

Technical Information

BMV 28/32, 41/51 Integrated Drive Motor



Revision history*Table of revisions*

Date	Changed	Rev
December 2025	Fixed case drain port numbers at O-ring boss table	0102
December 2025	First Edition	0101

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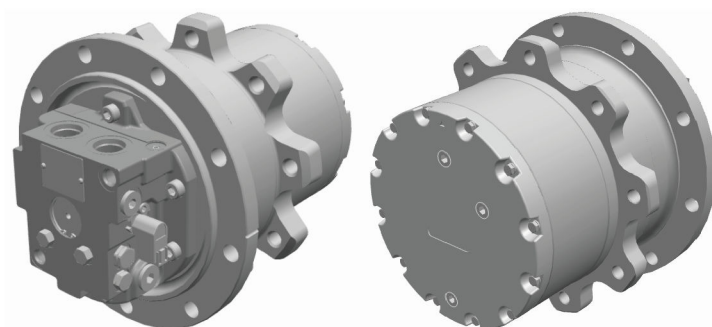
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General Description

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

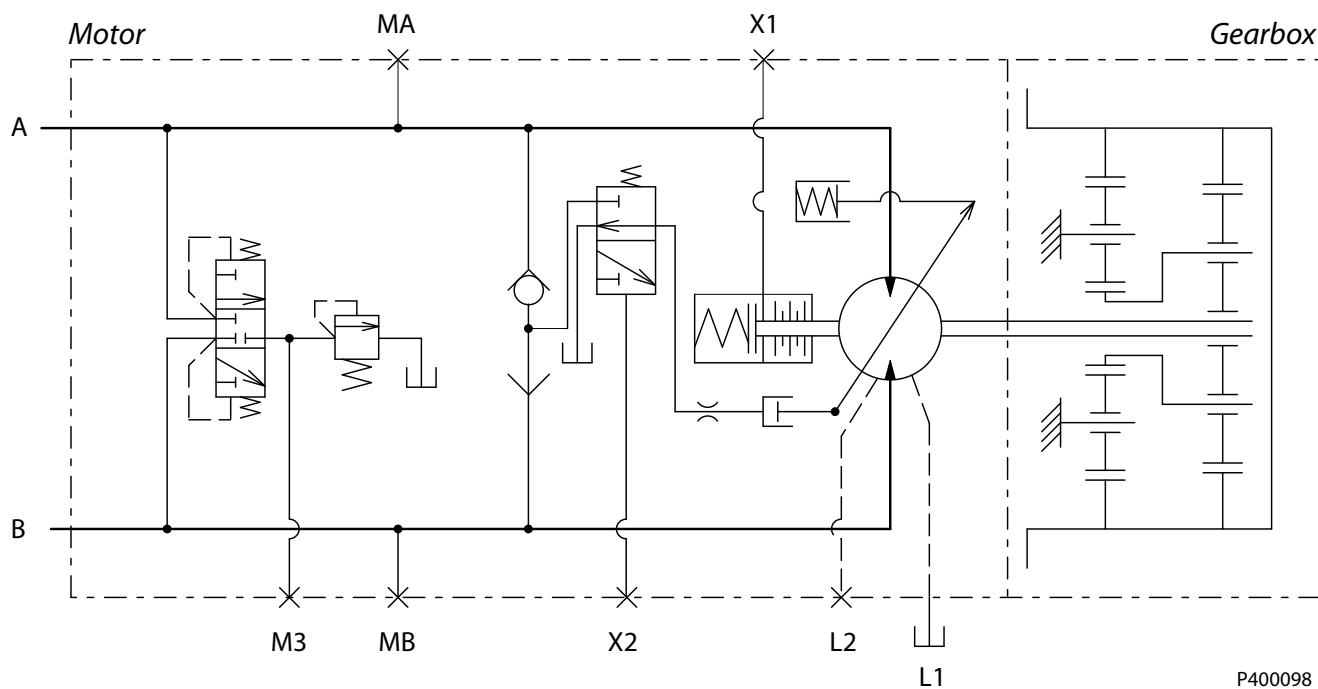
Typical Applications

Ideal for crawler type vehicles:

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

General Description

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			

Technical Specification

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		β-ratio	22/18/13			
	Efficiency (charge pressure filtration)			β ₁₅₋₂₀ =75 (β ₁₀ ≥10)			
	Efficiency (suction and return line filtration)			β ₃₅₋₄₅ =75 (β ₁₀ ≥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.

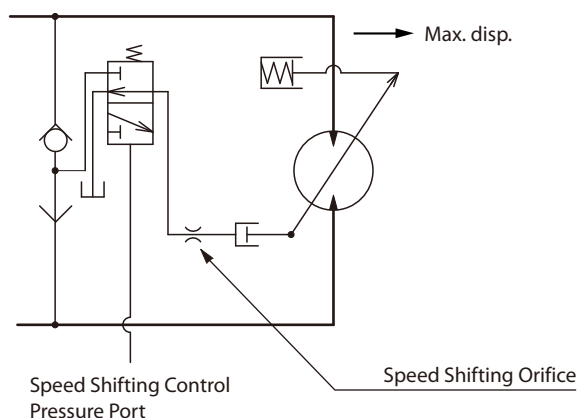
Hydraulic Two Position Control

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.

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



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Warning

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

Operations

Gear Box

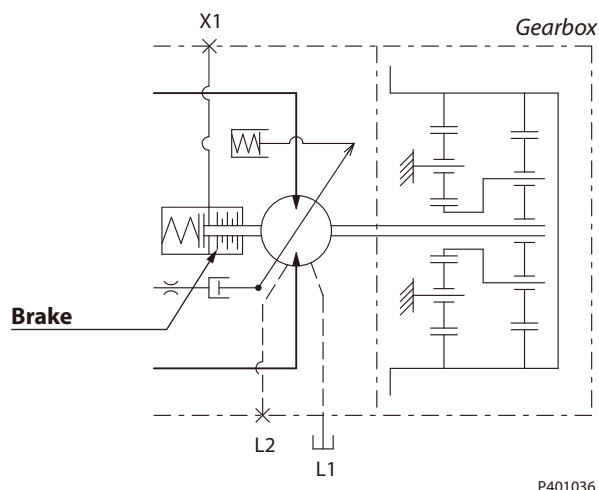
The gearbox is designed to increase torque and to decrease speed.

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.

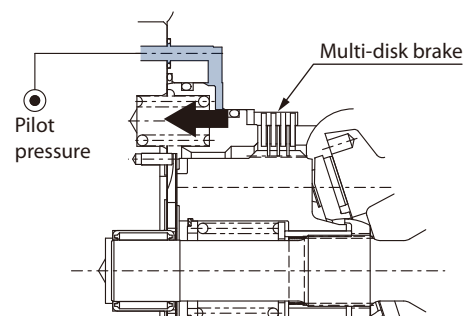
Parking Brake



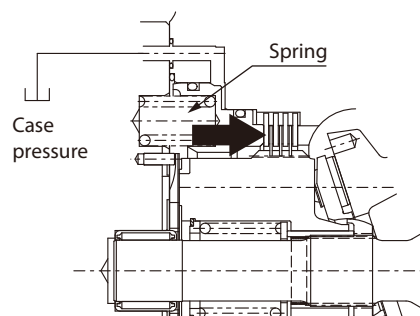
The brake is designed to be used to hold or park the vehicle statically. Since the brake torque exceeds 127% of the maximum theoretical output torque, the vehicle never starts moving as long as the parking brake is engaged.

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

Brake released



Brake engaged



Warning

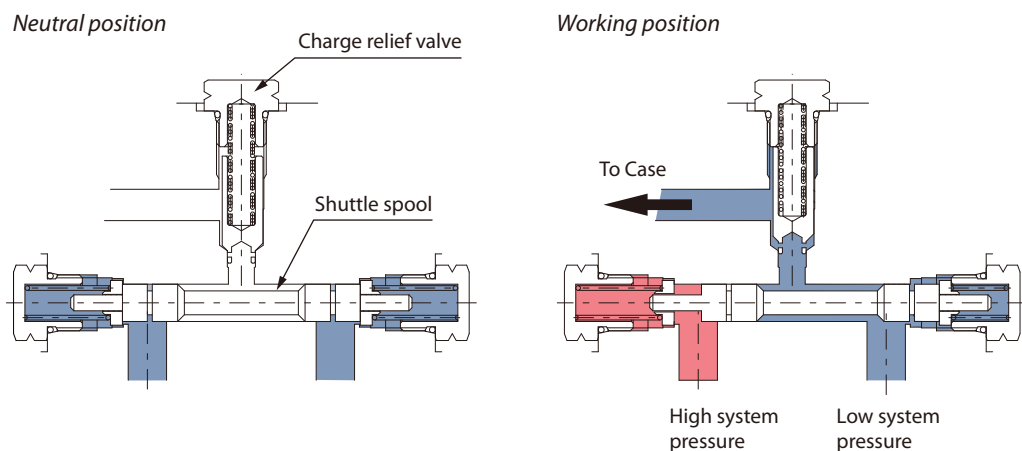
Never use this parking brake as dynamic brake regularly, except for emergency stop.

Operations

Loop Flushing Valve

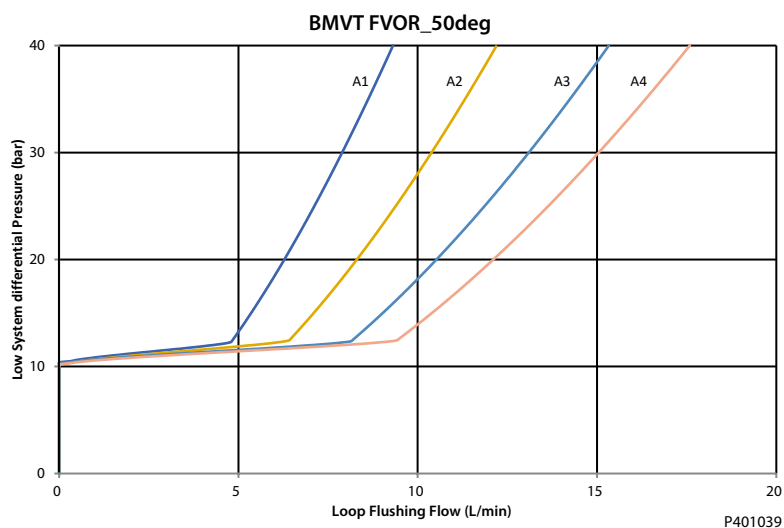
The loop-flushing valve is used to replace hydraulic oil from the system circuit to cool the transmission or to remove excessive contamination in the closed circuit.

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.



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Loop Flushing Relief Valve Option



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Operations

Speed Sensor

BMVT 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]

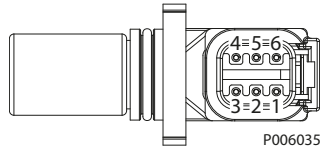
Mating Connectors

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

Operations

Speed Sensor 4.5 - 8 V

Speed sensor connector, 6-pin



Pinout:

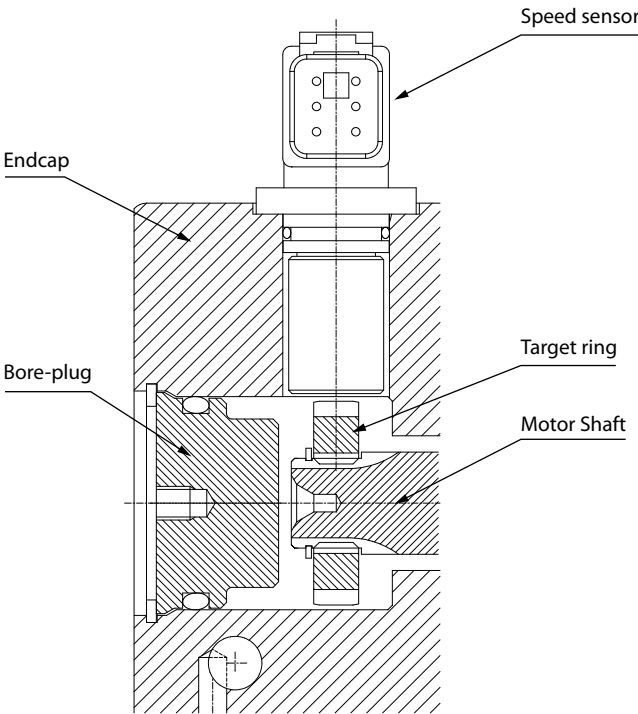
1. Speed signal 2
2. Direction signal
3. Speed signal 1
4. Supply
5. Ground
6. Temperature

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			

Operations

Sensor Position



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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
--------------------------------	----

[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).

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

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.

Operating Parameters

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.

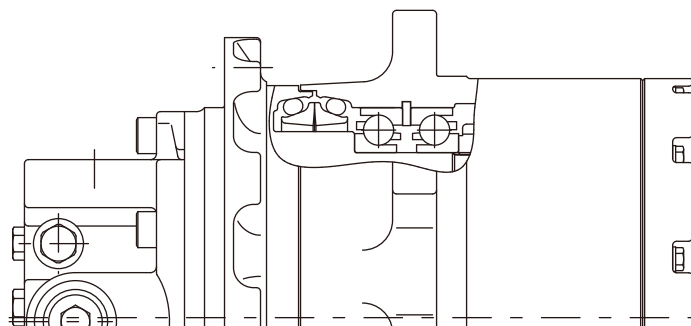
- Radial load
- Output speed

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

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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Operating Parameters

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.

Technical Information
BMV 28/32, 41/51 Integrated Drive Motor

Model Code

Model Code: A - F

Prod **Size** **A** **B** **C** **D** **E** **F** **G** **H** **J** **K** **L** **M** **N** **P**
 BMV T

Prod - Product Type

Code	Description	028	032	041	051
T	Motor w/ Gear Box, Variable, Bi-Directional	●	●	●	●

Size - Frame Size

Code	Description	028	032	041	051
028	28 cc/rev displacement at maximum angle	●			
032	31.5 cc/rev displacement at maximum angle		●		
041	41 cc/rev displacement at maximum angle,			●	
051	51 cc/rev displacement at maximum angle,				●

A - Port Configuration

Code	Description	028	032	041	051
A	Inch, Customer O-ring Ports Sealing according to ISO 11926-1	●	●	●	●
G	G, Customer O-ring Ports Sealing according to JIS B 2351-1	●	●	●	●

B - Control

Code	Description	028	032	041	051
S	Hydraulic 2 Position	●	●	●	●

C - Orifices

Code	Description	028	032	041	051
8N	0.8mm Diameter Orifice	●	●	●	●

D - Displacement Setting

Code	Description	028	032	041	051
65	65.4% Minimum Displacement (12.0 deg), 100% Maximum Displacement (18.0 deg)	●	●	●	●
68	68.2% Minimum Displacement (12.5 deg), 100% Maximum Displacement (18.0 deg)	●	●		

E - Speed Sensor

Code	Description	028	032	041	051
N	No Speed Sensor	●	●	●	●
S	Speed Sensor, 4.5V to 8V DEUTSCH DTM 04-6P CONNECTOR	●	●	●	●

F - Parking Brake

Code	Description	028	032	041	051
B	Standard, Brake plate: 3pc	●	●	●	●

Model Code

Model Code: G - L

Prod **Size** **A** **B** **C** **D** **E** **F** **G** **H** **J** **K** **L** **M** **N** **P**
 BMV T

G - Loop Flushing Shuttle System

Code	Description	028	032	041	051
A	Standard	●	●	●	●
N	Defeted Loop Flushing Valve	●	●	●	●

H - Loop Flushing Relief Valve

Code	Description	028	032	041	051
NN	Defeted Loop Flushing Valve	●	●	●	●
A1	8L/min, Non Adjustable, 10bar Cracking Pressure	●	●		
A2	11L/min, Non Adjustable, 10bar Cracking Pressure	●	●		
A3	13L/min, Non Adjustable, 10bar Cracking Pressure			●	●
A4	15L/min, Non Adjustable, 10bar Cracking Pressure			●	●

J - Special Hardware

Code	Description	028	032	041	051
NN	Standard	●	●	●	●

K - Mounting Flange

Code	Description	028	032	041	051
M1	Standard Flange, 225mm Pilot dia., Bolt Hole: 17mm dia. x9	●	●		
M3	Standard Flange, 262mm Pilot dia., Bolt Hole: 17mm dia. x9				●
M4	Standard Flange, 262mm Pilot dia., Bolt Hole: 17mm dia. x9			●	

L - Endcap Ports

Code	Description	028	032	041	051
RA	System ports: Radial, O-ring boss (Inch), Drain ports: Side, O-ring boss (Inch), Pilot ports: Axial, O-ring boss (Inch)	●	●	●	●
R1	System ports: Radial, O-ring boss (G), Drain ports: Side, O-ring boss (G), Pilot ports: Radial, O-ring boss (G)	●	●	●	●
R3	System ports: Radial, O-ring boss (G), Drain ports: Side_1 port, O-ring boss (G), Pilot ports: Axial, O-ring boss (G)			●	●

Technical Information
BMV 28/32, 41/51 Integrated Drive Motor

Model Code

Model Code: M - P

Prod **Size** **A** **B** **C** **D** **E** **F** **G** **H** **J** **K** **L** **M** **N** **P**
BMV T

M - Ring Gear / Floating Seal

Code	Description	028	032	041	051
NN	Ring Gear: Standard ring gear, Floating Seal: Standard	●	●	●	●

N - Reduction Gear Ratio

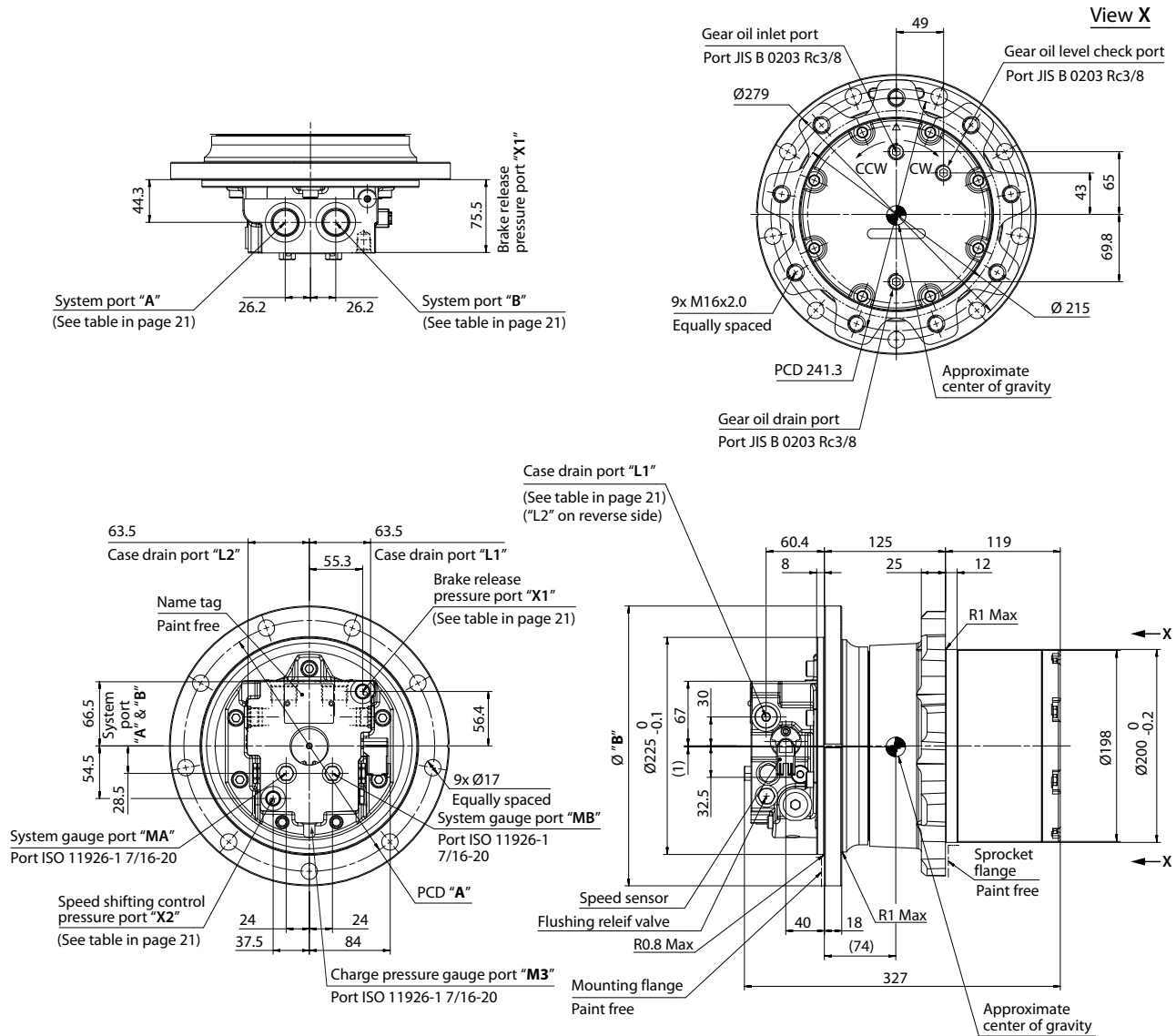
Code	Description	028	032	041	051
A	24.362			●	●
B	25.680	●	●		

P - Paint / Nametag

Code	Description	028	032	041	051
NNN	Black Paint, Tag: Danfoss logo, Black, Layout: Format A	●	●	●	●
C08	No Paint, Tag: Danfoss logo, Black, Layout: Format A	●	●	●	●

Installation Drawings

BMV028/032



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Motor flange option	PCD "A"	Ø "B"
M1	260	290

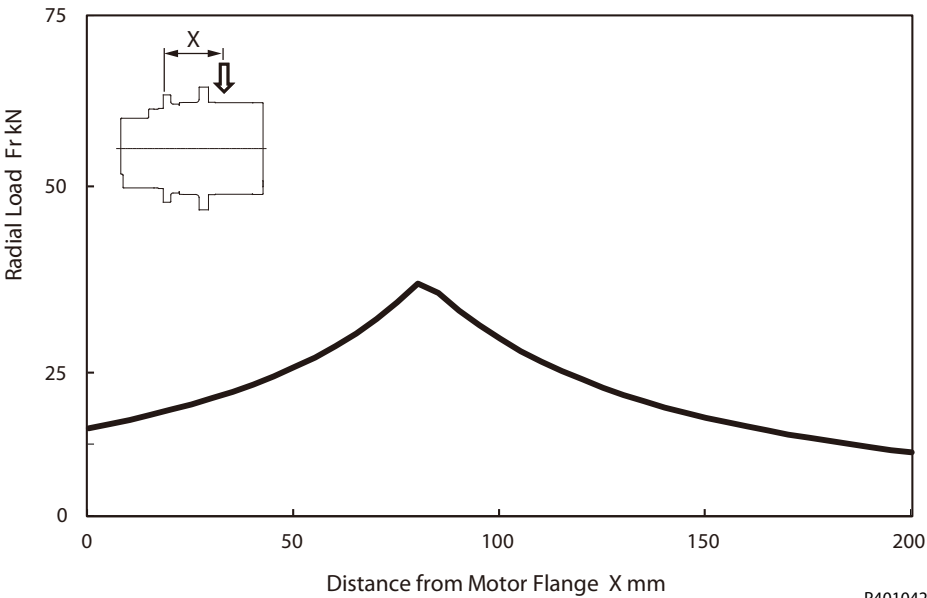
Flow-In	Flow-Out	Rotation of Direction (View from "X")
A	B	CCW
B	A	CW

Installation Drawings

BMV028/032 O-ring Boss

	System Port	Case Drain Port	Speed shifting control Pressure Port	Brake Release Pressure Port
UNF ISO 11926-1	1 1/16-12UN-2B	3/4-16UN-2B	9/16-18UNF-2B	9/16-18UNF-2B
JIS B 2351-1	G3/4	G1/2	G1/4	G1/4

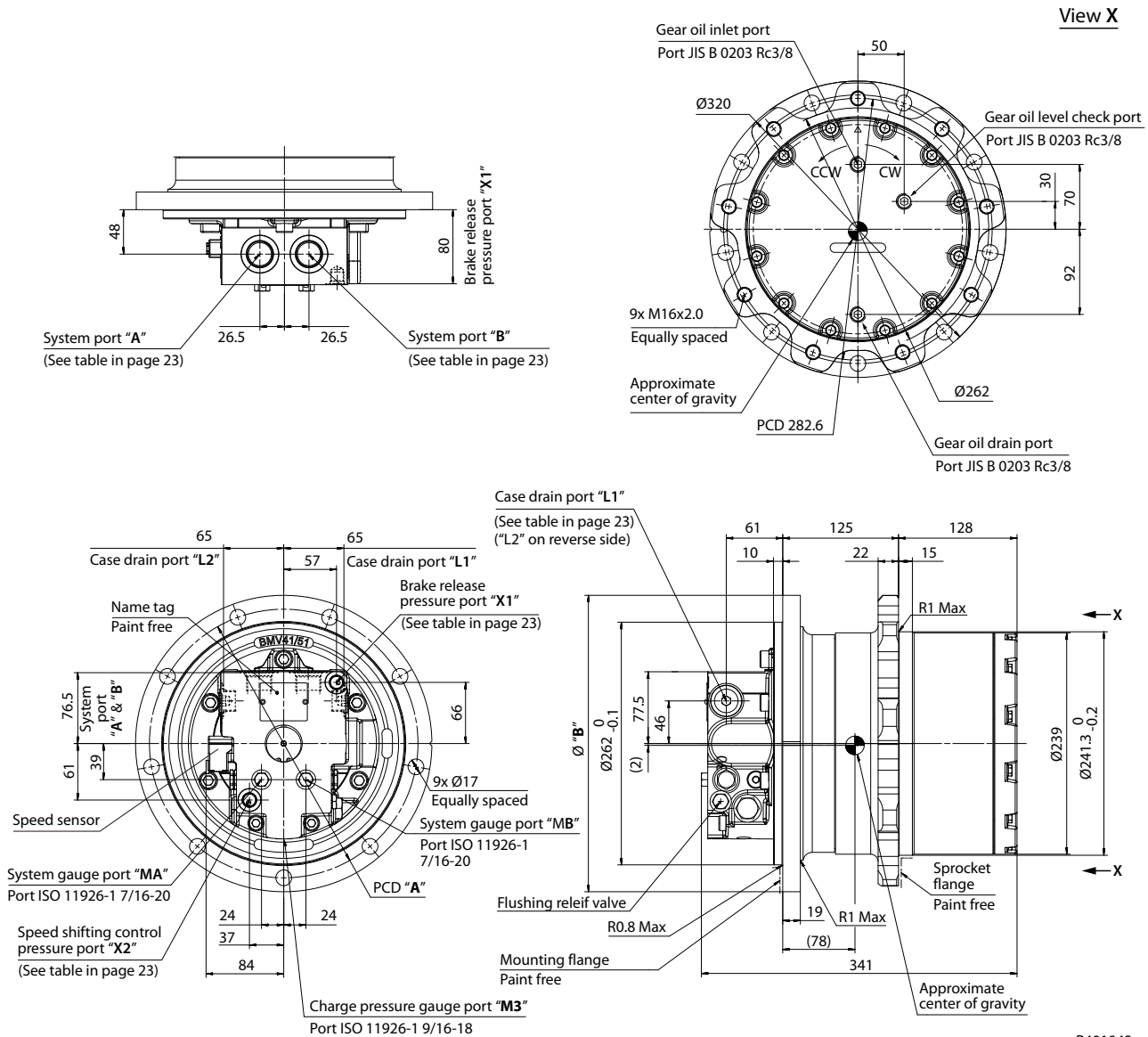
BMV 028/032 Representative Wheel Bearing Life Curve at 67 rpm and 5,000 hrs



P401042

Installation Drawings

BMV041/051



P401043

Motor flange option	PCD "A"	Ø "B"
M3 (BMV051)	290	320
M4 (BMV041)		

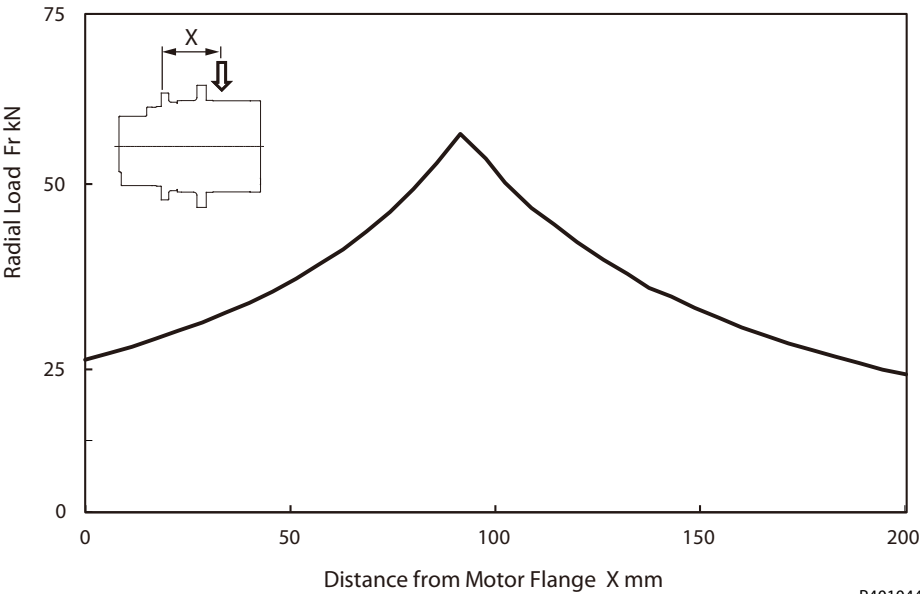
Flow-In	Flow-Out	Rotation of Direction (View from "X")
A	B	CCW
B	A	CW

Installation Drawings

BMV041/051 O-ring Boss

	System Port	Case Drain Port	Speed shifting control Pressure Port	Brake Release Pressure Port
UNF ISO 11926-1	1 1/16-12UN-2B	7/8-14UN-2B	9/16-18UNF-2B	9/16-18UNF-2B
JIS B 2351-1	G3/4	G3/4	G1/4	G1/4

BMV 041/051 Representative Wheel Bearing Life Curve at 67 rpm and 5,000 hrs



P401044

Annex

Application Data Worksheet

Customer Information

Company Name	
Address	
E-mail	
Contact Person	

Vehicle Data

Type of Vehicle			
Number of Tracks			
Gross Vehicle Weight (kg)			
Max Weight Possible on One Track (kg)			
Amount of Vehicle Weight Supported by One motor (kg)			
Engine Power (kN) @ (rpm)			
Amount of the Engine power other than propelling motors (%)			
HST system; 2 pumps - 2 motors (Dual pass) / other			
Hydraulic Pump Displacement (cm ³ /rev)			
Hydraulic Pump Speed (rpm)			
Hydraulic Pump High Pressure Relief Valve Setting on System Circuit (bar)			
Hydraulic Pump Charge Pressure (bar)			
Sprocket Pitch Diameter (mm)			
Distance Sprocket Centerline to the Fixing Flange (mm)			
Shoe Type - Rubber Tire / Crawler Belt			
Tensioning Device Working Pre-Load (kN)			
Brake Torque Requirement (Nm)			
Brake Release Pressure (bar)			

Driving Performance Data

Max Gradeability (Degrees)	
Max Drawbar Pull (kN)	
Max Output Torque Required (Nm)	
Vehicle Speed (Working/Max) (km/h)	
Underfoot Surface (Mud, Sand, etc.)	
Estimated Machine Use per Year (Hrs)	
Desired Design Life (Hrs)	

Business Data

Estimated Annual # of Vehicle	
Start of Production	

Annex

Vehicle Data

Condition #	Driving Mode (Examples: Starting/Working/ Turning/Transferring, w/ or w/o MAX load)	HYD Motor Shifting (Lo/Hi)	Output Torque (Nm)	Radial Liad (kN)	Output Speed (rpm)	Time Rate (%)
1						
2						
3						
4						
5						

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.

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