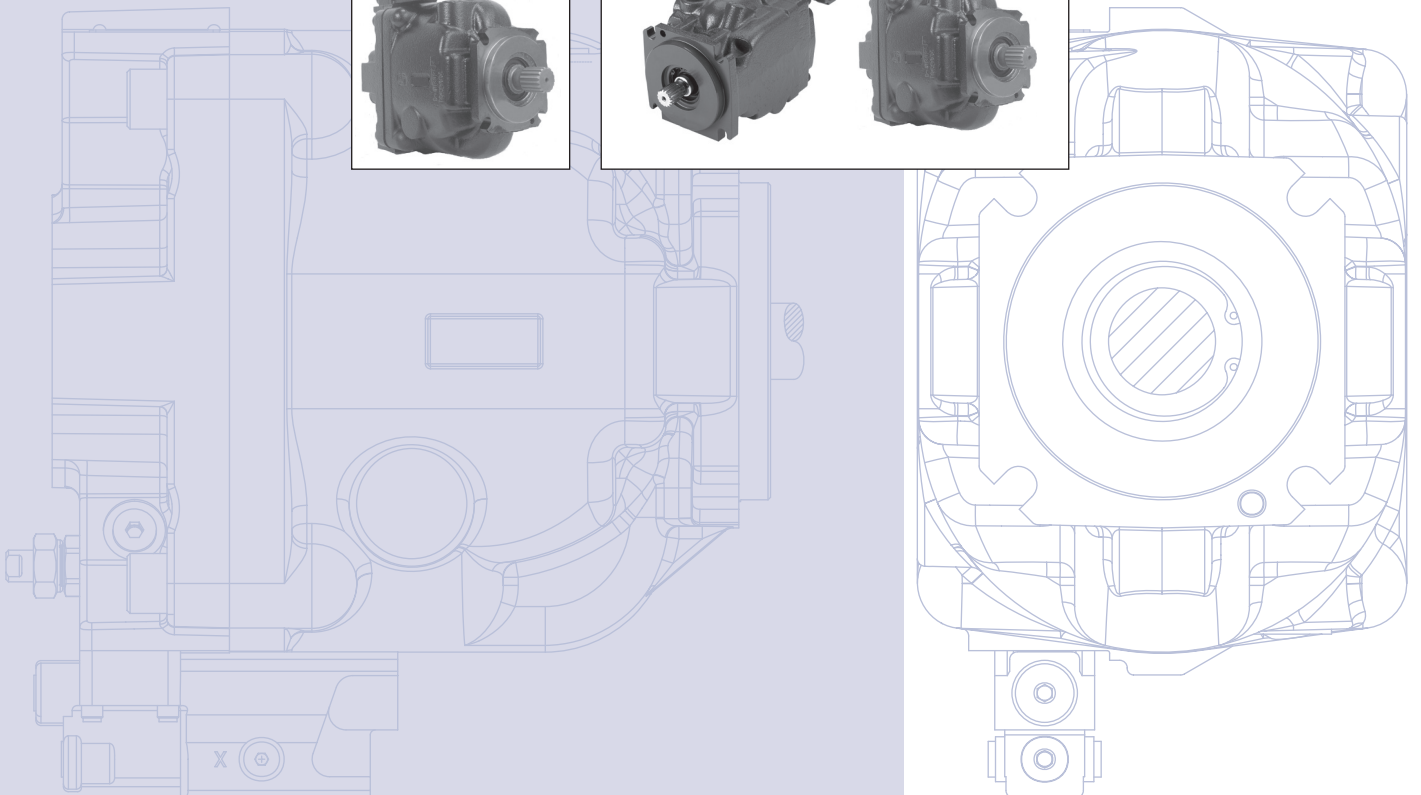
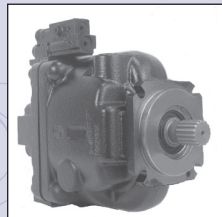
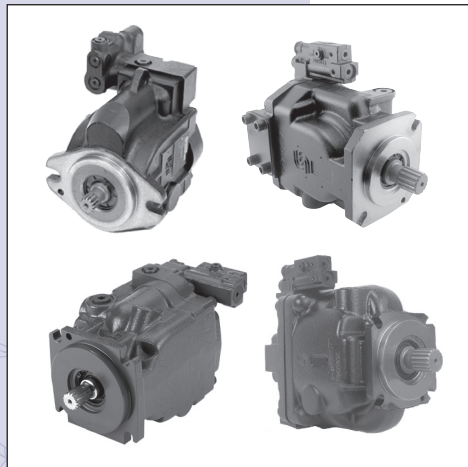
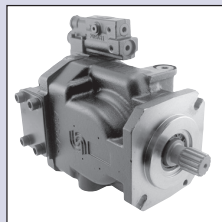
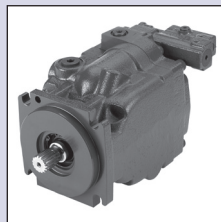
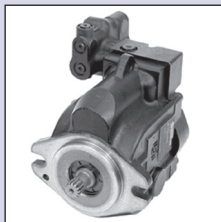




Series 45
Axial Piston
Open Circuit Pumps

Technical
Information



History of Revisions

Table of Revisions

| Date | Page | Changed | Rev. |
|----------------|------------------------|---|------|
| March 2012 | 110 | delete running cover dimensions drawing | GK |
| January 2012 | various | add system instability, pg 20 , various model code edits | GJ |
| December 2011 | 75 | correction to A2 shaft description | GI |
| October 2011 | various | multiple changes and corrections | GH |
| June 2011 | various | edit to technical specifications, edit to model codes | GG |
| May 2011 | 56 | correction to schematic | GF |
| April 2011 | 108 | change to spline engagement dimensions | GE |
| March 2011 | various | numerous corrections throughout | GD |
| January 2011 | 45, 50 | 060B max. speed 3120, mounting flange corrections | GC |
| November 2010 | 45 | add bearing life data for 065C, 075C | GB |
| October 2010 | various | edits and changes - major reorganization | GA |
| October 2009 | 22, 27, 31, 41, 43, 47 | various minor edits, add EJ, EA control dimensions | FO |
| July 2009 | 34, 28 | remove T2 shaft option from L and K Frames | FN |
| May 2009 | various | revise fitting depth warning to LS port X | FM |
| March 2009 | various | add fitting depth warning to LS port X | FL |
| October 2008 | 62, 65 | add SAE-C two bolt housing | FK |
| September 2008 | 58-62 | dimension changes for Frame J | FJ |
| June 2008 | 78, 93, 94, 95 | various minor edits, removed S5 shaft from Frame E | FI |
| May 2008 | 32, 74, 75, 92 | correction to schematics drawings | FH |
| April 2008 | 76 | correction to S2 spline width (inch measurement only) | FG |
| April 2008 | 52, 53 | correction to schematics drawings | FG |
| April 2008 | 27, 50, 72, 89 | add Load sensing - RP and BP must be 20 bar | FF |
| April 2008 | 76 | Correction to S2 shaft - Class 6 and 37.91 mm length | FF |
| March 2008 | 4 | Correction to TOC | FE |
| February 2008 | Various | Add LS setting to specifications for each frame | FD |
| December 2007 | Various | Relocate F and E sections, add displacement limiter info. | FC |
| November 2007 | 50 | Change load sensing setting - bar increments | FB |
| September 2007 | Various | Add Frame F, remove Frame G, and many edits | FA |
| November 2006 | 51, 52, 53 | Revised schematics information | E |
| August 2005 | - | Removed Frame H, added Frame J | D |
| April 2003 | - | Added Frame E | C |
| May 2001 | - | Added Frame H and Frame G | B |
| May 1999 | - | First printing | A |

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Front cover illustrations: F301 389, P003 515

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Overview

Series 45 is a complete family of high performance variable displacement, axial piston pumps. Each frame is designed to exceed the demanding work function requirements of the mobile equipment marketplace. Each frame within the Series 45 family is uniquely designed to optimize performance, size, and cost.

Design

High Performance

- Displacements from 25 cm³ - 147 cm³ [1.53 - 8.97 in³/rev]
- Speeds up to 3600 rpm
- Pressures up to 310 bar [4495 psi]
- Variety of control system options including load sensing and pressure compensated

Latest Technology

- Customer-driven using quality function deployment (QFD) and design for manufacturability (DFM) techniques
- Optimized design maximizes efficiency and quiet operation
- Computer-modeled castings to optimize inlet conditions for maximum pump speed
- Compact package size minimizing installation space requirements
- Heavy-duty tapered roller bearings for long life
- Single piece rigid housing to reduce noise and leak paths
- Integrated controls for high speed response and system stability

Reliability

- Designed to rigorous standards
- Proven in both laboratory and field
- Manufactured to rigid quality standards
- Long service life
- Significantly fewer parts
- No gasket joints
- Robust input shaft bearings to handle large external shaft loads
- Integrated gauge ports for monitoring operating conditions

Benefits

Reduced Installation Costs

- Through-drive capability for multi-circuit systems
- Range of mounting flanges, shafts and porting options for ease of installation
- Compact size minimizes installation space requirements
- Help meet engine emission standards
- Reduce engine size by managing power usage more effectively

Reduce Operating Costs

- Optimize machine power usage to maximize fuel economy
- Simple design reduces service requirements
- Heavy duty taper roller shaft bearings provide long service life

Increased Customer Satisfaction

- Reduced noise for operator comfort
- High performance increases productivity

Reduced Heat Load on Cooling System

- High efficiency reduces hydraulic heat generation
- Allows for smaller cooling packages

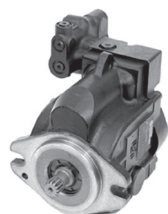
Typical applications

- Cranes
- Telescopic handlers
- Forklift trucks
- Wheel loaders
- Sweepers
- Backhoe loaders
- Forestry and agricultural machinery
- Fan drives
- Paving Machines
- Mining Equipment
- Mowers
- Dozers
- Drilling Machines
- Mini-Excavators
- Other Applications

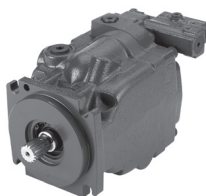
The Series 45 product family

Basic units

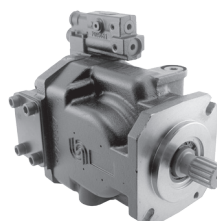
The series 45 family of open circuit, variable piston pumps, offers a range of displacements from 25 to 147 cm³/rev [1.53 to 8.97 in³/rev]. With maximum speeds up to 3600 rpm and continuous operating pressures up to 310 bar [4495 psi], product selection is easily tailored to the flow and pressure requirements of individual applications.



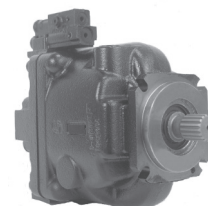
K/L Frame



J Frame



F Frame



E Frame

General performance specifications for the series 45 pump family

| Pump | | Displacement | | Speed | | | Pressure | | Theoretical flow (at rated speed) | | Mounting |
|--------------------------------------|-------|-----------------|-----------------|-------------------------|-------------------------|-------------------------|----------|------|--------------------------------------|-------|------------------------------------|
| | | | | Continuous | Max. | Min. | Maximum | | | | |
| Frame | Model | cm ³ | in ³ | min ⁻¹ (rpm) | min ⁻¹ (rpm) | min ⁻¹ (rpm) | bar | psi | US gal/min | l/min | Flange |
| Frame L <i>See page 21</i> | L25C | 25 | 1.53 | 3200 | 3600 | 500 | 260 | 3770 | 21.0 | 80.0 | SAE B - 2 bolt |
| | L30D | 30 | 1.83 | 3200 | 3600 | 500 | 210 | 3045 | 25.4 | 96.0 | SAE B - 2 bolt |
| Frame K <i>See page 21</i> | K38C | 38 | 2.32 | 2650 | 2800 | 500 | 260 | 3770 | 26.6 | 100.7 | SAE B - 2 bolt |
| | K45D | 45 | 2.75 | 2650 | 2800 | 500 | 210 | 3045 | 31.5 | 119.3 | SAE B - 2 bolt |
| Frame J <i>See page 44</i> | J45B | 45 | 2.75 | 2800 | 3360 | 500 | 310 | 4495 | 33.3 | 126.0 | SAE B 2-bolt SAE C 2 and 4-bolt |
| | J51B | 51 | 3.11 | 2700 | 3240 | 500 | 310 | 4495 | 36.4 | 137.7 | SAE B 2-bolt SAE C 2 and 4-bolt |
| | J60B | 60 | 3.66 | 2600 | 3120 | 500 | 310 | 4495 | 41.2 | 156.0 | SAE B 2-bolt SAE C 2 and 4-bolt |
| | J65C | 65 | 3.97 | 2500 | 3000 | 500 | 260 | 3770 | 42.9 | 162.6 | SAE B 2-bolt SAE C 2 and 4-bolt |
| | J75C | 75 | 4.58 | 2400 | 2880 | 500 | 260 | 3770 | 47.5 | 180.0 | SAE B 2-bolt SAE C 2 and 4-bolt |
| Frame F <i>See page 72</i> | F74B | 74 | 4.52 | 2400 | 2800 | 500 | 310 | 4495 | 46.9 | 177.6 | SAE B 2-bolt SAE C 4-bolt |
| | F90C | 90 | 5.49 | 2200 | 2600 | 500 | 260 | 3770 | 52.3 | 198 | SAE B 2-bolt SAE C 4-bol |
| Frame E <i>See page 92</i> | E100B | 100 | 6.10 | 2450 | 2880 | 500 | 310 | 4495 | 64.7 | 245.0 | SAE C 4-bolt |
| | E130B | 130 | 7.93 | 2200 | 2600 | 500 | 310 | 4495 | 75.5 | 286.0 | SAE C 4-bolt |
| | E147C | 147 | 8.97 | 2100 | 2475 | 500 | 260 | 3770 | 81.5 | 308.7 | SAE C 4-bolt |

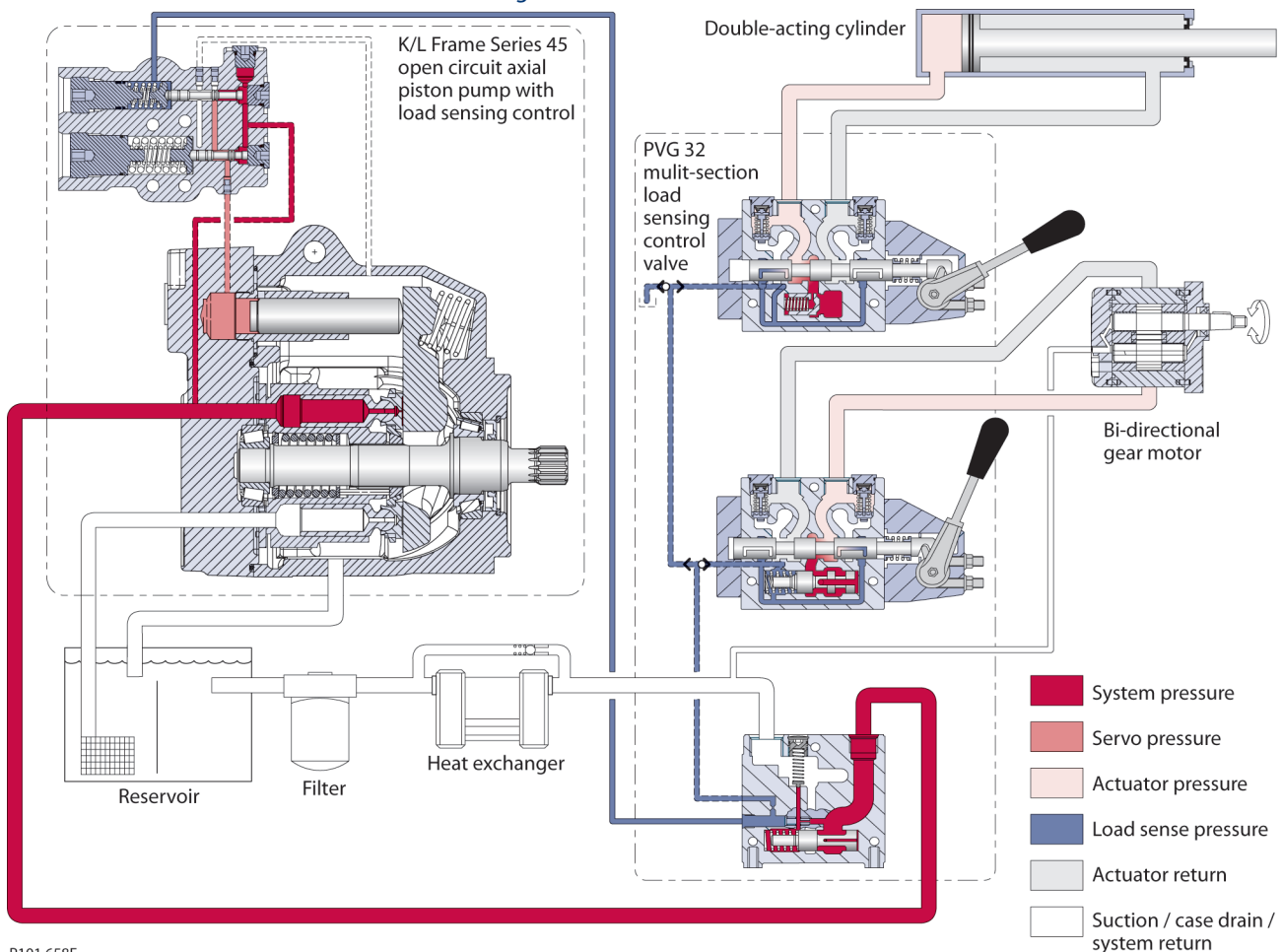
Load sensing open circuit system

The pump receives fluid directly from the reservoir through the inlet line. A screen in the inlet line protects the pump from large contaminants. The pump outlet feeds directional control valves such as PVG-32's, hydraulic integrated circuits (HIC), and other types of control valves. The PVG valve directs pump flow to cylinders, motors and other work functions. A heat exchanger cools the fluid returning from the valve. A filter cleans the fluid before it returns to the reservoir.

Flow in the circuit determines the speed of the actuators. The position of the PVG valve determines the flow demand. A hydraulic pressure signal (LS signal) communicates demand to the pump control. The pump control monitors the pressure differential between pump outlet and the LS signal, and regulates servo pressure to control the swashplate angle. Swashplate angle determines pump flow.

Actuator load determines system pressure. The pump control monitors system pressure and will decrease the swashplate angle to reduce flow if system pressure reaches the PC setting. A secondary system relief valve in the PVG valve acts as a back-up to control system pressure.

Pictorial circuit diagram



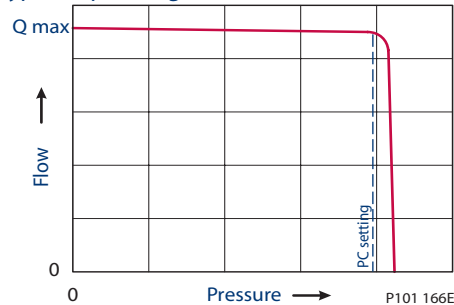
P101 658E

Pressure compensated controls

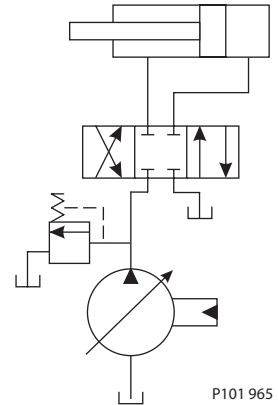
Operation

The PC control maintains constant system pressure in the hydraulic circuit by varying the output flow of the pump. Used with a closed center control valve, the pump remains in high pressure standby mode at the PC setting with zero flow until the function is actuated. This condition is often called a **dead head** condition.

Typical operating curve



Simple closed-center circuit



Once the closed center valve is opened, the PC control senses the immediate drop in system pressure and increases pump flow by increasing the swashplate angle. The pump continues to increase flow until system pressure reaches the PC setting. If system pressure exceeds the PC setting, the PC control reduces the swashplate angle to maintain system pressure by reducing flow. The PC control continues to monitor system pressure and changes swashplate angle to match the output flow with the work function pressure requirements.

If the demand for flow exceeds the capacity of the pump, the PC control directs the pump to maximum displacement. In this condition, actual system pressure depends on the actuator load.

For additional system protection, install a relief valve in the pump outlet line.

Each section includes control schematic diagrams, setting ranges, and response / recovery times for each control available. **Response** is the time (in milliseconds) for the pump to reach zero displacement when commanded by the control. **Recovery** is the time (in milliseconds) for the pump to reach full displacement when commanded by the control. Actual times can vary depending on application conditions.

Pressure compensated system characteristics

- Constant pressure and variable flow
- High pressure standby mode when flow is not needed
- System flow adjusts to meet system requirements
- Single pump can provide flow to multiple work functions
- Quick response to system flow and pressure requirements

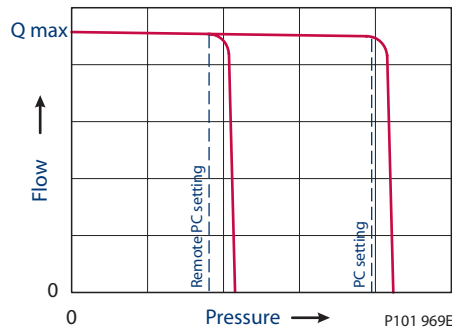
Typical applications for pressure compensated systems

- Constant force cylinders (bailers, compactors, refuse trucks)
- On/off fan drives
- Drill rigs
- Sweepers
- Trenchers

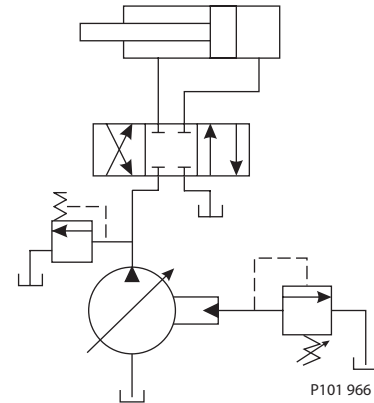
Remote pressure compensated controls

The remote PC control is a two-stage control that allows multiple PC settings. Remote PC controls are commonly used in applications requiring low and high pressure PC operation.

Typical operating curve



Closed center circuit with remote PC



The remote PC control uses a pilot line connected to an external hydraulic valve. The external valve changes pressure in the pilot line, causing the PC control to operate at a lower pressure. When the pilot line is vented to reservoir, the pump maintains pressure at the load sense setting. When pilot flow is blocked, the pump maintains pressure at the PC setting. An on-off solenoid valve can be used in the pilot line to create a low-pressure standby mode. A proportional solenoid valve, coupled with a microprocessor control, can produce an infinite range of operating pressures between the low pressure standby setting and the PC setting.

Each section includes control schematic diagrams, setting ranges, and response / recovery times for each control available. **Response** is the time (in milliseconds) for the pump to reach zero displacement when commanded by the control. **Recovery** is the time (in milliseconds) for the pump to reach full displacement when commanded by the control. Actual times can vary depending on application conditions.

Size the external valve and plumbing for a pilot flow of 3.8 l/min [1 US gal/min]. For additional system protection, install a relief valve in the pump outlet line.

Remote pressure compensated system characteristics

- Constant pressure and variable flow
- High or low pressure standby mode when flow is not needed
- System flow adjusts to meet system requirements
- Single pump can provide flow to multiple work functions
- Quick response to system flow and pressure requirements

Typical applications for remote pressure compensated systems

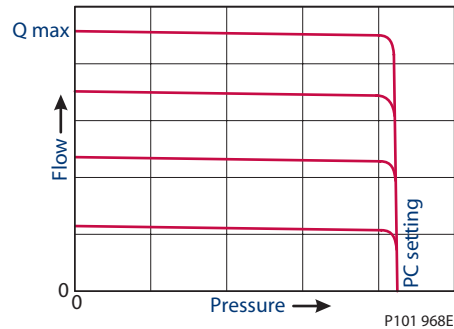
- Modulating fan drives
- Anti-stall control with engine speed feedback
- Front wheel assist
- Road rollers
- Combine harvesters
- Wood chippers

Load sensing controls

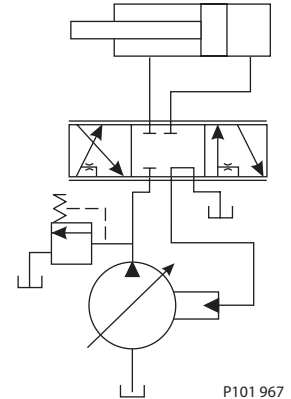
Operation

The LS control matches system requirements for both pressure and flow in the circuit regardless of the working pressure. Used with a closed center control valve, the pump remains in low-pressure standby mode with zero flow until the valve is opened. The LS setting determines standby pressure.

Typical operating curve



Load sensing circuit



Most load sensing systems use parallel, closed center, control valves with special porting that allows the highest work function pressure (LS signal) to feed back to the LS control. **Margin pressure** is the difference between system pressure and the LS signal pressure. The LS control monitors margin pressure to read system demand. A drop in margin pressure means the system needs more flow. A rise in margin pressure tells the LS control to decrease flow.

LS control with bleed orifice

The load sense signal line requires a bleed orifice to prevent high-pressure lockup of the pump control. Most load-sensing control valves include this orifice. An optional internal bleed orifice is available, for use with control valves that do not internally bleed the LS signal to tank.

Integral PC function

The LS control also performs as a PC control, decreasing pump flow when system pressure reaches the PC setting. The pressure compensating function has priority over the load sensing function.

For additional system protection, install a relief valve in the pump outlet line.

Each section includes control schematic diagrams, setting ranges, and response / recovery times for each control available. **Response** is the time (in milliseconds) for the pump to reach zero displacement when commanded by the control. **Recovery** is the time (in milliseconds) for the pump to reach full displacement when commanded by the control. Actual times can vary depending on application conditions.

Load sensing system characteristics

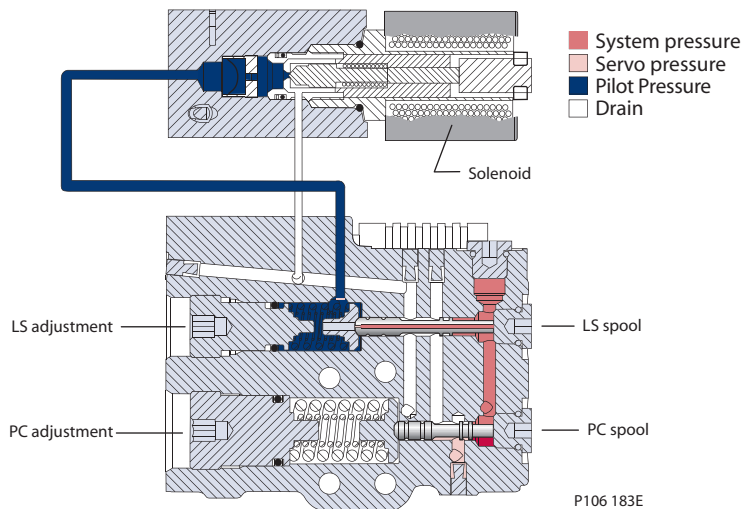
- Variable pressure and flow
- Low pressure standby mode when flow is not needed
- System flow adjusted to meet system requirements
- Lower torque requirements during engine start-up
- Single pump can supply flow and regulate pressure for multiple circuits
- Quick response to system flow and pressure requirements

Electrical on/off pressure compensated controls

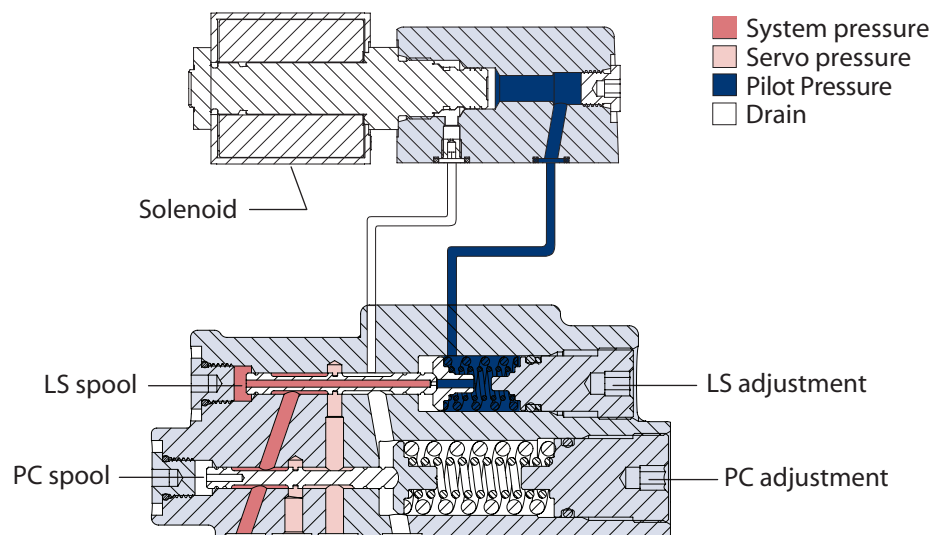
The electrical on/off pressure compensated control allows the pump to operate as a PC type control under normal operating conditions. A solenoid valve overrides the PC control allowing the pump to operate in a low-pressure standby mode. This function provides reduced horsepower and torque loss in certain situations. It may be particularly useful to reduce loads on a system during engine start.

When closed, the solenoid valve prevents flow across the LS spool gain orifice, defeating the LS spool. The pump then functions as a PC control pump. When open, the solenoid valve allows flow across the LS spool gain orifice to reservoir. This flow generates a pressure differential across the LS spool that shifts the spool and de-strokes the pump. The pump then operates in a low-pressure standby condition. The solenoid valve is available in a normally closed or normally open configuration.

Electric Control (frames K and L)



Electric Control (frames E, F, and J)

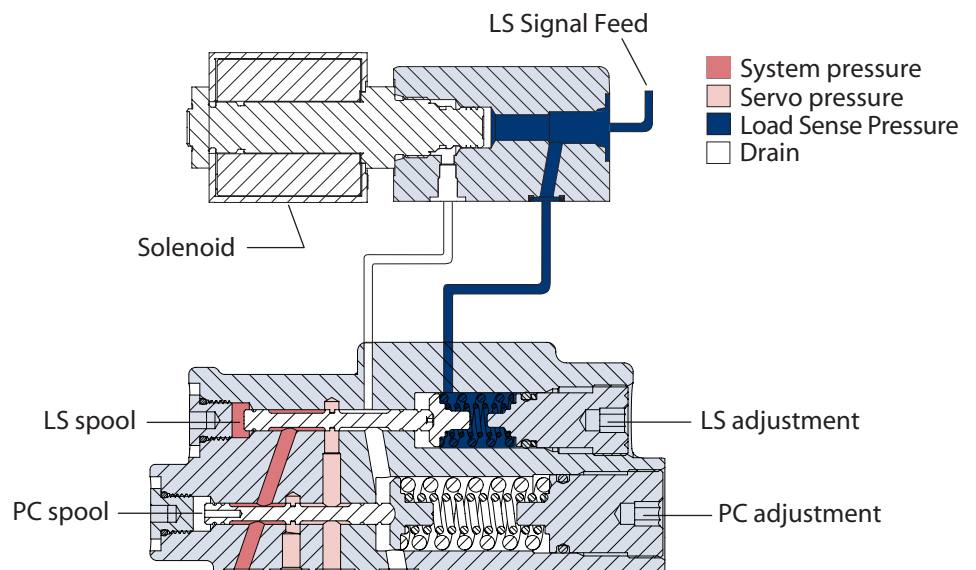


**Electric dump valve
 PC/LS controls**

The electric dump valve pressure-compensated/load sense control allows the pump to operate as a PC/LS type control under normal operating conditions. The solenoid dump valve overrides the PC control, allowing the pump to operate in a low-pressure standby mode. This function provides reduced horsepower and torque loss in certain situations. It may be particularly useful to reduce loads on a system during engine start.

When closed, the solenoid valve allows the control to act as a PC/LS control. When open, the solenoid valve allows flow from the incoming load sense pressure to dump to case. This reduces the pressure in the LS spring cavity, shifting the LS spool, and allows the pump to de-stroke to the low pressure standby condition. This control is for applications needing a PC/LS control with the ability to switch to low pressure standby electronically. The solenoid valve is only available in a normally closed configuration.

Electric Dump Control (frames E, F and J)



P108 589E

Operating parameters

Fluids

Ratings and performance data for Series 45 products are based on operating with premium hydraulic fluids containing oxidation, rust, and foam inhibitors. These include premium turbine oils, API CD engine oils per SAE J183, M2C33F or G automatic transmission fluids (ATF), Dexron II (ATF) meeting Allison C-3 or Caterpillar T0-2 requirements, and certain specialty agricultural tractor fluids. For more information on hydraulic fluid selection, see Sauer-Danfoss publications **520L0463** *Hydraulic Fluids and Lubricants, Technical Information*, and **520L0465** *Experience with Biodegradable Hydraulic Fluids, Technical Information*.

Viscosity

Maintain fluid viscosity within the recommended range for maximum efficiency and pump life.

Minimum Viscosity – This should only occur during brief occasions of maximum ambient temperature and severe duty cycle operation.

Maximum Viscosity – This should only occur at cold start. Pump performance will be reduced. Limit speeds until the system warms up.

Fluid viscosity limits

| Condition | | mm ² /s (cSt) | SUS |
|-----------|---------------------------|--------------------------|------|
| v min. | continuous | 9 | 58 |
| | intermittent | 6.4 | 47 |
| v max. | continuous | 110 | 500 |
| | intermittent (cold start) | 1000 | 4700 |

Temperature

Maintain fluid temperature within the limits shown in the table. **Minimum temperature** relates to the physical properties of the component materials.

Cold oil will not affect the durability of the pump components. However, it may affect the ability of the pump to provide flow and transmit power. **Maximum temperature** is based on material properties. Don't exceed it. Measure maximum temperature at the hottest point in the system. This is usually the case drain.

Temperature limits

| | |
|---|-------------------|
| Minimum (intermittent, cold start) | - 40° C [- 40° F] |
| Continuous | 82° C [180° F] |
| Maximum | 104° C [220° F] |

Ensure fluid temperature and viscosity limits are concurrently satisfied.

Inlet pressure

Maintain inlet pressure within the limits shown in the table. Refer to Inlet pressure vs. speed charts for each displacement.

Inlet pressure limits

| | |
|-----------------------------|---|
| Minimum (continuous) | 0.8 bar absolute [6.7 in. Hg vac.] (at reduced maximum speed) |
| Minimum (cold start) | 0.5 bar absolute [15.1 in. Hg vac.] |

Case pressure

Maintain case pressure within the limits shown in the table. The housing must always be filled with hydraulic fluid.

Case pressure limits

| | |
|----------------------------------|-----------------------------|
| Maximum (continuous) | 0.5 bar [7 psi] above inlet |
| Intermittent (cold start) | 2 bar [29 psi] above inlet |

⚠ Caution

Operating outside of inlet and case pressure limits will damage the pump. To minimize this risk, use full size inlet and case drain plumbing, and limit line lengths.

**Operating parameters
 (continued)**

Pressure ratings

The specification tables in each section give maximum pressure ratings for each displacement. Not all displacements within a given frame operate under the same pressure limits. Definitions of the operating pressure limits appear below.

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

Maximum working pressure is the highest, regularly occurring operating pressure. Operating at or below this pressure should yield satisfactory product life. For all applications, the load should move below this pressure.

Speed ratings

The specification tables in each section give minimum, maximum, and rated speeds for each displacement. Not all displacements within a given frame operate under the same speed limits. Definitions of these speed limits appear below.

Rated speed is the fastest recommended operating speed at full displacement and 1 bar abs. [0 in Hg vac] inlet pressure. Operating at or below this speed should yield satisfactory product life.

Maximum speed is the highest recommended operating speed at full power conditions. Operating at or beyond maximum speed requires positive inlet pressure and/or a reduction of pump outlet flow. Refer to *Inlet pressure vs. speed* charts for each displacement.

Minimum speed is the lowest operating speed allowed. Operating below this speed will not yield satisfactory performance.

Duty cycle and pump life

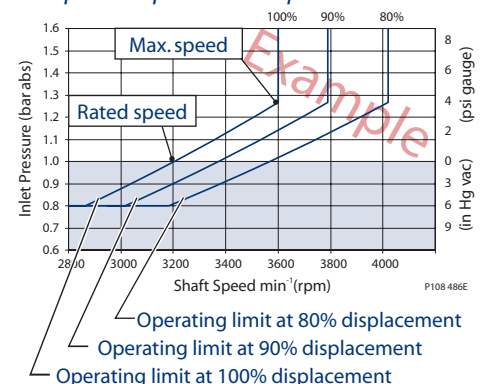
Knowing the operating conditions of your application is the best way to ensure proper pump selection. With accurate duty cycle information, your Sauer-Danfoss representative can assist in calculating expected pump life.

Speed, flow, and inlet pressure

Inlet pressure vs. speed charts in each section show the relationship between speed, flow, and inlet pressure for each displacement. Use these charts to ensure your application operates within the prescribed range.

The charts define the area of inlet pressures and speeds allowed for a given displacement. Operating at lower displacements allows greater speed or lower inlet pressure.

Sample inlet pressure vs. speed chart



Design parameters**Installation**

Series 45 pumps may be installed in any position. To optimize inlet conditions, install the pump at an elevation below the minimum reservoir fluid level. Design inlet plumbing to maintain inlet pressure within prescribed limits (see *Inlet pressure limits*, page 13)

Fill the pump housing and inlet line with clean fluid during installation. Connect the case drain line to the uppermost drain port (L1 or L2) to keep the housing full during operation.

To allow unrestricted flow to the reservoir, use a dedicated drain line. Connect it below the minimum reservoir fluid level and as far away from the reservoir outlet as possible. Use plumbing adequate to maintain case pressure within prescribed limits (see *Case pressure limits*, page 13).

Filtration

To prevent damage to the pump, including premature wear, fluid entering the pump inlet must be free of contaminants. Series 45 pumps require system filtration capable of maintaining fluid cleanliness at ISO 4406-1999 class 22/18/13 or better.

Sauer-Danfoss does not recommend suction line filtration. Suction line filtration can cause high inlet vacuum, which limits pump operating speed. Instead we recommend a 125 μm (150 mesh) screen in the reservoir covering the pump inlet. This protects the pump from coarse particle ingestion.

Return line filtration is the preferred method for open circuit systems. Consider these factors when selecting a system filter:

- Cleanliness specifications
- Contaminant ingress rates
- Flow capacity
- Desired maintenance interval

Typically, a filter with a beta ratio of $\beta_{10} = 10$ is adequate. However, because each system is unique, only a thorough testing and evaluation program can fully validate the filtration system. For more information, see Sauer-Danfoss publication **520L0467** *Design Guidelines for Hydraulic Fluid Cleanliness*.

Reservoir

The reservoir provides clean fluid, dissipates heat, and removes entrained air from the hydraulic fluid. It allows for fluid volume changes associated with fluid expansion and cylinder differential volumes. Minimum reservoir capacity depends on the volume needed to perform these functions. Typically, a capacity of one to three times the pump flow (per minute) is satisfactory.

Locate the reservoir outlet (suction line) near the bottom, allowing clearance for settling foreign particles. Place the reservoir inlet (return lines) below the lowest expected fluid level, as far away from the outlet as possible.

Design parameters (continued)

Fluid velocity

Choose piping sizes and configurations sufficient to maintain optimum fluid velocity, and minimize pressure drops. This reduces noise, pressure drops, and overheating. It maximizes system life and performance.

Recommended fluid velocities

| | |
|---------------------|--------------------------------|
| System lines | 6 to 9 m/sec [20 to 30 ft/sec] |
| Suction line | 1 to 2 m/sec [4 to 6 ft/sec] |
| Case drain | 3 to 5 m/sec [10 to 15 ft/sec] |

Typical guidelines; obey all pressure ratings.

Velocity equations SI units

Q = flow (l/min)
A = area (mm²)

$$\text{Velocity} = \frac{16.67 \cdot Q}{A} \quad (\text{m/sec})$$

US units

Q = flow (US gal/min)
A = area (in²)

$$\text{Velocity} = \frac{0.321 \cdot Q}{A} \quad (\text{ft/sec})$$

Shaft loads

Series 45 pumps have tapered roller bearings capable of accepting external radial and thrust (axial) loads. The external radial shaft load limits are a function of the load position, orientation, and the operating conditions of the pump.

The maximum allowable radial load (R_e) is based on the maximum external moment (M_e) and the distance (L) from the mounting flange to the load. Compute radial loads using the formula below. Tables in each section give maximum external moment (M_e) and thrust (axial) load (T_{in} , T_{out}) limits for each pump frame size and displacement.

Radial load formula

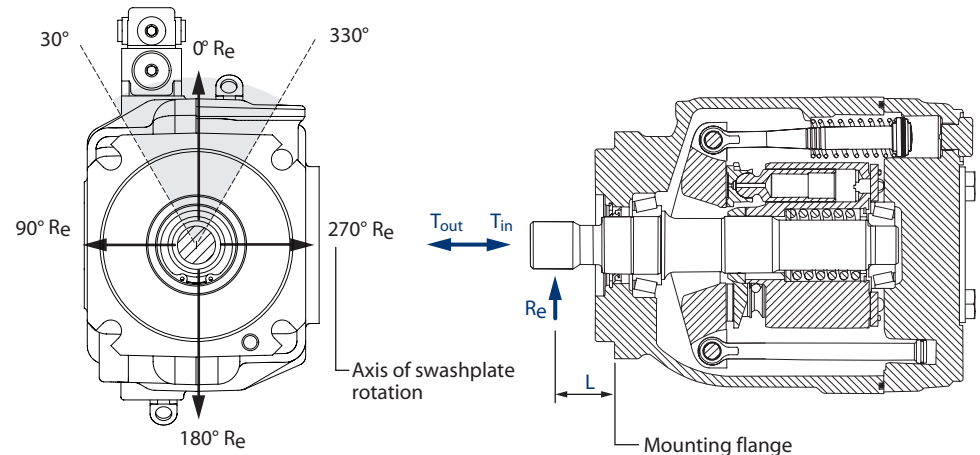
$$M_e = R_e \cdot L$$

L = Distance from mounting flange to point of load

M_e = Maximum external moment

R_e = Maximum radial side load

Shaft load orientation



P101 080E

Bearing life

All shaft loads affect bearing life. In applications where external shaft loads can not be avoided, maximize bearing life by orientating the load between the 30° and 330° positions, as shown. Tapered input shafts or clamp-type couplings are recommended for applications with radial shaft loads. Tables in each section give B_{10} bearing life for each pump frame size and displacement.

**Design parameters
 (continued)**

Mounting flange loads

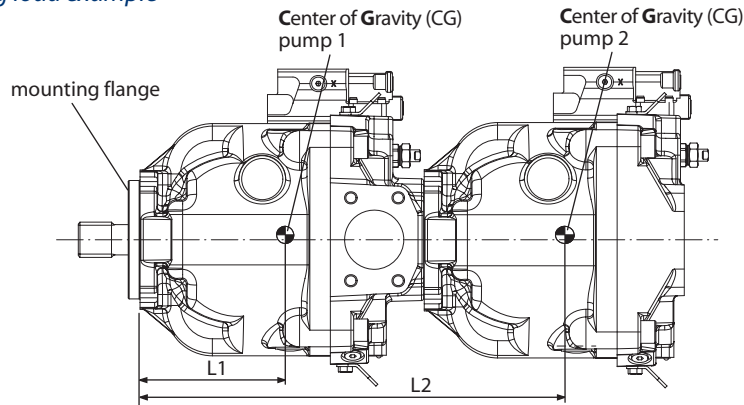
Adding auxiliary pumps and/or subjecting pumps to high shock loads may overload the pump mounting flange. Tables in each section give allowable continuous and shock load moments for each frame size. Applications with loads outside allowable limits require additional pump support.

- **Shock load moment (M_s)** is the result of an instantaneous jolt to the system.
- **Continuous load moments (M_c)** are generated by the typical vibratory movement of the application.

Estimating overhung load moments

Use the equations below to estimate the overhung load moments for multiple pump mounting. See installation drawings in each section to find the distance from the mounting flange to the center of gravity for each frame size. Refer to the technical specifications in each section to find pump weight.

Overhung load example



P101 081E

Shock load formula $M_s = G_s \cdot K \cdot (W_1 \cdot L_1 + W_2 \cdot L_2 + \dots W_n \cdot L_n)$

Continuous load formula $M_c = G_c \cdot K \cdot (W_1 \cdot L_1 + W_2 \cdot L_2 + \dots W_n \cdot L_n)$

SI units

- M_s = Shock load moment (N•m)
- M_c = Continuous (vibratory) load moment (N•m)
- G_s = Acceleration due to external shock (G's)
- G_c = Acceleration due to continuous vibration (G's)
- K = Conversion factor = 0.00981
- W_n = Mass of n^{th} pump (kg)
- L_n = Distance from mounting flange to n^{th} pump CG (mm)

US units

- M_s = Shock load moment (lbf•in)
- M_c = Continuous (vibratory) load moment (lbf•in)
- G_s = Acceleration due to external shock (G's)
- G_c = Acceleration due to continuous vibration (G's)
- K = Conversion factor = 1
- W_n = Weight of n^{th} pump (lb)
- L_n = Distance from mounting flange to n^{th} pump CG (in)

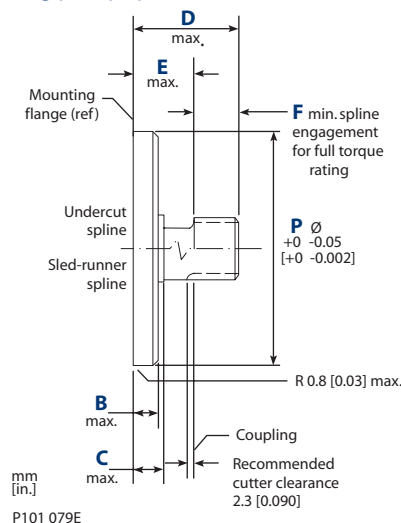
**Design parameters
 (continued)**

Auxiliary mounting pads

Auxiliary mounting pads are available for all radial ported Series 45 pumps. Since the auxiliary pad operates under case pressure, use an O-ring to seal the auxiliary pump mounting flange to the pad. Oil from the main pump case lubricates the drive coupling.

- All mounting pads meet SAE J744 Specifications.
- The combination of auxiliary shaft torque and main pump torque must not exceed the maximum pump input shaft rating. Tables in each section give input shaft torque ratings for each frame size.
- Applications subject to severe vibratory or shock loading may require additional support to prevent mounting flange damage. Tables in each section give allowable continuous and shock load moments for each frame size.
- The drawing and table below give mating pump dimensions for each size mount. Refer to installation drawings in each section for auxiliary mounting pad dimensions.

Mating pump specifications



Dimensions

| | SAE A | SAE B | SAE C |
|----------|------------------|-------------------|-------------------|
| P | 82.55 [3.250] | 101.60 [4.000] | 127.00 [5.000] |
| B | 6.35 [0.250] | 9.65 [0.380] | 12.70 [0.500] |
| C | 12.70 [0.500] | 15.20 [0.600] | 23.37 [0.920] |
| D | 58.20 [2.290] | 53.10 [2.090] | 55.60 [2.190] |
| E | 15.00 [0.590] | 17.50 [0.690] | 30.50 [1.200] |
| F | 13.50 [0.530] | 14.20 [0.560] | 18.30 [0.720] |

Input shaft torque ratings

Input shaft tables in each section give maximum torque ratings for available input shafts. Ensure that your application respects these limits.

Maximum torque ratings are based on shaft strength. Do not exceed them.

Coupling arrangements that are not oil-flooded provide a reduced torque rating. Contact your Sauer-Danfoss representative for proper torque ratings if your application involves non oil-flooded couplings.

Sauer-Danfoss recommends mating splines adhere to ANSI B92.1-Class 5. Sauer-Danfoss external splines are modified class 5 fillet root side fit. The external major diameter and circular tooth thickness dimensions are reduced to ensure a good clearance fit with the mating spline. Tables in each section give full spline dimensions and data.

**Design parameters
(continued)****Understanding and minimizing system noise**

Charts in each section give sound levels for each frame size and displacement. Sound level data are collected at various operating speeds and pressures in a semi-anechoic chamber. Many factors contribute to the overall noise level of any application. Below is some information to help understand the nature of noise in fluid power systems, and some suggestions to help minimize it.

Noise is transmitted in fluid power systems in two ways: as fluid borne noise, and structure borne noise.

Fluid-borne noise (pressure ripple or pulsation) is created as pumping elements discharge oil into the pump outlet. It is affected by the compressibility of the oil, and the pump's ability to transition pumping elements from high to low pressure. Pulsations travel through the hydraulic lines at the speed of sound (about 1400 m/s [4600 ft/sec] in oil) until there is a change (such as an elbow) in the line. Thus, amplitude varies with overall line length and position.

Structure-borne noise is transmitted wherever the pump casing connects to the rest of the system. The way system components respond to excitation depends on their size, form, material, and mounting.

System lines and pump mounting can amplify pump noise. Follow these suggestions to help minimize noise in your application:

- Use flexible hoses.
- Limit system line length.
- If possible, optimize system line position to minimize noise.
- If you must use steel plumbing, clamp the lines.
- If you add additional support, use rubber mounts.
- Test for resonants in the operating range, if possible avoid them.

Understanding and minimizing system instability

Knowing the operating conditions and system setup of your application is the best way to ensure a stable system. All fan-drive circuits should use a choke orifice to ensure system stability. With accurate system information, your Sauer-Danfoss representative can assist you in the selection of a choke orifice.

Sizing equations

Use these equations to help select the right pump size, displacement and power requirements for your application:

Based on SI units

Flow Output flow $Q = \frac{V_g \cdot n \cdot \eta_v}{1000}$ (l/min)

Torque Input torque $M = \frac{V_g \cdot \Delta p}{20 \cdot \pi \cdot \eta_m}$ (N·m)

Power Input power $P = \frac{M \cdot n \cdot \pi}{30\,000} = \frac{Q \cdot \Delta p}{600 \cdot \eta_t}$ (kW)

Based on US units

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

Input torque $M = \frac{V_g \cdot \Delta p}{2 \cdot \pi \cdot \eta_m}$ (lbf·in)

Input power $P = \frac{M \cdot n \cdot \pi}{198\,000} = \frac{Q \cdot \Delta p}{1714 \cdot \eta_t}$ (hp)

Variables SI units [US units]

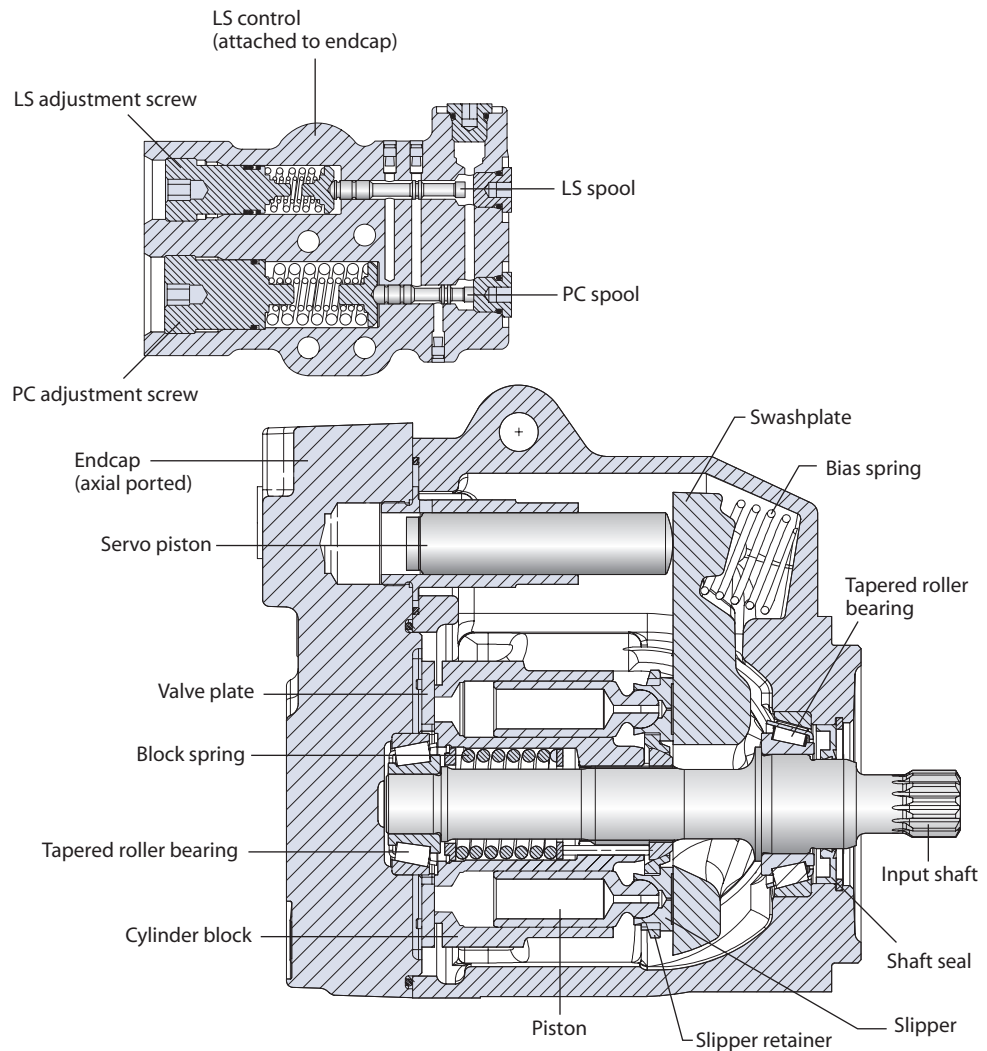
| | | |
|------------|--|---|
| V_g | = Displacement per revolution | cm ³ /rev [in ³ /rev] |
| p_o | = Outlet pressure | bar [psi] |
| p_i | = Inlet pressure | bar [psi] |
| Δp | = $p_o - p_i$ (system pressure) | bar [psi] |
| n | = Speed | min ⁻¹ (rpm) |
| η_v | = Volumetric efficiency | |
| η_m | = Mechanical efficiency | |
| η_t | = Overall efficiency ($\eta_v \cdot \eta_m$) | |

Design

Series 45 Frame L and K pumps have a single servo piston design with a cradle-type swashplate set in polymer-coated journal bearings. A bias spring and internal forces increase swashplate angle. The servo piston decreases swashplate angle. Nine reciprocating pistons displace fluid from the pump inlet to the pump outlet as the cylinder block rotates on the pump input shaft. The block spring holds the piston slippers to the swashplate via the slipper retainer. The cylinder block rides on a bi-metal valve plate optimized for high volumetric efficiency and low noise. Tapered roller bearings support the input shaft and a viton lip-seal protects against shaft leaks.

An adjustable one spool (PC only, not shown) or two spool (LS and remote PC) control senses system pressure and load pressure (LS controls). The control ports system pressure to the servo piston, adjusting swashplate angle to control pump output flow.

Frame K/L cross section



P101 659E

Technical Specifications

For general operating parameters, including fluid viscosity, temperature, and inlet and case pressures, [see page 13](#). For system design parameters, including installation, filtration, reservoir, and line velocities, [see page 15](#).

For definitions of pressure and speed ratings, [see page 14](#). For more information on external shaft loads, [see page 16](#); mounting flange loads, [see page 17](#).

| | | Unit | L Frame | | K Frame | |
|---|---|---|-------------------|-------------------|-------------------|-------------------|
| | | | L25C | L30D | K38C | K45D |
| Maximum Displacement | | cm ³ [in ³] | 25 [1.53] | 30 [1.83] | 38 [2.32] | 45 [2.75] |
| Working Input Speed | Minimum | min ⁻¹ (rpm) | 500 | 500 | 500 | 500 |
| | Continuous | | 3200 | 3200 | 2650 | 2650 |
| | Maximum | | 3600 | 3600 | 2800 | 2800 |
| Working Pressure | Maximum | bar [psi] | 260 [3770] | 210 [3045] | 260 [3770] | 210 [3045] |
| Flow at rated speed (theoretical) | | l/min [US gal/min] | 80 [21] | 96 [25.4] | 100.7 [26.6] | 119.3 [31.5] |
| Input torque at maximum displacement (theoretical) at 49° C [120°F] | | N•m/bar [lbf•in/1000 psi] | 0.398 [243] | 0.477 [291] | 0.605 [369] | 0.716 [438] |
| Mass moment of inertia of internal rotating components | | kg•m ² [slug•ft ²] | 0.00169 [0.00125] | 0.00161 [0.00119] | 0.00184 [0.00135] | 0.00203 [0.00150] |
| Weight | Axial ports | kg [lb] | 19 [42] | | | |
| | Radial ports | | 24 [53] | | | |
| External Shaft Loads | External moment (M _e) | N•m [lbf•in] | 61 [540] | 61 [540] | 76 [673] | 76 [673] |
| | Thrust in (T _{in}), out (T _{out}) | N [lbf] | 1000 [225] | 1000 [225] | 1200 [270] | 1200 [270] |
| Bearing Life (1800 rpm, no external shaft loading) | at 140 bar [2030 psi] | B ₁₀ hours | 49100 | 24600 | 35300 | 19600 |
| | at 210 bar [3045 psi] | | 14100 | 7230 | 11 400 | 6200 |
| | at 260 bar [3770 psi] | | 6590 | — | 5870 | — |
| Mounting flange load moments | Vibratory (continuous) | N•m [lbf•in] | 1005 [8895] | | | |
| | Shock (maximum) | | 3550 [31420] | | | |

Order code

| | | | | | | | | | | | | | |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| R | S | P | C | D | E | F | G | H | J | K | L | M | N |
| <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |

Code description

| Code | Description |
|------|--|
| R | Product Frame, Variable Open Circuit Pump |
| S | Rotation |
| P | Displacement |
| C | Control Type |
| D | Pressure Compensator Setting |
| E | Load Sense Setting |
| F | Not Used |
| G | Choke Orifice |
| H | Gain Orifice |
| J | Input Shaft/Auxiliary Mount/Endcap |
| K | Shaft Seal/Front Mounting Flange/Housing Ports |
| L | Displacement Limiter |
| M | Special Hardware |
| N | Special Features |

Order code (continued)

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| R | S | P | C | D | E | F | G | H | J | K | L | M | N |
| | | | | | | | | | | | | | |

R Frame

| | | L Frame | | K Frame | |
|-----------|--|---------|------|---------|------|
| | | 025C | 030D | 038C | 045D |
| KR | K Frame, variable displacement open circuit pump | | | • | • |
| LR | L Frame, variable displacement open circuit pump | • | • | | |

S Rotation

| | | | | | |
|----------|------------------------------|---|---|---|---|
| L | Left Hand (counterclockwise) | • | • | • | • |
| R | Right Hand (clockwise) | • | • | • | • |

P Displacement

| | | | | | |
|-------------|--|---|---|---|---|
| 025C | 025 cm ³ /rev [1.53 in ³ /rev] | • | | | |
| 030D | 030 cm ³ /rev [1.83 in ³ /rev] | | • | | |
| 038C | 038 cm ³ /rev [2.32 in ³ /rev] | | | • | |
| 045D | 045 cm ³ /rev [2.75 in ³ /rev] | | | | • |

C Control type

| | | L Frame | | K Frame | |
|-----------|---|---------|------|---------|------|
| | | 025C | 030D | 038C | 045C |
| PC | Pressure Compensator | • | • | • | • |
| LB | Load Sensing/Pressure Comp. with internal bleed orifice | • | • | • | • |
| LS | Load Sensing/Pressure Comp. | • | • | • | • |
| RP | Remote Pressure Compensator | • | • | • | • |
| EB | Electric on/off, 12VDC, Normally Closed, Deutsch | • | • | • | • |
| EA | Electric on/off, 12VDC, Normally Open, Deutsch | • | • | • | • |

D PC setting (2 digit code, 10 bar increments)

| | | | | | |
|----------------|-----------------------------------|---|---|---|---|
| Example | 25 = 250 bar (3625 psi) | | | | |
| 10-21 | 100 to 210 bar [1450 to 3045 psi] | • | • | • | • |
| 22-26 | 220 to 260 bar [3190 to 3771 psi] | • | • | • | • |

E Load sensing setting (2 digit code, 1 bar increments)

| | | | | | |
|----------------|---|---|---|---|---|
| Example | 20 = 20 bar (290 psi) | | | | |
| 12-36 | 12 to 36 bar [174 to 522 psi] | • | • | • | • |
| NN | Not applicable (pressure compensated only controls) | • | • | • | • |

F Not used

| | | | | | |
|-----------|----------------|---|---|---|---|
| NN | Not applicable | • | • | • | • |
|-----------|----------------|---|---|---|---|

G Pilot/Choke Orifice

| | | | | | |
|----------|-----------------|---|---|---|---|
| N | None (standard) | • | • | • | • |
|----------|-----------------|---|---|---|---|

H Gain Orifice

| | | | | | |
|----------|-----------------|---|---|---|---|
| 3 | 1.0 mm diameter | • | • | • | • |
|----------|-----------------|---|---|---|---|

Order code (continued)

| | | | | | | | | | | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|-------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| R | S | P | C | D | E | F | G | H | J | K | L | M | N |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

J Input Shaft

| | |
|-----------|----------------------------------|
| C2 | 13 tooth, 16/32 pitch |
| C3 | 15 tooth, 16/32 pitch |
| K1 | 0.875 inch straight keyed |
| K2 | 0.875 inch straight keyed (long) |
| T1 | 1.0 inch Taper |

Auxiliary Mount/Endcap Style

| Auxiliary Description | Endcap Style | Inlet Porting | Outlet Porting | Endcap Description | Code |
|-----------------------|--------------|---------------|----------------|--|------|
| None | Axial | O-Ring Boss | O-Ring Boss | Inlet - SAE O-Ring boss port (1.875 inch threads) Outlet - SAE O-Ring boss port (1.3125 inch threads) Control - Left Side | NF |
| None | Axial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (1.25 inch port 0.4375 inch threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port 0.375 inch threads) Control - Left Side | NM |
| None | Axial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (1.25 inch port M10 threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port M10 threads) Control - Left Side | NP |
| None | Radial | O-Ring Boss | O-Ring Boss | Inlet - SAE O-Ring boss port (1.875 inch threads) Outlet - SAE O-Ring boss port (1.3125 inch threads) Control - Right Side | NG |
| None | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (1.5 inch port 0.5 inch threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port 0.375 inch threads) Control - Right Side | NK |
| None | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (1.5 inch port M12 threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port M12 threads) Control - Right Side | NR |
| Running Cover | Radial | O-Ring Boss | O-Ring Boss | Inlet - SAE O-Ring boss port (1.875 inch threads) Outlet - SAE O-Ring boss port (1.3125 inch threads) Control - Right Side | RG |
| Running Cover | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (1.5 inch port 0.5 inch threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port 0.375 inch threads) Control - Right Side | RK |
| SAE-A, 11 teeth | Radial | O-Ring Boss | O-Ring Boss | Inlet - SAE O-Ring boss port (1.875 inch threads) Outlet - SAE O-Ring boss port (1.3125 inch threads) Control - Right Side | TG |
| SAE-A, 9 teeth | Radial | O-Ring Boss | O-Ring Boss | Inlet - SAE O-Ring boss port (1.875 inch threads) Outlet - SAE O-Ring boss port (1.3125 inch threads) Control - Right Side | AG |
| SAE-A, 9 teeth | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (1.5 inch port 0.5 inch threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port 0.375 inch threads) Control - Right Side | AK |
| SAE-B, 13 teeth | Radial | O-Ring Boss | O-Ring Boss | Inlet - SAE O-Ring boss port (1.875 inch threads) Outlet - SAE O-Ring boss port (1.3125 inch threads) Control - Right Side | BG |
| SAE-B, 13 teeth | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (1.5 inch port 0.5 inch threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port 0.375 inch threads) Control - Right Side | BK |
| SAE-B, 13 teeth | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (1.5 inch port M12 threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port M12 threads) Control - Right Side | BR |
| SAE-BB, 15 teeth | Radial | O-Ring Boss | O-Ring Boss | Inlet - SAE O-Ring boss port (1.875 inch threads) Outlet - SAE O-Ring boss port (1.3125 inch threads) Control - Right Side | VG |
| SAE-BB, 15 teeth | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (1.5 inch port 0.5 inch threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port 0.375 inch threads) Control - Right Side | VK |

Order code (continued)

| | | | | | | | | | | | | | |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| R | S | P | C | D | E | F | G | H | J | K | L | M | N |
| <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |

J Input Shaft/Auxiliary Mount/Endcap

Available Combinations

| | L Frame | | K Frame | |
|--------|---------|------|---------|------|
| | 025C | 030D | 038C | 045D |
| C2AG* | • | • | • | • |
| C2BG* | • | • | • | • |
| C2NF* | • | • | • | • |
| C2NG** | • | • | • | • |
| C2NK** | | | • | • |
| C2NM** | | | • | • |
| C2NP** | | | • | • |
| C2NR* | | | • | • |
| C2RG* | • | • | • | • |
| C2TG* | • | • | • | • |
| C3AG* | • | • | • | • |
| C3AK** | | | • | • |
| C3BG* | • | • | • | • |
| C3NF* | • | • | • | • |
| C3NG** | • | • | • | • |
| C3NK** | | | • | • |
| C3RG* | • | • | • | • |

| | L Frame | | K Frame | |
|--------|---------|------|---------|------|
| | 025C | 030D | 038C | 045D |
| C3TG* | • | • | • | • |
| C3VG* | | | • | • |
| K1AG* | • | • | | |
| K1NF* | • | • | • | • |
| K1NG** | • | • | • | • |
| K1RG* | • | • | | |
| K2AG* | • | • | • | • |
| K2BG* | • | • | • | • |
| K2NF* | • | • | • | • |
| K2NG** | • | • | • | • |
| K2NM** | | | • | • |
| K2RG* | • | • | • | • |
| T1BG* | | | • | • |
| T1NF* | • | • | • | • |
| T1NG** | • | • | • | • |
| T1RG* | • | • | • | • |

* PLB or AAA Displacement limiter options only ** KNB Displacement limiter options only

| K Shaft seal | | L Frame | | K Frame | |
|---------------------|----------------|---------|------|---------|------|
| | | 025C | 030D | 038C | 045D |
| A | Single (Viton) | • | • | • | • |

| K Mounting flange and housing port style | | | | | |
|---|---|---|---|---|---|
| 6 | SAE-B Flange 2-bolt/SAE O-ring boss ports | • | • | • | • |

| K Not used | | | | | |
|-------------------|----------------|---|---|---|---|
| N | Not applicable | • | • | • | • |

| L Displacement limiter | | | | | |
|-------------------------------|--------------------------------------|---|---|---|---|
| AAA | Adjustable, factory set at max angle | • | • | • | • |
| KNB | None | • | • | • | • |
| PLB | None (plugged) | • | • | • | • |

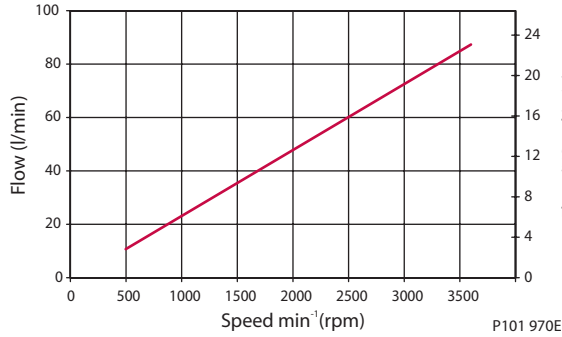
| M Special hardware | | | | | |
|---------------------------|------|---|---|---|---|
| NNN | None | • | • | • | • |

| N Special features | | | | | |
|---------------------------|------|---|---|---|---|
| NNN | None | • | • | • | • |

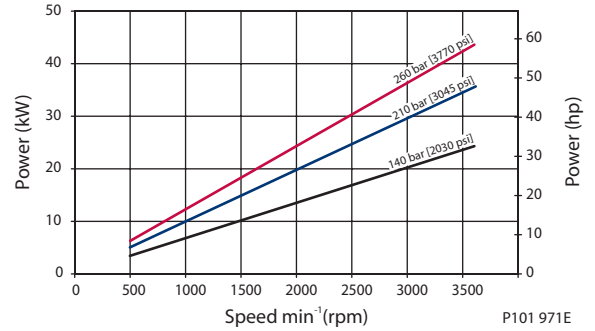
Performance L25C

Flow and power data valid at 49°C [120°F] and viscosity of 17.8 mm²/sec [88 SUS].

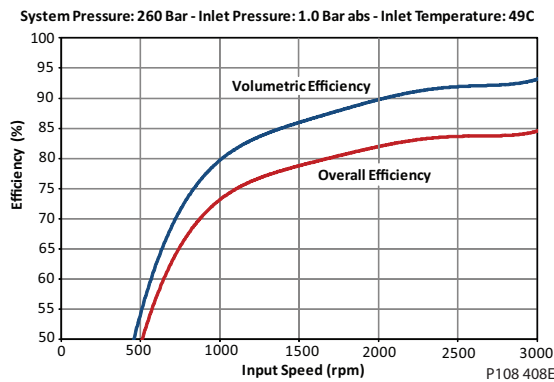
Flow vs. speed



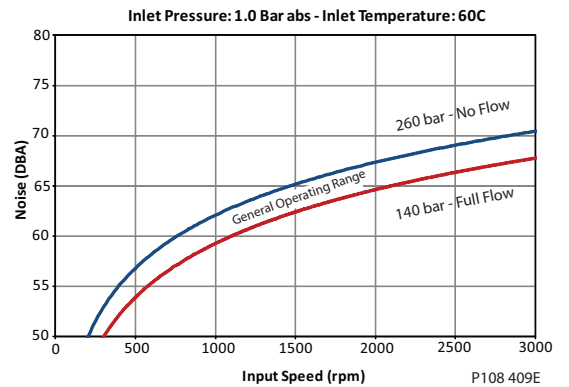
Input power vs. speed



Efficiency

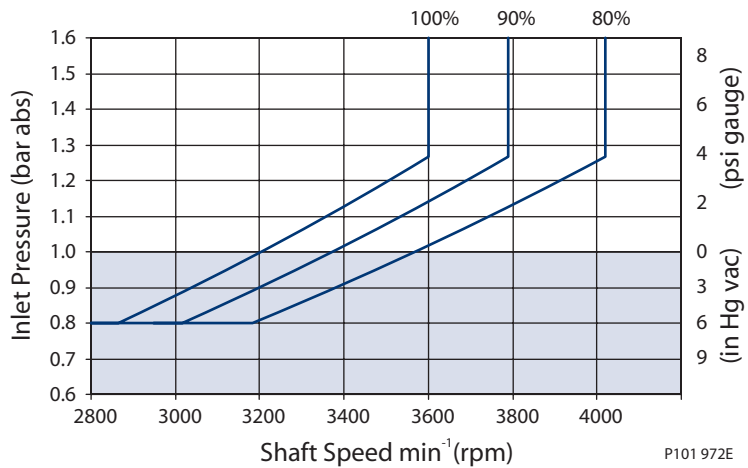


Noise



Inlet pressure vs. speed

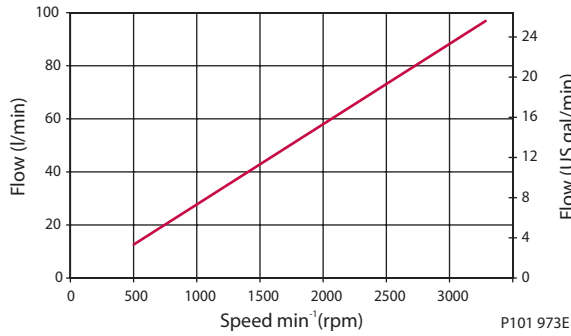
The chart on the right shows allowable inlet pressure and speed at various displacements. Greater speeds and lower inlet pressures are possible at reduced displacement. Operating outside of acceptable limits reduces pump life.



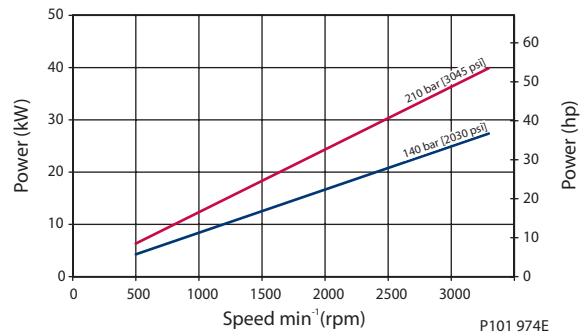
Performance L30D

Flow and power data valid at 49°C [120°F] and viscosity of 17.8 mm²/sec [88 SUS].

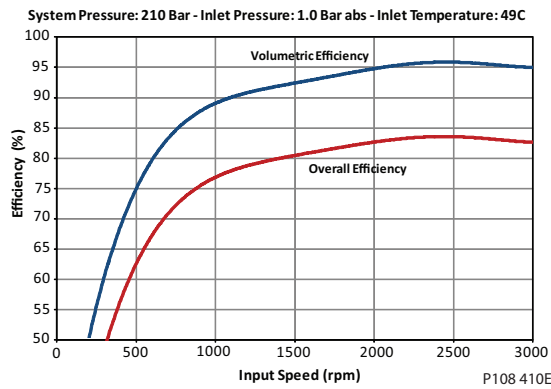
Flow vs. speed



Input power vs. speed



Efficiency

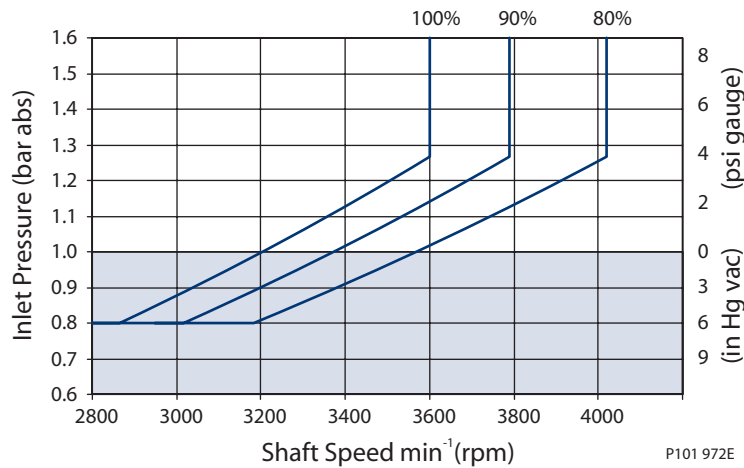


Noise

| dB(A) | 210 bar [3045 psi] | |
|-------|------------------------------|-------------|
| | 1800 min ⁻¹ (rpm) | Rated Speed |
| L30D | 66 | 70 |

Inlet pressure vs. speed

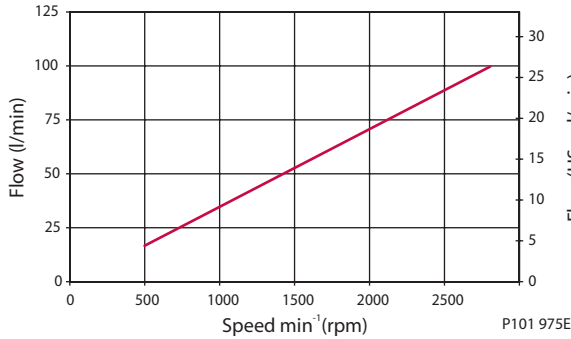
The chart on the right shows allowable inlet pressure and speed at various displacements. Greater speeds and lower inlet pressures are possible at reduced displacement. Operating outside of acceptable limits reduces pump life.



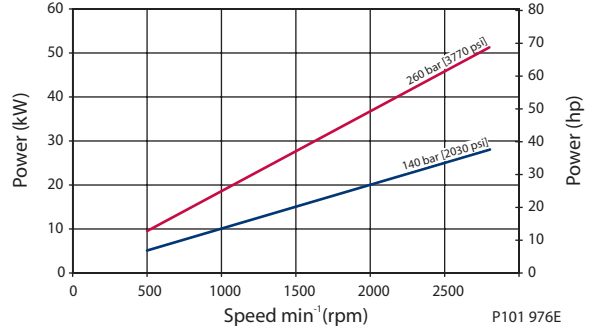
Performance K38C

Flow and power data valid at 49°C [120°F] and viscosity of 17.8 mm²/sec [88 SUS].

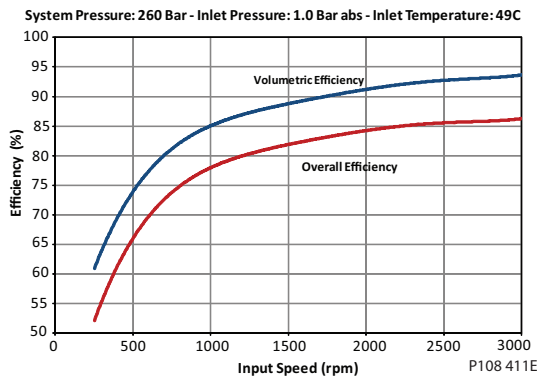
Flow vs. speed



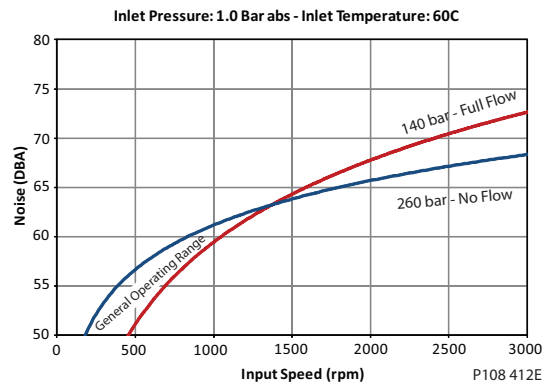
Input power vs. speed



Efficiency

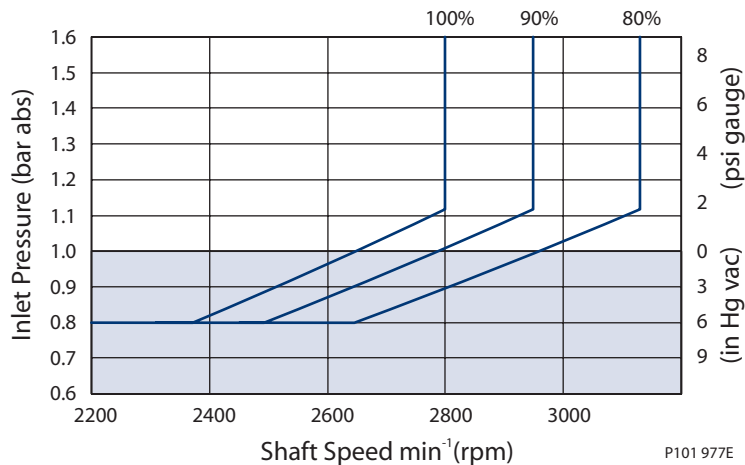


Noise



Inlet pressure vs. speed

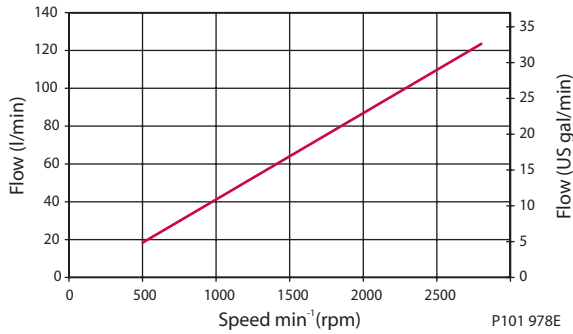
The chart on the right shows allowable inlet pressure and speed at various displacements. Greater speeds and lower inlet pressures are possible at reduced displacement. Operating outside of acceptable limits reduces pump life.



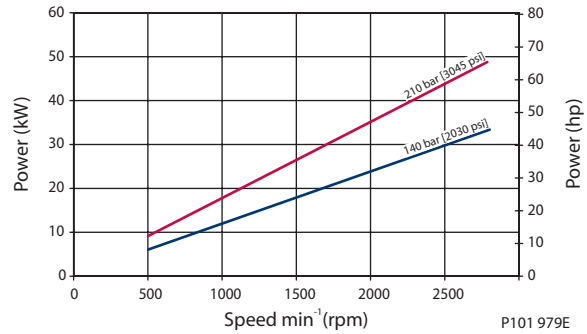
Performance K45D

Flow and power data valid at 49°C [120°F] and viscosity of 17.8 mm²/sec [88 SUS].

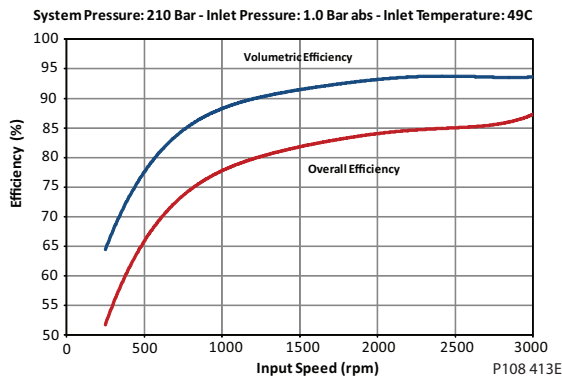
Flow vs. speed



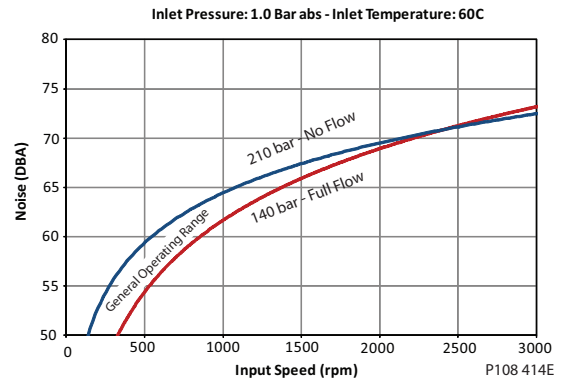
Input power vs. speed



Efficiency

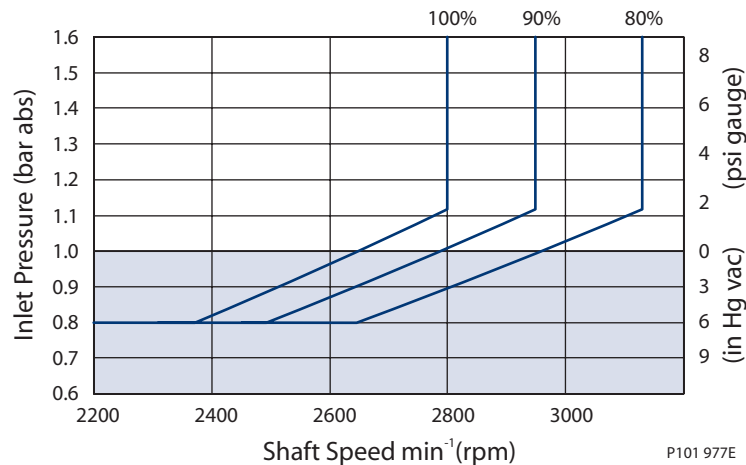


Noise



Inlet pressure vs. speed

The chart on the right shows allowable inlet pressure and speed at various displacements. Greater speeds and lower inlet pressures are possible at reduced displacement. Operating outside of acceptable limits reduces pump life.



Hydraulic Controls

Pressure Compensated Controls

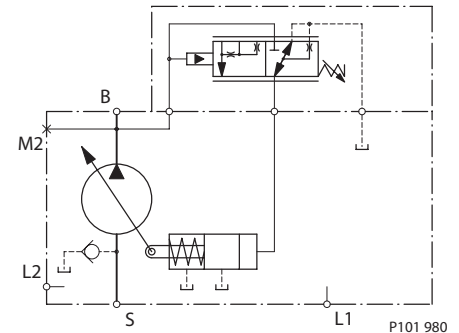
Response/Recovery Times

| (ms) | Response | Recovery |
|-------------|----------|----------|
| L25C | 30 | 90 |
| L30D | 30 | 100 |
| K38C | 30 | 105 |
| K45D | 30 | 110 |

PC Setting Range

| Model | bar | psi |
|-------------|---------|-----------|
| L25C | 100–260 | 1450–3770 |
| L30D | 100–210 | 1450–3045 |
| K38C | 100–260 | 1450–3770 |
| K45D | 100–210 | 1450–3045 |

Schematic



Legend

- B = Outlet
- S = Inlet
- L1, L2 = Case drain
- M2 = System pressure gauge port

Remote Pressure Compensated Controls

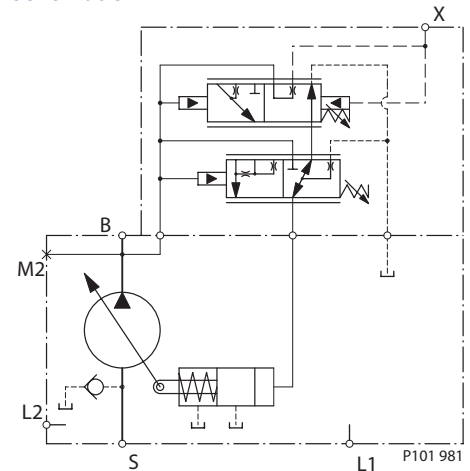
Response/Recovery Times

| (ms) | Response | Recovery |
|-------------|----------|----------|
| L25C | 30 | 90 |
| L30D | 30 | 100 |
| K38C | 30 | 105 |
| K45D | 30 | 110 |

PC Setting Range

| Model | bar | psi |
|-------------|---------|-----------|
| L25C | 100–260 | 1450–3770 |
| L30D | 100–210 | 1450–3045 |
| K38C | 100–260 | 1450–3770 |
| K45D | 100–210 | 1450–3045 |

Schematic



Legend

- B = Outlet
- S = Inlet
- L1, L2 = Case drain
- M2 = System pressure gauge port
- X = Remote PC port

**Hydraulic Controls
 (continued)**

**Load Sensing/Pressure Compensated
 Controls**

Response/Recovery Times

| (ms) | Response | Recovery |
|------|----------|----------|
| L25C | 30 | 70 |
| L30D | 30 | 70 |
| K38C | 30 | 80 |
| K45D | 30 | 80 |

PC Setting Range

| Model | bar | psi |
|-------|---------|-----------|
| L25C | 100–260 | 1450–3770 |
| L30D | 100–210 | 1450–3045 |
| K38C | 100–260 | 1450–3770 |
| K45D | 100–210 | 1450–3045 |

LS setting range

| Model | bar | psi |
|-------|-------|---------|
| All | 12-40 | 174-580 |

**Load Sensing Control with Bleed Orifice
 /Pressure Compensated**

Response/Recovery Times

| (ms) | Response | Recovery |
|------|----------|----------|
| L25C | 30 | 70 |
| L30D | 30 | 70 |
| K38C | 30 | 80 |
| K45D | 30 | 80 |

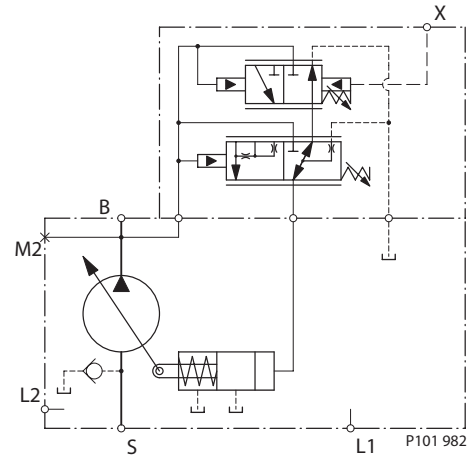
PC Setting Range

| Model | bar | psi |
|-------|---------|-----------|
| L25C | 100–260 | 1450–3770 |
| L30D | 100–210 | 1450–3045 |
| K38C | 100–260 | 1450–3770 |
| K45D | 100–210 | 1450–3045 |

LS setting range

| Model | bar | psi |
|-------|-------|---------|
| All | 12-40 | 174-580 |

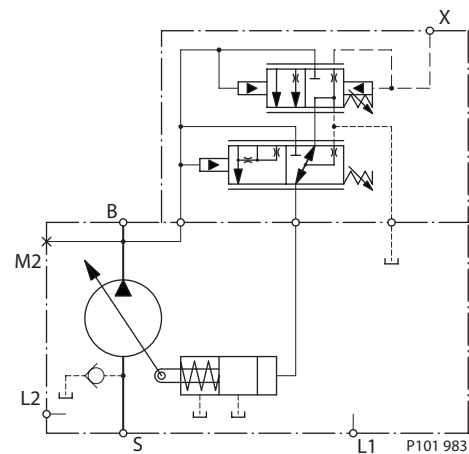
Schematic



Legend

- B = Outlet
- S = Inlet
- L1, L2 = Case drain
- M2 = System pressure gauge port
- X = LS signal port

LB Schematic



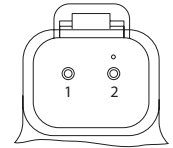
Legend

- B = Outlet
- S = Inlet
- L1, L2 = Case drain
- M2 = System pressure gauge port
- X = LS signal port

Electric Controls

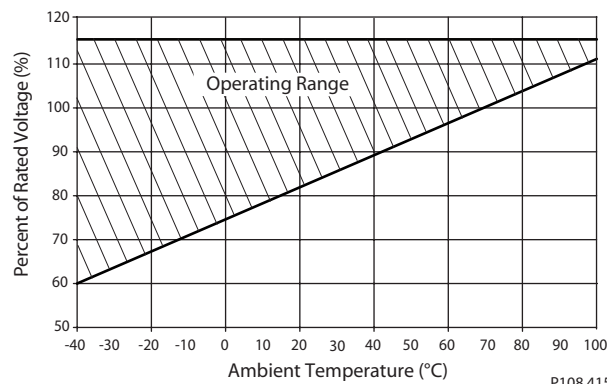
Connectors

| Description | Quantity | Ordering Number |
|------------------------------------|----------|-------------------------|
| Mating Connector | 1 | Deutsch® DT06-2S |
| Wedge Lock | 1 | Deutsch® W25 |
| Socket Contact (16 and 18 AWG) | 2 | Deutsch® 0462-201-16141 |
| Sauer-Danfoss mating connector kit | 1 | K29657 |



P003 480

Continuous Duty Operating Range



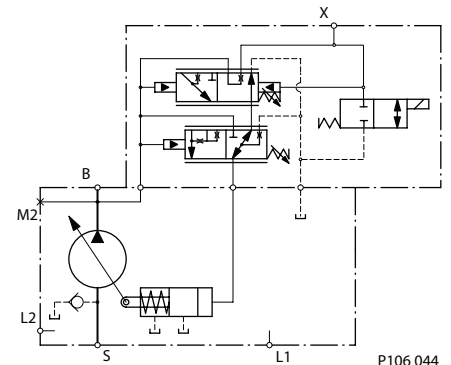
P108 415E

Normally Closed On/Off Electric Pressure Compensated Controls

Schematic

*Response/recovery times**

| (ms) | Response | Recovery |
|-------------|----------|----------|
| L25C | 30 | 90 |
| L30D | 30 | 100 |
| K38C | 30 | 105 |
| K45D | 30 | 110 |



P106 044

PC control setting range

| Model | bar | psi |
|-------------------|-------------|-----------------|
| L25C, K38C | 100-240 bar | [1450-3480 psi] |
| L30D, K45D | 100-210 bar | [1450-3045 psi] |

LS setting range

| Model | bar | psi |
|------------|-------|---------|
| All | 12-40 | 174-580 |

Legend

- B = Outlet
- S = Inlet
- L1, L2 = Case drain
- M2 = System pressure gauge port

**Electric Controls
 (continued)**

**Normally Open On/Off Electric Pressure
 Compensated Controls**

*Response/recovery times**

| (ms) | Response | Recovery |
|-------------|----------|----------|
| L25C | 30 | 90 |
| L30D | 30 | 100 |
| K38C | 30 | 105 |
| K45D | 30 | 110 |

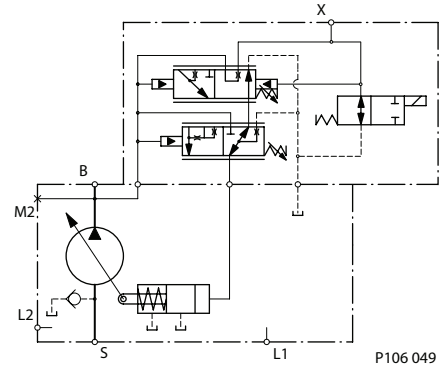
PC control setting range

| Model | bar | psi |
|-----------------------|-------------|-----------|
| L25C, K38C | 100-260 bar | 1450-3370 |
| L30D, K45D | 100-210 bar | 1450-3045 |

LS setting range

| Model | bar | psi |
|------------|-------|---------|
| All | 12-40 | 174-580 |

Schematic



Legend

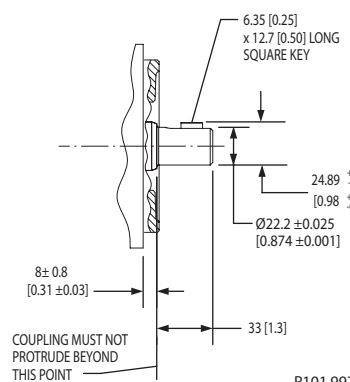
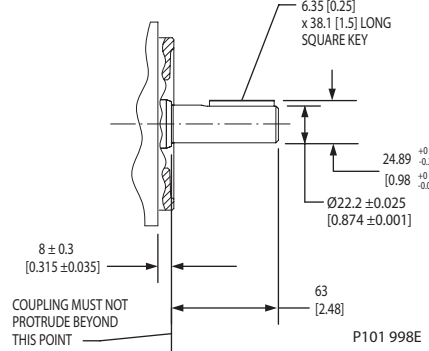
- B = Outlet
- S = Inlet
- L1, L2 = Case drain
- M2 = System pressure gauge port

Input shafts

| Code | Description | Maximum torque rating ¹ N·m [lbf·in] | Drawing |
|------|---|--|---------|
| C2 | 13 tooth spline 16/32 pitch (ANSI A92.1 1970 - Class 5) | 288 [2546] | |
| C3 | 15 tooth spline 16/32 pitch (ANSI A92.1 1970 - Class 5) | 404 [3575] | |
| T1 | Ø 25.4 mm [1 in] 1:8 taper (SAE J501) | 362 [3200] | |

1. See *Input shaft torque ratings*, page 18 for an explanation of maximum torque.

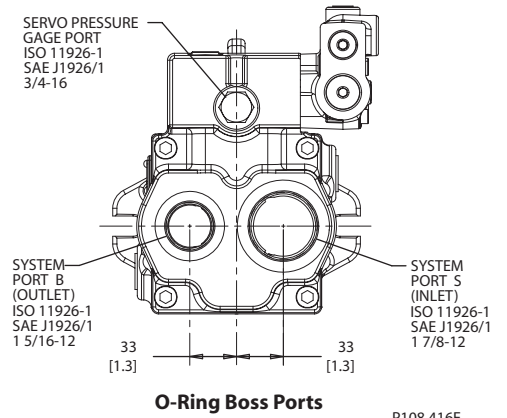
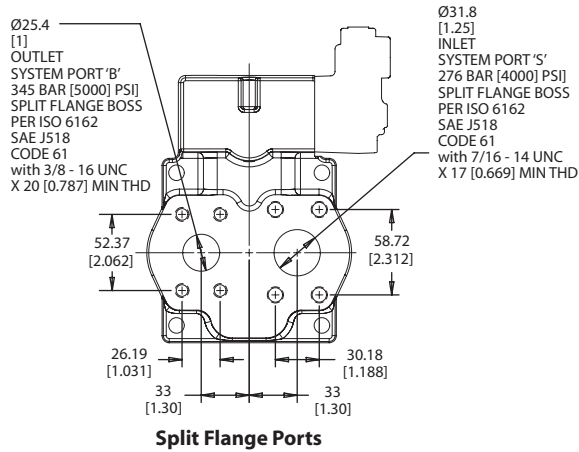
**input shafts
 (continued)**

| Code | Description | Maximum torque rating ¹ N•m [lbf•in] | Drawing |
|------|---|--|--|
| K1 | Ø 22.23 mm [0.875 in] 33 mm [1.3 in] | 305 [2700] |  <p>P101 997E</p> |
| K2 | Ø 22.23 mm [0.875 in] 63 mm [2.48 in] long | 305 [2700] |  <p>P101 998E</p> |

1. See *Input shaft torque ratings*, page 18 for an explanation of maximum torque.

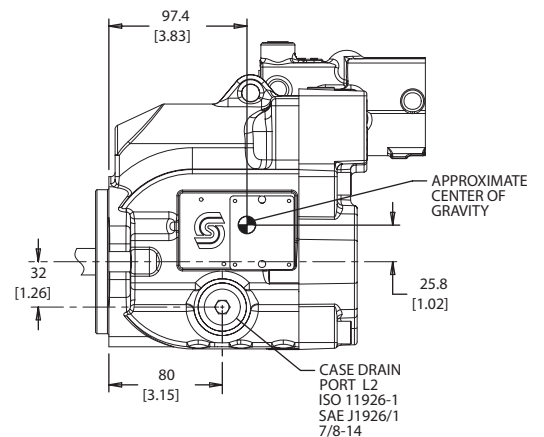
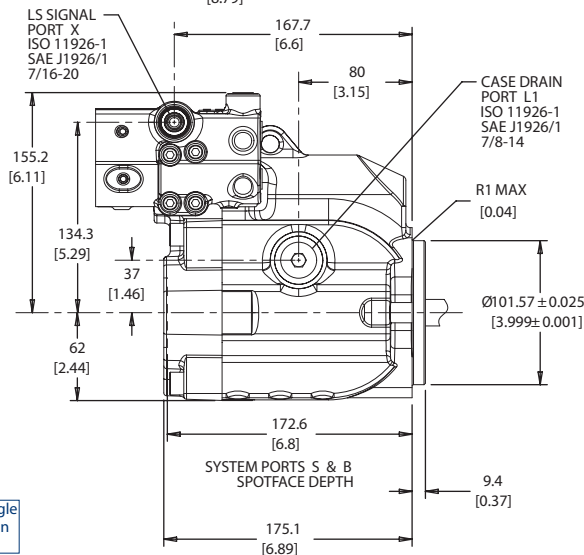
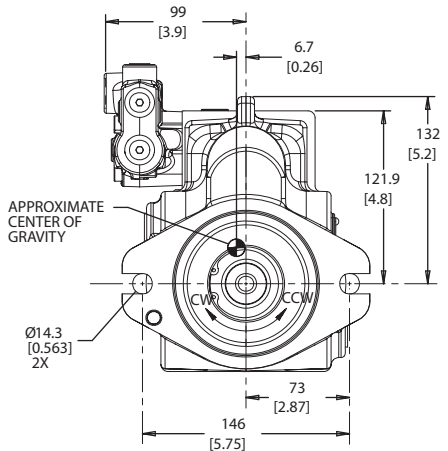
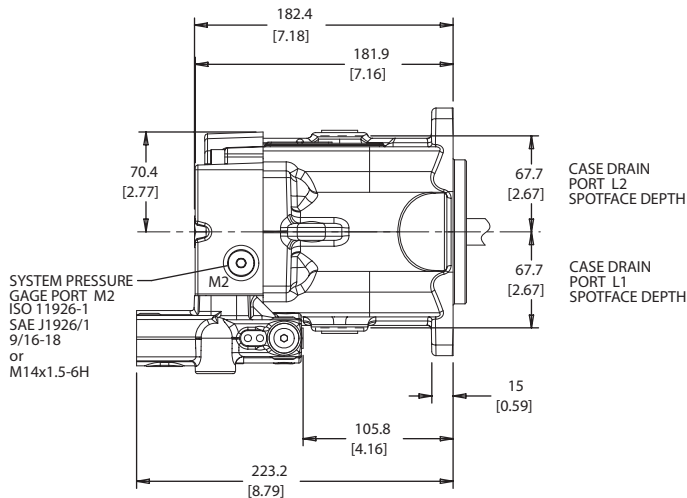
Installation drawings

Axial Ported Endcap



P108 416E

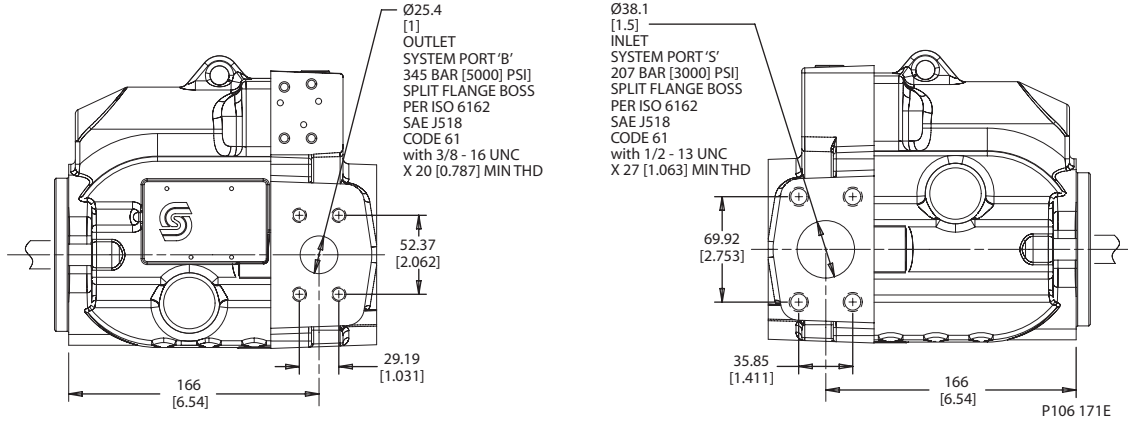
Axial Ported Endcap Installation Dimensions



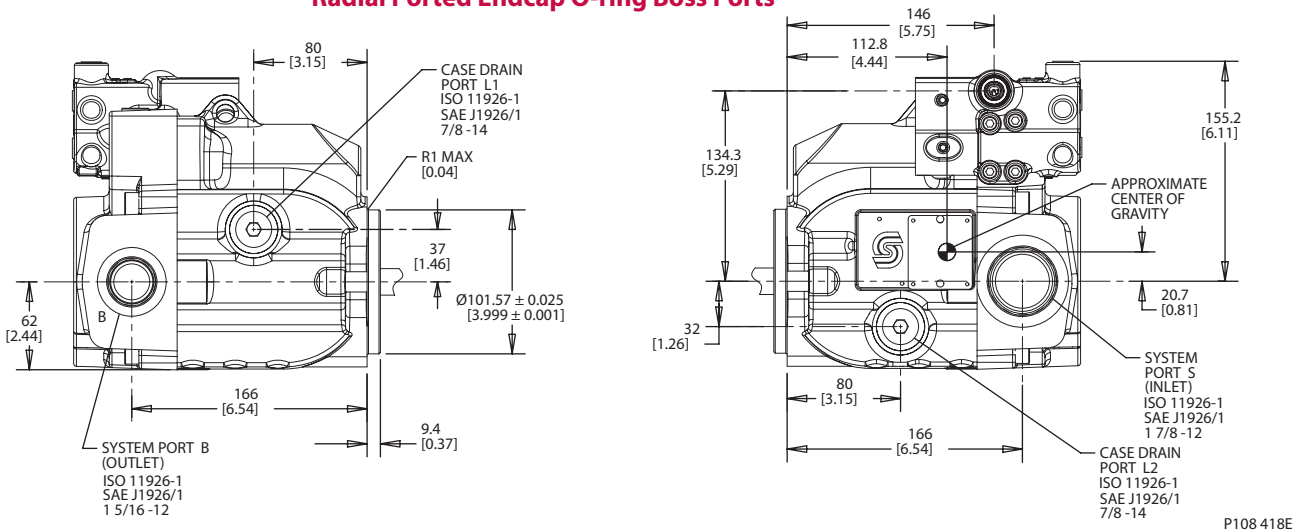
P106170E

**Installation drawings
(continued)**

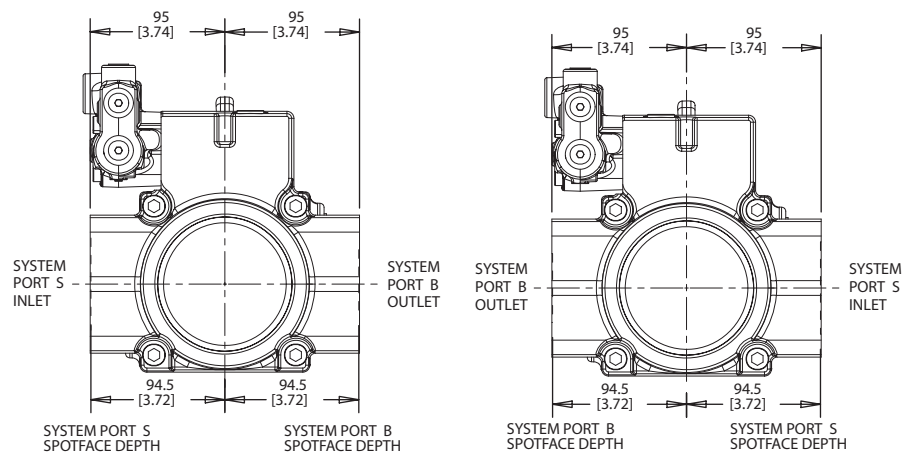
Radial Ported Endcap Split Flange Ports



Radial Ported Endcap O-ring Boss Ports



Radial Ported Endcap Rear View



Right Hand Rotation (CW)

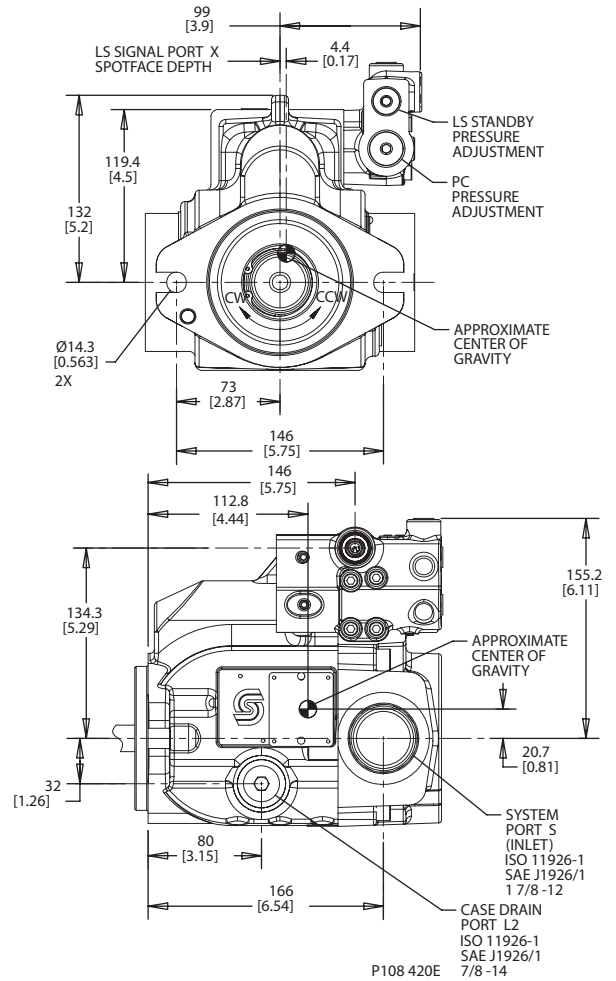
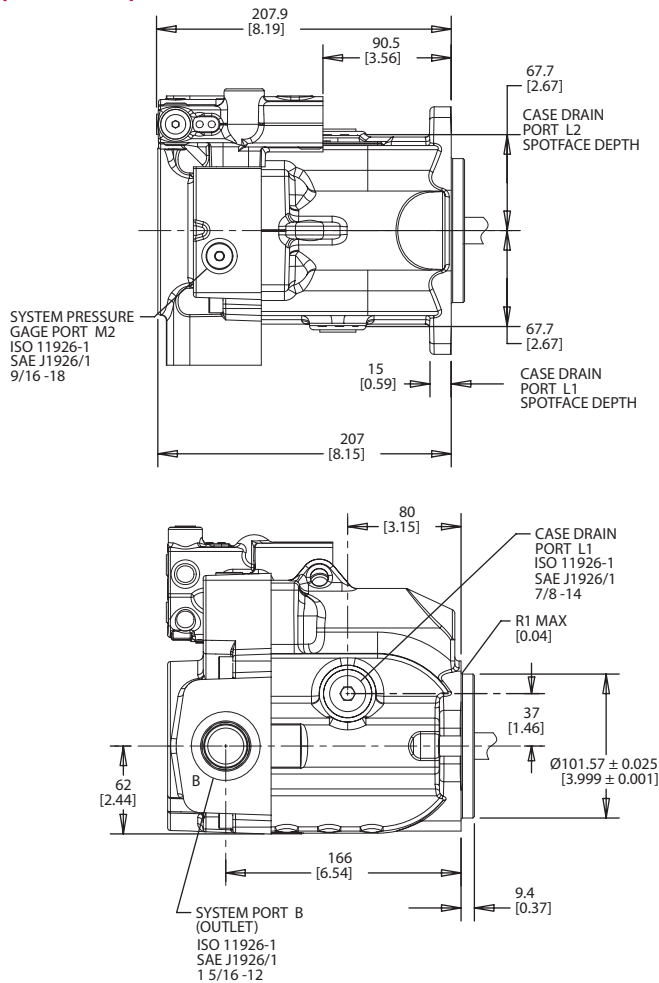
Left Hand Rotation (CCW)

P108 419E

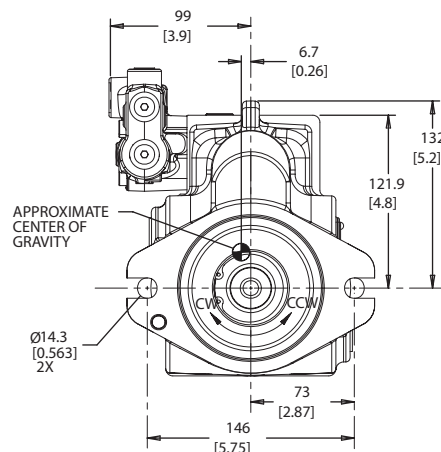


**Installation drawings
(continued)**

Radial Ported Endcap Installation Dimensions



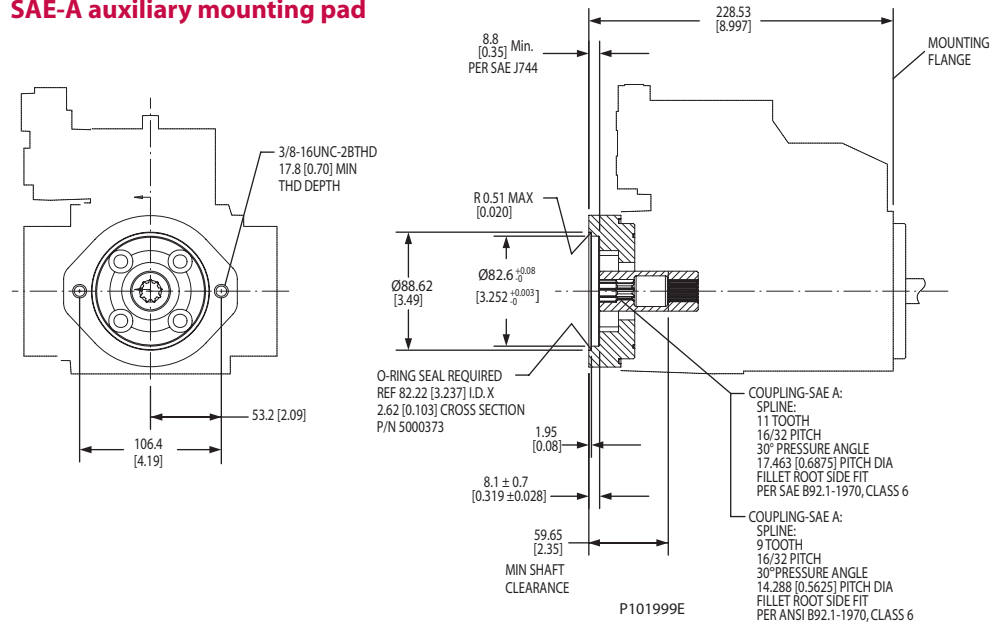
Front Mounting Flange - SAE-B two bolt



P108 421E

Installation drawings
 (continued)

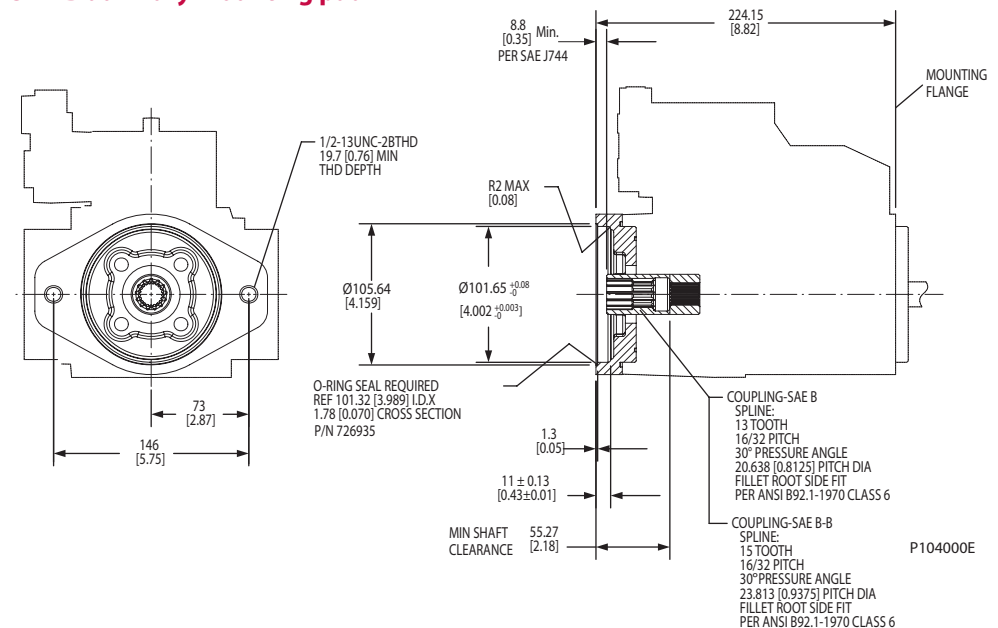
SAE-A auxiliary mounting pad



Specifications

| Coupling | 9-tooth | 11-tooth |
|---------------------------|----------------------|-----------------------|
| Spline minimum engagement | 12.6 mm [0.50 in] | 13.5 mm [0.53 in] |
| Maximum torque | 107 N•m [950 lbf•in] | 147 N•m [1300 lbf•in] |

SAE-B auxiliary mounting pad

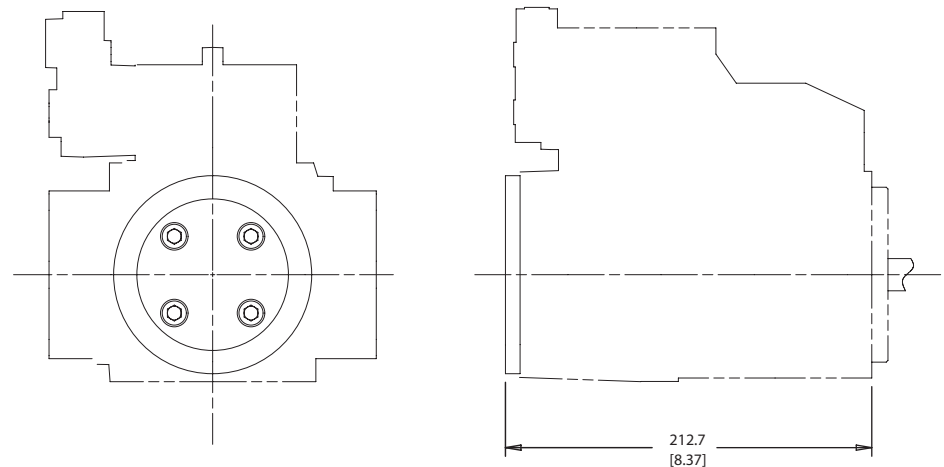


Specifications

| Coupling | 13-tooth | 15-tooth |
|---------------------------|-----------------------|-----------------------|
| Spline minimum engagement | 13.2 mm [0.52 in] | 16.1 mm [0.63 in] |
| Maximum torque | 171 N•m [1512 lbf•in] | 171 N•m [1512 lbf•in] |

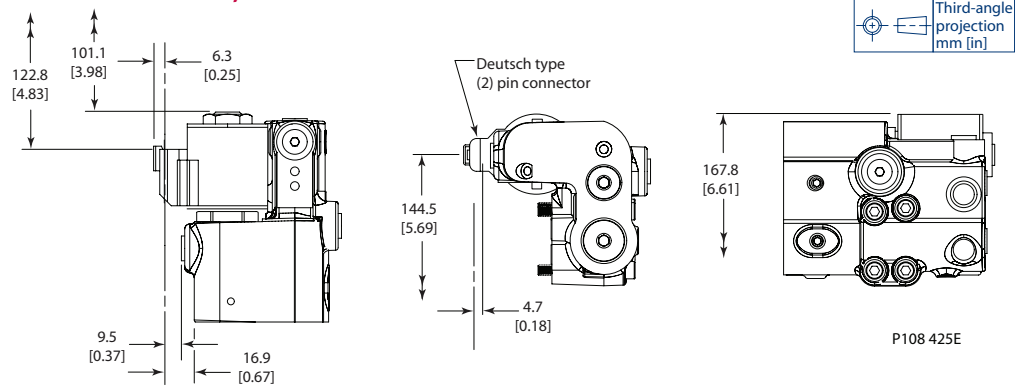
Installation drawings
 (continued)

Auxiliary Mounting Pad - Running Cover



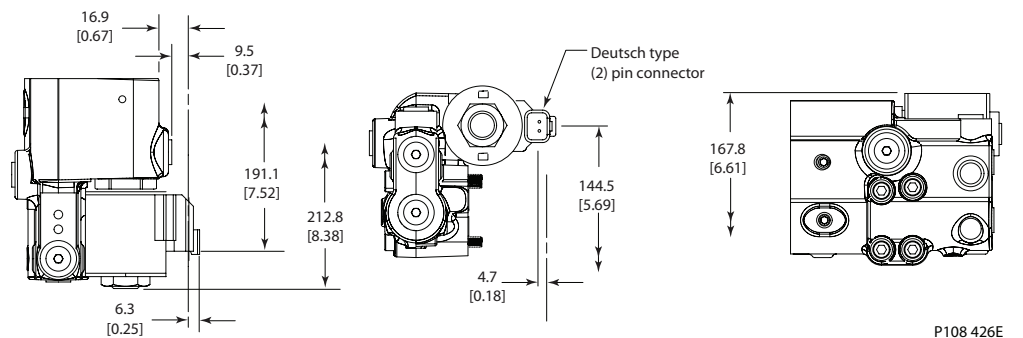
P106 077E

Electric Solenoid, Left Side



P108 425E

Electric Solenoid, Right Side



P108 426E

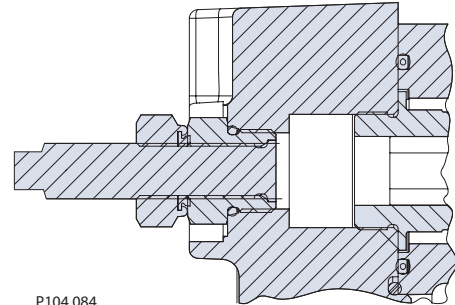
Displacement limiter

L and K Frame open circuit pumps are available with an optional adjustable displacement limiter. This adjustable stop limits the pump's maximum displacement.

Setting range

| | |
|-------------|--|
| L25C | 0 to 25 cm ³ [0 to 1.53 in ³] |
| L30D | 0 to 30 cm ³ [0 to 1.83 in ³] |
| K38C | 0 to 38 cm ³ [0 to 2.32 in ³] |
| K45D | 0 to 45 cm ³ [0 to 2.75 in ³] |

Cross-Section

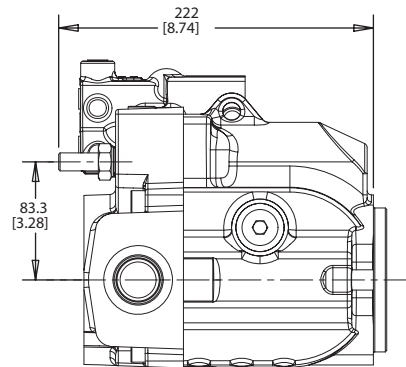


P104 084

Displacement per turn

| | |
|-------------|---|
| L25C | 1.20 cm ³ /rev [0.07 in ³ /rev] |
| L30D | 1.43 cm ³ /rev [0.09 in ³ /rev] |
| K38C | 1.81 cm ³ /rev [0.11 in ³ /rev] |
| K45D | 2.15 cm ³ /rev [0.13 in ³ /rev] |

Installation Dimensions



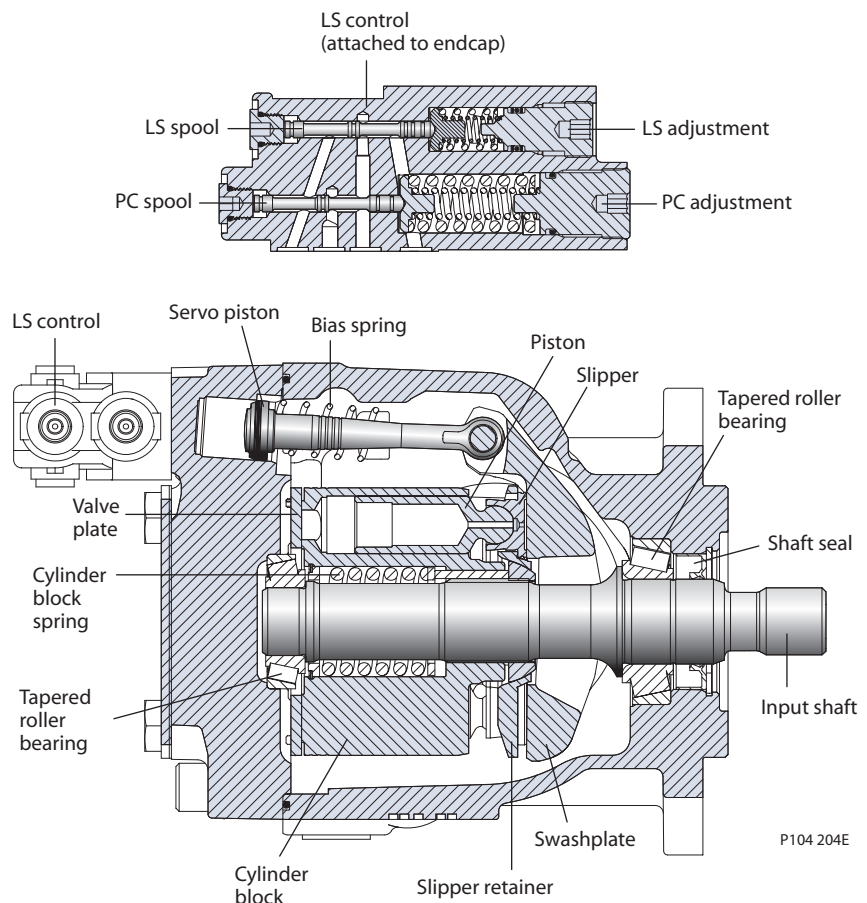
P104 065E

Design

Series 45 Frame J pumps have a single servo piston design with a cradle-type swashplate set in polymer-coated journal bearings. A bias spring and internal forces increase swashplate angle. The servo piston decreases swashplate angle. Nine reciprocating pistons displace fluid from the pump inlet to the pump outlet as the cylinder block rotates on the pump input shaft. The block spring holds the piston slippers to the swashplate via the slipper retainer. The cylinder block rides on a bi-metal valve plate optimized for high volumetric efficiency and low noise. Tapered roller bearings support the input shaft and a viton lip-seal protects against shaft leaks.

An adjustable one spool (PC only, not shown) or two spool (LS and PC) control senses system pressure and load pressure (LS controls). The control ports system pressure to the servo piston to control pump output flow.

Frame J cross section



Technical Specifications

For general operating parameters, including fluid viscosity, temperature, and inlet and case pressures, *see page 13*. For system design parameters, including installation, filtration, reservoir, and line velocities, *see page 15*.

For definitions of pressure and speed ratings, *see page 14*. For more information on external shaft loads, *see page 16*; mounting flange loads, *see page 17*.

| | | J Frame | | | | | |
|---|---|---|--|-------------------|-------------------|-------------------|-------------------|
| | | Unit | 045B | 051B | 060B | 065C | 075C |
| Maximum Displacement | | cm ³ [in ³] | 45 [2.75] | 51 [3.11] | 60 [3.66] | 65 [3.97] | 75 [4.58] |
| Working Input Speed | Minimum | min ⁻¹ (rpm) | 500 | 500 | 500 | 500 | 500 |
| | Continuous | | 2800 | 2700 | 2600 | 2500 | 2400 |
| | Maximum | | 3360 | 3240 | 3120 | 3000 | 2880 |
| Working Pressure | Maximum | bar [psi] | 310 [4495] | 310 [4495] | 310 [4495] | 260 [3770] | 260 [3370] |
| Flow at rated speed (theoretical) | | l/min [US gal/min] | 126 [33.3] | 138 [36.4] | 156 [41.2] | 163 [42.9] | 180 [47.6] |
| Input torque at maximum displacement (theoretical) at 49° C [120°F] | | N·m/bar [lbf·in/1000 psi] | 0.717 [437.4] | 0.812 [495.7] | 0.955 [583.2] | 1.035 [631.8] | 1.194 [729] |
| Mass moment of inertia of internal rotating components | | kg·m ² [slug·ft ²] | 0.00455 [0.00336] | 0.00455 [0.00336] | 0.00455 [0.00336] | 0.00433 [0.00319] | 0.00433 [0.00319] |
| Weight | Axial ports | kg [lb] | 23 [51] | | | | |
| | Radial ports | | 27 [59] | | | | |
| External Shaft Loads | External moment (M _e) | N·m [lbf·in] | 226 [2000] | 226 [2000] | 226 [2000] | 226 [2000] | 226 [2000] |
| | Thrust in (T _{in}), out (T _{out}) | N [lbf] | 2200 [495] | 2200 [495] | 2200 [495] | 2200 [495] | 2200 [495] |
| Bearing Life (1800 rpm, no external shaft loading) | at 140 bar [2030 psi] | B ₁₀ hours | 29712 | 29712 | 29712 | 10755 | 10755 |
| | at 210 bar [3045 psi] | | 6834 | 6834 | 6834 | 2474 | 2474 |
| | at 260 bar [3770 psi] | | 3151 | 3151 | 3151 | 1810 | 1810 |
| | at 310 bar [4495 psi] | | 1666 | 1666 | 1666 | – | – |
| Mounting flange load moments | Vibratory (continuous) | N·m [lbf·in] | SAE-C: 1500 [13300], SAE-B: 735 [6600] | | | | |
| | Shock (maximum) | | SAE-C: 5600 [49600], SAE-B: 2600 [23100] | | | | |

Order code

| | | | | | | | | | | | | | |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| R | S | P | C | D | E | F | G | H | J | K | L | M | N |
| <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |

Code description

| Code | Description |
|------|--|
| R | Product Frame, Variable Open Circuit Pump |
| S | Rotation |
| P | Displacement |
| C | Control Type |
| D | Pressure Compensator Setting |
| E | Load Sense Setting |
| F | Not Used |
| G | Choke Orifice |
| H | Gain Orifice |
| J | Input Shaft/Auxiliary Mount/Endcap |
| K | Shaft Seal/Front Mounting Flange/Housing Ports |
| L | Displacement Limiter |
| M | Special Hardware |
| N | Special Features |

Order code (continued)

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| R | S | P | C | D | E | F | G | H | J | K | L | M | N |
| | | | | | | | | | | | | | |

R Product

| | | J Frame | | | | |
|----|--|---------|------|------|------|------|
| | | 045B | 051B | 060B | 065C | 075C |
| JR | J Frame, variable displacement open circuit pump | • | • | • | • | • |

S Rotation

| | | 045B | 051B | 060B | 065C | 075C |
|---|------------------------------|------|------|------|------|------|
| L | Left Hand (counterclockwise) | • | • | • | • | • |
| R | Right Hand (clockwise) | • | • | • | • | • |

P Displacement

| | | 045B | 051B | 060B | 065C | 075C |
|------|--|------|------|------|------|------|
| 045B | 045 cm ³ /rev [2.75 in ³ /rev] | • | | | | |
| 051B | 051 cm ³ /rev [3.11 in ³ /rev] | | • | | | |
| 060B | 060 cm ³ /rev [3.66 in ³ /rev] | | | • | | |
| 065C | 065 cm ³ /rev [3.97 in ³ /rev] | | | | • | |
| 075C | 075 cm ³ /rev [4.58 in ³ /rev] | | | | | • |

C Control type

| | | J Frame | | | | |
|-----|--|---------|------|------|------|------|
| | | 045B | 051B | 060B | 065C | 075C |
| PC | Pressure Compensator | • | • | • | • | • |
| BC* | Pressure Compensator | • | • | • | | |
| LB | Load Sensing/Pressure Comp. with internal bleed orifice | • | • | • | • | • |
| BB* | Load Sensing/Pressure Comp. with internal bleed orifice | • | • | • | | |
| LS | Load Sensing/Pressure Comp. | • | • | • | • | • |
| BS* | Load Sensing/Pressure Comp. | • | • | • | | |
| FA | Load Sensing/Pressure Comp. with electric dump valve (Axial endcap, CW rotation) or (Radial endcap, CCW rotation) only | • | • | • | • | • |
| FB | Load Sensing/Pressure Comp. with electric dump valve (Axial endcap, CCW rotation) or (Radial endcap, CW rotation) only | • | • | • | • | • |
| RP | Remote Pressure Compensator | • | • | • | • | • |
| BP* | Remote Pressure Compensator | • | • | • | | |
| AF | Electric on/off, 12VDC, Normally Open, Deutsch (Axial endcap, CCW rotation) or (Radial endcap, CW rotation) only | • | • | • | • | • |
| BF* | Electric on/off, 12VDC, Normally Open, Deutsch (Axial endcap, CCW rotation) or (Radial endcap, CW rotation) only | • | • | • | | |
| AN | Electric on/off, 12VDC, Normally Open, Deutsch (Axial endcap, CW rotation) or (Radial endcap, CCW rotation) only | • | • | • | • | • |
| BN* | Electric on/off, 12VDC, Normally Open, Deutsch (Axial endcap, CW rotation) or (Radial endcap, CCW rotation) only | • | • | • | | |
| AG | Electric on/off, 12VDC, Normally Closed, Deutsch (Axial endcap, CCW rotation) or (Radial endcap, CW rotation) only | • | • | • | • | • |
| BE* | Electric on/off, 12VDC, Normally Closed, Deutsch (Axial endcap, CCW rotation) or (Radial endcap, CW rotation) only | • | • | • | | |
| AR | Electric on/off, 12VDC, Normally Closed, Deutsch (Axial endcap, CW rotation) or (Radial endcap, CCW rotation) only | • | • | • | • | • |
| BR* | Electric on/off, 12VDC, Normally Closed, Deutsch (Axial endcap, CW rotation) or (Radial endcap, CCW rotation) only | • | • | • | | |
| AY | Electric on/off, 24VDC, Normally Closed, Deutsch (Axial endcap, CCW rotation) or (Radial endcap, CW rotation) only | • | • | • | • | • |
| BG* | Electric on/off, 24VDC, Normally Closed, Deutsch (Axial endcap, CCW rotation) or (Radial endcap, CW rotation) only | • | • | • | | |
| CR | Electric on/off, 24VDC, Normally Closed, Deutsch (Axial endcap, CW rotation) or (Radial endcap, CCW rotation) only | • | • | • | • | • |
| DR* | Electric on/off, 24VDC, Normally Closed, Deutsch (Axial endcap, CW rotation) or (Radial endcap, CCW rotation) only | • | • | • | | |

* Not available on 65cc and 75cc pumps

Order code (continued)

| | | | | | | | | | | | | | |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| R | S | P | C | D | E | F | G | H | J | K | L | M | N |
| <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |

D *PC setting (2 digit code, 10 bar increments)*

| | | J Frame | | | | |
|----------------|-----------------------------------|---------|------|------|------|------|
| | | 045B | 051B | 060B | 065C | 075C |
| Example | 25 = 250 bar (3625 psi) | | | | | |
| 10-26 | 100 to 260 bar [1450 to 3771 psi] | . | . | . | . | . |
| 27-28 | 270 to 280 bar [3916 to 4061 psi] | . | . | . | | |
| 29-31 | 290-310 bar [4206 to 4496 psi] | . | . | . | | |

E *Load sensing setting (2 digit code, 1 bar increments)*

| | | | | | | |
|----------------|---|---|---|---|---|---|
| Example | 20 = 20 bar (290 psi) | | | | | |
| 10-40 | 10 to 40 bar [175 to 580 psi] | . | . | . | . | . |
| NN | Not applicable (pressure compensated only controls) | . | . | . | . | . |

F *Not used*

| | | | | | | |
|-----------|----------------|---|---|---|---|---|
| NN | Not applicable | . | . | . | . | . |
|-----------|----------------|---|---|---|---|---|

G *Pilot/Choke Orifice*

| | | | | | | |
|----------|-----------------|---|---|---|---|---|
| N | None (standard) | . | . | . | . | . |
|----------|-----------------|---|---|---|---|---|

H *Gain Orifice*

| | | | | | | |
|----------|-----------------|---|---|---|---|---|
| 3 | 1.0 mm diameter | . | . | . | . | . |
|----------|-----------------|---|---|---|---|---|

Order code (continued)



| J Input Shaft | |
|---------------|--------------------------|
| C2 | 13 tooth, 16/32 pitch |
| C3 | 15 tooth, 16/32 pitch |
| K4 | 1.25 inch straight keyed |
| S1 | 14 tooth 12/24 pitch |
| T0 | 1.25 Inch Taper |

Auxiliary Mount/Endcap Style

| Auxiliary Description | Endcap Style | Inlet Porting | Outlet Porting | Endcap Description | Code |
|-----------------------|--------------|---------------|----------------|--|------|
| None | Axial | O-Ring Boss | O-Ring Boss | Inlet - SAE O-Ring boss port (1.875 inch threads) Outlet - SAE O-Ring boss port (1.3125 inch threads) | N3 |
| None | Axial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2 inch port 0.5 inch threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port 0.375 inch threads) | N4 |
| None | Axial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2 inch port 0.5 inch threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port 0.375 inch threads), w/ Disp.Limiter | NW |
| None | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2 inch port 0.5 inch threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port 0.375 inch threads) | N2 |
| None | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2 inch port 0.5 inch threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port 0.375 inch threads) | N5 |
| Running Cover | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2 inch port 0.5 inch threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port 0.375 inch threads) | R2 |
| Running Cover | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2 inch port 0.5 inch threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port 0.375 inch threads), w/ Disp.Limiter | RV |
| SAE-A, 11 teeth | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2 inch port 0.5 inch threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port 0.375 inch threads) | T2 |
| SAE-A, 11 teeth | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2 inch port 0.5 inch threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port 0.375 inch threads) with integral SAE "A" Aux. pad (0.375 inch threads) | TA |
| SAE-A, 11 teeth | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2 inch port 0.5 inch threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port 0.375 inch threads) with displacement limiter | TV |
| SAE-A, 11 teeth | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2 inch port M12 threads) Outlet - Code 62 Split Flange Port 4 Bolt (1 inch port M10 threads) with integral SAE "A" Aux. pad (0.375 inch threads) | TM |
| SAE-A, 9 teeth | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2 inch port 0.5 inch threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port 0.375 inch threads) | A2 |
| SAE-A, 9 teeth | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2 inch port 0.5 inch threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port 0.375 inch threads) with integral SAE "A" Aux. pad (0.375 inch threads) | AA |
| SAE-A, 9 teeth | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2 inch port 0.5 inch threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port 0.375 inch threads) with integral SAE "A" Aux. pad (0.375 inch threads) | AV |
| SAE-A, 9 teeth | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2 inch port M12 threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port M10 threads) | A5 |
| SAE-B, 13 teeth | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2 inch port 0.5 inch threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port 0.375 inch threads) | B2 |
| SAE-B, 13 teeth | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2 inch port 0.5 inch threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port 0.375 inch threads), w/ Disp.Limiter | BV |
| SAE-B, 13 teeth | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2 inch port M12 threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port M10 threads) | B5 |
| SAE-BB, 15 teeth | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2 inch port 0.5 inch threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port 0.375 inch threads) | V2 |
| SAE-BB, 15 teeth | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2 inch port 0.5 inch threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port 0.375 inch threads), w/ Disp.Limiter | VV |
| SAE-BB, 15 teeth | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2 inch port M12 threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port M10 threads) | V5 |
| SAE-C, 14 teeth | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2 inch port 0.5 inch threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port 0.375 inch threads) | C2 |
| SAE-C, 14 teeth | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2 inch port 0.5 inch threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port 0.375 inch threads), w/ Disp.Limiter | CV |
| SAE-C, 14 teeth | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2 inch port M12 threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port M10 threads) | C5 |

Order code (continued)

| | | | | | | | | | | | | | |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| R | S | P | C | D | E | F | G | H | J | K | L | M | N |
| <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |

J Input Shaft/Auxiliary Mount/Endcap

Available Combinations

| | J Frame | | | | |
|--------|---------|------|------|------|------|
| | 045B | 051B | 060B | 065C | 075C |
| C2A2* | . | . | . | . | . |
| C2AA* | . | . | . | . | . |
| C2B2* | . | . | . | . | . |
| C2C2* | . | . | . | . | . |
| C2N2* | . | . | . | . | . |
| C2N3* | . | . | . | . | . |
| C2N4* | . | . | . | . | . |
| C2NW** | . | . | . | . | . |
| C2R2* | . | . | . | . | . |
| C2RV** | . | . | . | . | . |
| C2RV* | . | . | . | . | . |
| C3A2* | . | . | . | . | . |
| C3B2* | . | . | . | . | . |
| C3C2* | . | . | . | . | . |
| C3N2* | . | . | . | . | . |
| C3N3* | . | . | . | . | . |
| C3N4* | . | . | . | . | . |
| C3NW** | . | . | . | . | . |
| C3R2* | . | . | . | . | . |
| C3RV** | . | . | . | . | . |
| C3V2* | . | . | . | . | . |
| K4A2* | . | . | . | . | . |
| K4B2* | . | . | . | . | . |
| K4C2* | . | . | . | . | . |
| K4N2* | . | . | . | . | . |

| | J Frame | | | | |
|--------|---------|------|------|------|------|
| | 045B | 051B | 060B | 065C | 075C |
| K4N3* | . | . | . | . | . |
| K4N4* | . | . | . | . | . |
| K4NW** | . | . | . | . | . |
| K4R2* | . | . | . | . | . |
| K4RV** | . | . | . | . | . |
| S1A2* | . | . | . | . | . |
| S1AA* | . | . | . | . | . |
| S1AV** | . | . | . | . | . |
| S1B2* | . | . | . | . | . |
| S1BV** | . | . | . | . | . |
| S1C2* | . | . | . | . | . |
| S1CV** | . | . | . | . | . |
| S1N2* | . | . | . | . | . |
| S1N3* | . | . | . | . | . |
| S1N4* | . | . | . | . | . |
| S1NW** | . | . | . | . | . |
| S1R2* | . | . | . | . | . |
| S1RV** | . | . | . | . | . |
| S1T2* | . | . | . | . | . |
| S1V2* | . | . | . | . | . |
| TOB2* | . | . | . | . | . |
| TOC2* | . | . | . | . | . |
| TON4* | . | . | . | . | . |
| TOR2* | . | . | . | . | . |

* NNN Displacement limiter options only ** FFF Displacement limiter options only

Order code (continued)

| | | | | | | | | | | | | | |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| R | S | P | C | D | E | F | G | H | J | K | L | M | N |
| <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |

| | | J Frame | | | | |
|----------|-------------------|---------|------|------|------|------|
| | | 045B | 061B | 060B | 065C | 075C |
| K | <i>Shaft seal</i> | | | | | |
| A | Single (Viton) | • | • | • | • | • |

| | | 045B | 061B | 060B | 065C | 075C |
|----------|---|------|------|------|------|------|
| K | <i>Mounting flange and housing port style</i> | | | | | |
| 2 | SAE-C Flange 4-bolt/SAE O-ring boss ports | • | • | • | • | • |
| 8 | SAE-B Flange 2-bolt/SAE O-ring boss ports | • | • | • | • | • |
| 9 | SAE-C Flange 2-bolt/SAE O-ring boss ports | • | • | • | • | • |

| | | | | | | |
|----------|-----------------|---|---|---|---|---|
| K | <i>Not used</i> | | | | | |
| N | Not applicable | • | • | • | • | • |

| | | 045B | 061B | 060B | 065C | 075C |
|------------|--------------------------------------|------|------|------|------|------|
| L | <i>Displacement limiter</i> | | | | | |
| NNN | None | • | • | • | • | • |
| FFF | Adjustable, factory set at max angle | • | • | • | • | • |

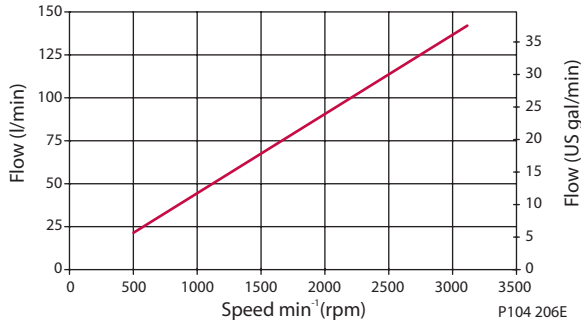
| | | | | | | |
|------------|-------------------------|---|---|---|---|---|
| M | <i>Special hardware</i> | | | | | |
| NNN | None | • | • | • | • | • |

| | | | | | | |
|------------|-------------------------|---|---|---|---|---|
| N | <i>Special features</i> | | | | | |
| NNN | None | • | • | • | • | • |

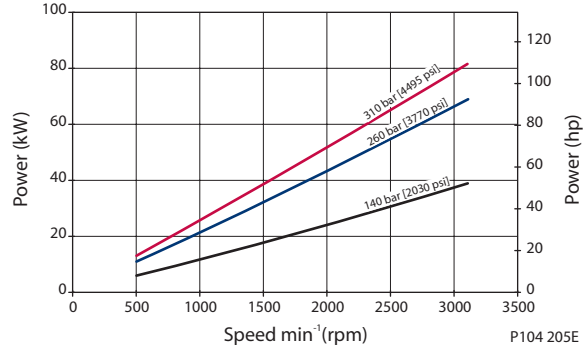
Performance J45B

Flow and power data valid at 49°C [120°F] and viscosity of 17.8 mm²/sec [88 SUS].

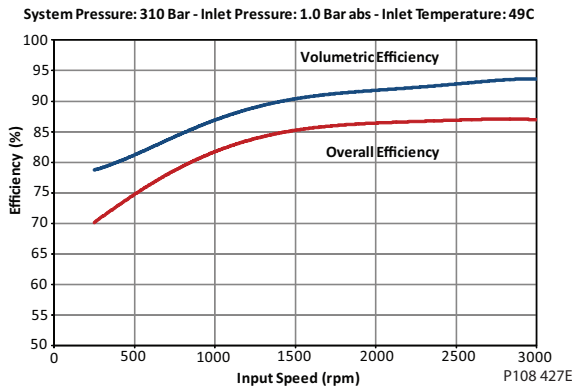
Flow vs. speed



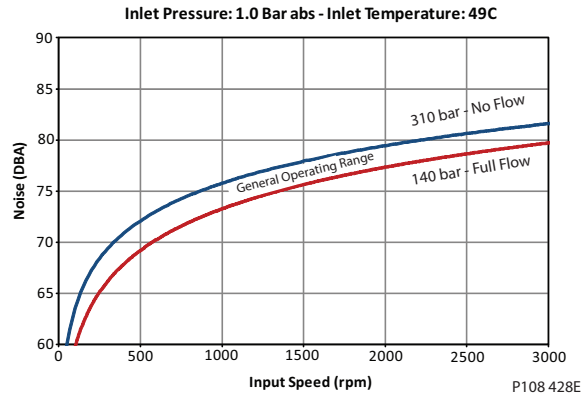
Input power vs. speed



Efficiency

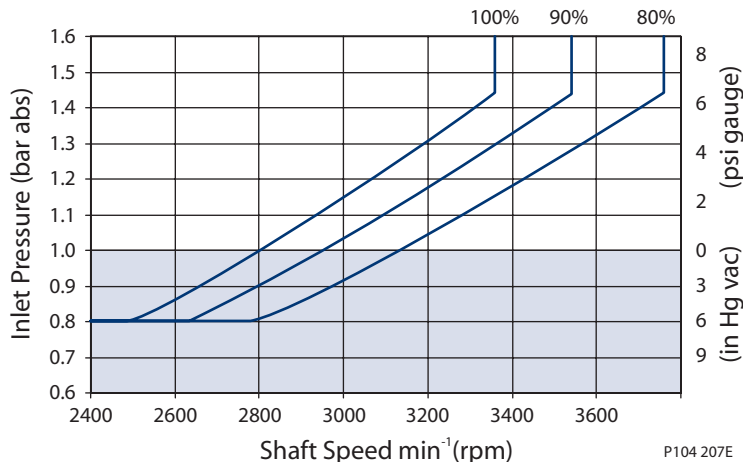


Noise



Inlet pressure vs. speed

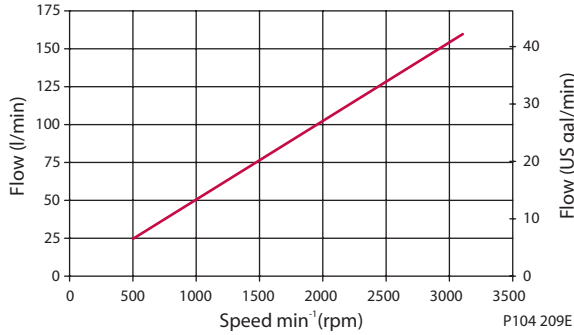
The chart on the right shows allowable inlet pressure and speed at various displacements. Greater speeds and lower inlet pressures are possible at reduced displacement. Operating outside of acceptable limits reduces pump life.



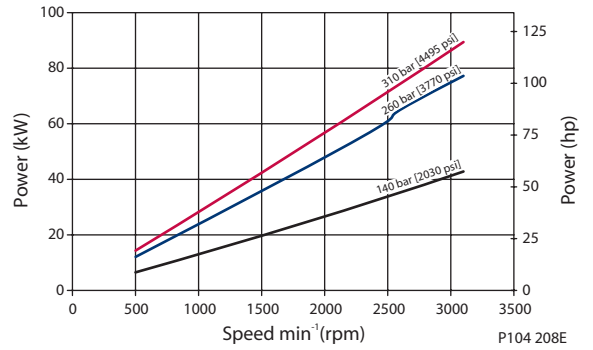
Performance J51B

Flow and power data valid at 49°C [120°F] and viscosity of 17.8 mm²/sec [88 SUS].

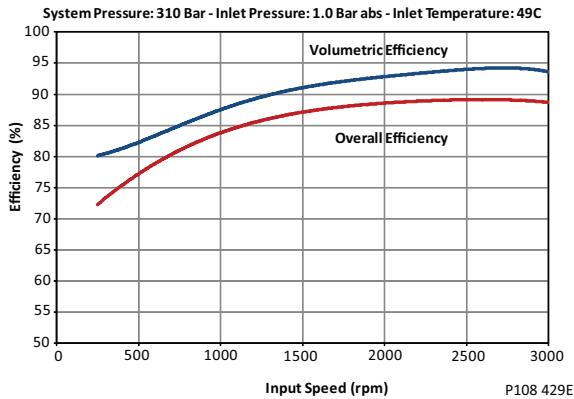
Flow vs. speed



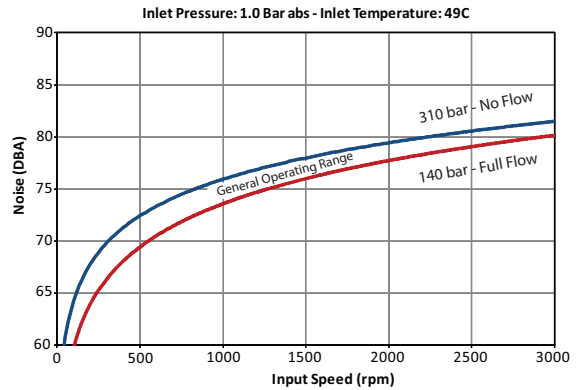
Input power vs. speed



Efficiency

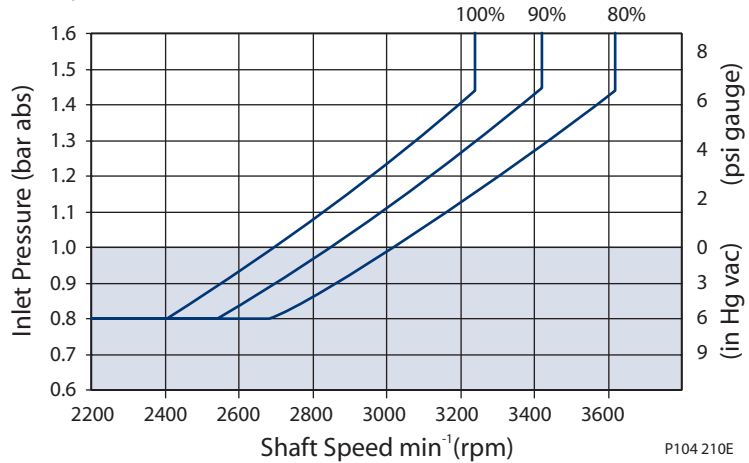


Noise



The chart on the right shows allowable inlet pressure and speed at various displacements. Greater speeds and lower inlet pressures are possible at reduced displacement. Operating outside of acceptable limits reduces pump life.

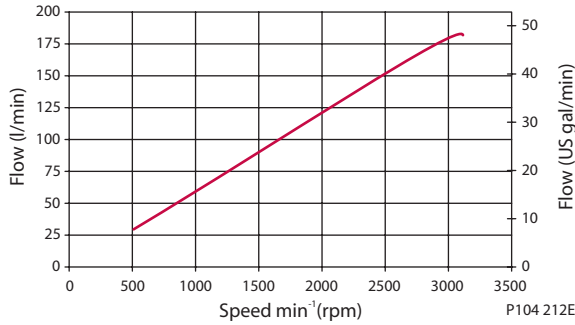
Inlet pressure vs. speed



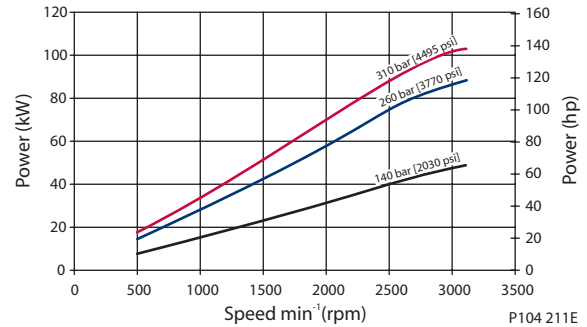
Performance J60B

Flow and power data valid at 49°C [120°F] and viscosity of 17.8 mm²/sec [88 SUS].

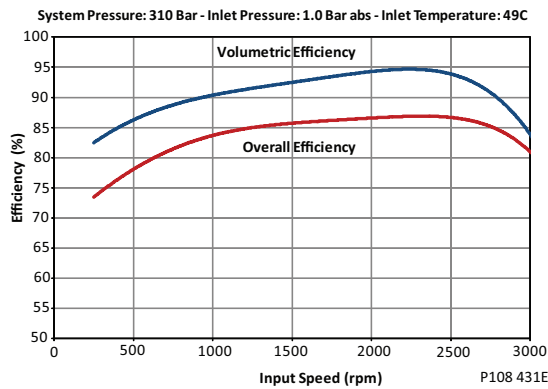
Flow vs. speed



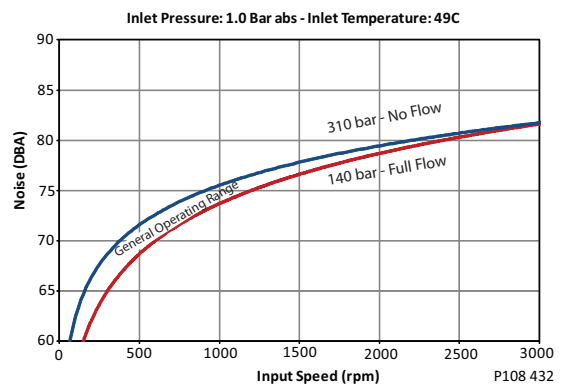
Input power vs. speed



Efficiency

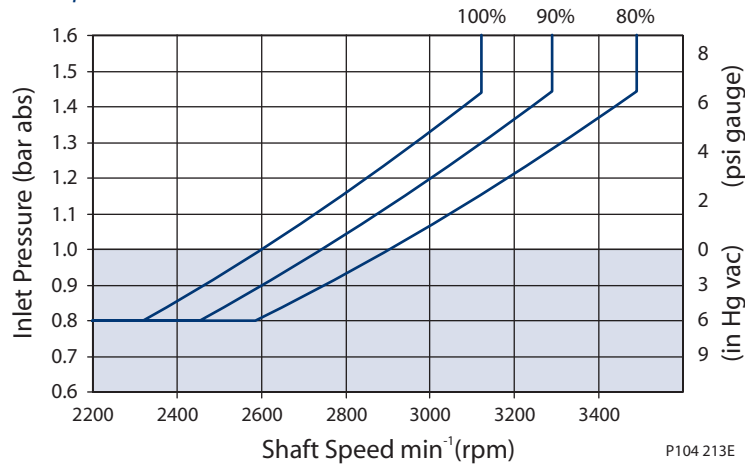


Noise



Inlet pressure vs. speed

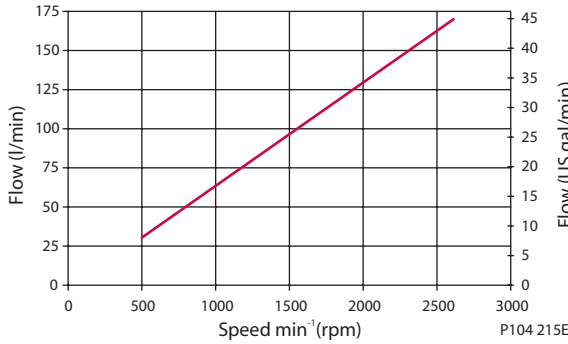
The chart on the right shows allowable inlet pressure and speed at various displacements. Greater speeds and lower inlet pressures are possible at reduced displacement. Operating outside of acceptable limits reduces pump life.



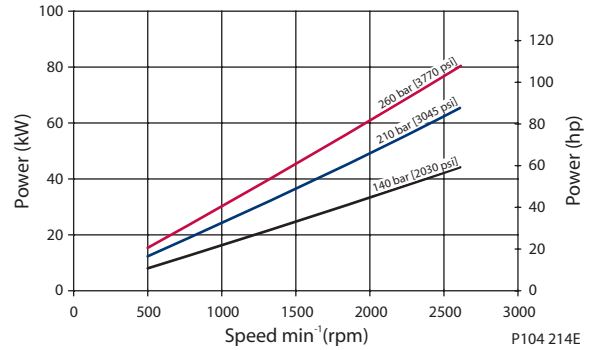
Performance J65C

Flow and power data valid at 49°C [120°F] and viscosity of 17.8 mm²/sec [88 SUS].

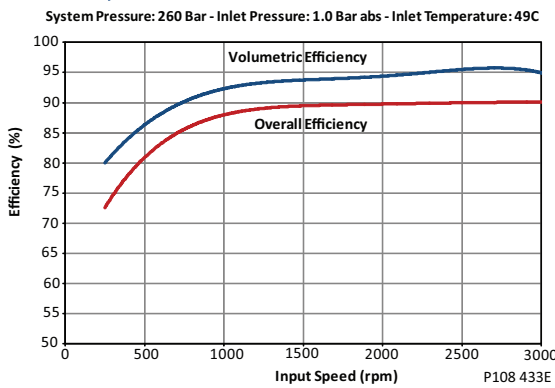
Flow vs. speed



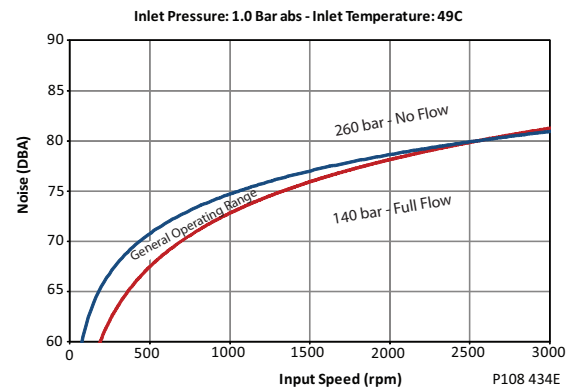
Input power vs. speed



Efficiency

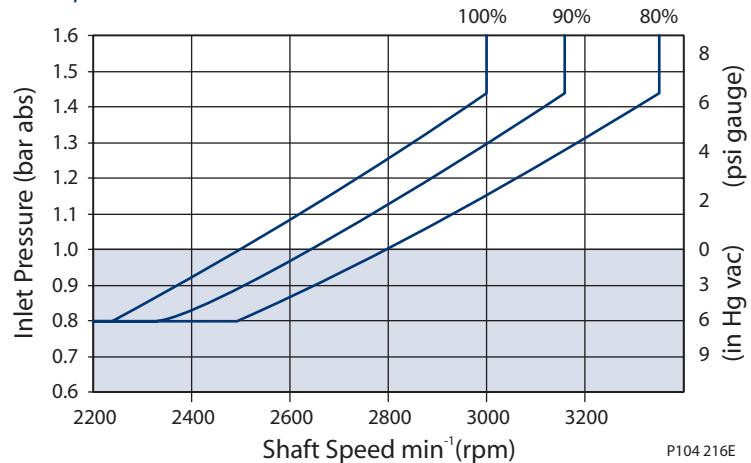


Noise



The chart on the right shows allowable inlet pressure and speed at various displacements. Greater speeds and lower inlet pressures are possible at reduced displacement. Operating outside of acceptable limits reduces pump life.

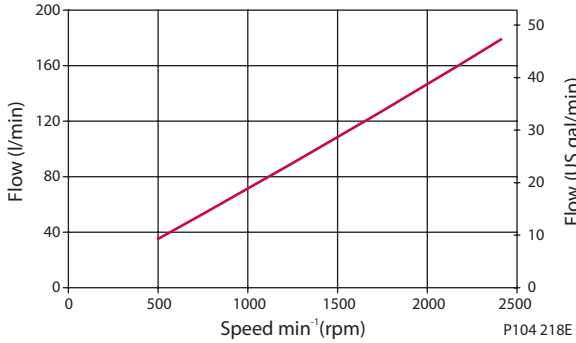
Inlet pressure vs. speed



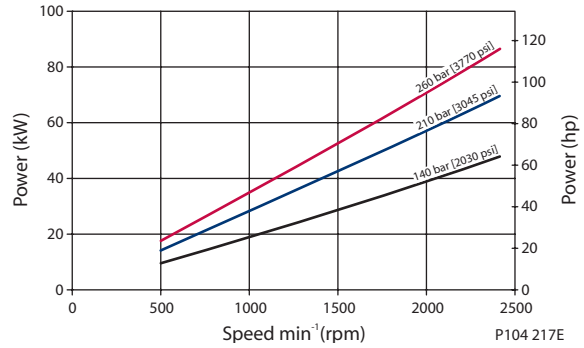
Performance J75C

Flow and power data valid at 49°C [120°F] and viscosity of 17.8 mm²/sec [88 SUS].

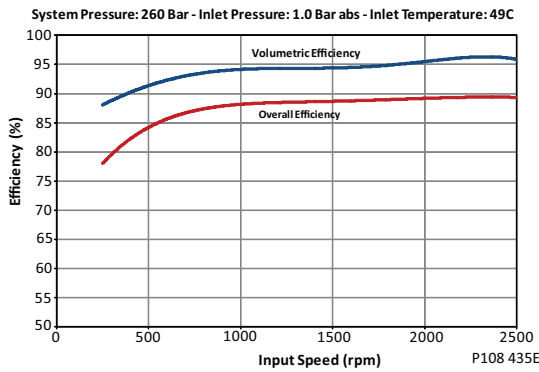
Flow vs. speed



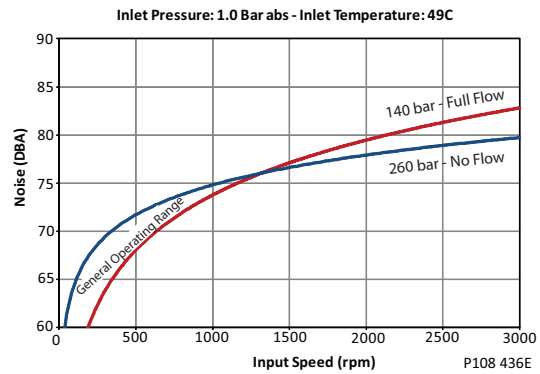
Input power vs. speed



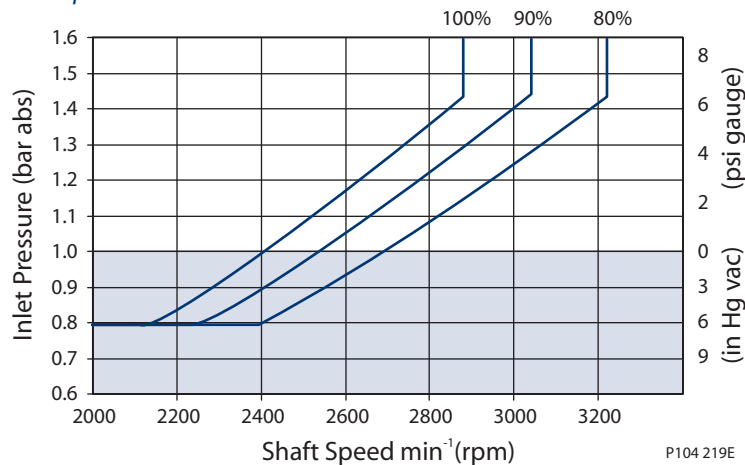
Efficiency



Noise



Inlet pressure vs. speed



The chart on the right shows allowable inlet pressure and speed at various displacements. Greater speeds and lower inlet pressures are possible at reduced displacement. Operating outside of acceptable limits reduces pump life.

Pressure Compensated Controls

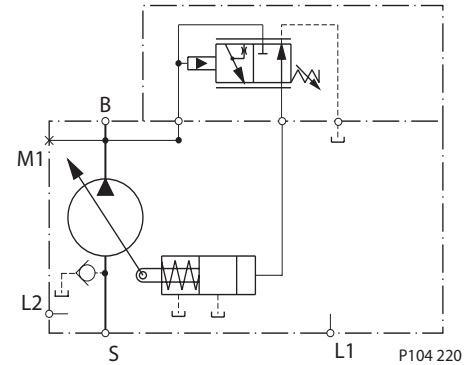
*Response/Recovery Times**

| (ms) | Response | Recovery |
|-------------|----------|----------|
| J45B | 33 | 140 |
| J51B | 33 | 150 |
| J60B | 39 | 170 |
| J65B | 45 | 140 |
| J75B | 45 | 150 |

PC Setting range

| Model | PC | BC |
|-------------|--------------------------------|--------------------------------|
| J45B | 100-280 bar [1450-4060 psi] | 290-310 bar [4205-4495 psi] |
| J51B | 100-280 bar [1450-4060 psi] | 290-310 bar [4205-4495 psi] |
| J60B | 100-280 bar [1450-4060 psi] | 290-310 bar [4205-4495 psi] |
| J65C | 100-260 bar [1450-3770 bar] | N/A |
| J75C | 100-260 bar [1450-3770 bar] | N/A |

Schematic



Legend

- B = Outlet
- S = Inlet
- L1, L2 = Case drain
- M1* = System pressure gauge port
- * M1 port is available on axially ported endcaps only

Remote Pressure Compensated Controls

Remote Pressure Compensated Controls

*Response/Recovery Times**

| (ms) | Response | Recovery |
|-------------|----------|----------|
| J45B | 33 | 140 |
| J51B | 33 | 150 |
| J60B | 39 | 170 |
| J65B | 45 | 140 |
| J75B | 45 | 150 |

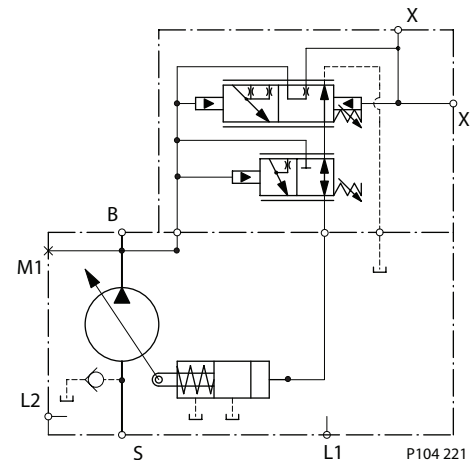
PC Setting Range

| Model | RP | BP |
|-------------|--------------------------------|--------------------------------|
| J45B | 100-280 bar [1450-4060 psi] | 290-310 bar [4205-4495 psi] |
| J51B | 100-280 bar [1450-4060 psi] | 290-310 bar [4205-4495 psi] |
| J60B | 100-280 bar [1450-4060 psi] | 290-310 bar [4205-4495 psi] |
| J65C | 100-260 bar [1450-3770 bar] | N/A |
| J75C | 100-260 bar [1450-3770 bar] | N/A |

LS Setting range

| Model | bar | psi |
|------------|-------|---------|
| All | 10-40 | 145-580 |

Schematic



Legend

- B = Outlet
- S = Inlet
- L1, L2 = Case drain
- X = Remote PC port
- M1* = System pressure gauge port
- * M1 port is available on axially ported endcaps only

Load sensing/Pressure compensated Controls

*Response/Recovery Times**

| (ms) | Response | Recovery |
|------|----------|----------|
| J45B | 28 | 111 |
| J51B | 30 | 125 |
| J60B | 33 | 140 |
| J65B | 43 | 101 |
| J75B | 45 | 140 |

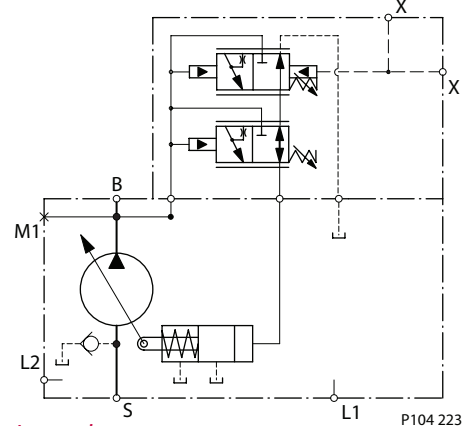
PC control setting range

| Code | LS | BS |
|-------|--------------------------------|--------------------------------|
| J45B | 100-280 bar [1450-4060 psi] | 290-310 bar [4205-4495 psi] |
| J51B | 100-280 bar [1450-4060 psi] | 290-310 bar [4205-4495 psi] |
| J60B | 100-280 bar [1450-4060 psi] | 290-310 bar [4205-4495 psi] |
| J65C, | 100-260 bar [1450-3770 bar] | N/A |
| J75C | 100-260 bar [1450-3770 bar] | N/A |

LS setting range

| Model | bar | psi |
|-------|-------|---------|
| All | 10-40 | 145-580 |

Schematic



Legend

- B = Outlet
- S = Inlet
- L1, L2 = Case drain
- X = LS signal port
- M1* = System pressure gauge port
- * M1 port is available on axially ported endcaps only

Load sensing Control with Bleed Orifice/ Pressure Compensated

*Response/Recovery Times**

| (ms) | Response | Recovery |
|------|----------|----------|
| J45B | 28 | 111 |
| J51B | 30 | 125 |
| J60B | 33 | 140 |
| J65B | 43 | 101 |
| J75B | 45 | 140 |

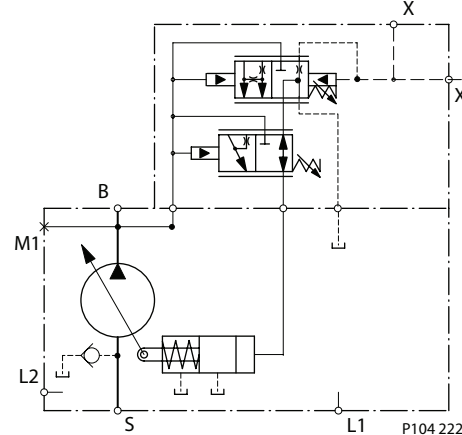
PC control setting range

| Code | LB | BB |
|-------|--------------------------------|--------------------------------|
| J45B | 100-280 bar [1450-4060 psi] | 290-310 bar [4205-4495 psi] |
| J51B | 100-280 bar [1450-4060 psi] | 290-310 bar [4205-4495 psi] |
| J60B | 100-280 bar [1450-4060 psi] | 290-310 bar [4205-4495 psi] |
| J65C, | 100-260 bar [1450-3770 bar] | N/A |
| J75C | 100-260 bar [1450-3770 bar] | N/A |

LS setting range

| Model | bar | psi |
|-------|-------|---------|
| All | 10-40 | 145-580 |

LSBSchematic



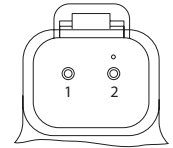
Legend

- B = Outlet
- S = Inlet
- L1, L2 = Case drain
- X = LS signal port
- M1* = System pressure gauge port
- * M1 port is available on axially ported endcaps only

Electric Controls

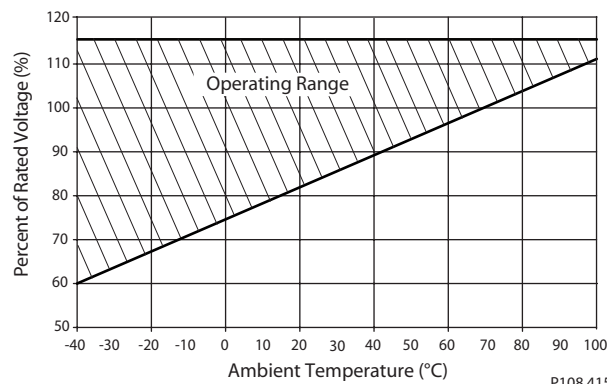
Connectors

| Description | Quantity | Ordering Number |
|------------------------------------|----------|-------------------------|
| Mating Connector | 1 | Deutsch® DT06-2S |
| Wedge Lock | 1 | Deutsch® W25 |
| Socket Contact (16 and 18 AWG) | 2 | Deutsch® 0462-201-16141 |
| Sauer-Danfoss mating connector kit | 1 | K29657 |



P003 480

Continuous Duty Operating Range



P108 415E

Normally Closed on/off Electric Pressure Compensated Controls

*Response/Recovery Times**

| (ms) | Response | Recovery |
|------|----------|----------|
| J45B | 33 | 140 |
| J51B | 33 | 150 |
| J60B | 39 | 170 |
| J65B | 45 | 140 |
| J75B | 45 | 150 |

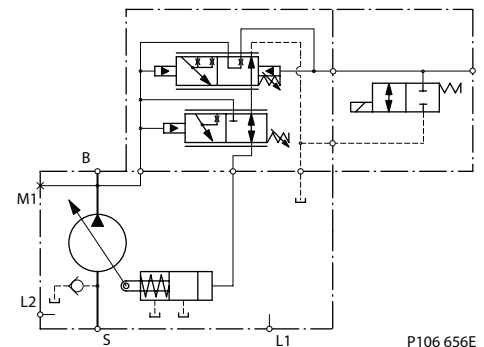
PC control setting range

| Code | AG, AR, AY, CR | BE, BR, BG, DR |
|-------|--------------------------------|--------------------------------|
| J45B | 100-280 bar [1450-4060 psi] | 290-310 bar [4205-4495 psi] |
| J51B | 100-280 bar [1450-4060 psi] | 290-310 bar [4205-4495 psi] |
| J60B | 100-280 bar [1450-4060 psi] | 290-310 bar [4205-4495 psi] |
| J65C, | 100-260 bar [1450-3770 bar] | N/A |
| J75C | 100-260 bar [1450-3770 bar] | N/A |

LS setting range

| Model | bar | psi |
|-------|-------|---------|
| All | 10-40 | 145-580 |

Schematic



P106 656E

Legend

- B = Outlet
- S = Inlet
- L1, L2 = Case drain
- M1* = System pressure gauge port
- * M1 port is available on axially ported endcaps only

**Normally Open on/
 off Electric Pressure
 Compensated Controls**

*Response/Recovery Times**

| (ms) | Response | Recovery |
|------|----------|----------|
| J45B | 33 | 140 |
| J51B | 33 | 150 |
| J60B | 39 | 170 |
| J65B | 45 | 140 |
| J75B | 45 | 150 |

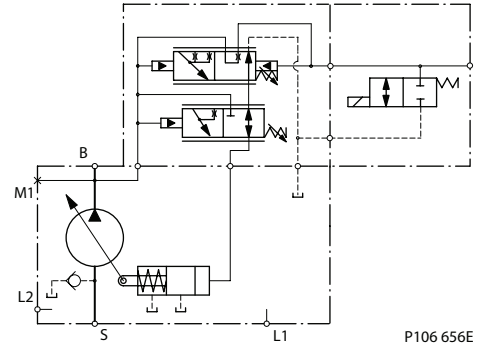
PC control setting range

| Code | AF, AN | BF, BN |
|-------|--------------------------------|--------------------------------|
| J45B | 100-280 bar [1450-4060 psi] | 290-310 bar [4205-4495 psi] |
| J51B | 100-280 bar [1450-4060 psi] | 290-310 bar [4205-4495 psi] |
| J60B | 100-280 bar [1450-4060 psi] | 290-310 bar [4205-4495 psi] |
| J65C, | 100-260 bar [1450-3770 bar] | N/A |
| J75C | 100-260 bar [1450-3770 bar] | N/A |

LS setting range

| Model | bar | psi |
|-------|-------|---------|
| All | 10-40 | 145-580 |

Schematic



Legend

- B = Outlet
- S = Inlet
- L1, L2 = Case drain
- M1* = System pressure gauge port
- * M1 port is available on axially ported endcaps only

**Normally Closed Electric
 Dump Valve PC/LS**

*Response/Recovery Times**

| (ms) | Response | Recovery |
|------|----------|----------|
| J45B | 29 | 127 |
| J51B | 29 | 134 |
| J60B | 31 | 152 |
| J65B | 41 | 116 |
| J75B | 36 | 129 |

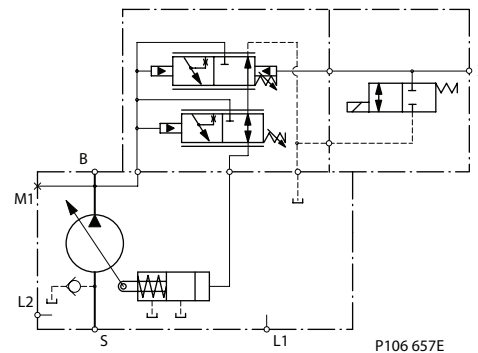
PC control setting range

| Code | FA, FB |
|-------|--------------------------------|
| J45B | 100-280 bar [1450-4060 psi] |
| J51B | 100-280 bar [1450-4060 psi] |
| J60B | 100-280 bar [1450-4060 psi] |
| J65C, | 100-260 bar [1450-3770 bar] |
| J75C | 100-260 bar [1450-3770 bar] |

LS setting range

| Model | bar | psi |
|-------|-------|---------|
| All | 10-40 | 145-580 |

Schematic



Legend

- B = Outlet
- S = Inlet
- L1, L2 = Case drain
- X = LS signal port
- M1* = System pressure gauge port
- * M1 port is available on axially ported endcaps only

Input shafts

| Code | Description | Maximum torque rating ¹ N•m [lbf•in] | Drawing |
|------|--|--|---------|
| C2 | 13 tooth spline 16/32 pitch (ANSI A92.1 1970 - Class 5) <i>For use with SAE-B</i> | 288 [2546] | |
| C3 | 15 tooth spline 16/32 pitch (ANSI A92.1 1970 - Class 5) <i>For use with SAE-B</i> | 404 [3575] | |

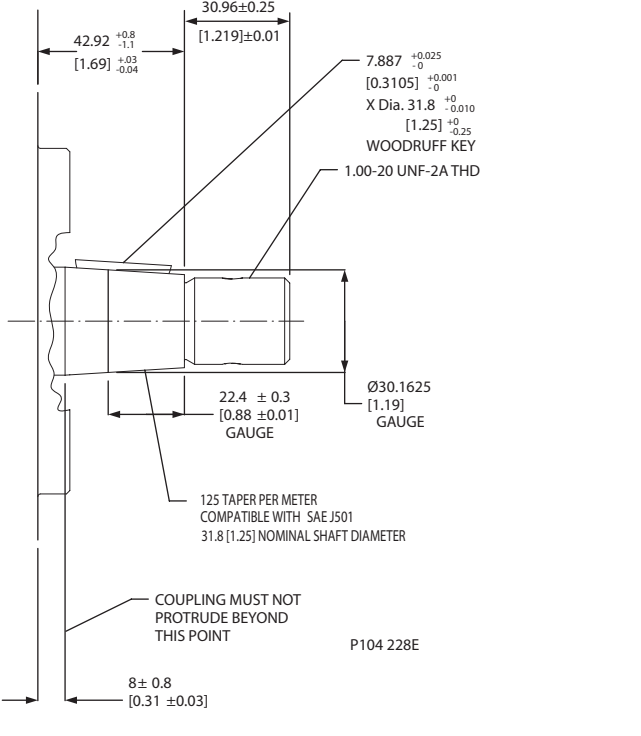
1. See *Input shaft torque ratings*, page 18 for an explanation of maximum torque.

input shafts
(continued)

| Code | Description | Maximum torque rating ¹ N•m [lbf•in] | Drawing |
|------|---|--|--|
| S1 | 14 tooth spline 12/24 pitch (ANSI A92.1 1970 - Class 5) | 800 [7080] | <p>47.6 [1.87] Ø25.5 MAX [1] Ø31.14 ± 0.08 [1.226 ± 0.003] 28 ± 0.5 [1.1 ± 0.02] 8 ± 0.8 [0.31 ± 0.03] COUPLING MUST NOT PROTRUDE BETOND THIS POINT P104 226E</p> <p>14 TOOTH 12/24 PITCH 30° PRESSURE ANGLE 29.634 [1.167] PITCH FILLET ROOT SIDE FIT COMPATIBLE WITH ANSI B92.1-1970 CLASS 5 ALSO MATES WITH FLAT ROOT SIDE FIT</p> |
| K4 | Ø 31.75 mm [1.25 in] straight key | 655 [5797] | <p>56 [2.2] 48.03 ± 0.43 [1.89 ± 0.02] 7.94 [0.313] X 28.56 [1.125] LONG SQUARE KEY 35.2 ± 0.13 [1.39 ± 0.01] Ø31.72 ± 0.025 [1.249 ± 0.001] 8 ± 0.8 [0.31 ± 0.03] COUPLING MUST NOT PROTRUDE BETOND THIS POINT P104 227E</p> <p>27.9 max. 19 min. 3.8 max. 5/16-18 thd Dia. 11.18</p> |

1. See *Input shaft torque ratings*, page 18 for an explanation of maximum torque.

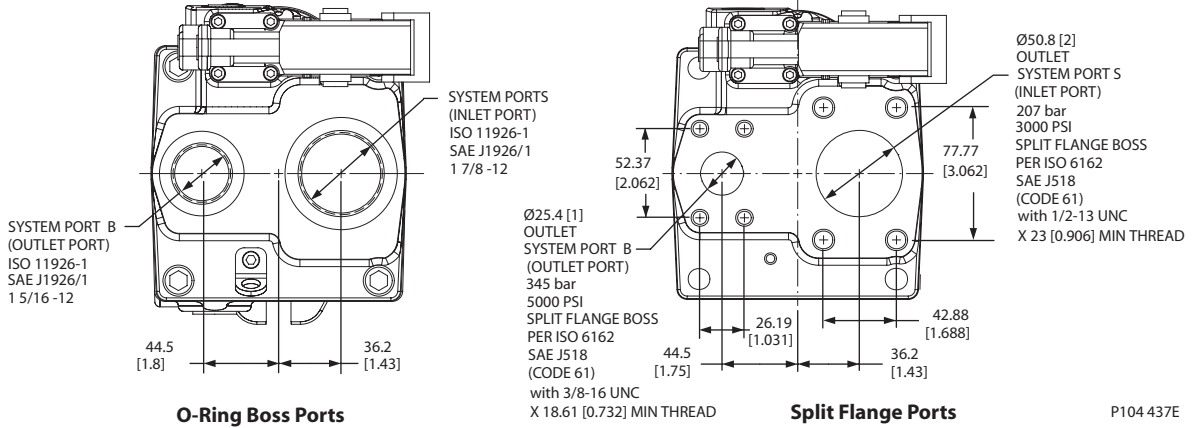
input shafts
(continued)

| Code | Description | Maximum torque rating ¹ N•m [lbf•in] | Drawing |
|------|-----------------------------------|--|--|
| TO | Ø 31.75 mm [1.25 in] 1:8 taper | 734 [6495] |  <p>Technical drawing of an input shaft with the following dimensions and specifications:</p> <ul style="list-style-type: none"> Total length: $42.92^{+0.8}_{-1.1}$ [1.69] Distance from end to keyway: 30.96 ± 0.25 [1.219] ± 0.01 Keyway depth: $7.887^{+0.025}_{-0}$ [0.3105] ± 0.001 Key diameter: X Dia. $31.8^{+0}_{-0.010}$ [1.25] ± 0.25 Key type: WOODRUFF KEY Thread: 1.00-20 UNF-2A THD Distance from end to gauge: 22.4 ± 0.3 [0.88 ± 0.01] GAUGE Gauge diameter: Ø30.1625 [1.19] GAUGE Taper: 125 TAPER PER METER COMPATIBLE WITH SAE J501 31.8 [1.25] NOMINAL SHAFT DIAMETER End diameter: 8 ± 0.8 [0.31 ± 0.03] Note: COUPLING MUST NOT PROTRUDE BEYOND THIS POINT Part number: P104 228E |

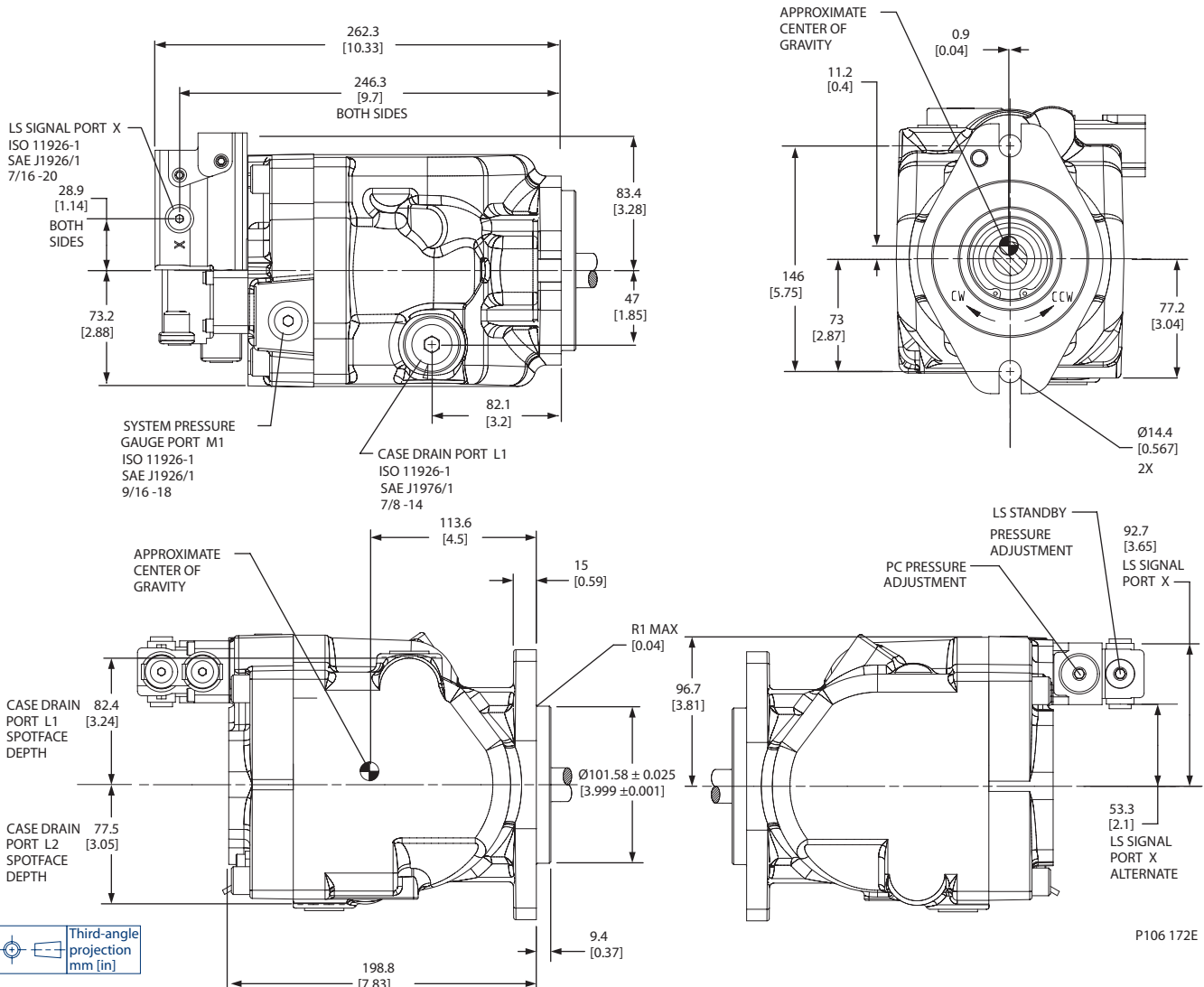
1. See *Input shaft torque ratings*, page 18 for an explanation of maximum torque.

Installation drawings

Axial Ported Endcap

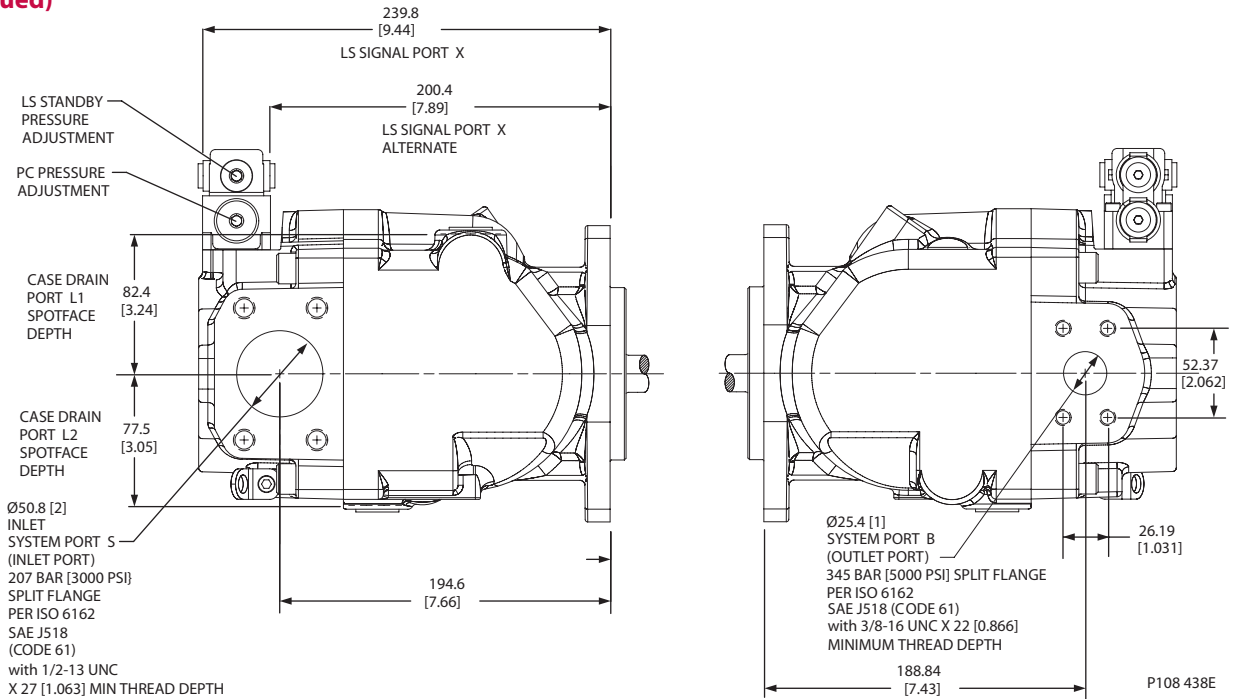


Axial Ported Endcap Installation Dimensions



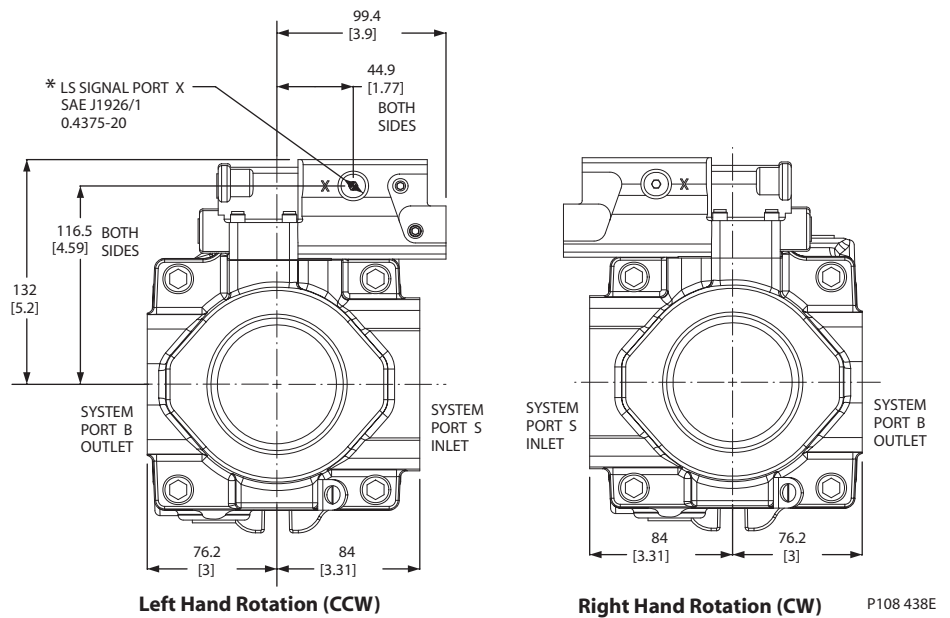
**Installation drawings
(continued)**

Radial Ported Endcap Split Flange Ports



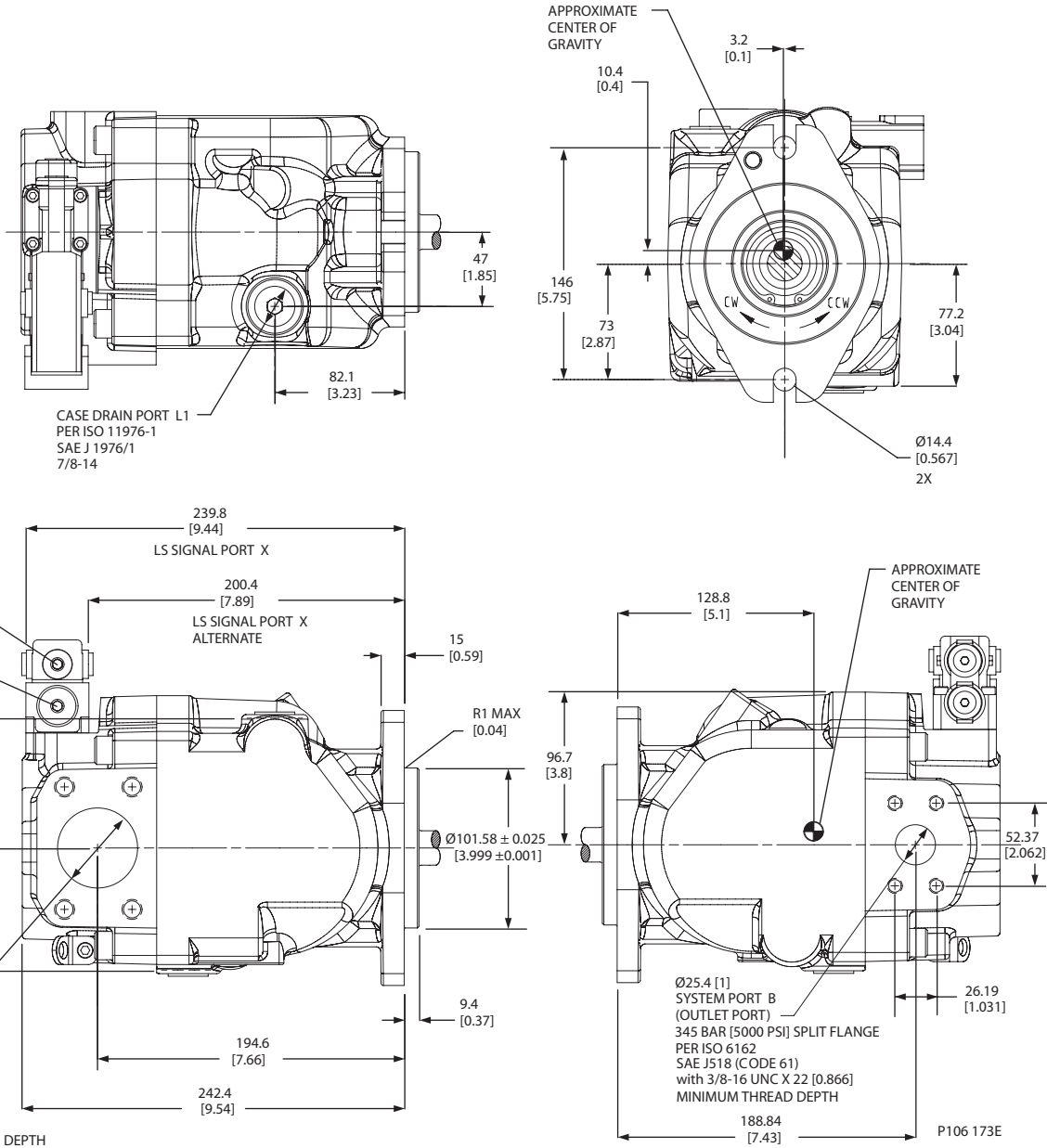
Radial Ported Endcap Rear View

* Interference with internal components will occur if fitting depth in port X is greater than 11.8 mm [0.465 in]



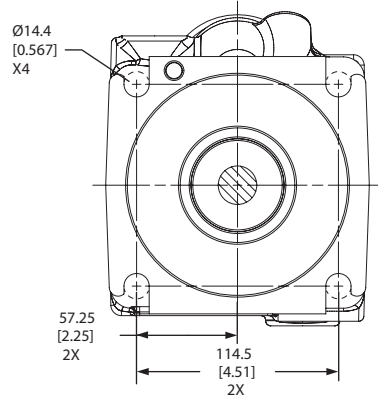
**Installation drawings
(continued)**

Radial Ported Endcap Installation Dimensions

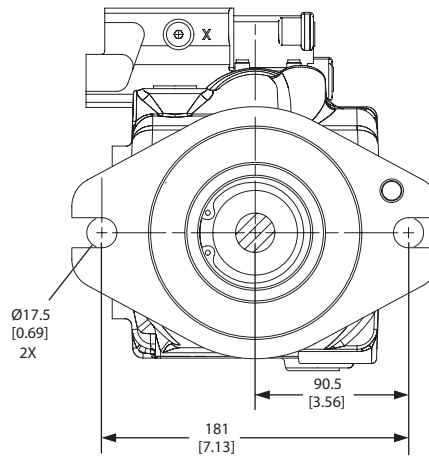


Installation drawings
(continued)

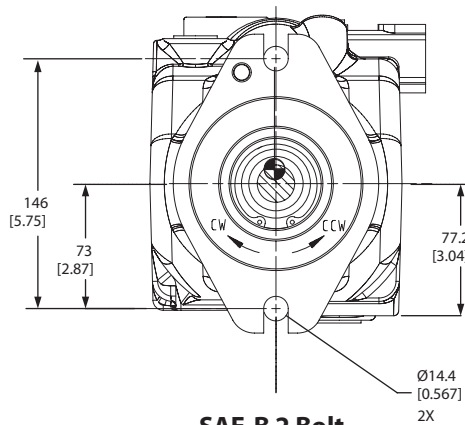
Front Mounting Flange



SAE-C 4 Bolt



SAE-C 2 Bolt



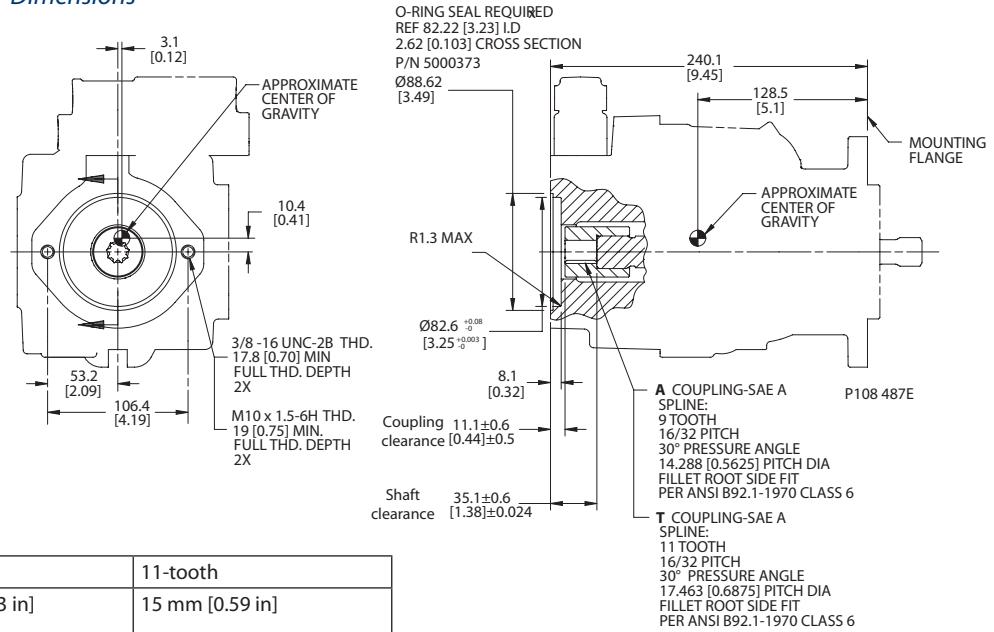
SAE-B 2 Bolt

P108 440E



Auxiliary mounting pads **SAE-A auxiliary mounting pad (integrated)**

Dimensions

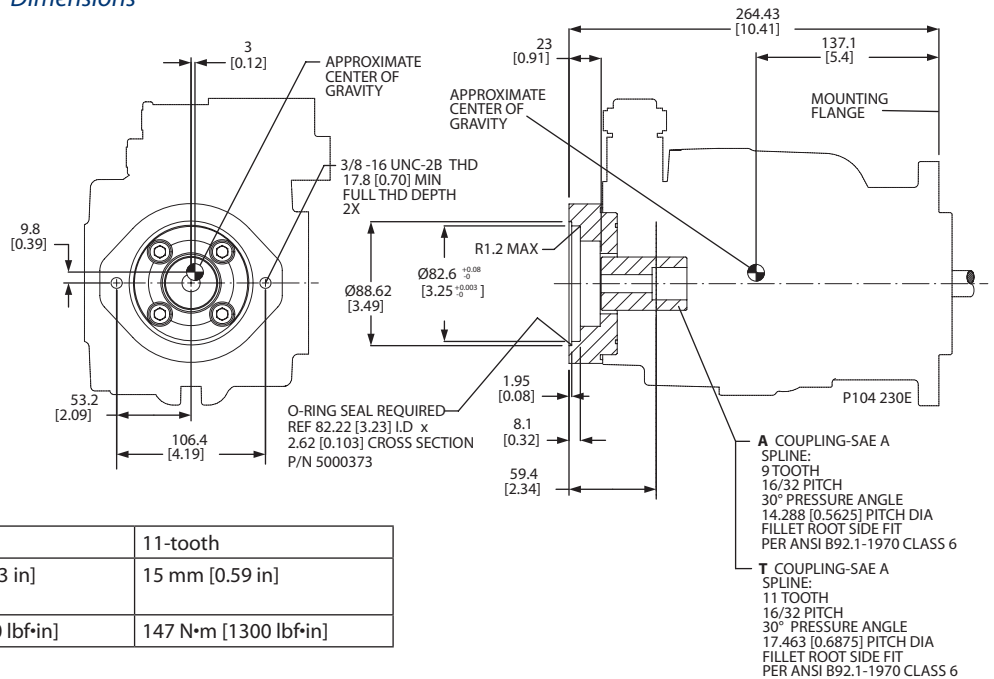


Specifications

| Coupling | 9-tooth | 11-tooth |
|---------------------------|----------------------|-----------------------|
| Spline minimum engagement | 13.5 mm [0.53 in] | 15 mm [0.59 in] |
| Maximum torque | 107 N·m [950 lbf·in] | 147 N·m [1300 lbf·in] |

SAE-A auxiliary mounting pad (non-integral)

Dimensions

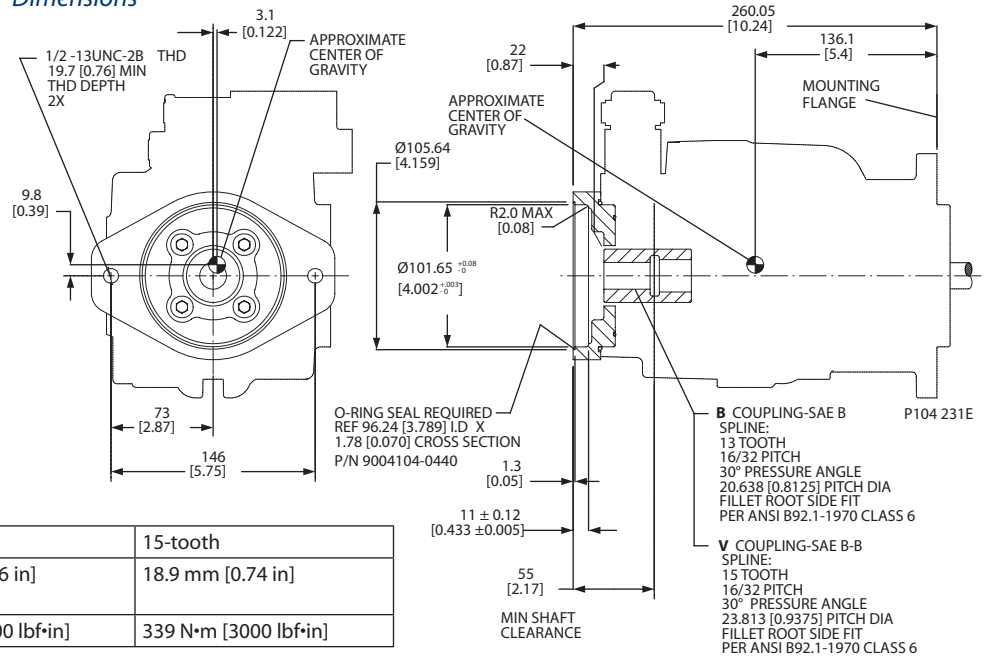


Specifications

| Coupling | 9-tooth | 11-tooth |
|---------------------------|----------------------|-----------------------|
| Spline minimum engagement | 13.5 mm [0.53 in] | 15 mm [0.59 in] |
| Maximum torque | 107 N·m [950 lbf·in] | 147 N·m [1300 lbf·in] |

SAE-B auxiliary mounting pad

Dimensions

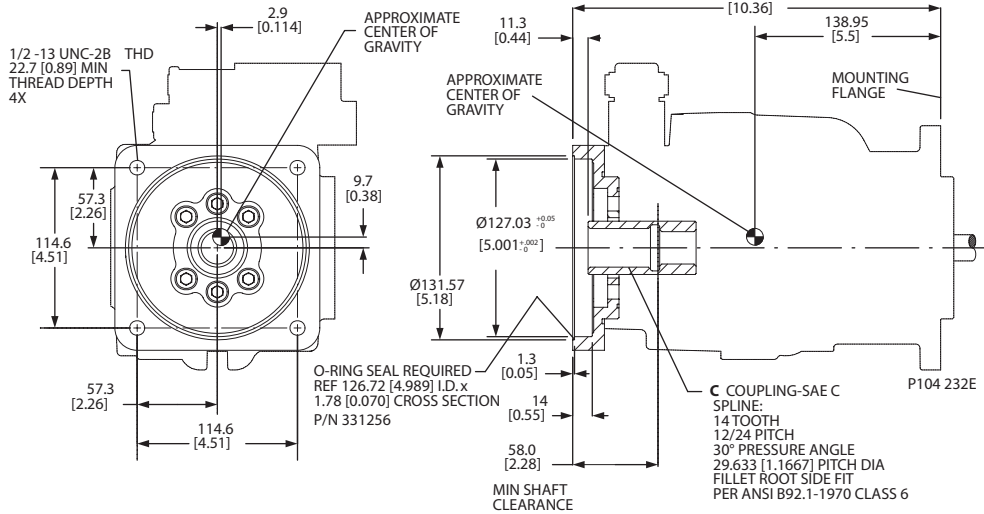


Specifications

| | 13-tooth | 15-tooth |
|----------------------------------|-----------------------|-----------------------|
| Coupling | 13-tooth | 15-tooth |
| Spline minimum engagement | 14.2 mm [0.56 in] | 18.9 mm [0.74 in] |
| Maximum torque | 249 N•m [2200 lbf•in] | 339 N•m [3000 lbf•in] |

**Auxiliary mounting pads
 (continued)**

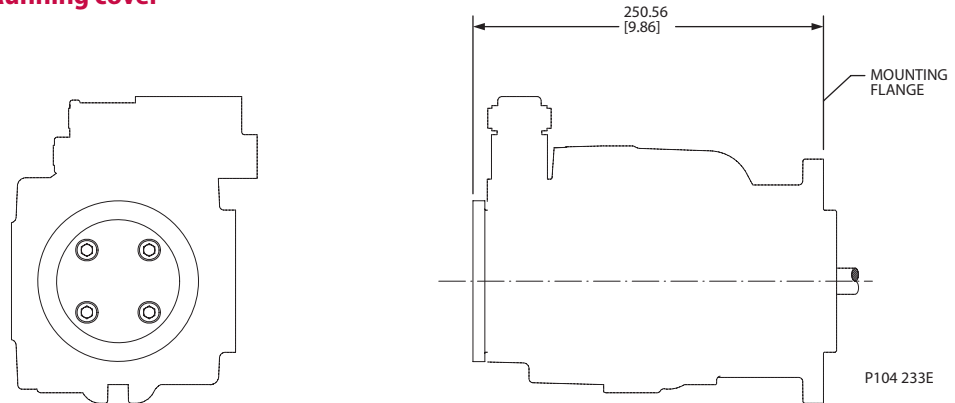
**SAE-C auxiliary mounting pad
 Dimensions**



Specifications

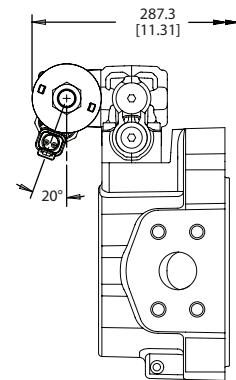
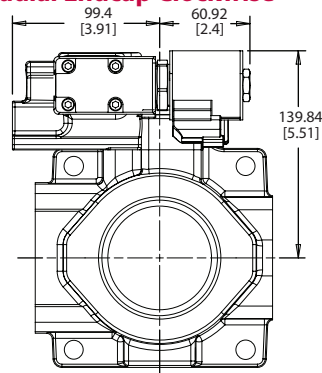
| | |
|----------------------------------|-----------------------|
| Coupling | 14-tooth |
| Spline minimum engagement | 18.3 mm [0.72 in] |
| Maximum torque | 339 N·m [3000 lbf·in] |

Running cover



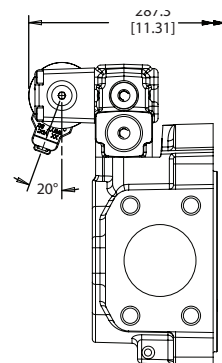
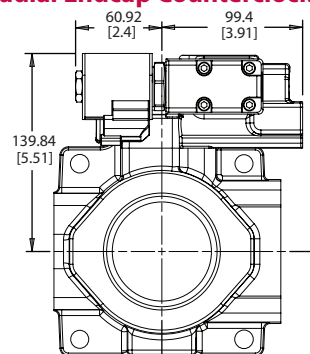
**Installation drawings
(continued)**

Radial Endcap Clockwise



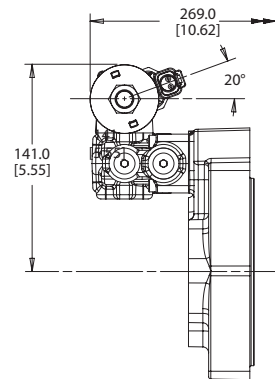
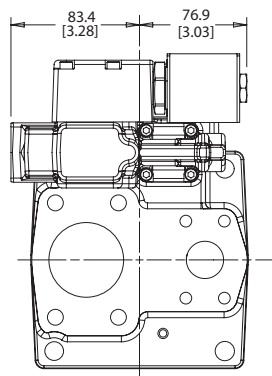
P108 441E

Radial Endcap Counterclockwise



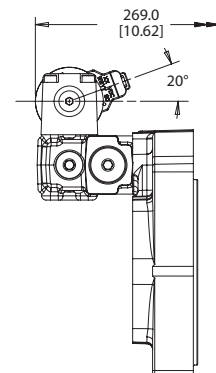
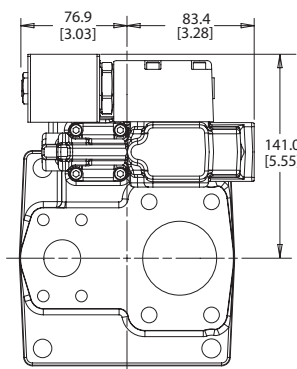
P106 191E

Axial Endcap Clockwise



P106 191E

Axial Endcap Counterclockwise



P106 191E

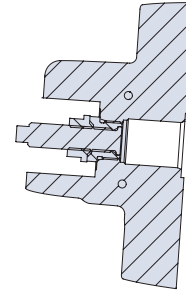


Third-angle
projection
mm [in]

Displacement limiter

J Frame open circuit pumps are available with an optional adjustable displacement limiter. This adjustable stop limits the pump's maximum displacement.

Displacement limiter cross-section



P106 727E

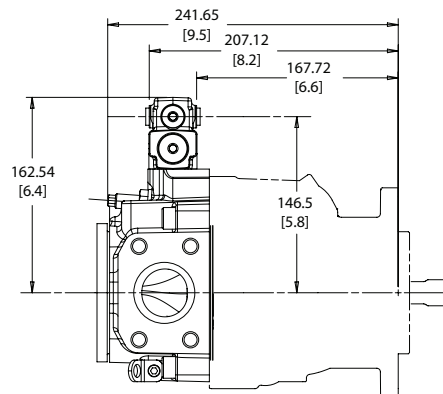
Setting range

| | |
|-------------|--|
| J45B | 8.4 to 45 cm ³ [0.51 to 2.75 in ³] |
| J51B | 13.7 to 51 cm ³ [0.84 to 3.11 in ³] |
| J60B | 16.8 to 60 cm ³ [1.03 to 3.66 in ³] |
| J65B | 25.4 to 65 cm ³ [1.55 to 3.97 in ³] |
| J75B | 28.4 to 75 cm ³ [1.73 to 4.58 in ³] |

Displacement per turn

| | |
|-------------|--|
| J45B | 6.2 cm ³ /rev [0.38 in ³ /rev] |
| J51B | 6.2 cm ³ /rev [0.38 in ³ /rev] |
| J60B | 6.2 cm ³ /rev [0.38 in ³ /rev] |
| J65B | 7.2 cm ³ /rev [0.44 in ³ /rev] |
| J75B | 7.2 cm ³ /rev [0.44 in ³ /rev] |

Displacement limiters are only available for endcap options V and W.



P106 728E

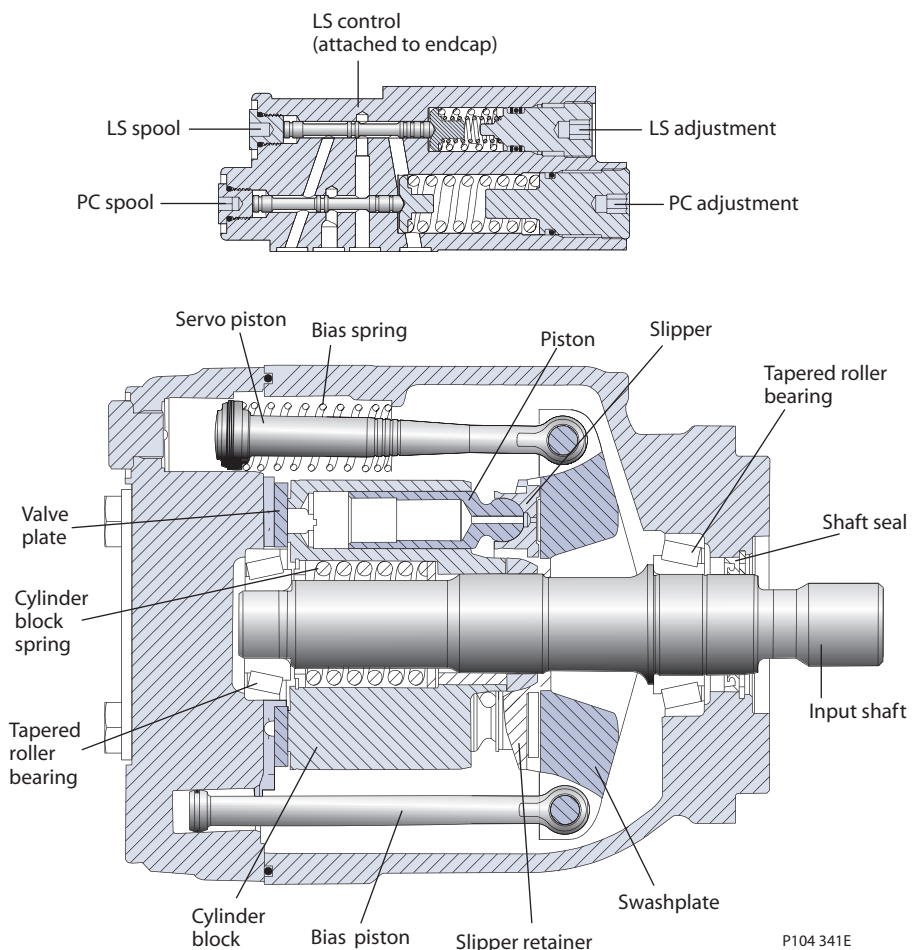


Design

Series 45 Frame F pumps have a single servo piston design with a cradle-type swashplate set in polymer-coated journal bearings. A bias spring and internal forces increase swashplate angle. The servo piston decreases swashplate angle. Nine reciprocating pistons displace fluid from the pump inlet to the pump outlet as the cylinder block rotates on the pump input shaft. The block spring holds the piston slippers to the swashplate via the slipper retainer. The cylinder block rides on a bi-metal valve plate optimized for high volumetric efficiency and low noise. Tapered roller bearings support the input shaft and a viton lip-seal protects against shaft leaks.

An adjustable one spool (PC only, not shown) or two spool (LS and PC) control senses system pressure and load pressure (LS controls). The control ports system pressure to the servo piston to control pump output flow.

Frame F cross section



Technical Specifications

For general operating parameters, including fluid viscosity, temperature, and inlet and case pressures, *see page 13*. For system design parameters, including installation, filtration, reservoir, and line velocities, *see page 15*.

For definitions of pressure and speed ratings, *see page 14*. For more information on external shaft loads, *see page 16*; mounting flange loads, *see page 17*.

| | | F Frame | | |
|---|---|---|------------------|------------------|
| | | Unit | 074B | 090C |
| Maximum Displacement | | cm ³ [in ³] | 74 [4.52] | 90 [5.49] |
| Working Input Speed | Minimum | min ⁻¹ (rpm) | 500 | 500 |
| | Continuous | | 2400 | 2200 |
| | Maximum | | 2800 | 2600 |
| Working Pressure | Maximum | bar [psi] | 310 [4495] | 260 [3770] |
| Flow at rated speed (theoretical) | | l/min [US gal/min] | 178 [46.9] | 198 [52.3] |
| Input torque at maximum displacement (theoretical) at 49° C [120°F] | | N•m/bar [lbf•in/1000 psi] | 1.178 [719.3] | 1.433 [874.8] |
| Mass moment of inertia of internal rotating components | | kg•m ² [slug•ft ²] | 0.0063 [0.00465] | 0.0065 [0.00479] |
| Weight | Axial ports | kg [lb] | 29 [64] | |
| | Radial ports | | 32 [70] | |
| External Shaft Loads | External moment (M _e) | N•m [lbf•in] | 300 [2655] | 300 [2655] |
| | Thrust in (T _{in}), out (T _{out}) | N [lbf] | 2900 [652] | 2900 [652] |
| Bearing Life (1800 rpm, no external shaft loading) | at 150 bar [2175 psi] | B ₁₀ hours | 31 300 | 17 400 |
| | at 200 bar [2900 psi] | | 11 100 | 5700 |
| | at 250 bar [3625 psi] | | 4810 | 2490 |
| | at 280 bar [4060 psi] | | 3080 | - |
| Mounting flange load moments | Vibratory (continuous) | N•m [lbf•in] | 3730 [33 100] | |
| | Shock (maximum) | | 13220 [117 100] | |

Order code

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| R | S | P | C | D | E | F | G | H | J | K | L | M | N |
| <input style="width: 20px; height: 20px;" type="text"/> | <input style="width: 20px; height: 20px;" type="text"/> | <input style="width: 20px; height: 20px;" type="text"/> | <input style="width: 20px; height: 20px;" type="text"/> | <input style="width: 20px; height: 20px;" type="text"/> | <input style="width: 20px; height: 20px;" type="text"/> | <input style="width: 20px; height: 20px;" type="text"/> | <input style="width: 20px; height: 20px;" type="text"/> | <input style="width: 20px; height: 20px;" type="text"/> | <input style="width: 20px; height: 20px;" type="text"/> | <input style="width: 20px; height: 20px;" type="text"/> | <input style="width: 20px; height: 20px;" type="text"/> | <input style="width: 20px; height: 20px;" type="text"/> | <input style="width: 20px; height: 20px;" type="text"/> |

Code description

| Code | Description |
|------|--|
| R | Product Frame, Variable Open Circuit Pump |
| S | Rotation |
| P | Displacement |
| C | Control Type |
| D | Pressure Compensator Setting |
| E | Load Sense Setting |
| F | Not Used |
| G | Choke Orifice |
| H | Gain Orifice |
| J | Input Shaft/Auxiliary Mount/Endcap |
| K | Shaft Seal/Front Mounting Flange/Housing Ports |
| L | Displacement Limiter |
| M | Special Hardware |
| N | Special Features |

Order code (continued)

| | | | | | | | | | | | | | |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| R | S | P | C | D | E | F | G | H | J | K | L | M | N |
| <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |

R Product

| | | F Frame | |
|-----------|--|---------|------|
| | | 074B | 090C |
| FR | F Frame, variable displacement open circuit pump | • | • |

S Rotation

| | | | |
|----------|------------------------------|---|---|
| L | Left Hand (counterclockwise) | • | • |
| R | Right Hand (clockwise) | • | • |

P Displacement

| | | | |
|-------------|--|---|---|
| 074B | 074 cm ³ /rev [4.52 in ³ /rev] | • | |
| 090C | 090 cm ³ /rev [5.49 in ³ /rev] | | • |

C Control type

| | | | |
|------------|--|---|---|
| PC | Pressure Compensator | • | • |
| BC* | Pressure Compensator | • | |
| LB | Load Sensing/Pressure Comp. with internal bleed orifice | • | • |
| BB* | Load Sensing/Pressure Comp. with internal bleed orifice | • | |
| LS | Load Sensing/Pressure Comp. | • | • |
| BS* | Load Sensing/Pressure Comp. | • | |
| RP | Remote Pressure Compensator | • | • |
| BP* | Remote Pressure Compensator | • | |
| AG | Electric on/off, 12VDC, Normally Closed, Deutsch (CCW rotation) only | • | • |
| BE* | Electric on/off, 12VDC, Normally Closed, Deutsch (CCW rotation) only | • | |
| AR | Electric on/off, 12VDC, Normally Closed, Deutsch (CW rotation) only | • | • |
| BR* | Electric on/off, 12VDC, Normally Closed, Deutsch (CW rotation) only | • | |

* Not available on 90cc pumps

Order code (continued)

| | | | | | | | | | | | | | |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| R | S | P | C | D | E | F | G | H | J | K | L | M | N |
| <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |

D *PC setting (2 digit code, 10 bar increments)*

| | | F Frame | |
|----------------|-----------------------------------|---------|------|
| | | 074B | 090C |
| Example | 25 = 250 bar (3625 psi) | | |
| 10-26 | 100 to 260 bar [1450 to 3771 psi] | . | . |
| 27-28 | 270 to 280 bar [3916 to 4061 psi] | . | . |
| 29-31 | 290-310 bar [4206 to 4496 psi] | . | . |

E *Load sensing setting (2 digit code, 1 bar increments)*

| | | | | | | |
|----------------|---|---|---|---|---|---|
| Example | 20 = 20 bar (290 psi) | | | | | |
| 10-40 | 10 to 34 bar [145 to 508 psi] | . | . | . | . | . |
| NN | Not applicable (pressure compensated only controls) | . | . | . | . | . |

F *Not used*

| | | | | | | |
|-----------|----------------|---|---|---|---|---|
| NN | Not applicable | . | . | . | . | . |
|-----------|----------------|---|---|---|---|---|

G *Pilot/Choke Orifice*

| | | | | | | |
|----------|-----------------|---|---|---|---|---|
| N | None (standard) | . | . | . | . | . |
|----------|-----------------|---|---|---|---|---|

H *Gain Orifice*

| | | | | | | |
|----------|-----------------|---|---|---|---|---|
| 3 | 1.0 mm diameter | . | . | . | . | . |
|----------|-----------------|---|---|---|---|---|

Order code (continued)

| | | | | | | | | | | | | | |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| R | S | P | C | D | E | F | G | H | J | K | L | M | N |
| <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |

J Input Shaft

| | |
|-----------|--------------------------|
| S1 | 14 tooth 12/24 pitch |
| S2 | 17 tooth, 12/24 pitch |
| K4 | 1.25 inch straight keyed |

Auxiliary Mount/Endcap Style

| Auxiliary Description | Endcap Style | Inlet Porting | Outlet Porting | Endcap Description | Code |
|-----------------------|--------------|---------------|----------------|---|------|
| None | Axial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2 inch port 0.5 inch threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port 0.375 inch threads) | N4 |
| None | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2 inch port 0.5 inch threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port 0.375 inch threads) | N2 |
| Running Cover | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2 inch port 0.5 inch threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port 0.375 inch threads) | R2 |
| SAE-A, 9 teeth | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2 inch port 0.5 inch threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port 0.375 inch threads) | A2 |
| SAE-A, 11 teeth | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2 inch port 0.5 inch threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port 0.375 inch threads) | T2 |
| SAE-B, 13 teeth | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2 inch port 0.5 inch threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port 0.375 inch threads) | B2 |
| SAE-BB, 15 teeth | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2 inch port 0.5 inch threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port 0.375 inch threads) | V2 |
| SAE-C, 14 teeth | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2 inch port 0.5 inch threads) Outlet - Code 61 Split Flange Port 4 Bolt (1 inch port 0.375 inch threads) | C2 |

J Input Shaft/Auxiliary Mount/Endcap

Available Combinations

| | F Frame | |
|-------------|---------|------|
| | 074B | 090C |
| K4A2 | • | • |
| K4B2 | • | • |
| K4C2 | • | • |
| K4N2 | • | • |
| K4N4 | • | • |
| K4R2 | • | • |
| K4T2 | • | • |
| K4V2 | • | • |
| S1A2 | • | • |
| S1B2 | • | • |
| S1C2 | • | • |
| S1N2 | • | • |
| S1N4 | • | • |
| S1R2 | • | • |
| S1T2 | • | • |
| S1V2 | • | • |

| | F Frame | |
|-------------|---------|------|
| | 074B | 090C |
| S2A2 | • | • |
| S2B2 | • | • |
| S2C2 | • | • |
| S2N2 | • | • |
| S2N4 | • | • |
| S2R2 | • | • |
| S2T2 | • | • |
| S2V2 | • | • |

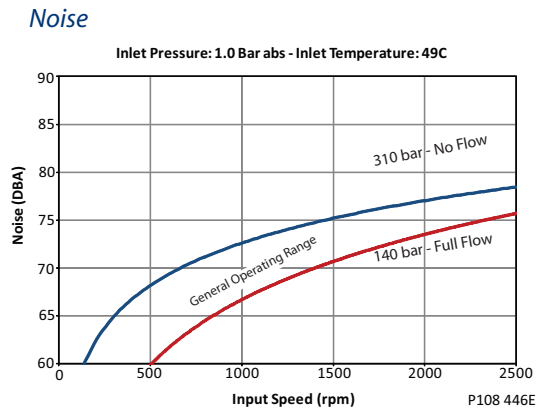
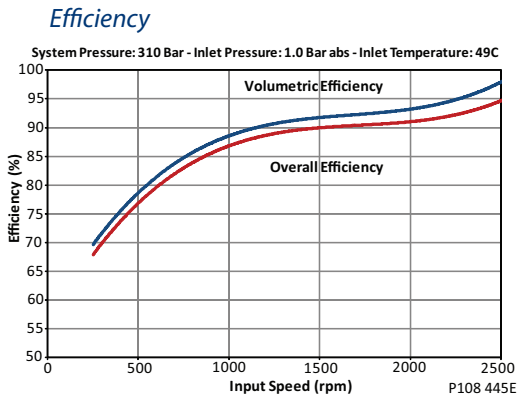
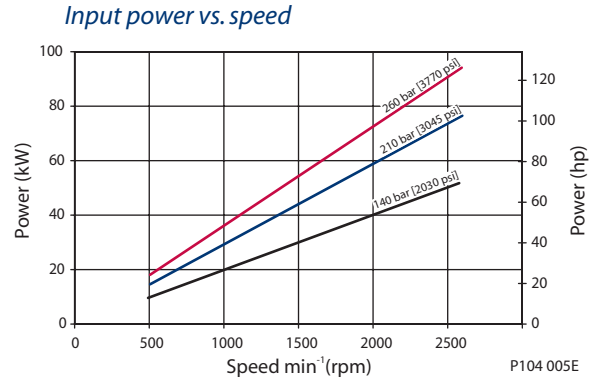
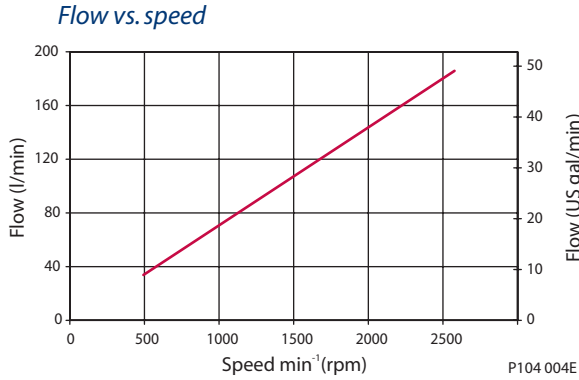
Order code (continued)

| | | | | | | | | | | | | | |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| R | S | P | C | D | E | F | G | H | J | K | L | M | N |
| <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |

| | | F Frame | |
|------------|---|---------|------|
| | | 074B | 090C |
| K | <i>Shaft seal</i> | | |
| A | Single (Viton) | • | • |
| K | <i>Mounting flange and housing port style</i> | | |
| 1 | SAE-C Flange 4-bolt/SAE O-ring boss ports | • | • |
| 3 | SAE-B Flange 2-bolt/SAE O-ring boss ports | • | • |
| K | <i>Not used</i> | | |
| N | Not applicable | • | • |
| L | <i>Displacement limiter</i> | | |
| NNN | None (plugged) | • | • |
| AAA | Adjustable, factory set at max angle | • | • |
| M | <i>Special hardware</i> | | |
| NNN | None | • | • |
| N | <i>Special features</i> | | |
| NNN | None | • | • |

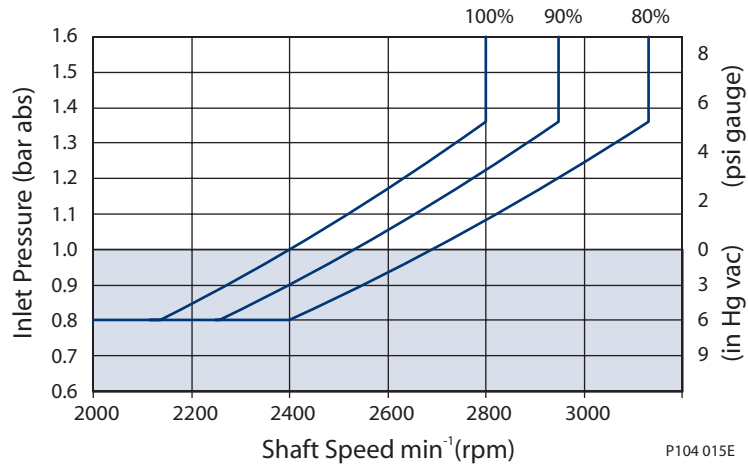
Performance F74B

Flow and power data valid at 49°C [120°F] and viscosity of 17.8 mm²/sec [88 SUS].



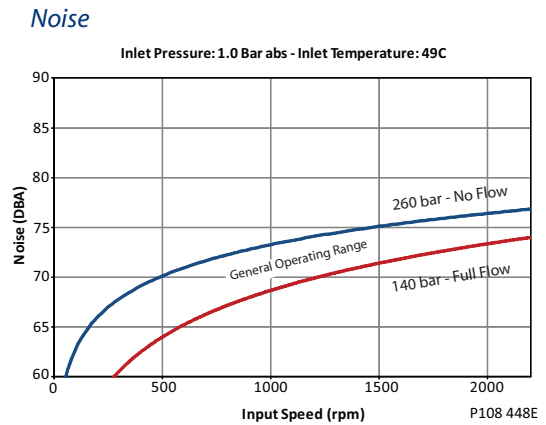
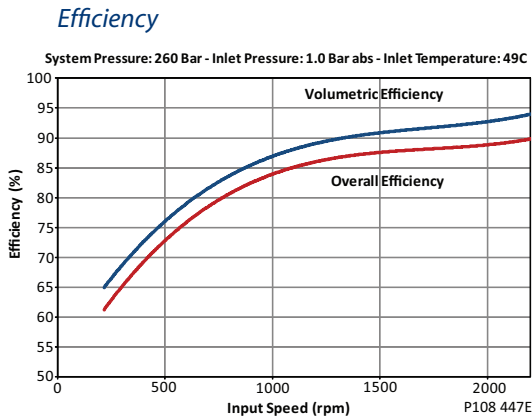
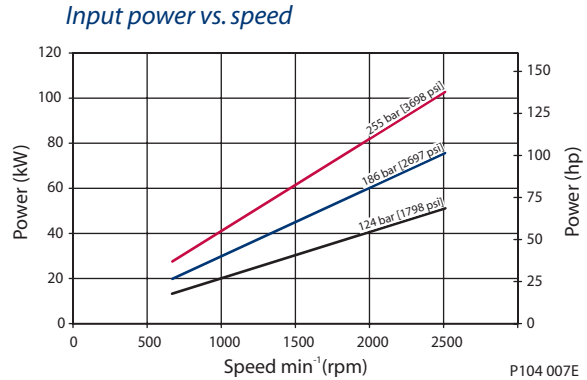
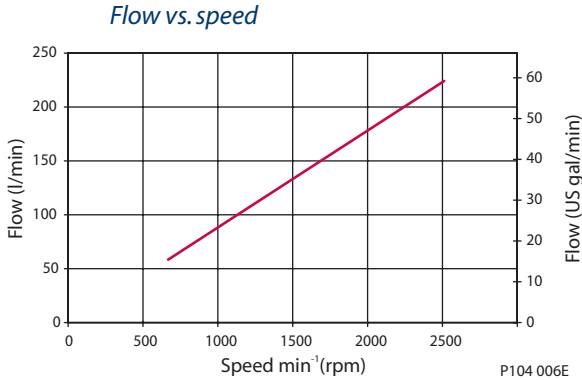
The chart on the right shows allowable inlet pressure and speed at various displacements. Greater speeds and lower inlet pressures are possible at reduced displacement. Operating outside of acceptable limits reduces pump life.

Inlet pressure vs. speed



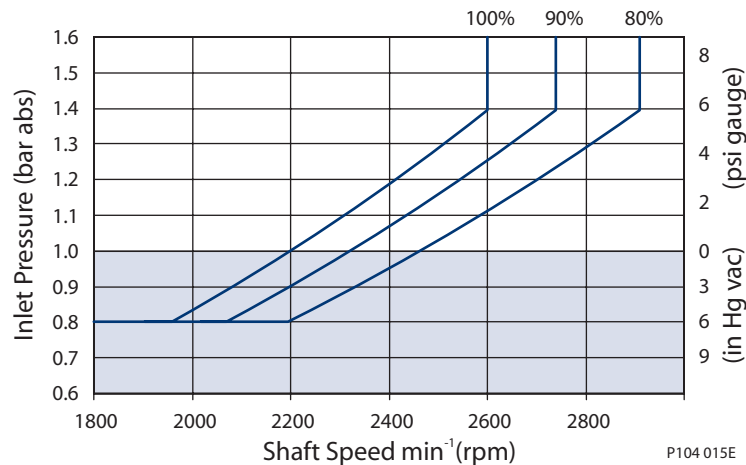
Performance F90C

Flow and power data valid at 49°C [120°F] and viscosity of 17.8 mm²/sec [88 SUS].



Inlet pressure vs. speed

The chart on the right shows allowable inlet pressure and speed at various displacements. Greater speeds and lower inlet pressures are possible at reduced displacement. Operating outside of acceptable limits reduces pump life.



Hydraulic Controls

Pressure Compensated Controls

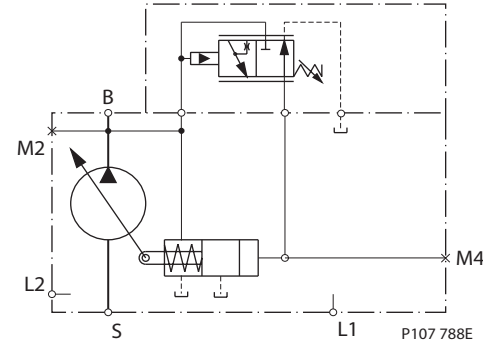
Response/recovery times

| (ms) | Response | Recovery |
|-------------|----------|----------|
| F74B | 35 | 120 |
| F90C | 35 | 135 |

PC setting range

| Model | PC | BC |
|-------------|--------------------------------|--------------------------------|
| F74B | 100-280 bar [1450-4060 psi] | 290-310 bar [4205-4495 psi] |
| F90C | 100-260 bar [1450-3770 psi] | N/A |

Schematic



Legend

- B = Outlet
- S = Inlet
- L1, L2 = Case drain
- M2 = System pressure gauge port
- M4 = Servo pressure gauge port

Remote Pressure Compensated Controls

Remote PC schematic

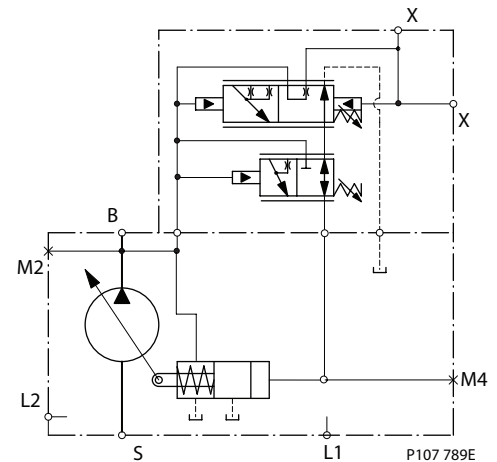
Response/recovery times

| (ms) | Response | Recovery |
|-------------|----------|----------|
| F74B | 35 | 120 |
| F90C | 35 | 135 |

PC setting range

| Model | RP | BP |
|-------------|--------------------------------|--------------------------------|
| F74B | 100-280 bar [1450-4060 psi] | 290-310 bar [4205-4495 psi] |
| F90C | 100-260 bar [1450-3770 psi] | N/A |

An LS Setting of 20 is required for this control



Legend

- B = Outlet
- S = Inlet
- L1, L2 = Case drain
- M2 = System pressure gauge port
- M4 = Servo pressure gauge port
- X = Remote PC port

**Controls
 (continued)**

Load Sensing/Pressure Compensated Controls

*Response/recovery times**

| (ms) | Response | Recovery |
|------|----------|----------|
| F74B | 35 | 135 |
| F90C | 45 | 135 |

* For definitions, see page 11.

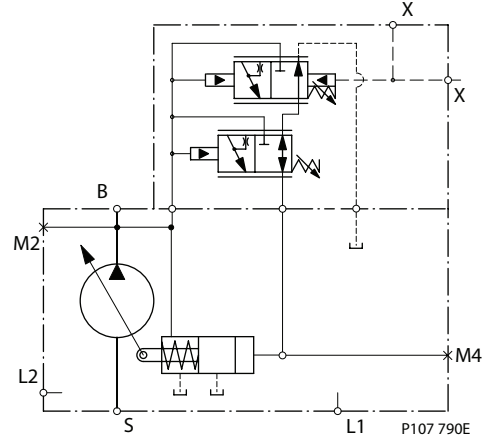
PC setting range

| Model | bar | psi |
|-------|--------------------------------|--------------------------------|
| F74B | 100-280 bar [1450-4060 psi] | 290-310 bar [4205-4495 psi] |
| F90C | 100-260 bar [1450-3770 psi] | N/A |

LS setting range

| Model | bar | psi |
|-------|-------|---------|
| All | 10-30 | 145-435 |

Schematic



Legend

- B = Outlet
- S = Inlet
- L1, L2 = Case drain
- M2 = System pressure gauge port
- M4 = Servo pressure gauge port
- X = LS signal port

Load Sensing Control with Bleed Orifice/Pressure Compensated

*Response/recovery times**

| (ms) | Response | Recovery |
|------|----------|----------|
| F74B | 35 | 135 |
| F90C | 40 | 135 |

* For definitions, see page 11.

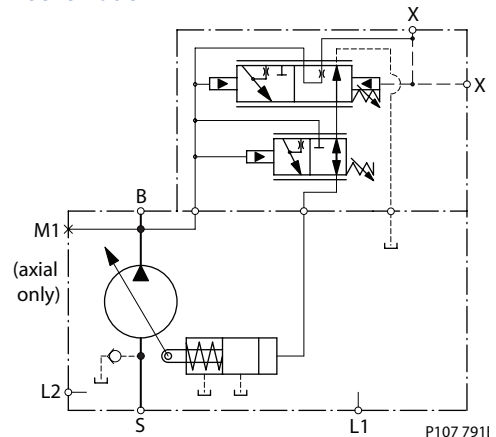
PC setting range

| Model | LB | BB |
|-------|--------------------------------|--------------------------------|
| F74B | 100-280 bar [1450-4060 psi] | 290-310 bar [4205-4495 psi] |
| F90C | 100-260 bar [1450-3770 psi] | N/A |

LS setting range

| Model | bar | psi |
|-------|-------|---------|
| All | 10-34 | 145-508 |

Schematic



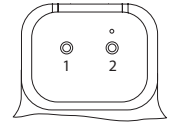
Legend

- B = Outlet
- S = Inlet
- L1, L2 = Case drain
- M2 = System pressure gauge port
- M4 = Servo pressure gauge port
- X = LS signal port

Electric Controls

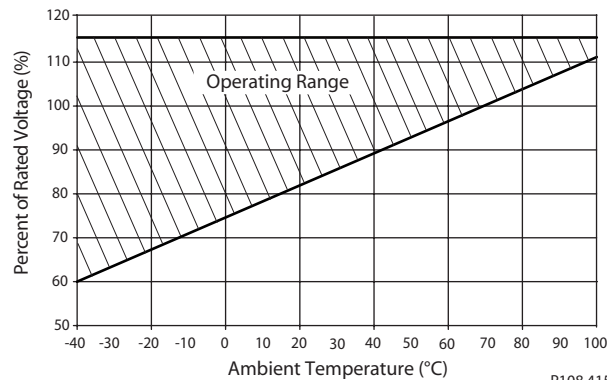
Connectors

| Description | Quantity | Ordering Number |
|------------------------------------|----------|-------------------------|
| Mating Connector | 1 | Deutsch® DT06-2S |
| Wedge Lock | 1 | Deutsch® W25 |
| Socket Contact (16 and 18 AWG) | 2 | Deutsch® 0462-201-16141 |
| Sauer-Danfoss mating connector kit | 1 | K29657 |



P003 480

Continuous Duty Operating Range



P108 415E

Normally Closed on/off Electric Pressure Compensated Controls

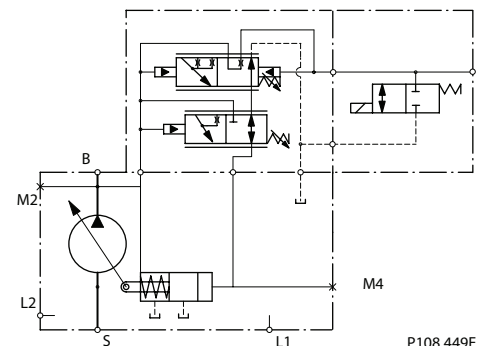
*Response/Recovery Times**

| (ms) | Response | Recovery |
|------|----------|----------|
| F74B | 35 | 120 |
| F90C | 35 | 135 |

PC setting range

| Code | AG, AR | BE, BR |
|------|--------------------------------|--------------------------------|
| F74B | 100-280 bar [1450-4060 psi] | 290-310 bar [4205-4495 psi] |
| F90C | 100-260 bar [1450-3770 bar] | N/A |

Schematic



P108 449E

Legend

- B = Outlet
- S = Inlet
- L1, L2 = Case drain
- M2 = System pressure gauge port
- M4 = Servo pressure gauge port

Normally Open on/off Electric Pressure Compensated Controls

PC setting range

| Code | AN |
|------|--------------------------------|
| F74B | 100-280 bar [1450-4060 psi] |
| F90C | 100-260 bar [1450-3770 bar] |

LS setting range

| Model | bar | psi |
|-------|-------|---------|
| All | 10-34 | 145-508 |

Input shafts

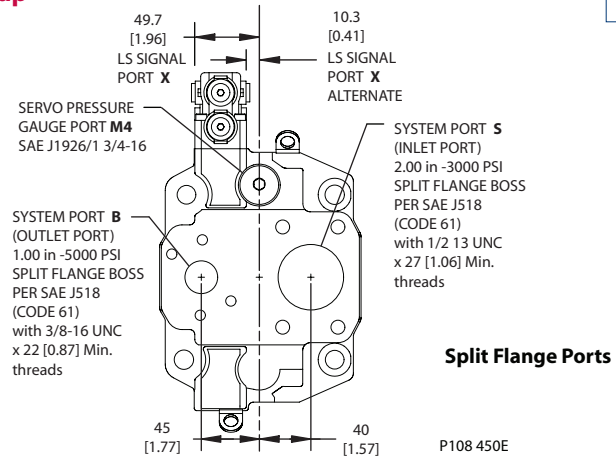
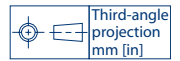
Shaft data

| Code | Description | Maximum torque rating ¹ N·m [lbf·in] | Drawing |
|------|---|--|---------|
| K4 | Ø 31.75 mm [1.25 in] Straight keyed | 734 [6495] | |
| S1 | 14 tooth spline 12/24 pitch (ANSI B92.1 1970 - Class 5) | 800 [7080] | |
| S2 | 17 tooth spline 12/24 pitch (ANSI B92.1 1970 - Class 5) | 1150 [10178] | |

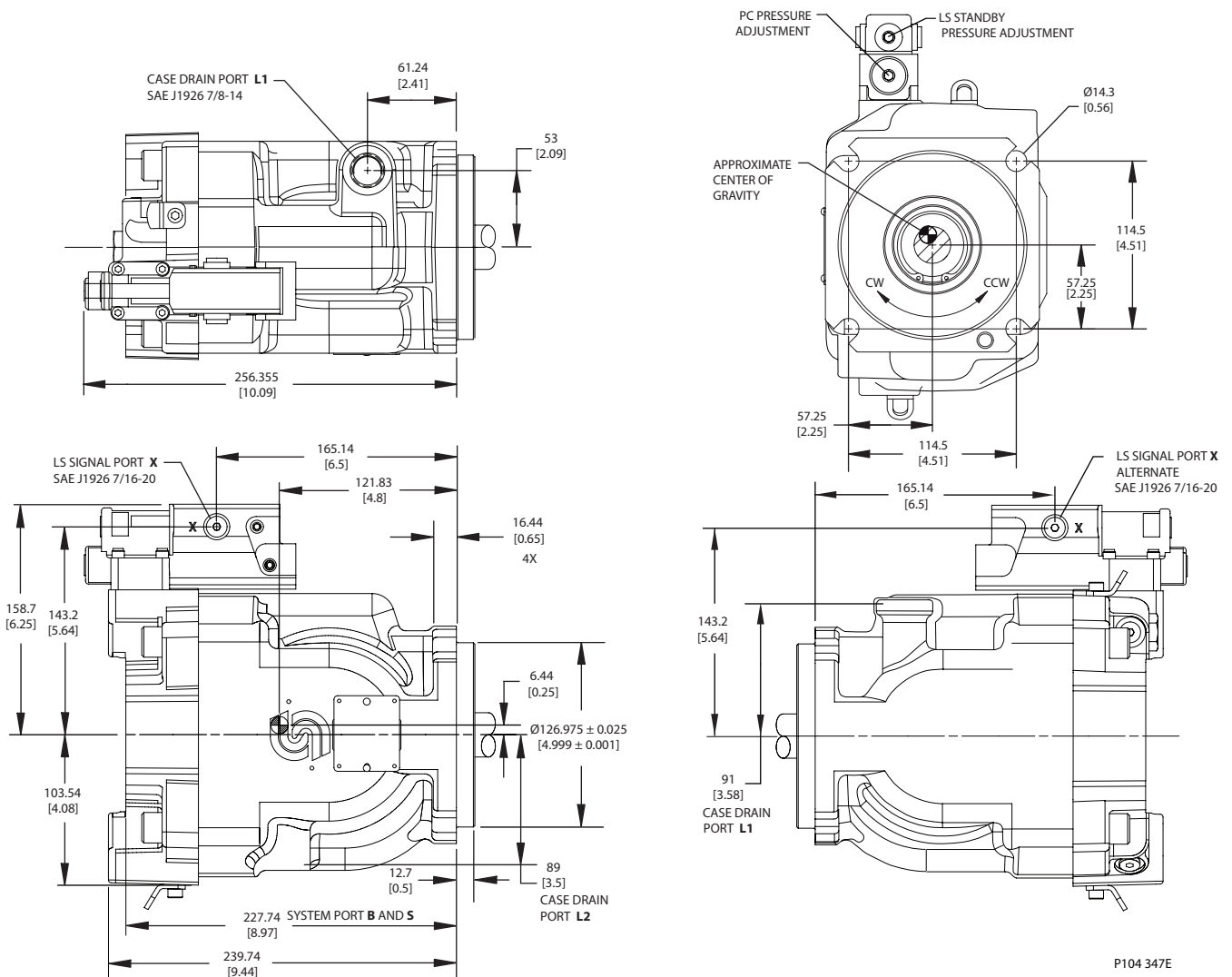
1. See *Input shaft torque ratings*, page 18 for an explanation of maximum torque.

Installation drawings

Axial Ported Endcap

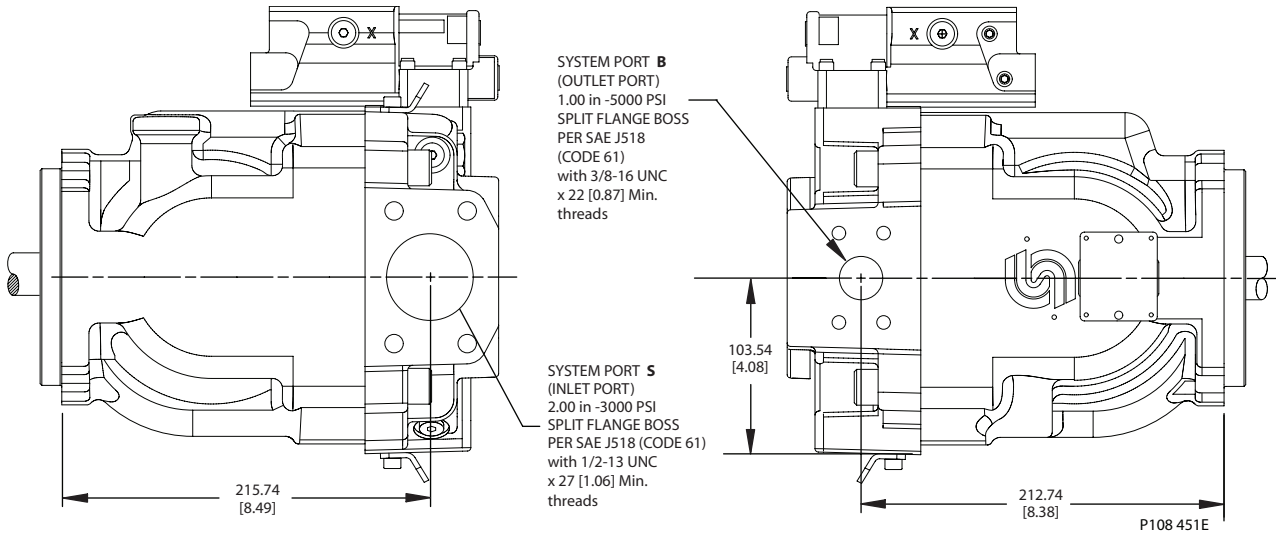


Axial Ported Endcap Installation Dimensions

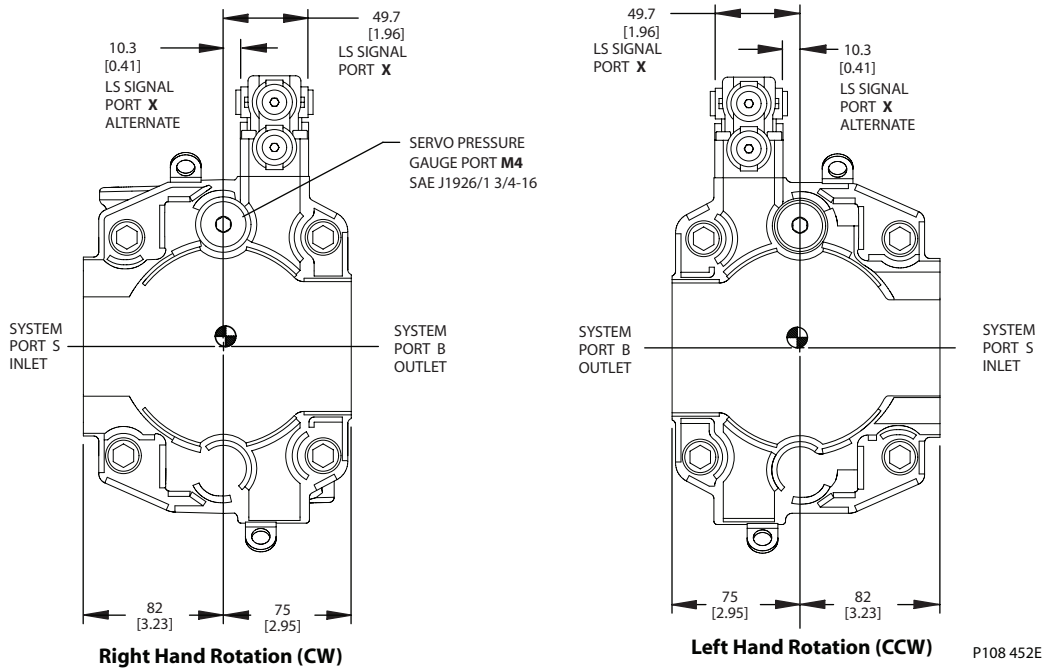


Installation drawings
 (continued)

Radial Ported Endcap Split Flange Ports

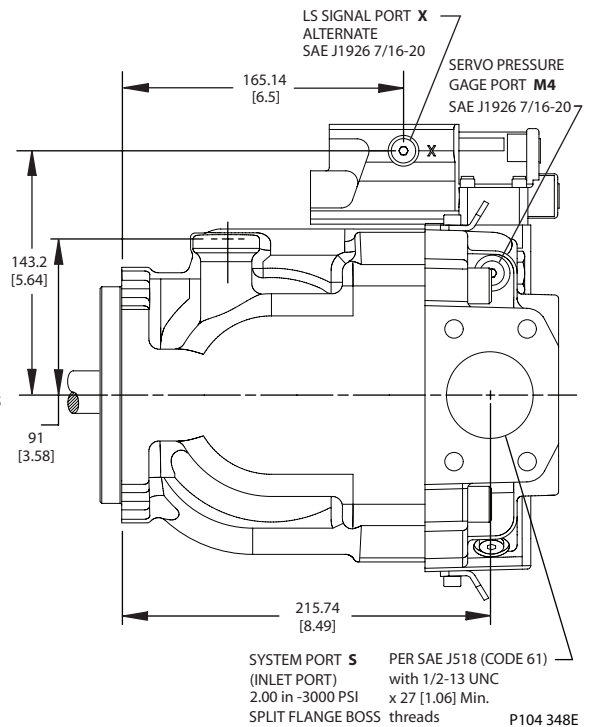
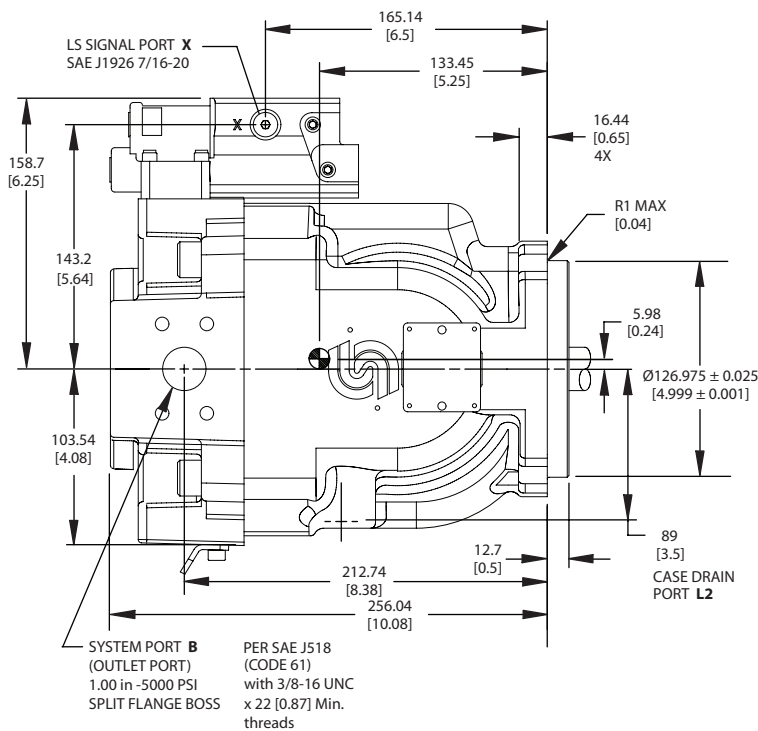
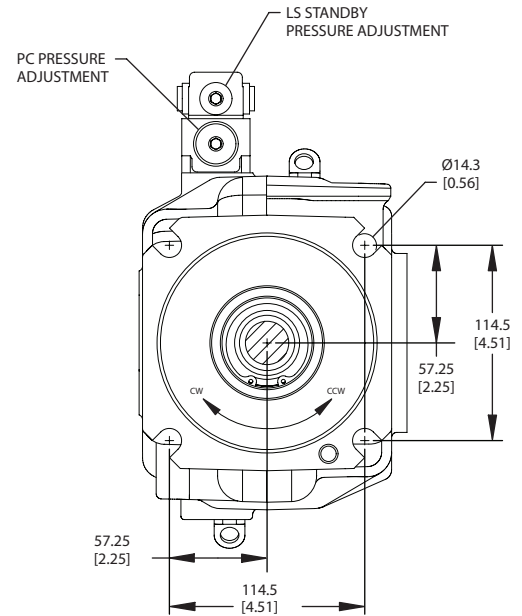
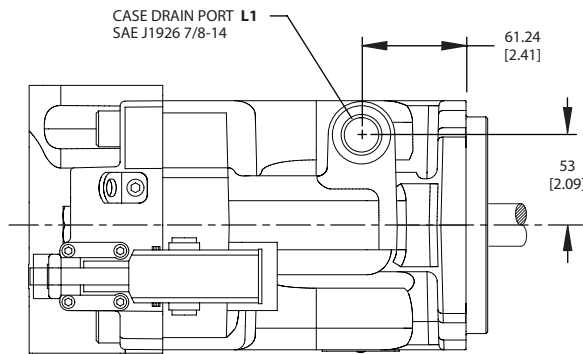


Radial Ported Endcap Rear View



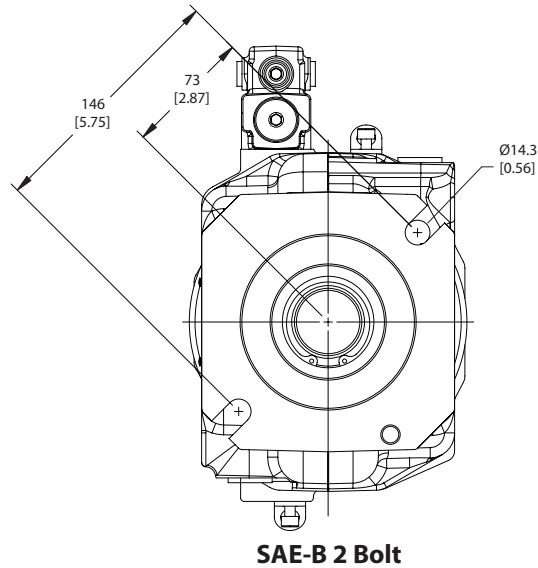
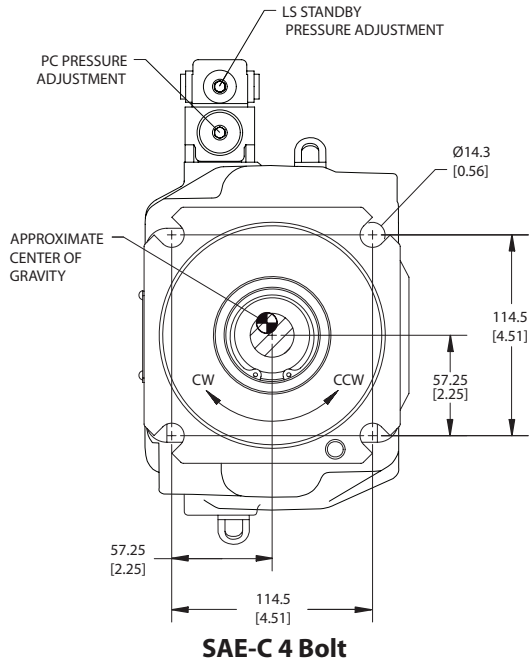
Installation drawings
 (continued)

Radial Ported Endcap Installation Dimensions



Installation drawings
(continued)

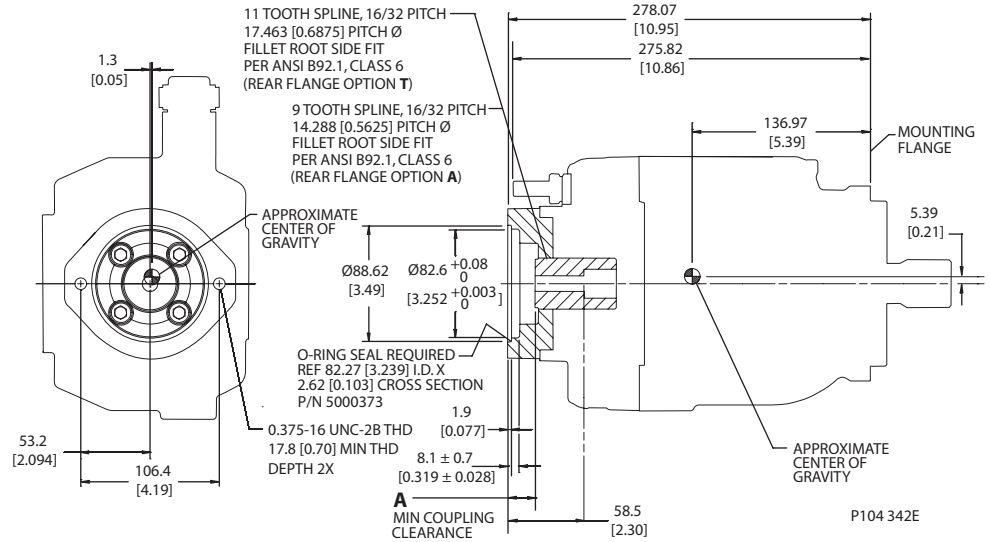
Front Mounting Flange



P108 453E

Auxiliary mounting pads **SAE-A auxiliary mounting pad**

Dimensions

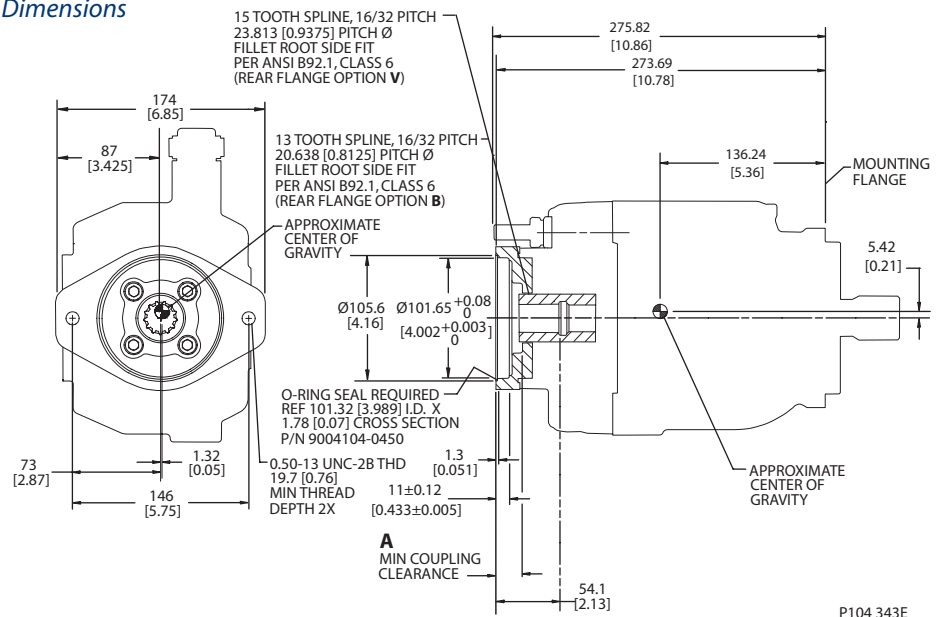


Specifications

| Coupling | 9-tooth | 11-tooth |
|---------------------------|----------------------|-----------------------|
| Spline minimum engagement | 13.5 mm [0.53 in] | 15 mm [0.59 in] |
| Maximum torque | 107 N•m [950 lbf•in] | 147 N•m [1300 lbf•in] |
| Dimension A | 14.9 mm [0.59 in] | 16.1 mm [0.63 in] |

SAE-B auxiliary mounting pad

Dimensions



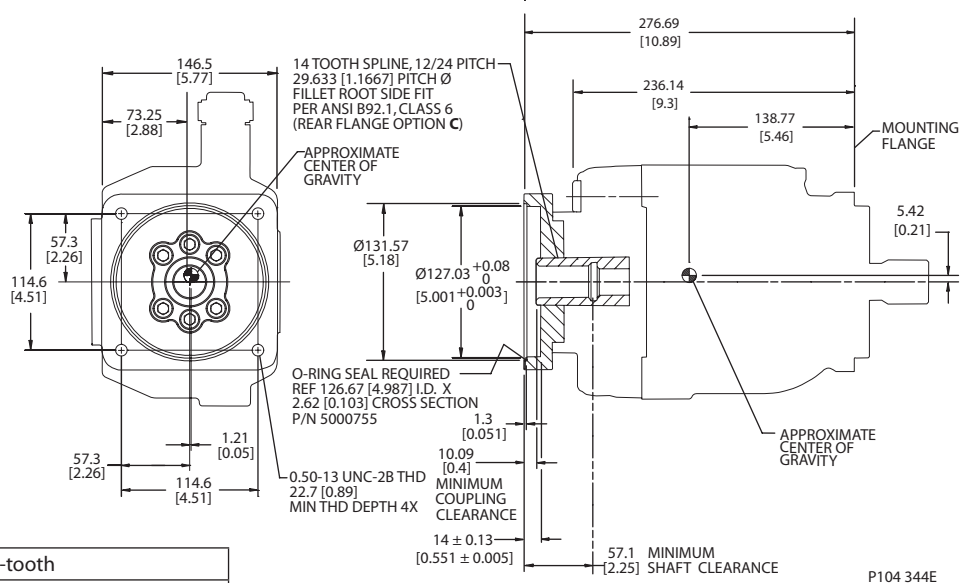
Specifications

| Coupling | 13-tooth | 15-tooth |
|---------------------------|-----------------------|-----------------------|
| Spline minimum engagement | 14.2 mm [0.56 in] | 18.9 mm [0.74 in] |
| Maximum torque | 249 N•m [2200 lbf•in] | 339 N•m [3000 lbf•in] |
| Dimension A | 20.7 mm [0.81 in] | 12.7 mm [0.5 in] |

**Auxiliary mounting pads
 (continued)**

**SAE-C auxiliary mounting pad
 Dimensions**

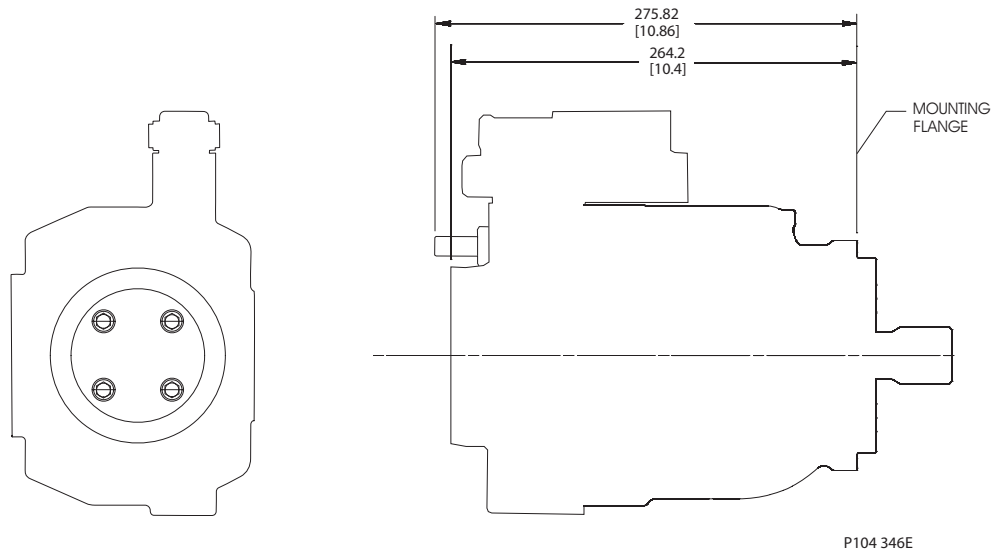
See page 18 for mating pump
 pilot and spline dimensions.



Specifications

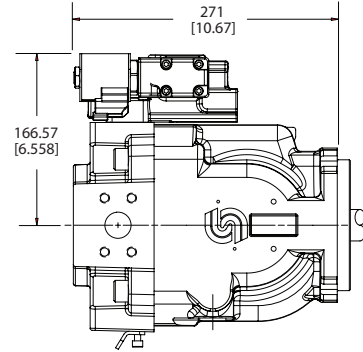
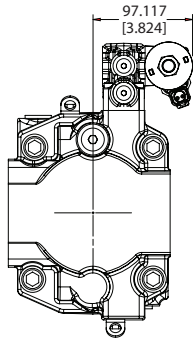
| | |
|----------------------------------|-----------------------|
| Coupling | 14-tooth |
| Spline minimum engagement | 18.3 mm [0.72 in] |
| Maximum torque | 339 N•m [3000 lbf•in] |

**Running Cover
 Dimensions**



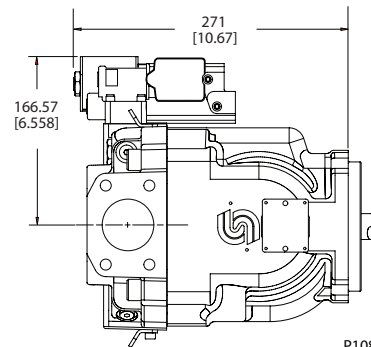
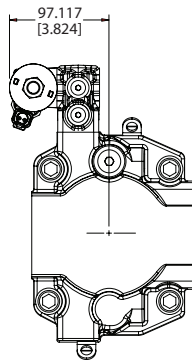
**Installation drawings
(continued)**

Radial Endcap Clockwise



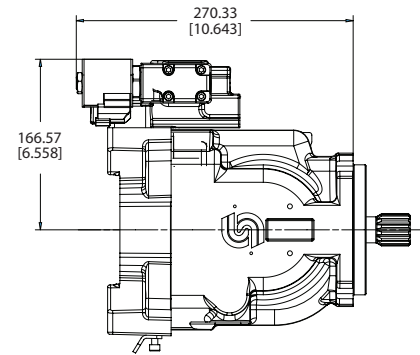
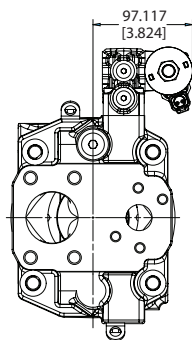
P108 457E

Radial Endcap Counterclockwise



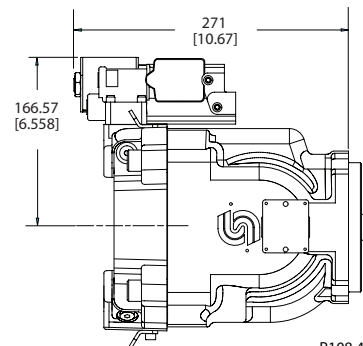
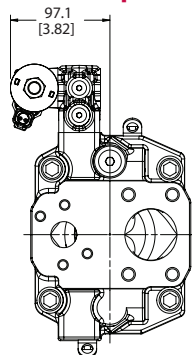
P108 455E

Axial Endcap Clockwise



P108 456E

Axial Endcap Counterclockwise



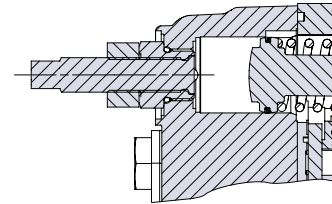
P108 457E



Displacement limiter

Series 45 F90C and F74B open circuit pumps are available with an optional adjustable displacement limiter. This adjustable stop limits the pump's maximum displacement.

Displacement limiter cross-section



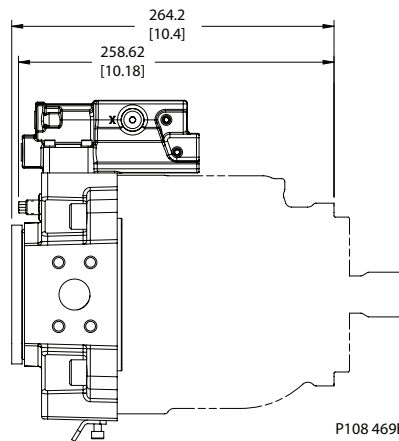
P104 345

Setting range

| | |
|-------------|--|
| F90C | 45.6 to 90 cm ³ [2.78 to 5.49 in ³] |
| F74B | 34.1 to 74 cm ³ [1.92 to 4.52 in ³] |

Displacement per turn

| | |
|-------------|--|
| F90C | 6.8 cm ³ /rev [0.41 in ³ /rev] |
| F74B | 6.1 cm ³ /rev [0.37 in ³ /rev] |



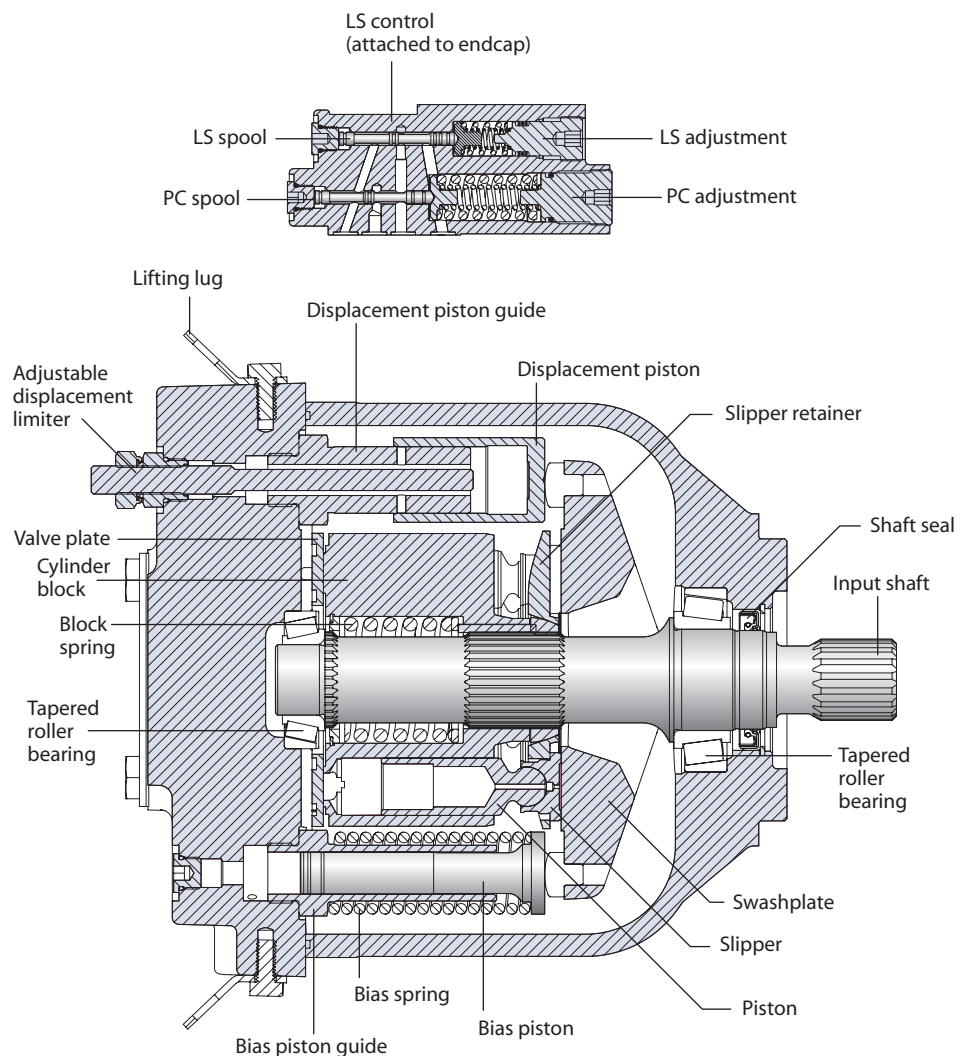
P108 469E

Design

Series 45 Frame E pumps have a single servo piston design with a cradle-type swashplate set in polymer-coated journal bearings. A bias spring and internal forces increase swashplate angle. The servo piston decreases swashplate angle. Nine reciprocating pistons displace fluid from the pump inlet to the pump outlet as the cylinder block rotates on the pump input shaft. The block spring holds the piston slippers to the swashplate via the slipper retainer. The cylinder block rides on a bi-metal valve plate optimized for high volumetric efficiency and low noise. Tapered roller bearings support the input shaft and a viton lip-seal protects against shaft leaks.

An adjustable one spool (PC only, not shown) or two spool (LS and PC) control senses system pressure and load pressure (LS controls). The control ports system pressure to the servo piston to control pump output flow.

Frame E cross section



P104 001E

Technical Specifications

For general operating parameters, including fluid viscosity, temperature, and inlet and case pressures, *see page 13*. For system design parameters, including installation, filtration, reservoir, and line velocities, *see page 15*.

For definitions of pressure and speed ratings, *see page 14*. For more information on external shaft loads, *see page 16*; mounting flange loads, *see page 17*.

| | | E Frame | | | |
|---|---|--|---------------------|---------------------|---------------------|
| | | Unit | 100B | 130B | 147C |
| Maximum Displacement | | cm ³ [in ³] | 100 [6.1] | 130 [7.93] | 147 [8.97] |
| Working Input Speed | Minimum | min ⁻¹ (rpm) | 500 | 500 | 500 |
| | Continuous | | 2450 | 2200 | 2100 |
| | Maximum | | 2880 | 2600 | 2475 |
| Working Pressure | Maximum | bar [psi] | 310 [4495] | 310 [4495] | 260 [3770] |
| Flow at rated speed (theoretical) | | l/min [US gal/min] | 245 [64.7] | 286 [75.6] | 309 [81.5] |
| Input torque at maximum displacement (theoretical) at 49° C [120°F] | | N•m/bar [lbf•in/1000 psi] | 1.592 [972] | 2.07 [1263.6] | 2.341 [1428.8] |
| Mass moment of inertia of internal rotating components | | kg•m ² [slug•ft ²] | 0.0128 [0.00944] | 0.0128 [0.00944] | 0.0128 [0.00944] |
| Weight | Axial ports | kg [lb] | 52 [115] | | |
| | Radial ports | | 56 [123] | | |
| External Shaft Loads | External moment (M _e) | N•m [lbf•in] | 455 [4027] | 360 [3186] | 396 [3505] |
| | Thrust in (T _{in}), out (T _{out}) | N [lbf] | 2846 [640] | 1735 [390] | 2113 [475] |
| Bearing Life (1800 rpm, no external shaft loading) | at 140 bar [2030 psi] | B ₁₀ hours | 77 200 | 32 700 | 21 600 |
| | at 210 bar [3045 psi] | | 11 100 | 5700 | 5500 |
| | at 260 bar [3770 psi] | | 9700 | 4116 | 2700 |
| | at 310 bar [4495 psi] | | 5400 | 2300 | -- |
| Mounting flange load moments | Vibratory (continuous) | N•m [lbf•in] | 1920 [17000] | | |
| | Shock (maximum) | | 6779 [60000] | | |

Order code

| | | | | | | | | | | | | | |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| R | S | P | C | D | E | F | G | H | J | K | L | M | N |
| <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |

Code description

| Code | Description |
|------|--|
| R | Product Frame, Variable Open Circuit Pump |
| S | Rotation |
| P | Displacement |
| C | Control Type |
| D | Pressure Compensator Setting |
| E | Load Sense Setting |
| F | Not Used |
| G | Choke Orifice |
| H | Gain Orifice |
| J | Input Shaft/Auxiliary Mount/Endcap |
| K | Shaft Seal/Front Mounting Flange/Housing Ports |
| L | Displacement Limiter |
| M | Special Hardware |
| N | Special Features |

Order code (continued)

| | | | | | | | | | | | | | |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| R | S | P | C | D | E | F | G | H | J | K | L | M | N |
| <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |

R Product

| | | E Frame | | |
|-----------|--|---------|------|------|
| | | 100B | 130B | 147C |
| ER | E Frame, variable displacement open circuit pump | • | • | • |

S Rotation

| | | 100B | 130B | 147C |
|----------|------------------------------|------|------|------|
| L | Left Hand (counterclockwise) | • | • | • |
| R | Right Hand (clockwise) | • | • | • |

P Displacement

| | | 100B | 130B | 147C |
|-------------|--|------|------|------|
| 100B | 100 cm ³ /rev [6.10 in ³ /rev] | • | | |
| 130B | 130 cm ³ /rev [7.93 in ³ /rev] | | • | |
| 147C | 147 cm ³ /rev [8.97 in ³ /rev] | | | • |

C Control type

| | | 100B | 130B | 147C |
|------------|--|------|------|------|
| PC | Pressure Compensator | • | • | • |
| BC* | Pressure Compensator (290-310 bar) [4200-4500 psi] | • | • | |
| LB | Load Sensing/Pressure Comp. with internal bleed orifice | • | • | • |
| BB* | Load Sensing/Pressure Comp. with internal bleed orifice (290-310 bar) [4200-4500 psi] | • | • | |
| LS | Load Sensing/Pressure Comp. | • | • | • |
| BS* | Load Sensing/Pressure Comp. (290-310 bar) [4200-4500 psi] | • | • | |
| RP | Remote Pressure Compensator | • | • | • |
| BP* | Remote Pressure Compensator (290-310 bar) [4200-4500 psi] | • | • | |
| AG | Electric on/off, 12VDC, Normally Closed, Deutsch (CCW rotation) only | • | • | • |
| BE* | Electric on/off, 12VDC, Normally Closed, Deutsch (CCW rotation) only (290-310 bar) [4200-4500 psi] | • | • | |
| AR | Electric on/off, 12VDC, Normally Closed, Deutsch (CW rotation) only | • | • | • |
| BR* | Electric on/off, 12VDC, Normally Closed, Deutsch (CW rotation) only (290-310 bar) [4200-4500 psi] | • | • | |

* Not available on 147cc pumps

Order code (continued)

| | | | | | | | | | | | | | |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| R | S | P | C | D | E | F | G | H | J | K | L | M | N |
| <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |

D *PC setting (2 digit code, 10 bar increments)*

| | | E Frame | | |
|----------------|-----------------------------------|---------|------|------|
| | | 100B | 130B | 147C |
| Example | 25 = 250 bar (3625 psi) | | | |
| 10-26 | 100 to 260 bar [1450 to 3771 psi] | . | . | . |
| 27-28 | 270 to 280 bar [3916 to 4061 psi] | . | . | |
| 29-31 | 290-310 bar [4206 to 4496 psi] | . | . | |

E *Load sensing setting (2 digit code, 1 bar increments)*

| | | | | |
|----------------|---|---|---|---|
| Example | 20 = 20 bar (290 psi) | | | |
| 10-34 | 10 to 34 bar [145 to 508 psi] | . | . | . |
| NN | Not applicable (pressure compensated only controls) | . | . | . |

F *Not used*

| | | | | |
|-----------|----------------|---|---|---|
| NN | Not applicable | . | . | . |
|-----------|----------------|---|---|---|

G *Pilot/Choke Orifice*

| | | | | |
|----------|-----------------|---|---|---|
| N | None (standard) | . | . | . |
|----------|-----------------|---|---|---|

H *Gain Orifice*

| | | | | |
|----------|-----------------|---|---|---|
| 3 | 1.0 mm diameter | . | . | . |
|----------|-----------------|---|---|---|

Order code (continued)

| | | | | | | | | | | | | | |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| R | S | P | C | D | E | F | G | H | J | K | L | M | N |
| <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |

J Input Shaft

| | |
|-----------|-------------------------|
| K5 | 1.5 inch straight keyed |
| S1 | 14 tooth 12/24 pitch |
| S2 | 17 tooth, 12/24 pitch |
| S4 | 13 tooth, 8/16 pitch |

Auxiliary Mount/Endcap Style

| Auxiliary Description | Endcap Style | Inlet Porting | Outlet Porting | Endcap Description | Code |
|----------------------------------|--------------|---------------|----------------|--|------|
| None | Axial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2.5 inch port 0.5 inch threads) Outlet - Code 62 Split Flange Port 4 Bolt (1.25 inch port 0.5 inch threads) | NL |
| None | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2.5 inch port 0.5 inch threads) Outlet - Code 62 Split Flange Port 4 Bolt (1.25 inch port 0.5 inch threads) | NP |
| Running Cover | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2.5 inch port 0.5 inch threads) Outlet - Code 62 Split Flange Port 4 Bolt (1.25 inch port 0.5 inch threads) | RP |
| SAE-A, 11 teeth | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2.5 inch port 0.5 inch threads) Outlet - Code 62 Split Flange Port 4 Bolt (1.25 inch port 0.5 inch threads) | TP |
| SAE-A, 9 teeth | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2.5 inch port 0.5 inch threads) Outlet - Code 62 Split Flange Port 4 Bolt (1.25 inch port 0.5 inch threads) | AP |
| SAE-B, 13 teeth | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2.5 inch port 0.5 inch threads) Outlet - Code 62 Split Flange Port 4 Bolt (1.25 inch port 0.5 inch threads) | BP |
| SAE-B, 14 teeth | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2.5 inch port 0.5 inch threads) Outlet - Code 62 Split Flange Port 4 Bolt (1.25 inch port 0.5 inch threads) | LP |
| SAE-BB, 13 teeth/with M12 thread | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2.5 inch port M12 metric threads) Outlet - Code 62 Split Flange Port 4 Bolt (1.25 inch port M12 metric threads) | U6 |
| SAE-BB, 15 teeth | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2.5 inch port 0.5 inch threads) Outlet - Code 62 Split Flange Port 4 Bolt (1.25 inch port 0.5 inch threads) | VP |
| SAE-C, 14 teeth | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2.5 inch port 0.5 inch threads) Outlet - Code 62 Split Flange Port 4 Bolt (1.25 inch port 0.5 inch threads) | CP |
| SAE-CC, 17 teeth | Radial | Split Flange | Split Flange | Inlet - Code 61 Split Flange Port 4 Bolt (2.5 inch port 0.5 inch threads) Outlet - Code 62 Split Flange Port 4 Bolt (1.25 inch port 0.5 inch threads) | WP |

J Input Shaft/Auxiliary Mount/Endcap

Available Combinations

| | E Frame | | |
|-------------|---------|------|------|
| | 100B | 130B | 147C |
| K5AP | • | • | • |
| K5BP | • | • | • |
| K5CP | • | • | • |
| K5NL | • | • | • |
| K5NP | • | • | • |
| K5RP | • | • | • |
| K5VP | • | • | • |
| S1AP | • | • | • |
| S1BP | • | • | • |
| S1CP | • | • | • |
| S1LP | • | • | • |
| S1NL | • | • | • |
| S1NP | • | • | • |
| S1RP | • | • | • |
| S1TP | • | • | • |
| S1VP | • | • | • |
| S2AP | • | • | • |

| | E Frame | | |
|-------------|---------|------|------|
| | 100B | 130B | 147C |
| S2BP | • | • | • |
| S2CP | • | • | • |
| S2NL | • | • | • |
| S2NP | • | • | • |
| S2RP | • | • | • |
| S2TP | • | • | • |
| S2VP | • | • | • |
| S2WP | • | • | • |
| S4AP | • | • | • |
| S4BP | • | • | • |
| S4CP | • | • | • |
| S4NL | • | • | • |
| S4NP | • | • | • |
| S4RP | • | • | • |
| S4U6 | • | • | • |
| S4TP | • | • | • |
| S4VP | • | • | • |
| S4WP | • | • | • |

Order code (continued)

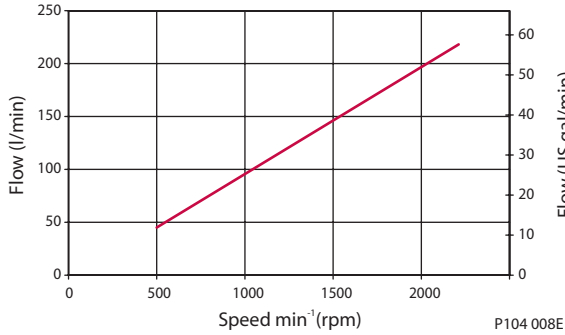
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|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| R | S | P | C | D | E | F | G | H | J | K | L | M | N |
| <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |

| | | E Frame | | |
|------------|---|---------|------|------|
| | | 100B | 130B | 147C |
| K | <i>Shaft seal</i> | | | |
| A | Single (Viton) | • | • | • |
| K | <i>Mounting flange and housing port style</i> | | | |
| 1 | SAE-C Flange 4-bolt/SAE O-ring boss ports | • | • | • |
| K | <i>Not used</i> | | | |
| N | Not applicable | • | • | • |
| L | <i>Displacement limiter</i> | | | |
| NNN | None (plugged) | • | • | • |
| AAA | Adjustable, factory set at max angle | • | • | • |
| M | <i>Special hardware</i> | | | |
| NNN | None | • | • | • |
| N | <i>Special features</i> | | | |
| NNN | None | • | • | • |

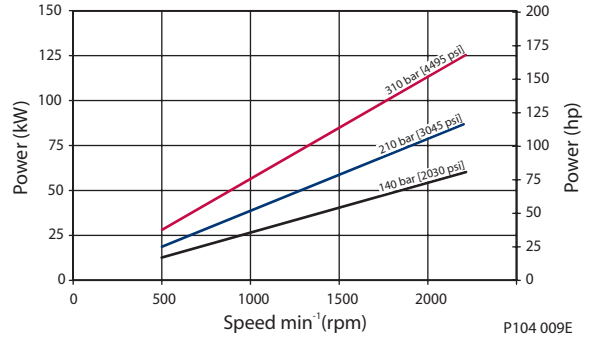
Performance E100B

Flow and power data valid at 49°C [120°F] and viscosity of 17.8 mm²/sec [88 SUS].

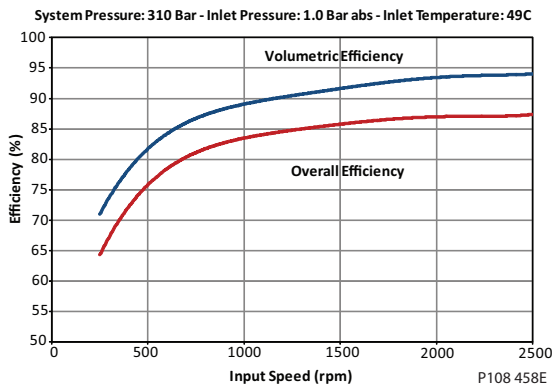
Flow vs. speed



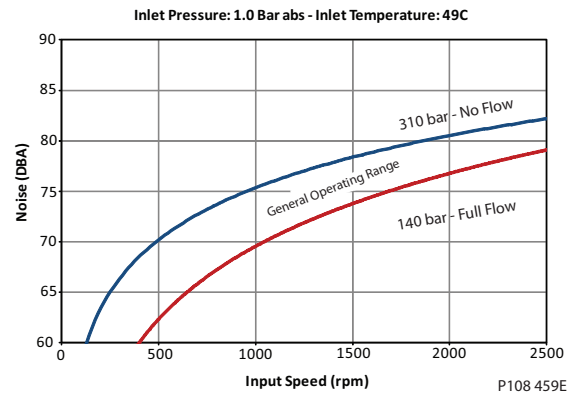
Input power vs. speed



Efficiency

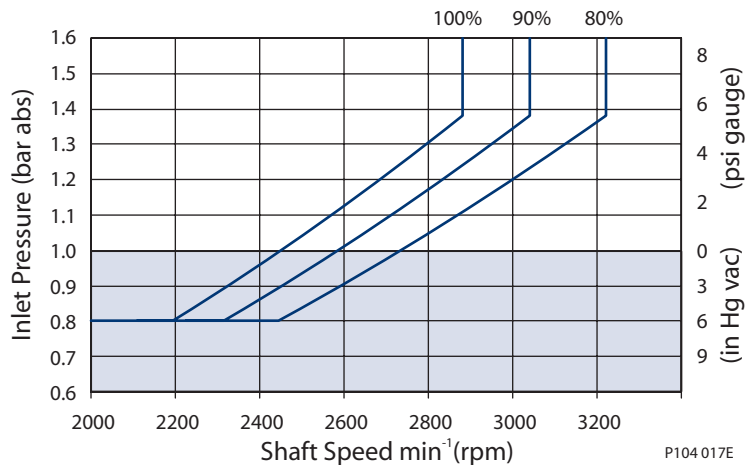


Noise



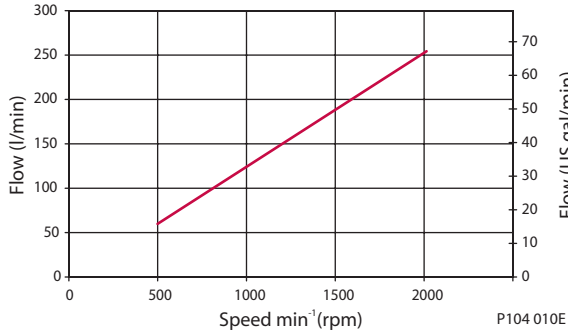
Inlet pressure vs. speed

The chart on the right shows allowable inlet pressure and speed at various displacements. Greater speeds and lower inlet pressures are possible at reduced displacement. Operating outside of acceptable limits reduces pump life.

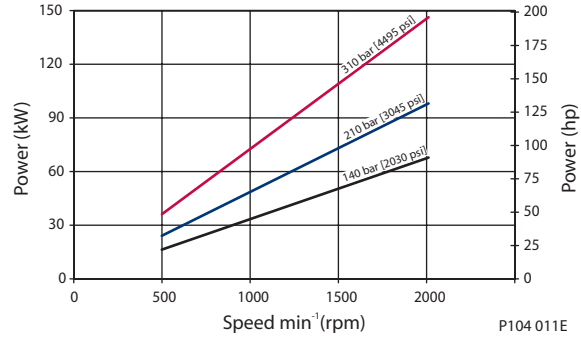


Performance E130B

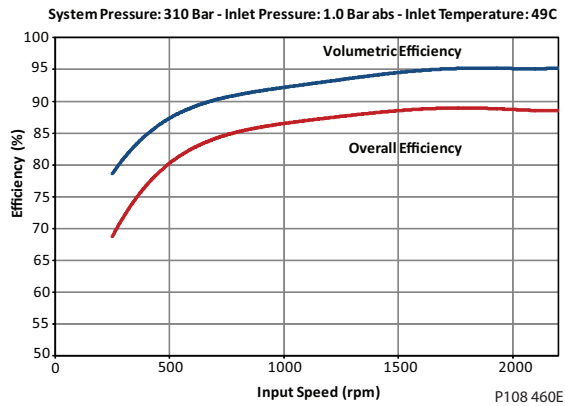
Flow vs. speed



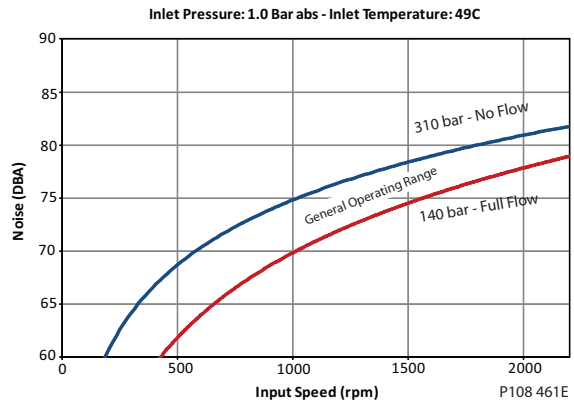
Input power vs. speed



Efficiency

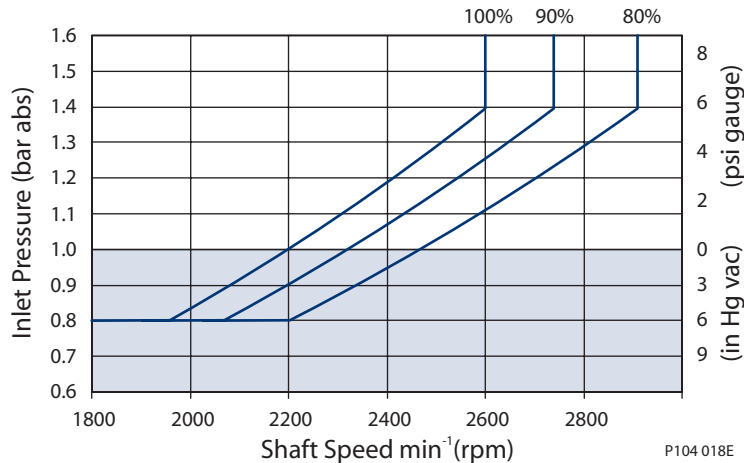


Noise



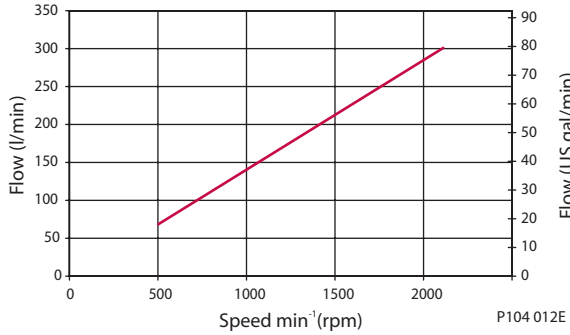
Inlet pressure vs. speed

The chart on the right shows allowable inlet pressure and speed at various displacements. Greater speeds and lower inlet pressures are possible at reduced displacement. Operating outside of acceptable limits reduces pump life.

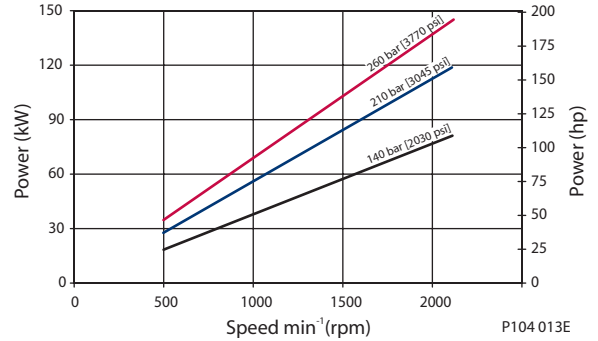


Performance E147C

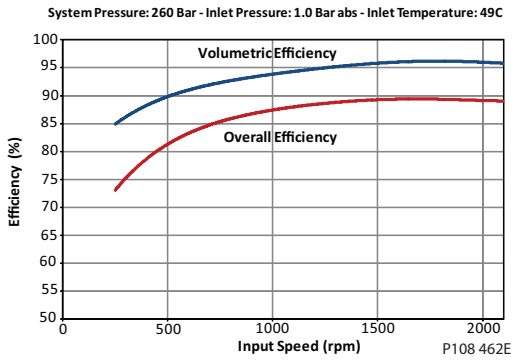
Flow vs. speed



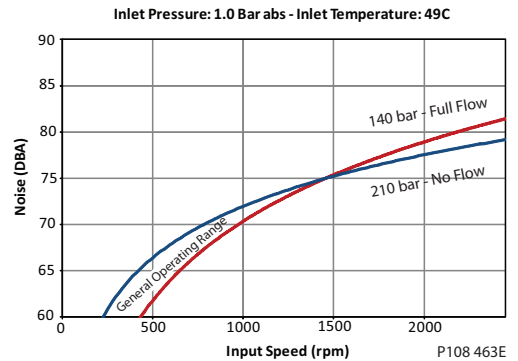
Input power vs. speed



Efficiency

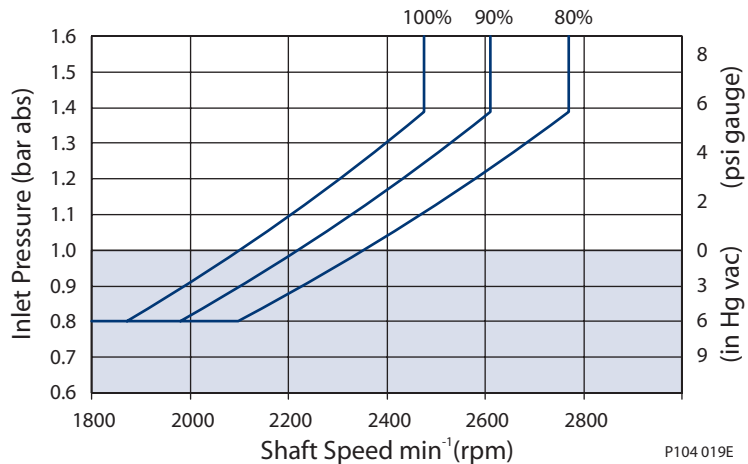


Noise



Inlet pressure vs. speed

The chart on the right shows allowable inlet pressure and speed at various displacements. Greater speeds and lower inlet pressures are possible at reduced displacement. Operating outside of acceptable limits reduces pump life.



Hydraulic Controls

Pressure Compensated Controls

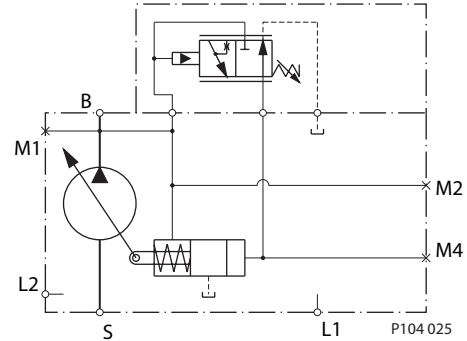
Response/recovery times

| (ms) | Response | Recovery |
|--------------|----------|----------|
| E100B | 45 | 175 |
| E130B | 55 | 175 |
| E147C | 60 | 190 |

PC Setting range

| Model | PC | BC |
|--------------|--------------------------------|--------------------------------|
| E100B | 100-280 bar [1450-4060 psi] | 290-310 bar [4205-4495 psi] |
| E130B | 100-280 bar [1450-4060 psi] | 290-310 bar [4205-4495 psi] |
| E147C | 100-260 bar [1450-3770 psi] | N/A |

Schematic



Legend

- B = Outlet
- S = Inlet
- L1, L2 = Case drain
- M2 = System pressure gauge port
- M4 = Servo pressure gauge port

Remote Pressure Compensated Controls

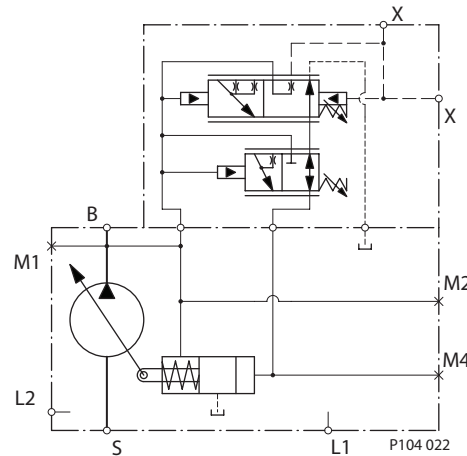
Response/recovery times

| (ms) | Response | Recovery |
|--------------|----------|----------|
| E100B | 45 | 175 |
| E130B | 55 | 175 |
| E147C | 60 | 190 |

PC Setting range

| Model | RP | BP |
|--------------|--------------------------------|--------------------------------|
| E100B | 100-280 bar [1450-4060 psi] | 290-310 bar [4205-4495 psi] |
| E130B | 100-280 bar [1450-4060 psi] | 290-310 bar [4205-4495 psi] |
| E147C | 100-260 bar [1450-3770 psi] | N/A |

Schematic



Legend

- B = Outlet
- S = Inlet
- L1, L2 = Case drain
- M2 = System pressure gauge port
- M4 = Servo pressure gauge port
- X = Remote PC port

**Hydraulic Controls
 (continued)**

Load Sensing/Pressure Compensated

*Response/recovery times**

| (ms) | Response | Recovery |
|--------------|----------|----------|
| E100B | 45 | 200 |
| E130B | 50 | 200 |
| E147C | 60 | 200 |

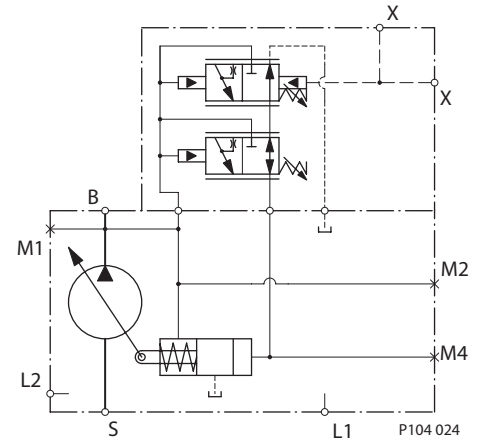
PC Setting range

| Model | LS | BS |
|--------------|--------------------------------|--------------------------------|
| E100B | 100-280 bar [1450-4060 psi] | 290-310 bar [4205-4495 psi] |
| E130B | 100-280 bar [1450-4060 psi] | 290-310 bar [4205-4495 psi] |
| E147C | 100-260 bar [1450-3770 psi] | N/A |

LS setting range

| Model | bar | psi |
|------------|-------|---------|
| All | 10-30 | 145-435 |

Schematic



Legend

- B = Outlet
- S = Inlet
- L1, L2 = Case drain
- M2 = System pressure gauge port
- M4 = Servo pressure gauge port
- X = LS signal port

Load Sensing with Bleed Orifice/Pressure Compensated

PC setting range

| Model | bar | psi |
|--------------|---------|-----------|
| E100B | 100-310 | 1450-4495 |
| E130B | 100-310 | 1450-4495 |
| E147C | 100-260 | 1450-3770 |

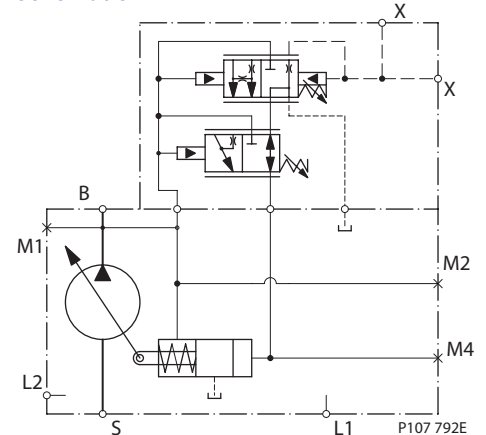
PC Setting range

| Model | LB | BB |
|--------------|--------------------------------|--------------------------------|
| E100B | 100-280 bar [1450-4060 psi] | 290-310 bar [4205-4495 psi] |
| E130B | 100-280 bar [1450-4060 psi] | 290-310 bar [4205-4495 psi] |
| E147C | 100-260 bar [1450-3770 psi] | N/A |

LS setting range

| Model | bar | psi |
|------------|-------|---------|
| All | 10-30 | 145-435 |

Schematic



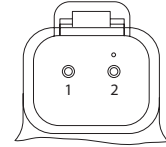
Legend

- B = Outlet
- S = Inlet
- L1, L2 = Case drain
- M2 = System pressure gauge port
- M4 = Servo pressure gauge port
- X = LS signal port

Electric Controls

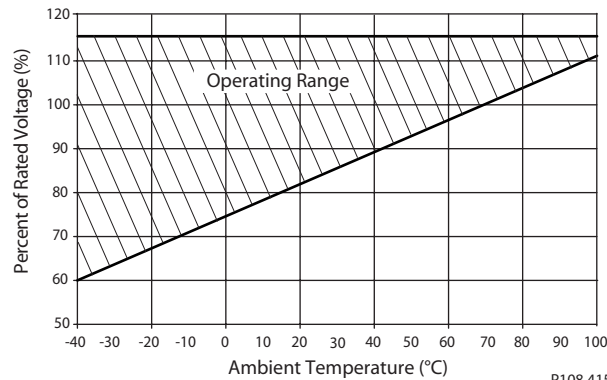
Connectors

| Description | Quantity | Ordering Number |
|------------------------------------|----------|-------------------------|
| Mating Connector | 1 | Deutsch® DT06-2S |
| Wedge Lock | 1 | Deutsch® W25 |
| Socket Contact (16 and 18 AWG) | 2 | Deutsch® 0462-201-16141 |
| Sauer-Danfoss mating connector kit | 1 | K29657 |



P003 480

Continuous Duty Operating Range

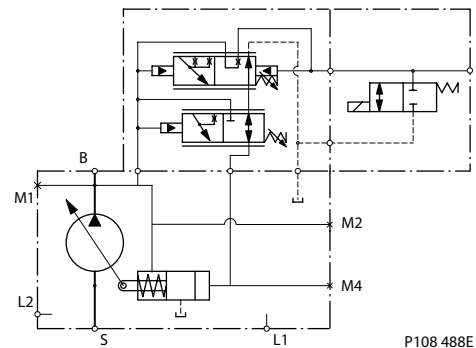


Normally Closed on/off Electric Pressure Compensated Controls

*Response/Recovery Times**

| (ms) | Response | Recovery |
|--------------|----------|----------|
| E100B | 45 | 175 |
| E130B | 55 | 175 |
| E147C | 60 | 190 |

Schematic



Legend

- B = Outlet
- S = Inlet
- L1, L2 = Case drain
- M1 = System pressure gauge port

PC setting range

| Code | AG, AR | BE, BR |
|--------------|--------------------------------|--------------------------------|
| E100B | 100-280 bar [1450-4060 psi] | 290-310 bar [4205-4495 psi] |
| E130B | 100-280 bar [1450-4060 psi] | 290-310 bar [4205-4495 psi] |
| E147B | 100-260 bar [1450-3770 bar] | N/A |

LS setting range

| Model | bar | psi |
|------------|-------|---------|
| All | 10-34 | 145-508 |

Normally Open on/off Electric Pressure Compensated Controls

PC setting range

| Code | AG, AR |
|--------------|--------------------------------|
| E100B | 100-280 bar [1450-4060 psi] |
| E130B | 100-280 bar [1450-4060 psi] |
| E147B | 100-260 bar [1450-3770 bar] |

LS setting range

| Model | bar | psi |
|------------|-------|---------|
| All | 10-34 | 145-508 |

Input shafts

Shaft data

| Code | Description | Maximum torque rating ¹ N•m [lbf•in] | Drawing |
|------|---|--|---|
| K5 | Ø 38.08 mm [1.5 in] Straight keyed | 1161 [10 270] | <p>9.525 [0.375] X 38.1 [1.5] LONG SQUARE KEY Ø38.075 ± 0.025 [1.5 ± 0.0009] Ø42.26 ± 0.125 [1.664 ± 0.005] 54 [2.13] 8 ± 0.8 [0.31 ± 0.03] COUPLING MUST NOT PROTRUDE BEYOND THIS POINT P104 037E</p> |
| S1 | 14-tooth spline 12/24 pitch (ANSI B92.1 1970 - Class 5) | 800 [7080] | <p>Ø47.58 ± 0.43 [1.87 ± 0.017] Ø25.53 Max. [1.01] 14 TOOTH 12/24 PITCH 29.634 [1.167] PITCH Ø FILLET ROOT SIDE FIT COMPATIBLE WITH ANSI B92.1-1970 CLASS 5 - ALSO MATES WITH FLAT ROOT SIDE FIT Ø31.14 ± 0.08 [1.226 ± 0.003] 28 ± 0.5 [1.87 ± 0.017] 8 ± 0.8 [0.31 ± 0.03] COUPLING MUST NOT PROTRUDE BEYOND THIS POINT P104 038E</p> |
| S2 | 17-tooth spline 12/24 pitch (ANSI B92.1 1970 - Class 5) | 1150 [10178] | <p>17 TOOTH 12/24 PITCH 30° PRESSURE ANGLE 35.983 [1.417] PITCH DIA FILLET ROOT SIDE FIT COMPATIBLE WITH ANSI B92.1-1970 CLASS 5 ALSO MATES WITH FLAT ROOT SIDE FIT Ø30.75 [1.211] MAX Ø36.66 ± 0.08 [1.443 ± 0.003] 34 ± 0.15 [1.339 ± 0.006] 54 [2.126] 8 ± 0.8 [0.31 ± 0.03] COUPLING MUST NOT PROTRUDE BEYOND THIS POINT P104 036E</p> |

1. See *Input shaft torque ratings*, page 18 for an explanation of maximum torque.

Input shafts
(continued)

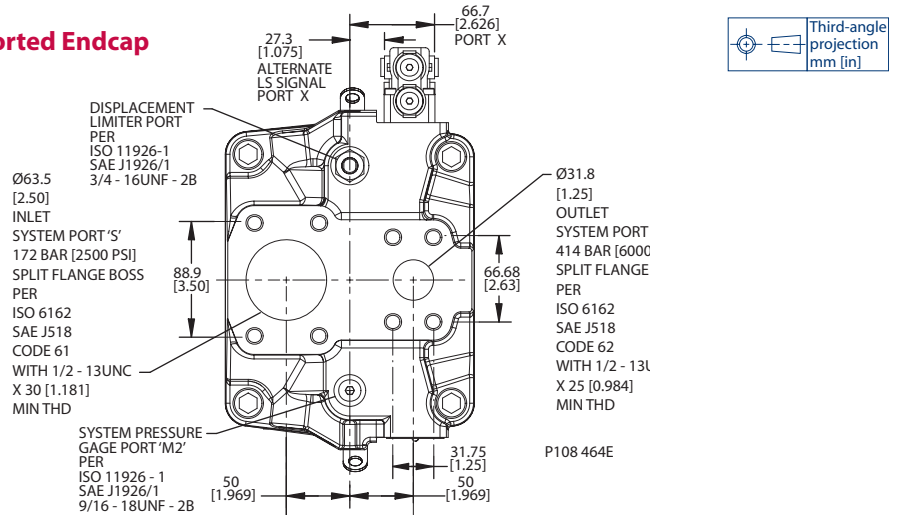
Shaft data

| Code | Description | Maximum torque rating ¹ N•m [lbf•in] | Drawing |
|------|--|--|--|
| S4 | 13-tooth spline 8/16 pitch (ANSI B92.1 1970 - Class 5) | 1560 [13 807] | <p>13 TOOTH 8/16 PITCH 30° PRESSURE ANGLE 41.28 [1.625] PITCH DIA FILLET ROOT SIDE FIT COMPATIBLE WITH ANSI B92.1-1970 CLASS 5 ALSO MATES WITH FLAT ROOT SIDE FIT</p> <p>Ø34.25 [1.348] MAX</p> <p>Ø43.94 ± 0.08 [1.73 ± 0.003]</p> <p>42 ± 0.15 [1.654 ± 0.006]</p> <p>67 [2.638]</p> <p>8 ± 0.8 [0.31 ± 0.03]</p> <p>COUPLING MUST NOT PROTRUDE BEYOND THIS POINT</p> <p>P104 035E</p> |

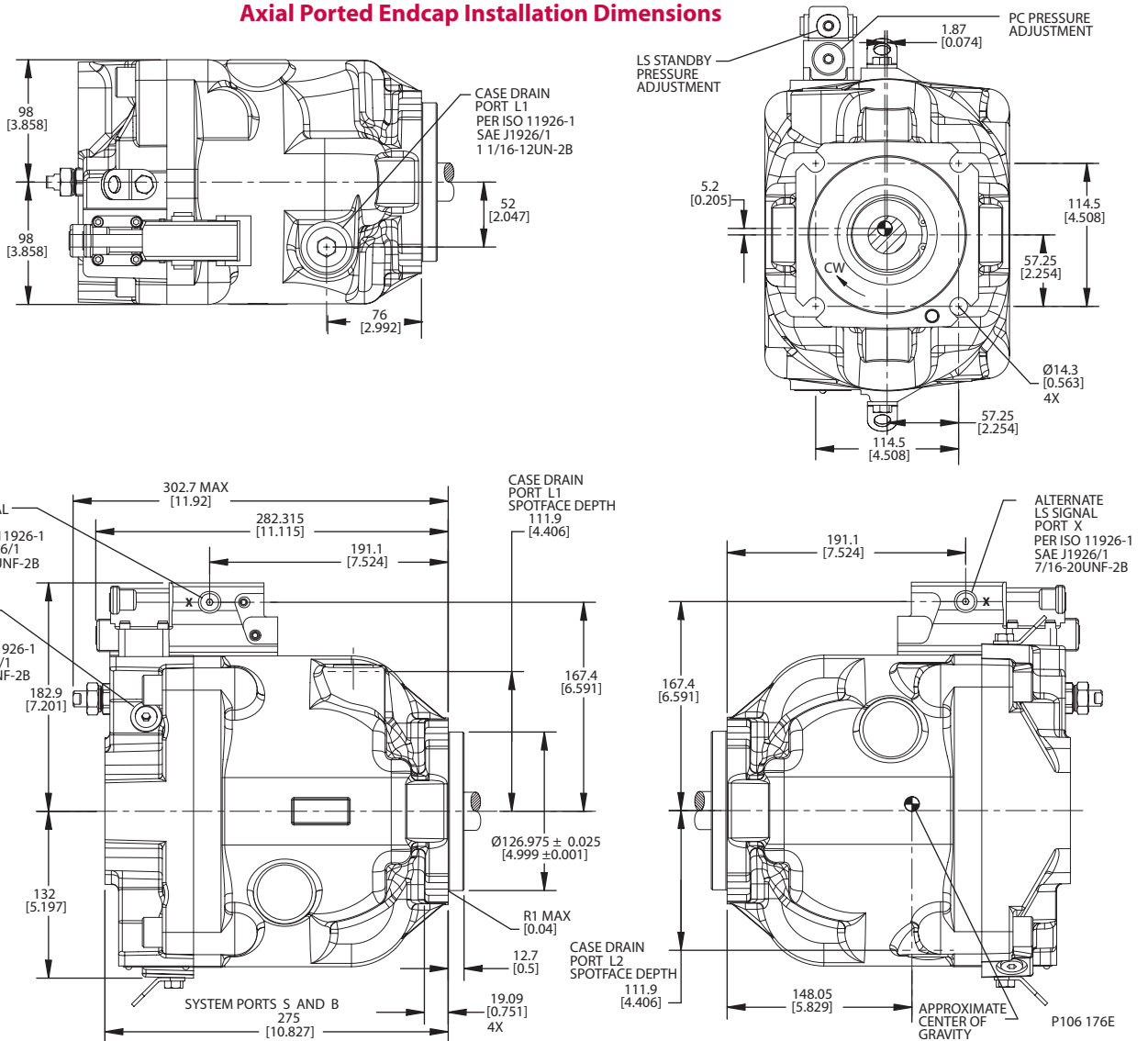
1. See *Input shaft torque ratings*, page 18 for an explanation of maximum torque.

Installation drawings

Axial Ported Endcap

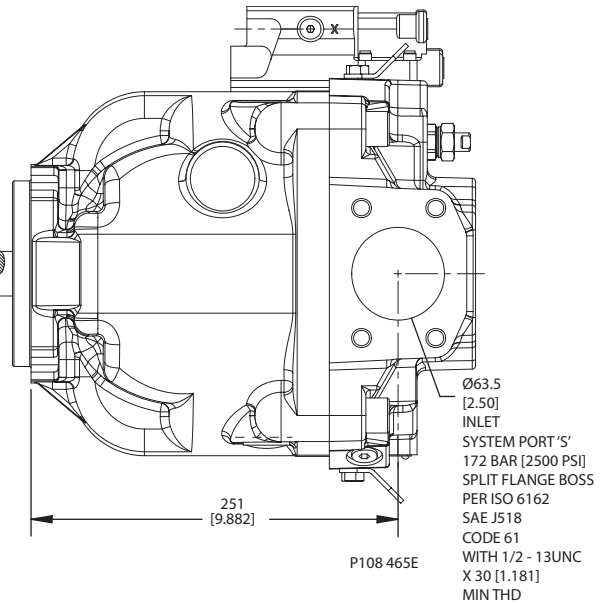
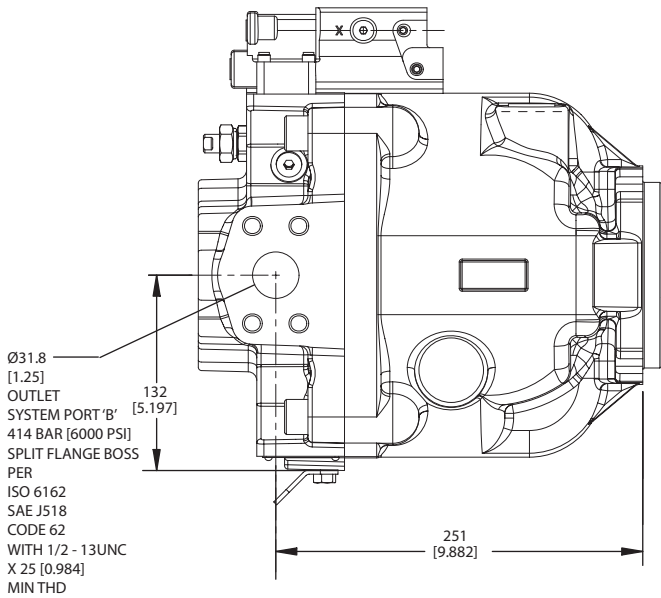


Axial Ported Endcap Installation Dimensions

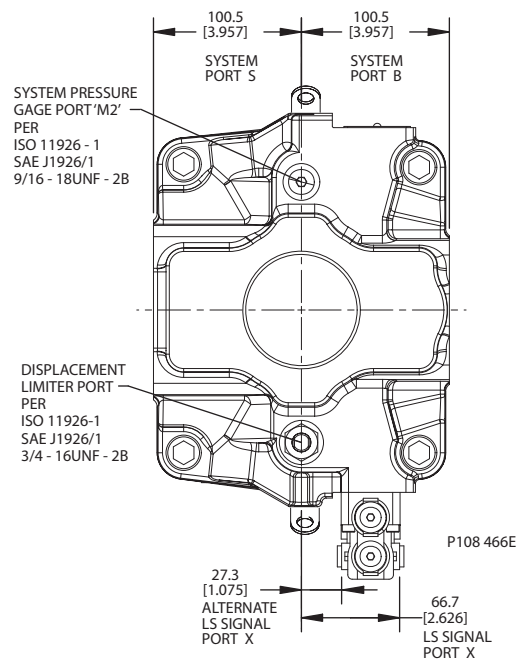
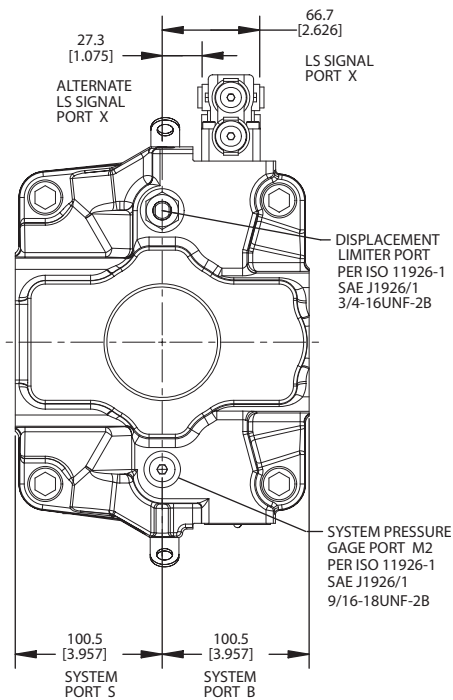


**Installation drawings
(continued)**

Radial Ported Endcap Split Flange Ports

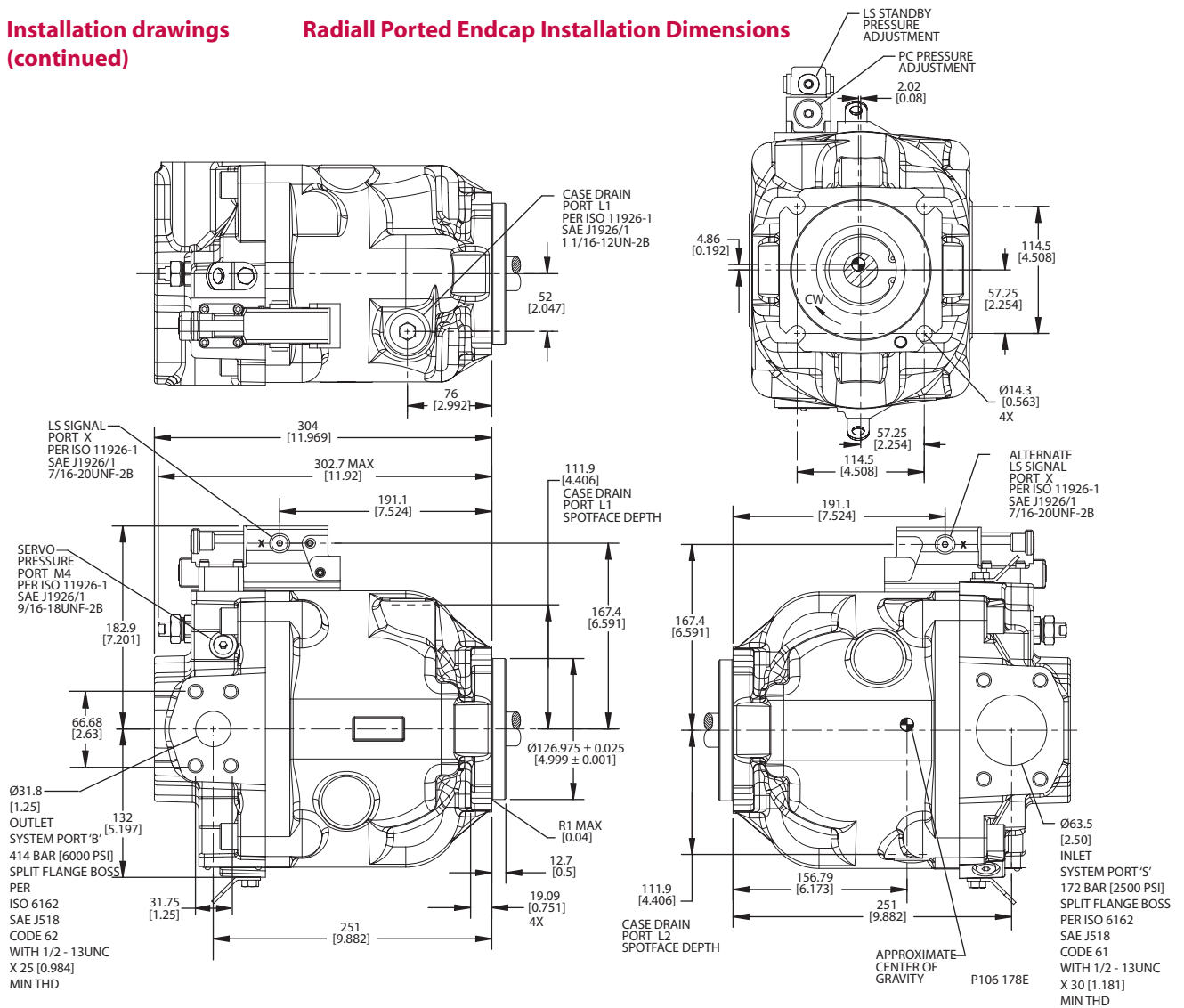


Radial Ported Endcap Rear View

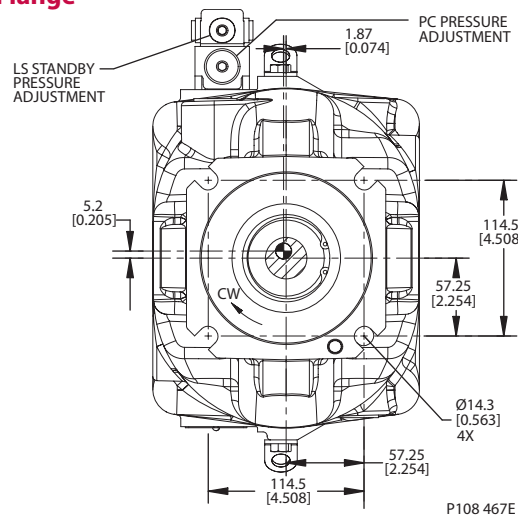


Installation drawings
 (continued)

Radial Ported Endcap Installation Dimensions

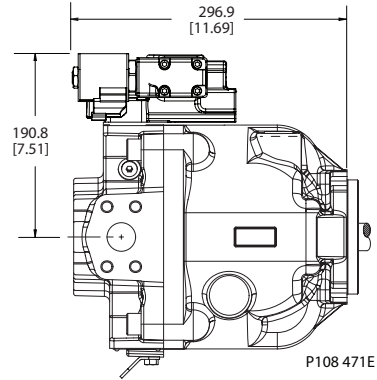
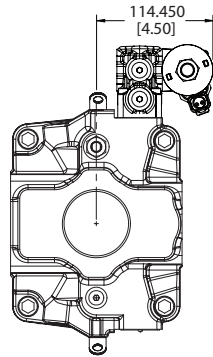


Front Mounting Flange

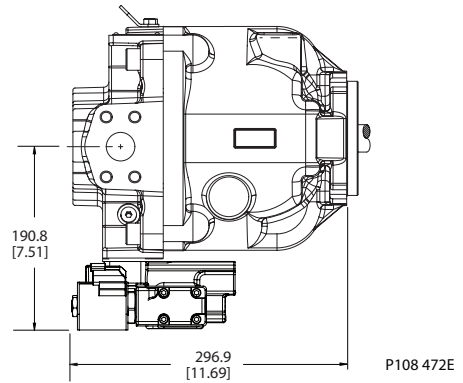
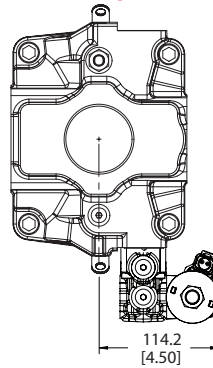


**Installation drawings
(continued)**

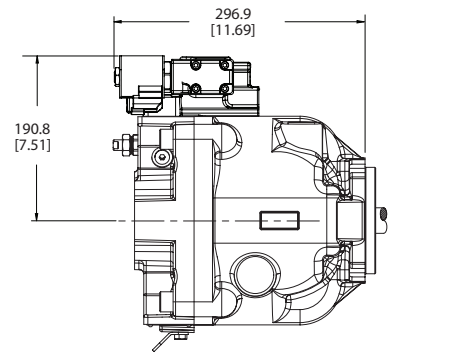
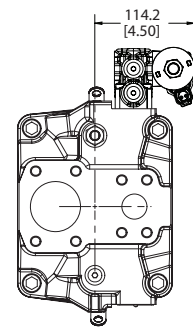
Radial Endcap Clockwise



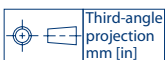
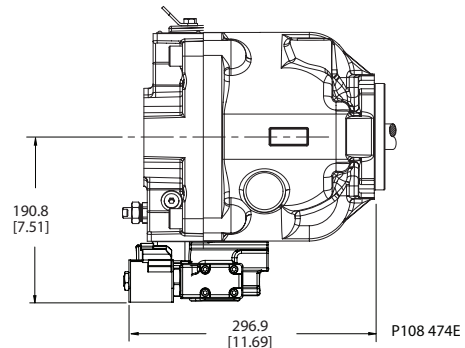
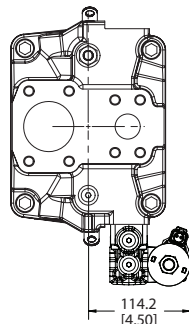
Radial Endcap Counterclockwise



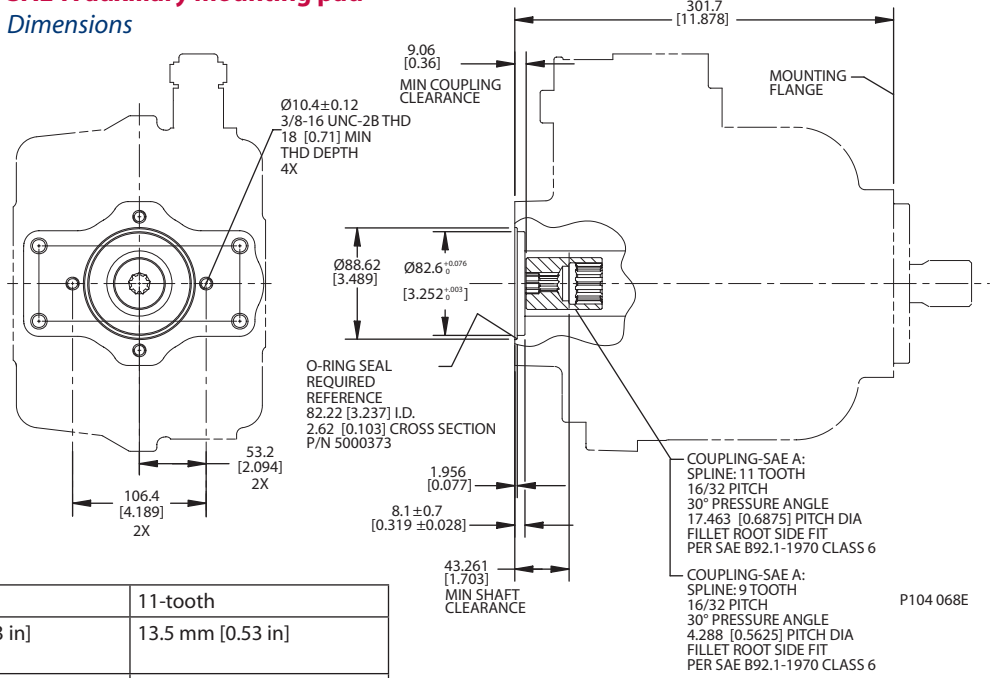
Axial Endcap Clockwise



Axial Endcap Counterclockwise



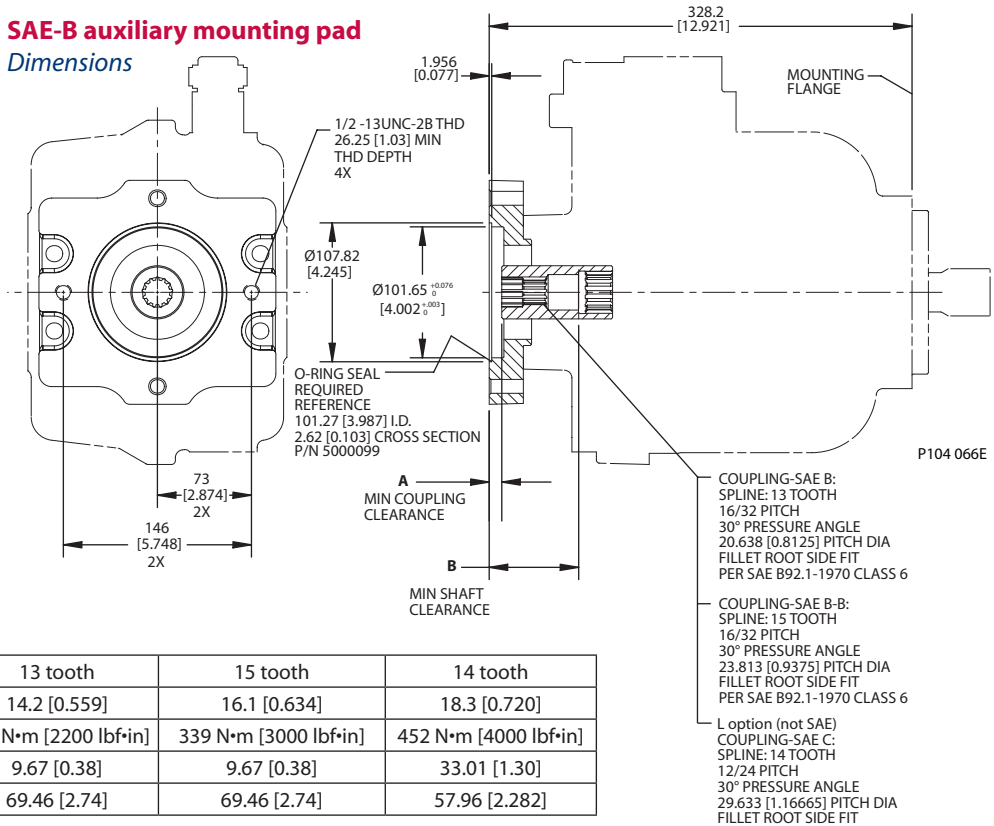
Auxiliary mounting pads **SAE-A auxiliary mounting pad**
 Dimensions



Specifications

| Coupling | 9-tooth | 11-tooth |
|---------------------------|----------------------|-----------------------|
| Spline minimum engagement | 13.5 mm [0.53 in] | 13.5 mm [0.53 in] |
| Maximum torque | 107 N·m [950 lbf·in] | 147 N·m [1300 lbf·in] |

SAE-B auxiliary mounting pad
 Dimensions



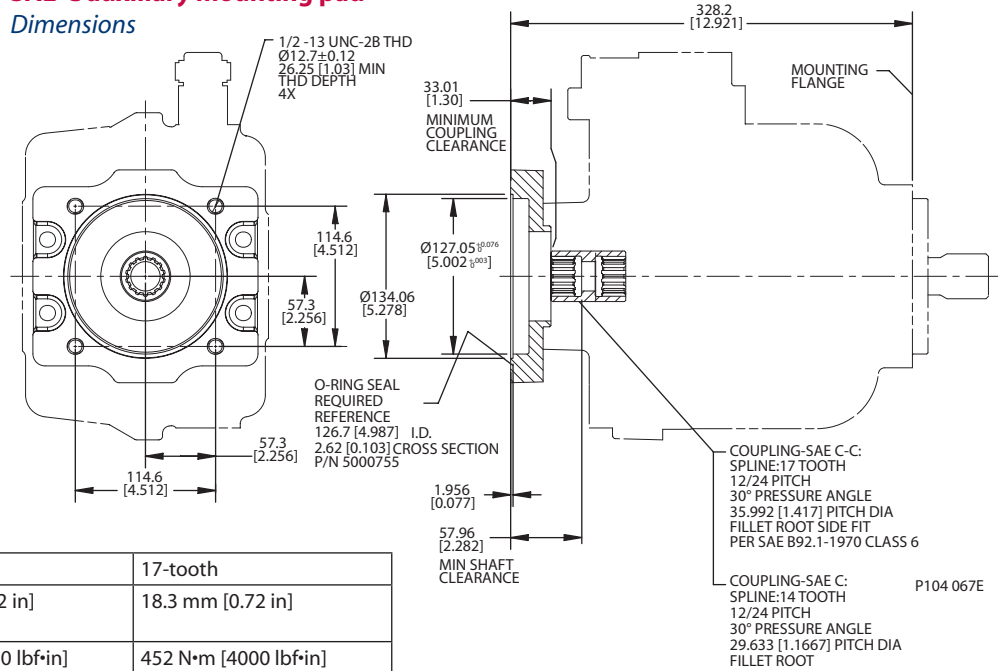
Specifications

| Coupling | 13 tooth | 15 tooth | 14 tooth |
|---------------------------|-----------------------|-----------------------|-----------------------|
| Spline Minimum Engagement | 14.2 [0.559] | 16.1 [0.634] | 18.3 [0.720] |
| Maximum Torque | 249 N·m [2200 lbf·in] | 339 N·m [3000 lbf·in] | 452 N·m [4000 lbf·in] |
| Dimension A | 9.67 [0.38] | 9.67 [0.38] | 33.01 [1.30] |
| Dimension B | 69.46 [2.74] | 69.46 [2.74] | 57.96 [2.282] |

**Auxiliary mounting pads
 (continued)**

See page 18 for mating pump
 pilot and spline dimensions.

**SAE-C auxiliary mounting pad
 Dimensions**



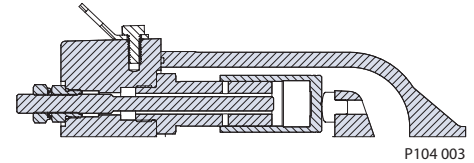
Specifications

| Coupling | 14-tooth | 17-tooth |
|---------------------------|-----------------------|-----------------------|
| Spline minimum engagement | 18.3 mm [0.72 in] | 18.3 mm [0.72 in] |
| Maximum torque | 452 N·m [4000 lbf·in] | 452 N·m [4000 lbf·in] |

Displacement Limiters

E Frame open circuit pumps are available with an optional adjustable displacement limiter. This adjustable stop limits the pump's maximum displacement.

Displacement limiter cross-section

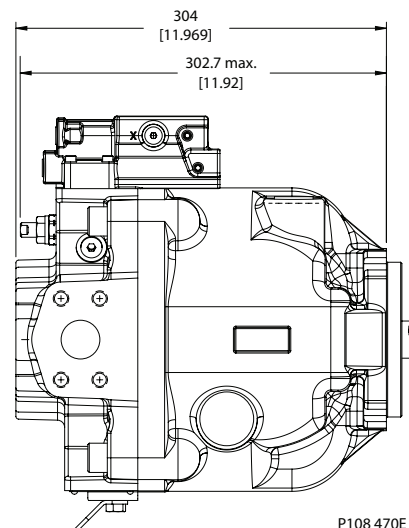


Setting range

| | |
|--------------|---|
| E100B | 40 to 100 cm ³ [2.44 to 6.1 in ³] |
| E130B | 70 to 130 cm ³ [4.27 to 7.93 in ³] |
| E147C | 87 to 147 cm ³ [5.31 to 8.97 in ³] |

Displacement per turn

| | |
|--------------|--|
| E100B | 8.4 cm ³ /rev [0.51 in ³ /rev] |
| E130B | 8.4 cm ³ /rev [0.51 in ³ /rev] |
| E147C | 8.4 cm ³ /rev [0.51 in ³ /rev] |





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