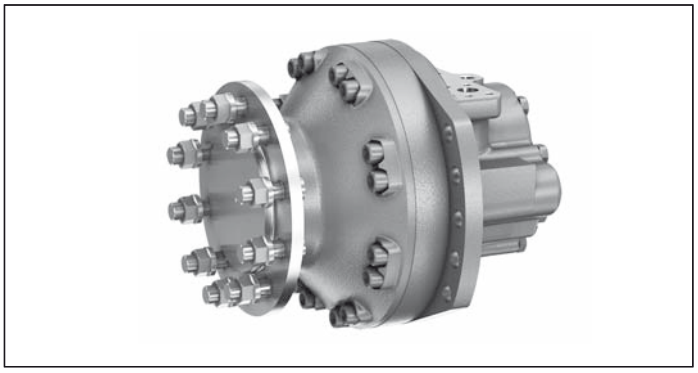
The Drive & Control Company

Rexroth
Bosch Group

Radial piston motor for compact drives
MCR-C

RE 15197
Edition: 12.2013



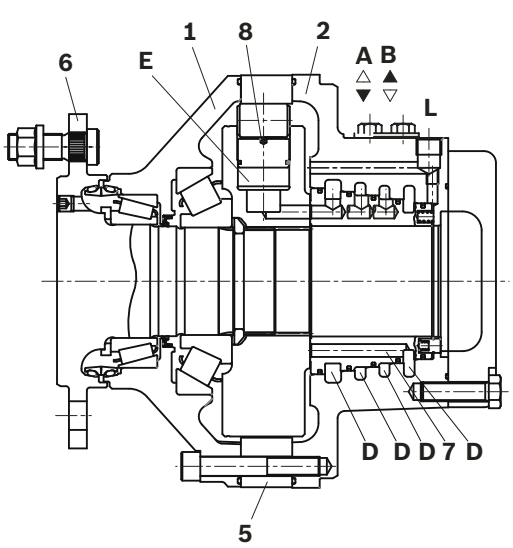
- Frame size MCR20
- Displacement 1750 cc to 3000 cc
- Differential pressure up to 450 bar
- Torque output up to 19099 Nm
- Speed up to 125 rpm
- Open and closed circuits

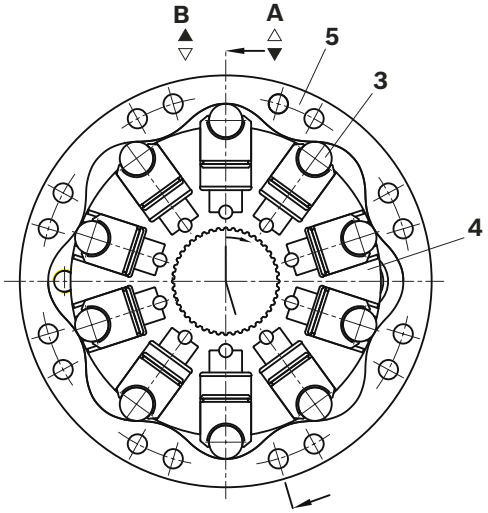
Features

- Compact robust construction
- High volumetric and mechanical efficiencies
- Rear case mount
- Wheel flange with wheel studs
- High reliability
- Low maintenance
- Smooth running at very low speeds
- Low noise
- Bi-directional
- Sealed tapered roller bearings
- Freewheeling possible
- Available with:
  - Holding brake (multi-disc)
  - Bi-directional two speed
  - Integrated flushing valve
  - Speed sensor

Contents

Functional description



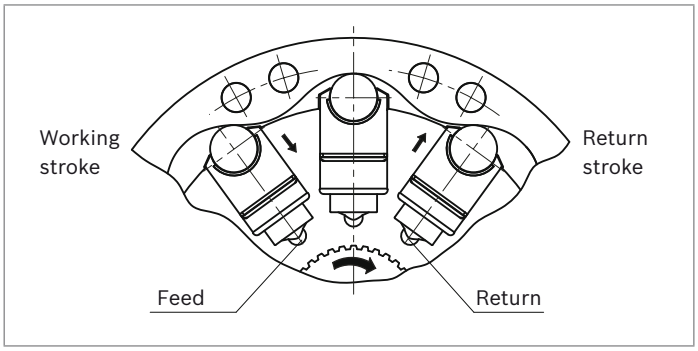


Hydraulic motors of the type MCR-C are radial piston motors with rear case mounting and flanged drive shaft. These motors have a compact front housing and are intended for drives in open or closed circuits. These motors are used in a wide range of applications where there is lower external loading. The integrated flange with wheel studs allows easy installation of standard wheel rims.

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 (**8**) are arranged radially in the cylinder block (**4**) and make contact with the cam (**5**) via rollers (**3**).

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.

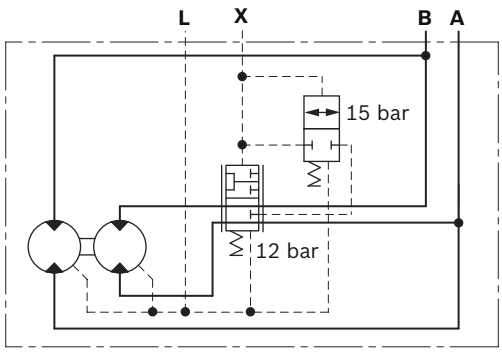
Freewheeling
In certain applications there may be a requirement to freewheel the motor. This may be achieved by connecting ports **A** and **B** to zero pressure and simultaneously applying a pressure of 2 bar to the housing through port **L**. In this condition, the pistons are forced into the cylinder block which forces the rollers to lose 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. 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. The spool valve requires either an additional sequence valve or electro-proportional control to operate in “soft-shift” mode.

▼ **Schematic**



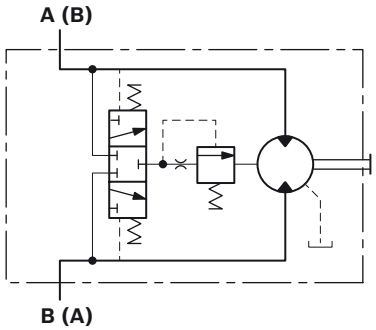
Flushing valve

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 takes 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, cool 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.

▼ **Schematic**



Flushing flow rates

Flushing code	Orifice size (mm)	Flow (l/min) at 25 bar[1)] 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

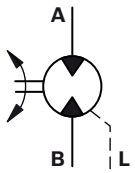
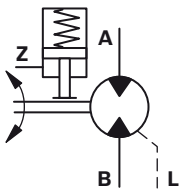
Holding brake (multi-disc brake)

Mounting
By way of rear housing (**2**) and brake shaft (**14**).

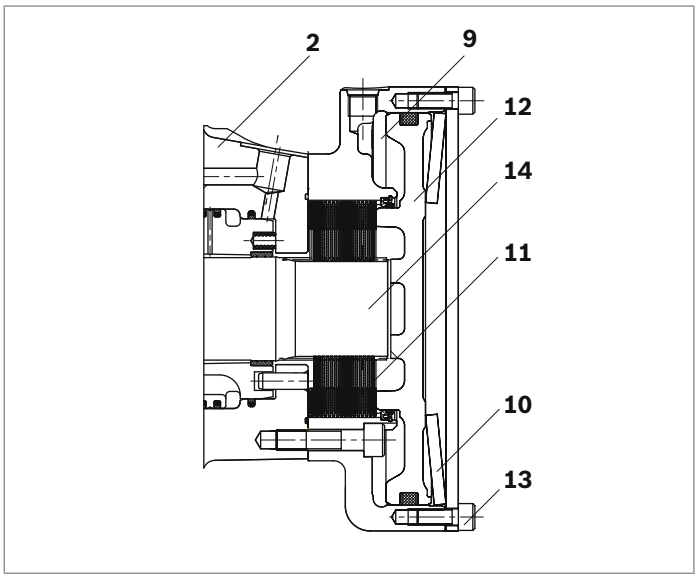
Brake application
As a safety requirement in mobile applications a parking brake may be provided to ensure that the motor cannot turn when the machine is not in use. The parking brake provides holding torque by means of discs (**11**) that are compressed by a disc spring (**10**). The brake is released when oil pressure is applied to brake port "**Z**" and the pressure in the annular area (**9**) compresses the disc spring using brake piston (**12**) thus allowing the brake discs (**11**) to turn independently.

Note
This brake is provided solely for static use - not to be used dynamically.

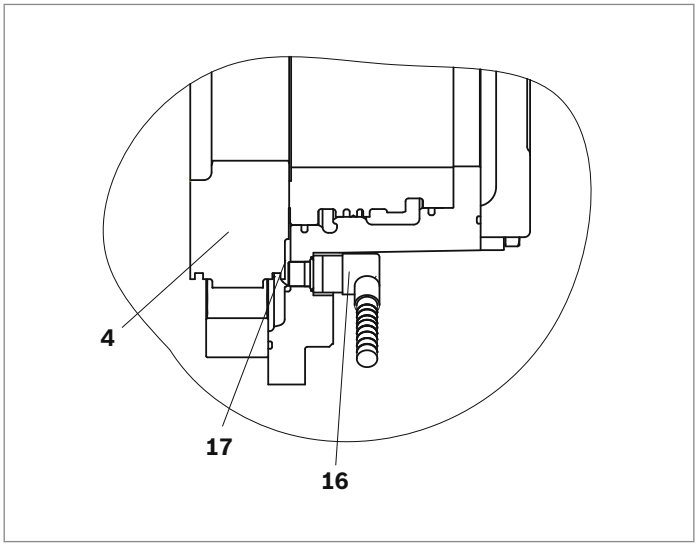
▼ **Schematic diagrams**

Motor without brake	Motor with holding brake
	

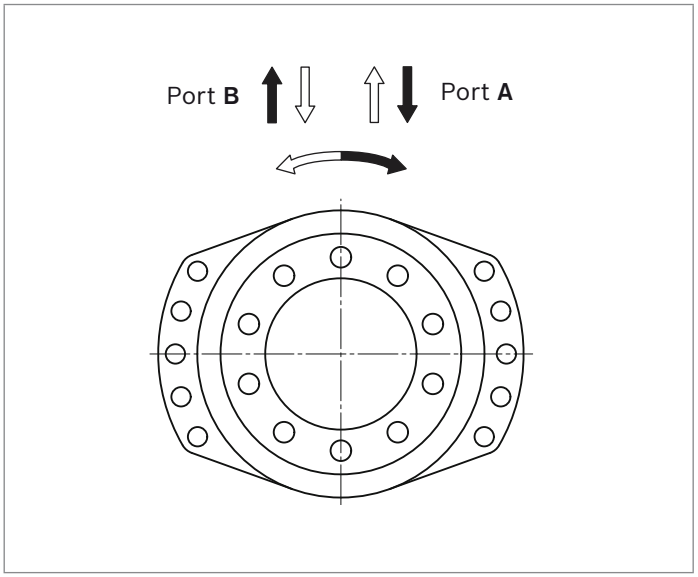
Manual release of holding brake
The brake may also be released manually by loosening screws (**13**).



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	16
MCR	**20**	**C**		**F280**	**Z**	**/**	**33**				**42**					

Radial piston motor

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

Frame size

02	Frame size 20	**20**

Housing type

03	Short front case – rear case mounting flange	**C**

Nominal size, displacement V_g in cm³/rev

04	Frame size 20		**1750**	**2100**	**2500**	**3000**
	Low displacement: motors use standard cylindrical pistons	LD	●	●	–	–
	High displacement: motors use stepped pistons	HD	–	–	●	●

Drive shaft

05	With flange ø280 mm	**F280**

Rear shaft

06	Without rear shaft	**Z**

Series

07	Series 33	**33**[1)]

Brake

08	Without brake	**A0**
	Hydraulic release spring applied multi-disc holding brake 19000 Nm	**B19**

Seals

09	NBR (nitrile rubber)	**M**
	FKM (fluoroelastomer / Viton)	**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 (SAE J514) (A and B ports SAE split flange metric bolt holes)	**42**

Studs

12	Without studs (no code)	
	With wheel studs and nuts	**S**
	With twice normal number of wheel studs and nuts	**SS**

Speed sensor

13	Without sensor (no code)	
	Sensor ready	**P0**
	Sensor without regulator	**P1**
	Sensor with regulator	**P2**

● = Available – = Not available

[1)] This data sheet also applies to series 32.

01	02	03	04	05	06		07	08	09	10	11	12	13	14	15	16
MCR	**20**	**C**		**F280**	**Z**	**/**	**33**				**42**					

Flushing

14	Without flushing (no code)	
	With flushing (see table on page 3)	**F1-F7**

Special order

15	Special feature	**SOXXX**

Other

16	Mark in text here	*

Footer from page 7

1) Ensure motor case is filled with oil prior to start-up.
2) For installation and maintenance details, please see instruction manual 15215-B.
3) For use with environmentally acceptable fluids HEES, HEPG, HETG, fluoroelastomer / Viton seals must be specified.
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) Guide values for up to 5000 hours of motor operation (ISO VG46 at 50 °C).

Note

- Motor performance values are based on theoretical calculations.
- Efficiencies are not taken into consideration for theoretical calculations.
- Brake torque accounts for tolerances. Values are based when used with standard mineral oil (HLP)

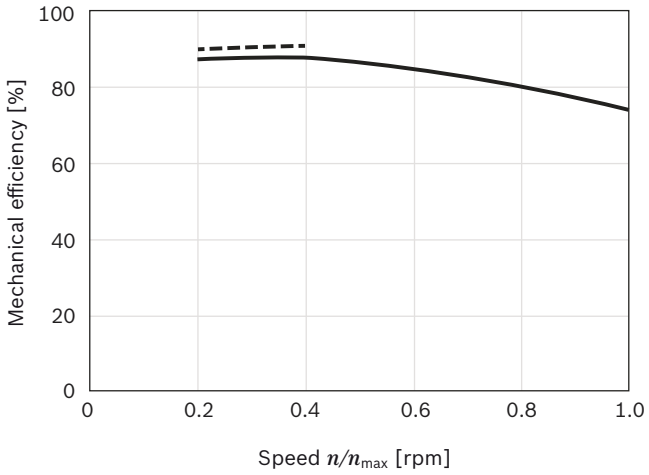
Please refer the related foot notes for more details.

Technical data

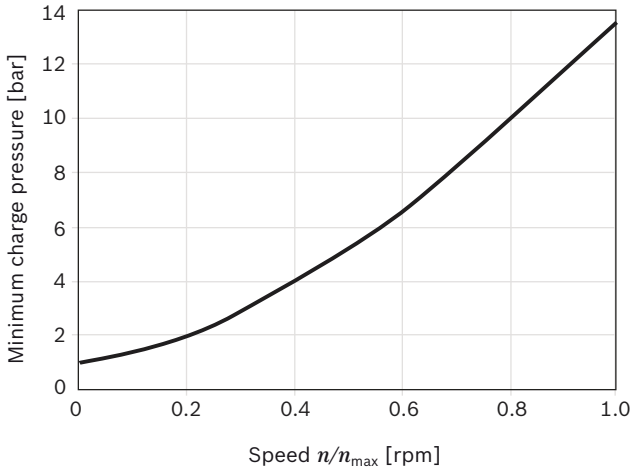
Frame size			**MCR20**			
Type of mounting			Flange mounting			
Pipe connections[1)2)]			Threaded per SAE J514; Flanged per SAE J518			
Shaft loading			see page 9			
Weight						
Single speed (1L)	m	kg	121			
Two speed (2WL)	m	kg	121			
Hydraulic fluid[3)]						
Fluid cleaniness			ISO 4406, Class 20/18/15			
Fluid viscosity range	$\nu_{min/max}$	mm²/s	10 to 2000			
Fluid temperature range[4)]	$\theta_{min/max}$	°C	-20 to +85			
Pressure			Low displacement		High displacement	
Operating pressure	p_{nom}	bar	250		250	
Maximum differential pressure[5)6)]	Δp_{max}	bar	450		400	
Maximum pressure at port **A** or **B**[5)6)]	p_{max}	bar	470		420	
Maximum case drain pressure	$p_{case\ max}$	bar	10		10	
Motor performance						
Displacement	V_g	cm³/rev	1750	2100	2500	3000
Specific torque		Nm/bar	28	33	40	44
Maximum torque[5)]	T_{max}	Nm	12533	15040	15915	19099
Minimum speed for smooth running[7)]	n_{min}	rpm	0.5	0.5	0.5	0.5
Maximum speed (1L and 2WL)[8)9)]	n_{max}	rpm	125	125	115	115
Continuous operating power[10)]	P	kW	117.29	103.12	94.18	93.01
			MCR20			
Holding brake (disc brake)			**B19**			
Minimum holding torque	$t_{min/max}$	Nm	19000			
Release pressure (min)	$p_{rel\ min}$	bar	15			
Release pressure (max)	$p_{rel\ max}$	bar	30			
Maximum pressure at brake port „Z“	p_{max}	bar	40			
Oil volume to operate brake	V_{rel}	cm³	99			

Efficiencies

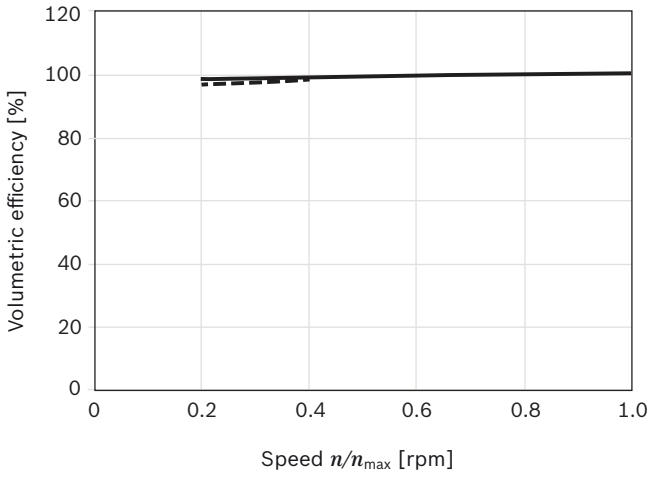
▼ **Mechanical efficiency**



▼ **Charge pressure**



▼ **Volumetric efficiency**



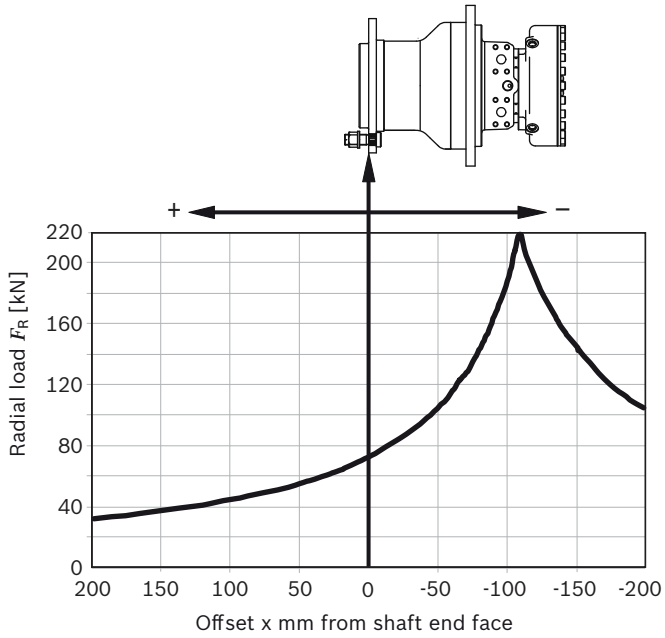
100 bar / 1450 psi
300 bar / 4350 psi

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

Permitted loading on drive shaft

Drive shaft ...20C F280...

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



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

$F_{ax\,max}$ = 113000 N ← +

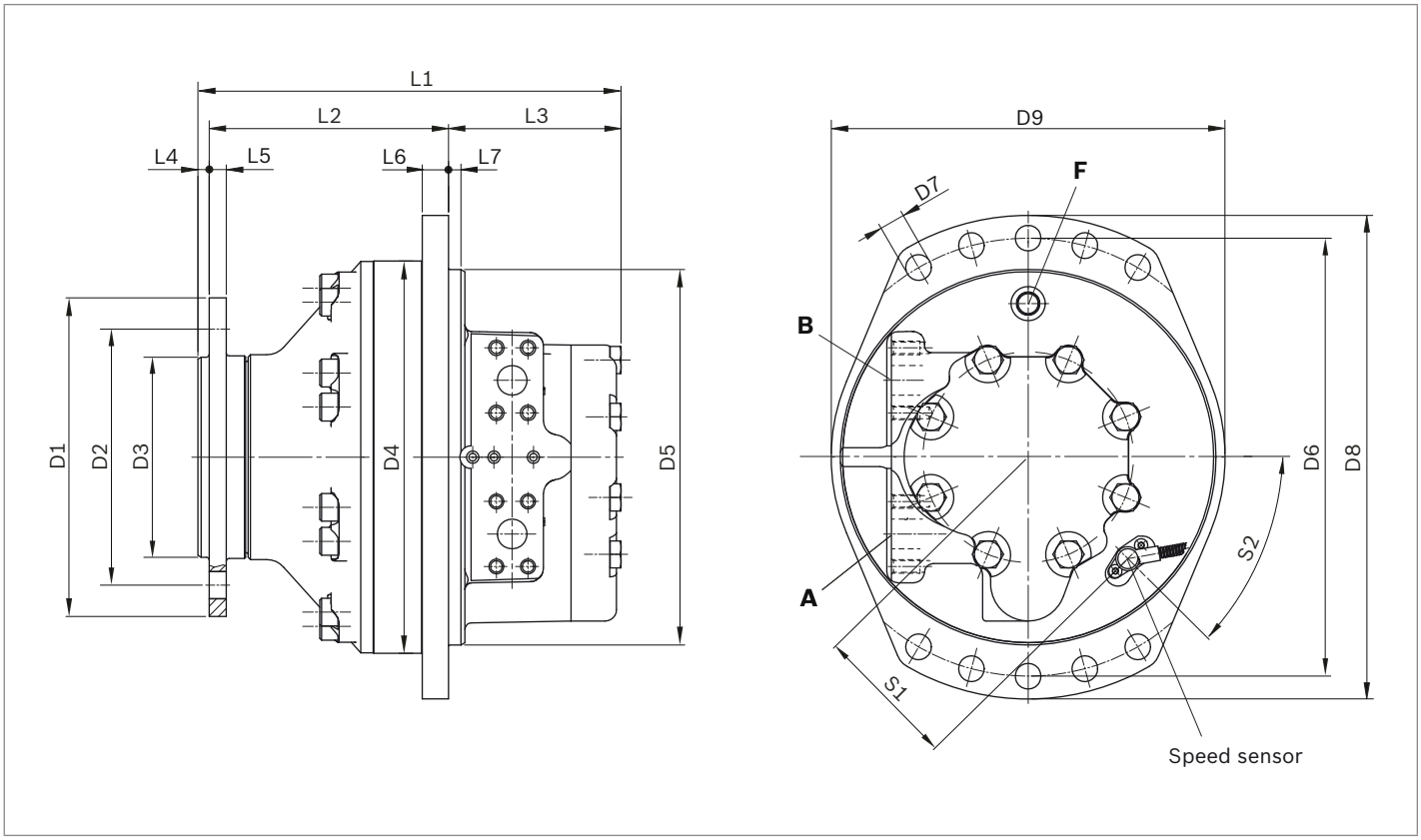
$F_{ax\,max}$ = 49500 N → –

Note:

- These values and graphs are for initial guidance only
- For actual motor life calculations under typical or specified duty cycles, contact Bosch Rexroth Engineering Department in Glenrothes

Dimensions

MCR-C single speed (1L)



Motor	D1	D2	D3	D4	D5	D6	D7	D8	D9
MCR20	ø280	ø225	ø175.8	ø345	ø330	ø385	ø22.5	ø425	ø345

Motor	L1	L2	L3	L4	L5	L6	L7	S1	S2
MCR20	371.75	210	151.65	10	15	23	11	125	45°

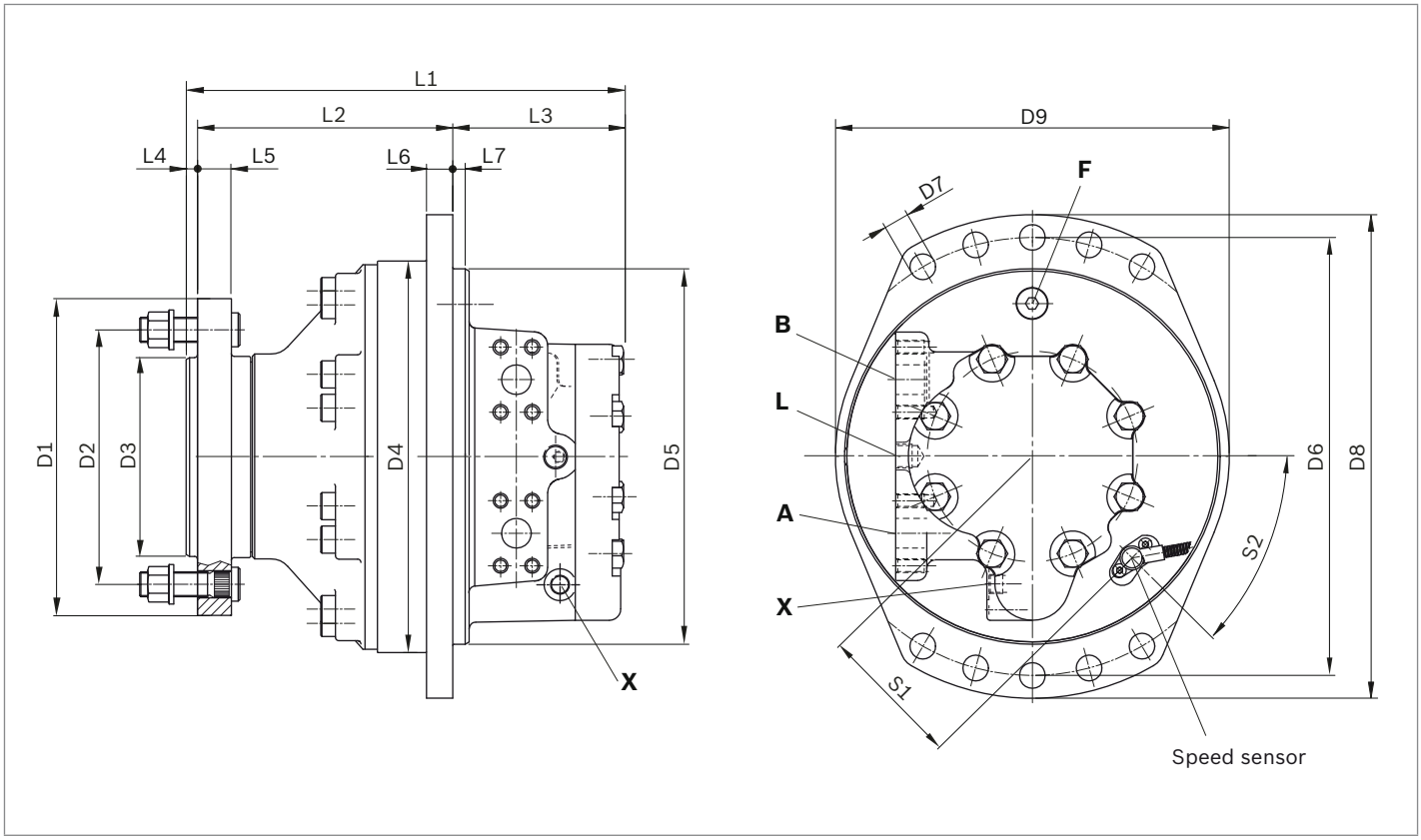
Before finalizing your design, request a binding installation drawing.
Dimensions in mm.

Ports

Motor	Designation	Port function	Code	Size	p_{max} [bar]	State[2)]
MCR20	**A, B**	Inlet, outlet	SAE J518[3)]	1 in	470/420[1)]	O
	L	Case drain	SAE J514	3/4-16 UNF	10	O
	F	Filler port	SAE J514	3/4-16 UNF	10	X

1) Depends on nominal size
2) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)
3) Dimensions according to SAE J518 (Code 62 - high pressure series)

MCR-C two speed (2WL)



Motor	D1	D2	D3	D4	D5	D6	D7	D8	D9
MCR20	ø280	ø225	ø175.8	ø345	ø330	ø385	ø22.5	ø425	ø345

Motor	L1	L2	L3	L4	L5	L6	L7	S1	S2
MCR20	386.65	225	151.65	10	30	23	11	125	45°

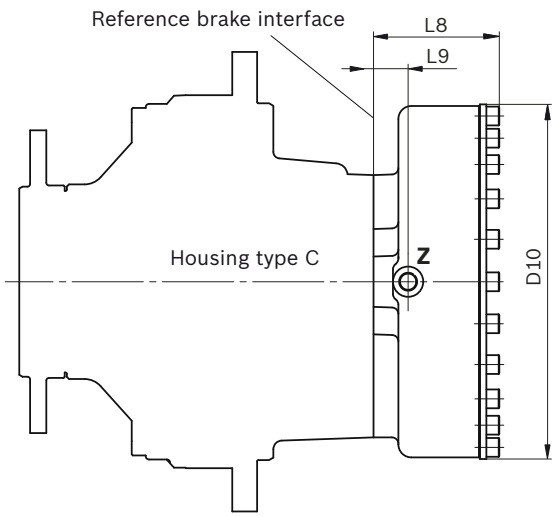
Before finalizing your design, request a binding installation drawing.
Dimensions in mm.

Ports

Motor	Designation	Port function	Code	Size	p_{max} [bar]	State[2)]
MCR20	**A, B**	Inlet, outlet	SAE J518[3)]	1 in	470/420[1)]	O
	L	Case drain	SAE J514	3/4-16 UNF	10	O
	F	Filler port	SAE J514	3/4-16 UNF	10	X
	X	2 speed port	SAE J514	9/16-18 UNF	35	O

1) Depends on nominal size
2) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)
3) Dimensions according to SAE J518 (Code 62 - high pressure series)

Holding brake (multi-disc brake)



Motor	Brake	L8	L9	D10
MCR20	**B19**	116.3	32	ø328

Ports

Motor	Designation	Port function	Code	Size	p_{max} [bar]	State
MCR20	Z	Brake Port	SAE J515	9/16-18 SAE	40	O

1) O = Must be connected (plugged on delivery)

Before finalizing your design, request a binding installation drawing.
Dimensions in mm.

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	**MCR-F** Wheel drives		●	●	–	●	●	–
15200	**MCR-W** Heavy duty wheel drives		●	●	–	●	–	–
15195	**MCR-A** Frame integrated drives		●	●	–	●	–	–
15199	**MCR-H** Integrated drives		●	●	–	●	●	●
15221	**MCR-T** Track drives		–	●	●	●	–	–
15223	**MCR-R Series 40** Hydraulic drive assist		–	–	–	●	–	–
15214	**MCR-X** Slew drives		●	●	–	–	–	–
15197	**MCR-C** Compact drives		–	–	–	–	–	●
15196	**MCR-D** Industrial applications		●	●	–	●	–	–
	MCR-E Industrial applications		–	●	–	–	–	–

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