Analogue command value module

RE 29902/07.05 1/6
Replaces: 02.03

Type VT-SWMA-1

Series 1X

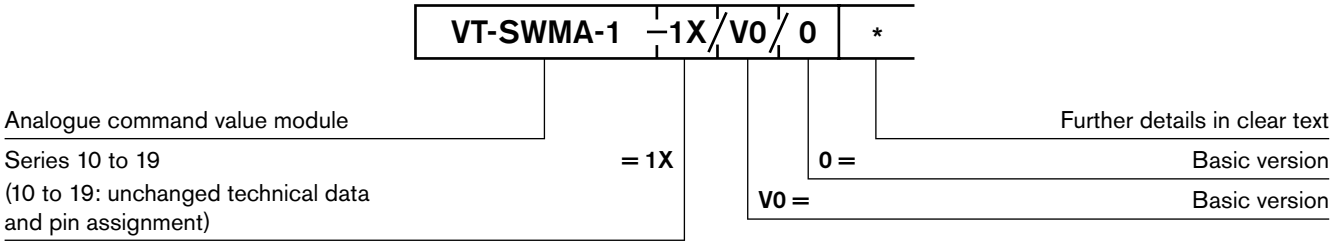
H5999

Table of contents

Features

- Suitable for controlling valves with integral electronics
- Possibility of realising simple hydraulic functions via digital controlling
- Adjustment elements:
  1 potentiometer for zero point adjustment (command value offset)
  1 potentiometer for command value attenuation (for differential input)
  4 potentiometers for command value preselection
  5 potentiometers for ramp time adjustment
- LED lamps: Command value call-up (4 x)
  Active ramp time (4 x)
  Quadrant recognition
  Polarity reversal
  Power
- Measuring sockets for command value and ramp time
- Differential input
- 4 call-up possibilities each for command value and ramp time
- Ramp generator with 5 ramp times; 4-quadrant recognition
- Control signal output
- Power supply unit without raised zero point
- Without power part

Ordering code



Functional description

General

The command value module is to be snapped onto top hat rails to EN 60715. The electrical connection is made using screw-type terminals. The module is operated with 24V DC voltage. A power supply unit [1] provides the internally required positive and negative supply voltages. The green LED (power) lights up as soon as the power supply unit is in operation.

Internal command value

The internal command value is generated from the external command value signal applied to differential input [2], a called up signal and an offset signal (zero point potentiometer “Z“ [3]).

The external command value signal can be changed from 0 % to approx. 110 % by means of potentiometer “G“ (amplitude attenuator [4]).

Command value call-ups

Call-up signals w1 to w4 [5] can also be adjusted between 0 % and 110 %. Call-up signals w1 and w2 have a positive, call-up signals w3 and w4 a negative polarity. This allows the realisation of two forward and two reverse movements of the hydraulic drive without requiring any additional circuitry. For applications that require more than two signals of the same polarity, command value inversion is provided [6]. If this is activated, for example, together with call-up 3, call-up signal w3 also provides a positive control variable.

Only 1 call-up is possible at a time. If several call-ups are activated simultaneously, the following is valid: Call-up “1“ has the lowest priority, call-up “4“ has the highest priority [7].

Quadrant recognition

When quadrant recognition [8] is activated, the electronics automatically recognises the polarity [9] and any changes (up/down) [10] in the control variable and assigns a ramp time to the current signal state.

Ramp time	Polarity of-control output	Signal changes in direction of…	
t1	+	Maximalwert	0 % → Maximum value (+)
t2	+	0 %	Maximum value (+) → 0 %
t3	–	Maximalwert	0 % → Maximum value (–)
t4	–	0 %	Maximum value (–) → 0 %

As long as the signal is being changed, the LED assigned to the current ramp is alight.

Ramp time call-ups [11]

When quadrant recognition is not activated, a separate ramp time “t1” to “t4” is assigned to each command value call-up “w1” to “w4”.

As long as a signal is being changed, the LED assigned to the current ramp time is alight.

Ramp time “t5“ [12]

If neither quadrant recognition nor a call-up is activated, ramp time “t5” is always valid. This ramp time can be used, among others, for an emergency stop function. The valve can be closed with the defined ramp time “t5“.

Ramp time adjustment

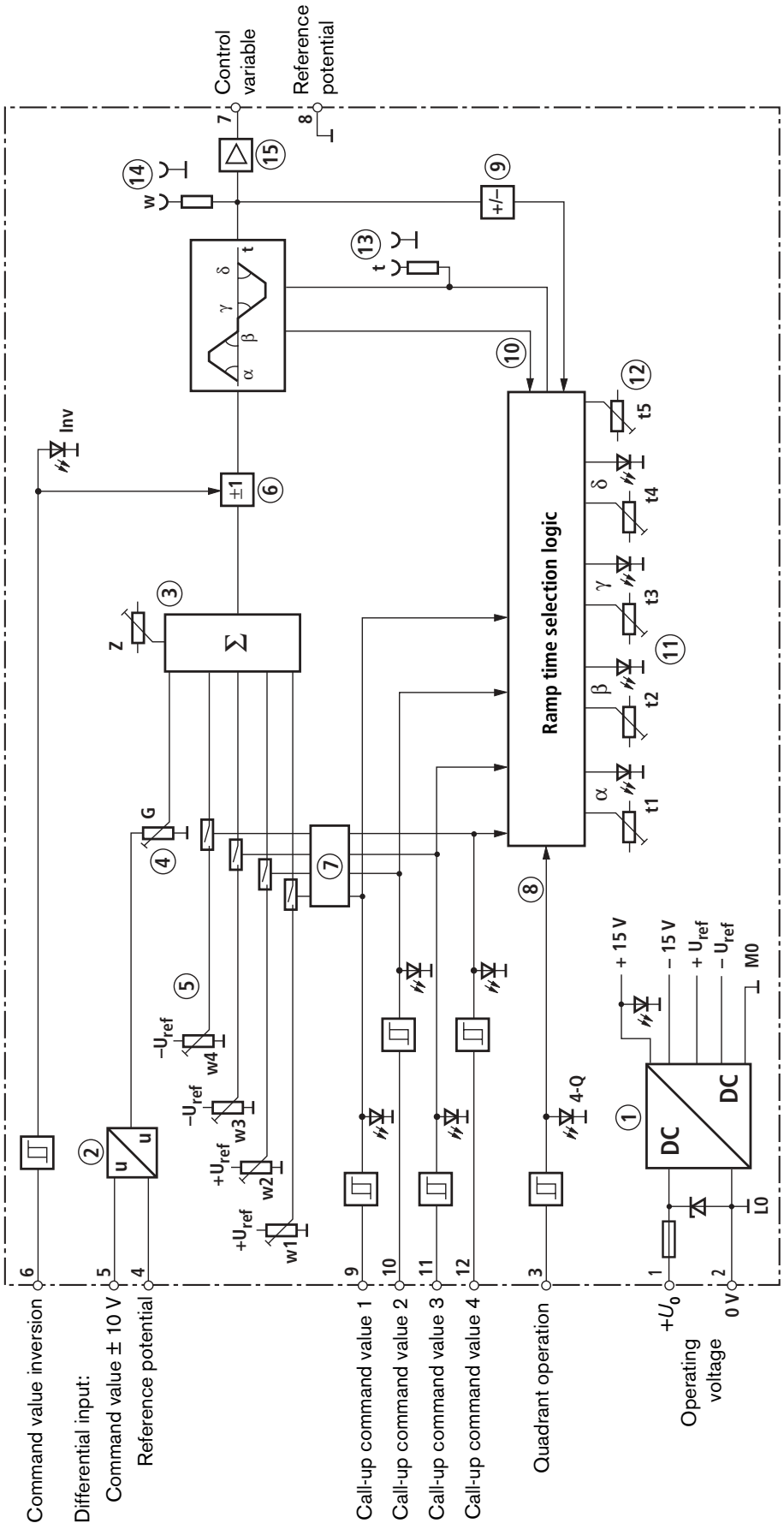
The current ramp time can be checked at measuring socket “t“ [13]. Ramp times “t1” to “t4” can be adjusted with the help of the ramp time potentiometers. Through activation of a call-up signal, ramp time signal “t” at the measuring socket is clearly assigned to one of the ramp times t1 to t4. t5 is assigned to the ramp time signal at the measuring socket, if neither a call-up nor quadrant recognition is activated. The adjustment range of the ramp time is selected so that these can be set reproducibly (for details, see “Technical data”).

Output

The output signal of the ramp generator can be checked at measuring socket “w“ [14]. The downstream matching amplifier [15] provides the control signal for the valve via output “control variable” [16].

[ ] = Cross-reference to block circuit diagram on page 3

Block circuit diagram / pin assignment



1 Power supply unit
2 Differential amplifier
3 Summator with zero point potentiometer
4 Amplitude attenuator
5 Call-up signals
6 Command value inversion
7 Priority logic
8 Quadrant recognition
9 Polarity recognition
10 Recognition of changes in the contol variable (up/down)
11 Ramp time call-ups
12 Ramp time potentiometer “t5“
13 Measuring socket “ramp time signal“
14 Measuring socket “internal command value“
15 Matching amplifier

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

Operating voltage	U_o	24 VDC +40 % −10 %
Operating range:		
– Upper limit value	$u_o(t)_{max}$	35 V
– Lower limit value	$u_o(t)_{min}$	18 V
Power consumption	P_S	12 VA
Current consumption	I_{max}	0.5 A
Fuse		Thermal overload protection (reactivation when temperature falls below threshold)
Inputs		
– Command value (differential input with attenuator)	U_i	0 to ±10 V; $R_i > 50$ kΩ
– Quadrant operation “4-Q“		
• active	$U_{4\text{-}Q}$	8.5 V to 35 V; $R_i > 50$ kΩ
• inactive	$U_{4\text{-}Q}$	0 to 6.5 V
– Command value inversion “Inv“		
• active	U_{Inv}	8.5 V to 35 V; $R_i > 50$ kΩ
• inactive	U_{Inv}	0 to 6.5 V
– Command value call-ups 1 to 4		
• active	U	8.5 V to 35 V; $R_i > 50$ kΩ
• inactive	U	0 to 6.5 V
Adjustment ranges:		
– Zero balancing (potentiometer “Z“)		±30 %
– Amplitude attenuator (potentiometer “G“)		0 % to ca. 110 %
– Command values (potentiometers “w1“ to “w4“)		0 % to ca. 110 % (factory setting 100 %)
– Ramp times (potentiometers “t1“ to “t5“)		20 ms to 5 s
Outputs:		
– Control variable	U	0 to ±10 V; ±2 mA; $R_L > 5$ kΩ
– Measuring socket for control variable “w“	U_w	0 to ±10 V (+100 % = +10 V; −100 % = −10 V)
– Measuring socket for ramp time “t“	U_t	0,01 V to +10 V 0,01 V(t_{max} = ca. 10 s); 10 V(t_{min} = ca. 10 ms)
Type of connection		12 screw terminals
Type of mounting		Top hat rail TH 35/7.5 to EN 60715
Type of protection		IP 20 to EN 60529
Dimensions (W x H x D)		40 x 79 x 85,5 mm
Permissible operating temperature range	ϑ	0 to +50 °C
Storage temperature range	ϑ	−25 to +85 °C
Weight	m	0.3 kg

Note:
For details regarding **environment simulation tests** in the field of EMC (electro-magnetic compatibility), climate and mechanical stress, see RE 29902-U (declaration on environmental compatibility).

Note on the adjustment and measurement of the ramp time
For adjusting the ramp time potentiometers we recommend that 4-quadrant recognition be switched off and call-ups be activated.

Value at measuring socket "t"	U_t in V	5	3	2	1	0,5	0,3	0,2	0,1	0,05	0,03	0,02
Current ramp time (± 20 %)	t in ms	20	33	50	100	200	333	500	1000	2000	3333	5000

The following is valid: $t = \frac{100\ \text{V ms}}{U_t}$

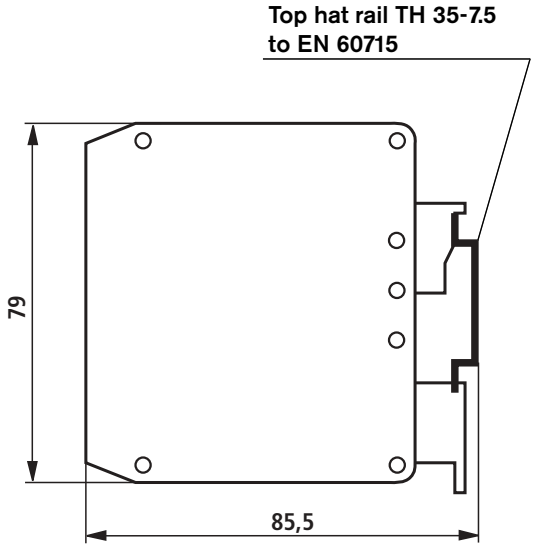
Example: Measured $U_t = 5$ V

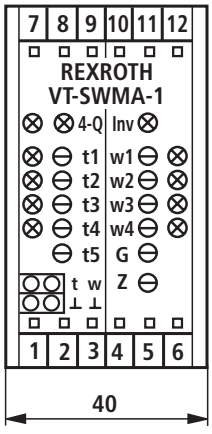
Results in $t = \frac{100\ \text{V ms}}{5\ \text{V}} = 20$ ms

Terminal assignment

Operating voltage	$+U_0$	1	7	Control variable output
	0 V	2	8	Reference potential
Quadrant operation	$+U_{4\text{-}Q}$	3	9	Call-up command value 1
Differential input	Reference potential	4	10	Call-up command value 2
	$\pm U_{comm}$	5	11	Call-up command value 3
Command value inversion	$+U_{Inv}$	6	12	Call-up command value 4

Unit dimensions (Dimensions in mm)





Potentiometers (some with LED lamps):
"t1" to "t5" → Ramp times
"w1" to "w4" → Command value call-ups
"G" → Amplitude attenuator for differential input
"Z" → Zero point balancing

LED lamps:
"4-Q" → Quadrant recognition
"Inv" → Inversion active
green → Ready for operation "power" (no lettering)

Measuring sockets:
"t" → Current ramp time
"w" → Internal control variable
"⊥" → Reference potential / ground

Engineering / maintenance notes / supplementary information

- The amplifier module may only be unplugged when disconnected from the power supply!
- Ensure a sufficient distance to aerial lines, radio sources and radar equipment (>> 1 m)!
- Shield command value lines, do **not** lay near power cables!
- **Caution:** When the **differential input** is used, **both inputs** must be activated or deactivated **simultaneously**!

  Note: Electrical signals (e.g. control variable) brought out via control electronics must not be used for switching safety-relevant machines functions!
  (See also the European standard “Safety requirements for fluid power systems and components – hydraulics”, EN 982)