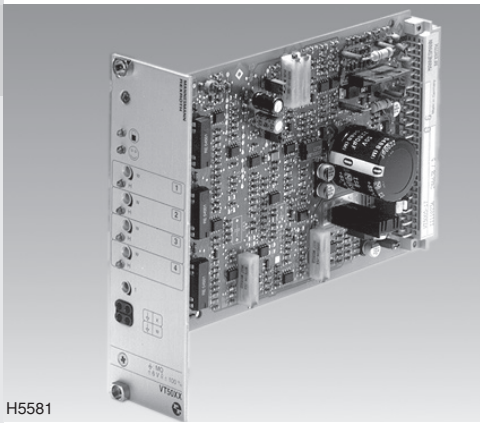
Rexroth
Bosch Group

Electric amplifier for flow control with proportional valves

RE 29955/07.14 1/8
Replaces: 09.11

Type VT 5035

Component series 1X


H5581

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Features

- Suitable for the flow control of the axial piston variable displacement pumps A4VSO and A4VSG with EO1 or EO2 control or A4CSG with EO2 control (see data sheets 92050, 92076 and 92100).
- Differential input
- Enable input with LED display
- "Ready for operation" message by LED display
- Ramp time adjustable by means of the potentiometer
- Four command values adjustable by means of the potentiometer, call-ups indicated by LEDs
- Controller for the pump swivel angle
- Two synchronized power output stages
- Oscillator and demodulator for inductive position measurement with cable break detection
- Reverse polarity protection for the voltage supply

Ordering code

VT 5035 –1X / *

Amplifier for the flow control of the axial piston variable displacement pumps A4VSO and A4VSG with EO1 or EO2 control or A4CSG with EO2 control

1X = Component series 10 to 19
(10 to 19: Unchanged technical data and pinout

Further details in the plain text

Accessories (not included in the scope of delivery)

Card holder:

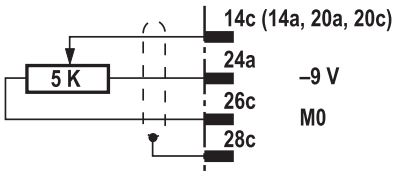
Type VT 3002-1-2X/32D, see data sheet 29928

Functional description

The printed circuit board is used for the electric flow control of an AV4VSO and AV4SG with EO1 and EO2 control or an AVCSG with EO2 control.

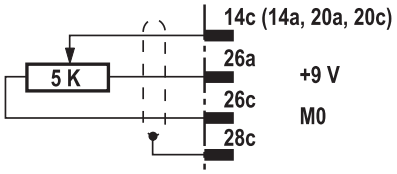
The amplifier controls the proportional valve of the swivel angle actuating cylinder and controls its position analogously to the specified command value. The swivel angle position is recorded as actual value.

Using the command value inputs 1 to 4, command values can be retrieved [1] by actuating the related relays (K1 to K4). The command value voltage is either specified directly, by the regulated voltages ±9 V of the internal power supply [10] or via an external command value potentiometer. For these inputs, ±9 V ≙ 100 % [1)]. If these four command value inputs are directly connected to the regulated voltages ±9 V, four different command values can be set at the "w1" to "w4" potentiometers. When external command value potentiometers are used at these inputs, the internal potentiometers function as attenuators or limiters unless they have been set to the maximum.



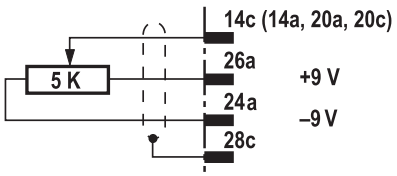
Inputs

Control solenoid "b"



Inputs

Control solenoid "a"



Inputs

Control solenoids "a" + "b"

External command value potentiometers

The LEDs "H1" to "H4" indicate which command value is just being called. If more than one command value is called at a time, the input with the highest number will take priority.

Example: If command value 1 and command value 3 are activated simultaneously, command value 3 will take effect.

Another output of the card supplies a supply voltage for the command value call-ups which can be switched from +9 V to –9 V by means of the relay K6 [1)].

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

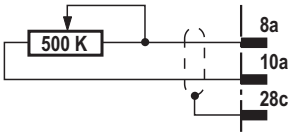
The command value input 5 is a differential input (0 to ±10 V). If the command value is specified by external electronics with a different reference potential, this input has to be used. When disconnecting or connecting the command value voltage, it has to be ensured that both signal lines are in each case separated from or connected with the input.

Before they are forwarded, all command values will be added up according to their absolute value and their sign [3].

The down-stream ramp generator [4] generates a ramp-shaped output signal from a given step-shaped input signal. The time constant of the output signal can be adjusted using the "t" potentiometer. The specified ramp time refers to a command value step of 100 % and may - depending on the jumper setting (J5, J6), be approx. 1 s or 5 s. If a command value step of less than 100 % is switched to the ramp generator input, the ramp time will be correspondingly shorter.

Functional description

External time potentiometer and ramp "Off"



Ramp "controllable"

Ramp "On/Off"

Notice:

When using an external time potentiometer, the internal potentiometer for the ramp time must be set to maximum. The maximum ramp time is reduced as the resistance value of the external potentiometer is switched in parallel to that of the internal one (ca. 500 kΩ).

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

The output signal of the ramp generator [4] is the swivel angle command value and is supplied to the PID controller [5], the "w" measurement socket on the front panel of the card and port 4a (command value after ramp/external limiting potential). A voltage of –6 V at the "w" command value measurement socket corresponds to a command value of +100 %.

The PID controller has been especially optimized for the specified pump types. The power output stages are controlled depending on the difference between swivel angle command value and actual swivel angle value. A positive command value signal at the amplifier input actuates the output stage for solenoid "a", a negative command value signal the output stage for solenoid "b".

The inductive position transducer [11] detects the actual swivel angle value. The AC voltage signal of the position transducer is converted in the oscillator/demodulator [9] and returned to the PID controller as actual swivel angle value.

The zero point of the position transducer (actual value zero point) can be adjusted by means of the "Zx" potentiometer (on the printed circuit board). The amplification of the actual swivel angle value has been calibrated in the factory and must not be changed (±6V ≙ max. swivel angle position).

With a signal of > 8.5 V at the enable input, the output stages are enabled (indication by the yellow "H11" LED on the front plate). By setting jumper J7, the output stages are permanently enabled irrespective of the enable input status. The enable input will then be ineffective.

In case of failure-free operation, the "H12" LED (ready for operation) is illuminated; in detail if:

- The enable signal is applied,
- The internal ±9 V voltage supply functions (amplitude and symmetry),
- No short-circuit of the solenoid lines and
- No cable break

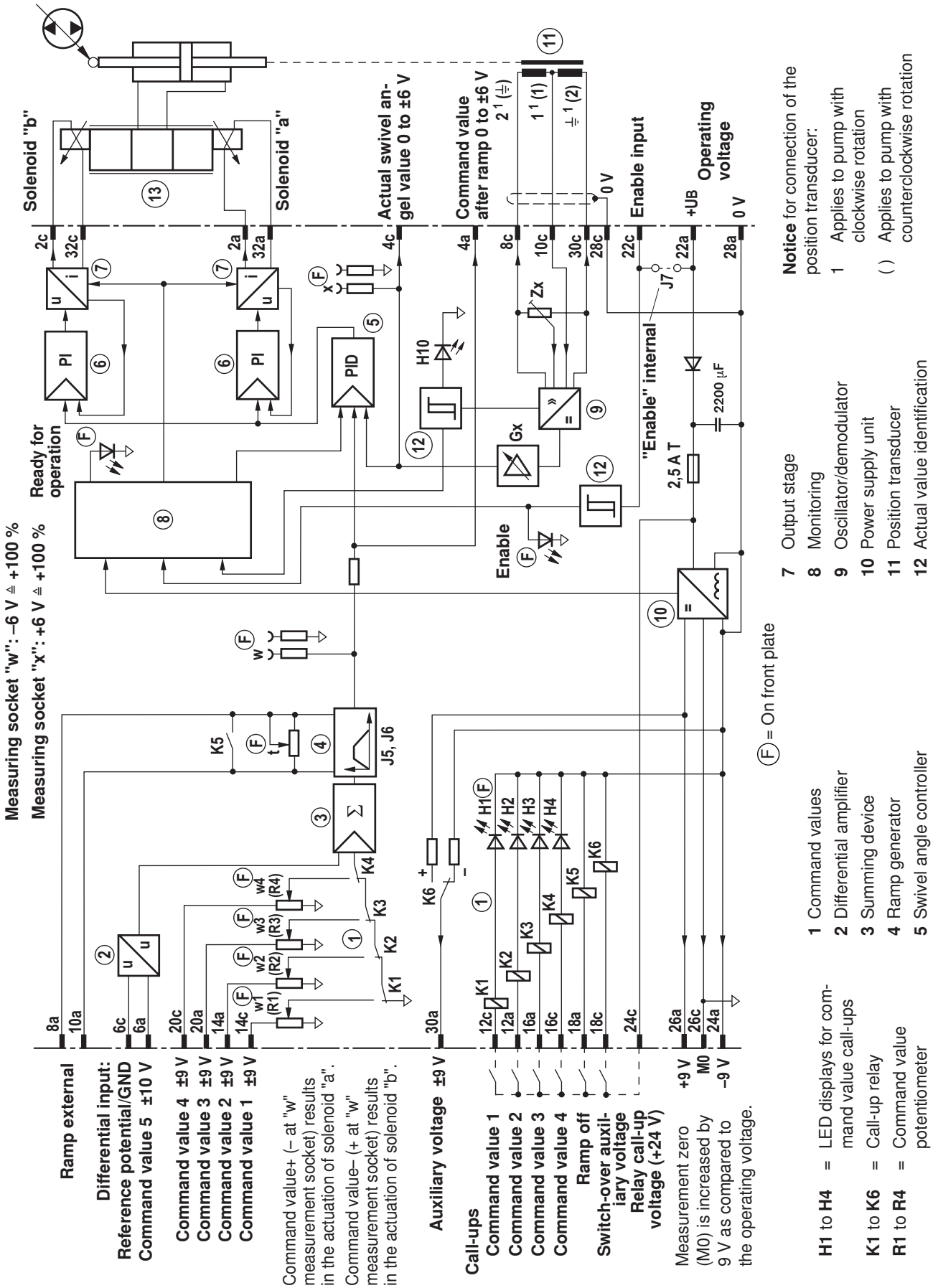
In the position transducer lines exists.

In case of failure, the two output stages are immediately de-energized, the controller is switched off and the "Ready for operation" message is reset. After remedy of the failure, the card is immediately functional again; the "H12" LED lights up again.

[1] The reference potential for the command values 1 to 4 is M0 (measurement zero).

[ ] = Assignment to the block diagram

Block diagram / **pinout** (from series 17)



H1 to **H4** = LED displays for command value call-ups
K1 to **K6** = Call-up relay
R1 to **R4** = Command value potentiometer
t = Ramp time

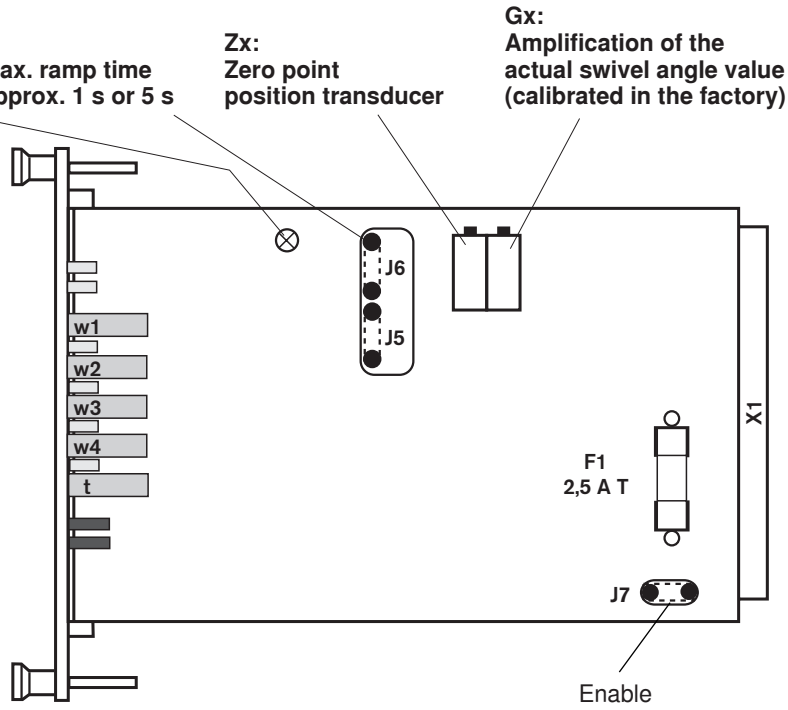
1 Command values
2 Differential amplifier
3 Summing device
4 Ramp generator
5 Swivel angle controller
6 Flow controller
7 Output stage
8 Monitoring
9 Oscillator/demodulator
10 Power supply unit
11 Position transducer
12 Actual value identification
13 Proportional valve

Notice for connection of the position transducer:
1 Applies to pump with clockwise rotation
( ) Applies to pump with counterclockwise rotation

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

Operating voltage	U_B	24 VDC + 40 % – 5 %
Operating range:		
– Upper limit value	$u_B(t)_{max}$	35 V including superimposed residual ripple
– Lower limit value	$u_B(t)_{min}$	22 V
Power consumption	P_S	< 50 VA
Current consumption	I	< 2 A
Fuse	I_S	2.5 A slow-blow
Inputs:		
– Command values 1 to 4	U_e	±9 V (reference potential is M0)
– Command value 5	U_e	0 to ±10 V
– Enable		
• Active	U_F	> 8.5 V
• Not active	U_F	< 6.5 V
Relay data:		
– Nominal voltage	U	Operating voltage U_B
– Response voltage	U	16.8 V
– Step-back voltage	U	2.4 V
– Coil resistance	R	2150 Ω
Ramp time (setting range)	t	30 ms to approx. 1 s or 5 s (in each case ±20 %)
Outputs:		
– Output stage		
• Solenoid current/resistance	I_{max}	1.8 A ± 20 %; $R_{(20)}$ = 5.4 Ω
• Clock frequency	f	Self-clocking up to ca. 1.5 kHz
– Driver for the inductive position transducer		
• Oscillator frequency	f	2.5 kHz ± 10 %
• Max. load capacity	I	30 mA
• Voltage amplitude (U_{ss})	U_a	5 V per output
– Regulated voltage	U	±9 V ± 1 %; 25 mA externally loadable
– Measuring sockets		
• Swivel angle command value "w"	U_w	0 to ±6 V (–6 V ≙ +100 %; +6 V ≙ –100 %); R_i = 100 Ω
• Actual swivel angle value "x"	U_x	0 to ±6 V (+6 V ≙ +100 %; –6 V ≙ –100 %); R_i = 100 Ω
Type of connection		32-pole male multipoint connector, DIN 41612, design D
Card dimensions		European 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
Admissible operating temperature range	ϑ	0 to 50 °C
Storage temperature range	ϑ	–25 to +85 °C
Weight	m	0.15 kg

Display / adjustment elements

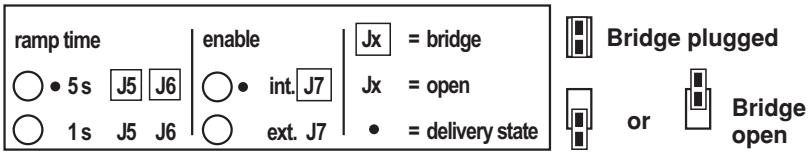


LED display "Enable" (yellow)
LED display "Ready for operation" (green)

w1/H1	Command value 1 with LED display
w2/H2	Command value 2 with LED display
w3/H3	Command value 3 with LED display
w4/H4	Command value 4 with LED display
t	Ramp time (in the condition as supplied set to the minimum value)
x	Measuring sockets for actual swivel angle value
w	Measuring sockets for swivel angle command value

Meaning of the jumpers on the card for the settings

(Plate on the back side of the front plate)



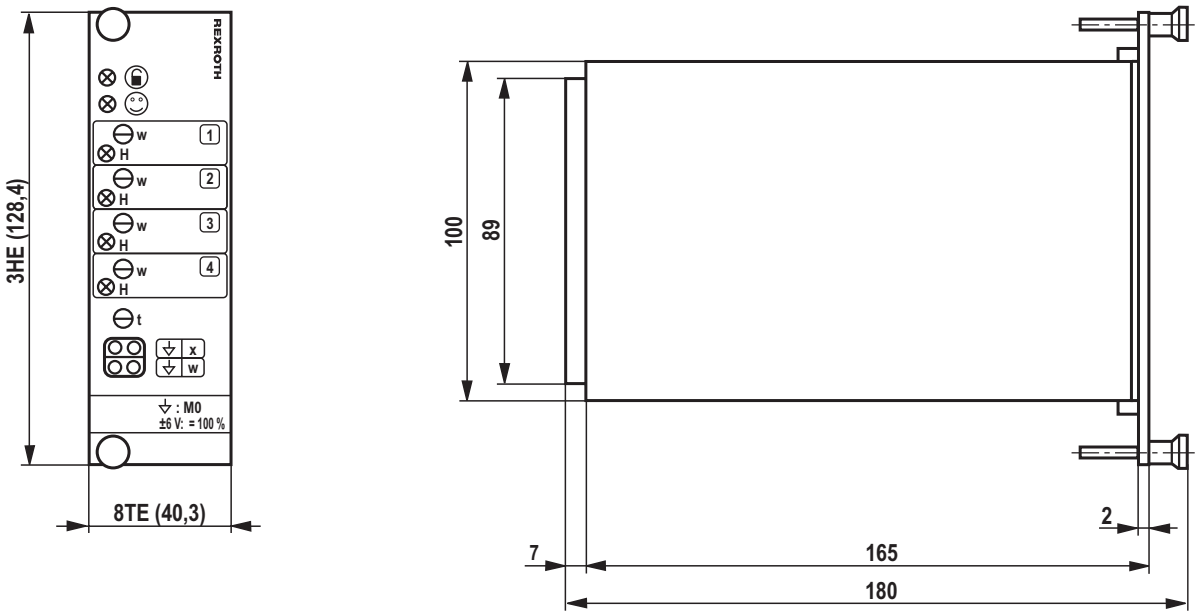
Ramp time Enable

Notice:

The circles (◯) serve the marking of the settings made by the customer.

The condition as supplied is marked with "•".

Unit dimensions (dimensions in mm)



Project planning / maintenance instructions / additional information

- The amplifier card may only be unplugged and plugged when de-energized.
- No plug-in connectors with free-wheeling diodes or LED indicators must be used for solenoid connection.
- Only carry out measurements at the card using instruments R_i > 100 kΩ.
- Measurement zero (M0) is increased by +9 V as compared to the operating voltage and not potentially isolated, i.e. –9 V regulated voltage ≙ 0 V operating voltage. Thus, do not connect measurement zero (M0) to 0 V operating voltage.
- For switching command values, relays with gold-plated contacts have to be used (small voltages, low currents).
- For switching the card relays, only switching contacts with a load capacity of approx. 40 V, 50 mA may be used.
  In case of external control, the residual ripple of the control voltage may maximally be 10 %.
- Always shield command value lines and lines of the inductive position transducer separately; connect shielding to 0 V operating voltage on the card-side, other side open (risk of ground loops).
  Recommendation: Also shield the solenoid conductors.
  For solenoid lines up to 50 m in length, use cables with a wire cross-section of 1.5 mm^2.
  With greater lengths, please contact us.
- The distance to aerial lines, radios, and radar systems has to be 1 m at least.
- Do not lay solenoid and signal lines near power cables.
- The charging current of the smoothing capacitor on the card requires the pre-fuses to be of a slow-blowing nature.
- Do not connect the ground sign at the inductive position transducer with the ground.
  (Prerequisite for the compatibility with previous component series.)

Notices:

- If the differential input is used, both inputs must always be connected or disconnected at the same time.
- Electric signals taken out via control electronics (e.g. actual value) must not be used for switching safety-relevant machine functions. (also see the European standard "Safety requirements on fluid-powered systems and components - Hydraulics", EN ISO 13849)