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<th>Date</th>
<th>Page</th>
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<th>Rev.</th>
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<td>September 2008</td>
<td>26</td>
<td>flange to shaft length dimension should be [5.15 ±0.001]</td>
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<td>April 2007</td>
<td>18</td>
<td>Remove allowable shaft loading data - consult factory</td>
<td>DA</td>
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<td>March 2004</td>
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<td>Fourth edition</td>
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Technical Information

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General description

Series 90 hydrostatic pumps and motors can be applied together or combined with other products in a system to transfer and control hydraulic power. They are intended for closed circuit applications.

**Series 90 variable displacement pumps** are compact, high power density units. All models utilize the parallel axial piston/slipper concept in conjunction with a tiltable swashplate to vary the pump's displacement. Reversing the angle of the swashplate reverses the flow of oil from the pump and thus reverses the direction of rotation of the motor output.

Series 90 pumps include an integral charge pump to provide system replenishing and cooling oil flow, as well as control fluid flow. They also feature a range of auxiliary mounting pads to accept auxiliary hydraulic pumps for use in complementary hydraulic systems. A complete family of control options is available to suit a variety of control systems (mechanical, hydraulic, electric).

**Series 90 motors** also use the parallel axial piston/slipper design in conjunction with a fixed or tiltable swashplate. They can intake/discharge fluid through either port; they are bidirectional. They also include an optional loop flushing feature that provides additional cooling and cleaning of fluid in the working loop.

- Series 90 – advanced technology today
- Seven sizes of variable displacement pumps
- Five sizes of fixed displacement motors
- One variable displacement motor
- SAE and cartridge mount configurations
- Efficient axial piston design
- Proven reliability and performance
- Compact, lightweight
- Worldwide sales and service
**FIXED DISPLACEMENT MOTOR**

Cross section

- Loop flushing valve
- Valve plate
- Piston
- Roller bearing
- Output shaft
- Fixed swashplate
- Cylinder block

Name plate

- Model Code
- Serial Number
- Place of Manufacture

**Series 90 Axial Piston Motors**
**Technical Information**
**General description**
General description

**VARIABLE DISPLACEMENT MOTOR**

**Cross section**

- Valve plate
- Piston
- Roller bearing
- Output shaft
- Cradle swashplate
- Cylinder block
- Control valve
- Minimum angle control piston
- Maximum angle control piston

**Name plate**

- Model Code
- Model Number
- Serial Number
- Place of Manufacture
- Made in USA

**Model No./Ident-No.**

- A - 00 - 13 - 67890
- P104 287E

**Cylindrical block**

- Made in USA

**Control valve**

- A - 00 - 13 - 67890
- P104 287E
Series 90 Axial Piston Motors
Technical Information
General description

**FIXED DISPLACEMENT MOTOR, CARTRIDGE MOUNT**

**Cross section**

- Cylinder block
- Charge relief valve
- Loop flushing valve
- Valve plate
- Piston
- Roller bearing
- Output shaft
- Swashplate

**Name plate**

- Model Code
- Serial Number
- Place of Manufacture

Model Number:

```
Model Code 90M100 NC 0 N 7 N 0
C7 W 00 CBA 00 00 83
```

Serial Number:

```
A - 00 - 13 - 67890
```

Made in USA

```
P104 253E
```

```
P101 372E
```
This configuration shows a hydrostatic transmission using a Series 90 axial piston variable displacement pump and a Series 90 fixed displacement motor.
## Technical Information

### OVERVIEW
Specifications for the Series 90 motors are listed here for quick reference. For definitions and additional information, see *Operating Parameters*, page 13, *Features and Options*, page 19, and the *Series 90 Model Code Supplement*.

### FEATURES AND OPTIONS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>042 MF</th>
<th>055 MF</th>
<th>055 MV</th>
<th>075 MF</th>
<th>100 MF</th>
<th>130 MF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor type</td>
<td>In-line, axial, closed loop, positive displacement motors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direction of rotation</td>
<td>Bi-directional, see outline drawings for rotation vs. flow direction information</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation position</td>
<td>Discretionary: Housing must be filled with hydraulic fluid</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other system requirements</td>
<td>Independent braking system, overpressure protection, suitable reservoir, proper filtration</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>042 MF</th>
<th>055 MF</th>
<th>055 MV</th>
<th>075 MF</th>
<th>100 MF</th>
<th>130 MF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Types of mounting (SAE flange size per SAE J744)</td>
<td>SAE B, SAE C, cartridge</td>
<td>SAE C, cartridge</td>
<td>SAE C, cartridge</td>
<td>SAE C</td>
<td>SAE D</td>
<td></td>
</tr>
<tr>
<td>Port connections</td>
<td>Twin</td>
<td>Twin, axial</td>
<td>Twin</td>
<td>Twin, axial</td>
<td>Twin</td>
<td>Twin</td>
</tr>
<tr>
<td>Output shaft options</td>
<td>Spline</td>
<td>Spline, tapered, straight</td>
<td>Spline</td>
<td>Spline, tapered, straight</td>
<td>Spline, tapered, straight</td>
<td>Spline</td>
</tr>
<tr>
<td>Control options</td>
<td>—</td>
<td>—</td>
<td>Two-position electro-hydraulic, hydraulic</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Loop flushing</td>
<td>✧</td>
<td>✧</td>
<td>✧</td>
<td>✧</td>
<td>✧</td>
<td>✧</td>
</tr>
<tr>
<td>Speed sensor</td>
<td>✧</td>
<td>✧</td>
<td>✧</td>
<td>✧</td>
<td>✧</td>
<td>✧</td>
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<tr>
<td>Displacement limiters</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

✧ Standard  ✧ Optional  — Not available / not applicable

### SPECIFICATIONS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>042 MF</th>
<th>055 MF</th>
<th>055 MV</th>
<th>075 MF</th>
<th>100 MF</th>
<th>130 MF</th>
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<tbody>
<tr>
<td>Swashplate</td>
<td>Fixed</td>
<td>Fixed</td>
<td>Variable</td>
<td>Fixed</td>
<td>Fixed</td>
<td>Fixed</td>
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<tr>
<td>Theoretical torque Nm/bar [lb/(in/1000 psi)]</td>
<td>0.67 [410]</td>
<td>0.88 [530]</td>
<td>0.88 [530]</td>
<td>1.19 [730]</td>
<td>1.59 [970]</td>
<td>2.07 [1260]</td>
</tr>
<tr>
<td>Weight kg [lb]</td>
<td>SAE 15 [34]</td>
<td>22 [49]</td>
<td>39 [86]</td>
<td>26 [57]</td>
<td>34 [74]</td>
<td>45 [99]</td>
</tr>
<tr>
<td>Mass moment of inertia kg·m² [slug·ft²]</td>
<td>0.0023 [0.0017]</td>
<td>0.0060 [0.0044]</td>
<td>0.0060 [0.0044]</td>
<td>0.0096 [0.0071]</td>
<td>0.0150 [0.0111]</td>
<td>0.0230 [0.0170]</td>
</tr>
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### OPERATING PARAMETERS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>042 MF</th>
<th>055 MF</th>
<th>055 MV</th>
<th>075 MF</th>
<th>100 MF</th>
<th>130 MF</th>
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<tbody>
<tr>
<td>Speed limits</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continuous (max. disp.)</td>
<td>min⁻¹ (rpm)</td>
<td>4200</td>
<td>3900</td>
<td>3900</td>
<td>3600</td>
<td>3300</td>
<td>3100</td>
</tr>
<tr>
<td>Maximum (max. disp.)</td>
<td></td>
<td>4600</td>
<td>4250</td>
<td>4250</td>
<td>3950</td>
<td>3650</td>
<td>3400</td>
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<tr>
<td>Continuous (min. disp.)</td>
<td></td>
<td>—</td>
<td>—</td>
<td>4600</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Maximum (min. disp.)</td>
<td></td>
<td>—</td>
<td>—</td>
<td>5100</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>System pressure</td>
<td>bar [psi]</td>
<td>420 [6000]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>Continuous</td>
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<tr>
<td>Maximum</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum (max. disp., max. speed)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Case pressure</td>
<td>bar [psi]</td>
<td>3 [44]</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Continuous</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum (cold start)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</table>

### FLUID SPECIFICATIONS

<table>
<thead>
<tr>
<th>Viscosity</th>
<th>mm²/sec (cSt) [SUS]</th>
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<tbody>
<tr>
<td>Minimum</td>
<td>7 [49]</td>
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<tr>
<td>Continuous</td>
<td>12-80 [70-370]</td>
</tr>
<tr>
<td>Maximum</td>
<td>1600 [7500]</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Temperature</th>
<th>°C [°F]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum</td>
<td>-40 [-40]</td>
</tr>
<tr>
<td>Continuous</td>
<td>104 [220]</td>
</tr>
<tr>
<td>Maximum</td>
<td>115 [240]</td>
</tr>
</tbody>
</table>

| Filtration | Cleanliness | 22/18/13 or better per ISO 4406 |
|           | Efficiency (suction filtration) | $\beta_{10,10} > 75$ ($\beta_{10,2} \geq 2$) |
|           | Efficiency (charge filtration)  | $\beta_{10,10} = 75$ ($\beta_{10,2} \geq 10$) |
|           | Recommended inlet screen size   | 100-125 µm [0.0039-0.0049 in] |
**Efficiency Graphs**

**Motor performance as a function of operating speed**

The following performance graph provides typical volumetric and overall efficiencies for Series 90 motors. These efficiencies apply for all frame sizes.

*Efficiency vs. speed*

![Efficiency vs. speed graph](image1.png)

**Motor performance as a function of pressure and speed**

The performance map provides typical motor overall efficiencies at various pressures and speeds. These efficiencies also apply for all frame sizes.

*Efficiency plotted at various pressures and speeds*

![Efficiency plotted at various pressures and speeds](image2.png)
Series 90 Axial Piston Motors
Technical Information
Operating parameters

OVERVIEW
Maintain operating parameters within prescribed limits during all operating conditions. This section defines operating limits given in the table Operating parameters, page 11.

SPEED LIMITS
Continuous speed is the highest input speed recommended at full power condition. Operating at or below this speed should yield satisfactory product life. In a machine propel application, maximum motor speed during unloaded, on-road travelling on level ground should not exceed this limit.

Maximum speed is the highest operating speed permitted. Exceeding maximum speed reduces product life and can cause loss of hydrostatic power and braking capacity. Never exceed the maximum speed limit under any operating conditions.

Consult Pressure and speed limits, BLN-9984, when determining speed limits for a particular application.

⚠️ Warning
Unintended vehicle or machine movement hazard.
Exceeding maximum speed may cause a loss of hydrostatic drive line power and braking capacity. You must provide a braking system, redundant to the hydrostatic transmission, sufficient to stop and hold the vehicle or machine in the event of hydrostatic drive power loss.

SYSTEM PRESSURE
System pressure is the differential pressure between system ports A and B. It is the dominant operating variable affecting hydraulic unit life. High system pressure, which results from high load, reduces system life. System pressure must remain at or below continuous pressure during normal operation to achieve expected life.

Continuous pressure is the average, regularly occurring operating pressure. Operating at or below this pressure should yield satisfactory product life.

Maximum pressure is the highest intermittent pressure allowed. Maximum machine load should never exceed this pressure. For all applications, the load should move below this pressure.

CASE PRESSURE
All pressure limits are differential pressures referenced to low loop (charge) pressure. Subtract low loop pressure from gauge readings to compute the differential.

Under normal operating conditions, the maximum continuous case pressure must not exceed 3 bar (44 psi). Maximum allowable intermittent case pressure during cold start must not exceed 5 bar (73 psi). Size drain plumbing accordingly.

⚠️ Caution
Possible component damage or leakage
Operation with case pressure in excess of these limits may damage seals, gaskets, and/or housings, causing external leakage. Performance may also be affected since charge and system pressure are additive to case pressure.
HYDRAULIC FLUIDS

Ratings and data are based on operating with hydraulic fluids containing oxidation, rust and foam inhibitors. These fluids must possess good thermal and hydrolytic stability to prevent wear, erosion, and corrosion of pump components. Never mix hydraulic fluids of different types.

Fire resistant fluids are also suitable at modified operating conditions. Please see Sauer-Danfoss publication 520L0463 for more information. Refer to publication 520L0465 for information relating to biodegradable fluids.

Suitable Hydraulic fluids:
• Hydraulic fluids per DIN 51 524, 2-HLP,
• Hydraulic fluids per DIN 51 524, 3-HVLP,
• API CD, CE and CF engine fluids per SAE J183,
• M2C33F or G automatic transmission fluids (ATF),
• Dexron II (ATF), which meets the Allison C3- and Caterpillar TO-2 test,
• Agricultural multi purpose oil (STOU),
• Premium turbine oils.

TEMPERATURE AND VISCOSITY

Temperature and viscosity requirements must be concurrently satisfied. The data shown in the table Fluid specifications, page 11, assume petroleum-based fluids are used.

The high temperature limits apply at the hottest point in the transmission, which is normally the motor case drain. The system should generally be run at or below the rated temperature. The maximum temperature is based on material properties and should never be exceeded.

Cold oil will generally not affect the durability of the transmission components, but it may affect the ability of oil to flow and transmit power; therefore temperatures should remain 16 °C [30 °F] above the pour point of the hydraulic fluid. The minimum temperature relates to the physical properties of component materials.

For maximum unit efficiency and bearing life the fluid viscosity should remain in the recommended operating range. The minimum viscosity should be encountered only during brief occasions of maximum ambient temperature and severe duty cycle operation. The maximum viscosity should be encountered only at cold start.

Heat exchangers should be sized to keep the fluid within these limits. Testing to verify that these temperature limits are not exceeded is recommended.
FLUID AND FILTRATION

To prevent premature wear, it is imperative that only clean fluid enter the hydrostatic transmission circuit. A filter capable of controlling the fluid cleanliness to ISO 4406 class 22/18/13 (SAE J1165) or better under normal operating conditions is recommended.

The filter may be located either on the inlet (suction filtration) or discharge (charge pressure filtration) side of the charge pump. The selection of a filter depends on a number of factors including the contaminant ingestion rate, the generation of contaminants in the system, the required fluid cleanliness, and the desired maintenance interval. Filters are selected to meet the above requirements using rating parameters of efficiency and capacity.

Filter efficiency may be measured with a Beta ratio (\(\beta\)). For simple suction-filtered closed circuit transmissions and open circuit transmissions with return line filtration, a filter with a \(\beta\)-ratio within the range of \(\beta_{15-45} = 75\) (\(\beta_{10} \geq 2\)) or better has been found to be satisfactory. For some open circuit systems, and closed circuits with cylinders being supplied from the same reservoir, a considerably higher filter efficiency is recommended. This also applies to systems with gears or clutches using a common reservoir. For these systems, a charge pressure or return filtration system with a filter \(\beta\)-ratio in the range of \(\beta_{15-20} = 75\) (\(\beta_{10} \geq 10\)) or better is typically required.

Because each system is unique, only a thorough testing and evaluation program can fully validate the filtration system. Please see Design Guidelines for Hydraulic Fluid Cleanliness, 520L0467, for more information.

INDEPENDENT BRAKING SYSTEM

⚠️ Warning

Unintended vehicle or machine movement hazard.

The loss of hydrostatic drive line power, in any mode of operation (forward, neutral, or reverse) may cause the system to lose hydrostatic braking capacity. You must provide a braking system, redundant to the hydrostatic transmission, sufficient to stop and hold the vehicle or machine in the event of hydrostatic drive power loss.

RESERVOIR

The reservoir should be designed to accommodate maximum volume changes during all system operating modes and to promote de-aeration of the fluid as it passes through the tank.

A suggested minimum total reservoir volume is 5/8 of the maximum charge pump flow per minute with a minimum fluid volume equal to 1/2 of the maximum charge pump flow per minute. This allows 30 seconds fluid dwell for removing entrained air at the maximum return flow. This is usually adequate to allow for a closed reservoir (no breather) in most applications.

The reservoir outlet to the charge pump inlet should be above the bottom of the reservoir to take advantage of gravity separation and prevent large foreign particles from entering the charge inlet line. A 125 mm screen over the outlet port is recommended. The reservoir inlet (fluid return) should be positioned so that flow to the reservoir

---

1 Filter \(\beta\)-ratio is a measure of filter efficiency defined by ISO 4572. It is defined as the ratio of the number of particles greater than a given diameter (“x” in microns) upstream of the filter to the number of these particles downstream of the filter.
RESERVOIR
(continued)

is discharged below the normal fluid level, and also directed into the interior of the
reservoir for maximum dwell and efficient de-aeration. A baffle (or baffles) between the
reservoir inlet and outlet ports will promote de-aeration and reduce surging of the fluid.

OVERPRESSURE
PROTECTION

Series 90 motors (as well as other system components) have pressure limitations. As
Series 90 motors are not equipped with overpressure protection, it is necessary that relief
valves or pressure limiters are present elsewhere in the high pressure circuit to protect
components from excessive pressures.

Series 90 pumps are designed with a sequenced pressure limiting system and high
pressure relief valves. When the preset pressure is reached, the pressure limiter system
acts to rapidly de-stroke the pump in order to limit the system pressure. For unusually
rapid load application, the high pressure relief valve function is available to also limit the
pressure level. Refer to publication BLN-10029 for more information.

For systems with relief valves only, high pressure relief valves are intended for transient
overpressure protection and are not intended for continuous pressure control. Operation
over relief valves for extended periods of time may result in severe heat build up. High
flows over relief valves may result in pressure levels exceeding the nominal valve setting
and potential damage to system components.

CASE DRAIN

A case drain line must be connected to one of the case outlets (L1 or L2) to return
internal leakage and loop flushing flow to the system reservoir. The higher of the two
case outlets should be used to promote complete filling of the case. Since case drain
fluid is typically the hottest fluid in the system, it is advantageous to return this flow
through the heat exchanger.
The following equations are helpful when sizing hydraulic motors. Generally, the sizing process is initiated by an evaluation of the machine system to determine the required motor speed and torque to perform the necessary work function. Refer to Selection of drive line components, BLN-9985, for a more complete description of hydrostatic drive line sizing. First, the motor is sized to transmit the maximum required torque. The pump is then selected as a flow source to achieve the maximum motor speed.

### Based on SI units

**Input flow** \( Q = \frac{V_g \cdot n}{1000 \cdot \eta_v} \) (l/min)

**Output torque** \( M = \frac{V_g \cdot \Delta p \cdot \eta_m}{20 \cdot \pi} \) (N•m)

**Output power** \( P = \frac{Q \cdot \Delta p \cdot \eta_m}{600} \) (kW)

**Motor speed** \( n = \frac{Q \cdot 1000 \cdot \eta_v}{V_g} \) (min\(^{-1}\)rpm)

### Based on US units

**Input flow** \( Q = \frac{V_g \cdot n}{231 \cdot \eta_v} \) (US gal/min)

**Output torque** \( M = \frac{V_g \cdot \Delta p \cdot \eta_m}{2 \cdot \pi} \) (lbf•in)

**Output power** \( P = \frac{Q \cdot \Delta p \cdot \eta_m}{1714} \) (hp)

**Motor speed** \( n = \frac{Q \cdot 231 \cdot \eta_v}{V_g} \) (min\(^{-1}\)rpm)

### Variables

**SI units [US units]**

- \( V_g \) = Displacement per revolution \( \text{cm}^3/\text{rev} \) [\text{in}^3/\text{rev}]
- \( p_o \) = Outlet pressure \( \text{bar} \) [psi]
- \( p_i \) = Inlet pressure \( \text{bar} \) [psi]
- \( \Delta p \) = \( p_o - p_i \) (system pressure) \( \text{bar} \) [psi]
- \( n \) = Speed \( \text{min}^{-1} \) [rpm]
- \( \eta_v \) = Volumetric efficiency
- \( \eta_m \) = Mechanical efficiency
- \( \eta_t \) = Overall efficiency (\( \eta_v \cdot \eta_m \))
Series 90 Axial Piston Motors
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System design parameters

EXTERNAL SHAFT LOADING AND BEARING LIFE

Bearing life is a function of several operating conditions including shaft speed, system pressure, swashplate angle, fluid viscosity, fluid cleanliness and external loading. The bearing will not limit motor life to less than 10,000 hours at rated speeds for any duty cycle assuming proper fluid conditions are maintained and no external loads are present. Particle contamination and poor viscosity reduce the life of bearings.

External radial forces on the shaft transfer to the bearing and are additive to the internal bearing loads. The net effect on bearing life is thus a function of the orientation as well as the magnitude of the external shaft load. Maximum allowable external shaft load \( (Re) \) is determined from the maximum allowable bending moment \( (Me) \) in the table, Allowable shaft loading (below), given as a function of orientation as shown in the figure External shaft load orientation (right).

\[
Re = \frac{Me}{L}
\]

Although shaft deflection increases, bearing life can be optimized by orientating the external load so that it is not additive to the internal loading.

To offset the internal bearing loads and optimize bearing life, the external load should be oriented at around 180° if possible. External overhung adapters (or outboard bearings) are recommended for installations with high radial and/or axial loads. Tapered input shafts or clamp-type couplings are recommended for installations where radial shaft loads are present. Splined shafts are not recommended installations where radial loads are present.

Please contact your Sauer-Danfoss representative for a bearing life analysis if:
• continuously applied external radial load exceeds 25% of the maximum allowable.
• design life is greater than 10,000 hours.

Provide information on location and direction of the external load.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>042</th>
<th>055</th>
<th>075</th>
<th>100</th>
<th>130</th>
</tr>
</thead>
<tbody>
<tr>
<td>( M_e ) at 0°</td>
<td>N·m [lbf·in]</td>
<td>consult factory</td>
<td>consult factory</td>
<td>consult factory</td>
<td>consult factory</td>
<td>consult factory</td>
</tr>
<tr>
<td>( M_e ) at 90°, 180°, 270°</td>
<td>N·m [lbf·in]</td>
<td>consult factory</td>
<td>consult factory</td>
<td>consult factory</td>
<td>consult factory</td>
<td>consult factory</td>
</tr>
<tr>
<td>( T_{in} )</td>
<td>N (lbf)</td>
<td>consult factory</td>
<td>consult factory</td>
<td>consult factory</td>
<td>consult factory</td>
<td>consult factory</td>
</tr>
<tr>
<td>( T_{out} )</td>
<td>N (lbf)</td>
<td>consult factory</td>
<td>consult factory</td>
<td>consult factory</td>
<td>consult factory</td>
<td>consult factory</td>
</tr>
</tbody>
</table>
Series 90 Axial Piston Motors
Technical Information
Features and options

**TWO-POSITION HYDRAULIC CONTROL (PT)**

Displacement can be changed hydraulically under load from maximum displacement to minimum displacement and vice-versa, by applying a hydraulic signal to port X1. The slow orifice option will give an appropriate motor shift rate. More abrupt shifts can be achieved with the fast orifice option. The fast orifice option may be required on dual path (differential steer) applications to prevent steering errors during shifting.

![Control schematic diagram](image)

Legend
- A, B = Main pressure lines
- M3 = Charge pressure gage port
- L1, L2 = Drain lines
- M1, M2 = Gauge port for port “A” & “B”
- X1 = Control pressure port

Port X1 pressurized = Min. displacement
Port X1 drained = Max. displacement
Min. Required Pressure = 60 psi over case pressure

**TWO-POSITION ELECTROHYDRAULIC DISPLACEMENT CONTROL (NA, NB, NC, ND)**

Displacement can be changed electrohydraulically under load from maximum displacement to minimum displacement and vice-versa, by using a built-in solenoid valve. The “slow” orifice option will give an appropriate motor shift rate. More abrupt shifts can be achieved with a “fast” orifice option. The fast orifice option may be required on “dual path” (differential steer) applications to prevent steering errors during shift.

![Control schematic diagram](image)

Legend
- A, B = Main pressure lines
- M3 = Charge pressure gage port
- L1, L2 = Drain lines
- M1, M2 = Gauge port for port “A” & “B”

- Coil energized = Min. Displacement
- Coil de-energized = Max. Displacement

Either polarity of control voltage is acceptable.

**Coil and connector options**

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>N8</td>
<td>12V Packard® Weather Pack (part no. 12010973)</td>
</tr>
<tr>
<td>ND</td>
<td>24V Packard® Weather Pack (part no. 12015792)</td>
</tr>
<tr>
<td>NA or NC</td>
<td>12 or 24V MS connector (part no. 12015792)</td>
</tr>
</tbody>
</table>

Mating parts kit
- N8: Part no. K03383, Ident # 712190 (female terminals)
- ND: Part no. K03377, Ident # 629725 (male terminals)
- NA or NC: Part no. MS101A05L-4P (female terminals)
Series 90 Axial Piston Motors
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LOOP FLUSHING

⚠️ Warning
Unintended vehicle or machine movement hazard.
Excessive motor loop flushing flow may result in the inability to build required system pressure in some conditions. Maintain correct charge pressure under all conditions of operation to maintain pump control performance in hydrostatic systems.

An integral non-adjustable loop flushing valve is incorporated into Series 90 motors. Installations that require fluid to be removed from the low pressure side of the system circuit because of cooling requirements or contamination removal will benefit from loop flushing.

The integral loop flushing valve is equipped with an orificed charge pressure relief valve designed with a cracking pressure of 16 bar [232 psi]. Valves are available with several orifice sizes to meet the flushing flow requirements of all system operating conditions.

The total system charge pump flow should be of sufficient volume to accommodate:

• The number of motors in the system
• System efficiency under worst case conditions
• Pump control requirements
• External needs

Although charge pump sizing requires the consideration of many system variables, the following table gives a recommendation of what charge pump displacement may be required to accommodate the flushing flow of each available charge relief valve orifice.

**Equation**

\[ Q_{\text{flush}} = \frac{Q_{\text{charge}} - Q_{\text{leak}}}{2 \cdot k_{\text{mo}}} \]

**Where**

- \( Q_{\text{flush}} \) = flushing flow per motor
- \( Q_{\text{charge}} \) = charge flow at operating speed
- \( k_{\text{mo}} \) = number of motors fed by one pump
- \( Q_{\text{leak}} \) = sum of external leakages including the following:
  - motor leakage
  - pump leakage + internal consumers: 8 l/min [2.11 US gal/min] for displacement control pumps or for non-feedback controlled pumps at 200 bar [2900 psi]
  - external consumers (brakes, cylinders, other pumps)

**Recommended charge pump displacement**

<table>
<thead>
<tr>
<th>Orifice option</th>
<th>Charge pump displacement</th>
</tr>
</thead>
<tbody>
<tr>
<td>E4</td>
<td>8 cm³ [0.49 in³]</td>
</tr>
<tr>
<td>E6</td>
<td>8 cm³ [0.49 in³]</td>
</tr>
<tr>
<td>F0</td>
<td>11 cm³ [0.67 in³]</td>
</tr>
<tr>
<td>F3</td>
<td>14 cm³ [0.85 in³]</td>
</tr>
<tr>
<td>G0</td>
<td>17 or 20 cm³ [1.04 or 1.22 in³]</td>
</tr>
<tr>
<td>G3</td>
<td>26 cm³ [1.59 in³]</td>
</tr>
<tr>
<td>H0</td>
<td>34.37 or 65 cm³ [2.07, 2.26, or 3.97 in³]</td>
</tr>
</tbody>
</table>

**Schematic diagram of loop flushing valve**

**Loop flushing flow curves**

**Loop flushing valve cross section**
SPEED SENSOR

An optional speed sensor for direct measurement of speed is available. This sensor may also be used to sense the direction of rotation.

A special magnetic ring is pressed onto the outside diameter of the cylinder block and a Hall effect sensor is located in the motor housing. The sensor accepts supply voltage and outputs a digital pulse signal in response to the speed of the ring. The output changes its high/low state as the north and south poles of the permanently magnetized speed ring pass by the face of the sensor. The digital signal is generated at frequencies suitable for microprocessor based controls. The sensor is available with different connectors (see below).

**Specifications**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage*</td>
<td>4.5 to 8.5 VDC</td>
</tr>
<tr>
<td>Supply voltage (regulated)</td>
<td>15 VDC max.</td>
</tr>
<tr>
<td>Required current</td>
<td>12 mA at 5 VDC, 1 Hz</td>
</tr>
<tr>
<td>Max. current</td>
<td>20 mA at 5 VDC, 1 Hz</td>
</tr>
<tr>
<td>Max. frequency</td>
<td>15 kHz</td>
</tr>
<tr>
<td>Voltage output (high)</td>
<td>Supply -0.5 V min.</td>
</tr>
<tr>
<td>Voltage output (low)</td>
<td>0.5 V max.</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-40° to 110°C (-40° to 230°F)</td>
</tr>
</tbody>
</table>

* Do not energize the 4.5 to 8.5 VDC sensor with 12 VDC battery voltage. Use a regulated power supply. If you need to energize the sensor with battery voltage, contact your Sauer-Danfoss representative for a special sensor.

**Pulse frequency**

<table>
<thead>
<tr>
<th>Pulse frequency</th>
<th>042</th>
<th>055</th>
<th>075</th>
<th>100</th>
<th>130</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulse per revolution</td>
<td>48</td>
<td>52</td>
<td>58</td>
<td>63</td>
<td>69</td>
</tr>
</tbody>
</table>

**Speed sensor with Turck® Eurofast connector**

**Speed sensor with Packard® Weather-Pack connector**
SHAFT OPTIONS

Series 90 motors are available with a variety of splined, straight keyed, and tapered shaft ends. Nominal shaft sizes and torque ratings are shown in the accompanying table.

Torque ratings assume no external radial loading. Continuous torque ratings for splined shafts are based on spline tooth wear, and assume the mating spline has a minimum hardness of Rc 55 and full spline depth with initial lubrication. Maximum torque ratings are based on fatigue and assume 200,000 load reversals. The permissible continuous torque may approach the maximum rating if the spline is immersed in circulating oil.

**Series 90 shaft options**

<table>
<thead>
<tr>
<th>Shaft description</th>
<th>Option code</th>
<th>Torque rating</th>
<th>Frame size availability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>N(\text{m})</td>
<td>in-lbf</td>
</tr>
<tr>
<td>15 tooth, 16/32 pitch spline</td>
<td>C3 (SAE)</td>
<td>Maximum:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>192</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Continuous:</td>
<td></td>
</tr>
<tr>
<td>21 tooth, 16/32 pitch spline</td>
<td>C6</td>
<td>Maximum:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 000</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Continuous:</td>
<td></td>
</tr>
<tr>
<td>23 tooth, 16/32 pitch spline</td>
<td>C7</td>
<td>Maximum:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>14 000</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Continuous:</td>
<td></td>
</tr>
<tr>
<td>27 tooth, 16/32 pitch spline</td>
<td>C8</td>
<td>Maximum:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>26 000</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Continuous:</td>
<td></td>
</tr>
<tr>
<td>13 tooth, 8/16 pitch spline</td>
<td>F1</td>
<td>Maximum:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>16 000</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Continuous:</td>
<td></td>
</tr>
<tr>
<td>13 tooth, 8/16 pitch spline (long)</td>
<td>F2</td>
<td>Maximum:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>16 000</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Continuous:</td>
<td></td>
</tr>
<tr>
<td>14 tooth, 12/24 pitch spline</td>
<td>S1</td>
<td>Maximum:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6500</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Continuous:</td>
<td></td>
</tr>
<tr>
<td>17 tooth, 12/24 pitch spline</td>
<td>S5</td>
<td>Maximum:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>15 000</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Continuous:</td>
<td></td>
</tr>
<tr>
<td>34.9 mm [1.374 in] dia. straight keyed</td>
<td>K1</td>
<td>Maximum:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6800</td>
<td></td>
</tr>
<tr>
<td>38.07 mm [1.499 in] dia. straight keyed</td>
<td>K2</td>
<td>Maximum:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 000</td>
<td></td>
</tr>
<tr>
<td>44.42 mm [1.749 in] dia. straight keyed</td>
<td>K3</td>
<td>Maximum:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>14 000</td>
<td></td>
</tr>
</tbody>
</table>

Available: ☑️ Not available: ☐

Recommended mating splines for Series 90 splined output shafts should be in accordance with ANSI B92.1 Class 5. Sauer-Danfoss external splines are modified class 5 fillet root side fit. The external spline major diameter and circular tooth thickness dimensions are reduced to assure a clearance fit with the mating spline. Contact your Sauer-Danfoss representative for other splined shaft options.
Series 90 Axial Piston Motors
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DISPLACEMENT LIMITERS
(055MV ONLY)

Series 90 055MV variable motors include mechanical displacement (stroke) limiters. Both maximum and minimum displacement of the motor can be limited.

Adjustments can be made by loosening the seal lock nut and rotating the limiter screw. Reducing displacement increases motor speed for a given flow rate, increasing displacement reduces speed. The seal lock nut must be re-torqued after any adjustment.

Series 90 variable motors are shipped with the minimum displacement limiter set at the lowest displacement setting and the maximum displacement setting set at full displacement.

⚠️ WARNING
Undesirable vehicle or machine speed hazard.
To avoid undesirable speed conditions, adjust displacement limiters carefully. Make small adjustments and test in a controlled environment. Re-torque the sealing lock nut after every adjustment to prevent an unexpected changes and external leakage. Replace tamper-resistant caps before returning the motor to service.

### Motor shaft rotation

<table>
<thead>
<tr>
<th>Shaft direction</th>
<th>Flow direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port A</td>
<td>Port B</td>
</tr>
<tr>
<td>Clockwise (CW)</td>
<td>in</td>
</tr>
<tr>
<td>Counterclockwise (CCW)</td>
<td>out</td>
</tr>
</tbody>
</table>

### Displacement limiter adjustment screws
All SAE straight thread O-rings ports per SAE J1926 (fittings per SAE 514). Shaft rotation is determined by viewing motor from output shaft end. Contact your Sauer-Danfoss representative for specific installation drawings.

---

**90M42 FIXED MOTOR**

**SAE MOUNT**

View "Z" (rear view)

View "Wa" (bottom port view)

twin ports

System pressure "A" gauge port M1
9/16-18UNF-2B

System pressure "B" gauge port M2
9/16-18UNF-2B

Case drain
7/8-14UNF-2B

Main port
¾ dia. – 6000 psi
split flange boss per SAE J518
3/8-16UNC-2B
20 [0.787] minimum full thread depth

<table>
<thead>
<tr>
<th>Port</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>42.00 [1.65]</td>
</tr>
<tr>
<td>B</td>
<td>23.80 [0.94]</td>
</tr>
<tr>
<td>&quot;Z&quot;</td>
<td>156 [6.14]</td>
</tr>
<tr>
<td>&quot;Wa&quot;</td>
<td>25.40 [1.00]</td>
</tr>
</tbody>
</table>

mm [in]
All SAE straight thread O-rings ports per SAE J1926 (fittings per SAE 514). Shaft rotation is determined by viewing motor from output shaft end. Contact your Sauer-Danfoss representative for specific installation drawings.
All SAE straight thread O-rings ports per SAE J1926 (fittings per SAE 514). Shaft rotation is determined by viewing motor from output shaft end. Contact your Sauer-Danfoss representative for specific installation drawings.
Series 90 Axial Piston Motors
Technical Information
Installation drawings

**90K55 FIXED MOTOR CARTRIDGE MOUNT**
(continued)

### Splined output shaft options

<table>
<thead>
<tr>
<th>Output shaft option</th>
<th>Shaft diameter T [mm]</th>
<th>Full spline length U [mm]</th>
<th>Major diameter V [mm]</th>
<th>Pitch diameter W [mm]</th>
<th>Number of teeth Y</th>
<th>Pitch Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>24.9 [0.98]</td>
<td>27.9 [1.10]</td>
<td>31.13 [1.2258]</td>
<td>29.634 [1.1667]</td>
<td>14</td>
<td>12/24</td>
</tr>
</tbody>
</table>

### Flow direction

<table>
<thead>
<tr>
<th>Shaft rotation</th>
<th>Flow direction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Port &quot;A&quot;</td>
</tr>
<tr>
<td>Clockwise (CW)</td>
<td>Out</td>
</tr>
<tr>
<td>Counterclockwise (CCW)</td>
<td>In</td>
</tr>
</tbody>
</table>

### Splined shaft options
(see tables)

**Shaft option K1**

All SAE straight thread O-rings ports per SAE J1926 (fittings per SAE 514). Shaft rotation is determined by viewing motor from output shaft end. Contact your Sauer-Danfoss representative for specific installation drawings.
**Series 90 Axial Piston Motors**

**Technical Information**

**Installation drawings**

---

### 90M55 FIXED MOTOR

**SAE MOUNT**

- Endcap ports 1.00 in dia. - 6000 psi (4) bolt split flange type per SAE J518 (code 62) except 20.8 [0.82] minimum full depth

- View “Z” (rear view) twin ported

- View “W” (bottom view)

- View “Y” (top view)

- Axial ported

- Twin ported

- Left side view

- All SAE straight thread O-rings ports per SAE J1926 (fittings per SAE 514). Shaft rotation is determined by viewing motor from output shaft end. Contact your Sauer-Danfoss representative for specific installation drawings
Splined output shaft options

<table>
<thead>
<tr>
<th>Output shaft option</th>
<th>Shaft diameter T</th>
<th>Full spline length U</th>
<th>Major diameter V</th>
<th>Pitch diameter W</th>
<th>Number of teeth Y</th>
<th>Pitch Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>24.9 [0.98]</td>
<td>27.9 [1.10]</td>
<td>31.13 [1.2258]</td>
<td>29.634 [1.1667]</td>
<td>14</td>
<td>12/24</td>
</tr>
</tbody>
</table>

Flow direction

<table>
<thead>
<tr>
<th>Shaft rotation</th>
<th>Flow direction</th>
<th>Flow direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clockwise (CW)</td>
<td>Port “A” Out</td>
<td>Port “B” In</td>
</tr>
<tr>
<td>Counterclockwise (CCW)</td>
<td>In Out</td>
<td></td>
</tr>
</tbody>
</table>

Splined shaft options

<table>
<thead>
<tr>
<th>Shaft option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>24.9 [0.98]</td>
</tr>
<tr>
<td>C6</td>
<td>29 [1.14]</td>
</tr>
</tbody>
</table>

All SAE straight thread O-rings ports per SAE J1926 (fittings per SAE 514). Shaft rotation is determined by viewing motor from output shaft end. Contact your Sauer-Danfoss representative for specific installation drawings.

mm [in]
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90M55 VARIABLE MOTOR CARTRIDGE MOUNT

All SAE straight thread O-rings ports per SAE J1926 (fittings per SAE 514). Shaft rotation is determined by viewing motor from output shaft end. Contact your Sauer-Danfoss representative for specific installation drawings.
**Series 90 Axial Piston Motors**

**Technical Information**

**Installation drawings**

---

**90M55 VARIABLE MOTOR CARTRIDGE MOUNT (continued)**

### Splined output shaft option

<table>
<thead>
<tr>
<th>Output shaft option</th>
<th>Shaft diameter T</th>
<th>Full spline length U</th>
<th>Major diameter V</th>
<th>Pitch diameter W</th>
<th>Number of teeth Y</th>
<th>Pitch Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>24.9 [0.98]</td>
<td>25.4 [1.00]</td>
<td>31.14 [1.2258]</td>
<td>29.634</td>
<td>14</td>
<td>12/24</td>
</tr>
</tbody>
</table>

### Flow direction

<table>
<thead>
<tr>
<th>Shaft rotation</th>
<th>Flow direction</th>
<th>Port A</th>
<th>Port B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clockwise (CW)</td>
<td>in</td>
<td>out</td>
<td></td>
</tr>
<tr>
<td>Counterclockwise (CCW)</td>
<td>out</td>
<td>in</td>
<td></td>
</tr>
</tbody>
</table>

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All SAE straight thread O-rings ports per SAE J1926 (fittings per SAE 514). Shaft rotation is determined by viewing motor from output shaft end. Contact your Sauer-Danfoss representative for specific installation drawings.

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**mm [in]**

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520L0604 • Rev DB • September 2008
All SAE straight thread O-rings ports per SAE J1926 (fittings per SAE 514). Shaft rotation is determined by viewing motor from output shaft end. Contact your Sauer-Danfoss representative for specific installation drawings.
90V55 VARIABLE MOTOR
SAE MOUNT
(continued)

Splined output shaft option

<table>
<thead>
<tr>
<th>Output shaft option</th>
<th>Shaft diameter T</th>
<th>Full spline length U</th>
<th>Major diameter V</th>
<th>Pitch diameter W</th>
<th>Number of teeth Y</th>
<th>Pitch Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>24.9 [0.98]</td>
<td>27.9 [1.10]</td>
<td>31.13 [1.2258]</td>
<td>29.634 [1.1667]</td>
<td>14</td>
<td>12/24</td>
</tr>
</tbody>
</table>

Flow direction

<table>
<thead>
<tr>
<th>Shaft rotation</th>
<th>Flow direction</th>
<th>Port A</th>
<th>Port B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clockwise (CW)</td>
<td>in</td>
<td>out</td>
<td></td>
</tr>
<tr>
<td>Counterclockwise (CCW)</td>
<td>out</td>
<td>in</td>
<td></td>
</tr>
</tbody>
</table>

All SAE straight thread O-rings ports per SAE J1926 (fittings per SAE S14). Shaft rotation is determined by viewing motor from output shaft end. Contact your Sauer-Danfoss representative for specific installation drawings.
All SAE straight thread O-rings ports per SAE J1926 (fittings per SAE 514). Shaft rotation is determined by viewing motor from output shaft end. Contact your Sauer-Danfoss representative for specific installation drawings.
Series 90 Axial Piston Motors
Technical Information
Installation drawings

**Splined output shaft options**

<table>
<thead>
<tr>
<th>Output shaft option</th>
<th>Shaft diameter T</th>
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<td>14</td>
<td>12/24</td>
</tr>
<tr>
<td>C7</td>
<td>32.3 [1.27]</td>
<td>34.8 [1.37]</td>
<td>37.59 [1.480]</td>
<td>36.513 [1.4375]</td>
<td>23</td>
<td>16/32</td>
</tr>
</tbody>
</table>

**Flow direction**

| Shaft rotation       | Flow direction
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Port &quot;A&quot;</td>
</tr>
<tr>
<td>Clockwise (CW)</td>
<td>In</td>
</tr>
<tr>
<td>Counterclockwise (CCW)</td>
<td>Out</td>
</tr>
</tbody>
</table>

**Splined shaft options**

(see table)

**Shaft options K2**
(keyed)

All SAE straight thread O-rings ports per SAE J1926 (fittings per SAE S14). Shaft rotation is determined by viewing motor from output shaft end. Contact your Sauer-Danfoss representative for specific installation drawings.
Series 90 Axial Piston Motors
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90M75 FIXED MOTOR
SAE MOUNT

End cap ports: options 3 & 7
axial ported 1.00 – 6000 psi (4) bolt split
flange type per SAE J518 (code 62) except 20.8 (0.82)
minimum full thread depth

All SAE straight thread O-rings ports per SAE J1926 (fittings per SAE 514). Shaft rotation
is determined by viewing motor from output shaft end. Contact your Sauer-Danfoss
representative for specific installation drawings.
Splined output shaft options

<table>
<thead>
<tr>
<th>Output shaft option</th>
<th>Shaft diameter T</th>
<th>Full spline length U</th>
<th>Major diameter V</th>
<th>Pitch diameter W</th>
<th>Number of Teeth Y</th>
<th>Pitch Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>24.9 [0.96]</td>
<td>27.9 [1.10]</td>
<td>31.13 [1.2256]</td>
<td>29.634 [1.167]</td>
<td>14</td>
<td>12/24</td>
</tr>
<tr>
<td>C7</td>
<td>32.3 [1.27]</td>
<td>34.6 [1.37]</td>
<td>37.59 [1.460]</td>
<td>36.513 [1.4375]</td>
<td>23</td>
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</table>

Flow direction

<table>
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<tbody>
<tr>
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All SAE straight thread O-rings ports per SAE J1926 (fittings per SAE S14). Shaft rotation is determined by viewing motor from output shaft end. Contact your Sauer-Danfoss representative for specific installation drawings.
Series 90 Axial Piston Motors
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90M100 FIXED MOTOR
SAE MOUNT

All SAE straight thread O-rings ports per SAE J1926 (fitting per SAE 514). Shaft rotation is determined by viewing motor from output shaft end. Contact your Sauer-Danfoss representative for specific installation drawings.
All SAE straight thread O-rings ports per SAE J1926 (fittings per SAE S14). Shaft rotation is determined by viewing motor from output shaft end. Contact your Sauer-Danfoss representative for specific installation drawings.
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**90M130 FIXED MOTOR**

**SAE MOUNT**

- **View “Y” (top view)**
- **View “Z” (rear view)**
- **Left side view**
- **View “W” (bottom view)**

All SAE straight thread O-rings ports per SAE J1926 (fittings per SAE 514). Shaft rotation is determined by viewing motor from output shaft end. Contact your Sauer-Danfoss representative for specific installation drawings.
Splined output shaft options

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<th>Pitch diameter W</th>
<th>Number of teeth Y</th>
<th>Pitch Z</th>
<th>Length S</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>34.5 [1.36]</td>
<td>42.5 [1.67]</td>
<td>43.94 [1.730]</td>
<td>41.275 [1.6250]</td>
<td>13</td>
<td>8/16</td>
<td>66.7 [2.625]</td>
</tr>
<tr>
<td>C8</td>
<td>37.5 [1.48]</td>
<td>42.5 [1.67]</td>
<td>43.94 [13730]</td>
<td>42.862 [1.6875]</td>
<td>27</td>
<td>16/32</td>
<td>66.7 [2.625]</td>
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Flow direction

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<th>Shaft rotation</th>
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