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REXROTH

Electronic amplifier for the control of proportional valves without position control Model VT 3000, Series 3X

RA
29 935/06.98
Replaces: 02.96

The amplifier VT 3000-3X is suitable for the control of pilot operated proportional directional valves (WRZ, Series 6X and older) and direct operated pressure valves (DBEP6, 3DREP6, Series 1X) without position feedback.

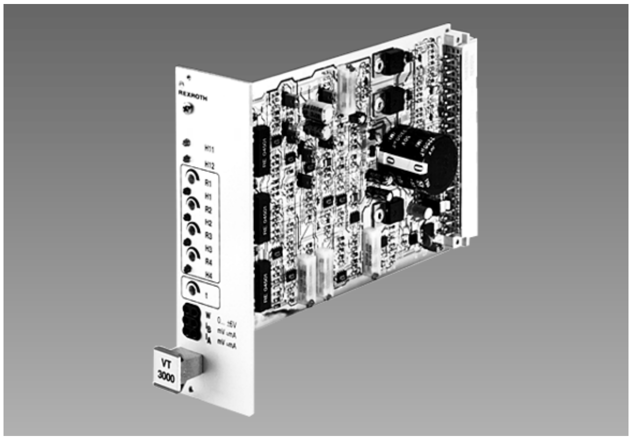
Characteristics:

- Four command values adjustable with potentiometers
- Four command value call-ups with LED display
- Differential input
- Step function generator
- Ramp generator
- Two pulsed current output stages
- Polarity protection for the voltage supply

Note:
When supplied the amplifiers have a ramp time of 5 s.
(Setting of ramp time of 1 s see page 5)

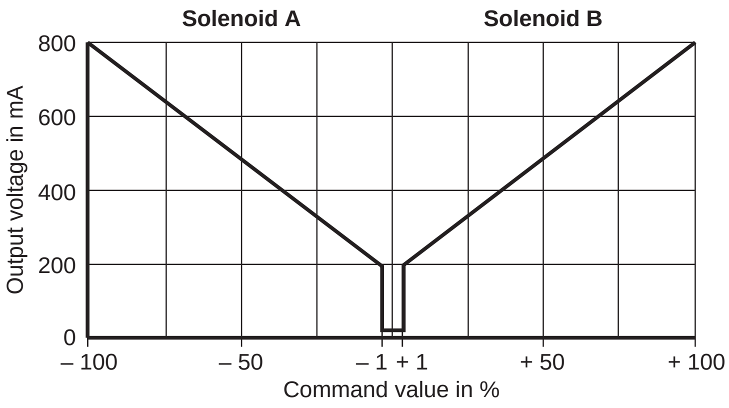
Card Holder:
- CH 32C-1X, see RA 29 921
- VT 3002-2X/32, see RA 29 928

H/A 4156/94



VT 3000-3X

Output curve



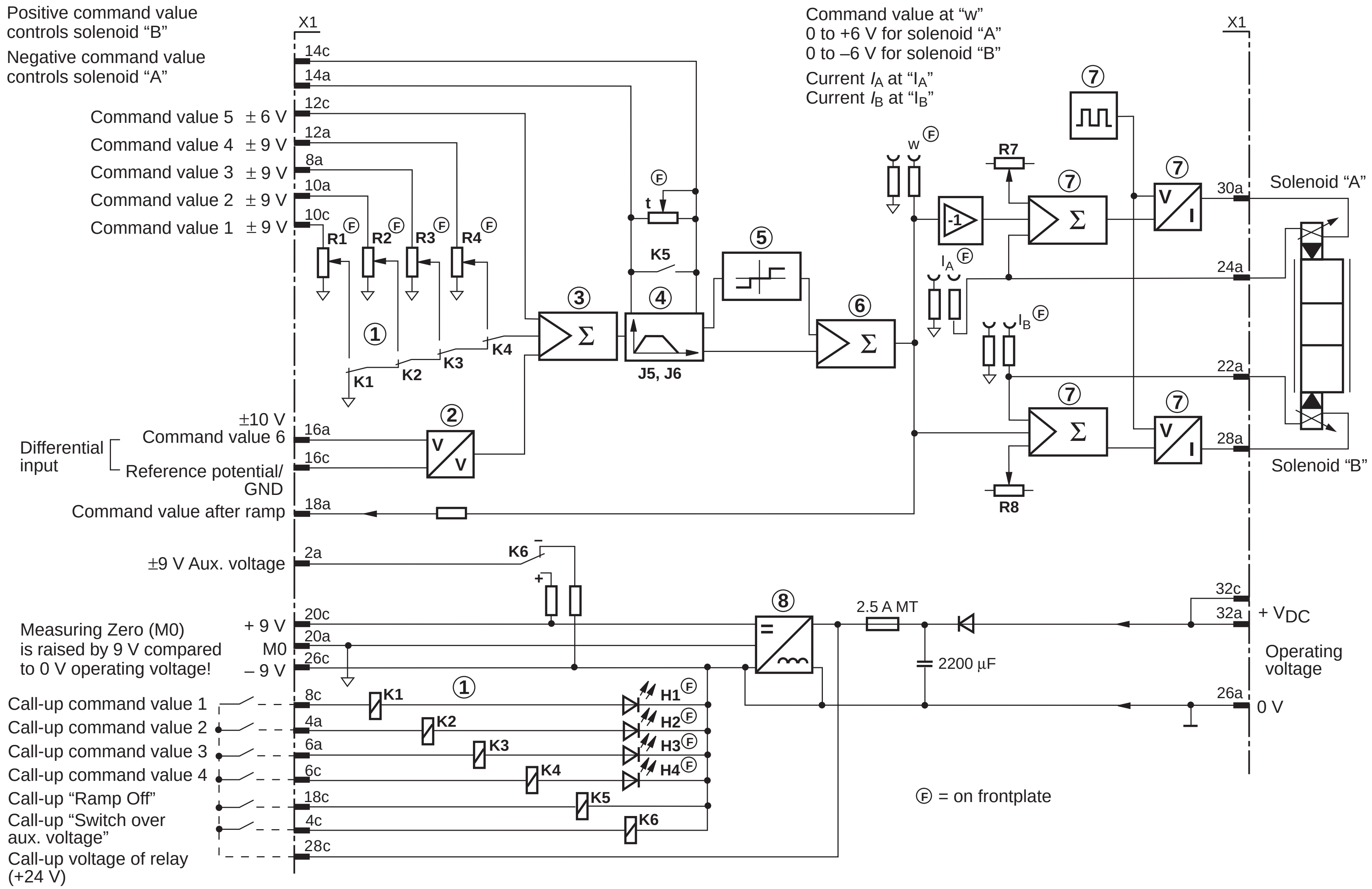
Technical data (For application outside these parameters please consult us!)

Operating voltage [1])	V_{DC}	24 VDC; + 60 %; – 5 %
Function range – upper limit value (momentary value) – lower limit value (momentary value)	 $V_{DC}(t)_{max}$ $V_{DC}(t)_{min}$	 39 V 22 V
Power consumption	I	< 1 A (with loading current)
Fuse	I_S	2.5 A time lag, M5 x 20
Inputs – Command values 1 to 4 – Command value 5 – Command value input 6 (differential input)	 V_e V_e V_e	 ± 9 V (reference potential is M0) ± 6 V (reference potential is M0) 0 to ±10 V; R_e = 100 kΩ
Relay data – Nominal voltage – Threshold voltage – Return voltage – Coil resistance	 V V V R	 Operating voltage V_{DC} 16.8 V 2.4 V 2150 Ω
Ramp time (setting range)	t	30 ms to approx. 1 s or 5 s
Controlled voltage	V	± 9 V ± 1 %; 50 mA. externally loadable
Solenoid current – Pilot current – Pulse frequency of the output stages	I_{max} I f	800 mA; $R_{(20)}$ = 19.5 Ω 20 mA ± 25 % 170 Hz ± 10 %
Test points – Command value *w* – Actual current value I_A, I_B	 V V_A, V_B	 ± 6 V; R_i = 5 kΩ 0 to 800 mV ≙ 0 to 800 mA
Type of connection		32-pin terminal strip, DIN 41 612, type D
Card dimensions		Euro-Card 100 x 160 mm, DIN 41 494
Front plate dimensions – Height – Width soldering side – Width component side		 3 U, 5.06 in (128.4 mm) 1 HP, 0.20 in (5.08 mm) = 1 division 7 HP = 7 divisions
Permissible operating temperature Storage temperature range	t t	+32 … +122 °F (0 … 50 °C) to DIN/IEC 68-2, T1, T2, T14 and T30 [2]) –13 … +185 °F (– 25 … 85 °C) [2])
Disturbance resistance		Class 3 to DIN/VDE 843 T2 and T4 [2])
Mechanical loadability		to DIN/IEC 68-2, T6, T24 and T27 [2])
Weight	m	0.29 lbs (0.13 kg)

[1]) To guarantee the maximum solenoid current for the 19.5 Ω-solenoid in the highest solenoid temperature range the operating voltage must be at least 28 VDC!

[2]) For further details please consult us !

Block circuit diagram / terminal connection VT 3000 – 3X



H1 to H4 = LED-display for command value call-ups
K1 to K6 = Call-up relay
R1 to R4 = Command value

R7 = Pilot current solenoid "A"
R8 = Pilot current solenoid "B"
t = Ramp time

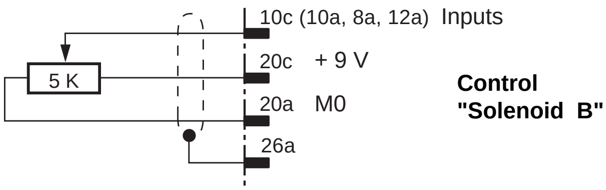
1 Command values
2 Differential input
3; **6** Summation
4 Ramp generator

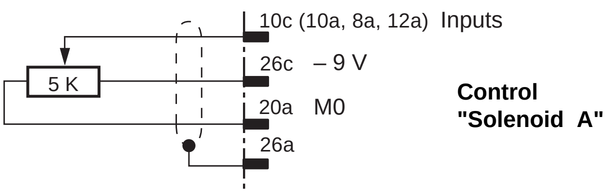
5 Step function
7 Current amplifier with pulse generator
8 Power supply

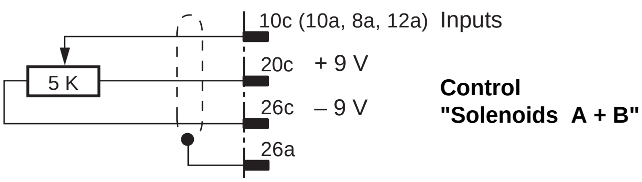
Functional description

With the command value inputs 1 to 4 command values [1] can be called up by operating the corresponding relays (K1 to K4). The command value voltage is either given directly through the controlled voltages ± 9 V of the power supply [8] 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 functions as a limiter when these are not set to maximum. Clockwise increases the command value.

External command value potentiometer







Which command value is 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 command value 1 and command value 3 are activated simultaneously command value 3 becomes effective.

An auxiliary 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 [1]) with relay K6.

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

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

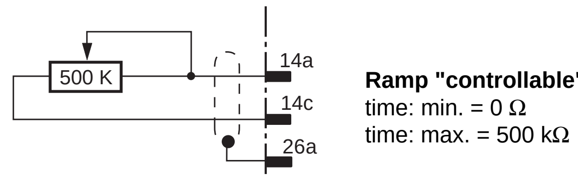
The command value input 6 is a differential input (0 to ± 10 V) [2]). When using external electronics, this differential input [2] must be used. When switching off or on the command value voltage care must be taken that both signal lines should be separated from or connected to the input.

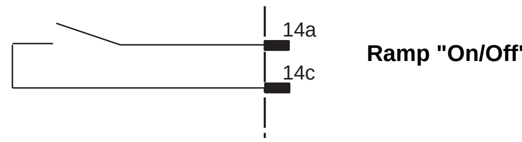
All command values are summed with the correct value and sign before they are connected further [3].

The added ramp generator [4] produces a ramp output signal from the given step input signal. The time constant of the output signal can be set with the potentiometer "t". The ramp time given refers to a command value jump of 100% and can be set through the selection via jumpers - approximately 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. Clockwise increases ramp time.

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 connected parallel to the internal potentiometer.

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 of >±1% a polarity-dependent jump signal which is added to the output signal of the ramp generator. This jump function causes the rapid travelling across the overlapping area of the valve.

The output signal of the summation [6] is the command current value 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, a negative signal controls the output stage for solenoid A. When the command value signal is smaller than ±1% (step function still ineffective) a pilot current of 20 mA flows through both solenoids. The actual values of the currents through both solenoids have to be measured separately at the sockets I_A (solenoid A) and I_B (solenoid B). Here a current of 800 mA corresponds to a voltage of 800 mV.

[1]) = Reference potential for the command values 1 to 6 is M0 (meas. zero)

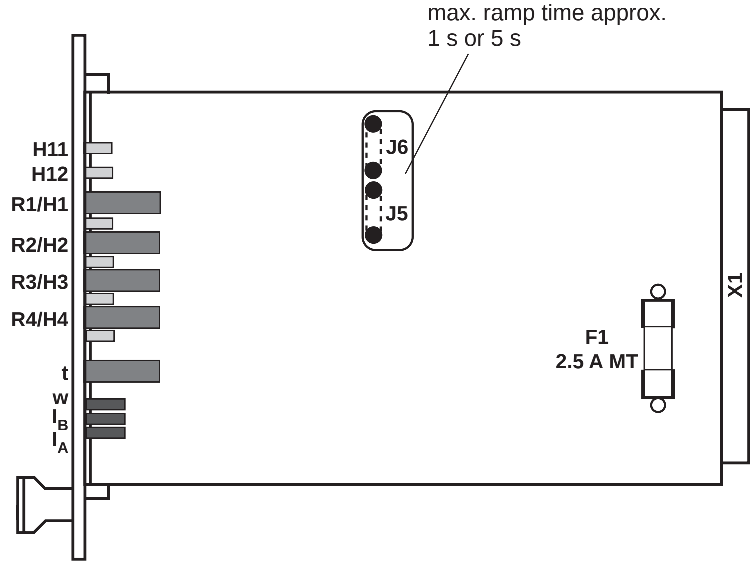
[2]) = Reference potential for the differential input should be grounded to 0 V at source end.

[ ] = Allocation in block circuit diagram

Display / setting elements VT 3000 – 3X

H11 - yellow LED display "power on"
H12 - green LED display "no fault"
R1 / H1 - Command value 1 with LED display
R2 / H2 - Command value 2 with LED display
R3 / H3 - Command value 3 with LED display
R4 / H4 - Command value 4 with LED display

t - ramp time
w - Command value solenoid current
I_B - Actual current value solenoid B
I_A - Actual current value solenoid A



Meaning of jumpers on the card for settings
(Label on the back of the frontplate)

ramp time					
● 5 s	[J5] [J6]	[Jx]	= bridge	bridge plugged in
○ 1 s	J5 J6	Jx	= open	bridge open
		●	= delivery state	Delivery condition

Ramp time

Note: The loss of unused jumpers can be avoided by plugging the jumpers into only one pin.

Project / maintenance instructions / additional information

– The amplifier card may only be plugged or unplugged when power is off !
– Do not use plugs with fly-back diodes or LED's when connecting the solenoids !
– Measurements at the card may only be carried out with instruments R_i > 100 kΩ !
– Measuring zero (M0) is increased by + 9V compared to 0V - operating voltage and is **not potentially separated** – i.e. –9 V controlled voltage = 0 V operating voltage. Therefore, the measuring zero (M0) must **not** be connected with 0 V operating voltage !
– For switching of the command values use relays with dry contacts (small voltages, small currents) !
– For switching of the card relay only use contacts with a load capacity of approx. 40 V, 50 mA !
When using external control the control voltage may have a residual ripple factor of a maximum of 10% !
– Always shield command value lines; shield to be connected to 0 V operating voltage on the card side, leave other side open (Danger of earth loops) !
Recommendation: Also shield solenoid lines !
For solenoid lines of up to 150 ft (50 m) length use cable type stranded 16 AWG (LiYCY 1.5 mm$^{2)}$.
For longer lengths please consult us !
– The distance to aerial lines, radio sources and radar equipment must be at least 3 ft (1 m) !
– Do not lay solenoid and signal lines near power lines !
– Because of loading current for the smoothing capacitor of the card, fuse should be time lag !
– If switching the differential input, both sides must be switched simultaneously (use DPDT dry contacts).
– When using the differential input, an isolated analog common should be grounded to 0 V from the card's power source, at one point on the source end.

Ordering code

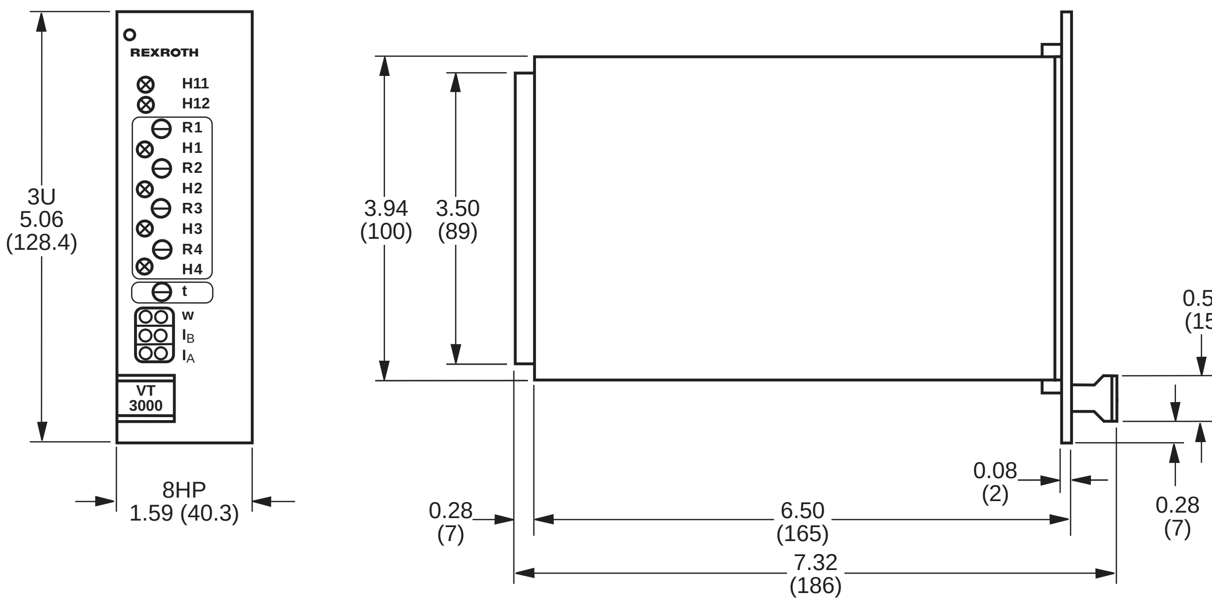
VT 3000 – 3X / *

Amplifier for proportional valves without position control

Series 30 to 39 **= 3X**
(Series 30 to 39: technical data and terminal connections unchanged)

Further details to be written in clear text

Unit dimensions: dimensions in inches (millimeters)



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