Controllers devices DR, DP, FR and DFR for Variable axial piston pump A4VSO

RE 92060
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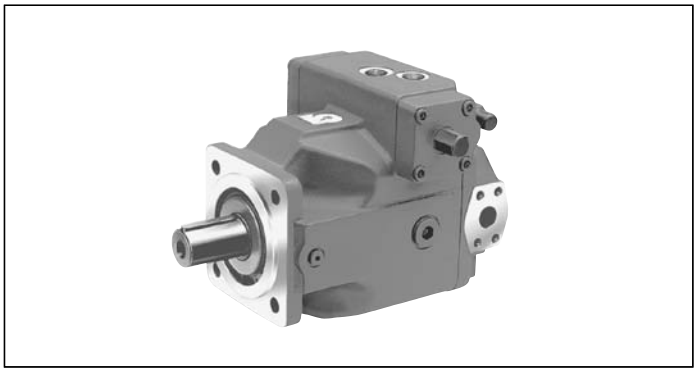


- For variable pump A4VSO series 1 and 3
- Open circuit

Features

- Control of pressure and flow
- Remote controlled optional
- Pressure controller for parallel operation optional
- Mechanical $V_{g\ min}$ – and $V_{g\ max}$ –limitation
- The special version enables mooring, swivel-through operation, and decompression over the pump

Variable pump A4VSO, data sheet 92050

Contents

Ordering code – A4VSO

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

Hydraulic fluid

01	For details see data sheet 92050	

Axial piston unit

02	Swashplate design, variable	**A4VS**

Charge pump (impeller)

03	without charge pump (no symbol)	●	●	●	●	●	●	●	●	●	
	with charge pump (impeller) only with port plate 25 (service line ports)	–	–	–	–	–	–	–	●	–	**L**

Operating mode

04	Pump, open circuit	**O**

Size (NG)

05	Geometric displacement	**40**	**71**	**125**	**180**	**250**	**355**	**500**	**750**	**1000**

Control device

06	Pressure controller	DR			●	●	●	●	●	●	●	●	●	**DR**[1]
	remote controlled	DR	G		●	●	●	●	●	●	●	●	●	**DRG**[1]
	Pressure control for parallel operation	DP			●	●	●	●	●	●	●	●	●	**DP**[1]
	with flow control	DP	F		–	–	●	●	●	●	–	–	–	**DPF**
	Flow controller	FR			●	●	●	●	●	●	–	–	–	**FR**
	with pressure control, remote controlled	FR	G		●	●	●	●	●	●	–	–	–	**FRG**
	FR no connection from X_F to the tank	FR		1	●	●	●	●	●	●	–	–	–	**FR1**
	FRG no connection from X_F to the tank	FRG		1	●	●	●	●	●	●	–	–	–	**FRG1**
	Pressure and flow controller	DFR			●	●	●	●	●	●	–	–	–	**DFR**
	no connection from X_F to the tank	DFR		1	●	●	●	●	●	●	–	–	–	**DFR1**

Series

07	Series 1, index 0	●	●	–	–	–	–	–	–	–	**10**
	Series 3, index x	–	–	●	●	●	●	●	●	●	**3x**

For details see data sheet 92050

08	Direction of rotation
09	Seal
10	Drive shaft
11	Mounting flange
12	Service line ports
13	Through drive

● = Available – = Not available

1) Available in mooring and swivel-through operation on request

DR – pressure controller

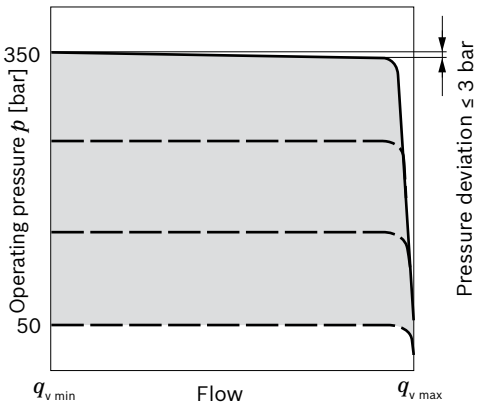
The pressure controller limits the maximum pressure at the pump outlet within the control range of the variable pump. The variable pump only moves as much hydraulic fluid as is required by the consumers. If the operating pressure exceeds the pressure setting at the pressure control valve, the pump will regulate to a smaller displacement to reduce the control differential.

- Recommended setting range 50 to 350 bar.
  350 bar is set as standard.
  When ordering, please state other values in plain text.
- Initial position in depressurized state: $V_{g\,max}$
- Mechanical minimum and maximum swivel angle limitation
  - The $V_{g\,min}$ stop is set so that a pressure of 15 to 20 bar is set when port B is plugged.
  - The $V_{g\,max}$ stop is set to nominal $V_{g\,max}$. When ordering, please state other settings values in plain text (possible setting ranges $V_{g\,max}$ to 50 % $V_{g\,max}$).

The pressure controller for mooring and swivel-through operation is available on request. For decompression, the pump swivels over zero in operation as a motor.

Remote controlled pressure control optionally available – DRG see page 6, pressure controller for parallel operation DP see page 11

▼ **Static characteristic**

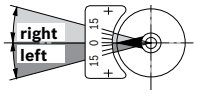


A4VSO · open circuit

▼ **Flow direction S to B**

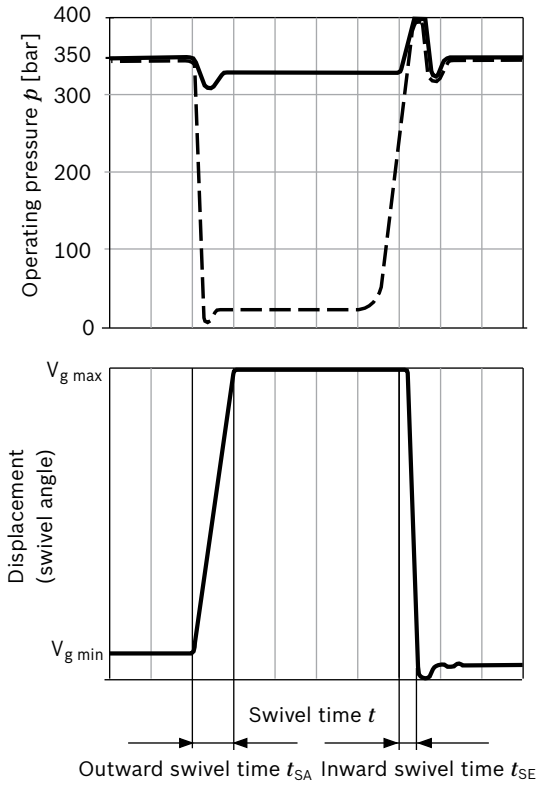
Direction of rotation Pump	Swiveling range[1)]	High pressure port
clockwise	left	**B**
counter-clockwise	right	**B**

[1)] cf. swivel angle indicator



Dynamic characteristics

Load step by opening and closing a pressure line with a pressure-relief valve as load valve 1 m after the connection flange of the axial piston unit.



Note

Characteristics are measured median values at:

- n = 1500/1800 rpm
- Pressure safeguarding at 400 bar

Swivel times

NG	t_{SA} [s] against 20 bar	t_{SA} [s] against 330 bar	t_{SE} [s] zero stroke 350 bar
40	approx. 0.12	approx. 0.08	0.02
71	approx. 0.20	approx. 0.10	0.03
125	approx. 0.30	approx. 0.20	0.04
180	approx. 0.30	approx. 0.20	0.05
250	approx. 0.40	approx. 0.30	0.06
355	approx. 0.40	approx. 0.30	0.08
500	approx. 0.50	approx. 0.30	0.10
750	approx. 1.00	approx. 0.60	0.15
1000	approx. 1.50	approx. 0.90	0.20

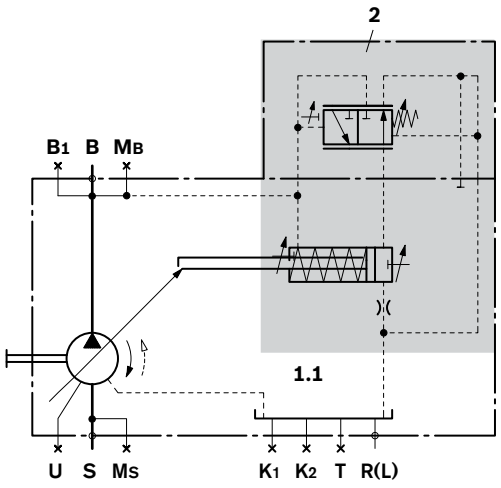
The values of the outward swivel time t_{SA} ($V_{g\,min} \rightarrow V_{g\,max}$) can be shortened by the factor 2 to 3 if required (please contact us).

This does not have any effect on the inward swivel time t_{SE}.

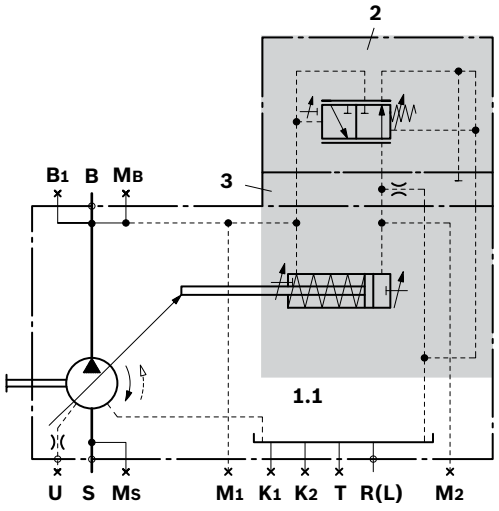
DR schematics

Controller range (gray field) applicable for A4VSO

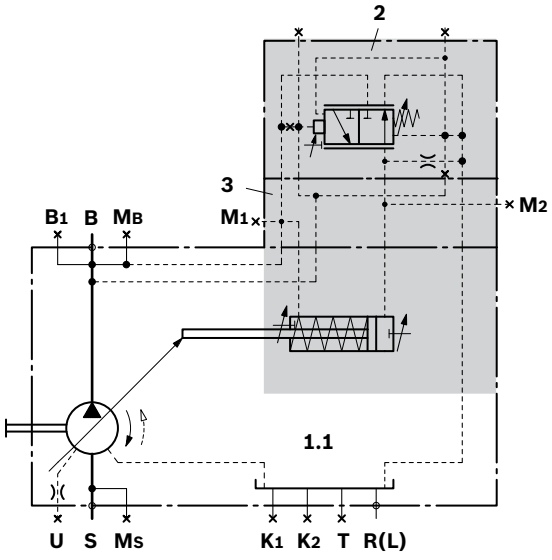
▼ **Example A4VSO, sizes 40 and 71**



▼ **Example A4VSO, sizes 125 to 355**



▼ **Example A4VSO, sizes 500 to 1000**



Components	
1	Pump with hydraulic control device
1.1	A4VSO (see data sheet 92050)
2	Pressure control valve
3	Intermediate plate (NG 125 to 1000)

DRG – remote controlled pressure controller

Function and equipment as for DR.
A pressure-relief valve (pos.4) can be piped externally at port $\mathbf{X_D}$ for remote control, although the pressure-relief valve is not included in the scope of supply for the DRG control.
Version with built-on valve on request.

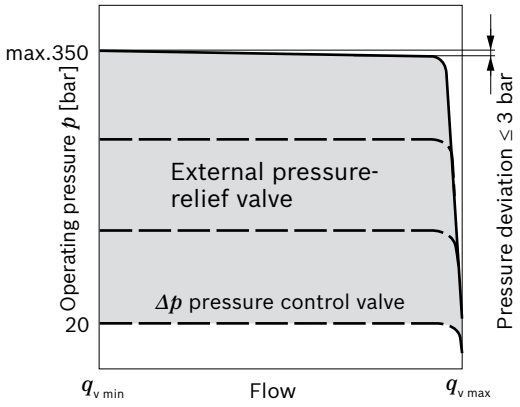
The differential pressure at the pressure control valve (pos.2) is set to 20 bar as standard, the quantity of control liquid emerging at port $\mathbf{X_D}$ is then approx. 1.5 l/min. If a different setting (recommended range 20 to 50 bar) is required, please state in plain text.

As a separate pressure-relief valve, we recommend:
- DBD 6 (hydraulic) as per data sheet 25402.
- DBETA-6X (elektrical) as per data sheet 29262.

The maximum wire length should not exceed 2 m.

Note for setting the remote controlled pressure control:
The setting value for the external pressure relief valve plus the differential pressure value at the pressure control valve determines the level of pressure control.

Example:	External pressure relief valve	330 bar
	Differential pressure at pressure control valve	20 bar
	Pressure control at	330 + 20 = 350 bar

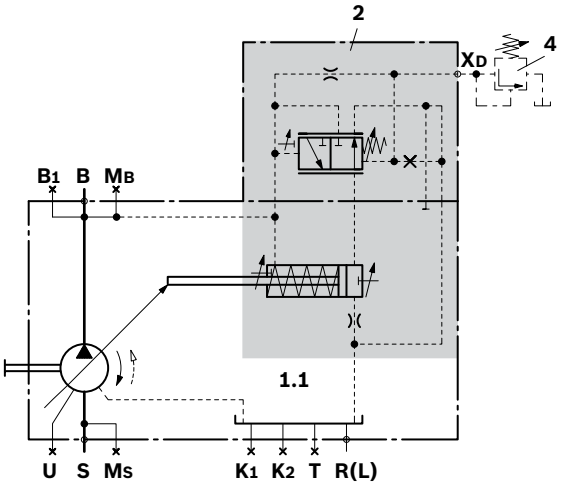


For the function, description, and swivel times of the pressure controller DR, see pages 3 and 4.

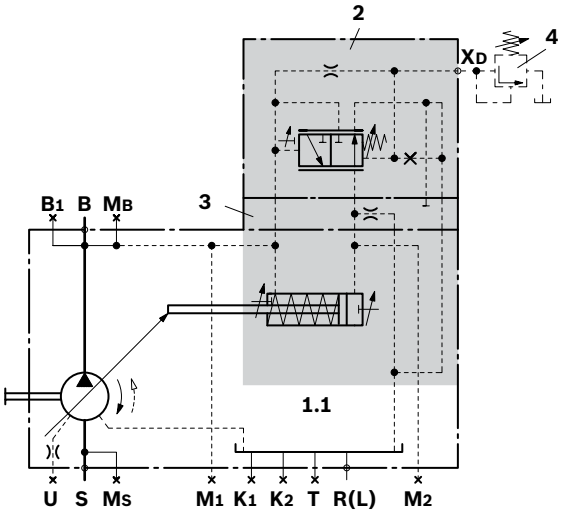
DRG schematics

Controller range (gray field) applicable for A4VSO

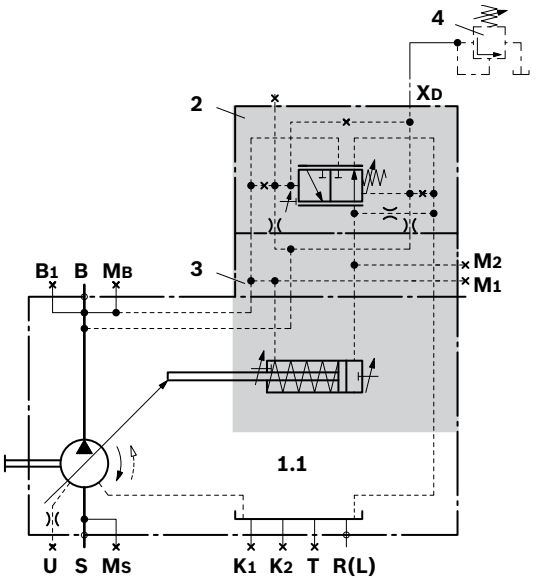
▼ **Example A4VSO, sizes 40 and 71**



▼ **Example A4VSO, sizes 125 to 355**



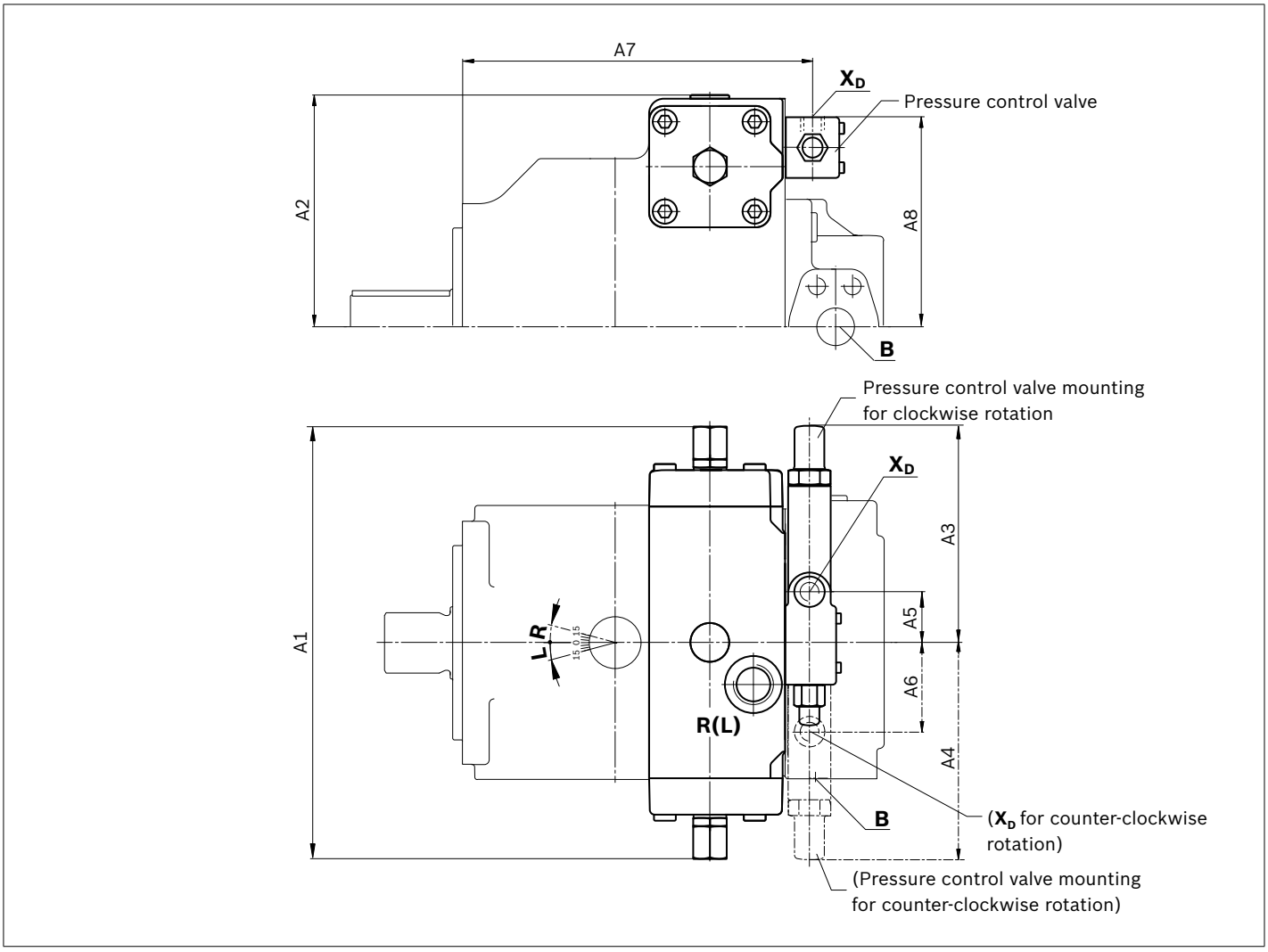
▼ **Example A4VSO, sizes 500 to 1000**



Components	
1	Pump with hydraulic control device
1.1	A4VSO (see data sheet 92050)
2	Pressure control valve
3	Intermediate plate (NG 125 to 1000)
4	External pressure-relief valve (not included in the scope of supply)

Dimensions DR / DRG

▼ **A4VSO, sizes 40 and 71**

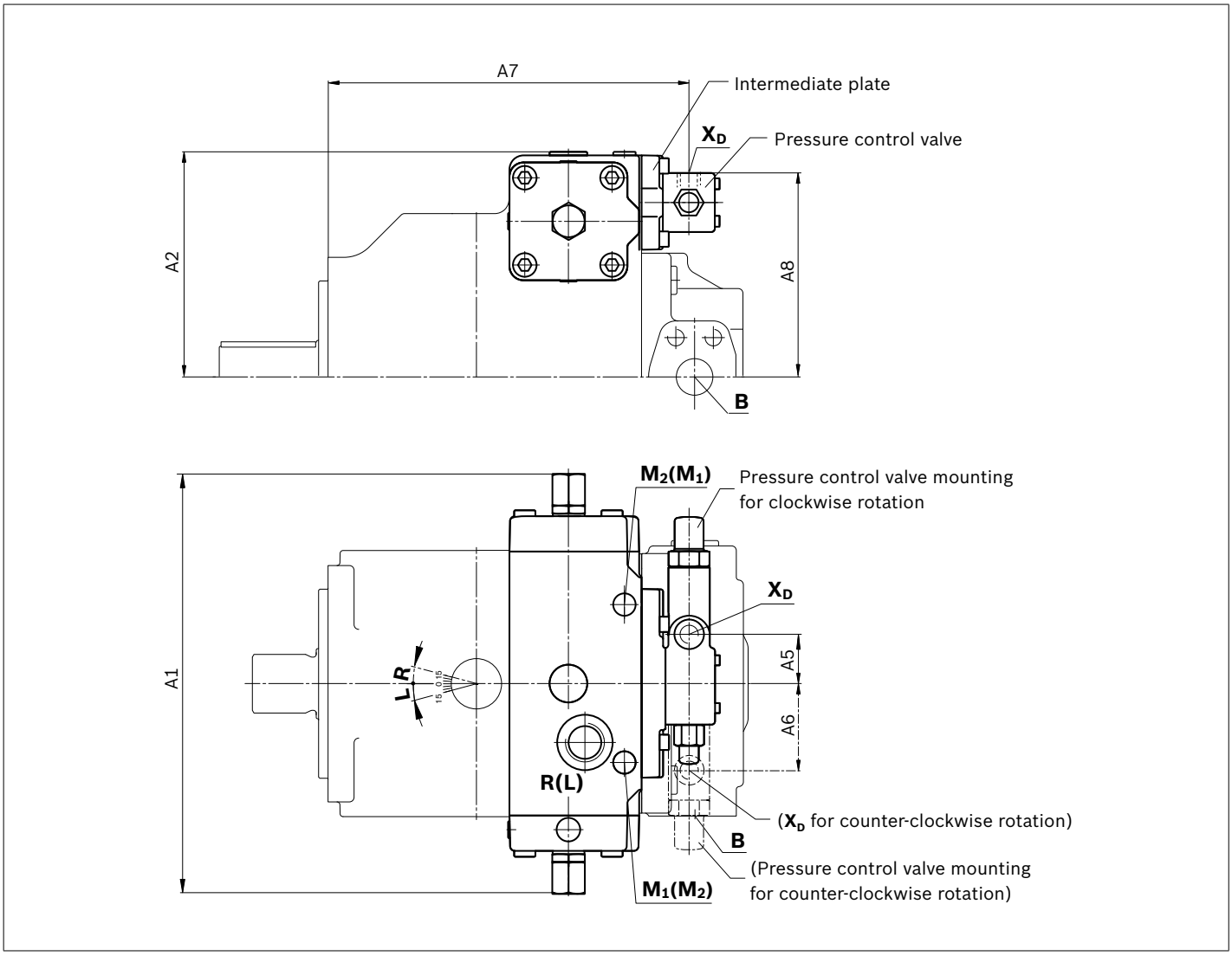


NG[1]	A1	A2	A3	A4	A5	A6	A7	A8	
40	260	140	147	137	47	67	209	128	For detailed dimensions and technical data of the variable pump, see data sheet 92050 (A4VSO)
71	298	157	142	142	42	72	236	144	

Port		Standard	Size[2]	$p_{max\ abs}$ [bar][3]	State[4]
X_D (DRG)	Pilot pressure remote control pressure controller	DIN 3852	M14 x 1.5; 12 deep	400	O
X_D (DR)					X

1) For sizes 500 to 1000 see page 10
2) For notes on tightening torques, see the instruction manual
3) Momentary pressure spikes may occur depending on the application. Keep this in mind when selecting measuring devices and fittings.
4) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

▼ **A4VSO, sizes 125 to 355**

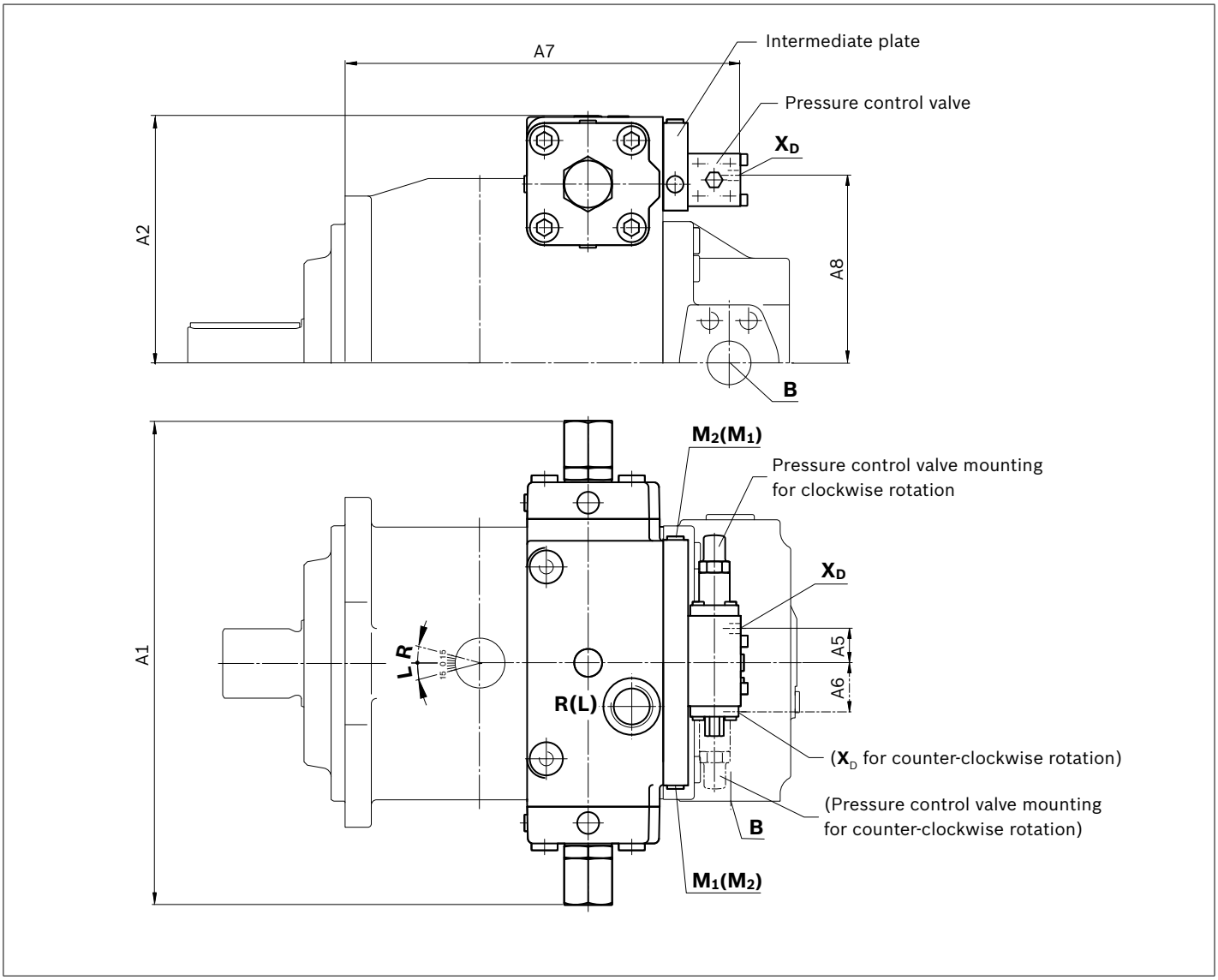


NG[1]	A_1	A_2	A_5	A_6	A_7	A_8	
125/180	354	191	41	71	305	172	For detailed dimensions and technical data of the variable pump, see data sheet 92050 (A4VSO)
250/355	424	238	41	71	367	208	

Port		Standard	Size[2]	$p_{max\ abs}$ [bar][3]	State[4]
X_D (DRG)	Pilot pressure remote control pressure controller	DIN 3852	M14 x 1.5; 12 deep	400	O
X_D (DR)					X
M_1; M_2	Measurement of stroking chamber pressure	DIN 3852	M14 x 1.5; 12 deep (NG 125 and 180) M18 x 1.5; 12 deep (NG 250 and 355)	400	X X

1) For sizes 500 to 1000 see page 10
2) For notes on tightening torques, see the instruction manual
3) Momentary pressure spikes may occur depending on the application. Keep this in mind when selecting measuring devices and fittings.
4) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

▼ **A4VSO, sizes 500 to 1000**



NG[1]	A_1	A_2	A_5	A_6	A_7	A_8	
500	510	283	41	51	452	216	For detailed dimensions and technical data of the variable pump, see data sheet 92050 (A4VSO)
750	582	322	41	51	484	235	
1000	622	350	41	51	550	269	

Port		Standard	Size[2]	$p_{max\ abs}$ [bar][3]	State[4]
X_D (DRG)	Pilot pressure remote control pressure controller	DIN 3852	M14 x 1.5; 12 deep	400	O
X_D (DR)					X
M_1; M_2	Measurement of stroking chamber pressure	DIN 3852	M14 x 1.5; 12 deep	400	X

1) For sizes 40 and 71 see page 8; for sizes 125 to 355 see page 9
2) For notes on tightening torques, see the instruction manual.
3) Momentary pressure spikes may occur depending on the application. Keep this in mind when selecting measuring devices and fittings.
4) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

DP – pressure controller for parallel operation

Suitable for pressure control of multiple axial piston units A4VS in parallel operation.
An external pressure-relief valve (pos. **4**) actuates multiple axial piston units together over ports **X_D**. The respective throttle valve (Pos. **5**) provides the pressure increase proportional to the current pump setting that is required for parallel control.

▶ Initial position in depressurized state: $V_{g\,max}$

Differential pressure setting on the controller
The control valve (pos. **2**) plus throttle valve (pos. **5**) is set to 33 bar when the **X_D** port is relieved. The quantity of control liquid emerging at port **X_D** is then approx. 1.5 l/min. The setting value for the external pressure relief valve plus the basic setting of the controller determines the level of pressure control.

▶ **Adjustment range 33 to 350 bar**

The pressure increase is retained independently of the setting value of the external pressure-relief valve and ensures the swivel angle deviation is low for all mutually activated pumps.
Use the same as possible line lengths from ports **X_D** to the pressure-relief valve.

The pressure-relief valve (Pos. **4**) is not included in the scope of supply of the DP - please order separately.

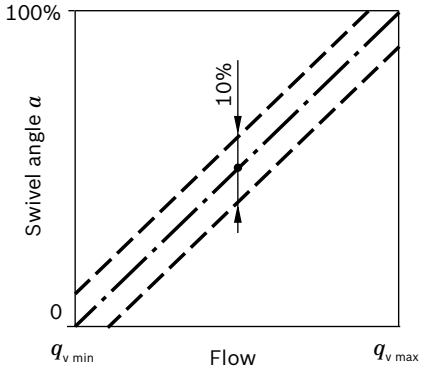
▶ Recommendation:
DBD 6 (hydraulic) as per data sheet 25402
or DBETA-6x (elektrical) as per data sheet 29262 at maximum 3 pumps.

▶ Mechanical minimum and maximum swivel angle limitation
  – The $V_{g\,min}$ stop is set so that a pressure of 15 to 20 bar is set when port **B** is plugged.
  – The $V_{g\,max}$ stop is set to nominal $V_{g\,max}$. When ordering, please state other settings requests in plain text (possible setting ranges $V_{g\,max}$ to 50 % $V_{g\,max}$).

The maximum number of pumps is limited by the output of the used pressure-relief valve (pos. **4**).
Single pumps can be relieved to the amount of the basic setting by the relief valve (pos. **6**) as required. A check valve (pos. **7**) is then additionally needed at the pressure port.
Both valves are not included in the scope of supply.
Special version with mounted relief valve (pos. **6**) is available on request.

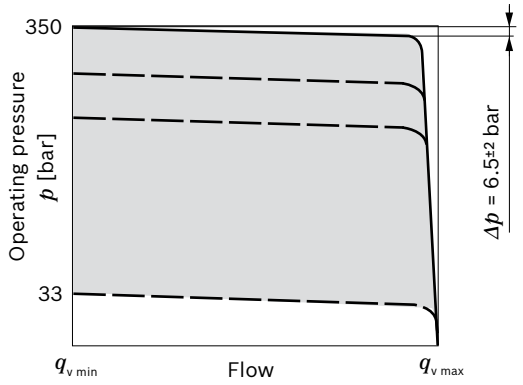
The DP controller for mooring and swivel-through operation is available on request. For decompression, the pump swivels over zero in operation as a motor.

Swivel times as for DR, see page 4.
Flow control is optionally available – DPF see page 18



Swivel angle deviation ± 10 % from the setpoint value

▼ **Static characteristic**

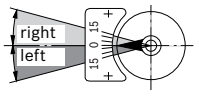


A4VSO - open circuit

▼ **Flow direction S to B**

Direction of rotation pump	Swiveling range[1)]	High-pressure port
clockwise	left	**B**
counter-clockwise	right	**B**

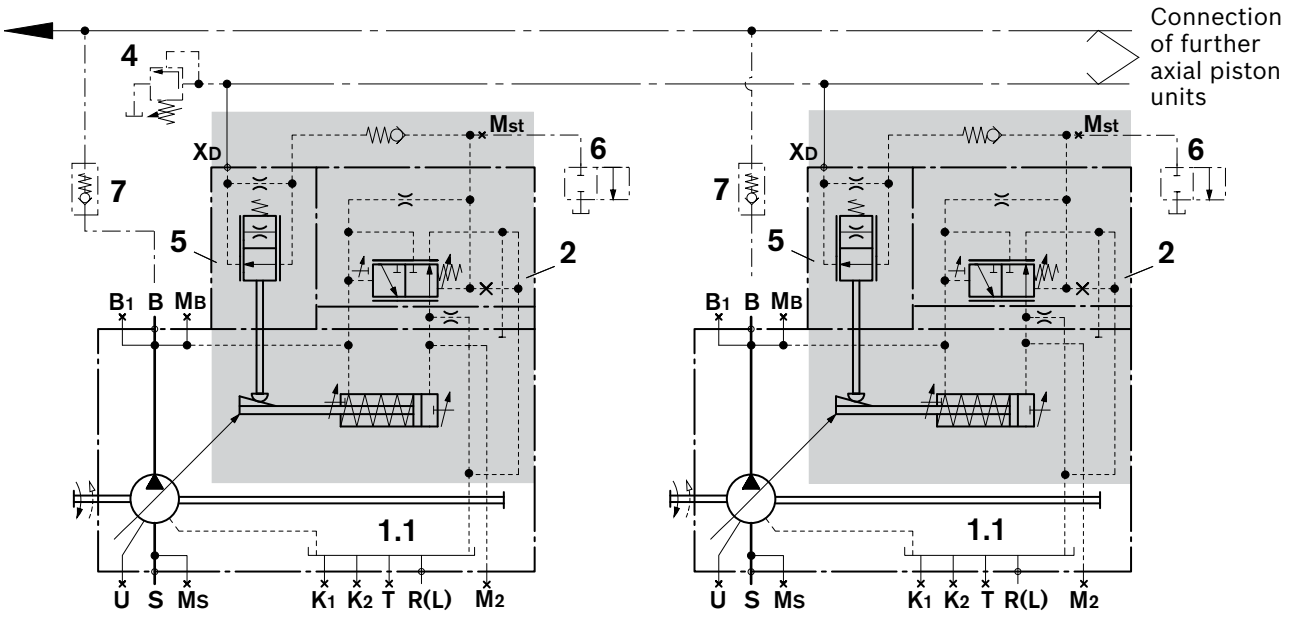
[1)] cf. swivel angle indicator



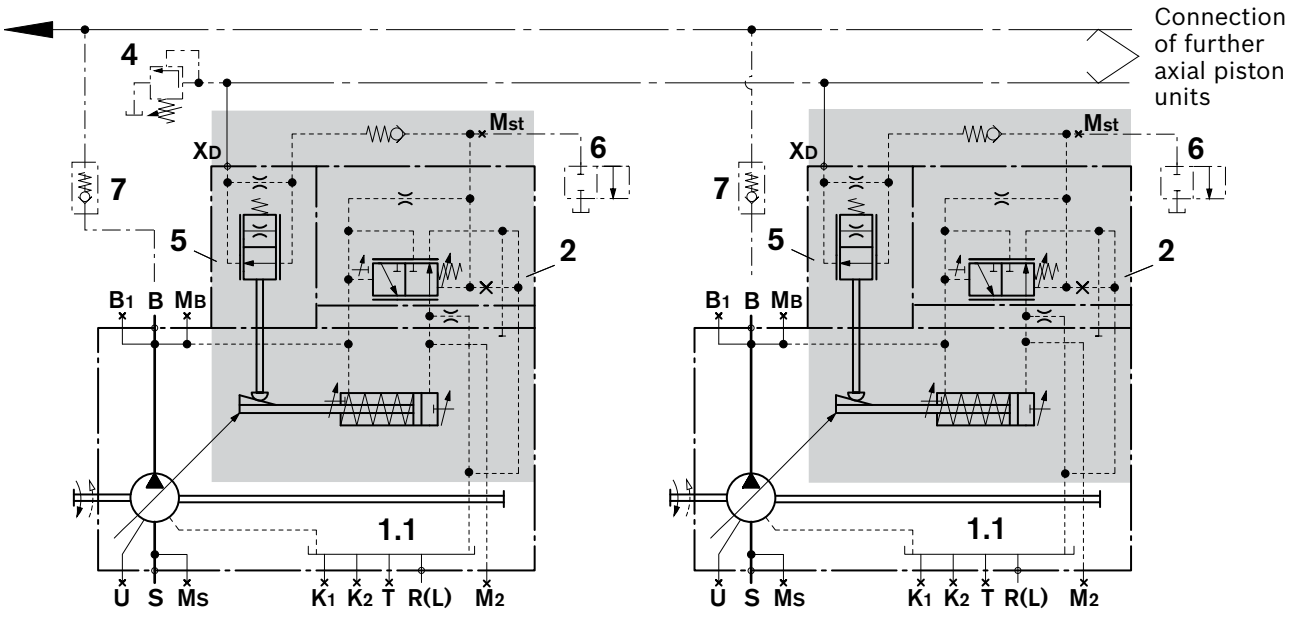
DP schematics

Controller range (gray field) applicable for A4VSO

▼ **Example A4VSO, sizes 40 and 71**

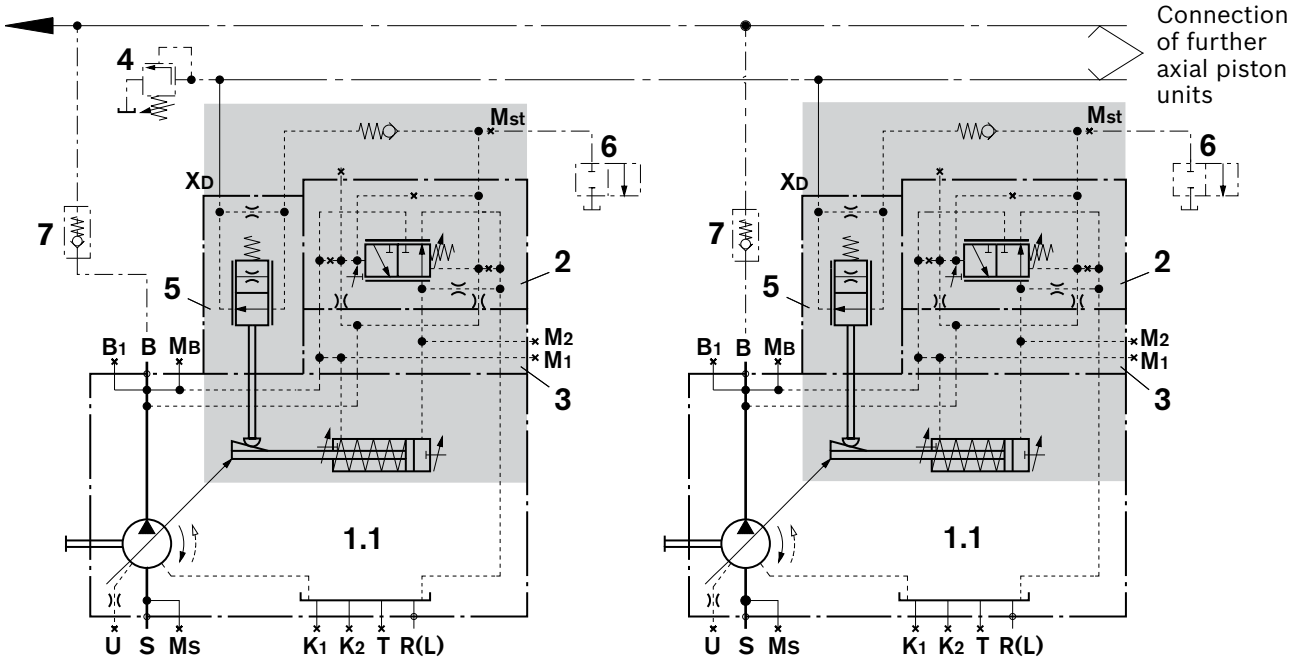


▼ **Example A4VSO, sizes 125 to 355**



Port	
X_D	Pilot pressure pressure controller
M_{St}	Pilot pressure measurement
M1, M2	Measurement stroking chamber pressure (NG 125 to 1000)

▼ **Example A4VSO, sizes 500 to 1000**

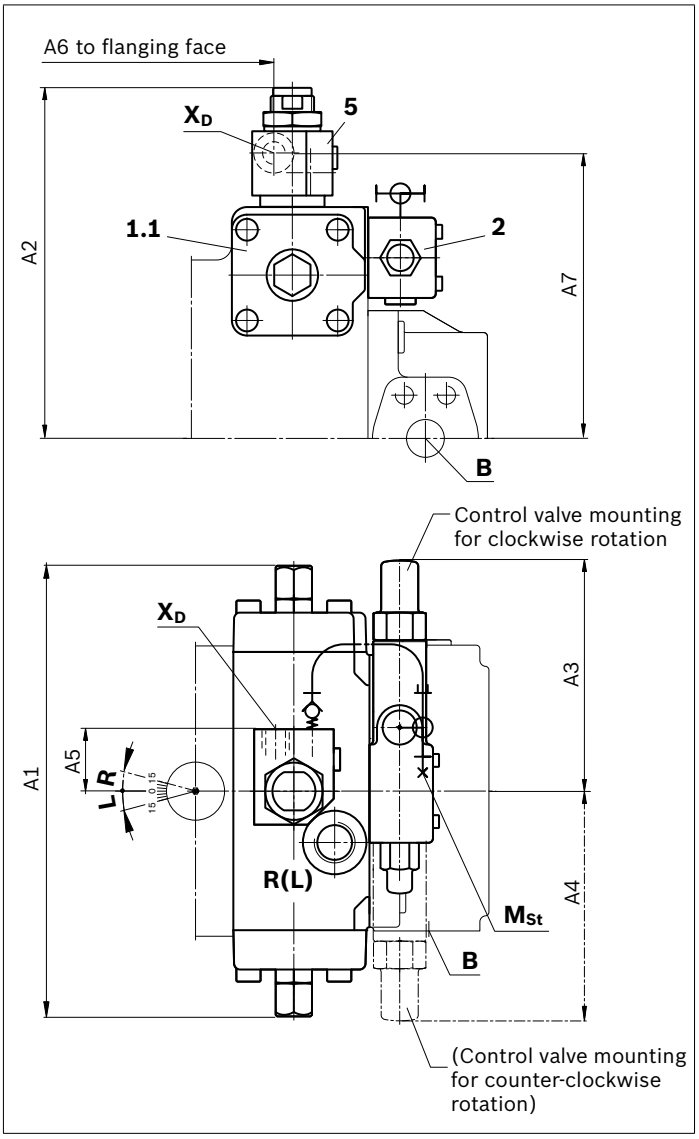


Port	
X_D	Pilot pressure pressure controller
M_{St}	Pilot pressure measurement
M1, M2	Measurement of stroking chamber pressure

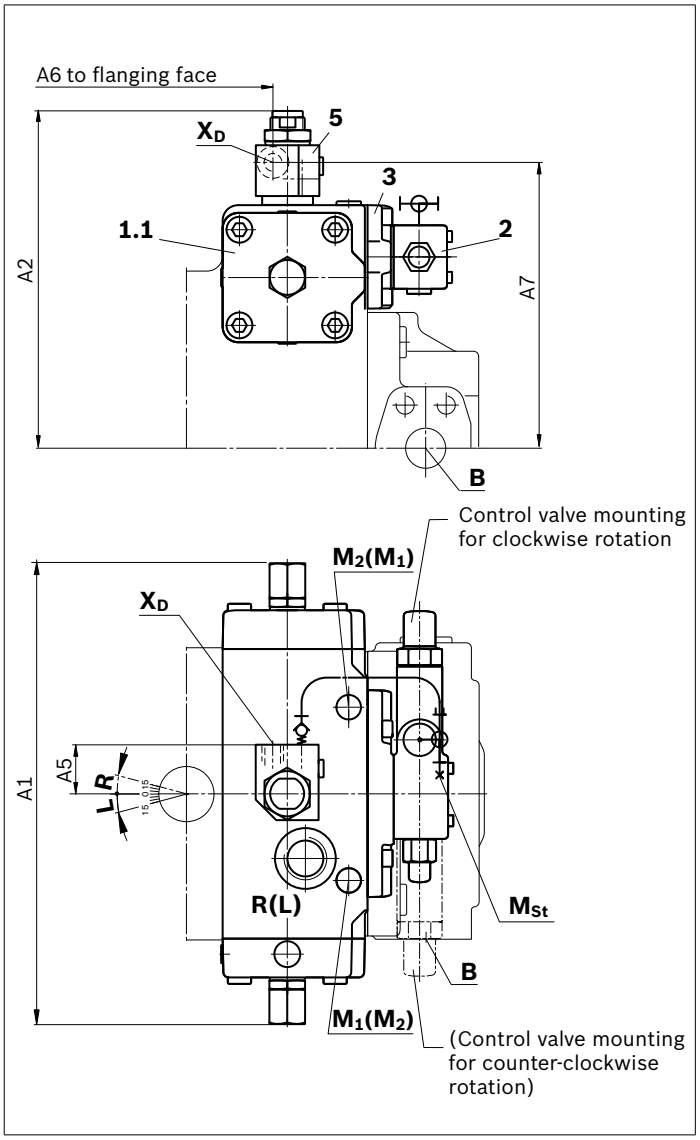
Components	
1	Pump with hydraulic control device
1.1	A4VSO (see data sheet 92050)
2	Control valve with pressure compensator
3	Intermediate plate (NG 500 to 1000)
4	Pressure-relief valve (not included in the scope of supply)
5	Throttle valve
6	Relief valve (not included in the scope of supply)
7	Check valve (not included in the scope of supply) only required in combination with relief valve

Dimensions DP

▼ **A4VSO, sizes 40 and 71**



▼ **A4VSO, sizes 125 to 355**



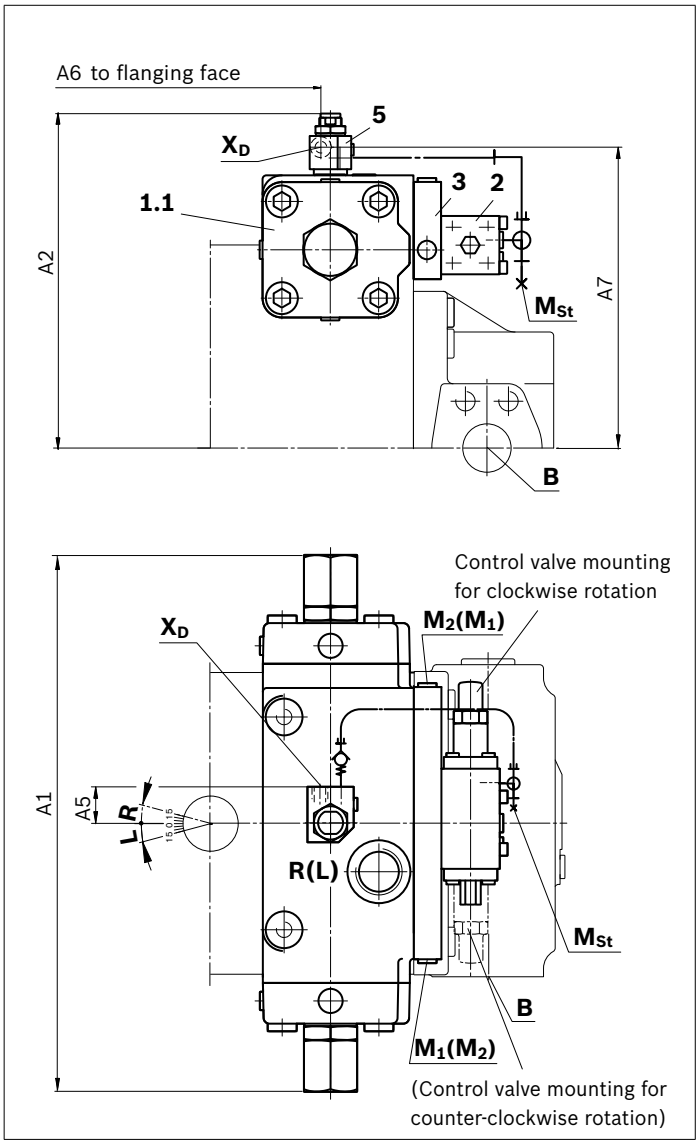
NG	A_1	A_2	A_3	A_4	A_5	A_6	A_7	
40	260	210	147	137	39	133	170	For detailed dimensions and technical data of the variable pump, see data sheet 92050 (A4VSO)
71	225	225	142	142	39	155	187	
125/180	354	261	–	–	39	192	221	
250/355	424	306	–	–	39	237	268	

Port		Standard	Size[2]	$p_{max\ abs}$ [bar][3]	State[4]
X_D	Pilot pressure pressure controller	DIN 3852	M14 x 1.5; 12 deep	400	O
M_{St}	Measurement of stroking chamber pressure	DIN 3853	S8 shape W	400	X
M_1; M_2	Measurement of stroking chamber pressure	DIN 3852	M14 x 1.5; 12 deep (NG 125 and 180)	400	X
			M18 x 1.5; 12 deep (NG 250 and 355)		X

Components, see page 13

1) For notes on tightening torques, see the instruction manual
2) Momentary pressure spikes may occur depending on the application. Keep this in mind when selecting measuring devices and fittings.
3) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

▼ **A4VSO, sizes 500 to 1000**



Components	
1	Pump with hydraulic control device
1.1	A4VSO (see data sheet 92050)
2	Control valve with pressure compensator
3	Intermediate plate (NG 125 to 1000)
5	Throttle valve

NG	A_1	A_2	A_5	A_6	A_7	
500	510	353	39	268	313	For detailed dimensions and technical data of the variable pump, see data sheet 92050 (A4VSO)
750	582	392	39	290	352	
1000	622	419	39	349	379	

Port		Standard	Size[1]	$p_{max\ abs}$ [bar][3]	State[3]
X_D	Pilot pressure pressure controller	DIN 3852	M14 x 1.5; 12 deep	400	O
M_{St}	Pilot pressure measurement	DIN 3853	S8 shape W	400	X
M_1; M_2	Measurement of stroking chamber pressure	DIN 3852	M14 x 1.5; 12 deep	400	X

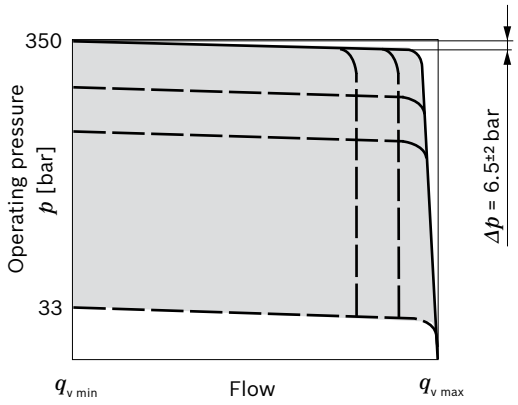
1) For notes on tightening torques, see the instruction manual
2) Momentary pressure spikes may occur depending on the application. Keep this in mind when selecting measuring devices and fittings.
3) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

DPF – with flow controller

In addition to the pressure control function, a differential pressure can be used to control the flow from the pumps, e. g. by an orifice between the pump and consumer. The pump supplies only the amount of fluid actually required by the consumer.
The flow of the pump is then dependent on the cross section of the external measuring orifice (pos. **9**), which is located between the pump and the consumer. The flow is nearly independent of the load pressure below the setting value of the pressure control and within the control range of the pump.
For a description of the flow controller, see FR page 19.
For the function and technical data of the parallel pressure controller DP, see page 11.

A4VSO - open circuit

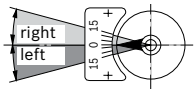
▼ **Static characteristic**



▼ **Flow direction S to B**

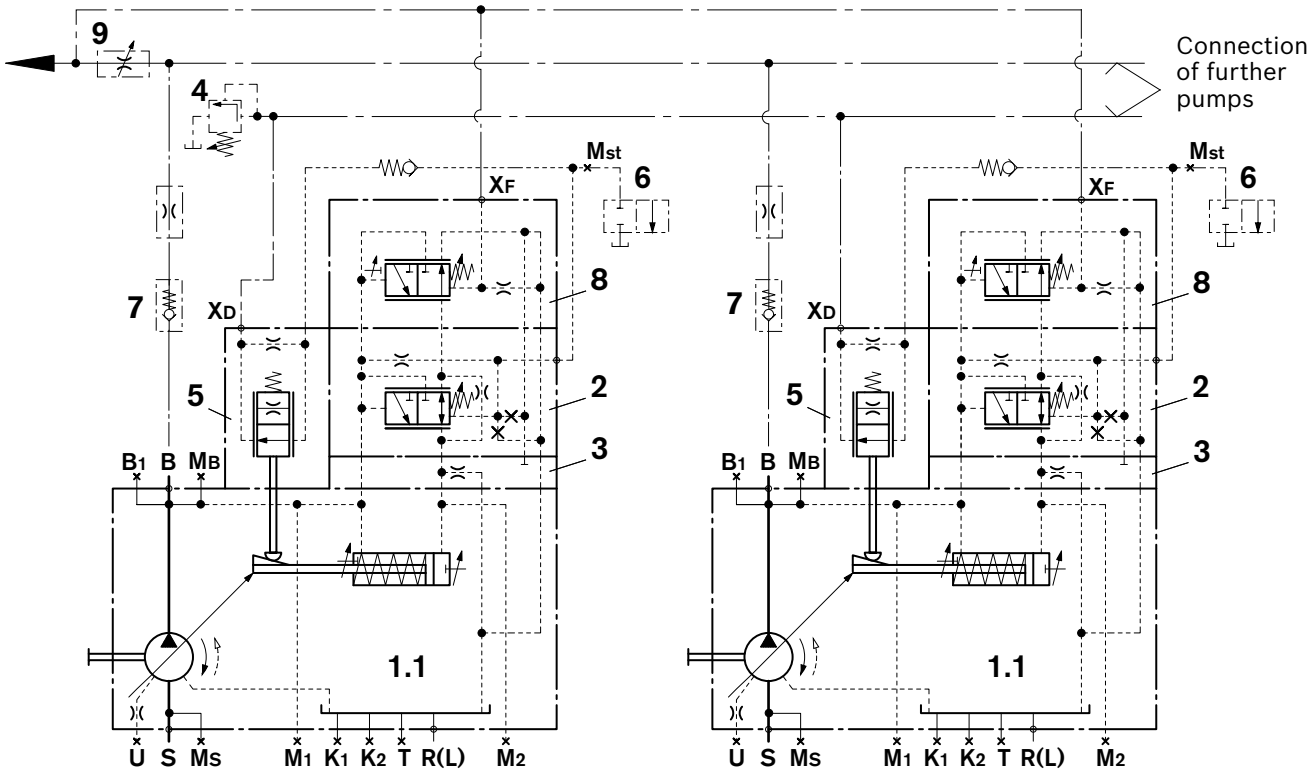
Direction of rotation pump	Swiveling range[1)]	High-pressure port
clockwise	left	**B**
counter-clockwise	right	**B**

[1)] cf. swivel angle indicator



DPF schematics

▼ **A4VSO, size 125 to 355**

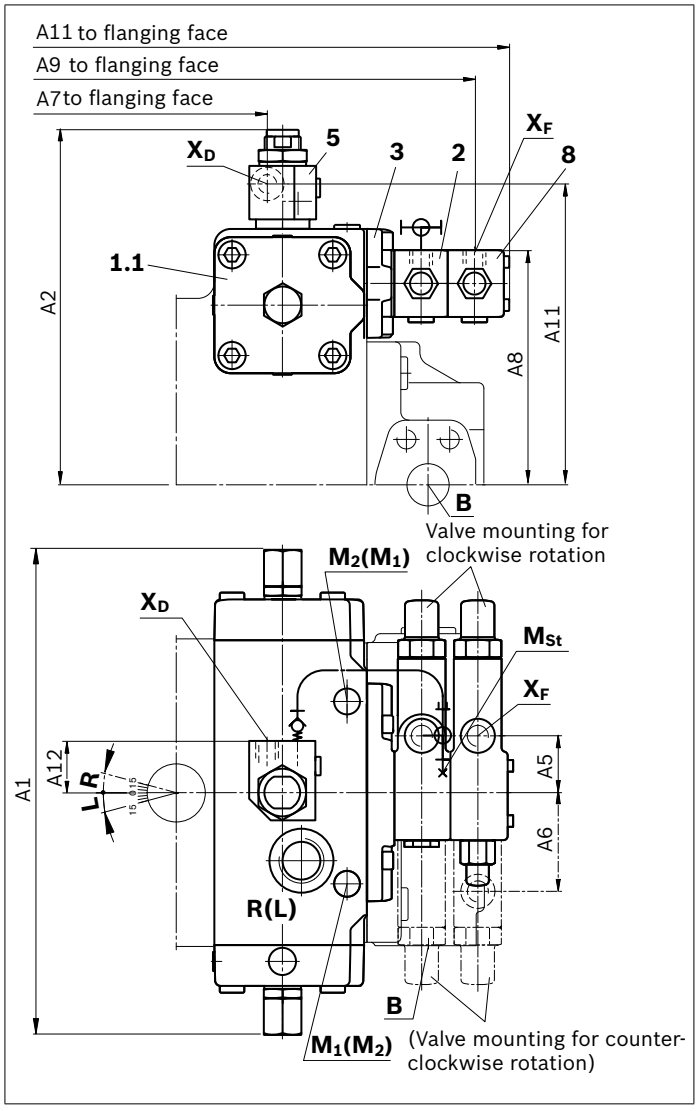


Port	
X_D	Pilot pressure pressure controller
X_F	Pilot pressure flow controller
M_{St}	Pilot pressure measurement
M1, M2	Measurement of stroking chamber pressure

Components	
1	Pump with hydraulic control device
1.1	A4VSO (see data sheet 92050)
2	Control valve with pressure compensator
3	Intermediate plate
4	Pressure-relief valve (not included in the scope of supply)
5	Throttle valve
6	Relief valve (not included in the scope of supply)
7	Check valve (not included in the scope of supply) only required in combination with relief valve
8	Flow control valve
9	External measuring orifice (not included in the scope of supply)

Dimensions DPF

▼ **A4VSO, size 125 to 355**



NG	A_1	A_2	A_5	A_6	A_7	A_8	A_9	A_{10}	A_{11}	A_{12}	
125	354	261	41	71	191.5	172	345	220.5	371	39	For detailed dimensions and technical data of the variable pump, see data sheet 92050 (A4VSO)
180	354	261	41	71	191.5	172	345	220.5	371	39	
250	424	306	41	51	236.5	208	407	267.5	433	39	
355	424	306	41	51	236.5	208	407	267.5	433	39	

Port		Standard	Size [1]	$p_{max\ abs}$ [bar][2]	State [3]
X_D	Pilot pressure pressure controller	DIN 3852	M14 x 1.5; 12 deep	400	O
X_F	Pilot pressure flow controller	DIN 3852	M14 x 1.5; 12 deep	400	O
M_{St}	Pilot pressure measurement	DIN 3853	S8 shape W	400	X
M_1; M_2	Measurement of stroking chamber pressure	DIN 3852	M14 x 1.5; 12 deep (NG 125 and 180) M18 x 1.5; 12 deep (NG 250 and 355)	400	X X

Components, see page 17

1) For notes on tightening torques, see the instruction manual
2) Momentary pressure spikes may occur depending on the application. Keep this in mind when selecting measuring devices and fittings.
3) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

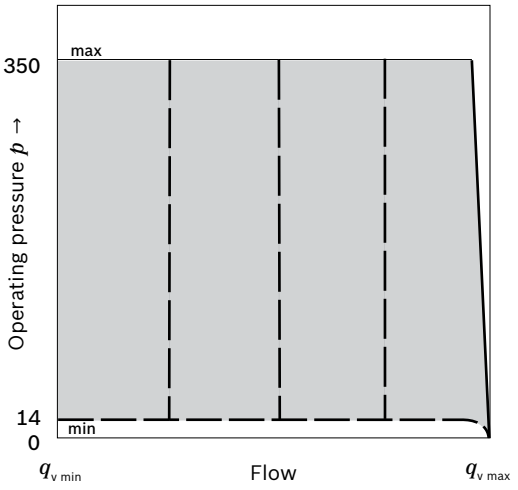
FR/FR1 – flow controller

The flow controller adjusts the displacement of the pump to the volume required by the consumer.
The flow of the pump is then dependent on the cross section of the external measuring orifice (pos. **4**), which is located between the pump and the consumer. The flow is nearly independent of the load pressure within the control range of the pump (see maximum flow deviation below).
The opening cross section of the measuring orifice determines the flow of the pump.
The flow controller compares the pressure before the measuring orifice with that after the orifice and maintains the pressure drop encountered here (differential pressure Δp) and thus controls the flow.
If the differential pressure Δp increases, the pump is swiveled back (towards $V_{g\,min}$), if the differential pressure Δp decreases the pump is swiveled out (towards $V_{g\,max}$), until equilibrium in the valve is restored.
$\Delta p_{orifice} = p_{pump} - p_{consumer}$
The standard setting on the flow control valve (pos. **2**) for Δp is 14 bar. If a different setting (recommended range 14 to 25 bar) is required, please state in plain text. Higher values on request.
The stand-by pressure in zero stroke operation (sensing orifice plugged) is slightly above the Δp setting.
The DFR1 version has no connection from $\mathbf{X_F}$ to the tank.

- Initial position in depressurized state: $V_{g\,max}$
- Mechanical minimum and maximum swivel angle limitation
  - The $V_{g\,min}$ stop is set so that a pressure of 15 to 20 bar is set when port **B** is plugged.
  - The $V_{g\,max}$ stop is set to nominal $V_{g\,max}$. When ordering, please state other settings requests in plain text (possible setting ranges $V_{g\,max}$ to 50 % $V_{g\,max}$).

A4VSO - open circuit

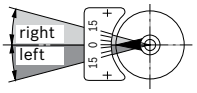
▼ **Static characteristic**



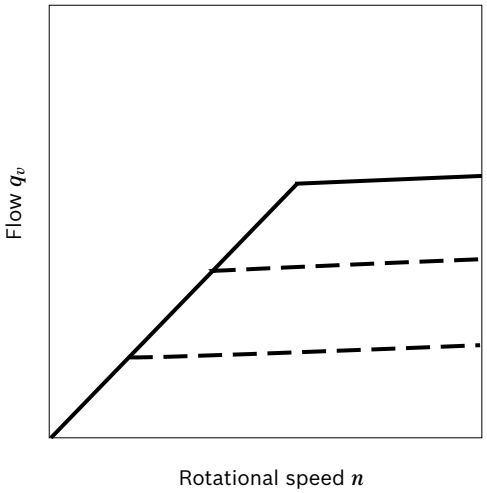
▼ **Flow direction S to B**

Direction of rotation pump	Swiveling range[1)]	High-pressure port
clockwise	left	**B**
counter-clockwise	right	**B**

[1)] cf. swivel angle indicator



▼ **Static characteristic at variable rotational speed**



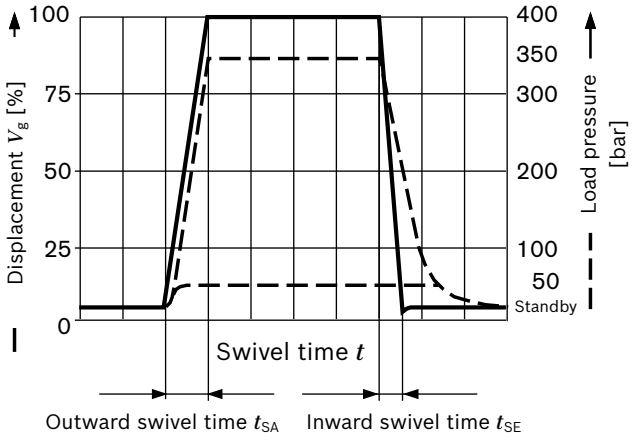
▼ **Max. flow deviation**

measured at drive speed n = 1500 rpm

Size	40	71	125	180	250	355
Δp_v [l/min]	3	3	5	6	8	10

▼ **Dynamic characteristic**

The characteristics are measured median values.
Flow step standby / $q_{v\,max}$ through relief of the **X** port to the tank.



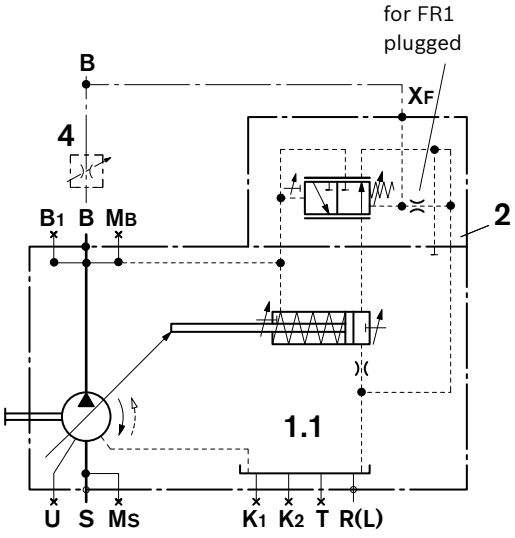
Swivel times

NG	t_{SA} [s] standby...350 bar	t_{SE} [s] 350 bar...standby	t_{SE} [s] 50 bar...standby
40	approx. 0.1	0.02	0.050
71	approx. 0.2	0.03	0.075
125	approx. 0.3	0.04	0.100
180	approx. 0.4	0.05	0.120
250	approx. 0.4	0.06	0.150
355	approx. 0.5	0.07	0.180

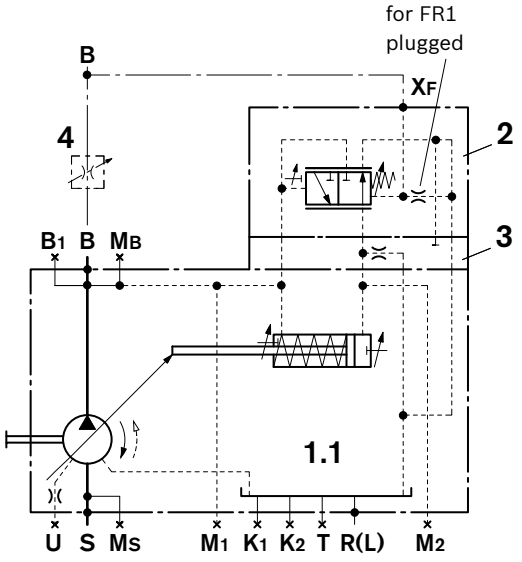
The values of the outward swivel time t_{SA} ($V_{g\,min} \rightarrow V_{g\,max}$) can be shortened by the factor 2 to 3 if required (please contact us).
This does not have any effect on the inward swivel time t_{SE} .

FR/FR1 schematics

▼ **A4VSO, sizes 40 and 71**



▼ **A4VSO, sizes 125 to 355**

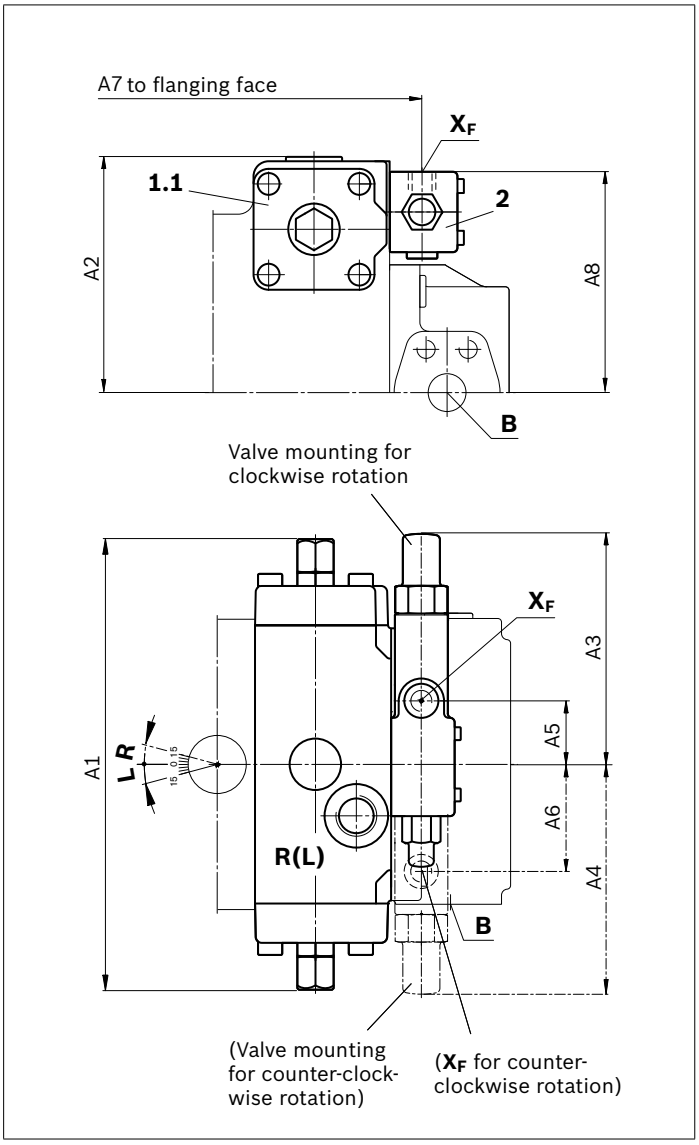


Port	
X_F	Pilot pressure flow controller
M1, M2	Measurement stroking chamber pressure (NG 125 to 355)

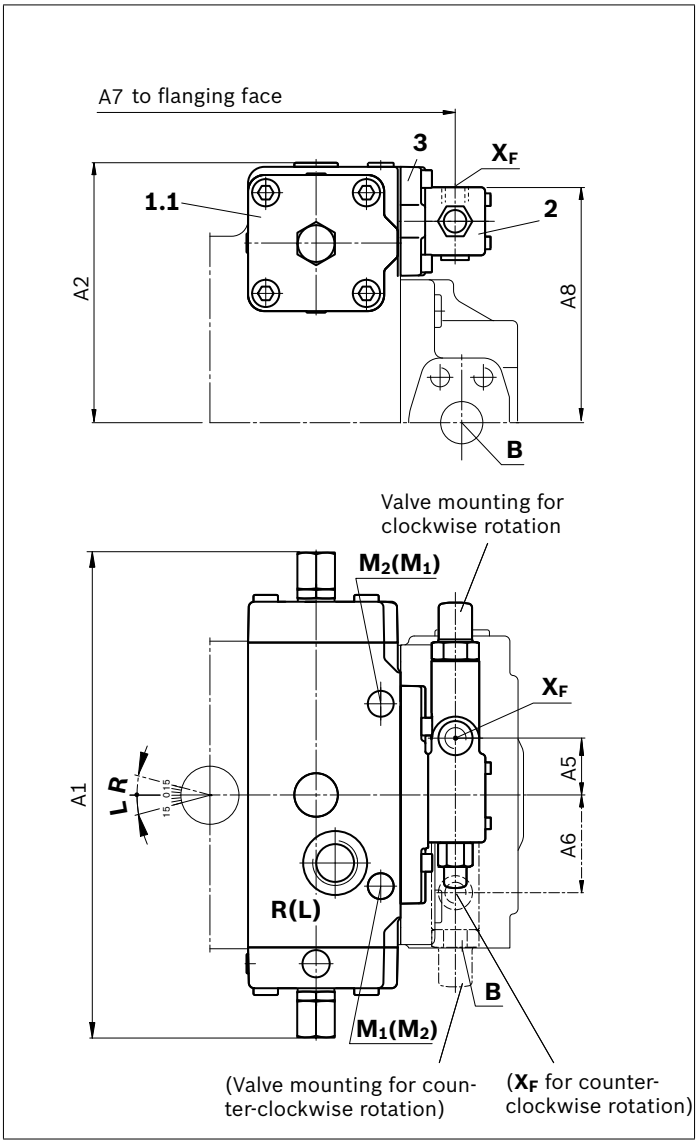
Components	
1	Pump with hydraulic control device
1.1	A4VSO (see data sheet 92050)
2	Flow control valve
3	Intermediate plate (NG 125 to 355)
4	External measuring orifice (not included in the scope of supply)

Dimensions FR/FR1

▼ **A4VSO, sizes 40 and 71**



▼ **A4VSO, size 125 to 355**



NG	A1	A2	A3	A4	A5	A6	A7	A8	
40	260	140	147	137	47	67	209	128	For detailed dimensions and technical data of the variable pump, see data sheet 92050 (A4VSO)
71	298	157	142	142	42	72	236	144	
125/180	354	191	–	–	41	71	305	172	
250/355	424	238	–	–	41	71	367	208	

Port		Standard	Size[1]	$p_{max\ abs}$ [bar][2]	State[3]
X_F	Pilot pressure flow controller	DIN 3852	M14 x 1.5; 12 deep	400	O
M_1; M_2	Measurement of stroking chamber pressure	DIN 3852	M14 x 1.5; 12 deep (NG 125 and 180) M18 x 1.5; 12 deep (NG 250 and 355)	400	X X

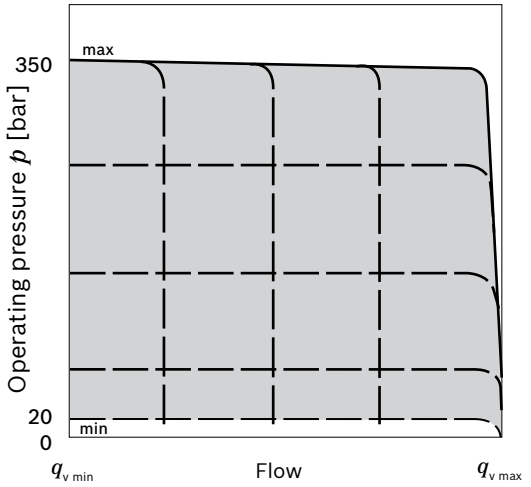
1) For notes on tightening torques, see the instruction manual
2) Momentary pressure spikes may occur depending on the application. Keep this in mind when selecting measuring devices and fittings.
3) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

FRG/FRG1 – flow controller with remote controlled pressure control

The FRG pressure flow controller is a combination of FR (FR1) and DRG.
The flow control is overridden by a pressure control that is controlled by a separate pressure-relief valve (pos. **4**).
For the function and technical data of the remote controlled pressure control, see page 7.
For the function and technical data of the FR flow controller, see pages 19 and 20.
The FRG1 version has no connection from $\mathbf{X_F}$ to the tank.

A4VSO - open circuit

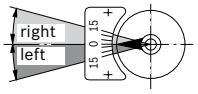
▼ **Characteristic**



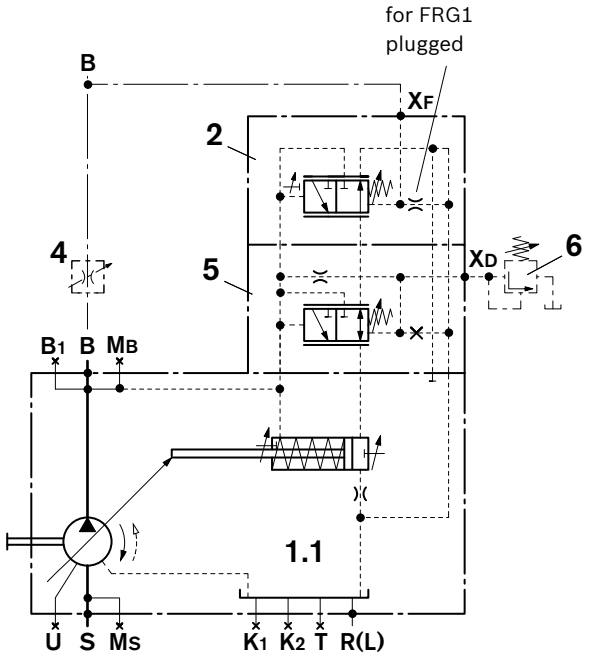
▼ **Flow direction S to B**

Direction of rotation Pump	Swiveling range[1)]	High-pressure port
clockwise	left	**B**
counter-clockwise	right	**B**

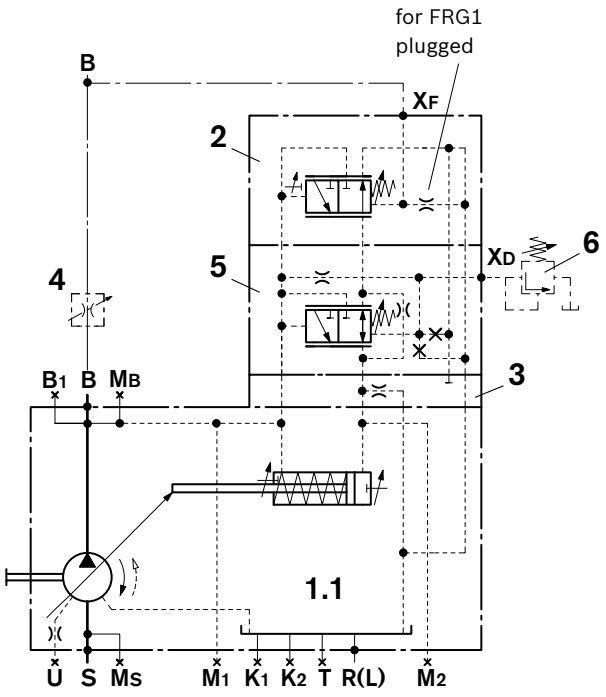
[1)] cf. swivel angle indicator



▼ **A4VSO, sizes 40 and 71**



▼ **A4VSO, sizes 125 to 355**

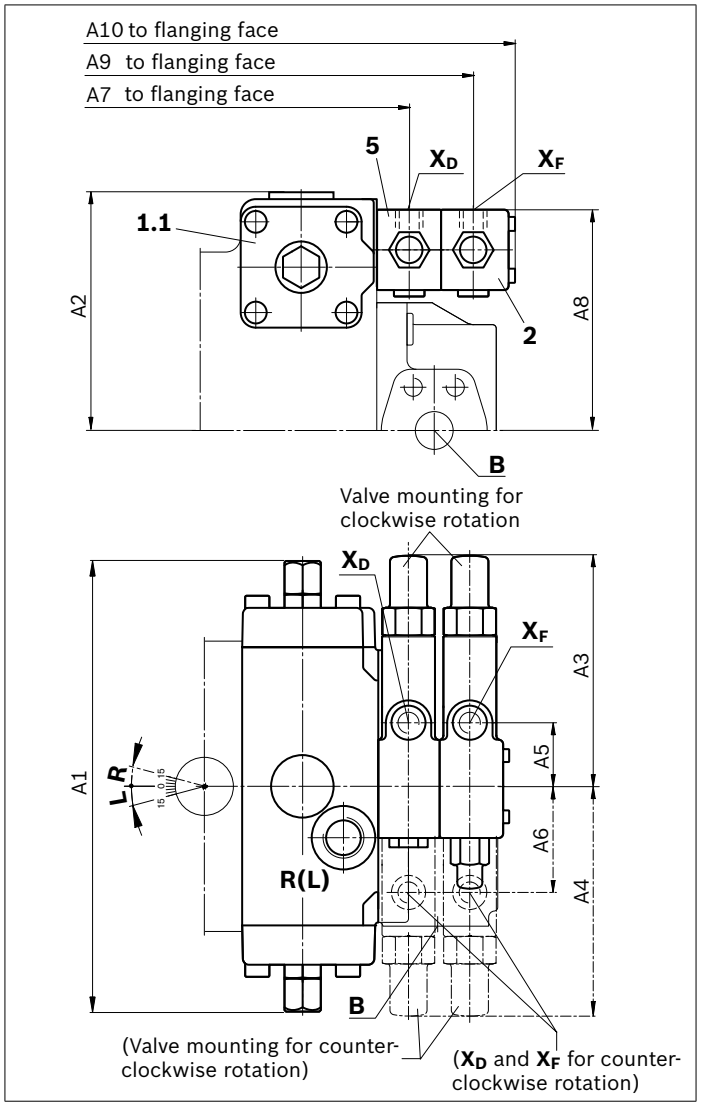


Port	
X_D	Pilot pressure remote control pressure controller
X_F	Pilot pressure flow controller
M1, M2	Measurement stroking chamber pressure (NG 125 to 355)

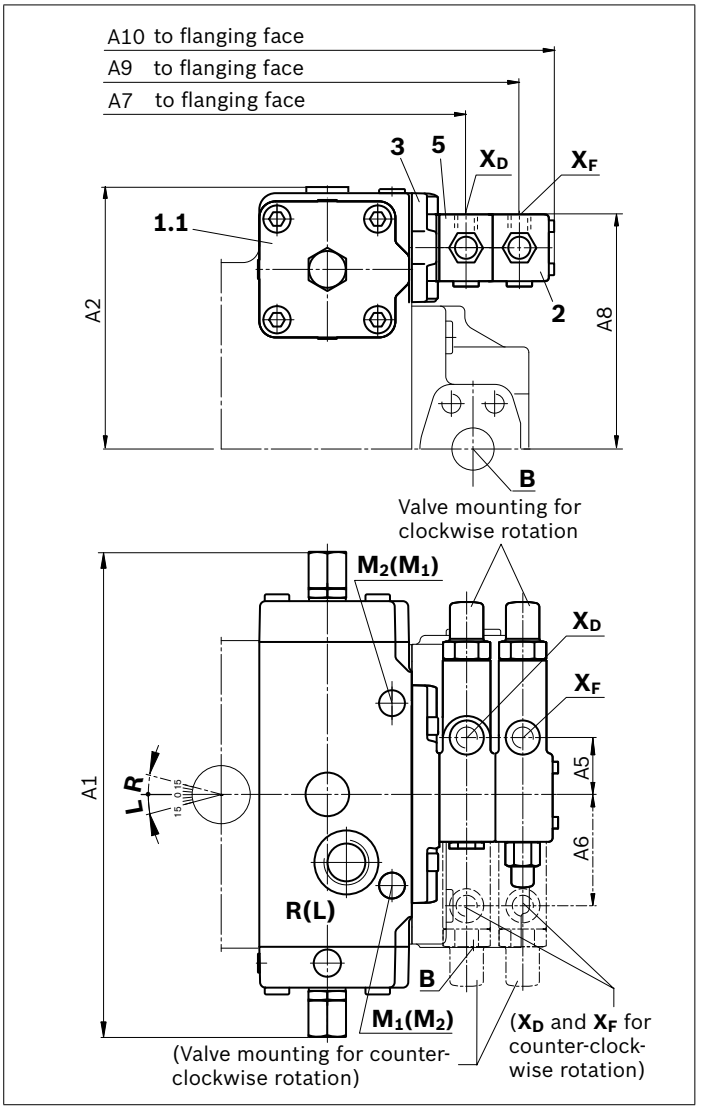
Components	
1	Pump with hydraulic control device
1.1	A4VSO (see data sheet 92050)
2	Flow control valve
3	Intermediate plate (NG 125 to 355)
4	External measuring orifice (not included in the scope of supply)
5	Pressure control valve
6	External pressure control valve (not included in the scope of supply)

Dimensions FRG/FRG1

▼ **A4VSO, sizes 40 and 71**



▼ **A4VSO, size 125 to 355**



NG	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	
40	260	140	147	137	47	67	209	128	249	275	For detailed dimensions and technical data of the variable pump, see data sheet 92050 (A4VSO)
71	298	157	142	142	42	72	236	144	276	302	
125/180	354	191	–	–	41	71	305	172	345	371	
250/355	424	238	–	–	41	71	367	208	407	433	

Port		Standard	Size[1]	$p_{max\ abs}$ [bar][2]	State[3]
X_D	Pilot pressure remote control pressure controller	DIN 3852	M14 x 1.5; 12 deep	400	O
X_F	Pilot pressure flow controller	DIN 3852	M14 x 1.5; 12 deep	400	O
M_1; M_2	Measurement of stroking chamber pressure	DIN 3852	M14 x 1.5; 12 deep (NG 125 and 180) M18 x 1.5; 12 deep (NG 250 and 355)	400	X X

Components, see page 23

1) For notes on tightening torques, see the instruction manual
2) Momentary pressure spikes may occur depending on the application. Keep this in mind when selecting measuring devices and fittings.
3) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

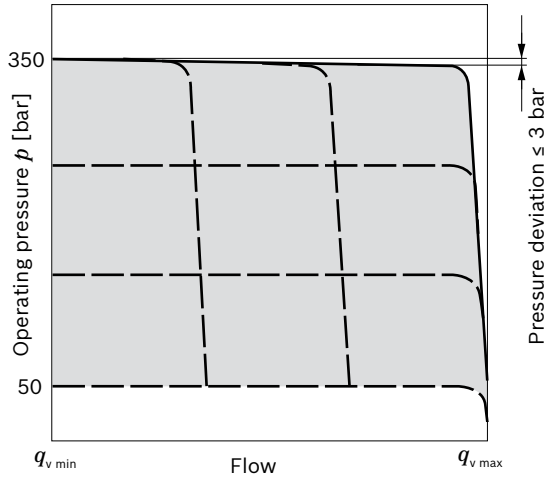
DFR/DFR1 – pressure-flow controller

The DFR pressure and flow controller DFR is a combination of the DR pressure controller and FR flow controller.
For the function and technical data, see DR (page 3) and FR (page 19).
The DFR1 version has no connection from X_F to the tank.

- Initial position in depressurized state: $V_{g\,max}$
- Mechanical minimum and maximum swivel angle limitation
  - The $V_{g\,min}$ stop is set so that a pressure of 15 to 20 bar is set when port **B** is plugged.
  - The $V_{g\,max}$ stop is set to nominal $V_{g\,max}$. When ordering, please state other settings requests in plain text (possible setting ranges $V_{g\,max}$ to 50 % $V_{g\,max}$).

A4VSO - open circuit

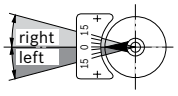
▼ **Static characteristic**



▼ **Flow direction S to B**

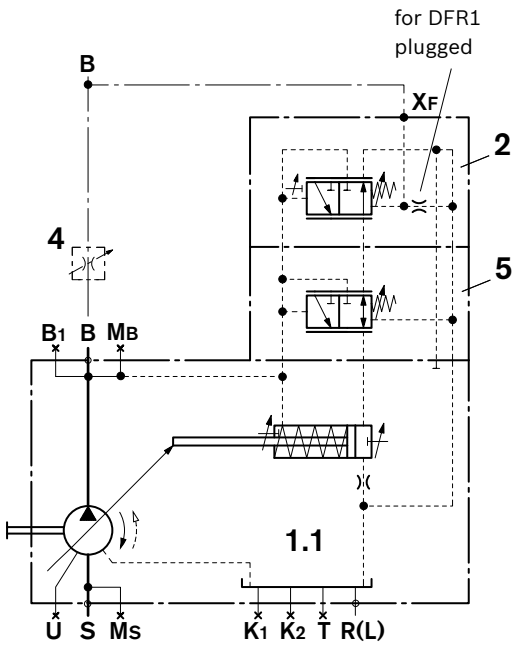
Direction of rotation pump	Swiveling range[1)]	High-pressure port
clockwise	left	**B**
counter-clockwise	right	**B**

[1)] cf. swivel angle indicator

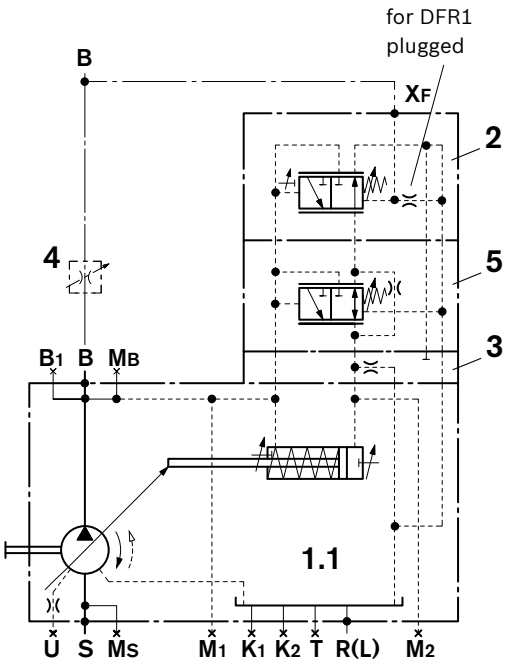


DFR/DFR1 schematics

▼ **A4VSO, sizes 40 and 71**



▼ **A4VSO, sizes 125 to 355**

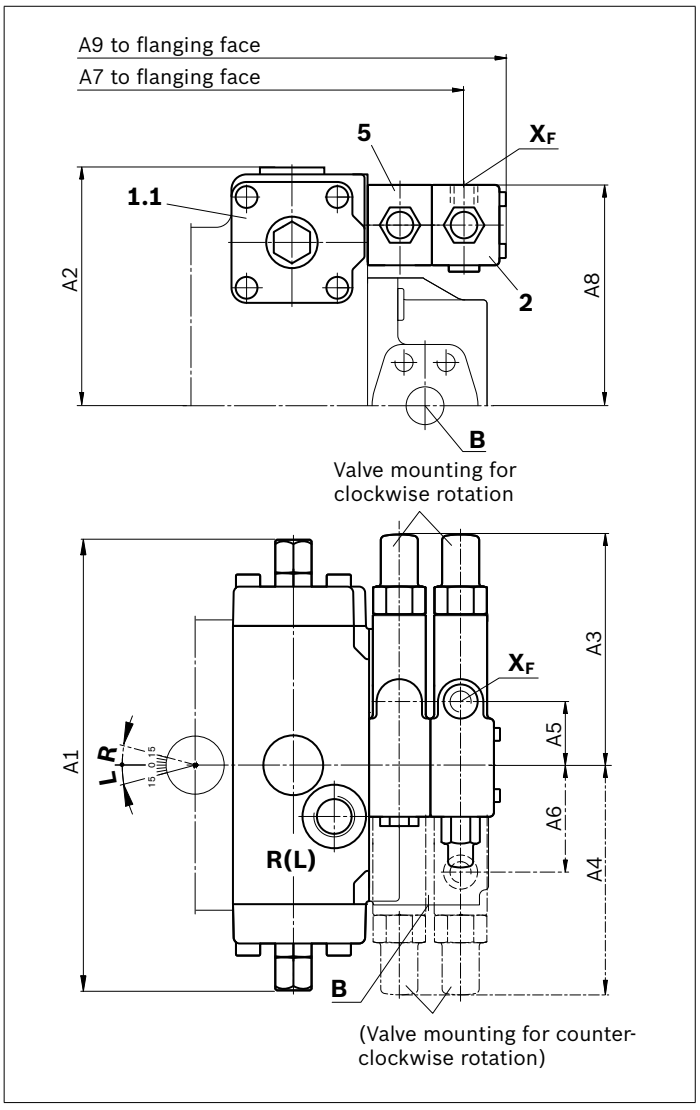


Port	
X_F	Pilot pressure flow controller
M1, M2	Measurement stroking chamber pressure (NG 125 to 355)

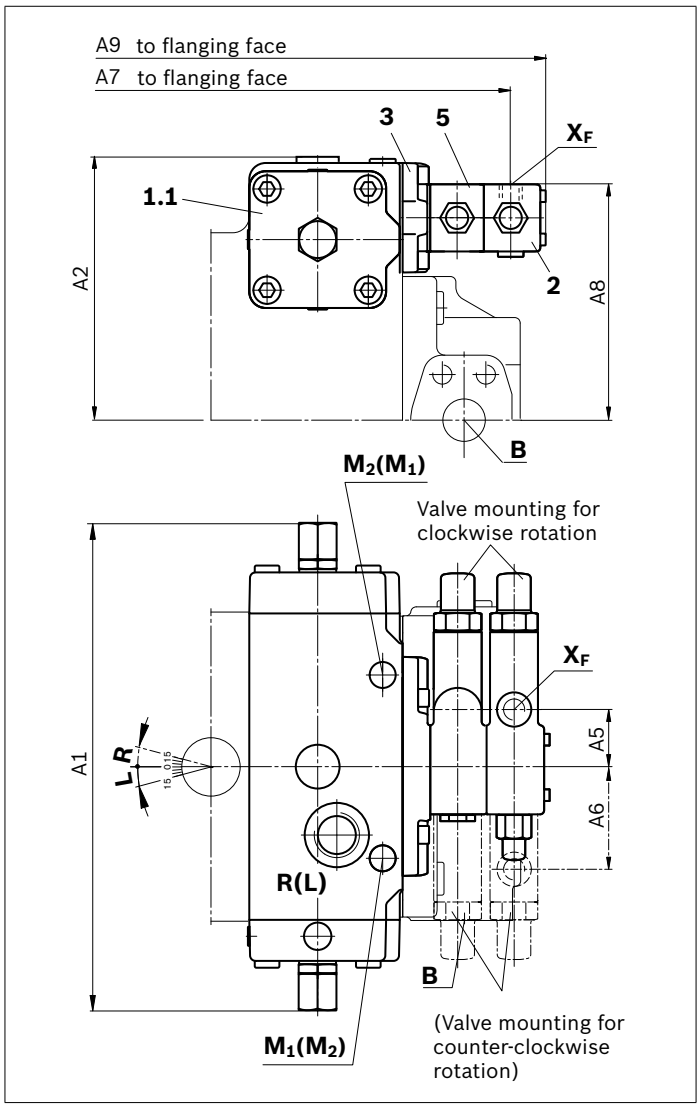
Components	
1	Pump with hydraulic control device
1.1	A4VSO (see data sheet 92050)
2	Flow control valve
3	Intermediate plate (NG 125 to 355)
4	External measuring orifice (not included in the scope of supply)
5	Pressure control valve

Dimensions DFR/DFR1

▼ **A4VSO, sizes 40 and 71**



▼ **A4VSO, size 125 to 355**



NG	A1	A2	A3	A4	A5	A6	A7	A8	A9	
40	260	140	147	137	47	67	249	128	275	For detailed dimensions and technical data of the variable pump, see data sheet 92050 (A4VSO)
71	298	157	142	142	42	72	276	144	302	
125/180	354	191	–	–	41	71	345	172	371	
250/355	424	238	–	–	41	71	407	208	433	

Port		Standard	Size[1]	$p_{max\ abs}$ [bar][2]	State[3]
X_F	Pilot pressure flow controller	DIN 3852	M14 x 1.5; 12 deep	400	O
M_1; M_2	Measurement of stroking chamber pressure	DIN 3852	M14 x 1.5; 12 deep (NG 125 and 180)	400	X
			M18 x 1.5; 12 deep (NG 250 and 355)		X

1) For notes on tightening torques, see the instruction manual
2) Momentary pressure spikes may occur depending on the application. Keep this in mind when selecting measuring devices and fittings.
3) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

Project planning notes

- The A4VSO axial piston variable pump is designed to be used in open circuit.
- 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, these can be requested from Bosch Rexroth.
- Before finalizing your design, please request a binding installation drawing.
- The specified data and notes contained herein must be observed.
- Depending on the operating conditions of the axial piston unit (working pressure, fluid temperature), the characteristic curve may shift.
- 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 the instruction manual.
- Not all versions of the product are approved for use in a safety function pursuant to ISO 13849. Please consult the responsible contact person at Bosch Rexroth if you require reliability parameters (e.g. $MTTF_d$) for functional safety.
- Depending on the type of control used, electromagnetic effects can be produced when using solenoids. When a direct current is applied, solenoids do not cause electromagnetic interference nor is their operation impaired by electromagnetic interference.
  Other behavior can result when a modulated direct current (e.g. PWM signal) is applied. Potential electromagnetic interference for persons (e.g. persons with a pacemaker) and other components must be tested by the machine manufacturer.
- Pressure controllers are not protection against overpressure. A pressure relief valve is to be provided for the hydraulic system.
- 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 appropriate safety measures (e.g. by wearing protective clothing).
- Moving parts in control equipment (e.g. valve pistons) can, under certain circumstances get stuck in position as a result of contamination (e.g. impure 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 filter) will not rule out a fault but merely reduce the risk. The machine/system manufacturer must test whether remedial measures are needed on the machine for the application concerned in order to set the consumer being driven to a safe position (e.g. safe stop) and if necessary to ensure it is properly implemented.

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