RE 15195/2020-01-27
Replaces: 02.2017

rexroth
A Bosch Company

Radial piston motor for frame integrated drives MCR-A

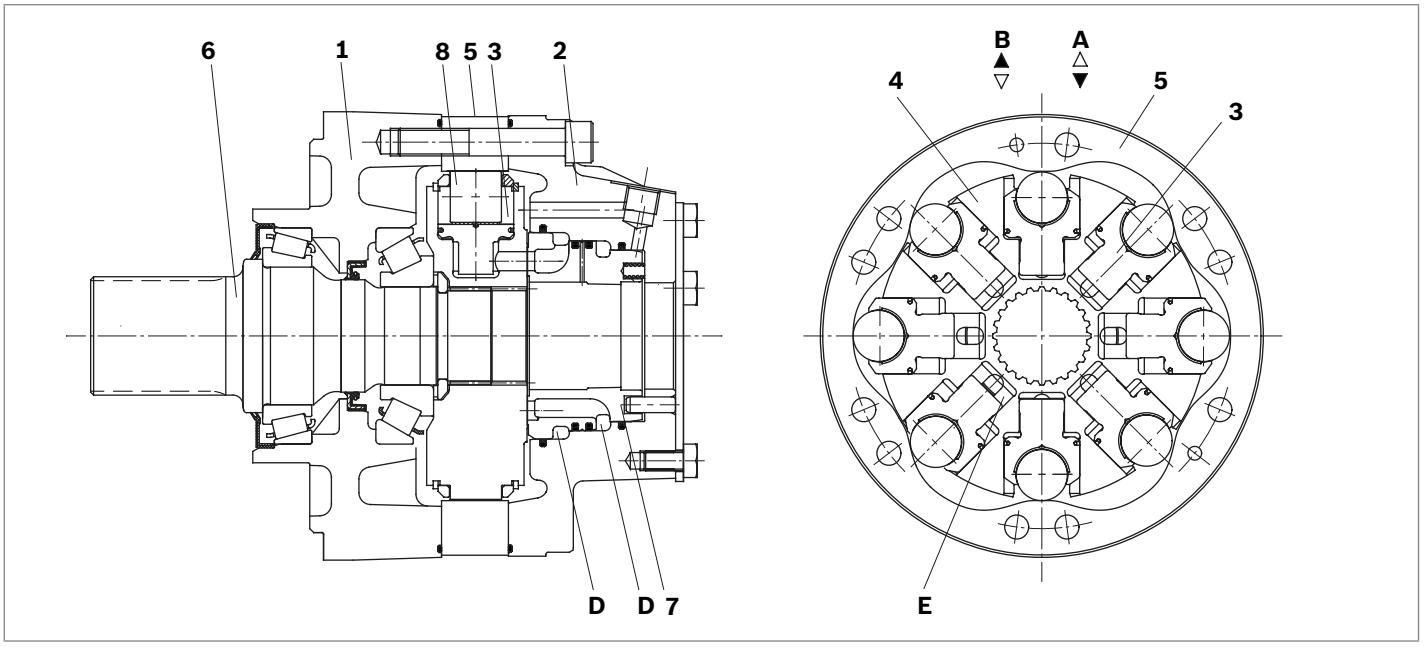
- Frame size MCR3, MCR5, MCR10, MCR15
- Displacement 160 cc to 2150 cc
- Differential pressure up to 450 bar
- Torque output up to 13687 Nm
- Speed up to 875 rpm
- Open and closed circuits

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.

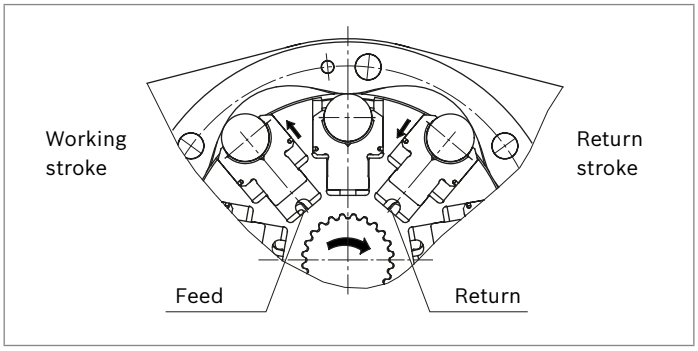
Construction

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.

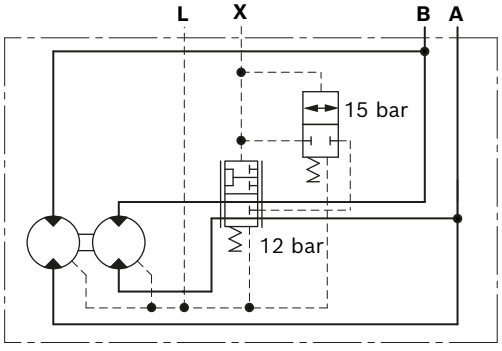
For more information refer to the MCR information sheet on „2-speed soft shift“ (RE 15225-03).

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

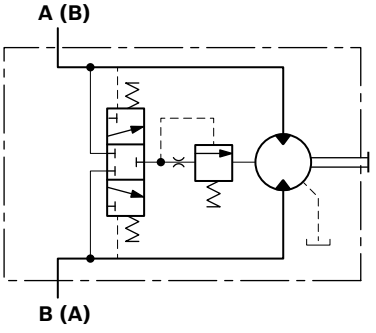
In a closed circuit, the same hydraulic fluid continuously flows between the pump and the motor. This could therefore lead to overheating of the hydraulic fluid.

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

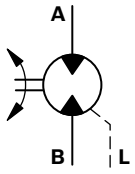
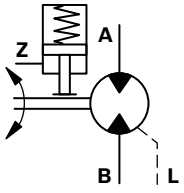
By way of rear housing and brake shaft.

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**

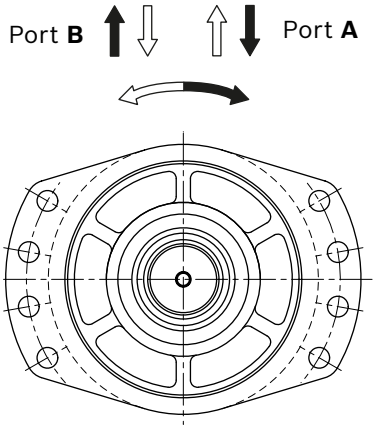
Motor without brake	Motor with holding brake
	

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.

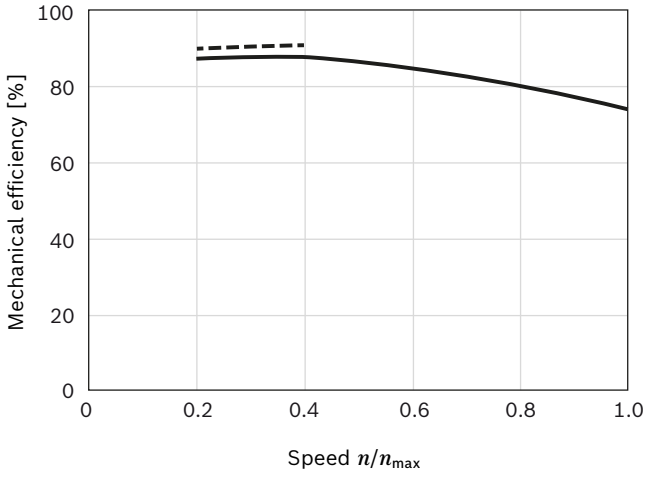
Technical data

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	

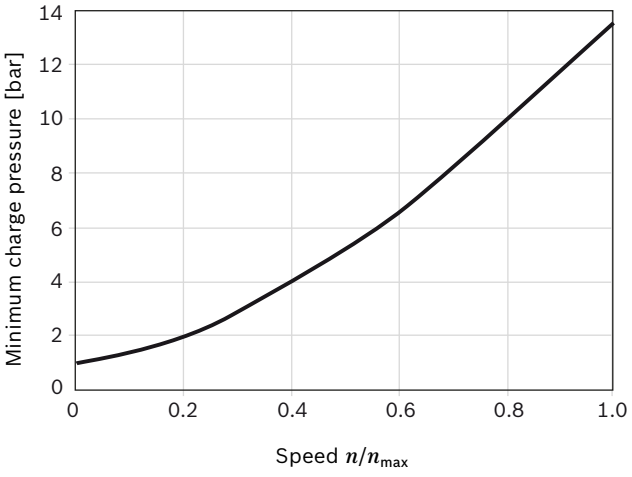
Footer on page 6

Efficiencies

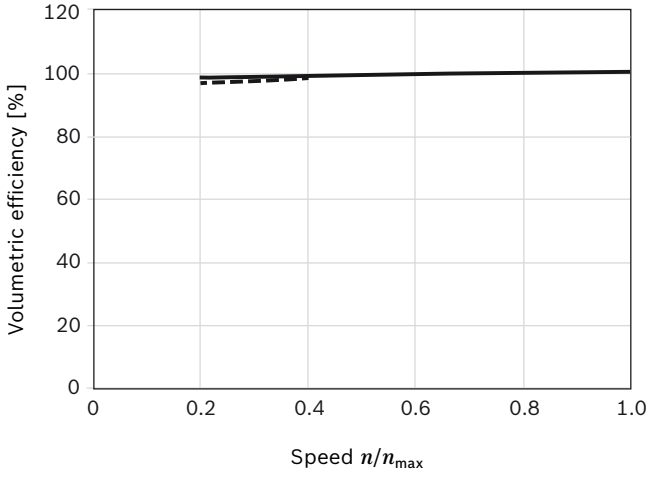
Mechanical efficiency



Charge pressure



Volumetric efficiency



100 bar
300 bar

Notice

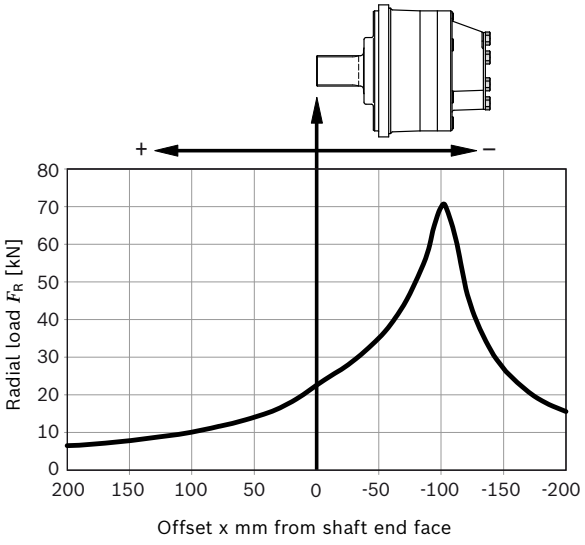
- If the correct charge pressure is not maintained and the motor is starved of oil, the motor may go into free wheel mode!
- For specific performance information or operating conditions contact the Engineering Department at Bosch Rexroth, Glenrothes.

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)



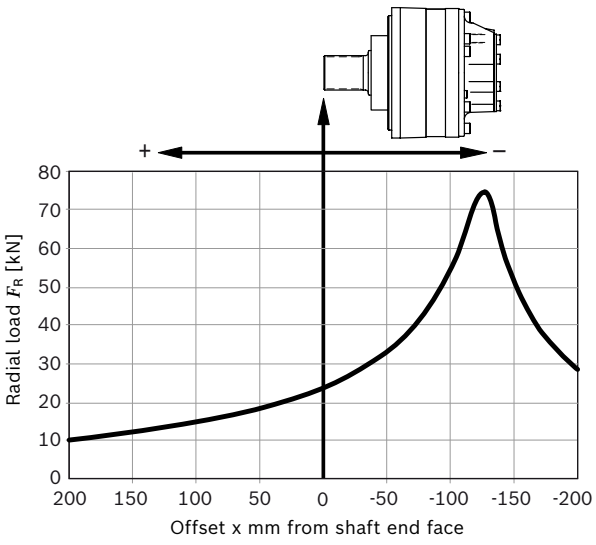
Maximum axial load $F_{ax\,max}$ (with radial load F_R = 0):

$F_{ax\,max}$ = 30700 N ← +

$F_{ax\,max}$ = 25200 N → –

Drive shaft ...10A A75...

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



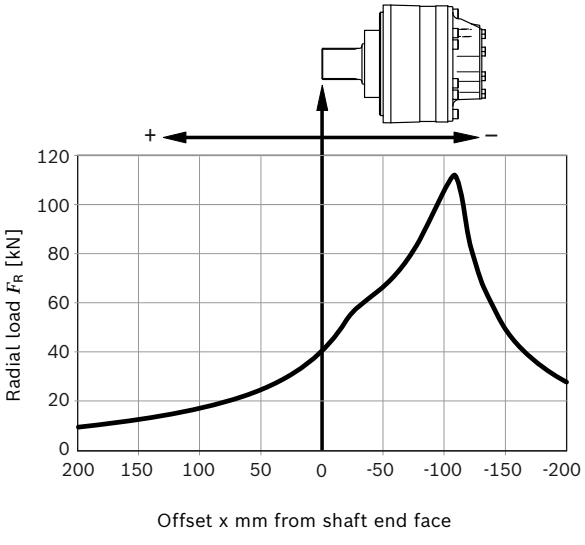
Maximum axial load $F_{ax\,max}$ (with radial load F_R = 0):

$F_{ax\,max}$ = 68000 N ← +

$F_{ax\,max}$ = 63400 N → –

Drive shaft ...5A A60...

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



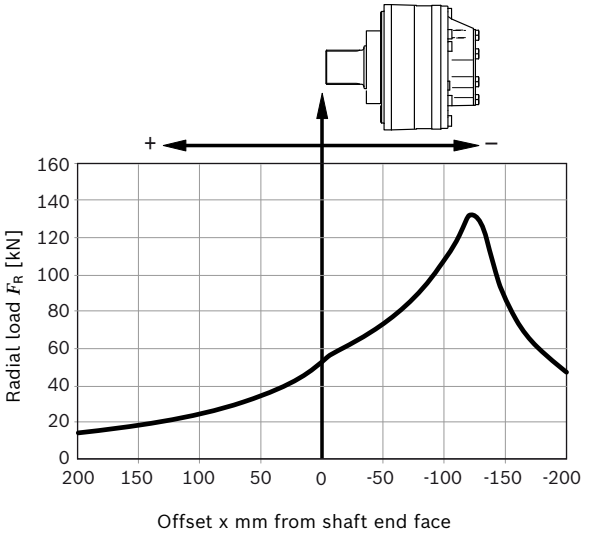
Maximum axial load $F_{ax\,max}$ (with radial load F_R = 0):

$F_{ax\,max}$ = 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 ← +

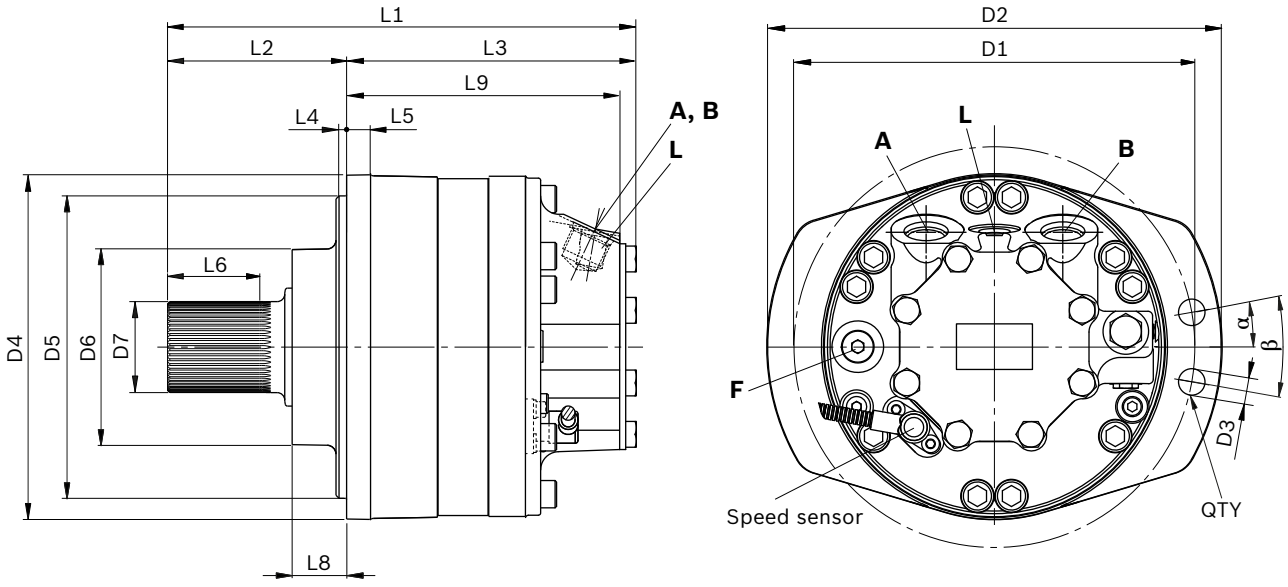
$F_{ax\,max}$ = 82600 N → –

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

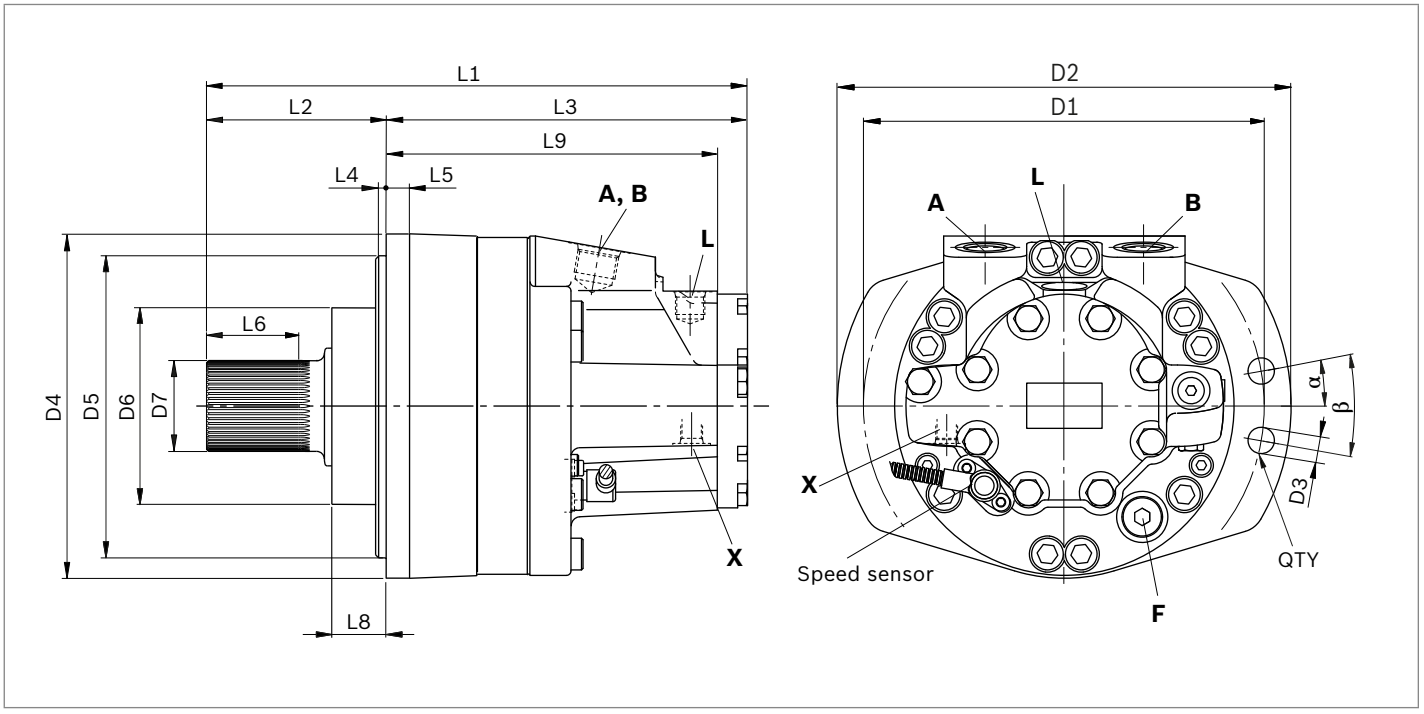
Ports

Motor	Designation	Port function	SAE Ports Standard	SAE Ports Size	BSP Ports Standard	BSP Ports 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

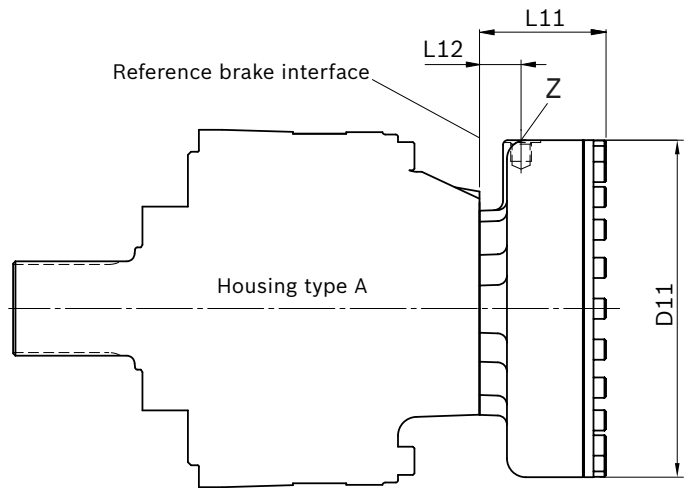
Ports

			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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