RE 15195/2020-01-27
Replaces: 02.2017

rexroth
A Bosch Company

Radial piston motor for frame integrated drives MCR-A

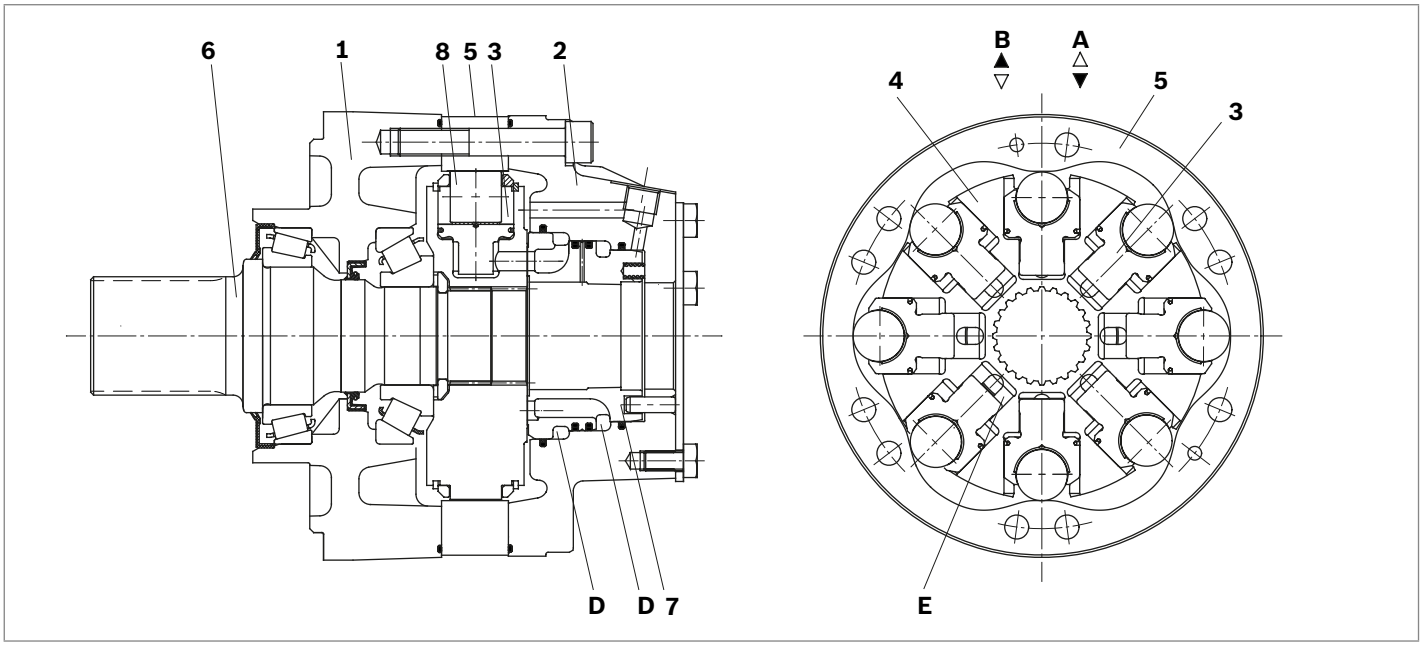
- Frame size MCR3, MCR5, MCR10, MCR15
- Displacement 160 cc to 2150 cc
- Differential pressure up to 450 bar
- Torque output up to 13687 Nm
- Speed up to 875 rpm
- Open and closed circuits

Features

- Compact robust construction
- High volumetric and mechanical efficiencies
- Front case mount
- Splined drive shaft
- 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-A are radial piston motors incorporating a front case mounting and splined drive shaft. A-type motors are suitable for a variety of applications either as a direct drive into a gearbox or by fitting an external component (e.g. gear pinion or chain sprocket). They are suitable for use in open or closed circuit operations.

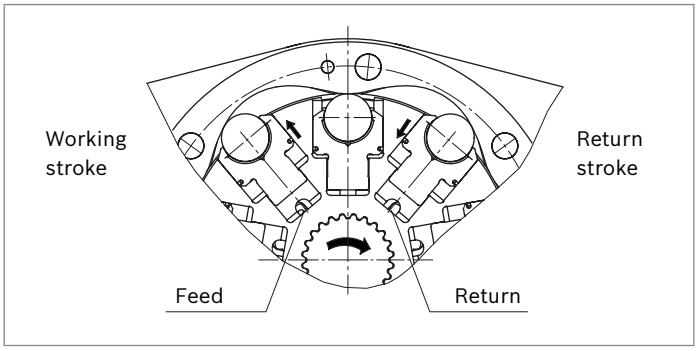
Construction

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 pushed back into the cylinder block, the rollers to lose contact with the cam which allows 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.

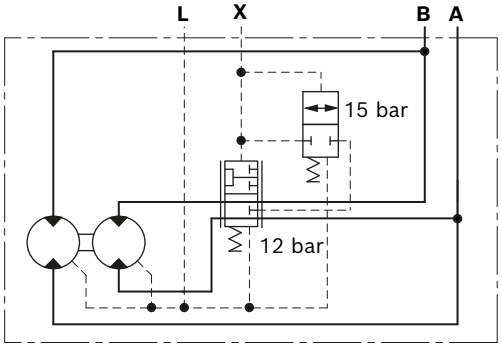
For more information refer to the MCR information sheet on „2-speed soft shift“ (RE 15225-03).

Two Stroke Cams (2W)

Standard two speed operates with a reduced displacement which is half full displacement. In some cases it is possible to offer a motor with a reduced displacement that is not 50% (e.g. 60% full displacement).

For further information contact Bosch Rexroth Engineering Dept, Glenrothes.

▼ **Schematic**



Flushing valve

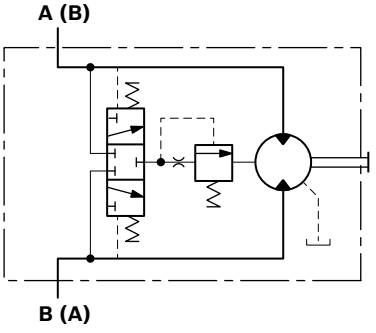
In a closed circuit, the same hydraulic fluid continuously flows between the pump and the motor. This could therefore lead to overheating of the hydraulic fluid.

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 anti-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.

For more information, refer to the MCR Information Sheet „Standard Flushing on MCR Motors“, RE 15225-01.

▼ **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
F4	Ø2	8.2	10.7
F6	Ø2.3	8.8	11.4
F7	Ø1.7	6.4	7.8

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

Holding brake (multi-disc brake)

Mounting

By way of rear housing and brake shaft.

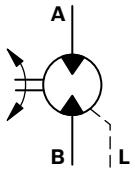
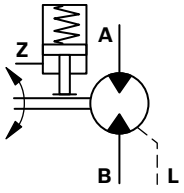
Brake application

An optional holding brake is availaible to ensure that the motor cannot turn when the machine is not in use. This works on the principle of a Spring Applied Hydraulic Release (SAHR) Brake and is released when oil pressure is applied to brake port **Z**. In the event of a loss of hydraulics, the brake can be released manually. Refer to the MCR operating manual RE15215-01 for more information on manual brake release.

Notice

The brakes are intended only for static use. Use of the brakes in a dynamic case will cause damage to the motor!

▼ **Schematic diagrams**

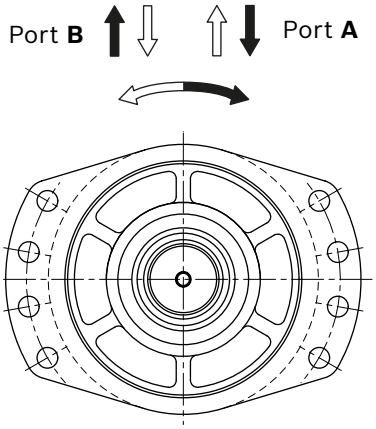
Motor without brake	Motor with holding brake
	

Speed sensor

Sensors can then be connected to a controller such as the Rexroth BODAS controller.
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. These “sensor-ready” motors may be fitted with a sensor at a later date.
For more details refer to the MCR Information Sheet „Speed Sensors on MCR Motors“ RE15225-06.

Direction of shaft rotation with flow

(viewed from drive shaft)



Ordering code ... 1L ... or ... 2WL ...

Ordering code

01	02	03	04	05	06		07	08	09	10	11	12	13	14	15
MCR		**A**			**Z**	**/**									

Radial piston motor

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

Frame size

02	Frame size	3	**3**
		5	**5**
		10	**10**
		15	**15**

Housing type

03	Front case flanged	**A**

Nominal size, displacement V_g in cm^3/rev

04	Frame size 3		**160**	**225**	**255**	**280**	**325**	**365**	**400**	
	Low displacement: motors use standard cylindrical pistons	LD	●	●	●	●	–	–	–	
	High displacement: motors use stepped pistons	HD	–	–	–	–	●	●	●	
	Frame size 5		**380**	**470**	**520**	**565**	**620**	**680**	**750**	**820**
	Low displacement: motors use standard cylindrical pistons	LD	●	●	●	●	–	–	–	–
	High displacement: motors use stepped pistons	HD	–	–	–	–	●	●	●	●
	Frame size 10		**780**	**860**	**940**	**1120**	**1250**	**1340**		
	Low displacement: motors use standard cylindrical pistons	LD	●	●	●	–	–	–		
	High displacement: motors use stepped pistons	HD	–	–	–	●	●	●		
	Frame size 15		**1130**	**1250**	**1500**	**1780**	**2150**			
	Low displacement: motors use standard cylindrical pistons	LD	●	●	●	–	–			
	High displacement: motors use stepped pistons	HD	–	–	–	●	●			

Drive shaft

05	Spline shaft ANSI B92.1	MCR3	**A45**
		MCR5	**A60**
		MCR10	**A75**
		MCR15	**W80**

Rear shaft

06	Without rear shaft	**Z**

Series

07	Series 32	**32**
	Series 33	**33**

Brake			**MCR3**	**MCR5**	**MCR10**	**MCR15**	
08	Without brake		●	●	●	●	**A0**
	Hydraulic release spring applied multi-disc holding brake	2200 Nm	●	●	–	–	**B2**
		4400 Nm	–	●	–	–	**B4**
		4400 Nm	–	–	●	–	**B5**
		7000 Nm	–	–	●	–	**B7**
		11000 Nm	–	–	–	●	**B11**

Seals

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

● = Available – = Not available

01	02	03	04	05	06		07	08	09	10	11	12	13	14	15
MCR		**A**			**Z**	**/**									

Single/two-speed operation		**MCR3**	**MCR5**	**MCR10**	**MCR15**	
10	Single speed, standard direction of rotation	●	●	●	●	**1L**
	Bi-directional two speed, standard direction of rotation[1)]	●	●	–	–	**2WL**
	Switchable two speed, anti-clockwise direction of rotation	–	●	–	●	**2L**
	Switchable two speed, clockwise direction of rotation	–	●	–	●	**2R**

Ports		**MCR3**	**MCR5**	**MCR10**	**MCR15**	
11	Tapped with BSP thread (ISO 228-1)	●	●	–	–	**01**
	Tapped with BSP thread (ISO 228-1)	–	–	●	●	**11**
	Tapped with UNF thread (ISO 11926)	●	●	–	–	**12**
	Tapped with UNF thread (ISO 11926) A and B ports split flange metric bolt holes (SAE J518-2)	–	–	●	●	**42**

Studs		
12	Without studs (no code)	

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

Speed sensor		
14	Without sensor (no code)	
	Speed sensor ready	**P3**
	Speed sensor DSA2 - 12+24V	**P5**
	Speed sensor DSA1 - 12+24V	**P6**

Special order		
15	Special feature	**SOXXX**

● = Available – = Not available

1) Not available for MCR10A

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 more information on hydraulic fluids, see datasheets 90220 and 90223
4) 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.
5) When operating motors in series, please consult Bosch Rexroth Engineering Department in Glenrothes.
6) For continuous operation at speeds <5 rpm please consult Bosch Rexroth Engineering Department in Glenrothes.
7) Based on nominal no-load Δp of 20 bar in full-displacement mode.
8) **Caution:**
Brake torque may be significantly lower when using fluids other than mineral oil. Brake hold must be checked on an application-specific basis, for further advice contact the Engineering Department at Bosch Rexroth, 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 based when used with standard mineral oil (HLP).
- During the running in period of the motor (min 20 hrs) it should not be run unloaded at >100 rpm

Please refer the related foot notes for more details.

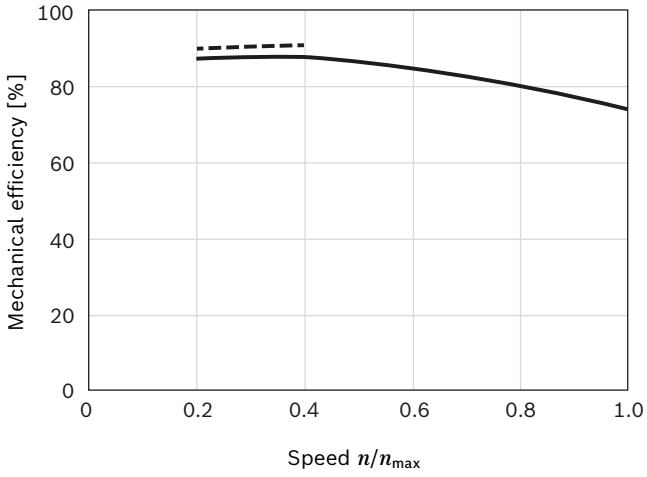
Technical data

Frame size			**MCR3**	**MCR5**	**MCR10**	**MCR15**				
Type of mounting			Front case flange mounting							
Pipe connections[1)2)]			Threaded per ISO 11926 and ISO228-1; Flanged per SAE J518-2							
Shaft loading			see page 9							
Weight (unbraked)										
Single speed (1L)	m	kg	24	43	68	102				
Two speed (2WL)	m	kg	37	50	73	–				
Two speed (2L/2R)	m	kg		43		102				
Hydraulic fluid[3)]			Mineral oil type HLP/HLVP to DIN 51524							
Fluid cleaniness			ISO 4406, Class 20/18/15							
Fluid viscosity range	$v_{min/max}$	mm²/s	10 to 2000							
Fluid temperature range	$\theta_{min/max}$	°C	–20 to +85							
Pressure			Low displacement				High displacement			
Maximum differential pressure[4)5)]	Δp_{max}	bar	450				400			
Maximum pressure at port **A** or **B**[4)5)]	p_{max}	bar	470				420			
Maximum case drain pressure	$p_{case\ max}$	bar	10				10			
Motor performance MCR3										
Displacement	V_g	cm³/rev	**160**	**225**	**255**	**280**	**325**	**365**	**400**	
Specific torque		Nm/bar	2.54	3.61	4.05	4.39	5.21	5.83	6.33	
Maximum torque[4)]	T_{max}	Nm	1146	1611	1826	2005	2069	2324	2546	
Minimum speed for smooth running[6)]	n_{min}	rpm	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	
Maximum speed (1L)[7)]	n_{max}	rpm	**670**	**475**	**420**	**385**	**330**	**295**	**270**	
Maximum speed (2WL)[7)]	n_{max}	rpm	**875**	**620**	**550**	**500**	**430**	**385**	**350**	
Motor performance MCR5										
Displacement	V_g	cm³/rev	380	470	520	565	620	680	750	820
Specific torque		Nm/bar	6.13	7.48	8.24	8.97	9.85	10.83	11.94	12.99
Maximum torque[4)]	T_{max}	Nm	2722	3366	3724	4047	3947	4329	4775	5220
Minimum speed for smooth running[6)]	n_{min}	rpm	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Maximum speed (1L)[7)]	n_{max}	rpm	475	385	350	320	290	265	240	220
Maximum speed (2WL)[7)]	n_{max}	rpm	570	465	420	385	350	320	290	265
Motor performance MCR10										
Displacement	V_g	cm³/rev	780	860	940		1120	1250	1360	
Specific torque		Nm/bar	12.46	13.71	14.96		18.04	19.85	21.65	
Maximum torque[4)]	T_{max}	Nm	5586	6159	6732		7130	7958	8531	
Minimum speed for smooth running[6)]	n_{min}	rpm	0.5	0.5	0.5		0.5	0.5	0.5	
Maximum speed (1L and 2WL)[7)]	n_{max}	rpm	215	195	180		150	135	125	
Motor performance MCR15										
Displacement	V_g	cm³/rev	1130	1250	1500		1780	2150		
Specific torque		Nm/bar	18.09	20.02	24.04		28.51	34.41		
Maximum torque[4)]	T_{max}	Nm	8093	8952	10743		11332	13687		
Minimum speed for smooth running[6)]	n_{min}	rpm	0.5	0.5	0.5		0.5	0.5		
Maximum speed (1L and 2L/2R)[7)]	n_{max}	rpm	145	130	110		105	90		
Brake			**MCR3**		**MCR5**		**MCR10**		**MCR15**	
Holding brake (disc brake)			**B2**		**B2**	**B4**	**B5**	**B7**	**B11**	
Minimum holding torque[8)]	$t_{min/max}$	Nm	2200		2200	4400	4400	7000	11000	
Release pressure (min)	$p_{rel\ min}$	bar	11		11	11	11	11	12	
Release pressure (max)	$p_{rel\ max}$	bar	15		15	15	15	15	15	
Maximum pressure at brake port „Z“	p_{max}	bar	40		40	40	30	30	30	
Oil volume to operate brake	V_{rel}	cm³	23		23	39	17	58	77	

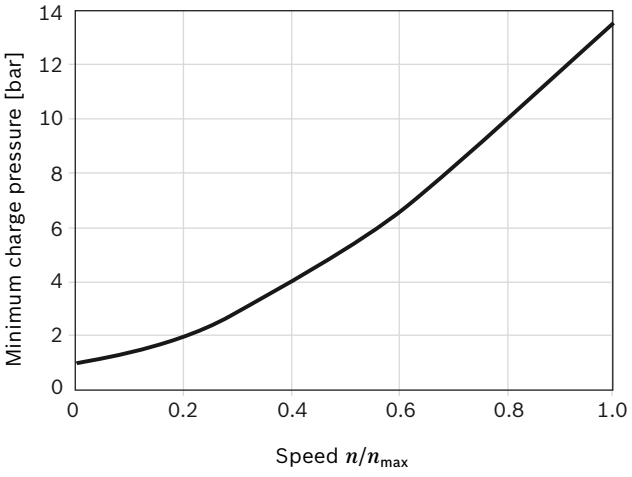
Footer on page 6

Efficiencies

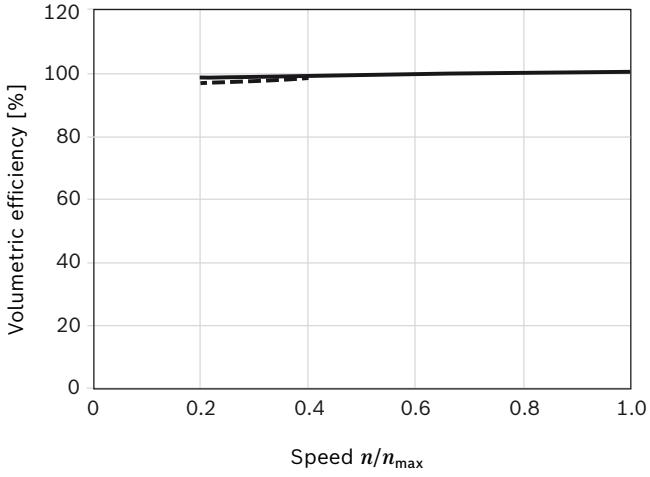
▼ **Mechanical efficiency**



▼ **Charge pressure**



▼ **Volumetric efficiency**



100 bar
300 bar

Notice

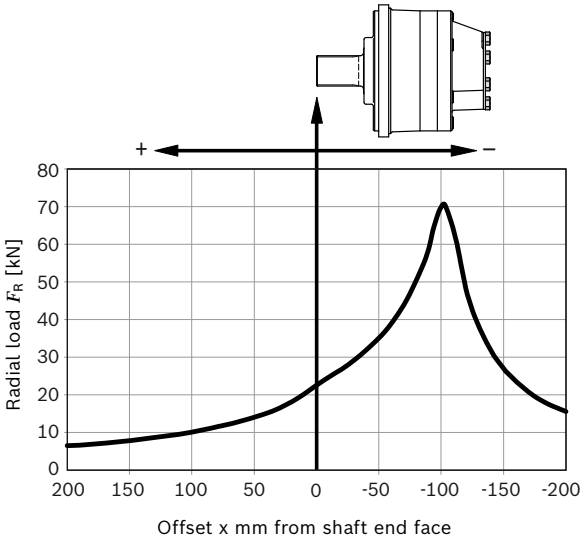
- If the correct charge pressure is not maintained and the motor is starved of oil, the motor may go into free wheel mode!
- For specific performance information or operating conditions contact the Engineering Department at Bosch Rexroth, Glenrothes.

Permitted loading on drive shaft

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

Drive shaft ...3A A45...

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



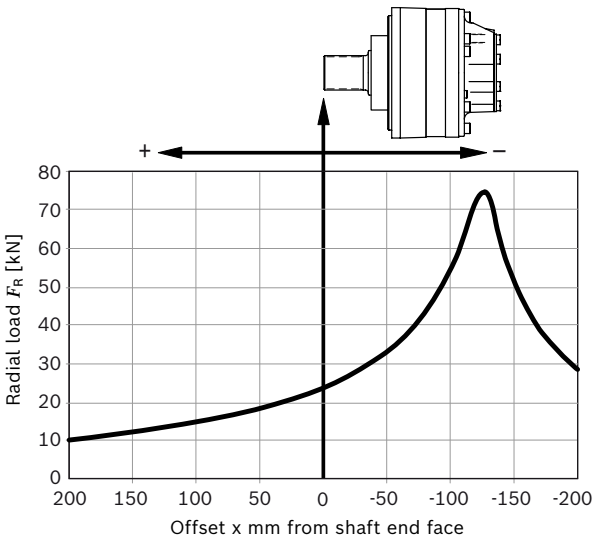
Maximum axial load $F_{ax\,max}$ (with radial load F_R = 0):

$F_{ax\,max}$ = 30700 N ← +

$F_{ax\,max}$ = 25200 N → –

Drive shaft ...10A A75...

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



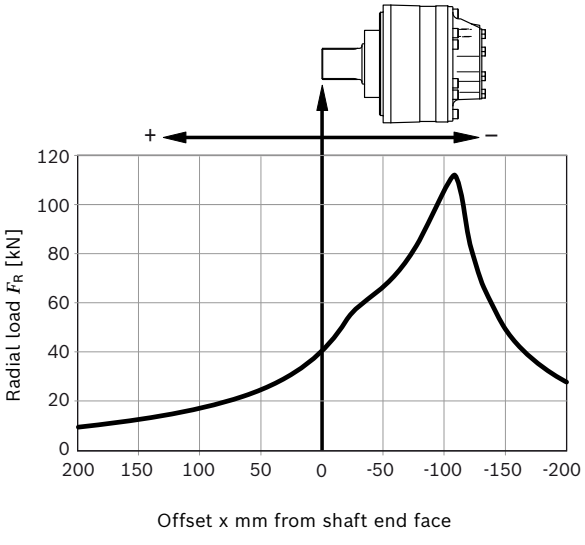
Maximum axial load $F_{ax\,max}$ (with radial load F_R = 0):

$F_{ax\,max}$ = 68000 N ← +

$F_{ax\,max}$ = 63400 N → –

Drive shaft ...5A A60...

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



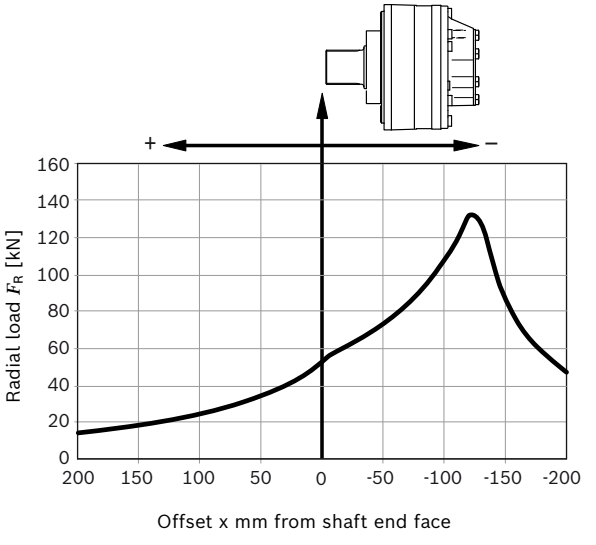
Maximum axial load $F_{ax\,max}$ (with radial load F_R = 0):

$F_{ax\,max}$ = 49000 N ← +

$F_{ax\,max}$ = 35400 N → –

Drive shaft ...15A W80...

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



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

$F_{ax\,max}$ = 95400 N ← +

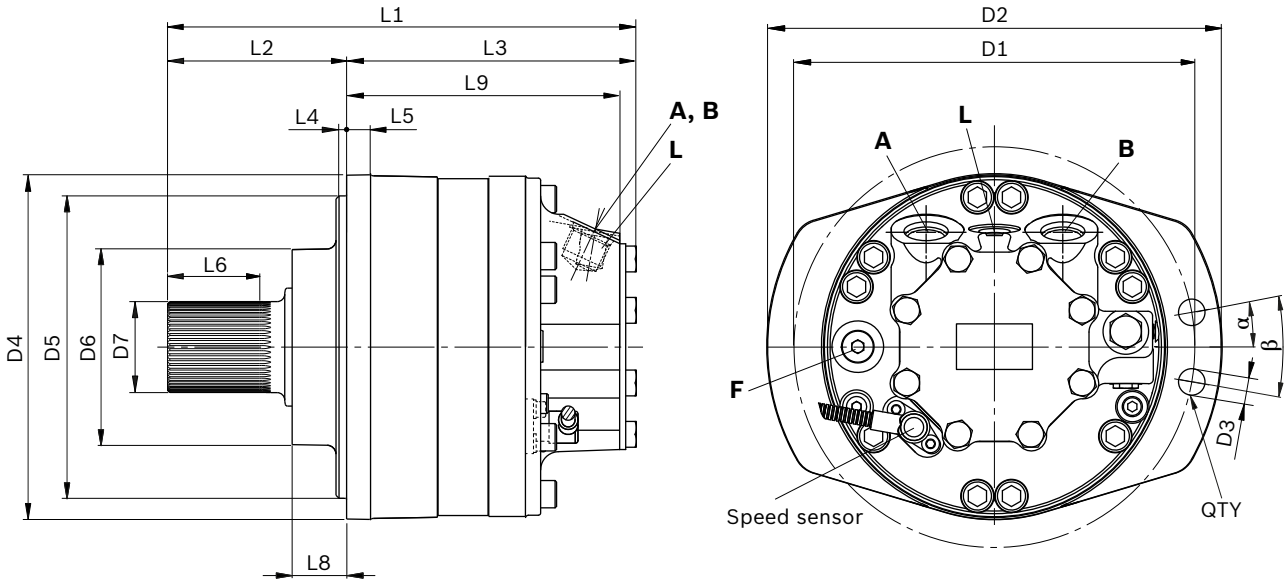
$F_{ax\,max}$ = 82600 N → –

Notice

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

Dimensions

MCR-A single speed (1L)



Motor	D1	D2	D3	D4	D5	D6	D7
MCR3	ø210	ø237	ø14	ø198	ø180	ø100	ø45.52
MCR5	ø265	ø300	ø17.5	ø228	ø200	ø131	ø60.2
MCR10	ø300	ø335	ø17.5	ø262	ø224	ø160	ø74.6
MCR15	ø335	ø375	ø22.5	ø310	ø280	ø176	ø80

Motor	L1	L2	L3	L4	L5	L6	L8	L9	α	β	QTY
MCR3	242	75	167	6	15	54	24	157	0°	15°	10
MCR5	308.5	118.5	190	5	23	61	36	179	10°	20°	8
MCR10	352	110	242	12	25	47	32	223	0°	15°	10
MCR15	383.5	133	250.5	17	26	57	46	224.9	10°	20°	8

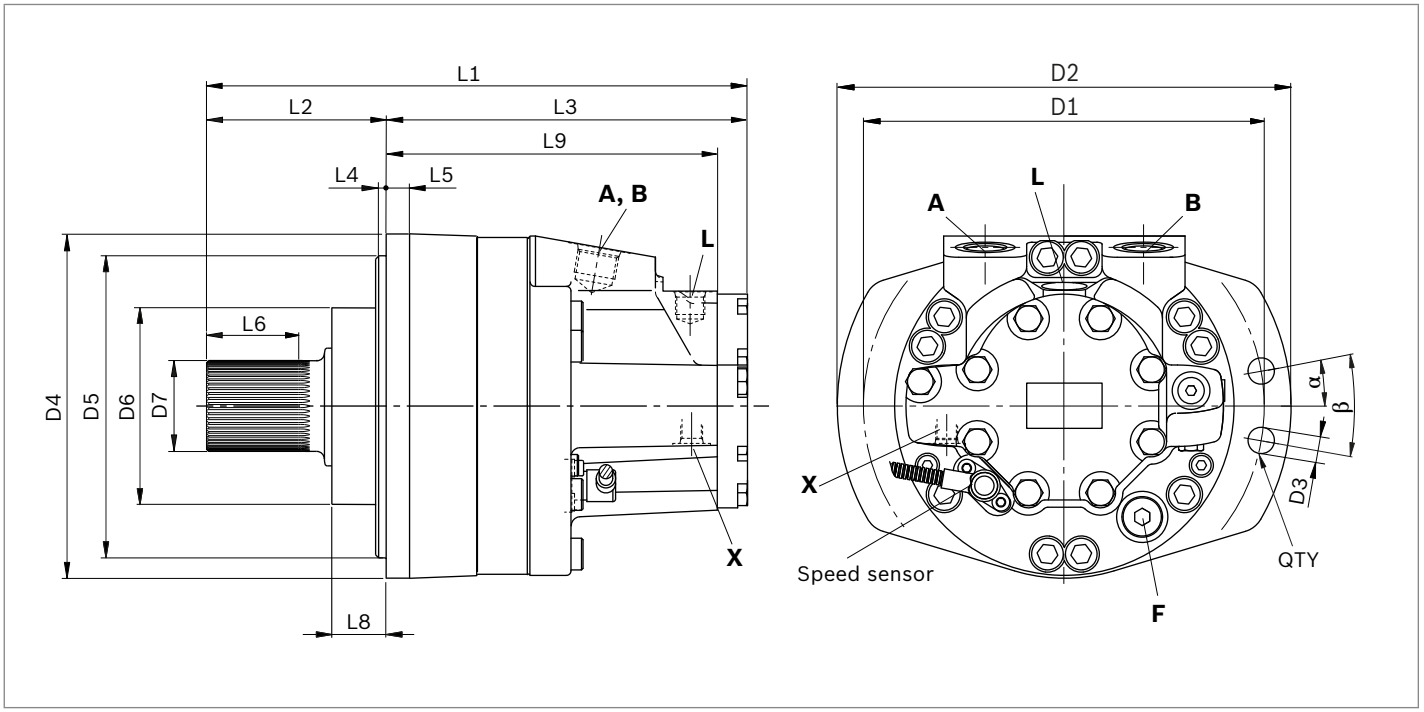
Ports

Motor	Designation	Port function	SAE Ports		BSP Ports			
			Standard	Size	Standard	Size	p_{max} [bar]	State[2]
MCR3	**A, B**	Inlet, outlet	ISO 11926	7/8-14 UNF	ISO 228-1	3/4 BSP	470/420[1]	O
	L	Case drain	ISO 11926	9/16-18 UNF	ISO 228-1	3/8 BSP	10	O
	F	Filler port	ISO 11926	3/4-16 UNF	ISO 228-1	1/2 BSP	10	X
MCR5	**A, B**	Inlet, outlet	ISO 11926	1 1/16-12 UNF	ISO 228-1	3/4 BSP	470/420[1]	O
	L	Case drain	ISO 11926	3/4-16 UNF	ISO 228-1	3/8 BSP	10	O
	F	Filler port	ISO 11926	3/4-16 UNF	ISO 228-1	1/2 BSP	10	X
MCR10	**A, B**	Inlet, outlet	SAE J518-2	3/4 in	SAE J518-2	3/4 in	420	O
	L	Case drain	ISO 11926	3/4-16 UNF	ISO 228-1	1/2 BSP	10	O
	F	Filler port	ISO 11926	3/4-16 UNF	ISO 228-1	1/2 BSP	10	X
MCR15	**A, B**	Inlet, outlet	SAE J518-2	3/4 in	SAE J518-2	3/4 in	420	O
	L	Case drain	ISO 11926	3/4-16 UNF	ISO 228-1	1/2 BSP	10	O
	F	Filler port	ISO 11926	3/4-16 UNF	ISO 228-1	1/2 BSP	10	X

1) Depends on displacement
2) O = Must be connected (plugged on delivery)
X = Metal plug fitted (in normal operation)

Before finalising your design, request a specific installation drawing. Dimensions may vary from the data sheet.

MCR-A two speed (2WL)



Motor	D1	D2	D3	D4	D5	D6	D7
MCR3	ø210	ø237	ø14	ø198	ø180	ø100	ø45.52
MCR5	ø265	ø300	ø17.5	ø228	ø200	ø131	ø60.2

Motor	L1	L2	L3	L4	L5	L6	L8	L9	α	β	QTY
MCR3	219.5	93.1	226.5	6	15	53.5	22.75	208.5	0°	15°	10
MCR5	358.8	118.5	240.3	10	23	61	36	216.7	10°	20°	8

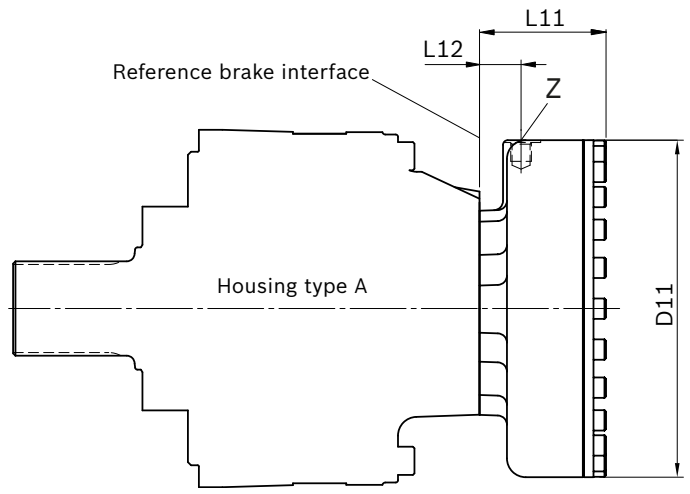
Ports

			SAE Ports		BSP Ports			
Motor	**Designation**	**Port function**	**Standard**	**Size**	**Standard**	**Size**	p_{max} **[bar]**	**State**[2]
MCR3	**A, B**	Inlet, outlet	ISO 11926	1 1/16-12 UNF	ISO 228-1	3/4 BSP	470/420[1]	O
	L	Case drain	ISO 11926	9/16-18 UNF	ISO 228-1	3/8 BSP	10	O
	F	Filler port	ISO 11926	3/4-16 UNF	ISO 228-1	1/2 BSP	10	X
	X	2 speed port	ISO 11926	9/16-18 UNF	ISO 228-1	1/4 BSP	35	O
MCR5	**A, B**	Inlet, outlet	ISO 11926	1 1/16-12 UNF	ISO 228-1	3/4 BSP	470/420[1]	O
	L	Case drain	ISO 11926	3/4-16 UNF	ISO 228-1	3/8 BSP	10	O
	F	Filler port	ISO 11926	3/4-16 UNF	ISO 228-1	1/2 BSP	10	X
	X	2 speed port	ISO 11926	9/16-18 UNF	ISO 228-1	1/4 BSP	35	O

1) Depends on displacement
2) O = Must be connected (plugged on delivery)
X = Metal plug fitted (in normal operation)

Before finalising your design, request a specific installation drawing. Dimensions may vary from the data sheet.

Holding brake (multi-disc brake)



Motor	Brake	L11	L12	D11
MCR3	**B2**	67.3	22	ø174
MCR5	**B2**	67.3	22	ø174
	B4	80.7	**26.5**	ø215
MCR10	**B5**	84.7	26.5	ø215
	B7	97.8	29	ø251
MCR15	**B11**	102.3	33	ø282

			SAE Ports		BSP Ports			
Motor	**Designation**	**Port function**	**Standard**	**Size**	**Standard**	**Size**	**p_{max} [bar]**	**State**[1)]
MCR3	**Z**	Brake port	ISO 11926	9/16-18 UNF	ISO 228-1	1/4 BSP	40	O
MCR5	**Z**	Brake port	ISO 11926	9/16-18 UNF	ISO 228-1	1/4 BSP	40	O
MCR10	**Z**	Brake port	ISO 11926	9/16-18 UNF	ISO 228-1	3/8 BSP	30	O
MCR15	**Z**	Brake port	ISO 11926	9/16-18 UNF	ISO 228-1	3/8 BSP	30	O

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

Before finalising your design, request a specific installation drawing. Dimensions may vary from the data sheet.

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		–	–	●	–	–	–	–

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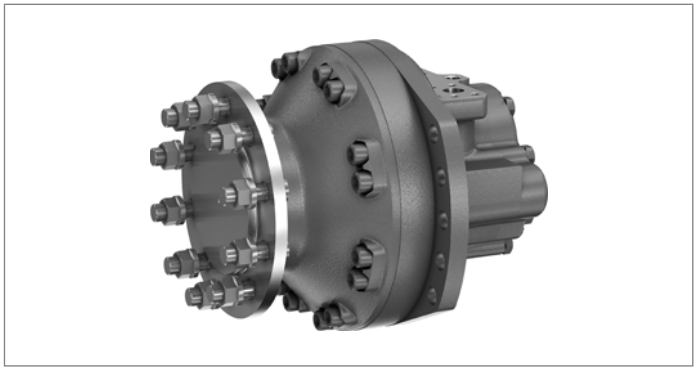
Radial piston motor for compact drives

MCR-C

RE 15197
Edition: 02.2017
Replaces: 12.2013



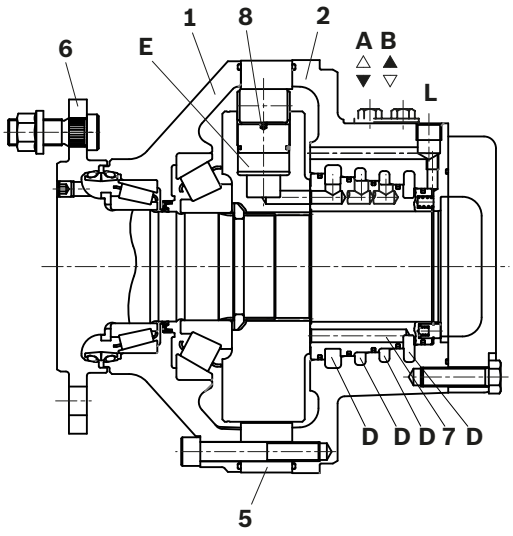
- Frame size MCR20
- Displacement 1750 cc to 3000 cc
- Differential pressure up to 450 bar
- Torque output up to 19099 Nm
- Speed up to 125 rpm
- Open and closed circuits

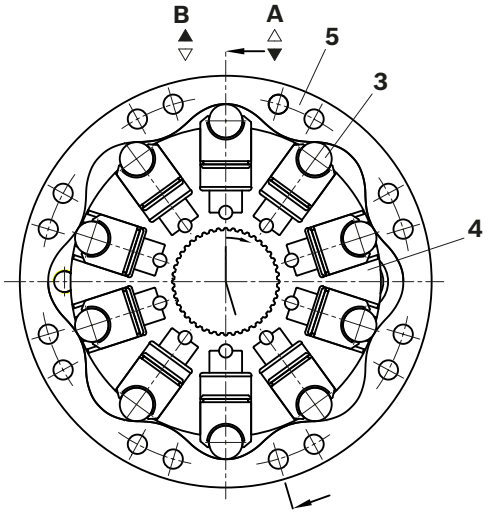
Features

- 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



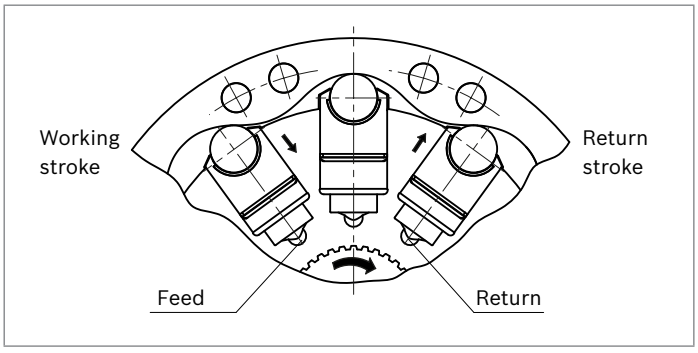


Hydraulic motors of the type MCR-C are radial piston motors with rear case mounting and flanged drive shaft. These motors have a compact front housing and are intended for drives in open or closed circuits. These motors are used in a wide range of applications where there is lower external loading. The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

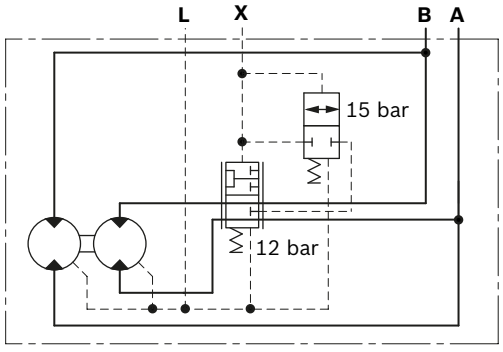
Freewheeling
In certain applications there may be a requirement to free-wheel the motor. This may be achieved by connecting ports **A** and **B** to zero pressure and simultaneously applying a pressure of 2 bar to the housing through port **L**. In this condition, the pistons are forced into the cylinder 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**

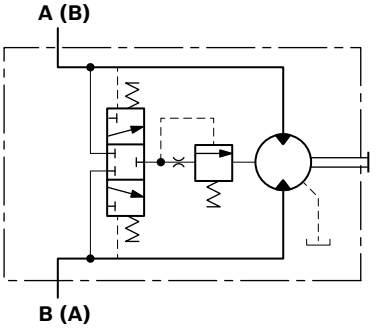


Flushing valve

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

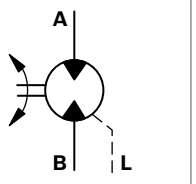
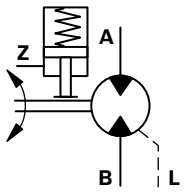
Holding brake (multi-disc brake)

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

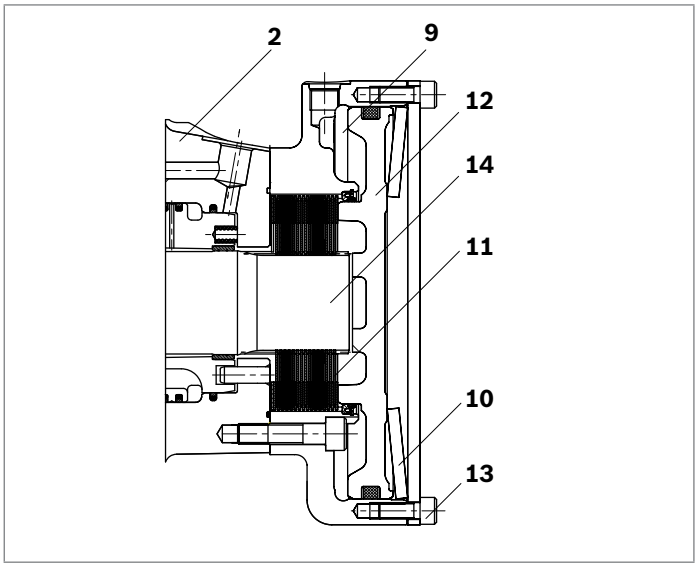
Brake application
As a safety requirement in mobile applications a parking brake may be provided to ensure that the motor cannot turn when the machine is not in use. The parking brake provides holding torque by means of discs (**11**) that are compressed by a disc spring (**10**). The brake is released 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.

Notice
Brakes not for dynamic use!

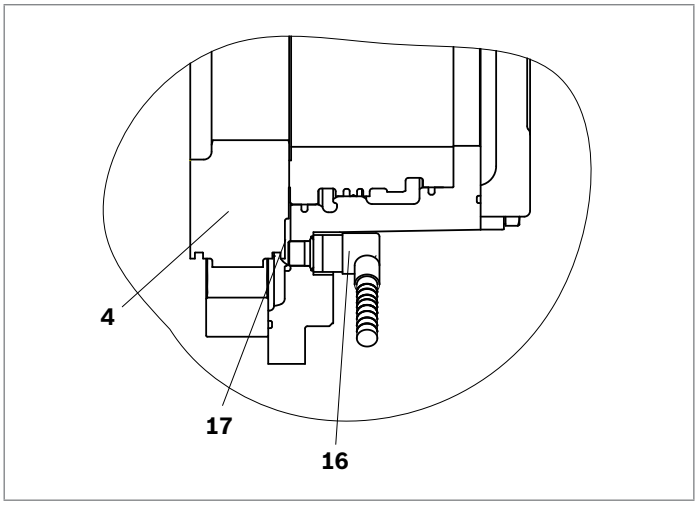
▼ **Schematic diagrams**

Motor without brake	Motor with holding brake
	

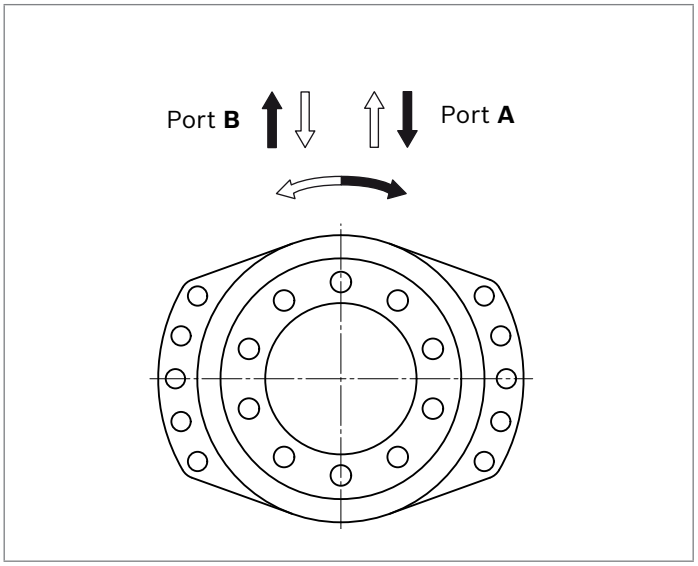
Manual release of holding brake
The brake may also be released manually by loosening screws (**13**).



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 cm^3/rev

			1750	2100	2500	3000
04	Frame size 20					
	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. Other options available on request.

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	*****

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)]			Mineral oil type HLP/HLVP to DIN 51524			
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	
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
			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	30			
Oil volume to operate brake	V_{rel}	cm³	99			

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 any other fluid type contact the Engineering Department at Bosch Rexroth, Glenrothes. For more information on hydraulic fluids, see datasheets 90220 and 90223.
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.

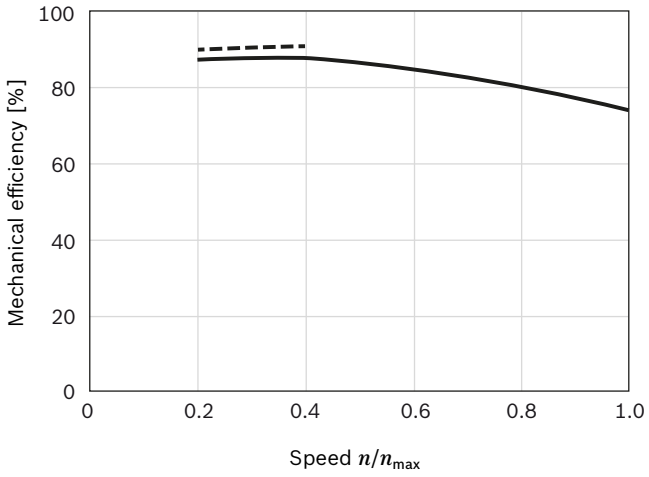
Notice

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

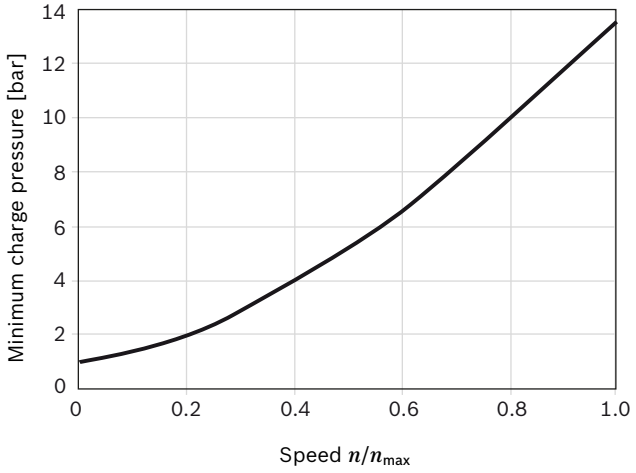
Please refer the related foot notes for more details.

Efficiencies

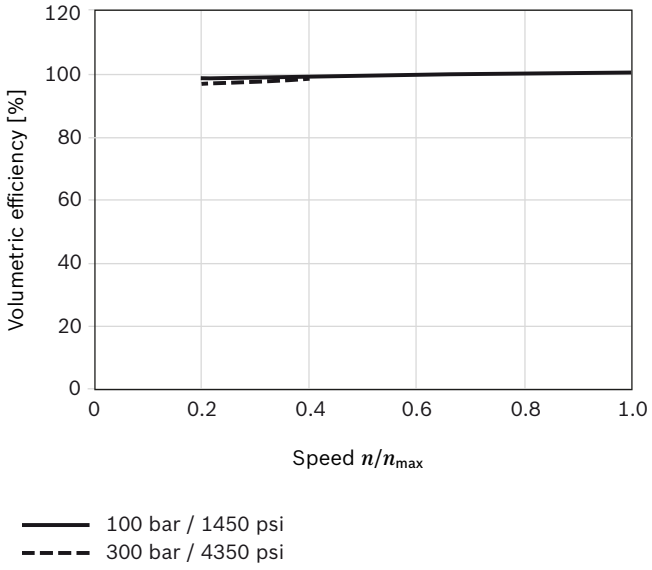
▼ **Mechanical efficiency**



▼ **Charge pressure**



▼ **Volumetric efficiency**



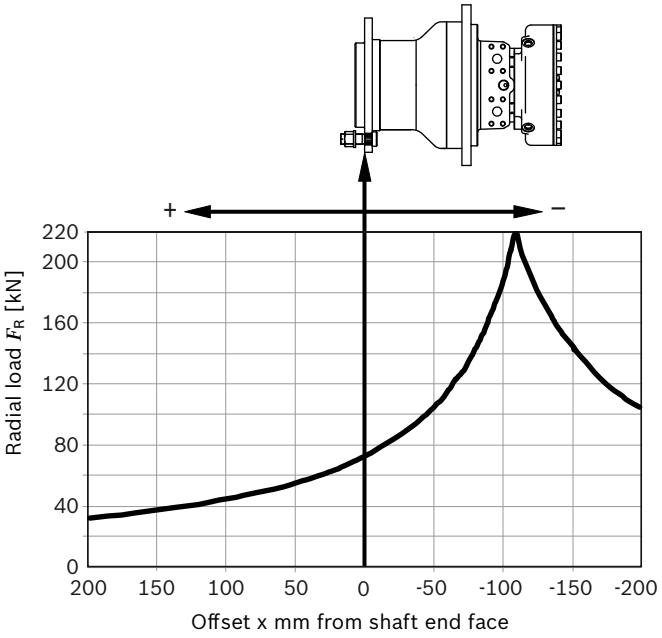
Notice
For specific performance information or operating conditions contact the Engineering Department at Bosch Rexroth, Glenrothes.

Permitted loading on drive shaft

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

Drive shaft ...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 ← +

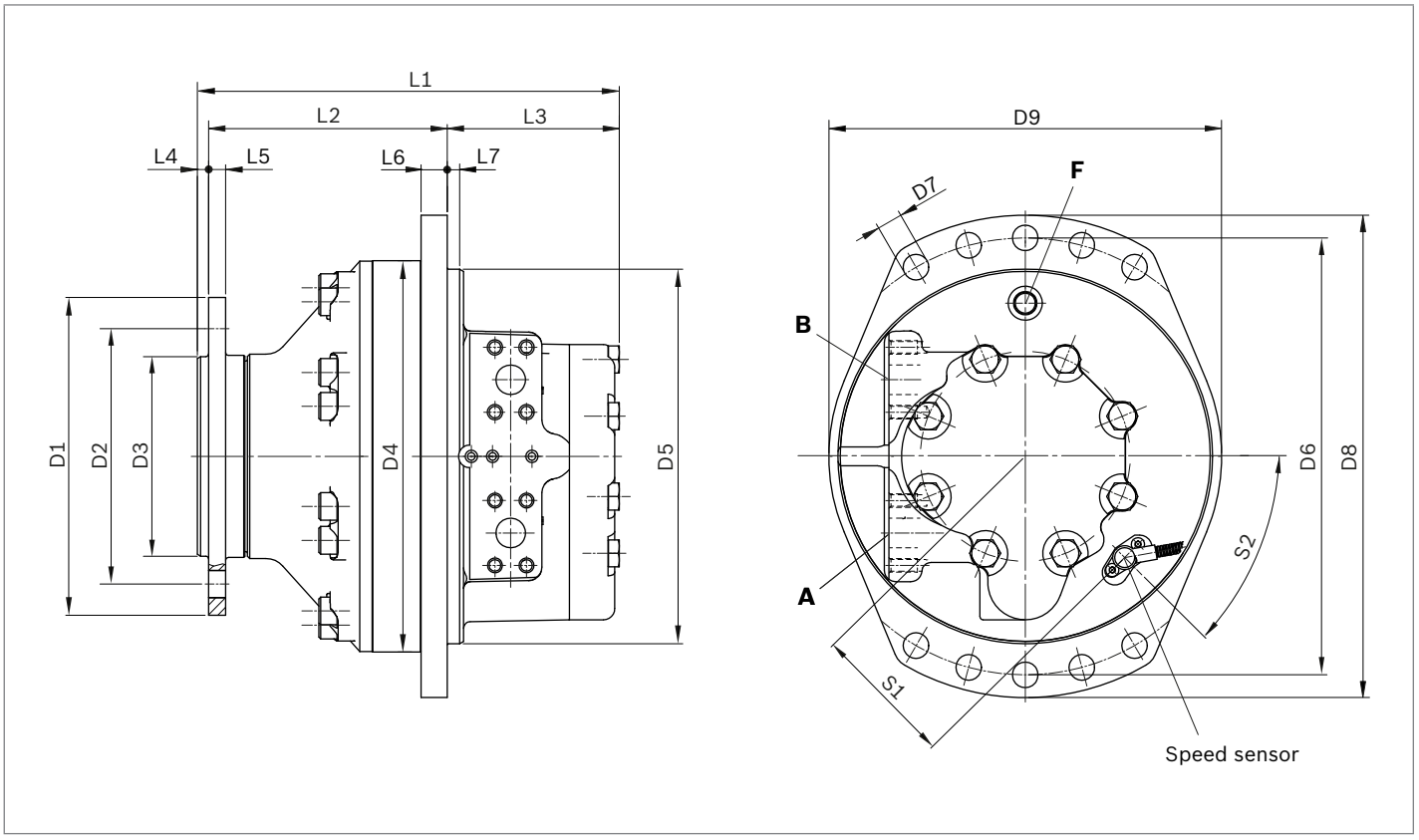
$F_{ax\,max}$ = 49500 N → –

Notice

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

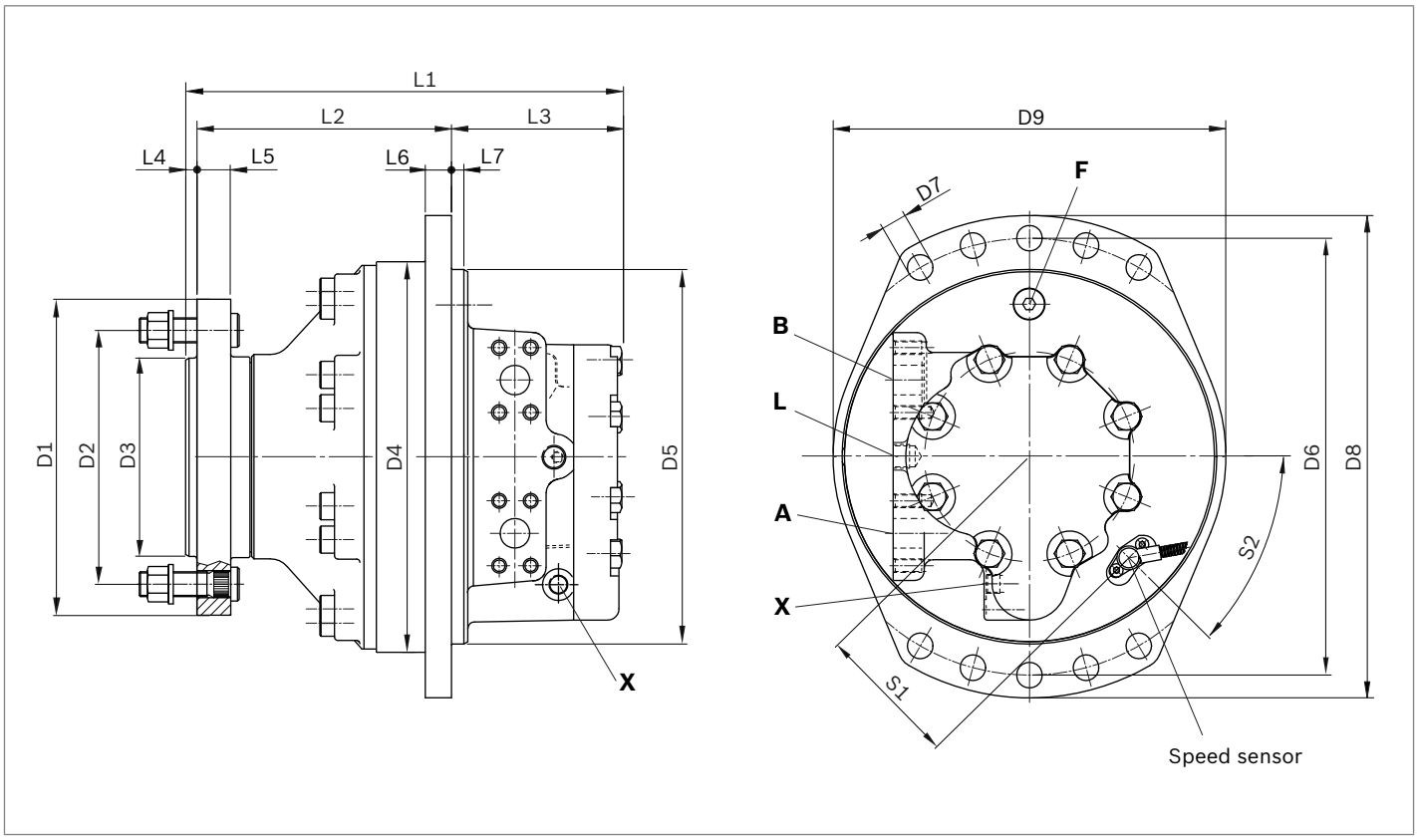
Before finalizing your design, request a binding installation drawing.

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°

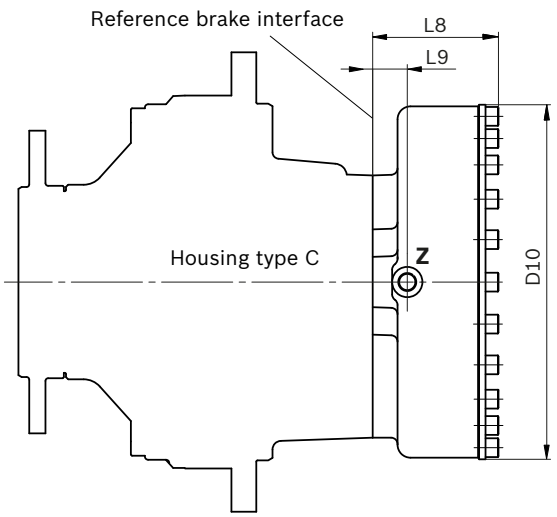
Before finalizing your design, request a binding installation drawing.

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[1)]
MCR20	Z	Brake Port	SAE J515	9/16-18 SAE	30	O

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

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	**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 41** 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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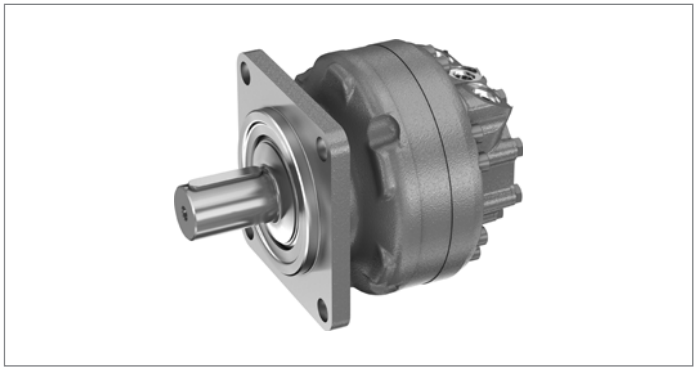
Bosch Rexroth AG, RE 15197/02.2017

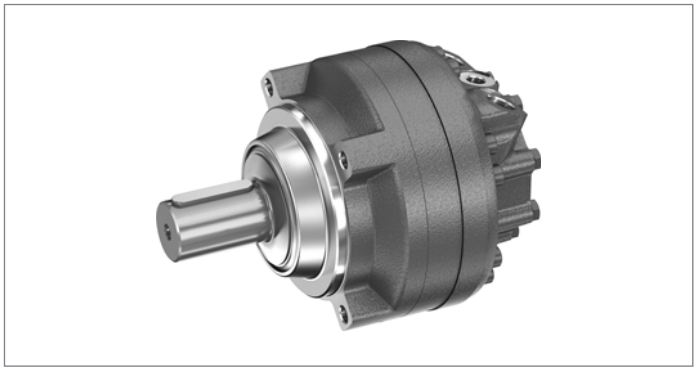
Radial piston motors for industrial applications
MCR-D
MCR-E

RE 15196
Edition: 02.2017
Replaces: 12.2013



MCR-D

- Frame size MCR3, MCR5, MCR10
- Displacement 160 cc to 1340 cc
- Differential pressure up to 450 bar
- Torque output up to 4800 Nm
- Speed up to 875 rpm
- Open and closed circuits



MCR-E

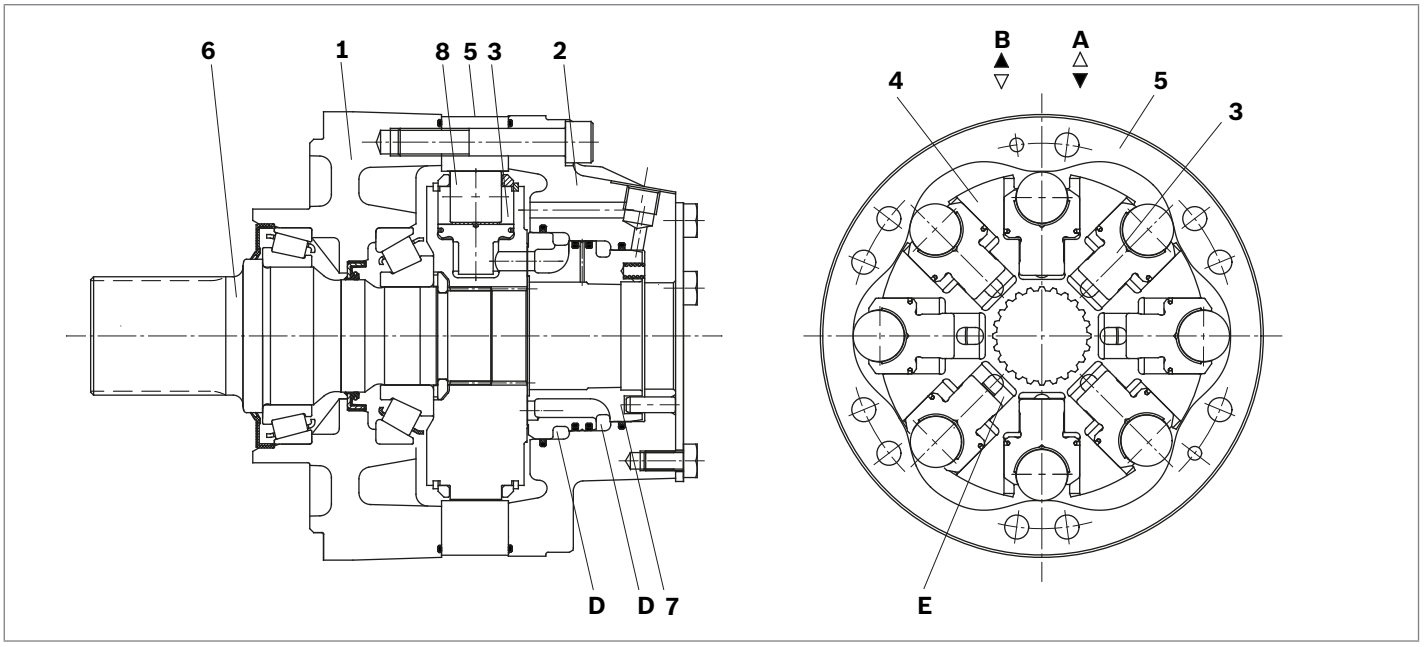
- Frame size MCR5
- Displacement 380 cc to 820 cc
- Differential pressure up to 450 bar
- Torque output up to 3000 Nm
- Speed up to 570 rpm
- Open and closed circuits

Features

- Compact robust construction
- High volumetric and mechanical efficiencies
- Front case mount
- Parallel shaft with key
- 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

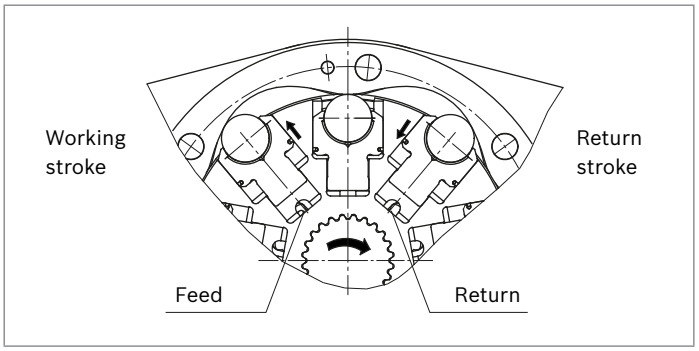


Hydraulic motors of the type MCR-D, MCR-E are radial piston motors with front case mounting and parallel shaft with key. MCR-D and MCR-E have the same type of rotary group and rear case assembly but differ in the front case mounting. These motors are intended for open or closed circuit operations as drive motors for various industrial applications.

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.

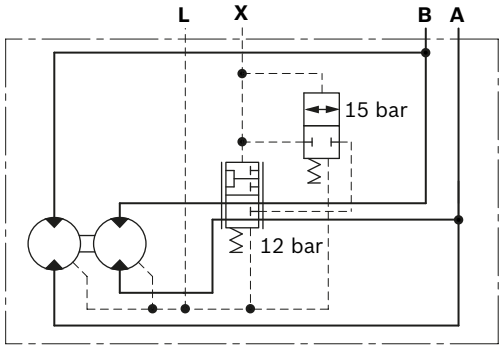
Freewheeling
In certain applications there may be a requirement to free-wheel the motor. This may be achieved by connecting ports **A** and **B** to zero pressure and simultaneously applying a pressure of 2 bar to the housing through port **L**. In this condition, the pistons are forced into the cylinder 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**

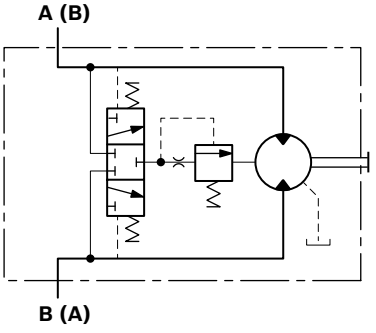


Flushing valve

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 anti-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

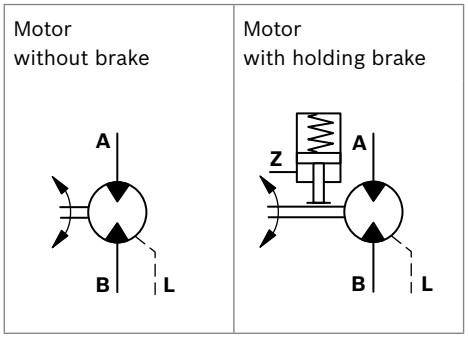
Holding brake (multi-disc brake)

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

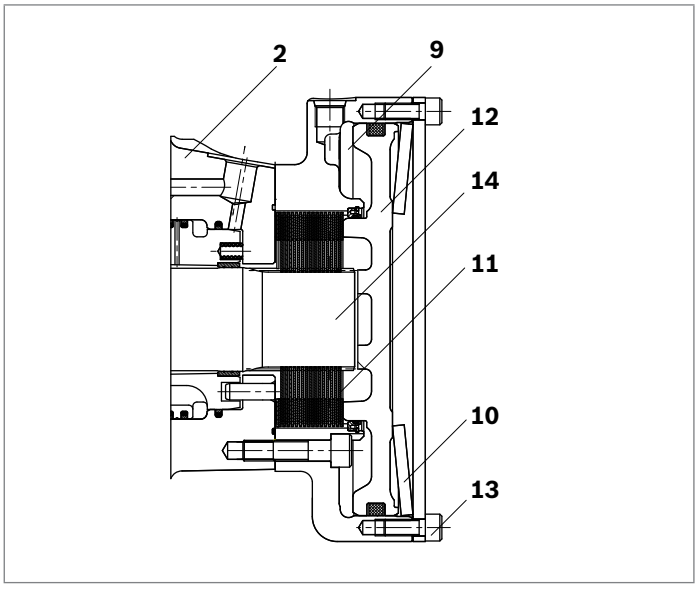
Brake application
As a safety requirement in mobile applications a parking brake may be provided to ensure that the motor cannot turn when the machine is not in use. The parking brake provides holding torque by means of discs (**11**) that are compressed by a disc spring (**10**). The brake is released 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.

Notice
Brakes not for dynamic use!

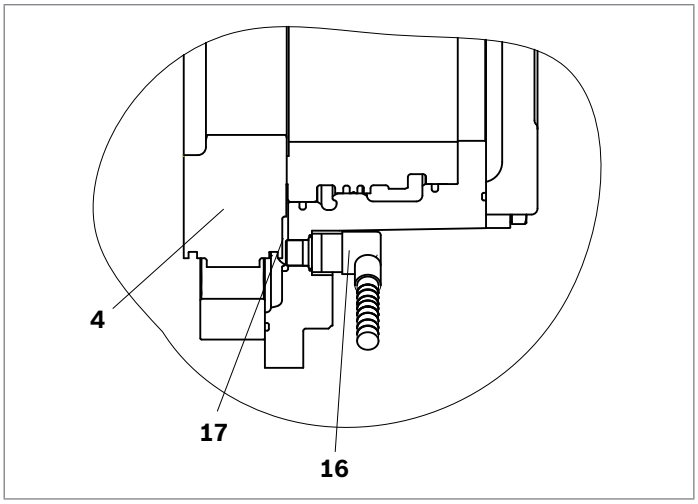
▼ **Schematic diagrams**



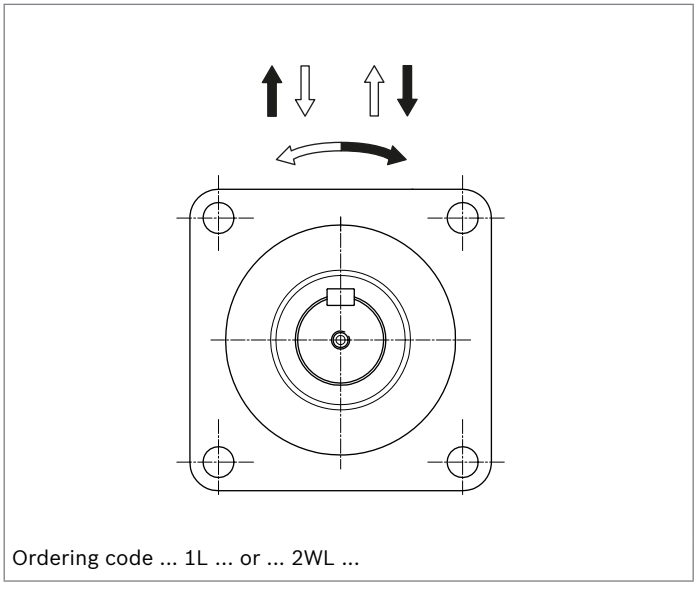
Manual release of holding brake
The brake may also be released manually by loosening screws (**13**).



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					**Z**	**/**	**33**									

Radial piston motor

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

Frame size

			MCR-D	MCR-E	
02	Frame size	3	●	–	**3**
		5	●	●	**5**
		10	●	–	**10**

Housing type

03	Front case square mounting flange - SAE 4 off holes	**D**
	Front case mounting - 4 off M16 tapped holes	**E**

Nominal size, displacement V_g in cm^3/rev

04	Frame size 3 (only for MCR-D)		**160**	**225**	**255**	**280**	**325**	**365**	**400**	
	Low displacement: motors use standard cylindrical pistons	LD	●	●	●	●	–	–	–	
	High displacement: motors use stepped pistons	HD	–	–	–	–	●	●	●	
	Frame size 5		**380**	**470**	**520**	**565**	**620**	**680**	**750**	**820**
	Low displacement: motors use standard cylindrical pistons	LD	●	●	●	●	–	–	–	–
	High displacement: motors use stepped pistons	HD	–	–	–	–	●	●	●	●
	Frame size 10 (only for MCR-D)		**780**	**860**	**940**	**1120**	**1250**	**1340**		
	Low displacement: motors use standard cylindrical pistons	LD	●	●	●	–	–	–		
	High displacement: motors use stepped pistons	HD	–	–	–	●	●	●		

Drive shaft

05	Parallel keyed shaft	ø40 mm only for MCR3D	**L40**
		ø50 mm available for MCR5D and MCR5E	**L50**
		ø60 mm only for MCR10D	**L60**

Through shaft

06	Without through shaft	**Z**

Series

07	Series 33	**33**

Brake

			MCR3	MCR5	MCR10	
08	Without brake		●	●	●	**A0**
	Hydraulic release spring applied multi-disc holding brake	2200 Nm	●	–	–	**B2**
		4400 Nm	–	●	–	**B4**
		7000 Nm	–	–	●	**B7**

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)	**12**
	Tapped with UNF thread (SAE J514) (A and B ports SAE split flange metric bolt holes)	**42**

● = Available – = Not available

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

Studs

12	Without studs (no code)	

Speed sensor

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

Flushing

14	Without flushing (no code)	
	With flushing (see table on page 3)	**F1-F8**

Special order

15	Special feature	**SOXXX**

Other

16	Mark in text here	*

Footer from page 7

1) Not available for E-Type
2) Ensure motor case is filled with oil prior to start-up. See instruction manual 15215-B.
3) For installation and maintenance details, please see instruction manual 15215-B.
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 Δp 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 at 50 °C).
12) Maximum pressure is restricted according to maximum torque

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 based when used with standard mineral oil (HLP).

Please refer the related foot notes for more details.

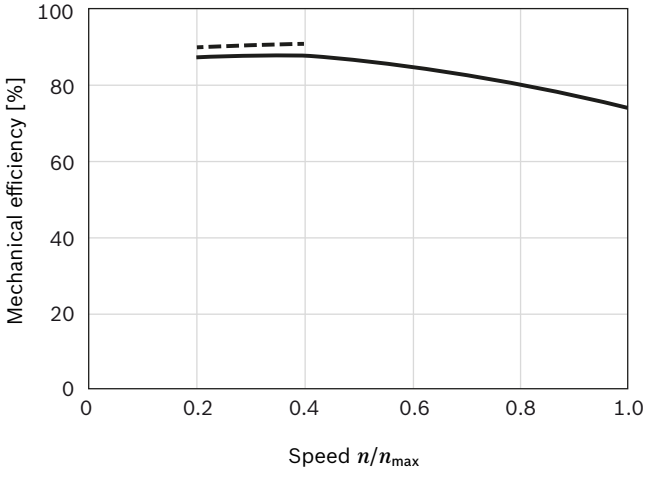
Technical data

Frame size			**MCR3**[1)]	**MCR5**	**MCR10**[1)]				
Type of mounting			Flange mounting, face mounting						
Pipe connections[2)3)]			Threaded per SAE J514; Flanged per SAE J518						
Shaft loading			see page 9						
Weight			**MCR3D**	**MCR5D**	**MCR5E**	**MCR10D**			
Single speed (1L)	*m*	kg	21	39	36	62			
Two speed (2WL)	*m*	kg	27	47	44	67			
Hydraulic fluid[4)]			Mineral oil type HLP/HLVP to DIN 51524						
Fluid cleaniness			ISO 4406, Class 20/18/15						
Fluid viscosity range	$v_{min/max}$	mm²/s	10 to 2000						
Fluid temperature range[5)]	$\theta_{min/max}$	°C	-20 to +85						
Pressure			Low displacement				High displacement		
Maximum differential pressure[6)7)]	Δp_{max}	bar	450				400		
Maximum pressure at port **A** or **B**[6)7)]	p_{max}	bar	470				420		
Maximum case drain pressure	$p_{case\ max}$	bar	10				10		
Motor performance MCR3									
Displacement	V_g	cm³/rev	**160**	**225**	**255**	**280**	**325**	**365**	**400**
Specific torque		Nm/bar	3	4	4	4	5	6	6
Maximum torque[6)12)]	T_{max}	Nm	1146	1500	1500	1500	1500	1500	1500
Minimum speed for smooth running[8)]	n_{min}	rpm	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**
Maximum speed (1L)[9)10)]	n_{max}	rpm	**670**	**475**	**420**	**385**	**330**	**295**	**270**
Maximum speed (2WL)[9)10)]	n_{max}	rpm	**875**	**620**	**550**	**500**	**430**	**385**	**350**
Motor performance MCR5									
Displacement	V_g	cm³/rev	380	470	520	565	620	680	750	820
Specific torque		Nm/bar	6	7	8	9	10	11	12	13
Maximum torque[6)12)]	T_{max}	Nm	2722	3000	3000	3000	3000	3000	3000	3000
Minimum speed for smooth running[8)]	n_{min}	rpm	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Maximum speed (1L)[9)10)]	n_{max}	rpm	475	385	350	320	290	265	240	220
Maximum speed (2WL)[9)10)]	n_{max}	rpm	570	465	420	385	350	320	290	265
Motor performance MCR10									
Displacement	V_g	cm³/rev	780	860	940		1120	1250	1340	
Specific torque		Nm/bar	12	14	15		18	20	21	
Maximum torque[6)12)]	T_{max}	Nm	4800	4800	4800		4800	4800	4800	
Minimum speed for smooth running[8)]	n_{min}	rpm	0.5	0.5	0.5		0.5	0.5	0.5	
Maximum speed (1L and 2WL)[9)10)]	n_{max}	rpm	215	195	180		150	135	125	
Brake			**MCR3D**		**MCR5D, MCR5E**		**MCR5D, MCR5E**		**MCR10D**	
Holding brake (disc brake)			**B2**		**B2**		**B4**		**B7**	
Minimum holding torque	$t_{min/max}$	Nm	2200		2200		4400		7000	
Release pressure (min)	$p_{rel\ min}$	bar	11		11		11		11	
Release pressure (max)	$p_{rel\ max}$	bar	15		15		15		15	
Maximum pressure at brake port „Z“	p_{max}	bar	40		40		40		30	
Oil volume to operate brake	V_{rel}	cm³	23		23		46		36	

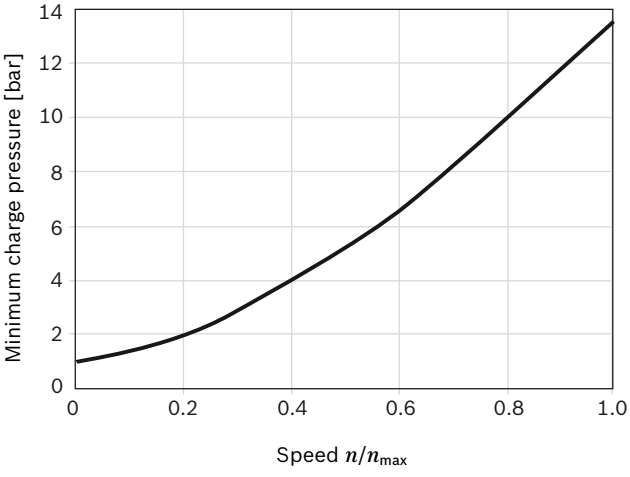
Footer on page 6

Efficiencies

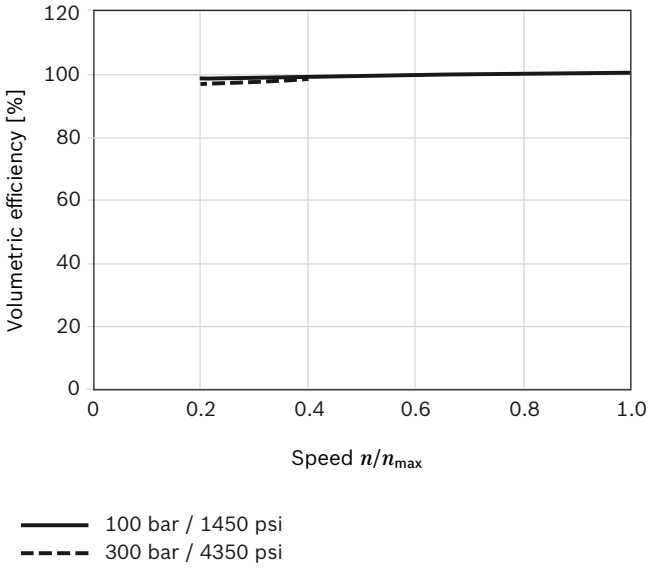
▼ **Mechanical efficiency**



▼ **Charge pressure**



▼ **Volumetric efficiency**



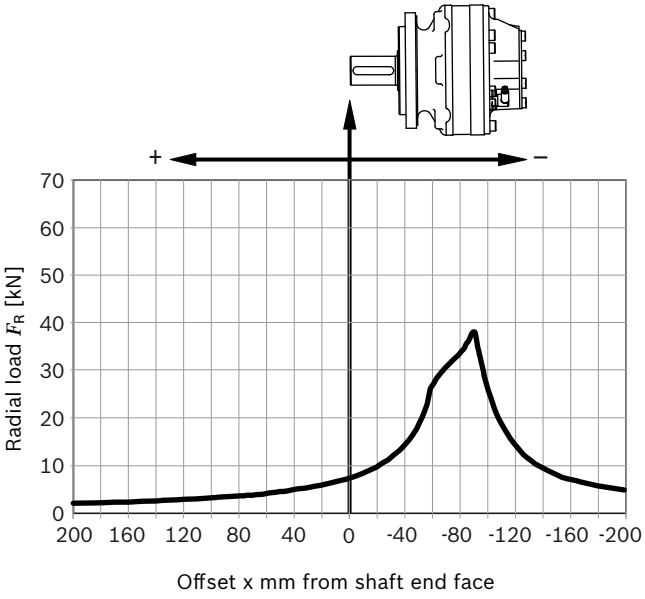
Notice
For specific performance information or operating conditions contact the Engineering Department at Bosch Rexroth, Glenrothes.

Permitted loading on drive shaft

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

Drive shaft ...3D L40...

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



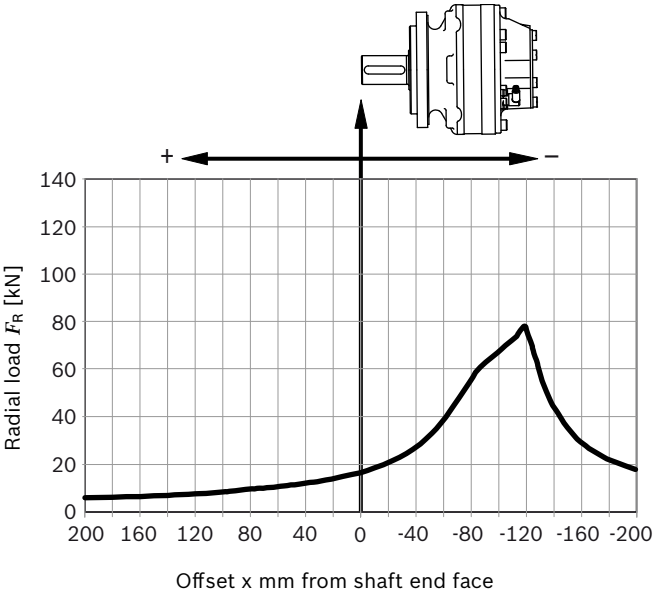
Maximum axial load $F_{ax\,max}$ (with radial load F_R = 0):

$F_{ax\,max}$ = 30200 N ← +

$F_{ax\,max}$ = 27000 N → –

Drive shaft ...10D L60...

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



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

$F_{ax\,max}$ = 78700 N ← +

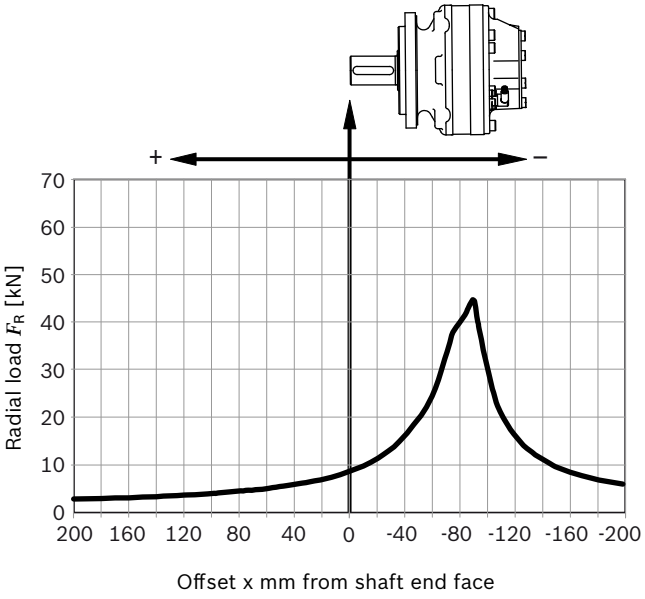
$F_{ax\,max}$ = 63400 N → –

Notice

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

Drive shaft ...5D L50...5E L50...

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



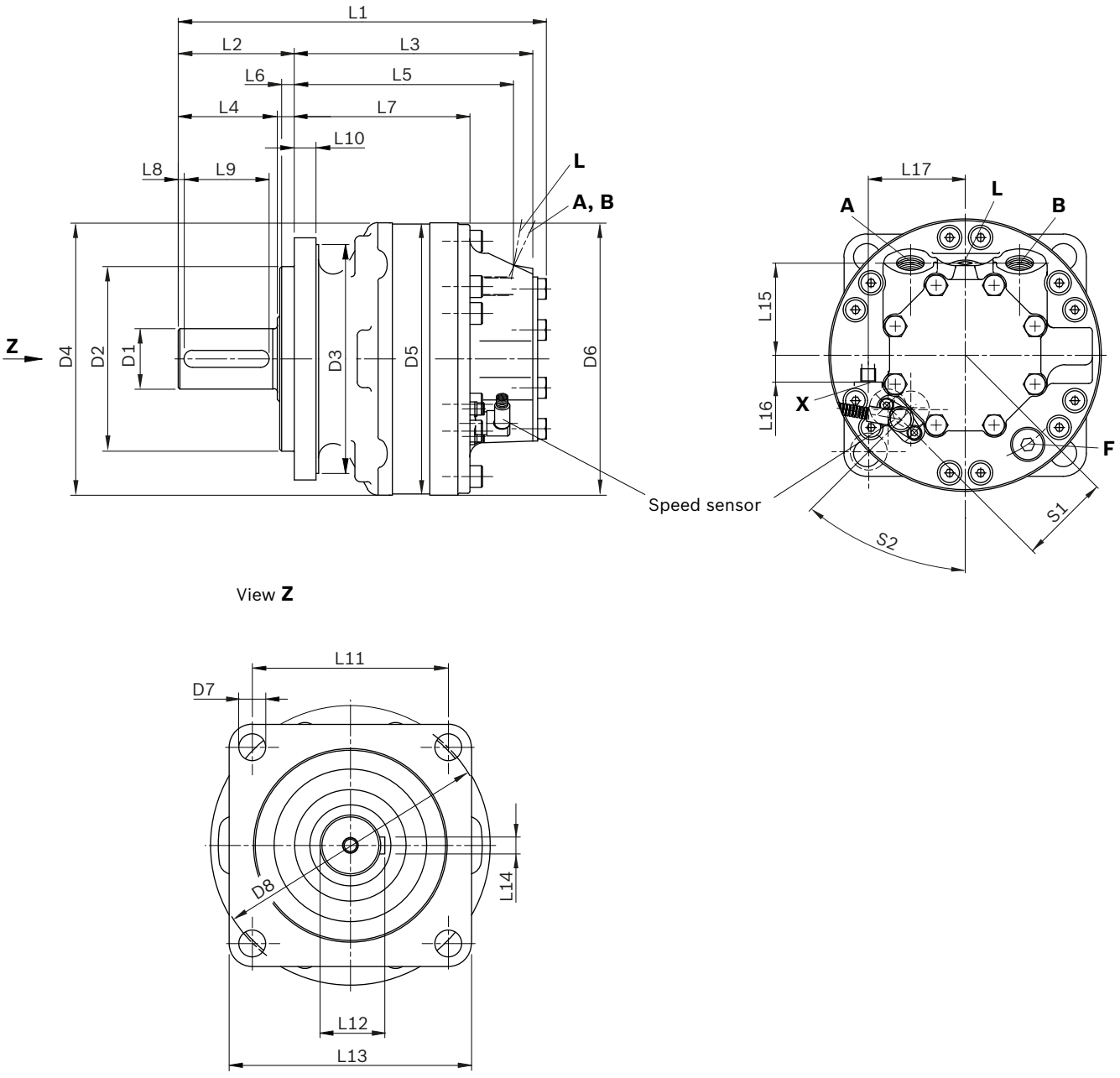
Maximum axial load $F_{ax\,max}$ (with radial load F_R = 0):

$F_{ax\,max}$ = 50000 N ← +

$F_{ax\,max}$ = 32000 N → –

Dimensions

MCR-D



Before finalizing your design, request a binding installation drawing.

Single speed (1L)

Motor	D1	D2	D3	D4	D5	D6	D7	D8	L1	L2	L3	L4	L5	L6
MCR3	ø40	ø125	ø134	–	ø180	–	ø14	ø160	281.3	114.4	167	84.5	133	9
MCR5	ø50	ø152.4	ø189	ø225	ø223	ø225	ø22	ø229	304	96	197	82	181	10.5
MCR10	ø60	ø152.4	ø189	ø264	ø262	ø262	ø20.5	ø229	407	123	259	105	223	10.5

Motor	L7	L8	L9	L10	L11	L12	L13	L14	L15	S1	S2
MCR3	112	5	70	14	113	43	140	12	66.5	63.5	90°
MCR5	145	5	70	18	162	53.5	200	14	76	75	45°
MCR10	182	6	80	19	162	64	200	18	98	89	45°

Two speed (2WL)

Motor	D1	D2	D3	D4	D5	D6	D7	D8	L1	L2	L3	L4	L5	L6
MCR3	ø40	–	ø134	–	ø180	–	ø14	ø160	341	114.4	226.7	84.5	105.7	9
MCR5	ø50	ø152.4	ø189	ø225	ø223	ø225	ø22	ø229	343	96	237	82	159	10.5
MCR10	ø60	ø152.4	ø189	ø264	ø262	ø262	ø20.5	ø229	432	123	283.5	105	247.5	10.5

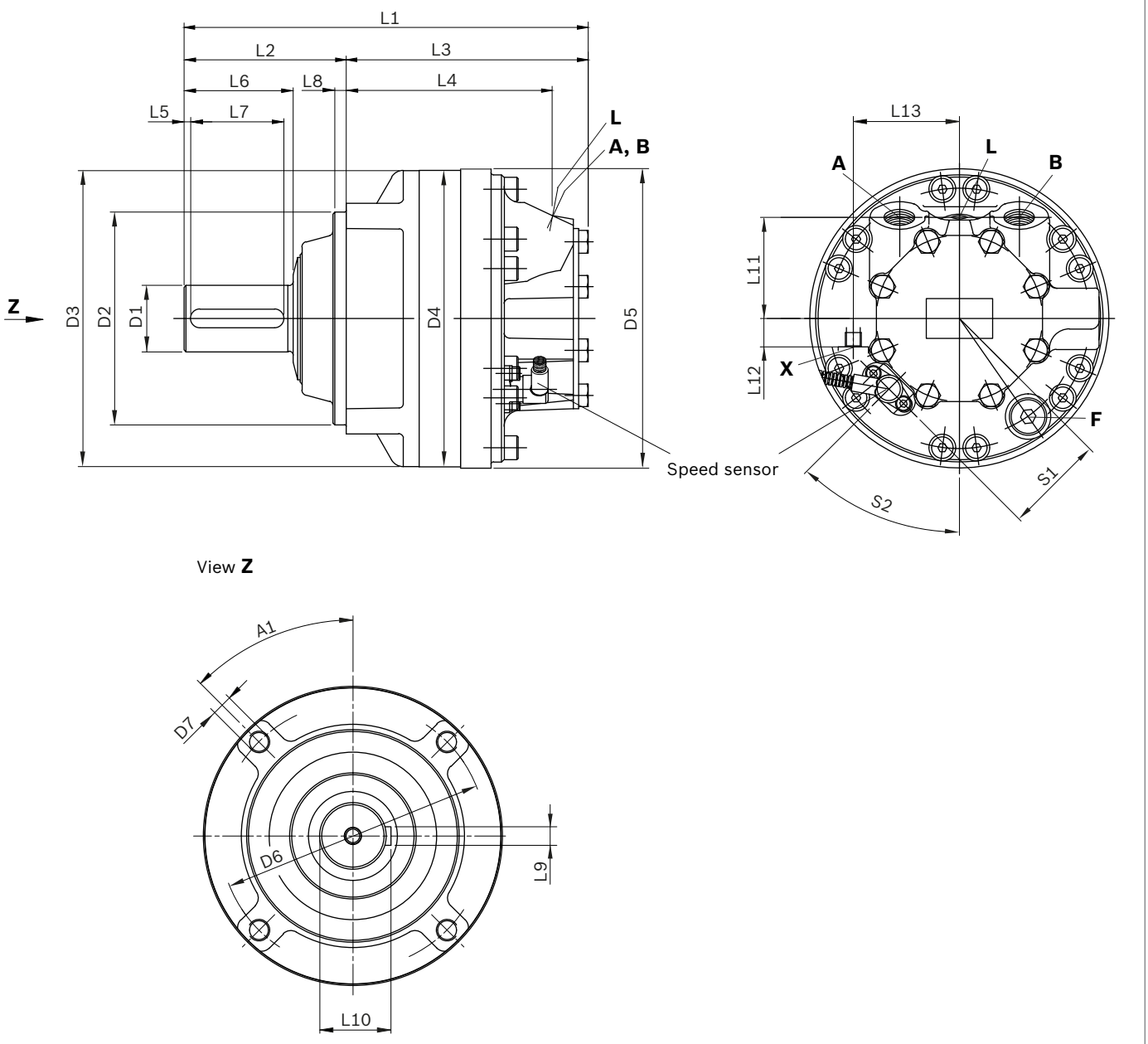
Motor	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	S1	S2
MCR3	112	5	70	14	113	43	140	12	67.5	26	65	63.5	30°
MCR5	–	5	70	18	162	53.5	200	14	105	23.5	78	75	45°
MCR10	180.5	5	80	19	162	64	200	18	88	25	107	89	45°

Ports

Motor	Designation	Port function	Code	Size	p_{max} [bar]	State[2)]
MCR3	**A, B**	Inlet, outlet	SAE J514	7/8-14 UNF[4)] 1 1/16-12 UNF[5)]	470/420[1)]	O
	L	Case drain	SAE J514	9/16-18 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
MCR5	**A, B**	Inlet, outlet	SAE J514	1 1/16-12 UNF	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
MCR10	**A, B**	Inlet, outlet	SAE J518[3)]	3/4 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) Only dimensions according to SAE J518
(Code 62 - high pressure series)
4) Valid for MCR3 single speed
5) Valid for MCR3 two speed

MCR-E



Before finalizing your design, request a binding installation drawing.

Single speed (1L)

Motor	D1	D2	D3	D4	D5	D6	D7	L1	L2	L3	L4	L5
MCR5	ø50	ø160	ø222.5	ø223	ø225	ø200	M16	304	122	182	155	5

Motor	L6	L7	L8	L9	L10	L11	A1	S1	S2
MCR5	82	70	8.5	14	53.45	76	45°	75	45°

Two speed (2WL)

Motor	D1	D2	D3	D4	D5	D6	D7	L1	L2	L3	L4	L5
MCR5	ø50	ø160	ø222.5	ø223	ø225	ø200	M16	343	122	221	134.4	5

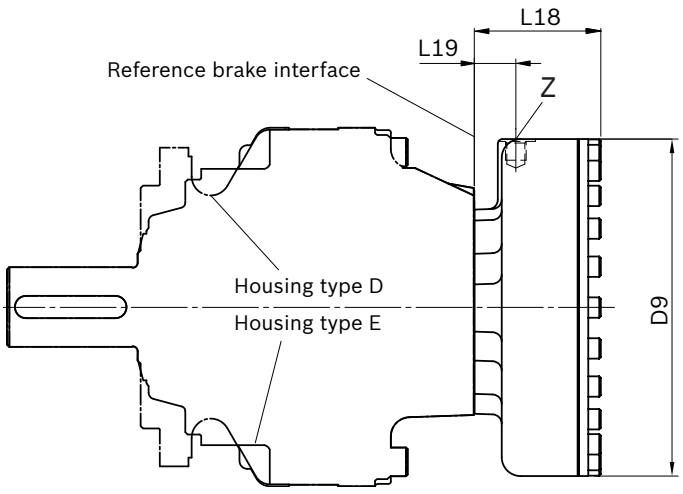
Motor	L6	L7	L8	L9	L10	L11	L12	L13	A1	S1	S2
MCR5	82	70	8.5	14	53.45	76	23.5	78	45°	75	45°

Ports

Motor	Designation	Port function	Code	Size	p_{max} [bar]	State[2)]
MCR5	**A, B**	Inlet, outlet	SAE J514	1 1/16-12 UNF	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) Only dimensions according to SAE J518
(Code 62 - high pressure series)

Holding brake (multi-disc brake)



Motor	Brake	L18	L19	D9
MCR3	**B2**	67.3	22	ø174
MCR5	**B2**	67.3	22	ø174
	B4	80.7	26.5	ø215
MCR10	**B7**	97.8	29	ø251

Motor	Designation	Port function	Code	Size	p_{max} [bar]	State[1)]
MCR3	**Z**	Brake port	SAE J515	9/16-18 SAE	40	O
MCR5	**Z**	Brake port	SAE J515	9/16-18 SAE	40	O
MCR10	**Z**	Brake port	SAE J515	9/16-18 SAE	30	O

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

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	**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 41** Hydraulic drive assist		–	–	–	●	–	–
15214	**MCR-X** Slew drives		●	●	–	–	–	–
15197	**MCR-C** Compact drives		–	–	–	–	–	●
15196	**MCR-D** Industrial applications		●	●	–	●	–	–
	MCR-E Industrial applications		–	●	–	–	–	–

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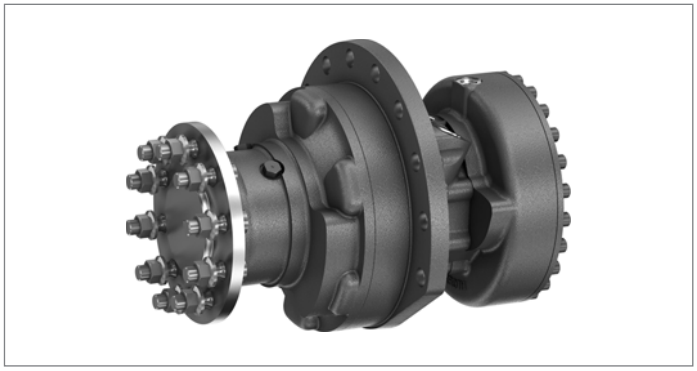
Phone +44 15 92 631 777
Telefax +44 15 92 631 936
www.boschrexroth.com

Radial piston motor for wheel drives
MCR-F

RE 15198
Edition: 02.2017
Replaces 07.2015



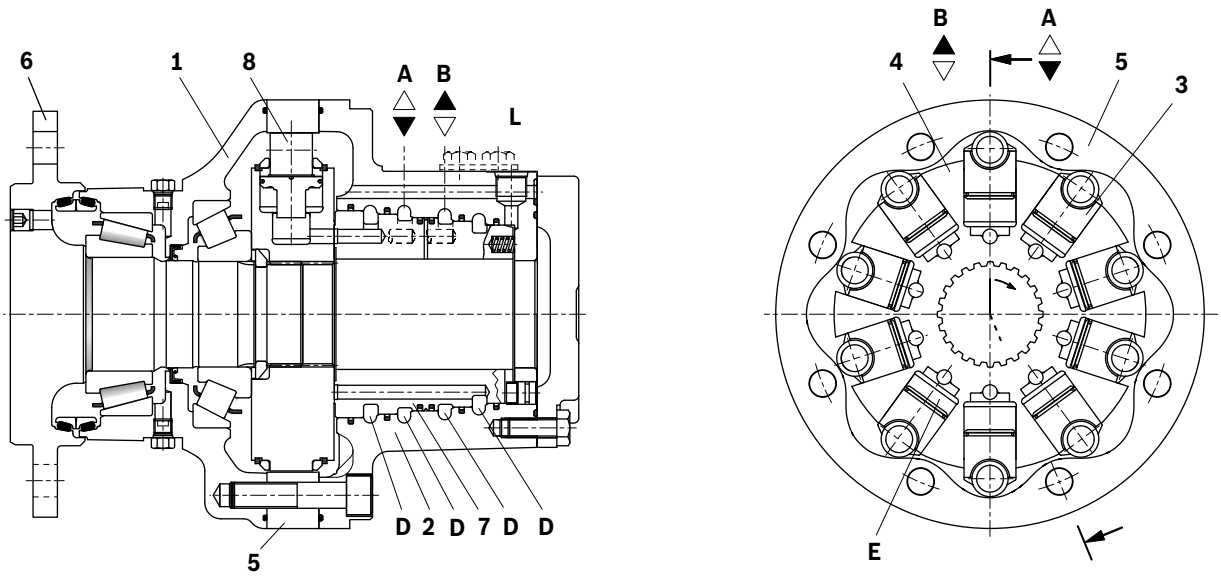
- Frame size MCR3, MCR5, MCR10, MCR15
  (for frame size 20 see MCR20-C)
- Displacement 160 cc to 2150 cc
- Differential pressure up to 450 bar
- Torque output up to 13687 Nm
- Speed up to 875 rpm
- Open and closed circuits

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
- High radial forces permitted on drive shaft
- Freewheeling possible
- Available with:
  - Holding brake (multi-disc) or dynamic (drum) brake
  - Bi-directional two speed
  - Integrated flushing valve
  - Speed sensor

Contents

Functional description

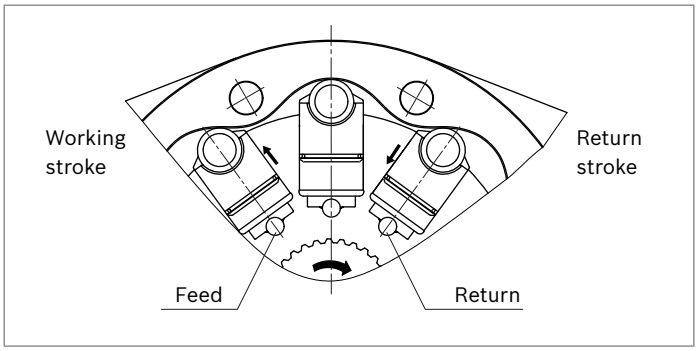


Hydraulic motors of the type MCR-F are radial piston motors with rear case mounting and flange shaft. The MCR-F motors are intended for wheel drives in open or closed circuits. These motors are used in a wide range of applications such as municipal vehicles, fork lift trucks, agricultural and forestry machines. 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 (**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.

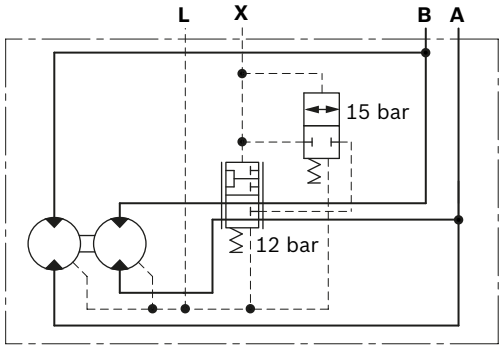
Freewheeling
In certain applications there may be a requirement to free-wheel the motor. This may be achieved by connecting ports **A** and **B** to zero pressure and simultaneously applying a pressure of 2 bar to the housing through port **L**. In this condition, the pistons are forced into the cylinder 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**

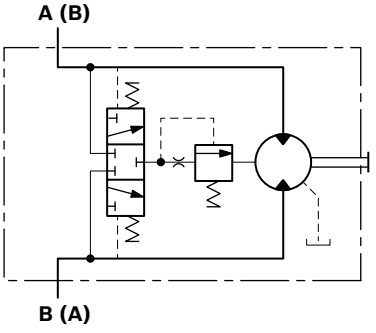


Flushing valve

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 anti-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

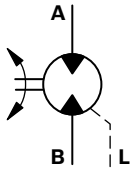
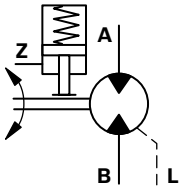
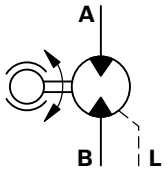
Holding brake (multi-disc brake)

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

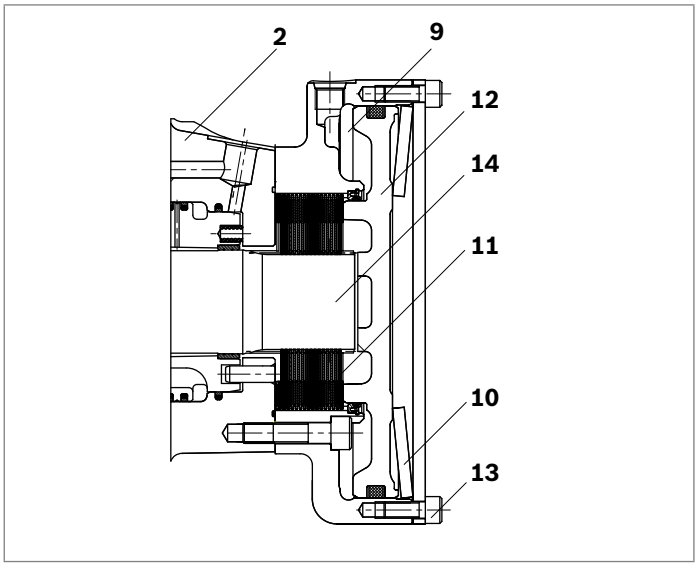
Brake application
As a safety requirement in mobile applications a parking brake may be provided to ensure that the motor cannot turn when the machine is not in use. The parking brake provides holding torque by means of discs (**11**) that are compressed by a disc spring (**10**). The brake is released 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.

Notice
Brakes not for dynamic use!

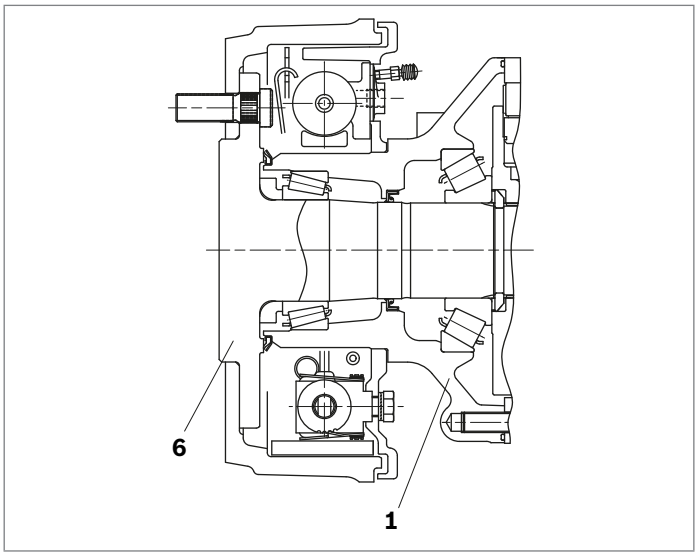
▼ **Schematic diagrams**

Motor without brake	Motor with holding brake	Motor with dynamic brake
		

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



Dynamic brake
Where mechanical dynamic braking is required, a drum brake may be specified. The drum brake is mounted directly onto the drive shaft (**6**) and front housing (**1**). Braking torque is provided by brake shoes acting on the inside of the drum.
The drum brake can also provide mechanical park brake function by use of bowden cable.

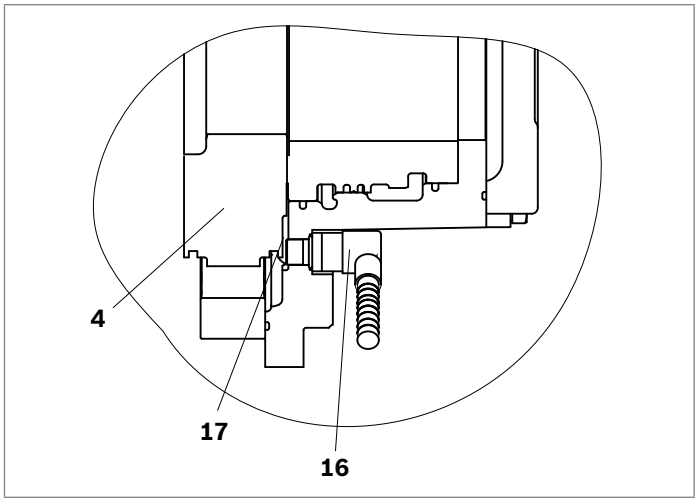


Speed sensor

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.

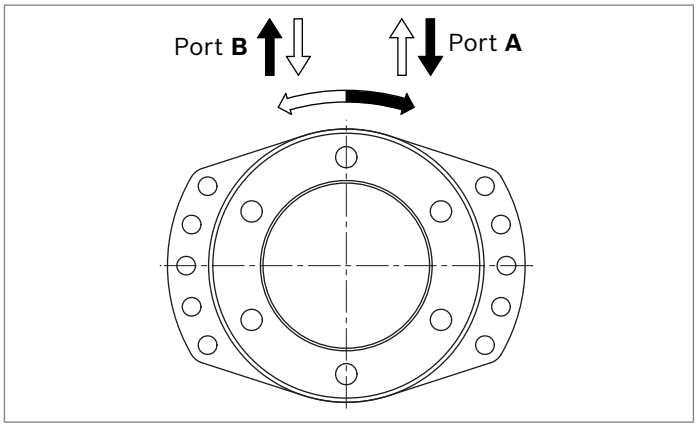
Versions are available for use with regulated supplies 10 V (Code P1) and for direct connection to a 12 V or 24 V unregulated supply (Code P2).

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		**F**			**Z**	**/**										

Radial piston motor

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

Frame size

02	Frame size	3	**3**
		5	**5**
		10	**10**
		15	**15**

Housing type

03	Rear case mounting flange	**F**

Nominal size, displacement V_g in cm^3/rev

04	Frame size 3		**160**	**225**	**255**	**280**	**325**	**365**	**400**	
	Low displacement: motors use standard cylindrical pistons	LD	●	●	●	●	–	–	–	
	High displacement: motors use stepped pistons	HD	–	–	–	–	●	●	●	
	Frame size 5		**380**	**470**	**520**	**565**	**620**	**680**	**750**	**820**
	Low displacement: motors use standard cylindrical pistons	LD	●	●	●	●	–	–	–	–
	High displacement: motors use stepped pistons	HD	–	–	–	–	●	●	●	●
	Frame size 10		**780**	**860**	**940**	**1120**	**1250**	**1340**		
	Low displacement: motors use standard cylindrical pistons	LD	●	●	●	–	–	–		
	High displacement: motors use stepped pistons	HD	–	–	–	●	●	●		
	Frame size 15		**1130**	**1250**	**1500**	**1780**	**2150**			
	Low displacement: motors use standard cylindrical pistons	LD	●	●	●	–	–			
	High displacement: motors use stepped pistons	HD	–	–	–	●	●			

Drive shaft

		MCR3	**MCR5**	**MCR10**	**MCR15**	
05	With flange ø180 mm	●	●	–	–	**F180**
	With flange ø250 mm	–	●	●	–	**F250**
	With flange ø280 mm	–	–	–	●	**F280**

Rear shaft

06	Without rear shaft	**Z**

Series

07	Series 32	**32**
	Series 33	**33**

Brake

			MCR3	**MCR5**	**MCR10**	**MCR15**	
08	Without brake		●	●	●	●	**A0**
	Hydraulic release spring applied multi-disc holding brake	2200 Nm	●	●	–	–	**B2**
		4400 Nm	–	●	–	–	**B4**
		4400 Nm	–	–	●	–	**B5**
		7000 Nm	–	–	●	–	**B7**
		11000 Nm	–	–	–	●	**B11**
	Dynamic brake (drum-brake) with maximum torque	2900 Nm	●	–	–	–	**C2L/R**
		4000 Nm	–	●	–	–	**C4L/R**
		6400 Nm	–	–	●	–	**C7L/R**
		12000 Nm	–	–	–	●	**C12L/R**

● = Available – = Not available

01	02	03	04	05	06		07	08	09	10	11	12	13	14	15	16
MCR		**F**			**Z**	**/**										

Seals

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

Single/two-speed operation		**MCR3**	**MCR5**	**MCR10**	**MCR15**	
10	Single speed, standard direction of rotation	●	●	●	●	**1L**
	Bi-directional two speed, standard direction of rotation	●	●	●	–	**2WL**
	Switchable two speed, anti-clockwise direction of rotation	–	–	–	●	**2L**
	Switchable two speed, clockwise directon of rotation	–	–	–	●	**2R**

Ports		**MCR3**	**MCR5**	**MCR10**	**MCR15**	
11	Tapped with UNF thread (SAE J514)	●	●	–	–	**12**
	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 the 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**

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	*

● = Available – = Not available

Technical data

Frame size			**MCR3**	**MCR5**	**MCR10**	**MCR15**				
Type of mounting			Flange mounting							
Pipe connections[1)2)]			Threaded per SAE J514; Flanged per SAE J518							
Shaft loading			see page 11							
Weight										
Single speed (1L)	m	kg	21	38	65	95				
Two speed (2WL, 2L and 2R)	m	kg	26	46	70	95				
Hydraulic fluid[3)]			Mineral oil type HLP/HLVP to DIN 51524							
Fluid cleaniness			ISO 4406, Class 20/18/15							
Fluid viscosity range	$v_{min/max}$	mm²/s	10 to 2000							
Fluid temperature range[4)]	$\theta_{min/max}$	°C	-20 to +85							
Pressure			Low displacement				High displacement			
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 MCR3										
Displacement	V_g	cm³/rev	160	225	255	280	325	365	400	
Specific torque		Nm/bar	3	4	4	4	5	6	6	
Maximum torque[5)]	T_{max}	Nm	1146	1611	1826	2005	2069	2324	2546	
Minimum speed for smooth running[7)]	n_{min}	rpm	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
Maximum speed (1L)[8)9)]	n_{max}	rpm	670	475	420	385	330	295	270	
Maximum speed (2WL)[8)9)]	n_{max}	rpm	875	620	550	500	430	385	350	
Motor performance MCR5										
Displacement	V_g	cm³/rev	380	470	520	565	620	680	750	820
Specific torque		Nm/bar	6	7	8	9	10	11	12	13
Maximum torque[5)]	T_{max}	Nm	2722	3366	3724	4047	3947	4329	4775	5220
Minimum speed for smooth running[7)]	n_{min}	rpm	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Maximum speed (1L)[8)9)]	n_{max}	rpm	475	385	350	320	290	265	240	220
Maximum speed (2WL)[8)9)]	n_{max}	rpm	570	465	420	385	350	320	290	265
Motor performance MCR10										
Displacement	V_g	cm³/rev	780	860	940		1120	1250	1340	
Specific torque		Nm/bar	12	14	15		18	20	21	
Maximum torque[5)]	T_{max}	Nm	5586	6159	6732		7130	7958	8531	
Minimum speed for smooth running[7)]	n_{min}	rpm	0.5	0.5	0.5		0.5	0.5	0.5	
Maximum speed (1L and 2WL)[8)9)]	n_{max}	rpm	215	195	178		150	135	125	
Motor performance MCR15										
Displacement	V_g	cm³/rev	1130	1250	1500		1780	2150		
Specific torque		Nm/bar	18	20	24		28	34		
Maximum torque[5)]	T_{max}	Nm	8093	8952	10743		11332	13687		
Minimum speed for smooth running[7)]	n_{min}	rpm	0.5	0.5	0.5		0.5	0.5		
Maximum speed (1L, 2L and 2R)[8)9)]	n_{max}	rpm	145	130	110		90	75		

			MCR3		MCR5		MCR10		MCR15	
Holding brake (disc brake)			**B2**		**B2**	**B4**	**B5**	**B7**	**B11**	
Minimum holding torque	$t_{min/max}$	Nm	2200		2200	4400	4400	7000	11000	
Release pressure (min)	$p_{rel\ min}$	bar	11		11	11	11	11	12	
Release pressure (max)	$p_{rel\ max}$	bar	15		15	15	15	15	15	
Maximum pressure at brake port „**Z**“	p_{max}	bar	40		40	40	30	30	30	
Oil volume to operate brake	V_{rel}	cm^3	23		23	46	17	36	77	
			MCR3		**MCR5**		**MCR10**		**MCR15**	
Dynamic brake			**C2L/R**		**C4L/R**		**C7L/R**		**C12L/R**	
Braking torque	$t_{min/max}$	Nm	2000	2900	3000	4000	4700	6400	9000	12000
Brake cable tension		N	1000	1440	1270	1661	1755	2400	2580	3460
Brake port pressure	p_{max}	bar	82	117	73	97	89	120	84	112
Brake cylinder operating volume	V	cm^3	7	7	9	9	13	13	24.91	24.91

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 based when used with standard mineral oil (HLP).
- For MCR20 frame size, please refer MCR-C data sheet (15197).

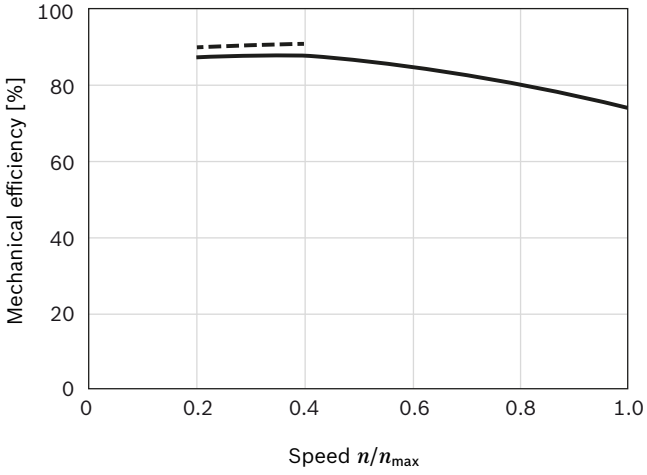
Please refer the related foot notes for more details.

Footer from page 8 and 9

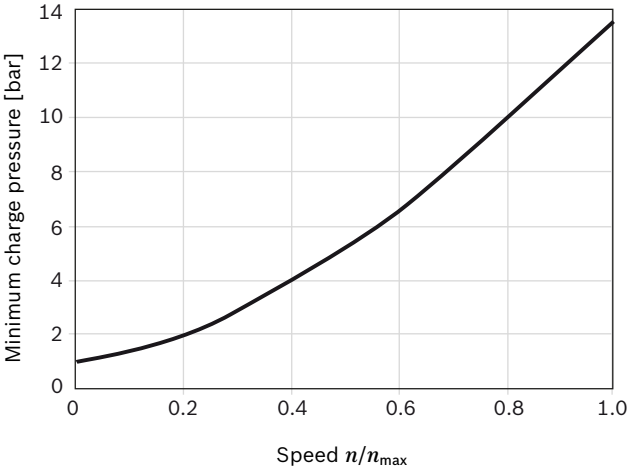
1) Ensure motor case is filled with oil prior to start-up. See instruction manual 15215-B.
2) For installation and maintenance details, please see instruction manual 15215-B.
3) For any other fluid type contact the Engineering Department at Bosch Rexroth, Glenrothes. For more information on hydraulic fluids, see datasheets 90220 and 90223.
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.

Efficiencies

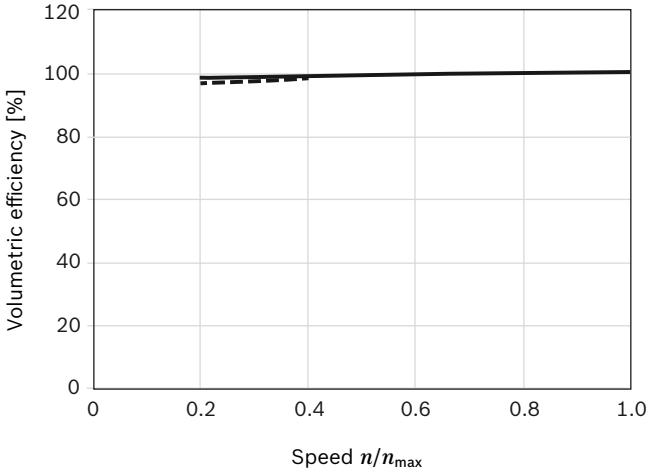
▼ **Mechanical efficiency**



▼ **Charge pressure**



▼ **Volumetric efficiency**



100 bar / 1450 psi
300 bar / 4350 psi

Notice

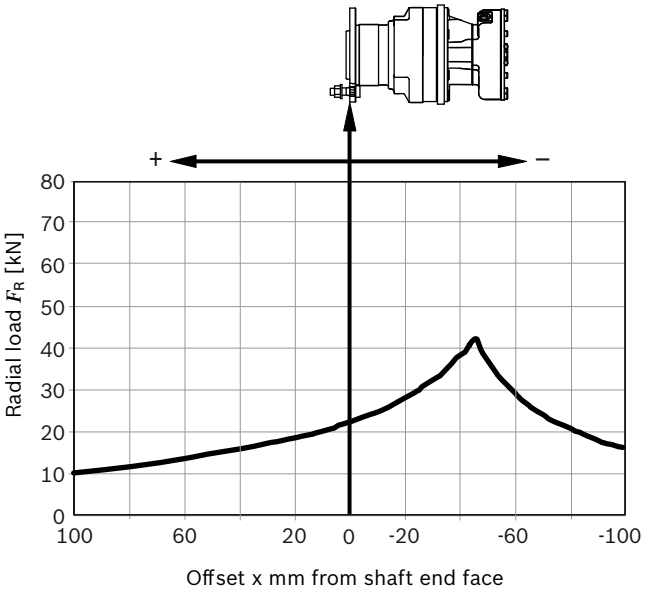
For specific performance information or operating conditions contact the Engineering Department at Bosch Rexroth, Glenrothes.

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)



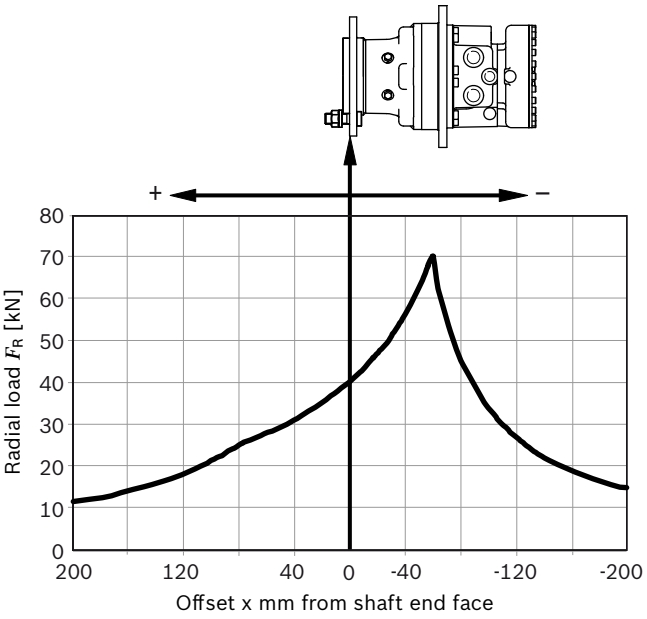
Maximum axial load $F_{ax\,max}$ (with radial load F_R = 0):

$F_{ax\,max}$ = 18300 N ← +

$F_{ax\,max}$ = 28000 N → –

Drive shaft ...5F F250...

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



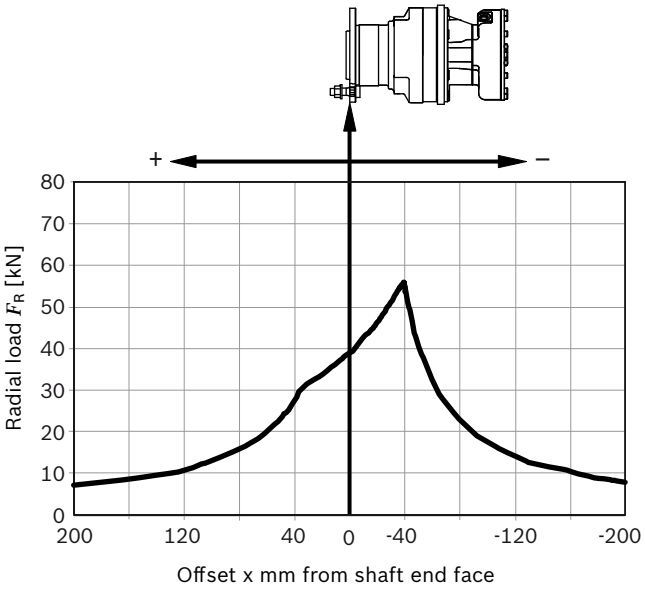
Maximum axial load $F_{ax\,max}$ (with radial load F_R = 0):

$F_{ax\,max}$ = 37500 N ← +

$F_{ax\,max}$ = 36800 N → –

Drive shaft ...5F F180...

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



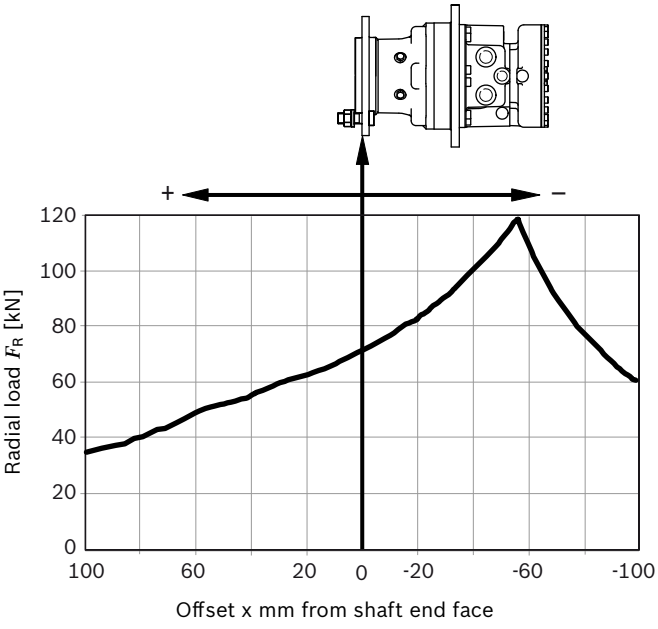
Maximum axial load $F_{ax\,max}$ (with radial load F_R = 0):

$F_{ax\,max}$ = 37500 N ← +

$F_{ax\,max}$ = 36800 N → –

Drive shaft ...10F F250...

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



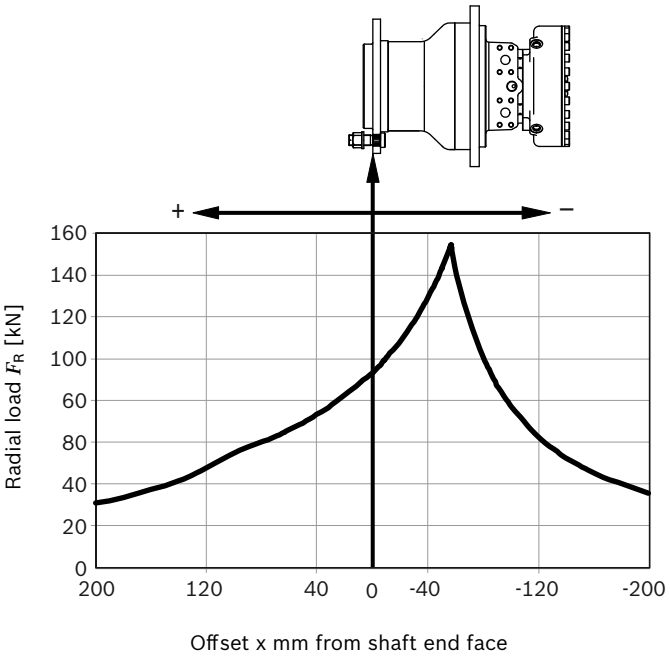
Maximum axial load $F_{ax\,max}$ (with radial load F_R = 0):

$F_{ax\,max}$ = 76100 N ← +

$F_{ax\,max}$ = 67400 N → –

Drive shaft ...15F 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):

$F_{ax\,max}$ = 95400 N ← +

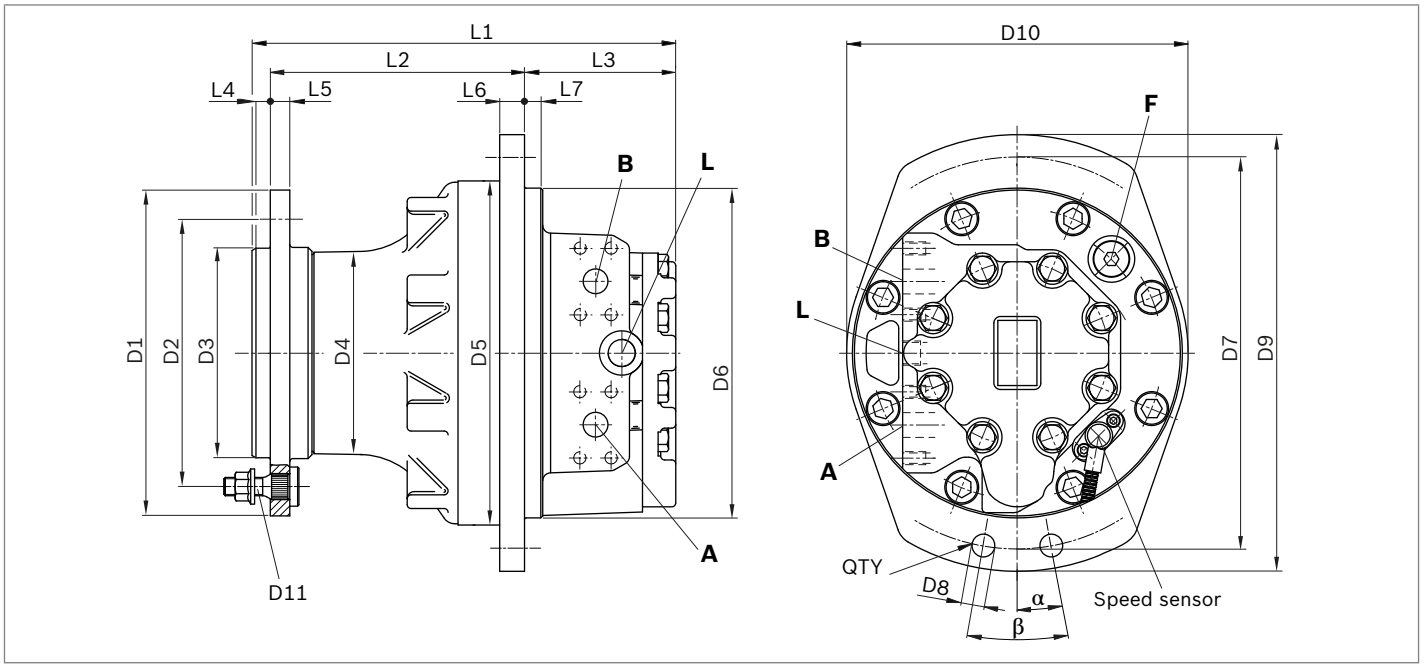
$F_{ax\,max}$ = 88700 N → –

Notice

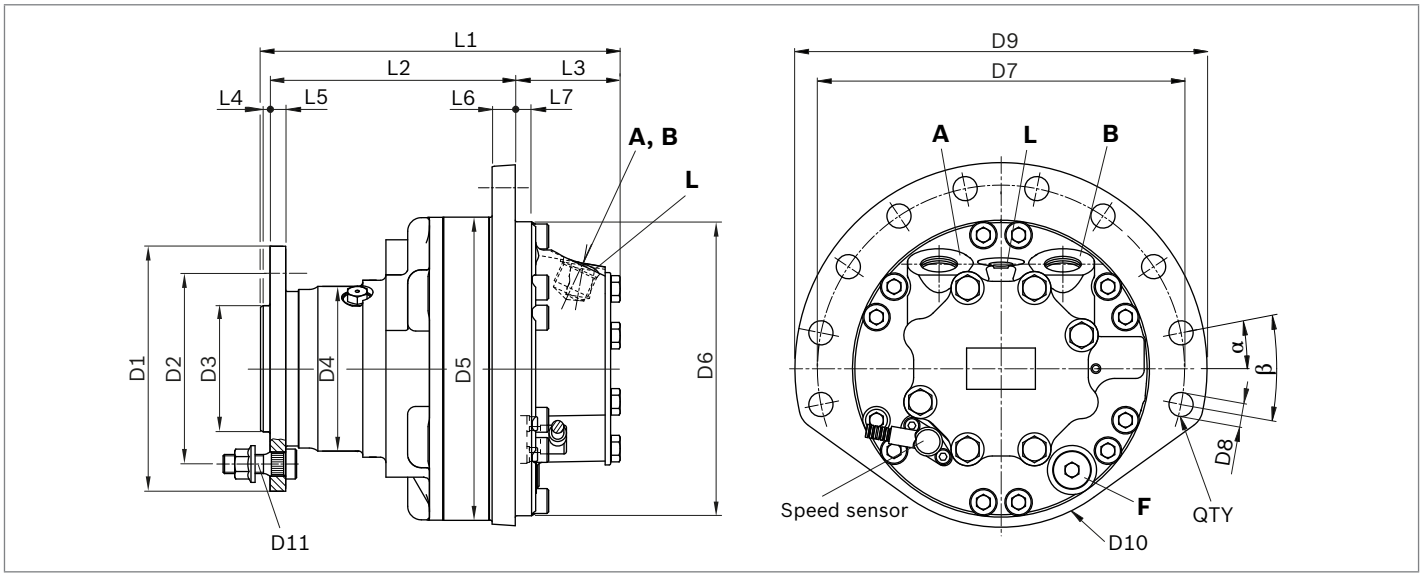
- These values and graphs are for initial guidance only
- For actual motor life calculations under typical or specified duty cycles, contact the Engineering Department at Bosch Rexroth, Glenrothes.
- For drum braked motors, the permitted loading varies depending on the offset.

Dimensions

MCR3F, MCR10F and MCR15F single speed (1L)



MCR5F single speed (1L)



Motor	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11
MCR3	ø172.5	ø140	ø92.8	–	ø180	ø180	ø210	ø14	ø237	ø190	5×M14×1.5
MCR5	ø180	ø140	ø92.7	ø116.5	ø223	ø215.95	ø267	ø17.4	ø298	ø228	8×M20×1.5
MCR10	ø250	ø205	ø160	ø162	ø264	ø253	ø300	ø17.5	ø335	ø264	10×M22×1.5
MCR15	ø280	ø225	ø175.8	ø190	ø304	ø285	ø335	ø17.4	ø375	–	10×M22×1.5

Motor	L1	L2	L3	L4	L5	L6	L7	α	β	QTY
MCR3	217.5	143.5	67	6	12	13	6	0°	15°	10
MCR5	264.1	180	77	5	11.5	17	12	11.25°	22.5°	10
MCR10	325	195	116	14	15	19	12.5	0°	15°	10
MCR15	334.4	219.4	98.9	15	16	36.5	9	10°	20°	8

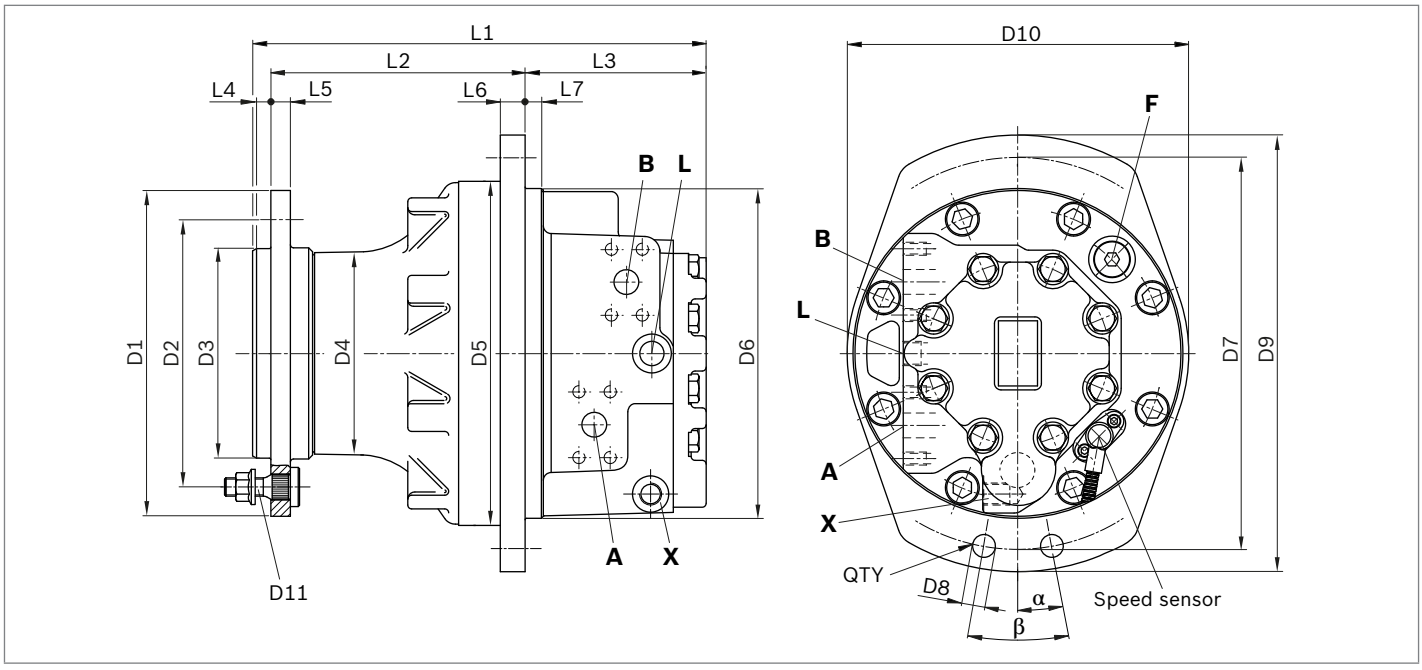
Before finalizing your design, request a binding installation drawing.

Ports

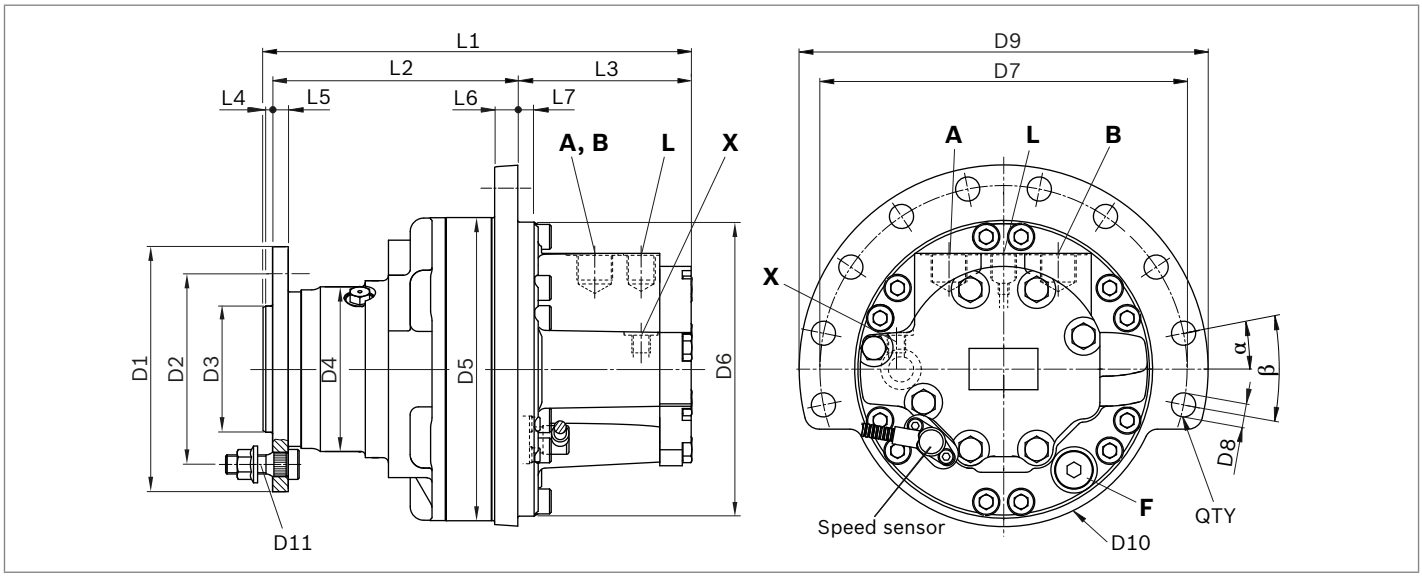
Motor	Designation	Port function	Code	Size	p_{max} [bar]	State[2)]
MCR3	**A, B**	Inlet, outlet	SAE J514	7/8-14 UNF	470/420[1)]	O
	L	Case drain	SAE J514	9/16-18 UNF	10	O
	F	Filler port	SAE J514	3/4-16 UNF	10	X
MCR5	**A, B**	Inlet, outlet	SAE J514	1 1/16-12 UNF	470/420[1)]	O
	L	Case drain	SAE J514	3/4-16 UNF	10	O
	F	Filler port	SAE J514	3/4-16 UNF	10	X
MCR10	**A, B**	Inlet, outlet	SAE J518[3)]	3/4 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
MCR15	**A, B**	Inlet, outlet	SAE J518[3)]	3/4 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)

MCR3F, MCR10F and MCR15F two speed (2WL, 2L and 2R)



MCR5F two speed (2WL, 2L and 2R)



Motor	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11
MCR3	ø172	ø140	ø92.7	–	ø180	ø180	ø210	ø14	ø237	ø190	5×M14×1.5
MCR5	ø180	ø140	ø92.7	ø116.5	ø223	ø215.96	ø267	ø17.4	ø298	ø228	10×M18×1.5
MCR10	ø250	ø205	ø160	ø162	ø264	ø253	ø300	ø17.5	ø330	ø262	8×M20×1.5
MCR15	ø280	ø225	ø175.8	ø190	ø304	ø285	ø335	ø22.4	ø375	–	10×M22×1.5

Motor	L1	L2	L3	L4	L5	L6	L7	α	β	QTY
MCR3	274.1	143.6	123.5	6	12	13	6	0°	15°	10
MCR5	313.8	180	126.7	7	11.5	17	12	11.25°	22.5°	10
MCR10	350	195	141	14	15	19	12.5	0°	15°	10
MCR15	334.4	219.5	98.9	14	16	36.5	9	10°	20°	8

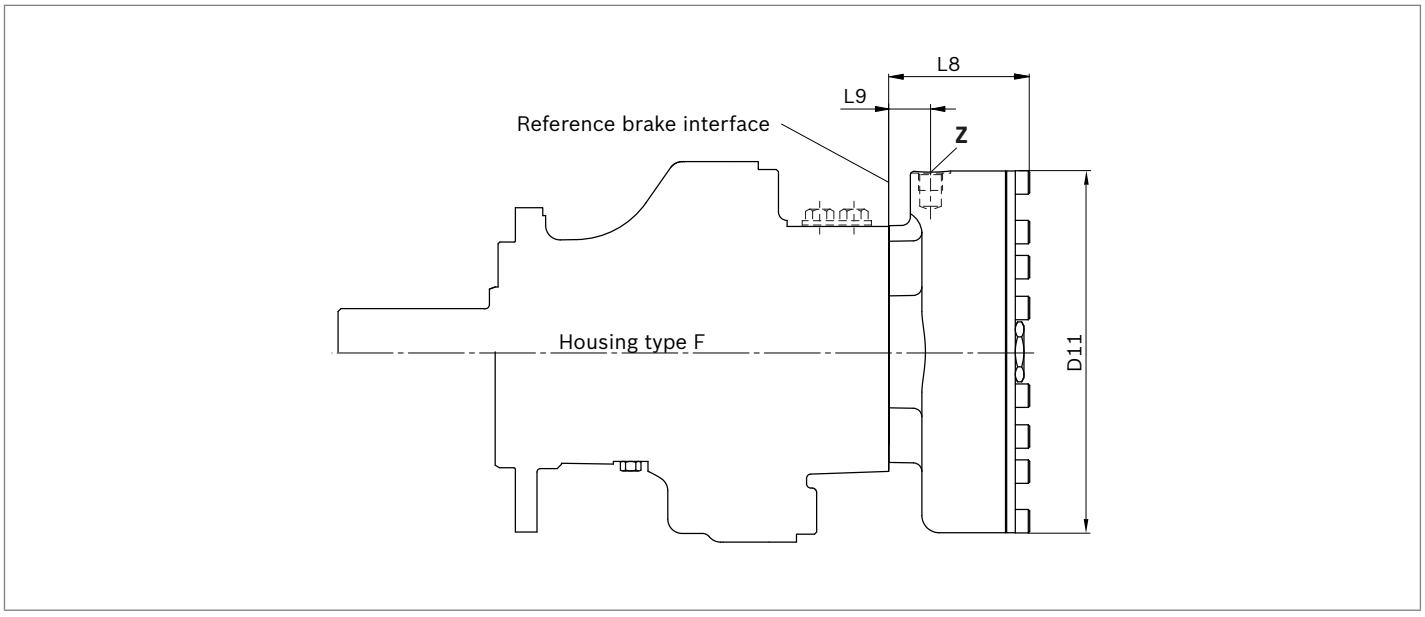
Before finalizing your design, request a binding installation drawing.

Ports

Motor	Designation	Port function	Code	Size	p_{max} [bar]	State[2)]
MCR3	**A, B**	Inlet, outlet	SAE J514	1 1/16-12 UNF	470/420[1)]	O
	L	Case drain	SAE J514	9/16-18 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
MCR5	**A, B**	Inlet, outlet	SAE J514	1 1/16-12 UNF	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
MCR10	**A, B**	Inlet, outlet	SAE J518[3)]	3/4 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
MCR15	**A, B**	Inlet, outlet	SAE J518[3)]	3/4 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)



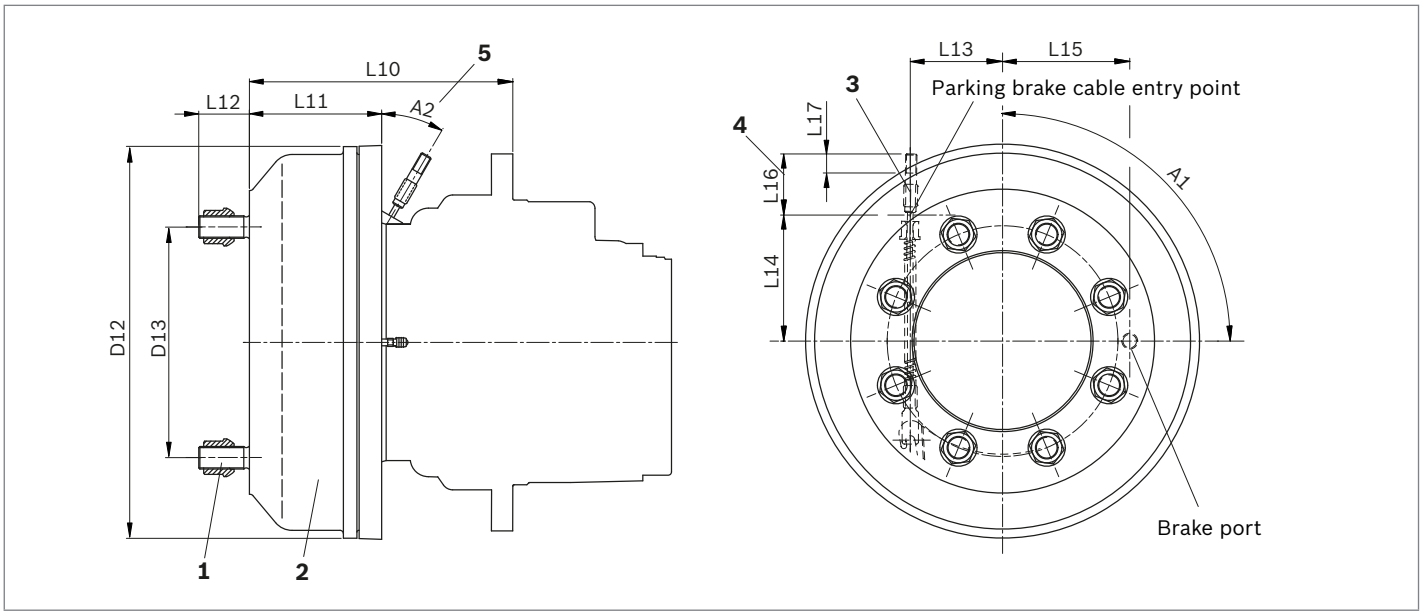
Motor	Brake	L8	L9	D11
MCR3	**B2**	67.3	22	ø174
MCR5	**B2**	67.3	22	ø174
	B4	80.7	26.5	ø215
MCR10	**B5**	84.7	26.5	ø215
	B7	97.8	29	ø251
MCR15	**B11**	102.3	33	ø282

Motor	Designation	Port function	Code	Size	p_{max} [bar]	State[1)]
MCR3	**Z**	Brake port	SAE J515	9/16-18 SAE	40	O
MCR5	**Z**	Brake port	SAE J515	9/16-18 SAE	40	O
MCR10	**Z**	Brake port	SAE J515	9/16-18 SAE	30	O
MCR15	**Z**	Brake Port	SAE J515	9/16-18 SAE	30	O

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

Before finalizing your design, request a binding installation drawing.

Dynamic brake (drum brake)



Motor	Brake	L10	L11	L12	L13	L14	L15	L16	L17	D12	D13	A1	A2
MCR3	**C2**	193	94.75	34.5	45	82	68.5	55	19	ø222	ø140	90°	30°
MCR5	**C4**	192	95	32.5	65	86	89	83	19	ø272	ø140	30°	30°
MCR10	**C7**	234.1	117.5	45	82	–	113	54	17	ø348	ø205	90°	30°
MCR15	**C12**	294.6	132	36	80	–	120	40	17	ø365	ø225	90°	30°

1	**C2**	5 Studs M14x1.5 with spherical wheel nuts
	C4	10 Studs M18x1.5 with spherical wheel nuts
	C7	8 Studs M20x1.5 with spherical wheel nuts
	C12	10 Studs M22x1.5 with hexagonal wheel nuts
2	Dynamic drum brake for use with brake fluid DOT 3+5 or SAE JI 703. If brake is to be used with mineral oil a special order is to be made. Please state if seals for mineral oil are required when placing order.	
3	For use as a mechanical park brake a brake cable (Bowden cable) can be connected from right side for C*R and left side for C*L (left is s mirror image of the right type) (* = 2, 4, 7, 12). Mechanical brake cable is not supplied with the motor.	
4	Brake cable length.	
5	Angular position of brake cable.	

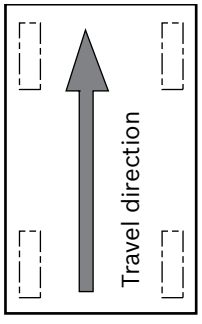
Before finalizing your design, request a binding installation drawing.

Dynamic drum brake run-in procedure

- Brake the machine hard in forward and reverse directions until the brake drum temperature reaches 200 °C.
- Allow the brake to cool.
- To remove residue, brake gently 2 times each in the forward and reverse directions.

Notice
The drum brake cylinder port must be oriented as instructed in the installation drawing. The drum brake also has an influence on permitted radial loading due to its offset.

Left side of vehicle
Ordering code C4L



Right side of vehicle
Ordering code C4R

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 41** 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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