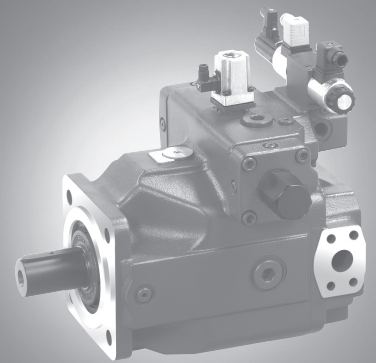


Control Systems HM, HS, HS4 and EO

RE 92076/08.10 1/52
Replaces: 03.05 and 05.10

Data sheet

For the axial piston variable pumps
A4VSO, A4VBO and A4VSG series 1 and 3
A4CSG series 3
Open and closed circuit



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Features

- Basis system to control the displacement of variable piston pumps A4VSO, A4VBO, A4VSG and A4CSG
- Control with servo or proportional valve
- In conjunction with amplifier and PC-program BODAC free programmable (HS4)
- High precision control of displacement, pressure and power (HS4P)
- Mechanical limitation of $V_{g \min}$ and $V_{g \max}$
- Electrical control system for oil immersed mounting inside the reservoir (HS4M)
- Special version for mooring, over centre operation and decompression by means of the pump.
- Optional with internal control pressure supply (HS4V)

Further information:

Variable pump A4VSO	Size 40...1000	RE 92050
Variable pump A4VBO	Size 71...450	RE 92122
Variable pump A4VSG	Size 40...1000	RE 92100
Variable pump A4CSG	Size 250...750	RE 92105

Ordering code for A4VSO

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

01 Fluid / version (detailed information see RE 92050)

Axial piston unit / Type of operation

02 Swash plate design, variable / pump, open circuit (see RE 92050) **A4VS(L)O**

Size

03 Displacement $V_{g \max}$ in cm^3 **40 71 125 180 250 355 500 750 1000**

Control device

04	Hydraulic control, control volume dependent											
	min. control pressure 20 bar										● ● ● - ● - - - -	HM1
	min. control pressure 50/100/125 bar										● ● ● ● ● ● ● ● ● ●	HM2
	Hydraulic control, with servo valve for electrical control of displacement with VT-SR7-1X										● ● ● ● ● ● ● ● ● ●	HS*
	supply without valve										● ● ● ● ● ● ● ● ● ●	HSE
	with short circuit valve										● ● ● ● ● ● ● ● ● ●	HSK*
	Hydraulic control with proportional valve, for electrical and electronic control of displacement- as well as control of pressure and power with VT -VPCD-1X										● ● ● ● ● ● ● ● ● ●	HS4*
	with short circuit valve										● ● ● ● ● ● ● ● ● ●	HS4K*
	with pressure transducer HM 17										● ● ● ● ● ● ● ● ● ●	HS4P*
	with short circuit valve and press. transducer HM 17										● ● ● ● ● ● ● ● ● ●	HS4KP*
	suitable for oil immersed operation										● ● ● ● ● ● ● ● ● ●	HS4M*
	with internal control pressure supply										○ ○ ○ ○ ● ● - - -	HS4V*
	Hydraulic control with proportional valve for electrical control of displacement with VT 5035-1X											
	min. control pressure 20 bar										● ● ● - ● - - - -	EO1*
	with short circuit valve										● ● ● - ● - - - -	EO1K*
min. control pressure 50/100/125 bar										● ● ● ● ● ● ● ● ● ●	EO2*	
with short circuit valve										● ● ● ● ● ● ● ● ● ●	EO2K*	

Series

05	● ● - - - - - - - -	10
	- - ● ● ● ● ● ● ● ●	30

06	Direction of rotation	
07	Seals	
08	Drive shaft	For detailed information
09	Mounting flange	see RE 92050 – A4VSO
10	Service line connections	
11	Through drive	

Filtration (only for HS-control)

12		40 71 125 180 250 355 500 750 1000
	Without filter (no code)	● ● ● ● ● ● ● ● ● ●
	Sandwich plate filter for HS-control	● ● ● ● ● ● - - - Z

* Operation with HF-fluids on request

● = available ○ = on request - = not available

Ordering code for A4VBO

A4VBO		HS4	/			-					
01	02	03		04	05		06	07	08	09	10

Axial piston unit / Type of operation

01	Swash plate design, variable / pump, open circuit (see RE 92122)	A4VBO
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Size

02	Displacement $V_{g \max}$ in cm^3	071	125	450
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Control device

03	Hydraulic control with proportional valve for electrical and electronic control of displacement and power with VT -VPCD-1X	●	●	●	HS4*
----	--	----------	----------	----------	-------------

Series

04	Series 1, Index 0	●	-	-	10
	Series 3, Index 0	-	●	●	30

05	Direction of rotation	
06	Seals	
07	Drive shaft	For detailed information: _____
08	Mounting flange	see RE 92122 – A4VBO
09	Service line connections	
10	Through drive	

* Operation with HF-fluids on request

● = available - = not available

Ordering code for A4VSG

	A4VSG			/			-							
01	02	03	04		05	06		07	08	09	10	11	12	13

01 **Fluid / version** (detailed information see RE 92100)

Axial piston unit / Type of operation

02 Swash plate design, variable / pump, closed circuit (see RE 92100) **A4VSG**

Size

03 Displacement $V_{g \max}$ in cm^3

40	71	125	180	250	355	500	750	1000
----	----	-----	-----	-----	-----	-----	-----	------

Control device

04	Hydraulic control, control volume dependent										
	min. control pressure 20 bar	●	●	●	-	●	-	-	-	-	HM1
	min. control pressure 50/100/125 bar	●	●	●	●	●	●	●	●	●	HM2
	Hydraulic control with servo valve										
	for electrical control of displacement with VT-SR7-1X	●	●	●	●	●	●	●	●	●	HS*
	supply without valve	●	●	●	●	●	●	●	●	●	HSE
	with short circuit valve	●	●	●	●	●	●	●	●	●	HSK*
	Hydraulic control with proportional valve										
	for electrical and electronic control of displacement- as well as control of pressure and power with VT -VPCD-1X	●	●	●	●	●	●	●	●	●	HS4*
	with short circuit valve	●	●	●	●	●	●	●	●	●	HS4K*
	with pressure transducer HM 17	●	●	●	●	●	●	●	●	●	HS4P*
	with short circuit valve and press. transducer HM 17	●	●	●	●	●	●	●	●	●	HS4KP*
	suitable for oil immersed operation	●	●	●	●	●	●	●	●	●	HS4M*
	Hydraulic control with proportional valve										
for electrical control of displacement with VT 5035-1X											
min. control pressure 20 bar	●	●	●	-	●	-	-	-	-	EO1*	
with short circuit valve	●	●	●	-	●	-	-	-	-	EO1K*	
min. control pressure 50/100/125 bar	●	●	●	●	●	●	●	●	●	EO2*	
with short circuit valve	●	●	●	●	●	●	●	●	●	EO2K*	

Series

05	●	●	-	-	-	-	-	-	-	10
	-	-	●	●	●	●	●	●	●	30

06	Direction of rotation	
07	Seals	
08	Drive shaft	
09	Mounting flange	For detailed information: see RE 92100 – A4VSG
10	Service line connections	
11	Through drive	
12	Valves	

Filtration

		40	71	125	180	250	355	500	750	1000	
13	Without filter	●	●	●	●	●	●	●	●	●	N
	With filter, mounted in boost circuit	●	●	●	●	●	●	●	●	●	F
	With sandwich plate filter for HS-control	●	●	●	●	●	●	-	-	-	Z
	With filter, mounted in boost circuit and sandwich plate filter for HS-control	●	●	●	●	●	●	-	-	-	U

* Operation with HF-fluids on request

● = available ○ = on request - = not available

Ordering code for A4CSG

A4CSG			/	30		-								
01	02	03		04	05		06	07	08	09	10	11	12	13

Axial piston unit/ Type of operation

01	Compact unit swash plate design, variable / pump, closed circuit (see RE 92105)	A4CSG
----	---	--------------

Size

02	Displacement $V_{g, max}$ in cm ³	250	355	500	750
----	--	------------	------------	------------	------------

Control device

03	Hydraulic control, control volume dependent min. control pressure 100/125 bar	●	●	●	●	HM2
	Hydraulic control with servo valve for electrical control of displacement with VT-SR7-1X	●	●	●	●	HS
	supply without valve	●	●	●	●	HSE
	with short circuit valve	●	●	●	●	HSK
	Hydraulic control with proportional valve for electrical and electronic control of displacement- as well as control of pressure and power with VT -VPCD-1X	●	●	●	●	HS4
	with short circuit valve	●	●	●	●	HS4K
	with pressure transducer HM 17	●	●	●	●	HS4P
	with short circuit valve and press. transducer HM 17	●	●	●	●	HS4KP
	suitable for oil immersed operation	●	●	●	●	HS4M
	Hydraulic control with proportional valve for electrical control of displacement with VT 5035-1X					
min. control pressure 100/125 bar	●	●	●	●	EO2	
with short circuit valve	●	●	●	●	EO2K	

Series

04		●	●	●	●	30
----	--	---	---	---	---	-----------

05	Direction of rotation	
06	Seals	
07	Drive shaft	
08	Mounting flange	For detailed information:
09	Service line connections	see RE 92105 – A4CSG
10	Boost pump	
11	Through drive	
12	Valves	

Filtration

		250	355	500	750	
13	Without filter	●	●	●	●	N
	With threaded connection for filter in boost circuit	●	●	●	●	D
	With mounted filter in boost circuit (with optical-electrical dirt indicator)	●	●	●	●	M
	With threaded connection for filter in boost circuit (D) and sandwich plate filter for HS-control	●	●	-	-	Z
	With mounted filter in boost circuit (M) and sandwich plate filter for HS-control	●	●	-	-	U

● = available

○ = on request

- = not available

HM1 / HM2 – Hydraulic control, control volume dependent

For A4VSO and A4VSG: HM1, HM2

For A4CSG: only HM2

The HM 1/2- control adjusts the pump displacement, dependent on the control oil volume.

This control is used for 2-point control systems or as a base unit for controls with proportional valves (an additional electric feed back device is required).

The minimum and maximum swivel angle limitation is mechanically adjustable up to 50 % of $V_{g \max}$. For the size 500 $V_{g \min}$ is also adjustable up to 50 % of $V_{g \max}$ but $V_{g \max}$ only up to 70% of $V_{g \max}$.

Setting at the A4VSO and A4VBO (open circuit):

The $V_{g \min}$ -stop is set in such a position, that, with a blocked pressure port B a pressure of 15...20 bar is reached.

The $V_{g \max}$ -stop is set to the nominal value of $V_{g \max}$.

Setting at the A4VSG and A4CSG (closed circuit):

The $V_{g \max}$ -stops on both sides of centre are set to the nominal value of $V_{g \max}$.

If other settings are desired, please state in clear text when ordering.

Spring centering of the control cylinder is standard. It is used for settings and adjustments in the unpressurized zero (centre) position, however without a defined reset during high pressure operation.

2 versions are available:

HM1 Minimum control pressure 20 bar for sizes 40, 71, 125 and 250 see page 7

HM2 Minimum control pressure 50/100/125 bar for sizes 40...1000 see page 8

Over centre operation of the A4VSO is available on request.

Important

At the **A4VSO** for open circuit operation (one side of centre) the $V_{g \min}$ -stop is set in such a position, that, with a blocked pressure port B a pressure of approx. 20 bar is reached.

HM1

Size 40 to 125 and 250 for A4VSO and A4VSG

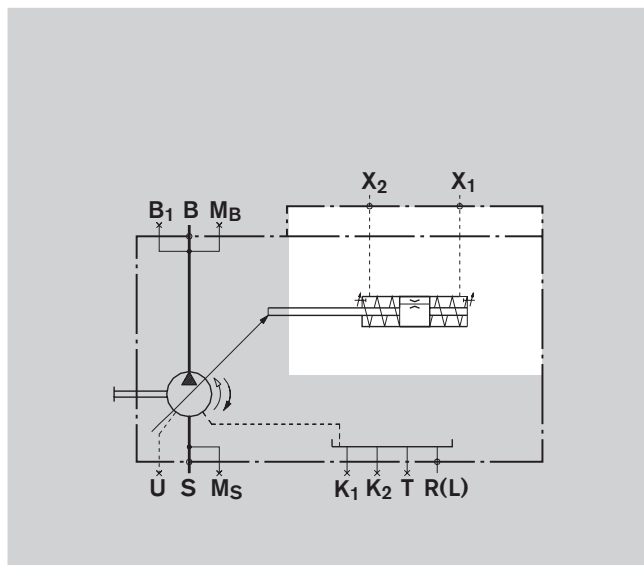
Technical data

Size		40	71	125	250
Control pressure (in X_1, X_2)	p_{min}	20			
	p_{max}	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)	kg	38	55	92	194

Schematics

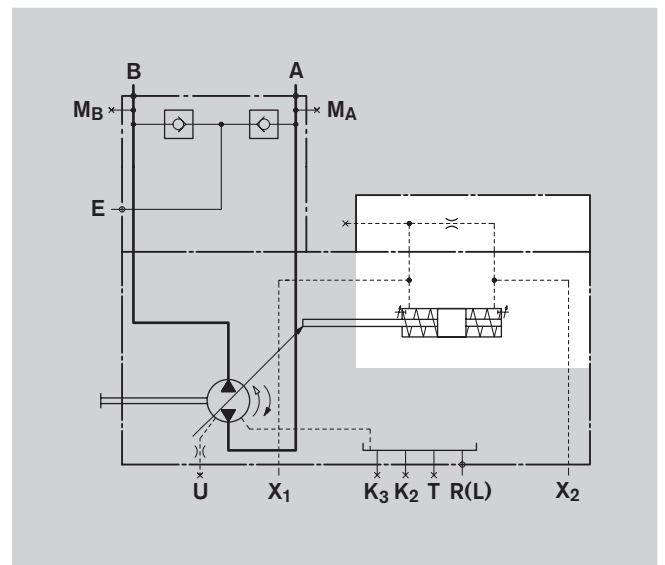
Size 40 and 71

Example: open circuit A4VSO



Size 125 and 250

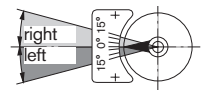
Example: closed circuit A4VSG



Ports and direction of flow

X_1	Control pressure port	for pressure in B at clockwise rotation, swivel range* left for pressure in A at counter clockwise rotation, swivel range* left
X_2	Control pressure port	for pressure in A at clockwise rotation, swivel range* right for pressure in B at counter clockwise rotation, swivel range* right

* compare swivel angle indicator



For example of schematic with proportional valve see page 29

HM2

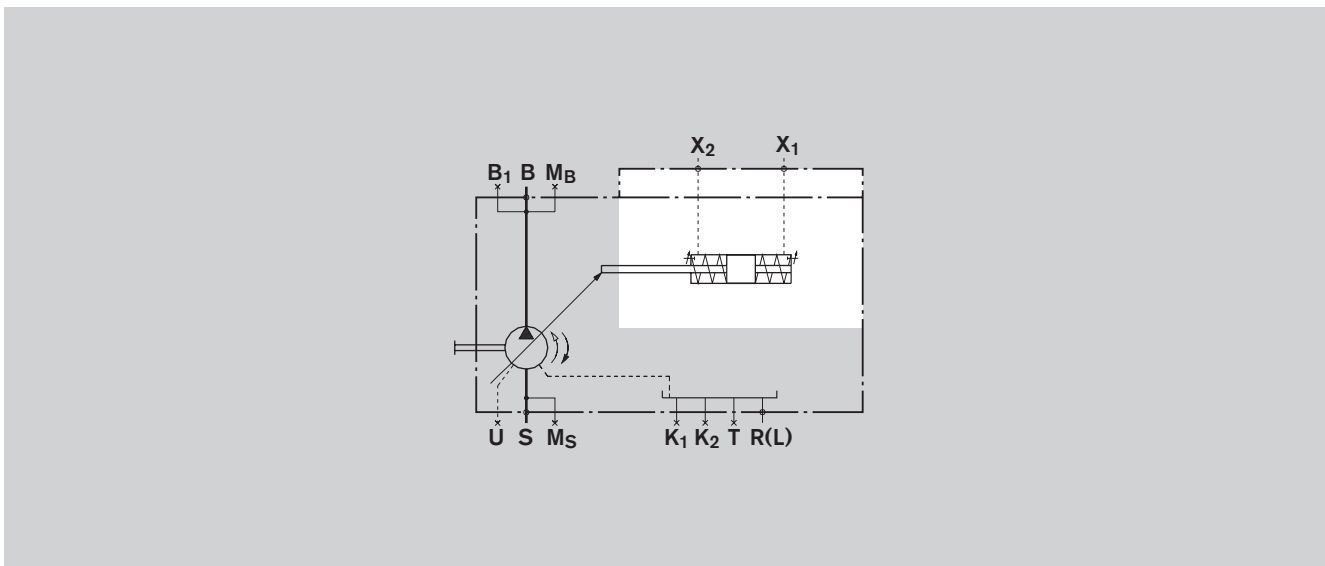
Size 40 and 71 for A4VSO and A4VSG

Technical data

Size		40	71
Control pressure (in X ₁ , X ₂)	p_{min}	50	50
	p_{max}	350	
Control stroke s_{max}	mm	14.2	17.1
Control area A	cm ²	8.1	12.6
Control volume $V_{S max}$	cm ³	11.4	21.5
Weight approx. (A4VSO...HM2...N00)	kg	38	55

Schematic

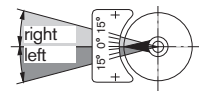
Example: open circuit A4VSO



Ports and direction of flow

X ₁	Control pressure port	for pressure in B at clockwise rotation, swivel range* left for pressure in A at counter clockwise rotation, swivel range* left
X ₂	Control pressure port	for pressure in A at clockwise rotation, swivel range* right for pressure in B at counter clockwise rotation, swivel range* right

* compare swivel angle indicator



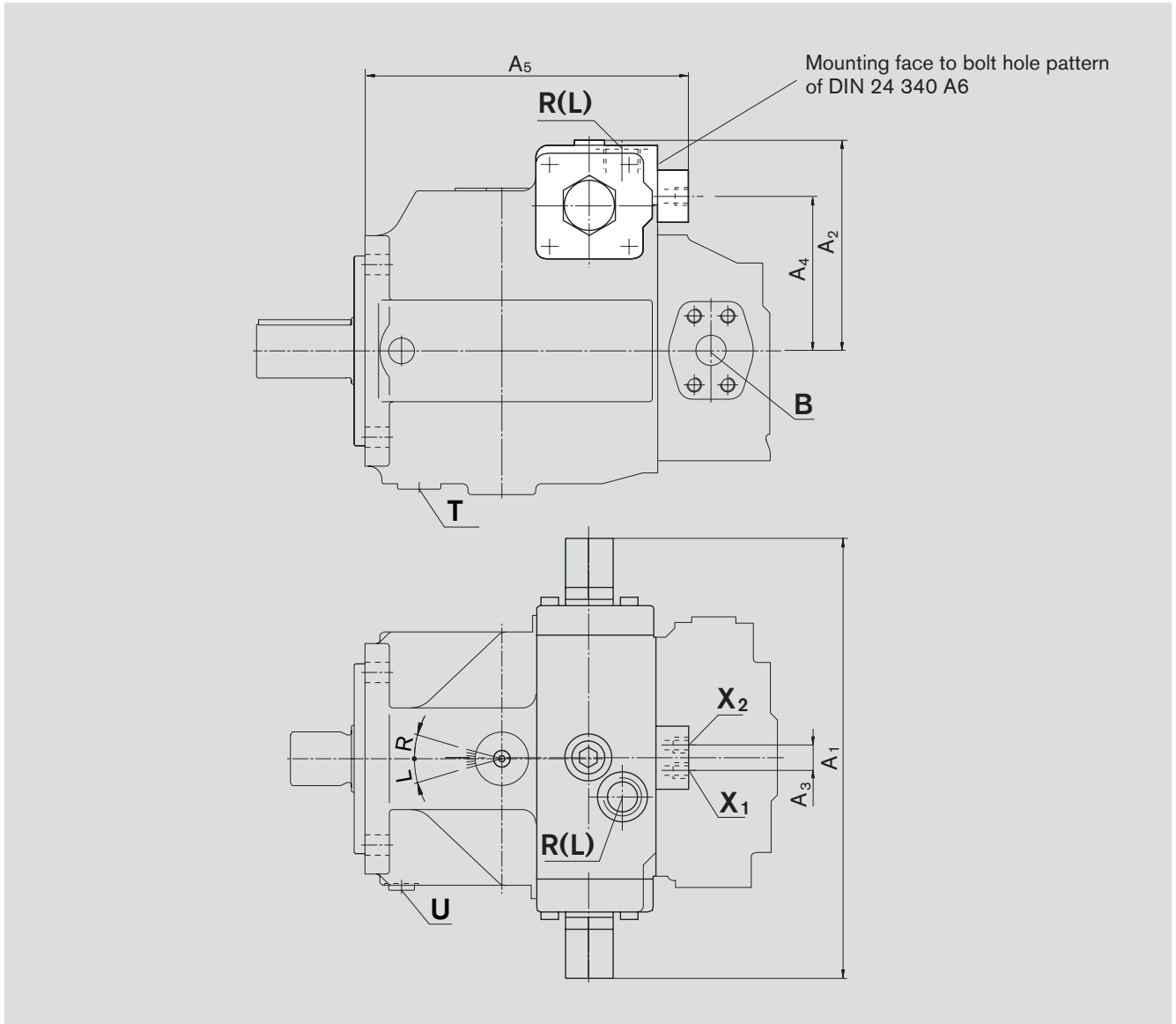
Example of schematic with proportional valve see page 29

Dimensions HM1 / HM2

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

Size 40 and 71

Dimensions are valid for A4VSO and A4VSG



Size	A ₁	A ₂	A ₃	A ₄	A ₅	
40	296	136	24	102	217	For detailed dimensions and technical data of the variable pumps see data sheets A4VSO RE 92050 or A4VSG RE 92100
71	332	157	28	120	245	

Ports

Designation	Port for	Standard	Size ¹⁾	Peak pressure [bar] ²⁾	State
X ₁ ; X ₂	control pressure	DIN 3852-1	M14 x 1.5; 12 deep	100 (bei HM1) 350 (bei HM2)	O

1) For the maximum tightening torques the general safety information on page 52 must be observed.

2) Depending on the application momentary pressure spikes can occur. To be considered when selecting the measuring equipment and fittings.

O = Must be connected (plugged upon delivery)

HM2

Size 125 to 355 for A4VSO and A4VSG
Size 250 and 355 for A4CSG

Pump **A4CSG** with HM2-control does not need the control pressure relief valve and the cavity is plugged.

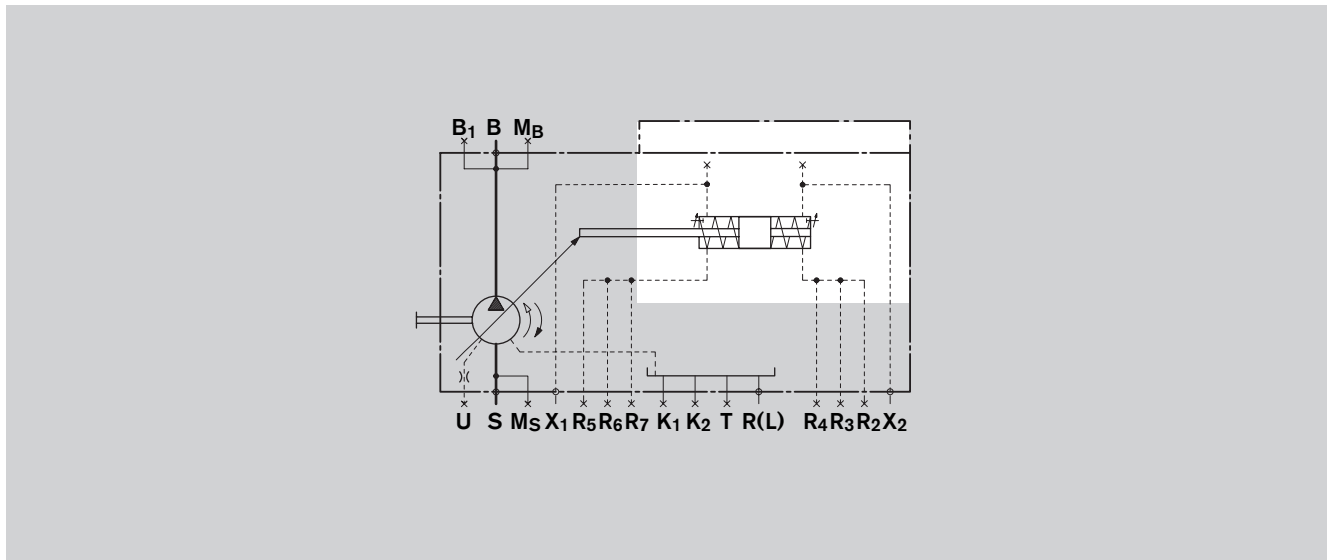
In order to minimize the control fluid consumption the control chambers on the sizes 125...1000 are sealed, and can be bled through the ports R₂...R₇.

Technical data

Size		125	180	250	355
Control pressure (in X ₁ , X ₂)	p_{min} bar	50	100	100	100
	p_{max} bar	350			
Control stroke s_{max}	mm	20.7	20.7	25.9	25.9
Control area A	cm ²	18.1	18.1	28.3	28.3
Control volume $V_{S max}$	cm ³	37.5	37.5	73.2	73.2
Weight approx. (A4VSO...HM2...N00)	kg	92	106	194	214

Schematic

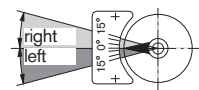
Example: open circuit A4VSO



Ports and direction of flow

- X₁ Control pressure port for pressure **in B** at clockwise rotation, swivel range* left
for pressure **in A** at counter clockwise rotation, swivel range* left
- X₂ Control pressure port for pressure **in A** at clockwise rotation, swivel range* right
for pressure **in B** at counter clockwise rotation, swivel range* right
- R₂...R₇ Air bleed control chamber

* compare swivel angle indicator



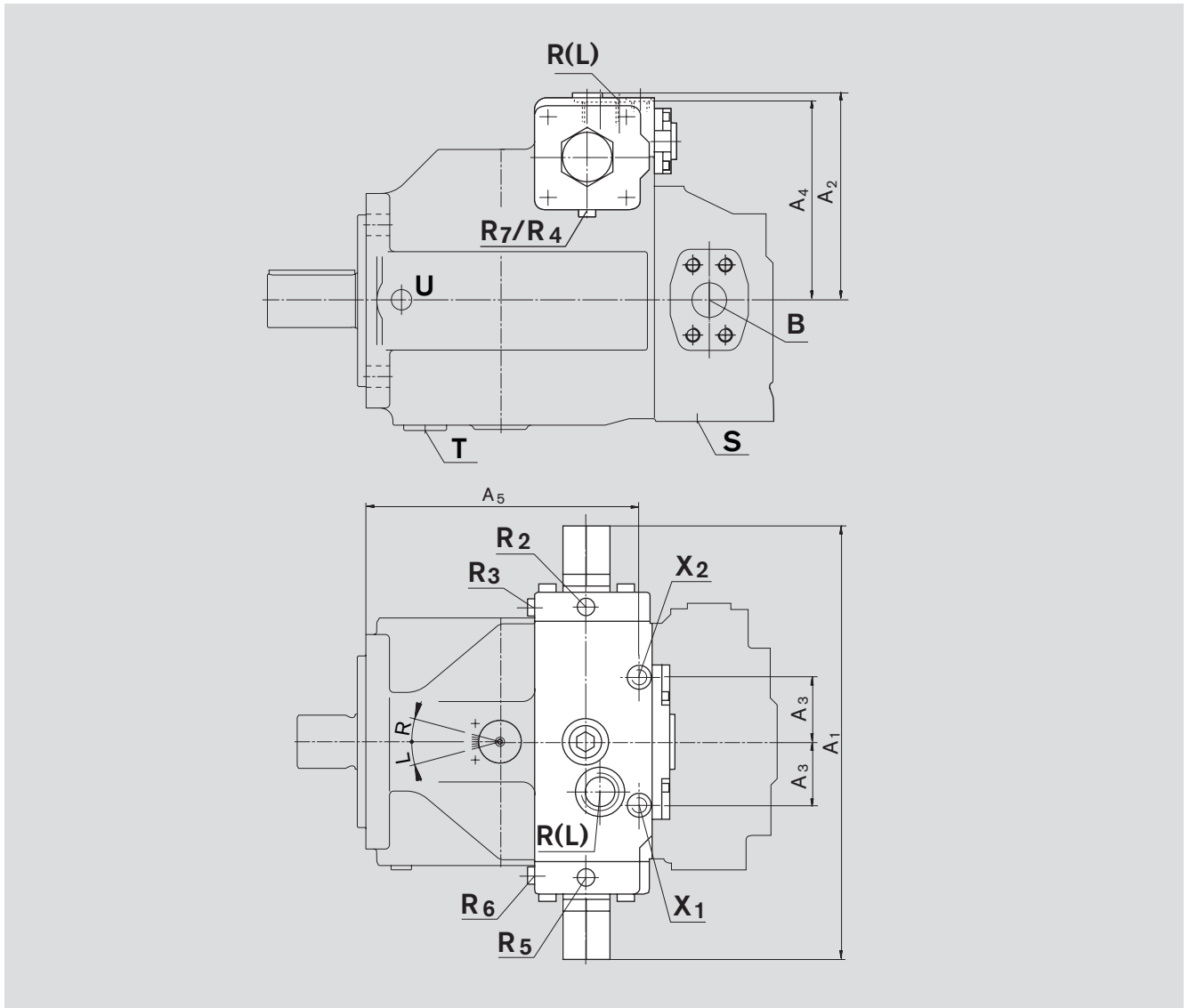
Example of schematic with proportional valve see page 29

Dimensions HM1 / HM2

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

Size 125 to 355

Dimensions are valid for A4VSO, A4VSG and A4CSG



Size	A ₁	A ₂	A ₃	A ₄	A ₅	
125/180 ¹⁾	402	191	67	186.5	251	For detailed dimensions and technical data of the variable pumps see data sheets A4VSO RE 92050, A4VSG RE 92100 or A4CSG RE 92105
250/355 ¹⁾	485	238	71	233	311	

Ports

Designation	Port for	Standard	Size ²⁾	Peak pressure [bar] ³⁾	State
X ₁ ; X ₂	Control pressure	DIN 3852-1	M14 x 1.5; 12 deep (Size125 and 180) M18 x 1.5; 12 deep (Size250 and 355)	100 (HM1) 350 (HM2)	O O
R ₂ ...R ₇	Bleed port control chamber	DIN 3852-1	M10 x 1; 8 deep	350 (only at HM2)	X

1) Size 180 and 355 only at HM2

2) For the maximum tightening torques the general safety information on page 52 must be observed.

3) Depending on the application momentary pressure spikes can occur. To be considered when selecting the measuring equipment and fittings.

O = Must be connected (plugged upon delivery)

X = Plugged (in normal operation)

HM2

Size 500 to 1000 for A4VSO and A4VSG Size 500 and 750 for A4CSG

Pump **A4CSG** with HM2-control does not need the control pressure relief valve and the cavity is plugged.

In order to minimize the control fluid consumption the control chambers on the sizes 500 to 1000 are sealed, and can be bled through the ports $R_2...R_7$.

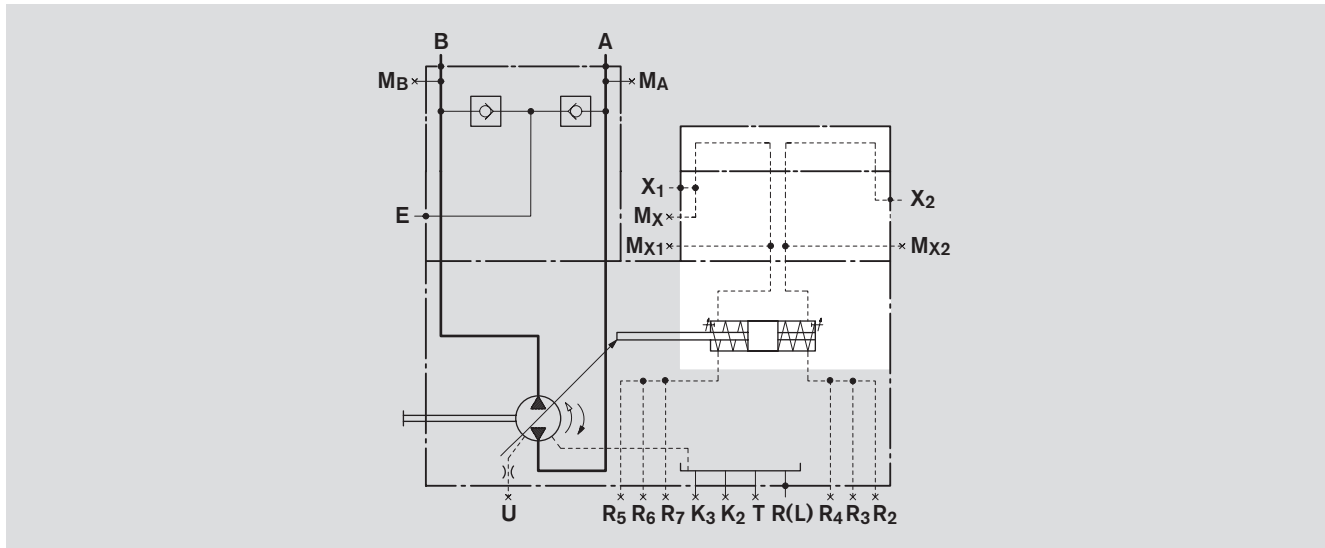
Technical data

Size		500	750	1000
Control pressure (in X_1, X_2)	p_{min} bar	125	125	125
	p_{max} bar		350	
Control stroke s_{max}	mm	32.6	37.0	41.4
Control area A	cm ²	38.2	56.8	63.6
Control volume $V_{S max}$	cm ³	124.5	210	263.3
Weight approx. (A4VSO...HM2...N00)	kg	327	470	600

Schematic

Size 500...1000

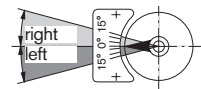
Example: closed circuit A4VSG



Ports and direction of flow

- X_1 Control pressure port
for pressure **in B** at clockwise rotation, swivel range* left
for pressure **in A** at counter clockwise rotation, swivel range* left
- X_2 Control pressure port
for pressure **in A** at clockwise rotation, swivel range* right
for pressure **in B** at counter clockwise rotation, swivel range* right
- $M_X; M_{X1}; M_{X2}$ Measuring ports control pressure
- $R_2...R_7$ Bleed ports control chamber

* compare swivel angle indicator



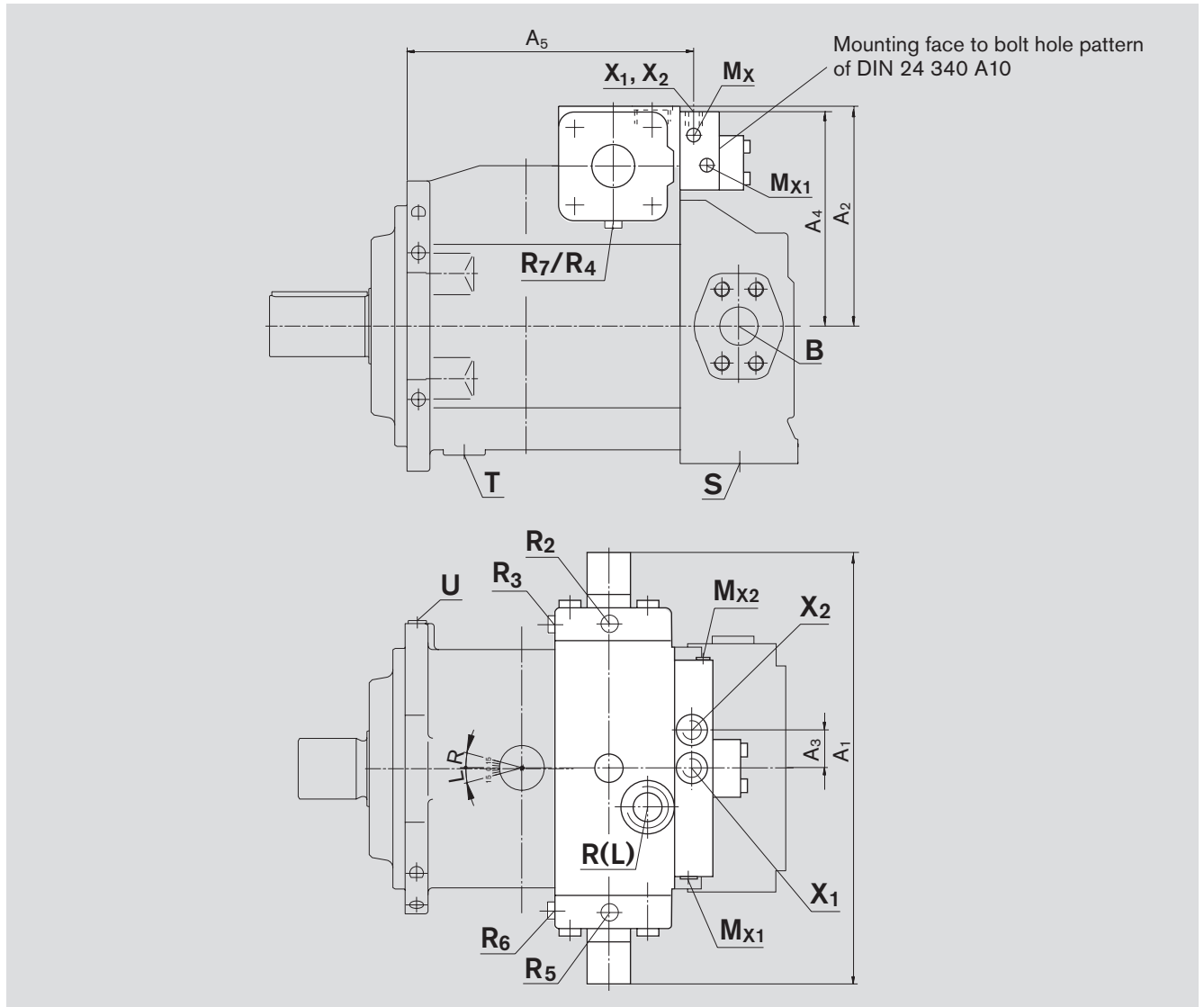
Example of schematic with proportional valve see page 29

Dimensions HM2

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

Size 500 to 1000

Dimensions are valid for A4VSO, A4VSG and A4CSG



Size	A ₁	A ₂	A ₃	A ₄	A ₅
500	555	283	50	274	388
750	630	320	50	304	420
1000	670	347	50	327	486

For detailed dimensions and technical data of the variable pumps see data sheets A4VSO RE 92050, A4VSG RE 92100 or A4CSG RE 92100

Ports

Designation	Port for	Standard	Size ¹⁾	Peak pressure [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 bleed control chamber	DIN 3852-1	M14 x 1.5; 12 deep	350	X

1) For the maximum tightening torques the general safety information on page 52 must be observed.

2) Depending on the application momentary pressure spikes can occur. To be considered when selecting the measuring equipment and fittings.

O = Must be connected (plugged upon delivery)

X = Plugged (in normal operation)

HS – Control system with servo valve

For A4VSO, A4VSG und A4CSG

for electric control of displacement with VT-SR7-1X

The HS- control adjusts the pump displacement with a servo valve proportional to a setpoint value.

The feed back of the actual pump swivel angle (pump displacement) is accomplished with a built on positional transducer. In conjunction with the compatible amplifier VT-SR7-1X we have a very accurate control of pump displacement.

This amplifier VT-SR7-1X does not belong to the supply of the HS-control. Please order separately acc. to RE 29993.

Spring centering in the control cylinder is standard. It is used for **settings and adjustments in the unpressurized zero position**, however without a defined reset during high pressure operation.

The spring centering is not a safety device.

The minimum and maximum **swivel angle limitation** is mechanically adjustable up to 50 % of $V_{g\ max}$. For the size 500, $V_{g\ min}$ is also adjustable up to 50 % of $V_{g\ max}$ but $V_{g\ max}$ only up to 70% of $V_{g\ max}$.

Setting at the A4VSO (open circuit):

The $V_{g\ min}$ -stop is set in such a position, that, with a blocked pressure port B a pressure of 15...20 bar is reached.

The $V_{g\ max}$ -stop is set to the nominal value of $V_{g\ max}$.

Setting at the A4VSG and A4CSG (closed circuit):

The $V_{g\ max}$ -stops on both sides of centre are set to the nominal value of $V_{g\ max}$.

If other settings are desired, please state in clear text when ordering.

In order to minimize the control fluid consumption the control chambers in the sizes 125...1000 are sealed and can be bled through the ports $R_2 - R_7$.

In order to protect the servo valve the pump is supplied with a sandwich flushing plate (see schematic).

After the flushing process the flushing plate must be removed and the servo valve must be screwed directly onto the subplate (using the screws supplied). Please observe the commissioning and flushing instructions in RE 07700 and RE 29583.

Optional: HSE without servo valve or HSK with short circuit valve

Important

The valve spool in the control system can get stuck in a non defined position (contaminated hydraulic fluid, wear particles or contamination from the general system components). Through this, the pump flow will not follow the operators commands anymore

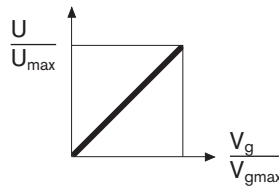
Check whether your machine needs safety measures to bring the driven actuators in a safe position (i.e. immediate stop).

A4VSO - open circuit

Please note: On the **A4VSO** pump for open circuit applications (swivel to one side only) the $V_{g\ min}$ -stop is set so that, when port B is plugged a pressure of approx. 20 bar is reached.

Over centre operation of the A4VSO is available on request.

Characteristic

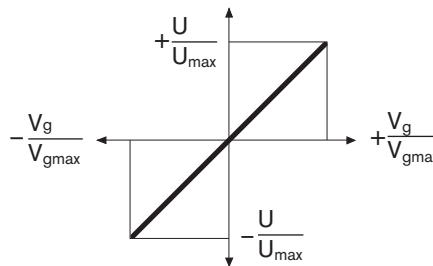


Direction of flow S to B

Direction of rotation	Swivel range*
clockwise	left
counter clockwise	right

A4VSG and A4CSG - closed circuit

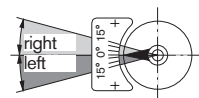
Characteristic



Direction of flow

Direction of rotation	Swivel range*
clockwise	counter clockwise
B to A	A to B
A to B	B to A

* compare swivel angle indicator



HS – Control system with servo valve

Technical data

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
	$p_{max}^{1)}$	bar	315							
Cleanliness class of fluid ¹⁾ Optional sandwich plate filter see page 49		18/16/13 to ISO 4406 (C)								
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	*
Weight approx. (A4VSO...HS...N00)	kg	42	59	98	112	200	220	333	476	606
Quality of control loop	hysteresis	≤ 0.2 %								
	repeating accuracy	≤ 0.2 %								
	swivel angle linearity deviation	≤ 1.0 %								

¹⁾ conditional upon permissible data of servo valve

²⁾ at minimum control pressure

* on request

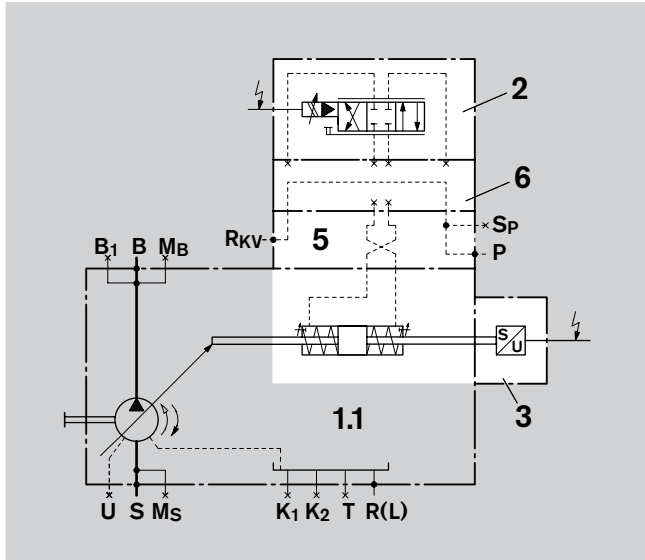
HS – Control system with servo valve

Size 40 to 355 for A4VSO and A4VSG
 Size 250 to 355 for A4CSG

Schematics

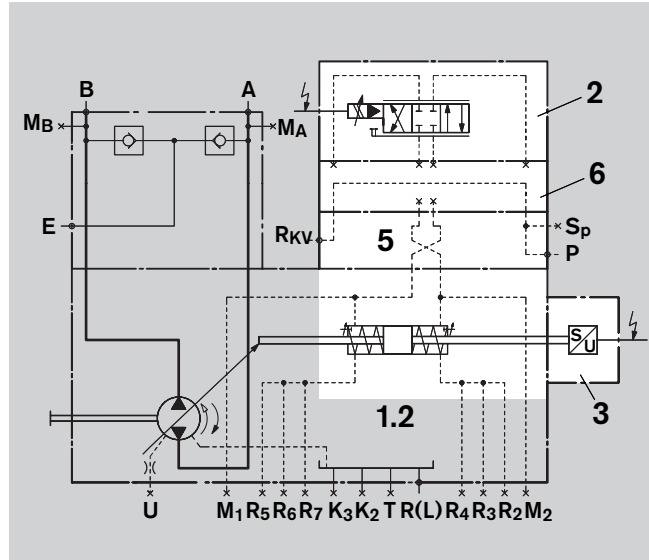
Size 40 and 71

Example: open circuit A4VSO



Size 125 to 355

Example: closed circuit A4VSG



Ports

- P Control pressure port
- Sp Port for control pressure accumulator
- RkV Return line control fluid
- M₁; M₂ Measuring port control pressure (plugged), Size 125...355
- R₂...R₇ Bleed port control chamber (plugged), Size 125...355

Components

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

Size	Type
40 and 71	4WS2EM10-5X/20B11ET315K31EV
125 and 180	4WS2EM10-5X/30B11ET315K31EV
250 and 355	4WS2EM10-5X/45B11ET315K31EV

with cable box to DIN EN 175.201-804
for cable diameter 8...13.5mm

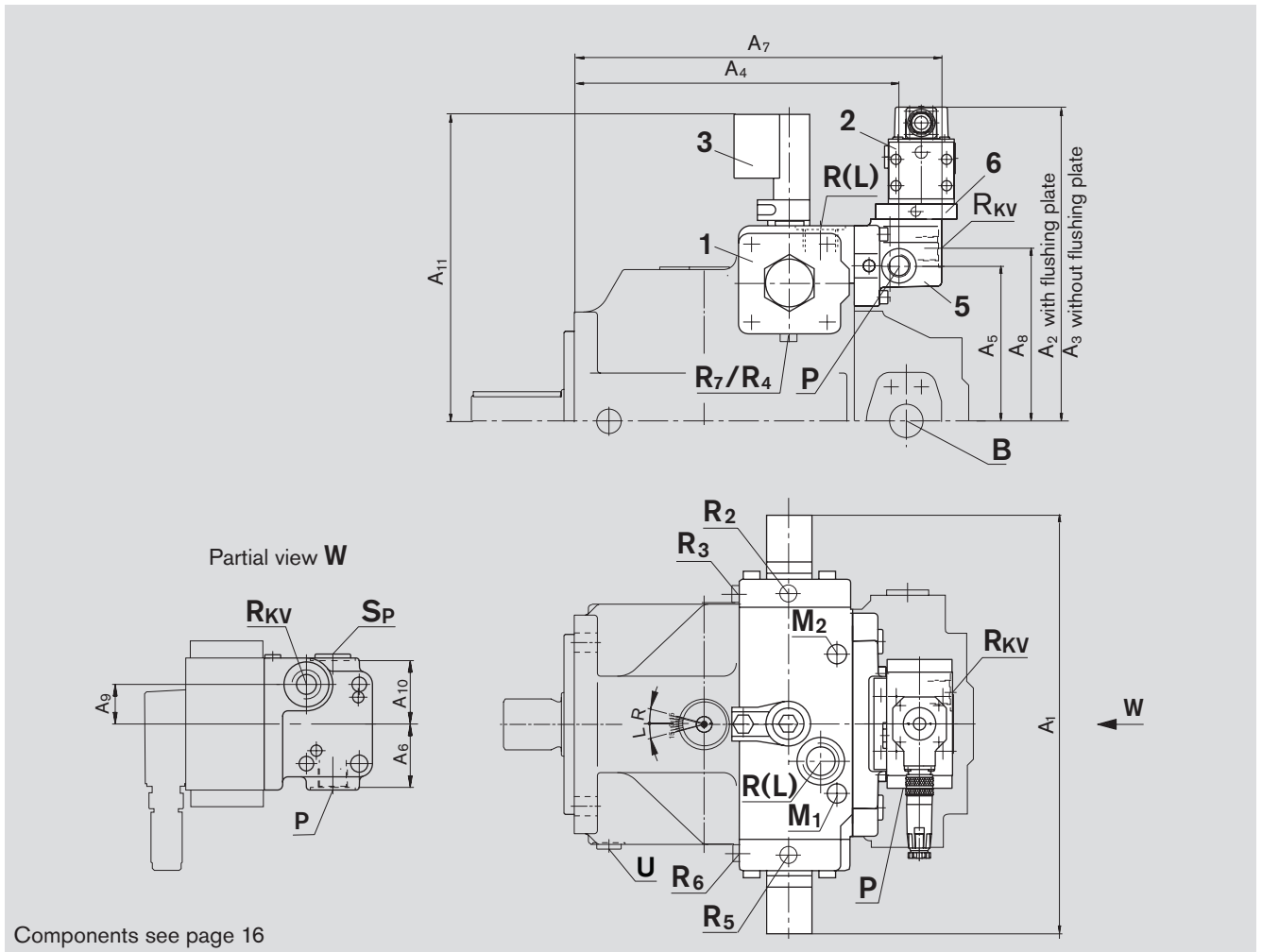
- 3 Inductive positional transducer IW9-03-01
with cable box (mating plug) to DIN EN 175 301-803-A / ISO 4400
cable connection M16 x 1.5 for cable diameter 4.5...10mm
- 5 Sandwich plate
- 6 Flushing plate

Dimensions HS

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

Size 40 to 355

Dimensions are valid for A4VSO, A4VSG and A4CSG



Size	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 of the variable pumps see data sheets A4VSO RE 92050, A4VSG RE 92100 or A4CSG RE 92105
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

Designation	Port for	Standard	Size ¹⁾	Peak pressure [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}	Return line control fluid	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) M18 x 1.5; 12 deep (size 250 and 355)	315 315	X X
R ₂ ...R ₇	Bleed port control chamber	DIN 3852-1	M10x1; 8 deep	315	X

1) For the maximum tightening torques the general safety information on page 52 must be observed.

2) Depending on the application momentary pressure spikes can occur. To be considered when selecting the measuring equipment and fittings.

O = Must be connected (plugged upon delivery)

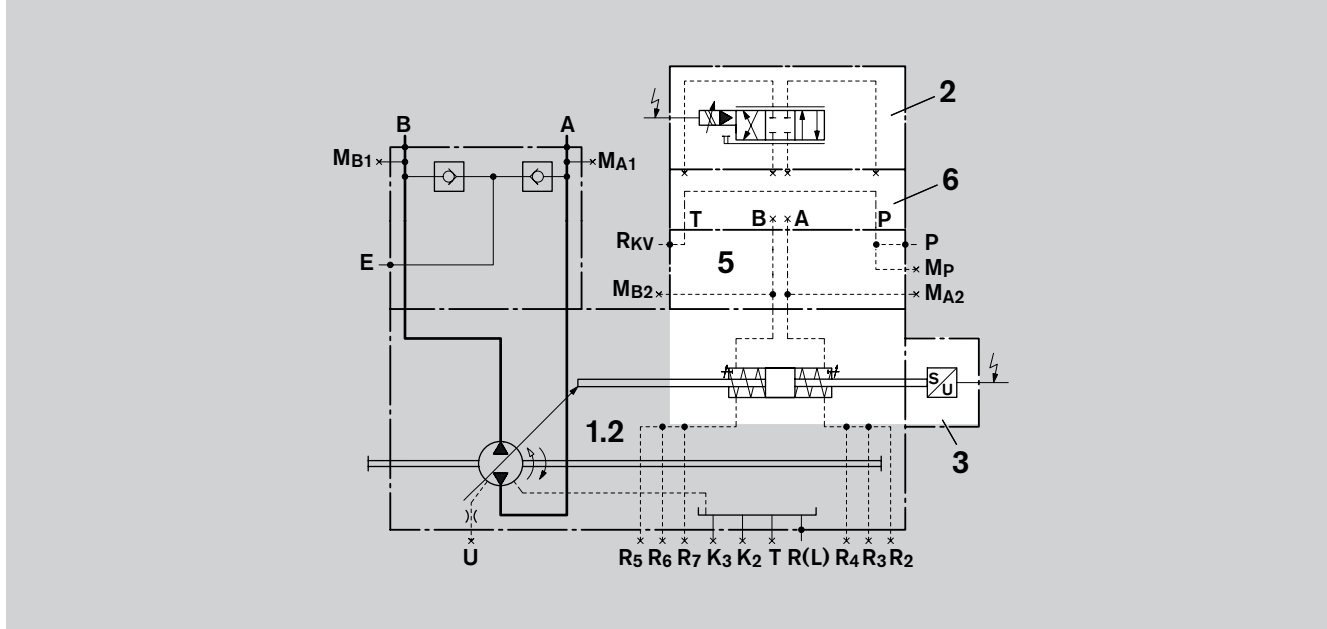
X = Plugged (in normal operation)

HS – Control system with servo valve

Size 500 to 1000 for A4VSO and A4VSG
 Size 500 and 750 for A4CSG

Schematic

Example: closed circuit A4VSG



Ports

- P Control pressure port
- R_{KV} Return line control fluid
- M_{A2}; M_{B2}; M_P Measuring ports control pressure (plugged)
- R₂...R₇ Bleed port control chamber (plugged)

Components

- 1 Pump with hydraulic control device
- 1.2 A4VSG (see RE 92100)
- 2 4/3-way servo valve (see RE 29583)

Size	Type
500...1000	4WS2EM10-5X/75B11ET315K31EV with cable box to DIN EN 175.201-804 for cable diameter 8...13.5 mm

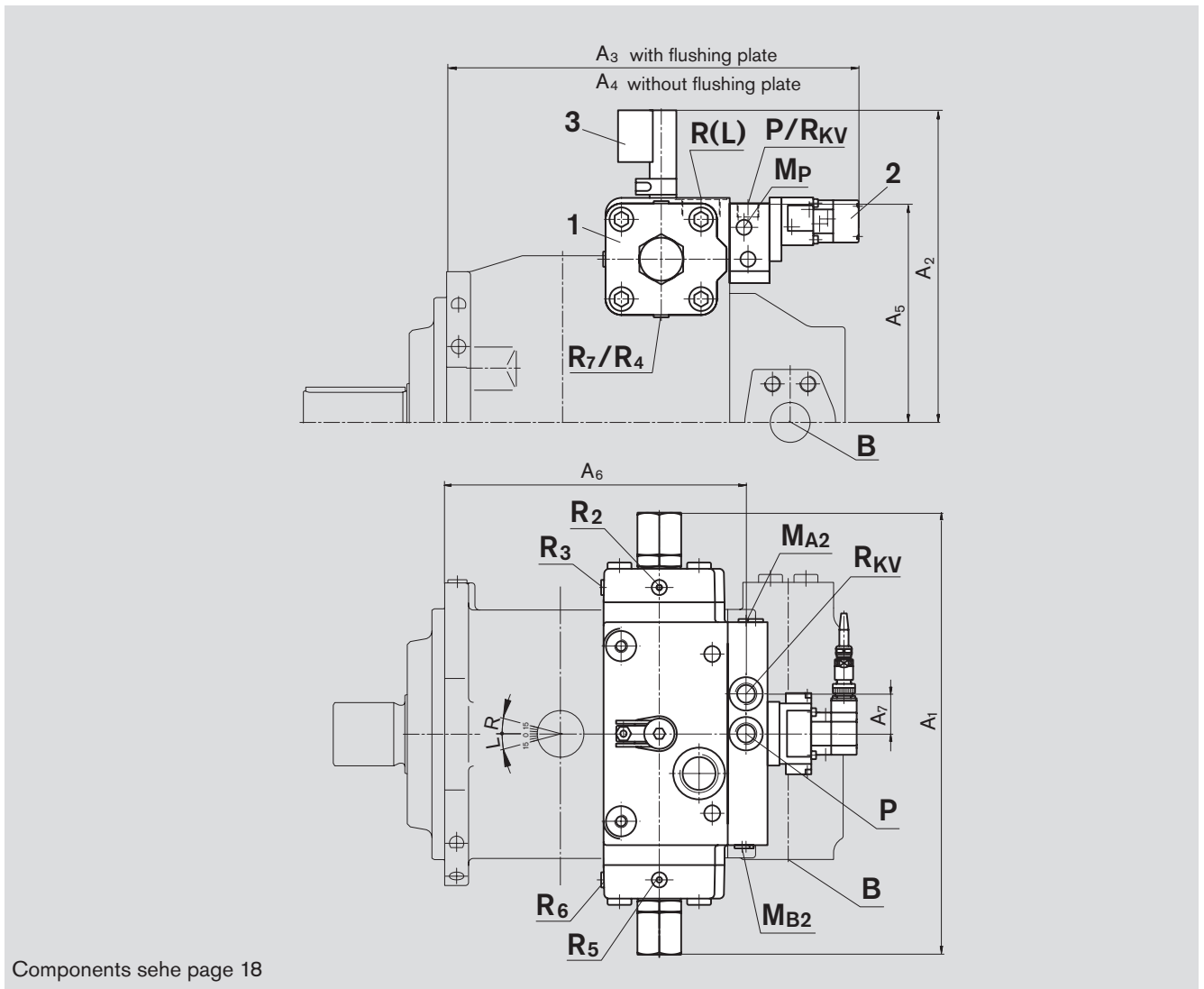
- 3 Inductive positional transducer IW9-03-01 with cable box (mating plug) to DIN EN 175 301-803-A / ISO 4400 cable connection M16 x 1.5 for cable diameter 4.5...10mm
- 5 Sandwich plate
- 6 Flushing plate

Dimensions HS

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

Size 500 to 1000

Dimensions are valid for A4VSO, A4VSG and A4CSG



Size	A ₁	A ₂	A ₃	A ₄	A ₅	A ₆	A ₇
500	555	392	527	512	274	388	50
750	630	427	558	543	304	420	50
1000	670	456	624	609	327	486	50

For detailed dimensions and technical data of the variable pumps see data sheets A4VSO RE 92050, A4VSG RE 92100 or A4CSG RE 92105

Ports

Designation	Port for	Standard	Size ¹⁾	Peak pressure [bar] ²⁾	State
P	Control pressure	DIN 3852-1	M27 x 2; 16 deep	315	O
R _{KV}	Return line control fluid	DIN 3852-1	M27 x 2; 16 deep	100	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	Bleed port control chamber	DIN 3852-1	M14 x 1.5; 12 deep	315	X

1) For the maximum tightening torques the general safety information on page 52 must be observed.

2) Depending on the application momentary pressure spikes can occur. To be considered when selecting the measuring equipment and fittings.

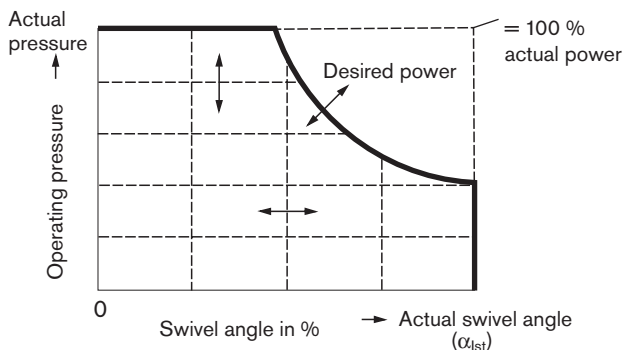
O = Must be connected (plugged upon delivery)

X = Plugged (in normal operation)

HS4(P) – Control system with proportional valve

For A4VSO, A4VBO, A4VSG and A4CSG

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



The HS4-control adjusts the pump displacement with a directly controlled proportional valve proportional to a setpoint value.

Actual pump swivel angle (displacement) feedback is provided by means of a position transducer.

Control HS4P features a built on pressure transducer HM17 which serves to detect and feed back system pressure, pumps A4VSG and A4CSG have a pressure transducer on each pressure side. In conjunction with the compatible control module VT-VPCD and the operating software BODAC the user has at his disposal a highly accurate and free programmable control, which offers a comfortable operating and diagnostics interface.

The digital control amplifier VT-VPCD-1X to drive the HS4-control does not belong to the scope of supply. It must be ordered separately to RE 30028.

Programming the digital control amplifier VT-VPCD is executed via the amplifier's serial interface with the PC-program BODAC. For more information see RE 30028.

- Optional:
- HS4P with pressure transducer for additional pressure and power control
 - HS4K, HS4KP with short circuit valve
 - HS4M suitable for oil immersed operation
 - HS4V with internal control pressure supply

The minimum and maximum **swivel angle limitation** is mechanically adjustable up to 50 % of $V_{g \max}$. For the size 500, $V_{g \min}$ is also adjustable up to 50 % of $V_{g \max}$ but $V_{g \max}$ only up to 70% of $V_{g \max}$. (75% at the A4VBO 450)

Setting at the A4VSO and A4VBO (open circuit):

The $V_{g \min}$ -stop is set in such a position, that, with a blocked pressure port B a pressure of 15...20 bar is reached.

The $V_{g \max}$ -stop is set to the nominal value of $V_{g \max}$.

Setting at the A4VSG and A4CSG (closed circuit):

The $V_{g \max}$ -stops on both sides of centre are set to the nominal value of $V_{g \max}$.

If other settings are desired, please state in clear text when ordering.

Spring centering in the control cylinder is standard. It is used for settings and adjustments in the unpressurized zero position, however without a defined reset during high pressure operation.

The spring centering is not a safety device.

In order to minimize the control fluid consumption, the control chambers in pump sizes 125...1000 are sealed and can be bled via ports R_2 - R_7 .

Important

The valve spool in the control system can get stuck in a non defined position (contaminated hydraulic fluid, wear particles or contamination from the general system components). Through this, the pump flow will not follow the operators commands anymore

Check whether your machine needs safety measures to bring the driven actuators in a safe position (i.e. immediate stop).

HS4(P) – Control system with proportional valve

Technical data

Size	NG	40	71	125	180	250	355	500	750	1000	
Control pressure in P	p_{min} A4VSO, A4VSG, A4CSG	bar	100	100	100	125	125	125	150	150	150
	p_{min} A4VBO	bar	–	130	130	–	–	–	190	–	–
	$p_{max}^{1)}$	bar	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)	kg	42	59	98	112	200	220	333	476	606	
Quality of control loop	hysteresis	≤ 0.2 %									
	repeating accuracy	≤ 0.2 %									
	swivel angle linearity deviation	≤ 1.0 %									
	pressure linearity deviation	≤ 1.5 % of $p_{max}^{3)}$									

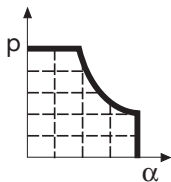
¹⁾ conditional upon the permissible data of the proportional valve

²⁾ at minimum control pressure

³⁾ Pressure transducer value

A4VSO – open circuit

Characteristic



Initial position at version without short circuit valve, de-energized proportional valve and connected control pressure:

$V_{g min}$ (see table)

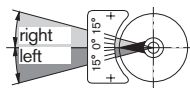
Direction of flow S to B

Direction of rotation	Swivel range*	Initial position
clockwise	left	$V_{g min}$ (from left)
counter clockwise	right	$V_{g min}$ (from right)

Over centre operation is available on request.

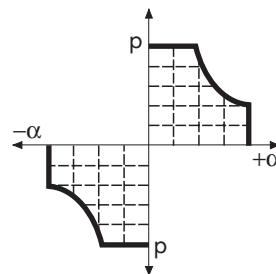
The $V_{g min}$ -stop is set in such a position, that, with a blocked pressure port B a pressure of approx. 20 bar is reached.

* compare swivel angle indicator



A4VSG, A4CSG – closed circuit

Characteristic



Initial position at version without short circuit valve, de-energized proportional valve and connected control pressure:

$V_{g max}$ (see table)

Direction of flow

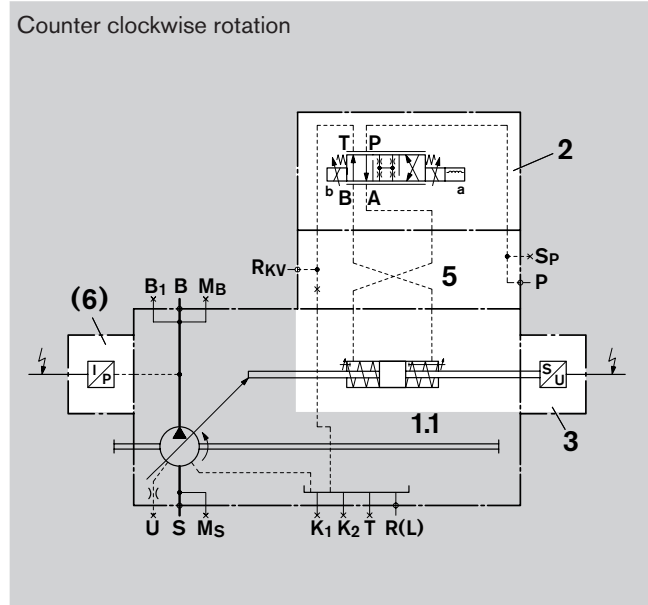
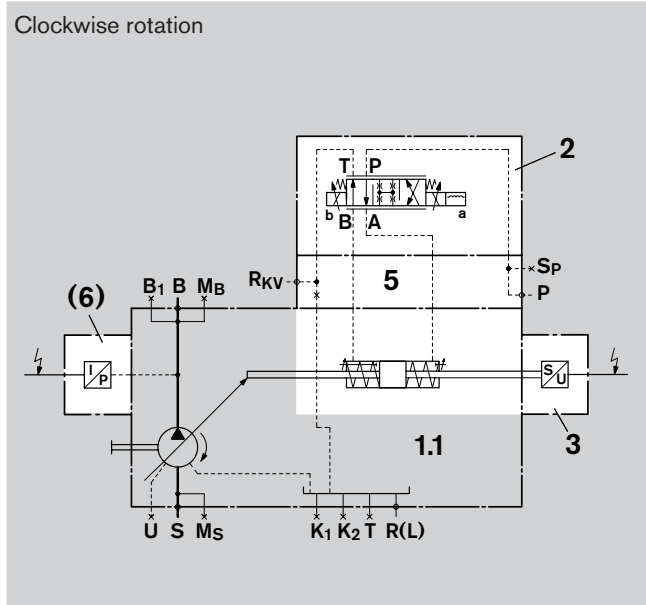
Direction of rotation	Swivel range*	Direction of flow	Initial position
clockwise	right	B to A	$V_{g max}$ right
	left	A to B	
counter clockwise	right	A to B	$V_{g max}$ left
	left	B to A	

HS4(P) – Control system with proportional valve

Size 40 and 71 for A4VSO and A4VSG
Size 71 for A4VBO

Schematics

Example: A4VSO HS4P (with pressure transducer)



Ports

P	Control pressure port
S _P	Port for control pressure accumulator
R _{KV}	Return line control fluid

Components

- 1 Pump with hydraulic control device
- 1.1 A4VSO (see RE 92050) or A4VBO (see RE 92122)
- 2 4/3-way proportional valve (see RE 29061) with electric positional feedback (incl. cable connector 4-pin Pg7-G4W1F)

Size	Type
40 and 71	4WRE6V08-2X/G24K4/V-822 Solenoids with plugs to DIN EN 175.301-803 / ISO 4400 cable screw connection M16 x 1.5 for cable diameter 4.5...10mm

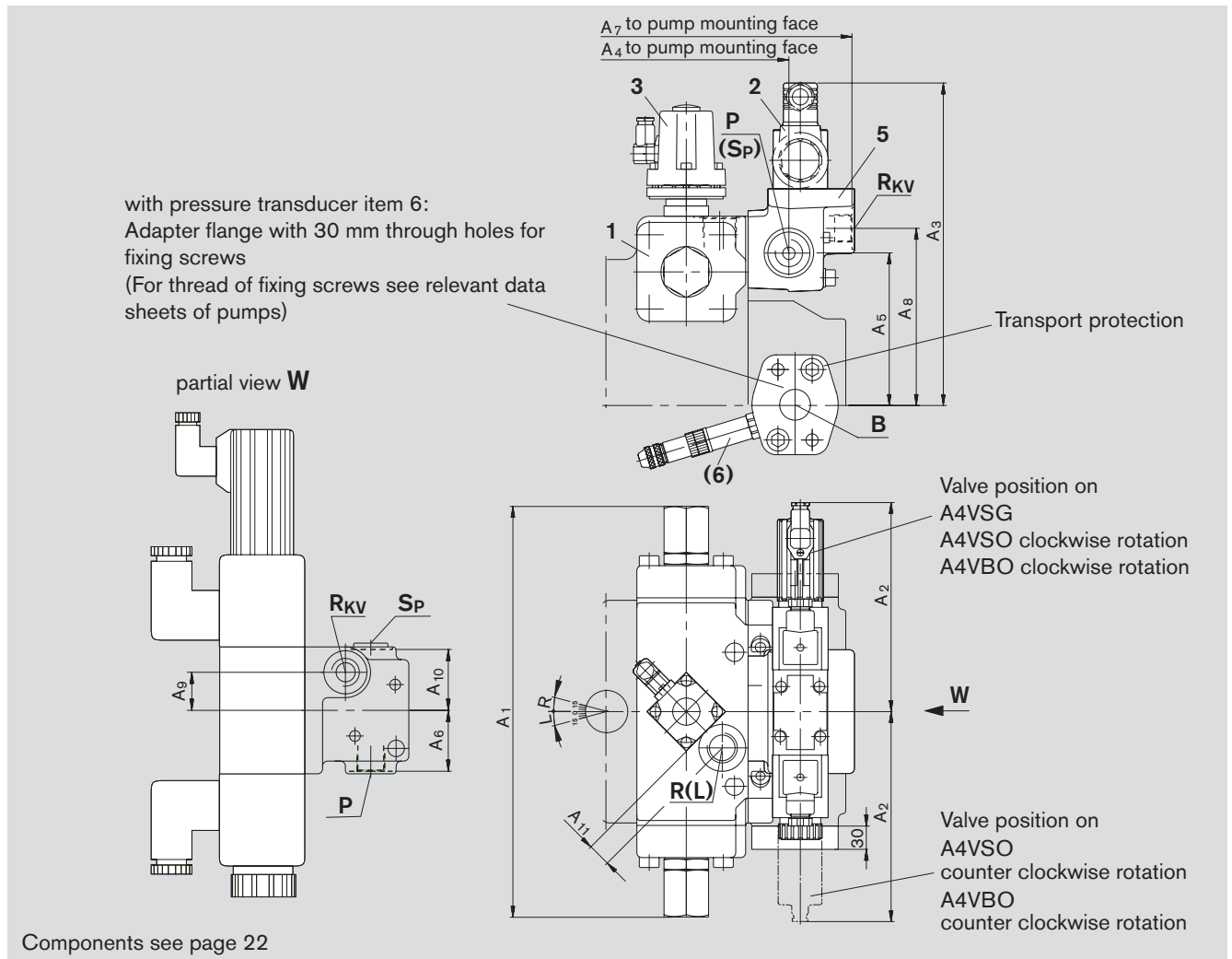
- 3 Inductive positional transducer AWXF004D01 with cable connector 4-pin Pg7-G4W1F
- 5 Sandwich plate
- 6 **only on HS4P** pressure transducer HM17-1X/450-C/VO/O (see RE 30269) with adaptor flange, on A4VSG and A4CSG (closed circuit) each pressure side has a built on pressure transducer

Dimensions HS4(P)

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

Size 40 and 71 Example: A4VSO HS4P with a pressure transducer in port B

On A4VSO and A4VBO clockwise and counter clockwise rotation some dimensions are different („R“ and „L“).
For A4VSG the dimensions „R“ are valid for both directions of rotation



Size	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 of the variable pumps see data sheets A4VSO RE 92050, A4VBO RE 92122 or A4VSG RE 92100

Ports

Designation	Port for	Standard ¹⁾	Size ²⁾	Peak pressure [bar] ³⁾	State
P	Control pressure	DIN 3852-1	M22 x 1.5; 14 deep	315	O
Sp	Accumulator control press.	DIN 3852-1	M22 x 1.5; 14 deep	315	X
Rkv	Return line control fluid	DIN 3852-1	M22 x 1.5; 14 deep	210	O

1) ISO 6149 on A4VBO 71

2) For the maximum tightening torques the general safety information on page 52 must be observed.

3) Depending on the application momentary pressure spikes can occur. To be considered when selecting the measuring equipment and fittings

O = Must be connected (plugged upon delivery)

X = Plugged (in normal operation)

HS4(P) – Control system with proportional valve

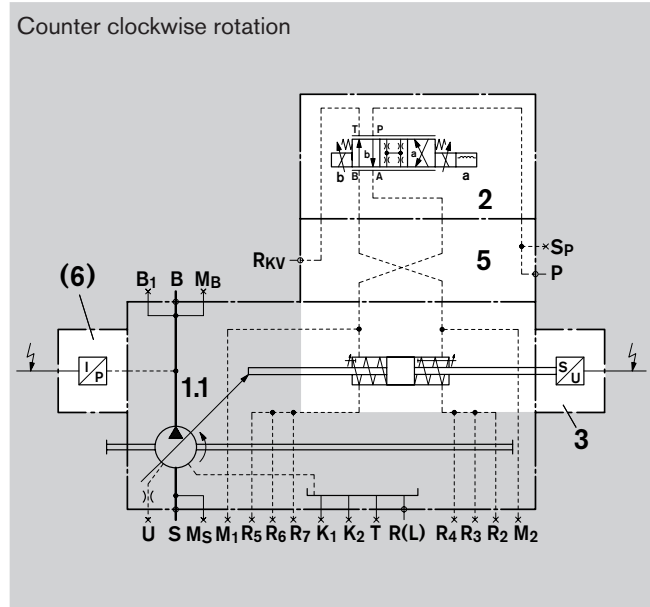
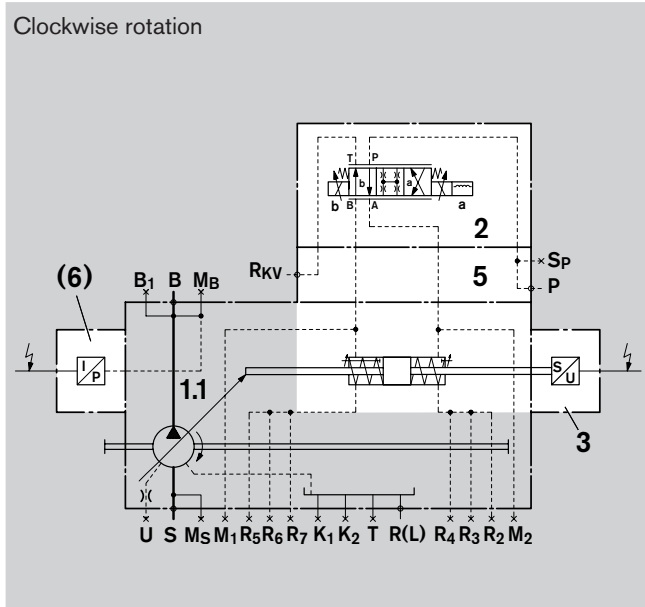
Size 125 to 355 for A4VSO and A4VSG

Size 125 for A4VBO

Size 250 and 355 for A4CSG

Schematics

Example: A4VSO HS4P (with pressure transducer)



Ports

- P Control pressure port
- Sp Port for control pressure accumulator
- Rkv Return line control fluid
- M₁; M₂ Measuring ports control pressure
- R₂...R₇ Bleed port control chamber

Components

- 1 Pump with hydraulic control device
- 1.1 A4VSO (see RE 92050)
- 2 4/3-way proportional valve (see RE 29061) with electric positional feedback (incl. cable connector 4-pin Pg7-G4W1F)

Size	Type
125 and 180	4WRE6V08-2X/G24K4/V-822
250 und 355	4WRE6V16-2X/G24K4/V-822

Solenoids with plugs to DIN EN 175.301-803 / ISO 4400 cable screw connection M16 x 1.5 for cable diameter 4.5...10mm

- 3 Inductive positional transducer AWXF004D01 with cable connector 4-pin Pg7-G4W1F
- 5 Sandwich plate
- 6 **only on HS4P** pressure transducer HM17-1X/450-C/VO/O (see RE 30269) with adapter flange, on A4VSG and A4CSG each pressure side has a built on pressure transducer

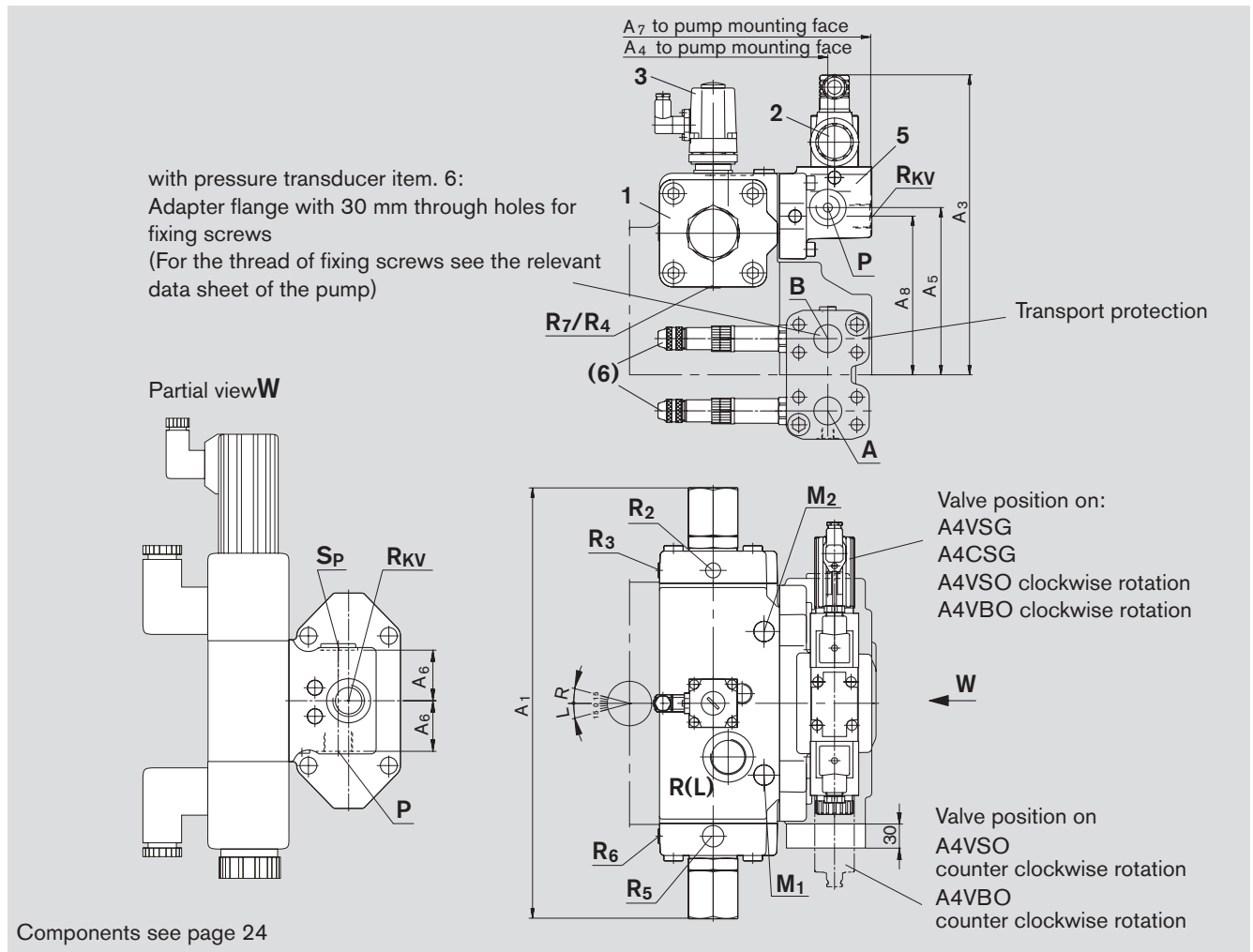
Dimensions HS4(P)

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

Size 125 to 355 Example: A4VSG HS4P with a pressure transducer on port A and B

On A4VSO and A4VBO dimension A_4 is different for clockwise and counter clockwise rotation.

On A4VSG und A4CSG the dimension A_{4R} is valid for both directions of rotation.



Size	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 of the variable pumps see data sheets A4VSO RE 92050, A4VBO RE 92122, A4VSG RE 92100 or A4CSG RE 92105
250/355	485	316	372	380.5	192	39	412	184	

Ports

Designation	Port for	Standard ¹⁾	Size ²⁾	Peak pressure [bar] ³⁾	State
P	Control pressure	DIN 3852-1	M22 x 1.5; 14 deep	315	O
S _p	Control pressure accumulator	DIN 3852-1	M22 x 1.5; 14 deep	315	X
R _{KV}	Return line control fluid	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 x 1.5; 12 deep; (Size 250 and 355)	315 315	X X
R ₂ ...R ₇	Bleed control chamber	DIN 3852-1	M10 x 1; 8 deep	315	X

1) ISO 6149 on A4VBO 125

2) For the maximum tightening torques the general safety information on page 52 must be observed.

3) Depending on the application momentary pressure spikes can occur. To be considered when selecting the measuring equipment and fittings.

O = Must be connected (plugged upon delivery)

X = Plugged (in normal operation)

HS4(P) – Control system with proportional valve

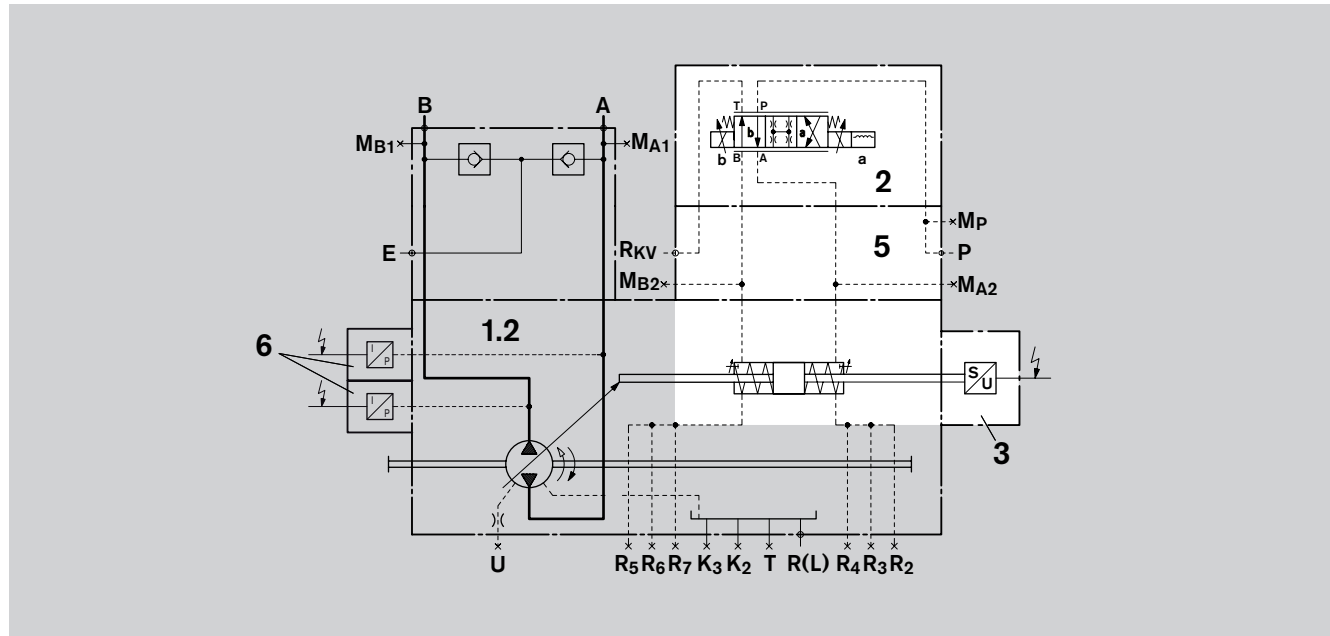
Size 500 to 1000 for A4VSO and A4VSG

Size 450 for A4VBO

Size 500 and 750 for A4CSG

Schematic

Example: A4VSG HS4P (with pressure transducer)



Ports

P	Control pressure port
R _{KV}	Return line control fluid
M _{A2} ; M _{B2} ; M _P	Measuring port control pressure
R ₂ ...R ₇	Bleed port control chamber

Components

- 1 Pump with hydraulic control device
- 1.2 A4VSG (see RE 92100)
- 2 4/3-way proportional valve (see RE 29061) with electric positional feedback (incl. cable connector 4-pin Pg7-G4W1F)

Size	Type
500...1000	4WRE6V16-2X/G24K4/V-822 Solenoids with plug to DIN EN 175.301-803 / ISO 4400 cable screw connection M16 x 1.5 for cable diameter 4.5...10mm

- 3 Inductive positional transducer AWXF004D01 with cable connector 4-pin Pg7-G4W1F
- 5 Adapter plate
- 6 **only on HS4P** pressure transducer HM17-1X/450-C/VO/O (see RE 30269) with adapter flange, on A4VSG and A4CSG each pressure side has a built on pressure transducer

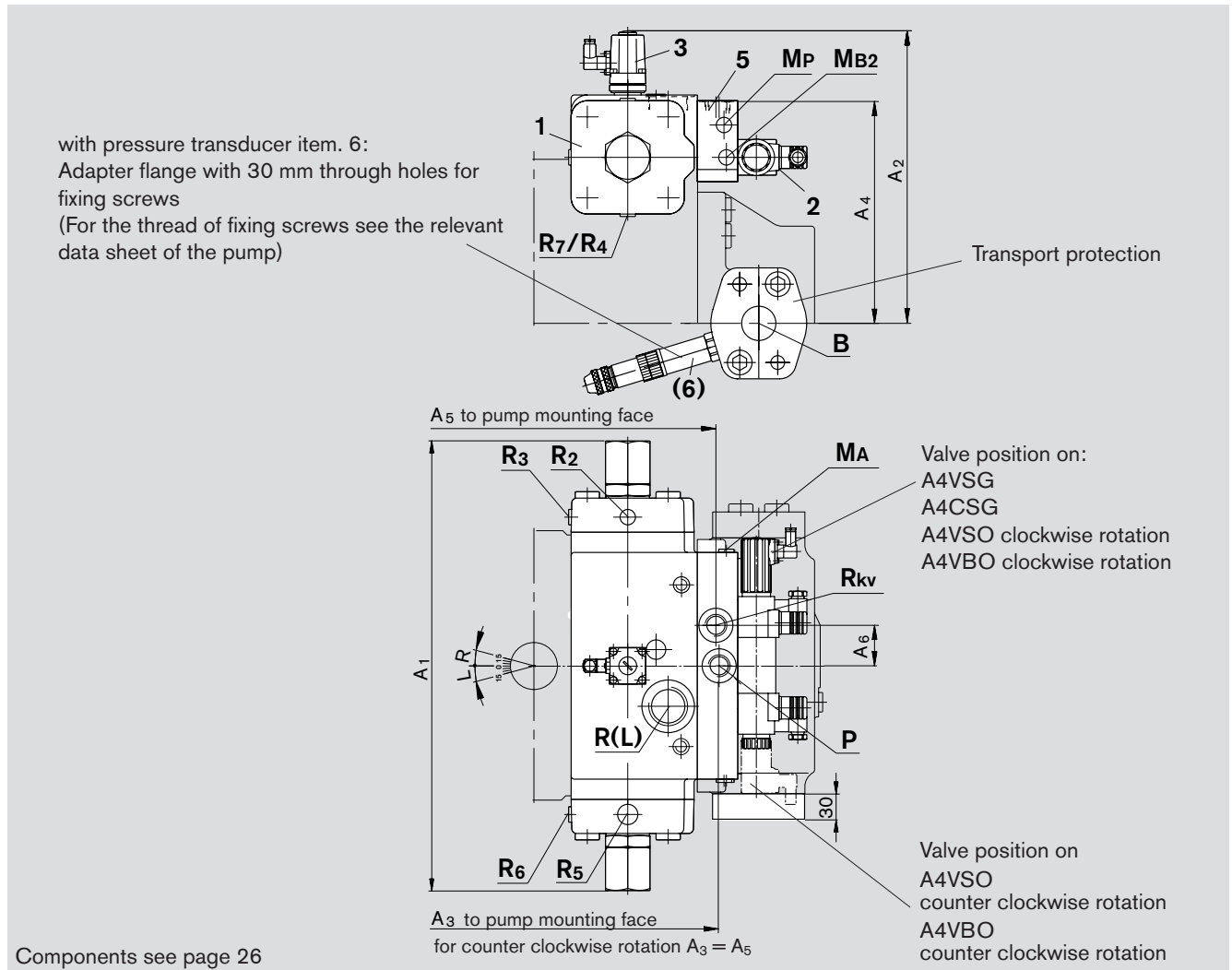
Dimensions HS4(P)

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

Size 500 to 1000

Example A4VSO HS4P with a pressure transducer in port B

Dimensions are valid for A4VSO, A4VBO, A4VSG and A4CSG



Size	A ₁	A ₂	A ₃	A ₄	A ₅	A ₆	
500 (450 for A4VBO)	555	361	392	274	388	50	For detailed dimensions and technical data of the variable pump see data sheets A4VSO RE 92050, A4VBO RE 92122, A4VSG RE 92100 or A4CSG RE 92105
750	630	400	424	304	420	50	
1000	670	427	490	327	486	50	

Ports

Designation	Port for	Standard ¹⁾	Size ²⁾	Peak pressure [bar] ³⁾	State
P	Control pressure	DIN 3852-1	M27 x 2; 16 deep	315	O
R _{KV}	Return line control fluid	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 bleed control chamber	DIN 3852-1	M14 x 1.5; 12 deep	315	X

1) ISO 6149 on A4VBO 450

2) For the maximum tightening torques the general safety information on page 52 must be observed.

3) Depending on the application momentary pressure spikes can occur. To be considered when selecting the measuring equipment and fittings.

O = Must be connected (plugged upon delivery)

X = Plugged (in normal operation)

HS4M – for oil immersed (under oil level) operation

For A4VSO, A4VSG and A4CSG

Control option HS4M corresponds to the HS4 version however without proportional valve, but with control pressure ports X_1 and X_2 .

The proportional valve can be mounted separately into the system and be connected to the relevant ports X_1 and X_2 of the pump. The pump unit together with the attached positional transducer can be mounted inside the reservoir.

Approved for HLP-fluids DIN 51524.

Recommended: proportional valve 4WRE6-2X see RE 29061
 electronic control VT-VPD-1X see RE 30028
 cable see RE 30028-B

Please note:

On the **A4VSO** pumps for open circuit applications (one side of centre) the $V_{g\ min}$ -stop is set so that, when port B is plugged, a pressure of approx. 20 bar is reached.

Over centre operation is available on request.

Technical data

Size		40	71	125	180	250	355	500	750	1000
Control pressure (in X_1, X_2)	p_{min} bar	50	50	50	100	100	100	125	125	125
	p_{max} bar	350 ¹⁾								
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)	kg	38	55	92	106	194	214	327	470	600

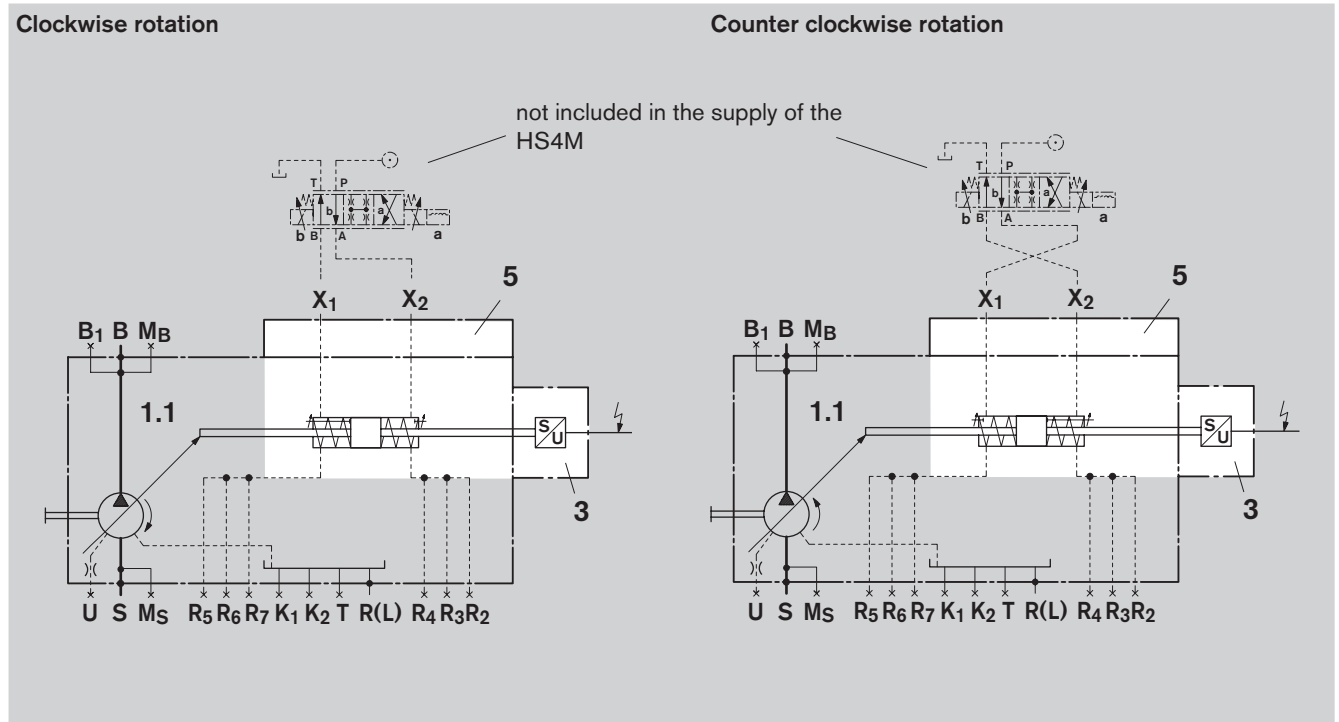
1) Observe possible restrictions due to the used proportional valve

HS4M – for oil immersed operation

Size 40 to 750 for A4VSO and A4VSG
Size 250 to 500 for A4CSG

Example of schematic for open circuit

Example: A4VSO 500 and 750



Ports and direction of the flow

X₁ Control pressure port

for pressure **in B** with clockwise rotation, swivel range* left
for pressure **in A**¹⁾ with c.clockwise rotation, swivel range* left

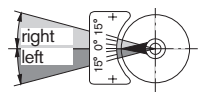
X₂ Control pressure port

for pressure **in A**¹⁾ with clockwise rotation, swivel range* right
for pressure **in B** with c.clockwise rotation, swivel range* right

R₂...R₇ Bleed port control chamber (size 125...1000)

¹⁾ only for closed circuit

* compare swivel angle indicator



Components

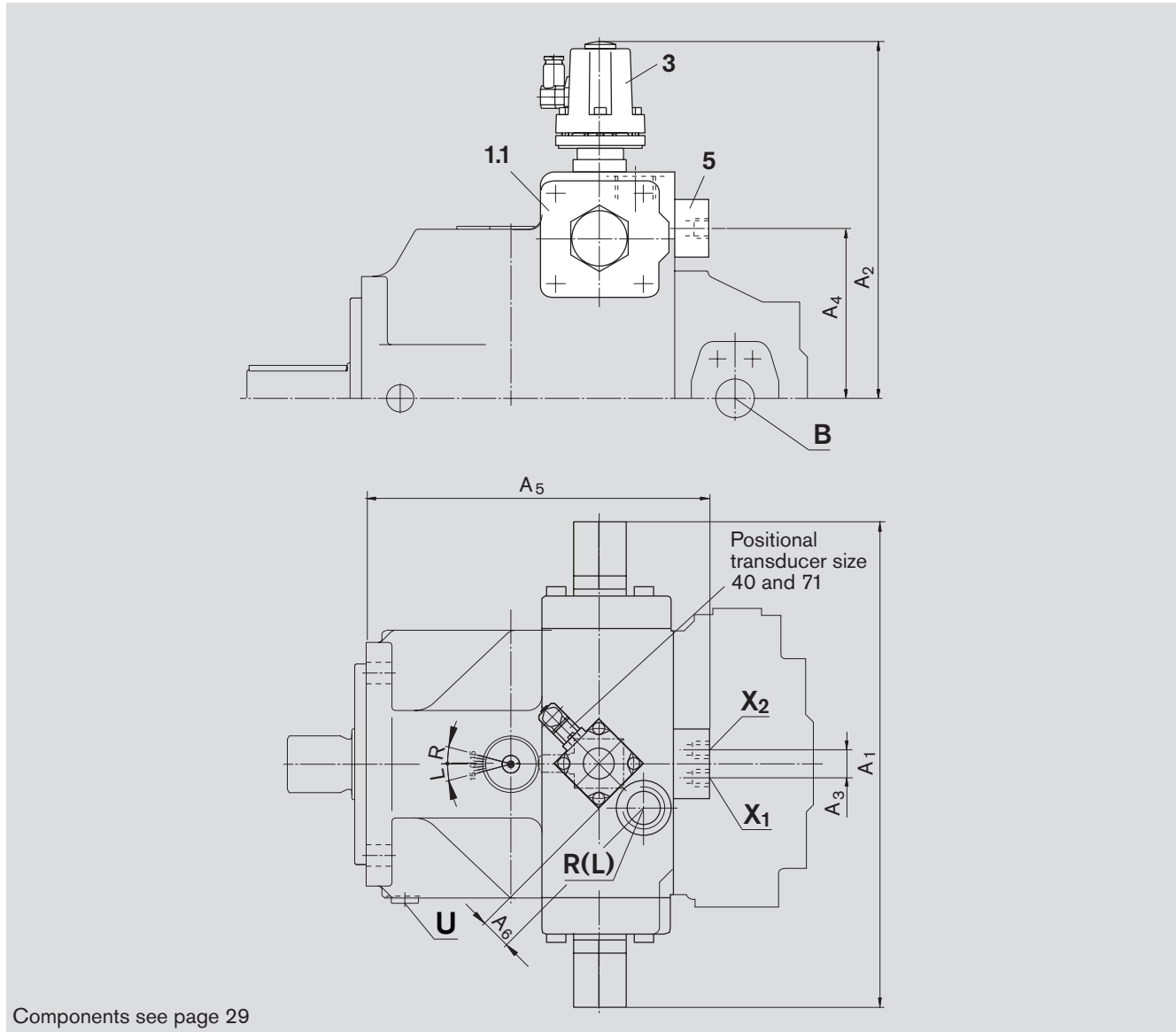
- 1 Pump with hydraulic control device
- 1.1 A4VSO (see RE 92050)
- 3 Inductive positional transducer AWWF004D01 with cable connector 4-pin Pg7-G4W1F, protection IP65
- 5 Subplate (size 40, 71, 500 and 750) or end plate (size 125 to 355)

Dimensions HS4M

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

Size 40, 71, 500 and 750

Dimensions are valid for A4VSO, A4VSG and A4CSG



Components see page 29

Size	A ₁	A ₂	A ₃	A ₄	A ₅	A ₆
40	296	221.5	28	102	217	16.5
71	332	243	28	120	245	20.9
500	555	361	224	205	399	-
750	630	400	224	235	431	-

For detailed dimensions and technical data of the variable pumps see data sheets A4VSO RE 92050, A4VSG RE 92100 or A4CSG RE 92105

Ports

Designation	Port for	Standard	Size ¹⁾	Peak pressure [bar] ²⁾	State
X ₁ ; X ₂	Control pressure	DIN 3852-1	M14 x 1.5; 12 deep (size 40 and 71)	350	O
			M22 x 1.5; 14 deep (size 500)	350	O

1) For the maximum tightening torques the general safety information on page 52 must be observed.

2) Depending on the application momentary pressure spikes can occur. To be considered when selecting the measuring equipment and fittings.

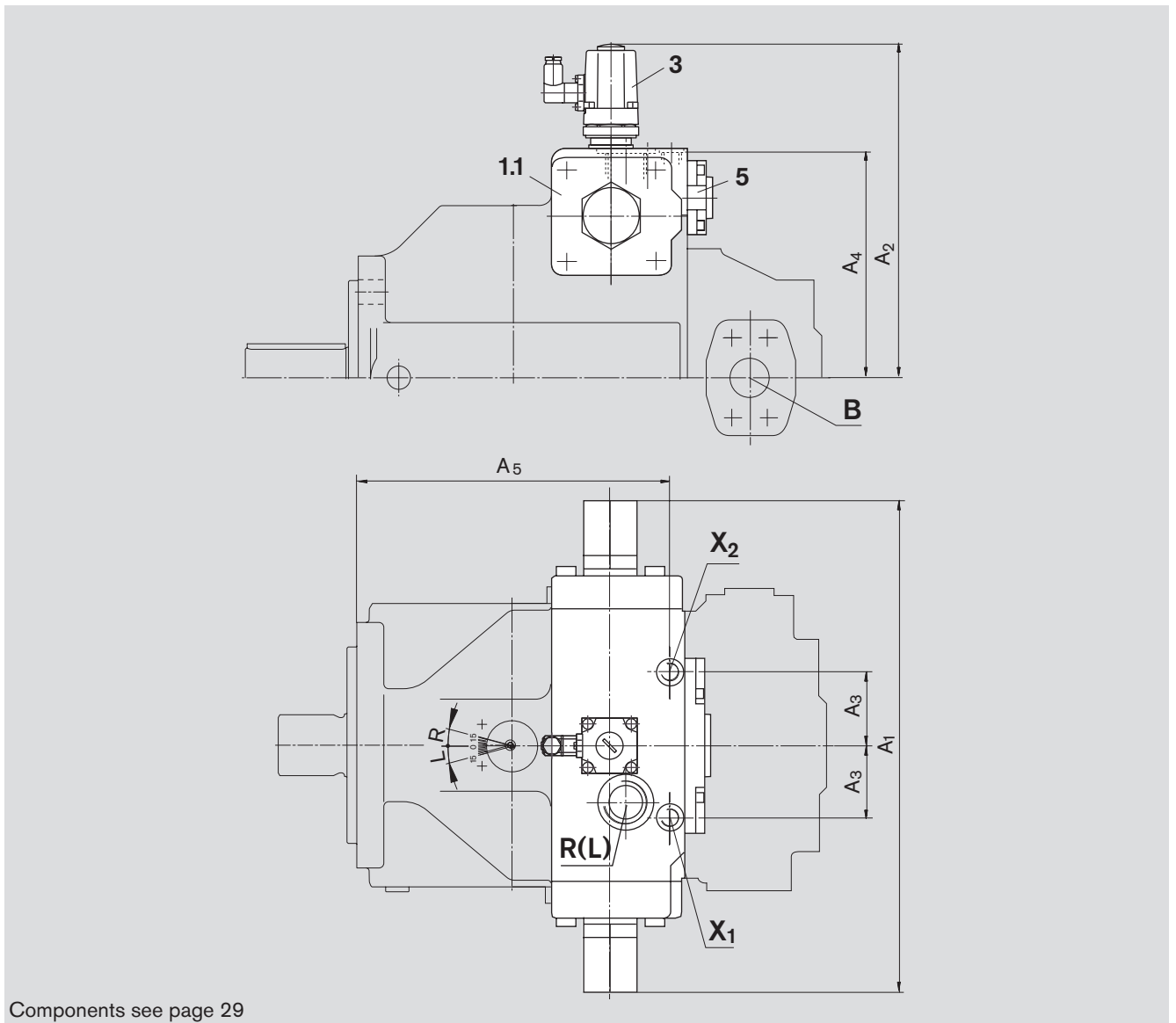
O = Must be connected (plugged upon delivery)

Dimensions HS4M

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

Size 125 to 355

Dimensions are valid for A4VSO, A4VSG and A4CSG



Size	A ₁	A ₂	A ₃	A ₄	A ₅	
125/180	402	273	67	186.5	251	For detailed dimensions and technical data of the variable pumps see data sheets A4VSO RE 92050, A4VSG RE 92100 or A4CSG RE 92105
250/355	485	309	71	233	311	

Ports

Designation	Port for	Standard	Size ¹⁾	Peak pressure [bar] ²⁾	State
X ₁ ; X ₂	Control pressure	DIN 3852-1	M14 x 1.5; 12 deep (size125 and 180) M18 x 1.5; 12 deep (size250 and 355)	350 350	O O

1) For the maximum tightening torques the general safety information on page 52 must be observed.

2) Depending on the application momentary pressure spikes can occur. To be considered when selecting the measuring equipment and fittings.

O = Must be connected (plugged upon delivery)

HS4V – with internal control pressure supply

For A4VSO

The HS4V control type corresponds to the HS4-version however with internal control pressure supply, differential control piston and an unpressurized initial position $V_{g \max}$. This eliminates the need for an external control pressure supply. The control pressure is taken directly out of the pump pressure outlet.

With a switched-off electric motor and an unpressurized control system a spring force will swivel the pump to it's maximum displacement ($V_{g \max}$).

For a reliable control, the system pressure must be at least 20 bar.

If the pump must be controlled below this 20 bar, it is necessary to use a pressure pre-charge block AGEV4-05728-AA/46 (see example of schematic). Please consult us.

Fail Safe-properties

With a de-energized proportional valve and a closed pump outlet, the unit will swivel to the minimum pressure (6 to 10 bar). This will also happen in case of an error or without a control release.

Electronics: VT-VPCD-1X see RE 30028

Technical data

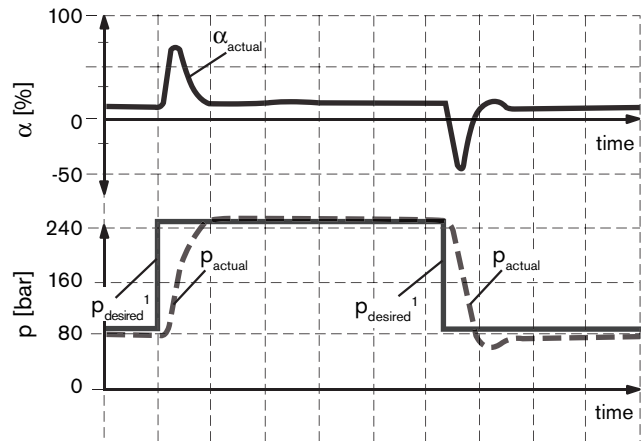
Max. operating pressure	$p_{nom}^{1)}$	315	bar
Min. operating pressure	p_{min}	20	bar

¹⁾ limited through the permissible data of the proportional valve, higher pressure on request

Swivel range -100% to +100%

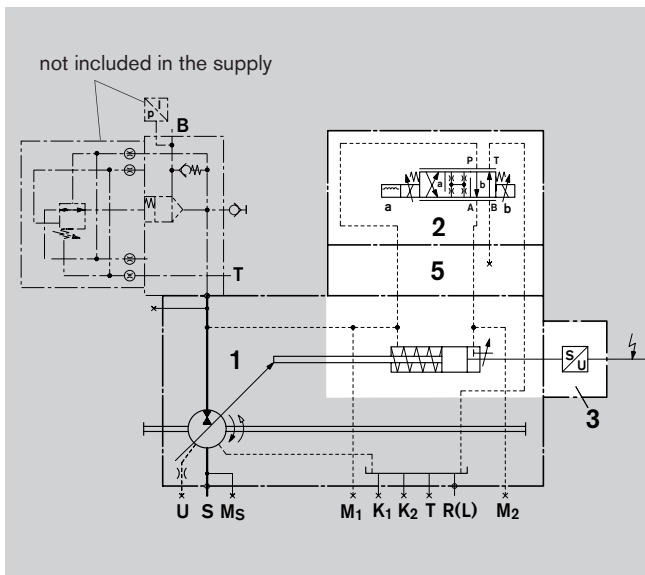
As a special feature, the pump can reverse the direction of flow. This possibility to swivel over centre enables a very fast pressure decrease.

Dynamic characteristic of the sudden pressure drop via the pump



Schematic

Example: A4VSO HS4V (size 250 and 355) with pre-charge block AGEV4-05728-AA/46



Ports

M₁; M₂ Measuring ports control pressure

Components

- 1 Pump with hydraulic control device A4VSO (see RE 92050)
- 2 4/3-way proportional valve (see RE 29061) with electric positional feedback (incl. cable connector 4-pin Pg7-G4W1F)

Size	Type
250 and 355	4WRE6V16-2X/G24K4/V-822 Solenoids with plug to DIN EN 175.301-803 / ISO 4400 cable screw connection M16 x 1.5 for cable diameter 4.5...10mm

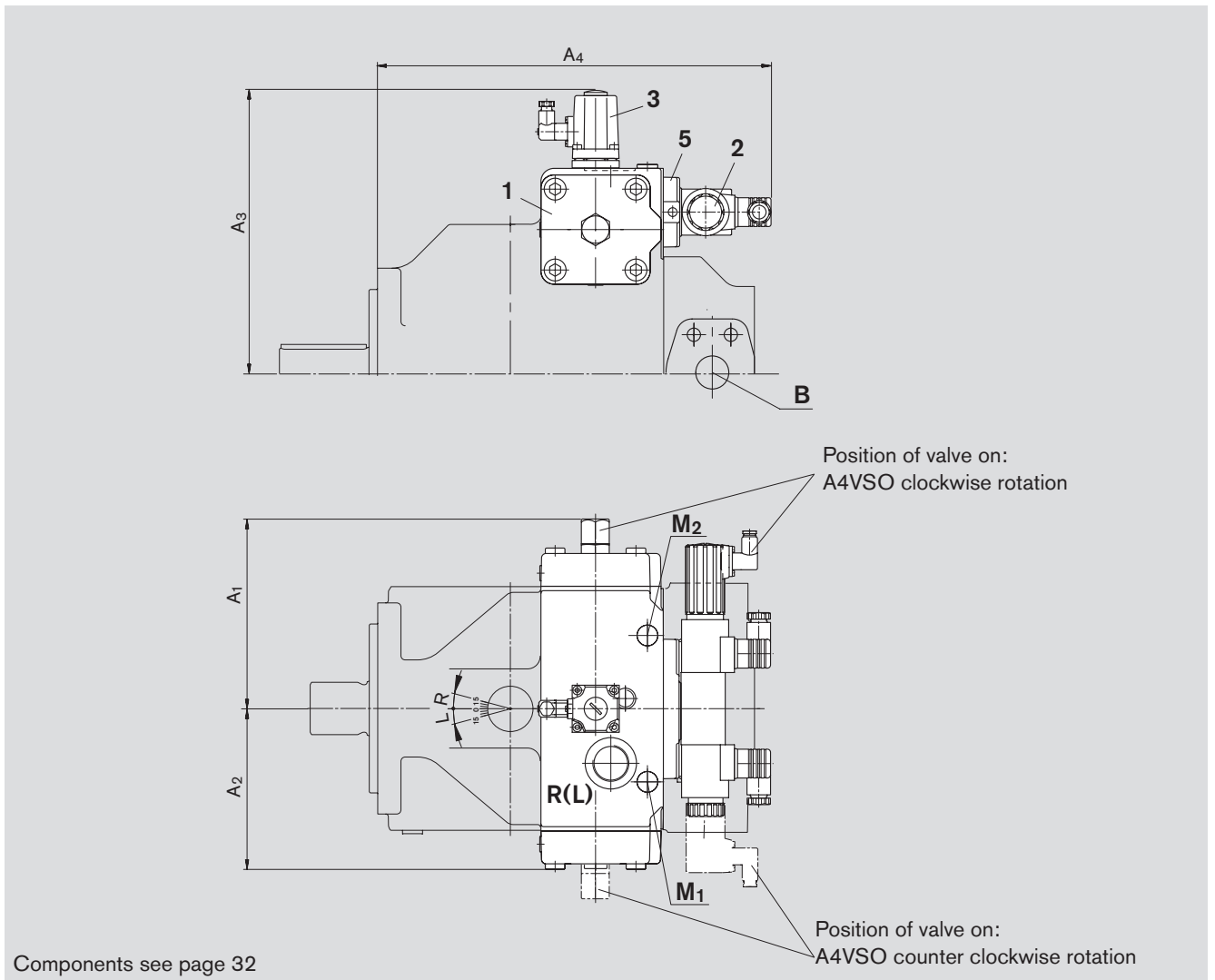
- 3 Inductive positional transducer AWXF004D01 with cable connector 4-pin Pg7-G4W1F

- 5 Sandwich plate

Dimensions HS4(V)

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

Size 250 and 355



Size	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 A4VSO RE 92050

Ports

Designation	Port for	Standard	Size ¹⁾	Peak pressure [bar] ²⁾	State
M ₁ ; M ₂	Measuring control pressure	DIN 3852-1	M18 x 1.5; 12 deep	315	X

1) For the maximum tightening torques the general safety information on page 52 must be observed.

2) Depending on the application momentary pressure spikes can occur. To be considered when selecting the measuring equipment and fittings.

X = Plugged (in normal operation)

EO1 / EO2 – Control system with proportional valve

For A4VSO and A4VSG: EO1, EO2
For A4CSG: only EO2

For electric control of displacement with VT 5035-1X

The EO1/2 control adjusts the pump displacement proportional to a command input value, by means of a built on directly driven proportional directional valve.

The feedback signal for the actual pump swivel angle (displacement) is provided by a positional transducer.

The minimum and maximum swivel angle limitation is mechanically adjustable up to 50 % of $V_{g \max}$. For the size 500, $V_{g \min}$ is also adjustable up to 50 % of $V_{g \max}$ but $V_{g \max}$ only up to 70% of $V_{g \max}$.

Setting at the A4VSO and A4VBO (open circuit):

The $V_{g \min}$ -stop is set in such a position, that, with a blocked pressure port B a pressure of 15...20 bar is reached.

The $V_{g \max}$ -stop is set to the nominal value of $V_{g \max}$.

Setting at the A4VSG and A4CSG (closed circuit):

The $V_{g \max}$ -stops on both sides of centre are set to the nominal value of $V_{g \max}$.

If other settings are desired, please state in clear text when ordering.

Spring centering of the control cylinder is standard. It is used for **settings and adjustments in the unpressurized zero position**, however without a defined reset during high pressure operation.

The spring centering is not a safety device.

The electric amplifier VT 5035-1X to control the pump displacement does not belong to the supply of the EO, it must be ordered separately acc. to RE 29955.

2 versions are available:

EO1 min. control pressure 20 bar for pump sizes 40...250 see page 35...38

EO2 min. control pressure 50/100/125 bar for pump sizes 40...1000 see page 39...43

Important

The valve spool in the control system can get stuck in a non defined position(contaminated hydraulic fluid, wear particles or contamination from the general system components). Through this, the pump flow will not follow the operators commands anymore

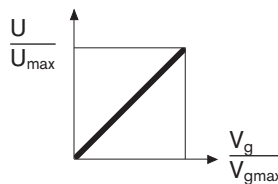
Check whether your machine needs safety measures to bring the driven actuators in a safe position (i.e. immediate stop).

A4VSO - open circuit

Please note: On the **A4VSO** pump for open circuit applications (swivel to one side only) the $V_{g \min}$ -stop is set so that, when port B is plugged a pressure of approx. 20 bar is reached.

Over centre operation is available on request.

Characteristic

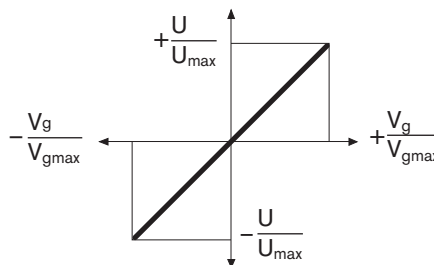


Direction of flow S to B

Direction of rotation	Swivel range* / or solenoid energized
clockwise	left / a
counter clockwise	right / b

A4VSG and A4CSG - closed circuit

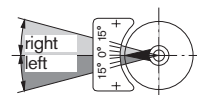
Characteristic



Direction of flow

Direction of rotation	Swivel range* / or solenoid energized
clockwise	right / b
counter clockwise	left / a

* compare swivel angle indicator



EO1 – Control system with proportional valve

Technical data

Size			40	71	125	250
Control pressure in P	p_{min}	bar	20			
	p_{max}	bar	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
Control time $t_{min}^{1)}$		s	0.12	0.20	0.22	0.40
Weight approx. (A4VSO...EO1..N00)		kg	42	59	98	200
maximum hysteresis $\Delta V_g^{2)}$			$\leq \pm 2\%$ of $V_{g_{max}}$			
minimum repeating accuracy $^{2)}$			$\leq \pm 1.5\%$ of $V_{g_{max}}$			
Linearity deviation $^{2)}$			$\leq 2.5\%$ of $V_{g_{max}}$			

1) at 50 bar control pressure

2) Values are valid for constant operating temperature of 50 °C

EO1 – Control system with proportional valve

Size 40, 71, 125 and 250 for A4VSO and A4VSG

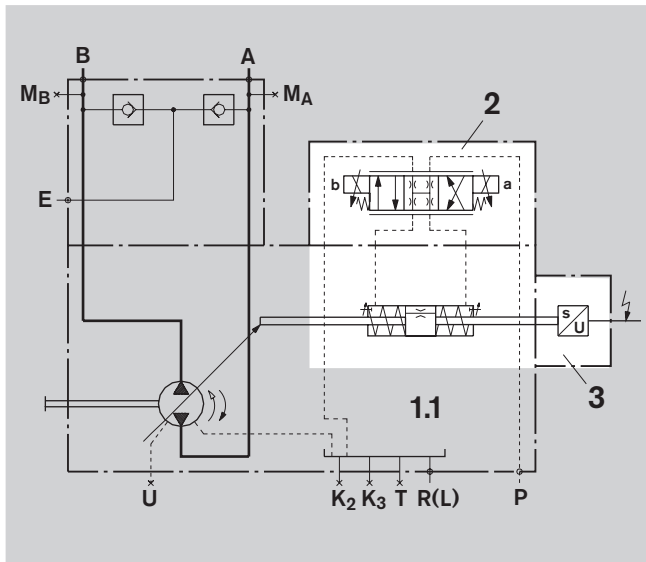
The external control fluid, which must be fed into port P is leaving the pump via the case drain port R(L).

For pump type **A4CSG** with EO1- control, the control is fed from the boost circuit (port M_{E3}), that means port P is piped already. Recommended setting of boost pressure relief valve: 25 bar.

Schematics

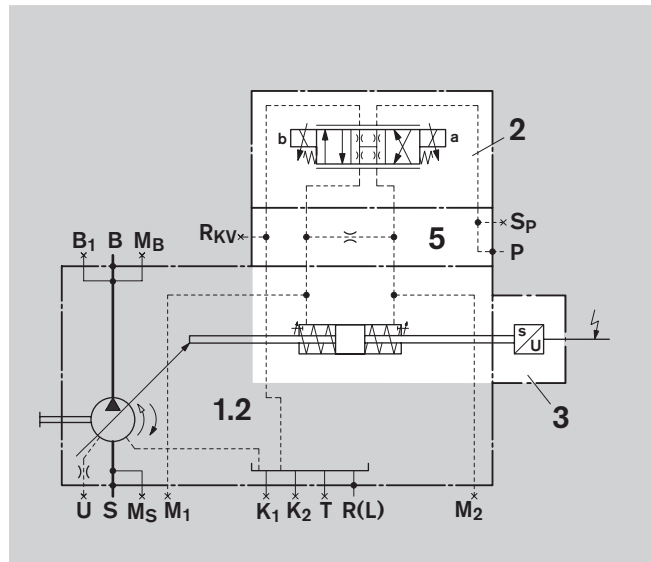
Size 40 and 71

Example: closed circuit A4VSG



Size 125 and 250

Example: open circuit A4VSO



Ports

- P Control pressure port
- S_P Port for control pressure accumulator
Size 125 and 250
- R_{KV} Return line control fluid
Size 125 and 250
- M₁; M₂ Measuring ports control pressure
Size 125 and 250

Components

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

Size	Type
40 and 71	4WRA6V15-2X/G24N9K4/V-589 with plug in connector to DIN EN 175 301-803 / ISO 4400
125 and 250	4WRA6V30-2X/G24N9K4/V-589 cable screw joint M16x1.5 for cable diameter 4.5..10mm

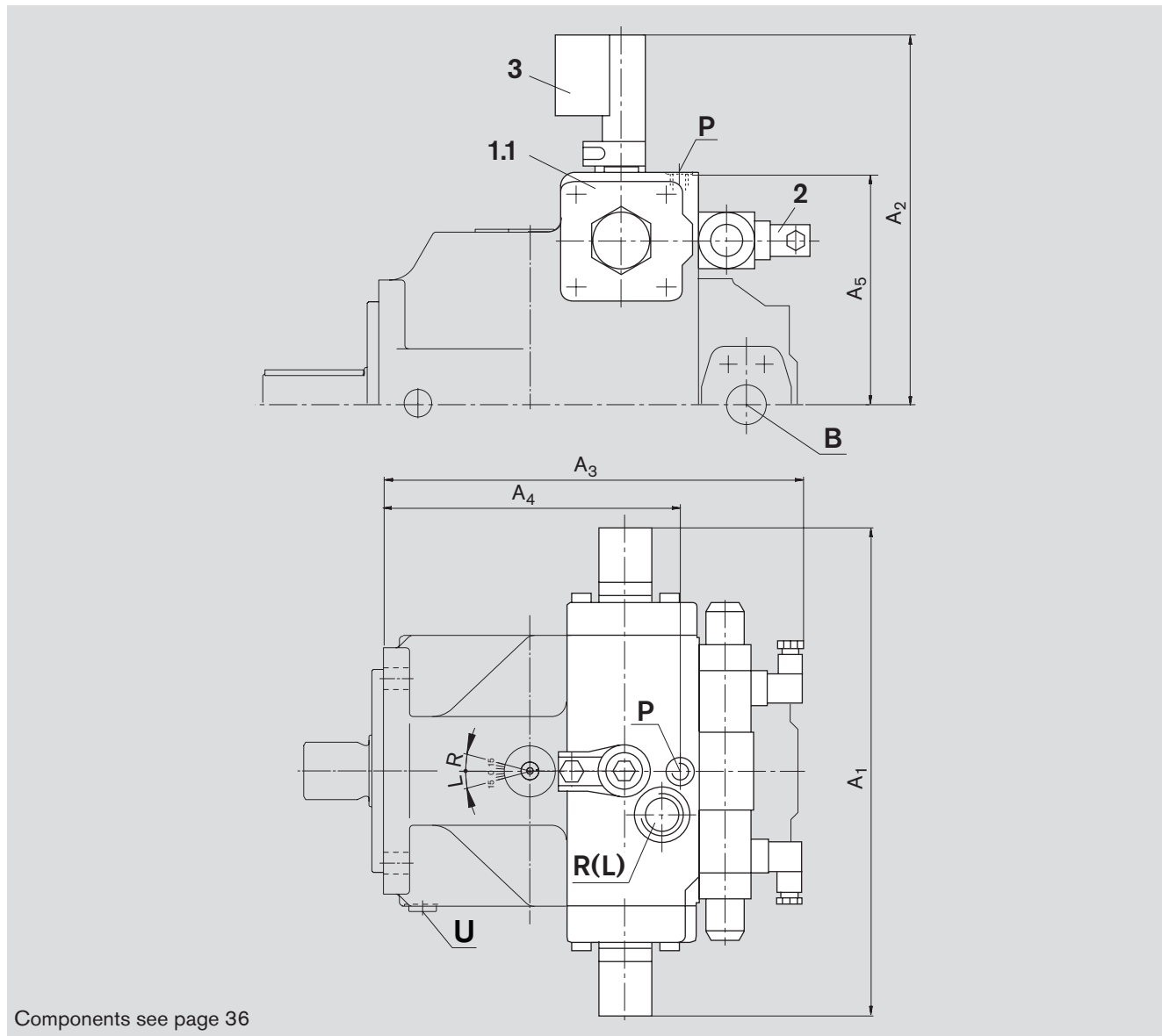
- 3 Inductive positional transducer IW9-03-01
with plug in connector to DIN EN 175 301-803-A / ISO 4400
cable screw joint M16x1.5 for cable diameter 4.5...10mm
- 5 Throttle plate

Dimensions EO1

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

Size 40 and 71

Dimensions are valid for A4VSO and A4VSG



Size	A ₁	A ₂	A ₃	A ₄	A ₅	
40	296	246	279	178	135	For detailed dimensions and technical data of the variable pumps see A4VSO RE 92050, or A4VSG RE 92100
71	332	265	306	205	152	

Ports

Designation	Port for	Standard	Size ¹⁾	Peak pressure [bar] ²⁾	State
P	Control pressure	DIN 3852-1	M14 x 1.5; 12 deep	100	O

1) For the maximum tightening torques the general safety information on page 52 must be observed.

2) Depending on the application momentary pressure spikes can occur. To be considered when selecting the measuring equipment and fittings.

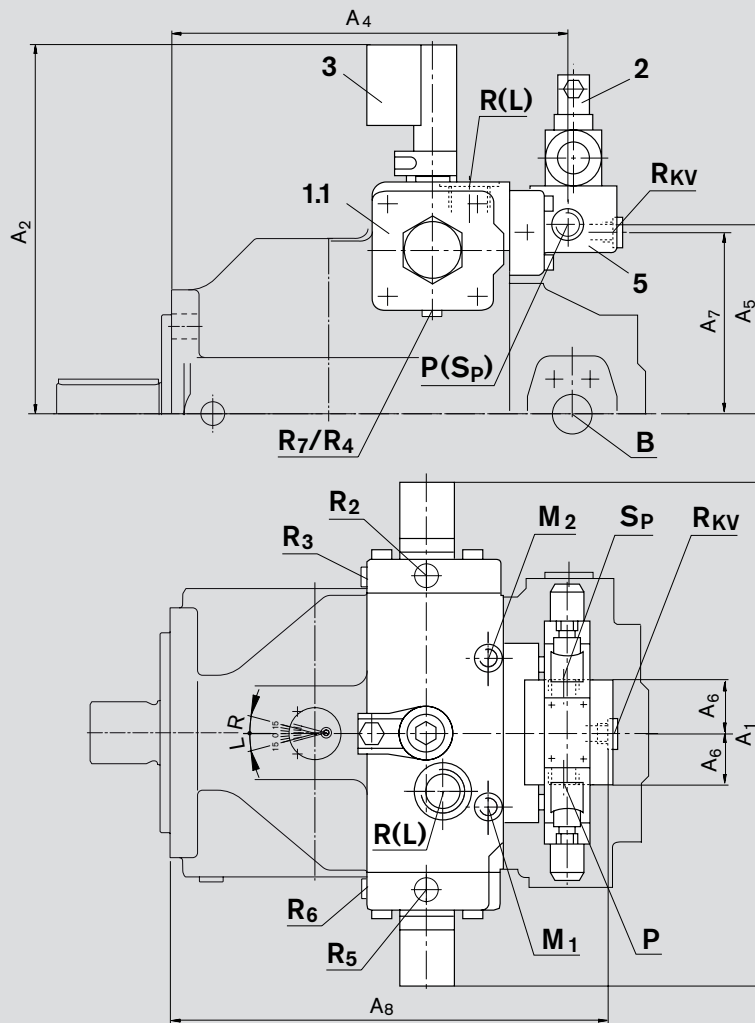
O = Must be connected (plugged upon delivery)

Dimensions EO1

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

Size 125 and 250

Dimensions are valid for A4VSO and A4VSG



Components see page 36

Size	A ₁	A ₂	A ₄	A ₅	A ₆	A ₇	A ₈
125	402	298	312	156	39	148	352
250	485	345	372	192	39	184	412

For detailed dimensions and technical data of the variable pumps see A4VSO RE 92050 or A4VSG RE 92100

Ports

Designation	Port for	Standard	Size ¹⁾	Peak pressure [bar] ²⁾	State
P	Control pressure	DIN 3852-1	M22 x 1.5; 14 deep	100	O
S _p	Control pressure accumulator	DIN 3852-1	M22 x 1.5; 14 deep	100	X
R _{KV}	Return line control fluid	DIN 3852-1	M22 x 1.5; 14 deep	4	X
M ₁ ; M ₂	Measuring control pressure	DIN 3852-1	M14 x 1.5; 12 deep (size 125) M18 x 1.5; 12 deep (size 250)	100 100	X X
R ₂ ...R ₇	Air bleed control chamber	DIN 3852-1	M10 x 1; 8 deep	100	X

1) For the maximum tightening torques the general safety information on page 52 must be observed.

2) Depending on the application momentary pressure spikes can occur. To be considered when selecting the measuring equipment and fittings.

O = Must be connected (plugged upon delivery)

X = Plugged (in normal operation)

EO2 – Control system with proportional valve

Technical data

Size			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								
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	0.1	0.12	0.2	0.2	0.25	0.25	0.3	*	*
Weight approx. (A4VSO..EO2..N00)		kg	42	59	98	112	200	220	338	481	611
maximum hysteresis $\Delta V_g^{3)}$			$\leq \pm 2\%$ of $V_{g\ max}$								
minimum repeating accuracy ³⁾			$\leq \pm 1.5\%$ of $V_{g\ max}$								
Linearity deviation ³⁾			$\leq 2.5\%$ of $V_{g\ max}$								

1) limited by permissible data of proportional valve

2) at minimum control pressure

3) Values are valid for constant operating temperature of 50 °C

* on request

EO2 – Control system with proportional valve

Size 40 to 355 for A4VSO and A4VSG
Size 250 and 355 for A4CSG

The external control fluid, which must be fed into port P leaves the pump via case drain port R(L).

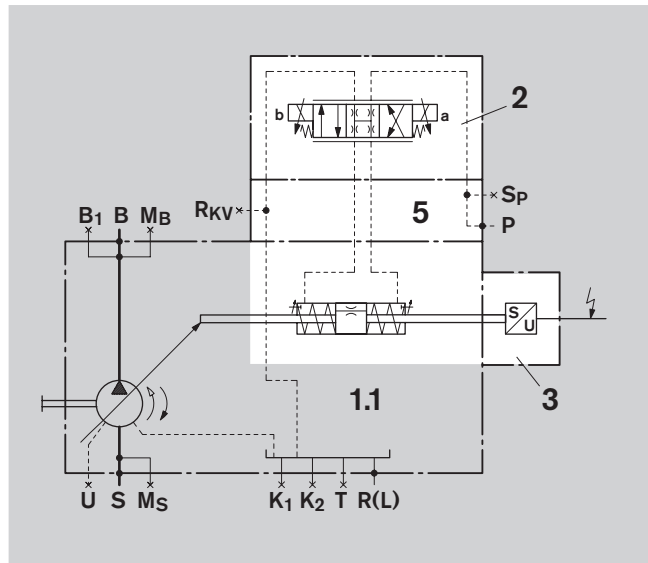
On pump type **A4CSG** with EO2-control the control pressure relief valve is not needed and replaced by a plug.

In order to minimize the control fluid consumption the control chambers on the sizes 125...355 are sealed and can be bled via ports R₂ R₇.

Schematics

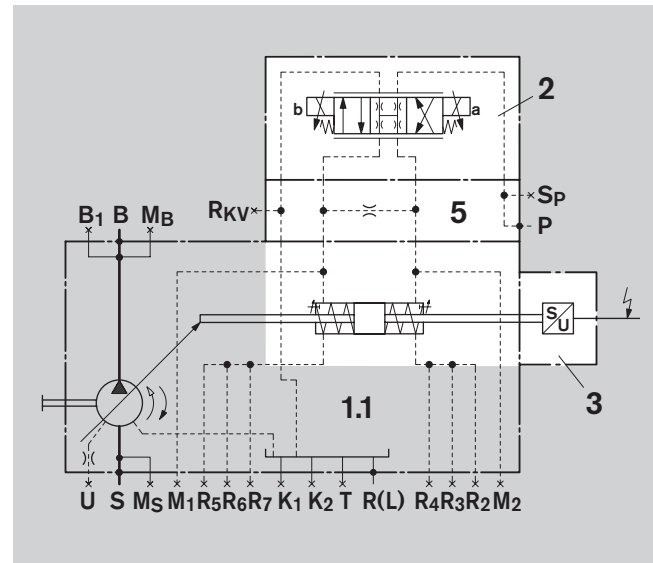
Size 40 and 71

Example: open circuit A4VSO



Size 125 to 355

Example: open circuit A4VSO



Ports

- P Control pressure port
- Sp Port for control pressure accumulator
- Rkv Return line control fluid
- M₁; M₂ Measuring ports control pressure
Size 125 to 355
- R₂...R₇ Bleed port control chamber
size 125 to 355

Components

- 1 Pump with hydraulic control device
- 1.1 A4VSO (see RE 92050)
- 2 4/3-way proportional valve

Size	Typ
40 and 71	4WRA6V15-2X/G24N9K4/V-589 with plug in connector to DIN EN 175 301-803 / ISO 4400
125 to 355	4WRA6V30-2X/G24N9K4/V-589 cable screw joint M16x1.5 for cable diameter 4.5..10mm

- 3 Inductive positional transducer IW9-03-01
with plug in connector (mating plug) to DIN EN 175 301-803-A / ISO 4400
cable screw joint M16x1.5 for cable diameter 4.5...10mm

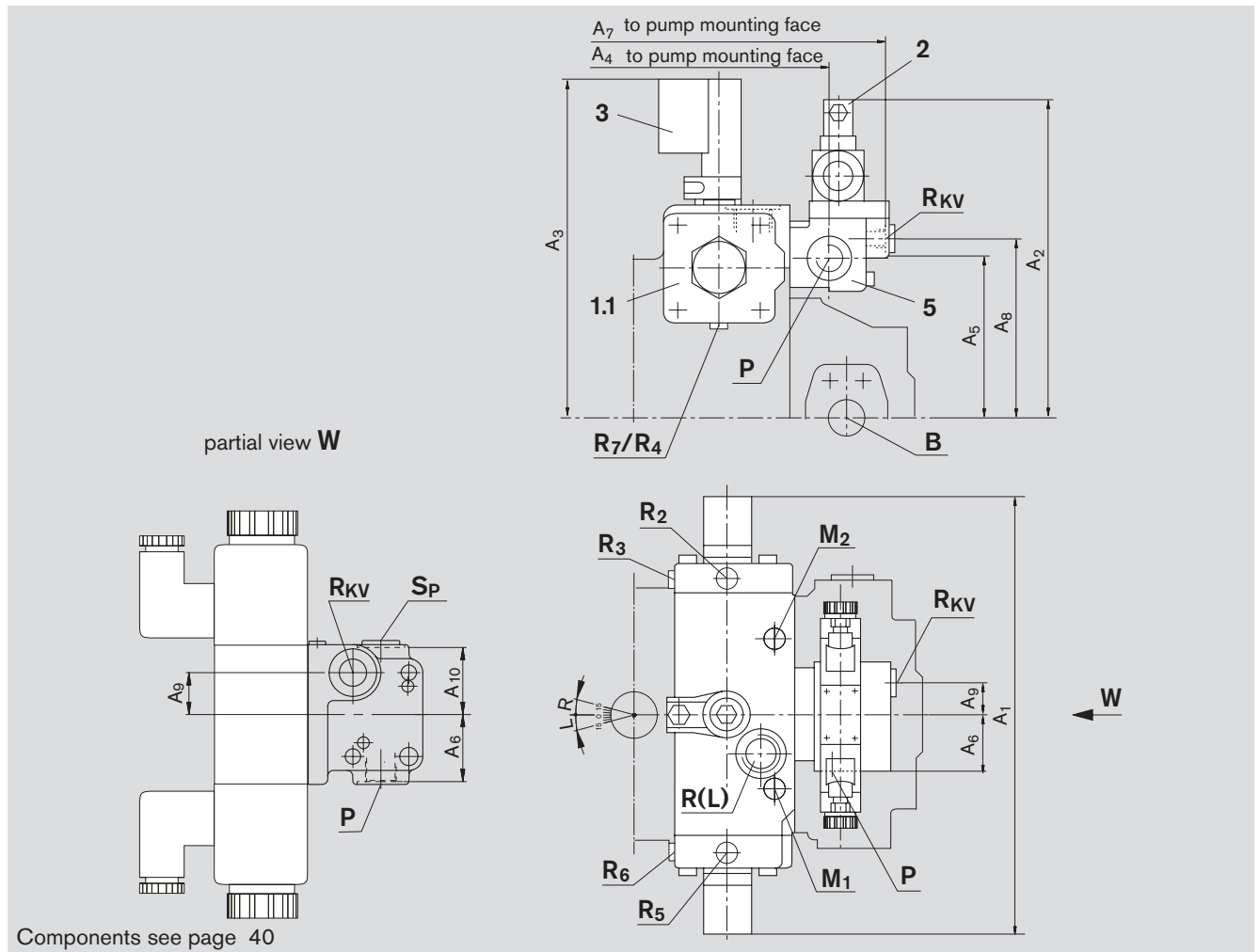
- 5 Sandwich plate

Dimensions EO2

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

Size 40 to 355

Dimensions are valid for A4VSO, A4VSG and A4CSG



Size	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 of the variable pumps see A4VSO RE 92050, A4VSG RE 92100 or A4CSG RE 92105
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

Designation	Port for	Standard	Size ¹⁾	Peak pressure [bar] ²⁾	State
P	Control pressure	DIN 3852-1	M22 x 1.5; 14 deep	315	O
S _p	Control pressure accumulator	DIN 3852-1	M22 x 1.5; 14 deep	315	X
R _{KV}	Return line control fluid	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) M18 x 1.5; 12 deep (size 250 and 355)	315 315	X X
R ₂ ...R ₇	Air bleed control chamber	DIN 3852-1	M10 x 1; 8 deep (size 125 to 355)	315	X

1) For the maximum tightening torques the general safety information on page 52 must be observed.

2) Depending on the application momentary pressure spikes can occur. To be considered when selecting the measuring equipment and fittings.

O = Must be connected (plugged upon delivery)

X = Plugged (in normal operation)

EO2 – Control system with proportional valve

Size 500 to 1000 for A4VSO and A4VSG
Size 500 and 750 for A4CSG

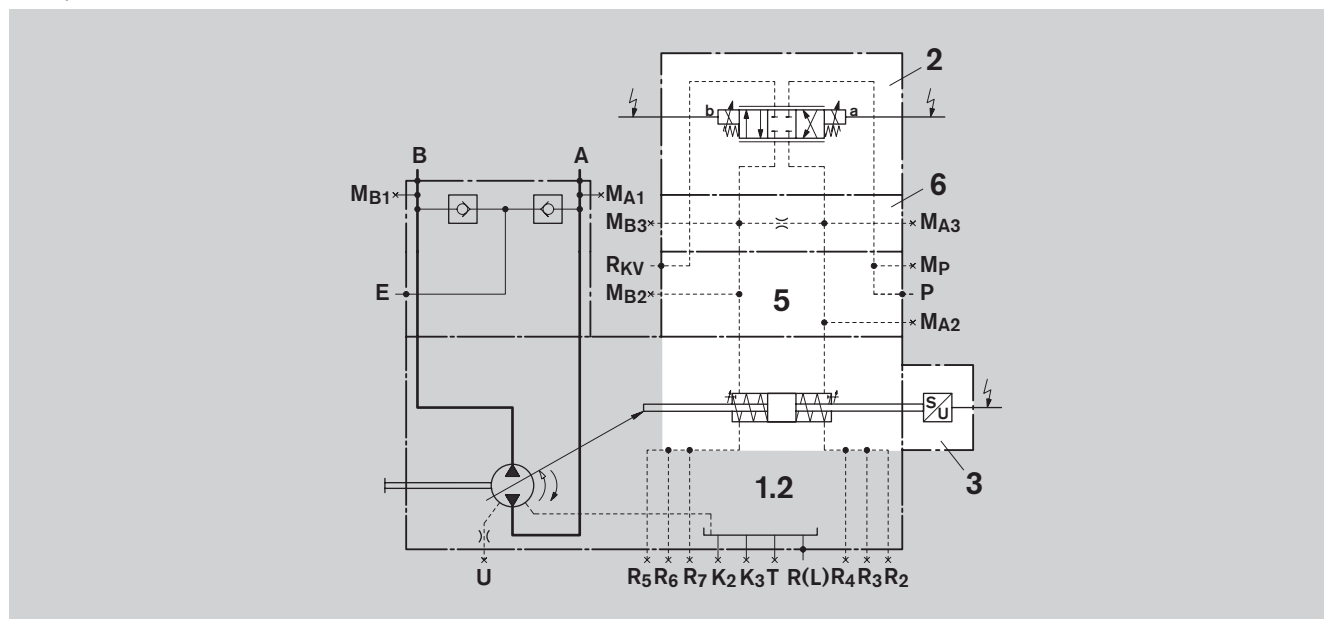
The external control fluid, which must be fed into port P is discharged via port R_{KV}, which must be piped to tank.

On pump type **A4CSG** with EO2-control the control pressure relief valve is not needed and replaced by a plug.

In order to minimize the control fluid consumption the control chambers are sealed and can be bled via ports R₂ ... R₇.

Schematic

Example: closed circuit A4VSG



Ports

P	Control pressure port
R _{KV}	Return line control fluid
M _{A2} ; M _{B2} ; M _P ; M _{A3} ; M _{B3}	Measuring ports control pressure
R ₂ ...R ₇	Bleed port control chamber

Components

1 Pump with hydraulic control device

1.2 A4VSG (see RE 92100)

2 4/3-way proportional valve

Size	Type	
500 to 1000	4WRE10E25-2X/24K4/V-93	with plug in connector to DIN EN 175 301-803 / ISO 4400 cable screw joint M16x1.5 for cable diameter 4.5..10mm

3 Inductive positional transducer IW9-03-01
with plug in connector (mating plug) to DIN EN 175 301-803-A / ISO 4400
cable screw joint M16 x 1.5 for cable diameter 4.5...10mm

5 Sandwich plate

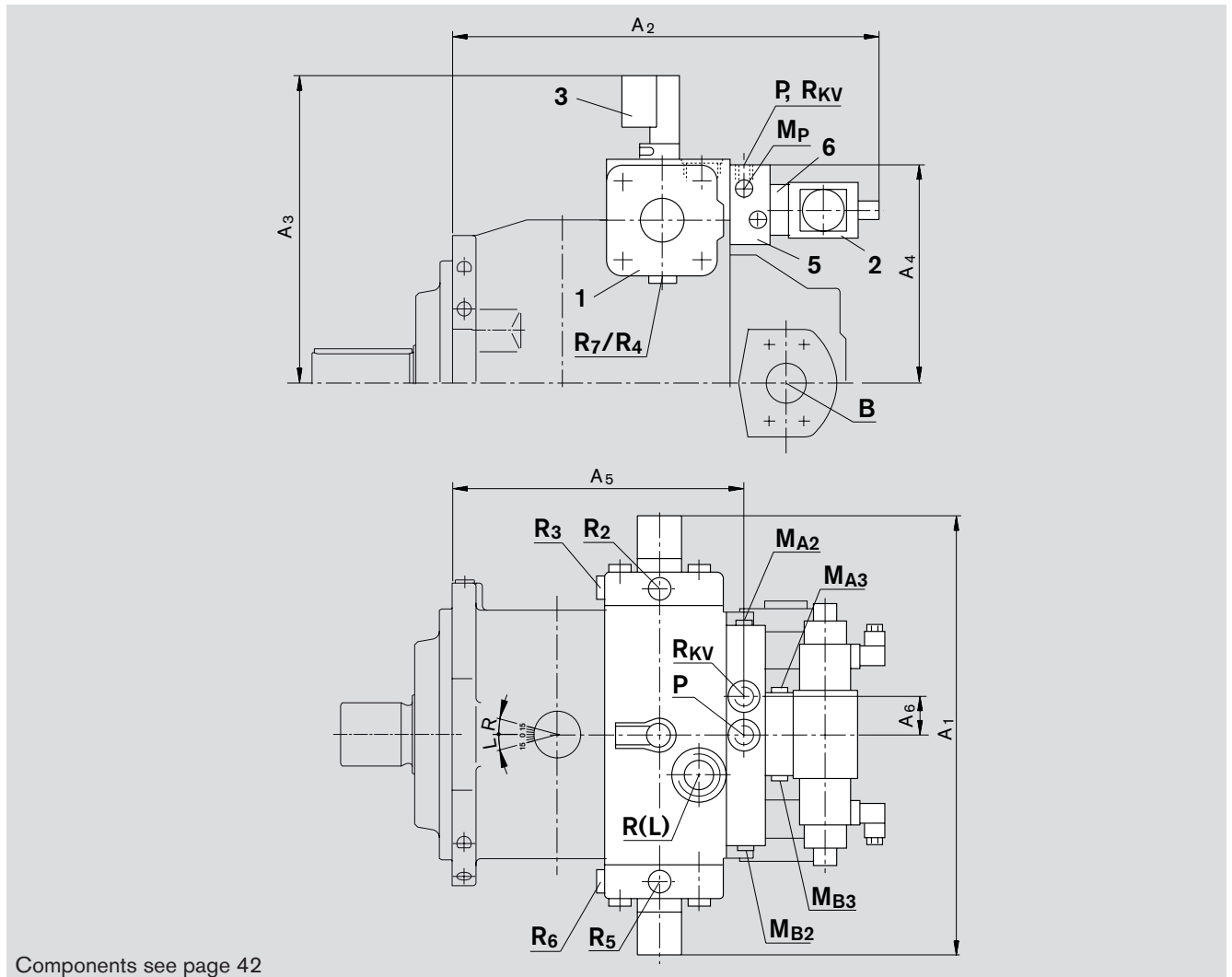
6 Throttle plate

Dimensions EO2

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

Size 500 to 1000

Dimensions are valid for A4VSO, A4VSG and A4CSG



Size	A ₁	A ₂	A ₃	A ₄	A ₅	A ₆
500	555	559	392	274	388	50
750	630	591	427	304	420	50
1000	670	657	456	327	486	50

For detailed dimensions and technical data of the variable pumps see A4VSO RE 92050, A4VSG RE 92100 or A4CSG RE 92105

Ports

Designation	Port for	Standard	Size ¹⁾	Peak pressure [bar] ²⁾	State
P	Control pressure	DIN 3852-1	M27 x 2; 16 deep	315	O
R _{KV}	Return line control fluid	DIN 3852-1	M27 x 2; 16 deep	210	O
M _P ; M _{A2} ; M _{B2}	Measuring control pressure	DIN 3852-1	M14 x 1.5; 12 deep	315	X
M _{A3} ; M _{B3}	Measuring control pressure	DIN 3852-2	G 1/4 in	315	X
R ₂ ...R ₇	Air bleed control chamber	DIN 3852-1	M14 x 1.5; 12 deep	315	X

1) For the maximum tightening torques the general safety information on page 52 must be observed.

2) Depending on the application momentary pressure spikes can occur. To be considered when selecting the measuring equipment and fittings.

O = Must be connected (plugged upon delivery)

X = Plugged (in normal operation)

HSE without valve

Size 40 to 1000 for A4VSO and A4VSG
Size 250 to 750 for A4CSG

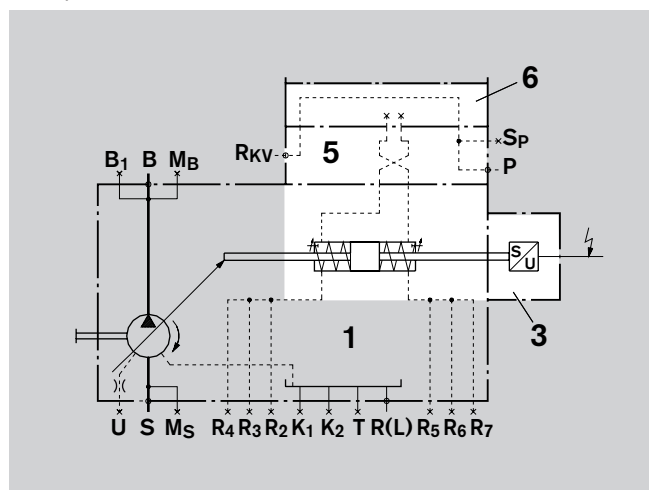
The HSE-version is being supplied without servo valve.

Apart from that, this version corresponds to the respective basic execution – technical data, respective schematics and unit dimensions see basic control version HS page 14 ff.

The mounting pad for the servo valve for all pump sizes corresponds to **porting pattern DIN 24340-A10**.

Schematic

Example A4VSO size 125 to 355



Ports

P	Control pressure port
Sp	Port for control pressure accumulator
Rkv	Return line control fluid
R ₂ ...R ₇	Bleed port control chamber

Components

1	Pump with hydraulic control device
3	Inductive positional transducer Type IW9-03-01
5	Sandwich plate
6	Flushing plate

HSK – short circuit valve

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

Size 40 to 1000 for A4VSO and A4VSG
Size 250 to 750 for A4CSG

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

This short circuit arrangement is used for settings and adjustments in the unpressurized zero position, however without a defined reset during high pressure operation – **this is not an emergency shut-down function.**

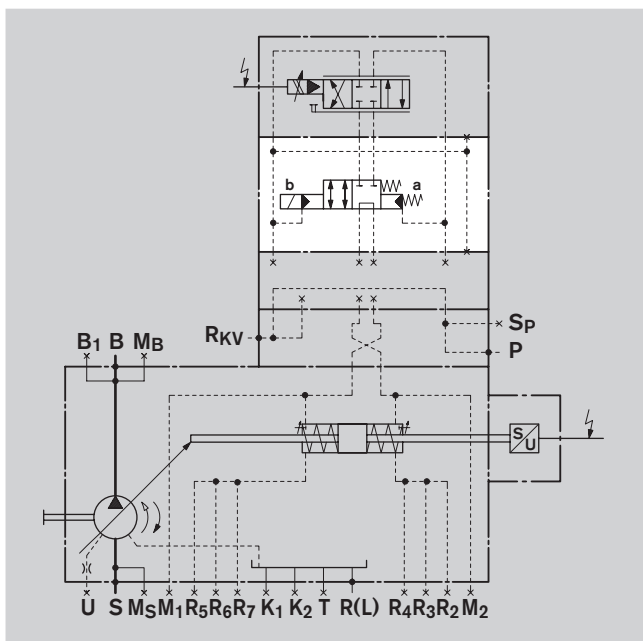
Important:

With a de-energized short circuit valve the servo valve cannot be activated due to the interrupted connection.

Short circuit valve (4/2-way shut off valve) type Z4WEH10E68-4X/6EG24N9ETZ4/B10D3 (see RE 24753) with plug in connector DIN EN 175301-803-A cable screw joint M16 x 1.5 for cable diameter 4.5...10 mm.

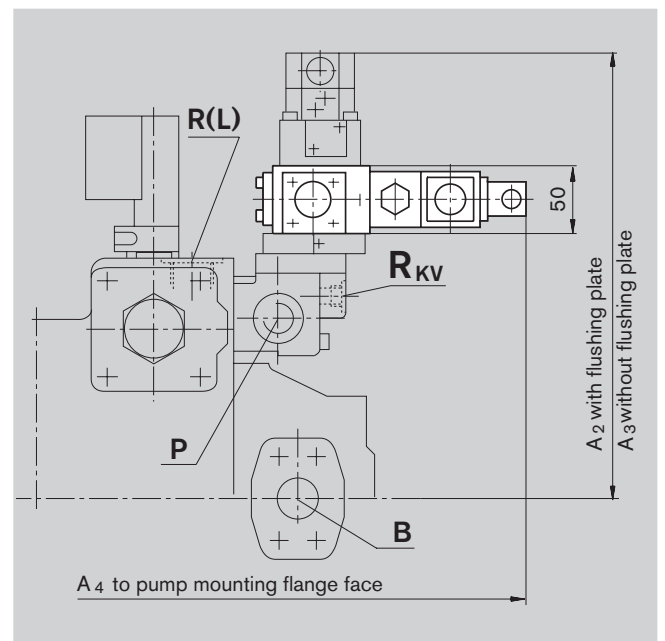
Schematic

Example: A4VSO size 125 to 355
 on sizes 40 and 71 the ports R₂...R₇ are omitted



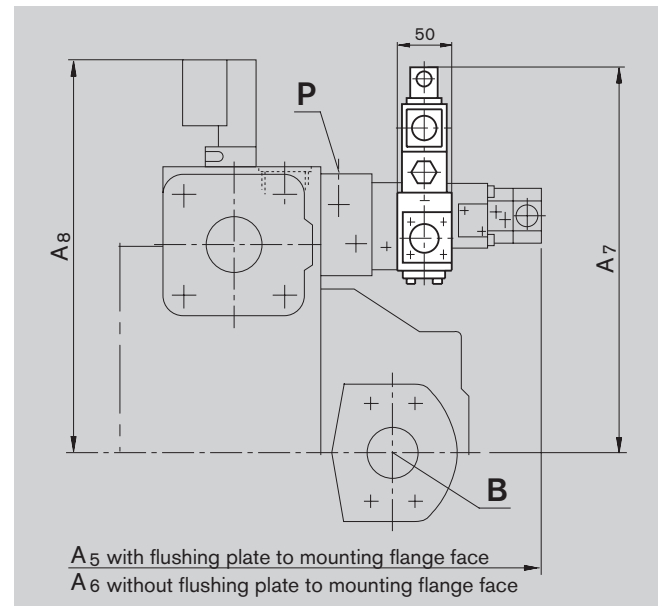
Dimensions

Size 40 to 355



Size	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

Size 500 to 1000



HS4K / EO1K / EO2K size 40 to 355 see page 46 and 47

EO2K size 500 to 1000 see page 48

HS4K / EO1K / EO2K – short circuit valve

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

HS4K size 40 to 1000
EO1K size 40 to 125 and 250
EO2K size 40 to 355

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

This short circuit arrangement is used for settings and adjustments in the unpressurized zero position, however without a defined reset during high pressure operation – **this is not an emergency shut-down function.**

Important:

With a de-energized short circuit valve the proportional valve cannot be activated due to the interrupted connection.

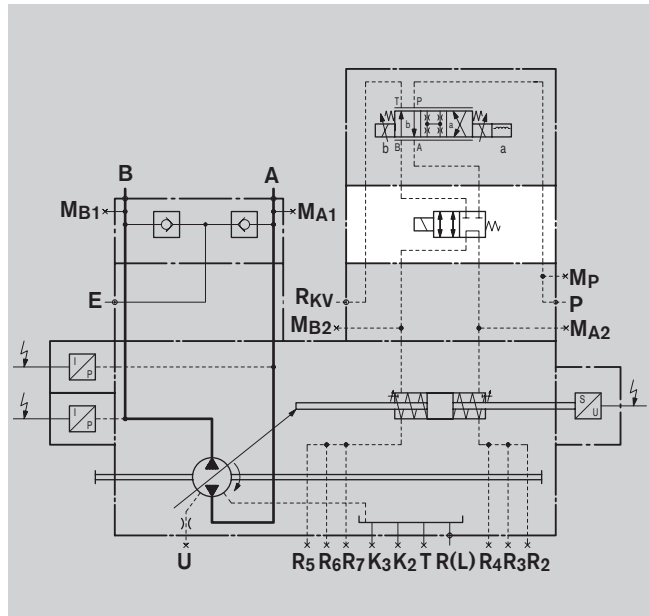
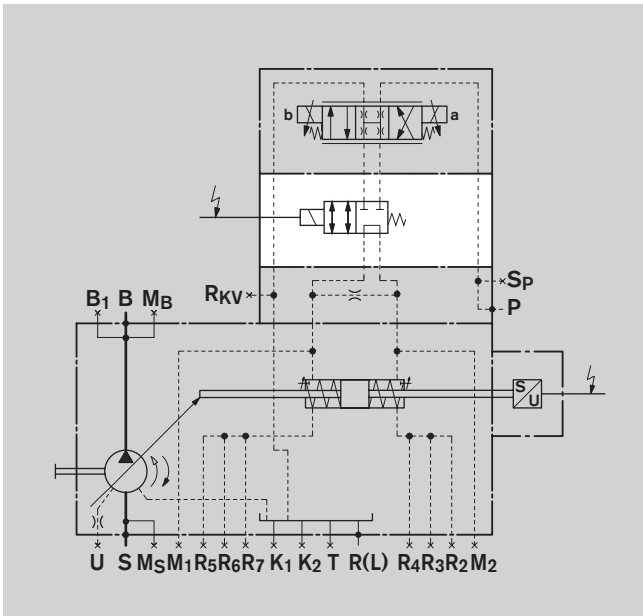
Short circuit valve (4/2-way shut off valve) type Z4WEH10E68-4X/6EG24N9ETZ4/B10D3 (see RE 24753) with plug in connector DIN EN 175301-803-A cable screw joint M16 x 1.5 for cable diameter 4.5...10 mm.

Please observe performance limits to RE 23193.

Schematics

Example: A4VSO EO2K size 125 to 355

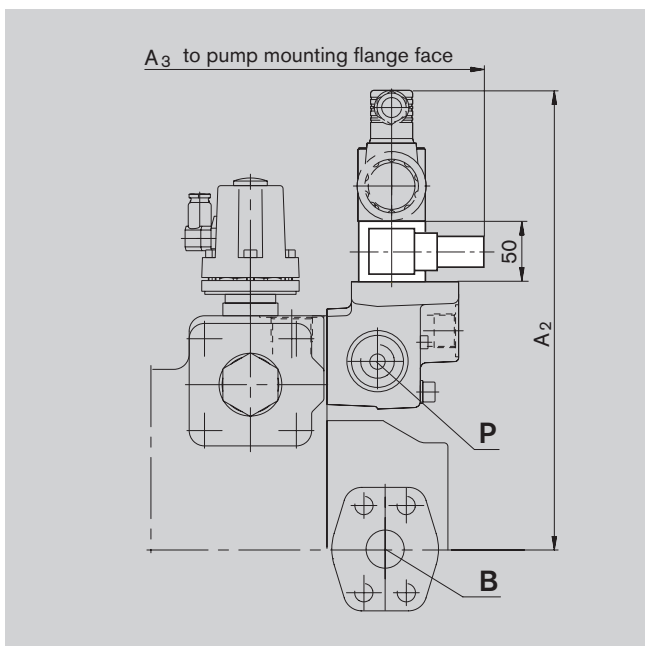
Example: A4VSG HS4KP size 500 to 1000



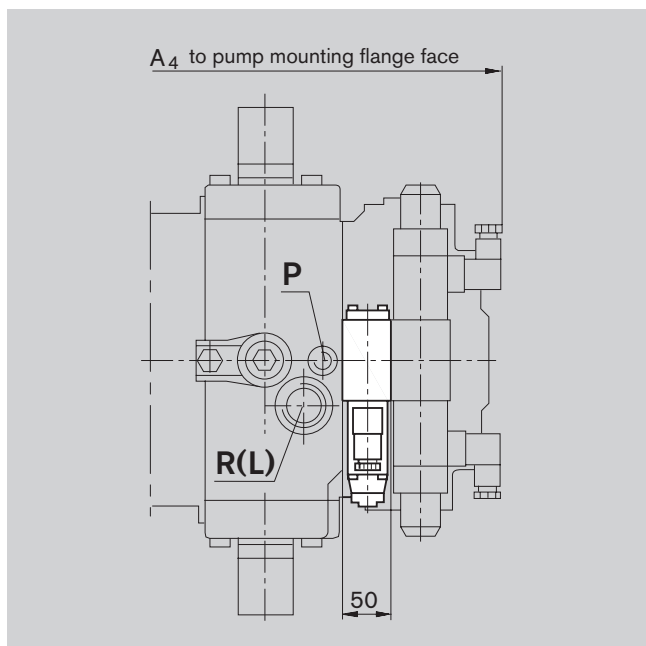
HS4K / EO1K / EO2K – Dimensions

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

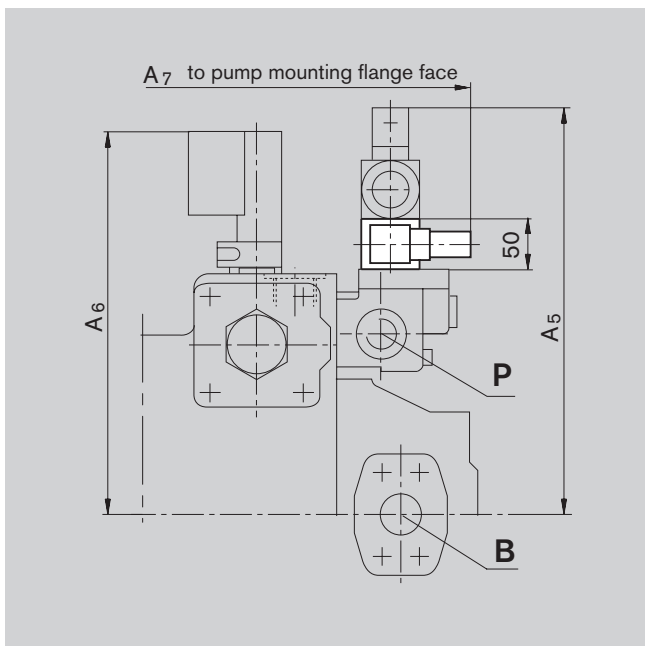
HS4K size 40 to 355



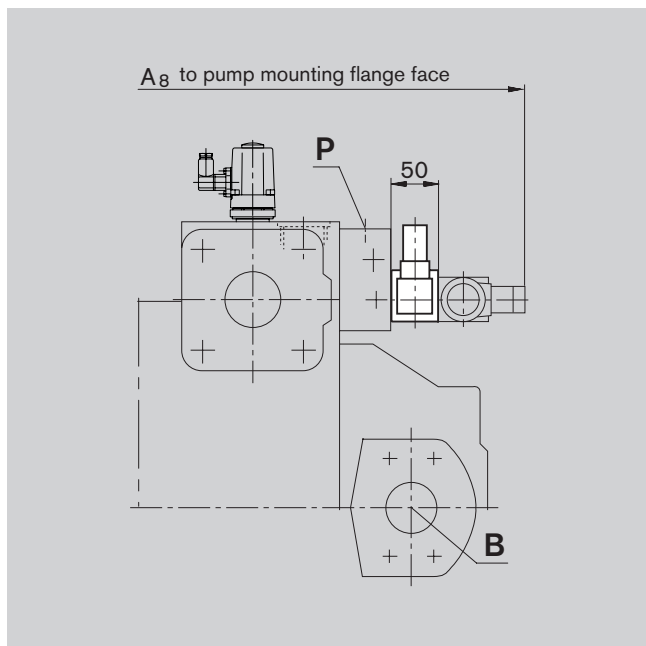
EO1K size 40 and 71



EO1K size 125 and 250
EO2K size 40 to 355



HS4K size 500 to 1000



Size	A ₂	A ₃	A ₄	A ₅	A ₆	A ₇
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

Size	A ₈
500	551
750	583
1000	649

EO2K size 500 to 1000 see page 48

EO2K – short circuit valve

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

Size 500 to 1000

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

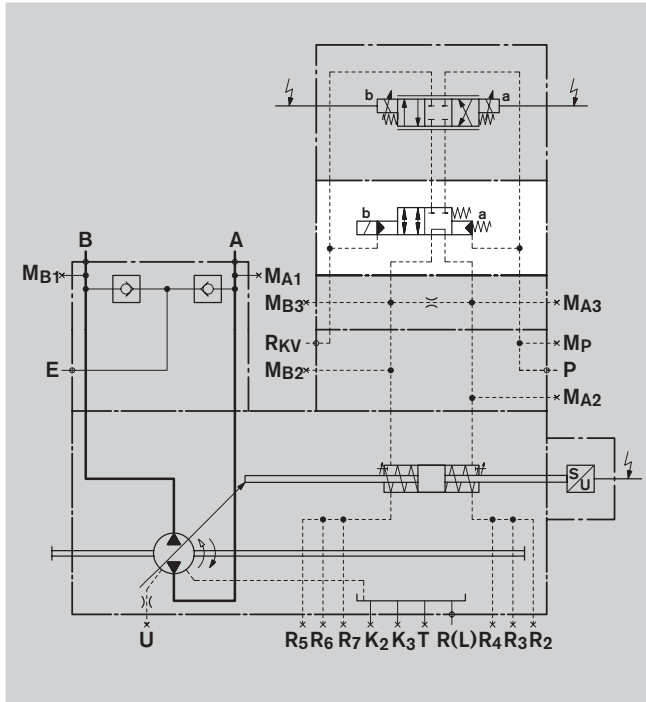
This short circuit arrangement is used for settings and adjustments in the unpressurized zero position, however without a defined reset during high pressure operation – **this is not an emergency shut-down function.**

Important:

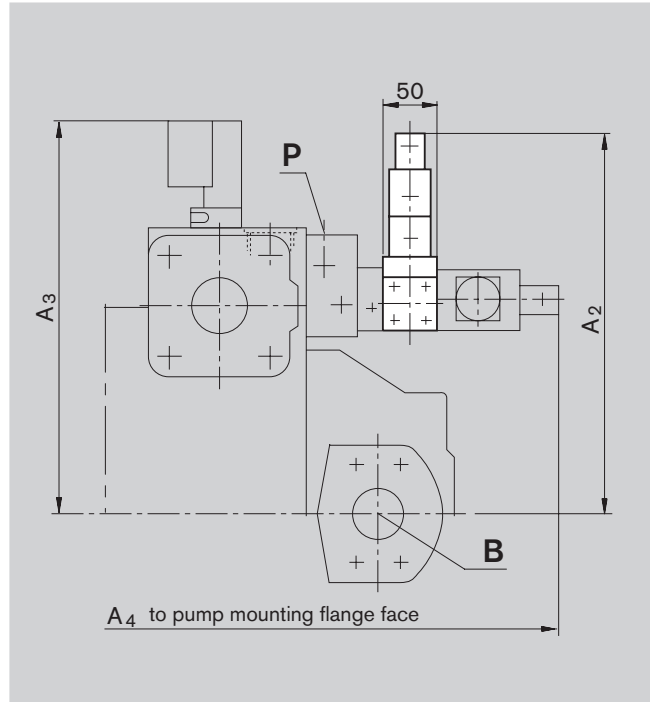
With a de-energized short circuit valve the proportional valve cannot be activated due to the interrupted connection.

Schematic

Example: A4VSG



Dimensions



Short circuit valve (4/2-way shut off valve)
 type Z4WEH10E68-4X/6EG24N9ETZ4/B10D3
 (see RE 24753)
 with plug in connector DIN EN 175301-803-A
 cable screw joint M16 x 1.5
 for cable diameter 4.5...10 mm.

Size	A ₂	A ₃	A ₄
500	386	392	609
750	417	427	641
1000	439	456	707

Z – sandwich plate filter at HS

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

Indicated by the digit in the filtration option of the ordering code

Size 40 to 355 for A4VSO and A4VSG
 Size 250 to 355 for A4CSG

This sandwich plate filter is used to filter the control fluid before entering the servo valve in the HS-control. It is denoted with the letter Z in the pump model code.

HS4 with sandwich plate filter on request.

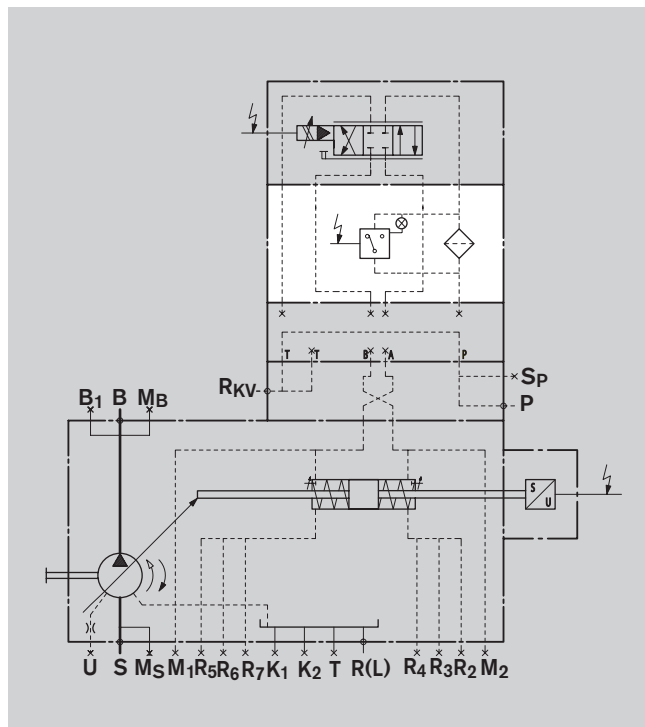
Sandwich plate filter

The contamination indicator is optical and electrical –
 Indicator lamp voltage 24V

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

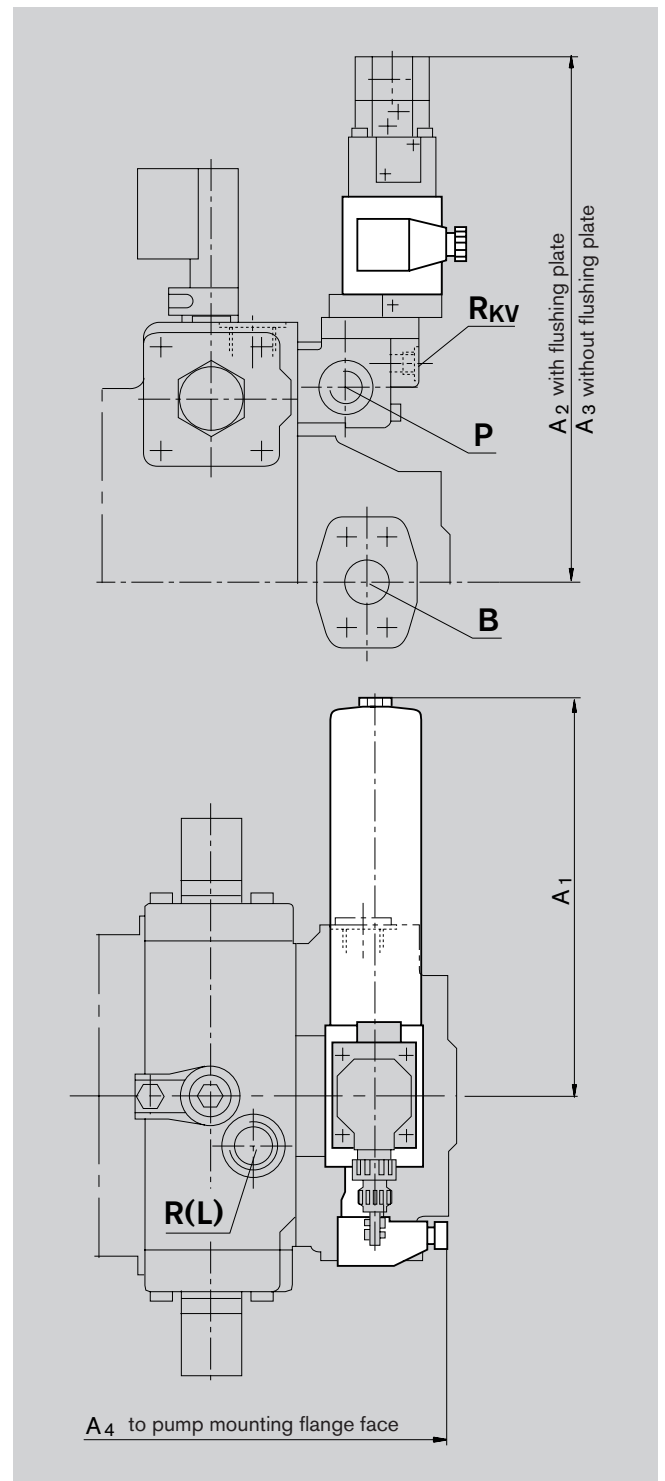
Schematic

Example: A4VSG



Size	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 HS...Z



Installation instructions

Basically the installation instructions for the respective variable pumps are applicable:

A4VSO – RE 92050

A4VBO – RE 92122

A4VSG – RE 92100

A4CSG – RE 92105

Only the control versions HM1, HM2 and HS4M are suitable for oil immersed (under fluid level) operation.

Notes

General safety information

- The control systems HM, HS, HS4 and EO were designed for operation in open loop circuits (A4VSO, A4VBO) or closed circuits (A4VSG, A4CSG).
- Systems design, installation and commissioning of the axial piston unit require trained technicians or tradesmen.
- Before operating the axial piston unit make sure to read the relevant operating manual carefully and completely. If needed, request this information from Rexroth
- All hydraulic ports can only be used for the fastening of hydraulic service lines.
- During and shortly after operation of a pump the housing and especially a solenoid can be extremely hot, avoid being burned; take suitable safety measures (wear protective clothing).
- Pressure ports:
All materials and port threads are selected and designed in such a manner, that they can withstand the peak pressures.
The machine and system manufacturer must ensure, that all connecting elements and hydraulic lines are suitable for the actual operating conditions (pressures, flow, fluid, temperature) in accordance with the necessary safety factors.
- All given data and information must be adhered to.
- The product has not been released as a component in the safety concept of a total machine system acc. to DIN EN ISO 13849
- The following tightening torques are valid:
 - Fittings:
please comply with the manufacturer's information regarding the maximum permissible tightening torques for the used fittings.
 - Fastening bolts:
for fastening bolts to DIN 13 we recommend to check the permissible tightening torques in each individual case to VDI 2230.
 - Female threads in the axial piston unit:
the maximum permissible tightening torques $M_{G \max}$ are maximum values for the female threads in the pump casting and may not be exceeded. For values see table below.
 - Plugs:
for the metal plugs, supplied with the axial piston unit the following minimum required tightening torques M_V apply (see table)

Thread size of ports		Maximum permissible tightening torque for female thread $M_{G \max}$	Minimum required tightening torque of plugs M_V	Across the flats in socket of Allan head screw
A4VSO, A4VSG, A4CSG				
M10 x 1	DIN 3852-1	30 Nm	12 Nm	5 mm
M14 x 1.5	DIN 3852-1	80 Nm	35 Nm	6 mm
M18 x 1.5	DIN 3852-1	140 Nm	60 Nm	8 mm
M22 x 1.5	DIN 3852-1	210 Nm	80 Nm	10 mm
M27 x 2	DIN 3852-1	330 Nm	135 Nm	12 mm
G 1/4 in	DIN 3852-2	70 Nm	30 Nm	6 mm
A4VBO				
M10 x 1	ISO 6149	30 Nm	20 Nm	5 mm
M14 x 1.5	ISO 6149	80 Nm	45 Nm	6 mm
M18 x 1.5	ISO 6149	140 Nm	70 Nm	8 mm
M22 x 1.5	ISO 6149	210 Nm	100 Nm	10 mm
M27 x 2	ISO 6149	330 Nm	170 Nm	12 mm