Rexroth
Bosch Group

Radial Piston Motor (Multi Stroke) Type MCR 5

RE 15 206/06.06 1/16
Replaces: 02.98

Technical Data Sheet

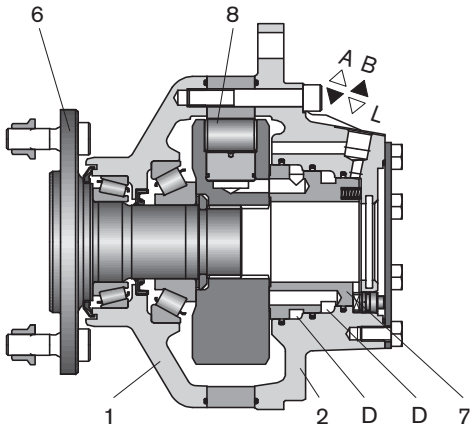
Series 3X
Displacement 380cc to 820cc
Differential pressure up to 450 bar
Torque output up to 4900 Nm
Speed up to 570 rpm

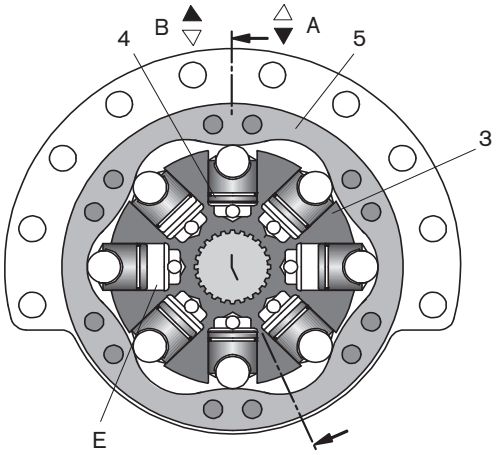
Contents

Features

- Compact robust construction
- High volumetric and mechanical efficiencies
- High pressure rating
- High reliability
- Low maintenance
- Smooth running at very low speeds
- Low noise
- Reversible
- Sealed tapered roller bearings
- High radial forces permitted on output shaft
- Freewheeling possible
- Available with optional holding brake (multi-disc) or dynamic (drum) brake
- Available with:
  - Bi-directional two speed
  - Integrated flushing valve
  - Speed sensor

Functional Description





Hydraulic motors type MCR are radial piston motors with a rotating shaft.

Construction

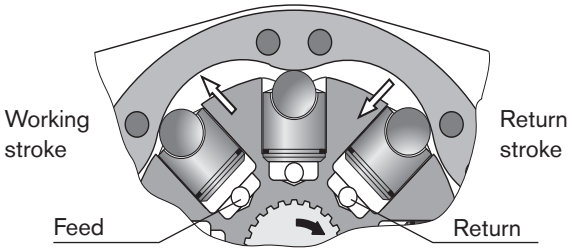
Two part housing (1, 2), rotary group (3, 4), cam (5), output shaft (6) and flow distributor (7).

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 to the cam (5) via rollers (8).

Torque Generation

The number of power and exhaust strokes corresponds to the number of lobes on the cam x number of pistons (8).



Flow Paths

The cylinder chambers (E) are connected to ports A and B via the axial bores and the annular passages (D).

Bearings

Tapered roller bearings capable of transmitting high axial and radial forces are fitted as standard, except on Hydrobase motors.

Freewheeling

In certain applications there may be a requirement to freewheel the motor. If ports A and B are connected to zero pressure and 2 bar is simultaneously applied to the housing by way of port L, the pistons will be forced into the cylinder block. The rollers will no longer be in contact with the cam profile and it will be possible for the shaft to be freely rotated.

Two Speed Operation (2W)

In mobile applications where vehicles are required to travel some distance, transmission motors are required to run at high speed for longer durations. This means engines and pumps are also running at high speeds. To preserve vehicle economy and engine / pump life, an integrated valve allows MCR motors to be switched, reducing motor displacement and thus the engine and pump speed. Motor maximum speed remains unchanged.

In this "reduced-displacement" mode, the pistons are connected to the A/B ports during only half of their strokes. During their remaining strokes, the feed and return sides are "short-circuited" and connected to the 2-speed valve control port X.

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 mode” and is fitted as standard to 2W motors. The spool valve requires either an additional sequence valve or electro-proportional control to operate in soft shift mode.

Flushing Valve

In mobile applications, to assist with circuit cooling and thereby prolong motor life, there may be a requirement to introduce flushing.

The flushing relief valve has a standard setting of 14 bar (other options available on request) and is used to safeguard the minimum boost pressure. A fixed flow of fluid is taken via an orifice from the low pressure side of the circuit and fed into the motor housing. This flow is then passed back to tank via the case drain. Fluid thus removed from the closed circuit must be made up by means of the boost pump.

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.

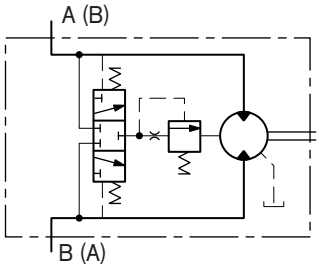
Functional Description

Flushing Flow Rates

(for $p_{charge} - p_{case} = 25$ bar)

Ordering Code	Flow	(±1 l/min)
F1	3	l/min
F2	5	l/min
F7	7	l/min
F4	10	l/min
F8	12.5	l/min
F6	13.5	l/min

Flushing Schematic Representation



Holding Brake (Multi-Disc Brake)

Mounting

By way of rear housing (2) and brake shaft (16).

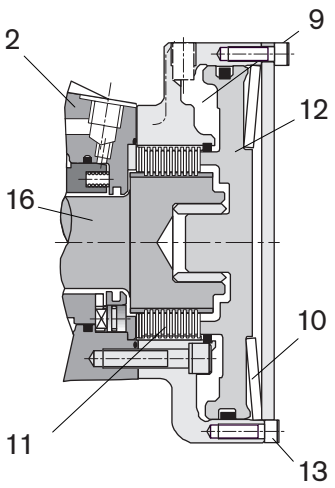
Brake application

Often in mobile applications there is a safety requirement to ensure 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 allowing the brake discs to turn independently.

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

Manual release of holding brake

The brake may also be released manually by loosening screws (13).



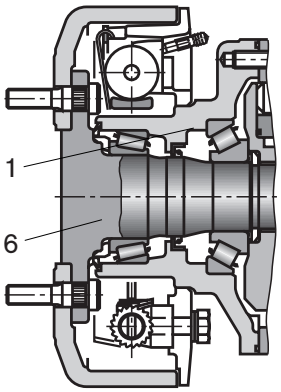
Dynamic Brake

In addition to hydrostatic braking there may be a requirement for extra dynamic braking. A drum brake is available which is mounted directly onto the drive shaft (6) and front housing (1). Braking torque is provided by shoes acting on the inside of the drum.

Operation of brake

– hydraulic brake fluid (special order required for mineral oil operation).

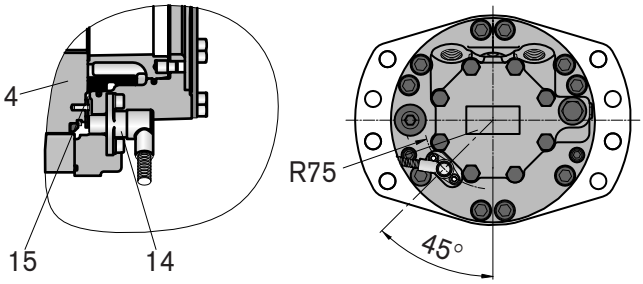
– mechanical brake cable - (not supplied).



Speed Sensor

The motor can be fitted with an optional dual-channel Hall-Effect speed sensor that is capable of detecting direction and speed.

The sensor (14) produces pulses when the teeth of a target disc (15), mounted to the cylinder block (4), pass in front of the sensor. The sensor has two phase-displaced channels to enable detection of direction and is available for both regulated and unregulated voltage supplies.



Ordering Code

MCR	5				Z	–3X				/12				*

Frame size

Size 5	**5**

Housing type

Front case flanged	**A**
Front case flanged, SAE 4 hole	**D**
Rear case flanged, compact	**C**
Rear case flanged	**F**
Hydrobase (half motor)	**H**

Nominal size, displacement V

380 cm³	**380**	**LD** [1]
470 cm³	**470**	
520 cm³	**520**	
565 cm³	**565**	
620 cm³	**620**	**HD** [2]
680 cm³	**680**	
750 cm³	**750**	
820 cm³	**820**	

Main shaft

Splined shaft	**A60** [3]
Parallel keyed shaft Ø 50 mm	**L50** [4]
With flange Ø 180 mm	**F180**
Without shaft	**Z** [5]

Through shaft

Without through shaft	**Z**

Series

Series 30 to 39	**3X**
(30 to 39, externally interchangeable)	

Special Ordering

Flushing

	without flushing (no code)
F1 to F8	with flushing (see table on page 3)

Speed sensor

P1	Speed Sensor (without regulator)
P2	Speed Sensor (with regulator)

Studs

	without studs (no code)
S [7]	with wheel studs and nuts
SS [6]	with twice normal number of wheel studs and nuts

Ports

/12	UNF thread (SAE J514)

Single / Two speed operation

1L	Single speed, standard direction of rotation
2WL	bi-directional two speed, standard direction of rotation

Seals

M	NBR seals suitable for mineral oil to DIN 51 524 (HL , HLP) (except dynamic brake see page 16)
V	FPM seals to DIN 51524 (Viton)

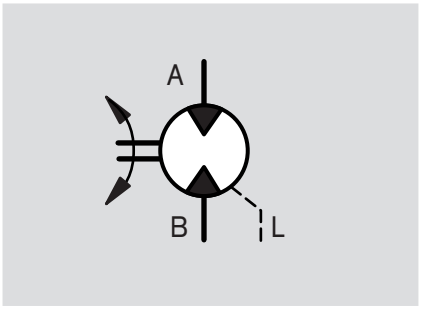
Brake mounting

A0	without brake
B2	Hydraulic release holding brake (spring pressure disc brake) 2200 Nm
B4	Hydraulic release holding brake (spring pressure disc brake) 4400 Nm
C4R [6]	Dynamic travel brake (drum brake) for right hand side of vehicle (see Fig. , Page 16)
C4L [6]	Dynamic travel brake (drum brake) for left hand side of vehicle (see Fig. , Page 16)

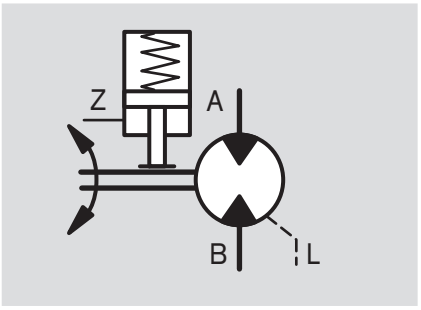
[1]) Low Displacement: standard cylindrical pistons
[2]) High Displacement: stepped pistons
[3]) only available with housing type "A"
[4]) only available with housing type "D" - maximum torque 3000 Nm
[5]) only available with Hydrobase
[6]) only available with housing type "C"
[7]) Studs only fitted to motors with "C" or "F" housing type
5 studs on "C" type, 10 studs on "F" type

Symbols

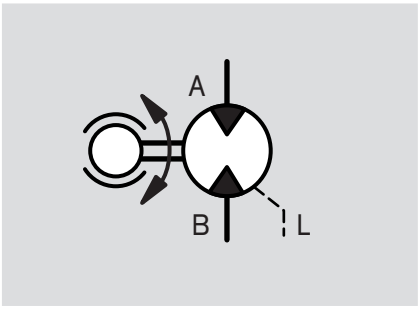
Motor without brake



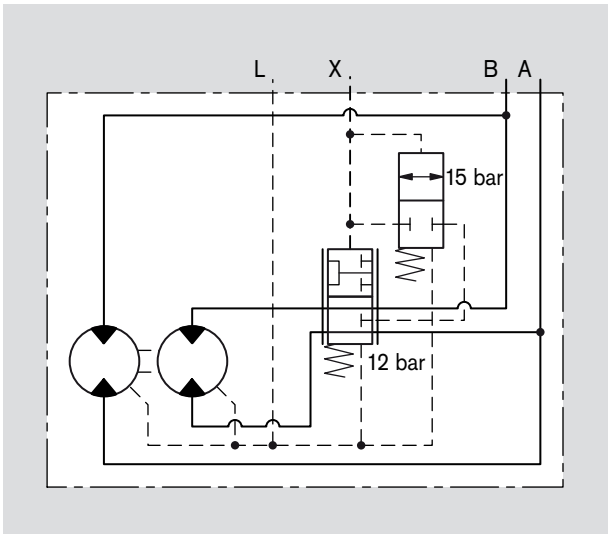
Motor with holding brake



Motor with travel brake

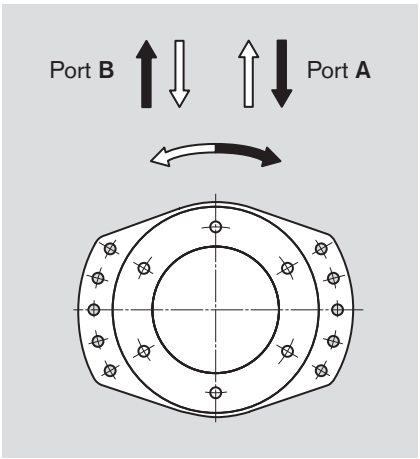


Two-speed motor schematic



Rotation (view on output shaft)

Standard



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

Technical Data (For operation outside of these parameters, please consult Bosch Rexroth)

Description			Radial-piston type, low-speed, high-torque motor							
Frame size			MCR 5...							
Type of mounting			Flange mounting; face mounting							
Pipe connections [1) 2)]			Threaded per SAE J514							
Shaft loading			see page 9							
Displacement	V_g	cm³/rev	380	470	520	565	620	680	750	820
Output torque										
Specific torque (at $\Delta p = 250$ bar)	T	Nm/bar	5.62	6.96	7.70	8.36	9.18	10.06	11.10	12.14
Maximum torque [3) 4)]	T	Nm	2530	3130	3460	3760	3670	4030	4440	4860
Output speed										
Min. speed for smooth running	n_{min}	rpm	5 (standard)				<1 (by special order)			
Max. speed **(1L)** [5) 6) 7)]	n_{max}	rpm	475	385	350	320	290	265	240	220
Max. speed **(2WL)** [5) 6)]	n_{max}	rpm	570	465	420	385	350	320	290	265
Weight	m	kg	see unit dimensions pages 10-16							
Moment of inertia	J_m	kgm²	see unit dimensions pages 10-16							
Hydraulic										
Pressure [8)]										
Nominal pressure [9)]	p_{nom}	bar	250	250	250	250	250	250	250	250
Max. differential pressure [3)]	Δp_{max}	bar	450	450	450	450	400	400	400	400
Max. pressure at port „A“ or „B“ [3)]	p_{max}	bar	470	470	470	470	420	420	420	420
Max. case drain pressure	$p_{case\ max}$	bar	10	10	10	10	10	10	10	10
Hydraulic fluid [10)]			Mineral oils (HL, HLP) to DIN 51 524							
Hydraulic fluid temperature range	$t_{min/max}$	°C	–20 to +85 [11)]							
Viscosity range	$\nu_{min/max}$	mm²/s	10 to 2000							
Fluid cleanliness			ISO 4406, Class 20/18/15							
Brake										
Holding brake (disc brake)			B2				B4			
Min. holding torque	T_{min}	Nm	2200				4400			
Release pressure (min/max)	p_{rel}	bar	15/30				15/30			
Oil volume to operate brake	V_{rel}	cm³	23				46			
Dynamic brake (drum brake)			see table page 16							

1) Ensure motor case is filled with oil prior to start-up.
2) For installation and maintenance details, please see Service Manual.
3) Maximum values should only be applied for a small portion of the duty cycle.
Please consult Rexroth Engineering Department in Glenrothes for motor life calculations based on particular operating cases.
4) For motors with housing type D, maximum torque is 3000 Nm, which restricts maximum pressure accordingly.
5) Based on nominal no-load Δp of 20 bar in full-displacement mode.
6) Warning! During the running in period of the motor (min. 20 hrs) it should not be run unloaded at >100 rpm.
7) Single-speed (1L) motors are available by special order with a 20% increase in the stated maximum speed.
8) When operating motors in series, please consult Rexroth Engineering Department in Glenrothes.
9) Nominal values are guide values for continuous operation.
10) For use with environmentally acceptable fluids HEES, HEPG, HETG, Viton seals must be specified.
For further information, please see RE 90 221.
11) Extension of the allowable temperature range may be possible, depending on specification.
Please consult Rexroth Engineering Department in Glenrothes for further details.

Technical Data (Mean values, measured at ν = 46 mm²/s and t = 45 °C)

– All torques apply to run-in motors

– For switched displacement operating mode multiply the torques by ratio of switched displacement

– For maximum case leakage multiply qVL by 2

T = Torque in Nm

q_V = Input flow in l/min

q_{VL} = Mean case leakage in l/min

p = Minimum charge pressure in pump mode in bar

Note:
Where flushing is used, q_{VL} will increase by the flushing flow.

			MCR 05 . 380						**MCR 05 . 520**					
Pressure Diff. Δp in bar	**Speed n**	rpm	0	25	50	100	150	220	0	25	50	100	150	220
100	T	Nm	393	513	538	544	525	507	538	702	737	744	683	620
	q_V	l/min	0.3	9.8	19.3	38.6	57.7	84.4	0.4	13.4	26.4	52.8	79	116
	q_{VL}	l/min	0.15	0.15	0.15	0.3	0.35	0.4	0.2	0.2	0.2	0.4	0.5	0.8
200	T	Nm	846	1075	1123	1111	1087		1158	1472	1537	1520	1487	
	q_V	l/min	0.7	10.2	19.7	38.9	58		0.8	13.8	26.8	53.2	79.4	
	q_{VL}	l/min	0.35	0.35	0.35	0.45	0.5		0.4	0.4	0.4	0.6	0.7	
300	T	Nm	1268	1613	1685	1667			1735	2207	2305	2281		
	q_V	l/min	0.9	10.4	19.9	39.2			1.2	14.2	27.2	53.6		
	q_{VL}	l/min	0.45	0.45	0.45	0.6			0.6	0.6	0.6	0.8		
400	T	Nm	1691	2150	2247				2314	2942	3074			
	q_V	l/min	1.5	11	20.5				2	15	28			
	q_{VL}	l/min	0.75	0.75	0.75				1	1	1			
450	T	Nm	1903	2419	2528				2604	3310	3459			
	q_V	l/min	2.2	11.7	21.2				3	16	29			
	q_{VL}	l/min	1.1	1.1	1.1				1.5	1.5	1.5			
Min. charge pressure	p	bar	1	4	4	6	9	14	1	6	6	7	11	17

			MCR 05 . 470						**MCR 05 . 565**					
Pressure Diff. Δp in bar	Speed n	rpm	0	25	50	100	150	220	0	25	50	100	150	220
100	T	Nm	484	632	662	670	647	625	567	747	783	792	765	738
	q_V	l/min	0.4	12.2	23.9	47.8	71.5	105	0.4	14.5	28.7	57.3	85.8	125.9
	q_{VL}	l/min	0.2	0.2	0.2	0.4	0.5	0.8	0.2	0.2	0.2	0.4	0.5	0.8
200	T	l/min	1042	1324	1384	1369	1339		1224	1566	1638	1620	1584	
	q_V	l/min	0.8	12.6	24.3	48.2	71.9		0.8	14.9	29.1	57.7	86.2	
	q_{VL}	l/min	0.4	0.4	0.4	0.6	0.7		0.4	0.4	0.4	0.6	0.7	
300	T	Nm	1562	1986	2076	2053			1836	2349	2457	2430		
	q_V	l/min	1.2	13	24.7	48.6			1.2	15.3	29.5	58.1		
	q_{VL}	l/min	0.6	0.6	0.6	0.8			0.6	0.6	0.6	0.8		
400	T	Nm	2083	2649	2768				2448	3132	3276			
	q_V	l/min	2	13.8	25.5				2	16.1	30.3			
	q_{VL}	l/min	1	1	1				1	1	1			
450	T	Nm	2344	2980	3114				2754	3524	3686			
	q_V	l/min	3	14.8	26.5				3	17.1	31.3			
	q_{VL}	l/min	1.5	1.5	1.5				1.5	1.5	1.5			
Min. charge pressure	p	bar	1	5	5	7	10	16	1	6	6	8	12	18

Technical Data (Mean values, measured at $\nu = 46\ mm^2/s$ and $t = 45\ °C$)

– All torques apply to run-in motors

– For switched displacement operating mode multiply the torques by ratio of switched displacement

– For maximum case leakage multiply q_{VL} by 2

T = Torque in Nm

q_V = Input flow in l/min

q_{VL} = Mean case leakage in l/min

p = Minimum charge pressure in pump mode in bar

Note:
Where flushing is used, q_{VL} will increase by the flushing flow.

			MCR 05 . 620						MCR 05 . 750					
Pressure Diff. Δp in bar	Speed n	rpm	0	25	50	100	150	220	0	25	50	100	150	
100	T	Nm	543	908	908	829	750	641	657	1091	1098	1002	906	
	q_V	l/min	0.88	16.44	32	63.14	94.28	137.68	0.88	19.39	38.43	77.01	113.26	
	q_{VL}	l/min	0.44	0.47	0.5	0.57	0.64	0.64	0.44	0.47	0.5	0.57	0.64	
200	T	Nm	1283	1776	1835	1796	1737		1551	2137	2224	2176		
	q_V	l/min	2.4	17.94	33.48	64.6	95.82		2.4	20.3	39.59	79.17		
	q_{VL}	l/min	1.2	1.22	1.24	1.3	1.41		1.2	1.22	1.24	1.3		
300	T	Nm	2131	2723	2723	2723			2578	3270	3338			
	q_V	l/min	3.7	19.24	34.94	66.28			3.7	20.99	40.32			
	q_{VL}	l/min	1.85	1.91	1.97	2.14			1.85	1.91	1.97			
400	T	Nm	2842	3592	3671	3631			3438	4345	4430			
	q_V	l/min	4.34	20.2	35.66	66.8			4.34	21.66	41.73			
	q_{VL}	l/min	2.70	2.35	2.33	2.4			2.17	2.35	2.37			
Min. charge pressure	p	bar	1	2	3	7	12	23	1	3	4	9	15	

			MCR 05 . 680						MCR 05 . 820					
Pressure Diff. Δp in bar	Speed n	rpm	0	25	50	100	150	220	0	25	50	100	150	
100	T	Nm	5.95	989	995	908	821	698	718	1192	1200	1095	990	
	q_V	l/min	0.88	17.64	34.93	70.01	102.76	139.54	0.88	21.14	41.93	84.01	123.76	
	q_{VL}	l/min	0.44	0.47	0.5	0.57	0.64	0.64	0.44	0.47	0.5	0.57	0.64	
200	T	Nm	1407	1938	2017	1973	1862		1697	2337	2432	2380		
	q_V	l/min	2.4	18.55	36.09	72.17	103.61		2.4	22.05	43.09	86.17		
	q_{VL}	l/min	1.2	1.22	1.24	1.3	1.41		1.2	1.22	1.24	1.3		
300	T	Nm	2338	2964	3026	3013			2819	3573	3649			
	q_V	l/min	3.7	19.24	36.82	71.98			3.7	22.74	43.82			
	q_{VL}	l/min	1.85	1.91	1.97	2.14			1.85	1.91	1.97			
400	T	Nm	3116	3939	4017				3758	4750	4844			
	q_V	l/min	4.34	19.91	38.18				4.34	23.35	45.18			
	q_{VL}	l/min	2.17	2.35	2.33				2.17	2.35	2.37			
Min. charge pressure	p	bar	1	3	4	9	15	25	1	4	6	11	19	

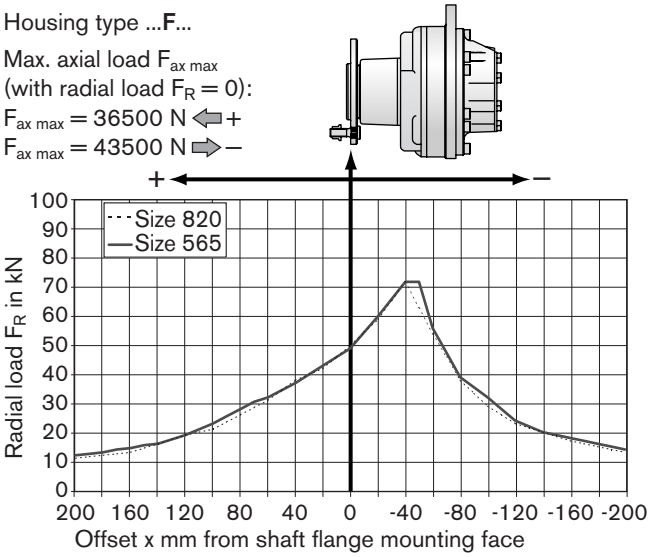
Permitted Loading on Output Shaft

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

Shaft end ...F180... (10 studs M14)

Housing type ...**F**...

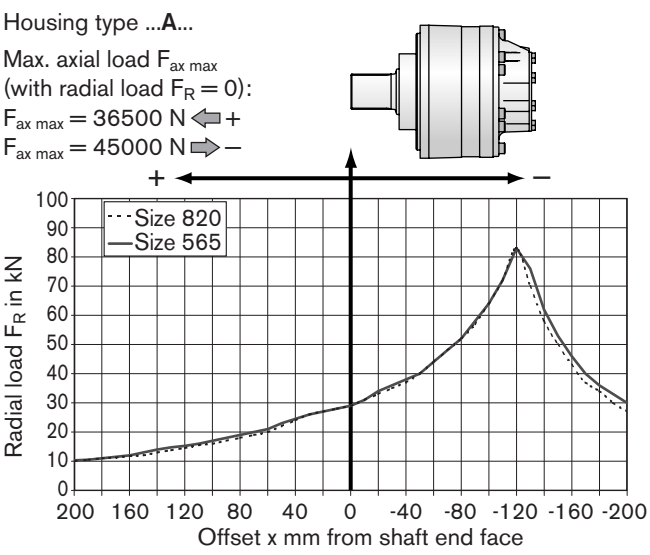
Max. axial load $F_{ax\ max}$
(with radial load $F_R = 0$):
$F_{ax\ max}$ = 36500 N ⇦ +
$F_{ax\ max}$ = 43500 N ⇨ –



Shaft end ...A60...

Housing type ...**A**...

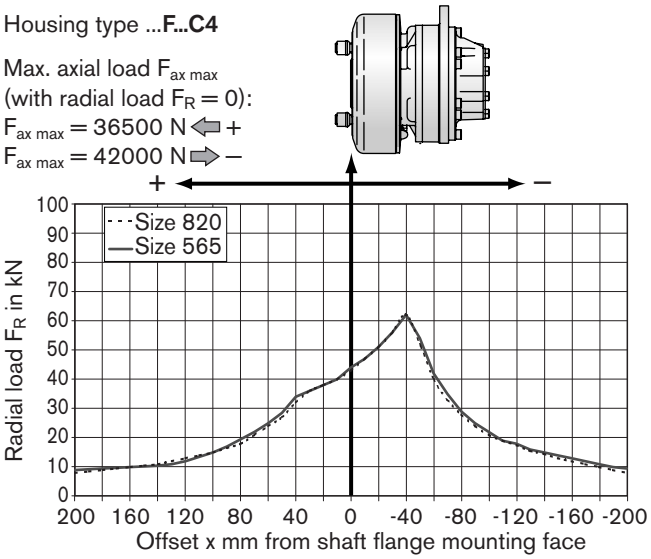
Max. axial load $F_{ax\ max}$
(with radial load $F_R = 0$):
$F_{ax\ max}$ = 36500 N ⇦ +
$F_{ax\ max}$ = 45000 N ⇨ –



Shaft end ...F180... (10 studs M18) C4 Brake

Housing type ...**F...C4**

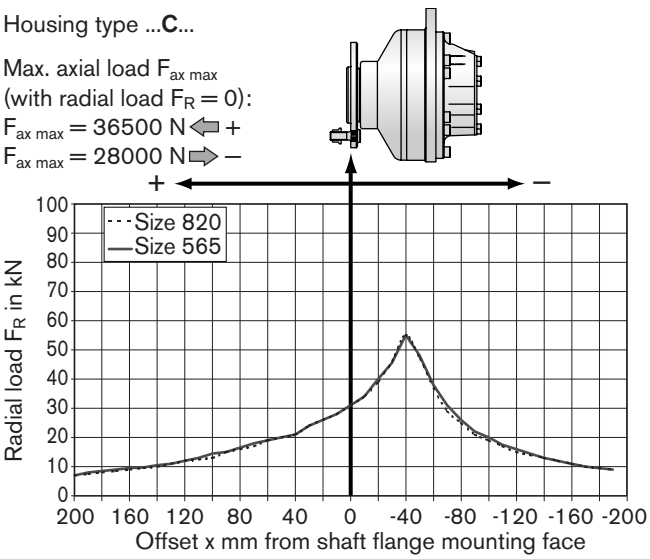
Max. axial load $F_{ax\ max}$
(with radial load $F_R = 0$):
$F_{ax\ max}$ = 36500 N ⇦ +
$F_{ax\ max}$ = 42000 N ⇨ –



Shaft end ...F180... (5 studs M14)

Housing type ...**C**...

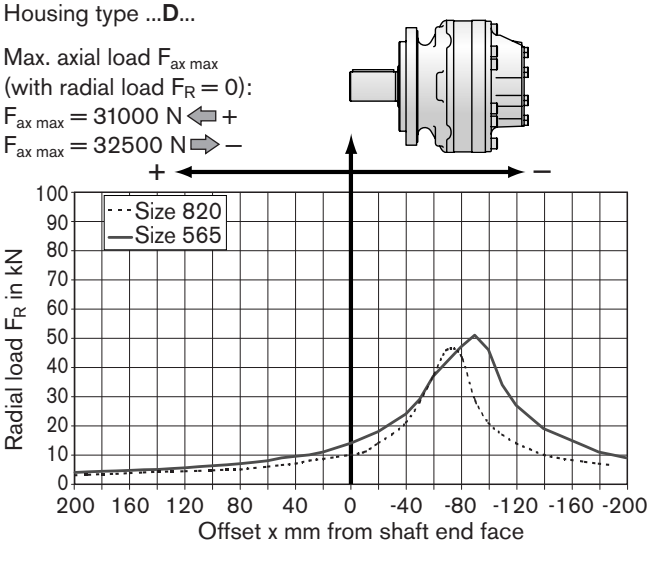
Max. axial load $F_{ax\ max}$
(with radial load $F_R = 0$):
$F_{ax\ max}$ = 36500 N ⇦ +
$F_{ax\ max}$ = 28000 N ⇨ –



Shaft end ...L50...

Housing type ...**D**...

Max. axial load $F_{ax\ max}$
(with radial load $F_R = 0$):
$F_{ax\ max}$ = 31000 N ⇦ +
$F_{ax\ max}$ = 32500 N ⇨ –



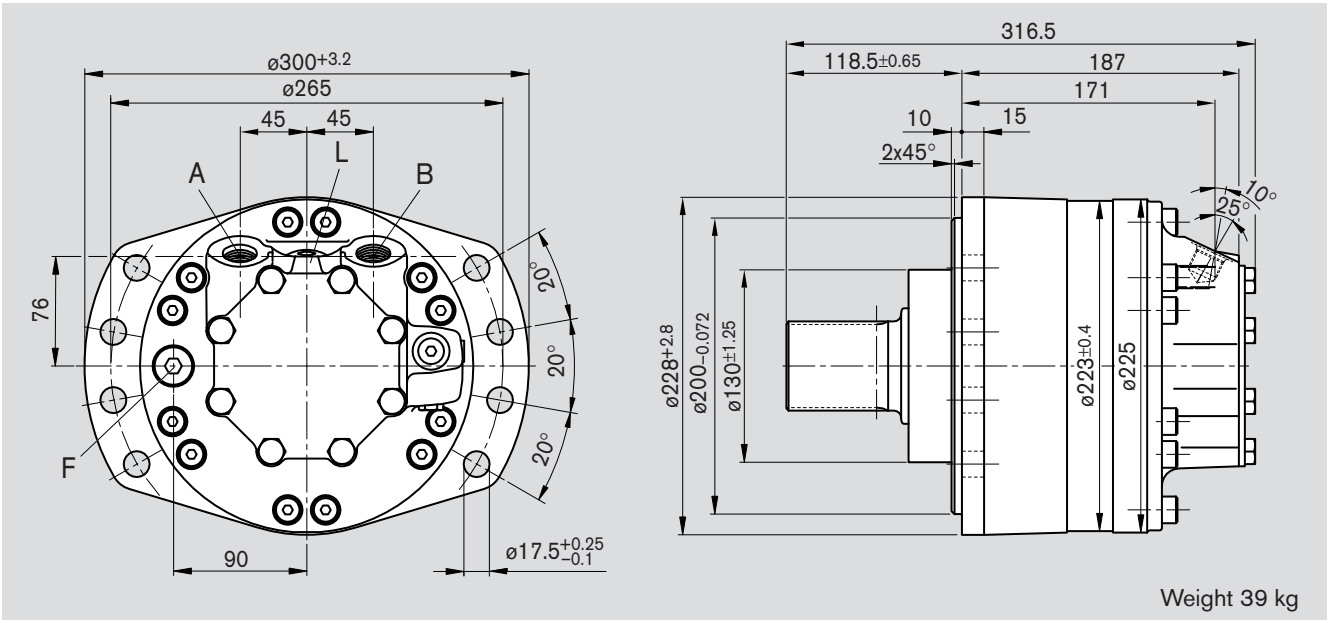
Note:

These values and graphs are for initial guidance only.

For actual motor life calculations under typical or specified duty cycles, contact Rexroth Engineering Department in Glenrothes.

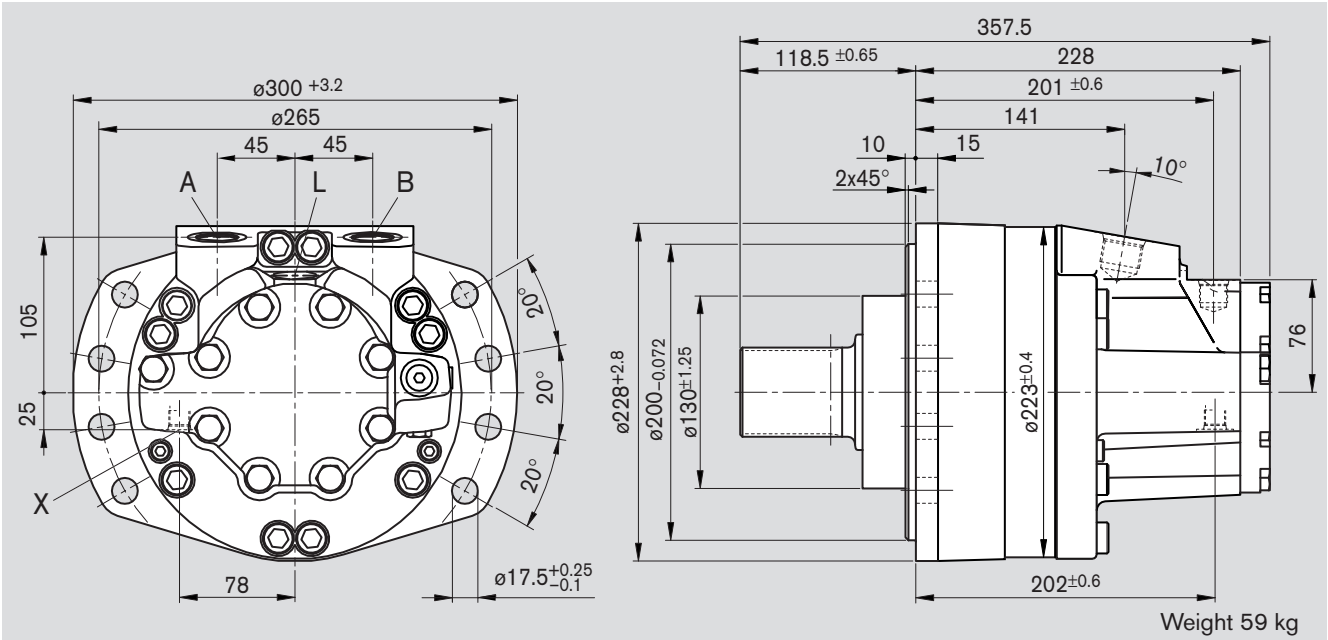
Unit Dimensions (in mm)

Flanged front housing, splined output shaft, single speed (1)
Ordering code: **"MCR5A . . . A60Z-32/A0 . 1L/12 . /. ."**



Weight 39 kg

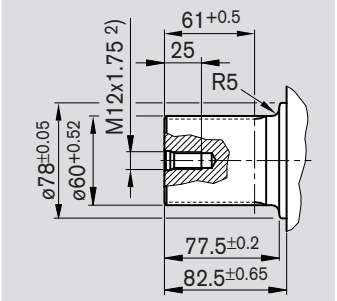
Flanged front housing, splined output shaft, two-speed (2W)
Ordering code: **"MCR5A . . . A60Z-32/A0 . 2WL/12 . /. ."**



Weight 59 kg

Shaft ends

A60 Splined shaft [1)]



Ports			
A, B	Inlet, Outlet	SAE J514	1 1/16-12
L	Case drain	SAE J514	3/4-16
F	Filling port	SAE J514	3/4-16
X	2 speed port	SAE J514	9/16-18

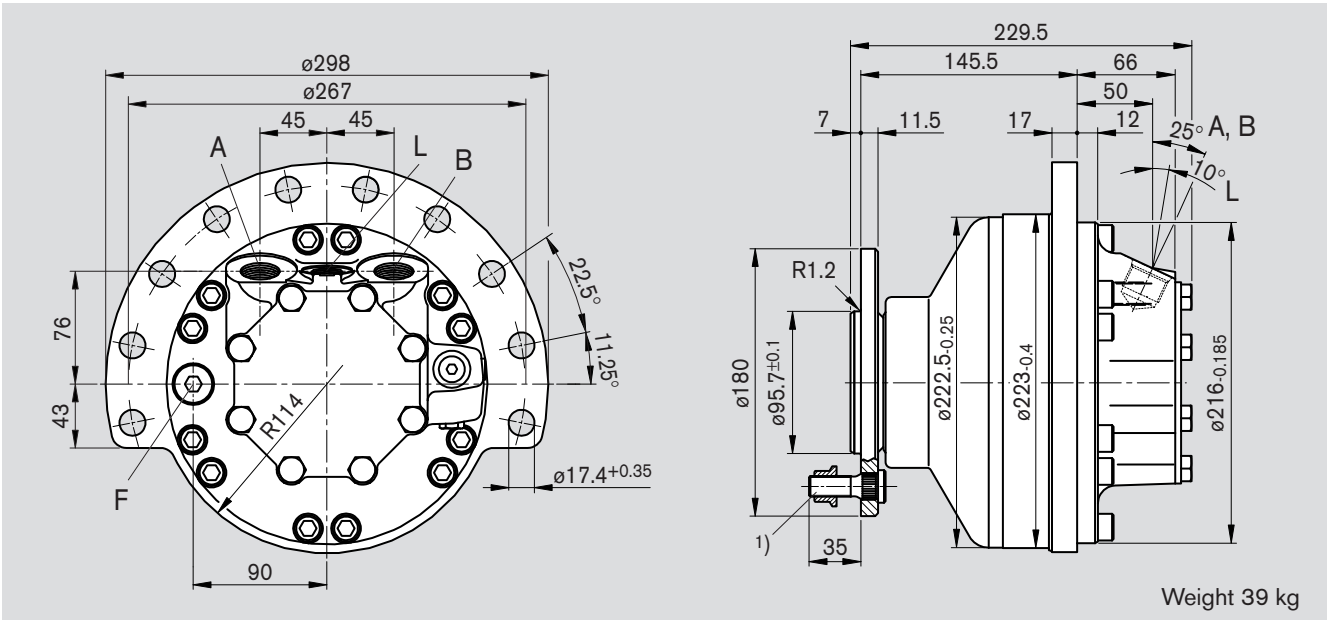
Polar moment of inertia $J_M = 0.025$ kgm^2

1) Shaft A60: ø60+0.5 INVOLUTE SPLINE 56T 24/48DP
ANSI B92.1a-1976, 30° pressure angle, flat root side fit, tolerance class 5

2) Centring bore in accordance with DIN 332 (thread to DIN 13)

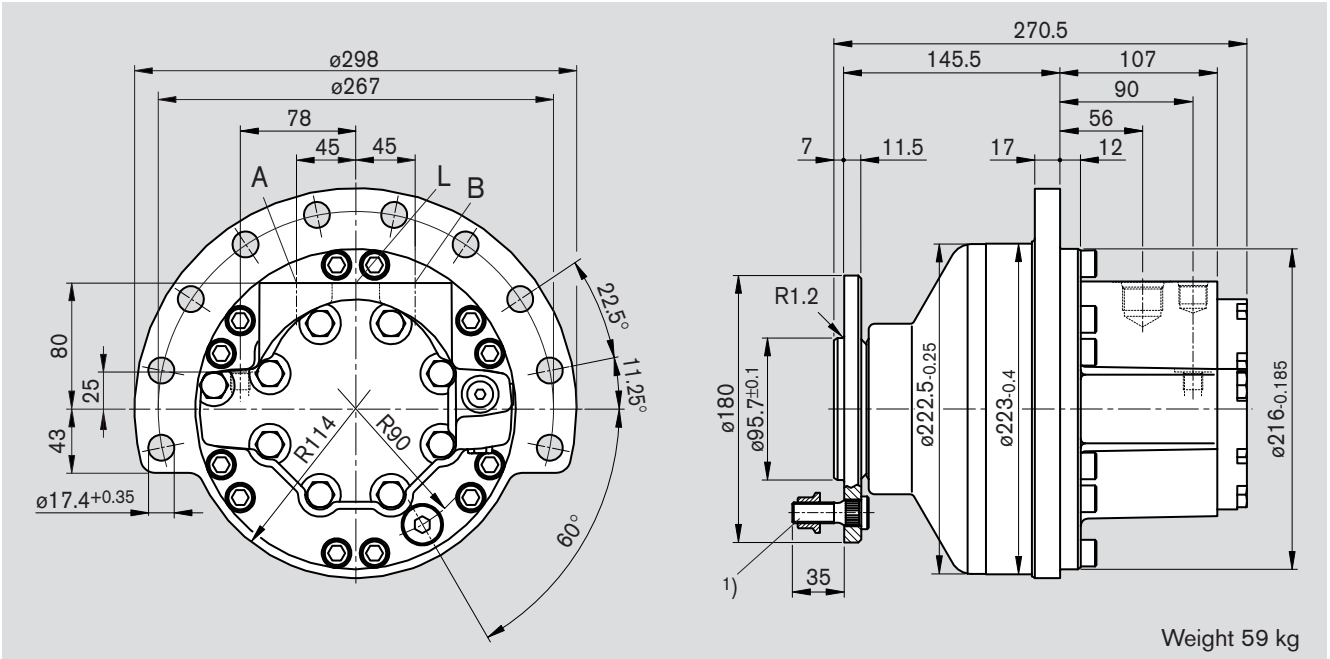
Unit Dimensions (in mm)

Flanged rear housing, flanged output shaft, compact front housing, single speed (1)
Ordering code: **"MCR5C . . . F180Z-32/A0 . 1L/12 . /. ."**



Weight 39 kg

Flanged rear housing, flanged output shaft, compact front housing, two speed (2W)
Ordering code: **"MCR5C . . . F180Z-32/A0 . 2WL/12 . /. ."**



Weight 59 kg

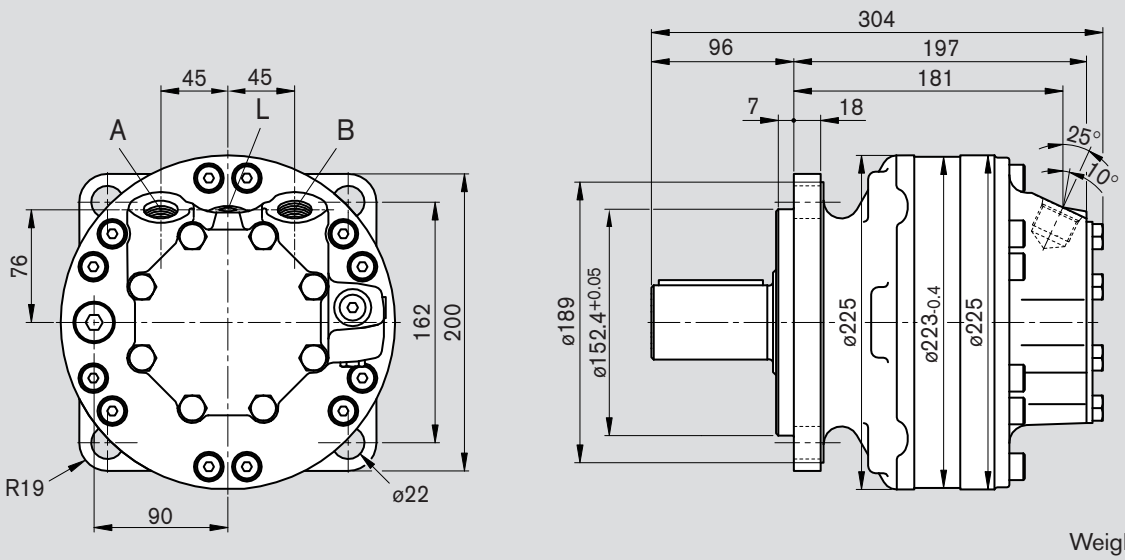
Ports			
A, B	Inlet, Outlet	SAE J514	1 1/16-12
L	Case drain	SAE J514	3/4-16
F	Filling port	SAE J514	3/4-16
X	2 speed port	SAE J514	9/16-18

Polar moment of inertia $J_M = 0.025$ kgm²

1) 5x Wheel studs **M14x1.5** with shouldered hex nut for wheel fixing, clamping length 5 to 20 mm; ordering code **S** (wheel studs & nuts equally spaced on a P.C.D. of 140)

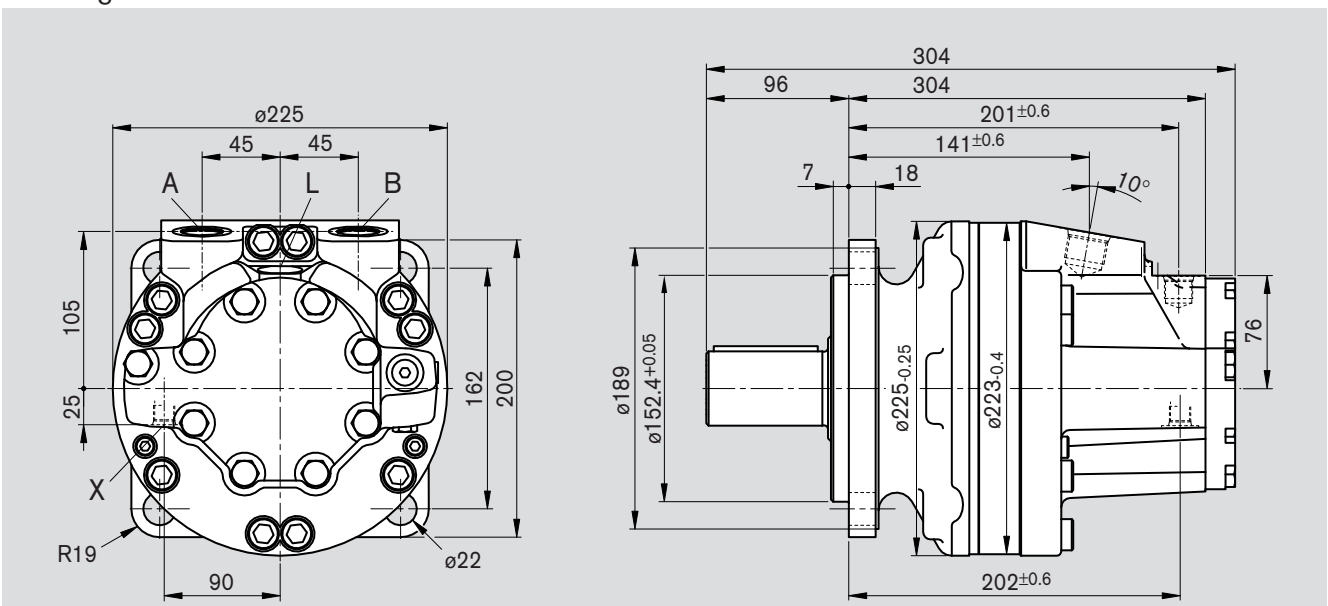
Unit Dimensions (in mm)

4 hole SAE flanged front housing, single speed (1):
Ordering code **“MCR5D . . . L50Z-32/A0 . 1L/12 . /. .“**



Weight 39 kg

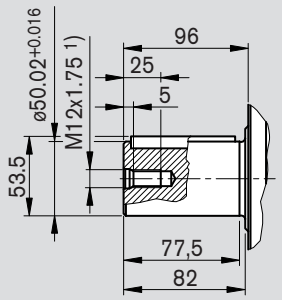
4 hole SAE flanged front housing, two speed (2W):
Ordering code **“MCR5D . . . L50Z-32/A0 . 2WL/12 . /. .“**



Weight 59 kg

Shaft ends

L50 Parallel keyed shaft, DIN 6885, AS14x9x70



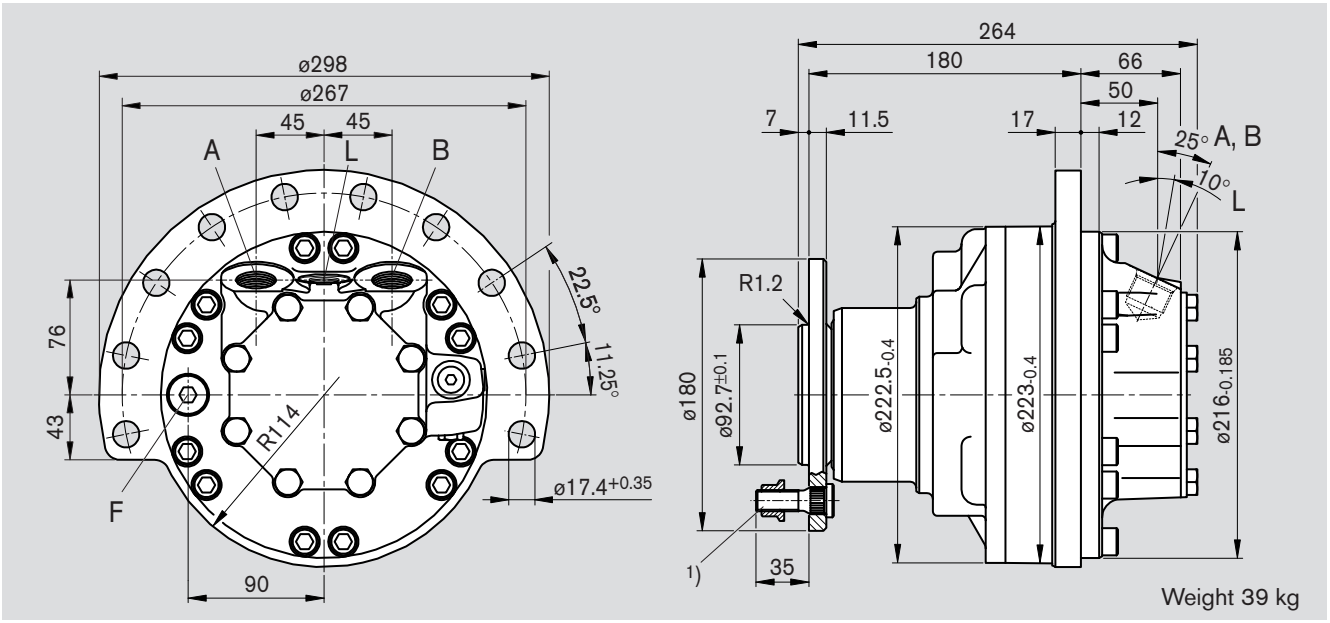
Ports			
A, B	Inlet, Outlet	SAE J514	1 1/16-12
L	Case drain	SAE J514	3/4-16
F	Filling port	SAE J514	3/4-16
X	2 speed port	SAE J514	9/16-18

Polar moment of inertia $J_M = 0.025$ kgm^2

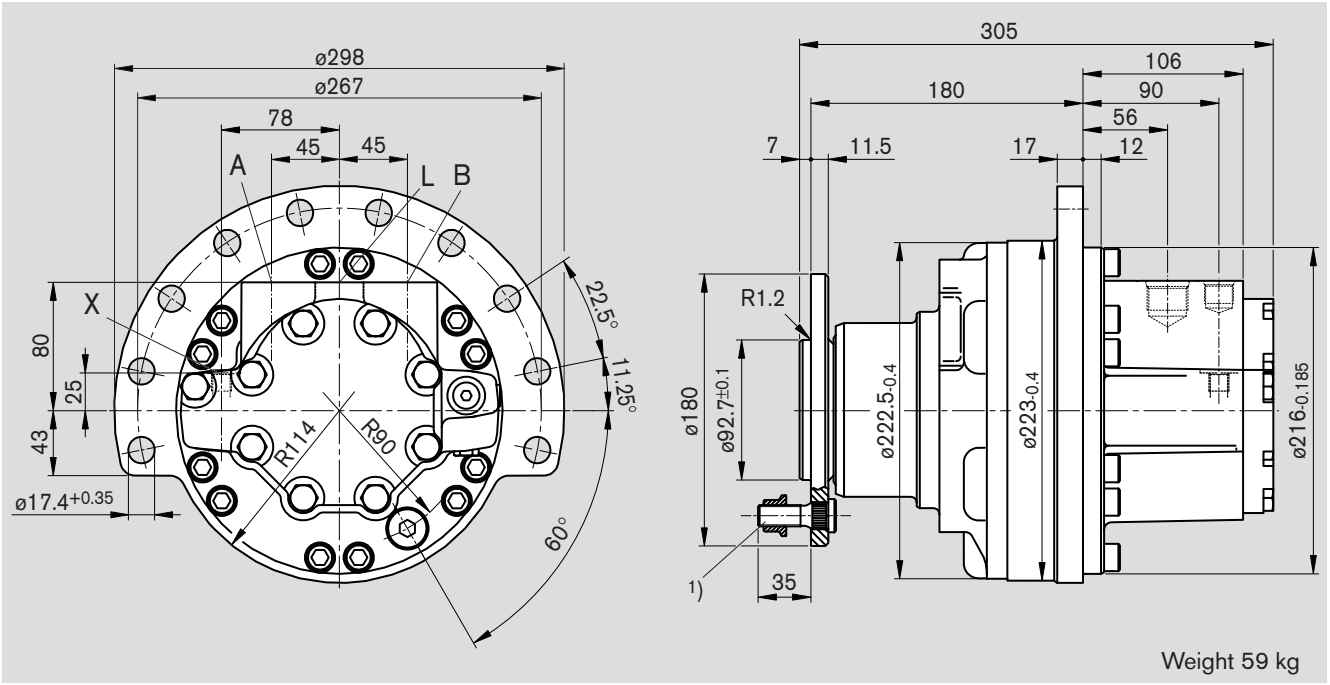
1) Centring bore in accordance with DIN 332 (thread to DIN 13)

Unit Dimensions (in mm)

Flanged rear housing, flanged output shaft, single speed (1)
Ordering code: **"MCR5F . . . F180Z-32/A0 . 1L/12 . /. ."**



Flanged rear housing, flanged output shaft, two speed (2W)
Ordering code: **"MCR5F . . . F180Z-32/A0 . 2WL/12 . /. ."**



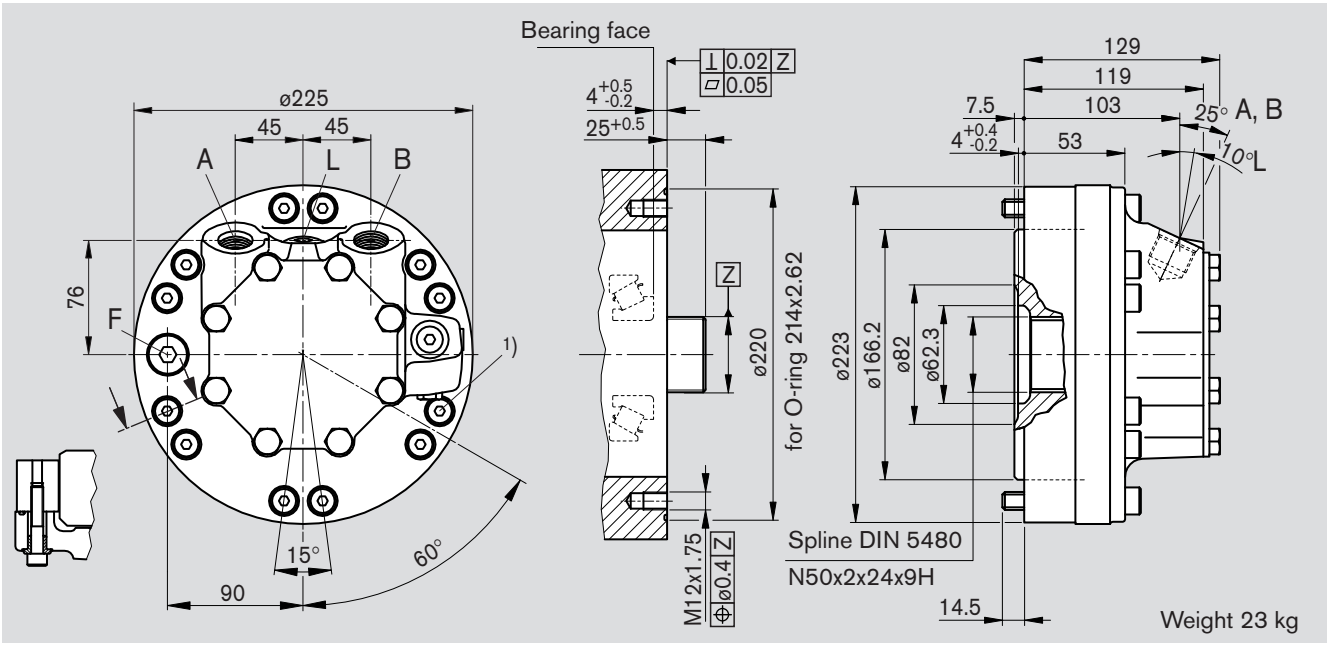
Ports			
A, B	Inlet, Outlet	SAE J514	1 1/16-12
L	Case drain	SAE J514	3/4-16
F	Filling port	SAE J514	3/4-16
X	2 speed port	SAE J514	9/16-18

Polar moment of inertia $J_M = 0.025$ kgm^2

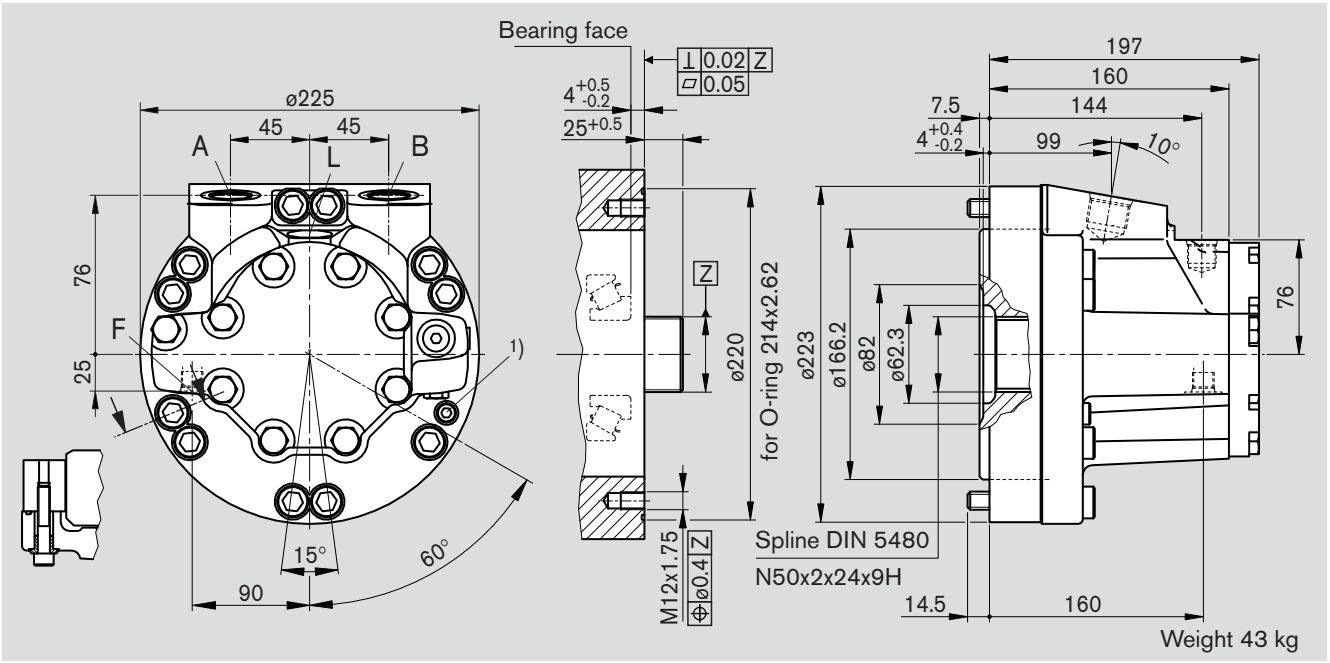
1) 10x Wheel studs **M14x1.5** with shouldered hex nut for wheel fixing, clamping length 5 to 20 mm; ordering code **S** (wheel studs & nuts equally spaced on a P.C.D. of 140)

Unit Dimensions (in mm)

Hydrobase for mounting on customer´s shaft, single speed (1)
Ordering code: **“MCR5H . . . ZZ-32/A0 . 1L/12 . /. .“**



Hydrobase for mounting on customer´s shaft, two speed (2W)
Ordering code: **“MCR5H . . . ZZ-32/A0 . 2WL/12 . /. .“**



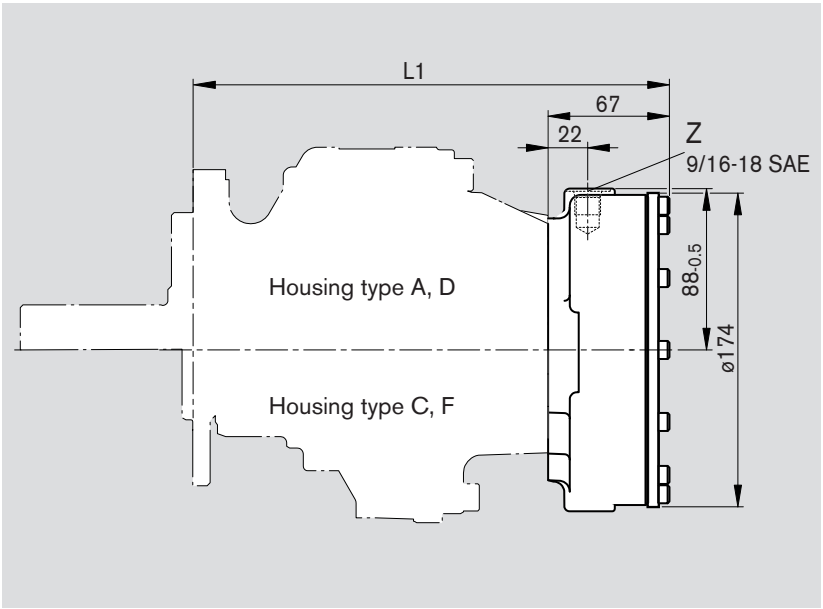
Ports			
A, B	Inlet, Outlet	SAE J514	1 1/16-12
L	Case drain	SAE J514	3/4-16
F	Filling port	SAE J514	3/4-16
X	2 speed port	SAE J514	9/16-18

Polar moment of inertia $J_M = 0.025$ kgm^2

1) 10x **M12x1.75** Bolts on a P.C.D of 196, 2 bolts used to retain cam and cannot be used for mounting motor, see bolt sectional view.

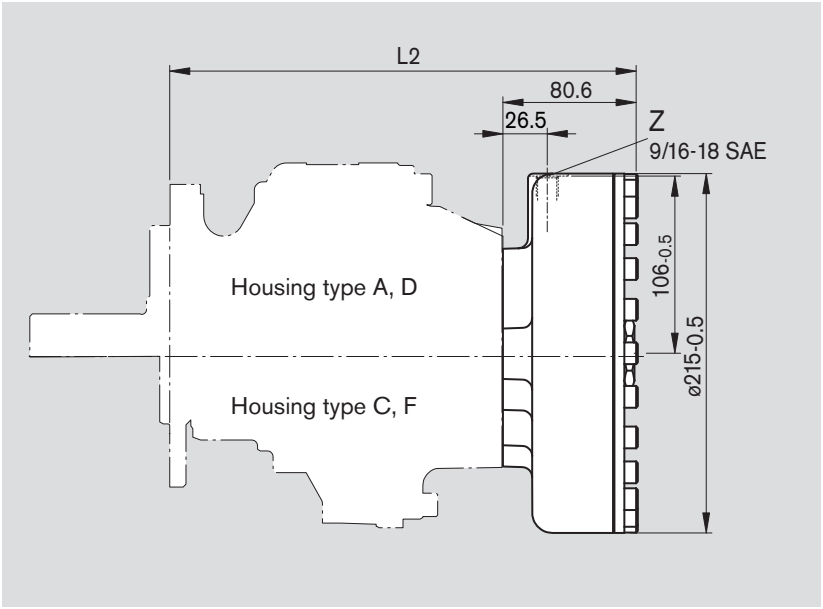
Unit Dimensions (in mm)

Holding Brake (multi-disc brake)**:** Ordering code **“B2“**



Housing type	Single speed (1) L1	Two speed (2W) L1
A	372.5	404.5
C	285.5	316.5
D	360	392
E	360	392
F	320	351
H	185	217
Polar moment of inertia $J_M = 1562$ kgmm^2		
Weight 8 kg		

Holding Brake (multi-disc brake)**:** Ordering code **“B4“**

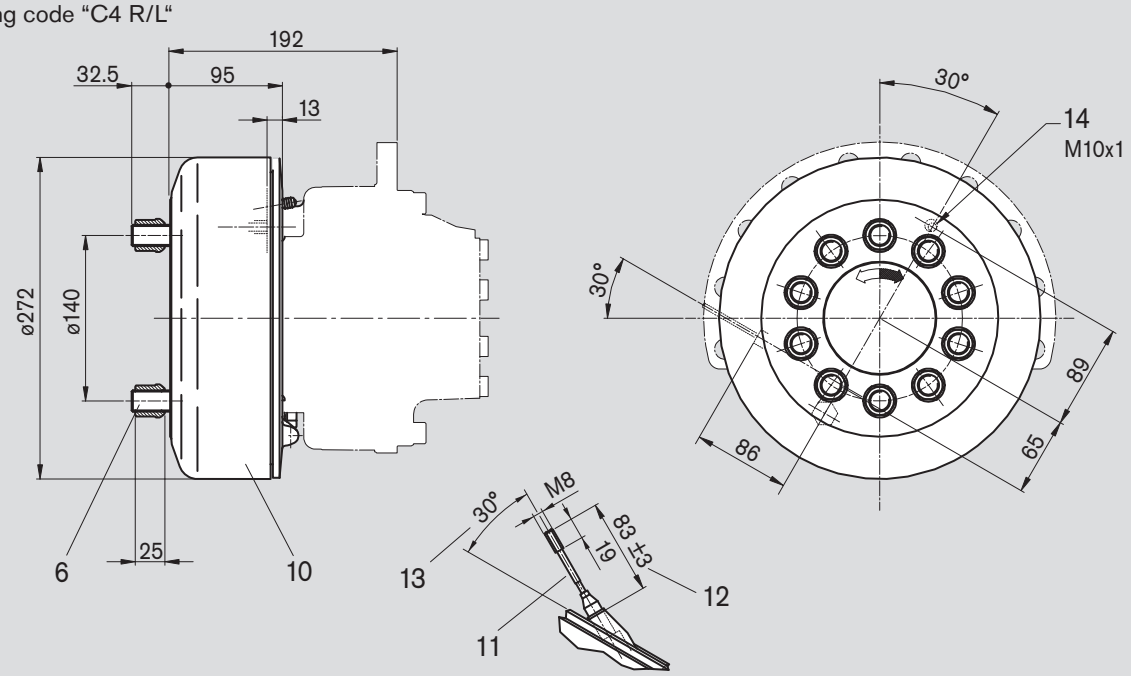


Housing type	Single speed (1) L2	Two speed (2W) L2
A	386.1	418.1
C	299.1	330.1
D	373.6	405.6
E	373.6	405.6
F	333.6	364.6
H	198.6	230.6
Polar moment of inertia $J_M = 2229$ kgmm^2		
Weight 16 kg		

Unit Dimensions (in mm)

Travel Brake (drum brake):

Ordering code “C4 R/L“



6 Studs M18 x 1.5 with spherical wheel nuts

10 Travel brake (drum brake) ordering code C4L/R 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.

11 Brake cable (Bowden cable). The brake illustrated is for right side of vehicle. The left side brake is a mirror image of this (see fig. below).

12 Brake cable length.

13 Angular position of brake cable.

14 Brake port $p_{max} = 97$ bar.

15 Brake cylinder operating volume $V = 9$ cm³.

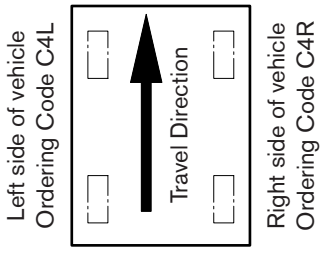
Brake torque after run-in			
Braking Torque	Cable Tension	Braking Torque	Port Pressure
3000 Nm	1270 Nm	3000 Nm	73 bar
4000 Nm	1661 Nm	4000 Nm	93 bar
Polar moment of interia $J_m = 53546$ kgmm²			
Weight 19 kg			

MCR 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.



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