



Test and service case  
VT-PPV-1-1X/V0/O

Operating instructions

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# 1 Presentation of the test and service case

## 1.1 Possible use

**Intended use** The VT-PPV-1-1X/V0/O test and service case is a test device with the help of which you can test the functions and features of hydraulic proportional valves and their control electronics.

You can use the test and service case for:

- commissioning machines and plants
- maintenance work
- troubleshooting and repair work
- commissioning and presetting of control electronics

**The use of the test case during normal operation of a system is prohibited!**

Different connection options of the case allow you to connect various types of control electronics to the case:

- Amplifiers and command value cards in Euro-card format
- Amplifiers of modular design
- Proportional valves with integral electronics\*

**Note:** You must not plug or connect more than 1 electronic card or system. Several electronics plugged or connected at the same time can destroy each other.

The designations (types) of control electronics that you can test with the help of the test case can be found in the tables in chapter 1.2 on page 6.

\*) Control possible via separate cable (not included in the scope of supply!) – connecting cable with open ends is included.

**Functions of the test and service case**

Depending on the functions and features of the connected electronics you can utilize the following functions of the case:

- Adjustment and preselection of command values
- Measurement of command and actual voltages
- Measurement of solenoid currents
- Test of call-up functions of connected electronics
- Adjustment and measurement of ramp times
- Switching and testing of relays and analog switches installed on amplifier cards
- Check of 24V outputs of the electronics with the help of LEDs

In addition, the case can be used for taking external (= independent of the test set-up) DC voltage measurements up to 100 V.

**EMC Directive/  
Low-Voltage Directive**

The test and service case meets the requirements of the EMC Directive (89/336/EEC = directive on electromagnetic compatibility) and the requirements of the Low-Voltage Directive (73/23/EEG and its amendments).

In this context, the notes from chapter 5.1 and chapter have to be observed.

## 1.2 Overview of types of electronics, functions and features that can be tested

The table below lists all the control electronics that can be connected to the test and service case. The functions and features that can be adjusted (preselected) and/or tested with the help of the case are given for each electronic system.

Functions/ features		VT 2000	VT 2010	VT 2013	VT 2023	VT 3000	VT 3006	VT 3013	VT 3014	VT 3017	VT 3018	VT 3024	VT 5001	VT 5002	VT 5003	VT 5004	VT 5005
Differential input	0 - +10 V	X	X	X	X								X	X	X	X	X
	0 - +10 V/4 - 20 mA *)																
	0 - ±10 V					X	X	X	X	X	X	X					
	0 - ±10 V/4 - 20 mA *)																
Current input	4 – 20 mA																
4 command value call-ups						X	X	X	X	X	X						X
6 command value call-ups																	
Command value pre-selection	0 - 6 V												X	X	X	X	
	0 - ±6 V					X	X	X	X	X	X	X					
	0 - 9 V	X	X	X	X								X	X	X	X	
	0 - ±9 V																
Command value inversion						X	X	X	X	X	X						X
4 ramp call-ups																	
Quadrant operation																	
Relay call-ups 1 to 4						X	X	X	X	X	X						X
External enable						X	X	X	X	X	X	X					
Ramp OFF External		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Command value output		X	X	X	X								X	X	X	X	X
Actual value output		X	X	X	X								X	X	X	X	X
"Ready for operation" output (24 V)																	
Ramp ready (24 V)																	
"Output stages OFF" output (24 V)																	
Actual value monitoring output (24 V)																	
External error output																	
Signal output 1																	
Signal output 2																	
Output + 10 V external																	
Output - 10 V external																	
Solenoid current	Solenoid A	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Solenoid B					X	X	X	X	X	X	X					

\*) can be switched via the electronics

## 1 Presentation of the test and service case

Functions/ features		VT 5006	VT 5007	VT 5008	VT 5010	VT 5011	VT 5012	VT 5013	VT 5014	VT 5015	VT 5016	VT 5017	VT 5018	VT 5020	VT 5021	VT 5022	VT 5023
Differential input	0 - +10 V					X	X	X	X	X	X	X	X	X	X	X	X
	0 - +10 V/4 - 20mA *)																
	0 - ±10 V	X	X	X													
	0 - ±10 V/4 - 20 mA *)																
Current input	4 – 20 mA																
4 command value call-ups		X	X	X													
6 command value call-ups																	
Command value pre-selection	0 - 6 V				X	X	X	X	X	X	X	X	X	X	X	X	X
	0 - ±6 V																
	0 - 9 V				X	X	X	X	X	X	X	X	X	X	X	X	X
	0 - ±9 V																
Command value inversion		X	X	X													
4 ramp call-ups																	
Quadrant operation																	
Relay call-ups 1 to 4		X	X	X													
External enable																	
Ramp OFF External		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Command value output		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Actual value output		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
"Ready for operation" output (24 V)																	
Ramp ready (24 V)																	
"n Output stages OFF" output (24 V)																	
Actual value monitoring output (24 V)																	
External error output																	
Signal output 1																	
Signal output 2																	
Output + 10 V external																	
Output - 10 V external																	
Solenoid current	Solenoid A	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Solenoid B	X	X	X													

\*) can be switched via the electronics

Functions/ features		VT 5024	VT 5025	VT 5032	VT 5033	VT 5034	VT 5035	VT 5036	VT 5037	VT 5062	VT 5063	VT 5064	VT 5065	VT 5066	VT-SWKA	VT-SWKD
Differential input	0 - +10 V			X	X	X	X	X	X	X	X	X	X	X		
	0 - +10 V/4 - 20 mA *)															
	0 - ±10 V	X	X												X	X
	0 - ±10 V/4 - 20 mA *)															
Current input	4 – 20 mA		X	X	X	X	X	X	X	X	X	X	X	X		
4 command value call-ups							X								X	
6 command value call-ups																X
Command value pre-selection	0 - 6 V			X	X	X		X	X	X	X	X	X			
	0 - ±6 V															
	0 - 9 V			X	X	X		X	X	X	X	X	X	X		
	0 - ±9 V						X									
Command value inversion							X								X	
4 ramp call-ups															X	
Quadrant operation															X	
Relay call-ups 1 to 4							X									
External enable		X	X				X		X	X	X	X	X		X	X
Ramp OFF External		X	X	X	X	X	X									X
Command value output		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Actual value output		X	X	X	X	X	X	X	X	X	X	X	X	X		X
"Ready for operation" output (24 V)															X	X
Ramp ready (24 V)															X	X
"Output stages OFF" output (24 V)																
Actual value monitoring output (24 V)																
External error output																X
Signal output 1																X
Signal output 2																X
Output + 10 V external															X	X
Output - 10 V external															X	X
Solenoid current	Solenoid A	X	X	X	X	X	X	X	X	X	X	X	X	X		
	Solenoid B	X	X				X									

\*) can be switched via the electronics

## 1 Presentation of the test and service case

Functions features		VT-VRPA1-5x (32-pin)	VT-VRPA1-5x (48-pin)	VT-VRPA2	VT-VRPD	VT-VSPA1-1 (32-pin)	VT-VSPA1-1 (48-pin)	VT-VSPA2-1 (32-pin)	VT-VSPA2-1 (48-pin)	VT-VSPA2-5x (32-pin)	VT-VSPA2-5x (48-pin)	VT-VSPD	Amplifier of modular design	Valves with integral electronics <small>Control possible via separate cable (not included in the scope of supply!) – connecting cable with open ends is included.</small>
Differential input	0 - +10 V *)		X				X						X	X
	0 - +10 V/4 - 20 mA *)	X			X	X						X		
	0 - ±10 V			X					X		X		X	X
	0 - ±10 V/4 - 20 mA *)							X		X				
Current input	4 – 20 mA		X	X					X		X			
4 command value call-ups				X				X	X	X	X			
6 command value call-ups					X							X		
Command value pre-selection	0 - 6 V / 0 - ±6 V	X						X		X				
	0 - 9 V / 0 - ±9 V	X				X				X				
Command value inversion				X				X	X	X	X			
4 ramp call-ups				X					X		X			
Quadrant operation				X					X		X			
Relay call-ups 1 - 4								X		X				
External enable		X	X	X	X			X	X	X	X	X	X	X
Ramp OFF External		X	X		X	X	X	X	X	X	X	X		
Command value output		X	X		X	X	X					X		
Actual value output		X	X		X	X	X					X		
"Ready for operation" output (24 V)				X	X	X	X					X		
Ramp ready (24 V)				X	X							X		
"Output stages OFF" output (24 V)				X			?		?					
Actual value monitoring output (24 V)				X			?		?					
External error output					X							X		
Signal output 1					X							X		
Signal output 2					X							X		
Output + 10 V external				X	X							X		
Output - 10 V external				X	X							X		
Solenoid current	Solenoid A	X	X	X	X	X	X	X	X	X	X		X	X
	Solenoid B			X	X			X	X	X	X		X	X

\*) can be switched via the electronics

? in preparation

### 1.3 Case layout

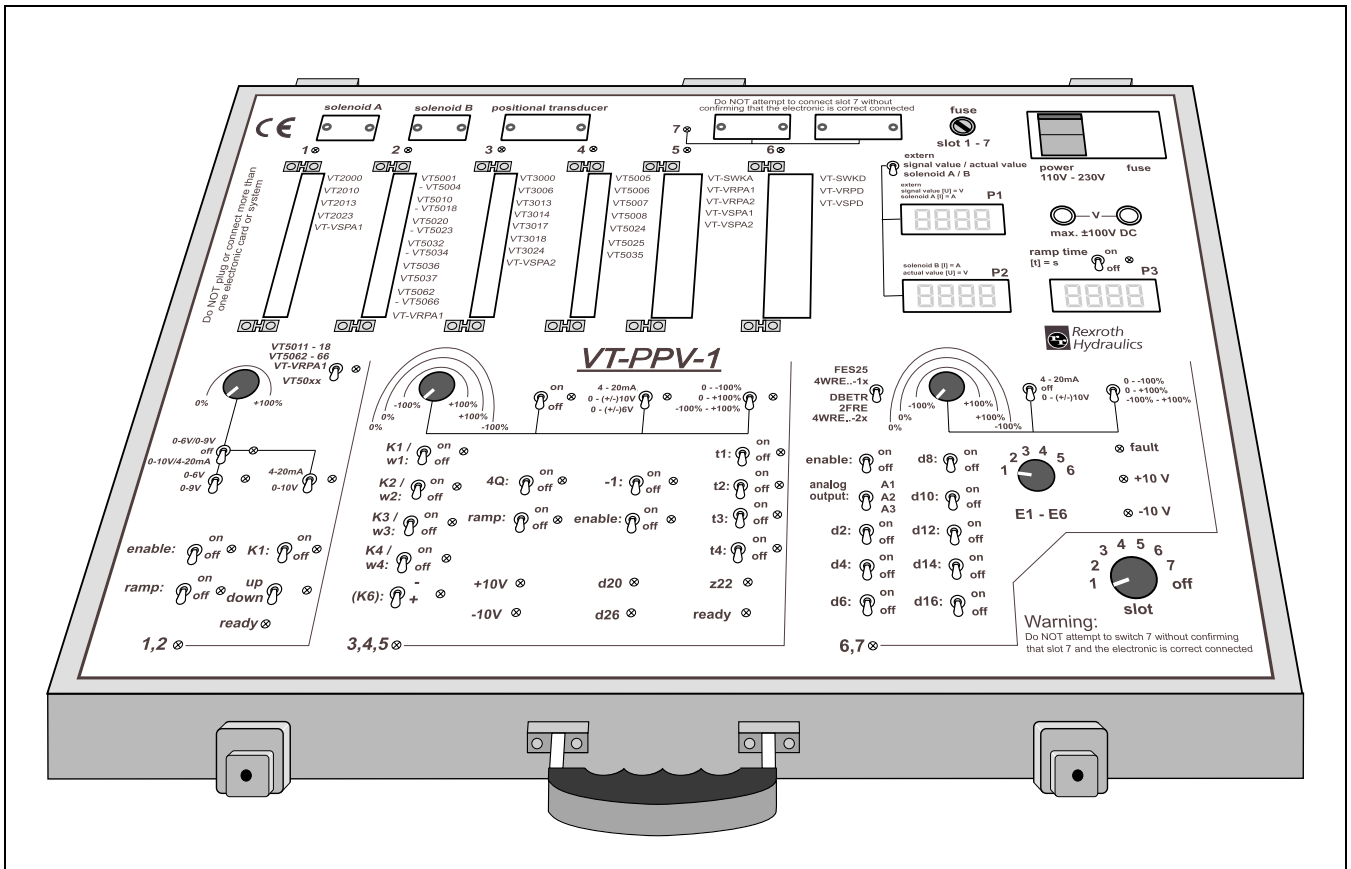


Fig. 1.1: VT-PPV-1-1X/V0/0 test and service case

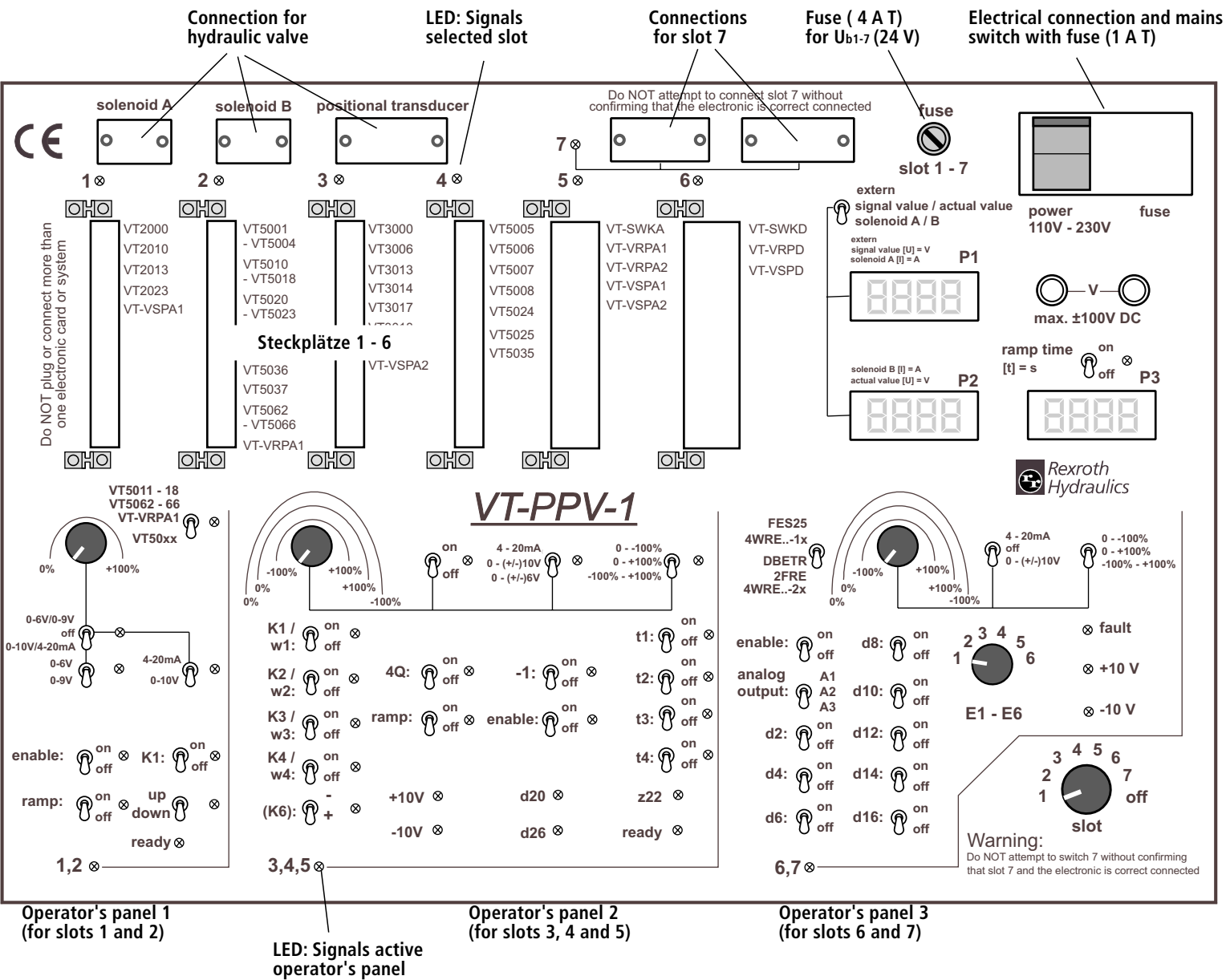


Fig. 1.2: Front panel

## 1.4 Accessories

### Accessories (included in the scope of supply)

- 2 x "VT-PPV 2-pin cable set for solenoid"; mat. no.: 899764
- 1 x "VT-PPV 3-pin cable set for position transducer"; mat. no.: 899765
- 1 x "VT-PPV 4-pin cable set for position transducer; mat. no.: 899766
- 1 x "VT-PPV 4-pin cable set for connection to slot 7"; mat. no.: 899767
- 1 x "VT-PPV 5-pin cable set for connection to slot 7"; mat. no.: 899768
- 2 measuring cables (red and black) laboratory plugs (4 mm → 2 mm)
- 1 power supply cable
- 1 screw driver
- Spare fuses

### Accessories (not included in the scope of supply)

- 1 x "VT-PPV cable set to slot 7 ±10 mA-adapter" mat. no.: 733785

## 2 Block circuit diagrams

A general overview and block circuit diagrams for the individual operator's panels and the associated slots are shown on the following pages.

## 2.1 Overview

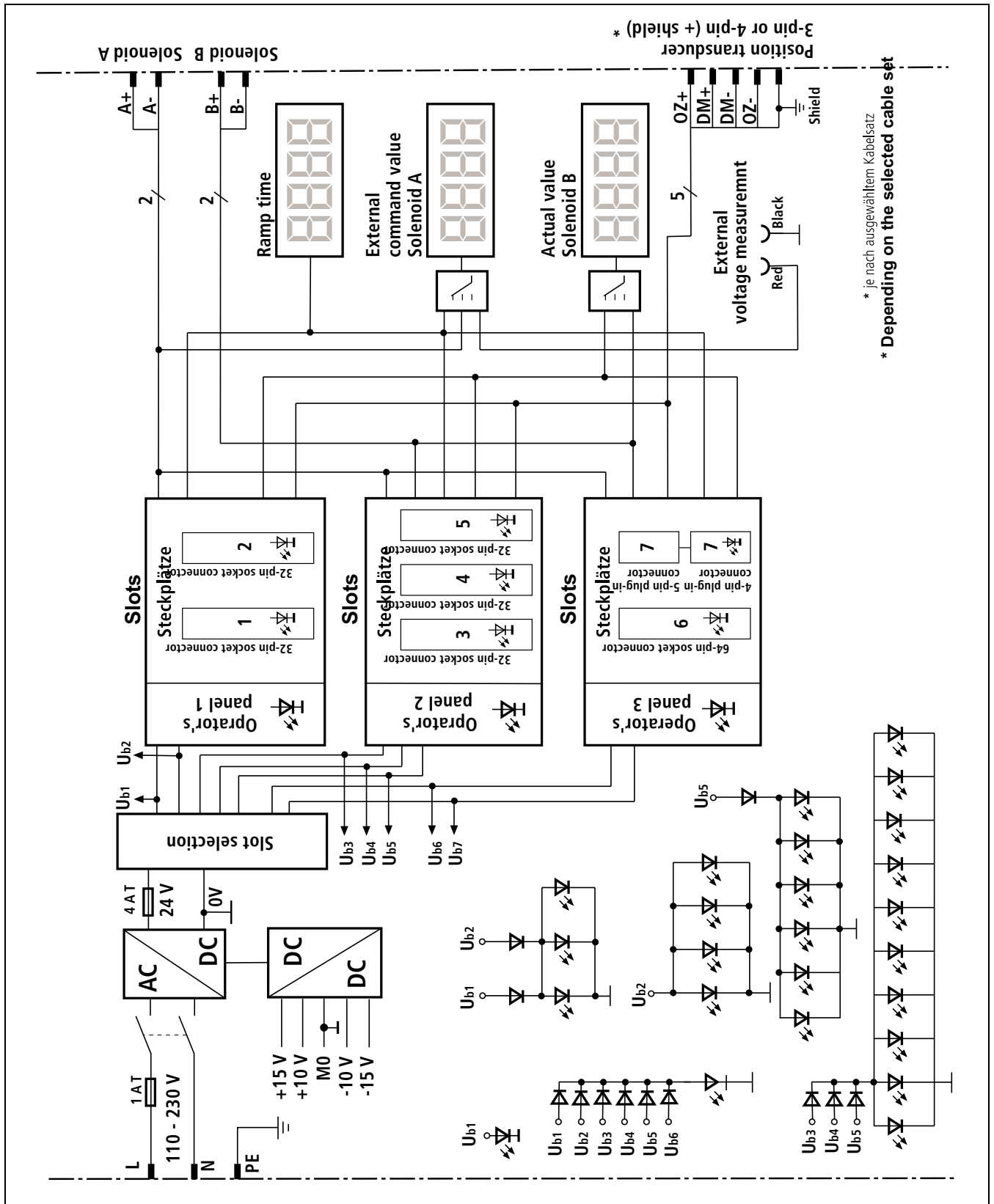


Fig. 2.1: Block circuit diagram of the test and service case (overview)

2.2 Operator's panel 1

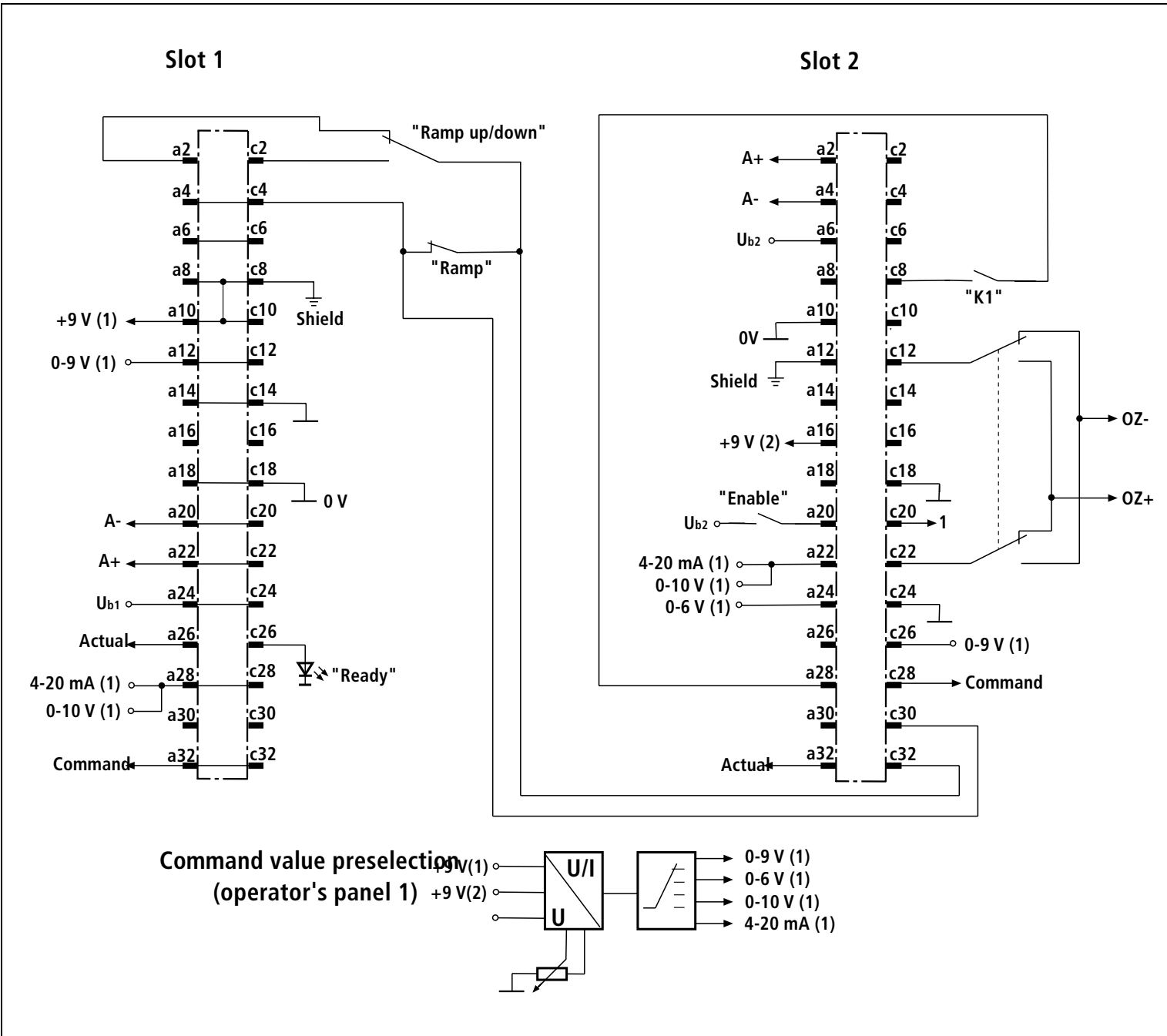


Fig. 2.2: Block circuit diagram of operator's panel 1

### 2.3 Operator's panel 2

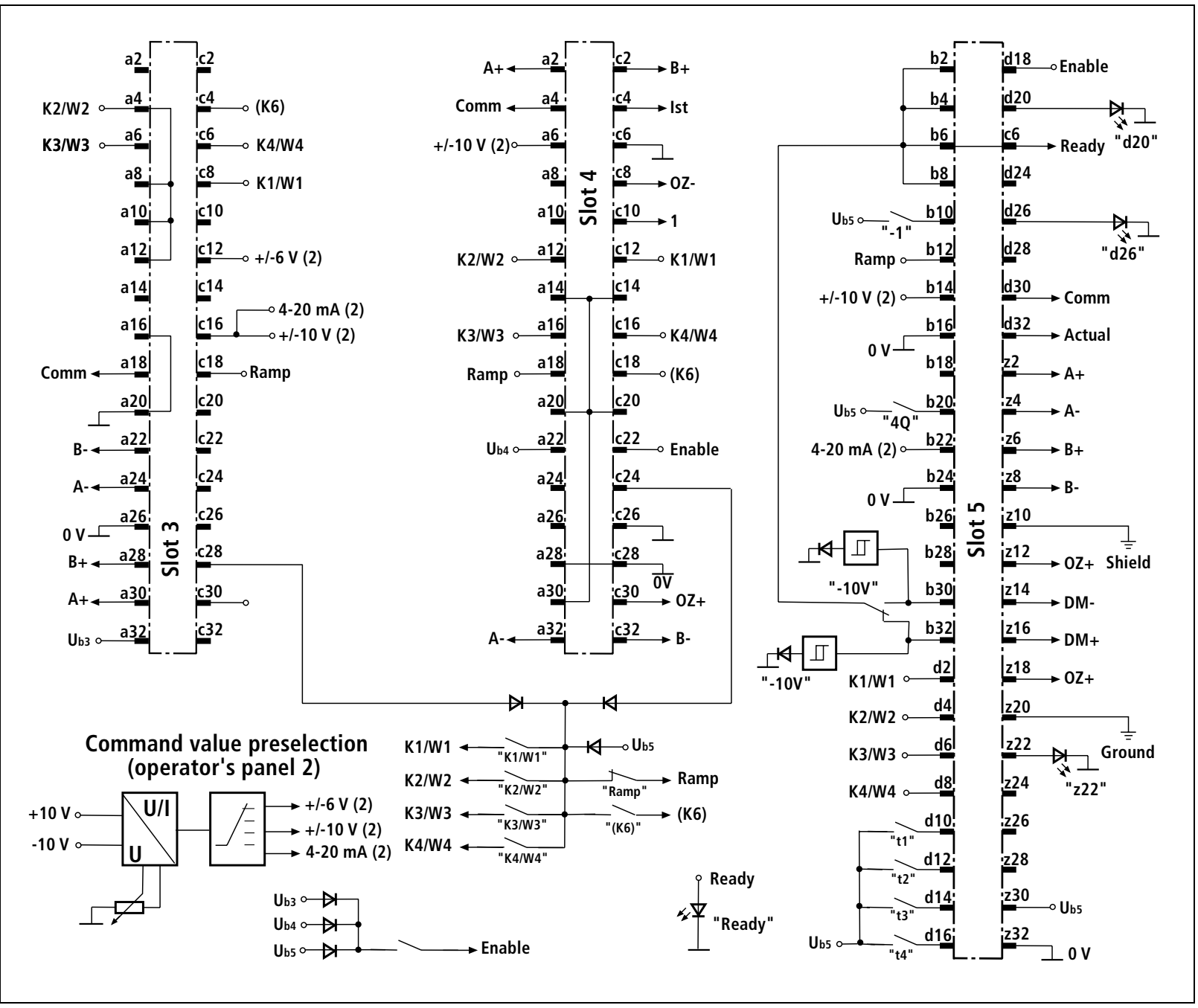


Fig. 2.3: Block circuit diagram of operator's panel 2

2.4 Operator's panel 3

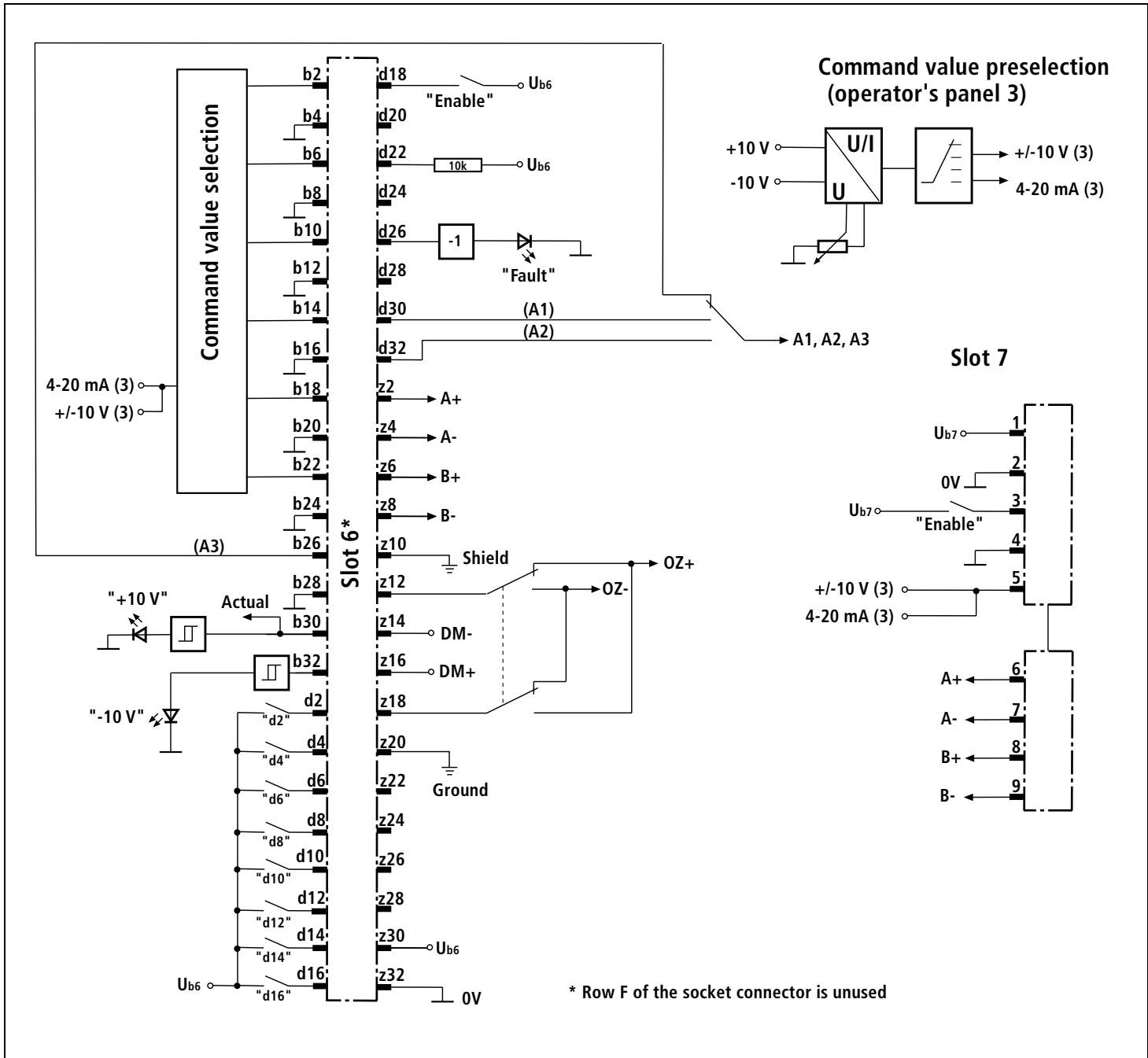


Fig. 2.4: Block circuit diagram of operator's panel 3

### 3 Technical data

#### General data

Designation		Value
Operating voltage	$U_B$	110 – 230 V -15 /+10 %
	$f$	47 - 63 Hz
Max. current consumption	$I$	ca. 0.5 A
Max. power consumption	$P_s$	ca. 55 VA
Fuses	Primary side	1 AT (110 - 230 V)
	Secondary side	4,0 AT (24 V)
Dimensions	Length x width x height	530 mm x 380 mm x 210 mm
Weight	$m$	ca. 10 kg
Permissible operating temperature range	$v$	0 to + 50 °C
Storage temperature range	$v$	- 25 °C to + 85 °C

For details on **environment simulation tests** in the field of EMC (electromagnetic compatibility), climate and mechanical stress, please refer to the "declaration on environmental compatibility" (RE 29687-U).

#### Voltages Slots 1 - 7

Designation		Value	
Supply voltage	$U_{B(1-7)}$	24 V ± 5 %	
Possible command value selections	Operator's panel 1	$U$	0 - +6 V + ca. 10 %* 0 - +9 V + ca. 10 %* 0 - +10 V + ca.10 %
		$I$	4 - 20 mA (ca. 2.5 - 21.5 mA)
	Operator's panel 2	$U$	-6 V - +6 V + ca. 10 %* -10 V - +10 V + ca.10 %
		$I$	4 - 20 mA (ca. 2.5 - 21.5 mA)
	Operator's panel 3	$U$	-10 V - +10 V + ca.10 %
		$I$	4 - 20 mA (ca. 2.5 - 21.5 mA)
Call-ups	Slots 2 - 4	$U$	24 V ± 20 %**
	Slots 6 and 7	$U$	24 V ± 5 %
* Voltages are generated by the electronics output "-9 V/+9 V" (auxiliary voltage output). ** 24 V call-up voltage is picked up by the electronics from the relevant output.			

### 3 Technical data

#### Measuring range

Designation		Measuring range	Tolerance/resolution
Voltage measurement		0 - ± 19.99 V DC	± 2 % ± 10 mV
Current measurement	Indicator	0 - 19.99 A	± 2 % ± 10 mA
	Permissible	0 - ± 3.5 A	± 2 % ± 10 mA
Ramp time measurement		0,01 s - 99.99 s	± 5 % ± 10 ms
External voltage measurement		0 - ± 100 V DC	± 5 % ± 100 mV

#### Connections

Designation	Value
Mains voltage	IEC plug for non-heating apparatus
Solenoid A	2-pin plug-in connector
Solenoid B	2-pin plug-in connector
Inductive position transducer	5-pin plug-in connector (depending on the selection of the supplied cable set for 4-pin or 3-pin position transducer connection)
Slot 1 - 4	32-pin socket connector (form D)
Slot 5	48-pin socket connector (form F)
Slot 6	64-pin socket connector (form G with "Millerspalte")
Slot 7	5-pin plug-in connector
	4-pin plug-in connector (for measuring solenoid currents)
External voltage measurement	4 mm sockets

## 4 Control elements and indicators

The control elements and indicators of the test and service case can be classified as follows:

- Control elements and indicators that have a **higher-level function** (for all slots)
- Control elements and indicators whose function refer to **certain slots only**. These elements are assigned to 3 different operator's panels (operator's panel 1 – operator's panel 3).

4.1 ... with higher-level function

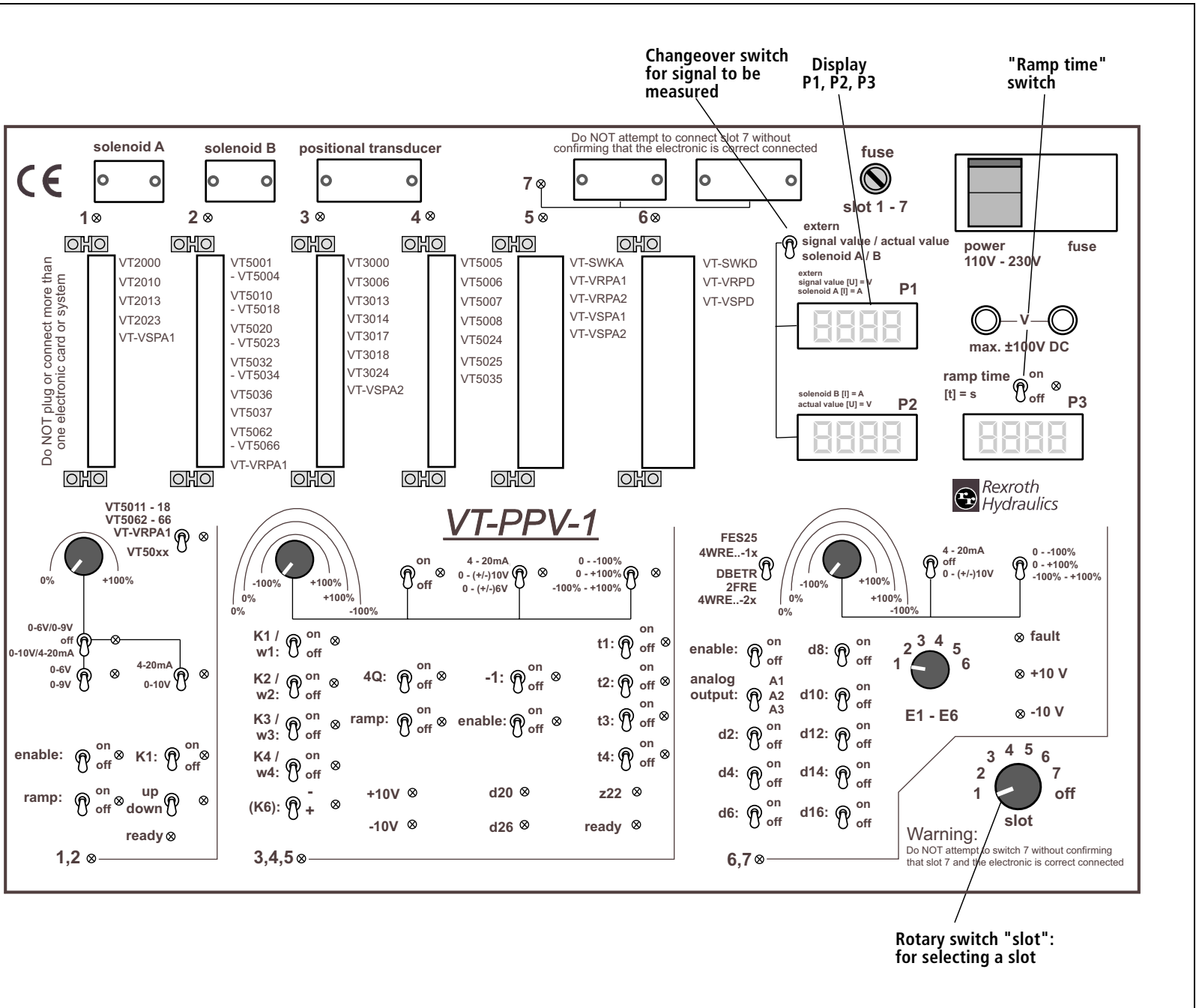


Fig. 4.1: Control elements with higher-level function

**Changeover switch for signal to be measured**

You can use this switch to select the signals that are to be measured and shown on the two digital displays:

- **Solenoid A/B** (solenoid current A/B)

The solenoid currents are measured and displayed as follows:

- Solenoid A: Display P1
- Solenoid B: Display P2

The values are given in Ampere (A).

- **Signal value/actual value** (command value/actual value)

The voltages in the command and actual value output are measured and displayed as follows:

- Command value output: Display P1
- Actual value output: Display P2

The values are given in Volt (V).

- **External**

When the switch is at this position you can use the two 4 mm sockets to measure an external **DC voltage**. The measured values are shown in display P1 (in Volt). At this switch position, measuring device P2 is switched off.

**P1** Depending on the switch position of the measured signal selector switch, this display shows the following measured values:

- **External:** Externally measured DC voltage (in Volt)
- **Signal value:** Voltage at the command value or signal output (in Volt)
- **Solenoid A:** Solenoid current A (in Ampere)

**P2** Depending on the switch position of the measured signal selector switch, this display shows the following measured values:

- **External:** The measuring device is switched off
- **Actual value:** Voltage at the actual value output (in Volt)
- **Solenoid B:** Solenoid current B (in Ampere)

**P3** This display shows the measured ramp time (in seconds).

- Ramp time**
- **on:** The function of the test and service case for measuring the ramp time is ready for operation.
  - **off:** The ramp counter is reset. The ramp time cannot be measured.

The LED installed next to the switch lights up when slots 1 to 6 are selected. For slot 7, the ramp time cannot be measured.

**Rotary switch "slot"** Turn this rotary switch to activate a slot:

- Position "1" – "7": The slot with the relevant number is activated. This means that the functions of the control elements are available for the selected slot.  
  
The LED of the relevant slot is on. The LED of the associated operator's panel is also on.
- Position "OFF": No slot activated.

**Caution! Only turn the switch to slot 7 (= position 7) when you verified that the electronic card or system is correctly plugged into slot 7 and all the required connecting cables are properly connected.**

**Caution! You must not plug or connect more than 1 electronic card or system. Several electronics plugged or connected at the same time can destroy each other.**

## 4.2 ... relating to operator's panel 1

As far as possible, the control elements are explained in the order in which they are arranged on the operator's pane; i.e. from top left to bottom right.

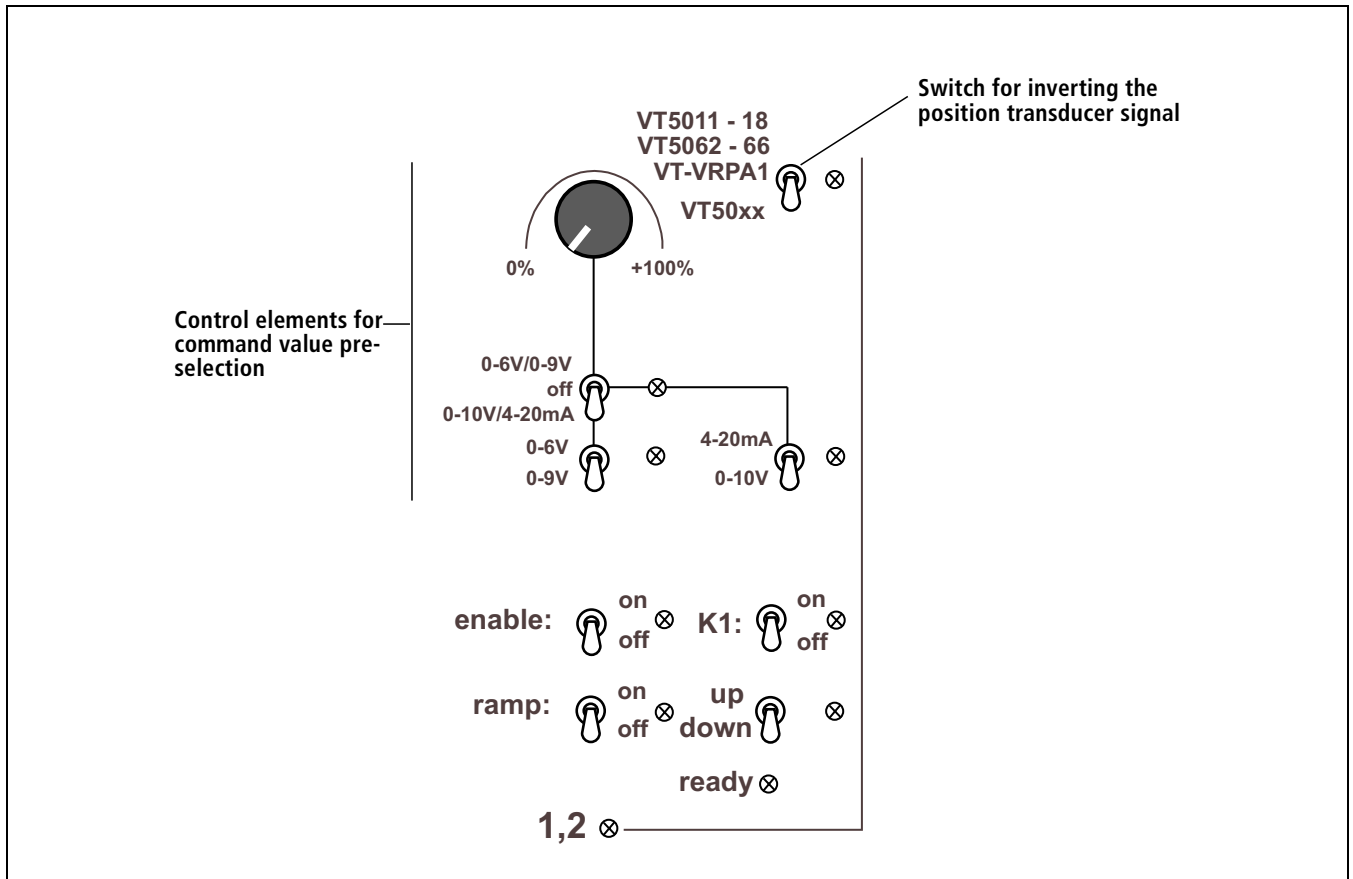


Fig. 4.2: Control and indicator elements on operator's panel 1 (for slots 1 and 2)

### LEDs next to the individual switches

- LED ON → The switch installed next to the LED provides a function for the selected slot. However, the switch is only relevant for the connected electronic card or system, if the latter features the function offered by the test device.
- LED OFF → The switch is irrelevant for the activated slot.

---

## 4 Control elements and indicators

### Inversion of the position transducer signal

With the help of this switch you can invert the input signal of the inductive position transducer.

**Note:** The pin allocation of the position transducer is not identical on all amplifiers for a certain slot and must, therefore, be adapted additionally.

### Control elements for preselecting command values

You can adjust the command value with the help of these control elements:

- Switch "Preselection":
  - **off:** No command value preselection
  - **0-6 V/0-9 V**
  - **0-10 V/4-20 mA**
- Depending on the preselection you have to determine/delimit the command value in more detail:
  - **0-6 V** or **0-9 V**
  - **4-20 mA** or **0-10 V**

- Potentiometer "**0 % to +100 %**":

This regulator can be used to adjust the command value precisely within the limits specified in your preselection.

**enable** External enable:

- **on:** An enable signal is sent to the connected electronic card or system.
- **off:** No enable signal is sent to the connected electronic card or system.

- K1** ■ **on:** The relay/switch on the connected electronic card or system receives a signal and switches.
- **off:** The relay/switch on the connected electronic card or system does not receive a signal.

**ramp** External ramp time OFF function:

- **on:** The ramp function of the connected electronic card or system is activated.
- **off:** The ramp function of the connected electronic card or system is switched off.

- up/down** This switch determines the edge of the ramp that is to be switched off:
- **up:** The "up" ramp is switched off when the "ramp" switch is set to "off" .
  - **down:** The "down" ramp is switched off when the "ramp" switch is set to "off" .

**Note:** For slot 1 you can switch off either the "up" or the "down" ramp, but not both at the same time.

- LED "ready"** Status indicator of the "ready for operation" output (24 V):
- LED ON → A voltage of 24 V is applied to the "ready for operation" output of the connected electronics.  
In this case, the electronics and the case are correctly connected. Now you can carry out tests and take measurements.
  - LED OFF → The connected electronic card or system is not ready for operation.
- LED "1,2"**
- LED ON → Operator's panel 1 for slots 1 and 2 is activated. One LED is assigned to each switch of the selected slot (LED is installed next to the associated switch).
  - LED OFF → Operator's panel 1 is not activated. This means that the control elements on operator's panel 1 have no function.

### 4.3 ... relating to operator's panel 2

As far as possible, the control elements are explained in the order in which they are arranged on the operator's panel; i.e. from top left to bottom right.

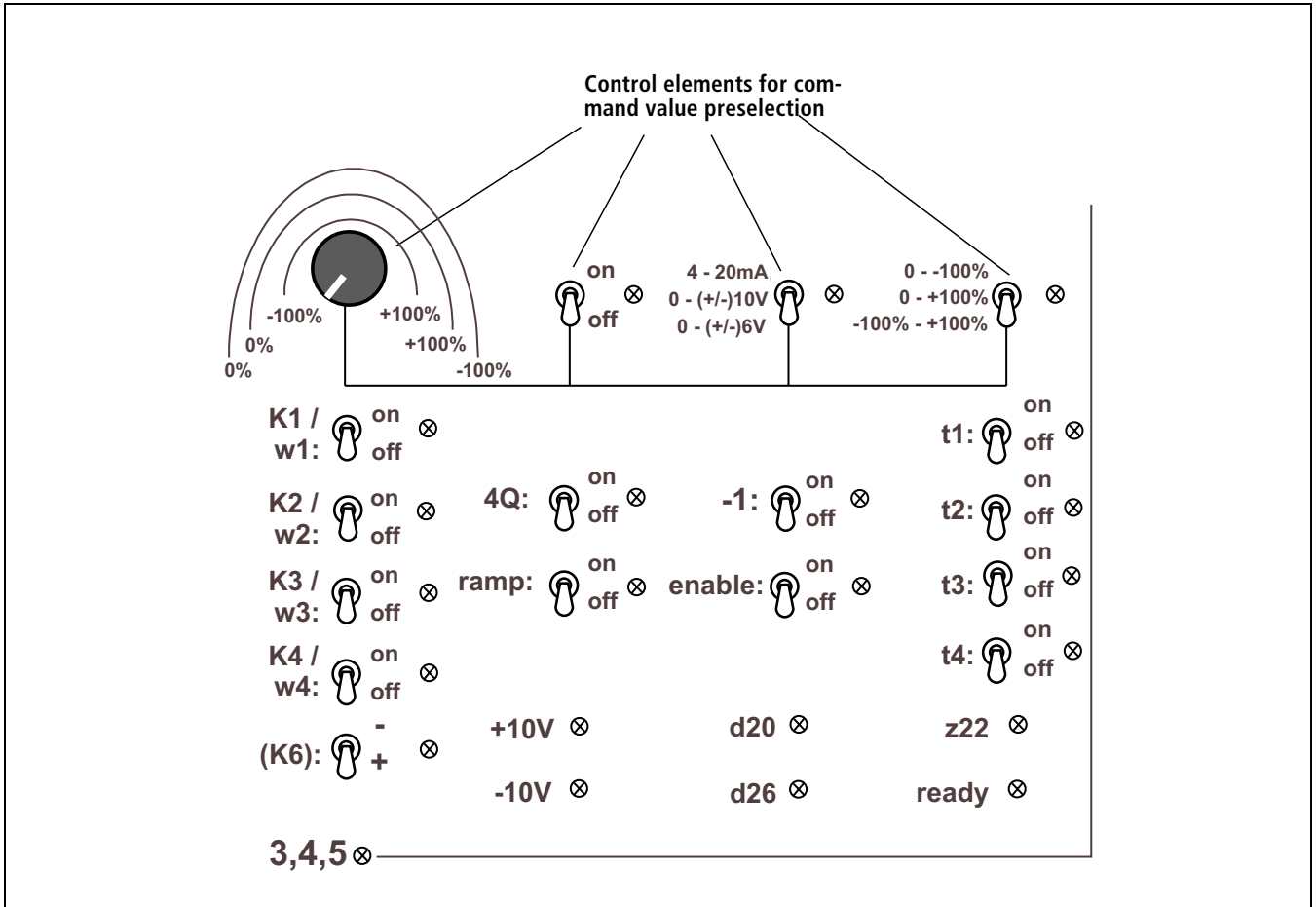


Fig. 4.3: Control and indicator elements on operator's panel 2 (for slots 3, 4 and 5)

**LEDs next to individual switches**

- LED ON → The switch installed next to the LED provides a function for the selected slot. However, the switch is only relevant for the connected electronic card or system, if the latter features the function offered by the test device.
- LED OFF → The switch has no function for the activated slot.

**Control elements for command value preselection**

With the help of these control elements you can adjust the command value:

- Switch "Command value preselection" :
  - **on**: Command value preselection is activated
  - **off**: Command value preselection is deactivated.
- You have to determine/delimit the type of command value using the switch "type of command value" :
  - **4-20 mA**
  - **0-(+/-)10 V**
  - **0-(+/-)6 V**
- The switch "command value range" can be used to determine whether the command value is to be within the positive and/or negative range
  - **0 - -100 %**
  - **0 - +100 %**
  - **-100 % - + 100 %**
- Potentiometer "**0 % to -100 %**", "**0 % to +100 %**", "**100 % to +100 %**":
 

This regulator can be used to adjust the relevant command value precisely within the preselected limits.

**K1/w1 – K4/w4** (Valid only for electronics having the relevant functionality). Depending on the slot, this switch offers the following functions:

- Relay (switch) ON and OFF (slots 3 and 4)
- Command value call-up ON and OFF (slot 5)

Switch positions:

- **on**:
  - **Slots 3 and 4**: The input for switching the associated relay on the connected electronics receives a 24 V input signal. → The relay switches.
  - **Slot 5**: The input of the command value call-up on the connected electronics receives a 24 V input signal.
- **off**: No signal is fed to the relevant inputs of the connected electronics.

**(K6)** Only for electronics having the relevant function:

Depending on the slot and type of the connected electronics, this switch inverts the input voltage of the callable command value inputs (potentiometer inputs) directly or indirectly by means of the following functions:

- Relay for polarity reversal of the  $\pm 9$  V reference voltage output ON and OFF (slots 3 and 4)
- Inversion of the call-up command value input voltage by switching the reference output voltages between +10 V and -10 V (slot 5)

Switch positions:

- -:
  - **Slots 3 and 4:** The input for switching the relevant relay on the connected electronics receives a 24 V input signal. → The relay switches. The reference voltage output whose polarity can be reversed is switched over to -9 V. It is firmly connected to the potentiometer inputs.
  - **Slot 5:** The command value inputs (w1 to w4) and/or potentiometer inputs are connected to the -10 V output.
- +:
  - **Slots 3 and 4:** The relevant relay input of the connected electronics does not receive a signal. The reference voltage output whose polarity can be reversed is switched over to +9 V. It is firmly connected to the potentiometer inputs
  - **Slot 5:** The command value inputs (w1 to w4) and/or potentiometer inputs are connected to the +10 V output.

**4Q** 4-quadrant operation (valid only for electronics that feature this function)

- **on:** The relevant input of the connected electronics receives a 24V input signal, which is used to activate 4-quadrant operation.
- **off:** 4-quadrant operation on the connected electronics is switched off.

**Note:** When 4-quadrant operation is active, the electronics automatically recognize the command value polarity (e.g. positive) and the direction of change of the command value (e.g. "ramp up") and assign a ramp time to the current signal state.

4-quadrant operation has priority over any ramp time call-ups (switches "t1" – "t4").

- 1 External command value inversion (valid only for electronics that feature this function)
  - **on:** The relevant input of the connected electronics receives a 24V input signal. → The set command value is internally inverted on the electronics.
  - **off:** The relevant input of the connected electronics does not receive a signal; hence, the command value is not inverted.
  
- ramp** External ramp time ON/OFF function (valid only for electronics that feature this function)
  - **on:** The ramp function is switched on on the electronics.
  - **off:** The ramp function is switched off on the electronics (i.e. no or minimum ramp time).
  
- enable** External enable (valid only for electronics that feature this function)
  - **on:** The connected electronic card or system receives an enable signal.
  - **off:** The connected electronic card or system receives no enable signal.
  
- t1 - t4** Ramp time call-ups (24 V) 1 – 4 (valid only for electronics that feature this function)
  - **on: The relevant input (1, 2, 3 or 4) of the connected electronic card or system receives a 24 V call-up signal.**
  - **off: The connected electronic card or system receives no call-up signal.**

**Note:** Only when 4-quadrant operation is switched off can a call-up signal (24 V input) be used to call up 4 ramp times. Only 1 call-up is possible at a time. If several call-ups are activated at the same time, call-up " 1 " has lowest priority and call-up " 4 " highest priority.

---

## 4 Control elements and indicators

- LED "ready"** Status indicator of the "ready for operation" output (24 V) (valid only for electronics that feature this function):
- LED ON → A voltage of 24 V is applied to the "ready for operation" output of the connected electronic card or system.  
In this case, the electronic card or system and the case are correctly connected. You can start to carry out tests and take measurements.
  - LED OFF → The connected electronic card or system is not ready for operation.
- LEDs "3, 4, 5"**
- LED ON → Operator's panel 2 for slots 3, 4 and 5 is activated. An LED that is assigned to each of the switches (installed next to the switch) indicates the status of the switch.
  - LED OFF → Operator's panel 2 is not activated. This means that the control elements on operator's panel 2 are operable.
- LED "d20"** LED ON → A voltage of 24 V is applied to output "d20" of the connected electronic card or system.
- A voltage of 24 V is applied to output "z22" of the connected electronic card or system.
- LED "d26"** LED ON → A voltage of 24 V is applied to output "d26" of the connected electronic card or system.
- LED "+10 V"** LED ON → A voltage of +9.5 V to +10.5 V is applied to the "+10 V" output of the connected electronic card or system.
- LED "-10 V"** LED ON → A voltage of -10.5 V to -9.5 V is applied to the "-10 V" output of the connected electronic card or system.

## 4.4 ... relating to operator's panel 3

As far as possible, the operating elements are explained in the order in which they are arranged on the operator's panel; i.e. from top left to bottom right.

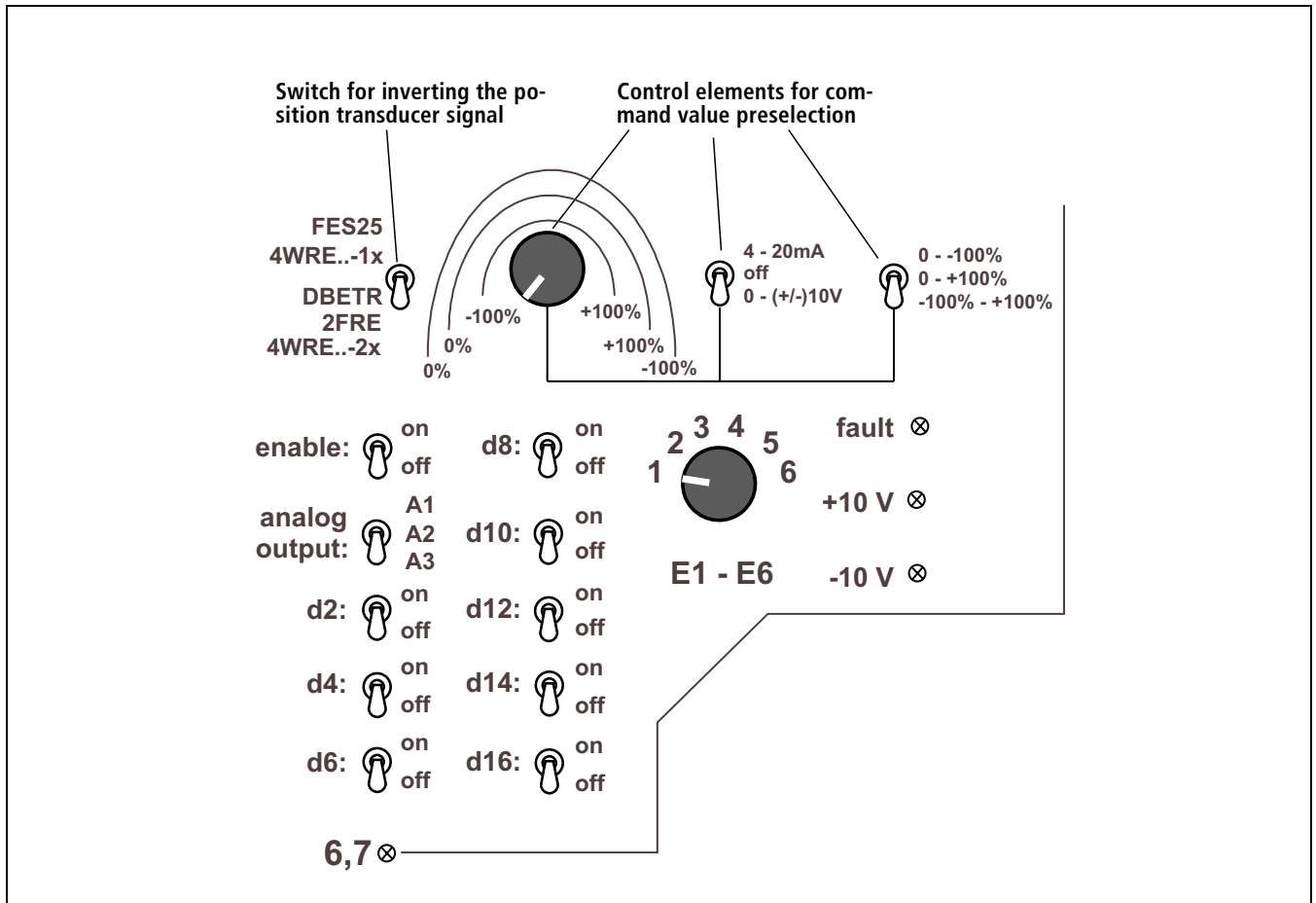


Fig. 4.4: Control and indicator elements on operator's panel 3 (for slots 6 and 7)

### Inversion of the position transducer signal

This switch can be used to invert the signal from the inductive position transducer.

**Note:** The pin assignment of the position transducer is not identical on all amplifiers that can be used in a slot and must, therefore, be adapted additionally.

---

## 4 Control elements and indicators

### Operating elements for command value preselection

You can adjust the command value with the help of the following control elements:

- You have to determine/delimit the type of command value using the "type of command value" switch:
  - **4-20 mA**
  - **off**: command value preselection is switched off.
  - **0-(+/-)10 V**
- Use the "command value range" switch to determine whether the command value is to be within the positive and/or negative range of values:
  - **0 - -100 %**
  - **0 - +100 %**
  - **-100 % - + 100 %**
- Potentiometer "**0 % to 100 %**", "**0 to +100 %**", "**-100 % to +100 %**":

This regulator can be used to adjust the relevant command value precisely within the limit specified in your preselection.

**enable** External enable:

- **on**: The connected electronic card or system receives an enable signal.
- **off**: The connected electronic card or system receives no enable signal.

**analog output** You can use this switch to connect the signal output of the electronics (for slot 6) to measuring device P1:

- **A1**: The voltage in output "**d30**" is indicated on display P1.
- **A2**: The voltage in output "**d32**" is indicated on display P1.
- **A3**: The voltage in output "**d b26**" is indicated on display P1.

**d2 - d16** Digital inputs 24 V

- **on**: A 24 input signal is applied to the relevant input (d2 - d16) of the connected electronic card or system.
- **off**: The input receives no signal.

**E1 - E6** This rotary switch is provided for selecting the command value input (on the connected electronics), to which the set command value signal (to be adjusted with the help of the "control elements for command value preselection") is to be fed.

- LED "6, 7"**
- LED ON → Operator's panel 3 for slots 6 and 7 is active. An LED that is assigned to each switch of the selected slot (LED is installed next to the associated switch) signals the state of this switch.
  - LED OFF → Operator's panel 3 is not activated. This means that the control elements on operator's panel 1 have no function.

**LED "fault"** LED ON → A voltage of 0 V is applied to the "fault" output of the connected electronics. This means that an error has occurred on the electronics.

LED OFF → A voltage of 24 V is applied to the "fault" output of the connected electronics. This means that no error has occurred on the electronics.

**LED "+10 V"** LED ON → A voltage of between +9.5 V and +10.5 V is applied to the "+10 V" output of the connected electronics.

**LED "-10 V"** LED ON → A voltage of between -10.5 V and -9.5 V is applied to the "-10 V" output of the connected electronics.

## 5 How to connect and switch on the test and service case

### 5.1 Safety regulations

**The test and service case may only be connected by trained and qualified specialists in line with generally valid electro-technical rules.**

Please note and observe the following safety regulations:

- Determine the place of use of the case so that:
  - the distance between the case and aerial lines, radio and radar equipment is at least 1 m.
  - the permissible operating temperature range of 0 to 50 °C for the case is not exceeded!
- **Caution! You must always plug or connect only one electronic card or system at a time. Several electronics plugged or connected at the same time can destroy each other.**
- **Never connect an electronic card or system to the wrong slot. This may result in damage to the electronics!**
- **Only connect the case when the power switch of the case is turned to OFF or the case is disconnected from the power supply.**
- For EMC reasons, the connection between the case and a proportional valve must be established using the connecting cable that is included in the scope of supply.
- Never route connecting cables near power cables!
- If you use slot 7, connect the cable sets on the module or the integral electronics\* first, then the cable sets at the case.
- **In order to prevent the risk of personal injury and damage to property due to uncontrolled valve movements, observe the connecting procedure prescribed for the case (see chapter 5.3 on page 45).**

**After having completed the tests/measurements, switch the case off and then disconnect the cables.**

\*) Control possible via separate cable (not included in the scope of supply!) – connecting cable with open ends is included.

**Caution:**

Electrostatic discharge (ESD) may damage components of the test case as well as components of the electronics to be tested. In order to avoid this, please observe the following precautions.

- Assure an equipotential bonding in order to discharge frictional electricity from your body.
- Work in a safe environment. Do not use any devices generating or presenting an electrostatic charging within the working environment. Avoid performing the test setup in environments where the floor or the working surface are made of materials which might generate an electrostatic charging.
- Handle the test case and the electronics with care. Do not touch any accessible connection pins or sensitive components of the electronics.
- Transport and store the test case and the electronics with care. – Use an antistatic bag or an adequate recipient for the electronics.

## 5.2 How to establish connections

- **Follow the steps below to connect the test and service case correctly:**
  - Set the mains switch on the case to **off**.
  - Turn the rotary switch "slot" to **off**.
  - If an electronic card or system is to be tested in conjunction with a valve: Connect the proportional valve to the test and service valve (see also connection examples, see Fig. 5.1 on page 41 and Fig. 5.2 on page 42).



### CAUTION!

When using slot 7: **Risk of short-circuits due to wrong connecting sequence!**

- First connect the cable sets to the module or integral electronics\*.
- Then connect the cable sets to the case.

- 
- Establish the mains connection between the test case and the power supply of the building.
  - Determine the slot for the electronics to be tested (see chapter "Assignment of electronics to slots" from page 39)
  - Plug the electronics into the correct slot.



### CAUTION!

**Several electronics plugged or connected!**

The electronics may destroy each other!

- Always plug or connect only **one** electronic card or system.

- 
- ✓ The case is now correctly connected and can be switched on (for the procedure, see chapter 5.3 on page 45).

\*) Control possible via separate cable (not included in the scope of supply!) – connecting cable with open ends is included.

## Assignment of electronics to slots

Electronics	Slot						
	1 (32-pin socket connector)	2 (32-pin socket connector)	3 (32-pin socket connector)	4 (32-pin socket connector)	5 (48-pin socket connector)	6 (64-pin socket connector with „Miller-spalte“)	7 (4-pin and 5-pin plug-in connector)
VT 2000	X						
VT 2010	X						
VT 2013	X						
VT 2023	X						
VT 3000			X				
VT 3006			X				
VT 3013			X				
VT 3014			X				
VT 3017			X				
VT 3018			X				
VT 3024			X				
VT 5001		X					
VT 5002		X					
VT 5003		X					
VT 5004		X					
VT 5005				X			
VT 5006				X			
VT 5007				X			
VT 5008				X			
VT 5010		X					
VT 5011		X					
VT 5012		X					
VT 5013		X					
VT 5014		X					
VT 5015		X					
VT 5016		X					
VT 5017		X					
VT 5018		X					
VT 5020		X					
VT 5021		X					
VT 5022		X					
VT 5023		X					
VT 5024				X			
VT 5025				X			

## 5 How to connect and switch on the test and service case

Continued on next page

Electronics	Slot						
	1 (32-pin socket connector)	2 (32-pin socket connector)	3 (32-pin socket connector)	4 (32-pin socket connector)	5 (48-pin socket connector)	6 (64-pin socket connector with „Millerspalte“)	7 (4-pin and 5-pin plug-in connector)
VT 5032		X					
VT 5033		X					
VT 5034		X					
VT 5035				X			
VT 5036		X					
VT 5037		X					
VT 5062		X					
VT 5063		X					
VT 5064		X					
VT 5065		X					
VT 5066		X					
VT-SWKA					X		
VT-SWKD						X	
VT-VRPA1		X			X		
VT-VRPA2					X		
VT-VRPD						X	
VT-VSPA1	X				X		
VT-VSPA2			X		X		
VT-VSPD						X	
Amplifier of modular design							X
Valves with integral electronics*							X

\*) Control possible via separate cable (not included in the scope of supply!) – connecting cable with open ends is included.

Connection example of slots 1 - 6

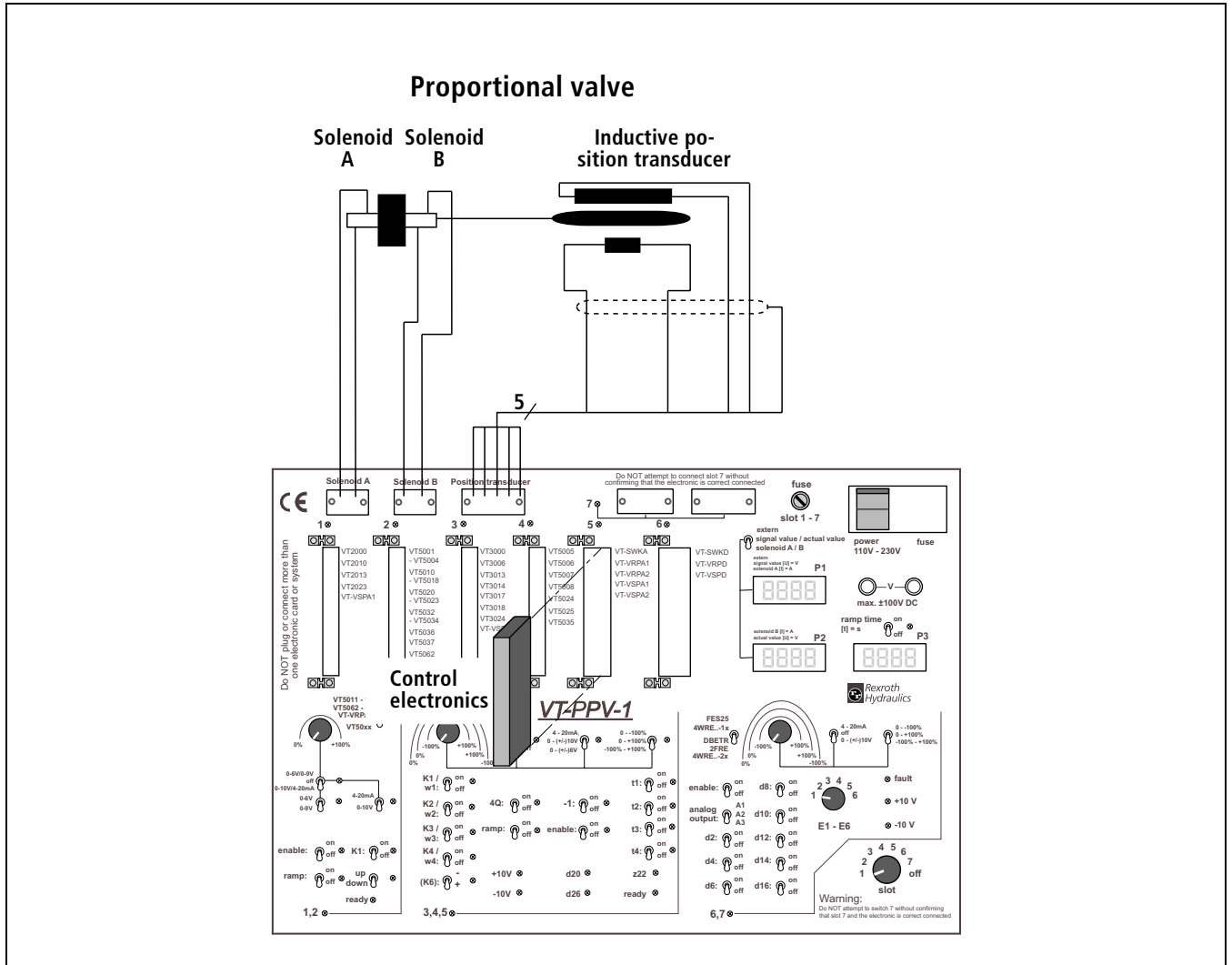


Fig. 5.1: Connection example

5 How to connect and switch on the test and service case

Connection example of slot 7

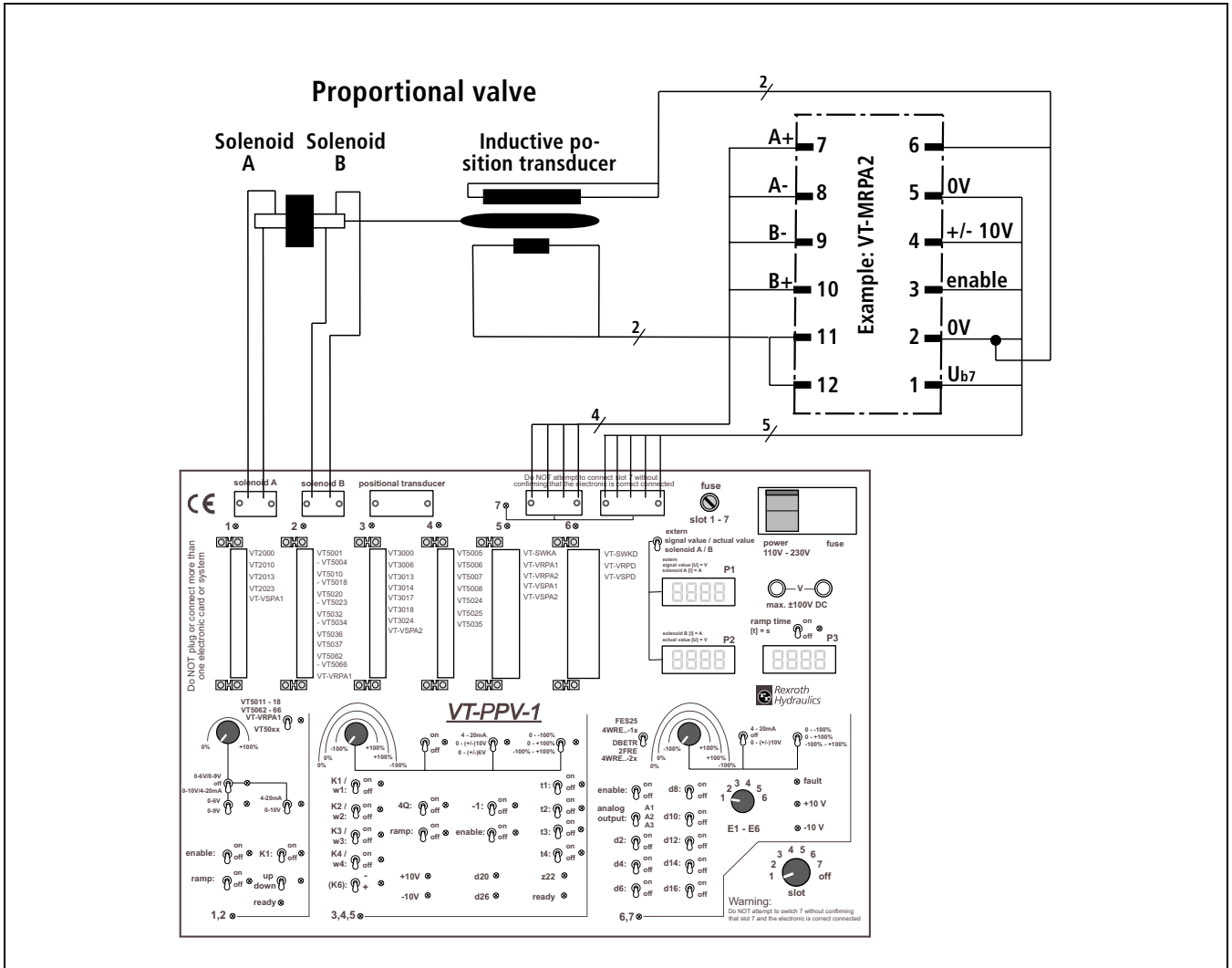


Fig. 5.2: Example of connecting a modular amplifier

The solenoid current can (as shown in the example) be fed via the test and service case to the modular amplifier. However, in this case, the position transducer must be connected directly to the modular amplifier.

**Cable set for slot 7**

Slot 7 is provided with a 5-pin and a 4-pin plug-in connector.

**5-pin connecting cable  
(mat. no. 89768)**

The following signals are transmitted via the 5-pin cable that is included in the scope of supply:

Conductor no. *)	Signal	Description
1	U <sub>b7</sub>	24 V supply voltage
2	0 V	0 V supply voltage
3	Enable	24 V enable signal: can be switched on or off using the "enable" switch on operator's panel 3.
4	Differential input -	Reference point for command value preselection
5	Differential input +	Command value preselection Amount, range and type of the command value can be adjusted using the potentiometer and the associated selector switches (operator's panel 3).

\*) The number of the conductor is printed on the insulation of the individual conductors.

**4-pin connecting cable  
(mat. no. 89767)**

The following signals are transmitted via the 4-pin cable that is included in the scope of supply:

Conductor no. *)	Signal	Description
1	A +	For measuring the solenoid current
2	A -	For measuring the solenoid current
3	B +	For measuring the solenoid current
4	B -	For measuring the solenoid current

\*) The number of the conductor is printed on the insulation of the individual conductors.

**Additional cable set for slot 7 (not included in the scope of supply)**

5-pin connecting cable with integrated adapter,  
mat. no.: 733785

The following signals are transmitted via the 5-pin cable:

Conductor no. *)	Signal	Description		
1	$U_{b7}$	24 V supply voltage		
2	0 V	0 V supply voltage		
3	Enable	24 V enable signal: can be switched on or off using the "enable" switch on operator's panel 3.		
4	Differential input -	Reference point for command value preselection		
5	Differential input +	Command value preselection Amount, range and type of the command value can be adjusted using the potentiometer and the associated selector switches (operator's panel 3), the command value having to be preselected within the range "0 - ± 10 V". Reason:		
		Preselection via operator's panel	Signal at conductor no. 5 (reference: conductor no. 4)	
		+10 V	+10 mA	± +100 %
		0 V or "off"	0 mA	± 0 %
		-10 V	-10 mA	± -100 %
*) The number of the conductor is printed on the insulation of the individual conductors.				

### 5.3 How to switch on the test and service case

**In order to prevent the risk of personal injury and damage to property due to uncontrolled valve movements, observe the connecting procedure given here.**

**Precondition:**

The hydraulic valve is correctly connected to the test and service case.

**-and/or-**

The control electronic card or system is plugged into the correct slot (see also chapter 5.2 on page 38).

- Verify, whether the mains switch is set to **off**; if required, set the mains switch to **off**.
- Verify, whether the rotary switch "slot" is turned to **off**; if required, turn the rotary switch to **off**.
- Set the command value preselection on the active operator's panel to **off**.
- Adjust the command value potentiometer to ca. 0 %.
- Switch on mains switch.
- Turn rotary switch "slot" to the slot (1 - 7) into which the electronic card or system is plugged.



**CAUTION!**

When using slot 7: **Risk of short-circuits due to incorrect connection of components!**

- Before turning rotary switch "slot" to slot 7 (= position 7), check that the electronic card or system is correctly plugged into slot 7 and all the required cables are correctly connected.

- ✓ The LED for the set (selected) slot is ON. The LED on the activated operator's panel is ON.
- ✓ The test and service case is now ready for operation and can be used to carry out tests and take measurements.

## 6 How to carry out tests and take measurements

The procedure for the individual testing work depends to a great extent on the electronics to be tested and the proportional valve used. For this reason, we can describe only the following basic testing procedures:

- Current and voltage measurements
- Ramp time measurements

### 6.1 Safety regulations

**Carrying out tests and taking measurements requires special knowledge of electronics and hydraulics. For this reason, only those specialists are allowed to work with the case who:**

- **know the characteristics and functions of the electronics to be tested**
- **know the characteristics and functions of the connected proportional valve**
- **know the characteristics and functions of the system (machine / plant) in which the proportional valve is installed**
- **have basic knowledge of measuring and control technology**

Read and observe the documentation (technical description, commissioning instructions) which is supplied with the plugged-in control electronics.

Do not take external DC voltage measurements which can reach voltages greater than  $\pm 100$  V.

Make sure that the permissible operating temperature range of 0 to 50 °C is not exceeded at the place of use of the case!

**After having completed the tests/measurements, switch off the case first and then remove the connecting cables.**

**Note:**

- During the operation of the test case, the electronics is in a test and service situation where the installation of the electronics according to EMC regulations is not assured. Emissions above the normal limits are possible, resulting in an interference with neighbouring equipment. External faults may also have an impact on the electronics to be tested. Due to eventual interfering EMC emissions, the test case must not be used **without** connected electronics as soon as solenoid and/or position transducer cables are connected.
- The ESD safety regulations – as described in Chapter 5.1 – must in any case be observed also during operation. Touching the open electronics, electrical cables and contacts may result in unpredictable reactions of the electronics and of the equipment.
- The use of the test case is forbidden, if it may result in faulty reactions or damages, especially personal injury.

## 6.2 How to measure currents and voltages

With the help of the measuring instruments installed in the case you can measure different signals. The measured values are shown on displays P1 and P2.

### General procedure:

Precondition: The test and service case is ready for operation.

- Switch the changeover switch for the signal to be measured to the required signal:
  - External (external DC voltage)
  - Signal value/actual value (command value/actual value)
  - Solenoid A/B (solenoid current A/B)
  -
- ✓ Now, the selected signal is measured and displayed as follows:
  - P1: External DC voltage  
Command value voltage  
Solenoid current of solenoid A
  - P2: Actual value voltage  
Solenoid current of solenoid B

### 6.3 How to measure ramp times

When ramp times are to be measured, the internal command value signal of the electronics to be measured is evaluated. For this measurement a command value preselection – a step-change – is required, for example:

- from % to +100 % or -100 % (ramp “up”) or from
- -100 % or +100 % to 0 % (ramp down)

The following is valid here:

- The measurement “ramp ‘up’” starts at a signal  $> +1\%$  (or  $< -1\%$ ) and ends as soon as the signal reaches  $+100\%$  (or  $-100\%$ ).
- The measurement “ramp ‘down’” starts at a signal  $+100\%$  (or  $-100\%$ ) and ends as soon as the signal reaches  $+1\%$  (or  $-1\%$ ).

#### Proceed as follows:

Precondition: The test and service case is ready for operation.

- Set “Ramp” switch (on the operator’s panel) to **on**.
- Set switch “Ramp time” to **off**.
- ✓ The ramp time is to be reset (display: 00.00).
- Set the command value preselection to **off**.
- Turn the potentiometer for adjusting the command value preselection to  $+100\%$ .
- ✓ The command value inputs of the electronics must be open (corresponds to a command value preselection of  $0\%$ ).
- Check that the internal command value =  $0\%$ ; if required, correct the value on the plugged-in control electronics using the relevant potentiometer until the measuring instrument P1 displays a command value of 00.00 V.
- ✓ The presettings are now complete
- Turn the “Ramp time” switch to position **on**.
- ✓ The equipment for measuring the ramp time is ready for operation.
- Activate the command value preselection: e.g. switch over from **off** to **0-10 V**.
- ✓ Now the ramp time is measured until the voltage in the command value output of the electronics to be tested is between  $1\%$  ( $-1\%$ ) and  $+100\%$  ( $-100\%$ ).

**Note:** The function „Measuring ramp times” refers to slots 1 – 6.

## 7 How to recognize errors/malfunction of the case

Error/malfunction	Possible cause	Remedy
Indicator lamp on the mains switch does not light up.	Mains switch is switched off or mains connection is not established.	Establish the mains connection and/or switch on mains switch.
	Fuse in the mains switch (1 A T) is defective.	Check for an external short-circuit (e.g. of the connection on slot 7).
		Check and, if required, replace fuses
No LED lights up on the test and service case.	Fuse for slots 1 - 7 (4 A T) is defective.	Check whether an external short-circuit is present (e.g. connection on slot 7).
		Check and, if required, replace fuses
Closed-loop position-controlled valve moves to limit stop due to positive feedback.	Switch for inversion of the position transducer signal is at the wrong position.	Check and, if required, change the position of the switch.
	Solenoid cables between the case and the proportional valve are exchanged.	Connect solenoid cables correctly.



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