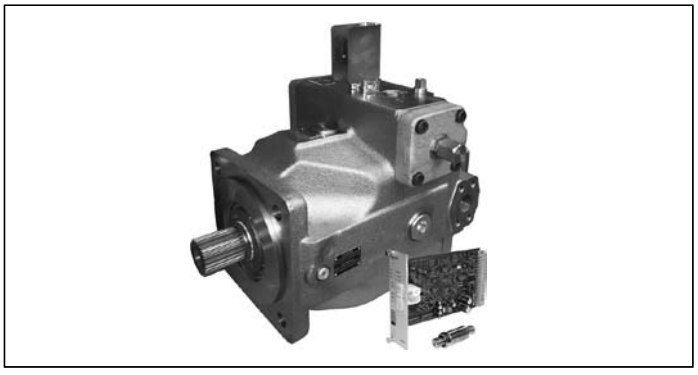
Electro-hydraulic control system DFE1x for axial piston variable pumps A4VSO and A4VBO Series 1x and 3x

RE 92088
Edition: 10.2018
Replaces: 08.2004



- A4VSO size 40 ... 355 series 1x and 3x
  - Nominal pressure: 350 bar
  - Maximum pressure: 400 bar
- A4VBO size 71 ... 250 series 1x and 3x
  - Nominal pressure: 450 bar
  - Maximum pressure: 500 bar
- Open circuit

Features

- **DFE1** – with internal control pressure supply, for the electro-hydraulic control of
  - Pressure
  - Flow
  - Power (optional)
  - Rapid decompression via pump by flow direction change as standard
- **DFE1Y/DFE1Z** – with external control pressure supply (alternatively with preload block "„DFE1“ on page 6)
- Rotary group optimized for long standby operating times
- Pump combinations are possible
- In case of use below the hydraulic fluid level, please contact us.

Related documentation:
Variable pump A4VSO, data sheet 92050
Variable pump A4VBO, data sheet 92122
A4VSO for HFC hydraulic fluids, data sheet 92053
Pressure and flow control system, data sheet 30035

Inhalt

Type 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**

Operating mode

03	Pump, open circuit	**O**

Sizes (NG)

04	Geometric displacement	**40**	**71**	**125**	**180**	**250**	**355**	

Control devices

05	Pressure/flow control, electronic							
	Control pressure, internal, swiveling range -100% to +100%	●	●	●	●	●	●	**DFE1**
	Control pressure, external, swiveling range -100% to +100%	●	●	●	●	●	●	**DFE1Y**
	Control pressure, external, swiveling range 0 to +100%	●	●	●	●	●	●	**DFE1Z**

Series

06	Series 1, index 0	●	●	–	–	–	–	**10**
	Series 3, index 0	–	–	●	●	▲	●	**30**
	Series 3, index 3, efficiency-optimized version. Only with high-speed rotary group "HA4VSO..." and "Sealing material FKM" version	–	–	–	–	●	○	**33**

For details see data sheet 92050

07	Directions of rotation
08	Seals (With HFC hydraulic fluids see also data sheet 92053)
09	Drive shafts
10	Mounting flange
11	Working port
12	Through drives
13	Filtration

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

1) Available in mooring and overcenter operation on request

Type code – A4VBO

01	02	03	04	05	06		07	08	09		10	11	12
	A4VB	**O**				**/**				**–**			

Rotary group version

		71	125	250	
01	High-speed version	–	–	●	**H**

Axial piston unit

02	Swashplate design, variable, for details see data sheet 92122	**A4VB**

Operating mode

03	Pump, open circuit	**O**

Sizes (NG)

		71	125	250
04	Geometric displacement	**71**	**125**	**250**

Control devices

05	Pressure/flow control, electronic				
	Control pressure, internal	●	●	●	**DFE1**
	Control pressure, external	●	●	●	**DFE1Z**

Series

06	Series 1, index 0	●	–	–	**10**
	Series 3, index 0	–	●	–	**30**
	Series 3, index 3, efficiency-optimized version. Only with high-speed rotary group "HA4VBO..." and "Sealing material FKM" version	–	–	●	**33**

For details see data sheet 92122

07	Directions of rotation
08	Seal
09	Drive shaft
10	Mounting flange
11	Working port
12	Through drives

● = Available ○ = On request – = Not available

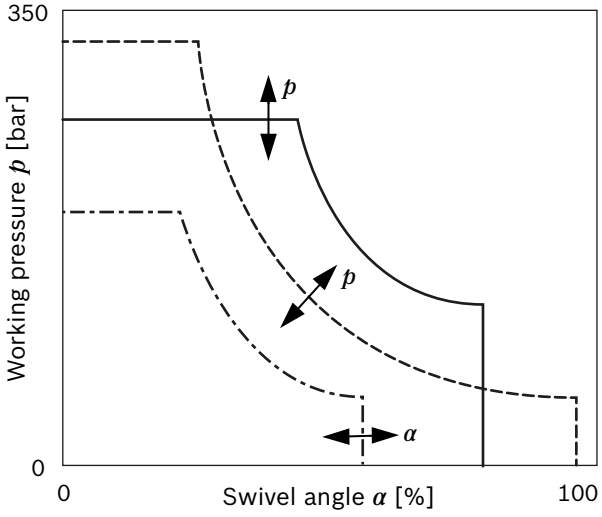
1) Available in mooring and overcenter operation on request

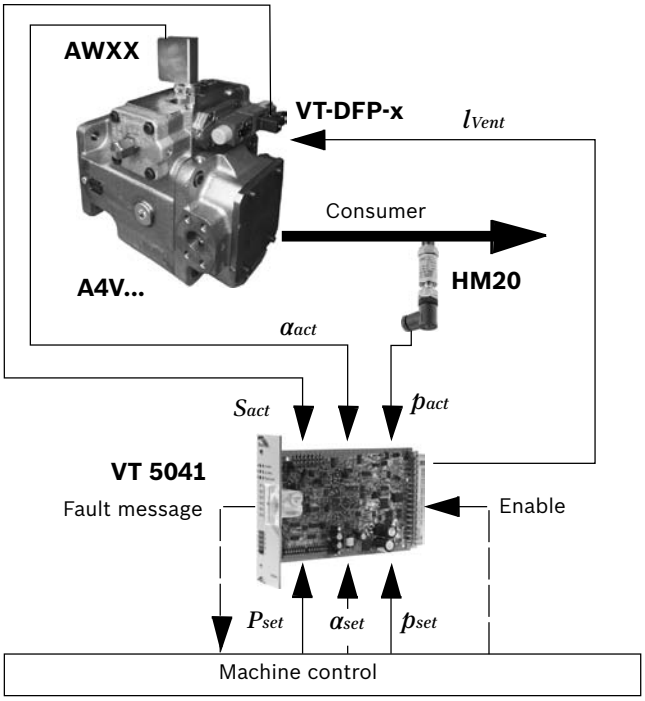
Components

The DFE1x control system consists of the subsequently listed components:

- Well proven high-pressure axial piston pump **A4VSO** and/or **A4VBO** in swashplate design for industrial applications.
- Proportional valve[1)] **VT-DFP-x-2X** for exact control with position monitoring (see data sheet 29016).
- Inductive position transducer[1)] **AWXX** on the control system for swivel angle recording.
- Pressure transducer[1)] **HM 20-2x** for recording the system pressure acc. to data sheet 30272 (optional, only required with pressure and power control function, please order separately).
- analog amplifier **VT 5041-3x** according to data sheet 30242 (please order separately).

▼ **Characteristic curve DFE1x**





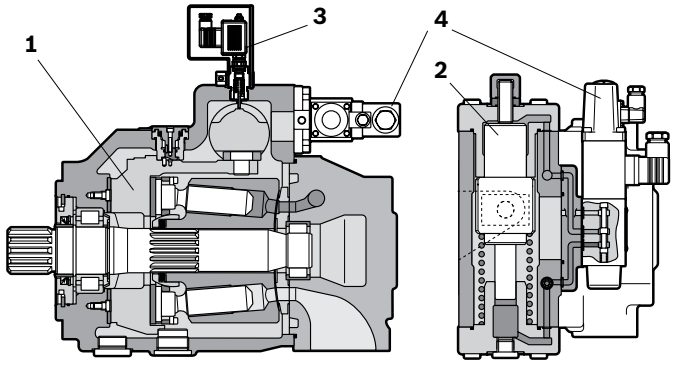
1) Plug-in connector and mating connector are only included in the scope of delivery of complete units.

Functional description

An electrically actuated proportional valve controls the pressure and swivel angle as well as the power limitation of the A4V...DFE1 variable pump (**4**). The current at the proportional valve determines the position of the swashplate (**1**) and thus the flow of the pump via the stroking piston (**2**) and the position transducer (**3**).
With the electric motor switched off and actuator system depressurized, the pump swivels to maximum displacement ($V_{g\,max}$) through spring force.

Zero stroke pressure (DFE1):
With a de-energized proportional valve and plugged pump outlet, the pump switches to $V_{g\,min}$ - zero stroke pressure. In this operating condition, an equilibrium from 4 to 8 bar is established. This is also true in the event of a fault or without control release.
This basic position (= zero-stroke operation) is taken with inactive control electronics (e.g. controller enable not granted) and in case of an error (in case of plugged pump outlet). If the residual pressure form 4 to 8 bar is not desired, DFE1Y, DFE1Z can be used.

▼ **Sectional view A4VSO with DFE1**



There are three possibilities to provide the control fluid for the hydraulic control system of the pump (and thus the control power):

- Internal (DFE1) from own medium (page 6)
- Internal (DFE1) with preload block (alternatively) (only with A4VSO NG 250 and 355).
- External (DFE1Y, DFE1Z) with control pressure supply (page 7 and page 8)

An analog controller card VT 5041-3x provides for the control of the proportional valve. This controller card processes all required control signals which are necessary to operate the A4V...DFE1x variable pump. By default, it has one command value input for pressure and swivel angle each and optionally one input for the power setpoint. The pressure actual value is recorded by a pressure transducer. A position transducer (**3**) at the control system records the swivel angle actual value. The recorded actual values are processed in the amplifier and compared to the specified command values. The minimum value generator makes sure that only the controller assigned to the desired working point is automatically active. The output signal of the minimum value generator is the command value for the proportional solenoid at the valve. In order to achieve better control quality of the entire system, the proportional valve is designed as subordinate position control loop.

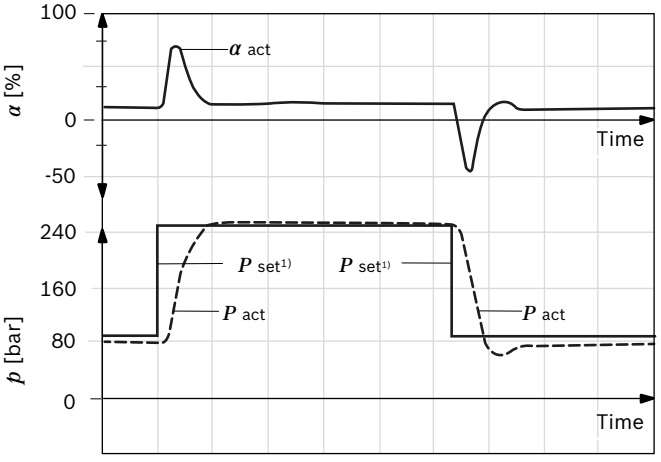
Control loop performance

	Swivel angle control	**Pressure control**
Linearity tolerance	≤ 1.0%	≤ 1.5%
Hysteresis	≤ 0.2%	≤ 0.2%
Repeat accuracy	≤ 0.2%	≤ 0.2%

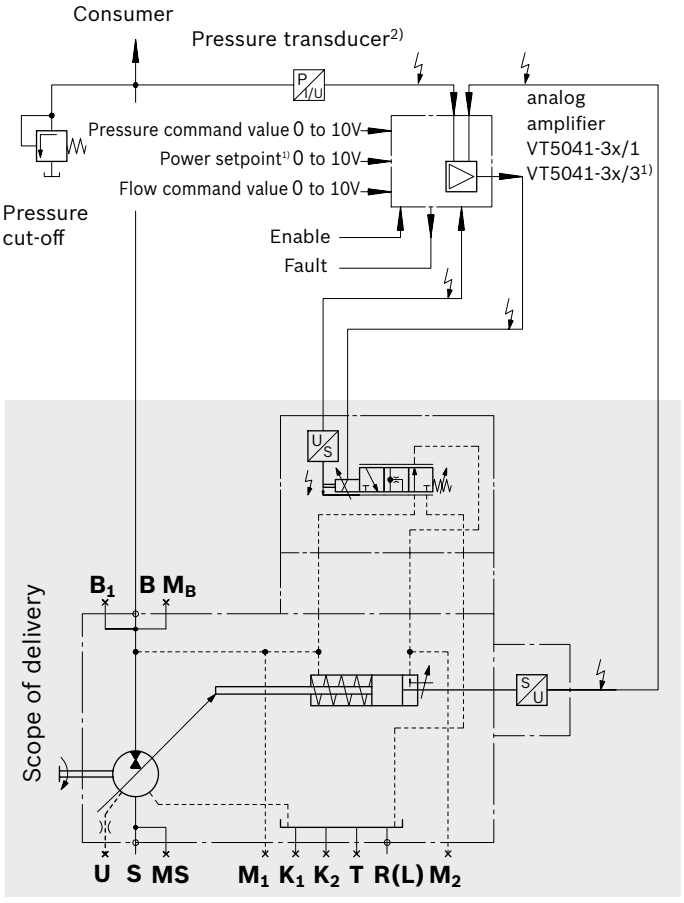
DFE1

Control system supply, internal,
Swiveling range ±100% A4VSO, 0% to +100% A4VBO.
With DFE1, the control power is provided internally. The system pressure must always be higher than 4 to 8 bar (see also point "Zero stroke pressure" on page 5 and "Fail-safe features"), in order to allow for the control of flow, pressure or power of the pump. Below a high pressure of 4 to 8 bar, the pump strives to swivel back to $V_{g\,max}$ - irrespective of the command value at the valve. At a pressure of more than 4 to 8 bar in **B**, the flow direction of the pump is reversed. This feature of switching over the neutral position enables a quick pressure reduction via the pump. For reliable control, the system pressure must be at least 20 bar.
If the pump is to be controlled below 20 bar, the preload block **AGEV4-05728-AA/46** is required for generating the required control power (only for A4VSO NG250 and NG355). Please contact us.

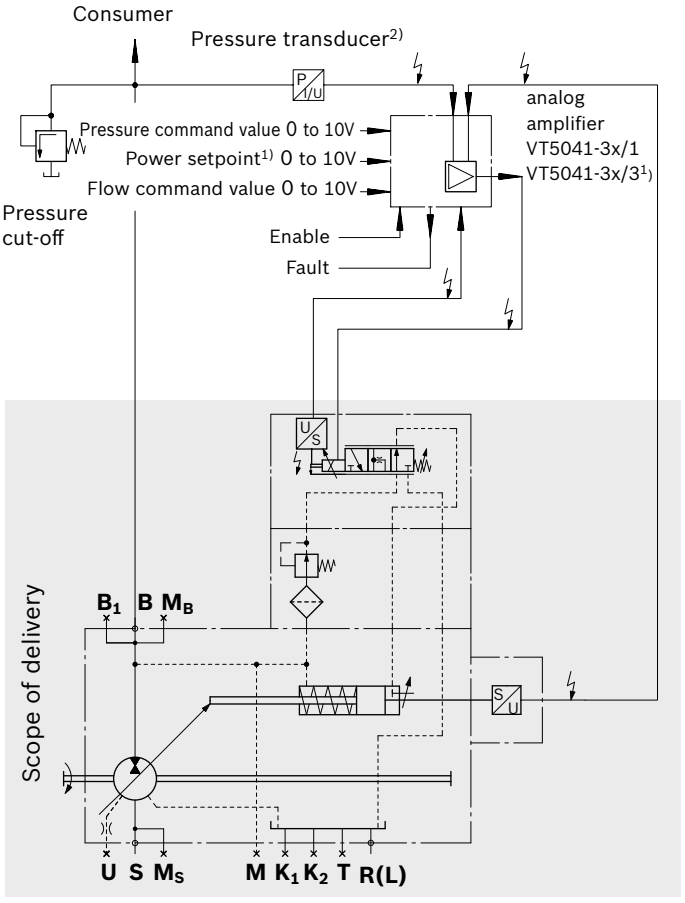
Fail safe features
By default, the pump will - below the high pressure of 4 to 8 bar - swivel back to higher flow; so undesired operation in negative direction of flow is not possible!



▼ **System circuit diagram A4VSO....DFE1**



▼ **System circuit diagram A4VBO....DFE1**



1) optional, power limitation
2) only required for pressure and/or power control

DFE1Y

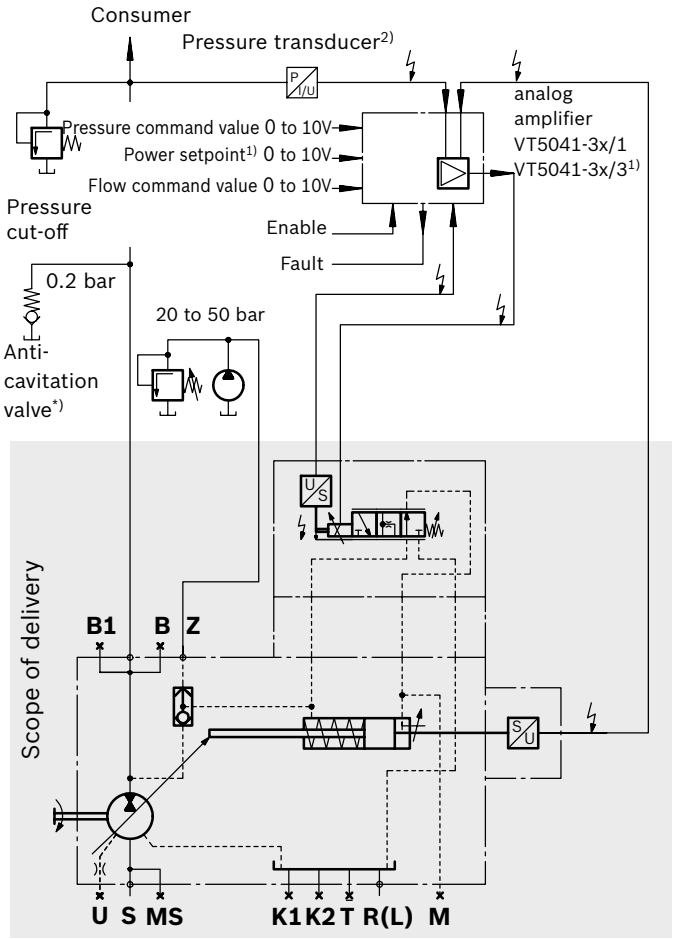
Control system supply, external,
Swiveling range -100% to +100%

With DFE1Y, the control power of 20 to 50 bar is supplied externally, e.g. by means of a gear pump. The automatic switch-over to internal supply is effected by means of a shuttle valve.
With this version, the flow direction can be inverted as special feature - also with pressures below 4 to 8 bar. This feature of switching over zero enables a quick pressure reduction via the pump.

Notice

- With externally supplied control systems (swiveling range ± 100%), the feature by means of which the controller card swivels the pump to zero stroke if the output stage is de-energized is deactivated.
- With de-energized output stage of the controller card (e.g. in case of error), the swivel plate of the controller pump is pushed to the negative stop by the external pressure (displacement of 100% flow from the system into the reservoir). In order to prevent cavitation in this case, it is necessary to use an anti-cavitation valve*) (check valve with 0.2 bar spring).
- If an error is detected, the output stage is switched off and due to the external supply, the pump swivels in the direction of the negative stop. If a failure message is active, reaction by the machine control is imperatively necessary (e.g. switch off drive motor of the pump, interrupt external supply of the control system).
- Command values for pressure and flow must always be greater than zero (p_{set} ≥ 3 bar, α_{set} ≥ 5%) as due to drift or inexact setting, there is no exact "zero" pressure or a "zero" swivel angle. In the worst case, smaller command value specifications may cause cavitation.

▼ **System circuit diagram A4VSO....DFE1Y**



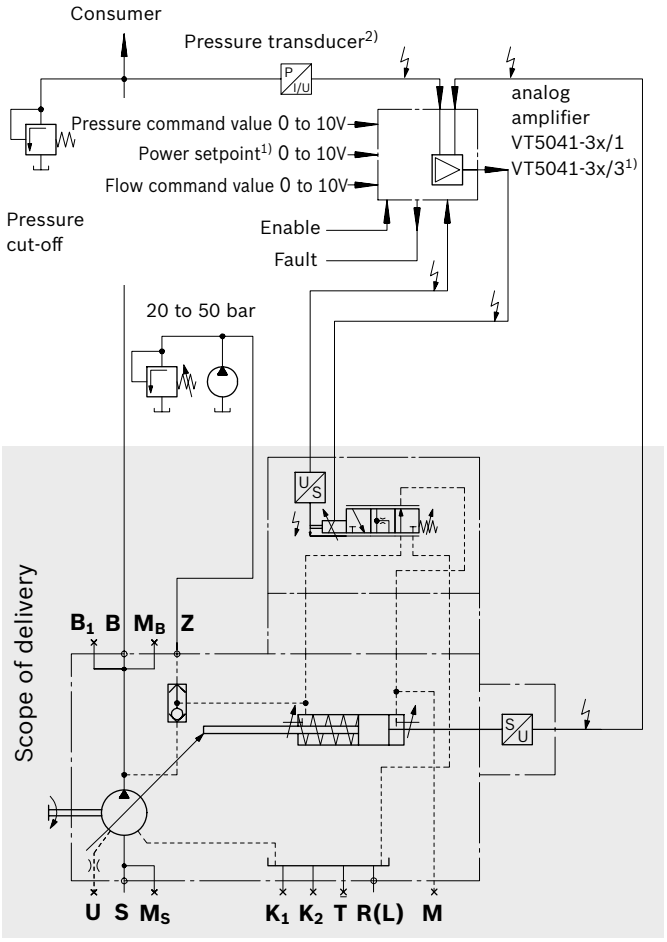
1) optional, power limitation
2) only required for pressure and/or power control

DFE1Z

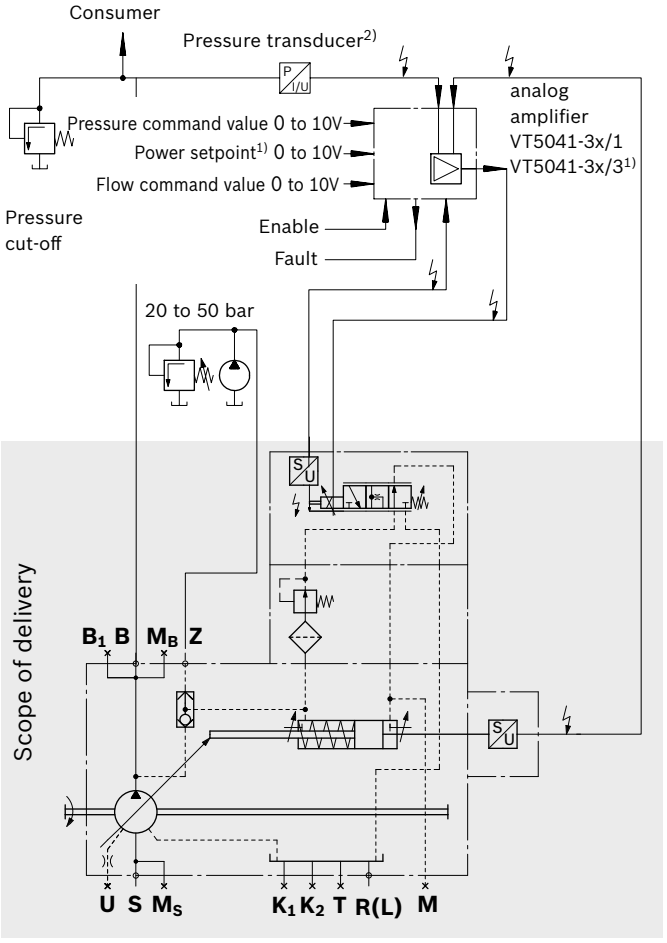
Control system supply, external,
Swiveling range 0 to +100%

With DFE1Z, the control power of 20 to 50 bar is supplied externally, e.g. by means of a gear pump. With DFE1Z, a $V_{g\,min}$ limitation screw is provided as special feature which prevents swiveling through the neutral position. Thus, the quick pressure reduction option via the pump is no longer available.

▼ **System circuit diagram A4VSO....DFE1Z**



▼ **System circuit diagram A4VBO....DFE1Z**



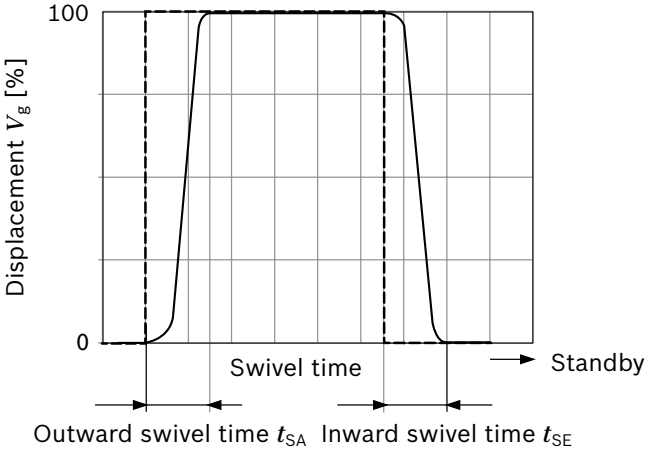
1) optional, power limitation
2) only required for pressure and/or power control

Swivel times in case of a swivel angle command value jump

▼ **With p= 100 bar**

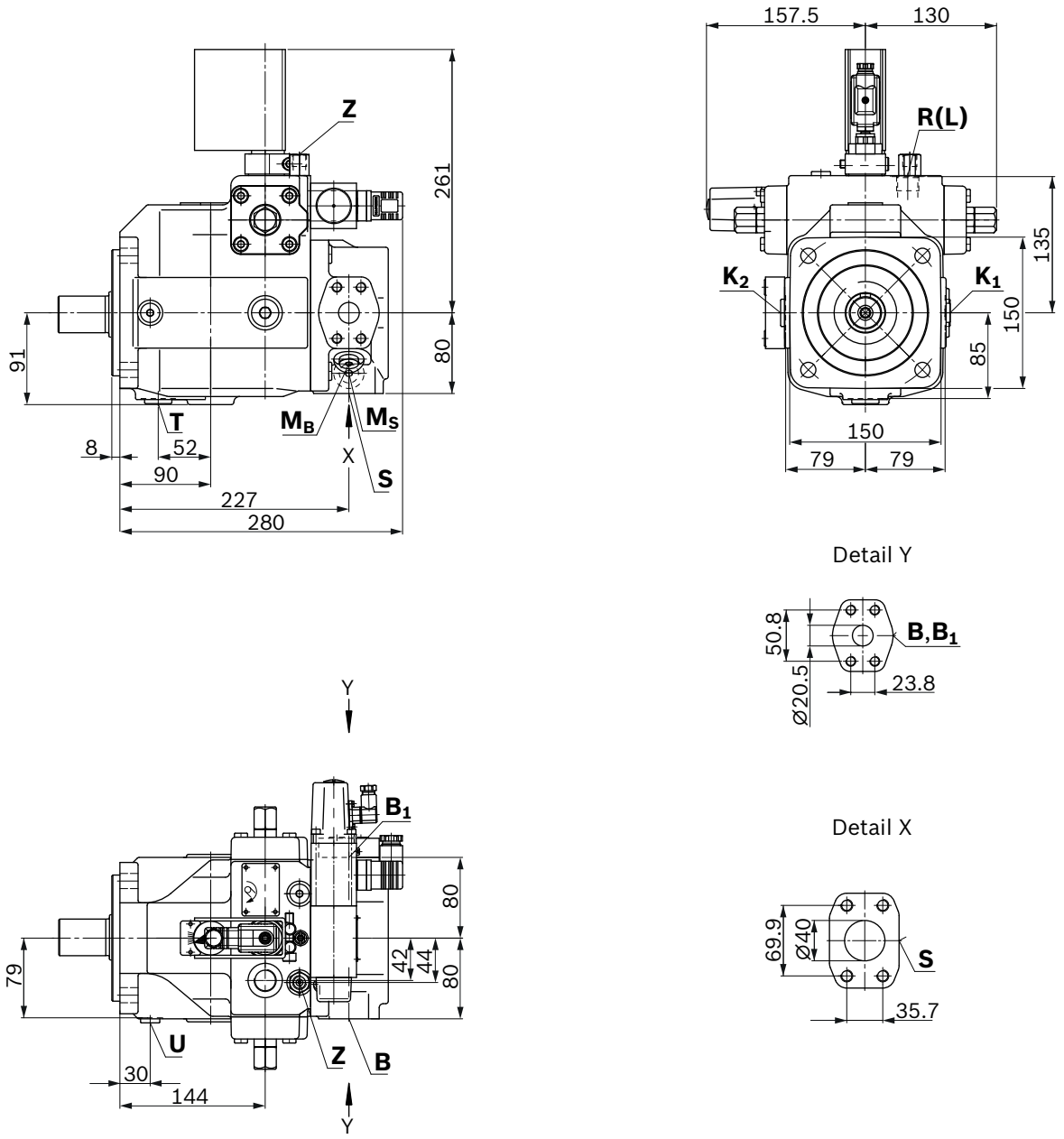
NG	**t_{SA} [ms]** to α 100%	**t_{SE} [ms]** from α 100% to 0%
40	65	30
71	80	60
125	95	110
180	105	110
250	115	140
355	170	180

▼ **Characteristic curve command value jump**



Dimensions A4VSO size 40

Example: **DFE1Z – Electro-hydraulic control system with external control pressure supply**



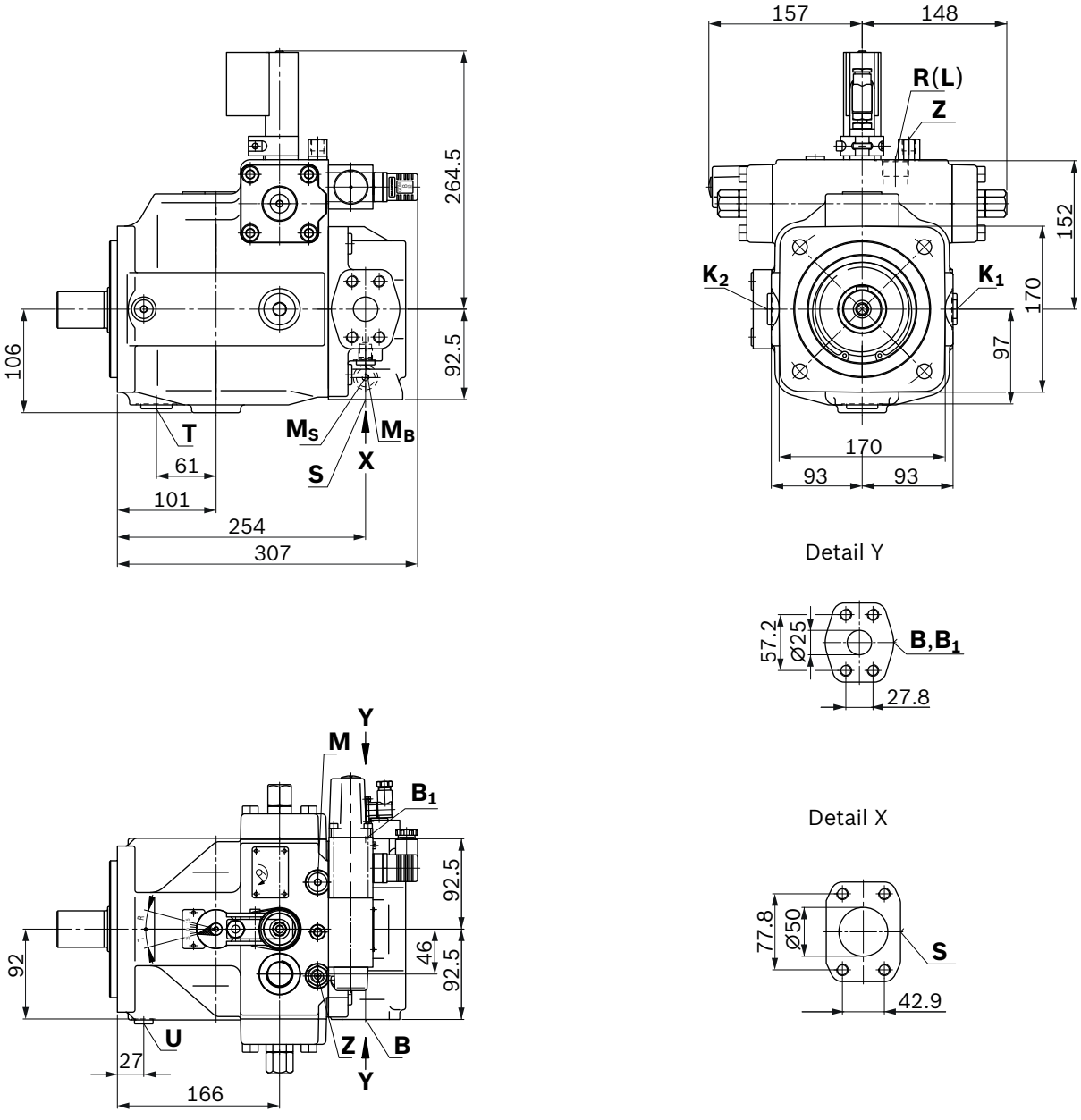
- For connection table, see page 11
- For detailed dimensions, standards and thread depth of the variable pump, see data sheet 92050

Ports		**Standard**	**Size**[1]	$p_{max\ abs}$ **[bar]**[2]	**State**[6]
S	Suction port (standard pressure series) Fastening thread	SAE J518[3] DIN 13	1 1/2 in M12 × 1.75; 20 deep	30	O
for port plate version 13					
B	Pressure port (high-pressure series) Fastening thread	SAE J518[3] DIN 13	3/4 in M10 × 1.5; 17 deep	400	O
B_1	Additional connection	DIN 3852	M22 × 1.5; 14 deep	400	X
for port plate version 25					
B	Pressure port (high-pressure series)	SAE J518[3]	3/4 in	400	O
	Fastening thread	DIN 13	M10 × 1.5; 17 deep		
B_1	2. working port (high-pressure series)	SAE J518[3]	3/4 in	400	X[7]
	Fastening thread	DIN 13	M10 × 1.5; 17 deep		
K_1, K_2	Flushing port	DIN 3852	M22 × 1.5; 14 deep	4	X[5]
T	Drain port	DIN 3852[4]	M22 × 1.5; 14 deep	4	X[5]
M_B	Measuring port working pressure	DIN 3852	M14 × 1.5; 12 deep	400	X
M_S	Measuring port suction pressure	DIN 3852	M14 × 1.5; 12 deep	30	X
R(L)	Drain port	DIN 3852[4]	M22 × 1.5; 14 deep	4	O[5]
Z	Control pressure (for DFE1Z)	ISO 6149	M14 × 1.5; 15.5 deep	50	O
U	Flushing port	DIN 3852	M14 × 1.5; 12 deep	5	X

1) Observe the notes in the instruction manual concerning the maximum tightening torques.
2) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
3) Metric fastening thread is a deviation from standard.
4) The countersink may be deeper than specified in the standard.
5) Depending on the installation position, **T_1**, **K_2**, **K_3** or **R**(**L**) must be connected (see also installation instructions in data sheet 92050).
6) O = Must be connected (comes plugged)
X = Plugged (in normal operation)
7) Plugged with flange plate

Dimensions A4VSO size 71

Example: **DFE1Z – Electro-hydraulic control system with external control pressure supply**



▶ For connection table, see page 13

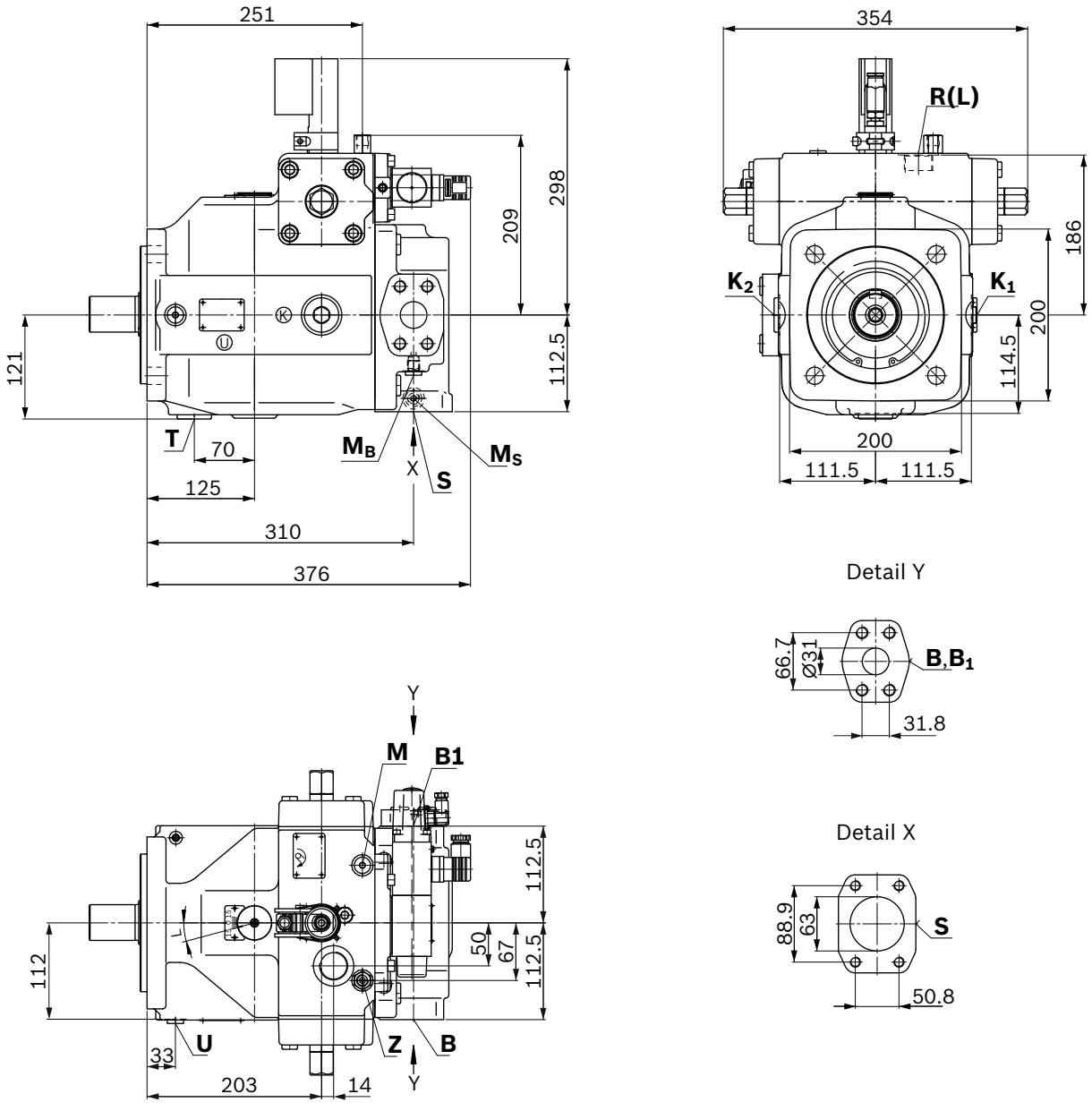
▶ For detailed dimensions, standards and thread depth of the variable pump, see data sheet 92050

Ports		**Standard**	**Size**[1]	$p_{max\ abs}$ **[bar]**[2]	**State**[5]
S	Suction port (standard pressure series) Fastening thread	SAE J518[3] DIN 13	2 in M12 × 1.75; 20 deep	30	O
for port plate version 13					
B	Pressure port (high-pressure series) Fastening thread	SAE J518[3] DIN 13	1 in M12 × 1.75; 20 deep	400	O
B_1	Additional connection	DIN 3852	M27 × 2; 16 deep	400	X
for port plate version 25					
B	Pressure port (high-pressure series)	SAE J518[3]	1 in	400	O
	Fastening thread	DIN 13	M12 × 1.75; 20 deep		
B_1	2. working port (high-pressure series)	SAE J518[3]	1 in	400	X[7]
	Fastening thread	DIN 13	M12 × 1.75; 20 deep		
K_1, K_2	Flushing port	DIN 3852	M27 × 2; 16 deep	4	X[6]
T	Drain port	DIN 3852[4]	M27 × 2; 16 deep	4	X[6]
M	Control pressure measuring port	DIN 3852	M14 × 1.5; 12 deep	400	X
M_B	Measuring port working pressure	DIN 3852	M14 × 1.5; 12 deep	400	X
M_S	Measuring port suction pressure	DIN 3852	M14 × 1.5; 12 deep	30	X
R(L)	Drain port	DIN 3852[4]	M27 × 2; 16 deep	4	O[6]
Z	Control pressure (for DFE1Z)	ISO 6149	M14 × 1.5; 15.5 deep	50	O
U	Flushing port	DIN 3852	M14 × 1.5; 12 deep	5	X

1) Observe the notes in the instruction manual concerning the maximum tightening torques.
2) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
3) Metric fastening thread is a deviation from standard.
4) The countersink may be deeper than specified in the standard.
5) Depending on the installation position, **T_1**, **K_2**, **K_3** or **R**(**L**) must be connected (see also installation instructions in data sheet 92050).
6) O = Must be connected (comes plugged)
X = Plugged (in normal operation)
7) Plugged with flange plate

Dimensions A4VSO size 125

Example: **DFE1Z – Electro-hydraulic control system with external control pressure supply**



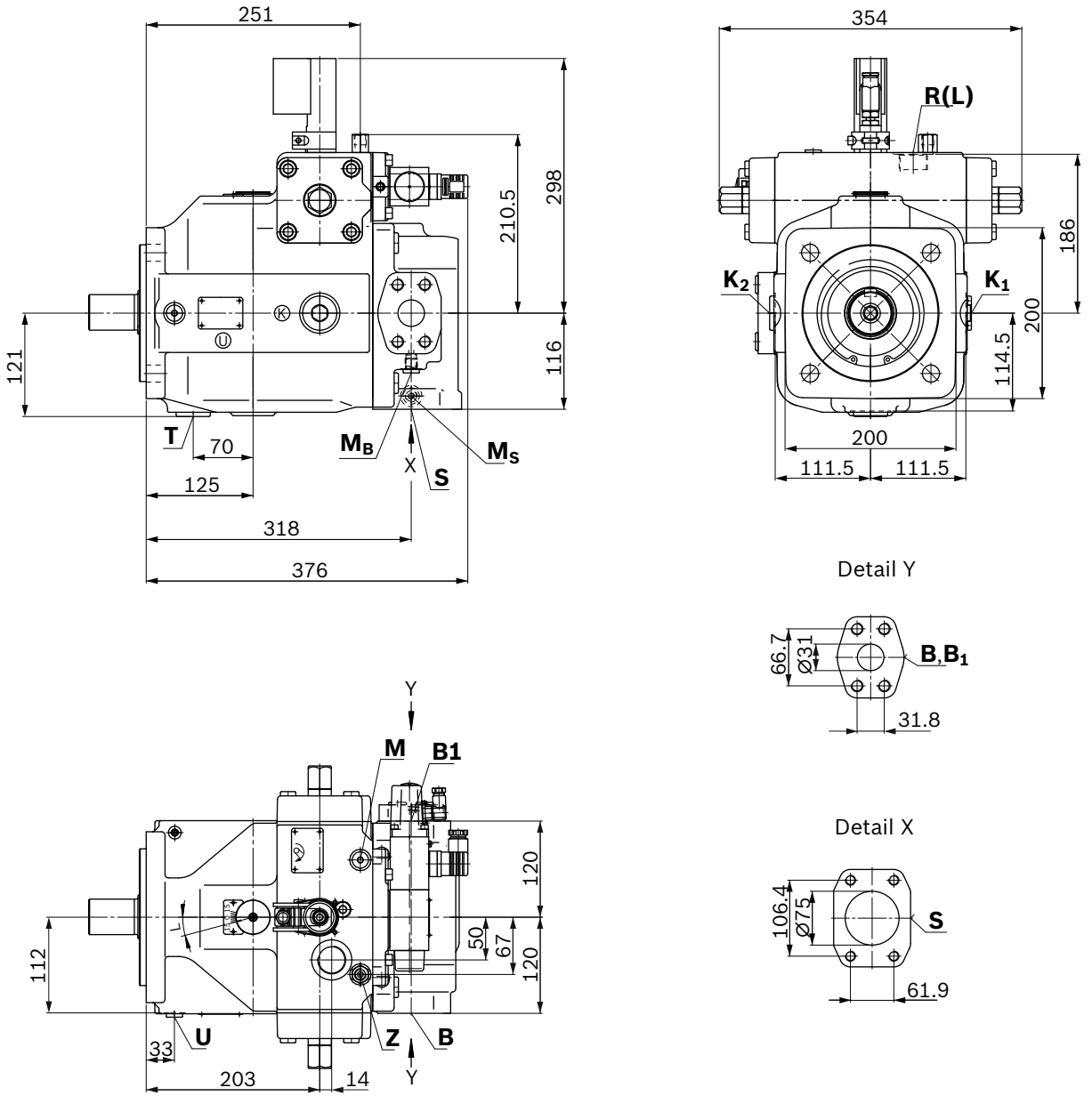
- For connection table, see page 15
- For detailed dimensions, standards and thread depth of the variable pump, see data sheet 92050

Ports		**Standard**	**Size**[1]	$p_{max\ abs}$ **[bar]**[2]	**State**[6]
S	Suction port (standard pressure series) Fastening thread	SAE J518[3] DIN 13	2 1/2 in M12 × 1.75; 20 deep	30	O
for port plate version 13					
B	Pressure port (high-pressure series) Fastening thread	SAE J518[3] DIN 13	1 1/4 in M14 × 2; 19 deep	400	O
B_1	Additional connection	DIN 3852	M33 × 2; 18 deep	400	X
for port plate version 25					
B	Pressure port (high-pressure series)	SAE J518[3]	1 1/4 in	400	O
	Fastening thread	DIN 13	M14 × 2; 19 deep		
B_1	2. working port (high-pressure series)	SAE J518[3]	1 1/4 in	400	X[7]
	Fastening thread	DIN 13	M14 × 2; 19 deep		
K_1, K_2	Flushing port	DIN 3852	M33 × 2; 18 deep	4	X[5]
T	Drain port	DIN 3852[4]	M33 × 2; 18 deep	4	X[5]
M	Control pressure measuring port	DIN 3852	M14 × 1.5; 12 deep	400	X
M_B	Measuring port working pressure	DIN 3852	M14 × 1.5; 12 deep	400	X
M_S	Measuring port suction pressure	DIN 3852	M14 × 1.5; 12 deep	30	X
R(L)	Drain port	DIN 3852[7]	M33 × 2; 18 deep	4	O[5]
Z	Control pressure (for DFE1Z)	ISO 6149	M14 × 1.5; 15.5 deep	50	O
U	Flushing port	DIN 3852	M14 × 1.5; 12 deep	5	X

1) Observe the notes in the instruction manual concerning the maximum tightening torques.
2) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
3) Metric fastening thread is a deviation from standard.
4) The countersink may be deeper than specified in the standard.
5) Depending on the installation position, **T_1**, **K_2**, **K_3** or **R**(**L**) must be connected (see also installation instructions in data sheet 92050).
6) O = Must be connected (comes plugged)
X = Plugged (in normal operation)
7) Plugged with flange plate

Dimensions A4VSO size 180

Example: **DFE1Z – Electro-hydraulic control system with external control pressure supply**



▶ For connection table, see page 17

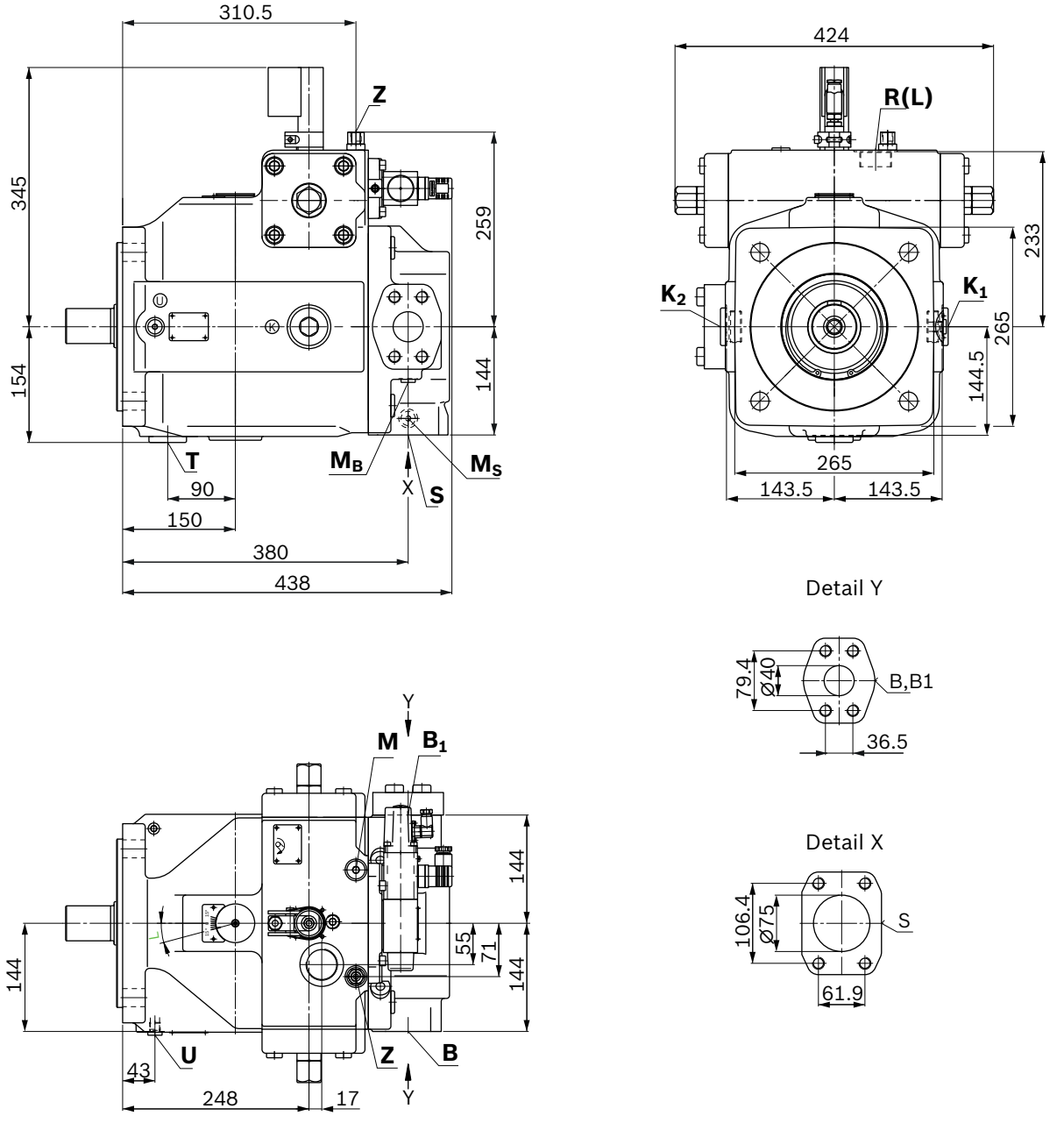
▶ For detailed dimensions, standards and thread depth of the variable pump, see data sheet 92050

Ports		**Standard**	**Size**[1]	$p_{max\ abs}$ **[bar]**[2]	**State**[6]
S	Suction port (standard pressure series) Fastening thread	SAE J518[3] DIN 13	3 in M16 × 2; 24 deep	30	O
for port plate version 13					
B	Pressure port (high-pressure series) Fastening thread	SAE J518[3] DIN 13	1 1/4 in M14 × 2; 19 deep	400	O
B_1	Additional connection	DIN 3852	M33 × 2; 18 deep	400	X
for port plate version 25					
B	Pressure port (high-pressure series)	SAE J518[3]	1 1/4 in	400	O
	Fastening thread	DIN 13	M14 × 2; 19 deep		
B_1	2. working port (high-pressure series)	SAE J518[3]	1 1/4 in	400	X[7]
	Fastening thread	DIN 13	M14 × 2; 19 deep		
K_1, K_2	Flushing port	DIN 3852	M33 × 2; 18 deep	4	X[5]
T	Drain port	DIN 3852[4]	M33 × 2; 18 deep	4	X[5]
M	Control pressure measuring port	DIN 3852	M14 × 1.5; 12 deep	400	X
M_B	Measuring port working pressure	DIN 3852	M14 × 1.5; 12 deep	400	X
M_S	Measuring port suction pressure	DIN 3852	M14 × 1.5; 12 deep	30	X
R(L)	Drain port	DIN 3852[7]	M33 × 2; 18 deep	4	O[5]
Z	Control pressure (for DFE1Z)	ISO 6149	M14 × 1.5; 15.5 deep	50	O
U	Flushing port	DIN 3852	M14 × 1.5; 12 deep	5	X

1) Observe the notes in the instruction manual concerning the maximum tightening torques.
2) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
3) Metric fastening thread is a deviation from standard.
4) The countersink may be deeper than specified in the standard.
5) Depending on the installation position, **T_1**, **K_2**, **K_3** or **R**(**L**) must be connected (see also installation instructions in data sheet 92050).
6) O = Must be connected (comes plugged)
X = Plugged (in normal operation)
7) Plugged with flange plate

Dimensions A4VSO size 250

Example: **DFE1Z – Electro-hydraulic control system with external control pressure supply**



▶ For connection table, see page 19

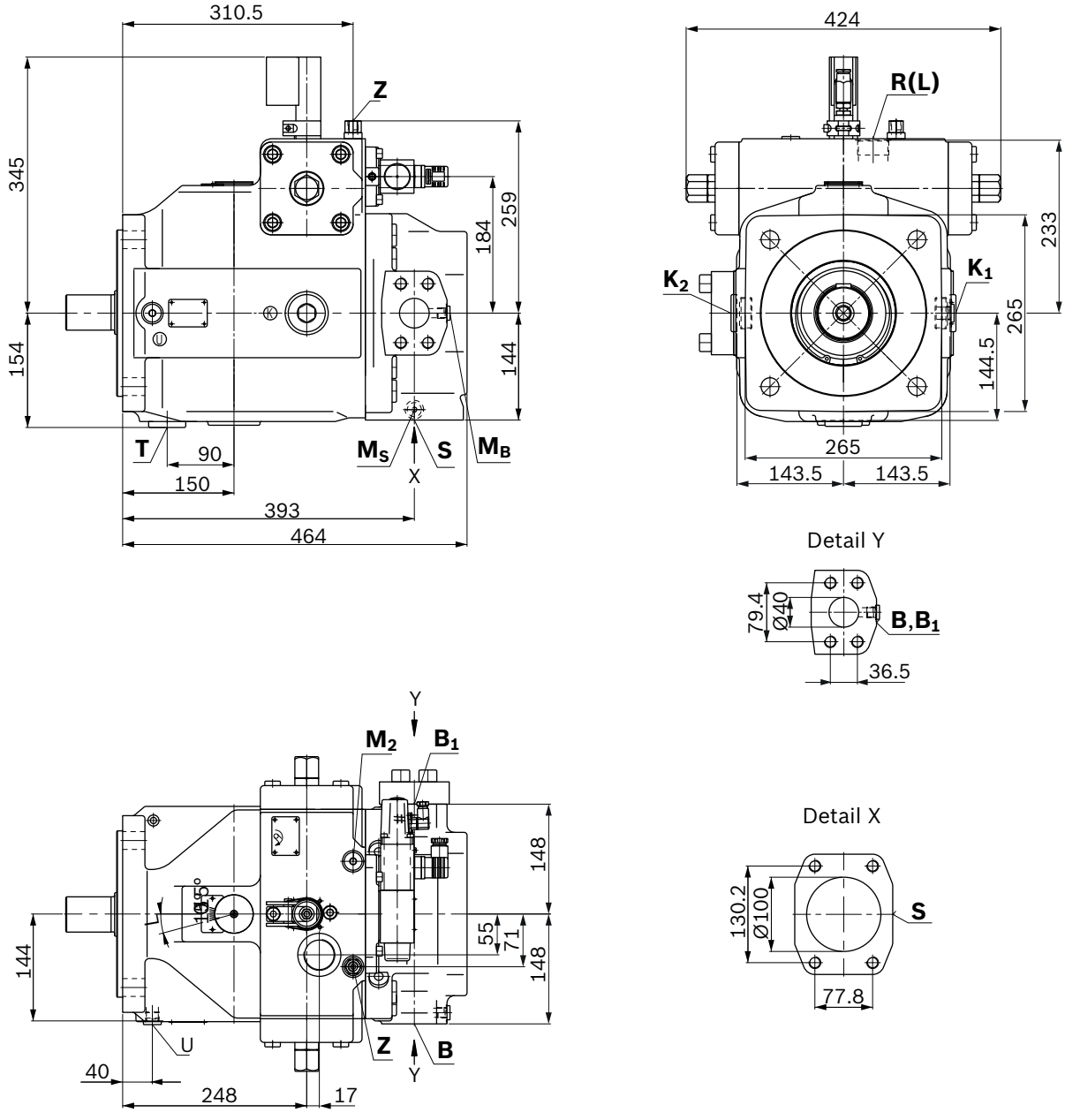
▶ For detailed dimensions, standards and thread depth of the variable pump, see data sheet 92050

Ports		**Standard**	**Size**[1]	$p_{max\ abs}$ **[bar]**[2]	**State**[6]
S	Suction port (standard pressure series) Fastening thread	SAE J518[3] DIN 13	3 in M16 × 2; 24 deep	30	O
for port plate version 13					
B	Pressure port (high-pressure series) Fastening thread	SAE J518[3] DIN 13	1 1/2 in M16 × 2; 25 deep	400	O
B_1	Additional connection	DIN 3852	M42 × 2; 20 deep	400	X
for port plate version 25					
B	Pressure port (high-pressure series) Fastening thread	SAE J518[3] DIN 13	1 1/2 in M16 × 2; 25 deep	400	O
B_1	2. working port (high-pressure series) Fastening thread	SAE J518[3] DIN 13	1 1/2 in M16 × 2; 25 deep	400	X[7]
K_1, K_2	Flushing port	DIN 3852	M42 × 2; 20 deep	4	X[5]
T	Drain port	DIN 3852[4]	M42 × 2; 20 deep	4	X[5]
M	Control pressure measuring port	DIN 3852	M14 × 1.5; 12 deep	400	X
M_B	Measuring port working pressure	DIN 3852	M14 × 1.5; 12 deep	400	X
M_S	Measuring port suction pressure	DIN 3852	M14 × 1.5; 12 deep	30	X
R(L)	Drain port	DIN 3852[7]	M42 × 2; 20 deep	4	O[5]
Z	Control pressure (for DFE1Z)	ISO 6149	M14 × 1.5; 15.5 deep	50	O
U	Flushing port	DIN 3852	M14 × 1.5; 12 deep	5	X

1) Observe the notes in the instruction manual concerning the maximum tightening torques.
2) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
3) Metric fastening thread is a deviation from standard.
4) The countersink may be deeper than specified in the standard.
5) Depending on the installation position, **T_1**, **K_2**, **K_3** or **R**(**L**) must be connected (see also installation instructions in data sheet 92050).
6) O = Must be connected (comes plugged)
X = Plugged (in normal operation)
7) Plugged with flange plate

Dimensions A4VSO size 355

Example: **DFE1Z – Electro-hydraulic control system with external control pressure supply**



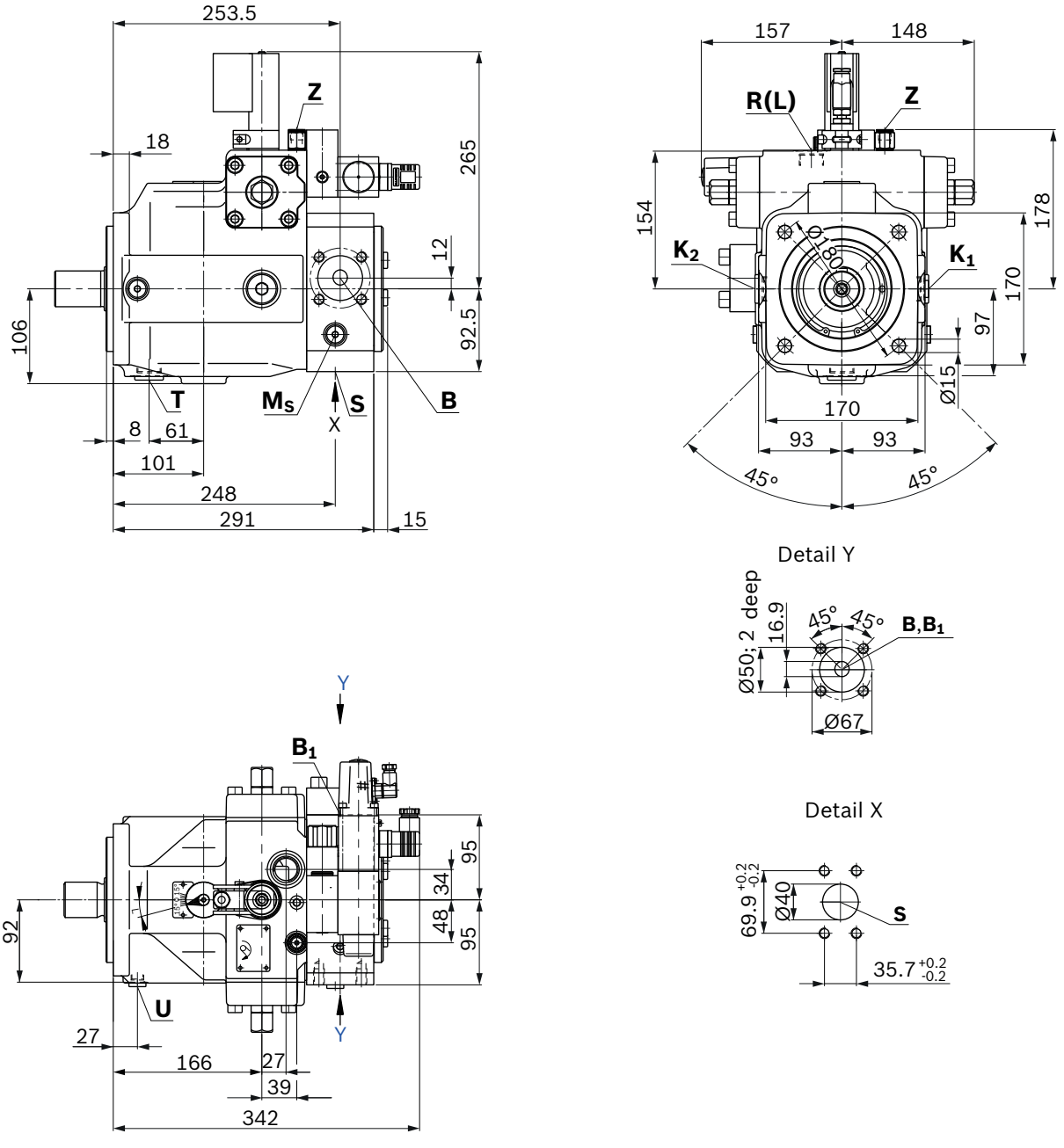
- For connection table, see page 21
- For detailed dimensions, standards and thread depth of the variable pump, see data sheet 92050

Ports		**Standard**	**Size**[1]	$p_{max\ abs}$ **[bar]**[2]	**State**[6]
S	Suction port (standard pressure series) Fastening thread	SAE J518[3] DIN 13	4 in M16 × 2; 21 deep	30	O
for port plate version 13					
B	Pressure port (high-pressure series) Fastening thread	SAE J518[3] DIN 13	1 1/2 in M16 × 2; 25 deep	400	O
B_1	Additional connection	DIN 3852	M42 × 2; 20 deep	400	X
for port plate version 25					
B	Pressure port (high-pressure series)	SAE J518[3]	1 1/2 in	400	O
	Fastening thread	DIN 13	M16 × 2; 25 deep		
B_1	2. working port (high-pressure series)	SAE J518[3]	1 1/2 in	400	X[7]
	Fastening thread	DIN 13	M16 × 2; 25 deep		
K_1, K_2	Flushing port	DIN 3852	M42 × 2; 20 deep	4	X[5]
T	Drain port	DIN 3852[4]	M42 × 2; 20 deep	4	X[5]
M	Control pressure measuring port	DIN 3852	M14 × 1.5; 12 deep	400	X
M_B	Measuring port working pressure	DIN 3852	M14 × 1.5; 12 deep	400	X
M_S	Measuring port suction pressure	DIN 3852	M14 × 1.5; 12 deep	30	X
R(L)	Drain port	DIN 3852[7]	M42 × 2; 20 deep	4	O[5]
Z	Control pressure (for DFE1Z)	ISO 6149	M14 × 1.5; 15.5 deep	50	O
U	Flushing port	DIN 3852	M18 × 1.5; 12 deep	5	X

1) Observe the notes in the instruction manual concerning the maximum tightening torques.
2) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
3) Metric fastening thread is a deviation from standard.
4) The countersink may be deeper than specified in the standard.
5) Depending on the installation position, **T_1**, **K_2**, **K_3** or **R**(**L**) must be connected (see also installation instructions in data sheet 92050).
6) O = Must be connected (comes plugged)
X = Plugged (in normal operation)
7) Plugged with flange plate

Dimensions A4VBO size 71

Example: **DFE1Z – Electro-hydraulic control system with external control pressure supply**



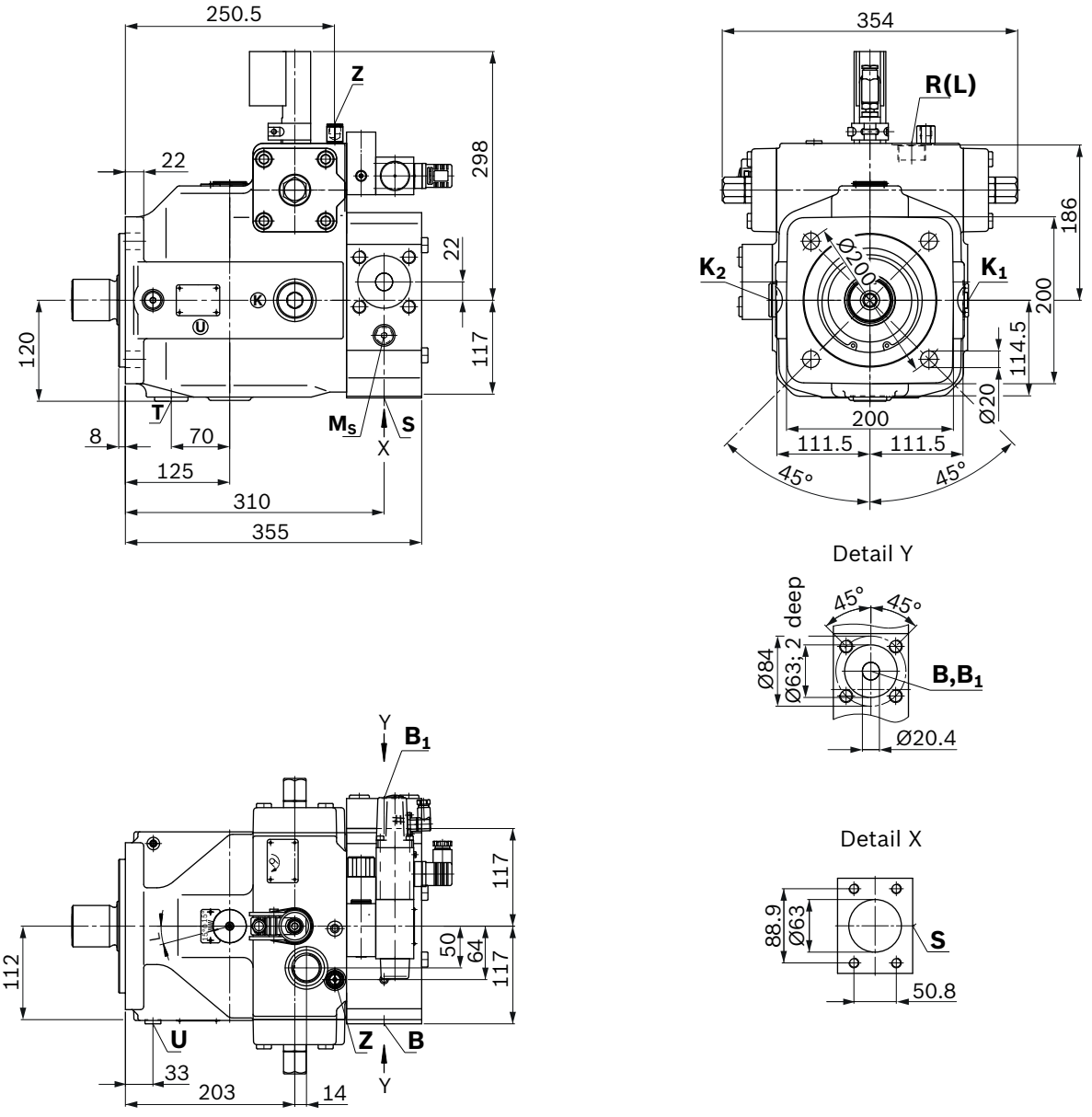
- For connection table, see page 23
- For detailed dimensions, standards and thread depth of the variable pump, see data sheet 92122

Ports		Standard	Size[1]	$p_{max\ abs}$ [bar][2]	State[6]
B	Working port (high-pressure series) Fastening thread	ISO/DIS 6164-3 DIN 13	DN-16 M12 × 1.75; 18 deep	500	O
B_1	Working port (high-pressure series) Fastening thread	ISO/DIS 6164-3 DIN 13	DN-16 M12 × 1.75; 18 deep	500	X
S	Suction port (standard pressure series) Fastening thread	SAE J518[3] DIN 13	SAE 1 1/2in M12 × 1.75; 20 deep	30	O
M_B	Measuring working pressure	ISO 6149	M14 × 1.5; 11.5 deep	500	X
M_S	Measuring suction pressure	ISO 6149	M14 × 1.5; 11.5 deep	30	X
T	Fluid drain	ISO 6149[4]	M27 × 2; 16 deep	4	X[5]
K_1, K_2	Filling – air bleeding, return flow (drain port)	ISO 6149[4]	M27 × 2; 19 deep	4	X[5]
R(L)	Filling – air bleeding, return flow (drain port)	ISO 6149	M27 × 2; 16 deep	4	O[5]
Z	Control pressure (for DFE1Z)	ISO 6149	M14 × 1.5; 15.5 deep	50	O
U	Bearing flushing	ISO 6149	M14 × 1.5; 11.5 deep	4	X

1) Observe the notes in the instruction manual concerning the maximum tightening torques.
2) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
3) Metric fastening thread is a deviation from standard.
4) The countersink may be deeper than specified in the standard.
5) Depending on the installation position, **T_1**, **K_2**, **K_3** or **R**(**L**) must be connected (see also installation instructions in data sheet 92122).
6) O = Must be connected (comes plugged)
X = Plugged (in normal operation)

Dimensions A4VBO size 125

Example: **DFE1Z – Electro-hydraulic control system with external control pressure supply**



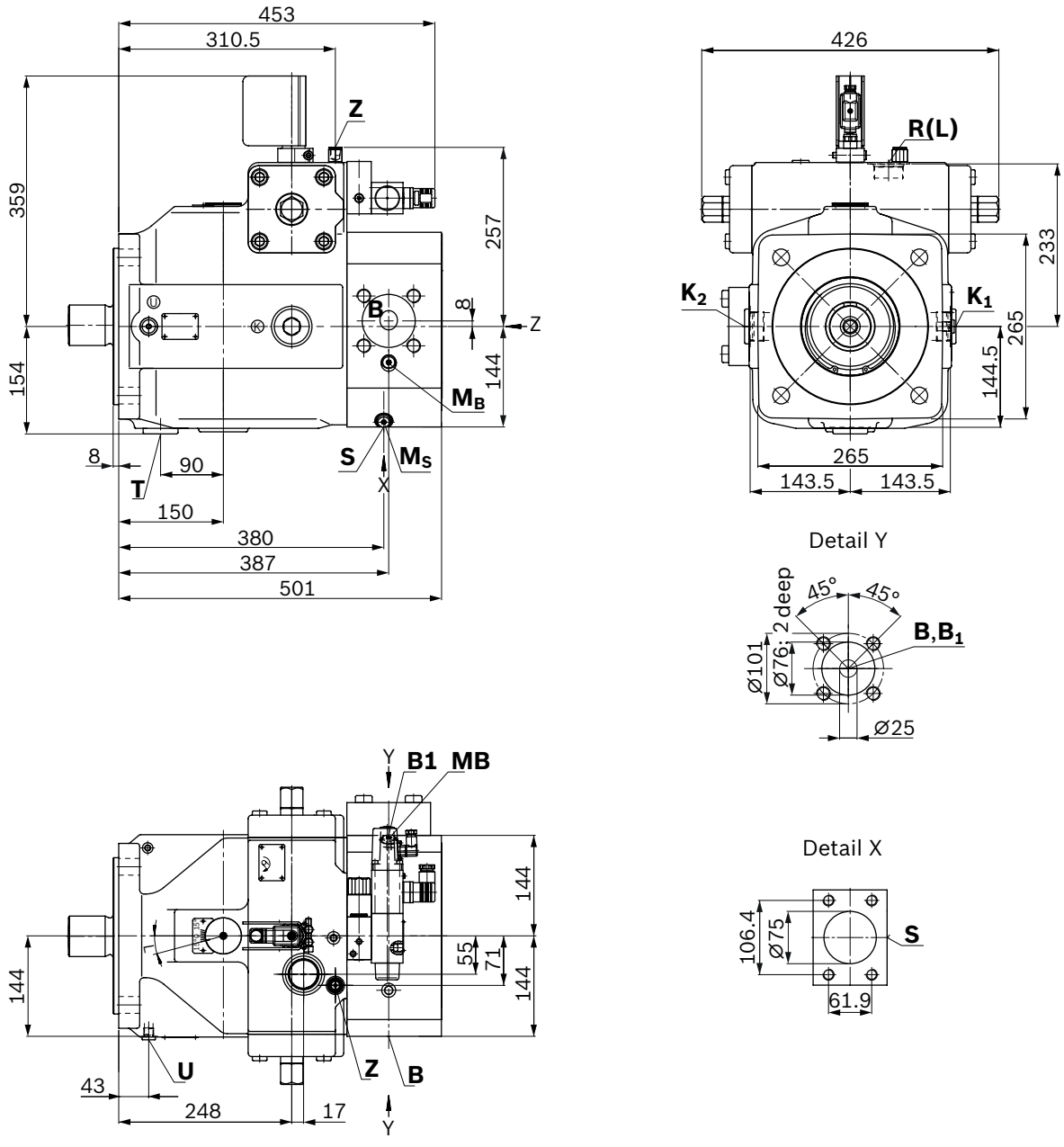
- For connection table, see page 25
- For detailed dimensions, standards and thread depth of the variable pump, see data sheet 92122

Ports		Standard	Size[1]	$p_{max\ abs}$ [bar][2]	State[6]
B	Working port (high-pressure series) Fastening thread	ISO/DIS 6164-3 DIN 13	DN-20 M16 × 2; 24 deep	500	O
B_1	Working port (high-pressure series) Fastening thread	ISO/DIS 6164-3 DIN 13	DN-20 M16 × 2; 24 deep	500	X
S	Suction port Fastening thread	SAE J518[3] DIN 13	SAE 2 1/2in M12 × 1.75; 18 deep	30	O
M_B	Measuring working pressure	ISO 6149	M14 × 1.5; 11.5 deep	500	X
M_S	Measuring suction pressure	ISO 6149	M14 × 1.5; 11.5 deep	30	X
M_1, M_2	Measuring control pressure	ISO 6149	M14 × 1.5; 11.5 deep	315	X
T	Fluid drain	ISO 6149[4]	M33 × 2; 18 deep	4	X[5]
K_1, K_2	Filling – air bleeding, return flow (drain port)	ISO 6149[4]	M33 × 2; 18 deep	4	X[5]
R(L)	Filling – air bleeding, return flow (drain port)	ISO 6149[4]	M33 × 2; 18 deep	4	O[5]
Z	Control pressure	ISO 6149	M14 × 1.5; 15.5 deep	50	O
U	Bearing flushing	ISO 6149	M14 × 1.5; 11.5 deep	4	X

1) Observe the notes in the instruction manual concerning the maximum tightening torques.
2) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
3) Metric fastening thread is a deviation from standard.
4) The countersink may be deeper than specified in the standard.
5) Depending on the installation position, **T_1**, **K_2**, **K_3** or **R**(**L**) must be connected (see also installation instructions in data sheet 92122).
6) O = Must be connected (comes plugged)
X = Plugged (in normal operation)

Dimensions A4VBO size 250

Example: **DFE1Z – Electro-hydraulic control system with external control pressure supply**



- For connection table, see page 27
- For detailed dimensions, standards and thread depth of the variable pump, see data sheet 92122

Ports		Standard	Size[1]	$p_{max\ abs}$ [bar][2]	State[6]
B	Working port (high-pressure series) Fastening thread	ISO/DIS 6164-3 DIN 13	DN-25 M20 × 2.5; 24 deep	500	O
B_1	Working port (high-pressure series) Fastening thread	ISO/DIS 6164-3 DIN 13	DN-25 M20 × 2.5; 24 deep	500	X
S	Suction port Fastening thread	SAE J518[3] DIN 13	SAE 3 in M12 × 1.75; 18 deep	30	O
M_B	Measuring working pressure	ISO 6149	M14 × 1.5; 11.5 deep	500	X
M_S	Measuring suction pressure	ISO 6149	M14 × 1.5; 11.5 deep	30	X
T	Fluid drain	ISO 6149[4]	M42 × 2; 18 deep	4	X[5]
K_1, K_2	Filling – air bleeding, return flow (drain port)	ISO 6149[4]	M42 × 2; 18 deep	4	X[5]
R(L)	Filling – air bleeding, return flow (drain port)	ISO 6149[4]	M42 × 2; 18 deep	4	O[5]
Z	Control pressure	ISO 6149	M14 × 1.5; 15.5 deep	50	O
U	Bearing flushing	ISO 6149	M14 × 1.5; 11.5 deep	4	X

1) Observe the notes in the instruction manual concerning the maximum tightening torques.
2) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
3) Metric fastening thread is a deviation from standard.
4) The countersink may be deeper than specified in the standard.
5) Depending on the installation position, **T_1**, **K_2**, **K_3** or **R**(**L**) must be connected (see also installation instructions in data sheet 92122).
6) O = Must be connected (comes plugged)
X = Plugged (in normal operation)

Project planning notes

- The A4VSO and A4VBO axial piston variable pump with the DFE1x control system is designed to be used in open circuit.
- The project planning, assembly and commissioning of the axial piston unit require the involvement of qualified skilled persons.
- 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 listed 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 preservation is required (maximum 24 months), please specify this in plain text when placing your order. The preservation periods apply under optimal storage conditions, which can be found in 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 proper contact at Bosch Rexroth if you require reliability parameters (e.g., $MTTF_d$) for functional safety.
- Depending on the type of control used, electromagnetic effects can be produced when using solenoids. The use of the 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 this 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 ×9). This can be prevented with suitably designed hydraulic lines.
- Please note the details regarding the tightening torques of port threads and other threaded joints in the instruction manual.
- Working ports:
  - The ports and fastening threads are designed for the specified maximum pressure. The machine or system manufacturer must ensure 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 burned on the axial piston unit, especially on the solenoids. Take the appropriate safety measures (e.g., by wearing protective clothing).
- Under certain circumstances, moving parts in control equipment (e.g., valve spools) can get stuck in an undefined position due to 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 filtration) will not rule out a fault but merely reduce the risk. The machine/system manufacturer should 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 make sure any measures are properly implemented.

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