

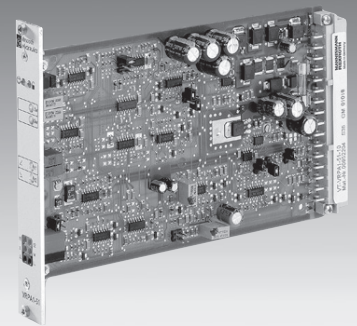
External control electronics for the DFE1 control of A10VSO axial piston pumps

RA 30241/02.03
 Replaces: 10.02

1/6

Model VT-5041

Component series 2X



H/A/D 6197/99

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Features

- Integral part of the SYDFE1 pressure and flow control system (series 1X and 2X) for controlling A10VSO... axial piston units with DFE1 control
- Implementation of the electronic functions of the DFE1 control; pressure and swivel angle control; optional power limiter
- Circuitry of the pressure controller can be matched to existing hydraulic fluid volumes (actuator plus lines)
- Differential amplifier inputs
- Controller for valve spool position
- Minimum value generator for pressure and swivel angle controller
- Self-clocking output stage
- Pressure-related leakage compensation (can be switched off)
- Polarity reversal protection for power supply
- Switchable actual pressure value input (current, voltage, range)
- LED lamps on the front panel:
 - Error / no enable "H1"
 - Internal supply voltage "H2"
- Indicator instrument for actual swivel angle value on the front panel (optional)
- Power limiter with internal or external command value feedforward (optional)

Card holder:

- Type VT 3002-2X/32, see RE 29 928
- Single card holder without power supply unit

Power supply unit:

- Type VT-NE32-1X, see RE 29 929
- Compact power supply unit 115/230 VAC → 24 VDC
 - Output 1 (60 VA) for supplying amplifier card type VT 5041
 - Output 2 (25 VA) for supplying pressure transducers; e.g. types HM 12 or HM 13, see RE 29 933

Ordering code

VT 5041-2X/ / *

External control electronics for the DFE1 control of A10VSO axial piston pumps

Further details
in clear text

Series 25 to 29
(25 to 29: unchanged technical data and pin assignment)

= 2X

Additional functions:

- Without power limiter, without indicator instrument = 1
- With power limiter, with indicator instrument = 3

Standard types

Material no.	Type
R900749982	VT5041-2X/1
R900749983	VT5041-2X/3

Functional description

VT 5041-2X analogue amplifiers are designed as plug-in cards in Euro-format. As a standard, they are provided with one command value input each for pressure and swivel angle [1] (power limiter, optional). The actual pressure value is sensed by a pressure transducer. A position transducer on the pump acquires the actual swivel angle value. The acquired actual values are processed in an amplifier [10 and 12] and compared with the injected command values. Minimum value generator [4] ensures that only the controller assigned to the relevant working point is automatically activated. The output signal of minimum value generator [4] becomes the command value for the closed control loop of the valve.

The optional power limiter is automatically activated by the feed-forward of a suitable command value. The power command value can be provided internally or externally. If required, it acts directly on swivel angle controller [3] via a minimum value generator [13].

The actual valve value (position of the valve spool) is acquired by an inductive position transducer. Oscillator/demodulator circuit [10] processes the signal. Valve spool position controller [5] determines and processes the system deviation. The output signal of valve controller [5] forms the command value for self-clocking current output stage [6], which controls the proportional solenoid of the valve.

The amplifier card is fitted with an error signal output, to which a voltage of 0 V is applied in the case of an error. At the same time,

LED "H1" lights up and the output stage is deactivated.

The following events trigger an error message:

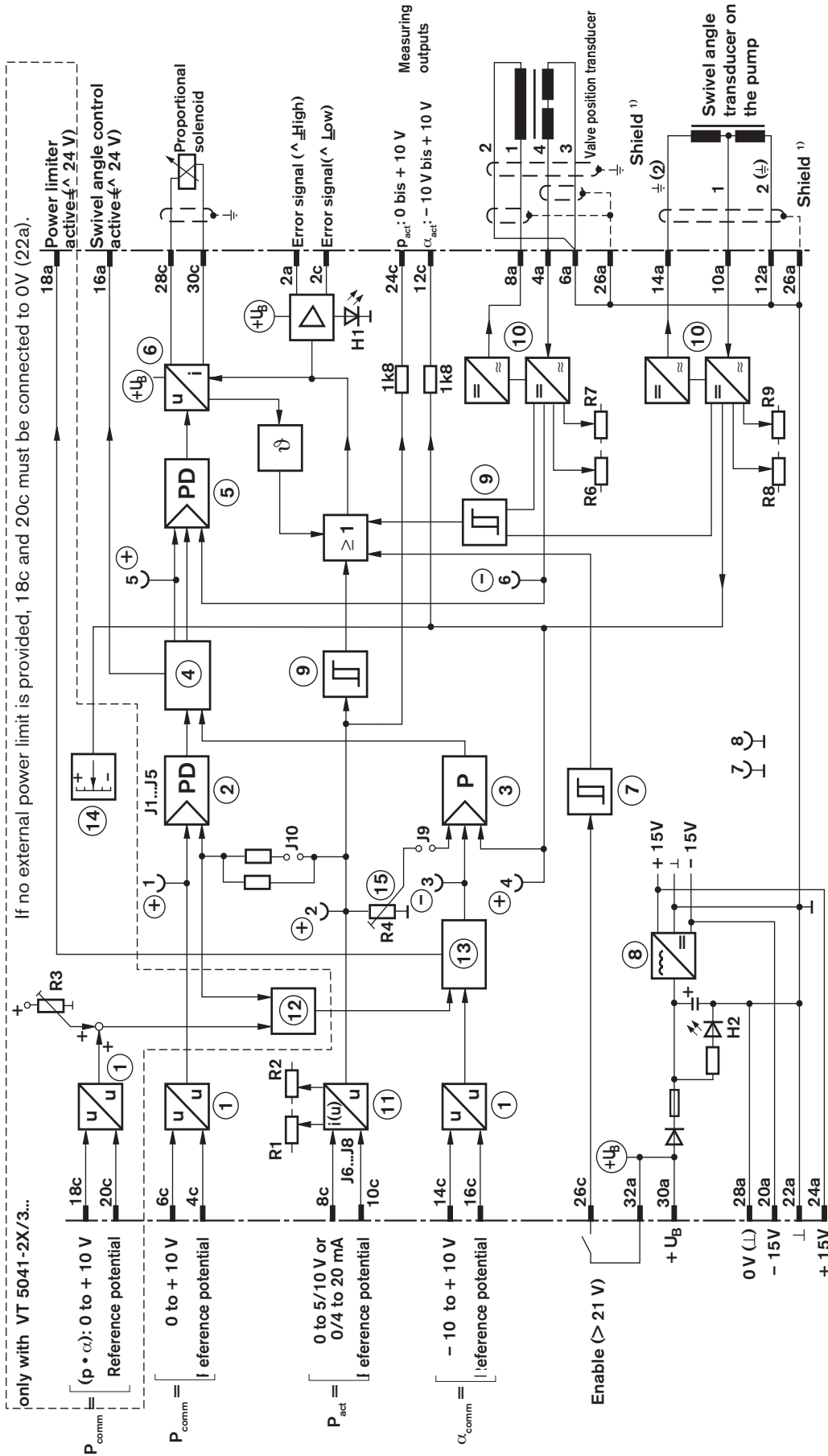
- Actual pressure value greater than permissible system pressure (socket 2 $p_{act} > 10\text{ V}$)
- Enable signal missing at connection 26c
- Excessive temperature of the output stage
- Cable break or range of swivel angle feedback exceeded
- Cable break or range of valve spool position feedback exceeded
- Cable break "proportional solenoid"
- Cable break "pressure transducer" (only in conjunction with setting 4 to 20 mA)

In the case of an error, the output stage is deactivated and the valve spool pushed by a spring to its mechanical end position. The error can only be acknowledged by a reset of the enable signal.

The pressure-related pump leakage can be compensated for via the swivel angle control loop using potentiometer [15].

[] = Cross-reference to block circuit diagram on page 3

Block circuit diagram / pin assignment



only with VT 5041-2X/3... If no external power limit is provided, 18c and 20c must be connected to 0V (22a).

$P_{comm} = (p \cdot \alpha)$: 0 to +10 V Reference potential
 18a Power limiter active \neq 24 V
 16a Swivel angle control active \neq 24 V

$P_{comm} =$ 0 to +10 V Reference potential
 6c 0 to +10 V Reference potential
 4c 0 to +10 V Reference potential

$P_{act} =$ 0 to 5/10 V or 0/4 to 20 mA Reference potential
 8c 0 to 5/10 V or 0/4 to 20 mA Reference potential
 10c 0 to 5/10 V or 0/4 to 20 mA Reference potential

$\alpha_{comm} =$ -10 to +10 V Reference potential
 14c -10 to +10 V Reference potential
 16c -10 to +10 V Reference potential

Enable ($> 21 V$)
 26c Enable ($> 21 V$)
 32a +U_B
 30a +15V
 28a 0 V (L)
 20a -15V
 22a 0 V
 24a +15V

- 1** Differential amplifier
2 Pressure controller
3 Swivel angle controller
4 Minimum value generator
5 Valve position controller
6 Output stage
7 Output stage enable
8 Power supply unit
9 Cable break detector
10 Oscillator/demodulator
11 Input amplifier
12 Divider
13 Min. value generator
14 Indicator instrument
15 Leakage compensation
- Note:**
 - Connection of the swivel angle transducer is valid for clockwise rotating pump ('') anti-clockwise rotating pump ('')
 - Deviations between α_{comm} (socket 3) and α_{act} (socket 4) can also result from the setting of R4 (leakage compensation).
- Explanation re indicator and adjustment elements (H, R), see page 5**
For notes on the shielding, see engineering notes for the complete system, RE 30030-01-V

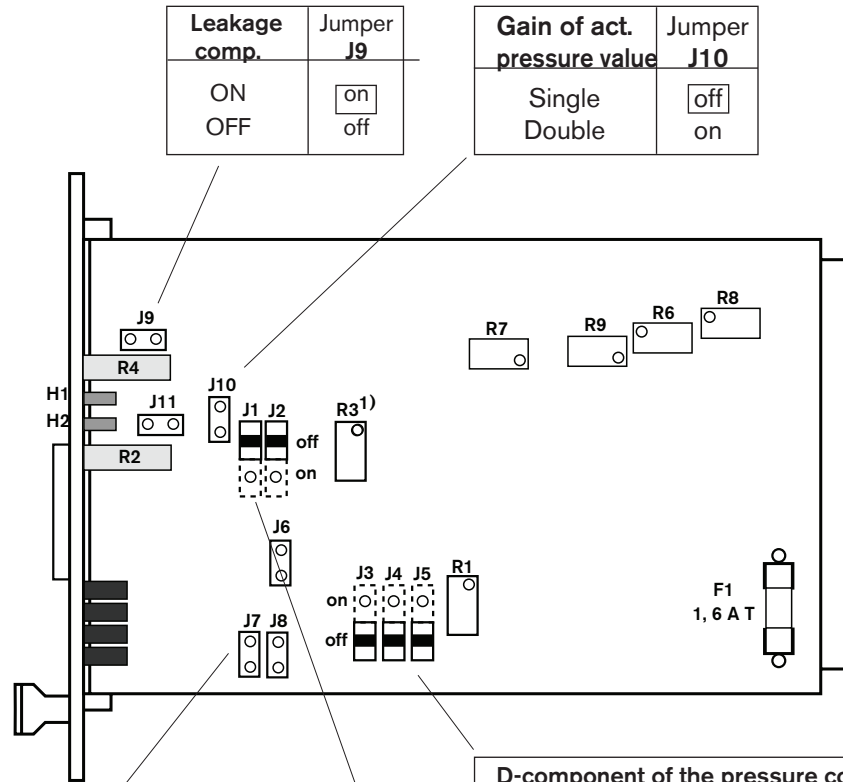
Technical data (for applications outside these parameters, please consult us!)

Operating voltage	U_B	24 VDC + 40 % – 10 %
Operating range:		
– Upper limit value	$u_B(t)_{\max}$	35 V
– Lower limit value	$u_B(t)_{\min}$	21 V
Power consumption	P_S	35 VA
Current consumption	I_{nom}	0.6 A ($I_{\text{max}} = 1.25$ A)
Fuse	I_F	1.6 A T
Inputs:		
– Command values (pressure, swivel angle)	U_i	0 to 10 V; $R_e = 100$ k Ω
– Actual value (pressure)	U_i	0 to 5 V or 0 to 10 V; $R_e = 100$ k Ω
	I_i	0 to 20 mA or 4 to 20 mA; $R_e = 500$ Ω
– Power selection ($p \cdot a$) _{comm} (only with VT 5041-2X/3...)	U_i	0 to 10 V; $R_e > 100$ k Ω
– Enable	U_e	> 21 V (use relay with contact for currents < 10 mA)
Outputs:		
– Output stage		
• Solenoid current / resistance	I_{max}	2.5 A; $R_{(20)} = 2$ Ω
– Drivers for inductive transducers:		
• Oscillator frequency	f	ca. 5 kHz
• Voltage amplitude (U_{SS})	U_a	10 V
– Signal voltages		
• Actual value (pressure, swivel angle)	U	0 to 10 V
• Swivel angle control active	U	$U_b - 1$ V
• Power limiter active (only with VT 5041-2X/3...)	U	$U_b - 1$ V
– Auxiliary voltages	U	± 15 V ± 3 %; 10 mA
– Error signal		
• L-active	U_o	$\geq U_B - 5$ V; 10 mA (short-circuit-proof); error at $U_o < 1$ V
• H-active	U_o	< 1 V; error at $\geq U_B - 5$ V; 10 mA
– Measuring sockets		
• Pressure command value (p_{comm}) "1"	U	+ 10 V \triangleq 100 %
• Actual pressure value (p_{act}) "2"	U	+ 10 V \triangleq 100 %
• Swivel angle command value (a_{comm}) "3"	U	- 10 V \triangleq 100 %
• Actual swivel angle value (a_{act}) "4"	U	+ 10 V \triangleq 100 %
• Spool position command value (s_{comm}) "5"	U	± 10 V \triangleq ± 100 %
• Actual spool position value (s_{act}) "6"	U	± 10 V \triangleq ± 100 %
Type of transducer:		
– for pump		IW 9 (throttle circuit; ± 4 mm; 3-wire connection)
– for valve		DM2 (transformer circuit; ± 0.6 mm; 4-wire connection)
Type of connection		32-pin male connector, DIN 41 612, form D
Card dimensions		Euro-card 100 x 160 mm, DIN 41 494
Front panel dimensions:		
– Height		3 HE (128.4 mm)
– Width circuit board conductor side		1 TE
– Width component side		
• VT 5041-2X/1...		5 TE
• VT 5041-2X/3...		9 TE
Permissible operating temperature range	J	0 to 50 °C
Storage temperature range	J	- 20 to + 70 °C
Weight		
• VT 5041-2X/1...	m	0.19 kg
• VT 5041-2X/3...	m	0.21 kg

Note:

For details on **Environment simulation tests** in the fields of EMC (electromagnetic compatibility), climate and mechanical stress, see RE 30 024-U (declaration on environmental compatibility).

Indicator / adjustment elements: VT 5041-2X/1 and VT 5041-2X/3 from series 25



Leakage comp.	Jumper J9
ON	<input type="checkbox"/> on
OFF	<input type="checkbox"/> off

Gain of act. pressure value	Jumper J10
Single	<input type="checkbox"/> off
Double	<input type="checkbox"/> on

Actual pressure value for changeover			
Input signal	Jumper position		
	J6	J7	J8
0 to 10 V	<input type="checkbox"/> off	<input type="checkbox"/> off	<input type="checkbox"/> off
0 to 5 V	<input type="checkbox"/> off	<input type="checkbox"/> off	<input type="checkbox"/> on
0 to 20 mA	<input type="checkbox"/> on	<input type="checkbox"/> off	<input type="checkbox"/> off
4 to 20 mA	<input type="checkbox"/> on	<input type="checkbox"/> on	<input type="checkbox"/> off

D-component of the pressure controller			
Hydraulic fluid volume (in litres) in the system (actuators plus lines)	Jumper position		
	J3	J4	J5
≤ 5.0	<input type="checkbox"/> off	<input type="checkbox"/> off	<input type="checkbox"/> off
7.5	<input type="checkbox"/> off	<input type="checkbox"/> on	<input type="checkbox"/> off
10.0	<input type="checkbox"/> on	<input type="checkbox"/> on	<input type="checkbox"/> off
15.0	<input type="checkbox"/> on	<input type="checkbox"/> off	<input type="checkbox"/> on
20.0	<input type="checkbox"/> off	<input type="checkbox"/> on	<input type="checkbox"/> on
25.0	<input type="checkbox"/> on	<input type="checkbox"/> on	<input type="checkbox"/> on

... Factory setting of jumpers

Potentiometers:

- R1** Zero point of actual pressure value
- R2** Actual pressure value adjustment (factory setting: right-hand limit stop \triangle max. gain)
- R3¹⁾** Power command value
 -> is added to an externally provided command value (factory setting: left-hand limit stop \triangle max. power)
- R4** Leakage compensation (factory setting: left-hand limit stop \triangle min. compensation)
- R6** Zero point of valve position transducer
- R7** Amplitude of valve position transducer (factory setting)
- R8** Zero point of swivel angle transducer
- R9** Amplitude of swivel angle transducer (factory setting)

LED lamps:

- H1** Error / no enable (red)
- H2** Internal voltage supply (green)

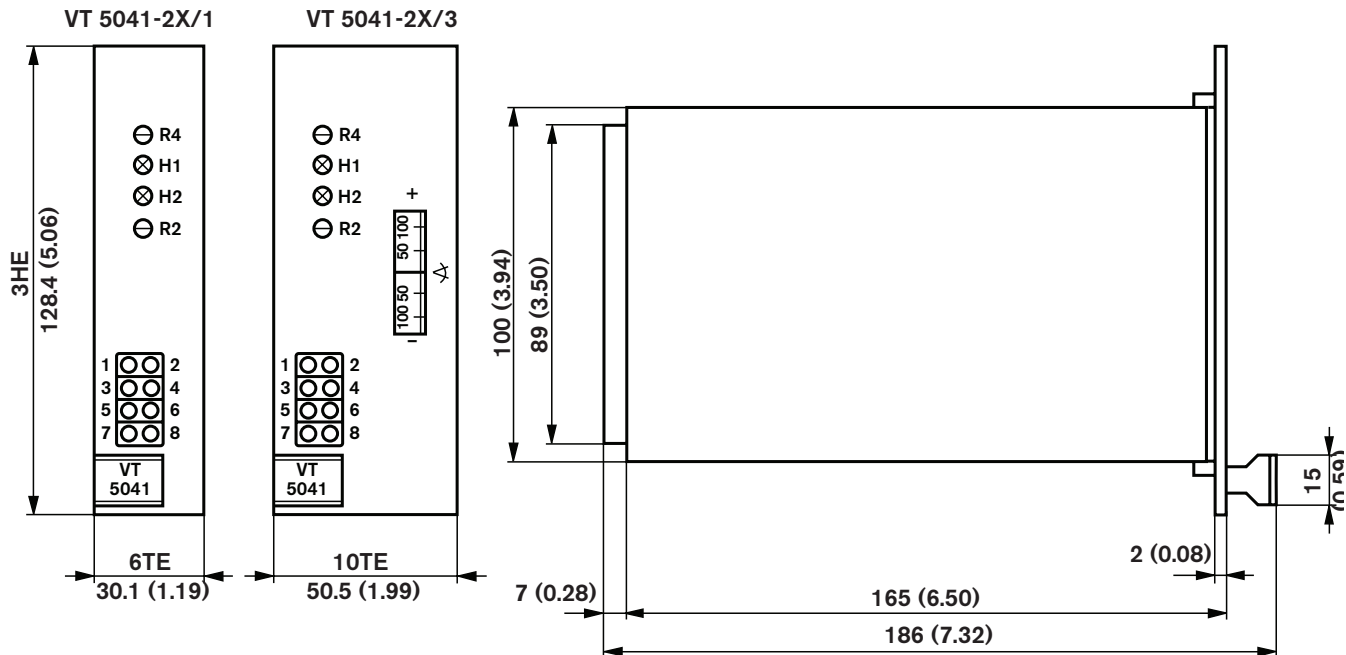
P-component of the pressure controller			
P-gain	Jumper position		
	J1	J2	J11
2	<input type="checkbox"/> on	<input type="checkbox"/> on	<input type="checkbox"/> on
2.4	<input type="checkbox"/> on	<input type="checkbox"/> off	<input type="checkbox"/> on
2.7	<input type="checkbox"/> on	<input type="checkbox"/> on	<input type="checkbox"/> off
3	<input type="checkbox"/> off	<input type="checkbox"/> on	<input type="checkbox"/> on
3.4	<input type="checkbox"/> on	<input type="checkbox"/> off	<input type="checkbox"/> off
4	<input type="checkbox"/> off	<input type="checkbox"/> off	<input type="checkbox"/> on
4.8	<input type="checkbox"/> off	<input type="checkbox"/> on	<input type="checkbox"/> off
8	<input type="checkbox"/> off	<input type="checkbox"/> off	<input type="checkbox"/> off

For further information and notes, see commissioning instructions for the SYDFE1-2X closed-loop control system (RE 30 024-B or latest version of RE 30 022-01-B)!

¹⁾ Only with VT 5041-2X/3

Unit dimensions

(Dimensions in mm)



Potentiometers:

- "R2" → Matching of amplitude p_{act} (pressure transducer)
- "R4" → Leakage compensation

LED lamps:

- "H1" → Error / no enable
- "H2" → Internal supply voltage

Measuring socket:

- "1" → Pressure command value p_{comm}
- "2" → Actual pressure value p_{act}
- "3" → Swivel angle command value α_{comm}
- "4" → Actual swivel angle value α_{act}
- "5" → Spool position command value s_{comm}
- "6" → Actual spool position value s_{act}
- "7" and "8" → Reference potential / ground

Supplementary information

Note: Electrical signals processed by control electronics (e.g. actual value) must not be used for activating safety-relevant machine functions!
 (See also european standard "Safety requirements for fluid power systems and components – hydraulics", EN 982).

For detailed instructions and notes on engineering and commissioning, see:

- Engineering aids for für SYDFEX-2X control systems (RE 30 030-01-V)
- Commissioning instructions for SYDFE1-2X control systems (RE 30 022-01-B)

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