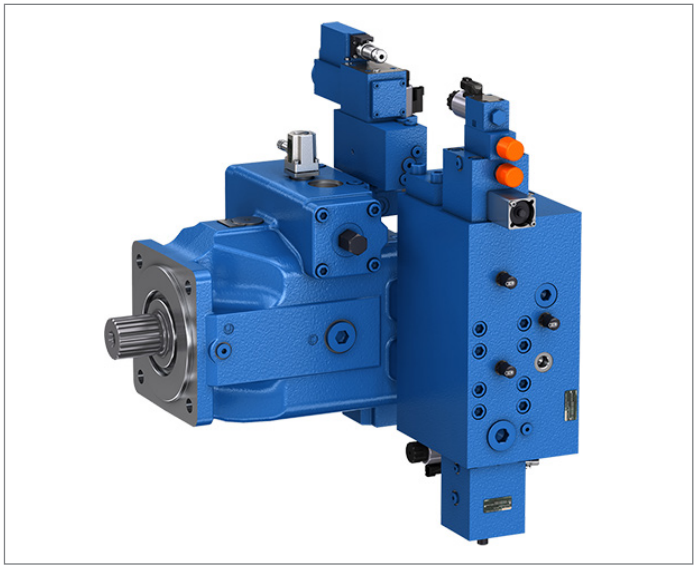
RE 92058/2022-08-02
Replaces: 11.2018

rexroth
A Bosch Company

Axial piston units with DS2 secondary control A4VSG series 10 and 3x



- For highly dynamic applications
- Sizes 40 to 1000
- Nominal pressure 315 bar
- Maximum pressure 400 bar
- Closed circuit

Features

- Highly dynamic rotary drive
- Motor and generator operation for both directions of rotation
- With energy recovery and energy storage
- With rotational speed, position, or torque control for high control performance and dynamics
- Throttle-free coupling and energy transmission of any number of independently operating axial piston units (motor or generator operation) on a common supply line with constant working pressure.
- Compact digital control electronics.

Contents

Type code

01	02	03	04	05	06		07	08		09	10	11	12	13	14	15
	A4VS	**G**				**/**		**W**	**–**	**V**			**10**			

			40	71	125	180	250	355	500	750	1000	
Hydraulic fluid												
01	Mineral oil and HFD hydraulic fluids (no code)		●	●	●	●	●	●	●	●	●	
	HFA, HFB, and HFC hydraulic fluids Only with sealing material NBR nitrile rubber and shaft seal PTFE. Please order with code P in position 09.		●	●	●	●	●	●	●	–	–	**E**
Axial piston unit												
02	Swashplate design, variable, nominal pressure 315 bar, maximum pressure 400 bar											**A4VS**
Operating mode												
03	Pump / motor, closed circuit											**G**
Size (NG)												
04	Geometric displacement, see table of values on page 9		**40**	**71**	**125**	**180**	**250**	**355**	**500**	**750**	**1000**	
Control device			**40**	**71**	**125**	**180**	**250**	**355**	**500**	**750**	**1000**	
05	Secondary rotational speed control	With mounted control valve	●	●	●	●	●	●	●	●	●	**DS2R**
		With mounted servo valve	○	○	○	○	○	○	○	○	○	**DS2S**
		Without valve	○	○	○	○	○	○	○	○	○	**DS2E**
Additional valve (see table Flow direction on page 5 to 7)			**40**	**71**	**125**	**180**	**250**	**355**	**500**	**750**	**1000**	
06	Load-holding function with LS 1363	Clockwise swivel direction	●	●	●	●	●	●	●	●	●	**LR**
		Counter-clockwise swivel direction	●	●	●	●	●	●	●	●	●	**LL**
	Load-holding function with LS 1363 not piped up (see page 34)		●	●	●	●	●	●	●	●	●	**LX**
	Without load-holding function		●	●	●	●	●	●	●	●	●	**0**
Series			**40**	**71**	**125**	**180**	**250**	**355**	**500**	**750**	**1000**	
07	Series 1, index 0		●	●	–	–	–	–	–	–	–	**10**
	Series 3, index 0		–	–	●	●	▲	●	▲	●	●	**30**
	Series 3, index 3; efficiency-optimized rotary group		–	–	–	–	●	–	●	○	–	**33**
Direction of rotation			**40**	**71**	**125**	**180**	**250**	**355**	**500**	**750**	**1000**	
08	Viewed on drive shaft	Variable	●	●	●	●	●	●	●	●	●	**W**
Sealing material[1]			**40**	**71**	**125**	**180**	**250**	**355**	**500**	**750**	**1000**	
09	FKM (fluorocarbon rubber) according to ISO 1629		●	●	●	●	●	●	●	●	●	**V**
Drive shaft			**40**	**71**	**125**	**180**	**250**	**355**	**500**	**750**	**1000**	
10	Parallel keyed shaft DIN 6885		●	●	●	●	●	●	●	●	●	**P**
	Splined shaft DIN 5480		●	●	●	●	●	●	●	●	●	**Z**
Mounting flange			**40**	**71**	**125**	**180**	**250**	**355**	**500**	**750**	**1000**	
11	In accordance with ISO 3019-2 metric	4-hole	●	●	●	●	●	●	–	–	–	**B**
		8-hole	–	–	–	–	–	–	●	●	●	**H**
Working port			**40**	**71**	**125**	**180**	**250**	**355**	**500**	**750**	**1000**	
12	SAE flange ports **A** and **B**, position lateral on same side, metric fastening thread		●	●	●	●	●	●	●	●	●	**10**

● = Available ○ = On request – = Not available ▲ = Not for new projects

1) For more information about sealing material, see data sheet 92100

01	02	03	04	05	06		07	08		09	10	11	12	13	14	15
	A4VS	**G**				**/**		**W**	**–**	**V**			**10**			

Through drives (for mounting options and dimensions see data sheet 92100)

	Flange **ISO 3019-1** (metric)		Hub for splined shaft[1]										
	Diameter	Attachment	Diameter	**40**	**71**	**125**	**180**	**250**	**355**	**500**	**750**	**1000**	
13	Without through drive			●	●	●	●	●	●	●	●	●	**N00**
	125, 4-hole	⌘	32x22x14x9g	●	●	●	●	●	○	○	○	○	**K31**
	140, 4-hole		40x2x18x9g	–	●	●	●	●	●	●	○	●	**K33**
	160, 4-hole		50x2x24x9g	–	–	●	●	●	●	●	○	●	**K34**
	224, 4-hole		60x2x28x9g	–	–	–	–	●	●	●	●	●	**K35**
	224, 4-hole		70x3x22x9g	–	–	–	–	–	●	●	○	○	**K77**
	315, 8-hole	⌬	80x3x25x9g	–	–	–	–	–	–	●	○	○	**K43**
	400, 8-hole		90x3x28x9g	–	–	–	–	–	–	–	●	●	**K76**
	400, 8-hole		100x3x32x9g	–	–	–	–	–	–	–	–	●	**K88**
	With mounted incremental encoder 1000 pulses/rev.			●	●	●	●	●	●	●	●	●	**T03**[3]
	Prepared for mounted incremental encoder, through drive plugged with cover			●	●	●	●	●	●	●	●	●	**T10**[3]
	Special tachometer mounting			○	○	○	○	○	○	○	○	○	**T99**
	Prepared for special tachometer mounting, plugged with cover			○	○	○	○	○	○	○	○	○	**T00**
	Prepared for through drive, with pressure-proof plugged cover			●	●	●	●	●	●	●	●	●	**K99**

Valves		**40**	**71**	**125**	**180**	**250**	**355**	**500**	**750**	**1000**	
14	Without valve block	●	●	●	●	●	●	●	●	●	**0**
	Mounted electrically releasable check valve RVE	●	●	●	●	●	●	●	●	●	**1**[2]
	Electrically releasable shut-off block for combination with load-holding function LS 1363, type code L, without overload protection for deactivated isolator valve.	●	●	●	●	●	●	●	●	●	**2**[4]
	Electrically releasable shut-off block for combination with load-holding function LS 1363, type code L, and block for manual overload protection MOPS	●	●	●	●	●	●	●	●	●	**3**

Filtration		**40**	**71**	**125**	**180**	**250**	**355**	**500**	**750**	**1000**	
15	Without filter	●	●	●	●	●	●	●	●	●	**N**
	Intermediate plate filter (see data sheet 92076)	●	●	●	●	●	●	●	●	●	**Z**

● = Available ○ = On request – = Not available

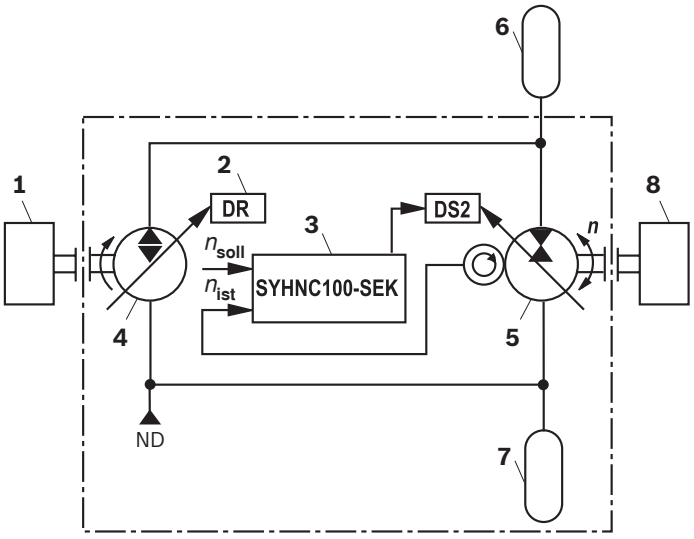
Notice

- Note the project planning notes on page 37.
- In addition to the type code, please specify the relevant technical data when placing your order. (See also data sheet 92100)

1) Hub for splined shaft according to ANSI B92.1a
2) Combination with swivel direction (position 06) L or R not possible.
3) Preferred types
4) For more information see "A4VSG...DS2 for use in winch and crane applications" on page 34

Function

Secondary control is an energy-saving drive concept with high dynamics for the installation of rotational speed, position, or torque controls with energy recovery.
The secondary controlled hydrostatic axial piston units operate on a supply network with constant high pressure and low pressure.
The power takeoff or return to the supply network is throttle-free and based on demand whereby the displacement of the axial piston units adapts to the respective load case.
Any number of units operating as a motor or pump can thereby be arranged in parallel. Four-quadrant operation is possible, whereby the units for reversing the rotational speed or torque are swiveled over "zero". This also reverses the direction of the flow.

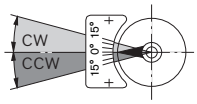


An energy accumulator can be installed in the high and low pressure system between the primary and secondary units if necessary.
The flow peaks are covered by the accumulator.
It is also used to store the energy recovered in the hydraulic network from the secondary unit if no other consumers are present.
Together with the pressure-controlled primary unit and the operating conditions of the secondary unit, the charge state of the accumulator and its pre-charge pressure determine the constant high pressure of the system.
The specific properties of the secondary control, such as the reduction in technical equipment in the primary area, the possibilities of energy recovery and the storage of braking energy, and the virtually load-independent rotational speed and positioning accuracy open up a wide field of applications.

1	Drive	**5**	Secondary unit
2	Pressure controller	**6**	HP accumulator
3	Control electronics	**7**	LP accumulator
4	Primary unit	**8**	Output drive

Associated electronics (see also page 15)
- Digital controller assembly group SYHNC100-SEK...3x
- Amplifier card VT-VRRA 1-527-20/V0 (for sizes 40 and 71)
- Amplifier card VT-VRRA 1-537-20/V0 (for sizes 125 to 1000)
- Card holder VT3002-1-2x/32F

Flow direction

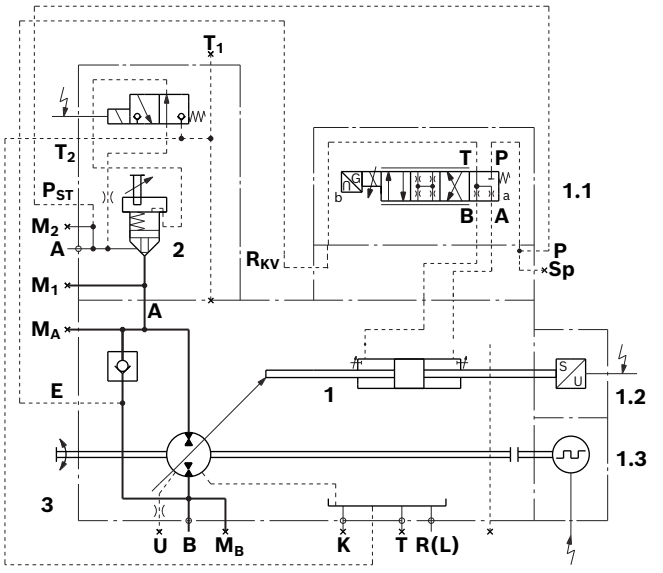


Swiveling range[1)]	Direction of rotation[2)]		High pressure in	Operating mode
	Clockwise	Counter-clockwise		
Clockwise	**B** to **A**	–	**B**	Motor
Clockwise	–	**A** to **B**	**B**	Pump
Counter-clockwise	–	**B** to **A**	**B**	Motor
Counter-clockwise	**A** to **B**	–	**B**	Pump
Clockwise	**B** to **A**	–	**A**	Pump
Clockwise	–	**A** to **B**	**A**	Motor
Counter-clockwise	–	**B** to **A**	**A**	Pump
Counter-clockwise	**A** to **B**	–	**A**	Motor

1) Cf. swivel angle indicator
2) Viewed on drive shaft

Circuit diagram DS.. Sizes 40 to 71

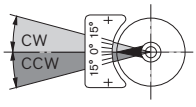
▼ **Circuit diagram standard A4VSG...DS2R/...W-... 10 T03...1N**



Secondary unit components	
1	Axial piston unit A4VSG size 40 to 71
1.1	4-way control valve (see data sheet 29026)
	NG (A4VS) **Type**
	40, 71 4WRPH6 C3 B24L -2X/G24KO/M-750
1.2	Swivel angle sensor AWXF (see page 13)
1.3	Incremental encoder GEL 293 (see page 12)
2	Electrically releasable check valve RVE Ordering code: Order item 14, type code 1 (see page 14)
3	Anti-cavitation valve, order separately (see page 14)

Ports	
A	Working pressure (high-pressure series)
B	Low pressure (high-pressure series)
M_A; M_1	Measuring working pressure
M_B	Measuring low pressure
M_2	Measuring working pressure
M_3; M_4	Measuring control pressure (from NG125)
S_P	External control pressure
T	Fluid drain
T_1; T_2	Leakage/air bleeding
K	Flushing
R(L)	Control fluid return flow
U	Bearing flushing
P_{ST}	Pilot pressure
E	Boost pressure
R_{KV}	Control fluid return flow
P	Control pressure

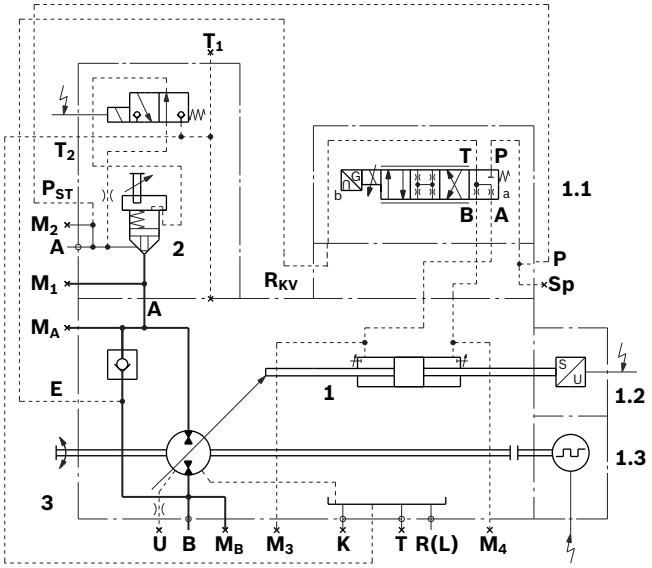
Flow direction

Size 40 to 71	Swivel direction[1]	Direction of rotation[2] Clockwise	Direction of rotation[2] Counter-clockwise	High pressure in[3]	Operating mode	Control valve 4WRPH Control part	Control valve 4WRPH Flow direction	Sign Swivel angle Actual value
	Clockwise	**B** to **A**		**A**	Pump		**P** to **A** **B** to **T**	Positive
	Clockwise		**A** to **B**	**A**	Motor		**P** to **A** **B** to **T**	Positive
	Counter-clockwise		**B** to **A**	**A**	Pump		**P** to **B** **A** to **T**	Negative
	Counter-clockwise	**A** to **B**		**A**	Motor		**P** to **B** **A** to **T**	Negative

1) Vertical view of the optical swivel angle indicator
2) Viewed on drive shaft
3) Valid for high pressure at port **A** (standard) When using the MPOS block, only high pressure at port **A** is possible.

Circuit diagram DS.. Sizes 125 to 355

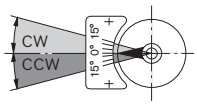
▼ **Circuit diagram standard A4VSG...DS2R/...W-... 10 T03...1N**



Secondary unit components	
1	Axial piston unit A4VSG size 125 to 355
1.1	4-way control valve (see data sheet 29026)
	NG (A4VS) **Type**
	125 to 355 4WRPH10 C3 B50L -2X/G24KO/M-750
1.2	Swivel angle sensor AWXF (see page 13)
1.3	Incremental encoder GEL 293 (see page 12)
2	Electrically releasable check valve RVE Ordering code: Order item 14, type code 1 (see page 14)
3	Anti-cavitation valve, order separately (see page 14)

Ports	
A	Working pressure (high-pressure series)
B	Low pressure (high-pressure series)
M_A; M_1	Measuring working pressure
M_B	Measuring low pressure
M_2	Measuring working pressure
M_3; M_4	Measuring control pressure (from NG125)
S_P	External control pressure
T	Fluid drain
T_1; T_2	Leakage/air bleeding
K	Flushing
R(L)	Control fluid return flow
U	Bearing flushing
P_{ST}	Pilot pressure
E	Boost pressure
R_{KV}	Control fluid return flow
P	Control pressure

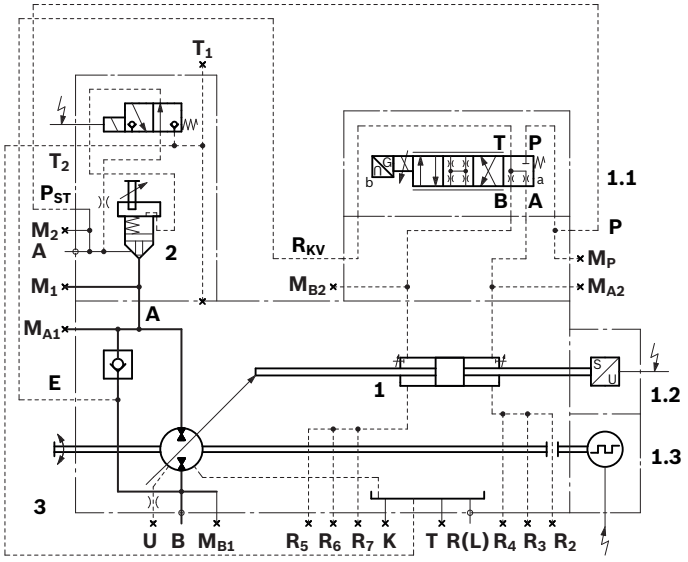
Flow direction

Size 125 to 355	Swivel direction[1]	Direction of rotation[2] Clockwise	Direction of rotation[2] Counter-clockwise	High pressure in[3]	Operating mode	Control valve 4WRPH: Control part	Control valve 4WRPH: Flow direction	Sign Swivel angle: Actual value
	Clockwise	**B** to **A**		**A**	Pump		**P** to **B** **A** to **T**	Positive
	Clockwise		**A** to **B**	**A**	Motor		**P** to **B** **A** to **T**	Positive
	Counter-clockwise		**B** to **A**	**A**	Pump		**P** to **A** **B** to **T**	Negative
	Counter-clockwise	**A** to **B**		**A**	Motor		**P** to **A** **B** to **T**	Negative

1) Vertical view of the optical swivel angle indicator
2) Viewed on drive shaft
3) Valid for high pressure at port **A** (standard).
When using the MPOS block, only high pressure at port **A** is possible.

Circuit diagram DS.. Sizes 500 to 1000

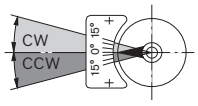
▼ **Circuit diagram standard A4VSG...DS2R/...W-... 10 T03...1N**



Secondary unit components	
1	Axial piston unit A4VSG size 500 to 1000
1.1	4-way control valve (see data sheet 29026)
	NG (A4VS) **Type**
	500 to 1000 4WRPH10 C3 B50L -2X/G24KO/M-750
1.2	Swivel angle sensor AWXF (see page 13)
1.3	Incremental encoder GEL 293 (see page 12)
2	Electrically releasable check valve RVE Ordering code: Order item 14, type code 1 (see page 14)
3	Anti-cavitation valve, order separately (see page 14)

Ports	
A	Working pressure (high-pressure series)
B	Low pressure (high-pressure series)
M_{A1}; M_1; M_2	Measuring working pressure
M_{B1}	Measuring low pressure
M_{A2}	Measuring control pressure
M_{B2}	Measuring control pressure
M_P	External control pressure
T	Fluid drain
T_1; T_2	Leakage/air bleeding
K	Flushing
R(L)	Control fluid return flow
U	Bearing flushing
P_{ST}	Pilot pressure
E	Boost pressure
R_{KV}	Control fluid return flow
P	Control pressure
R2 - R7	Air bleeding the control

Flow direction

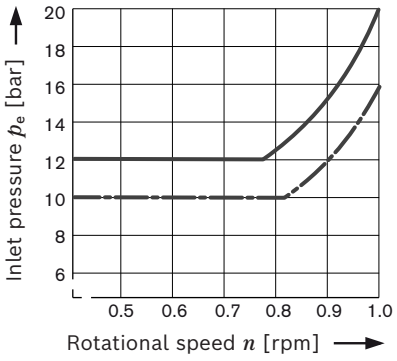
Size 500 to 1000	**Swivel direction**[1]	**Direction of rotation**[2] **Clockwise**	**Counter-clockwise**	**High pressure in**[3]	**Operating mode**	**Control valve 4WRPH** **Control part**	**Flow direction**	**Sign Swivel angle Actual value**
	Clockwise	**B** to **A**		**A**	Pump		**P** to **A** **B** to **T**	Positive
	Clockwise		**A** to **B**	**A**	Motor		**P** to **A** **B** to **T**	Positive
	Counter-clockwise		**B** to **A**	**A**	Pump		**P** to **B** **A** to **T**	Negative
	Counter-clockwise	**A** to **B**		**A**	Motor		**P** to **B** **A** to **T**	Negative

1) Vertical view of the optical swivel angle indicator
2) Viewed on drive shaft
3) Valid for high pressure at port **A** (standard).
When using the MPOS block, only high pressure at port **A** is possible.

Working pressure range

Pressure at working port A or B		Definition
Nominal pressure p_{nom}	315 bar[1)]	The nominal pressure corresponds to the maximum design pressure.
Maximum pressure p_{max}	400 bar[2)]	The maximum pressure corresponds to the maximum working pressure within a single operating period. The sum of single operating periods must not exceed the total operating period.
Single operating period	1 s	
Total operating period	300 h	
Minimum pressure (high-pressure side)	15 bar	Minimum pressure at the high-pressure side (**A** or **B**) which is required to prevent damage to the axial piston unit.
Minimum pressure (low-pressure side)		Minimum pressure on the low-pressure side (**A** or **B**) required to prevent damage to the axial piston unit. The minimum pressure depends on the rotational speed and the boost pressure (see diagram).
Rate of pressure change $R_{A\,max}$	16000 bar/s	Maximum permissible speed of pressure build-up and reduction during a pressure change across the entire pressure range.
Recommended boost pressure p_{SP} (input) (for boost pumps, see data sheet 92100)		
	16 bar	Size 40 to 500 series 1x and 30
	10 bar	Sizes 250 and 500 series 33
	25 bar	Size 750 to 1000 series 30
Maximum boost pressure - attachment pump $p_{S\,max}$ at control[3)]:		
	50 bar	For details on the pilot or control pressure, see diagram "Required pilot pressure depending on the working pressure"
Case pressure at connection K_2, K_3, R(L)		
Max. static pressure $p_{L\,max}$	4 bar absolute[4)]	Maximum 1.2 bar higher than inlet pressure at port **S**, but not higher than $p_{L\,max}$. The permissible case pressure depends on the rotational speed (see diagram). A drain line to the reservoir is required.
Pressure peaks $p_{L\,peak}$	6 bar absolute	t< 0.1 s

▼ **Minimum pressure, low-pressure side (boost pressure)**



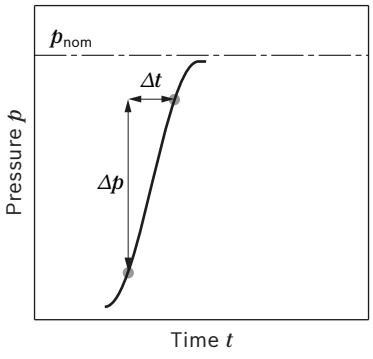
NG 750 and 1000/30

NG 40 to 500/30

Minimum recommended setting (pressure gauge indicator)

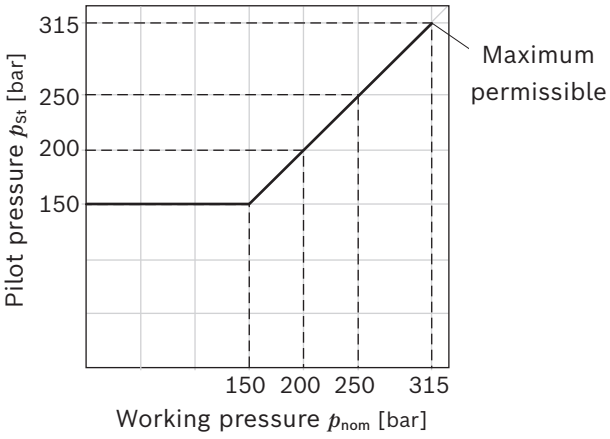
NG 250 and 500/33

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



For details on the shaft seal ring, see data sheet 92100.

▼ **Required pilot pressure depending on the working pressure**



Notice

The table data are reference values (valid for mineral oil).
Specified pressures according to DIN 24312.
Please contact us for special operating conditions (sales.industry.horb@boschrexroth.de).

1) Due to the permissible data of the control valve and other system components
2) For permissible inlet pressure of the respective attachment pump, see the corresponding data sheet
3) For permissible inlet pressure of the respective attachment pump, see the corresponding data sheet
4) Please contact us if the value cannot be observed

Technical data

For a highly dynamic accurate drive system, a backlash-free minimum mass moment of inertia directly on the shaft of the secondary unit is required. Information on this can be found in the row "Required minimum total moment of inertia". A higher moment of inertia improves the control behavior.

Size		NG		40	71	125	180	250	355	500	750	1000
Geometric displacement, per revolution		$V_{g\,max}$	cm^3	40	71	125	180	250	355	500	750	1000
Maximum rotational speed[1)]	at 1.0 $V_{g\,max}$; $p_E \geq 15$ bar	n_{nom}	rpm	3700	3200	2600	2400	2000	2000	1800	1600	1600
	at 0.8 $V_{g\,max}$; $p_E \geq 15$ bar	n_{max}	rpm	4900	4100	3400	2900	2600	2200	2000	1800	1600
Power	at n_{nom}, $V_{g\,max}$ and Δp = 300 bar	P	kW	74	114	163	216	250	355	450	600	800
Torque	at $V_{g\,max}$ and Δp = 300 bar	M	Nm	191	339	597	859	1194	1695	2387	3581	4775
Control volume	from 0 to $V_{g\,max}$	$V_{S\,max}$	cm^3	5.9	10.5	26.0	26.0	50.9	50.9	63.8	105	129
Actuating time	from 0 to $V_{g\,max}$	t_s	s	0.030	0.040	0.050	0.050	0.060	0.060	0.080	0.090	0.10
Moment of inertia			kgm^2	0.0049	0.0121	0.0300	0.055	0.0959	0.19	0.3325	0.66	1.20
Required minimum total moment of inertia			kgm^2	0.025	0.06	0.15	0.27	0.48	0.95	1.66	3.33	6
Weight (with RVE and incremental encoder) approx.		m	kg	67	83	126	140	225	248	381	523	630

Determining the characteristics for operation as a pump

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

Key

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

Determining the characteristics for operation as a motor

Displacement	$q_v = \frac{V_g \times n}{1000 \times \eta_v}$	[l/min]
Torque	$M = \frac{V_g \times \Delta p \times \eta_{hm}}{20 \times \pi}$	[Nm]
Output power	$P = \frac{2\,\pi \times M \times n}{60000} = \frac{q_v \times \Delta p \times \eta_t}{600}$	[kW]

Key

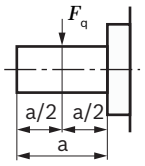
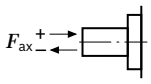
V_g	=	Displacement per revolution [cm^3]
Δp	=	Differential pressure [bar]
n	=	Rotational speed [rpm]
η_v	=	Volumetric efficiency
η_{hm}	=	Hydraulic-mechanical efficiency
η_t	=	Total efficiency ($\eta_t = \eta_v \times \eta_{hm}$)

Notice

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

1) The values are applicable:
- for the optimum viscosity range from ν_{opt} = 36 to 16 mm^2/s
- with hydraulic fluid based on mineral oils

Permissible radial and axial loading of the drive shaft

Size		NG		41	71	125	180	250	355	500	750	1000
Maximum radial force at a/2		$F_{q\,max}$	N	1200	1700	2500	3100	4000	4400	5000	6000	10000
Maximum axial force												
at case pressure p_{max} 1 bar absolute		± $F_{ax\,max}$	N	1000	1400	1900	2250	3000	3600	4000	5450	8000
at case pressure p_{max} 4 bar absolute		+ $F_{ax\,max}$	N	620	810	1050	1400	1850	2100	2500	3150	4700
		– $F_{ax\,max}$	N	1380	1950	2750	3050	4150	5050	5500	7800	11000

Notice

- The values given are maximum values and do not apply to continuous operation. The drive with radial loading (pinion, V-belt) is not permissible!

1) Vertical view of the optical swivel angle indicator
2) Viewed on drive shaft

DS2R rotational speed control

Rotational speed control is when the DS2 control device changes the swivel angle and thus the displacement of the axial piston unit at a constant working pressure until the torque required to maintain the specified rotational speed is built up.
In a supply network with constant working pressure, the torque is proportional to the swivel angleIn the displacement of the axial piston unit. The displacement is sensed by an inductive position transducer, the rotational speed by an incremental encoder.
A control valve controls the displacement.
When higher requirements are placed on the dynamics of the drive system, the control valve can be replaced with a servo valve.
When the emergency shut-down is used, the electrically releasable check valve RVE (hydraulic connector) at the pressure port is brought to the locked position.
This then prevents energy from being supplied to the secondary unit; only regenerative braking with energy recovery to the hydraulic network is possible.

The following pages describe:

- The incremental encoder GEL 293 for sensing the rotational speed
- The position transducer AWXF for sensing the swivel angle
- The electrically releasable RVE A4VS check valve
- The digital controller assembly group SYHNC100-SEK

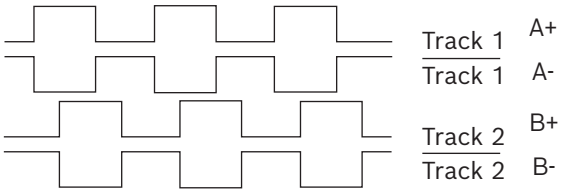
Information on pilot valve (DS2R) 4WRPH6/10..-750 can be found in data sheet 29026.

Incremental encoder GEL 293

Technical data (type code position 12 "T03")	
Resolution	
T03	1000 increments/revolution
Type of protection according to EN 60529	IP 66 with installed and locked plug-in connector
Power consumption: R_L= ∞; U_B= 5 V	≤1.3 W
Ambient temperature	–20 °C to +85 °C

Signal pattern T

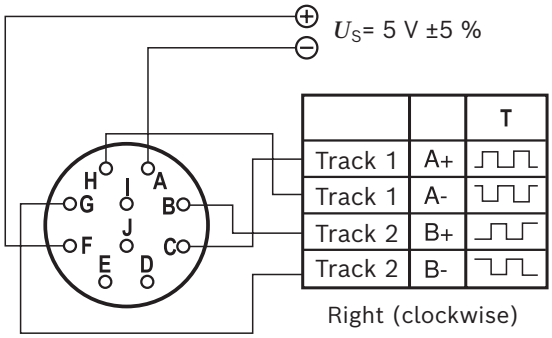
Supply voltage U_S= 5 V ±5%; signal voltage U_{Si}= 5 V
Clockwise-rotating signal image viewed on drive shaft



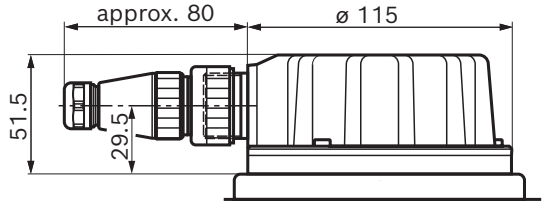
Electrical connection

Maximum cable lengths
Between the incremental encoder and the downstream electronics: Earth the cable shield on one side of the receiver. The data specified are reference values and refer to the cable type LiYCY 6 (10) x 0.25 mm².

f	[kHz]	5	10	20	50	100	200
l_{max}	[m]	200	200	200	200	145	72



▼ **Dimensions** (in mm)



The plug-in connector is included in the scope of delivery. It is possible to use other rotational speed sensing systems. In this case, please contact us (sales.industry.horb@boschrexroth.de).

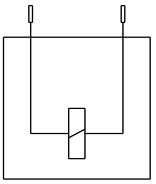
Connector for solenoids

DEUTSCH DT04-2P-EP04

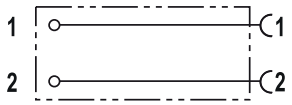
Molded, 2-pin, without bidirectional suppressor diode.
The following type of protection ensues with the mounted mating connector:

▶ IP67/IP66 (DIN/EN 60529)

▼ **Switching symbol**



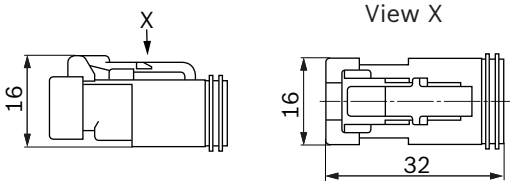
▼ **Circuit diagram pin image**



▼ **Plug-in connector**
Directional valve with device connector K40 (DEUTSCH connector)

Code 2P DT06 K40..	**Voltage** DC/AC U	**Current** I_{max}	**Color**	**Wire cross section** [mm²]	**Material number**
..AWG14	10...32 V	5 A	gray	AWG14-16 1.3..2.08	R900733451
..AWG16	10...32 V	5 A	gray	AWG16-18 0.83..1.3	R901017847

▼ **Dimensions** (in mm)



The mating connector is not included in the scope of delivery and must be ordered separately.
The following are required:

Load-holding function LS1363	1 connector
Electrically releasable check valve	1 connector
Electrically releasable shut-off block	1 connector
Manual overload protection MOPS	2 connectors

Accessories (not included in the scope of delivery)

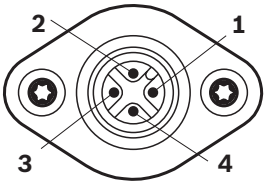
Crimping tool	Type HDT-4800, Deutsch

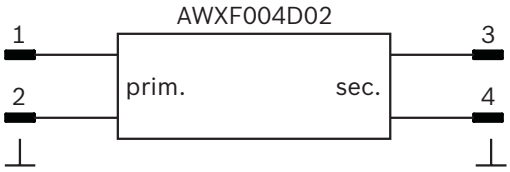
Notice
Further information in RE 08006 "Plug-in connectors and wiring harnesses for valves and sensors in hydraulic systems".

Swivel angle sensor AWXF

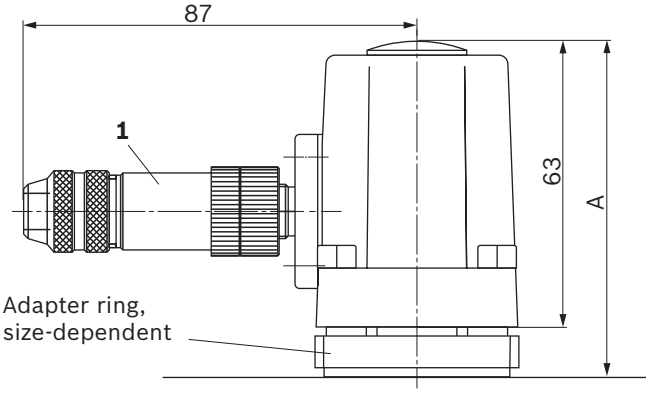
Technical data			
Measuring system			Differential transformer
Control stroke		mm	±4.5
Linearity tolerance		%	≤1.0
Carrier frequency		kHz	5
Coil resistance (At 20 °C)	Primary coil	Ω	120
	per secondary coil	Ω	280
Electrical connection			Plug-in connection M12 × 1, 4-pin
Plug-in connection type of protection according to EN 60529			IP66/IP67 with mounted and locked plug-in connector
Ambient temperature			–20 °C to +80 °C

▼ **Electrical connection**





▼ **Dimensions** (in mm)



1 Plug-in connector is included in the scope of delivery.

▼ **Table of values dimension A**

Size								
40	**71**	**125**	**180**	**250**	**355**	**500**	**750**	**1000**
86	90	96	86	81	81	81	81	81

Electrically releasable check valve RVE

(Order item 14, type code 1)

Technical data		
Electric (see also directional seat valve M–3SED6, data sheet 22049)		
DC voltage	V	24
Power consumption	W	30
Duty cycle		Continuous operation
Type of protection according to EN 60529		IP66/IP67 with mounted and locked plug-in connector

Hydraulic (see also cartridge valves type LC.., data sheet 21010)			
Size	Logic element	Installed in the housing	Maximum flow $q_{v\,max}$ in l/min at a pressure drop of 5 bar
40	LC16B40D-7X/	AGEV4-05701-AB/46	200
71	LC25B40D-7X/	AGEV4-05702-AB/46	400
125	LC32B40D-7X/	AGEV4-05703-AB/46	700
180	LC32B40D-7X/	AGEV4-05703-AB/46	700
250	LC32B40D-7X/	AGEV4-05704-AB/46	700
355	LC32B40D-7X/	AGEV4-05704-AB/46	700
500	LC40B40D-7X/	AGEV4-05705-AB/46	1200
750	LC40B40D-7X/	AGEV4-05705-AB/46	1200
1000	LC40B40D-7X/	AGEV4-05705-AB/46	1200

Anti-cavitation valve S...A

(Without order item, selection according to the following table)

Ordering code for A4VSG	
Size	Anti-cavitation valve
40	S10A1.0
71	S15A1.0
125	S20A1.0
180	S20A1.0
250	S25A1.0
355	S25A1.0
500	S30A1.0
750	S30A1.0
1000	S30A1.0

Notice

- For details on the anti-cavitation valves, see data sheet 20375.

Digital controller assembly group SYHNC100-SEK...3x

(Without order item; selection according to data sheet 30162)

Features

The digital controller assembly group SYHNC100-SEK-...-3x is suitable for the rotational speed control, closed loop torque control and open loop torque control of secondary controlled axial piston units type A4VS..DS2.
It contains interfaces to measure the swivel angle position of single or tandem units as well as for rotational speed return with incremental encoders. The software contains control and monitoring functions specifically designed for the secondary control.

Additional features:

- Up to 2 modules for evaluating the signals from up to 4 LVDT swivel angle sensors
- Up to 2 incremental encoder inputs with monitoring function for rotational speed sensing
- Up to 8 analog inputs (voltage or current) for the setpoint specification
- Up to 6 analog outputs for controlling downstream valve amplifiers
- Digital inputs and outputs for communication with a higher-level control
- Profibus DP or CANopen for communication with a higher-level control
- Layout of the master/slave applications via internal CAN interface
- Installation on a 35 mm top hat rail

Software functionality

The software basically contains the control types: rotational speed control, closed loop torque control, and open loop torque control.
You can switch between the control types during operation without any hitches.
The configuration, parameterization and diagnosis of the SYHNC100-SEK-...-3x is done using the PC program WINPED. Only the "WIN-PED 6.6" version is used.
This can be downloaded from www.boschrexroth.com/hnc100 free of charge.
System-specific software extensions can be created on request.

Monitoring functions

- Cable break monitoring for incremental and SSI encoders
- Cable break monitoring for swivel angle sensor
- Acceleration too high
- Overspeed (max. rotational speed)
- Rotational speed difference target / actual
- Swivel angle difference target / actual

Further information

Data sheet 30162 "Digital controller assembly group HNC100-SEK for secondary control of axial piston units, type SYHNC100-SEK

Notice about the system structure

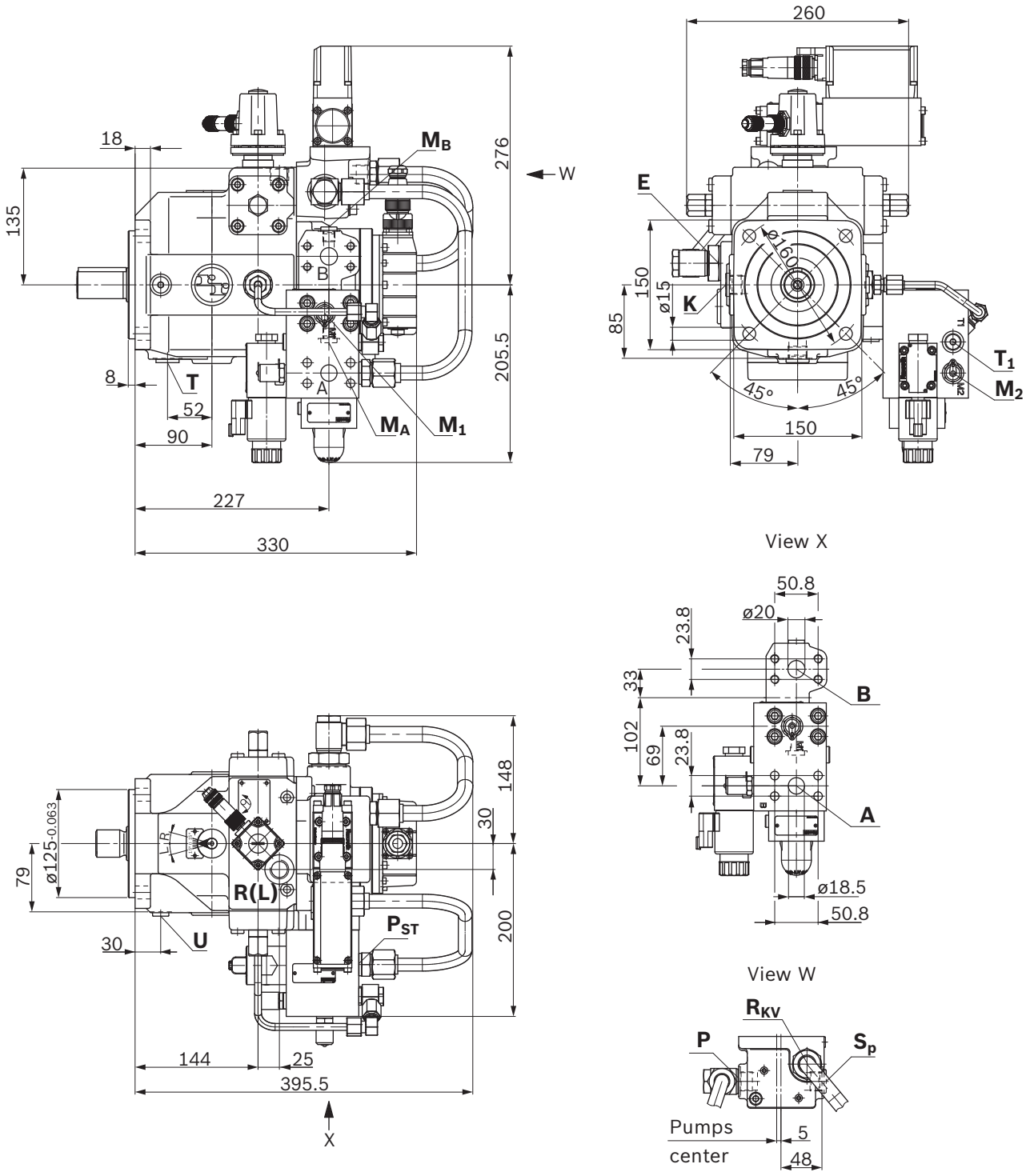
The secondary unit with ordering code 04 = "DS2R" (with control valve) additionally requires the following, which are not included in the scope of delivery:

- Digital controller assembly group SYHNC100-SEK-...-3x according to data sheet 30162
- Amplifier VT-VRRA 1-527-20/V0 according to data sheet 30041 (for A4VS size 40 and 71)
  or
  Amplifier VT-VRRA 1-537-20/V0 according to data sheet 30041 (for A4VS size 125 to 1000)
- Card holder VT3002-1-2X/32F, material number 1834486001, according to data sheet 29928

Dimensions, size 40

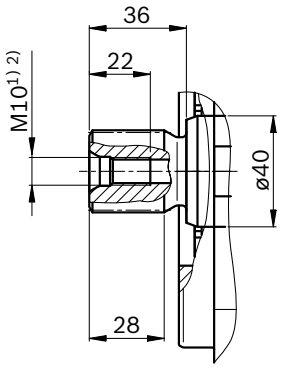
DS2 – secondary controlled unit with RVE check valve

Bidirectional direction of rotation



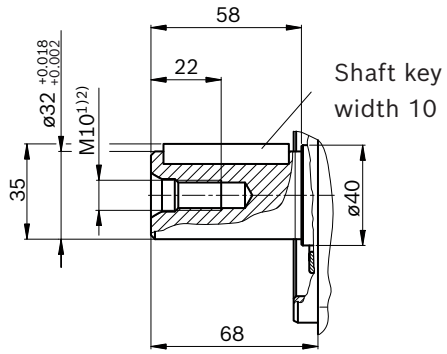
▼ **Splined shaft DIN 5480**

Z – W32x2x14x9g



▼ **Parallel keyed shaft DIN 6885**

P – Ø32 AS 10x8x56



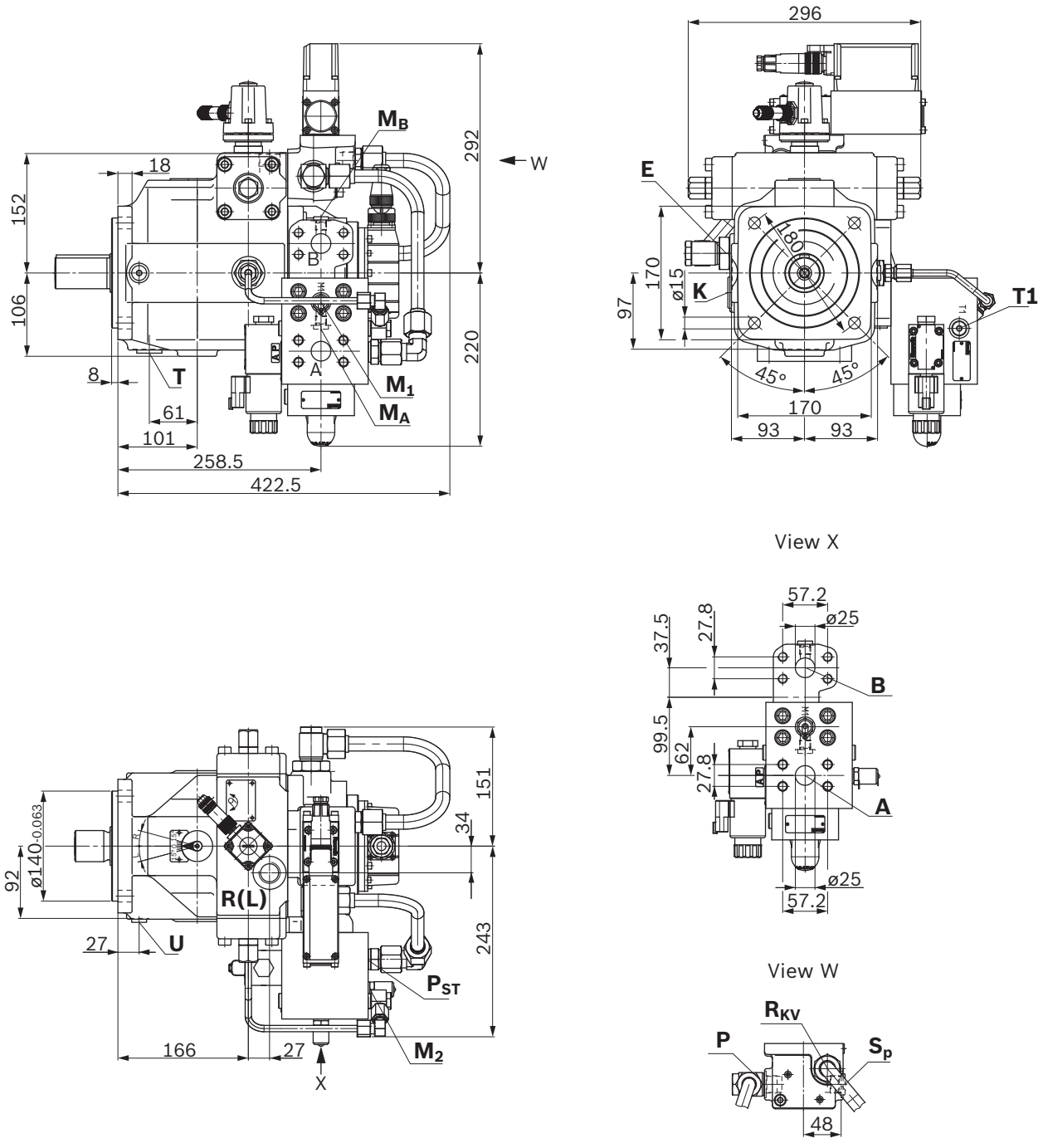
Ports		Standard	Size[1)]	$p_{max\ abs}$ [bar][2)]	State[6)]
A, B	Working port (high-pressure series) Fastening thread	SAE J518[3)] DIN 13	3/4 in M10 × 1.5; 17 deep	400	O
M_A; M_B	Measuring working pressure	DIN 3852	M14 × 1.5; 12 deep	400	X
M_1; M_2	Measuring working pressure	DIN 3852	G 1/4 in; 12 deep	400	X
S_P	Control pressure	DIN 3852	M22 × 1.5; 14 deep	315	O
T	Fluid drain	DIN 3852	M22 × 1.5; 14 deep	4	X
T_1; T_2	Leakage/air bleeding	DIN 3852	G 1/4 in; 12 deep	4	X
K	Flushing	DIN 3852[4)]	M22 × 1.5; 14 deep	4	O[5)]
R(L)	Control fluid return flow	DIN 3852[4)]	M22 × 1.5; 14 deep	4	O[5)]
U	Bearing flushing	DIN 3852	M14 × 1.5; 12 deep	7	X
P_{ST}	Pilot pressure	ISO 228	G 1/2; 15 deep	315	piped up
E	Boost pressure	DIN 3852[4)]	M22 × 1.5; 20 deep	50	O
R_{KV}	Control fluid return flow	DIN 3852[4)]	M22 × 1.5; 14 deep	100	piped up
P	Control pressure	DIN 3852[4)]	M22 × 1.5; 14 deep	315	piped up

1) Observe the notes in the instruction manual concerning the maximum tightening torques.
2) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
3) Metric fastening thread is a deviation from standard.
4) The countersink may be deeper than specified in the standard.
5) Depending on the installation position, **K** or **R**(**L**) must be connected (also see installation instructions in data sheet 92100).
6) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

Dimensions, size 71

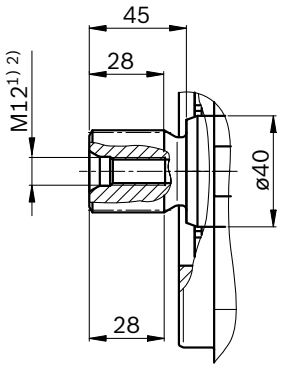
DS2 – secondary controlled unit with RVE check valve

Bidirectional direction of rotation



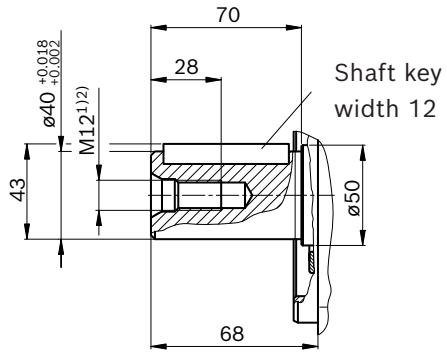
▼ **Splined shaft DIN 5480**

Z – W40x2x18x9g



▼ **Parallel keyed shaft DIN 6885**

P – Ø40 AS 12x8x58



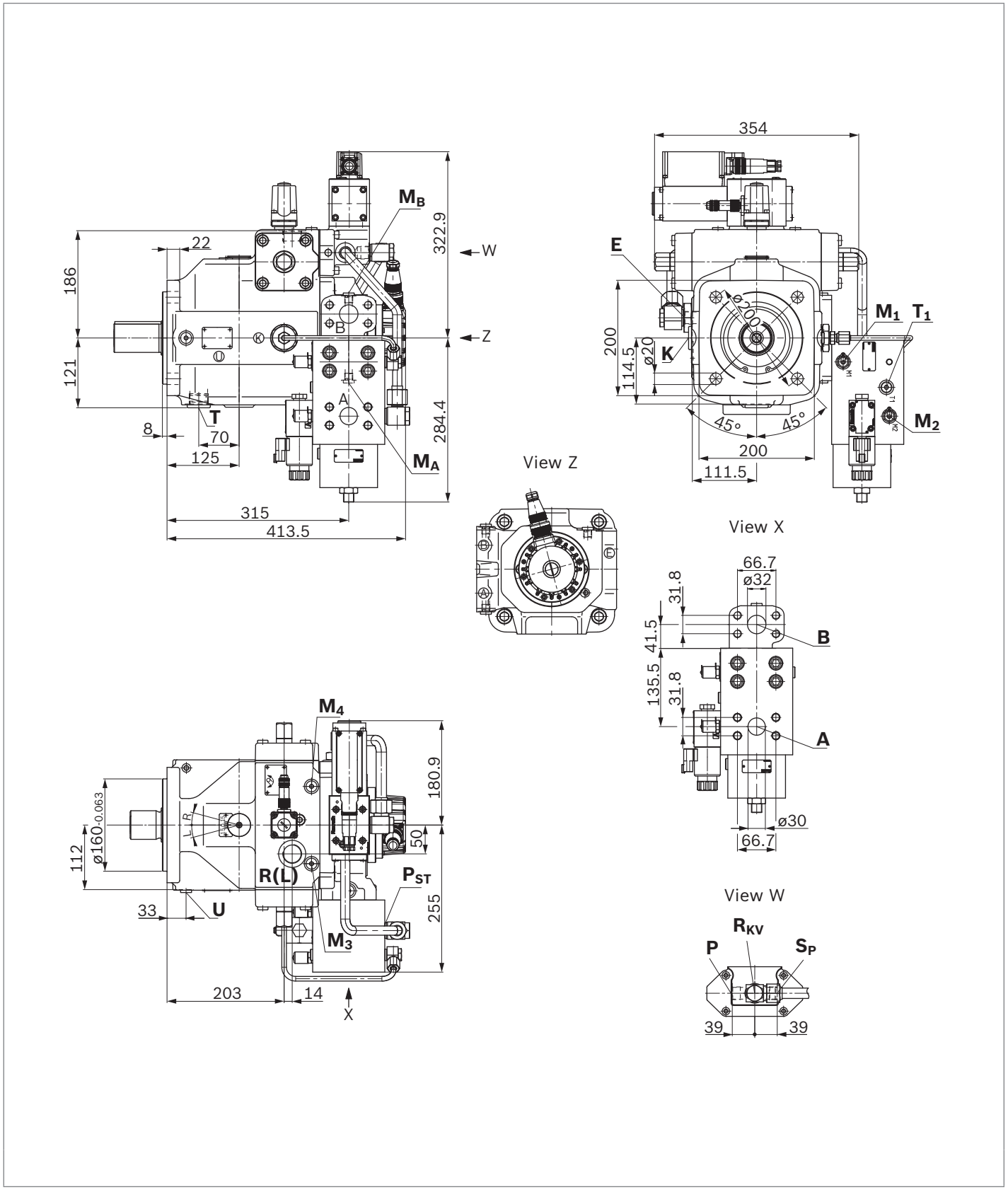
Ports		Standard	Size[1)]	$p_{max\ abs}$ [bar][2)]	State[6)]
A, B	Working port (high-pressure series) Fastening thread	SAE J518[3)] DIN 13	1 in M12 × 1.75; 17 deep	400	O
M_A; M_B	Measuring working pressure	DIN 3852	M14 × 1.5; 12 deep	400	X
M_1; M_2	Measuring working pressure	DIN 3852	G 1/4 in; 12 deep	400	X
S_P	Control pressure	DIN 3852	M22 × 1.5; 14 deep	315	O
T	Fluid drain	DIN 3852	M27 × 2; 12 deep	4	X
T_1; T_2	Leakage/air bleeding	DIN 3852	G 1/4 in; 12 deep	4	X
K	Flushing	DIN 3852[4)]	M27 × 2; 14 deep	4	O[5)]
R(L)	Control fluid return flow	DIN 3852[4)]	M27 × 2; 16 deep	4	O[5)]
U	Bearing flushing	DIN 3852	M14 × 1.5; 12 deep	7	X
P_{ST}	Pilot pressure	ISO 228	G 1/2; 15 deep	315	piped up
E	Boost pressure	DIN 3852[4)]	M22 × 1.5; 20 deep	50	O
R_{KV}	Control fluid return flow	DIN 3852[4)]	M22 × 1.5; 14 deep	100	piped up
P	Control pressure	DIN 3852[4)]	M22 × 1.5; 14 deep	315	piped up

1) Observe the notes in the instruction manual concerning the maximum tightening torques.
2) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
3) Metric fastening thread is a deviation from standard.
4) The countersink may be deeper than specified in the standard.
5) Depending on the installation position, **K** or **R**(**L**) must be connected (also see installation instructions in data sheet 92100).
6) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

Dimensions, size 125

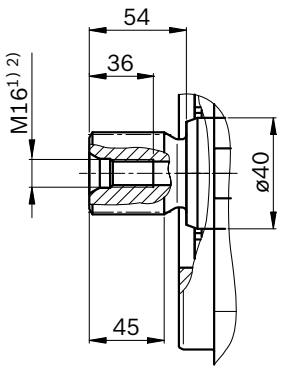
DS2 – secondary controlled unit with RVE check valve

Bidirectional direction of rotation



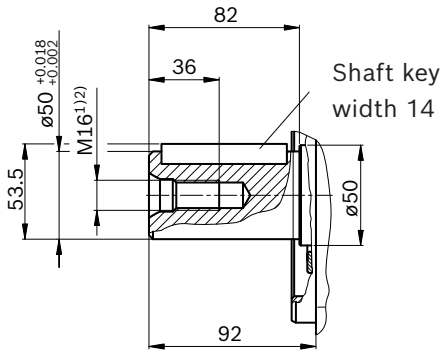
▼ **Splined shaft DIN 5480**

Z – W50x2x24x9g



▼ **Parallel keyed shaft DIN 6885**

P – Ø50 AS 14x9x80



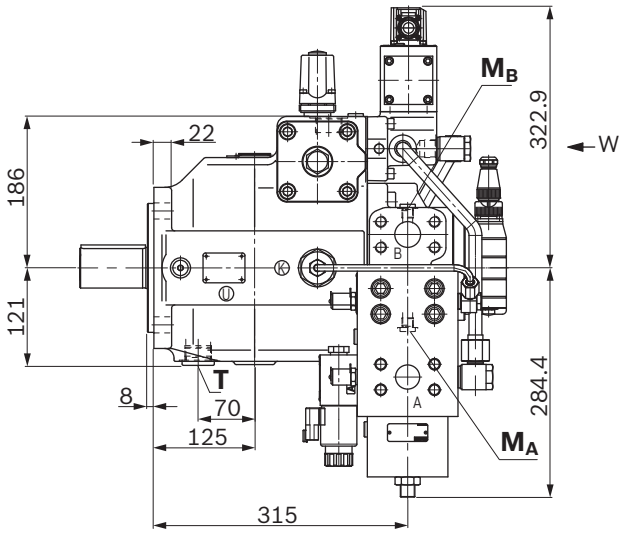
Ports		Standard	Size[1)]	$p_{max\ abs}$ [bar][2)]	State[6)]
A, B	Working port (high-pressure series) Fastening thread	SAE J518[3)] DIN 13	1 1/4 in M14 × 2; 19 deep	400	O
M_A; M_B	Measuring working pressure	DIN 3852	M14 × 1.5; 12 deep	400	X
M_1; M_2	Measuring working pressure	DIN 3852	M14 × 1.5; 12 deep	400	X
M_3; M_4	Measuring working pressure	DIN 3852	M14 × 1.5; 12 deep	400	X
S_P	Control pressure	DIN 3852	M22 × 1.5; 14 deep	315	O
T	Fluid drain	DIN 3852	M33 × 2; 18 deep	4	X
T_1; T_2	Leakage/air bleeding	DIN 3852	G 1/4 in; 12 deep	4	X
K	Flushing	DIN 3852[4)]	M33 × 2; 18 deep	4	O[5)]
R(L)	Control fluid return flow	DIN 3852[4)]	M33 × 2; 18 deep	4	O[5)]
U	Bearing flushing	DIN 3852	M14 × 1.5; 12 deep	7	X
P_{ST}	Pilot pressure	ISO 228	G 1/2; 15 deep	315	piped up
E	Boost pressure	DIN 3852[4)]	M22 × 1.5; 14 deep	50	O
R_{KV}	Control fluid return flow	DIN 3852[4)]	M22 × 1.5; 14 deep	100	piped up
P	Control pressure	DIN 3852[4)]	M22 × 1.5; 14 deep	315	piped up

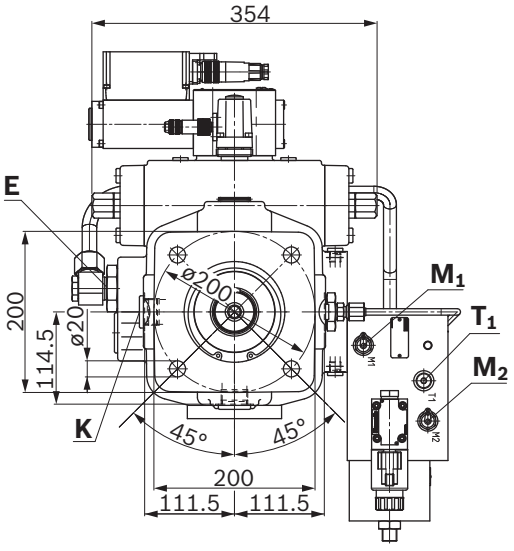
1) Observe the notes in the instruction manual concerning the maximum tightening torques.
2) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
3) Metric fastening thread is a deviation from standard.
4) The countersink may be deeper than specified in the standard.
5) Depending on the installation position, **K** or **R**(**L**) must be connected (also see installation instructions in data sheet 92100).
6) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

Dimensions, size 180

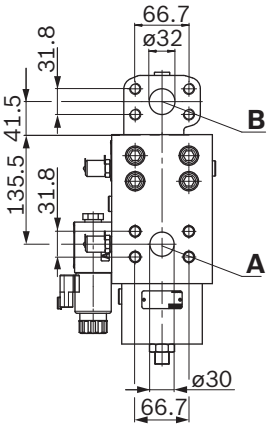
DS2 – secondary controlled unit with RVE check valve

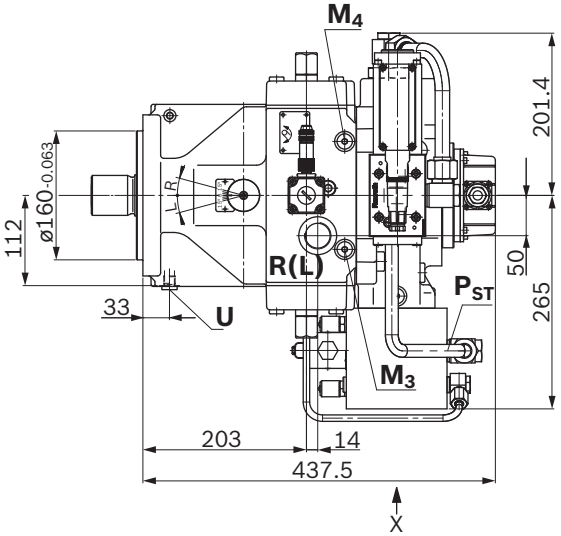
Bidirectional direction of rotation



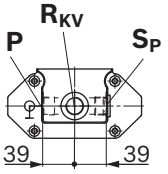


View X



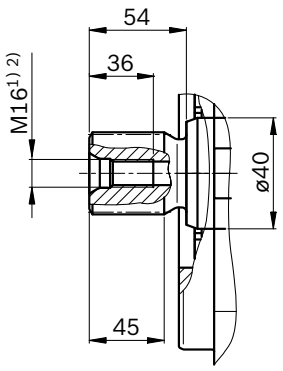


View W



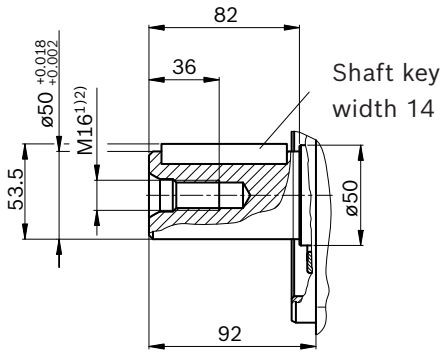
▼ **Splined shaft DIN 5480**

Z – W50x2x24x9g



▼ **Parallel keyed shaft DIN 6885**

P – Ø50 AS 14x9x80



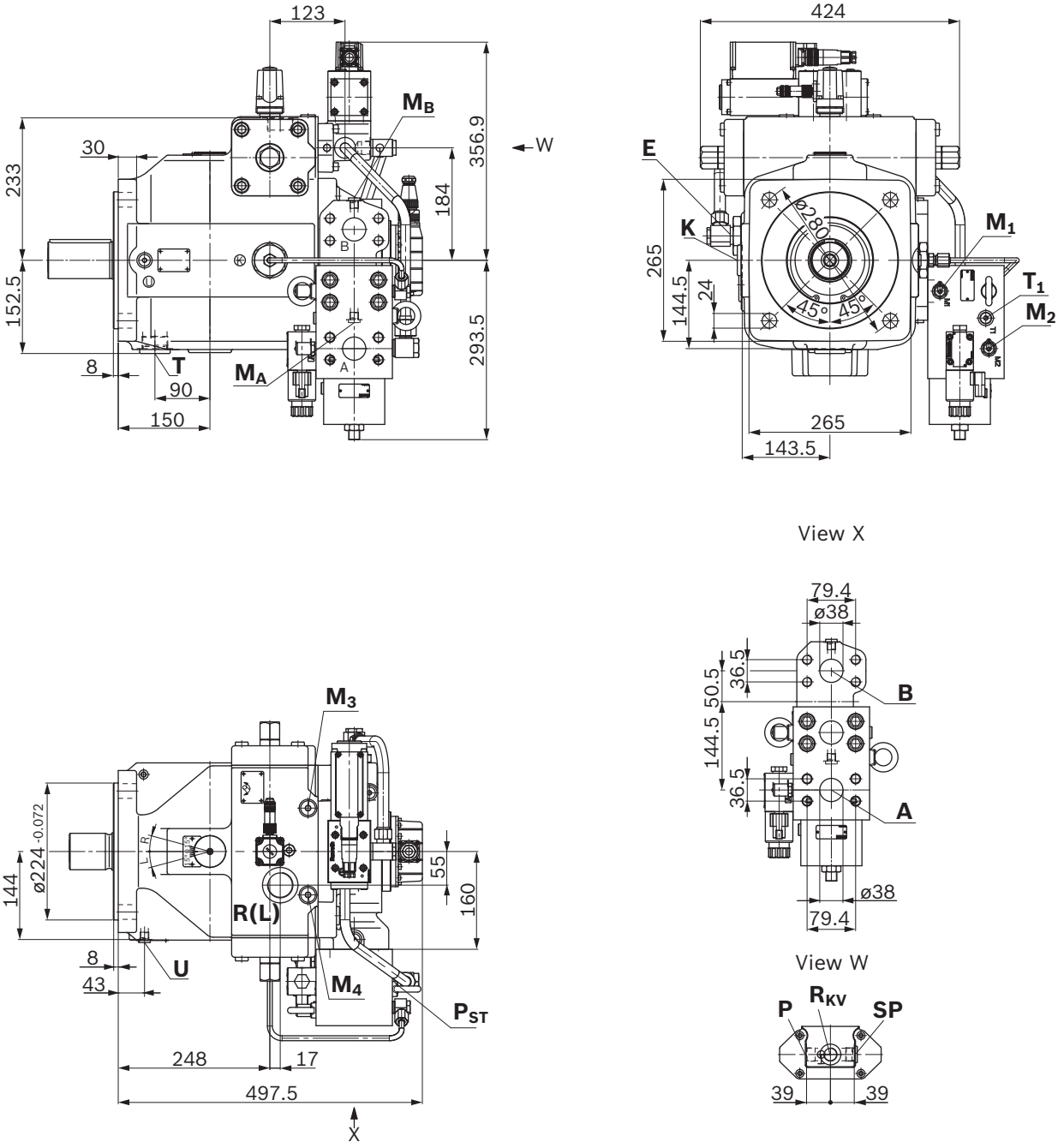
Ports		Standard	Size[1)]	$p_{max\ abs}$ [bar][2)]	State[6)]
A, B	Working port (high-pressure series) Fastening thread	SAE J518[3)] DIN 13	1 1/4 in M14 × 2; 19 deep	400	O
M_A; M_B	Measuring working pressure	DIN 3852	M14 × 1.5; 12 deep	400	X
M_1; M_2	Measuring working pressure	DIN 3852	G 1/4 in; 12 deep	400	X
S_P	Control pressure	DIN 3852	M22 × 1.5; 14 deep	315	O
T	Fluid drain	DIN 3852	M33 × 2; 18 deep	4	X
T_1; T_2	Leakage/air bleeding	DIN 3852	G 1/4 in; 12 deep	4	X
K	Flushing	DIN 3852[4)]	M33 × 2; 18 deep	4	O[5)]
R(L)	Control fluid return flow	DIN 3852[4)]	M33 × 2; 18 deep	4	O[5)]
U	Bearing flushing	DIN 3852	M14 × 1.5; 12 deep	7	X
P_{ST}	Pilot pressure	ISO 228	G 1/2; 15 deep	315	piped up
E	Boost pressure	DIN 3852[4)]	M22 × 1.5; 14 deep	50	O
R_{KV}	Control fluid return flow	DIN 3852[4)]	M22 × 1.5; 14 deep	100	piped up
P	Control pressure	DIN 3852[4)]	M22 × 1.5; 14 deep	315	piped up

1) Observe the notes in the instruction manual concerning the maximum tightening torques.
2) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
3) Metric fastening thread is a deviation from standard.
4) The countersink may be deeper than specified in the standard.
5) Depending on the installation position, **K** or **R**(**L**) must be connected (also see installation instructions in data sheet 92100).
6) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

Dimensions, size 250

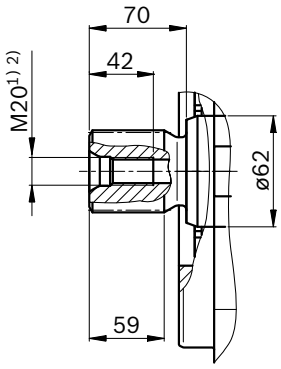
DS2 – secondary controlled unit with RVE check valve

Bidirectional direction of rotation



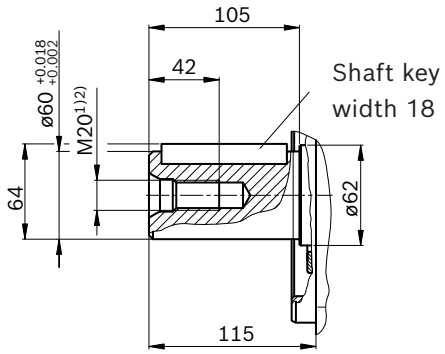
▼ **Splined shaft DIN 5480**

Z – W60x2x28x9g



▼ **Parallel keyed shaft DIN 6885**

P – Ø60 AS 18x11x100



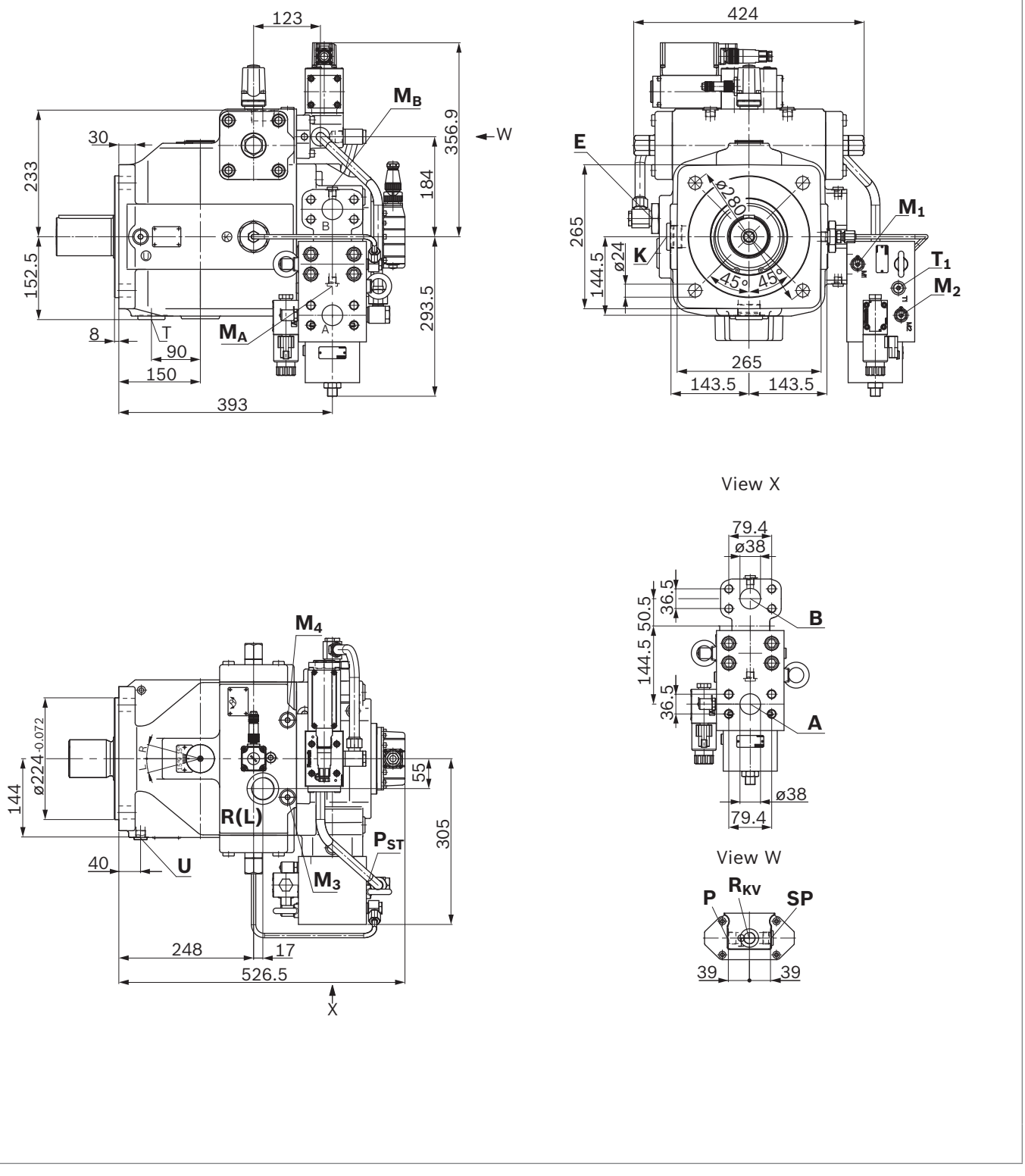
Ports		Standard	Size[1)]	$p_{max\ abs}$ [bar][2)]	State[6)]
A, B	Working port (high-pressure series) Fastening thread	SAE J518[3)] DIN 13	1 1/2 in M16 × 2; 21 deep	400	O
M_A; M_B	Measuring working pressure	DIN 3852	M14 × 1.5; 12 deep	400	X
M_1; M_2	Measuring working pressure	DIN 3852	G 1/4; 12 deep	400	X
S_P	Control pressure	DIN 3852	M22 × 1.5; 14 deep	315	O
T	Fluid drain	DIN 3852	M42 × 2; 20 deep	4	X
T_1; T_2	Leakage/air bleeding	DIN 3852	G 1/4 in; 12 deep	4	X
K	Flushing	DIN 3852[4)]	M42 × 2; 20 deep	4	O[5)]
R(L)	Control fluid return flow	DIN 3852[4)]	M42 × 2; 20 deep	4	O[5)]
U	Bearing flushing	DIN 3852	M14 × 1.5; 12 deep	7	X
P_{ST}	Pilot pressure	ISO 228	G 1/2; 15 deep	315	piped up
E	Boost pressure	DIN 3852[4)]	M22 × 1.5; 14 deep	50	O
R_{KV}	Control fluid return flow	DIN 3852[4)]	M22 × 1.5; 14 deep	100	piped up
P	Control pressure	DIN 3852[4)]	M22 × 1.5; 14 deep	315	piped up

1) Observe the notes in the instruction manual concerning the maximum tightening torques.
2) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
3) Metric fastening thread is a deviation from standard.
4) The countersink may be deeper than specified in the standard.
5) Depending on the installation position, **K** or **R**(**L**) must be connected (also see installation instructions in data sheet 92100).
6) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

Dimensions, size 355

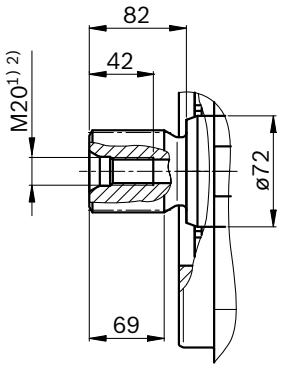
DS2 – secondary controlled unit with RVE check valve

Bidirectional direction of rotation



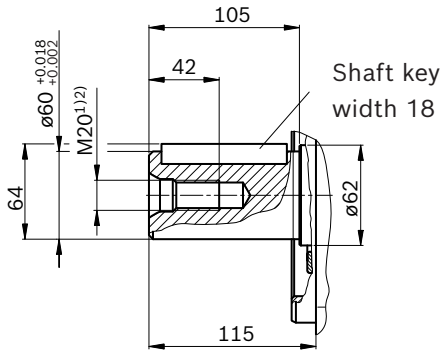
▼ **Splined shaft DIN 5480**

Z – W70x3x22x9g



▼ **Parallel keyed shaft DIN 6885**

P – Ø76 AS 20x12x100



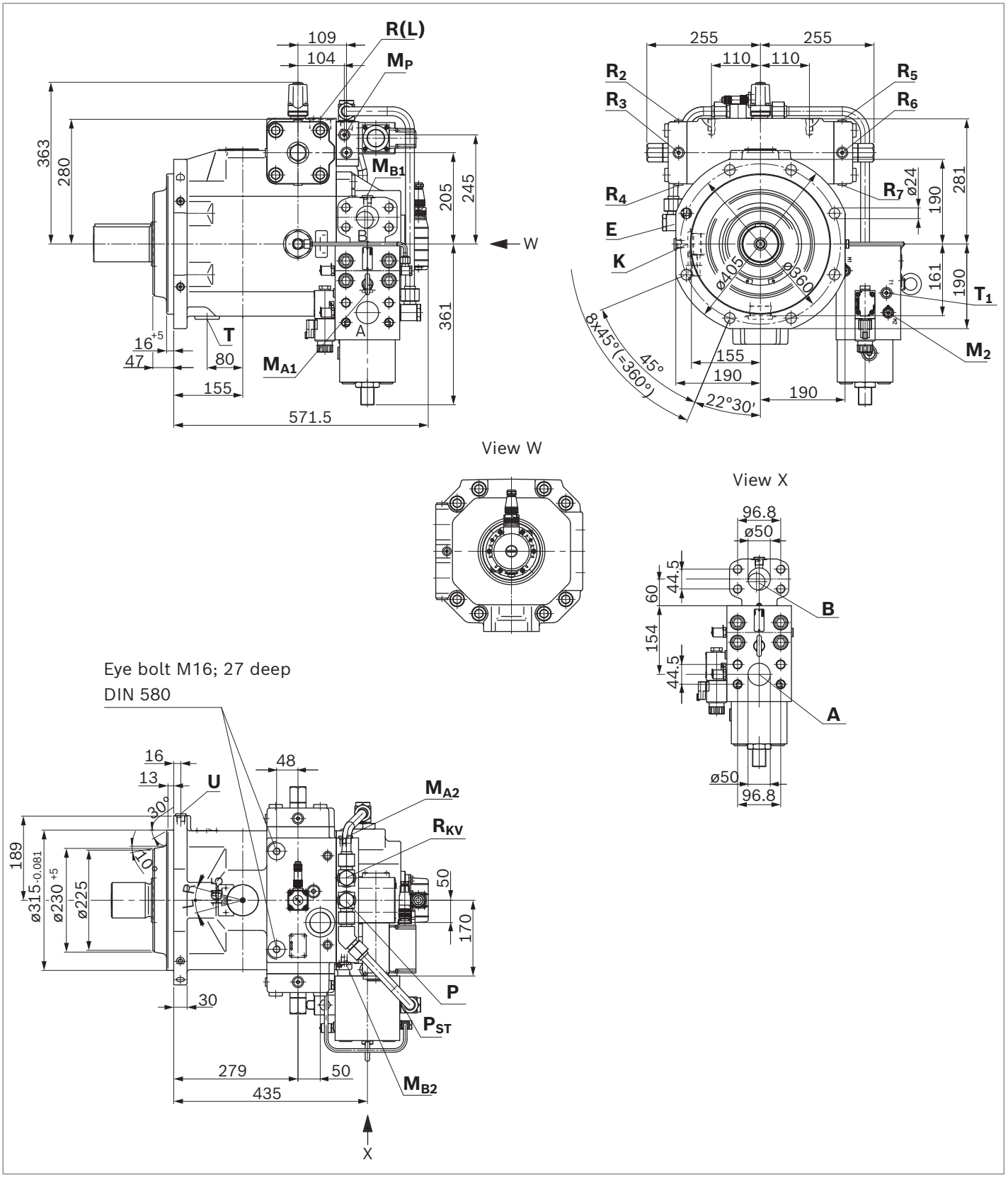
Ports		Standard	Size[1)]	$p_{max\ abs}$ [bar][2)]	State[6)]
A, B	Working port (high-pressure series) Fastening thread	SAE J518[3)] DIN 13	1 1/2 in M16 × 2; 21 deep	400	O
M_A; M_B	Measuring working pressure	DIN 3852	M14 × 1.5; 12 deep	400	X
M_1; M_2	Measuring working pressure	DIN 3852	G 1/4; 12 deep	400	X
M_3; M_4	Measuring working pressure	DIN 3852	M18 × 1.5; 12 deep	400	X
S_P	Control pressure	DIN 3852	M22 × 1.5; 14 deep	315	O
T	Fluid drain	DIN 3852	M42 × 2; 20 deep	4	X
T_1; T_2	Leakage/air bleeding	DIN 3852	G 1/4 in; 12 deep	4	X
K	Flushing	DIN 3852[4)]	M42 × 2; 20 deep	4	O[5)]
R(L)	Control fluid return flow	DIN 3852[4)]	M42 × 2; 20 deep	4	O[5)]
U	Bearing flushing	DIN 3852	M18 × 1.5; 12 deep	7	X
P_{ST}	Pilot pressure	ISO 228	G 1/2; 15 deep	315	piped up
E	Boost pressure	DIN 3852[4)]	M22 × 1.5; 14 deep	50	O
R_{KV}	Control fluid return flow	DIN 3852[4)]	M22 × 1.5; 14 deep	100	piped up
P	Control pressure	DIN 3852[4)]	M22 × 1.5; 14 deep	315	piped up

1) Observe the notes in the instruction manual concerning the maximum tightening torques.
2) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
3) Metric fastening thread is a deviation from standard.
4) The countersink may be deeper than specified in the standard.
5) Depending on the installation position, **K** or **R**(**L**) must be connected (also see installation instructions in data sheet 92100).
6) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

Dimensions, size 500

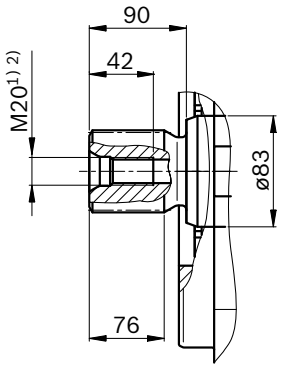
DS2 – secondary controlled unit with RVE check valve

Bidirectional direction of rotation



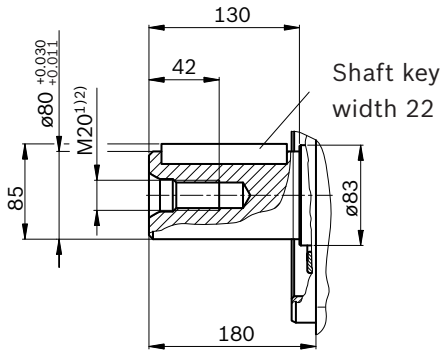
▼ **Splined shaft DIN 5480**

Z – W80x3x25x9g



▼ **Parallel keyed shaft DIN 6885**

P – Ø80 AS 22x14x125



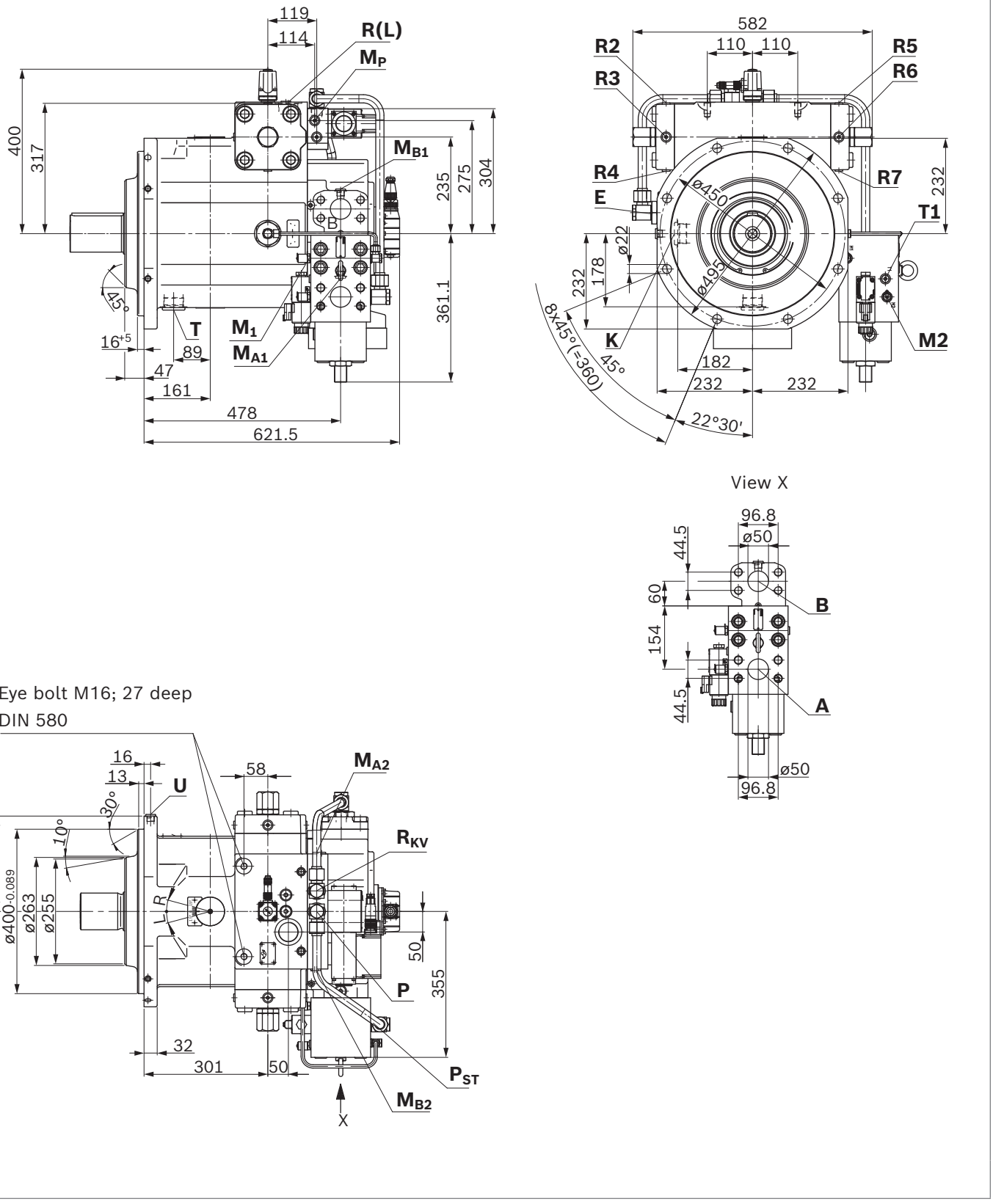
Ports		Standard	Size[1)]	$p_{max\ abs}$ [bar][2)]	State[6)]
A, B	Working port (high-pressure series) Fastening thread	SAE J518[3)] DIN 13	2 in M20 × 2.5; 24 deep	400	O
M_{A1}; M_{B1}	Measuring working pressure	DIN 3852	M18 × 1.5; 12 deep	400	X
M_{A2}; M_{B2}, M_P	Measuring control pressure	DIN 3852	M14 × 1.5; 12 deep	315	X
M_1; M_2	Measuring working pressure	DIN 3852	G 1/4; 12 deep	400	X
T	Fluid drain	DIN 3852	M48 × 2; 20 deep	4	X
T_1; T_2	Leakage/air bleeding	DIN 3852	G 1/4 in; 12 deep	4	X
K	Flushing	DIN 3852[4)]	M48 × 2; 20 deep	4	O[5)]
R(L)	Control fluid return flow	DIN 3852[4)]	M48 × 2; 20 deep	4	O[5)]
R_2 to **R_7**	Air bleeding the control	DIN 3852	M14 × 1.5; 12 deep	315	X
U	Bearing flushing	DIN 3852	M18 × 1.5; 12 deep	7	X
P_{ST}	Pilot pressure	ISO 228	G 3/4; 17 deep	315	piped up
E	Boost pressure	DIN 3852[4)]	M27 × 2; 20 deep	50	O
R_{KV}	Control fluid return flow	DIN 3852[4)]	M27 × 2; 16 deep	100	piped up
P	Control pressure	DIN 3852[4)]	M27 × 2; 16 deep	315	piped up

1) Observe the notes in the instruction manual concerning the maximum tightening torques.
2) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
3) Metric fastening thread is a deviation from standard.
4) The countersink may be deeper than specified in the standard.
5) Depending on the installation position, **K** or **R**(**L**) must be connected (also see installation instructions in data sheet 92100).
6) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

Dimensions, size 750

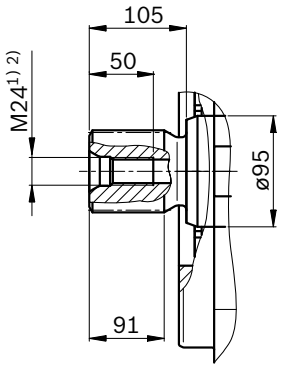
DS2 – secondary controlled unit with RVE check valve

Bidirectional direction of rotation



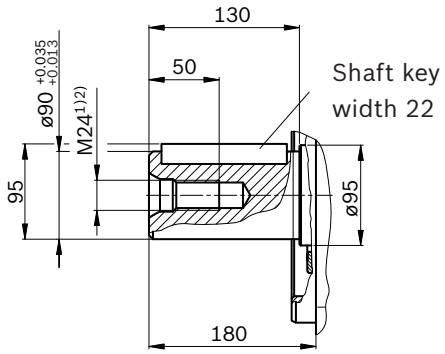
▼ **Splined shaft DIN 5480**

Z – W90x3x28x9g



▼ **Parallel keyed shaft DIN 6885**

P – Ø90 AS 25x14x125



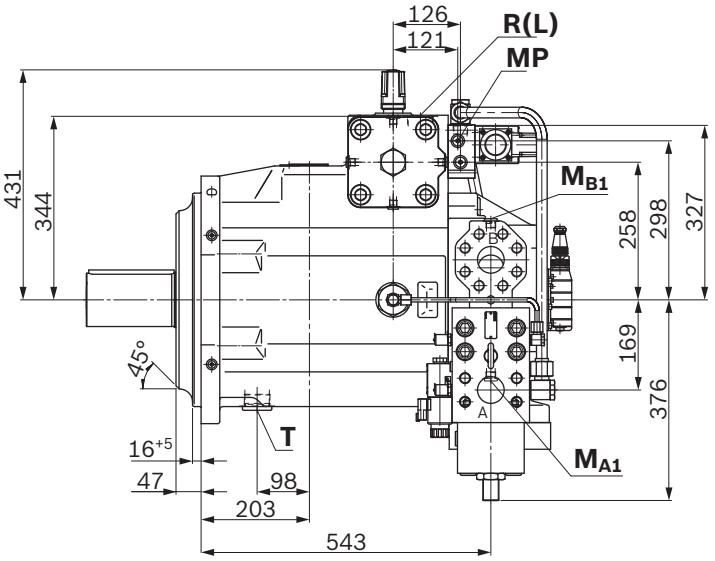
Ports		Standard	Size[1)]	$p_{max\ abs}$ [bar][2)]	State[6)]
A, B	Working port (high-pressure series) Fastening thread	SAE J518[3)] DIN 13	2 in M20 × 2.5; 28 deep	400	O
M_{A1}; M_{B1}	Measuring working pressure	DIN 3852	M18 × 1.5; 12 deep	400	X
M_{A2}; M_{B2}:M_P	Measuring working pressure	DIN 3852	M14 × 1.5; 12 deep	400	X
M_1; M_2	Measuring working pressure	DIN 3852	G 1/4; 12 deep	400	X
R_2 to R_7	Air bleeding the control	DIN 3852	M14 × 1.5; 12 deep	315	X
T	Fluid drain	DIN 3852	M48 × 2; 20 deep	4	X
T_1; T_2	Leakage/air bleeding	DIN 3852	G 1/4 in; 12 deep	4	X
K	Flushing	DIN 3852[4)]	M48 × 2; 20 deep	4	O[5)]
R(L)	Control fluid return flow	DIN 3852[4)]	M48 × 2; 20 deep	4	O[5)]
U	Bearing flushing	DIN 3852	M18 × 1.5; 12 deep	7	X
P_{ST}	Pilot pressure	ISO 228	G 3/4; 17 deep	315	piped up
E	Boost pressure	DIN 3852[4)]	M27 × 2; 20 deep	50	O
R_{KV}	Control fluid return flow	DIN 3852[4)]	M27 × 2; 16 deep	100	piped up
P	Control pressure	DIN 3852[4)]	M27 × 2; 16 deep	315	piped up

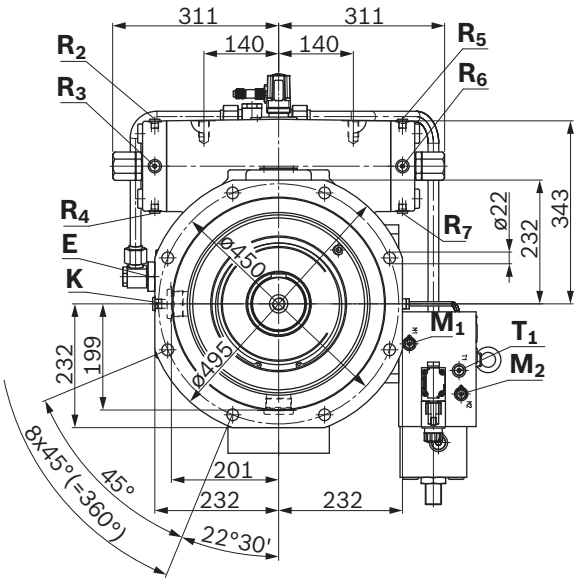
1) Observe the notes in the instruction manual concerning the maximum tightening torques.
2) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
3) Metric fastening thread is a deviation from standard.
4) The countersink may be deeper than specified in the standard.
5) Depending on the installation position, **K** or **R**(**L**) must be connected (also see installation instructions in data sheet 92100).
6) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

Dimensions, size 1000

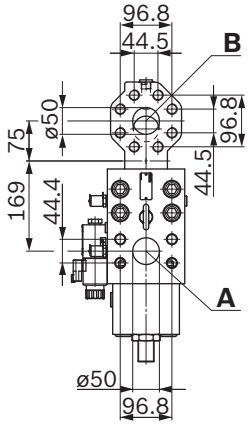
DS2 – secondary controlled unit with RVE check valve

Bidirectional direction of rotation

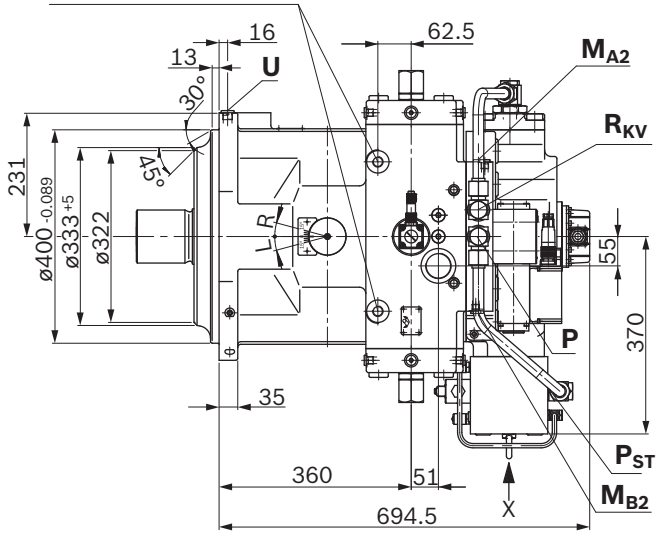




View X

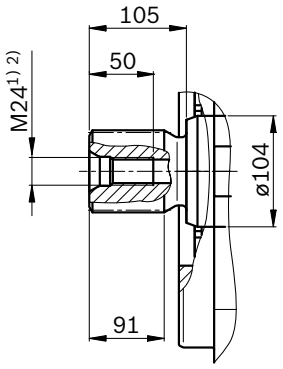


Eye bolt M16; 27 deep
DIN 580



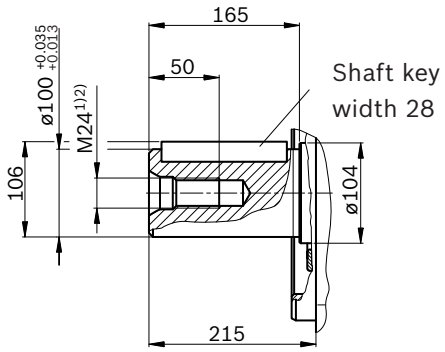
▼ **Splined shaft DIN 5480**

Z – W100x3x32x9g



▼ **Parallel keyed shaft DIN 6885**

P – Ø100 AS 28x16x160



Ports		Standard	Size[1)]	$p_{max\ abs}$ [bar][2)]	State[6)]
A, B	Working port (high-pressure series) Fastening thread	SAE J518[3)] DIN 13	2 in M20 × 2.5; 24 deep	400	O
M_{A1}; M_{B1}	Measuring working pressure	DIN 3852	M18 × 1.5; 12 deep	400	X
M_{A2}; M_{B2}:M_P	Measuring working pressure	DIN 3852	M14 × 1.5; 12 deep	400	X
M_1; M_2	Measuring working pressure	DIN 3852	G 1/4; 12 deep	400	X
R_2 to R_7	Air bleeding the control	DIN 3852	M14 × 1.5; 12 deep	315	X
T	Fluid drain	DIN 3852	M48 × 2; 20 deep	4	X
T_1; T_2	Leakage/air bleeding	DIN 3852	G 1/4 in; 12 deep	4	X
K	Flushing	DIN 3852[4)]	M48 × 2; 20 deep	4	O[5)]
R(L)	Control fluid return flow	DIN 3852[4)]	M48 × 2; 20 deep	4	O[5)]
U	Bearing flushing	DIN 3852	M18 × 1.5; 12 deep	7	X
P_{ST}	Pilot pressure	ISO 228	G 3/4; 17 deep	315	piped up
E	Boost pressure	DIN 3852[4)]	M27 × 2; 20 deep	50	O
R_{KV}	Control fluid return flow	DIN 3852[4)]	M27 × 2; 16 deep	100	piped up
P	Control pressure	DIN 3852[4)]	M27 × 2; 16 deep	315	piped up

1) Observe the notes in the instruction manual concerning the maximum tightening torques.
2) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
3) Metric fastening thread is a deviation from standard.
4) The countersink may be deeper than specified in the standard.
5) Depending on the installation position, **K** or **R**(**L**) must be connected (also see installation instructions in data sheet 92100).
6) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

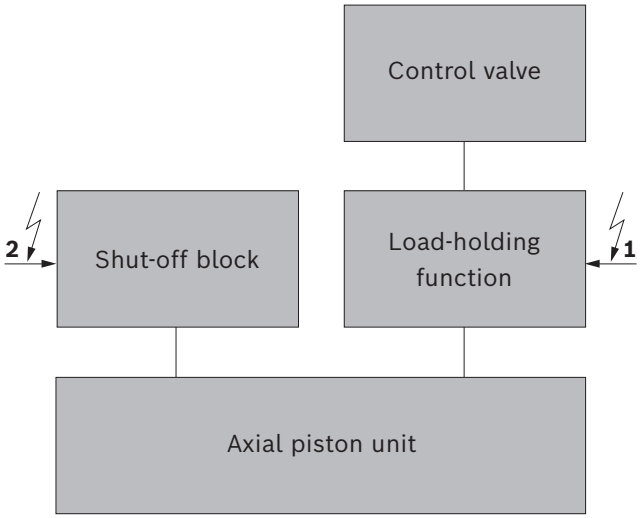
A4VSG...DS2 for use in winch and crane applications

For use in cranes and winches, specifically in the marine and offshore sectors, safety functions are required to comply with the specifications of the classification societies. For this purpose control blocks are available, which guarantee the required emergency functions such as holding the load in the event of a hydraulic system failure, emergency lifting and lowering, or the emergency jettisoning of a load in the event of a system failure.

The following combinations are available:
- Holding the load in the event of a hydraulic system failure
- Holding the load in the event of a hydraulic system failure and manual overload protection
  MOPS (**M**anual **O**verload **P**rotection **S**ystem)
- Emergency lifting and lowering in the event of a system failure

Holding the load in the event of a hydraulic system failure
Order item 14, code 2:
Electrically releasable shut-off block for combination with load-holding function LS 1363
Order item 6, code LL/LR

▼ **Layout diagram**



1 Load-holding function
- **0 V** = load-holding function **on**, winch drive **off**.
- **24 V** = load-holding function **off**, winch drive **on**.

2 Shut-off block
- **0 V** = enable axial piston unit **inactive**
- **24 V** = enable axial piston unit **active**.

The load-holding function with LS 1363 is mounted between the control valve and the secondary unit and allows the secondary unit to swivel into a predefined end stop in an emergency. This function ensures that when the shut-off block is closed, the load is held with maximum torque and no high pressure without the use of any external control or PLC.
The clockwise (LR) / counter-clockwise (LL) swivel parameter is necessary to determine the correct effective direction of the holding torque.
For LX, the load-holding function LS 1363 is not piped up when delivered and can thus be piped up to adapt to the swivel direction. The end user is then responsible for the piping.

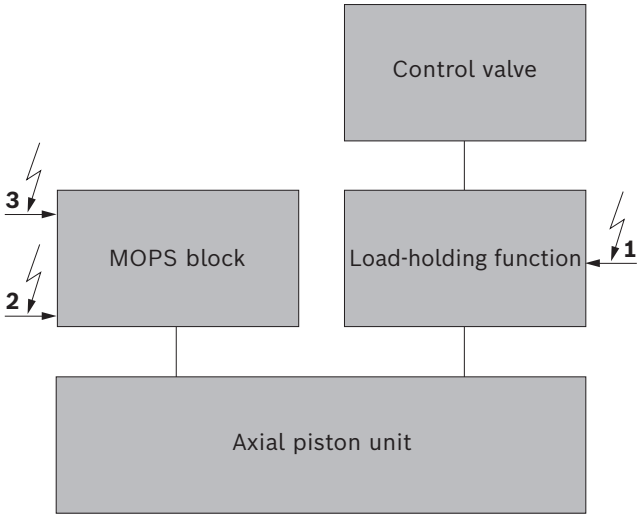
In the secondary controlled winch drive, the LS1363 is switched on with 24 V and is inactive. The emergency function is activated when the valve is switched off. The winch drive can no longer be controlled.

Notice
This order item 14, code 2 does not have integrated maximum pressure limitation as standard. This must be provided externally or as a mounting block. Please contact us for a technical explanation (sales.industry.horb@boschrexroth.de).

Holding the load in the event of a hydraulic system failure and manual overload protection MOPS

Order item 14, code 3:
Electrically releasable shut-off block for combination with load-holding function LS 1363, type code LL/LR, and manual overload protection MOPS

▼ **Layout diagram**



1 Load-holding function
- ▶ **0 V** = load-holding function **on**, winch drive **off**.
- ▶ **24 V** = load-holding function **off**, winch drive **on**.

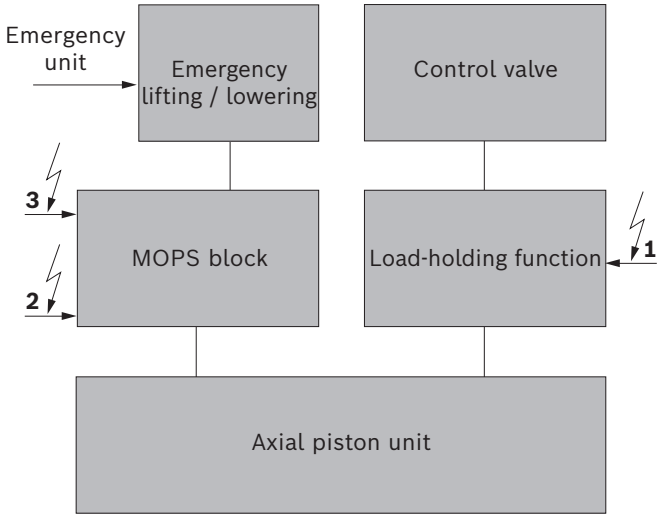
2 MOPS block shut-off function
- ▶ **0 V** = enable axial piston unit **inactive**
- ▶ **24 V** = enable axial piston unit **active**

3 MOPS block pressure limitation
- ▶ **0 V** = system pressure p_{HD} **on**, MOPS function **off**
- ▶ **24 V** = system pressure p_{HD} **off**, MOPS function **on**

In addition to holding the load with maximum torque and no high pressure, this block combination also enables the "manual overload protection" function, which can be used to drop the load in the event of an emergency in order to secure the crane and the crew. The function of the load-holding function with LS1363 is described on page 34.

▼ **Layout diagram for emergency lifting and lowering**

In the event of a system failure, this function and an emergency unit can be used to lift the suspended load on board again or to lower it to the bottom of the sea with limited function.



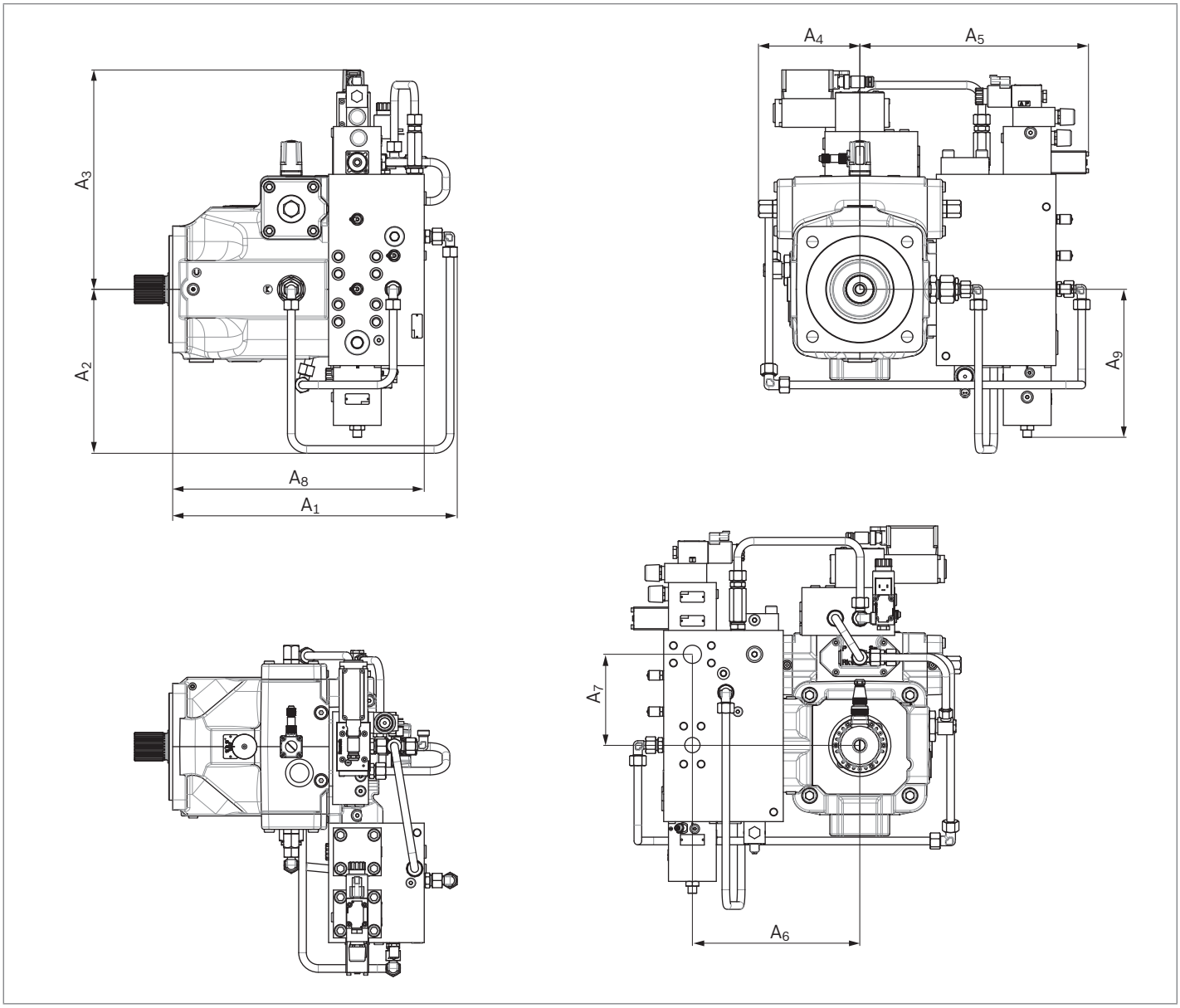
The load-holding function, MOPS block shut-off function and MOPS block pressure limitation are controlled as described under order item 14, code 3 on the left

Emergency lifting and lowering

Notice
The emergency lifting and lowering function must be designed specifically for the project. Please contact us for a technical explanation (sales.industry.horb@boschrexroth.de).

Dimensions of all valve block attachments

DS2 – Secondary controlled unit with all valve block attachments (order item 14, code 3)
Bidirectional direction of rotation



NG	A1	A2	A3	A4	A5	A6	A7	A8	A9
40	401	260	365	130	342	225	83	332	227
71	433	265	360	158	357	240	88	364	232
125	519	340	441	177	426	305	115	450	307
180	519	340	441	177	436	315	115	450	307
250	595	343	459	212	478	350	191	526	310
355	602	344	447	212	498	370	190	533	311
500	674	469	447	254	545	410	165	605	436
750	717	469	447	292	585	450	165	648	436
1000	782	484	462	309	600	465	180	713	451

Project planning notes

- The axial piston variable pump A4VSG is intended for use in a closed circuit.
- The project planning, installation and commissioning of the axial piston unit requires the involvement of skilled personnel.
- Before using the axial piston unit, please read the corresponding instruction manual completely and thoroughly. If necessary, this can be requested from Bosch Rexroth.
- Before finalizing your design, please request a binding installation drawing.
- The specified data and notes contained herein must be observed.
- Depending on the operating conditions of the axial piston unit (working pressure, fluid temperature), the characteristic curve may shift.
- The characteristic curve may also shift due to the dither frequency or control electronics.
- Preservation: Our axial piston units are supplied as standard with preservation protection for a maximum of 12 months. If longer preservation protection is required (maximum 24 months), please specify this in plain text when placing your order. The preservation periods apply under optimal storage conditions, details of which can be found in the data sheet 90312 or the instruction manual.
- Not all versions of the product are approved for use in safety functions according to ISO 13849. Please consult the proper contact at Bosch Rexroth if you require reliability parameters (e.g. $MTTF_d$) for functional safety.
- Depending on the type of control used, electromagnetic effects can be produced when using solenoids. Applying a direct voltage signal (DC) to solenoids does not create electromagnetic interference (EMI) nor is the solenoid affected by EMI. Electromagnetic interference (EMI) potential exists when operating and controlling a solenoid with a modulated direct voltage signal (e.g. PWM signal) Appropriate testing and measures should be taken by the machine manufacturer to ensure other components or operators (e.g. with pacemaker) are not affected by this potential.
- Pressure controllers are not safeguards against pressure overload. Be sure to add a pressure relief valve to the hydraulic system.
- For controllers requiring external pilot pressure, sufficient control fluid must be provided to the associated ports to ensure the required pilot pressures for the respective controller function. These controllers are subject to leakage due to their design. An increase in control fluid demand has to be anticipated over the total operating time. The design of the control fluid supply must thus be sufficiently large. If the control fluid is too low, the respective controller function may be impaired and undesired system behavior may result.
- For drives that are operated for a long period of time with constant rotational speed, the natural frequency of the hydraulic system can be stimulated by the excitation frequency of the pump (rotational speed frequency x 9). This can be prevented with suitably designed hydraulic lines.
- Please note the details regarding the tightening torques of port threads and other threaded joints in the instruction manual.
- The ports and fastening threads are designed for the p_{max} permissible pressures of the respective ports, see the connection tables. The machine or system manufacturer must ensure that the connecting elements and lines correspond to the specified application conditions (pressure, flow, hydraulic fluid, temperature) with the necessary safety factors.
- The service ports and function ports are only intended to accommodate hydraulic lines.

Safety instructions

- During and shortly after operation, there is a risk of getting burnt on the axial piston unit and especially on the solenoids. Take the appropriate safety measures (e.g. by wearing protective clothing).
- Moving parts in control equipment (e.g. valve spools) can, under certain circumstances, get stuck in position as a result of contamination (e.g. contaminated hydraulic fluid, abrasion, or residual dirt from components). As a result, the hydraulic fluid flow and the build-up of torque in the axial piston unit can no longer respond correctly to the operator's specifications. Even the use of various filter elements (external or internal flow filtration) will not rule out a fault but merely reduce the risk. The machine/system manufacturer must test whether remedial measures are needed on the machine for the application concerned in order to bring the driven consumer into a safe position (e.g. safe stop) and ensure any measures are properly implemented.
- In certain conditions, moving parts in high pressure relief valves might get stuck in an undefined position due to contamination (e.g. contaminated hydraulic fluid). This can result in restriction or loss of load-holding functions in lifting winches.
  The machine/system manufacturer must check whether additional measures are required on the machine for the relevant application in order to keep the load in a safe position and ensure they are properly implemented.

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