High Torque Vane Motor – MV015 Series
Technical Data Sheet

Features
Use: Medium speed, high torque applications requiring reliability in demanding mobile equipment applications. Small size, high torque at start and stall, and through-hole are important features.

- Eight fixed displacement rotating groups ranging from 6 in³ to 15 in³ (98 cm³/rev to 246 cm³/rev)
- Starting and stall torques up to 94% of theoretical torque
- Speed to 2000 RPM continuous
- Up to 150 HP (112 kW)
- Can conform to SAE 'C' mounting specification
- Customizable for direct drive applications
- High power to weight ratio
- High reliability in demanding applications
- Long service life

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

<table>
<thead>
<tr>
<th>01</th>
<th>02</th>
<th>03</th>
<th>04</th>
<th>05</th>
<th>06</th>
<th>07</th>
<th>08</th>
<th>09</th>
</tr>
</thead>
<tbody>
<tr>
<td>MV015</td>
<td>-</td>
<td>61</td>
<td>-</td>
<td>1S</td>
<td>-</td>
<td>011</td>
<td>-</td>
<td>30</td>
</tr>
</tbody>
</table>

**Port Options** - Rear housing and speed selection. Consult factory for two-speed design.

<table>
<thead>
<tr>
<th>02</th>
<th>Code 61</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cast rear housing with 1-1/4&quot; 4-bolt flange, single speed</td>
</tr>
</tbody>
</table>

**Rotary Group Designation**

<table>
<thead>
<tr>
<th>03</th>
<th>Standard speed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1S</td>
</tr>
</tbody>
</table>

**Displacement Options**

<table>
<thead>
<tr>
<th>04</th>
<th>Single rotating group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6 in³ (98 cc)/rev.</td>
</tr>
<tr>
<td></td>
<td>006</td>
</tr>
<tr>
<td></td>
<td>7 in³ (115 cc)/rev.</td>
</tr>
<tr>
<td></td>
<td>007</td>
</tr>
<tr>
<td></td>
<td>8 in³ (131 cc)/rev.</td>
</tr>
<tr>
<td></td>
<td>008</td>
</tr>
<tr>
<td></td>
<td>9.5 in³ (156 cc)/rev.</td>
</tr>
<tr>
<td></td>
<td>009</td>
</tr>
<tr>
<td></td>
<td>10.5 in³ (172 cc)/rev.</td>
</tr>
<tr>
<td></td>
<td>010</td>
</tr>
<tr>
<td></td>
<td>11.5 in³ (188 cc)/rev.</td>
</tr>
<tr>
<td></td>
<td>011</td>
</tr>
<tr>
<td></td>
<td>13 in³ (213 cc)/rev.</td>
</tr>
<tr>
<td></td>
<td>013</td>
</tr>
<tr>
<td></td>
<td>15 in³ (246 cc)/rev.</td>
</tr>
<tr>
<td></td>
<td>015</td>
</tr>
</tbody>
</table>

**Shaft Selection**

<table>
<thead>
<tr>
<th>05</th>
<th>Weights</th>
<th>lbs.</th>
<th>kg</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Keyed shaft conforming to SAE C</td>
<td>48</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Splined shaft conforming to SAE C</td>
<td>48</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Wheel motor with tapered shaft conforming to SAE J501</td>
<td>63</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>Keyed shaft out front &amp; rear tachometer shaft</td>
<td>47</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>Splined shaft out front &amp; rear tachometer shaft</td>
<td>47</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>Manually retractable splined shaft</td>
<td>67</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Smooth shaft – configured to customer specifications</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Hollow shaft with CA21-1 male drill rod threads</td>
<td>61</td>
<td>28</td>
</tr>
</tbody>
</table>

**Shaft Seal** (see page 6)

<table>
<thead>
<tr>
<th>07</th>
<th>TCN (radial lip seal) in FKM (Viton) only (only shaft seal for 53 hollow shaft code)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Quad ring</td>
</tr>
</tbody>
</table>

**Main Body O-rings** (see page 5 for seal material specifications)

<table>
<thead>
<tr>
<th>08</th>
<th>NBR (Buna) – standard (only main body option for 53 hollow shaft code)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FKM (Viton) – optional</td>
</tr>
</tbody>
</table>

**Special Index Number**

<table>
<thead>
<tr>
<th>09</th>
<th>Standard design – special features are designated with a three-digit code (consult factory)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>000</td>
</tr>
</tbody>
</table>
Technical data

The 15 series motors are hydraulically balanced internally and therefore no significant radial loads are induced on the motor bearings which contribute to long service life. The motor can be configured with various bearing options to accommodate external radial and axial loading. This data sheet details standard motors (see Figure 1); technically feasible, custom solutions may be offered. Please consult factory.

Oil supply lines are connected to ports A and B. Case drain lines can be installed on the C1 port. Reference motor unit drawings for additional case line locations and Case Drain section on page 23 for details. Using the “A” port as the inlet will provide clockwise shaft rotation as seen from the front of the shaft. Using the “B” port will provide counter-clockwise shaft rotation also seen from the front of the shaft (see Figure 2).

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### Technical data

**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

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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.

Motor specifications

<table>
<thead>
<tr>
<th>Standard Series Code 61</th>
<th>Displacement</th>
<th>Pressure</th>
<th>Speed</th>
<th>Torque @ 3000 psid (207 bar)*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(in³/rev)</td>
<td>(cm³/rev)</td>
<td>Continuous (psid)</td>
<td>Intermittent (psid)</td>
</tr>
</tbody>
</table>
| MV015                   | 6       | 98       | 3000 | 207 | 2000 | 183 | 248
|                         | 7       | 115      |      |     | 1900 | 230 | 312
|                         | 8       | 131      |      |     | 1800 | 274 | 372
|                         | 9.5     | 156      |      |     | 1700 | 308 | 418
|                         | 10.5    | 172      |      |     | 1600 | 352 | 477
|                         | 11.5    | 188      |      |     | 1500 | 395 | 536
|                         | 13      | 213      |      |     | 1500 | 428 | 580
|                         | 15      | 246      |      |     | 1500 | 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 factory.
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

<table>
<thead>
<tr>
<th>System Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 3000 psi / 207 bar</td>
</tr>
<tr>
<td>19/17/14*</td>
</tr>
</tbody>
</table>

* ISO 4406 Standard

Viscosity

<table>
<thead>
<tr>
<th>Minimum Operating Viscosity</th>
<th>100 SSU / 20 cSt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Operating Viscosity</td>
<td>250 SSU / 54 cSt</td>
</tr>
</tbody>
</table>

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).

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.

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

Bosch Rexroth Rineer offers two types of rotary seals, namely radial lip seal and quad ring. The lip seal is only available in FKM. The quad seal is available in both NBR and FKM. The radial lip seal accommodates external radial loads imposed on the shaft to a greater degree than quad seal designs. All 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 build up 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.

<table>
<thead>
<tr>
<th>Seal Type</th>
<th>Maximum Case Pressure</th>
<th>External Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radial Lip Seal</td>
<td>35 psig (2.4 bar)</td>
<td>Radial / Axial</td>
</tr>
<tr>
<td>Quad Seal</td>
<td>100 psig (6.9 bar)</td>
<td>Low Radial / Axial</td>
</tr>
</tbody>
</table>
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:
\[ T = \frac{P \times 9549.09}{n} = \frac{37.28 \times 9549.09}{1000} = 356 \text{ N-m} \]

U.S.:
\[ T = \frac{P \times 5252}{n} = \frac{50 \times 5252}{1000} = 263 \text{ lb-ft} \]

Theoretical displacement (ideal no losses):

for condition \( T = 356 \text{ N-m} \) (\( T = 263 \text{ lb-ft} \))

Metric:
\[ d = \frac{T \times 62.81}{\Delta p} = \frac{356 \times 62.81}{172} = -130 \text{ cc} \]

U.S.:
\[ d = \frac{T \times 75.4}{\Delta p} = \frac{263 \times 75.4}{2500} = 8 \text{ cir} \]

Referencing the chart “Torque 8 cir (131 cc)”

An 8 cir (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 cir (131 cc)”

An 8 cir (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).
Technical data

Flow & output torque – 6 cir

![Graph showing total required flow and torque for different pressures](image-url)
Technical data

Flow & output torque – 7 cir

Total Required Flow
7 cir / 115 cc

Torque
7 cir / 115 cc
Technical data

Flow & output torque – 8 cir

Total Required Flow
8 cir / 131 cc

- 206 bar (3000 psid)
- 172 bar (2500 psid)
- 138 bar (2000 psid)
- 103 bar (1500 psid)
- 69 bar (1000 psid)
- 35 bar (500 psid)

Torque
8 cir / 131 cc

Bosch Rexroth Corp., RA 10551, edition: 2013-11
Technical data

Flow & output torque – 9.5 cir

**Total Required Flow**
9.5 cir / 156 cc

**Torque**
9.5 cir / 156 cc
Technical data

Flow & output torque – 10.5 cir

Total Required Flow
10.5 cir / 172 cc

Torque
10.5 cir / 172 cc

Bosch Rexroth Corp., RA 10551, edition: 2013-11
Technical data

Flow & output torque – 11.5 cir

Total Required Flow
11.5 cir / 188 cc

Torque
11.5 cir / 188 cc
Technical data

Flow & output torque – 13 cir

Total Required Flow
13 cir / 213 cc

Torque
13 cir / 213 cc
Technical data

Flow & output torque – 15 cir

Total Required Flow
15 cir / 246 cc

Torque
15 cir / 246 cc
Technical data

Bearing data – Standard motor (B1 bearing) with shaft code 30, 31, 34, 49, & 52

Bearing loading
The bearings in the 15 Series can accept radial load per the radial capacity charts above. Thrust loading is not recommended for the standard motor. For thrust-type applications, see the thrust capable motor bearing chart.
Technical data

Bearing data – Wheel motor (T1 bearing)

Refer to page 18 for Combined Load Bearing Chart
Technical data

Bearing data – Drill motor (T1 bearing)

*Radial load located at center of effective output of the shaft.*
The drawings on the following pages represent basic motor configurations.

**Unit dimensions**

**Standard key**

```
<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C1</th>
<th>C2</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.56 [14.3]</td>
<td>4X</td>
<td>1.047 [26.59]</td>
<td>6.82 [173.1]</td>
</tr>
<tr>
<td>2.254 [57.25]</td>
<td>1/2-13UNC-2B</td>
<td>4.508 [114.5]</td>
<td>5.000 [126.95]</td>
</tr>
<tr>
<td>0.313</td>
<td>0.315</td>
<td>1.246</td>
<td>1.38</td>
</tr>
<tr>
<td>7.45 [189.3]</td>
<td>2.17 [55.1]</td>
<td>7.46 [189.3]</td>
<td>5.98 [151.9]</td>
</tr>
</tbody>
</table>
```

**Model #:**

MV015-61-1S-***-30-B1.-**-000

**Standard spline**

```
<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C1</th>
<th>C2</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.56 [14.3]</td>
<td>4X</td>
<td>1.047 [26.59]</td>
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<td>4.508 [114.5]</td>
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<td>0.315</td>
<td>1.246</td>
<td>1.38</td>
</tr>
<tr>
<td>7.45 [189.3]</td>
<td>2.17 [55.1]</td>
<td>7.46 [189.3]</td>
<td>5.98 [151.9]</td>
</tr>
</tbody>
</table>
```

**Model #:**

MV015-61-1S-***-31-B1.-**-000
Unit dimensions

Wheel motor

Standard front key with rear tach shaft

Model #: MV015-61-1S-***-32-T1-**-000

Model #: MV015-61-1S-***-34-B1-**-000
Unit dimensions

Standard front spline with rear tach shaft

Standard retractable spline shaft

Model #:
MV015-61-1S-***-49-B1-**-000

Model #:
MV015-61-1S-***-50-B1-**-000
Unit dimensions

Custom smooth shaft

Standard hollow shaft drill motor

Model #:

MV015-61-1S-***-52-B1-**-080
Sample of customer specific shaft.

Model #:

MV015-61-1S-***-53-T1-D*-000
Engineering guidelines

Case Drain
The 15 Series motor is designed for either internal or external case drains. If operating in an open loop circuit, 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. 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 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 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.

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 return line flow. Using the “B” port for inlet flow will simply reverse the direction of rotation of the shaft and the “A” port will become the return line port.

Clockwise rotation

Counter-clockwise rotation