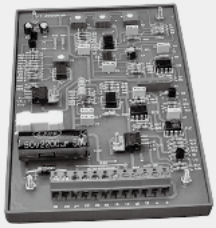
6.15

Proportional amplifier

Type VT 2000

For controlling proportional pressure valve.
EURO circuit board structure.



Contents

Features

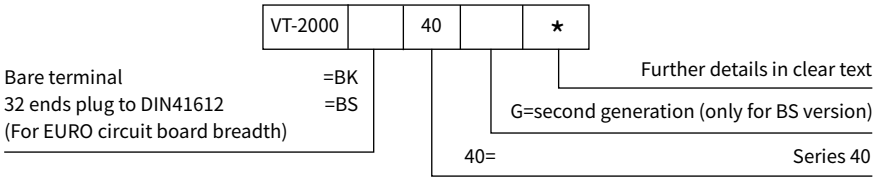
VT-2000 is a proportional power amplifier and consists of:

- Voltage regulator
- Two input circuits of differential and potentiometer
- Controllable constant current generator
- Ramp generator
- Oscillator 200Hz
- Ramp adjustable for time of "up" and "down"

Technical data

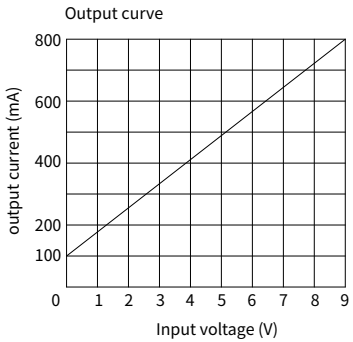
Weight	m	Approx. 0.15kg
Voltage	U	DC 24V (-5%~+10%)
Power	P	30VA
Fuse wire	Is	1.2AT
Control voltage	U	Input differential 0~+10V
		Manual potentiometer input 0~+9V
Min. load resistance for control vloltage	R	500Ω
Max. output current	I_{max}	800mA
Max. load resistance	R	30Ω
Pilot current	I	100mA
Vibration current frequency	f	200Hz
Ambient temperature	t	0~40 °C
Temperature drift		0.5‰ (max. current value)/ °C

Ordering code



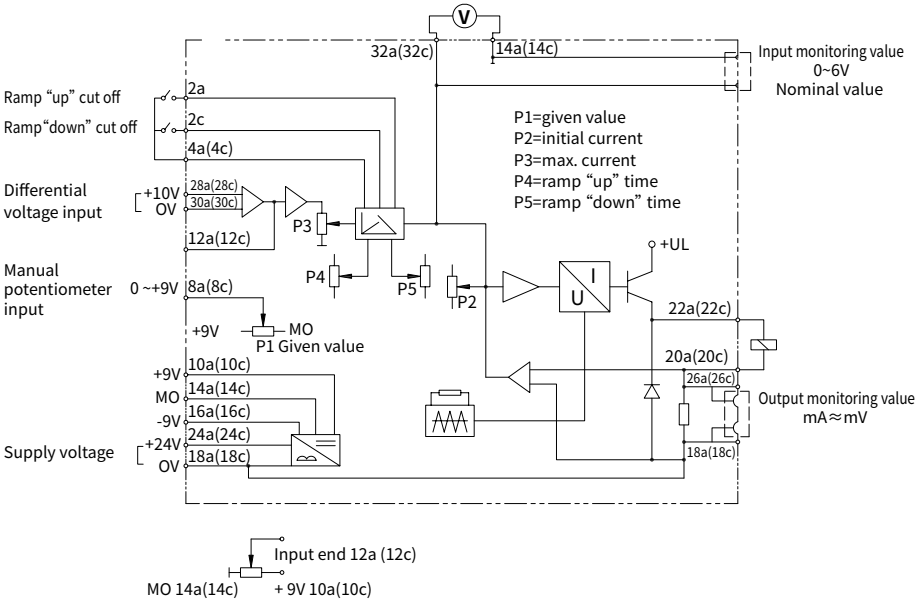
06

Characteristic curve



Wiring diagram of amplifier

Type VT-2000BS40G



Application specification

Type VT-2000BS40G

Principle chart of Hydro-electric proportional amplifier type VT-2000BS40G see Wiring Chart

1. 20a (20c), 22a (22c) in the right of the dotted line, connects with proportional solenoid coil, And 22a (22c) is the high electric potential and 20a(20c) is the low electric potential.

2. 24a (24c), 18a (18c, 16a, 16c) in the left of the dotted line, connects with DC 24V power, among them, 24a (24c) connects the positive pole, 18a (18c, 16a, 16c) connects the negative pole. The controller's power shall be separate with the differential input power, namely 30a (30c) can't connect the 14a (14c) and 18a (18c, 16a, 16c), otherwise, it could be damage the controller.

3. Two controlling methods:

(1). manual control:

a: External potentiometer (provided by user themselves, suggesting to use one with resistance greater than 5K and smaller than 10K but smaller than 2K is not permitted; Power is not limited), one end connects 10a (10c) (+9), another end connects 14a (14c) (M0 is the measurement zero); and the slide end connects 12a (12c). Input the voltage value 0~ +9 V into 12a (12c) end by adjusting the potentiometer, and 100~800mA square wave pulse current will proportionally appears from the proportional solenoid.

b: The controller has a built-in input potentiometer P1, the amplifier panel <given value> potentiometer, which can replace of external potentiometer. When using P1, put through 8a (8c)and 12a (12c), then it can get 100~800mA current from the solenoid to control the solenoid outputting force.

(2). Automatic control:

Differential voltage signal from the programmable controller (PLC), function generator and so on inputs from 28a (28c), 30a (30c), and 28a (28c) connects high frequency, while 30a (30c) low frequency. Correspondingly appearing 100~800mA in the solenoid when the differential changes at range of 0~10V. Notes: Don't make the 30a (30c) connected with the 14a (14c)(M0) or negative end 18a (18c), 16a (16c) of the DC24V power, namely the PLC and the proportional controller can't use one power or have mutual grounding.

When the requiring current is less than 800mA, it can limit the max. current by adjusting the P3 in the amplifier panel, e.g. input +9V to end 12, it can limit the output current 800mA into 600mA or other values by adjusting the potentiometer P3.

Two potentiometer P4 and P5 in the amplifier panel is respectively used for adjusting the time of ramp "up" and "down", and the adjustable time range is 0.2~5 seconds.

There is two pairs test holes, the 0~+6V test hole for monitoring the input voltage signal, mV ≈ mA hole for monitoring the output current and the mV measured by the voltage meter approx. equal the mA value in the solenoid.

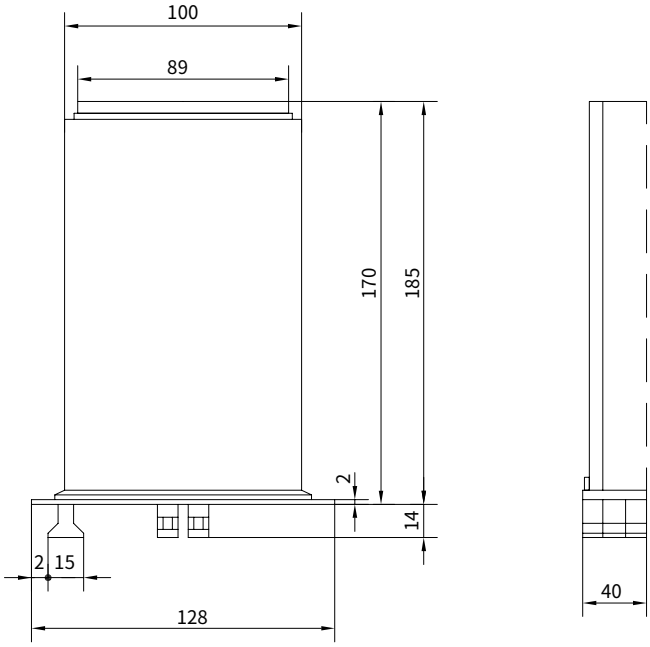
Potentiometer P2 (initial current) on the panel is used for adjusting the pilot current with the range 0~400mA; and preset current is 100mA before dispatch from factory.

Note:

Other potentiometers on the panel have been adjusted before shipment from the factory, if you modify them, the performance parameter given by the manual will not be effective. This amplifier can be plugged in and off only under the electric breakaway.

Outline dimension

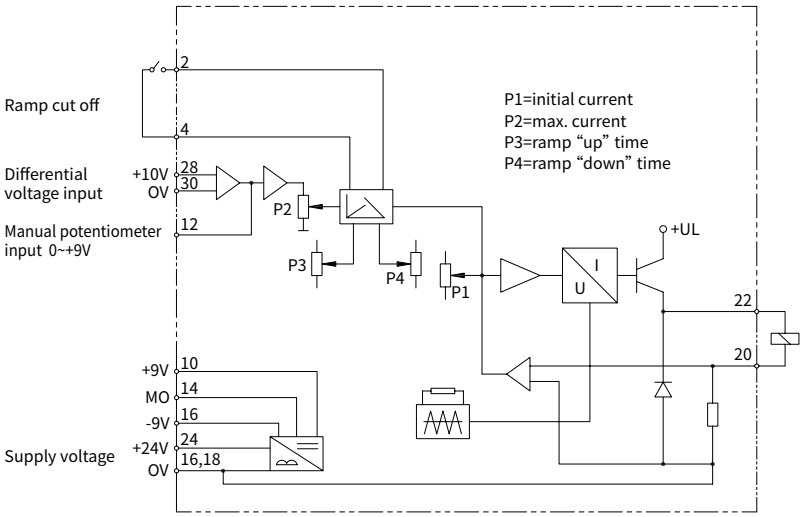
Type VT-2000BS40G

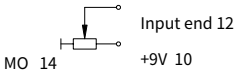


Amplifier type VT-2000BS40G circuit outline dimension adopts Europe standard 100×160 mm, connecter is Europe 32 ends plug. and it has a stand type VT-3002L forming a complete set.

Wiring diagram of amplifier

Type VT-2000BK40





Application specification

Type VT-2000BK40

Principle chart of Hydro-electrical proportional amplifier type VT-2000BK40 see Wiring Chart.
1. End 20 and 22 in the right of the dotted line, connects with proportional solenoid coil (22 is the high electric potential and 20 is the low electric potential.)

2. End 24, 18 (or 16) in the left of the dotted line, connects with DC 24V power, among them, 24 connects the positive pole, 18 or 16 connects the negative pole. The controller's power shall be separate with the differential input power, namely end 30 can't connect the 14 and 18 or 16, otherwise, it could be damage the controller.

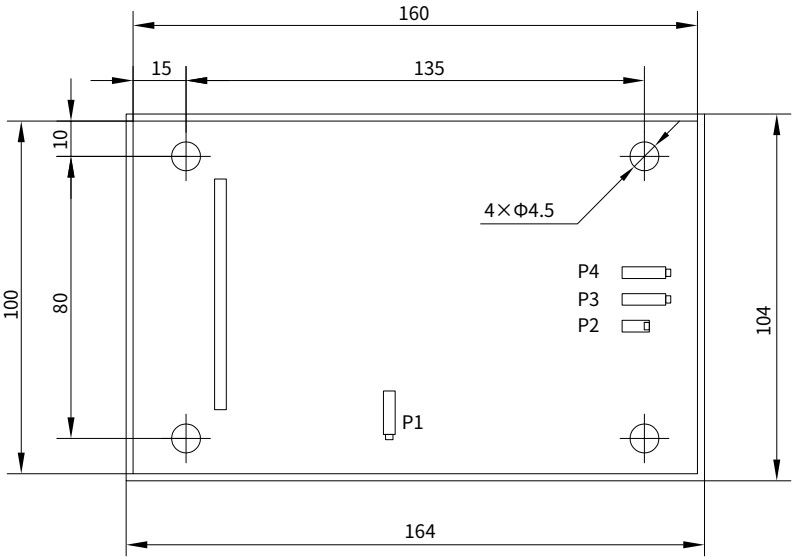
3. Two controlling methods:
(1) Manual control:
External potentiometer (provided by user themselves, suggesting to use one with resistance greater than 5K and smaller than 10K but smaller than 2K is not permitted; Power is not limited), one end connects 10 (+9), another end connects 14 (M0 is the measurement zero); and the slide end connects 12. Input the voltage value 0~+9V into end12 by adjusting the potentiometer, and 100~800 mA square wave pulse current will proportionally appear from the proportional solenoid to actuate it.

(2) Automatic control:
Differential voltage signal from the programmable controller (PLC), function generator and so on inputs from end 28 and 30, among them, end 28 connects high frequency, while 30 low frequency. Correspondingly appearing 100~800mA in the solenoid when the differential changes at range of 0~10V.
Notes: Don't make the end 30 connected with the 14 (M0) or negative end 18, 16 of the DC24V power, namely the PLC and the proportional controller can't use one power or have mutual grounding.
When the requiring current is less than 800mA, it can limit the max. current by adjusting the P2 in the amplifier panel, e.g. input +9V to end 12, it can limit the output current 800mA into 600mA or other values by adjusting the potentiometer P2.
Two potentiometer P3 and P4 in the amplifier panel is respectively used for adjusting the time of ramp "up" and "down", and the Max. time of ramp is 5 seconds. If system needn't ramp time, 2 and 4 can be short-circuited.
Potentiometer P1 on the panel is used for adjusting the pilot current with the range 0~400mA ; and preset current is 100mA before dispatch from factory.

Note:
Other potentiometers on the panel have been adjusted before shipment from factory, if you modify it, the performance parameter given by the manual will not be assured.

Outline dimension

Type VT-2000BK40



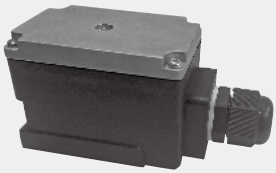
Amplifier type VT-2000BK40 circuit outline dimension adopts Europe standard 100×160 mm, with plastics supporting board (1mm thick), the wring terminal can connects the cable directly.

6.16

Plug-in amplifier

Type VT-SSPA1

Analog amplifier for controlling proportional valves
(pressure and directional valves) without position control.



Contents

Features

- Differential input
- Ramp time adjustable (60 ms...5 s)
- Sensitivity, valve zero point, dither frequency adjustable
- Operating voltage 24 V

Function and configuration

The active connector is used for controlling proportional valves without position control. It is directly attached to the solenoid plug of the valve. Theconnection cable on the control side (U_B, command value) is led through a gland fitting and connected. An LED signals the available supply voltage. Depending on the type of the active connector, the command value is specified as voltage 0...10V or as cur-rent 4...20mA.

The command value can be adjusted with regard to zero point and sensitivity. In case of voltage specification, a differential input is available. Apart from that, the command value can be led via a ramp. In order to allow for adjustment to special applications, thedither amplitude was designed variably. Upon delivery, the dither amplitude has already been set to a perfect value so that another adjustment is only necessary in the above-mentioned special cases.

Ordering code, accessories

VT	–	S	S	P	A	1	–	–	L2X	/	V0	/

Design :
Plug-in amplifier =S

Hydraulic component for valves without electrical feedback = S

Valve type : Proportional valve = P

Control Analog =A

Output stages: 1 output stage =1

Control
0 = Voltage 0...10 V
I = Current 4...20 mA

Customer version
V0 = Catalog version

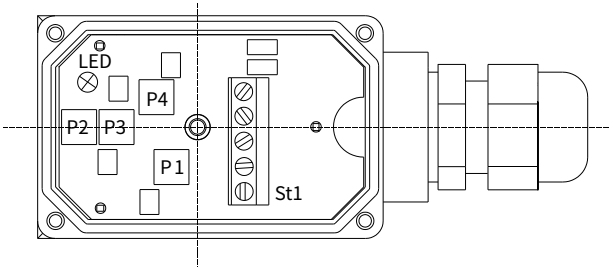
Component series L20 to L29
L2X= (L20 to L29: Unchanged technical data and pin assignment)

Serial number for types: 508=0.8A solenoid
516=1.6A solenoid
525=2.5A solenoid

Technical data

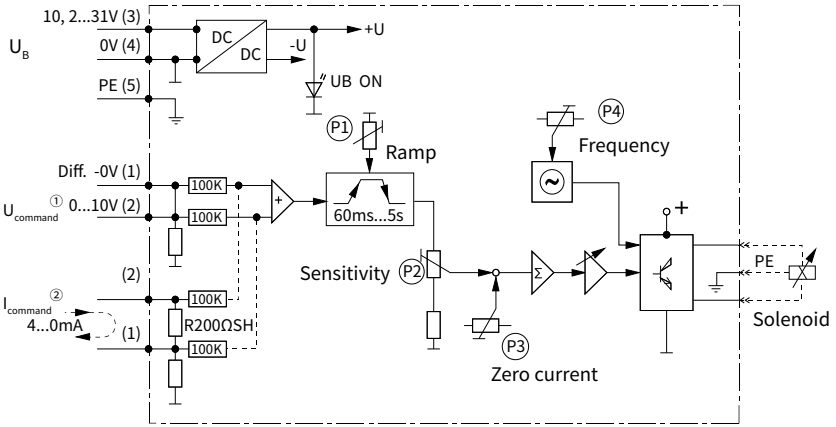
Supply voltage nom. 24 V =	Solenoid2.5A	Battery voltage 10.2...31V Rectified voltage 10.2...27V
	Solenoid1.6A	Battery voltage 18...31V Rectified voltage 18...27V
	Solenoid0.8A	Battery voltage 21...31V Rectified voltage 21...27V
	Residual ripple	< $2V_{SS}$
Power consumption max.	Va	55 (see valve data)
Command value		0...10V
		4...20 mA
Output		I_{max}=2.5A(rectangular voltage, pulse-modulated) I_{max}=0.8A(rectangular voltage, pulse-modulated) I_{max}=1.6A(rectangular voltage, pulse-modulated)
Ramp time		60ms...5s
Dither frequency range	Hz	95...340
Zero point calibration range		See characteristic curves
Sensitivity adjustment range		
Special features		LED (green): Supply voltage is available, Clocked output stage, Fast energization for short actuating times, Adjustments via trimming potentiometer.
Protection class		IP 65, in plugged condition
Electro-magnetic compatibility tested according to		EN 61000-6-2: 2002-08 EN 61000-6-3: 2002-08
Design		Connector housing
Connections	– Solenoid – U_B，command value	DIN 43650 Cable 5×0.75mm^2, shielded incl. PE
Ambient temperature	° C	-20...+70
Storage temperature range	° C	-20...+85
Weight	m	0.23 kg

Connections and adjustment



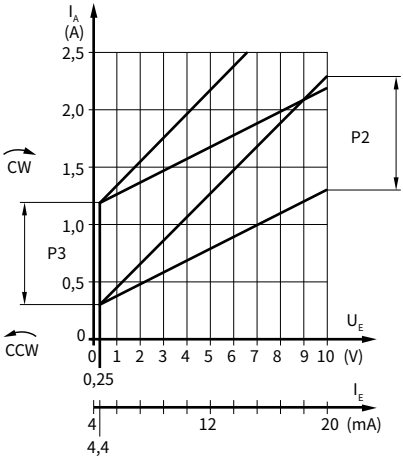
P1 – Ramp time
P2 – Sensitivity
P3 – Zero point
P4 – Dither frequency
St 1 – Connection terminal
LED – Display U_B

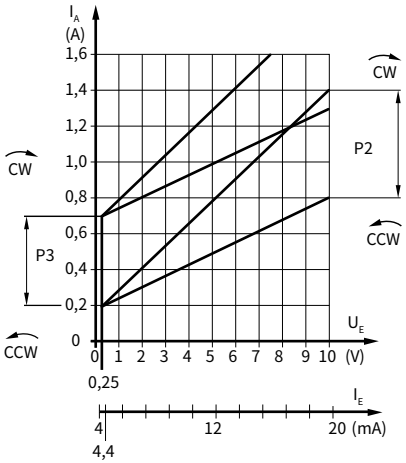
Block diagram and pin assignment

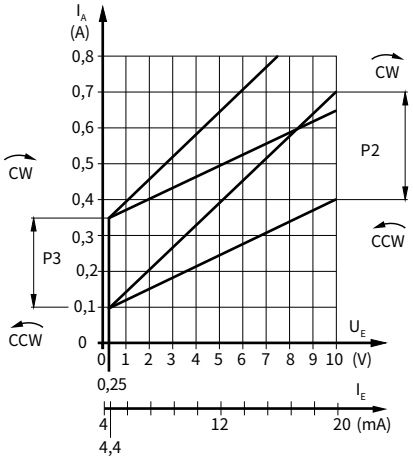


Characteristic curves

Commissioning and adjustment



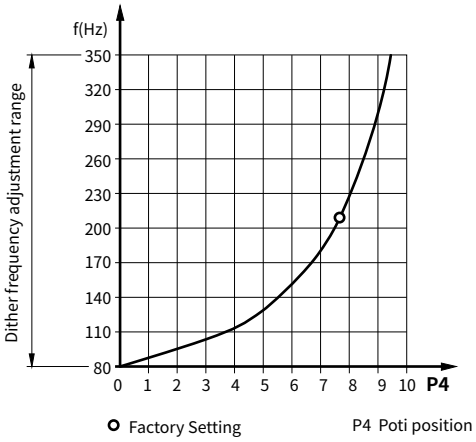




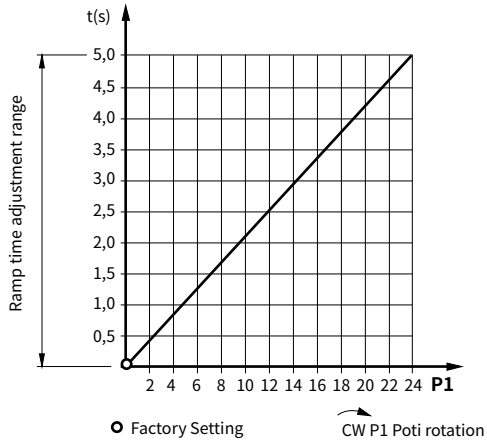
P2 Sensitivity range
P3 Zero current range

Characteristic curves

Commissioning and adjustment



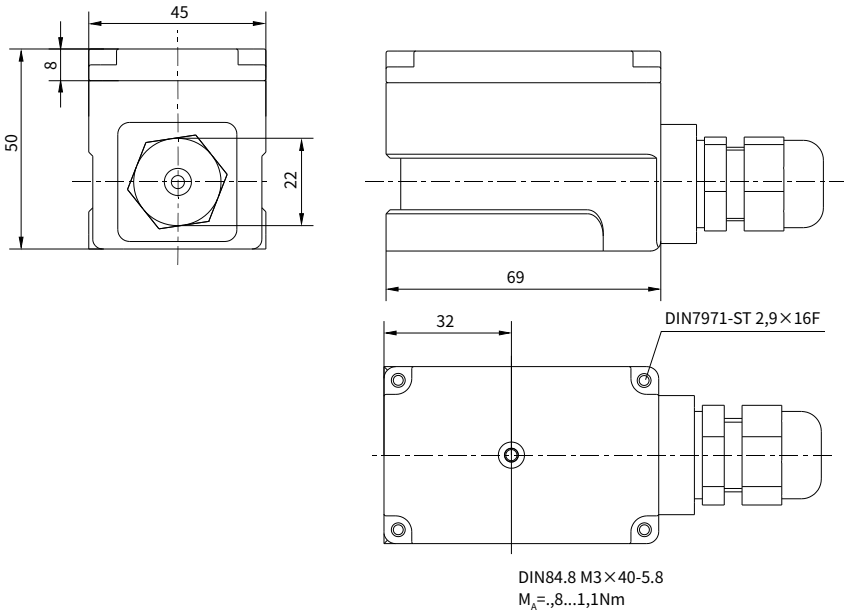
1.Dither frequency adjustment
→ Poti P4.
The dither frequency has already been correctly adjusted upon delivery.
For special applications, correction may be necessary.



2. Ramp time adjustment (accelerations and braking)
→ Poti P1

Unit dimensions

(dimensions in mm)



中国 +86 400 101 8889
美国 +01 630 995 3674
德国 +49 172 3683463
日本 +81 03 6809 1696

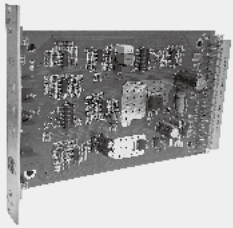
Hengli®

6.17

Proportional amplifier

Type VT-VSPA1-1
Type VT-VSPA1K-1

Component series L1X



Contents

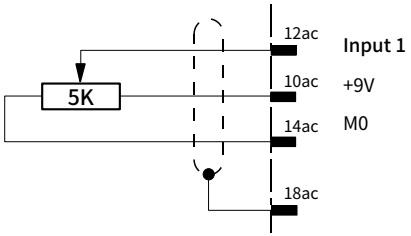
Features

- Suitable for controlling all direct and pilot operated proportional pressure control valves without electrical position feedback and only one solenoid as actuator that are available at the time of publication of this data sheet
- Differential input, can be switched between voltage and current input
- Additional command value input, 0 to +9V
- Ramp generator, can be adjusted separately for up and down ramps
- Signal "ready for operation" (VT-VSPA1K-1 only with LED indicator lamp)
- Reverse polarity protection for voltage supply
- Cable break detection of current input 4 to 20 mA
- Short-circuit protection of solenoid cable
- Cable break detection of solenoid cable

Function and configuration

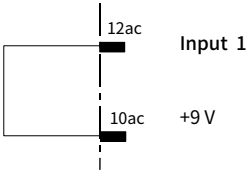
The command value voltage is applied to command value input 1 either directly or via an external command value potentiometer with the help of the regulated + 9V voltage from the power supply unit [14]. The following is valid for this input: +9 V ≙ +100 %

· External command value feedforward:

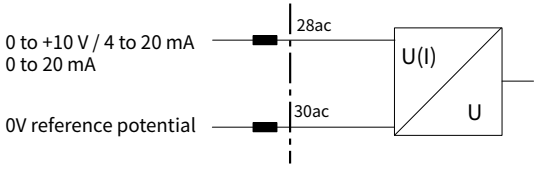


Note:
When an external command value potentiometer is used, internal potentiometer "Gw" [3] must be set to maximum or the required maximum pressure.

· Internal command value feedforward:



· Differential input (input 2):



Additions to the pin designations in brackets are only valid for type VT-VSPA1-1.

Command value input 2 is a differential input [1] (0 to + 10 V). With the help of DIL switches [2)] it can be configured as current input (4 to 20mA or 0 to +20mA). If the command valueis fed forward by external electronics with a different reference potential (e.g. by a PLC), this input must be used. When the command value voltage is applied or withdrawn, care must be taken that both signal cables are disconnected from or connected to the input.

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

The downstream ramp generator [4] generates a ramp-shaped out put signal from a stepped input signal. The time constant of this signal can be adjusted separately for "up" and "down" ramps with the help of two potentiometers. The specifi ed ramp time refers to a command value step-change of 100% and can be approx. 1s or 5s, depending on the setting of a DIL switch [2)]. If a command value step-change of less than 100% is fed to the input of the ramp generator or when attenuator [3] is effective, the pamp time shortens accordingly.

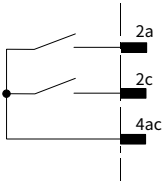
Function and configuration

The following is valid for type VT-VSPA1-1:
The up and down ramp times can be set separately to their minimum value (ap-prox. 30ms) with the help of the external contacts "ramp up/down OFF".

The following is valid for type VT-VSPA1K-1:
The up and down ramp times can be set collectively to their minimum value (ap-prox. 30ms) with the help of the external contact

· Ramp "up/down" OFF :

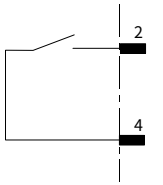
VT-VSPA1-1



Ramp "up" OFF

Ramp "down" OFF

VT-VSPA1K-1

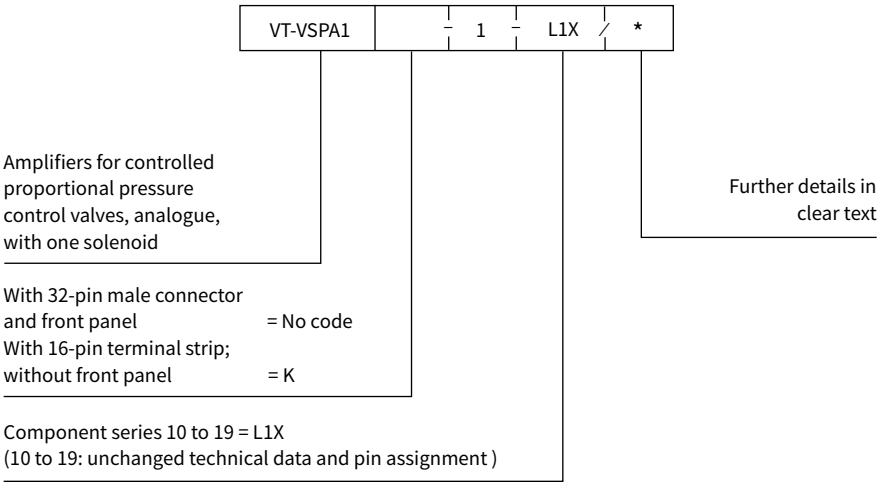


Ramp OFF

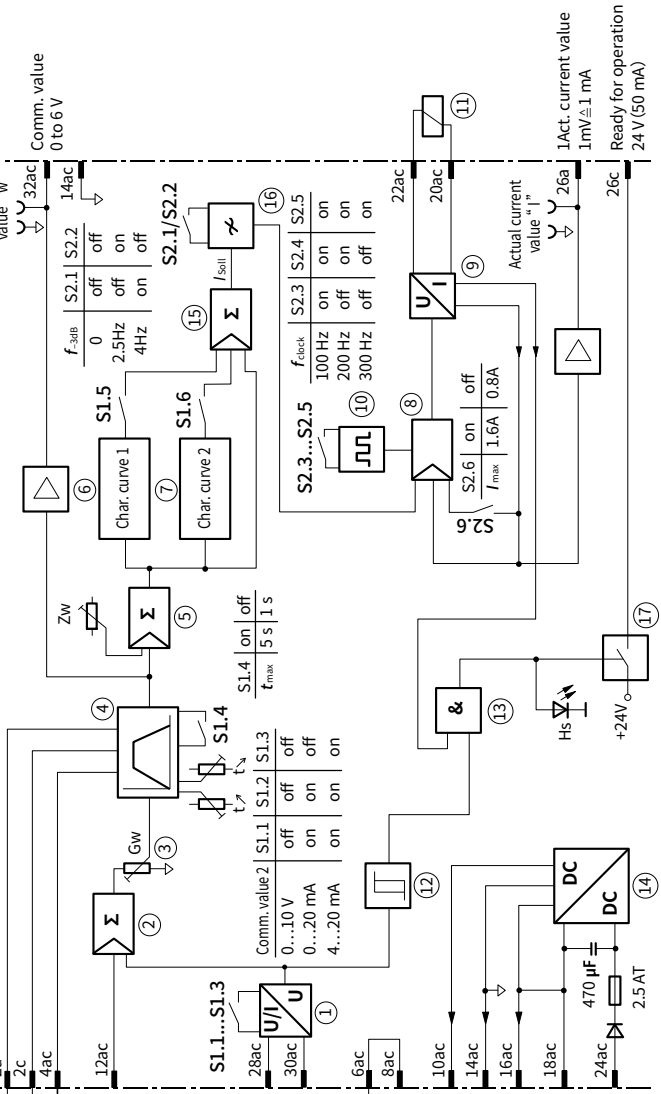
The output signal of ramp generator [4] is fed as current command value to the summing amplifier [5]. Here, a command value of 100 % corresponds to a voltage of +6 V.
Suming amplifier [15] adds the output signals of the characteristic curve generators [6 or 7] to the command value (can be selected by means of DIL switches depending on the valve to be controlled). The current command value can alsvo be filtered through a lowpass filter that can be cut in.
Current out-put stage [9] is controlled via current regulator[8]. In addition, the current regulator modulates the current command value with clock-pulse encoder signal [10] (the frequency can be programmed with the help of DIL switches.
The clocked actual current value acts in the solenoid of the valve like a constant current with overlaid dither signal. Type VT-VSPA1-1 is provided with measuring sockets for the internal command value and the actual value.
The following is valid for the command value: +6 V ≙ 100%
The following is valid for the actual value: 1 mV ≙ 1mA

The signal "ready for operation" is output and LED "Hs"
on the front panel (with VSPA1-1) or LED "Hs" (with VSPA1K-1) is lit,
When:
– The solenoid cables are not short-circuited and the output stage is not overloaded,
– a command value is applied (cable break detection),
– there is no cable break present on the solenoid cable.

Ordering code



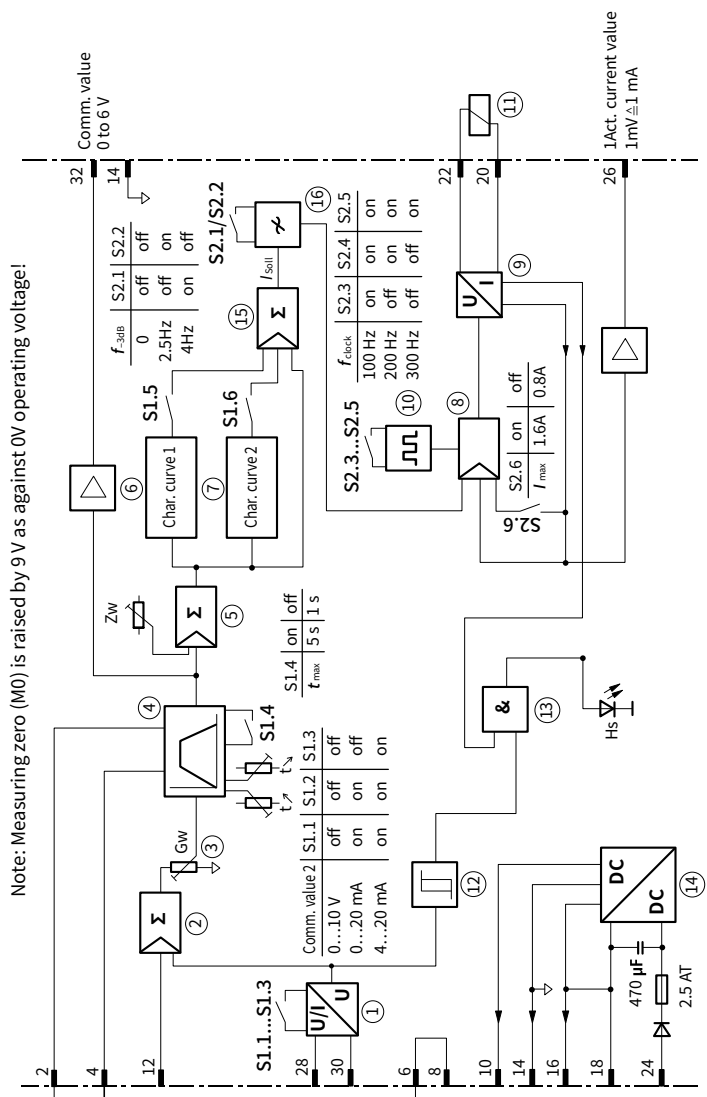
Block circuit diagram / pin assignment: VT-VSPA1-1



1. Differential input
2; 5; 15 Summator
3. Max. command value attenuator
4. Ramp generator
6. Characteristic curve generator 1
7. Characteristic curve generator 2
8. Current regulator
9. Current output stage
10. Clock-pulse generator
11. Proportional solenoid of valve
12. Command value monitoring
13. Monitors
14. Power supply unit
16. Low-pass filter
17. Output "ready for operation"

Hs = Signal "ready for operation"
Gw = Command value attenuation
T = Ramp time adjustment
Zw = Additional biasing current adjustment
(0 to 300mA or 0 to 600mA)

Block circuit diagram / pin assignment: VT-VSPA1K-1



1. Differential input
2. 5; 15 Summator
3. Max. command value attenuator
4. Ramp generator
6. Characteristic curve generator 1
7. Characteristic curve generator 2
8. Current regulator
9. Current output stage
10. Clock-pulse generator
11. Proportional solenoid of valve
12. Command value monitoring
13. Monitors
14. Power supply unit
16. Low-pass filter

HS = Signal "ready for operation"
Gw = Command value attenuation
T = Ramp time adjustment
Zw = Additional biasing current adjustment (0 to 300 mA or 0 to 600 mA)

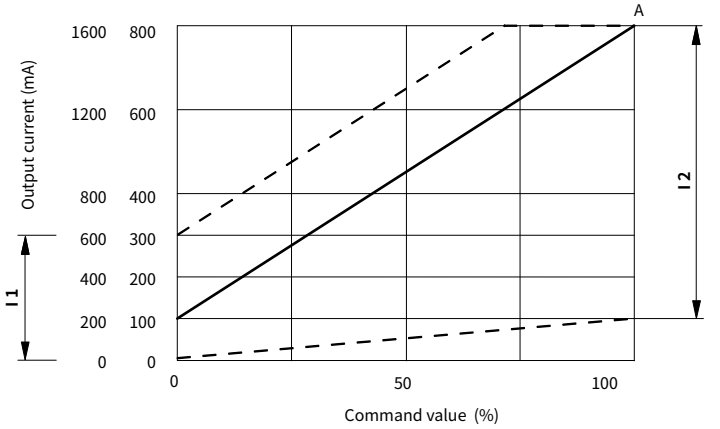
Technical data

Operating voltage	U_0	+24VDC +40% –5%
Operating range:		
- Upper limit value	$U_0(t)_{max}$	+35 V
- Lower limit value	$U_0(t)_{min}$	+22 V
Max. power consumption	Ps	＜ 50 VA
Max. current consumption	I	＜ 1.8 A
Fuse	I_F	2.5 AT
Inputs:		
- Command value 1	U_i	0 to +9 V (reference potential is M0)
- Command value 2 (differential input)	U_i	0 to +10V； R_e =100KΩ ┐ depending on setting with S11 to S13
or	I_i	4 to 20 mA (load R_B =100Ω) ┘
or	I_i	0 to 20 mA (load R_B =100Ω)
Ramp time (adjustment range)	t	30 ms to approx. 1s or 5s (depending on setting with S14)
Outputs:		
- Output stage		
·Solenoid current/resistance	I_{max}	800mA +20% , R_{20} =19.5Ω ┐ depending on setting with S26 [1]
or	I_{max}	1600mA +20% , R_{20} =5.4Ω ┘
·Biasing current at I_{max} =800 mA	I_v	50mA or 100mA ┐ depending on setting with S26 [1] and "Zw"
at I_{max} =1600 mA	I_v	100mA ┘
additionally at I_{max} =800 mA	I_v	0 to 300mA +20% ┐ Adjustable by means of "Zw" on the printed-circuit board
at I_{max} =1600 mA	I_v	0 to 600mA +20% ┘
·Clock frequency	f	100 Hz, 200 Hz, 300 Hz or 370 Hz ±10%each (depending on setting with S23 to S25)
- Signal "ready for operation" (only with VT-SPA1-1)		
·Rready for operation	U	approx. U_0 , 50mA ┐ Load resistance >10kΩ
·Break down	U	0V, R_i = 10kΩ ┘
	U	
- Regulated voltage	U	±9V ± 1 %, ±25 mA externally laodable
- Measuring sockets		
·Command value "w"	U	0 to +6 V (+6V ≙ 100% solenoid current), R_i =1kΩ
·Actual current value "I"		0 to 1600mV ≙ 0 to 1600mA ±20mA
	U	
	U	
Type of connection:		
- VT-VSPA1-1		32-pin male connector, DIN 41612, form D
- VT-VSPA1K-1		16-pin terminal strip
Card dimensions:		Euro-card 100 x 160 mm, DIN 41494
Front panel dimensions		
- Height		3HE(128.4mm)
- Width soldering side		1TE(5.08mm)
- Width component side		3TE
Permissible operating temperature range	ϑ	0 to + 50°C
Storage temperature range	ϑ	–25 to + 85°C
Weight	m	0.1kg

[1] The maximum current I_{max} can be set to the required value by means of command value attenuator potentionmeter "Gw".

Output characteristic curves

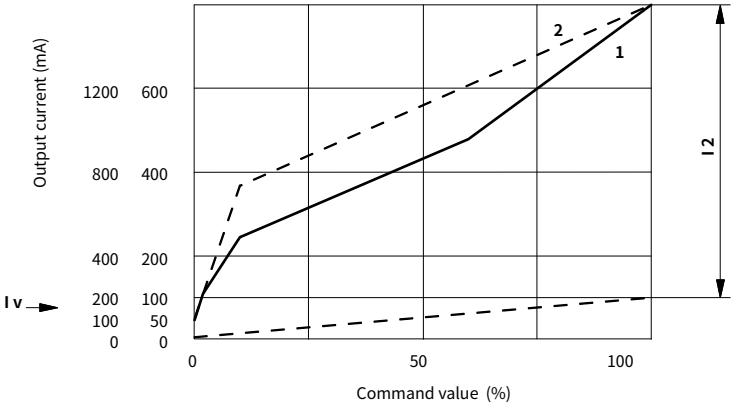
Linear output charcteristic curve (basic characteristic curve)



I 1 Adjustment range of biasing current Ib by means of potentiometer "Zw" on the printed-circuit board
I 2 Adjustment range of maximum command value by means of potentiometer "Gw"
A Characteristic curve with factory setting

06

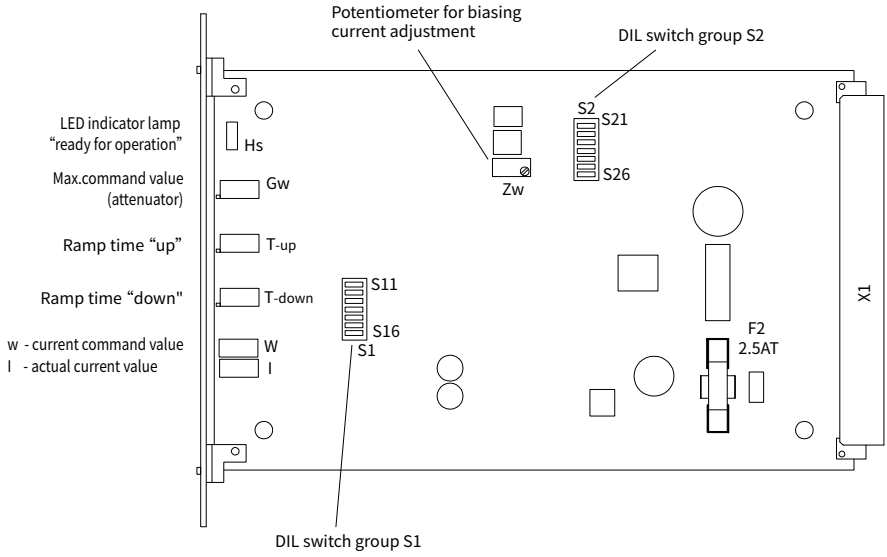
Output characteristic curve with firmly set characteristics



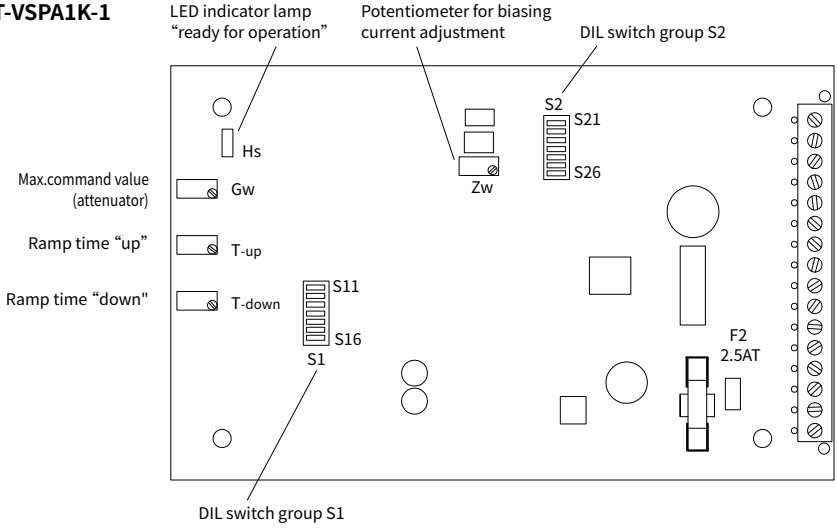
I v Biasing current curve 2 (qualitative representation)
I 2 Adjustment range of maximum command value by means of potentio meter "Gw"
1 Characteristic curve 1 (qualitative representation)
2 Characteristic curve 2 (qualitative representation)

Indicator / adjustment elements

· **VT-VSPA1-1，** from component series 11



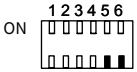
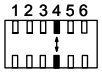
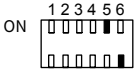
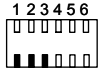
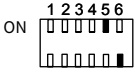
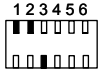
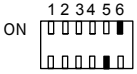
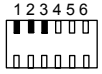
· **VT-VSPA1K-1**



06

Indicator / adjustment elements

Assignment of DIL switch setting on the card to the valve type (see also lable on the printed-circuit board)

setting for valve types:	S15 ...S16	S21 ...S26 [2]	Setting valid for all valve types:	S11 ...S14
DBE(M)T, DBE(M)30, DRE(M)30, 3DRE(M)10 [1], 3DRE(M)16 [1], DBEP6A, DBEP6B, 3DREP6A, 3DREP6B pumps			Ramp time 5s ↕ 1s	
DRE(M)10-L5X, DRE(M)20-L5X		 X	Command valve 2 +10V	
DBE(M)10-L5X, DBE(M)20-L5X, 3DRE(M)10P-L6X, 3DRE(M)16P-L6X, ZDRE10, (Z)DBE6		 X	0 ...20mA	
DRE6, ZDRE6		 X	4 ...20mA	

[1] Up to component series L5X
[2] Clock frequency can be set by switches S23 to S25

Meaning of potentiometers "Zw" and "Gw":

▶ Adjustment of biasing current by means of potentiometer "Zw"
- Turning clockwise → increase in biasing current
- Turning counter-clockwise → reduction of biasing current

▶ Adjustment of the max. command value by means of potentiometer "Gw"
- Turning clockwise → increase in command value
- Turning counter-clockwise → reduction of command value

Meaning of the DIL switches

Note (X): Before commissioning the amplifiers, make sure that the DIL switches on the printed-circuit board are set according to the relevant application.

Switch positions with reference to the current valve types or previous amplifier cards

	Valve types / amplifier cards			
DIL Switch	DBE(M)T，DBE(M)30 DRE(M)30，3DRE(M)10 3DRE(M)16 DBEP6A，DBEP6B 3DREP6A，3DREP6B pumps	DRE(M)10-L5X DRE(M)20-L5X	DBE(M)10-L5X DBE(M)20-L5X ZDRE10 (Z)DBE6 3DRE(M)10P-L6X 3DRE(M)16P-L6X	DRE, ZDRE6
	VT 2000			
	Characteristic curves			
	Basic characteristic curve	Characteristic curve 1	Characteristic curve 1	Characteristic curve 2
S15	OFF	ON	ON	OFF
S16	OFF	OFF	OFF	ON
	Command value filters			
		f_{-3dB} = 4Hz	f_{-3dB} = 4Hz	f_{-3dB} = 2.5Hz
S21	OFF	ON	ON	OFF
S22	OFF	OFF	OFF	ON
	Max. output current [1)]			
	I_{max}=800mA	I_{max}=800mA	I_{max}=1.6A	I_{max}=1.6A
S26	ON	ON	OFF	OFF
	Clock frequency			
	f=200Hz	f=200Hz	f=300Hz	f=370Hz
S23	OFF	OFF	OFF	OFF
S24	ON	ON	OFF	OFF
S25	ON	ON	ON	OFF
	Basic biasing current setting			
"Zw"	100mA	50mA	100mA	100mA

[1)] Doubling of the maximum output current doubles the adjustment range and the set biasing current.

Adjustment range of biasing current using potentiometer "Zw"

I_{max} = 800mA → I_v = 0 to 300mA I_{max} = 1600mA → I_v = 0 to 600mA

Adjustment options inedependent of the valve type (command value 2 and ramp time)

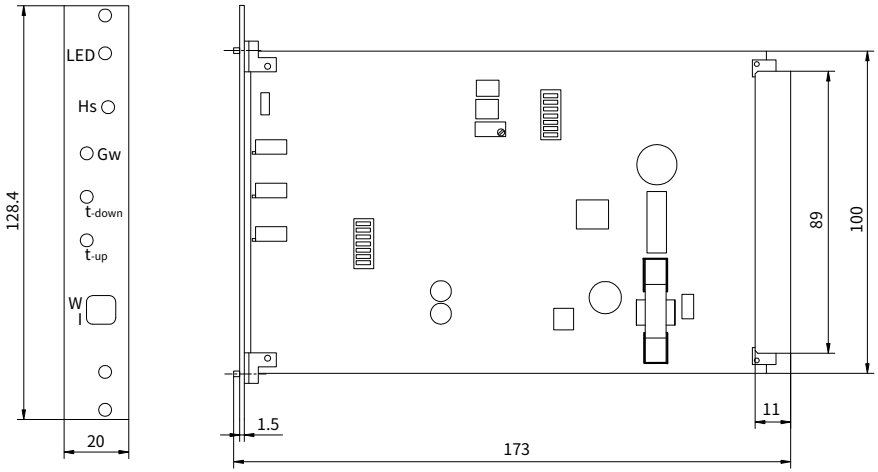
	Configuration of differential input		
	Command value 2: +10V	Command value 2: 0 to 20mA	Command value 2: 4 to 20mA
S11	OFF	ON	ON
S12	OFF	ON	ON
S13	OFF	OFF	ON
	Max. ramp time		
S14	OFF ≙ 1S		ON ≙ 5S

Note: Factory setting (corresponds to the configuration lf a VT 2000 amplifier).

Unit dimensions

(Dimensions in mm)

· VT-VSPA1-1



· VT-VSPA1K-1