Control devices
HM, HS, HS4 and EO

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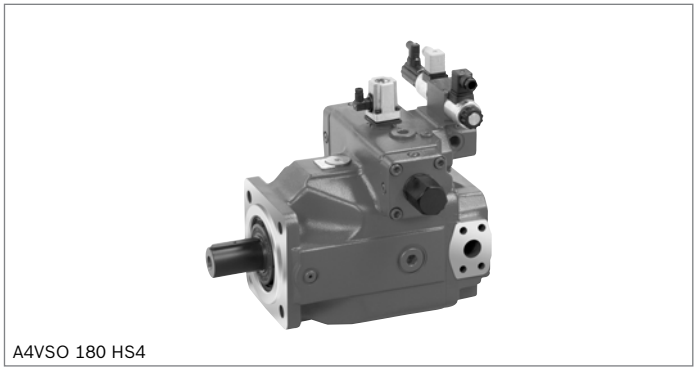


A4VSO 180 HS4

- Control device for axial piston variable pumps A4VSO, A4VBO, A4VSG and A4CSG
- Open and closed circuits

Features

- Control with servo or proportional valve
- Together with amplifier and PC program BODAC, freely programmable (HS4)
- High-precision control of swivel angle, pressure and power (HS4P)
- Mechanical $V_{g\,min}$ and $V_{g\,max}$ limitation
- Electric control system for inside-reservoir installation under fluid (HS4M)
- The special version enables mooring, overcenter and decompression via the pump.
- With optional internal control pressure supply (HS4V)

Further information

- Variable pump A4VSO, data sheet 92050
- Variable pump A4VBO, data sheet 92122
- Variable pump A4VSG, data sheet 92100
- Variable pump A4CSG, data sheet 92105

Contents

Type code for A4VSO

01	02	03	04		05	06		07	08	09	10	11	12	13
	A4VS(L)	**O**		**/**			**–**							

Hydraulic fluid

01	For details see data sheet 92050

Axial piston unit

02	Swashplate design, variable	**A4VS(L)**[1]

Operating mode

03	Pump, open circuit (see data sheet 92050)	**O**

Size (NG)

04	Geometric displacement V_g [cm³]	**40**	**71**	**125**	**180**	**250**	**355**	**500**	**750**	**1000**	

Control devices		**40**	**71**	**125**	**180**	**250**	**355**	**500**	**750**	**1000**	
05	**Hydraulic control, control volume dependent**										
	minimum control pressure 20 bar	●	●	●	–	●	–	–	–	–	**HM1**
	minimum control pressure 50/100/125 bar	●	●	●	●	●	●	●	●	●	**HM2**
	Hydraulic control, with servo valve for electric displacement control with VT-SR7-1X	●	●	●	●	●	●	●	●	●	**HS**[2]
	without valve	●	●	●	●	●	●	●	●	●	**HSE**
	with short circuit valve	●	●	●	●	●	●	●	●	●	**HSK**[2]
	Hydraulic control, with proportional valve for electric and electronic displacement, as well as pressure and power control with VT-VPCD-1X	●	●	●	●	●	●	●	●	●	**HS4**[2]
	with short circuit valve	●	●	●	●	●	●	●	●	●	**HS4K**[2]
	with pressure transducer HM20	●	●	●	●	●	●	●	●	●	**HS4P**[2]
	with short circuit valve and pressure transducer HM20	●	●	●	●	●	●	●	●	●	**HS4KP**[2]
	suitable for use under fluid	●	●	●	●	●	●	●	●	●	**HS4M**[2]
	with internal control pressure supply	●	●	●	●	●	●	–	–	–	**HS4V**[2]
	Hydraulic control, with proportional valve for electric displacement control with VT 5035-1X										
	minimum control pressure 20 bar	●	●	●	–	●	–	–	–	–	**EO1**[2]
	with short circuit valve	●	●	●	–	●	–	–	–	–	**EO1K**[2]
	minimum control pressure 50/100/125 bar	●	●	●	●	●	●	●	●	●	**EO2**[2]
	with short circuit valve	●	●	●	●	●	●	●	●	●	**EO2K**[2]

Series

06	Series 1, index 0	●	●	–	–	–	–	–	–	–	**10**
	Series 3, index 0	–	–	●	●	●	●	●	●	●	**30**

For details see data sheet 92050 (A4VSO)

07	Direction of rotation
08	Sealing material
09	Drive shaft
10	Mounting flange
11	Port plate for working lines
12	Through drive

Filtration (parameter only with HS control)		**40**	**71**	**125**	**180**	**250**	**355**	**500**	**750**	**1000**	
13	Without filter (without symbol)	●	●	●	●	●	●	●	●	●	
	Intermediate plate filter with HS control	●	●	●	●	●	●	–	–	–	**Z**

1) Charge pump (L) only available with NG750
2) Operation with HF hydraulic fluids on request

● = Available o = On request – = Not available

Type code for A4VBO

01	02	03		04	05	06		07	08	09	10	11
A4VB	**O**		**/**			**–**						

Axial piston unit

01	Swashplate design, variable	**A4VB**

Operating mode

02	Pump, open circuit (see data sheet 92122)	**O**

Size (NG)

03	Geometric displacement V_g [cm³]	**71**	**125**	**450**	

Control devices		**71**	**125**	**450**	
04	**Hydraulic control, with proportional valve** for electric and electronic displacement, as well as pressure and power control with VT-VPCD-1X	●	●	●	**HS4**[1)]

Series

05	Series 1, index 0	●	–	–	**10**
	Series 3, index 0	–	●	●	**30**

For details see data sheet 92122 (A4VBO)

06	Direction of rotation
07	Sealing material
08	Drive shaft
09	Mounting flange
10	Port plate for working lines
11	Through drive

● = Available – = Not available

1) Operation with HF hydraulic fluids on request

Type code for A4VSG

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

Hydraulic fluid

01	For details see data sheet 92100	

Axial piston unit

02	Swashplate design, variable	**A4VS**

Operating mode

03	Pump, closed circuit (see data sheet 92100)	**G**

Size (NG)

04	Geometric displacement V_g [cm³]	**40**	**71**	**125**	**180**	**250**	**355**	**500**	**750**	**1000**	

Control devices		**40**	**71**	**125**	**180**	**250**	**355**	**500**	**750**	**1000**	
05	**Hydraulic control, control volume dependent**										
	minimum control pressure 20 bar	●	●	●	–	●	–	–	–	–	**HM1**
	minimum control pressure 50/100/125 bar	●	●	●	●	●	●	●	●	●	**HM2**
	Hydraulic control, with servo valve for electric displacement control with VT-SR7-1X	●	●	●	●	●	●	●	●	●	**HS**[1]
	without valve	●	●	●	●	●	●	●	●	●	**HSE**
	with short circuit valve	●	●	●	●	●	●	●	●	●	**HSK**[1]
	Hydraulic control, with proportional valve for electric and electronic displacement, as well as pressure and power control with VT-VPCD-1X	●	●	●	●	●	●	●	●	●	**HS4**[1]
	with short circuit valve	●	●	●	●	●	●	●	●	●	**HS4K**[1]
	with pressure transducer HM20	●	●	●	●	●	●	●	●	●	**HS4P**[1]
	with short circuit valve and pressure transducer HM20	●	●	●	●	●	●	●	●	●	**HS4KP**[1]
	suitable for use under fluid	●	●	●	●	●	●	●	●	●	**HS4M**[1]
	Hydraulic control, with proportional valve for electric displacement control with VT 5035-1X										
	minimum control pressure 20 bar	●	●	●	–	●	–	–	–	–	**EO1**[1]
	with short circuit valve	●	●	●	–	●	–	–	–	–	**EO1K**[1]
	minimum control pressure 50/100/125 bar	●	●	●	●	●	●	●	●	●	**EO2**[1]
	with short circuit valve	●	●	●	●	●	●	●	●	●	**EO2K**[1]

Series

06	Series 1, index 0	●	●	–	–	–	–	–	–	–	**10**
	Series 3, index 0	–	–	●	●	●	●	●	●	●	**30**

For details see data sheet 92100 (A4VSG)

07	Direction of rotation
08	Sealing material
09	Drive shaft
10	Mounting flange
11	Port plate for working lines
12	Through drive
13	Valve

Filtration		**40**	**71**	**125**	**180**	**250**	**355**	**500**	**750**	**1000**	
14	Without filter	●	●	●	●	●	●	●	●	●	**N**
	With mounted filter in the boost circuit	●	●	●	●	●	●	●	●	●	**F**
	Intermediate plate filter with HS control	●	●	●	●	●	●	–	–	–	**Z**
	With mounted filter in the boost circuit (**F**) and intermediate plate filter with HS control	●	●	●	●	●	●	–	–	–	**U**

1) Operation with HF hydraulic fluids on request ● = Available o = On request – = Not available

Type code for A4CSG

01	02	03		04	05		06	07	08	09	10	11	12	14
A4CS	**G**		**/**	**30**		**–**								

Axial piston unit

01	Swashplate design, variable	**A4CS**

Operating mode

02	Pump, closed circuit (see data sheet 92105)	**G**

Size (NG)

03	Geometric displacement V_g [cm³]	**250**	**355**	**500**	**750**	

Control devices		**250**	**355**	**500**	**750**	
04	**Hydraulic control, control volume dependent**					
	minimum control pressure 50/100/125 bar	●	●	●	●	**HM2**
	Hydraulic control, with servo valve for electric displacement control with VT-SR7-1X	●	●	●	●	**HS**
	without valve	●	●	●	●	**HSE**
	with short circuit valve	●	●	●	●	**HSK**
	Hydraulic control, with proportional valve for electric and electronic displacement, as well as pressure and power control with VT-VPCD-1X	●	●	●	●	**HS4**
	with short circuit valve	●	●	●	●	**HS4K**
	with pressure transducer HM20	●	●	●	●	**HS4P**
	with short circuit valve and pressure transducer HM20	●	●	●	●	**HS4KP**
	suitable for use under fluid	●	●	●	●	**HS4M**
	Hydraulic control, with proportional valve for electric displacement control with VT 5035-1X					
	minimum control pressure 100/125 bar	●	●	●	●	**EO2**
	with short circuit valve	●	●	●	●	**EO2K**

Series

05	Series 3, index 0	●	●	●	●	**30**

For details see data sheet 92105 (A4CSG)

06	Direction of rotation
07	Sealing material
08	Drive shaft
09	Mounting flange
10	Port plate for working lines
11	Boost pump
12	Through drive
13	Valve

Filtration		**250**	**355**	**500**	**750**	
14	Without filter	●	●	●	●	**N**
	With threaded port for filter in the boost circuit	●	●	●	●	**D**
	With mounted filter (optical/electrical contamination indicator) in the boost circuit	●	●	●	●	**M**
	With threaded port for filter in the boost circuit (**D**) and intermediate plate filter with HS control	●	●	–	–	**Z**
	With mounted filter in the boost circuit (**M**) and intermediate plate filter with HS control	●	●	–	–	**U**

● = Available – = Not available

HM1 / HM2 – Hydraulic control, control volume dependent

Type / Size	40	71	125	180	250	355	500	750	1000	
A4VSO, A4VSG	●	●	●	–	●	–	–	–	–	**HM1**
A4VSO, A4VSG	●	●	●	●	●	●	●	●	●	**HM2**
A4CSG	–	–	–	–	●	●	●	●	–	

The control **HM1/2** sets the displacement of the pump depending on the pilot oil volume.
This control is used for 2-point circuit or as a base device for controls with proportional valves (additional electric feedback required).

Spring-centering

The spring-centering of the stroking cylinder is standard. It is used for setting and adjustment in depressurized neutral position, but without defined reset during high-pressure operation.

Swivel angle limitation

Minimum and maximum swivel angle limitation is mechanically adjustable up to 50 % $V_{g\,max}$. For size 500, $V_{g\,min}$ is adjustable up to 50 % $V_{g\,max}$ and $V_{g\,max}$ up to 70 % $V_{g\,max}$.

Notes

- Setting with A4VSO and A4VBO (open circuit):
  - The $V_{g\,max}$ stop is set to nominal $V_{g\,max}$.
- Setting with A4VSG and A4CSG (closed circuit):
  - The $V_{g\,max}$ stops are set on both sides to nominal $V_{g\,max}$.

When ordering, please state other setting requests in plain text.

Two versions are available:

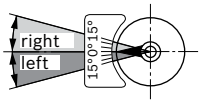
Type	Control pressure [bar]	Sizes
HM1	above 20	40, 71, 125 and 250 (see page 7)
HM2	from 50/100/125	40...1000 (see page 8)

▼ **Flow direction**

Direction of rotation		Swiveling range[1)]
right	**left**	
B to **A**	**A** to **B**	right
A to **B**	**B** to **A**	left

Overcenter with A4VSO is available on request.

1) cf. swivel angle indicator

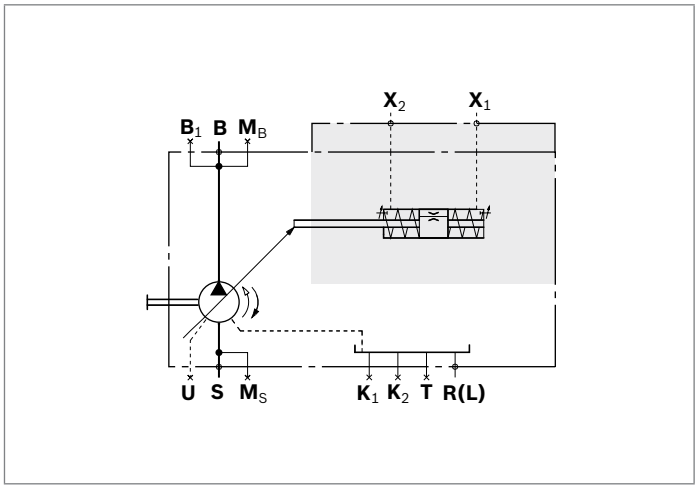


Technical data HM1

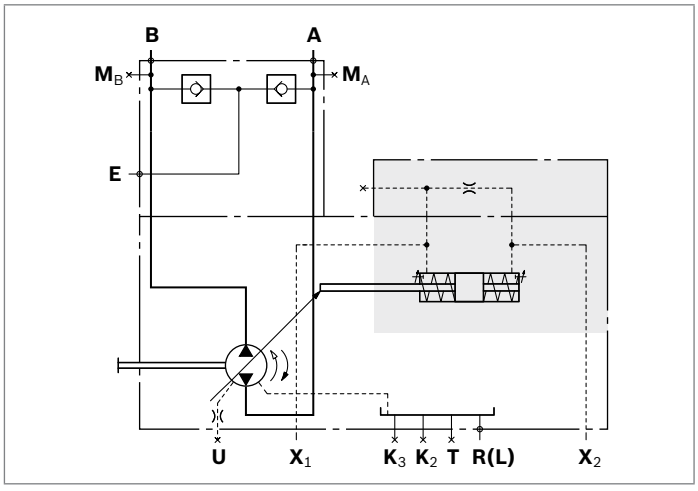
Size		NG	40	71	125	250
Control pressure (in X_1, X_2)	p_{min}	bar	20	20	20	20
	P_{max}	bar	100	100	100	100
Control stroke	s_{max}	mm	14.2	17.1	20.7	25.9
Control area	A	cm^2	16.6	24.6	36.3	56.7
Control volume	$V_{S\,max}$	cm^3	23.6	42.1	75.2	147
Weight: approx. (A4VSO...HM1...N00)	m	kg	38	55	92	194

Circuit diagrams HM1

▼ **Size 40 and 71**
Example: open circuit A4VSO



▼ **Size 125 and 250**
Example: closed circuit A4VSG



Ports	
X_1	Control pressure
X_2	Control pressure

Technical data HM2

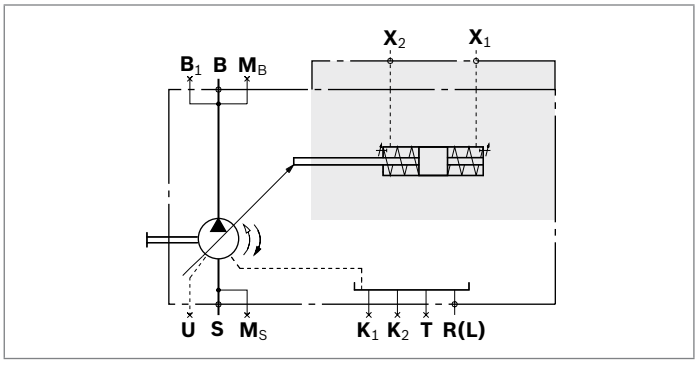
For A4CSG with HM2, the control pressure relief valve (see data sheet 92105, circuit diagram for version **F** with integrated boost pump) is not required and is replaced with a threaded plug.

To minimize the control fluid consumption, the stroking chambers are sealed with sizes 125...1000 and can be bled via the ports $\mathbf{R_2}$...$\mathbf{R_7}$.

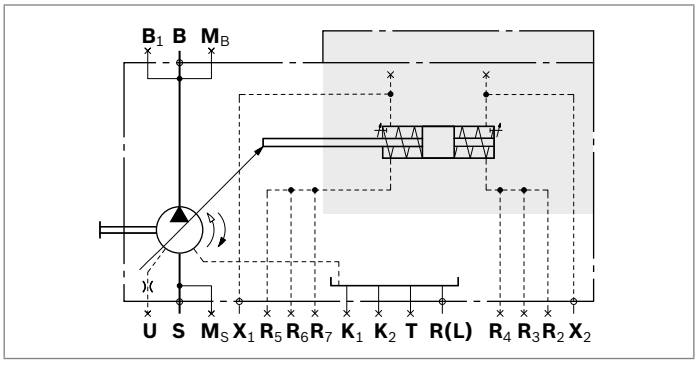
Size		NG	40	71	125	180	250	355	500	750	1000
Control pressure (in $\mathbf{X_1}$, $\mathbf{X_2}$)	p_{min}	bar	50	50	50	100	100	100	125	125	125
	P_{max}	bar	350	350	350	350	350	350	350	350	350
Control stroke	s_{max}	mm	14.2	17.1	20.7	20.7	25.9	25.9	32.6	37.0	41.4
Control area	A	cm^2	8.1	12.6	18.1	18.1	28.3	28.3	38.2	56.8	63.6
Control volume	$V_{S\,max}$	cm^3	11.4	21.5	37.5	37.5	73.2	73.2	124.5	210	263.3
Weight: approx. (A4VSO...HM2...N00)	m	kg	38	55	92	106	194	214	327	470	600

Circuit diagrams HM2

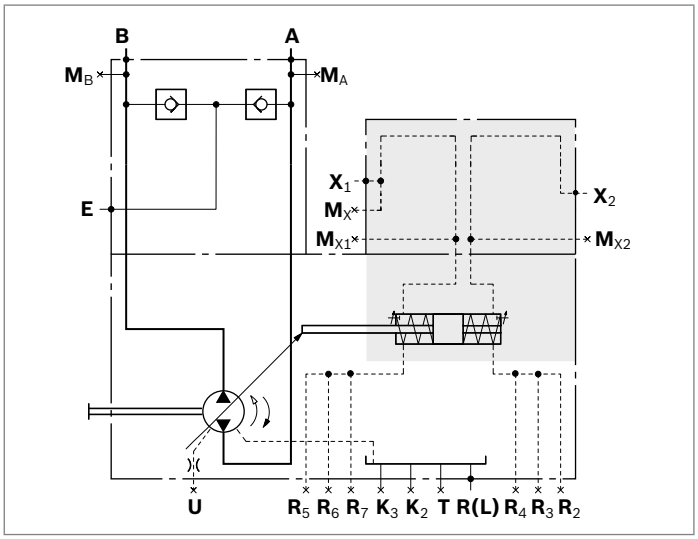
▼ **Size 40 and 71**
Example: open circuit A4VSO



▼ **Size 125 to 355**
Example: open circuit A4VSO



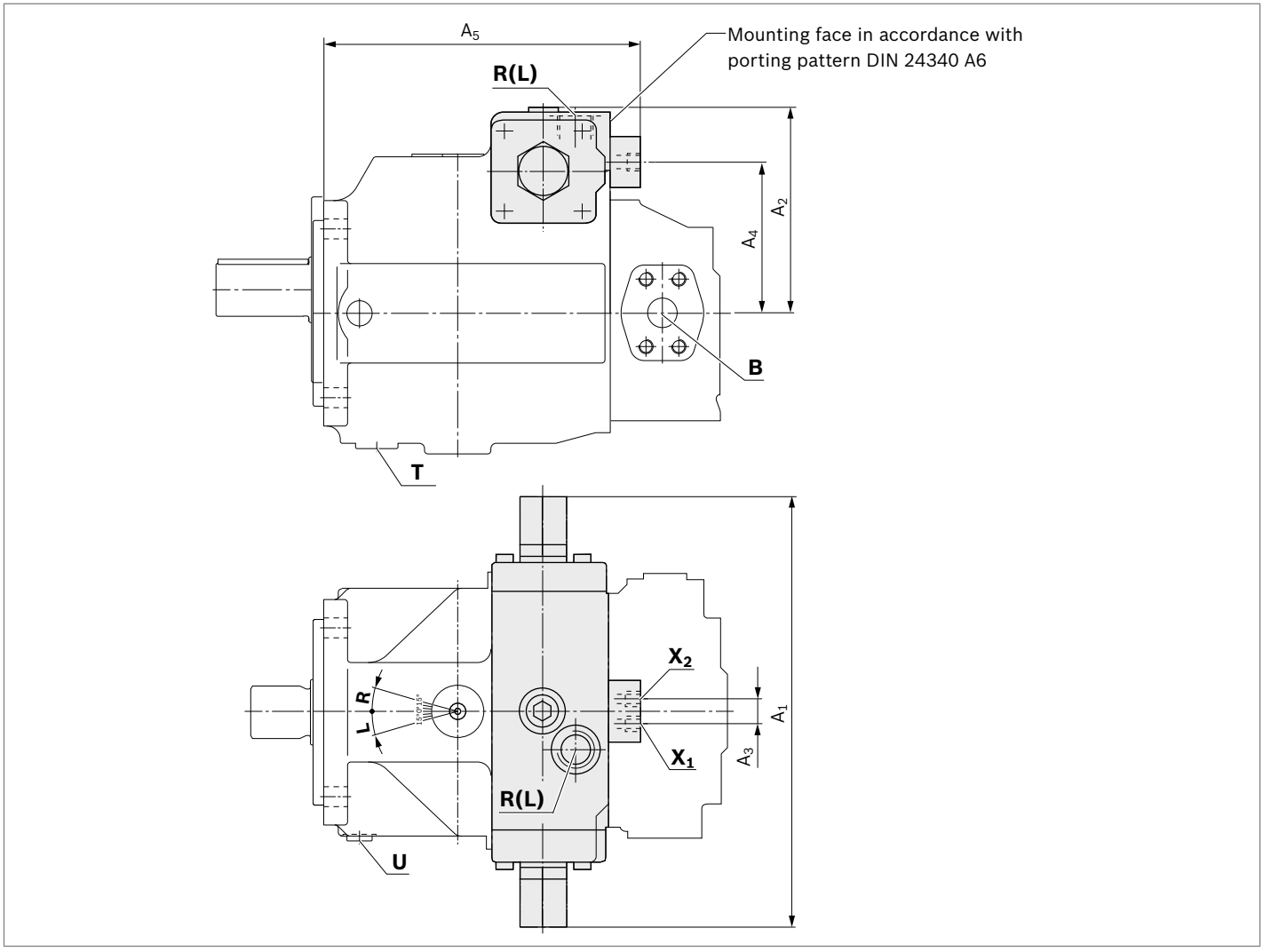
▼ **Size 500 to 1000**
Example: closed circuit A4VSG



Ports	
$\mathbf{X_1}$	Control pressure
$\mathbf{X_2}$	Control pressure
$\mathbf{M_X}$, $\mathbf{M_{X1}}$, $\mathbf{M_{X2}}$	Measuring ports control pressure
$\mathbf{R_2}$ ... $\mathbf{R_7}$	Air bleeding of stroking chamber

Dimensions HM1/HM2

▼ **A4VSO and A4VSG, size 40 and 71**



NG	A_1	A_2	A_3	A_4	A_5	
40	296	136	24	102	217	For detailed dimensions and technical data for the variable pump, see data sheet 92050 (A4VSO) or 92100 (A4VSG)
71	332	157	28	120	245	

Ports		Standard	Size[1)]	$p_{max\ abs}$ [bar][2)]	State
X_1, X_2	Control pressure	DIN 3852-1	M14 x 1.5; 12 deep	100 (with HM1) 350 (with HM2)	O

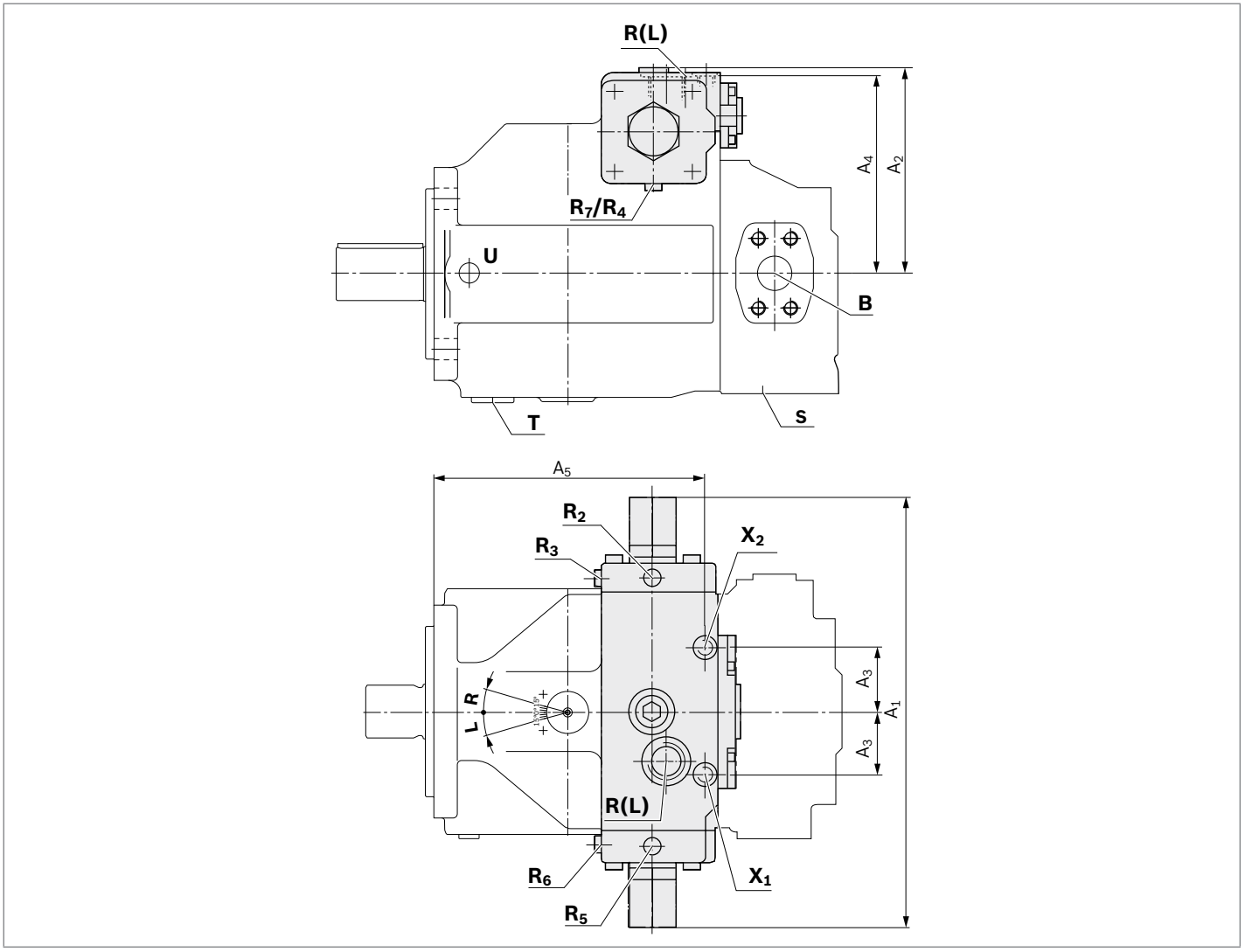
1) For notes on tightening torques, see instruction manual.

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

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

Dimensions HM1/HM2

▼ **A4VSO, A4VSG and A4CSG, size 125 to 355**



NG	A_1	A_2	A_3	A_4	A_5	
125/180[3]	402	191	67	186.5	251	For detailed dimensions and technical data for the variable pump, see data sheet 92050 (A4VSO), 92100 (A4VSG) or 92105 (A4CSG)
250/355[3]	485	238	71	233	311	

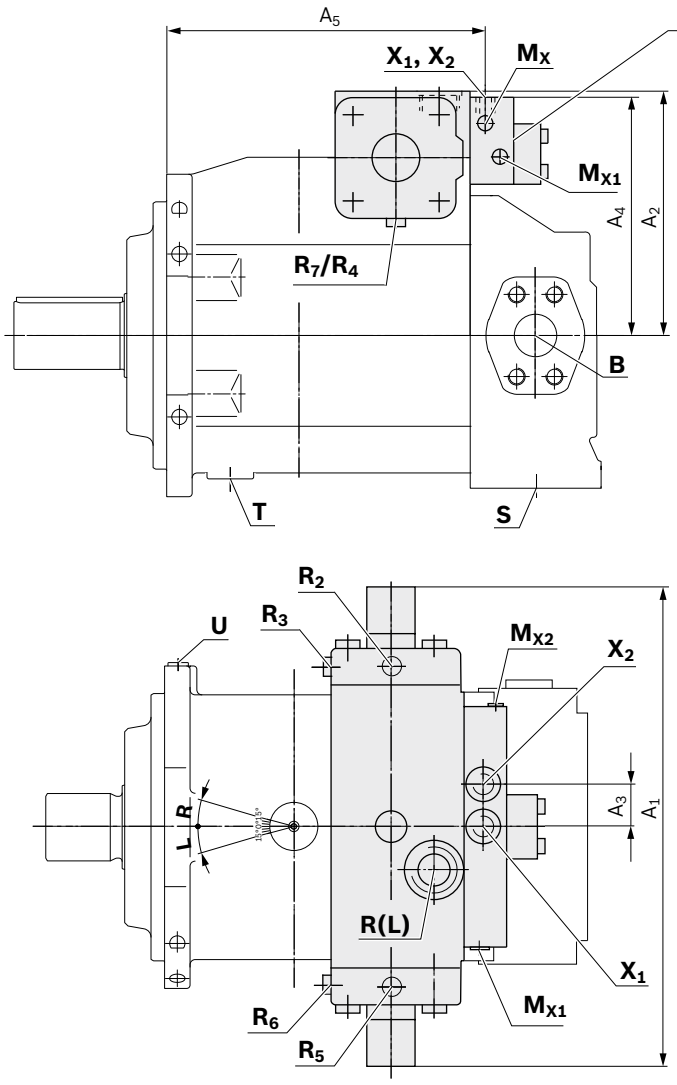
Ports		Standard	Size[1]	$p_{max\ abs}$ [bar][2]	State
X_1, X_2	Control pressure	DIN 3852-1	M14 x 1.5; 12 deep (size 125 and 180)	100 (with HM1)	O
			M18 × 1.5; 12 deep (size 250 and 355)	350 (with HM2)	O
R_2 ... R_7	Air bleeding of stroking chamber	DIN 3852-1	M10 × 1; 8 deep	350 (only with HM2)	X

1) For notes on tightening torques, see instruction manual.
2) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
3) Size 180 and 355 only with HM2

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

Dimensions HM2

▼ **A4VSO, A4VSG and A4CSG, size 500 to 1000**



NG	A_1	A_2	A_3	A_4	A_5	
500	555	283	50	274	388	For detailed dimensions and technical data for the variable pump, see data sheet 92050 (A4VSO), 92100 (A4VSG) or 92105 (A4CSG)
750	630	320	50	304	420	
1000	670	347	50	327	486	

Ports		Standard	Size[1)]	$p_{max\ abs}$ [bar][2)]	State
X_1, X_2	Control pressure	DIN 3852-1	M27 x 2; 16 deep	350	O
M_X, M_{X1}, M_{X2}	Measuring, control pressure	DIN 3852-1	M14 x 1.5; 12 deep	350	X
R_2 ... R_7	Air bleeding of stroking chamber	DIN 3852-1	M14 x 1.5; 12 deep	350	X

1) For notes on tightening torques, see instruction manual.
2) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.

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

HS – Control with servo valve

Type / Size	40	71	125	180	250	355	500	750	1000	
A4VSO, A4VSG	●	●	●	●	●	●	●	●	●	**HS**
A4CSG	–	–	–	–	●	●	●	●	–	

For electric displacement control with VT-SR7-1X
The control **HS** sets the displacement of the pump with the mounted servo valve proportional to the setpoint value.
The pump setting is reported by an inductive position transducer. In conjunction with the suitable electric amplifier VT-SR7-1X, a precise control of the pump swivel angle is available.
The electric amplifier VT-SR7-1X for controlling the pump swivel angle is not included in the HS scope of delivery, please order separately in accordance with data sheet 29993.

Spring-centered
The spring-centering of the stroking cylinder is standard. It is used for setting and adjustment in depressurized neutral position, but without defined reset during high-pressure operation.
The spring-centering is not a safety device.

Swivel angle limitation
Minimum and maximum swivel angle limitation is mechanically adjustable up to 50 % $V_{g\,max}$. For size 500, $V_{g\,min}$ is adjustable up to 50 % $V_{g\,max}$ and $V_{g\,max}$ up to 70 % $V_{g\,max}$.

Notes
- Setting with A4VSO (open circuit):
  - The $V_{g\,max}$ stop is set to nominal $V_{g\,max}$.
- Setting with A4VSG and A4CSG (closed circuit):
  - The $V_{g\,max}$ stops are set on both sides to nominal $V_{g\,max}$.

When ordering, please state other setting requests in plain text.

To minimize the control fluid consumption, the stroking chambers are sealed with sizes 125...1000 and can be bled via the ports $\mathbf{R}_2$...$\mathbf{R}_7$.
The pump is supplied with an intermediate flushing plate (see circuit diagram) to protect the servo valve.
After the flushing process, the flushing plate must be removed and the servo valve must be screwed directly on to the port plate (the screws supplied are suitable). Please observe the commissioning and flushing instructions in the data sheets 07700 and 29583.

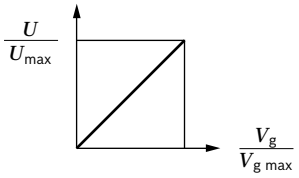
Optional:
- **HSE** without servo valve (see page 17)
- **HSK** with short circuit valve (see page 31)

Technical data HS

Size		NG	40	71	125	180	250	355	500	750	1000
Control pressure (in **P**)	p_{min}	bar	100	100	100	125	125	125	150	150	150
	p_{max}[1]	bar	315	315	315	315	315	315	315	315	315
Control stroke	s_{max}	mm	14.2	17.1	20.7	20.7	25.9	25.9	32.6	37.0	41.4
Control area	A	cm^2	8.1	12.6	18.1	18.1	28.3	28.3	38.2	56.8	63.6
Control volume	$V_{S\ max}$	cm^3	11.4	21.5	37.5	37.5	73.2	73.2	124.5	210	263.3
Control time	t_{min}[2]	s	0.04	0.06	0.09	0.09	0.12	0.12	0.15	0.2	0.25
Weight: approx. (A4VSO...HS...N00)	m	kg	42	59	98	112	200	220	333	476	606
Maximum permissible degree of contamination of the hydraulic fluid Cleanliness level according to ISO 4406 (c)[3]			Class 18/16/13								
Control loop performance hysteresis			≤ 0.2 %								
Repeatability			≤ 0.2 %								
Linearity deviation swivel angle			≤ 1.0 %								

A4VSO – open circuit

▼ Characteristic curve

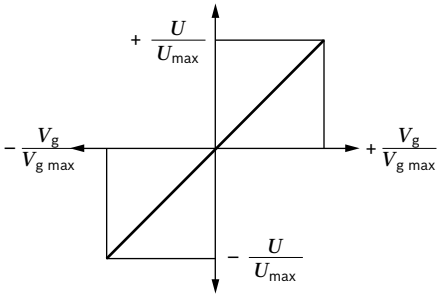


▼ Flow direction S to B

Direction of rotation	Swiveling range[4]
right	left
left	right

A4VSG and A4CSG – closed circuit

▼ Characteristic curve

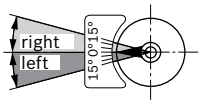


▼ Flow direction

Direction of rotation		Swiveling range[4]
right	**left**	
B to **A**	**A** to **B**	right
A to **B**	**B** to **A**	left

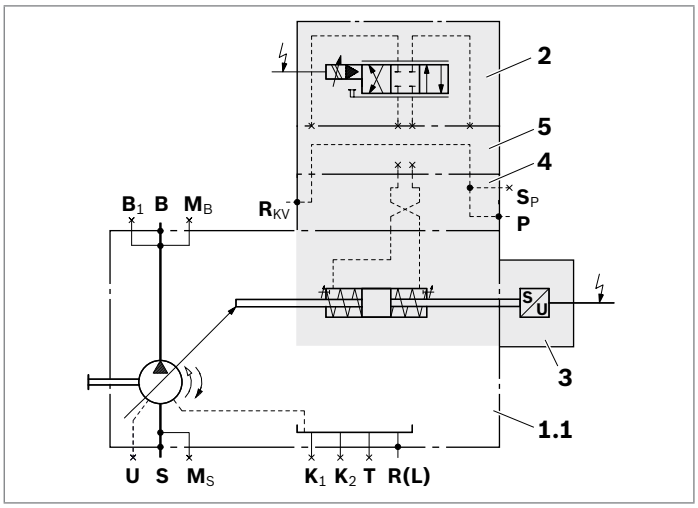
1) Due to the permissible data of the servo valve
2) With minimum control pressure
3) Intermediate plate filter, optional, see page 45

4) cf. swivel angle indicator

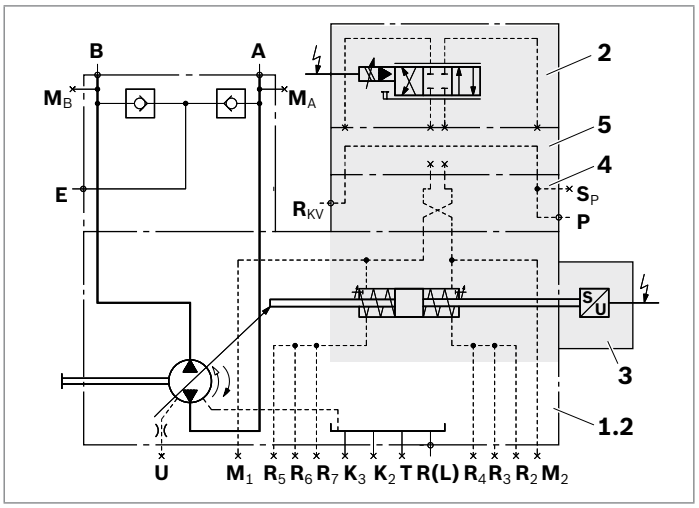


Circuit diagrams HS

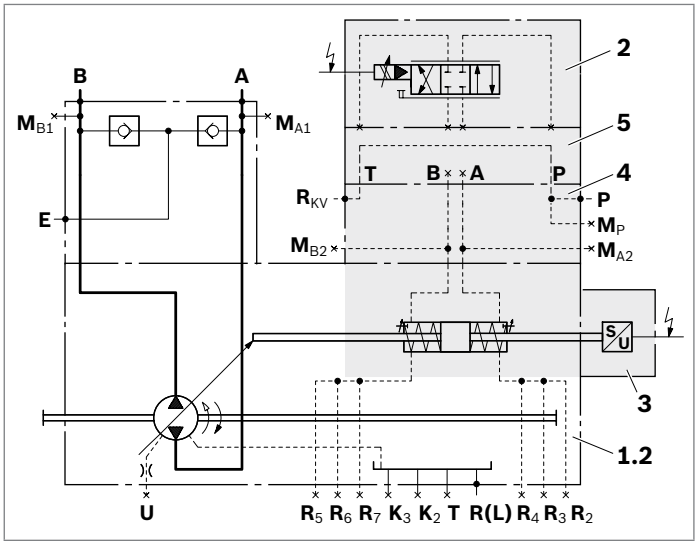
▼ **Size 40 and 71**
Example: open circuit A4VSO



▼ **Size 125 to 355**
Example: closed circuit A4VSG



▼ **Size 500 to 1000**
Example: closed circuit A4VSG



1 Pump with hydraulic control device
1.1 A4VSO (see data sheet 92050)
1.2 A4VSG (see data sheet 92100)
2 4/3-way servo valve (see data sheet 29583)

NG	Type[1)]
40 and 71	4WS2EM10-5X/20B11ET315K31EV
125 and 180	4WS2EM10-5X/30B11ET315K31EV
250 and 355	4WS2EM10-5X/45B11ET315K31EV
500 to 1000	4WS2EM10-5X/75B11ET315K31EV

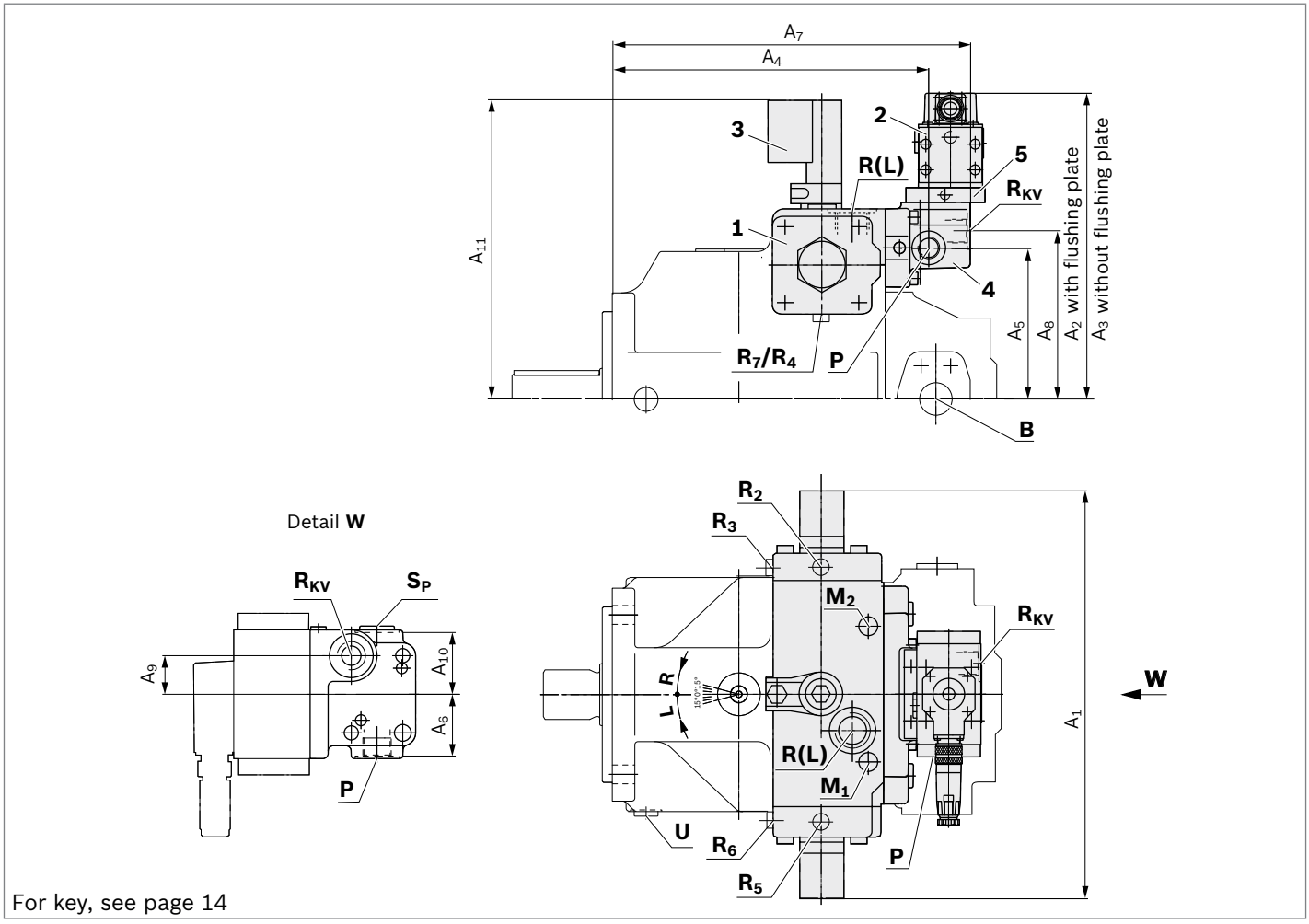
3 Inductive position transducer IW9-03-01 with plug-in connector (mating connector) in accordance with DIN EN 175 301-803-A / ISO 4400 cable gland M16 × 1.5 for cable diameters 4.5...10 mm
4 Intermediate plate
5 Flushing plate

Ports	
P	Control pressure
S_P	Accumulator control pressure
R_{KV}	Control fluid return flow
$M_{...}$	Measuring ports control pressure (closed)
R_2 ... R_7	Bleeding stroking chamber (closed)

1) With plug-in connector in accordance with DIN EN 175 201-804 for cable diameters 8 to 13.5 mm

Dimensions HS

▼ **A4VSO, A4VSG and A4CSG, size 40 to 355**



For key, see page 14

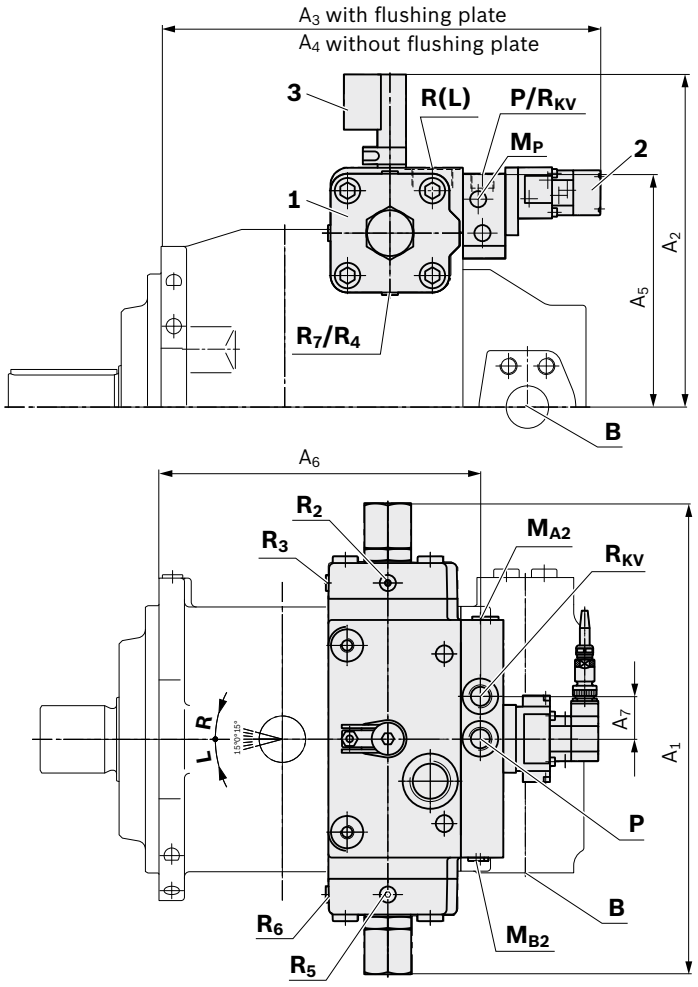
NG	A_1	A_2	A_3	A_4	A_5	A_6	A_7	A_8	A_9	A_{10}	A_{11}	
40	296	269	254	222	108	43	273	128	35	53	246	For detailed dimensions and technical data for the variable pump, see data sheet 92050 (A4VSO), 92100 (A4VSG) or 92105 (A4CSG)
71	332	287	272	249	123	48	300	143	30	48	263	
125 / 180	402	304	289	309	148	39	350	148	0	39	298	
250 / 355	485	341	326	371	184	39	412	184	0	39	345	

Ports		Standard	Size[1)]	$p_{max\ abs}$ [bar][2)]	State
P	Control pressure	DIN 3852-1	M22 x 1.5; 14 deep	315	O
S_P	Accumulator control pressure	DIN 3852-1	M22 x 1.5; 14 deep	315	X
R_{KV}	Control fluid return flow	DIN 3852-1	M22 x 1.5; 14 deep	100	O
M_1, M_2	Measuring, control pressure	DIN 3852-1	M14 x 1.5; 12 deep (size 125 and 180)	315	X
			M18 × 1.5; 12 deep (size 250 and 3500)	315	X
R_2 ... R_7	Air bleeding of stroking chamber	DIN 3852-1	M10 × 1; 8 deep	315	X

1) For notes on tightening torques, see instruction manual.
2) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.

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

▼ **A4VSO, A4VSG and A4CSG, size 500 to 1000**



For key, see page 14

NG	A_1	A_2	A_3	A_4	A_5	A_6	A_7	
500	555	392	527	512	274	388	50	For detailed dimensions and technical data for the variable pump, see data sheet 92050 (A4VSO), 92100 (A4VSG) or 92105 (A4CSG)
750	630	427	558	543	304	420	50	
1000	670	456	624	609	327	486	50	

Ports		Standard	Size[1)]	$p_{max\ abs}$ [bar][2)]	State
P	Control pressure	DIN 3852-1	M27 x 2; 16 deep	315	O
$\mathbf{R_{KV}}$	Control fluid return flow	DIN 3852-1	M27 x 2; 16 deep	100	O
$\mathbf{M_{A2}}$, $\mathbf{M_{B2}}$, $\mathbf{M_P}$	Measuring, control pressure	DIN 3852-1	M14 x 1.5; 12 deep	315	X
$\mathbf{R_2}$ ... $\mathbf{R_7}$	Air bleeding of stroking chamber	DIN 3852-1	M14 x 1.5; 12 deep	315	X

1) For notes on tightening torques, see instruction manual.
2) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.

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

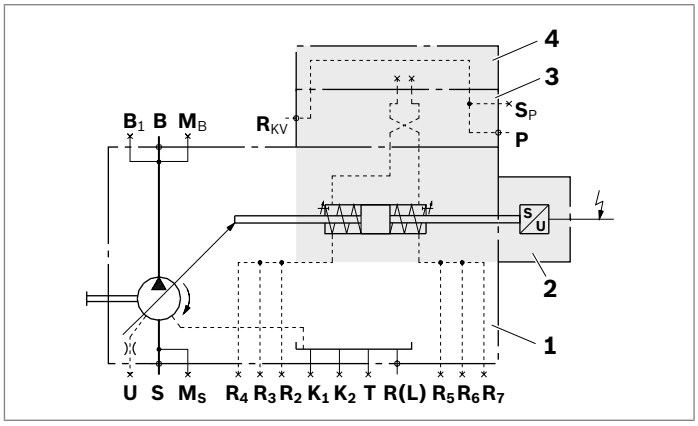
HSE – Control without valve

Type / Size	40	71	125	180	250	355	500	750	1000	
A4VSO, A4VSG	●	●	●	●	●	●	●	●	●	**HSE**
A4CSG	–	–	–	–	●	●	●	●	–	

The **HSE** design is supplied without a servo valve. Otherwise, this version is the same as the relevant basic version – for technical data, further circuit diagrams and dimensions, see basic setting **HS** page 12 ff.
The porting pattern DIN 24340-A10 is available for all sizes for mounting the servo valve.

Circuit diagram HSE

▼ **Size 125 to 355**
Example: open circuit A4VSO



1 Pump with hydraulic control device A4VSO (see data sheet 92050)
2 Inductive position transducer IW9-03-01[1)]
3 Intermediate plate
4 Flushing plate

1) Solenoids with plug-in connector in accordance with DIN EN 175.301-803 / ISO 4400 cable gland M16 × 1.5 for cable diameters 4.5 to 10 mm

HS4(P) – Control with proportional valve

Type / Size	40	71	125	180	250	355	500	750	1000	
A4VSO, A4VSG	●	●	●	●	●	●	●	●	●	HS4(P)
A4CSG	–	–	–	–	●	●	●	●	–	
A4VBO	–	●	●	–	–	–	● (450)	–	–	

For electric and electronic displacement, as well as pressure and power control with VT-VPCD-1X

The control **HS4** sets the displacement of the pump with the mounted direct operated proportional valve proportional to the setpoint value.

The pump setting is reported by an inductive position transducer.

With **HS4P**, the mounted pressure transducer HM20 records the system pressure, with A4VSG and A4CSG, each pressure side is assigned a pressure transducer. Together with the relevant control electronics VT-VPCD and the operating software BODAC, the user has a highly precise and freely programmable control, which offers a comfortable operating and diagnosis interface.

The digital control amplifier VT-VPCD-1X for actuating the HS4 control is not included in the scope of delivery, please order separately in accordance with data sheet 30028.

The programming of the digital control amplifier VT-VPCD is carried out via the serial interface of the amplifier with the PC program BODAC. For further information, see data sheet 30028.

Spring-centering

The spring-centering of the stroking cylinder is standard. It is used for setting and adjustment in depressurized neutral position, but without defined reset during high-pressure operation.

The spring-centering is not a safety device.

To minimize the control fluid consumption, the stroking chambers are sealed with sizes 125...1000 and can be bled via the ports $\mathbf{R}_2$ ... $\mathbf{R}_7$.

Swivel angle limitation

Minimum and maximum swivel angle limitation is mechanically adjustable up to 50 % $V_{g\,max}$. For size 500, $V_{g\,min}$ is adjustable up to 50 % $V_{g\,max}$ and $V_{g\,max}$ up to 70 % $V_{g\,max}$ (75 % with A4VBO 450).

Notes

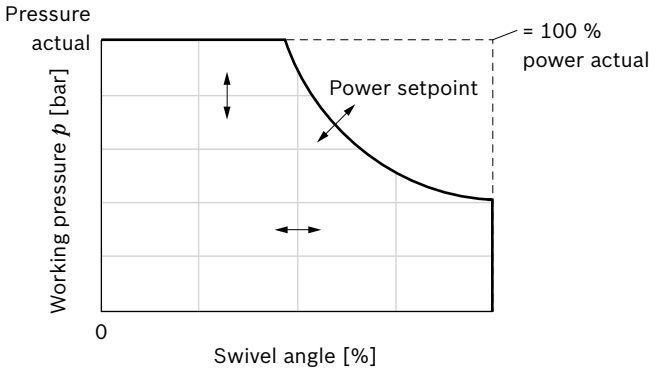
- Setting with A4VSO and A4VBO (open circuit):
  - The $V_{g\,max}$ stop is set to nominal $V_{g\,max}$.
- Setting with A4VSG and A4CSG (closed circuit):
  - The $V_{g\,max}$ stops are set on both sides to nominal $V_{g\,max}$.

When ordering, please state other setting requests in plain text.

Optional:

- **HS4P** with pressure transducer for additional pressure and power control
- **HS4K**, **HS4KP** with short circuit valve
- **HS4M** suitable for use under fluid
- **HS4V** with internal control pressure supply

▼ **Characteristic curve**

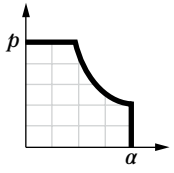


Technical data HS4(P)

Size			NG	40	71	125	180	250	355	500	750	1000
Control pressure (in **P**)	A4VSO, A4VSG, A4CSG	p_{min}	bar	100	100	100	125	125	125	150	150	150
	A4VBO	p_{min}	bar	–	130	130	–	–	–	190 Size 450	–	–
		p_{max}[1]	bar	315	315	315	315	315	315	315	315	315
Control stroke		s_{max}	mm	14.2	17.1	20.7	20.7	25.9	25.9	32.6	37.0	41.4
Control area		A	cm^2	8.1	12.6	18.1	18.1	28.3	28.3	38.2	56.8	63.6
Control volume		$V_{S\ max}$	cm^3	11.4	21.5	37.5	37.5	73.2	73.2	124.5	210	263.3
Control time		t_{min}[2]	s	0.04	0.06	0.09	0.09	0.12	0.12	0.15	0.2	0.25
Weight: approx. (A4VSO...HS4...N00)		m	kg	42	59	98	112	200	220	333	476	606
Control loop performance hysteresis								≤ 0.2 %				
Repeatability								≤ 0.2 %				
Linearity deviation swivel angle								≤ 1.0 %				
Linearity deviation pressure								≤ 1.5 % of p_{max}[3]				

A4VSO – open circuit

▼ **Characteristic curve**



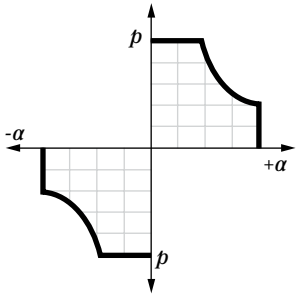
Basic setting for design without short circuit valve, de-energized proportional valve and connected control pressure: $V_{g\ min}$ (see table).

▼ **Flow direction S to B**

Direction of rotation	Swiveling range[4]	Basic setting
right	left	$V_{g\ min}$ (from left)
left	right	$V_{g\ min}$ (from right)

A4VSG and A4CSG – closed circuit

▼ **Characteristic curve**

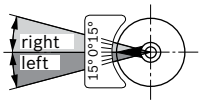


Basic setting for design without short circuit valve, de-energized proportional valve and connected control pressure: $V_{g\ max}$ (see table).

▼ **Flow direction**

Direction of rotation	Swivel range[4]	Flow direction	Basic setting
right	right	**B** to **A**	$V_{g\ max}$ right
	left	**A** to **B**	
left	right	**A** to **B**	$V_{g\ max}$ left
	left	**B** to **A**	

1) Due to the permissible data of the proportional valve
2) With minimum control pressure
3) Pressure transducer value
4) cf. swivel angle indicator

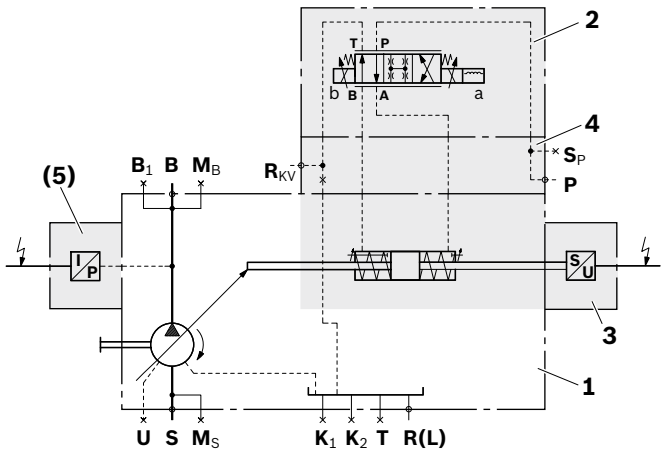


Circuit diagrams HS4(P)

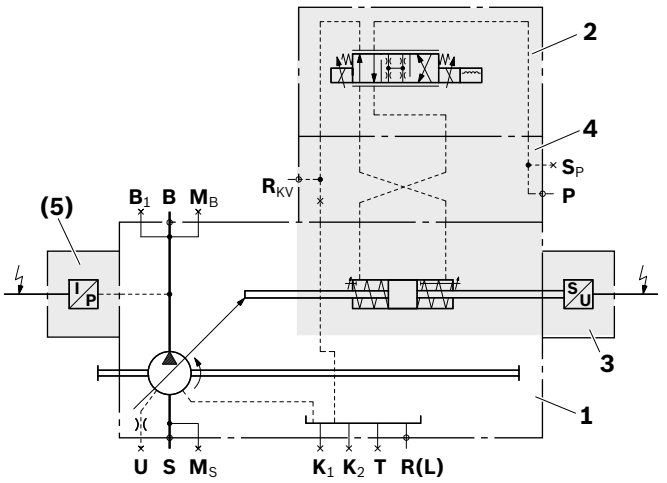
▼ **Size 40 and 71**

Example: A4VSO HS4P (with pressure transducer)

Clockwise rotation



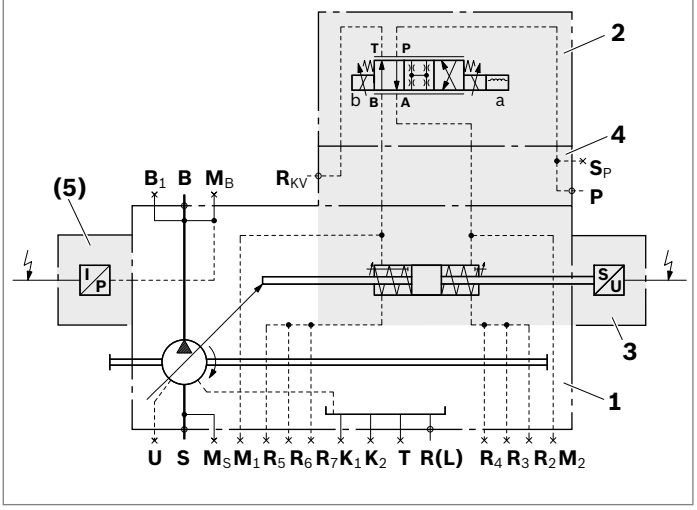
Counter-clockwise rotation



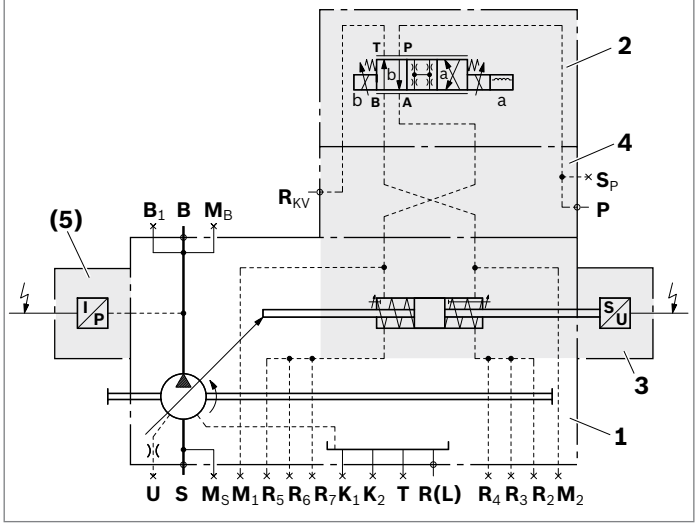
▼ **Size 125 to 355**

Example: A4VSO HS4P (with pressure transducer)

Clockwise rotation



Counter-clockwise rotation



1 Pump with hydraulic control device A4VSO (see data sheet 92050) or A4VBO (see data sheet 92122)

2 4/3-proportional directional valve (see data sheet 29061) with electric position feedback (incl. plug-in connector 4-pin Pg7-G4W1F)

NG	Type[1)]
40 and 71	4WRE6V08-2X/G24K4/V-822
125 and 180	4WRE6V08-2X/G24K4/V-822
250 and 355	4WRE6V16-2X/G24K4/V-822

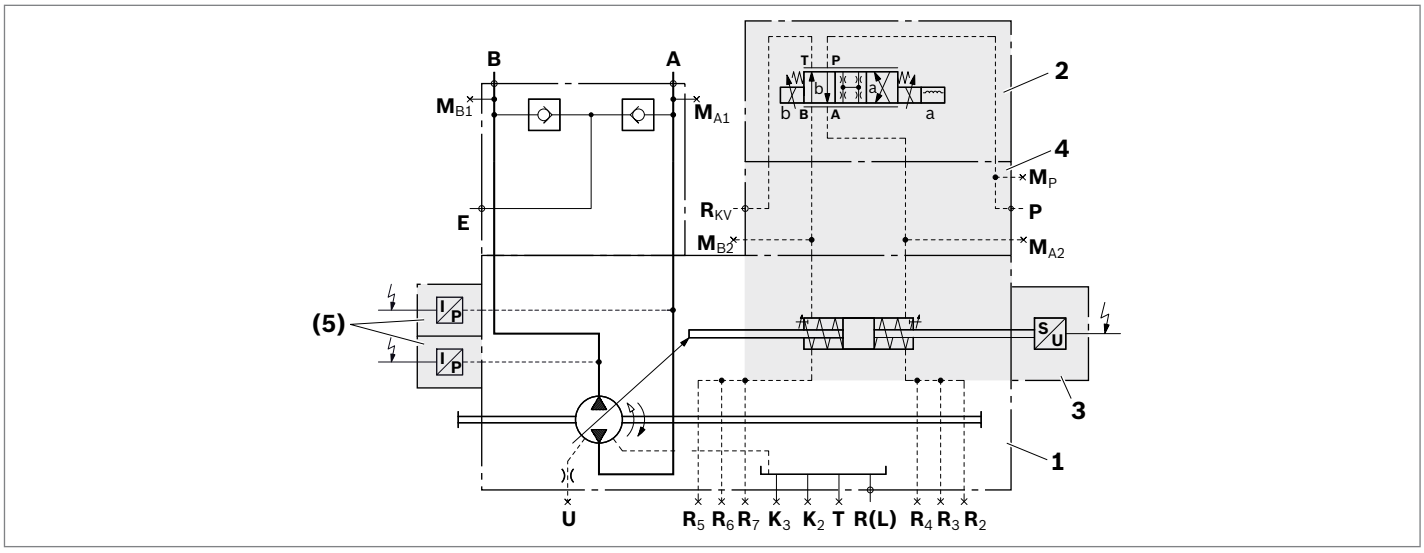
3 Inductive position transducer AWXF004D01 with plug-in connector 4-pin Pg7-G4W1F

4 Intermediate plate

5 **Only with HS4P:** Pressure transducer HM20-2X/630-C-K35 (see data sheet 30272) with intermediate flange, with A4VSG and A4CSG, each pressure side has 1 pressure transducer assigned and mounted

1) With plug-in connector in accordance with DIN EN 175.301-803 / ISO 4400 cable gland M16 × 1.5 for cable diameters 4.5 to 10 mm

▼ **Size 500 to 1000**
Example: A4VSG HS4P (with pressure transducer)



1 Pump with hydraulic control device A4VSG (see data sheet 92100)

2 4/3-proportional directional valve (see data sheet 29061) with electric position feedback (incl. plug-in connector 4-pin Pg7-G4W1F)

NG	Type[1)]
500 to 1000	4WRE6V16-2X/G24K4/V-822

3 Inductive position transducer AWXF004D01 with plug-in connector 4-pin Pg7-G4W1F

4 Intermediate plate

5 **Only with HS4P:** Pressure transducer HM20-2X/630-C-K35 (see data sheet 30272) with intermediate flange, with A4VSG and A4CSG, each pressure side has 1 pressure transducer assigned and mounted

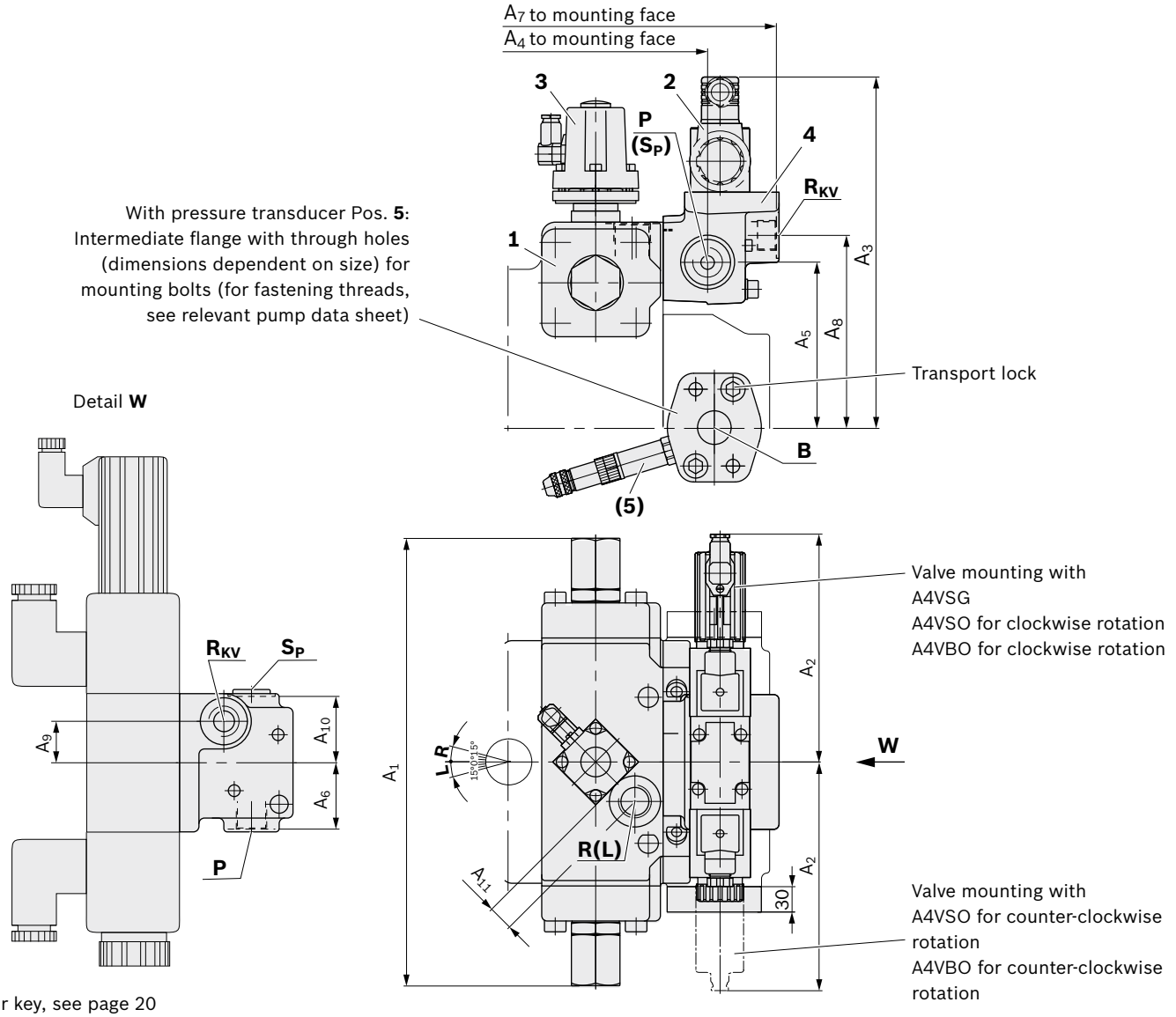
Ports	
P	Control pressure
S_P	Accumulator control pressure
R_{KV}	Control fluid return flow
$M_{...}$	Measuring ports control pressure
R_2 ... R_7	Air bleeding of stroking chamber

1) With plug-in connector in accordance with DIN EN 175.301-803 / ISO 4400 cable gland M16 × 1.5 for cable diameters 4.5 to 10 mm

Dimensions HS4(P)

▼ **Size 40 and 71, example A4VSO HS4P with a pressure transducer on port B**

With A4VSO and A4VBO direction of rotation right and left, partly different dimensions (“R” and “L”).
With A4VSG, the dimensions “R” apply for both directions of rotation.



For key, see page 20

NG	A_1	A_{2R}	A_{2L}	A_{3R}	A_{3L}	A_{4R}	A_{4L}	A_5	A_6	A_{7R}	A_{7L}	A_{8R}	A_{8L}	A_{9R}	A_{9L}	A_{10}	A_{11}
40	296	174	166	245	226	230	222	108	43	273	253	128	94	35	5	54	16.5
71	332	169	171	261	243	257	249	123	48	300	280	143	109	30	0	48	20.9

For detailed dimensions and technical data for the variable pump, see data sheets 92050 (A4VSO), 92122(A4VBO) or 92100 (A4VSG)

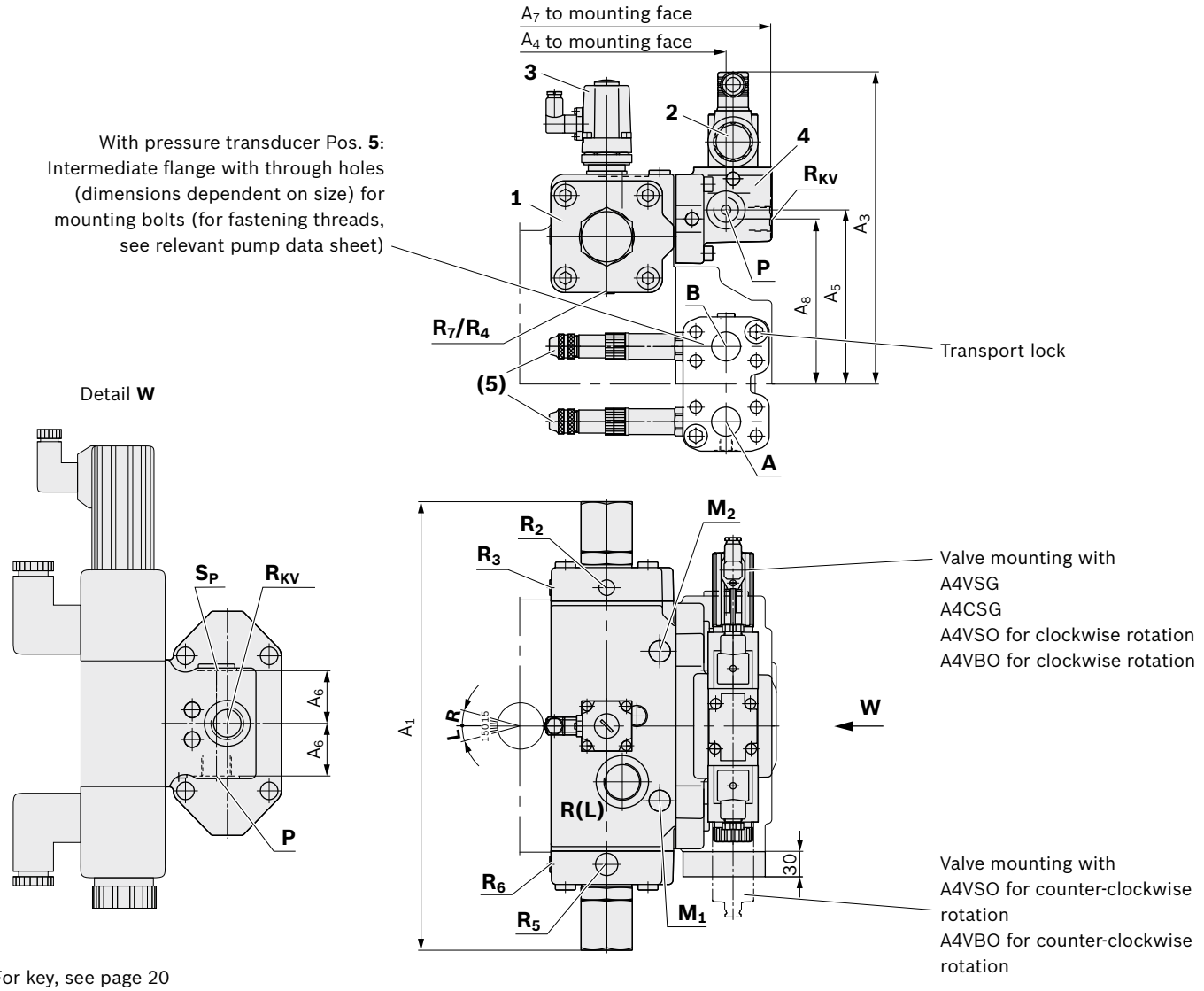
Ports		Standard[1)]	Size[2)]	$p_{max\ abs}$ [bar][3)]	State
P	Control pressure	DIN 3852-1	M22 x 1.5; 14 deep	315	O
S_P	Accumulator control pressure	DIN 3852-1	M22 x 1.5; 14 deep	315	X
R_{KV}	Control fluid return flow	DIN 3852-1	M22 x 1.5; 14 deep	210	O

1) ISO 6149 with A4VBO 71
2) For notes on tightening torques, see instruction manual.
3) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.

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

▼ **Size 125 to 355, example A4VSG HS4P with a pressure transducer on port A and B**

With A4VSO and A4VBO, the dimension A_4 is different for clockwise and counter-clockwise rotation.
With A4VSG and A4CSG, dimension A_{4R} (clockwise) applies for both directions of rotation.



For key, see page 20

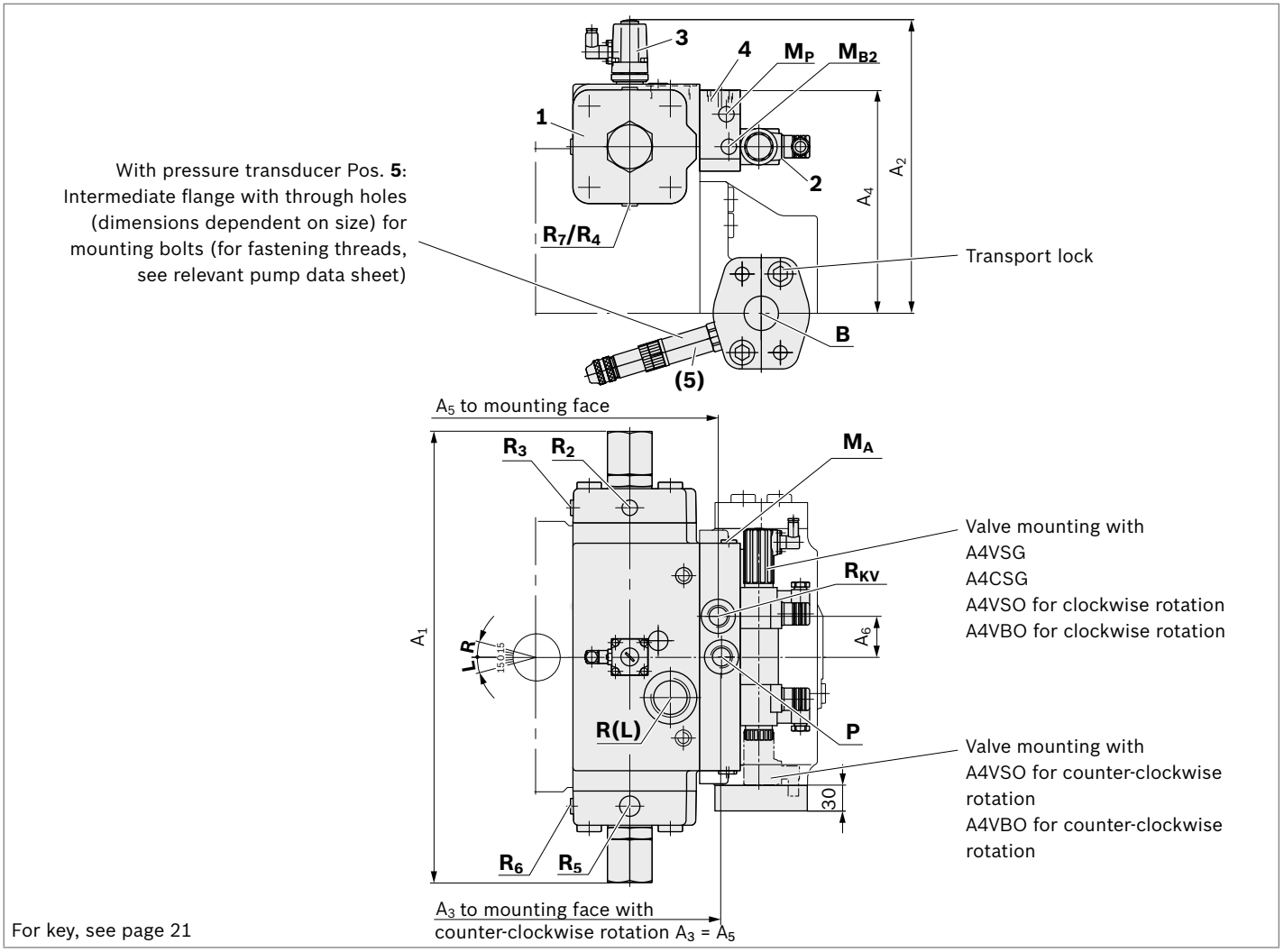
NG	A_1	A_3	A_{4R}	A_{4L}	A_5	A_6	A_7	A_8	
125/180	402	280	310	318.5	156	39	350	148	For detailed dimensions and technical data for the variable pump, see data sheet 92050 (A4VSO), 92122(A4VBO), 92100 (A4VSG) or 92105 (A4CSG)
250/355	485	316	372	380.5	192	39	412	184	

Ports		Standard[1]	Size[2]	$p_{max\ abs}$ [bar][3]	State
P	Control pressure	DIN 3852-1	M22 x 1.5; 14 deep	315	O
S_P	Accumulator control pressure	DIN 3852-1	M22 x 1.5; 14 deep	315	X
R_{KV}	Control fluid return flow	DIN 3852-1	M22 x 1.5; 14 deep	210	O
M_1, M_2	Measuring, control pressure	DIN 3852-1	M14 x 1.5; 12 deep (size 125 and 180) M18 × 1.5; 12 deep (size 250 and 355)	315 315	X X
R_2 ... R_7	Air bleeding of stroking chamber	DIN 3852-1	M10 × 1; 8 deep	315	X

1) ISO 6149 with A4VBO 71
2) For notes on tightening torques, see instruction manual.
3) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.

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

▼ **A4VSO, A4VBO, A4VSG and A4CSG, size 500 to 1000**
Example A4VSO HS4P with a pressure transducer on port **B**



For key, see page 21

NG	A_1	A_2	A_3	A_4	A_5	A_6	
500 (450 with A4VBO)	555	361	392	274	388	50	For detailed dimensions and technical data for the variable pump, see data sheet 92050 (A4VSO), 92122(A4VBO), 92100 (A4VSG) or 92105 (A4CSG)
750	630	400	424	304	420	50	
1000	670	427	490	327	486	50	

Ports		Standard[1]	Size[2]	$p_{max\ abs}$ [bar][3]	State
P	Control pressure	DIN 3852-1	M27 x 2; 16 deep	315	O
R_{KV}	Control fluid return flow	DIN 3852-1	M27 x 2; 16 deep	120	O
M_{A2}, M_{B2}, M_P	Measuring, control pressure	DIN 3852-1	M14 x 1.5; 12 deep	315	X
R_2 ... R_7	Air bleeding of stroking chamber	DIN 3852-1	M14 x 1.5; 12 deep	315	X

1) ISO 6149 with A4VBO 71
2) For notes on tightening torques, see instruction manual.
3) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.

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

HS4M – Suitable for use under fluid

Type / Size	40	71	125	180	250	355	500	750	1000	
A4VSO, A4VSG	●	●	●	●	●	●	●	●	●	**HS4M**
A4CSG	–	–	–	–	●	●	●	●	–	

The version **HS4M** corresponds to the HS4 design, but without proportional valve, but with pilot pressure ports $\mathbf{X}_1$ and $\mathbf{X}_2$.
The proportional valve can be positioned separately in the system and connected via the designated ports $\mathbf{X}_1$ and $\mathbf{X}_2$ of the pump.
The unit can be installed in the reservoir together with the directly mounted position transducer.
Approved for HLP fluids DIN 51524.
Recommendation:

- Proportional valve 4WRE6-2X see data sheet 29061
- Electronics VT-VPCD-1X see data sheet 30028
- For cables, see data sheet 30028-B

Notes

- Setting with A4VSO (open circuit):
  - The $V_{g\,max}$ stop is set to nominal $V_{g\,max}$.
- Setting with A4VSG and A4CSG (closed circuit):
  - The $V_{g\,max}$ stops are set on both sides to nominal $V_{g\,max}$.

▼ **Flow direction**

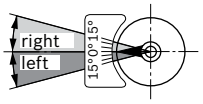
Direction of rotation		Swiveling range[1]
right	**left**	
B to **A**	**A** to **B**	right
A to **B**	**B** to **A**	left

Overcenter is available on request.

Technical data HS4M

Size		NG	40	71	125	180	250	355	500	750	1000
Control pressure (in $\mathbf{X}_1$, $\mathbf{X}_2$)	p_{min}	bar	50	50	50	100	100	100	125	125	125
	p_{max}[1]	bar	350	350	350	350	350	350	350	350	350
Control stroke	s_{max}	mm	14.2	17.1	20.7	20.7	25.9	25.9	32.6	37.0	41.4
Control area	A	cm^2	8.1	12.6	18.1	18.1	28.3	28.3	38.2	56.8	63.6
Control volume	$V_{S\,max}$	cm^3	11.4	21.5	37.5	37.5	73.2	73.2	124.5	210	263.3
Weight: approx. (A4VSO...HS4M...N00)	m	kg	38	55	92	106	194	214	327	470	600

1) cf. swivel angle indicator

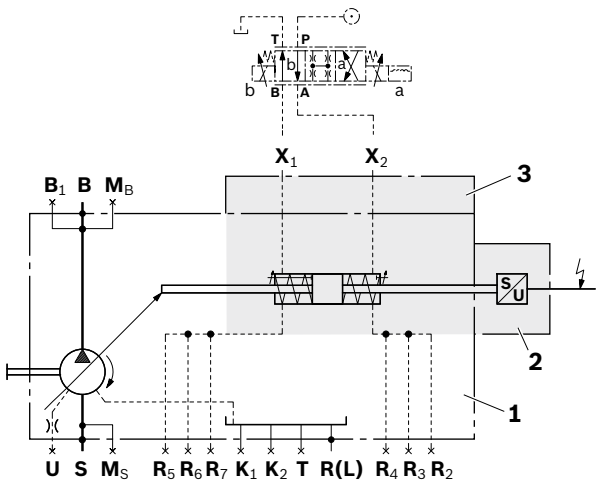


2) Only with closed circuit
3) Observe any restrictions due to the proportional valve

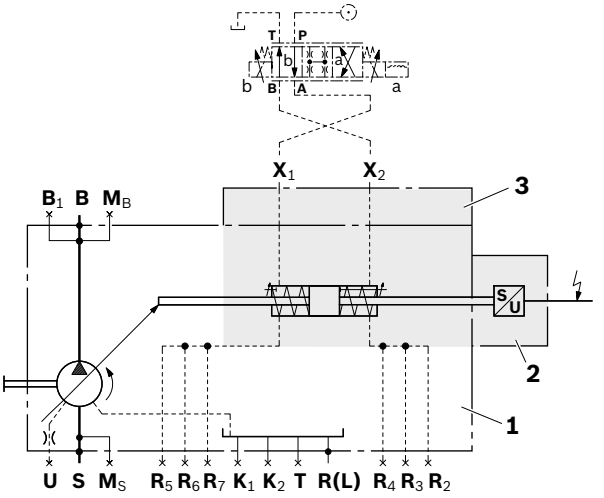
Circuit diagrams HS4M

▼ **Size 40 to 1000 for A4VSO and A4VSG, size 250 to 750 for A4CSG**
Example: A4VSO...HS4M, **size 125 to 1000**

Clockwise rotation



Counter-clockwise rotation

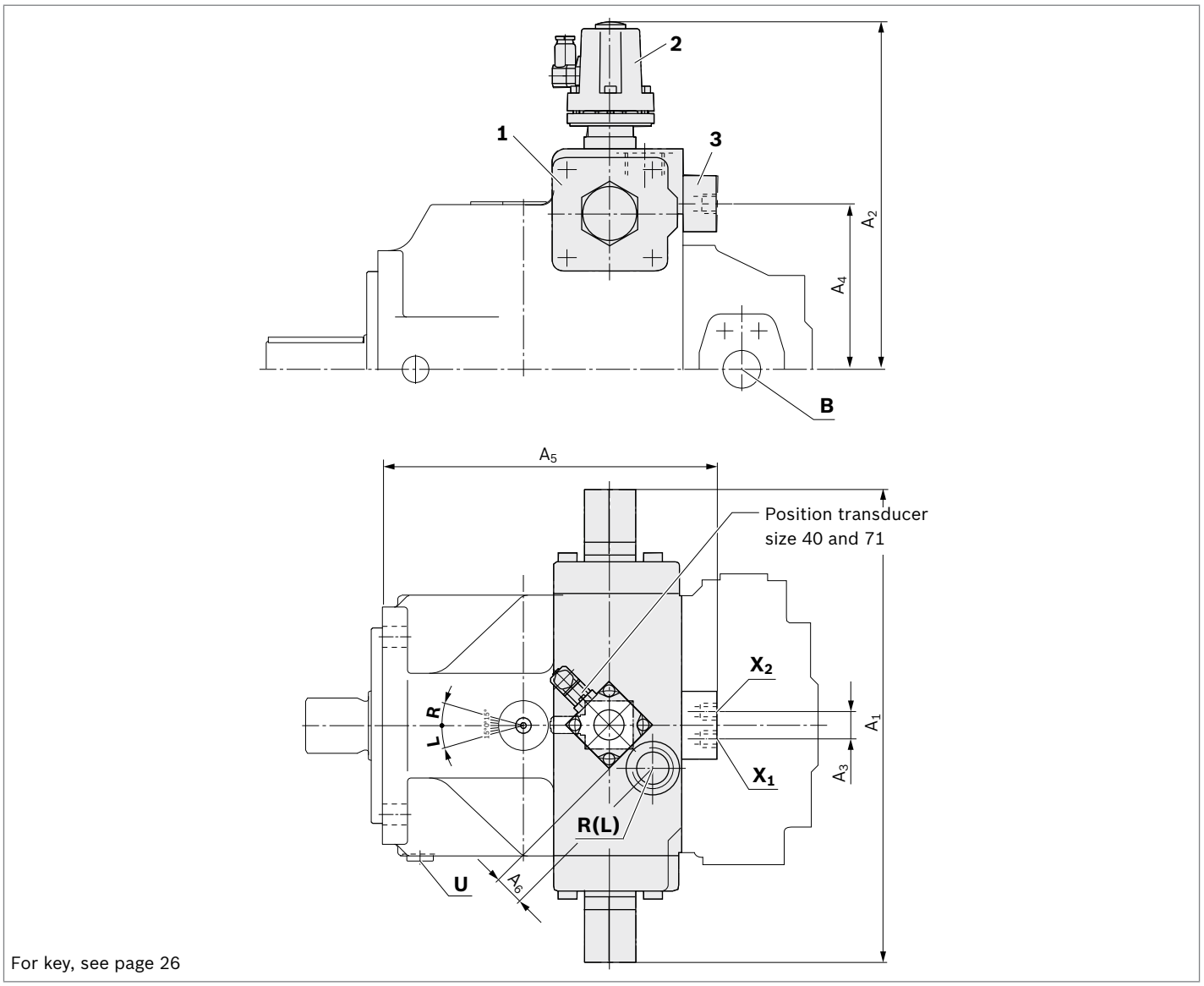


1 Pump with hydraulic control device A4VSO (see data sheet 92050)
2 Inductive position transducer AWXF004D01 with plug-in connector 4-pin Pg7-G4W1F type of protection IP65
3 Port plate

Ports	
X_1	Control pressure
X_2	Control pressure
R_2 ... R_7	Bleeding stroking chamber (size 125 to 1000)

Dimensions HS4M

▼ **A4VSO, A4VSG and A4CSG, size 40, 71, 500 and 750**



For key, see page 26

NG	A_1	A_2	A_3	A_4	A_5	A_6	
40	296	221.5	28	102	217	16.5	For detailed dimensions and technical data for the variable pump, see data sheet 92050 (A4VSO), 92100 (A4VSG) or 92105 (A4CSG)
71	332	243	28	120	245	20.9	
500	555	361	224	205	399	–	
750	630	400	224	235	431	–	

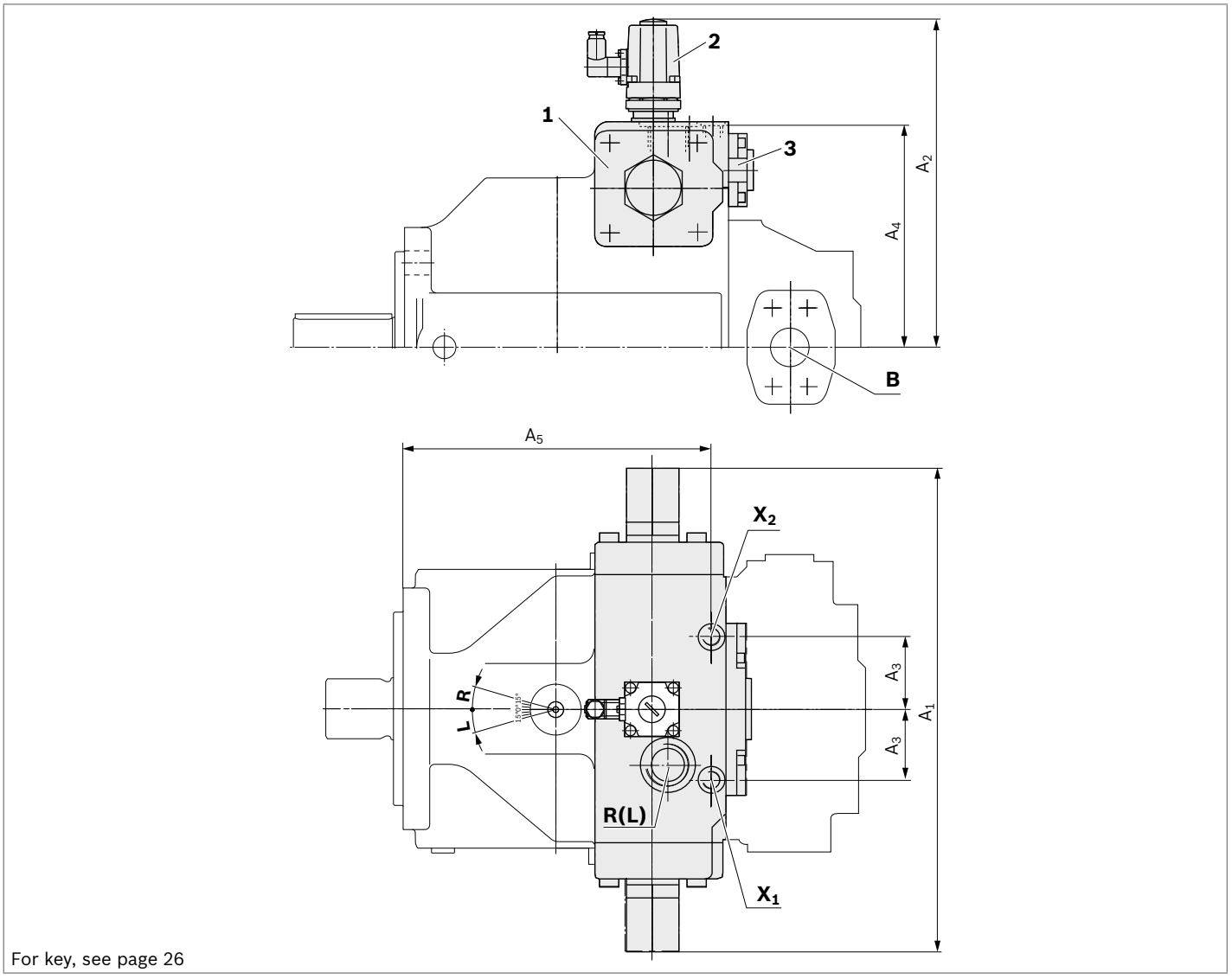
Ports		Standard	Size[1]	$p_{max\ abs}$ [bar][2]	State
X_1, X_2	Control pressure	DIN 3852-1	M14 × 1.5; 12 deep (size 40 and 71)	350	O
			M22 × 1.5; 14 deep (size 500)	350	O

1) For notes on tightening torques, see instruction manual.

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

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

▼ **A4VSO, A4VSG and A4CSG, size 125 to 355**



For key, see page 26

NG	A_1	A_2	A_3	A_4	A_5	
125/180	402	273	67	186.5	251	For detailed dimensions and technical data for the variable pump, see data sheet 92050 (A4VSO), 92100 (A4VSG) or 92105 (A4CSG)
250/355	485	309	71	233	311	

Ports		Standard	Size[1)]	$p_{max\ abs}$ [bar][2)]	State
X_1, X_2	Control pressure	DIN 3852-1	M14 x 1.5; 12 deep (size 125 and 180)	350	O
			M18 × 1.5; 12 deep (size 250 and 355)	350	O

1) For notes on tightening torques, see instruction manual.
2) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.

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

HS4V – Control with internal control pressure supply

Type	Size	40	71	125	180	250	355	500	750	1000	
A4VSO		●	●	●	●	●	●	–	–	–	**HS4V**

The version **HS4V** corresponds to the HS4 design, but with internal control pressure supply, differential stroking pistons and depressurized basic setting $V_{g\,max}$. This removes the need for an external control pressure supply. The control pressure supply takes place directly from the high pressure.
With the electric motor switched off and actuator system depressurized, the pump swivels to maximum displacement ($V_{g\,max}$) through spring force.
For reliable control, the system pressure must be at least 20 bar.
If the pump is to be controlled below 20 bar, the preload block AGEV4-05728-AA/46 is required for generating the required control power (see circuit example). Please contact us.

Fail safe features

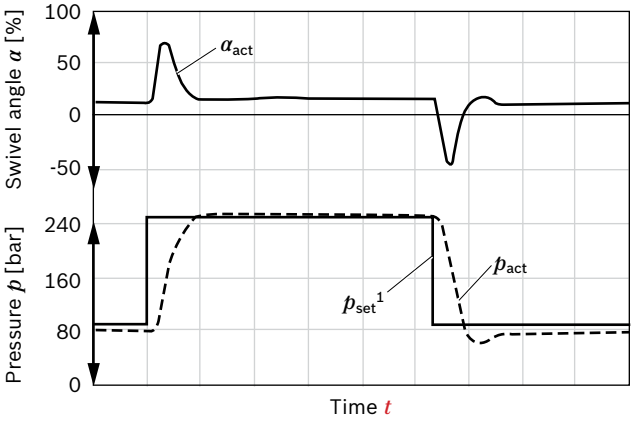
With a de-energized proportional valve and closed pump outlet, the pump switches to minimum pressure (6 to 10 bar). This is also true in the event of a fault or without control release.
Electronics:

- VT-VPCD-1X see data sheet 30028

Swiveling range –100 % to +100 %

As a special feature, the pump can switch the conveying direction. This feature of switching over the neutral position enables a quick pressure reduction via the pump.

▼ **Dynamic characteristic curve for pressure reduction via the pump**

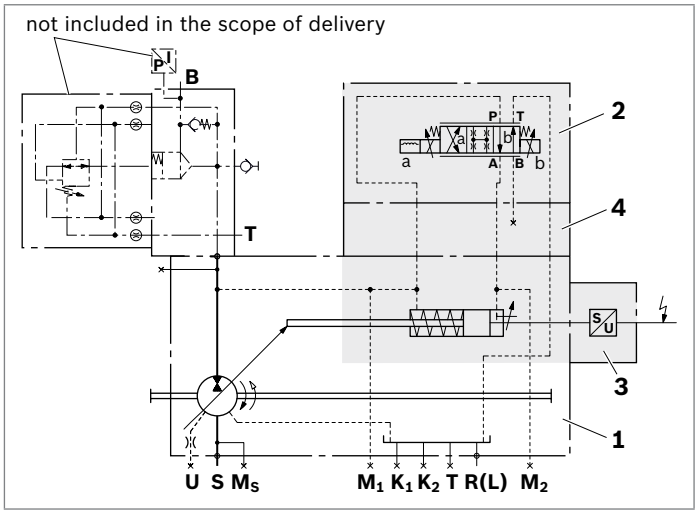


Technical data HS4V

Size		NG	250	355
Minimum working pressure	p_{nom} [1]	bar	315	315
Minimum working pressure	p_{min}	bar	20	20

Circuit diagram HS4V

▼ **Size 250 and 355**
Example: A4VSO HS4V with preload block AGEV4-05728-AA/46



1 Pump with hydraulic control device A4VSO (see data sheet 92050)
2 4/3-proportional directional valve (see data sheet 29061) with electric position feedback (incl. plug-in connector 4-pin Pg7-G4W1F)

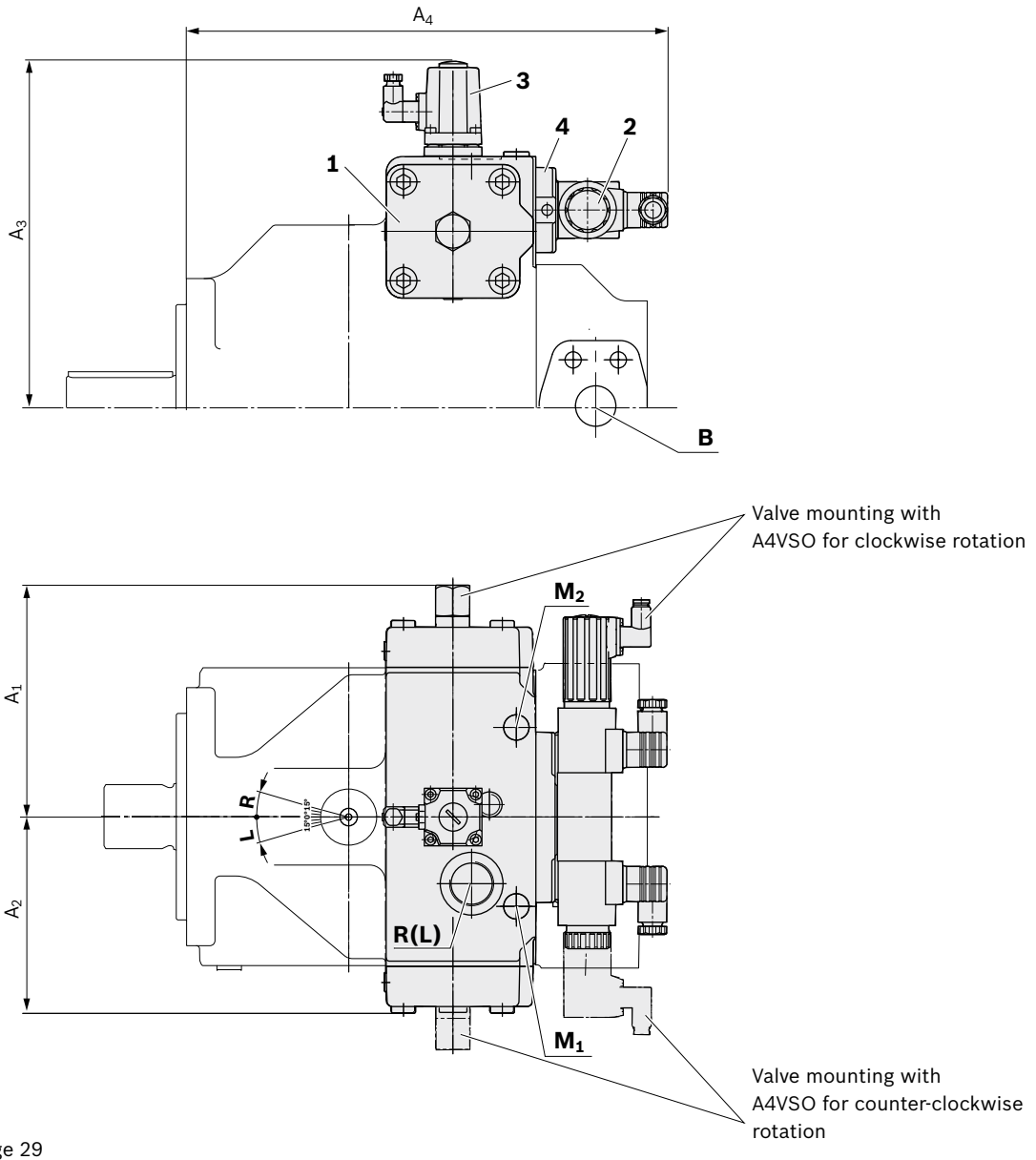
NG	Type [2]
250 and 355	4WRE6V16-2X/G24K4/V-822

3 Inductive position transducer AWXF004D01 with plug-in connector 4-pin Pg7-G4W1F
4 Intermediate plate

1) Due to the permissible data of the proportional valve, higher pressures on request
2) With plug-in connector in accordance with DIN EN 175.301-803 / ISO 4400 cable gland M16 × 1.5 for cable diameters 4.5 to 10 mm

Dimensions HS4V

▼ **A4VSO, sizes 250 and 355**



For key, see page 29

NG	A_1	A_2	A_3	A_4	
250/355	212	179	309	433	For detailed dimensions and technical data of the variable pump, see data sheet 92050 (A4VSO)

Ports		Standard	Size[1]	$p_{max\ abs}$ [bar][2]	State
M_1, M_2	Measuring, control pressure	DIN 3852-1	M18 x 1.5; 12 deep	315	X

1) For notes on tightening torques, see instruction manual.
2) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.

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

HSK – Short circuit valve

Type / Size	40	71	125	180	250	355	500	750	1000	
A4VSO, A4VSG	●	●	●	●	●	●	●	●	●	**HSK**
A4CSG	–	–	–	–	●	●	●	●	–	

A 4/2-way shut-off valve is installed between the servo valve and control device.

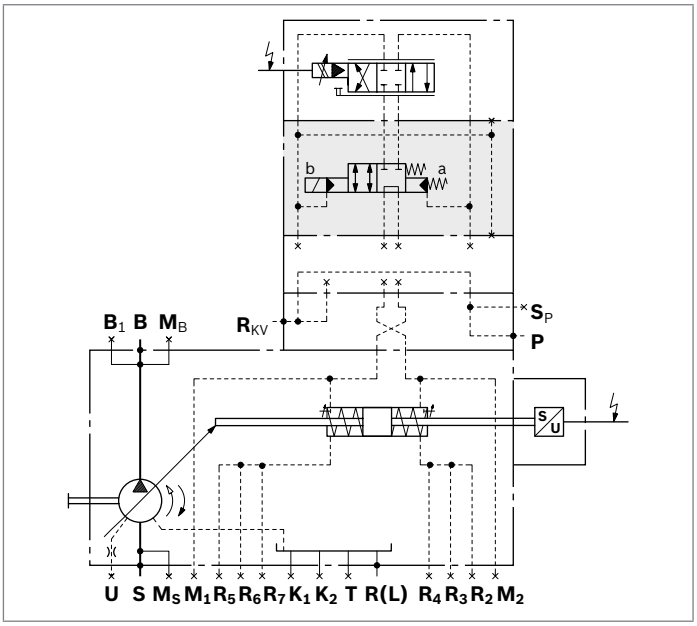
Notes

- The short circuit switching is used for setting and adjustment in depressurized neutral position, but without defined reset during high-pressure operation – **no emergency off function**.
- With a de-energized short circuit valve, the servo valve has no function due to the interrupted connection, i.e. the control does not follow the setpoint value.

Short circuit valve (4/2-way shut-off valve)
Type Z4WEH10E68-4X/6EG24N9ETZ4/B10D3[1)]
(see data sheet 24753).

Circuit diagram HSK

▼ **Size 125 to 355**
Example: open circuit A4VSO

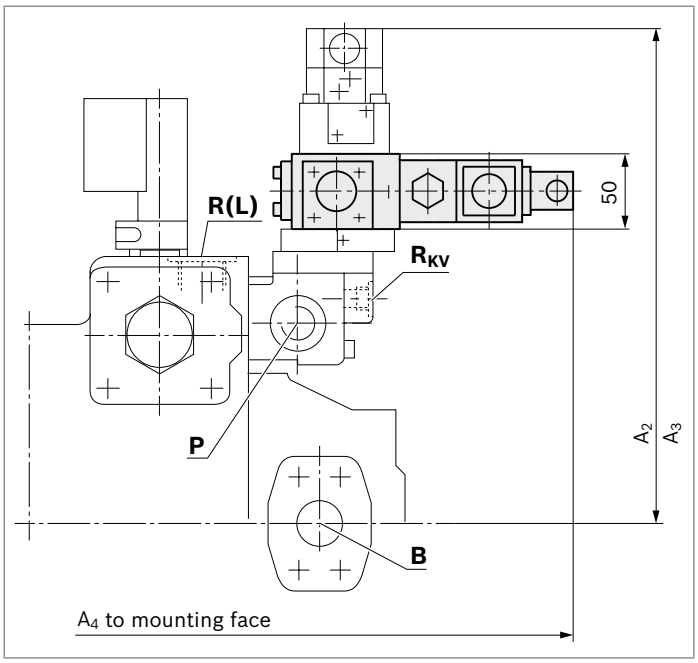


With size 40 and 71, the ports $\mathbf{R_2}$...$\mathbf{R_7}$ are not present.

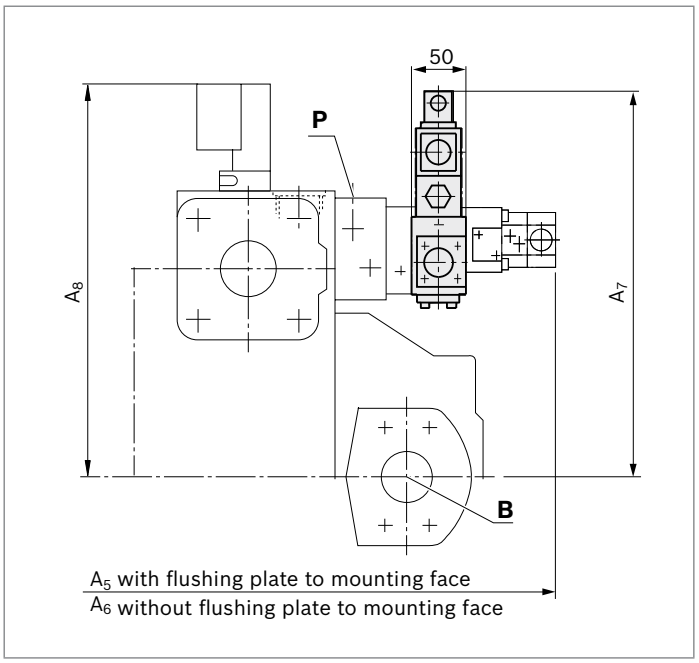
1) With plug-in connector in accordance with DIN EN 175.301-803 / ISO 4400 cable gland M16 × 1.5 for cable diameters 4.5 to 10 mm

Dimensions HSK

▼ **Size 40 to 355**



▼ **Size 500 to 1000**



NG	A_2	A_3	A_4	A_5	A_6	A_7	A_8
40	318	303	403	–	–	–	–
71	336	321	430	–	–	–	–
125 / 180	355	340	479	–	–	–	–
250 / 355	390	375	541	–	–	–	–
500	–	–	–	577	562	401	392
750	–	–	–	608	593	431	427
1000	–	–	–	674	659	454	456

HS4K / EO1K / EO2K – Short circuit valve

Type / Size	40	71	125	180	250	355	500	750	1000	
A4VSO, A4VSG	●	●	●	●	●	●	●	●	●	HS4K
A4CSG	–	–	–	–	●	●	●	●	–	
A4VSO, A4VSG	●	●	●	–	●	–	–	–	–	EO1K
	●	●	●	●	●	●	▲[2]	▲[2]	▲[2]	EO2K
A4CSG	–	–	–	–	●	●	▲[2]	▲[2]	–	

A 4/2-way shut-off valve is installed between the proportional valve and control device.

Notes

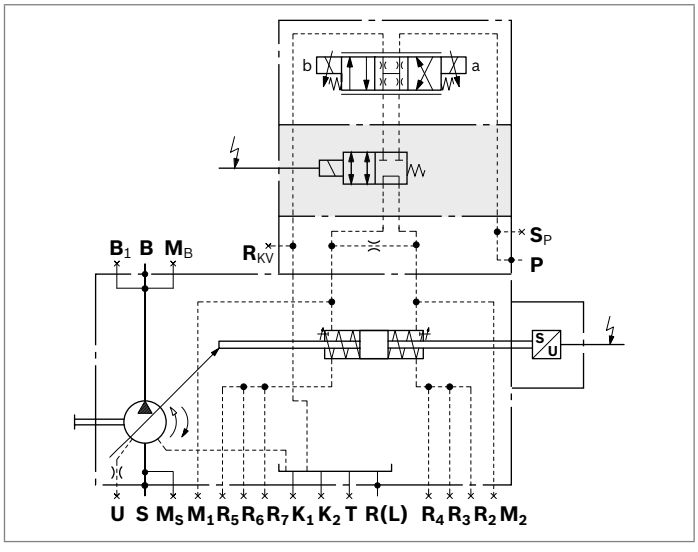
- The short circuit switching is used for setting and adjustment in depressurized neutral position, but without defined reset during high-pressure operation – **no emergency off function**.
- With a de-energized short circuit valve, the servo valve has no function due to the interrupted connection, i.e. the control does not follow the setpoint value.

● **= Short circuit valve** (4/2-way shut-off valve)
Type Z4WE6E68-3X/EG24N9Z4/V[1] (see data sheet 23193, please observe limits of performance).

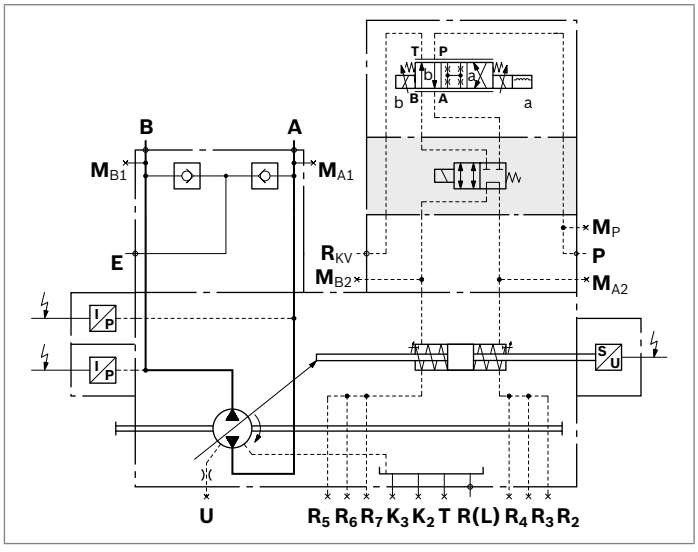
▲ **= Short circuit valve** (4/2-way shut-off valve)
Type Z4WEH10E68-4X/6EG24N9ETZ4/B10D3[1]
(see data sheet 24753).

Circuit diagrams

▼ **Size 125 to 355**
Example: open circuit A4VSO **EO2K**



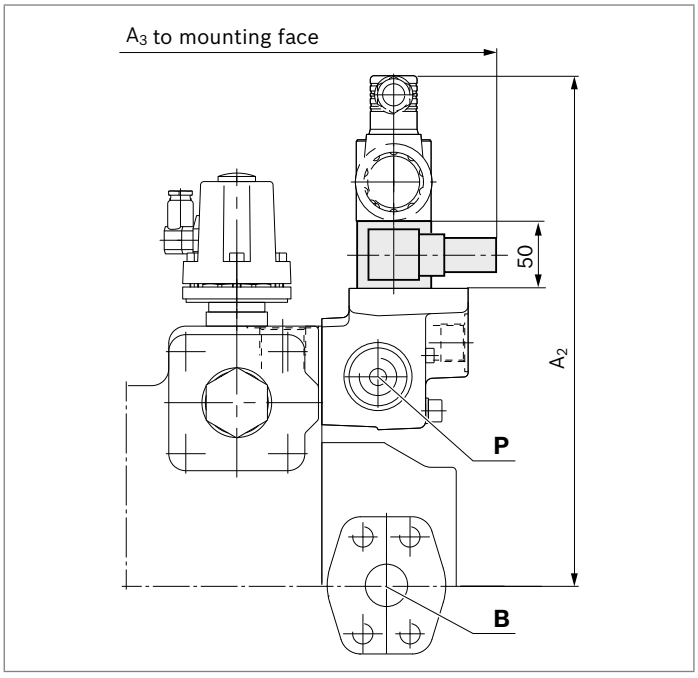
▼ **Size 500 to 1000**
Example: closed circuit A4VSG **HS4KP**



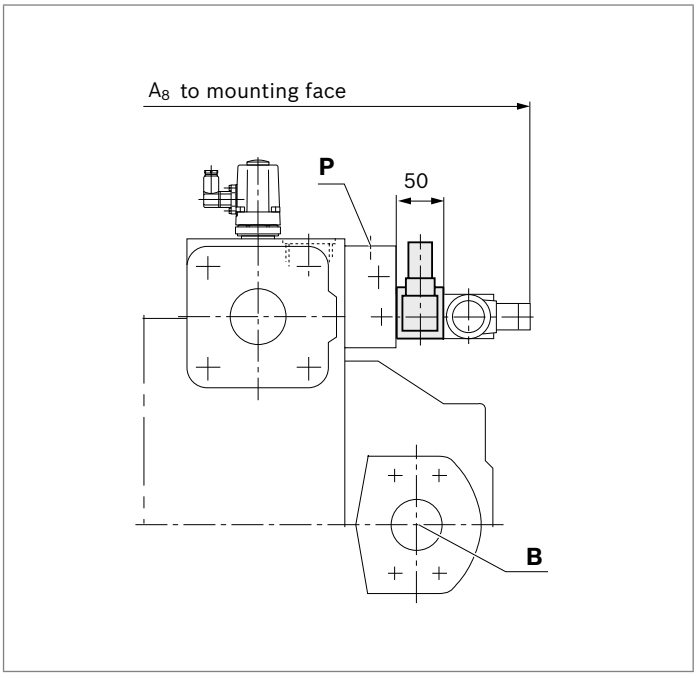
1) With plug-in connector in accordance with DIN EN 175.301-803 / ISO 4400 cable gland M16 × 1.5 for cable diameters 4.5 to 10 mm
2) For circuit diagram and dimensions, see page 35

Dimensions

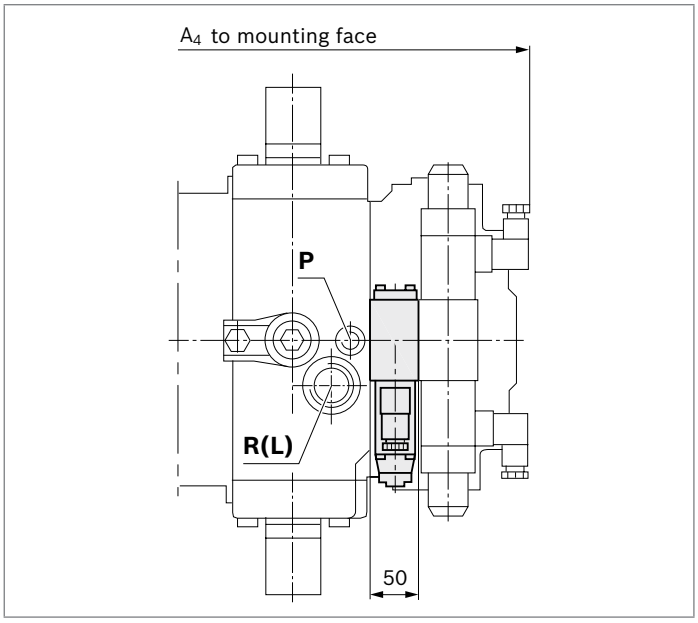
▼ **HS4K, size 40 to 355**



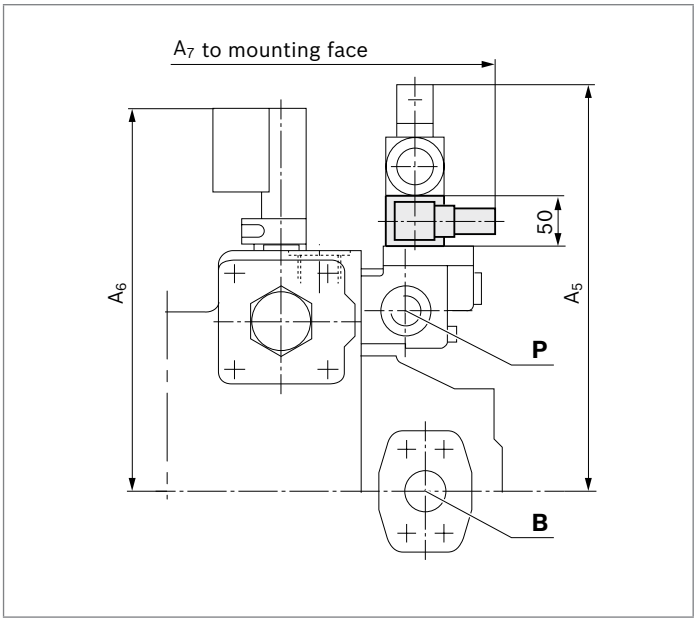
▼ **HS4K, size 500 to 1000**



▼ **EO1K, size 40 and 71**



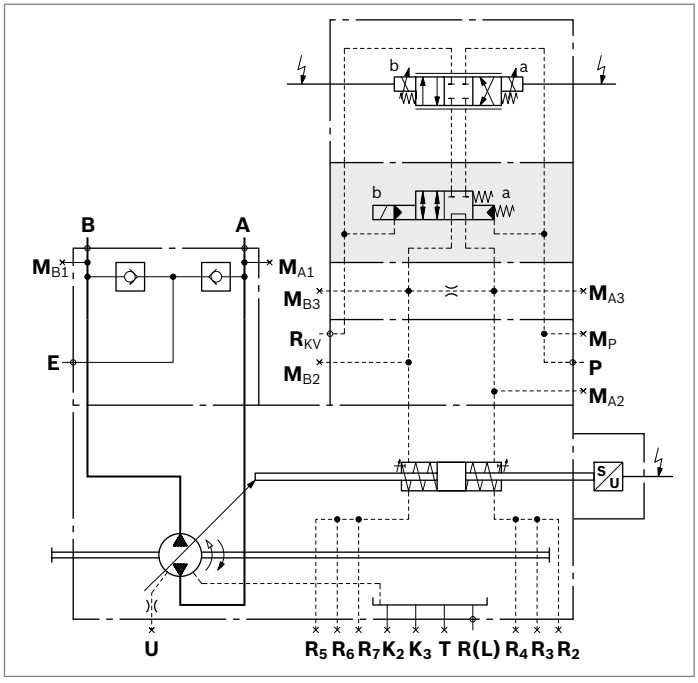
▼ **EO1K, size 125 and 250,**
EO2K size 40 to 355



NG	A_2	A_3	A_4	A_5	A_6	A_7	A_8
40	295	296	324	298	246	295	–
71	311	323	351	314	265	322	–
125 / 180	330	381	–	331	298	379	–
250 / 355	365.5	443	–	365	345	443	–
500	–	–	–	–	–	–	551
750	–	-–	–	–	-–	–	583
1000	–	–	–	–	–	–	649

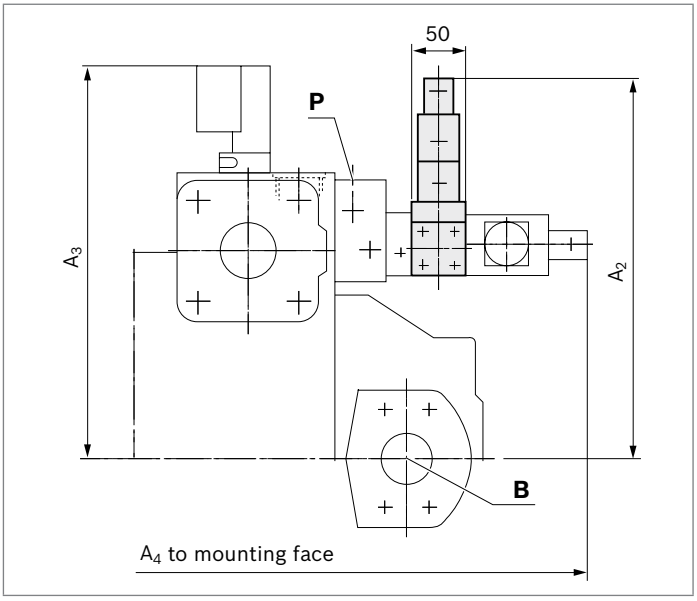
EO2K circuit diagram

▼ **Size 500 to 1000**
Example: closed circuit A4VSG **EO2K**



Dimensions EO2K

▼ **Size 500 to 1000**



NG	A_2	A_3	A_4
500	386	392	609
750	417	427	641
1000	439	456	707

EO1 / EO2 – Control with proportional valve

Type / Size	40	71	125	180	250	355	500	750	1000	
A4VSO, A4VSG	●	●	●	–	●	–	–	–	–	**EO1**
	●	●	●	●	●	●	●	●	●	**EO2**
A4CSG	–	–	–	–	●	●	●	●	–	

For electric displacement control with VT-5035-1X
The control **EO1/2** sets the displacement of the pump with the mounted direct operated proportional directional valve proportional to the setpoint value.
The pump setting is reported by an inductive position transducer.

Spring-centering
The spring-centering of the hydraulic stroking cylinder is standard. It is used for setting and adjustment in depressurized neutral position, but without defined reset during high-pressure operation.
The spring-centering is not a safety device.

Swivel angle limitation
Minimum and maximum swivel angle limitation is mechanically adjustable up to 50 % $V_{g\,max}$. For size 500, $V_{g\,min}$ is adjustable up to 50 % $V_{g\,max}$ and $V_{g\,max}$ up to 70 % $V_{g\,max}$.

Notes
- Setting with A4VSO (open circuit):
  - The $V_{g\,max}$ stop is set to nominal $V_{g\,max}$.
- Setting with A4VSG and A4CSG (closed circuit):
  - The $V_{g\,max}$ stops are set on both sides to nominal $V_{g\,max}$.

When ordering, please state other setting requests in plain text.

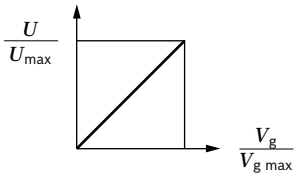
Electric amplifier
The electric amplifier VT 5035-1X for controlling the pump swivel angle is not included in the EO scope of delivery, please order separately in accordance with data sheet 29955.

Two versions are available:

Type	Control pressure [bar]	Sizes
EO1	above 20	40, 71, 125 and 250 (see from page 37)
EO2	from 50/100/125	40...1000 (see from page 41)

A4VSO – open circuit

▼ **Characteristic curve**



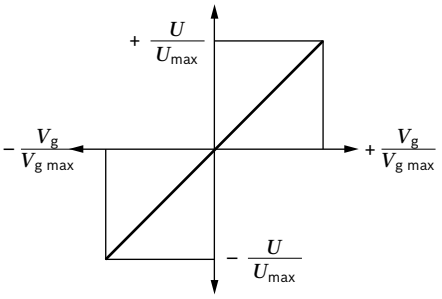
▼ **Flow direction S to B**

Direction of rotation	Swiveling range[1)]	Actuation of solenoid
right	left	a
left	right	b

Overcenter is available on request.

A4VSG and A4CSG – closed circuit

▼ **Characteristic curve**



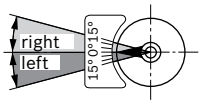
▼ **Flow direction**

Direction of rotation	Swiveling range[1)]	Flow direction	Actuation of solenoid
right	right	**B** to **A**	b
	left	**A** to **B**	a
left	right	**A** to **B**	b
	left	**B** to **A**	a

Technical data EO1

Size		NG	40	71	125	250
Control pressure (in **P**)	p_{min}	bar	20	20	20	20
	P_{max}	bar	100	100	100	100
Control stroke	s_{max}	mm	14.2	17.1	20.7	25.9
Control area	A	cm^2	16.6	24.6	36.6	56.7
Control volume	$V_{S\,max}$	cm^3	23.6	42.1	75.2	147
Control time[2)]	t_{min}	s	0.12	0.20	0.22	0.40
Weight: approx. (A4VSO...EO1...N00)	m	kg	42	59	98	200
Maximum hysteresis ΔV_g[3)]			≤ ±2 % of $V_{g\,max}$			
Minimum repeatability[3)]			≤ ±1.5 % of $V_{g\,max}$			
Linearity deviation[3)]			≤ 2.5 % of $V_{g\,max}$			

1) cf. swivel angle indicator

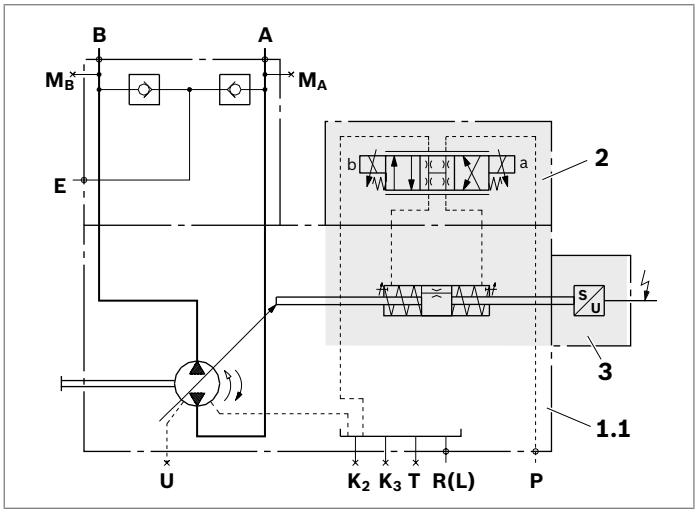


2) With 50 bar control pressure
3) Values are valid for a constant operating temperature of 50 °C

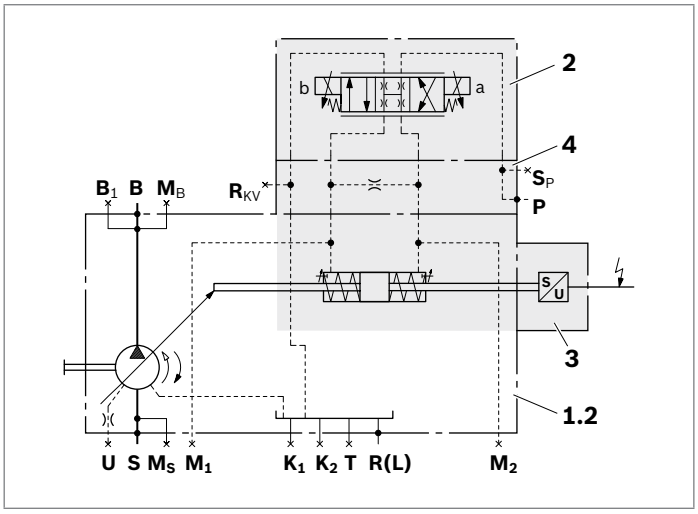
EO1 circuit diagrams

The control fluid to be supplied externally on port **P** is drained internally via the drain port **R(L)** of the pump.
For A4CSG with EO1, the control is supplied permanently from the boost circuit (port **ME3**), i.e. port **P** is already connected. Recommended setting value on the boost-pressure relief valve: 25 bar.

▼ **Size 40 and 71**
Example: closed circuit A4VSG



▼ **Size 125 to 355**
Example: open circuit A4VSO



1 Pump with hydraulic control device
1.1 A4VSG (see data sheet 92100)
1.2 A4VSO (see data sheet 92050)
2 4/3-way proportional valve (see data sheet 29055)

NG	Type[1)]
40 and 71	4WRA6V15-2X/G24N9K4/V-589
125 and 250	4WRA6V30-2X/G24N9K4/V-589

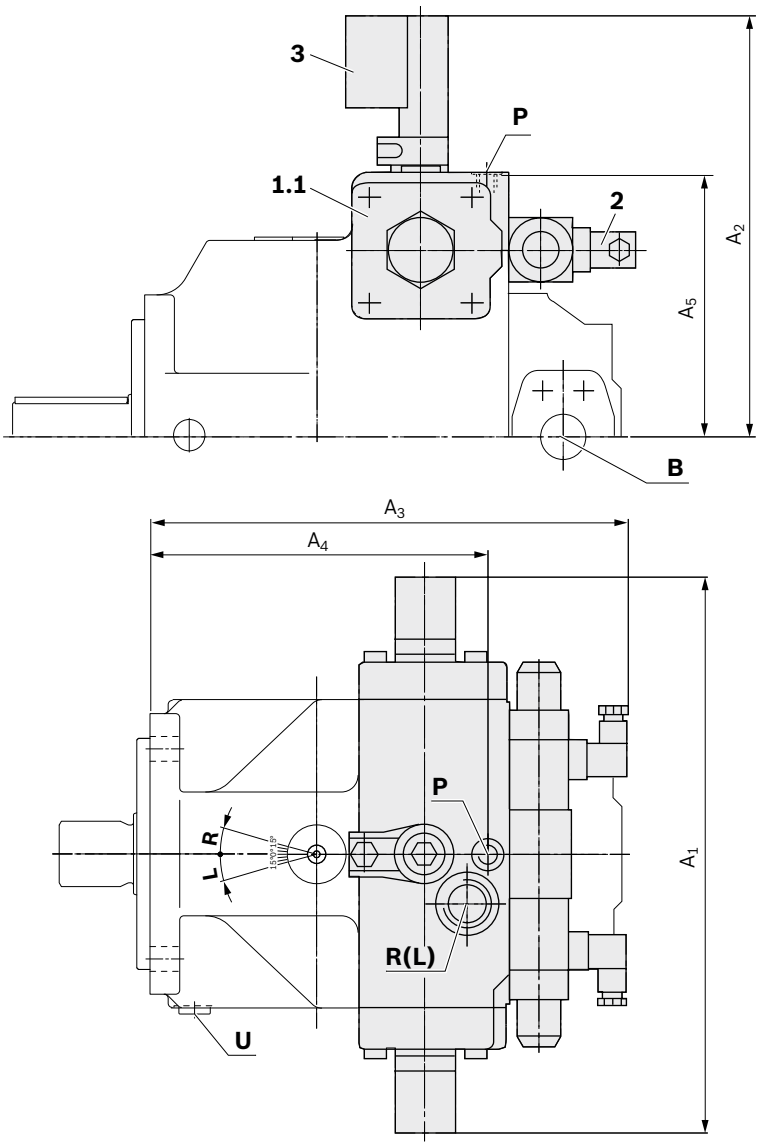
3 Inductive position transducer IW9-03-01[1)]
4 Flow control plate

Ports	
P	Control pressure
S_P	Accumulator control pressure
R_{KV}	Control fluid return flow
M_1, M_2	Measuring ports control pressure

1) Solenoids with plug-in connector in accordance with DIN EN 175.301-803 / ISO 4400 cable gland M16 × 1.5 for cable diameters 4.5 to 10 mm

Dimensions EO1

▼ **A4VSO and A4VSG, size 40 and 71**



For key, see page 38

NG	A_1	A_2	A_3	A_4	A_5	
40	296	246	279	178	135	For detailed dimensions and technical data for the variable pump, see data sheet 92050 (A4VSO) or 92100 (A4VSG)
71	332	265	306	205	152	

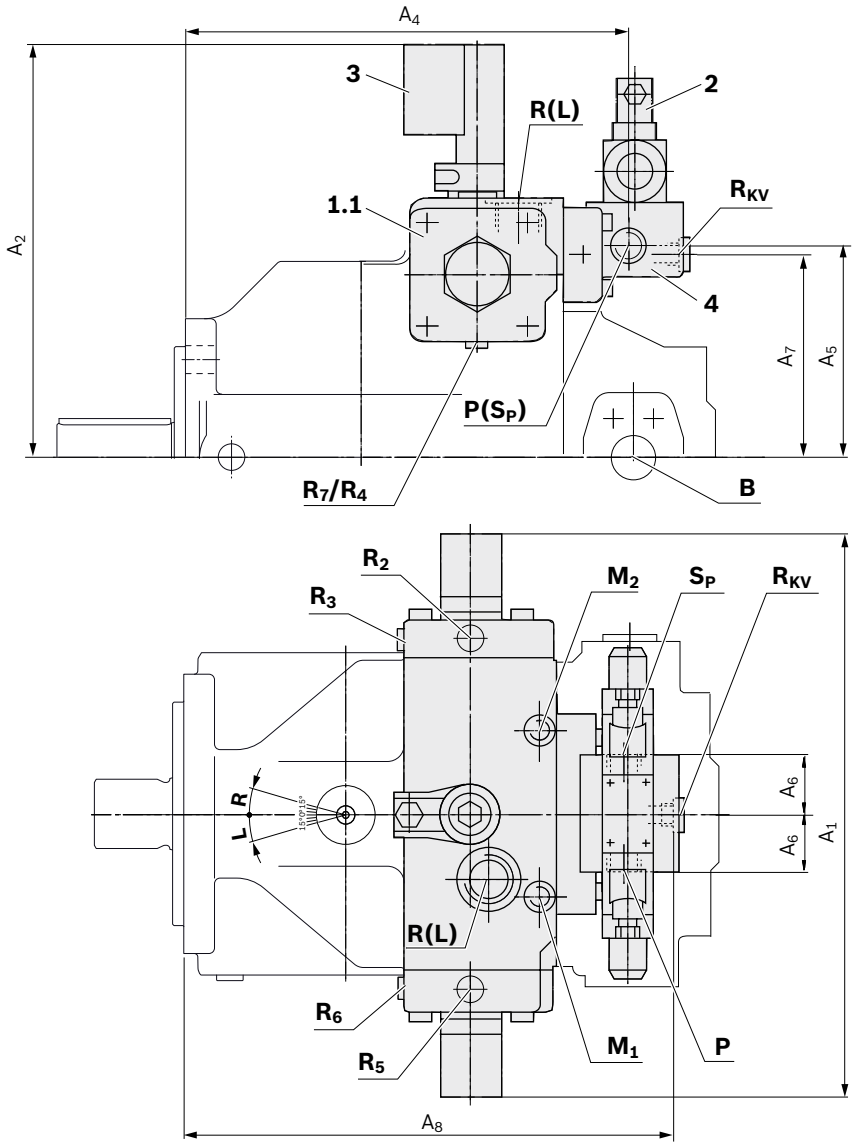
Ports		Standard	Size[1)]	$p_{max\ abs}$ [bar][2)]	State
P	Control pressure	DIN 3852-1	M14 x 1.5; 12 deep	100	O

1) For notes on tightening torques, see instruction manual.

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

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

▼ **A4VSO and A4VSG, size 125 and 250**



For key, see page 38

NG	A_1	A_2	A_4	A_5	A_6	A_7	A_8	
125	402	298	312	156	39	148	352	For detailed dimensions and technical data for the variable pump, see data sheet 92050 (A4VSO) or 92100 (A4VSG)
250	485	345	372	192	39	184	412	

Ports		Standard	Size[1)]	$p_{max\ abs}$ [bar][2)]	State
P	Control pressure	DIN 3852-1	M22 x 1.5; 14 deep	100	O
S_P	Accumulator control pressure	DIN 3852-1	M22 x 1.5; 14 deep	100	X
R_{KV}	Control fluid return flow	DIN 3852-1	M22 x 1.5; 14 deep	4	O
M_1, M_2	Measuring, control pressure	DIN 3852-1	M14 × 1.5; 12 deep (size 125)	100	X
			M18 × 1.5; 12 deep (size 250)	100	X
R_2 ... R_7	Air bleeding of stroking chamber	DIN 3852-1	M10 × 1; 8 deep	100	X

1) For notes on tightening torques, see instruction manual.
2) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.

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

Technical data EO2

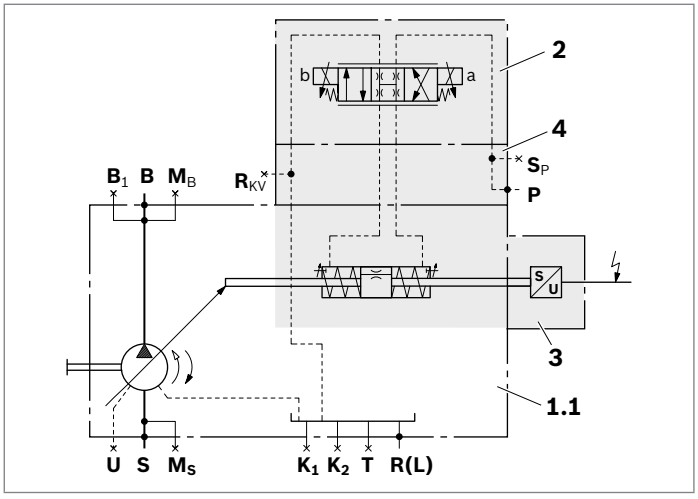
Size		**NG**	**40**	**71**	**125**	**180**	**250**	**355**	**500**	**750**	**1000**
Control pressure (in **P**)	p_{min}	bar	50	50	50	100	100	100	125	125	125
	p_{max} [1)]	bar	315	315	315	315	315	315	315	315	315
Control stroke	s_{max}	mm	14.2	17.1	20.7	20.7	25.9	25.9	32.6	37.0	41.4
Control area	A	cm^2	8.1	12.6	18.1	18.1	28.3	28.3	38.2	56.8	63.6
Control volume	$V_{S\ max}$	cm^3	11.4	21.5	37.5	37.5	73.2	73.2	124.5	210	263.3
Control time [2)]	t_{min}	s	0.1	0.12	0.2	0.2	0.25	0.25	0.3	[3)]	[3)]
Weight: approx. (A4VSO...EO2...N00)	m	kg	42	59	98	122	200	220	338	481	611
Maximum hysteresis ΔV_g [4)]			≤ ±2 % of $V_{g\ max}$								
Minimum repeatability [4)]			≤ ±1.5 % of $V_{g\ max}$								
Linearity deviation [4)]			≤ 2.5 % of $V_{g\ max}$								

1) Due to the permissible data of the proportional valve
2) With minimum control pressure
3) Values are valid for a constant operating temperature of 50 °C
4) On request

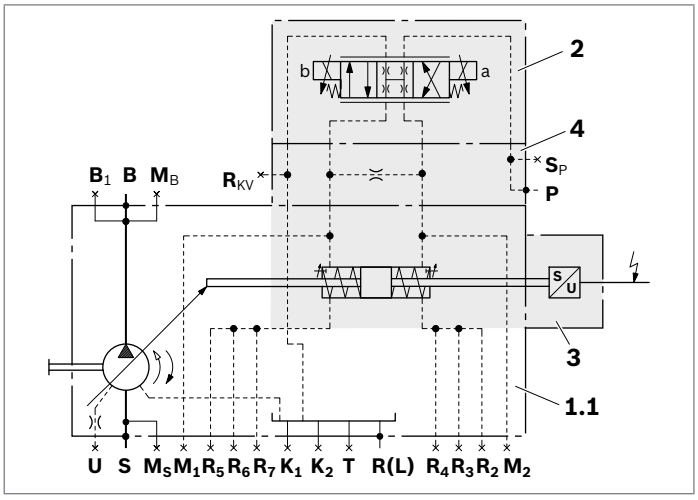
Circuit diagrams EO2 – size 40 to 355

The control fluid to be supplied externally on port **P** is drained internally via the drain port **R(L)** of the pump.
For A4CSG with EO2, the control pressure relief valve is not required and is replaced with a threaded plug.
To minimize the control fluid consumption, the stroking chambers are sealed with sizes 125...355 and can be bled via the ports $\mathbf{R}_2$ to $\mathbf{R}_7$.

▼ **Size 40 and 71**
Example: open circuit A4VSO



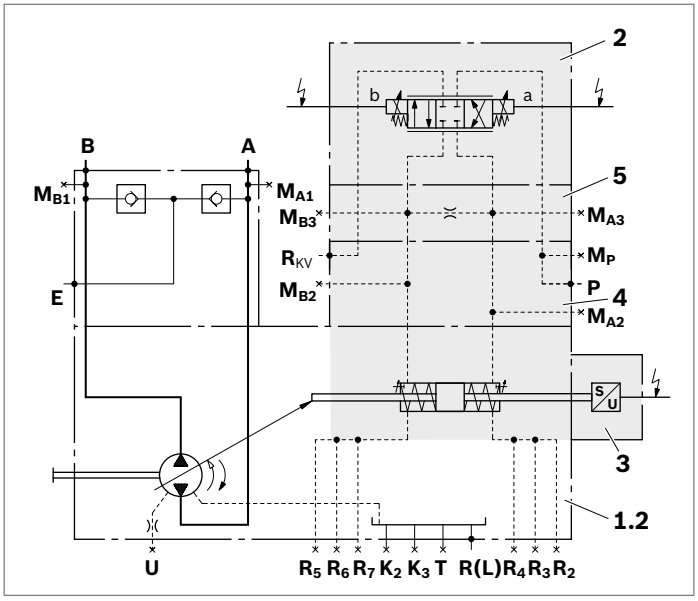
▼ **Size 125 to 355**
Example: open circuit A4VSO



Circuit diagram EO2 – size 500 to 1000

The control fluid to be supplied externally on port **P** is drained via the port $\mathbf{R}_{KV}$ to be connected externally to the reservoir.
For A4CSG with EO2, the control pressure relief valve is not required and is replaced with a threaded plug.
To minimize the control fluid consumption, the stroking chambers are sealed and can be bled via the ports $\mathbf{R}_2$ to $\mathbf{R}_7$.

▼ **Size 500 to 1000**
Example: closed circuit A4VSG



1 Pump with hydraulic control device
1.1 A4VSO (see data sheet 92050)
1.2 A4VSG (see data sheet 92100)
2 4/3-way proportional valve (see data sheet 29055 or 29061)

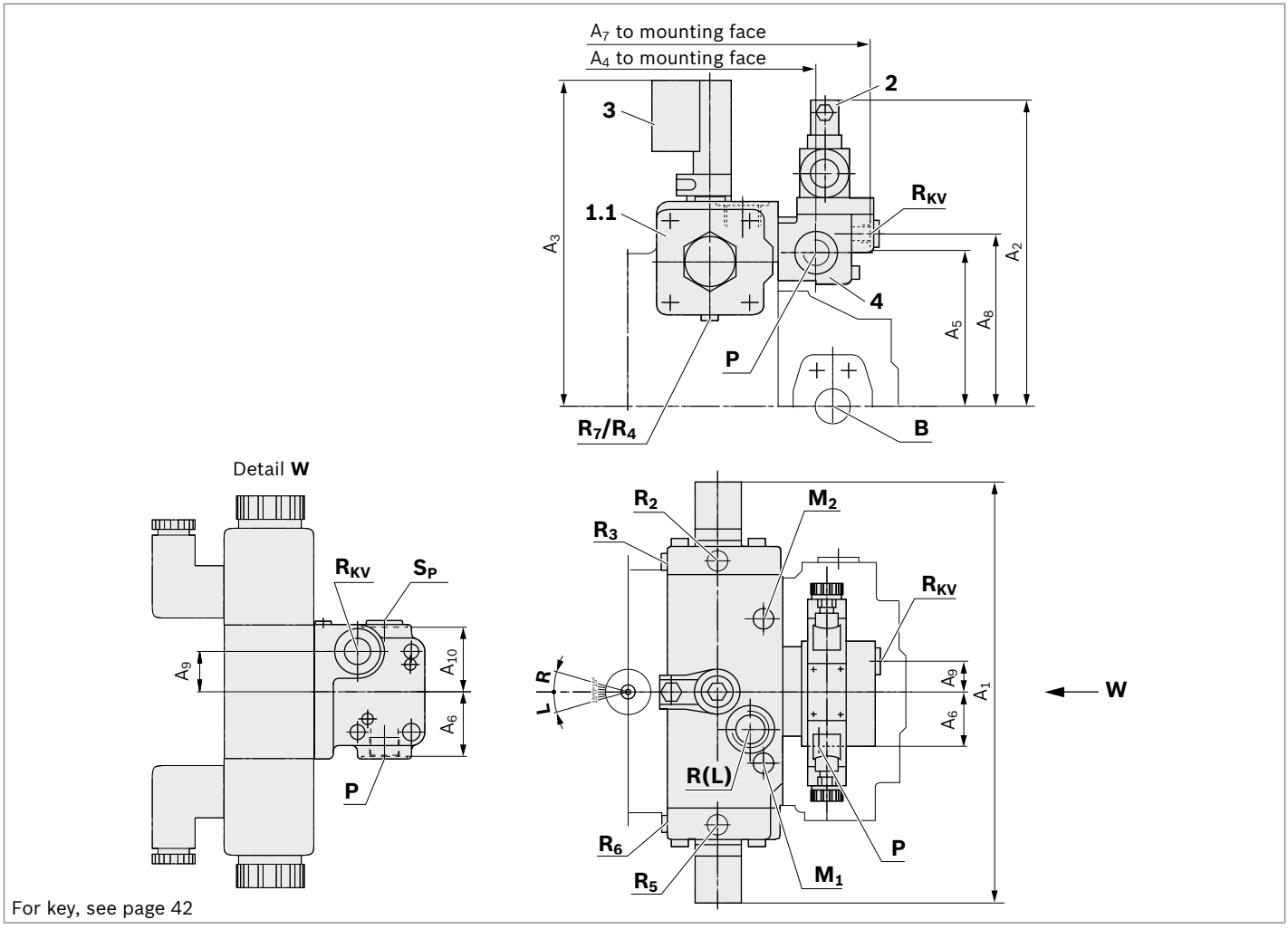
NG	Type[1)]
40 and 71	4WRA6V15-2X/G24N9K4/V-589
125 to 355	4WRA6V30-2X/G24N9K4/V-589
500 to 1000	4WRE10E25-2X/24K4/V-93

3 Inductive position transducer IW9-03-01[1)]
4 Intermediate plate
5 Flow control plate

1) Solenoids with plug-in connector in accordance with DIN EN 175.301-803 / ISO 4400 cable gland M16 × 1.5 for cable diameters 4.5 to 10 mm

Dimensions EO2

▼ **A4VSO, A4VSG and A4CSG, size 40 to 355**



For key, see page 42

NG	A_1	A_2	A_3	A_4	A_5	A_6	A_7	A_8	A_9	A_{10}	
40	296	248	246	222	108	43	273	128	35	53	For detailed dimensions and technical data for the variable pump, see data sheet 92050 (A4VSO), 92100 (A4VSG) or 92105 (A4CSG)
71	332	264	265	249	123	48	300	143	30	48	
125/180	402	281	298	310	156	39	350	148	0	39	
250/355	485	317	345	372	192	39	412	184	0	39	

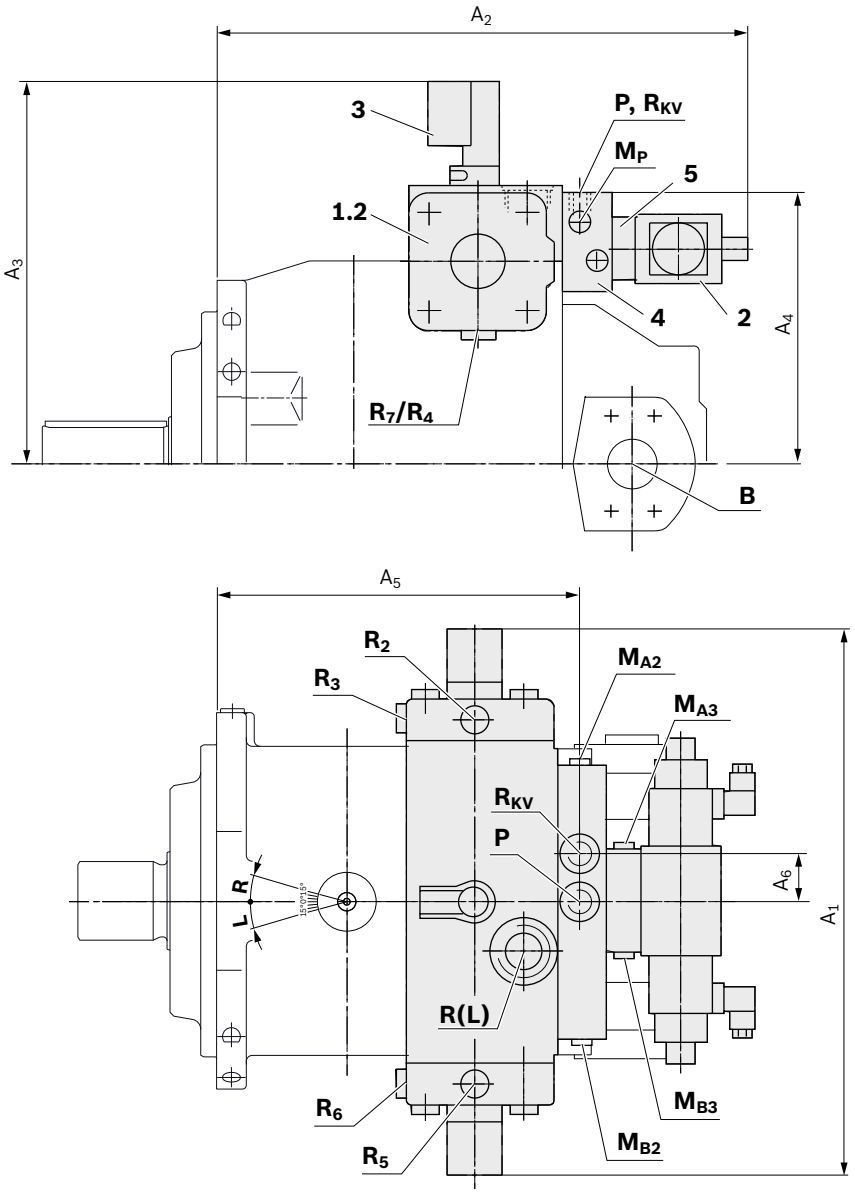
Ports		Standard	Size[1]	$p_{max\ abs}$ [bar][2]	State
P	Control pressure	DIN 3852-1	M22 x 1.5; 14 deep	315	O
S_P	Accumulator control pressure	DIN 3852-1	M22 x 1.5; 14 deep	315	X
R_{KV}	Control fluid return flow	DIN 3852-1	M22 x 1.5; 14 deep	210	X
M_1, M_2	Measuring, control pressure	DIN 3852-1	M14 x 1.5; 12 deep (size 125 and 180)	315	X
			M18 × 1.5; 12 deep (size 250 and 355)	315	X
R_2 ... R_7	Air bleeding of stroking chamber	DIN 3852-1	M10 × 1; 8 deep (size 125 to 355)	315	X

1) For notes on tightening torques, see instruction manual.

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

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

▼ **A4VSO, A4VSG and A4CSG, size 500 to 1000**



For key, see page 42

NG	A_1	A_2	A_3	A_4	A_5	A_6	
500	555	559	392	274	388	50	For detailed dimensions and technical data for the variable pump, see data sheet 92050 (A4VSO), 92100 (A4VSG) or 92105 (A4CSG)
750	630	591	427	304	420	50	
1000	670	657	456	327	486	50	

Ports		Standard	Size[1)]	$p_{max\ abs}$ [bar][2)]	State
P	Control pressure	DIN 3852-1	M27 x 2; 16 deep	315	O
$\mathbf{R_{KV}}$	Control fluid return flow	DIN 3852-1	M27 x 2; 16 deep	210	O
$\mathbf{M_P}$, $\mathbf{M_{A2}}$, $\mathbf{M_{B2}}$	Measuring, control pressure	DIN 3852-1	M14 x 1.5; 12 deep	315	X
$\mathbf{M_{A3}}$, $\mathbf{M_{B3}}$	Measuring, control pressure	DIN 3852-1	G 1/4 in	315	X
$\mathbf{R_2}$ ... $\mathbf{R_7}$	Air bleeding of stroking chamber	DIN 3852-1	M14 x 1.5; 12 deep	315	X

1) For notes on tightening torques, see instruction manual.

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

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

Z – Intermediate plate filter with HS control

Type / Size	40	71	125	180	250	355	500	750	1000	
A4VSO, A4VSG	●	●	●	●	●	●	–	–	–	**Z**
A4CSG	–	–	–	–	●	●	–	–	–	

The intermediate plate filter is used for filtration before the servo valve with **HS**.
It is ordered with **Z** with the filtration type code point.
HS4 with intermediate plate filter on request.

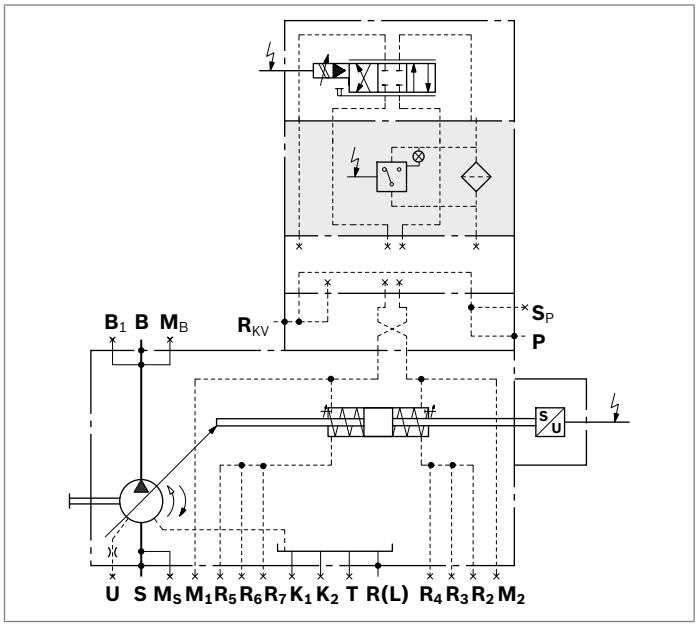
Intermediate plate filter

The contamination indicator takes place optically and electrically – lamp 24 V voltage

NG	Type
40 and 71	DFBH/HC60Z10D2.0/V-L24
125 to 355	DFBH/HC110Z10D2.0/V-L24

Circuit diagram

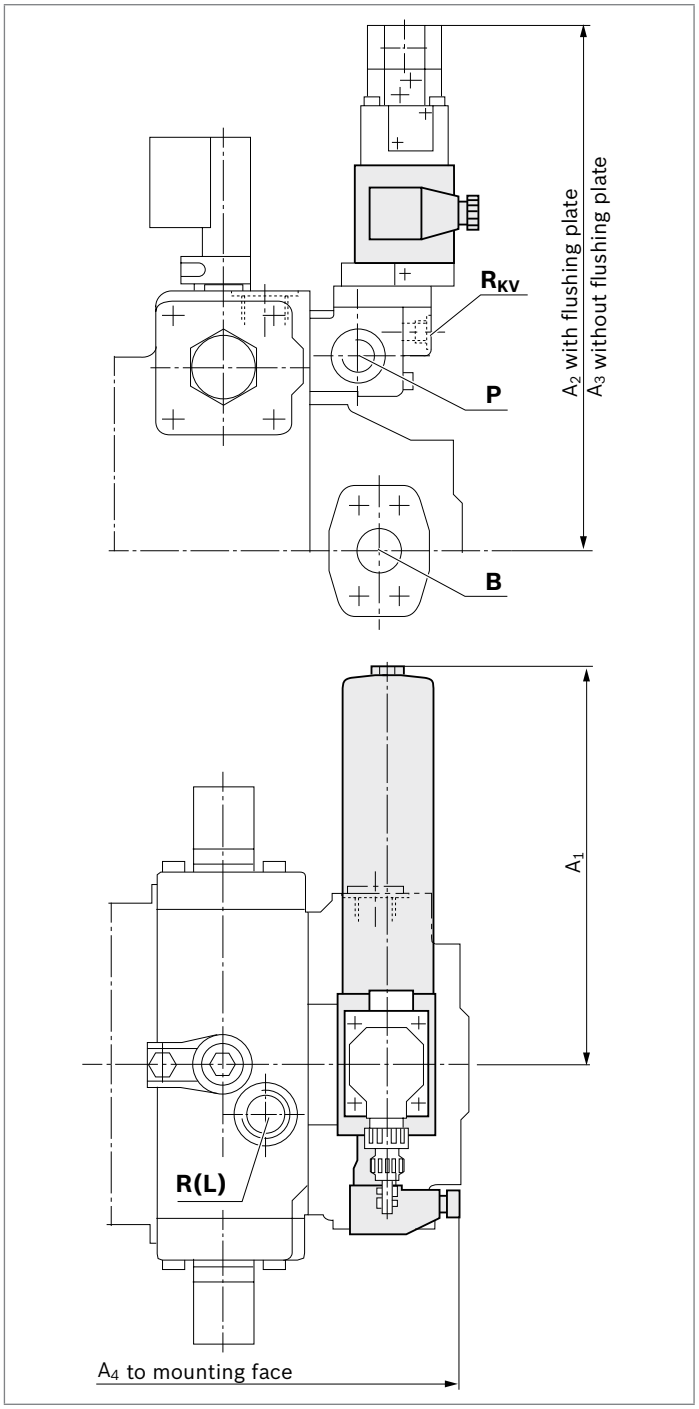
▼ **Example: A4VSG**



NG	A_2	A_3	A_4	A_5
40	216	342	327	300
71	212	350	335	312
125 / 180	272	374	359	376
250 / 355	272	411	396	438

Dimensions

▼ **Example: HS...Z**



Installation instructions

The installation instructions for the relevant variable pump apply:

- A4VSO, data sheet 92050
- A4VBO, data sheet 92122
- A4VSG, data sheet 92100
- A4CSG, data sheet 92105

Only the controls **HM1**, **HM2** and **HS4M** are suitable for use under fluid.

Project planning notes

- The control devices HM, HS, HS4 and EO are designed for use in the open circuit (A4VSO, A4VBO) or closed circuit (A4VSG, A4CSG) depending on the pump.
- The project planning, installation and commissioning of the axial piston unit require the involvement of qualified skilled person.
- Before using the axial piston unit, please read the corresponding instruction manual completely and thoroughly. If necessary, these can be requested from Bosch Rexroth.
- Before finalizing your design, request a binding installation drawing.
- The specified data and notes must be observed.
- 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 condition of the axial piston unit (operating pressure, fluid temperature), the characteristic curve may shift.
- Not all versions of the product are approved for use in a safety function pursuant to ISO 13849. Please consult the responsible contact person at Bosch Rexroth if you require reliability parameters (e.g. $MTTF_d$) for functional safety.
- Working ports:
  - The ports and fastening threads are designed for the specified peak pressure. The machine or system manufacturer must ensure that the connecting elements and lines correspond to the specified operating conditions (pressure, flow, hydraulic fluid, temperature) with the necessary safety factors.
  - The working ports and function ports can only be used 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 equipment (e.g. valve spools) can, under certain circumstances, get blocked in position as a result of contamination (e.g. impure hydraulic fluid, abrasion, or residual dirt from components). As a result, the flow of hydraulic fluid 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 filtering) cannot rule out errors, but can only help minimize risks. 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.

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