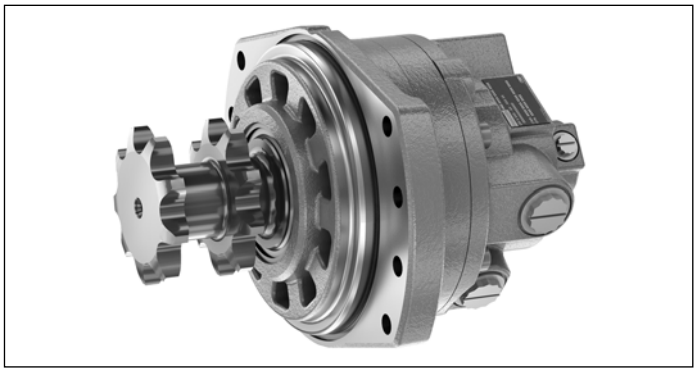
RE 15226/04.2019
Replaces: 02.2019

rexroth
A Bosch Company

Radial piston motor for chain drives MCR-S



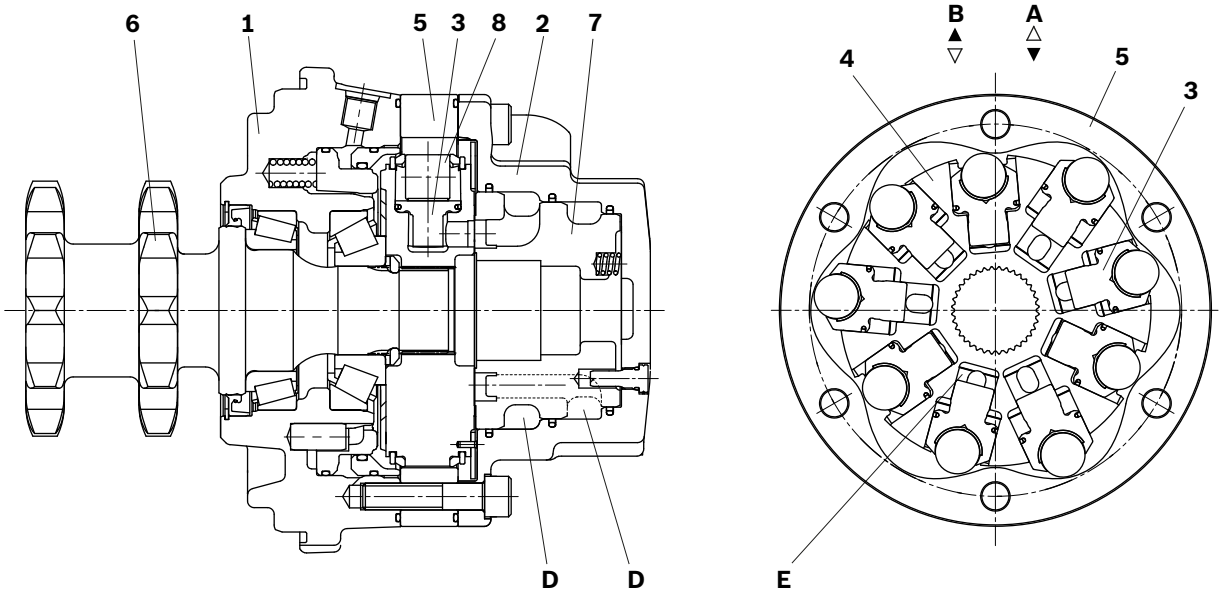
- Frame size MCR4
- Displacement 260 to 470 ccm
- Differential pressure up to 400 bar
- Torque output up to 2900 Nm
- Speed up to 420 rpm
- Open and closed circuits

Features

- Compact robust construction
- High volumetric and mechanical efficiencies
- Front case mount
- Sprocket drive shaft
- High reliability
- Low maintenance
- Smooth running at very low speeds
- Low noise
- Bi-directional
- Sealed tapered roller bearings
- Form brake
- Available with:
  - Bi-directional two speed
  - Integrated flushing valve
  - Speed sensor

Contents

Functional description

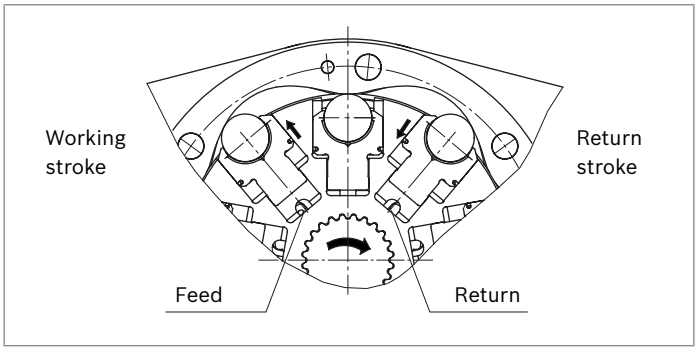


Hydraulic motors, of the type MCR-S, are radial piston motors with front case mounting and sprocket shaft. The MCR-S motors are intended for open or closed circuit operations as drive motors for chain drive functions. The MCR-S motor has the potential to be used in a wide range of applications such as municipal vehicles, agricultural and forestry machines however, the main application for this motor is skid steer loaders.

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, direct 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
Contact the Engineering Department at Bosch Rexroth, Glenrothes for freewheeling. This is available as special order for certain configurations.
For more detail refer to information sheet 15225-02 “Freewheeling on MCR motors”

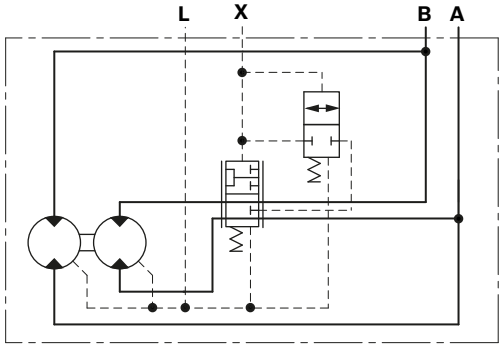
Two speed operation (2W)

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 two-thirds of the motor while continuously re-circulating the fluid in the other third. A unique feature of the Rexroth valve is that the recirculating fluid is taken from the low pressure boost circuit. This ensures there is minimal impact on motor efficiency and that this efficiency is identical in both directions. The motor maximum speed 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. However, the spool valve requires an additional sequence valve or electro-proportional control to operate in “soft-shift” mode.

For more detail refer to information sheet 15225-03 “MCR 2-Speed soft-shift”.

▼ **Schematic**



Flushing valve

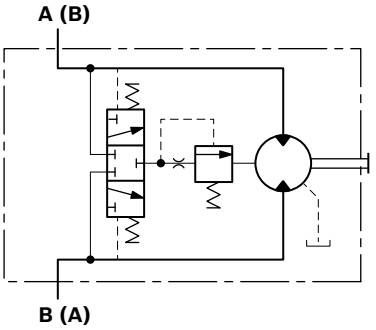
In a closed circuit, the same hydraulic fluid continuously flows between the pump and the motor which could lead to overheating of the hydraulic fluid and damage to system components.

The function of the flushing valve option is to replace hydraulic fluid in the closed circuit with cooler fluid from the reservoir. When the hydraulic motor is operated under load, either in the clockwise or anti-clockwise direction, the flushing spool opens and takes a fixed flow of fluid through an orifice from the low pressure side of the motor. This flow is directed into the motor case and back to the system reservoir via the motor case drain. Fluid volume in the low pressure side of the circuit is maintained by cool fluid drawn from the reservoir by the boost pump. The flushing feature incorporates a relief valve which ensures a minimum boost pressure is maintained, this 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.

For more detail refer to information sheet 15225-01 “Standard flushing on MCR motors”.

▼ **Schematic**



Flushing flow rates

Flushing code[2)]	**Orifice size [mm]**	**Flow at 25 bar**[1)] **[l/min]**
F0_	Ø0.0	0
F1_	Ø1.0	3
F2_	Ø1.5	5
F4_	Ø2.0	10
F6_	Ø2.3	13.5
F7_	Ø1.7	7
F8_	Ø2.2	12.5
Pressure code	**Pressure [bar]**	
F_2	2	
F_6	6	
F_0	16	

1) 0.6 mm Shim, Cracking pressure = 11±3 bar (Standard), others are available as “SO”.

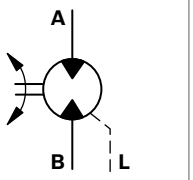
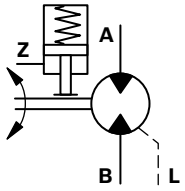
Parking brake (form brake)

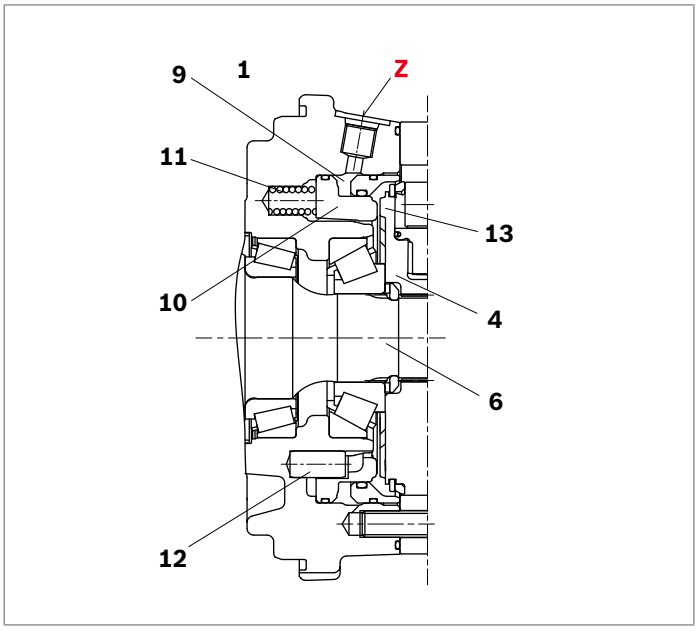
The form brake consists of a toothed brake piston (**10**) which is housed within the motor's front case (**1**). The brake piston is prevented from rotating by dowel pins (**12**). The cylinder block (**4**) which is splined onto the motor's shaft (**6**) has teeth formed on its forward face (**13**) which engage with the teeth on the brake piston and prevent rotation of the shaft. This engagement is maintained by an annular arrangement of springs (**11**). To release the brake, hydraulic pressure is applied to the brake piston chamber (**9**) via the port (**Z**) to compresses the springs and disengage the teeth.

Notice

- This brake is not for dynamic use!

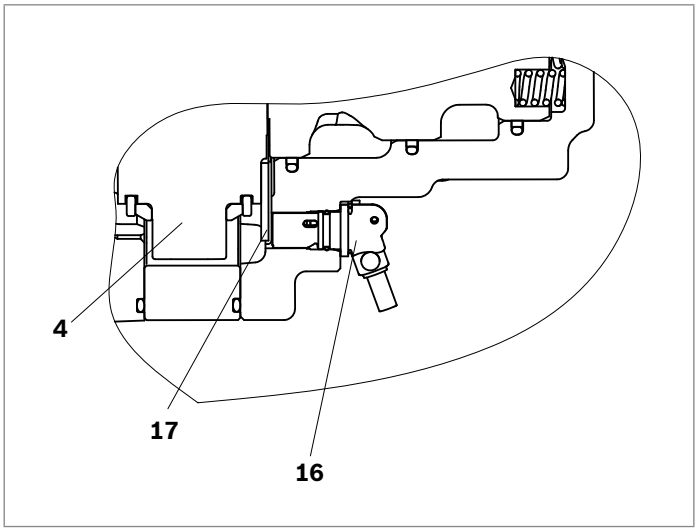
▼ **Schematic diagrams**

Motor without brake	Motor with parking brake
	



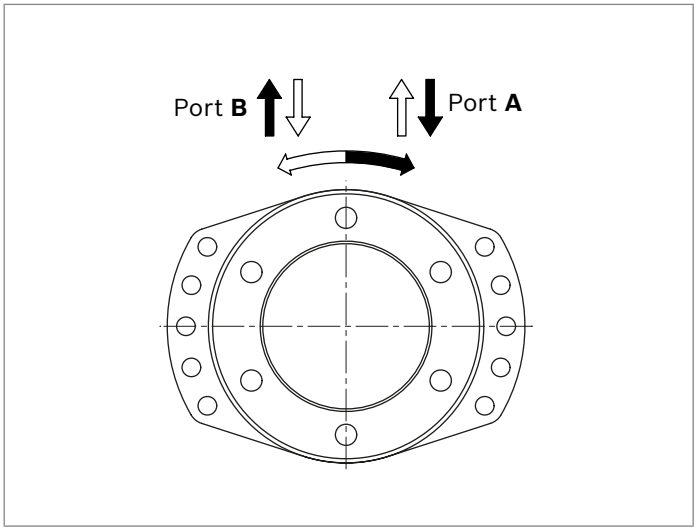
Speed sensor

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. Motor can be made speed sensor ready with special order (SO).
For more details and available options refer to the information sheet 15226-06 "Speed sensors on MCR motors"



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	16
MCR	**4**	**S**			**Z**	**/**										

Radial piston motor

01	Radial-piston type, low-speed, high-torque motor	**MCR**

Frame size

02	Frame size	**4**

Housing type

03	Front case mounting flange	**S**

Nominal size, displacement V_g in cm^3/rev

04	Frame size 4, high displacement: motors use stepped pistons	HD	**470**

Drive shaft

05	Sprocket shaft (9 teeth)	**S106**
	Sprocket shaft (11 teeth)	**S130**

Rear shaft

06	Without rear shaft	**Z**

Series

07	Series 33	**33**

Brake

08	Without brake		**A0**
	With form brake	2200 Nm	**F2**

Seals

09	NBR (nitrile rubber)	**M**
	FKM (fluoroelastomer)	**V**

Single/two-speed operation

10	Single speed, standard direction of rotation	**1L**
	Bi-directional two speed, standard direction of rotation	**2WL**

Ports

11	Tapped with UNF thread (ISO11926)	**12**

Studs

12	Without studs (no code)	

Speed sensor

13	Without sensor (no code)	
	Sensor ready (DSA)	**P3**
	Sensor (DSA2)	**P5**

Flushing

14	Without flushing (no code)	
	With flushing (see table on page 3)	**F__**

Special order

15	Special feature	**SOXXX**

Other

16	Mark in text here	*****

Technical data

Frame size			**MCR4**
Type of mounting			Front case flange mounting
Pipe connections[1)2)]			Threaded per ISO11926
Shaft loading			see page 10
Weight			
Single speed (1L)	m	kg	33
Two speed (2WL, 2L and 2R)	m	kg	35
Hydraulic fluid[3)]			Mineral oil type HLP/HLVP to DIN 51524
Fluid cleanliness			ISO 4406, Class 20/18/15
Fluid viscosity range	$\nu_{min/max}$	mm²/s	10 to 2000
Fluid temperature range[4)]	$\theta_{min/max}$	°C	–20 to +115
Pressure			High displacement
Maximum differential pressure[5)6)]	Δp_{max}	bar	400
Maximum pressure at port **A** or **B**[5)6)]	p_{max}	bar	420
Maximum case drain pressure	$p_{case\ max}$	bar	10
Motor performance			**MCR4**
Displacement[10)]	V_g	cm³/rev	**470**
Specific torque		Nm/bar	6
Maximum torque[5)]	T_{max}	Nm	2992
Minimum speed for smooth running[7)]	n_{min}	rpm	**0.5**
Maximum speed (1L)[8)9)]	n_{max}	rpm	420
Maximum speed (2WL)[8)9)]	n_{max}	rpm	420
Brake			**MCR4**
Parking brake (form brake)			**F2**
Minimum parking torque	$T_{brake\ min}$	Nm	2200
Release pressure			See notice
Maximum pressure at brake port „**Z**“	p_{max}	bar	40
Oil volume to operate brake	V_{rel}	cm³	22.9

1) Ensure motor case is filled with oil prior to start-up. See instruction manual 15215-B.
2) For installation and maintenance details, please see instruction manual 15215-B.
3) For any other fluid type contact the Engineering Department at Bosch Rexroth, Glenrothes.
4) Extension of the allowable temperature range may be possible depending on specification. Please consult Bosch Rexroth Engineering Department in Glenrothes for further details.
5) 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.
6) When operating motors in series, please consult Bosch Rexroth Engineering Department in Glenrothes.
7) For continuous operation at speeds <5 rpm please consult Bosch Rexroth Engineering Department in Glenrothes.
8) Based on nominal no-load Δp of 20 bar in full-displacement mode.
9) Warning!
During the running in period of the motor (min. 20 hrs) it should not be run unloaded at >100 rpm.
10) For details of other displacements contact Bosch Rexroth Engineering Department in Glenrothes

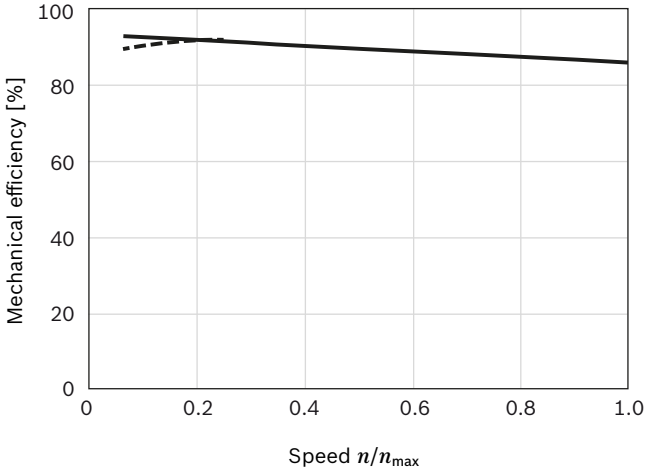
Notice

- Motor performance values are based on theoretical calculations.
- Efficiencies are not taken into consideration for theoretical calculations.
- Brake torque accounts for tolerances. Values are valid when used with standard mineral oil (HLP).
- For brake release pressures, please refer to the MCRS installation drawing.

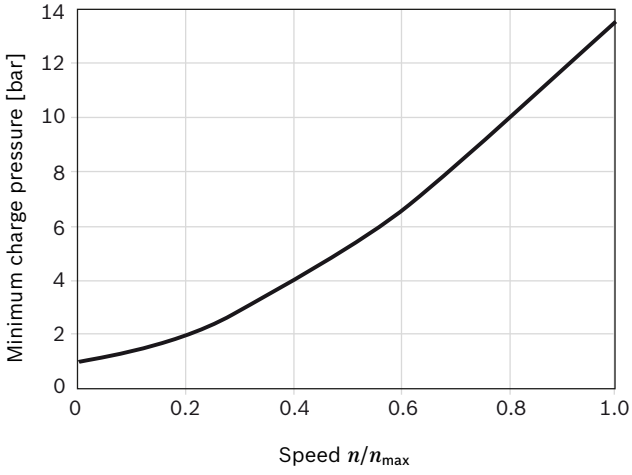
Please refer the related foot notes for more details.

Efficiencies

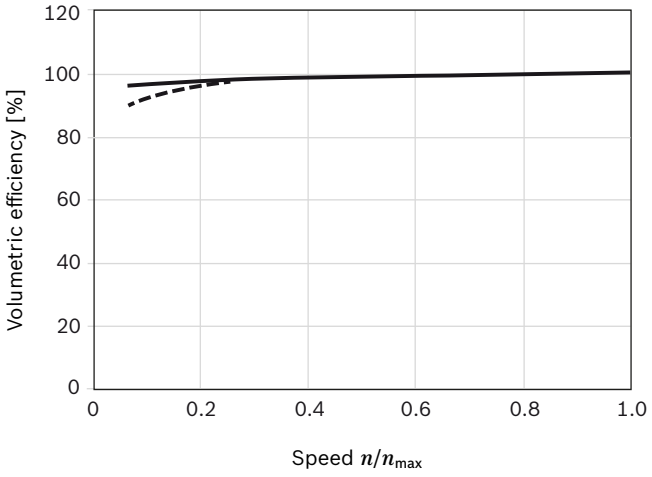
▼ **Mechanical efficiency**



▼ **Charge pressure**



▼ **Volumetric efficiency**



100 bar / 1450 psi
300 bar / 4350 psi

Notice

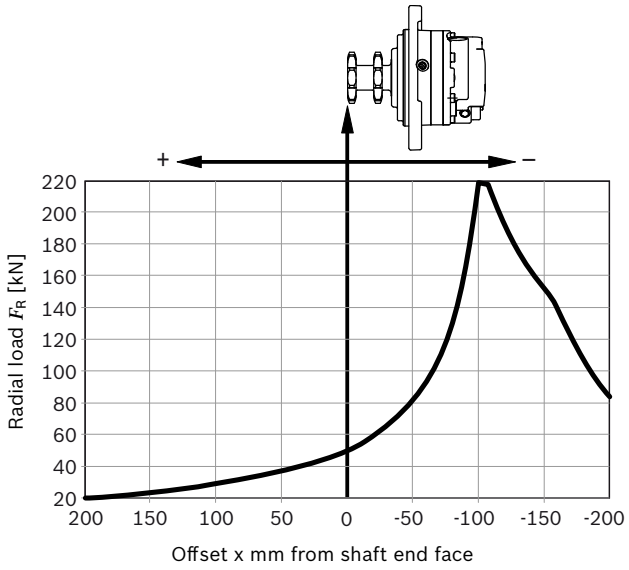
For specific performance information or operating conditions contact the Engineering Department at Bosch Rexroth, Glenrothes.

Permitted loading on drive shaft

(Speed n = 50 rpm, pressure differential Δp = 250 bar, 2000 hrs L10 life at 50 °C)

Drive shaft ...3F F180...

Maximum radial load $F_{R\,max}$ (with axial load F_{ax} = 0)



Maximum axial load $F_{ax\,max}$ (with radial load F_R = 0):

$F_{ax\,max}$ = 30700 N ← +

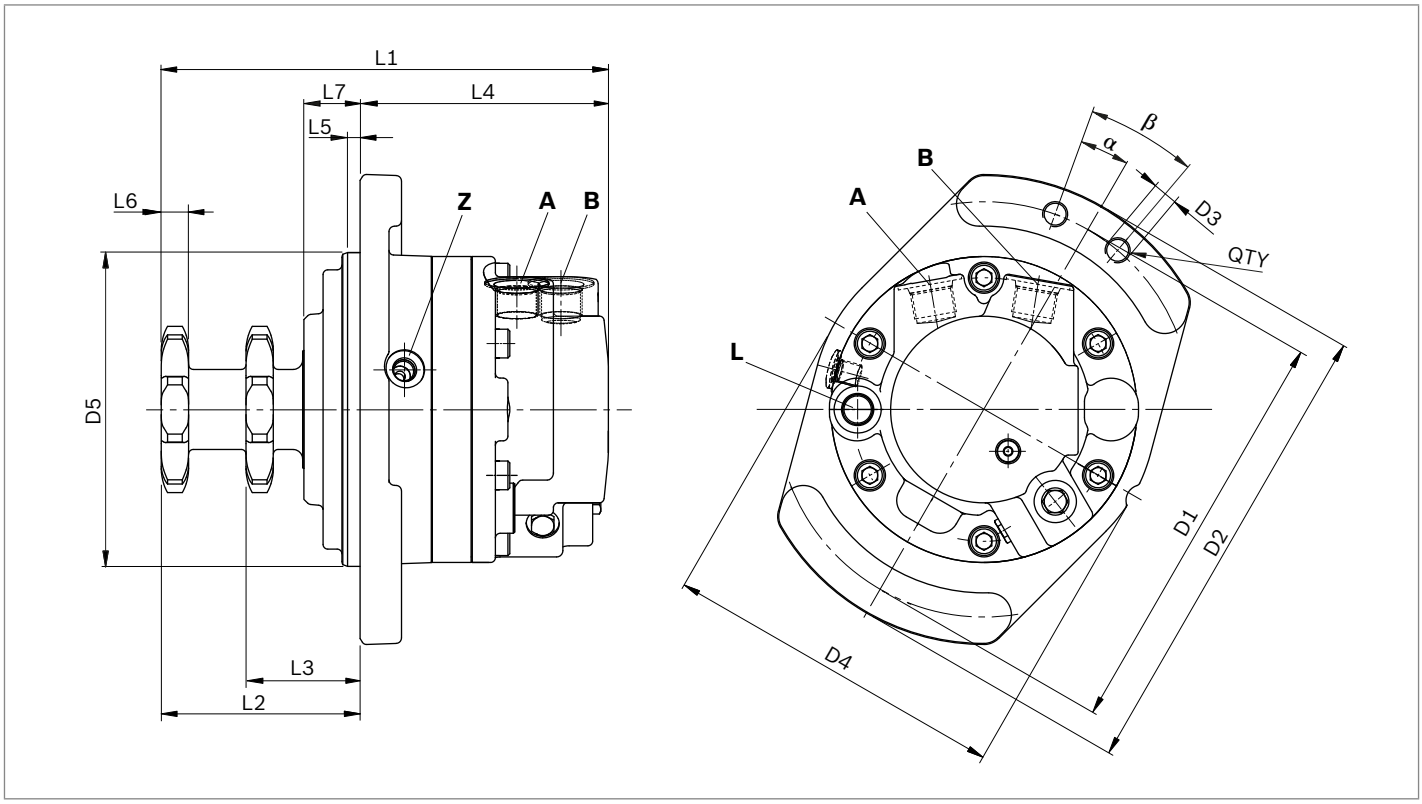
$F_{ax\,max}$ = 25200 N → –

Notice

- These values and graphs are for initial guidance only
- To ensure maximum bearing life, the rear sprocket should be used to drive whichever axle experiences the greater tractive forces/radial loads
- For actual motor life calculations under typical or specified duty cycles, contact the engineering department at Bosch Rexroth, Glenrothes.

Dimensions

MCR-S single speed (1L)



Motor	D1	D2	D3	D4	D5
MCR4	ø265	ø300	M16	ø220	ø200

Motor	L1	L2	L3	L4	L5	L6	α	β	QTY
MCR4	285	126.7	72.7	158.2	8.0	17.4	10°	20°	8

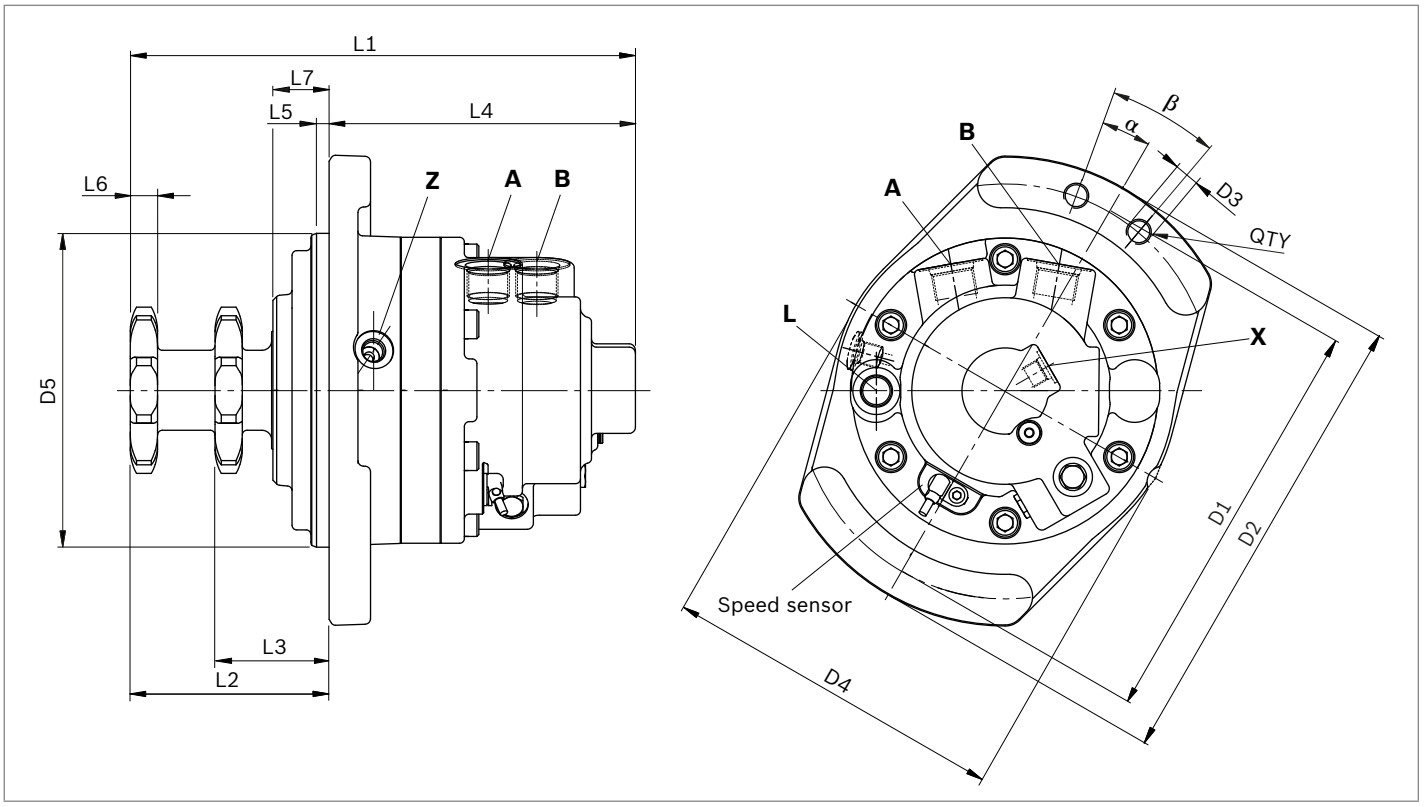
Ports

Motor	Designation	Port function	Standard	Size	p_{max} [bar]	State[2)]
MCR4	**A, B**	Inlet, outlet	ISO11926	1 1/16-12 UN	420/400[1)]	O
	L	Case drain	ISO11926	3/4-16 UNF	10	O
	Z	Brake port	ISO11926	9/16-18 UNF	40	X

1) Depends on nominal size
2) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

Before finalizing your design, request a binding installation drawing.

MCR-S two speed (2WL)



Motor	D1	D2	D3	D4	D5
MCR4	ø265	ø300	M16	ø220	ø200

Motor	L1	L2	L3	L4	L5	L6	α	β	QTY
MCR4	322	126.7	72.7	195.2	8.0	17.4	10°	20°	8

Ports

Motor	Designation	Port function	Code	Size	p_{max} [bar]	State[2)]
MCR4	**A, B**	Inlet, outlet	ISO11926	1 1/16-12 UNF	420/400[1)]	O
	L	Case drain	ISO11926	3/4-16 UNF	10	O
	X	Two speed	ISO11926	9/16-18 UNF	40	X
	Z	Brake port	ISO11926	9/16-18 UNF	40	X

1) Depends on nominal size
2) 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	4 260..470 cc	5 380..820 cc	6 820..920 cc	10 780..1340 cc	15 1130..2150 cc	20 1750..3000 cc
15198	**MCR-F** Wheel drives		●	–	●	–	●	●	–
15200	**MCR-W** Heavy duty wheel drives		●	–	●	–	●	–	–
15197	**MCR-C** Compact drives		–	–	–	–	–	–	●
15195	**MCR-A** Frame integrated drives		●	–	●	–	●	●	–
15226	**MCR-S** Chain drives		–	●	–	–	–	–	–
15221	**MCR-T** Track drives		–	–	●	●	●	–	–
15199	**MCR-H** Integrated drives		●	–	●	–	●	●	●
15223	**MCR-R Series 41** Hydraulic drive assist		–	–	–	–	●	–	–
15196	**MCR-D** Industrial applications		●	–	●	–	●	–	–
	MCR-E Industrial applications		–	–	●	–	–	–	–

Bosch Rexroth Limited
Viewfield Industrial Estate
Glenrothes, Fife
Scotland, KY6 2RD
UK
Phone +44 15 92 631 777
Telefax +44 15 92 631 936
www.boschrexroth.com