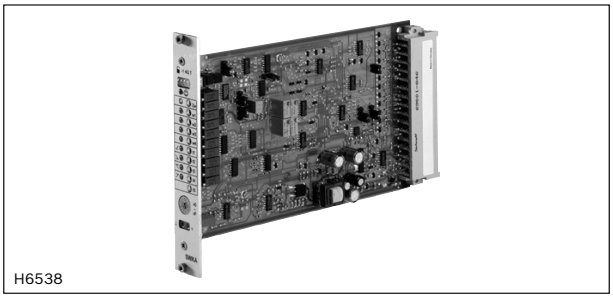
The Drive & Control Company

Rexroth
Bosch Group

Command value and ramp card

Type VT-SWKA-1

RE 30255
Edition: 2013-04
Replaces: 06.05


H6538

- Component series 1X
- Analog, Euro-card format
- Suitable for controlling valves with integrated electronics. For controlling valves without integrated electronics, an additional suitable amplifier is necessary.
- Suitable for generating, linking and standardizing command value signals

Features

- Configuration and parameterization of the command value card using potentiometers
- Command value inputs:
  - Differential input ±10 V
  - 4 callable command value inputs ±10 V
  - Current input 4 to 20 mA
  (standard 0 to 100 %; switchable ±100 %)
- Actuating variable outputs:
  - Voltage ±10 V
  - Current 4 to 20 mA
  (standard 0 to 100 %; switchable ±100 %)
- Inverting of the internal command value signal via 24 V input or jumper
- Selection of ramp time via quadrant recognition (24 V input) or ramp time call-ups (24 V inputs)
- Switching of the ramp time range via jumper
- Characteristic curve correction by means of separately adjustable step levels and maximum values
- Enable input
- "Ramp ready" output signal as auxiliary process variable
- "Ready for operation" output signal
- Switchable measuring socket
- Reverse polarity protection for the voltage supply

Contents

More information:

- Product description and commissioning instructions VT-SWKA-1, see 30255-B

Ordering code

01		02		03		04		05
VT-SWKA-1	**–**	**1X**	**/**	**V0**	**/**	**0**	**/**	*****

01	Analog command value card	**VT-SWKA-1**
02	Component series 10 to 19 (10 to 19: Unchanged technical data and pin assignment)	**1X**
04	Version: Standard	**V0**
05	Standard option	**0**
06	Further details in the plain text	*****

Suitable card holder:

- Open card holder VT 3002-1-2X/48F (see data sheet 29928)

Functional description

General
The command value card is set up as printed circuit board in Euro format, 100 x 160 mm, and suitable for installation in a rack. An internal power supply unit [1] supplies all internally required positive and negative supply voltages. If the power supply unit is in operation and no error is detected, the green LED on the front plate is lit and the "ready for operation" signal is set.

Current input [3]
There is no switching between current and voltage input. Both inputs are permanently available (see terminal assignment). The input signals are internally standardized and added up. The zero point and the value range of the current input can be switched using jumper J5.

Command value call-ups [4]
Four command value signals "w1" to "w4" can be called up. The external command value voltages (command values 1 to 4) are either defined directly by the regulated voltage outputs +10 V and –10 V or via external potentiometers. If these command value inputs are directly connected to the regulated voltages, the command values are set at the potentiometers "w1" to "w4". When using external potentiometers, the internal potentiometers will function as attenuators or limiters.
Only one call-up can be operated at the same time. If several call-ups are operated simultaneously, call-up "1" has the lowest priority and call-up "4" has the highest priority.
The respective active call-up is indicated via a yellow LED on the front plate.

Command value inversion [7]
The command value created internally from the input signals, the command value call-ups and the zero point offset signal can be inverted by an external signal or jumper J1. If an external inverting signal is connected, this is indicated by an LED ("–1") on the front plate.

Enable function [8]
The enable function switches the input signal of the ramp generator on or off. If enable is switched on or off, the control output changes with the set ramp time irrespective of the command value. Thus, a controlled valve does not open or close abruptly. If an error signal occurs, the ramp generator input signal is also set to 0 %. The enable signal is indicated by an LED on the front plate.

Ramp generator [9]
The ramp generator limits the rise of the control output. The downstream step functions and amplitude attenuators do not extend or shorten the ramp time.
Using jumper J2, the ramp time is set to a minimum (< 2 ms) (ramp off).

External ramp time setting:
Using an external potentiometer, the internally set ramp time can be extended. The setting can be verified by means of the measuring socket. In case of a cable break, the internal default setting will be valid automatically.
Note for setting and measuring the ramp time:

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Functional description (continued)

Value at measuring socket "v"	U_t / V	5	3	2
Current ramp time (±20 %)	**t / ms**	20	33	50

U_t / V	1	0.5	0.3	0.2	0.1	0.05	0.03	0.02
t / ms	100	200	333	500	1000	2000	3333	5000

By reconnecting the jumper J3, the ramp times specified above can be increased tenfold.

Ramp status signal [11]
The "ramp ready" status signal indicates that the control output has reached the desired end value. By means of this signal (24 V output), superior sequence controls can be more easily synchronized with the valve function or the controlled hydraulic function.

Characteristic curve generator [12]
Using the adjustable characteristic curve generator, step level and maximum values for positive and negative signals can be set separately, adjusted to the hydraulic requirements. The actual development of the characteristic curve through the zero point is not stepped but linear.

Amplitude limiter [13]
The control outputs (current output and voltage output) are limited to approx. ±110 % of the nominal range.

Fault recognition [14]
The internal operating voltages and the voltage outputs are monitored and, if the jumper J7 (1-2) is connected, the current output is checked for cable break. If there is no error, the green "ready for operation" LED is lit and the "ready for operation" output is switched to 24 V (operating voltage).

Measuring points [15]
A measuring socket on the front plate is provided for verifying the settings of the command value call-up, the ramp times and further internal signals. The measuring points are selected via the measuring point selector switch which is also located on the front plate. The signal of the measuring socket is also connected to the male multipoint connector (b26).

[ ] = references to the block diagram on page 4

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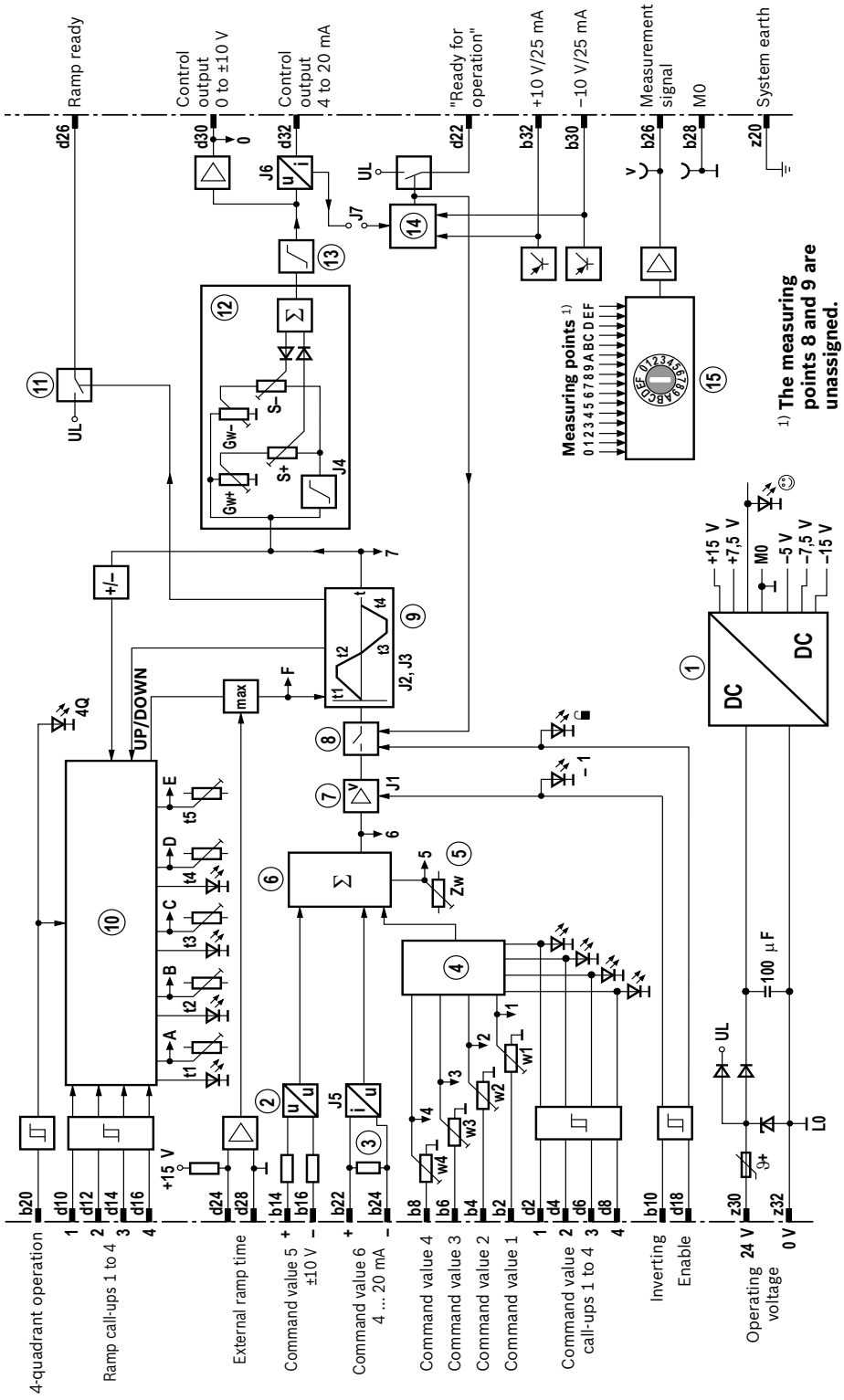
Block diagram / pin assignment



1 Power supply unit
2 Differential amplifier
3 Current input
4 Command value selection logic
5 Zero point setting
6 Command value summation
7 Command value inverting
8 Enable function
9 Ramp generator
10 Ramp time selection logic
11 Ramp status function
12 Characteristic curve generator
13 Amplitude limiter
14 Fault recognition
15 Measuring point switch-over

Explanations regarding the jumpers and position and meaning of the display and adjustment elements see page 6.

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

Operating voltage	U_B	24 VDC + 40 % – 20 %
Operating range:		
Upper limit value	U_B (t)$_{max}$	35 V
Lower limit value	U_B (t)$_{min}$	18 V
Power consumption	P_S	< 7 VA
Current consumption	I	< 0.3 A
Fuse	I_S	Thermal overload protection; self-activating after tripping
Inputs, analog		
Command values 1 to 4 (potentiometer inputs)	U_e	0 ... ±10 V, R_e > 100 kΩ (M0 is reference)
Command value 5 (differential input)	U_e	0 ... ±10 V, R_e > 50 kΩ
Command value 6 (current input)	I_e	4 ... 20 mA, load R_B = 100 Ω (zero point switchable)
External ramp time	U_e	0 ... +10 V, R_e = 10 kΩ (internally increased to +15 V, M0 is reference)
Inputs, digital		
Command value call-ups, Command value inversion, Enable, Ramp call-ups, 4-quadrant operation	U U	8.5 V ... U_B –> ON, R_e > 100 kΩ 0 ... 6.5 V –> OFF, R_e > 100 kΩ
Setting ranges		
Zero adjustment (potentiometer "Zw")		±30 %
Command values (potentiometers "w1" to "w4")		0 ... 110 %
Ramp times (potentiometer "t1" to "t5")		20 ms ... 5 s, switchable to 0.2 ... 50 s using J3
Step level (potentiometer "S+" and "S–")		0 ... 50 % (step level reached at approx. 2 % of specified command value)
Amplitude attenuator (potentiometer "G+" and "G–")		0 ... 110 % (applies to the step level setting of 0 %)
Outputs, analog		
Control output voltage	U	±10 V ± 2 %, I_{max} = 2 mA
Control output current	U	4 mA ... 20 mA ± 2 %; $R_{B\ max}$ = 500 Ω (zero point switchable)
Measurement signal	U	±10 V ± 2 %, I_{max} = 2 mA
Outputs, digital		
Ramp ready		> 16 V, 50 mA → ramp ready < 1 V; R_i = 10 kΩ → ramp on
Ready for operation	U	> 16 V, 50 mA (in case of a fault: U < 1 V, R_i = 10 kΩ)
Regulated voltages	U	±10 V ± 2 %, 25 mA, short-circuit-proof
Measuring sockets		
Measurement signal "v" (depending on the position of the measuring point switch-over)	U	±10 V ± 2 %, I_{max} = 2 mA
Type of connection		48-pin male multipoint connector, DIN 41612, design F
Card dimensions		Euro-card 100 x 160 mm, DIN 41494
Admissible operating temperature range	ϑ	0 ... 50 °C
Storage temperature range	ϑ	–25 °C ... +85 °C
Weight	m	0.15 kg (net)

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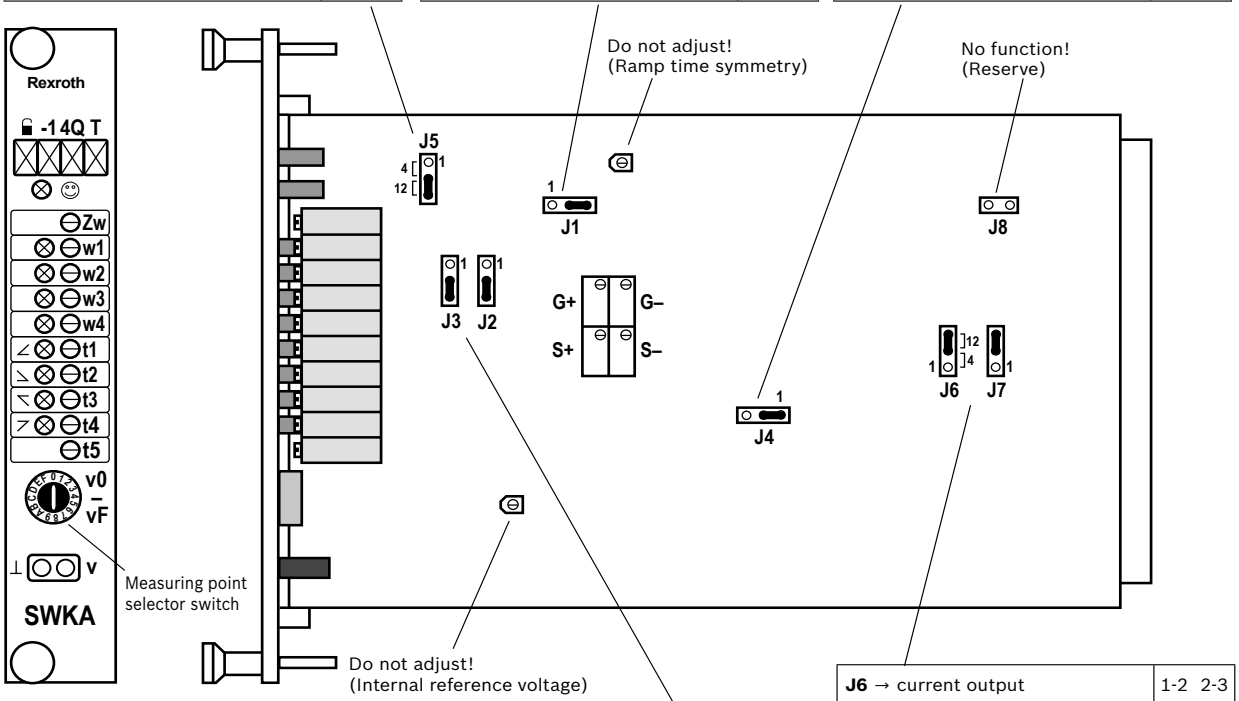
Display / adjustment elements

J5 → current input	1-2	2-3
0 % ≙ 4 mA	•	–
0 % ≙ 12 mA	–	•

J1 → inverting	1-2	2-3
Inverting	•	–
Not inverting	–	•

J4 → step function	1-2	2-3
Off	•	–
On	–	•



J6 → current output	1-2	2-3
0 % ≙ 4 mA	•	–
0 % ≙ 12 mA	–	•

J7 → cable break monitoring	1-2	2-3
On	•	–
Off	–	•

J2 → ramp function	1-2	2-3
Off	•	–
On	–	•
J3 → ramp time		
Tenfold	•	–
Simple	–	•

LED indicators:

☺ Ready for operation (green)

Enable (yellow)

–1 External inverting

4Q Quadrant recognition

T Reserved

Potentiometers (some with LED indicator):

Zw Zero point calibration

w1 Command value 1

w2 Command value 2

w3 Command value 3

w4 Command value 4

t1 Ramp time 1

t2 Ramp time 2

t3 Ramp time 3

t4 Ramp time 4

t5 Ramp time 5

Cannot be set via front plate:

G+ Amplitude attenuator for positive command values

G– Amplitude attenuator for negative command values

S+ Step level for positive direction

S– Step level for negative direction

Measuring sockets:

v Measurement signal (see page 7)

⊥ Measurement zero

• ... Connection activated

– ... Connection open

▭ ... Factory setting of the jumpers

For further information and important notices see product description and commissioning instructions 30255-B.

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Display / adjustment elements (continued)

Measuring socket "v"

Signal designation	Measuring point selector switch	Measurement signal "v"
Internal command value	0	±100 % ≙ ±10 V
Command value call-up 1	1	±100 % ≙ ±10 V
Command value call-up 2	2	±100 % ≙ ±10 V
Command value call-up 3	3	±100 % ≙ ±10 V
Command value call-up 4	4	±100 % ≙ ±10 V
Zero point offset "Zw"	5	±30 % ≙ ±3 V
1 composite signal of the command values	6	±100 % ≙ ±10 V
Ramp output signal	7	±100 % ≙ ±10 V
Not connected	8	
Not connected	8	
Ramp time "t1"	A	10 mV ... 10 V
Ramp time "t2"	B	10 mV ... 10 V
Ramp time "t3"	C	10 mV ... 10 V
Ramp time "t4"	D	10 mV ... 10 V
Ramp time "t5"	E	10 mV ... 10 V
Current ramp time "t"	F	10 mV ... 10 V

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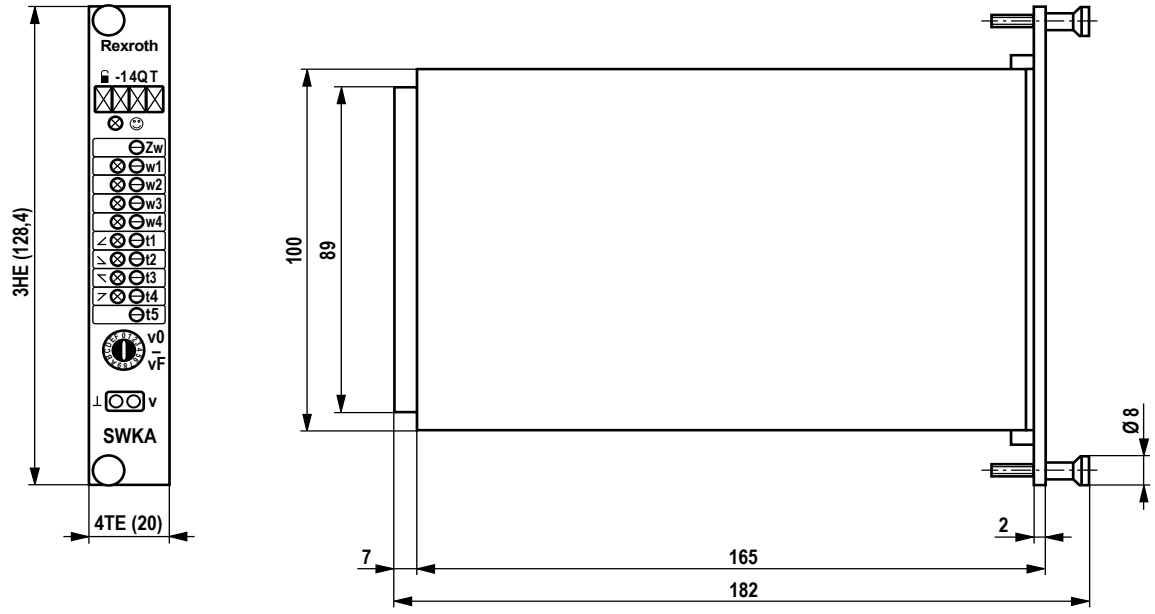
Dimensions (dimensions in mm)



Project planning / maintenance instructions / additional information

- The command value card may only be unplugged and plugged when de-energized.
- Do not lay lines close to power cables.
- The distance to aerial lines, radios, and radar systems has to be 1 m at least.
- For switching command values, relays with gold-plated contacts have to be used (small voltages, low currents).
- Always shield command value lines, connect shielding to protective earth (PE) on the card side.

Notice:
If the **differential input** is used, **both inputs must always be connected or disconnected at the same time.**

For further information see "Product description and commissioning instructions VT-SWKA-1" (30255-B).

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