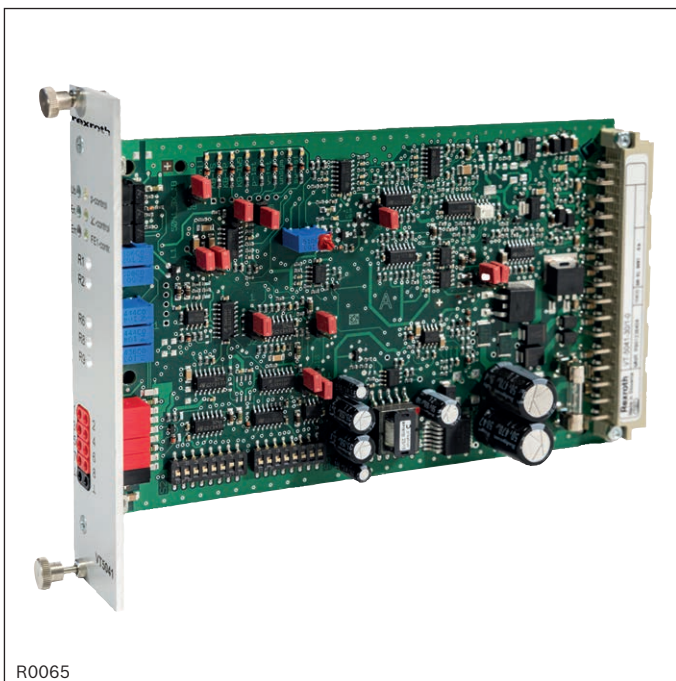


# External control electronics for SYDFE1 adjustment of the axial piston variable displacement pump type A10VSO

## Type VT 5041



R0065

- Component series 3X
- Analog, euro-card format
- Part of the SYDFE1 pressure and flow control system (component series 1X, 2X, and 3X) for controlling the axial piston variable displacement pump type A10VSO... with SYDFE1 adjustment via the valve type VT-DFP...2X

### Features

- Implementation of the electronic functions of the SYDFE1 control; pressure and swivel angle control; optional power limitation
- Pressure controller circuitry can be adjusted and switched to two existing hydraulic fluid volumes (actuators plus lines)
- Minimum value generator for pressure and swivel angle controller
- Pressure-dependent leakage compensation (can be switched off)
- Switchable actual pressure value input (current, voltage, range)
- 6 LED displays on the front plate for the operating state
- Power limitation with internal or external command value presetting (optional)

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Ordering code

01	02	03	04
VT 5041	-	3X	/   -   0

01	External control electronics for SYDFE1 control of the axial piston variable displacement pump A10VSO	VT 5041
02	Component series 30 ... 39 (30 ... 39: unchanged technical data and pin assignment)	3X

Additional functions

03	Without power limitation (front plate width 6TE)	1
	Without power limitation (front plate width 8TE)	2
	With power limitation	3
04	For swivel angle sensor IW9 (standard)	0

Available variants

Type	Material no.
VT 5041-3X/1-0	R901236404
VT 5041-3X/2-0	R901263598
VT 5041-3X/3-0	R901196678

## Function

The analog control electronics type VT5041-3X... are designed as an insertion card in euro format. It is provided with a command value input each for pressure and swivel angle (1) as a standard (optional power limitation). The actual pressure value is measured with a pressure transducer. The position transducer at the pump measures the actual swivel angle value. The measured actual values are processed in the amplifier (2) and (3) and compared with the provided command values. The minimum value generator (4) controls that only controller (6) or (10) which is allocated to the requested operating point is automatically activated. The output signal of the minimum value generator (4) becomes the command value for the valve control loop. The optionally available power limitation is automatically activated by the provision of a suitable command value. The power command value can be provided internally or externally. If necessary, it limits the swivel angle command value by means of a minimum value generator (5). The resulting swivel angle command value can be measured at socket 7. The actual valve value (position of the valve control spool) is measured with an inductive position transducer. An oscillator/demodulator switch (7) enhances the signal. The control deviation is generated and processed in the controller for the valve spool position (8). The output signal of the valve controller (8) forms the command value for the self-timing power output stage (9) which controls the proportional solenoid of the valve.

The control electronics are equipped with a fault message output where a voltage of 0 V is applied in an error case (= low-active). At the same time, the "Err." LED lights up. Depending on the jumper J1 configuration, the valve output stage can be de-energized in case of an error message.

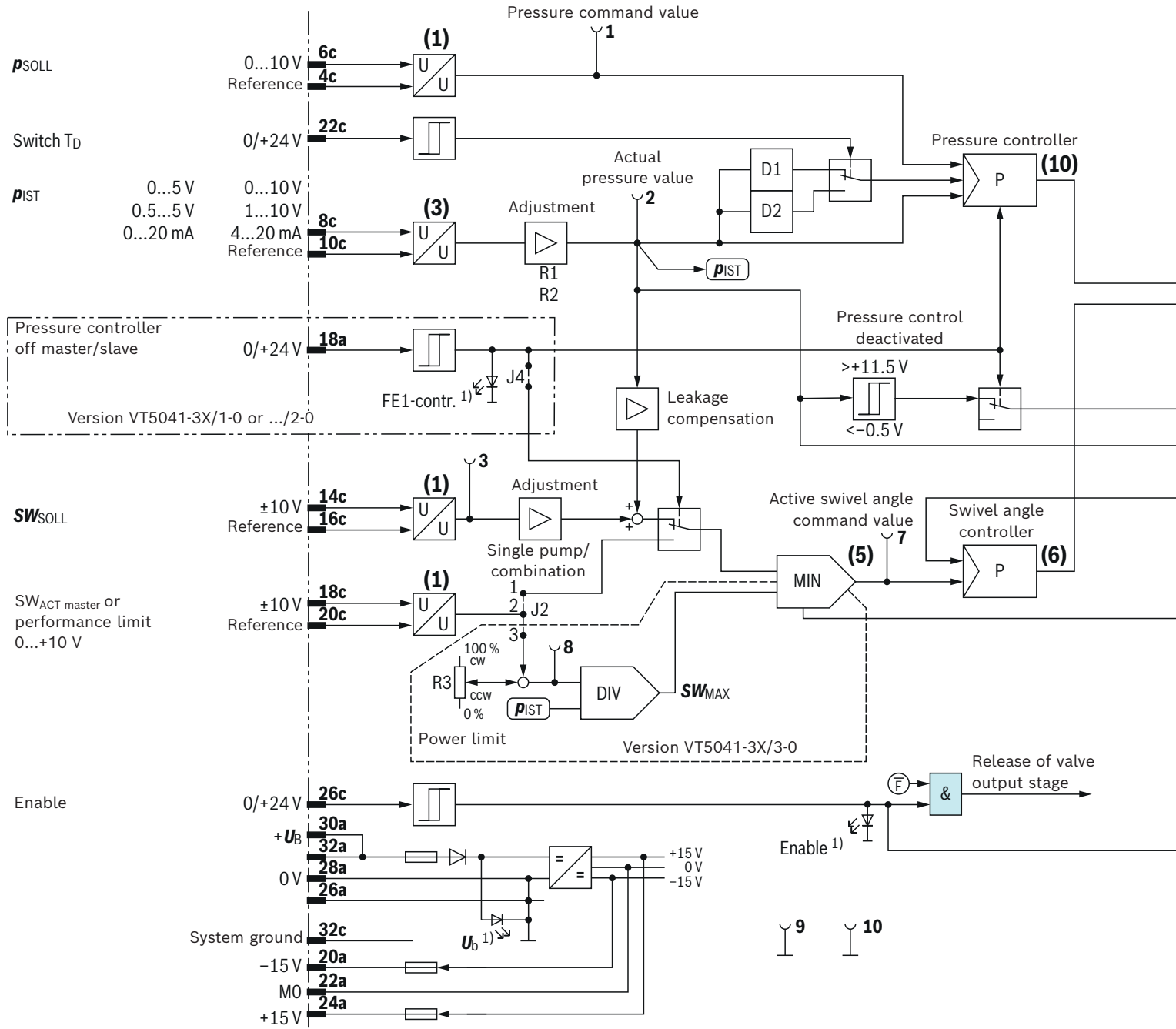
Causes for fault messages:

- ▶ Error in the internal voltage supply
- ▶ The actual pressure value is greater than the admissible system pressure (socket 2:  $p_{\text{act}} > 11.5 \text{ V}$ )
- ▶ No enable signal at port 26c
- ▶ Cable break or exceeding of range for the swivel angle return
- ▶ Cable break or exceeding of range for the valve control spool return
- ▶ "Pressure transducer" cable break (with settings 4 ... 20 mA, 0.5 ... 5 V and 1 ... 10 V)
- ▶ Control error (control difference x controller amplification) is greater than 4 V (40%) for more than 1 second

In an error case, the electronics can be configured so that the output stage is de-energized and the valve control spool is pushed to its mechanical end position. This causes the pump to swivel back. The error can only be acknowledged by resetting the enable signal.

See also "block diagram" on page 4 and 5.

## Block diagram / pin assignment



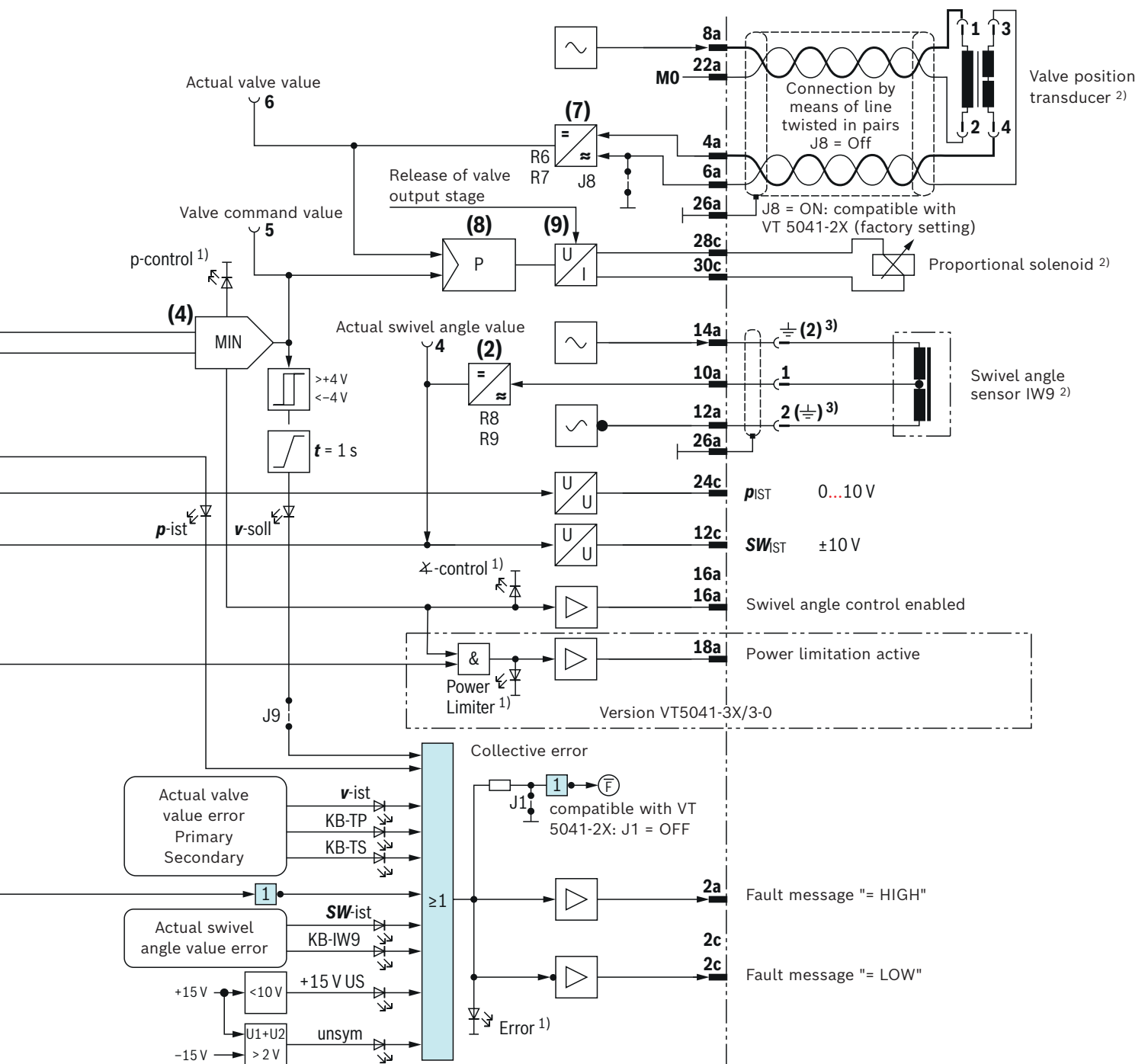
### Abbreviations for signals

$p_{COMMAND}$	Pressure command value
$p_{ACTUAL}$	Actual pressure value
Switch $T_D$	Oil volume switch-over
$SW_{COMMAND}$	Swivel angle command value
$SW_{ACTUAL}$	Actual swivel angle value
$SW_{ACT}$ master	Actual master swivel angle value
FE1 contr.	Pressure controller disabled

Function of the jumpers and switches on the electronic card see page 8.

For the meaning of the measuring sockets, display and adjustment elements (potentiometer) at the front plate, see page 9.

## Block diagram / pin assignment



### Diagnostic LEDs on the printed circuit board

<b>v</b> command	Persisting control deviation is too great	+15 V US	+15V undervoltage (internal power supply unit)
<b>v</b> actual	Actual valve value error - exceeding of range	asym	Internal voltage supply is asymmetric
<b>p</b> actual	Actual pressure value error		
<b>SW</b> actual	Actual swivel angle value error - exceeding of range		1) LED display at the front plate (for meaning refer to page 9)
KB-TP	Valve position transducer cable break - primary		2) For further information with regard to the connection, see operating instructions 30011-B
KB-TS	Valve position transducer cable break - secondary		
KB-IW9	Swivel angle position sensor cable break		3) Connection diagram for left-rotating systems with "A10VSQ base pump" in ().

## Technical data

Supply voltage	► Nominal value	VDC	24
	► Minimum	V	21
	► Maximum	V	35
	► Current consumption during operation <sup>1)</sup>	Rated current	A 0.6
		Impulse current	A 1.25
Analog input, command value	► Pressure $p_{\text{COMMAND}}$ <sup>2)</sup>	V	0 ... 10
	► Swivel angle $SW_{\text{COMMAND}}$ <sup>2)</sup>		
		– Standard	V $\pm 10$
		– Regenerative	V 0 ... 10
	► Power <sup>2)</sup>		
	– $(p \times SW)_{\text{max}}$	V	0 ... 10
Analog input, actual value	► Pressure $p_{\text{ACT}}$		
	– Voltage <sup>2)</sup>	V	0 ... 5, 0 ... 10 0.5 ... 5, 1 ... 10
	– Current	mA	0 ... 20, 4 ... 20; $R_B = 100 \Omega$
	Enable input (PLC)	V	>12
Analog output	► Output stage		
	– Solenoid current	A	2.5; $R_{20} = 2 \Omega$
	► Oscillator		
	– Frequency	kHz	5.4
	– Amplitude for IW9 (actual swivel angle value)	V	1 (port 12a /14a)
	– Amplitude for DM2 (actual valve value)	V	3.6 (port 8a)
	► Signal voltage outputs		
	– Actual pressure value	V	0 ... 10
	– Actual swivel angle value	V	–10 ... +10 (–100 ... +100 %)
	Auxiliary voltages for external use ( $I_{\text{max}} = 10 \text{ mA}$ )	V	$\pm 15$ ; +2 ... –6 %
Measuring sockets, function and number	► Pressure command value ( $p_{\text{COMMAND}}$ )	1	V 0 ... 10 (0 ... +100%; $R_i = 2 \text{ k}\Omega$ )
	► Actual pressure value ( $p_{\text{ACT}}$ )	2	V 0 ... 10 (0 ... +100%; $R_i = 2 \text{ k}\Omega$ )
	► Swivel angle command value ( $SW_{\text{COMMAND}}$ )	3	V $\pm 10$ ( $\pm 100\%$ ; $R_i = 2 \text{ k}\Omega$ )
	► Actual swivel angle value ( $SW_{\text{ACT}}$ )	4	V $\pm 10$ ( $\pm 100\%$ ; $R_i = 2 \text{ k}\Omega$ )
	► Valve command value ( $x_{\text{vcommand}}$ )	5	V $\pm 10$ ( $\pm 100\%$ ; $R_i = 2 \text{ k}\Omega$ )
	► Actual valve value ( $x_{\text{vact}}$ )	6	V $\pm 10$ ( $\pm 100\%$ ; $R_i = 2 \text{ k}\Omega$ )
	► Active swivel angle command value	7	V $\pm 10$ ( $\pm 100\%$ ; $R_i = 2 \text{ k}\Omega$ )
	► Power limit ( $P_{\text{max}}$ )	8	V 0 ... 10 (0 ... +100%; $R_i = 2 \text{ k}\Omega$ )
	► Reference	9, 10	
Message outputs	► Swivel angle control enabled	V	$U_B \dots 3$ ( $I_{\text{max}} = 20 \text{ mA}$ )
	► Power limitation active	V	$U_B \dots 3$ ( $I_{\text{max}} = 20 \text{ mA}$ )
Fault messages	► Low-active	V	$U_B \dots 3$ ( $I_{\text{max}} = 20 \text{ mA}$ ); error at $U < 1$
	► High-active	V	$U_B \dots 3$ ( $I_{\text{max}} = 20 \text{ mA}$ )
Transducer type	► Swivel angle		
	– IW9 (inductive position transducer)		Throttle circuit; $\pm 4 \text{ mm}$ ; 3-conductor connection
	► Valve		
	– DM2 (inductive position transducer)		Trafo circuit; $\pm 0.6 \text{ mm}$ ; 4-conductor port
Type of connection	► Compatibility		32-pole male multipoint connector; DIN 41612; design D
	► Card dimensions		Euro-card 100 x 160 mm; DIN 41494

<sup>1)</sup> The making current peak is usually higher (depending on power supply unit, supply line, and capacities).

<sup>2)</sup>  $R_e > 50 \text{ k}\Omega$

## Technical data

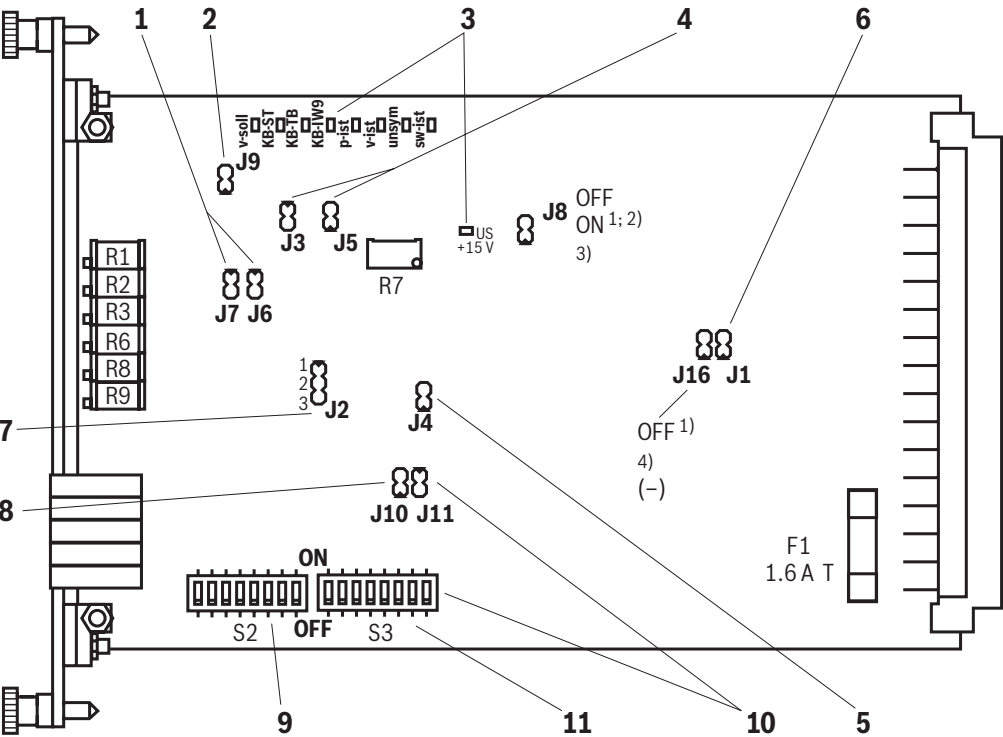
Front plate dimensions	► Height	3 HE (128.4 mm)
	► Conductor path side width	1 TE
	► Component side width	
	– Version "1"	6 TE
	– Version "2" and "3"	6 TE
Operating temperature range		°C 0 ... +50
Storage temperature range		°C –20 ... +70
Weight	► Without display	kg 0.19
	► With display	kg 0.21

## Environmental compatibility for the areas EMC, climate and mechanical load

Mechanical load	
Sine test according to EN 60068-2-6	10 cycles / 10 ... 500 ... 10 Hz / $\Delta f = 1$ Oct./min. / max. 2 g
Vibrations, random (broadband noise) according to IEC 68-2-36 / DIN 40046-24	20 ... 500 Hz / 2.2 g <sub>RMS</sub> / 0.01 g <sup>2</sup> /Hz / 30 min per axis
Transport shock according to EN 60068-2-27	Half-sine 15 g / 11 ms, 3 x each in positive and in negative direction per axis
Electro-magnetic compatibility (EMC)	
Interference resistance	Testing according to EN 61000-6-2
ESD – EN 61000-4-2	Air discharge SG 3 / BWK B Contact discharge SG 2 / BWK B
Burst – EN 61000-4-4	Repetition rate 5 kHz / 100 kHz Ub: SG 3 / BWK B Data line: SG 3 / BWK B
Surge – EN 61000-4-5	Ub: SG 2 / BWK B Data line: SG 2 / BWK B
HF fields – EN 61000-4-6	Ub: SG 3/ BWK A 0.15 ... 80 MHz (-230 MHz)
Interference emission	EN 61000-6-3+A1
Radio interference voltage – EN 55016-2-1	Limit values according to EN 61000-6-3+A1 Table 3 / Section 3 Direct current mains connection 0.15...30 MHz Complies with Class A, EN 55022
	Limit values according to EN 61000-6-3+A1 Table 2 / Section 2.1 AC mains connection 0.15...30 MHz Corresponds to class B, EN 55022
Radio interference field strength – EN 55016-2-3 (housing, free radiated)	Limit values according to EN 61000-6-3+A1 30 ... 230 ... 1000 MHz / 2 ... 5 ... 6 GHz Table 1 / Section 1.1 and Table 1 / Section 1.4 Corresponds to class B, EN 55022

SG = severity level  
BWK = evaluation criterion

Electronic card: Display and adjustment elements



1	Leakage compensation	Jumper	
		J6	J7
		Off	OFF
		4 %	OFF
		6 %	ON

2	Valve command value monitoring	Jumper	
		J9	
		On	ON

3	Diagnostic LEDs	
	For a description, see page 5 and the operating instructions 30011-B	

4	Regenerative operation	Jumper	
		J3	J5
		On	ON

5	Function pin 18a <sup>5)</sup>	Jumper	
		J4	
		Pressure control on/off	OFF

6	Valve switch-off in case of error	Jumper	
		J1	
		Active	OFF <sup>2)</sup>

7	Selection for analog input at pin 18c	Jumper	
		J2 bridge	
		Actual master swivel angle value	1-2

8	Actual pressure value gain	Jumper	
		J10	
		1-fold	OFF

9	Signal adjustment actual pressure value	Switch S2							
		.1	.2	.3	.4	.5	.6	.7	.8
V	0 ... 10 V	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON
E	1 ... 10 V	OFF	OFF	OFF	OFF	ON	OFF	OFF	ON
D	0 ... 5 V	OFF	OFF	ON	ON	OFF	OFF	ON	ON
F	0.5 ... 5 V	OFF	OFF	ON	ON	ON	OFF	OFF	ON
B	0 ... 20 mA	ON	ON	OFF	OFF	OFF	OFF	ON	ON
C	4 ... 20 mA	ON	ON	OFF	OFF	ON	ON	OFF	OFF

10	p gain pressure controller	Switch S3		Jumper	J11
		.7	.8		
	8.0	OFF	OFF	OFF	OFF
	4.8	OFF	ON	OFF	OFF
	4.0	OFF	OFF	ON	ON
	3.0	OFF	ON	ON	ON
	2.4	ON	OFF	ON	ON
	2.0	ON	ON	ON	ON

11	Volume adjustment of pressure controller					
	Switch S3			Switch S3		
	Input switch T <sub>D</sub> = OFF	.1	.2	.3	Input switch T <sub>D</sub> = ON	.4
						.5
						.6
	≤5.0 l	OFF	OFF	OFF	12.5 l	OFF
	7.5 l	OFF	ON	OFF	30.0 l	OFF
	10.0 l	ON	ON	OFF	45 l	ON
	15.0 l	ON	OFF	ON	60 l	ON
	20.0 l	OFF	ON	ON	75 l	OFF
	25.0 l	ON	ON	ON	90 l	ON

ON Bridge closed

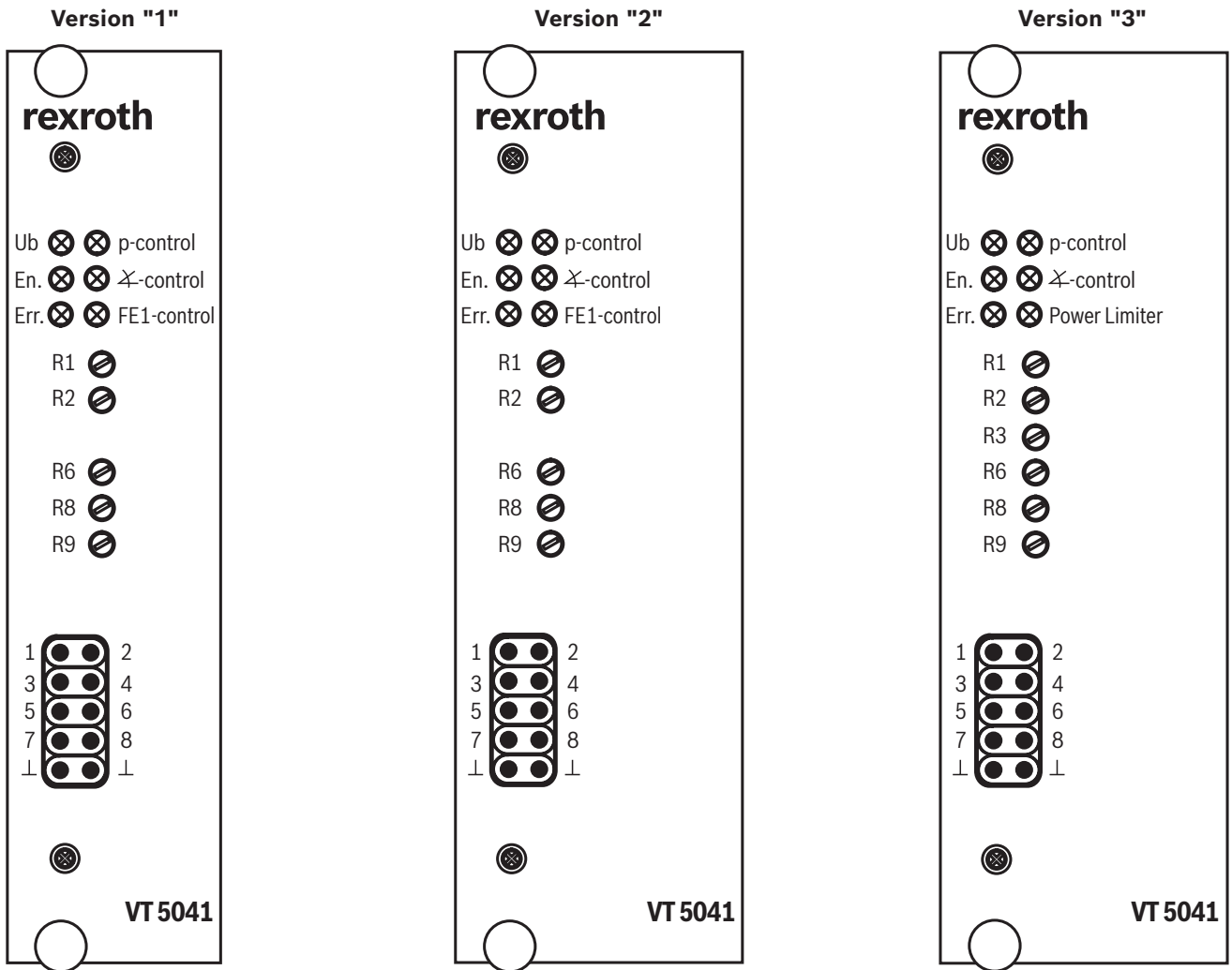
OFF Bridge open

Factory setting

- 1) Factory setting
- 2) Compatible with VT 5041-2X
- 3) Reference for position transducer
- 4) Reference for actual pressure value
- 5) Only version "1" and "2" (without power limitation)

Measuring sockets, display and adjustment elements (potentiometer) at the front plate see page 9.



**Front plate:** Display and adjustment elements, measuring sockets**LED displays**

Ub (green)	Supply voltage available
En. (green)	Enable available
Err. (red)	Fault/collective error
p-control (yellow)	Pressure control enabled
$\propto$ -control (yellow)	Swivel angle control enabled
FE1 contr. (yellow)	Pressure controller disabled
Power Limiter (yellow)	Power limitation active

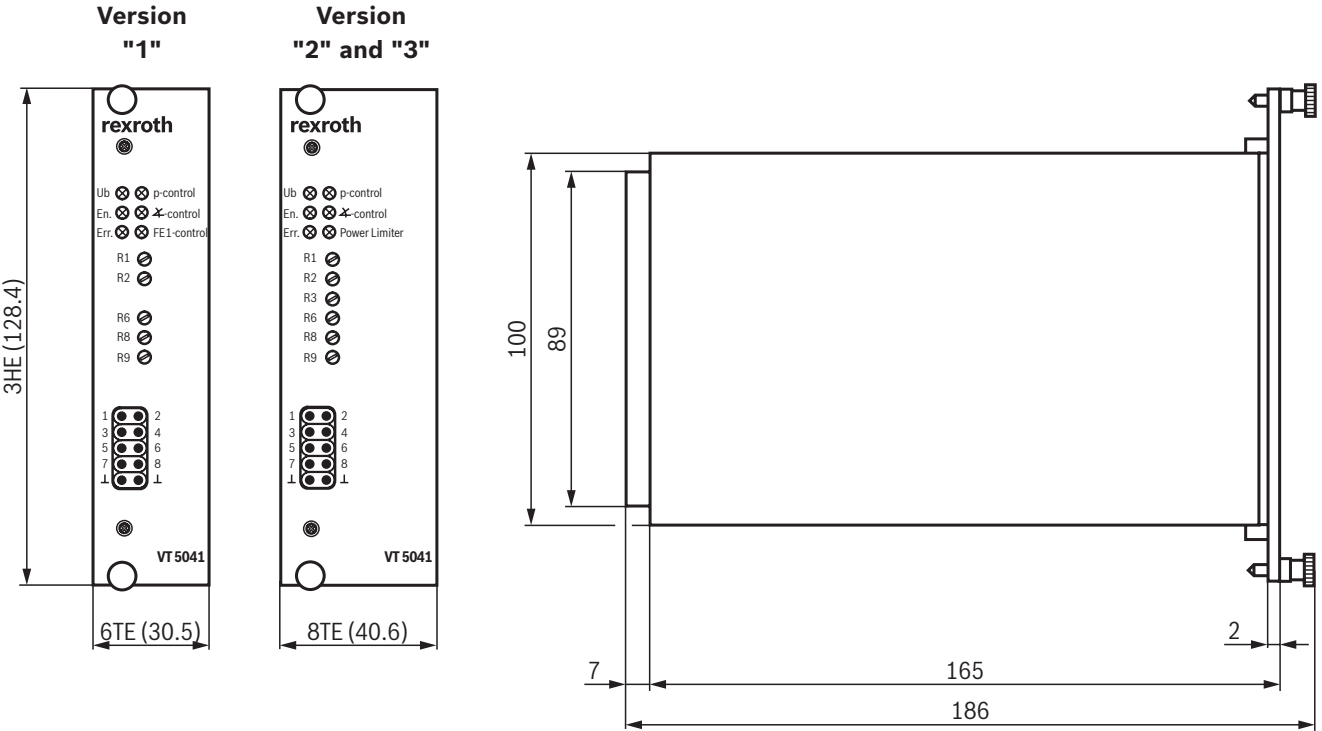
**Adjustment elements (potentiometer)**

R1	Zero point of actual pressure value
R2	Actual pressure value gain
R3	Setting of the power limit
R6	Zero point of actual valve value
R8	Zero point of actual swivel angle value
R9	Gain of actual swivel angle value

**Measuring sockets ( $R_i = 2 \text{ k}\Omega$ )**

1	Pressure command value 0...+10 V
2	Actual pressure value 0...+10 V
3	Swivel angle command value $\pm 10 \text{ V}$
4	Actual swivel angle value $\pm 10 \text{ V}$
5	Valve command value $\pm 10 \text{ V}$
6	Actual valve value $\pm 10 \text{ V}$
7	Active swivel angle command value $\pm 10 \text{ V}$
8	Power limit 0 +10 V
⊥	Reference for measured values
⊥	Reference for measured values

**Dimensions**  
(dimensions in mm)



**Accessories** (separate order)

Card holder	Material number	Data sheet
Open card holder VT 3002-1-2X/32D	R900020153	29928

Pressure sensor	Material number	Data sheet
Type HM20-2X	-	30272

## Notes

## Notes

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