HYDROSTAR®

MRH-270
MRH2-270

Low Speed—High Torque
SINGLE SPEED HYDRAULIC MOTOR
MULTIPLE SPEED HYDRAULIC MOTOR
**Specifications**

Displacement: 268.4 IN³/REV

Maximum continuous pressure: 3570 PSI

Intermittent peak pressure: 4000 PSI

Maximum continuous back pressure: 350 PSI

Maximum intermittent back pressure: 1000 PSI

Maximum continuous output torque: 11648 FT.-LBS.

Starting torque at 3570 PSI: 9550 FT.-LBS.

Maximum continuous speed: 125 RPM

Maximum continuous power: 225 HP

Moment of Inertia (GD²): 4354 LB.-IN²

Maximum fluid temperature: 175°F

Dry weight: 820 LBS.

**How To Order**

<table>
<thead>
<tr>
<th>Model</th>
<th>Displacement</th>
<th>Shaft Type</th>
<th>Ports</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRH</td>
<td>270</td>
<td>S—Spline (23T)</td>
<td>W</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T—Taper</td>
<td>Flange</td>
</tr>
<tr>
<td></td>
<td></td>
<td>E—Spline (20T)</td>
<td>(Interchangeable)</td>
</tr>
</tbody>
</table>

**Graph 1**

Static Leakage

Graph 1 indicates the total static leakage is internal leakage & external leakage. Total static leakage is used when the outlet port is blocked and the torque load attempts to rotate the shaft as in winch applications. Values given will be considerably greater unless sufficient inlet pressure is maintained. The creep speed can be calculated from the following formula:

\[
\text{Creep Speed} = \frac{\text{Total Static Leakage (IN³/MIN.)}}{268.4 \text{ (IN³/REV.)}}
\]

**Graph 2**

Idling Pressure Requirement

Graph 2 indicates pressure difference required to idle the motor at various speeds and no output torque. Values will be slightly greater at higher viscosities.

Caution should be taken to assure sufficient inlet pressure is maintained to prevent cavitation when the motor operates as a pump or when the load overruns the motor. Sufficient back pressure should be maintained to counteract centrifugal forces in the motor. Back or boost pressure is the pressure present at the low pressure port of the motor. These minimum pressures can be calculated as follows:

\[
\text{Boost or Back Pressure (PSI)} = \frac{1}{2} \text{ Idling Pressure (PSI)} + \text{Crankcase Pressure (PSI)}
\]

**Graph 3**

Volumetric Efficiency

Input flow required to attain any given speed and pressure can be calculated from the graph using the nominal motor displacement of 268.4 cu. in./rev.

\[
\text{Input Flow (IN³/MIN.)} = 268.4 \text{ (IN³/REV.)} \times \frac{\text{Motor Speed (RPM)}}{100} \times \text{Motor Volumetric Efficiency} \%
\]

1 GAL./MIN. = 231 IN³/MIN.

**Graph 4**

Starting Torque Characteristic

Starting torque varies with the crankshaft angle and maximum and minimum values are shown by the graph. A reduction in torque occurs if back pressure is excessive but viscosity effects are negligible.

Above curves are results obtained on mineral oil of 160-200 SUS viscosity.
Oil and Filtration

Because the oil not only transfers the force but also lubricates mating parts of the motor, care must be taken to assure minimum fluid viscosity is 120 SUS. However, it is recommendable for continuous operation to maintain the viscosity between 165 and 345. Maximum operating temperature should be less than 175°F.

However, even when the proper oil is used, wear will accelerate as oil becomes contaminated. The hydraulic fluid’s life depends on conditions under which it is used and only experience can determine precise intervals at which fluid should be changed. With mineral oils it is recommended that samples be taken at about 1000 hour intervals and sent to the manufacturer for analysis. This will help determine the best timing for fluid changes. Filtration recommendation is 25 micron. Generally the pumps are more critical to contamination, therefore, it is advisable to investigate what filtration will be required to sustain the life of the pump.

Minimum operating speed

Minimum operating speed of 1 rpm is possible depending on load characteristics, but smooth performance of 3 rpm is normal. Starting torque varies with crankshaft angle. A reduction in torque occurs if the back pressure is excessive, but viscosity effects are negligible.

Bearing B10-LIFE

Bearing B10-LIFE of taper roller bearings used in HYDROSTAR motors is explained in Graph 5 below. Bearing B10-LIFE is the number of hours at which 10% of the bearings may be expected to show some evidence of wear. The other 90% will be satisfactory. In fact, the average life of the bearings is 4 times the B10-LIFE.

Graph 5
MRH2-270 Performance Curve

Graph 6
Static Leakage

Total static leakage is the combination of internal leakage and external leakage. Total static leakage is used when the outlet port is blocked and the torque load attempts to rotate the shaft, such as a winch application. Unless significant back pressure is maintained, the creep speed will increase drastically and the motor may rotate out of control. The creep speed can be calculated from the following formula:

\[
\text{Creep Speed} = \frac{\text{Total Static Leakage (IN.}^2\text{MIN. RPM)}}{268.4 \text{ or } 134.2 \text{ (IN.}^2\text{REV.)}}
\]

Graph 7
Idling Pressure and Boost Pressure Requirement

Boost or Back Pressure (PSI) = 1/2 Idling Pressure (PSI) + Crankcase Pressure (PSI)

Graph 8
Torque Requirement When Free Wheeling

Input torque to motor when free wheeling.

Specifications

<table>
<thead>
<tr>
<th></th>
<th>MRH2-270-1</th>
<th>MRH2-270-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displacement (IN/REV)</td>
<td>268.4/134.2</td>
<td>268.4/0</td>
</tr>
<tr>
<td>Max. Continuous Pressure (PSI)</td>
<td>3570</td>
<td>3570/150</td>
</tr>
<tr>
<td>Intermittent Peak Pressure (PSI)</td>
<td>4000</td>
<td>4000/250</td>
</tr>
<tr>
<td>Max. Continuous Back Pressure (PSI)</td>
<td>350</td>
<td>350/100</td>
</tr>
<tr>
<td>Max. Intermittent Back Pressure (PSI)</td>
<td>1000</td>
<td>1000/100</td>
</tr>
<tr>
<td>Max. Continuous Output Torque (FT.-LBS.)</td>
<td>11640/5540</td>
<td>11640/0</td>
</tr>
<tr>
<td>Maximum Speed (RPM)</td>
<td>75/120</td>
<td>75/-</td>
</tr>
<tr>
<td>Max. Fluid Temperature °F</td>
<td>125/240</td>
<td>2000</td>
</tr>
<tr>
<td>Max. Continuous Power (HP)</td>
<td>225</td>
<td></td>
</tr>
<tr>
<td>Dry Weight (LBS.)</td>
<td>899</td>
<td></td>
</tr>
</tbody>
</table>

For other displacement combinations consult KYB Corporation.

How To Order

Model  No. of Speeds Displacement Shaft Type Ports
MRH  2 - 375 - E W

See specification chart for displacement designation

SAE 4-bolt Flange
Typical Circuit

2-Speed Motor

The illustration shows how to change the motor displacement. When "X" port is pressurized, the eccentric cam moves away from the crankshaft, and the motor operates at full displacement.

When the "Y" port is pressurized, the eccentric cam moves toward the center of the crankshaft, and the motor will operate at the minimum displacement. This can be half or less of the full displacement, dependent upon the piston length used to change stroke.

Note: System pressure is required to actuate the change.

<table>
<thead>
<tr>
<th>Large Displacement</th>
<th>&quot;X&quot; Port</th>
<th>&quot;Y&quot; Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressurize</td>
<td>To the Reservoir</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Small Displacement</th>
<th>&quot;X&quot; Port</th>
<th>&quot;Y&quot; Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>To the Reservoir</td>
<td>Pressurize</td>
<td></td>
</tr>
</tbody>
</table>

NOTE:

1. Pilot pressure should be equal to or greater than system pressure and at least 150 psi.
2. When freewheeling the pressure above the pistons should be less than 200 psi.
3. Cooling may be required if motor is freewheeled for long periods. Consult KYB Corp.

Graph 9

Volumetric Efficiency (Full Displacement)

Input flow required to attain any given speed and pressure can be calculated from the graph using the nominal motor displacement of 268.4 IN.³/REV. (Graph 9) or 134.2 IN.³/REV. (Graph 10).

\[
\text{Input Flow (IN.³/MIN) = } \frac{268.4 \text{ (IN.³/REV)} \times \text{Motor Speed (RPM)} \times 100}{\text{Motor Volumetric Efficiency} \times \%} \quad \text{OR} \quad \frac{134.2 \text{ (IN.³/REV)} \times \text{Motor Speed (RPM)} \times 100}{\text{Motor Volumetric Efficiency} \times \%}
\]

1 GALLON/MIN. = 231 IN.³/MIN.

Above curves are results obtained on mineral oil of 160-200 SUS viscosity.
Dimensions (in inches)

SINGLE SPEED

Drain port on body housing (3 locations)
MAXIMUM CRANKCASE PRESSURE 15 PSI

7 holes .787 equally spaced
ON 20.5 P.C.D. POSN. TOL. .016

MULTIPLE SPEED

Drain port on body housing (3 locations)
MAXIMUM CRANKCASE PRESSURE 12 PSI

7 holes .787 equally spaced
ON 20.5 P.C.D. POSN. TOL. .016

NOTE: FOR 2 SPEED MOTOR ONLY. E-TYPE SHAFT STANDARD

Spline Adapter Billets
A steel billet having internal splines to match the motor spline shaft is available. The shaft fits into the billet, which is intended for welding onto drive gears, sprockets, etc.