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The Drive & Control Company

Rexroth
Bosch Group

External gear motor High Performance
AZMB

RE 14027
Edition: 03.2016

- Platform B
- Fixed displacement
- Sizes 2.5 to 7.1
- Continuous pressure up to 220 bar
- Intermittent pressure up to 250 bar

Features

- Consistently high quality due to high-volume series production
- Long service life
- Large speed range
- Slide bearings for high loads
- Optional reversible version for 2-quadrant and 4-quadrant operation
- Variety of versions available
- Output shafts conform to ISO or SAE and customer-specific solutions
- Line connections: Connection flange or screw thread
- High pressures with small installation space and low weight
- Large viscosity and temperature range

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RE 14027/03.2016, **Bosch Rexroth AG**

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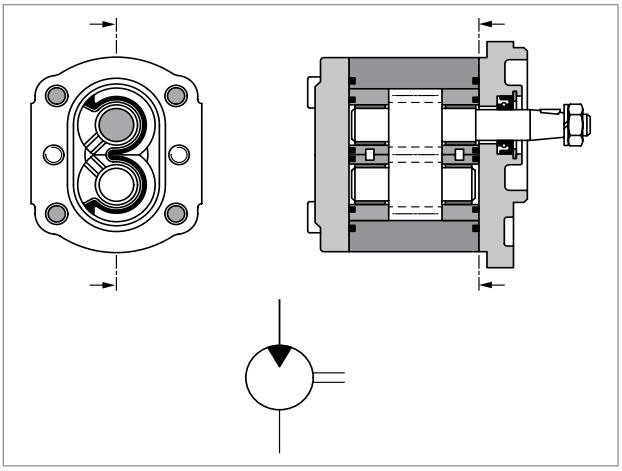
Functional description

General
If pressurized oil is fed into the motor, a torque can be obtained from the shaft leading out of the housing. Motors can be either for one direction of rotation or reversible.

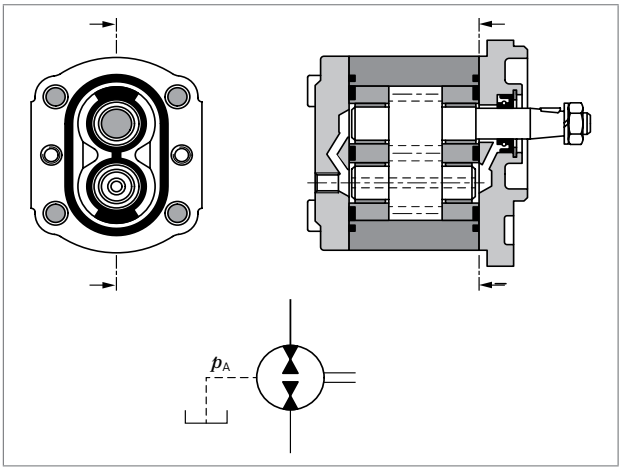
Gear motor for one direction of rotation
These gear motors are designed asymmetrically, i.e., fixed high-pressure and low-pressure ends. This means they cannot be reversed. Motors require a special start-up sequence to ensure good efficiency. Any leakage oil is drained internally. The shaft seal limits drainage pressure.

Reversible gear motor
The displacement principle of external gear motors is the opposite of that of pumps. Reversible motors are an exception to this concept. Due to their symmetrical layout, the high-pressure and low-pressure chambers are separate from the bearing and shaft seal chambers. Any leakage oil is drained through a separate drain port in the housing cover. This drainage allows the motor to run in reverse, making series connections possible. Standard motors and pumps can only withstand up to approx. 3 bar due to the connection between the shaft seal and the low-pressure end.
The figure shows a reversible motor for four-quadrant operation, i.e., output torque and drive torque in both directions (hydraulic motor functions as a pump when the load is reversed).

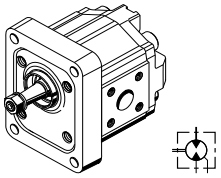
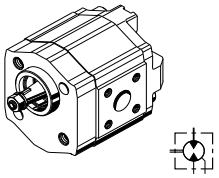
▼ **Gear motor for one direction of rotation**



▼ **Reversible gear motor**



▼ **Product overview AZMB preferred types**

Version	
	
AZMB-32-...UHO20PL, page 11	**AZMB-32-...UCP20PL**, page 12

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Type code

01	02		03	04		05	06	07	08	09	10	11		12
AZM	**B**	**–**			**–**								**–**	

External gear unit

01	External gear motor	**AZM**

Series

02	High Performance, Platform B	**B**

Series

03	Bearing pin Ø12 mm	**3**

Version

04	Corrosion-resistant, pinned	**2**

Size (NG)

05	Geometric displacement V_g [cm³], see “Technical data” on page 5	**2.5**	**3.1**	**4.0**	**4.5**	**5.0**	**6.3**	**7.1**

Direction of rotation

06	Viewed on drive shaft	Clockwise	**R**
		Counter-clockwise	**L**
		Universal	**U**

Drive shaft			**Suitable front cover**	
07	Tapered shaft	1 : 5	**P**	**C**
		1 : 8	**O**	**H**
	Dihedral, claw		**M**	**N**

Front cover

08	Rectangular flange	Ø25.38 mm		**O**
	2-bolt mounting	Ø32 mm	with O-ring	**M**
		Ø32 mm		**P**

Line connection

09	DIN EN ISO 228-1 pipe thread	**01**
	DIN 3852-1 metric thread	**02**
	Square flange for ISO 8434-1 fitting	**20**

Sealing material

10	NBR (nitrile rubber)	**M**
	FKM (fluoroelastomer)	**P**
	NBR (nitrile rubber), shaft seal made of FKM (fluoroelastomer)	**K**

Rear cover

11	Standard (for non-reversible motors)	**B**
	With drain port (for reversible motors)	**L**
	With axial pressure/suction port	**A**
	With pressure relief valve, internal residual current, 3-digit cracking pressure in bar, e.g., 180 bar	**D180**

Special version

12	Serial number, e.g., S0001	**SXXXX**

Notice

- Not all of the variants according to the type code are possible.
- Special options are available on request.
- Please select the desired motor with the help of the selection table (preferred types) or after consulting with Bosch Rexroth.

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Technical data

General				
Weight			kg	See dimensions starting on page 11
Installation position				No restrictions
Mounting type				Flange or through-bolting with spigot
Line connections				Flange, thread
Direction of rotation (viewed on drive shaft)				Non-reversible or reversible
Drive shaft load				Radial and axial forces only after consultation
Ambient temperature range θ			°C	-30 to +80 with NBR seals (NBR = nitrile rubber) -20 to +110 with FKM seals (FKM = fluoroelastomer)

Hydraulic				
Hydraulic fluid				Mineral oil according to DIN 51524 1–3, with higher load however at least HLP-compliant according to DIN 51524 Part 2 recommended. HEES according to DIN ISO 15380, FKM seals recommended. Observe data sheets 90220 and 90221. Other hydraulic fluids on request
Hydraulic fluid temperature range		θ	°C	-30 to +80 with NBR seals (NBR = nitrile rubber) -20 to +110 with FKM seals (FKM = fluoroelastomer)
Viscosity range	Minimum for continuous operation	ν	mm^2/sec	12 to 800
	Recommended for continuous operation	ν_{opt}	mm^2/sec	20 to 100
	Minimum for cold start	ν_{max}	mm^2/sec	≤ 2000
Maximum admissible degree of contamination of the hydraulic fluid Cleanliness level according to ISO 4406 (c)				Class 20/18/15[1], filter with min. retention rate of $\beta_{20} \geq 75$ recommended

Notice

- Observe applicable safety requirements for the entire system.
- Please contact us for applications with frequent load changes.

1) For hydraulic systems or devices with function-related critical failure effects, such as steering and brake valves, the type of filtration selected must be adapted to the sensitivity of these devices.

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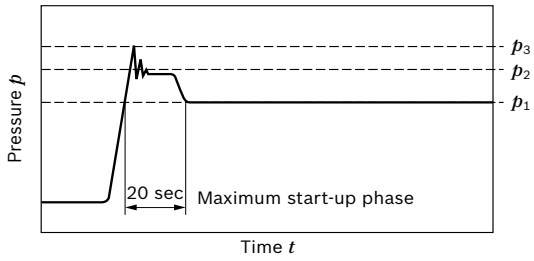
AZMB-3x			NG	2.5	3.1	4.0	4.5	5.0	6.3	7.1
Geometric displacement per revolution		V_g	cm^3	2.5	3.15	4.0	4.5	5.0	6.3	7.1
Maximum drain port pressure[1]	abs.	p_L	bar	3	3	3	3	3	3	3
	On start-up	p_L	bar	10	10	10	10	10	10	10
Minimum motor input pressure[2]	abs.	p_{min}	bar	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Maximum continuous pressure		p_1	bar	220	220	220	220	220	220	200
Maximum intermittent pressure		p_2	bar	250	250	250	250	250	250	230
Motor output pressure		p_A	bar	For reversible motors: ≤ working pressure For non-reversible motors: max. 3 bar absolute, 10 bar on start-up						
Minimum speed		n_{min}	rpm	750	750	750	750	750	750	750
Maximum speed	At p_1	n_{max}	rpm	5000	4000	4000	4000	4000	3500	3500

▼ Pressure definition

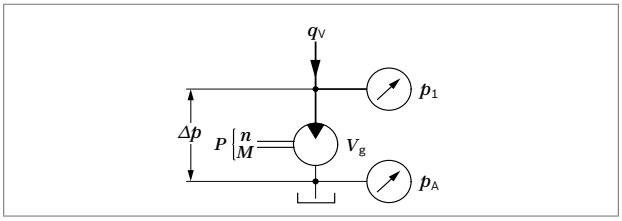


p_1 Maximum continuous pressure
p_2 Maximum intermittent pressure
p_3 Maximum pressure peak

Design calculations for motors			
Inlet flow	$q_v = \frac{V_g \times n}{1000 \times \eta_v}$		[l/min]
Rotational speed	$n = \frac{q_v \times 1000 \times \eta_v}{V_g}$		[rpm]
Torque	$M = \frac{V_g \times \Delta p \times \eta_{hm}}{20 \times \pi}$		[Nm]
Power	$P = \frac{2 \pi \times M \times n}{60000}$	$= \frac{q_v \times \Delta p \times \eta_t}{600}$	[kW]
Pressure	$\Delta p = \frac{M \times 20 \times \pi}{V_g \times \eta_{hm}}$		[bar]
	$\Delta p = \frac{P \times 600}{q_v \times \eta_t}$		[bar]
Displacement	$V_g = \frac{q_v \times 1000 \times \eta_v}{n}$		[cm^3]
	$V_g = \frac{M \times 20 \times \pi}{\Delta p \times \eta_{hm}}$		[cm^3]

Key

V_g Displacement per revolution [cm^3]
Δp Differential pressure [bar] ($\Delta p = p_1 - p_A$)
n Rotational speed [rpm]
q_v Inlet flow [l/min]
M Torque [Nm]
P Power [kW]
η_v Volumetric efficiency[2]
η_{hm} Hydraulic-mechanical efficiency[2]
η_t Total efficiency ($\eta_t = \eta_v \times \eta_{hm}$)[2]



Notice
On the following pages you can find diagrams for a rough calculation.

1) For reversible motors
2) Parameter as a decimal, e.g., 0.9

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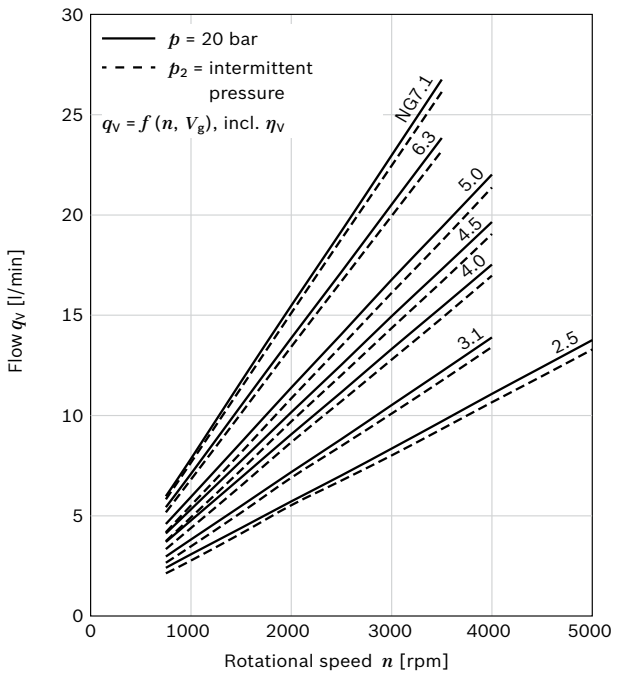
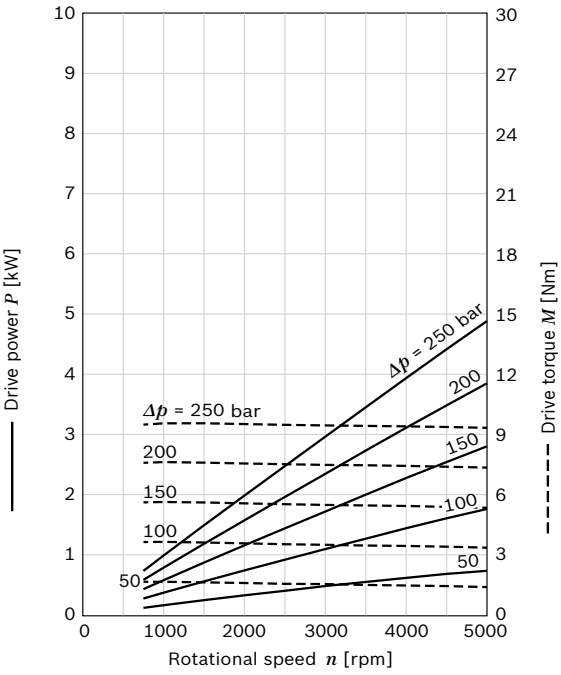
Flow and power characteristic curves

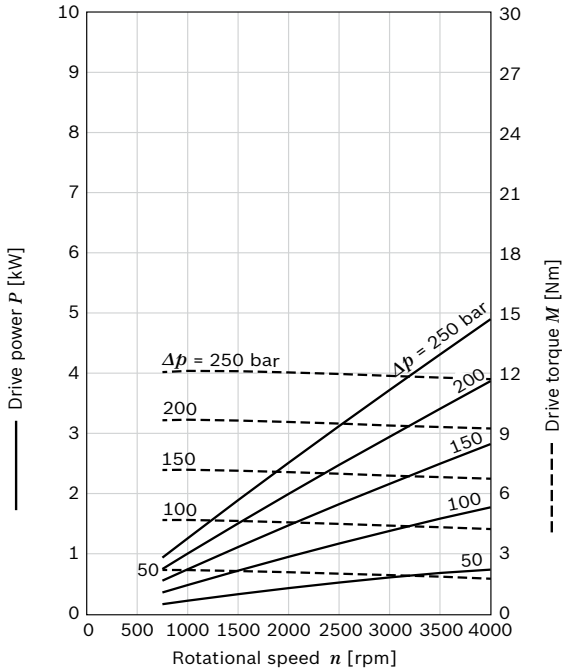
▼ **Flow**



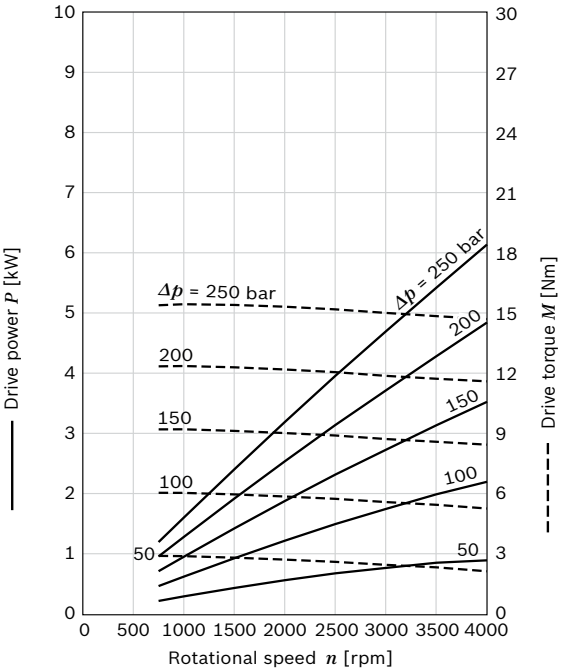
▼ **Size 2.5**



▼ **Size 3.1**



▼ **Size 4.0**



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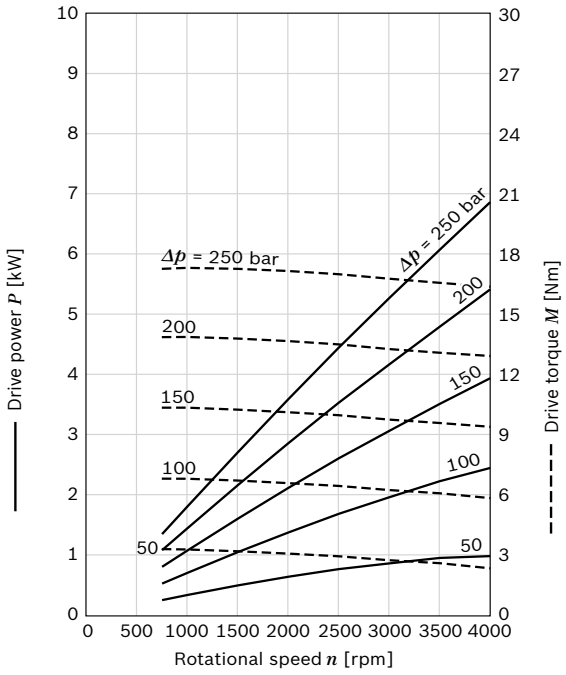
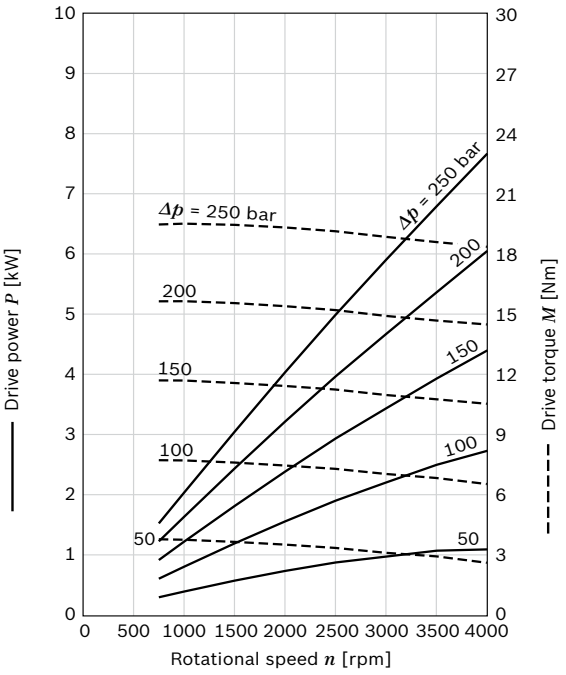
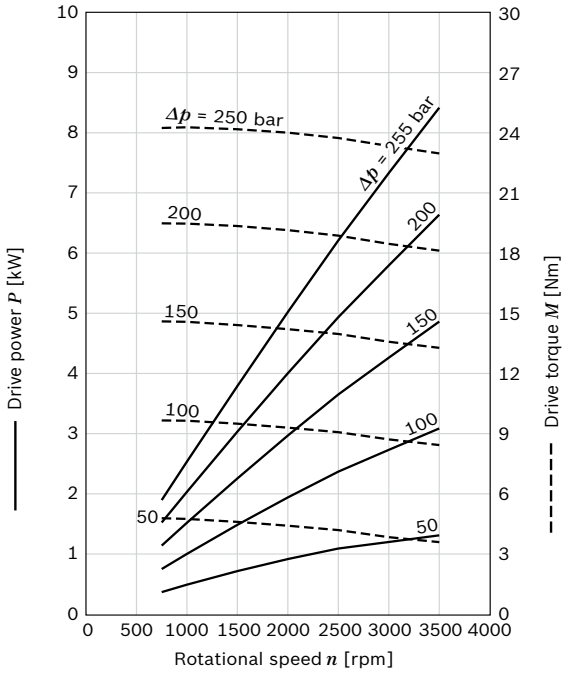
▼ **Size 4.5**



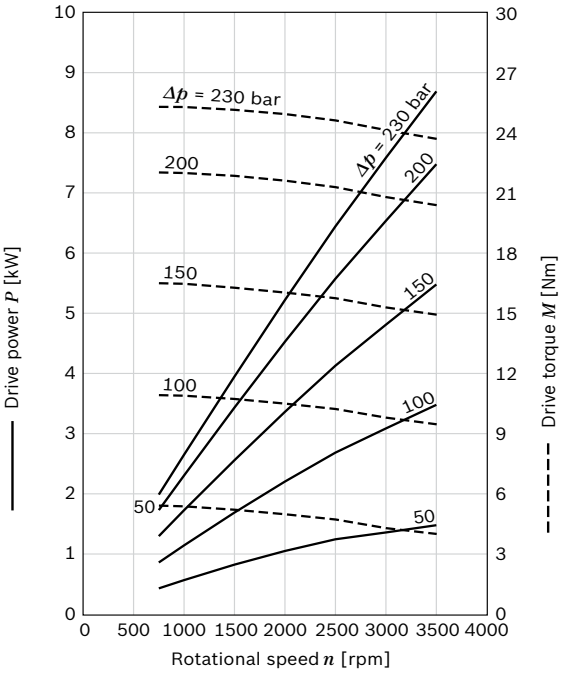
▼ **Size 5.0**



▼ **Size 6.3**



▼ **Size 7.1**



Notice
Characteristic curves measured at ν = 32 mm²/sec and θ = 50 °C.

$P = f(n, p)$, incl. η_t ——————
$M = f(n, p)$, incl. η_{hm} - - - - - -

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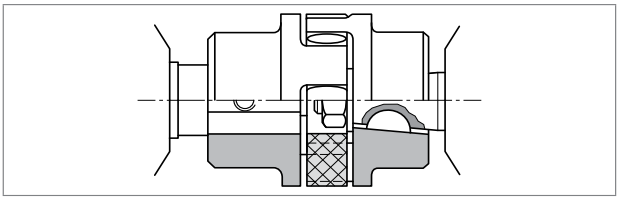
Output drives

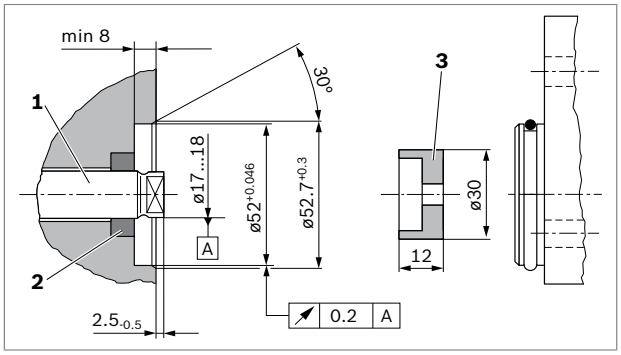
1. Elastic couplings

- The coupling should not transfer any radial or axial forces to the motor.
- The maximum radial run-out from the shaft to the spigot should not exceed 0.2 mm.
- See the coupling manufacturer's assembly instructions for permissible shaft misalignments.



2. Coupling dog

- For attaching the motor directly to a gear, etc.
- Motor drive shaft with special coupling dog and driver (**3**)
- No shaft seal
- Output side installation and sealing according to following recommendations and dimensions



Drive shaft	M_{max} [Nm]	Size	p_{max} [bar]
C	26	2.5 to 5.0	270
		6.3	230
		7.1	205
H	30	2.5 to 6.3	270
		7.1	235
N	25	2.5 to 5.0	270
		6.3	225
		7.1	200

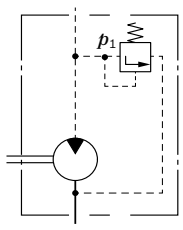
- **Output shaft on the customer side (1)**
  - Case-hardening steel as per DIN 17210 e.g., 20 MnCrS 5 case-hardened 0.6 deep; HRC 60$^{\pm 3}$
  - Seal ring running surface ground without rifling $R_{max} \leq 4\ \mu m$
- **Radial shaft seal on the customer side (2)**
  - Provide with rubber cover (see DIN 3760, type AS, or double-lipped ring)
  - When designing the installation space, note the seal manufacturer's design guidelines.

Gear motors with integrated valves

In order to reduce pipework, a pressure relief valve can be integrated into the cover of the gear motor.

▼ **Pressure relief valve, pressure guide in suction line**
p_1 = 5 to 250 bar

D180XX (example)



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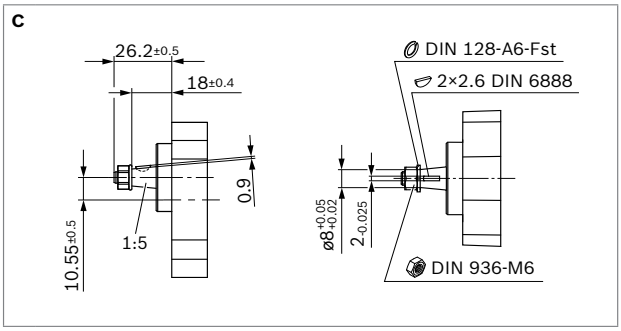
Dimensions – drive shafts

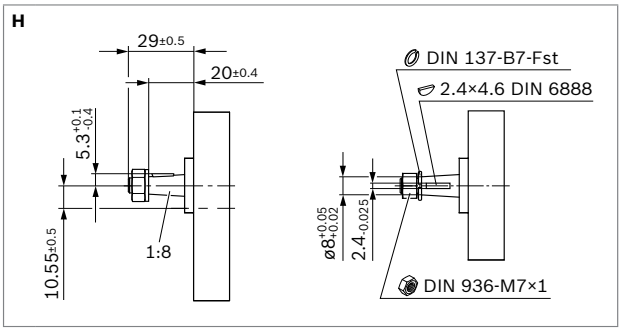
▼ **Tapered shaft 1 : 5**

C



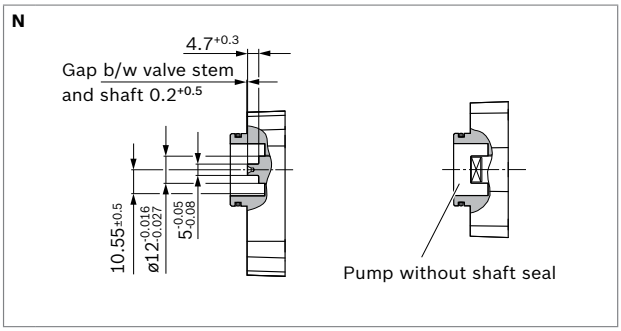
▼ **Tapered shaft 1 : 8**

H



▼ **Dihedral claw**

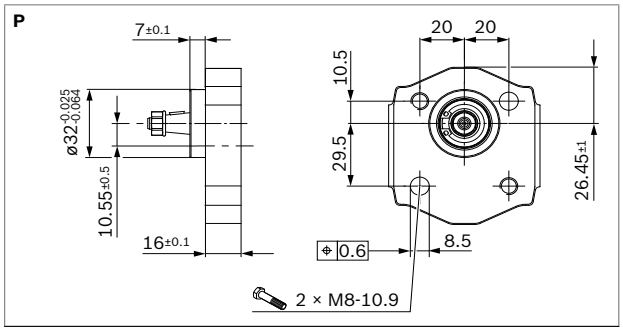
N



Dimensions – front cover

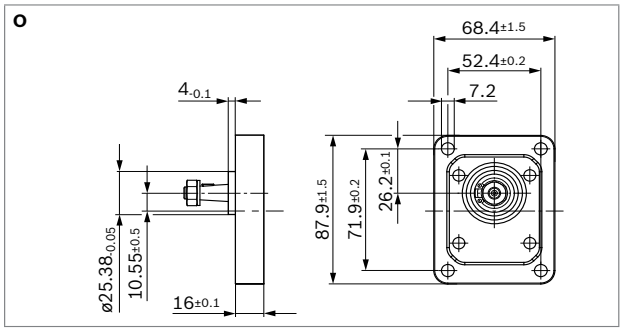
▼ **2-bolt mounting Ø32 mm**

P



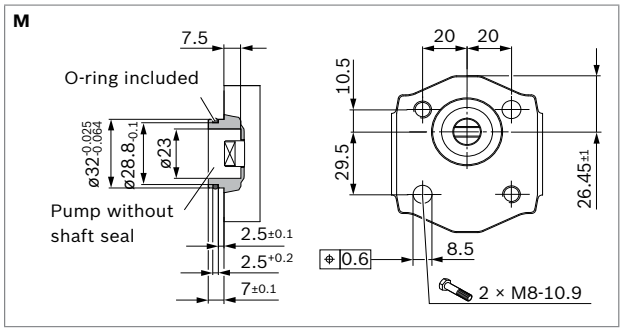
▼ **Rectangular flange Ø25.28 mm**

O



▼ **2-bolt mounting Ø32 mm with O-ring**

M



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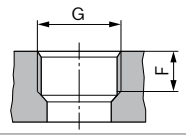
Dimensions – line connections

▼ **ISO 228/1 pipe thread** (limited service life compared to line connection 20)

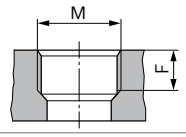
01



Size	Upstream side		Downstream side	
	G	F	G	F
2.5 to 3.1	G 3/8	13	G 3/8	13
4.0 to 7.1	G 3/8	13	G 1/2	13

▼ **ISO 9974-1 pipe thread** (limited service life compared to line connection 20)

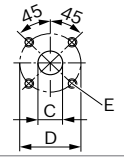
02



Size	Upstream side		Downstream side	
	M	F	M	F
2.5 to 3.1	14 × 1.5	13	M18 × 1.5	13
4.0 to 7.1	14 × 1.5	13	M22 × 1.5	13

▼ **Square flange**

20



Size	Upstream side			Downstream side		
	C	D	E	C	D	E
2.5	12	30	M6; 13 deep	12	30	M6; 11.5 deep
3.1 to 7.1	15	35	M6; 13 deep	15	35	M6; 11.5 deep

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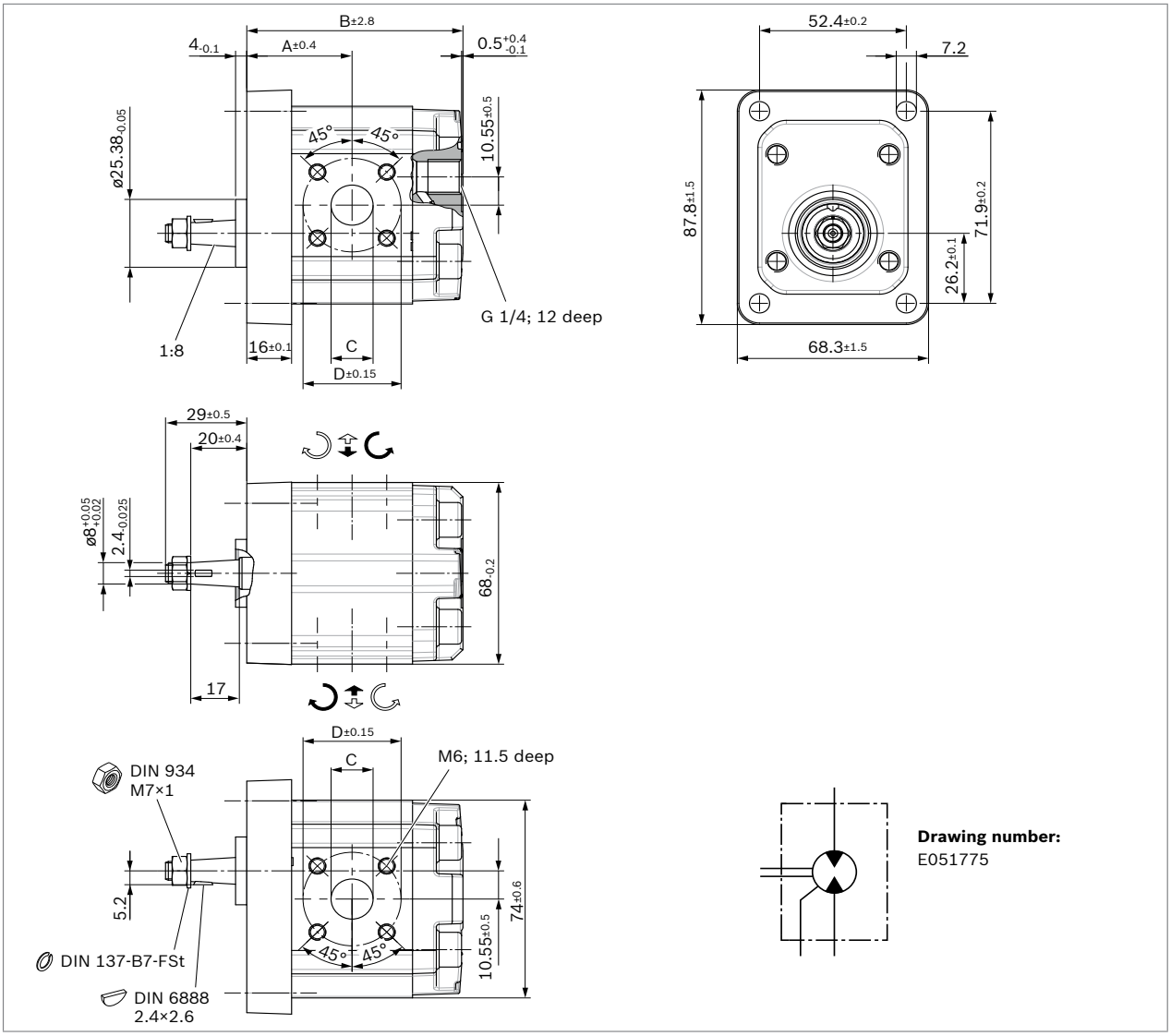
Dimensions – preferred series

▼ **Tapered shaft 1:8 with rectangular flange Ø25.38 mm**
AZMB–32– ... **UHO20**PL



Drawing number:
E051775

NG	Order number Direction of rotation universal	Maximum intermittent pressure p_2 [bar]	Maximum rotational speed [rpm]	Weight [kg]	Dimensions [mm]			
					A	B	C	D
2.5	R979106592	250	5000	1.5	33.8	69.6	12	30
3.1	R979106593	250	4000	1.5	35.0	72.1	15	35
4.0	R979106594	250	4000	1.6	36.6	75.3	15	35
4.5	R979106252	250	4000	1.6	37.6	77.2	15	35
5.0	R979106595	250	4000	1.6	38.6	79.3	15	35
6.3	R979106596	250	3500	1.7	41.0	84.0	15	35
7.1	R979106597	230	3500	1.7	42.5	87.1	15	35

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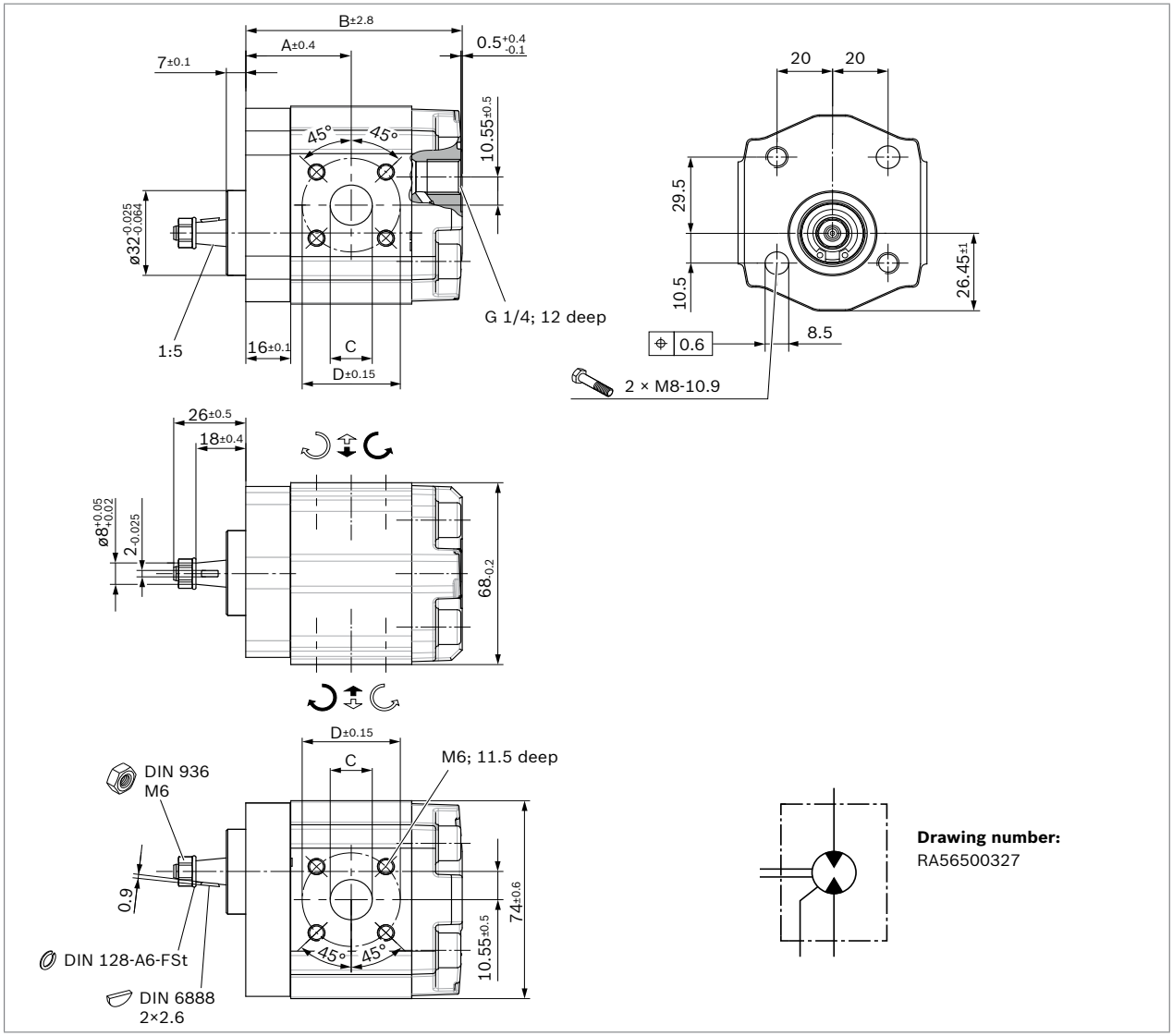
▼ **Tapered shaft 1:5 with rectangular flange Ø32 mm**
AZMB–32– ... **UCP20**PL



Drawing number:
RA56500327

NG	Order number Direction of rotation universal	Maximum intermittent pressure p_2 [bar]	Maximum rotational speed [rpm]	Weight [kg]	Dimensions [mm]			
					A	B	C	D
2.5	R979106804	250	5000	1.5	33.8	69.6	12	30
3.1	R979106805	250	4000	1.5	35.0	72.1	15	35
4.0	R979106806	250	4000	1.6	36.6	75.3	15	35
4.5	R979106807	250	4000	1.6	37.6	77.2	15	35
5.0	R979106808	250	4000	1.6	38.6	79.3	15	35
6.3	R979106809	250	3500	1.7	41.0	84.0	15	35
7.1	R979106810	230	3500	1.7	42.5	87.1	15	35

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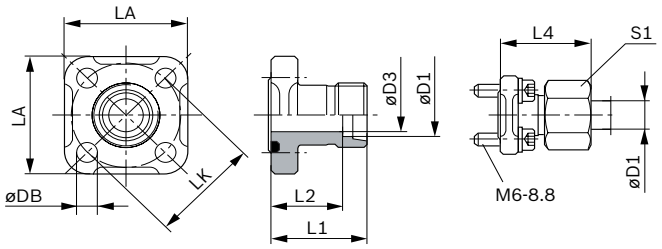
Accessories

Gear motor flanges, straight, for square flange 20 (see page 10)

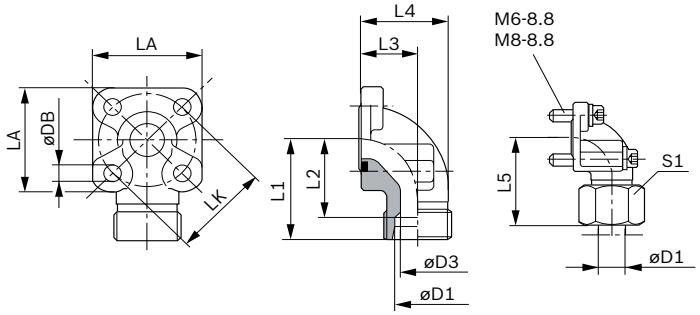
Complete fitting with
O-ring, metric screw set,
nuts and olive.



LK	D1	D3	L1	L2	L4	LA	S1	DB	Screws 4x	O-ring NBR	Weight [kg]	Order number	p [bar]
35	10L	8	30	23.0	39.0	40	19	6.4	M6 × 22	20 × 2.5	0.09	1 515 702 064	315
35	12L	10	30	23.0	39.0	40	22	6.4	M6 × 22	20 × 2.5	0.10	1 515 702 065	315
35	15L	12	30	23.0	38.0	40	27	6.4	M6 × 22	20 × 2.5	0.10	1 515 702 066	250

Gear pump flanges, 90° angle, for square flange 20 (see page 10)

Complete fitting with
O-ring, metric screw set,
nuts and olive.



LK	D1	D3	L1	L2	L3	L4	L5	LA	S1	DB	Screws 2x	Screws 2x	O-ring NBR	Weight [kg]	Order number	p [bar]
35	10L	8	38	31.0	16.5	26.5	47.0	40	19	6.4	M6 × 22	M6 × 35	20 × 2.5	0.16	1 515 702 070	315
35	12L	10	38	31.0	16.5	26.5	47.0	40	22	6.4	M6 × 22	M6 × 35	20 × 2.5	0.16	1 515 702 071	315
35	15L	12	38	31.0	16.5	26.5	46.0	40	27	6.4	M6 × 22	M6 × 35	20 × 2.5	0.15	1 515 702 072	250
35	16S	12	38	29.5	20.0	31.0	48.0	40	30	6.4	M6 × 22	M6 × 40	20 × 2.5	0.18	1 515 702 002	315
35	18L	15	38	29.5	20.0	31.0	47.0	40	32	6.4	M6 × 22	M6 × 40	20 × 2.5	0.18	1 545 702 006	250
35	20S	16	45	34.5	25.0	38.0	56.0	40	36	6.4	M6 × 22	M6 × 45	20 × 2.5	0.24	1 515 702 017	315

Notice
You can find the permissible tightening torques in our publication 07012-B1 “General Instruction Manual for External Gear Units”.

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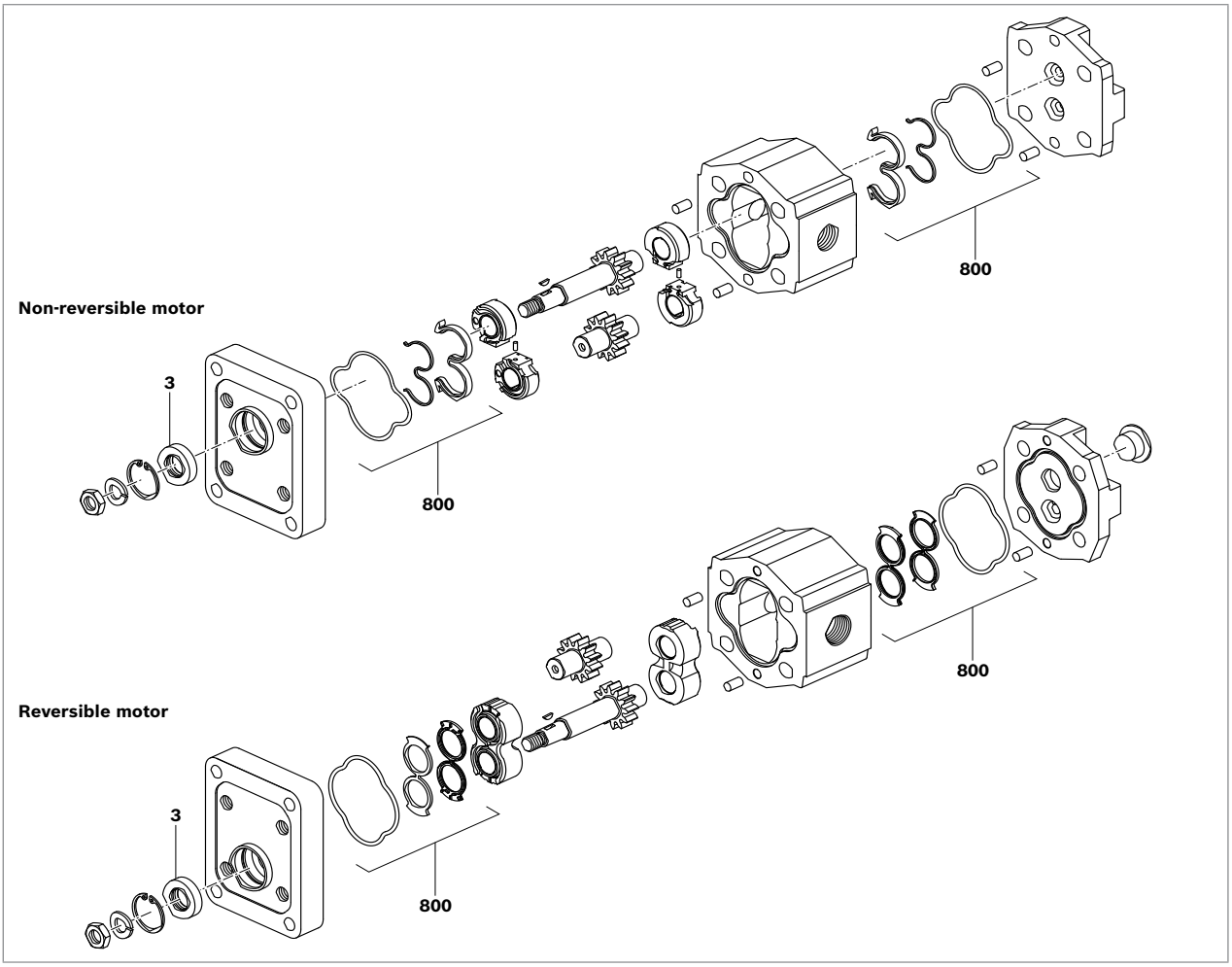
Spare parts

Notice
Spare parts can be found online at
www.boschrexroth.com/spc

Item	Designation	Order number	Dimensions	Material	AZMB–32 – ... R ...	AZMB–32 – ... L ...	AZMB–32 – ... U ...
3	Shaft seal	1 510 283 074	22 × 12 × 6	NBR	x	x	x
		1 510 283 071	22 × 12 × 6	FKM	x	x	x
800	Seal kit	1 517 010 248		NBR	x	x	–
		1 517 010 269		FKM	x	x	–
		1 517 010 251		FKM	–	–	x

▼ **Schematic diagram**



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Notes on commissioning

General
Motors delivered by Bosch Rexroth are tested for function and performance. Any modifications will void the warranty. The motor should only be operated with the permissible data (see page 4).

Technical data
All specified technical data depends on manufacturing tolerances and apply under certain general conditions. Note that this can result in some variance and that technical data may also vary under certain general conditions (e.g., viscosity).

Characteristic curves
When dimensioning the gear motor, observe the maximum possible application data based on the characteristic curves starting on page 6.

Scope of delivery
The scope of delivery includes the components with the characteristics described under type codes and dimensions starting on page 11.

Further information
- Further information on installation, commissioning, and operation can be found in the publication 07012-B1: “General Instruction Manual for External Gear Units”.
- Extensive notes and suggestions can be found in the Hydraulic Trainer Vol. 3: “Project planning recommendations and design of hydraulic systems”, order number R900018547.

Filter recommendation
Since the majority of premature failures in gear motors occur due to contaminated hydraulic fluid, filtration should maintain a cleanliness level of 20/18/15 as defined by ISO 4406. Cleanliness level 20/18/15 can reduce contamination to an acceptable degree in terms of particle size and concentration.

Bosch Rexroth generally recommends full-flow filtration. Basic contamination of the hydraulic fluid should not exceed class 20/18/15 as defined by ISO 4406. New fluids are often above this value. In such instances, a filling device with a special filter should be used.
Bosch Rexroth is not liable for wear due to contamination.

RE 14027/03.2016, **Bosch Rexroth AG**

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Order number overview

Order number	Type	Page
R979106252	AZMB–32–4.5UHO20PL	11
R979106592	AZMB–32–2.5UHO20PL	11
R979106593	AZMB–32–3.1UHO20PL	11
R979106594	AZMB–32–4.0UHO20PL	11
R979106595	AZMB–32–5.0UHO20PL	11
R979106596	AZMB–32–6.3UHO20PL	11
R979106597	AZMB–32–7.1UHO20PL	11
R979106804	AZMB–32–2.5UCP20PL	12
R979106805	AZMB–32–3.1UCP20PL	12
R979106806	AZMB–32–4.0UCP20PL	12
R979106807	AZMB–32–4.5UCP20PL	12
R979106808	AZMB–32–5.0UCP20PL	12
R979106809	AZMB–32–6.3UCP20PL	12
R979106810	AZMB–32–7.1UCP20PL	12

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