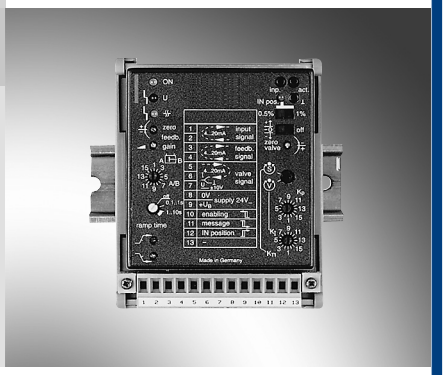
Analog positioning module

RE 30050/07.12 1/12
Replaces: 03.04

Type VT-MACAS-...

Component series 1X



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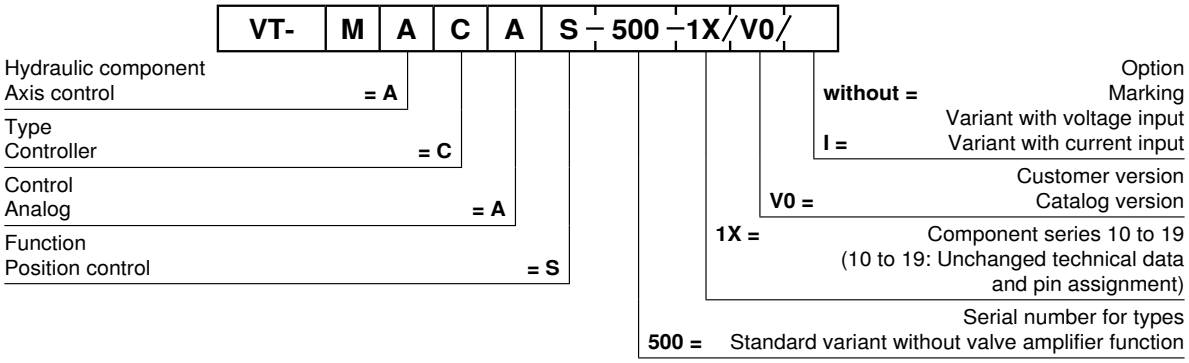
Features

- Suitable for controlling valves with installed electronics for position and velocity control
- Design: Module for snapping onto carrier rails
- Enable input
- Cable break detection for actual value cable
- Interfaces short-circuit-proof
- Test points on front plate
- Compensation step that can be switched off
- Position: PT1 control
- Velocity control possible in connection with tachometer (speed indicator): PI control
- Area adjustment cylinder

Notice:

The photo is an example configuration.
The delivered product differs from the figure.

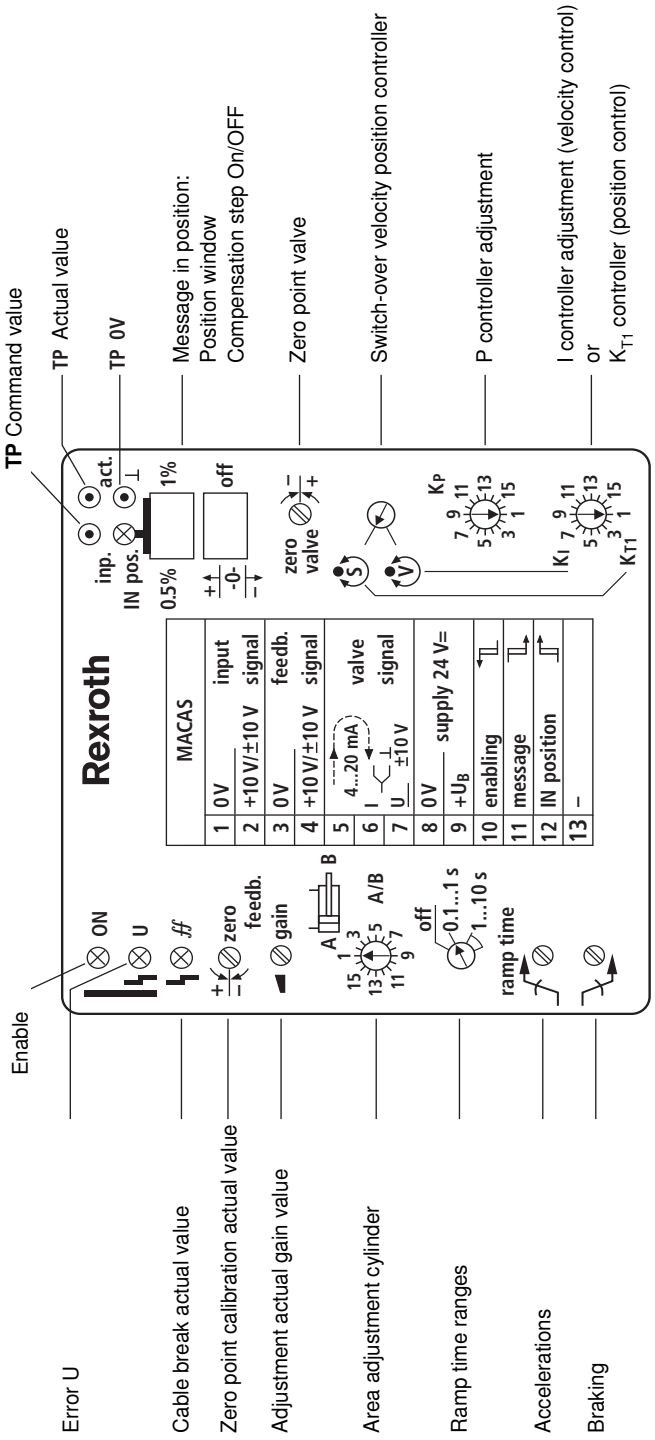
Ordering code



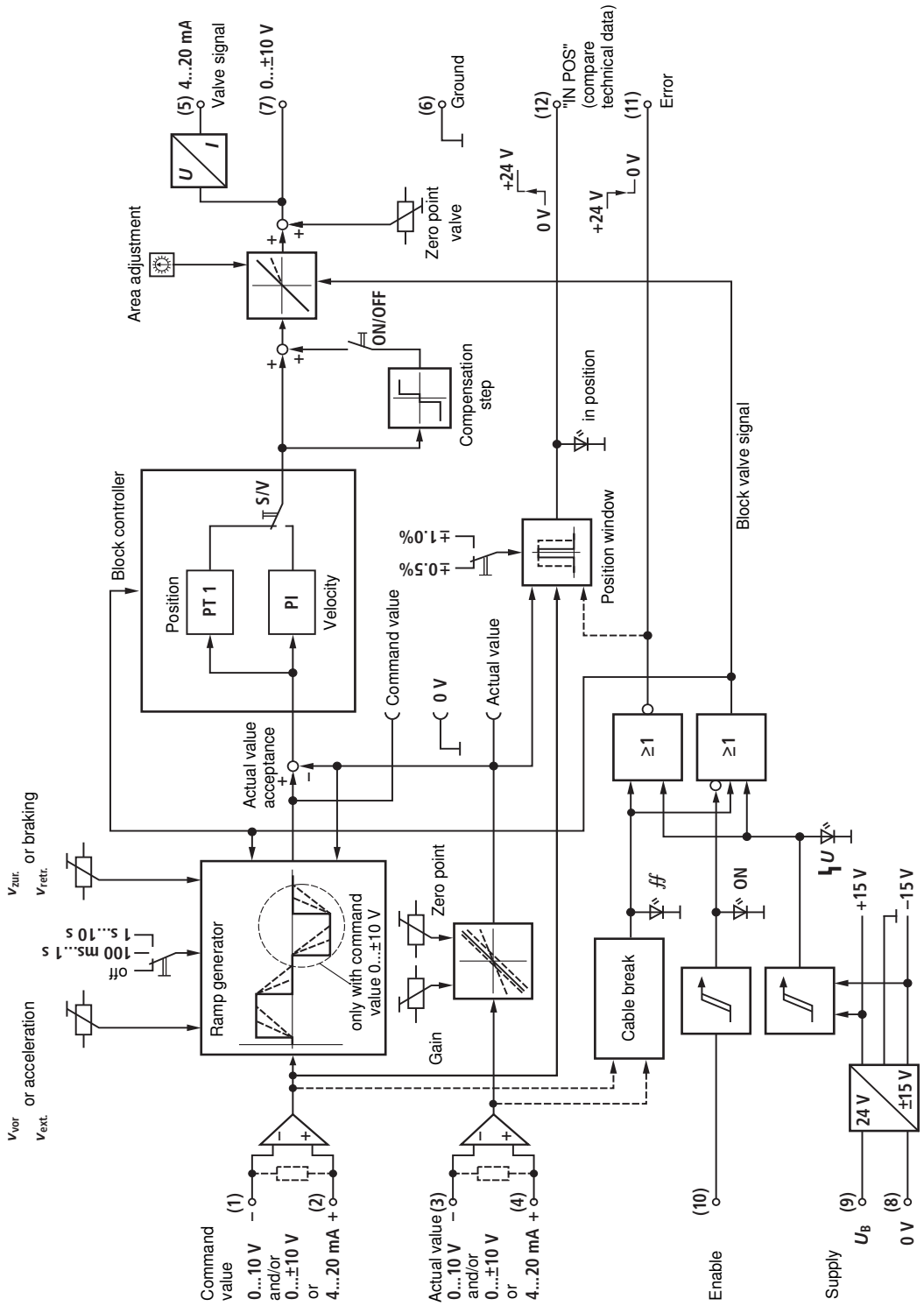
Preferred types

Amplifier type	Material number
VT-MACAS-500-10/V0	0811405139
VT-MACAS-500-10/V0/I	0811405140

Front plate



Block diagram with pin assignment



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

Supply voltage (8), (9)			Nominal 24 V = Battery voltage 21...40 V, Rectified alternating voltage U_{eff} = 21...28 V (one-phase, full-wave rectifier)
Current consumption, max.		mA	200
Signal input (1), (2)	VT-MACAS-500-10/V0		$U_{command}$: ±10 V, differential amplifier R_i = 100 kΩ
	VT-MACAS-500-10/V0/I		$I_{command}$: 4...20 mA R_{sh} = 200 Ω
Actual value signal (3), (4)	VT-MACAS-500-10/V0		U_{actual}: ±10 V, differential amplifier R_i = 100 kΩ
	VT-MACAS-500-10/V0/I		I_{actual}: 4...20 mA R_{sh} = 200 Ω
Valve signal (5), (6), (7))			U_V = ±10 V (max. 10 mA) or I_V = 4...20 mA (middle 12 mA)
Compensation step			Can be switched off; effective in a range of ± 4 %
Enable signal (10)		V=	8.5...40
Error message (11)			No error: 24 V_{nom} (U_B) max. 50 mA Error: < 2 V
IN POS message (12)			IN POS: 24 V_{nom} (U_B) max. 50 mA Not IN POS: < 2 V
Ramp ranges			I: 0.1 ... 1 s II: 1 ... 10 s
Area adjustment A_K:A_R			Min. 1:1; max. 1:4
Actual value adjustment			Zero point: –5...10 % Gain: 50...110 %
Controller type			Position: PT_1 Velocity: PI
Zero point valve		%	±5
Special features			– Switchable from position to velocity control – Switchable position window – Test points on front plate – Interfaces short-circuit-proof
Format/design		mm	(86 x 110 x 95.5) / module
Mounting			Top hat rail TH35-7,5 or G rail G32 according to EN 60715
Connection			Connectors + terminals
Ambient temperature		°C	0...+70
Storage temperature range		°C	–20...+70
Weight		*m*	0.38 kg

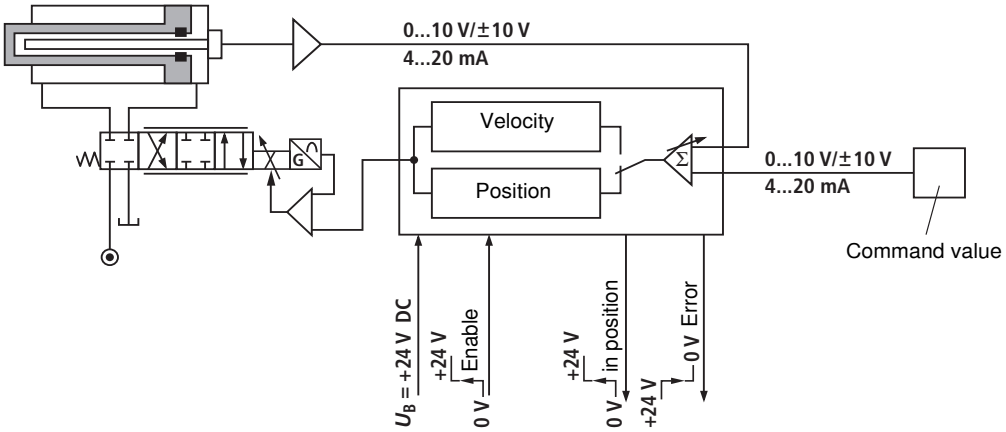
Function

Applications

By means of this controller module, simple position or velocity controls can be represented in connection with Bosch Rexroth servo cylinders with analog position measurement systems (potentiometer). As the entire signal processing is analog and the module is only equipped with the necessary features for the set-up of controls, the costs for the drive can be kept low. There is moreover the particularity that the module can be internally switched to velocity control (front plate) and one version is in each case offered for voltage interface and current interface, referring to the command and actual values.

Position control

Command and actual value of the position are compared and the deviation is forwarded to the valve amplifier. In case of an abrupt change of the input signal, the system will react with maximum dynamics. The times for accelerating or braking a load are either limited by the available power or the system gain. With a ramp function as input value, the load is moved with a constant velocity.

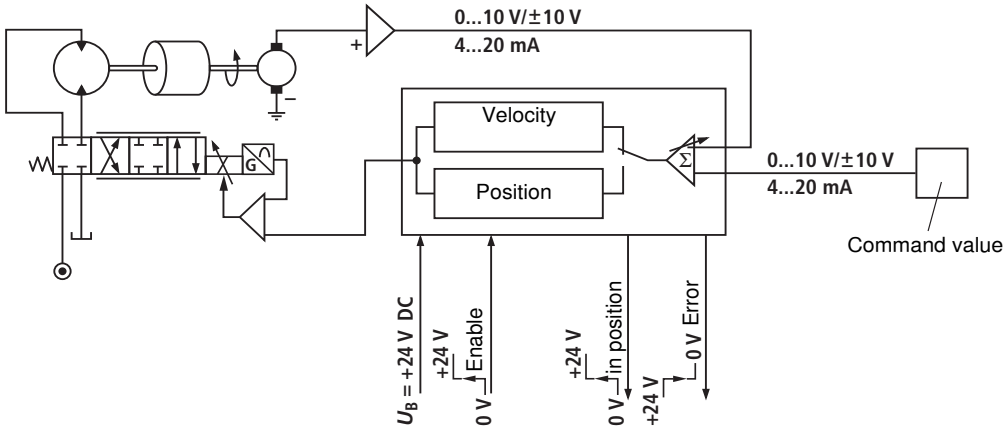


Velocity control*

Command and actual value of the velocity are compared and the deviation is forwarded to the valve amplifier. The signal is amplified by integration so that even smallest errors are compensated.

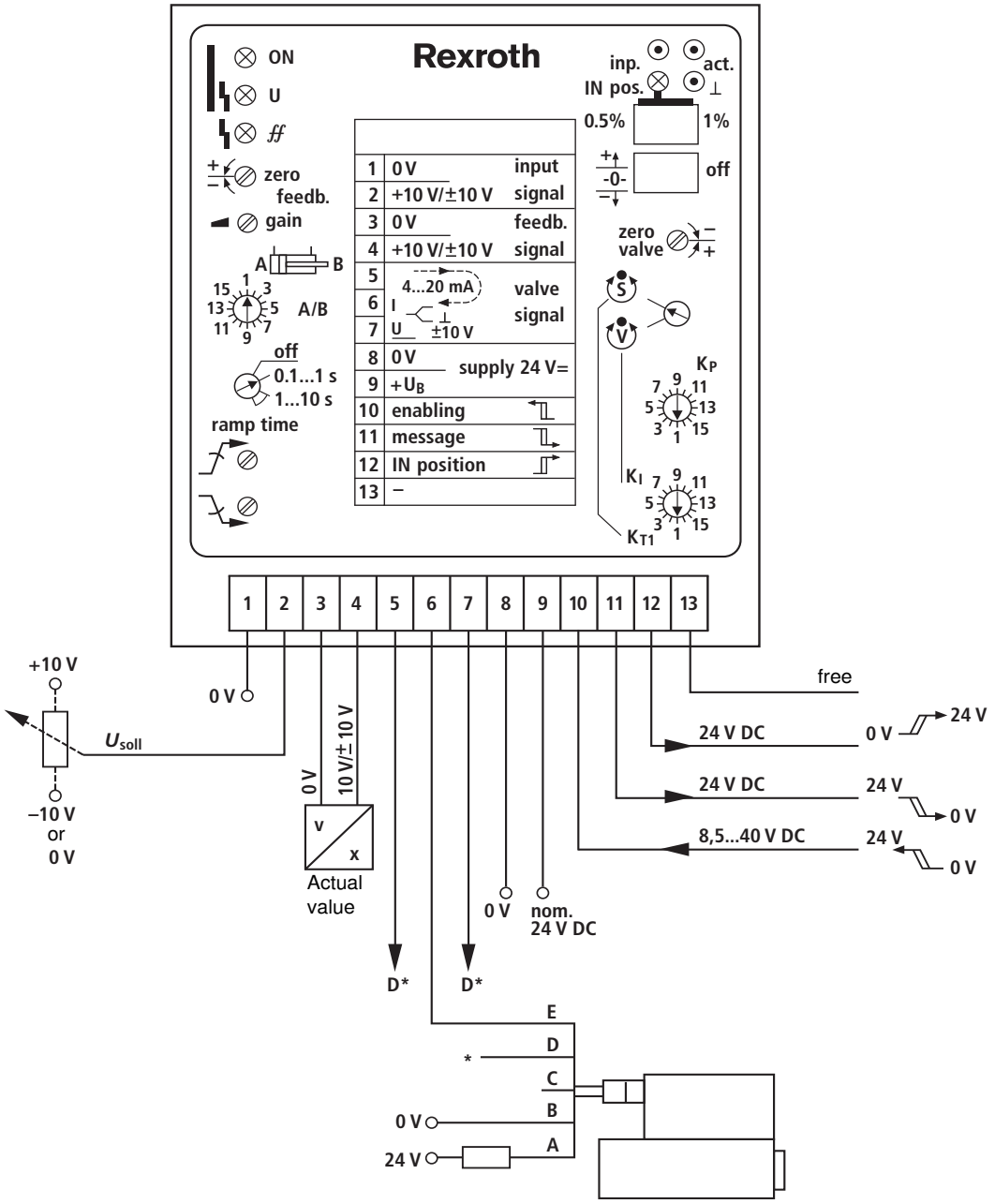
With a ramp function as input signal, there is a gradual acceleration and/or deceleration with a constant value.

* Only possible with tachometer (speed indicator).



Electrical connection

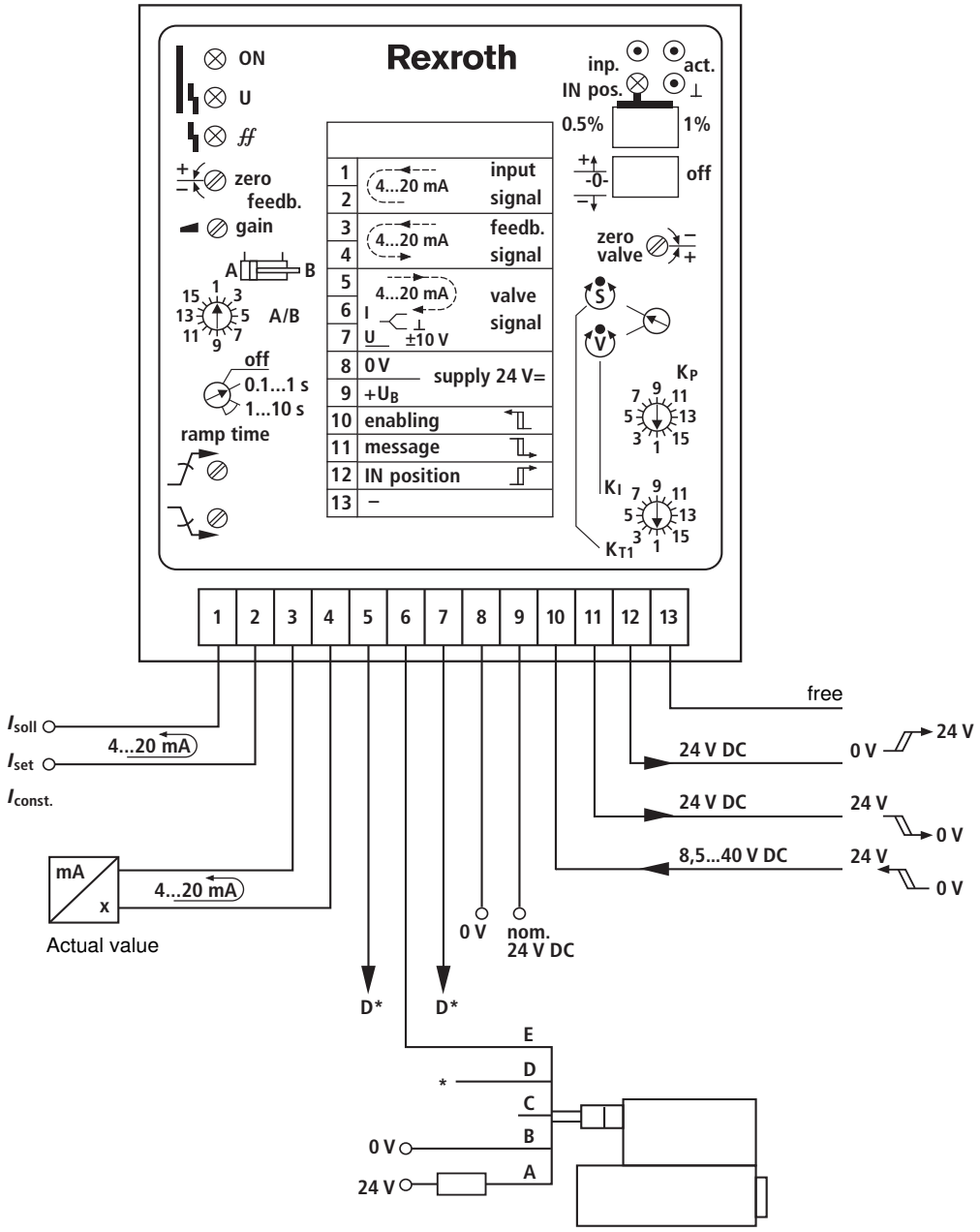
Wiring diagram
AVPC-V



D* valve signal for valve with voltage or current interface

Electrical connection

Wiring diagram
AVPC-mA



D* valve signal for valve with voltage or current interface

Adjustment and commissioning

The entire adjustment of the module is carried out at the front plate with operating pressure.

Checking the wiring (page 6)

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Mode settings

- Velocity controller/position controller
- Compensation step ON / OFF
- Position window 0.5 % / 1 %
- Ramp ON / OFF

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Controller default setting

- $K_P = 1$ with position control
- $K_I = 2$ / $K_{TI} = 1$ with velocity control ($K_I = 1$ forbidden)

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Area ratio default setting

- Hex switch "A / B"; according to the area ratio of the cylinder

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Supply voltage ON Enable ON (cl. 10)

- LED "ON" is illuminated
- LED "ϟU" and LED "ϟ∫∫" are not illuminated
  → otherwise, see error reactions, page 10

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Adjustment of the actual value transducer

- Specification of the command value minimum
  → by means of "zero feedb." potentiometer actual value adjustment to 0 V
  (TP "act." against TP "⊥")
- Specification of the command value maximum (e.g. + 10 V; 20 mA)
  → by means of "gain" potentiometer actual value adjustment to 10 V
  (TP "act." against TP "⊥")

Notice
At the 13-pin connection terminal of the module, no measuring devices must be connected in order to perform voltage measurements of the actual or command value.

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Adjustment of the valve signal

- Enable OFF
- Specification of the command value for valve zero position
  → By means of "zero valve" potentiometer adjustment of the valve signal
  (e.g. cylinder standstill; 0 V at the valve)

↓

Controller adjustment

- Gradual increase in the K_P share, then
- Gradual increase in the K_{TI} /K_I share
- Adjustment aid, page 10

↓

Ramp adjustment

- If ramp function required:
  Ramp ON → time range pre-selection
- Specification of the command value step (e.g. 20 %...60 %)
  Setting of the velocity ramps (position) and/or acceleration ramps (velocity) by means of the potentiometer

↓

Fine adjustment area adjustment

- Comparison of the chronological sequence s(t) and/or v(t) of both directions of movement by means of an oscilloscope
  → by means of hexcode switch "A / B"
  compensation of differences

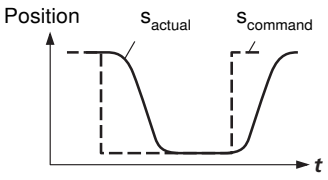
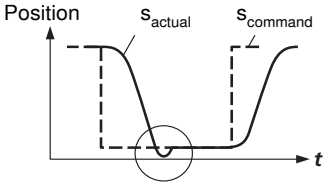
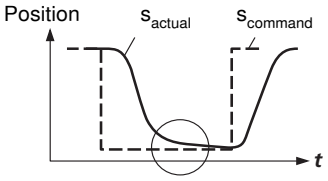
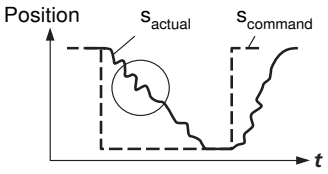
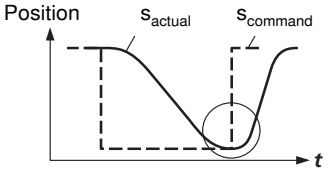
Error reactions

ϟ U: Tripping if the value falls below the minimum internal supply voltage
⇒ Valve signal 0 V and/or 12 mA;
⇒ Message LED "ϟ U" and (11)

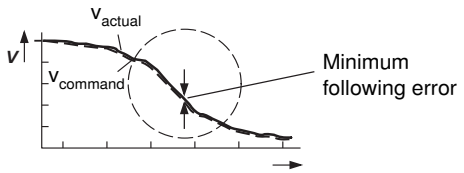
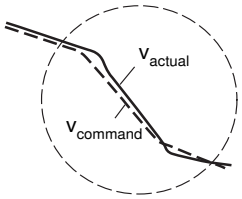
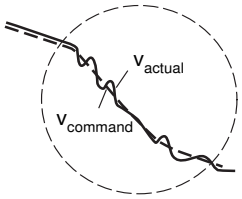
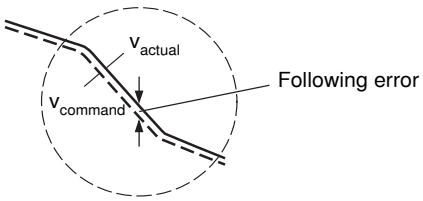
Possible causes: External supply voltage too low (< 16 V) or internal error (→ repair).

ϟ ∫∫: **Tripping** if the actual value or command value lines break
⇒ Valve signal 0 V and/or 12 mA;
⇒ Message LED "∫∫" and (9)

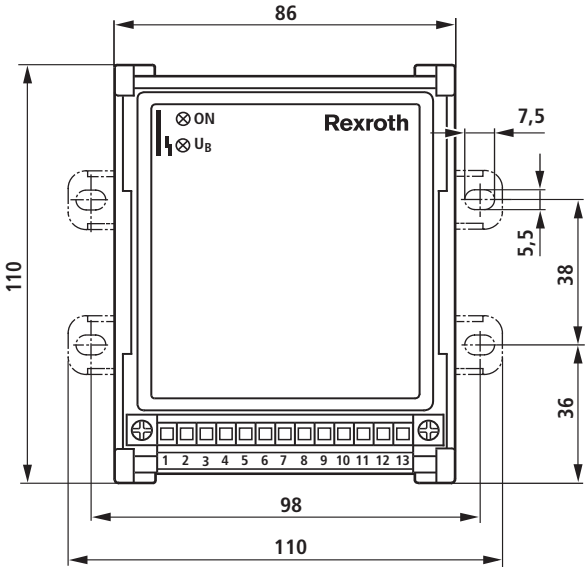
The error is stored.
Deletion of the error by switching the enable signal or the supply voltage off and on again.

	Ideal development (without command value ramps)
	"Overshooting", P gain too high, → rotate switch K_P against 1
	"Creeping into the position", P gain too low, → rotate switch K_P against 16
	"Vibrations", time constant too small, → rotate switch K_{T1} against 16
	"Area ratio wrong"; set symmetric motion sequence by means of switch A/B

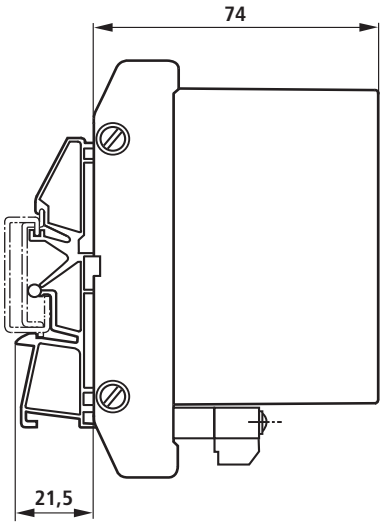
Velocity controller adjustment

	Ideal development (without command value ramps)
	P gain too small, → rotate switch K_P against 16
	P gain too large, → rotate switch K_P against 1
	P gain correct, however following error too large, minimization of the following error by means of the I controller → rotate switch K_I until the min. following error is reached

Device dimensions (dimensions in mm)



Wall mounting (86 x 110 x 95.5) mm



Carrier rail assembly (snap-in)

Project planning / maintenance instructions / additional information

- The distance to aerial lines, radios and radar systems must be sufficient (> 1 m).
- Do not lay solenoid and signal lines near power cables.
- For signal lines and solenoid conductors, we recommend using shielded cables.
  The cable shield must be connected to the control cabinet extensively and as short as possible.
- The valve solenoid must not be connected to free-wheeling diodes or other protection circuits.