Rexroth
Bosch Group

Analog amplifier

Type VT 3000

Component series 3X
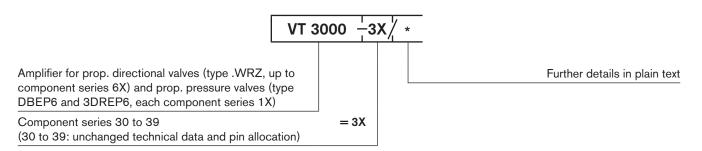
H4162

Overview of contents

Contents

Features

– Suitable for the control of pilot operated proportional directional valves (type .WRZ, up to component series 6X) and direct operated proportional pressure valves (type DBEP6 and 3DREP6, each component series 1X) without electrical position feedback

– 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 the ramp time of 1 s see page 6).

Ordering code

$$\text{VT 3000} \quad -3\text{X}/\ *$$

Amplifier for prop. directional valves (type .WRZ, up to component series 6X) and prop. pressure valves (type DBEP6 and 3DREP6, each component series 1X)

Further details in plain text

Component series 30 to 39   = 3X
(30 to 39: unchanged technical data and pin allocation)

Card holder:
– Type VT 3002-2X/32, see RE 29928
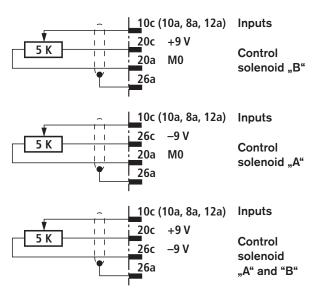 Single card holder without power pack

Power pack:
– Type VT-NE30-2X, see RE 29929
  Compact power pack 115/230 VAC → 24 VDC, 108 W

Functional description

With the command value inputs 1 to 4 command values can be called up [1] 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 [10] or via an external command value potentiometer. For this 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 potentiometers also function as weakeners or limiters when these are not set to maximum.

External command value potentiometer

	10c (10a, 8a, 12a)	Inputs
5 K	20c +9 V	
	20a M0	Control solenoid „B"
	26a	

	10c (10a, 8a, 12a)	Inputs
5 K	26c −9 V	
	20a M0	Control solenoid „A"
	26a	

	10c (10a, 8a, 12a)	Inputs
5 K	20c +9 V	
	26c −9 V	Control solenoid „A" and "B"
	26a	

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 command value 1 and command value 3 are activated simultaneously the command value 3 becomes effective.

A further output of the card provides 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].

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

Additionally, the direct command value input 5 is available 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). If the command value is presented by a separate electronics with a different reference potential this input must be used. When switching on or off the command value it must be taken care that both signal lines are either separated from or connected to the input.
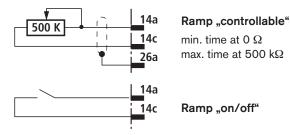
All command values are summated with the correct value and sign before they are connected further [3].

The added ramp generator [4] produces a ramp-like output signal from the jump-like given input signal. The time constant can be set with the potentiometers „t1" to „t5". The ramp time given refers to a command value jump of 100 % and can be, according to the setting through the selection via jumpers (J5, J6), approximately 1 s or 5 s. If a command value jump smaller than 100 % is switched to the input of the ramp generator the ramp time shortens appropriately.

[1]   = Reference potential for the command values 1 to 5 is M0 (measuring zero)

Functional Description

External time potentiometer and ramp „Off"

14a	**Ramp „controllable"**
14c	min. time at 0 Ω
26a	max. time at 500 kΩ

14a	
14c	**Ramp „on/off"**

Note:

When using an external 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 (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] runs parallel to the summator [6] and the step function generator [5]. On command values $> \pm 1$ % the step function generator produces a polarity-dependent constant step signal with the command value voltages 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.

The output signal of the summator [6] is the command current value and is led to the two current output stages [7] and to the test point „w" on the front plate 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 command value signal the output stage for solenoid „A". If 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 the two solenoids can be measured separately at the test points „I_A" (solenoid „A") and „I_B" (solenoid „B"). Here a current of 800 mA corresponds to a voltage of 800 mV.

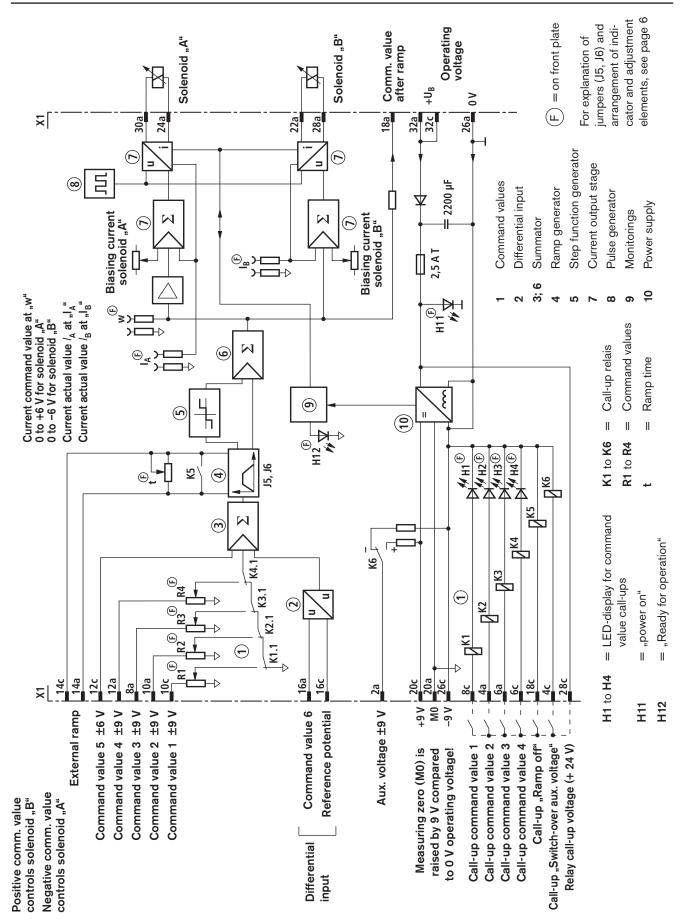LED „H11" lights up when the system is powered up.

LED „H12" („Ready for operation") lights up to indicate trouble-free operation as long as:
– the internal power supply (±9 V) is functioning properly
– there is no short-circuit in the solenoid lines

In the event of a fault, both output stages are immediately deenergized and the signal „Ready for operation" is cancelled. Once the fault has been cleared, the amplifier card is immediately operable and LED „H12" lights up again.

[ ]　　　= Allocation in block circuit diagram page 4

Block circuit diagram / pin allocation

Positive comm. value controls solenoid „B"
Negative comm. value controls solenoid „A"

Solenoid „A"
Solenoid „B"
Comm. value after ramp
Operating voltage
+U_B
0 V

X1

30a 24a 22a 28a 18a 32a 32c 26a

Current command value at „w"
0 to +6 V for solenoid „A"
0 to −6 V for solenoid „B"

Current actual value I_A / at „I_A"
Current actual value I_B at „I_B"

Biasing current solenoid „A"
Biasing current solenoid „B"

2200 µF
2,5 AT
H11

External ramp
Command value 5 ±6 V
Command value 4 ±9 V
Command value 3 ±9 V
Command value 2 ±9 V
Command value 1 ±9 V

Differential input { Command value 6 / Reference potential

Aux. voltage ±9 V

Measuring zero (M0) is raised by 9 V compared to 0 V operating voltage!

+9 V
M0
−9 V

Call-up command value 1
Call-up command value 2
Call-up command value 3
Call-up command value 4
Call-up „Ramp off"
Call-up „Switch-over aux. voltage"
Relay call-up voltage (+ 24 V)

X1
14c 14a 12c 12a 8a 10a 10c   16a 16c   2a   20c 20a 26c 8c 4a 6a 6c 18c 4c 28c

K5 K4.1 K3.1 K2.1 K1.1
R4 R3 R2 R1
K6

K1 K2 K3 K4 K5 K6
H1 H2 H3 H4

1 Command values
2 Differential input
3; 6 Summator
4 Ramp generator
5 Step function generator
7 Current output stage
8 Pulse generator
9 Monitorings
10 Power supply

K1 to K6 = Call-up relais
R1 to R4 = Command values
t = Ramp time

H1 to H4 = LED-display for command value call-ups
H11 = „power on"
H12 = „Ready for operation"

(F) = on front plate

For explanation of jumpers (J5, J6) and arrangement of indicator and adjustment elements, see page 6

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

Operating voltage [1]	U_B	24 VDC +60 % −5 %
Operating range:		
– Upper limit value	$u_B(t)_{max}$	39 V
– Lower limit value	$u_B(t)_{min}$	22 V
Power consumption	P_S	< 50 VA
Current consumption	I	< 1 A (with loading current)
Fuse	I_S	2.5 A slow
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 6 (differential input)	U_e	0 to ±10 V; R_e = 100 kΩ
Ramp time (setting range)	t	30 ms to approx. 1 s or 5 s
Outputs:		
– Output stage		
• Solenoid current/resistance	I_{max}	800 mA; $R_{(20)}$ = 19.5 Ω
• Biasing current	I_V	20 mA ±25 %
• Pulse frequency	f	170 Hz ±10 %
– Regulated voltage	U	±9 V ±1 %; ±25 mA externally loadable
– Measuring sockets		
• Current command value „w"	U	±6 V; R_i = 5 kΩ
• Current actual value „I_A"; „I_B"	U_A; U_B	0 to 800 mV equivalent 0 to 800 mA
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
Type of connection		32-pin terminal strip, DIN 41612, form D
Card dimensions		Euro-card 100 x 160 mm, DIN 41494
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

[1] To guarantee the max. solenoid current for the solenoid
(19.5 Ω) in the complete solenoid temperature range the
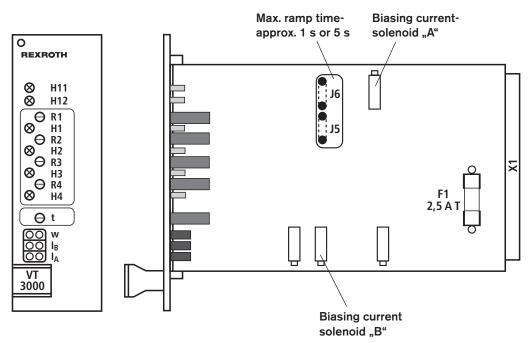operating voltage must be at least 28 VDC!

Note:

For details regarding **environmental simulation test** in the
field of EMC (electromagnetic compatibility), climate and me-
chanical stress, see RE 30304-U (declaration on environmen-
tal compatibility).

Output curve

Solenoid „A"   Solenoid „B"

Output current in mA →

800

600

400

200

20

− 100 %   − 50 %   − 1 % + 1 %   + 50 %   + 100 %

← Command value in % →

Indicator / Adjustment elements

Max. ramp time-
approx. 1 s or 5 s

Biasing current-
solenoid „A"

Biasing current
solenoid „B"

LED lamps:

H1	Call-up command value 1
H2	Call-up command value 2
H3	Call-up command value 3
H4	Call-up command value 4
H11	Operating voltage „Power on" (yellow)
H12	Indication „Ready for operation" (green)

Potentiometer:

R1	Command value 1
R2	Command value 2
R3	Command value 3
R4	Command value 4
t1	Ramp time

Measuring sockets:

w	Command value solenoid current
I_A	Actual current value solenoid „A"
I_B	Actual current value solenoid „B"

Meaning of the jumpers on the card for the settings
Meaning of the jumpers on the card for the settings

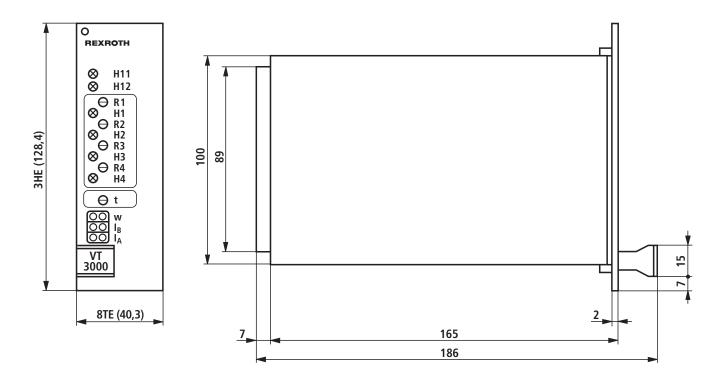| ramp time		Jx = bridge	jumper plugged in
● 5 s	J5 J6	Jx = open	Jumper open
○ 1 s	J5 J6	● = delivery state	delivery condition

Rampenzeit

Note:

The loss of unused jumpers can be avoided by plugging these jumpers into only one pin.

Unit dimensions (Dimensions in mm)

Engineering notes / maintenance instructions / supplementary information

– The amplifier card may only be plugged in or unpluged when switched off!

– Do not use plugs with free wheel diodes or LED displays when connecting the solenoids!

– Only carry out measurements on the cards with instruments $R_i > 100$ kΩ!

– Measuring zero (M0) is raised by +9 V compared to 0V operating voltage and is not potentially separated, i.e. −9 V controlled voltage is equivalent to 0V operating voltage. Therefore do not connect measuring zero (M0) to 0V operating voltage!

– When switching command values use relays with gold contacts (small voltages, small currents)!

– When switching card relays only use contacts with a loadability of approx. 40 V, 50 mA!
  When controlling externally the control voltage may have a maximum residual ripple of 10 %!

– Always screen command value lines; connect screen to 0 V operating voltage on the card side, other side remains open (danger of earth loops)!

  Recommendation: Also screen solenoid lines!
  Use cable type LiYCY 1.5 mm^2 for solenoid lines of up to 50 m in length.
  For longer lengths please consult us!

– Minimum distance to arial lines, radio sources and radar equipment must be at least 1m!

– Do not lay solenoid and signal lines near power lines!

– Because of the loading current of the smoothing capacitor on the card pilot fuses must be slow!

– **Note:** When using the differential input both inputs must always be switched on or off simultaneously!

Notes