

# Radial piston motor for track drives

## MCR-T

**RE 15221**

Edition: 03.2017

Replaces 07.2015



- ▶ Frame size MCR5, MCR6, MCR10
- ▶ Displacement 620cc to 1340cc
- ▶ Differential pressure up to 400 bar
- ▶ Torque output up to 8530 Nm
- ▶ Speed up to 250 rpm
- ▶ Open and closed circuits

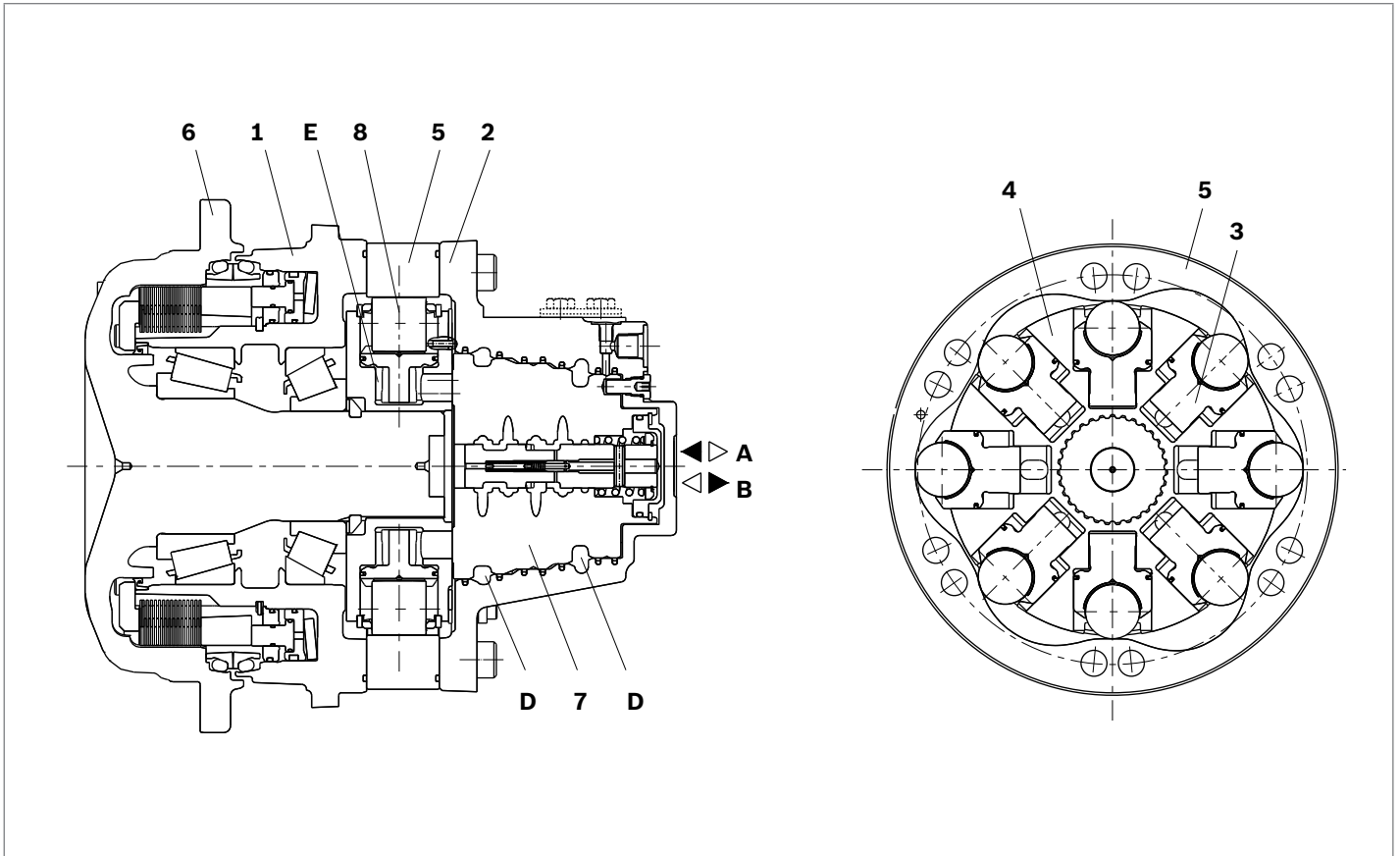
### Features

- ▶ Compact robust construction
- ▶ High brake capacity
- ▶ High volumetric and mechanical efficiencies
- ▶ High pressure rating
- ▶ High reliability
- ▶ High bearing life
- ▶ Low maintenance
- ▶ Smooth running at very low speeds
- ▶ Low noise
- ▶ Freewheeling possible
- ▶ Available with
  - Integrated parking brake
  - Bi-directional two speed
  - Integrated flushing valve
  - Speed sensor

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## Functional description



Hydraulic motors of the type MCR-T are radial piston motors with front case mounting and flanged shaft. They are specially designed for track drive applications and are primarily used as drive motors on skid-steer loaders and compact track loaders.

The MCR-T type motor can be used in open as well as closed hydraulic circuits.

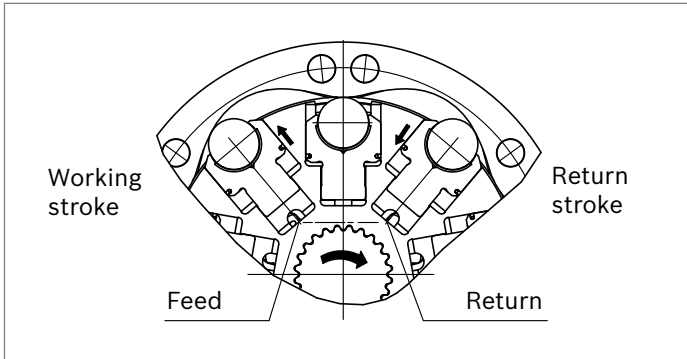
### Construction

Two part housing (1, 2), rotary group (3, 4, 8), cam (5), drive shaft (6) and flow distributor (7)

### Transmission

The cylinder block (4) is connected to the shaft (6) by means of splines. The pistons (3) are arranged radially in the cylinder block (4) and make contact with the cam (5) via rollers (8).

### Torque generation



The number of working and return strokes corresponds to the number of lobes on the cam multiplied by number of pistons in the cylinder block.

### Flow paths

The ports **A** and **B**, which are located in the rear case, carry oil through the distributor to the cylinder chambers (**E**).

### Bearings

Tapered roller bearings capable of transmitting high axial and radial forces are fitted as standard.

### Freewheeling

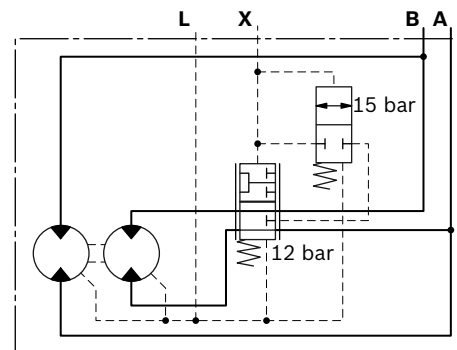
In certain applications there may be a requirement to freewheel the motor. This may be achieved by connecting ports **A** and **B** to zero pressure and simultaneously applying a pressure of 2 bar to the housing through port **L**. In this condition, the pistons are forced into the cylinder block which forces the rollers to loose contact with the cam thus allowing free rotation of the shaft.

### Two speed operation (2W)

In mobile applications where vehicles are required to operate at high speed with low motor loads, the motor can be switched to a low-torque and high-speed mode. This is achieved by operating an integrated valve which directs hydraulic fluid to only one half of the motor while continuously re-circulating the fluid in the other half. This “reduced displacement” mode reduces the flow required for a given speed and gives the potential for cost and efficiency improvements. Maximum rated speed of the motor remains unchanged.

Bosch Rexroth has developed a special spool valve to allow smooth switching to reduced displacement whilst on the move. This is known as “soft-shift” and is a standard feature of 2W motors. The spool valve requires either an additional sequence valve or electro-proportional control to operate in “soft-shift” mode. Alternatively, enhanced soft-shifting via software control primarily for Compact Track Loader applications is now available from Bosch Rexroth.

#### ▼ Two-speed motor



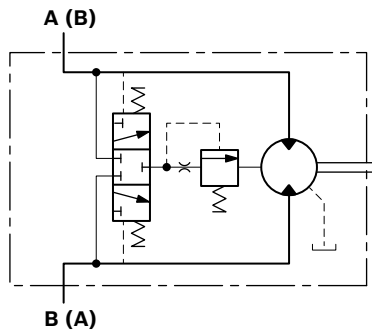
#### Note

2W can not be used in open circuit.

**Flushing valve**

In a closed circuit, the same hydraulic fluid continuously flows between the pump and the motor. This could therefore lead to overheating of the hydraulic fluid. The function of the flushing valve option is to replace hydraulic fluid in the closed circuit with that from the reservoir. When the hydraulic motor is operated under load, either in the clockwise or counter-clockwise direction, the flushing valve opens and allows a fixed flow of fluid through an orifice from the low pressure side of the circuit. This flow is then fed to the motor housing and back to the reservoir normally via a cooler. In order to charge the low pressure side of the circuit, cold fluid is drawn from the reservoir by the boost pump and is fed to the pump inlet through the check valve. Thus the flushing valve ensures a continuous renewal and cooling of the hydraulic fluid. The flushing feature incorporates a relief valve which is used to maintain a minimum boost pressure and operates at a standard setting of 14 bar (other options available on request). Different orifice sizes may be used to select varying flows of flushing fluid. The following table gives flushing rate values based on a boost / charge pressure of 25 bar.

▼ **Motor with flushing valve**



**Flushing flow rates**

Flushing code	Orifice size (mm)	Flow (l/min) at 25 bar <sup>1)</sup>	
		min	max
F1	ø1	2.2	2.7
F2	ø1.5	5.0	6.1
F7	ø1.7	6.4	7.8
F4	ø2	8.2	10.7
F6	ø2.3	8.8	11.4

1) 0.6 mm Shim (Standard), Cracking pressure = 11±3 bar

**Holding brake (multi-disc brake)**

**Mounting**

The MCR T-type motor has a spring applied pressure released holding brake integrated into the front of the motor.

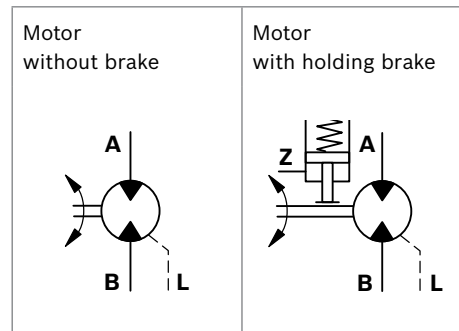
**Brake application**

As a safety requirement in mobile applications a parking brake is provided to ensure that the motor cannot turn when the machine is not in use. The parking brake provides holding torque by means of discs that are compressed by a disc spring. The brake is released when oil pressure is applied to brake port “Z” and the pressure in the annular area compresses the disc spring allowing the brake discs to turn independently.

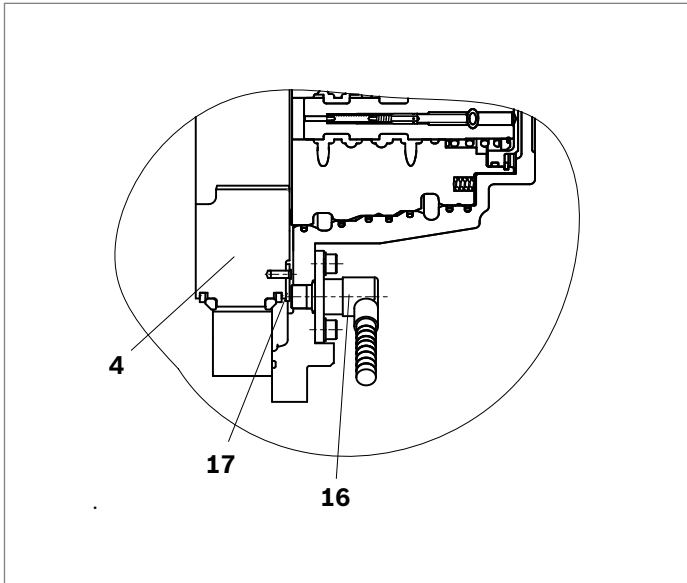
**Notice**

Brakes not for dynamic use!

▼ **Schematic diagrams**



### Speed sensor

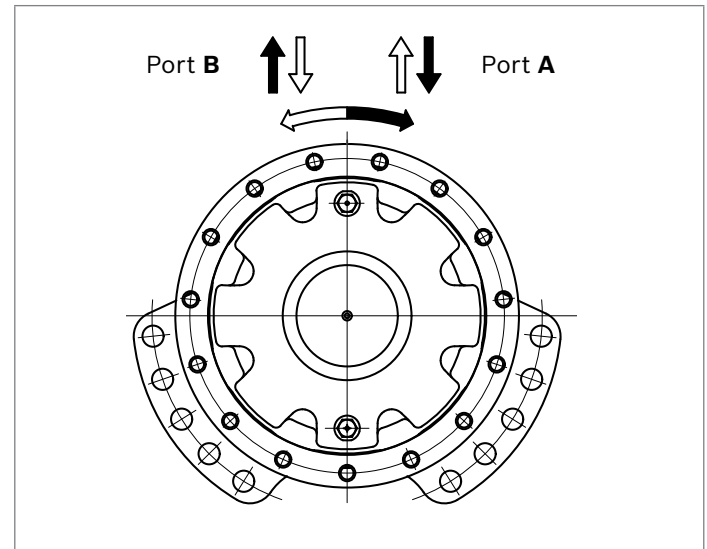


A Hall-effect speed sensor (**16**) may be fitted as an option, giving a two-channel output of phase-displaced square waves, and enabling detection of speed and direction. A toothed target disc (**17**) is fitted to the motor cylinder block (**4**), and the sensor, fitted to a port in the rear case, produces a pulse on each channel as each tooth passes in front of it. The frequency of the pulses is proportional to the rotational speed.

Versions are available for use with regulated supplies 10 V (Code P1) and for direct connection to a 12 V or 24 V unregulated supply (Code P2).

The motor can also be supplied fitted with a target disc and with a speed sensor port machined, but covered and sealed with a blanking plate (Code P0). These “sensor-ready” motors may be fitted with a sensor at a later date.

### Direction of shaft rotation with flow (viewed from drive shaft)



## Ordering code

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
<b>MCR</b>		<b>T</b>			<b>Z</b>	<b>/</b>	<b>33</b>		<b>V</b>					

### Radial piston motor

01	Radial-piston type, low-speed, high-torque motor	<b>MCR</b>
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### Frame size

02	Frame size	5	<b>5</b>
		6	<b>6</b>
		10	<b>10</b>

### Housing type

03	Front case flanged	<b>T</b>
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### Nominal size, displacement $V_g$ in $\text{cm}^3/\text{rev}$

04	Frame size 5			<b>620</b>	<b>680</b>	<b>750</b>	<b>820</b>
		High displacement: motors use stepped pistons	HD	•	•	•	•
	Frame size 6				<b>820</b>	<b>920</b>	
		High displacement: motors use stepped pistons	HD		•	•	
	Frame size 10			<b>1070</b>	<b>1120</b>	<b>1180</b>	<b>1340</b>
		High displacement: motors use stepped pistons	1L	•	•	-	-
		High displacement: motors use stepped pistons	2W	•	•	•	•

### Drive shaft

05	With flange $\varnothing 284$ mm (only available with MCR5T and MCR6T)	<b>F284</b>
	With flange $\varnothing 315$ mm (only available with MCR10T)	<b>F315</b>

### Through shaft

06	Without through shaft	<b>Z</b>
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### Series

07	Series 33	<b>33</b>
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### Brake

08	Hydraulic release spring applied multi-disc holding brake 4500 Nm	<b>B5</b>
	Hydraulic release spring applied multi-disc holding brake 7000 Nm (only available with MCR10T)	<b>B7</b>

### Seals

09	FKM (fluoroelastomer / Viton)	<b>V</b>
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### Single/two-speed operation

10	Single speed, standard direction of rotation	<b>1L</b>
	Bi-directional two speed, standard direction of rotation	<b>2WL</b>

### Ports

11	Tapped with UNF thread (SAE J514) (only available with MCR5T and MCR6T)	<b>12</b>
	Tapped with UNF thread (SAE J514) (A & B ports SAE split flange metric bolt holes) (only available with MCR10T)	<b>48</b>

• = Available      - = Not available

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
<b>MCR</b>		<b>T</b>			<b>Z</b>	<b>/</b>	<b>33</b>		<b>V</b>					

**Studs**

12	Without studs (no code)	
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**Speed sensor**

13	Without sensor (no code)	
	Sensor ready	<b>P0</b>
	Sensor without regulator	<b>P1</b>
	Sensor with regulator	<b>P2</b>

**Flushing**

14	Without flushing (no code)	
	With flushing (see table on page 3)	<b>F1-F7</b>

**Special order**

15	Special feature	<b>SOXXX</b>
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## Technical data

Frame size			MCR5T	MCR6T	MCR10T	
Description			Radial-piston type, low-speed, high-torque motor			
Type of mounting			Flange mounting			
Pipe connections <sup>1)2)</sup>			Threaded per SAE J514; Flanged per SAE J518			
Weight						
Single speed (1L)	<i>m</i>	kg	58	60	84	
Two speed (2WL)	<i>m</i>	kg	63	66	93	
Two speed ratio <sup>3)</sup>						
Full displacement			1:1	1:1	1:1	
Reduced displacement			1:2	2:3	1:2	
Hydraulic fluid <sup>4)</sup>			Mineral oil type HLP/HLVP to DIN 51524			
Fluid cleanliness			ISO 4406, Class 20/18/15			
Fluid viscosity range	$v_{\min/\max}$	mm <sup>2</sup> /s	10 to 2000			
Fluid temperature range <sup>5)</sup>	$\theta_{\min/\max}$	°C	-20 to +115			
Pressure			High displacement			
Maximum differential pressure <sup>6)7)</sup>	$\Delta p_{\max}$	bar	400			
Maximum pressure at port <b>A</b> or <b>B</b> <sup>6)7)</sup>	$p_{\max}$	bar	420			
Maximum case drain pressure	$p_{\text{case max}}$	bar	10			
<b>Motor performance MCR5T</b>	<b>Size</b>		<b>620</b>	<b>680</b>	<b>750</b>	<b>820</b>
Displacement	$V_g$	cm <sup>3</sup> /rev	620	680	750	820
Specific torque		Nm/bar	10	11	12	13
Maximum torque <sup>6)12)</sup>	$T_{\max}$	Nm	3947	4329	4775	5220
Minimum speed for smooth running <sup>8)</sup>	$n_{\min}$	rpm	0.5	0.5	0.5	0.5
Maximum speed (1L) <sup>9)10)</sup>	$n_{\max}$	rpm	250	250	230	210
Maximum speed (2WL) <sup>9)10)</sup>	$n_{\max}$	rpm	250	250	250	230
<b>Motor performance MCR6T</b>	<b>Size</b>		<b>820</b>	<b>920</b>		
Displacement	$V_g$	cm <sup>3</sup> /rev	820	920		
Specific torque		Nm/bar	13	15		
Maximum torque <sup>6)12)</sup>	$T_{\max}$	Nm	5220	5857		
Minimum speed for smooth running <sup>8)</sup>	$n_{\min}$	rpm	0.5	0.5		
Maximum speed (1L) <sup>9)10)</sup>	$n_{\max}$	rpm	230	205		
Maximum speed (2WL) <sup>9)10)</sup>	$n_{\max}$	rpm	250	250		
<b>Motor performance MCR10T</b>	<b>Size</b>		<b>1070</b>	<b>1120</b>	<b>1180</b>	<b>1340</b>
Displacement	$V_g$	cm <sup>3</sup> /rev	1070	1120	1180	1340
Specific torque		Nm/bar	17	18	19	21
Maximum torque <sup>6)12)</sup>	$T_{\max}$	Nm	6812	7130	7512	8531
Minimum speed for smooth running <sup>8)</sup>	$n_{\min}$	rpm	0.5	0.5	0.5	0.5
Maximum speed (1L) <sup>9)10)</sup>	$n_{\max}$	rpm	185	180	170	150
Maximum speed (2WL) <sup>9)10)</sup>	$n_{\max}$	rpm	240	240	235	205



<b>Holding brake (disc brake)</b>	<b>Size</b>		<b>B5</b>	<b>B7</b>
Minimum holding torque	$T_{\min/\max}$	Nm	4500	7000
Release pressure (min) <sup>13)</sup>	$P_{\text{rel min}}$	bar	12	10
Release pressure (max) <sup>13)</sup>	$P_{\text{rel max}}$	bar	15	15
Maximum pressure at brake port "Z"	$P_{\text{max}}$	bar	40	40
Oil volume to operate brake	$V_{\text{rel}}$	cm <sup>3</sup>	20	22

**Notice**

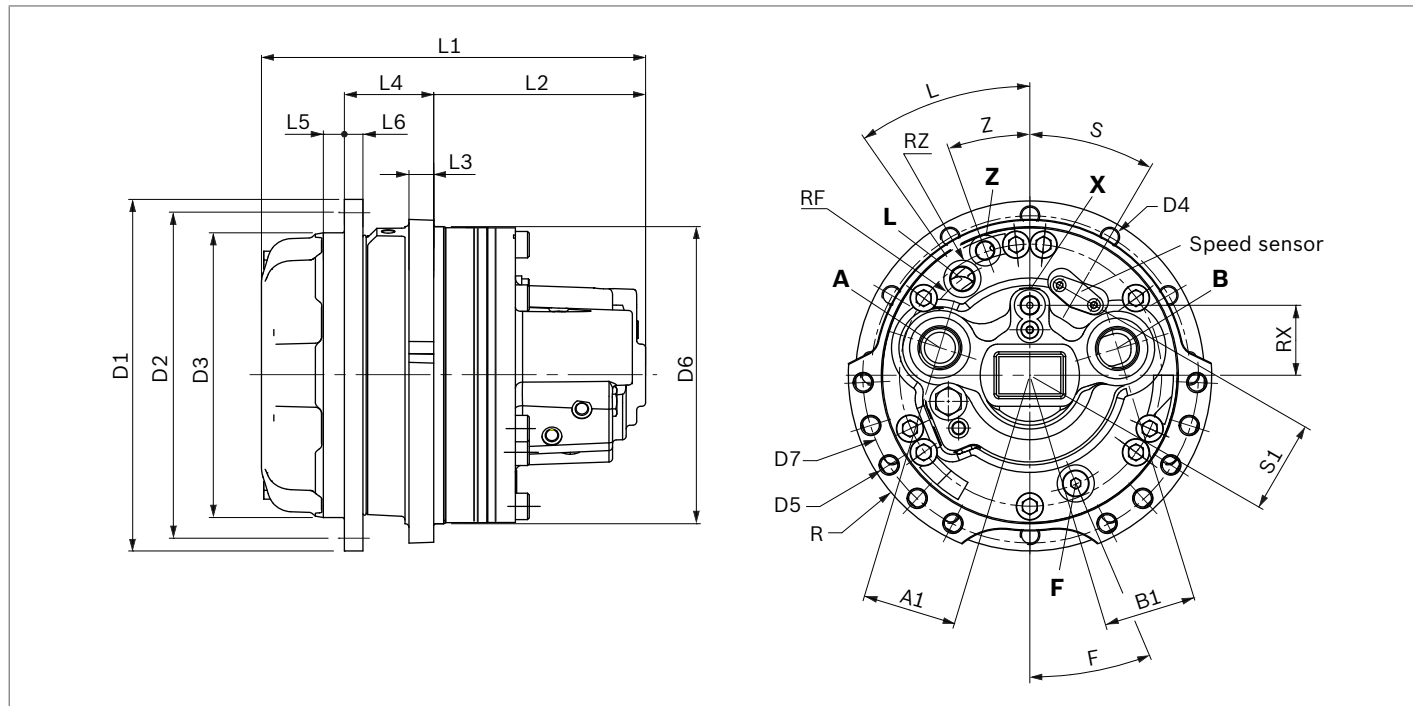
- ▶ Motor performance values all based on theoretical calculations.
  - ▶ Efficiencies not taken into consideration for theoretical calculations.
  - ▶ Brake torque accounts for tolerances.
- Please refer the related foot notes for more details.

## Footer from page 8 and 9

- 1) Ensure motor case is filled with oil prior to start-up.
- 2) For installation and maintenance details, please see operating manual 15215-B.
- 3) Other displacements and ratios contact Bosch Rexroth.
- 4) For any other fluid type contact the Engineering Department at Bosch Rexroth, Glenrothes. For more information on hydraulic fluids, see datasheets 90220 and 90223.
- 5) Extension of the allowable temperature range may be possible depending on specification. Please consult Bosch Rexroth Engineering Department in Glenrothes for further Details.
- 6) Maximum values should only be applied for a small portion of the duty cycle. Please consult Bosch Rexroth Engineering Department in Glenrothes for motor life calculations based on particular operating cases.
- 7) When operating motors in series, please consult Bosch Rexroth Engineering Department in Glenrothes.
- 8) For continuous operation at speeds <5 rpm please consult Bosch Rexroth Engineering Department in Glenrothes.
- 9) Based on nominal no-load  $\Delta p$  of 20 bar in full- displacement mode.
- 10) Warning! During the running in period of the motor (min. 20 hrs) it should not be run unloaded at >100 rpm.
- 11) Guide values for up to 5000 hours of motor operation (ISO VG46 and 50°).
- 12) Low displacement = 450 bar, high displacement = 400 bar
- 13) At 0 bar case pressure, the quoted brake release pressure is over and above any case pressure present.

## Dimensions

### MCR5, MCR6



Motor	D1	D2	D3	D4	D5	D6	D7	R	L	S	Z	F
<b>MCR5T1L</b>	ø284	ø260	ø230	M16	ø17.5	ø240	ø322.58	148	36.5°	25°	20.7°	23°
<b>MCR5T2WL</b>	ø284	ø260	ø230	1/2-13 UNC 2B	ø16.5	ø230	ø264	148	30°	30°	6.5°	23°
<b>MCR6T1L</b>	ø284	ø260	ø230	1/2-13 UNC 2B	ø17.5	ø240	ø322.58	176.5	35°	-	19.8°	23°
<b>MCR6T2WL</b>	ø284	ø260	ø230	M16	ø16.5	ø240	ø272	148	35°	30°	19.8°	23°

Motor	L1	L2	L3	L4	L5	L6	RX	RZ	RF	A1	B1	S1
<b>MCR5T1L</b>	270	130.8	20	72.2	17	15	-	R101.5	R90	76	74	75
<b>MCR5T2WL</b>	310.4	171.2	20	72.2	17	15	56.5	R101	R90	76	74	75
<b>MCR6T1L</b>	270	130.8	20	72.2	17	15	-	R107	R95	76	74	-
<b>MCR6T2WL</b>	310.4	171.2	20	72.2	17	15	56.5	R107	R95	76	74	75

### Ports

Designation	Port function	Ordering code 12	Size	Ordering code 48 <sup>1)</sup>	Size <sup>1)</sup>	Maximum pressure [bar]	State <sup>2)</sup>
<b>A, B</b>	Inlet, outlet	SAE J514	1 5/16-12 UN	SAE J518	3/4 in	420	O
<b>L</b>	Case drain	SAE J514	3/4-16 UNF	SAE J514	3/4-16 UNF	10	O
<b>X</b>	2 speed port	SAE J514	9/16-18 UNF	SAE J514	9/16-18 UNF	30	O
<b>Z</b>	Brake port	SAE J514	9/16-18 UNF	SAE J514	9/16-18 UNF	40	O
<b>F</b>	Filler port	SAE J514	3/4-16 UNF	SAE J514	3/4-16 UNF	10	X

<sup>1)</sup> Applicable to MCR10T only

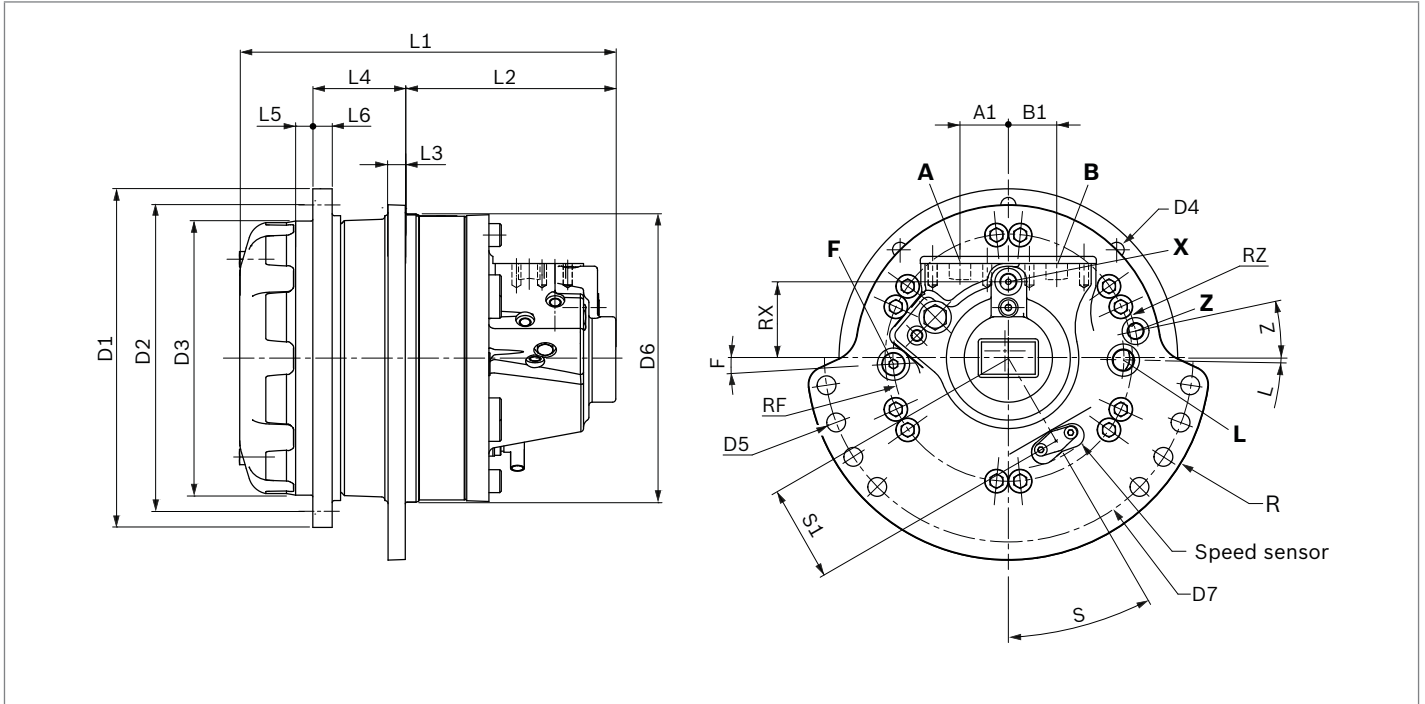
<sup>2)</sup> O = Must be connected (plugged on delivery)

X = Plugged (in normal operation)

Before finalizing your design, request a binding installation drawing.

## Dimensions

### MCR10



Motor	D1	D2	D3	D4	D5	D6	D7	R	L	S	Z	F
<b>MCR10T1L</b>	ø315	ø285	ø255	5/8-11 UNC 2	ø17.5	ø268	ø342	187.5	3°	-	10°	3°
<b>MCR10T2WL</b>	ø315	ø285	ø255	M16	ø17.5	ø268	ø342	187.5	1°	30°	12°	3°

Motor	L1	L2	L3	L4	L5	L6	RX	RZ	RF	A1	B1	S1
<b>MCR10T1L</b>	293.5	139.5	16	86	16	18	-	R121	R107	45	45	-
<b>MCR10T2WL</b>	349.8	195.8	16	86	16	18	71	R121	R107	45	45	89

### Ports

Designation	Port function	Ordering code 12	Size	Ordering code 48 <sup>1)</sup>	Size <sup>1)</sup>	Maximum pressure [bar]	State <sup>2)</sup>
<b>A, B</b>	Inlet, outlet	SAE J514	1 5/16-12 UN	SAE J518	3/4 in	420	O
<b>L</b>	Case drain	SAE J514	3/4-16 UNF	SAE J514	3/4-16 UNF	10	O
<b>X</b>	2 speed port	SAE J514	9/16-18 UNF	SAE J514	9/16-18 UNF	30	O
<b>Z</b>	Brake port	SAE J514	9/16-18 UNF	SAE J514	9/16-18 UNF	40	O
<b>F</b>	Filler port	SAE J514	3/4-16 UNF	SAE J514	3/4-16 UNF	10	X








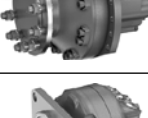


<sup>1)</sup> Applicable to MCR10T only

<sup>2)</sup> O = Must be connected (plugged on delivery)

X = Plugged (in normal operation)

Before finalizing your design, request a binding installation drawing.

## Selection guide

Data sheet	Motor type Application		Frame size					
			3 160..400 cc	5 380..820 cc	6 820..920 cc	10 780..1340 cc	15 1130..2150 cc	20 1750..3000 cc
15198	<b>MCR-F</b> Wheel drives		•	•	-	•	•	-
15200	<b>MCR-W</b> Heavy duty wheel drives		•	•	-	•	-	-
15195	<b>MCR-A</b> Frame integrated drives		•	•	-	•	•	-
15199	<b>MCR-H</b> Integrated drives		•	•	-	•	•	•
15221	<b>MCR-T</b> Track drives		-	•	•	•	-	-
15223	<b>MCR-R Series 41</b> Hydraulic drive assist		-	-	-	•	-	-
15214	<b>MCR-X</b> Slew drives		•	•	-	-	-	-
15197	<b>MCR-C</b> Compact drives		-	-	-	-	-	•
15196	<b>MCR-D</b> Industrial applications		•	•	-	•	-	-
	<b>MCR-E</b> Industrial applications		-	•	-	-	-	-

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