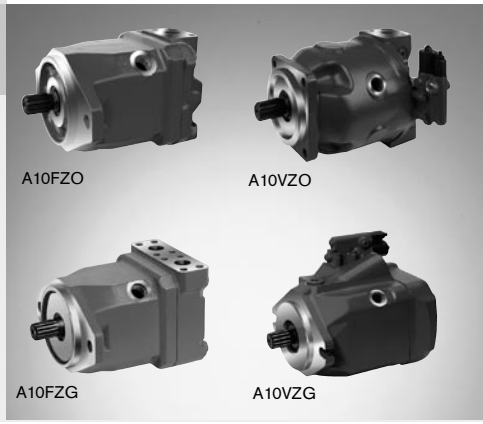
Rexroth
Bosch Group

Variable-Speed Drive with Fixed Displacement Unit A10FZO/G Variable Displacement Unit A10VZO/G

RE 91485/06.11 1/60

Data sheet



Series 10
Size 6 to 180
For nominal pressure, maximum pressure, see Technical data, pages 9 to 11
Open and closed circuits

Contents

Features

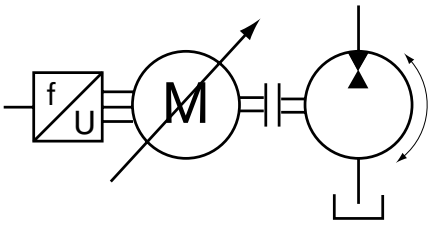
- Suitable for variable-speed operation with synchronous and asynchronous motors
- Suitable for start/stop operation
- Suitable for long pressure retention operation
- Proven A10 rotary group technology
- Through-drive option
- High efficiency
- For use in single-, double- and four-quadrant operation

Function and assembly of variable-speed drives

Rexroth has developed the proven axial piston units of the A10 product family further for use in energy-efficient variable-speed drive systems 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 BlueHydraulics technology reduce energy consumption in industrial applications and at the same time avoid medium-level 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. These are approved for start/stop operation and for changing directions of rotation. At the lowest speeds, between 0 and 200 rpm, they provide a constant pressure and are characterized by very high efficiency in pressure retention 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 single-, double- 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 6 to 63 cm^3. The axial piston variable displacement units are available in the sizes 10 to 180 cm^3 (A10VZO). Equipped with a torque controller and 2-point control, they are employed for dimensioning smaller servomotors. The numerous combination options allow a wide range of different customized system requirements to be satisfied.

A10FZO

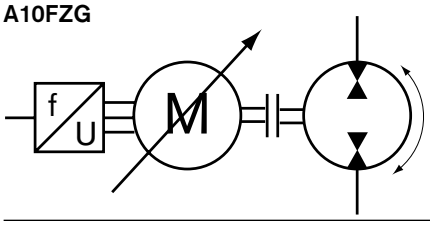


Axial piston fixed displacement units in **open circuit** with changing direction of rotation and unchanging pressure side (depends on the principal direction of rotation of the pump).

Single- or double-quadrant operation

For type codes, see page 3.
For technical data, see pages 12 and 13.

A10FZG

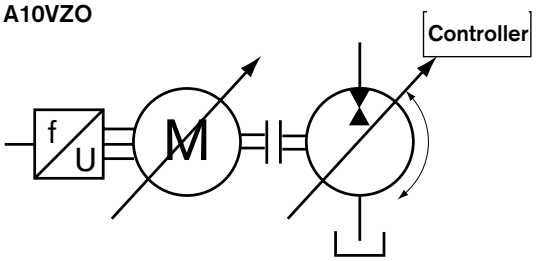


Axial piston fixed displacement unit in **closed circuit** with changing direction of rotation and two pressure sides.

Four-quadrant operation

For type codes, see page 4.
For technical data, see pages 14 and 15.

A10VZO

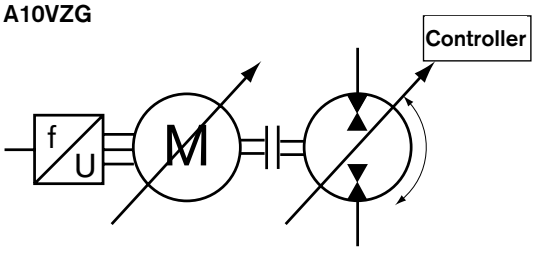


Axial piston variable displacement units in **open circuit** with changing direction of rotation and unchanging pressure side (depends on the principal direction of rotation of the pump).

Single- or double-quadrant operation

For type codes, see pages 6 and 7.
For technical data, see pages 16 and 17.

A10VZG



Axial piston variable displacement unit in **closed circuit** with changing direction of rotation and two pressure sides.

Four-quadrant operation

For type codes, see page 5.
Technical data on request.

Type codes for standard program, A10FZO

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

Axial piston unit

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

Type of operation

02	Variable-speed drives	**Z**

Type of operation

03	Pump/motor, open circuit[1)]	**O**

Size (NG)

04	Geometric displacement (see table of values on page 12)	**006**	**008**	**010**	**011**	**014**	**016**	**018**	**021**	**023**	**028**	**037**	**045**	**058**	**063**

Series

05	Series 1, Index 0	**10**

Direction of rotation[1)]

06	With view on drive shaft	clockwise	**R**
		counter-clockwise	**L**

Seal

07	FKM (fluoro-rubber)	**V**

Drive shaft

08	Splined shaft ANSI B92.1a	**S**

Mounting flange

09	ISO 3019-1 – 2-hole	**C**

	Service line ports	**006**	**008**	**010**	**011**	**014**	**016**	**018**	**021**	**023**	**028**	**037**	**045**	**058**	**063**	
10	SAE flange port A and B, opposite sides, metric fixing thread	●	●	●	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	**02**

	Through drive		**006**	**008**	**010**	**011**	**014**	**016**	**018**	**021**	**023**	**028**	**037**	**045**	**058**	**063**	
11	Without through drive																**N00**
	Flange ISO 3019-1	Coupling for splined shaft[2)]															
	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) Changing direction of rotation permissible with same pressure side (e.g. pressure drain)
2) 30° pressure angle, flat base, flank centering, tolerance class 5

● = Available ❍ = On request – = Not available

Type codes for standard program, A10FZG

A10F	Z	G		/	10	W	–	V		C		N00
01	02	03	04		05	06		07	08	09	10	11

Axial piston unit

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

Application area

02	Variable-speed drives	**Z**

Type of operation

03	Pump/motor in closed circuit	**G**

Size (NG)

04	Geometric displacement (see table of values on page 14)	**006**	**008**	**010**	**011**	**018**	**028**	**045**	**063**

Series

05	Series 1, Index 0	**10**

Direction of rotation

06	With view on drive shaft, alternating	**W**

Seal

07	FKM (fluoro-rubber)	**V**

	Drive shaft	**006**	**008**	**010**	**011**	**018**	**028**	**045**	**063**	
08	Splined shaft ANSI B92.1a	●	●	●	–	–	❍	❍	–	**S**
	Splined shaft for higher torque, ANSI B92.1a	–	–	–	❍	❍	–	–	❍	**R**

Mounting flange

09	ISO 3019-1 – 2-hole	**C**

	Service line ports	**06**	**08**	**010**	**011**	**018**	**028**	**045**	**063**	
10	SAE flange port A and B, opposite sides, metric fixing thread	●	●	●	❍	❍	❍	❍	❍	**02**

Through drive

11	Without through drive	**N00**

● = Available ❍ = On request – = Not available

Type codes for standard program, A10VZG

A10V	Z	G			/	10	W		–	V	S	C	20	N00	H
01	02	03	04	05		06	07	08		09	10	11	12	13	14

Axial piston unit

01	Swashplate design, variable, nominal pressure 280 bar, maximum pressure 350 bar	**A10V**

Application area

02	Variable-speed drives	**Z**

Type of operation

03	Pump/motor in closed circuit	**G**

Size (NG)

			010	018	028	045	063	
04	Geometric displacement $V_{g\,max}$ in cm^3							

Control and adjustment device[1)]

			010	018	028	045	063	
05	Two-point control, electric	U = 12V	❍	❍	❍	❍	❍	**EZ1**
		U = 24V	❍	❍	❍	❍	❍	**EZ2**

Series

06	Series 1, Index 0	**10**

Direction of rotation

07	With view on drive shaft, alternating	**W**

Minimum displacement

			010	018	028	045	063	
08	$V_{g\,min}$ (in cm^3) steplessly adjustable State default setting in clear text	from	–	–	8	12	16	**1**
		to			28	25	38	
		from	–	–	–	26	40	**2**
		to				45	42	

Seal

09	FKM (fluoro-rubber)	**V**

Drive shaft

10	Splined shaft ANSI B92.1a–	**S**

Mounting flange

11	ISO 3019-1 – 2-hole	**C**

Service line ports

12	SAE flange port A and B, opposite sides, metric fixing thread	**02**

Through drive

13	Without through drive	**N00**

Connectors for solenoids[2)]

14	HIRSCHMANN connector – without suppressor diode	**H**

1) Other controllers on request
2) Connectors for other electric components can deviate.

● = Available ❍ = On request – = Not available

Type codes for standard program, A10VZO

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

Axial piston unit

		010	018	028	045	071	100	140	180	
	Swashplate design, variable									**A10V**
01	Nominal pressure 250 bar, maximum pressure 315 bar	●	–	–	–	–	–	–	–	
	Nominal pressure 280 bar, maximum pressure 350 bar	–	●	●	●	●	●	●	●	

Application area

02	Variable-speed drives	**Z**

Type of operation

03	Pump/motor, open circuit	**O**

Size (NG)

		010	018	028	045	071	100	140	180
04	Geometric displacement (see table of values on page 16)	**010**	**018**	**028**	**045**	**071**	**100**	**140**	**180**

Control device

				010	018	028	045	071	100	140	180	
05	Pressure control			●	●	●	●	●	●	●	●	**DR**[1]
		hydraulic, remotely operated		●	●	●	●	●	●	●	●	**DRG**[1]
	Torque controller	size 10	size 18 to 180									
	Beginning of control	10 to 35 bar	up to 50 bar	–	●	●	●	●	●	●	●	**LA5D**
		36 to 70 bar	51 to 90 bar	–	●	●	●	●	●	●	●	**LA6D**
		71 to 105 bar	91 to 160 bar	–	●	●	●	●	●	●	●	**LA7D**
		106 to 140 bar	161 to 240 bar	–	●	●	●	●	●	●	●	**LA8D**
		141 to 230 bar	more than 240 bar	–	●	●	●	●	●	●	●	**LA9D**
	Two-point control, electric		U = 12V	–	●	●	●	●	●	●	●	**EZ3**[2]
			U = 24V	–	●	●	●	●	●	●	●	**EZ4**[2]

Series

06	Series 1, Index 0	**10**

Direction of rotation[3]

07	With view on drive shaft	clockwise	**R**
		counter-clockwise	**L**

Seal

08	FKM (fluoro-rubber)	**V**

Drive shaft

09	Splined shaft ANSI B92.1a	**S**

1) For DR and DRG in conjunction with changing direction of rotation, Please contact us
2) If a mechanical flow limitation is required, please refer to item 11, port plate 12.
3) Changing direction of rotation permissible with unchanging pressure side (e.g. pressure drain)

● = Available ❍ = On request – = Not available

Type codes for standard program, A10VZO

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

	Mounting flange	010	018	028	045	071	100	140	180	
10	ISO 3019-1 – 2-hole	●	●	●	–	–	–	–	–	**C**
	ISO 3019-1 – 4-hole	–	–	–	●	●	●	●	●	**D**

	Service line ports	010	018	028	045	071	100	140	180	
11	SAE flange port, top and bottom, opposite sides, metric fixing thread, with universal through drive	–	–	–	●	●	●	●	●	**22**
	SAE flange port, top and bottom, opposite sides, metric fixing thread, size 45 to 140 without through drive	–	●	●	●	●	●	●	❍	**12[1)]**
	DIN metric threaded ports, rear, not for through drive	●	–	–	–	–	–	–	–	**14**
	DIN threaded ports, opposite sides	●	–	–	–	–	–	–	–	**7**

	Through drive		010	018	028	045	071	100	140	180	
12	With through-drive shaft, without coupling, without intermediate flange, sealed with functionally reliable cover; only port plate 22[3)]		–	–	–	●	●	●	●	●	**U00[2)]**
	Without through drive; only port plate 12[3)]		●	●	●	●	●	●	●	●	**N00**
	Flange ISO 3019-1	Coupling for splined shaft[4)]									
	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**
	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**

	Connectors for solenoids[5)]	
13	HIRSCHMANN connector – without suppressor diode	**H**

1) A mechanical flow limitation mechanism is only fitted as standard on the version 12 N00 with EZ control, sizes 18 to 140
$V_{g\,max}$: setting range $V_{g\,max}$ up to 50% $V_{g\,max}$ stepless
$V_{g\,min}$: setting range $V_{g\,min}$ up to 50% $V_{g\,max}$ stepless
State settings values in clear text.
$V_{g\,max}$ and $V_{g\,min}$ limitations for through drives with port plates 12K.. and 22U.. can only be made with permanently defined values. Again here, state in clear text.

2) See RE 95581 Universal through drive

3) When ordering sizes 45 to 180 with port plate 22U, please order the corresponding through drive **without** "K"
Example: A10VO180DRS/32R-VSD**22U01**
When ordering sizes 18 to 28 with port plate 12, please order the corresponding through drive **with** "K"
Example: A10VO18DRS/32R-VSD**12K01**

4) Coupling for splined shaft as per ANSI B92.1a (splined shaft assignment as per SAE J744)

5) Connectors for other electric components may differ.

● = Available ❍ = On request – = Not available

Technical data

Hydraulic fluid

Prior to project design, please see our data sheets RE 90220 (mineral oil) and RE 90221 (environmentally acceptable hydraulic fluids) for detailed information on hydraulic fluid and operating conditions.

When using environmentally acceptable hydraulic fluids, the limitations regarding technical data and seals must be observed. Please contact us. When ordering, indicate the hydraulic fluid that is to be used.

Operating viscosity range

We recommend you to choose the operating viscosity (at operating temperature) in the optimum range for efficiency and useful life of

ν_{opt} = opt. operating viscosity 16 ... 36 mm²/s

taking into account the reservoir temperature (open circuit) or circuit temperature (closed circuit).

Limits of viscosity range

For critical operating conditions the following values apply:

ν_{min} = 10 mm²/s
for short periods (t ≤ 1 min)
at a max. perm. case drain temperature of 90 °C.

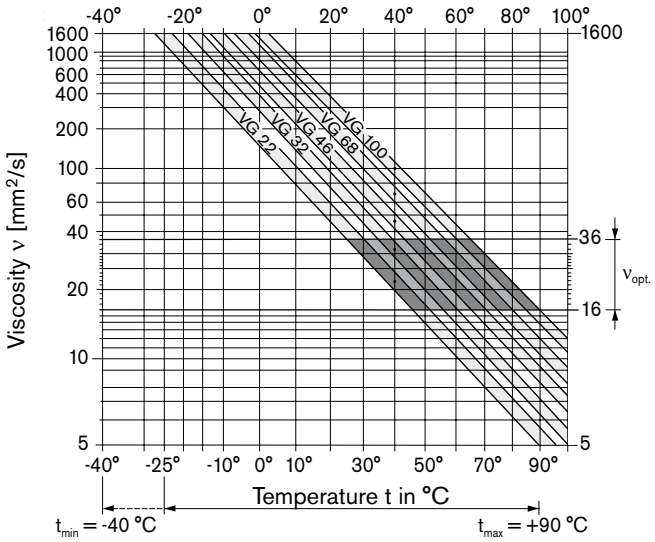
Note that the maximum case drain temperature of 90 °C may not be exceeded even locally (e.g. in the bearing area). The temperature in the bearing area is approx. 5 K higher than the average case drain temperature.

ν_{max} = 1600 mm²/s
for short periods (t ≤ 1 min)
on cold start
(p ≤ 30 bar, n ≤ 1000 rpm, t_{min} -25 °C)

Depending on the installation situation, special measures are necessary at temperatures between -40 °C and -25 °C. Please contact us.

For detailed information about operation with low temperatures, see RE 90300-03-B.

Selection diagram



Hydraulic fluid temperature range

Notes on the selection of the hydraulic fluid

In order to select the correct fluid, it is necessary to know the operating temperature in the reservoir (open circuit) in relation to the ambient temperature: in an open circuit, the reservoir temperature; in a closed circuit, the circuit temperature.

The hydraulic fluid should be selected so that the viscosity in the operating temperature range is within the optimum range (ν_{opt}), see shaded area of the selection diagram. We recommended that the higher viscosity class be selected in each case.

Example: at an ambient temperature of X °C, an operating temperature of 60 °C is set in the circuit. In the optimum operating viscosity range (ν_{opt}, shaded area), this corresponds to the viscosity classes VG 46 or VG 68. VG 68 should be selected.

Note
The case drain temperature, which is influenced by pressure and speed, is always higher than the reservoir temperature. However, at no point in the component may the temperature exceed 90 °C. The temperature difference specified on the left is to be taken into account when determining the viscosity in the bearing.

If the above conditions cannot be met due to extreme operating parameters, please contact us.

Filtration of the hydraulic fluid
The finer the filtration, the better the hydraulic fluid cleanliness class, and the longer the service life of the axial piston unit.

In order to guarantee the functional reliability of the axial piston unit, it is necessary to carry out a gravimetric evaluation of the hydraulic fluid to determine the particle contamination and the cleanliness class according to ISO 4406. The minimum cleanliness class to be observed is 20/18/15.
At very high hydraulic fluid temperatures (90 °C to maximum 115 °C), a cleanliness class of at least 19/17/14 according to ISO 4406 is necessary.

If the above classes cannot be maintained, please contact us.

Technical data

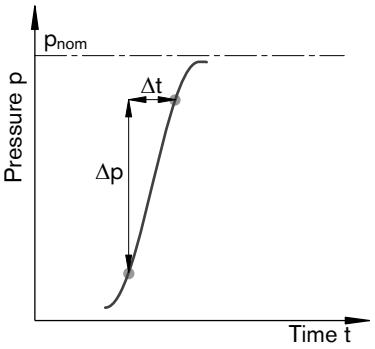
Operating pressure range, A10FZO

Pressure at service line port B

Nominal pressure p_{nom} _____ 315 bar absolute
Maximum pressure p_{max} _____ 350 bar absolute
Individual operating period _____ 2.0 s
Total operating period _____ 300 h

Minimum pressure (high-pressure side) _____ 10 bar

Rate of pressure change R_A _____ 16,000 bar/s



Pressure at suction port A (inlet)

Minimum pressure $p_{S\ min}$ _____ 0.8 bar absolute

Maximum pressure $p_{S\ max}$ _____ 5 bar absolute

Case drain pressure

Maximum permissible case drain pressure
(at port L, L_1):
Maximum 0.5 bar higher than inlet pressure at port S,
but not higher than 2 bar absolute.

$p_{L\ max\ abs}$ _____ 2 bar

Flow direction

Direction of rotation, with view on drive shaft		
Type of operation	clockwise	counter-clockwise
Pump mode	**A** to **B**	**B** to **A**
Motor mode	**A** to **B**	**B** to **A**

Operating pressure range, A10FZG

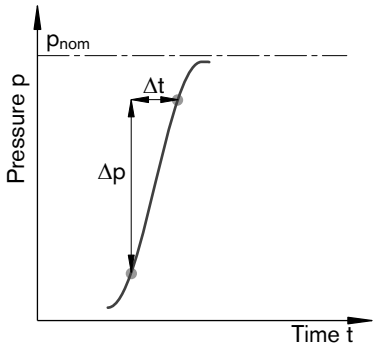
Pressure at service line port A or B

Nominal pressure p_{nom} _____ 315 bar absolute
Maximum pressure p_{max} _____ 350 bar absolute
Individual operating period _____ 2.0 s
Total operating period _____ 300 h

Minimum pressure (high-pressure side) _____ 10 bar

Minimum pressure (low-pressure side) ___ 0.8 bar absolute

Rate of pressure change R_A _____ 16,000 bar/s



Case drain pressure

Maximum permissible case drain pressure
(at port L, L_1):
Maximum 0.5 bar higher than inlet pressure at port A or B,
but not higher than 2 bar absolute.

$p_{L\ max\ abs}$ _____ 2 bar

Flow direction

Direction of rotation, with view on drive shaft		
Type of operation	clockwise	counter-clockwise
Pump mode	**A** to **B**	**B** to **A**
Motor mode	**A** to **B**	**B** to **A**

For pressure definitions, see page 11

Technical data

Operating pressure range, A10VZO size 10

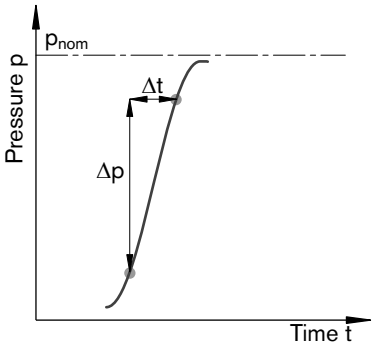
Pressure at service line port B

Nominal pressure p_{nom} _____ 250 bar absolute

Maximum pressure p_{max} _____ 315 bar absolute
Individual operating period _____ 2.0 s
Total operating period _____ 300 h

Minimum pressure (high-pressure side) _____ 10 bar

Rate of pressure change R_A _____ 16,000 bar/s



Pressure at suction port S (inlet)

Minimum pressure $p_{abs\ min}$ _____ 0.8 bar absolute
Maximum pressure $p_{abs\ max}$ _____ 5 bar absolute

Case drain pressure

Maximum permissible case drain pressure
(at port L, L_1):
Maximum 0.5 bar higher than inlet pressure at port S,
but not higher than 2 bar absolute.

$p_{L\ max\ abs}$ _____ 2 bar

Flow direction

Direction of rotation, with view on drive shaft		
Type of operation	clockwise	counter-clockwise
Pump	**S** to **B**	**S** to **B**[1)]
Pressure drain	**B** to **S**[1)]	**B** to **S**

1) Note: Comply with installation drawings for counter-clockwise rotation

Operating pressure range, A10VZO, size 18 to 180

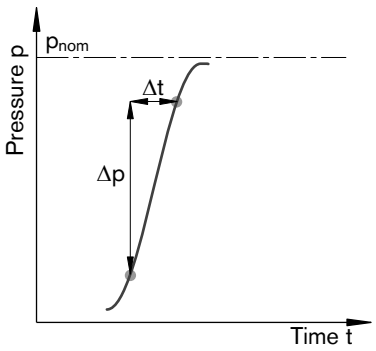
Pressure at service line port B

Nominal pressure p_{nom} _____ 280 bar absolute
For 10% actuated time _____ 315 bar absolute

Maximum pressure p_{max} _____ 350 bar absolute
Individual operating period _____ 2.5 s
Total operating period _____ 300 h

Minimum pressure (high-pressure side) _____ 10 bar

Rate of pressure change R_A _____ 16,000 bar/s



Pressure at suction port S (inlet)

Minimum pressure $p_{abs\ min}$ _____ 0.8 bar absolute
Maximum suction pressure $p_{abs\ max}$ _____ 10 bar absolute

Case drain pressure

Maximum permissible case drain pressure
(at port L, L_1):
Maximum 0.5 bar higher than inlet pressure at port S,
but not higher than 2 bar absolute.

$p_{L\ max\ abs}$ _____ 2 bar

Flow direction

Direction of rotation, with view on drive shaft		
Type of operation	clockwise	counter-clockwise
Pump	**S** to **B**	**S** to **B**[1)]
Pressure drain	**B** to **S**[1)]	**B** to **S**

For pressure definitions, see page 11

Technical data

Definition

Nominal pressure p_{nom}
The nominal pressure corresponds to the maximum design pressure.

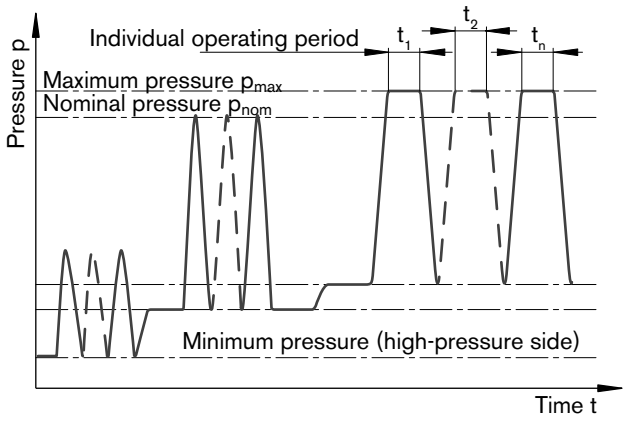
Maximum pressure p_{max}
The maximum pressure corresponds to the maximum operating pressure within the individual operating period. The sum of the individual operating periods must not exceed the total operating period.

Minimum pressure (high-pressure side)
Minimum pressure on high-pressure side (A or B) that is required to prevent damage to the axial piston unit.

Minimum pressure (inlet) open circuit
Minimum pressure at suction port S (inlet) that is required to prevent damage to the axial piston unit. The minimum pressure depends on the speed and displacement of the axial piston unit.

Minimum pressure (low-pressure side) closed circuit
Minimum pressure on the low-pressure side (A or B) that is required to prevent damage to the axial piston unit.

Rate of pressure change R_A
Maximum permissible rate of pressure build-up and pressure reduction with a pressure change over the entire pressure range.



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

Technical data, A10FZO

Table of values (theoretical values, without efficiency levels and tolerances; values rounded)

Size		NG		6	8	10
Displacement, geometric (per revolution)		V_g	cm^3	6	8.1	10.6
Speed, maximum at V_g						
Suction speed, pump mode[1)]		n_{nom}	rpm	3600	3600	3600
Max. speed, pressure drain mode[2)]		n_{nom}	rpm	3600	3600	3600
Flow						
at n_{nom}		$q_{vol\ max}$	l/min	21.6	28.8	38.2
at n_E = 1500 rpm		$q_{vE\ max}$	l/min	9	12	15.9
Power, pump mode						
at n_{nom}, Δp = 315 bar		P_{max}	kW	11.3	15.3	20
at n_E = 1500 rpm		P_{max}	kW	4.7	6.4	8.3
Torque						
at V_g and	Δp = 315 bar	T_{max}	Nm	30	40.5	53
	Δp = 100 bar	T	Nm	9.5	12.7	16.8
Torsional stiffness	Drive shaft S	c	Nm/rad	8100	8100	8100
Moment of inertia for rotary group		J_{GR}	kgm^2	0.0006	0.0006	0.0006
Angular acceleration[3)]		α	rad/s^2	14000	14000	14000
Filling capacity		V	L	0.14	0.14	0.14
Mass (without filling capacity) approx.		m	kg	6.4	6.4	6.4

1) The values are applicable:
- for absolute pressure p_{abs} = 1 bar at suction port S
- for the optimum viscosity range of ν_{opt} = 16 to 36 mm^2/s
- for mineral-based operating materials with a specific mass of 0.88 kg/l.

2) Higher values on request

3) Values are only permissible if a pressure of 1 bar absolute is maintained at the suction port, and only for single pumps. Multiple-pump configurations on request.

Important

Exceeding the maximum or falling below the minimum permissible values can lead to a loss of function, a reduction in operational service life or the total destruction of the axial piston unit. We recommend checking the loading through tests or calculation / simulation and comparison with the permissible data.

Determination of size

Flow (absorbed volume flow)
$$q_v = \frac{V_g \cdot n \cdot \eta_V}{1000 \cdot (\eta_V)} \quad [l/min]$$

Torque, pump mode (pressure drain mode)
$$T = \frac{1.59 \cdot V_g \cdot \Delta p \cdot (\eta_{mh})}{100 \cdot \eta_{mh}} \quad [Nm]$$

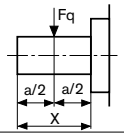
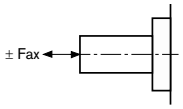
Power, pump mode (pressure drain mode)
$$P = \frac{2\pi \cdot T \cdot n}{60000} = \frac{q_V \cdot \Delta p \cdot (\eta_t)}{600 \cdot \eta_t} \quad [kW]$$

Drive speed (output speed)
$$n = \frac{q_V \cdot 1000 \cdot (\eta_V)}{V_g \cdot \eta_V} \quad [rpm]$$

V_g = Displacement per revolution in cm^3
Δp = Differential pressure in bar
n = Speed in rpm
η_V = Volumetric efficiency
η_{mh} = Mechanical-hydraulic efficiency
η_t = Overall efficiency ($\eta_t = \eta_V \cdot \eta_{mh}$)

Technical data, A10FZO

Permissible radial and axial loading on drive shaft

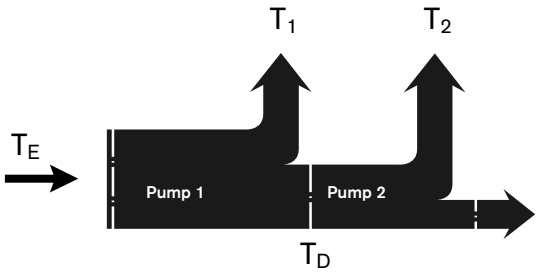
Size				06 to 10
Radial force, maximum	 at a/2	$F_{q\ max}$	N	250
Axial force, maximum		$F_{ax\ max}$	N	400

Permissible input and through-drive torques

Size	NG		6 to 10
Torque at V_g and $\Delta p = 315$ bar[1)]	T_{max}	Nm	See table of values on page 12
Input torque at drive shaft, maximum[2)]			
S	$T_{E\ max}$ Ø drive shaft	Nm in	126 3/4
Through-drive torque at drive shaft, maximum			
S	$T_{D\ max}$	Nm	42

1) Without considering efficiency
2) For drive shafts free of radial load

Distribution of torque



Technical data, A10FZG

Table of values (theoretical values, without efficiency levels and tolerances; values rounded)

Size		NG		6	8	10
Displacement, geometric (per revolution)		V_g	cm^3	6	8.1	10.6
Speed, maximum at V_g						
Suction speed, pump mode[1)]		n_{nom}	rpm	3000	3000	3000
Maximum speed, motor mode[2)]		n_{nom}	rpm	3000	3000	3000
Flow, pump mode						
at n_{nom}		$q_{vol\ max}$	l/min	18	24.3	32
at n_E = 1500 rpm		$q_{vE\ max}$	l/min	9	12	15.9
Displacement, motor mode						
at n_{nom}		$q_{vol\ max}$	l/min	18	24.3	32
at n_E = 1500 rpm		$q_{vE\ max}$	l/min	9	12	15.9
Power, pump mode						
at n_{nom}, Δp = 315 bar		P_{max}	kW	9.4	12.8	16.7
at n_E = 1500 rpm		P_{max}	kW	4.7	6.4	8.3
Power, motor mode						
at n_{nom}, Δp = 315 bar		P_{max}	kW	9.4	12.8	16.7
at n_E = 1500 rpm		P_{max}	kW	4.7	6.4	8.3
Torque						
at V_g and	Δp = 315 bar	T_{max}	Nm	30.1	40.5	53.1
	Δp = 100 bar	T	Nm	9.5	12.7	16.8
Torsional stiffness of drive shaft	S	c	Nm/rad	9370	9370	9370
	R	c	Nm/rad	–	–	–
Moment of inertia for rotary group		J_{GR}	kgm^2	0.0006	0.0006	0.0006
Angular acceleration[3)]		α	rad/s^2	14000	14000	14000
Filling capacity		V	L	0.14	0.14	0.14
Mass (without filling capacity) approx.		m	kg	6.4	6.4	6.4

1) The values are applicable:
- for absolute pressure p_{abs} = 1 bar at ports A or B
- for the optimum viscosity range of ν_{opt} = 16 to 36 mm^2/s
- for mineral-based operating materials with a specific mass of 0.88 kg/l.

2) Higher values on request (could possibly cause an increase in low pressure)

3) Values are only permissible if a pressure of 1 bar absolute is maintained at the suction port, and only for single pumps. Multiple-pump configurations on request.

Note

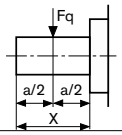
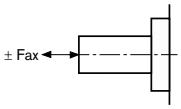
Exceeding the maximum or falling below the minimum permissible values can lead to a loss of function, a reduction in operational service life or the total destruction of the axial piston unit. We recommend checking the loading through tests or calculation / simulation and comparison with the permissible data.

Technical data, A10FZG

Determining the size

Absorbed volume flow (flow)	$q_v = \frac{V_g \cdot n \cdot (\eta_V)}{1000 \cdot \eta_V}$	[l/min]	V_g = Displacement per revolution in cm^3
Torque, motor mode (pump mode)	$T = \frac{1.59 \cdot V_g \cdot \Delta p \cdot \eta_{mh}}{100 \cdot (\eta_{mh})}$	[Nm]	Δp = Differential pressure in bar n = Speed in rpm η_V = Volumetric efficiency
Power, motor mode (pump mode)	$P = \frac{2\pi \cdot T \cdot n}{60000} = \frac{q_V \cdot \Delta p \cdot \eta_t}{600 \cdot (\eta_t)}$	[kW]	η_{mh} = Mechanical-hydraulic efficiency η_t = Overall efficiency ($\eta_t = \eta_V \cdot \eta_{mh}$)
Output speed (drive speed)	$n = \frac{q_V \cdot 1000 \cdot \eta_V}{V_g \cdot (\eta_V)}$	[rpm]	

Permissible radial and axial loading on drive shaft

Size					06	08	10
Radial force, maximum		at a/2	$F_{q\,max}$	N	250	250	250
Axial force, maximum			$F_{ax\,max}$	N	400	400	400

Technical data, A10VZO

Table of values (theoretical values, without efficiency levels and tolerances; values rounded)

Size			NG		10	18	28	45	71	100	140	180
Displacement, geometric (per revolution)			$V_{g\,max}$	cm^3	10.5	18	28	45	71.1	100	140	180
Speed, maximum at $V_{g\,max}$												
Suction speed, pump mode[1]			n_{nom}	rpm	3600	3300	3000	3000	2550	2300	2200	1800
Maximum speed, pressure drain mode[2]			n_{nom}	rpm	3600	3300	3000	3000	On request			
Flow												
at n_{nom}			$q_{vo\,max}$	l/min	38	59	84	135	181	230	308	324
at n_E = 1500 rpm			$q_{vE\,max}$	l/min	15	27	42	68	106.6	150	210	270
Power, pump mode												
at n_{nom} and	Δp =	250 bar	P_{max}	kW	16	–	–	–	–	–	–	–
		280 bar	P_{max}	kW	–	27.7	39	63	84.5	107	143	151
at n_E = 1500 rpm			P_{max}	kW	7.5	12.5	20	31	50	70	98	125
Torque												
at $V_{g\,max}$ and	Δp =	250 bar	T_{max}	Nm	42	–	–	–	–	–	–	–
		280 bar	T_{max}	Nm	–	80	125	200	317	445	623	801
	Δp =	100 bar	T	Nm	17	29	45	72	113	159	223	286
Torsional stiffness	Drive shaft S		c	Nm/rad	8100	10000	21500	35000	71884	121142	169537	171107
Moment of inertia for rotary group			J_{GR}	kg/m^2	0.0006	0.00093	0.0017	0.0033	0.0087	0.0185	0.0276	0.033
Angular acceleration[3]			α	rad/s^2	14000	12600	11200	9500	7500	6200	5000	4000
Filling capacity			V	L	0.2	0.25	0.3	1.0	1.6	2.2	3.0	2.7
Mass (without filling) approx.			m	kg	8	12	15	30	47	69	73	78

1) The values are applicable:
- for absolute pressure p_{abs} = 1 bar at the suction port S
- for the optimum viscosity range of ν_{opt} = 16 to 36 mm^2/s
- for mineral-based operating materials with a specific mass of 0.88 kg/l.

2) Higher values on request.

3) Values are only permissible if a pressure of 1 bar absolute is maintained at the suction port, and only for single pumps. Multiple-pump configurations on request.

Note

Exceeding the maximum or falling below the minimum permissible values can lead to a loss of function, a reduction in operational service life or the total destruction of the axial piston unit. We recommend checking the loading through tests or calculation / simulation and comparison with the permissible data.

Determination of size

Flow (absorbed volume flow)

$$q_v = \frac{V_g \cdot n \cdot \eta_V}{1000 \cdot (\eta_V)} \quad [l/min]$$

Torque, pump mode (pressure drain mode)

$$T = \frac{1.59 \cdot V_g \cdot \Delta p \cdot (\eta_{mh})}{100 \cdot \eta_{mh}} \quad [Nm]$$

Power, pump mode (pressure drain mode)

$$P = \frac{2\pi \cdot T \cdot n}{60000} = \frac{q_V \cdot \Delta p \cdot (\eta_t)}{600 \cdot \eta_t} \quad [kW]$$

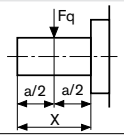
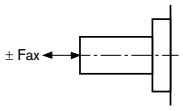
Drive speed (output speed)

$$n = \frac{q_V \cdot 1000 \cdot (\eta_V)}{V_g \cdot \eta_V} \quad [rpm]$$

V_g = Displacement per revolution in cm^3
Δp = Differential pressure in bar
n = Speed in rpm
η_V = Volumetric efficiency
η_{mh} = Mechanical-hydraulic efficiency
η_t = Overall efficiency ($\eta_t = \eta_V \cdot \eta_{mh}$)

Technical data, A10VZO

Permissible radial and axial loading on drive shaft

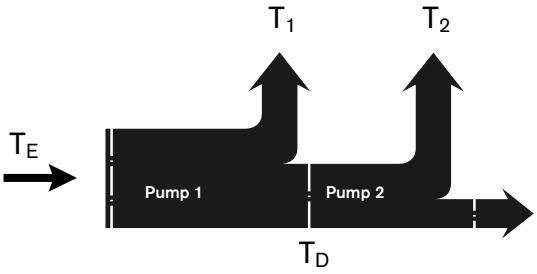
Size					10	18	28	45	71	100	140	180
Radial force, maximum		at a/2	$F_{q\,max}$	N	250	250	1200	1500	1900	2300	2800	2300
Axial force, maximum			F_{ax}	N	400	400	1000	1500	2400	4000	4800	800

Permissible input and through-drive torques

Size		NG			10	18	28	45	71	100	140	180
Torque at $V_{g\,max}$ and $\Delta p = 280$ bar[1)]		T_{max}	Nm		50	90	140	225	356	500	701	901
Input torque at drive shaft, maximum[2)]												
ANSI B92.1a	S	$T_{E\,max}$	Nm		126	124	198	319	626	1104	1620	1620
		Ø drive shaft	in		3/4	3/4	7/8	1	1 1/4	1 1/2	1 3/4	1 3/4
Through-drive torque at drive shaft, maximum												
	S	$T_{D\,max}$	Nm		42	108	160	319	492	778	1266	1266

1) Without considering efficiency
2) For drive shafts free of radial load

Distribution of torque



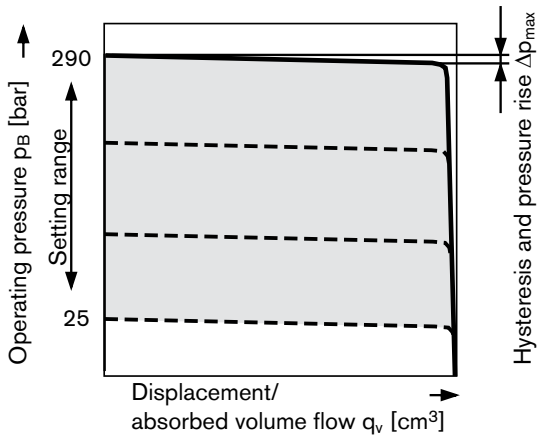
DR-Pressure control, A10VZO

The pressure control limits the maximum pressure at the pump output within the pump control range. The variable pump only supplies as much hydraulic fluid as is required by the consumers. If the operating pressure exceeds the pressure setpoint set at the integrated pressure valve, the pump will adjust towards a smaller displacement. The pressure can be set steplessly at the control valve.

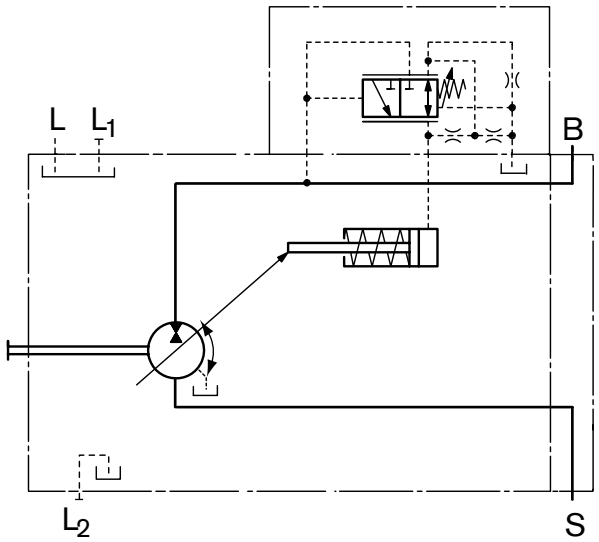
Please contact us with respect to applications with pressure control and changing direction of rotation.

Static characteristic

(at $n_1 = 1500$ rpm; $t_{fluid} = 50$ °C)

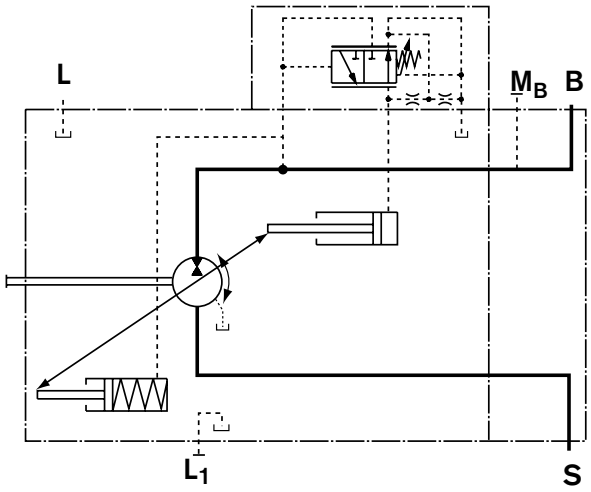


Schematic, A10VZO; size 10



Ports for	
B	Service line
S	Suction line
L, L1	Case drain (L_1, L_2 plugged)

Schematic, A10VZO; size 18 to 180
port plate 22



Port for	
B	Service line
S	Suction line
L, L1	Case drain (L_1 plugged)
MB	Measuring operating pressure (plugged)

Control data

Hysteresis and repeatability Δp _____ max. 3 bar

Pressure rise, max.

NG		10	18	28	45	71	100	140	180
Δp	bar	6	6	6	6	8	10	12	14

Control fluid consumption, _____ max. approx. 4.5 l/min

DRG-Pressure control, remotely operated

The DRG control valve overrides the function of the DR pressure control, see page 18.

A pressure-relief valve can be externally connected to port X as a remote control. This pressure-relief valve is included in the delivery contents of the DRG control.

The differential pressure at the control valve is set as standard to 20 bar. The pilot oil flow at port X is approx. 1.5 l/min. If another setting is required (range 10 to 22 bar), please state in clear text.

As a separate pressure-relief valve we recommend:

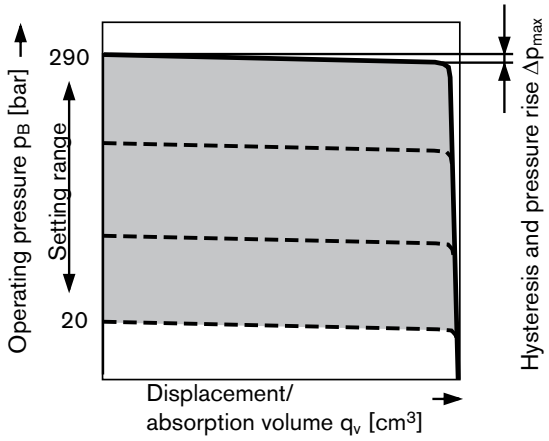
DBDH 6 (hydraulic) as per RE 25402 or
DBETR-SO 381 with orifice Ø 0.8 mm in P (electric) to RE 29166.

The maximum line length must not exceed 2 m.

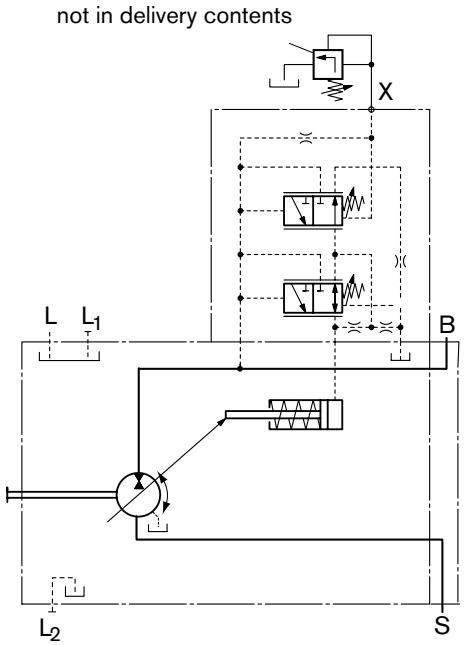
Please contact us with respect to applications with remotely operated pressure control and changing direction of rotation.

Static characteristic

(at $n_1 = 1500$ rpm; $t_{fluid} = 50$ °C)

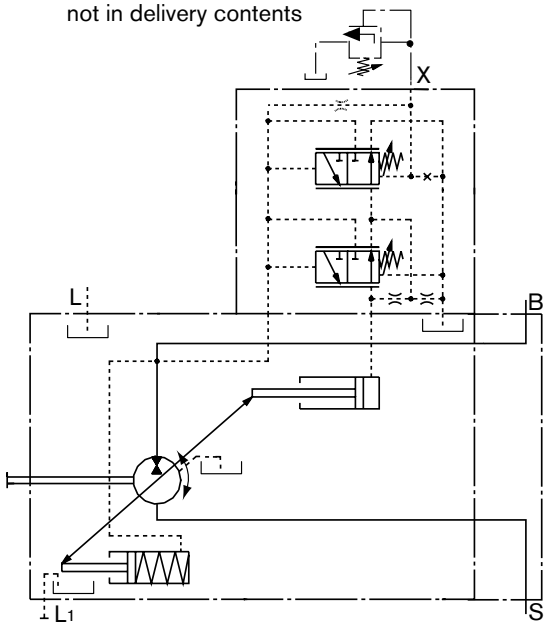


Schematic, A10VZO; size 10



Port for	
B	Service line
S	Suction line
L, $L_{1,2}$	Case drain (L_1, L_2 plugged)
X	Pilot pressure (plugged)

Schematic, A10VZO; size 18 to 180
port plate 22



Port for	
B	Service line
S	Suction line
L, L_1	Case drain (L_1 plugged)
X	Pilot pressure (plugged)
M_B	Measuring operating pressure (plugged)

Control data

Hysteresis and repeatability Δp _____ max. 3 bar

Pressure rise, max.

NG		10	18	28	45	71	100	140	180
Δp	bar	6	6	6	6	8	10	12	14

Control fluid consumption_____ max. approx. 4.5 l/min

LA.D-Pressure/torque controller (A10VZO)

Pressure control equipment as DR, see page 18.

In order to achieve a constant drive torque with varying operating pressure, the swivel angle and with it the output flow from the axial piston pump is varied so that the product of flow and pressure remains constant.

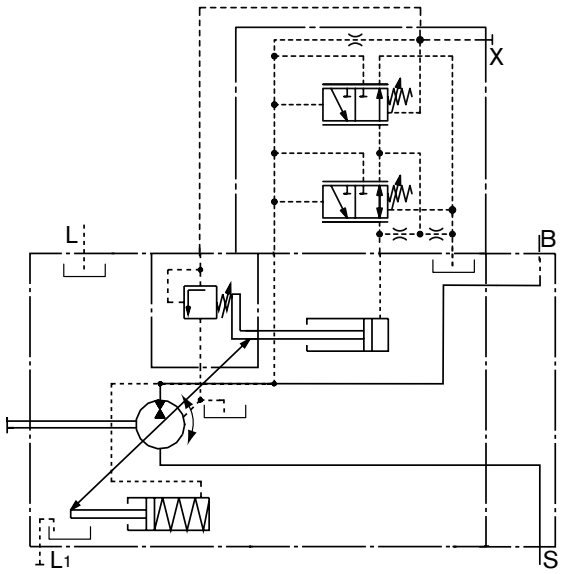
The torque characteristics are set at the plant. Please state in clear text, e.g. T = 50 Nm.

Control data

For data and notes about the DR pressure control, see page 18.

For data and notes about the remotely operated DRG pressure control, see page 19.

Schematic, A10VZO LAxD with pressure cut-off, size 18 to 180

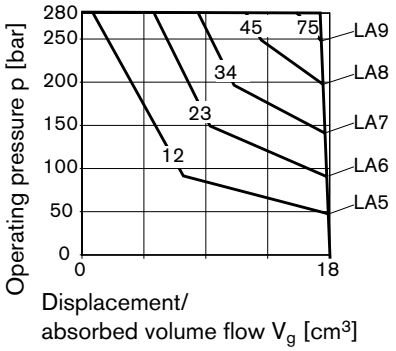


	Port for
B	Service line
S	Suction line
L, L_1,	Case drain (L_1, L_2 plugged)

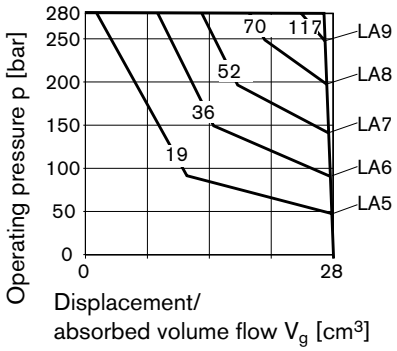
LA.D-Pressure/torque controller, characteristic curve (A10VZO)

Torque characteristic fields in Nm

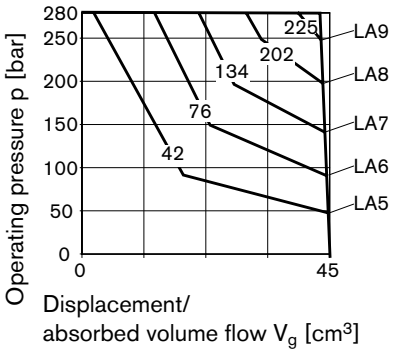
Size 18



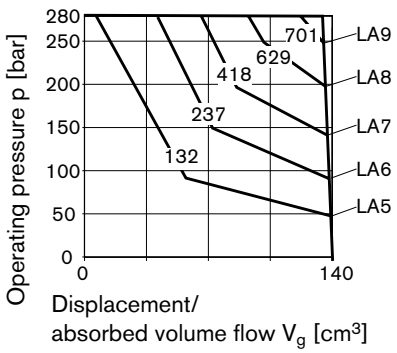
Size 28



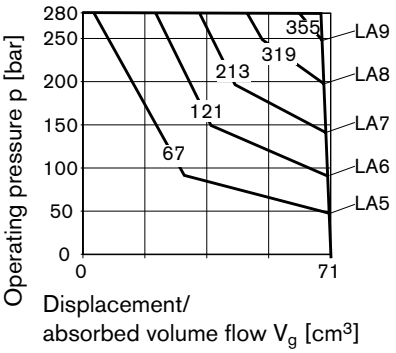
Size 45



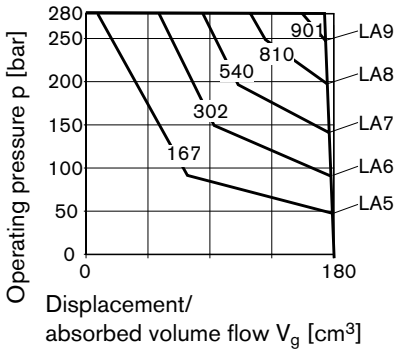
Size 140



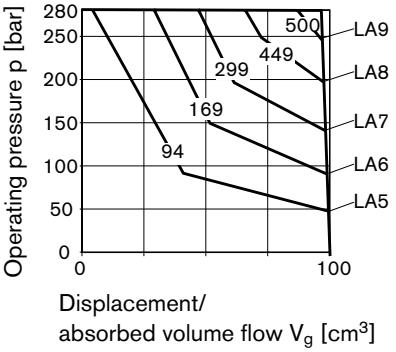
Size 71



Size 180



Size 100



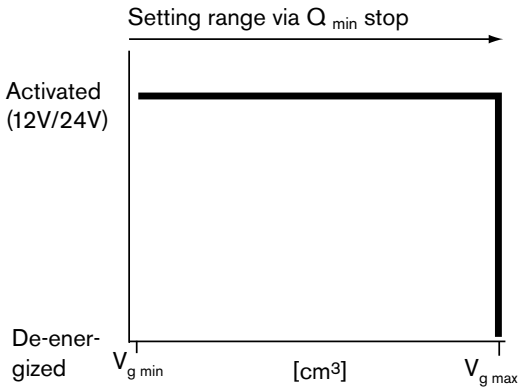
EZ-Two-point control, electric (A10VZO, A10VZG)

The variable displacement unit is set to minimum swivel angle by operating the switching solenoids. This supplies control pressure to the stroke piston via the switching valve.

The control pressure is taken internally from the respective high-pressure side, whereby a minimum operating pressure differential of $\Delta_{pA,B} \geq 20$ bar is required.

The axial piston unit can only be activated between $V_{g\,max}$ and $V_{g\,min}$.

Please state $V_{g\,min}$ default setting in clear text when ordering.



De-energized $\hat{=} V_{g\,max}$

Current energized $\hat{=} V_{g\,min}$

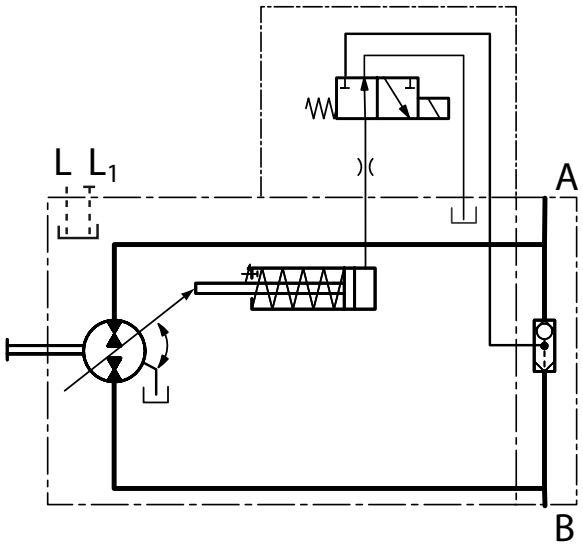
Technical data, solenoid	EZ1/3	EZ2/4
Voltage	12V (±15%)	24V (±15%)
Position $V_{g\,max}$	De-energized	De-energized
Position $V_{g\,min}$	Current energized	Current energized
Rated current at 20 °C	1.5 A	0.8 A
Actuated time	100%	100%
Type of protection see connector design, page 55		

Ambient temperature range -20 °C to +60 °C.
If these temperatures cannot be achieved, please contact us.

For further information, please refer to page 55

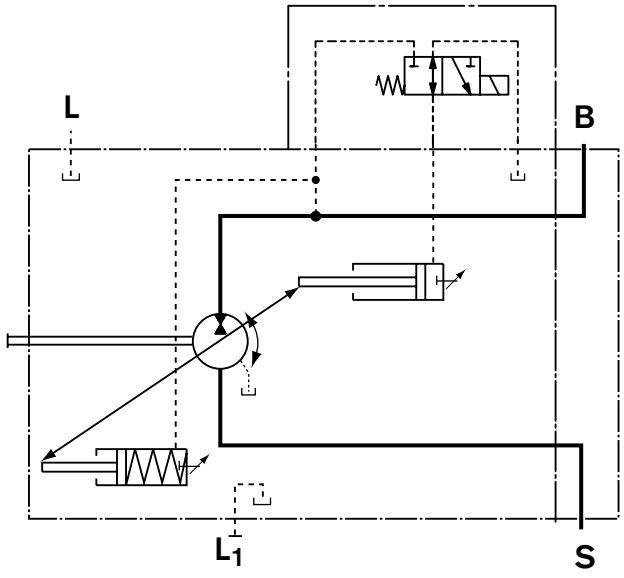
EZ-Two-point control, electric (A10VZO, A10VZG)

Schematic, A10VZG EZ1/2,



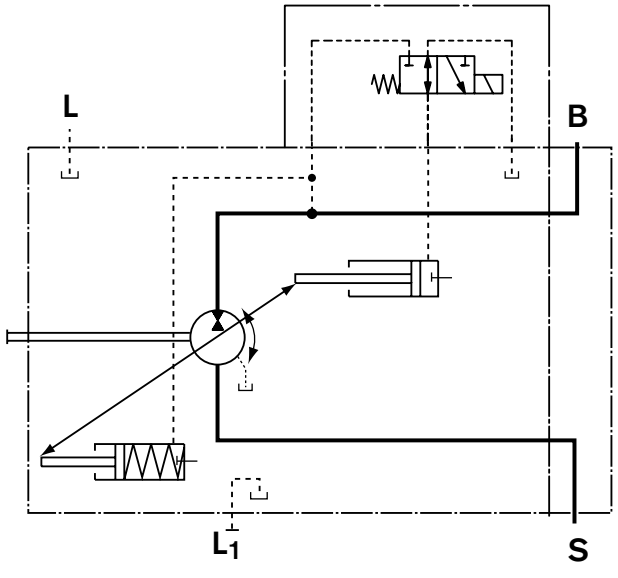
Port for	
A, B	Service line
L, L_1	Case drain (L_1 plugged)

Schematic, A10VZO EZ3/4; size 18 to 140
port plate 12



Port for	
B	Service line
S	Suction line
L, L_1	Case drain (L_1 plugged)

Schematic, A10VZO EZ3/4; size 45 to 180
port plate 22



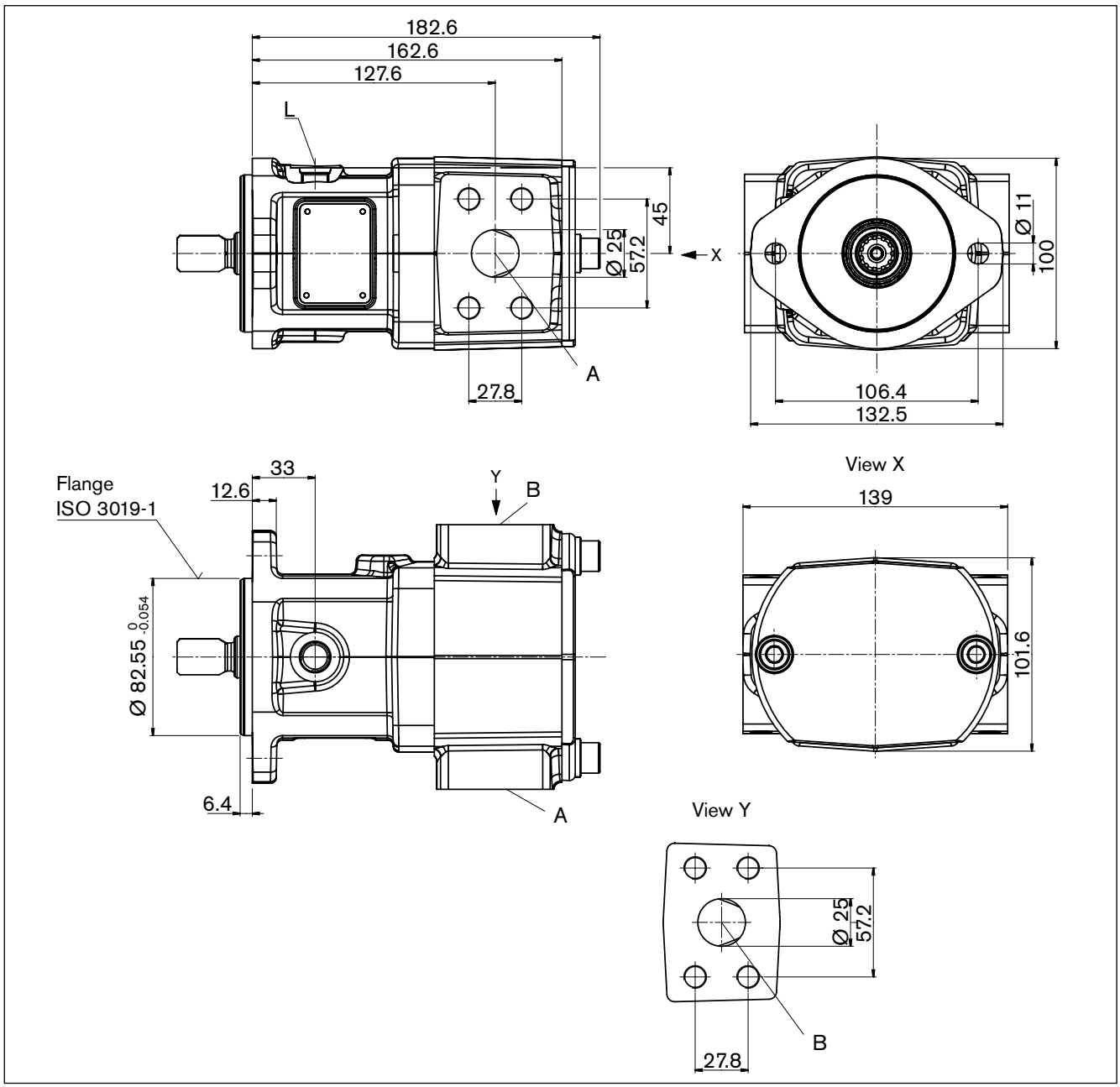
Port for	
B	Service line
S	Suction line
L, L_1	Case drain (L_1 plugged)

Dimensions, A10FZO

Before finalizing your design, request a certified installation drawing. Dimensions in mm.

Size 06 to 10

Port plate 02: SAE flange port on opposite side, clockwise rotation



Ports

Designation	Port for	Standard	Size [1]	Maximum pressure [bar] [2]	State
A, B	Suction and Service line[5] Fixing thread	SAE J518[3] DIN 13	1 in M12 x 1.75; 17 deep	350	O
L	Case drain fluid	ISO 11926[4]	9/16-18UNF-2B; 10 deep	2	O

1) Please observe the general information on page 60 for the maximum tightening torques.
2) Short-term pressure spikes may occur depending on the application. Keep this in mind when selecting measuring devices and fittings.
3) Only dimensions complying with SAE J518. A metric fixing thread is a deviation from standard.
4) The countersink may be deeper that specified in the standard.
5) See table on side 9

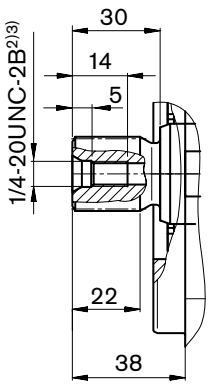
O = Must be connected (plugged on delivery)

Dimensions, A10FZO

Before finalizing your design, request a certified installation drawing. Dimensions in mm.

Drive shaft

S Splined shaft 3/4 in
11T 16/32DP[1] (SAE J744)



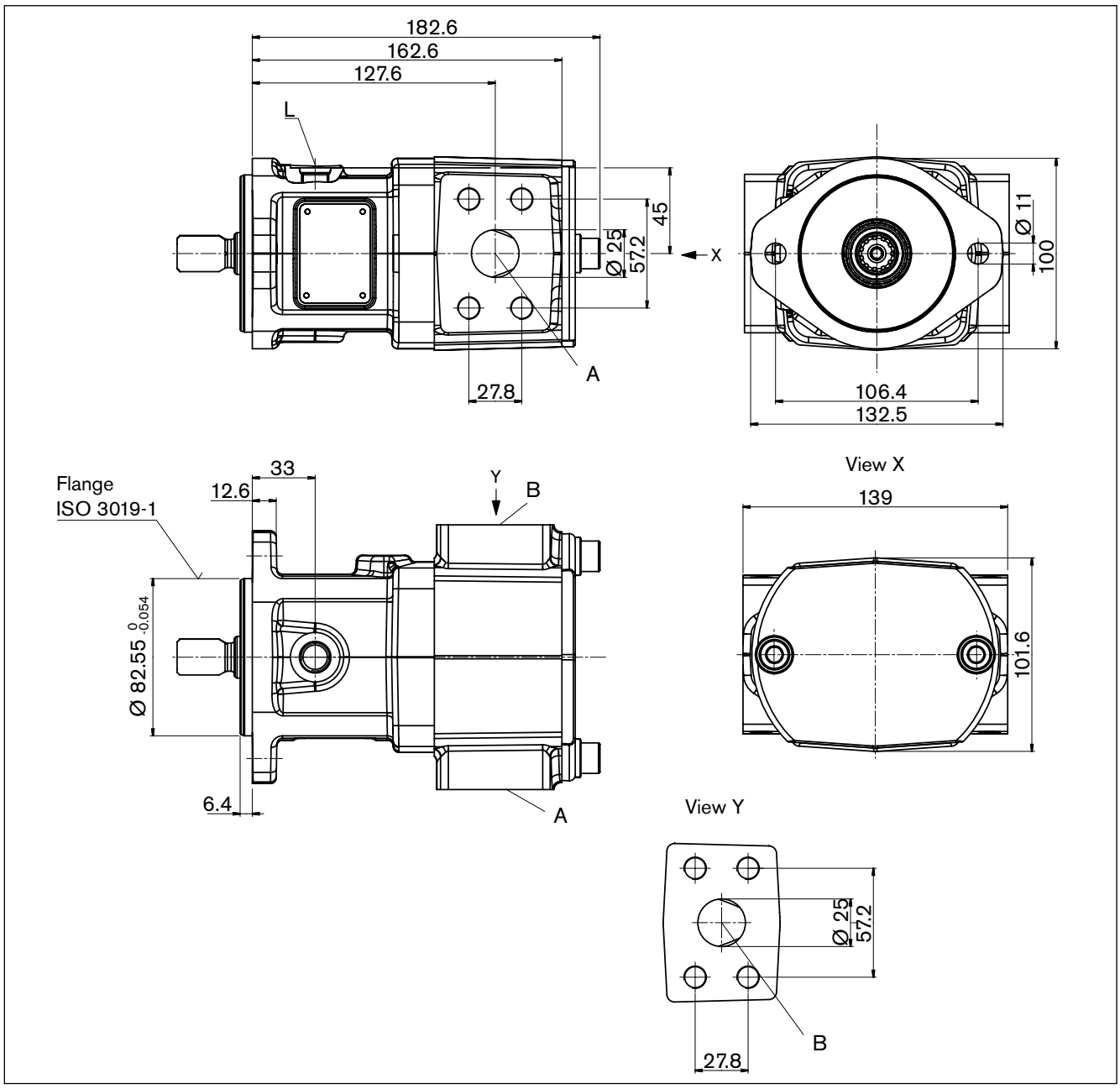
1) ANSI B92.1a, 30° pressure angle, flat base, flank centering, tolerance class 5
2) Thread according to ASME B1.1
3) Please observe the general information on page 68 for the maximum tightening torques.

Dimensions, A10FZG

Before finalizing your design, request a certified installation drawing. Dimensions in mm.

Size 06 to 10

Port plate 02: SAE flange port on opposite side, clockwise rotation



Ports

Designation	Port for	Standard	Size [1]	Maximum pressure [bar] [2]	State
A, B	Service line Fixing thread	SAE J518[3] DIN 13	1 in M12 x 1.75; 17 deep	350	O
L	Case drain fluid	ISO 11926[4]	9/16-18UNF-2B; 10 deep	2	O

1) Please observe the general information on page 60 for the maximum tightening torques.
2) Short-term pressure spikes may occur depending on the application. Keep this in mind when selecting measuring devices and fittings.
3) Only dimensions complying with SAE J518. A metric fixing thread is a deviation from standard.
4) The countersink may be deeper that specified in the standard.

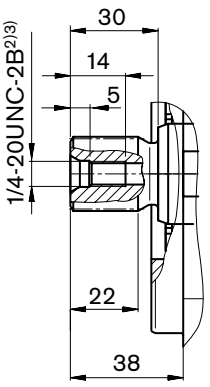
O = Must be connected (plugged on delivery)

Dimensions, A10FZG

Before finalizing your design, request a certified installation drawing. Dimensions in mm.

Drive shaft

S Splined shaft 3/4 in
11T 16/32DP[1] (SAE J744)



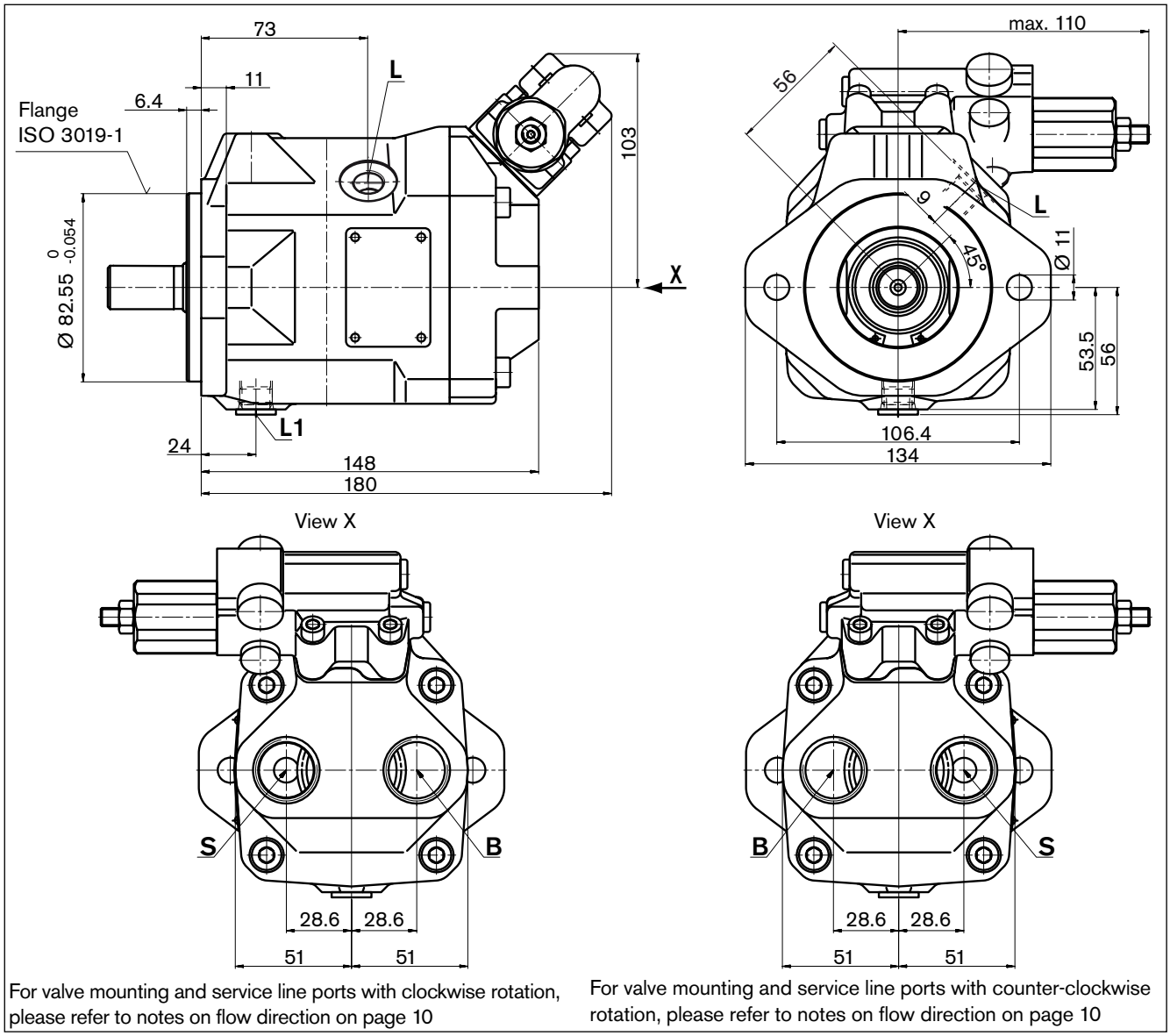
1) ANSI B92.1a, 30° pressure angle, flat base, flank centering, tolerance class 5
2) Thread according to ASME B1.1
3) Please observe the general information on page 68 for the maximum tightening torques.

Dimensions, A10VZO

Before finalizing your design, request a certified installation drawing. Dimensions in mm.

Size 10

DR pressure control, hydraulic, **port plate 14** – DIN threaded ports at rear, clockwise rotation



For valve mounting and service line ports with clockwise rotation, please refer to notes on flow direction on page 10

For valve mounting and service line ports with counter-clockwise rotation, please refer to notes on flow direction on page 10

Ports

Designation	Port for	Standard	Size [1]	Maximum pressure [bar] [2]	State
B	Service line	DIN 3852-1	27 x 2; 16 deep	315	O
S	Suction line	DIN 3852-1	27 x 2; 16 deep	5	O
L	Case drain fluid	ISO 11968 [4]	9/16-18UNF-2B; 10 deep	2	O [3]
L_1	Case drain fluid	ISO 11968 [4]	9/16-18UNF-2B; 10 deep	2	X [3]

1) Please observe the general information on page 60 for the maximum tightening torques.
2) Short-term pressure spikes may occur depending on the application. Keep this in mind when selecting measuring devices and fittings.
3) Depending on the installation position, L or L_1 must be connected (see installation notes on page 56, 57)
4) The countersink may be deeper that specified in the standard.

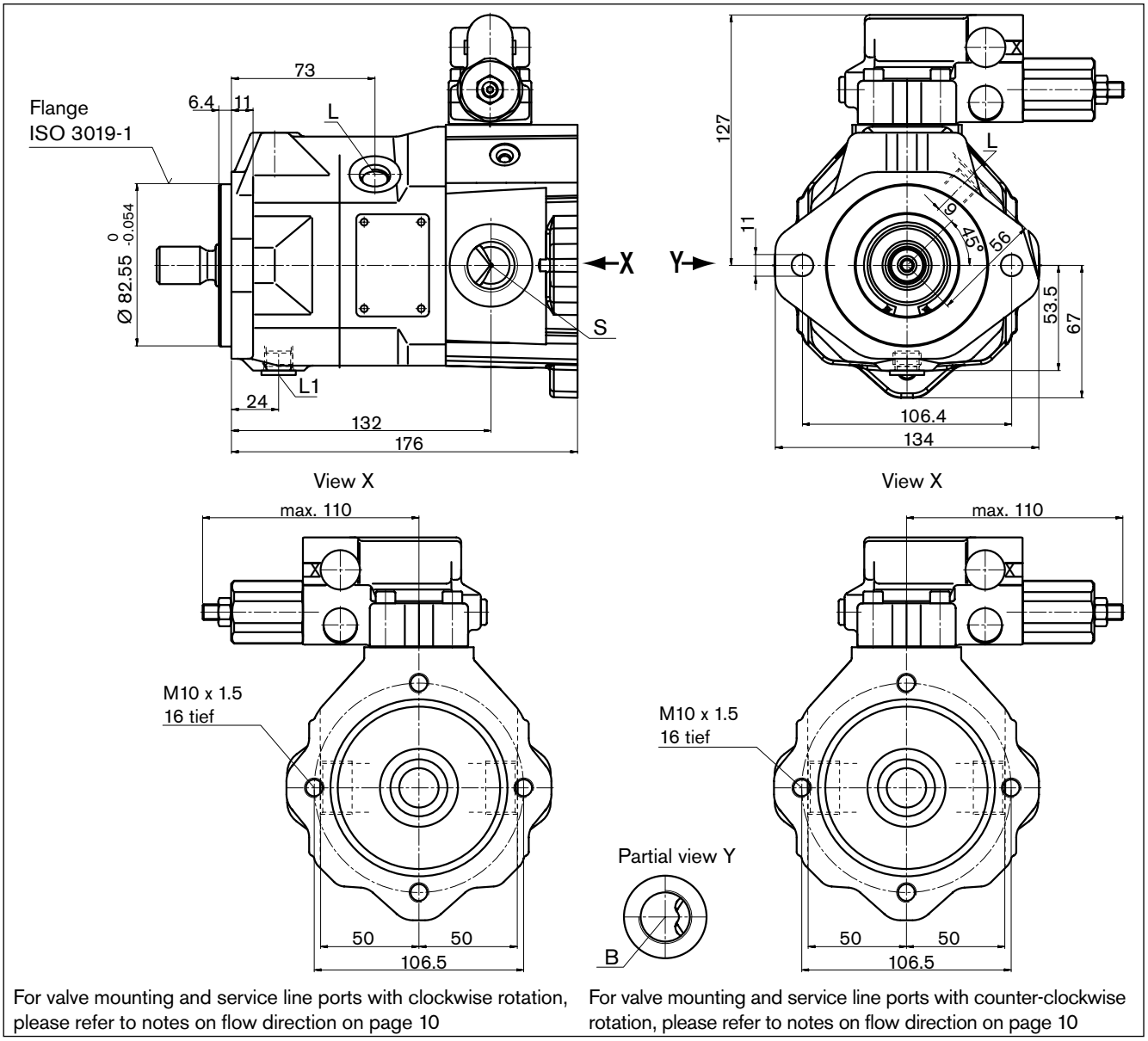
O = Must be connected (plugged on delivery)
X = Plugged in normal operation

Dimensions, A10VZO

Before finalizing your design, request a certified installation drawing. Dimensions in mm.

Size 10

DR pressure control, hydraulic, **port plate 07** – DIN threaded ports on opposite side, clockwise rotation



For valve mounting and service line ports with clockwise rotation, please refer to notes on flow direction on page 10

For valve mounting and service line ports with counter-clockwise rotation, please refer to notes on flow direction on page 10

Ports

Designation	Port for	Standard	Size [1]	Maximum pressure [bar] [2]	State
B	Service line	DIN 3852-1	27 x 2; 16 deep	315	O
S	Suction	DIN 3852-1	27 x 2; 16 deep	5	O
L	Case drain fluid	ISO 11968 [4]	9/16-18UNF-2B; 10 deep	2	O [3]
L_1	Case drain fluid	ISO 11968 [4]	9/16-18UNF-2B; 10 deep	2	X [3]

1) Please observe the general information on page 60 for the maximum tightening torques.
2) Short-term pressure spikes may occur depending on the application. Keep this in mind when selecting measuring devices and fittings.
3) Depending on the installation position, L or L_1 must be connected (see installation notes on page 56, 57)
4) The countersink may be deeper that specified in the standard.

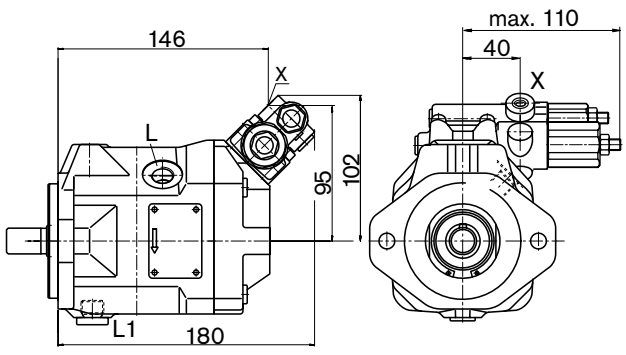
O = Must be connected (plugged on delivery)
X = Plugged in normal operation

Dimensions, A10VZO

Before finalizing your design, request a certified installation drawing. Dimensions in mm.

DRG

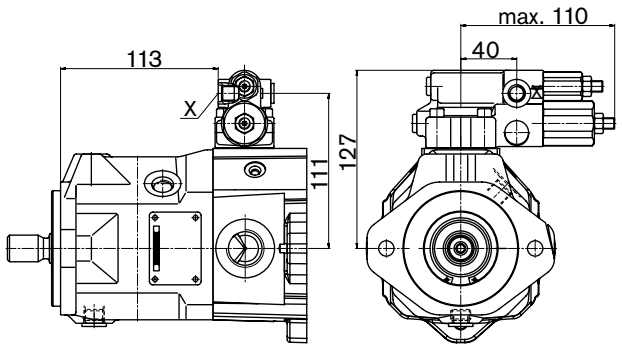
Remotely operated pressure control, **port plate 14**



For valve mounting with counter-clockwise rotation, see page 28

DRG

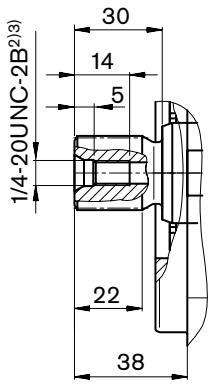
Remotely operated pressure control, **port plate 7**



For valve mounting with counter-clockwise rotation, see page 29

Drive shaft

S Splined shaft 3/4 in
11T 16/32DP[1] (SAE J744)



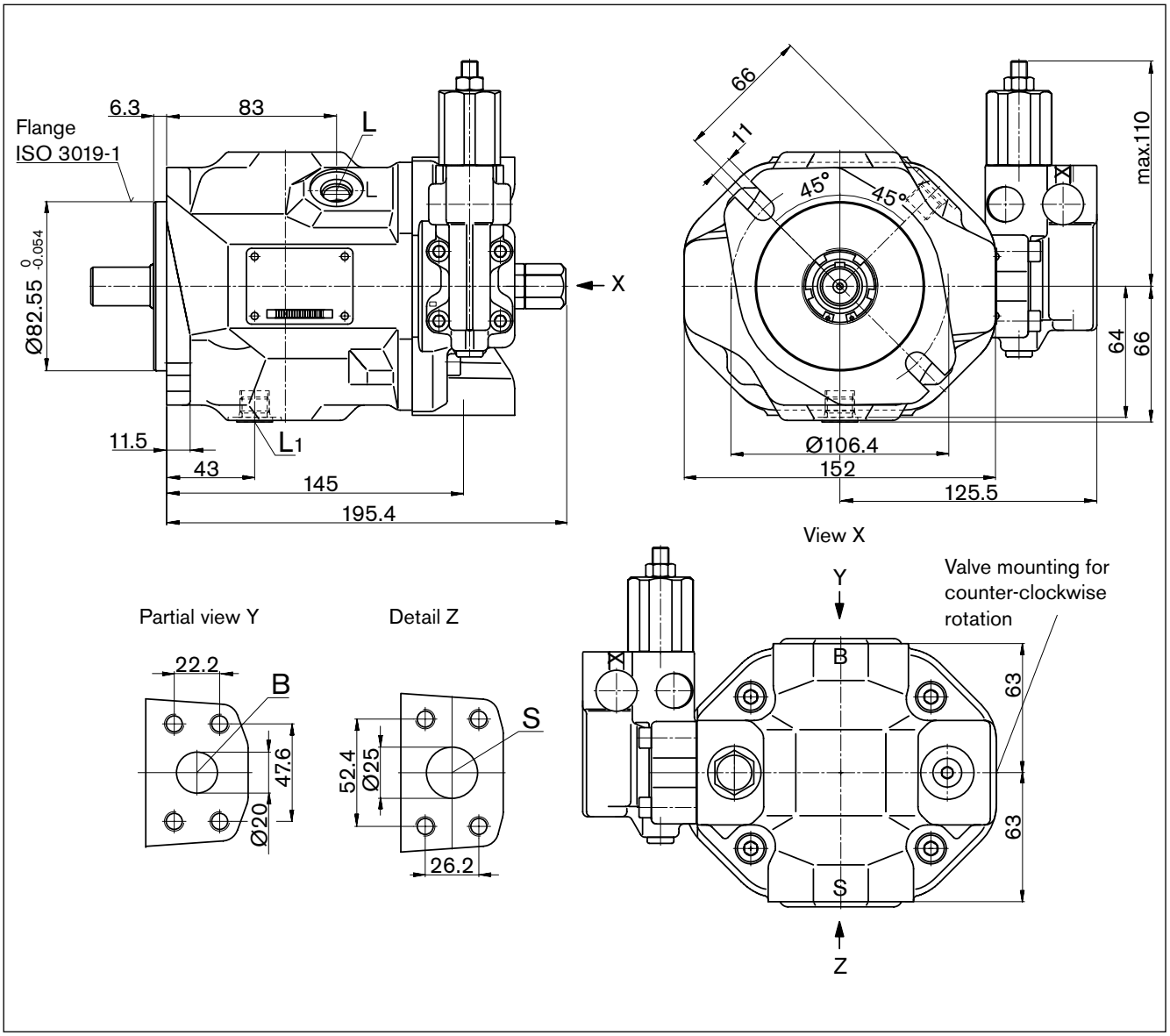
1) ANSI B92.1a, 30° pressure angle, flat base, flank centering, tolerance class 5
2) Thread according to ASME B1.1
3) Please observe the general information on page 60 for the maximum tightening torques.

Dimensions, A10VZO

Before finalizing your design, request a certified installation drawing. Dimensions in mm.

Size 18

DR pressure control, hydraulic, port plate 12: SAE flange port on opposite side, clockwise rotation



Ports

Designation	Port for	Standard	Size [1]	Maximum pressure [bar] [2]	State
B	Service line, Fixing thread	SAE J518[5] DIN 13	3/4 in M10 x 1.5; 17 deep	350	O
S	Suction line, fixing thread	SAE J518[5] DIN 13	1 in M10 x 1.5; 17 deep	10	O
L	Case drain fluid	ISO 11926 [4]	9/16-18 UNF-2B; 10 deep	2	O [3]
L_1	Case drain fluid	ISO 11926 [4]	9/16-18 UNF-2B; 10 deep	2	X [3]
X	Pilot pressure	ISO 11926 [4]	7/16-20UNF-2B; 11.5 deep	350	O

1) Please observe the general information on page 60 for the maximum tightening torques.
2) Short-term pressure spikes may occur depending on the application. Keep this in mind when selecting measuring devices and fittings.
3) Depending on the installation position, L or L_1 must be connected (see installation notes on page 56, 57)
4) The countersink may be deeper that specified in the standard.
5) Only dimensions complying with SAE J518. A metric fixing thread is a deviation from standard.

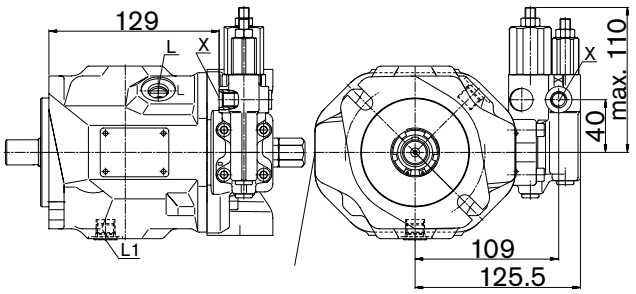
O = Must be connected (plugged on delivery)
X = Plugged in normal operation

Dimensions, A10VZO

Before finalizing your design, request a certified installation drawing. Dimensions in mm.

DRG

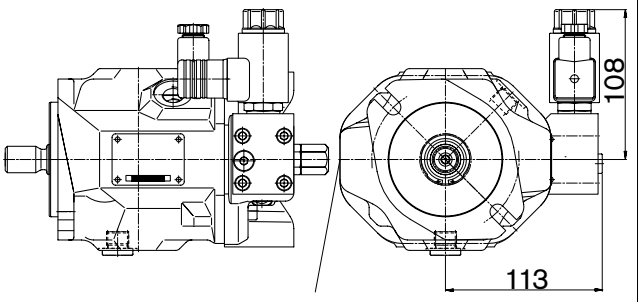
Pressure control, remotely operated



Valve mounting for
counter-clockwise rotation

EZx

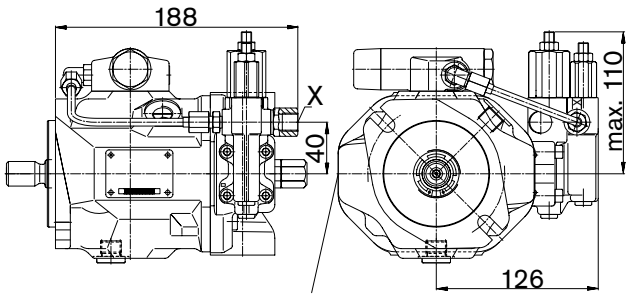
Two-point control, electric



Valve mounting for
counter-clockwise rotation

LAxD

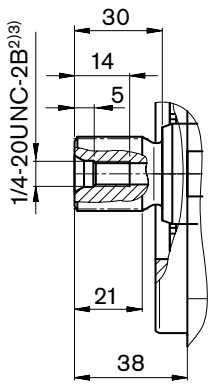
Torque controller



Valve mounting for
counter-clockwise rotation

Drive shaft

S Splined shaft 3/4 in
11T 16/32DP[1] (SAE J744)



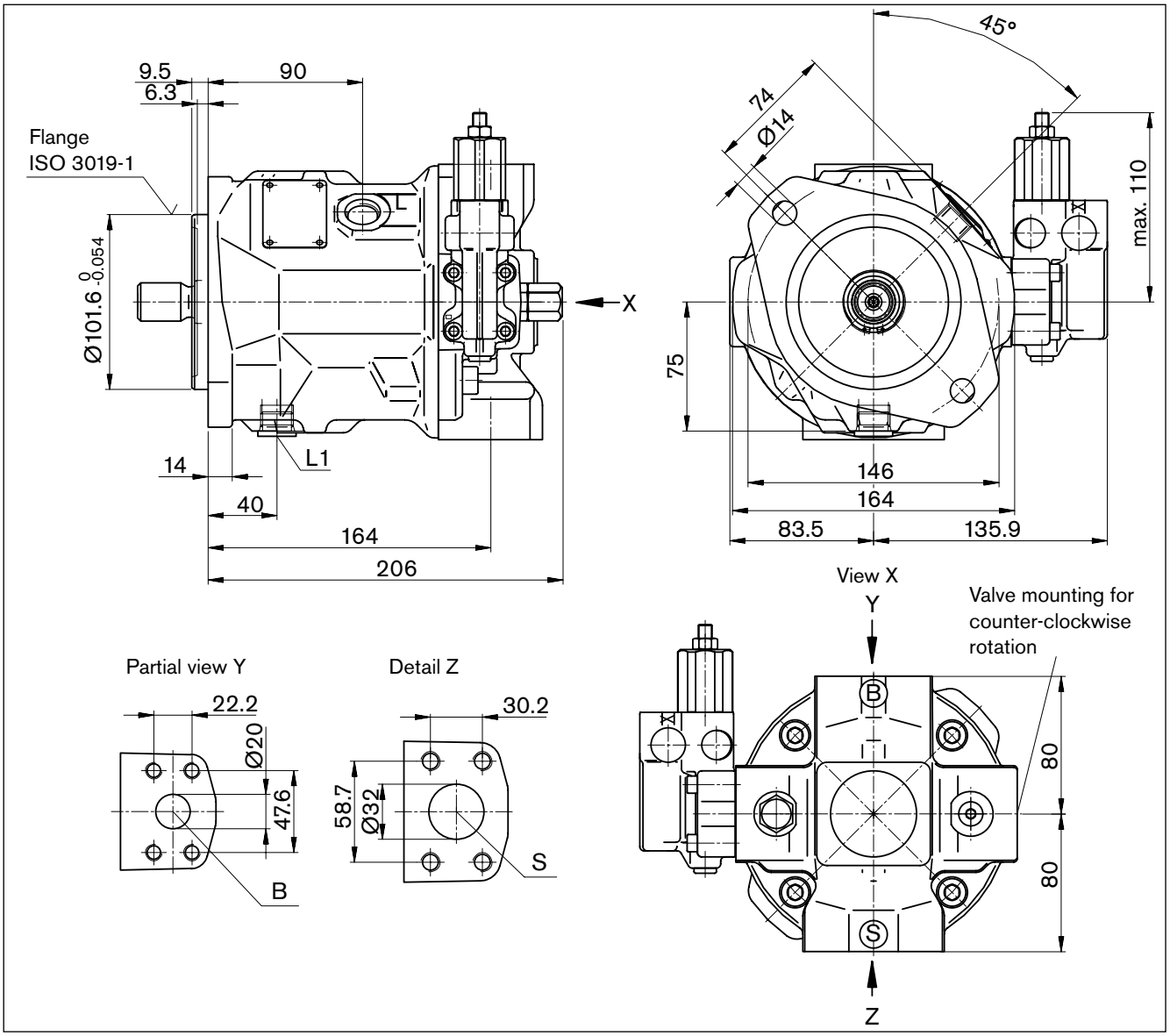
1) ANSI B92.1a, 30° pressure angle, flat base, flank centering, tolerance class 5
2) Thread according to ASME B1.1
3) Please observe the general information on page 60 for the maximum tightening torques.

Dimensions, A10VZO

Before finalizing your design, request a certified installation drawing. Dimensions in mm.

Size 28

DR pressure control, hydraulic, port plate 12: SAE flange port on opposite side, clockwise rotation



Ports

Designation	Port for	Standard	Size [1]	Maximum pressure [bar] [2]	State
B	Service line, Fixing thread	SAE J518[5] DIN 13	3/4 in M10 x 1.5; 17 deep	350	O
S	Suction line, fixing thread	SAE J518[5] DIN 13	1 1/4 in M10 x 1.5; 17 deep	10	O
L	Case drain fluid	ISO 11926 [4]	3/4-16 UNF-2B; 11 deep	2	O [3]
L_1	Case drain fluid	ISO 11926 [4]	3/4-16 UNF-2B; 11 deep	2	X [3]
X	Pilot pressure	ISO 11926 [4]	7/16-20UNF-2B; 11.5 deep	350	O

1) Please observe the general information on page 60 for the maximum tightening torques.
2) Short-term pressure spikes may occur depending on the application. Keep this in mind when selecting measuring devices and fittings.
3) Depending on the installation position, L or L_1 must be connected (see installation notes on page 56, 57)
4) The countersink may be deeper that specified in the standard.
5) Only dimensions complying with SAE J518. A metric fixing thread is a deviation from standard.

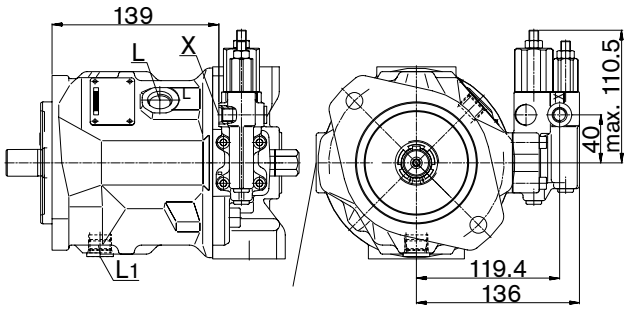
O = Must be connected (plugged on delivery)
X = Plugged in normal operation

Dimensions, A10VZO

Before finalizing your design, request a certified installation drawing. Dimensions in mm.

DRG

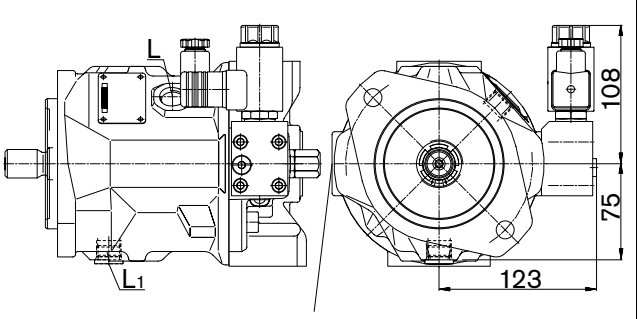
Pressure control, remotely operated



Valve mounting for counter-clockwise rotation

EZx

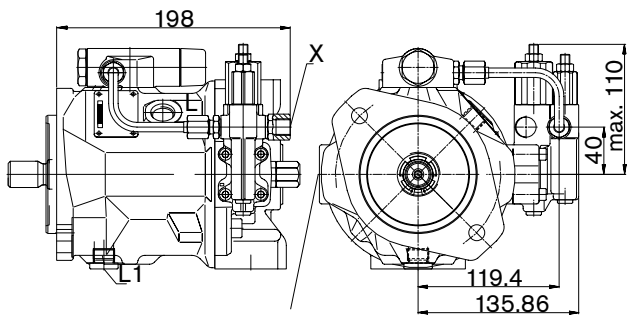
Two-point control, electric



Valve mounting for counter-clockwise rotation

LAxD

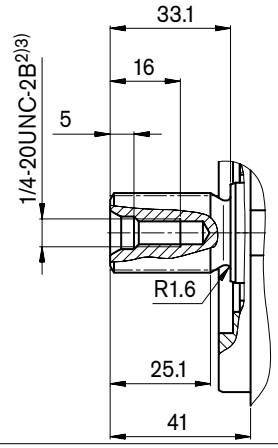
Torque controller



Valve mounting for counter-clockwise rotation

Drive shaft

S Splined shaft 7/8 in
13T 16/32DP[1] (SAE J744)



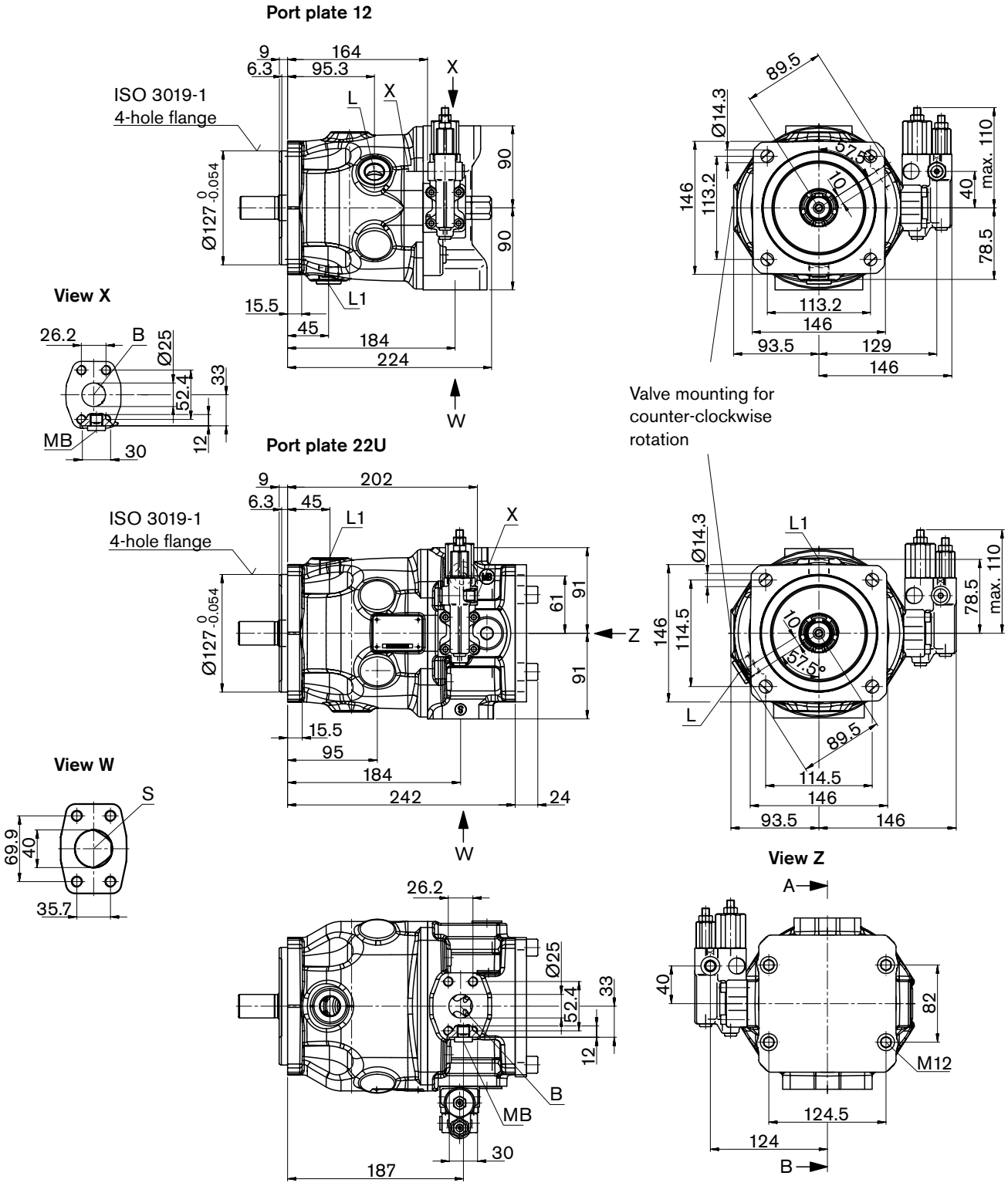
1) ANSI B92.1a, 30° pressure angle, flat base, flank centering, tolerance class 5
2) Thread according to ASME B1.1
3) Please observe the general information on page 60 for the maximum tightening torques.

Dimensions, A10VZO

Before finalizing your design, request a certified installation drawing. Dimensions in mm.

Size 45

DRG pressure control, remotely operated, port plate 12/22: SAE flange port on opposite side, clockwise rotation



Please refer to notes on flow direction on page 10

For dimensions of ports, please refer to page 36

Dimensions, A10VZO

Size 45

Before finalizing your design, request a certified installation drawing. Dimensions in mm.

Ports

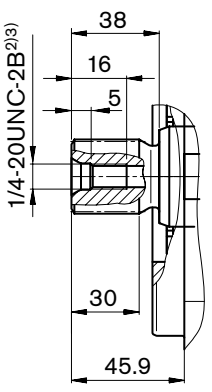
Designation	Port for	Standard	Size [1]	Maximum pressure [bar] [2]	State
B	Service line, Fixing thread	SAE J518[5] DIN 13	1 in M10 x 1.5; 17 deep	350	O
S	Suction line, fixing thread	SAE J518[5] DIN 13	1 1/2 in M12 x 1.75; 20 deep	10	O
L	Case drain fluid	ISO 11926[4]	7/8-14 UNF-2B; 13 deep	2	O [3]
L_1	Case drain fluid	ISO 11926[4]	7/8-14 UNF-2B; 13 deep	2	X [3]
X	Pilot pressure	ISO 11926[4]	7/16-20UNF-2B; 11.5 deep	350	O
M_B	Measuring, pressure B	DIN 3852[4]	G 1/4 in; 12 deep	350	X

1) Please observe the general information on page 60 for the maximum tightening torques.
2) Short-term pressure spikes may occur depending on the application. Keep this in mind when selecting measuring devices and fittings.
3) Depending on the installation position, L or L_1 must be connected (see installation notes on page 56, 57)
4) The countersink may be deeper that specified in the standard.
5) Only dimensions complying with SAE J518. A metric fixing thread is a deviation from standard.

O = Must be connected (plugged on delivery)
X = Plugged in normal operation

Drive shaft

S Splined shaft 1 in
15T 16/32DP[1] (SAE J744)



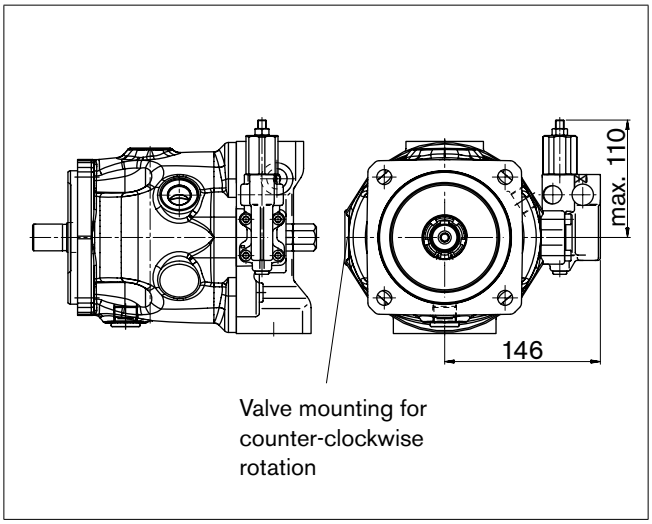
1) ANSI B92.1a, 30° pressure angle, flat base, flank centering, tolerance class 5
2) Thread according to ASME B1.1
3) Please observe the general information on page 60 for the maximum tightening torques.

Dimensions, A10VZO

Before finalizing your design, request a certified installation drawing. Dimensions in mm.

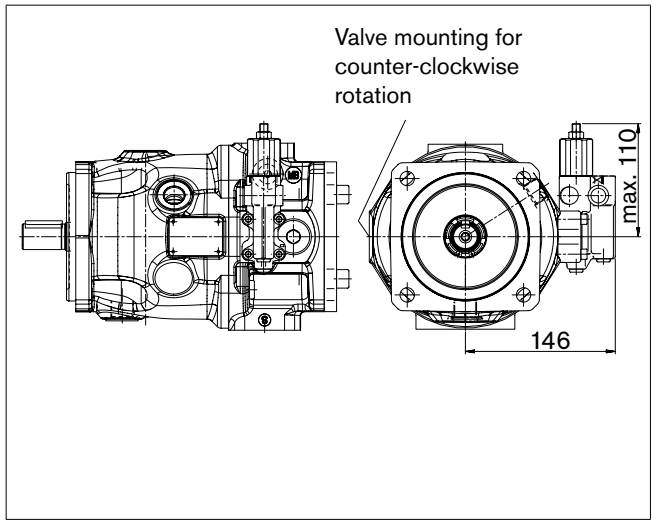
DR

Hydraulic pressure control, port plate 12



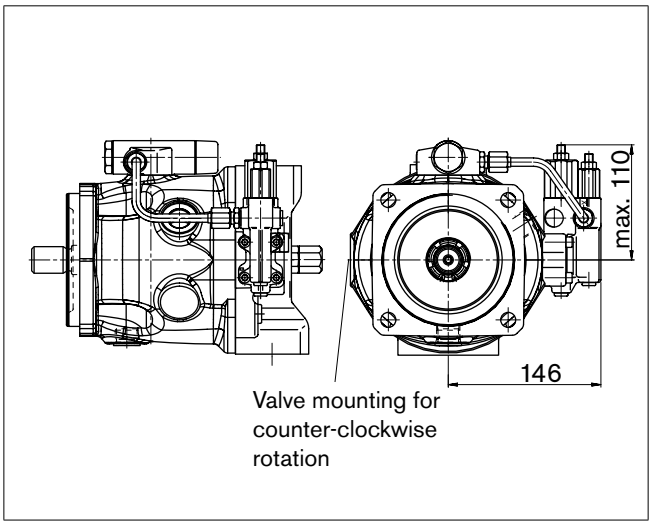
DR

Hydraulic pressure control, port plate 22



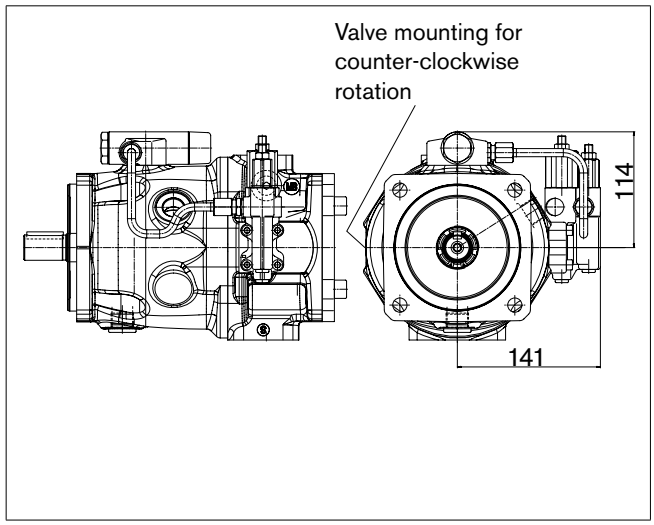
LAxD

Torque controller, port plate 12



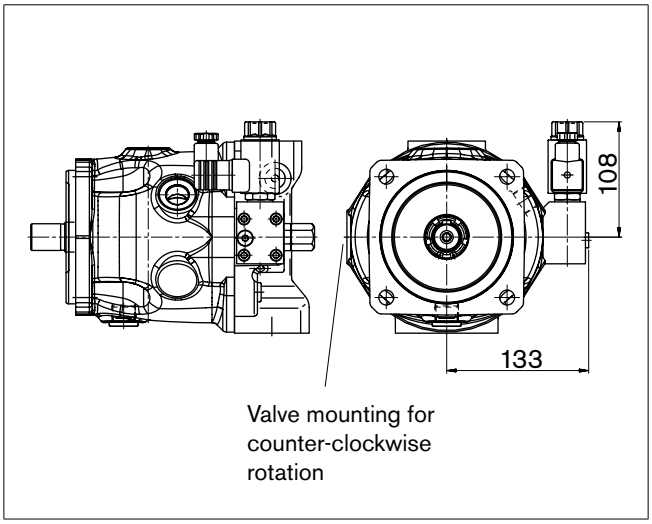
LAxD

Torque controller, port plate 22



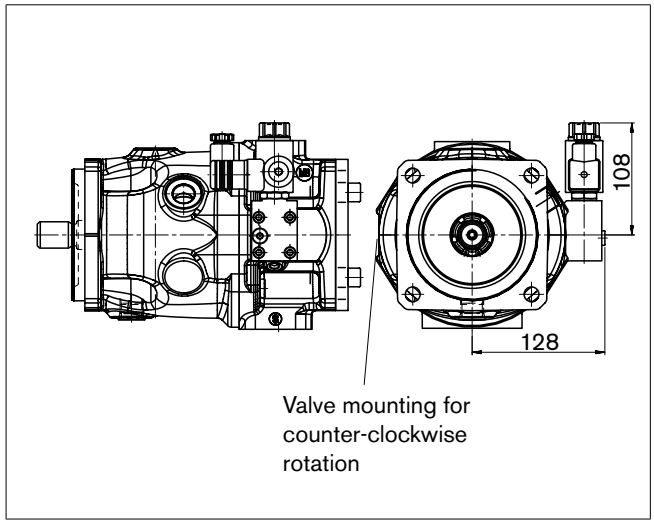
EZx

Two-point control, electric, port plate 12



EZx

Two-point control, electric, port plate 22



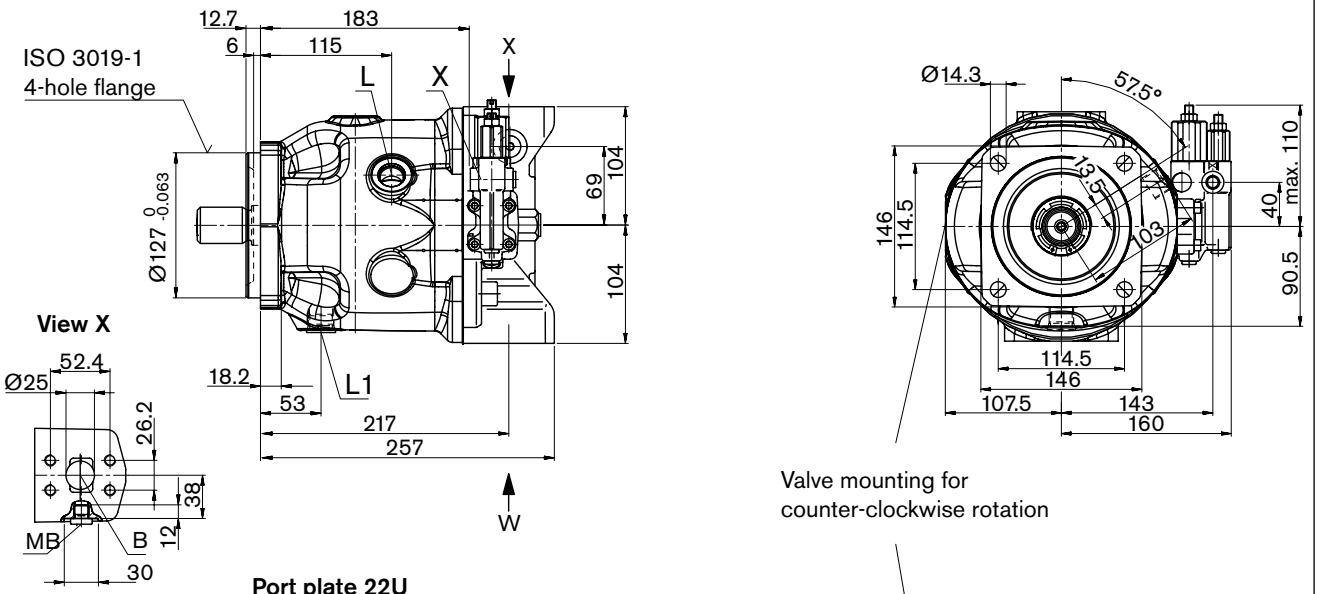
Dimensions, A10VZO

Before finalizing your design, request a certified installation drawing. Dimensions in mm.

Size 71

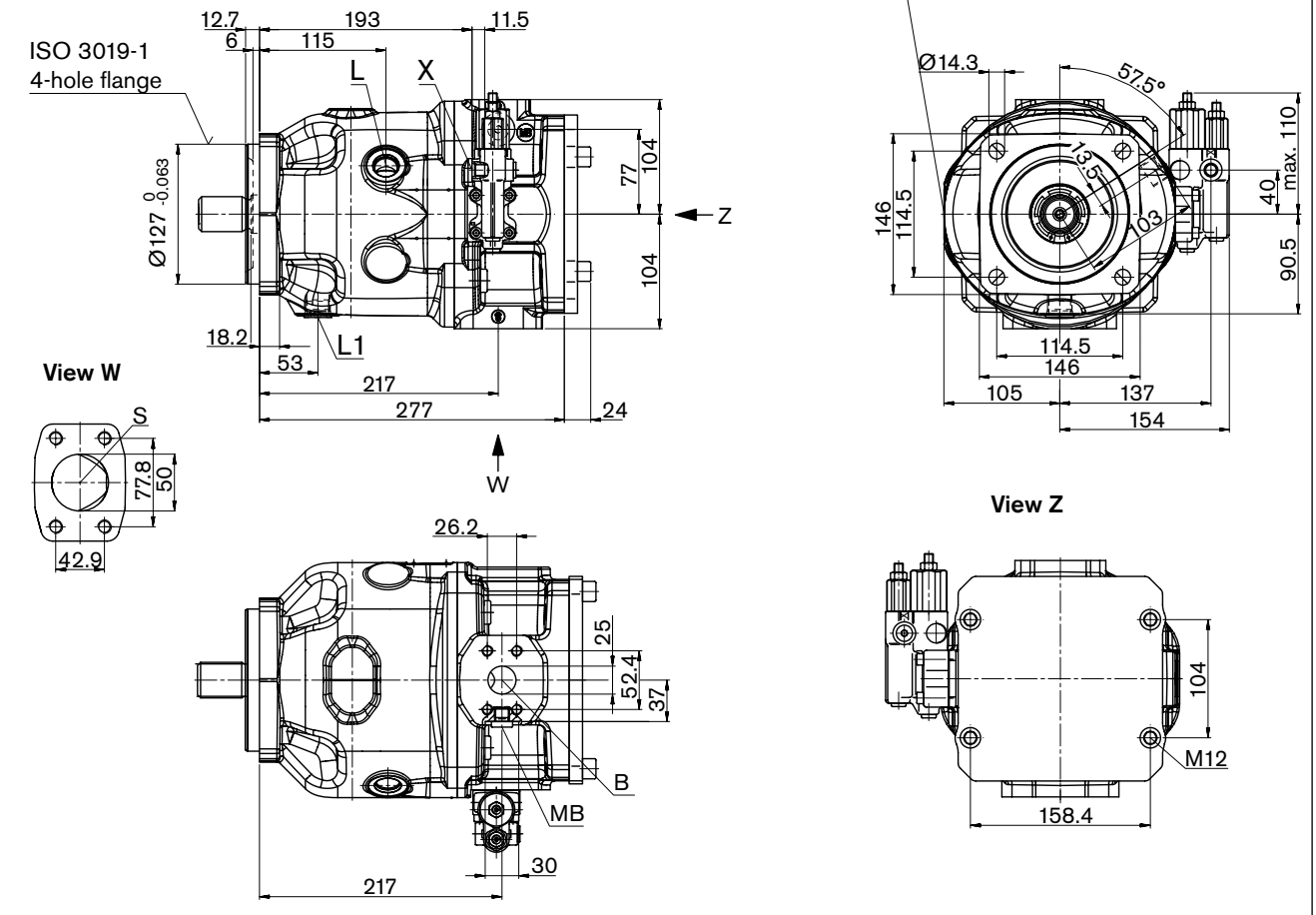
DRG pressure control, remotely operated, port plate 12/22: SAE flange port on opposite side, clockwise rotation

Port plate 12



Valve mounting for
counter-clockwise rotation

Port plate 22U



Please refer to notes on flow direction on page 10

For dimensions of ports, please refer to page 39

Dimensions, A10VZO

Before finalizing your design, request a certified installation drawing. Dimensions in mm.

Size 71

Ports

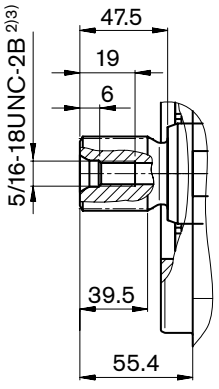
Designation	Port for	Standard	Size [1]	Maximum pressure [bar] [2]	State
B	Service line, Fixing thread	SAE J518[5] DIN 13	1 in M10 x 1.5 ; 17 deep	350	O
S	Suction line, fixing thread	SAE J518[5] DIN 13	2 in M12 x 1.75; 20 deep	10	O
L	Case drain fluid	ISO 11926[4]	7/8-14 UNF-2B; 12 deep	2	O [3]
L_1	Case drain fluid	ISO 11926[4]	7/8-14 UNF-2B; 12 deep	2	X [3]
X	Pilot pressure	ISO 11926[4]	7/16-20UNF-2B; 11.5 deep	350	O
M_B	Measuring, pressure B	DIN 3852[4]	G 1/4 in; 12 deep	350	X

1) Please observe the general information on page 60 for the maximum tightening torques.
2) Short-term pressure spikes may occur depending on the application. Keep this in mind when selecting measuring devices and fittings.
3) Depending on the installation position, L or L_1 must be connected (see installation notes on page 56, 57)
4) The countersink may be deeper that specified in the standard.
5) Only dimensions complying with SAE J518. A metric fixing thread is a deviation from standard.

O = Must be connected (plugged on delivery)
X = Plugged in normal operation

Drive shaft

S Splined shaft 1 1/4 in
14T 12/24DP[1] (SAE J744)



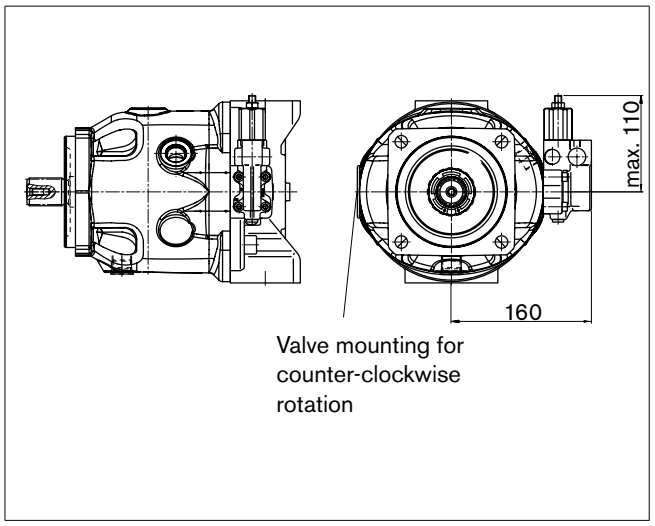
1) ANSI B92.1a, 30° pressure angle, flat base, flank centering, tolerance class 5
2) Thread according to ASME B1.1
3) Please observe the general information on page 60 for the maximum tightening torques.

Dimensions, A10VZO

Before finalizing your design, request a certified installation drawing. Dimensions in mm.

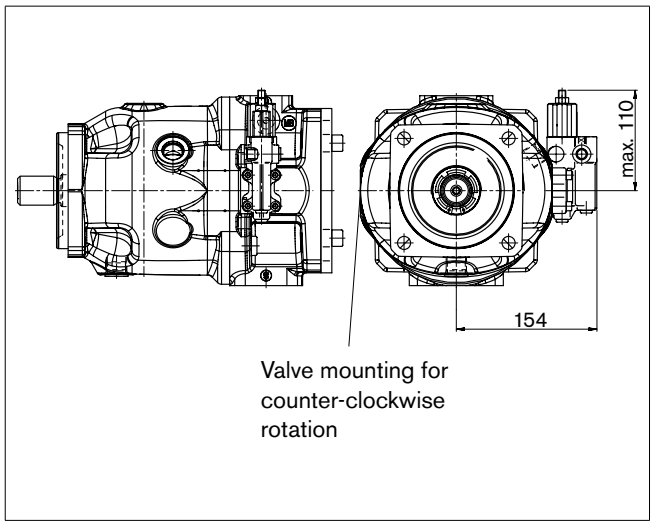
DR

Hydraulic pressure control, port plate 12



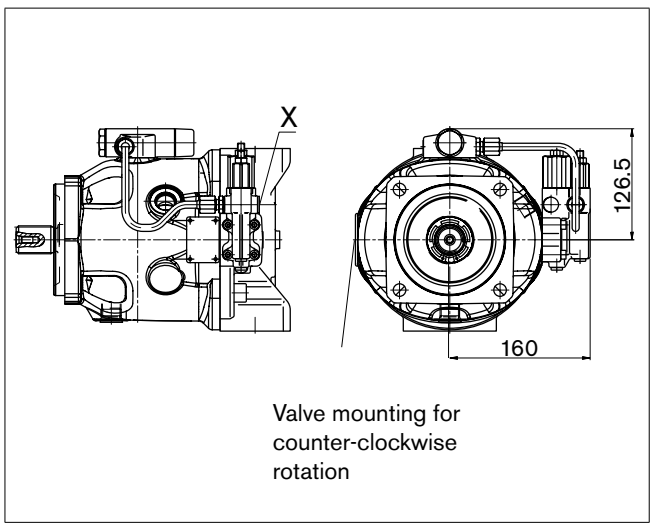
DR

Hydraulic pressure control, port plate 22



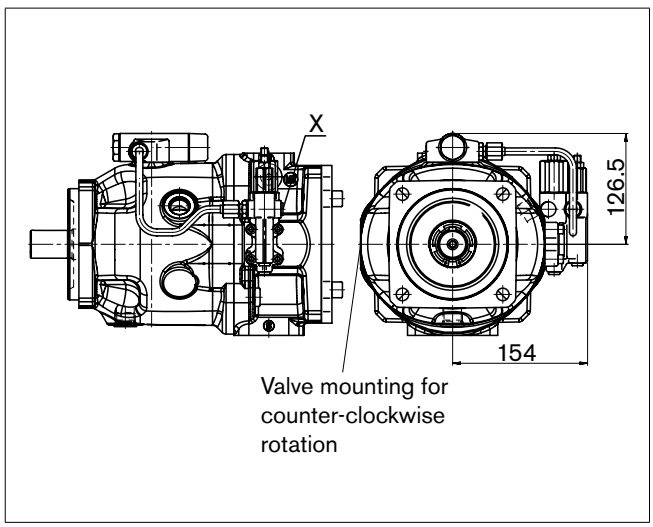
LAxD

Torque controller, port plate 12



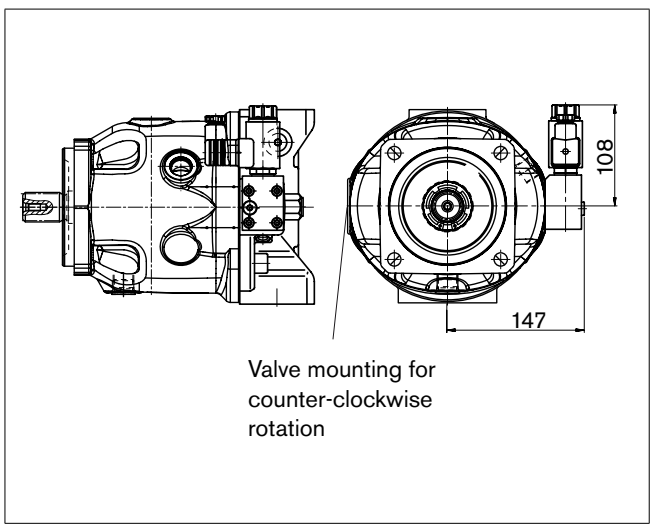
LAxD

Torque controller, port plate 22



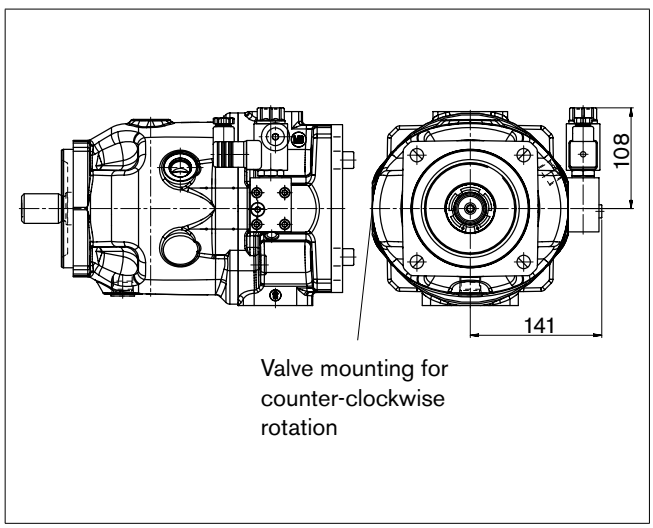
EZx

Two-point control, electric, port plate 12



EZx

Two-point control, electric, port plate 22



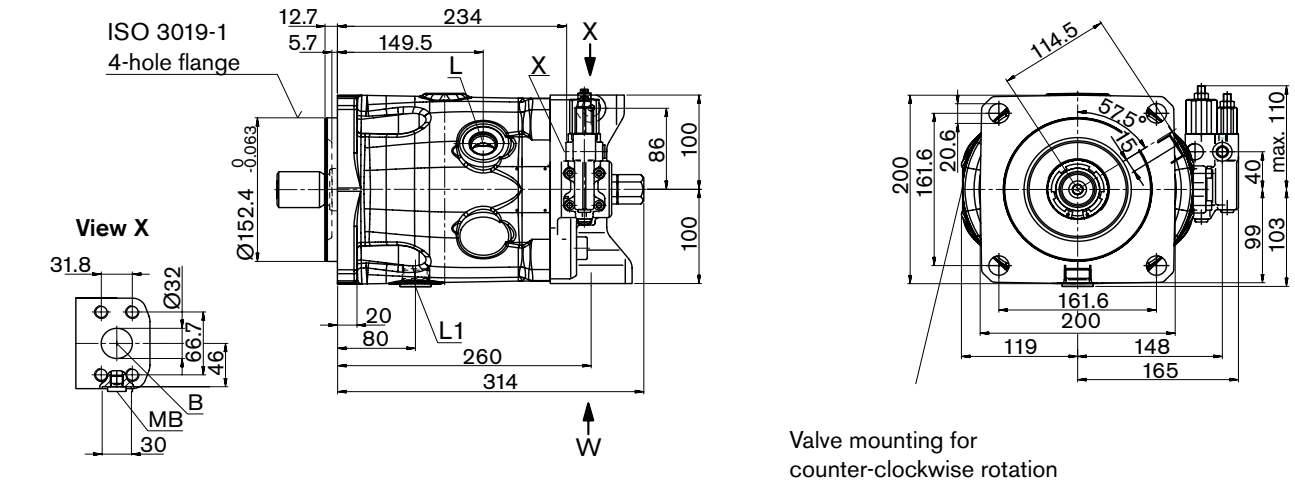
Dimensions, A10VZO

Before finalizing your design, request a certified installation drawing. Dimensions in mm.

Size 100

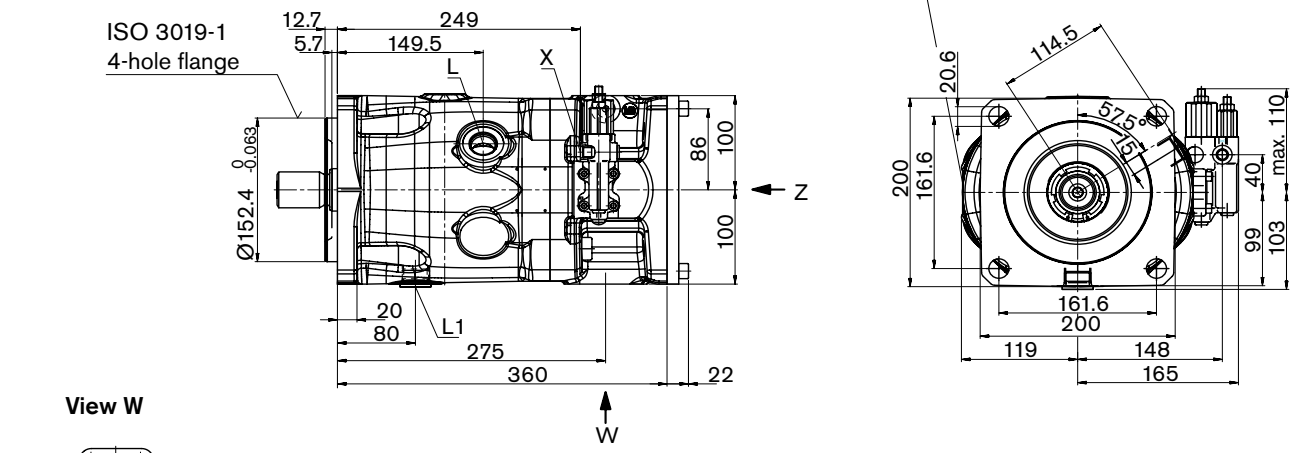
DRG pressure control, remotely operated, port plate 12/22: SAE flange port on opposite side, clockwise rotation

Port plate 12

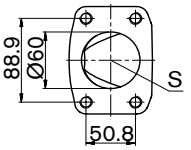


Valve mounting for
counter-clockwise rotation

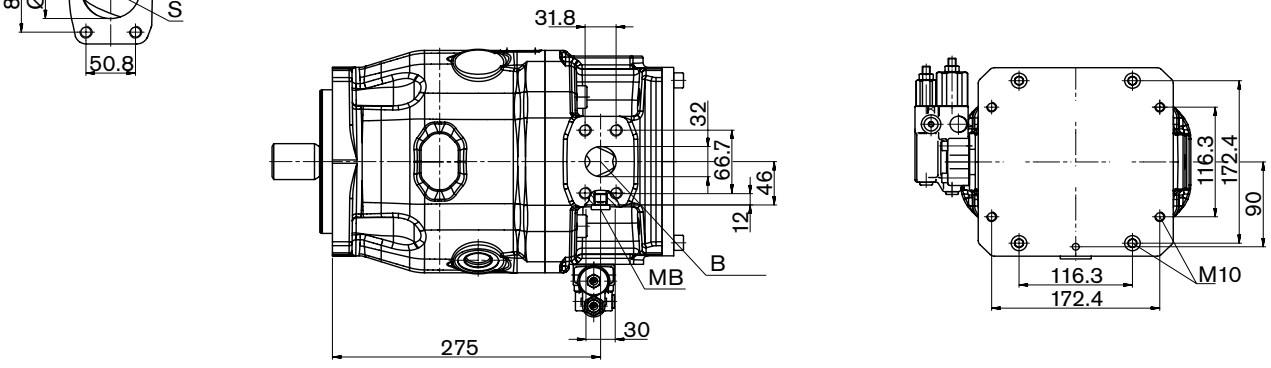
Port plate 22U



View W



View Z



Please refer to notes on flow direction on page 10

For dimensions of ports, please refer to page 42

Dimensions, A10VZO

Before finalizing your design, request a certified installation drawing. Dimensions in mm.

Size 100

Ports

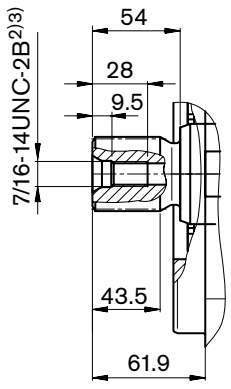
Designation	Port for	Standard	Size [1]	Maximum pressure [bar] [2]	State
B	Service line, Fixing thread	SAE J518[5] DIN 13	1 1/4 in M14 x 2 ; 19 deep	350	O
S	Suction line, fixing thread	SAE J518[5] DIN 13	2 1/2 in M12 x 1.75; 17 deep	10	O
L	Case drain fluid	ISO 11926[4]	1 1/16-12 UNF-2B; 15 deep	2	O [3]
L_1	Case drain fluid	ISO 11926[4]	1 1/16-12 UNF-2B; 15 deep	2	X [3]
X	Pilot pressure	ISO 11926[4]	7/16-20UNF-2B; 11.5 deep	350	O
M_B	Measuring pressure in B	DIN 3852[4]	G 1/4 in; 12 deep	350	X

1) Please observe the general information on page 60 for the maximum tightening torques.
2) Short-term pressure spikes may occur depending on the application. Keep this in mind when selecting measuring devices and fittings.
3) Depending on the installation position, L or L_1 must be connected (see installation notes on page 56, 57)
4) The countersink may be deeper that specified in the standard.
5) Only dimensions complying with SAE J518. A metric fixing thread is a deviation from standard.

O = Must be connected (plugged on delivery)
X = Plugged in normal operation

Drive shaft

S Splined shaft 1 1/2 in
17T 12/24DP[1] (SAE J744)

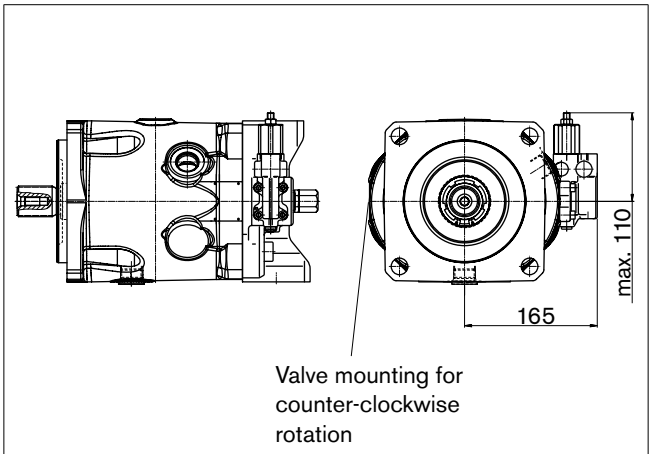


1) ANSI B92.1a, 30° pressure angle, flat base, flank centering, tolerance class 5
2) Thread according to ASME B1.1
3) Please observe the general information on page 68 for the maximum tightening torques.

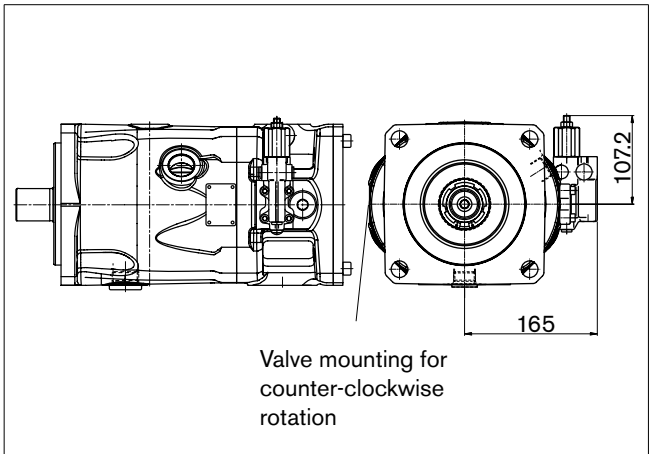
Dimensions, A10VZO

Before finalizing your design, request a certified installation drawing. Dimensions in mm.

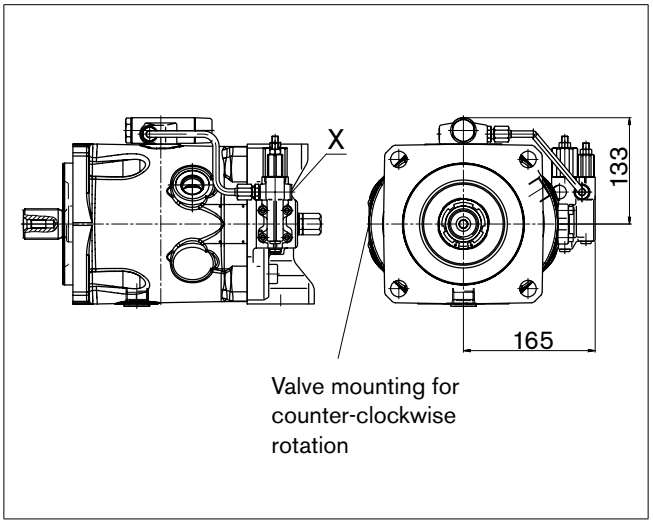
DR
Hydraulic pressure control, port plate 12



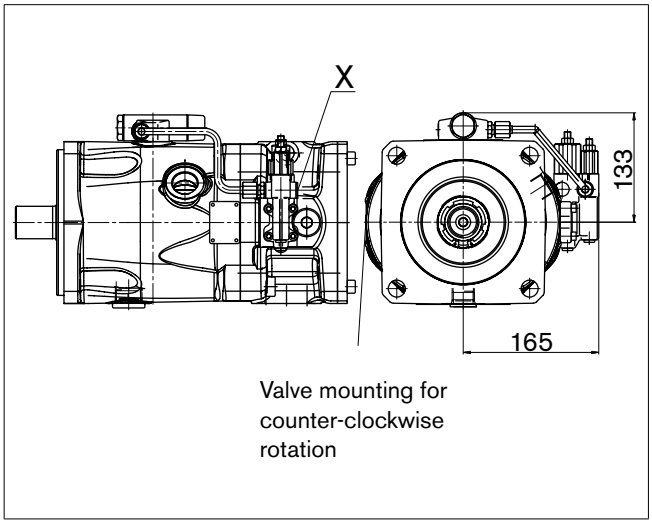
DR
Hydraulic pressure control, port plate 22



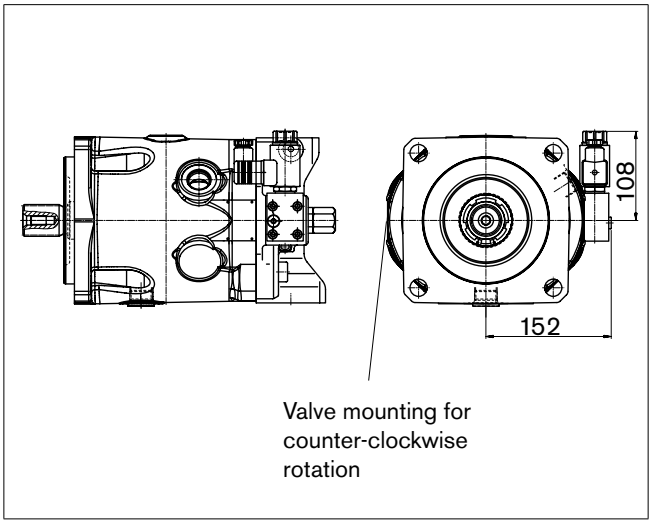
LAxD
Torque controller, port plate 12



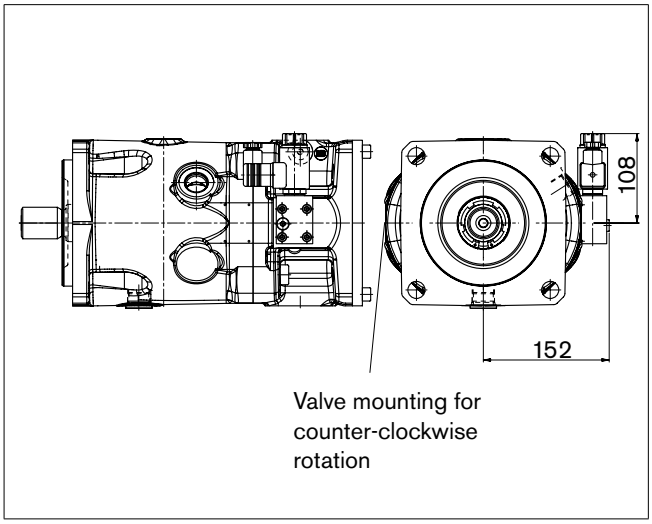
LAxD
Torque controller, port plate 22



EZx
Two-point control, electric, port plate 12



EZx
Two-point control, electric, port plate 22



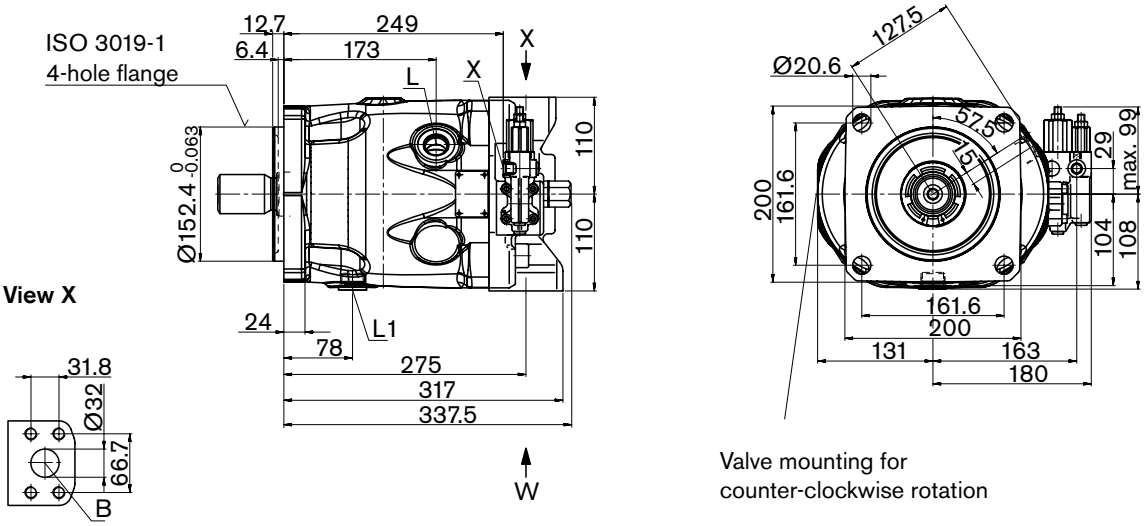
Dimensions, A10VZO

Before finalizing your design, request a certified installation drawing. Dimensions in mm.

Size 140

DRG pressure control, remotely operated, port plate 12/22: SAE flange port on opposite side, clockwise rotation

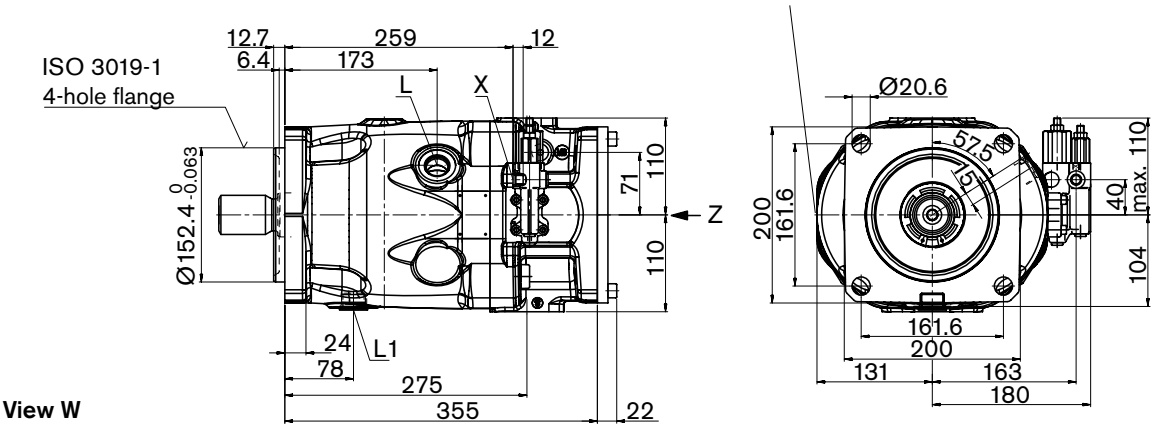
Port plate 12



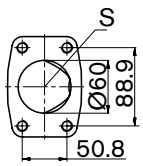
View X

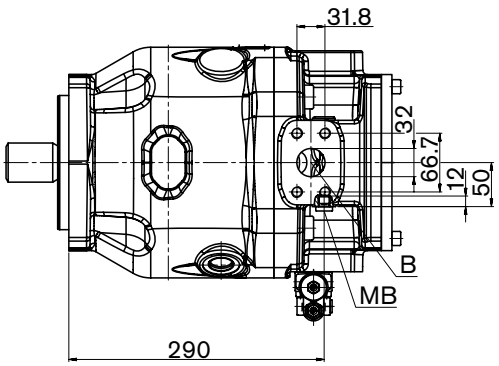
Valve mounting for
counter-clockwise rotation

Port plate 22U

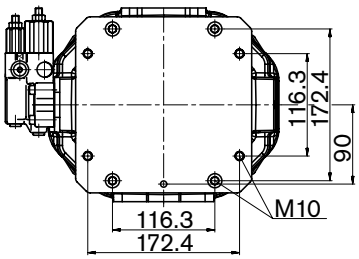


View W





View Z



Please refer to notes on flow direction on page 10

For dimensions of ports, please refer to page 45

Dimensions, A10VZO

Before finalizing your design, request a certified installation drawing. Dimensions in mm.

Size 140

Ports

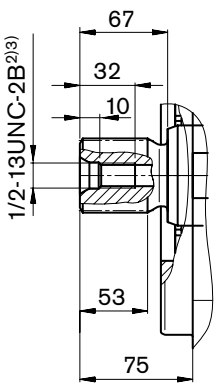
Designation	Port for	Standard	Size [1]	Maximum pressure [bar] [2]	State
B	Service line, Fixing thread	SAE J518[5] DIN 13	1 1/4 in M14 x 2 ; 19 deep	350	O
S	Suction line, fixing thread	SAE J518[5] DIN 13	2 1/2 in M12 x 1.75; 17 deep	10	O
L	Case drain fluid	ISO 11926[4]	1 1/16-12 UNF-2B; 15 deep	2	O [3]
L_1	Case drain fluid	ISO 11926[4]	1 1/16-12 UNF-2B; 15 deep	2	X [3]
X	Pilot pressure	ISO 11926[4]	7/16-20UNF-2B; 12 deep	350	O
M_B	Measuring, pressure B	DIN 3852[4]	G 1/4 in; 12 deep	350	X

1) Please observe the general information on page 60 for the maximum tightening torques.
2) Short-term pressure spikes may occur depending on the application. Keep this in mind when selecting measuring devices and fittings.
3) Depending on the installation position, L or L_1 must be connected (see installation notes on page 56, 57)
4) The countersink may be deeper that specified in the standard.
5) Only dimensions complying with SAE J518. A metric fixing thread is a deviation from standard.

O = Must be connected (plugged on delivery)
X = Plugged in normal operation

Drive shaft

S Splined shaft 1 3/4 in
13T 8/16DP[1] (SAE J744)



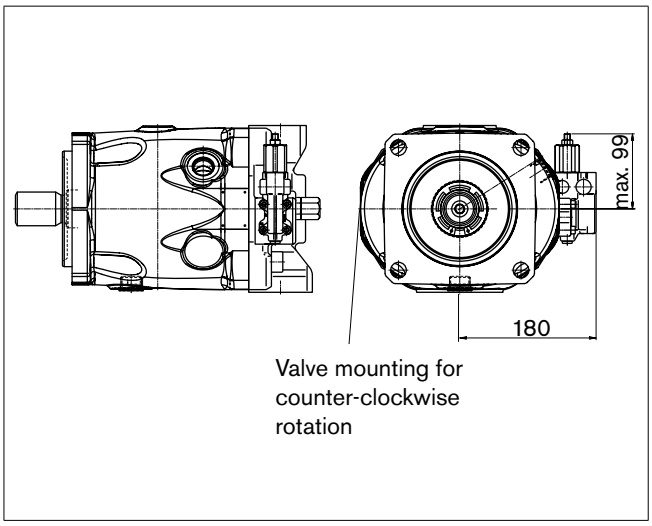
1) ANSI B92.1a, 30° pressure angle, flat base, flank centering, tolerance class 5
2) Thread according to ASME B1.1
3) Please observe the general information on page 68 for the maximum tightening torques.

Dimensions, A10VZO

Before finalizing your design, request a certified installation drawing. Dimensions in mm.

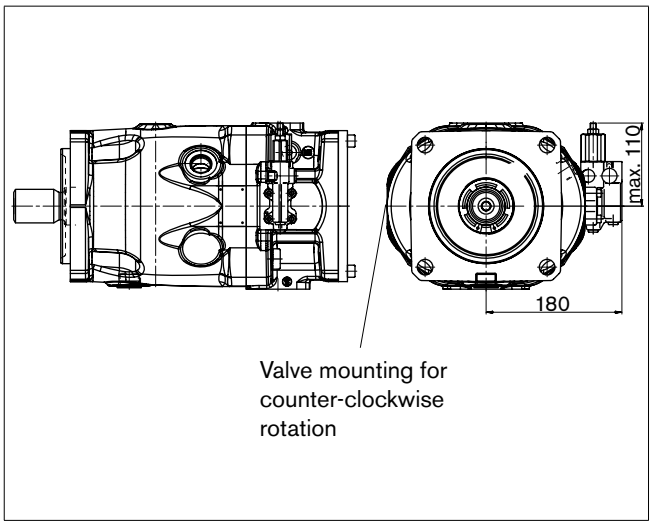
DR

Hydraulic pressure control, port plate 12



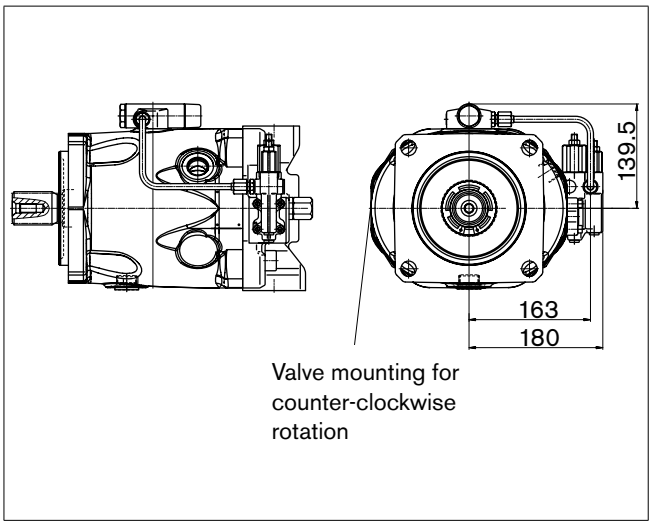
DR

Hydraulic pressure control, port plate 22



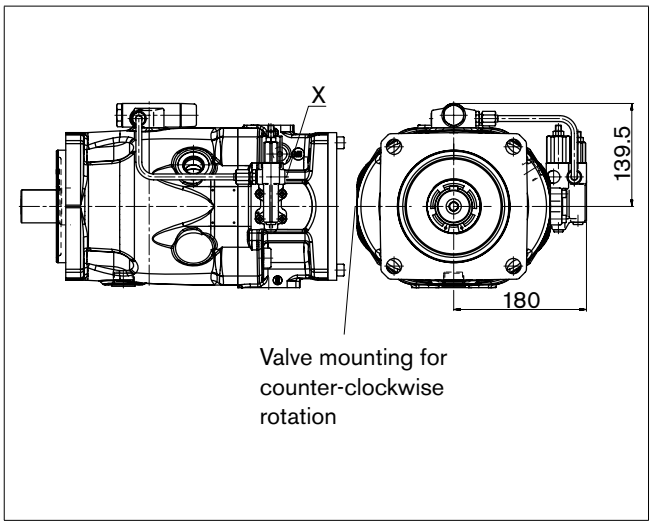
LAxD

Torque controller, port plate 12



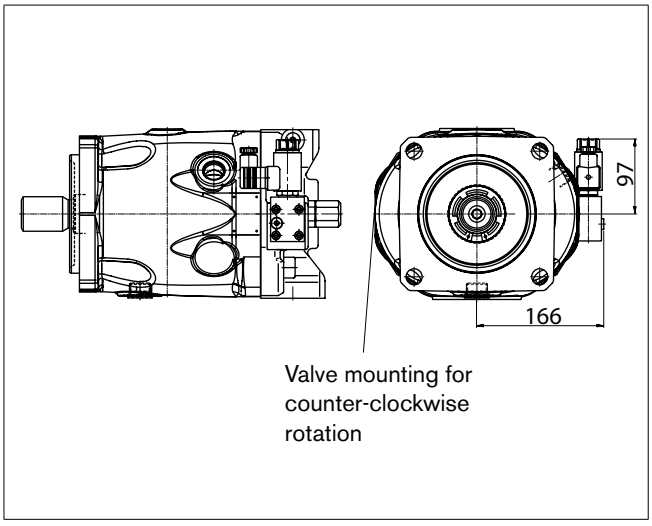
LAxD

Torque controller, port plate 22



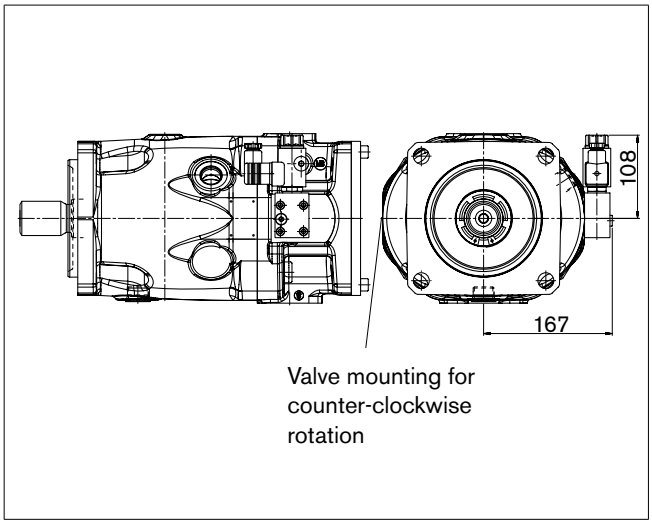
EZx

Two-point control, electric, port plate 12



EZx

Two-point control, electric, port plate 22

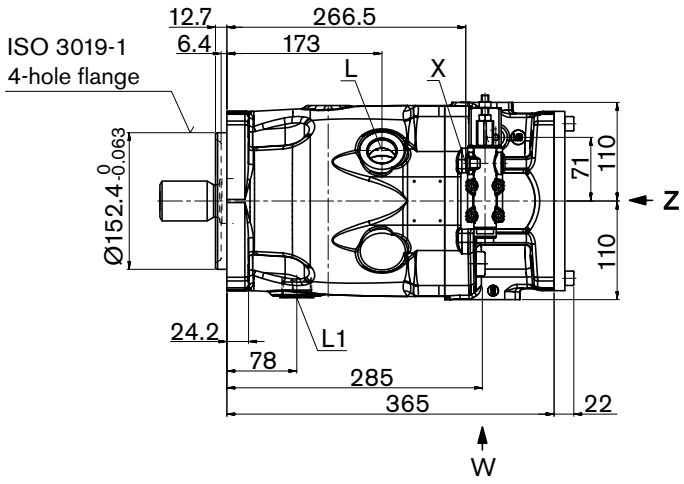


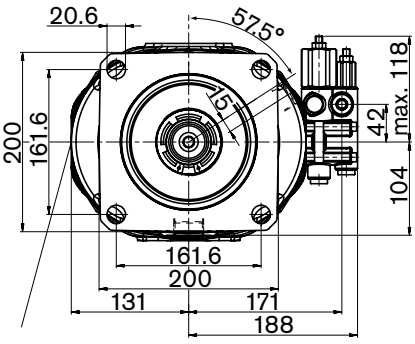
Dimensions, A10VZO

Before finalizing your design, request a certified installation drawing. Dimensions in mm.

Size 180

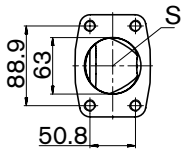
DRG pressure control, remotely operated, port plate 22: SAE flange port on opposite side, clockwise rotation

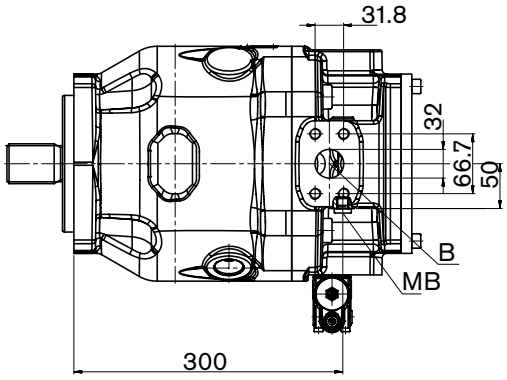




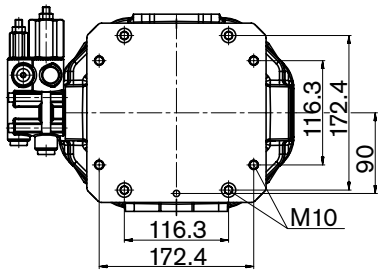
Valve mounting for
counter-clockwise rotation

View W





View Z



Please refer to notes on flow direction on page 10

For dimensions of ports, please refer to page 48

Dimensions, A10VZO

Before finalizing your design, request a certified installation drawing. Dimensions in mm.

Size 180

Ports

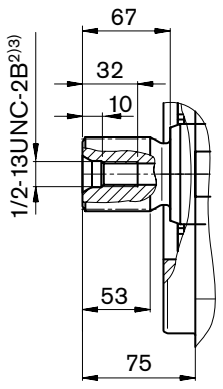
Designation	Port for	Standard	Size [1]	Maximum pressure [bar] [2]	State
B	Service line, Fixing thread	SAE J518[5] DIN 13	1 1/4 in M14 x 2; 19 deep	350	O
S	Suction line, fixing thread	SAE J518[5] DIN 13	2 1/2 in M12 x 1.75; 17 deep	10	O
L	Case drain fluid	ISO 11926[4]	1 5/16-12 UNF-2B; 15 deep	2	O [3]
L_1	Case drain fluid	ISO 11926[4]	1 5/16-12 UNF-2B; 15 deep	2	X [3]
X	Pilot pressure	ISO 11926[4]	7/16-20UNF-2B; 12 deep	350	O
M_B	Measuring, pressure B	DIN 3852[4]	G 1/4 in; 12 deep	350	X

1) Please observe the general information on page 60 for the maximum tightening torques.
2) Short-term pressure spikes may occur depending on the application. Keep this in mind when selecting measuring devices and fittings.
3) Depending on the installation position, L or L_1 must be connected (see installation notes on page 56, 57)
4) The countersink may be deeper that specified in the standard.
5) Only dimensions complying with SAE J518. A metric fixing thread is a deviation from standard.

O = Must be connected (plugged on delivery)
X = Plugged in normal operation

Drive shaft

S Splined shaft 1 3/4 in
13T 8/16DP[1] (SAE J744)



1) ANSI B92.1a, 30° pressure angle, flat base, flank centering, tolerance class 5
2) Thread according to ASME B1.1
3) Please observe the general information on page 68 for the maximum tightening torques.

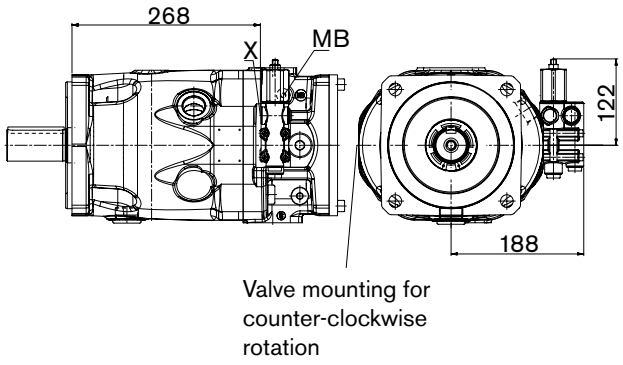
Dimensions, A10VZO

Before finalizing your design, request a certified installation drawing. Dimensions in mm.

DR
Hydraulic pressure control, port plate 12

on request

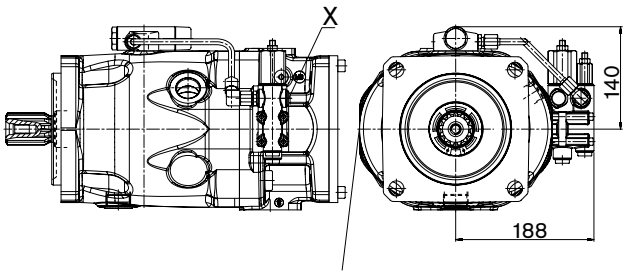
DR
Hydraulic pressure control, port plate 22



LAxD
Torque controller, port plate 12

on request

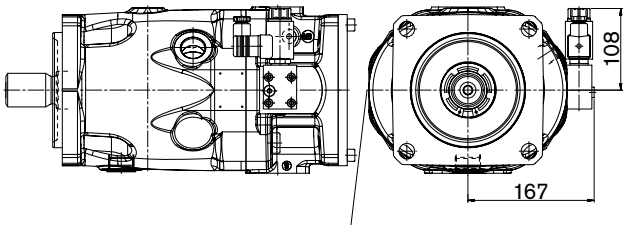
LAxD
Torque controller, port plate 22



EZx
Two-point control, electric, port plate 12

on request

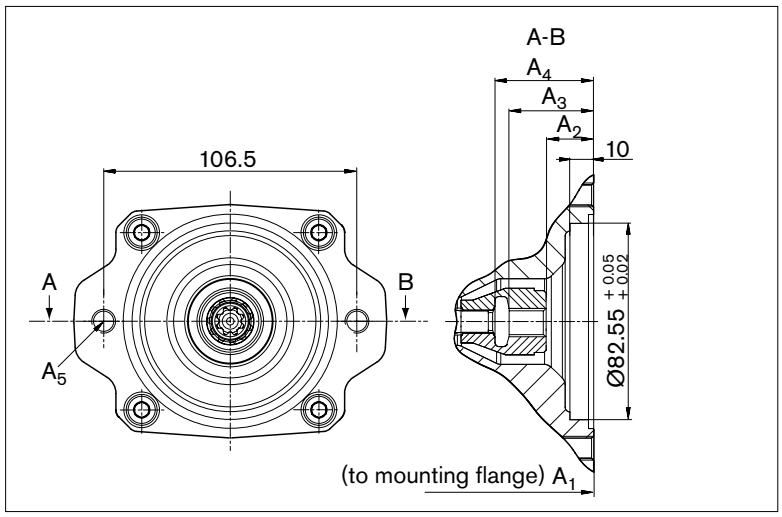
EZx
Two-point control, electric, port plate 22



Through drive dimensions

Before finalizing your design, please request approved installation drawing. Dimensions in mm.

K01 Flange SAE J744 - 82-2 (A)
Coupling for splined shaft to ANSI B92.1a 5/8in 9T 16/32 DP1) (SAE J744 - 16-4 (A))



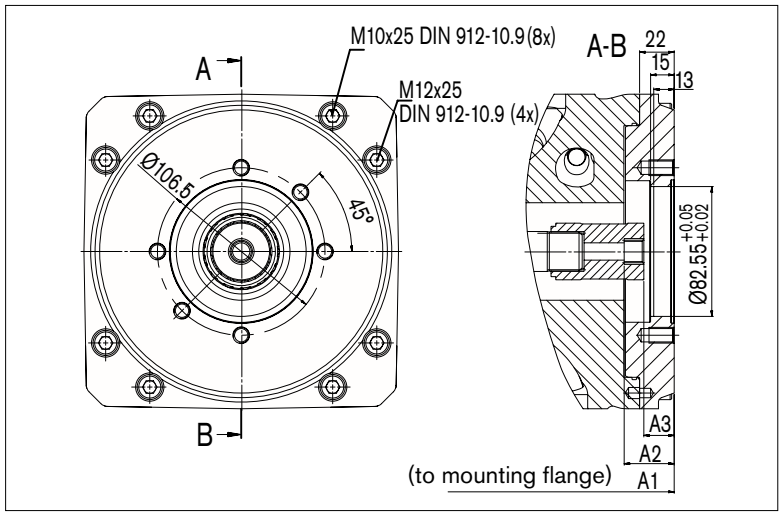
A10FZO

NG	A_1	A_2	A_3	A_4	A_5 2)
06 - 10	162.6	20	35.5	41.5	M10x1.5; 15 deep
11 - 18	on request				
21 - 28					
37 - 45					
58 - 63					

A10VZO

NG	A_1	A_2	A_3	A_4
10	on request			

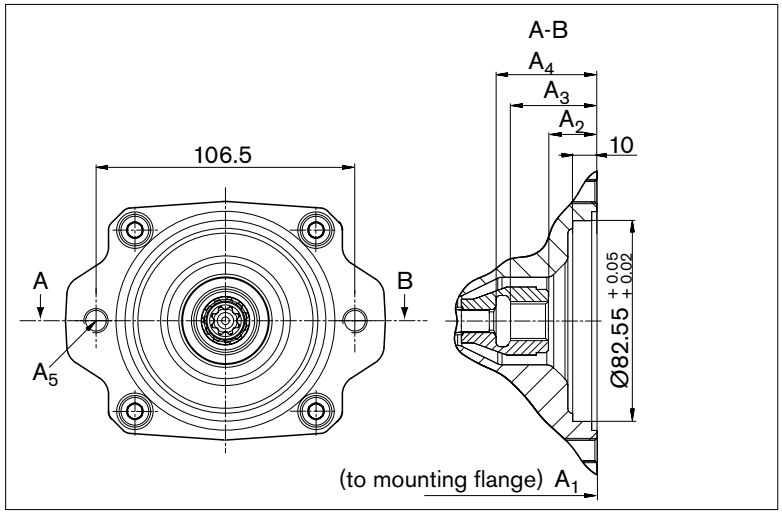
U01 Flange SAE J744 - 82-2 (A)
Coupling for splined shaft to ANSI B92.1a 5/8in 9T 16/32 DP1) (SAE J744 - 16-4 (A))



A10VZO

NG	A_1	A_2	A_3	A_4 2)
45	264	31.8	19.3	M10x1.5; 16 deep
71	299	31.8	19.3	M10x1.5; 16 deep
100	360	31.8	Inquiry	M10x1.5; 16 deep
140	377	31.8	Inquiry	M10x1.5; 16 deep
180	387	31.8	Inquiry	M10x1.5; 16 deep

K52 Flange SAE J744 - 82-2 (A)
Coupling for splined shaft to ANSI B92.1a 3/4in 11T 16/32 DP1) (SAE J744 - 19-4 (A-B))



A10FZO

NG	A_1	A_2	A_3	A_4	A_5 2)
06 - 10	162.6	20	35.5	41.5	M10x1.5; 15 deep
11 - 18	on request				
21 - 28					
37 - 45					
58 - 63					

A10VZO

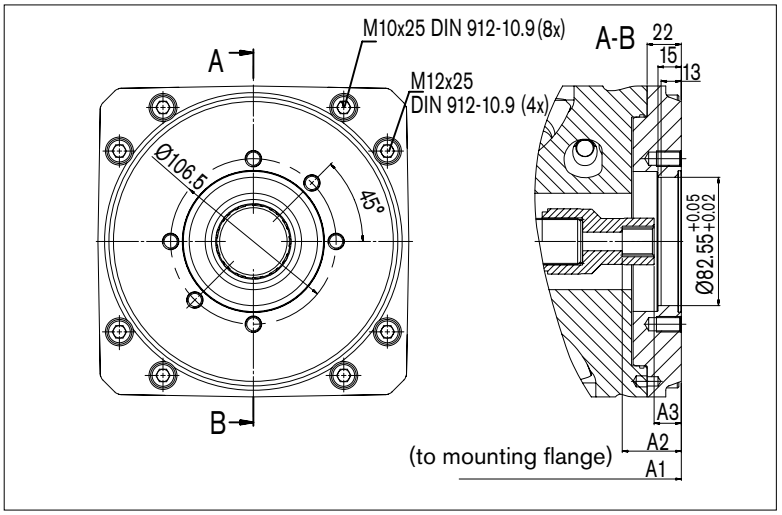
NG	A_1	A_2	A_3	A_4
10			on request	

1) 30° pressure angle, flat base, flank centering, tolerance class 5
2) Thread according to DIN 13, observe the general information on page 60 for the maximum tightening torques.

Through drive dimensions

Before finalizing your design, please request approved installation drawing. Dimensions in mm.

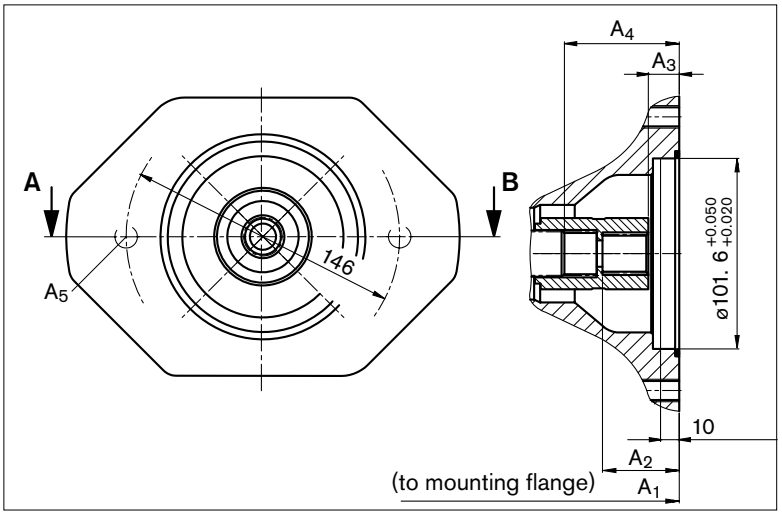
U52 Flange SAE J744 - 82-2 (A)
Coupling for splined shaft to ANSI B92.1a 3/4in 11T 16/32 DP1) (SAE J744 - 19-4 (A-B))



A10VZO

NG	A_1	A2	A_3	A_4 2)
45	264	38	17.5	M10x1.5; 16 deep
71	299	38	17.5	M10x1.5; 16 deep
100	360	38	17.5	M10x1.5; 16 deep
140	377	38	17.5	M10x1.5; 16 deep
180	387	38	17.5	M10x1.5; 16 deep

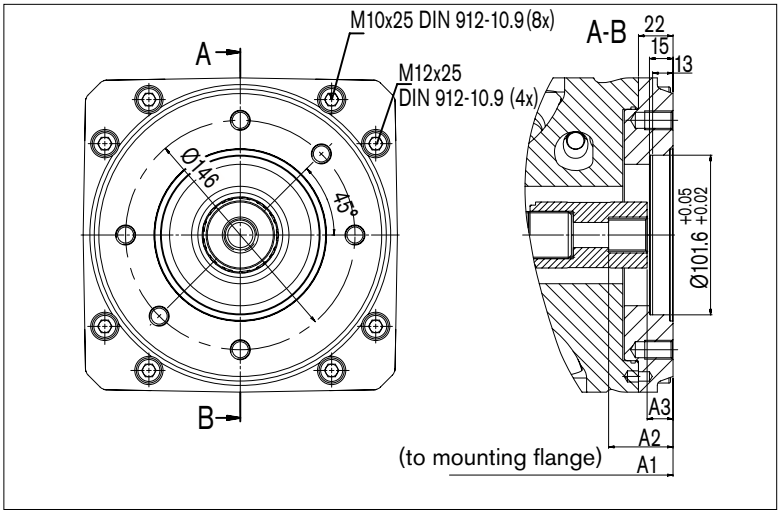
K68 Flange SAE J744 - 101-2 (B)
Coupling for splined shaft to ANSI B92.1a 7/8in 13T 16/32 DP1) (SAE J744 - 22-4 (B))



A10FZO

NG	A_1	A2	A_3	A_4	A_5 2)
21-28	on request				
37-45					

U68 Flange SAE J744 - 101-2 (B)
Coupling for splined shaft to ANSI B92.1a 7/8in 13T 16/32 DP1) (SAE J744 - 22-4 (B))



A10VZO

NG	A_1	A2	A_3	A_4 2)
45	264	41	16.5	M12x1.75; 18 deep
71	299	41	16.5	M12x1.75; 18 deep
100	360	41	16.5	M12x1.75; 18 deep
140	377	41	16.5	M12x1.75; 18 deep
180	387	41	16.5	M12x1.75; 18 deep

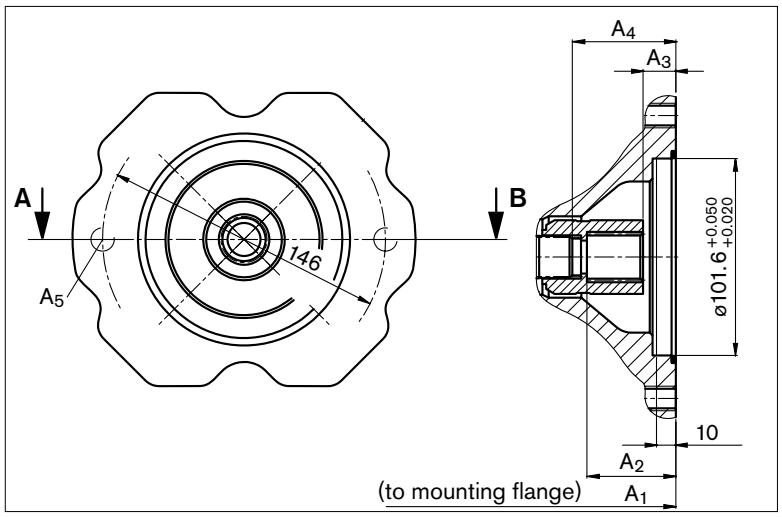
1) 30° pressure angle, flat base, flank centering, tolerance class 5
2) Thread according to DIN 13, observe the general information on page 60 for the maximum tightening torques.

Through drive dimensions

Before finalizing your design, please request approved installation drawing. Dimensions in mm.

K04 Flange SAE J744 - 101-2 (B)
Coupling for splined shaft to ANSI B92.1a-1996

1in 15T 16/32 DP1) (SAE J744 - 25-4 (B-B))

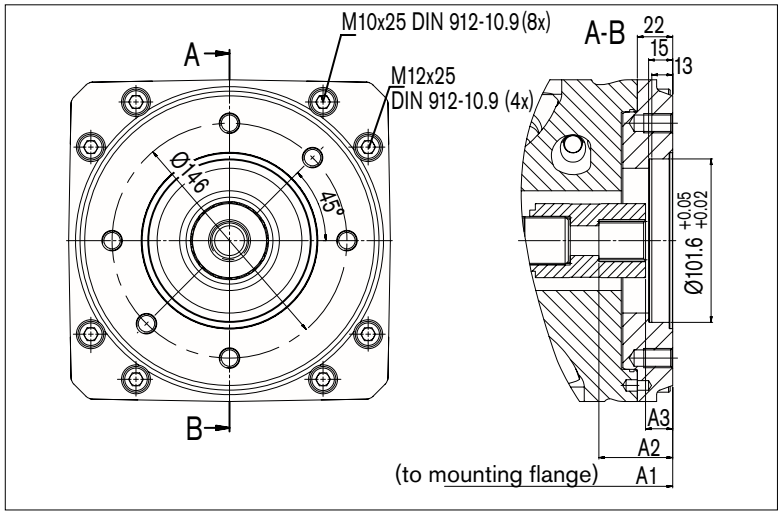


A10FZO

NG	A_1	A2	A_3	A_4 2)
21-28	on request			
37-45				

U04 Flange SAE J744 - 101-2 (B)
Coupling for splined shaft to ANSI B92.1a-1996

1in 15T 16/32 DP1) (SAE J744 - 25-4 (B-B))



A10VZO

NG	A_1	A2	A_3	A_4 2)
45	264	45.9	16.9	M12x1.75; 18 deep
71	299	45.9	16.9	M12x1.75; 18 deep
100	360	45.9	16.9	M12x1.75; 18 deep
140	377	45.9	16.9	M12x1.75; 18 deep
180	387	45.9	16.9	M12x1.75; 18 deep

1) 30° pressure angle, flat base, flank centering, tolerance class 5
2) Thread according to DIN 13, observe the general information on page 60 for the maximum tightening torques.

Overview of attachments

Through drive - A10FZO			Attachment of 2nd pump			Through drive
Flange ISO 3019-1	Coupling for splined shaft	Short code	A10FZO Size (shaft)	A10VZO Size (shaft)	External gear pump Size (NG)	Available for size
82-2(A)	5/8 in	**K01**	06 to 10, 11 to 18 (S)	10, 18 (S)	F (5 to 22)	11 to 63
	3/4 in	**K52**	06 to 10, 11 to 18 (S)	10, 18 (S)	–	06 to 63
101-2(B)	7/8 in	**K68**	21 to 28 (S)	28 (S)	N/G (26 to 49)	21 to 63
	1 in	**K04**	21 to 28 (S)	28 (S)	–	21 to 63

Through drive - A10VZO			Attachment of 2nd pump			Through drive
Flange ISO 3019-1	Coupling for splined shaft	Short code	A10FZO Size (shaft)	A10VZO Size (shaft)	External gear pump Size (NG)	Available for size
82-2(A)	5/8 in	**K01**	06 to 10, 11 to 18 (S)	10, 18 (S)	F (5 to 22)	18 to 28
	3/4 in	**K52**	06 to 10, 11 to 18 (S)	10, 18 (S)	–	18 to 28
101-2(B)	7/8 in	**K68**	21 to 28 (S)	28 (S)	N/G (26 to 49)	28
	1 in	**K04**	21 to 28 (S)	28 (S)	–	28
82-2(A)	5/8 in	**U01**	06 to 10, 11 to 18 (S)	10, 18 (S)	F (5 to 22)	45 to 180
	3/4 in	**U52**	06 to 10, 11 to 18 (S)	10, 18 (S)	–	45 to 180
101-2(B)	7/8 in	**U68**	21 to 28 (S)	28 (S)	N/G (26 to 49)	45 to 180
	1 in	**U04**	21 to 28 (S)	28 (S)	–	45 to 180

The A10VZO in sizes 45 to 180 is equipped with a flexible universal through-drive (U..). This allows the through drive to be exchanged without having to machine the port plate. Details of the add-on parts can be found in data sheet RE 95581.

Combination pumps A10VZO + A10VZO; A10FZO + A10FZO

When using combination pumps, it is possible to have multiple, independent hydraulic circuits without the need for a splitter gearbox.

When ordering combination pumps, the model codes of the 1st and 2nd pumps must be joined by a "+".

Order example: A10VZO45DR/32R-VPD22U01 + A10VZO45DR/32R-VSD22U00
A10FZO 28/10R-VSC12K01 + A10FZO 28/10R-VSC11N00

Permissible moments of inertia

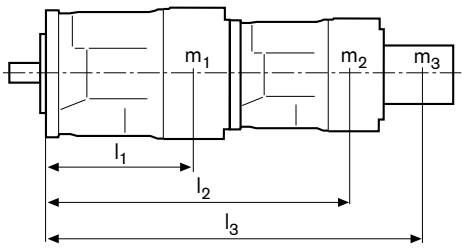
The arrangement of two single pumps in line is permissible up to the same size (tandem pump), taking into account a dynamic mass acceleration of max. 10 g (98.1 m/s2) without additional support.

A10VZO

NG			10	18	28	45	71	100	140	180
Permissible moment of inertia			on request							
Static	T_m	Nm		500	880	1370	3000	4500	4500	4500
Dynamic at 10 *g* (98.1 m/s²)	T_m	Nm		50	88	137	300	450	450	450
Ground	m_1	kg		18	18	30	47	69	73	78
Distance of center of gravity	l_1	mm		90	110	130	142	169	172	196

A10FZO

NG			06-10	11-18	21-28	37-45	58-63
Permissible moment of inertia							
Static	T_m	Nm					
Dynamic at 10 *g* (98.1 m/s²)	T_m	Nm		on request			
Ground	m_1	kg					
Distance of center of gravity	l_1	mm					



m1, m2, m3 mass of pumps [kg]

l1, l2, l3 Distance of center of gravity [mm]

$$T_m = (m_1 \cdot l_1 + m_2 \cdot l_2 + m_3 \cdot l_3) \cdot \frac{1}{102} \text{ [Nm]}$$

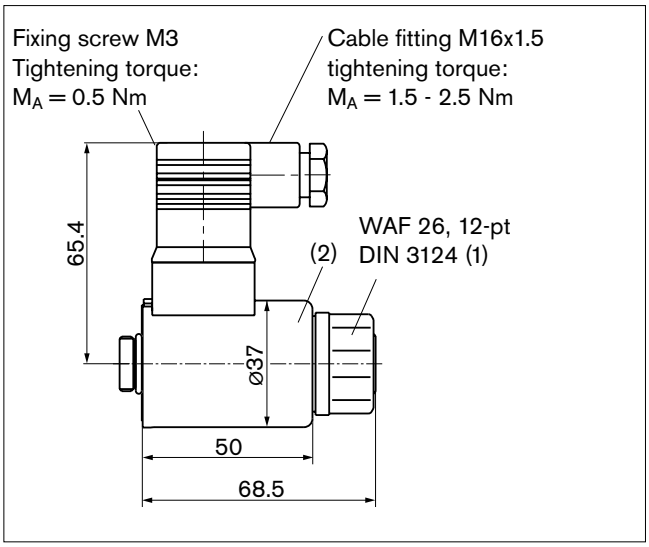
Connector for solenoids

HIRSCHMANN DIN EN 175 301-803-A /ISO 4400

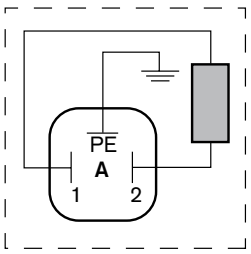
Without bidirectional suppressor diode _____ H
type of protection as per DIN/EN 43650 _____ IP65

The sealing ring in the screw cable fitting is suitable for line diameters of 4.5 mm to 10 mm.

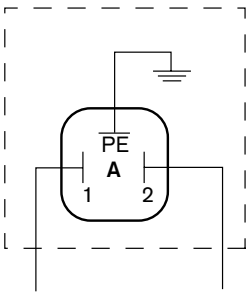
The line connector is not included in the delivery contents. This can be supplied by Rexroth on request.
Rexroth material number: R902602623



Equipment connector as per DIN 43650



Line connector DIN EN 175301-803-A Wiring screw connector M 16x1.5



Changing connector position

If necessary, you can change the position of the connector by turning the solenoid.

To do this, proceed as follows:

1. Loosen the mounting nut (1) of the solenoid.
   To do this, turn the mounting nut (1) one revolution counter-clockwise.
2. Turn the solenoid body (2) to the desired position.
3. Retighten the mounting nut of the solenoid.
   Tightening torque of the mounting nut: 5+1 Nm.
   (size WAF26, 12-pt DIN 3124)

On delivery, the position of the connector may differ from that shown in the brochure or drawing.

Control	Electronics function	Electronics		Further information
Electric two point control	Controlled power outlet	RA	Analog	RE 95 230
		VT2000	Analog	RE 29 904
		RC2-2/21 [1)]	Digital	RE 95 201

[1)] Power outlets for 2 valves, can be actuated separately

Installation notes

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 empty via the hydraulic lines.

Especially with the installation position "drive shaft upwards" or "drive shaft downward", attention must be paid to a complete filling and air bleeding since there is a risk, for example, of dry running.

The case drain fluid in the case interior must be directed to the reservoir via the highest case drain port (L_1, $L_{2, L3}$).

For combinations comprising several units, make sure that the respective case pressure is not exceeded. If there is a pressure difference at case drain port L, each pump is to be fitted with a separate case drain line.

To achieve favorable noise values, decouple all connecting lines using elastic elements and avoid above-reservoir installation.

In all operating states, the suction line and case drain line must flow into the reservoir below the minimum fluid level . The permissible suction height h_S is a result of the overall pressure loss, but may not be greater than $h_{S\ max} = 800$ mm. The minimum suction pressure at port S of $p_{S\ min} = 0.8$ bar absolute must not be exceeded in operation.

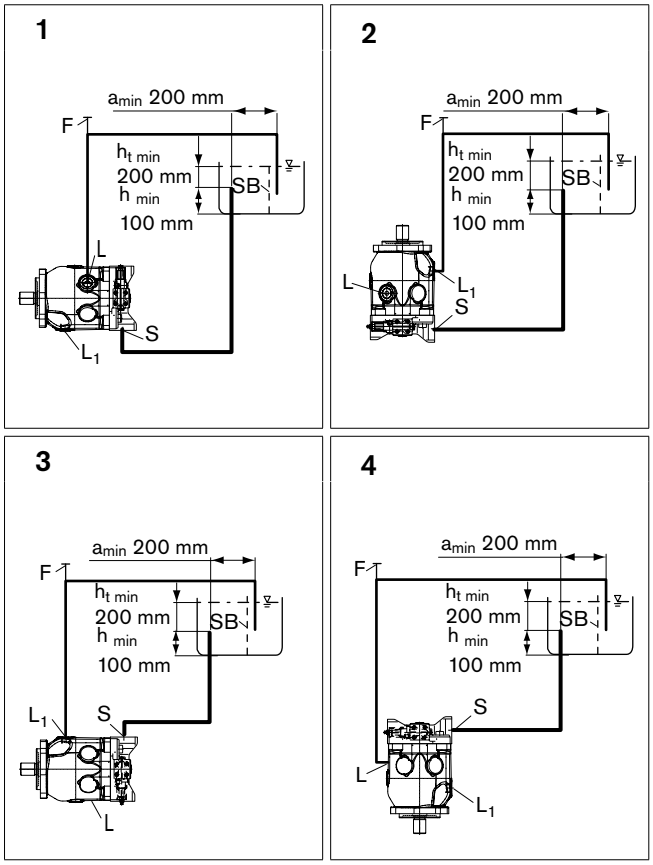
Installation position

See the following examples 1 to 12.
Additional installation positions are available upon request.

Recommended installation positions: 1 and 3.

Below-reservoir installation (standard)

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



Installation position	Air bleed	Filling
1, 3	F	S + L, L_1 (F)
2, 4	F	S + L, L_1 (F)

Key, see page 51.

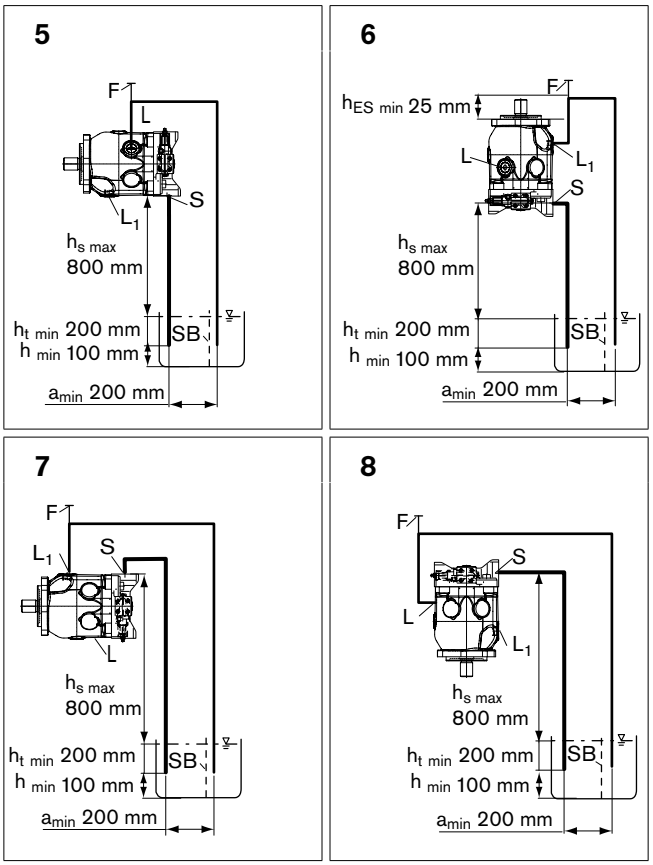
Installation notes

Above-reservoir installation

Above-reservoir installation means 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 installation position 6

Observe the maximum permissible suction height $h_{S\ max}$ = 800 mm.

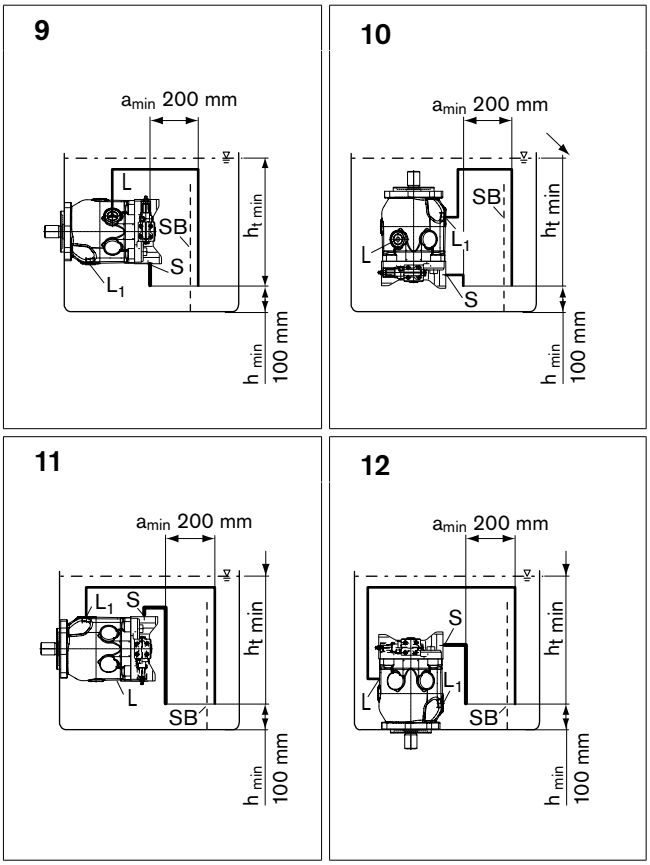
A check valve in the case drain line is only permissible in individual cases. Consult us for approval.



Installation position	Air bleed	Filling
5, 7	F	L, L_1 (F)
6, 8	F	S + L, L_1 (F)

Inside-reservoir installation

Inside-reservoir installation means the pump is installed within the minimum reservoir fluid level.



Installation position	Air bleed	Filling
9, 11	L, L_1	L, L_1
10, 12	L, L_1	S + L, L_1

S	Filling / air bleeding
F	Air bleed port
S	Suction port
L, L_1	Case drain port
SB	Baffle (baffle plate)
$h_{t\ min}$	Minimum necessary immersion depth (200 mm)
h_{min}	Minimum necessary spacing to reservoir base (100 mm)
$h_{ES\ min}$	Minimum necessary height needed to protect the axial piston unit from draining (25 mm).
$h_{S\ max}$	Maximum permissible suction height (800 mm)
a_{min}	When designing the reservoir, ensure adequate distance between the suction line and the case drain line. This prevents the heated, return flow from being drawn directly back into the suction line.

Notes

Notes

General information

– The axial piston units A10FZO and A10VZO are designed to be used in open circuits.
The axial piston unit A10FZG and A10VZG is specified for use in closed circuits.

– Project planning, assembly and commissioning of the axial piston unit require the involvement of qualified personnel.

– Before operating the axial piston unit, please read the appropriate operating instructions thoroughly and completely.
If necessary, request these from Rexroth.

– During and shortly after operation, there is a risk of burns on the axial piston unit and especially on the solenoids.
Take appropriate safety measures (e.g. by wearing protective clothing).

– Depending on the operating conditions of the axial piston unit (operating pressure, fluid temperature), the characteristics may shift.

– Service line ports:

- The ports and fixing 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 operating conditions (pressure, flow, hydraulic fluid, temperature) with the necessary safety factors.
- The service line ports and function ports are only designed to accommodate hydraulic lines.

– Pressure cut-off and pressure control do not provide security against pressure overload. A separate pressure relief valve is to be provided in the hydraulic system.

– The data and notes contained herein must be adhered to.

– The product is not approved as a component for the safety concept of a general machine according to DIN EN ISO 13849.

– The following tightening torques apply:

- Fittings:
Observe the manufacturer's instruction regarding the tightening torques of the used fittings.
- Fixing screws:
For fixing screws with metric ISO thread according to DIN 13 or thread according to ASME B1.1, we recommend checking the tightening torque individually according to VDI 2230.
- Female threads in axial piston unit:
The maximum permissible tightening torques $M_{G\ max}$ are maximum values for the female threads and must not be exceeded. For values, see the following table.

Threaded plugs:
For the metal threaded plugs supplied with the axial piston unit, the required tightening torques of the threaded plugs M_V apply. For values, see the following table.

Ports		Maximum permissible tightening torque for female threads $M_{G\ max}$	Required tightening torque for threaded plugs M_V	WAF hexagon socket for threaded plugs
Standard	Thread size			
ISO 11936	7/16-20 UNF-2B	40 Nm	15 Nm	3/16 in
	9/16-18UNF-2B	80 Nm	25 Nm	1/4 in
	3/4-16UNF-2B	160 Nm	62 Nm	5/16 in
	7/8-14UNF-2B	240 Nm	127 Nm	3/8 in
	1 1/16-12 UNF-2B	360 Nm	147 Nm	9/16 in
DIN 3852	G 1/4 in	70 Nm	–	–
	M14x1.5	80 Nm	35 Nm	6 mm
	M16x1.5	100 Nm	50 Nm	8 mm
	M18x1.5	140 Nm	60 Nm	8 mm
	M22x1.5	210 Nm	80 Nm	10 mm
	M27x2	330 Nm	135 Nm	12 mm

Bosch Rexroth AG
Hydraulics
Axialkolbeneinheiten
An den Kelterwiesen 14
72160 Horb a.N., Germany
Tel.: +49-7451-92-0
Fax: +49-7451-82-21
info.brm-ak@boschrexroth.de
www.boschrexroth.com/axialkolbenpumpen