

Industrial Hydraulics

Electric Drives and Controls

Linear Motion and Assembly Technologies

Pneumatics

Service Automation

Mobile Hydraulics

**Rexroth**  
Bosch Group

## RE 15 190/07.03

Replaces: 02.92

### Radial piston hydraulic motors with a fixed displacement Types MKM, MRM

Nominal sizes 11 to 250

Series 1X

Maximum operating pressure 315 bar

Maximum displacement 251 L/min

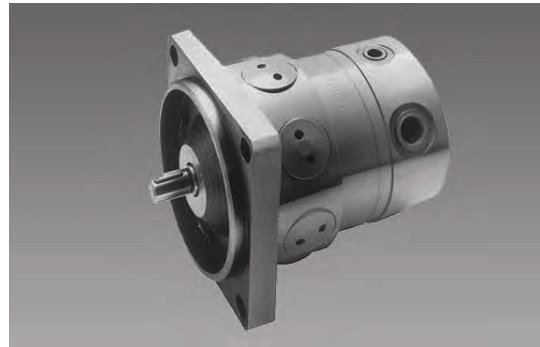
Maximum torque 1165 Nm

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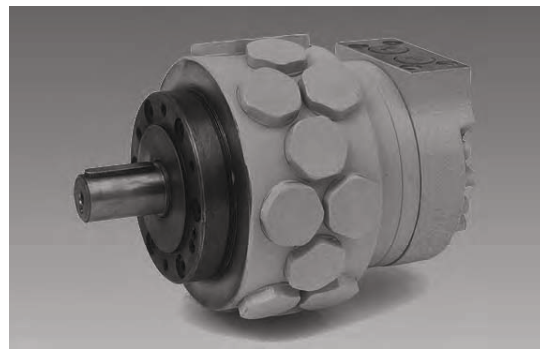
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#### Features

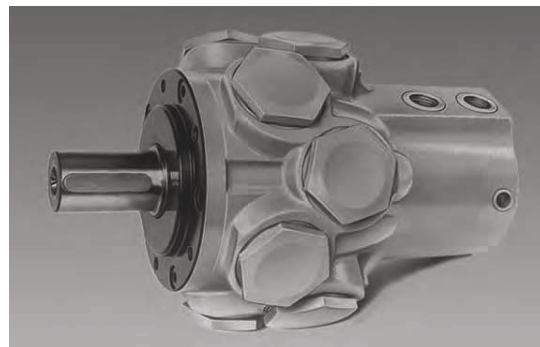
- Wide speed range
- Linear acting backlash compensation control
- Smooth rotation even at very low speeds
- Extremely small moment of inertia permitting high reversal frequency
- Very suitable for control applications
- Suitable for fire resistant fluids
- Very low operating noise level
- Versions with:
  - Shaft for tachometer
  - Through shaft
  - Built-on valves
  - With brakes



Type MKM 11 AZ 1X/M2 A0



Type MKM 90 AZ 1X/M1 A1



Type MRM 160 AZ 1X/M1 A0



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## Technical data (for applications outside these parameters, please consult us!)

### General

Design	Radial piston motor, fixed displacement													
Type	MKM; MRM													
Mounting style	Flange mounting; front face mounting													
Connection type	Threaded; flange (depending on version)													
Installation	Optional													
Shaft loading, bearing life	See page 6													
Nominal size	<i>NS</i>	11 <sup>1)</sup>	11 <sup>2)</sup>	22	32	45	63	80	90	110	125	160	250	
Moment of inertia <i>J</i>	kg cm <sup>2</sup>	2.63	2.63	2.8	2.8	3.3	3.3	17	3.9	4.1	17	23	23	
Weight	<i>m</i>	kg	12	12	17.4	17.4	18.8	18.8	40	21.4	21.4	40	58	58

### Hydraulic

Displacement	<i>V</i>	cm <sup>3</sup>	11	11	22	33	44	66	81	89	110	126	161	251	
Torque	Specific theoretic	<i>T</i>	Nm/bar	0.17	0.17	0.35	0.52	0.7	1.05	1.29	1.41	1.75	2	2.56	4
	Specific average	<i>T</i>	Nm/bar	0.15	0.15	0.32	0.48	0.63	0.95	1.16	1.27	1.59	1.8	2.38	3.7
	Continuous	<i>T</i>	Nm	21	24	50	76.8	100	152	290	178	223	360	595	740
	Max.	<i>T</i>	Nm	31.5	37.5	78	120	157	237	365	266	334	567	750	1165
Pressure differential	Continuous pressure	$\Delta p$	bar	140	160	160	160	160	160	250	140	140	200	250	200
	Operating pressure, max	$\Delta p$	bar	210	250	250	250	250	250	315	210	210	315	315	315
	Peak pressure <sup>3)</sup>	$\Delta p$	bar	250	315	315	315	315	315	400	250	250	350	400	350
Max. summated pressure in ports A + B	$p$	bar	250	315	315	315	315	315	400	250	250	350	400	350	
Leakage fluid pressure	$p$	bar	1.5 bar (special seals for higher pressures on request.)												
Speed range	From	<i>n</i>	min <sup>-1</sup>	10	5	10	10	5	5	5	5	5	5	5	5
	Up to	<i>n</i>	min <sup>-1</sup>	3000	3600	2250	1500	1800	1200	800	900	750	600	800	600
Power	Continuous	<i>P</i>	kW	3.5	4.7	6	6	9.5	9.5	12	8.5	8.5	12	24	24
	Intermittent	<i>P</i>	kW	4.3	5.8	7.5	7.5	11	11	15	10	10	15	30	30

For speeds  $\leq 10 \text{ min}^{-1}$  please take the operating instructions into account, depending on the application minimum speeds of  $0.1 \text{ min}^{-1}$  are possible in closed loop applications.

$P_{\text{continuous}}$  Continuous working power (with a max. return pressure of 10 bar): If continuously exceeded, then rotary group flushing should be provided.

$P_{\text{intermittent}}$  Power that intermittently (max. 10 % ED within an operating period of one hour) can be demanded.

Pressure fluid	HLP mineral oil to DIN 51 524 part 2 HFB and HFC fluids – pressures reduced to 70 %, Phosphate ester (HFD), FKM seals required												
Pressure fluid temperature range	$\vartheta$	°C	– 30 to + 90										
Viscosity range	$\nu$	mm <sup>2</sup> /s	20 to 150 recommended operating range 30 to 50, up to 1000 on start-up										
Cleanliness class to ISO code	Maximum permissible degree of contamination of the pressure fluid is to ISO 4406 class 20/18/15												

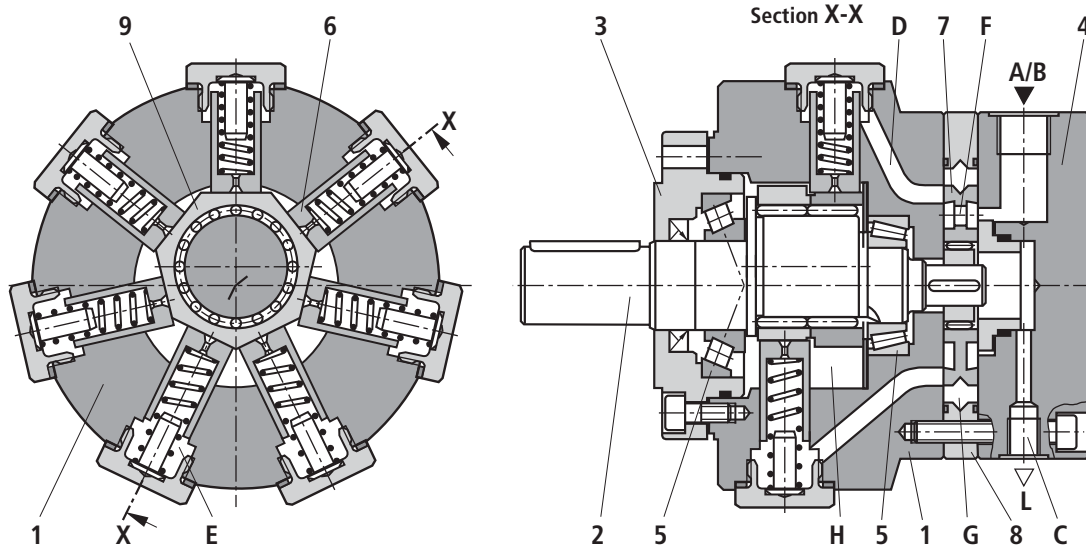
The cleanliness class stated for the components must be adhered too in hydraulic systems. Effective filtration prevents faults from occurring and at the same time increases the component service life.

For the selection of filters see catalogue sheets RE 50 070, RE 50 076 and RE 50 081.

### Technical data for the holding brake

Design	Spring pressure multiple disc brake, static holding brake; dynamic operation only in the case of an emergency													
Brake type	LBD9A2 17      LBD11A2 190      LBD124A2 400      LBD249A2 740													
Static braking moment (wet running)	$T_{\text{ü}}$	Nm	11			140			300			500		
Dynamic braking moment (wet running)	$T_{\text{s}}$	Nm	11			140			300			500		
Air pressure	$p$	bar	20 – 250			30 – 320			30 – 320			30 – 320		
Weight	<i>m</i>	kg	8			9.5			28			32		
Motor type cross reference	MKM 11 A2 MRM 11 A2			MKM 22 A1 MKM 32 A1 MKM 45 A1 MKM 63 A1 MKM 90 A1 MKM 110 A1			MRM 80 K2 MRM 125 K2			MRM 160 K2 MRM 250 K2				
<sup>1)</sup> MKM; <sup>2)</sup> MRM <sup>3)</sup> Definition to DIN 24 312 peak pressure = pressure curve which temporarily exceeds the maximum operating pressure and at which the motor continues to remain operable.														

## Function, section



Types MKM and MRM hydraulic motors are fixed displacement external radial piston motors.

### Design

The main components are housing (1), crankshaft (2), cover (3), cover plate (4), tapered roller bearings (5), pistons (6), control (7).

### Rotary group details

The radial pistons (6) act on the crankshaft (2) via needle bearings (9) or via heptagonal rings with needle bearings.

#### Crankshaft bearings:

Pre-stressed, generously sized tapered roller bearings (5) in the X-arrangement.

#### Power transmission pistons (6) – crankshaft (2):

Via needle bearings (9) (or heptagon ring with needle bearings)

Low friction losses, very long life, not sensitive to contamination, also suitable for maximum pressures and motor speeds, high starting torque, no stick/slip at low motor speeds, minimal leakage and high efficiency.

### Operating medium, feed and return

The operating medium is supplied to and carried away from the motor by way of ports A or B. The cylinder chambers (E) are filled or emptied by way of the control and the channels (D) in the housing (1).

### Torque generation; operating stroke

The operating medium in the cylinder chambers (E), which are at present connected to the supply, are pressurised. The pistons (6) are pushed from the outside (external loading!) onto the eccentric of the crankshaft (operating stroke) and the crankshaft rotates.

### Operating medium return

The pistons (6), which are again pushed outwards by the rotation of the crankshaft (2) eccentric, expel the fluid from the cylinder chambers (E), which are at present connected to the return flow line.

### Control

#### Design:

A flat distributor which moves in a linear manner.

#### Purpose:

Distribution of incoming flow to the cylinder chambers, collection of return flow.

#### Operating principle:

The control plate (7) incorporates an inner annular area (F) and forms with the annulus (8) an external annular chamber (G). By offsetting the control plate (7) radially between the motor housing (1) and locking cover (4) with the help of the eccentric which is connected firmly relative to the crankshaft (2) the inner and the outer annular areas are alternately brought into contact with the cylinders. The annular areas themselves open out into ports A or B on the outside.

### Leakages

Leakages occurring at piston (6) and control (7) are collected in the motor casing (H) and discharged via drain port (C).

### Flushing

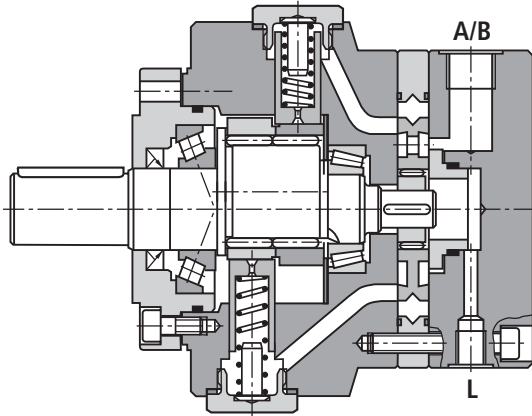
With high powers and/or temperatures we recommend the use of rotary group flushing.

Dependent on the type, 1 to 4 litres of flushing oil is fed into the drain connection L (4) and is then passed together with the motor leakage via the flushing port S99 to tank.

## Motor types - overview

## Features

### MKM



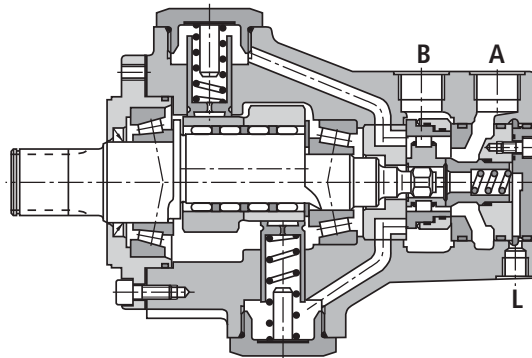
#### Rotary group

- 7, 14 or 21 radially arranged pistons
- Power transmission piston - crankshaft: by means of pistons via heptagonal ring with needle cage

#### Control

- Needle cage between the control plate and eccentric
- A flat distributor plate that moves in a linear manner with gap seals to counter internal leakage and gap compensating sealing against external leakage.
- Hydrostatic spring supported pressing of the pressure piece onto the control plate
- Reduction in external leakage with minimal friction losses

### MRM



#### Rotary group

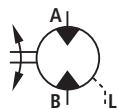
- 5 or 10 radially arranged pistons
- Power transmission piston - crankshaft: by means of hydrostatically unloaded pistons and pentagonal ring with needle cage

#### Control

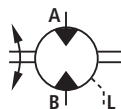
- Roller bearings between the control rings and eccentric
- A flat distributor plate that moves in a linear manner with backlash compensation
- Hydrostatic spring supported pressing of the control rings onto the flat surfaces
- Hydrostatic backlash compensation of the flat eccentric surfaces, spring supported via the pressure piece
- Reliable backlash compensation even at high reversing frequencies
- Only very slight leakage with minimal friction losses
- The miniaturised shuttle valve ensures: that within the ring chamber, between the control lands, the higher pressure that the motor is being subjected too is applied

## Symbols

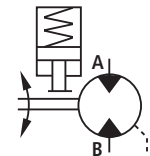
With one shaft end



With 2 shaft ends



With holding brake



## Bearing life, shaft strength

$L_{n-hyd10}$  is the modified nominal bearing life using mineral oil with a viscosity of  $n = 36 \text{ mm}^2/\text{s}$  in operating hours where 10 % of the bearings may fail. 90 % achieve a higher bearing life. The average mean bearing life  $L_{n-hyd50}$  with mineral oil is approximately five times  $L_{n-hyd10}$ . In practice a minimum of  $L_{n-hyd50}$  can be expected for hydraulic

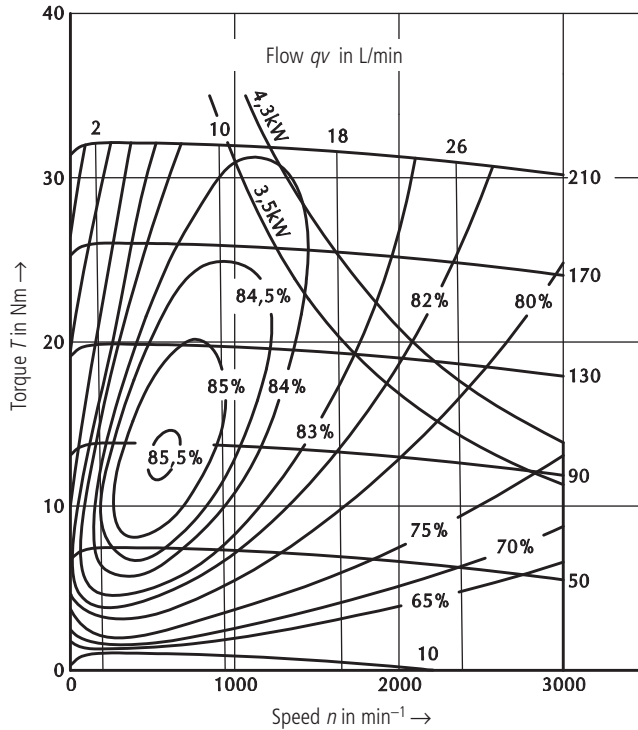
drives with mineral oil. As the operating speed is incorporated into the calculation approximately as a proportionate figure, the table value is converted accordingly.

Type	Speed $n$ ( $\text{min}^{-1}$ )	$L_{n-hyd10}$ in operating hours at a defined $\Delta p$ and speed $n$ with no external forces on the drive shaft.						
		100 bar	140 bar	160 bar	180 bar	210 bar	250 bar	315 bar
MKM / MRM11	1000	>100000	88950	56995	38489	23024		
MKM 22/32	500	>100000	>100000	81400	54969	32883	18388	
MKM 45/63	350	43679	14228	9119	6157	3683	2059	
MKM 90/110	250	15719	5121	3281	2216	1325		
MRM 80	400	>100000	>100000	>100000	>100000	97424	54484	25217
MRM 125	400	>100000	85030	54484	36792	22009	12308	5697
MRM 160	400	>100000	38925	24941	16843	10075	5634	2608
MRM 250	300	31319	10203	6537	4415	2641	1477	684

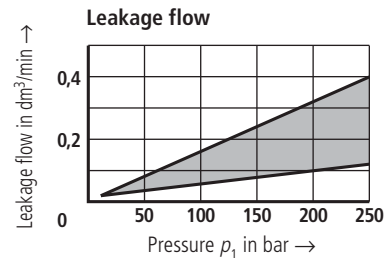
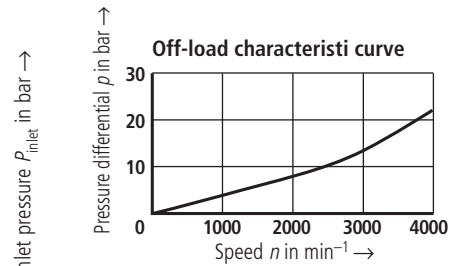
Type	Speed $n$ ( $\text{min}^{-1}$ )	$L_{n-hyd10}$ in operating hours at a defined $\Delta p$ and speed $n$ MKM 11, 22, 32, 45, 63 max. permissible radial force at the centre of the output shaft = 4500 N MKM 90, 110 max. permissible radial force at the centre of the output shaft = 3000 N MRM 80, 125, 160, 250 max. permissible radial force at the centre of the output shaft = 10 000 N						
		100 bar	140 bar	160 bar	180 bar	210 bar	250 bar	315 bar
MKM / MRM11	1000	4963	4485	4235	3983	3614		
MKM 22/32	500	5838	5092	4717	4353	3839	3225	
MKM 45/63	350	9319	5898	4713	3788	2767	1704	
MKM 90/110	250	11423	4689	3098	2115	1281		
MRM 80	400	27172	22727	20610	18623	15923	12872	9118
MRM 125	400	20998	15203	12872	10897	8514	6190	3810
MRM 160	400	25074	14939	11648	9167	6523	4289	2344
MRM 250	300	14150	6882	4977	3681	2421	1387	656

Characteristic curves (average value) measured at  $v = 36 \text{ mm}^2/\text{s}$ ;  $\vartheta_{\text{oil}} = 50 \text{ }^\circ\text{C}$ ;  $p_{\text{outlet}} = 0 \text{ bar}$ ;  $p_{\text{leakage oil}} = 0 \text{ bar}$

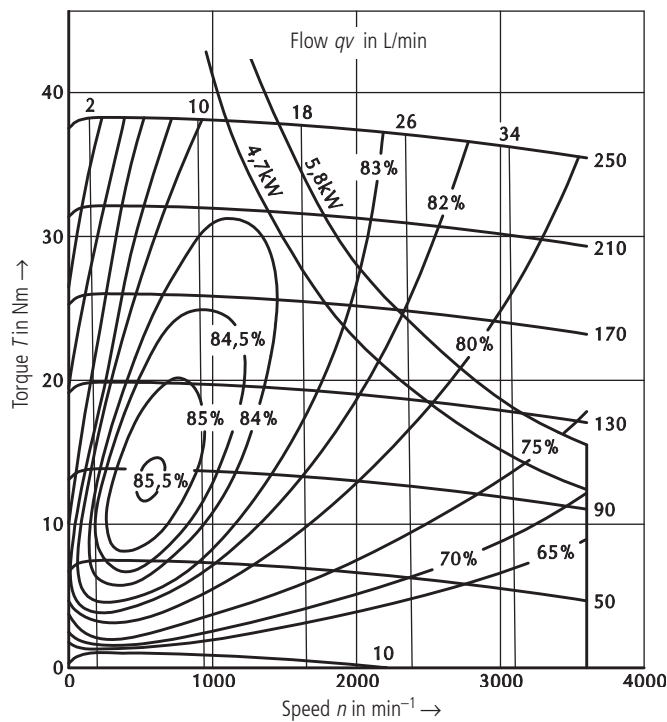
### MKM 11



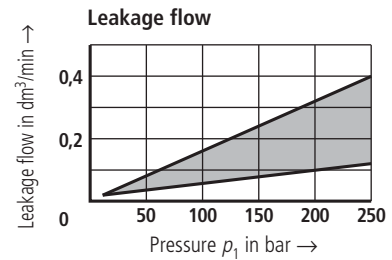
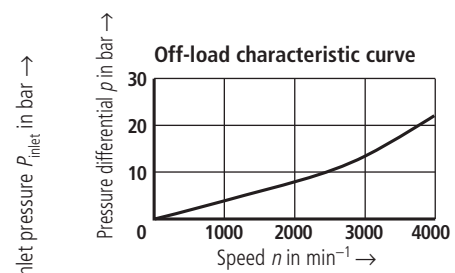
Minimum feed pressure during brake operation and closed circuit operation to the off-load characteristic curve.



### MRM 11

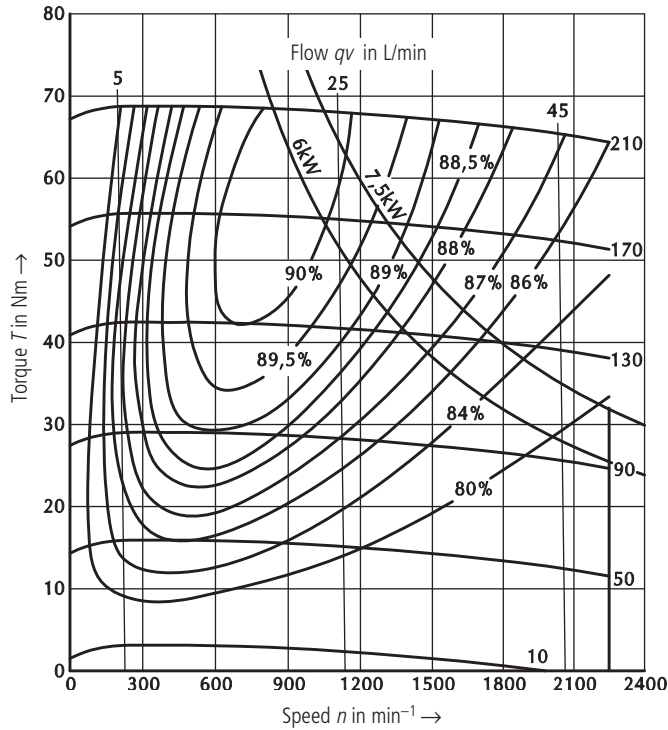


Minimum feed pressure during brake operation and closed circuit operation to the off-load characteristic curve.

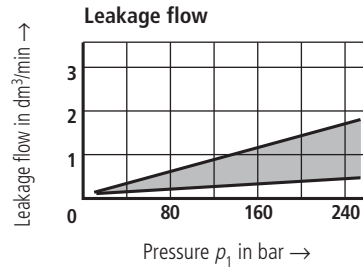
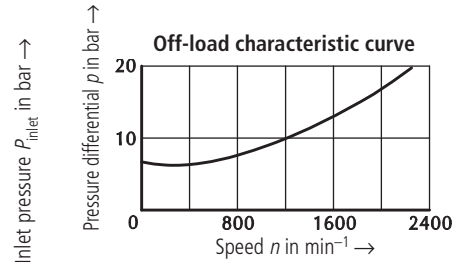


Characteristic curves (average value) measured at  $v = 36 \text{ mm}^2/\text{s}$ ;  $\vartheta_{\text{oil}} = 50 \text{ }^\circ\text{C}$ ;  $p_{\text{outlet}} = 0 \text{ bar}$ ;  $p_{\text{leakage oil}} = 0 \text{ bar}$

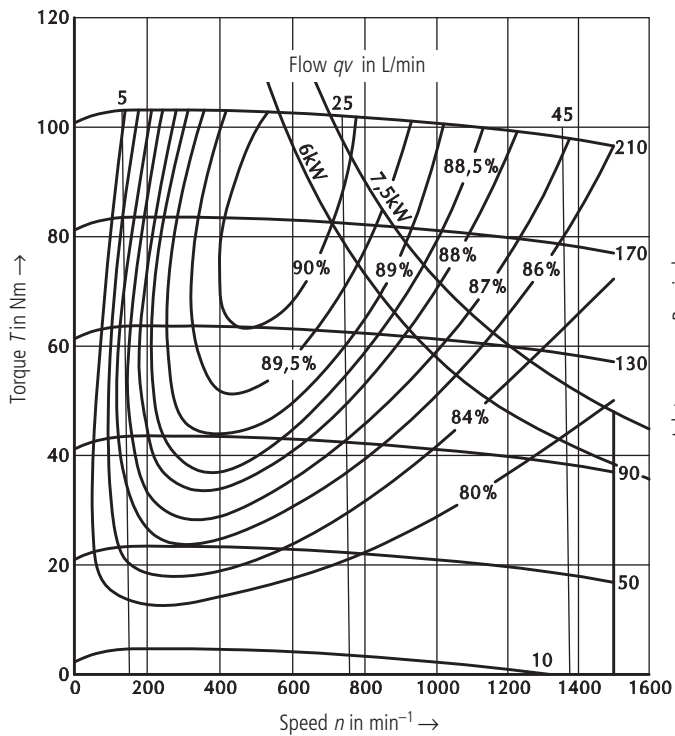
### MKM 22



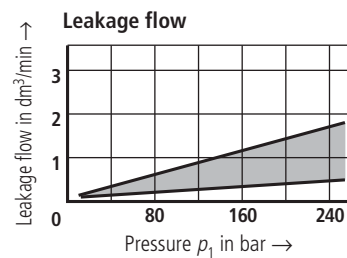
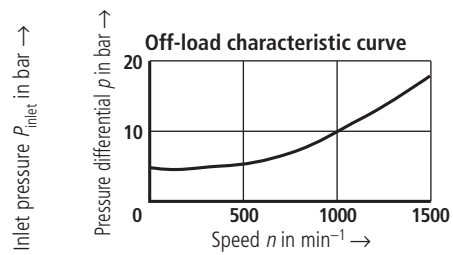
Minimum feed pressure during brake operation and closed circuit operation to the off-load characteristic curve.



### MKM 32

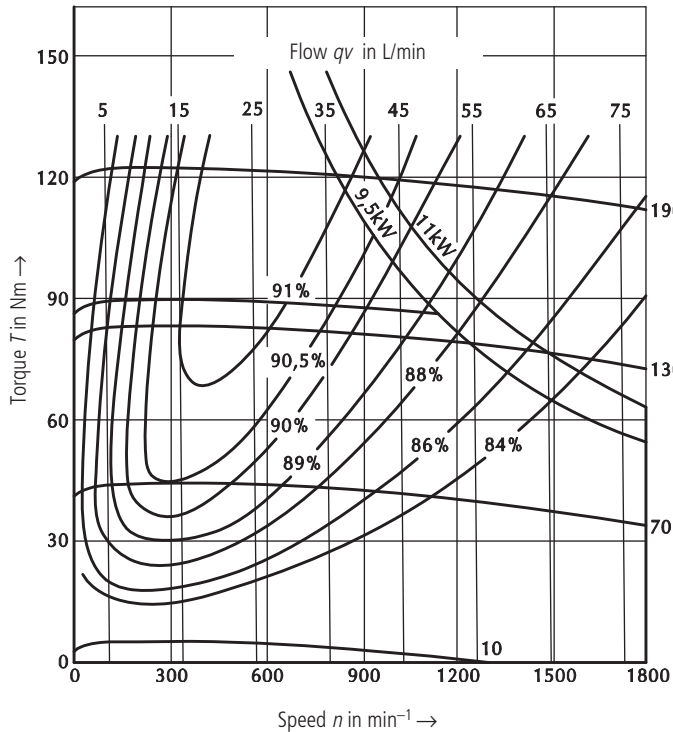


Minimum feed pressure during brake operation and closed circuit operation to the off-load characteristic curve.

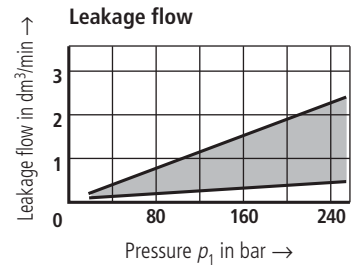
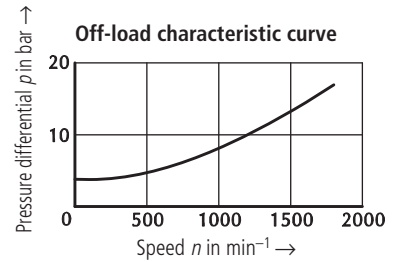


Characteristic curves (average value) measured at  $v = 36 \text{ mm}^2/\text{s}$ ;  $\vartheta_{\text{oil}} = 50 \text{ }^\circ\text{C}$ ;  $p_{\text{outlet}} = 0 \text{ bar}$ ;  $p_{\text{leakage oil}} = 0 \text{ bar}$

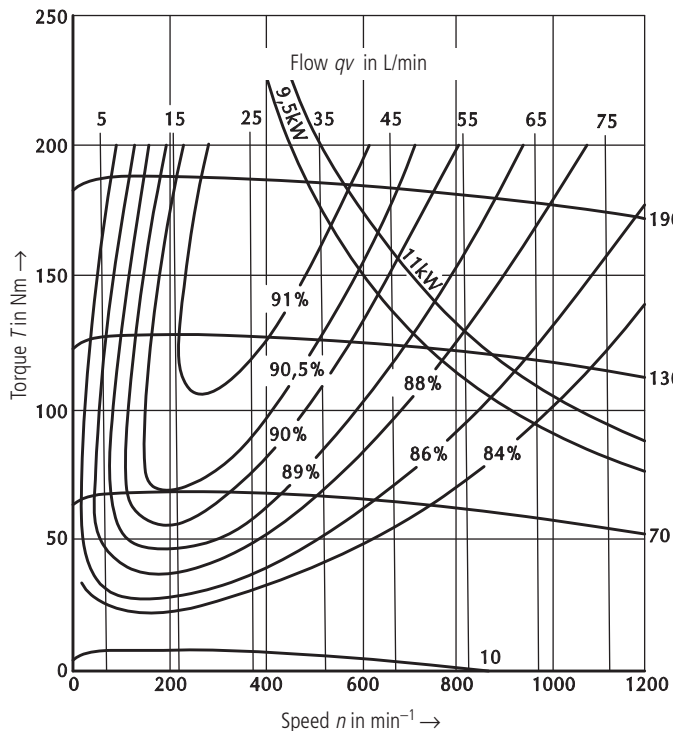
### MKM 45



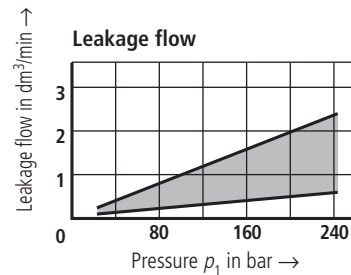
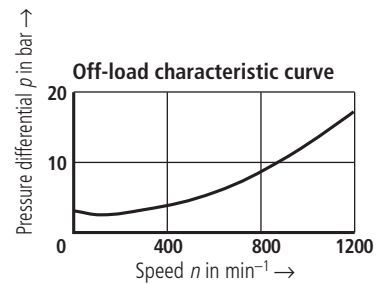
Minimum feed pressure during brake operation and closed circuit operation to the off-load characteristic curve.



### MKM 63

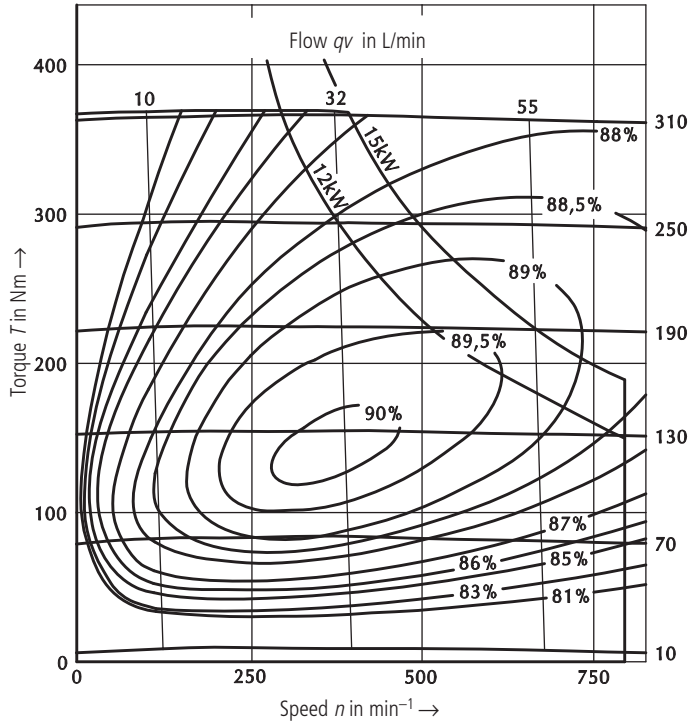


Minimum feed pressure during brake operation and closed circuit operation to the off-load characteristic curve.

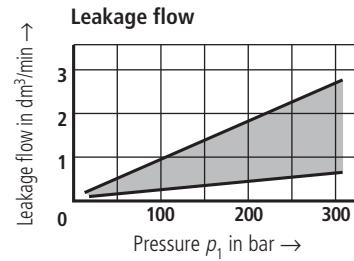
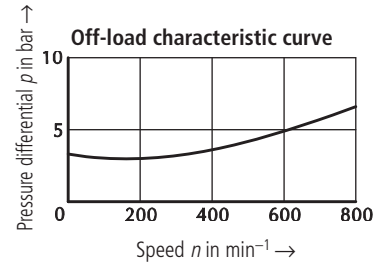


Characteristic curves (average value) measured at  $v = 36 \text{ mm}^2/\text{s}$ ;  $\vartheta_{\text{oil}} = 50 \text{ }^\circ\text{C}$ ;  $p_{\text{outlet}} = 0 \text{ bar}$ ;  $p_{\text{leakage oil}} = 0 \text{ bar}$

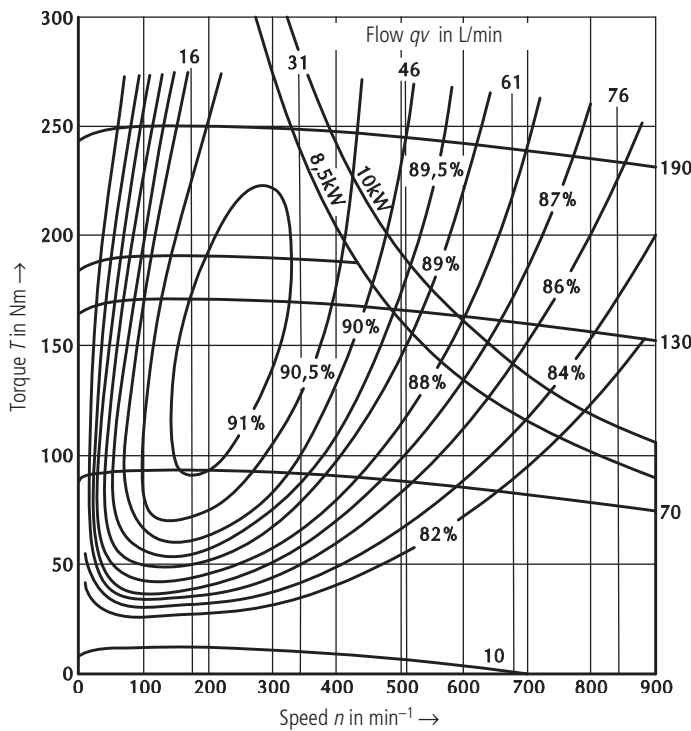
### MRM 80



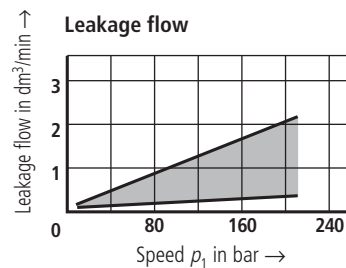
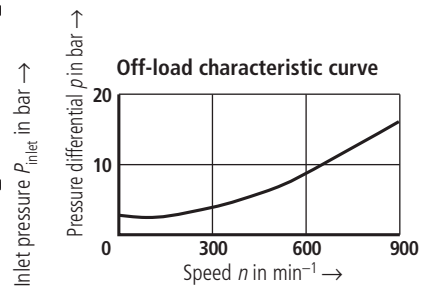
Minimum feed pressure during brake operation and closed circuit operation to the off-load characteristic curve.



### MKM 90

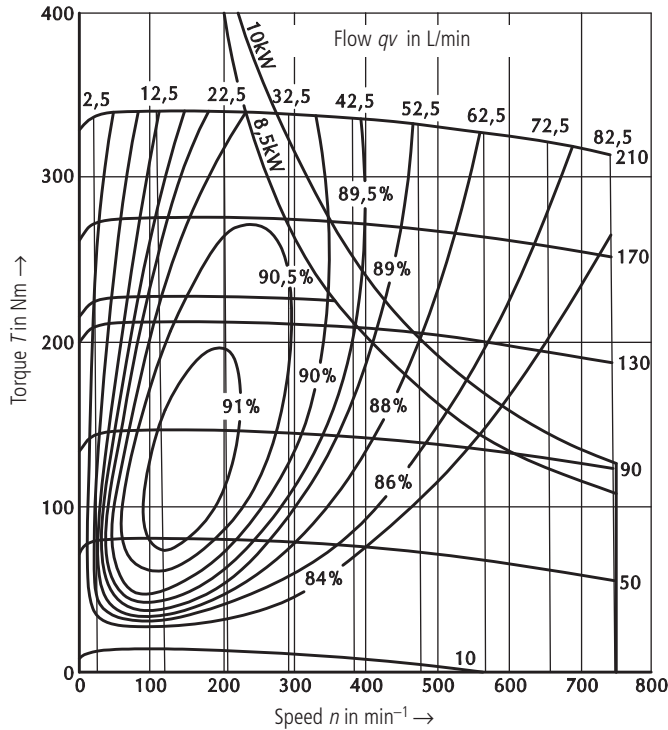


Minimum feed pressure during brake operation and closed circuit operation to the off-load characteristic curve.

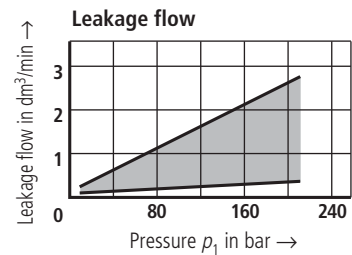
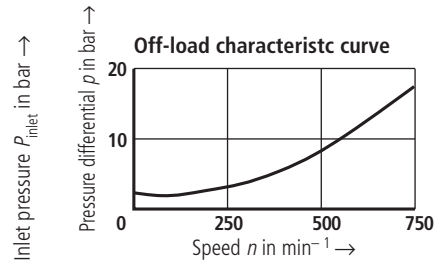


Characteristic curves (average value) measured at  $v = 36 \text{ mm}^2/\text{s}$ ;  $\vartheta_{\text{oil}} = 50 \text{ }^\circ\text{C}$ ;  $p_{\text{outlet}} = 0 \text{ bar}$ ;  $p_{\text{leakage oil}} = 0 \text{ bar}$

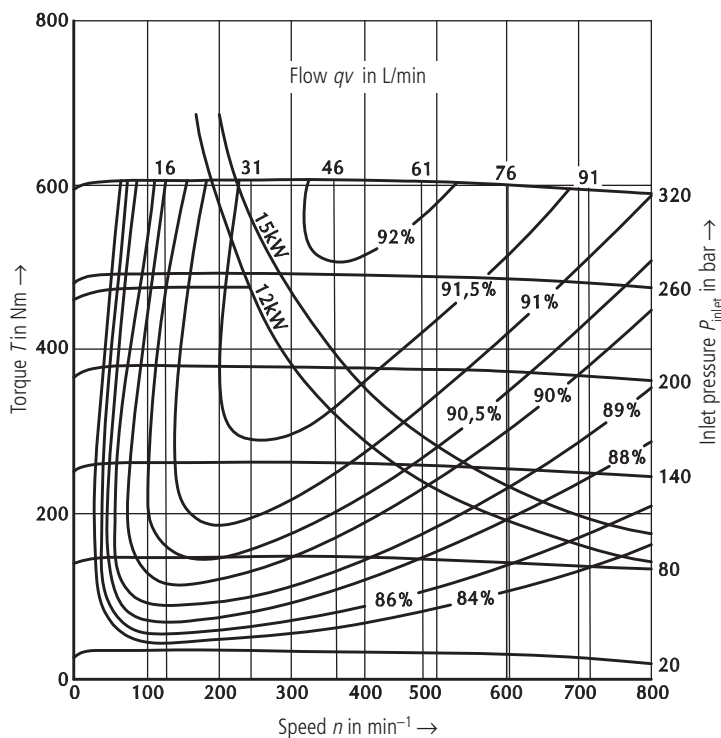
### MKM 110



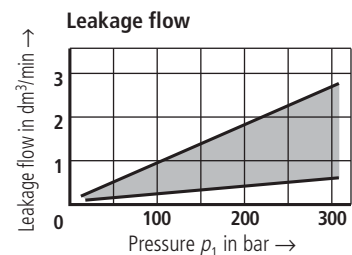
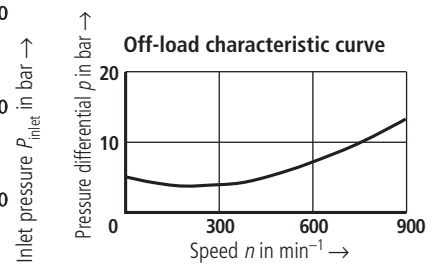
Minimum feed pressure during brake operation and closed circuit operation to the off-load characteristic curve.



### MRM 125

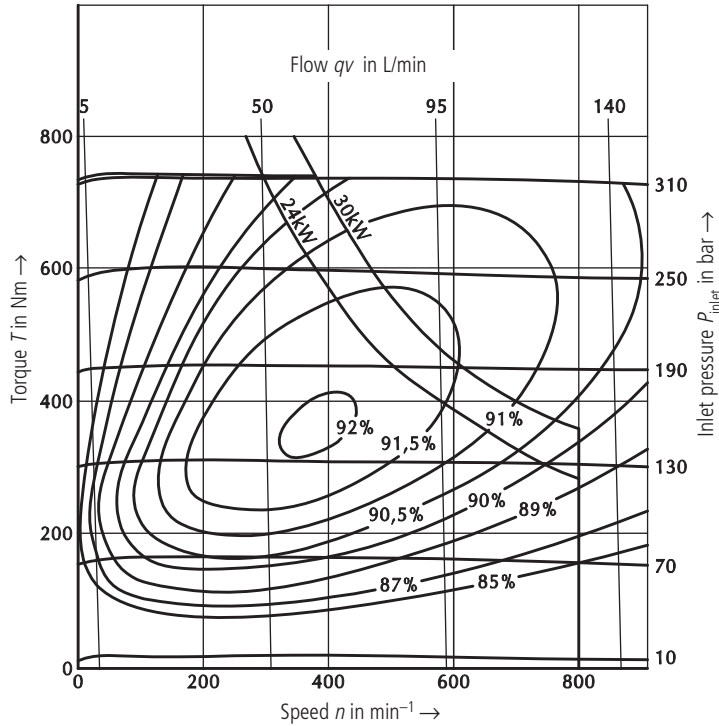


Minimum feed pressure during brake operation and closed circuit operation to the off-load characteristic curve.

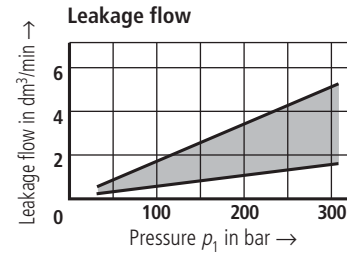
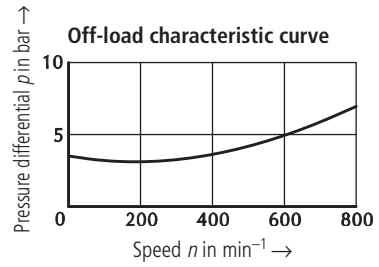


Characteristic curves (average value) measured at  $v = 36 \text{ mm}^2/\text{s}$ ;  $\vartheta_{\text{oil}} = 50 \text{ }^\circ\text{C}$ ;  $p_{\text{outlet}} = 0 \text{ bar}$ ;  $p_{\text{leakage oil}} = 0 \text{ bar}$

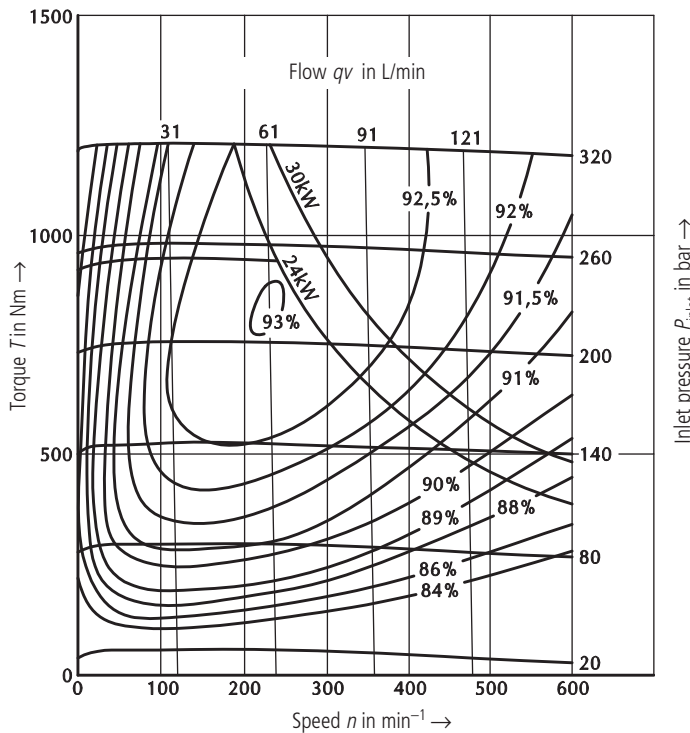
### MRM 160



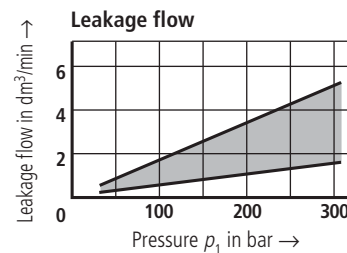
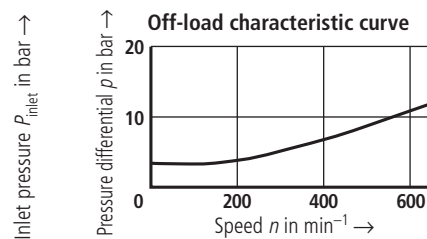
Minimum feed pressure during brake operation and closed circuit operation to the off-load characteristic curve.



### MRM 250



Minimum feed pressure during brake operation and closed circuit operation to the off-load characteristic curve.

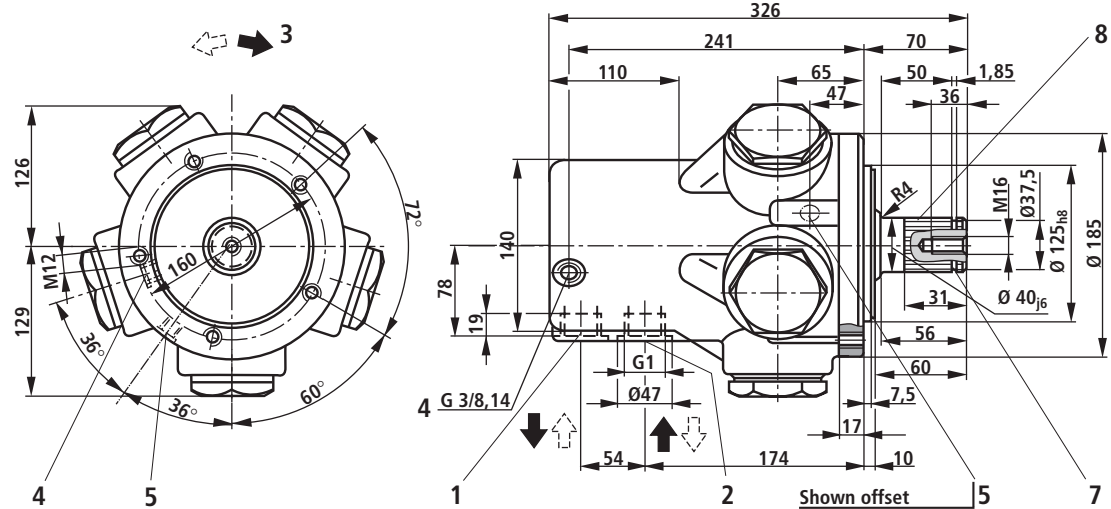




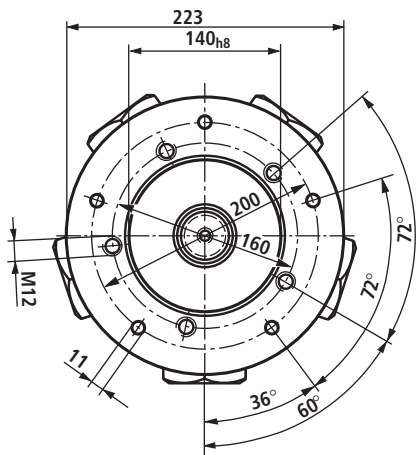


## Unit dimensions: MRM 80 and 125 (dimensions in mm)

Flange version „1“ with splined shaft „K“  
Pipe connection „A0“

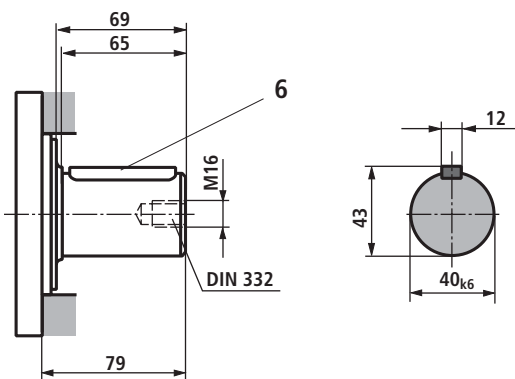


Flange version „2“  
with through holes

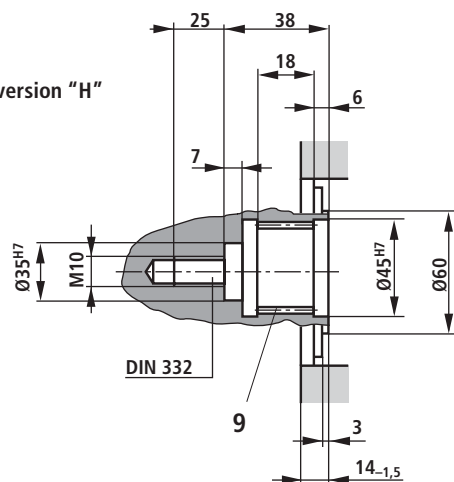


- 1 Port A G 1
- 2 Port B G 1
- 3 Direction of rotation viewed on the shaft end  
**Right:** With flow from port B to A  
**Left:** With flow from port A to B
- 4 Leakage port G 3/8  
Counterbore  $\varnothing 28$  mm, offset  $72^\circ$  in relation to ports A and B
- 5 Flushing connection G 3/8 (version „S99“)
- 6 Key A 12 x 8 x 56 DIN 6885
- 7 Shaft groove for retaining ring DIN 471
- 8 Splined shaft connection DIN 5480  
W40 x 2 x 18 x 7h
- 9 Splined shaft connection DIN 5480  
N45 x 2 x 21 x 9H

Shaft version „A“



Shaft version „H“

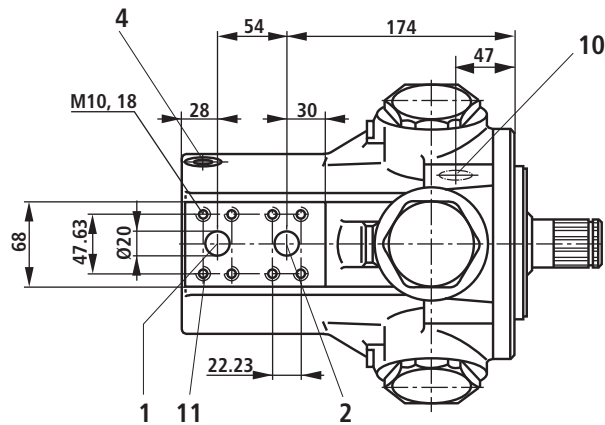
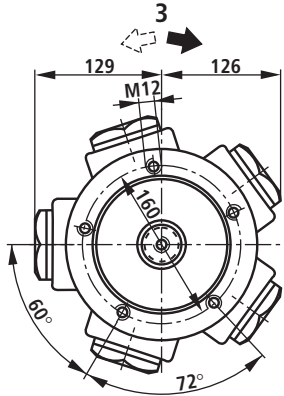




## Unit dimensions MRM 80, 125, 160 a und 250 (dimensions in mm)

MRM 80, MRM 125  
Flange version "1"  
with splined shaft "K"  
Pipe connection "A1"

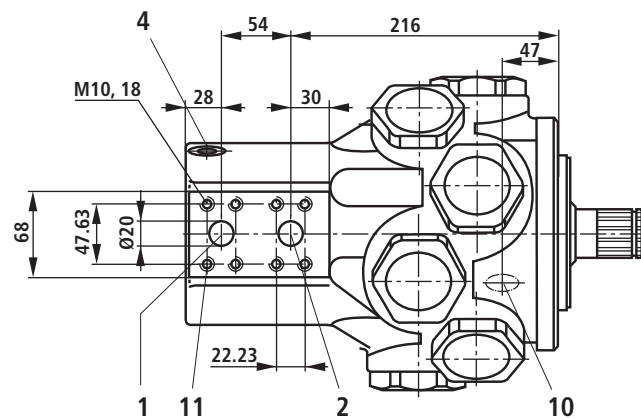
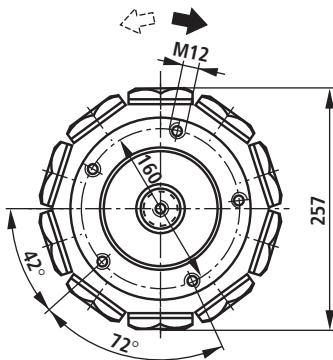
For dimensions  
see page 15



- 1 Port A SAE J 518 3/4" standard
- 2 Port B SAE J 518 3/4" standard
- 3 Direction of rotation viewed on the shaft end  
**Right:** With flow from port B to A  
**Left:** With flow from port A to B
- 4 Leakage port G 3/8  
Counterbore  $\varnothing$  28 mm, offset 72° in relation to ports A and B
- 10 Flushing connection G 3/8 (version „S99“)
- 11 Flange height from centre of shaft  $80^{+0.5}$  mm

MRM 160, MRM 250  
Flange version "1"  
with splined shaft "K"  
Pipe connection "A1"

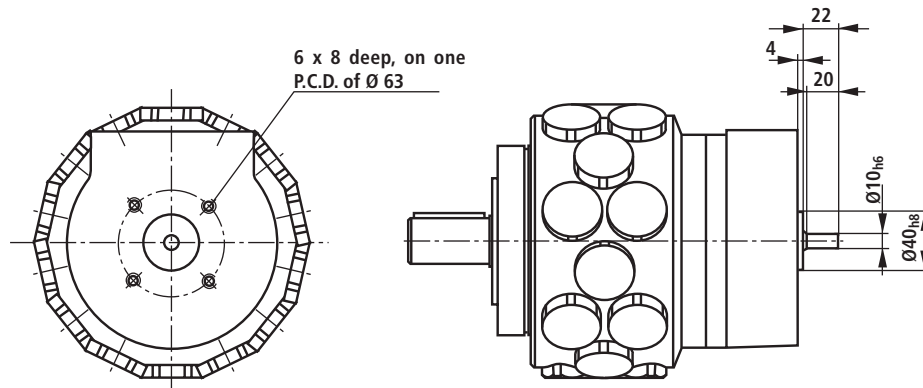
For dimensions  
see page 16



## Motor with tachometer shaft (dimensions in mm)

Ordering detail "M"

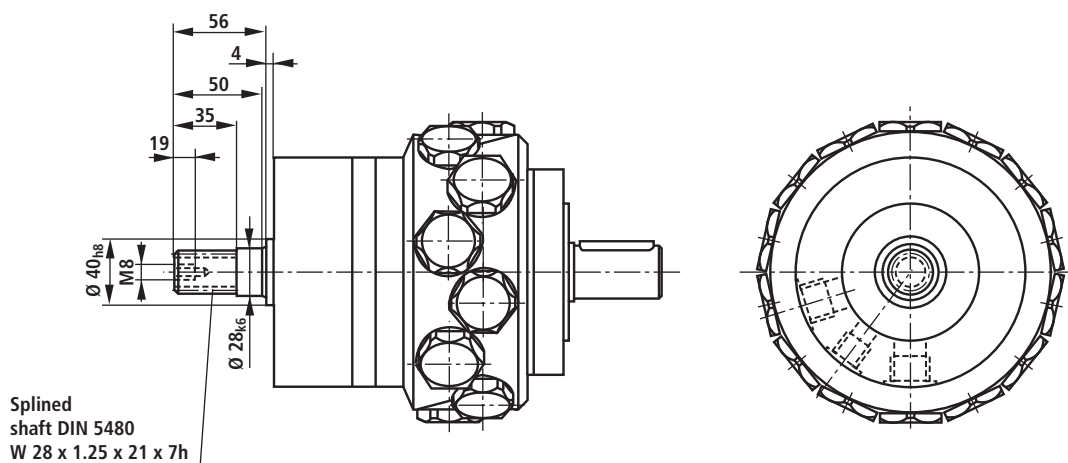
One size of tachometer shaft for all types, for measuring the motor speed, transmits a maximum torque of 5 Nm (for higher output torques please consult us).



## Motor with through shaft (dimensions in mm)

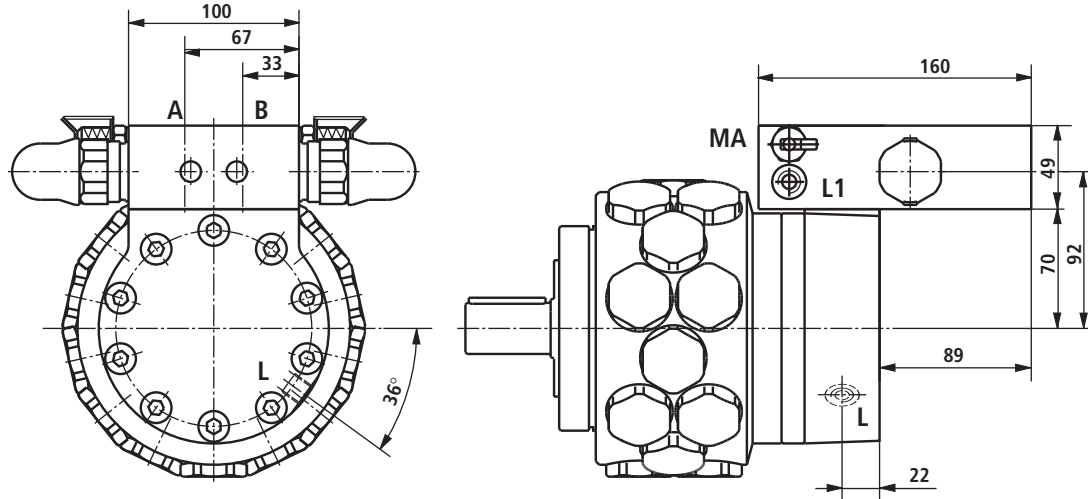
Ordering detail "M10-" (only for MKM 22 to 110)

All of the radial piston motors of series MKM without the MKM 11 can be supplied with a through shaft, ordering detail M10-, for transmitting the full motor torque.

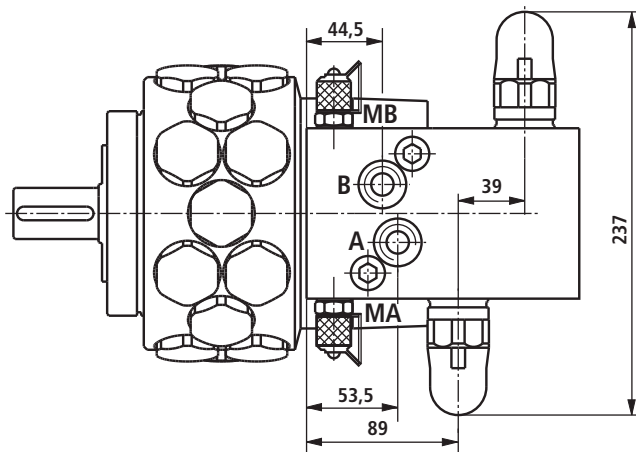


## Valve design: pressure relief, anti-cavitation/feed, MKM...N01 (dimensions in mm)

Series MKM radial piston motors with two direct operated pressure relief valves, gauge port G 1/4, anti-cavitation/feed via two 0.1 bar check valves and G 1/2 pipe connections.



Port	Thread		Counter bore	
	Thread	Depth	Ø	Depth
A	G 1/2	16	28	1.3 <sup>+0.1</sup>
B	G 1/2	16	28	1.3 <sup>+0.1</sup>
L	G 1/4	14	25	1.3 <sub>-0.3</sub>
L1	G 1/4	14	20	1
L2	G 1/4	14	20	1
MA	G 1/4	12	20	1
MB	G 1/4	12	20	1
Pressure stage I			Up to 100 bar	
Pressure stage II			Up to 200 bar	
Pressure stage III			Up to 315 bar	

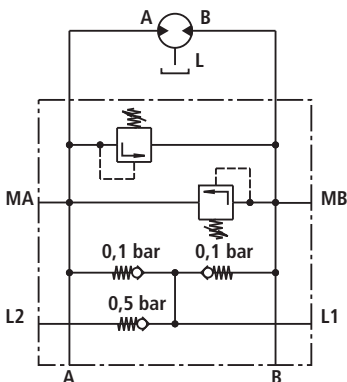


### Note:

The valve cartridges are **not** included within the scope of supply, they must be ordered separately!

Pressure stage to be stated in clear text!

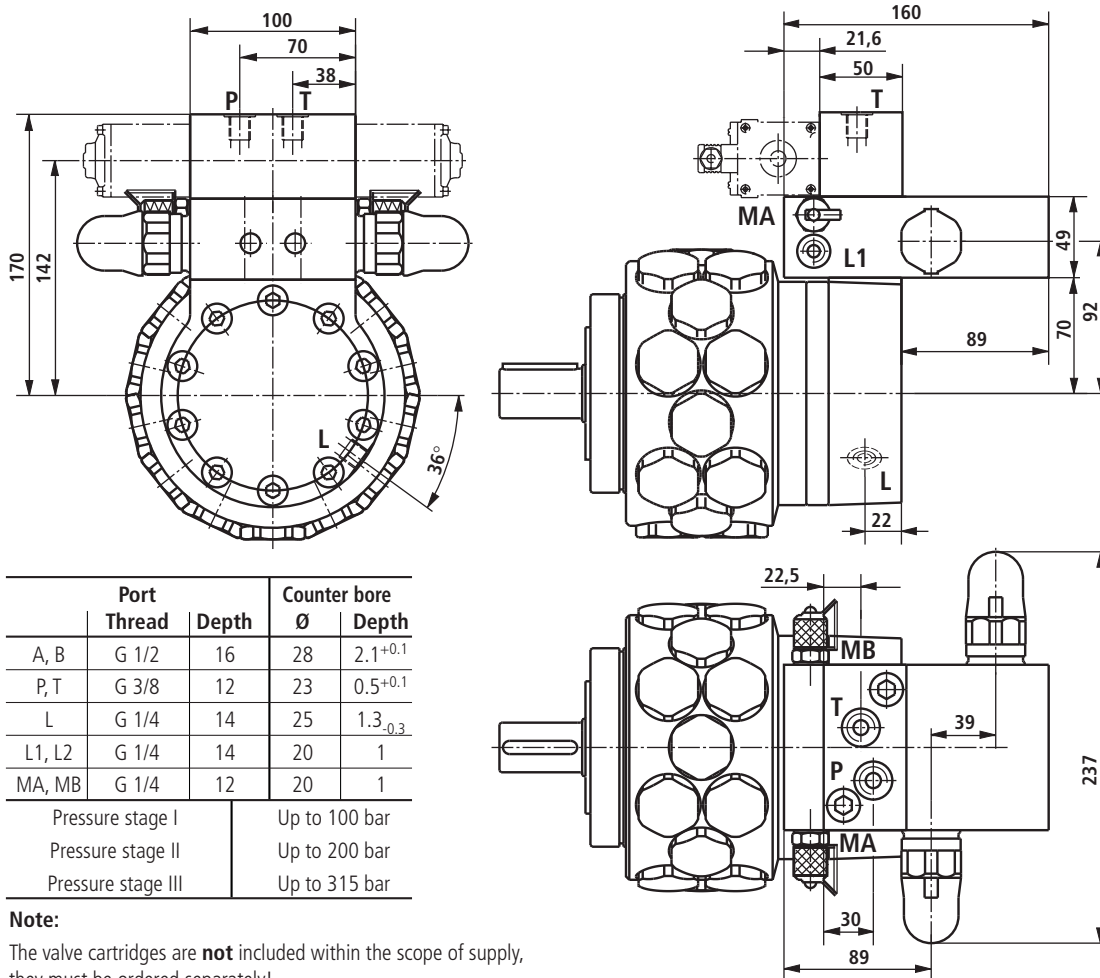
## Symbol (Version „MKM...N01“), function



Two individually adjustable DBDS 10 K1X/... valves protect the drive from overloads. Via port L1 and two 0.1 bar check valves the occurring leakage is fed back into the drive. A flow control valve can be screwed into port L1 so that the feed flow can be controlled. For the anti-cavitation function, the motor connection L is connected to L1 on the block and L2 is connected to tank. The leakage back pressure of 0.5 bar causes the motor leakage oil to be fed into the circuit.

## Valve design: pressure relief, anti-cavitation/feed, valve connection NS 6, MKM...N61 (in mm)

Series MKM radial piston motors with two direct operated pressure relief valves, gauge ports G 1/4, anti-cavitation/feed via two 0.1 bar check valves, G 1/2 pipe connections and valve connections NS 6 to DIN 24 340 form A6 (CETOP 3).

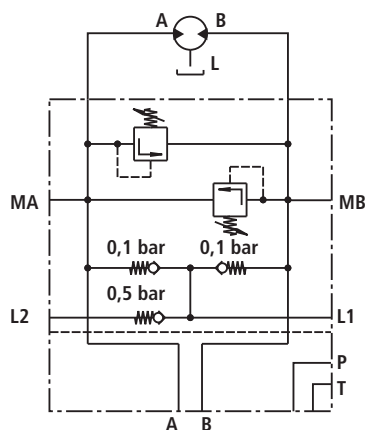


### Note:

The valve cartridges are **not** included within the scope of supply, they must be ordered separately!

Pressure stage to be stated in clear text!

## Symbol (version „MKM...N61“), function

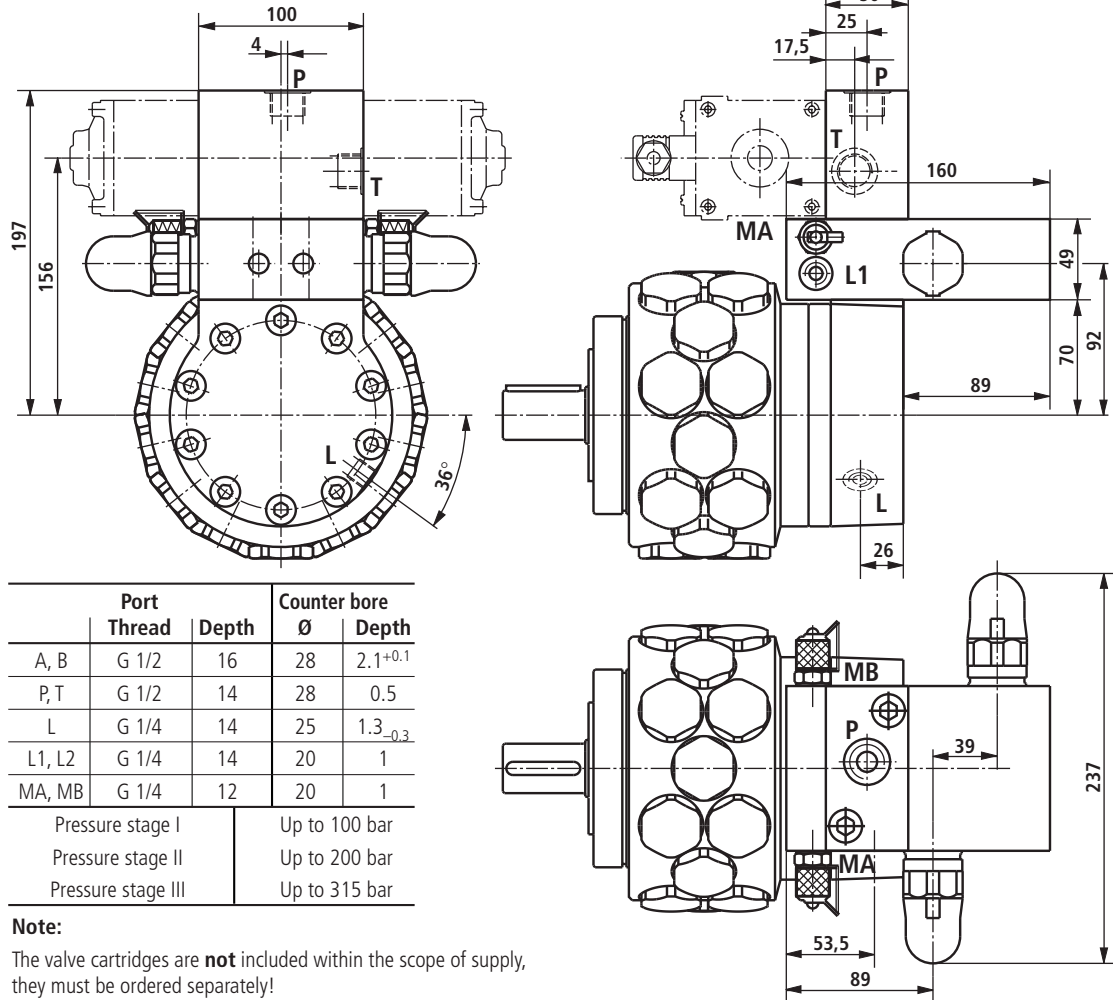


With this block design valves with a porting pattern to DIN 24 340 form A6 are bolted directly onto the motor.

Two individually adjustable DBDS 10 K1X/... valves protect the drive from overloads. Via port L1 and two 0.1 bar check valves, the occurring leakage is fed back into the drive. A flow control valve can be screwed into port L1 so that the feed flow can be controlled. For the anti-cavitation function the motor connection L is connected to L1 on the block and L2 is connected to tank. The leakage back pressure of 0.5 bar causes the motor leakage oil to be fed into the circuit.

## Valve design: pressure relief, anti-cavitation/feed, valve connection NS 10, MKM...N101 (in mm)

Series MKM radial piston motors with two direct operated pressure relief valves, gauge port G 1/4, anti-cavitation/feed via two 0.1 bar check valves and valve connection DIN 24 340 form A10 (CETOP 5).

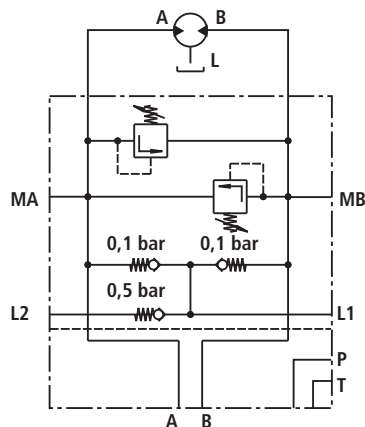


### Note:

The valve cartridges are **not** included within the scope of supply, they must be ordered separately!

Pressure stage to be stated in clear text!

## Symbol (version „MKM...N101”), function

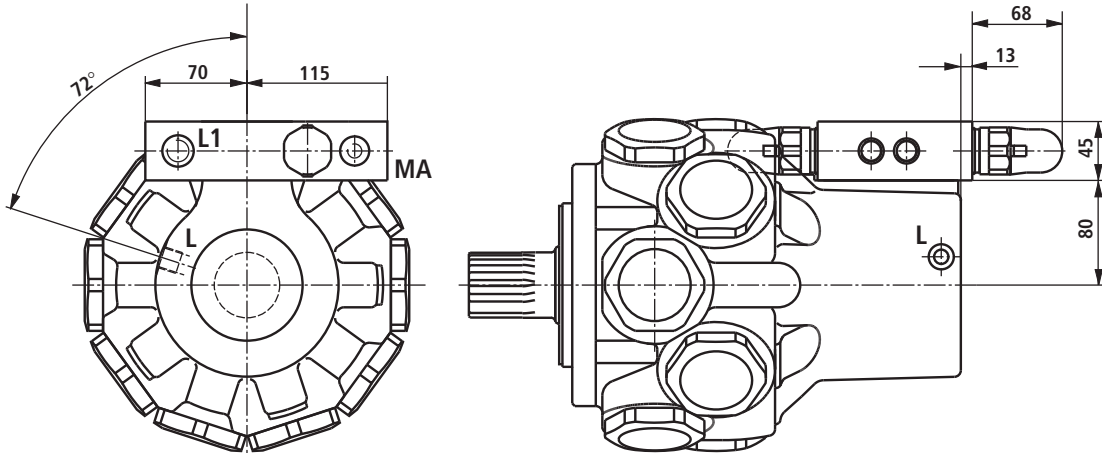


With this block design, directional, proportional or servo valves with a porting pattern to DIN 24 340 form A10 are bolted directly onto the motor.

Two individually adjustable DBDS 10 K1X/... valves protect the drive from overloads. Via port L1 and two 0.1 bar check valves the occurring leakage is fed back into the drive. A flow control valve can be screwed into port L1 so that the feed flow can be controlled. For anti-cavitation function the motor connection L is connected to L1 on the block and L2 is connected to tank. The leakage back pressure of 0.5 bar causes the motor leakage oil to be fed into the circuit.

## Valve design: pressure relief, anti-cavitation/feed, MRM...N01 (dimensions in mm)

Series MRM radial piston motors with two direct operated pressure relief valves, gauge ports G1/4, anti-cavitation/feed via two 0.1 bar check valves and G 3/4 pipe connections.



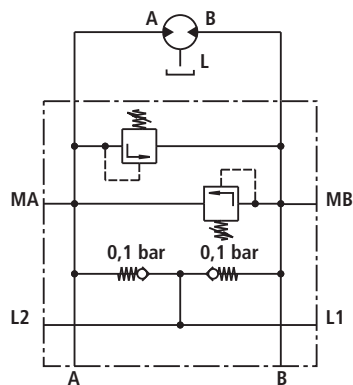
Port	Thread		Counter bore	
	Thread	Depth	Ø	Depth
A, B	G 3/4	17	33	2.1 <sup>+0.1</sup>
L	G 3/8	14	28	1.5
L1, L2	G 3/8	14	24	1
MA, MB	G 1/4	14	20	1
Pressure stage I			Up to 100 bar	
Pressure stage II			Up to 200 bar	
Pressure stage III			Up to 315 bar	

### Note:

The valve cartridges are **not** included within the scope of supply, they must be ordered separately!

Pressure stage to be stated in clear text!

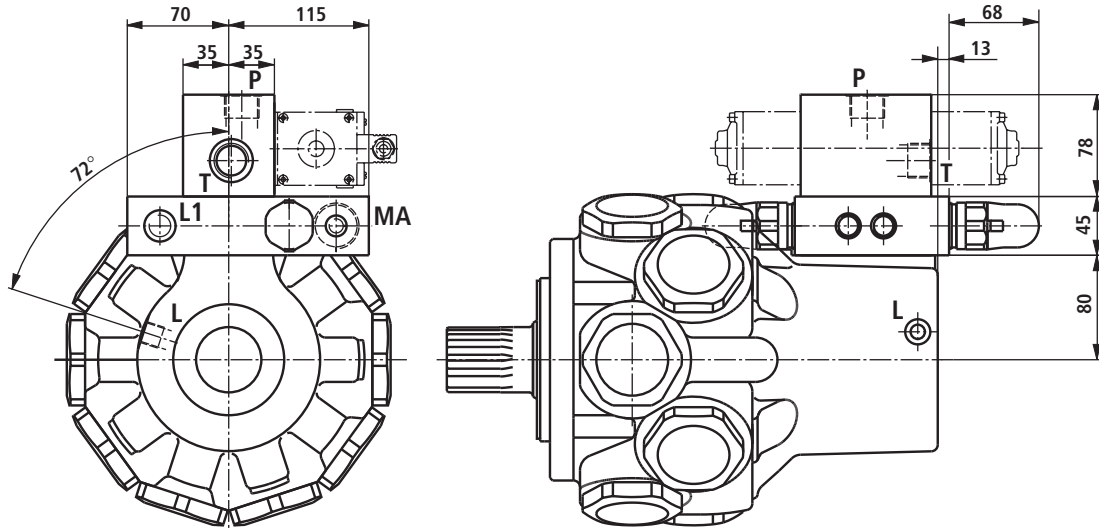
## Symbol (version „MRM...N01“), function



Two individually adjustable DBDS 10 K1X/... valves protect the drive from overloads. Via port L1 and two 0.1 bar check valves the occurring leakage is fed back into the drive. A flow control valve can be screwed into port L1 so that the feed flow can be controlled. When there is sufficient back pressure L1 can be connected with the tank line.

## Valve design: pressure relief, anti-cavitation/feed, valve connection NS 6, MRM...N61 (in mm)

Series MRM radial piston motors with two direct operated pressure relief valves, gauge port G 1/4, anti-cavitation/feed via two 0.1 bar check valves and valve connection DIN 24 340 form A6 (CETOP 3).



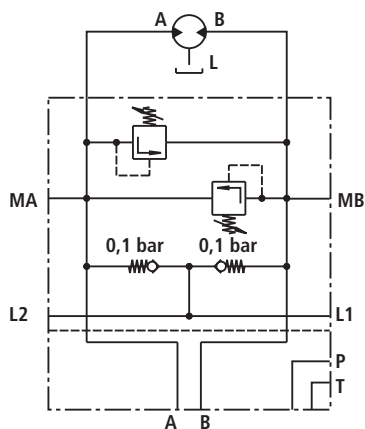
Port	Thread		Counter bore	
	Thread	Depth	Ø	Depth
P, T	G 1/2	17	28	1
L	G 3/8	14	28	1.5
L1, L2	G 3/8	14	24	1
MA, MB	G 1/4	14	20	1
Pressure stage I			Up to 100 bar	
Pressure stage II			Up to 200 bar	
Pressure stage III			Up to 315 bar	

### Note:

The valve cartridges are **not** included within the scope of supply, they must be ordered separately!

Pressure stage to be stated in clear text!

## Symbol (version „MRM...N61”), function

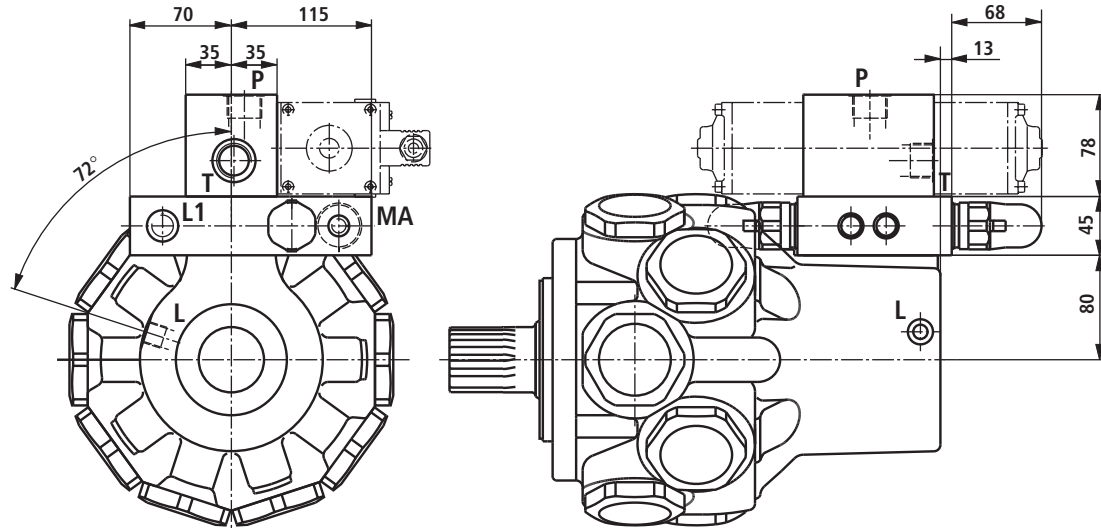


With this block design, valves with a porting pattern to DIN 24 340 form A6 are bolted directly onto the motor, due to the low entrapped volume of oil, this gives the drive good open loop or closed loop control characteristics.

Two individually adjustable DBDS 10 K1X/... valves protect the drive from overloads. Via port L1 and two 0.1 bar check valves the occurring leakage is fed back into the drive. A flow control valve can be screwed into port L1 so that the feed flow can be controlled. When there is sufficient back pressure L1 can be connected with the tank line. L2 is plugged.

## Valve design: pressure relief, anti-cavitation/feed, valve connection NS 10, MRM...N101 (in mm)

Series MRM radial piston motors with two direct operated pressure relief valves, gauge port G 1/4, anti-cavitation/feed via two 0.1 bar check valves and valve connection DIN 24 340 form A10 (CETOP 5).



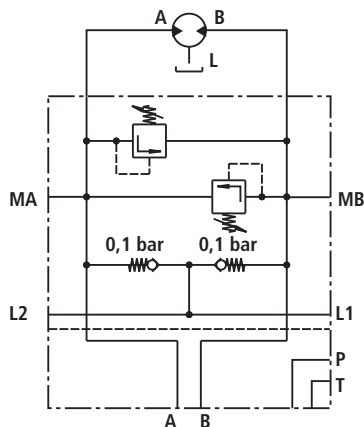
Port	Thread		Counter bore	
	Thread	Depth	Ø	Depth
P, T	G 3/4	18	33	0.5
L	G 3/8	14	28	1.5
L1, L2	G 3/8	14	24	1
MA, MB	G 1/4	14	20	1
Pressure stage I			Up to 100 bar	
Pressure stage II			Up to 200 bar	
Pressure stage III			Up to 315 bar	

### Note:

The Valve cartridges are **not** included within the scope of supply, they must be ordered separately!

Pressure stage to be stated in clear text!

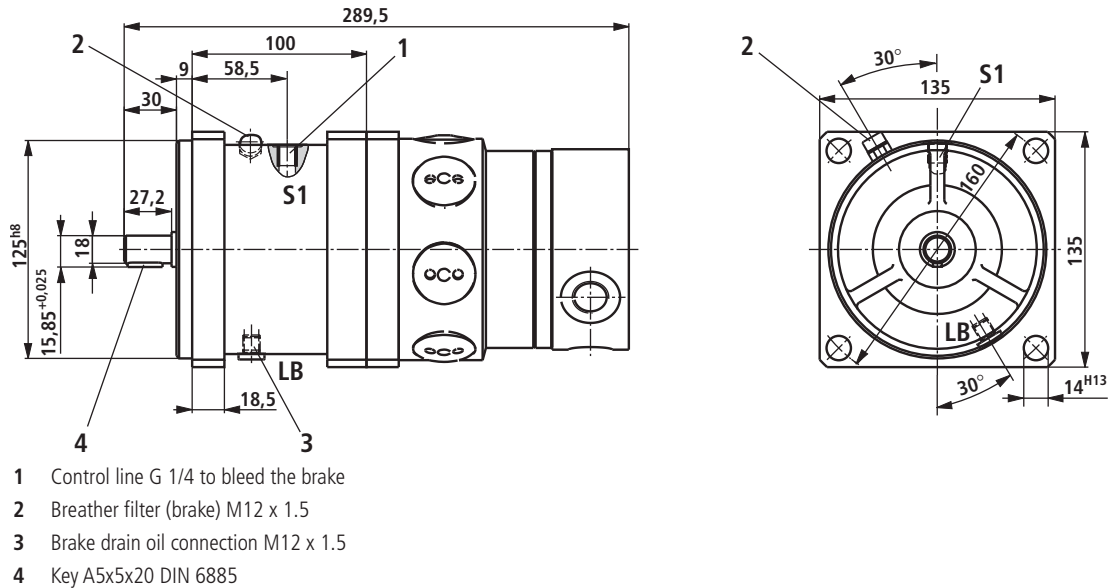
## Symbol (version „MRM...N101”), function



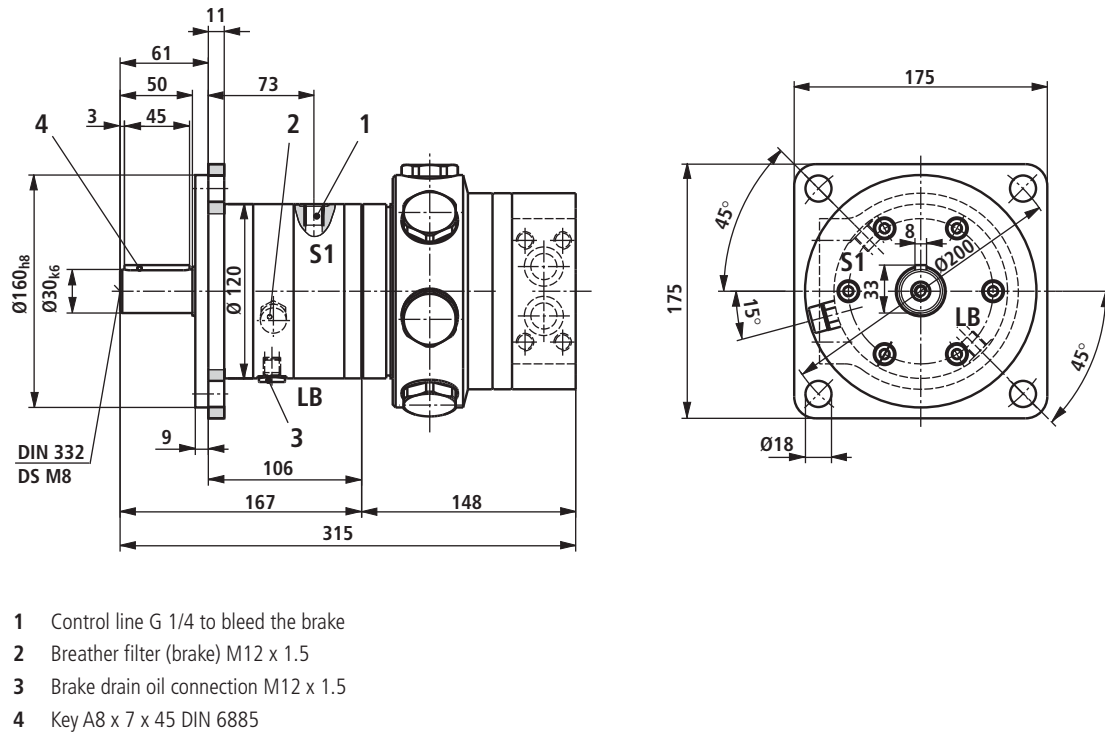
With this block design, valves with a porting pattern to DIN 24 340 form A10 are bolted directly onto the motor, due to the low entrapped volume of oil, this gives the drive good open loop or closed loop control characteristics.

Two individually adjustable DBDS 10 K1X/... valves protect the drive from overloads. Via port L1 and two 0.1 bar check valves the occurring leakage is fed back into the drive. A flow control valve can be screwed into port L1 so that the feed flow can be controlled. When there is sufficient back pressure L1 can be connected with the tank line. L2 is plugged.

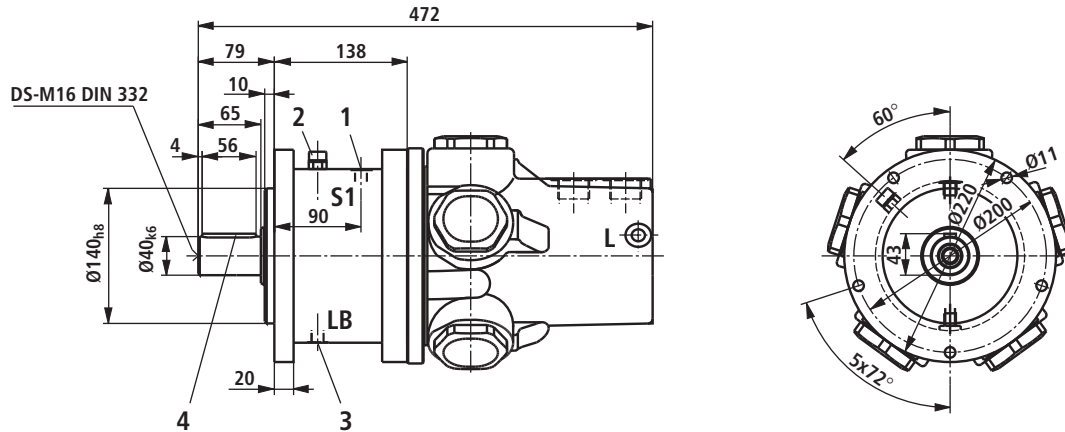
## Holding brake type LBD9A2 for motor types MKM 11 and MRM 11 (dimensions in mm)



## Holding brake type LBD11A2 for motor types MKM 22 to 110 (dimensions in mm)

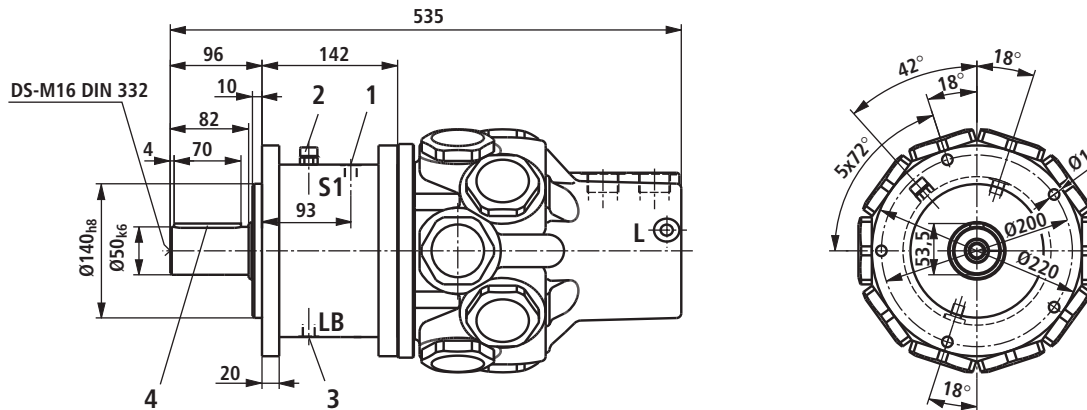


## Holding brake type LBD124A2 for motor types MRM 80 / MRM 125 (dimensions in mm)



- 1 Control line G 1/4 to bleed the brake
- 2 Breather filter (brake) M12 x 1.5
- 3 Brake drain oil connection M12 x 1.5
- 4 Key A12 x 8 x 56 DIN 6885

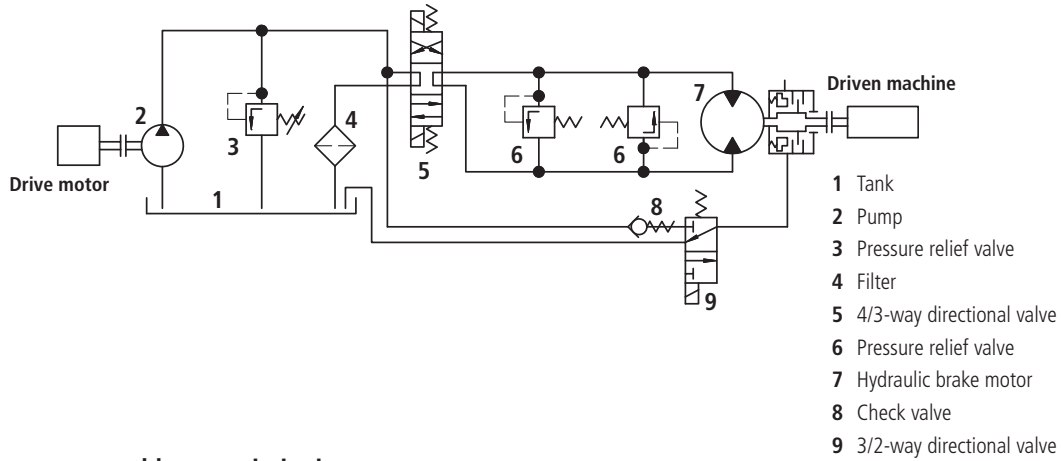
## Holding brake type LBD249A2 for motor types MRM 160 / MRM 250 (dimensions in mm)



- 1 Control line G 1/4 to bleed the brake
- 2 Breather filter (brake) M12 x 1.5
- 3 Brake drain oil connection M12 x 1.5
- 4 Key A14 x 9 x 70 DIN 6885

## Circuit example

### Open circuit with brake control



## Storage, assembly, commissioning

### Storage

As delivered all of the connection holes in the motor housing are plugged with plastic plugs. The internal components are coated with hydraulic oil from the run on the test rig. The drive shaft and connection flange are protected by an anti-corrosion oil. The motor can be stored in this condition, in a dry room, for approx. 6 months.

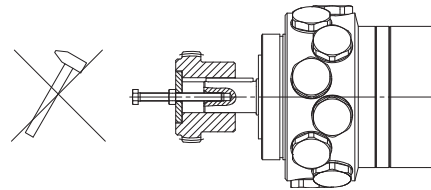
For longer storage periods the motor is to be fully filled with a water emulsifying hydraulic oil H-LPD. All ports are to be plugged or have blanking flanges, these are to be oil tight. After no later than 12 months the hydraulic oil must be replaced and the drive shaft rotated by hand approx. 10 times.

### Mounting, assembly

- The installation orientation is optional.
- Never use a hammer to drive on the couplings, pinions, etc., use screws to pull them on. Use the threaded hole in the drive shaft.
- The mounting surface must be flat and rigid.
- Use fixing screws with a minimum tensile strength class of 10.9, with reversal operation used location bolts.
- Correctly line up the motor during assembly.
- Tighten the bolts to the prescribed tightening torque.

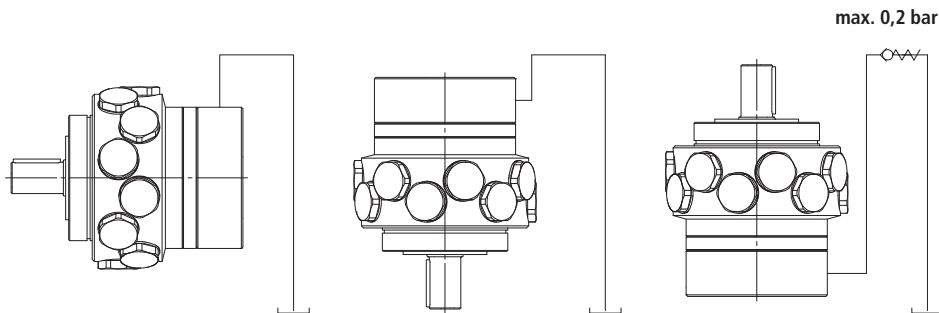
The brakes have a leakage oil connection and a breather filter M12x1.5. Both of the connections can be exchanged. Fit the filter to the highest point so that oil cannot run out.

When installing the holding brake apply it with pilot pressure so that the shaft can be rotated.



### Drain oil line

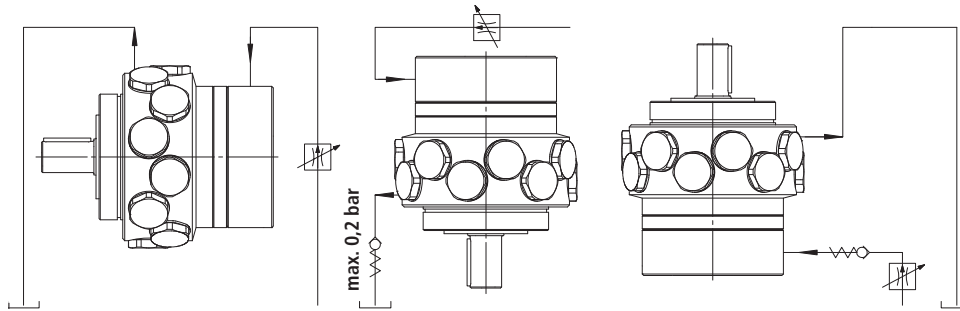
Lay the drain oil line so that the motor housing cannot drain, if necessary fit a check valve with maximum opening pressure of 0.2.



## Storage, assembly, commissioning

### Flushing connection

Flushing the motor with approx. 1 - 3 l/min (dependent on the type) is recommended for high temperatures and powers. Leakage and flushing fluid is passed back to the reservoir. The maximum permissible housing pressure in the leakage chamber is 1.5 bar.



### Commissioning

#### Motor

Before the initial commissioning the motor has to be filled with filtered operating medium via the drain connection. Drive the motor at a low power until leakage oil escapes, then full power can be applied.

For motors with a separate flushing circuit first switch on the flushing circuit then the motor.

Check the housing pressure: maximum of 1.5 bar leakage pressure.

#### Brake

Fill the brake before commissioning via the breather filter, remove the filter to access the filling point (wet running).

LBD9A2	LBD11A2	LBD124A2	LBD249A2
0.01 litre	0.01 litre	0.02 litre	0.04 litre

Switch the holding brake more than once and check for correct function.

During operation the motor and holding brake must not become warmer than the operating medium.

The data specified above only serves to describe the product. No statements concerning a certain condition or suitability for a certain application can be derived from our information. The details stated do not release you from the responsibility for carrying out your own assessment and verification. It must be remembered that our products are subject to a natural process of wear and ageing.