HYDROSTAR

MRH-95  SINGLE SPEED

MRH 2-95  TWO SPEED

LOW SPEED • HIGH TORQUE

HYDRAULIC MOTORS

KYB®
**MRH - 95 SINGLE SPEED HYDRAULIC MOTOR**

**MRH-95 Performance Curve**

**Graph 1**

Static Leakage

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:

\[
\text{Creep Speed} = \frac{\text{Total Static Leakage (IN.}^3/\text{MIN.)}}{536.7 (\text{IN.}^3/\text{REV.})}
\]

**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:

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

**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 93.4 in.³/rev.

\[
\text{Input Flow (IN.}^3/\text{MIN.)} = \frac{93.4 \text{ (IN.}^3/\text{REV.)} \times \text{Motor Speed (RPM)} \times 100}{\text{Motor Volumetric Efficiency (})%\text{)}
\]

**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 affects are negligible.

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

1 GALL./MIN. = 231 IN.³/MIN.

**SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displacement</td>
<td>93.4 IN.³/REV.</td>
</tr>
<tr>
<td>Maximum continuous pressure</td>
<td>3570 PSI</td>
</tr>
<tr>
<td>Intermittent peak pressure</td>
<td>5000 PSI</td>
</tr>
<tr>
<td>Maximum continuous back pressure</td>
<td>350 PSI</td>
</tr>
<tr>
<td>Maximum intermittent back pressure</td>
<td>1000 PSI</td>
</tr>
<tr>
<td>Maximum continuous output torque</td>
<td>4130 FT.-LBS.</td>
</tr>
<tr>
<td>Stalling torque at 3570 PSI</td>
<td>3540 FT.-LBS.</td>
</tr>
<tr>
<td>Maximum continuous speed</td>
<td>300 RPM</td>
</tr>
<tr>
<td>Maximum continuous power</td>
<td>190 HP</td>
</tr>
<tr>
<td>Moment of inertia (GD²)</td>
<td>690 LB.-IN.²</td>
</tr>
<tr>
<td>Maximum fluid temperature</td>
<td>175°F</td>
</tr>
<tr>
<td>Dry weight</td>
<td>363 LBS.</td>
</tr>
</tbody>
</table>

**HOW TO ORDER**

- **Model**: MRH
- **Displacement**: 95
- **Shaft Type**: S — Spline (18T)
  T — Taper
  E — Spline (14T) (Interchangeable)
- **Ports**: W

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**Notes**

- Graph 1
- Graph 2
- Graph 3
- Graph 4
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 recommended 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. Hydraulic fluid life depends on conditions under which it is used and only experience can determine precise intervals at which fluids 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. Since pumps are more critical to contamination, 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

Example of use (See chain dotted line)

**GIVEN**
- Side load \( W = 6,000 \text{ LBS.} \)
- Distance from mounting face \( A = 3 \text{ IN.} \)
- Pressure \( P = 2000 \text{ PSI} \)
- Speed \( N = 50 \text{ RPM} \)

**ANSWER**
- Estimated Bearing B10-LIFE \( = 45,000 \text{ HOURS} \)
MRH 2-95 TWO SPEED HYDRAULIC MOTOR

MRH 2-95 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:

\[
\text{Creep Speed (RPM)} = \frac{\text{Total Static Leakage (IN.³/MIN.)}}{93.4 \text{ or } 46.7 \text{ (IN.³/REV.)}}
\]

Graph 7

**Idling Pressure and Boost Pressure Requirement**

Graph 8

**Torque Requirement When Free Wheeling**

Input torque to motor when free wheeling.

SPECIFICATIONS

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MRH 2-95-1</td>
</tr>
<tr>
<td>Displacement (IN.³/REV.)</td>
<td>93.4 / 46.7</td>
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<tr>
<td>Max. Continuous Pressure (PSI)</td>
<td>3570</td>
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<tr>
<td>Intermittent Peak Pressure (PSI)</td>
<td>4000</td>
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<tr>
<td>Max. Continuous Back Pressure (PSI)</td>
<td>350</td>
</tr>
<tr>
<td>Max. Intermittent Back Pressure (PSI)</td>
<td>1000</td>
</tr>
<tr>
<td>Max. Continuous Output Torque (FT. LBS.)</td>
<td>4050 / 1850</td>
</tr>
<tr>
<td>Maximum Speed (RPM)</td>
<td>@ 3570 PSI</td>
</tr>
<tr>
<td></td>
<td>@ 3000 PSI</td>
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<tr>
<td>Free Wheeling</td>
<td>-</td>
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<tr>
<td>Max. Continuous Power (HP)</td>
<td>190</td>
</tr>
<tr>
<td>Max. Fluid Temperature (*F)</td>
<td>175</td>
</tr>
<tr>
<td>Dry Weight (LBS.)</td>
<td>419</td>
</tr>
</tbody>
</table>

For other displacement combinations consult KYB Americas LLC

How To Order

Model  No. of Speeds  Displacement  Shaft Type  Ports
MRH 2 - 95 - - E W

See specification chart for displacement designation

SAE 4-Bolt Flange

Input torque to motor when free wheeling.
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 America LLC.

Graph 9

Volumetric Efficiency (Full Displacement)

Graph 10

Volumetric Efficiency (Half Displacement)

Input flow required to attain any given speed and pressure can be calculated from the graph using the nominal motor displacement of 93.4 IN. 3/4 REV. (Graph 9) or 46.7 IN. 3/4 REV. (Graph 10).

Input Flow (IN. 3/4 MIN.) =

\[
\frac{93.4 \text{ IN. 3/4 REV.} \times \text{Motor Speed (RPM)} \times 100}{\text{Motor Volumetric Efficiency (%)}} \quad \text{OR} \quad \frac{46.7 \text{ IN. 3/4 REV.} \times \text{Motor Speed (RPM)} \times 100}{\text{Motor Volumetric Efficiency (%)}}
\]

1 GALL./MIN. = 231 IN. 3/4 MIN.

Above curves are results obtained on mineral oil of 160-200 SUS viscosity.
SINGLE SPEED

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

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.