

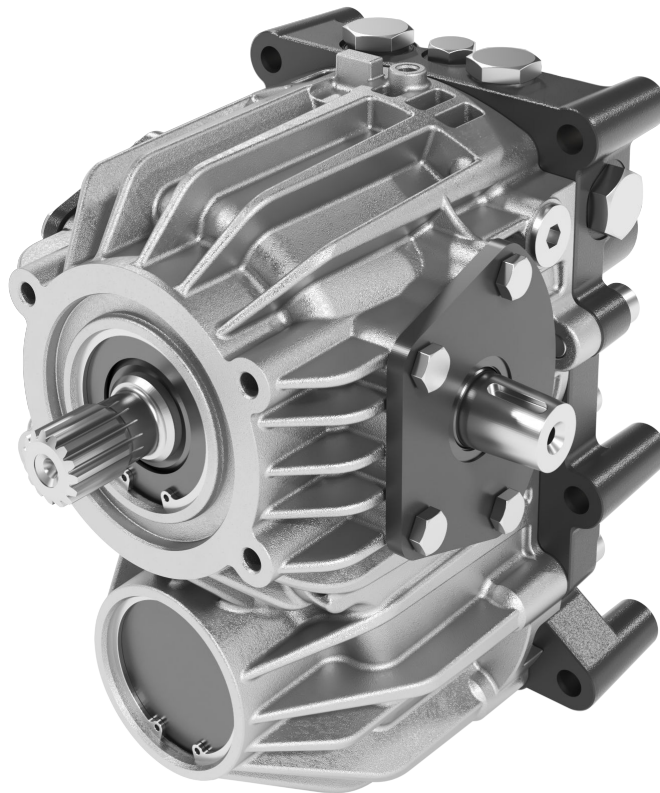
ENGINEERING  
TOMORROW



Service Manual

**LDU32**

Closed Circuit Axial Piston Transmission





**Revision history***Table of revisions*

Date	Changed	Rev
March 2025	First edition	0101



## Contents

### Introduction

Overview.....	5
Warranty.....	5
General Instructions.....	5
Remove the unit.....	5
Keep it clean.....	5
Lubricate moving parts.....	5
Replace all O-rings and gaskets.....	5
Secure the unit.....	5
Safety Precautions.....	5
Unintended machine movement.....	6
Flammable cleaning solvents.....	6
Fluid under pressure.....	6
Personal safety.....	6
Hazardous material.....	6
Symbols Used in Danfoss Literature.....	7

### General Description

Basic Design.....	8
Key Features.....	8
Typical Applications.....	8
Schematic Diagram.....	8

### Operation

Check / High Pressure Relief Valve.....	9
Check / High Pressure Relief Valve with Orifice.....	9
CPRV (Charge Pressure Relief Valve).....	10
Control.....	10
Direct Displacement Control.....	10
Control Handle Requirements.....	10

### Operating Parameters

Overview.....	11
Input / Output Speed.....	11
System Pressure.....	11
Input Power.....	11
Charge Pressure.....	12
Case Pressure.....	12
Viscosity.....	12
Temperature.....	12

### Technical Specifications

General Specifications.....	13
Physical Properties.....	13
Operating Parameters.....	13
Fluid Specifications.....	14

### Fluid and Filter Maintenance

Fluid and Filter Recommendations.....	15
---------------------------------------	----

### Pressure Measurements

Port Locations and Gauge Installation.....	16
--	----

### Initial Startup Procedure

Startup Procedure.....	17
------------------------	----

### Troubleshooting

Overview.....	18
System Operating Hot.....	18
Transmission Operates Normally in One Direction Only.....	18
System will not Operate in Either Direction.....	18
System Noise or Vibration.....	18
Sluggish System Response.....	19



**Contents****Required Tools and Standard Procedures**

Required Tools.....	20
Standard Procedures.....	20
Charge Check/HPRV Adjustments.....	20
Checking for proper charge check/HPRV operation.....	20

**Minor Repair**

Shaft Seals.....	21
Removal.....	21
Inspection.....	21
Assembly.....	21
Charge Check/HPRV.....	22
Removal.....	22
Inspection.....	22
Reassembly.....	22

**Torque Chart**

Plug Size and Torque Chart.....	23
---------------------------------	----



## Introduction

### Overview

This manual includes information on the installation, maintenance, and minor repair of LDU32 transmission (HST). It includes a description of the unit and its individual components, troubleshooting information, and minor repair procedures.

Performing minor repairs may require removal from the vehicle/machine. Thoroughly clean the unit before beginning maintenance or repair activities. Since dirt and contamination are the greatest enemies of any type of hydraulic equipment, follow cleanliness requirements strictly. This is especially important when changing the system filter and when removing hoses or plumbing.

A worldwide network of Danfoss Authorized Service Centers is available for major repairs. Danfoss trains and certifies Authorized Service Centers on a regular basis. You can locate your nearest Authorized Service Center using the distributor locator at [www.danfoss.com](http://www.danfoss.com).

### Warranty

Performing installation, maintenance, and minor repairs according to the procedures in this manual will not affect your warranty. Major repairs requiring the removal of the units center section voids the warranty unless completed by a Danfoss Global Service Partner.

### General Instructions

Follow these general procedures.

#### Remove the unit

Prior to performing major repairs, remove the unit from the vehicle/machine. Chock the wheels on the vehicle or lock the mechanism to inhibit movement. Be aware that hydraulic fluid may be under high pressure and/or hot. Inspect the outside of the HST and fittings for damage. Cap hoses and plug ports after removal to prevent contamination.

#### Keep it clean

Cleanliness is a primary means of assuring satisfactory HST life, on either new or repaired units. Clean the outside of the HST thoroughly before disassembly. Take care to avoid contamination of the system ports. Cleaning parts using a clean solvent wash and air drying is usually adequate.

As with any precision equipment, keep all parts free of foreign materials and chemicals. Protect all exposed sealing surfaces and open cavities from damage and foreign material. If left unattended, cover the transmission with a protective layer of plastic.

#### Lubricate moving parts

During assembly, coat all moving parts with clean hydraulic fluid. This assures that these parts are lubricated during start-up.

#### Replace all O-rings and gaskets

Danfoss recommends you replace all O-rings, seals, and gaskets during repair. Lightly lubricate all O-rings with clean petroleum jelly prior to assembly. Grease must be soluble in hydraulic fluid.

#### Secure the unit

For major repair, place the unit in a stable position with the shaft pointing downward. It is necessary to secure the transmission while removing and torquing components and fasteners.

### Safety Precautions

Always consider safety precautions before beginning a service procedure. Protect yourself and others from injury. Take the following general precautions whenever servicing a hydraulic system.



## Introduction

### Unintended machine movement

#### **Warning**

Unintended movement of the machine or mechanism may cause injury to the technician or bystanders. To protect against unintended movement, secure the machine or disable/disconnect the mechanism while servicing.

---

### Flammable cleaning solvents

#### **Warning**

Some cleaning solvents are flammable. To avoid possible fire, do not use cleaning solvents in an area where a source of ignition may be present.

---

### Fluid under pressure

#### **Warning**

Escaping hydraulic fluid under pressure can have sufficient force to penetrate your skin causing serious injury and/or infection. This fluid may also be hot enough to cause burns. Use caution when dealing with hydraulic fluid under pressure. Relieve pressure in the system before removing hoses, fittings, gauges, or components. Never use your hand or any other body part to check for leaks in a pressurized line. Seek medical attention immediately if you are cut by hydraulic fluid.

---

### Personal safety

#### **Warning**

Protect yourself from injury. Use proper safety equipment, including safety glasses, at all times.

---

### Hazardous material

#### **Warning**






Hydraulic fluid contains hazardous material. Avoid prolonged contact with hydraulic fluid. Always dispose of used hydraulic fluid according to environmental regulations.

---



## Introduction

### Symbols Used in Danfoss Literature

	WARNING may result in injury
	CAUTION may result in damage to product or property
	Non-reusable part, use a new part
	External hex head
	Internal hex head
	Lubricate with hydraulic fluid
	Apply grease / petroleum jelly
	Inspect for wear or damage
	Clean area or part
	Be careful not to scratch or damage
	Note correct orientation
	Torque specification
	Press in – press fit
	Measurement required
	Pull out with tool – press fit
	Flatness specification
	Parallelism specification
	Cover splines with installation cylinder
	Mark orientation for reinstallation

The symbols above appear in the illustrations and text of this manual. They are intended to communicate helpful information at the point where it is most useful to the reader. In most instances, the appearance of the symbol itself denotes its meaning. The legend above defines each symbol and explains its purpose.



## General Description

### Basic Design

LDU32 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. LDU32 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 LDU32.

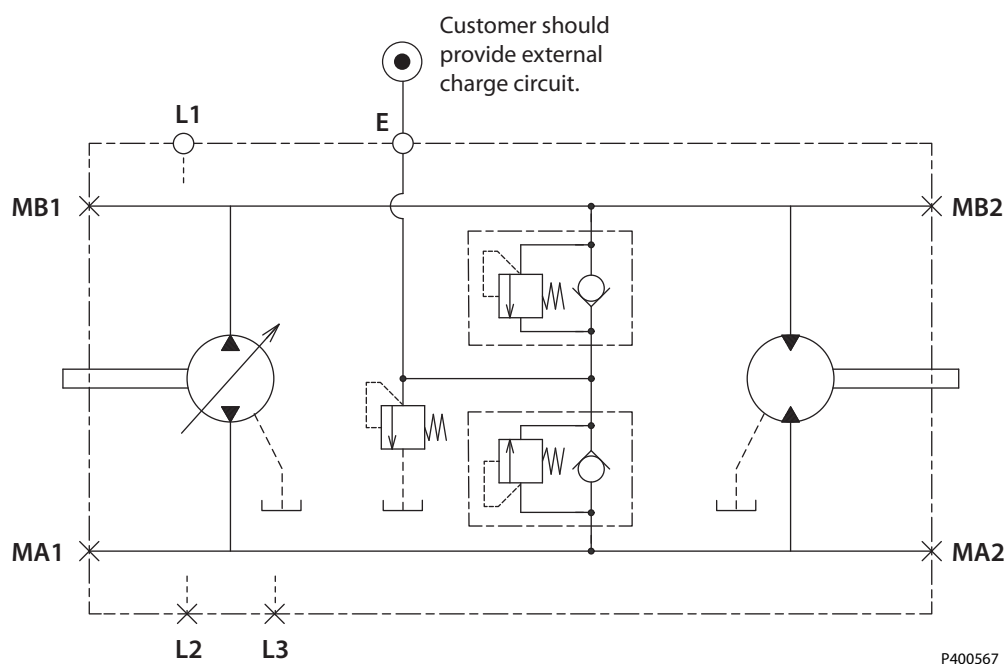
### Key Features

- Easy to use design as Complete Hydrostatic Transmission package for Turf care machines & Compact Utility Tractors up to 29.8kw[40HP]
- Compact design
- U-style layout in One housing with Z-shaft configuration
- Require external charge
- Best in class Efficiency...Can reach approximately 75% overall efficiency
- Longer life kit, Higher Duty Cycle capability in the most compact design in this class of HST
- Low control arm operating force
- Serviced by a Worldwide Network of Danfoss

### Typical Applications

- Compact utility tractor

### Schematic Diagram



\*L1, L2 and L3 are (Case) Drain ports.

\*E is Charge Inlet port. Customer should provide external charge circuit.



## Operation

### Check / High Pressure Relief Valve

The LDU32 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 nonadjustable 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 gain wider neutral dead-band. When HPRV valves with orifice are used, it is only for High pressure ports when vehicle goes in reverse. The system pressure order code for pumps with only HPRV 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.

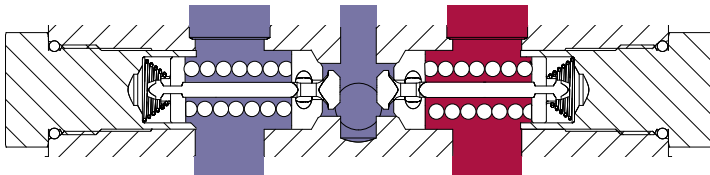
### Check / High Pressure Relief Valve with Orifice

As an option, The LDU32 offers Check / HPRV with an orifice produce a larger neutral deadband.

In some applications, it is desirable to use Check / HPRV with an orifice to expand neutral 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 neutral 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 creep. 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]



P400005

### Caution

HPRVs 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 flow above a valve setting. Consult factory for application review.



## Operation

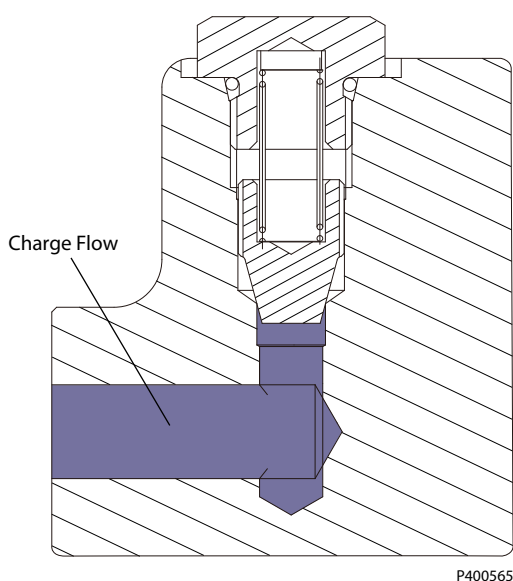
### CPRV (Charge Pressure Relief Valve)

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 settings for external charge supply*

	Flow l/min [US gal/min]
LDU 32	13.8 [3.6]

*Charge Pressure Relief Valve Function*



## Control

### Direct Displacement Control

The LDU32 features Direct Displacement Control (DDC). The swashplate angle is set directly by a control lever or linkage attached directly to the swashplate control arm. 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 LDU32.

### Control Handle Requirements

Maximum allowable control arm torque is 79.1 N·m [700 lbf·in]. The approximate torque necessary to rotate the control arm at 300 bar system operating pressure and 3000 rpm is 30 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 LDU32 technical Information manual BC281913833325.

### Warning

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



## Operating Parameters

### Overview

This section defines the operating parameters and limitations for LDU32 with regard to input speeds and pressures. For actual parameter data, refer to the Operating Parameters in the Technical Specifications section.

### Input / Output 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. An independent braking system is required, redundant to the hydrostatic transmission, which is sufficient to stop and hold the vehicle or machine under all conditions of operation in the event of hydrostatic drive power loss.

---

### System Pressure

**System pressure** is the differential pressure measured between the gage ports Ma and Mb. It is the dominant operating variable affecting hydraulic unit life. High system pressure, which results from high load, reduces expected life. Hydraulic unit fatigue life depends on speed and normal operating—or weighted average—pressure that you can only determine 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** (peak) is the highest intermittent pressure allowed under any circumstances. Applications with applied pressures between maximum working and maximum intermittent require factory approval with complete application, duty cycle, and life expectancy analysis.

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 output power.



## Operating Parameters

### 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 safe working conditions allow in the system.

### 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 the fluid specifications in LDU32 Technical Information manual **BC281913833325**.

### Temperature

1. Maintain fluid temperature within the limits shown in the Technical Specification section.

**Minimum temperature** relates to the physical properties of the component materials. Cold oil may affect the ability of the transmission to provide flow and transmit power.

**Continuous temperature** should not be exceeded for longer than 2 minutes (single event) or for more than 2% of the application duty cycle. Operating the unit at or below continuous temperature should yield satisfactory unit life. The application's cooling system shall be designed to maintain the oil temperature below the continuous temperature limit.

**Maximum intermittent temperature:** is based on material properties. Don't exceed it.

2. Measure maximum temperature at the hottest point in the system.

Refer to the Fluid Specifications in LDU32 Technical Information manual BC281913833325 for data.

3. Ensure fluid temperature and viscosity limits are concurrently satisfied.



## Technical Specifications

### General Specifications

Design	U-style HST with variable displacement piston pump and fixed motor
Direction of Rotation	Clockwise
Recommended Installation Position	Discretionary: The housing must be filled with hydraulic fluid

### Physical Properties

Features		Units	LDU32
Displacement	Pump side <sup>1</sup>	cm <sup>3</sup> /rev [in <sup>3</sup> /rev]	0-31.5 [0-1.92]
	Motor side		31.5 [1.92]
Recommended charge pump displacement for external charge supply		cm <sup>3</sup> /rev [in <sup>3</sup> /rev]	6-8 [0.37-0.49]
Torque at maximum displacement (theoretical)		N•m/bar [lbf•in/1000 psi]	0.51 [310.8]
Mass moment of inertia of rotating components	Pump side	kg•m <sup>2</sup> [slug•ft <sup>2</sup> ]	0.0019 [0.0014]
	Motor side		0.0019 [0.0014]
Weight dry		kg [lb]	21 [46.3]
Oil volume	Case only	liter [US gal]	1.4 [0.37]
	With passage		1.6 [0.42]

<sup>1</sup> Max Swash angle is 18 deg.

### Operating Parameters

Features		Units	LDU32
Input speed	Minimum	min <sup>-1</sup> (rpm)	1000
	Rated		3200
	Maximum		3400
System pressure	Maximum working pressure	bar [psi]	300 [4350]
	Maximum pressure		345 [5004]
Input power	Maximum	kw [HP]	29.8 [40]
Charge pressure	Minimum	bar [psi]	5 [73]
Case pressure	Rated	bar [psi]	1 [14.5]
	Maximum		3 [43.5]



## Technical Specifications

### Fluid Specifications

Features		Units	LDU32
Viscosity	Minimum	mm <sup>2</sup> /sec. [ SUS]	7 [49]
	Continuous		12-60 [66-280]
	Maximum		1600 [7500]
Temperature	Minimum	Degrees C [Degrees F]	-40 [-40]
	Recommended range		+82 [+180]
	Maximum		+104 [+220]
Filtration (recommended minimum)	Cleanliness per ISO 4406		22/18/13
	Efficiency (charge pressure filtration)	β-ratio	β <sub>15-20</sub> =75(β <sub>10</sub> ≥10)
	Efficiency (suction and return line filtration)		β <sub>35-45</sub> =75(β <sub>10</sub> ≥2)
	Recommended inlet screen mesh size	μm	100-125



## Fluid and Filter Maintenance

### Fluid and Filter Recommendations

To ensure optimum life, perform regular maintenance of the fluid and filter. Contaminated fluid is the main cause of unit failure. Take care to maintain fluid cleanliness when servicing.

Check the reservoir daily for proper fluid level, the presence of water, and rancid fluid odor. Fluid contaminated by water may appear cloudy or milky or free water may settle in the bottom of the reservoir. Rancid odor indicates the fluid has been exposed to excessive heat. Change the fluid immediately if these conditions occur. Correct the problem immediately.

Inspect vehicle for leaks daily.

Change the fluid and filter per the vehicle/machine manufacturer's recommendations or at these intervals.

We recommend first fluid change occur at 500 hours of operation.

#### *Fluid and Filter Change Interval*

Reservoir Type	Max. Oil Change Interval
Sealed	2000 Hours
Breather	500 Hours

#### **Caution**

High temperatures and pressures accelerate fluid aging. This may require more frequent fluid changes.

Change the fluid more frequently if it becomes contaminated with foreign matter (dirt, water, grease, etc.) or if the fluid is subjected to temperature levels greater than the recommended maximum. Dispose of used hydraulic fluid properly. Never reuse hydraulic fluid.

Change filters when changing fluid or when the filter indicator directs. Replace all fluid lost during filter change

#### **Warning**

Hydraulic fluid contains hazardous material. Avoid contact with hydraulic fluid. Always dispose of used hydraulic fluid according to state, and federal environmental regulations. Never reuse hydraulic fluid.



## Pressure Measurements

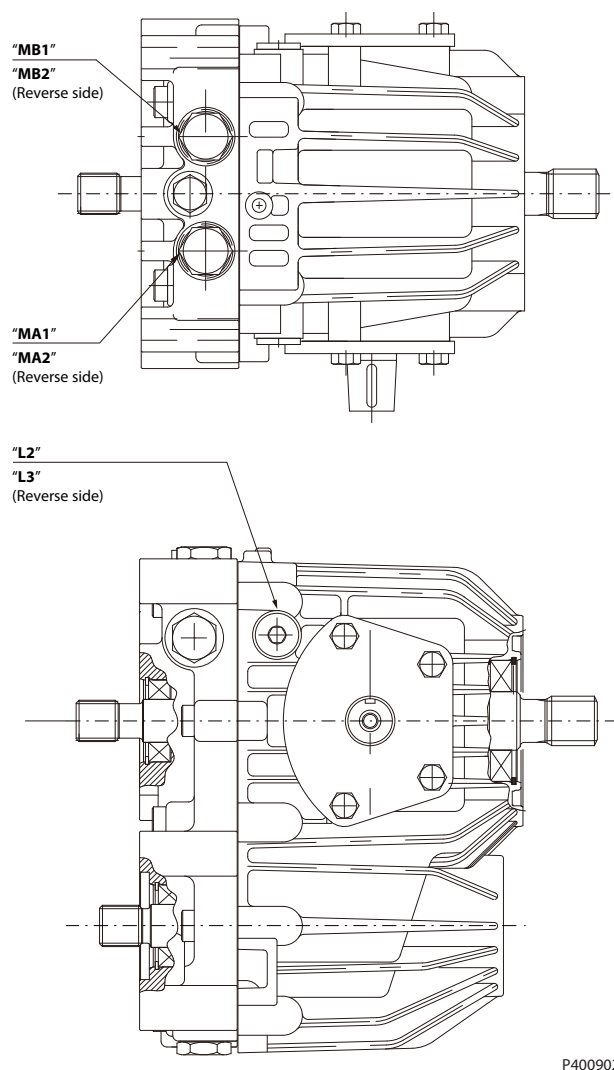
### Port Locations and Gauge Installation

The following table and drawing show the port locations and gauge sizes needed.

#### Port Information

Port Identifier	Port Size	Wrench Size	Pressure Obtained	Gauge Size, bar [psi]
L2, L3	3/4-16 UNF	5/16 internal hex	Case Drain	10 [145.0]
MA1, MA2, MB1, MB2	M18x1.5	24mm external hex	System Pressure	500 [7251.9]

#### Port Locations





## Initial Startup Procedure

### Startup Procedure

Always follow this procedure when starting up a new LDU32 installation or when the transmission has been removed and reinstalled on a machine. If the unit was torn down and reassembled before reinstalling on a machine, the product should be tested on a test stand and pass the necessary quality checks according to the test specification for LDU32.

#### **Warning**

This service procedure may require disabling a vehicle/machine (raising the wheels off the ground, or disconnecting the work function) to prevent injury to the technician and bystanders. Take the necessary safety precautions.

1. Before installing the transmission, inspect the unit for possible damage incurred during shipping and handling.
2. Make certain all system components (reservoir, hoses, valves, fittings, heat exchanger, and so forth) are clean before filling with fluid.
3. Install new system filter element(s) if necessary. Check that inlet line fittings are properly tightened and free of air leaks.
4. Install the transmission.
5. Fill the housing by adding filtered hydraulic fluid to the upper case drain port.
6. Fill the reservoir with hydraulic fluid of the recommended type and viscosity. Use a 10-micron filler. Ensure construction plug is closed after filling is complete.
7. Place the control lever in neutral, The control linkage must be disconnected from the transmission during initial start up.

#### **Caution**

After start-up the fluid level in the reservoir may drop due to system components filling with fluid. Damage to hydraulic components may occur if the fluid supply runs out. Ensure reservoir remains full of fluid during start-up.

Air entrapment in oil under high pressure may damage hydraulic components. Check carefully for inlet line leaks.

Do not run at maximum pressure until system is free of air and fluid has been thoroughly filtered.

8. Use a common method to disable the engine to prevent it from starting. Crank the starter for several seconds. Do not to exceed the engine manufacturer's recommendation. Wait 30 seconds and then crank the engine a second time as stated above. This operation helps remove air from the system lines. Refill the reservoir to recommended full oil level.
9. When the gauge begins to register charge pressure, enable and start engine. Let the engine run for a minimum of 30 seconds at low idle to allow the air to work itself out of the system. Check for leaks at all line connections and listen for cavitation. Check for proper fluid level in reservoir.
10. When adequate charge pressure is established (as shown in model code), increase engine speed to normal operating rpm to further purge residual air from the system.
11. Shut off the engine. Connect the control linkage. Start the engine, checking to be certain the pump remains in neutral. Run the engine at normal operating speed and carefully check for forward and reverse control operation.
12. Continue to cycle between forward and reverse for at least 5 minutes to bleed all air and flush system contaminants out of the system loop.

Charge pressure may decrease slightly during forward or reverse operation.

13. Check that the reservoir is full. The transmission is now ready for operation.



## Troubleshooting

### Overview

This section provides general steps to follow if you observe undesirable system conditions. Follow the steps listed until you solve the problem. Some of the items are system specific. We reference the section in this manual of more information is available. Always observe the safety precautions listed in the Introduction section and any precautions related to your specific equipment.

### System Operating Hot

Item	Description	Action
Oil level in reservoir.	Insufficient hydraulic fluid does not meet cooling demands of system.	Fill reservoir to proper level.
Heat exchanger.	Heat exchanger is not sufficiently cooling the system.	Check air flow and input air temperature for heat exchanger. Clean, repair or replace heat exchanger.
System relief pressure settings	If the system relief valves are worn, contaminated, or valve settings are too low, the relief valves get overworked.	Verify settings of high pressure relief valves and adjust or replace as necessary.
System pressure.	Frequent or long term operation over system relief setting creates heat in system.	Measure system pressure. If pressure is too high, reduce loads.

### Transmission Operates Normally in One Direction Only

Item	Description	Action
Control linkage	Control linkage is operating improperly.	Repair/replace linkage
Interchange charge check/HPRVs	Interchanging the charge check/HPRVs will show if the problem is related to the valve function.	If the problem changes direction, replace the defective valve.

### System will not Operate in Either Direction

Item	Description	Action
Oil level in reservoir	Insufficient hydraulic fluid to supply system loop.	Fill reservoir to proper level.
Charge pressure with pump in neutral	Low charge pressure insufficient to recharge system loop	Measure charge pressure with the pump in neutral. If pressure is low, go to next step.
System pressure	Low system pressure does not provide enough power to move load.	Measure system pressure. Continue to next step.
Charge check/HPRVs	Low system pressure does not provide enough power to move load.	Repair or replace charge check/HPRVs
Control linkage	Linkage operating improperly.	Repair/replace linkage

### System Noise or Vibration

Item	Description	Action
Reservoir oil level	Low oil level leads to cavitation.	Fill reservoir.
Aeration of the oil/charge inlet vacuum	Air in the system decreases efficiency of units and controls. Air in the system is indicated by excessive noise in HST, foaming in oil, and hot oil.	Find location where air is entering into the system and repair. Check that inlet line is not restricted and is proper size.
Cold oil	If oil is cold, it may be too viscous for proper function and pump cavitates	Allow the oil to warm up to its normal operating temperature with engine at idle speed.
Charge inlet vacuum	High inlet vacuum causes noise/cavitation.	Check that inlet line is not restricted and is proper size. Check filter.
Shaft couplings	A loose shaft coupling causes excessive noise.	Replace loose shaft coupling.
Shaft alignment	Misaligned HST and prime mover shafts create noise.	Align shafts.
Charge check/HPRVs	Unusual noise may indicate sticking valves. Possible contamination.	Clean/replace valves and test the unit.



## Troubleshooting

### Sluggish System Response

Item	Description	Action
Oil level in reservoir	Low oil level causes sluggish response.	Fill reservoir.
Charge check/HPRVs	Incorrect pressure settings affects system reaction time.	Replace charge check/HPRVs
Low prime mover speed	Low engine speed reduces system performance	Adjust engine speed.
Air in system	Air in system produces sluggish system response	Fill tank to proper level. Cycle system slowly for several minutes to remove air from system.
Charge inlet vacuum	Inlet vacuum is too high resulting in reduced system pressure.	Measure charge inlet vacuum. Inspect line for proper sizing. Replace filter. Confirm proper bypass operation.
Control linkage	Linkage operating improperly	Repair or replace control linkage



## Required Tools and Standard Procedures

### Required Tools

The service procedures described in this manual can be performed using common mechanic's hand tools. Special tools, if required, are shown. When testing system pressure, calibrate pressure gauges frequently to ensure accuracy. Use snubbers to protect gauges.

### Standard Procedures

#### **Caution**

Contamination can damage internal components and void the warranty. Take precautions to ensure system cleanliness when removing and reinstalling system lines.

1. With the prime mover off, thoroughly clean all dirt and grime from the outside of the transmission. Ensure the surrounding areas are clean and free of contaminants such as dirt and grime.
2. If removing the transmission, tag each hydraulic line connected to the transmission. If you disconnect hydraulic lines, plug each open port to keep dirt and contamination out of the transmission.
3. Inspect the system for contamination. Look at the hydraulic fluid for signs of system contamination, such as oil discoloration, foam in the oil, sludge, or small metal particles.
4. Remove the transmission.

#### **Caution**

Be careful not to damage solenoids and electrical connections when using straps or chains to remove transmission from machine.

5. Perform transmission function test.
6. Before re-installing the transmission on the machine, test for leaks , drain the system, flush all lines, replace all filters, and fill with new hydraulic fluid.

### Charge Check/HPRV Adjustments

The Charge Check/HPRV combines the charge check and high pressure relief functions. Whenever you replace a Charge Check/HPRV, operate the vehicle/machine through its full range of functions to ensure proper HST operation. The Charge Check/HPRVs are preset at the factory. No adjustment is possible.

#### Checking for proper charge check/HPRV operation

If you suspect Charge Check/HPRV malfunction, swap valves and test operation. If the symptoms switch direction, replace the faulty valve.



## Minor Repair

### Shaft Seals

#### Removal

1. Using a snap ring pliers, remove retaining ring (F125, H125, F215, H215).
2. Use a slide-hammer style puller to remove seal (F115, F210, H210) and bore plug (H115). Be careful not to damage the shaft or seal bore when removing the seal. Discard seal.

#### Inspection

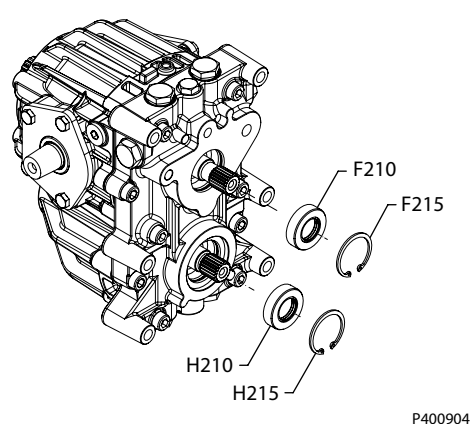
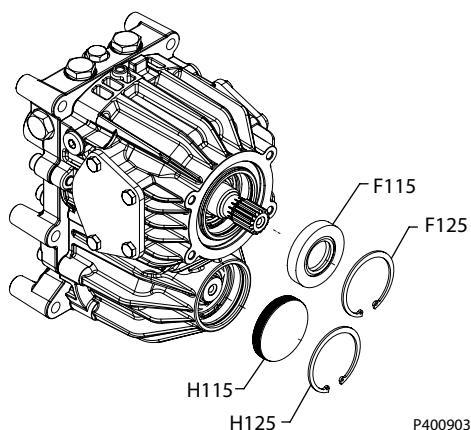
Inspect retaining ring for wear or damage.

#### Assembly

1. Lubricate inside diameter of new seal. Cover the shaft splines with protective sleeve to avoid damaging the seal during installation.
2. Using a seal installation tool, start the seal into the housing bore. Hand press the seal the rest of the way into the housing bore. Ensure the seal clears the retaining ring groove in the housing. Remove the protective sleeve from the shaft.

Do not press seal beyond snap ring groove. Stop pressing just when you have room to install the retaining ring into the bore.

3. Using a snap ring pliers, install retaining ring (F125, H125, F215, H215).





## Minor Repair

### Charge Check/HPRV

The high pressure relief and charge check valve assembly may be removed for cleaning and replacement of the O-rings. These valves are factory set and are not field adjustable. Refer to the transmission model code for the factory setting when ordering replacements.

#### Removal

1. Using a 24 mm hex wrench, remove the valve seat plug assemblies (J140, J150).
2. Carefully lift the valve (N110, P110) and spring (N100, P100) assemblies from the center section using a magnet.

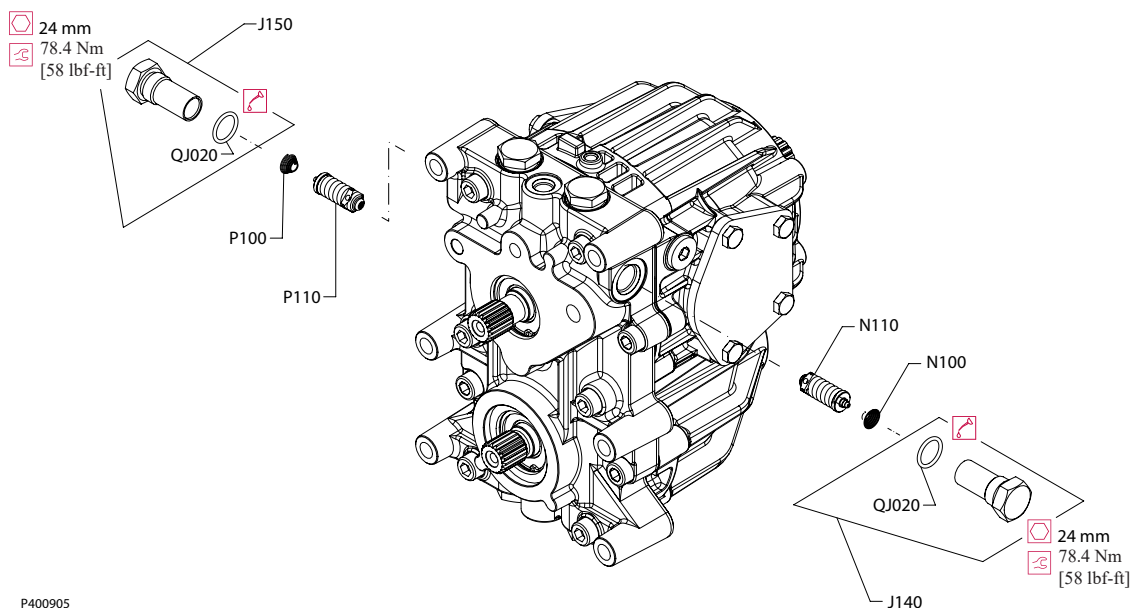
#### Inspection

Inspect the valves and mating seats in the valve seat plug assemblies (J140, J150) for damage or foreign material.

#### Reassembly

1. Lubricate and install new O-rings (QJ020) on valve seat plug assemblies (J140, J150).
2. Verify that the conical springs (N100, P100) are properly retained on the check relief valves (N110, P110). Install the valve assemblies into the center section. Ensure each valve assembly moves freely in its bore.
3. Install the valve seat plugs into the center section and torque to 78.4 N·m [58 lbf·ft].
4. Operate vehicle/machine through full range of controls to ensure proper operation. Check for leaks.

#### Charge Check/HPRV



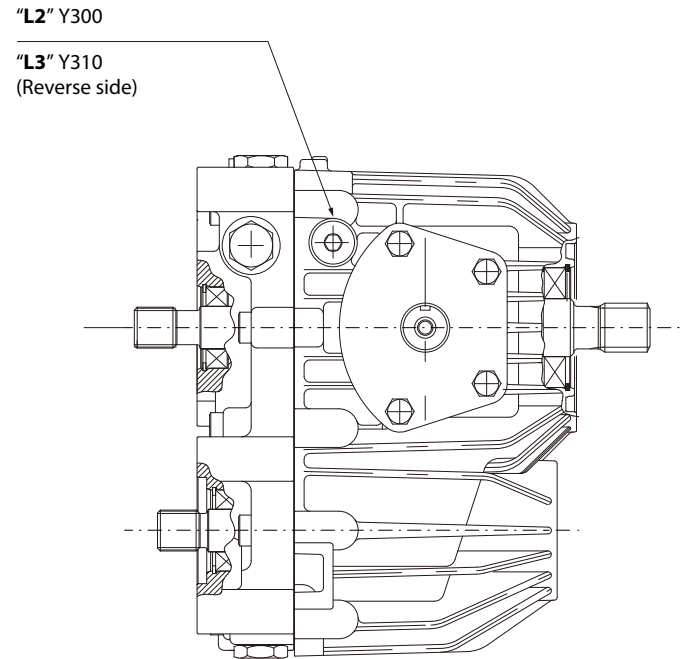
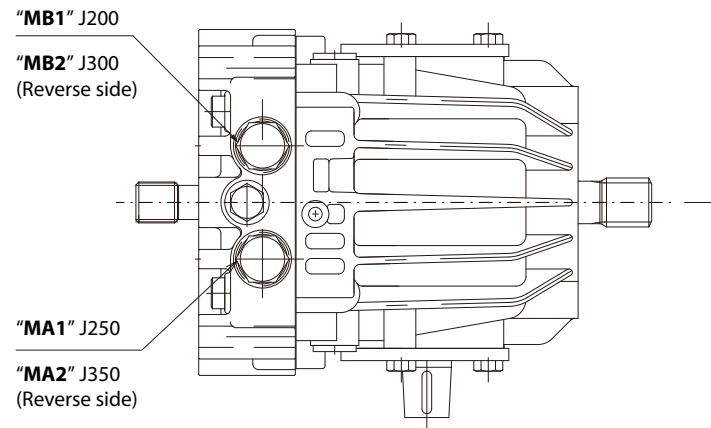


# Torque Chart

## Plug Size and Torque Chart

Item	O-ring Plug	Wrench Size	Torque N•m [lbf•ft]
J200, J250, J300, J350	M18x1.5	24mm external hex	70.0 [51.6]
Y300, Y310	3/4-16 UNF	5/16 internal hex	29.0 [21.4]

### Plugs



P400906



**Products we offer:**

- Cylinders
- Electric converters, machines, and systems
- Electronic controls, HMI, and IoT
- Hoses and fittings
- Hydraulic power units and packaged systems
- Hydraulic valves
- Industrial clutches and brakes
- Motors
- PLUS+1® software
- Pumps
- Steering
- Transmissions

**Danfoss Power Solutions** designs and manufactures a complete range of engineered components and systems. From hydraulics and electrification to fluid conveyance, electronic controls, and software, our solutions are engineered with an uncompromising focus on quality, reliability, and safety.

Our innovative products makes increased productivity and reduced emissions a possibility, but it's our people who turn those possibilities into reality. Leveraging our unsurpassed application know-how, we partner with customers around the world to solve their greatest machine challenges. Our aspiration is to help our customers achieve their vision — and to earn our place as their preferred and trusted partner.

**Go to [www.danfoss.com](http://www.danfoss.com) or scan the QR code for further product information.**

**Hydro-Gear**

[www.hydro-gear.com](http://www.hydro-gear.com)

**Daikin-Sauer-Danfoss**

[www.daikin-sauer-danfoss.com](http://www.daikin-sauer-danfoss.com)

**Danfoss  
Power Solutions (US) Company**  
2800 East 13th Street  
Ames, IA 50010, USA  
Phone: +1 515 239 6000

**Danfoss  
Power Solutions GmbH & Co. OHG**  
Krokamp 35  
D-24539 Neumünster, Germany  
Phone: +49 4321 871 0

**Danfoss  
Power Solutions ApS**  
Nordborgvej 81  
DK-6430 Nordborg, Denmark  
Phone: +45 7488 2222

**Danfoss  
Power Solutions Trading  
(Shanghai) Co., Ltd.**  
Building #22, No. 1000 Jin Hai Rd  
Jin Qiao, Pudong New District  
Shanghai, China 201206  
Phone: +86 21 2080 6201

Danfoss can accept no responsibility for possible errors in catalogues, brochures and other printed material. Danfoss reserves the right to alter its products without notice. This also applies to products already on order provided that such alterations can be made without subsequent changes being necessary in specifications already agreed. All trademarks in this material are property of the respective companies. Danfoss and the Danfoss logotype are trademarks of Danfoss A/S. All rights reserved.