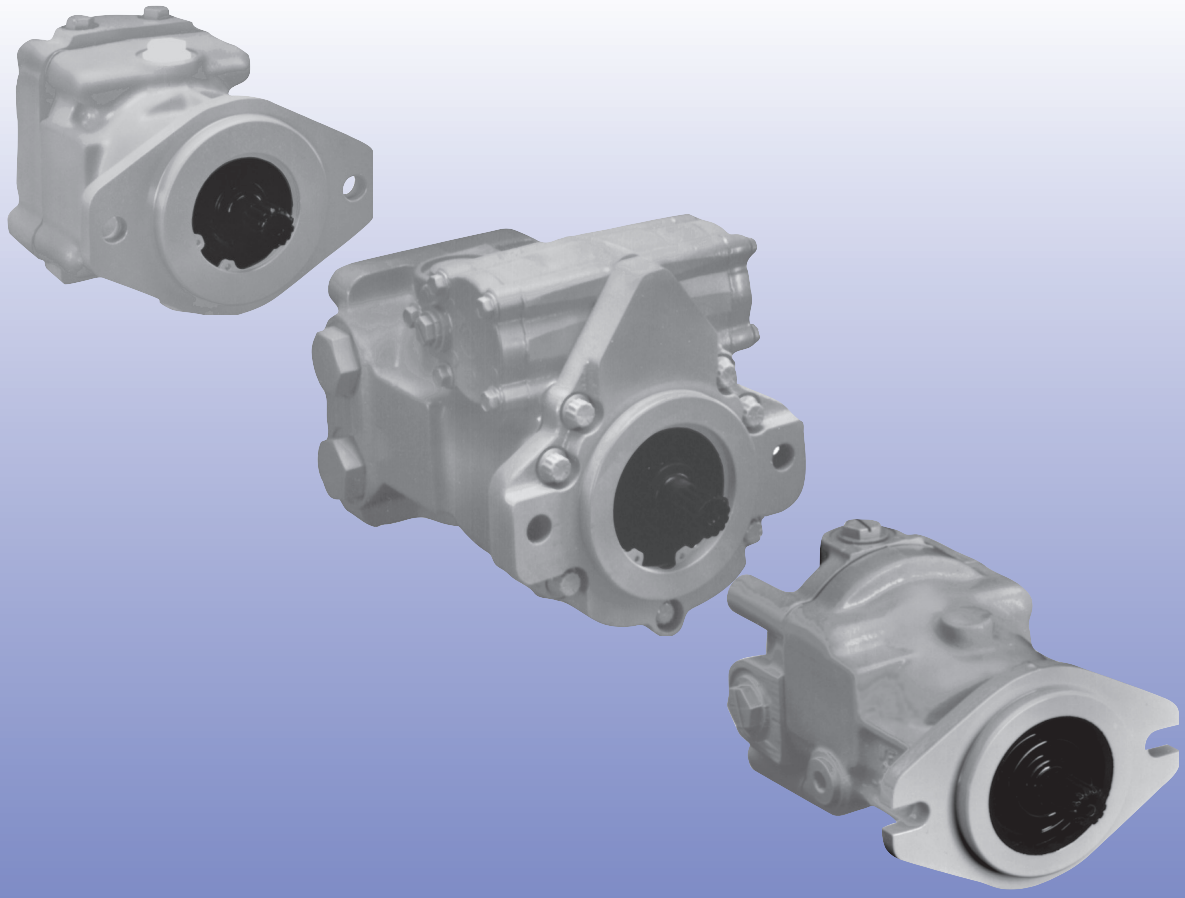
BACK

SAUER DANFOSS

Series 40



Axial Piston Motors

Technical Information

General Description

Series 40 motors can be applied together or combined with other products in a system to transfer and control hydraulic power.

Series 40 motors utilize parallel axial piston / slipper design in conjunction with a fixed or tiltable swashplate. There are M25, M35, M44, M46 fixed motor units and M35, M44, M46 variable motor units.

The M35 and M44 variable motors feature a trunnion style swashplate and direct displacement control. The M46 variable motors utilize a cradle swashplate design and a two-position hydraulic servo control.

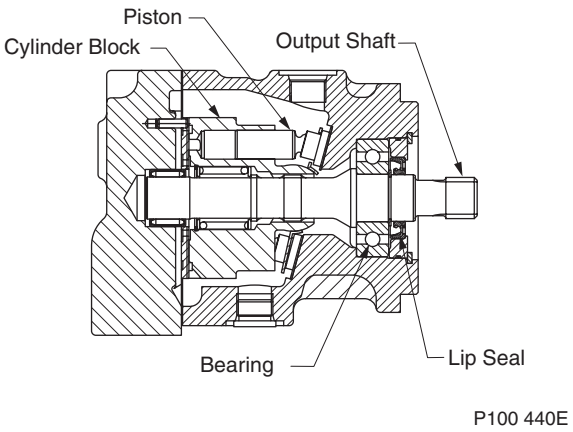
The M46 variable motor is available in a cartridge flange version, which is designed to be compatible with CW and CT compact planetary gearboxes. This combination provides a short final drive length for applications with space limitations.

- **Series 40 - Advanced Technology Today**
- **4 Sizes of Fixed Displacement Motors**
- **3 Sizes of Variable Displacement Motors**
- **High Performance at Low Cost**
- **Efficient Axial Piston Design**
- **Complete Family of Control Systems**
- **Proven Reliability and Performance**
- **Optimum Product Configurations**
- **Compact, Lightweight**
- **Worldwide Sales and Service**

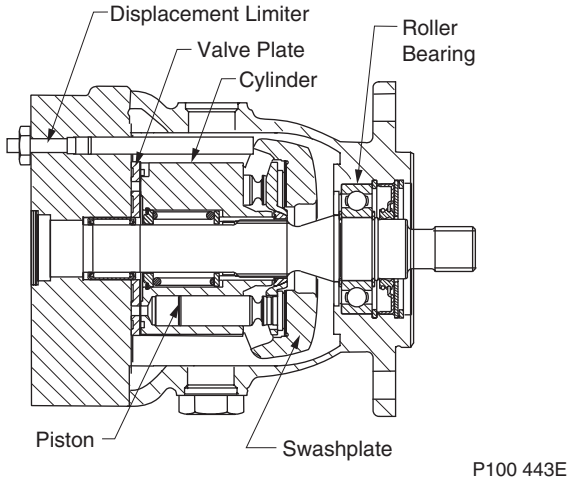
Front page: Variable and fixed displacement motors series 40
F000727, F000728, F000729

Contents

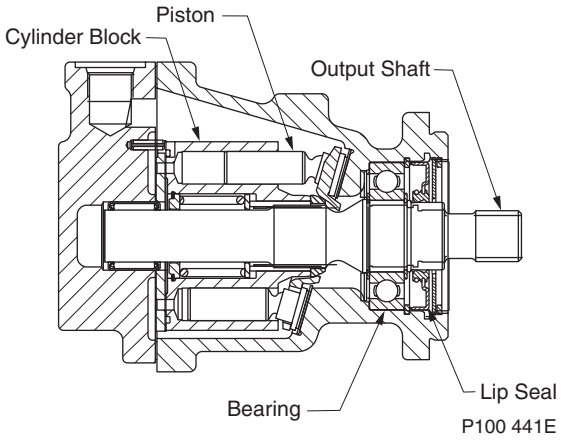
Series 40 Motor Features



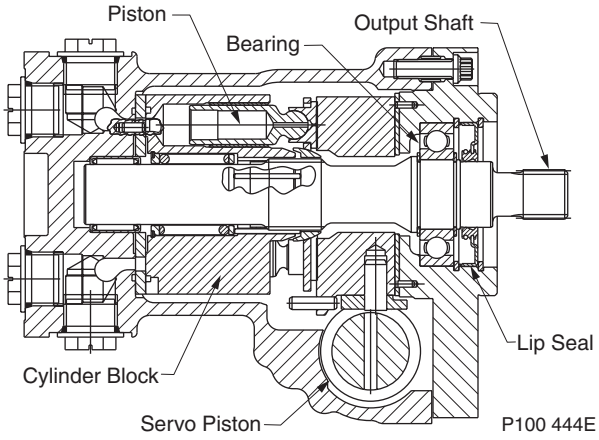
M25 Fixed Motor (MF)



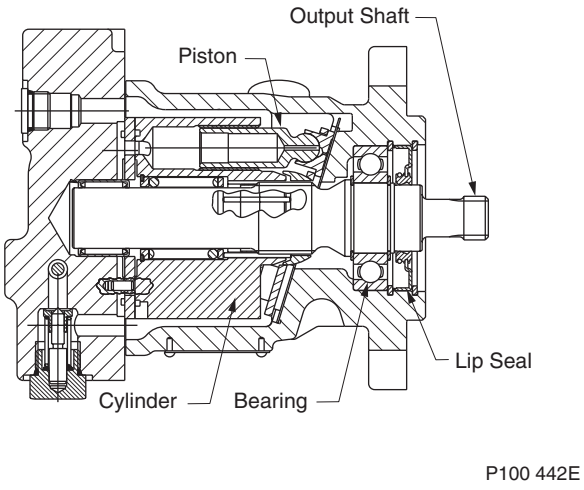
M35 Variable Motor (MV)



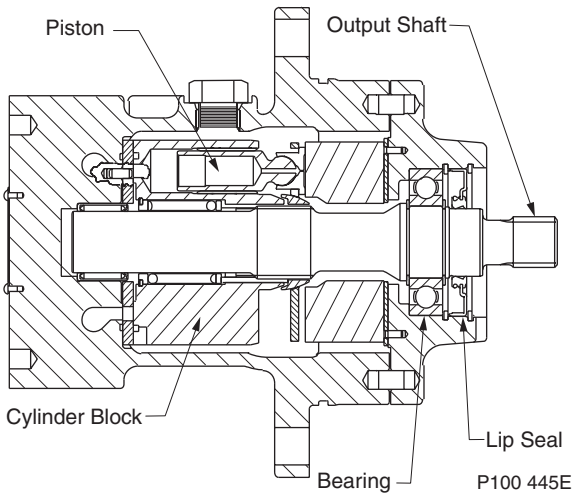
M35 Fixed Motor (MF)



M46 Variable Motor (MV) (SAE Flange)

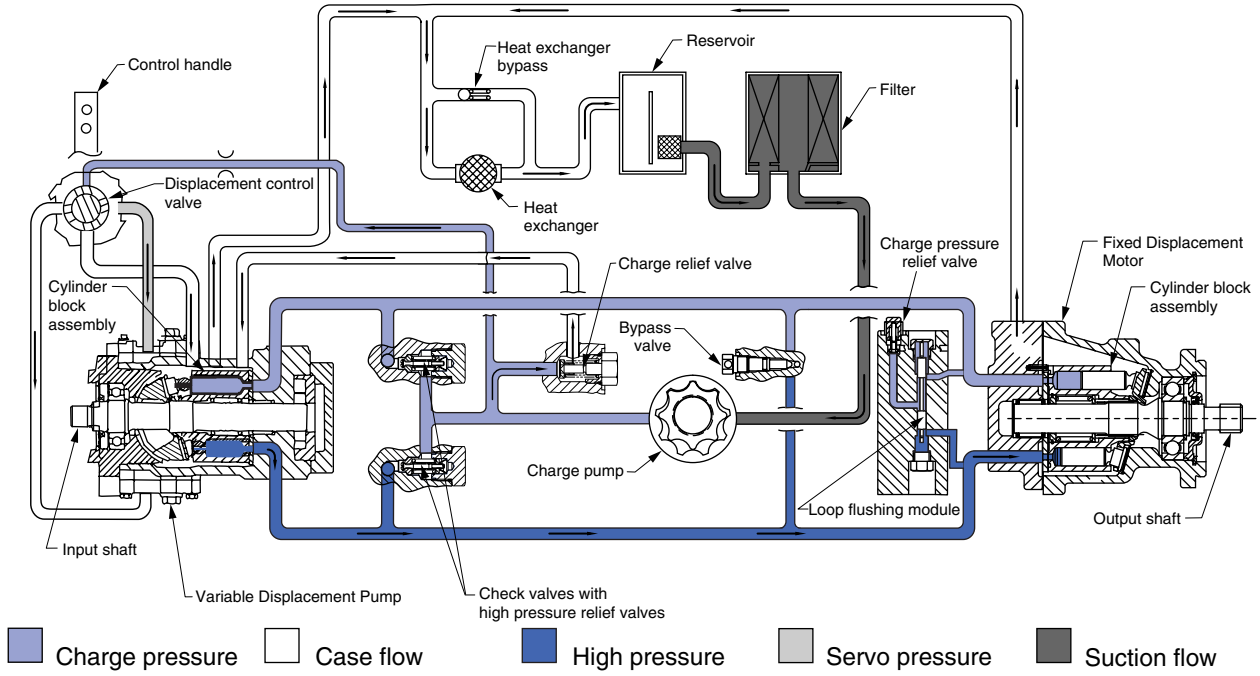


M46 Fixed Motor (MF)



M46 Variable Motor (MV) (Cartridge Flange)

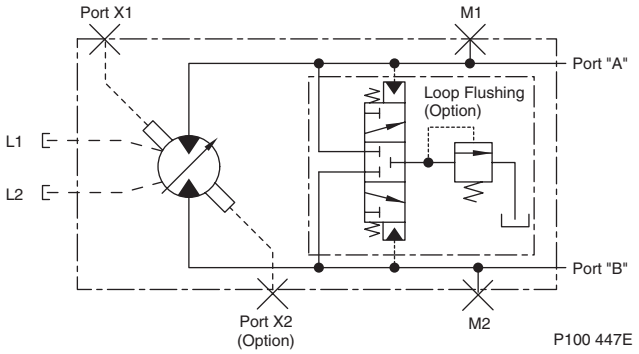
System Circuit Description



P100 307E

A Series 40-M35 fixed motor (right) is shown in a hydraulic circuit with a Series 40-M46 variable pump. The white half of the circuit includes pump features. A suction filtration configuration is shown. Pressure regulation valves are included on the pump. A loop flushing module is included on the motor. Note the position of the reservoir and heat exchanger.

Motor Circuit Description



P100 447E

A Series 40 - M46 variable motor circuit schematic is shown above. The system ports "A" and "B" hook up to the high pressure work lines. The motor receives pressurized fluid in its inlet port and discharges de-energized fluid through the outlet port. Either port can act as inlet or outlet; flow can be bidirectional. System port pressure can be gauged through ports M1 and M2. The motor has two case drains (L1 and L2). The motor may or may not include loop flushing. Loop flushing provides additional cooling and filtration capacity.

Technical Specification

General Specification

Specifications for Series 40 motors are listed on these two pages. For definitions of the various specifications, see the related pages in this publication. Not all hardware options are available for all configurations; consult the Series 40 Motor Model Code Supplement or Price Book for more information.

General Specifications	
Motor Type	In-line, axial piston, positive displacement motors.
Direction of Rotation	Bidirectional, see outline drawings for rotation vs. flow direction information.
Installation Position	Discretionary, the housing must be filled with hydraulic fluid.
Filtration Configuration	Suction or charge pressure filtration
Other System Requirements	Independent braking system, circuit overpressure protection, suitable reservoir
	T002 051E

Specific Data

Specific Data								
Frame Size		**M25 MF**	**M35 MF**	**M44 MF**	**M46 MF**	**M35 MV**	**M44 MV**	**M46 MV**
Motor Configuration		Fixed Motor				Variable Motor		
Displacement	**cm^3/rev** in^3/rev	**25** 1.50	**35** 2.14	**44** 2.65	**46** 2.80	**35** 2.14	**44** 2.65	**46** 2.80
Weight	**kg** lb	**11** 25	**11** 25	**11** 25	**14** 30	**21** 47	**21** 47	**23** 51
Mass moment of inertia of the internal rotation parts	**kgm^2** $lb\text{-}ft^2$	**0.0017** 0.040	**0.0029** 0.067	**0.0028** 0.065	**0.0046** 0.110	**0.0029** 0.067	**0.0028** 0.065	**0.0049** 0.116
Two (2) bolt flange, size B (SAE J744)		❍	❍	❍	❍	❍	❍	❍
Cartridge flange		-	-	-	-	-	-	❍
Port connection SAE straight thread O-ring boss	axial	❍	❍	❍	❍	-	-	❍
	side	-	❍	❍	❍	-	-	❍
	twin	❍	❍	❍	❍	❍	❍	❍
Output shaft options	tapered	-	❍	❍	❍	-	-	❍
	straight key	-	❍	❍	❍	-	-	-
	splined	❍	❍	❍	❍	❍	❍	❍
Control options		-	-	-	-	DDC	DDC	HDC
Loop flushing		❍	❍	❍	❍	❍	❍	❍
Displacement limiters		❍	❍	❍	❍	❍	❍	❍
Speed sensors		❍	❍	❍	❍	-	-	❍
								T002 052E

❍ = Option
- = not available

System Parameters

Speed Limits							
	min^{-1} • rpm						
Frame Size	**M25 MF**	**M35 MF**	**M44 MF**	**M46 MF**	**M35 MV**	**M44 MV**	**M46 MV**
Rated speed at max. disp.	4000	3600	3300	3600	3600	3300	4000
Maxim. speed at max. disp.	5000	4500	4100	3600	4500	4100	4100
Rated speed at min. disp.	-	-	-	-	5300	4850	5000

T002 054E

Case Pressure			
	MPa	bar	psi
Continuous pressure	**0.17**	1.7	25
Maximum pressure	**0.52**	5.2	75

T002 053E

System Pressure Range			
	MPa	bar	psi
Rated pressure	**21**	210	3 000
Maximum pressure	**34.5**	345	5 000

T002 055E

Fluid and Filtration Specifications

Temperature Range		
	°C	°F
Intermittent (cold start)	-40	-40
Continuous	82	180
Intermittent	104	220

T002 056E

Viscosity			
	mm^2/s	[SUS]	
Minimum	7	[49]	intermittent
Recommended operating range	12-60	[70-278]	
Maximum	1 600	[7 500]	intermittent, cold start

T002 010E

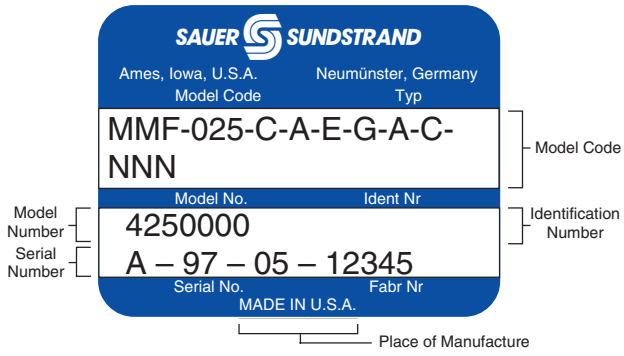
Cleanliness Level and β_x-Ratio	
Required fluid cleanliness level	ISO 4406 Class 18/13
Recommended β_x-ratio for suction filtration	$\beta_{35-45}=75$ $(\beta_{10}\geq 2)$
Recommended β_x-ratio for charge pressure filtration	$\beta_{15-20}=75$ $(\beta_{10}\geq 10)$
Recommended inlet screen size for charge pressure filtration	100 µm-125 µm

T002 007E

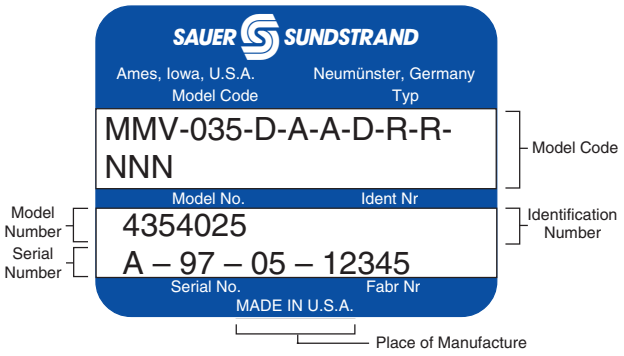
Model Code

The model code is a modular description of a specific product and its options. To create a model code to include the specific options desired, see the Series 40 Motor Model Code Supplement or the Series 40 Price Book.

Name Plate (Fixed Motor)



Name Plate (Variable Motor)



Model Code Modules

		Frame										
				C	D	E	F	G		T		
M	M	F	0 2 5	C	A	E	G	A	C	N	N	N
Product				Type								

Module	Description
Product:	Fixed Displacement Pump
Frame:	Displacement
Type:	Product Version
C:	Seal Group
D:	Output Shaft / Through Shaft Configuration
E:	End Cap Configuration
F:	Cylinder Block Group
G:	Housing Type
T:	Special Hardware Features

Model Code Modules

		Frame										
				C	D	E	F	G		T		
M	M	V	0 3 5	D	A	A	D	R	R	N	N	N
Product				Type								

Module	Description
Product:	Variable Displacement Pump
Frame:	Displacement
Type:	Product Version
C:	Seal Group
D:	Output Shaft / Through Shaft Configuration
E:	Minimum Swashplate Angle
F:	Control Features
G:	End Cap Configuration
T:	Special Hardware Features

Hydraulic Equations for Motor Selection

The motor size required for a specific application can be calculated using the equations below.

Metric System

Based on MPa

Input flow $Q_e = \frac{Vg \cdot n}{1\,000 \cdot \eta_v}$ l/min

Output torque $M_e = \frac{Vg \cdot \Delta_p \cdot \eta_{mh}}{2 \cdot \pi}$ Nm

Output power $P_e = \frac{M_e \cdot n}{955} = \frac{Q_e \cdot \Delta p \cdot \eta_t}{60}$ kW

Speed $n = \frac{Q_e \cdot 1\,000 \cdot \eta_v}{Vg}$ min^{-1}

Vg	=	Motor displacement per rev.	cm^3
Δp	=	$p_{HD} - p_{ND}$	**MPa**
η_v	=	Motor volumetric efficiency	
η_{mh}	=	Motor mechanical-hydraulic (Torque) efficiency	
η_t	=	Motor overall efficiency	
p_{HD}	=	High pressure	**MPa**
p_{ND}	=	Low pressure	**MPa**

Based on bar

Input flow $Q_e = \frac{Vg \cdot n}{1\,000 \cdot \eta_v}$ l/min

Output torque $M_e = \frac{Vg \cdot \Delta_p \cdot \eta_{mh}}{2 \cdot \pi}$ Nm

Output power $P_e = \frac{M_e \cdot n}{9\,550} = \frac{Q_e \cdot \Delta p \cdot \eta_t}{60}$ kW

Speed $n = \frac{Q_e \cdot 1\,000 \cdot \eta_v}{Vg}$ min^{-1}

Vg	=	Motor displacement per rev.	cm^3
Δp	=	$p_{HD} - p_{ND}$	bar
η_v	=	Motor volumetric efficiency	
η_{mh}	=	Motor mechanical-hydraulic (Torque) efficiency	
η_t	=	Motor overall efficiency	
p_{HD}	=	High pressure	bar
p_{ND}	=	Low pressure	bar

Inch System

Input flow $Q_e = \frac{Vg \cdot n}{231 \cdot \eta_v}$ US gal/min

Output torque $M_e = \frac{Vg \cdot \Delta_p \cdot \eta_{mh}}{2 \cdot \pi}$ lbf-in

Output power $P_e = \frac{Vg \cdot n \cdot \Delta_p \cdot \eta_t}{396\,000}$ hp

Speed $n = \frac{Q_e \cdot 231 \cdot \eta_v}{Vg}$ rpm

Vg	=	Motor displacement per rev.	in^3
Δp	=	$p_{HD} - p_{ND}$	psid
η_v	=	Motor volumetric efficiency	
η_{mh}	=	Motor mechanical-hydraulic (Torque) efficiency	
η_t	=	Motor overall efficiency	
p_{HD}	=	High pressure	psid
p_{ND}	=	Low pressure	psid

System Parameters

Case Presure

Under normal operating conditions, case pressure must not exceed the **rated pressure**. Momentary case pressure exceeding this rating is acceptable under cold start conditions, but still must stay below the **maximum pressure** rating. The **minimum pressure** provides proper lubrication at high speeds. Operation with case pressure in excess of these limits may result in external leakage due to damage to seals, gaskets, and/or housings.

Case Pressure			
	MPa	bar	psi
Continuous pressure	**0.17**	1.7	25
Maximum pressure	**0.52**	5.2	75

T002 053E

Speed Limits

Rated Speed is the speed limit recommended at full power condition and is the highest value at which normal life can be expected

Maximum Speed is the highest operating speed permitted and cannot be exeeded without reduction in the life of the product or risking immediat failure and loss of driveline power (which may create a safety hazard). In the range between rated and maximum speed please contact your SAUER-SUNDSTRAND representative.

WARNING
The loss of hydrostatic drive line power in any mode of operation (e.g., forward, reverse, or "neutral" mode) may cause the loss of hydrostatic braking capacity. A braking system, redundant to the hydrostatic transmission must, therefore, be provided which is adequate to stop and hold the system should the condition develop.

S000001E

Speed Limits							
	min^{-1} • rpm						
Frame Size	**M25 MF**	**M35 MF**	**M44 MF**	**M46 MF**	**M35 MV**	**M44 MV**	**M46 MV**
Rated speed at max. disp.	4000	3600	3300	3600	3600	3300	4000
Maxim. speed at max. disp.	5000	4500	4100	3600	4500	4100	4100
Rated speed at min. disp.	-	-	-	-	5300	4850	5000

T002 054E

System Pressure

System pressure is the differential pressure between system ports referenced to case pressure. It is a dominant operating variable affecting hydraulic unit life. High pressure, which results from high load, reduces expected life in a manner similar to many mechanical assemblies such as engines and gear boxes. There are load-to-life relationships for the rotating group and for the shaft bearings.

Rated pressure is the average, regularly occurring operating pressure that should yield satisfactory product life. **Maximum pressure** is the highest intermittent pressure allowed, and is the relief valve setting. It is determined by the maximum machine load demand. For most systems, the load should move at this pressure. Maximum pressure is assumed to occur a small percentage of operating time, usually less than 2% of the total. Both the continuous and maximum pressure limits must be satisfied to achieve the expected life.

All pressure limits are differential pressures (referenced to charge pressure) and assume normal charge pressure and no externally applied shaft loads.

System Pressure Range			
	MPa	bar	psi
Rated pressure	**21**	210	3 000
Maximum pressure	**34.5**	345	5 000

T002 055E

Fluid Specifications

Hydraulic Fluid

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 the internal components.

Fire resistant fluids are also suitable at modified operating conditions. Please see SAUER-SUNDSTRAND publication 697581 or BLN-9887 for more information. Refer to publication ATI-9101E for information relating to biodegradable fluids.

It is not permissible to mix hydraulic fluids. For more information contact your SAUER-SUNDSTRAND representative.

Suitable Hydraulic fluids:

- Hydraulic fluids per DIN 51 524, part 2 (HLP)
- Hydraulic fluids per DIN 51 524, part 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 tables 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 to flow oil 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.

Temperature Range		
	°C	°F
Intermittent (cold start)	-40	-40
Continuous	82	180
Intermittent	104	220

T002 056E

Viscosity			
	mm^2/s	[SUS]	
Minimum	7	[49]	intermittent
Recommended operating range	12-60	[70-278]	
Maximum	1 600	[7 500]	intermittent, cold start

T002 010E

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 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 selected filtration system must maintain a cleanliness level of 18/13 per ISO 4406.

The selection of a filter depends on a number of factors including the contaminant ingression 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[1] (β_x). For simple suction-filtered closed circuit transmissions and open circuit transmissions with return line filtration, a filter with a β-ratio within the range of $\beta_{35-45} = 75$ ($\beta_{10} \geq 2$) 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 filter within the range of $\beta_{15-20} = 75$ ($\beta_{10} \geq 10$) or better is typically required.

Since each system is unique, the filtration requirement for that system will be unique and must be determined by test in each case. It is essential that monitoring of prototypes and evaluation of components and performance throughout the test program be the final criteria for judging the adequacy of the filtration system. See publication BLN-9887 or 697581 and ATI-E9201 for more information.

Cleanliness Level and β_x-Ratio	
Required fluid cleanliness level	ISO 4406 Class 18/13
Recommended β_x-ratio for suction filtration	$\beta_{35-45}=75$ ($\beta_{10}\geq 2$)
Recommended β_x-ratio for charge pressure filtration	$\beta_{15-20}=75$ ($\beta_{10}\geq 10$)
Recommended inlet screen size for charge pressure filtration	100 µm-125 µm

T002 007E

[1] Filter β_x-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 µm) upstream of the filter to the number of these particles downstream of the filter.

System Requirements

Independent Braking System

WARNING
The loss of hydrostatic drive line power in any mode of operation (e.g., forward, reverse, or "neutral" mode) may cause the loss of hydrostatic braking capacity. A braking system, redundant to the hydrostatic transmission must, therefore, be provided which is adequate to stop and hold the system should the condition develop.

S000001E

Reservoir

The function of the reservoir is to remove air and to provide make up fluid for volume changes associated with fluid expansion or contraction, possible cylinder flow, and minor leakage.

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

A suggested minimum reservoir volume equal to 1/2 charge pump flow/min. 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.

The reservoir inlet (fluid return) should be positioned so that the flow to the reservoir is discharged below the normal fluid level, and also directed into the interior of the reservoir for maximum dwell and efficient deaeration.

Overpressure Protection

Series 40 motors (as well as other system components) have pressure limitations. Relief valves or pressure limiters should be present in the high pressure circuit to protect components from excessive pressures.

Series 40 pumps are available with a range of high pressure relief valve settings. Refer to publication BLN-9989 for more information.

WARNING
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.

S000031E

Bypass Valves

In some applications it is desirable to bypass fluid around the variable displacement pump allowing, for example, a vehicle to be moved short distances at low speeds without running the prime mover. This is accomplished by a manually operated bypass valve. When open, this valve connects both sides of the pump/motor circuit and allows the motor to turn. This valve must be fully closed for normal operation.

Bypass valves are available in Series 40 pumps. Refer to publication BLN-9989 for more information.

WARNING
Bypass valves are intended for moving a machine or vehicle for very short distances at very slow speeds. They are NOT intended as "tow" valves.

S000030E

Product Features and Options

Loop Flushing Valve

Series 40 motors may incorporate an integral loop flushing valve. Installations that require additional fluid to be removed from the main hydraulic circuit because of fluid cooling requirements, or circuits requiring the removal of excessive contamination, will benefit from loop flushing. A loop flushing valve will remove heat and contaminants from the main loop at a rate faster than otherwise possible. (Contact your Sauer-Sundstrand representative for production availability on specific frame size motors.)

Series 40 motors equipped with an integral loop flushing valve include a loop flushing relief valve and may include an orifice with the valve. The flushing flow will be a function of the relative settings of the motor charge relief, the pump charge relief valve, and the orifice size (if present). The motor relief must be set to a pressure less than or equal to the pump relief to provide loop flushing.

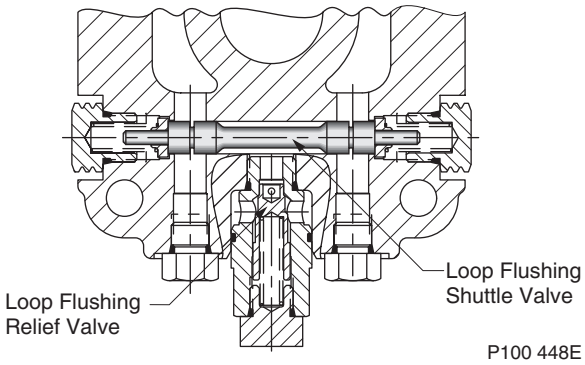
Loop flushing flows of 3.8 to 7.6 l/min (1 to 2 gpm) are adequate for most applications. Contact your Sauer-Sundstrand representative for assistance.

WARNING
Incorrect charge pressure settings may result in the inability to build required system pressure and/or inadequate loop flushing flows. Correct charge pressure must be maintained under all conditions of operation to maintain pump control performance.

S000002E

Loop Flushing Specs	
Typical Flow Rate	**3.8 - 7.6 l/min.** (1-2 gpm)
Relief Setting	**1.4 - 2.5 MPa** [14 - 25 bar] (200 - 355 psi)
Orifice Size	non or **1.4 mm** (0.055 in)

T002 061E



P100 448E

Loop Flushing Valve - M25 MF

Displacement Limiters

M35, M44, and M46 variable motors have **minimum displacement limiters**. These can be adjusted by loosening the sealing lock nut, adjusting displacement by rotating the screw with a wrench, then locking the adjuster by torquing the sealing lock nut.

Minimum unit displacement is obtained with the adjuster screw at its maximum extension from the end cap or displacement control piston cover. All motors are shipped with the limiter set for minimum motor displacement.

The M35 and M44 MV minimum displacement limiter is located in the end cap.

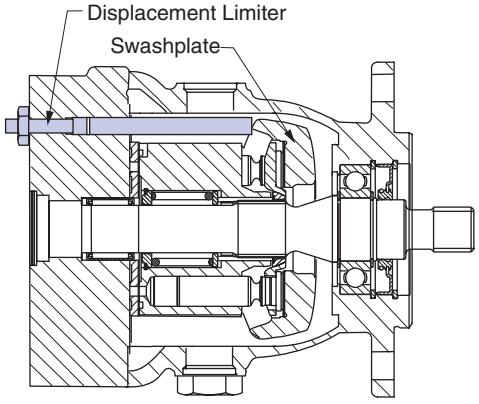
The M46 MV minimum displacement limiter is located in the displacement control piston cavity. The length and configuration of this limiter will depend upon the control option installed in the motor.

M46 MV units may have an optional mechanical **maximum displacement limiter** located in the displacement control piston cover. The maximum displacement limit can be adjusted by loosening the sealing lock nut, adjusting displacement by rotating the screw with a screwdriver, then locking the adjuster by torquing the sealing lock nut.

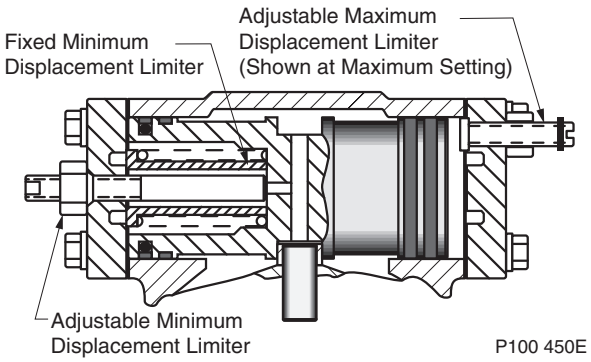
Maximum unit displacement is obtained with the adjuster screw standing at its maximum height out of the displacement control piston cover. All motors are shipped with the limiter set for maximum motor displacement.

WARNING
Care should be taken in adjusting displacement limiters to avoid an undesirable condition of output flow or speed. The sealing lock nut must be retorqued after every adjustment to prevent an unexpected change in output conditions and to prevent external leakage during pump operation.

S000012E



Displacement Limiter - M35 MV



Displacement Limiter - M46 MV (SAE Flange)

Speed Sensor Option

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 speed pick-up ring is pressed onto the outside diameter of the shaft 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 a Packard Weather-Pack 4-pin sealed connector.

Contact your SAUER-SUNDSTRAND representative for more information.

For detailed technical data please see the table.

Connecting pin designation:

Pin 1 or A : Supply voltage
Pin 2 or D : Direction of rotation
Pin 3 or B : Speed signal, digital
Pin 4 or C : Gnd common

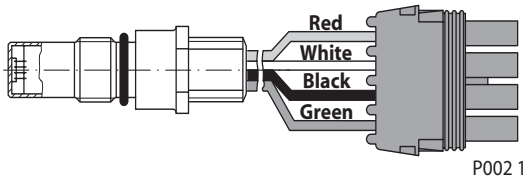
Technical Data Speed Sensor	
Supply voltage [1]	4.5-15 V_{DC}
Required current	12 mA at 5 V_{DC} (no load)
Max. current	20 mA at 5 V_{DC}
Max. frequency	15 kHz
Voltage “high”	Supply voltage -0.5 V
Voltage “low”	0.5 VDC max.
Temperature range	-40 to 110 °C [-40 to 250 °F]

T000 049E

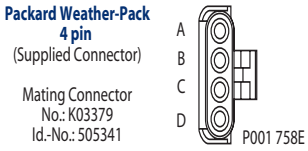
[1] It is not acceptable to energize the 4.5-15 V_{DC} speed sensor with 12 V_{DC} battery voltage; it must be energized by a regulated power supply. If it is desirable to energize the sensor with battery voltage, contact your Sauer-Danfoss representative for an optional speed sensor.

Data Magnetic Speed Pick-up Ring				
Frame Size	**M25**	**M35**	**M44**	**M46**
Pulse/Rev	43	46	46	51

T000 079E

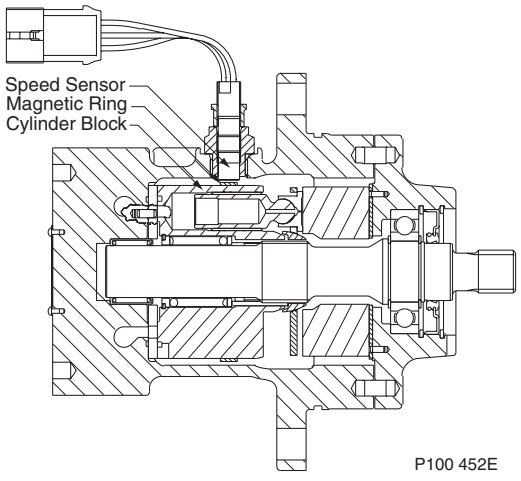


P002 108E



P001 758E

Speed Sensor with Packard Weather-Pack Connector



P100 452E

Cross-Section of Speed Sensor on Cylinder Kit

Shaft Options

Series 40 motors are available with a variety of splined, straight keyed, and tapered shaft ends. Nominal shaft sizes and torque ratings for some available shafts are shown in the accompanying table.

Torque ratings assume no external radial loading. **Continuous (Cont) torque** ratings for splined shafts are based on spline tooth wear, and assume the mating spline has a minimum hardness of R_c 55 and full spline depth with good lubrication.

Maximum torque ratings are based on shaft torsional strength and assume a maximum of 200 000 load reversals.

Contact your SAUER-SUNDSTRAND representative for more information.

Shaft Availability and Torque Ratings

			Frame Size						
Shaft Options			**M25 MF**	**M35 MF**	**M44 MF**	**M46 MF**	**M35 MV**	**M44 MV**	**M46 MV**
Spline 13 tooth, 16/32 pitch	Continuous torque	**Nm** lbf-in	**85** 750	**73** 650					
	Maximum torque	**Nm** lbf-in	**140** 1 240	**226** 2 000					
Spline 15 tooth, 16/32 pich	Continuous torque	**Nm** lbf-in	–	**153** 1 350					
	Maximum torque	**Nm** lbf-in	–	**362** 3 200					

T002 063E

– = not available

NOTE: Recommended mating splines for splined output shafts should be in accordance with ANSI B92.1 Class 5. Sauer-Sundstrand external splines are modified Class 5 Fillet Root Side Fit. The external spline Major Diameter and Circular Tooth Thickness dimensions are reduced in order to assure a clearance fit with the mating spline.

S000029E

Through-Shaft Options

Optional through-shafts are available on Series 40 fixed and variable displacement motors (as noted in the accompanying table). Through-shafts are provided for use in secondary (parking) braking systems. Through-shaft ends are not intended for continuous power transmission.

Contact your Sauer-Sundstrand representative when considering the through-shaft option.

Available Through-Shaft Options

Frame Size	**Shaft Spline**	Max. Torque Limit **Nm** lbf-in
M35 MF	13 Z 16/32 T	**328** 2 900
M44 MF	13 Z 16/32 T	
M46 MF/MV(SAE)	13 Z 16/32 T	

T002 064E

WARNING
Exeeding these torque limits could cause shaft breakage, which could result in a loss of breaking function and machine control, and a potential runaway condition.

S000006E

Loading, Life, and Efficiency

Bearing Life and External Shaft Loading

Bearing life is a function of speed, pressure and swashplate angle plus any external loads. Other life factors include oil type and viscosity.

In vehicle propulsion drives with no external loads, where the speed, pressure, and swashplate angle are often changing, normal bearing B10 (90% survival) life will exceed the hydraulic unit life.

In non-propel drives, such as conveyors or fan drives, the operating speed and pressure may be nearly constant leading to a distinctive duty cycle compared to that of a propulsion drive. In these types of applications, a bearing life review is recommended.

Series 40 motors are designed with bearings that can accept some incidental external radial and thrust loads. However, any amount of external load will reduce the expected bearing life.

The allowable radial shaft loads are a function of the load position, the load orientation, and the operating pressures of the hydraulic unit. All external shaft loads will have an effect on bearing life. In motor applications where external shaft loads cannot be avoided, the impact on bearing life can be minimized by orienting the load to the 180 degree position.

The recommended maximum radial loads (R_e) is based on an external moment (M_e) and the distance (L) from the mounting flange to the load, see table at right. The loads in the table reflect a worst case external load orientation (0 degrees), continuously applied working pressure of 140 bar (2000 psi), 20 bar (285 psi) charge pressure, 1800 rpm and a bearing life (B10) of 2000 hours.

The recommended maximum allowable radial load is calculated as:

$$R_e = M_e / L$$

Thrust loads in either direction should be avoided.

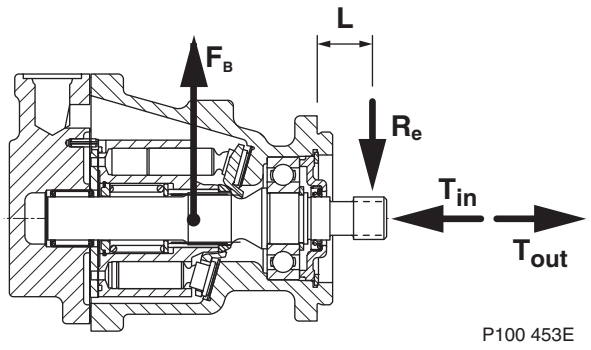
If continuously applied external radial loads exceed the recommended maximum allowable, or thrust loads are known to occur, contact Sauer-Sundstrand for an evaluation of unit bearing life. Optional high capacity bearings are available.

Tapered output shafts or “clamp-type” couplings are recommended for applications where radial shaft side loads are present.

External Shaft Moments

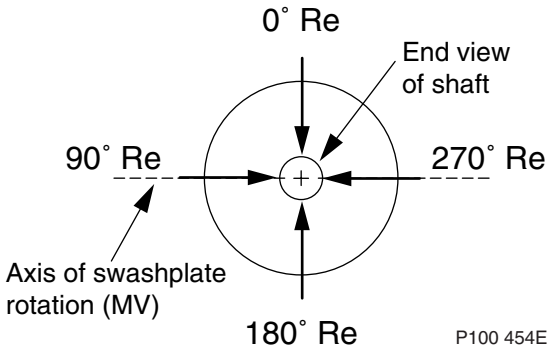
		Frame Size			
		M25MF	**M35MF**	**M44MF**	**M46MF**
M_e	**Nm** lbf-in	**29** 255	**25** 225		**24** 215
T_{in}	**N** lbf	**1 380** 310			**2 000** 450
T_{out}	**N** lbf	**690** 155	**1 380** 310	**1 820** 409	**2 000** 450

T002 065E



P100 453E

Shaft Loading (with 180° Side Load, R_e)



P100 454E

F_B Force of block (applies at center of gravity)
L Distanc from mounting flange to point of load
Me External shaft moment
Re Maximum radial side load
T_{in} Max. axial shaft load
T_{out} Max. axial shaft load

External Shaft Load Orientation

Hydraulic Unit Life

Hydraulic unit life is defined as the life expectancy of the hydraulic components. Hydraulic unit life is a function of speed and system pressure; however, system pressure is the dominant operating variable affecting hydraulic unit life. High pressure, which results from high load, reduces expected life in a manner similar to many mechanical assemblies such as engines and gear boxes.

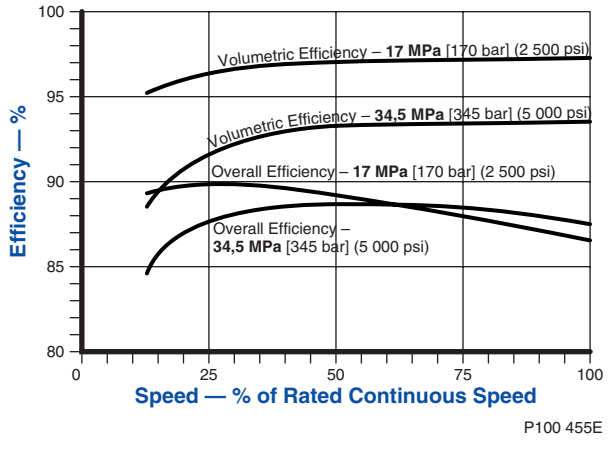
It is desirable to have a projected machine duty cycle with percentages of time at various loads and speeds. An appropriate design pressure can be calculated by Sauer-Sundstrand from this information . This method of selecting operating pressure is recommended whenever duty cycle information is available. In the absence of duty cycle data, an estimated design pressure can usually be established based on normal input power and maximum pump displacement.

Note that all pressure limits are differential pressures (referenced to charge pressure) and assume normal charge pressure.

Series 40 motors will meet satisfactory life expectancy if applied within the parameters specified in this bulletin (see p. 10). For more detailed information on hydraulic unit life see BLN-9884, "Pressure and Speed Limits."

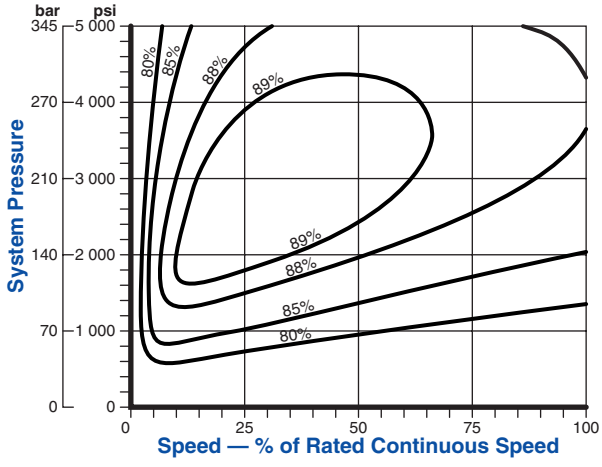
Efficiency Graphs

The following performance graph provides typical volumetric and overall efficiencies for Series 40 motors. These efficiencies apply for all Series 40 motors at maximum displacement.



Motor Performance as a Function of Operating Speed[1]

The performance map provides typical motor overall efficiencies at various operating parameters. These efficiencies also apply for all Series 40 motors at maximum displacement.



Motor Performance at Select Operating Parameters[1]

[1] At maximum displacement, assumes fluid viscosity in continuous range (p. 11).

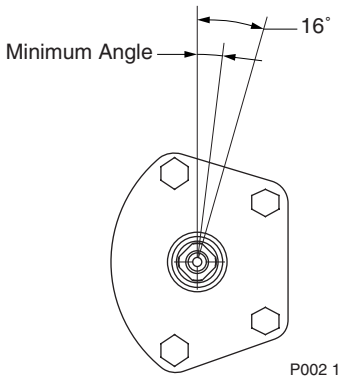
Variable Motor Controls

Direct Displacement Control (DDC)

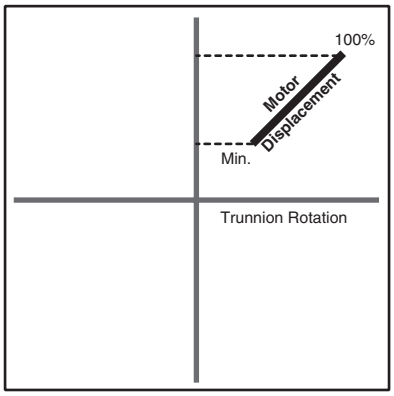
The Direct Displacement Control can be located on either side of the M35 and M44 variable motors. It provides a simple, positive method of control. Movement of the control shaft causes a proportional swashplate movement, thus varying the motor's displacement from full displacement to minimum displacement.

Some applications (generally vehicle propel) will require a provision for non-linear control input to produce desirable control feel.

- Minimum torque necessary to hold the swash plate per 7 MPa [70 bar] (1 000 psi) of differential system pressure is 11.3 Nm (100 lbf-in).
- Maximum allowable trunnion torque is 79.1 Nm (700 lbf-in)
- Maximum trunnion angle is 16° for M35 and M44.



DDC on Left Side of M25, M35 and M44



Motor Displacement vs Swashplate Rotation

Data DDC		
Maximum torque	**Nm** lbf-in	**79.1** 700
Minimum torque to hold per 7 MPa [70 bar] (1 000 psi)	**Nm** lbf-in	**11.3** 100
Maximum angle		16°
		T002 067E

Two-Position Hydraulic Displacement Control (HDC)

Series 40 - M46 variable displacement motors are equipped with a hydraulically controlled swashplate. The motor is typically spring biased toward maximum displacement. A hydraulic piston is used to shift the swashplate from maximum to minimum displacement. SAE flange motors utilize a single servo piston which can be regulated by a single- or two-line control. Cartridge flange motors utilize a two piston control which is regulated by a single-line control.

With the standard **single-line control** option, hydraulic pressure is supplied to the "bottom" control port (port X1) to shift the motor to minimum displacement. The opposite end of the displacement control piston is internally drained to the motor case. A minimum pressure of 1.38 MPa [13.8 bar] (200 psi) is required to shift the swashplate. When the control pressure is removed, the bias spring returns the motor to maximum displacement.

A customer supplied 2-position, 3-way control valve is generally used with the single-line control. Hydraulic pressure on the control piston must not exceed 2.76 MPa [27.6 bar] (400 psi).

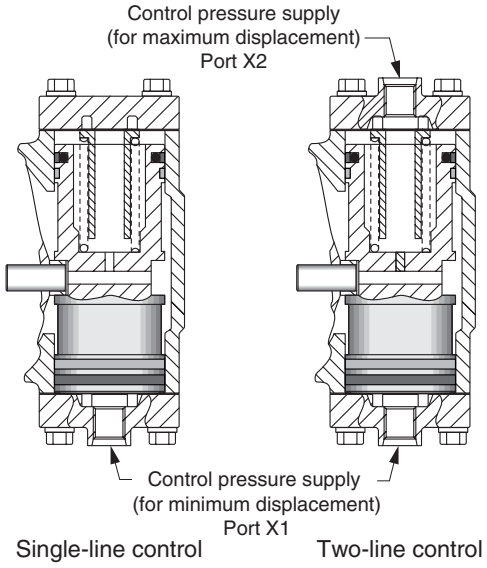
When the M46 variable motor is utilized in applications where frequent shifting "on-the-go" is encountered as part of the normal duty cycle, the optional **two-line control** is recommended. Applications with routine shifting from "work" range to "travel" range do not require the two-line control.

Control pressure is ported to port X1 and drained from port X2 to command minimum displacement and ported to port X2 and drained from port X1 to command maximum displacement.

A customer supplied 2-position, 4-way control valve is generally used with the two-line control. Hydraulic pressure on the control piston must not exceed 2.76 MPa [27.6 bar] (400 psi).

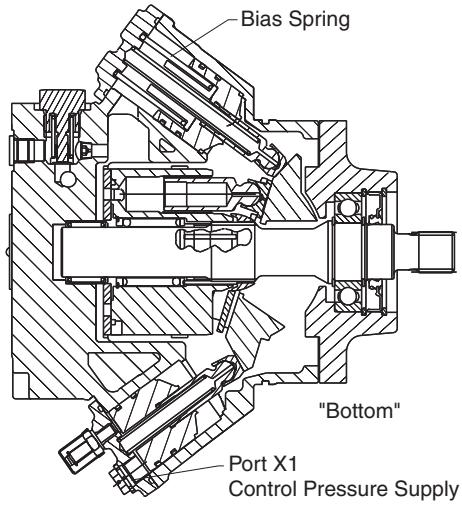
The shift rate for either the single- or two-line control can be optimized for the application requirements by orifices in either (or both) the control valve supply and drain lines.

Contact your Sauer-Sundstrand representative for additional information.



P002 114E

M46 2-Position Hydraulic Displacement Controls (SAE Flange Motors)



P100 460E

M46 2-Position Hydraulic Displacement Controls (Cartridge Flange Motors)

Data HDC			
		Single line control	Two line control
Maximum pressure on control	**MPa** bar psi	**2.76** 27.6 400	
Minimum pressure to shift	**MPa** bar psi	**1.38** 13.8 200	
Control valve (customer supplied)		2-position/ 3-way	2-position/ 4-way

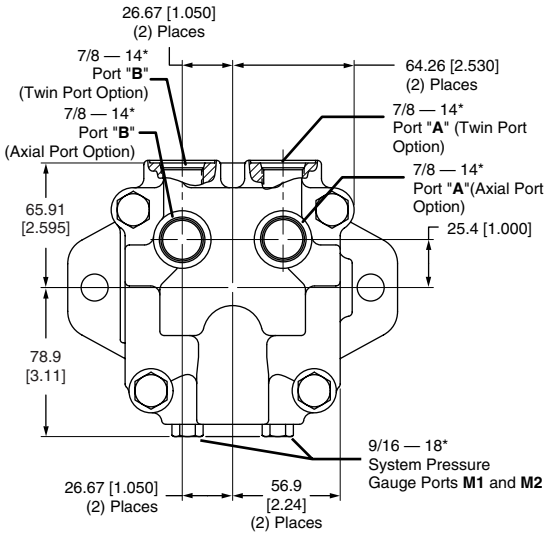
T002 068E

M25 MF Dimensions

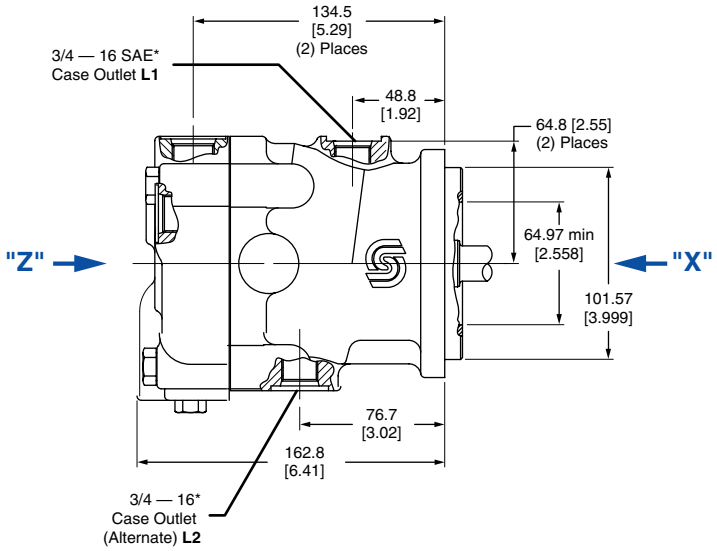
M25 MF: Axial Ports, Twin Ports, Loop Flushing, Speed Sensor

Motor Shaft Rotation	Flow Direction	
	Port "A"	Port "B"
Clockwise (CW)	In	Out
Counterclockwise (CCW)	Out	In

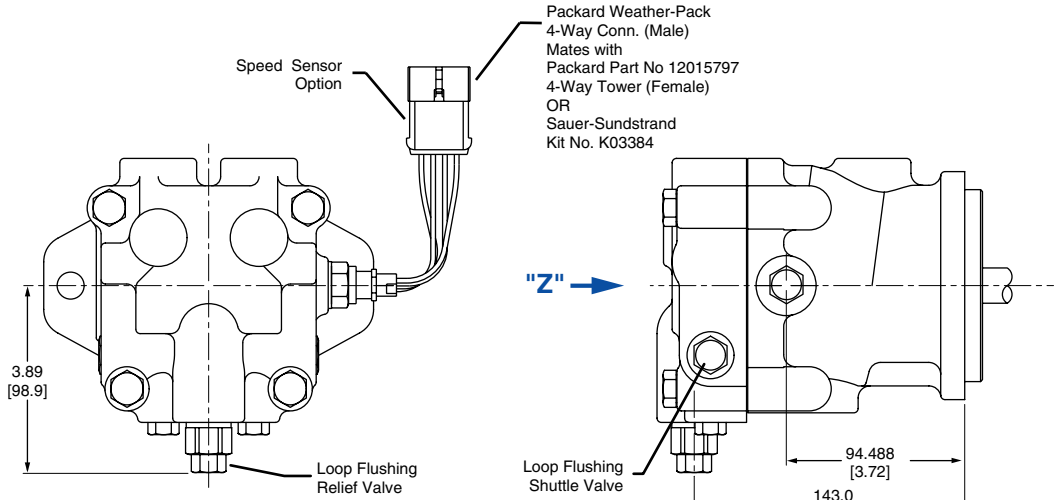
mm
[in.]



VIEW "Z" (REAR VIEW)
AXIAL OR TWIN PORTS



LEFT SIDE VIEW
AXIAL OR TWIN PORTS



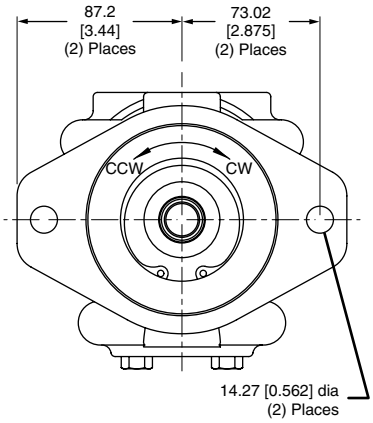
VIEW "Z" (REAR VIEW)
W/ LOOP FLUSHING

LEFT SIDE VIEW
W/ LOOP FLUSHING

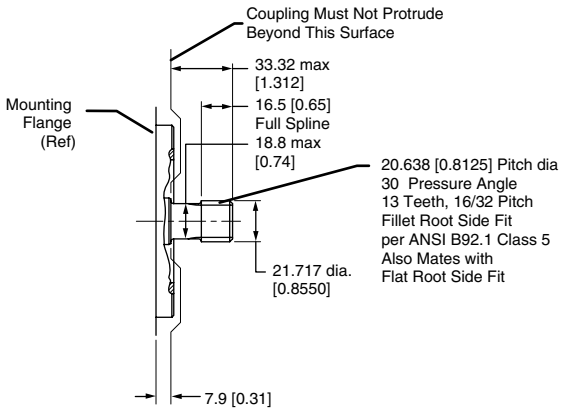
P100 461-1E

*All SAE straight thread O-Ring ports per SAE J1926.
Shaft rotation is determined by viewing motor from output shaft end.
Contact your SAUER-SUNDSTRAND representative for specific installation drawings.

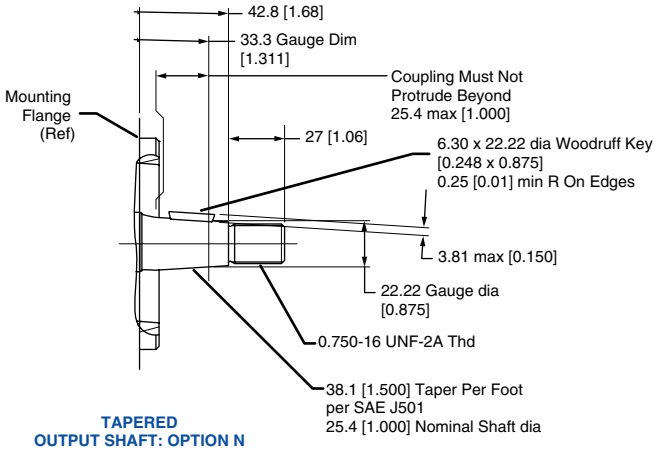
M25 MF: Mounting Flange, Shaft



VIEW "X"
(FRONT VIEW)



SPLINED
OUTPUT SHAFT: OPTION E



TAPERED
OUTPUT SHAFT: OPTION N

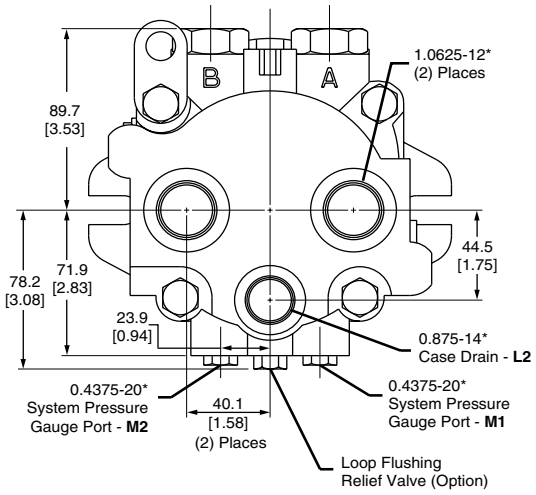
P100 461-2E

M35/M44 MF Dimensions

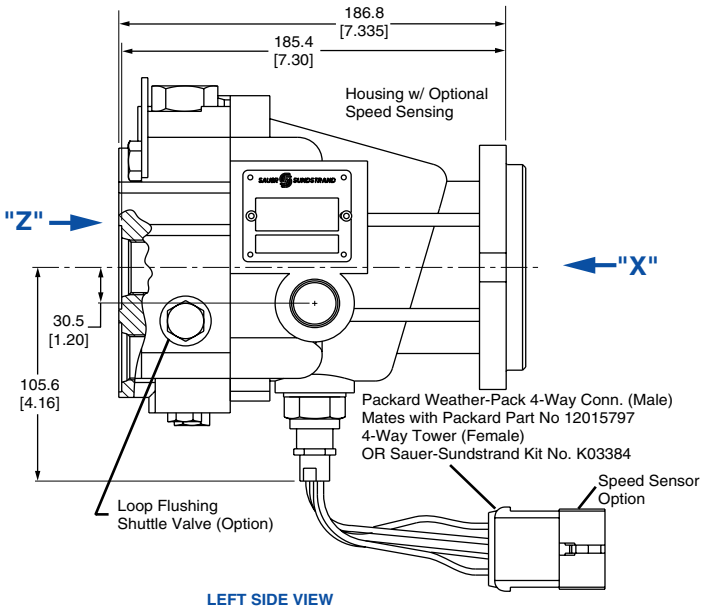
M35/M44 MF: Axial Ports, Twin Ports, Loop Flushing, Speed Sensor

Motor Shaft Rotation	Flow Direction	
	Port "A"	Port "B"
Clockwise (CW)	In	Out
Counterclockwise (CCW)	Out	In

mm
[in.]

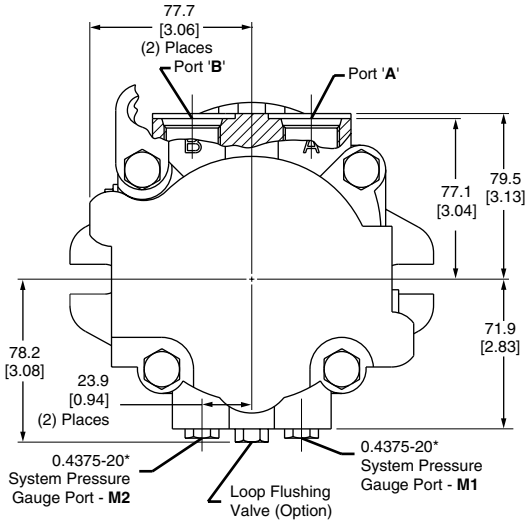


VIEW "Z" (REAR VIEW)
AXIAL PORTS

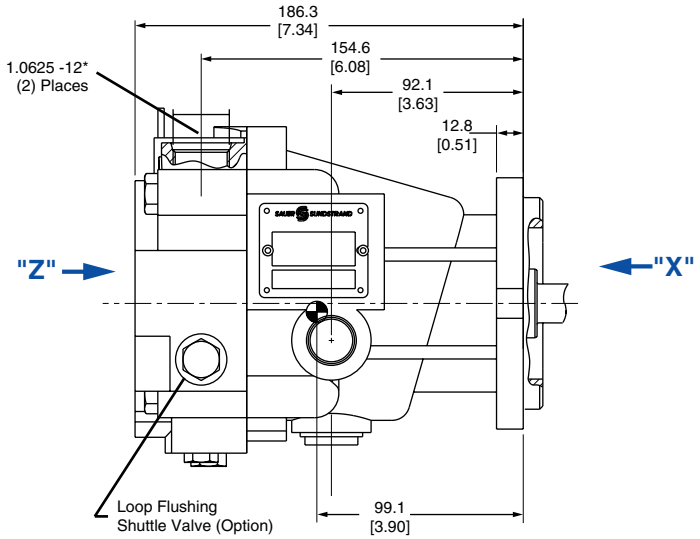


LEFT SIDE VIEW
AXIAL PORTS

P100 462E



VIEW "Z" (REAR VIEW)
TWIN PORTS



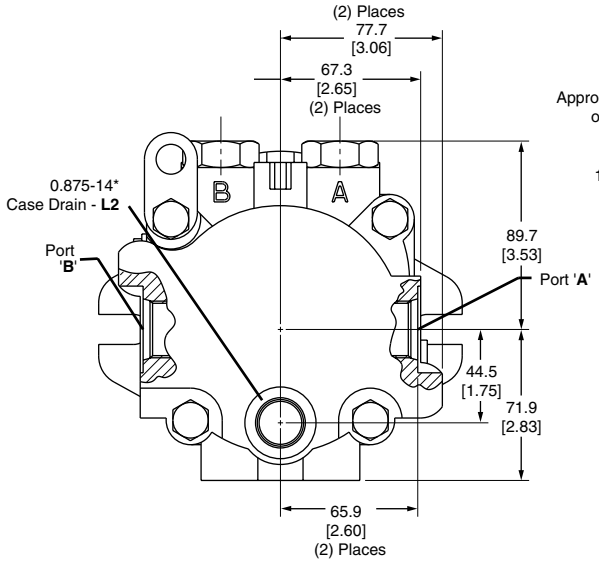
LEFT SIDE VIEW
TWIN PORTS

P100 463E

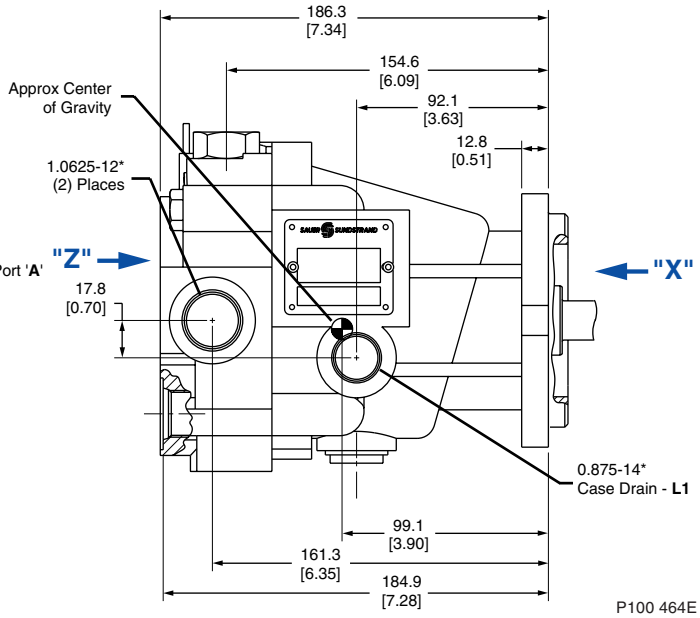
*All SAE straight thread O-Ring ports per SAE J1926.
Shaft rotation is determined by viewing motor from output shaft end.
Contact your SAUER-SUNDSTRAND representative for specific installation drawings.

M35/M44 MF: Side Ports, Thru Shaft

Motor Shaft Rotation	Flow Direction	
	Port "A"	Port "B"
Clockwise (CW)	In	Out
Counterclockwise (CCW)	Out	In

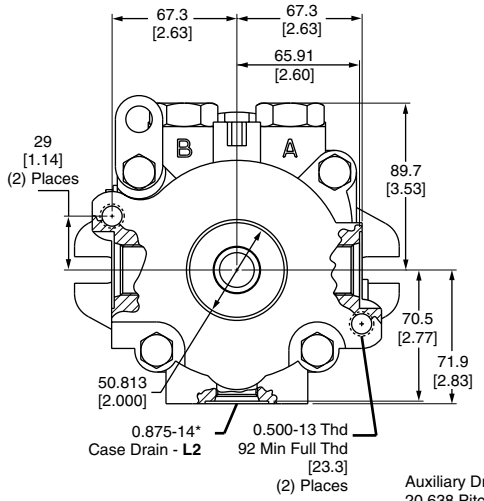


VIEW "Z" (REAR VIEW)
SIDE PORTS

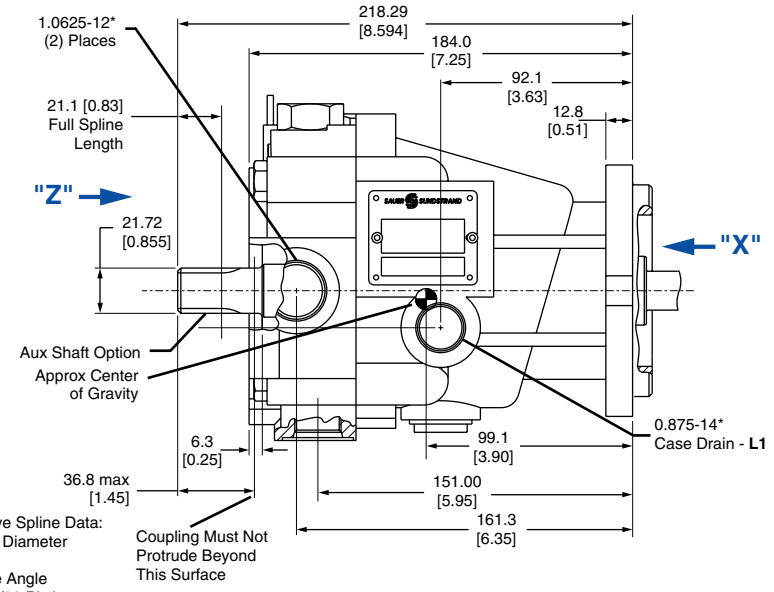


P100 464E

LEFT SIDE VIEW
SIDE PORTS



VIEW "Z"(REAR VIEW)
SIDE PORTS
W/ THRU SHAFT



Auxiliary Drive Spline Data:
20.638 Pitch Diameter
[0.8125]
30° Pressure Angle
13 Teeth, 16/32 Pitch
Fillet Root Side Fit
ANSI B92.1-1970 Class No. 5
Also Mates with Flat
Root Side Fit

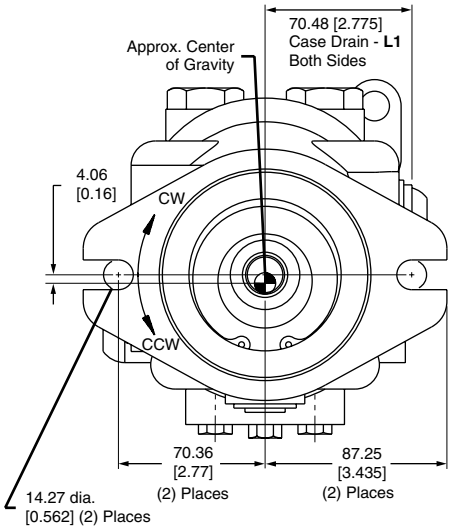
LEFT SIDE VIEW
SIDE PORTS
W/ THRU SHAFT

P100 465E

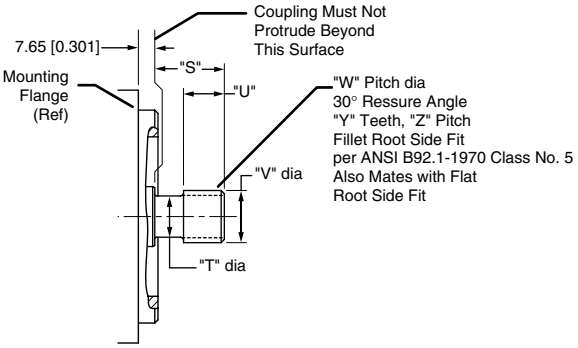
M35/M44 MF: Mounting Flange, Shafts

M35 / M44 MF Splined Shaft Options								
Shaft Option	Shaft Length "S"	Shaft Diameter "T"	Full Spline "U"	Major Dia. "V"	Pitch Dia. "W"	No. Teeth "Y"	Pitch "Z"	Thru Shaft
A	33.55 [1.321]	18.8 [.74]	16.5 [.65]	21.72 [.8550]	20.638 [.8125]	13	16/32	---
C	33.55 [1.321]	18.8 [.74]	16.5 [.65]	21.72 [.8550]	20.638 [.8125]	13	16/32	13T
F	33.55 [1.321]	21.98 [.865]	18.5 [.73]	24.89 [.9800]	23.812 [.9375]	15	16/32	---

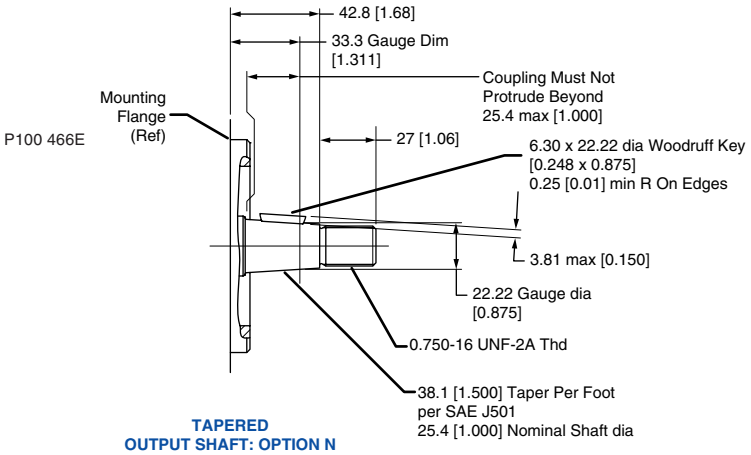
mm
[in.]



VIEW "X"
(FRONT VIEW)

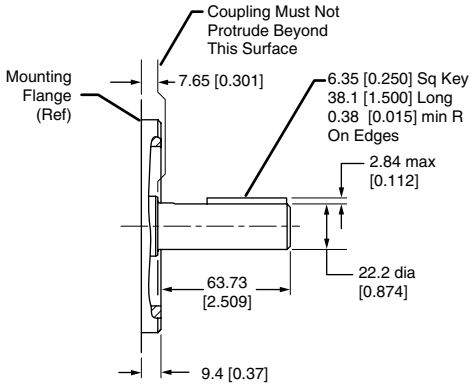


SPLINED
OUTPUT SHAFT (SEE TABLE)



P100 466E

TAPERED
OUTPUT SHAFT: OPTION N



STRAIGHT KEYED
OUTPUT SHAFT: OPTION Y

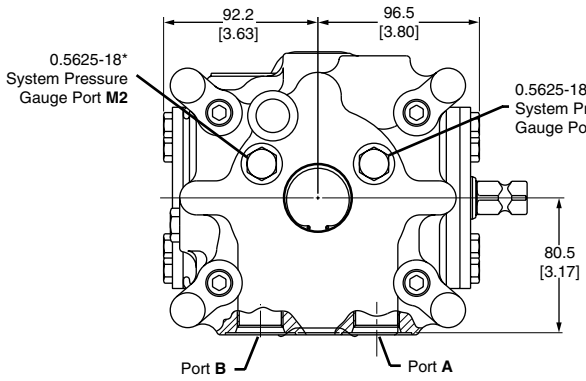
P100 467E

*All SAE straight thread O-Ring ports per SAE J1926.
Shaft rotation is determined by viewing motor from output shaft end.
Contact your SAUER-SUNDSTRAND representative for specific installation drawings.

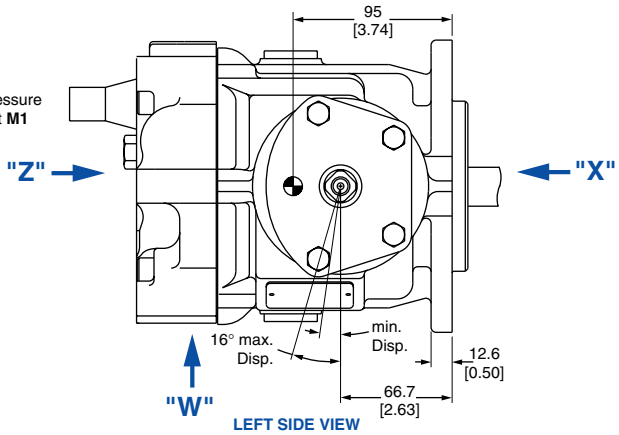
M35/M44 MV Dimensions

M35/44 MV: Twin Ports, Thru Shaft

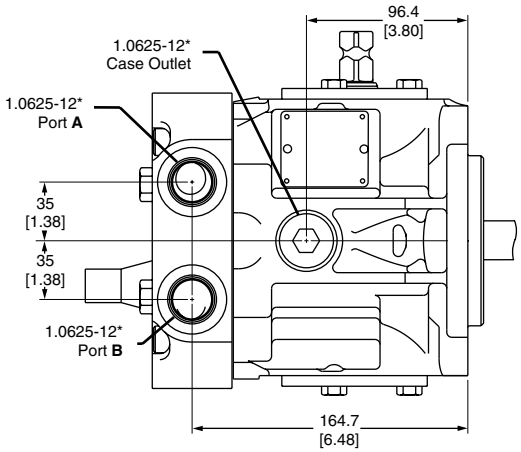
Motor Shaft Rotation	Flow Direction	
	Port "A"	Port "B"
Clockwise (CW)	In	Out
Counterclockwise (CCW)	Out	In



VIEW "Z" (REAR VIEW)
TWIN PORTS



LEFT SIDE VIEW



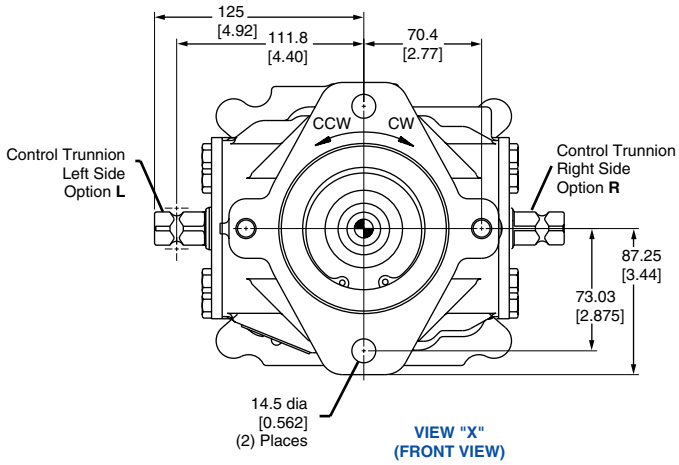
VIEW "W"

P100 468E

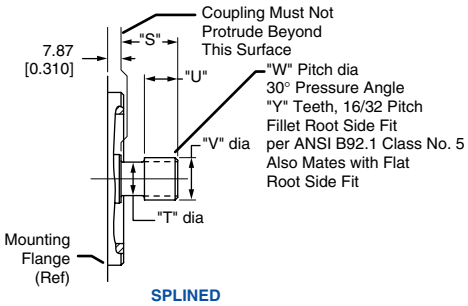
M35/M44 MV: Mounting Flange, Shaft, Trunnion Control

mm
[in.]

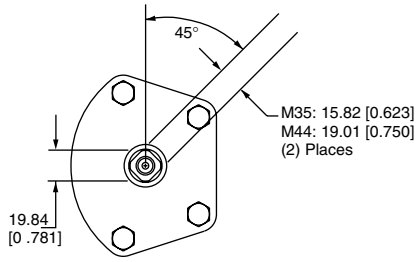
M35 / M44 MV Splined Shaft Options								
Shaft Option	Max. Coupling Engagement "S"	Shaft Diameter "T"	Full Spline Length "U"	Major Dia. "V"	Pitch Dia. "W"	No. Teeth "Y"	Pitch	Thru Shaft
A	33.3 [1.31]	18.8 [0.74]	16.5 [0.65]	21.72 [0.855]	20.638 [0.8125]	13	16/32	---
E	33.3 [1.31]	21.98 [0.865]	18.5 [0.73]	24.89 [0.980]	23.812 [0.9375]	15	16/32	---



VIEW "X"
(FRONT VIEW)



SPLINED
OUTPUT SHAFT (SEE TABLE)



TRUNNION CONTROL

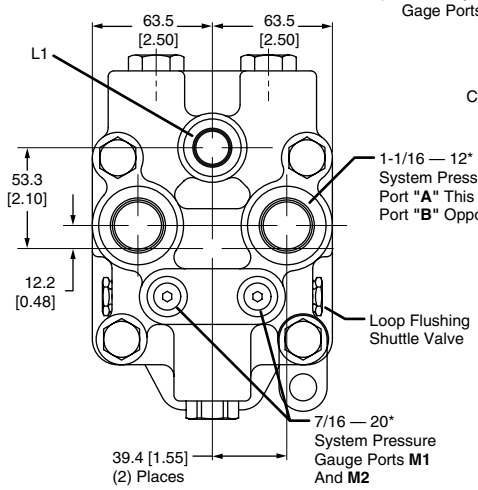
P100 469E

*All SAE straight thread O-Ring ports per SAE J1926.
Shaft rotation is determined by viewing motor from output shaft end.
Contact your SAUER-SUNDSTRAND representative for specific installation drawings.

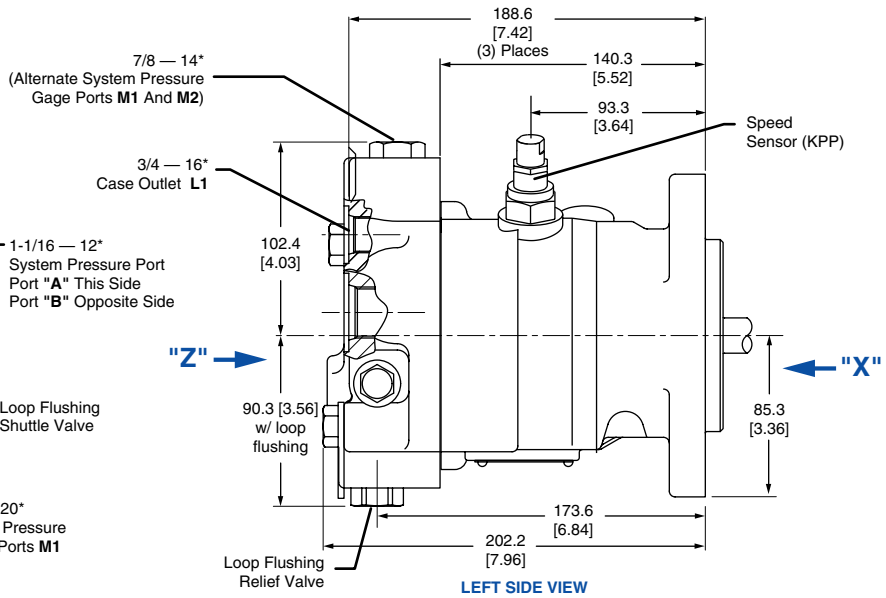
M46 MF Dimensions

M46 MF: Axial Ports, Twin Ports, Loop Flushing, Speed Sensor

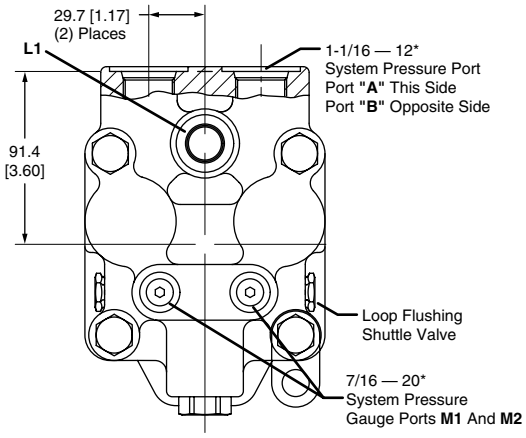
Motor Shaft Rotation	Flow Direction	
	Port "A"	Port "B"
Clockwise (CW)	In	Out
Counterclockwise (CCW)	Out	In



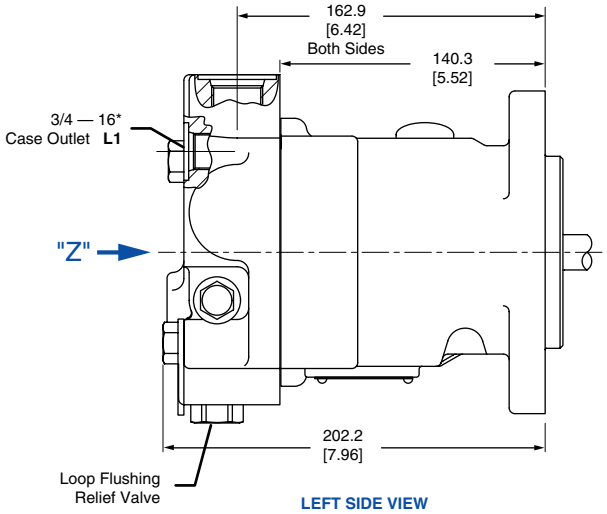
VIEW "Z"
(REAR VIEW)
AXIAL PORTS
W/ LOOP FLUSHING



LEFT SIDE VIEW
AXIAL PORTS
W/ LOOP FLUSHING



VIEW "Z"
RADIAL (TWIN) PORTS
W/ LOOP FLUSHING



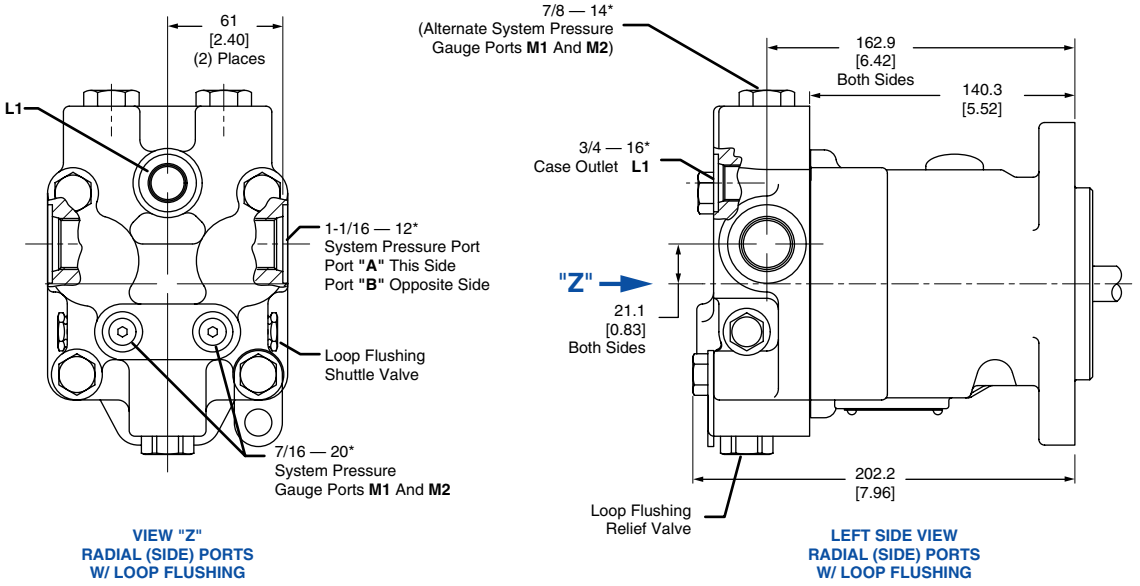
LEFT SIDE VIEW
RADIAL (TWIN) PORTS
W/ LOOP FLUSHING

P100 470E

M46 MF: Side Ports, Loop Flushing, Thru Shaft

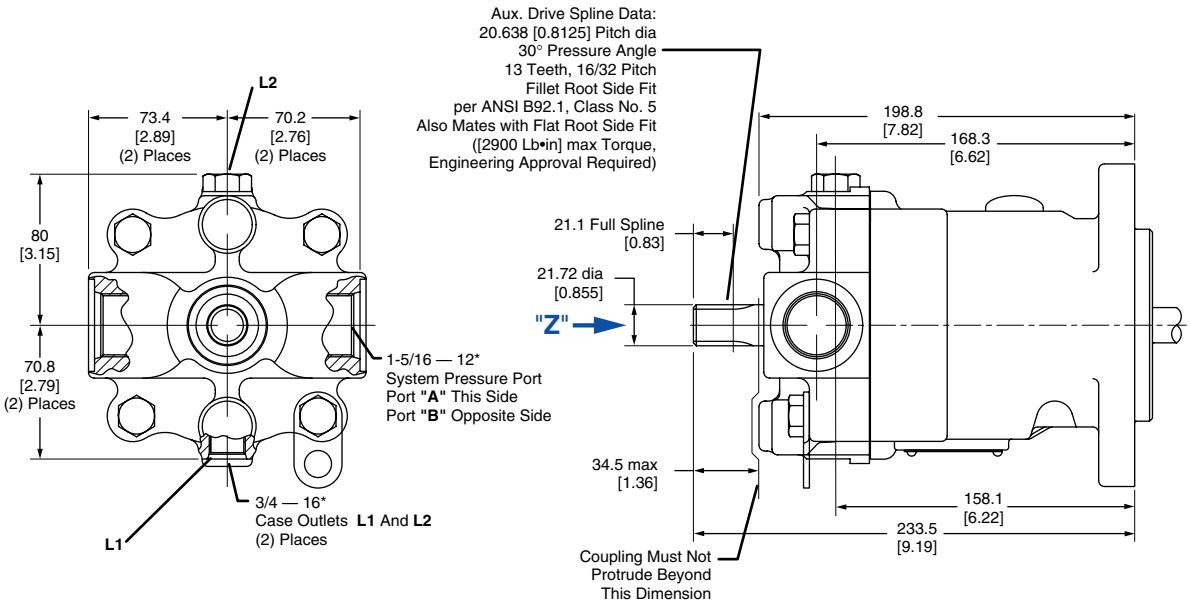
Motor Shaft Rotation	Flow Direction	
	Port "A"	Port "B"
Clockwise (CW)	In	Out
Counterclockwise (CCW)	Out	In

mm
[in.]



VIEW "Z"
RADIAL (SIDE) PORTS
W/ LOOP FLUSHING

LEFT SIDE VIEW
RADIAL (SIDE) PORTS
W/ LOOP FLUSHING



VIEW "Z"
(REAR VIEW)
RADIAL (SIDE) PORTS
W/ THRU SHAFT

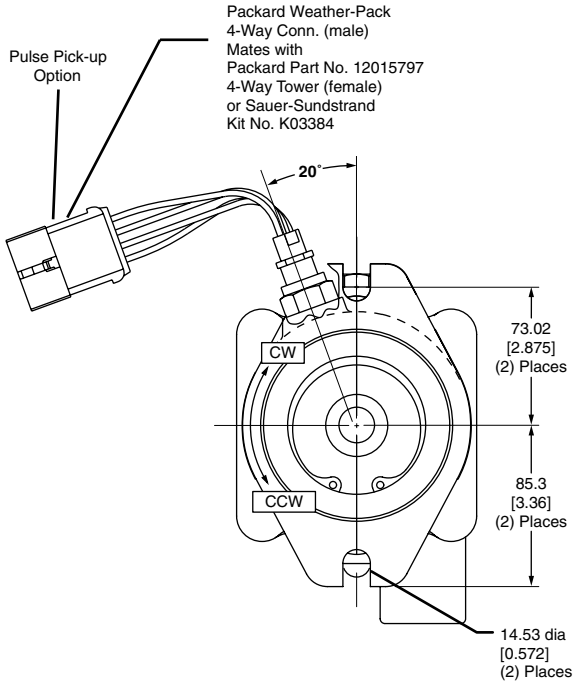
LEFT SIDE VIEW
RADIAL (SIDE) PORTS
W/ THRU SHAFT

P100 471E

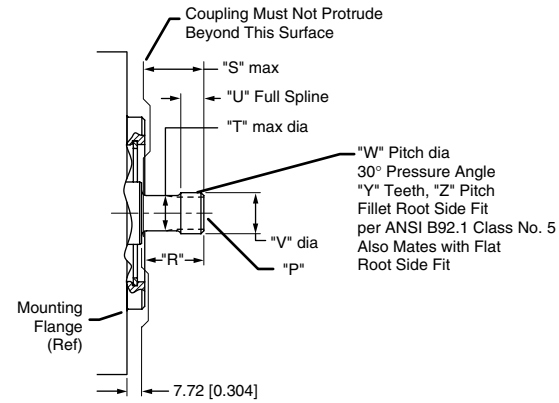
*All SAE straight thread O-Ring ports per SAE J1926.
Shaft rotation is determined by viewing motor from output shaft end.
Contact your SAUER-SUNDSTRAND representative for specific installation drawings.

M46 MF: Mounting Flange, Shaft, Speed Sensor

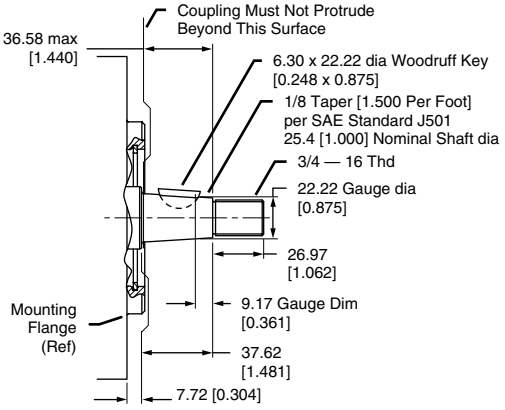
M46 MF Splined Shaft Options										
Shaft Option	**Threaded Hole "P"**	**Shaft Extension "R"**	**Max. Coupling Engagement "S"**	**Shaft Diameter "T"**	**Full Spline Length "U"**	**Major Dia. "V"**	**Pitch Dia. "W"**	**No. Teeth "Y"**	**Pitch "Z"**	**Thru Shaft**
E	3/16 - 24 2B Thd 15.7 [.62] Full	32.94 [1.297]	32 [1.26]	19.1 [.75]	12.7 [.50]	21.72 [.855]	20.638 [.8125]	13	16/32	---
H	N/A	37.72 [1.485]	36.6 [1.44]	22.3 [.88]	19.6 [.77]	24.89 [.980]	23.812 [.9375]	15	16/32	13T
K	N/A	37.72 [1.485]	36.6 [1.44]	22.3 [.88]	19.6 [.77]	24.89 [.980]	23.812 [.9375]	15	16/32	---



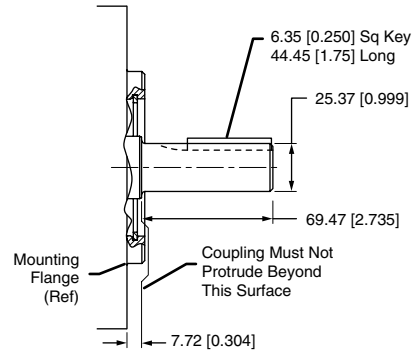
VIEW "X"
(FRONT VIEW)



SPLINED
OUTPUT SHAFT (SEE TABLE)



TAPERED
OUTPUT SHAFT: OPTION M



SHTRAIGHT KEYED
OUTPUT SHAFT: OPTION T

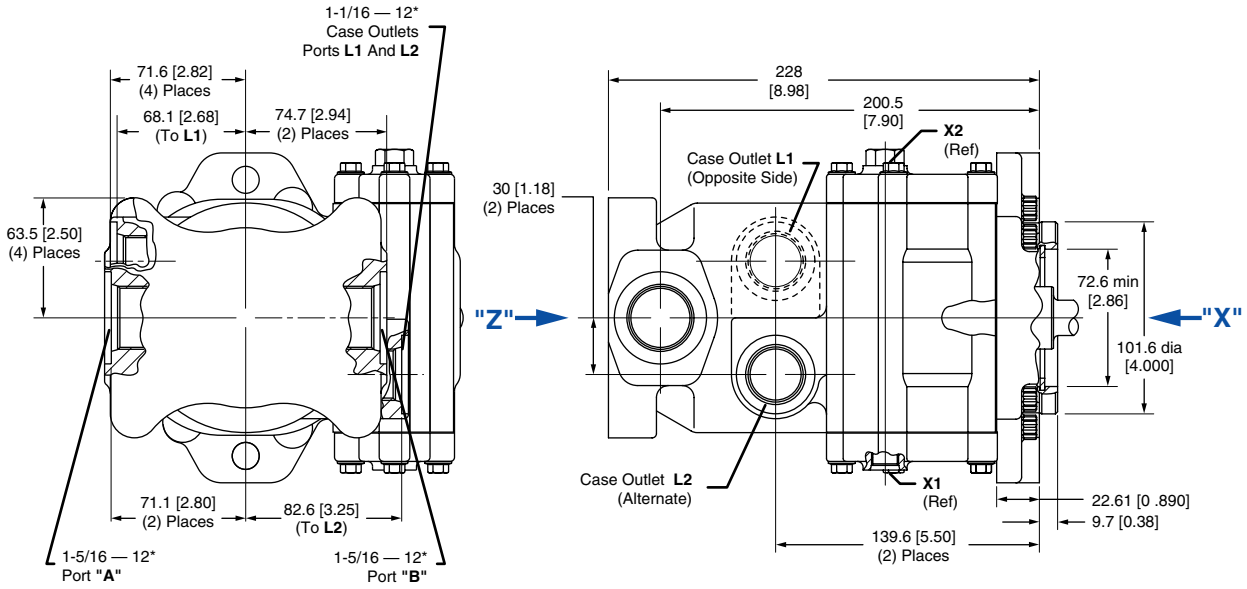
P100 473E

M46 MV (SAE Flange) Dimensions

M46 MV (SAE Flange): Side Ports, Loop Flushing

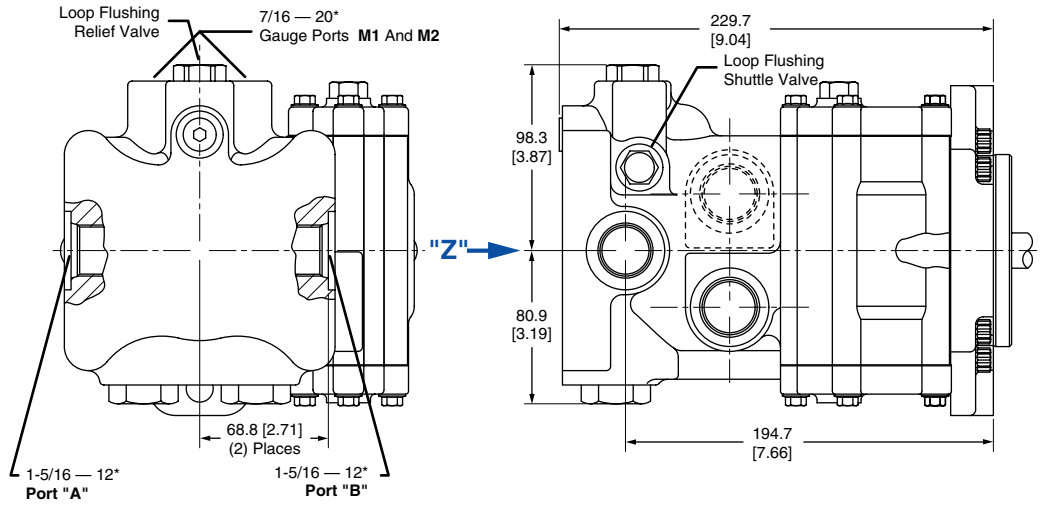
Motor Shaft Direction	Flow Direction	
	Port "A"	Port "B"
Clockwise (CW)	Out	In
Counterclockwise (CCW)	In	Out

mm
[in.]



VIEW "Z"
(REAR VIEW)
RADIAL (SIDE) PORTS W/O LOOP FLUSHING

LEFT SIDE VIEW
RADIAL (SIDE) PORTS W/O LOOP FLUSHING



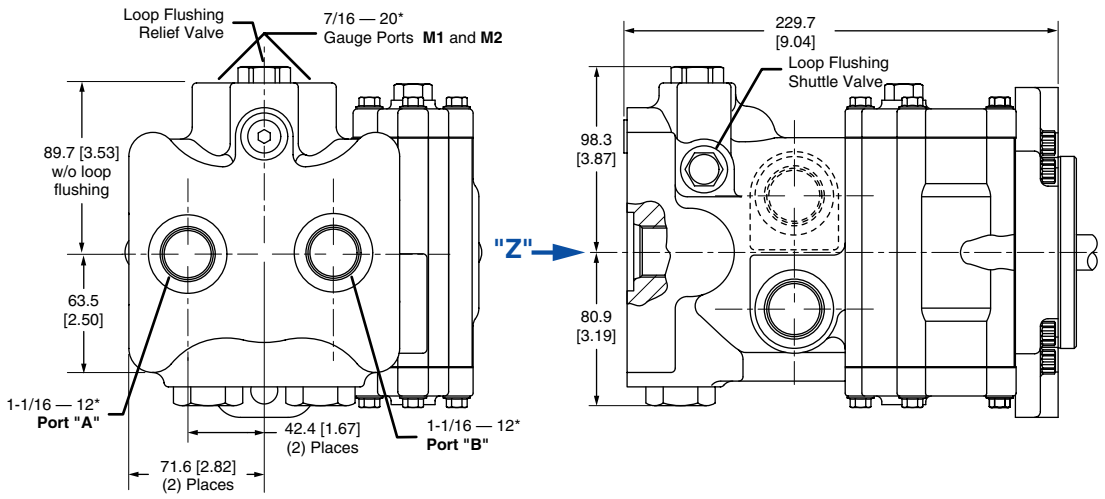
VIEW "Z"
(REAR VIEW)
RADIAL (SIDE) PORTS W/ LOOP FLUSHING

LEFT SIDE VIEW
RADIAL (SIDE) PORTS W/ LOOP FLUSHING

P100 474E

*All SAE straight thread O-Ring ports per SAE J1926.
Shaft rotation is determined by viewing motor from output shaft end.
Contact your SAUER-SUNDSTRAND representative for specific installation drawings.

M46 MV (SAE Flange): Axial Ports, Loop Flushing



VIEW "Z"
(REAR VIEW)
AXIAL PORTS W/ LOOP FLUSHING

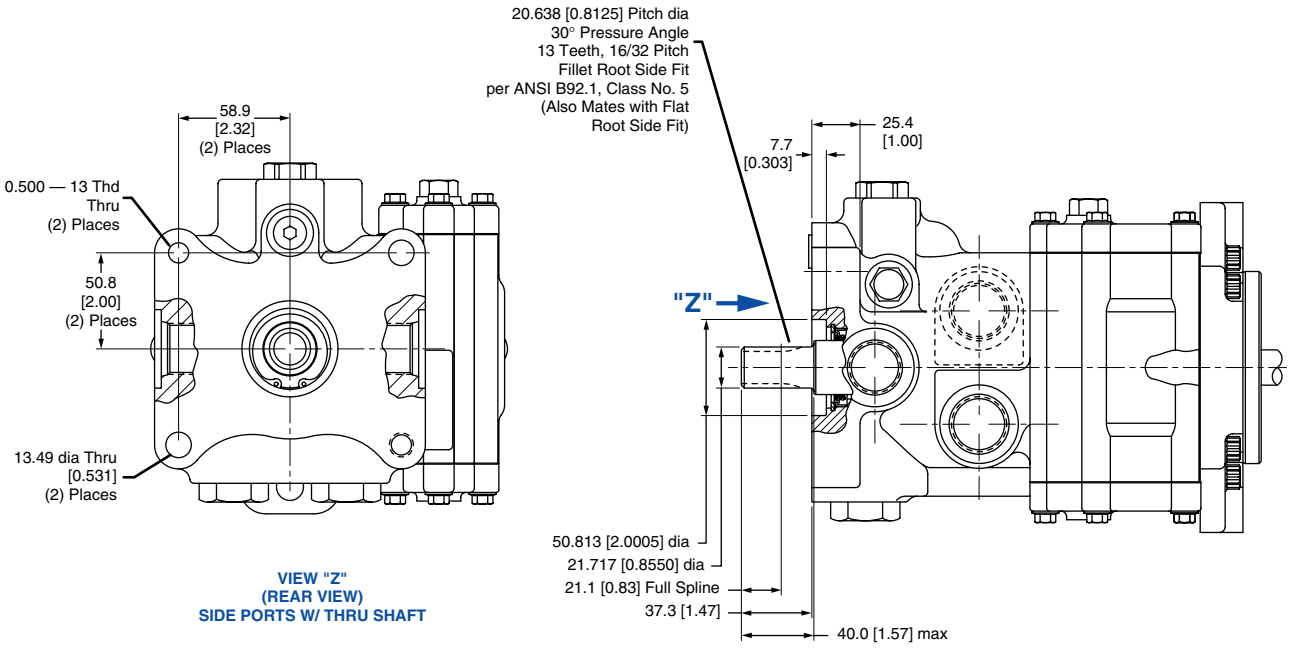
LEFT SIDE VIEW
AXIAL PORTS W/ LOOP FLUSHING

P100 475

M46 MV (SAE Flange): Side Ports, Thru Shaft, Twin Ports, Loop Flushing

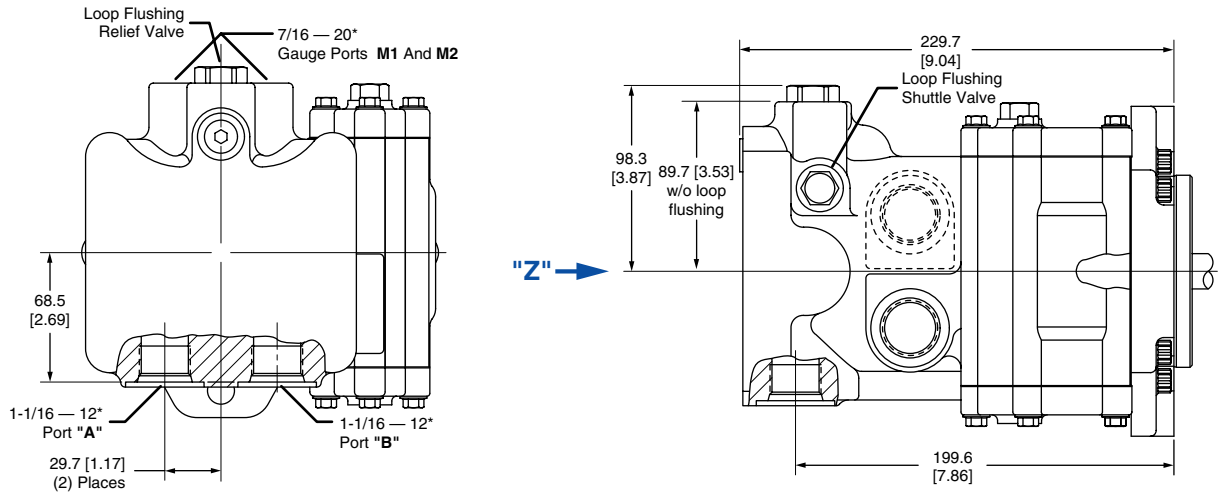
Motor Shaft Direction	Flow Direction	
	Port "A"	Port "B"
Clockwise (CW)	Out	In
Counterclockwise (CCW)	In	Out

mm
[in.]



VIEW "Z"
(REAR VIEW)
SIDE PORTS W/ THRU SHAFT

LEFT SIDE VIEW
RADIAL (SIDE) PORTED W/ LOOP FLUSHING SHOWN
W/ THRU SHAFT



VIEW "Z"
(REAR VIEW)
RADIAL (TWIN) PORTS W/ LOOP FLUSHING

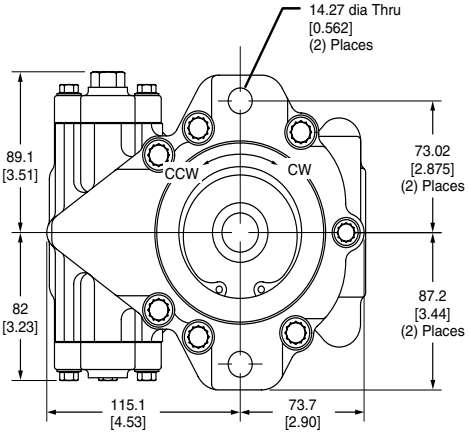
LEFT SIDE VIEW
RADIAL (TWIN) PORS W/ LOOP FLUSHING

P100 476E

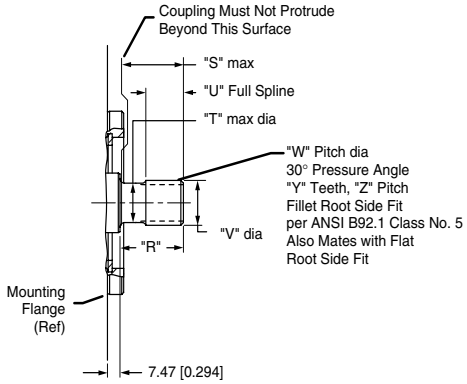
*All SAE straight thread O-Ring ports per SAE J1926.
Shaft rotation is determined by viewing motor from output shaft end.
Contact your SAUER-SUNDSTRAND representative for specific installation drawings.

M46 MV (SAE Flange): Mounting Flange, Shaft

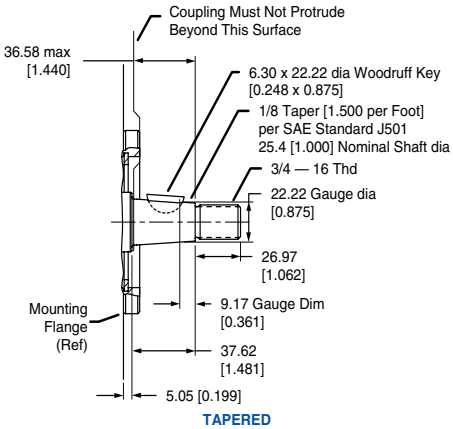
M46 MV (SAE) Splined Shaft Options									
Shaft Option	**Shaft Extension "R"**	**Max. Coupling Engagement "S"**	**Shaft Diameter "T"**	**Full Spline Length "U"**	**Major Dia. "V"**	**Pitch Dia. "W"**	**No. Teeth "Y"**	**Pitch "Z"**	**Thru Shaft**
A	32.94 [1.297]	32 [1.26]	19.1 [0.75]	15.8 [0.62]	21.72 [0.855]	20.638 [0.8125]	13	16/32	---
B	32.94 [1.297]	32 [1.26]	19.1 [0.75]	15.8 [0.62]	21.72 [0.855]	20.638 [0.8125]	13	16/32	13T
E	37.72 [1.485]	36.6 [1.44]	28.4 [1.119]	22.86 [0.90]	24.89 [0.980]	23.812 [0.9375]	15	16/32	---
F	37.72 [1.485]	36.6 [1.44]	28.4 [1.119]	22.86 [0.90]	24.89 [0.980]	23.812 [0.9375]	15	16/32	13T



VIEW "X"
(FRONT VIEW)



SPLINED
OUTPUT SHAFT (SEE TABLE)

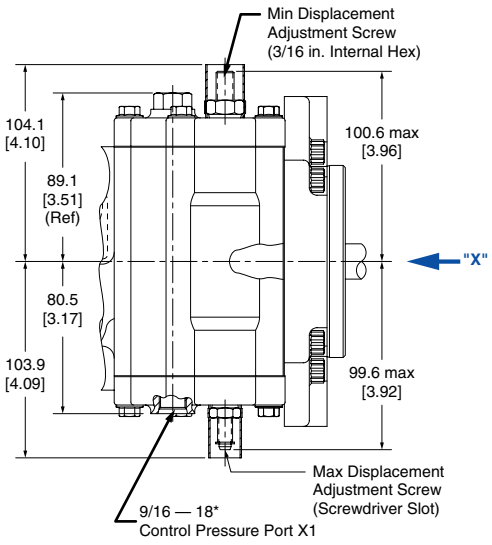


TAPERED
OUTPUT SHAFT: OPTION J

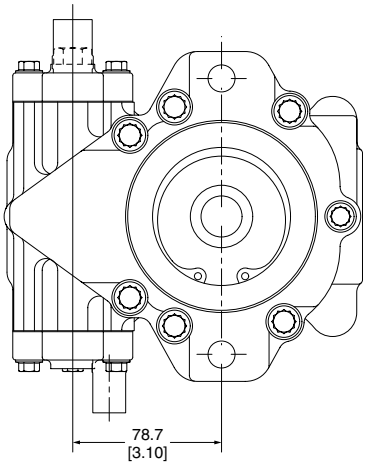
P100 477E

M46 MV (SAE Flange): Control Ports

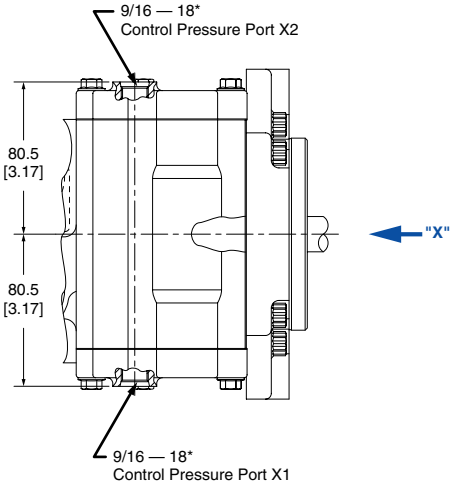
mm
[in.]



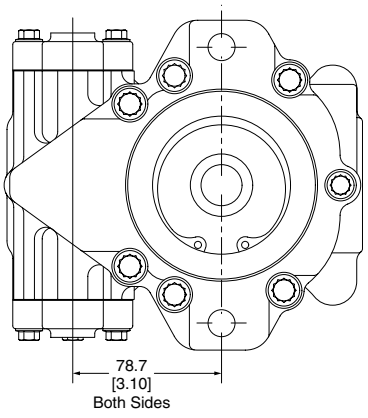
LEFT SIDE VIEW
CONTROL W/ BOTTOM PRESSURE
SUPPLY PORT AND EXTERNALLY
ADJUSTABLE DISPLACEMENT LIMITERS



VIEW IN DIRECTION "X"
(FRONT VIEW)
CONTROL W/ BOTTOM PRESSURE
SUPPLY PORT AND EXTERNALLY
ADJUSTABLE DISPLACEMENT LIMITERS



LEFT SIDE VIEW
CONTROL W/ TOP AND
BOTTOM PRESSURE SUPPLY PORTS



VIEW "X"
(FRONT VIEW)
CONTROL W/ TOP AND
BOTTOM PRESSURE SUPPLY PORTS

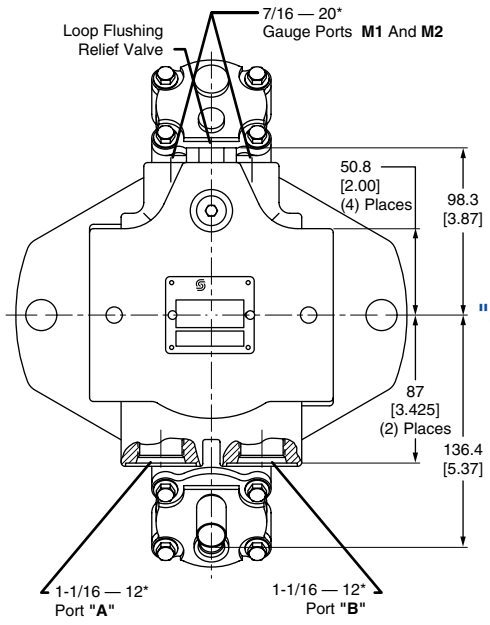
P100 478E

*All SAE straight thread O-Ring ports per SAE J1926.
Shaft rotation is determined by viewing motor from output shaft end.
Contact your SAUER-SUNDSTRAND representative for specific installation drawings.

M46 MV (Cartridge Flange) Dimensions

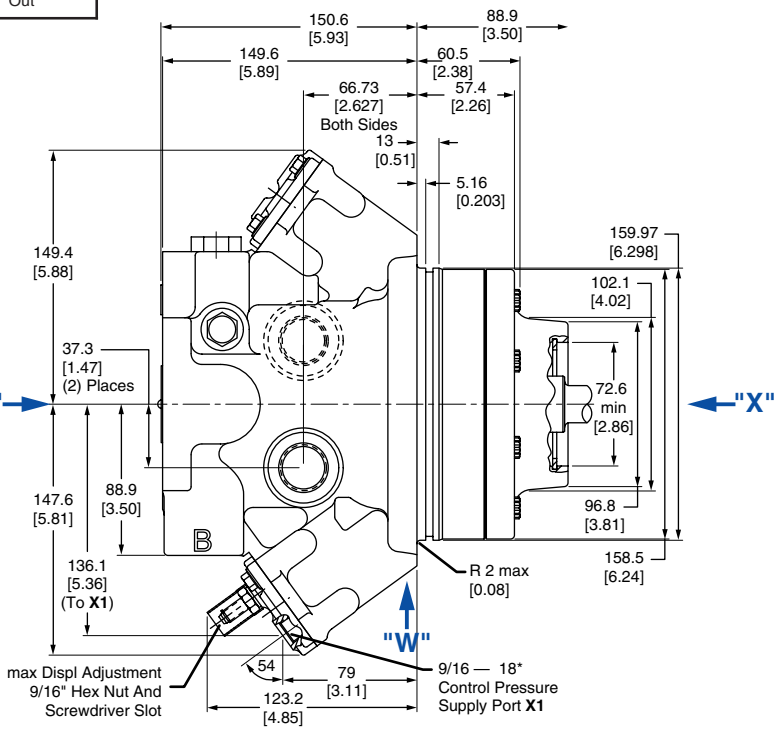
M46 MV (Cartridge Flange): Twin Ports, Loop Flushing, Speed Sensor

Motor Shaft Direction	Flow Direction	
	Port "A"	Port "B"
Clockwise (CW)	Out	In
Counterclockwise (CCW)	In	Out

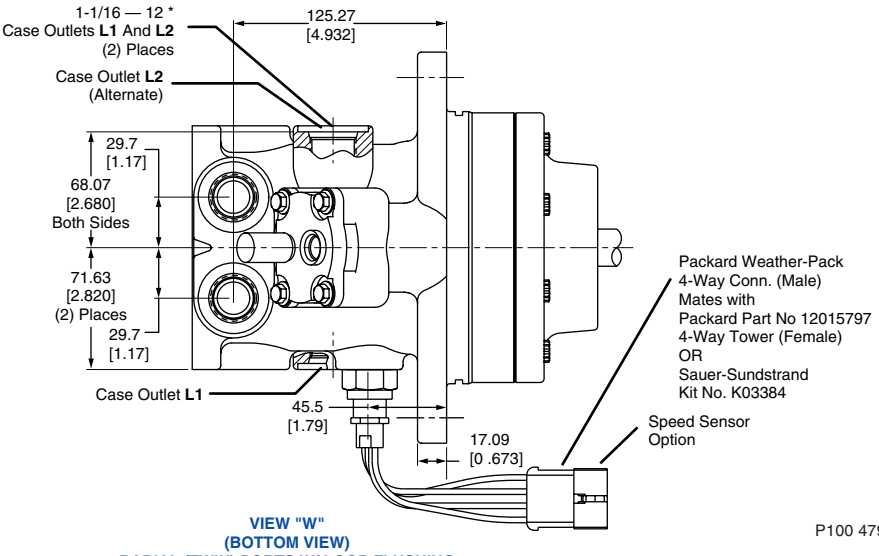


VIEW "Z"
(REAR VIEW)
RADIAL (TWIN) PORTS
W/ LOOP FLUSHING

NOTE: Units w/ defeated loop flushing have same dimensions



LEFT SIDE VIEW
RADIAL (TWIN) PORTS W/ LOOP FLUSHING



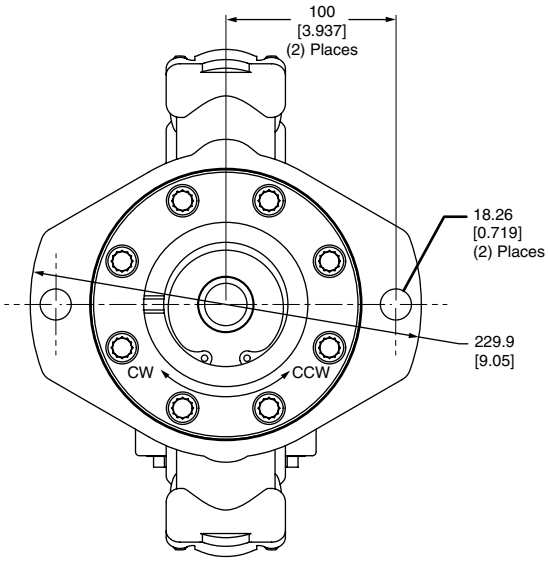
VIEW "W"
(BOTTOM VIEW)
RADIAL (TWIN) PORTS W/ LOOP FLUSHING

P100 479-1E

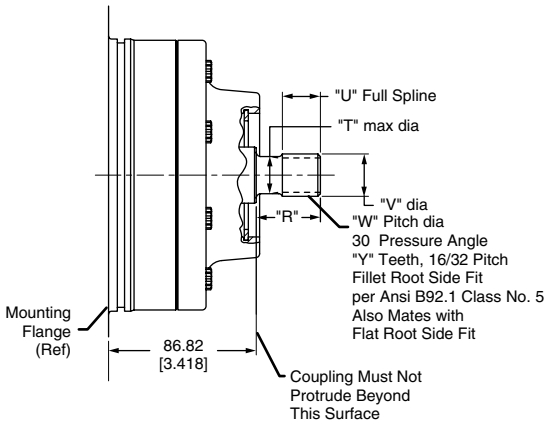
M46 MV (Cartridge Flange): Mounting Flange, Shaft

M46 MV (Cartridge) Splined Shaft Options									
Shaft Option	Compatible with CW or CT	Shaft Extension "R"	Shaft Diameter "T"	Full Spline Length "U"	Major Dia. "V"	Pitch Dia. "W"	No Teeth "Y"	Pitch	Thru Shaft
A	No	32.94 [1.297]	19.1 [0.75]	12.7 [0.50]	21.72 [0.855]	20.638 [0.8125]	13	16/32	---
E	Yes	37.72 [1.485]	22.9 [0.90]	22.9 [0.90]	24.89 [0.980]	23.812 [0.9375]	15	16/32	---

mm
[in.]



VIEW "X"
(FRONT VIEW)



SPLINED
OUTPUT SHAFT (SEE TABLE)

P100 479-2E

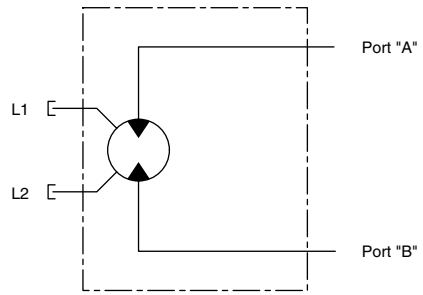
Designed to be compatible with CW12, CW18, CT18, CT26, and CT35 Compact Planetary Drives.

*All SAE straight thread O-Ring ports per SAE J1926.

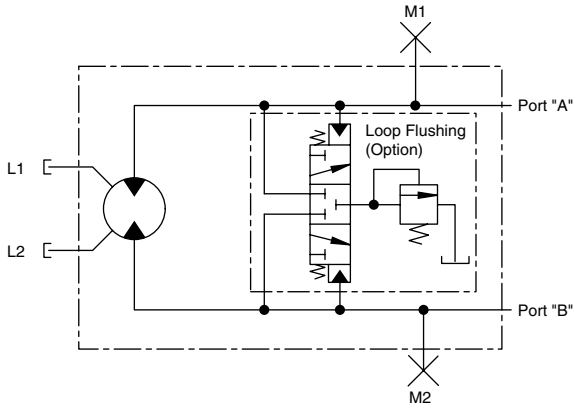
Shaft rotation is determined by viewing motor from output shaft end.

Contact your SAUER-SUNDSTRAND representative for specific installation drawings.

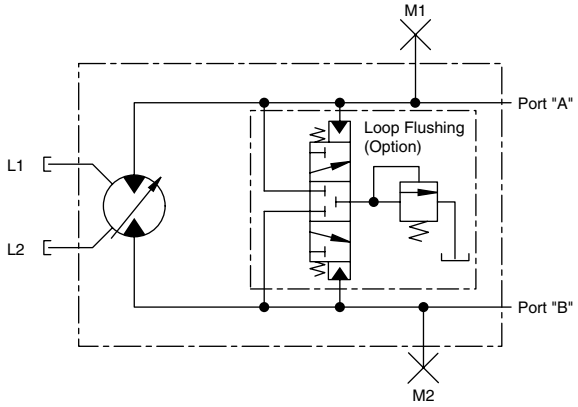
S40 Motor Schematics



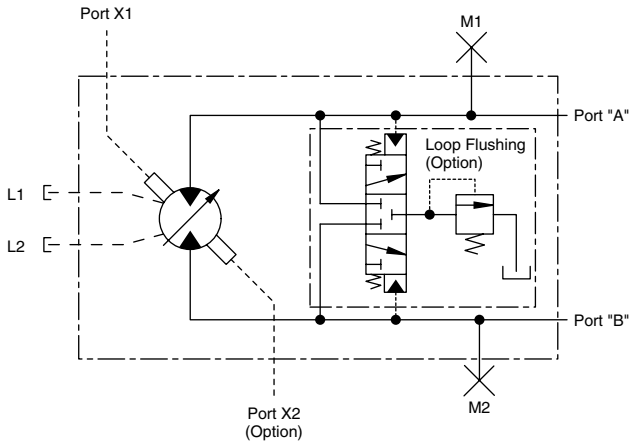
Series 40 - M25 Fixed Motor Schematic (No Loop Flushing)



Series 40 - M25/M35/M44/M46 Fixed Motor Schematic



Series 40 - M25/M35/M44 Variable Motor Schematic



Series 40 - M46 Variable Motor Schematic

P100 480E

BACK

SAUER DANFOSS

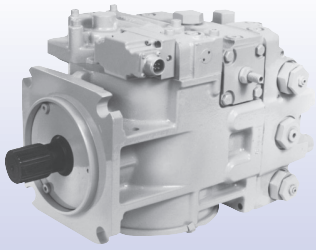
Hydraulic Power Systems

SAUER-SUNDSTRAND Hydraulic Power Systems - Market Leaders Worldwide

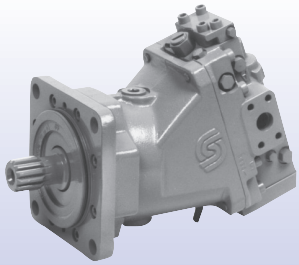
SAUER-SUNDSTRAND is a world leader in the design and manufacture of Hydraulic Power Systems. Research and development resources in both North America and Europe enable SAUER-SUNDSTRAND to offer a wide range of design solutions utilizing hydraulic power system technology.

SAUER-SUNDSTRAND specializes in integrating a full range of system components to provide vehicle designers with the most advanced total-design system.

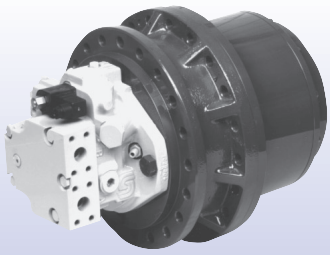
SAUER-SUNDSTRAND is Your World Source for Controlled Hydraulic Power Systems.



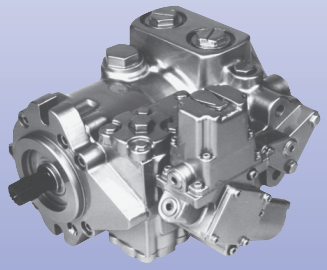
Heavy Duty Axial Piston Pumps and Motors



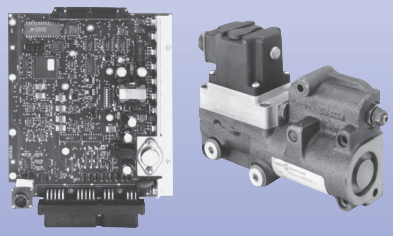
Heavy Duty Bent Axis Variable Motors



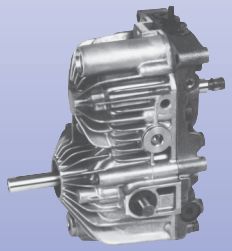
Cartridge Motors/ Compact Wheel Drives



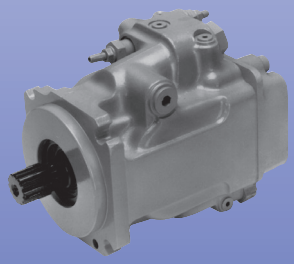
Medium Duty Axial Piston Pumps and Motors



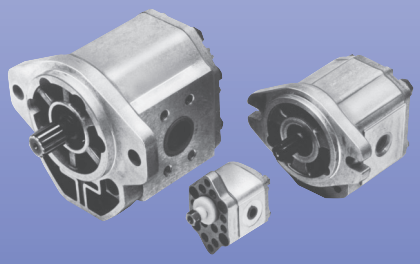
Mikrocontrollers and Electrohydraulic Controls



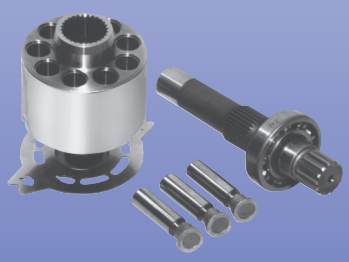
Hydrostatic Transmissions Packages



Open Circuit Axial Piston Pumps



Gear Pumps and Motors



Genuine Service Parts

Worldwide Service Support

SAUER-SUNDSTRAND provides comprehensive worldwide service for its products through an extensive network of Authorized Service Centers strategically located in all parts of the world.

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