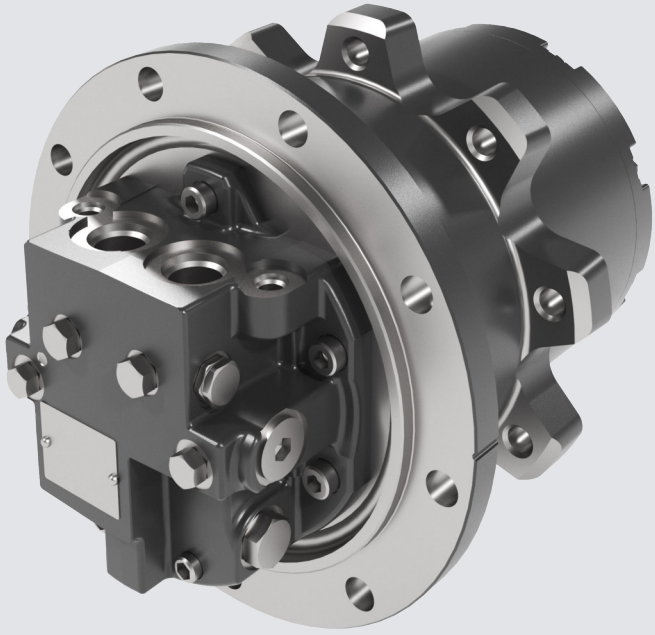
Service Manual
danfoss.com

BMV 28/32, 41/51
Integrated Drive Motor



Revision history

Table of revisions

Date	Changed	Rev
March 2026	First Edition	0101

Torque Chart

Introduction

Hydrostatics Servicing Overview

This manual includes information for the installation, maintenance, and minor repair procedures for BMV motor. 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.

Only Danfoss global service partners (GSPs) are authorized to perform major repairs.Danfoss trains Global Service Partners and certifies their facilities on a regular basis. You can locate your nearest service partner at **www.danfoss.com** > **Contact us** > **Danfoss sales and services** > **Distributor and service partners**

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.

Unintended machine movement

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

Flammable cleaning solvents

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

Hazardous material

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

Fluid Under Pressure

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.
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. Use caution when dealing with hydraulic fluid under pressure. Seek medical attention immediately if you are cut by hydraulic fluid.

Personal safety

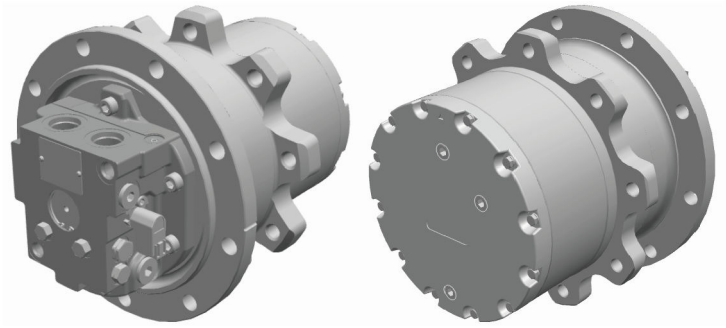
Protect yourself from injury whenever servicing a hydraulic system.
Use proper safety equipment, including safety glasses, at all times.

General Description

Basic Design

The BMV integrated drive motor is composed of a variable two-displacement axial piston motor and a planetary gearbox.

This product is designed to be combined with a pump in a closed-circuit system to transfer and control hydraulic power. The hydrostatic motor has two displacements—maximum and minimum—by switching the swashplate angle, and the two-stage planetary gearbox provides low-speed and high-torque.



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Key Features

These functions create opportunities to easily improve the machine performance for:

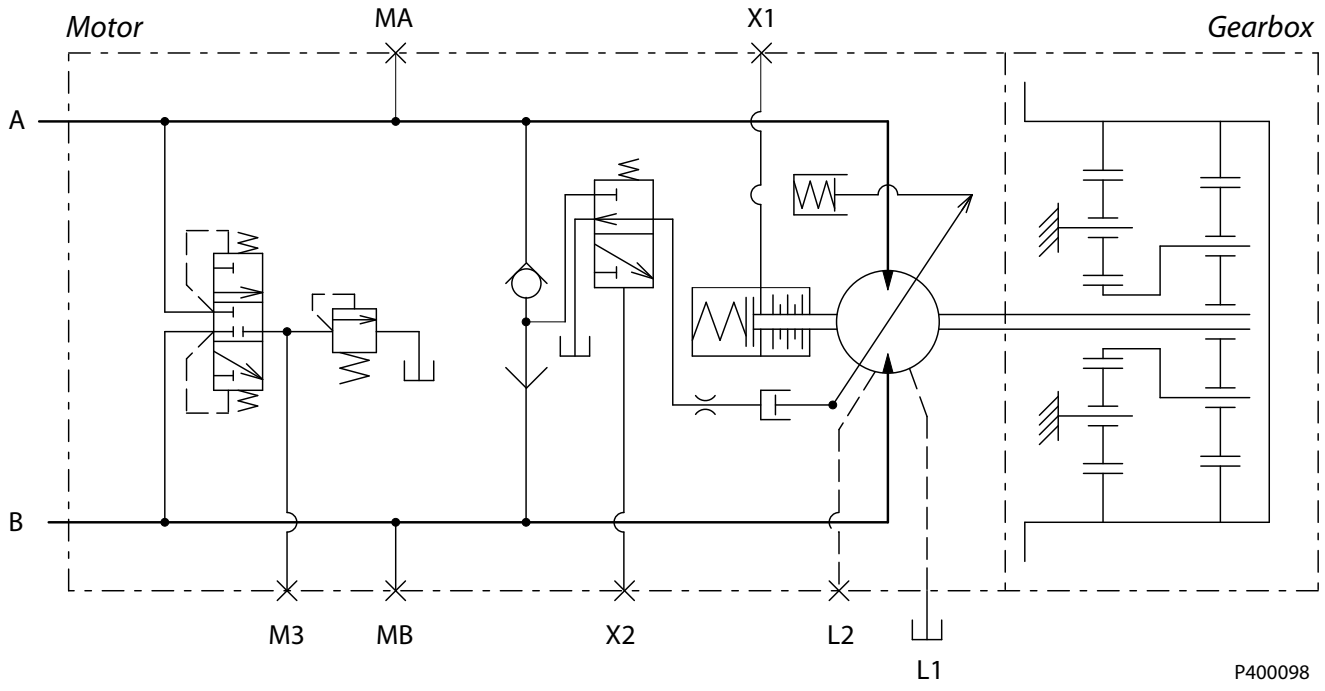
- Compactness of the integrated design
- Proven performance and reliability
- Variable two-speed motor
- Integrated high-torque parking brake
- Easy installation and removal
- Two port configuration options (Inch and Metric)
- Loop flushing valve option
- PLUS+1® Compliance, speed sensor option

Typical Applications

Ideal for crawler type vehicles:

- Compact truck loader (CTL)
- Crawler carrier/forwarder
- Other specialty vehicles: crawler tractor, crawler mower, etc.

Schematic Diagram



- A and B are System ports.
- MA and MB are System Pressure Gauge ports.
- L1 and L2 are Case Drain port.
- X1 is Brake Release Pressure port.
- X2 is Speed Shifting Control Pressure port.
- M3 is Charge Pressure Gauge port.

Technical Specification

BMV design specifications

Features	BMV
Design	Axial piston motors with dual speed variable displacement, Two-stage planetary gearbox.
Direction of input rotation	Bi-directional
Recommended installation position	Normal installation is horizontal. For other position, contact Danfoss for non-conformance to these guidelines. Housing must always be filled with hydraulic fluid. Gearbox must be filled with gear oil.
Filtration configuration	SAE or JIS straight thread O-ring boss.

Physical Properties

Features		Units	BMV028	BMV032	BMV041	BMV051
Displacement	Maximum	cm^3	28.0	31.5	41.0	51.0
	Minimum		18.3 19.1	20.6 21.5	26.8	33.4
Weight with gear oil		kg	57		81	

Operation Parameters

Features			Units	BMV028	BMV032	BMV041	BMV051
System pressure	Maximum working pressure		bar	350			
	Maximum pressure			380			
Low side pressure			bar	15 - 40		15 - 40	
Gear ratio			i : 1	25.680		24.362	
Equivalent displacement			cm^3	719	809	999	1242
Max. theoretical output torque			N・m	4000	4500	5560	6920
Output speed	Rated	Max. disp.	min^{-1} (rpm)	108		103	
		Min. disp.		162		155	
	Max.	Max. disp.		119		113	
		Min. disp.		178		171	
Parking brake torque			N・m	5720		8840	
Brake releasing pressure			bar	15 - 50			
Speed shifting control pressure	Max. disp.		bar	Control pressure < Case pressure + 3 bar			
	Min. disp.			15 ~ 50			
Maximum motor case pressure	Rated		bar	3			
	Max.			10			

Fluid Specifications

Features			Units	BMV028	BMV032	BMV041	BMV051
Hydraulic oil				Abrasion resistant fluid i			
	Recommended viscosity range		mm^2/sec	12 ~ 80			
	Minimum viscosity			7 (max. 5 minutes)			
	Maximum viscosity			1600(max. 5 minutes, Cold start)			
	Hydraulic oil temp. range		°C	-20 ~ 104 in case (max. 5 minutes 115C°)			
	Filtration (recommended minimum)	Cleanliness per ISO 4406		22/18/13			
		Efficiency (charge pressure filtration)	β-ratio	$\beta_{15\text{-}20}=75$ ($\beta_{10}\geq 10$)			
		Efficiency (suction and return line filtration)		$\beta_{35\text{-}45}=75$ ($\beta_{10}\geq 2$)			
		Recommended inlet screen mesh size	µm	100 - 125			
Gear oil				Grade: API service GL-4 Extreme Pressure Additives included			
	Recommended viscosity range		mm^2/sec	40-2000			
	Minimum viscosity			25 (max. 5 minutes)			
	Maximum viscosity			20000 (max. 5 minutes, Cold start)			
	Oil volume capacity		L	1.0		1.6	

Please see **520L0463** *Hydraulic Fluids and Lubricants* for detailed information.

Gear Oil Change

The gearbox is shipped with oil filling which viscosity is SAE 90. Due to the contact surface between gears that have not been run-in during the early time of the operation, metallic particles are generated in the oil. These particles have a negative effect on the life of gear and bearing.

It is recommended:

- First oil change after 250 working hours, and then every 1500 hours, but at least once a year.
- Check the oil level every 250 working hours and add it if necessary.
- Refer to ***Hydraulic and gear oil above chart*** for oil classification and level. Since gear oil volume is a little more than half of gearbox internal capacity, you can check oil volume by the level gage.

Gear Oil Temperature

In order to avoid deterioration of sealing rubber parts, the gearbox surface temperature should be less than 90C° .

Only intermittent operation (within 10 minutes) is allowable with over 90C° gearbox surface temperature.

Operations

Hydrostatic Motor

The hydrostatic motor is designed to convert hydraulic power into torque and speed.

The high-pressure hydraulic fluid enters through the input main port. The fluid pressure behind the pistons makes them move down along the swashplate. As the piston returns up the swashplate again, the fluid is allowed to exit through the output main port. The spinning pistons are housed in the cylinder block which is connected to the shaft. The output torque can be transmitted to the 1st stage sun gear of the gear box.

Hydraulic Two Position Control

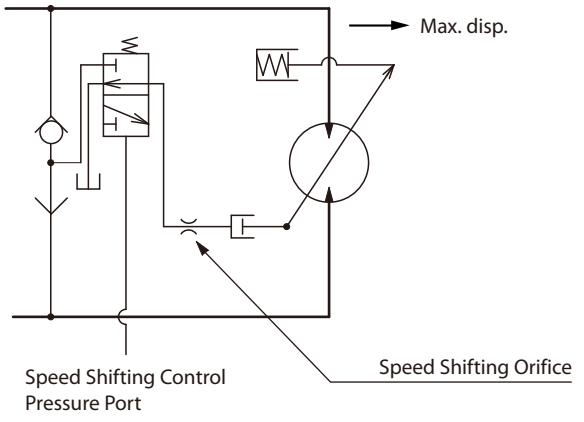
The swashplate of this motor can be switched between minimum and maximum angle to amplify torque and speed. With no control pressure applied, the motor operates at maximum displacement, and, the motor provides the maximum output torque.

When control pressure is applied, the spool shifts, porting high system pressure to the servo piston, shifting the motor to minimum displacement.

At minimum displacement, the motor provides the maximum speed. Speed shifting orifice can be chosen to delay speed shifting.

Note

Do not use the speed shifting control pressure between 3 bar and 15 bar to avoid unstable swashplate position.



Warning

Speed shifting is not recommended during running. Please contact Danfoss if necessary.

Gear Box

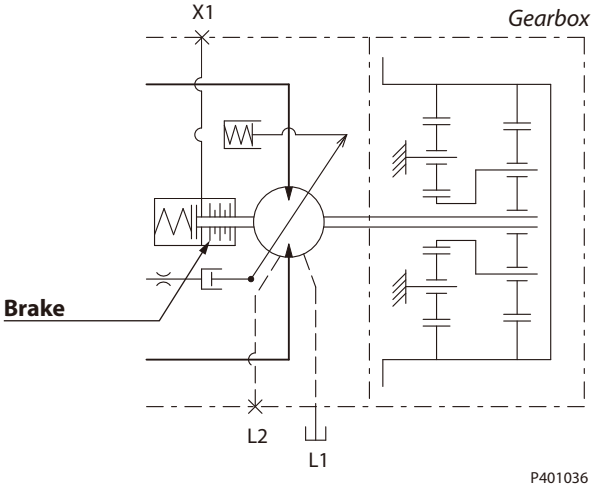
The gearbox is designed to increase torque and to decrease speed.

The gearbox consists of two simple planetary stages connected in series. Each planetary stage consists of a sun gear, an internal tooth ring gear and a set of planet gears mounted on a carrier. The sun gear “floats” within the planet gears so as to gain uniform load distribution at the multiple gear mesh points.

The hydrostatic motor drives the 1st stage sun gear which in turn drives the 1st planet gears within the ring gear causing rotation of the 1st stage carrier. The 1st stage carrier is coupled directly to the 2nd stage sun gear. The 2nd stage carrier is a part of motor housing and the 2nd stage planet gears transmit the torque to the ring gear. Output hub rotation is opposite to the input rotation.

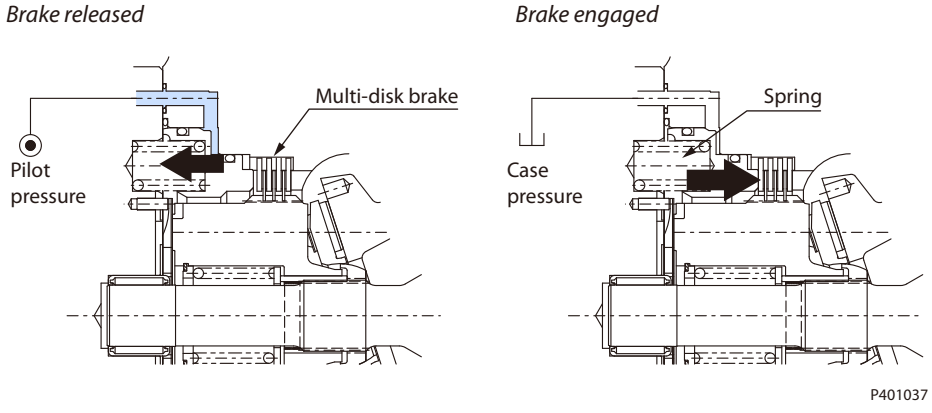
The planet gears are supported on bearings. The output hub is supported on bearings to provide large external load carrying capability.

Parking Brake



The brake is designed to be used to hold or park the vehicle statically. Since the brake torque exceeds 127% of the maximum theoretical output torque, the vehicle never starts moving as long as the parking brake is engaged.

This brake works with spring force mechanically and hydraulic pressure is required to release it.



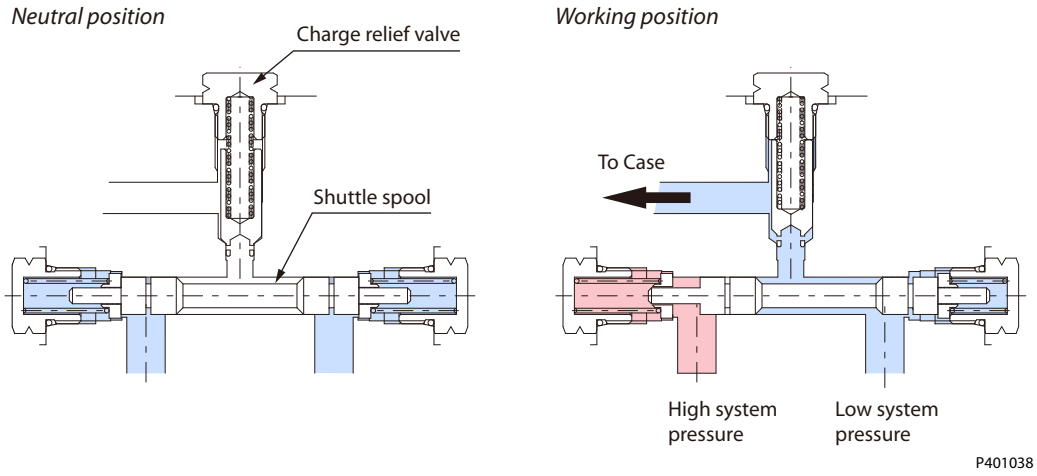
Warning

Never use this parking brake as dynamic brake regularly, except for emergency stop.

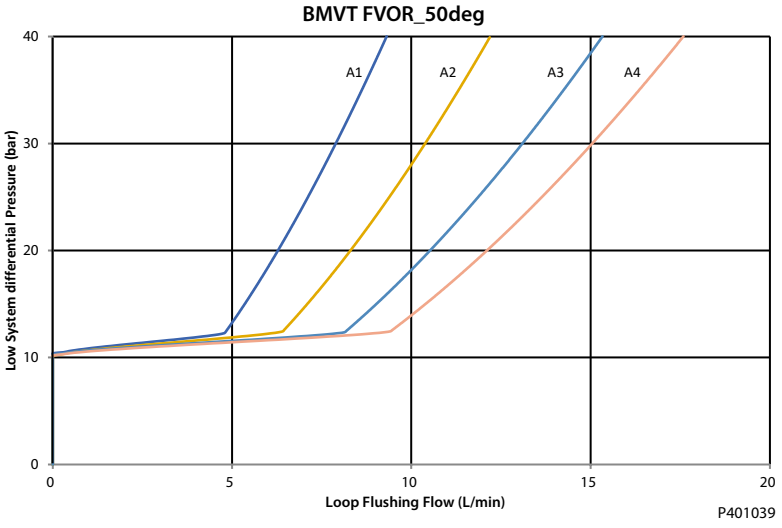
Loop Flushing Valve

The loop-flushing valve is used to replace hydraulic oil from the system circuit to cool the transmission or to remove excessive contamination in the closed circuit.

The shuttle spool and the charge relief valve are installed in the end cap to provide the loop flushing function. The shuttle valve selects the low system pressure. The charge relief valve regulates the charge pressure level. The shuttle valve is centered by the spring so that no high-pressured fluid is lost from the circuit.



Loop Flushing Relief Valve Option



Speed Sensor

BMV motors are available with an optional speed sensor. This hall-effect pulse pick-up is located in the motor endcap. The sensor accepts supply voltage and outputs a digital pulse signal in response to the speed of the cylinder block. The output changes its high/low state as the target teeth pass by the sensor's face. The digital (on-off-on-off) pulse train is fed to a controller, which interprets its rate of change as a speed. A logic circuit decodes the two signals to provide an additional direction indication (high or low) depending on direction.

The speed sensor is designed for rugged outdoor, mobile or heavy industrial speed sensing applications. The detection of the speed is contactless and does not need any calibration or adjustments. There is only one optional sensor available.

Available Sensors

Description	Order number
	149055
Supply voltage	4.5 – 8 V
Speed signals	Two, 90° Phase shift
Direction signal	One
Temperature signal	One
PLUS+1 Compliance	Yes

Protection Characteristics

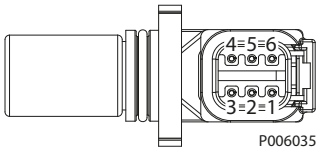
Parameter	Data
Protection Code (IP class) according IEC 60529 and DIN 40050	IP 67 (without connector installed) IP 69k (with connector installed)
EMC Emission	EN 61000-6-3
EMC Immunity (EMI)	100 V/m incl. 1 kHz AM 80 %; ISO 11452-5 and -2
ESD	EN 61000-4-2 Air discharge: 15 kV Contact discharge: 8 kV
Vibration	30 G (294 m/s^2)
Shock	50 G (490 m/s^2)
Case maximum pressure	5 bar [72.5 psi]

Mating Connectors

Ordering number	
11033865	**11033863**
Assembly Bag, DEUTSCH DTM06-6S-E004; black, (24-20 AWG) 0.21 -0.52 mm^2	Assembly Bag, DEUTSCH DTM06-6S, gray, (24-20 AWG) 0.21 -0.52 mm^2

Speed Sensor 4.5 - 8 V

Speed sensor connector, 6-pin

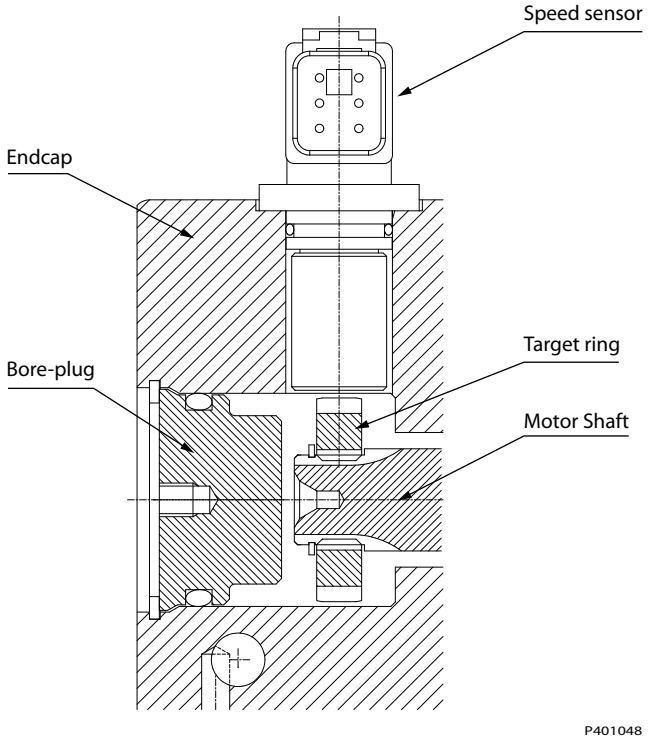


Pinout:
1. Speed signal 2
2. Direction signal
3. Speed signal 1
4. Supply
5. Ground
6. Temperature

Technical data

Parameter	Min.	Nom.	Max.	Note
Supply voltage	4.5 V_{DC}	5 V_{DC}	8 V_{DC}	Regulated supply voltage. Reverse polarity protected.
Supply protection	–	–	30 V_{DC}	Shuts off above 9 V.
Pulses per revolution	**NPN & PNP**			
Max. required supply current	–	–	25 mA	At supply voltage
Max. output current	–	–	50 mA	
Operation mode	**NPN & PNP**			Push-Pull amplifier
Temperature signal	-40°C = 2.318V	–	100°C = 0.675V	
Output low speed signal	5 %	8.5 %	12 %	Ratiometric output voltage Low state > 0 V to provide wire fault detection
Output high speed signal	88 %	91.5 %	95 %	
Detectable frequency range	1 Hz	–	10 000 Hz	
Ordering number	**149055**			
Color of connector	Black			

Sensor Position



Sensor target

The 18 teeth on the target ring as target of sensor for detection of direction (CW/CCW) and rotation.

Output Pulses

The expected number of output pulses per revolution is shown below.

The number of pulses (per rev)	**18**

Note

For more technical information, please contact your Danfoss representative.

PLUS+1® Compliance

The Speed Sensor has met and passed the Danfoss PLUS+1® compliance standard testing, and as such, this Speed Sensor is PLUS+1® compliant.

Operating Parameters

Overview

This section defines the operation parameters and limitation for BMV motors with regard to output speeds and pressures. For actual parameters, refer to the specification for each size.

Output Speed

Start Speed and Low Speed Stability

The motor produces maximum starting torque at maximum displacement.

Stable operation can be achieved at 1 – 2 min^{-1}, depending on system pressure, in applications that require low speed stability. Output speed becomes more stable as speed increases.

Rated speed is the highest output speed recommended at full power condition. Operating at, or below this speed will yield satisfactory product life.

Maximum speed is the highest operating speed permitted. Exceeding maximum speed reduces the product life and can cause loss of hydrostatic power, dynamic brake capacity or oil leakage from the floating seal. Never exceed the maximum speed limit under any operation conditions.

Operation between Rated Speed and Maximum speed is reserved for Intermittent Operation not to exceed 5 minute durations. Speed above Rated is anticipated to occur during downhill braking (negative power).

Note

Contact Danfoss for any operation above Rated Speed when negative is not involved.

Note

During hydraulic braking and downhill conditions, the prime mover must be capable of providing sufficient braking torque in order to avoid pump over speed. This is especially important to consider for turbocharged and Tier 4 engines.

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

Application Pressure is the highest pressure relief or pressure limiter setting normally defined within the order code of the pump. This is the applied system pressure at which the driveline generates the maximum calculated pull or torque in the application.

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, Maximum Working Pressure should yield satisfactory unit life given proper component sizing.

Maximum Pressure is the highest allowable application pressure under any circumstance. For applications which are above the Maximum Pressure, please contact Danfoss.

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

Low Side Pressure is lower pressure among high pressure gauge ports. Minimum limit must be maintained under all operating conditions to avoid cavitation. Maximum limit must be obeyed to keep the swashplate position at minimum or maximum displacement.

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.

Temperature

The high temperature limits apply at the hottest point in the transmission, which is normally the motor case drain. The system should generally be run at or below the published rated temperature.

The maximum intermittent temperature is based on material properties and should never be exceeded.

Cold oil will generally not affect the durability of the transmission components, but it may affect the ability of oil to flow and to transmit power. Therefore, temperatures should remain 16°C above the pour point of the hydraulic fluid.

The minimum temperature relates to the physical properties of component materials.

Size heat exchangers to keep the fluid within these limits. Danfoss recommends testing to verify that these temperature limits are not exceeded.

Viscosity

For maximum efficiency and bearing life, ensure that the fluid viscosity remains in the recommended continuous range.

Minimum intermittent viscosity should be encountered only during brief periods of maximum ambient temperature and severe duty cycle operation.

Maximum intermittent viscosity should be encountered only at cold start.

Wheel Bearing Life

Wheel bearings which are shown in below schematic support the gearbox case rotating on the hydraulic motor. The bearing life is based on the following items.

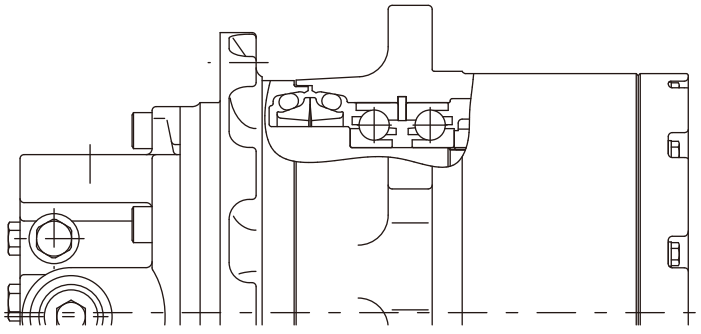
- Radial load
- Output speed

Each representative bearing life curve is shown in the general dimentions.

If detailed lifetime is necessary, please contact Danfoss.

If operating conditions are variable, that is, the wheel gear is subject to a work cycle with different levels of torque and/or output speeds, all information is necessary for the detailed life calculation.

Please see the annexed “Application Data Worksheet”, and complete it.



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Gear Life

When torque is applied to a BMV gearbox, the gear teeth experience both bending and surface compression stresses. Both stresses are based on required output torque.

The gear life calculation needs not only output torque, also output speed.

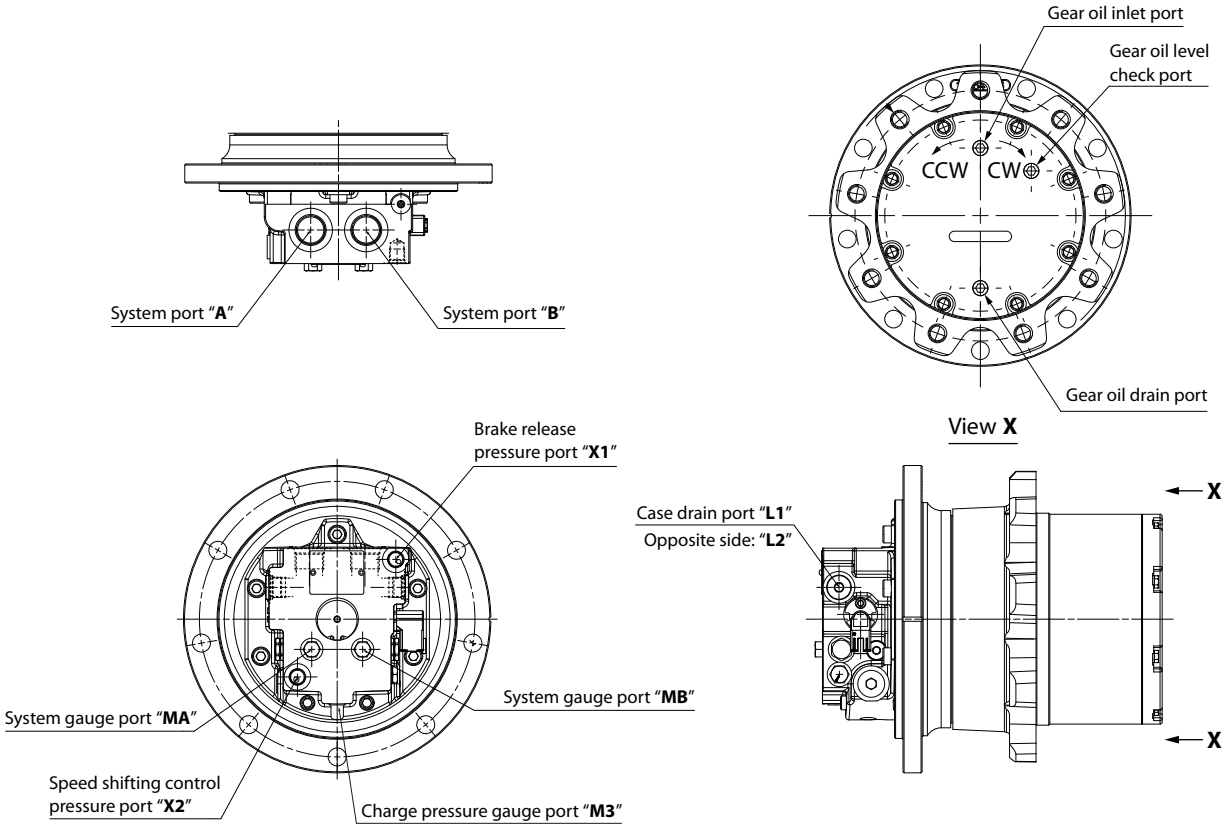
If detailed lifetime is necessary, please contact Danfoss.

If operating conditions are variable, that is, the wheel gear is subject to a work cycle with different levels of torque and/or output speeds, all information is necessary for the detailed life calculation.

Please see the annexed “Application Data Worksheet”, and complete it.

Pressure Measurements

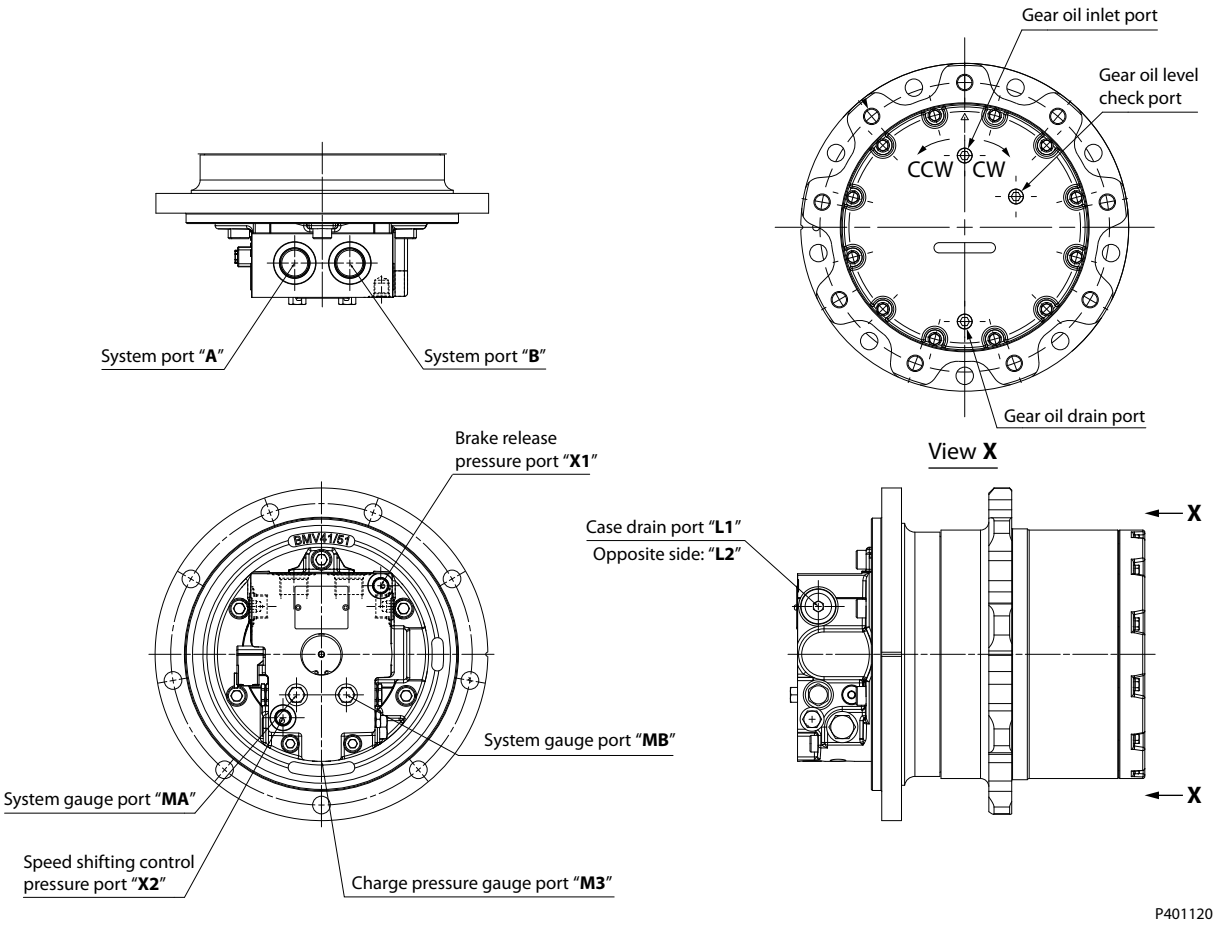
BMV 28/32 Port Locations and Specifications



Port description

Port	Pressure obtained	Gauge size	Port size	Tool size
L1, L2	Case drain	10 bar [145 psi]	3/4-16	9/16 inch hex bit socket
			G1/2	10 mm hex bit socket
M3	Charge gauge	50 bar [725 psi]	7/16-20	3/16 inch hex bit socket
MA, MB	System gauge	500 bar [7,250 psi]	7/16-20	9/16 inch hex socket
A, B	System pressure	-	1-1/16-12	-
			G3/4	-
X1	Hydraulic control inlet	-	9/16-18	-
			G1/4	-
X2	Hydraulic control inlet	-	9/16-18	-
			G1/4	-
Gear oil inlet port, Gear oil level check port, Gear oil drain port	-	-	Rc3/8	8 mm hex bit socket

BMV 41/51 Port Locations and Specifications



Port description

Port	Pressure obtained	Gauge size	Port size	Tool size
L1, L2	Case drain	10 bar [145 psi]	7/8-14	3/8 inch hex bit socket
			1-1/16-12	9/16 inch hex bit socket
			G3/4	12 mm hex bit socket
M3	Charge gauge	50 bar [725 psi]	7/16-20	3/16 inch hex bit socket
			9/16-18	1/4 inch hex bit socket
MA, MB	System gauge	500 bar [7,250 psi]	7/16-20	9/16 inch hex socket
A, B	System pressure	-	1-1/16-12	-
			G3/4	-
X1	Hydraulic control inlet	-	9/16-18	-
			G1/4	-
X2	Hydraulic control inlet	-	9/16-18	-
			G1/4	-
Gear oil inlet port, Gear oil level check port, Gear oil drain port	-	-	Rc3/8	8 mm hex bit socket

Fluid and Filter Maintenance

Recommendations of Fluid and Filter Maintenance

To ensure optimal product 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. Water in the fluid may be noted by a cloudy or milky appearance or free water 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: 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 that the recommended maximum.

Fluid and filter change interval

Reservoir type	Maximum change interval
Sealed	2000 hours
Breather	500 hours

Caution

High temperatures and pressures accelerate fluid aging. These conditions will require more frequent fluid changes.

Change filters whenever the fluid is changed or when the filter indicator shows that it is necessary to change the filter. 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.

Initial Start-Up Procedures

Procedure

Warning

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

Note

Always follow this procedure when starting-up a new BMV installation or when the motor has been removed.

1. Before installing the motor, inspect the units 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. Fill the reservoir with recommended hydraulic fluid. Pass this fluid through a 10 micron (nominal, no bypass) filter before it enters the reservoir.
4. Fill the inlet line leading from the reservoir to the pump.
5. Check inlet line for properly tightened fittings. Make sure the inlet line is free of restrictions and air leaks.
6. Fill the motor and pump housings with clean hydraulic fluid before start up. Fill by pouring filtered oil into the upper case drain port.

   Caution

   Never start the prime mover unless the motor and pump housings are filled completely with clean hydraulic fluid.
7. For closed loop systems, install a 0-35 bar [0-508 psi] pressure gauge in the charge pressure gauge port of the pump to monitor the charge pressure during start-up.

   Note

   For open circuit systems, use gauges in system ports.
8. Disconnect any external control input signal from the pump control until after initial start-up. This ensures that the pump remains in its neutral position.
9. Jog (slowly rotate) prime mover until charge pressure starts to rise.
10. Start the prime mover and run at the lowest possible speed until charge pressure builds.

    Warning

    Do not start the prime mover unless the pump is in neutral position (swash plate at 0° angle). Take necessary precautions to prevent machine movement in case pump is actuated (in stroke) during initial start-up.

    Note

    If necessary, bleed excess air from the high pressure lines through the high pressure system gauge ports.
11. Once charge pressure is established, increase to normal operating speed. Charge pressure should be as indicated in the pump model code. If charge pressure is low, shut down and determine cause.

    Caution

    Low charge pressure may affect ability to control the machine.
12. Shut down the prime mover.
13. Connect the external control input signal/command.
14. Reconnect the machine function if disconnected earlier.
15. Start the prime mover, checking to ensure the pump remains in neutral.

16. Check for forward and reverse machine operation, with the prime mover at normal operating speed.

> **Note**
>
> Charge pressure may decrease slightly during forward or reverse operation.

17. Continue to cycle slowly between forward and reverse for at least five minutes.
18. Shut down prime mover.
19. Remove gauges. Replace plugs at the gauge ports.
20. Check reservoir level. Add filtered fluid if needed.

The motor/transmission is now ready for operation.

Troubleshooting

Overview

This section provides general steps to follow if you observe undesirable system conditions. Follow the steps until you solve the problem. Some of the items are system specific. Always observe the safety precautions in the *Introduction* section.

⚠ 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.

System Operating Hot

Item	Description	Action
Oil level	Insufficient amount of hydraulic fluid may cause overheating.	Fill the reservoir to the proper level.
Heat exchanger	Blocked heat exchanger or low air flow may cause system overheating.	Check temperature upstream and downstream of heat exchanger. Clean, repair, or replace heat exchanger if necessary.
Loop flushing shuttle	Loop flushing shuttle may be sticking in one direction.	Ensure the shuttle moves freely in its bore.
Air in system	Entrained air generates heat under pressure.	Look for foam or bubbles in reservoir. Check for leaks on inlet side of charge pump.
Internal leakage	Excessive internal leakage may overheat the system.	Install loop flushing defeat option and monitor case flow. If case flow is excessive, motor may require major repair. Contact your Danfoss authorized service center.

System Noise or Vibration

Item	Description	Action
Oil level in reservoir	Insufficient hydraulic fluid may cause cavitation.	Fill the reservoir to the proper level.
Air in the system	Air bubbles may lead to cavitation.	Look for foam or bubbles in reservoir. Check for leaks on inlet side of charge pump.

Improper Output Speed

Item	Description	Action
Oil level in reservoir	Insufficient amount of hydraulic fluid may reduce system efficiency.	Fill the reservoir to the proper level.
Internal leakage	Excessive internal leakage may cause lower charge pressure and affect motor performance including output speed.	Install loop flushing defeat option and measure case flow. If case flow is excessive, motor may require major repair. Contact your Danfoss authorized service center.

Low Output Torque

Item	Description	Action
Internal leakage	Excessive internal leakage may cause lower charge pressure to decay, reducing output torque.	Install loop flushing defeat option and measure case flow. If case flow is excessive, motor may require major repair. Contact your Danfoss authorized service center.

Minor Repair

2-Speed Shifting Spool

Disassembly

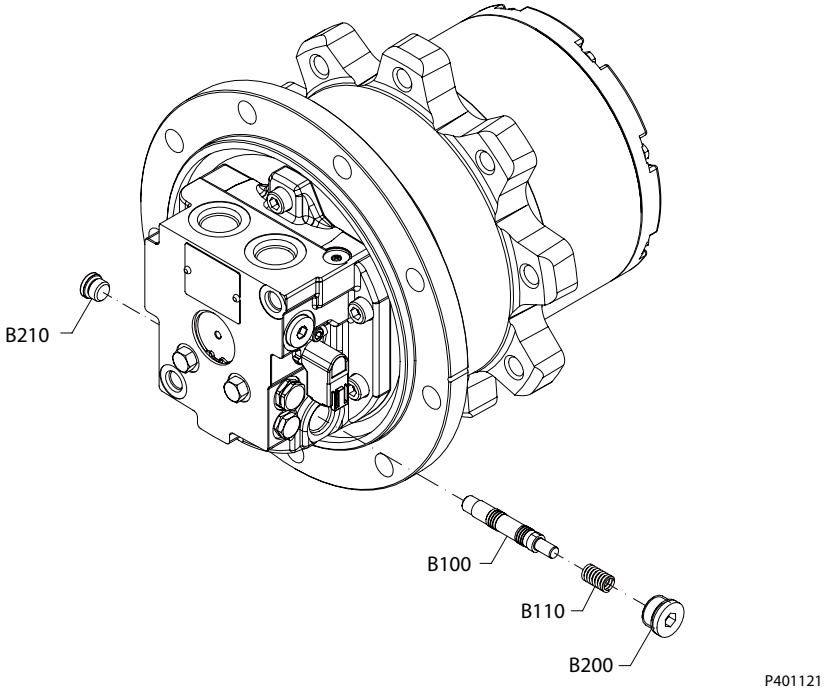
1. Orient the motor with the endcap pointing upward.
2. Remove the hex plug assembly (B200) using a 22-mm hex socket (For BMV 28/32, see the chart on page 30 for the other tool size). Discard the O-ring on the hex plug assembly.
3. Remove the spring (B110) and the 2-speed shifting spool (B100).
4. Remove the socket plug assembly (B210) using a 1/4-inch hex bit socket. Remove and discard the O-ring on the socket plug assembly.

Inspection

Clean and inspect the 2-speed shifting spool (B100). If it is damaged or worn, replace it. Replace the spring (B110) if it is cracked or bent.

Assembly

1. Lubricate and install the socket plug assembly (B210) with the new O-ring, using a 1/4-inch hex bit socket, and tighten it to a torque of 35 Nm.
2. Lubricate and install the 2-speed shifting spool (B100) and the spring (B110).
3. Lubricate and install the hex plug assembly (B200) with the new O-ring, using a 22-mm hex socket (For BMV 28/32, see the chart on page 30 for the other tool size), and tighten it to a torque of 50 Nm.



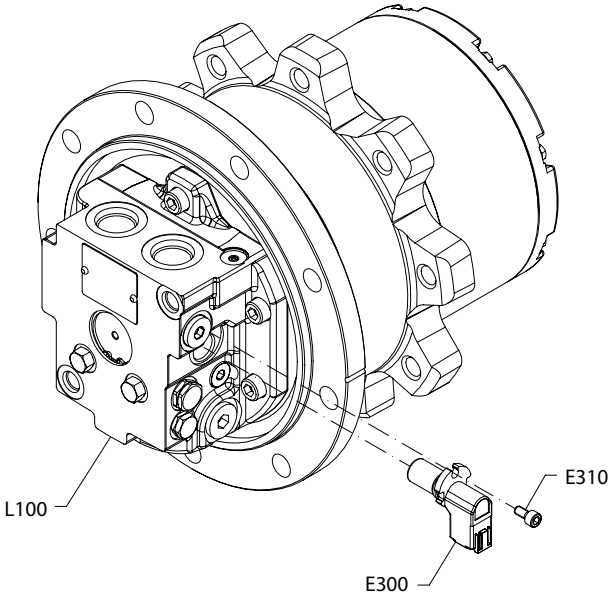
Speed Sensor

Disassembly

1. Remove the socket screw (E310) using a 5-mm hex bit socket.
2. Remove the speed sensor (E300).

Assembly

1. Install the new speed sensor (E300).
2. Install the socket screw (E310), using a 5-mm hex bit socket, and tighten it to a torque of 12 Nm.



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Target Ring

Disassembly

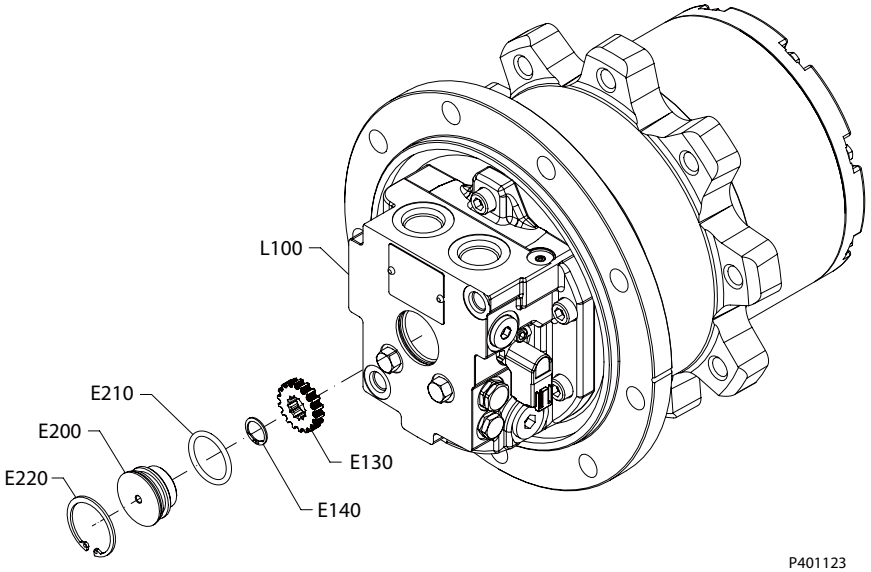
1. Remove the retaining ring (E220) using snap ring pliers.
2. Using an M6 x P1.0 screw, remove the bore plug (E200) with the O-ring (E210). Discard the O-ring.
3. Remove the retaing ring (E140) using snap ring pliers.
4. Remove the target ring (E130) using snap ring pliers or a magnet.

Inspection

Clean and inspect the retaining ring (E130). If it is damaged or worn, replace it.

Assembly

1. Lubricate and install the target ring (E130).
2. Install the retaining ring (E140) using snap ring pliers.
3. Lubricate and install the bore plug (E200) with the new O-ring (E210).
4. Install the retaining ring (E220) using snap ring pliers.



Loop Flushing Relief Valve

Disassembly

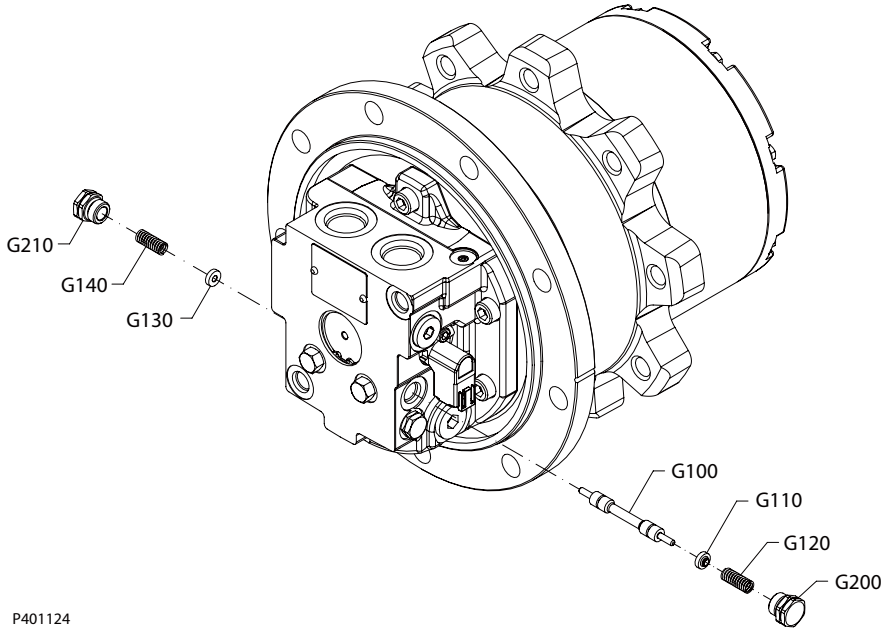
1. Remove the hex plug assembly (H120) using a 5/8-inch hex socket. Discard the O-ring.
2. Remove the loop flushing spring (H110) and the relief valve poppet (H100). ing spring (H110) and the relief valve poppet (H100).

Inspection

Clean and inspect the relief valve poppet (H100). If it is damaged or worn, replace it. Replace the loop flushing spring (H110) if it is cracked or bent.

Assembly

1. Lubricate and install the relief valve poppet (H100) and the loop flushing spring (H110).
2. Lubricate and install the hex plug assembly (H120) with the new O-ring, using a 5/8-inch hex socket, and tightening it to a torque of 30 Nm.



Loop Flushing Shuttle Spool

Disassembly

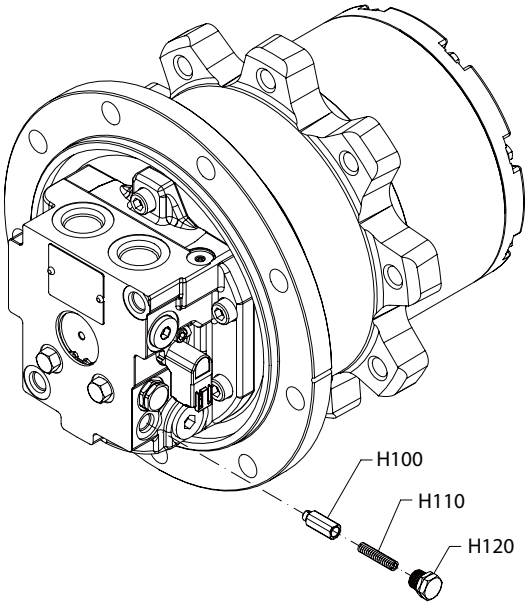
1. Remove the hex pulg assemblies (G200 & G210) using a 19-mm hex socket. Discard the O-ring.
2. Remove the springs (G120 & G140), the guides (G110 & G130), and the shuttle spool (G100).

Inspection

Clean and inspect the shuttle spool (G100). If it is damaged or worn, replace it. Clean and inspect the guides (G110 & G130). If they are damaged or worn, replaec them. Replace the springs (G120 & G140) if they are cracked or bent.

Assembly

1. Lubricate and install the shuttle spool (G100), the guides (G110 & G130), and the springs (G120 & G140).
2. Lubricate and install the hex plug assemblies (G200 & G210) with the new O-rings, using a 19-mm hex socket, and tighten them to a torque of 35 Nm.



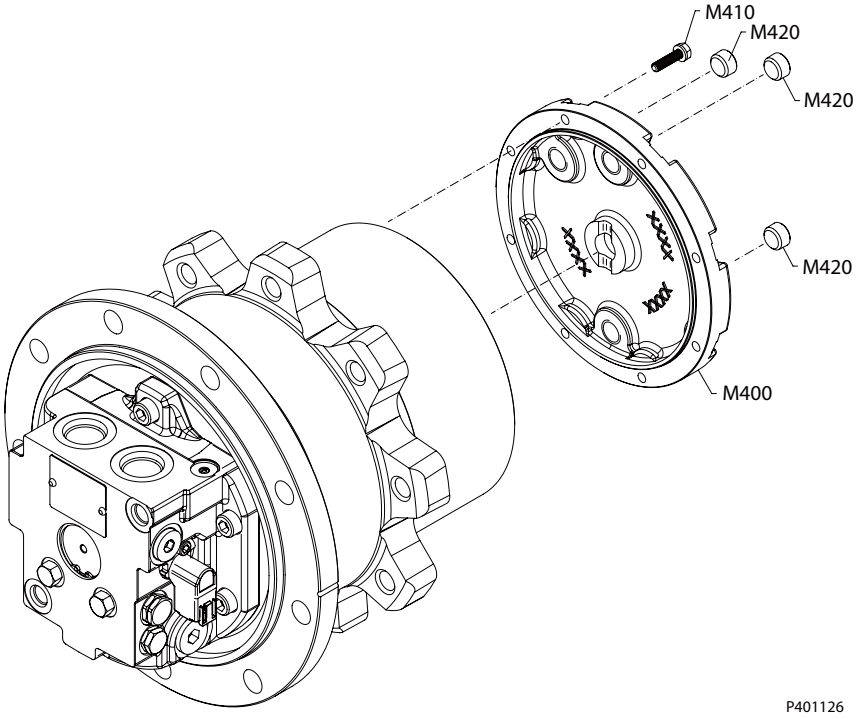
Ring Gear Cover

Disassembly

1. Remove the tapered socket plugs (M420) using an 8-mm hex bit socket, then drain the gear oil through the gear oil drain port (see page 17 or 18.) on the ring gear cover (M400).
2. Remove the hex screws (M410) using a 10-mm hex socket, then remove the ring gear cover (M400).

Assembly

1. Evenly apply liquid sealant (such as Locite 515 or ThreeBond 1215) to the entire mounting surface of the ring gear cover (M400).
2. Install the ring gear cover (M400) with the hex screws (M410), and tighten them to a torque of 12 Nm using a 10-mm hex socket.
3. Fill the gear oil through the gear oil inlet port (see page 17 or 18.) on the ring gear cover (M400). (See the table on page 9 for the gear oil grade, viscosity, and volume.)
4. Install the tapered socket plugs (M420) with the new sealing tape wrapped around them, using an 8-mm hex bit socket, and tighten them to a torque of 22 Nm.



Torque Chart

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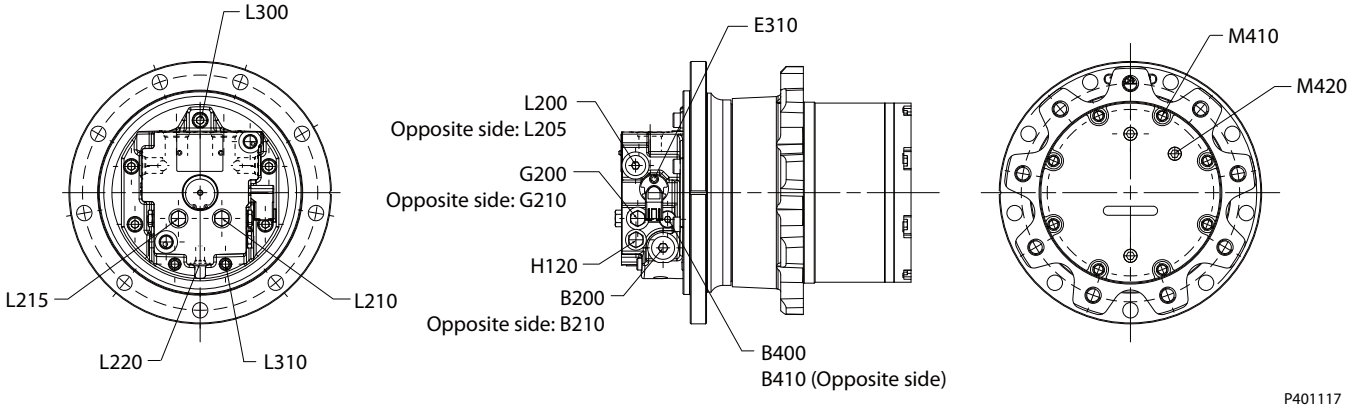

Item	Fastener	Wrench size	Torque
B200	7/8 inch two speed shifting spool plug	3/8 inch hex bit socket	100 Nm [74 lbf•ft]
B200	3/4 inch 2-speed shifting spool socket head plug	22 mm hex bit socket	50 Nm [37 lbf•ft]
B210	9/16 inch 2-speed shifting spool socket head plug	1/4 inch hex bit socket	35 Nm [26 lbf•ft]
B400/B410	9/16 inch socket head plug	1/4 inch hex bit socket	35 Nm [26 lbf•ft]
E310	M6 speed sensor socket head screw	5 mm hex bit socket	12 Nm [9 lbf•ft]
G200/G210	9/16 inch loop flushing shuttle hex head plug	19 mm hex socket	35 Nm [26 lbf•ft]
H120	1/2 inch charge relief valve hex head plug	5/8 inch hex socket	30 Nm [22 lbf•ft]
L200/L205	3/4 inch drain port socket head plug	9/16 inch hex bit socket	50 Nm [37 lbf•ft]
L200/L205	3/4 inch drain port plastic plug	21 mm hex bit socket	2 Nm [1.5 lbf•ft]
L210/L215	7/16 inch system pressure gauge port plug	9/16 inch hex socket	21 Nm [15.5 lbf•ft]
L220	7/16 inch charge pressure gauge port plug	3/16 inch hex bit socket	17 Nm [12.5 lbf•ft]
L300	M10 endcap tightening socket screw	8 mm hex bit socket	60 Nm [44 lbf•ft]
L310	M8 endcap tightening socket screw	6 mm hex bit socket	30 Nm [22 lbf•ft]
M410	M6 gear cover hex screw	10 mm hex socket	12 Nm [9 lbf•ft]
M420	PT3/8 gear cover tapered socket plug	8 mm hex bit socket	22 Nm [16 lbf•ft]

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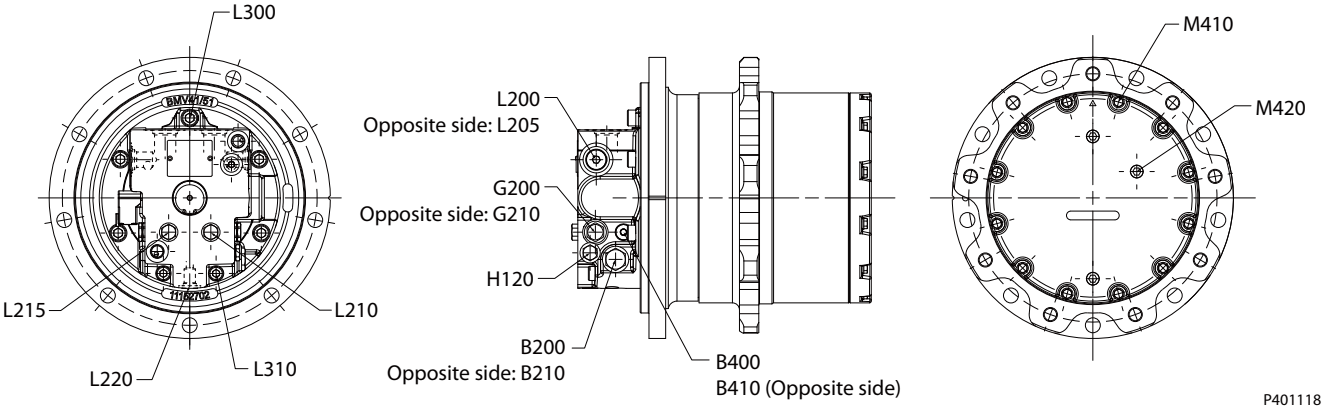

Item	Fastener	Wrench size	Torque
B200	3/4 inch 2-speed shifting spool hex head plug	22 mm hex socket	50 Nm [37 lbf•ft]
B210	9/16 inch 2-speed shifting spool socket head plug	1/4 inch hex bit socket	35 Nm [26 lbf•ft]
B400/B410	9/16 inch socket head plug	1/4 inch hex bit socket	35 Nm [26 lbf•ft]
E310	M6 speed sensor socket head screw	5 mm hex bit socket	12 Nm [9 lbf•ft]
G200/G210	9/16 inch loop flushing valve hex head plug	19 mm hex socket	35 Nm [26 lbf•ft]
H120	1/2 inch charge relief valve hex head plug	5/8 inch hex socket	30 Nm [22 lbf•ft]
L200/L205	7/8 inch drain port socket head plug	3/8 inch hex bit socket	100 Nm [74 lbf•ft]
L200/L205	1-1/16 inch drain port socket head plug	9/16 inch hex bit socket	100 Nm [74 lbf•ft]
L200/L205	G3/4 drain port socket head plug	12 mm hex bit socket	120 Nm [89 lbf•ft]
L200	G3/4 drain port plastic plug	14 mm hex bit socket	3 Nm [2.2 lbf•ft]
L210/L215	7/16 inch system pressure gauge port hex head plug	9/16 inch hex socket	21 Nm [15.5 lbf•ft]
L220	9/16 inch charge pressure gauge port socket head plug	1/4 inch hex bit socket	35 Nm [26 lbf•ft]
L220	7/16 inch charge pressure gauge port socket head plug	3/16 inch hex bit socket	17 Nm [12.5 lbf•ft]
L300	M12 endcap tightening socket head screw	10 mm hex bit socket	100 Nm [74 lbf•ft]
L310	M10 endcap tightening socket head screw	8 mm hex bit socket	60 Nm [44 lbf•ft]
M410	M6 gear cover hex head screw	10 mm hex socket	12 Nm [9 lbf•ft]
M420	PT3/8 gear cover tapered socket head plug	8 mm hex bit socket	22 Nm [16 lbf•ft]

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