

Control systems

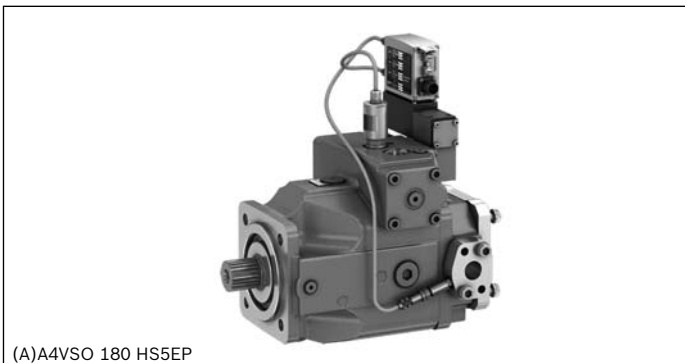
HM, HS, HS5 and EO

Americas

RE-A 92076

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(A)A4VSO 180 HS5EP

- ▶ Control systems for the axial piston variable pumps (A)A4VSO, A4VBO, A4VHO, (A)A4VSG and (A)A4CSG
- ▶ Open and closed circuits

Features

- ▶ Electrohydraulic control with servo, proportional and control valve
- ▶ Digital electrohydraulic control systems with amplifier or on-board electronics and IntraWorks freely programmable operating software (HS5 and HS5E)
- ▶ Control of swivel angle, pressure and torque limitation (HS5P)
- ▶ Mechanical $V_{g \min}$ and $V_{g \max}$ limitation
- ▶ Electric control for inside-reservoir installation under fluid (HS5M)
- ▶ The special version enables overcenter and decompression via the pump.
- ▶ HS5V with internal control pressure supply, including overcenter and decompression

Further information

- ▶ Variable pump (A)A4VSO, data sheet 92050
- ▶ Variable pump A4VBO, data sheet 92122
- ▶ Variable pump (A)A4VSG, data sheet 92100
- ▶ Variable pump (A)A4CSG, data sheet 92105

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Type code for (A)A4VSO

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

Hydraulic fluid

01	For details see data sheet 92050
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Axial piston unit

02	Swashplate design, variable (SAE-version: size 40...355 / Metric-version: size 500...1000)	A4VS(L) ¹⁾
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Operating mode

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

04	Geometric displacement V_g	[cm ³]	40	71	125	180	250	355	500	750	1000
		[in ³ /rev.]	2.44	4.33	7.63	10.98	15.26	21.66	30.51	45.76	61.02

Control device

		40	71	125	180	250	355	500	750	1000	
05	Hydraulic control, volume dependent										
	minimum control pressure 290 psi (20 bar)	●	●	●	-	●	-	-	-	-	HM1
	minimum control pressure 725/1450/1800 psi (50/100/125 bar)	●	●	●	●	●	●	●	●	●	HM2
	Customer compact solution: electrohydraulic control with proportional valve and with AWAX - position transducer (prepared for customer-specific control system)	○	○	●	○	●	○	●	○	○	HM2C
	with pressure transducer HM20-2X/630-C-K35	○	○	●	○	●	○	●	○	○	HM2CP
	Analog electrohydraulic control, with servo valve for electric displacement control with VT-SR7-1X	●	●	●	●	●	●	●	●	●	HS ²⁾
	with short circuit valve	●	●	●	●	●	●	●	●	●	HSK ²⁾
	Digital electrohydraulic control, with control valve for electric displacement, as well as pressure and torque limitation with VT-HPC-1-1X	●	●	●	●	●	●	●	●	●	HS5 ²⁾
	with pressure transducer HM20-2X/630-C-K35	●	●	●	●	●	●	●	●	●	HS5P ²⁾
	suitable for use under fluid	●	●	●	●	●	●	●	●	●	HS5M ²⁾
	with internal control pressure supply	●	●	●	●	●	●	○	○	-	HS5V ²⁾
	Digital electrohydraulic control system, with control valve with OBE for electric displacement and pressure control, as well as torque limitation										
	with digital electronics as On Board Electronics	●	●	●	●	●	●	●	○	○	HS5E ²⁾
	with internal control pressure supply	○	○	○	○	○	○	○	○	○	HS5EV ²⁾
	with pressure transducer HM20-2X/630-C-K35	●	●	●	●	●	●	●	○	○	HS5EP ²⁾
	Analog electrohydraulic control, with proportional valve for electric displacement control with VT 5035-1X										
minimum control pressure 290 psi (20 bar)	●	●	●	-	●	-	-	-	-	EO1 ²⁾	
with short circuit valve	●	●	●	-	●	-	-	-	-	EO1K ²⁾	
minimum control pressure 725/1450/1800 psi (50/100/125 bar)	●	●	●	●	●	●	●	●	●	EO2 ²⁾	
with short circuit valve	●	●	●	●	●	●	●	●	●	EO2K ²⁾	

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

1) Charge pump (L) only available with size 750
 2) Operation with HF hydraulic fluids on request

Type code for A4VSO

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

Series

		40	71	125	180	250	355	500	750	1000	
06	Series 1, index 0	●	●	-	-	-	-	-	-	-	10
	Series 3, index 0	-	-	●	●	▲	●	▲	●	●	30
	Series 3, index 3 (efficiency-optimized version)	-	-	-	-	●	○	●	○	-	33

Further details on positions 07 to 12 can be found in data sheet 92050

Filtration (parameter only with HS control)

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

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

Type code for A4VBO

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

Rotary group version

01	For details see data sheet 92122
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Axial piston unit

		71	125	250	450	
02	Swashplate design, variable, high-pressure unit up to 6500 psi (450 bar) (see data sheet 92122)	●	●	●	●	A4VB
	Swashplate design, variable, high-pressure unit up to 9150 psi (630 bar) (data sheet in preparation)	-	-	-	●	A4VH

Operating mode

03	Pump, open circuit	O
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Size (NG)

04	Geometric displacement V_g	[cm ³]	71	125	250	450
		[in ³ /rev.]	4.33	7.63	15.26	27.50

Control device

		71	125	250	450	
05	Customer compact solution: electrohydraulic control with proportional valve and with AWAX - position transducer (prepared for customer-specific control system)	○	○	○	○	HM2C
	with pressure transducer HM20-2X/630-C-K35	○	○	○	○	HM2CP
	Digital electrohydraulic control, with control valve for electric displacement, as well as pressure and torque limitation with VT-HPC-1-1X	●	●	●	●	HS5
	with pressure transducer HM20-2X/630-C-K35	●	●	●	●	HS5P
	suitable for use under fluid	●	●	●	●	HS5M
	with internal control pressure supply	●	●	●	-	HS5V
	with digital electronics as On Board Electronics	●	●	●	●	HS5E

Series

06		71	125	250	450	
	Series 1, index 0	●	-	-	-	10
	Series 3, index 0	-	●	-	●	30
	Series 3, index 3 (efficiency-optimized version)	-	-	●	-	33

For details see data sheet 92122 (A4VBO); 92160 (in preparation) (A4VHO)

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

● = Available ○ = On request - = Not available

Type code for (A)A4VSG

01	02	03	04	05	06	07	08	09	10	11	12	13	14
	(A)A4VS	G			/	-							

Hydraulic fluid

01	For details see data sheet 92100
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Axial piston unit

02	Swashplate design, variable (SAE-version: size 40...355 / Metric-version: size 500...1000)	(A)A4VS
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Operating mode

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

04	Geometric displacement V_g	[cm ³]	40	71	125	180	250	355	500	750	1000
		[in ³ /rev.]	2.44	4.33	7.63	10.98	15.26	21.66	30.51	45.76	61.02

Control device

		40	71	125	180	250	355	500	750	1000		
05	Hydraulic control, volume dependent											
	minimum control pressure 280 psi (20 bar)	●	●	●	-	●	-	-	-	-	HM1	
	minimum control pressure 725/1450/1800 psi (50/100/125 bar)	●	●	●	●	●	●	●	●	●	HM2	
	Customer compact solution: electrohydraulic control with proportional valve and with AWAX - position transducer (prepared for customer-specific control system)	○	○	●	○	●	○	●	○	○	HM2C	
	with 2 pressure transducers HM20-2X/630-C-K35	○	○	●	○	●	○	●	○	○	HM2CP	
	Analog electrohydraulic control, with servo valve for electric displacement control with VT-SR7-1X	●	●	●	●	●	●	●	●	●	●	HS ¹⁾
	with short circuit valve	●	●	●	●	●	●	●	●	●	●	HSK ¹⁾
	Digital electrohydraulic control, with control valve for electric displacement, as well as pressure and torque limitation with VT-HPC-1-1X	●	●	●	●	●	●	●	●	●	●	HS5 ¹⁾
	with short circuit valve	●	●	●	●	●	●	●	●	●	●	HS5K ¹⁾
	with 2 pressure transducers HM20-2X/630-C-K35	●	●	●	●	●	●	●	●	●	●	HS5P ¹⁾
	with short circuit valve and 2 pressure transducers HM20-2..	●	●	●	●	●	●	●	●	●	●	HS5KP ¹⁾
	suitable for use under fluid	●	●	●	●	●	●	●	●	●	●	HS5M ¹⁾
	Digital electrohydraulic control system, with control valve with OBE for electric displacement and pressure control, as well as torque limitation											
	with digital electronics as On Board Electronics	○	○	○	○	○	○	○	○	○	○	HS5E ¹⁾
	with pressure transducer HM20-2X/630-C-K35	●	●	●	●	●	●	●	●	○	○	HS5EP
Analog electrohydraulic control, with proportional valve for electric displacement control with VT 5035-1X												
minimum control pressure 290 psi (20 bar)	●	●	●	-	●	-	-	-	-	-	EO1 ¹⁾	
with short circuit valve	●	●	●	-	●	-	-	-	-	-	EO1K ¹⁾	
minimum control pressure 725/1450/1800 psi (50/100/125 bar)	●	●	●	●	●	●	●	●	●	●	EO2 ¹⁾	
with short circuit valve	●	●	●	●	●	●	●	●	●	●	EO2K ¹⁾	

For details of positions 06 to 13 see data sheet 92100 ((A)A4VSG)

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 ○ = On request - = Not available

Type code for (A)A4CSG

01	02	03	04	05	06	07	08	09	10	11	12	14
(A)A4CS	G		/			-						

Axial piston unit

01	Swashplate design, variable (SAE-version 250...355 / Metric-version 500...750)	A4CS
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Operating mode

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

03	Geometric displacement V_g	[cm ³]	250	355	500	750
		[in ³ /rev.]	15.26	21.66	30.51	45.76

Control device

		250	355	500	750	
04	Hydraulic control, volume dependent					
	minimum control pressure 725/1450/1800 psi (50/100/125 bar)	●	●	●	●	HM2
	Customer compact solution: electrohydraulic control with proportional valve and with AWAX - position transducer (prepared for customer-specific control system)	●	○	●	○	HM2C
	with 2 pressure transducers HM20-2X/630-C-K35	●	○	●	○	HM2CP
	Analog electrohydraulic control, with servo valve for electric displacement control with VT-SR7-1X	●	●	●	●	HS
	with short circuit valve	●	●	●	●	HSK
	Digital electrohydraulic control, with control valve for electric displacement, as well as pressure and torque limitation with VT-HPC-1-1X	●	●	●	●	HS5
	with short circuit valve	●	●	●	●	HS5K
	with 2 pressure transducers HM20-2X/630-C-K35	●	●	●	●	HS5P
	with short circuit valve and 2 pressure transducers HM20-2X/630-C-K35	●	●	●	●	HS5KP
	suitable for use under fluid	●	●	●	●	HS5M
	Digital electrohydraulic control system, with control valve with OBE for electric displacement and pressure control, as well as torque limitation					
	with digital electronics as On Board Electronics	○	○	○	○	HS5E
	Analog electrohydraulic control, with proportional valve for electric displacement control with VT 5035-1X					
minimum control pressure 1450/1800 psi (100/125 bar)	●	●	●	●	EO2	
with short circuit valve	●	●	●	●	EO2K	

Series

05	Series 3, index 0	●	●	●	●	30
	Series 3, index 3 (efficiency-optimized version)	○	○	●	○	33

For details of positions 06 to 13 see data sheet 92105 ((A)A4CSG)

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 ○ = On request - = Not available

HM1 / HM2 – Hydraulic control, volume dependent

Type	Size	40	71	125	180	250	355	500	750	1000	
(A)A4VSO, (A)A4VSG		●	●	●	–	●	–	–	–	–	HM1
(A)A4VSO, (A)A4VSG		●	●	●	●	●	●	●	●	●	HM2
(A)A4CSG		–	–	–	–	●	●	●	●	–	

The control **HM1/2** sets the displacement of the pump depending on the control fluid quantity.
 This control is used for 2-point circuit or as a base device for controls with proportional valves (additional electric feedback required), e.g. HS5, HS5E, HS, E02, E01.

Spring-centering

The spring-centering of the stroking cylinder is standard. It is used for setting and adjustment in depressurized neutral position, but without a 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% $V_{g \max}$.

Notices

Setting with (A)A4VSO and A4VBO (open circuit):

- ▶ The $V_{g \max}$ stop is set to nominal $V_{g \max}$ as standard. Other values should be specified when placing the order
- ▶ The $V_{g \min}$ stop is set to $V_g = 0$ gpm (0 l/min) with $P_{HD} = 290$ psi (20 bar) as standard. Other values should be specified when placing the order.

Setting with (A)A4VSG and (A)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 [psi (bar)]	Sizes
HM1	from 290 (20)	40, 71, 125 and 250 (see page 8)
HM2	from 725/1450/1800 (50/100/125)	40...1000 (see page 8)

HM2: To minimize the pilot fluid consumption, the stroking chambers are sealed in sizes 125 to 750.

▼ Flow direction in closed circuit

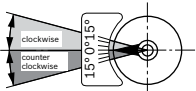
Direction of rotation		Swiveling range ¹⁾
clockwise	counter-clockwise	
B to A	A to B	clockwise
A to B	B to A	counter-clockwise

Overcenter with A4VSO is available on request.

▼ Flow direction in open circuit

Direction of rotation		Swiveling range ¹⁾
clockwise	counter-clockwise	
S to B		counter-clockwise
	S to B	clockwise

1) cf. swivel angle indicator



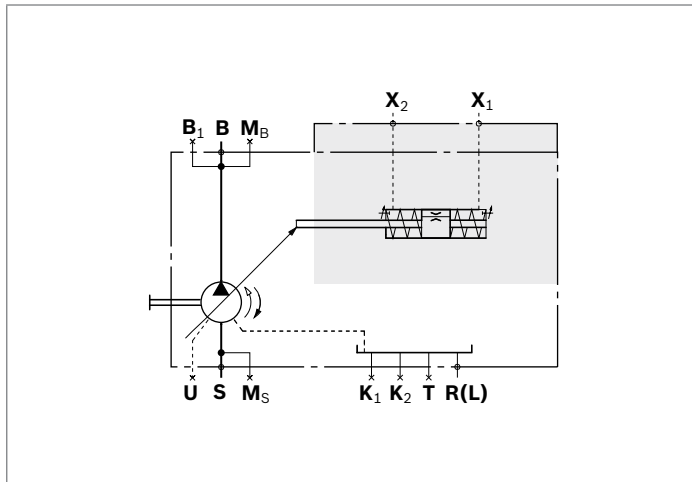
Technical data HM1

Size		NG	40	71	125	250
Control pressure (in X ₁ , X ₂)	p_{min}	psi (bar)	290 (20)	290 (20)	290 (20)	290 (20)
	p_{max}	psi (bar)	1450 (100)	1450 (100)	1450 (100)	1450 (100)
Control stroke	s_{max}	inch (mm)	0.56 (14.2)	0.67 (17.1)	0.81 (20.7)	1.02 (25.9)
Control area	A	inch ² (cm ²)	2.56 (16.6)	3.81 (24.6)	5.63 (36.3)	8.79 (56.7)
Control volume	$V_{S max}$	inch ³ (cm ³)	1.44 (23.6)	2.57 (42.1)	4.59 (75.2)	8.97 (147)
Weight: approx. ((A)A4VSO...HM1...N00)	m	lbs (kg)	84 (38)	121 (55)	202 (92)	427 (194)

Circuit diagrams HM1

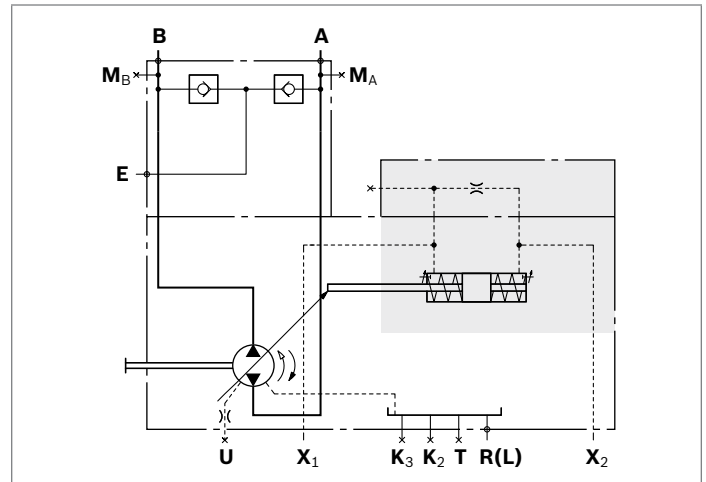
▼ **Size 40 and 71**

Example: open circuit (A)A4VSO



▼ **Size 125 and 250**

Example: closed circuit (A)A4VSG



Ports	with swivel direction	
X ₁	Control pressure	counter-clockwise
X ₂	Control pressure	clockwise

Technical data HM2

For (A)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.

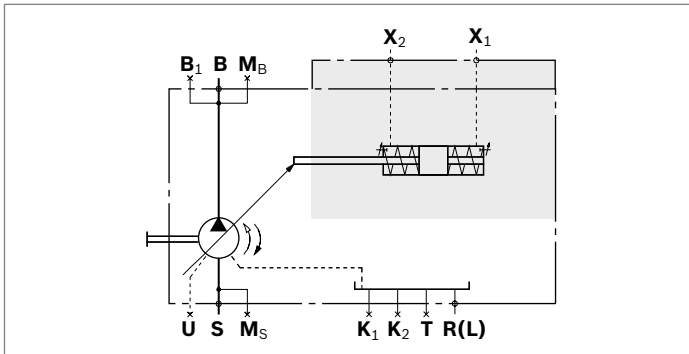
To minimize the pilot fluid consumption, the stroking chambers are sealed in sizes 125...1000 and can be bled via the ports **R₂...R₇**.

Size		NG	40	71	125	180	250	355	500	750	1000
Control pressure (in X₁ , X₂)	p_{min}	psi	725	725	725	1450	1450	1450	1800	1800	1800
		(bar)	(50)	(50)	(50)	(100)	(100)	(100)	(125)	(125)	(125)
	p_{max}	psi	5100	5100	5100	5100	5100	5100	5100	5100	5100
		(bar)	(350)	(350)	(350)	(350)	(350)	(350)	(350)	(350)	(350)
Control stroke	s_{max}	inch	0.56	0.67	0.81	0.81	1.02	1.02	1.28	1.46	1.63
		(mm)	(14.2)	(17.1)	(20.7)	(20.7)	(25.9)	(25.9)	(32.6)	(37.0)	(41.4)
Control area	A	inch ²	1.26	1.95	2.81	2.81	4.39	4.39	5.92	8.80	9.86
		(cm ²)	(8.1)	(12.6)	(18.1)	(18.1)	(28.3)	(28.3)	(38.2)	(56.8)	(63.6)
Control volume	$V_{S max}$	inch ³	0.70	1.31	2.29	2.29	4.47	4.47	7.60	12.80	16.10
		(cm ³)	(11.4)	(21.5)	(37.5)	(37.5)	(73.2)	(73.2)	(124.5)	(210)	(263.3)
Weight: approx. ((A)A4VSO...HM2...N00)	m	lbs	84	121	203	234	428	472	721	1036	1323
		(kg)	(38)	(55)	(92)	(106)	(194)	(214)	(327)	(470)	(600)

Circuit diagrams HM2

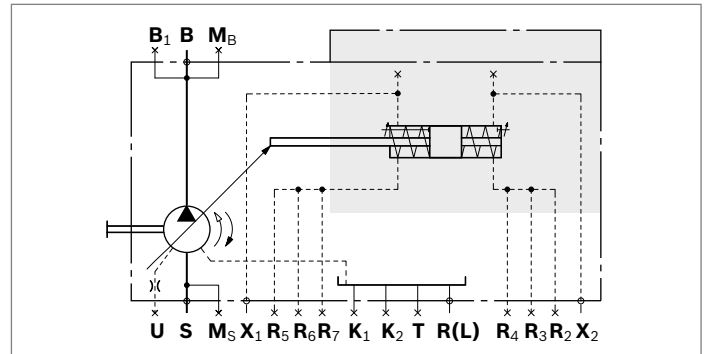
▼ **Size 40 and 71**

Example: open circuit (A)A4VSO



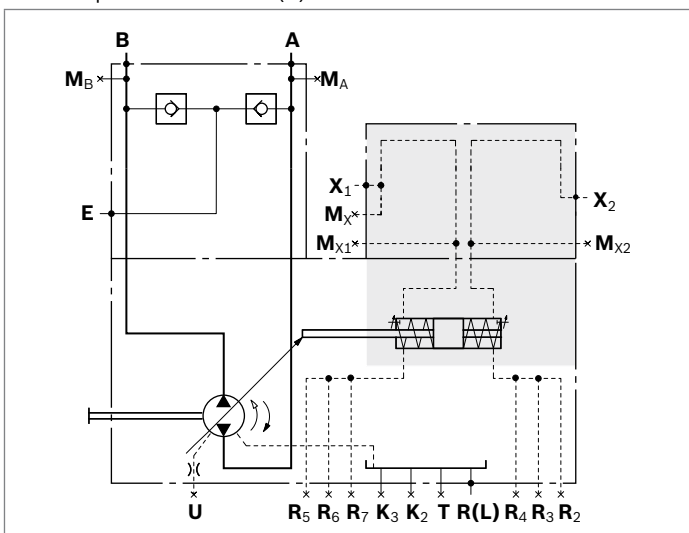
▼ **Size 125 to 355**

Example: open circuit (A)A4VSO



▼ **Size 500 to 1000**

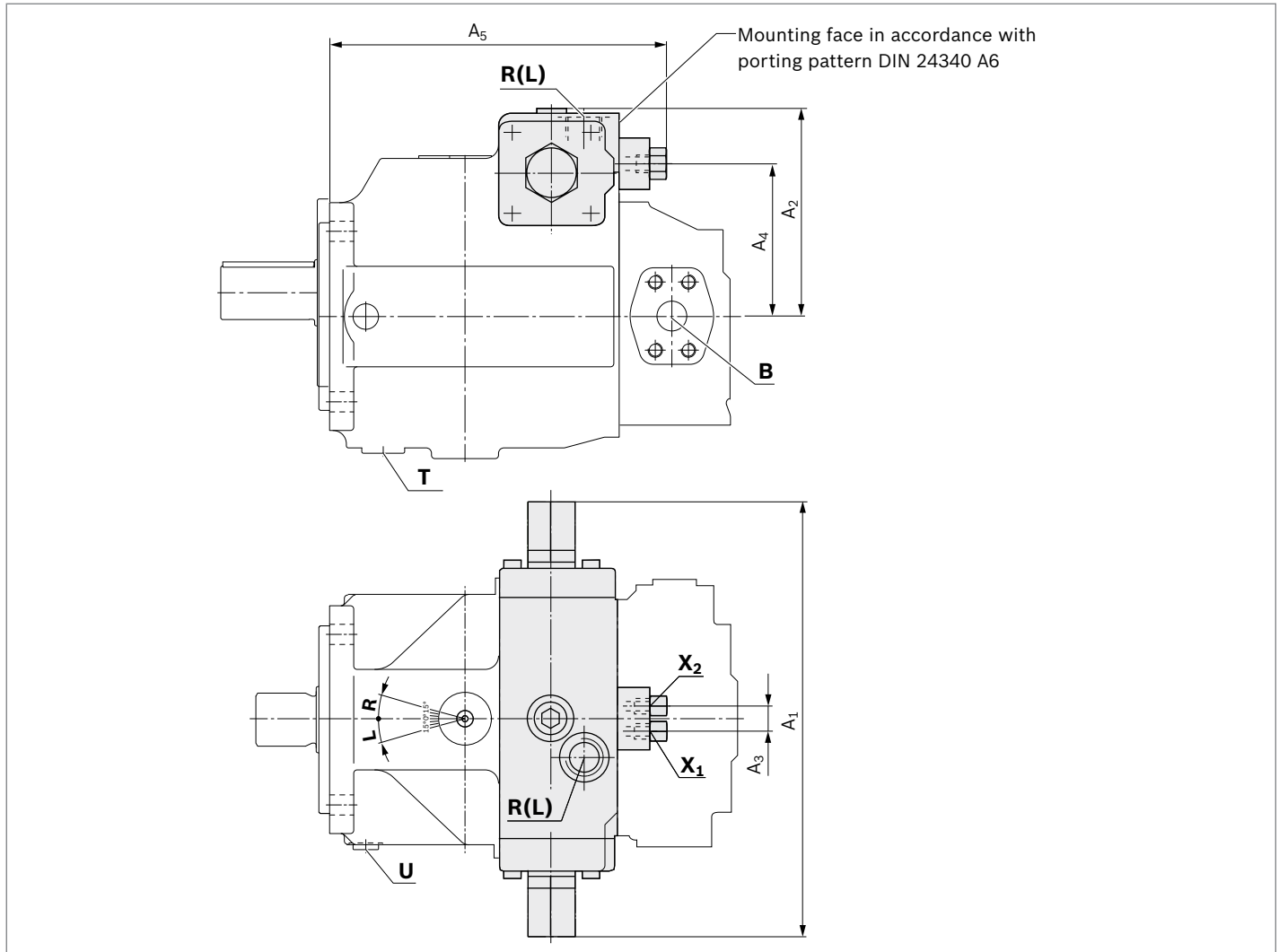
Example: closed circuit (A)A4VSG



Ports	
X₁	Control pressure
X₂	Control pressure
M_X, M_{X1}, M_{X2}	Measuring ports control pressure
R₂ ... R₇	Air bleeding the stroking chamber

Dimensions HM1/HM2

▼ **(A)A4VSO and (A)A4VSG, size 40 and 71**



NG	A ₁	A ₂	A ₃	A ₄	A ₅	
40	11.65 (296)	5.35 (136)	0.94 (24)	4.02 (102)	9.76 (248)	For detailed dimensions and technical data for the variable pump, see data sheets 92050 ((A)A4VSO) or 92100 ((A)A4VSG)
71	13.07 (332)	6.18 (157)	1.10 (28)	4.72 (120)	10.90 (276)	

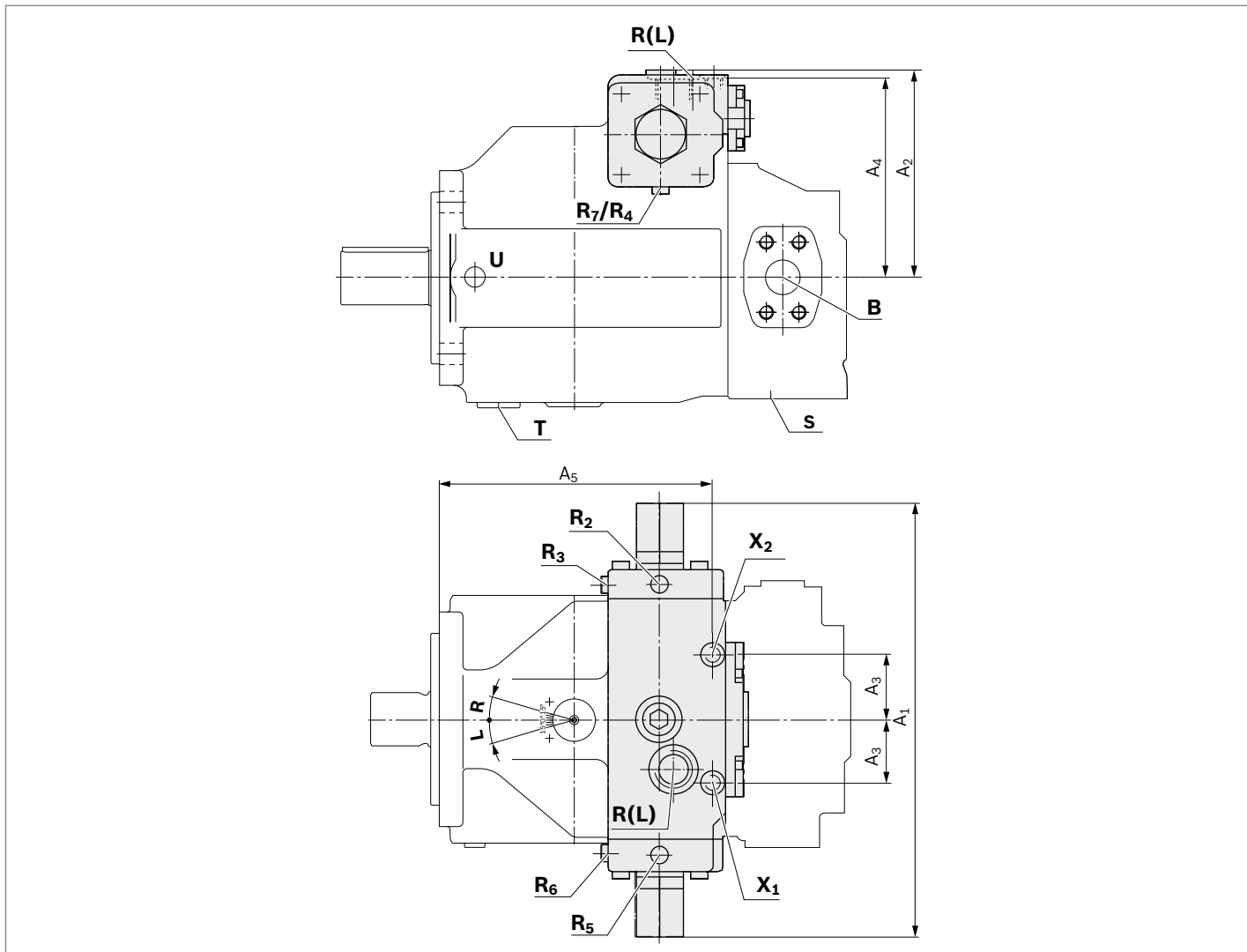
Ports		Standard	Size ¹⁾	$p_{max abs}$ [psi (bar)] ²⁾	State
X ₁ , X ₂	Control pressure	ISO 11926	9/16-18UNF-2B; 0.51 (13) deep	1450 (100) (with HM1) 5100 (350) (with HM2)	O

1) For notes on tightening torques, see the 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

▼ **(A)A4VSO, (A)A4VSG and (A)A4CSG, size 125 to 355**



NG	A ₁	A ₂	A ₃	A ₄	A ₅	
125/180 ³⁾	5.83 (402)	7.52 (191)	2.64 (67)	7.34 (186.5)	9.88 (251)	For detailed dimensions and technical data for the variable pump, see data sheets 92050 ((A)A4VSO), 92100 ((A)A4VSG) or 92105 ((A)A4CSG)
250/355 ³⁾	19.09 (485)	9.37 (238)	2.80 (71)	9.17 (233)	12.24 (311)	

Ports	Standard	Size ¹⁾	$p_{max abs}$ [psi (bar)] ²⁾	State	
X₁, X₂	Control pressure	ISO 11926	9/16-18UNF-2B; 0.51 (13) deep (size 125 and 180) 3/4-16UNF-2B; 0.59 (15) deep (size 250 and 355)	1450 (100) (with HM1) 5100 (350) (with HM2)	O O
R₂ ... R₇	Air bleeding the stroking chamber	DIN 3852-1	M10 x 1; 0.31 (8) deep	5100 (350) (only with HM2)	X

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

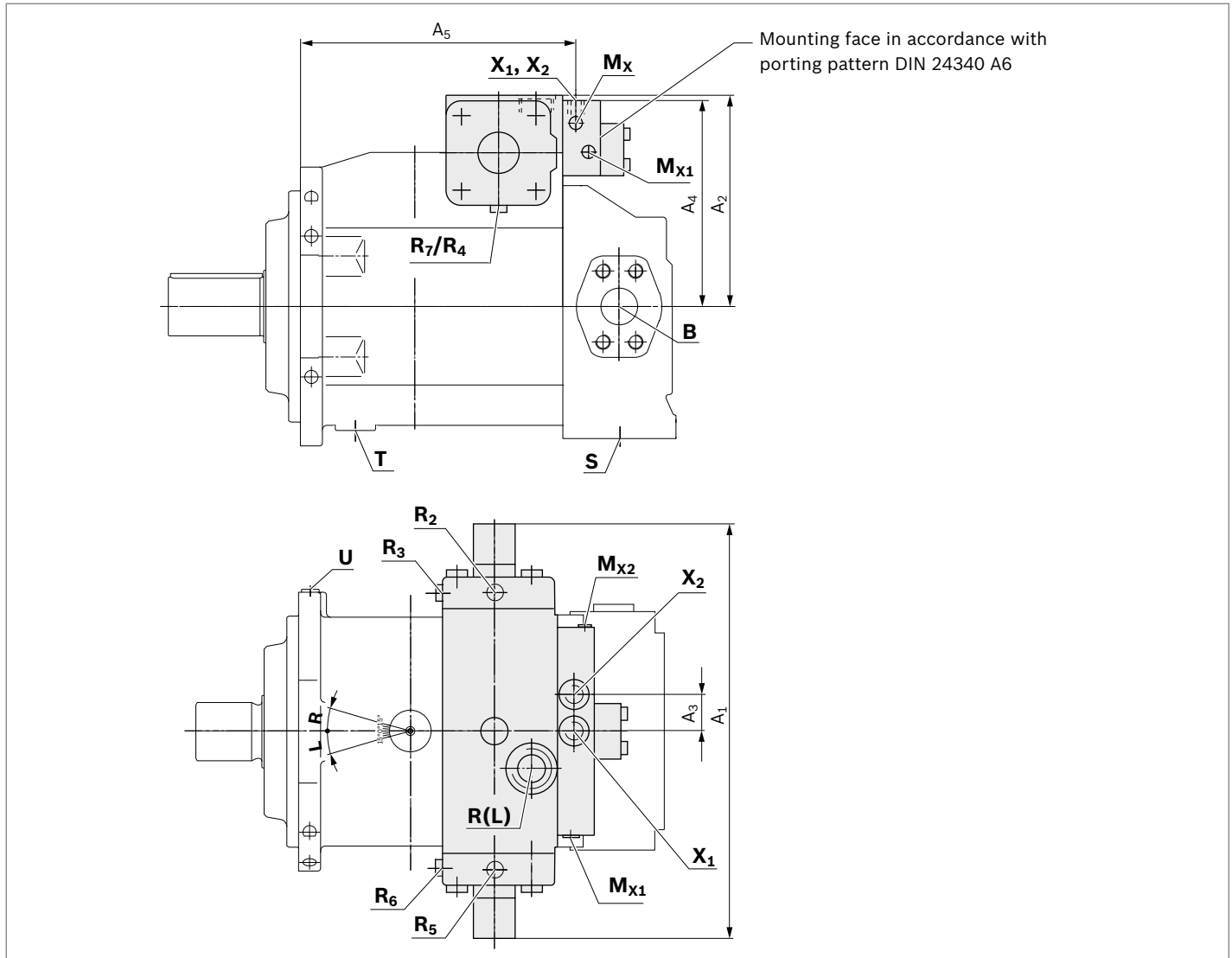
2) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.

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	21.58 (555)	11.14 (283)	1.97 (50)	10.79 (274)	15.28 (388)	For detailed dimensions and technical data for the variable pump, see data sheets 92050 ((A)A4VSO), 92100 ((A)A4VSG) or 92105 ((A)A4CSG)
750	24.80 (630)	12.60 (320)	1.97 (50)	11.97 (304)	16.54 (420)	
1000	26.38 (670)	13.66 (347)	1.97 (50)	12.87 (327)	19.13 (486)	

Ports		Standard	Size ¹⁾	$p_{\max \text{ abs}}$ [psi (bar)] ²⁾	State
X₁, X₂	Control pressure	DIN 3852-1	M27 × 2; 0.63 (16) deep	5100 (350)	O
M_x, M_{x1}, M_{x2}	Measuring control pressure	DIN 3852-1	M14 × 1.5; 0.47 (12) deep	5100 (350)	X
R₂ ... R₇	Air bleeding the stroking chamber	DIN 3852-1	M14 × 1.5; 0.47 (12) deep	5100 (350)	X

1) For notes on tightening torques, see the 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)

HM2C – Customer solution with proportional valve, position transducer (pressure transducer optional)

Type	NG	40	71	125	180	250	355	450	500	750	1000
(A)A4VSO		○	○	●	○	●	○	–	●	○	○
(A)A4VSG		○	○	●	○	●	○	–	●	○	○
(A)A4CSG		–	–	–	–	●	○	–	●	○	–
A4VBO		–	○	○	–	–	–	○	–	–	–

The HM2C customer solution provides the base unit, sensors and actuators required for a control system. This means that a pump control system can be built up by the end users themselves for electronic volume, pressure and power control. Notice: No finished pump control electronics is available for the HM2C like for the HS5. The HM2C can be integrated freely into the control architecture of the system operator's machine with defined standard interfaces.

On the pump side, the base unit is equipped with:

- ▶ a proportional valve (including integrated valve amplifier)
- ▶ Swivel angle sensor
- ▶ Optional(HM2CP): One pressure transducer with (A)A4VSO or two pressure transducers with (A)A4VSG/ (A)A4CSG

All components are already installed and connected and only have to be connected with the on-site control. The HM2C control receives the setpoint value for the mounted proportional valve from the superordinate control in the form of an electric current signal.

Component	Designation	Material number
Valve	Size 40 to 180 4WREE6V08-2X/ G24K31/F1V-989, data sheet 29061	R901438013
	Size 250 to 1000 4WREE6V16-2X/ G24K31/F1V-989, data sheet 29061	R901377315
Swivel angle sensor	Standardized output signal 4 to 20 mA and 2 to 10 V	Depending on the size
Pressure transducer (optional with HM2CP)	HM20-2x/630-C-K35 Measuring range 9150 psi (630 bar) (4 to 20 mA) data sheet 30272	R901342035

The pump setting is recorded via the swivel angle sensor. Optionally, the system pressure can be reported via the mounted pressure transducer(s) (HM2CP). These two parameters are therefore available to the superordinate control.

Example applications:

- ▶ The system operator wants to retain his own machine control and integrate the pump control in it.

This type of customer-specific solution can be set up with the HM2C and the Motion Logic Control (MLC) from Bosch Rexroth, for example. Together with a matching I/O axis module, a freely programmable control is available to the user.

The axis module and the MLC for actuating the HM2C control are not included in the HM2C scope of delivery.

Spring-centering

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

The spring-centering is not a safety device.

To minimize the pilot fluid consumption, the stroking chambers are sealed in sizes 125 to 1000 and can be bled via the ports R2 to R7.

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).

Notices

Setting with (A)A4VSO (open circuit):

- ▶ The $V_{g \max}$ stop is set to nominal $V_{g \max}$ as standard. Other values should be specified when placing the order
- ▶ The $V_{g \min}$ stop is set to $V_g = 0$ gpm (0 l/min) with $P_{HD} = 290$ psi (20 bar) as standard. Other values should be specified when placing the order.

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

Optional:

- ▶ HM2CP with one or two pressure transducer(s) for pressure and power control
- ▶ HM2CK with short circuit valve
- ▶ HM2CKP with short circuit valve and one or two pressure transducer(s)

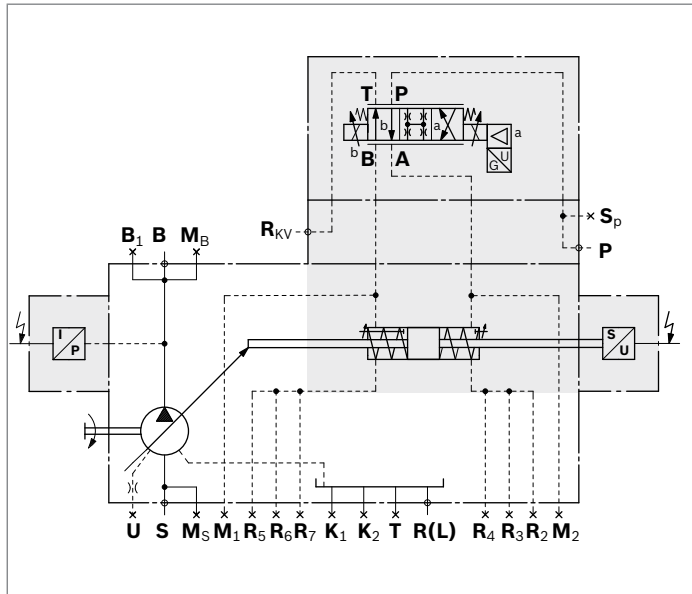
Technical data HM2C

Size		NG	125	250	500
Control pressure (in X ₁ , X ₂)	p_{min}	psi (bar)	725 (50)	1450 (100)	1800 (125)
	p_{max}	psi (bar)	5100 (350)	5100 (350)	5100 (350)
Control stroke	s_{max}	inch (mm)	0.81 (20.7)	1.02 (25.9)	1.28 (32.6)
Control area	A	inch ² (cm ²)	2.81 (18.1)	4.29 (28.3)	5.92 (38.2)
Control volume	$V_{S max}$	inch ³ (cm ³)	2.29 (37.5)	4.47 (73.2)	7.60 (124.5)
Weight: approx. ((A)A4VSO...HM2...N00)	m	lbs	203	428	721
		(kg)	(92)	(194)	(327)

Circuit diagrams HM2C

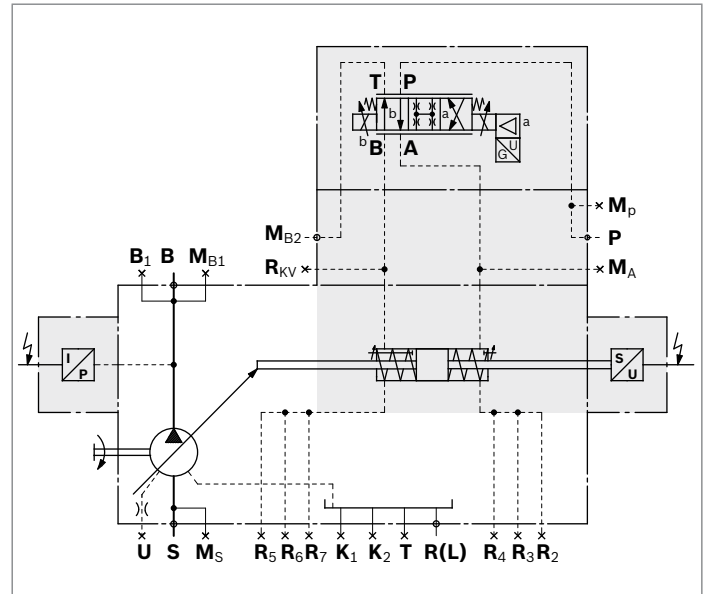
▼ **Size 125 to 250**

Example: open circuit (A)A4VSO HM2CP



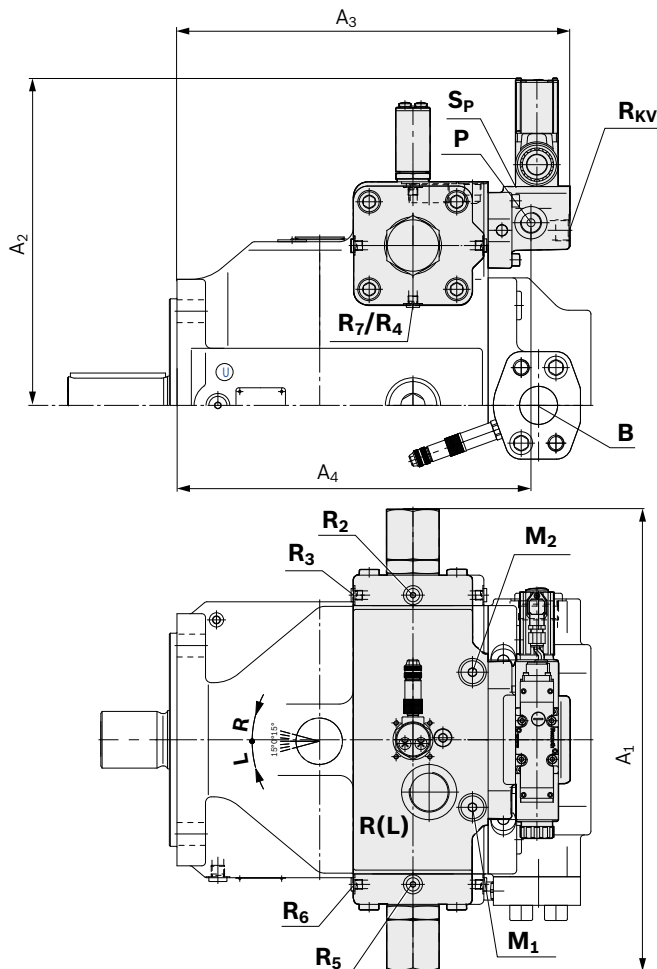
▼ **Size 500**

Example: open circuit (A)A4VSO HM2CP



Dimensions HM2C

▼ (A)A4VSO, (A)A4VSG and (A)A4CSG, size 125, 250



NG	A ₁	A ₂	A ₃	A ₄
125	15.80 (401)	12.00 (304)	13.80 (350)	12.20 (309)
250	19.10 (485)	13.50 (344)	16.20 (412)	14.60 (372)

For detailed dimensions and technical data for the variable pump, see data sheets 92050 ((A)A4VSO), 92100 ((A)A4VSG) or 92105 ((A)A4CSG)

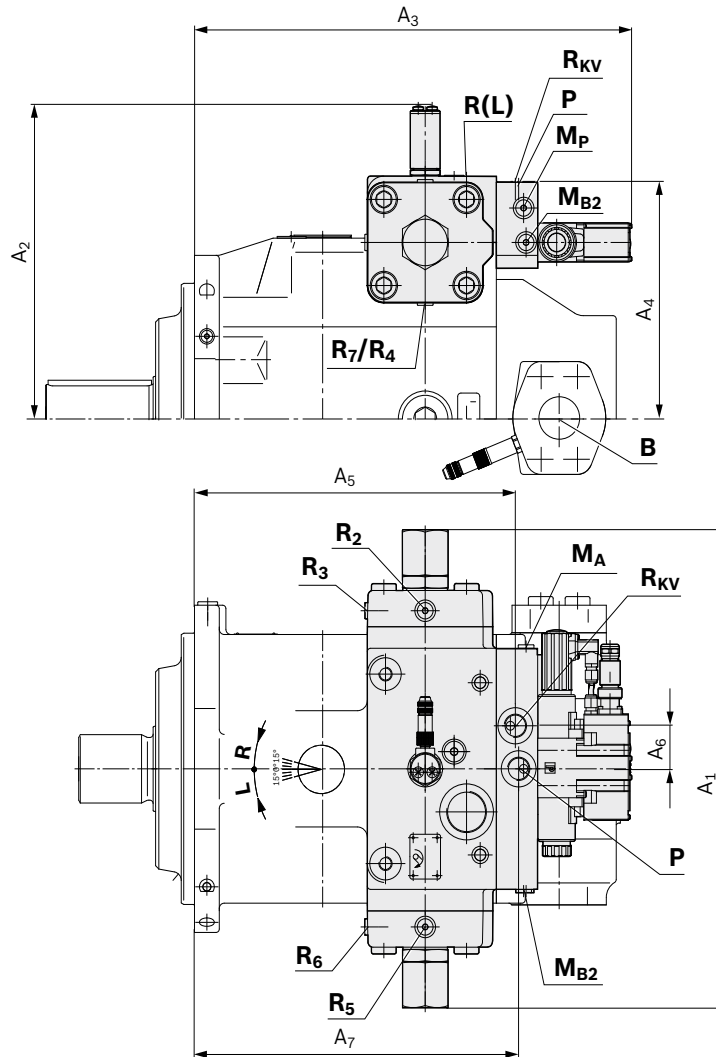
Ports	Standard	Size ¹⁾	p _{max abs} [psi (bar)] ²⁾	State	
P, R_{KV}	Control pressure	DIN 3852-1	M27 × 2; 0.63 (16) deep	1450 (100)	O
M_X, M_{X1}, M_{X2}	Measuring control pressure	DIN 3852-1	M14 × 1.5; 0.47 (12) deep	4550 (315)	X
R₂ ... R₇	Air bleeding the stroking chamber	DIN 3852-1	M14 × 1.5; 0.47 (12) deep	4550 (315)	X

1) For notes on tightening torques, see the 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)

HM2C – Customer solution with proportional valve, position transducer (pressure transducer optional)

Dimensions HM2C▼ **A4VSO, A4VSG and A4CSG, size 500**

NG	A ₁	A ₂	A ₃	A ₄	A ₅	A ₆	A ₇	
500	21.90 (555)	14.30 (363)	20.50 (520)	10.80 (274)	15.30 (388)	1.97 (50)	15.40 (392)	For detailed dimensions and technical data for the variable pump, see data sheets 92050 ((A)A4VSO), 92100 ((A)A4VSG) or 92105 ((A)A4CSG)

Ports		Standard	Size ¹⁾	$p_{\max \text{ abs}}$ [psi (bar)] ²⁾	State
P, R_{KV}	Control pressure	DIN 3852-1	M27 × 2; 0.63 (16) deep	1450 (100)	O
M_X, M_{X1}, M_{X2}	Measuring control pressure	DIN 3852-1	M14 × 1.5; 0.47 (12) deep	4550 (315)	X
R₂ ... R₇	Air bleeding the stroking chamber	DIN 3852-1	M14 × 1.5; 0.47 (12) deep	4550 (315)	X

1) For notes on tightening torques, see the 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 – electrohydraulic control with servo valve

Type	Size	40	71	125	180	250	355	500	750	1000	
(A)A4VSO, (A)A4VSG		•	•	•	•	•	•	•	•	•	HS
(A)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-centering

The spring-centering of the stroking cylinder is standard. It is used for setting and adjustment in depressurized neutral position, but without a 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% $V_{g \max}$

Notices

Setting with (A)A4VSO (open circuit):

- ▶ The $V_{g \max}$ stop is set to nominal $V_{g \max}$ as standard. Other values should be specified when placing the order
- ▶ The $V_{g \min}$ stop is set to $V_g = 0$ gpm (0 l/min) with $P_{HD} = 290$ psi (20 bar) as standard. Other values should be specified when placing the order.

Setting with (A)A4VSG and (A)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 pilot fluid consumption, the stroking chambers are sealed in sizes 125...1000 and can be bled via the ports **R₂...R₇**.

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 connection plate (the screws supplied are suitable). Please observe the commissioning and flushing instructions in the data sheets 07700 and 29583.

Optional:

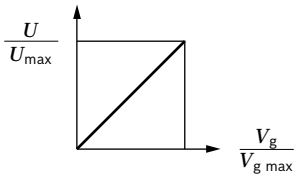
- ▶ **HSK** with short circuit valve (see page 43)

Technical data HS

Size		NG	40	71	125	180	250	355	500	750	1000
Control pressure (in P)	p_{min}	psi (bar)	1450 (100)	1450 (100)	1450 (100)	1800 (125)	1800 (125)	1800 (125)	2200 (150)	2200 (150)	2200 (150)
	$p_{max}^{1)}$	psi (bar)	4550 (315)	4550 (315)	4550 (315)	4550 (315)	4550 (315)	4550 (315)	4550 (315)	4550 (315)	4550 (315)
Control stroke	s_{max}	inch (mm)	0.56 (14.2)	0.67 (17.1)	0.81 (20.7)	0.81 (20.7)	1.02 (25.9)	1.02 (25.9)	1.28 (32.6)	1.46 (37.0)	1.63 (41.4)
Control area	A	inch ² (cm ²)	1.26 (8.1)	1.95 (12.6)	2.81 (18.1)	2.81 (18.1)	4.39 (28.3)	4.39 (28.3)	5.92 (38.2)	8.80 (56.8)	9.86 (63.6)
Control volume	$V_{S max}$	inch ³ (cm ³)	0.70 (11.4)	1.31 (21.5)	2.29 (37.5)	2.29 (37.5)	4.47 (73.2)	4.47 (73.2)	7.60 (124.5)	12.80 (210)	16.10 (263.3)
Actuating 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. ((A)A4VSO...HS...N00)	m	lbs (kg)	93 (42)	130 (59)	216 (98)	247 (112)	441 (200)	485 (220)	734 (333)	1049 (476)	1336 (606)
Maximum admissible degree of contamination of the hydraulic fluid							Class 18/16/13				
Cleanliness level according to ISO 4406 (c) ³⁾											
Control loop performance hysteresis							≤ 0.2%				
Repeatability							≤ 0.2%				
Linearity deviation swivel angle							≤ 1.0%				

(A)A4VSO – open circuit

▼ **Characteristic curve**

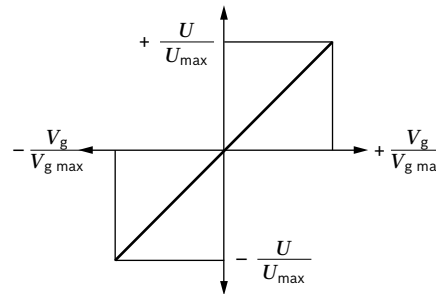


▼ **Flow direction S to B**

Direction of rotation	Swiveling range ⁴⁾
clockwise	counter-clockwise
counter-clockwise	clockwise

(A)A4VSG and (A)A4CSG – closed circuit

▼ **Characteristic curve**

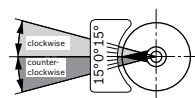


▼ **Flow direction**

Direction of rotation		Swiveling range ⁴⁾
clockwise	counter-clockwise	
B to A	A to B	clockwise
A to B	B to A	counter-clockwise

1) Due to the permissible data of the servo valve
 2) With minimum control pressure
 3) Intermediate plate filter, optional, see page 57

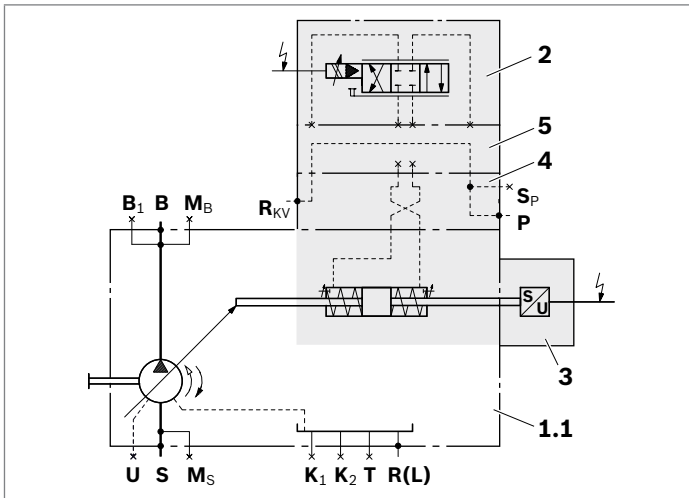
4) cf. swivel angle indicator



Circuit diagrams HS

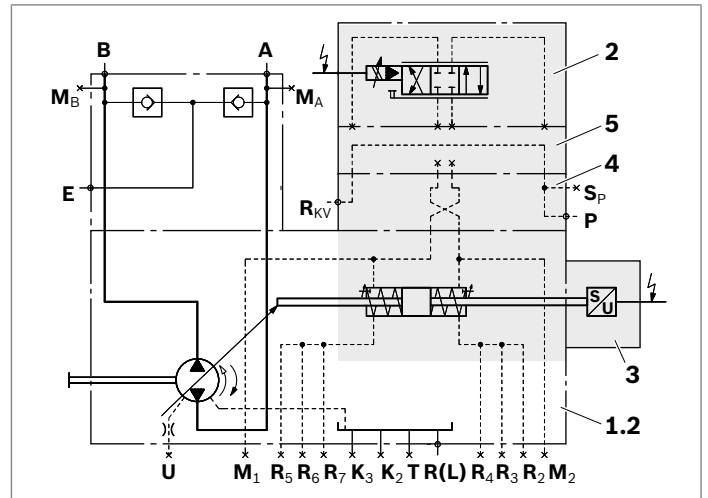
▼ **Size 40 and 71**

Example: open circuit (A)A4VSO



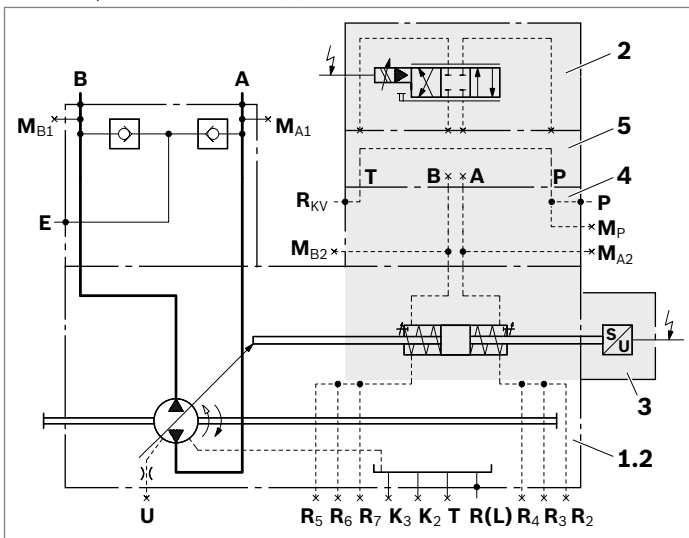
▼ **Size 125 to 355**

Example: closed circuit (A)A4VSG



▼ **Size 500 to 1000**

Example: closed circuit (A)A4VSG



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

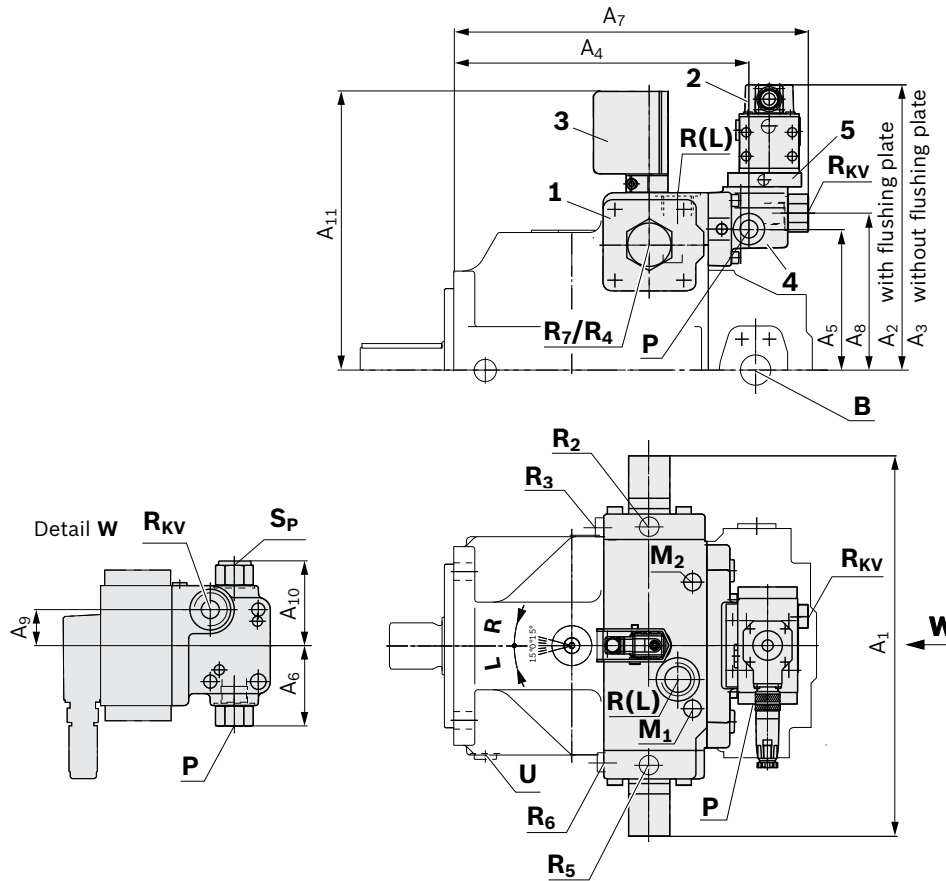
NG	Type ¹⁾
40 and 71	4WS2EM10-5X/20B11ET315K31EV
125 and 180	4WS2EM10-5X/30B11ET315K31EV
250 and 355	4WS2EM10-5X/45B11ET315K31EV
500 to 1000	4WS2EM10-5X/75B11ET315K31EV

- 3 Inductive position transducer AWXX004D02 with plug-in connector (mating connector) according to DIN EN 175 301-803-A / ISO 4400 cable gland M16 × 1.5 for cable diameters 0.18...0.39 inch (4.5...10 mm)
- 4 Intermediate plate
- 5 Flushing plate

Ports	
P	Control pressure
Sp	Accumulator control pressure
RkV	Control fluid return flow
M...	Measuring ports control pressure (plugged)
R2 ... R7	Air bleeding the stroking chamber (plugged)

Dimensions HS

▼ **(A)A4VSO, (A)A4VSG and (A)A4CSG, size 40 to 355**



For key, see page 19

NG	A ₁	A ₂	A ₃	A ₄	A ₅	A ₆	A ₇	A ₈	A ₉	A ₁₀	A ₁₁
40	11.65 (296)	10.59 (269)	10.00 (254)	8.74 (222)	4.25 (108)	2.91 (74)	12.06 (306)	5.04 (128)	1.38 (35)	3.31 (84)	9.69 (246)
71	13.07 (332)	11.30 (287)	10.72 (272)	9.80 (249)	4.84 (123)	3.11 (79)	13.11 (333)	5.63 (143)	1.18 (30)	3.11 (79)	10.35 (263)
125 / 180	15.85 (402)	11.97 (304)	11.38 (289)	12.17 (309)	5.83 (148)	2.76 (70)	15.08 (383)	5.83 (148)	0 (0)	2.76 (70)	11.73 (298)
250 / 355	19.09 (485)	13.43 (341)	12.83 (326)	14.61 (371)	7.24 (184)	2.76 (70)	17.52 (412)	7.24 (184)	0 (0)	2.76 (79)	13.58 (345)

For detailed dimensions and technical data for the variable pump, see data sheets
 92050 ((A)A4VSO), 92100 ((A)A4VSG) or
 92105 ((A)A4CSG)

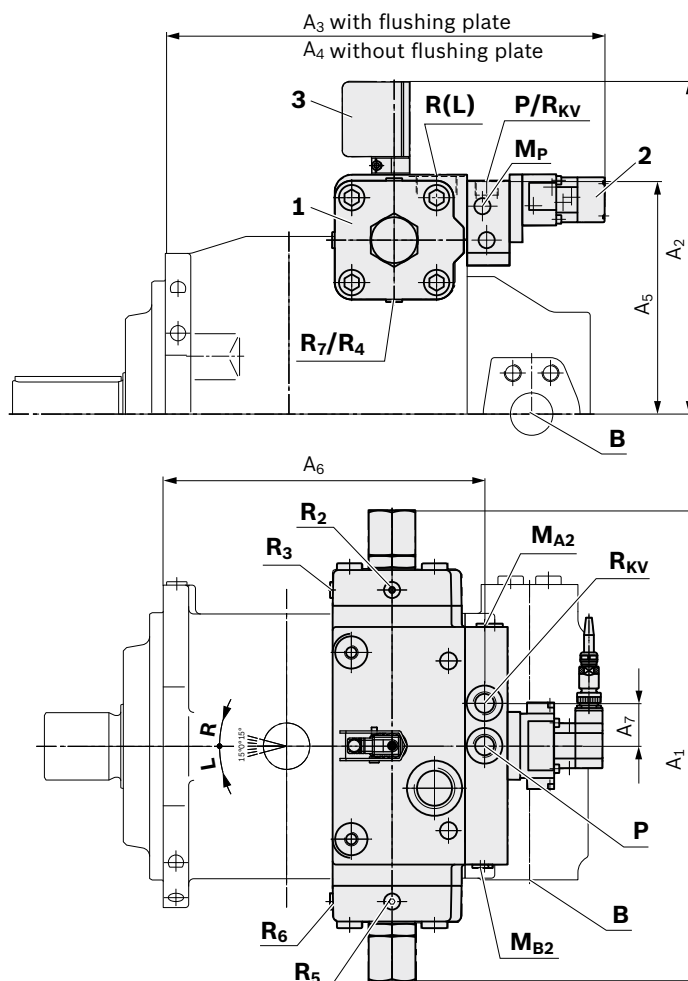
Ports	Standard	Size ¹⁾	p _{max abs} [psi (bar)] ²⁾	State
P	Control pressure	ISO 11926	7/8-14UNF-2B; 0.67 (17) deep	4550 (315) O
S_P	Accumulator control pressure	ISO 11926	7/8-14UNF-2B; 0.67 (17) deep	4550 (315) X
R_{KV}	Control fluid return flow	ISO 11926	7/8-14UNF-2B; 0.67 (17) deep	1450 (100) O
M₁, M₂	Measuring control pressure	DIN 3852-1	M14 x 1.5; 0.47 (12) deep (size 125 and 180) M18 x 1.5; 0.47 (12) deep (size 250 and 3500)	4550 (315) X 4550 (315) X
R₂ ... R₇	Air bleeding the stroking chamber	DIN 3852-1	M10 x 1; 0.31 (8) deep	4550 (315) X

1) For notes on tightening torques, see the 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 19

NG	A ₁	A ₂	A ₃	A ₄	A ₅	A ₆	A ₇
500	21.85 (555)	15.43 (392)	20.75 (527)	20.16 (512)	10.79 (274)	15.28 (388)	1.97 (50)
750	24.80 (630)	16.81 (427)	21.97 (558)	21.38 (543)	11.97 (304)	16.54 (420)	1.97 (50)
1000	26.38 (670)	17.95 (456)	24.57 (624)	23.98 (609)	12.87 (327)	19.13 (486)	1.97 (50)

For detailed dimensions and technical data for the variable pump, see data sheets 92050 ((A)A4VSO), 92100 ((A)A4VSG) or 92105 ((A)A4CSG)

Ports		Standard	Size ¹⁾	$p_{max abs}$ [psi (bar)] ²⁾	State
P	Control pressure	DIN 3852-1	M27 × 2; 0.63 (16) deep	4550 (315)	O
R_{KV}	Control fluid return flow	DIN 3852-1	M27 × 2; 0.63 (16) deep	1450 (100)	O
M_{A2}, M_{B2}, M_P	Measuring control pressure	DIN 3852-1	M14 × 1.5; 0.47 (12) deep	4550 (315)	X
R₂ ... R₇	Air bleeding the stroking chamber	DIN 3852-1	M14 × 1.5; 0.47 (12) deep	4550 (315)	X

1) For notes on tightening torques, see the 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)

HS5(P) – electrohydraulic control with control valve

Type	Size	40	71	125	180	250	355	500	750	1000	HS5(P)
(A)A4VSO, (A)A4VSG		●	●	●	●	●	●	●	●	●	
(A)A4CSG		–	–	–	–	●	●	●	●	–	
A4VBO, A4VHO		–	●	●	–	–	–	● (450)	–	–	

For electric displacement and pressure control, as well as power limitation with VT-HPC-1-1X

The control **HS5** sets the displacement of the pump with the mounted direct operated control valve proportional to the setpoint value.

The pump setting is reported by an inductive position transducer.

With **HS5P**, the mounted pressure transducer HM20 (see data sheet 30272) records the system pressure, with (A)A4VSG and (A)A4CSG, each pressure side is assigned a pressure transducer.

Together with the relevant control electronics VT-HPC-1-1X and the operating software IndraWorks, the user has a precise and freely parameterizable control, which offers a comfortable operating and diagnosis interface.

The digital control amplifier VT-HPC-1-1X for actuating the HS5 control is not included in the scope of delivery, please order separately in accordance with data sheet 30237.

The programming of the digital control electronics takes place via the Ethernet interface of the IndraWorks operating software.

Machine and system dynamics must be optimized by the system operator using the pressure control function.

Spring-centering

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

The spring-centering is not a safety device.

To minimize the pilot fluid consumption, the stroking chambers are sealed in sizes 125...1000 and can be bled via the ports **R**₂ ... **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).

Notices

Setting with (A)A4VSO (open circuit):

- ▶ The $V_{g \max}$ stop is set to nominal $V_{g \max}$ as standard. Other values should be specified when placing the order
- ▶ The $V_{g \min}$ stop is set to $V_g = 0$ gpm (0 l/min) with $P_{HD} = 290$ psi (20 bar) as standard. Other values should be specified when placing the order.

Setting with (A)A4VSG and (A)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:

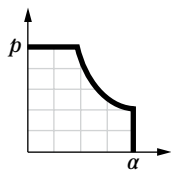
- ▶ **HS5P** with one or two pressure transducer(s) for pressure and power control

Technical data HS5(P)

Size			NG	40	71	125	180	250	355	500	750	1000	
Control pres- sure (in P)	(A)A4VSO, (A)A4VSG, (A)A4CSG	p_{min}	psi (bar)	1450 (100)	1450 (100)	1450 (100)	1800 (125)	1800 (125)	1800 (125)	2200 (150)	2200 (150)	2200 (150)	
	A4VBO, A4VHO	p_{min}	psi (bar)	–	1900 (130)	1900 (130)	–	–	–	2750 (190) Size 450	–	–	
		$p_{max}^{1)}$	psi (bar)	5100 (350)	5100 (350)	5100 (350)	5100 (350)	5100 (350)	5100 (350)	5100 (350)	5100 (350)	5100 (350)	
Control stroke		s_{max}	inch (mm)	0.56 (14.2)	0.67 (17.1)	0.81 (20.7)	0.81 (20.7)	1.02 (25.9)	1.09 (25.9)	1.28 (32.6)	1.46 (37.0)	1.63 (41.4)	
Control area		A	inch ² (cm ²)	1.26 (8.1)	1.95 (12.6)	2.81 (18.1)	2.81 (18.1)	4.39 (28.3)	4.39 (28.3)	5.92 (38.2)	8.80 (56.8)	9.85 (63.6)	
Control volume		$V_{S max}$	inch ³ (cm ³)	0.70 (11.4)	1.31 (21.5)	2.29 (37.5)	2.29 (37.5)	4.47 (73.2)	4.47 (73.2)	7.60 (124.5)	12.81 (210)	16.06 (263.3)	
Actuating 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. ((A)A4VSO...HS5...N00)		m	lbs (kg)	92 (42)	130 (59)	216 (98)	247 (112)	441 (200)	485 (220)	734 (333)	1049 (476)	1336 (606)	
Control loop performance hysteresis												≤ 0.2%	
Repeatability													≤ 0.2%
Linearity deviation swivel angle													≤ 1.0%
Linearity deviation pressure													≤ 1.5 % of $p_{max}^{3)}$

(A)A4VSO – open circuit

▼ **Characteristic curve**



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

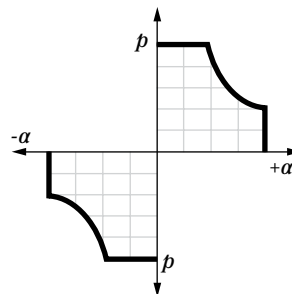
▼ **Flow direction S to B**

Direction of rotation	Swiveling range ⁴⁾	Basic setting
clockwise	counter-clockwise	$V_{g min}$ (from left)
counter-clockwise	clockwise	$V_{g min}$ (from right)

- 1) Due to the permissible data of the proportional valve
- 2) With minimum control pressure
- 3) Pressure transducer value

(A)A4VSG and (A)A4CSG – closed circuit

▼ **Characteristic curve**

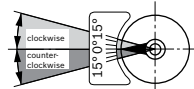


Basic setting for version without short circuit valve, de-energized proportional valve and connected control pressure: $V_{g max}$ (see table).

▼ **Flow direction**

Direction of rotation	Swiveling range ⁴⁾	Flow direction	Basic setting
	clockwise	B to A	$V_{g max}$ clockwise
clockwise	counter-clockwise	A to B	
counter-clockwise	clockwise	A to B	$V_{g max}$ counter-clockwise
	counter-clockwise	B to A	

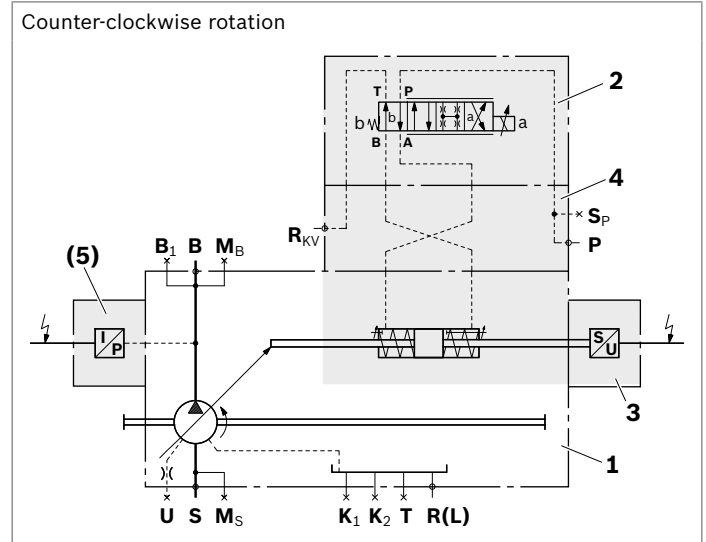
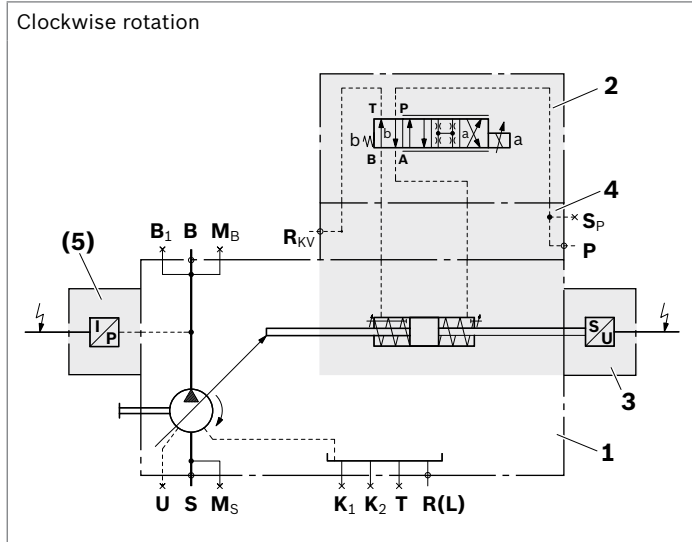
- 4) cf. swivel angle indicator



Circuit diagrams HS5(P)

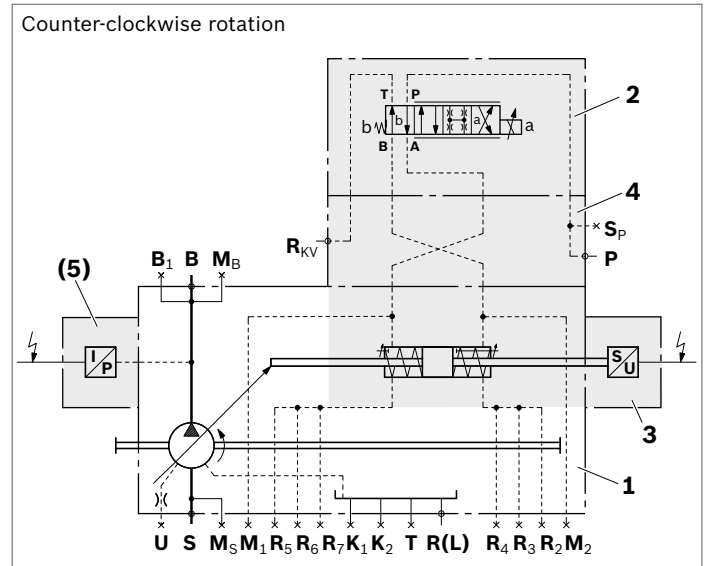
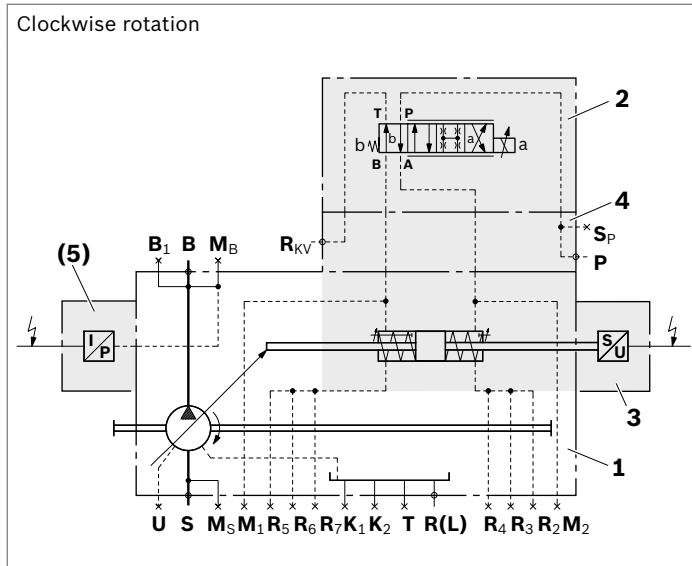
▼ **Size 40 and 71**

Example: (A)A4VSO HS5P (with pressure transducer)



▼ **Size 125 and 180**

Example: (A)A4VSO HS5P (with pressure transducer)



- 1 Pump with hydraulic control device (A)A4VSO (see data sheet 92050), A4VBO (see data sheet 92122) or A4VHO (data sheet in preparation)
- 2 4/4 directional control valve (see data sheet 29027)

NG	Type
40 to 180	4WRPH6CA24L-2X/G24Z4/V-855

- 3 Inductive position transducer

NG	Type
40, 125 and 180	AWAX004D03
71	AWAX004D02 with spacer

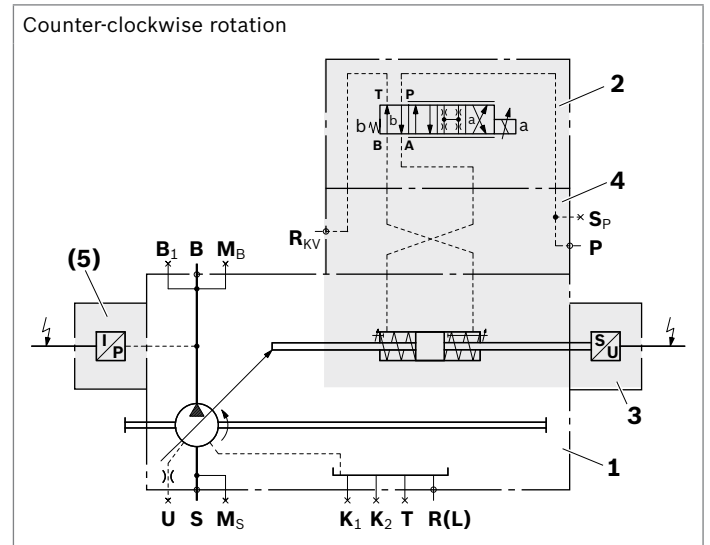
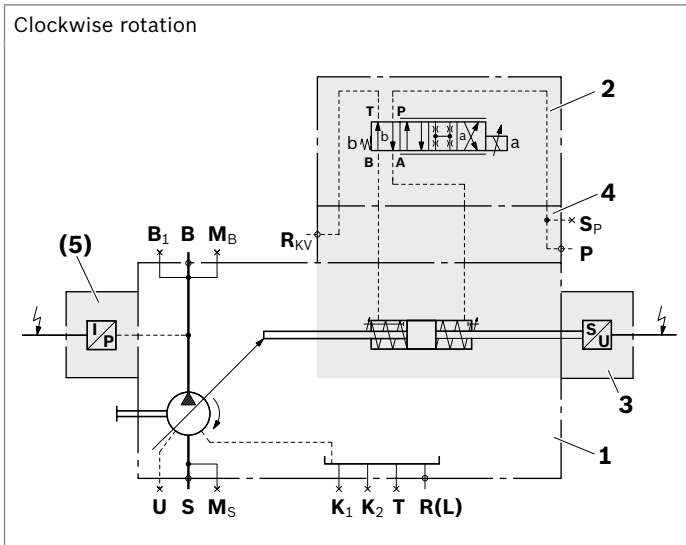
with round connector 4-pin M12 × 1

- 4 Intermediate plate
- 5 **Only with HS5P:** Pressure transducer HM20-2X/630-C-K35 (see data sheet 30272) with intermediate flange, with (A)A4VSG and (A)A4CSG, each pressure side has 1 pressure transducer assigned and mounted

Circuit diagrams HS5(P)

▼ **Size 250 and 355**

Example: (A)A4VSO HS5P (with pressure transducer)



- 1 Pump with hydraulic control device (A)A4VSO (see data sheet 92050), A4VBO (see data sheet 92122) or A4VHO (see data sheet 92160)
- 2 4/4 directional control valve (see data sheet 29027)

NG	Type
250 and 355	4WRPH6CA40L-2X/G24Z4/V-855

- 3 Inductive position transducer

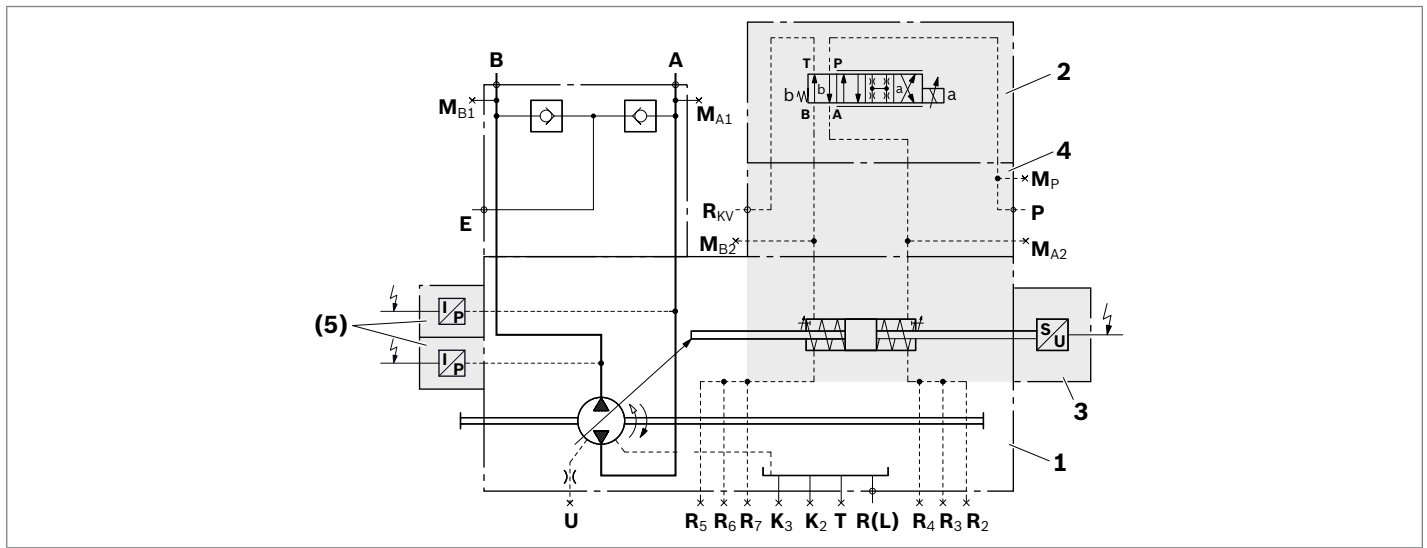
NG	Type
250 to 1000	AWAX004D02

with round connector 4-pin M12 × 1 Intermediate plate

- 4 **Only with HS5P:** Pressure transducer HM20-2X/630-C-K35 (see data sheet 30272) with intermediate flange, with (A)A4VSG and (A)A4CSG, each pressure side has 1 pressure transducer assigned and mounted

▼ **Size 500 to 1000**

Example: A4VSG HS5P (with pressure transducer)



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

2 4/4 directional control valve (see data sheet 29027)

NG	Type
500 to 1000	4WRPH6CA40L-2X/G24Z4/V-855

3 Inductive position transducer

NG	Type
5000 to 1000	AWAX004D02

with round connector 4-pin M12 × 1

4 Intermediate plate

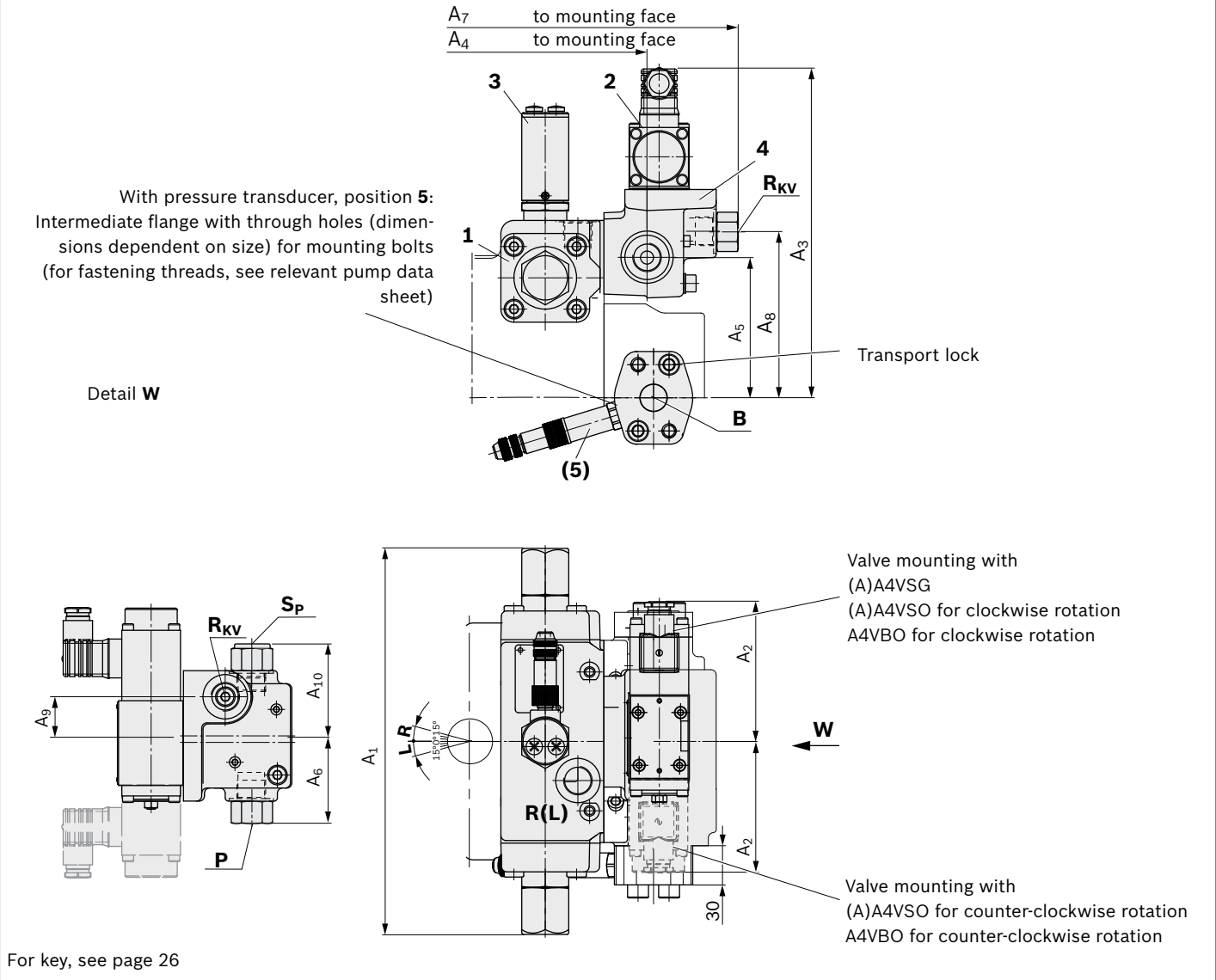
5 **Only with HS5P:** Pressure transducer HM20-2X/630-C-K35 (see data sheet 30272) with intermediate flange, with (A)A4VSG and (A)A4CSG, each pressure side has 1 pressure transducer assigned and mounted

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 the stroking chamber

Dimensions HS5(P)

▼ **Size 40 and 71, example (A)A4VSO HS5P with a pressure transducer on port B**

With (A)A4VSO and A4VBO, the dimensions (“R” and “L”) are partly different for the clockwise and counter-clockwise rotation.
 With (A)A4VSG, the dimensions “R” apply to both directions of rotation.



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
40	11.65 (296)	6.85 (174)	6.54 (166)	9.65 (245)	8.90 (226)	9.06 (230)	8.74 (222)	4.25 (108)	2.87 (73)	11.97 (304)	9.96 (253)	5.04 (128)	3.70 (94)	1.38 (35)	0.20 (5)	3.35 (85)
71	13.07 (332)	6.65 (169)	6.73 (171)	10.28 (261)	9.57 (243)	10.10 (257)	9.80 (249)	4.84 (123)	3.11 (79)	13.03 (331)	11.00 (280)	5.63 (143)	4.29 (109)	1.18 (30)	0 (0)	3.11 (79)

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} [psi (bar)] ³⁾	State	
P	Control pressure	ISO 11926	7/8-14UNF-2B; 0.67 (17) deep	4550 (315)	O
S_p	Accumulator control pressure	ISO 11926	7/8-14UNF-2B; 0.67 (17) deep	4550 (315)	X
R_{KV}	Control fluid return flow	ISO 11926	7/8-14UNF-2B; 0.67 (17) deep	3050 (210)	O

1) ISO 6149 with A4VBO 71

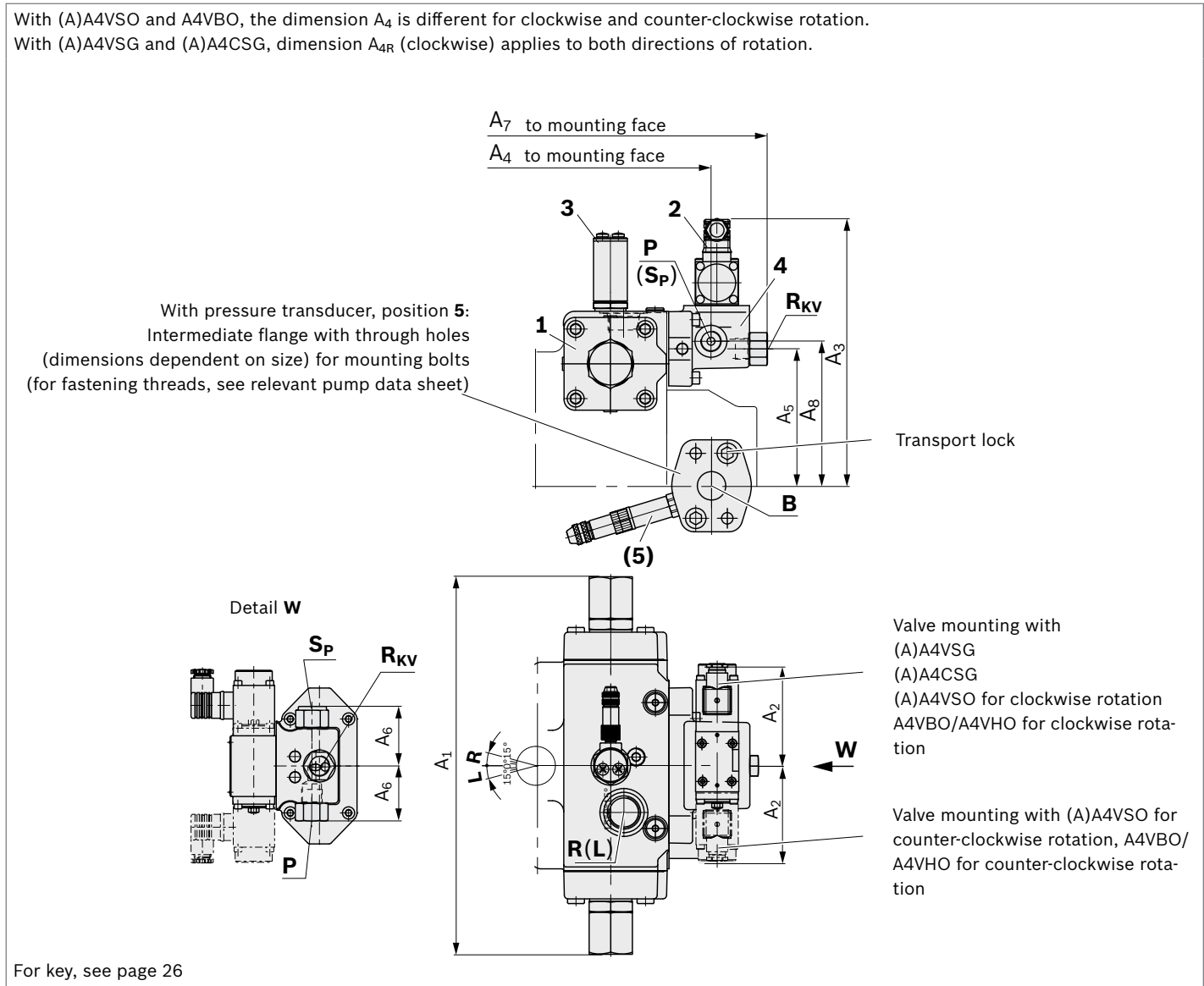
2) For notes on tightening torques, see the instruction manual.

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 (A)A4VSO HS5P with a pressure transducer on port B**

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



NG	A_1	A_3	A_{4R}	A_{4L}	A_5	A_6	A_7	A_8	
125/180	15.83 (402)	11.30 (286)	12.20 (310)	12.54 (318.5)	6.14 (156)	2.76 (70)	15.09 (383)	5.83 (148)	For detailed dimensions and technical data for the variable pump, see data sheets 92050 ((A)A4VSO), 92122(A4VBO), 92100 ((A)A4VSG) or 92105 ((A)A4CSG)
250/355	19.09 (485)	12.70 (322)	14.65 (372)	14.98 (380.5)	7.56 (192)	2.76 (70)	17.52 (445)	7.24 (184)	

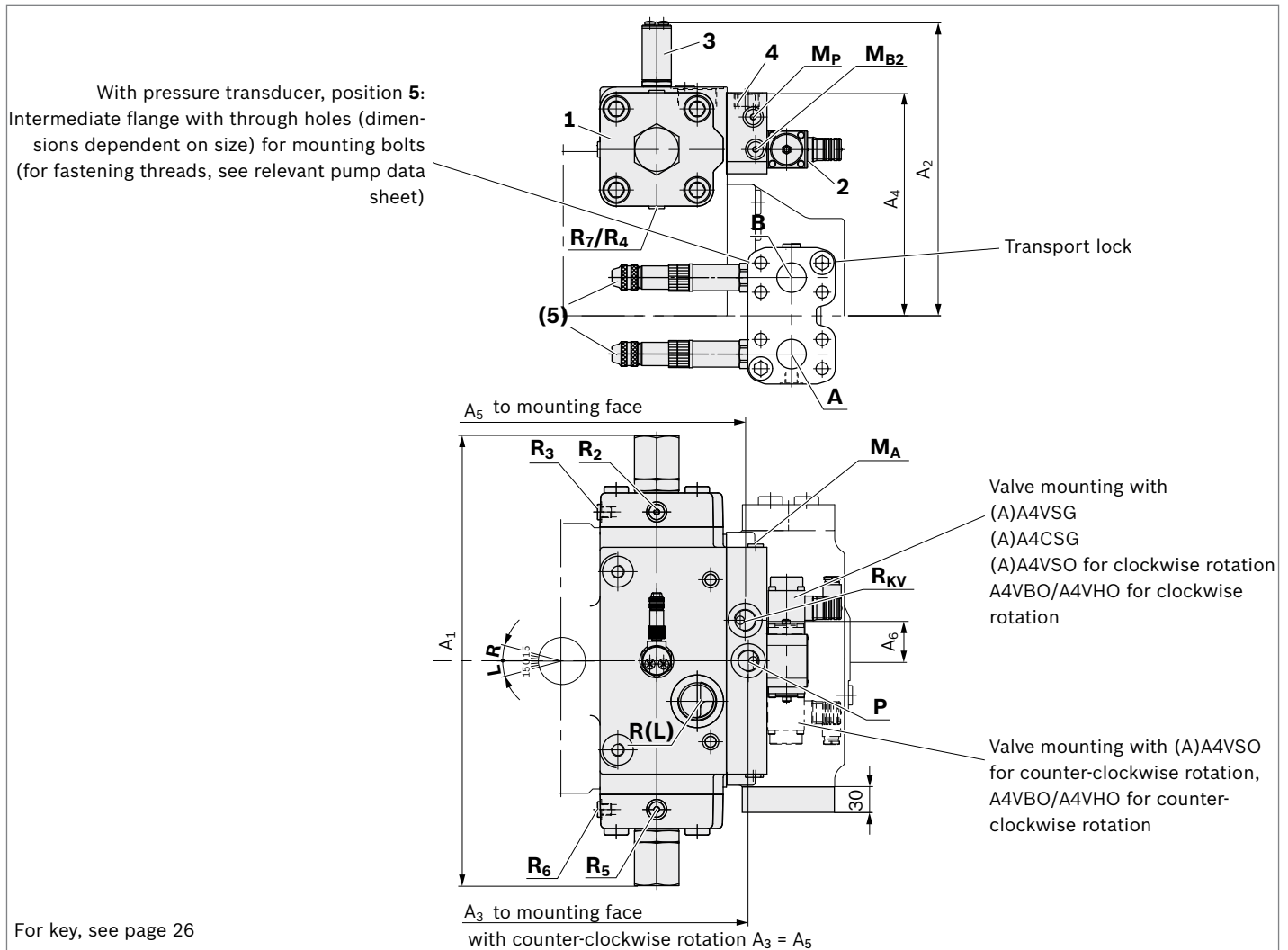
Ports		Standard	Size ¹⁾	$p_{\max \text{ abs}}$ [psi (bar)] ²⁾	State ⁴⁾
$P^{3)}$	Control pressure	ISO 11926	7/8-14UNF-2B; 0.67 (17) deep	4550 (315)	O
$S_p^{3)}$	Accumulator control pressure	ISO 11926	7/8-14UNF-2B; 0.67 (17) deep	4550 (315)	X
$R_{KV}^{3)}$	Control fluid return flow	ISO 11926	7/8-14UNF-2B; 0.67 (17) deep	3050 (210)	O
M_1, M_2	Measuring control pressure	DIN 3852-1	M14 x 1.5; 0.47 (12) deep (size 125 and 180)	4550 (315)	X
			M18 x 1.5; 0.47 (12) deep (size 250 and 355)	4550 (315)	X
$R_2 \dots R_7$	Air bleeding the stroking chamber	DIN 3852-1	M10 x 1; 0.31 (8) deep	4550 (315)	X

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

3) At A4VBO 125 M22 x 1.5; 14 deep acc. to ISO 6149 without adapter
 4) O = Must be connected (plugged on delivery)
 X = Plugged (in normal operation)

▼ **A4VSO, A4VBO, A4VSG and A4CSG, size 500 to 1000**

Example (A)A4VSG HS5P with two pressure transducers on port **B**



NG	A ₁	A ₂	A ₃	A ₄	A ₅	A ₆	
500 (450 with A4VBO/A4VHO)	21.85 (555)	14.30 (363)	15.34 (392)	10.79 (274)	15.38 (388)	1.97 (50)	For detailed dimensions and technical data for the variable pump, see data sheets 92050 ((A)A4VSO), 92122(A4VBO), 92100 ((A)A4VSG) or 92105 ((A)A4CSG)
750	24.80 (630)	15.80 (402)	16.69 (424)	11.97 (304)	16.54 (420)	1.97 (50)	
1000	26.38 (670)	16.90 (429)	19.29 (490)	12.97 (327)	19.13 (486)	1.97 (50)	

Ports	Standard	Size ¹⁾	p _{max abs} [psi (bar)] ²⁾	State
P	Control pressure	DIN 3852-1 M27 × 2; 0.63 (16) deep	4550 (315)	O
R_{KV}	Control fluid return flow	DIN 3852-1 M27 × 2; 0.63 (16) deep	1750 (120)	O
M_{A2}, M_{B2}, M_P	Measuring control pressure	DIN 3852-1 M14 × 1.5; 0.47 (12) deep	4550 (315)	X
R₂ ... R₇	Air bleeding the stroking chamber	DIN 3852-1 M14 × 1.5; 0.47 (12) deep	4550 (315)	X

1) For notes on tightening torques, see the 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)

HS5M – suitable for use under fluid

Type	Size	40	71	125	180	250	355	500	750	1000	HS5M
(A)A4VSO, (A)A4VSG		●	●	●	●	●	●	●	●	●	
(A)A4CSG		-	-	-	-	●	●	●	●	-	

The **HS5M** variant corresponds to the HS5 version, however, without proportional valve, but with pilot pressure ports **X₁** and **X₂**.

The proportional valve can be positioned separately in the system and connected via the designated ports **X₁** and **X₂** 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:

- ▶ Directional control valve 4WRPH6, see data sheet 29027
- ▶ For electronics VT-HPC-1-1X, see data sheet 30237
- ▶ For cables, see data sheet 30237-B

Notices

Setting with (A)A4VSO (open circuit):

- ▶ The $V_{g \max}$ stop is set to nominal $V_{g \max}$ as standard. Other values should be specified when placing the order
- ▶ The $V_{g \min}$ stop is set to $V_g = 0$ gpm (0 l/min) with $P_{HD} = 290$ psi (20 bar) as standard. Other values should be specified when placing the order.

Setting with (A)A4VSG and (A)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⁾	
clockwise	counter-clockwise	
B to A	A to B	clockwise
A to B	B to A	counter-clockwise

Overcenter is available on request.

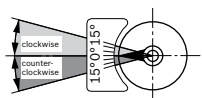
Technical data inductive position transducer AWAX

Temperature range	-13 °F (-25 °C) to +176 °F (+80 °C) for AWAX004D02 and AWAX004D03
Type of protection	IPX7 DIN VDE 0470-EN 60529
Typical temperature drift	0.05% / K (based on the total output voltage swing)
Vibration resistance	10 g sine; 10 g noise; 15 g shock
Use under fluid	approved for HLPD 46 (with installed mating connector)
Sealing material	FKM

Technical data HS5M

Size	NG	40	71	125	180	250	355	500	750	1000	
Control pressure (in X₁ , X₂)	p_{\min}	psi (bar)	725 (50)	725 (50)	725 (50)	1450 (100)	1450 (100)	1450 (100)	1800 (125)	1800 (125)	180 (125)
	$p_{\max}^{3)}$	psi (bar)	5100 (350)	5100 (350)	5100 (350)	5100 (350)	5100 (350)	5100 (350)	5100 (350)	5100 (350)	5100 (350)
Control stroke from 0 cm ³ to $V_{g \max}$	s_{\max}	inch (mm)	0.56 (14.2)	0.67 (17.1)	0.81 (20.7)	0.81 (20.7)	1.02 (25.9)	1.02 (25.9)	1.28 (32.6)	1.46 (37.0)	1.63 (41.4)
Control area	A	inch ² (cm ²)	1.26 (8.1)	1.95 (12.6)	2.81 (18.1)	2.81 (18.1)	4.39 (28.3)	4.39 (28.3)	5.92 (38.2)	8.80 (56.8)	9.86 (63.6)
Control volume	$V_{S \max}$	inch ³ (cm ³)	0.70 (11.4)	1.31 (21.5)	2.29 (37.5)	2.29 (37.5)	4.47 (73.2)	4.47 (73.2)	7.60 (124.5)	12.81 (210)	16.07 (263.3)
Weight: approx. (A4VSO...HS5M...N00)	m	lbs (kg)	84 (38)	121 (55)	202 (92)	233 (106)	427 (194)	471 (214)	719 (327)	1034 (470)	1320 (600)

1) cf. swivel angle indicator

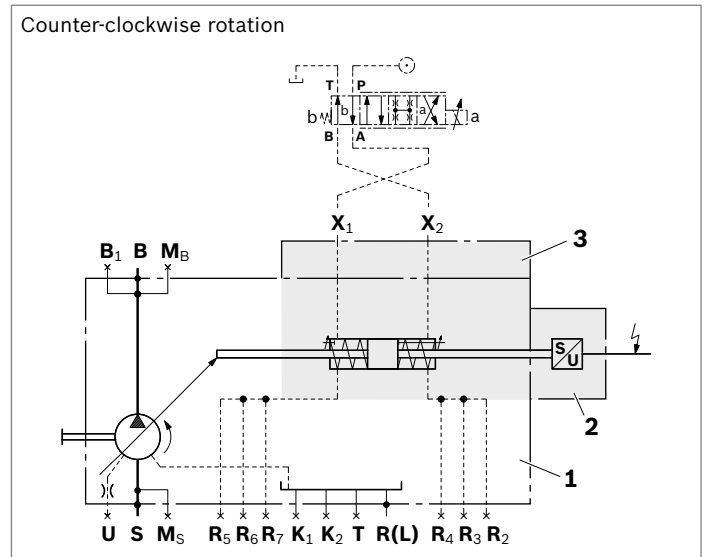
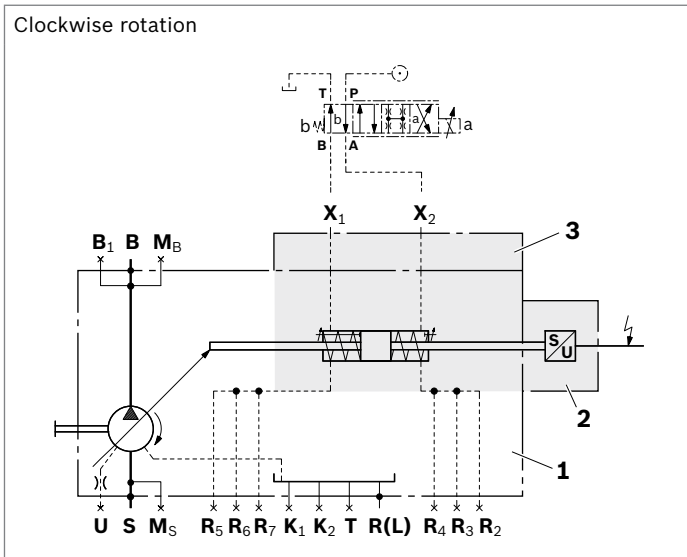


2) Only with closed circuit

3) Observe any restrictions due to the proportional valve

Circuit diagrams HS5M

- ▼ **Size 40 to 1000 for (A)A4VSO and (A)A4VSG, size 250 to 750 for (A)A4CSG**
 Example: (A)A4VSO...HS5M, size 125 to 1000



- 1** Pump with hydraulic control device (A)A4VSO (see data sheet 92050)
2 Inductive position transducer:

NG	Type
40, 125 and 180	AWAX004D03
71	AWAX004D02
250 to 1000	AWAX004D02

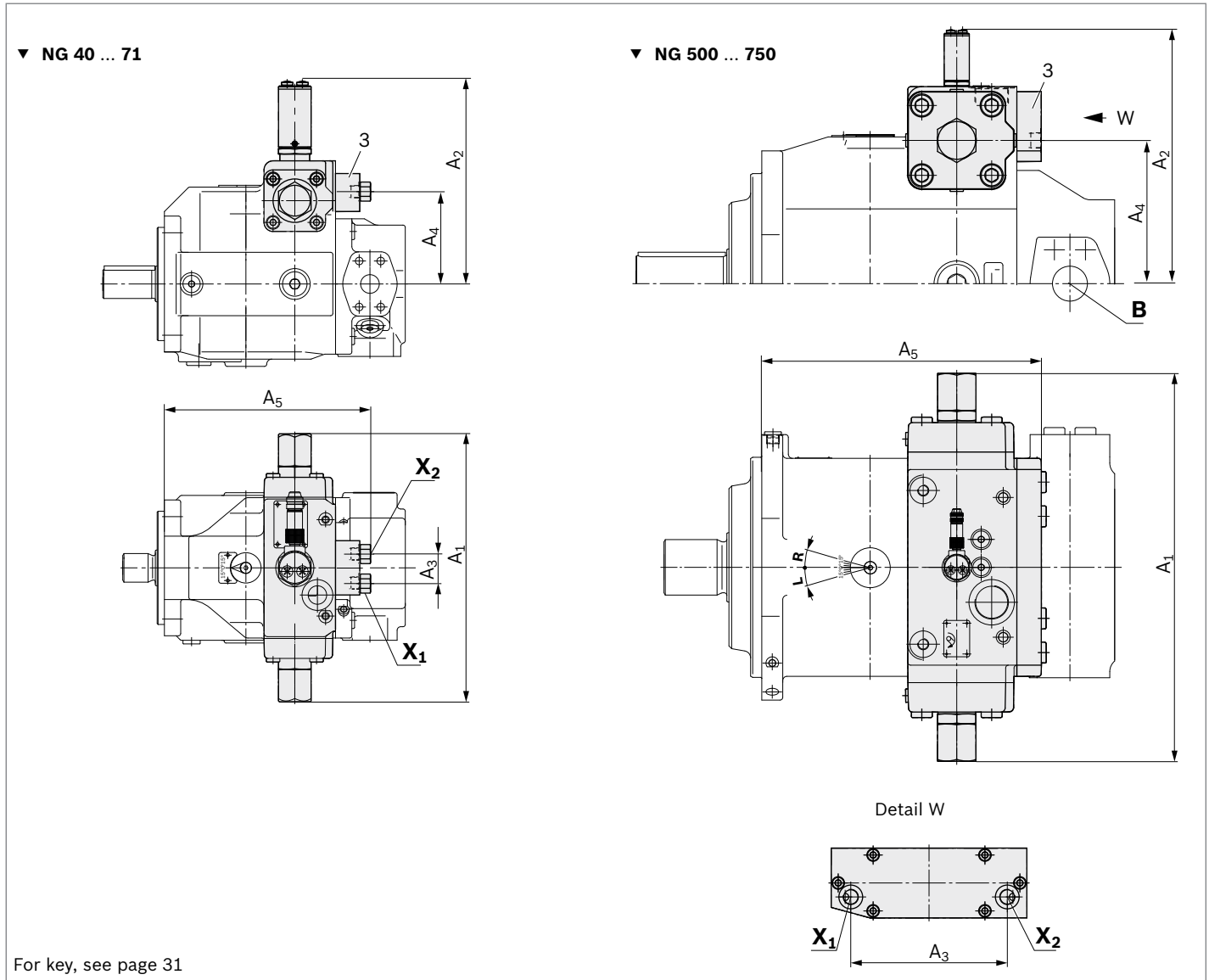
with round connector 4-pin M12 × 1

- 3** Connection plate

Ports	
X ₁	Control pressure
X ₂	Control pressure
R ₂ ... R ₇	Air bleeding the stroking chamber (size 125 to 1000)

Dimensions HS5M

▼ (A)A4VSO, (A)A4VSG and (A)A4CSG, size 40, 71, 500 and 750



NG	A ₁	A ₂	A ₃	A ₄	A ₅
40	11.65 (296)	8.81 (223.7)	1.10 (28)	4.09 (104)	9.49 (241)
71	13.07 (332)	9.57 (243)	1.10 (28)	4.72 (120)	10.59 (269)
500	21.85 (555)	14.30 (363)	8.82 (224)	8.07 (205)	15.71 (399)
750	24.80 (630)	15.75 (400)	8.82 (224)	9.25 (235)	16.97 (431)

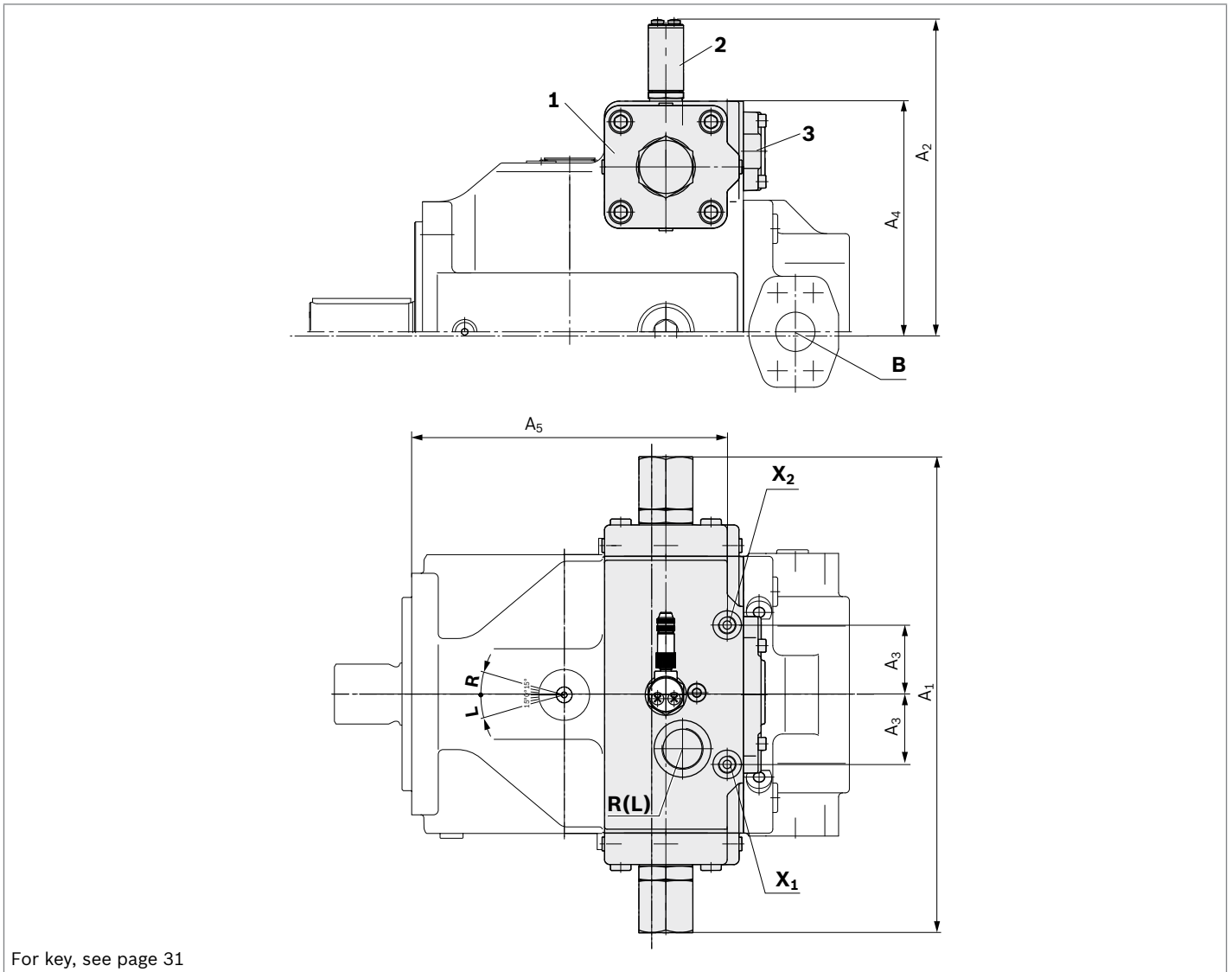
For detailed dimensions and technical data for the variable pump, see data sheets 92050 ((A)A4VSO), 92100 ((A)A4VSG) or 92105 ((A)A4CSG)

Ports	Standard	Size ¹⁾	p _{max abs} [bar] ²⁾	State	
X ₁ , X ₂	Control pressure	ISO 11926 DIN 3852-1	9/16-18UNF-2B; 0.51 (13) deep (size 40 and 71) M22 × 1.5; 0.55 (14) deep (size 500 and 750)	5100 (350) 5100 (350)	O O

1) For notes on tightening torques, see the 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)

▼ (A)A4VSO, (A)A4VSG and (A)A4CSG, size 125 to 355



NG	A ₁	A ₂	A ₃	A ₄	A ₅	
125/180	15.83 (402)	10.07 (272)	2.64 (67)	7.34 (186.5)	9.88 (251)	For detailed dimensions and technical data for the variable pump, see data sheets 92050 ((A)A4VSO), 92100 ((A)A4VSG) or 92105 ((A)A4CSG)
250/355	19.09 (485)	12.50 (318.2)	2.80 (71)	9.17 (233)	12.54 (310.5)	

Ports	Standard	Size ¹⁾	p _{max abs} [psi (bar)] ²⁾	State	
X₁, X₂	Control pressure	ISO 11926	9/16-18UNF-2B; 0.51 (13) deep (size 125 and 180) 3/4-16UNF-2B; 0.59 (15) deep (size 250 and 355)	5100 (350) 5100 (350)	O O

1) For notes on tightening torques, see the 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)

HS5V control with internal control pressure supply

Type	Size	40	71	125	180	250	355	500	750	1000	
A4VSO		•	•	•	•	•	•	○	○	-	HS5V

The **HS5V** variant corresponds to the HS5 version, 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 is supplied 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 290 psi (20 bar).

If the pump is to be controlled below 290 psi (20 bar), a preload block is required for generating the required control power. You need to contact us for a specific application.

Fail safe features

With a de-energized proportional valve and plugged pump outlet, the pump switches to minimum pressure (87 to 145 psi (6 to 10 bar)). This is also true in the event of a fault or when there is no control release.

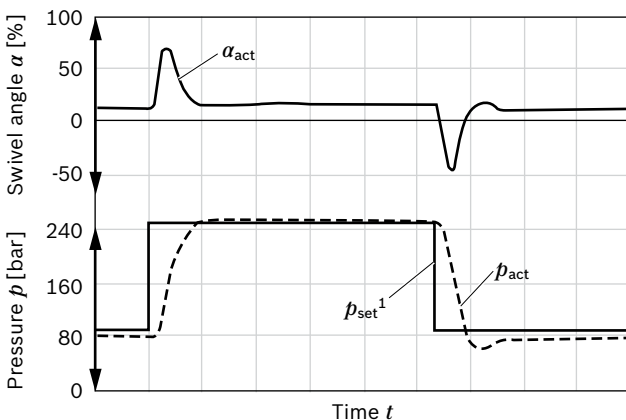
Electronics:

- ▶ VT-HPC-1-1X, see data sheet 30237

Swiveling range -100% to +100%

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

▼ Dynamic characteristic curve for pressure reduction via the pump



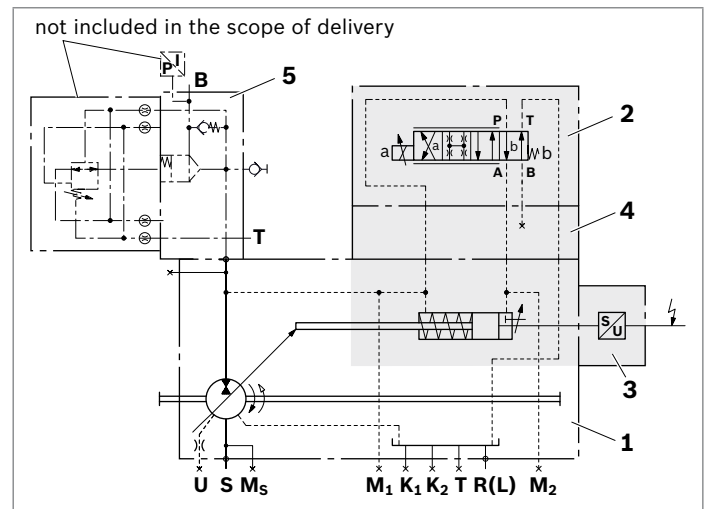
Technical data HS5V

Size	NG	40 to 355
Maximum working pressure $p_{\max}^{1)}$	psi (bar)	5100 (350)
Minimum working pressure p_{\min}	psi (bar)	290 (20)

Circuit diagram HS5V

▼ Size 250 and 355

Example: (A)A4VSO HS5V with preload block AGEV4-05728-AA/46



- 1 Pump with hydraulic control device (A)A4VSO (see data sheet 92050)
- 2 4/4 directional control valve (see data sheet 29027)

NG	Type
40 to 180	4WRPH6CA24L-2X/G24Z4/V-855
250 and 355	4WRPH6CA40L-2X/G24Z4/V-855

- 3 Inductive position transducer:

NG	Type
40, 125 and 180	AWAX004D03
71	AWAX004D02 and spacer ring
250 to 1000	AWAX004D02

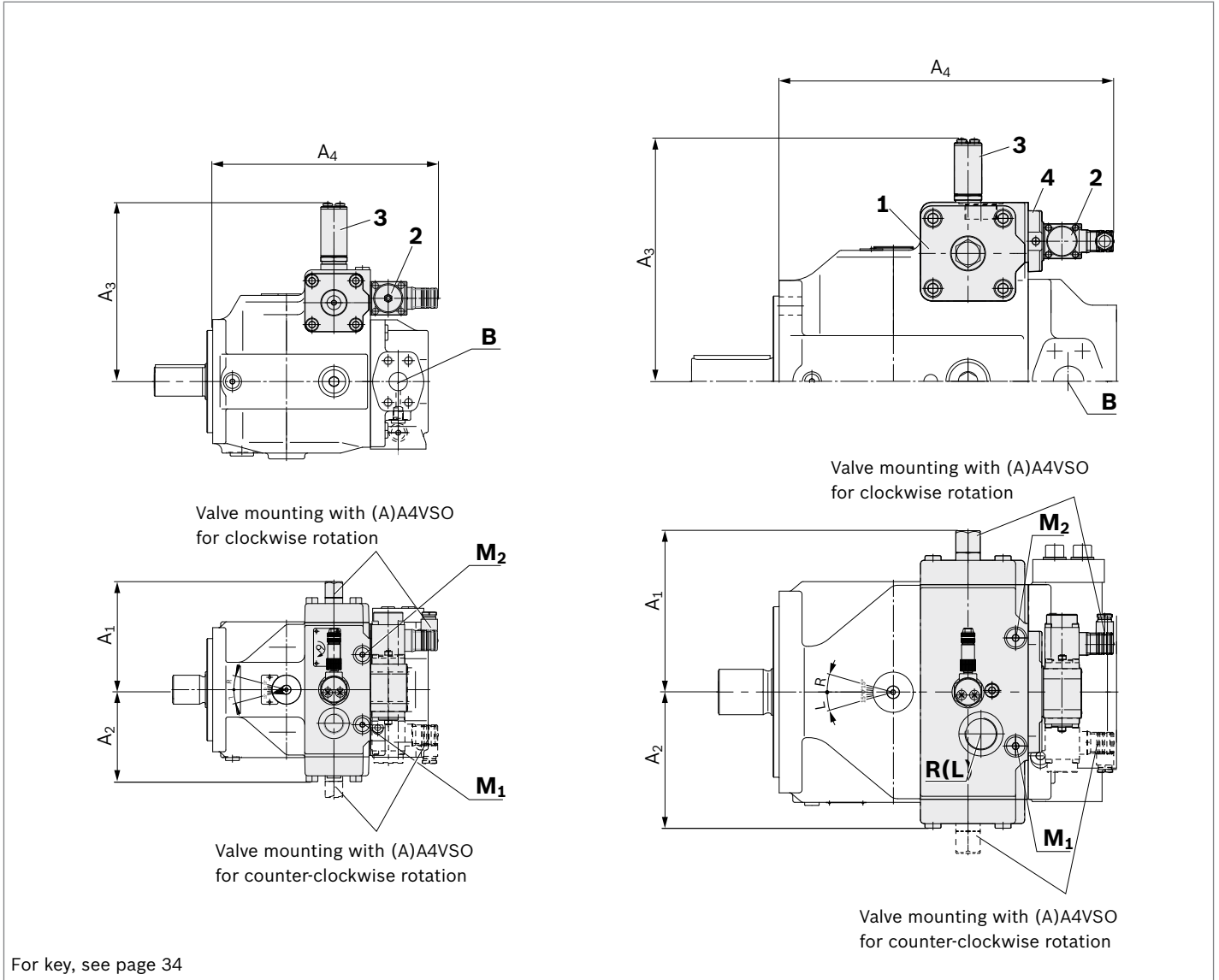
with round connector 4-pin M12 × 1

- 4 Intermediate plate
- 5 Preload block

1) Due to the permissible data of the proportional valve, higher pressures on request

Dimensions HS5V

▼ (A)A4VSO, sizes 40...355



NG	A ₁	A ₂	A ₃	A ₄
40	5.12 (130)	4.09 (104)	8.82 (224)	11.06 (281)
71	5.83 (148)	4.96 (126)	9.63 (244.7)	12.16 (309)
125/180	6.97 (177)	5.79 (147)	10.70 (271)	14.80 (375)
250/355	8.35 (212)	7.05 (179)	12.17 (309)	17.05 (433)

For detailed dimensions and technical data of the variable pump, see data sheet 92050 ((A)A4VSO)

Ports	Standard	Size ¹⁾	$p_{max\ abs}$ [psi (bar)] ²⁾	State	
M ₁ , M ₂	Measuring control pressure	DIN 3852-1	M14 × 1.5; 0.47 (12) deep (size 40 to 71) M18 × 1.5; 0.47 (12) deep (size 125 to 355)	4550 (315)	X

1) For notes on tightening torques, see the 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)

HS5E – control system with integrated digital electronics (OBE)

Type	NG	40	71	125	180	250	355	450	500	750	1000
(A)A4VSO		●	●	●	●	●	●	–	●	○	○
(A)A4VSG		○	○	○	○	○	○	–	○	○	○
(A)A4CSG		–	–	–	–	○	○	–	○	○	–
A4VBO		–	○	○	–	○	–	○	–	–	–

An axial piston variable pump with HS5E is a complete solution for an entire Bosch Rexroth pump control system for electrohydraulic

- ▶ swivel angle control
- ▶ Pressure control (optional HS5EP)
- ▶ Torque limitation (optional HS5EP)

The control system consists of the following components:

- ▶ Axial piston variable pump (A)A4VSO, (A)A4VSG, (A)A4CSG or A4VBO
- ▶ Directional control valve with **On Board Electronics**
- ▶ Swivel angle sensor for recording the pump swivel angle
- ▶ Optional (HS5EP): one pressure transducer with (A)A4VSO or two pressure transducers with (A)A4VSG/ (A)A4CSG

Machine and system dynamics must be optimized by the system operator using the pressure control function.

Spring-centering

The spring-centering of the pump control is standard. It is used for setting and adjustment in depressurized neutral position, but without a defined reset during high-pressure operation. The spring-centering is not a safety device. To minimize the pilot fluid consumption, the stroking chambers are sealed in sizes 125 to 1000 and can be bled via the ports R2 to R7.

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% $V_{g \max}$.

Notices

Setting with (A)A4VSO (open circuit):

- ▶ The $V_{g \max}$ stop is set to nominal $V_{g \max}$ as standard. Other values should be specified when placing the order
- ▶ The $V_{g \min}$ stop is set to $V_g = 0$ gpm (0 l/min) with $P_{HD} = 290$ psi (20 bar) as standard. Other values should be specified when placing the order.

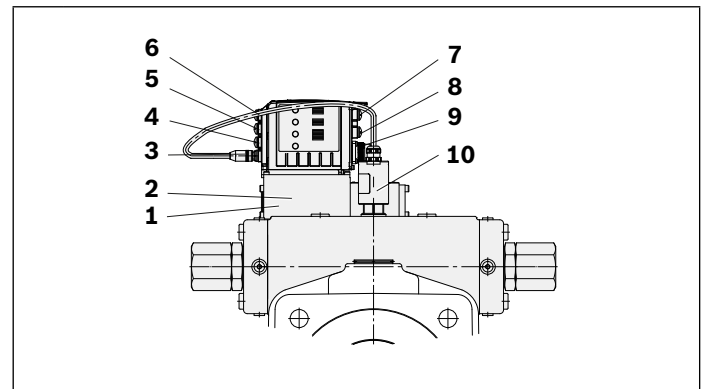
When ordering, please state other setting requests in plain text.

Electrical control loop performance

	Swivel angle control	Pressure control ¹⁾
Linearity tolerance	≤ 1.0%	≤ 1.5% (≤ 1.0% ²⁾)
Temperature error	≤ 0.5% / 10 K	≤ 0.5% / 10 K
Hysteresis	≤ 0.2%	≤ 0.2%
Repeatability	≤ 0.2%	≤ 0.2%

Connection

- ▶ Voltage supply 24 V
- ▶ Ambient temperature ≤ 140 °F (60 °C)
hydraulic fluid temperature ≤ 158 °F (70 °C)
- ▶ Status message via LED
- ▶ Interface for:
EtherNet/IP, Sercos III, EtherCAT, Powerlink or ProfiNet RT connection

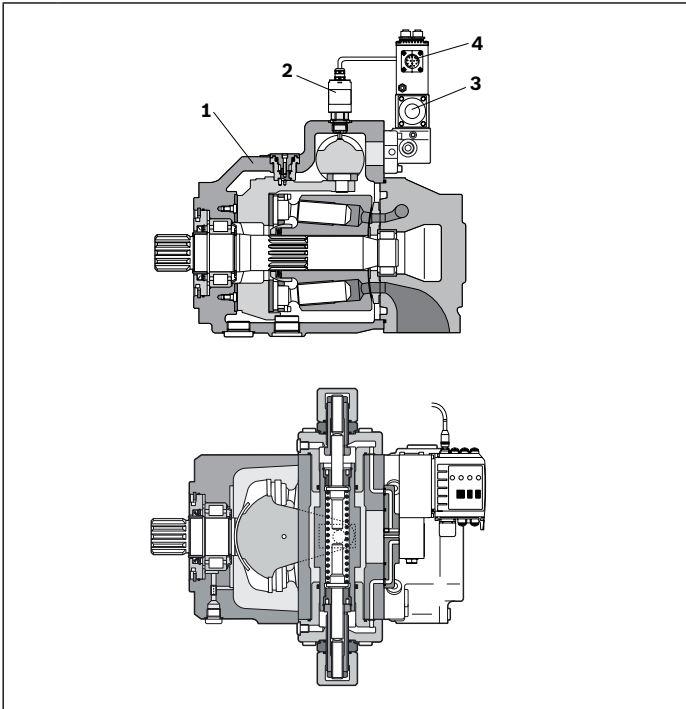


Example (A)A4VS size 250

- | | |
|----|--|
| 1 | Proportional solenoid |
| 2 | Inductive position transducer for valve position |
| 3 | Swivel angle actual value input X8A |
| 4 | reserved, X2N |
| 5 | Configurable sensor interface X2M2 (pressure sensor input) |
| 6 | Configurable sensor interface X2M1 (pressure sensor input) |
| 7 | Multi-EtherNet interface X7E1 |
| 8 | Multi-EtherNet interface X7E2 |
| 9 | Plug-in connector XH4 |
| 10 | VT-SWA-LIN-G15 swivel angle sensor |

1) Without taking into account the pump pulsation
 2) Using the integrated calibration function

Sectional view of (A)A4VSO...HS5E



- 1** Axial piston pump
- 2** Swivel angle sensor, e.g. VT-SWA-LIN-G15
- 3** Pilot valve
- 4** On Board Electronics

Optional:

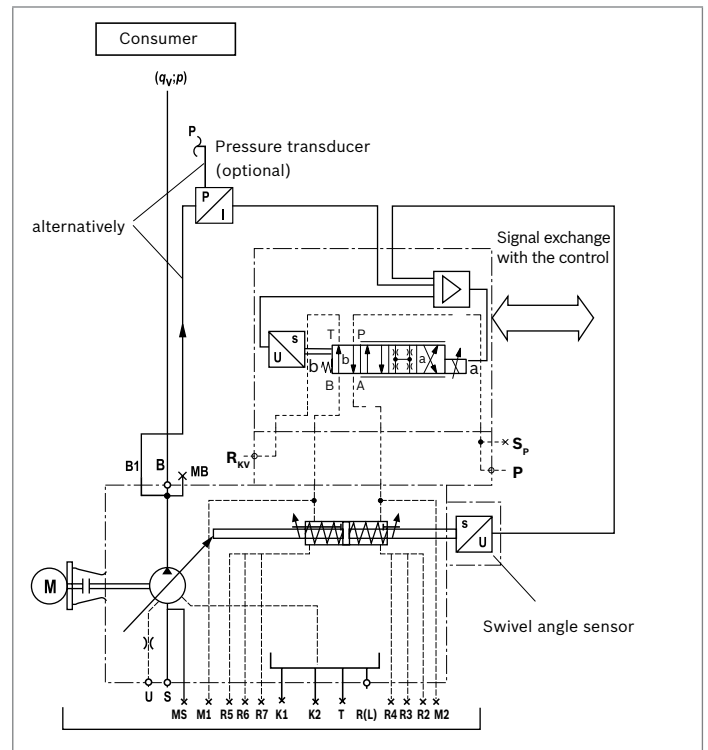
- ▶ HS5EP with one or two pressure transducer(s) for additional pressure and power control
- ▶ HS5EV with internal control fluid supply and integrated digital electronics (on request).

Swivel angle sensor VT-SWA-LIN

- ▶ The HS5E includes the swivel angle sensor VT-SWA-LIN-G15 as standard (data sheet 30263)
- ▶ Output signal 5 ± 3 V

System circuit diagram HS5E

▼ **Example: (A)A4VSO, size 125 to 500, clockwise rotation**

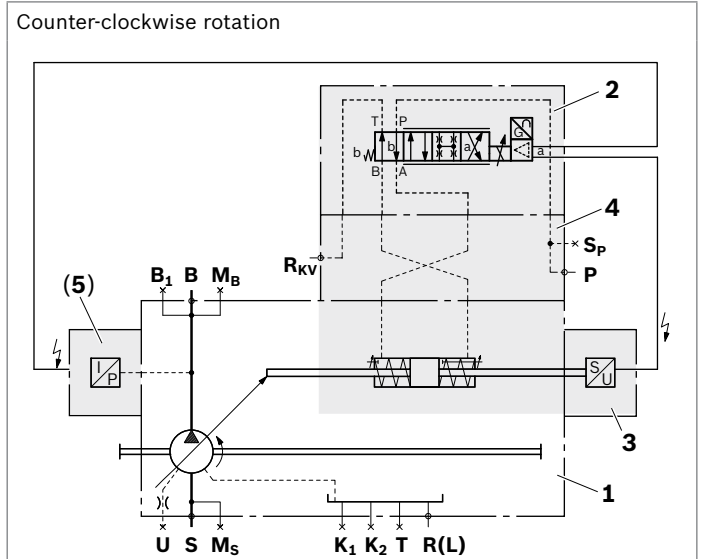
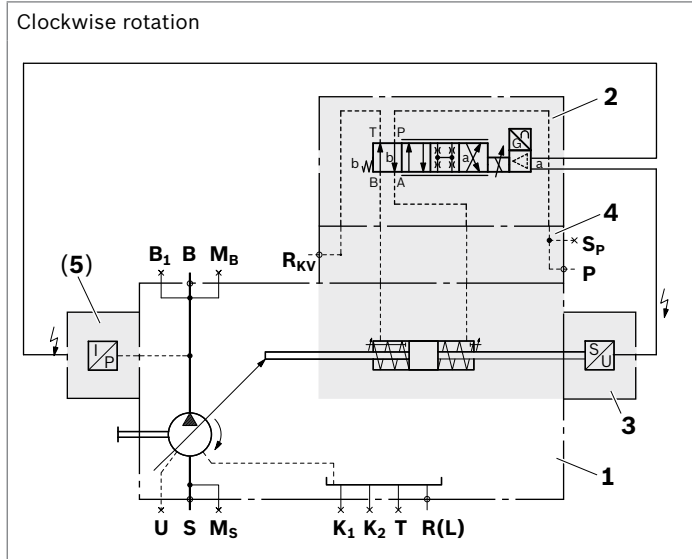


Ports	
S	Suction port
B	Working port
P	Control pressure
S_p	Accumulator control pressure
R_{kv}	Control fluid return flow
M₁, M₂	Measuring control pressure
R₂ ... R₇	Air bleeding the stroking chamber
M_s	Measuring suction pressure
M_b	Measuring operating pressure
K₁, K₂	Flushing port
T	Drain port
R(L)	Fluid filling; air bleeding (drain port)
U	Flushing port
B₁	Additional port

Circuit diagrams HS5EP

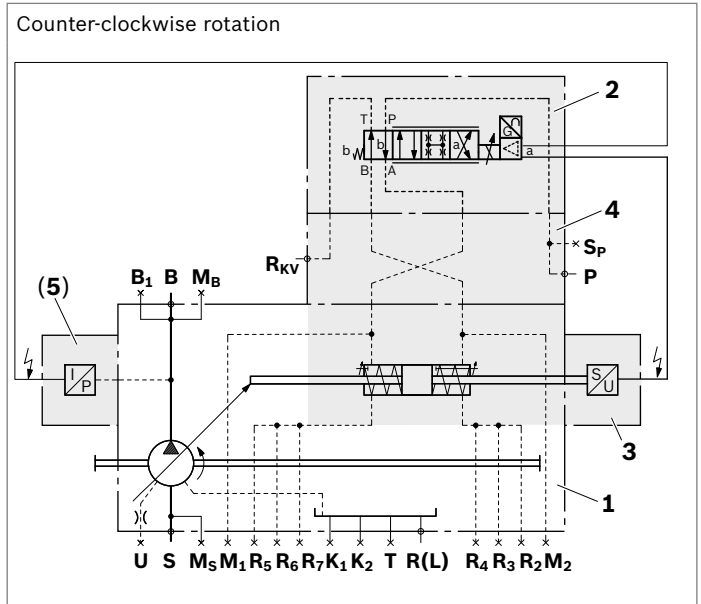
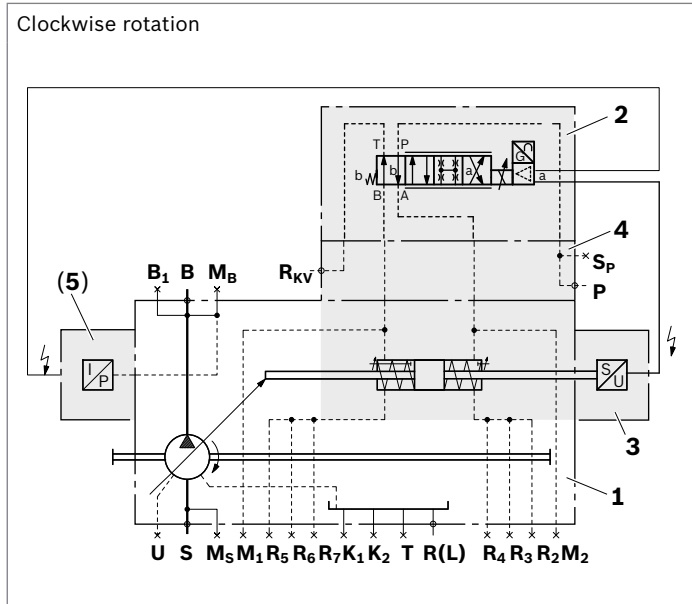
▼ **Size 40 and 71**

Example: (A)A4VSO...HS5EP (with pressure transducer)



▼ **Size 125 to 500**

Example: (A)A4VSO...HS5EP (with pressure transducer)



- 1 Pump with hydraulic control device (A)A4VSO (see data sheet 92050), A4VBO (see data sheet 92122) or A4VHO (data sheet in preparation)
- 2 Pilot control valve HS5E

- 3 Swivel angle sensor VT-SWA-LIN-G15
- 4 Intermediate plate
- 5 **Only with HS5EP:** Pressure transducer HM20-2X/630-C-K35 (see data sheet 30272) with intermediate flange, with (A)A4VSG and (A)A4CSG, each pressure side has 1 pressure transducer assigned and mounted

Electrical data of the pilot control valve

Type		HS5E
Supply voltage ¹⁾	Nominal voltage	24 VDC
	Lower limit value	18 VDC
	Upper limit value	36 VDC
	Maximum permissible residual ripple	2.5 Vss
Power consumption	maximum	40 W
Required external fuse protection		4 A, slow-blow
AD/DA resolution	Analog inputs	12 bit
	Analog outputs ²⁾	10 bit
Actual pressure value input XH4, pins 10 and 11	Analog voltage	0 to 10 V
	Analog current	0 to 20 mA With configuration to current input: Maximum permissible input current 30 mA
Ambient temperature range at the pump	θ	-4 to 140 °F (-20 to +60 °C)
Storage temperature range of pump/electronics	permitted	+32 to 158 °F (0 to +70 °C)
	Ideal storage temperature	41 to 68 °F (+5 to +20 °C)
Hydraulic fluid temperature	θ	-4 to 158 °F (-20 to +70 °C) (for detailed information see instruction manual 92076-01-B)

Environmentally acceptable systems for the areas of EMC, climate, and mechanical loading

Type	HS5E
Mechanical loading: Sinusoidal test according to DIN EN 60068-2-6	10 ... 2000 Hz / maximum 10g / 10 cycles / 3 axes
Mechanical loading: Noise check according to DIN EN 60068-2-64	20 ... 2000 Hz / 10g RMS / 30g peak / 30 min / 3 axes
Mechanical loading: Transport shock according to DIN EN 60068-2-27	15g / 11 ms / 3 axes
Electromagnetic compatibility (EMC)	
▶ EN 61000-6-2 / EN 61000-6-3	10 kV CD / 15 kV AD with BWK B
– EN 61000-4-2 ESD	2 kV with BWK B
– EN 61000-4-4 burst	0.5 kV (sym./asym.) with BWK B
– EN 61000-4-5 surge	10 Veff (150 kHz ... 80 MHz)
– EN 61000-4-6 HF line-conducted	with BWK A
– EN 55016-2-1 radio interference voltage	0.15 ... 30 MHz, Class A, EN 55022
Maximum relative humidity (non-condensing)	95%
Design of electronics	Integrated on pilot valve (OBE)
Electrical connection	See following page 40
Type of protection according to EN 60529 (pump including pilot valve)	IP 65 with mounted and locked plug-in connectors

Notices

- ▶ The information about mechanical loading only refers to components containing electronics, i.e. the HS5E pilot control valve, HM20 and the VT-SWA-Lin.

1) Supply voltage is used directly for sensor connections **X2M1**, **X2M2**, and **X8M** (no internal voltage limitation)
 2) Outputs can be parameterized; for as-delivered condition, see instruction manual 92076-01-B

Signals and pin assignment of the central connector

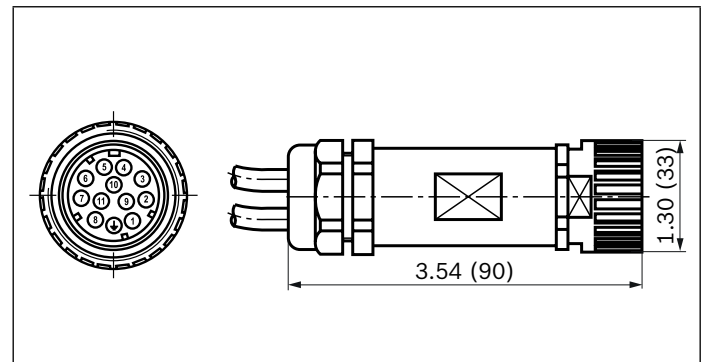
The following table shows the pin assignment of the central connector 11 + PE for pilot control valve HS5E. The column "code" refers to the cable set that can be ordered as optional accessories.

(For cable sets, see instruction manual 92076-01-B).

For the Ethernet M12 connecting cable, please contact Rexroth for the material number.

Please contact us if the unit is to be used outside the specified values.

▼ Central connector



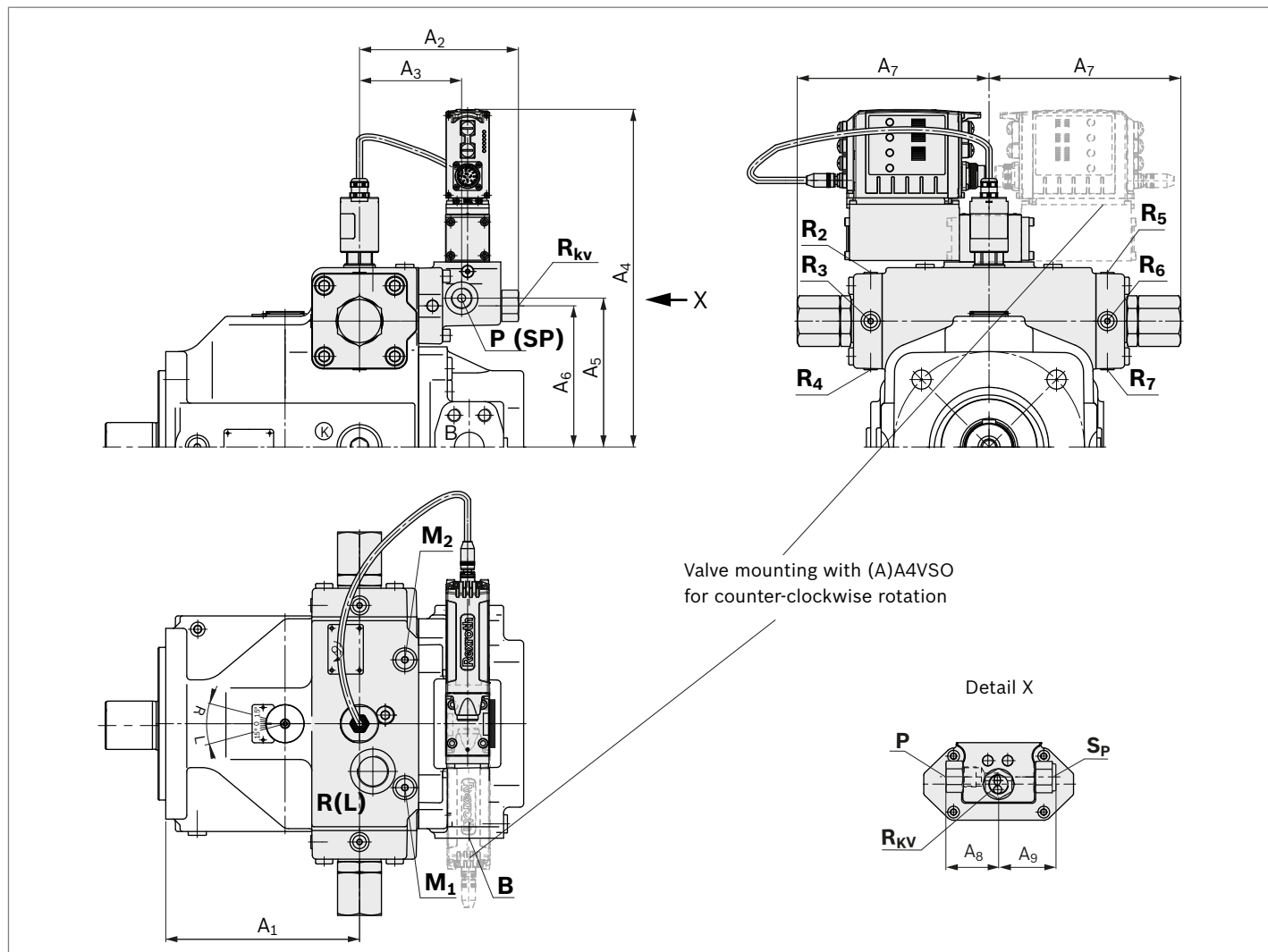
Pin	Signal	description	Signal direction	Signal level	Code
1	+ U _B	voltage supply	IN	+24 V	1
2	L0	Reference potential for voltage supply	-	-	2
⊕	Ground	Ground connection for the electronics	-	-	yellow/ green
3	DO	Switching output 24 V, max. 1.5 A Factory setting: Error signal	OUT	Logical 24 V (Load I _{max} ≤ 50 mA)	white
4	M0	Reference potential for analog signals	-	-	yellow
5	AI 2	Analog input 2 (or digital input, configuration via software) Factory setting: Swivel angle setpoint value standardized	IN	Analog +/-10 V or 0-20 mA (digital 24V)	green
6	AO 2	Analog output 2 Factory setting: Swivel angle actual value standardized	OUT	+/- 10 V or 0-20 mA (Load I _{max} ≤ 1 mA)	violet
7	AI 1	Analog input 1 (or digital input, configuration via software) Factory setting: Pressure setpoint value standardized	IN	+/- 10 V or 0-20 mA or 24 V digital	pink
8	AO 1	Analog output 1 Factory setting: Actual pressure value standardized	OUT	+/- 10 V or 0-20 mA (Load I _{max} ≤ 1 mA)	red
9	DI	Digital input (use can be freely configured) Factory setting: Error reset	IN	Logical 24 V	brown
10	Actual pressure value High	Pressure sensor input: Signal level dependent on parameter setting.	IN	0-10 V, 0-20 mA (freely configurable)	black
11	Actual pressure value Low	Reference potential for actual pressure value High (pin 10)	-	-	blue
n.c.					gray

Notice

- ▶ Connect M0 and L0 in the control cabinet to prevent potential shifts.

Dimensions HS5E

▼ (A)A4VSO, size 40 to 355



NG	A ₁	A ₂	A ₃	A ₄	A ₅	A ₆	A ₇	A ₈	A ₉
40	5.67 (144)	6.30 (160)	3.07 (78)	11.55 (293.5)	5.04 (128)	4.25 (108)	5.12 (130)	1.65 (42)	2.13 (54)
71	6.54 (166)	6.50 (165)	3.27 (83)	13.19 (335)	4.84 (123)	5.63 (143)	6.54 (166)	3.11 (79)	3.11 (79)
125	7.99 (203)	7.01 (178)	4.21 (107)	13.50 (343)	6.14 (156)	5.83 (148)	6.97 (177)	2.76 (70)	2.76 (70)
180	7.99 (203)	7.01 (178)	4.21 (107)	13.94 (354)	6.14 (156)	5.83 (148)	7.91 (201)	2.76 (70)	2.76 (70)
250	9.76 (248)	7.68 (195)	4.88 (124)	14.92 (379)	7.56 (192)	7.24 (184)	9.55 (242.5)	2.76 (70)	2.76 (70)
355	9.76 (248)	7.68 (195)	4.88 (124)	14.92 (379)	7.56 (192)	7.24 (184)	9.55 (242.5)	2.76 (70)	2.76 (70)

Ports	Standard	Size ¹⁾	p _{max abs} [psi (bar)] ²⁾	State ³⁾
M ₁ , M ₂	DIN 3852-1	M14 x 1.5; 0.47 (12) deep (size 125 and 180) M18 x 1.5; 0.47 (12) deep (size 250 and 355)	4550 (315)	X
P, SP	ISO 11926	7/8-14UNF-2B; 0.67 (17) deep	4550 (315)	O
R ₂ ... R ₇	DIN 3852-1	M14 x 1.5; 0.31 (8) deep	4550 (315)	X
R _{KV}	ISO 11926	7/8-14UNF-2B; 0.67 (17) deep	1750 (120)	O

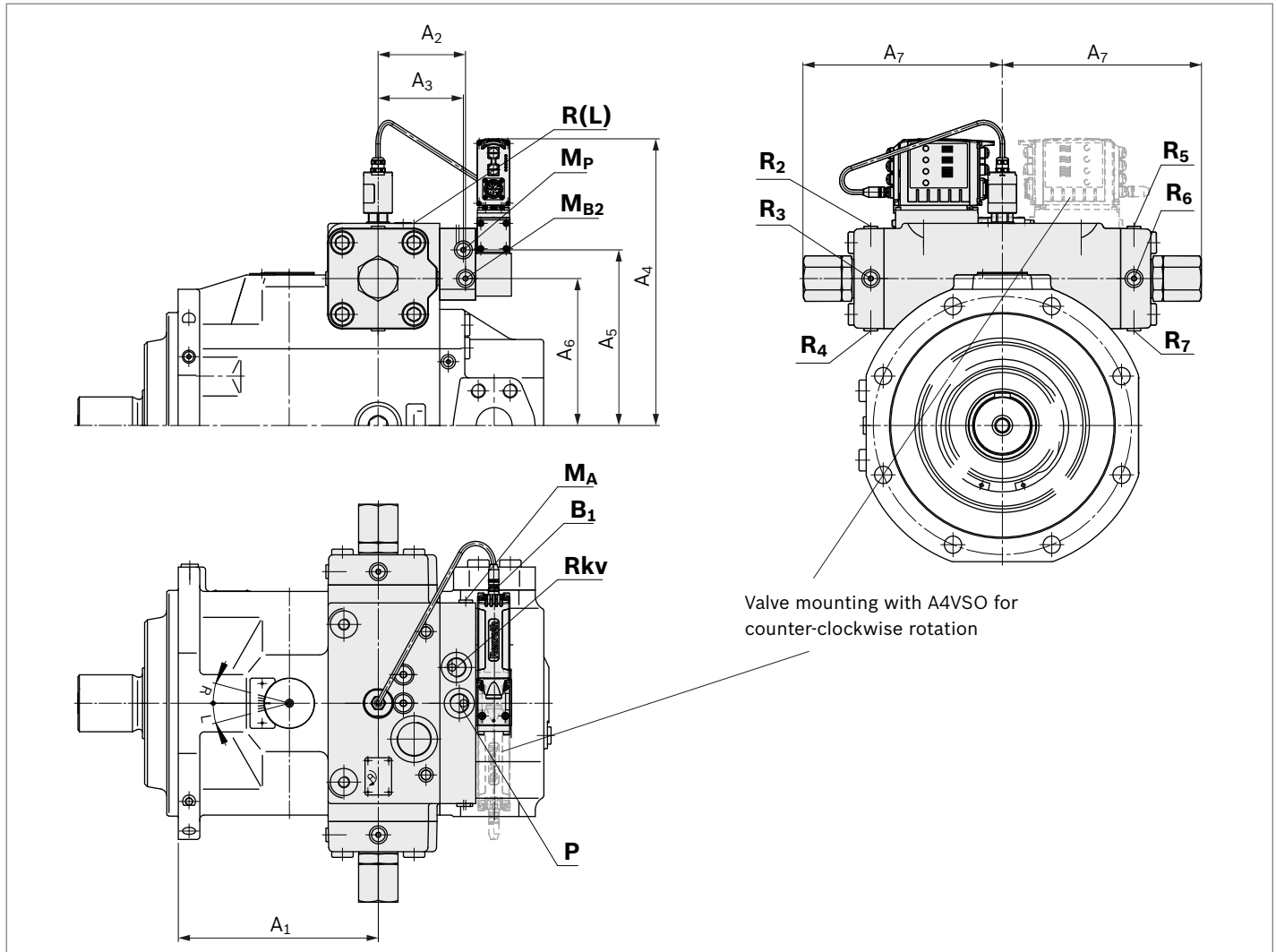
1) For notes on tightening torques, see the instruction manual.

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

3) O = Must be connected (plugged when delivered)
 X = Plugged (in normal operation)

Dimensions HS5E

▼ **A4VSO, size 500**



NG	A ₁	A ₂	A ₃	A ₄	A ₅	A ₆	A ₇	
500	10.98 (279)	4.80 (122)	4.68 (119)	15.75 (400)	9.65 (245)	8.07 (205)	10.93 (277.5)	For detailed dimensions and technical data of the variable pump, see data sheet 92050 ((A)A4VSO)

Ports	Standard	Size ¹⁾	$p_{\max \text{ abs}}$ [psi (bar)] ²⁾	State	
M_{B1}	Measuring control pressure	DIN 3852-1	M18 × 1.5; 0.47 (12) deep	4550 (315)	X
M_{B2}, M_A, M_P	Measuring control pressure	DIN 3852-1	M14 × 1.5; 0.47 (12) deep	4550 (315)	X
P, SP	Control pressure	DIN 3852-1	M27 × 2; 0.63 (16) deep	4550 (315)	O
R₂ ... R₇	Air bleeding the stroking chamber	DIN 3852-1	M14 × 1.5; 0.47 (12) deep	4550 (315)	X
R_{KV}	Control fluid return flow	DIN 3852-1	M27 × 2; 0.63 (16) deep	1750 (120)	O

- 1) For notes on tightening torques, see the instruction manual.
- 2) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
- 3) O = Must be connected (plugged when delivered)
 X = Plugged (in normal operation)

HSK – short circuit valve

Type	Size	40	71	125	180	250	355	500	750	1000	
(A)A4VSO, (A)A4VSG		●	●	●	●	●	●	●	●	●	HSK
(A)A4CSG		–	–	–	–	●	●	●	●	–	

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

Notices

- ▶ The short circuit switching is used for setting and adjustment in depressurized neutral position, but with no 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.

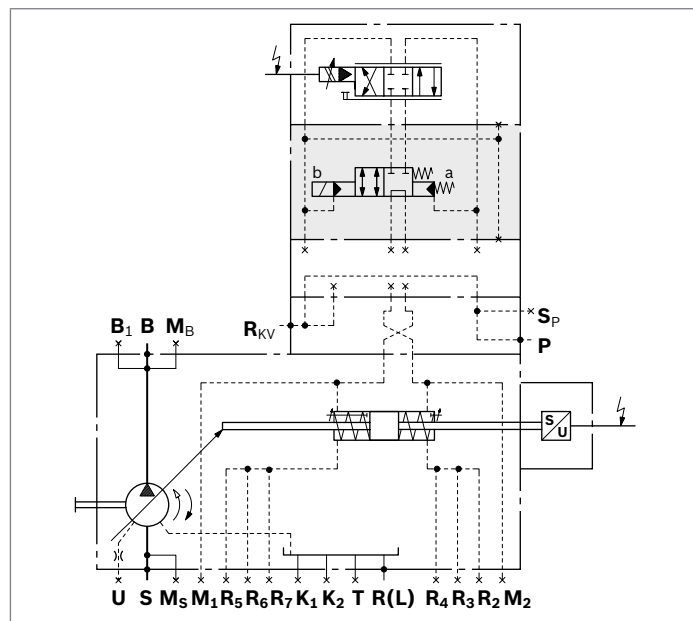
Short circuit valve (4/2-way shut-off valve)

Type Z4WEH10E68-4X/6EG24N9ETZ4/B10D3¹⁾
 (see data sheet 24753).

Circuit diagram HSK

▼ **Size 125 to 355**

Example: open circuit (A)A4VSO

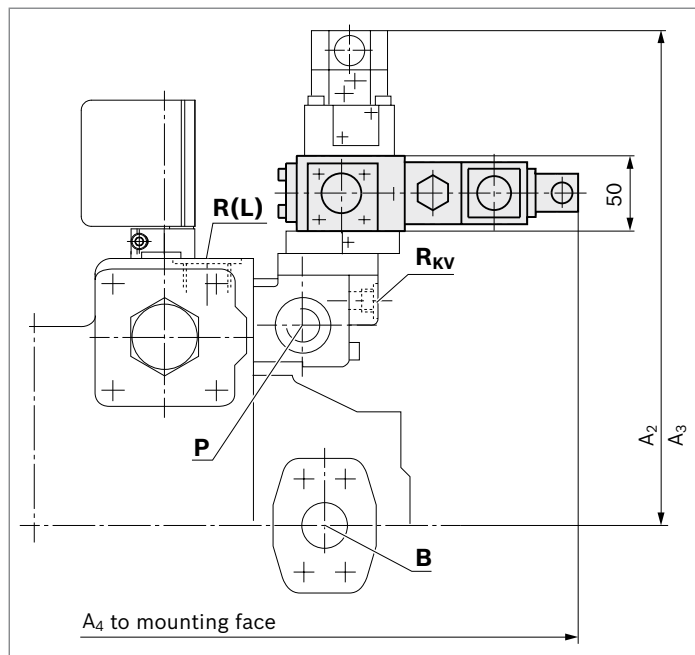


With size 40 and 71, the ports **R₂...R₇** are not present.

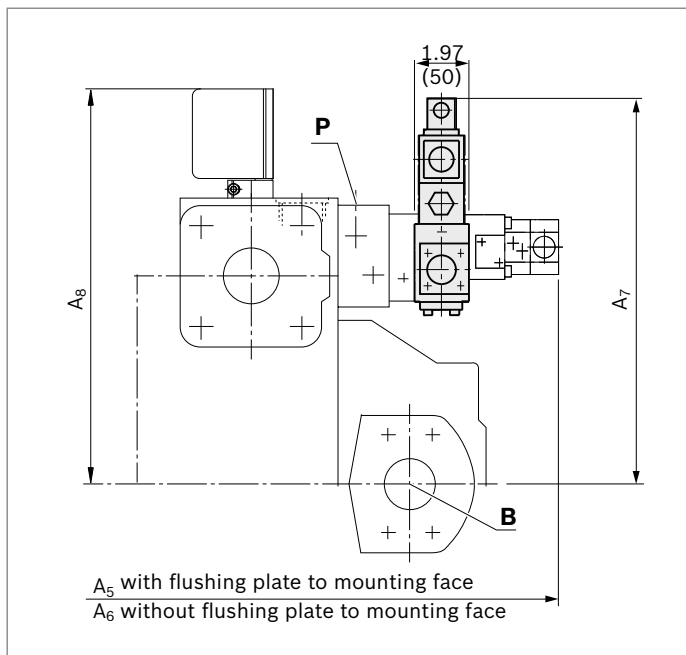
1) With plug-in connector according to DIN EN 175.301-803 / ISO 4400 cable gland M16 × 1.5 for cable diameters 0.18 to 0.93 inch (4.5 to 10 mm)

Dimensions HSK

▼ **Sizes 40 to 355**



▼ **Sizes 500 to 1000**



NG	A ₂	A ₃	A ₄	A ₅	A ₆	A ₇	A ₈
40	12.52 (318)	11.93 (303)	15.87 (403)	-	-	-	-
71	13.23 (336)	12.64 (321)	16.93 (430)	-	-	-	-
125 / 180	13.98 (355)	13.39 (340)	18.86 (479)	-	-	-	-
250 / 355	15.35 (390)	14.76 (375)	21.30 (541)	-	-	-	-
500	-	-	-	22.72 (577)	22.13 (562)	15.79 (401)	15.43 (392)
750	-	-	-	23.94 (608)	23.35 (593)	16.97 (431)	16.81 (427)
1000	-	-	-	26.54 (674)	25.94 (659)	17.87 (454)	17.95 (456)

HS5K / EO1K / EO2K – short circuit valve

Type	Size	40	71	125	180	250	355	500	750	1000	
(A)A4VSG		●	●	●	●	●	●	●	●	●	HS5K
(A)A4CSG		–	–	–	–	●	●	●	●	–	
(A)A4VSO, (A)A4VSG		●	●	●	–	●	–	–	–	–	EO1K
		●	●	●	●	●	●	▲ ²⁾	▲ ²⁾	▲ ²⁾	
(A)A4CSG		–	–	–	–	●	●	▲ ²⁾	▲ ²⁾	–	EO2K

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

Notices

- ▶ The short circuit switching is used for setting and adjustment in depressurized neutral position, but with no 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.

Detailed information on EO1 and EO2 control is available from page 48.

● = **Short circuit valve** (4/2-way shut-off valve)

Type Z4WE6E68-3X/EG24N9Z4/V¹⁾ (see data sheet 23193, please observe limits of performance).

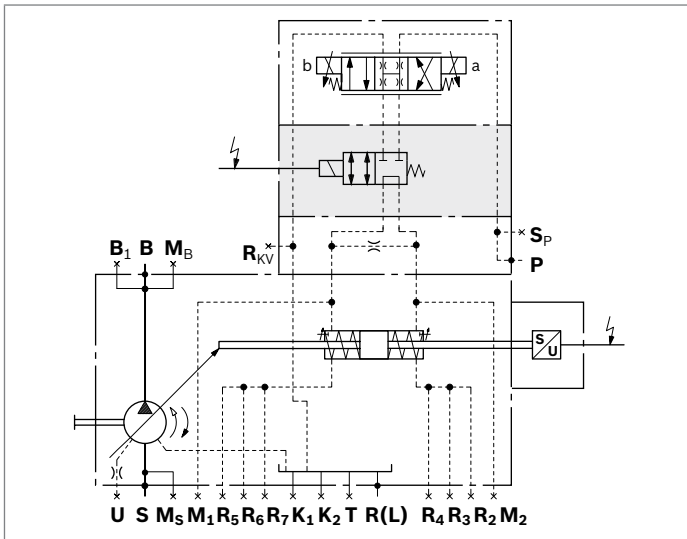
▲ = **Short circuit valve** (4/2-way shut-off valve)

Type Z4WEH10E68-4X/6EG24N9ETZ4/B10D3¹⁾ (see data sheet 24753).

Circuit diagrams

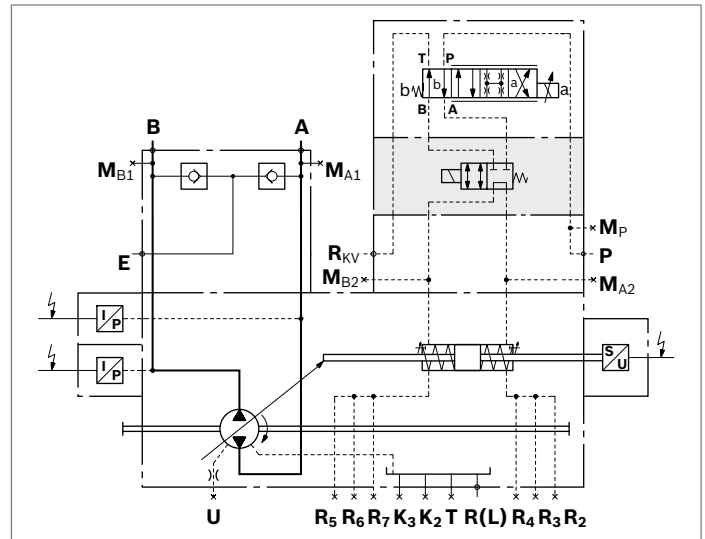
▼ Size 125 to 355

Example: open circuit (A)A4VSO **EO2K**



▼ Size 500 to 1000

Example: closed circuit A4VSG **HS5KP**

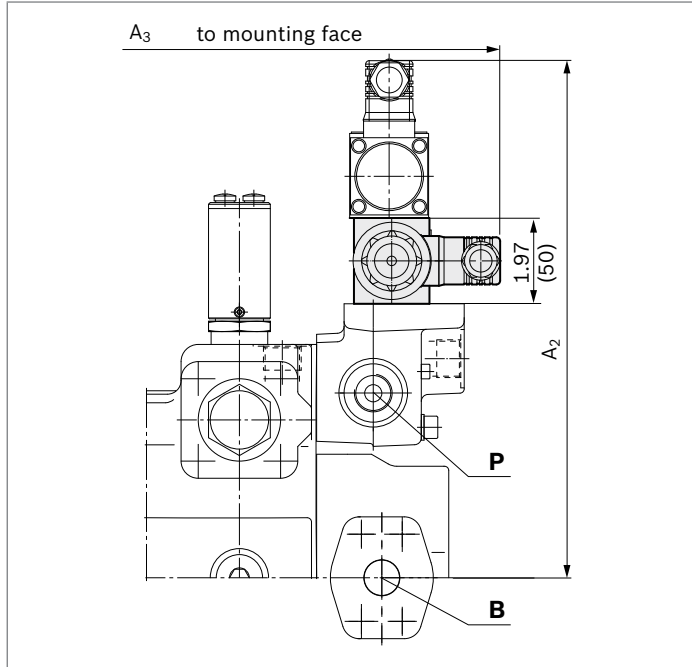


1) With plug-in connector according to DIN EN 175301-803 / ISO 4400 cable gland M16 × 1.5 for cable diameters 0.18 to 0.93 inch (4.5 to 10 mm)

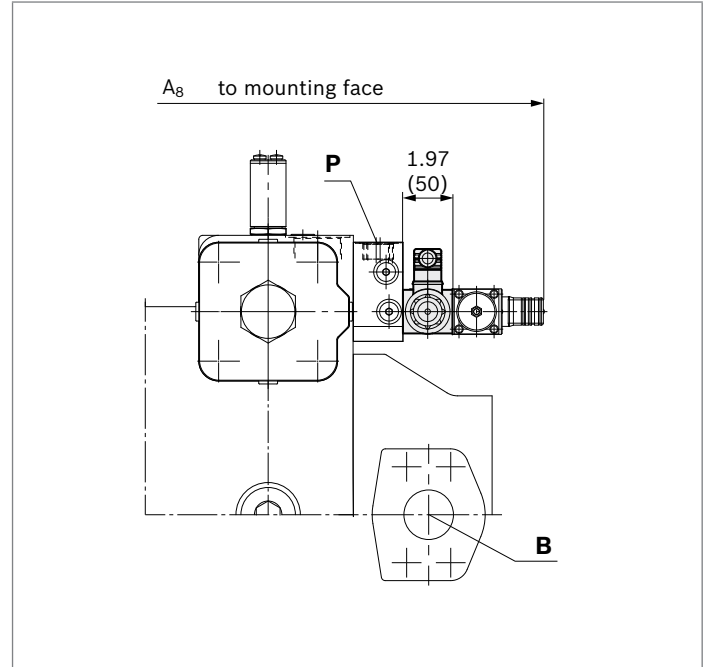
2) For circuit diagram and dimensions, see page 35

Dimensions

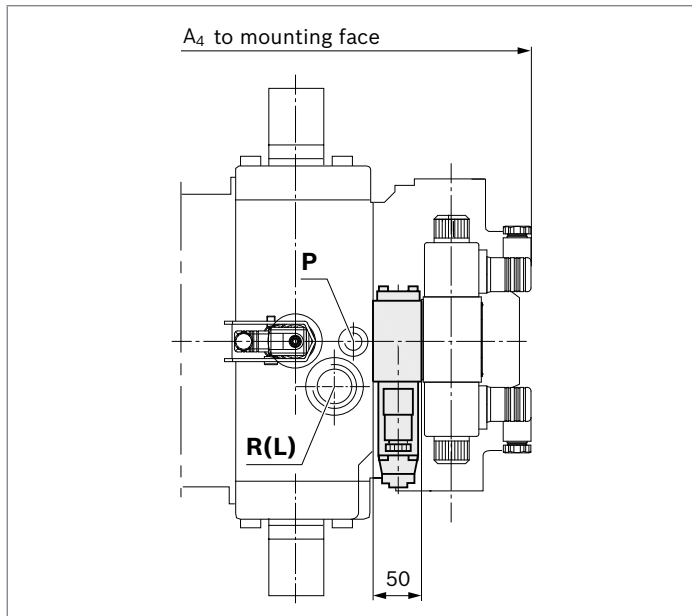
▼ **HS5K, size 40 to 355**



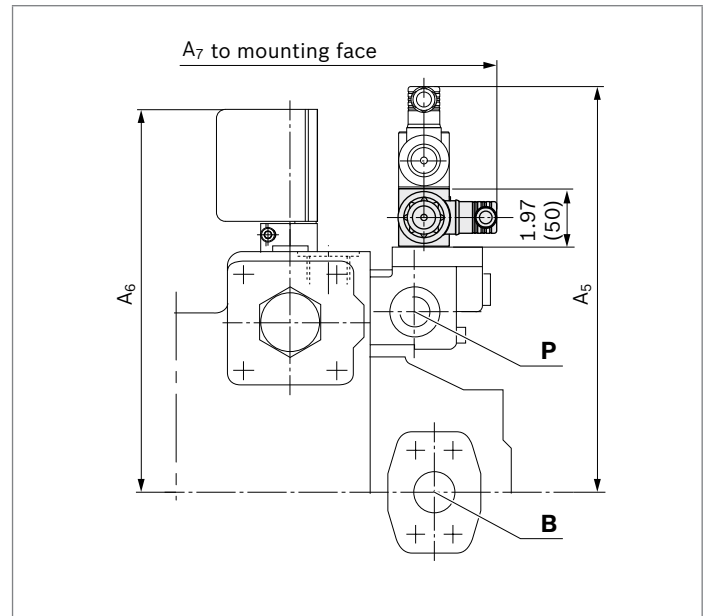
▼ **HS5K, size 500 to 1000**



▼ **EO1K, size 40 and 71**



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

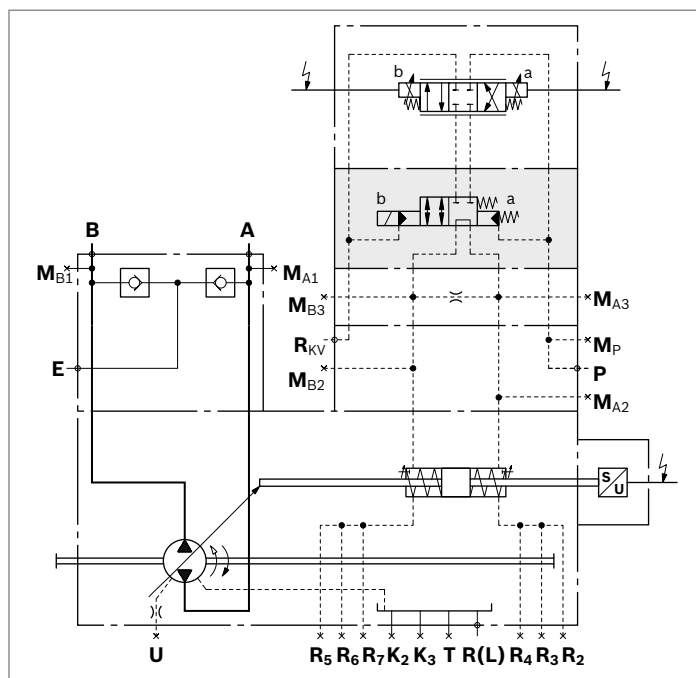


NG	A ₂	A ₃	A ₄	A ₅	A ₆	A ₇	A ₈
40	11.90 (301)	11.65 (296)	12.76 (324)	11.73 (298)	9.69 (246)	11.61 (295)	–
71	12.24 (311)	12.72 (323)	13.82 (351)	12.36 (314)	10.43 (265)	12.68 (322)	–
125 / 180	13.20 (336)	15.00 (381)	–	10.03 (331)	11.73 (298)	14.92 (379)	–
250 / 355	14.39 (365.5)	17.44 (443)	–	14.37 (365)	13.58 (345)	17.44 (443)	–
500	–	–	–	–	–	–	21.69 (551)
750	–	–	–	–	–	–	22.95 (583)
1000	–	–	–	–	–	–	25.55 (649)

Circuit diagram EO2K

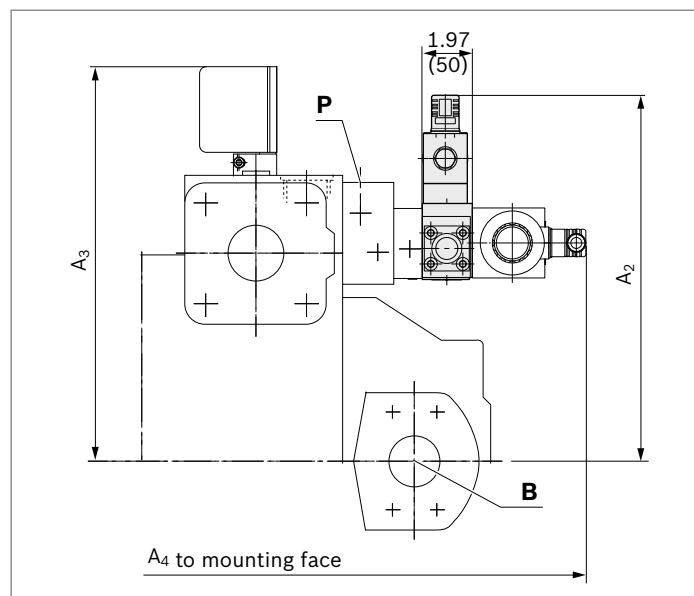
▼ **Size 500 to 1000**

Example: closed circuit A4VSG **EO2K**



Dimensions EO2K

▼ **Sizes 500 to 1000**



NG	A ₂	A ₃	A ₄
500	15.20 (386)	15.43 (392)	23.98 (609)
750	16.42 (417)	16.81 (427)	25.24 (641)
1000	17.28 (439)	17.95 (456)	27.83 (707)

EO1 / EO2 – control with proportional valve

Type	Size	40	71	125	180	250	355	500	750	1000	
(A)A4VSO, (A)A4VSG		●	●	●	–	●	–	–	–	–	EO1
		●	●	●	●	●	●	●	●	●	
(A)A4CSG		–	–	–	–	●	●	●	●	–	EO2

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 a 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% $V_{g \max}$.

Notices

Setting with (A)A4VSO (open circuit):

- ▶ The $V_{g \max}$ stop is set to nominal $V_{g \max}$ as standard. Other values should be specified when placing the order
- ▶ The $V_{g \min}$ stop is set to $V_g = 0$ gpm (0 l/min) with $P_{HD} = 290$ psi (20 bar) as standard. Other values should be specified when placing the order.

Setting with (A)A4VSG and (A)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

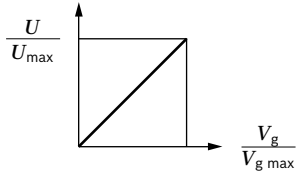
The electric amplifier VT 5035-1X for controlling the pump swivel angle is not included in the EO scope of delivery, please order separately in accordance with data sheet 29955.

Two versions are available:

Type	Control pressure [psi (bar)]	Sizes
EO1	from 290 (20)	40, 71, 125 and 250 (see from page 49)
EO2	from 725/1450/1850 (50/100/125)	40...1000 (see from page 51)

A4VSO – open circuit

▼ **Characteristic curve**



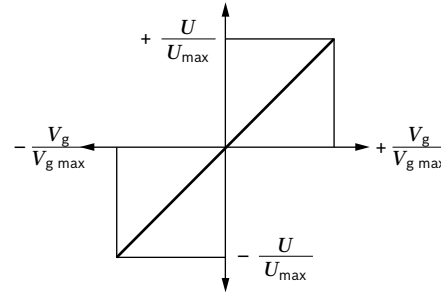
▼ **Flow direction S to B**

Direction of rotation	Swiveling range ¹⁾	Actuation of solenoid
clockwise	counter-clockwise	a
counter-clockwise	clockwise	b

Overcenter is available on request.

A4VSG and A4CSG – closed circuit

▼ **Characteristic curve**



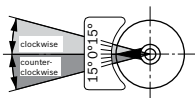
▼ **Flow direction**

Direction of rotation	Swiveling range ¹⁾	Flow direction	Actuation of solenoid
	clockwise	B to A	b
clockwise	counter-clockwise	A to B	a
	clockwise	A to B	b
counter-clockwise	counter-clockwise	B to A	a

Technical data EO1

Size		NG	40	71	125	250
Control pressure (in P)	p_{min}	psi (bar)	290 (20)	290 (20)	290 (20)	290 (20)
	p_{max}	psi (bar)	1450 (100)	1450 (100)	1450 (100)	1450 (100)
Control stroke	s_{max}	inch (mm)	0.56 (14.2)	0.67 (17.1)	0.81 (20.7)	1.02 (25.9)
Control area	A	in ² (cm ²)	2.57 (16.6)	3.81 (24.6)	5.63 (36.6)	8.79 (56.7)
Control volume	$V_{S max}$	in ³ (cm ³)	1.44 (23.6)	2.57 (42.1)	4.59 (75.2)	8.97 (147)
Setting time ²⁾	t_{min}	s	0.12	0.20	0.22	0.40
Weight: approx. ((A)A4VSO...EO1...N00)	m	lbs (kg)	92 (42)	130 (59)	216 (98)	440 (200)
Maximum hysteresis ΔV_g ³⁾			$\leq \pm 2\%$ of $V_{g max}$			
Minimum repeatability ³⁾			$\leq \pm 1.5\%$ of $V_{g max}$			
Linearity deviation ³⁾			$\leq 2.5\%$ of $V_{g max}$			

1) cf. swivel angle indicator



2) With 725 psi (50 bar) control pressure

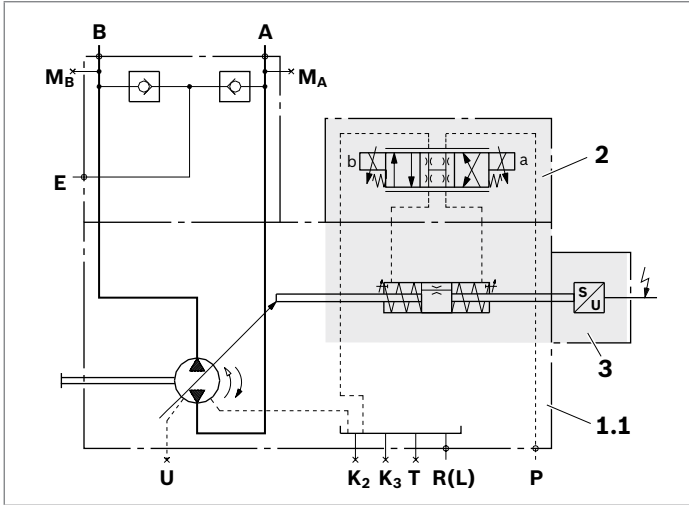
3) Values are valid for a constant operating temperature of 122 °F (50 °C)

Circuit diagrams EO1

The control fluid to be supplied externally on port **P** is drained internally via the drain port **R(L)** of the pump. For (A)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 flushing pressure relief valve: 365psi (25 bar).

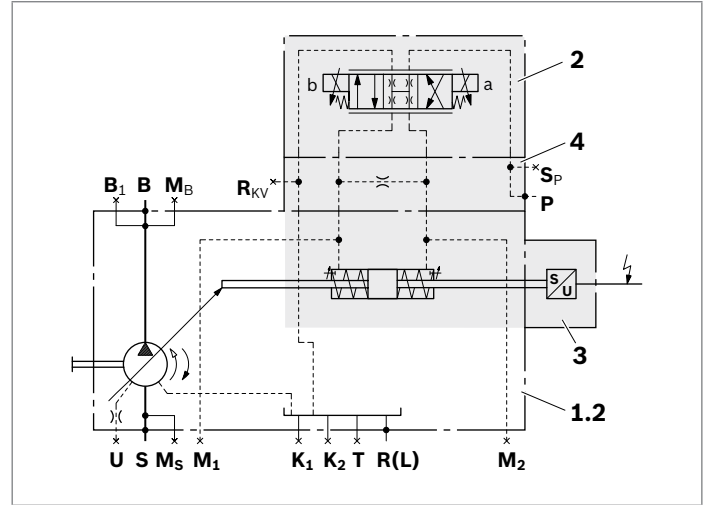
▼ **Size 40 and 71**

Example: closed circuit (A)A4VSG



▼ **Size 125 to 355**

Example: open circuit (A)A4VSO



- 1 Pump with hydraulic control device
- 1.1 (A)A4VSG (see data sheet 92100)
- 1.2 (A)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

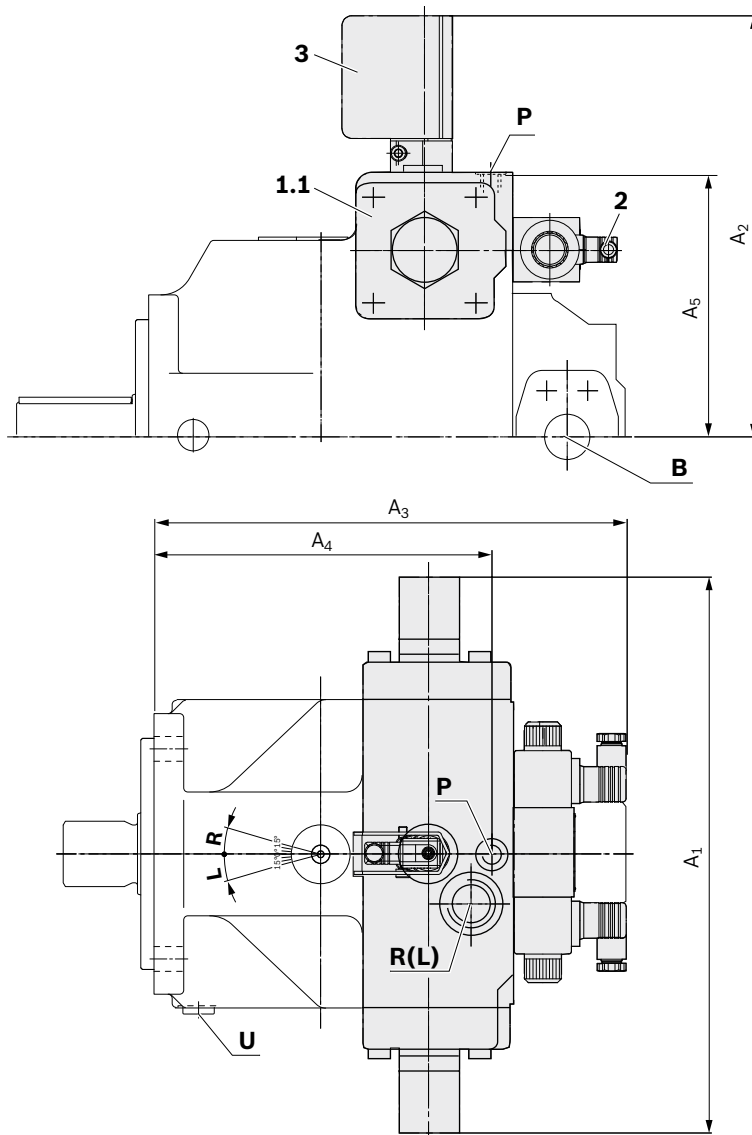
- 3 Inductive position transducer AWXX004D02¹⁾
- 4 Throttle plate

Ports	
P	Control pressure
SP	Accumulator control pressure
R_{KV}	Control fluid return flow
M₁, M₂	Measuring ports control pressure

1) Solenoids with plug-in connector according to DIN EN 175.301-803 / ISO 4400 cable gland M16 × 1.5 for cable diameters 0.18 to 0.39 inch (4.5 to 10 mm)

Dimensions EO1

▼ (A)A4VSO and (A)A4VSG, size 40 and 71



For key, see page 50

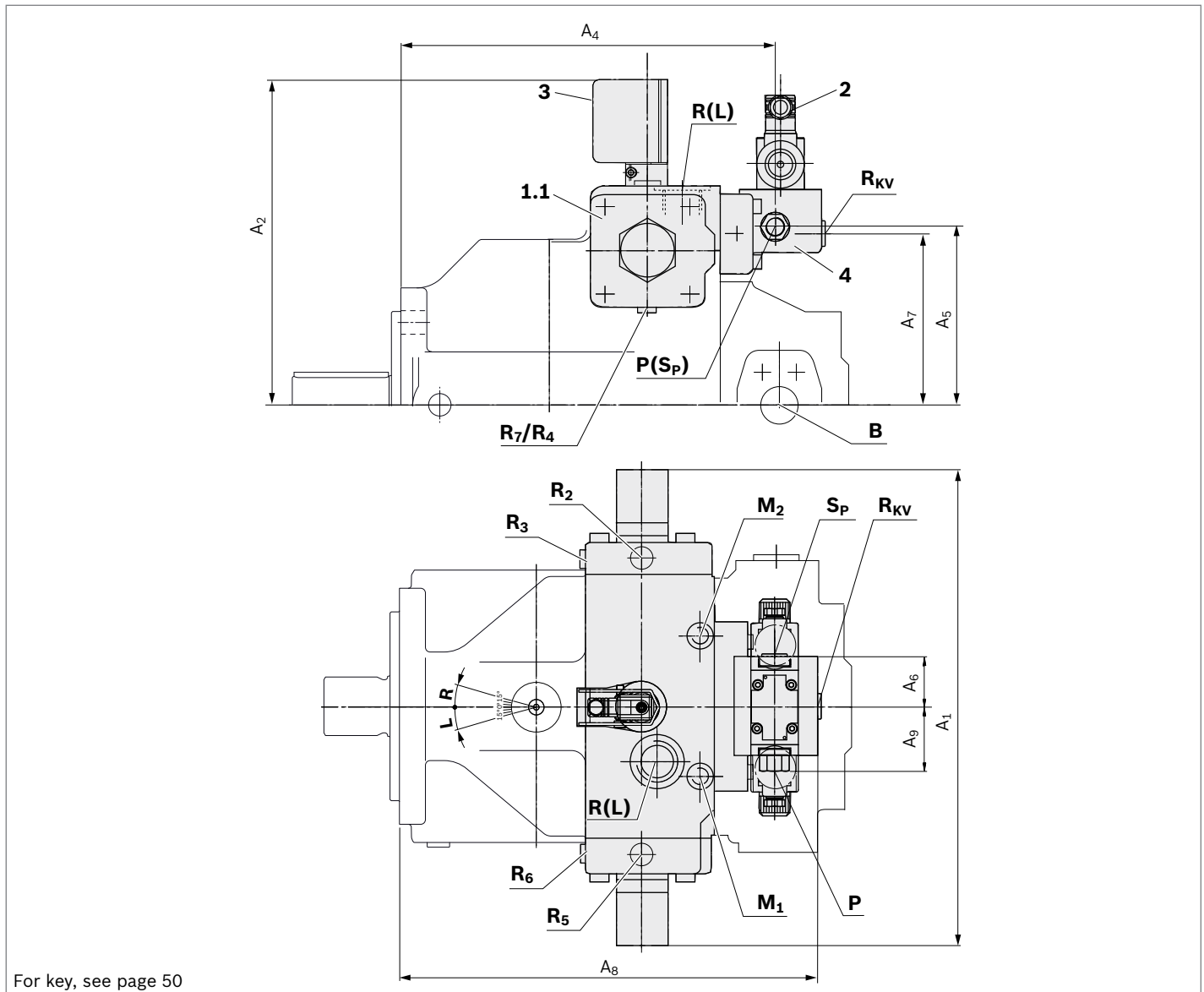
NG	A ₁	A ₂	A ₃	A ₄	A ₅	
40	11.65 (296)	9.69 (246)	10.98 (279)	7.01 (178)	5.31 (135)	For detailed dimensions and technical data for the variable pump, see data sheets 92050 ((A)A4VSO) or 92100 ((A)A4VSG)
71	13.07 (332)	10.43 (265)	12.05 (306)	8.07 (205)	5.98 (152)	

Ports	Standard	Size ¹⁾	$p_{max abs}$ [psi (bar)] ²⁾	State	
P	Control pressure	ISO 11926	9/16-18UNF-2B; 0.47 (12) deep	1450 (100)	O

1) For notes on tightening torques, see the 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)

▼ **(A)A4VSO and (A)A4VSG, size 125 and 250**



For key, see page 50

NG	A ₁	A ₂	A ₄	A ₅	A ₆	A ₇	A ₈	A ₉
125	15.83 (402)	11.73 (298)	12.28 (312)	6.14 (156)	1.54 (39)	5.83 (148)	13.86 (352)	2.76 (70)
250	10.09 (485)	13.58 (345)	14.65 (372)	7.56 (192)	1.54 (39)	7.24 (184)	16.22 (412)	2.76 (70)

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

Ports	Standard	Size ¹⁾	$p_{\max \text{ abs}}$ [psi (bar)] ²⁾	State	
P	Control pressure	ISO 11926	7/8-14UNF-2B; 0.67 (17) deep	1450 (100)	O
S_P	Accumulator control pressure	DIN 3852-1	M22 × 1.5; 0.55 (14) deep	1450 (100)	X
R_{KV}	Control fluid return flow	DIN 3852-1	M22 × 1.5; 0.55 (14) deep	60 (4)	O
M₁, M₂	Measuring control pressure	ISO 11926	9/16-18UNF-2B; 0.5 (13) deep (size 125) 3/4-16UNF-2B; 0.59 (15) deep (size 250)	1450 (100) 1450 (100)	X X
R₂ ... R₇	Air bleeding the stroking chamber	DIN 3852-1	M10 × 1; 0.31 (8) deep	1450 (100)	X

1) For notes on tightening torques, see the 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}	psi (bar)	725 (50)	725 (50)	725 (50)	1450 (100)	1450 (100)	1450 (100)	1850 (125)	1850 (125)	1850 (125)
	$p_{\max}^{1)}$	psi (bar)	4550 (315)	4550 (315)	4550 (315)	4550 (315)	4550 (315)	4550 (315)	4550 (315)	4550 (315)	4550 (315)
Control stroke	s_{\max}	inch (mm)	0.56 (14.2)	0.67 (17.1)	0.81 (20.7)	0.81 (20.7)	1.02 (25.9)	1.02 (25.9)	1.28 (32.6)	1.46 (37.0)	1.63 (41.4)
Control area	A	in ² (cm ²)	1.26 (8.1)	1.95 (12.6)	2.81 (18.1)	2.81 (18.1)	4.39 (28.3)	4.39 (28.3)	5.92 (38.2)	8.80 (56.8)	9.63 (63.6)
Control volume	$V_{S \max}$	in ³ (cm ³)	0.70 (11.4)	1.31 (21.5)	2.29 (37.5)	2.29 (37.5)	4.47 (73.2)	4.47 (73.2)	7.60 (124.5)	12.81 (210)	16.07 (263.3)
Setting time ²⁾	t_{\min}	s	0.1	0.12	0.2	0.2	0.25	0.25	0.3	³⁾	³⁾
Weight: approx. ((A)A4VSO...EO2...N00)	m	lbs (kg)	92 (42)	130 (59)	216 (98)	269 (122)	440 (200)	484 (220)	744 (338)	1058 (481)	1344 (611)
Maximum hysteresis $\Delta V_g^{4)}$	$\leq \pm 2\%$ of $V_{g \max}$										
Minimum repeatability ⁴⁾	$\leq \pm 1.5\%$ of $V_{g \max}$										
Linearity deviation ⁴⁾	$\leq 2.5\%$ of $V_{g \max}$										

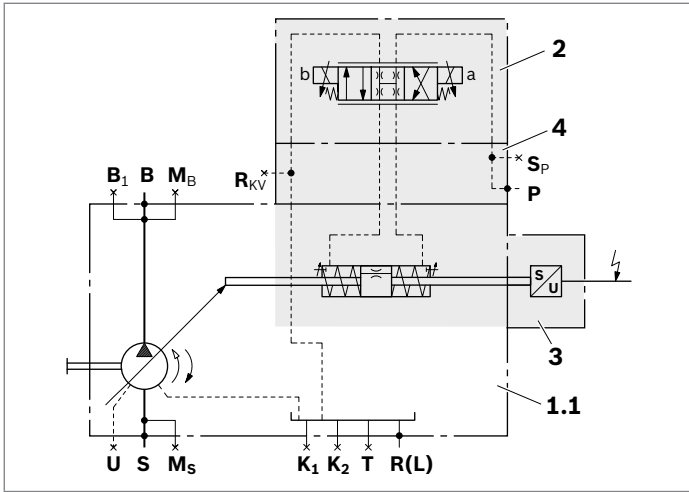
- 1) Due to the permissible data of the proportional valve
 2) With minimum control pressure
 3) Values are valid for a constant operating temperature of 122°F (50 °C)
 4) On request

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 pilot fluid consumption, the stroking chambers are sealed in sizes 125...355 and can be bled via the ports **R₂** to **R₇**.

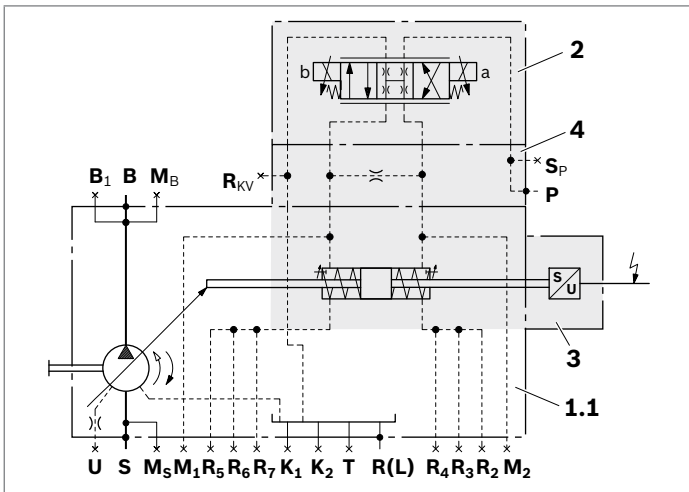
▼ **Size 40 and 71**

Example: open circuit (A)A4VSO



▼ **Size 125 to 355**

Example: open circuit (A)A4VSO



Circuit diagram EO2 – size 500 to 1000

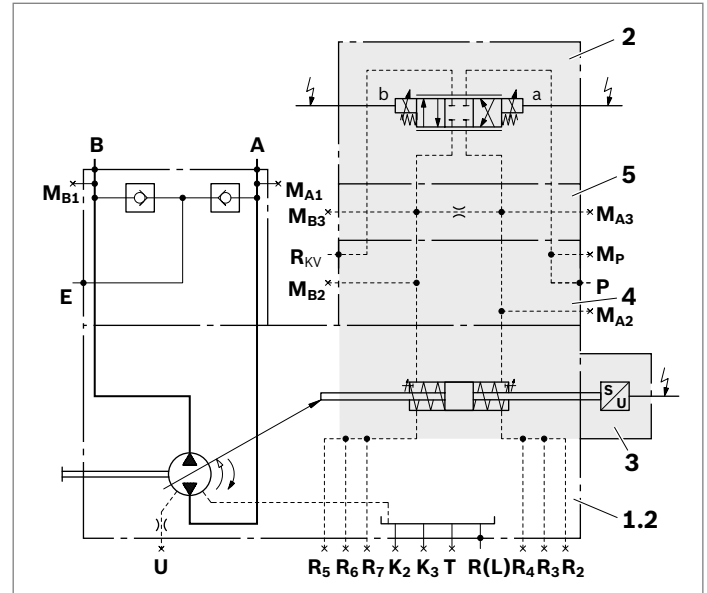
The control fluid to be supplied externally on port **P** is drained via the port **R_{KV}** to be connected externally to the reservoir.

For A4CSG with EO2, the control pressure relief valve is not required and is replaced with a threaded plug.

To minimize the pilot fluid consumption, the stroking chambers are sealed and can be bled via the ports **R₂** to **R₇**.

▼ **Size 500 to 1000**

Example: closed circuit A4VSG



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

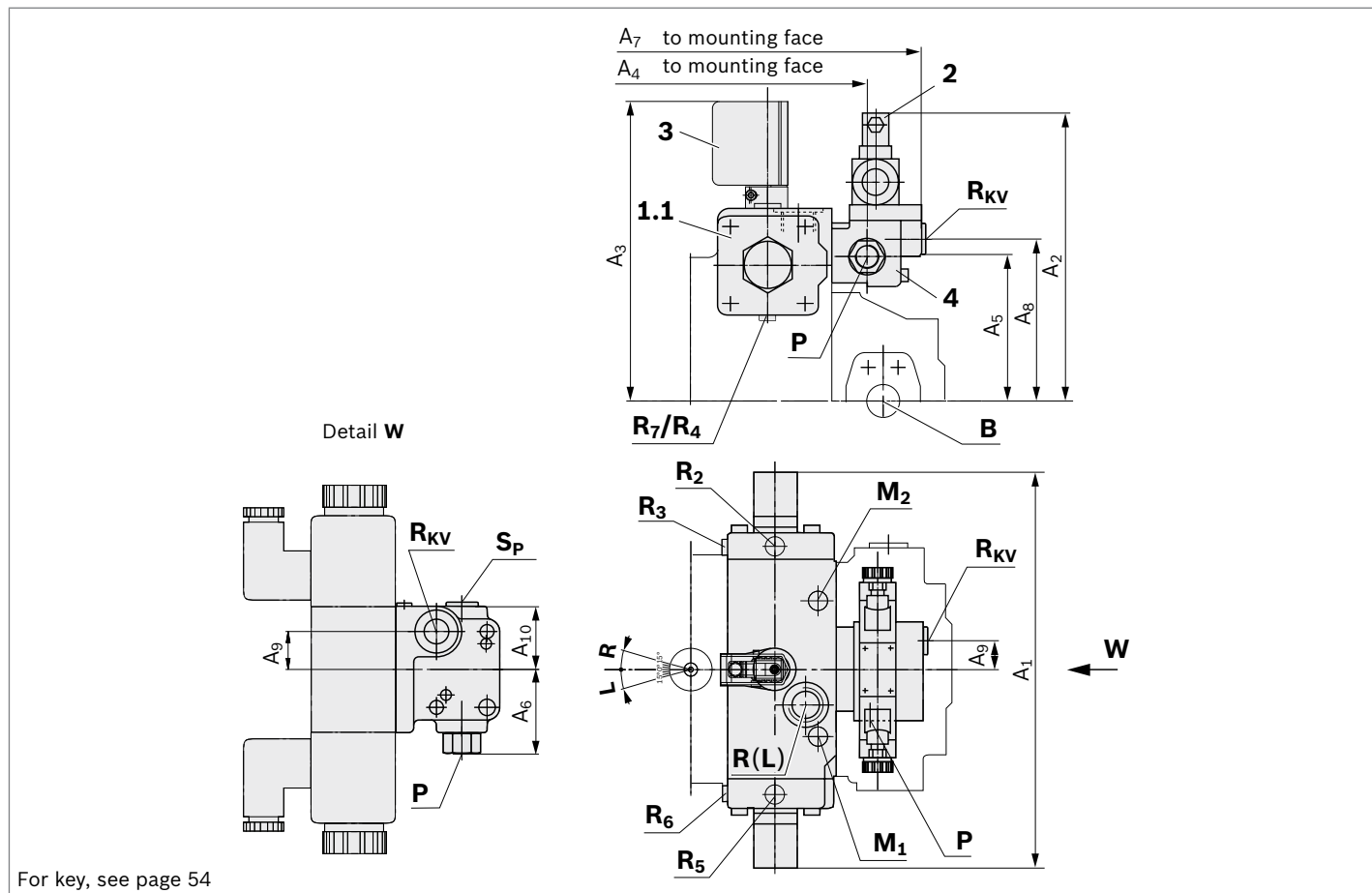
NG	Type ¹⁾
40 and 71	4WRA6V15-2X/G24N9K4/V-589
125 to 355	4WRA6V30-2X/G24N9K4/V-589
500 to 1000	4WRE10E25-2X/24K4/V-93

- 3 Inductive position transducer AWXX004D02¹⁾
- 4 Intermediate plate
- 5 Throttle plate

1) Solenoids with plug-in connector according to DIN EN 175.301-803 / ISO 4400 cable gland M16 × 1.5 for cable diameters 0.18 to 0.39 inch (4.5 to 10 mm)

Dimensions EO2

▼ (A)A4VSO, (A)A4VSG and (A)A4CSG, size 40 to 355



For key, see page 54

NG	A ₁	A ₂	A ₃	A ₄	A ₅	A ₆	A ₇	A ₈	A ₉	A ₁₀	
40	11.65 (296)	9.76 (248)	9.69 (246)	8.74 (222)	4.25 (108)	2.91 (74)	10.75 (273)	5.04 (128)	1.38 (35)	2.09 (53)	For detailed dimensions and technical data for the variable pump, see data sheets 92050 ((A)A4VSO), 92100 ((A)A4VSG) or 92105 ((A)A4CSG)
71	13.07 (332)	11.39 (264)	10.43 (265)	9.80 (249)	4.84 (123)	3.11 (79)	11.81 (300)	5.63 (143)	1.18 (30)	1.89 (48)	
125/180	15.83 (402)	11.06 (281)	11.73 (298)	12.20 (310)	6.14 (156)	2.76 (70)	13.78 (350)	5.83 (148)	0	1.54 (39)	
250/355	19.09 (485)	12.48 (317)	13.58 (345)	14.65 (372)	7.56 (192)	2.76 (70)	16.22 (412)	7.24 (184)	0	1.54 (39)	

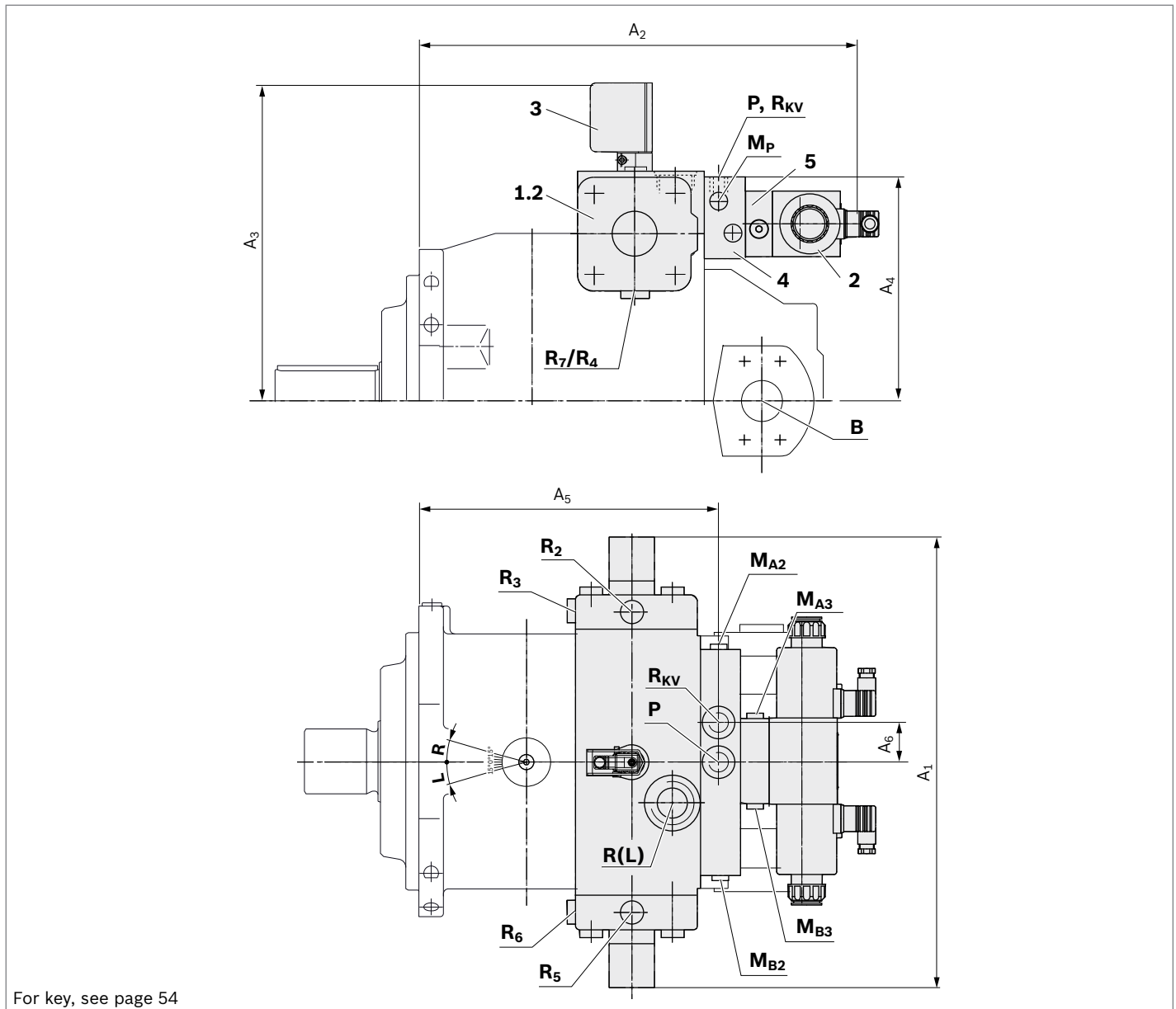
Ports	Standard	Size ¹⁾	p _{max abs} [psi (bar)] ²⁾	State	
P	Control pressure	ISO 11926	7/8-14UNf-2B; 0.67 (17) deep	4550 (315)	O
S_P	Accumulator control pressure	DIN 3852-1	M22 × 1.5; 0.55 (14) deep	4550 (315)	X
R_{KV}	Control fluid return flow	DIN 3852-1	M22 × 1.5; 0.55 (14) deep	3050 (210)	X
M₁, M₂	Measuring control pressure	DIN 3852-1	M14 × 1.5; 0.47 (12) deep (size 125 and 180) M18 × 1.5; 0.47 (12) deep (size 250 and 355)	4550 (315) 4550 (315)	X X
R₂ ... R₇	Air bleeding the stroking chamber	DIN 3852-1	M10 × 1; 0.31 (8) deep (size 125 to 355)	4550 (315)	X

1) For notes on tightening torques, see the 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 54

NG	A ₁	A ₂	A ₃	A ₄	A ₅	A ₆	
500	21.85 (555)	22.01 (559)	15.43 (392)	10.79 (274)	15.28 (388)	1.97 (50)	For detailed dimensions and technical data for the variable pump, see data sheets 92050 ((A)A4VSO), 92100 ((A)A4VSG) or 92105 ((A)A4CSG)
750	24.80 (630)	23.27 (591)	16.81 (427)	11.97 (304)	16.54 (420)	1.97 (50)	
1000	26.38 (670)	25.87 (657)	17.95 (456)	12.87 (327)	19.13 (486)	1.97 (50)	

Ports	Standard	Size ¹⁾	$p_{max abs}$ [psi (bar)] ²⁾	State	
P	Control pressure	DIN 3852-1	M27 × 2; 0.63 (16) deep	4550 (315)	O
R_{KV}	Control fluid return flow	DIN 3852-1	M27 × 2; 0.63 (16) deep	3050 (210)	O
M_P, M_{A2}, M_{B2}	Measuring control pressure	DIN 3852-1	M14 × 1.5; 0.47 (12) deep	4550 (315)	X
M_{A3}, M_{B3}	Measuring control pressure	DIN 3852-1	G 1/4 in	4550 (315)	X
R₂ ... R₇	Air bleeding the stroking chamber	DIN 3852-1	M14 × 1.5; 0.47 (12) deep	4550 (315)	X

1) For notes on tightening torques, see the 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	
(A)A4VSO, (A)A4VSG		•	•	•	•	•	•	-	-	-	Z
(A)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 position.
HS5 with intermediate plate filter on request.

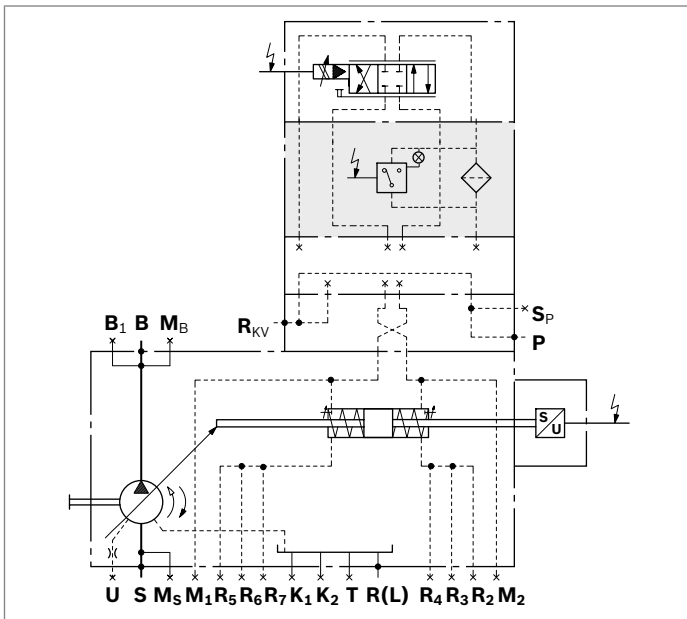
Intermediate plate filter

The contamination indicator is effected 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

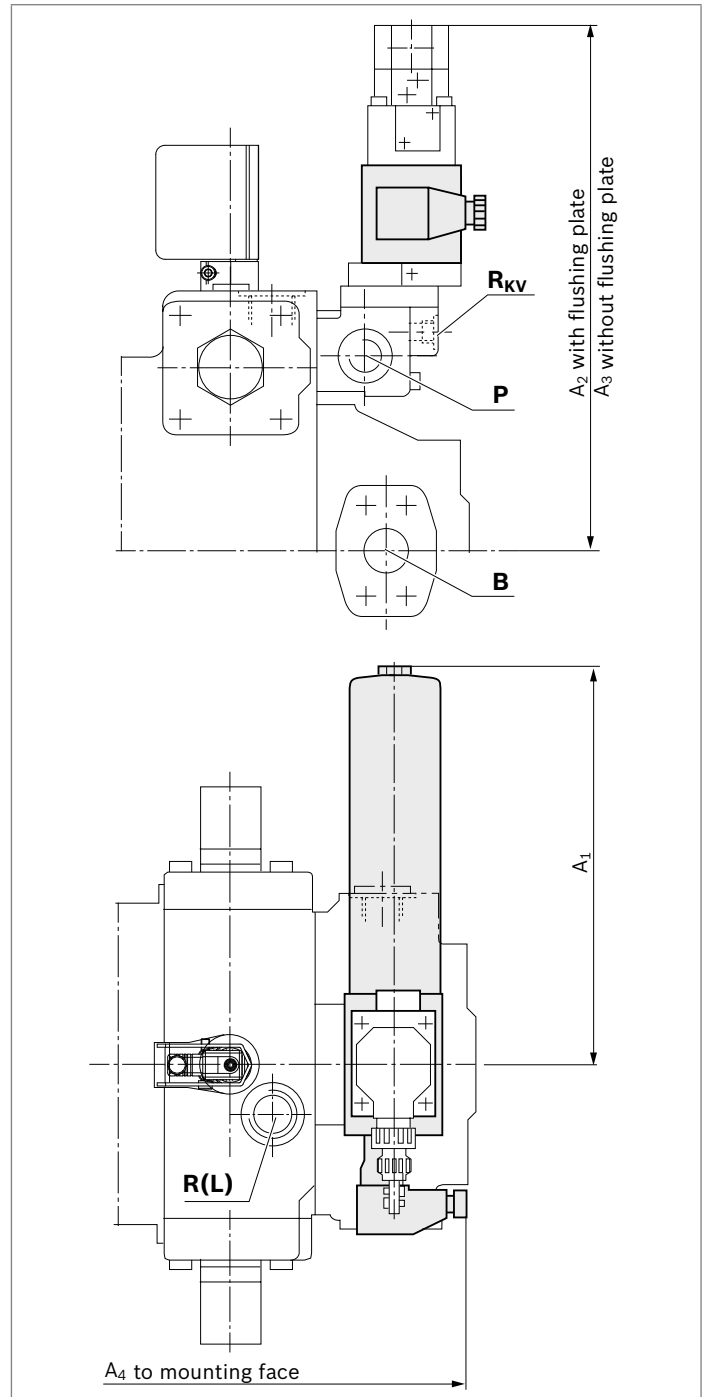
▼ Example: A4VSG



NG	A ₂	A ₃	A ₄	A ₅
40	8.50 (216)	13.46 (342)	12.87 (327)	11.81 (300)
71	8.35 (212)	13.78 (350)	13.19 (335)	12.28 (312)
125 / 180	10.71 (272)	14.72 (374)	14.13 (359)	14.80 (376)
250 / 355	10.71 (272)	16.18 (411)	15.59 (396)	17.24 (438)

Dimensions

▼ Example: HS...Z



Installation instructions

The installation instructions for the relevant variable pump apply:

- ▶ (A)A4VSO, data sheet 92050
- ▶ A4VBO, data sheet 92122
- ▶ (A)A4VSG, data sheet 92100
- ▶ (A)A4CSG, data sheet 92105

Only the controls **HM1**, **HM2** and **HS5M** are suitable for use under fluid.

Project planning notes

- ▶ The control systems HM, HS, HS5 and EO are intended for use in the open circuit ((A)A4VSO, A4VBO) or closed circuit ((A)A4VSG, (A)A4CSG) depending on the pump.
- ▶ The project planning, installation and commissioning of the axial piston unit requires the involvement of qualified skilled personnel.
- ▶ Before using the axial piston unit, please read the corresponding instruction manual completely and thoroughly. If necessary, this can be requested from Bosch Rexroth.
- ▶ Before finalizing your design, please request a binding installation drawing.
- ▶ The specified data and notes contained herein must be observed.
More information on the products can be found in the data sheets on page 1.
- ▶ Depending on the operating conditions of the axial piston unit (working pressure, fluid temperature), the characteristic curve may shift.
- ▶ The characteristic curve may also shift due to the dither frequency or control electronics.
- ▶ Preservation: Our axial piston units are supplied as standard with preservative protection for a maximum of 12 months. If longer preservative protection is required (maximum 24 months), please specify this in plain text when placing your order. The preservation periods apply under optimal storage conditions, details of which can be found in the data sheet 90312 or in the instruction manual.
- ▶ Not all versions of the product are approved for use in a safety function according to ISO 13849.
Please consult the responsible contact person at Bosch Rexroth if you require reliability parameters (e.g. $MTTF_d$) for functional safety.
- ▶ Depending on the type of control used, electromagnetic effects can be produced when using solenoids. Use of the recommended direct current (DC) on the electromagnet does not produce any electromagnetic interference (EMI), nor is the electromagnet influenced by EMI. Potential electromagnetic interference (EMI) exists if the solenoid is energized with a modulated direct current (e.g. PWM signal). The machine manufacturer should conduct appropriate tests and take appropriate measures to ensure that other components or operators (e.g. with a pacemaker) are not affected by the potentiality.
- ▶ Pressure controllers are not safeguards against pressure overload. A pressure relief valve is to be fitted in the hydraulic system.
- ▶ For drives that are operated for a long period with constant rotational speed, the natural frequency of the hydraulic system can be stimulated by the excitation frequency of the pump (rotational speed frequency $\times 9$). This can be prevented with suitably designed hydraulic lines.
- ▶ Please observe the notices in the instruction manual regarding the tightening torques for port threads and other threaded joints.
- ▶ Working ports:
 - The ports and fastening threads are designed for the specified maximum pressure. The machine or system manufacturer must ensure that the connecting elements and lines correspond to the specified application conditions (pressure, flow, hydraulic fluid, temperature) with the necessary safety factors.
 - The working ports and function ports are only intended to accommodate hydraulic lines.

Safety instructions

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

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