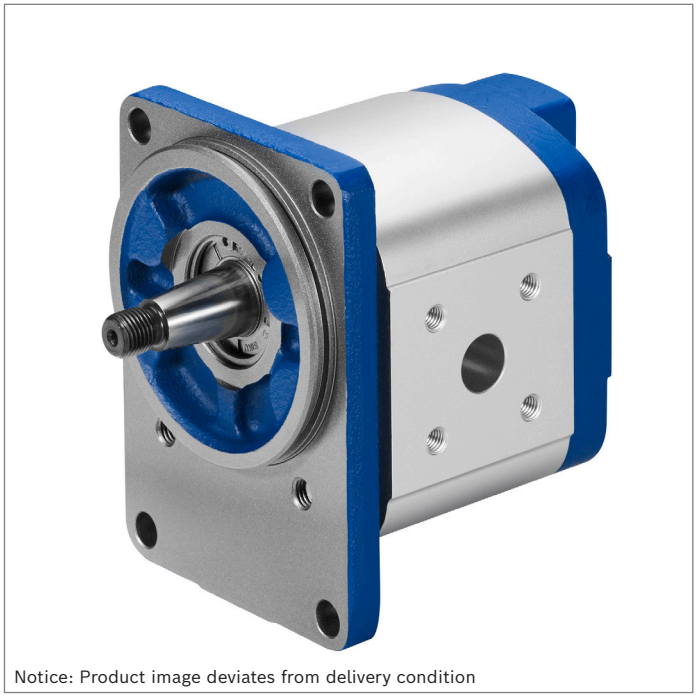
RE 14029/2024-05-24
Replaces: 2019-05-14

rexroth
A Bosch Company

External gear motor High Performance AZMN Series 1X



Notice: Product image deviates from delivery condition

- Platform N
- Fixed displacement
- Size 20 to 36
- Continuous pressure up to 250 bar
- Maximum intermittent pressure up to 280 bar

Features

- Consistently high quality due to high-volume series production
- Long service life
- Wide speed range
- Slide bearings for high loading
- Optional bi-directional version for 2- and 4-quadrant operation
- Numerous configuration variants available
- Output shafts according to ISO or SAE and customer-specific solutions
- Port connections:
  Connection flanges or screw-in threads
- High pressures though small installation space and low weight
- Wide viscosity and temperature range

Contents

Product description

General information

The key task of external gear motors is to convert hydraulic energy (flow and pressure) into mechanical energy (torque and rotational speed). To reduce heat loss, Rexroth external gear motors are designed to be extremely efficient. This efficiency is achieved through pressure-dependent gap sealing and high-precision manufacturing technology.
Rexroth external gear motors are available in four platforms: Platforms B, F, N and G, with different gear wheel widths within a platform for different displacements. Additional versions with different flanges, ports, shafts and valve attachments are also available.

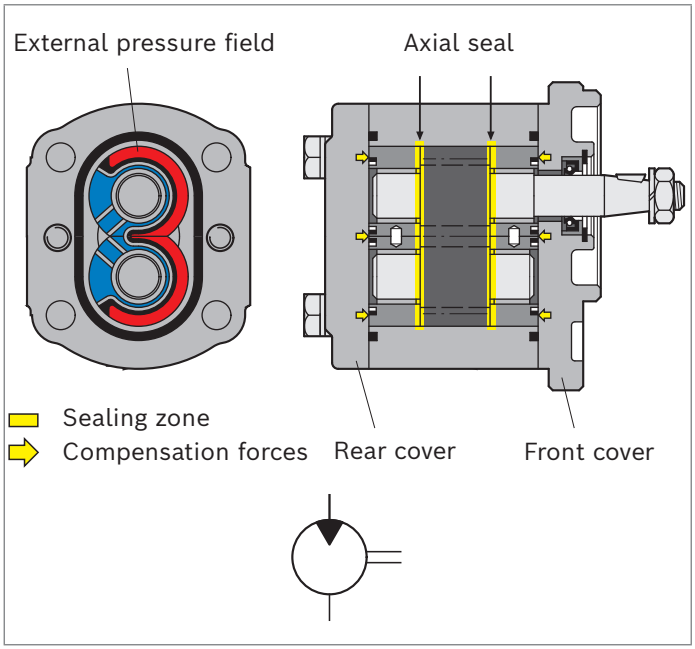
At external gear motors, you distinguish between motors for one direction of rotation and bi-directional motors.

Design

Design gear motor for one direction of rotation

These gear motors are designed asymmetrically, i.e., fixed high-pressure and low-pressure sides. This means reversing operation is not possible. Motors require a special start-up sequence to ensure good efficiency. Any leakage oil is drained internally. The shaft seal limits drain line pressure.

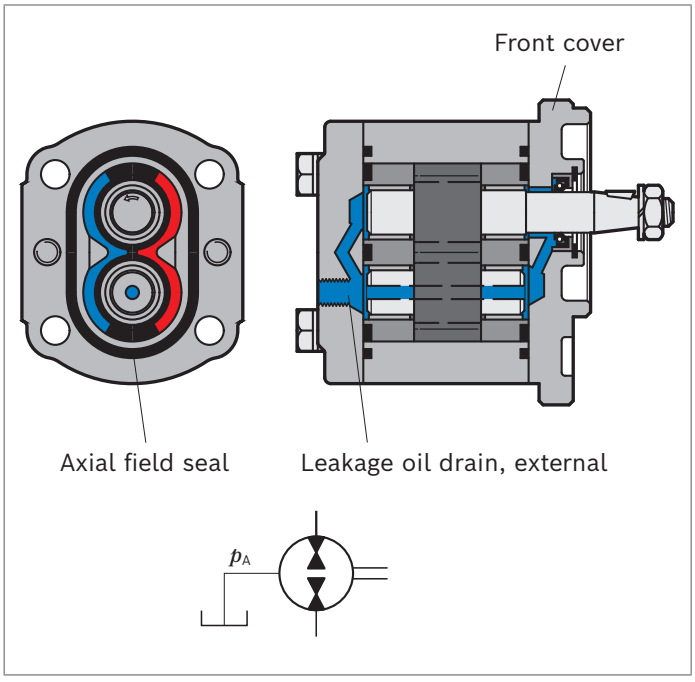
▼ **Design gear motor for one direction of rotation**



Gear motor, bi-directional

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 drain line allows the motor to run in reverse, making series connections possible. Standard motors and pumps can only withstand up to approx. 3 bar abs. due to the connection between the shaft seal and the low-pressure side.
The figure shows a bi-directional motor for 4-quadrant operation, i.e., output drive torque and drive torque in both directions (motor functions as a pump when the load is reversed).

▼ **Design gear motor, bi-directional**



Type code

01	02	03		04	05		06	07	08	09	10	11	12		13
AZ	**M**	**N**	**–**			**–**								**–**	

Product

01	External gear unit	**AZ**

Function

02	Motor	**M**

Model

03	High Performance, Platform N (20 ... 36 cm^3/rev)	**N**

Series

04	Housing width 92 mm	**1**
	Housing width 110 mm	**2**

Version

05	Phosphated, high precision cover fixation	**1**
	Zinc plated, high precision cover fixation	**2**

Nominal size (NG)

06	Geometric displacement V_g [cm^3], see chapter “Technical data”	**020**	**022**	**025**	**028**	**032**	**036**

Direction of rotation

07	Viewed on drive shaft	clockwise	**R**
		counter-clockwise	**L**
		bi-directional	**U**

Drive shaft			**Typical front cover**	
08	Tapered keyed shaft	1 : 5	**B**	**C**
	Splined shaft	SAE J744 22-4 13T	**C**	**D**
	Parallel keyed shaft	SAE J744 19-1, length 32 mm	**C**	**Q**

Front cover

09	Rectangular flange	spigot diameter 100 mm		**B**
	2-bolt flange	spigot diameter 101.6 mm	SAE J744 101-2 (B)	**C**

Port connection

10	UN-thread acc. to ISO 11926-1 / ASME B 1.1, O-ring		**12**
	Square flange (German version)		**20**

Sealing material

11	NBR (nitrile rubber)	**M**
	FKM (fluorocarbon rubber)	**P**
	NBR, shaft seal in FKM	**K**

Rear cover

12	Standard (cast iron)	**B**
	Axial drain port	**L**

Non standard version

13	Special version[1)] (characteristics not covered by type code)	**SXXXX**

1) For more information about special version, please contact us.

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.

Technical data

Operating conditions

Size					25	28	32
Series					Series 1x		
Displacement geometric, per revolution			V_g	cm³	25	28	32
Motor inlet pressure		start up pressure	$p_{start\text{-}up}$	bar	50	50	50
		maximum continuous pressure	p_1	bar	230	210	180
		maximum intermittent pressure[2]	p_2	bar	250	230	200
		maximum pressure peak	p_3	bar	270	250	220
		minimum inlet pressure absolute[2]	p_{min}	bar	0.7	0.7	0.7
Motor output pressure for	bi-directional motors		p_A	bar	≤ continuous pressure		
	non-bi-directional motors	abs.	p_A	bar	3	3	3
		upon start-up	p_A	bar	10	10	10
Maximum pressure in the drain port[1]		abs.	p_L	bar	3	3	3
		upon start-up	p_L	bar	10	10	10
Minimum rotational speed at	ν = 12 mm²/s	p < 100 bar	n_{min}	rpm	500	500	500
		p = 100 ... 180 bar	n_{min}	rpm	600	600	600
		p = 180 bar ... p_2	n_{min}	rpm	800	800	800
	ν = 25 mm²/s	at p_2	n_{min}	rpm	500	500	500
Maximum rotational speed		at p_2	n_{max}	rpm	3000	2800	2800

Size					20	22	25	28	32	36
Series					Series 2x					
Displacement geometric, per revolution			V_g	cm³	20	22.5	25	28	32	36
Motor inlet pressure		maximum continuous pressure	p_1	bar	250	250	250	230	210	180
		maximum intermittent pressure[2]	p_2	bar	280	280	280	260	240	210
		maximum pressure peak	p_3	bar	300	300	300	280	260	230
		minimum inlet pressure absolute[3]	p_{min}	bar	0.7	0.7	0.7	0.7	0.7	0.7
Motor output pressure for	bi-directional motors		p_A	bar	≤ continuous pressure					
	non-bi-directional motors	abs.	p_A	bar	3	3	3	3	3	3
		upon start-up	p_A	bar	10	10	10	10	10	10
Maximum pressure in the drain port[1]		abs.	p_L	bar	3	3	3	3	3	3
		upon start-up	p_L	bar	10	10	10	10	10	10
Minimum rotational speed at	ν = 12 mm²/s	p < 100 bar	n_{min}	rpm	500	500	500	500	500	500
		p = 100 ... 180 bar	n_{min}	rpm	600	600	600	600	600	600
		p = 180 bar ... p_2	n_{min}	rpm	800	800	800	800	800	800
	ν = 25 mm²/s	at p_2	n_{min}	rpm	500	500	500	500	500	500
Maximum rotational speed		at p_2	n_{max}	rpm	3000	3000	3000	2800	2800	2800

1) For bi-directional motors
2) Limited service life with threaded ports (applicable for applications with p_2 > 210 bar)
3) To avoid low inlet pressures with fast reduction of the inlet amount and large flywheel mass of the consumer, an anti-cavitation valve with correspondingly low pressure drop is to be provided.

Rotary stiffness of drive shaft

Drive shaft			C	D	Q
Rotary stiffness	c	Nm/rad	489	626	489

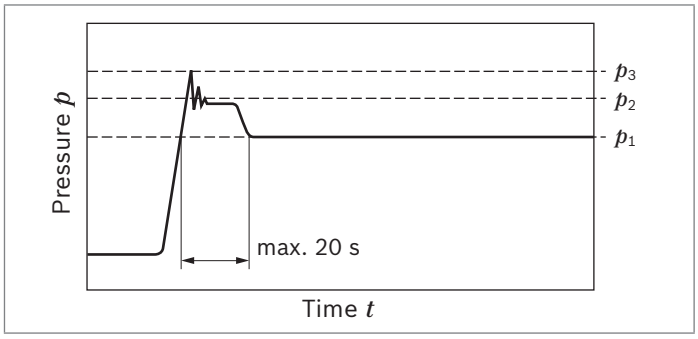
General technical data

Installation position			No restrictions
Type of mounting			See offer drawing
Port connections			See chapter "Port connections"
Direction of rotation viewed on drive shaft			One direction of rotation (motor rotation is only admissible in the indicated direction) or bi-directional.
Drive shaft loading			Axial and radial forces only after consultation
Ambient temperature range	t	°C	-30 ... +80 with NBR seals (NBR = nitrile rubber)
	t	°C	-20 ... +110 with FKM seals (FKM = fluorocarbon rubber)

Corrosion protection

Version 1 (phosphated): Unit with low corrosion protection	The surface serves for protection against flash rust during transport or as priming for painting.	
Version 2 (galvanized, passivated): Unit with corrosion protection	Degree of corrosion and rust according to DIN EN ISO 9227	Test duration 96 h: no red rust

▼ **Pressure definition**

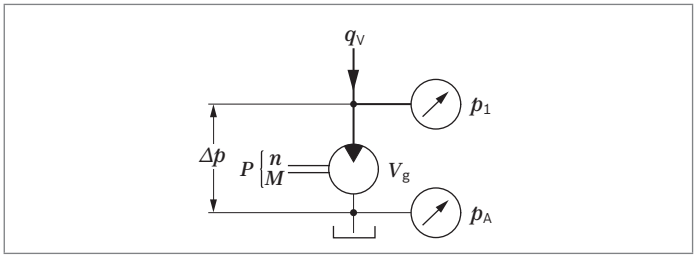


p_1 Maximum continuous pressure
p_2 Maximum intermittent pressure
p_3 Maximum pressure peak

Determining characteristics			
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]

Key

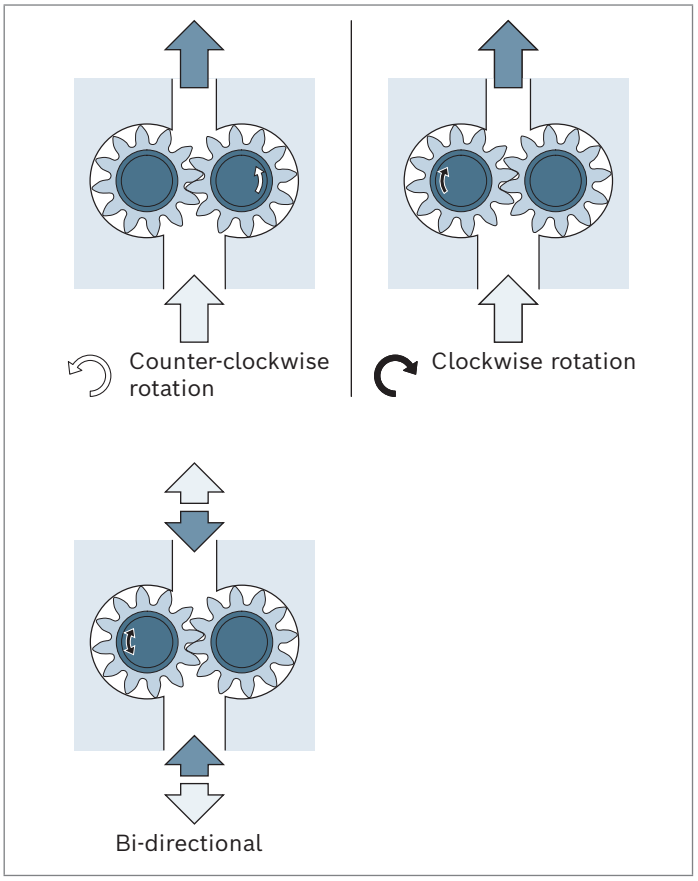
V_g	Displacement per revolution [cm³]
Δp	Differential pressure [bar] ($\Delta p = p_1 - p_A$)
n	Rotational speed [rpm]
q_v	Inlet flow [l/min]
M	Torque [Nm]
P	Power [kW]
η_v	Volumetric efficiency[1)]
η_{hm}	Hydraulic-mechanical efficiency[1)]
η_t	Total efficiency ($\eta_t = \eta_v \times \eta_{hm}$)[1)]



Notice

- Please observe the safety requirements for the overall system.
- Please contact us regarding applications with frequent load cycles.
- In the "Diagrams/characteristic curves" chapter, you can find diagrams for a rough calculation.

▼ **Direction of rotation viewed on drive shaft**



1) Parameter as a decimal, e.g. 0.9

Hydraulic fluid

The external gear unit is designed for operation with HLP mineral oil according to DIN 51524, 1-3. Under higher load, however, Bosch Rexroth recommends at least HLP compliant with DIN 51524 Part 2.
See the following data sheet for application instructions and requirements for selecting hydraulic fluid, behavior during operation as well as disposal and environmental protection before you begin project planning:

- 90220: Hydraulic fluids based on mineral oils and related hydrocarbons

Other hydraulic fluids on request.

Selection of hydraulic fluid
Bosch Rexroth evaluates hydraulic fluids on the basis of the Fluid Rating according to the technical data sheet 90235.
Hydraulic fluids with positive evaluation in the Fluid Rating are provided in the following technical data sheet:

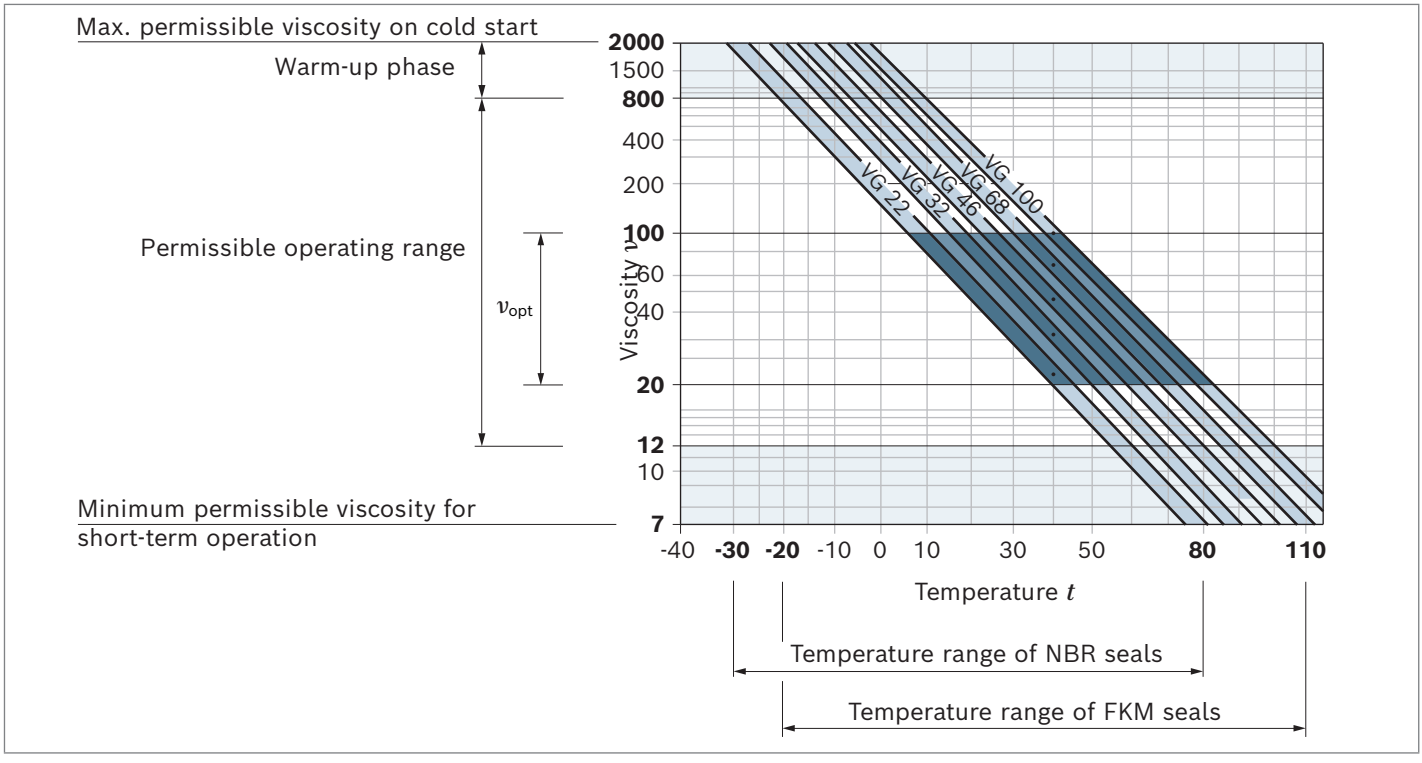
- 90245: Bosch Rexroth Fluid Rating List for Rexroth hydraulic components (pumps and motors)

Selection of hydraulic fluid shall make sure that the operating viscosity in the operating temperature range is within the optimum range (ν_{opt} see “Selection diagram”).

Viscosity and temperature of hydraulic fluids

Viscosity range	
Permissible operating range	ν = 12 ... 800 mm²/s
Recommended in continuous operation	ν_{opt} = 20 ... 100 mm²/s
Permissible for cold start	ν_{max} ≤ 2000 mm²/s
Temperature range	
With NBR seals (NBR = nitrile rubber)	t = -30 °C ... +80 °C
With FKM seals (FKM = fluorocarbon rubber)	t = -20 °C ... +110 °C

▼ **Selection diagram**

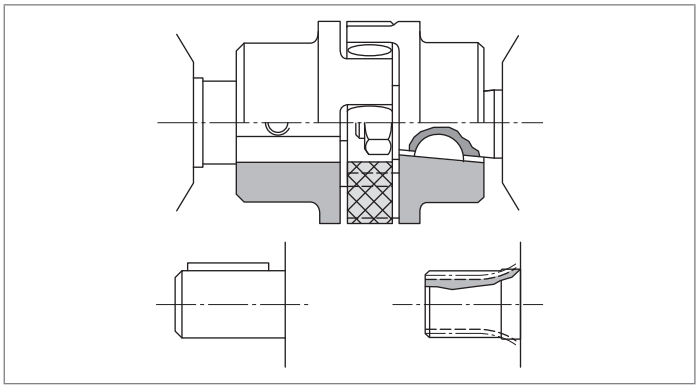


Please observe the information on the filtration of hydraulic fluid (see chapter "Project planning information").

Drives

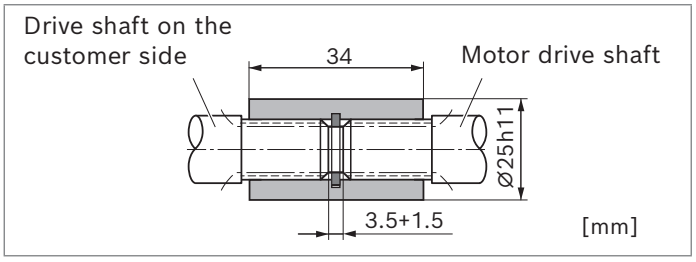
Elastic couplings

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



Coupling sleeve

- To be used for splined shaft profile according to DIN and SAE
- Attention: Make sure no radial and axial forces act on the motor shaft and coupling sleeve. The coupling sleeve should freely move in the axial direction.
- The distance between the motor drive shaft and the drive shaft on the customer side should be $3.5^{+1.5}$ mm
- Reserve installation space for the retaining ring.
- Oil-bath or oil-mist lubrication required



Maximum transferable drive torques

▼ **Tapered keyed shaft series 1x**

Drive shaft code	Designation	M_{max} Nm	Nominal size	$p_{2\,max}$ series 1x bar	$p_{2\,max}$ series 2x bar
C	1 : 5	200	20 ... 25	250	280
			28	230	260
			32	200	240
			36	180	210

▼ **Splined shaft**

Drive shaft code	Designation	M_{max} Nm	Nominal size	$p_{2\,max}$ series 1x bar	$p_{2\,max}$ series 2x bar
D	SAE J744 22-4 13T	320	20 ... 25	250	280
			28	230	260
			32	200	240
			36	180	210

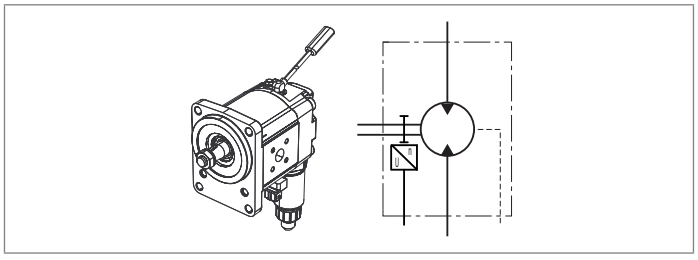
▼ **Parallel keyed shaft**

Drive shaft code	Designation	M_{max} Nm	Nominal size	$p_{2\,max}$ series 1x bar	$p_{2\,max}$ series 2x bar
Q	SAE J744 19-1, length 32 mm	80	20	220	220
			22	200	200
			25	180	180
			28	160	160
			32	140	140
			36	120	120

Gear motors with integrated sensor

The Hall effect-based DSM1-10 speed sensor has been specially developed for use under harsh conditions in mobile working machines. The sensor detects the rotational speed signal of ferromagnetic gear wheels. As an active sensor, he delivers a signal with a constant amplitude that is independent of the rotational speed. Due to its compact and robust design, the external gear motor with integrated speed sensor is particularly suitable for

- Fan drives in buses, trucks and construction machinery from 7 to 20 kW
- As vibration drive for road rollers and pavers.

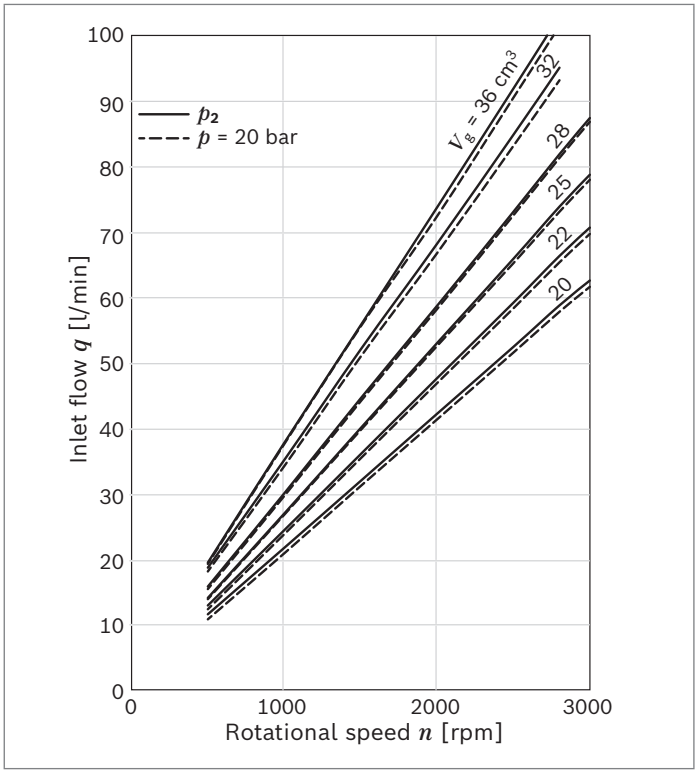


For further information see:
Speed sensor data sheet 95132.

Diagrams/characteristic curves

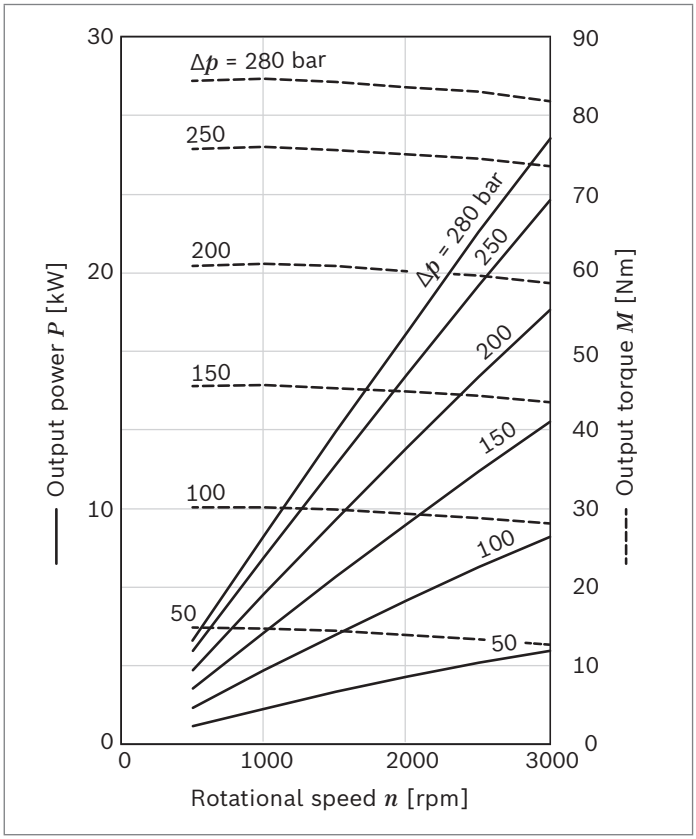
Inlet flow characteristic curve

▼ **Inlet flow**

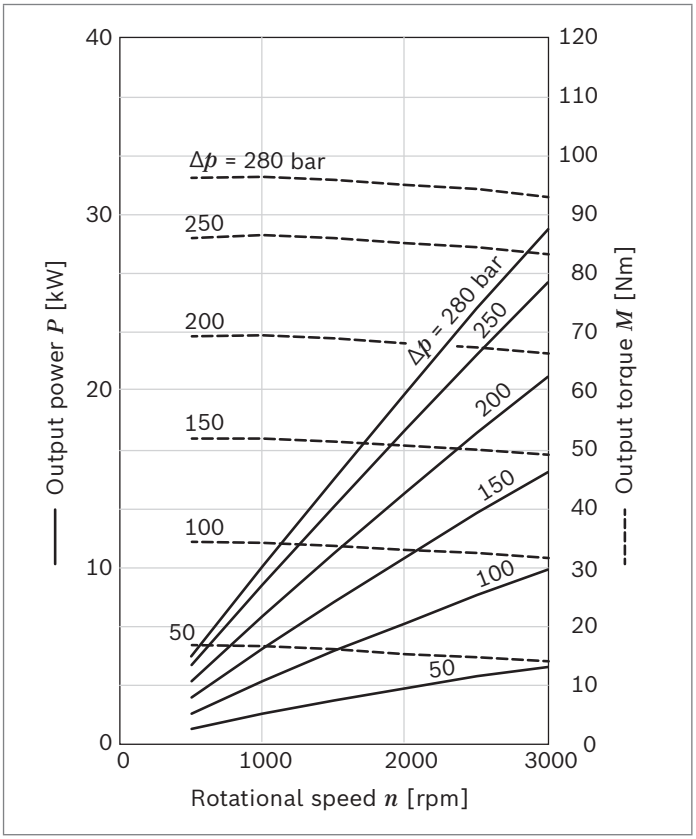


Performance charts

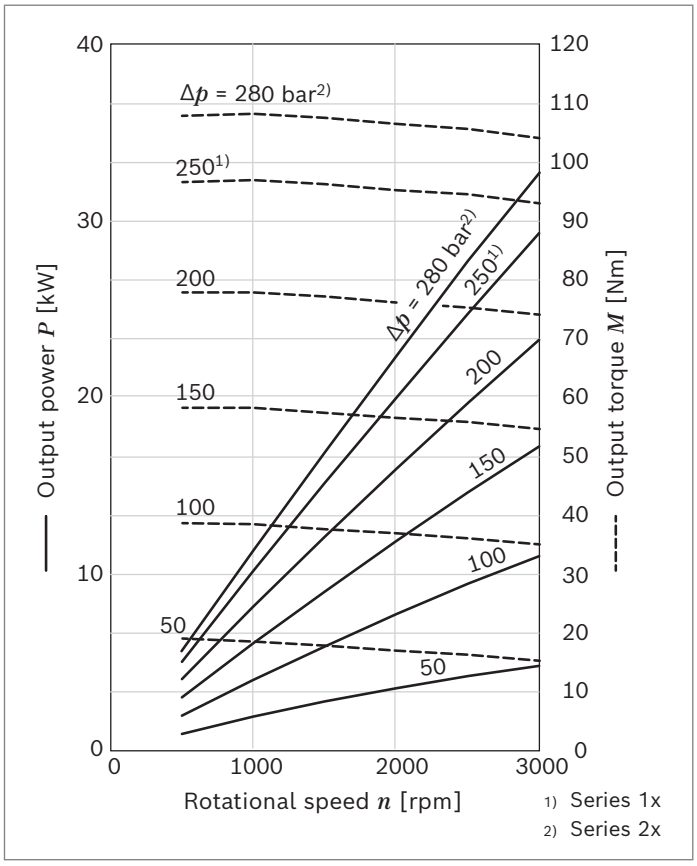
▼ **Size 20**



▼ **Size 22**

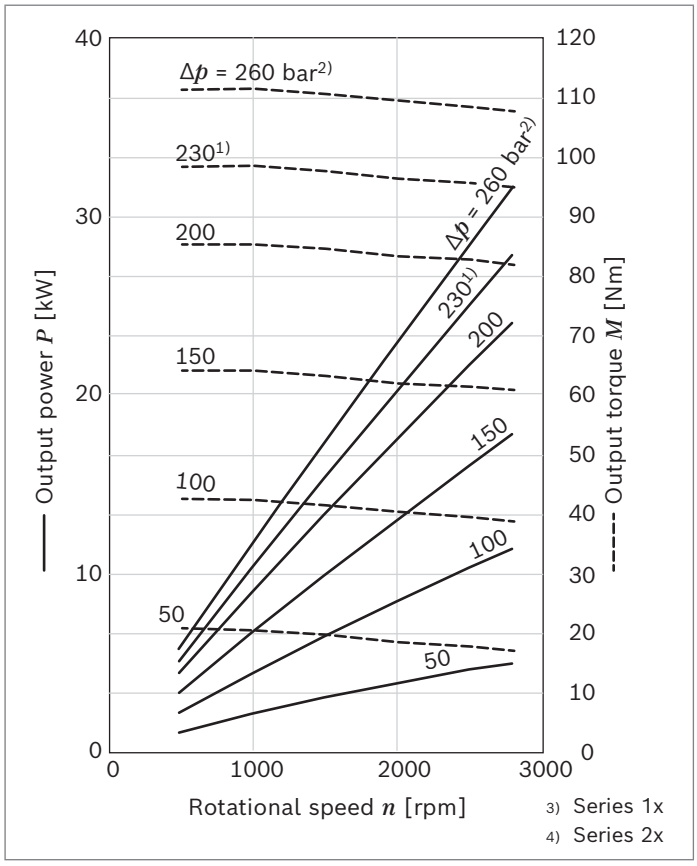


▼ **Size 25**



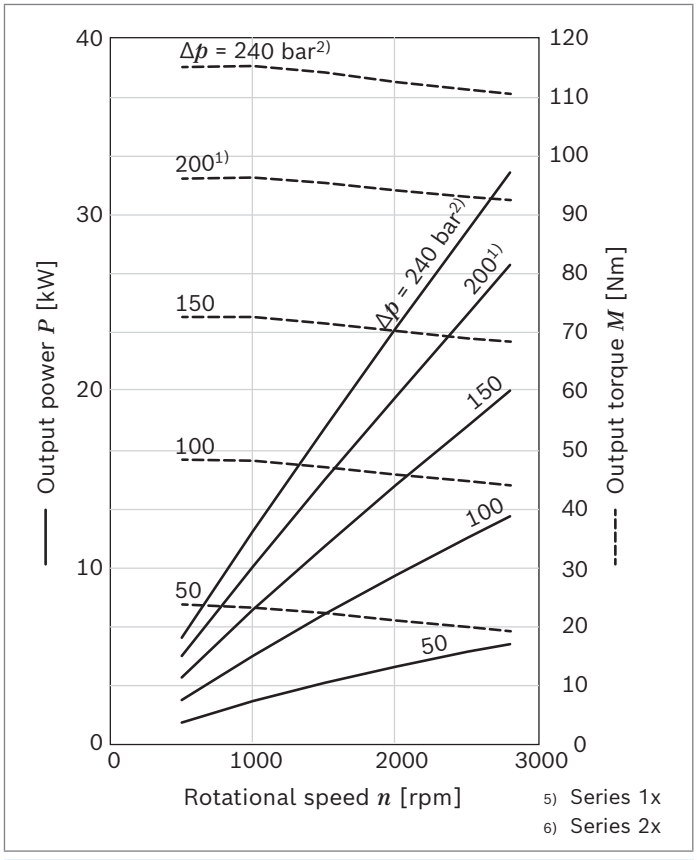
1) Series 1x
2) Series 2x

▼ **Size 28**



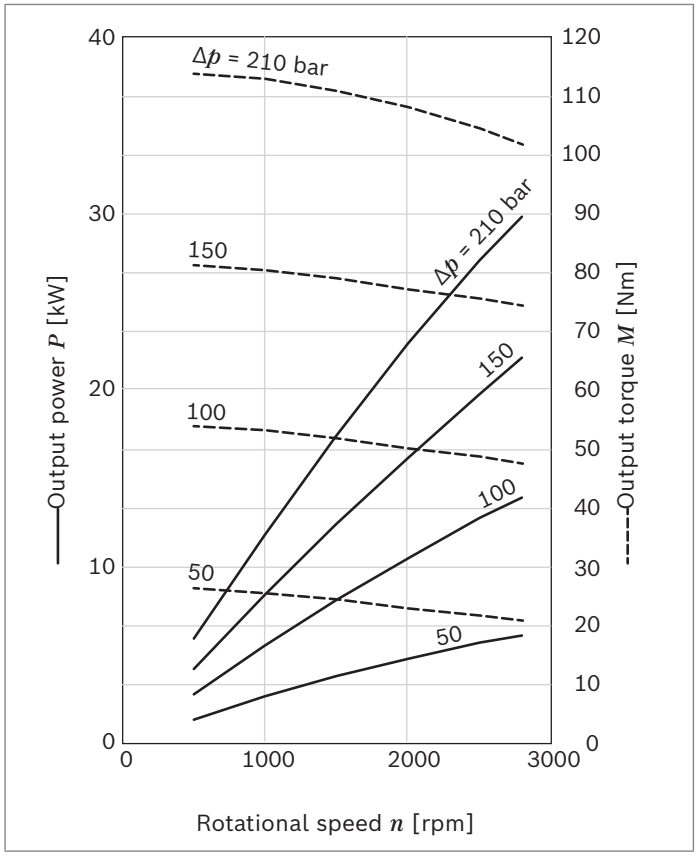
3) Series 1x
4) Series 2x

▼ **Size 32**



5) Series 1x
6) Series 2x

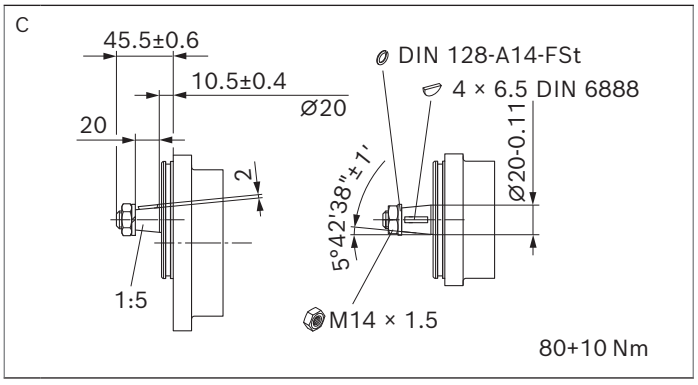
▼ **Size 36**



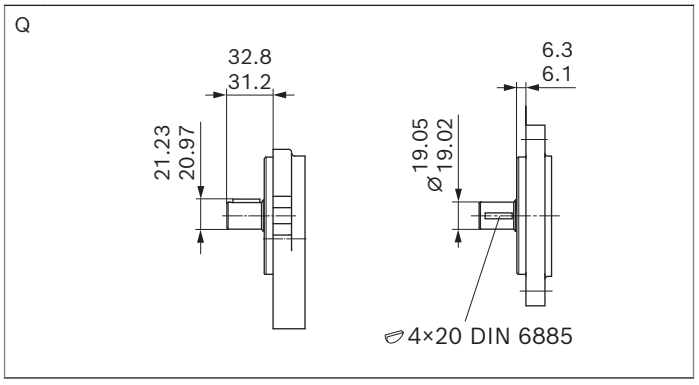
Notice
Characteristic curves measured at ν = 32 mm²/s and t = 50 °C.

Drive shafts

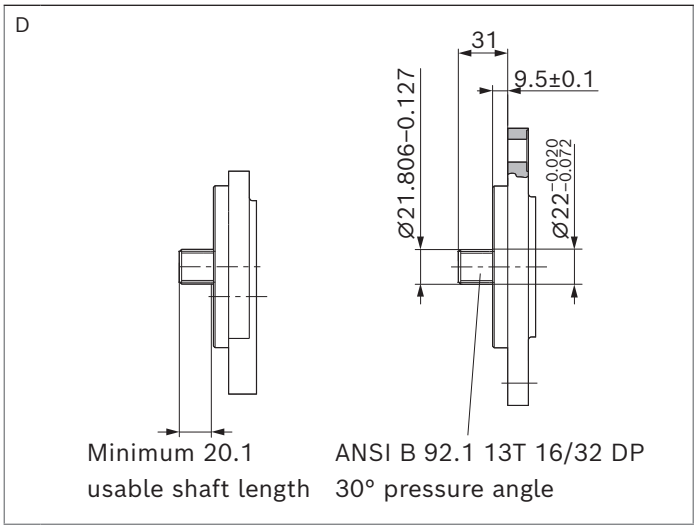
▼ **Tapered keyed shaft 1:5**



▼ **Parallel keyed shaft SAE J744 19-1, length 32 mm**

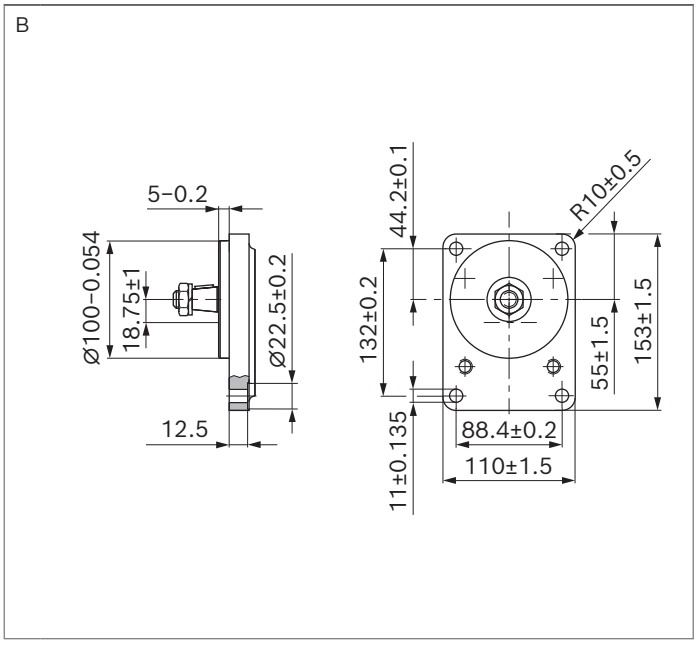


▼ **Splined shaft SAE J744 22-4 13T**

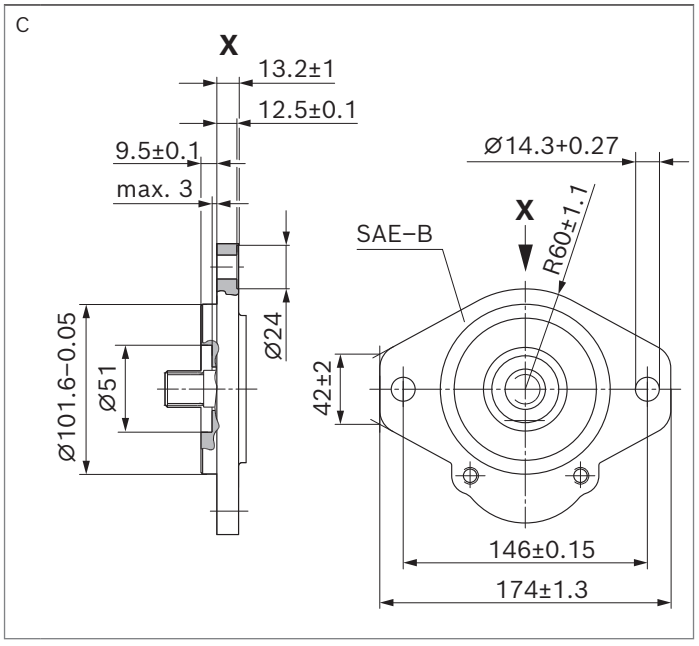


Front covers

▼ **Rectangular flange spigot dia 100 mm**



▼ **2-bolt flange SAE J744 101-2 (B) spigot dia. 101.6 mm**

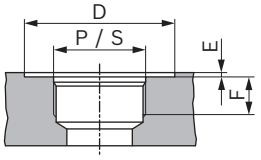


1) For other version, see offer drawing

Port connections[1)]

▼ **UN-thread acc. to ISO 11926-1 / ASME B 1.1, O-ring**[2)]

12

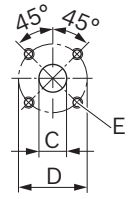


Direction of rotation	Series	Nominal size	Inlet port (pressure side)				Outlet port (tank side)			
			D [mm]	E [mm]	F [mm]	P	D [mm]	E [mm]	F [mm]	S
Clockwise/ Counter-clockwise	1x	20 ... 22	35	0.5	17	7/8-14 UN-2B	50	0.5	20	1 5/16-12 UN-2B
		25 ... 36	45		19	1 1/16-12 UN-2B				
	2x	20 ... 22	35	0.5	17	7/8-14 UN-2B	50	0.5	20	1 5/16-12 UN-2B
		25 ... 36	45		19	1 1/16-12 UN-2B	58			1 5/8-12 UN-2B

Direction of rotation	Series	Nominal size	Port connections			
			D [mm]	E [mm]	F [mm]	P
Bi-directional	1x	20 ... 22	35	0.5	17	7/8-14 UN-2B
		25 ... 36	45		19	1 1/16-12 UN-2B
	2x	20 ... 22	35	0.5	17	7/8-14 UN-2B
		25 ... 36	45		19	1 1/16-12 UN-2B

▼ **Square flange**

20



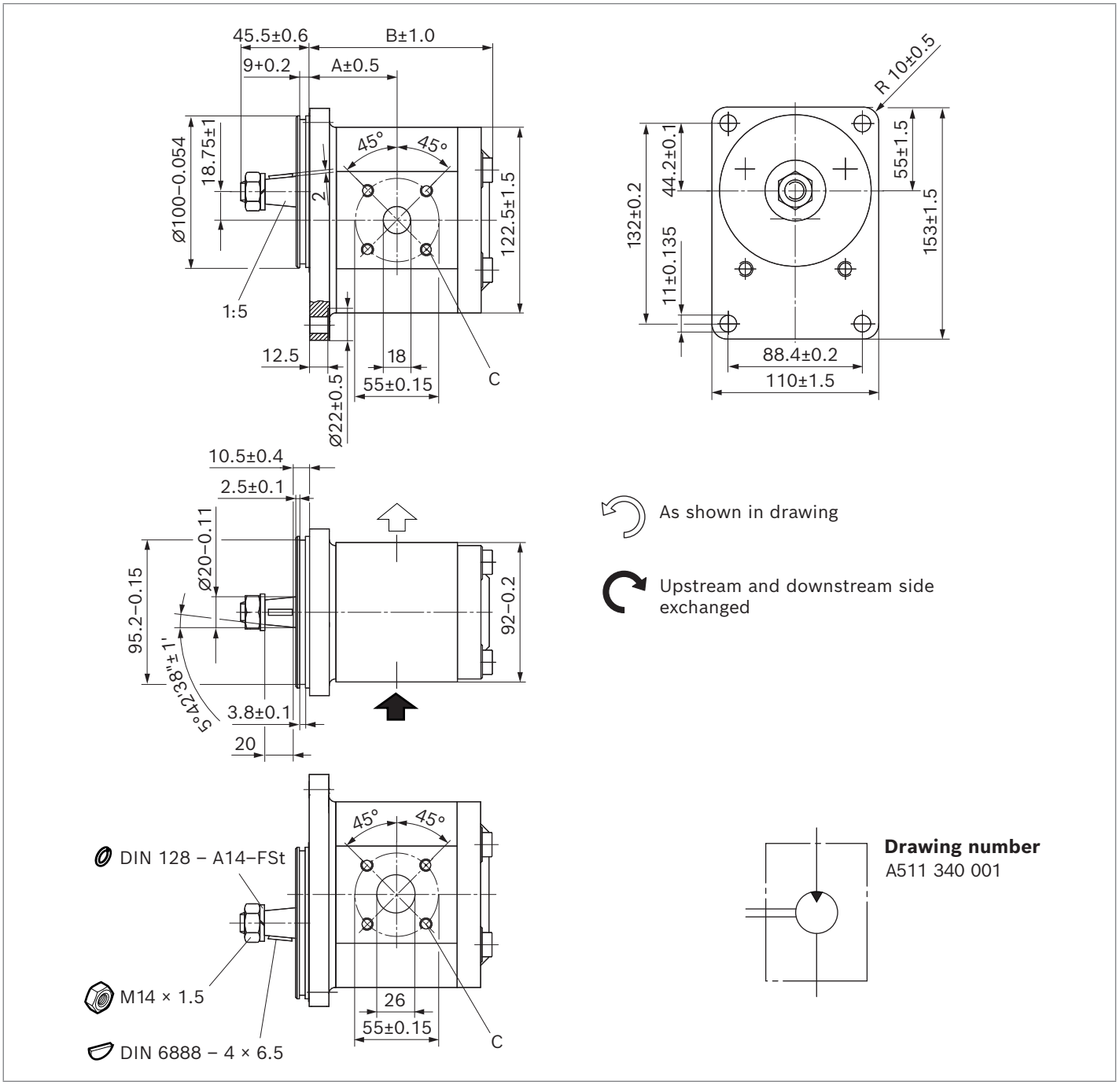
Direction of rotation	Series	Nominal size	Inlet port (pressure side)			Outlet port (tank side)		
			C [mm]	D [mm]	E [mm]	C [mm]	D [mm]	E [mm]
Clockwise/ Counter-clockwise	1x	20 ... 36	18	55	M8; 13 deep	26	55	M8; 13 deep
	2x	20 ... 36	18	55	M8; 13 deep	26	55	M8; 13 deep

Direction of rotation	Series	Nominal size	Port connections		
			C [mm]	D [mm]	E [mm]
Bi-directional	2x	30 ... 36	18	55	M8; 13 deep

1) Customer-specific versions may differ (see offer drawing)
2) Limited service life with threaded ports (applicable for applications with p_2 > 210 bar)

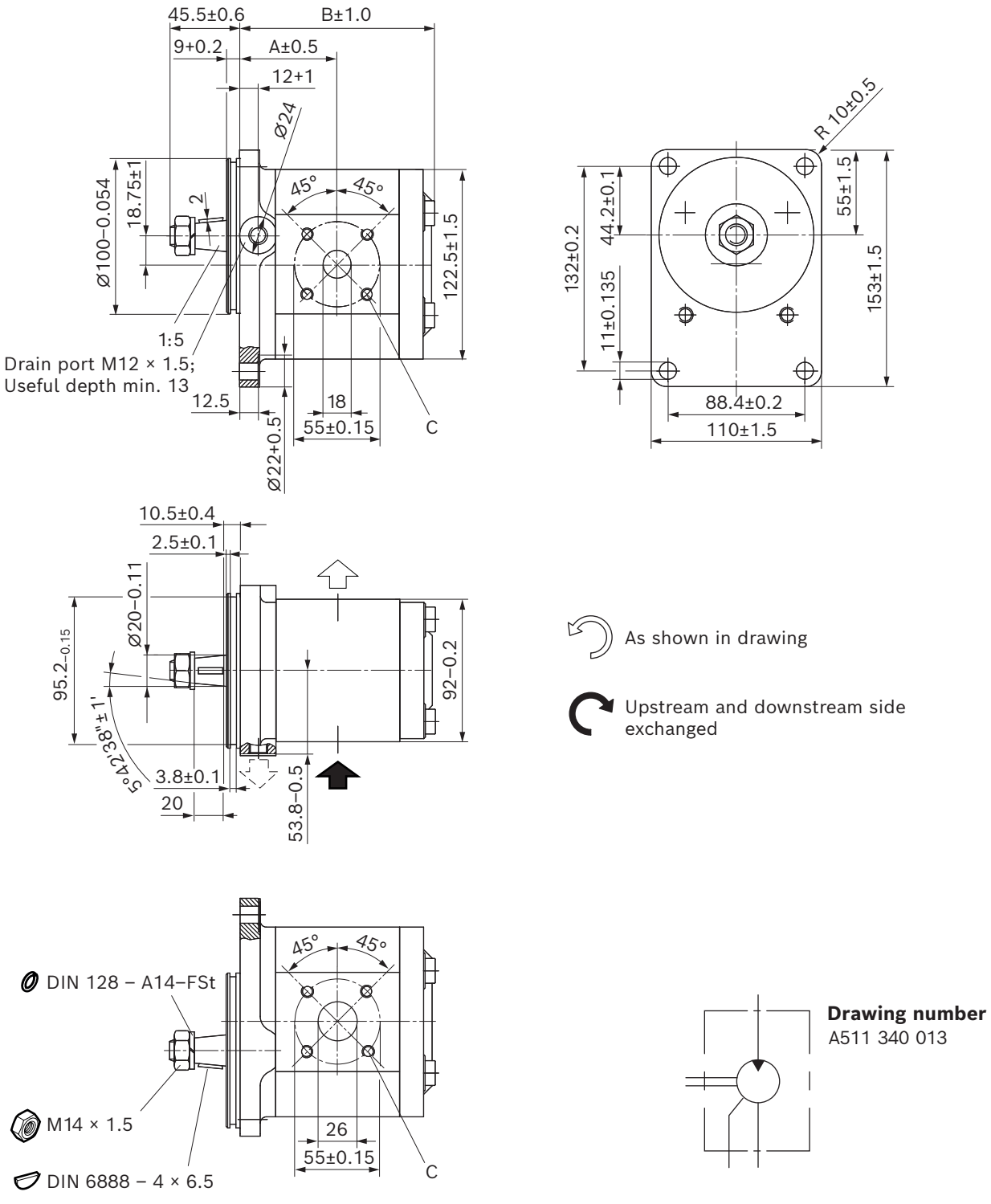
Dimensions – Preferred program

▼ **Tapered keyed shaft 1:5 with rectangular flange spigot dia. 100 mm**
AZMN–...–xCB20MB



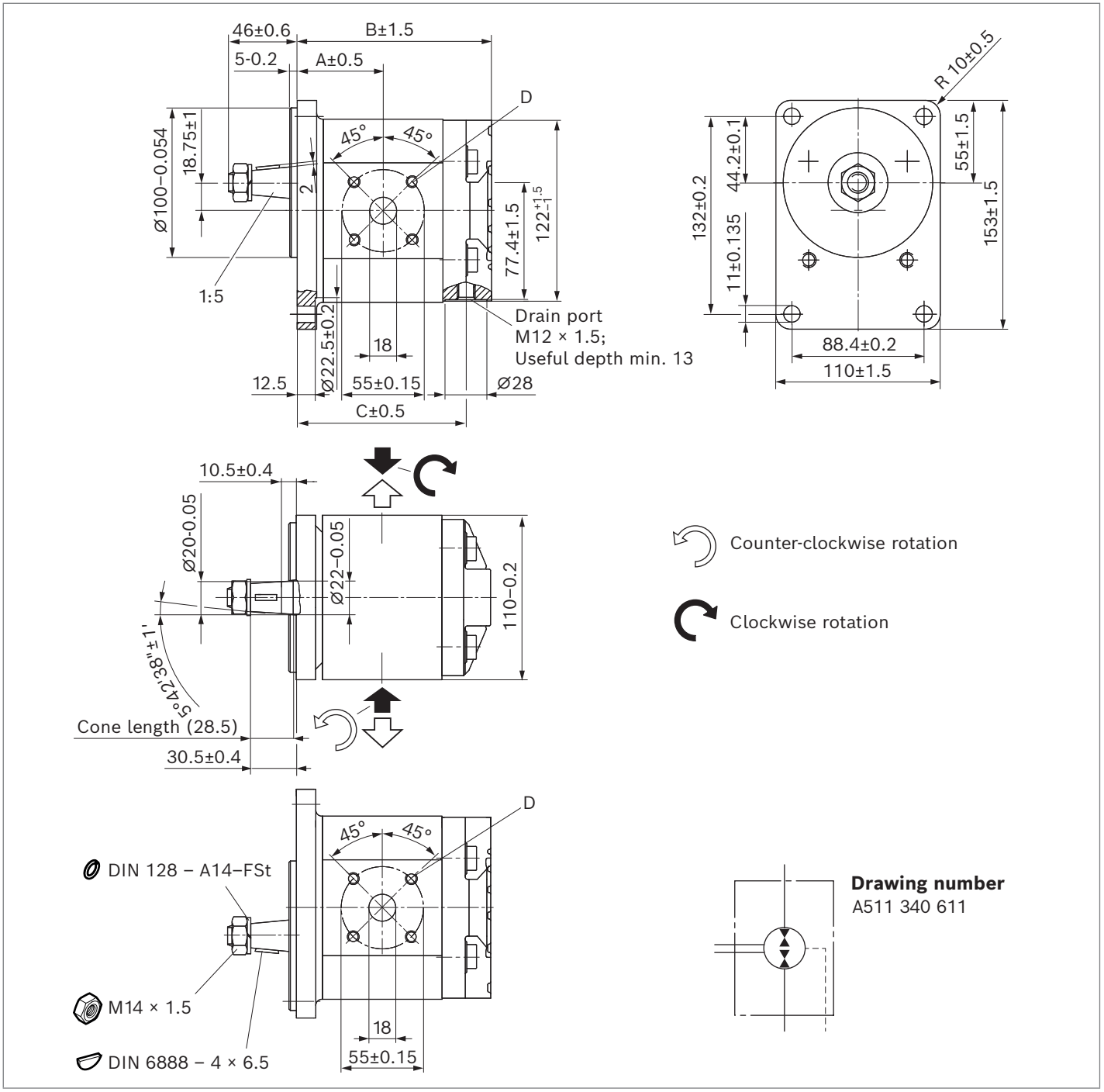
NG	Order number Direction of rotation Counter-clockwise	Maximum intermittent pressure p_2 [bar]	Maximum rotational speed [rpm]	Dimensions A	 B	 C
25	0511725307	210	3000	55	116.1	M8; min. 13 deep
28	0511725309	200	3000	56.6	119.1	

▼ **Tapered keyed shaft 1:5 with rectangular flange spigot dia. 100 mm and drain port in the front cover**
AZMN–...–xCB20PB–S0097



NG	Order number Direction of rotation		Maximum intermittent pressure p_2 [bar]	Maximum rotational speed [rpm]	Dimensions		
	Counter-clockwise	Clockwise			A	B	C
25		0511725024	210	3000	60.5	120.8	M8; min. 13 deep
28	0511725312		210	2800	62	123.8	

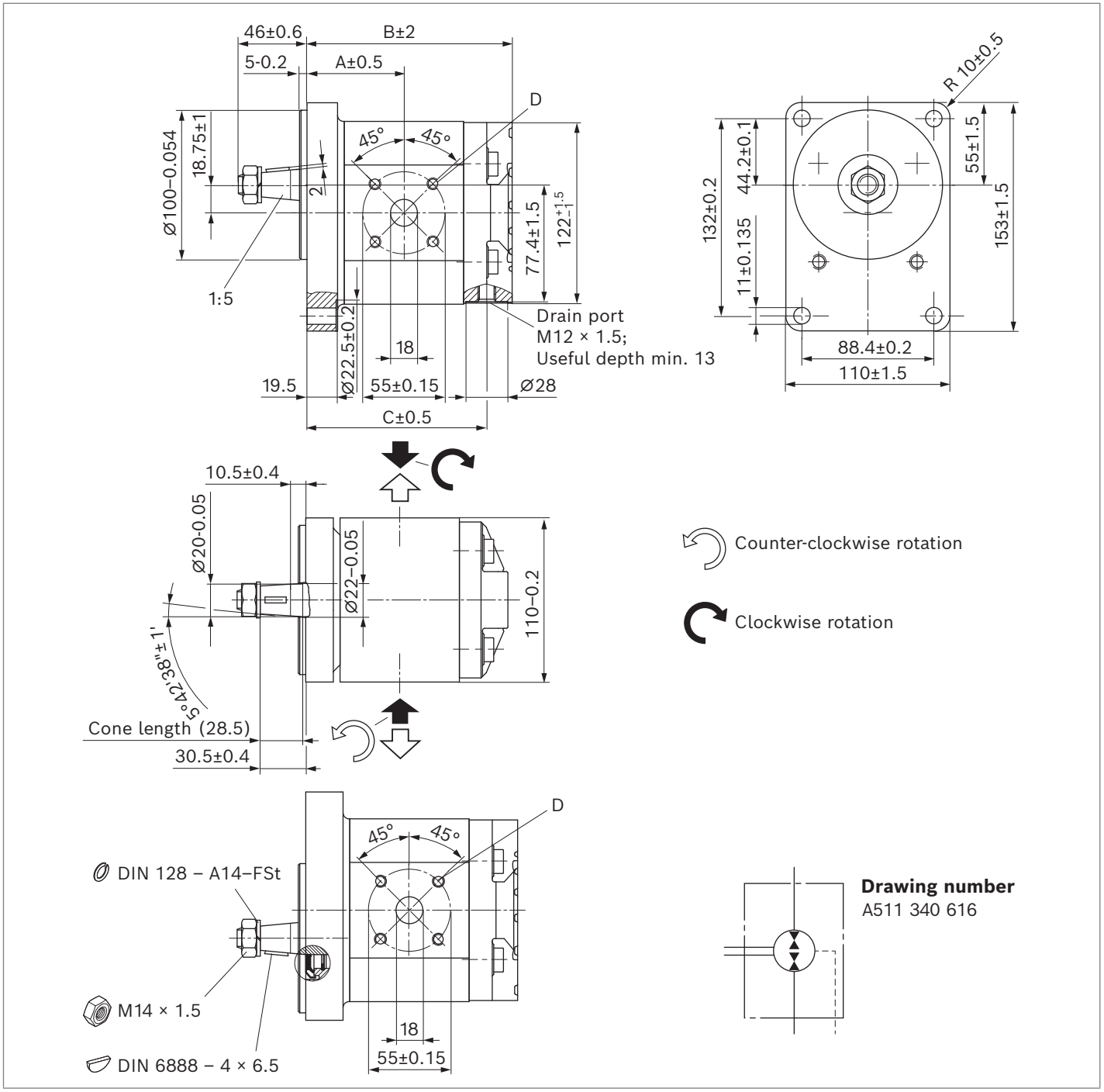
▼ **Tapered keyed shaft 1:5 with rectangular flange spigot dia. 100 mm and drain port in the rear cover AZMN–...–UCB20Px–S0077 (...-S0582 with size 36)**



NG	Order number Direction of rotation Bi-directional	Maximum intermittent pressure p_2 [bar]	Maximum rotational speed [rpm]	Dimensions A	 B	 C	 D
20	0511625611	280	3000	52.0	120.6	102.1	M8; min. 13 deep
22	0511725605	280	3000	53.5	123.6	105.1	
25	0511725604	280	3000	55.0	126.6	108.1	
28	0511725607	250	2800	56.5	129.6	111.1	
32	0511725613	250[1)]	2800	59.0	134.1	115.6	
36	0511725608	250[1)]	2500	61.0	137.0	120.1	

1) Short-term, in case of fan application

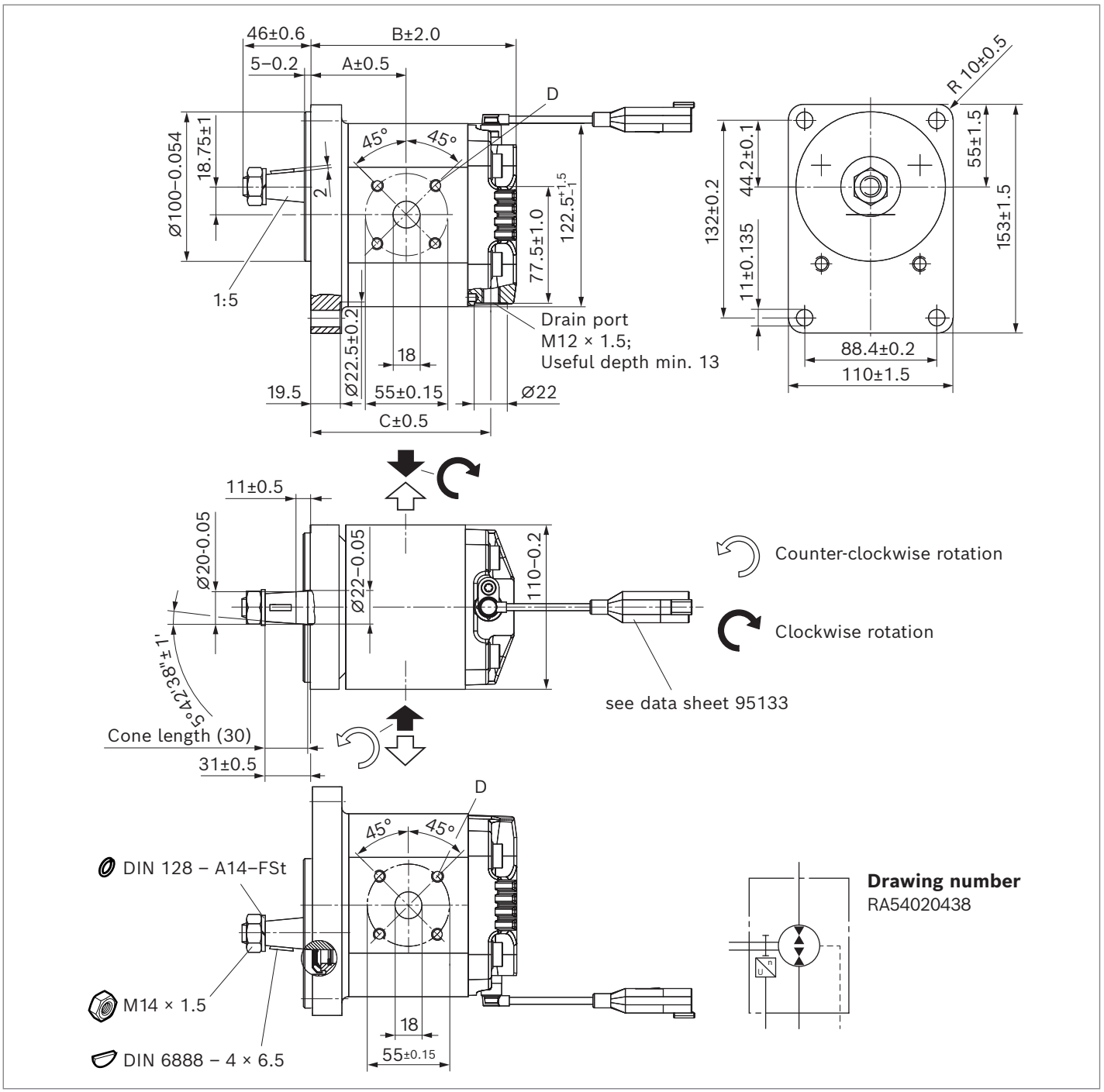
▼ **Tapered keyed shaft 1:5 with rectangular flange spigot dia. 100 mm and dust protection for shaft seal, radial drain port in the rear cover**
AZMN-...-UCB20Px-S0592



NG	Order number Direction of rotation Bi-directional	Maximum intermittent pressure p_2 [bar]	Maximum rotational speed [rpm]	Dimensions A	B	C	D
20	0511625613	250	3000	59.5	128.1	109.6	M8; min. 13 deep
22	0511725609	250	3000	61.0	131.1	112.6	
25	0511725610	250	3000	62.5	134.1	115.6	
28	0511725611	250	2800	64.0	137.1	118.6	
32	0511725614	250[1)]	2800	66.5	141.6	123.1	
36	0511725612	250[1)]	2500	68.5	146.1	127.6	

1) Short-term, in case of fan application

▼ **Tapered keyed shaft 1:5 with rectangular flange spigot dia. 100 mm with speed sensor and DPS (dual protection system) AZMN–...–UCB20Px–S0786**



NG	Order number Direction of rotation Bi-directional	Maximum intermittent pressure p_2 [bar]	Maximum rotational speed [rpm]	Dimensions A	 B	 C	 D
22	0511725625	280	3000	61.0	131.1	112.5	M8; min. 13 deep

Project planning information

Technical data

All mentioned technical data are dependent on manufacturing tolerances and are applicable for certain boundary conditions.
Note that certain deviations are therefore possible and that technical data may vary when certain boundary conditions (e.g., viscosity) change.
Motors delivered by Bosch Rexroth are tested for function and performance.
The motor may only be operated with the permissible data (see chapter “Technical data”).

Characteristic curves

When dimensioning the gear motor, observe the maximum possible application data on the basis of the characteristic curves shown.

Application information

External gear units are not approved in on-highway vehicles for safety-relevant functions, as well as functions in the drive train, for steering, braking and level regulation.
Classified as on-highway vehicles are e.g. vehicles such as motorbikes, private cars, trucks, vans, freight cars, buses and trailers. The European vehicle classes L (motorbikes), M (private cars),
N (vehicles for transporting goods such as trucks and vans) and O (trailers and semi-trailers) serve as reference.

Notice
When used as an auxiliary steering motor, the vehicle manufacturer should make sure that the steering system continues to operate safely, even if the auxiliary steering motor fails (regulation similar to ECE R-79 can be referred).

Filtration of the hydraulic fluid

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. Thus contamination can be reduced to an acceptable degree in terms of particle size and concentration.
Bosch Rexroth generally recommends full-flow filtration.
The basic contamination of the hydraulic fluid filled in should not exceed level 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.
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.

Drain line

For bi-directional motors and/or motors that can be loaded by the return flow, a drain line is to be connected directly at the reservoir. Ensure adequate dimensioning.

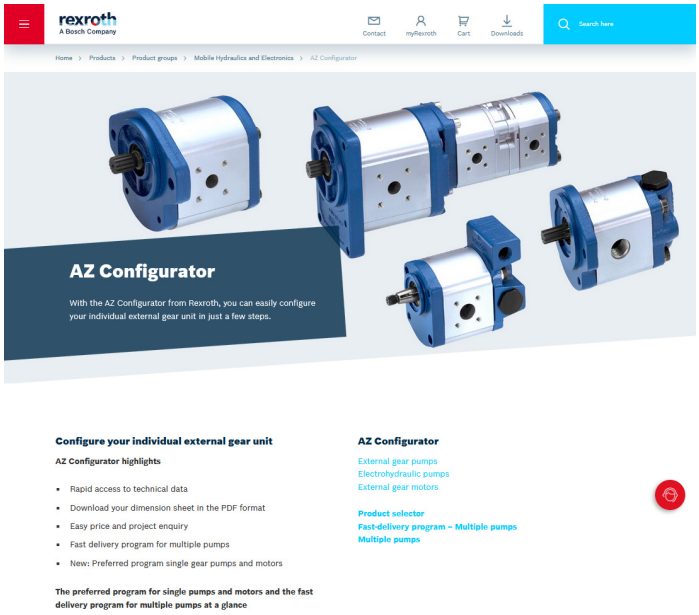
Further information

Installation drawings and dimensions are valid at date of publication, subject to modifications.
Further information and notes on project planning can be found in the “General instruction manual for external gear units”: www.boschrexroth.com/07012-B, chapter 5.5.

Information

AZ Configurator

With our practical product selector, it will take you next to no time to find the right solution for your applications, no matter whether you are looking for Standard Performance or any other external gear unit.
Based on a selection of features, the selector guides you through all of the products available for order. By clicking on the order number, you can view and download the following product information: data sheet, dimension sheet, instruction manual, operating conditions and tightening torques.
You can order your selection directly via our online shop and benefit from an additional discount of 2% in this way. And if you need something really quickly, simply use our fast delivery and preferred programs (GoTo). Your order will then be dispatched within 10 business days.
You also have the possibility of easily and conveniently configuring your custom external gear unit with our AZ Configurator. All the data required for the project planning of external gear units can be obtained through the menu navigation.
For an existing configuration, the result is the order number, the type code and further information. If your configuration does not result in an orderable product, our online tools give you the possibility of sending a project request directly to Bosch Rexroth. We will then get in contact with you.
Link: www.boschrexroth.de/az-configurator

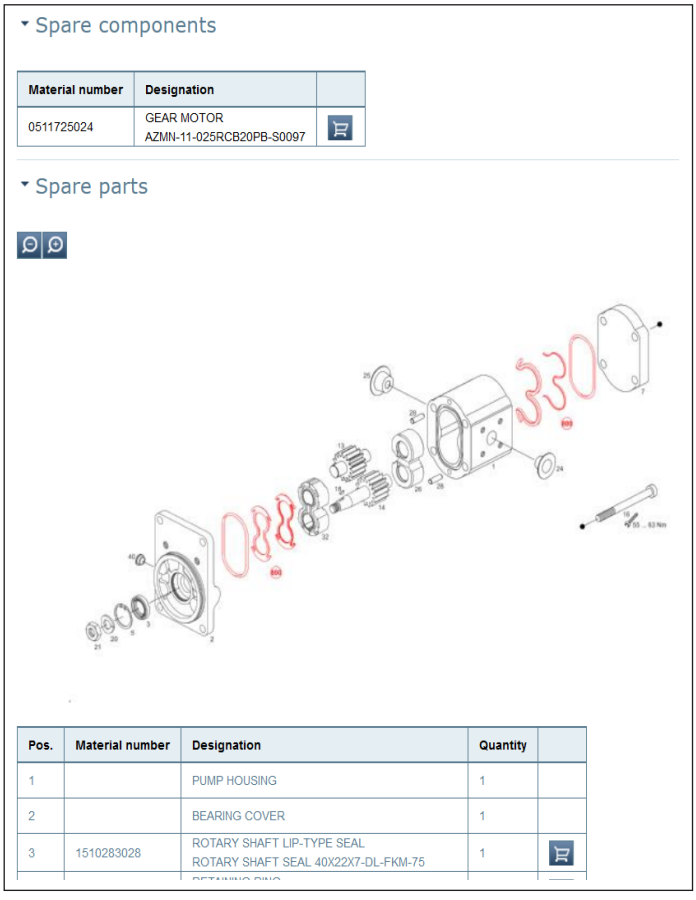


Spare parts

Spare parts can be found online at
www.boschrexroth.com/spc
Select “Spare parts and accessories” and enter the material number of the external gear units into the search field.

Example:
Material number: **0 511 725 024**
Type designation: AZMN-11-025RCB20PB-S0097

All available spare parts are listed under “Spare parts” and can be ordered via the shopping basket.



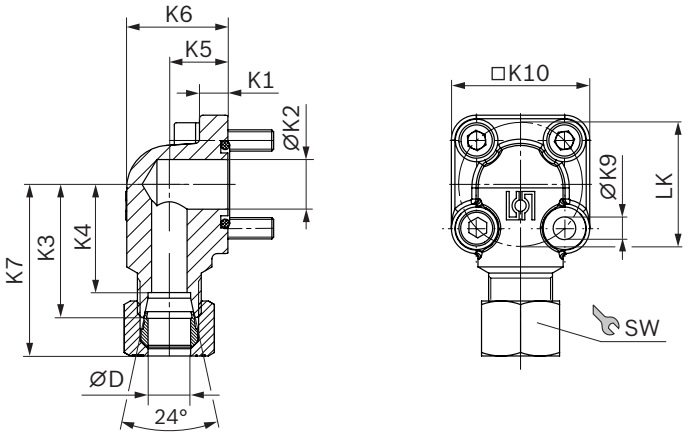
Further information

- Extensive notes and suggestions can be found in the Hydraulic Trainer, volume 3: “Planning and Design of Hydraulic Power Systems”, order number R900018538.

Accessories

▼ **90° angle flange, for square flange 20 (see chapter "Port connection")**

Complete fitting with
O-ring, metric screw set,
nut and cutting ring.



LK	D	Series[1)]	Material number	p_{max}	K1	K2	K3	K4	K5	K6	K7	K9	K10	SW	Screws		O-ring	Weight
mm	mm			bar	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	2 ×	2 ×	NBR	kg
55	20	S	1515702004	250	13	18.2	45	34.5	24	38	57.0	8.4	58	36	M8 × 25	M8 × 50	32 × 2.5	0.62
55	30	S	1515702006	250	12	26.5	49	38.5	32	51	63.5	8.4	58	50	M8 × 25	M8 × 50	32 × 2.5	0.63
55	35	L	1515702005	100	12	26.5	49	38.5	32	52	61.0	8.4	58	50	M8 × 25	M8 × 60	32 × 2.5	0.77
55	42	L	1515702019	100	12	26.5	49	38.0	40	64	61.5	8.4	58	60	M8 × 25	M8 × 70	32 × 2.5	1.04

Notice
Permissible tightening torques can be found in the “General instruction manual for external gear units”:
www.boschrexroth.com/07012-B

1) See DIN EN ISO 8434-1

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