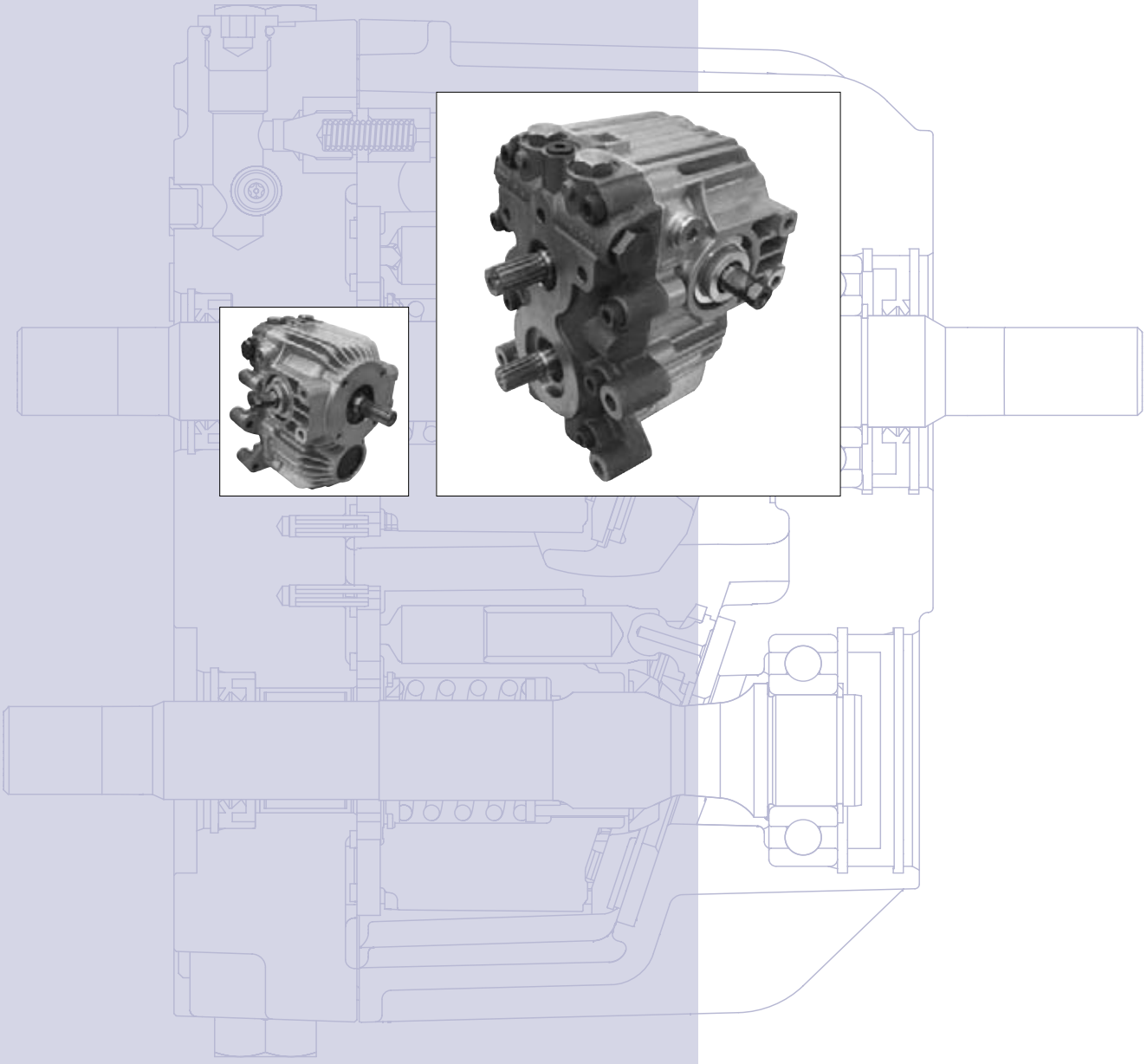
SAUER DANFOSS

LDU 20
Closed Circuit Axial Piston Transmission

Technical Information



HISTORY OF REVISIONS

Table of Revisions

Date	Page	Changed	Rev.
January 2011		First Edition	AA
March 2011			AB

Further available literature

Description	SD Order Number
Hydraulic Fluids, Technical Information	
Hydraulic Fluids and Lubricants	520L0463
Experience with Biodegradable Hydraulic Fluids	520L0465
Application information	
Applications Manual, Section 1, Selection of Driveline Components	BLN-9885
Service Manuals	
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LDU 20 Closed Circuit Axial Piston Transmission
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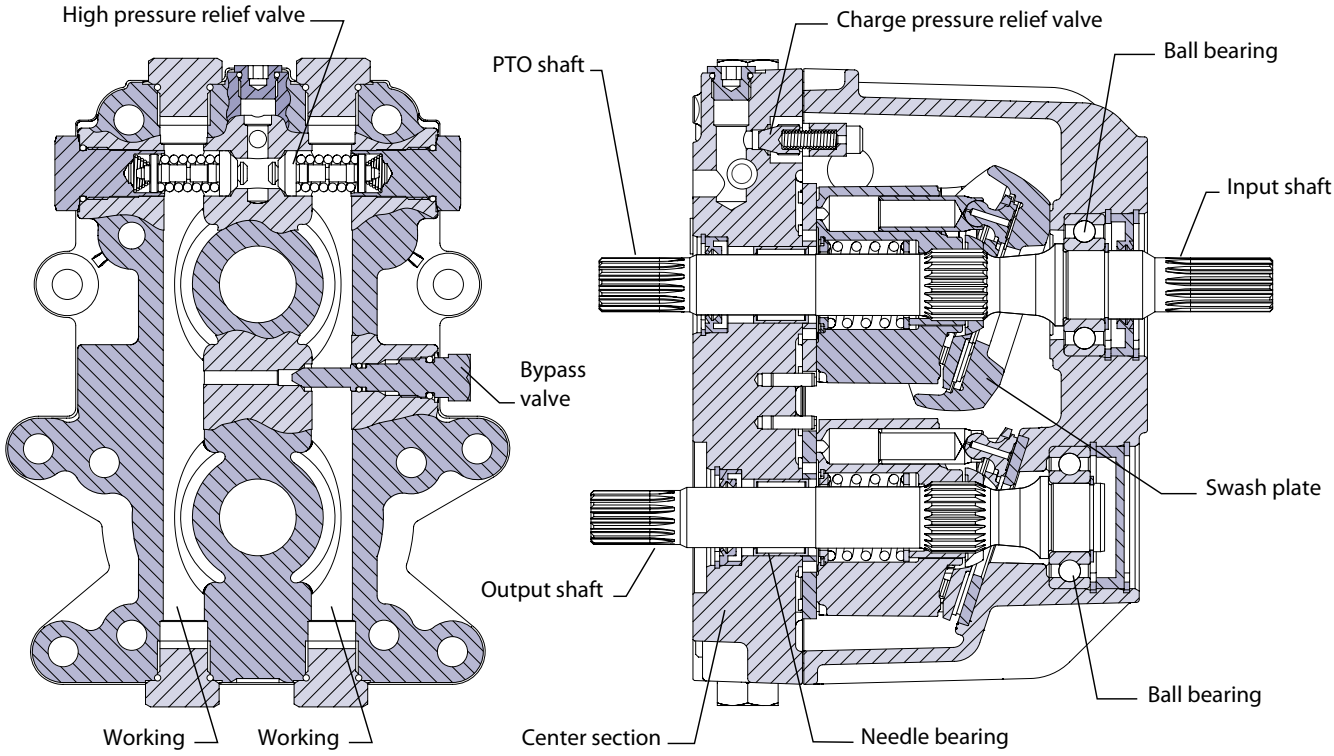
BASIC DESIGN

LDU20 is a kind of U-style HST hardware, including a closed circuit variable displacement piston pump with DDC (Direct displacement control) and a fixed motor. LDU20 is specially designed with optimized performance, size, and cost, in order to fulfill the demand of the mobile applications marketplace. This document provides the detailed specifications and features for LDU20.

LDU 20 cross-sectional view



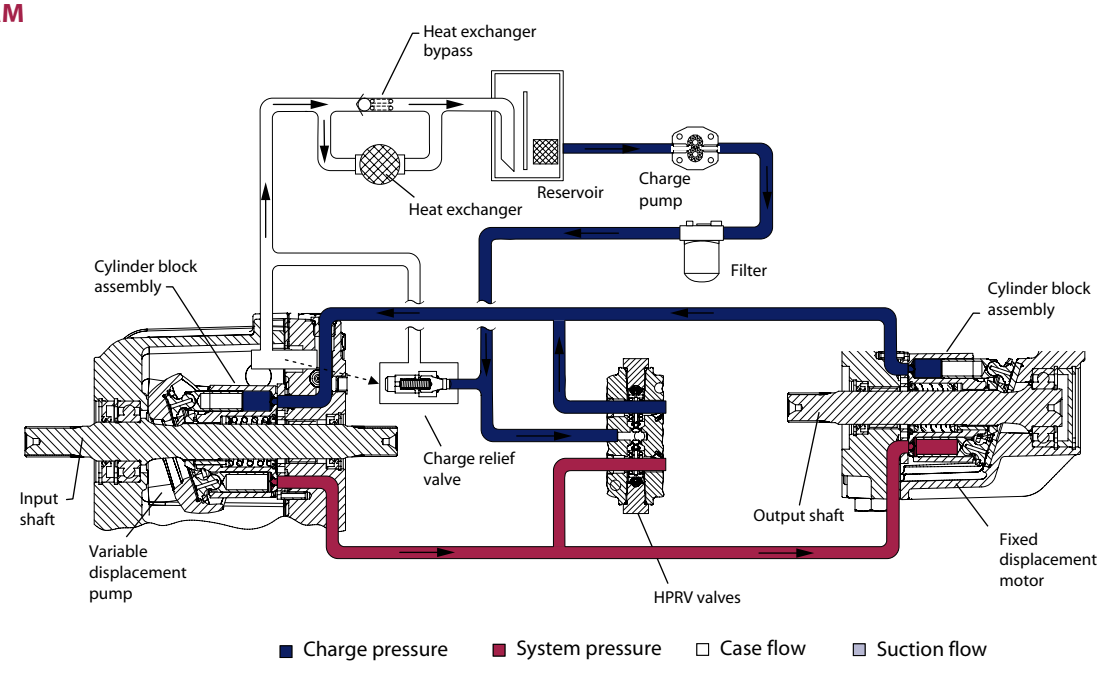
KEY FEATURES

- Easy to use design as Complete Hydrostatic Transmission package for Turf care machines & Compact Utility Tractors up to 22kw[30PS]
- Compact design
- U-style layout in One housing with Z-shaft configuration
- Available external charge
- Bypass valve to allow the vehicle to be towed
- Same shaft center distance as BDU21 85mm…Between pump and motor shaft Same drive line design is available between BDU21 and LDU20
- Best in class Efficiency by Female Piston & Male slipper design…Can reach approximately 80% overall efficiency
- Longer life kit, Higher Duty Cycle capability in the most compact design in this class of HST
- Low trunnion operating force
- Serviced by a Worldwide Network of Sauer-Danfoss

TYPICAL APPLICATIONS

- Compact utility tractor
- Turf care
- Small agricultural machinery

PICTORIAL CIRCUIT DIAGRAM



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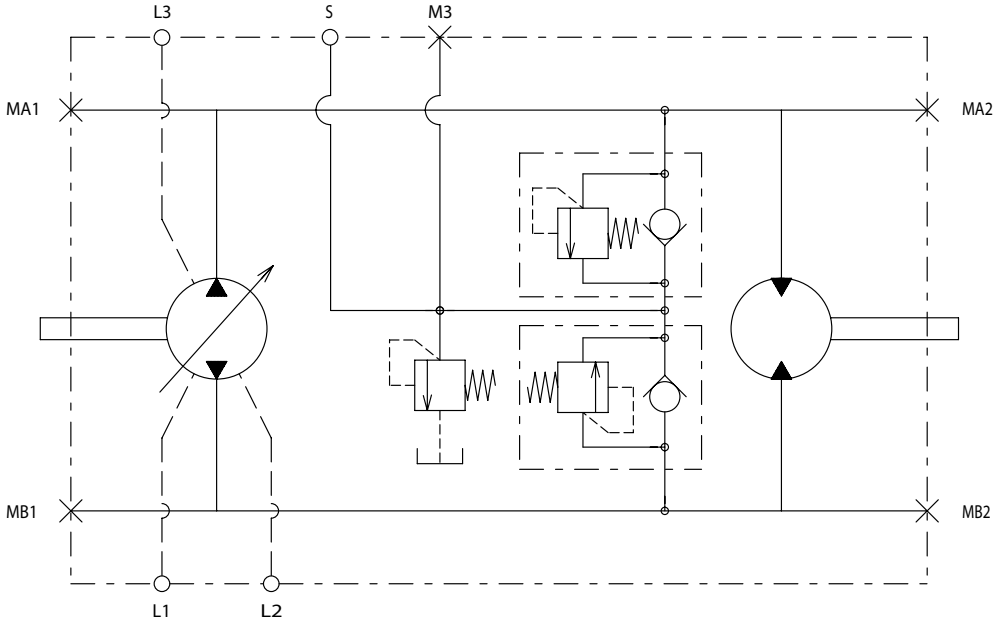
SCHEMATIC DIAGRAM



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PHYSICAL PROPERTIES

Features		Unit	LDU 20
Displacement	Pump side[1]	cm^3/rev [in^3/rev]	0 - 20.0 [0 - 1.22]
	Motor side		20 [1.22]
Recommended charge pump displacement for external charge supply		cm^3/rev [in^3/rev]	6 [0.37]
Torque at maximum displacement (theoretical)		N•m/bar [lbf•in/1000 psi]	0.32 [195.2]
Mass moment of inertia of rotating components	Pump side	kg•m^2 [slug•ft^2]	0.000936 [0.00693]
	Motor side		0.000928 [0.00683]
Weight dry		kg [lb]	14.1 [31.1]
Oil volume	Case only	liter [US gal]	1.1 [0.28]
	With passage	liter [US gal]	1.2 [0.32]
Installation			See *Installation Drawings*, page 25
Rotation			Clockwise or Counterclockwise
Ports (ISO 11926-1)			See *Installation Drawings*, page 25
Input shafts and PTO shafts			See *Installation Drawings*, page 25
Output shaft			See *Installation Drawings*, page 25
Control type			Direct displacement control

[1] Max Swash angle is 18 deg.

OPERATION PARAMETERS

Features		Unit	LDU 20
Input speed	Minimum for external charge supply	min^{-1} [rpm]	500
	Minimum for full performance		1300
	Rated		3400
	Maximum		3800
System pressure	Maximum working pressure	bar [psi]	300 [4350]
	Maximum pressure		345 [5000]
Input power	Maximum	kw [PS]	22 [30]
Charge pressure	Minimum	bar [psi]	5 [73]
Case pressure	Rated	bar [psi]	1 [14.5]
	Maximum		3 [43.5]

FLUID SPECIFICATIONS

Features		Unit	LDU 20
Viscosity	Min. intermittent	mm^2/sec [cSt]	7 [49]
	Optimum		12 - 60 [66 - 278]
	Max. intermittent		1600 [7500]
Temperature	Min.	°C [°F]	-40 [-40]
	Max. Continuous		+ 82 [+180]
	Max. intermittent		+ 104 [+220]
Filtration Level	Cleanliness per ISO 4406		22/18/13
	Efficiency (charge pressure filtration)	β-ratio	β15-20= 75 (β10≥ 10)
	Efficiency (suction filtration)		β35-45= 75 (β10≥ 2)
	Recommended inlet screen mesh size	µm	100 - 125

CHECK / HIGH PRESSURE RELIEF VALVE

LDU20 is equipped with a combination high pressure relief and charge check valve. The high-pressure relief function is a dissipative (with heat generation) pressure control valve for the purpose of limiting excessive system pressures. The charge check function acts to replenish the low-pressure side of the working loop with charge oil. Each side of the transmission loop has a dedicated HPRV valve that is non-adjustable with a factory set pressure. When system pressure exceeds the factory setting of the valve, oil is passed from the high pressure system loop, into the charge gallery, and into the low pressure system loop via the charge check.

The pump order code allows for different pressure settings to be used at each system port. HPRV valve with orifice is available to produce a wider neutral dead-band. When HPRV valves with an orifice are used, it should only be used for the pressure port that is High when the vehicle moves in reverse. The system pressure order code for pumps with HPRV only is a reflection of the HPRV setting.
The system pressure order code for pumps configured with pressure limiter and HPRV is a reflection of the pressure limiter setting.

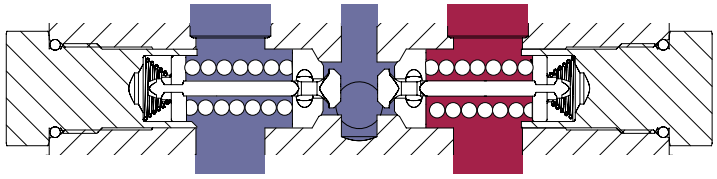
Check / High pressure relief valve with orifice

As an option, LDU20 offers Check / HPRV with an orifice produce a larger neutral dead-band.

In some applications, it is desirable to use Check / HPRV with an orifice to expand null dead band, which would help provide a larger margin of safety for vehicle movement in neutral and provide easier adjustment of the vehicle linkage for machine neutral. The orifice connects the working loop, which is a main hydraulic circuit, to a charge circuit. It always allows some internal leakage to ensure the expanding null dead band around neutral position of control shaft. However, it decreases the volumetric efficiency, particularly at high system pressure in the working loop. Check / HPRV with an orifice has possibility to increase downhill creap. It is recommended to install the orifice in a specific working loop, which is pressurized when the vehicle moves in reverse.

The HPRV are set at the following flow rates

Check / HPRV without orifice	5 l/min [1.3 US gal/min]
Check / HPRV with orifice	17 l/min [4.5 US gal/min]



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Caution

HPRV´s are factory set at a low flow condition. Any application or operating condition which leads to elevated HPRV flow will cause a pressure rise with pressures above the factory valve setting. Contact factory for application review.

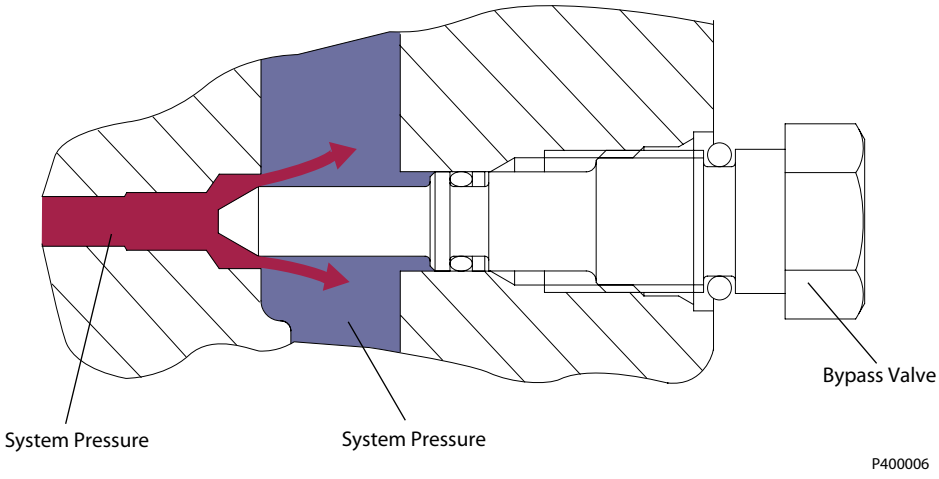
Warning

Unintended vehicle or machine movement hazard.

When in use Check / HPRV with an orifice, you must provide a braking system, redundant to the hydrostatic transmission, sufficient to stop and hold the vehicle or machine in the event of hydrostatic drive power loss.

BYPASS FUNCTION

The LDU20 contains a dedicated bypass valve option. The bypass function is activated when the bypass valve is mechanically backed out 3 full turns (maximum). The bypass function allows a machine or load to be moved without rotating the pump shaft or prime mover. In some applications, it is desirable to bypass the fluid around the variable displacement pump when pump shaft rotation is unachievable or undesired. To illustrate, an inoperable vehicle may need to be moved to the service or the repair location, or winched onto a trailer without operating the prime mover. Thus, LDU20 is designed with the bypass function as an option.



Caution

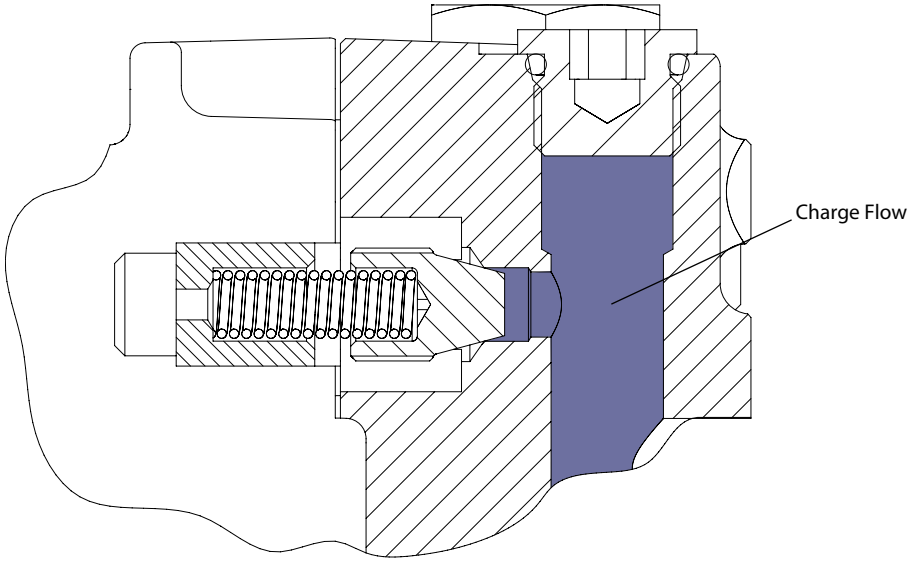
Excessive speed or extended movement will damage the pump and motor(s)
Avoid excessive speeds and extended load/vehicle movement. Do not move the load or vehicle more than 20 % of maximum speed or for longer than 3 minutes. When the bypass function is no longer needed, reseat the bypass valve to the normal operating position.

CPRV(CHARGE PRESSURE RELIEF VALVE)

The charge pressure relief valve maintains charge pressure at a designated level above case pressure. The charge pressure relief valve is a direct acting poppet valve which opens and discharges fluid to the HST case when pressure exceeds a designated level. For external charge flow the CPRV is set according to below table. The charge pressure relief valve setting is specified on the model code of the pump.

Charge pressure relief valve setting for external charge supply

	Flow l/min [US gal/min]
LDU20	10.8 [2.9]



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CONTROL

Direct displacement control

The LDU20 features a Direct Displacement Control (DDC) .The swashplate angle is set directly by a control lever or linkage attached directly to the swashplate trunnion. Control lever movement changes the speed and rotating direction of the motor by increasing or decreasing the swashplate angle.

The control input shaft is configurable on both of left and right hand side of the LDU20.

Control handle requirements

Maximum allowable trunnion torque is 79.1 N•m [700 lbf•in]. The approximate torque necessary to rotate the control at 300 bar system operating pressure and 3000 rpm is 25 N•m with the standard valveplate. Minimum torque necessary to hold the swashplate at a zero angle for neutral is 2.3 N•m [20 in•lbf]. The actual value will vary due to the influence of pump operating conditions. For mating dimensions, see Installation drawings, page 25.

Input shaft rotation	CW				CCW			
Trunnion location	Right		Left		Right		Left	
Trunnion rotation	CW	CCW	CW	CCW	CW	CCW	CW	CCW
Output rotation	CCW	CW	CW	CCW	CW	CCW	CCW	CW
High pressure port	MA	MB	MB	MA	MB	MA	MA	MB
Low pressure port	MB	MA	MA	MB	MA	MB	MB	MA

⚠ Warning

With no external forces applied to the swashplate trunnion, internal hydraulic forces may not return the swashplate to the neutral position under all conditions of operation.

OVERVIEW

This section defines the operating parameters and limitations for LDU20 with regard to input speeds and pressures. For actual parameters, refer to the Operating parameters.

INPUT SPEED

Minimum speed is the lowest input speed recommended during engine idle condition. Operating below minimum speed limits pump's ability to maintain adequate flow for lubrication and power transmission.

Rated speed is the highest input speed recommended at full power condition. Operating at or below this speed should yield satisfactory product life.

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

Operating conditions between Rated speed and Maximum speed should be restricted to less than full power and to limited periods of time. For most drive systems, maximum unit speed occurs during downhill braking or negative power conditions.

⚠ Warning

Unintended vehicle or machine movement hazard.

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

SYSTEM PRESSURE

System pressure is the differential pressure between system ports A and B. It is the dominant operating variable affecting hydraulic unit life. High system pressure, which results from high load, reduces expected life. Hydraulic unit life depends on the speed and normal operating, or weighted average, pressure that can only be determined from a duty cycle analysis.

Maximum Working Pressure - is the highest recommended Application pressure. Maximum working pressure is not intended to be a continuous pressure. Propel systems with Application pressures at, or below, this pressure should yield satisfactory unit life given proper component sizing.

Maximum pressure - is the highest allowable Application pressure under any circumstance. Application pressures above Maximum Working Pressure will only be considered with duty cycle analysis and factory approval.

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

INPUT POWER

Maximum continuous input power - is the highest recommended input power to HST excluding PTO input power.

CHARGE PRESSURE

An internal charge relief valve regulates charge pressure. Charge pressure maintains a minimum pressure in the low side of the transmission loop. Charge pressure is the differential pressure above case pressure.

Minimum charge pressure is the lowest pressure allowed to maintain a safe working condition in the low side of the loop.

Maximum charge pressure is the highest charge pressure allowed by the charge relief characteristic, and which provides normal component life.

CASE PRESSURE

Under normal operating conditions, the rated case pressure must not be exceeded. During cold start case pressure must be kept below **maximum intermittent case pressure**. Size drain plumbing accordingly.

Caution

Possible component damage or leakage

Operation with case pressure in excess of stated limits may damage seals, gaskets, and/or housings, causing external leakage. Performance may also be affected since charge and system pressure are additive to case pressure

VISCOSITY

Maintain fluid viscosity within the recommended range for maximum efficiency and bearing life. **Minimum viscosity** should only occur during brief occasions of maximum ambient temperature and severe duty cycle operation. **Maximum viscosity** should only occur at cold start. Limit speeds until the system warms up. Refer to *Fluid specifications*, page 25 for specifications.

TEMPERATURE

Maintain fluid temperature within the limits shown in the table. Operating parameters, on page 25 **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. Refer to *Fluid specifications*, page 8 for specifications.

Ensure fluid temperature and viscosity limits are concurrently satisfied.

FILTRATION SYSTEM

To prevent premature wear, ensure only clean fluid enters the hydrostatic transmission circuit. A filter capable of controlling the fluid cleanliness to ISO 4406 class 22/18/13 (SAE J1165) or better, under normal operating conditions, is recommended.
These cleanliness levels can not be applied for hydraulic fluid residing in the component housing/case or any other cavity after transport.

Filtration strategies include suction or pressure filtration. The selection of a filter depends on a number of factors including the contaminant ingression rate, the generation of contaminants in the system, the required fluid cleanliness, and the desired maintenance interval. Filters are selected to meet the above requirements using rating parameters of efficiency and capacity.

Filter efficiency can be measured with a Beta ratio[1] (β_x). For simple suction-filtered closed circuit transmissions and open circuit transmissions with return line filtration, a filter with a β-ratio within the range of $\beta_{35-45} = 75$ ($\beta_{10} \geq 2$) or better has been found to be satisfactory. For some open circuit systems, and closed circuits with cylinders being supplied from the same reservoir, a considerably higher filter efficiency is recommended. This also applies to systems with gears or clutches using a common reservoir.
For these systems, a charge pressure or return filtration system with a filter β-ratio in the range of $\beta_{15-20} = 75$ ($\beta_{10} \geq 10$) or better is typically required.

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

Cleanliness level and β_x-ratio			
Filtration (recommended minimum)	Cleanliness per ISO 4406		22/18/13
	Efficiency (charge pressure filtration)	β-ratio	$\beta_{15-20} = 75$ ($\beta_{10} \geq 10$)
	Efficiency (suction and return line filtration)		$\beta_{35-45} = 75$ ($\beta_{10} \geq 2$)
	Recommended inlet screen mesh size	µm	100 – 125

[1] Filter β_x-ratio is a measure of filter efficiency defined by ISO 4572. It is defined as the ratio of the number of particles greater than a given diameter ("x" in microns) upstream of the filter to the number of these particles downstream of the filter.

FILTRATION

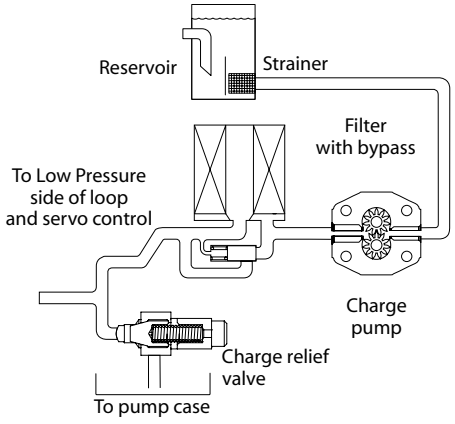
Charge filtration

The pressure filter is remotely mounted in the circuit after the charge pump, as shown in the accompanying illustration.

Filters used in charge pressure filtration circuits is recommended to be rated to at least 34.5 bar pressure. Sauer-Danfoss recommends locating a 100 - 125 µm screen in the reservoir or in the charge inlet line when using charge pressure filtration.

A filter bypass valve is necessary to prevent damage to the system. In the event of high pressure drop associated with a blocked filter or cold start-up conditions, fluid will bypass the filter. Avoid working with an open bypass for an extended period. We recommend a visual or electrical bypass indicator. Proper filter maintenance is mandatory.

Charge filtration



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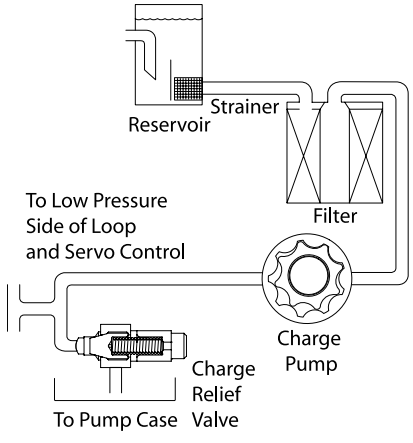
Suction filtration

The suction filter is placed in the circuit between the reservoir and the inlet to the charge pump as shown in the accompanying illustration.

Suction filtration



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INDEPENDENT BRAKING SYSTEM

⚠ Warning

Unintended vehicle or machine movement hazard.

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

FLUID SELECTION

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

Please see Hydraulic Fluids and Lubricants, Technical Information for more information 520L0463, for more information. Refer to Experience with Biodegradable Hydraulic Fluids Technical Information, 520L0465, for information relating to biodegradable fluids. Contact Sauer-Danfoss for fluids not mentioned below.

The following hydraulic fluids are suitable:

- Hydraulic Oil ISO 11 158 - HM (Seal compatibility and vane pump wear resistance per DIN 51 524-2 must be met)
- Hydraulic Oil ISO 11 158 - HV (Seal compatibility and vane pump wear resistance per DIN 51 524-3 must be met)
- Hydraulic Oil DIN 51 524-2 – HLP
- Hydraulic Oil DIN 51 524-3 - HVLP
- Engine oils API Classification SL, SJ (for gasoline engines) and CI-4, CH-4, CG-4, CF-4 and CF (for diesel engines)
- Super Tractor Oil Universal (STOU) special agricultural tractor fluid

RESERVOIR

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

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

Locate the reservoir outlet (charge pump inlet) above the bottom of the reservoir to take advantage of gravity separation and prevent large foreign particles from entering the charge inlet line. A 100 – 125 µm screen over the outlet port is recommended.

Position the reservoir inlet (fluid return) to discharge below the normal fluid level, toward the interior of the tank. A baffle (or baffles) will further promote de-aeration and reduce surging of the fluid.

CASE DRAIN

A case drain line must be connected to one of the case outlets to return internal leakage to the system reservoir. Use the higher of the outlets to promote complete filling of the case. Since case drain fluid is typically the hottest fluid in the system, it is a good idea to return this flow to the reservoir via the heat exchanger.

CHARGE PUMP

Charge flow requirements for the LDU20 should be equivalent to a 6-8cc/rev charge pump, depending on pump input speed. Charge flow must not exceed 30 l/min.

BEARING LOADS AND LIFE

Bearing life is a function of speed, system pressure, charge pressure, and swashplate angle, plus any external side or thrust loads. The influence of swashplate angle includes displacement as well as direction. External loads are found in applications where the pump is driven with a side/thrust load (belt or gear) as well as in installations with misalignment and improper concentricity between the pump and drive coupling. All external side loads will act to reduce the normal bearing life of a pump. Other life factors include oil type and viscosity.

In vehicle **propel** drives with no external shaft loads and where the system pressure and swashplate angle are changing direction and magnitude regularly, the normal L20 bearing life (80 % survival) will exceed the hydraulic load-life of the unit.

Bearing L_{20} Life

Bearing Life (max. swashplate angle)	At 167 bar system pressure 7 bar charge pressure 1800 rpm	L_{20} hours	10158

Applications with external shaft loads

LDU20 is designed with bearings that can accept some external radial and thrust loads. When external loads are present, the allowable radial shaft loads are a function of the load position relative to the Housing surface, the load orientation relative to the internal loads, and the operating pressures of the hydraulic unit. In applications where external shaft loads cannot be avoided, the impact on bearing life can be minimized by proper orientation of the load. Optimum pump orientation is a consideration of the net loading on the shaft from the external load, the pump rotating group.

- In applications where the pump is operated such that nearly equal amounts of forward vs. reverse swashplate operation is experienced; bearing life can be optimized by orientating the external side load at 90° or 270° such that the external side load acts 90° to the rotating group load (for details see drawing below).

- In applications where the pump is operated such that the swashplate is predominantly (> 75 %) on one side of neutral (ie vibratory, conveyor, typical propel); bearing life can be optimized by orientating the external side load generally opposite of the internal rotating group load. The direction of internal loading is a function of rotation and which system port has flow out.

- LDU20 is designed with bearings that can accept some thrust load such that incidental thrust loads are of no consequence. When thrust loads are anticipated the allowable load will depend on many factors and it is recommended that an application review be conducted.

BEARING LOADS AND LIFE (CONTINUED)

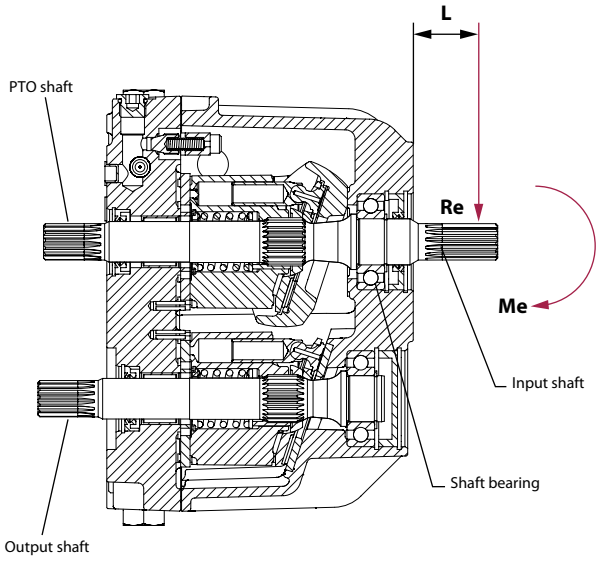
Contact Sauer-Danfoss for a bearing life review if external side loads are present.

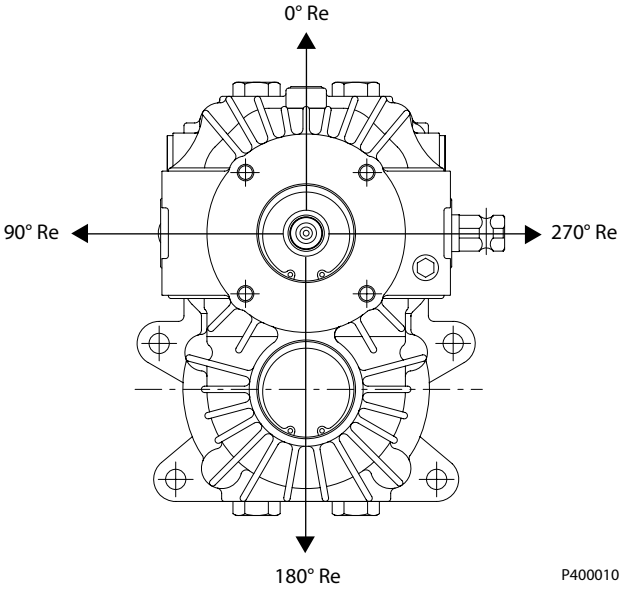
Thrust loads should be avoided. Contact factory in the event thrust loads are anticipated.

Input shaft

The **maximum allowable radial load (Re)** is based on the maximum external moment (Me) and the distance (L) from the mounting flange to the load. It is shown in the chart below.

Re = Me / L





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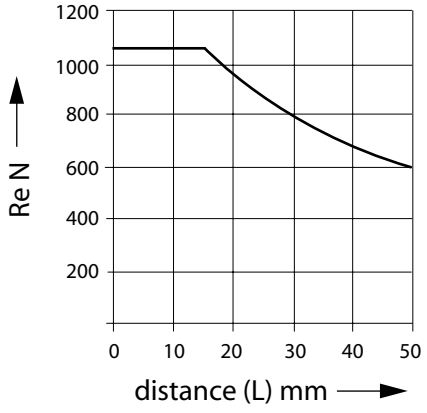
Me = Shaft moment
L = Flange distance
Re = External force to the shaft

Maximum allowable radial load (Re)



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BEARING LOADS AND LIFE (CONTINUED)

Sauer-Danfoss recommends clamp-type couplings for applications with radial shaft loads.

Contact your Sauer-Danfoss representative for an evaluation of unit bearing life if you have continuously applied external loads exceeding 25 % of the maximum allowable radial load (Re) or the pump swashplate is positioned on one side of center all or most of the time.

PTO shaft, Output shaft

Avoid any load in either direction.

SHAFT TORQUE RATING AND SPLINE LUBRICATION

Maximum torque ratings are based on torsional fatigue strength considering 100.000 full load reversing cycles. However, a spline running in oil-flooded environment provides superior oxygen restriction in addition to contaminant flushing. The rated torque of a flooded spline can increase to that of the maximum published rating. A flooded spline would be indicative of a pump driven by a pump drive or plugged into an auxiliary pad of a pump.

Maintaining a spline engagement at least equal to the Pitch Diameter will also maximize spline life. Spline engagements of less than ¾ Pitch Diameter are subject to high contact stress and spline fretting.

SHAFT AVAILABILITY AND TORQUE RATINGS

Alignment between the mating spline's pitch diameters is another critical factor in determining the operating life of a splined drive connection. *Plug-in*, or *rigid* spline drive installations can impose severe radial loads on the shaft. The radial load is a function of the transmitted torque and shaft eccentricity. Increased spline clearance will not totally alleviate this condition; BUT, increased spline clearance will prevent mechanical interference due to misalignment or radial eccentricity between the pitch diameters of the mating splines. Maximize spline life by adding an intermediate coupling between the bearing supported splined shafts.

SIZING EQUATIONS

The following equations are helpful when sizing hydraulic transmissions. Generally, the sizing process is initiated by an evaluation of the machine system to determine the required transmission speed and torque to perform the necessary work function. Refer to Selection of drive line components, BLN-9885, for a more complete description of hydrostatic drive line sizing.

	Based on SI units		Based on US units	
Input torque	$M_p = \frac{V_{gp} \cdot \Delta p}{20 \cdot \pi \cdot \eta_{mp}}$	Nm	$M_p = \frac{V_{gp} \cdot \Delta p}{2 \cdot \pi \cdot \eta_{mp}}$	[lbf•in]
Input power	$P_p = \frac{M_p \cdot \eta_p}{9550}$	kW	$P_p = \frac{V_{gp} \cdot \eta_p \cdot \Delta p}{396\,000 \cdot \eta_{tp}}$	[hp]
Output torque	$M_m = \frac{V_{gm} \cdot \Delta p \cdot \eta_{mm}}{20 \cdot \pi}$	Nm	$M_m = \frac{V_{gm} \cdot \Delta p \cdot \eta_{mm}}{2 \cdot \pi}$	[lbf•in]
Output power	$P_m = \frac{M_m \cdot \eta_m}{9550}$	kW	$P_m = \frac{V_{gm} \cdot \eta_m \cdot \eta_{tm}}{396\,000}$	[hp]

Where;

V_{gp} = Pump displacement per rev. cm^3 [in^3]
V_{gm} = Motor displacement per rev. cm^3 [in^3]
Δp = $p_{HD} - p_{ND}$ bar [psi]
η_{mp} = Pump Mechanical-hydraulic (Torque) efficiency
η_{mm} = Motor Mechanical-hydraulic (Torque) efficiency
η_{tp} = Pump Overall efficiency
η_{tm} = Motor Overall efficiency
p_{HD} = High pressure bar [psi]
p_{ND} = Low pressure bar [psi]
n_p = Input speed
n_m = Output speed

MODEL CODE

A *Displacement*

Code	Description
20D	Displacement: 20cc/rev / Block type : standard Block

B *Rotation*

Code	Description
L	Left hand side viewing from input shaft (CCW)
R	Right hand side viewing from input shaft (CW)

C *Valve Plate*

Code	Description
A	Standard

D *Control Arm Position*

Code	Description
L	Left hand side viewing from input shaft (pump located upside)
R	Right hand side viewing from input shaft (pump located upside)

E *Control Arm Configuration*

Code	Description
S	Square

F *Pump Shaft Configuration (Input Shaft/PTO Shaft)*

Code	Description
JJ	JIS 14T (Input) / JIS 14T (PTO)
AA	ANSI 16/32-13T (Input) / ANSI 16/32-13T (PTO)

H *Output Shaft Configuration*

Code	Description
J	JIS 14T
A	ANSI 16/32-13T

MODEL CODE (continued)

LDU A B C D E F H J K L M N P Y Z

J *Centersection Configuration*

Code	Description			
	Drain port: 9.8mm on centersection [1] Charge port : 9.8mm on centersection [1]		Drain port: 3/4-16 drain port on housing Charge port : 9/16-18 on centersection	
	Without Bypass valve	With Bypass valve on left side	Without Bypass valve	With Bypass valve on left side
A	**X**			
B			**X**	
F		**X**		
H				**X**

[1]Connect charge inlet and drain line directly from LDU20 centersection with trans axle.
See installation drawing on Page 29, 31 for detail.

K *Charge Pump Displacement*

Code	Description
N	None

L *Charge Relief Setting*

Code	Description
07	7 bar at 10.8 l/min [102 psi at 2.9 US gal/min]

M *Bypass Valve*

Code	Description
N	None
C	w/Bypass Valve Left hand side

MODEL CODE (continued)

L D U | A | B | C | D | E | F | H | J | K | L | M | N | P | Y | Z

N *Check & Relief Valve Side A*

Code	Description

P *Check & Relief Valve Side B*

Orifice must not be used for both side (A or B)

****N**	Check & Relief valve without orifice
14N	140 bar [2030 psi]
17N	175 bar [2538 psi]
21N	210 bar [3045 psi]
25N	250 bar [3625 psi]
28N	280 bar [4060 psi]
30N	300 bar [4351 psi]
32N[1]	325 bar [4713 psi]
34N[1]	345 bar [5003 psi]
00N	Poppet type check valve

****A**	Check & Relief valve with orifice (∅0.85)
14A	140 bar [2030 psi]
17A	175 bar [2538 psi]
21A	210 bar [3045 psi]
25A	250 bar [3625 psi]

Use to selection for ports "A" and "B"

[1] Duty cycle analysis and Factory approval is needed.
See Maximum pressure in System pressure, page 13.

Y *Special Hardware Features*

Code	Description
NNN	Housing Configuration : Standard

Z *Paint and Nametag*

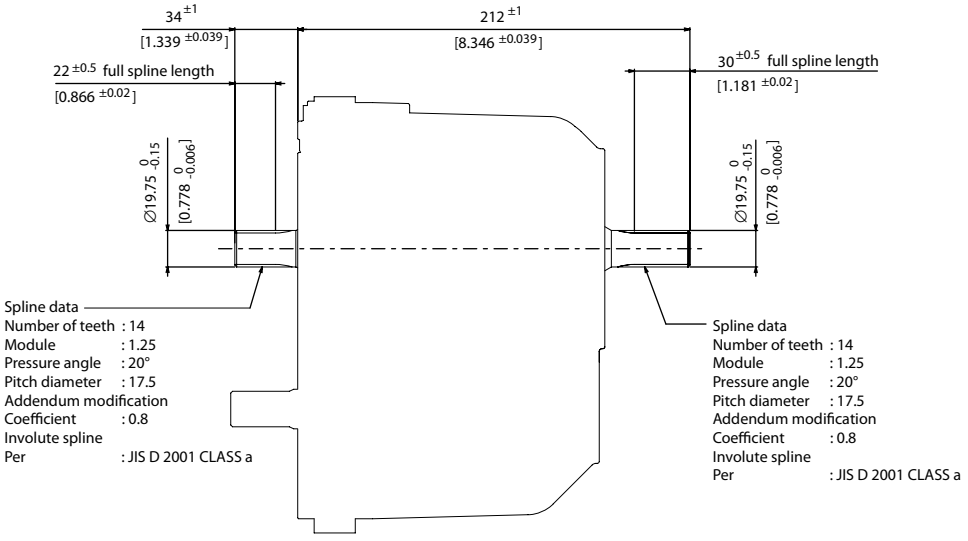
Long Description			Option
Paint	Tag Layout	Tag/Logo	
No Paint	Standard	Standard	NNN
Black Paint	Standard	Standard	BNN

SHAFT AVAILABILITY AND TORQUE RATINGS

Input Shaft/PTO Shaft

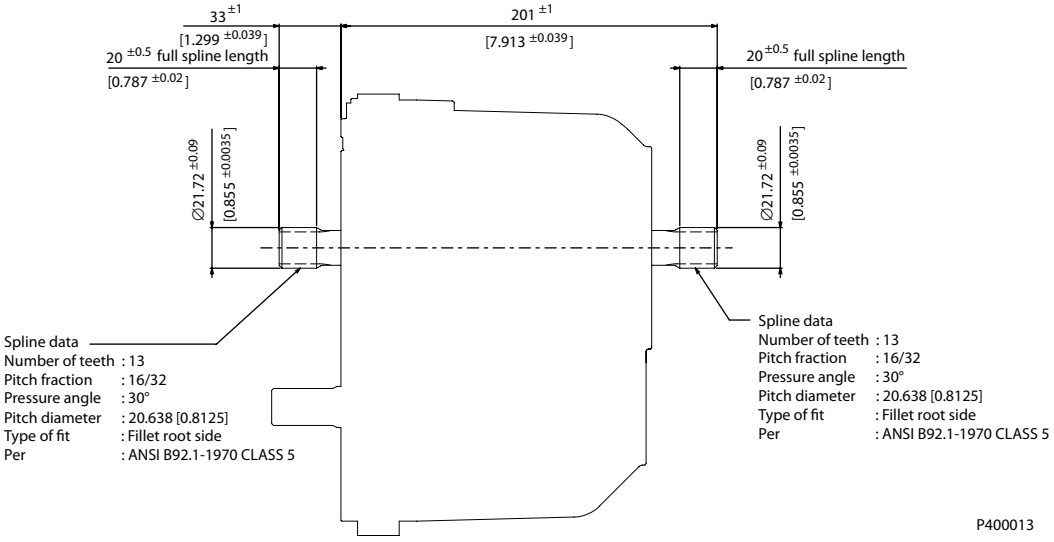
mm (inch)

Option	Spline	Torque Rating N•m [lbf•in]	
		Rated Torque	Maximum Torque
JJ	14 teeth, 1.25 module (Input)	122 [1080]	314 [2779]
	14 teeth, 1.25 module (PTO)	89 [788]	310 [2743]



P400012

Option	Spline	Torque Rating N•m [lbf•in]	
		Rated Torque	Maximum Torque
AA	13 theeth, 16/32 pitch (Input)	106 [938]	245 [2168]
	13 theeth, 16/32 pitch (PTO)	106 [938]	226 [2000]



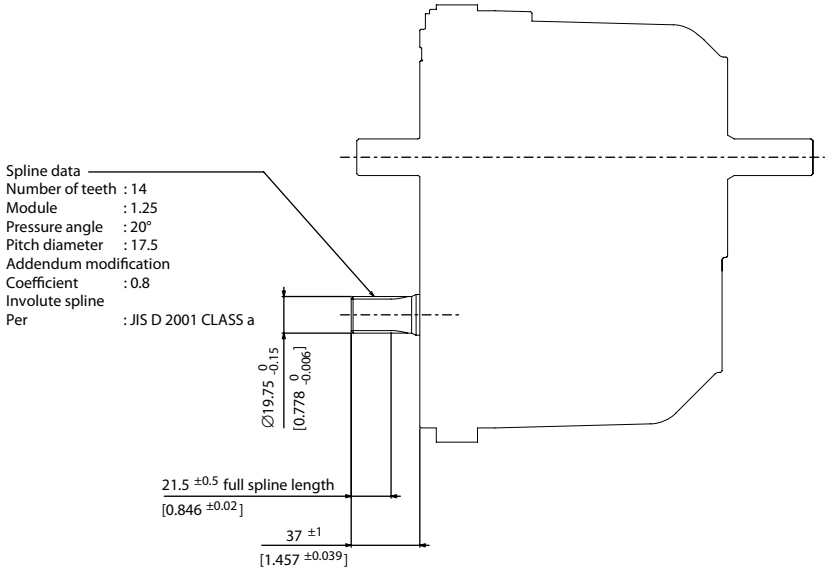
P400013

SHAFT AVAILABILITY AND TORQUE RATINGS (continued)

Output Shaft

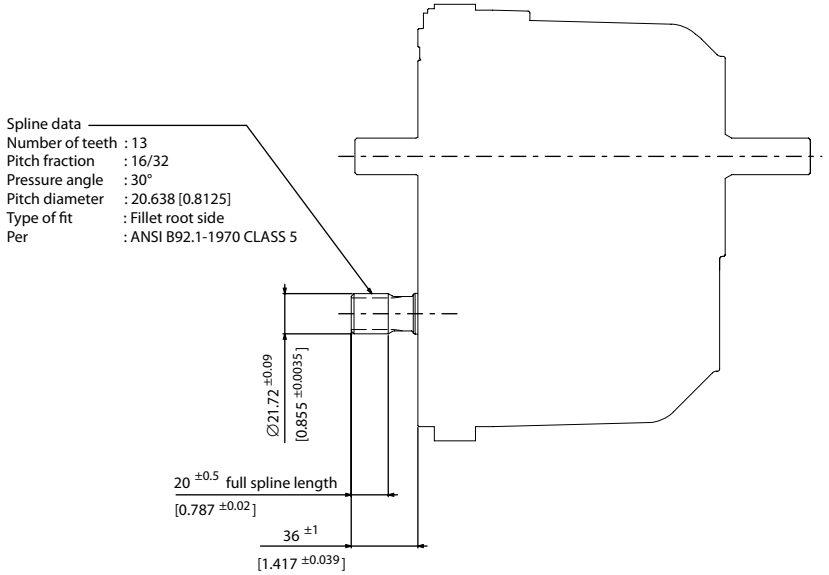
mm (inch)

Option	Spline	Torque Rating N•m [lbf•in]	
		Rated Torque	Maximum Torque
J	14 teeth, 1.25 module	87 [770]	310 [2743]



P400014

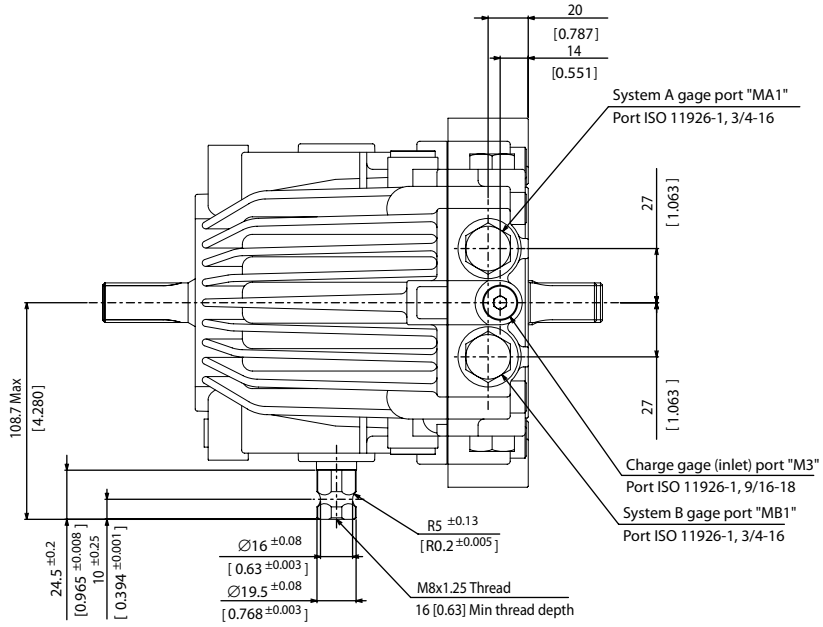
Option	Spline	Torque Rating N•m [lbf•in]	
		Rated Torque	Maximum Torque
A	13 teeth, 20mm pitch	106 [938]	226 [2000]

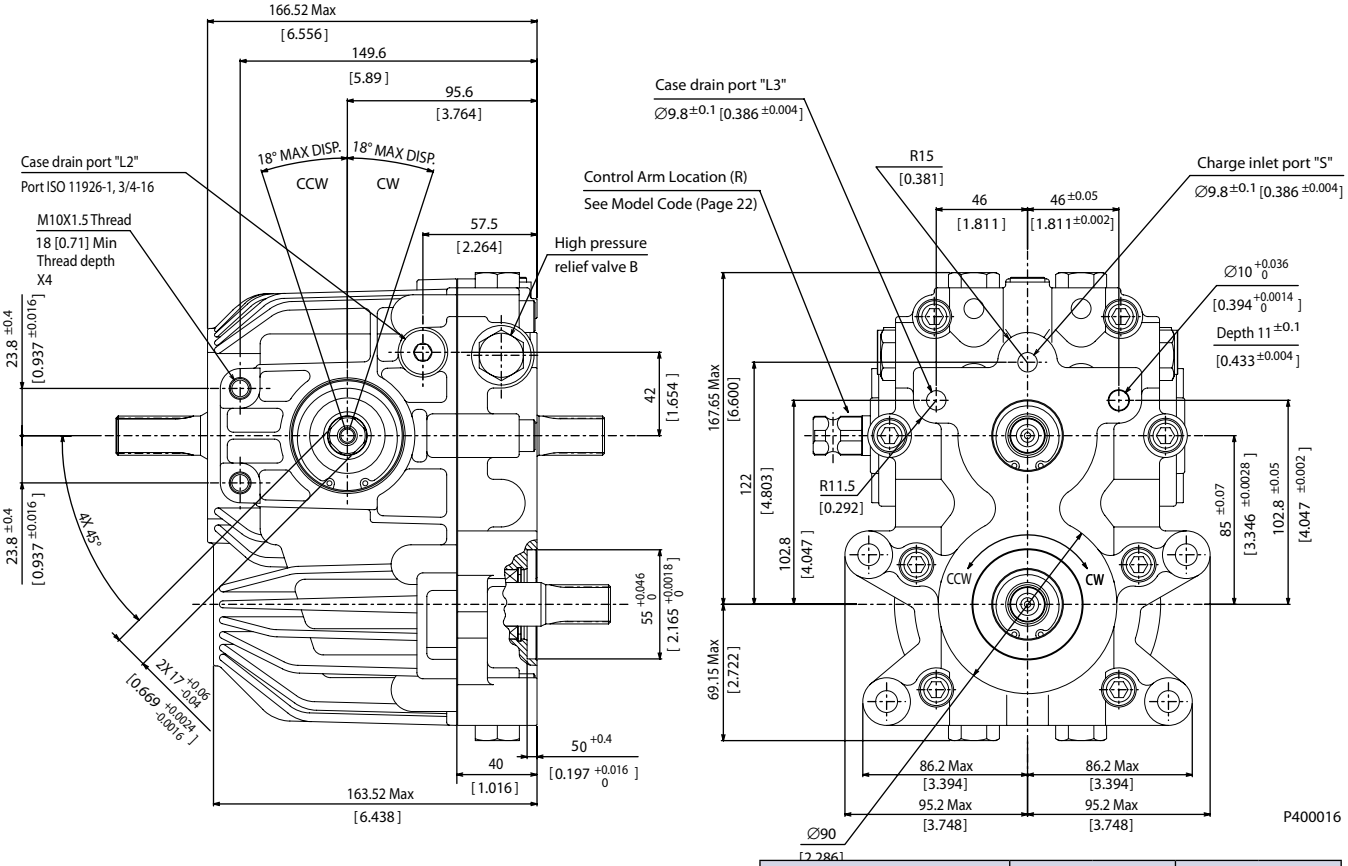


P400015

Installation drawings

mm (inch)

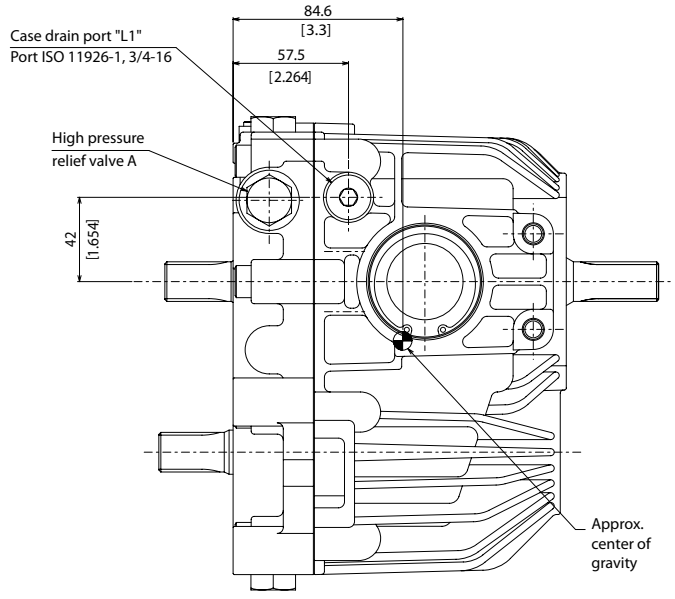


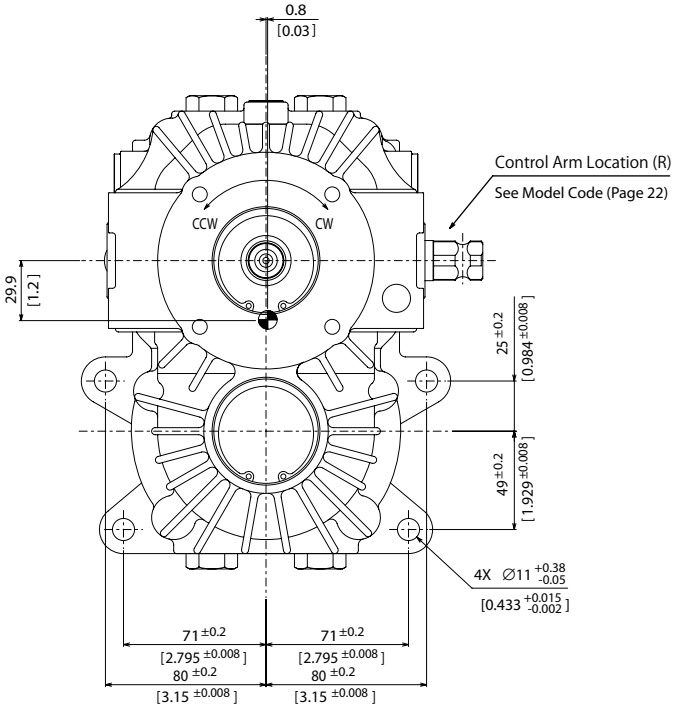


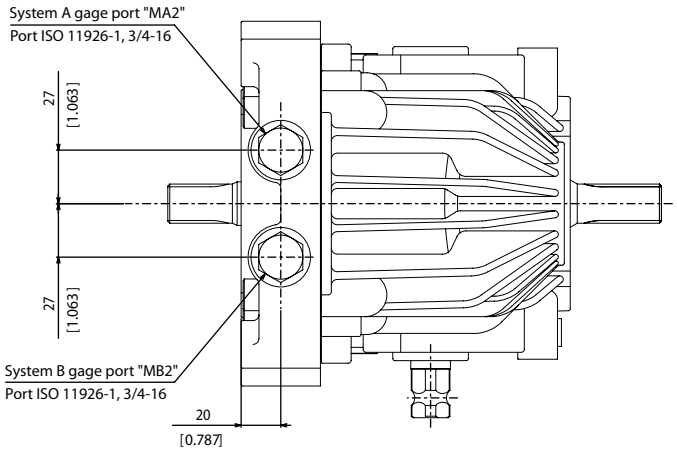
Input shaft rotation	CW		CCW	
Trunnion location	Right			
Trunnion rotation	CW	CCW	CW	CCW
Output rotation	CCW	CW	CW	CCW
High pressure port	MA	MB	MB	MA
Low pressure port	MB	MA	MA	MB

Installation drawings

mm (inch)





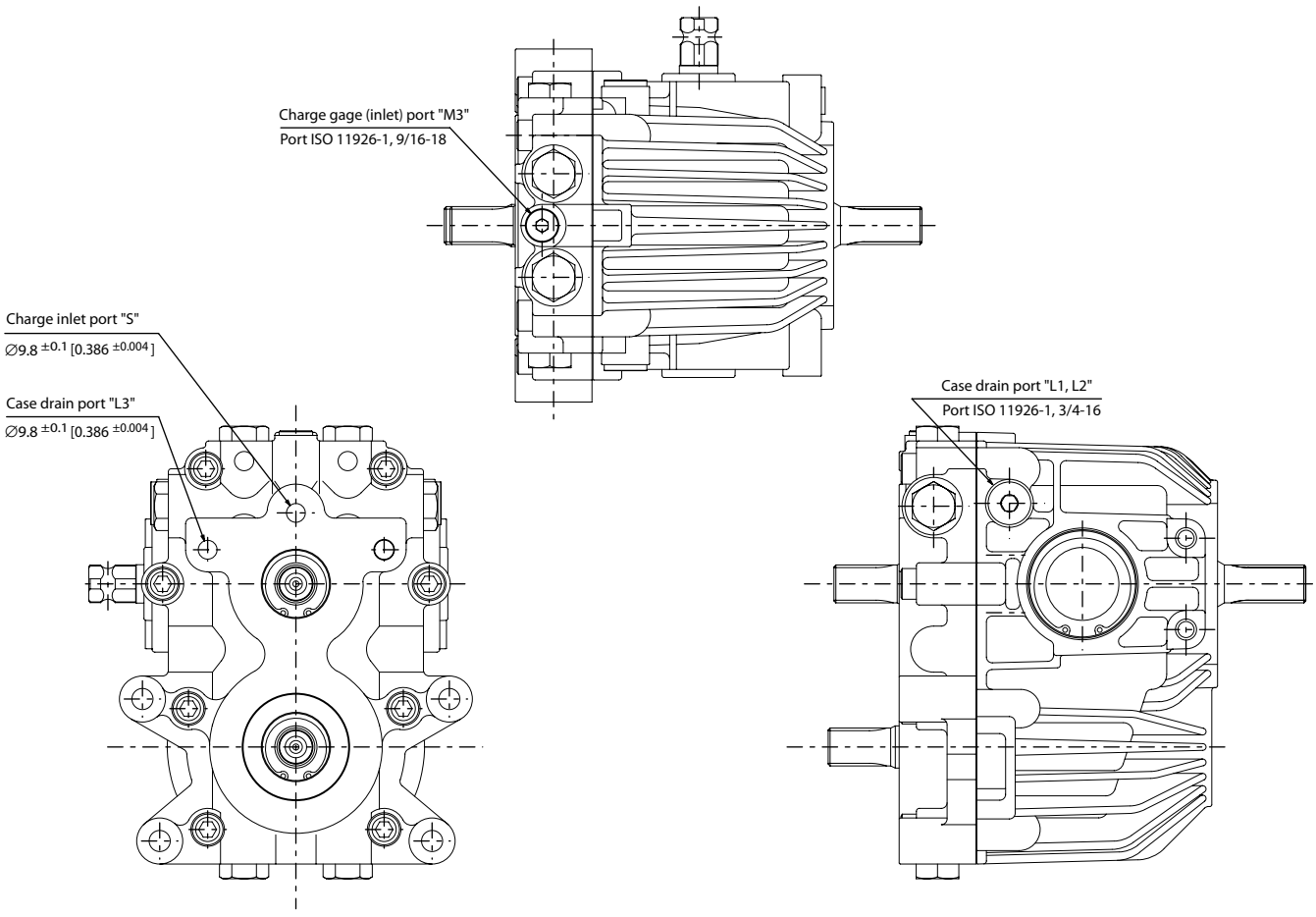


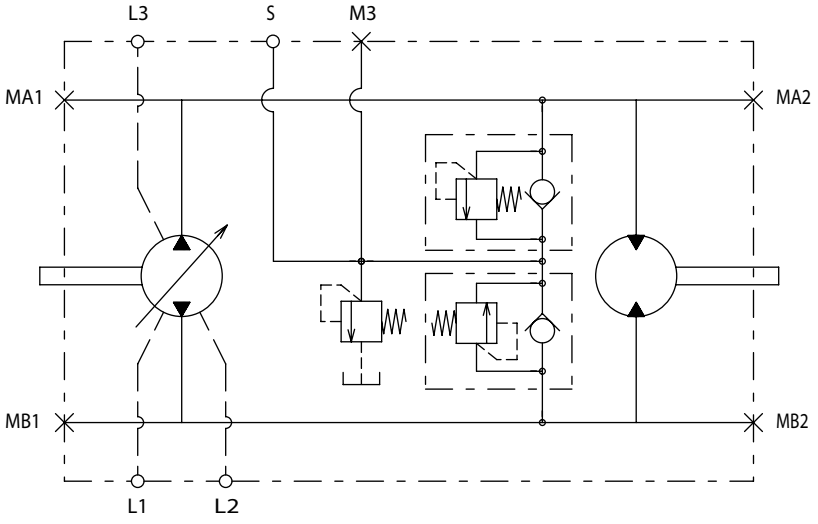
P400017

CENTER SECTION

Option A **Drain port: 9.8mm on centersection**
Charge port: 9.8mm on centersection

mm (inch)



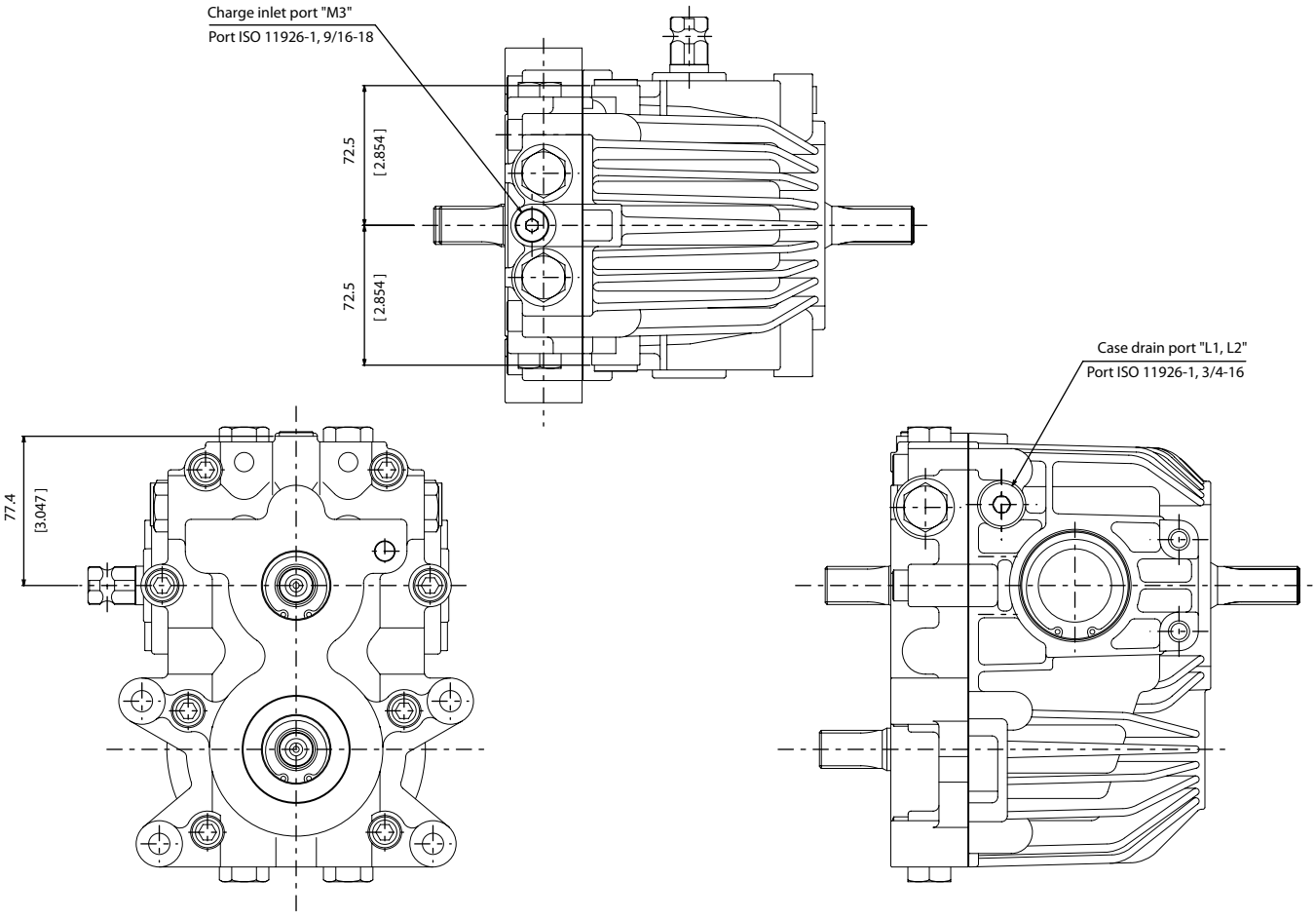


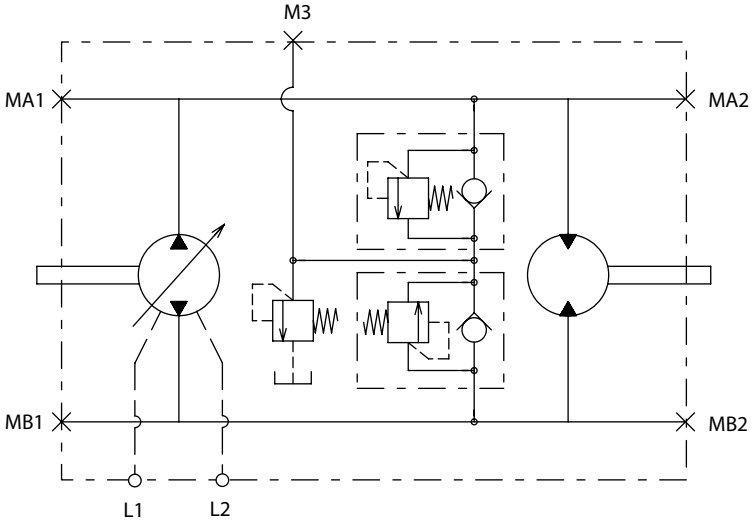
P400018

CENTER SECTION (CONTINUED)

Option B **Drain port: 3/4-16 on Housing**
Charge port: 9/16-18 on centersection

mm (inch)



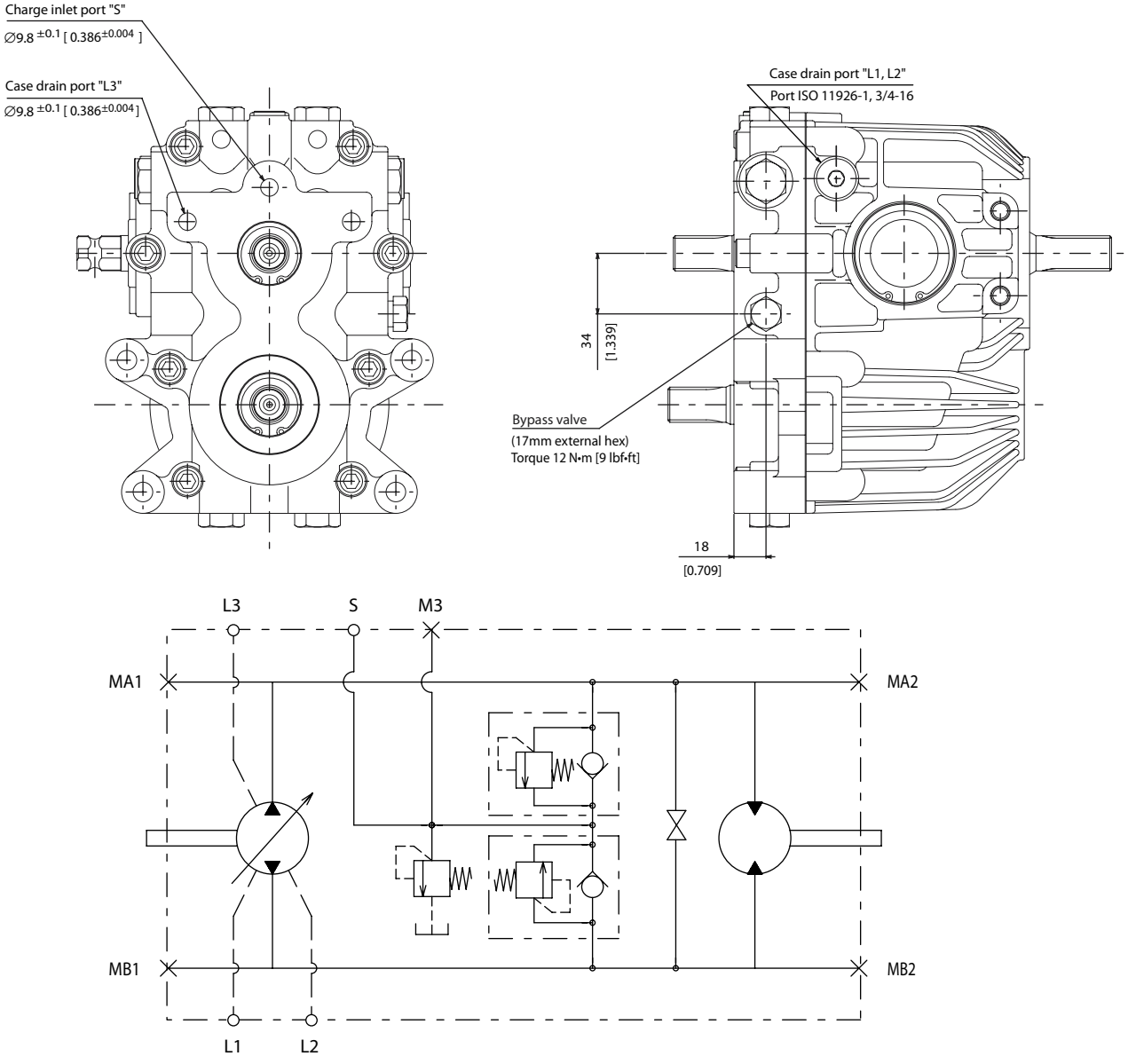


P400019

CENTER SECTION (CONTINUED)

Option F **Drain port: 9.8mm on centersection**
Charge port: 9.8mm on centersection
With Bypass valve

mm (inch)



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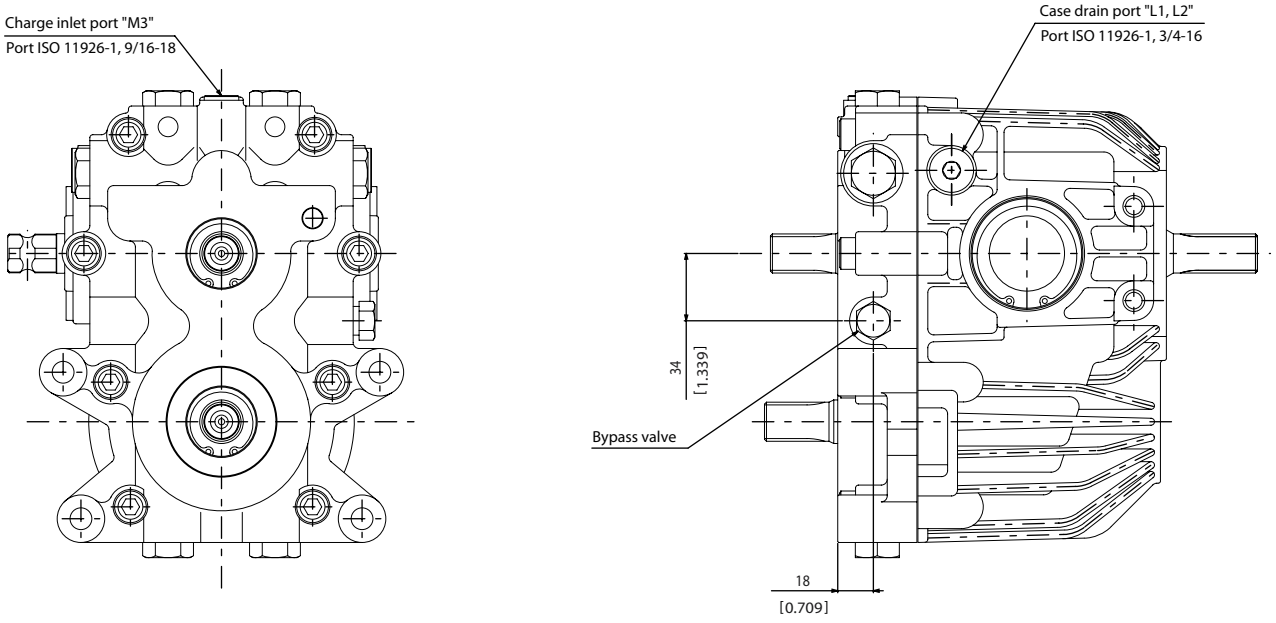
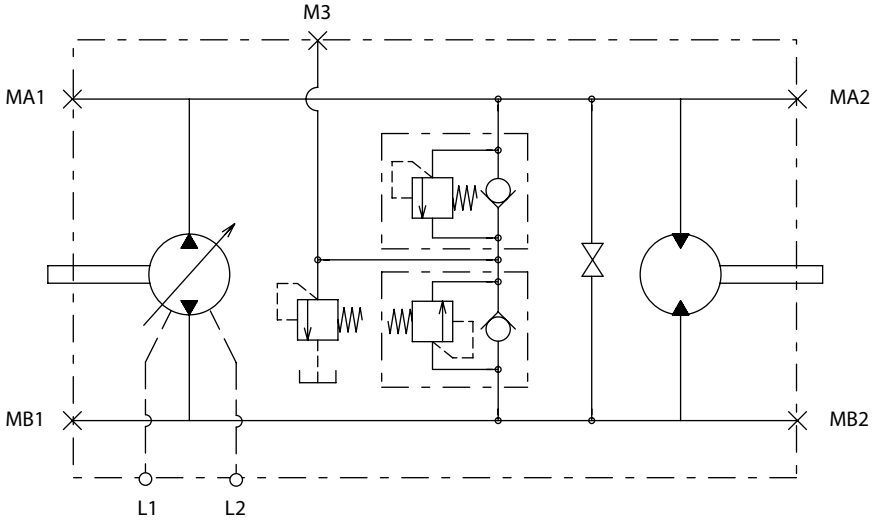
CENTER SECTION (CONTINUED)

Option H **Drain port: 3/4-16 on Housing**
Charge port: 9/16-18 on centersection
With Bypass valve

mm (inch)





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Notes

Notes

Notes

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