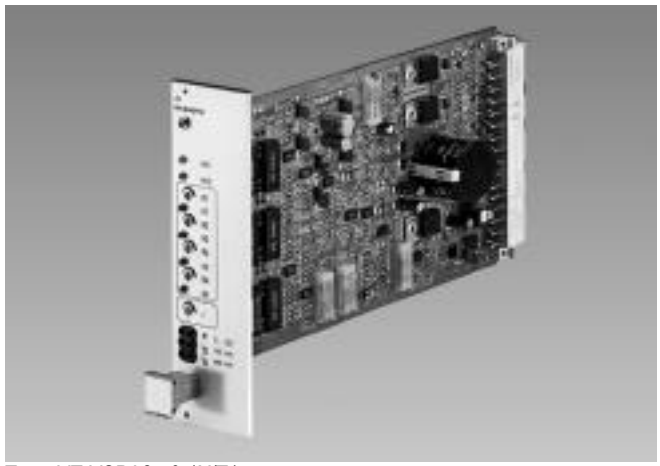
RE 30 113/07.98

Replaces: 11.97

Electrical amplifier
Type VT-VSPA2-50

Series 1X



H/A 4239/94

Type VT-VSPA2-50-1X/T1

Table of contents

Features

- Suitable for the control of proportional pressure valves (type 3DREP 6, from series 2X) and pilot operated proportional directional valves (type .WRZ, from series 7X) without electrical position feedback
- Four command values adjustable with potentiometers
- Four command value call-ups with LED display
- Differential input, switchable to current input
- Release input with LED display
- Signal "Ready for opertion" with LED display
- Step function generator
- Ramp generator with one or five ramp times
- Two pulsed current output stages
- Polarity protection for the voltage supply

Cardholder:

- Type VT 3002-2X/32, see RE 29 928
  single cardholder without power supply

Power supply:

- Type VT-NE30-1X, see RE 29 929
  compact power supply unit 115/230 VAC → 24 VDC, 70 VA

Ordering code

VT-VSPA2 - 50 - 1X/ | *

Amplifier for controlled proportional directional valves, analogue, with 2 output stages

Amplifier for proportional valves type 3DREP 6 (from series 2X) and type .WRZ (from series 7X) **= 50**

Series 10 to 19 **= 1X**
(10 to 19: unchanged technical data and terminal connection)

Further details in clear text

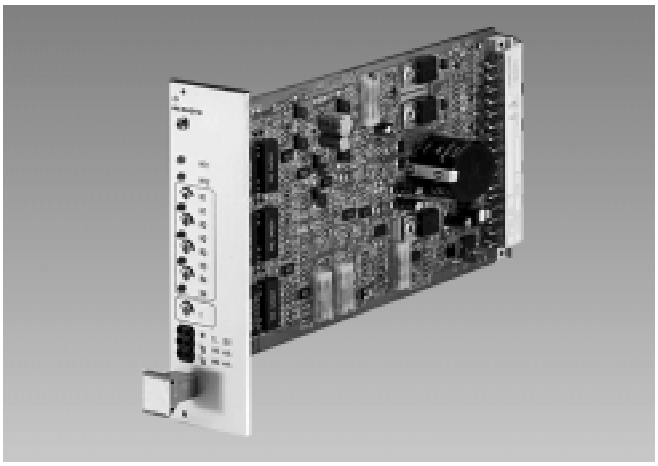
T1 = 1 Ramp time
T5 = 5 Ramp times

RE 30 113/07.98

Replaces: 11.97

Electrical amplifier
Type VT-VSPA2-50

Series 1X



H/A 4239/94

Type VT-VSPA2-50-1X/T1

Table of contents

Features

- Suitable for the control of proportional pressure valves (type 3DREP 6, from series 2X) and pilot operated proportional directional valves (type .WRZ, from series 7X) without electrical position feedback
- Four command values adjustable with potentiometers
- Four command value call-ups with LED display
- Differential input, switchable to current input
- Release input with LED display
- Signal "Ready for opertion" with LED display
- Step function generator
- Ramp generator with one or five ramp times
- Two pulsed current output stages
- Polarity protection for the voltage supply

Cardholder:
- Type VT 3002-2X/32, see RE 29 928
  single cardholder without power supply

Power supply:
- Type VT-NE30-1X, see RE 29 929
  compact power supply unit 115/230 VAC → 24 VDC, 70 VA

Ordering code

VT-VSPA2 – 50 – 1X/ *

Amplifier for controlled proportional directional valves, analogue, with 2 output stages

Amplifier for proportional valves type 3DREP 6 (from series 2X) and type .WRZ (from series 7X) **= 50**

Series 10 to 19 (10 to 19: unchanged technical data and terminal connection) **= 1X**

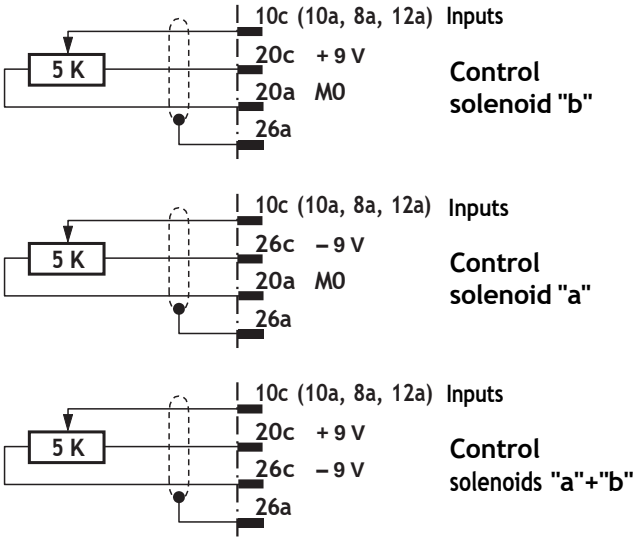
Further details in clear text

T1 = 1 Ramp time
T5 = 5 Ramp times

Functional description

With the command value inputs 1 to 4 command values [1] can be called up through the control of the corresponding relays (K1 to K4). The command value voltage is either given directly through the controlled voltages ± 9 V of the power supply [9] or via an external command value potentiometer. For these inputs ± 9 V = ± 100 % [1] is valid. If these four command value inputs are directly connected to the controlled voltages ± 9 V four different command values can be set at the potentiometers R1 to R4. When using external command value potentiometers at these inputs the internal potentiometer function as weakeners or limiters when these are not set to maximum.

External command value potentiometer



Which command value is momentarily called up is indicated by the LEDs "H1" to "H4". If more than one command value is called up simultaneously the input with the highest number has priority. Example: If commend values 1 and 3 are simultaneously called-up then command value 3 is active.

A further output of the card delivers a supply voltage for the command value call-ups which can be switched over from + 9 V to – 9 V with the relay K6 [1].

An adjustable ramp time ("t1" to "t4") is allocated to each of the four call-up command values with the amplifier variation with 5 ramp times (ordering code **T5**). If no command value is called up the time "t5" is effective with this unit.

All relays on the card are switched with 24 VDC (smoothed).

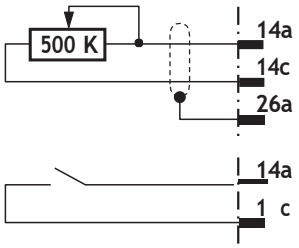
Additionally, the direct command value input 5 is present for the input voltage 0 to ± 6 V. Valid is ± 6 V = ± 100 %) [1].

The command value input is a differential input (0 to ± 10 V). It can be designed (see "setting elements" page 6) as current input (4 to 20 mA or 0 to ± 20 mA) through the setting of jumpers (plug-in bridges). If the command value is presented by a separate electronics with a different reference potential this input must be used. When switching off or on the command value voltage it must be taken care that both signal lines are either separated or connected to the input.

All command values are summated with the correct value and sign before they are connected further [3].

The subsequent ramp generator [4] generates from an applied step form input signal a ramp shaped output signal. The time constant can be set with the potentiometer "t"or "t1"to "t5". The given ramp time given refers to a command value jump of 100 % and can, dependent on the jumper settings (J5, J6), be approx. 1 s or 5 s. If a command value smaller than 100 % is switched onto the input of the ramp generator the ramp time shortens appropriately.

External ramp time potentiometer and ramp "Off"



Ramp "controllable"
Time: min. = 0 Ω
Time: max. = 500 kΩ

Ramp "On/Off"

Note:
When using an external ramp time potentiometer the internal potentiometer for the ramp time must be set at maximum. The maximum ramp time decreases because the resistance of the external potentiometer is switched parallel to the internal potentiometer (approx. 500 kΩ).

By switching the relay K5 or through an external bridge the ramp time is set to its minimum value (approx. 30 ms).

The output signal of the ramp generator [4] goes parallel to the summator [6] and the step function generator [5]. The step function generator produces with command value voltages > ± 1 % a polarity-dependent constant step signal which is added to the output signal of the ramp generator. This step function causes the rapid travelling across the overlapping area of the valve spool. With greater command value voltages the step function generator gives out a constant output signal.

The output signal of the summator [6] is the command current and is led to the two current output stages [7] and to the test point "w" on the frontplate of the card. A voltage of 6 V at the command value test point corresponds to a command value of 100 %. A positive command value signal at the input of the amplifier controls the output stage for solenoid B and a negative signal control the output stage for solenoid A. When the command value signal is smaller than ± 1 % (step function still ineffective) a pilot current of 50 mA flows through both solenoids. The actual values of the currents through both solenoids can be measured separately at the sockets "I_A" (solenoid "a") and "I_B" (solenoid "b"). Here a current of 1.5 A is the equivalent to a voltage of 1.5 V [2].

With a signal of > 8.5 V at the release input the output stages are released.(display with the yellow LED "H11" on the frontplate). With the setting of the jumper J7 the output stages are constantly released independent from the condition of the release input. The switching input is then ineffective.

The signal "Ready for operation" [10] and the green LED "H12" on the frontplate is illuminated when:

- the release signal is present
- the internal ± 9 V voltage supply is functioning (amplitude and symmetrics)
- no short circuit of the solenoid lines is present
- the current input (with connection of the input amplifier [2]for 4 to 20 mA) does not report any errors [10]

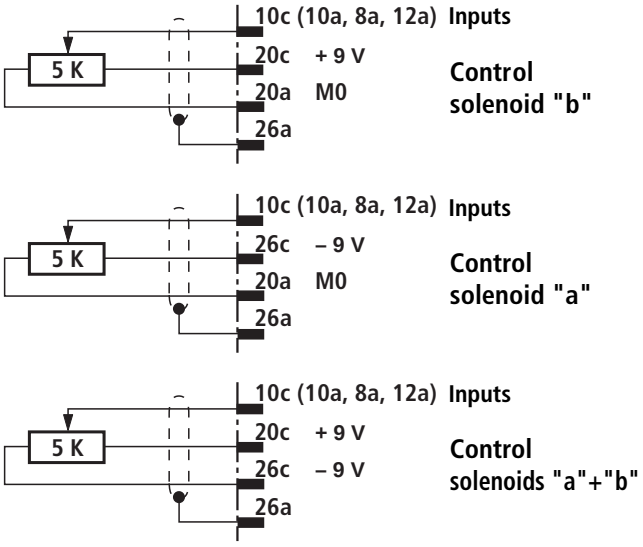
In case of error both output stages are immediately switched off and the message "Ready for operation" is reset. After removing the error the card is immediately able to function again; "Ready for operation", however, is signalled after a delay of 75 ms (± 30 %) so that even short-term disturbances can be recorded by a PLC.

1) = Reference potential for the command values 1 to 5 is M0 (measuring zero).
2) = Reference potential for the actual values it 0 V operating voltage.
[ ] = Allocation in block circuit diagram pages 3 and 4

Functional description

With the command value inputs 1 to 4 command values [1] can be called up through the control of the corresponding relays (K1 to K4). The command value voltage is either given directly through the controlled voltages ± 9 V of the power supply [9] or via an external command value potentiometer. For these inputs ± 9 V = ± 100 % [1] is valid. If these four command value inputs are directly connected to the controlled voltages ± 9 V four different command values can be set at the potentiometers R1 to R4. When using external command value potentiometers at these inputs the internal potentiometer function as weakeners or limiters when these are not set to maximum.

External command value potentiometer



Which command value is momentarily called up is indicated by the LEDs "H1" to "H4". If more than one command value is called up simultaneously the input with the highest number has priority. Example: If commend values 1 and 3 are simultaneously called-up then command value 3 is active.

A further output of the card delivers a supply voltage for the command value call-ups which can be switched over from + 9 V to – 9 V with the relay K6 [1].

An adjustable ramp time ("t1" to "t4") is allocated to each of the four call-up command values with the amplifier variation with 5 ramp times (ordering code **T5**). If no command value is called up the time "t5" is effective with this unit.

All relays on the card are switched with 24 VDC (smoothed).

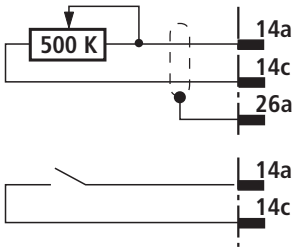
Additionally, the direct command value input 5 is present for the input voltage 0 to ± 6 V. Valid is ± 6 V = ± 100 %) [1].

The command value input is a differential input (0 to ± 10 V). It can be designed (see "setting elements" page 6) as current input (4 to 20 mA or 0 to ± 20 mA) through the setting of jumpers (plug-in bridges). If the command value is presented by a separate electronics with a different reference potential this input must be used. When switching off or on the command value voltage it must be taken care that both signal lines are either separated or connected to the input.

All command values are summated with the correct value and sign before they are connected further [3].

The subsequent ramp generator [4] generates from an applied step form input signal a ramp shaped output signal. The time constant can be set with the potentiometer "t" or "t1" to "t5". The given ramp time given refers to a command value jump of 100 % and can, dependent on the jumper settings (J5, J6), be approx. 1 s or 5 s. If a command value smaller than 100 % is switched onto the input of the ramp generator the ramp time shortens appropriately.

External ramp time potentiometer and ramp "Off"



Note:
When using an external ramp time potentiometer the internal potentiometer for the ramp time must be set at maximum. The maximum ramp time decreases because the resistance of the external potentiometer is switched parallel to the internal potentiometer (approx. 500 kΩ).

By switching the relay K5 or through an external bridge the ramp time is set to its minimum value (approx. 30 ms).

The output signal of the ramp generator [4] goes parallel to the summator [6] and the step function generator [5]. The step function generator produces with command value voltages > ± 1 % a polarity-dependent constant step signal which is added to the output signal of the ramp generator. This step function causes the rapid travelling across the overlapping area of the valve spool. With greater command value voltages the step function generator gives out a constant output signal.

The output signal of the summator [6] is the command current and is led to the two current output stages [7] and to the test point "w" on the frontplatte of the card. A voltage of 6 V at the command value test point corresponds to a command value of 100 %. A positive command value signal at the input of the amplifier controls the output stage for solenoid B and a negative signal control the output stage for solenoid A. When the command value signal is smaller than ± 1 % (step function still ineffective) a pilot current of 50 mA flows through both solenoids. The actual values of the currents through both solenoids can be measured separately at the sockets "I_A" (solenoid "a") and "I_B" (solenoid "b"). Here a current of 1.5 A is the equivalent to a voltage of 1.5 V [2].

With a signal of > 8.5 V at the release input the output stages are released. (display with the yellow LED "H11" on the frontplate). With the setting of the jumper J7 the output stages are constantly released independent from the condition of the release input. The switching input is then ineffective.

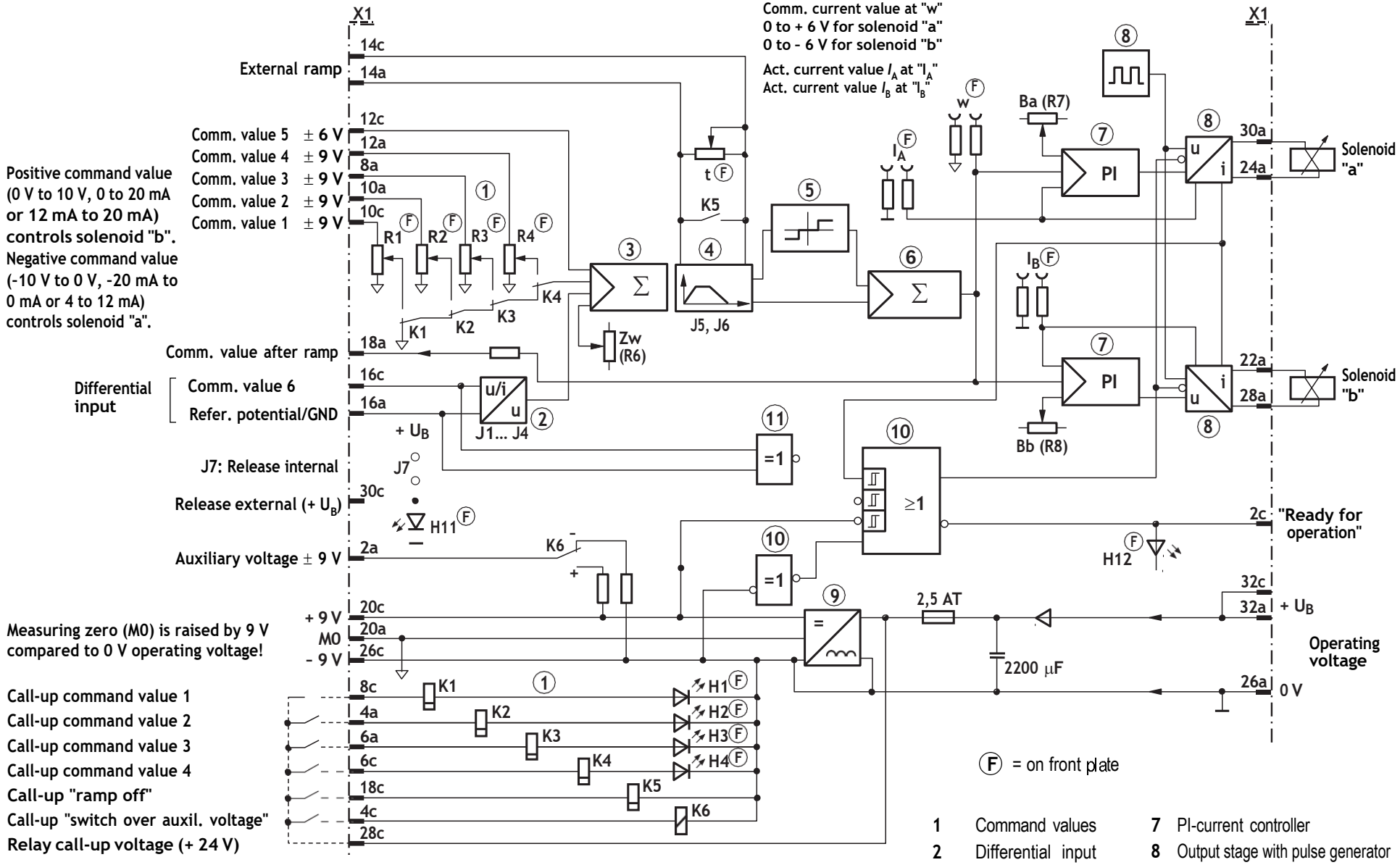
The signal "Ready for operation" [10] and the green LED "H12" on the frontplatte is illuminated when:

- the release signal is present
- the internal ± 9 V voltage supply is functioning (amplitude and symmetrics)
- no short circuit of the solenoid lines is present
- the current input (with connection of the input amplifier [2] for 4 to 20 mA) does not report any errors [10]

In case of error both output stages are immediately switched off and the message "Ready for operation" is reset. After removing the error the card is immediately able to function again; "Ready for operation", however, is signalled after a delay of 75 ms (± 30 %) so that even short-term disturbances can be recorded by a PLC.

[1] = Reference potential for the command values 1 to 5 is M0 (measuring zero).
[2] = Reference potential for the actual values it 0 V operating voltage.
[ ] = Allocation in block circuit diagram pages 3 and 4

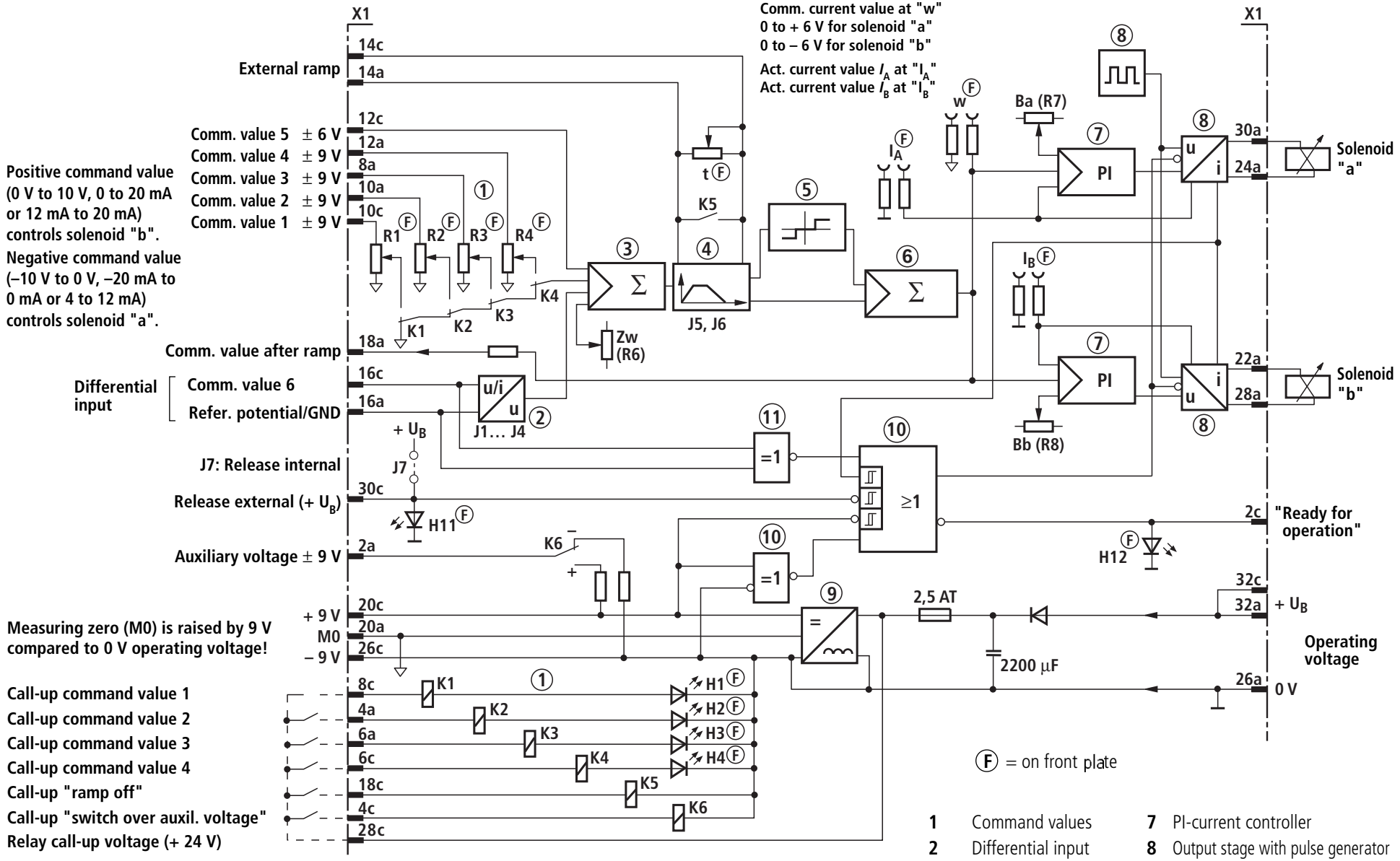
Block circuit diagram / terminal connection VT-VSPA2-50-1X/T1



H1 to **H4** = LED-displays for comm. value call-ups
K1 to **K6** = Call-up relay
R1 to **R4** = Command values
Zw (R6) = Zero point comm. value
Ba (R7) = Biasing current solen. "a"
Bb (R8) = Biasing current solen. "b"
t = Ramp time

1 Command values
2 Differential input
3; **6** Summator
4 Ramp generator
5 Step function
7 PI-current controller
8 Output stage with pulse generator
9 Power supply
10 Monitorings
11 Monitoring cable break (only for 4 to 20 mA)

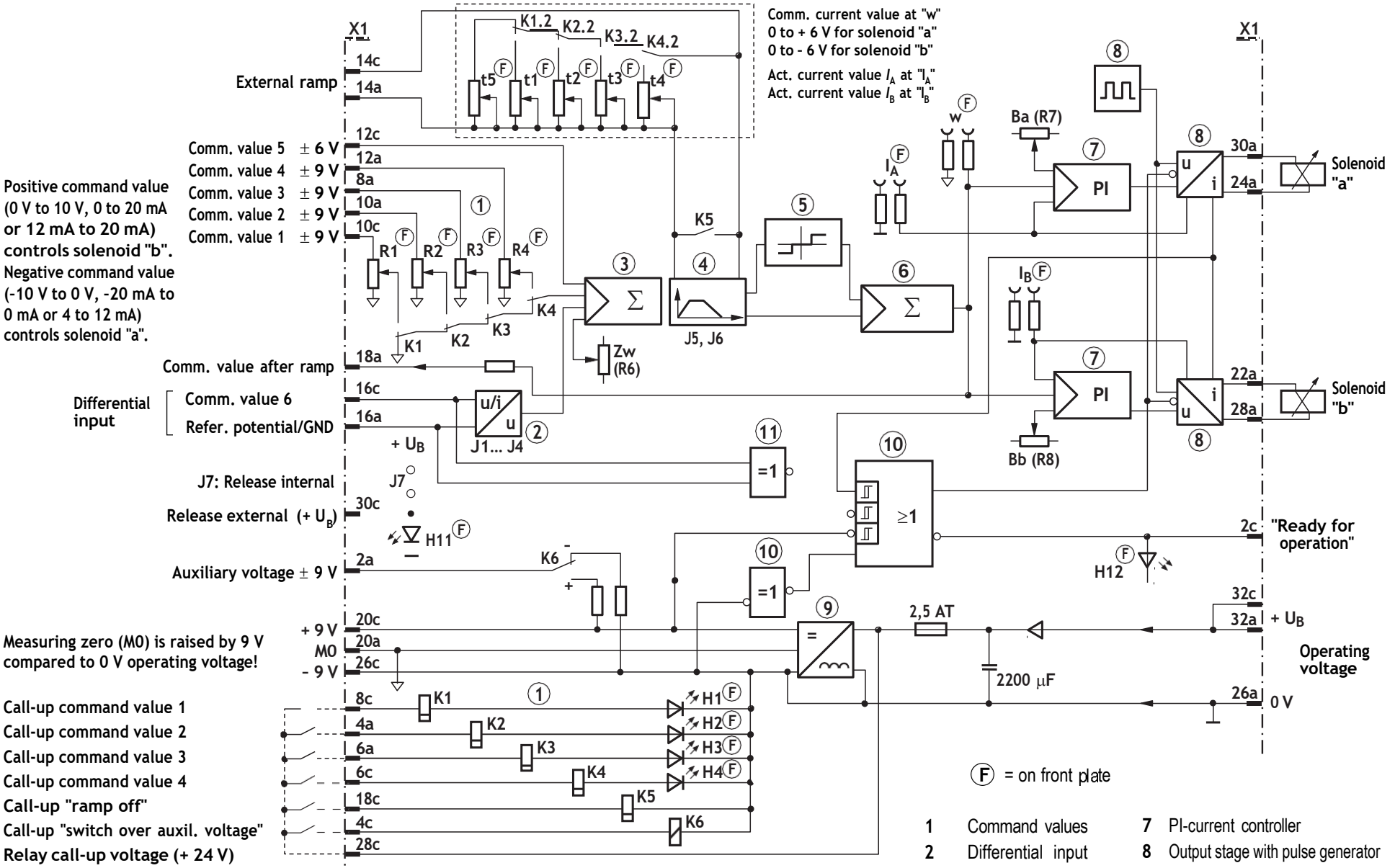
Block circuit diagram / terminal connection VT-VSPA2-50-1X/T1



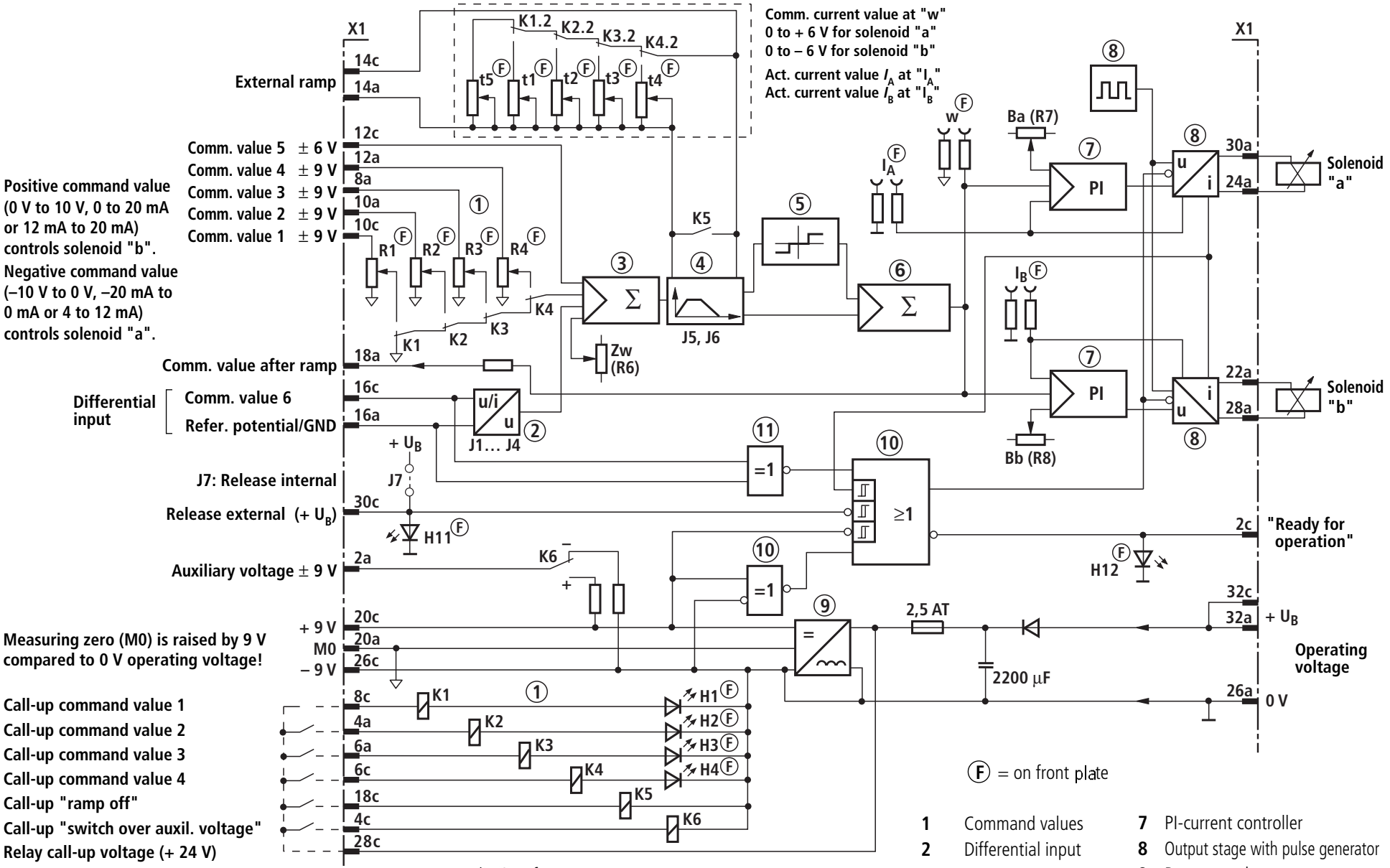
H1 to **H4** = LED-displays for comm. value call-ups
K1 to **K6** = Call-up relay
R1 to **R4** = Command values
Zw (R6) = Zero point comm. value
Ba (R7) = Biasing current solen. "a"
Bb (R8) = Biasing current solen. "b"
t = Ramp time

1 Command values
2 Differential input
3; **6** Summator
4 Ramp generator
5 Step function
7 PI-current controller
8 Output stage with pulse generator
9 Power supply
10 Monitorings
11 Monitoring cable break (only for 4 to 20 mA)

Block circuit diagram / terminal connection VT-VSPA2-50-1X/T5



Block circuit diagram / terminal connection VT-VSPA2-50-1X/T5



(F) = on front plate

H1 to **H4** = LED-displays for comm. value call-ups
K1 to **K6** = Call-up relay
R1 to **R4** = Command values
Zw (R6) = Zero point comm. value
Ba (R7) = Biasing current solen. "a"
Bb (R8) = Biasing current solen. "b"
t1 to **t5** = Ramp times

1 Command values
2 Differential input
3; **6** Summator
4 Ramp generator
5 Step function
7 PI-current controller
8 Output stage with pulse generator
9 Power supply
10 Monitorings
11 Monitoring cable break (only for 4 to 20 mA)

Technical data (For application outside these parameters please consult us!)

Operating voltage	U_B	24 VDC + 40 % – 5 %
Functional range:		
– upper limit value	$u_B(t)_{max}$	35 V
– lower limit value	$u_B(t)_{min}$	22 V
Current consumption	I	< 1,2 A
Power consumption	P_S	< 30 VA
Fuse	I_S	2,5 AT
Inputs:		
– Command values 1 to 4	U_e	± 9 V (reference potential is M0)
– Command value 5	U_e	± 6 V (reference potential is M0)
– Command value input 6 (differential input)	U_e	0 to ±10 V; R_e = 100 kΩ
or	I_e	4 to 20 mA; load R_B = 100 Ω (4 mA = – 100 %; 12 mA = 0 %; 20 mA = + 100 %)
or	I_e	0 to ± 20 mA
– Release		
• active	U_F	> 8,5 V
• not active	U_F	< 6,5 V
Relay data:		
– Nominal voltage	U	operating voltage U_B
– Threshold voltage	U	16,8 V
– Return voltage	U	2,4 V
– Coil resistance	R	2150 Ω
Ramp time (setting range)	t	30 ms to approx. 1 s or 5 s
Outputs:		
– Output stage		
• solenoid current / resistance	I_{max}	1,5 A; $R_{(20)}$ = 5 Ω
• biasing current	I	50 mA ± 25 %
• pulse frequency	f	220 Hz ± 10 %
– Signal "Ready for operation"		
• in condition ready for operation	U	> 16 V, 50 mA
• with error	U	< 1 V, R_i = 10 kΩ
– Regulated voltage	U	± 9 V ± 1 %; ± 25 mA externally loadable
– Measurement sockets		
• command value "w"	U	0 to ± 6 V; R_i = 5 kΩ (reference potential is M0)
• actual current value "I_A" and "I_B"	U_A; U_B	0 bis 1,5 V = 0 bis 1,5 A (reference potential is 0 V operat. voltage)
Type of connection		32pin blade connector, DIN 41 612, form D
Card dimensions		Eurocard 100 x 160 mm, DIN 41 494
Front plate dimensions:		
– Height		3 HE (128,4 mm)
– Width soldering side		1 TE (5,08 mm)
– Width component side		7 TE
Permissible operating temperature range	ϑ	0 to 50 °C
Storage temperature range	ϑ	– 25 to + 85 °C
Weight	m	0,13 kg

Note:

For details regarding **environmental simulation test** for the areas of EMC (electro-magnetic compatibility), climate and mechanical loadingsee RE 30 113-U (explanation regarding environmental compatibility).

Technical data (For application outside these parameters please consult us!)

Operating voltage	U_B	24 VDC + 40 % – 5 %
Functional range:		
– upper limit value	$u_B(t)_{max}$	35 V
– lower limit value	$u_B(t)_{min}$	22 V
Current consumption	I	< 1,2 A
Power consumption	P_S	< 30 VA
Fuse	I_S	2,5 AT
Inputs:		
– Command values 1 to 4	U_e	± 9 V (reference potential is M0)
– Command value 5	U_e	± 6 V (reference potential is M0)
– Command value input 6 (differential input)	U_e	0 to ±10 V; R_e = 100 kΩ
or	I_e	4 to 20 mA; load R_B = 100 Ω (4 mA ≙ – 100 %; 12 mA ≙ 0 %; 20 mA ≙ + 100 %)
or	I_e	0 to ± 20 mA
– Release		
• active	U_F	> 8,5 V
• not active	U_F	< 6,5 V
Relay data:		
– Nominal voltage	U	operating voltage U_B
– Threshold voltage	U	16,8 V
– Return voltage	U	2,4 V
– Coil resistance	R	2150 Ω
Ramp time (setting range)	t	30 ms to approx. 1 s or 5 s
Outputs:		
– Output stage		
• solenoid current / resistance	I_{max}	1,5 A; $R_{(20)}$ = 5 Ω
• biasing current	I	50 mA ± 25 %
• pulse frequency	f	220 Hz ± 10 %
– Signal "Ready for operation"		
• in condition ready for operation	U	> 16 V, 50 mA
• with error	U	< 1 V, R_i = 10 kΩ
– Regulated voltage	U	± 9 V ± 1 %; ± 25 mA externally loadable
– Measurement sockets		
• command value "w"	U	0 to ± 6 V; R_i = 5 kΩ (reference potential is M0)
• actual current value "I_A" and "I_B"	U_A; U_B	0 bis 1,5 V ≙ 0 bis 1,5 A (reference potential is 0 V operat. voltage)
Type of connection		32pin blade connector, DIN 41 612, form D
Card dimensions		Eurocard 100 x 160 mm, DIN 41 494
Front plate dimensions:		
– Height		3 HE (128,4 mm)
– Width soldering side		1 TE (5,08 mm)
– Width component side		7 TE
Permissible operating temperature range	ϑ	0 to 50 °C
Storage temperature range	ϑ	– 25 to + 85 °C
Weight	m	0,13 kg

Note:
For details regarding **environmental simulation test** for the areas of EMC (electro-magnetic compatibility), climate and mechanical loadingsee RE 30 113-U (explanation regarding environmental compatibility).