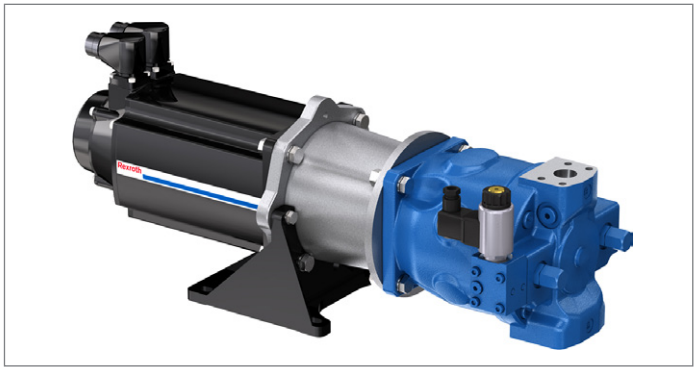
RE 91485/2021-11-11
Replaces: 10.2016

rexroth
A Bosch Company

Axial piston units for variable-speed drives A10FZO, A10VZO, A10FZG and A10VZG



- Suitable for variable-speed operation with synchronous and asynchronous motors
- Sizes 3 to 180
- Nominal pressure/maximum pressure see technical data
- Open and closed circuits

Features

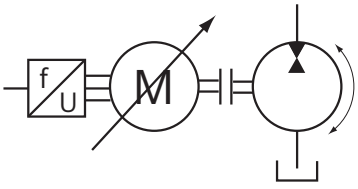
- Variable and fixed pumps with axial piston rotary group in swashplate design for hydrostatic drives in open and closed circuits.
- Suitable for start/stop operation
- Suitable for long pressure holding operation
- Proven A10 rotary group technology
- Through drive possibility
- High efficiency
- For use in one-, two- and four-quadrant operation

Contents

Function and layout of variable-speed drives

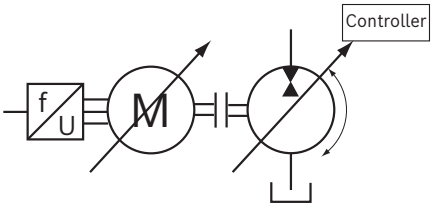
Rexroth has further developed the proven axial piston units from the A10 product family for use in energy-efficient variable-speed drives and optimized the interplay between the electric motor and the pump. The especially robust units are employed for small to medium sizes and satisfy individual requirements with their numerous combination options.
Variable-speed pump drives featuring Rexroth technology reduce energy consumption in industrial applications, while also reducing noise emissions. At the same time, the familiar performance is retained or even improved. The extensive spectrum of different variable-speed pump drives from Rexroth includes ready-to-use solutions that are finely scalable in both function and power.
The energy-efficient hydraulic drive can be realized with internal gear pumps, fixed or variable axial piston units. Equipped with a suitable controller, exactly the required flow and pressure are provided which are needed at the machine.
The proven axial piston units have been developed further for use in speed-controlled drives.
They are approved for start/stop operation and designed for a changing direction of rotation. Even at the lowest rotational speed between 0 and 200 rpm, they provide a constant pressure and offer extremely high efficiency in pressure holding operation. Efficiency is achieved optimized by either a fixed or variable displacement, depending on the requirements of the cycle. The A10 units can be used as pumps and as motors in one-, two- or four-quadrant operation.
For the implementation of variable-speed drives, the new axial piston units offer numerous options for combination.
The axial piston fixed displacement units A10FZO and A10FZG cover the sizes 3 to 63 cm^3. The axial piston variable displacement units are available in the sizes 3 to 180 cm^3 (A10VZO) and 3 to 63 cm^3 (A10VZG). Equipped with a torque controller and 2-point control, they allow for a smaller dimensioning of the electric drive. The numerous combination options allow a wide range of different customized system requirements to be satisfied.

A10FZO



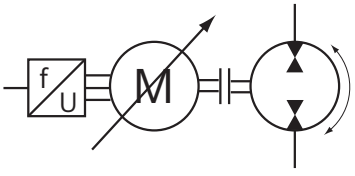
Axial piston fixed displacement units in open circuit with changing direction of rotation and unchanging pressure side (depends on the principal direction of rotation of the pump).
One- or two-quadrant operation
For type code, see page 6
For technical data, see page 10 and 11

A10VZO



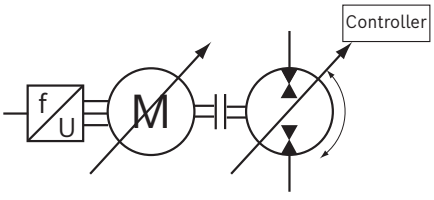
Axial piston variable displacement units in open circuit with changing direction of rotation and unchanging pressure side (depends on the principal direction of rotation of the pump).
One- or two-quadrant operation
For type code, see page 24 and 25
For technical data, see page 31

A10FZG



Axial piston fixed displacement unit in open and closed circuit with changing direction of rotation and two pressure sides.
One-, two- and four-quadrant operation
For type code, see page 76
For technical data, see page 81 and 67

A10VZG



Axial piston variable displacement unit in open and closed circuit with changing direction of rotation and two pressure sides.
One-, two- and four-quadrant operation
For type code, see page 94
For technical data, see page 99

Hydraulic fluids

The fixed displacement units A10FZO and A10FZG and variable displacement units A10VZO and 10VZG are designed for operation with HLP mineral oil according to DIN 51524.
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

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:

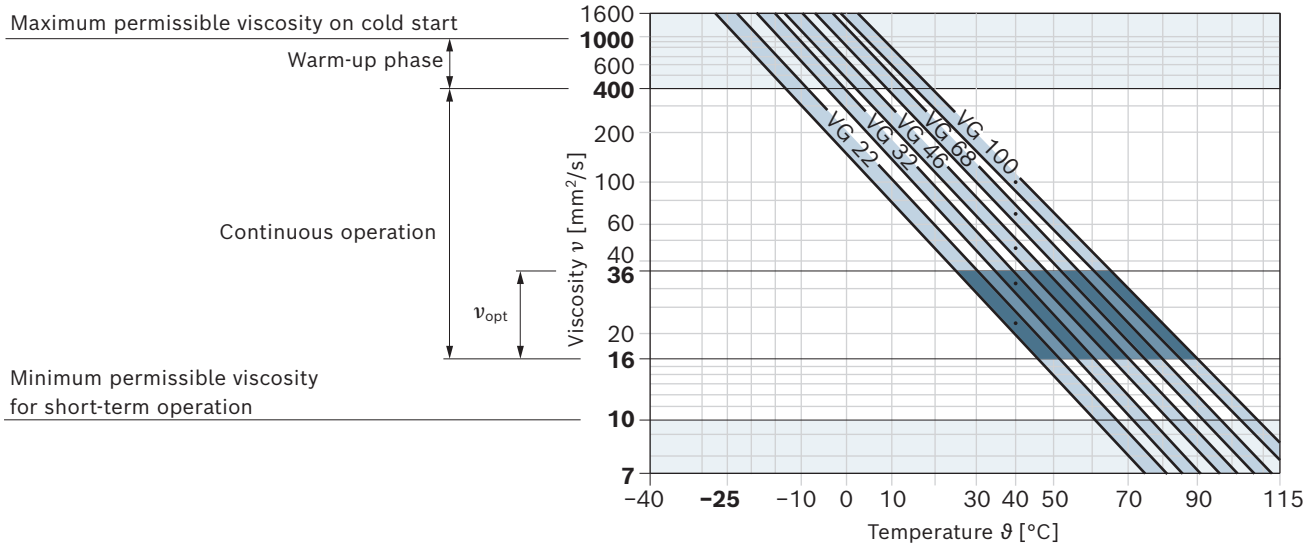
- 90245: Bosch Rexroth Fluid Rating List for Rexroth hydraulic components (pumps and motors)

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

Viscosity and temperature of hydraulic fluids

	Viscosity	Shaft seal	Temperature[2]	Comment
Cold start	v_{max} ≤ 1000 mm²/s	FKM	ϑ_{St} ≥ −25 °C	t ≤ 3 min, without load (p ≤ 30 bar), n ≤ 1000 rpm Permissible temperature difference between axial piston unit and hydraulic fluid in the system maximum 13 K
Warm-up phase	v = 1000 ... 400 mm²/s		ϑ = ≤ −25 °C	t ≤ 15 min, p ≤ 0.7 × p_{nom}, n ≤ 0.5 n_{nom}
Continuous operation	v = 400 ... 16 mm²/s[1]	FKM	ϑ ≤ +85 °C	Measured at port **L**, **L**$_1$
	v_{opt} = 36 ... 16 mm²/s			Optimal operating viscosity and efficiency range
Short-term operation	v_{min} = 16 ... 10 mm²/s	FKM	ϑ ≤ +85 °C	t ≤ 3 min, p ≤ 0.3 × p_{nom} , measured at port **L**, **L**$_1$

▼ **Selection diagram**



1) This corresponds, for example on the VG 46, to a temperature range of +4 °C to +70 °C (see selection diagram)

2) If the temperature at extreme operating parameters cannot be adhered to, please contact us.

Filtration of the hydraulic fluid

Finer filtration improves the cleanliness level of the hydraulic fluid, which increases the service life of the axial piston unit.

A cleanliness level of at least 20/18/15 under ISO 4406 should be maintained.

At a hydraulic fluid viscosity of 16 mm^2/s to 10 mm^2/s (e.g. due to high temperatures during short-term operation) at the drain port, a cleanliness level of at least 19/17/14 under ISO 4406 is required.

For example, viscosity corresponds to 10 mm^2/s at:

- HLP 32 a temperature of 73 °C
- HLP 46 a temperature of 85 °C

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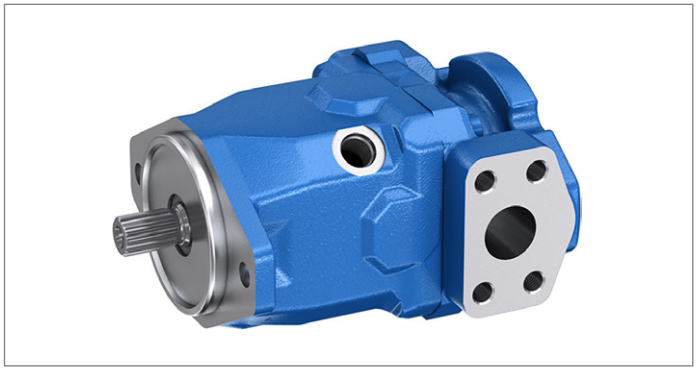
Axial piston fixed displacement unit A10FZO



- Suitable for variable-speed operation with synchronous and asynchronous motors
- Sizes 3 to 63
- Nominal pressure 315 bar
- Maximum pressure 350 bar
- Open circuit

Features

- For use in one- and two-quadrant operation
- Suitable for start/stop operation
- Suitable for long pressure holding operation
- Well-tried A10 rotary group technology
- Through drive possibility

Product description

The proven axial piston units from the A10 product family have now been further developed for use in speed-controlled drives. They are approved for start/stop operation and designed for a changing direction of rotation. Even at the lowest rotational speed between 0 and 200 rpm, they provide a constant pressure and offer extremely high efficiency in pressure holding operation. The A10FZO units can be used as pumps in one- and two-quadrant operation.

Contents

Type code A10FZO

01	02	03	04		05	06		07	08	09	10	11
A10F	**Z**	**O**		**/**	**10**		**–**	**V**		**C**	**02**	

Axial piston unit

01	Swashplate design, fixed, nominal pressure 315 bar, maximum pressure 350 bar	**A10F**

Application area

02	Variable-speed drives	**Z**

Operating mode

03	Pump, open circuit	**O**

Size (NG) Geometric displacement, see table of values on page 10 and 11

04	Superordinate size	**010**	**018**	**028**	**045**	**063**
	Other available intermediate sizes	003, 006, 008	012, 014, 016	021, 022, 023, 025, 026, 027	032, 035, 037, 039, 040, 042	051, 058

Series

		010 ... 063	
05	Series 1, index 0	●	**10**

Direction of rotation

			010 ... 063	
06	Viewed on drive shaft[1]	clockwise	●	**R**
		counter-clockwise	●	**L**

Sealing material

		010 ... 063	
07	FKM (fluorocarbon rubber)	●	**V**

Drive shaft

			010	**018**	**028**	**045**	**063**	
08	Splined shaft	Standard shaft	●	–	–	–	–	**S**
	ISO 3019-1	similar to shaft "S" however for higher torque	–	●	●	●	●	**R**

Mounting flange

		010 ... 063	
09	ISO 3019-1 (SAE)	●	**C**

Working port

		010 ... 063	
10	SAE flange ports ISO 6162 **A** and **B**, opposite sides, metric fastening thread	●	**02**

Through drive (for mounting options, see page 124)

11	For flange ISO 3019-1		Hub for splined shaft[2]							
	Diameter	Mounting[3]	Diameter		**010**	**018**	**028**	**045**	**063**	
	without through drive				●	●	●	●	●	**N00**
	82-2 (A)	∞	5/8 in	9T 16/32DP	●	●	●	●	●	**K01**
			3/4 in	11T 16/32DP	●	●	●	●	●	**K52**
	101-2 (B)	∞	7/8 in	13T 16/32DP	–	–	●	●	●	**K68**
			1 in	15T 16/32DP	–	–	–	●	●	**K04**
			1 1/4 in	14T 12/24DP	–	–	–	–	●	**K06**

● = Available ○ = On request – = Not available

Notes

- Note the project planning notes on page 129.
- In addition to the type code, please specify the relevant technical data when placing your order.

1) Changing direction of rotation permissible with the same pressure side for decompression.
2) According to ANSI B92.1a (splined shaft according to ISO 3019-1)
3) Mounting holes pattern viewed from through drive and position of the ports **A** and **B** horizontal.

Preferred program A10FZO

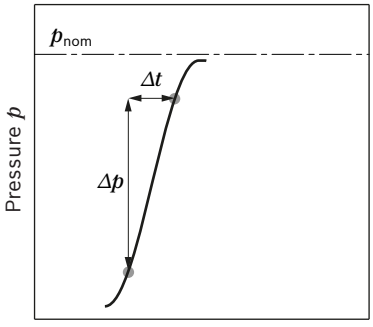
Overview of common configurations

Typ	Material number
A A10FZO003/10R-VSC02N00	R902546689
A A10FZO006/10R-VSC02N00	R902544386
A A10FZO008/10R-VSC02N00	R902518485
A A10FZO010/10R-VSC02N00	R902518486
A A10FZO012/10R-VRC02N00	R902551828
A A10FZO014/10R-VRC02N00	R902544053
A A10FZO016/10R-VRC02N00	R902544054
A A10FZO018/10R-VRC02N00	R902544056
A A10FZO021/10R-VRC02N00	R902564368
A A10FZO022/10R-VRC02N00	R902557864
A A10FZO023/10R-VRC02N00	R902557865
A A10FZO025/10R-VRC02N00	R902557866
A A10FZO026/10R-VRC02N00	R902557867
A A10FZO027/10R-VRC02N00	R902557868
A A10FZO028/10R-VRC02N00	R902534669
A A10FZO032/10R-VRC02N00	R902557869
A A10FZO035/10R-VRC02N00	R902557870
A A10FZO037/10R-VRC02N00	R902557871
A A10FZO039/10R-VRC02N00	R902557872
A A10FZO040/10R-VRC02N00	R902557873
A A10FZO042/10R-VRC02N00	R902557875
A A10FZO045/10R-VRC02N00	R902548015
A A10FZO051/10R-VRC02N00	R902557876
A A10FZO058/10R-VRC02N00	R902557877
A A10FZO063/10R-VRC02N00	R902550737

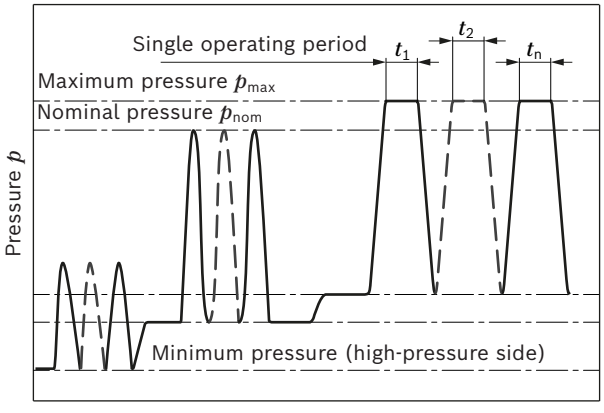
Working pressure range A10FZO

Pressure at working port (see table denomination of working port)		**Definition**
Nominal pressure p_{nom}	315 bar	The nominal pressure corresponds to the maximum design pressure.
Maximum pressure p_{max}	350 bar	The maximum pressure corresponds to the maximum working pressure within a single operating period. The sum of single operating periods must not exceed the total operating period.
Single operating period	2.0 ms	
Total operating period	300 h	
Rate of pressure change $R_{A\,max}$	16000 bar/s	Maximum permissible speed of pressure build-up and reduction during a pressure change across the entire pressure range.
Pressure at suction port (see table denomination of working port)		
Minimum pressure p_{min} Standard	0.8 bar absolute	Minimum pressure at suction port (see table) which is required in order to prevent damage to the axial piston unit. The minimum pressure depends on the rotational speed and displacement of the axial piston unit.
Maximum pressure p_{max}	10 bar absolute	
Case pressure at port L		
Maximum pressure $p_{L\,max}$	2 bar absolute[2)]	Maximum 0.5 bar higher than inlet pressure at suction port (see table), but not higher than $p_{L\,max}$. A drain line to the reservoir is required.

▼ **Rate of pressure change** $R_{A\,max}$



▼ **Pressure definition**



Total operating period = $t_1 + t_2 + \ldots + t_n$

Notice
Working pressure range applies when using hydraulic fluids based on mineral oils. Please contact us for values for other hydraulic fluids.

Denomination working port for the respective direction of rotation

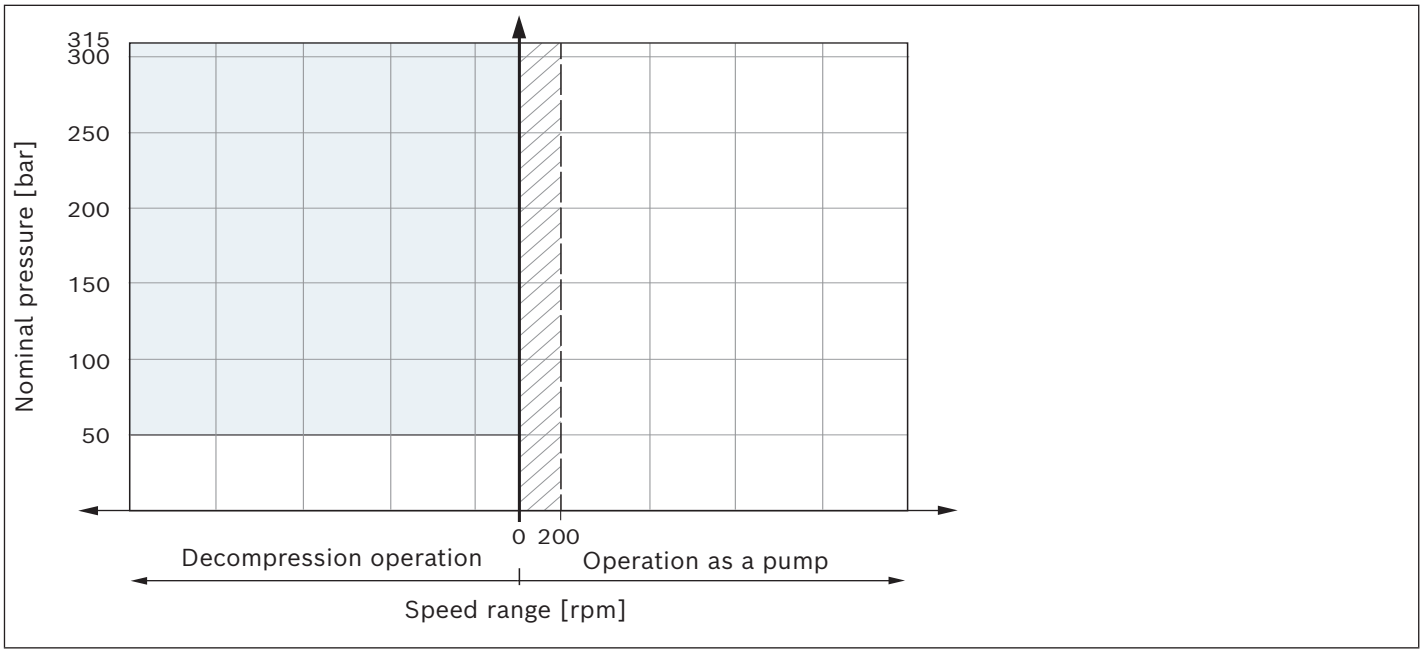
Direction of rotation, viewed on drive shaft	**Suction port**	**Working port**
Type code "**R**"	**A**	**B**
Type code "**L**"	**B**	**A**

Flow direction

Direction of rotation, viewed on drive shaft	**Direction of rotation**	**Flow**
Type code designation "**R**"	Clockwise	**A** to **B**
	Counter-clockwise[1)]	**B** to **A**
Type code designation "**L**"	Counter-clockwise	**B** to **A**
	Clockwise[1)]	**A** to **B**

1) Only permissible in decompression operation, a pressure side switch is not permitted
2) Higher values on request

A10FZO: Permissible operating data and operating ranges at $V_{g\,max}$



Operating range	
	Operation without restriction
	Permissible with single operating period $t \leq 3$ min; maximum cycle share 80%. For longer time periods $t > 3$ min, please use A10VZO.
	Operation as a motor possible with restrictions, please contact us. Permissible for short-term decompression operation $t \leq 200$ ms

Technical data A10FZO size 3 to 63

Superordinate size		**NG**		**10**				**18**							**28**
Available intermediate sizes		**NG**		**3**	**6**	**8**	**10**	**12**	**14**	**16**	**18**	**21**	**22**	**23**	**25**
Geometric displacement, per revolution		V_{gmax}	cm^3	3	6	8.1	10.6	12	14	16	18	21	22	23	25
Maximum rotational speed[1]	at $V_{g\,max}$														
Suction speed operation as a pump[1]		n_{nom}	rpm	3600				3300				3000			
Max. rotational speed decompression operation[2]		n_{nom}	rpm	3600				3300				3000			
Flow	at n_{nom} and $V_{g\,max}$	q_v	l/min	10.8	21.6	29	38.2	39.6	46.2	52.8	59.4	63	66	69	75
Power Operation as a pump	at n_{nom}, $V_{g\,max}$ and Δp = 315 bar	P	kW	5.6	11.3	15.3	20	21	24.2	27.7	31.2	33	34	36.3	39
Torque	at $V_{g\,max}$ and Δp = 315 bar	M	Nm	15	30	40	53	60	70	80	90.3	105	110	116	125
	at $V_{g\,max}$ and Δp = 100 bar	M	Nm	5	9.5	12.7	16.8	19.1	22.3	25.5	28.7	33.4	35	36.6	40
Rotary stiffness Drive shaft	S	c	Nm/rad	9200				–				–			
	R	c	Nm/rad	–				14800				26300			
Moment of inertia of the rotary group		J_{TW}	kgm^2	0.0006				0.0009				0.0017			
Maximum angular acceleration[2][3]		α	rad/s^2	14000				12600				11200			
Case volume		V	l	0.11				0.19				0.6			
Weight (approx.)		m	kg	9				10				15.5			

Determination of the characteristics					
Flow	q_v	=	$\frac{V_g \times n \times \eta_v}{1000}$		[l/min]
Torque	M	=	$\frac{V_g \times \Delta p}{20 \times \pi \times \eta_{hm}}$		[Nm]
Power	P	=	$\frac{2 \pi \times M \times n}{60000}$	= $\frac{q_v \times \Delta p}{600 \times \eta_t}$	[kW]

Key

V_g Displacement per revolution [cm^3]
Δp Differential pressure [bar]
n Rotational speed [rpm]
η_v Volumetric efficiency
η_{hm} Hydraulic-mechanical efficiency
η_t Total efficiency ($\eta_t = \eta_v \times \eta_{hm}$)

Notice

- Theoretical values, without efficiency and tolerances; values rounded
- Operation above the maximum values or below the minimum values may result in a loss of function, a reduced service life or in the destruction of the axial piston unit. We recommend checking loads through tests or calculation/simulation and comparing them with the permissible values.

Additional information about inlet pressure and rotational speed can be found on page 33

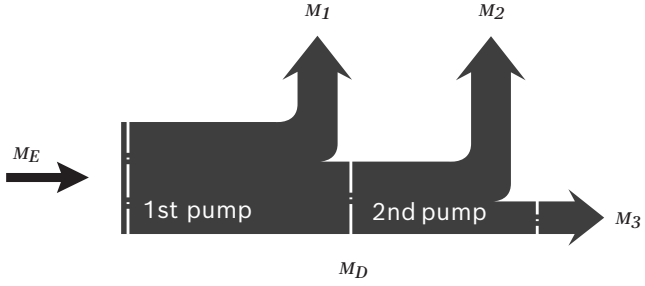
1) The values are applicable:
– At an absolute pressure p_{abs} = 1 bar at the suction port
– for the optimum viscosity range from v_{opt} = 36 to 16 mm^2/s
– with hydraulic fluid based on mineral oils
2) Higher values on request
3) The limit value is only valid for a single pump, multiple pump version available on request. The load capacity of the connection parts must be considered.

						45					63	
26	**27**	**28**	**32**	**35**	**37**	**39**	**40**	**42**	**45**	**51**	**58**	**63**
26	27	28	32	35	37	39	40	42	45	51	58	63
	3000					3000					2600	
	3000					3000					2600	
78	81	84	96	105	111	117	120	126	135	133	151	164
41	42	44	50	55	58.3	61	63	66	71	70	79	86
130.4	135	140.4	160	175	185.6	195	200	210	225.7	256	291	316
41.4	43	44.6	51	56	59	62	64	67	71.6	81	92	100
	–					–					–	
	26300					41000					69400	
	0.0017					0.003					0.0056	
	11200					9500					8000	
	0.6					0.7					0.8	
	15.5					21					26	

Permissible inlet and through-drive torques

Superordinate size				10	18	28	45	63
Torque at $V_{g\,max}$ and Δp = 315 bar[1]		M_{max}	Nm	For values of the individual sizes, see table of values on page 10 and 11				
Max. input torque on drive shaft[2]	S	$M_{E\,max}$	Nm	126	–	–	–	–
		Ø	in	3/4	–	–	–	–
	R	$M_{E\,max}$	Nm	–	160	250	400	650
		Ø	in	–	3/4	7/8	1	1 1/4
Maximum through-drive torque	S	$M_{D\,max}$	Nm	41	–	–	–	–
	R	$M_{D\,max}$	Nm	–	92	127	292	480

▼ **Distribution of torques**

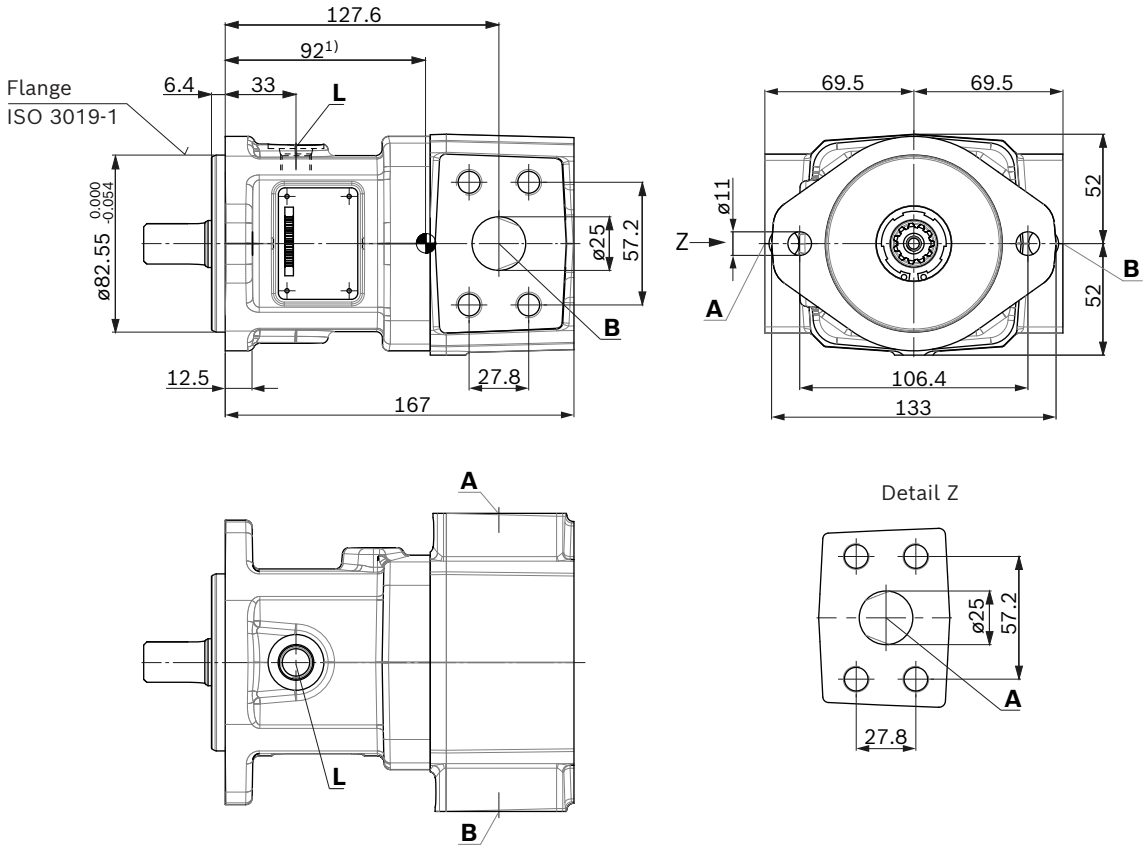


Torque at 1st pump	M_1		
Torque at 2nd pump	M_2		
Torque at 3rd pump	M_3		
Input torque	M_E	=	$M_1 + M_2 + M_3$
	M_E	<	$M_{E\,max}$
Through-drive torque	M_D	=	$M_2 + M_3$
	M_D	<	$M_{D\,max}$

1) Efficiency not considered
2) For drive shafts with no radial force

Dimensions A10FZO sizes 3 to 10

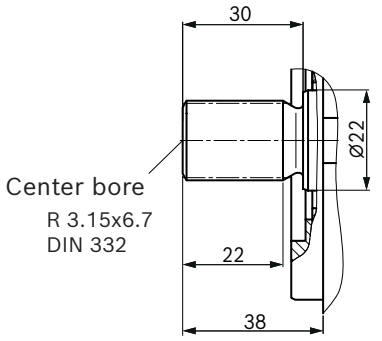
Clockwise and counter-clockwise rotation (flow direction see table page 8)



1) Center of gravity

▼ **Splined shaft 3/4 in (19-4, ISO 3019-1)**

S – 11T 16/32DP[1)]



Connection table **A10FZO**

Ports		Standard	Size	p_{max} [bar][2)]	State[4)]
B(**A**)	Working port (high-pressure series) Fastening thread	ISO 6162-2 DIN 13	1 in M12 × 1.75; 17 deep	350	O
A(**B**)	Suction port (high-pressure series) Fastening thread	ISO 6162-2 DIN 13	1 in M12 × 1.75; 17 deep	10	O
L	Drain port	DIN 11926[3)]	9/16-18UNF-2B; 13 deep	2	O

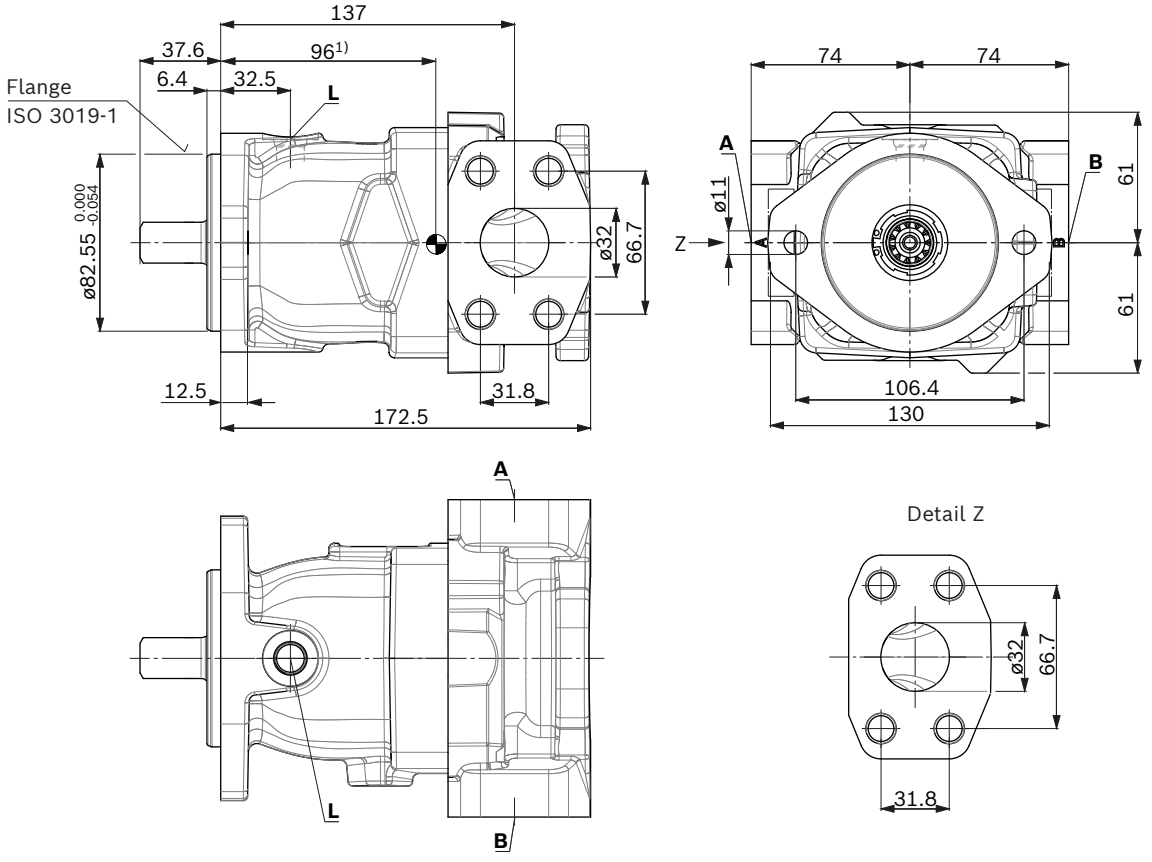
Denomination working port for the respective direction of rotation

Direction of rotation, viewed on drive shaft	Suction port	Working port
Type code "**R**"	**A**	**B**
Type code "**L**"	**B**	**A**

1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
3) The countersink may be deeper than specified in the standard.
4) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

Dimensions A10FZO sizes 12 to 18

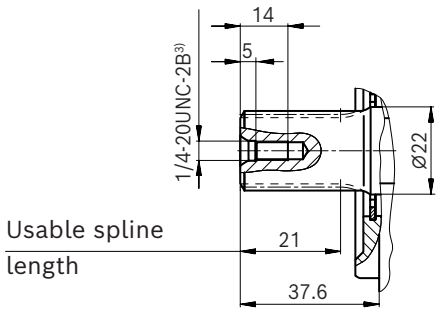
Clockwise and counter-clockwise rotation (flow direction see table page 8)



1) Center of gravity

▼ **Splined shaft 3/4 in (similar to ISO 3019-1)**

R – 11T 16/32DP[1)2)]



Connection table **A10FZO**

Ports		Standard	Size	p_{max} [bar][4)]	State[6)]
B(**A**)	Working port (high-pressure series) Fastening thread	ISO 6162-2 DIN 13	1 1/4 in M14 × 2; 19 deep	350	O
A(**B**)	Suction port (high-pressure series) Fastening thread	ISO 6162-2 DIN 13	1 1/4 in M14 × 2; 19 deep	10	O
L	Drain port	DIN 11926[5)]	9/16-18UNF-2B; 12.5 deep	2	O

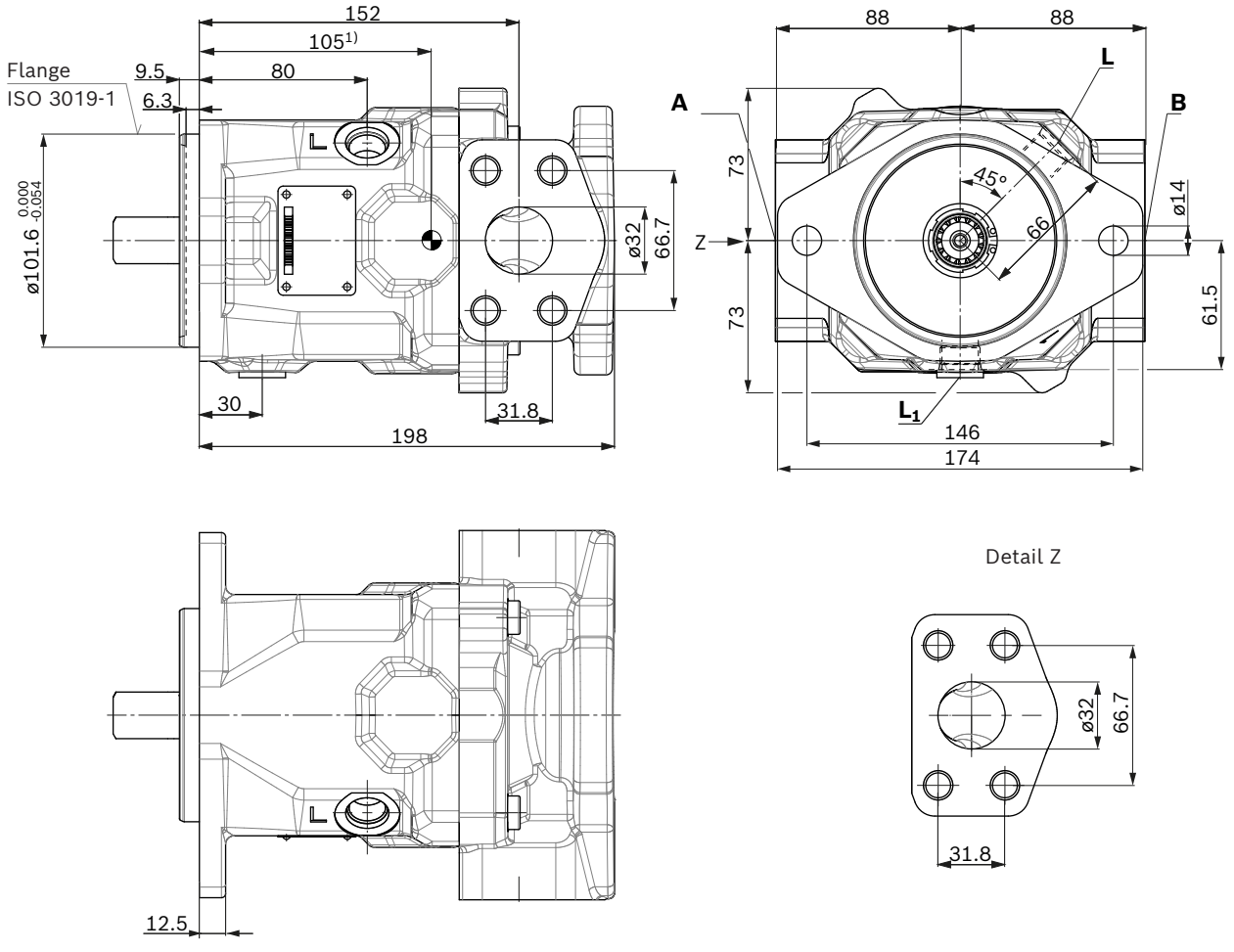
Denomination working port for the respective direction of rotation

Direction of rotation, viewed on drive shaft	Suction port	Working port
Type code "**R**"	**A**	**B**
Type code "**L**"	**B**	**A**

1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Splines according to ANSI B92.1a, spline runout is a deviation from standard ISO 3019-1.
3) Thread according to ASME B1.1
4) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
5) The countersink may be deeper than specified in the standard.
6) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

Dimensions A10FZO sizes 21 to 28

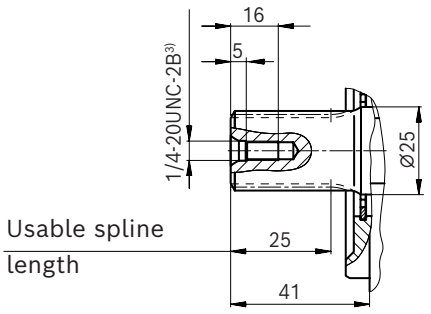
Clockwise and counter-clockwise rotation (flow direction see table page 8)



1) Center of gravity

▼ **Splined shaft 7/8 in (similar to ISO 3019-1)**

R – 13T 16/32DP[1)2)]



Connection table **A10FZO**

Ports		Standard	Size	p_{max} [bar][4)]	State[7)]
B(**A**)	Working port (high-pressure series) Fastening thread	ISO 6162-2 DIN 13	1 1/4 in M14 × 2; 19 deep	350	O
A(**B**)	Suction port (high-pressure series) Fastening thread	ISO 6162-2 DIN 13	1 1/4 in M14 × 2; 19 deep	10	O
L	Drain port	ISO 11926[5)]	3/4-16UNF-2B; 15 deep	2	O[6)]
L_1	Drain port	ISO 11926[5)]	3/4-16UNF-2B; 15 deep	2	X[6)]

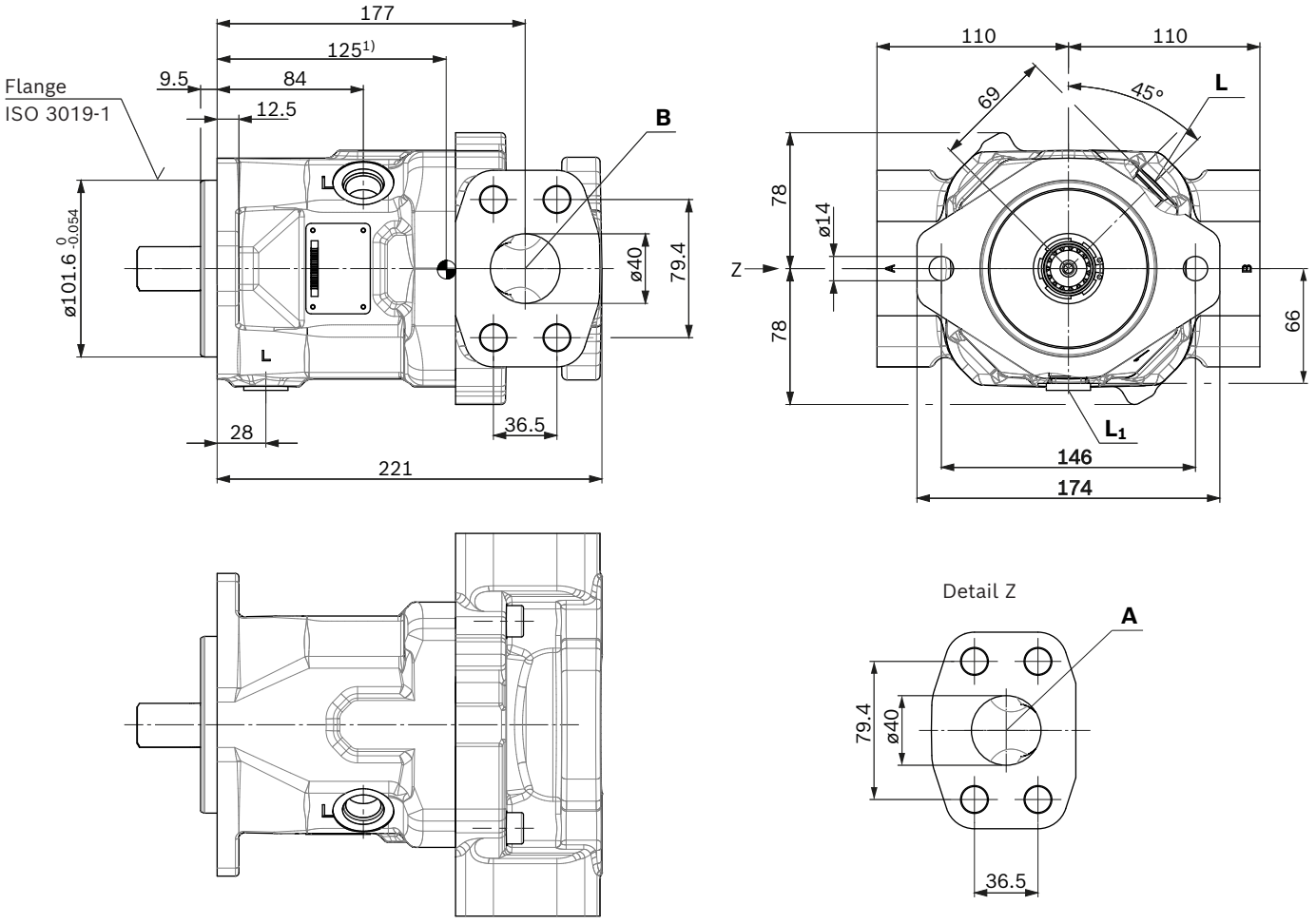
Denomination working port for the respective direction of rotation

Direction of rotation, viewed on drive shaft	Suction port	Working port
Type code "**R**"	**A**	**B**
Type code "**L**"	**B**	**A**

1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Splines according to ANSI B92.1a, spline runout is a deviation from standard ISO 3019-1.
3) Thread according to ASME B1.1
4) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
5) The countersink may be deeper than specified in the standard.
6) Depending on the installation position, **L** or **L_1** must be connected (also see installation instructions on page 127).
7) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

Dimensions A10 FZO, sizes 32 to 45

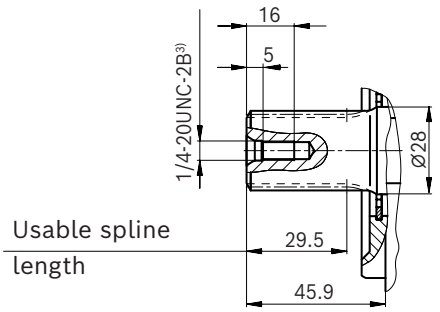
Clockwise and counter-clockwise rotation (flow direction see table page 8)



1) Center of gravity

▼ **Splined shaft 1 in (similar to ISO 3019-1)**

R – 15T 16/32DP[1)2)]



Connection table **A10FZO**

Ports		Standard	Size	p_{max} [bar][4)]	State[7)]
B(**A**)	Working port (high-pressure series) Fastening thread	ISO 6162-2 DIN 13	1 1/2 in M16 × 2; 21 deep	350	O
A(**B**)	Suction port (high-pressure series) Fastening thread	ISO 6162-2 DIN 13	1 1/2 in M16 × 2; 21 deep	10	O
L	Drain port	ISO 11926[5)]	7/8-14UNF-2B; 17 deep	2	O[6)]
$\mathbf{L_1}$	Drain port	ISO 11926[5)]	7/8-14UNF-2B; 17 deep	2	X[6)]

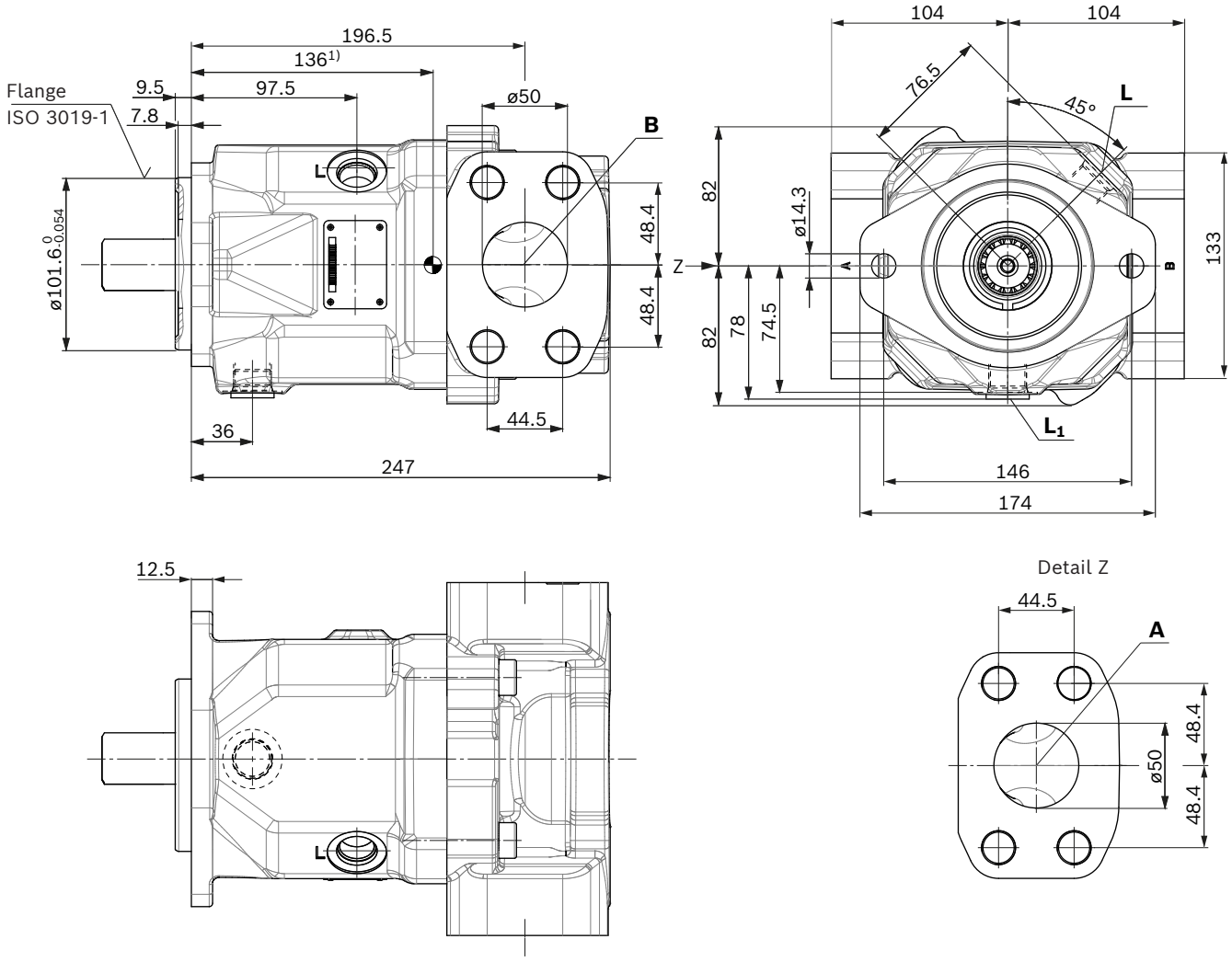
Denomination working port for the respective direction of rotation

Direction of rotation, viewed on drive shaft	Working port	Suction port
Type code "**R**"	**B**	**A**
Type code "**L**"	**A**	**B**

1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Splines according to ANSI B92.1a, spline runout is a deviation from standard ISO 3019-1.
3) Thread according to ASME B1.1
4) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
5) The countersink may be deeper than specified in the standard.
6) Depending on the installation position, **L**, $\mathbf{L_1}$ or $\mathbf{L_2}$ must be connected (also see installation instructions starting on page 127).
7) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

Dimensions A10 FZO size 51/58/63

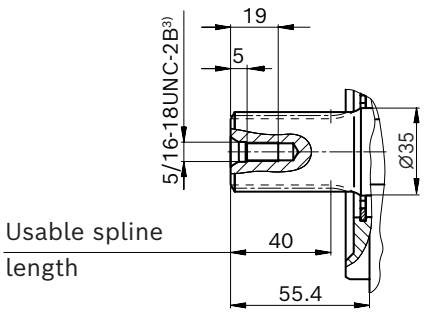
Clockwise and counter-clockwise rotation (flow direction see table page 8)



1) Center of gravity

▼ **Splined shaft 1 1/4 in (similar to ISO 3019-1)**

R – 14T 12/24DP[1)2)]



Connection table **A10FZO**

Ports		Standard	Size	p_{max} [bar][4)]	State[7)]
B(**A**)	Working port (high-pressure series) Fastening thread	ISO 6162-2 DIN 13	2 in M20 × 2.5; 24 deep	350	O
A(**B**)	Suction port (high-pressure series) Fastening thread	ISO 6162-2 DIN 13	2 in M20 × 2.5; 24 deep	10	O
L	Drain port	ISO 11926[5)]	7/8-14UNF-2B; 17 deep	2	O[6)]
$\mathbf{L_1}$	Drain port	ISO 11926[5)]	7/8-14UNF-2B; 17 deep	2	X[6)]

Denomination working port for the respective direction of rotation

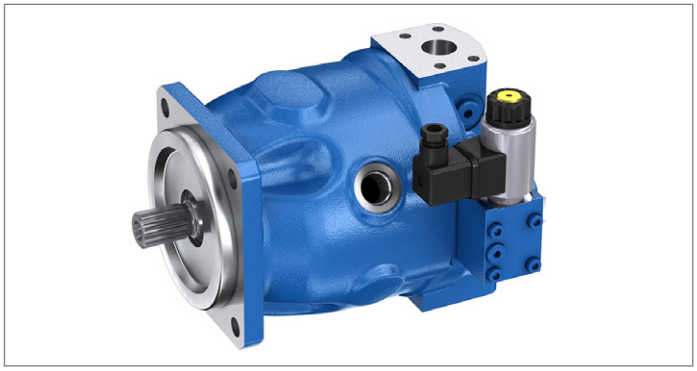
Direction of rotation, viewed on drive shaft	Working port	Suction port
Type code "**R**"	**B**	**A**
Type code "**L**"	**A**	**B**

1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Splines according to ANSI B92.1a, spline runout is a deviation from standard ISO 3019-1.
3) Thread according to ASME B1.1
4) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
5) The countersink may be deeper than specified in the standard.
6) Depending on the installation position, **L**, $\mathbf{L_1}$ or $\mathbf{L_2}$ must be connected (also see installation instructions starting on page 127).
7) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

RE 91485/2021-11-11
Replaces: 10.2016

rexroth
A Bosch Company

Axial piston variable displacement unit A10VZO



- Suitable for variable-speed operation with synchronous and asynchronous motors
- Size 10
  Nominal pressure/maximum pressure 250/315 bar
- Sizes 18 to 45
  Nominal pressure/maximum pressure 315/350 bar
  Sizes 71 to 180
  Nominal pressure/maximum pressure 280/350 bar
- Open circuit

Features

- For use in one- and two-quadrant operation
- Suitable for start/stop operation
- Suitable for long pressure holding operation
- Well-tried A10 rotary group technology
- Through drive possibility

Product description

The proven axial piston units from the A10 product family have now been further developed for use in speed-controlled drives. They are approved for start/stop operation and designed for a changing direction of rotation. Even at the lowest rotational speed between 0 and 200 rpm, they provide a constant pressure and offer extremely high efficiency in pressure holding operation. The A10VZO units can be used as pumps in one- and two-quadrant operation.

Contents

Type code A10VZO

01	02	03	04	05		06	07		08	09	10	11	12	13
A10V	**Z**	**O**			**/**	**10**		**–**	**V**					

Axial piston unit

01	Swashplate design, variable	**A10V**

Application area

02	Variable-speed drives	**Z**

Operating mode

03	Pump, open circuit	**O**

Size (NG)

04	Geometric displacement, see table of values on page 31	**010**	**018**	**028**	**045**	**071**	**100**	**140**	**180**	
	Other available intermediate sizes	003, 006, 008								

Control device

05	Two-point control	electric	U = 12 V	●	●	●	●	●	●	●	●	**EZ300**[1]
			U = 24 V	●	●	●	●	●	●	●	●	**EZ400**[1]
		hydraulic		●	●	●	●	●	●	●	●	**DG000**[1]
	Pressure controller	hydraulic		●	●	●	●	●	●	●	●	**DR000**
		remotely controlled hydraulically		●	●	●	●	●	●	●	●	**DRG00**
	Torque controller		NG 018 to 180									
	Beginning of control		up to 50 bar	–	●	●	●	●	●	●	●	**LA5D0**
			51 to 90 bar	–	●	●	●	●	●	●	●	**LA6D0**
			91 to 160 bar	–	●	●	●	●	●	●	●	**LA7D0**
			161 to 240 bar	–	●	●	●	●	●	●	●	**LA8D0**
			over 240 bar	–	●	●	●	●	●	●	●	**LA9D0**

Series

		010 ... 180	
06	Series 1, index 0	●	**10**

Direction of rotation[2]

			010 ... 180	
07	Viewed on drive shaft	clockwise	●	**R**
		counter-clockwise	●	**L**

Sealing material

		010 ... 180	
08	FKM (fluorocarbon rubber)	●	**V**

Drive shaft

			003 to 010	**018**	**028**	**045**	**071**	**100**	**140**	**180**	
09	Splined shaft	Standard shaft	●	–	–	–	–	●	●	●	**S**
	ISO 3019-1	similar to shaft "S" however for higher torque	–	●	●	●	●	–	–	–	**R**

Mounting flange

			003 to 010	**018**	**028**	**045**	**071**	**100**	**140**	**180**	
10	ISO 3019-1 (SAE)	2 Loch	●	●	●	–	–	–	–	–	**C**
		4-hole	–	–	–	●	●	●	●	●	**D**

● = Available ○ = On request – = Not available

Notes

- ▶ Note the project planning notes on page 129.
- ▶ In addition to the type code, please specify the relevant technical data when placing your order.

1) Please specify mechanical flow control $V_{g\,max}$ and $V_{g\,min}$ in the order text.
2) Changing direction of rotation permissible with the same pressure side for decompression

01	02	03	04	05		06	07		08	09	10	11	12	13
A10V	**Z**	**O**			**/**	**10**		**–**	**V**					

Working port[3]		003 ... 010	018	028	045	071	100	140	180	
11	SAE flange ports ISO 6162 at top and bottom, on opposite sides, metric fastening thread with universal through drive without pulsation damping	–	–	–	–	●	●	●	●	**22**[5]
	SAE flange ports ISO 6162 at top and bottom, on opposite sides, metric fastening thread with universal through drive with pulsation damping	–	–	–	–	●	●	○	●	**32**[5]
	SAE flange ports ISO 6162 at top and bottom, on opposite sides, metric fastening thread	–	●	●	●	●	●	●	●	**12**[3][5]
	DIN 3852 threaded ports at rear, not for through drive	●	–	–	–	–	–	–	–	**14**
	DIN 3852 threaded ports on opposite side, only for through drive	●	–	–	–	–	–	–	–	**07**

Through drive (for dimensions and mounting options, see page 115 onwards)

		003 ... 010	018	028	045	071	100	140	180	
12	With through-drive shaft, without hub, without intermediate flange; fastening thread metric, with universal through drive, only port plate 22 or 32	–	–	–	–	●	●	●	●	**U00**[4][5]
	Without through drive, only port plates 12 and 14	●	●	●	●	●	●	●	●	**N00**[5]

Port plate 12 and 07

For flange ISO 3019-1			Hub for splined shaft[6]								
Diameter	Anbau[7]		Diameter	003 ... 010	018	028	045	071	100	140	180	
82-2 (A)		5/8 in	9T 16/32DP	●	●	●	●	–	–	–	–	**K01**
		3/4 in	11T 16/32DP	●	●	●	●	–	–	–	–	**K52**
101-2 (B)		7/8 in	13T 16/32DP	–	–	●	●	–	–	–	–	**K68**
		1 in	15T 16/32DP	–	–	–	●	–	–	–	–	**K04**

Port plate 22U/32U

For flange ISO 3019-1			Hub for splined shaft[6]								
Diameter	Anbau[7]		Diameter	003 ... 010	018	028	045	071	100	140	180	
82-2 (A)		5/8 in	9T 16/32DP	–	–	–	–	●	●	●	●	**U01**
		3/4 in	11T 16/32DP	–	–	–	–	●	●	●	●	**U52**
101-2 (B)		7/8 in	13T 16/32DP	–	–	–	–	●	●	●	●	**U68**
		1 in	15T 16/32DP	–	–	–	–	●	●	●	●	**U04**
		1 1/4 in	14T 12/24DP	–	–	–	–	○	○	○	●	**U06**
127-4 (C)		1 in	15T 16/32DP	–	–	–	–	●	●	●	●	**UE2**
		1 1/4 in	14T 12/24DP	–	–	–	–	●	●	●	●	**U15**
152-4 (D)		1 1/2 in	17T 12/24DP	–	–	–	–	–	●	●	●	**U96**
		1 3/4 in	13T 8/16DP	–	–	–	–	–	–	●	●	**U17**

Connector for solenoids		010 ... 180	
13	Without, with hydraulic controllers	●	**0**
	HIRSCHMANN connector – without suppressor diode	●	**H**

3) A stepless mechanical flow control is only standard on version 12 N00 in sizes 018 to 140
$V_{g\,max}$: Setting range $V_{g\,max}$ to approx. 50% $V_{g\,max}$ stepless
$V_{g\,min}$: Setting range $V_{g\,min}$ to approx. 40% $V_{g\,max}$ stepless
Specify the settings in plain text.
$V_{g\,max}$ and $V_{g\,min}$ limitations on through drives with port plates 12K.. and 22U/32U.. can only be carried out via fixed set values, this should also be specified in plain text. For setting range, see page 26

4) See data sheet 95581 universal through drive

5) When ordering sizes 071 to 180 with port plate 22 and 32, please order the relevant through drive "U"
Example: A10VZO045DR000/10R-VSD22U01
When ordering sizes 003 to 028 with port plate 12, please order the relevant through drive **with** "K"
Example: A10VZO018DR000/10R-VSD12K01

6) Splined shaft according to ANSI B92.1a (splined shafts according to ISO 3019-1)

7) Mounting holes pattern viewed on through drive with control at top

Preferred program A10VZO

Overview of common configurations

Typ	Material number
A10VZO003EZ400/10R-VSC14N00H	R902557878
A10VZO003DR000/10R-VSC14N000	R902557885
A10VZO006EZ400/10R-VSC14N00H	R902557879
A10VZO006DR000/10R-VSC14N000	R902557886
A10VZO008EZ400/10R-VSC14N00H	R902557880
A10VZO008DR000/10R-VSC14N000	R902557887
A10VZO010EZ400/10R-VSC14N00H	R902544384
A10VZO010DR000/10R-VSC14N000	R902557888
A10VZO018EZ400/10R-VRC12N00H	R902544060
A10VZO018DR000/10R-VRC12N000	R902557889
A10VZO028EZ400/10R-VRC12N00H	R902547871
A10VZO028DR000/10R-VRC12N000	R902557890
A10VZO045DR000/10R-VRD12N000	R902557891
A10VZO045EZ400/10R-VRD12N00H	R902548677
A10VZO071EZ400/10R-VRD12N00H	R902557881
A10VZO071DR000/10R-VRD12N000	R902557892
A10VZO100EZ400/10R-VSD12N00H	R902557882
A10VZO100DR000/10R-VSD12N000	R902557893
A10VZO140EZ400/10R-VSD12N00H	R902557883
A10VZO140DR000/10R-VSD12N000	R902557894
A10VZO180EZ400/10R-VSD22U00H	R902557884
A10VZO180DR000/10R-VSD22U000	R902557895

Setting ranges for stop $V_{g\,min}$ / $V_{g\,max}$

Size	$V_{g\,min}$	$V_{g\,max}$
3	0 to 3 cm³; 0.9 cm³/U	3 cm³
6	0 to 4 cm³; 0.9 cm³/U	6 cm³
8	0 to 4 cm³; 0.9 cm³/U	8 cm³
10	0 to 4 cm³; 0.9 cm³/U	10 cm³
18	0 to 10 cm³; 1.1 cm³/U	9 to 18 cm³; 1.1 cm³/U
28	0 to 12 cm³; 1.6 cm³/U	14 to 28 cm³; 1.6 cm³/U
45	0 to 19 cm³; 3.2 cm³/U	25 to 45 cm³; 3.2 cm³/U
71	0 to 28 cm³; 4.7 cm³/U	45 to 71 cm³; 4.7 cm³/U
100	0 to 51 cm³; 6.2 cm³/U	50 to 100 cm³; 6.2 cm³/U
140	0 to 78 cm³; 7.1 cm³/U	70 to 140 cm³; 7.1 cm³/U
180	0 to 75 cm³; 10 cm³/U	90 to 180 cm³; 10 cm³/U

Only fixed stop possible with size 18 to 180 for port plates with through drive/universal through drive.

- Please specify settings $V_{g\,min}$ and $V_{g\,max}$ in plain text.

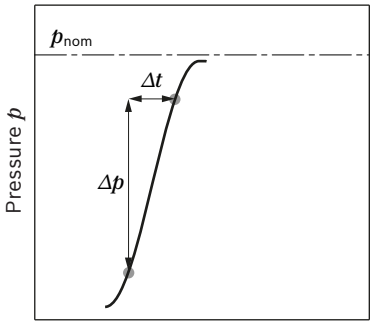
Notice

Observe the operating conditions for $V_{g\,min}$ 0 in connection with the controls DG and EZ on the respective pages 34 and 35

Working pressure range A10VZO – size 3 to 10

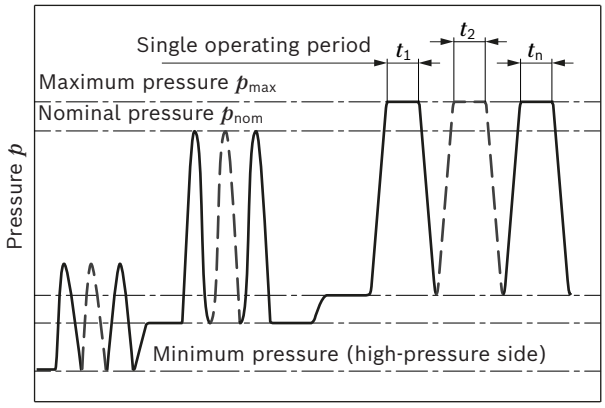
Pressure at working port B		**Definition**
Nominal pressure p_{nom}	250 bar	The nominal pressure corresponds to the maximum design pressure.
Maximum pressure p_{max}	315 bar	The maximum pressure corresponds to the maximum working pressure within a single operating period. The sum of single operating periods must not exceed the total operating period.
Single operating period	2.0 ms	
Total operating period	300 h	
Minimum pressure $p_{B\ absolute}$ (high-pressure side)	10 bar	Minimum pressure on the high-pressure side (**B**) which is required in order to prevent damage to the axial piston unit.
Rate of pressure change $R_{A\ max}$	16000 bar/s	Maximum permissible speed of pressure build-up and reduction during a pressure change across the entire pressure range.
Pressure at suction port S (inlet)		
Minimum pressure $p_{A\ min}$ Standard	0.8 bar absolute	Minimum pressure at suction port **S** (inlet) which is required to prevent damage to the axial piston unit. The minimum pressure depends on the rotational speed and displacement of the axial piston unit.
Maximum pressure $p_{S\ max}$	10 bar absolute	
Leakage pressure at port L, L_1		
Maximum pressure $p_{L\ max}$	2 bar absolute[2)]	Maximum 0.5 bar higher than inlet pressure at port **S**, but not higher than $p_{L\ max}$. A drain line to the reservoir is required.
Pilot pressure port X with external high pressure		
Maximum pressure p_{max}	315 bar	When designing all control lines with external high pressure, the values for the rate of pressure change, maximum single operating period and total operating period applicable to port **B** must not be exceeded.

▼ **Rate of pressure change** $R_{A\ max}$



Notice
Working pressure range applies when using hydraulic fluids based on mineral oils. Please contact us for values for other hydraulic fluids.

▼ **Pressure definition**



Total operating period = $t_1 + t_2 + ... + t_n$

Flow direction

Direction of rotation, viewed on drive shaft	**Direction of rotation**	**Flow**
Type code "**R**"	Clockwise	**S** to **B**
	Counter-clockwise[1)]	**B** to **S**
Type code "**L**"[3)]	Counter-clockwise	**S** to **B**
	Clockwise[1)]	**B** to **S**

1) Only permissible in decompression operation, a pressure side switch is not permitted.
2) Higher values on request
3) Position **S** and **B** with counter-clockwise rotation, observe installation drawing

Working pressure range A10VZO – size 18 to 45

Pressure at working port B		**Definition**
Nominal pressure p_{nom}	315 bar[1)]	The nominal pressure corresponds to the maximum design pressure.
Maximum pressure p_{max}	350 bar	The maximum pressure corresponds to the maximum working pressure within a single operating period. The sum of single operating periods must not exceed the total operating period.
Single operating period	2.5 ms	
Total operating period	300 h	
Minimum pressure $p_{B\ absolute}$ (high-pressure side)	10 bar[2)]	Minimum pressure on the high-pressure side (**B**) which is required in order to prevent damage to the axial piston unit.
Rate of pressure change $R_{A\ max}$	16000 bar/s	Maximum permissible speed of pressure build-up and reduction during a pressure change across the entire pressure range.
Pressure at suction port S (inlet)		
Minimum pressure $p_{S\ min}$ Standard	0.8 bar absolute	Minimum pressure at suction port **S** (inlet) which is required to prevent damage to the axial piston unit. The minimum pressure depends on the rotational speed and displacement of the axial piston unit.
Maximum pressure $p_{S\ max}$	10 bar absolute	
Case pressure at port L, L_1		
Maximum pressure $p_{L\ max}$	2 bar absolute[3)]	Maximum 0.5 bar higher than inlet pressure at port **S**, but not higher than $p_{L\ max}$. A drain line to the reservoir is required.
Pilot pressure port X with external high pressure		
Maximum pressure p_{max}	350 bar	When designing all control lines with external high pressure, the values for the rate of pressure change, maximum single operating period and total operating period applicable to port **B** must not be exceeded.

For details of the rate of pressure change and pressure definition, please refer to page 27

Notice
Working pressure range applies when using hydraulic fluids based on mineral oils. Please contact us for values for other hydraulic fluids.

Flow direction

Direction of rotation, viewed on drive shaft	**Direction of rotation**	**Flow**
Type code "**R**"	Clockwise	**S** to **B**
	Counter-clockwise[4)]	**B** to **S**
Type code "**L**"	Counter-clockwise	**S** to **B**
	Clockwise[3)]	**B** to **S**

1) For NG 45 and use of port plate 32, only possible with a nominal pressure of 280 bar.
2) Please contact us about lower pressures.
3) Higher values on request
4) Only permissible in decompression operation, a pressure side switch is not permitted.

Working pressure range A10VZO – size 71 to 180

Pressure at working port B			**Definition**
Nominal pressure p_{nom}		280 bar[2)]	The nominal pressure corresponds to the maximum design pressure.
Maximum pressure p_{max}		350 bar	The maximum pressure corresponds to the maximum working pressure within a single operating period. The sum of single operating periods must not exceed the total operating period.
Single operating period		2.5 ms	
Total operating period		300 h	
Minimum pressure $p_{B\ absolute}$ (high-pressure side)		10 bar	Minimum pressure on the high-pressure side (**B**) which is required in order to prevent damage to the axial piston unit.
Rate of pressure change $R_{A\ max}$		16000 bar/s	Maximum permissible speed of pressure build-up and reduction during a pressure change across the entire pressure range.
Pressure at suction port S (inlet)			
Minimum pressure $p_{S\ min}$	Standard	0.8 bar absolute	Minimum pressure at suction port **S** (inlet) which is required to prevent damage to the axial piston unit. The minimum pressure depends on the rotational speed and displacement of the axial piston unit.
Maximum pressure $p_{S\ max}$		10 bar absolute	
Case pressure at port L, L_1			
Maximum pressure $p_{L\ max}$		2 bar absolute[2)]	Maximum 0.5 bar higher than inlet pressure at port **S**, but not higher than $p_{L\ max}$. A drain line to the reservoir is required.
Pilot pressure port X with external high pressure			
Maximum pressure p_{max}		350 bar	When designing all control lines with external high pressure, the values for the rate of pressure change, maximum single operating period and total operating period applicable to port **B** must not be exceeded.

For details of the rate of pressure change and pressure definition, please refer to page 27

Notice
Working pressure range applies when using hydraulic fluids based on mineral oils. Please contact us for values for other hydraulic fluids.

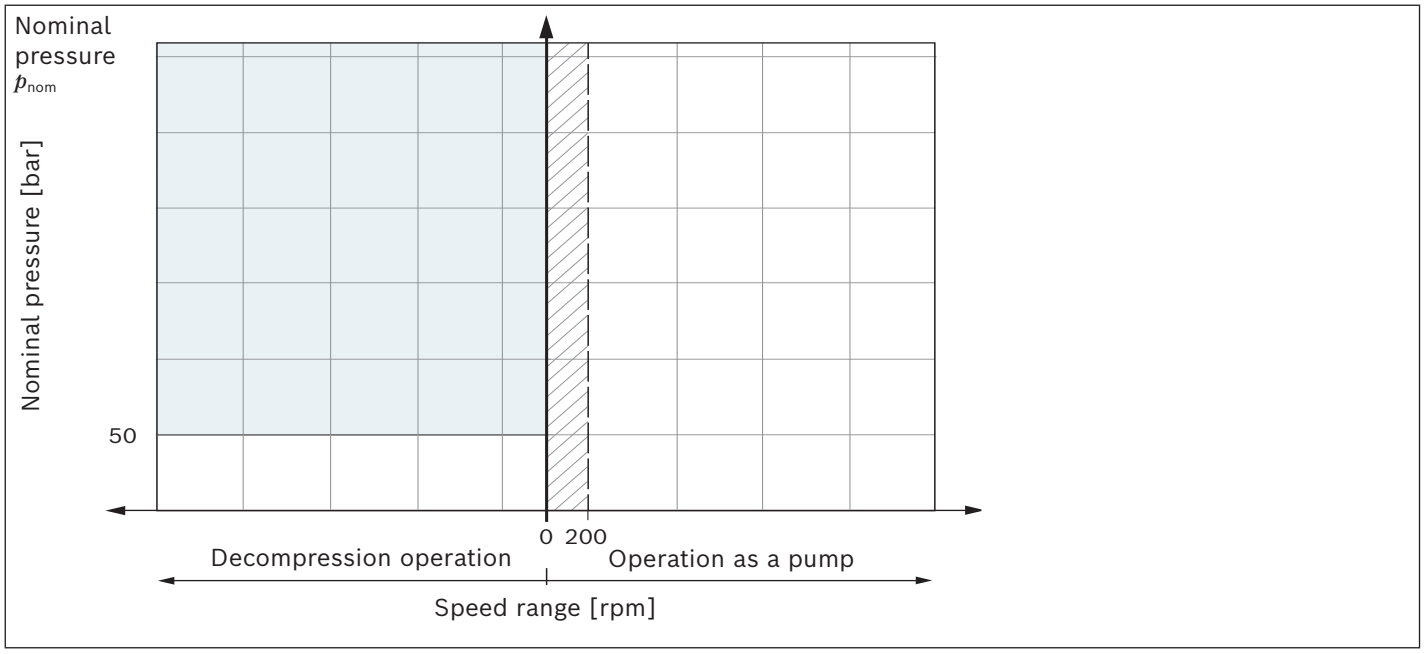
Flow direction

Direction of rotation, viewed on drive shaft	**Direction of rotation**	**Flow**
Type code "**R**"	Clockwise	**S** to **B**
	Counter-clockwise[1)]	**B** to **S**
Type code "**L**"	Counter-clockwise	**S** to **B**
	Clockwise[1)]	**B** to **S**

1) Only permissible in pressure decompression, a pressure side switch is not permitted.
2) Higher values on request

A10VZO, size 003 to 71: Permissible operating data and operating ranges

For NG100 to 180, the corresponding minimum speed of 200 rpm applies, decompression operation is not possible.



Operating range	
	Operation without restriction
	With V_g <40%, no time restriction With $V_{g\,max}$ single operating period t<3 min, maximum cycle share 80%
	Operation as a motor possible with restrictions, please contact us. With V_g <40%, no time restriction With $V_{g\,max}$ permissible for short-term decompression operation t ≤ 200 ms

Technical data A10VZO size 3 to 45

Size		NG		3	6	8	10	18	28	45
Displacement geometric, per revolution		$V_{g\,max}$	cm^3	3.5	6	8	10.5	18	28	45
Maximum rotational speed[1]	at $V_{g\,max}$									
Suction speed operation as a pump[1]		n_{nom}	rpm	3600	3600	3600	3600	3300	3000	3000
Maximum rotational speed[1]	at $V_{g\,max}$ and at p_{nom} 280 bar									
Suction speed operation as a pump with port plate 32		n_{nom}	rpm	–	–	–	–	–	–	–
Minimum speed (see diagram on page 30)		n_{min}	rpm	0	0	0	0	0	0	0
Max. rotational speed decompression operation[2]		n_{nom}	rpm	3600	3600	3600	3600	3300	3000	3000
Flow	at n_{nom} and $V_{g\,max}$	q_v	l/min	12.6	21.6	28.8	38	59	84	135
Power Operation as a pump at n_{nom}, $V_{g\,max}$	and Δp = 250 bar	P	kW	5	10	15	16	–	–	–
	and Δp = 315 bar	P	kW	–	–	–	–	34	39	44
Torque	at $V_{g\,max}$ and Δp = 250 bar	M	Nm	14	24	32	42	–	–	–
	at $V_{g\,max}$ and Δp = 315 bar	M	Nm	–	–	–	–	90	140	225
	at $V_{g\,max}$ and Δp = 100 bar	M	Nm	6	9	13	17	29	45	72
Rotary stiffness Drive shaft	S	c	Nm/rad	8100	8100	8100	8100	–	–	–
	R	c	Nm/rad	–	–	–	–	14800	26300	41000
Moment of inertia of the rotary group		J_{TW}	kgm^2	0.0006	0.0006	0.0006	0.0006	0.00093	0.0017	0.0033
Maximum angular acceleration[2][3]		α	rad/s^2	14000	14000	14000	14000	12600	11200	9500
Case volume		V	l	0.2	0.2	0.2	0.2	0.25	0.3	1.0
Weight **without** through drive (14N00, 12N00 approx.)		m	kg	8	8	8	8	12	15	27
Weight **without** through drive (22U00 approx.)		m	kg	–	–	–	–	–	–	–
Weight **with** through drive (07K.., 12K..approx.)		m	kg	10.5	10.5	10.5	10.5	14	18	28
Weight **with** through drive (22U..approx.)		m	kg	–	–	–	–	–	–	–

Determination of the characteristics				
Flow	q_v	$= \frac{V_g \times n \times \eta_v}{1000}$		[l/min]
Torque	M	$= \frac{V_g \times \Delta p}{20 \times \pi \times \eta_{hm}}$		[Nm]
Power	P	$= \frac{2 \pi \times M \times n}{60000}$	$= \frac{q_v \times \Delta p}{600 \times \eta_t}$	[kW]

Key

V_g Displacement per revolution [cm^3]
Δp Differential pressure [bar]
n Rotational speed [rpm]
η_v Volumetric efficiency
η_{hm} Hydraulic-mechanical efficiency
η_t Total efficiency ($\eta_t = \eta_v \times \eta_{hm}$)

Notice

- Theoretical values, without efficiency and tolerances; values rounded
- Operation above the maximum values or below the minimum values may result in a loss of function, a reduced service life or in the destruction of the axial piston unit. Bosch Rexroth recommends checking the load by means of test or calculation / simulation and comparison with the permissible values.

For further information on speed increase, see page 33

1) The values are applicable:
– At an absolute pressure p_{abs} = 1 bar at the suction port **S**
– for the optimum viscosity range from v_{opt} = 36 to 16 mm^2/s
– with hydraulic fluid based on mineral oils
2) Higher values on request
3) The limit value is only valid for a single pump, multiple pump version available on request. The load capacity of the connection parts must be considered.

Technical data A10VZO size 71 to 180

Size		NG		71	100	140	180
Displacement geometric, per revolution		$V_{g\,max}$	cm^3	71.1	100	140	180
Maximum rotational speed[1]	at $V_{g\,max}$						
Suction speed operation as a pump[1]		n_{nom}	rpm	2550	2300	2200	1800
Maximum rotational speed[1]	at $V_{g\,max}$						
Suction speed version with port plate 32		n_{nom}	rpm	2550	2150	–	1800
Minimum speed (unrestricted in time)		n_{min}	rpm	0	200	200	200
Max. rotational speed decompression operation[2]		n_{nom}	rpm	On request			
Flow	at n_{nom} and $V_{g\,max}$	q_v	l/min	181	230	308	324
Power Operation as a pump at n_{nom}, $V_{g\,max}$	and Δp = 280 bar	P	kW	84	107	143	151
Torque	at $V_{g\,max}$ and Δp = 280 bar	M	Nm	317	445	623	801
	at $V_{g\,max}$ and Δp = 100 bar	M	Nm	113	159	223	286
Rotary stiffness Drive shaft	S	c	Nm/rad	–	121142	169537	171107
	R	c	Nm/rad	76545	–	–	–
Moment of inertia of the rotary group		J_{TW}	kgm^2	0.0087	0.0185	0.0276	0.033
Maximum angular acceleration[2][3]		α	rad/s^2	7500	6200	5000	4000
Case volume		V	l	1.6	2.2	3.0	2.7
Weight **without** through drive (12N00, 42N00 approx.)		m	kg	36.5	55	70	75.2
Weight **without** through drive (22U00 approx.)		m	kg	51.8	76	90.2	89.4
Weight **with** through drive (12K..approx.)		m	kg	–	–	–	–
Weight **with** through drive (22U..approx.)		m	kg	51.8	76	90.2	89.4

Determination of the characteristics				
Flow	$q_v = \frac{V_g \times n \times \eta_v}{1000}$			[l/min]
Torque	$M = \frac{V_g \times \Delta p}{20 \times \pi \times \eta_{hm}}$			[Nm]
Power	$P = \frac{2 \pi \times M \times n}{60000}$	=	$\frac{q_v \times \Delta p}{600 \times \eta_t}$	[kW]

Key

V_g Displacement per revolution [cm^3]
Δp Differential pressure [bar]
n Rotational speed [rpm]
η_v Volumetric efficiency
η_{hm} Hydraulic-mechanical efficiency
η_t Total efficiency ($\eta_t = \eta_v \times \eta_{hm}$)

Notice

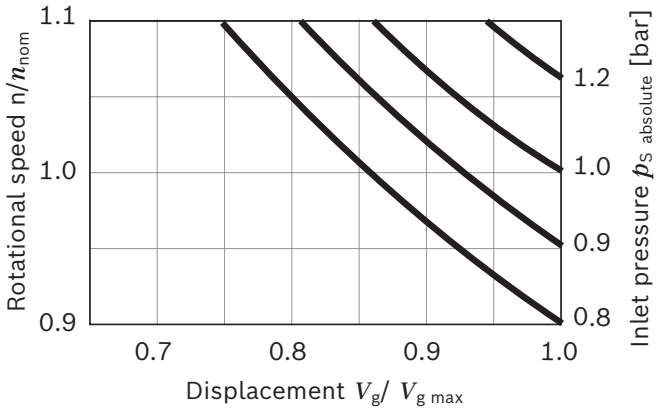
- Theoretical values, without efficiency and tolerances; values rounded
- Operation above the maximum values or below the minimum values may result in a loss of function, a reduced service life or in the destruction of the axial piston unit. Bosch Rexroth recommends checking the load by means of test or calculation / simulation and comparison with the permissible values.

For further information on speed increase, see page 33

1) The values are applicable:
– At an absolute pressure p_{abs} = 1 bar at the suction port **S**
– for the optimum viscosity range from v_{opt} = 36 to 16 mm^2/s
– with hydraulic fluid based on mineral oils
2) Higher values on request
3) The limit value is only valid for a single pump, multiple pump version available on request. The load capacity of the connection parts must be considered.

Minimum permissible inlet pressure at suction port S with speed increase

In order to avoid damage to the pump (cavitation), a minimum inlet pressure must be guaranteed at suction port **S**. The minimum inlet pressure level depends on the rotational speed and the displacement of the variable pump.

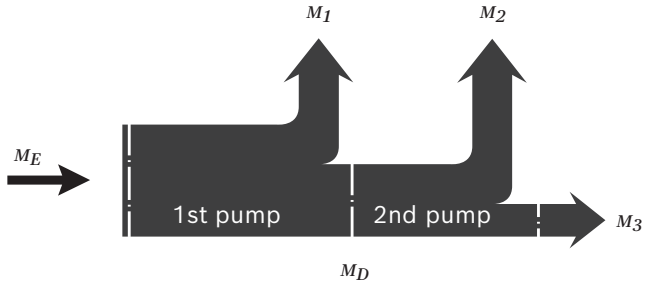


During continuous operation in overspeed over n_{nom}, a reduction in operational service life is to be expected due to cavitation erosion.

Permissible inlet and through-drive torques

Size				003 to 10	18	28	45	71	100	140	180
Input torque											
at drive shaft, maximum[2]	S	$M_{E\,max}$	Nm	126	–	–	–	–	1104	1620	1620
		Ø	in	3/4	–	–	–	–	1 1/2	1 3/4	1 3/4
	R	$M_{E\,max}$	Nm	–	160	250	400	650	–	–	–
		Ø	in	–	3/4	7/8	1	1 1/4	–	–	–
Maximum through-drive torque											
	S	$M_{D\,max}$	Nm	41	–	–	–	–	778	1266	1266
	R	$M_{D\,max}$	Nm	–	92	127	229	480	–	–	–

▼ **Distribution of torques**



Torque at 1st pump	M_1		
Torque at 2nd pump	M_2		
Torque at 3rd pump	M_3		
Input torque	M_E	=	$M_1 + M_2 + M_3$
	M_E	<	$M_{E\,max}$
Through-drive torque	M_D	=	$M_2 + M_3$
	M_D	<	$M_{D\,max}$

1) Efficiency not considered
2) For drive shafts with no radial force

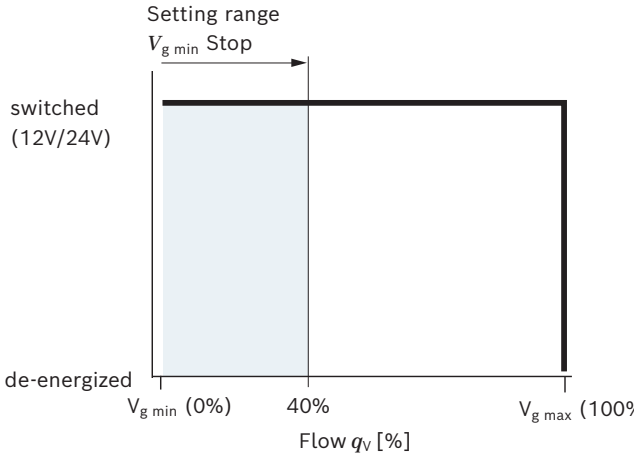
EZ300/EZ400 – Two-point control, electric

The variable displacement unit is set to minimum swivel angle by actuating switching solenoids. The control pressure is taken internally from the high-pressure side. A minimum system pressure depending on the operating data is required for the pump to be adjusted.

Notice
Starting up to $V_{g\,min}$ 0 and switching from $V_{g\,min}$ 0 below a working pressure of 10 bar is not permissible.

The axial piston unit can only be switched between $V_{g\,max}$ and $V_{g\,min}$.
Please specify the presetting in plain text.

▼ **Characteristic curve EZx00**

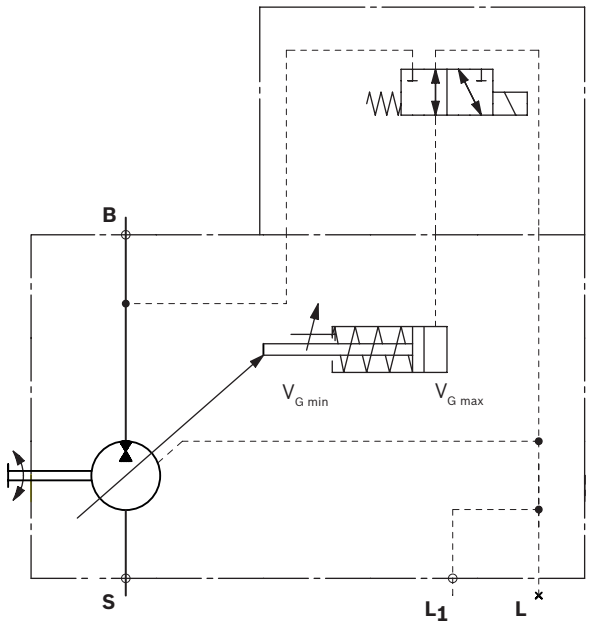


De-energized ≙ $V_{g\,max}$
Energized ≙ $V_{g\,min}$

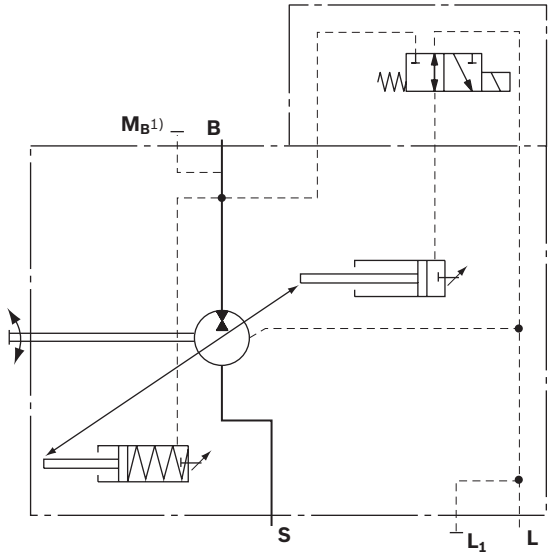
Technical data, solenoid	EZ300	EZ400
Voltage	12 V (±15%)	24 V (±15%)
Position $V_{g\,max}$	de-energized	de-energized
Position $V_{g\,min}$	Energized	Energized
Nominal current at 20°C	1.5 A	0.8 A
Duty cycle	100%	100%
Type of protection: see connector version page 126		

Ambient temperature range -20 °C to +60 °C.
Please contact us if these temperatures cannot be observed

▼ **Circuit diagram A10VZO...EZ3/4 sizes 3 to 10**



▼ **Circuit diagram A10VZO...EZ3/4 sizes 18 to 180**



1) Only port plate 22 and 32

DG000 – Two-point control, hydraulic

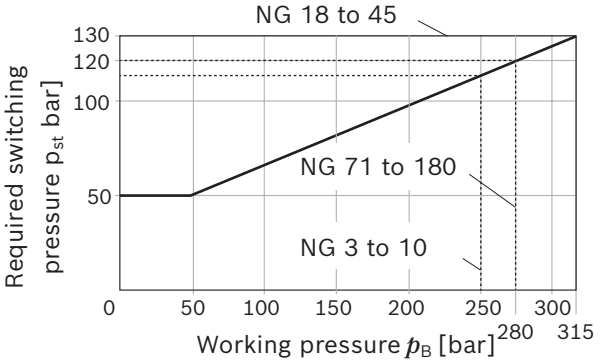
The variable pump can be set to a minimum swivel angle by connecting an external switching pressure to port **X.** This will supply control fluid directly to the stroking piston; a minimum pressure of $p_{St} \geq 50$ bar is required.
The variable pump can only be switched between $V_{g\,min}$ and $V_{g\,max}$. Specify the presetting in plain text.

Notice
Starting up to $V_{g\,min}$ 0 and switching from $V_{g\,min}$ 0 below a working pressure of 10 bar is not permissible.

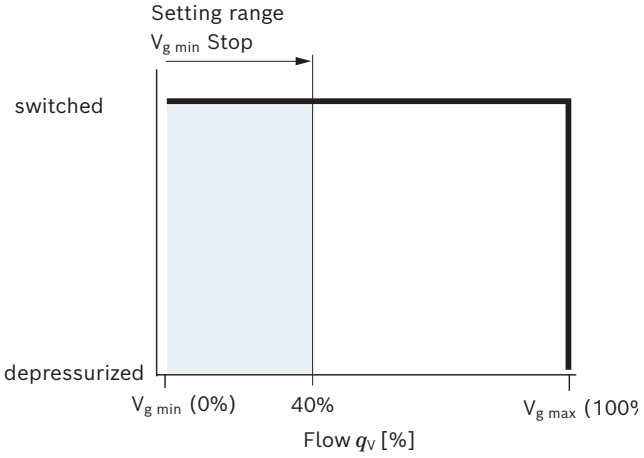
Please note that the required switching pressure at port **X** is directly dependent on the actual working pressure p_B at port **B**. (See switching pressure characteristic curve). The maximum permissible switching pressure corresponds to the nominal pressure of the pump.

- Switching pressure p_{St} in X= 0 bar ≙ $V_{g\,max}$
- Switching pressure p_{St} in X≥ 50 bar ≙ $V_{g\,min}$

▼ **Switching pressure characteristic curve**

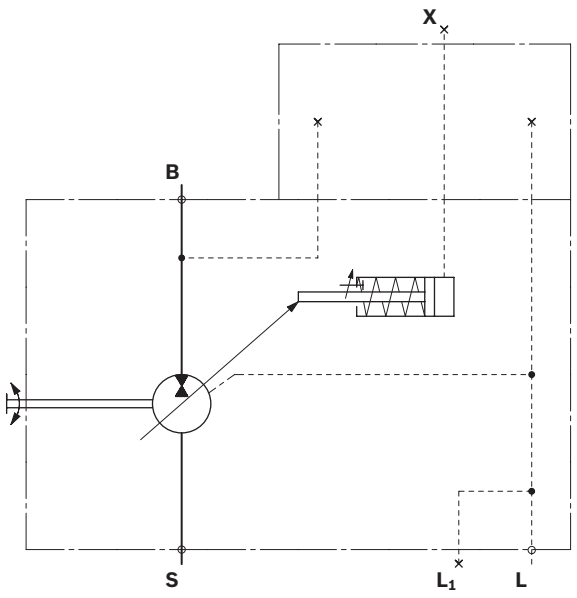


▼ **Characteristic curve DG000**

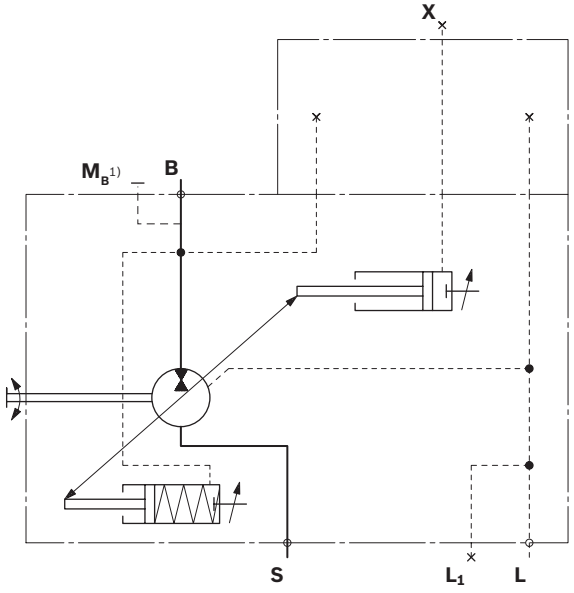


Depressurized ≙ $V_{g\,max}$
Pressure switched on ≙ $V_{g\,min}$

▼ **Circuit diagram DG000; A10VZO sizes 3 to 10**



▼ **Circuit diagram DG000; A10VZ0 sizes 18 to 180**



1) Only port plate 22 and 32

DR – Pressure controller

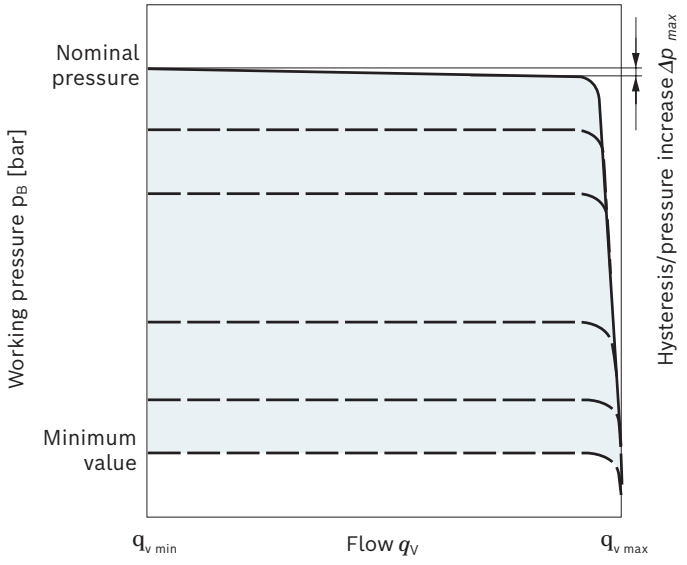
The pressure controller limits the maximum pressure at the pump outlet within the control range of the variable pump. The variable pump only supplies as much hydraulic fluid as is required by the consumers.
If the working pressure exceeds the pressure command value set at the pressure controller, the pump will regulate towards a minimum displacement $V_{g\,min}$. The minimum displacement can either be preselected or is a fixed setting. At $V_{g\,min}$ = 0 cm³ (value for "pressure controller" function), the control deviation is reduced. If the displacement volume is $V_{g\,min}$ > 0 cm³ (value for "2-step controller" function), there is no pressure controller function. A separate pressure relief valve in the system must always be provided.

- Basic position in depressurized state: $V_{g\,max}$.
- Setting range[1)] for pressure control, see characteristic curve DR and table.

Notice

- The described function is only available in the selected direction of rotation (type code R/L). Please contact us regarding switching the direction of rotation

▼ **Characteristic curve DR**



Characteristic curve valid at n_1 = 1500 rpm and θ_{fluid} = 50 °C.

Setting range for pressure control [bar]

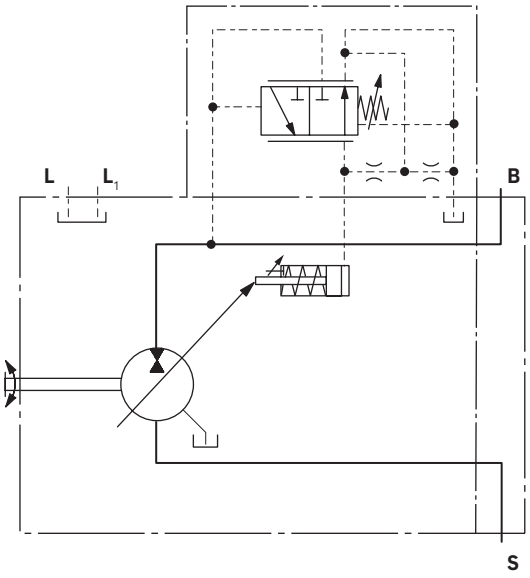
NG	10	18 to 45	71 to 180
Nominal pressure/ maximum value	250	315	280
Minimum value	50[3)]	50[3)]	50[3)]

Controller data DR

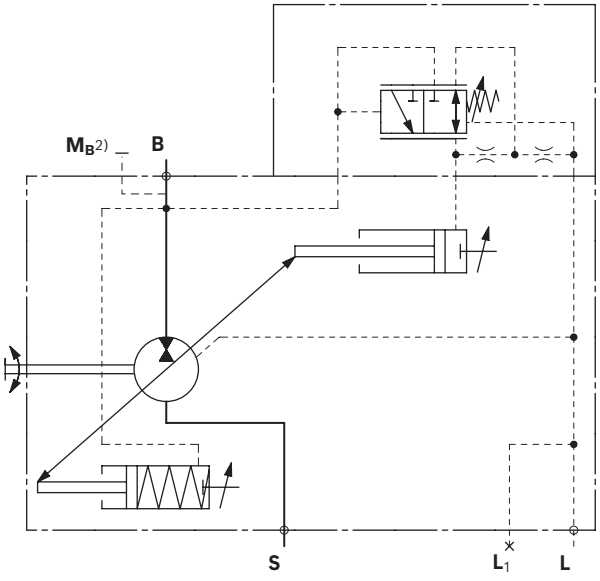
NG		10	18	28	45	71	100	140	180
Pressure increase	Δp [bar]	4	4	4	6	8	10	12	12
Hysteresis and repeatability	Δp [bar]	Maximum 4							
Pilot fluid consumption	[l/min]	maximum approx. 3							

1) In order to prevent damage to the pump and the system, the permissible setting range must not be exceeded. The range of possible settings at the valve is higher.
2) Only port plate 22 and 32
3) For settings below 50 bar, please use the SO275 special pressure controller (setting range: 20 to 100 bar).

▼ **Circuit diagram DR nominal size 3 to 10**



▼ **Circuit diagram DR nominal size 18 to 180**



DRG – Pressure controller, remotely controlled

For the remotely controlled pressure controller, the pressure limitation is performed using a separately arranged pressure relief valve. Therefore, any pressure control value under the pressure set on the pressure controller can be regulated. Pressure controller DR see page 36.

A pressure relief valve is externally piped up to port **X** for remote control. This relief valve is not included in the scope of delivery of the DRG control.

A differential pressure of 20 bar Δp (standard setting) results in a pilot oil flow of approx. 1.5 l/min at port **X**. If another setting is required (range from 10-22 bar) please state in plain text.

As a separate pressure relief valve (**1**) we recommend:

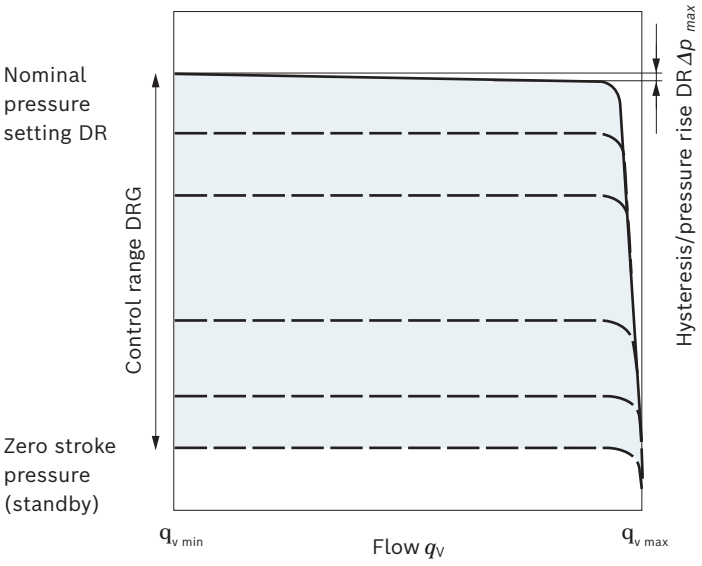
- A direct operated, hydraulic or electric proportional one, suitable for the quantity of pilot fluid mentioned above. The maximum line length should not exceed 2 m.
- Basic position in depressurized state: $V_{g\,max}$.
- Setting range[1)] for the pressure controller see table "Setting range for pressure controller" on page 36. (**3**)
- Setting range for differential pressure 10 - 22 bar (**2**) Standard is 20 bar.

Unloading port **X** to the reservoir results in a zero stroke (standby) pressure which is approx. 1 to 2 bar higher than the defined differential pressure Δp, however system influences are not taken into account.

Notice

- The described function is only available in the selected direction of rotation (type code R/L). Please contact us regarding switching the direction of rotation

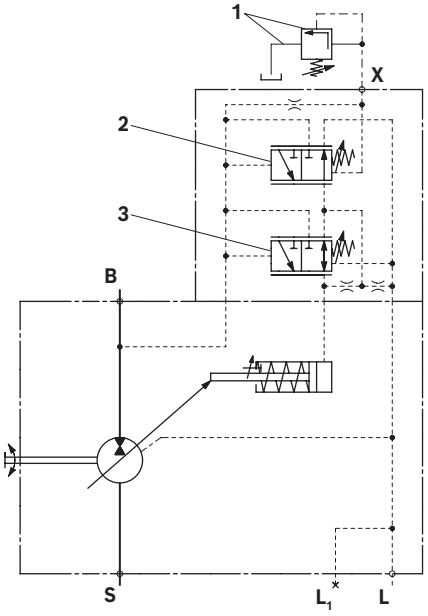
▼ **Characteristic curve DRG**



Characteristic curve valid at n_1 = 1500 rpm and θ_{fluid} = 50 °C.

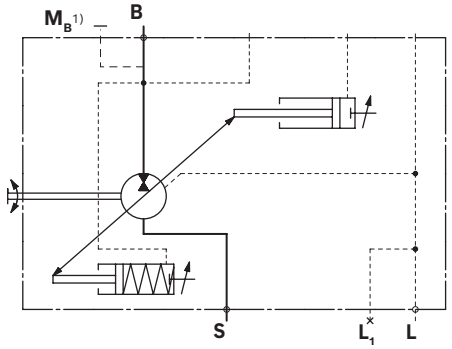
1) In order to prevent damage to the pump and the system, the permissible setting range must not be exceeded. The range of possible settings at the valve is higher.

▼ **Circuit diagram DRG A10VZO NG 3 to 10**



1 The separate pressure relief valve and the line are not included in the scope of delivery.
2 Remotely controlled pressure cut-off (**G**)
3 Pressure controller (**DR**)

▼ **Circuit diagram base unit A10VZO NG 18 to 180; valve setup, see NG 3 to 10**



Controller data DRG

NG		10	18	28	45	71	100	140	180
Hysteresis and repeatability	Δp [bar]	maximum 3							
Pilot fluid consumption DR and DRG	[l/min]	Maximum approx. 4.5							

1) Only port plate 22 and 32

LA.D – Pressure and torque controller

Pressure controller equipped like DR, see page 36.
In order to achieve a constant drive torque, the swivel angle of the axial piston pump is varied depending on the working pressure so that the drive torque remains constant. When ordering please state the torque characteristics to be set at the factory in plain text, e.g. 50 Nm.

Notice

- The described function is only available in the selected direction of rotation (type code R/L). Please contact us regarding switching the direction of rotation

Controller data

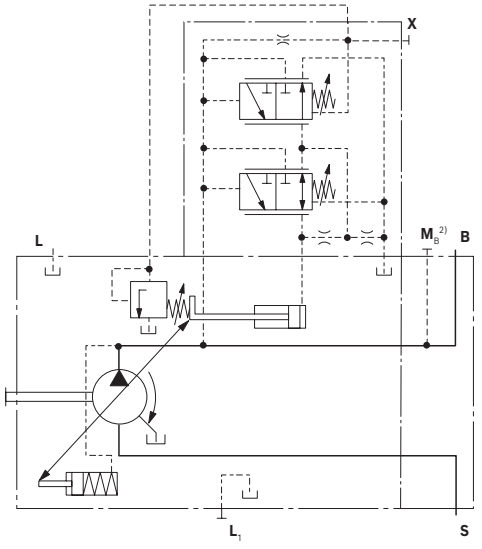
For technical data of pressure controller DR see page 36.
Pilot fluid consumption max. approx. 5.5 l/min.

Reference values	Torque M [Nm] for size							
Beginning of control	**18**	**28**	**45**	**71**	**100**	**140**	**180**	**Code**
up to 50 bar	to 17.0	to 26.0	to 42.0	to 67.0	to 94.0	to 132.0	to 170.0	**LA5**[1]
50 to 90	17.1 - 30.0	26.1 - 47.0	42.1 - 76.0	67.1 - 121.0	94.1 - 169.0	132.1 - 237.0	170.1 - 305.0	**LA6**
91 to 160	30.1 - 54.0	47.1 - 84.0	76.1 - 134.0	121.1 - 213.0	169.1 - 299.0	237.1 - 418.0	305.1 - 537.0	**LA7**
161 to 240	54.1 - 81.0	84.1 - 126.0	134.1 - 202.0	213.1 - 319.0	299.1 - 449.0	418.1 - 629.0	537.1 - 809.0	**LA8**
over 240	over 81.1	over 126.1	over 202.1	over 319.1	over 449.1	over 629.1	over 809.1	**LA9**

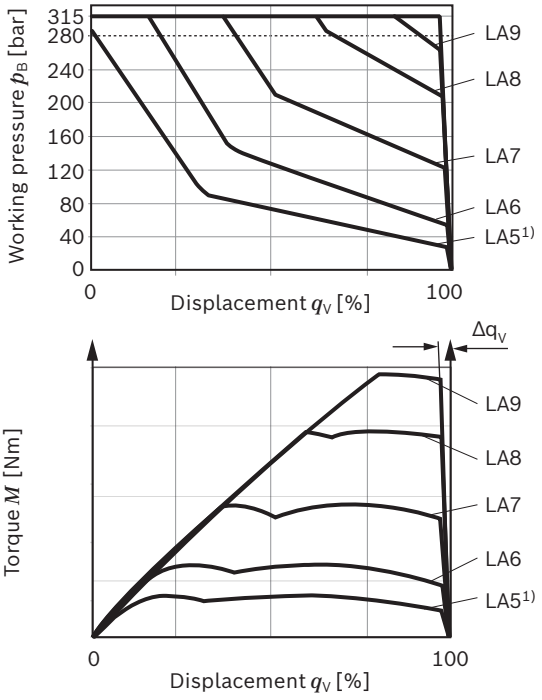
Conversion of the torque values in power [kW]

$P = \frac{M}{6.4}$ [kW] (At 1500 rpm) or $P = \frac{2\pi \times M \times n}{60000}$ [kW] (For rotational speeds see page 31 onwards)

▼ **Circuit diagram LA.D**



▼ **Characteristic curve LA.D**

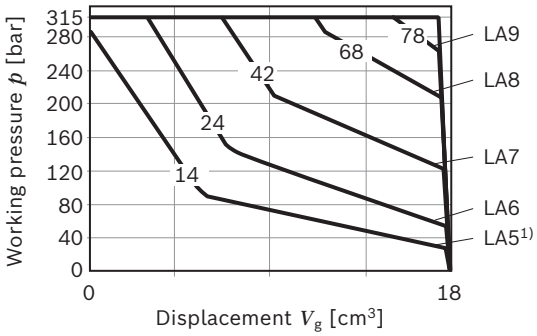


1) Please contact us.
2) Only with port plates 22 and 32

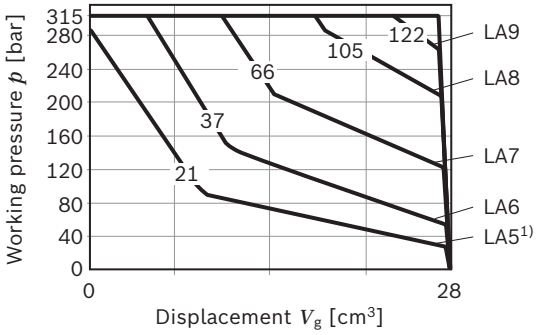
LA.D – Pressure and torque controller, characteristic curve

Torque characteristic curve in Nm

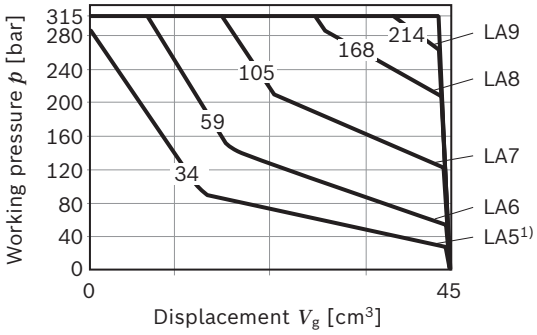
Size 18



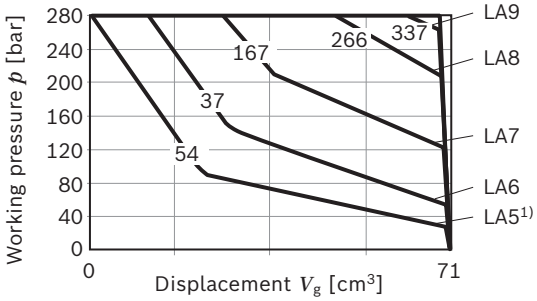
Size 28



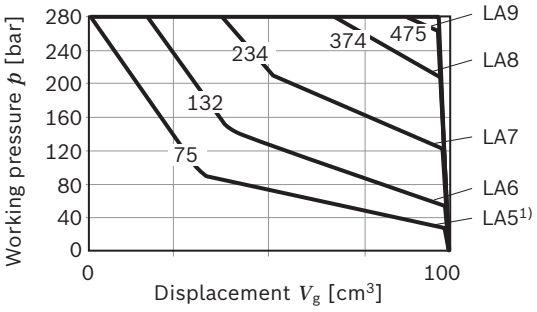
Size 45



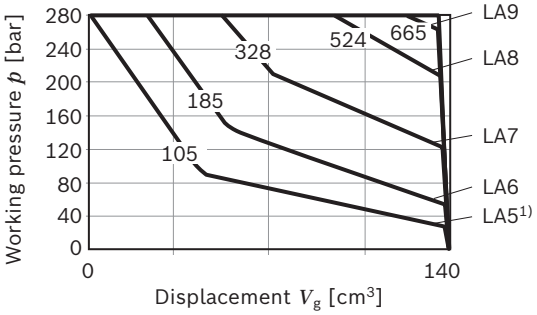
Size 71



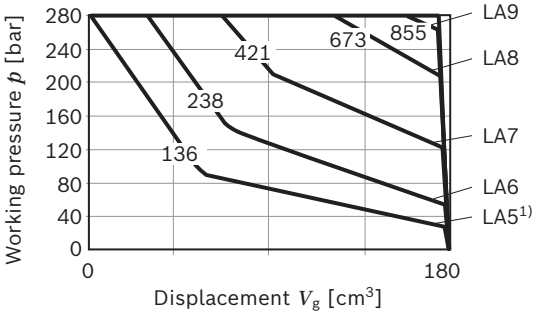
Size 100



Size 140



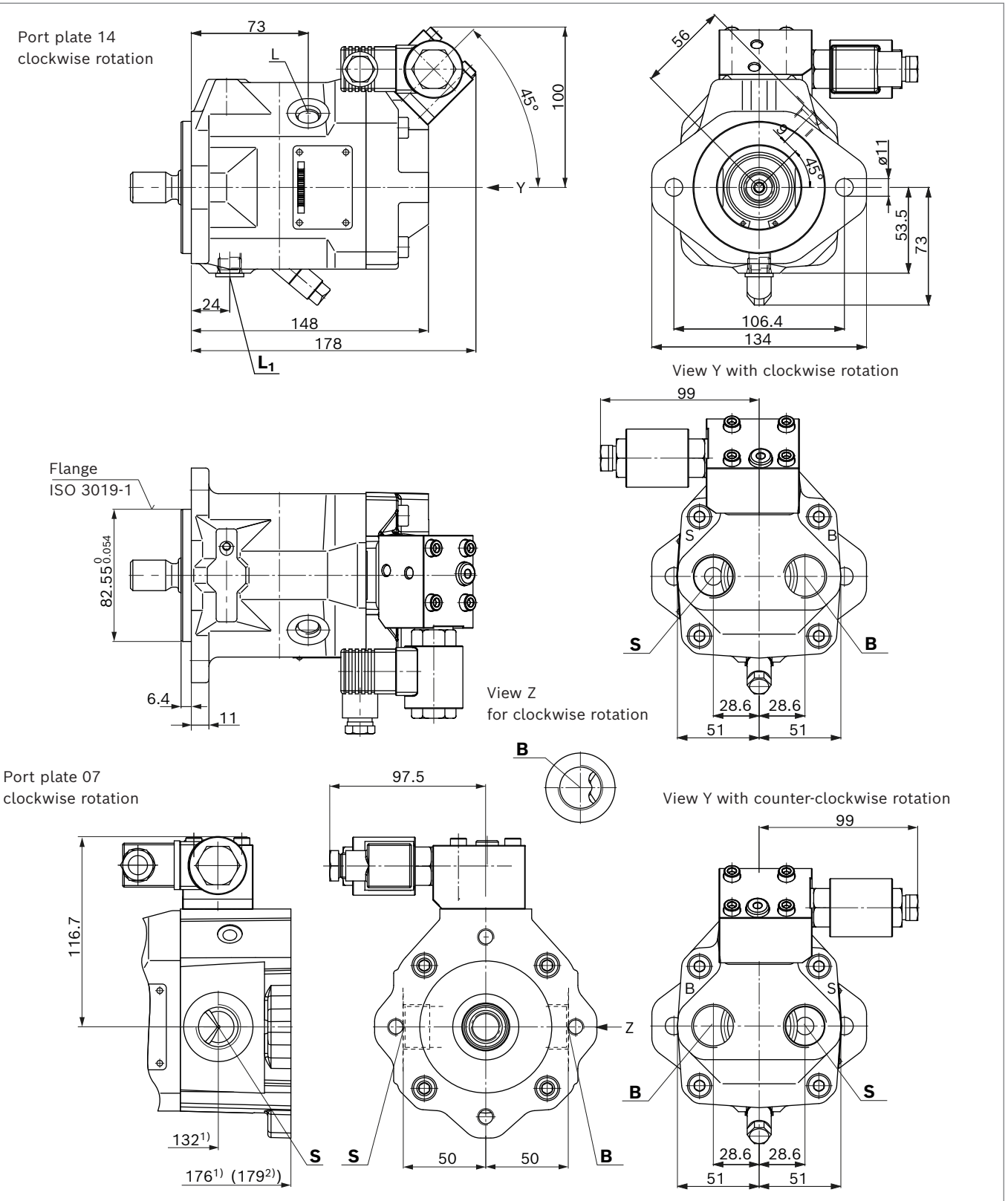
Size 180



1) Please contact us.

Dimensions A10VZO sizes 3 to 10

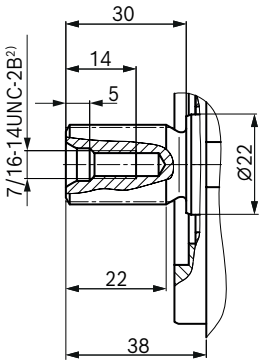
EZ3/4 – Two-point control electric, port plate 14 and 07, clockwise rotation



1) To flange surface with Kxx through drive
2) To flange surface with port plate N00

▼ **Splined shaft 3/4 in (19-4, ISO 3019-1)**

S – 11T 16/32DP[1)]

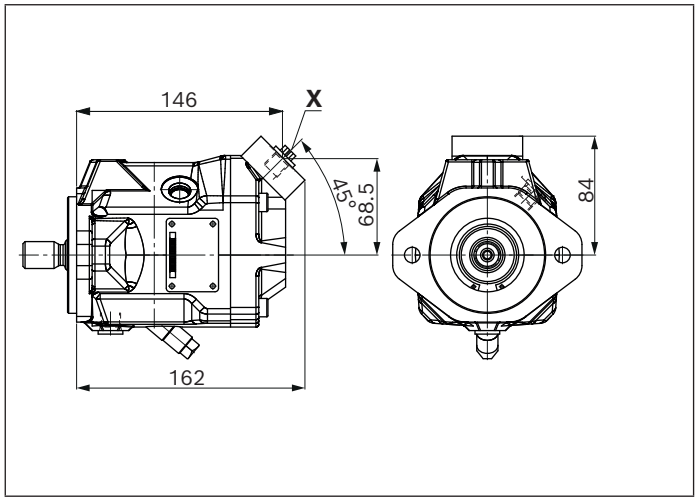


Connection table **A10VZO**

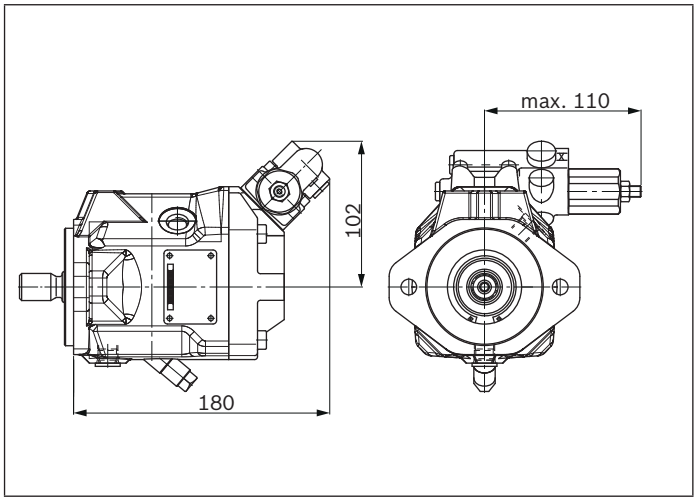
Ports		Standard	Size	p_{max} [bar][3)]	State[6)]
B	Working port	DIN 3852-1	M27 × 2; 16 deep	315	O
S	Suction port	DIN 3852-1	M27 × 2; 16 deep	5	O
L	Drain port	ISO 11926[4)]	9/16-18UNF-2B; 13 deep	2	O[5)]
L_1	Drain port	ISO 11926[4)]	9/16-18UNF-2B; 13 deep	2	X[5)]
X	Pilot pressure port with pressure controller, remotely controlled	ISO 11926	7/16-20UNF-2B; 11.5 deep	315	O
X	Pilot pressure port with DG	DIN 3852-2	G 1/4	315	O

1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Thread according to ASME B1.1
3) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
4) The countersink may be deeper than specified in the standard.
5) Depending on the installation position, **L** or **L_1** must be connected (also see installation instructions on page 127).
6) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

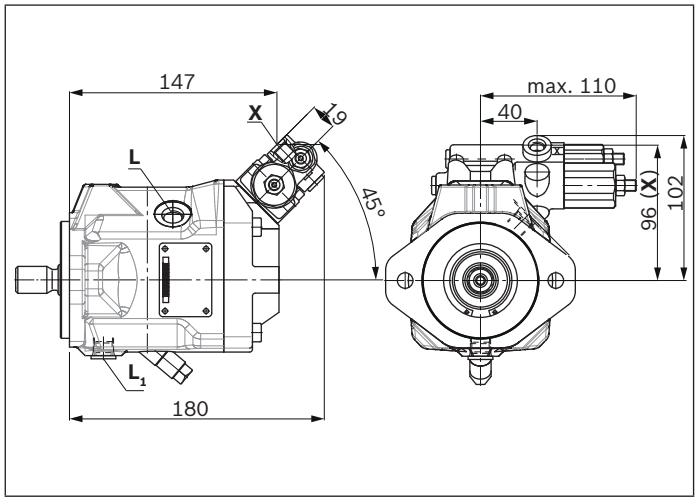
▼ **DG – Two-point control, direct operated, hydraulic**



▼ **DR – Pressure controller, hydraulic**



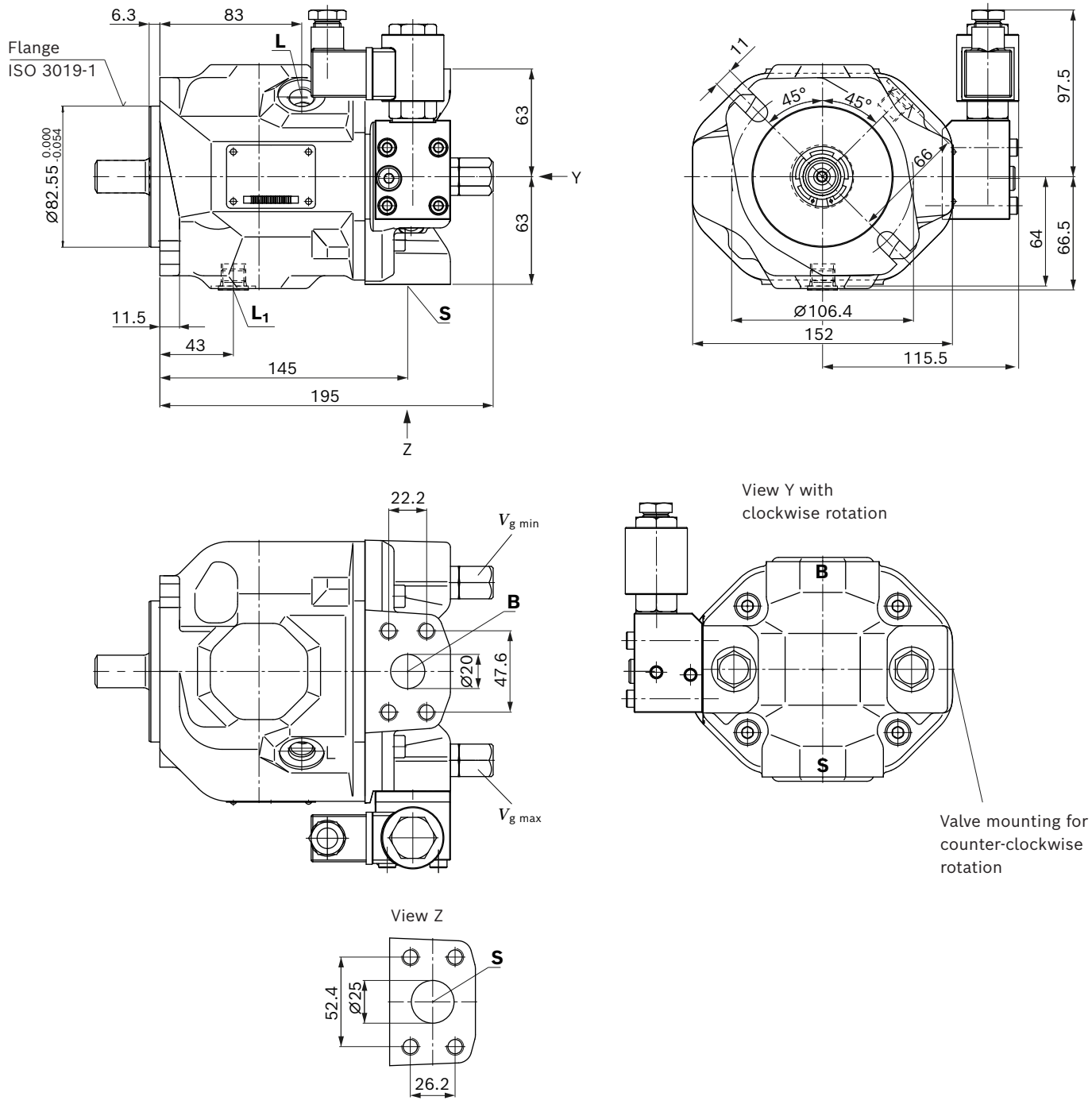
▼ **DRG – Pressure controller, remotely controlled, hydraulic**



Notice
Valve mounting for counter-clockwise rotation see overall dimensions on page 42.

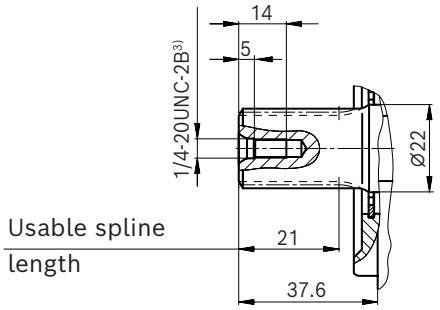
Dimensions A10 VZO size 18

EZ3/4 – Two-point control electric, port plate 12, clockwise rotation



▼ **Splined shaft 3/4 in (similar to ISO 3019-1)**

R – 11T 16/32DP[1)2)]

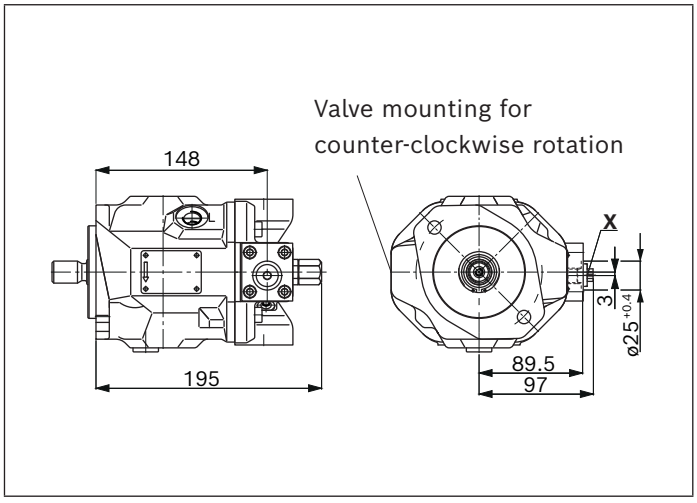


Connection table **A10VZO**

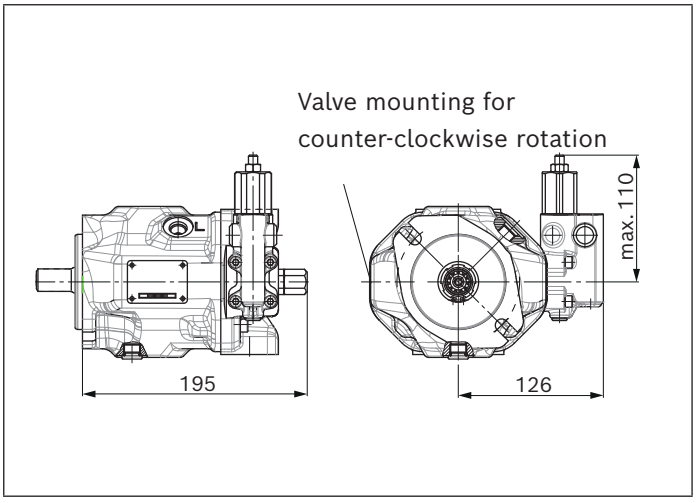
Ports		Standard	Size	p_{max} [bar][4)]	State[7)]
B	Working port (standard pressure series) Fastening thread	ISO 6162-1 DIN 13	3/4 in M10 × 1.5; 17 deep	350	O
S	Suction port (standard pressure series)	ISO 6162-1 DIN 13	1 in M10 × 1.5; 17 deep	10	O
L	Drain port	ISO 11926[5)]	9/16-18UNF-2B; 13 deep	2	O[6)]
L_1	Drain port	ISO 11926[5)]	9/16-18UNF-2B; 13 deep	2	X[6)]
X	Pilot pressure port with pressure controller, remotely controlled	ISO 11926	9/16-18UNF-2B; 13 deep	350	O
X	Pilot pressure port with DG	DIN 3852-2[5)]	G1/4; 12 deep	350	O

1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Splines according to ANSI B92.1a, spline runout is a deviation from standard ISO 3019-1.
3) Thread according to ASME B1.1
4) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
5) The countersink may be deeper than specified in the standard.
6) Depending on the installation position, **L** or **L_1** must be connected (also see installation instructions on page 127).
7) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

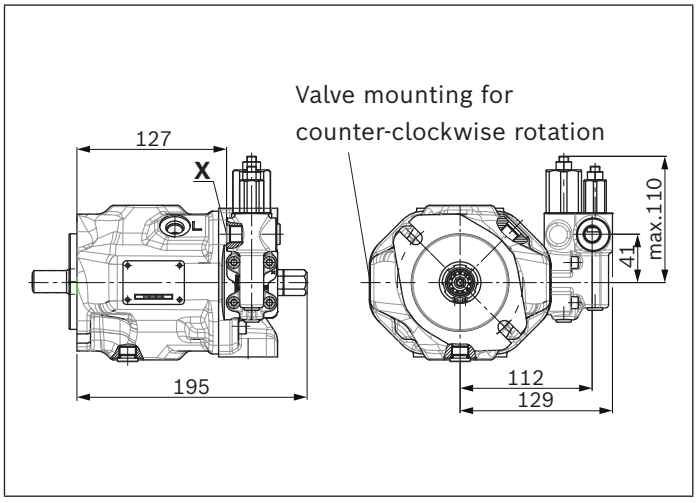
▼ **DG – Two-point control, direct operated, hydraulic**



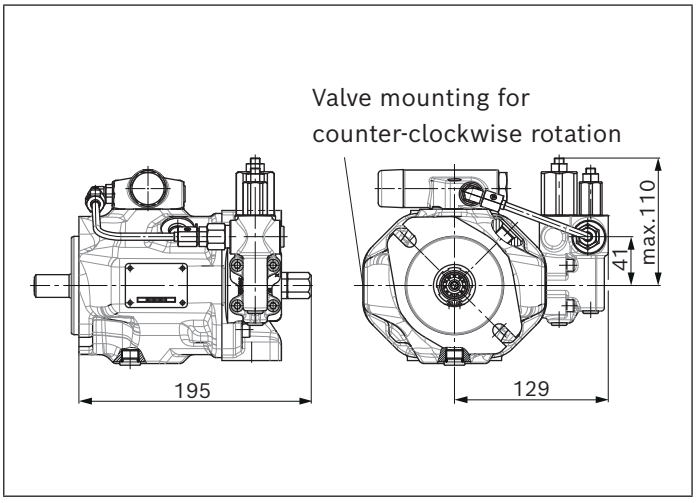
▼ **DR – Pressure controller, hydraulic**



▼ **DRG – Pressure controller, remotely controlled, hydraulic**

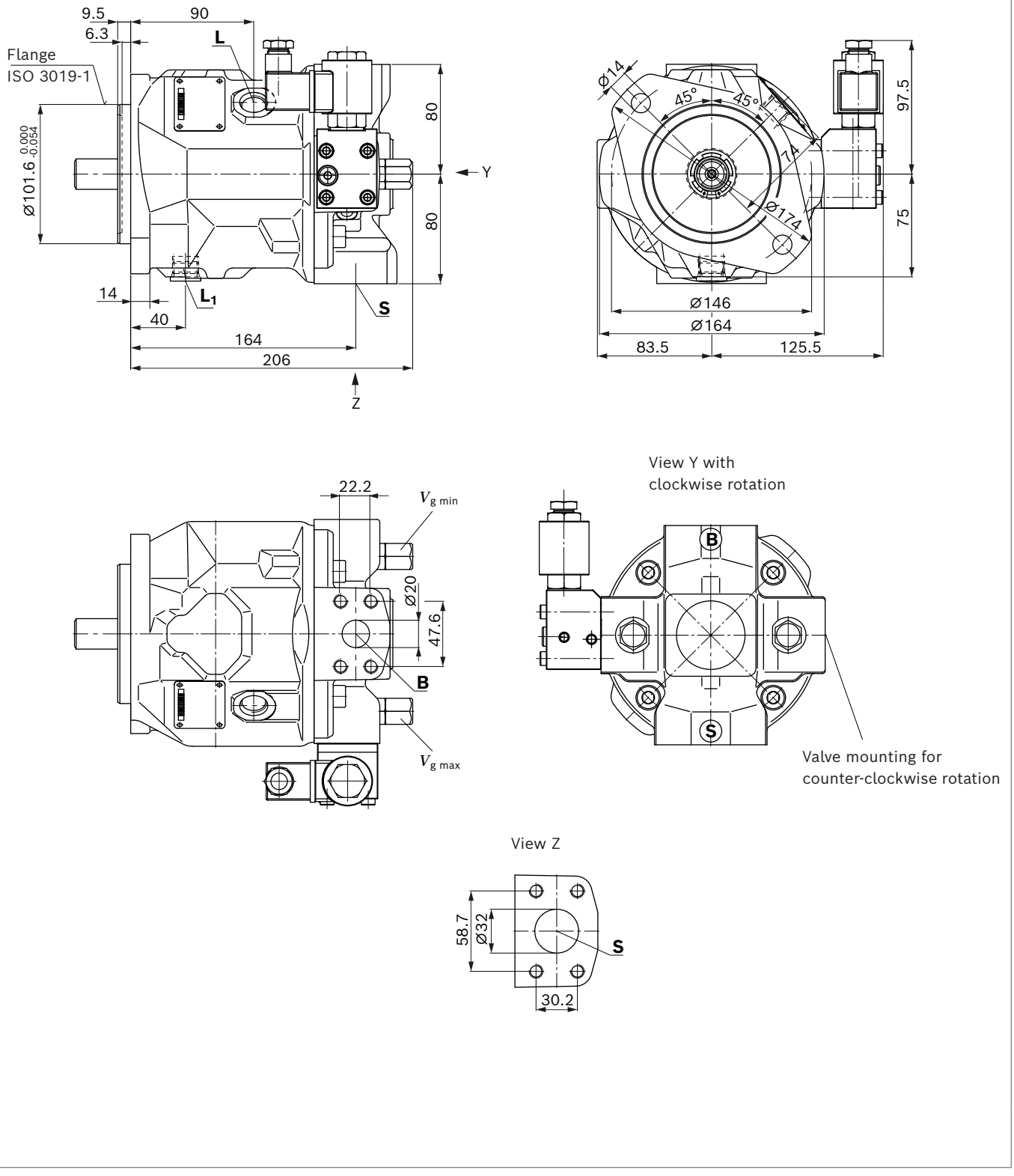


▼ **LAxD – Torque controller, hydraulic**



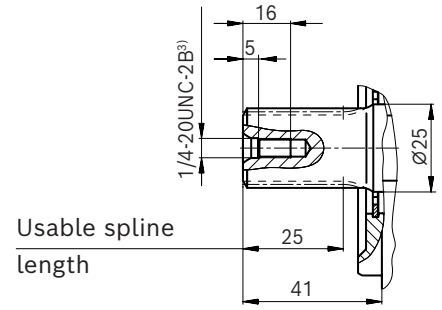
Dimensions A10VZO size 28

EZ3/4 – Two-point control electric, port plate 12, clockwise rotation



▼ **Splined shaft 7/8 in (similar to ISO 3019-1)**

R – 13T 16/32DP[1)2)]

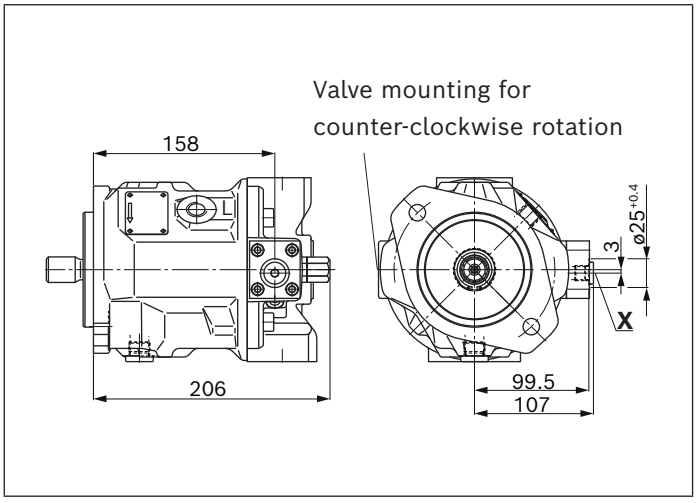


Connection table **A10VZO**

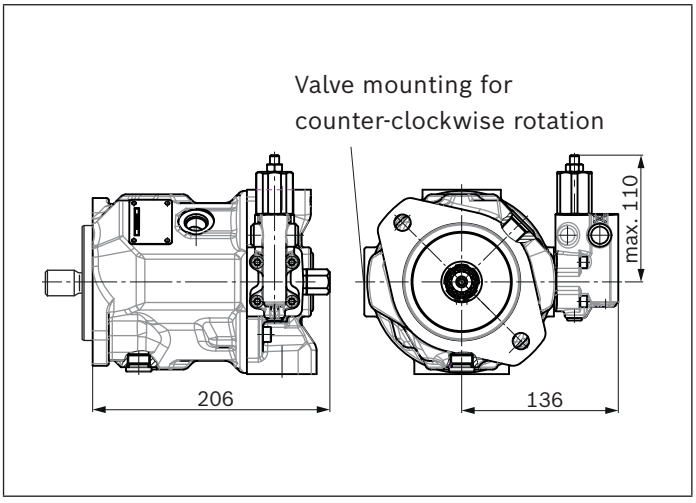
Ports		Standard	Size[4)]	p_{max} [bar][4)]	State[7)]
B	Working port (standard pressure series) Fastening thread	ISO 6162-1 DIN 13	3/4 in M10 × 1.5; 17 deep	350	O
S	Suction port (standard pressure series)	ISO 6162-1 DIN 13	1 1/4 in M10 × 1.5; 17 deep	10	O
L	Drain port	ISO 11926[5)]	3/4-16UNF-2B; 15 deep	2	O[6)]
L_1	Drain port	ISO 11926[5)]	3/4-16UNF-2B; 15 deep	2	X[6)]
X	Pilot pressure port with pressure controller, remotely controlled	ISO 11926	9/16-18UNF-2B; 13 deep	350	O
X	Pilot pressure port with DG	DIN 3852-2[5)]	G1/4; 12 deep	350	O

1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Splines according to ANSI B92.1a, spline runout is a deviation from standard ISO 3019-1.
3) Thread according to ASME B1.1
4) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
5) The countersink may be deeper than specified in the standard.
6) Depending on the installation position, **L** or **L_1** must be connected (also see installation instructions on page 127).
7) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

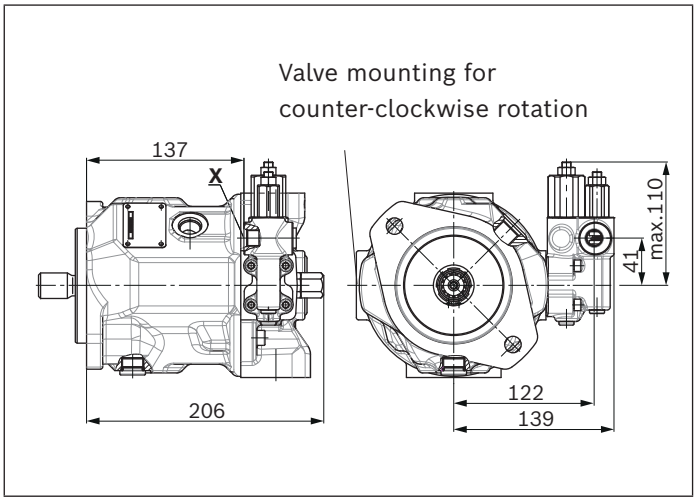
▼ **DG – Two-point control, direct operated, hydraulic**



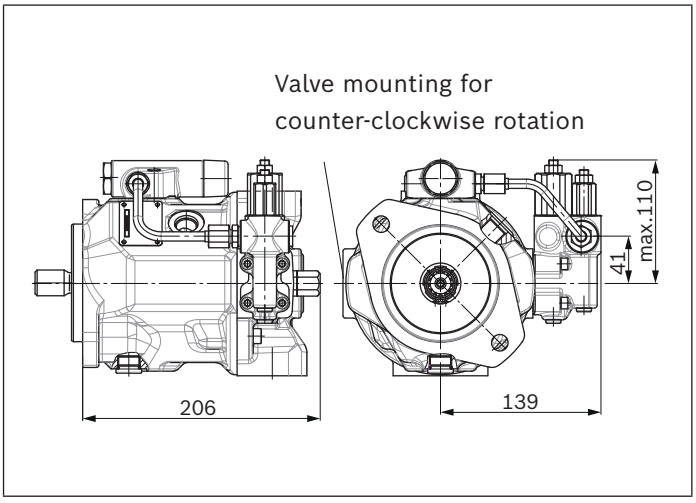
▼ **DR – Pressure controller, hydraulic**



▼ **DRG – Pressure controller, remotely controlled, hydraulic**

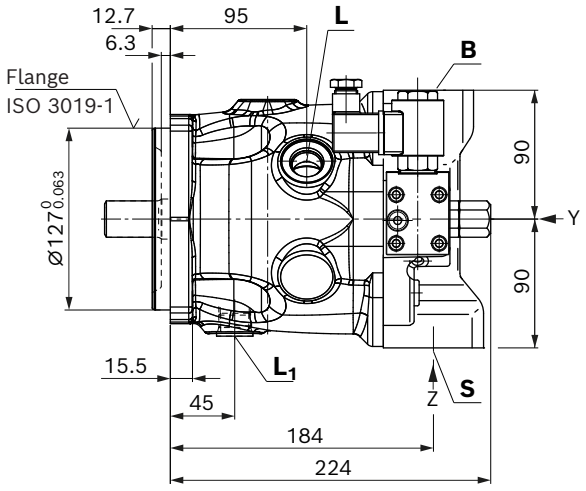


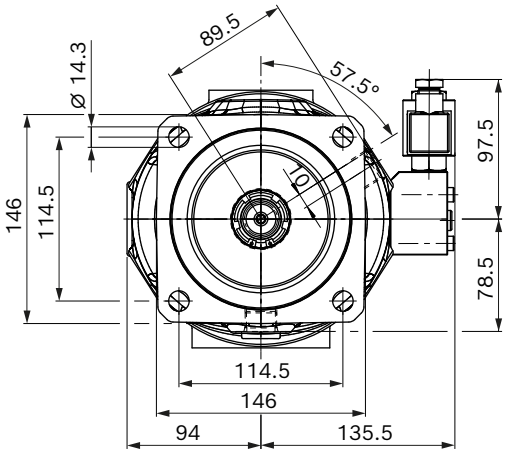
▼ **LAxD – Torque controller, hydraulic**

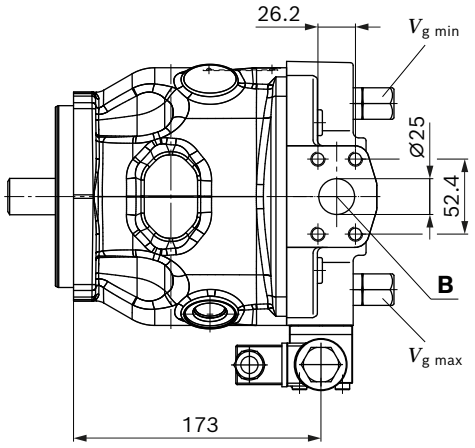


Dimensions A10VZO size 45

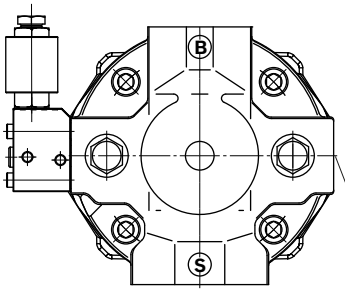
EZ3/4 – Two-point control electric, port plate 12, clockwise rotation





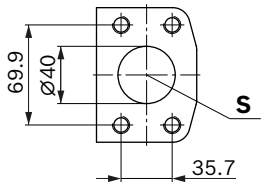


View Y with
clockwise rotation



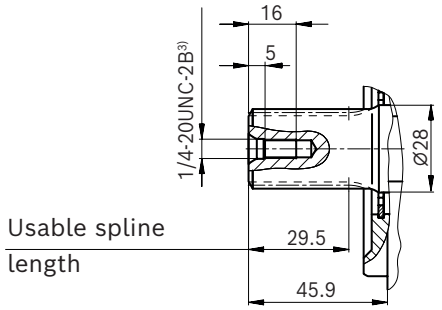
Valve mounting for
counter-clockwise rotation

View Z



▼ **Splined shaft 1 in (similar to ISO 3019-1)**

R – 15T 16/32DP[1)2)]

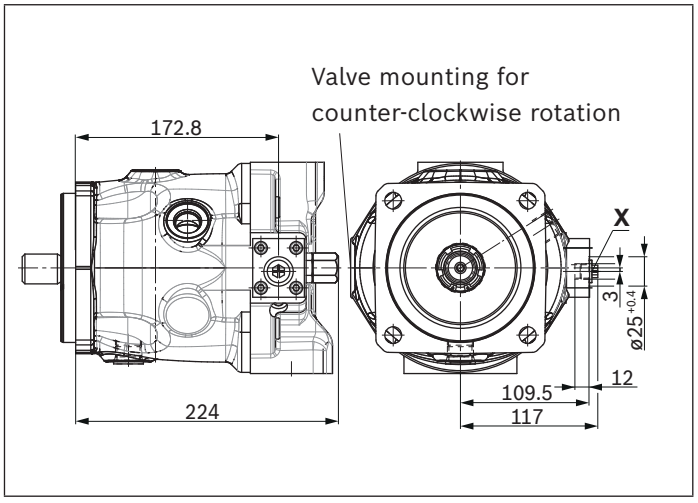


Connection table **A10VZO**

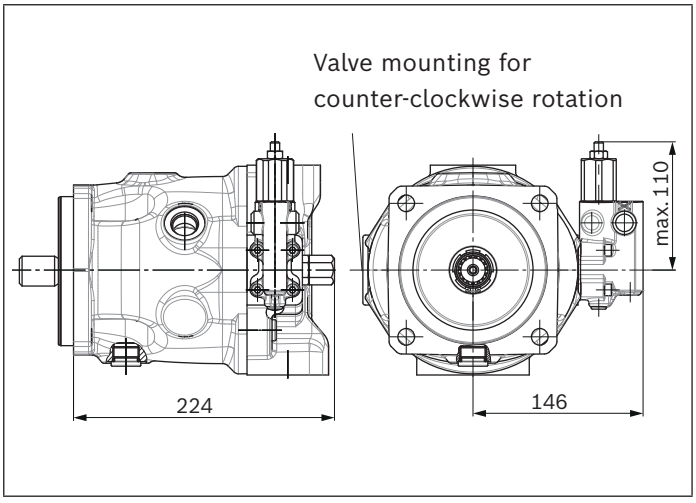
Ports		Standard	Size[4)]	p_{max} [bar][4)]	State[7)]
B	Working port (standard pressure series) Fastening thread	ISO 6162-1 DIN 13	1 in M10 × 1.5; 17 deep	350	O
S	Suction port (standard pressure series)	ISO 6162-1 DIN 13	1 1/2 in M12 × 1.75; 20 deep	10	O
L	Drain port	ISO 11926[5)]	7/8-14UNF-2B; 17 deep	2	O[6)]
L_1	Drain port	ISO 11926[5)]	7/8-14UNF-2B; 17 deep	2	X[6)]
X	Pilot pressure port with pressure controller, remotely controlled	ISO 11926	9/16-18UNF-2B; 13 deep	350	O
X	Pilot pressure with DG	DIN 3852-2[5)]	G1/4; 12 deep	315	O

1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Splines according to ANSI B92.1a, spline runout is a deviation from standard ISO 3019-1.
3) Thread according to ASME B1.1
4) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
5) The countersink may be deeper than specified in the standard.
6) Depending on the installation position, **L** or **L_1** must be connected (also see installation instructions on page 127).
7) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

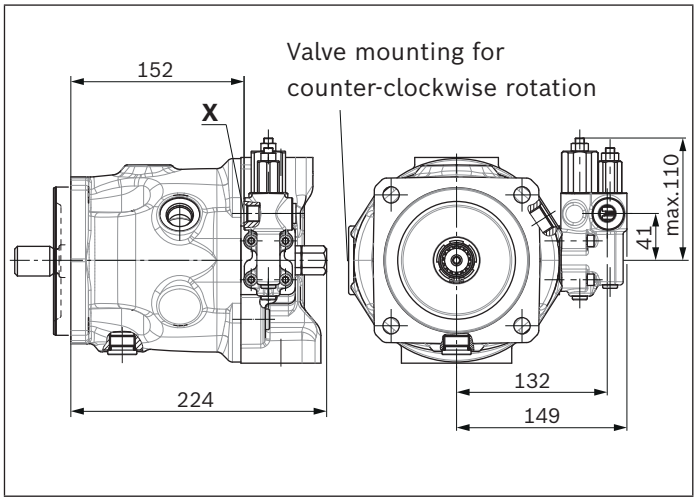
▼ **DG – Two-point control, direct operated, hydraulic**



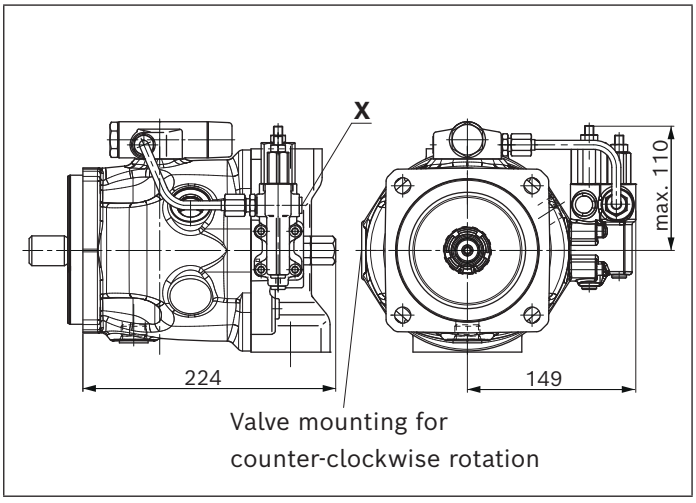
▼ **DR – Pressure controller, hydraulic**



▼ **DRG – Pressure controller, remotely controlled, hydraulic**

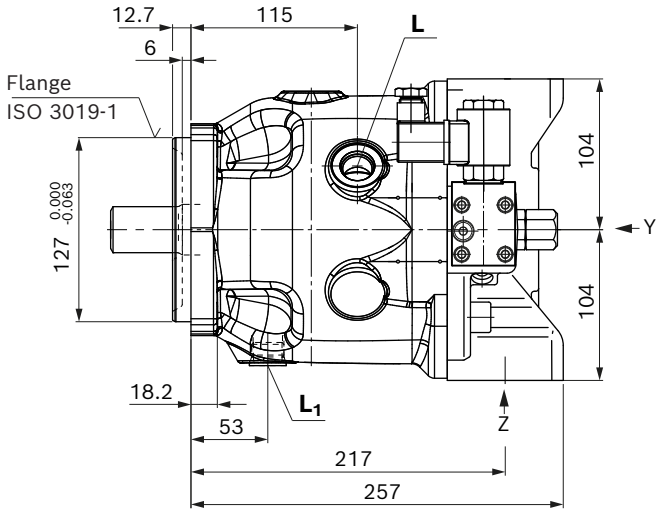


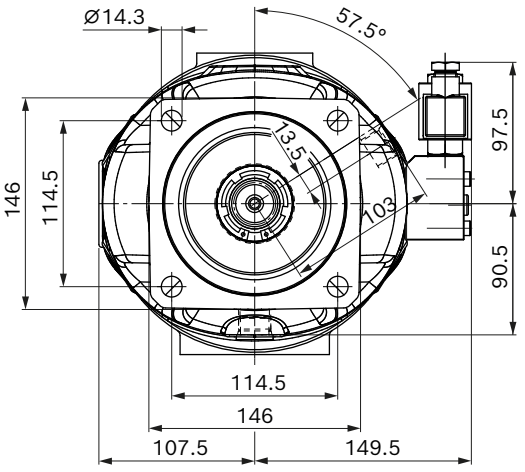
▼ **LAxD – Torque controller, hydraulic**

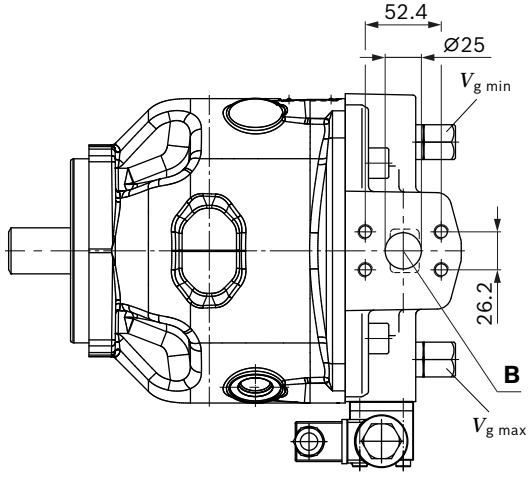


Dimensions A10VZO size 71

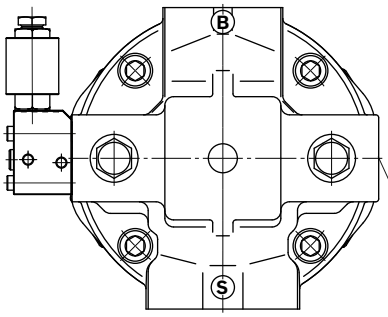
EZ3/4 – Two-point control electric, port plate 12, clockwise rotation





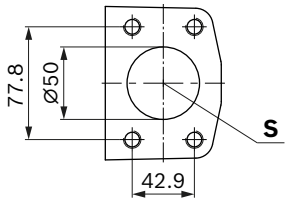


View Y with
clockwise rotation



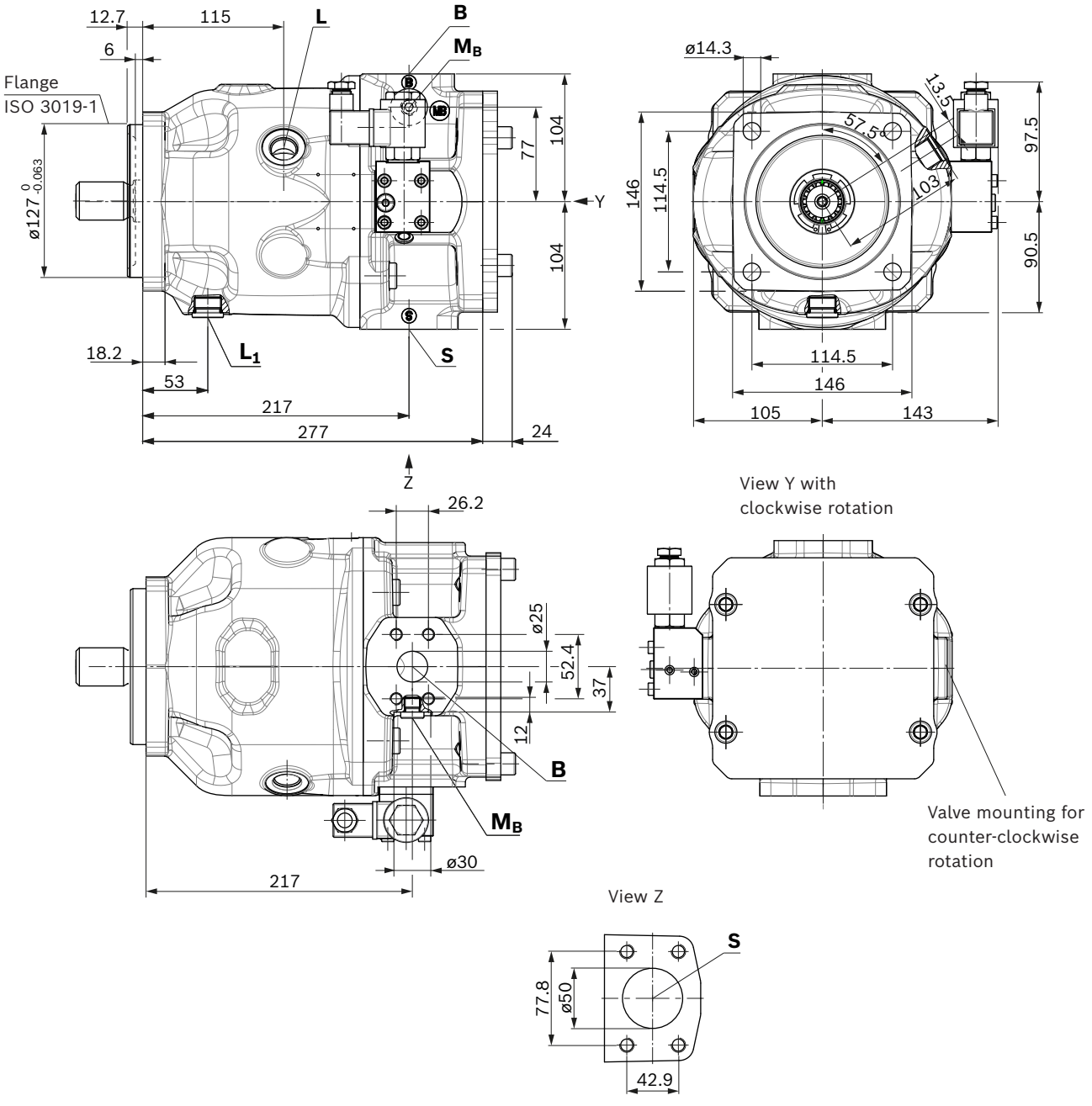
Valve mounting for
counter-clockwise
rotation

View Z



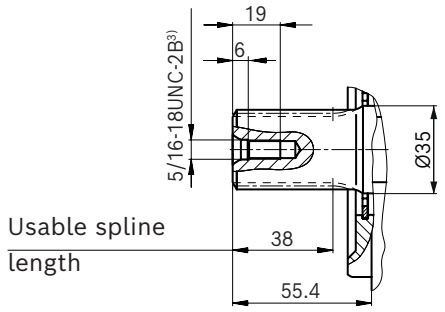
Dimensions A10VZO size 71

EZ3/4 – Two-point control electric, port plate 22/32, clockwise rotation



▼ **Splined shaft 1 1/4 in (similar to ISO 3019-1)**

R – 14T 12/24DP[1)2)]

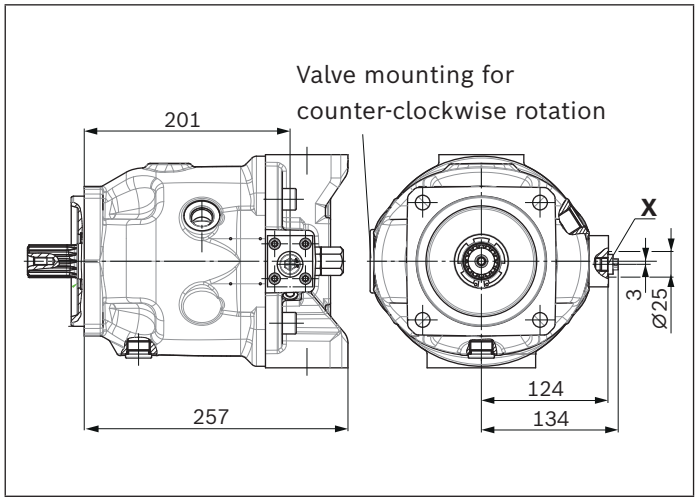


Connection table **A10VZO**

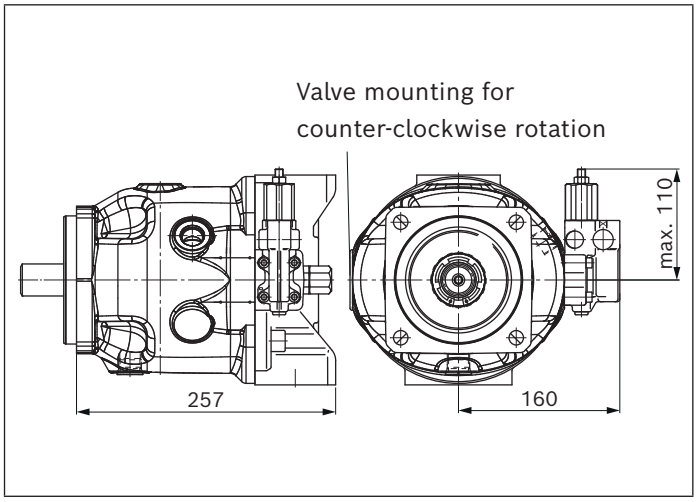
Ports		Standard	Size	p_{max} [bar][4)]	State[7)]
B	Working port (standard pressure series) Fastening thread	ISO 6162-1 DIN 13	1 in M10 × 1.5; 17 deep	350	O
S	Suction port (standard pressure series)	ISO 6162-1 DIN 13	2 in M12 × 1.75; 20 deep	10	O
L	Drain port	ISO 11926[5)]	7/8-14UNF-2B; 17 deep	2	O[6)]
L_1	Drain port	ISO 11926[5)]	7/8-14UNF-2B; 17 deep	2	X[6)]
X	Pilot pressure port with pressure controller, remotely controlled	ISO 11926	7/16-20UNF-2B; 11.5 deep	350	O
X	Pilot pressure with DG	DIN 3852-2[5)]	G1/4; 12 deep	315	O
M_B	Measuring port pressure in **B** only with port plates 22 and 32	DIN 3852-2[5)]	G1/4; 12 deep	350	X

1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Splines according to ANSI B92.1a, spline runout is a deviation from standard ISO 3019-1.
3) Thread according to ASME B1.1
4) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
5) The countersink may be deeper than specified in the standard.
6) Depending on the installation position, **L** or **L_1** must be connected (also see installation instructions on page 127).
7) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

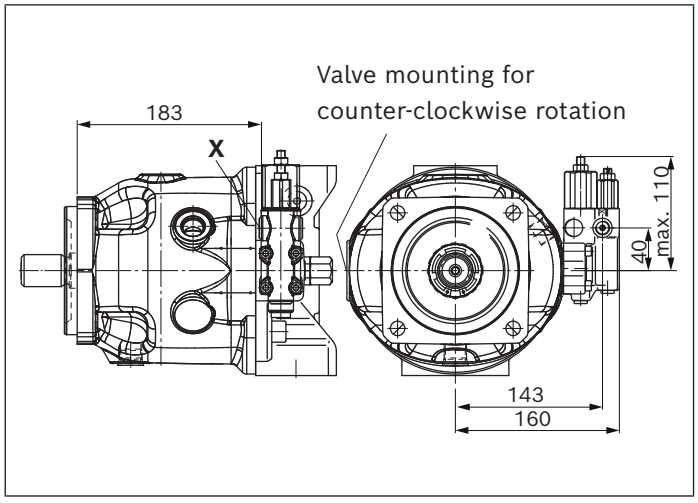
▼ **DG – Two-point control, direct operated, hydraulic**
Port plate 12; clockwise rotation



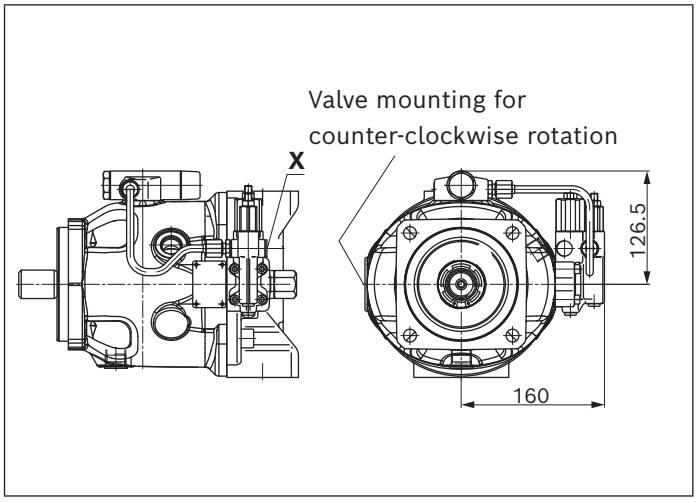
▼ **DR – Pressure controller, hydraulic**
Port plate 12; clockwise rotation



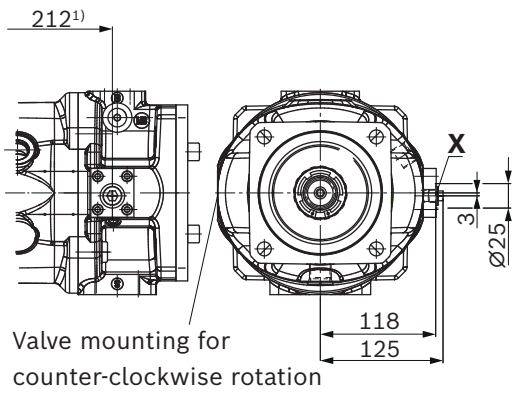
▼ **DRG – Pressure controller, remotely controlled, hydraulic**
Port plate 12; clockwise rotation



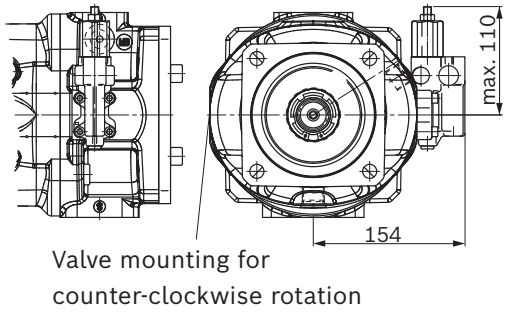
▼ **LAxD – Torque controller, hydraulic**
Port plate 12; clockwise rotation



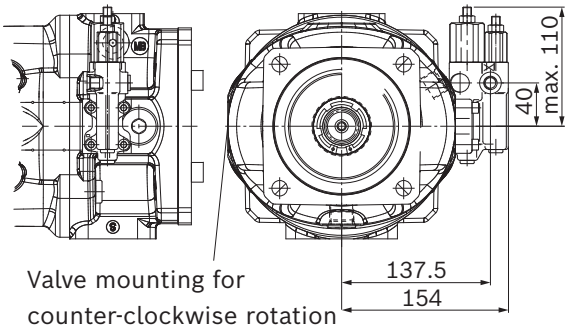
▼ **DG – Two-point control, direct operated, hydraulic**
Port plate 22/32; clockwise rotation



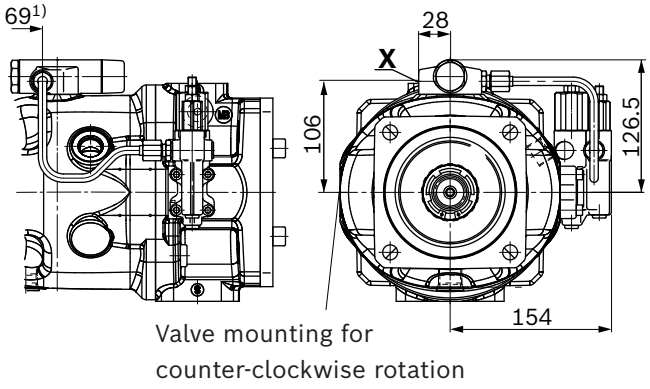
▼ **DR – Pressure controller, hydraulic**
Port plate 22/32; clockwise rotation



▼ **DRG – Pressure controller, remotely controlled, hydraulic**
Port plate 22/32; clockwise rotation



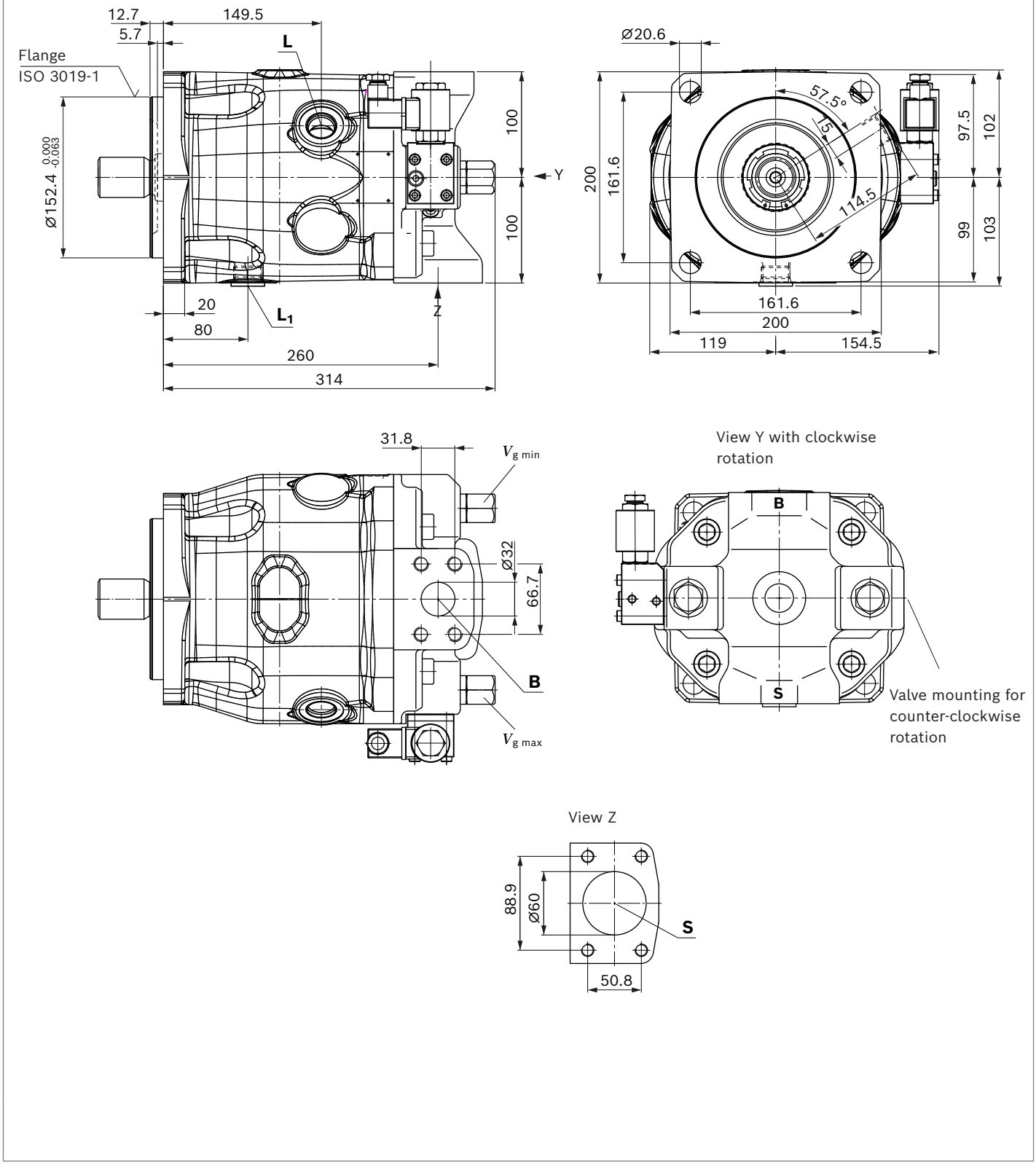
▼ **LAxD – Torque controller, hydraulic**
Port plate 22/32; clockwise rotation



1) To mounting flange

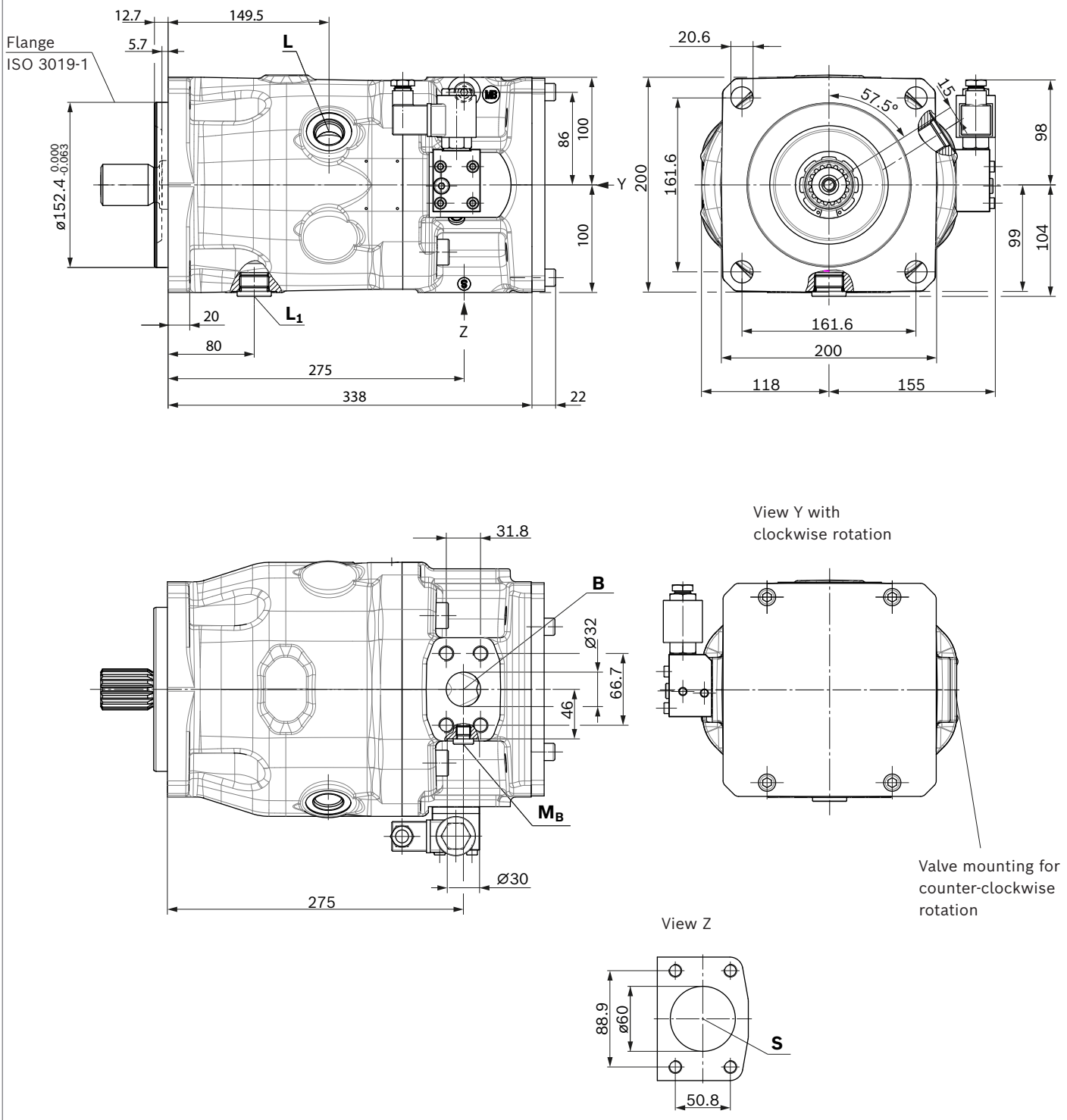
Dimensions A10VZO size 100

EZ3/4 – Two-point control electric, port plate 12, clockwise rotation



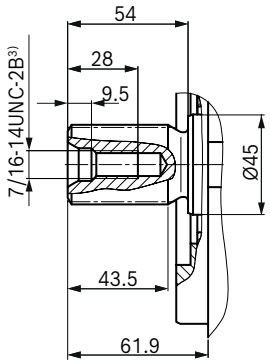
Dimensions A10VZO size 100

EZ3/4 – Two-point control electric, port plate 22/32, clockwise rotation



▼ **Splined shaft 1 1/2 in (38-4, ISO 3019-1)**

S – 17T 12/24DP[1)]

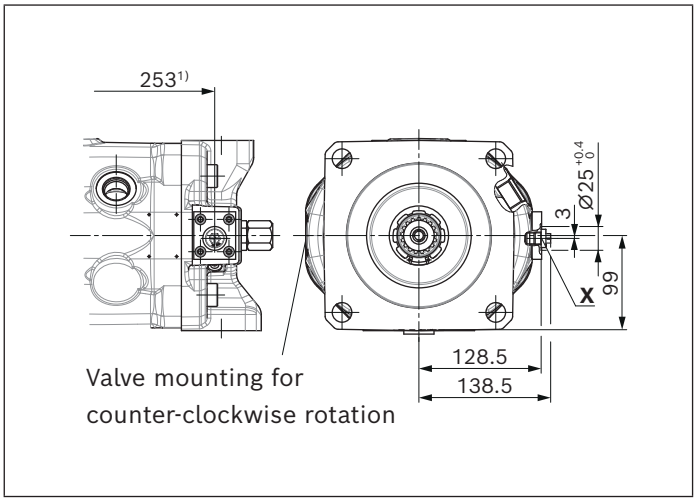


Connection table **A10VZO**

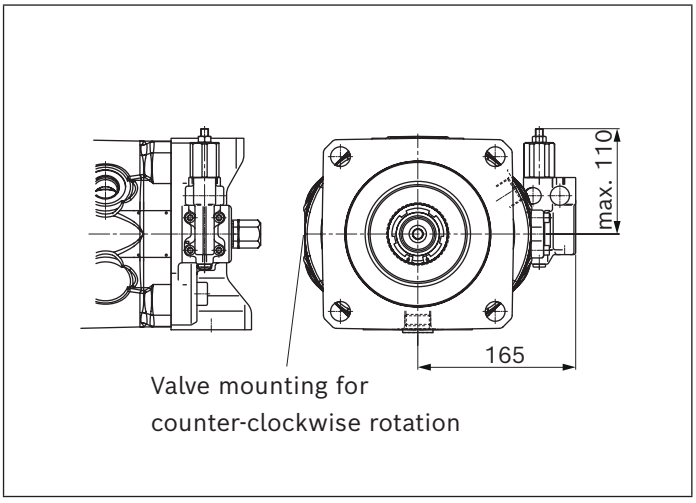
Ports		Standard	Size	p_{max} [bar][3)]	State[6)]
B	Working port (high-pressure series) Fastening thread	ISO 6162-2 DIN 13	1 1/4 in M14 × 2; 19 deep	350	O
S	Suction port (standard pressure series)	ISO 6162-1 DIN 13	2 1/2 in M12 × 1.75; 17 deep	10	O
L	Drain port	ISO 11926[4)]	1 1/16-12UNF-2B; 20 deep	2	O[5)]
L_1	Drain port	ISO 11926[4)]	1 1/16-12UNF-2B; 20 deep	2	X[5)]
X	Pilot pressure port with pressure controller, remotely controlled	ISO 11926	7/16-20UNF-2B; 11.5 deep	350	O
X	Pilot pressure with DG	DIN 3852-2[4)]	G1/4; 12 deep	315	O
M_B	Measuring port pressure in **B** only with port plates 22 and 32	DIN 3852-2[4)]	G1/4; 12 deep	350	X

1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Thread according to ASME B1.1
3) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
4) The countersink may be deeper than specified in the standard.
5) Depending on the installation position, **L** or **L_1** must be connected (also see installation instructions on page 127).
6) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

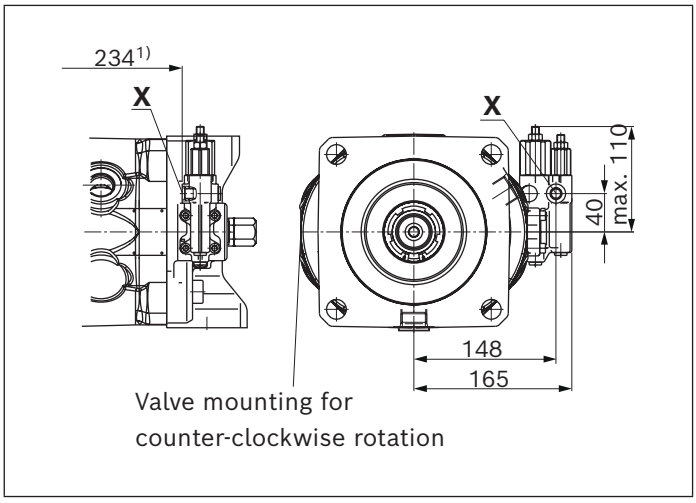
▼ **DG – Two-point control, direct operated, hydraulic**
Port plate 12; clockwise rotation



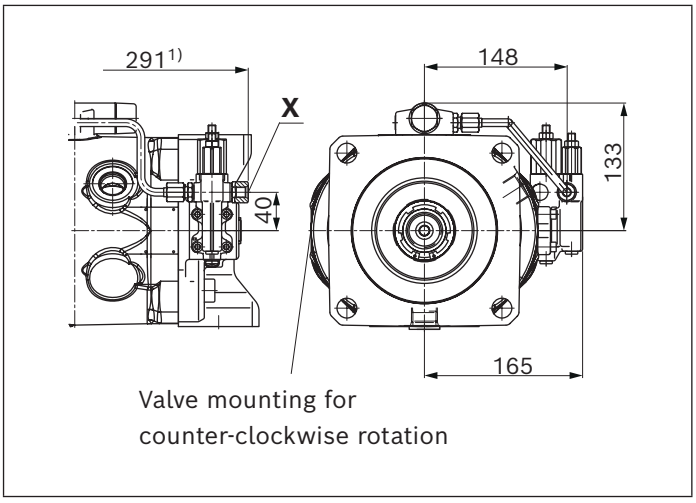
▼ **DR – Pressure controller, hydraulic**
Port plate 12; clockwise rotation



▼ **DRG – Pressure controller, remotely controlled, hydraulic**
Port plate 12; clockwise rotation

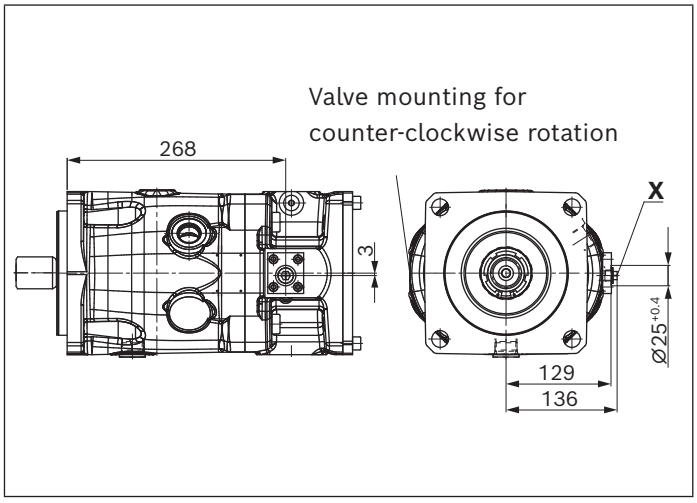


▼ **LAxD – Torque controller, hydraulic**
Port plate 12; clockwise rotation

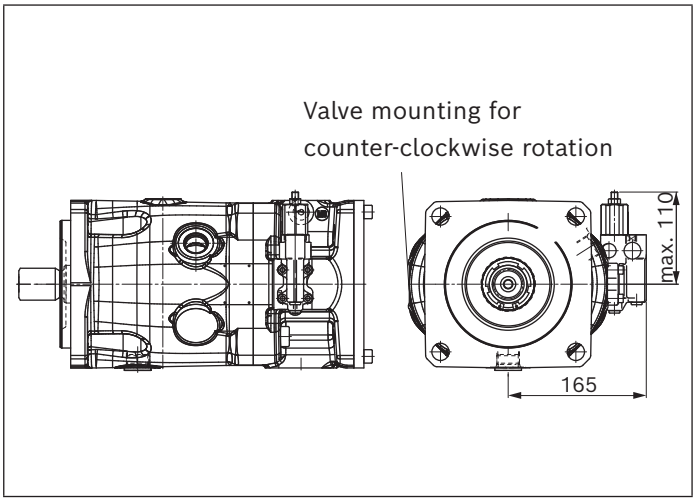


1) To mounting flange

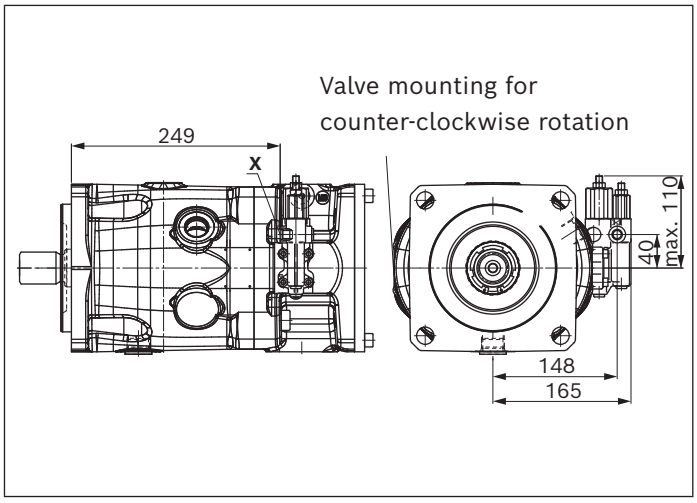
▼ **DG – Two-point control, direct operated, hydraulic**
Port plate 22/32; clockwise rotation



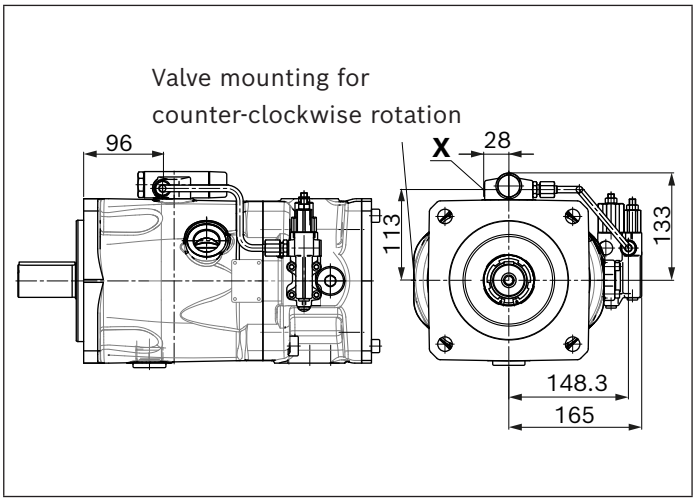
▼ **DR – Pressure controller, hydraulic**
Port plate 22/32; clockwise rotation



▼ **DRG – Pressure controller, remotely controlled, hydraulic**
Port plate 22/32; clockwise rotation

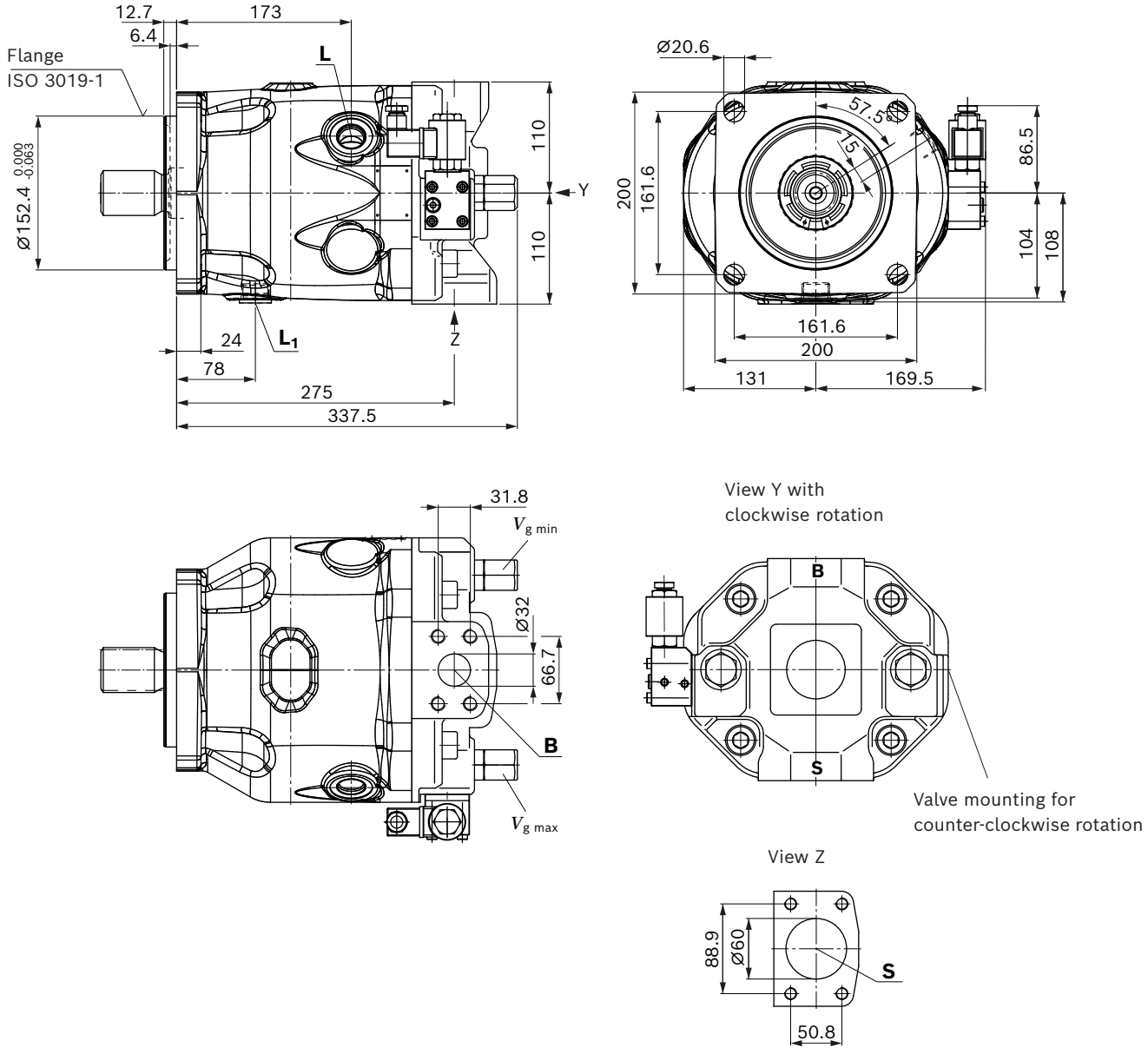


▼ **LAxD – Torque controller, hydraulic**
Port plate 22/32; clockwise rotation



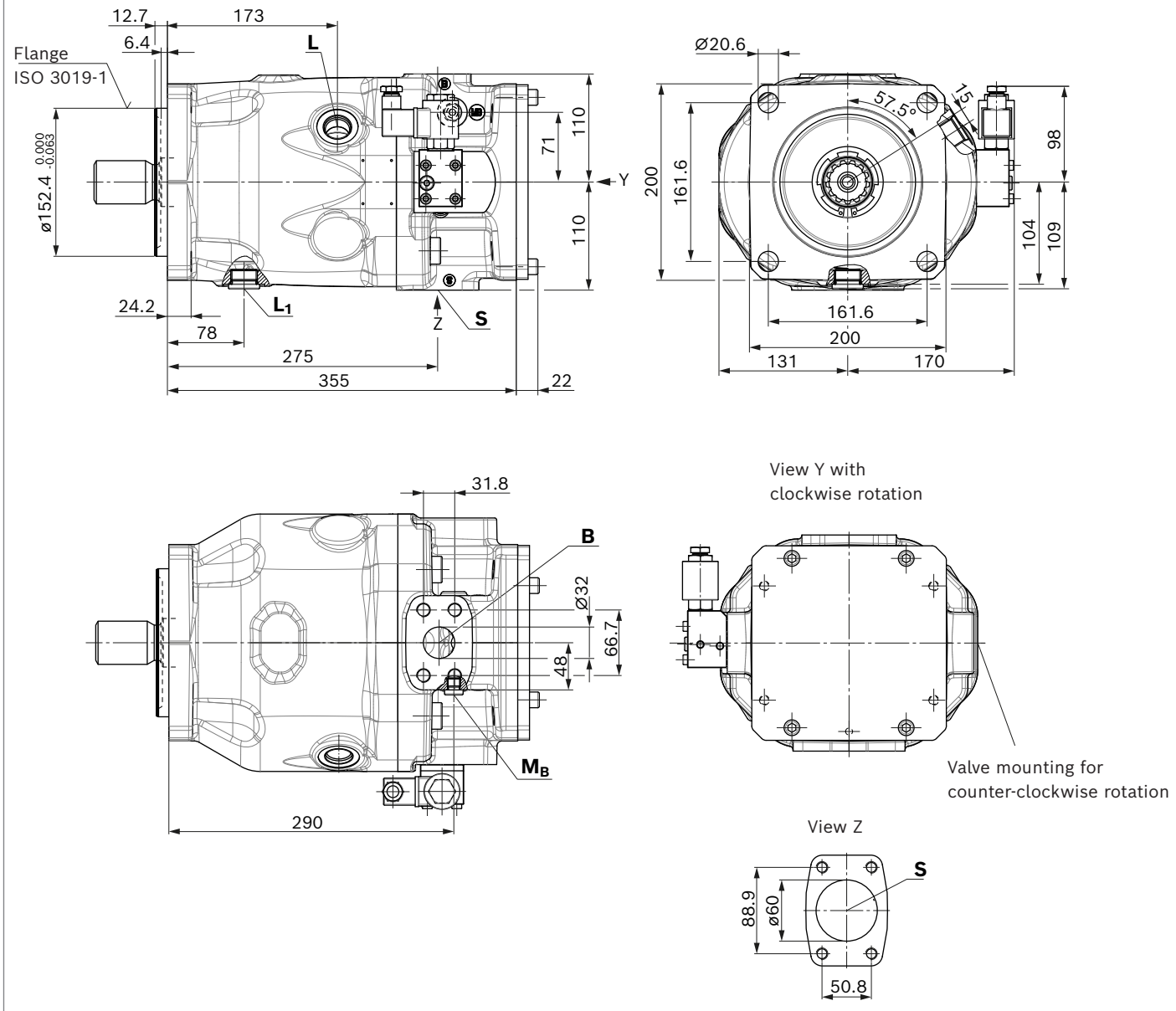
Dimensions A10VZO size 140

EZ3/4 – Two-point control electric, port plate 12, clockwise rotation



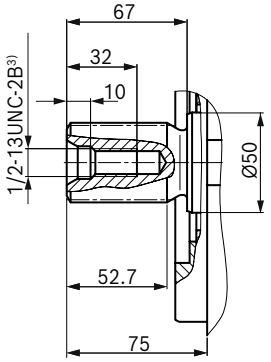
Dimensions A10VZO size 140

EZ3/4 – Two-point control electric, port plate 22/32, clockwise rotation



▼ **Splined shaft 1 3/4 in (44-4, ISO 3019-1)**

S – 13T 8/16DP[1)]

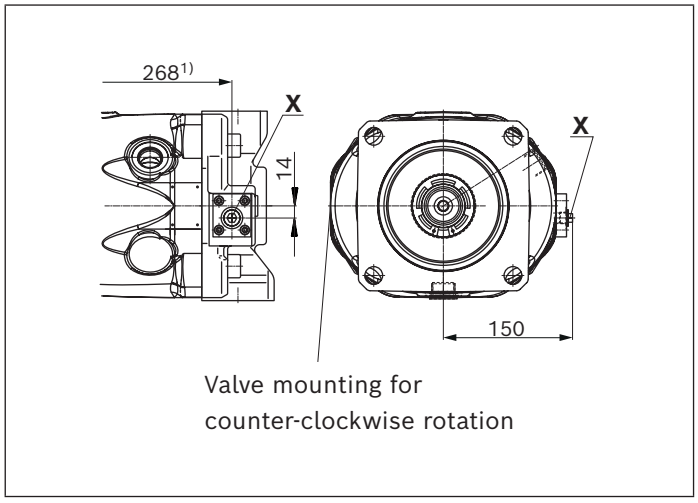


Connection table **A10VZO**

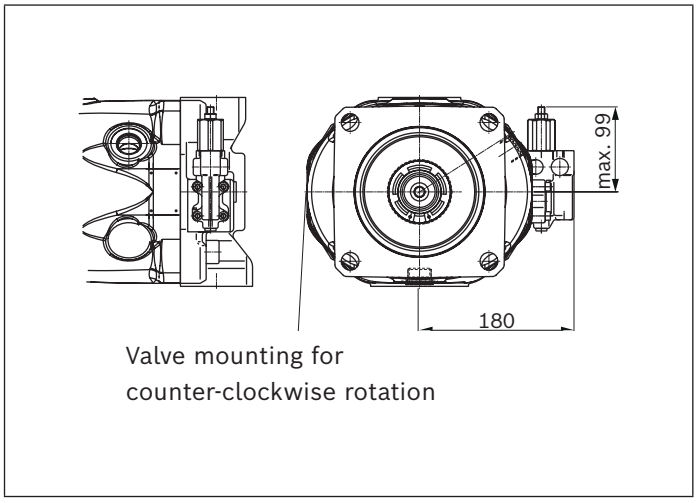
Ports		Standard	Size	p_{max} [bar][3)]	State[6)]
B	Working port (high-pressure series) Fastening thread	ISO 6162-2 DIN 13	1 1/4 in M14 × 2; 19 deep	350	O
S	Suction port (standard pressure series)	ISO 6162-1 DIN 13	2 1/2 in M12 × 1.75; 17 deep	10	O
L	Drain port	ISO 11926[4)]	1 1/16-12UNF-2B; 20 deep	2	O[5)]
L_1	Drain port	ISO 11926[4)]	1 1/16-12UNF-2B; 20 deep	2	X[5)]
X	Pilot pressure port with pressure controller, remotely controlled	ISO 11926	7/16-20UNF-2B; 11.5 deep	350	O
X	Pilot pressure with DG	DIN 3852-2[4)]	G1/4; 12 deep	315	O
M_B	Measuring port pressure in **B** only with port plates 22 and 32	DIN 3852-2[4)]	G1/4; 12 deep	350	X

1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Thread according to ASME B1.1
3) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
4) The countersink may be deeper than specified in the standard.
5) Depending on the installation position, **L** or **L_1** must be connected (also see installation instructions on page 127).
6) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

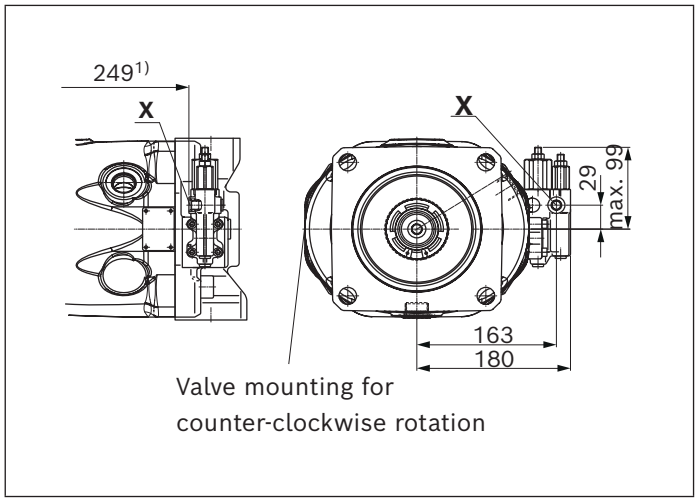
▼ **DG – Two-point control, direct operated, hydraulic**
Port plate 12; clockwise rotation



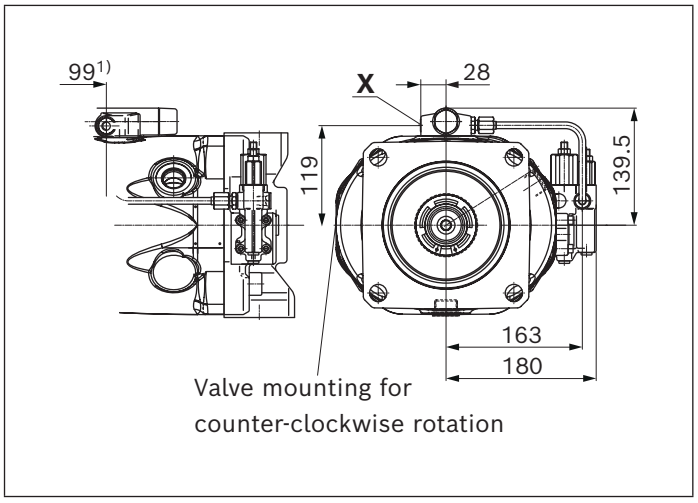
▼ **DR – Pressure controller, hydraulic**
Port plate 12; clockwise rotation



▼ **DRG – Pressure controller, remotely controlled, hydraulic**
Port plate 12; clockwise rotation

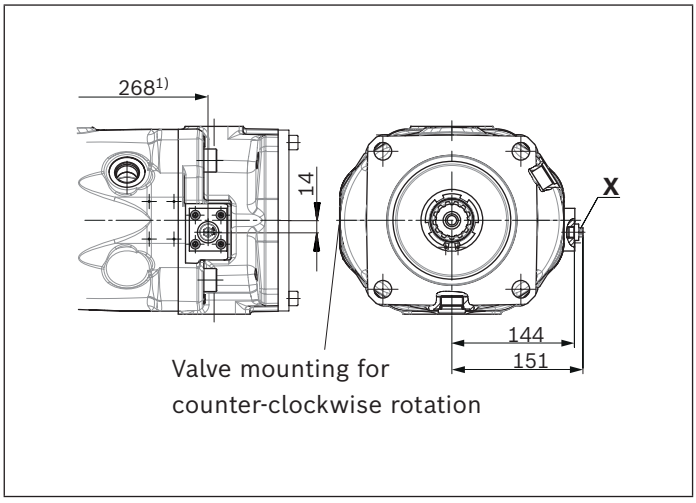


▼ **LAxD – Torque controller, hydraulic**
Port plate 12; clockwise rotation

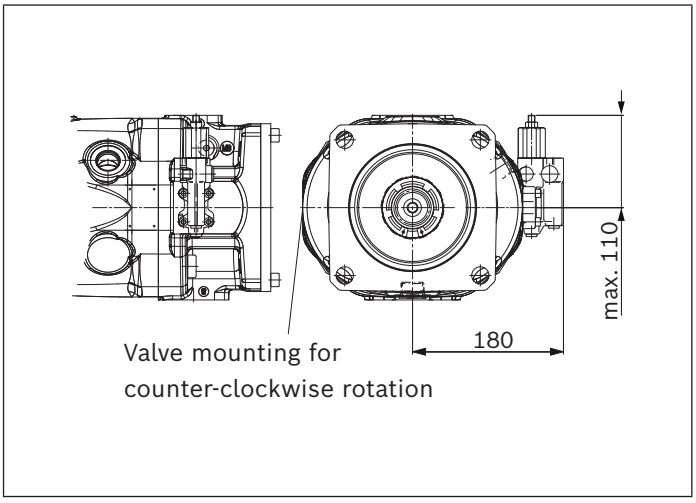


1) To mounting flange

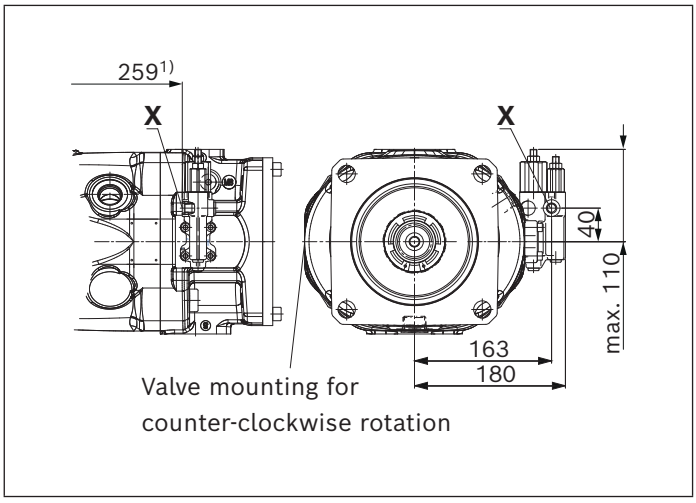
▼ **DG – Two-point control, direct operated, hydraulic**
Port plate 22/32; clockwise rotation



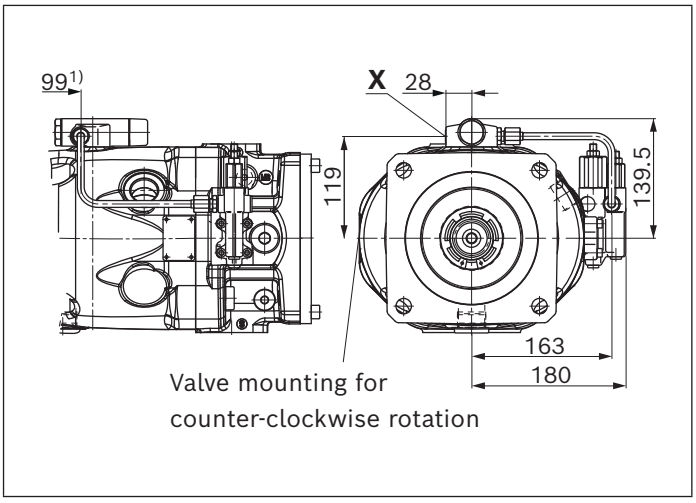
▼ **DR – Pressure controller, hydraulic**
Port plate 22/32; clockwise rotation



▼ **DRG – Pressure controller, remotely controlled, hydraulic**
Port plate 22/32; clockwise rotation



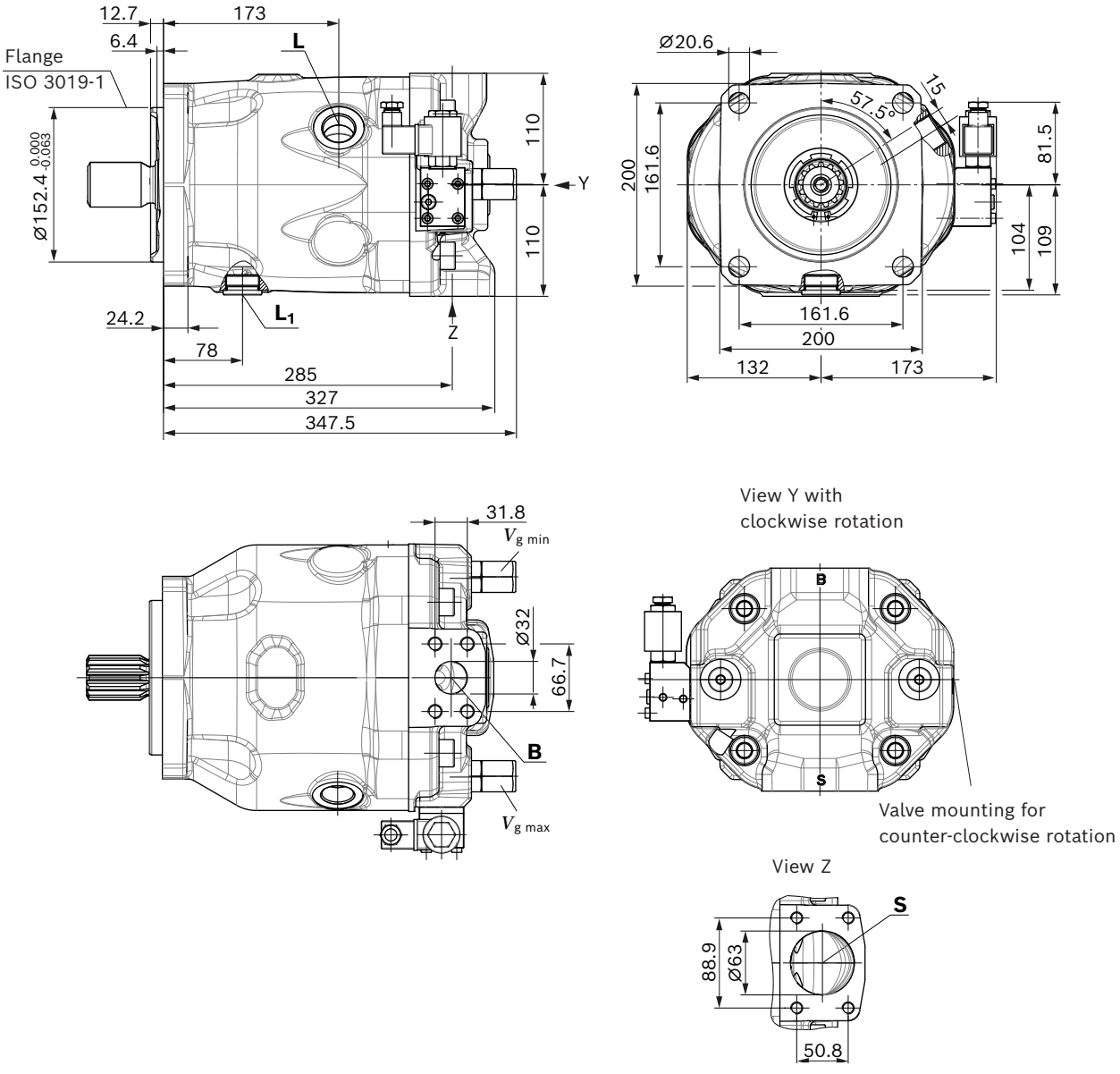
▼ **LAxD – Torque controller, hydraulic**
Port plate 22/32; clockwise rotation



1) To mounting flange

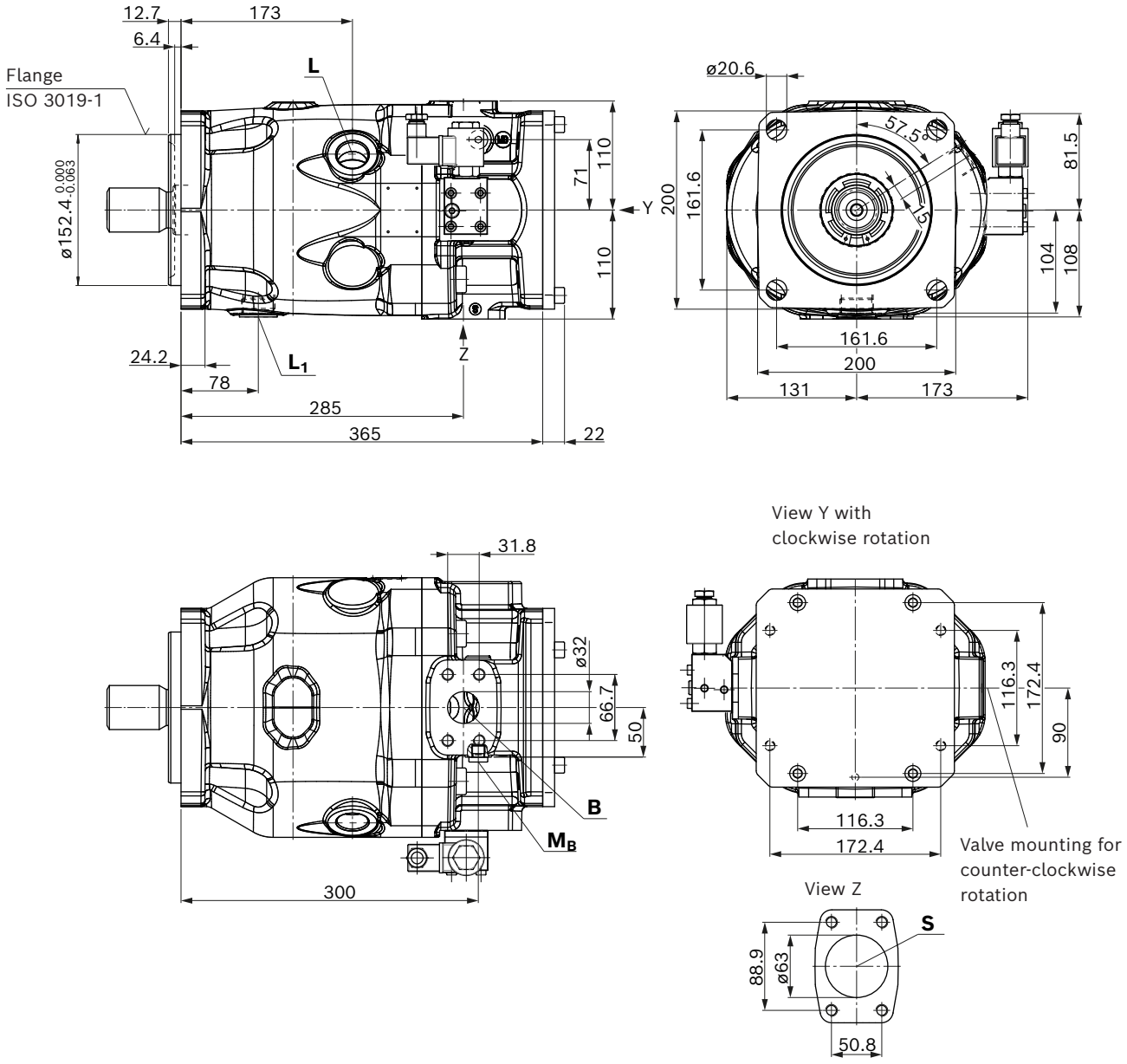
Dimensions A10VZO size 180

EZ3/4 – Two-point control electric, port plate 12, clockwise rotation



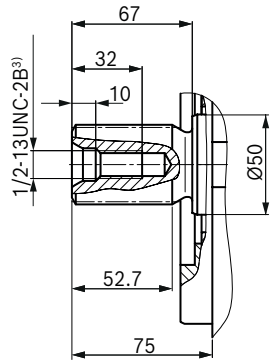
Dimensions A10VZO size 180

EZ3/4 – Two-point control electric, port plate 22/32, clockwise rotation



▼ **Splined shaft 1 3/4 in (44-4, ISO 3019-1)**

S – 13T 8/16DP[1)]



Connection table **A10VZO**

Ports		Standard	Size	p_{max} [bar][3)]	State[6)]
B	Working port (high-pressure series) Fastening thread	ISO 6162-2 DIN 13	1 1/4 in M14 × 2; 19 deep	350	O
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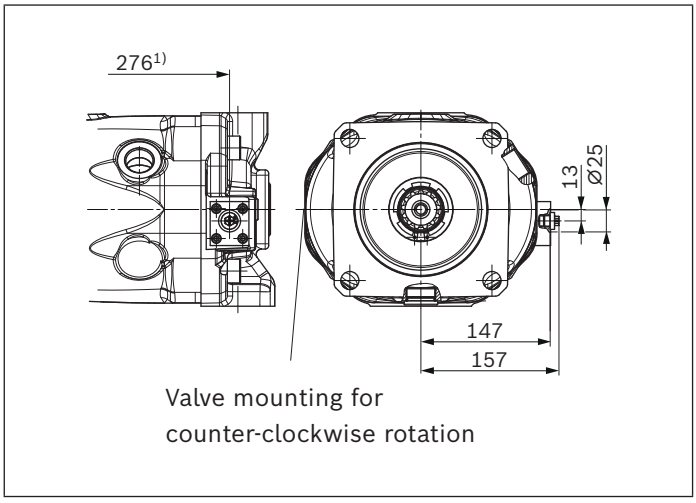
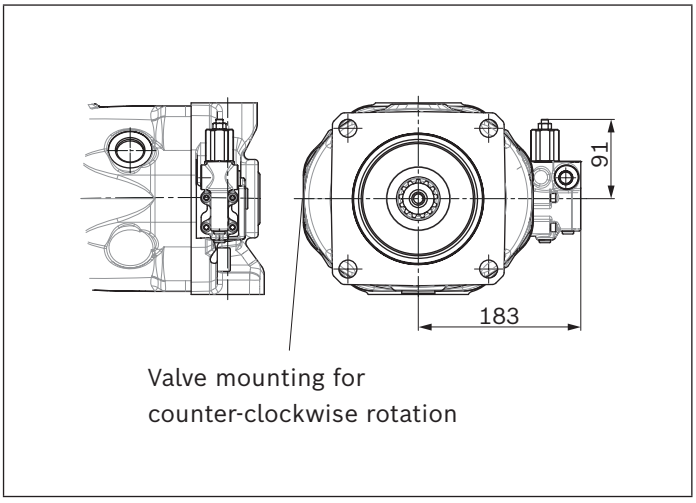
L	Drain port	ISO 11926[4)]	1 5/16-12UNF-2B; 20 deep	2	O[5)]
L_1	Drain port	ISO 11926[4)]	1 5/16-12UNF-2B; 20 deep	2	X[5)]
X	Pilot pressure port with pressure controller, remotely controlled	ISO 11926	7/16-20UNF-2B; 11.5 deep	350	O
X	Pilot pressure with DG	DIN 3852-2[4)]	G1/4; 12 deep	315	O
M_B	Measuring port pressure in **B** only with port plates 22 and 32	DIN 3852-2[4)]	G1/4; 12 deep	350	X

1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Thread according to ASME B1.1
3) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
4) The countersink may be deeper than specified in the standard.
5) Depending on the installation position, **L** or **L_1** must be connected (also see installation instructions on page 127).
6) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

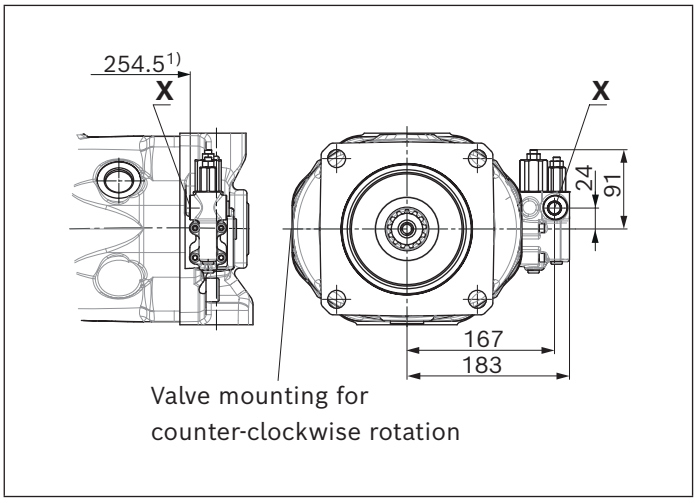
▼ **DG – Two-point control, direct operated, hydraulic**
Port plate 12; clockwise rotation



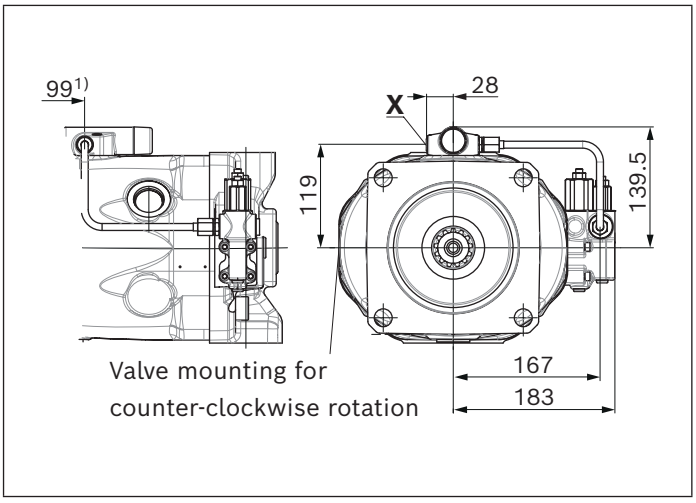
▼ **DR – Pressure controller, hydraulic**
Port plate 12; clockwise rotation



▼ **DRG – Pressure controller, remotely controlled, hydraulic**
Port plate 12; clockwise rotation

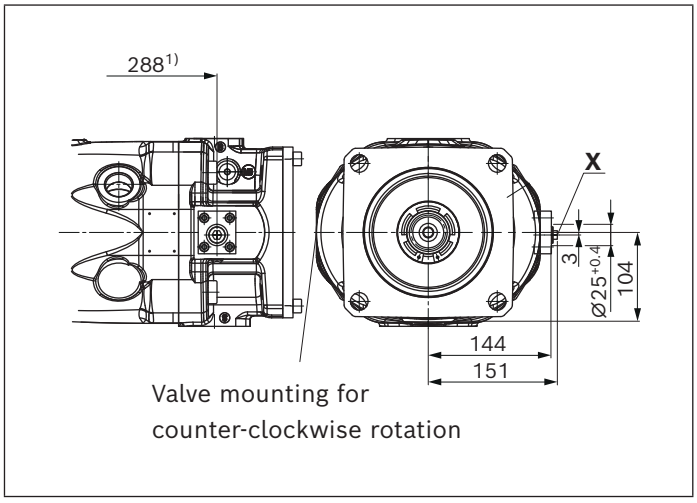


▼ **LAxD – Torque controller, hydraulic**
Port plate 12; clockwise rotation

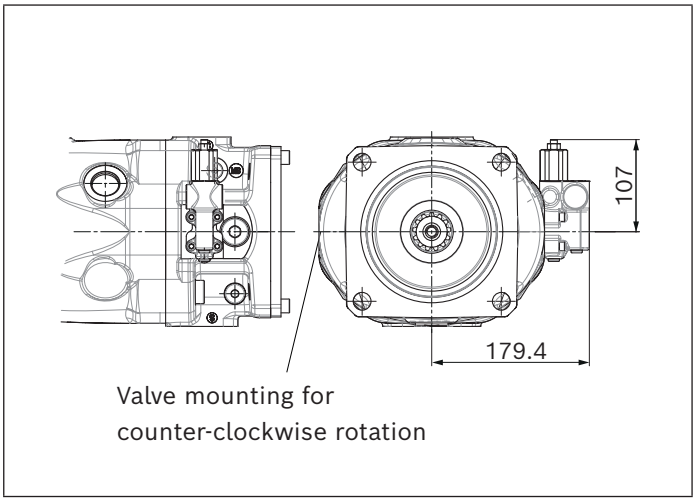


1) To mounting flange

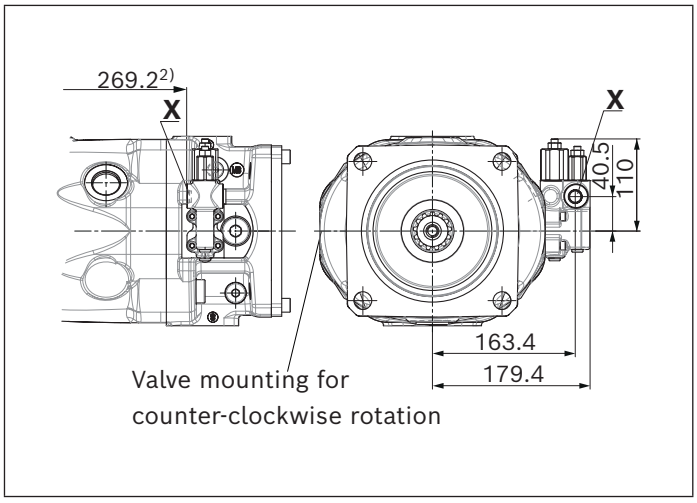
▼ **DG – Two-point control, direct operated, hydraulic**
Port plate 22/32; clockwise rotation



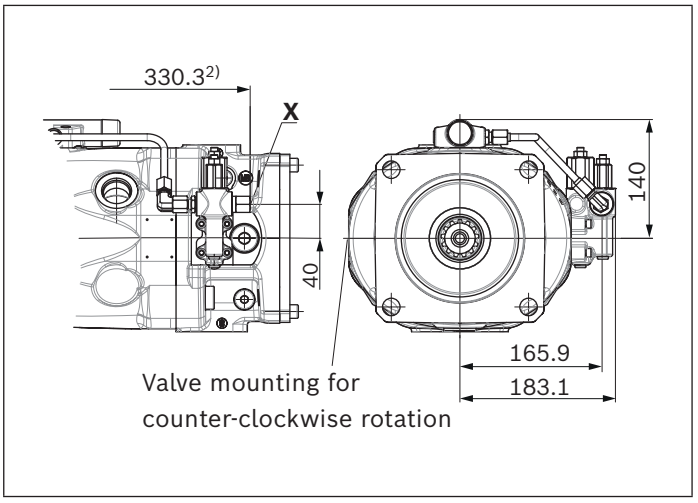
▼ **DR – Pressure controller, hydraulic**
Port plate 22/32; clockwise rotation



▼ **DRG – Pressure controller, remotely controlled, hydraulic**
Port plate 22/32; clockwise rotation



▼ **LAxD – Torque controller, hydraulic**
Port plate 22/32; clockwise rotation

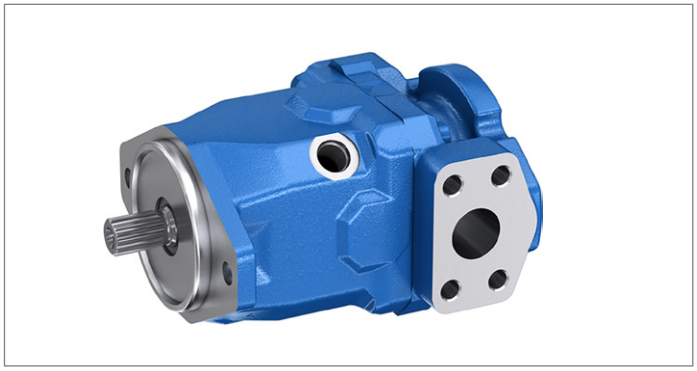


1) To mounting flange

RE 91485/2021-11-11
Replaces: 10.2016

rexroth
A Bosch Company

Axial piston fixed displacement unit A10FZG



- Suitable for variable-speed operation with synchronous and asynchronous motors
- Sizes 3 to 63
- Nominal pressure 315 bar
- Maximum pressure 350 bar
- Open and closed circuits

Features

- For use in one-, two- or four-quadrant operation
- Suitable for start/stop operation
- Suitable for long pressure holding operation
- Well-tried A10 rotary group technology
- Through drive possibility

Product description

The proven axial piston units from the A10 product family have now been further developed for use in speed-controlled drives. They are approved for start/stop operation and designed for a changing direction of rotation. Even at the lowest rotational speed between 0 and 200 rpm, they provide a constant pressure and offer extremely high efficiency in pressure holding operation. The A10FZG units can be used as a pump in one, two and four-quadrant operation.

Contents

Type code A10FZG

01	02	03	04		05	06		07	08	09	10	11
A10F	**Z**	**G**		**/**	**10**	**W**	**–**	**V**		**C**	**02**	

Axial piston unit

01	Swashplate design, fixed, nominal pressure 315 bar, maximum pressure 350 bar	**A10F**

Application area

02	Variable-speed drives	**Z**

Operating mode

03	Pump, open and closed circuit	**G**

Size (NG) Geometric displacement, see table of values on page 66 and 67

04	Superordinate sizes	**010**	**018**	**028**	**063**
	Other available intermediate sizes	003, 006, 008	012, 014, 016	021, 022, 023, 025, 026, 027	051, 058

Series

		010 ... 063	
05	Series 1, index 0	●	**10**

Direction of rotation

			010 ... 063	
06	Viewed on drive shaft	variable	●	**W**

Sealing material

		010 ... 063	
07	FKM (fluorocarbon rubber)	●	**V**

Drive shaft

08	Splined shaft ISO 3019-1	Standard shaft	●	–	–	–	**S**
		similar to shaft "S" however for higher torque	–	●	●	●	**R**

Mounting flange

		010 ... 063	
09	ISO 3019-1 (SAE)	●	**C**

Working port

		010 ... 063	
10	SAE flange ports ISO 6162 **A** and **B**, opposite sides, metric fastening thread	●	**02**

Through drive (for mounting options, see page 124)

11	For flange ISO 3019-1		Hub for splined shaft[2]					
	Diameter	Anbau[1]	Diameter		**010**	**018**	**028**	**063**	
	without through drive				●	●	●	●	**N00**
	82-2 (A)	○○	5/8 in	9T 16/32DP	●	●	●	●	**K01**
		○○	3/4 in	11T 16/32DP	●	●	●	●	**K52**
	101-2 (B)	○○	7/8 in	13T 16/32DP	–	–	●	●	**K68**
		○○	1 in	15T 16/32DP	–	–	–	●	**K04**
		○○	1 1/4 in	14T 12/24DP	–	–	–	●	**K06**

● = Available ○ = On request – = Not available

Notes

- Note the project planning notes on page 129.
- In addition to the type code, please specify the relevant technical data when placing your order.

1) Mounting holes pattern viewed from through drive
2) Splined shaft according to ANSI B92.1a (splined shafts according to ISO 3019-1)

Preferred program A10FZG

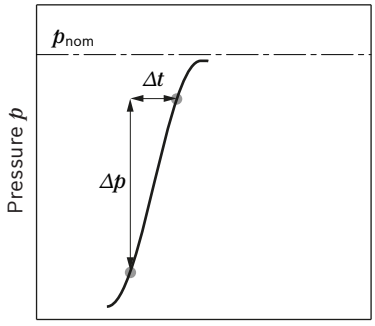
Overview of common configurations

Typ	Material number
A A10FZG003/10W-VSC02N00	R902544378
A A10FZG006/10W-VSC02N00	R902544475
A A10FZG008/10W-VSC02N00	R902544393
A A10FZG010/10W-VSC02N00	R902544389
A A10FZG012/10W-VRC02N00	R902530960
A A10FZG014/10W-VRC02N00	R902530961
A A10FZG016/10W-VRC02N00	R902530962
A A10FZG018/10W-VRC02N00	R902530963
A A10FZG021/10W-VRC02N00	R902536290
A A10FZG022/10W-VRC02N00	R902557896
A A10FZG023/10W-VRC02N00	R902557897
A A10FZG025/10W-VRC02N00	R902557898
A A10FZG026/10W-VRC02N00	R902557899
A A10FZG027/10W-VRC02N00	R902557900
A A10FZG028/10W-VRC02N00	R902534818
A A10FZG063/10W-VRC02N00	R902551150

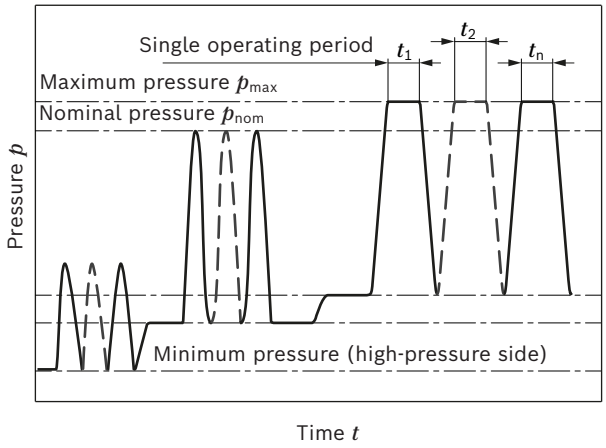
Working pressure range A10FZG

Pressure at working port B or A			Definition
Nominal pressure p_{nom}		315 bar	The nominal pressure corresponds to the maximum design pressure.
Maximum pressure p_{max}		350 bar	The maximum pressure corresponds to the maximum working pressure within a single operating period. The sum of single operating periods must not exceed the total operating period.
	Single operating period	2.0 ms	
	Total operating period	300 h	
Rate of pressure change $R_{A\,max}$		16000 bar/s	Maximum permissible speed of pressure build-up and reduction during a pressure change across the entire pressure range.
Pressure at port A or B (low-pressure side)			
Minimum pressure p_{min}	Standard	0.8 bar absolute	Minimum pressure on the low-pressure side **A** or **B** (depending on direction of rotation) that is required in order to prevent damage to the axial piston unit. The minimum pressure depends on the rotational speed and displacement of the axial piston unit.
Summation pressure			
			The sum of the pressures on ports **A** and **B** must not rise above 400 bar.
Case pressure at port L			
Maximum pressure $p_{L\,max}$		2 bar absolute[1)]	Maximum 0.5 bar higher than inlet pressure at low pressure port **A** or **B** (depending on direction of rotation) , but not higher than $p_{L\,max}$. A drain line to the reservoir is required.

▼ **Rate of pressure change $R_{A\,max}$**



▼ **Pressure definition**



Total operating period = $t_1 + t_2 + \ldots + t_n$

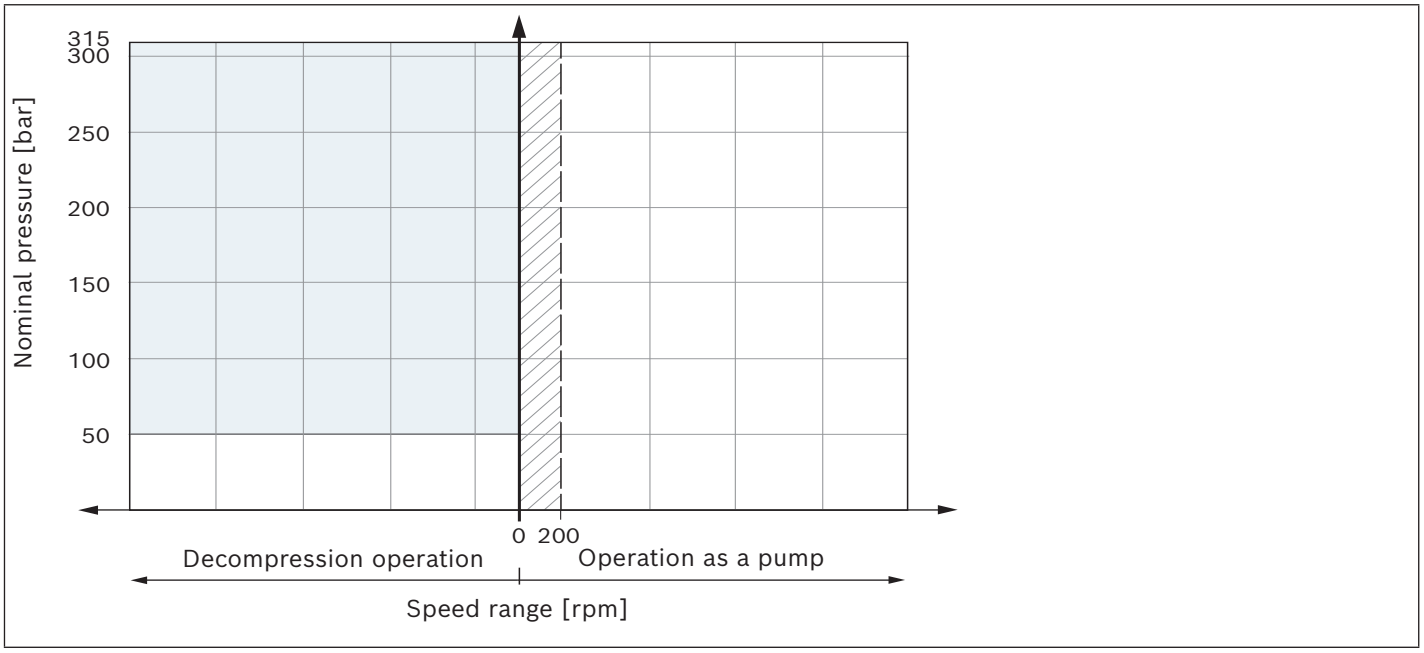
Notice
Working pressure range applies when using hydraulic fluids based on mineral oils. Please contact us for values for other hydraulic fluids.

Flow direction

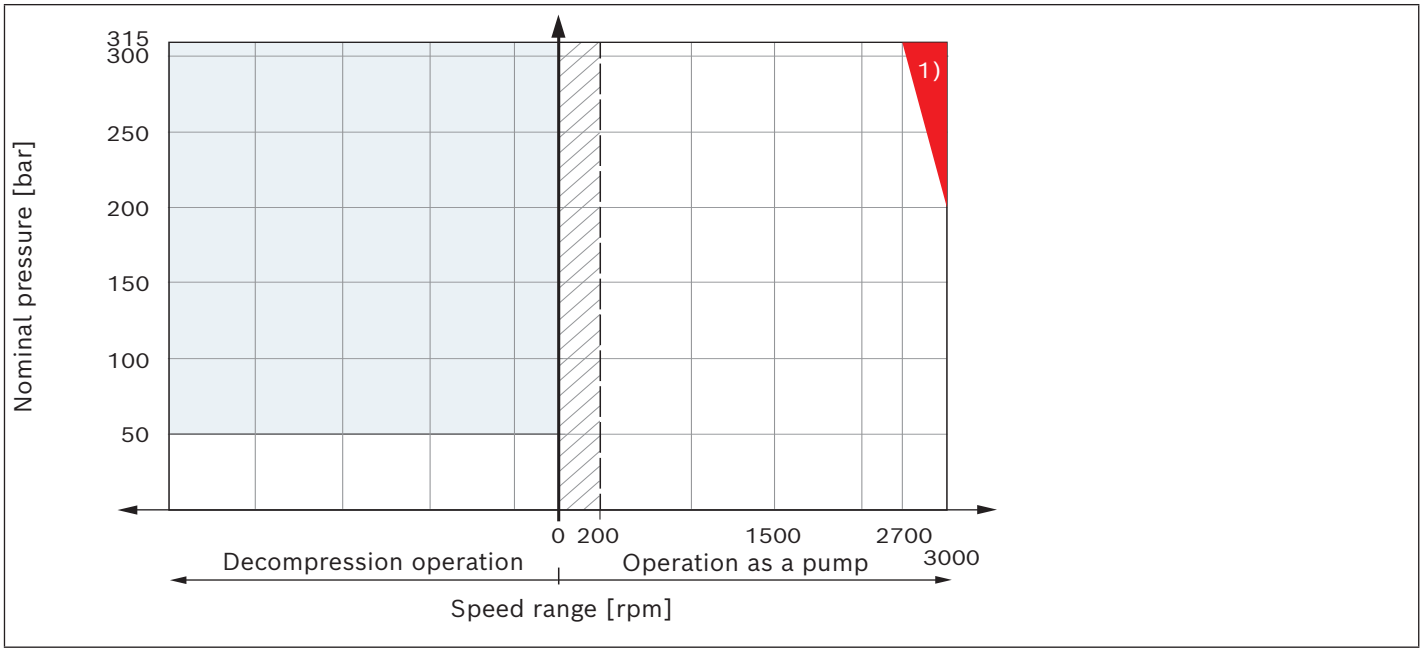
Direction of rotation, viewed on drive shaft	Direction of rotation	Flow
Type code "**W**"	Clockwise	**A** to **B**
	Counter-clockwise	**B** to **A**

1) Higher values on request

A10FZG 003 to 018: Permissible operating data and operating ranges at $V_{g\ max}$



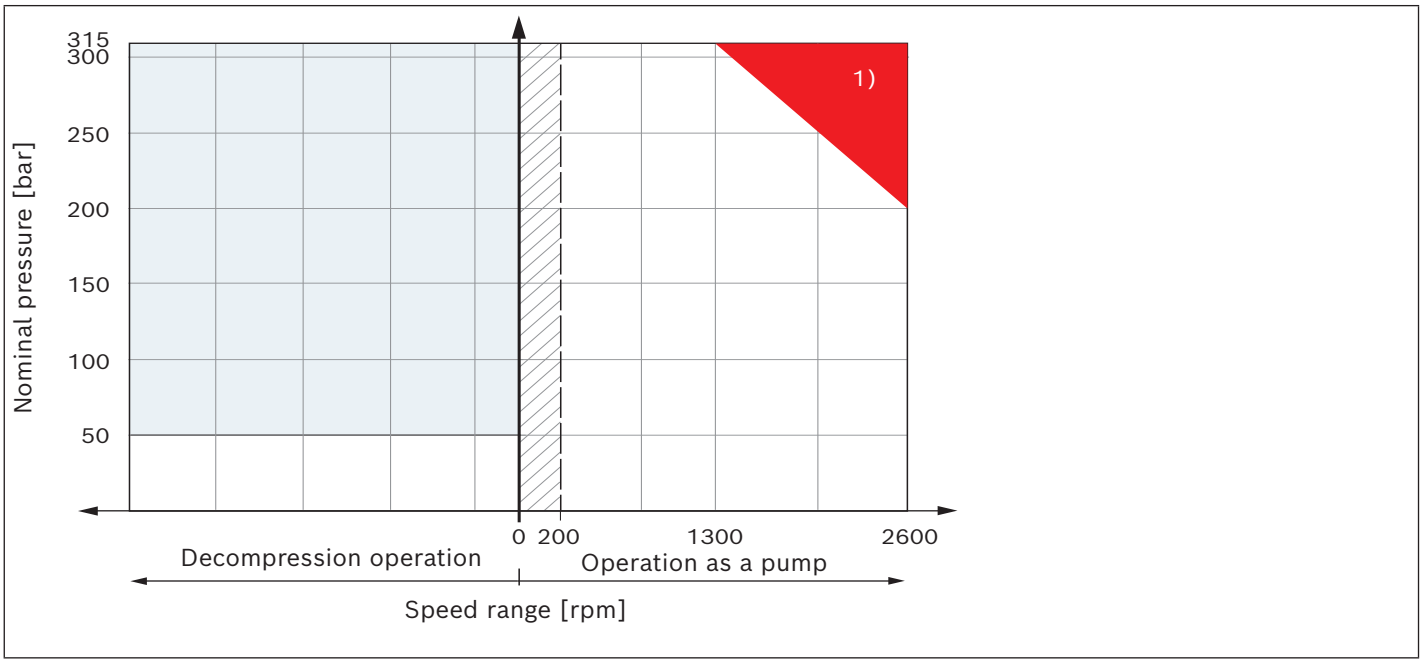
A10FZG 028: Permissible operating data and operating ranges at $V_{g\ max}$



Operating range
Operation without restriction
Permissible with single operating period t ≤ 3 min; maximum cycle share 80%. For longer time periods t > 3 min, please use A10VZG.
Operation as a motor possible with restrictions, please contact us. Permissible for short-term decompression operation t ≤ 200 ms

1) This range may only be operated at an inlet pressure of 2.5 bar absolute at port **A**/**B**.

A10FZG 063: Permissible operating data and operating ranges at $V_{g\ max}$



Operating range
Operation without restriction
Permissible with single operating period t ≤ 3 min; maximum cycle share 80%. For longer time periods t > 3 min, please use A10VZG.
Operation as a motor possible with restrictions, please contact us. Permissible for short-term decompression operation t ≤ 200 ms

1) This range may only be operated at an inlet pressure of 2.5 bar absolute at port **A**/**B**.

Technical data A10FZG size 3 to 18

Superordinate size		**NG**		**10**				**18**			
Available intermediate sizes		**NG**		**3**	**6**	**8**	**10**	**12**	**14**	**16**	**18**
Geometric displacement, per revolution		$V_{g\,max}$	cm^3	3	6	8.1	10.6	12	14	16	18
Maximum rotational speed[1]	at $V_{g\,max}$										
Suction speed operation as a pump[1]		n_{nom}	rpm	3600				3300			
Max. rotational speed decompression operation[2]		n_{nom}	rpm	3600				3300			
Flow	at n_{nom} and $V_{g\,max}$	q_v	l/min	10.8	21.6	29	38.2	39.6	46.2	52.8	59.4
Power Operation as a pump	at n_{nom}, $V_{g\,max}$ and Δp = 315 bar	P	kW	5.6	11.3	15.3	20	21	24.2	27.7	31.2
Torque	at $V_{g\,max}$ and Δp = 315 bar	M	Nm	15	30	40.5	53	60.2	70.2	80.2	90.3
	at $V_{g\,max}$ and Δp = 100 bar	M	Nm	5	9.5	12.7	16.8	19.1	22.3	25.5	28.7
Rotary stiffness Drive shaft	S	c	Nm/rad	9200				–			
	R	c	Nm/rad	–				14800			
Moment of inertia of the rotary group		J_{TW}	kgm^2	0.0006				0.0009			
Maximum angular acceleration[2][3]		α	rad/s^2	14000				12600			
Case volume		V	l	0.11				0.19			
Weight (approx.)		m	kg	9				10			

Determination of the characteristics				
Flow	$q_v = \frac{V_g \times n \times \eta_v}{1000}$			[l/min]
Torque	$M = \frac{V_g \times \Delta p}{20 \times \pi \times \eta_{hm}}$			[Nm]
Power	$P = \frac{2\pi \times M \times n}{60000}$	=	$\frac{q_v \times \Delta p}{600 \times \eta_t}$	[kW]

Key

V_g Displacement per revolution [cm^3]
Δp Differential pressure [bar]
n Rotational speed [rpm]
η_v Volumetric efficiency
η_{hm} Hydraulic-mechanical efficiency
η_t Total efficiency ($\eta_t = \eta_v \times \eta_{hm}$)

Notice

- Theoretical values, without efficiency and tolerances; values rounded
- Operation above the maximum values or below the minimum values may result in a loss of function, a reduced service life or in the destruction of the axial piston unit. We recommend checking loads through tests or calculation/simulation and comparing them with the permissible values.

1) The values are applicable:
– at an absolute pressure $p_{abs} \geq 1$ bar at the low-pressure side (input)
– for the optimum viscosity range from v_{opt} = 36 to 16 mm^2/s
– with hydraulic fluid based on mineral oils
2) Higher values on request
3) The limit value is only valid for a single pump, multiple pump version available on request. The load capacity of the connection parts must be considered.

Technical data A10FZG size 21 to 63

Superordinate size		**NG**					**28**				**63**		
Available intermediate sizes		**NG**		**21**	**22**	**23**	**25**	**26**	**27**	**28**	**51**	**58**	**63**
Geometric displacement, per revolution		$V_{g\,max}$	cm^3	21	22	23	25	26	27	28	51	58	63
Maximum rotational speed[1]	at $V_{g\,max}$												
Suction speed operation as a pump[1]		n_{nom}	rpm	3000					3000		2600		
Max. rotational speed decompression operation[2]		n_{nom}	rpm	3000					3000		2600		
Flow	at n_{nom} and $V_{g\,max}$	q_v	l/min	63	66	69	75	78	81	84	133	151	164
Power Operation as a pump	at n_{nom}, $V_{g\,max}$ and Δp = 315 bar	P	kW	33	34	36.3	39	41	42	44	70	79	86
Torque	at $V_{g\,max}$ and Δp = 315 bar	M	Nm	105	110	116	125	130.4	135	140.4	256	291	316
	at $V_{g\,max}$ and Δp = 100 bar	M	Nm	33.4	35	36.6	40	41.4	43	44.6	81	92	100
Rotary stiffness Drive shaft	S	c	Nm/rad	–					–		–		
	R	c	Nm/rad	26300					26300		69400		
Moment of inertia of the rotary group		J_{TW}	kgm^2	0.0017					0.0017		0.0056		
Maximum angular acceleration[2][3]		α	rad/s^2	11200					11200		8000		
Case volume		V	l	0.6					0.6		0.8		
Weight (approx.)		m	kg	15.5					15.5		26		

Determination of the characteristics				
Flow	$q_v = \frac{V_g \times n \times \eta_v}{1000}$			[l/min]
Torque	$M = \frac{V_g \times \Delta p}{20 \times \pi \times \eta_{hm}}$			[Nm]
Power	$P = \frac{2 \pi \times M \times n}{60000}$	=	$\frac{q_v \times \Delta p}{600 \times \eta_t}$	[kW]

Key

V_g Displacement per revolution [cm^3]
Δp Differential pressure [bar]
n Rotational speed [rpm]
η_v Volumetric efficiency
η_{hm} Hydraulic-mechanical efficiency
η_t Total efficiency ($\eta_t = \eta_v \times \eta_{hm}$)

Notice

- Theoretical values, without efficiency and tolerances; values rounded
- Operation above the maximum values or below the minimum values may result in a loss of function, a reduced service life or in the destruction of the axial piston unit. We recommend checking loads through tests or calculation/simulation and comparing them with the permissible values.

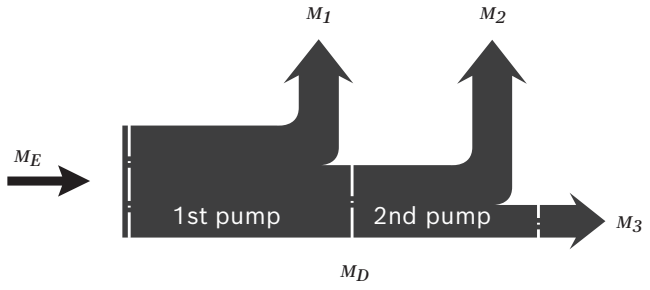
Additional information about inlet pressure and rotational speed can be found on page 33

1) The values are applicable:
– at an absolute pressure $p_{abs} \geq 1$ bar at the low-pressure side (input)
– for the optimum viscosity range from v_{opt} = 36 to 16 mm^2/s
– with hydraulic fluid based on mineral oils
2) Higher values on request
3) The limit value is only valid for a single pump, multiple pump version available on request. The load capacity of the connection parts must be considered.

Permissible inlet and through-drive torques

Superordinate size				10	18	28	63
Torque at $V_{g\,max}$ and Δp = 315 bar[1)]		M_{max}	Nm	For values of the individual sizes, see table of values on page 81 and 82			
Max. input torque on drive shaft[2)]	S	$M_{E\,max}$	Nm	126	–	–	–
		Ø	in	3/4	–	–	–
	R	$M_{E\,max}$	Nm	–	160	250	650
		Ø	in	–	3/4	7/8	1 1/4
Maximum through-drive torque	S	$M_{D\,max}$	Nm	41	–	–	–
	R	$M_{D\,max}$	Nm	–	92	127	480

▼ **Distribution of torques**

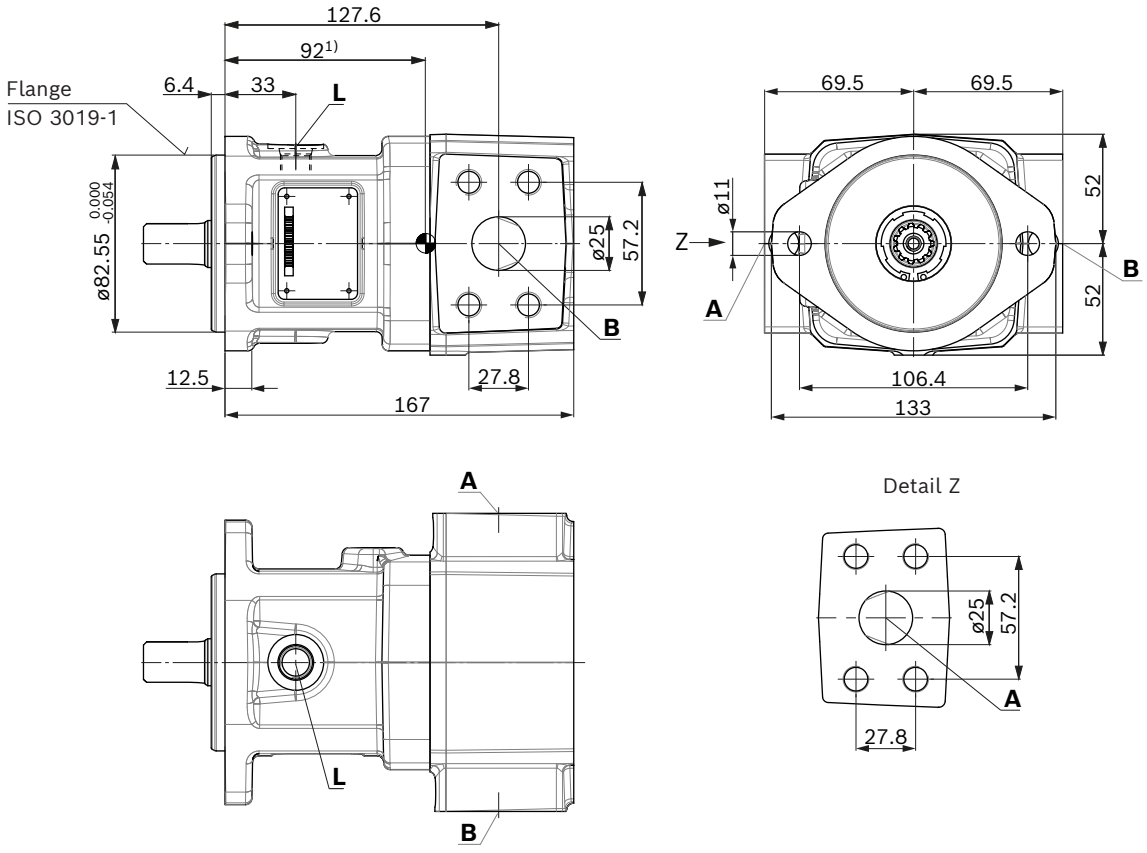


Torque at 1st pump	M_1		
Torque at 2nd pump	M_2		
Torque at 3rd pump	M_3		
Input torque	M_E	=	$M_1 + M_2 + M_3$
	M_E	<	$M_{E\,max}$
Through-drive torque	M_D	=	$M_2 + M_3$
	M_D	<	$M_{D\,max}$

1) Efficiency not considered
2) For drive shafts free of radial force

Dimensions A10FZG sizes 3 to 10

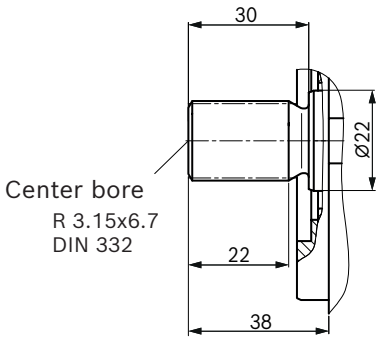
Direction of rotation changing (flow direction see table page 78)



1) Center of gravity

▼ **Splined shaft 3/4 in (19-4, ISO 3019-1)**

S – 11T 16/32DP[1)]



Connection table **A10FZG**

Ports		Standard	Size	$p_{max\ absolute}$ [bar][2)]	State[4)]
A/B	Working port (high-pressure series) Fastening thread	ISO 6162-2 DIN 13	1 in M12 × 1.75; 17 deep	350	O
L	Drain port	DIN 11926[3)]	9/16-18UNF-2B; 13 deep	2	O

1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5

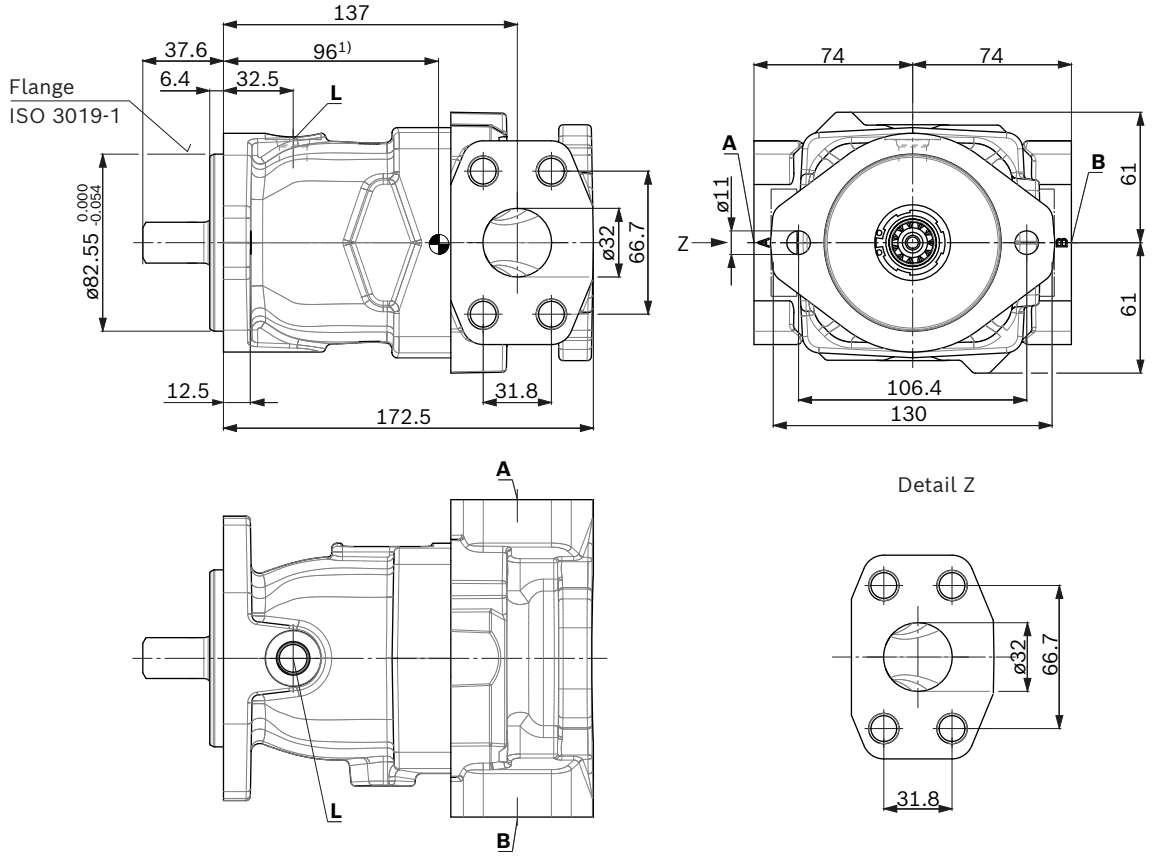
2) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.

3) The countersink may be deeper than specified in the standard.

4) O = Must be connected (plugged on delivery)

Dimensions A10FZG sizes 12 to 18

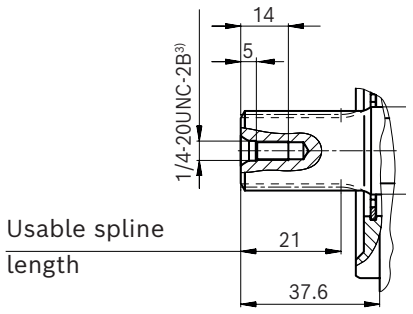
Direction of rotation changing (flow direction see table page 78)



1) Center of gravity

▼ **Splined shaft 3/4 in (similar to ISO 3019-1)**

R – 11T 16/32DP[1)2)]



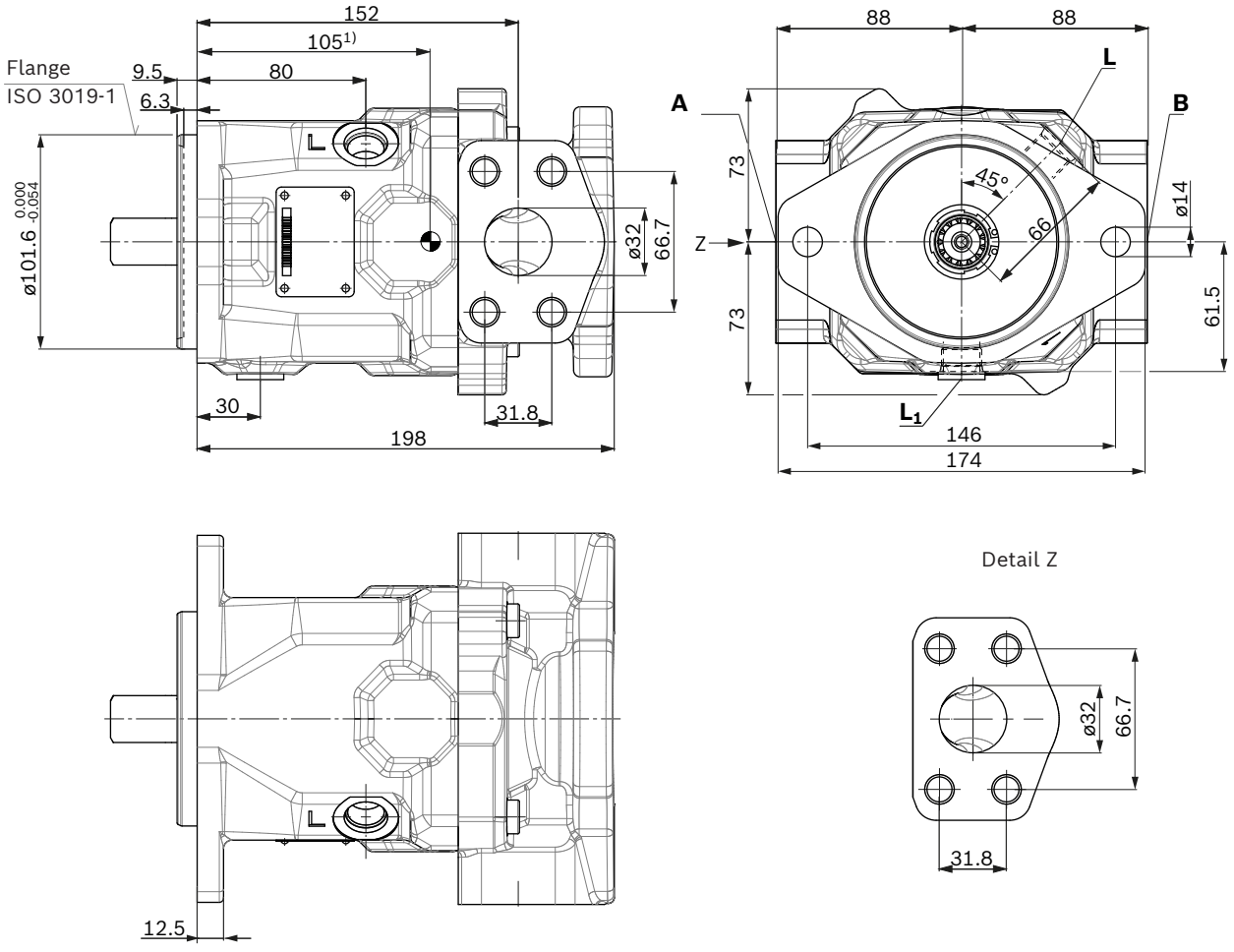
Connection table **A10FZG**

Ports		Standard	Size	p_{max} [bar][4)]	State[6)]
A/B	Working port (high-pressure series) Fastening thread	ISO 6162-2 DIN 13	1 1/4 in M14 × 2; 19 deep	350	O
L	Drain port	DIN 11926[5)]	9/16-18UNF-2B; 12.5 deep	2	O

1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Splines according to ANSI B92.1a, spline runout is a deviation from standard ISO 3019-1.
3) Thread according to ASME B1.1
4) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
5) The countersink may be deeper than specified in the standard.
6) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

Dimensions A10FZG sizes 21 to 28

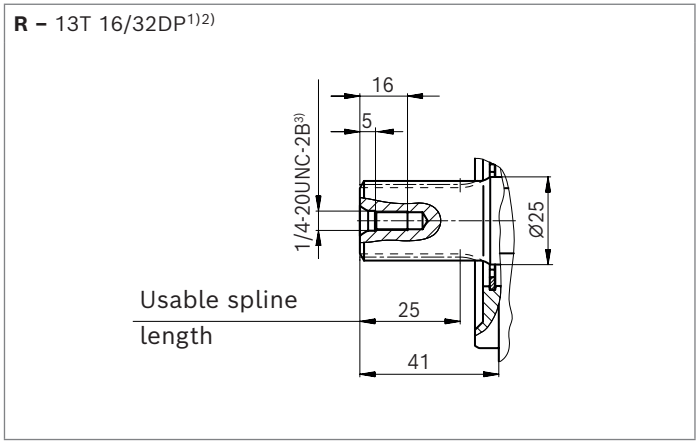
Direction of rotation changing (flow direction see table page 78)



1) Center of gravity

▼ **Splined shaft 7/8 in (similar to ISO 3019-1)**

R – 13T 16/32DP[1)2)]



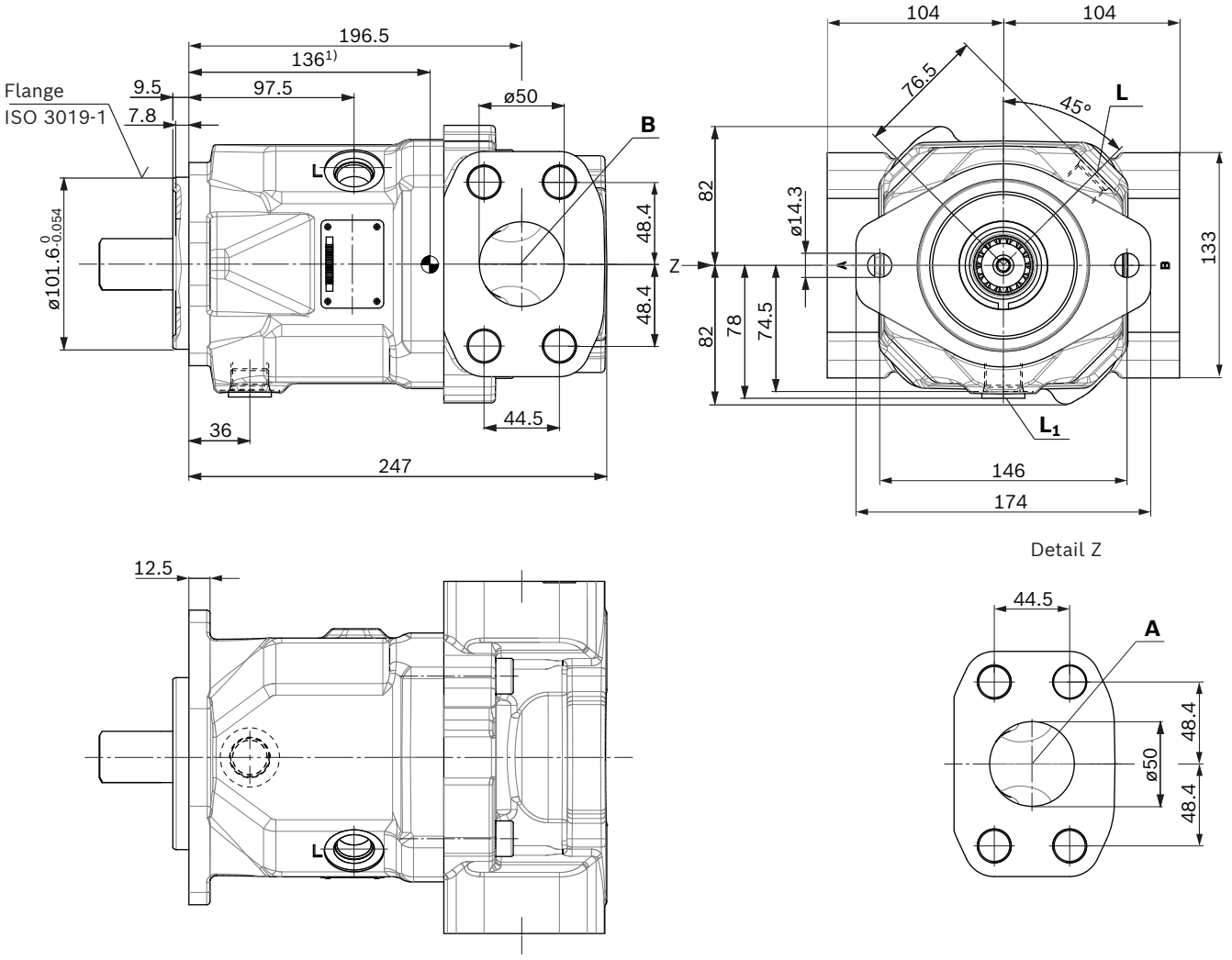
Connection table **A10FZG**

Ports		Standard	Size	p_{max} [bar][4)]	State[7)]
A/B	Working port (high-pressure series) Fastening thread	ISO 6162-2 DIN 13	1 1/4 in M14 × 2; 19 deep	350	O
L	Drain port	ISO 11926[5)]	3/4-16UNF-2B; 15 deep	2	O[6)]
L_1	Drain port	ISO 11926[5)]	3/4-16UNF-2B; 15 deep	2	X[6)]

1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Splines according to ANSI B92.1a, spline runout is a deviation from standard ISO 3019-1.
3) Thread according to ASME B1.1
4) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
5) The countersink may be deeper than specified in the standard.
6) Depending on the installation position, **L** or **L_1** must be connected (also see installation instructions on page 127).
7) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

Dimensions A10FZG size 63

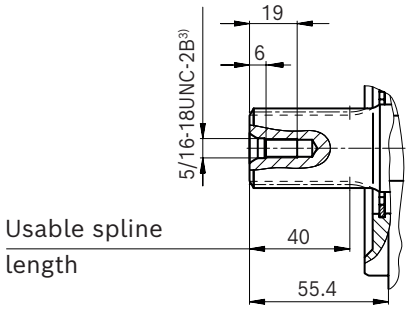
Direction of rotation changing (flow direction see table page 78)



1) Center of gravity

▼ **Splined shaft 1 1/4 in (similar to ISO 3019-1)**

R – 14T 12/32DP[1)2)]



Connection table **A10FZG**

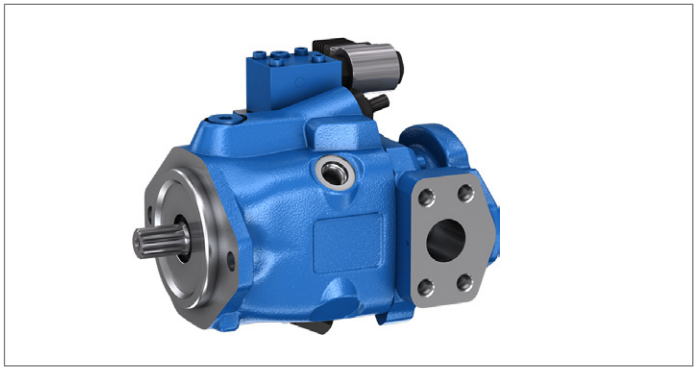
Ports		Standard	Size	p_{max} [bar][4)]	State[7)]
A/B	Working port (high-pressure series) Fastening thread	ISO 6162-2 DIN 13	2 in M20 × 2; 24 deep	350	O
L	Drain port	ISO 11926[5)]	7/8-14UNF-2B; 17 deep	2	O[6)]
L_1	Drain port	ISO 11926[5)]	7/8-14UNF-2B; 17 deep	2	X[6)]

1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Splines according to ANSI B92.1a, spline runout is a deviation from standard ISO 3019-1.
3) Thread according to ASME B1.1
4) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
5) The countersink may be deeper than specified in the standard.
6) Depending on the installation position, **L** or **L_1** must be connected (also see installation instructions on page 127).
7) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

RE 91485/2021-11-11
Replaces: 10.2016

rexroth
A Bosch Company

Axial piston variable displacement unit
A10VZG



- Suitable for variable-speed operation with synchronous and asynchronous motors
- Sizes 3 to 10
  Nominal pressure 250 bar
  Maximum pressure 315 bar
- Sizes 18 to 63
  Nominal pressure 280 bar
  Maximum pressure 315 bar
- Open and closed circuits

Features

- For use in one-, two- or four-quadrant operation
- Suitable for start/stop operation
- Suitable for long pressure holding operation
- Well-tried A10 rotary group technology

Product description

The proven axial piston units from the A10 product family have now been further developed for use in speed-controlled drives. They are approved for start/stop operation and designed for a changing direction of rotation. Even at the lowest rotational speed between 0 and 200 rpm, they provide a constant pressure and offer extremely high efficiency in pressure holding operation. The A10VZG units can be used as a pump in one-, two- and four-quadrant operation.

Contents

Type code A10VZG

01	02	03	04	05		06	07		08	9	10	11	12	13
A10V	**Z**	**G**			**/**	**10**	**W**	**–**	**V**		**C**		**N00**	

Axial piston unit

01	Swashplate design, variable, nominal pressure 250/315 bar, maximum pressure 315 bar	**A10V**

Application area

02	Variable-speed drives	**Z**

Operating mode

03	Pump, closed circuit	**G**

Size (NG)

04	Geometric displacement, see table of values on page 99		**003**	**006**	**008**	**010**	**018**	**028**	**063**	

Control device[2)]

			003	006	008	010	018	028	063	
05	Two-point control, electric	U = 12 V	●	●	●	●	●	●	●	**EZ300**[1)]
		U = 24 V	●	●	●	●	●	●	●	**EZ400**[1)]
	Two-point control, hydraulic		●	●	●	●	●	●	●	**DG000**[1)]

Series

			003 ... 063	
06	Series 1, index 0		●	**10**

Direction of rotation

			003 ... 063	
07	Viewed on drive shaft	variable	●	**W**

Sealing material

			003 ... 063	
08	FKM (fluorocarbon rubber)		●	**V**

Drive shaft

			003	006	008	010	018	028	063	
9	Splined shaft	Standard shaft	●	●	●	●	–	–	–	**S**
	ISO 3019-1	similar to shaft "S" however for higher torque	–	–	–	–	●	●	●	**R**

Mounting flange

			003 ... 063	
10	ISO 3019-1 (SAE)		●	**C**

Working port

			003	006	008	010	018	028	063	
11	SAE flange ports ISO 6162 **A** and **B**, opposite sides fastening thread, metric		–	–	–	–	●	●	●	**02**
	DIN 3852 threaded ports **A** and **B**, opposite sides		●	●	●	●	–	–	–	**03**

Through drive

			003 ... 063	
12	without through drive		●	**N00**

Connector for solenoids

			003 ... 063	
13	Without, with hydraulic controllers		●	**0**
	HIRSCHMANN connector – without suppressor diode		●	**H**

● = Available ○ = On request – = Not available

Notes

- ▶ Note the project planning notes on page 129.
- ▶ In addition to the type code, please specify the relevant technical data when placing your order.

1) Please specify mechanical flow control $V_{g\,max}$ and $V_{g\,min}$ in the order text.
2) Further controllers on request

Preferred program A10VZG

Overview of common configurations

Typ	Material number
A10VZG003EZ400/10W -VSC03N00H	R902557901
A10VZG006EZ400/10W -VSC03N00H	R902557902
A10VZG008EZ400/10W -VSC03N00H	R902557903
A10VZG010EZ400/10W -VSC03N00H	R902543656
A10VZG018EZ400/10W -VRC02N00H	R902550318
A10VZG028EZ400/10W-VRC02N00H	R902535127
A A10VZG063 EZ400/10W-VRC02N00H	R902551136

Setting ranges for stop $V_{g\,min}$ / $V_{g\,max}$

Size	Vg min	Vg max
3	0 to 3 cm^3; 0.9 cm^3/U	3 cm^3
6	0 to 4 cm^3; 0.9 cm^3/U	6 cm^3
8	0 to 4 cm^3; 0.9 cm^3/U	8 cm^3
10	0 to 4 cm^3; 0.9 cm^3/U	10 cm^3
18	0 to 7 cm^3; 1.3 cm^3/U	9 to 18 cm^3; 1.3 cm^3/U
28	0 to 11 cm^3; 1.7 cm^3/U	14 to 28 cm^3; 1.7 cm^3/U
63	0 to 25 cm^3; 3.0 cm^3/U	37 to 63 cm^3; 3.0 cm^3/U

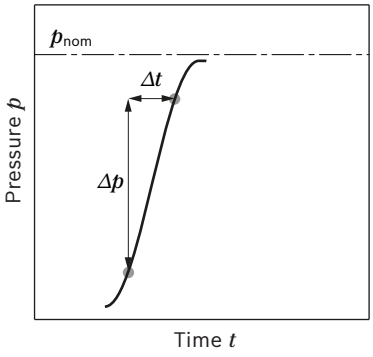
▶ Please specify settings $V_{g\,min}$ and $V_{g\,max}$ in plain text.

Notice
Observe the operating conditions for $V_{g\,min}$ 0 in connection with the controls DG and EZ on the respective pages 101 and 102

Working pressure range A10VZG

Pressure at working port B or A			Definition
Nominal pressure p_{nom}	NG 10	250 bar	The nominal pressure corresponds to the maximum design pressure.
	NG 18 to 63	280 bar	
Maximum pressure p_{max}	NG 10	315 bar	The maximum pressure corresponds to the maximum working pressure within a single operating period. The sum of single operating periods must not exceed the total operating period.
	NG 18 to 63	315 bar	
Single operating period		2.0 ms	
Total operating period		300 h	
Minimum pressure $p_{absolute}$ (high-pressure side)		10 bar[1)]	Minimum pressure on the high-pressure side that is required in order to prevent damage to the axial piston unit.
Rate of pressure change $R_{A\,max}$		16000 bar/s	Maximum permissible speed of pressure build-up and reduction during a pressure change across the entire pressure range.
Pressure at port A or B (low-pressure side)			
Minimum pressure p_{min}	Standard	0.8 bar absolute	Minimum pressure on the low-pressure side **A** or **B** (depending on direction of rotation) that is required in order to prevent damage to the axial piston unit. The minimum pressure depends on the rotational speed and displacement of the axial piston unit.
Summation pressure			
			The sum of the pressures on ports A and B must not rise above 280 bar.
Case pressure at port L			
Maximum pressure $p_{L\,max}$		2 bar absolute[2)]	Maximum 0.5 bar higher than inlet pressure at low pressure port **A** or **B** (depending on direction of rotation) , but not higher than $p_{L\,max}$. A drain line to the reservoir is required.
Pilot pressure port X with external high pressure			
Maximum pressure p_{max}	315 bar		When designing all control lines with external high pressure, the values for the rate of pressure change, maximum single operating period and total operating period applicable to working port **A** or **B** (depending on direction of rotation) must not be exceeded.

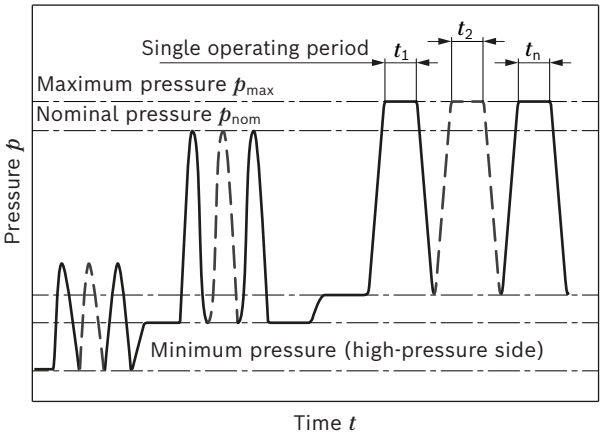
▼ **Rate of pressure change $R_{A\,max}$**



Flow direction

Direction of rotation, viewed on drive shaft	Direction of rotation	Flow
Type code "**W**"	Clockwise	**A** to **B**
	Counter-clockwise	**B** to **A**

▼ **Pressure definition**

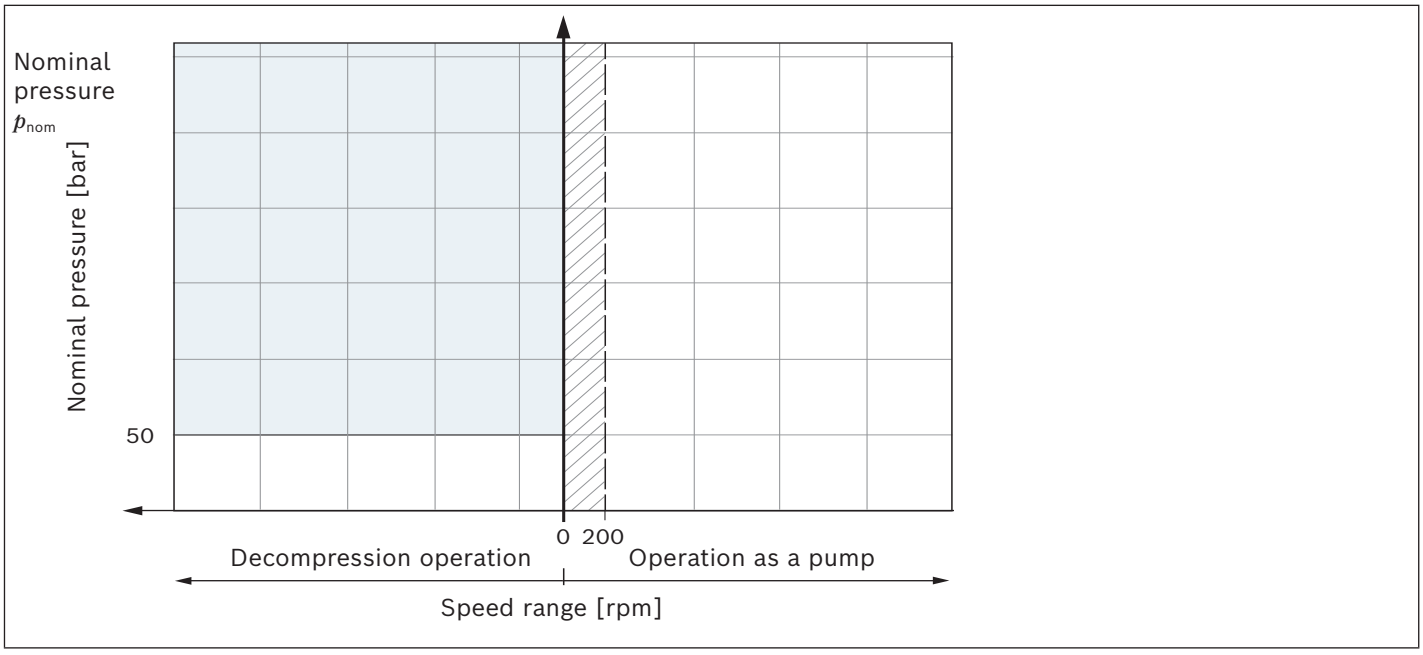


Total operating period = $t_1 + t_2 + ... + t_n$

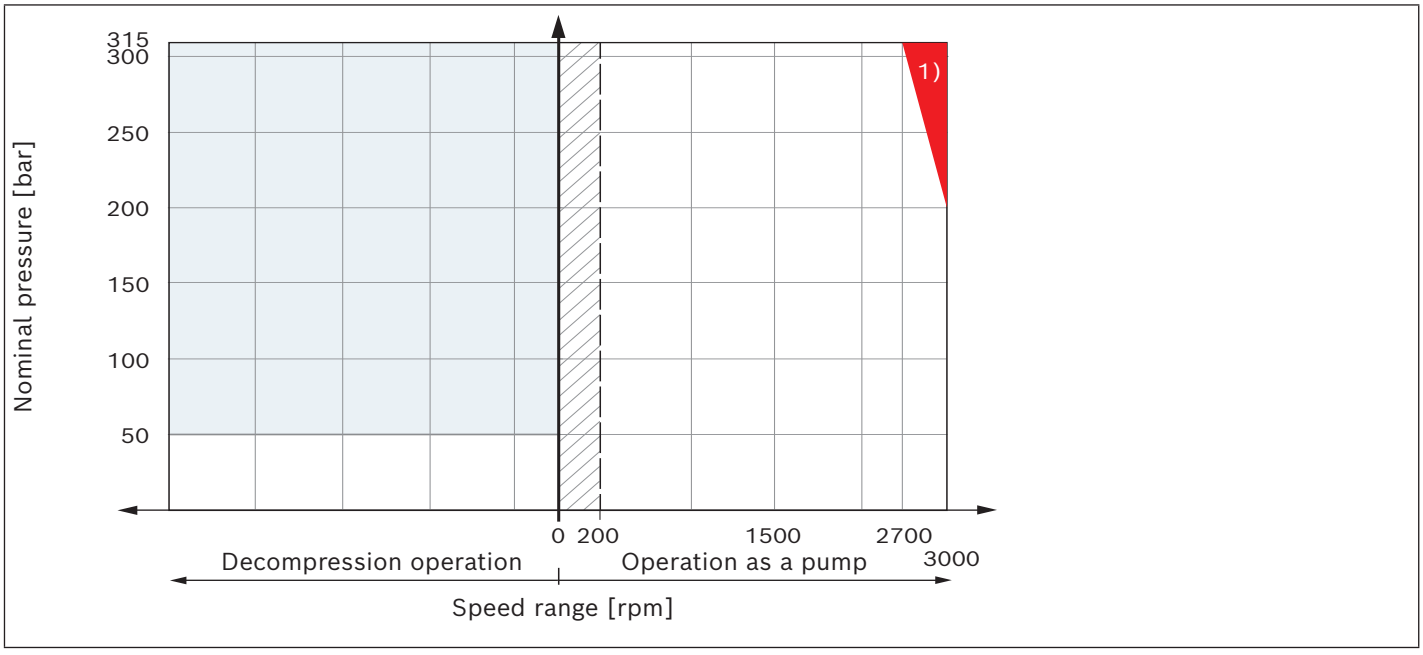
Notice
Working pressure range applies when using hydraulic fluids based on mineral oils. Please contact us for values for other hydraulic fluids.

1) Please contact us about lower pressures
2) Higher values on request

A10VZG 010 to 018: Permissible operating data and operating ranges at $V_{g\,max}$



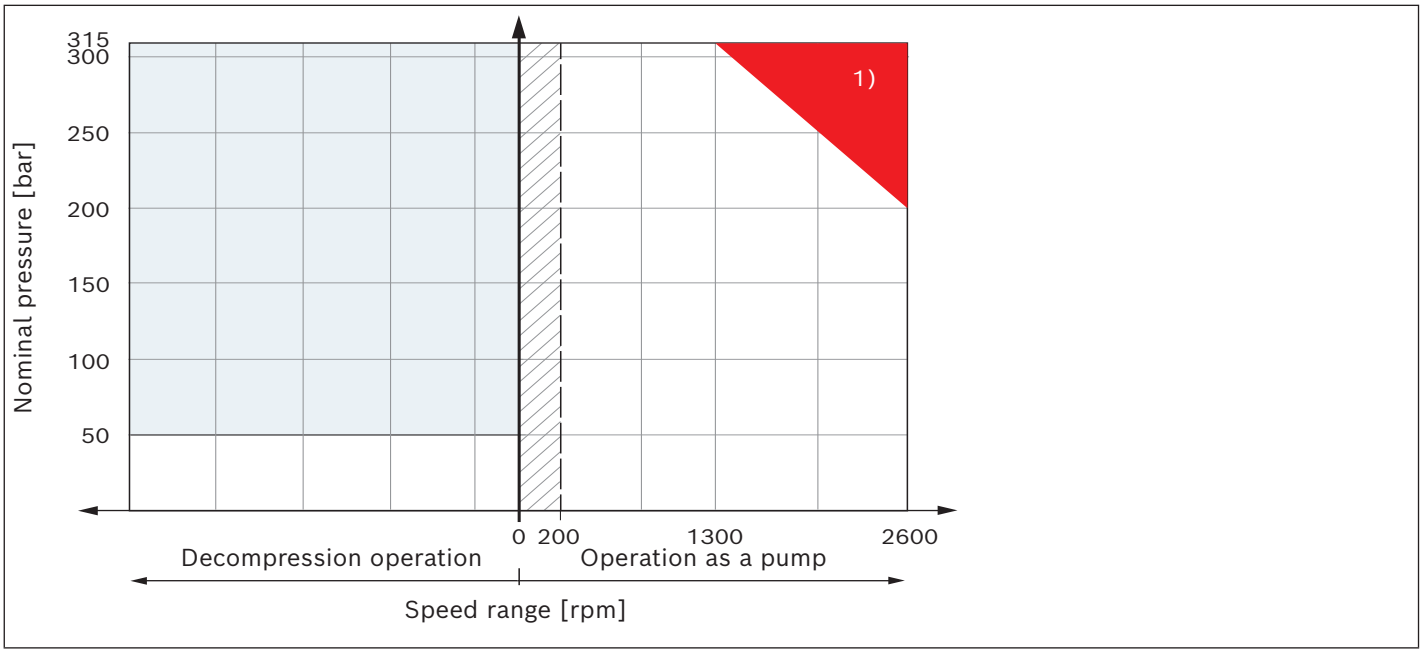
A10VZG 028: Permissible operating data and operating ranges at $V_{g\,max}$



Operating range
Operation without restriction
With V_g <40%, no time restriction With $V_{g\,max}$ single operating period t<3 min, maximum cycle share 80%
Operation as a motor possible with restrictions, please contact us. With V_g <40%, no time restriction With $V_{g\,max}$ permissible for short-term decompression operation t ≤ 200 ms

1) This range may only be operated at an inlet pressure of 2.5 bar absolute at port **A**/**B**.

A10VZG 063: Permissible operating data and operating ranges at $V_{g\ max}$



Operating range
Operation without restriction
With V_g <40%, no time restriction With $V_{g\ max}$ single operating period t<3 min, maximum cycle share 80%
Operation as a motor possible with restrictions, please contact us. With V_g <40%, no time restriction With $V_{g\ max}$ permissible for short-term decompression operation t ≤ 200 ms

1) This range may only be operated at an inlet pressure of 2.5 bar absolute at port **A**/**B**.

Technical data A10VZG

Size		NG		3	6	8	10	18	28	63
Displacement geometric, per revolution		$V_{g\,max}$	cm^3	3.5	6	8	10.5	18	28	63
Maximum rotational speed[1]	at $V_{g\,max}$									
Operation as a pump[1]		n_{nom}	rpm	3300	3300	3300	3300	3300	3000	2600
Decompression operation[2]		n_{nom}	rpm	3300	3300	3300	3300	3300	3000	2600
Flow Operation as a pump	at n_{nom} and $V_{g\,max}$	q_v	l/min	12	20	26	35	59	84	164
Power Operation as a pump	at n_{nom}, $V_{g\,max}$ and Δp = 250 bar	P	kW	5	8	11	14	–	–	–
	at n_{nom}, $V_{g\,max}$ and Δp = 280 bar	P	kW	–	–	–	–	28	39	76
Torque	at $V_{g\,max}$ and Δp = 250 bar	M	Nm	14	24	32	42	–	–	–
	at $V_{g\,max}$ and Δp = 280 bar	M	Nm	–	–	–	–	80	125	280
	at $V_{g\,max}$ and Δp = 100 bar	M	Nm	6	10	13	17	29	45	100
Rotary stiffness Drive shaft	S	c	Nm/rad	9200	9200	9200	9200	–	–	–
	R	c	Nm/rad	–	–	–	–	14800	26300	69400
Moment of inertia of the rotary group		J_{TW}	kgm^2	0.0006	0.0006	0.0006	0.0006	0.0009	0.0017	0.0056
Maximum angular acceleration[2][3]		α	rad/s^2	14000	14000	14000	14000	12600	11200	8000
Case volume		V	l	0.2	0.2	0.2	0.2	0.32	0.5	0.8
Weight (approx.)		m	kg	11.3	11.3	11.3	11.3	13.5	20	32

Determination of the characteristics					
Flow	q_v	=	$\frac{V_g \times n \times \eta_v}{1000}$		[l/min]
Torque	M	=	$\frac{V_g \times \Delta p}{20 \times \pi \times \eta_{hm}}$		[Nm]
Power	P	=	$\frac{2 \pi \times M \times n}{60000}$	= $\frac{q_v \times \Delta p}{600 \times \eta_t}$	[kW]

Key

V_g Displacement per revolution [cm^3]
Δp Differential pressure [bar]
n Rotational speed [rpm]
η_v Volumetric efficiency
η_{hm} Hydraulic-mechanical efficiency
η_t Total efficiency ($\eta_t = \eta_v \times \eta_{hm}$)

Notice

- Theoretical values, without efficiency and tolerances; values rounded
- Operation above the maximum values or below the minimum values may result in a loss of function, a reduced service life or in the destruction of the axial piston unit. Bosch Rexroth recommends checking the load by means of test or calculation / simulation and comparison with the permissible values.

Additional information about inlet pressure and rotational speed can be found on page 33

1) The values are applicable:
– at an absolute pressure $p_{abs} \geqq 1$ bar at the low-pressure side (input)
– for the optimum viscosity range from ν_{opt} = 36 to 16 mm^2/s
– with hydraulic fluid based on mineral oils
2) Higher values on request
3) The limit value is only valid for a single pump, multiple pump version available on request. The load capacity of the connection parts must be considered.

Permissible input torque

Size				10	18	28	63
Torque at $V_{g\,max}$ and Δp = 250 bar[1)]		M_{max}	Nm	42	–	–	–
Torque at $V_{g\,max}$ and Δp = 280 bar[1)]		M_{max}	Nm	–	80	125	280
Max. input torque on drive shaft[2)]							
	S	$M_{E\,max}$	Nm	126	–	–	–
		Ø	in	3/4	–	–	–
	R	$M_{E\,max}$	Nm	–	160	250	650
		Ø	in	–	3/4	7/8	1 1/4

1) Efficiency not considered
2) For drive shafts with no radial force

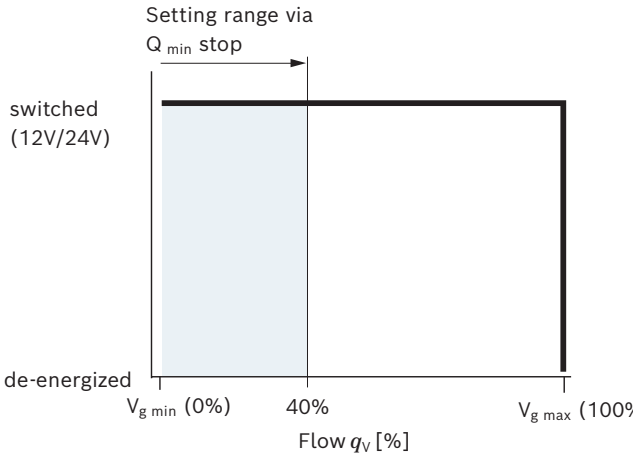
EZ300/EZ400 – Two-point control, electric

The variable displacement unit is set to minimum swivel angle by actuating switching solenoids. The control pressure is taken internally via the on/off valve of the relevant high-pressure side. A minimum system pressure depending on the operating data is required for the pump to be adjusted.

Notice
Starting up to $V_{g\,min}$ 0 and switching from $V_{g\,min}$ 0 below a working pressure of 10 bar is not permissible.

The axial piston unit can only be switched between $V_{g\,max}$ and $V_{g\,min}$.
Please specify the presetting in plain text.

▼ **Characteristic curve EZx00**

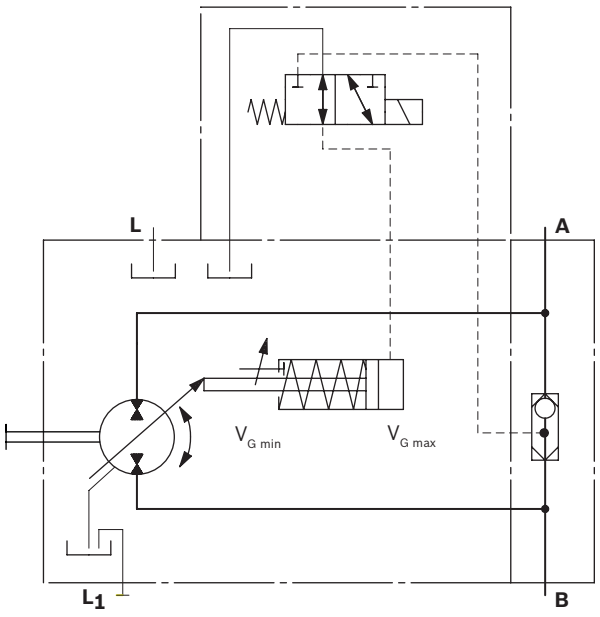


De-energized ≙ $V_{g\,max}$
Energized ≙ $V_{g\,min}$

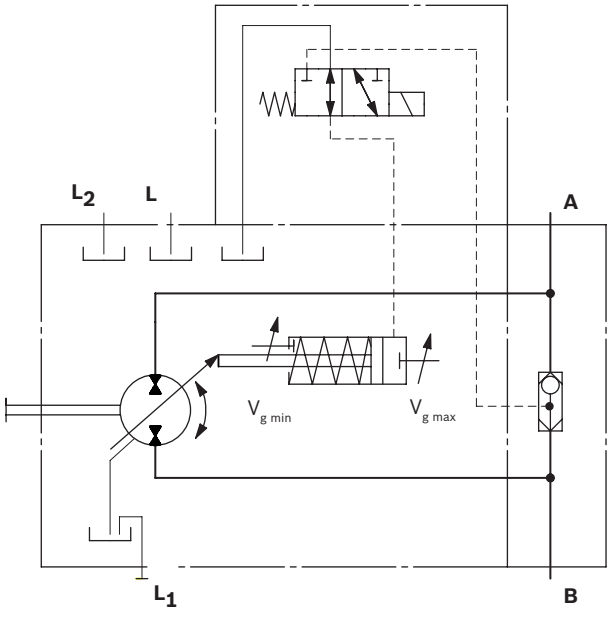
Technical data, solenoid	EZ300	EZ400
Voltage	12 V (±15%)	24 V (±15%)
Position $V_{g\,max}$	de-energized	de-energized
Position $V_{g\,min}$	Energized	Energized
Nominal current at 20°C	1.5 A	0.8 A
Duty cycle	100%	100%
Type of protection: see connector version page 126		

Ambient temperature range -20 °C to +60 °C.
Please contact us if these temperatures cannot be observed

▼ **Circuit diagram A10VZG...EZ 3/4 sizes 3 to 10**



▼ **Circuit diagram A10VZG...EZ 3/4 sizes 18 to 28**



DG000 – Two-point control, hydraulic

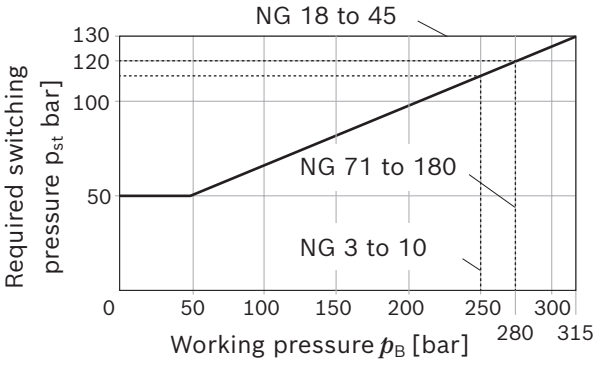
The variable pump can be set to a minimum swivel angle by connecting an external switching pressure to port **X.** This will supply control fluid directly to the stroking piston; a minimum pressure of $p_{St} \geq 50$ bar is required.

Notice
Starting up to $V_{g\,min}$ 0 and switching from $V_{g\,min}$ 0 below a working pressure of 10 bar is not permissible.

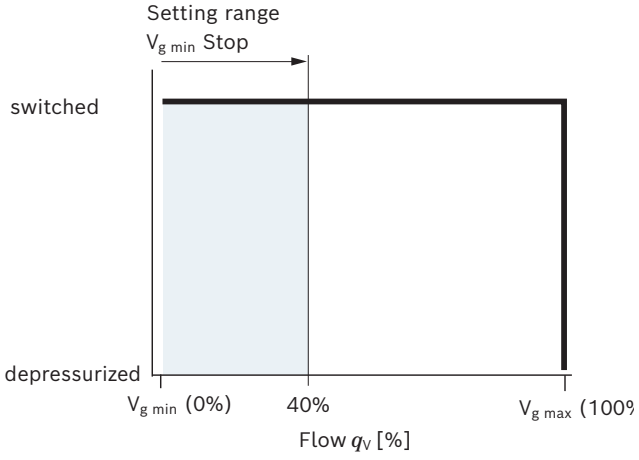
The variable pump can only be switched between $V_{g\,min}$ and $V_{g\,max}$. Specify the presetting in plain text.
Please note that the required switching pressure at port **X** is directly dependent on the actual working pressure p_B on working port **A** or **B**. (See switching pressure characteristic curve).
The maximum permissible switching pressure corresponds to the nominal pressure of the pump.

- Switching pressure p_{ST} in X= 0 bar ≙ $V_{g\,max}$
- Switching pressure p_{ST} in X≥ 50 bar ≙ $V_{g\,min}$

▼ **Switching pressure characteristic curve**

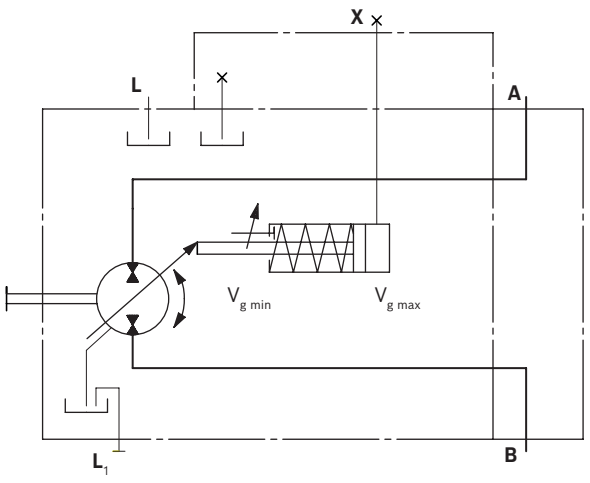


▼ **Characteristic curve DG000**

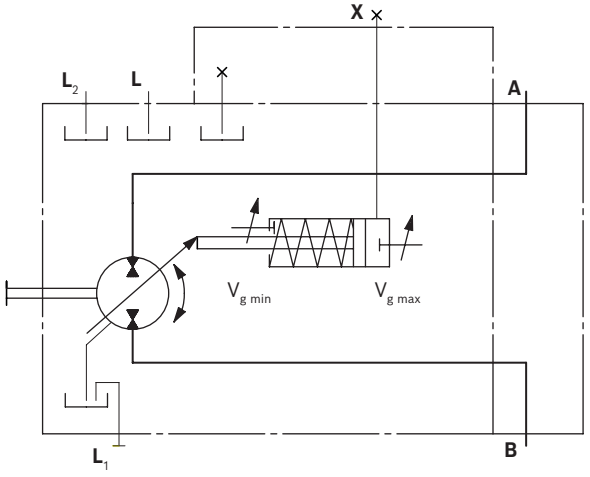


Depressurized ≙ $V_{g\,max}$
Pressure switched on ≙ $V_{g\,min}$

▼ **Circuit diagram DG; A10VZG size 3 to 10**

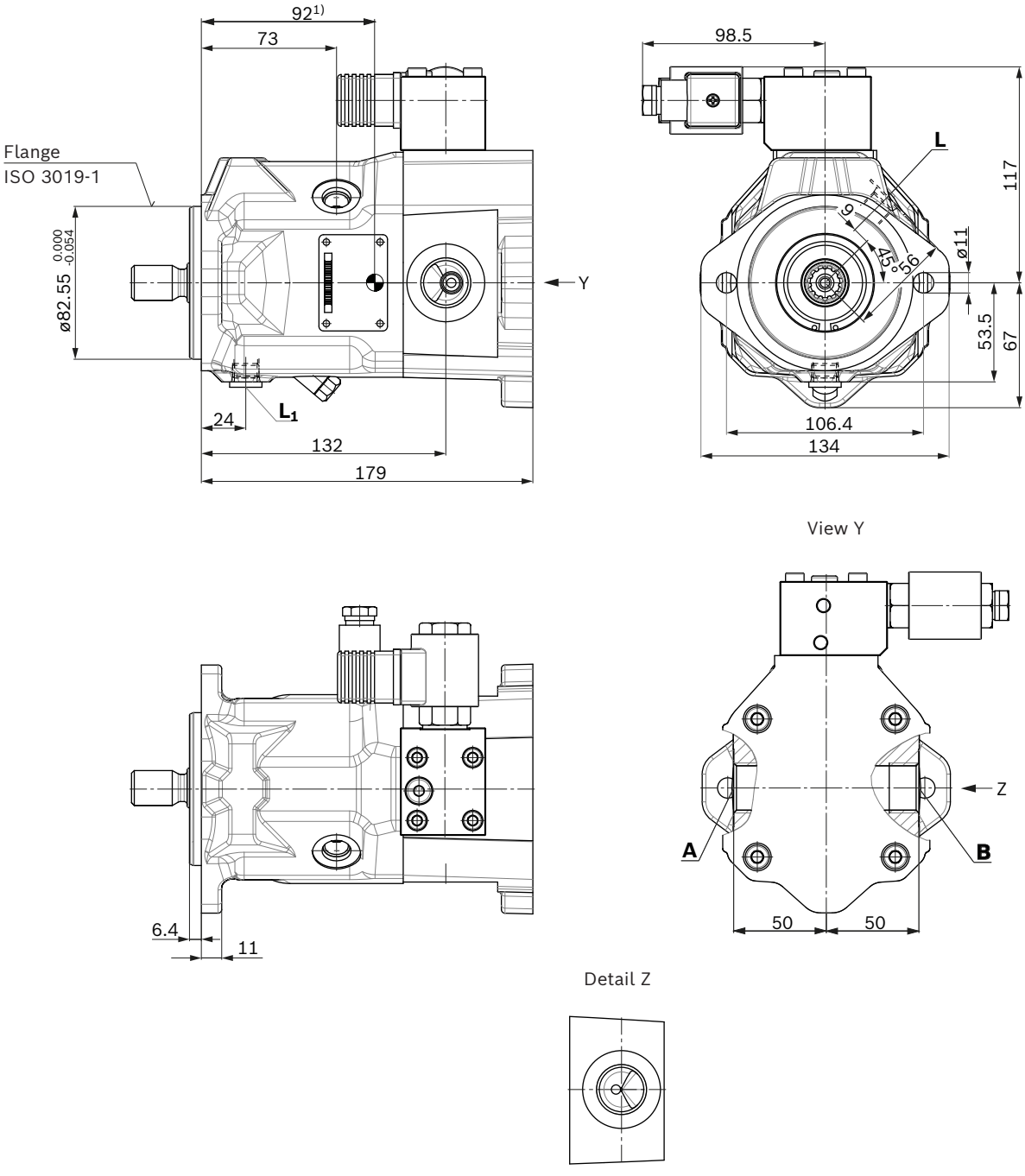


▼ **Circuit diagram DG; A10VZG size 18 to 28**



Dimensions A10 VZG, sizes 3 to 10

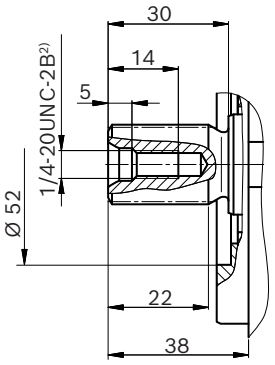
EZx – two-point control electric, direction of rotation changing (flow direction see table page 96)



1) Center of gravity

▼ **Splined shaft 3/4 in (19-4, ISO 3019-1)**

S – 11T 16/32DP[1)]

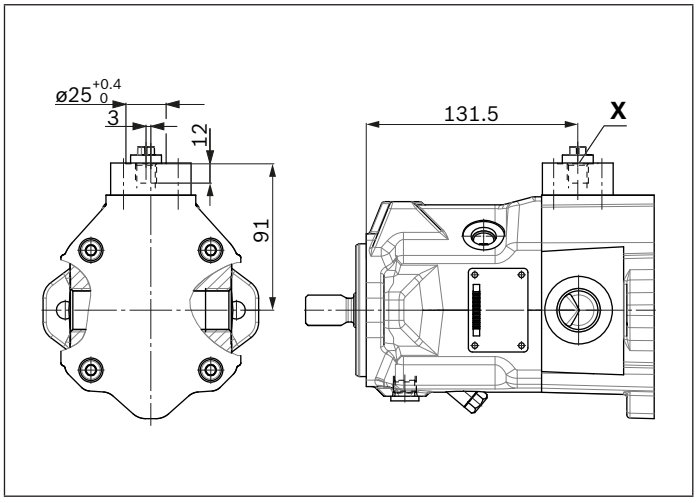


Connection table **A10VZG**

Ports		Standard	Size	p_{max} [bar][3)]	State[6)]
A/B	Working port	DIN 3852-1	M27 × 2; 16 deep	315	O
L	Drain port	ISO 11926[4)]	9/16-18UNF-2B; 13 deep	2	O[5)]
L_1	Drain port	ISO 11926[4)]	9/16-18UNF-2B; 13 deep	2	X[5)]
X	Pilot pressure port (DG only)	DIN 3852-2[4)]	G 1/4; 12 deep	315	O

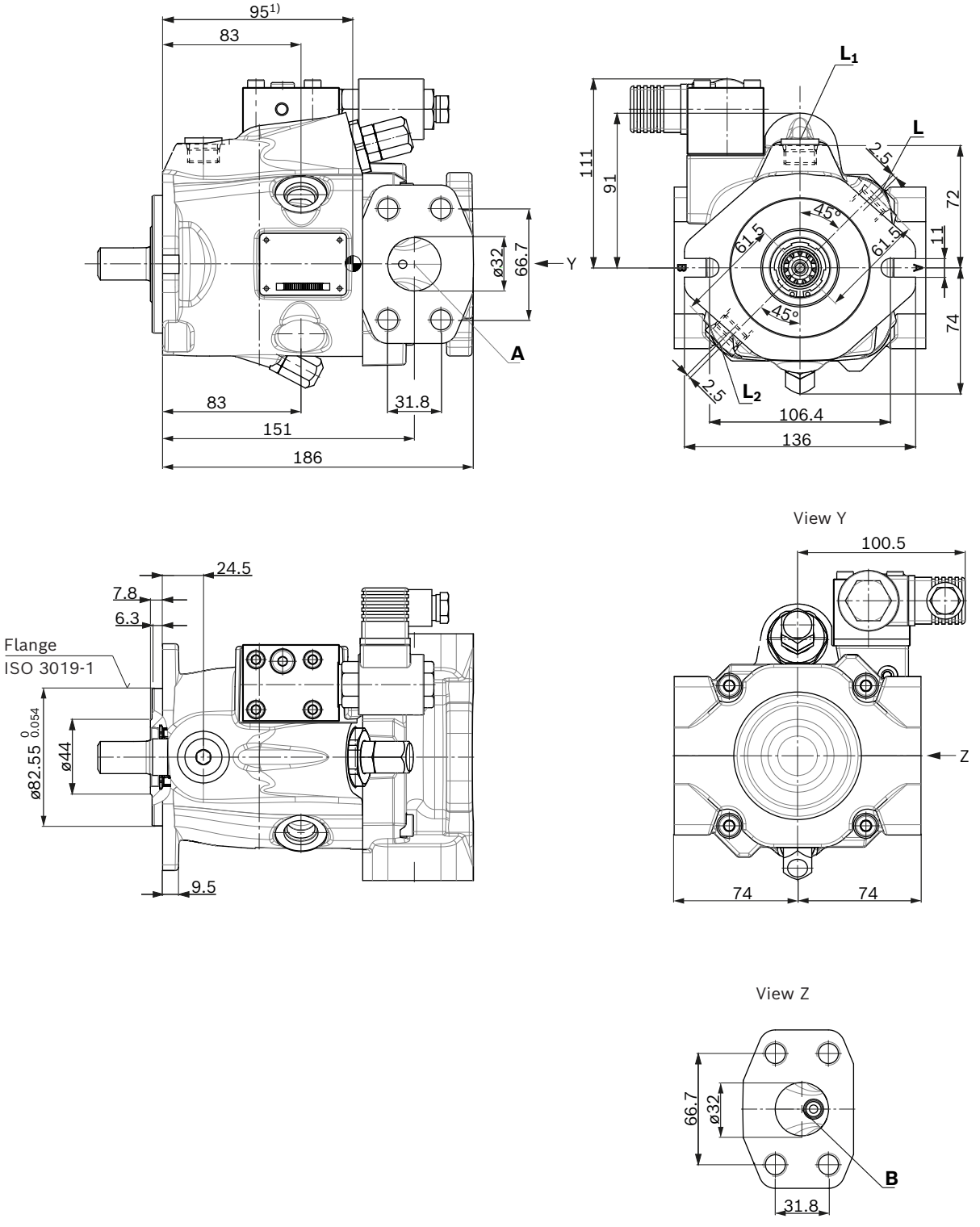
1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Thread according to ASME B1.1
3) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
4) The countersink may be deeper than specified in the standard.
5) Depending on the installation position, **L** or **L_1** must be connected (also see installation instructions on page 127).
6) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

▼ **DG – Two-point control, direct operated**



Dimensions A10 VZG size 18

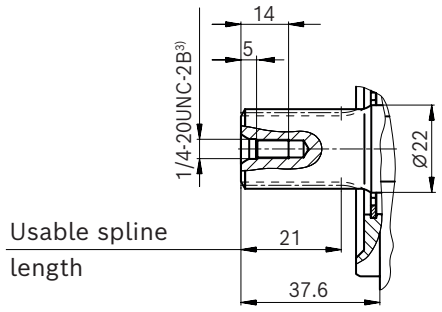
EZx – two-point control electric, direction of rotation changing (flow direction see table page 96)



1) Center of gravity

▼ **Splined shaft 3/4 in (similar to ISO 3019-1)**

R – 11T 16/32DP[1)2)]

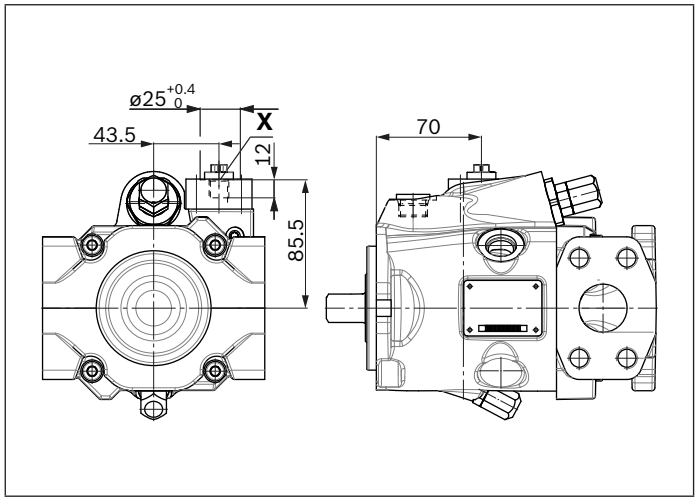


Connection table **A10VZG**

Ports		Standard	Size	p_{max} [bar][4)]	State[7)]
A/B	Working port (high-pressure series) Fastening thread	ISO 6162-2 DIN 13	1 1/4 in M14 × 2; 19 deep	315	O
L	Drain port	ISO 11926[5)]	3/4-16UNF-2B; 14 deep	2	O[6)]
L_1, L_2	Drain port	ISO 11926[5)]	3/4-16UNF-2B; 14 deep	2	X[6)]
X	Pilot pressure port (DG only)	DIN 3852-2[5)]	G 1/4; 12 deep	315	O

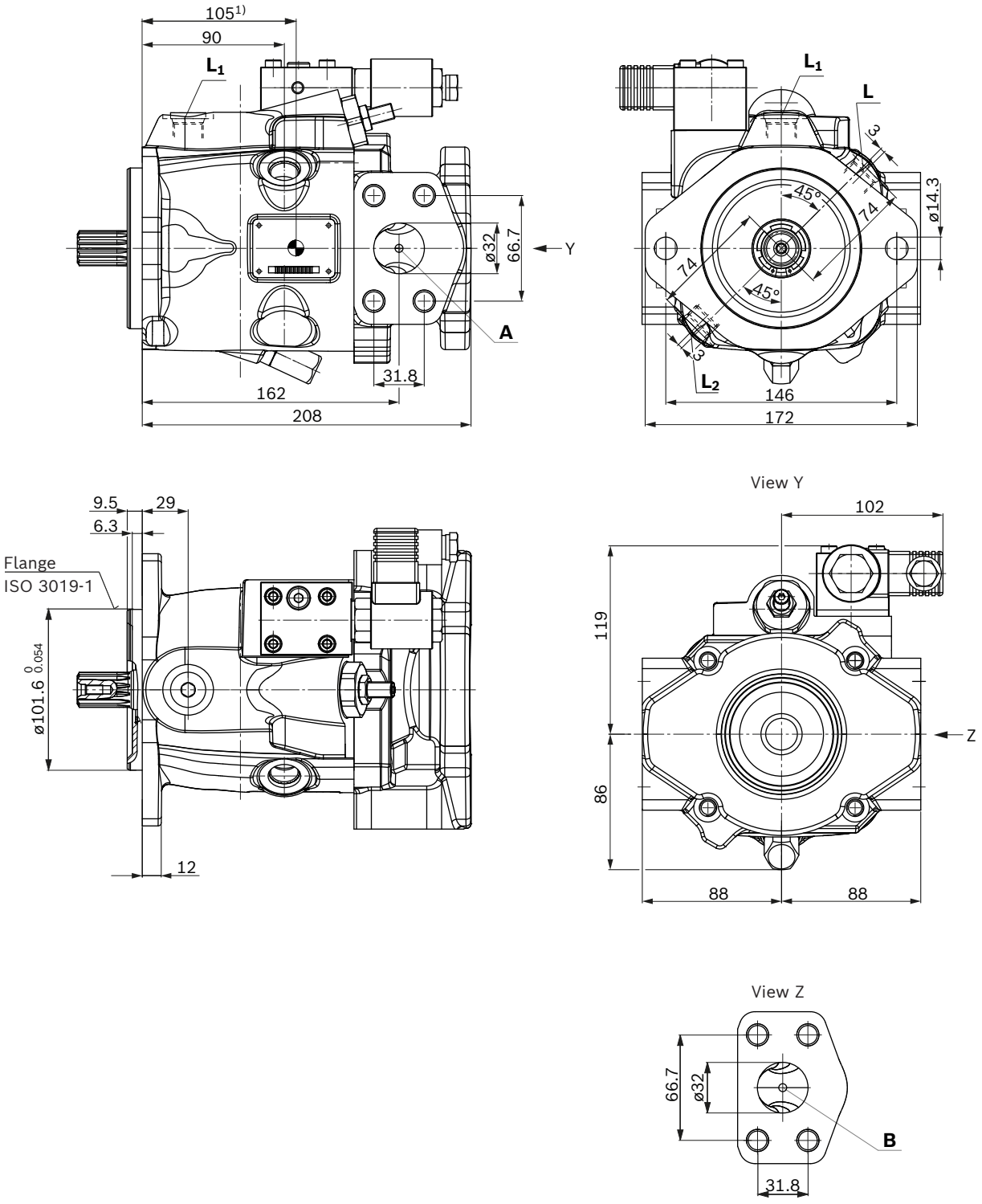
1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Splines according to ANSI B92.1a, spline runout is a deviation from standard ISO 3019-1.
3) Thread according to ASME B1.1
4) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
5) The countersink may be deeper than specified in the standard.
6) Depending on the installation position, **L**, **L_1** or **L_2** must be connected (also see installation instructions starting on page 127).
7) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

▼ **DG – Two-point control, direct operated**



Dimensions A10 VZG size 28

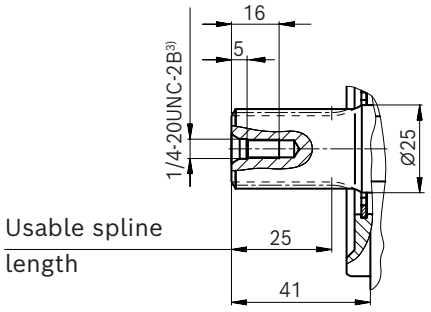
EZx – two-point control electric, direction of rotation changing (flow direction see table page 96)



1) Center of gravity

▼ **Splined shaft 7/8 in (similar to ISO 3019-1)**

R – 13T 16/32DP[1)2)]

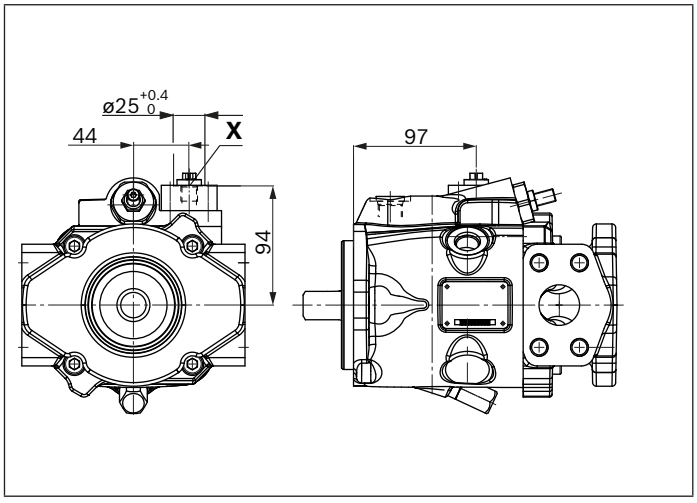


Connection table **A10VZG**

Ports		Standard	Size	p_{max} [bar][4)]	State[7)]
A/B	Working port (high-pressure series) Fastening thread	ISO 6162-2 DIN 13	1 1/4 in M14 × 2; 19 deep	315	O
L	Drain port	ISO 11926[5)]	3/4-16UNF-2B; 15 deep	2	O[6)]
L_1, **L_2**	Drain port	ISO 11926[5)]	3/4-16UNF-2B; 15 deep	2	X[6)]
X	Pilot pressure port (DG only)	DIN 3852-2[5)]	G 1/4; 12 deep	315	O

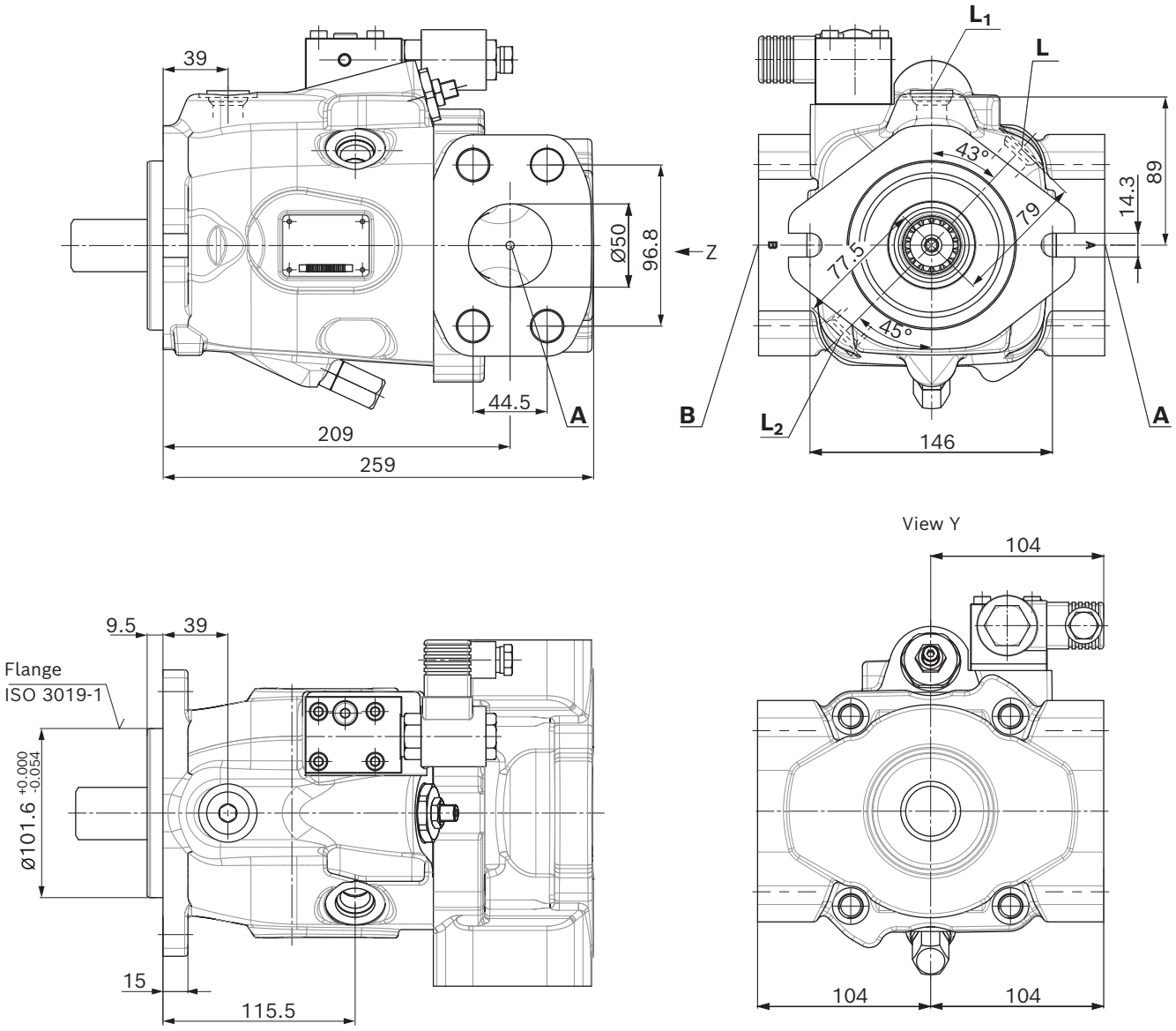
1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Splines according to ANSI B92.1a, spline runout is a deviation from standard ISO 3019-1.
3) Thread according to ASME B1.1
4) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
5) The countersink may be deeper than specified in the standard.
6) Depending on the installation position, **L**, **L_1** or **L_2** must be connected (also see installation instructions starting on page 127).
7) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

▼ **DG – Two-point control, direct operated**



Dimensions A10 VZG size 63

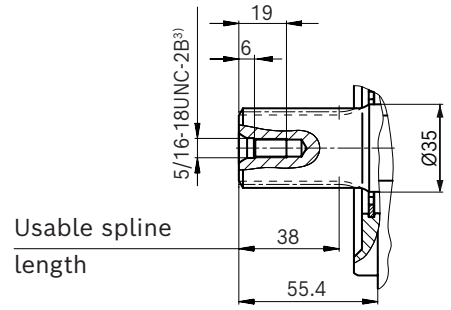
EZx – two-point control electric, direction of rotation changing (flow direction see table page 96)



1) Center of gravity

▼ **Splined shaft 1 1/4 in (similar to ISO 3019-1)**

R – 14T 12/24DP[1)2)]

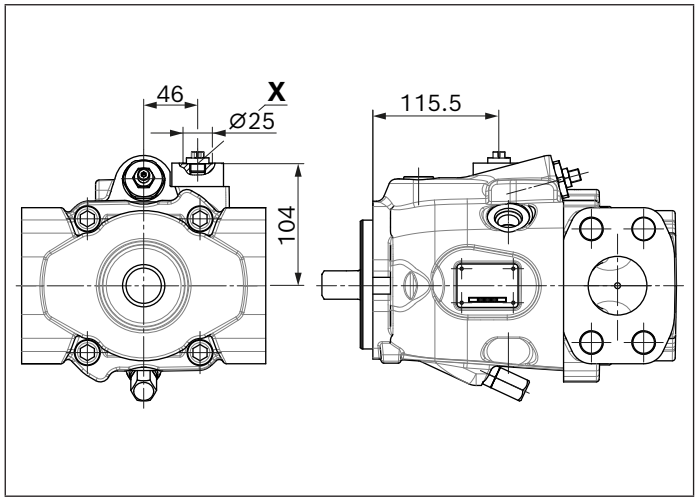


Connection table **A10VZG**

Ports		Standard	Size	p_{max} [bar][4)]	State[7)]
A/B	Working port (high-pressure series) Fastening thread	ISO 6162-2 DIN 13	2 in M20 × 2; 24 deep	315	O
L	Drain port	ISO 11926[5)]	7/8-14UNF-2B; 17 deep	2	O[6)]
L_1, **L_2**	Drain port	ISO 11926[5)]	7/8-14UNF-2B; 17 deep	2	X[6)]
X	Pilot pressure port (DG only)	DIN 3852-2[5)]	G 1/4; 12 deep	315	O

1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Splines according to ANSI B92.1a, spline runout is a deviation from standard ISO 3019-1.
3) Thread according to ASME B1.1
4) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
5) The countersink may be deeper than specified in the standard.
6) Depending on the installation position, **L**, **L_1** or **L_2** must be connected (also see installation instructions starting on page 127).
7) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

▼ **DG – Two-point control, direct operated**



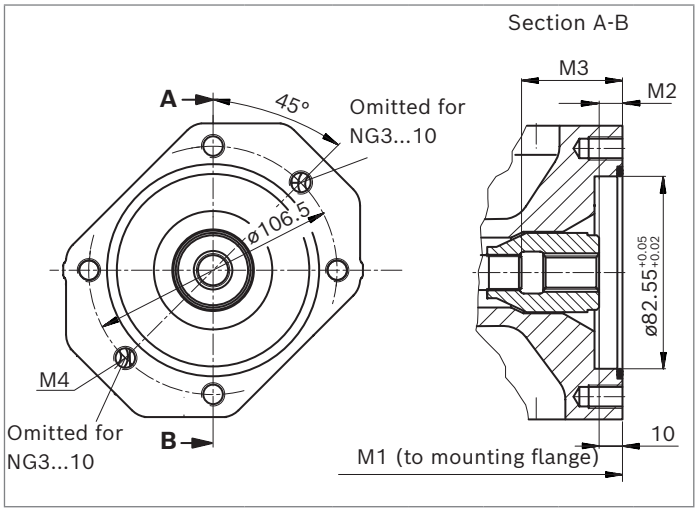
Dimensions through drive for port plates 07 and 12 (A10VZO)

For flanges and shafts according to ISO 3019-1

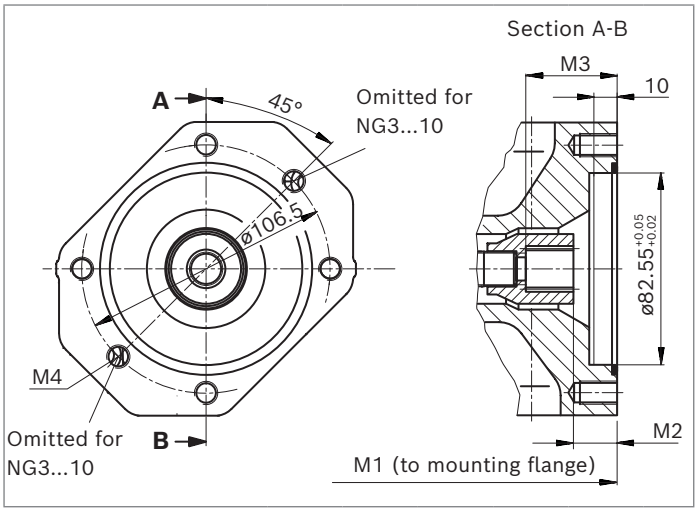
Flange ISO 3019-1 (SAE)		Hub for splined shaft[1]		Availability across sizes				Code
Diameter	**Mounting**[2]	**Diameter**		**3 to 10**	**18**	**28**	**45**	
82-2 (A)	⚷, ⚷, ⚷	5/8 in	9T 16/32DP	●	●	●	●	K01
		3/4 in	11T 16/32DP	●	●	●	●	K52

● = Available ○ = On request – = Not available

▼ **82-2**



▼ **82-2**



K01 (ISO 3019-1 16-4 (A))	**NG**	**M1**	**M2**[4]	**M3**[4]	**M4**[3]
	10	176	9.6	32.1	M10 × 1.5; 14.5 deep
	18	182	9.3	42.5	M10 × 1.5; 14.5 deep
	28	204	9.2	36.2	M10 × 1.5; 16 deep
	45	229	10.1	52.7	M10 × 1.5; 16 deep

K52 (ISO 3019-1 19-4 (A-B))	**NG**	**M1**	**M2**[4]	**M3**[4]	**M4**[3]
	10	176	16.4	38.4	M10 × 1.5; 14.5 deep
	18	182	18.3	39.2	M10 × 1.5; 14.5 deep
	28	204	18.4	39.4	M10 × 1.5; 16 deep
	45	229	18.4	38.8	M10 × 1.5; 16 deep

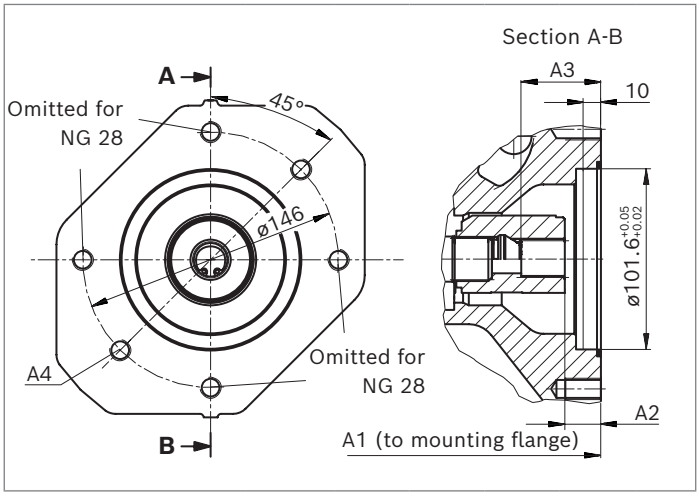
1) According to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Mounting holes pattern viewed on through drive with control at top
3) Thread according to DIN 13
4) Minimum dimension

For flanges and shafts according to ISO 3019-1

Flange ISO 3019-1 (SAE)		Hub for splined shaft[1]		Availability across sizes				Code
Diameter	**Mounting[2]**	**Diameter**		**3 to 10**	**18**	**28**	**45**	
101-2 (B)	⚷, ⚷, ⚷	7/8 in	13T 16/32DP	–	–	●	●	K68
		1 in	15T 16/32DP	–	–	–	●	K04

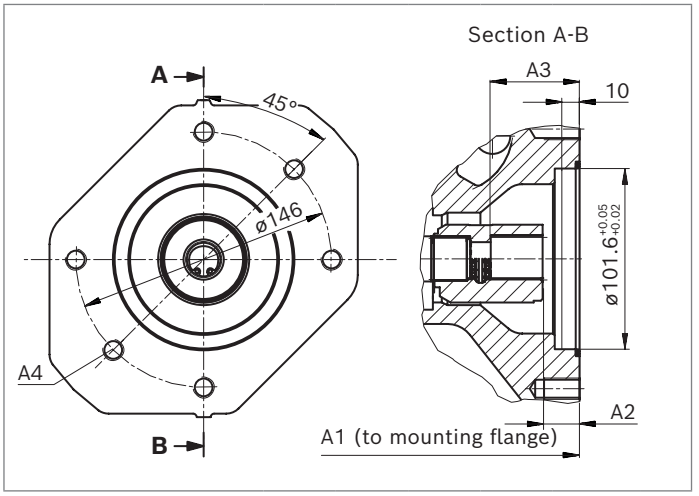
● = Available ○ = On request – = Not available

▼ **101-2**



K68 (ISO 3019-1 22-4 (B))	NG	A1	A2	A3	A4[3]
	28	204	17.4	42.4	M12 × 1.75; 18 deep
	45	229	17.4	41.8	M12 × 1.75; 18 deep

▼ **101-2**



K04 (ISO 3019-1 25-4 (B-B))	NG	A1	A2	A3	A4[3]
	45	229	17.9	47.4	M12 × 1.75; 18 deep

1) According to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Mounting holes pattern viewed on through drive with control at top
3) Thread according to DIN 13
4) Minimum dimension

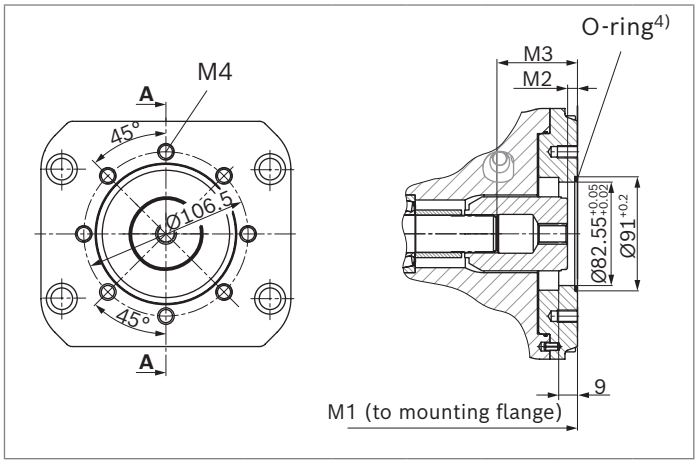
Dimensions through drive for port plates 22U and 32U (A10VZO)

For flanges and shafts according to ISO 3019-1

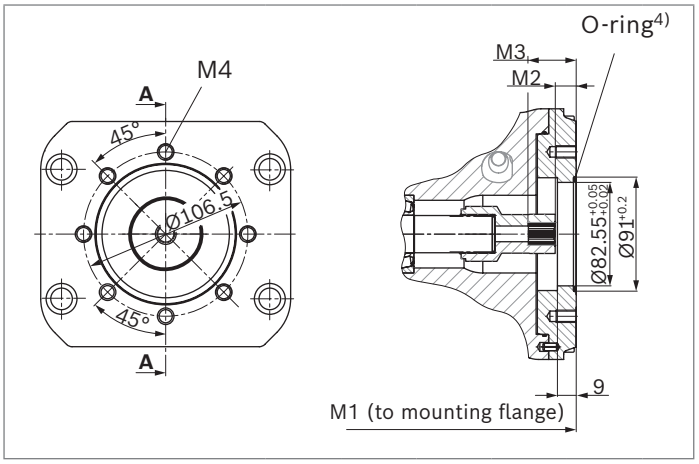
Flange ISO 3019-1 (SAE)		Hub for splined shaft[1]		Availability across sizes				Code
Diameter	**Mounting**[2]	**Diameter**		**71**	**100**	**140**	**180**	
82-2 (A)		5/8 in	9T 16/32DP	●	●	●	●	U01
		3/4 in	11T 16/32DP	●	●	●	●	U52

● = Available ○ = On request – = Not available

▼ 82-2 (A)



▼ 82-2 (A)



U01 (ISO 3019-1 16-4 (A))	**NG**	**M1**	**M2**[5]	**M3**[5]	**M4**[3]
	71	299	8.4	60.6	M10 × 1.5; 16 deep
	100	360	9.7	64.7	M10 × 1.5; 16 deep
	140	377	9.7	76.8	M10 × 1.5; 16 deep
	180	387	10.8	77.1	M10 × 1.5; 16 deep

U52 (ISO 3019-1 19-4 (A-B))	**NG**	**M1**	**M2**[5]	**M3**[5]	**M4**[3]
	71	299	20.8	41.2	M10 × 1.5; 16 deep
	100	360	19	40	M10 × 1.5; 16 deep
	140	377	18.6	39.6	M10 × 1.5; 16 deep
	180	387	18.9	39.9	M10 × 1.5; 16 deep

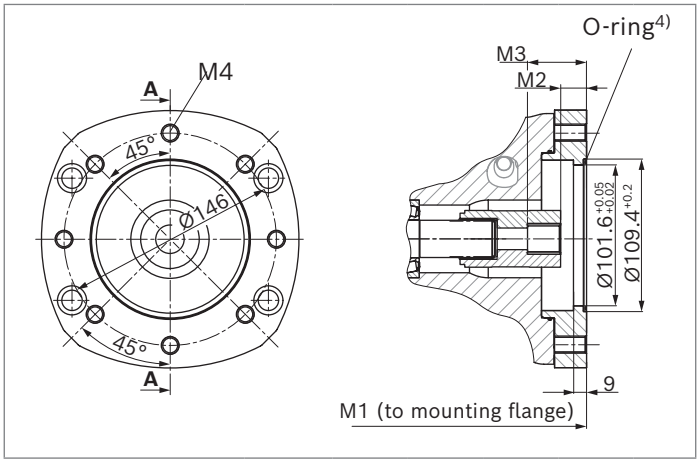
1) According to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Mounting holes pattern viewed on through drive with control at top
3) Thread according to DIN 13
4) O-ring included in the scope of delivery
5) Minimum dimension

For flanges and shafts according to ISO 3019-1

Flange ISO 3019-1 (SAE)		Hub for splined shaft[1]		Availability across sizes				Code
Diameter	**Mounting[2]**	**Diameter**		**71**	**100**	**140**	**180**	
101-2 (B)		7/8 in	13T 16/32DP	●	●	●	●	U68
		1 in	15T 16/32DP	●	●	●	●	U04

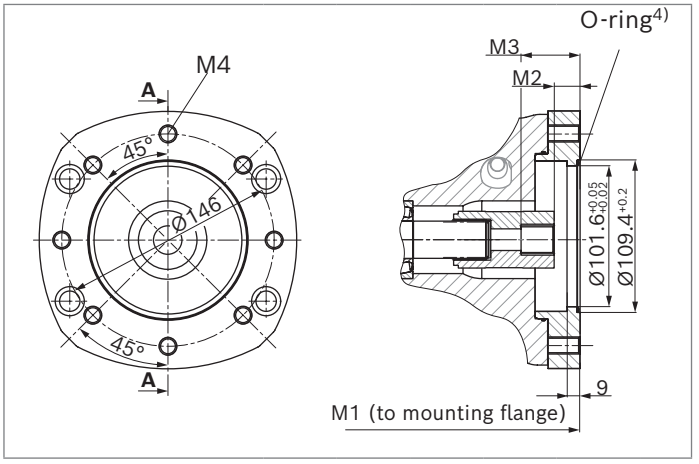
● = Available ○ = On request – = Not available

▼ 101-2 (B)



U68 (ISO 3019-1 22-4 (B))	NG	M1	M2[5]	M3[5]	M4[3]
	71	299	19.8	44.2	M12 × 1.75; 22 deep
	100	360	18	42.3	M12 × 1.75; 22 deep
	140	377	17.6	41.9	M12 × 1.75; 22 deep
	180	387	17.9	42.2	M12 × 1.75; 22 deep

▼ 101-2 (B)



U04 (ISO 3019-1 25-4 (B-B))	NG	M1	M2[5]	M3[5]	M4[3]
	71	299	20.3	49.2	M12 × 1.75; 22 deep
	100	360	18.2	47.0	M12 × 1.75; 22 deep
	140	377	18.1	47.6	M12 × 1.75; 22 deep
	180	387	18.4	47.9	M12 × 1.75; 22 deep

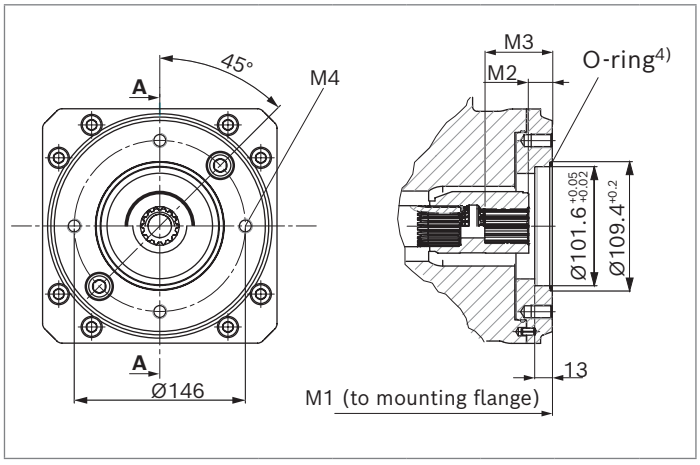
1) According to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Mounting holes pattern viewed on through drive with control at top
3) Thread according to DIN 13
4) O-ring included in the scope of delivery
5) Minimum dimension

For flanges and shafts according to ISO 3019-1

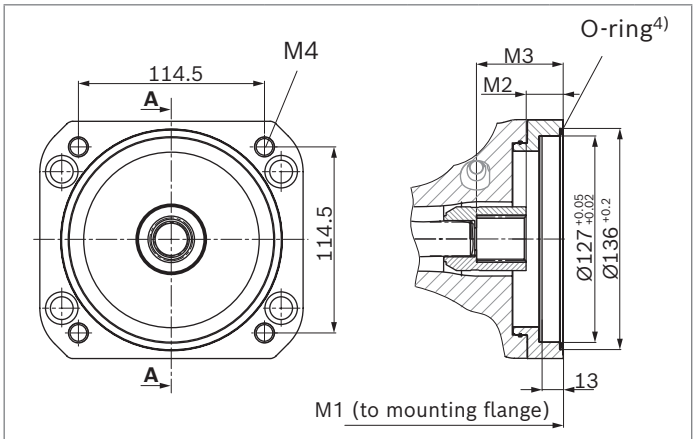
Flange ISO 3019-1 (SAE)		**Hub for splined shaft**[1]		**Availability across sizes**				**Code**
Diameter	**Mounting**[2]	**Diameter**		**71**	**100**	**140**	**180**	
101-2 (B)	⚷, ⚷, ⚷	1 1/4 in	14T 12/24DP	○	○	○	●	U06
127-4 (C)	⚷	1 in	15T 16/32DP	●	●	●	●	UE2
		1 1/4 in	14T 12/24DP	●	●	●	●	U15

● = Available ○ = On request – = Not available

▼ **101-2 (B)**



▼ **127-4 (C)**



U06 (ISO 3019-1 32-4 (C))	**NG**	**M1**	**M2**[5]	**M3**[5]	**M4**[3]
	71	299	On request		M12 × 1.75; 22 deep
	100	360			M12 × 1.75; 22 deep
	140	377			M12 × 1.75; 22 deep
	180	387	19.4	56.7	M12 × 1.75; 22 deep

UE2 (ISO 3019-1 25-4 (B-B))	**NG**	**M1**	**M2**[5]	**M3**[5]	**M4**[3]
	71	299	20.3	49.2	M12 × 1.75; 22 deep
	100	360	18.2	47.0	M12 × 1.75; 22 deep
	140	377	18.1	47.6	M12 × 1.75; 22 deep
	180	387	18.4	47.9	M12 × 1.75; 22 deep

U15 (ISO 3019-1 32-4 (C))	**NG**	**M1**	**M2**	**M3**	**M4**[3]
	71	299	20.3	58.3	M12 × 1.75; 22 deep
	100	360	19.5	57.5	M12 × 1.75; 22 deep
	140	377	19.1	56.4	M12 × 1.75; 22 deep
	180	387	19.4	56.7	M12 × 1.75; 22 deep

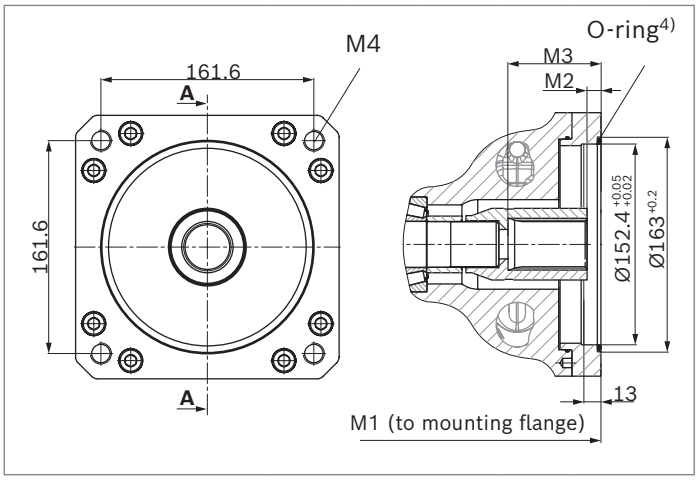
1) According to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Mounting holes pattern viewed on through drive with control at top
3) Thread according to DIN 13
4) O-ring included in the scope of delivery
5) Minimum dimension

For flanges and shafts according to ISO 3019-1

Flange ISO 3019-1 (SAE)		Hub for splined shaft[1]	Availability across sizes				Code
Diameter	**Mounting[2]**	**Diameter**	**71**	**100**	**140**	**180**	
152-4 (C)	⌘	1 1/2 in 17T 12/24DP	–	●	●	●	U96
		1 3/4 in 13T 8/16DP	–	–	●	●	U17

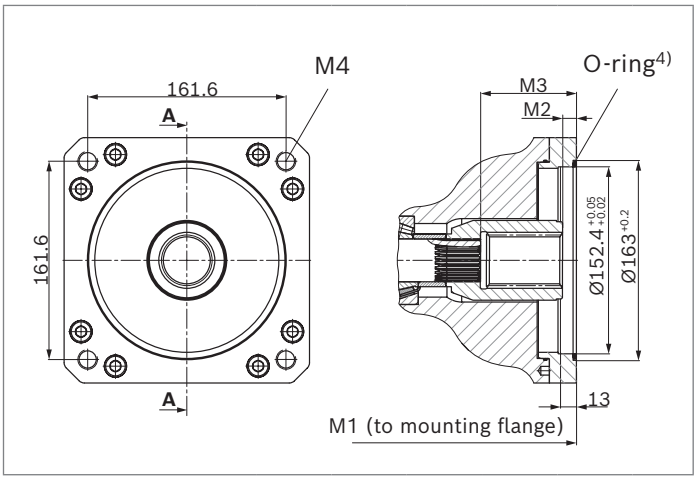
● = Available ○ = On request – = Not available

▼ **152-4 (C)**



U96 (ISO 3019-1 38-4 (C-C))	NG	M1	M2[5]	M3[5]	M4[3]
	100	360	21	63	M16×2; 22 deep
	140	377	9.6	68.6	M16×2; 22 deep
	180	387	9.9	68.9	M16×2; 22 deep

▼ **152-4 (C)**



U17 (ISO 3019-1 44-4 (D))	NG	M1	M2[5]	M3[5]	M4[3]
	140	377	9.3	75.9	M16×2; 22 deep
	180	387	10.4	76.4	M16×2; 22 deep

1) According to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Mounting holes pattern viewed on through drive with control at top
3) Thread according to DIN 13
4) O-ring included in the scope of delivery
5) Minimum dimension

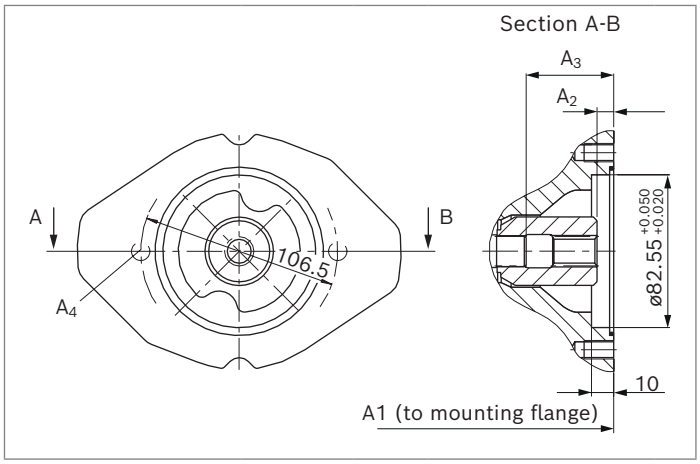
Dimensions through drive for port plate 02 (A10FZO and FZG)

For flanges and shafts according to ISO 3019-1

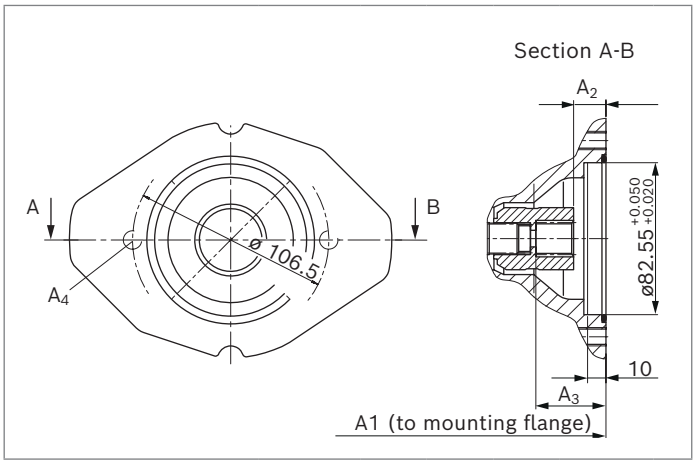
Flange ISO 3019-1 (SAE)		**Hub for splined shaft**[1]		**Availability across sizes**					**Code**
Diameter	**Symbol**[2]	**Diameter**		**3 to 10**	**12 to 18**	**21 to 28**	**37 to 45**[4]	**58 to 63**	
82-2 (A)	⊶	5/8 in	9T 16/32DP	●	●	●	●	●	K01
		3/4 in	11T 16/32DP	●	●	●	●	●	K52

● = Available ○ = On request – = Not available

▼ **82-2**



▼ **82-2**



K01 (ISO 3019-1 16-4 (A))	**NG**	**A1**	**A2**[5]	**A3**[5]	**A4**[3]
	3 to 10	163	10.6	33.1	M10 × 1.5; 14.5 deep
	12 to 18	168	9.7	42.9	M10 × 1.5; 14.5 deep
	21 to 28	194	9.1	36.2	M10 × 1.5; 16 deep
	37 to 45	217	10.0	52.6	M10 × 1.5; 16 deep
	58 to 63	243	8.7	58.2	M10 × 1.5; 16 deep

K52 (ISO 3019-1 19-4 (A-B))	**NG**	**A1**	**A2**[5]	**A3**[5]	**A4**[3]
	3 to 10	163	17.3	39.3	M10 × 1.5; 14.5 deep
	12 to 18	168	18.7	39.7	M10 × 1.5; 14.5 deep
	21 to 28	194	18.4	39.4	M10 × 1.5; 16 deep
	37 to 45	217	18.3	38.7	M10 × 1.5; 16 deep
	58 to 63	243	18.4	38.8	M10 × 1.5; 16 deep

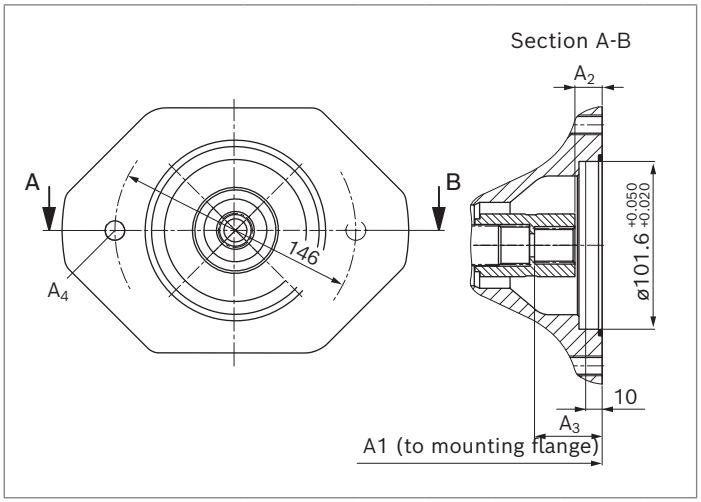
1) According to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Mounting hole pattern viewed on through drive and position of ports **A** and **B** horizontal.
3) Thread according to DIN 13
4) Only A10FZO
5) Minimum dimension

For flanges and shafts according to ISO 3019-1

Flange ISO 3019-1 (SAE)		Hub for splined shaft[1]		Availability across sizes					Code
Diameter	**Symbol**[2]	**Diameter**		**3 to 10**	**12 to 18**	**21 to 28**	**37 to 45**[4]	**58 to 63**	
101-2 (B)	⚯	7/8 in	13T 16/32DP	–	–	●	●	●	K68
		1 in	15T 16/32DP	–	–	–	●	●	K04

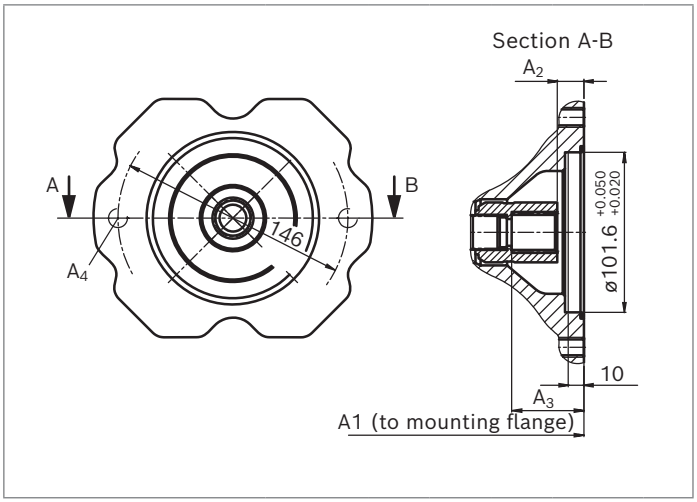
● = Available ○ = On request – = Not available

▼ **101-2**



K68 (ISO 3019-1 22-4 (B))	NG	A1	A2[5]	A3[5]	A4[3]
	21 to 28	194	17.4	42.4	M12 × 1.75; 18 deep
	37 to 45	217	17.3	41.7	M12 × 1.75; 18 deep
	58 to 63	243	17.4	41.8	M12 × 1.75; 18 deep

▼ **101-2**



K04 (ISO 3019-1 25-4 (B-B))	NG	A1	A2[5]	A3[5]	A4[3]
	37 to 45	217	17.8	47.3	M12 × 1.75; 18 deep
	58 to 63	243	17.9	46.8	M12 × 1.75; 18 deep

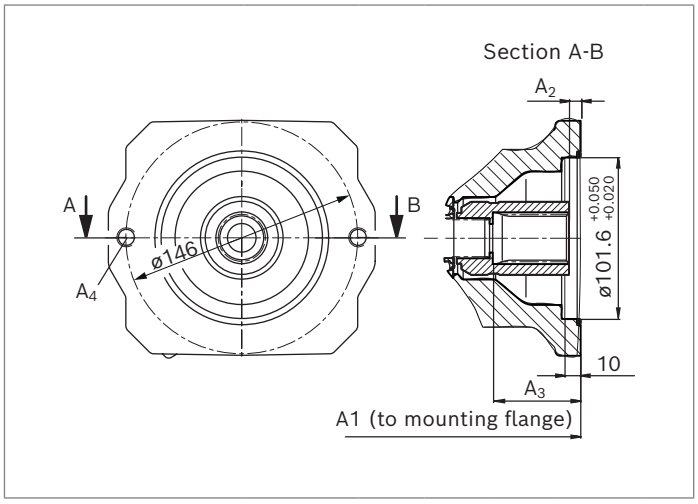
1) According to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Mounting hole pattern viewed on through drive and position of ports **A** and **B** horizontal.
3) Thread according to DIN 13
4) Only A10FZO
5) Minimum dimension

For flanges and shafts according to ISO 3019-1

Flange ISO 3019-1 (SAE)		**Hub for splined shaft**[1]	**Availability across sizes**					**Code**
Diameter	**Symbol**[2]	**Diameter**	**3 to 10**	**12 to 18**	**21 to 28**	**37 to 45**[4]	**58 to 63**	
101-2 (B)	⚯	1 1/4 in 14T 12/24DP	–	–	–	–	●	K06

● = Available ○ = On request – = Not available

▼ **101-2**



K06 (ISO 3019-1 32-4 (C))	**NG**	**A1**	**A2**[5]	**A3**[5]	**A4**[3]
	58 to 63	243	17.9	55.9	M12 × 1.75; 18 deep

1) According to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Mounting hole pattern viewed on through drive and position of ports **A** and **B** horizontal.
3) Thread according to DIN 13
4) Only A10FZO
5) Minimum dimension

Overview of mounting options for A10VZO with port plate 07 and 12 or A10FZO, A10FZG with port plate 02

Through drive			Mounting options – 2nd pump			
Flange (SAE) ISO 3019-1	**Hub for splined shaft**	**Code**	**A10VZO/10 NG (shaft)**	**A10FZO**	**A10FZG**	**A10VZG**
82-2 (A)	3/4 in	K52	3 to 10 (S) 18 (S) 18 (R)	3 to 10 (S) 11 to 18 (R)	3 to 10 (S) 11 to 18 (R)	3 to 10 (S) 18 (R)
101-2 (B)	7/8 in	K68	28 (R)	21 to 28 (R)	21 to 28 (R)	28 (R)
	1 in	K04	–	37 to 45 (R)	–	–
	1 1/4 in	K06	–	63 (R)	63 (R)	63 (R)

Overview of mounting options for A10VZO with port plate 22U

Through drive			Mounting options – 2nd pump			
Flange (SAE) ISO 3019-1	**Hub for splined shaft**	**Code**	**A10VZO/10 NG (shaft)**	**A10FZO**	**A10FZG**	**A10VZG**
82-2 (A)	3/4 in	U52	10 (S) , 18 (R)	3 to 10 (S) 11 to 18 (R)	3 to 10 (S) 11 to 18 (R)	3 to 10 (S) 18 (R)
101-2 (B)	7/8 in	U68	28 (R)	21 to 28 (R)	21 to 28 (R)	28 (R)
	1 in	U04	–	37 to 45 (R)	–	–
	1 1/4 in	U06	–	63 (R)	63 (R)	63 (R)
127-4 (C)	1 in	UE2	45 (R)	–	–	–
127-4 (C)	1 1/4 in	U15	71 (R)	–	–	–
127-2 (C)	1 1/2 in	U24	71 (R)	–	–	–
152-4 (D)	1 1/2 in	U96	100 (S)	–	–	–
	1 3/4 in	U17	140, 180 (S)	–	–	–

Combination pumps A10VZO + A10VZO, A10VZG, A10FZO or A10FZG

By using combination pumps, it is possible to have independent circuits without the need for splitter gearboxes. When ordering combination pumps the type designations for the 1st and the 2nd pump must be joined by a "**+**".

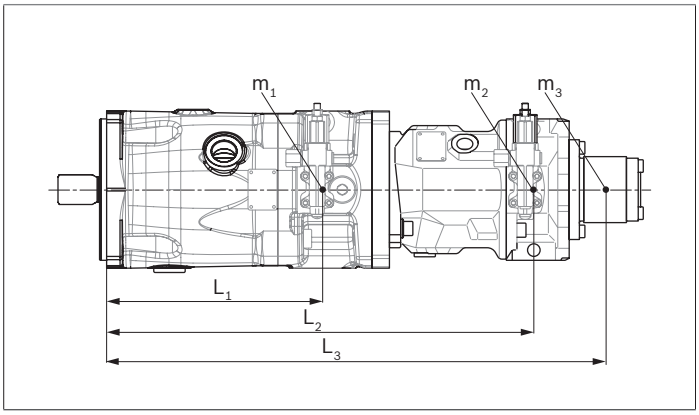
Order example:
A10VZO71LA5D/10R-VRD22UE2+
A10VZO45DRG/10R-VRD12N00

A tandem pump, with two pumps of equal size, is permissible without additional supports, assuming that the dynamic mass acceleration does not exceed maximum 10 *g* (= 98.1 m/s²).

For combination pumps consisting of more than two pumps, the mounting flange must be rated for the permissible mass torque (please contact us).

The "**K..**" On delivery, through drives are plugged with a **non-pressure-resistant** cover. If a second pump is not mounted, the hub and spacer must be removed and provided with a pressure-resistant cover before commissioning. Through drives can also be ordered with a pressure-resistant cover, please specify in plain text.

The "**U..**" Through drives are plugged with a **non-pressure-resistant** cover. Therefore, single pumps must be equipped with a pressure-resistant cover before commissioning. Through drives can also be ordered with a pressure-resistant cover, please specify in plain text.



m_1, m_2, m_3	Weight of pump	[kg]
l_1, l_2, l_3	Distance from center of gravity	[mm]
$T_m = (m_1 \times l_1 + m_2 \times l_2 + m_3 \times l_3) \times \frac{1}{102}$		[Nm]

U00 basic through drives (without hub and intermediate flange) are supplied **with a pressure-resistant** cover. This enables the utilization of various through drive options without mechanical machining of the port plate. Details of the assembled parts can be found in data sheet RE 95581.

Notice

K.. and **U..** Through drives with mounted hub are supplied with a spacer.

The spacer must be removed before installation of the 2nd pump and before commissioning. For information, please refer to operating instructions 91485-01-B

Permissible mass moments of inertia A10VZO

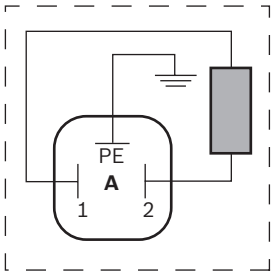
Size				10	18	28	45	71	100	140	180
static	T_m	Nm		500	500	880	1370	3000	4500	4500	4500
dynamic at 10 *g* (98.1 m/s²)	T_m	Nm		50	50	88	137	300	450	450	450
Weight **without** through drive plate (12N00, 14N00, 42N00 approx.)	m	kg		8	12	15	27	36.5	55	70.5	75.2
Weight **with** through-drive plate (07K.., 12K.. approx.)				10.5	14	18	28	–	–	–	–
Weight **without** through-drive plate (22/32U00 approx.)				–	–	–	–	51.8	76	90.2	89.4
Weight **with** through-drive plate (22/32U.. approx.)				–	–	–	–	51.8	76	90.2	89.4
Distance, center of gravity **without** through drive	l_1	mm		–	92	100	113	153	184	196	190
Distance, center of gravity **with** through drive	l_1	mm		–	98	107	120	153	184	196	190

Permissible mass moments of inertia A10FZO, A10FZG

Size			3 to 10	12 to 18	21 to 28	37 to 45	58 to 63
static	T_m	Nm	500	500	890	900	1370
dynamic at 10 *g* (98.1 m/s²)	T_m	Nm	50	50	89	90	137
Weight **(approx.)**	m	kg	9	10	15.5	21	26
Distance from center of gravity	l_1	mm	92	96	105	125	136

Connector for solenoids

Device plug on solenoid (version H) according to DIN EN 175301-803-A002M



With correctly mounted mating connector, the following type of protection can be achieved:

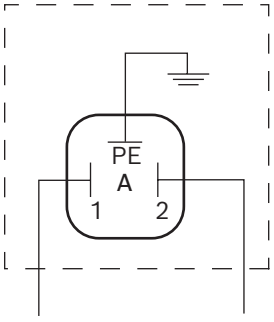
- IP65 (DIN/EN 60529)

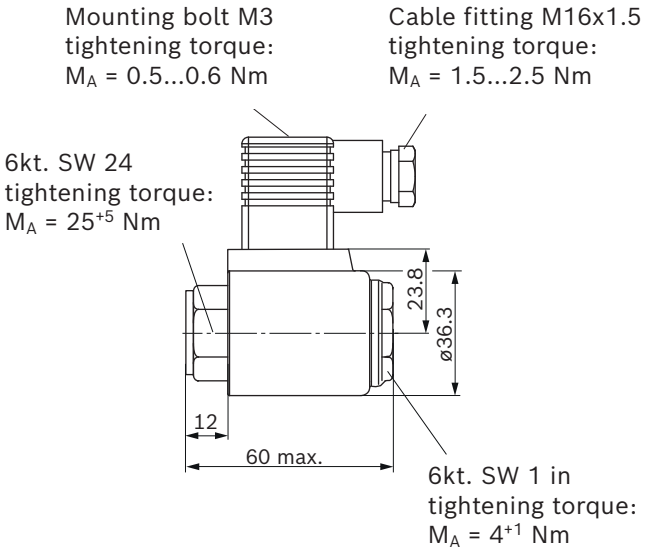
Notes

- If necessary, you can change the position of the connector by turning the solenoid body.
- The procedure is defined in the instruction manual 91485-01-B.

Mating connector

HIRSCHMANN **DIN EN 175301-803-A002F**
without bidirectional suppressor diode **H**
The mating connector (plug-in connector) is not included in the scope of delivery.
This can be supplied by Bosch Rexroth on request, under Bosch Rexroth material number: R902602623





1 Device plug on the solenoid
2 Mating connector (not included in the scope of delivery)

The seal ring in the cable fitting is suitable for lines of diameter 4.5mm to 10mm.

Installation instructions A10FZO; A10VZO; A10FZG; A10VZG

General

The axial piston unit must be filled with hydraulic fluid and air bled during commissioning and operation. This must also be observed following a longer standstill as the axial piston unit may empty via the hydraulic lines. Particularly with the "drive shaft up/down" installation position, filling and air bleeding must be carried out completely as there is, for example, a danger of dry running. The leakage in the housing area must be directed to the reservoir via the highest positioned drain port (**L**, **L_1**). If a shared drain line is used for several units, make sure that the respective case pressure in each unit is not exceeded. For combination pumps, the leakage must be drained off at each single pump. If a shared drain line is used for several units, make sure that the respective case pressure in each unit is not exceeded. The shared drain line must be dimensioned to ensure that the maximum permissible case pressure of all connected units is not exceeded in any operating condition, particularly at cold start. If this is not possible, separate drain line must be laid, if necessary.

To prevent the transmission of structure-borne noise, use elastic elements to decouple all connecting lines from all vibration-capable components (e.g. reservoir, frame parts).

Under all operating conditions, the suction lines and the drain lines must flow into the reservoir below the minimum fluid level.

The permissible suction height h_S results from the total pressure loss. However, it must not be higher than $h_{S\,max}$ = 800 mm. The minimum suction pressure at input **S**(**A**/**B**) must also not fall below 0.8 bar absolute during operation and during cold start. Above-reservoir installation reduces the permissible maximum speed.

When designing the reservoir, ensure that there is adequate distance between the suction line and the drain line. This minimizes oil turbulence and carries out degassing, which prevents the heated hydraulic fluid from being sucked directly back in again.

For key, see page 128.

Installation position

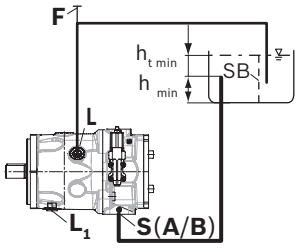
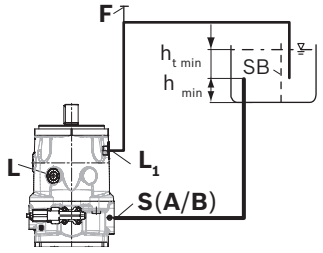
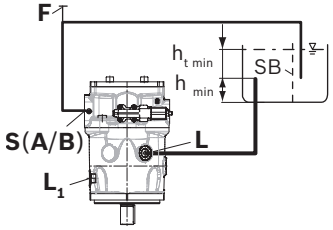
See the following examples **1** to **8**.

Further installation positions are available upon request.

Recommended installation position: **1** and **4**

Below-reservoir installation (standard)

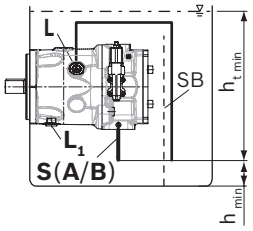
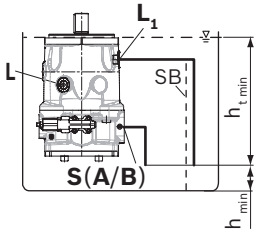
Below-reservoir installation means that the axial piston unit is installed outside of the reservoir below the minimum fluid level.

Installation position	Air bleed	Filling
1	**F**	**L** or **L_1**
		
2[1)]	**F**	**L_1**
		
3[1)]	**F**	**L_1**
		

1) Because complete air bleeding and filling are not possible in this position, the pump should be air bled and filled in a horizontal position before installation.

Inside-reservoir installation

Inside-reservoir installation is when the axial piston unit is installed in the reservoir below the minimum fluid level. The axial piston unit is completely below the hydraulic fluid.
If the minimum fluid level is equal to or below the upper edge of the pump, see chapter "Above-reservoir installation".
Axial piston units with electrical components (e.g. electric control, sensors) may not be installed in a reservoir below the fluid level.

Installation position	Air bleed	Filling
4 	Via the highest available port **L**	Automatically via the open port **L** or **L_1** due to the position under the hydraulic fluid level
5[1] 	Via the highest available port **L_1**	Automatically via the open port **L**, **L_1** due to the position under the hydraulic fluid level

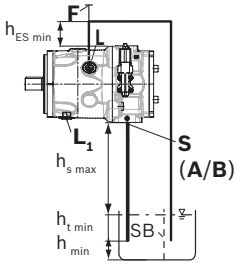
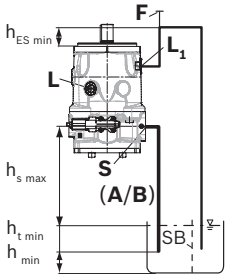
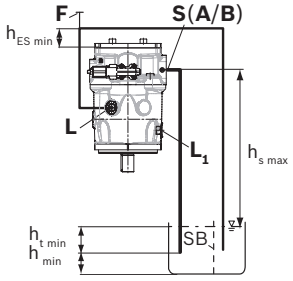
A check valve in the drain line is only permissible in individual cases. Consult us for approval.

Key and assembly note

Key	
F	Filling / Air bleeding
S	Suction port (for A10VZO)
A or B	Suction port (for A10FZG; A10FZO and A10VZG A/B)
L; L_1	Drain port
SB	Baffle (baffle plate)
$h_{t\,min}$	Minimum required immersion depth (200 mm)
h_{min}	Minimum required distance to reservoir bottom (100 mm)
$h_{ES\,min}$	Minimum height required to prevent axial piston unit from draining (25 mm)
$h_{S\,max}$	Maximum permissible suction height (800 mm)

Above-reservoir installation

Above-reservoir installation means that the axial piston unit is installed above the minimum fluid level of the reservoir. To prevent the axial piston unit from draining, a height difference $h_{ES\,min}$ of at least 25 mm is required in position 6 to 8.
Observe the maximum permissible suction height $h_{S\,max}$ = 800 mm.
The maximum speed in above-reservoir installation is only permissible if at least 1 bar absolute is complied with on input **S**(**A**/**B**).

Installation position	Air bleed	Filling
6 	**F**	**L_1** or **L**
7[1] 	**F**	**L_1**
8[1] 	**F**	**L_1**

Notice

Port **F** is part of the external piping and must be provided on the customer side to make filling and air bleeding easier.

1) Because complete air bleeding and filling are not possible in this position, the pump should be air bled and filled in a horizontal position before installation.

Project planning notes

- The axial piston units A10FZO and A10VZO are intended to be used in open circuit.
- The axial piston units A10FZG and A10VZG are intended to be used in open or closed circuit.
- The project planning, installation and commissioning of the axial piston unit requires the involvement of skilled personnel.
- Before using the axial piston unit, please read the corresponding instruction manual completely and thoroughly. If necessary, this can be requested from Bosch Rexroth.
- Before finalizing your design, please request a binding installation drawing.
- The specified data and notes contained herein must be observed.
- Depending on the operating conditions of the axial piston unit (working pressure, fluid temperature), the characteristic curves may shift.
- The characteristic curve may also shift due to the dither frequency or control electronics.
- Preservation: Our axial piston units are supplied as standard with preservation protection for a maximum of 12 months. If longer preservation protection is required (maximum 24 months), please specify this in plain text when placing your order. The preservation periods apply under optimal storage conditions, details of which can be found in the data sheet 90312 or the instruction manual.
- Not all versions of the product are approved for use in a safety function according to ISO 13849. Please consult the proper contact at Bosch Rexroth if you require reliability parameters (e.g. $MTTF_d$) for functional safety.
- Depending on the type of control used, electromagnetic effects can be produced when using solenoids. Use of the recommended direct current (DC) on the electromagnet does not produce any electromagnetic interference (EMI) nor is the electromagnet influenced by EMI. A possible electromagnetic interference (EMI) exists if the solenoid is supplied with modulated direct current (e.g. PWM signal). Appropriate testing and measures should be taken by the machine manufacturer to ensure other components or operators (e.g. with pacemaker) are not affected by this potential.
- Pressure controllers are not safeguards against pressure overload. Be sure to add a pressure relief valve to the hydraulic system.
- For drives that are operated for a long period with constant rotational speed, the natural frequency of the hydraulic system can be stimulated by the excitation frequency of the pump (rotational speed frequency ×9). This can be prevented with suitably designed hydraulic lines.
- Please note the details regarding the tightening torques of port threads and other threaded joints in the instruction manual.
- Working ports:
  - The ports and fastening threads are designed for the specified maximum pressure. The machine or system manufacturer must ensure that the connecting elements and lines correspond to the specified application conditions (pressure, flow, hydraulic fluid, temperature) with the necessary safety factors.
  - The service ports and function ports are only intended to accommodate hydraulic lines.

Safety instructions

- During and shortly after operation, there is a risk of getting burnt on the axial piston unit and especially on the solenoids. Take the appropriate safety measures (e.g. by wearing protective clothing).
- Moving parts in control equipment (e.g. valve spools) can, under certain circumstances, get stuck in position as a result of contamination (e.g. contaminated hydraulic fluid, abrasion, or residual dirt from components). As a result, the hydraulic fluid flow and the build-up of torque in the axial piston unit can no longer respond correctly to the operator's specifications. Even the use of various filter elements (external or internal flow filtration) will not rule out a fault but merely reduce the risk. The machine/system manufacturer should test whether additional measures are required on the machine for the relevant application in order to bring the driven consumer into a safe position (e.g. safe stop) and make sure any measures are properly implemented.

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