High Speed Vane Motors

M2U, M2-200 and 25M–50M Series for Industrial Equipment
Introduction

M2U and M2-200 Motors

General Information
These motors offer a combination of low cost, pressures to 138 bar (2000 psi), speeds to 2800 r/min, torques of 2.0, 2.8 or 4.0 Nm/6.9 bar (18, 25 or 35 lb. in./100 psi), flange or foot mounting, and choice of port locations.

Rotation
M2U motors operate in one direction only, and rotation must be specified when ordering. Shaft rotation of M2-200 motors can be reversed simply by reversing the direction of flow through the motor ports.

Low Speed Capability
Minimum speed can vary between 50 and 100 r/min, depending upon motor size and characteristics of the driven load.

Characteristics
An economical, efficient and compact means of applying variable speed, rotary hydraulic power, these motors have variable horsepower (constant torque) characteristics. They can be stalled under load without damage when protected by a relief valve.

Indirect Drive Capability
Rugged two-bearing construction permits motors to be used in direct or indirect drive installations. Indirect drive applications require approval by Vickers Engineering Department.

25M - 50M Motors

General Information
These high speed, high pressure motors offer a choice of 12 torque ratings from 4.7 to 33.9 Nm/6.9 bar (42 to 300 lb. in./100 psi); speeds from 400 to 3600 r/min continuous and 4000 r/min intermittent; pressures to 155 bar (2250 psi) continuous and 172 bar (2500 psi) intermittent; reversible shaft rotation; flange or foot mounting.

Rotation
Shaft rotation can be reversed simply by reversing the direction of flow through the motor ports. When properly protected by valves, the motor may be used for rapid cycle reversing or stalled without damage.

Low Speed Operation
Minimum speed is normally 100 r/min. Lower speeds are obtainable, depending upon torque requirements and the nature of the load.

Replaceable Cartridge
Rotary motion is developed within the drive cartridge which consists principally of a cam ring, rotor, ten vanes, and two pressure plates. The cartridge is bolted together so parts can be serviced separately or as an assembly. Replaceable cartridges permit motor overhauls in just 10 minutes. A cartridge can be replaced without removing the unit from the machine, and usually without disconnecting hydraulic lines.

Series Operation
25M - 50M motors are suited to series applications. Inlet and outlet ports can be pressurized simultaneously without affecting service life or operating smoothness.

Indirect Drive Capability
Double-row bearings are available for increased radial load capacity. Indirect drive applications require approval by Vickers Engineering Department.

Features and Benefits

M2U and M2-200 Motors

Low-wear Design
Two internal inlet chambers are diametrically opposed as are two outlet chambers. This construction eliminates bearing loads resulting from pressure, a major cause of wear in designs without this feature.

Installation Flexibility
The motor’s cover can be assembled in different positions with respect to the body. To change the relative location of the ports, it is necessary only to remove four cover bolts and rotate the cover to the desired position. This allows optimum positioning to suit connecting piping.

High Efficiency
Optimum running clearances and hydraulic balance assure sustained high efficiency over the life of the motor.

Smooth Operation
Inertia of rotating parts is low... parts are symmetrical, providing dynamic balance and freedom from vibration.

25M - 50M Motors

High Efficiency
A unique dual pressure plate design results in low internal leakage and overall operating efficiencies up to 90%. Efficiency varies with motor size, pressure, speed, and fluid viscosity and temperature.

Mounting Flexibility
The motor’s cover can be assembled in four positions with respect to the body. Changing port positions is accomplished by simply rotating the cover, and the cartridge which is pinned to the cover, in 90° increments, thus providing the optimum mounting for connecting piping.

Easy to Service
The drive cartridge is accessible by removing the motor’s cover and can normally be replaced in ten minutes without removing the motor from the machine. The torque capability of motors within the same model series can be changed by changing the cartridge or cam ring.

Low-wear Design
25M - 50M motors are hydraulically balanced to reduce wear and heat-producing friction. All internal inlet chambers are equally and diametrically opposed. As a result, pressure induced radial loads are balanced. Shaft bearings only have to carry external loads so wear is greatly reduced.

Proven Reliability
For more than two decades, the reliability of these high performance motors has been field proven on a variety of machinery applications.
# Table of Contents

## M2U and M2-200 Motors
- Specifications & Model Codes ................................................................. 4
- M2U Performance Curves ........................................................................ 5
- M2-200 Performance Curves ................................................................. 7
- M2U Installation Dimensions ................................................................. 8 & 10
- M2-200 Installation Dimensions ............................................................. 9 & 10

## 25M - 50M Motors
- Specifications & Model Codes ................................................................. 11
- 25M Performance Curves ........................................................................ 12
- 35M Performance Curves ....................................................................... 14
- 45M Performance Curves ....................................................................... 16
- 50M Performance Curves ....................................................................... 19
- 25M Installation Dimensions ................................................................. 21 & 25
- 35M Installation Dimensions ................................................................. 22 & 25
- 45M Installation Dimensions ................................................................. 23 & 25
- 50M Installation Dimensions ................................................................. 24 & 25

## Foot Mounts ............................................................................................ 26

## Application and Service Information .................................................... 28
- Motor Characteristics ............................................................................. 27
- Mounting Dimensions ........................................................................... 27
- Drives ...................................................................................................... 27
- Circuitry Requirements .......................................................................... 27
- Fluids ....................................................................................................... 28
- Application Guidance ........................................................................... 28
- Service Information ................................................................................ 28
- Fluid Cleanliness .................................................................................. 29
### Specifications

<table>
<thead>
<tr>
<th>Model series</th>
<th>Torque Nm/6.9 bar (lb in/100 psi)</th>
<th>Displacement cm³/r (in³/r)</th>
<th>Maximum speeds &amp; pressures r/min @ bar (psi)</th>
<th>Approx weight kg (lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M2U</td>
<td>2.0 (18)</td>
<td>21.6 (1.32)</td>
<td>2800 @ 138 (2000)</td>
<td>7.7 (17)</td>
</tr>
<tr>
<td></td>
<td>2.8 (25)</td>
<td>25.4 (1.55)</td>
<td>2500 @ 138 (2000)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.0 (35)</td>
<td>37.5 (2.29)</td>
<td>2000 @ 138 (2000)</td>
<td></td>
</tr>
<tr>
<td>M2–200</td>
<td>2.8 (25)</td>
<td>24.7 (1.51)</td>
<td>2200 @ 138 (2000)</td>
<td>9.5 (21)</td>
</tr>
<tr>
<td></td>
<td>4.0 (35)</td>
<td>35.4 (2.16)</td>
<td>1800 @ 121 (1750)</td>
<td></td>
</tr>
</tbody>
</table>

### Model Codes

**M 2 U - 1 S 35 S - 1 C 10 S60 L**

1. Vane motor
2. Series
3. Uni-directional rotation
4. Mounting
   1 – 2-bolt flange
5. Inlet port
   S – 1.5/16 – 12 st. thd.
6. Ring size – torque
   (lb in/100 psi)
   18, 25 and 35
7. Outlet port
   S – 1.5/16 – 12 st. thd.
8. Shaft type
   1 – Straight keyed
   3 – Threaded
   11 – Splined
9. Outlet position
   (Viewing cover end)
   A – Outlet port opposite inlet
   C – Port connections inline
10. Design
    Subject to change. Installation dimensions remain the same for designs –10 through –19.
11. Special suffix
    S60 – High pressure shaft seal
    3.4 bar (50 psi) continuous
    Omit if not required
12. Rotation
    L – Left hand (counterclockwise)
    Omit for right hand (clockwise)

**M 2 - 2 1 0 - 35 - 1 C - 13 - S2**

1. Vane motor
2. Series (bi-directional rotation)
3. Series frame size
4. Porting
   1 – 3/4 NPT both ports
5. Mounting
   0 – 2-bolt flange
   4 – Foot mounting
6. Ring size – torque
   (lb in/100 psi)
   25 and 35
7. Shaft type
   1 – Straight keyed
   3 – Threaded
   6 – Straight keyed (stub)
   11 – Splined
8. Cover position
   (Viewing cover end)
   A – Cover port opposite body port
   B – Cover port 90° CCW from body port
   C – Port connections in line
   D – Cover port 90° CW from body port
9. Design
    Subject to change. Installation dimensions remain the same for designs –10 through –19.
10. Special suffix
    S2 – Pressured vane extension
        (5.2 bar (75 psi) minimum pilot pressure required)
    S60 – High pressure shaft seal
        3.4 bar (50 psi continuous)
    S61 – BSPF metric ports
        Omit if not required
Typical Performance

Performance Constants:
Oil temp. 49°C (120°F), viscosity
32 cSt (150 SUS) @ 38°C (100°F)
Typical Performance

Performance Constants:
Oil temp. 49°C (120°F), viscosity 32 cSt (150 SUS) @ 38°C (100°F)

![Graphs showing typical performance, including volume required, torque, and power vs. speed for 35 LB. IN. RING under different pressures (138 bar, 103 bar, 69 bar, 34 bar).]
Typical Performance

Performance Constants:
Oil temp. 49°C (120°F), viscosity
32 cSt (150 SUS) @ 38°C (100°F)
Dimensions in millimeters (inches)

No. 1 shaft shown. See options on page 10.

Outlet position “A” shown. See model code, page 4, for other position.
Dimensions in millimeters (inches)

Fluid supply to connection "L" provides clockwise shaft rotation, viewed from shaft end. Fluid to connection "K" provides counterclockwise rotation.

No. 1 shaft shown See options on page 10.

Cover position “C” shown. See model code, page 4, for other positions.
M2U and M2-200 Series

M2U and M2-200
No. 3 Threaded Shaft
See no.1 shaft on pages 8 and 9.

M2-200
No. 6 Straight Stub Shaft
See no.1 shaft on page 9.
## Specifications

<table>
<thead>
<tr>
<th>Model Series</th>
<th>Torque Nm/6.9 bar (lb in/100 psi)</th>
<th>Displacement cm³/r (in³/r)</th>
<th>Flow input/required @1200 r/min L/min (USgpm)</th>
<th>Maximum speed &amp; pressures</th>
<th>Approx. weight kg (lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25M</td>
<td>4.7 (42) 6.2 (55) 7.3 (65)</td>
<td>43.9 (2.68) 57.7 (3.52) 68.7 (4.19)</td>
<td>52.6 (13.9) 69.3 (18.3) 82.5 (21.8)</td>
<td>3600 r/min @ 34 bar (500 psi) †</td>
<td>18 (40)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4000 r/min @ 34 bar (500 psi) ‡</td>
<td></td>
</tr>
<tr>
<td>35M</td>
<td>9.0 (80) 10.7 (95) 13.0 (115)</td>
<td>83.6 (5.10) 100.3 (6.12) 121.9 (7.44)</td>
<td>100.3 (26.5) 120.4 (31.8) 146.1 (38.6)</td>
<td>2600 r/min @ 155 bar (2250 psi) †</td>
<td>29 (64)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3000 r/min @ 172 bar (2500 psi) ‡</td>
<td></td>
</tr>
<tr>
<td>45M</td>
<td>14.7 (130) 17.5 (155) 20.9 (185)</td>
<td>138.0 (8.42) 163.2 (9.96) 193.2(11.79)</td>
<td>165.4 (43.7) 195.7 (51.7) 232.0 (61.3)</td>
<td>2800 r/min @ 34 bar (500 psi) †</td>
<td>39 (85)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3200 r/min @ 34 bar (500 psi) ‡</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2200 r/min @ 155 bar (2250 psi) †</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2400 r/min @ 172 bar (2500 psi) ‡</td>
<td></td>
</tr>
<tr>
<td>50M</td>
<td>24.9 (220) 28.8 (255) 33.9 (300)</td>
<td>231.2 (14.11) 268.1 (16.36) 317.1 (19.35)</td>
<td>277.5 (73.3) 321.8 (85.0) 380.4 (100.5)</td>
<td>73 (160)</td>
<td></td>
</tr>
</tbody>
</table>

† Continuous operation
‡ Intermittent operation: 10% of total operating time; each application of pressure and/or speed not to exceed 6 seconds
● 114 model suffix: 2500 psi, counterclockwise; 2250 psi, clockwise. (Rotation viewed from shaft end)
     124 model suffix: 2500 psi, bi-directional rotation

### Model Codes

**25 M 65 A – 11 C – 20 – *****

<table>
<thead>
<tr>
<th>1</th>
<th>Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>25M</td>
<td>Standard bearing</td>
</tr>
<tr>
<td>35M</td>
<td>26M Heavy duty bearing</td>
</tr>
<tr>
<td>45M</td>
<td>36M</td>
</tr>
<tr>
<td>50M</td>
<td>46M</td>
</tr>
<tr>
<td></td>
<td>51M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2</th>
<th>Vane motor</th>
</tr>
</thead>
<tbody>
<tr>
<td>25M: 42, 55 or 65</td>
<td></td>
</tr>
<tr>
<td>35M: 80, 95 or 115</td>
<td></td>
</tr>
<tr>
<td>45M: 130, 155 or 185</td>
<td></td>
</tr>
<tr>
<td>50M: 220, 255 or 300</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3</th>
<th>Ring size - Nominal torque rating (lb.in./100 psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25M: 42, 55 or 65</td>
<td></td>
</tr>
<tr>
<td>35M: 80, 95 or 115</td>
<td></td>
</tr>
<tr>
<td>45M: 130, 155 or 185</td>
<td></td>
</tr>
<tr>
<td>50M: 220, 255 or 300</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4</th>
<th>Mounting flange &amp; port connections</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>SAE type 2-bolt mounting flange and SAE 4-bolt flange connections</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5</th>
<th>Shaft</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Straight keyed</td>
</tr>
<tr>
<td>11</td>
<td>Splined</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6</th>
<th>Cover position (Viewing cover end)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Cover port opposite body port</td>
</tr>
<tr>
<td>B</td>
<td>Cover port 90° CCW from body port</td>
</tr>
<tr>
<td>C</td>
<td>Port connections in line</td>
</tr>
<tr>
<td>D</td>
<td>Cover port 90° CW from body port</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>7</th>
<th>Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject to change. Installation dimensions remain the same for designs –20 through –29.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>8</th>
<th>Special features suffix</th>
</tr>
</thead>
<tbody>
<tr>
<td>114</td>
<td>50M only</td>
</tr>
</tbody>
</table>

**NOTE:** For internal drain, side port, foot mount, case drain, and other options, contact your Vickers representative.
Typical Performance

Performance Constants:
Oil SAE 10W, temperature 49°C (120°F), viscosity 32 cSt (150 SUS) @ 38°C (100°F)

Starting torque is 65% (minimum) of 400 r/min torque.
Typical Performance

Performance Constants:
Oil SAE 10W, temperature
49°C (120°F), viscosity 32 cSt
(150 SUS) @ 38°C (100°F)

Starting torque is 65% (minimum) of 400 r/min torque.
Typical Performance

Performance Constants:
Oil SAE 10W, temperature 49°C (120°F), viscosity 32 cSt (150 SUS) @ 38°C (100°F)

Starting torque is 65% (minimum) of 400 r/min torque.
Typical Performance

Performance Constants:
Oil SAE 10W, temperature
49 °C (120 °F), viscosity 32 cSt
(150 SUS) @ 38 °C (100 °F)

Starting torque is 65%
(minimum) of 400 r/min torque
**45M Series**

**Typical Performance**

Performance Constants:
Oil SAE 10W, temperature
49°C (120°F), viscosity 32 cSt
(150 SUS) @ 38°C (100°F)

Starting torque is 65%
(minimum) of 400 r/min torque.
Typical Performance

Performance Constants:
Oil SAE 10W, temperature
49°C (120°F), viscosity 32 cSt
(150 SUS) @ 38°C (100°F)

Starting torque is 65%
(minimum) of 400 r/min torque.

---

Volume required – L/min (USgpm)
Torque – Nm (lb in)
Power – kW (hp)
45M Series

**Typical Performance**

Performance Constants:
Oil SAE 10W, temperature 49 °C (120°F), viscosity 32 cSt (150 SUS) @ 38 °C (100°F)

Starting torque is 65% (minimum) of 400 r/min torque.
**Typical Performance**

Performance Constants:
Oil SAE 10W, temperature
49°C (120°F), viscosity 32 cSt
(150 SUS) @ 38°C (100°F)

Starting torque is 65%
(minimum) of 400 r/min torque.
**Typical Performance**

Performance Constants:
Oil SAE 10W, temperature
49°C (120°F), viscosity 32 cSt
(150 SUS) @ 38°C (100°F)

Starting torque is 65%
(minimum) of 400 r/min torque.
25M Series

Dimensions in millimeters (inches)

Splined shaft shown below. Keyed shaft shown on page 25.

Fluid supply to connection "L" turns shaft clockwise as viewed from shaft end. Fluid supply to connection "K" turns shaft counterclockwise.

Cover position "C" shown. See model code, page 11, for other positions.
Dimensions in millimeters (inches)

Splined shaft shown below. Keyed shaft shown on page 25.
Fluid supply to connection "L" turns shaft clockwise as viewed from shaft end.
Fluid supply to connection "K" turns shaft counterclockwise.

Cover position “C” shown. See model code, page 11, for other positions.

---

35M Series

---

The diagram illustrates the key dimensions and features of the 35M Series component, including:

- Splined shaft dimensions
- Keyed shaft dimensions
- Fluid supply connections labeled "L" and "K"
- Cover position "C"
- SAE involute spline details
- Drain connection 3/8 NPTF-18 thread
- Threaded connections
- Major and Minor diameters
- Pressure angle
- Pitch diameter

---

3/8 NPTF-18 thread drain connection. Do not restrict.

---

SAE involute spline 12/24 diametral pitch
Flat root – Major dia. fit (modified OD)
14 teeth – 30° pressure angle
1.1667 pitch diameter
45M Series

Dimensions in millimeters (inches)

Splined shaft shown below. Keyed shaft shown on page 25.
Fluid supply to connection “L” turns shaft clockwise as viewed from shaft end.
Fluid supply to connection “K” turns shaft counterclockwise.
Cover position “C” shown. See model code, page 11, for other positions.
50M Series

Dimensions in millimeters (inches)

Keyed shaft shown on page 25.
Fluid supply to connection “L” turns shaft clockwise as viewed from shaft end.
Fluid supply to connection “K” turns shaft counterclockwise.
Cover position “C” shown. See model code, page 11, for other positions.
25M-50M Series

25M Series
No. 1 Straight-keyed Shaft
See no.11 splined shaft on page 21.

35M and 45M Series
No. 1 Straight-keyed Shaft
See no. 11 splined shaft on pages 22 and 23.

50M Series
No. 1 Straight-keyed Shaft
See no. 11 splined shaft on page 24.
The foot bracket kits tabulated below can be used to mount motors having standard SAE-J 744 2-bolt A, B, or C mounting flanges. These designations correspond to -A-, -B-, and -C- letters in the foot bracket kit model number. Each kit includes a bracket and screws for mounting to the motor. Kits are not included with motors and must be ordered separately by model number.

Also available are a bracket (part number 279625) and mounting screws (part number 214794, 2 required) to fit the SAE D mounting flange of 50M motors.

<table>
<thead>
<tr>
<th>Kit model number</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>FB–A–10</td>
<td>134.9 (5.31)</td>
</tr>
<tr>
<td>FB–B–10</td>
<td>180.8 (7.12)</td>
</tr>
<tr>
<td>FB–C–10</td>
<td>215.9 (8.50)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Kit model number</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>∅ J</td>
<td>K</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>FB–A–10</td>
<td>106.4 (4.19)</td>
</tr>
<tr>
<td>FB–B–10</td>
<td>146 (5.75)</td>
</tr>
<tr>
<td>FB–C–10</td>
<td>181.1 (7.13)</td>
</tr>
</tbody>
</table>
Motor Characteristics

Minimum Operating Speed
Normal speeds can be as low as 50 to 100 r/min for M2U and M2-200 motors, depending upon motor size and characteristics of the driven load. The minimum speed for 25M - 50M motors is normally 100 r/min. Lower speeds are permissible, depending upon torque requirements and characteristics of the driven load.

Stall Torque
Motor stall torque ranges between 65% and 100% of 1200 r/min running torque for a given pressure differential across the motor. This is dependent on the specific angular position of the shaft at stall and the volume supply of fluid to the motor.

Retarding and Braking
Motors may be used as retarders but not as hydraulic brakes. When a motor is used as a retarder, adequate pressure must be provided at the inlet port to prevent cavitation. Systems requiring positive holding capabilities (braking) must be provided with externally operated mechanical holding devices.

The maximum pressure obtainable in a system using a motor as a retarder (pumping) is dependent upon speed. At speeds below 1000 r/min, maximum obtainable pressure is proportionally diminished relative to speed as speed approaches stall.

Consult your Vickers representative before using motors as retarders, or if braking is required.

Mounting Dimensions

Requirements
Dimensional control requirements of the customer’s mounting pad to which the motor is affixed are as follows.

Pilot Diameter
Concentricity of the customer’s female pilot diameter relative to the effective axis of the female drive must be within 0,10 mm (.004 in.) total indicator reading. The clearance between the male and female pilot diameters must be +0,01 mm to +0,05 mm (+.0005 to +.0020 inch.)

Mounting Face
The customer’s mounting face to which the motor is affixed must be square to the axis of the female drive within 0,04 mm per mm (.0015 inch per inch).

Shafts
Dimensions of keyed shaft receivers must be between +0,003 and +0,03 mm (+.0001 and +.0010 inch) of the maximum shaft diameter shown on the Vickers installation drawing.

Drives
Direct drive through a flexible coupling is recommended but belt, chain or gear drives can be used. Indirect drive applications require approval by Vickers Engineering Department.

Circuitry Requirements

Valving
In the event of acceleration or deceleration of the drive or driven members, overrunning loads or system bleed-off, control valving and circuitry must provide a continuous supply of oil to the motor. This supply should be sufficient to prevent transient or continuous cavitation, but not so large as to result in speeds beyond published maximums.

Protect against hydraulic surge pressures (inlet, outlet or drain) applied to or generated by the motor. Relief valving must prevent surges from exceeding published pressure ratings.

M2-200 Motors (all)
Control valving used with M2-200 motors must have an open center crossover feature to prevent cavitation when the shaft is subject to overrunning loads.

M2-200 Standard Models
Back pressure must not exceed: 75% of supply pressure at 1800 r/min; 80% at 1200; 85% at 600. (Supply and back pressures are actual operating pressures at the ports of the motor.) In circuits where back pressure exists, a relief valve is required in both the inlet and outlet ports.

Consequently, for applications where cavitation, back pressure and/or series type circuits exist, an M2-200 “S2” type motor is recommended.

M2-200 “S2” Models
Pilot pressure must be continuously supplied at the S2 port (page 9) at a level equal to system pressure plus 5,2 bar (75 psi) minimum. This may be obtained by using a check valve in the system supply and with pilot pressure taken from between the pump and this valve.

Piping
Hydraulic lines should be as short and have as large an inside diameter as possible. Where lines are long, it is desirable to adapt to a larger capacity line than a motor’s ports specify. Inlet, outlet and drain lines should not be smaller than the nominal port size shown on installation drawings.

There should be as few bends and fittings in lines as possible. High-pressure lines and fittings are restrictive to flow and may result in excessive pressure drop through the system. They should be used only where necessary in a pressure line.

Drain Connection
The case drain line must be full size, unrestricted, and connected from the drain port directly to the reservoir in such a manner that the housing remains filled with fluid. The line must be piped to prevent siphoning and must terminate below the reservoir fluid level. No other lines are to be connected to this drain line.

Pressure surges at the case drain connection may not exceed 1,7 bar (25 psi). Normal pressure is not to exceed 0,7 bar (10 psi). Minimum pressure is zero.
Application and Service Information

Fluids

Fluid Type
Motors can be used with anti-wear hydraulic oil, or automotive type crankcase oil (designations SC, SD, SE, SF, or SG) per SAE J183 JUN89.

Before starting the motor, fill its case with oil. The case must be kept full at all times to provide internal lubrication.

Temperature
Normal operation (at rated conditions) is based on the use of petroleum oil in the 49° to 65°C (120° to 150°F) range. An operating temperature of 49°C (120°F) is recommended. Normally, temperatures should not exceed 65°C (150°F).

Viscosity
The oil viscosity range with the motor running should be 13-54 cSt (70-250 SUS).

Application Guidance
To ensure optimum motor performance in conjunction with your specific application, consult your Vickers representative if your:
- Oil viscosity at operating temperature is not within 13-54 cSt (70-250 SUS)
- Oil viscosity at startup is in excess of 860 cSt (4000 SUS)
- Operating temperature is not within 38 to 65°C (100 to 150°F). With proper application and fluid consideration, a greater temperature range is permissible.
- System requires fire resistant fluid
- Required minimum speed is less than 100 r/min
- Application has overrunning loads
- Needs require application assistance

Service Information
Refer to the following drawings for service parts information:

<table>
<thead>
<tr>
<th>Model Series</th>
<th>Drawing</th>
</tr>
</thead>
<tbody>
<tr>
<td>M2U</td>
<td>M-2711-S</td>
</tr>
<tr>
<td>M2-200</td>
<td>I-3701-S</td>
</tr>
<tr>
<td>25M</td>
<td>M-2741-S</td>
</tr>
<tr>
<td>35M</td>
<td>M-2742-S</td>
</tr>
<tr>
<td>45M</td>
<td>M-2743-S</td>
</tr>
<tr>
<td>50M</td>
<td>M-2744-S</td>
</tr>
</tbody>
</table>

The overhaul manual for M2-200 motors is M-2700-S. The manual for 25M - 50M motors is M-2740-S.
Fluid Cleanliness
Proper fluid condition is essential for long and satisfactory life of hydraulic components and systems. Hydraulic fluid must have the correct balance of cleanliness, materials, and additives for protection against wear of components, elevated viscosity, and inclusion of air.

Essential information on the correct methods for treating hydraulic fluid is included in Vickers publication 561 “Vickers Guide to Systemic Contamination Control” available from your local Vickers distributor or by contacting Vickers, Incorporated. Recommendations on filtration and the selection of products to control fluid condition are included in 561.

Recommended cleanliness levels, using petroleum oil under common conditions, are based on the highest fluid pressure levels in the system and are coded in the chart below. Fluids other than petroleum, severe service cycles, or temperature extremes are cause for adjustment of these cleanliness codes. See Vickers publication 561 for exact details.

Vickers products, as any components, will operate with apparent satisfaction in fluids with higher cleanliness codes than those described. Other manufacturers will often recommend levels above those specified. Experience has shown, however, that life of any hydraulic component is shortened in fluids with higher cleanliness codes than those listed below. These codes have been proven to provide a long, trouble-free service life for the products shown, regardless of the manufacturer.

<table>
<thead>
<tr>
<th>Product</th>
<th>System Pressure Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>bar (psi)</td>
</tr>
<tr>
<td></td>
<td>&lt;70 (&lt;1000)</td>
</tr>
<tr>
<td></td>
<td>70-210 (1000-3000)</td>
</tr>
<tr>
<td></td>
<td>210+ (3000+)</td>
</tr>
<tr>
<td>Vane Pumps – Fixed</td>
<td>20/18/15</td>
</tr>
<tr>
<td>Vane Pumps – Variable</td>
<td>18/16/14</td>
</tr>
<tr>
<td>Piston Pumps – Fixed</td>
<td>19/17/15</td>
</tr>
<tr>
<td>Piston Pumps – Variable</td>
<td>18/16/14</td>
</tr>
<tr>
<td>Directional Valves</td>
<td>20/18/15</td>
</tr>
<tr>
<td>Pressure/Flow Control Valves</td>
<td>19/17/14</td>
</tr>
<tr>
<td>CMX Valves</td>
<td>18/16/14</td>
</tr>
<tr>
<td>Servo Valves</td>
<td>16/14/11</td>
</tr>
<tr>
<td>Proportional Valves</td>
<td>17/15/12</td>
</tr>
<tr>
<td>Cylinders</td>
<td>20/18/15</td>
</tr>
<tr>
<td>Vane Motors</td>
<td>20/18/15</td>
</tr>
<tr>
<td>Axial Piston Motors</td>
<td>19/17/14</td>
</tr>
<tr>
<td>Radial Piston Motors</td>
<td>20/18/14</td>
</tr>
</tbody>
</table>