Radial piston motor for slew drives
MCR-X

RE 15214
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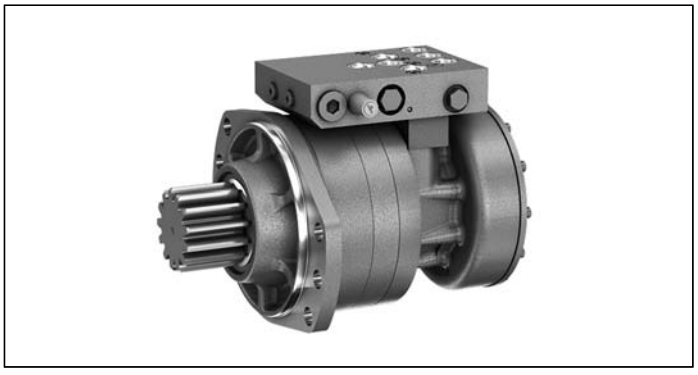


- Frame size MCR3, MCR5
- Displacement 160cc to 820cc
- Maximum pressure 350 bar
- Torque output up to 4000 Nm
- Open circuits

Features

- Low-speed radial-piston design
- Short installation length
- Industry-standard mounting
- Integrated pinion
- High volumetric and mechanical efficiency
- Smooth operation at very low speed
- Low noise and backlash
- Anti-shock cross-port relief valves
- Anti-cavitation valves
- Holding brake
- Optional brake release valve with delay function

Contents

Application

The MCR-X motors are intended for open-circuit operation as drive motors for the slewing function primarily of excavators in the 2 to 8 ton weight range (MCR3X for 2 to 4 ton and MCR5X for 4 to 8 ton). Other possible areas of application include slewing for forestry machines and aerial work platforms.

Functional description

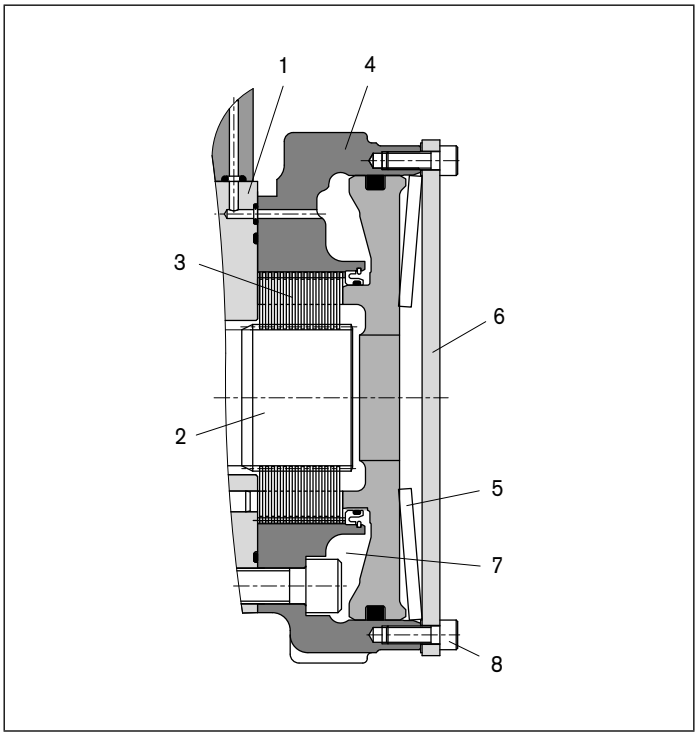
The MCR-X is a low-speed high-torque motor of radial-piston design. For a description of the operating principle see Bosch Rexroth data sheet 15195.

Anti-shock relief valves
Pressure relief valves venting to return line are fitted to facilitate use in open circuits. These valves have an anti-shock function to limit the rate of rise of pressure and prevent overly rapid changes in acceleration, thus limiting the shock felt by the machine operator and extending gear life. Different valve varients are used depending on the pressure.

Anti-cavitation valves
During deceleration it is necessary to maintain sufficient pressure at the motor inlet to hold the pistons against the cam ring and prevent cavitation. For this reason the motor is equipped with a make-up port M, which feeds anti-cavitation check valves connected to ports A and B (see schematic diagram on page 5). See Technical Data on page 6 for details of the pressure that is required at port M.

Holding brake
A holding brake is usually required to comply with relevant equipment standards such as EN474 and is, therefore, fitted as standard to the MCR-X motor.
A disc pack (3), with alternate discs splined to the brake shaft and brake housing (4), is compressed by the force of a disc spring (5) acting through a piston (6). The friction between the discs generates a holding torque.
When fluid is fed into the annular area (7), the pressure on the underside of the piston rises, opposing the spring force. If sufficient pressure is applied (see Technical data on page 6), the piston moves to the right, removing the compression on the disc pack and allowing the motor to turn freely.
When the pressure is removed the spring forces the piston back to the left and once again compresses the disc pack. Thus, the brake is fail-safe.
In case of hydraulic system failure, it may be manually released by loosening the end cover screws (8).

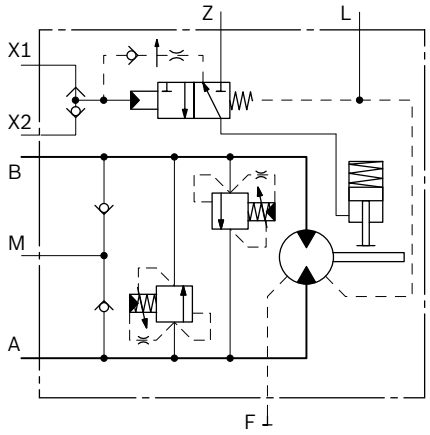
Section of holding brake



Brake valve option

The holding brake is designed to be engaged only once the motor has stopped rotating. Premature engagement can lead to noise, overheating and wear or seizure of the brake discs. Thus, there is a need to delay brake engagement after the control joystick pilot pressure falls to zero, for sufficient time to allow the machine upperstructure to come to rest in the worst case of maximum speed and maximum moment of inertia. For this reason, a brake control valve with a delay function is offered as an option on the MCR-X.

▼ **MCR-X with brake valve**

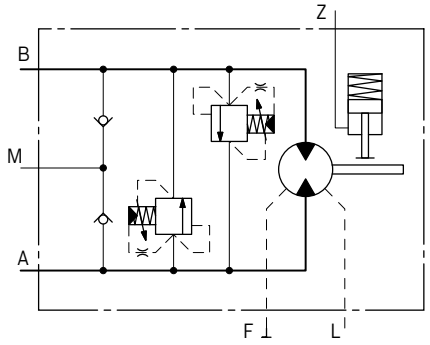


The valve functions as follows:

- The brake release pressure is fed to port Z.
- Pilot pressure from the joystick (one line for each direction) is fed to ports X1 and X2 and an internal shuttle valve feeds the higher of these to the brake control valve.
- If the pilot pressure is sufficient, the valve shifts and the brake is immediately released.
- When the joystick is returned to the centre position, pilot pressure falls, the valve shifts back and flow is drained from the brake at a metered rate determined by the diameter of an orifice within the valve. This metering of the flow out of the brake results in a delay in engagement.

Where the brake valve option is not supplied, the above functions must be implemented externally to the motor.

▼ **MCR-X without brake valve**

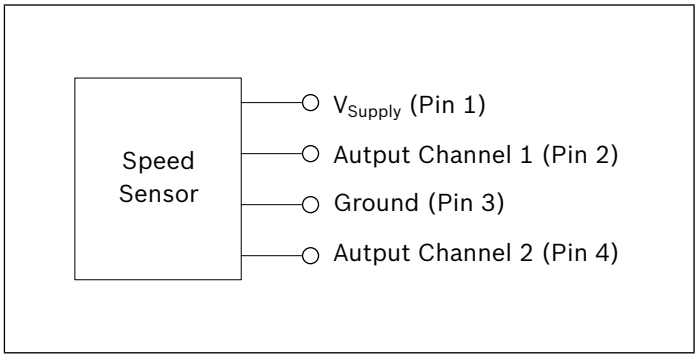


Speed sensor options

A hall-effect speed sensor 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 is fitted to the motor cylinder block, 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 (Code P1) and for direct connection to a 12 V or 24 V unregulated supply (Code P2).

The MCR-X may 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.

Terminal connections

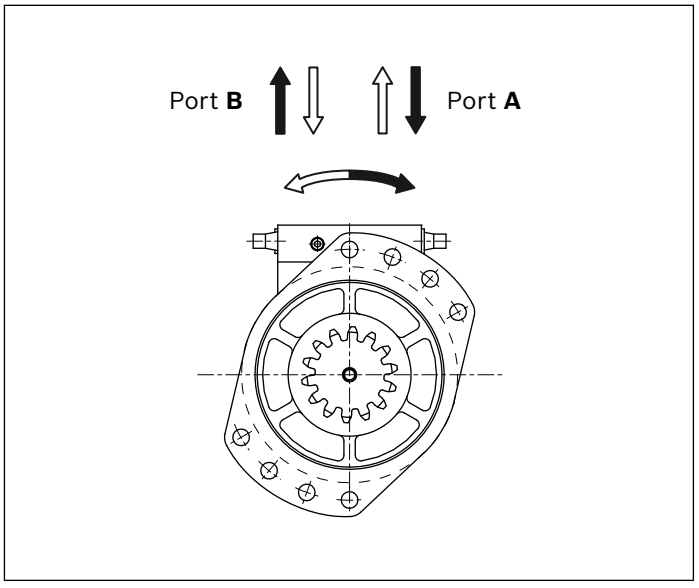


Connector _____ Deutsch DT04-4P-E008
Cable length _____ 600 mm

For technical data see standard DO/100/117 (please consult Rexroth Engineering Department in Glenrothes).

Direction of shaft rotation with flow

(view from drive shaft)



Ordering code

01	02	03	04	05	06		07	08	09	10	11	12	13	14	15	16
MCR		**X**			**Z**	**/**	**3X**									

Radial piston motor

01	Radial-piston type, low-speed, high-torque motor, equipped with cross-port relief and anti-cavitation valves	**MCR**

Frame size

02	Frame size	3	**3**
		5	**5**

Motor type

03	Slew motor	**X**

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	–	–	–	–	●	●	●	●

Drive shaft

05	Pinion specification: module 6, 14 teeth	**G101**
	Pinion specification: module 6.5, 17 teeth	**G126**
	Pinion specification: module 5, 13 teeth (only MCR3X)	**G79**
	Other[1)]	**GXXX**

Through shaft

06	Without through shaft	**Z**

Series

07	Series 30 to 39[2)]	**3X**

Brake

08	Hydraulic release multi-disc holding brake	**B2**
	Hydraulic release multi-disc holding brake (only MCR5X)	**B4**

Seals

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

Direction of rotation

10	Viewed from drive shaft: clockwise with flow into port A	**1L**

Ports

11	Tapped with UNF thread (SAE J514)	**12**
	Tapped to JIS B 2351	**64**

Speed sensor

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

01	02	03	04	05	06		07	08	09	10	11	12	13	14	15	16
MCR		**X**			**Z**	**/**	**3X**									

Valves

13	With brake valve orifice ø0.6 mm	**V01**
	Without brake valve	**V02**
	Other[3)]	**VXX**

Relief setting

14	220 bar	**A**
	Other	**B to Z**

Special order

15	Two-coat black paint	**SO400**
	Other	**SOXXX**

Other

16	Mark in text here	*

1) Other pinions may be provided to the customer's specification, depending on sales volume
2) Series 30 to 39 are dimensionally interchangeable
3) The brake delay orifice must be sized to suit the machine. ø0.6 mm is the standard size but other diameters may be supplied depending on the particular case.

● = Available – = Not available

Technical data

Frame size			**MCR3X and MCR5X**							
Type of mounting			Flange mounting via front case							
Mounting screws			6 - 8 x M16, Grade 12.9							
Minimum mounting screw torque		Nm	300							
Port type			Tapped to SAE J514 or JIS B 2351							
Shaft type			With integrated pinion (see page 9)							
Piston seat material			P23 (high efficiency)							
Weight										
MCR3X		kg	39							
MCR5X		kg	58							
Hydraulic fluid[1)2)]			Mineral oils (HL, HLP) to DIN 51 524							
Fluid cleanliness			ISO 4406, Class 20/18/15							
Fluid viscosity range[3)]	$n_{min/max}$	mm^2/s	10 to 2000							
Fluid temperature range	$t_{min/max}$	°C	-20 to +105							
Maximum flow into port A or B	$q_{V\,max}$	L/min	70							
Maximum pressure at ports A, B and M[4)]	p_{max}	bar	350							
Maximum pressure at port L	$p_{case\,max}$	bar	10							
Maximum pressure at ports X1 and X2	$p_{X\,max}$	bar	70							
Maximum pressure at port Z	$p_{Z\,max}$	bar	40							
Minimum pressure at port M[5)6)]	$p_{M\,min}$	bar	4							
Relief valves										
Pressure setting range[8)]		bar	100 to 300							
Anti-cavitation valves										
Cracking pressure		bar	**0.25**							
Brake delay valve										
Shift pressure	$p_{X\,shift}$	bar	**3.7**							
Orifice diameter[9)]		mm	**0.6**							
Delay time[9)]		s	**2.9 to 5.8**							
Speed sensor										
For technical data see standard DO/100/117 (please consult Rexroth Engineering Department in Glenrothes).										
Motor Performance MCR3X[7)]										
Displacement	V_g	cm^3/rev	160	225	255	280	325	365	400	
Maximum speed, Single speed motor (1L)	n_{max}	rpm	375	265	235	215	185	165	150	
Maximum torque[4)]	T_{max}	Nm	710	1000	1130	1240	1440	1620	1780	
Minimum speed for smooth running	n_{min}	rpm	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
Motor Performance MCR5X[7)]										
Displacement	V_g	cm^3/rev	380	470	520	565	620	680	750	820
Maximum speed, Single speed motor (1L)	n_{max}	rpm	155	125	115	105	95	85	80	75
Maximum torque[4)]	T_{max}	Nm	1685	2090	2310	2510	2750	3020	3330	3640
Minimum speed for smooth running	n_{min}	rpm	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Brake[10)]			**MCR3X**		**MCR5X**		**MCR5X**			
Holding brake			B2		B2		B4			
Minimum brake torque	$T_{br\,min}$	Nm	1170		2100		4400			
Minimum pressure at which brake release begins	$p_{rel\,min}$	bar	8		8		11			
Maximum pressure required to fully release brake	$p_{rel\,max}$	bar	11		11		15			

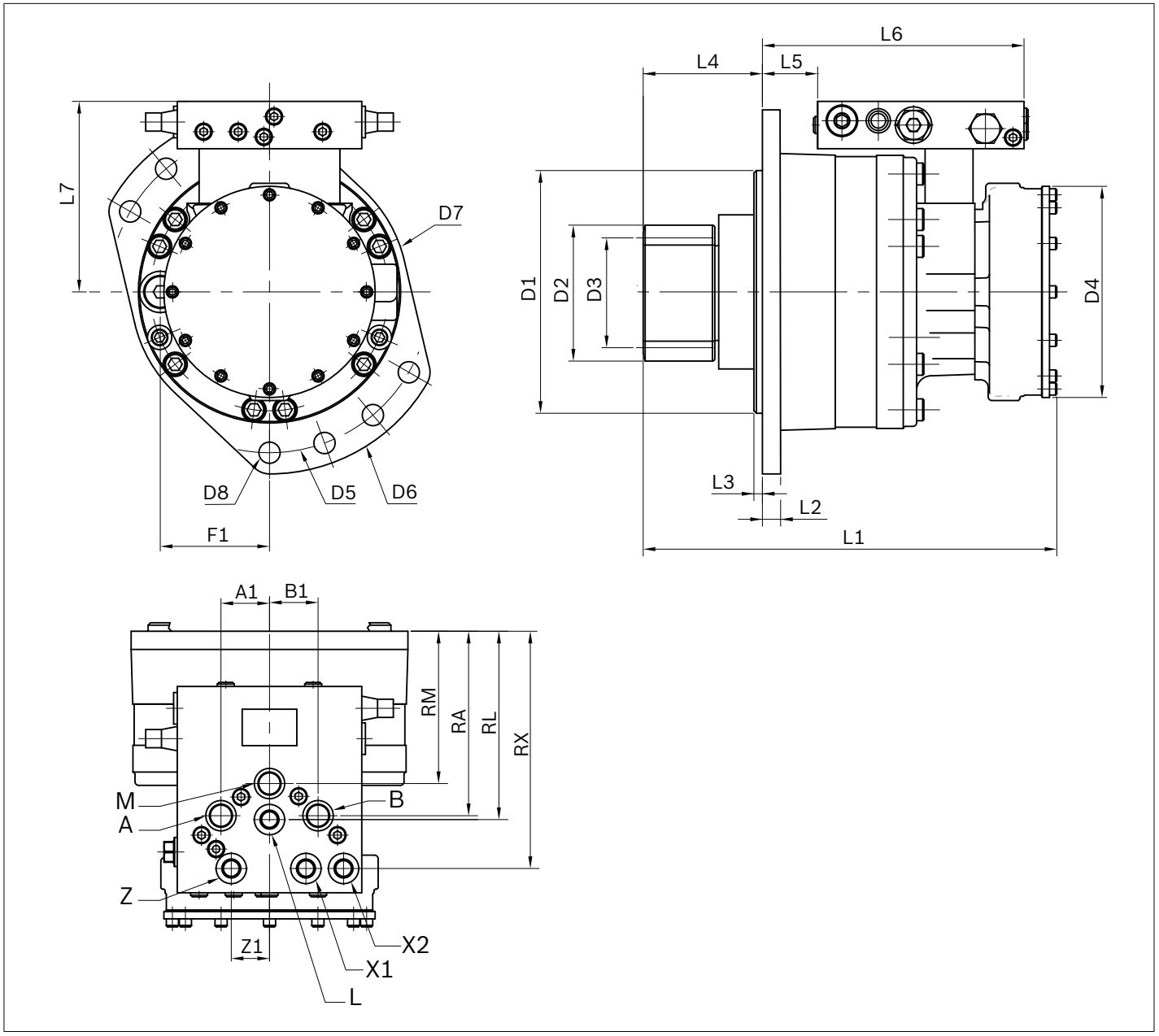
Note

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

Please refer the related foot notes for more details.

1) The motor must be filled with oil prior to start-up. The filler port F is provided for this purpose.
2) For use with other fluids, please consult Rexroth Engineering Department in Glenrothes.
3) With high oil viscosity, there is an increased risk of cavitation, so p_M may need to be increased.
   The machine should be tested at the minimum operating temperature to ensure satisfactory operation.
4) An increase in the maximum pressure to 350 bar, and corresponding torque increase, may be possible by special order.
   Please consult Rexroth Engineering Department in Glenrothes for further details.
5) For operation below the quoted make-up pressure, please contact Rexroth Engineering Department in Glenrothes.
6) The quoted make-up pressure applies at the port M. Please take pressure drop in the make-up line into account.
   Rexroth recommends a minimum make-up line diameter of 5/8 in, but this must be confirmed by machine testing.
7) The quoted values are for initial reference only. Please contact Rexroth Engineering Department in Glenrothes for a full technical evaluation prior to ordering.
8) The setting range quoted applies with standard springs. Extension of the range may be possible by special order.
9) The standard orifice diameter is quoted, along with the delay time for ISO VG46 oil at 50 °C. However, the orifice diameter must be selected to ensure that the brake does not apply before the motor has stopped rotating. Please contact Rexroth Engineering Department in Glenrothes for further information.
10) The holding brake must be applied only in the static condition. Application of the brake while the motor is turning may result in damage to the unit and reduction in holding torque. The machine designer must ensure that an adequate brake delay exists to prevent this. The brake is, however, applied with a noise-reduction coating, to prevent brake squeal during short-duration drive-through caused by swing ram operation.

Dimensions



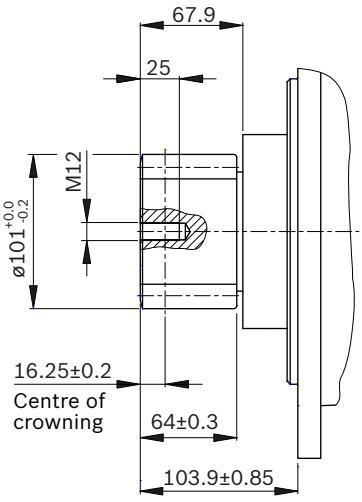
Motor	D1	D2	D3	D4	D5	D6	D7	D8	L1	L2	L3	L4	L5	L6	L7
MCR3X	ø175	ø79	ø69	ø174	ø220	ø248	ø190	ø17	315	15	8	17	15	191	132
MCR5X	ø200	ø112	ø91	ø174	ø265	ø300	ø228	ø17.5	334.7	15	7	16	18	215.5	157

Motor	A1	B1	Z1	F1	RM	RA	RL	RX
MCR3X	29.5	29.5	13	72	94	132	123.4	171
MCR5X	40	40	31.5	90	125.5	152	155.2	195.5

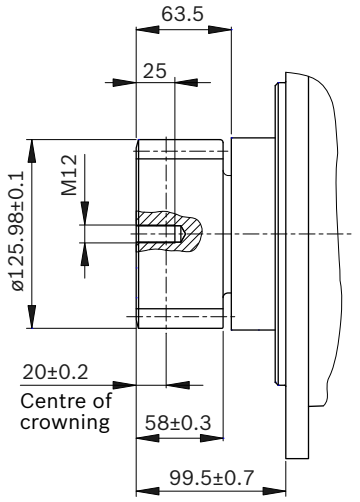
The drawings are for initial guidance only.
Before finalizing your design, request a binding installation drawing.
Dimensions in mm.

Drive shaft

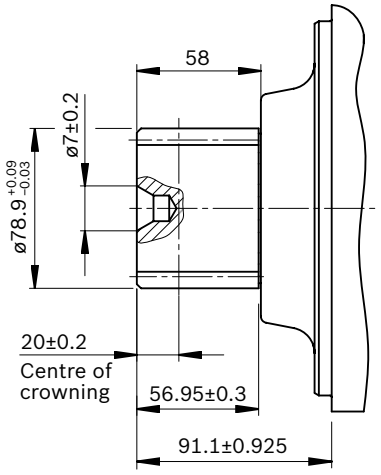
G101



G126



G79



Pinion data		**G101**	**G126**	**G79**
Module	mm	6	6.5	5
No. of teeth		14	17	13
Pressure angle	°	20	20	20
Addendum mod. coefficient		0.5	0.4	0.4
Dimension over pins	mm	102.88±0.05	128.64±0.04	81.7±0.09
Pin diameter	mm	10.5	11	9.60
Crowning	mm	0.0115/0.1035	0.0762/0.1016	0.0762/0.102
Accuracy grade (ISO1328)		8	8	8

Ports

Designation	**Port function**	**Ordering code 12**	**Size**	**Ordering code 64**	**Size**	**Maximum pressure [bar]**	**State**[1]
A, B	Inlet, outlet	SAE J514	3/4-16 UNF	JIS B 2351	G3/8 in	300	O
M	Anti-cavitation	SAE J514	3/4-16 UNF	JIS B 2351	G3/8 in	300	O
X1, X2	Brake pilot	SAE J514	9/16-18 UNF	JIS B 2351	G1/4 in	30	O
L	Case drain	SAE J514	9/16-18 UNF	JIS B 2351	G1/4 in	70	O
Z	Brake port	SAE J514	9/16-18 UNF	JIS B 2351	G1/4 in	40	O
F	Filler port	SAE J514	3/4-16 UNF	SAE J514	3/4 in - 16 UNF	10	X

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

Selection guide

Data sheet	Motor type Application		Frame size 3 160..400 cc	 5 380..820 cc	 6 820..920 cc	 10 780..1340 cc	 15 1130..2150 cc	 20 1750..3000 cc
15198	**MCR-F** Wheel drives		●	●	–	●	●	–
15200	**MCR-W** Heavy duty wheel drives		●	●	–	●	–	–
15195	**MCR-A** Frame integrated drives		●	●	–	●	–	–
15199	**MCR-H** Integrated drives		●	●	–	●	●	●
15221	**MCR-T** Track drives		–	●	●	●	–	–
15223	**MCR-R Series 40** Hydraulic drive assist		–	–	–	●	–	–
15214	**MCR-X** Slew drives		●	●	–	–	–	–
15197	**MCR-C** Compact drives		–	–	–	–	–	●
15196	**MCR-D** Industrial applications		●	●	–	●	–	–
	MCR-E Industrial applications		–	●	–	–	–	–

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