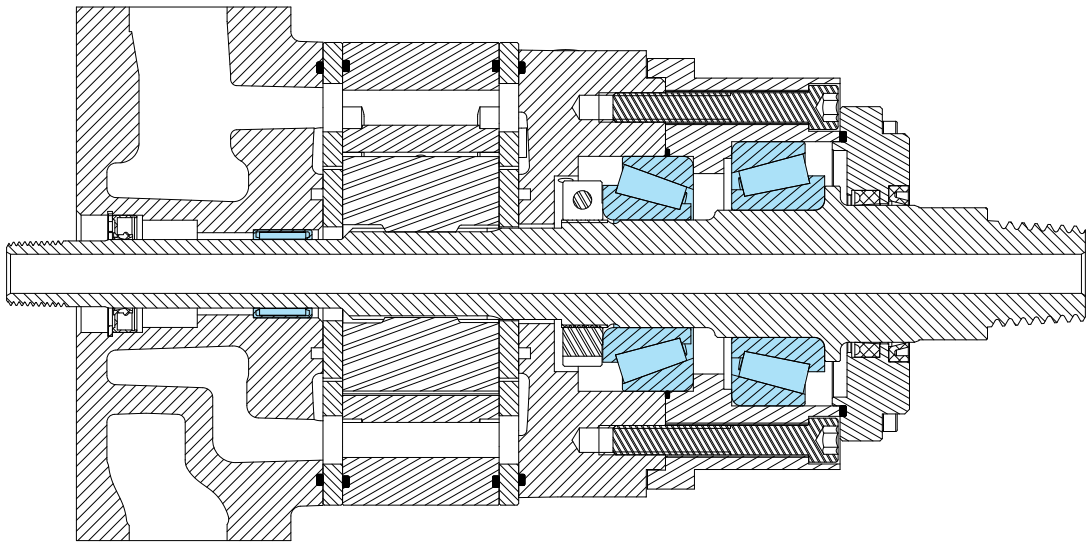


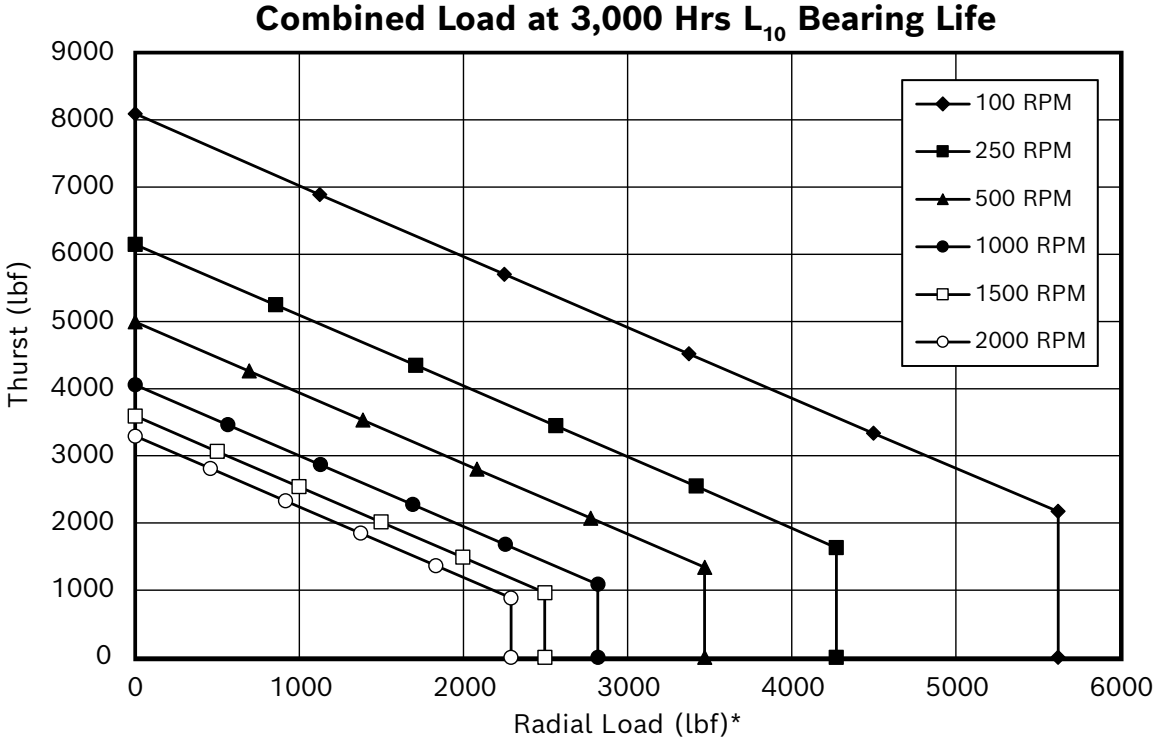
Model #:

MV015-61-1S-***-32-T1-**-000

Technical data

Bearing data – Code 61 Motor (T1 Bearing)

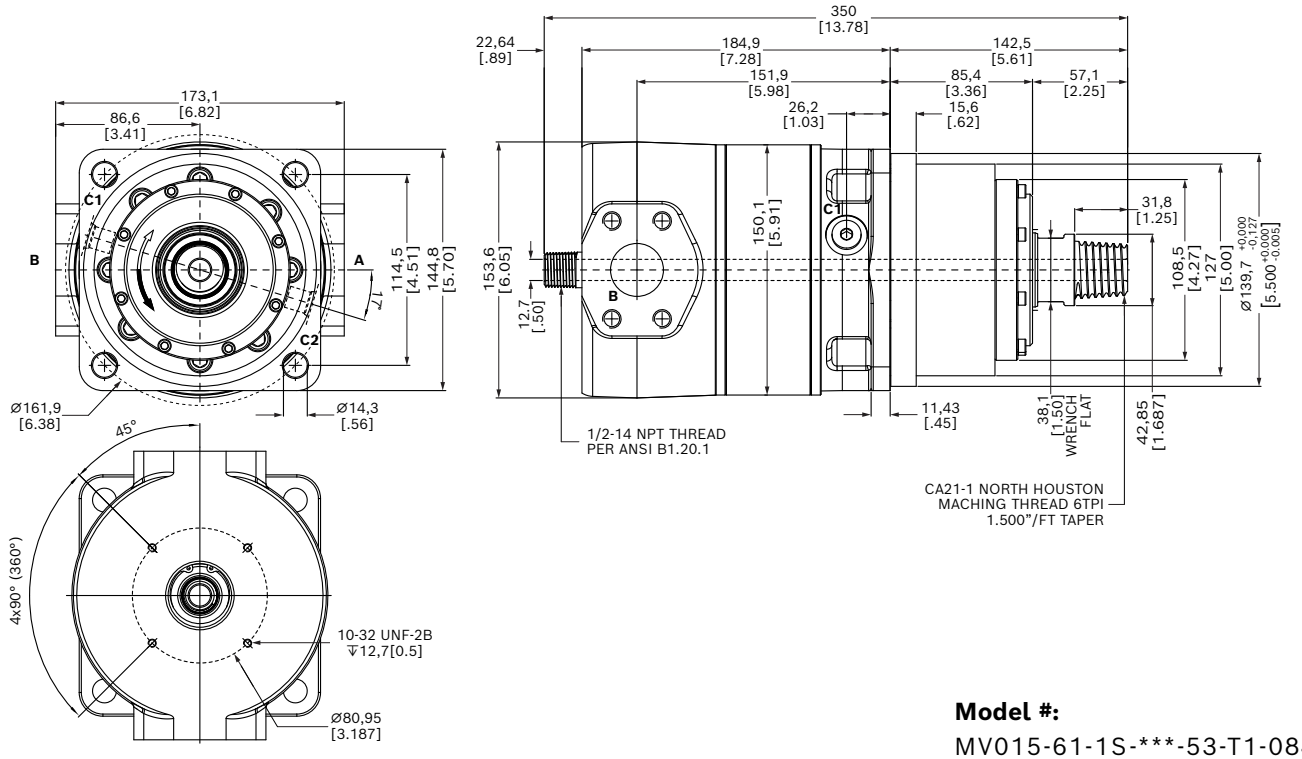




* Radial load located at center of effective output of the shaft.

Technical data

Unit dimensions – Code 61 Motor (T1 Bearing)



Model #:
MV015-61-1S-***-53-T1-084

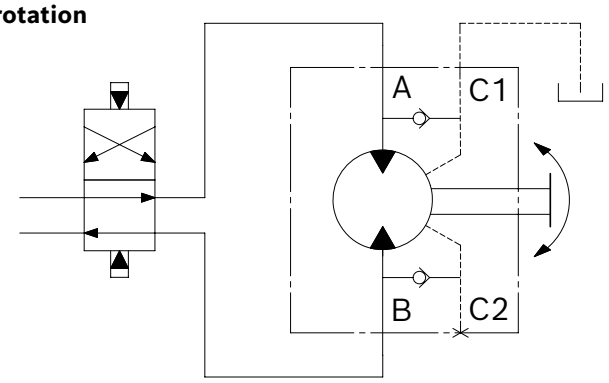
Engineering guidelines

Circuit design

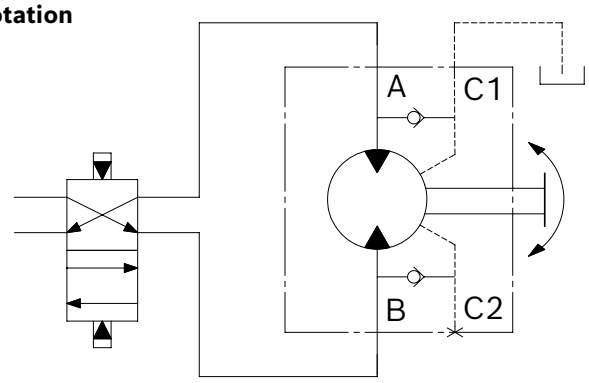
2-port motor circuit

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



Notes

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