Axial piston variable pump A4VSO for explosive areas ATEX II 3G ck IIC Tx

Part II of instruction manual according to ATEX directive 2014/34/EU Data Sheet RE 92050-01-X-B2

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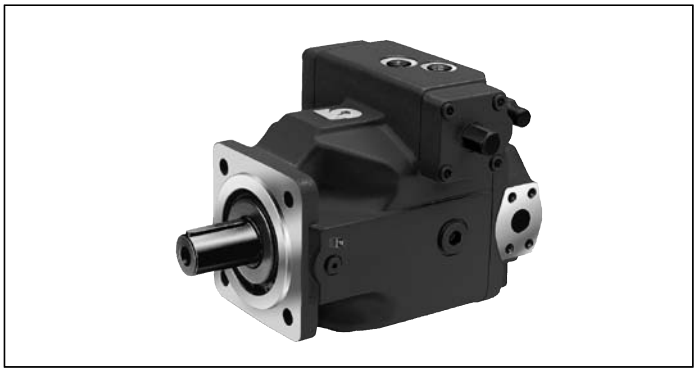


- Sizes 40 to 250
- Nominal pressure 350 bar
- Maximum pressure 400 bar
- Open circuit

Details on explosion protection

- Field of application according to ATEX 2014/34/EU
- Gas: II 3G ck IIC Tx according to DIN EN 13463-1:2009, DIN EN 13463-5:2011, DIN EN 13463-8:2003

Features

Variable pump with axial piston rotary group of swashplate design for hydrostatic drives in open circuit hydraulic system Flow is proportional to drive speed and displacement. Control of the swashplate allows the volume flow to be infinitely varied.

- Good suction characteristics
- Low noise
- Long service life
- Modular system
- Short control times
- Variable through-drive options
- Optical swivel angle indicator

Descriptions of control device, see separate data sheets 92060, 92064, 92080

Inhalt

Ordering code

01	02	03	04	05		06	07		08	09	10	11	12
	A4VS	**O**			**/**			**–**	**A**		**B**	**25**	

Hydraulic fluid/version

			40	71	125	180	250	
01	Mineral oil (without symbol)		●	●	●	●	●	
	High-speed version		–	–	–	–	●	**H**

Axial piston unit

02	Bent-axis design, variable, nominal pressure 350 bar, maximum pressure 400 bar	**A4VS**

Operating mode

03	Pump, open circuit	**O**

Sizes (NG)

		40	71	125	180	250
04	Geometric displacement, see table of values on page 6	**40**	**71**	**125**	**180**	**250**

Control devices

			40	71	125	180	250	
05	Without variable control facility		●	●	●	●	●	**OV**
	Pressure controller	Further information about choice of controller, see pages 10 and 92060	●	●	●	●	●	**DR**
	Pressure control for parallel operation		●	●	●	●	●	**DP**
	Flow controller		●	●	●	●	●	**FR..**
	Pressure and flow controller		●	●	●	●	●	**DFR.**
	Power controller with hyperbolic characteristic	Further information about choice of controller, see pages 11 and 92064	●	●	●	●	●	**LR2..**
	Power controller with remote controlled variable power characteristic		●	●	●	●	●	**LR3..**
	Hydraulic control, pressure-related	Further information about choice of controller, see pages 11 and 92080	●	●	●	●	●	**HD...**

Series

			40	71	125	180	250	
06	Series 1, index 0		●	●	–	–	–	**10**
	Series 1, index 1 only for HD control		●	●	–	–	–	**11**
	Series 3, index 0		–	–	●	●	●	**30**

Directions of rotation

			40	71	125	180	250	
07	Viewed on drive shaft	cw	●	●	●	●	●	**R**
		ccw	●	●	●	●	●	**L**

Seals and ATEX version

08	FKM (fluor-caoutchouc) and ATEX version II 3G ck IIC Tx	**A**

Drive shafts

09	Parallel keyed shaft DIN 6885	**P**
	Splined shaft DIN 5480	**Z**

Mounting flanges

10	Based on ISO 3019-2 (metric)	4-hole	**B**

Service line ports

11	SAE flange port, fastening thread Metric	B and S offset by 90° at sides	2nd pressure port B1 opposite B; plugged if supplied with flange plate	**25**

01	02	03	04	05		06	07		08	09	10	11	12
	A4VS	**O**			**/**			**–**	**A**		**B**	**25**	

Through drives[1] (mounting options, see page 31)

12	Flange, ISO 3019-2 (metric) Diameter	Hub for splined shaft Diameter		For mounting A4VSO ATEX II 3G c IIC T4	**40**	**71**	**125**	**180**	**250**	
	Without through drive and auxiliary pump				●	●	●	●	●	**N00**
	with through drive for mounting of axial piston pump				●	●	–	–	–	**K...**
	125-4 (ISO)	32x2x14x9g		A4VSO NG40	●	●	–	–	–	**31**
	140-4 (ISO)	40x2x18x9g		A4VSO NG71	–	●	–	–	–	**33**
	80-2 (ISO)	3/4 in	11T 16/32DP	A10VSO 18/31	●	●	–	–	–	**B2**
	100-2 (ISO)	7/8 in	13T 16/32DP	A10VSO 28/31	●	●	–	–	–	**B3**
	100-2 (ISO)	1 in	15T 16/32DP	A10VSO 45/31	●	●	–	–	–	**B4**
	125-2 (ISO)	1 1/4 in	14T 12/24DP	A10VSO 71/31	–	●	–	–	–	**B5**
	Universal through drive[2]				–	–	●	●	●	**U...**
	125-4	32x2x14x9g		NG40	–	–	●	●	●	**31**
	140-4	40x2x18x9g		NG71	–	–	●	●	●	**33**
	160-4	50x2x24x9g		NG125 und NG180	–	–	●	●	●	**34**
	224-4	60x2x28x9g		NG250	–	–	–	–	●	**35**
	80-2 (ISO)	3/4 in	11T 16/32DP	A10VSO 18/31	–	–	●	●	●	**B2**
	100-2 (ISO)	7/8 in	13T 16/32DP	A10VSO 28/31	–	–	●	●	●	**B3**
	100-2 (ISO)	1 in	15T 16/32DP	A10VSO 45/31	–	–	●	●	●	**B4**
	125-2 (ISO)	1 1/4 in	14T 12/24DP	A10VSO 71/31	–	–	●	●	●	**B5**
	125-2 (ISO)	1 1/2 in	17T 12/24DP	A10VSO 100/31	–	–	●	●	●	**B6**

● = Available ○ = On request – = Not available

Instructions

- Note the project planning notes on page 36.
- Preservation:
  - up to 12 months as standard
  - up to 24 months long-term
    (state in plain text when ordering)

Features of the ATEX version

The ATEX version is an advanced development of the A4VSO which is compliant with Directive 2014/34/EU (ATEX). External distinguishing features compared to the standard pump 92050 are the ground terminal, the EX marking and the CE marking on the name plate.

Temperature classes according to EN 13463-1

Depending on the temperature classes T3 and T4 the maximum temperatures should be noted (please refer “hydraulic fluid” and “monitoring the operational data for Tx”).

Instructions

- When ordering, please state which equipment group, category, explosion group, temperature class and type of ignition protection is required for your planned ATEX application.
- Potential equalization: The pump must have a ground connection. For ground connection points, see drawings from page 12. Compared to the standard pump, there are limitations in the technical data with respect to temperature, case pressure and bearing flushing / installation position.
- To avoid mechanically generated sparks from foreign particles of aluminum with iron oxide and/or rust particles on the surface[3], the pump is painted with a corrosion-resistant paint as standard. When ordering, please state the required color.
- The bearing service life must always be calculated. The load cycle is the basis for this calculation. Please contact us.

1) All attachment pumps must be compliant with the ATEX classification relevant to the application
2) With through-drive shaft, without hub, without intermediate flange, closed on a functionally reliable basis with cover
3) See DIN EN 13463-1, 6.4.2.1

Hydraulic fluid

The A4VSO ATEX II 3G ck IIC Tx variable pump is designed for operation with HLP mineral oil according to DIN 51524. Application instructions and requirements for hydraulic fluids should be taken from the following data sheets before the start of project planning:

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

Details regarding the selection of hydraulic fluid

The hydraulic fluid should be selected such that the operating viscosity in the operating temperature range is within the optimum range (v_{opt}, see selection diagram).

Note

The case drain temperature, which is affected by pressure and speed, is always higher than the reservoir temperature.

Temperature class T3 according to ATEX:

At no point of the component may the temperature be higher than 90 °C, howerver.

Temperature class T4 according to ATEX:

At no point of the component may the temperature be higher than 80 °C, howerver.

The temperature difference specified is to be taken into account when determining the viscosity in the bearing.

Ignition temperatur of hydraulic fluid

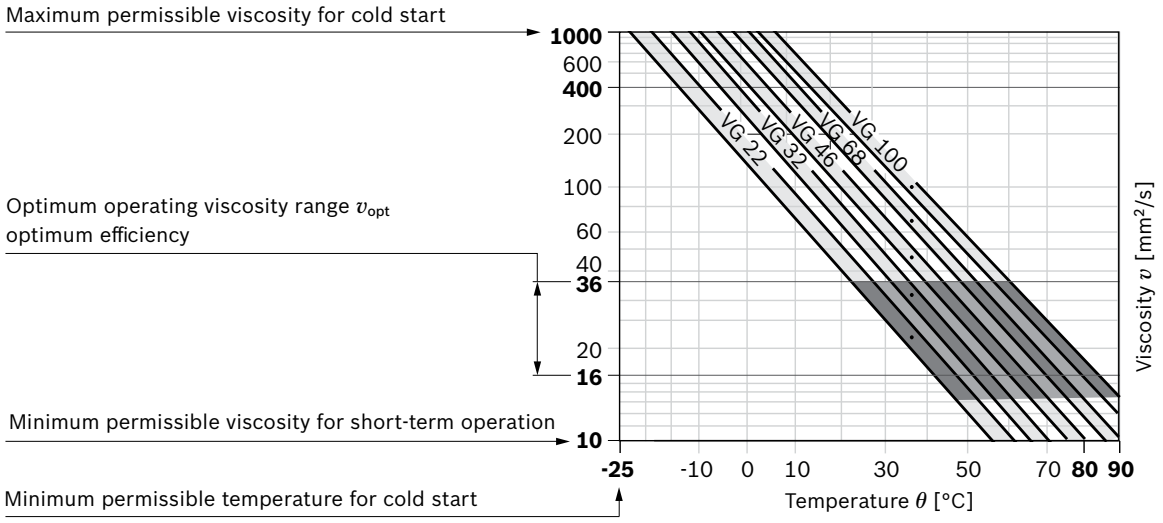
The pump is approved according to DIN EN 13463-1 for the temperature class T3 and T4.

According to DIN EN 13463-5 only use hydraulic fluids whose ignition temperatur is at least 50 K higher than the maximum surface temperatur of the approved temperature class eg.: The required temperature class for the application is T4. Therefor the ignition temperature of the hydraulic fluid has to be ≥ 185 °C.

Viscosity and temperature of hydraulic fluids

	viscosity	temperature	comment
Cold start	v_{max} ≤ 1000 mm²/s	θ_{St} ≥ -20 °C	t ≤ 3 min, without load p ≤ 50 bar
permissible temperature differenz		ΔT ≤ 25 K	between axial piston unit and hydraulic fluid
Warm-up phase	v = 1000 bis 100 mm²/s	θ ≥ -25 °C	at p_{nom}, 0.5 × n_{max} and t ≤ 15 min
Operating phase	v = 100 bis 16 mm²/s	**T3** θ = -20 °C bis +90 °C **T4** θ = -20 °C bis +80 °C	measured at leakage port **L** observe permissible temperature range of the shaft seal ring
	v_{opt} = 36 to 16 mm²/s		Range of optimum operating viscosity and efficiency
Short-term operation	v_{min} ≤ 10 mm²/s	θ_{max} = +90 °C	t < 3 min, p < 0.3 × p_{nom}

▼ **Selection diagram**



Monitoring operating data – specification for Tx

Safety instructions

Temperature class T3

To keep the **maximum leakage temperature of 90°C** at least one of the following measures must be taken and controlled regularly:

- check the leak oil temperature at port **T** or **R**(**L**) (maximum distance 30 cm)
- check the suction temperature at maximum 60°C at the suction port

Temperature class T4

To keep the **maximum leakage temperature of 80°C** at least one of the following measures must be taken and controlled regularly:

- check the leak oil temperature at port **T** or **R**(**L**) (maximum distance 30 cm)
- check the suction temperature at maximum 50°C at the suction port

Temperature class T3 and T4

- check the maximum suction temperature that is determined at the initial operation for the following working points:
  – maximum working pressure and maximum flow
  – maximum working pressure and minimum flow

In addition to that a monitoring of the tank filling height is to be made. When the temperature limits are exceeded, suitable countermeasures have to follow.

Bearing flushing

Bearing flushing is necessary for safe continuous operation under the following operating conditions:

- Operation with extreme temperature and viscosity conditions
- For vertical installation (drive shaft upward) and for installation above the reservoir (regardless of the position of the shaft), bearing flushing is stipulated for lubricating the front bearing and the shaft seal.

Bearing flushing is realized by port **U** in the area of the front flange of the variable pump. The flushing fluid flows through the front bearing and escapes through the case drain port with the pump case drain fluid.

For the individual sizes, the following minimum flushing flows are required:

Size			**40**	**71**	**125**	**180**	**250**
Flushing flow	q_{sp}	l/min	3	4	5	7	10

For the specified flushing flows, there is a pressure differential between port **U** (including fittings) and the case drain chamber of about 2 bar for series 10 and 11 and about 3 bar for series 30.

Notes on series 30

If using external bearing flushing, turn the throttle screw at port "**U**" in to the stop.

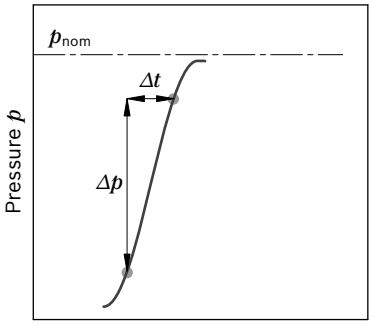
Flow direction

S to **B**

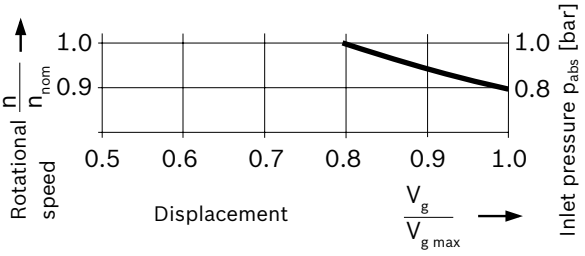
Operating pressure range

Pressure at service line port B		Definition
Nominal pressure p_{nom}	350 bar absolute[1)]	The nominal pressure corresponds to the maximum design pressure.
Maximum pressure p_{max}	400 bar absolute	The maximum pressure corresponds to the maximum operating pressure within the single operating period. The sum of the single operating periods must not exceed the total operating period.
Single operating period	1 s	
Total operating period	300 h	
Minimum pressure (high-pressure side)	15 bar absolute	Minimum pressure at the high-pressure side (**B**) which is required in order to prevent damage to the axial piston unit.
Rate of pressure change $R_{A\,max}$	16000 bar/s	Maximum permissible rate of pressure build-up and reduction during a pressure change over the entire pressure range.
Pressure at suction port S (inlet)		
Minimum pressure $p_{S\,min}$ **Standard**	0.8 bar absolute	Minimum pressure at suction port **S** (inlet) that is required in order to avoid damage to the axial piston unit. The minimum pressure depends on the speed and displacement of the axial piston unit.
Maximum pressure $p_{S\,max}$	30 bar absolute	
Case drain pressure at port L_1, L_2		
Maximum pressure $p_{L\,max}$	2 bar absolute	The permissible case drain pressure (case pressure) depend on rotational speed. These figures are guidelines figures only; restrictions may be necessary under certain operating conditions.

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

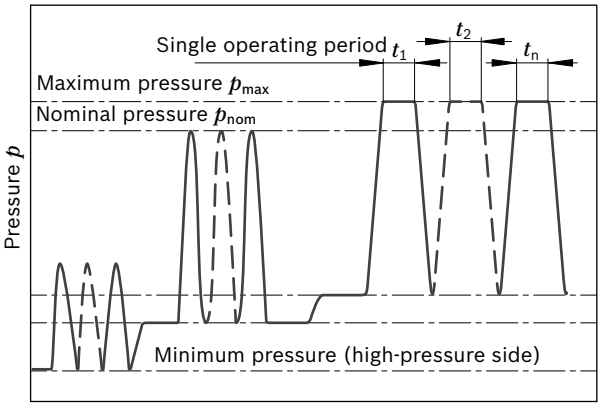


▼ **Minimum pressure (inlet)**
In order to avoid damage to the axial piston unit, a minimum pressure must be guaranteed at the suction port **S** (inlet). The minimum pressure depends on the speed and displacement of the axial piston unit



The inlet pressure is the static inlet pressure or the minimum dynamic pre-charge pressure value.
Maximum permissible rotational speed n_{nom}, see page 7.

▼ **Pressure definition**



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

Note
Operating pressure range valid when using hydraulic fluids based on mineral oils. Values for other hydraulic fluids, please contact us.

Technical data

Size		NG		40	71	125	180	250	250 H[1)]
Geometric displacement, per revolution		$V_{g\,max}$	cm^3	40	71	125	180	250	250
Maximum speed[2)]	at $V_{g\,max}$	n_{nom}	rpm	2600	2200	1800	1800	1500	1800
Flow	at n_{nom} and $V_{g\,max}$	$q_{v\,max}$	l/min	104	156	225	324	375	450
	at n_E = 1500 rpm	$q_{vE\,max}$	l/min	60	107	186	270	375	375
Power	at n_{nom}, $V_{g\,max}$ and Δp = 350 bar	P	kW	61	91	131	189	219	262
	at n_E = 1500 rpm, $V_{g\,max}$ and Δp = 350 bar	$P_{E\,max}$	kW	35	62	109	158	219	219
Torque	at $V_{g\,max}$ and Δp = 350 bar	T_{max}	Nm	223	395	696	1002	1391	1391
	at $V_{g\,max}$ and Δp = 100 bar	T	Nm	64	113	199	286	398	398
Rotary stiffness drive shaft	P	c	Nm/rad	80000	146000	260000	328000	527000	527000
	Z	c	Nm/rad	77000	146000	263000	332000	543000	543000
Moment of inertia for rotary group		J_{TW}	kgm^2	0.0049	0.0121	0.03	0.055	0.0959	0.0959
Angular acceleration, maximum[3)]		α	rad/s^2	17000	11000	8000	6800	4800	4800
Case volume		V	L	2	2.5	5	4	10	10
Weight without through drive (approx.)		m	kg	39	53	88	102	184	184

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

Key

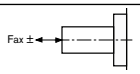
V_g	=	Displacement per revolution [cm^3]
Δp	=	Differential pressure [bar]
N	=	Rotational speed [rpm]
η_v	=	Volumetric efficiency
η_{mh}	=	Mechanical-hydraulic efficiency
η_t	=	Total efficiency ($\eta_t = \eta_v \cdot \eta_{mh}$)

Note

- Theoretical values, without efficiency levels and tolerances; values rounded
- Operation above the maximum values or below the minimum values may result in a loss of function, a reduced service life, the destruction of the axial piston unit or the loss of explosion protection. We recommend checking the loading by means of testing or calculation / simulation and comparison with the permissible values.
- Transport and storage
  - $\theta_{min} \geq -50$ °C
  - θ_{opt} = +5 °C to +20 °C

1) High-speed version
2) The values are applicable:
   – at absolute pressure p_{abs} = 1 bar at suction port **S**
   – for the optimum viscosity range of v_{opt} = 36 to 16 mm^2/s
   – for hydraulic fluid based on mineral oils
3) The data are valid for values between the minimum required and maximum permissible rotational speed. Valid for external excitation (e.g. diesel engine 2 to 8 times rotary frequency; cardan shaft twice the rotary frequency). The limit value applies for a single pump only. The load capacity of the connection parts must be considered.

Permissible radial and axial forces of the drive shaft

Size		NG		40	71	125	180	250
Maximum radial force at a/2		$\pm F_{q\ max}$	N	1000	1200	1600	2000	2000
Maximum axial force		$+ F_{ax\ max}$	N	600	800	1000	1400	1800

Note

- The values given are maximum values and do not apply to continuous operation. For drives with radial loading (pinion, V-belt drives), please contact us!

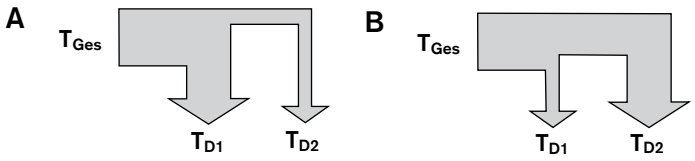
Permissible drive and through-drive torques

The axial piston unit can be supplied with a through drive, corresponding to the ordering code on page 2.
The through-drive version is identified by the identifier K/U 31...35.

It is advisable not to couple more than three single pump in series.
All attachment pumps must be compliant with the ATEX classification relevant to the application.

Size				40	71	125	180	250
Splined shaft								
Max. permissible total drive torque an shaft of 1st pump (1st pump + 2nd pump)		$T_{Tot\ max}$	Nm	446	790	1392	2004	2782
A Permissible through-drive torque		$T_{D1\ max}$	Nm	223	395	696	1002	1391
		$T_{D2\ max}$	Nm	223	395	696	1002	1391
B Permissible through-drive torque		$T_{D1\ max}$	Nm	223	395	696	1002	1391
		$T_{D2\ max}$	Nm	223	395	696	1002	1391
Shaft key								
Max. permissible total drive torque an shaft of 1st pump (1st pump + 2nd pump)		$T_{Tot\ max}$	Nm	380	700	1392	1400	2300
A Permissible through-drive torque		$T_{D1\ max}$	Nm	223	395	696	1002	1391
		$T_{D2\ max}$	Nm	157	305	696	398	909
B Permissible through-drive torque		$T_{D1\ max}$	Nm	157	305	696	398	909
		$T_{D2\ max}$	Nm	223	395	696	1002	1391

Torque distribution



Single pump with through drive

If no other pump is to be fitted by the plant, the simple type designation is sufficient.

The scope of supply includes:

- For all through drives hub, mounting bolts, seal and if necessary an intermediate shaft

Combination pumps

The user can make use of further independent circuits by attaching additional pumps.
If the combination pump consists of 2 Rexroth axial piston pumps and if these are to be supplied assembled together, the two type designations are to be joined with "+".

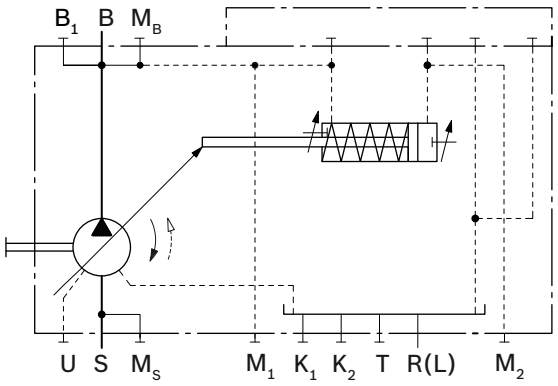
Ordering example:

A4VSO125DR/30R–APB25U33 +
A4VSO71DR/10R–AZB25N00

OV - Without variable control facility

On axial piston units without variable control facility (OV), the stroking piston is based on DR control. The stroking piston is relieved to the reservoir. The $V_{g\,max}$ limitation is variable from 50 to 100%. In operation, the axial piston unit without variable control facility acts like a fixed pump.

▼ **Schematic**



DR - Pressure controller

(see 92060)

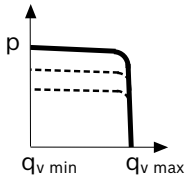
The DR pressure controller limits the maximum pressure at the pump outlet within the control range of the pump. The pressure can be infinitely varied on the control valve.

▶ Setting range 20...350 bar

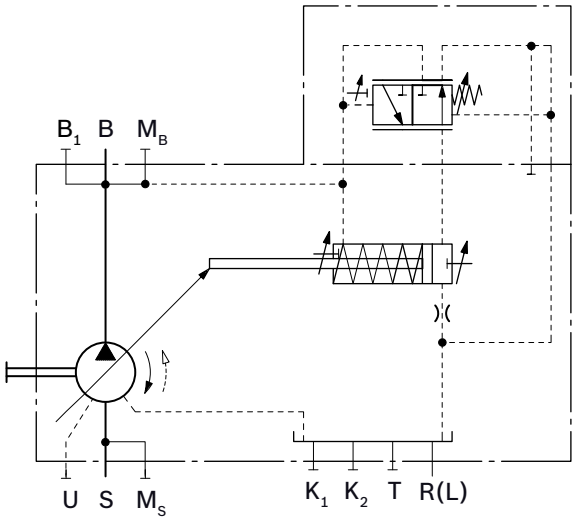
Optional:

Remote control facility (DRG)

▼ **Characteristic**



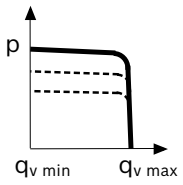
▼ **Schematic**



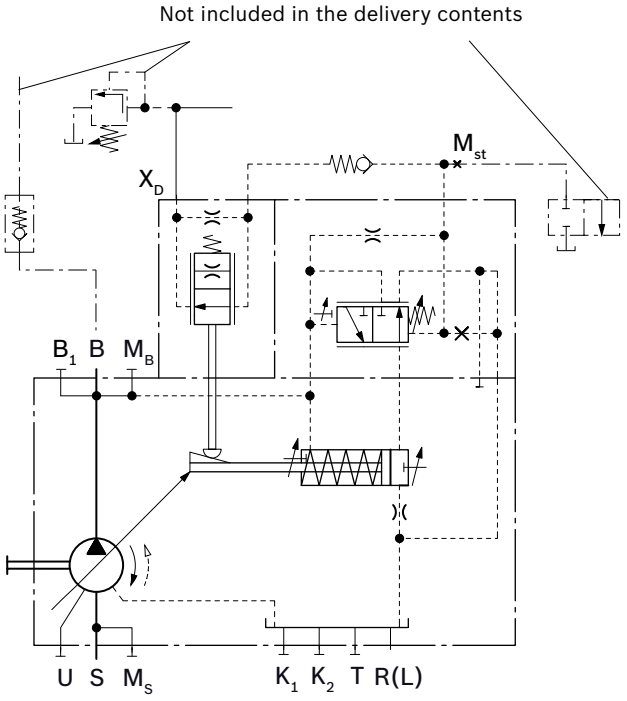
DP - Pressure controller for parallel operation (see 92060)

Suitable for pressure control of several axial piston units A4VSO ATEX II 3G ck IIC Tx in parallel operation.
Optional:
Flow control (DPF)

▼ **Characteristic**



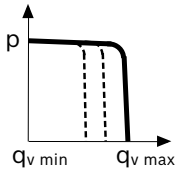
▼ **Schematic**



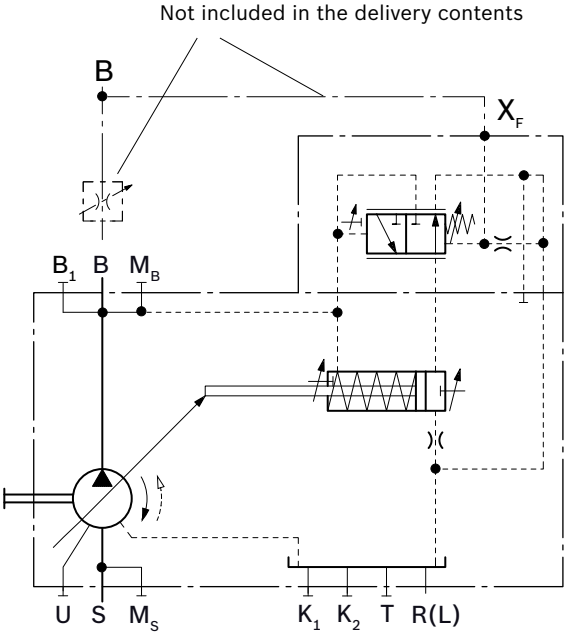
FR - Flow controller (see 92060)

Maintains a constant flow in a hydraulic system.
Optional:
Remote control pressure control (FRG)
Connection from X_F to the reservoir plugged (FR1, FRG1)

▼ **Characteristic**



▼ **Schematic**



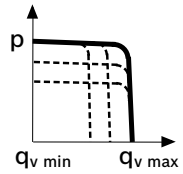
Note

- All additional components from 92060 and 92064 must be compliant with the ATEX classification relevant to the application.

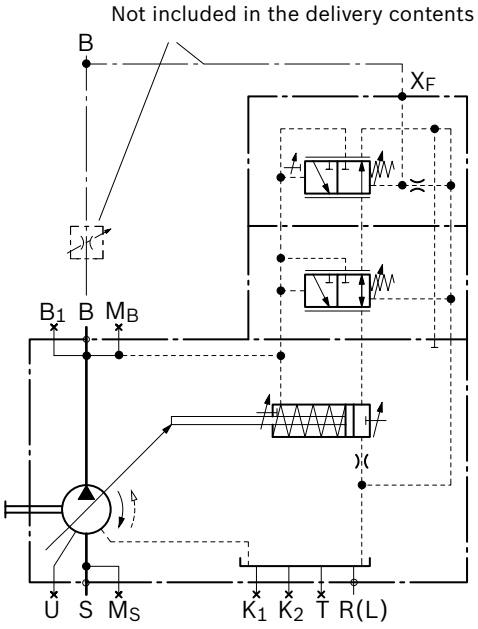
DFR - Pressure and flow controller
(see 92060)

This controller maintains the flow from the pump constant, even if operating conditions change.
Superimposed on the flow control is a mechanically adjustable pressure controller.
Optional:
Connection from X_F to the reservoir plugged (DFR1)

▼ **Characteristic**



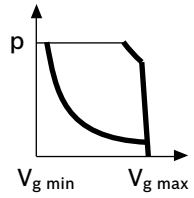
▼ **Schematic**



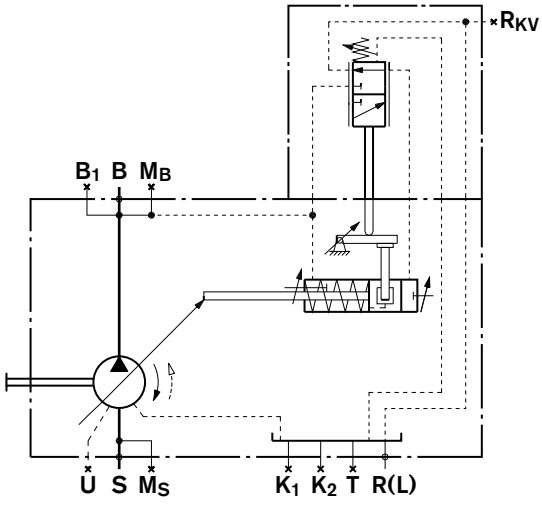
LR2 - Power controller with hyperbolic characteristic
(see 92064)

The hyperbolic power controller maintains the specified drive power constant at a constant drive speed.
Optional:
Pressure control (LR2D), remote controlled (LR2G);
Flow control (LR2F, LR2S);
Hydraulic two-point control (LR2Z)
Not available from RE 92064:
LR2.Y (electric drain valve)

▼ **Characteristic**



▼ **Schematic**



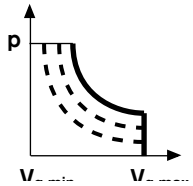
Note

- All additional components from 92060 and 92064 must be compliant with the ATEX classification relevant to the application.

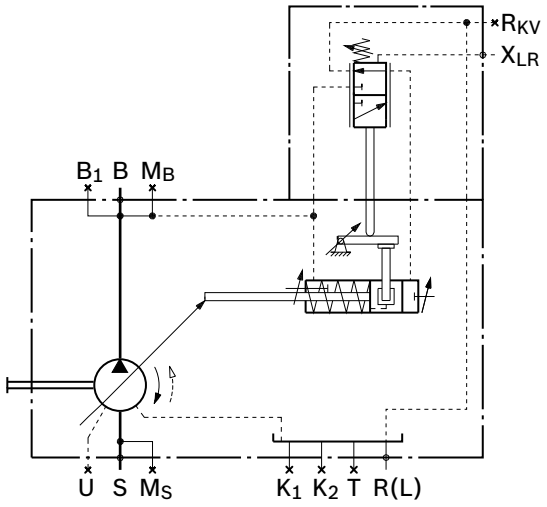
LR3 - Power controller with remote controlled variable power characteristic
(see 92064)

This hyperbolic power controller maintains the specified drive power constant, while the power characteristic can be remotely controlled.
Optional:
Pressure control (LR3D), remote controlled (LR3G);
Flow control (LR3F, LR3S); hydraulic two-point control (LR3Z)
Not available from RE 92064:
LR3.Y (electric drain valve)

▼ **Characteristic**



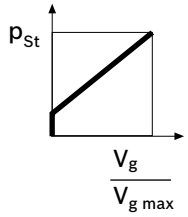
▼ **Schematic**



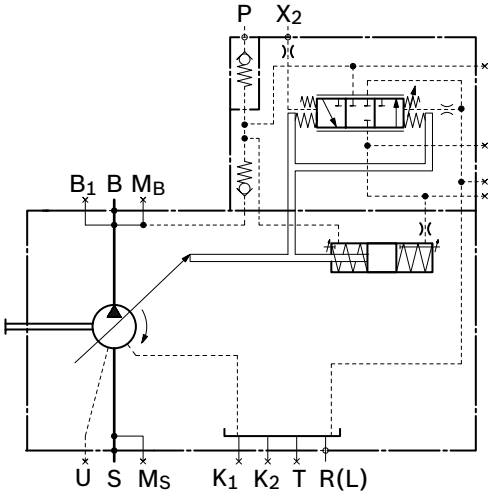
HD - Hydraulic control, pilot-pressure related
(see 92080)

Infinitely variable setting of pump displacement according to pilot pressure. The control is proportional to the specified pilot pressure setpoint (difference between pilot pressure and case pressure).
Optional:
Control characteristics (HD1, HD2, HD3); pressure control (HD.B); pressure control, remote controlled (HD.GB); power control (HD1P)
Not available from RE 92064:
HD..T and HD..U (DBEP6 mounted)

▼ **Characteristic**



▼ **Schematic**



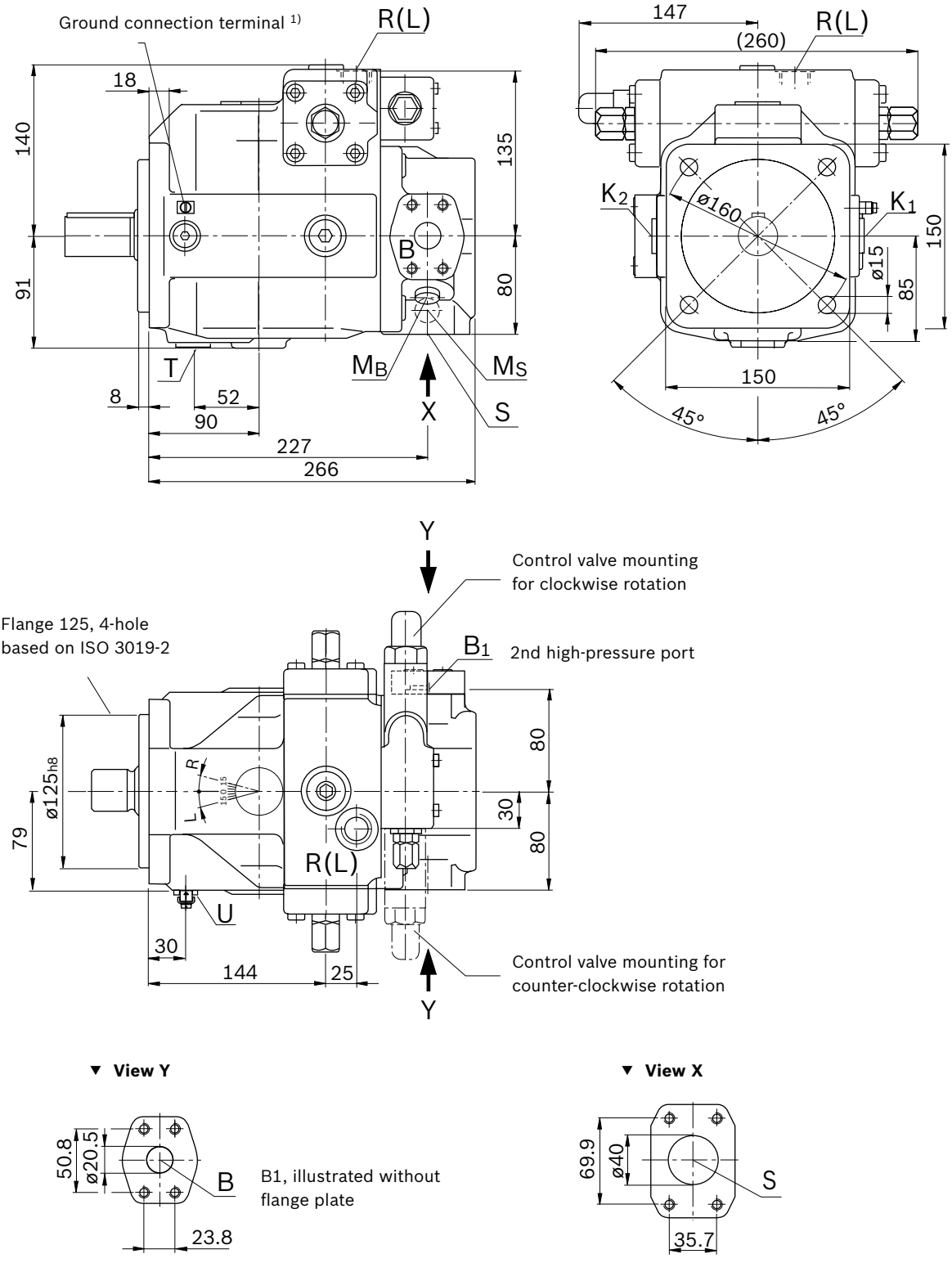
Note

- All additional components from 92060 and 92064 must be compliant with the ATEX classification relevant to the application.

Dimensions, size 40

DR – Pressure controller; flange version, metric

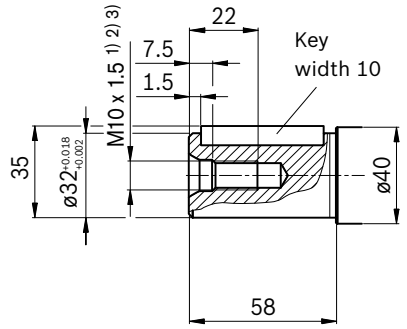
(further control device dimensions, see corresponding data sheets)



1) Protective ground connection terminal configured to 2×4 mm². Minimum cross-section of ground connection wire 2.5 mm²

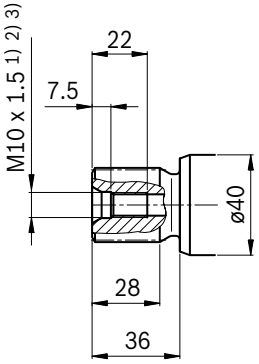
▼ **Keyed shaft (DIN 6885)**

P – Ø32 AS 10×8×56



▼ **Splined shaft (DIN 5480)**

Z – W32×2×14×9g



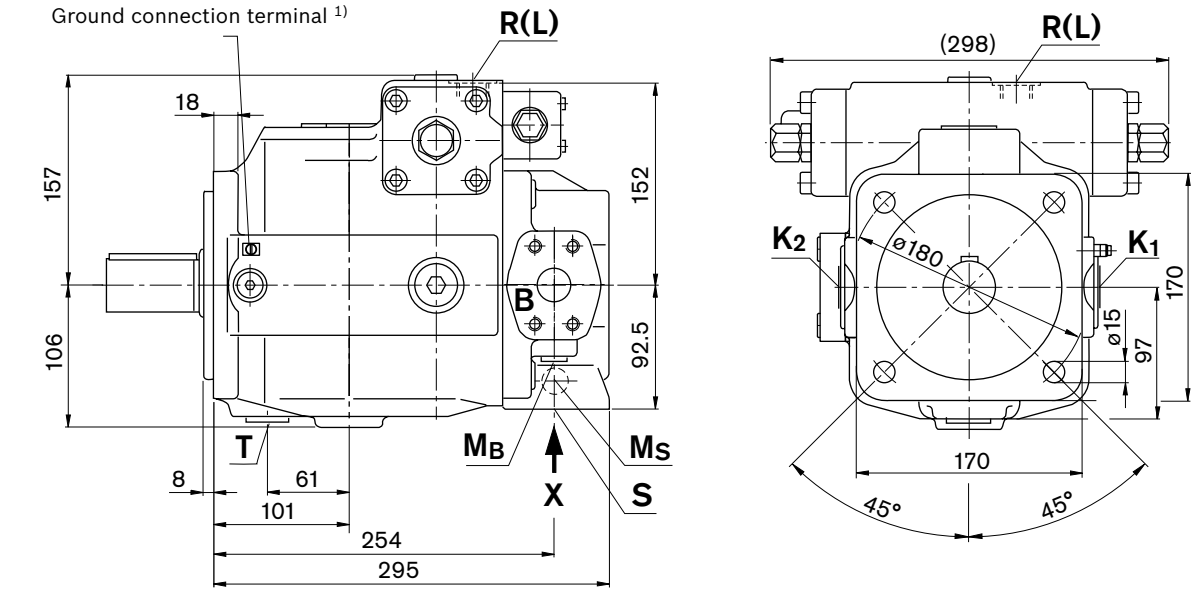
Ports		Standard	Size[3]	$p_{max\ abs}$ [bar][4]	State[9]
B	Service line port (high-pressure line) Fastening threads	SAE J518[6] DIN 13	3/4 in M10×1.5; 17 deep	400	O
B1	2nd service line port (high-pressure line) Fastening threads	SAE J518[6] DIN 13	3/4 in M10×1.5; 17 deep	400	X[8]
S	Suction port Fastening threads	SAE J518[6] DIN 13	1 1/2 in M12×1.75; 20 deep	30	O
K_1, K_2	Flow port	DIN 3852[5]	M22 × 1.5; 14 deep	2	X
T	Fluid drain	DIN 3852[5]	M22 × 1.5; 14 deep	2	X
M_B	Measured pressure B	DIN 3852[5]	M14 × 1.5; 12 deep	400	X
M_S	Measured pressure S	DIN 3852[5]	M14 × 1.5; 12 deep	30	X
R(L)	Fluid filling and air bleed (drain port)	DIN 3852[5]	M22 × 1.5; 12 deep	2	O
U	Flow port	DIN 3852[5]	M14 × 1.5; 11.5 deep	5	X[7]

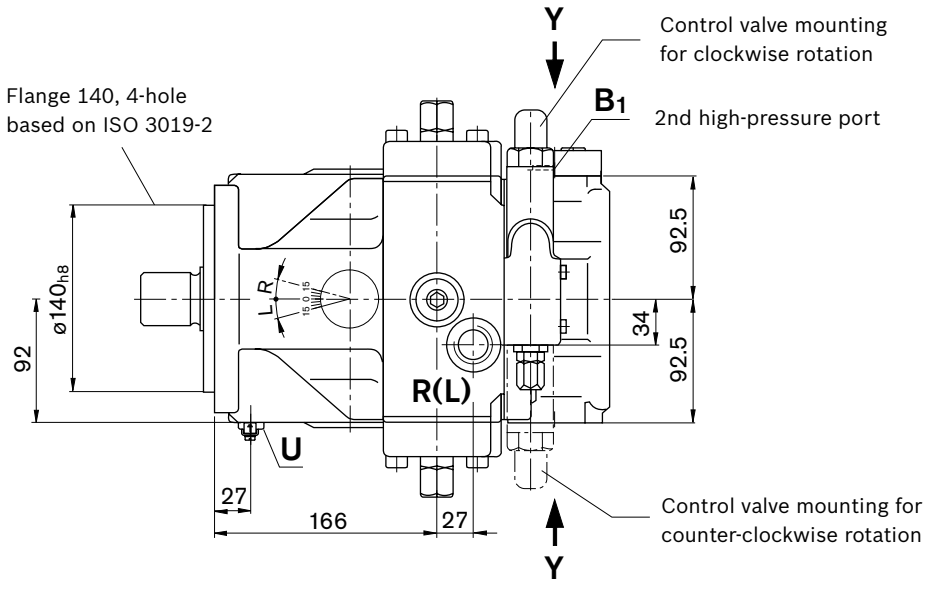
1) Center bore according to DIN 332
2) Thread according to DIN 13
3) For the maximum tightening torques, please refer to the notes in Part I (product-specific and general instructions).
4) Momentary pressure spikes may occur depending on the application. Keep this in mind when selecting measuring devices and fittings.
5) The spot face can be deeper than specified in the appropriate standard.
6) Metric fastening thread, deviating from standard
7) For above-reservoir installation and for any installation position with "drive shaft upward", a bearing flushing must be installed.
8) With flange plate plugged to withstand high pressure. Depending on the application, B and/or B_1 must be connected. The unused port must be plugged with the flange plate.
9) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

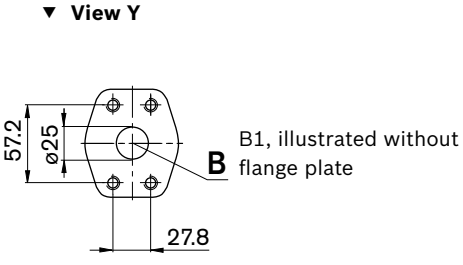
Dimensions size 71

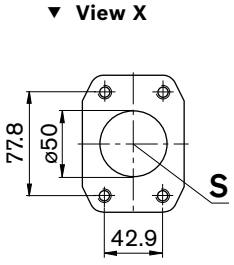
DR – Pressure controller; flange version, metric

(further control device dimensions, see corresponding data sheets)





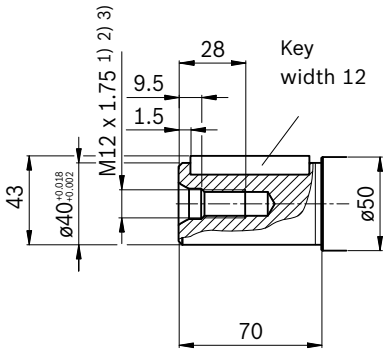




1) Protective ground connection terminal configured to 2×4 mm². Minimum cross-section of ground connection wire 2.5 mm²

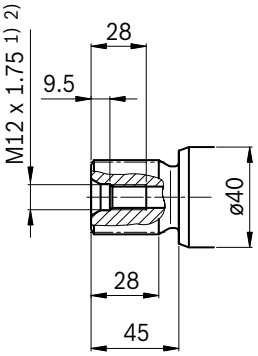
▼ **Keyed shaft (DIN 6885)**

P – Ø40 AS 12×8×68



▼ **Splined shaft (DIN 5480)**

Z – W40×2×18×9g



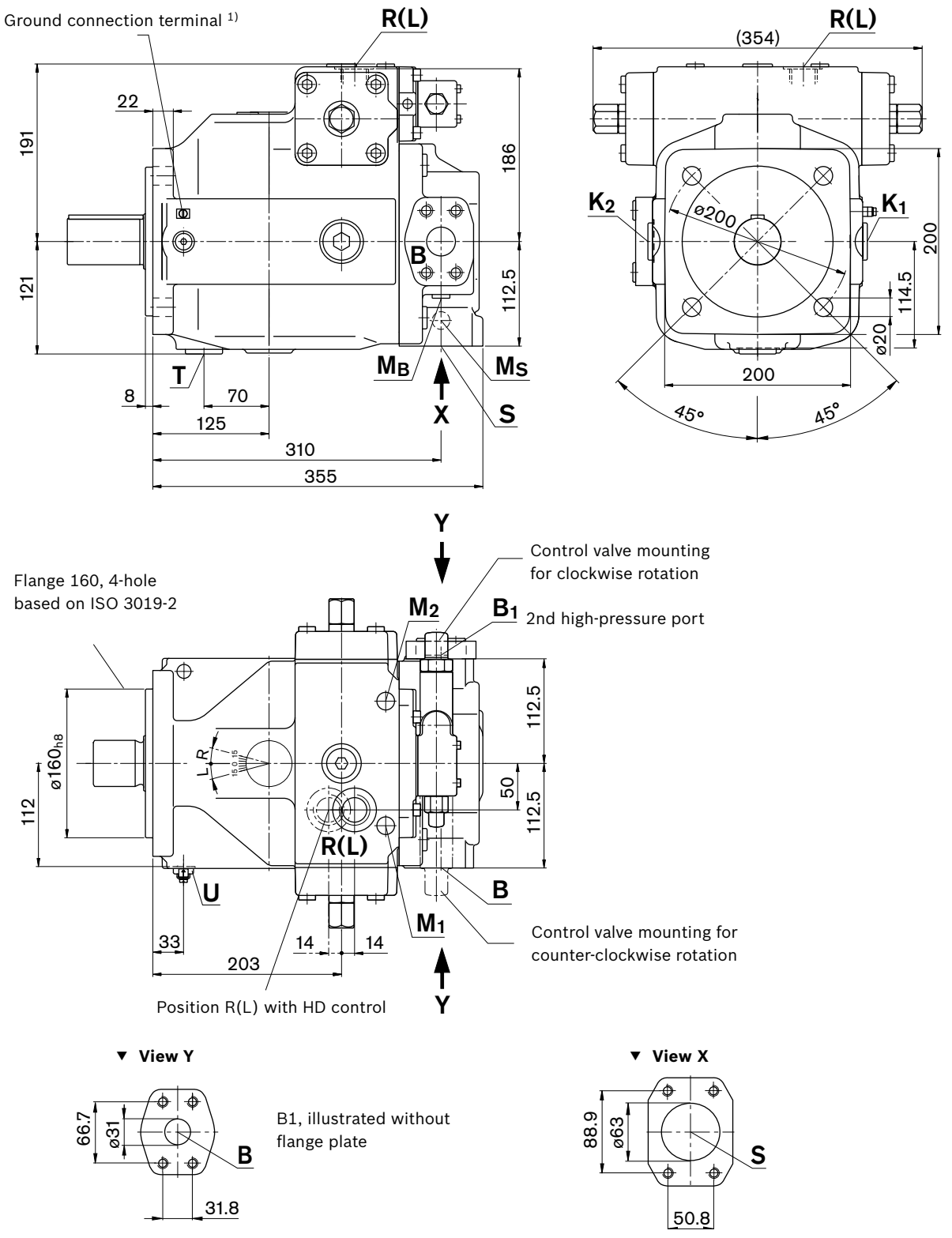
Ports		Standard	Size[3]	$p_{max\ abs}$ [bar][4]	State[9]
B	Service line port (high-pressure line) Fastening threads	SAE J518[6] DIN 13	1 in M12×1.75; 20 deep	400	O
B1	2nd service line port (high-pressure line) Fastening threads	SAE J518[6] DIN 13	1 in M12×1.75; 20 deep	400	X[8]
S	Suction port	SAE J518[6] DIN 13	2 in M12×1.75; 20 deep	30	O
K_1, K_2	Flow port	DIN 3852[5]	M27 × 2; 16 deep	2	X
T	Fluid drain	DIN 3852[5]	M27 × 2; 16 deep	2	X
M_B	Measured pressure B	DIN 3852[5]	M14 × 1.5; 12 deep	400	X
M_S	Measured pressure S	DIN 3852[5]	M14 × 1.5; 12 deep	30	X
R(L)	Fluid filling and air bleed (drain port)	DIN 3852[5]	M27 × 2; 16 deep	2	O
U	Flow port	DIN 3852[5]	M14 × 1.5; 12 deep	5	X[7]

1) Center bore according to DIN 332
2) Thread according to DIN 13
3) For the maximum tightening torques, please refer to the notes in Part I (product-specific and general instructions).
4) Momentary pressure spikes may occur depending on the application. Keep this in mind when selecting measuring devices and fittings.
5) The spot face can be deeper than specified in the appropriate standard.
6) Metric fastening thread, deviating from standard
7) For above-reservoir installation and for any installation position with "drive shaft upward", a bearing flushing must be installed.
8) With flange plate plugged to withstand high pressure. Depending on the application, B and/or B_1 must be connected. The unused port must be plugged with the flange plate.
9) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

Dimensions size 125

DR – Pressure controller; flange version, metric

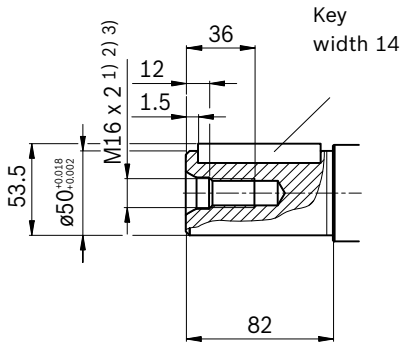
(further control device dimensions, see corresponding data sheets)



1) Protective ground connection terminal configured to 2×4 mm². Minimum cross-section of ground connection wire 2.5 mm²

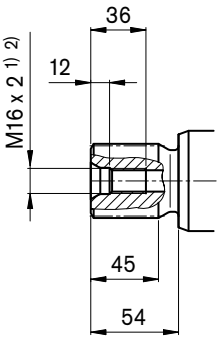
▼ **Keyed shaft (DIN 6885)**

P – Ø50 AS 14×9×80



▼ **Splined shaft (DIN 5480)**

Z – W50×2×24×9g



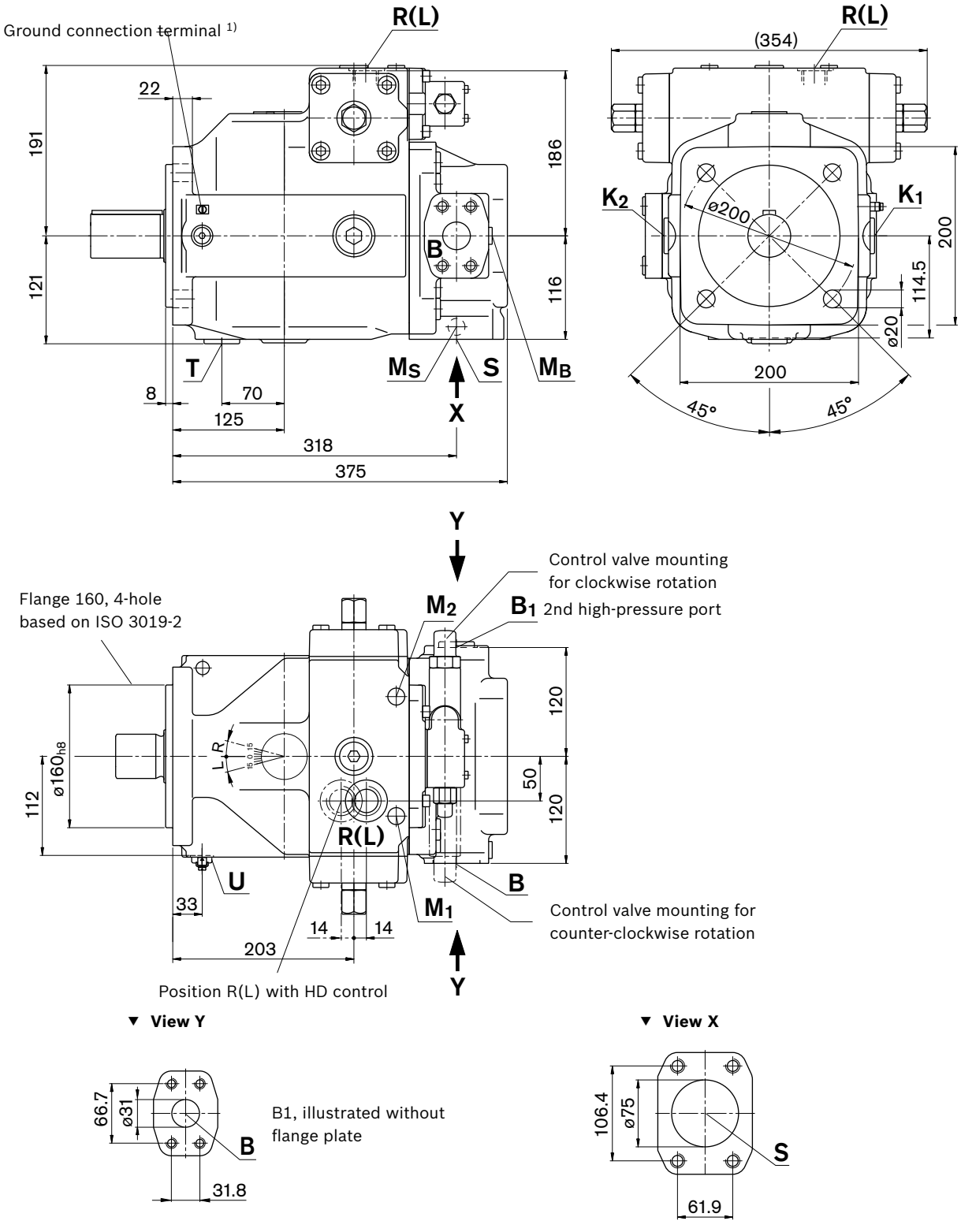
Ports		Standard	Size[3]	$p_{max\ abs}$ [bar][4]	State[9]
B	Service line port (high-pressure line) Fastening threads	SAE J518[6] DIN 13	1 1/4 in M14 × 2; 19 deep	400	O
B1	2nd service line port (high-pressure line) Fastening threads	SAE J518[6] DIN 13	1 1/4 in M14 × 2; 19 deep	400	X[8]
S	Suction port	SAE J518[6] DIN 13	2 1/2 in M12×1.75; 18 deep	30	O
K_1, K_2	Flow port	DIN 3852[5]	M33 × 2; 18 deep	2	X
T	Fluid drain	DIN 3852[5]	M33 × 2; 18 deep	2	X
M_B	Measured pressure B	DIN 3852[5]	M14 × 1.5; 12 deep	400	X
M_S	Measured pressure S	DIN 3852[5]	M14 × 1.5; 12 deep	30	X
R(L)	Fluid filling and air bleed (drain port)	DIN 3852[5]	M33 × 2; 18 deep	2	O
U	Flow port	DIN 3852[5]	M14 × 1.5; 12 deep	5	X[7]
M_1, M_2	Measuring control pressure	DIN 3852[5]	M14 × 1.5; 12 deep	400	X

1) Center bore according to DIN 332
2) Thread according to DIN 13
3) For the maximum tightening torques, please refer to the notes in Part I (product-specific and general instructions).
4) Momentary pressure spikes may occur depending on the application. Keep this in mind when selecting measuring devices and fittings.
5) The spot face can be deeper than specified in the appropriate standard.
6) Metric fastening thread, deviating from standard
7) For above-reservoir installation and for any installation position with "drive shaft upward", a bearing flushing must be installed.
8) With flange plate plugged to withstand high pressure. Depending on the application, B and/or B_1 must be connected. The unused port must be plugged with the flange plate.
9) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

Dimensions size 180

DR - Pressure controller; flange version, metric

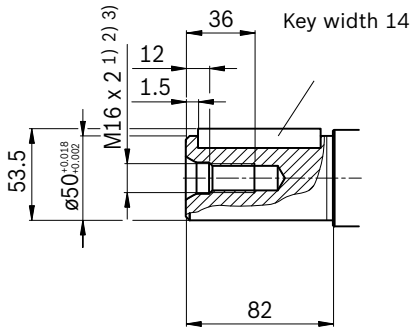
(further control device dimensions, see corresponding data sheets)



1) Protective ground connection terminal configured to 2×4 mm². Minimum cross-section of ground connection wire 2.5 mm²

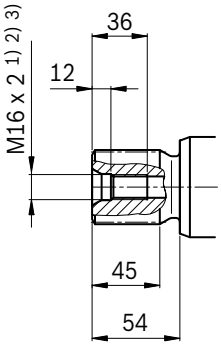
▼ **Keyed shaft (DIN 6885)**

P – Ø50 AS 14×9×80



▼ **Splined shaft (DIN 5480)**

Z – W50×2×24×9g



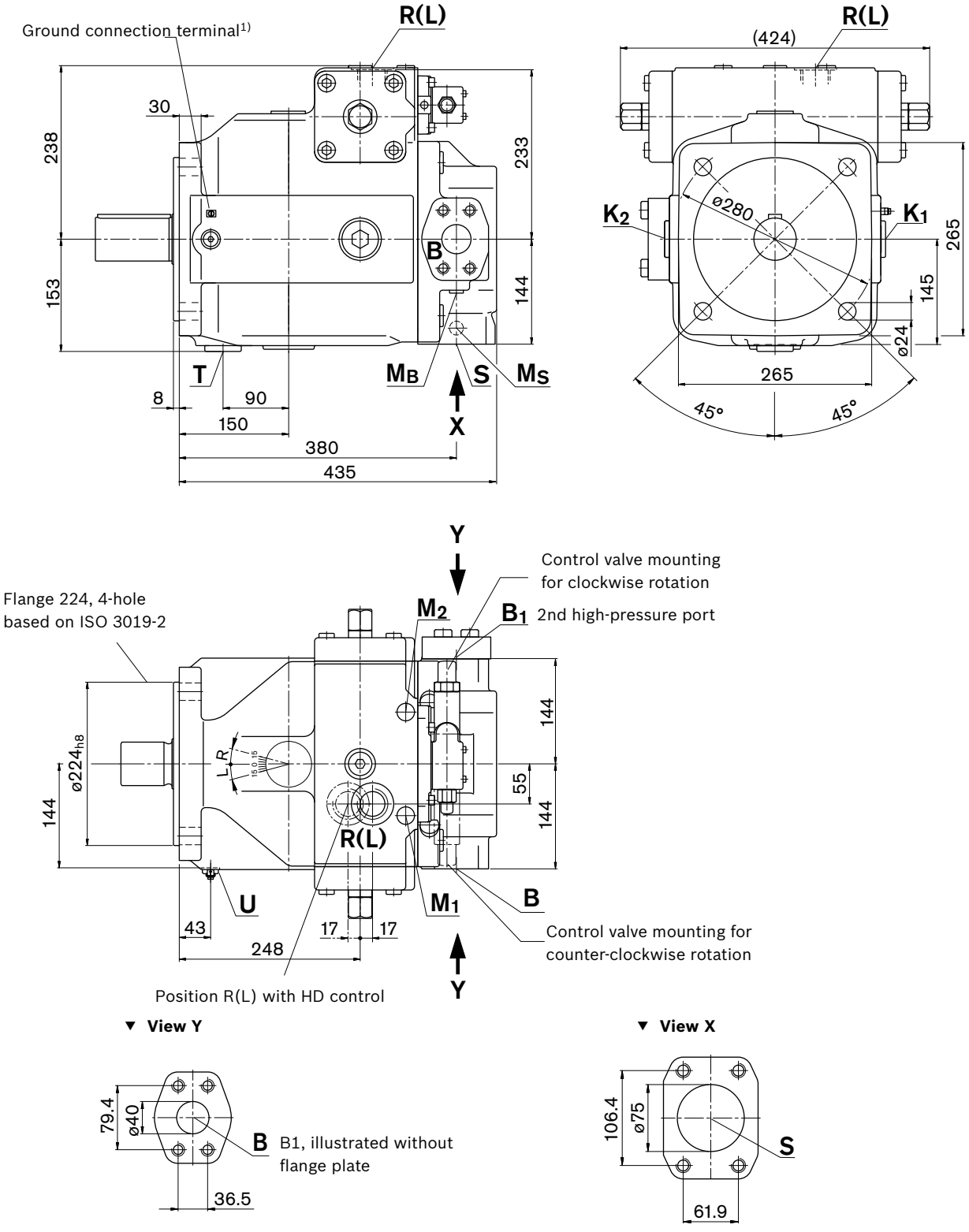
Ports		Standard	Size[3]	$p_{max\ abs}$ [bar][4]	State[9]
B	Service line port (high-pressure line) Fastening threads	SAE J518[6] DIN 13	1 1/4 in M14 × 2; 19 deep	400	O
B1	2nd service line port (high-pressure line) Fastening threads	SAE J518[6] DIN 13	1 1/4 in M14 × 2; 19 deep	400	X[8]
S	Suction port	SAE J518[6] DIN 13	3 in M16 × 2; 24 deep	30	O
K_1, K_2	Flow port	DIN 3852[5]	M33 × 2; 18 deep	2	X
T	Fluid drain	DIN 3852[5]	M33 × 2; 18 deep	2	X
M_B	Measured pressure B	DIN 3852[5]	M14 × 1.5; 12 deep	400	X
M_S	Measured pressure S	DIN 3852[5]	M14 × 1.5; 12 deep	30	X
R(L)	Fluid filling and air bleed (drain port)	DIN 3852[5]	M33 × 2; 18 deep	2	O
U	Flow port	DIN 3852[5]	M14 × 1.5; 12 deep	5	X[7]
$_M1$, M_2	Measuring control pressure	DIN 3852[5]	M14 × 1.5; 12 deep	400	X

1) Center bore according to DIN 332
2) Thread according to DIN 13
3) For the maximum tightening torques, please refer to the notes in Part I (product-specific and general instructions).
4) Momentary pressure spikes may occur depending on the application. Keep this in mind when selecting measuring devices and fittings.
5) The spot face can be deeper than specified in the appropriate standard.
6) Metric fastening thread, deviating from standard
7) For above-reservoir installation and for any installation position with "drive shaft upward", a bearing flushing must be installed.
8) With flange plate plugged to withstand high pressure. Depending on the application, B and/or B_1 must be connected. The unused port must be plugged with the flange plate.
9) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

Dimensions size 250

DR – Pressure controller; flange version, metric

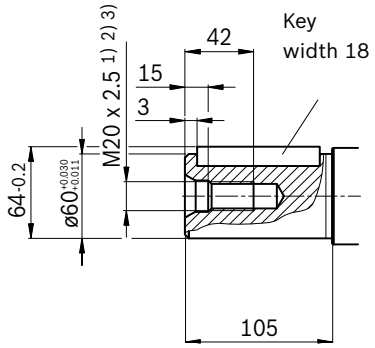
(further control device dimensions, see corresponding data sheets)



1) Protective ground connection terminal configured to 2×4 mm². Minimum cross-section of ground connection wire 2.5 mm²

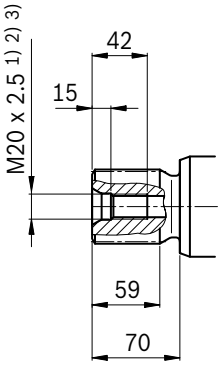
▼ **Keyed shaft (DIN 6885)**

P – Ø60 AS 18×11×100



▼ **Splined shaft (DIN 5480)**

Z – W60×2×28×9g



Ports		**Standard**	**Size**[3]	$p_{max\ abs}$ **[bar]**[4]	**State**[9]
B	Service line port (high-pressure line) Fastening threads	SAE J518[6] DIN 13	1 1/2 in M16 × 2; 25 deep	400	O
B1	2nd service line port (high-pressure line) Fastening threads	SAE J518[6] DIN 13	1 1/2 in M16 × 2; 25 deep	400	X[8]
S	Suction port	SAE J518[6] DIN 13	3 in M16 × 2; 24 deep	30	O
K_1, K_2	Flow port	DIN 3852[5]	M42 × 2; 20 deep	2	X
T	Fluid drain	DIN 3852[5]	M42 × 2; 20 deep	2	X
M_B	Measured pressure B	DIN 3852[5]	M14 × 1.5; 12 deep	400	X
M_S	Measured pressure S	DIN 3852[5]	M14 × 1.5; 12 deep	30	X
R(L)	Fluid filling and air bleed (drain port)	DIN 3852[5]	M42 × 2; 20 deep	2	O
U	Flow port	DIN 3852[5]	M14 × 1.5; 12 deep	5	X[7]
$_M$1, M_2	Measuring control pressure	DIN 3852[5]	M14 × 1.5; 12 deep	400	X

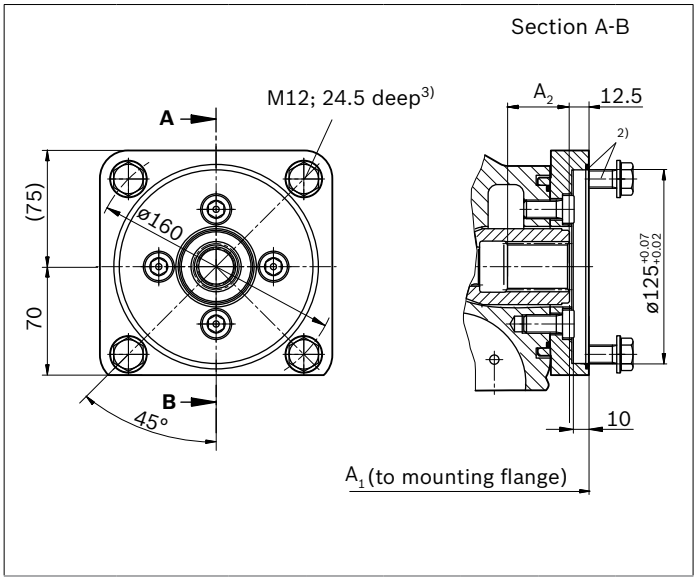
1) Center bore according to DIN 332
2) Thread according to DIN 13
3) For the maximum tightening torques, please refer to the notes in Part I (product-specific and general instructions).
4) Momentary pressure spikes may occur depending on the application. Keep this in mind when selecting measuring devices and fittings.
5) The spot face can be deeper than specified in the appropriate standard.
6) Metric fastening thread, deviating from standard
7) For above-reservoir installation and for any installation position with "drive shaft upward", a bearing flushing must be installed.
8) With flange plate plugged to withstand high pressure. Depending on the application, B and/or B_1 must be connected. The unused port must be plugged with the flange plate.
9) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

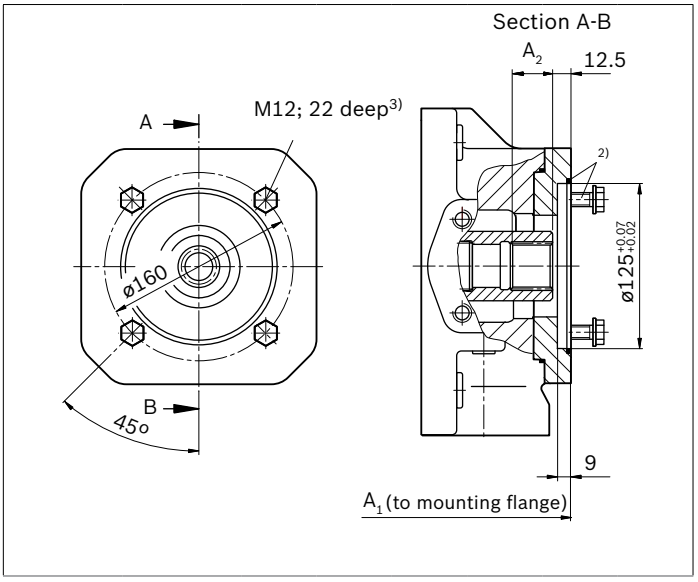
Through drive dimensions

Flange ISO 3019-2		Hub for splined shaft[1]	Availability for sizes					Code
Diameter	**Attachment[2]**	**Diameter**	**40**	**71**	**125**	**180**	**250**	
125-4		N32×2×14×8H	●	●	–	–	–	K31
		N32×2×14×8H	–	–	●	●	●	U31

● = Available – = Not available

▼ **125-4**





K31	NG	A1	A2
	40	288	40
	71	316	33.6

U31	NG	A1	A2
	125	369	35.6
	180	393	35.6
	250	453	38

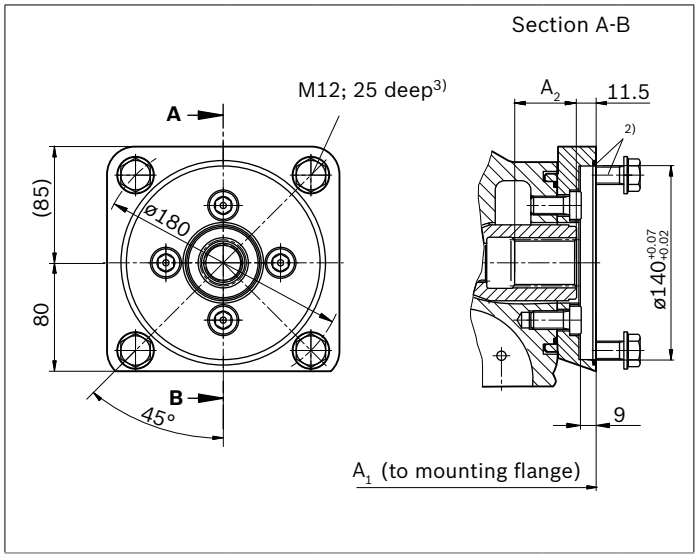
Note
All attachment pumps must be compliant with the ATEX classification relevant to the application.

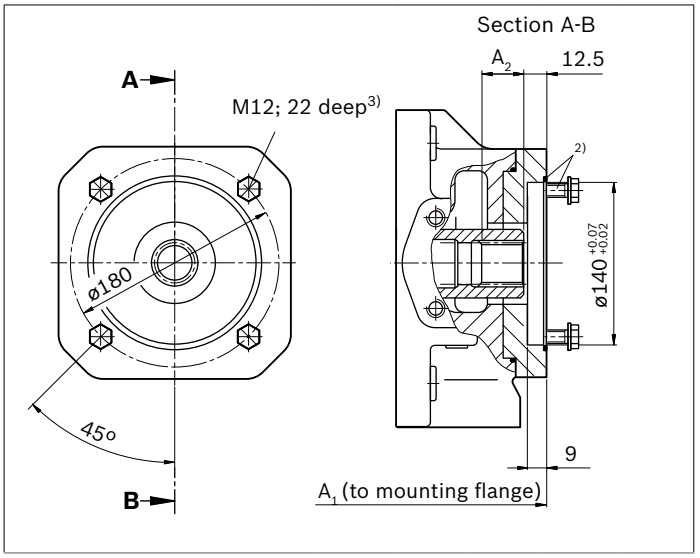
1) According to DIN 5480
2) Mounting drillings pattern viewed on through drive, with control at top. Mounting bolts and O-ring included in the scope of supply.
3) Thread according to DIN 13. For the maximum tightening torques, please refer to the notes in Part I (product-specific and general instructions.

Flange ISO 3019-2		Hub for splined shaft[1]	Availability for sizes					Code
Diameter	Attachment[2]	Diameter	40	71	125	180	250	
140-4	⌘	N40×2×18×8H	–	●	–	–	–	K33
		N40×2×14×8H	–	–	●	●	●	U33

● = Available – = Not available

▼ **140-4**





K33	NG	A1	A2
	71	316	42.8

U33	NG	A1	A2
	125	369	43.8
	180	393	43.8
	250	453	48.9

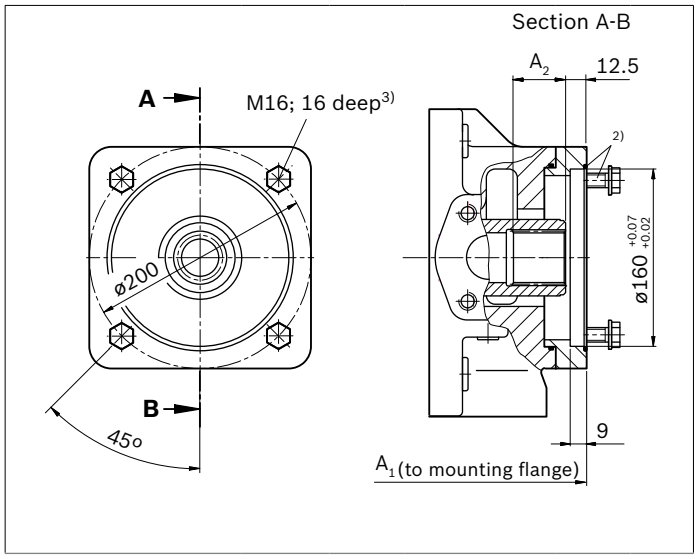
Note
All attachment pumps must be compliant with the ATEX classification relevant to the application.

1) According to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Mounting drillings pattern viewed on through drive with control at top Mounting bolts and O-ring included in the scope of supply.
3) Thread according to DIN 13. For the maximum tightening torques, please refer to the notes in Part I (product-specific and general instructions.

Flange ISO 3019-2		Hub for splined shaft[1]	Availability for sizes					Code
Diameter	**Attachment[2]**	**Diameter**	**40**	**71**	**125**	**180**	**250**	
160-4	⌘	N50×2×24×8H	–	–	–	●	●	U34
224-4	⌘	N60×2×28×8H	–	–	–	–	●	U35

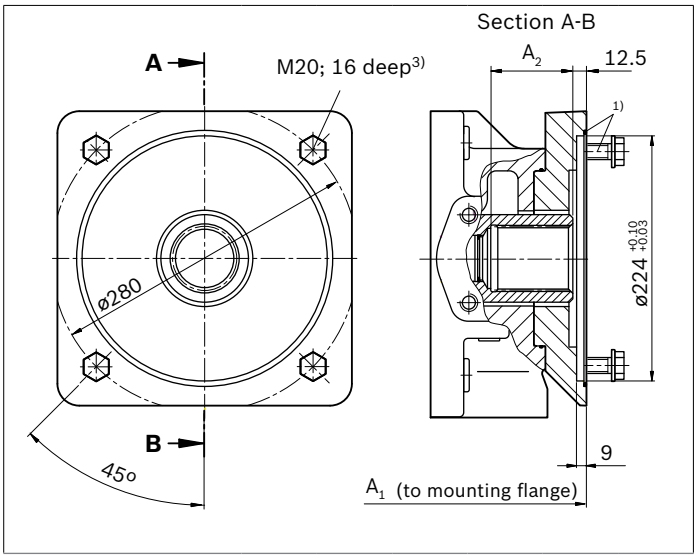
● = Available – = Not available

▼ **160-4**



U34	NG	A1	A2
	125	369	51.6
	180	393	51.6
	250	453	54

▼ **224-4**



U35	NG	A1	A2
	250	469	75

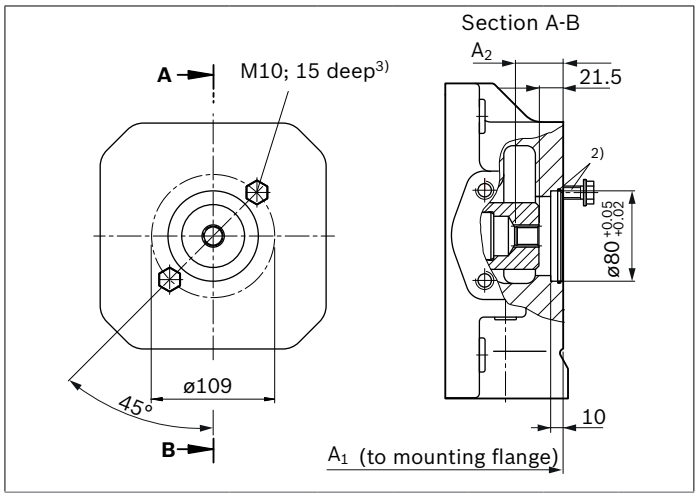
Note
All attachment pumps must be compliant with the ATEX classification relevant to the application.

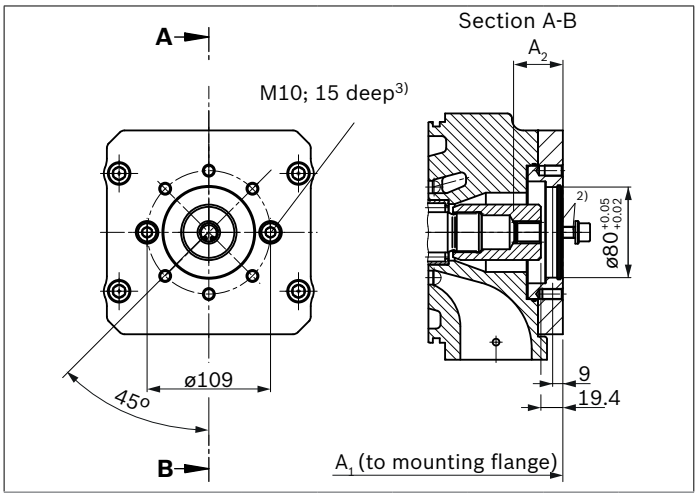
1) According to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Mounting drillings pattern viewed on through drive with control at top Mounting bolts and O-ring included in the scope of supply.
3) Thread according to DIN 13. For the maximum tightening torques, please refer to the notes in Part I (product-specific and general instructions.

Flange ISO 3019-2		Hub for splined shaft[1]	Availability for sizes					Code
Diameter	Attachment[2]	Diameter	40	71	125	180	250	
80-2		3/4 in 11T 16/32DP	●	●	–	–	–	KB2
		3/4 in 11T 16/32DP	–	–	●	●	●	UB2

● = Lieferbar – = Not available

▼ **80-2**





KB2	NG	A1	A2
	45	290	
	71	291	40.5

UB2	NG	A1	A2
	125	369	43.4
	180	393	40.5
	250	453	40.5

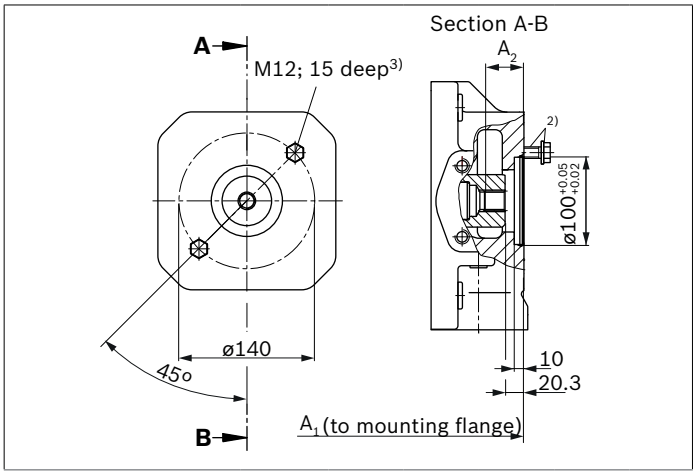
Note
All attachment pumps must be compliant with the ATEX classification relevant to the application.

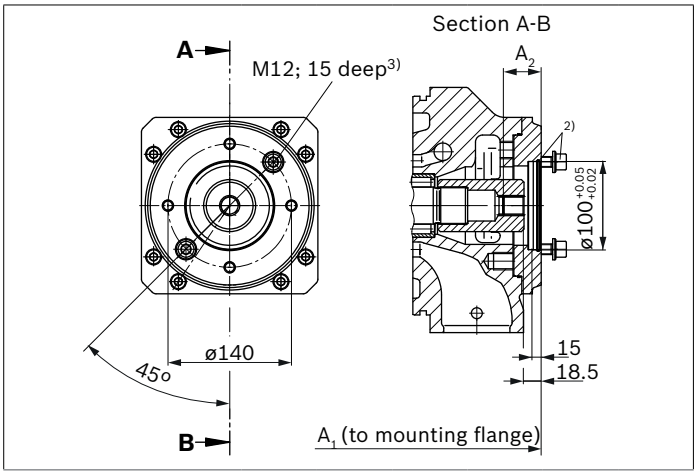
1) According to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Mounting drillings pattern viewed on through drive with control at top Mounting bolts and O-ring included in the scope of supply.
3) Thread according to DIN 13. For the maximum tightening torques, please refer to the notes in Part I (product-specific and general instructions.

Flange ISO 3019-2		Hub for splined shaft[1]	Availability for sizes					Code
Diameter	**Attachment[2]**	**Diameter**	**40**	**71**	**125**	**180**	**250**	
100-2		7/8 in 13T 16/32DP	●	●	–	–	–	KB3
		7/8 in 13T 16/32DP	–	–	●	●	●	UB3

● = Lieferbar – = Not available

▼ **100-2**





KB3	NG	A1	A2
	40	290	43.3
	71	291	43.4

UB3	NG	A1	A2
	125	369	43.4
	180	393	43.4
	250	453	43.5

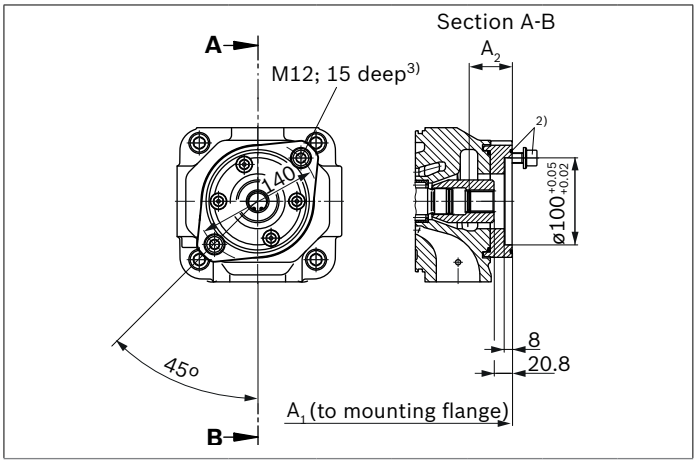
Note
All attachment pumps must be compliant with the ATEX classification relevant to the application.

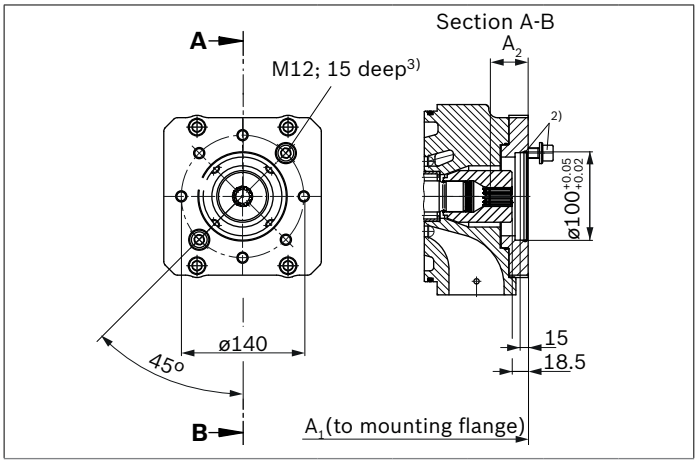
1) According to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Mounting drillings pattern viewed on through drive with control at top Mounting bolts and O-ring included in the scope of supply.
3) Thread according to DIN 13. For the maximum tightening torques, please refer to the notes in Part I (product-specific and general instructions.

Flange ISO 3019-2		Hub for splined shaft[1]	Availability for sizes					Code
Diameter	Attachment[2]	Diameter	40	71	125	180	250	
100-2	⚷, ⚷, ⚷	1 in 15T 16/32DP	●	●	–	–	–	KB4
		1 in 15T 16/32DP	–	–	●	●	●	UB4

● = Lieferbar – = Not available

▼ **100-2**





KB4	NG	A1	A2
	45	290	48.2
	71	291	48.3

UB4	NG	A1	A2
	125	369	43.4
	180	393	48.4
	250	453	48.4

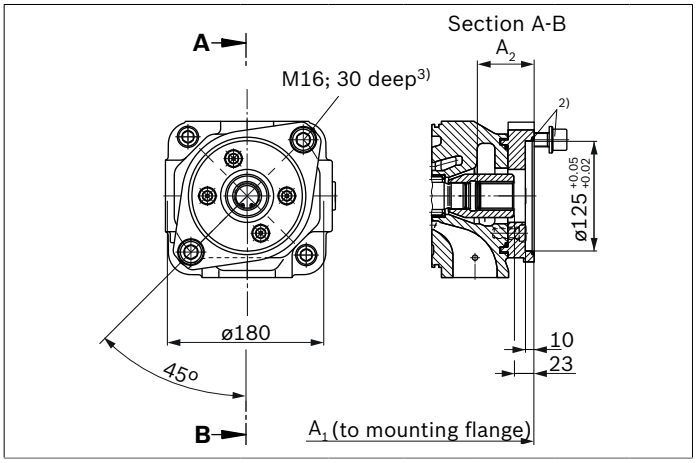
Note
All attachment pumps must be compliant with the ATEX classification relevant to the application.

1) According to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Mounting drillings pattern viewed on through drive with control at top Mounting bolts and O-ring included in the scope of supply.
3) Thread according to DIN 13. For the maximum tightening torques, please refer to the notes in Part I (product-specific and general instructions.

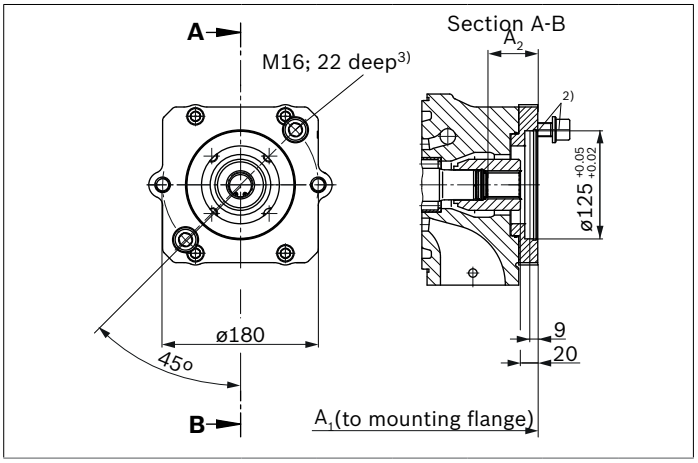
Flange ISO 3019-2		Hub for splined shaft[1]	Availability for sizes					Code
Diameter	**Attachment[2]**	**Diameter**	**40**	**71**	**125**	**180**	**250**	
125-2	☍	1 1/4 in 14T 12/24DP	–	●	–	–	–	KB5
	⚮	1 1/4 in 14T 12/24DP	–	–	●	●	●	UB5

● = Lieferbar – = Not available

▼ **125-2**



KB5	NG	A1	A2
	71	291	61



UB5	NG	A1	A2
	125	369	58
	180	393	58
	250	453	58.9

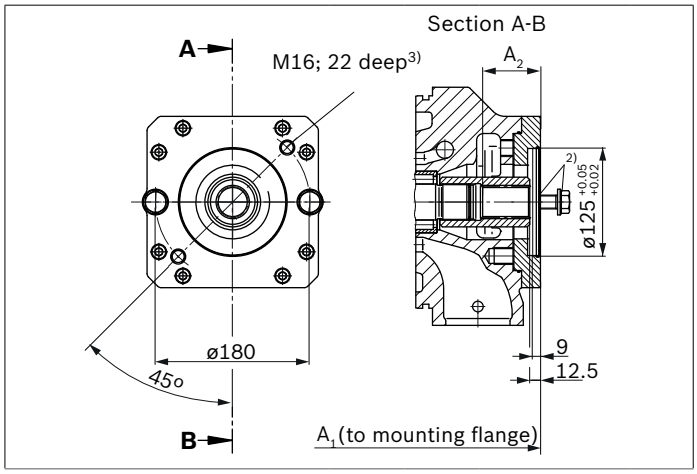
Note
All attachment pumps must be compliant with the ATEX classification relevant to the application.

1) According to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Mounting drillings pattern viewed on through drive with control at top Mounting bolts and O-ring included in the scope of supply.
3) Thread according to DIN 13. For the maximum tightening torques, please refer to the notes in Part I (product-specific and general instructions.

Flange ISO 3019-2		Hub for splined shaft[1]	Availability for sizes					Code
Diameter	Attachment[2]	Diameter	40	71	125	180	250	
125-2		1 1/2 in 17T 12/24DP	–	–	●	●	●	UB6

● = Lieferbar – = Not available

▼ **125-2**



UB6	NG	A1	A2
	125	369	60.4
	180	393	61.9
	250	453	67.5

Note
All attachment pumps must be compliant with the ATEX classification relevant to the application.

1) According to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Mounting drillings pattern viewed on through drive with control at top Mounting bolts and O-ring included in the scope of supply.
3) Thread according to DIN 13. For the maximum tightening torques, please refer to the notes in Part I (product-specific and general instructions.

Overview of attachment options

Through drive				**Mounting options – 2nd pump**
Flange ISO 3019-2	**Hub for splined shaft**		**Short designation**	**A4VSO ATEX II 3G ck IIC Tx NG (shaft)**
125–4	W32×2×14×9g		K31; U31	40 (Z)
140–4	W40×2×18×9g		K33; U33	71 (Z)
160–4	W50×2×24×9g		U34	125, 180 (Z)
224–4	W60×2×28×9g		U35	250 (Z)
Flange ISO 3019-2	**Hub for splined shaft**		**Short designation**	**A10VSO ATEX II 3G ck IIC Tx NG (shaft)**
80-2	3/4in	11T 16/32DP	KB2; UB2	18 (S, R)
100-2	7/8in	13T 16/32DP	KB3; UB3	28 (S, R)
100-2	1in	15T 16/32DP	KB4; UB4	45 (S, R)
125-2	1 1/4in	14T 12/24DP	KB5; UB5	71 (S, R)
125-2	1 1/2in	17T 12/24DP	KB6; UB6	100 (S)

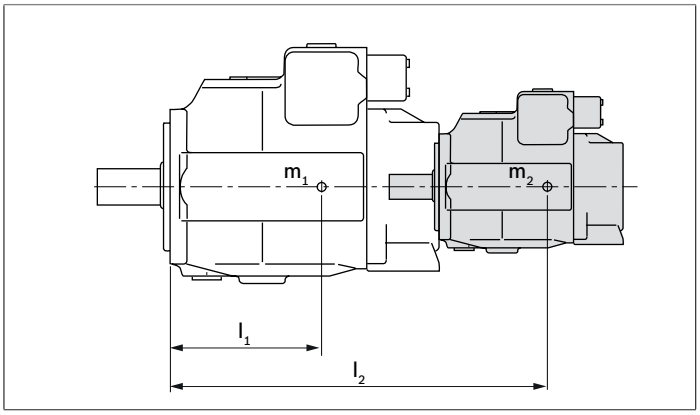
Combination pumps A4VSO + A4VSO (A4VSO + A10VSO)

A tandem pump consisting of two equal sizes is permissible without additional supports assuming that the dynamic mass acceleration does not exceed a maximum of 10 g (= 98.1 m/s^2).

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

Note

All attachment pumps must be compliant with the ATEX classification relevant to the application.



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

Permissible mass torques A4VSO

NG				**40**	**71**	**125**	**180**	**250**
Static	T_m	Nm		1800	2000	4200	4200	9300
Dynamic at 10 g (98.1 m/s^2)	T_m	Nm		180	200	420	420	930
Weight	m	kg		39	53	88	102	184
Distance from center of gravity	l_1	mm		120	140	170	180	210

Zulässige Massenmomente A10VSO

NG				**18**	**28**	**45**	**71**	**100**
Static	T_m	Nm		500	880	1370	2160	3000
Dynamic at 10 g (98,1 m/s^2)	T_m	Nm		50	88	137	216	300
Weight with throug drive	m	kg		14	19	25	39	54
Weight without throug drive plate				12	15	21	33	45
Distance from center of gravity	l_1	mm		90	110	130	150	160

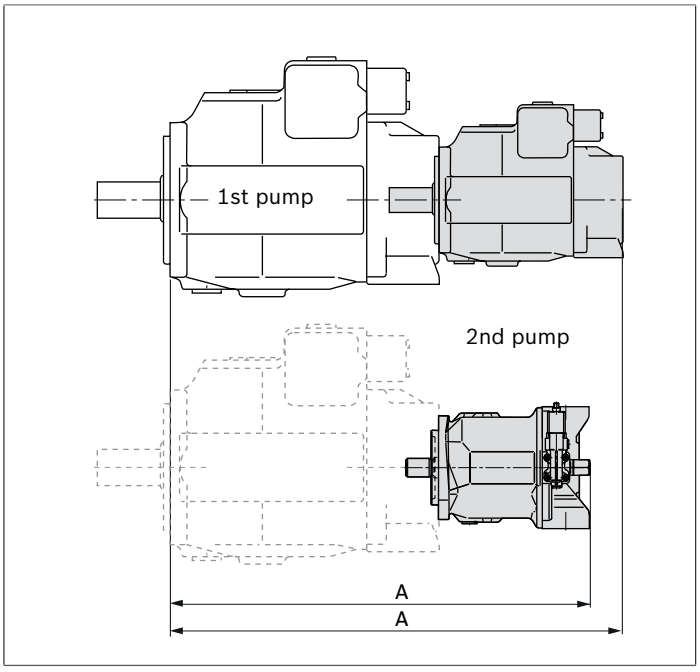
Dimensions of combination pumps with two A4VSO ATEX II 3G ck IIC Tx

Total length "A" at mounting pump A4VSO

1st pump Sizes	**2nd pump** Sizes				
	40	**71**	**125**	**180**	**250**
40	554	–	–	–	–
71	582	611	–	–	–
125	635	664	724	–	–
180	659	688	748	768	–
250	719	748	808	828	904

Total length “A” at mounting pump A10VSO

1st pump Sizes	**2nd pump** Sizes				
	18	**28**	**45**	**71**	**100**
40	485	496	514	–	–
71	486	497	515	548	–
125	564	575	593	*626*	*698*
180	588	599	617	650	*722*
250	648	659	677	710	782



Note
All attachment pumps must be compliant with the ATEX classification relevant to the application.

Rexroth
Bosch Group

EU declaration of conformity

(Translation of the original EU declaration of conformity) Date: 21.04.2016

- ☐ in accordance with Machinery Directive 2006/42/EC
- ☐ in accordance with Low Voltage Directive 2006/95/EC
- ☐ in accordance with EMC Directive 2004/108/EC
- ☐ in accordance with Pressure Equipment Directive 97/23/EC
- ☒ in accordance with ATEX Directive 2014/34/EU
- ☐ in accordance with RoHS Directive 2011/65/EC
- ☐

The manufacturer

Bosch Rexroth AG, An den Kelterwiesen 14, 72160 Horb a.N.

hereby declares that the product below

Name:	**Axial piston variable pump**
Type:	**A4VSO.../...-A... according to RE92050-01-X-B0**
Identification:	**II 3G ck IIC Tx**

was developed, designed and manufactured in compliance with the above-mentioned EU directive.

Harmonized Standards applied:
DIN EN 13463-1:2009
DIN EN 13463-5:2011
DIN EN 13463-8:2004

Further explanations:

With attention to instruction manual RE92050-01-X-B0

Place/date/signature as indicated in the original declaration.

We reserve the right to make changes to the content of the Declaration of Conformity. Current issue on request.

Project planning note

- The pump A4VSO ATEX II 3G ck IIC Tx is designed for use in open circuits.
- The project planning, installation and commissioning of the axial piston unit requires the involvement of skilled person.
- Before using the axial piston unit, please read the instruction manual (Part I and Part II) completely and thoroughly. If necessary, these can be requested from Bosch Rexroth.
- Before finalizing your design, request a binding installation drawing.
- The data and notes contained herein must be adhered to.
- Pressure controls are not backups against pressure overload. A separate pressure-relief valve is to be provided in the hydraulic system.
- Depending on the operating conditions of the axial piston unit (operating pressure, fluid temperature), the characteristic may shift.
- Not all variants of the product are approved for use in safety functions according to ISO 13849. Please consult the responsible contact person at Bosch Rexroth if you require reliability parameters (e.g. $MTTF_d$) for functional safety.
- Service line ports:
  - The ports and fastening threads are designed for the specified maximum pressure. The machine or system manufacturer must ensure that the connecting elements and lines correspond to the specified application conditions (pressure, flow, hydraulic fluid, temperature) with the necessary safety factors.
  - The service line ports and function ports is only designed to accommodate hydraulic lines.

Safety instructions

- 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).
- Moving parts in control and regulation systems (e.g. valve spools) may in certain circumstances become stuck in an undefined position due to contamination (e.g. impure hydraulic fluid, abrasion or residual dirt from components). As a result, the hydraulic fluid flow or build-up of torque of the axial piston unit will no longer respond correctly to the operator's commands. Even the use of different filter cartridges (external or internal inlet filter) will not rule out a fault but merely minimize the risk. The machine/system manufacturer must test whether remedial measures are needed on the machine for the application concerned in order to set the consumer being driven to a safe position (e.g. safe stop) and if necessary to ensure it is properly implemented.

Bosch Rexroth AG
Mobile Applications
An den Kelterwiesen 14
72160 Horb a.N., Germany
Tel. +49 7451 92-0
info.ma@boschrexroth.de
www.boschrexroth.com