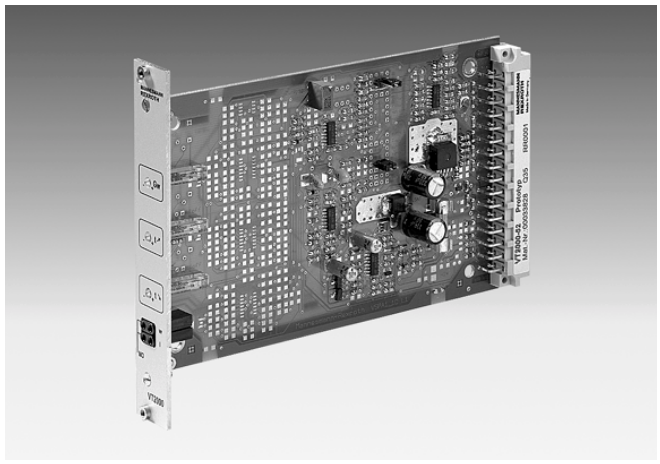
**RE 29 904/05.02**

Replaces: 04.98

# Electrical amplifier Type VT 2000

Series 5X



H/A/D 5896/97

Type VT 2000

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## Features

- Suitable for controlling direct and pilot operated proportional pressure control valves without electrical position feedback
- Differential input
- Additional command value input 0 to +9 V
- Ramp generators, separately adjustable for "up" and "down" ramps
- Clocked current output stage
- Reverse voltage protection for voltage supply
- Short-circuit protection of the solenoid cable

**Card holder:**

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

**Power supply unit:**

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

## Ordering code

**VT 2000 – 5X/**

Amplifier for proportional pressure control valves without electrical position feedback

Series 50 to 59 (50 to 59: unchanged technical data and pin assignment) **= 5X**

Further details in clear text

When ordering spares for VT 2000 amplifiers up to series 4X, a 4TE/3HE blind plate must be ordered separately.

**Material no. 00021004**

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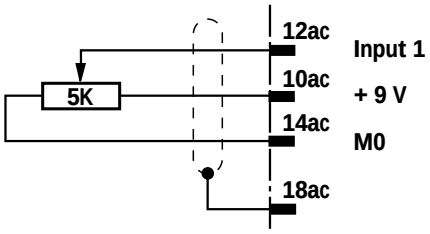
## Functional description

The command value voltage is fed to command value input 1 with the help of the regulated + 9 V voltage of the power supply unit [8] either directly or via an external command value potentiometer.

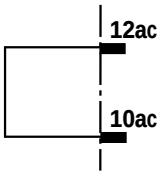
The following is valid for this input: + 9 V = + 100 % [1].

**External command value preselection**

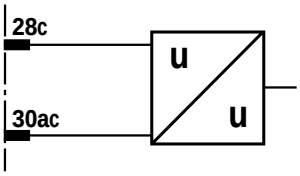



**Note:**
When an external command value potentiometer is used, the internal potentiometer "Gw" [3] must be set to maximum or to the required maximum pressure.

**Internal command value preselection**




**Differential input (input 2)**



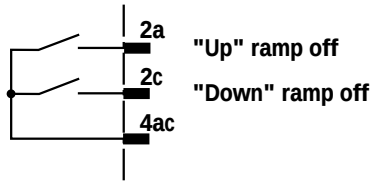

Command value input 2 is a differential input [1] (0 to + 10 V). If the command value is provided by external electronics with another reference potential (e.g. by a PLC), this input must be used. When cutting the command value voltage in or out, care must be taken that both signal lies are disconnected from or connected to this input.

Before being passed on, both command values are summated [2] and then fed to a potentiometer [3], which is accessible from the front panel of the card and acts as attenuator limiting the maximum command value.

The ramp generator [4] connected downstream creates a ramp-shaped output signal from a stepped input signal. The time constant of this signal can be adjusted separately for "up" and "down" ramps by means of two potentiometers. The given ramp time refers to a command value step-change of 100% and can be approx. 1 s or 5 s depending on the jumper setting. If a command value step-change of less than 100 % is fed to the input of the ramp generator or if attenuator [3] is effective, the ramp time shortens accordingly.

Due to the external contacts "ramp up/down off", the up and down ramp times can be set separately to their minimum value (approx. 30 ms).

**Ramp "Up/Down" OFF**




The output of ramp generator [4] is the internal current command value and is fed to measuring socket "w" on the front panel of the card. Here, a command value of 100 % corresponds to a voltage of + 6 V. In addition, the command value is fed via current regulator [5] to current output stage [6]. Current regulator [5] adds the value of the ramp generator to the value of potentiometer "Zw" (R130) for the biasing current. The current command value is modulated with clock-pulse generator signal [7]. The clocked actual current value acts in the solenoid of the valve like a constant current with superimposed dither signal. The actual current value through the solenoid can be measured at sockets "I". Here, a voltage of 800 mV corresponds to a current of 800 mA.

[1] Reference potential for command value 1 is M0 (measurement zero).

[ ] ... Reference to block circuit diagrams on page 3

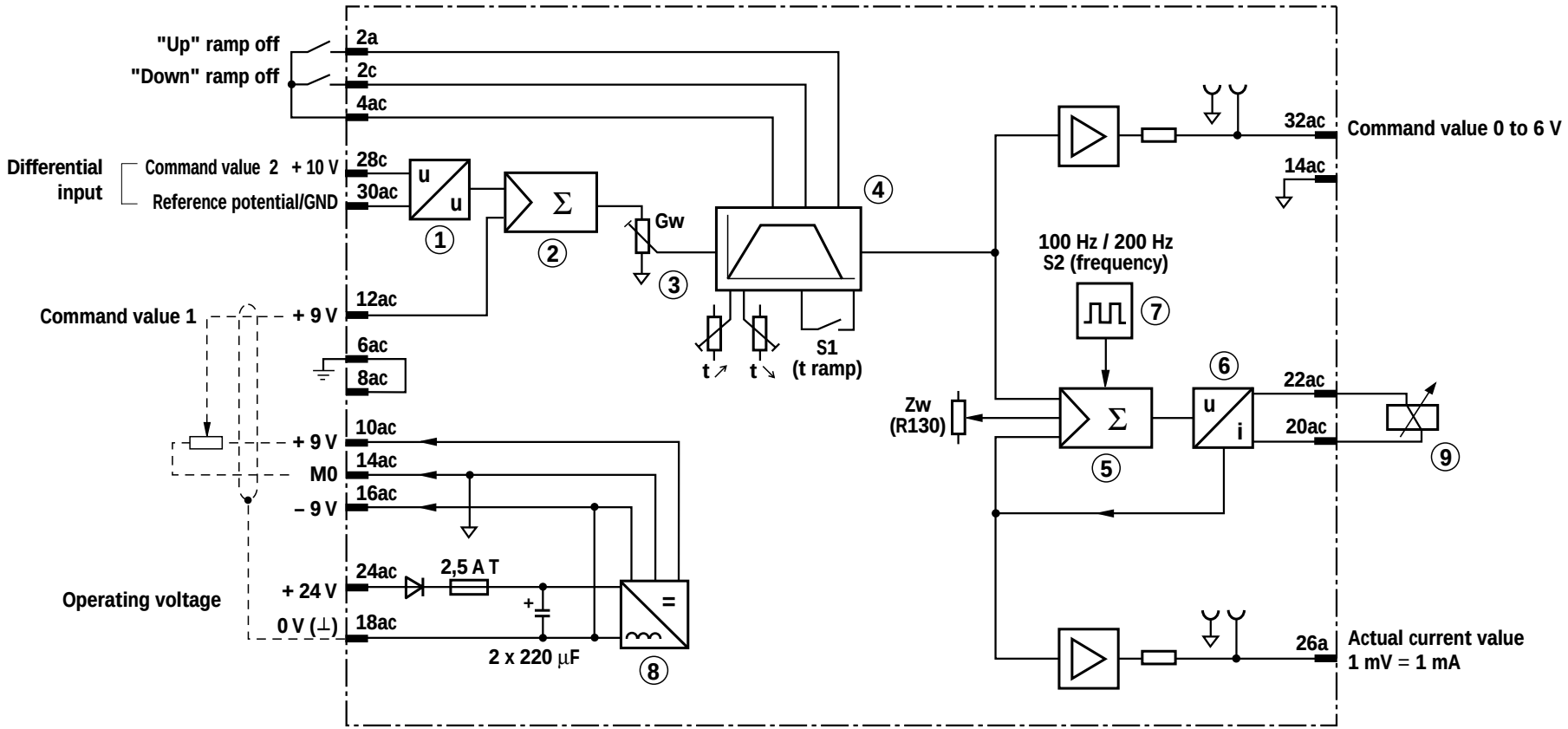
## Troubleshooting

If the VT 2000 amplifier card is not operable, follow the steps below for troubleshooting:

1. Operating voltage applied ?
   Measure contacts 24ac against 18ac
2. Fuse on the card defective ?
3. Internal operating voltage of ± 9 V available on the card ?
4. If the internal command value potentiometer is used, is the jumper from 10ac to 12ac plugged ?
5. Is the external potentiometer properly connected ?
   (For the connection, see top left)
6. Is the differential input correctly connected ?
   Check: Reference potential to 30ac
   0 to + 10 V to 28c
7. Is the solenoid correctly connected ?
   When the card is unplugged, a resistance of approx. 20 to 30 Ω must e measurable between contacts 22 ac and 20ac.
8. The internal command value potentiometer "Gw" must not be turned to the left-hand limit stop ("zero").

**Note:**
In the case of excessive temperatures (e.g. due to overloading), the output stage shuts down. This fault is not signalled separately!

**Measurement zero (M0) is raised by 9 V as against 0V operating voltage!**




**1** Differential input
**2** Summator
**3** Max. command value attenuator
**4** Ramp generator
**5** Current regulator with summator
**6** Current output stage
**7** Clock-pulse generator
**8** Power supply unit
**9** Proportional solenoid of the valve

**Gw** = Command value attenuation
**t** = Ramp time adjustment
**Zw (R130)** = Additional biasing current adjustment (0 to 300 mA)

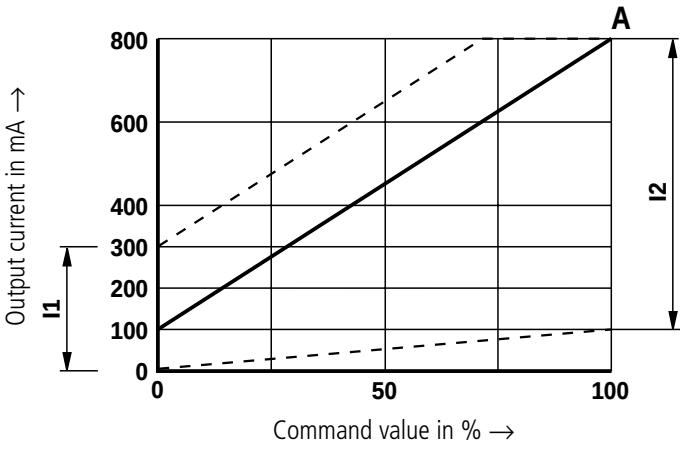
## **Technical data** (for applications outside these parameters, please consult us!)

| | | |
|---|---|---|
| Operating voltage | $U_0$ | 24 VDC + 40 % – 5 % |
| Operating range: | | |
| – Upper limit value | $u_B(t)_{max}$ | 35 V |
| – Lower limit value | $u_B(t)_{min}$ | 22 V |
| Power consumption | $P_S$ | < 25 VA |
| Current consumption | $I$ | < 1 A |
| Fuse | $I_F$ | 2.5 A T |
| Inputs: | | |
| – Command value 1 | $U_i$ | 0 to + 9 V (reference potential is M0) |
| – Command value 2 (differential input) | $U_i$ | 0 to + 10 V; $R_i$ = 100 kΩ |
| Ramp time (adjustment range) | $t$ | 30 ms to approx. 1 s or 5 s (depending on setting of S1) |
| Outputs: | | |
| – Output stage | | |
| • Solenoid current / resistance | $I_{max}$ | 800 mA [1] + 10 % – 5 %; $R_{(20)}$ = 19,5 Ω |
| • Biasing current | $I_V$ | 0 mA to 300 mA; adjustable using potentiometer "Zw (R130)" on the board |
| • Clock frequency | $f$ | 100 Hz or 200 Hz; ± 10 % each; depending on setting of jumper S2 ("frequency") |
| – Regulated voltage | $U$ | ± 9 V ± 1 %; ± 25 mA externally loadable |
| – Measuring sockets | | |
| • Command value "w" | $U$ | 0 to + 6 V (+ 6 V = 100 %); $R_i$ = 1 kΩ |
| • Actual current value "I" | $U$ | 0 to 800 mV = 0 to 800 mA ± 10 mA |
| 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 solder side | | 1 TE (5.08 mm) |
| – Width component side | | 3 TE |
| Permissible operating temperature range | $\vartheta$ | 0 to 50 °C |
| Storage temperature range | $\vartheta$ | – 25 to + 85 °C |
| Weight | $m$ | 0.1 kg |

[1] The maximum current $I_{max}$ can be set to the required value using the command value attenuator (potentiometer "Gw" on the front panel).

**Note:**
For details regarding **environment simulation tests** in the field of EMC (electromagnetic compatibility), climate and mechanical stress, see RE 30 111-U (declaration on environmental compatibility).

## Output characteristic curve

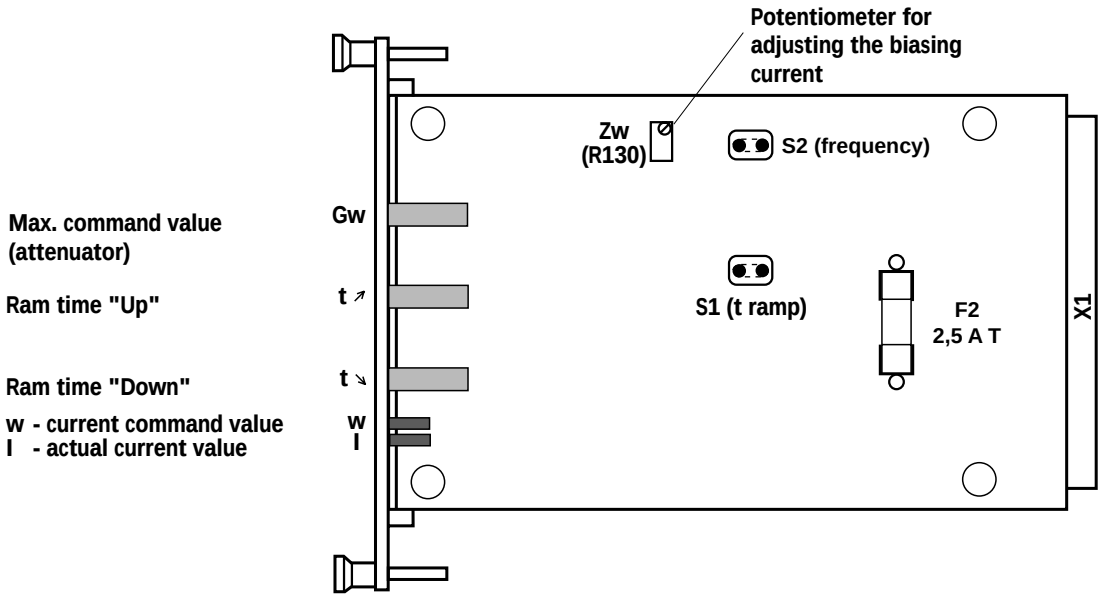



**I1** Biasing current adjustment range (0 to approx. 300 mA) using potentiometer "Zw (R130)" on the printed circuit board

**I2** Max. command value adjustment range using potentiometer "Gw" on the front panel

**A** Factory-set characteristic curve

## Indicator / adjustment elements




**Meaning of the jumpers on the card for the settings**
(nameplate on the printed circuit board)

| ramp time | | | frequency | | | Sx = bridge |
|---|---|---|---|---|---|---|
| ◯ • 5 s | S1 | | ◯ 100 Hz | S2 | | Sx = open |
| ◯ 1 s | S1 | | ◯ • 200 Hz | S2 | | • = delivery state |

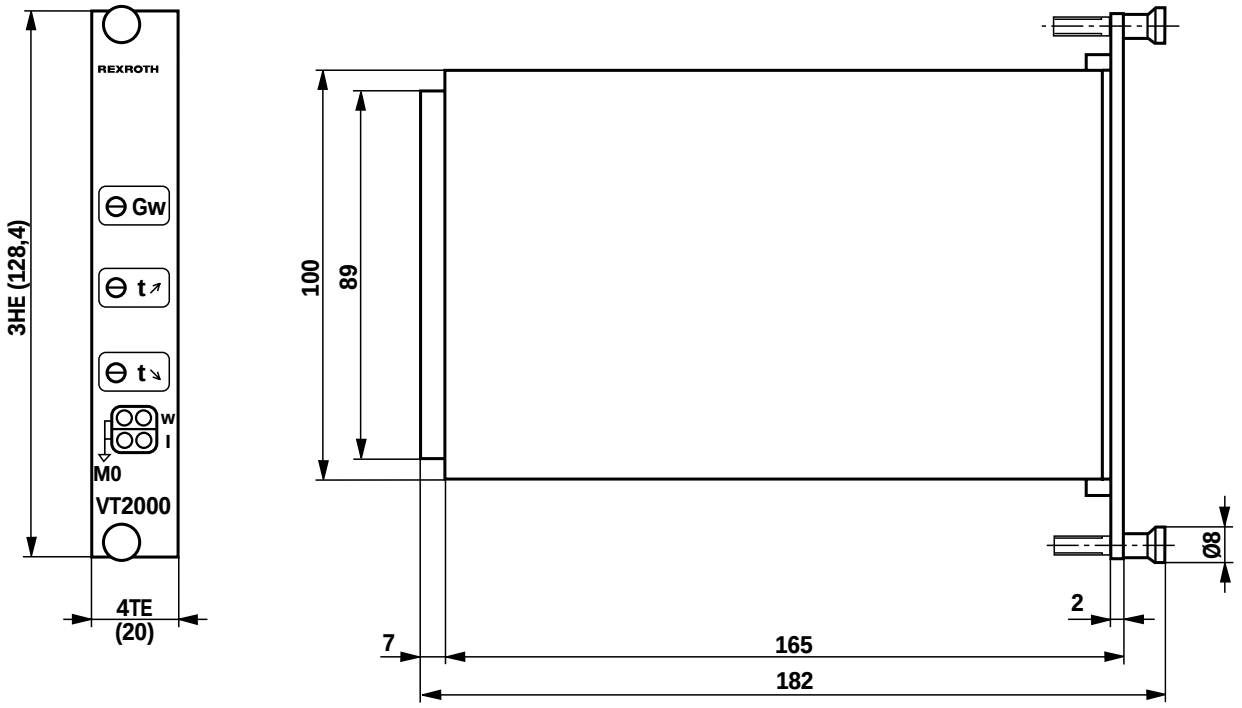
Bridge plugged

or

Bridge open

**Note:**
The circles ( ◯ ) can be used to mark settings made by the customer.
The factory settings are identified by "•".

## **Unit dimensions** (dimensions in mm)




## Engineering notes / maintenance instructions / supplementary information

- Before commissioning the amplifier, make sure that the jumpers on the printed circuit board are plugged according to the relevant application.
- When supplied, an amplifier of series 5X is interchangeable with amplifiers of series 4X with a ramp time of 5 s and a clock frequency of 200 Hz.
  If a series 5X amplifier is to be used as replacement for series 4X amplifiers, a 4TE wide blind plate is to be used that must be ordered separately (see ordering code on page 1).
- The amplifier card may only be plugged when disconnected from the power supply!
- Do not use plugs with free-wheeling diodes or LED lamps for the connection of solenoids!
- Measurements on the card may only be taken using instruments with $R_i > 100\ k\Omega$ !
- Measurement zero (M0) is raised by + 9 V as against 0V operating voltage and not electrically isolated, i.e. – 9 V regulated voltage = 0V operating voltage.
  The measurement zero (M0) must therefore not be connected to the 0V operating voltage!
- Use relays with gold-plated contacts for passing on command values (small voltages, small currents)!
- Always shield command value lines; connect the shield to ground on the card side and leave the other end open. connect the card to ground at connection 6 or 8. If no system ground is available, connect the 0V operating voltage.
  Recommendation: Also shield solenoid lines!
  For solenoid line lengths up to 50 m use cable type LiYCY 1.5 $mm^2$.
  For greater lengths, please consult us!
- The distance to aerial lines, radio sources and radar equipment must be at least 1 m!
- Never install solenoid and signal lines near power cables!
- Due to the charging current of the smoothing capacitor on the card, back-up fuses must be of the slow-blowing type!
- **Caution:** When using the differential input, both inputs must be switched on or off simultaneously!
  **Note:** Electrical signals (e.g. actual value) brought out via control electronics must not be used for switching safety-relevant machine functions!
  (See also the European standard "Safety requirements for fluid power systems and components – Hydraulics", prEN 982)

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