

**MEASURING TRANSDUCERS
E855A, E855B, E855C
E854A, E854B, E854C**

Operation manual

49501860.3.0005 P3

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WARNING! TRANSDUCER HAS A SAFETY SYMBOL SHOWING THAT SPECIFIC WARNING OR CAUTION INFORMATION IS GIVEN IN A MANUAL, TO AVOID PERSONAL INJURY OR EQUIPMENT DAMAGE.

This operation manual contains information for using and operating Measuring Transducers E855A, E855B, E855C, E854A, E854B, E854C (further - transducers) and information on packing, transportation and storage.

Read this manual before operation.

1 Description and operation

1.1 General Information

Transducers are intended for a linear alternating-current converting (E854A, E854B, E854C) and linear voltage converting (E855A, E855B, E855C) to unified output signals of a direct current and can be applied to monitoring currents and voltages of electrical systems, in the equipment of technical diagnostics, for an integrated automation of plants of power engineering and different industries.

Transducers correspond to engineering factors TY 4227-005-49501860-00.

Power Supply: 220 V(+10%; -15%); 50Hz.

Transducers are mounted on the rails TH-35 ГООТ Р МЭК 60715-2003 or immediately on the panel.

The transducers are hardware SSI products of the third order according to ГООТ 12997-84.

Vibration and Shock (ГООТ 12997-84):

- Group N1 – at mounting on the rail (vibration in a frequency band from 10 up to 55 Hz with a displacement amplitude 0,15 mm);
- Group N2 – at mounting immediately on the panel (vibration in a frequency band from 10 up to 55 Hz with a displacement amplitude 0,35 mm).

Operating Environment: Group C4 (ГООТ 12997-84):

- Ambient Air Temperature - 30 to 50 °C;
- Relative Humidity at 35 °C up to 95 %;
- Atmosphere pressure 84-106 kPa (630-800 mm Hg).

Climatic category YXJB (ГООТ 15150-69).

Standard conditions for use:

- Ambient Air Temperature 20±5 °C;
- Relative Humidity 30 to 80 %;
- Atmospheric pressure 84-106 kPa (630-800 mm Hg);
- Power Supply 220 ± 4,4 V.

Guard level IP00 (ГООТ14254-96, IEC 529-89).

Transducers are single-channel hardware products without galvanic link between input and output circuits.

1.2 Characteristics

1.2.1 Transducers convert input signal to direct current output signal according to table 1. Conversion function is linear.

Table 1

Type	Measurement range		Output DC range, mA	Load resistance range, Ω
	AC current, A	AC voltage, V		
E855A	–	0 – 125 0 – 250 0 – 400 75 – 125 150 – 250	0 – 5	0 – 3000
E855B	–	0 – 125 0 – 250 0 – 400	4 – 20	0 – 500
E855C	–	0 – 125 0 – 250 0 – 400	0 – 20	0 – 500
E854A	0 – 0,5 0 – 1,0 0 – 2,5 0 – 5,0	–	0 – 5	0 – 3000
E854B	0 – 0,5 0 – 1,0 0 – 2,5 0 – 5,0	–	4 – 20	0 – 500
E854C	0 – 0,5 0 – 1,0 0 – 2,5 0 – 5,0	–	0 – 20	0 – 500

1.2.2 Limits of intrinsic error are $\pm 0,5\%$ of the fiducial value.

The following value is taken as a fiducial value:

- upper value of output signal range for the transducers E855A-0-125, E855A-0-250, E855B, E855C, E854A, E854B, E854C;
- upper value of input signal measurement range for the transducers E855A-75-125, E855A-150-250.

1.2.3 Variations from influencing magnitudes correspond to table 2.

Table 2

Name of influencing magnitude	Value of influencing magnitude	Variation, % of the fiducial value
Ambient Air Temperature	- 30 to 50 °C	±0,4 on 10 °C of temperature variation
Relative Humidity	to 95% at 35 °C	±0,9
Frequency	45 to 65 Hz	±0,5
External magnetic field of frequency 45-65 Hz by strength	to 400 A/m	±0,5

1.2.4 Setup time of performance is 15 minutes.

1.2.5 Intrinsic error corresponds:

- On expiring a setup time of performance;
- For Load Resistance Range according to table 1;
- At grounding one of output contacts;
- For Power Supply from 187 to 242 V.

1.2.6 Setting time of output signal is 0,5 s.

1.2.7 Transducers withstand a long-lived break of a load circuit without failures. An output voltage at a break of a load circuit is no more than 25 V.

1.2.8 Pulsation amplitude 0,1 %.

1.2.9 Transducers withstand 120% overload by an input signal during 2 hours.

1.2.10 Transducers withstand short-term overloads by an input signal according to ГОСТ 24855-81.

1.2.11 Input Power Consumption:

E854A, E854B, E854C	0,2 V·A;
E855A-0-125, E855A-75-125, E855B-0-125, E855C-0-125	0,2 V·A;
E855A-0-250, E855A-150-250, E855B-0-250, E855C-0-250	0,4 V·A;
E855A-0-400, E855B-0-400, E855C-0-400	0,5 V·A.

1.2.12 Power Supply Consumption:

E854A, E855A	1,5 V·A;
E854B, E854C, E855B, E855C	2,5 V·A.

1.2.13 Isolation (between an input and power supply, between entering and output, between an output and power supply) withstands a testing voltage of practically sine-wave shape by frequency from 45 up to 65 Hz according to table 2a, during 1 min.

Table 2a

Upper value of measuring range		Testing voltage, kV RMS	
AC Current, A	AC Voltage, V	Test conditions	
		standard	95% R.H. at 35°C
0,5; 1,0; 2,5; 5,0	–	2,5	1,5
–	125; 250	2,5	1,5
–	400	3,5	2,0

1.2.14 Electrical insulation resistance of circuits pointed in 1.2.13 is not less than:

- 40 MΩ - in standard conditions;
- 10 MΩ - to 80% R.H. at 50°C;
- 2 MΩ - to 95% R.H. at 35°C.

1.2.15 Overall dimensions 70x80x77 mm.

1.2.16 Weight 0,5 kg.

1.3 Construction

1.3.1 General Form of the transducer can be seen in Annex A.

1.3.2 Transducer has the following parts:

- Case;
- Cover;
- Component board;
- Supply transformer;
- Measuring transformer;
- Latch.

1.3.3 The contacts, established on a cover, ensure strengthening a component board and reliable contact of conductors of a plated circuit to the leads.

The cover is mounted to a case through four screws, which can be sealed up.

The latch ensures mounting the transducer to the rail or panel depending on variant of installation.

1.4 Functional description

1.4.1 The transducer is the device of an implicit evaluation (RMS-converter), implementing the following algorithm of an evaluation:

$$Y = \frac{\overline{X(t)^2}}{Y} \quad (1)$$

or

$$Y = \sqrt{\frac{T}{(1/T) \int_0^T [X(t)^2] dt}} \quad (2)$$

where Y – output signal,

$X(t)$ – instantaneous value of input signal.

RMS-converter includes the multiplication-division unit (MDU) and low-pass filter. The operations of multiplication and division fulfill simultaneously at the expense of exponential - logarithmic feedbacks introduction in MDU.

The following algorithm is implemented in MDU:

$$Y = (1/T) \int_0^T \exp [2 \ln X(t) - \ln Y] dt. \quad (3)$$

1.4.2 Converter Block Diagram is shown in Figure 1.

Transducers E854 have not resistors R1, R2.

The input signal is transmitted on compensation measuring transformer CMT, which is also element of a galvanic isolation. Flowing on a primary winding of the transformer CMT input current I establishes a magnetic flux ΦI .

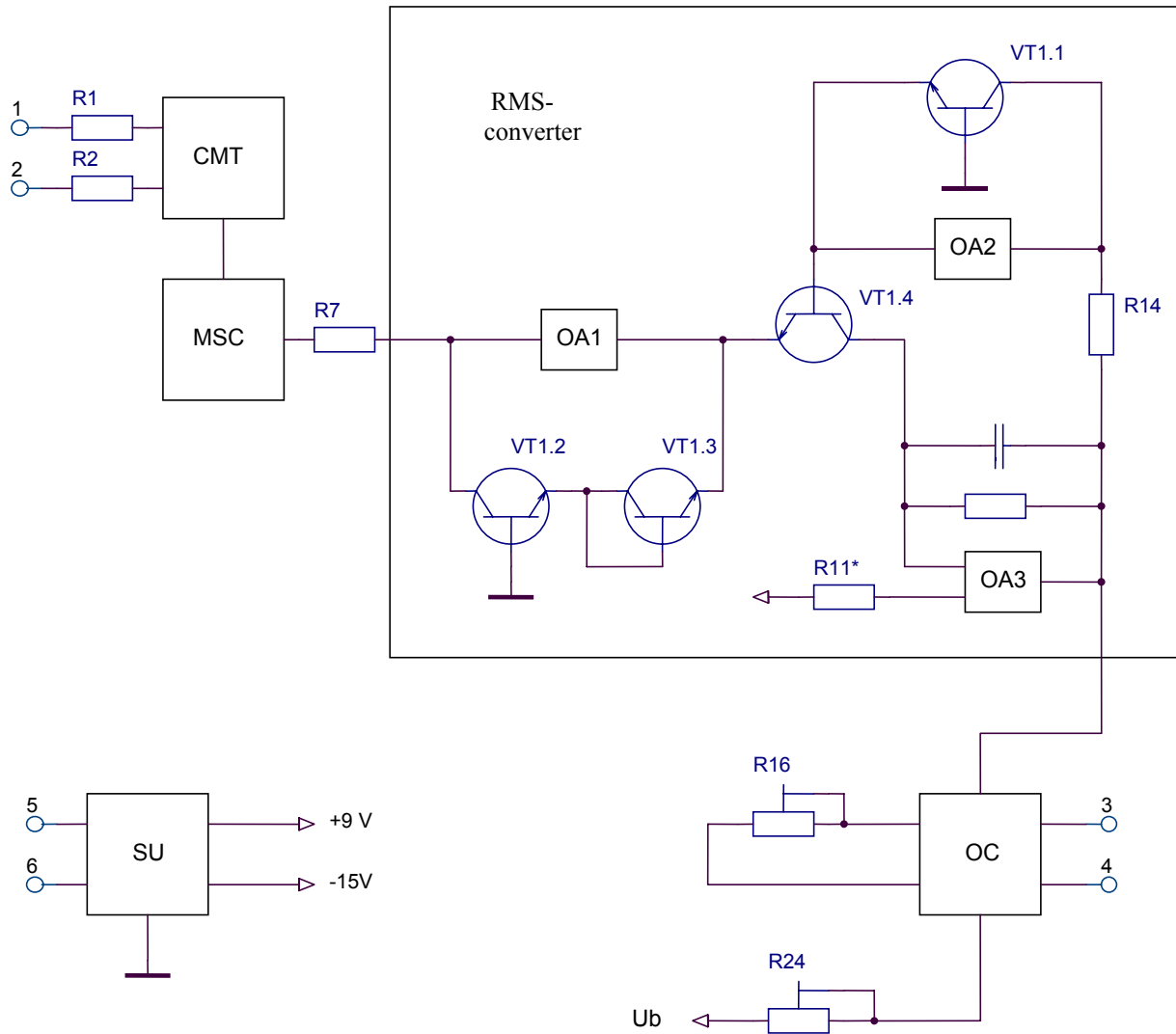


Figure 1. Block Diagram

Feedback flux Φ_2 is formed by a current I_2 , which flows on secondary winding, being simultaneously an output one. Unbalance signal is the voltage on a secondary winding. The CMT output signal moves on the circuit of selecting a module CSM and further on an input of the RMS-converter.

MDU consists of two log amplifiers (OA1, OA2) and exponentiating converter on the transistor VT1-4. Transistors VT1-2, VT1-3 are switched on in a feedback circuit of a log amplifier OA1. As transistors are switched on sequentially, the output voltage OA1 is proportional to $2 \ln U_{in}(t)$. The backward logarithmic converter is assembled on an operating amplifier OA2, in which feedback circuit the transistor VT1-1 is included.


All transistors work on exponential sections of volt-ampere characteristics. The voltage affixed on the “emitter – base” junction of transistor VT1-4 is proportional to a value $2 \ln U_{in}(t) - \ln U_{out}$. The current flowing through the resistor R14 is proportional to a collector current of the transistor VT1-4.

The low-pass filter is realized by operational amplifier OA3.

The voltage from an output RMC-converter moves to output cascade OC, which serves for matching a transducer’s output with a load. The resistor R16 regulates the slope of the transmission characteristic of the transducer. The resistor R24 regulates the initial value of an output signal in transducers E855A-75-125, E855A-150-250, E855B, E854B.

1.5 Marking and sealing

1.5.1 The following information is marked on a cover of the transducer:

- The name and type designation;
- Manufacturer’s mark;
- The nominal value of auxiliary supply voltage and nominal value of auxiliary supply frequency;
- Maximal value of power supply (VA);
- Input and output signals rated;
- Unit symbol of input and output signals;
- Frequency range of the input signal;
- Overvoltage category;
- Load resistance range;
- Module of intrinsic error;
- The table of connections;
- Designation of numbers and polarity of terminal;
- Symbol  ;
- Serial number and two last digits of Issue Year.

1.5.2 Sealing of the transducer is yielded with a bitumen mastic №1 (according to GOST 18680-73) applies on one of four located on a cover screws.

1.6 Packing

1.6.1 The transducers are delivered in transport container.

1.6.2 In transport container there is:

- Operation manual (1 copy for set of 50 transducers or on separate delivering);
- Packing leaf.

1.6.3 The transducer is packaged into individual packing.
The passport is inserted inside the individual packing.

2 Uses to assignment

2.1 Operational constraints

2.1.1 The transducers are not intended for operation in requirements explosion-hazard and hostile environment.

2.1.2 The transducers must not be effected by direct heat up to temperature more 50°C. The transducers should be placed on the premises without sharp temperature fluctuation and off the sources of strong electromagnetic field.

2.2 Preparation for use

2.2.1 Check integrity of packing after deriving the transducer. Unpack it. Take out the transducer, make exterior survey, get sure that any apparent mechanical damages are missing. Check completeness of delivering according to table 3.

Table 3

Name and nomenclature	Quantity
Transducer	1
Measuring Transducers E855A, E855B, E855C, E854A, E854B, E854C. Passport	1
Measuring Transducers E855A, E855B, E855C, E854A, E854B, E854C. Operation manual	1*
Individual package	1
Latch	1**
* On a batch in quantity 50 pieces, delivered at the one address	
** Set on the case	

2.2.2 Check the information on a cover of the transducer on correspondence to required parameters.

2.3 Use

2.3.1 All operations on mounting and maintenance should be making with observance of live rules on provision of safe service.

2.3.2 Make arranging a place of mounting of the transducer on plant according to an Annex B.

WARNING!



THE AUTOMATIC SWITCH OR THE SWITCH PLACED IN IMMEDIATE PROXIMITY FROM THE TRANSDUCER SHOULD BE INCLUDED IN INSTALLATION OF BUILDING WIRING. THE SWITCH SHOULD BE MARKED AS SWITCHING-OFF DEVICE FOR THE TRANSDUCER.

2.3.3 Installation of the transducer on plant

2.3.3.1 When mounting the transducer *on the rail*:

- place a latch according to figure B.1 to link the protuberances of a case to edge of the rail;
- push a case up to its fixing.

The mounting of the transducer on the rail is supposed at mount the rail on a horizontal or vertical plane.

When the rail is mounted on the vertical plane, its distortion from a horizontal position should not be more than 15°.

2.3.3.2 When mounting the transducer *on the panel*:

- fix a latch on the panel with the help of two screws according to figure B.2;
- pull the transducer over a latch against the stop.

Use two screws with a diameter 4 mm to fasten a latch on the panel. Screws should not overhang a mounting plane of the latch.

When mounting the transducer on a latch it is necessary to provide on object a place not less than 15 mm for initial fixing of the transducer.

2.3.4 Fix exterior conductive wires on contacts according to the table of connections, which is located on a cover of the transducer.

2.3.5 Verify the correspondence of output parameters of a radiant of a signal to data-ins of the transducer. Verify quality of wiring.

2.3.6 Turn on supply voltage 220 V on the transducer.

2.3.7 Turn on an input signal on the transducer.

2.4 Operation in extreme conditions

2.4.1 You should turn out the transducer immediately in case of originating an emergency condition of operation.

The switch or automatic switch should be used for cutting off.



3 Maintenance and repair

3.1 Safety

3.1.1 The qualified personnel should execute operations of maintenance.

3.1.2 The transducers correspond to ГОСТ Р 52319-2005 (IEC 61010-1:2001).

Insulation class is primary. Pollution degree is 2. Overvoltage category III.

3.1.3 IT IS FORBIDDEN: TO CHANGE EXTERNAL CONNECTIONS, WHEN INPUT SIGNAL AND SUPPLY VOLTAGE ARE AVAILABLE IN THE TRANSDUCER.



3.2 Order of maintenance

3.2.1 It is recommended quarterly to carry out routine inspection in field. For this purpose:

- to turn input signal and supply voltage off;
- to delete from a case a dust;
- to test a condition of a case; to be convinced of absence of mechanical failures; to test a condition of mounting;
- to turn a supply voltage and input signal on the transducer after the termination of survey on.

3.2.2 If the transducer is mounted on the rail you can carry demounting by release of a latch by a screwdriver inserted into a recess in the bottom of the case.

3.3 Metrology monitoring

3.3.1 To confirm real values of the metrology characteristics and fitness of the transducer to application, they can be exposed to calibration according to the document 49501860.3.0005 МП «Преобразователи измерительные Е855А, Е855В, Е855С, Е854А, Е854В, Е854С. Методика поверки» («Measuring transducers Е855А, Е855В, Е855С, Е854А, Е854В, Е854С. Calibration procedure») which was matched with ВНИИМС (All-Russian Research Institute).

The transducer should be calibrated on a 1-year interval determined by the requirements of this document.

3.4 Troubleshooting data

3.4.1 You can see the enumeration of possible defects and methods of their elimination in table 4.

Table 4

Defect	Probable reason	Method of elimination
Intrinsic error exceeds an acceptable value insignificantly	The characteristics of circuit components have varied	Make tuning with the help of resistors R24, R16
The output signal is not present at presence of an input signal	One of circuit components does not work	Check mode of operations of key elements of the circuit. Exchange an out-of-order element
The output signal does not vary at variation of an input signal.	One of circuit components does not work	Check mode of operations of key elements of the circuit. Exchange an out-of-order element
The output signal has a nonlinear dependence from an input signal.	One of circuit components does not work	Check mode of operations of key elements of the circuit. Exchange an out-of-order element

3.4.2 The specialized repair enterprise eliminates all failures.

The transducer should pass calibration after repair and be sealed up.

4 Storage

4.1 Before introduction in operation the transducers should be stored in storehouses according to GOST 12997-84.

4.2 Storage conditions for transducers in transport container:

- Ambient Air Temperature 5 to 50 °C;
- Relative Humidity at 25 °C up to 80 %;

4.3 Storage conditions for transducers in individual packing:

- Ambient Air Temperature 10 to 35 °C;
- Relative Humidity at 25 °C up to 80 %;

4.4 The contents of a dust, steams of acids and alkalis, aggressive gases and other harmful admixtures calling corrosion should not exceed the contents of the corrosion-active agents for the atmosphere of type 1 (GOST 15150-69).

5 Transportation

5.1 The transducers in transport container can be transported in the closed vehicles of any type. When air transportation the transducers should be disposed in heated hermetic bays.

5.2 Values of climatic and mechanical effects on the transducer at transportation should be in limits:

- Ambient Air Temperature - 50 to 50 °C;
- Relative Humidity at 35 °C up to 95 %;
- Atmospheric pressure, kPa (mm Hg) 84-106 (630-800).
- Impacts with peak shock acceleration 98 m/sec².

Annex A
(informative)
General form of the transducer

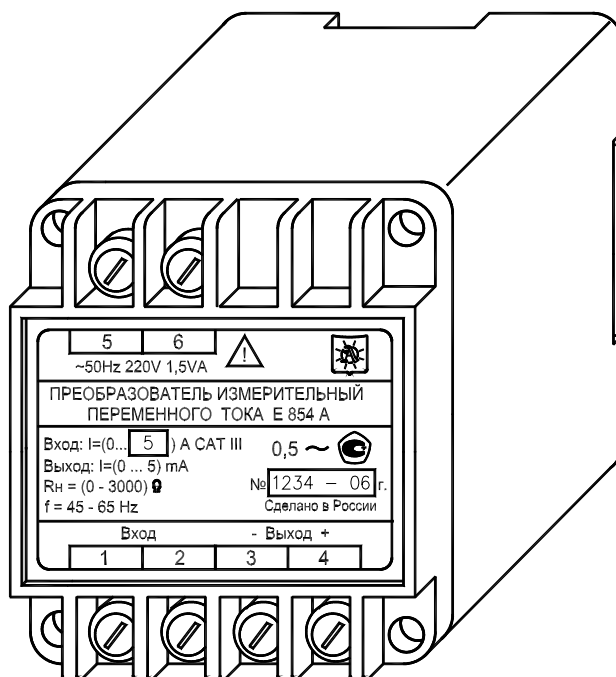


Figure A.1. Model E854

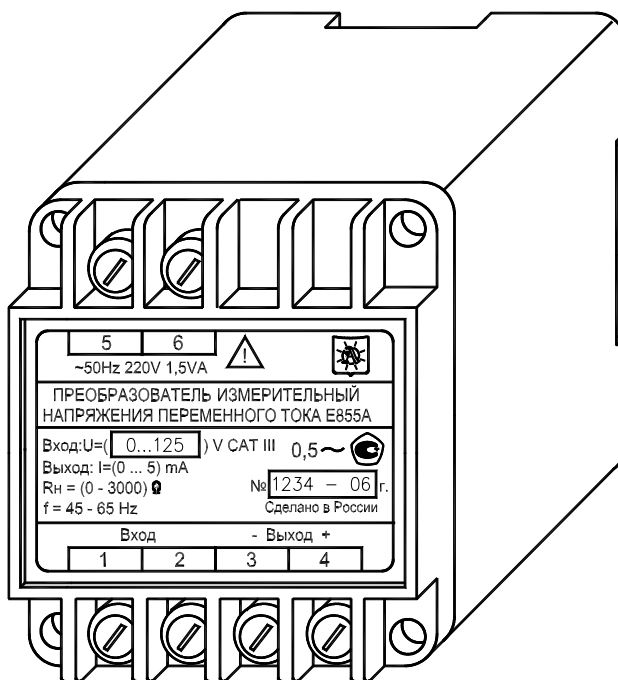


Figure A.2 Model E855

Annex B
(informative)
Variants of transducer mounting

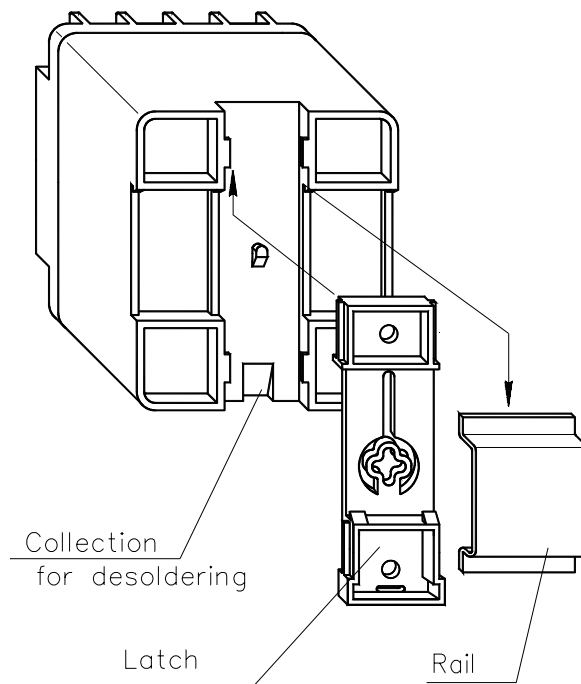


Figure B.1 Mounting on the Rail

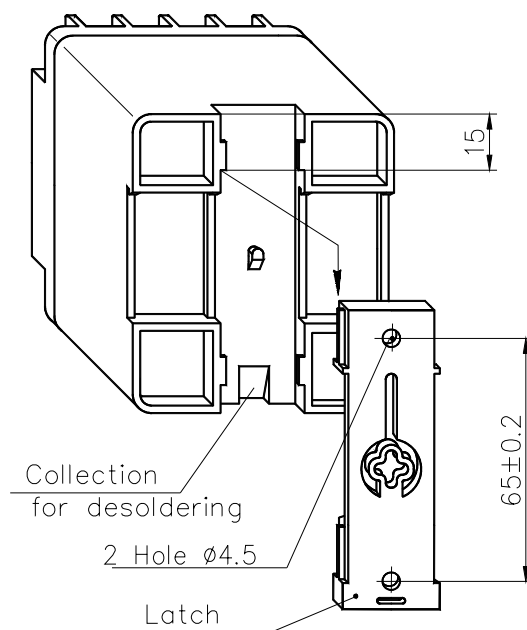
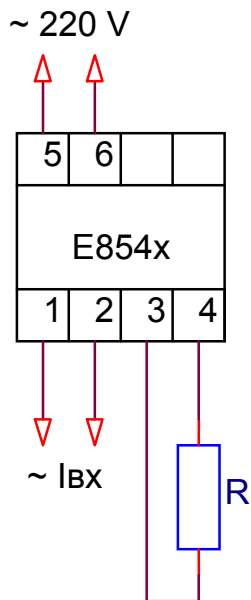
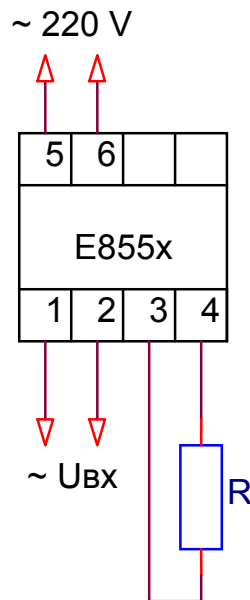


Figure B.2 Mounting on the Panel

Annex C (informative) Diagrams of transducer connections



- a) E854A
E854B
E854C



- b) E855A
E855B
E855C