THREE-PHASE CURRENT POWER MEASURING TRANSDUCERS E849, E859, E860 E1849, E1859, E1860

Operation manual

49501860.3.0012 РЭ

Contents

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 Three-phase current Power Measuring Transducers E849, E859, E860, E1849, E1859 (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 linear converting active and reactive power (E849, E1849), active power (E859, E1859), reactive power (E860, E1860) to unified output signals of a direct current and can be applied in the equipment of technical diagnostics, for an integrated automation of plants of power engineering and different industries.

Transducers correspond to engineering factors ТУ 4227-006-49501860-02.

The transducers E849, E1849 correspond to accuracy class 0,5; 1;
transducers E859, E860, E1859, E1860 - to accuracy class 0,5 (ГОСТ 8.401-80).

The transducers are produced of four variants:

- A - Output current range (0 - 5) mA;
- B - Output current range (4 - 20) mA;
- C - Output current range (0 -20) mA;
- E - Output current range (minus 5 - 0 - 5) mA.

Depending on a kind of supply voltage the transducers are produced of two variants:

- Index 1 - with a power supply from measuring circuit;
- Index 2 - with a power supply from alternating current network with voltage 220 V and frequency 50 Hz.

The transducers are products without galvanic coupling between input and output circuits.

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

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

Operating Environment: Group С4 (ГОСТ 12997-84):

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

Climatic category: УХЛ3 (ГОСТ 15150-69).

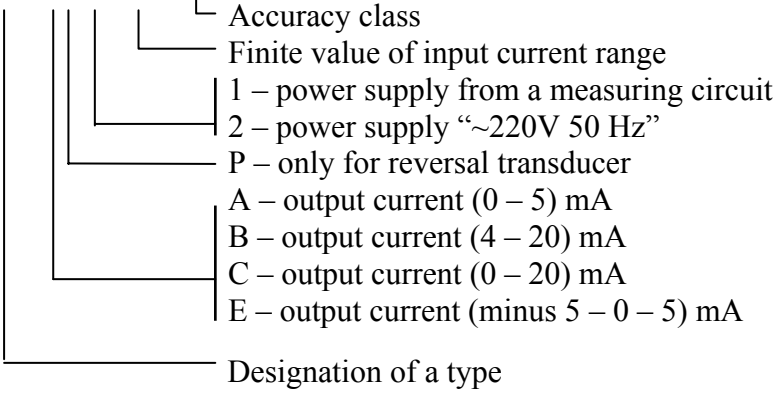
Standard conditions for use:

- Ambient Air Temperature ..... 20±5 °С;
- Relative Humidity, ... 30 to 80 %;
- Atmospheric pressure ..... 84-106 kPa (630-800 mm Hg);
- Power Supply (for index 2) ..... 220 ± 4,4 V.

Guard level: IP00 (ГОСТ 14254-96, МЭК 529-89).

Example of a designation of the transducer:

Transducer E849BP2 -1,0 cl.0,5 ТУ 4227-006-49501860-02.



1.2 Characteristics

1.2.1 The transducers execute a linear transformation from active (reactive) power to direct current output signal according to tables 1, 2.

Table 1

Type's modification	Input signal range				Output DC range, mA	Load resistance range, Ω
	Voltage, V	Current, A	Cos φ	Sin φ		
E849A	0 – 120 80–120*	0-0,5 (0,25) 0-1,0 (0,5) 0-2,5 (1,25) 0-5,0 (2,5)	0-1-0	0-1-0	0 – 5	0 – 2000 – 3000
E849AP			0-minus1--0-1-0	0-minus1--0-1-0	0 – 2,5 – 5	
E849B			0-1-0	0-1-0	4 – 20	0 – 200 – 300 – – 500
E849BP			0-minus1--0-1-0	0-minus1--0-1-0	4 – 12 – 20	
E849C			0-1-0	0-1-0	0 – 20	
E849CP			0-minus1--0-1-0	0-minus1--0-1-0	0 – 10 – 20	
E849EP			0-minus1--0-1-0	0-minus1--0-1-0	minus 5–0–5	0 – 2000 – 3000

Continuation of Table 1

Type's modification	Input signal range				Output DC range, mA	Load resistance range, Ω
	Voltage, V	Current, A	Cos φ	Sin φ		
E859A	0 – 120 80–120*	0-0,5 (0,25) 0-1,0 (0,5) 0-2,5 (1,25) 0-5,0 (2,5)	0-1-0		0 – 5	0 – 2000 – 3000
E859AP			0-minus1--0-1-0		0 – 2,5 – 5	
E859B			0-1-0		4 – 20	0 – 200 – 300 – – 500
E859BP			0-minus1--0-1-0		4 – 12 – 20	
E859C			0-1-0		0 – 20	
E859CP			0-minus1--0-1-0		0 – 10 – 20	
E859EP			0-minus1--0-1-0		minus 5–0–5	0 – 2000 – 3000
E860A	0 – 120 80–120*	0-0,5 (0,25) 0-1,0 (0,5) 0-2,5 (1,25) 0-5,0 (2,5)		0-1-0	0 – 5	0 – 2000 – 3000
E860AP				0-minus1--0-1-0	0 – 2,5 – 5	
E860B				0-1-0	4 – 20	0 – 200 – 300 – – 500
E860BP				0-minus1--0-1-0	4 – 12 – 20	
E860C				0-1-0	0 – 20	
E860CP				0-minus1--0-1-0	0 – 10 – 20	
E860EP				0-minus1--0-1-0	minus 5–0–5	0 – 2000 – 3000

*For transducers with a power supply from measuring circuit.

Note

1 The additional current measuring range specified in brackets is established with the crosspiece between contacts 13 and 14

2 Normal value area of load resistance range is underlined

Table 2

Type's modification	Input signal range				Output DC range, mA	Load resistance range, Ω
	Voltage, V	Current, A	Cos φ	Sin φ		
E1849A	0 – 456 323–437*	0-0,5 (0,25) 0-1,0 (0,5) 0-2,5 (1,25) 0-5,0 (2,5)	0-1-0	0-1-0	0 – 5	0 – 2000 – 3000
E1849AP			0-minus1--0-1-0	0-minus1--0-1-0	0 – 2,5 – 5	
E1849B			0-1-0	0-1-0	4 – 20	0 – 200 – 300 – 500
E1849BP			0-minus1--0-1-0	0-minus1--0-1-0	4 – 12 – 20	
E1849C			0-1-0	0-1-0	0 – 20	
E1849CP			0-minus1--0-1-0	0-minus1--0-1-0	0 – 10 – 20	
E1849EP			0-minus1--0-1-0	0-minus1--0-1-0	minus 5–0–5	0 – 2000 – 3000
E1859A	0 – 456 323–437*	0-0,5 (0,25) 0-1,0 (0,5) 0-2,5 (1,25) 0-5,0 (2,5)	0-1-0		0 – 5	0 – 2000 – 3000
E1859AP			0-minus1--0-1-0		0 – 2,5 – 5	
E1859B			0-1-0		4 – 20	0 – 200 – 300 – 500
E1859BP			0-minus1--0-1-0		4 – 12 – 20	
E1859C			0-1-0		0 – 20	
E1859CP			0-minus1--0-1-0		0 – 10 – 20	
E1859EP			0-minus1--0-1-0		minus 5–0–5	0 – 2000 – 3000

Continuation of Table 2

Type's modification	Input signal range				Output DC range, mA	Load resistance range, Ω
	Voltage, V	Current, A	Cos φ	Sin φ		
E1860A	0 – 456 323–437*	0-0,5 (0,25) 0-1,0 (0,5) 0-2,5 (1,25) 0-5,0 (2,5)		0-1-0	0 – 5	0 – 2000 – 3000
E1860AP				0-minus1--0-1-0	0 – 2,5 – 5	
E1860B				0-1-0	4 – 20	0 – 200 – 300 – – 500
E1860BP				0-minus1--0-1-0	4 – 12 – 20	
E1860C				0-1-0	0 – 20	
E1860CP				0-minus1--0-1-0	0 – 10 – 20	
E1860EP				0-minus1--0-1-0	minus 5–0–5	0 – 2000 – 3000

*For transducers with a power supply from measuring circuit.

Note

1 The additional current measuring range specified in brackets is established with the crosspiece between contacts 13 and 14

2 Normal value area of load resistance range is underlined

1.2.2 Nominal values of input signals correspond to table 3.

Table 3

Name of parameter	Value for a type					
	E849	E859	E860	E1849	E1859	E1860
Voltage, V	100	100	100	380	380	380
Current, A	0,5 (0,25) 1,0 (0,5) 2,5 (1,25) 5,0 (2,5)					
Power factor active (cos φ) reactive (sin φ)	1 1	1	1	1 1	1	1
Note– The additional current measuring range is specified in brackets						

1.2.3 Limits of the intrinsic error are:

E849, E1849 ± 0,5; ± 1,0 %;

E859, E860, E1859, E1860 ± 0,5 %.

Upper value of output signal range is taken as a fiducial value.

1.2.4 Variations from influencing magnitudes correspond to table 4.

Table 4

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 20 °C to 95% at 35 °C	±0,5 ±0,9
Frequency	45 to 65 Hz	±0,2
External magnetic field of frequency 45-65 Hz by strength	to 400 A/m	±0,5
Load resistance, Ω modification A, AP, EP modification B, BP, C, CP	 0 to 2000 0 to 200; above 300 to 500 incl.	 ±0,25 ±0,25
Power Supply (for index 2)	187 to 242 V	± 0,25
Input Voltage E849, E859, E860 (index1) E1849, E1859, E1860 (index 1)	 80 to 120 V 323 to 437 V	 ±0,5 ±0,5

1.2.5 Set-up time of performance is 15 min.

1.2.6 The transducers satisfy the requirements 1.2.3:

- on expiring a set-up time of performance;

– when alternating a power factor in accordance with table 1;

– when alternating an input voltage from 0 to 120 % for transducer with a power supply from a network (index 2);

– when nonuniform loading phases provided that the current in any of line conductors does not exceed more than 20 % of nominal value;

- when grounding one of the output contacts;

- when effecting the sine-wave vibrations in a frequency band from 10 up to 55 Hz with displacement amplitude 0,15 mm.

1.2.7 Ripple amplitude is no more than 0,2 %.

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

1.2.9 Transducers withstand 120% overload by an input signal (current and voltage) during 2 hours.

Output current, when overloading, is no more:

– for modifications A, AP, EP … ….. 5,5 mA;

– for modifications B, BP, C, CP ….. 21 mA.

1.2.10 Transducers withstand against short-term overloads by an input signal according to table 5.

Table 5

Circuit	Multiplicity	Number of overloads	Duration	Interval between overloads
Current	2 7 10	10 2 5	10 s 15 s 3 s	10 s 60 s 2,5 s
Voltage	1,5	9	0,5 s	60 s

1.2.11 Transducer withstands a long-lived break of a load circuit without failures. An output voltage at a break of a load circuit is no more than 30 V.

1.2.12 Power Consumption:

- with a power supply from network (index 2):
  - supply circuit (E849, E1849).....4 V·A;
  - supply circuit (E859, E1859, E860, E1860).....3 V·A;
  - current circuit.....0,2 V·A;
  - voltage circuit (E849, E859, E860) .....0,2 V·A;
  - voltage circuit (E1849, E1859, E1860) .....0,6 V·A;

- with a power supply from measuring circuit (index 1):
  - current circuit.....0,2 V·A;
  - voltage circuit AB, CB (E849, E859, E860) .....0,2 V·A;
  - voltage circuit AB, CB (E1849, E1859, E1860) .....0,6 V·A;
  - voltage circuit AC .....5 V·A.

1.2.13 Isolation of electric circuits concerning the body and between: current circuits and voltage circuits; separate current circuits; input and output; input and supply; output circuits and supply, - withstands a testing voltage of practically sine-wave shape by frequency from 45 up to 65 Hz during 1 min:

- 2,5 kV RMS - in standard conditions;
- 1,5 kV RMS - to 95% R.H. at 35°C.

1.2.14 Isolation between different outputs of transducers E849, E1849 withstands a testing voltage of practically sine-wave shape by frequency from 45 up to 65 Hz during 1 min:

- 0,5 kV RMS - in standard conditions;
- 0,3 kV RMS - to 95% R.H. at 35°C.

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

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

1.2.16 Overall dimensions: 120x80x120 mm.

1.2.17 Weight: 0,9 kg.

1.3 Construction

General Form of transducer is presented in Annex A.

Transducer has the following parts:

- Case;
- Cover;
- Switching board;
- Component board;
- Supply transformer;
- Two measuring transformer;
- Latch.

The contacts established on a cover ensure strengthening a component board and reliable contact of conductors of a plated circuit to bringing wires.

The electrical connection of the component board with a switching board is manufactured by the soldering. Inside a case the component board is arrested by guide ridge.

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

The transducer is the device with digital processing a signal.

Transducer Block Diagram is presented in Figure 1.

The transducer can be divided functionally into an input unit and galvanic unloosened output channels P and Q.

Transducers E859, E1859 have not the output channel Q.

Transducers E860, E1860 have not the output channel P.

Input unit consists of input cascades IC1 - IC4, at which the measured signals arrive, analog-digital converter ADC and computational part (microcontroller).

Input cascades IC1, IC2 are scaling amplifiers and have immediate galvanic communication with input voltage circuits.

Input cascades IC3, IC4 are carried out with the compensation circuits on measuring transformers and ensure a galvanic isolation of the measuring current circuits.

The input cascades will convert input signals of voltage and current into the proportional output voltage that is transmitted to inputs of four-channel ADC.

The discrete sampling the input signals and converting to a 12-discharge parallel binary code are yielded in ADC.

Parallel binary code is acting on input ports of a microcontroller

The microcontroller receives the data simultaneously through four channels about instantaneous value of the input signal with the sampling rate fd = 3200 Hz and yields evaluation of instantaneous values of components by active (P_{i1}, P_{i2}) and reactive (Q_{i3}, Q_{i4}) powers under the formulas:

$$P_{i1} = u_{ab} \cdot i_a , \quad (1)$$

$$P_{i2} = u_{cb} \cdot i_c , \quad (2)$$

$$Q_{i3} = u_{ab} \; i_c , \quad (3)$$

$$Q_{i4} = u_{cb} \cdot i_a , \quad (4)$$

where u_{ab}, u_{cb} - instantaneous values of voltage,
i_a, i_c - instantaneous values of current.

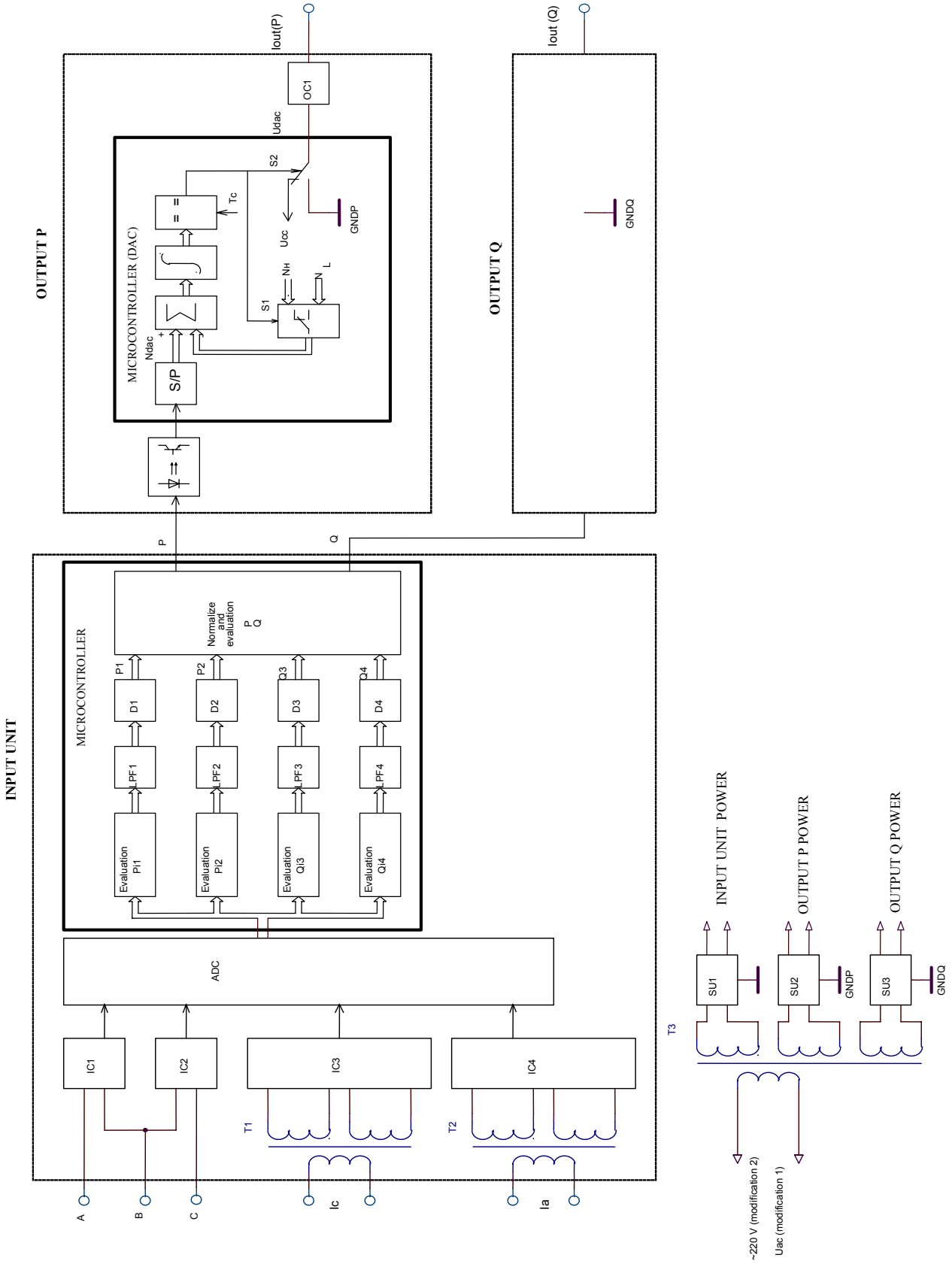


Figure 1. Block diagram (E849, E1849)

The evaluated instantaneous values of power's components are exposed to average in digital low-pass filters (LPF1 - LPF4) and decimators (D1 - D4). In result the average values of power's components (P1, P2, Q3, Q4) are gained on decimators outputs.

These values are multiplied to normalization coefficients (K_{n1}, K_{n2}, K_{n3}, K_{n4}) for deriving normalized values of power's components.

$$P_{n1} = P_1 \cdot K_{n1}, \quad (5)$$

$$P_{n2} = P_2 \cdot K_{n2}, \quad (6)$$

$$Q_{n3} = Q_3 \cdot K_{n3}, \quad (7)$$

$$Q_{n4} = Q_4 \cdot K_{n4}. \quad (8)$$

The normalized values of power's components are applied further for evaluation of active power P and reactive power Q:

$$P = P_{n1} + P_{n2}, \quad (9)$$

$$Q = \frac{1}{\sqrt{3}}(2 \cdot Q_{n3} - 2 \cdot Q_{n4} + P_{n1} - P_{n2}). \quad (10)$$

Evaluation value of active power P and reactive power Q as serial 12-discharge binary code arrive at microcontroller's output ports and transits through optocouplers to output channels of the transducer. Transferring values to output channels happens everyone 20 ms.

Each output channel includes the following parts: an optocoupler; a digital-analog converter DAC; a matching output cascade OC.

DAC is carried out by a principle of sigma - delta transformation. DAC is implemented on a microcontroller and includes the following parts: the series- to- parallel conversion (S/P); an adder; an integrator; a comparator.

The input code N_{DAC} arrives at the adder, where some value (N_H or N_L , depending on a condition of the comparator) is subtracted from its value. The result of a subtraction Nc moves to an integrator input. The comparator compares output value of the integrator Nint to threshold value and changes the condition, depending on result of comparison. The comparator drives the CMOS-structure of microcontroller's output port thus, that it connects an output bus to a power bus (Ucc), or to a common wire.

DAC works in discrete instants with sampling interval Td about 50 ms and represents the system with negative feedback, which supports averaged for anyone major time interval (Ta >> Td) value on the integrator output equal to response level of the comparator.

Thus voltage average for the interval Ta on the DAC output is defined by expression:

$$Udac = Ucc \cdot \left(1 - \frac{N_{DAC} - N_L}{N_H - N_L}\right), \quad (11)$$

Voltage Udac is proportional to an input code N_{DAC} and depends on it linearly.

DAC output voltage arrives at matching output cascade with the low-pass filter, where it is flattened and will be translated to transducer's output current.

The coefficients N_H and N_L are erected so that the value of an output current of the transducer is equaled:

- initial value of a range if $N_{DAC} = 0$;
- finite value of a range if $N_{DAC} = 2^{12} - 1$.

The precision circuits are applied to stabilization of a supply voltage of microcontrollers input and output units of the transducer.

The tuning of the transducer is carried on by an electronic mode through a technological connector.

1.5 Marking and sealing

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

- The name and type designation;
- Symbol В-4 ГОСТ 30012.1-2002:
- 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;
- Designation of accuracy class;
- Load resistance range;
- 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 ГОСТ 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 on everyone 50 transducers or on separate delivering);
- Calibration manual (1 copy 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 the 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 6.

Table 6

Name and nomenclature	Quantity
Transducer	1
Passport	1
Three-phase current Power Measuring Transducers E849, E859, E860, E1849, E1859. 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 terminals according to the diagram of transducer connections, which is located in the Annex C.

2.3.5 Install the exterior jumper between contacts 13 and 14 for use an additional current measuring range.

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

2.3.7 Turn on supply voltage 220 V on the transducer.

2.3.8 Turn on input signals 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 Common indicating

3.1.1 The operational supervision of operation of transducers should be manufactured by faces, which have the responsibility for this equipment.

3.1.2 The transducer having a warranty seal of the manufacturer should not be opened during operation.

3.1.3 The manufacturer eliminates all defects originating during operation.

3.2 Safety

3.2.1 The qualified personnel should execute operations of maintenance.

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

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

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

3.3 Order of maintenance

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

3.3.2 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.

3.4 Metrology monitoring

3.4.1 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 49501860.3.0007 МП « Преобразователи измерительные мощности трехфазного тока Е849, Е859, Е860, Е1849, Е1859, Е1860. Методика поверки» («Three-phase current Power Measuring Transducers E849, E859, E860, E1849, E1859. Calibration procedure»), which was matched with ВНИИМС (Russian Research Institute for Metrological Service).

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

4 Storage

4.1 Before introduction in operation the transducers should be stored in storehouses according to ГОСТ 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 a type 1 (ГОСТ 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/sec^2.

Annex A
(informative)

General Form of the transducer

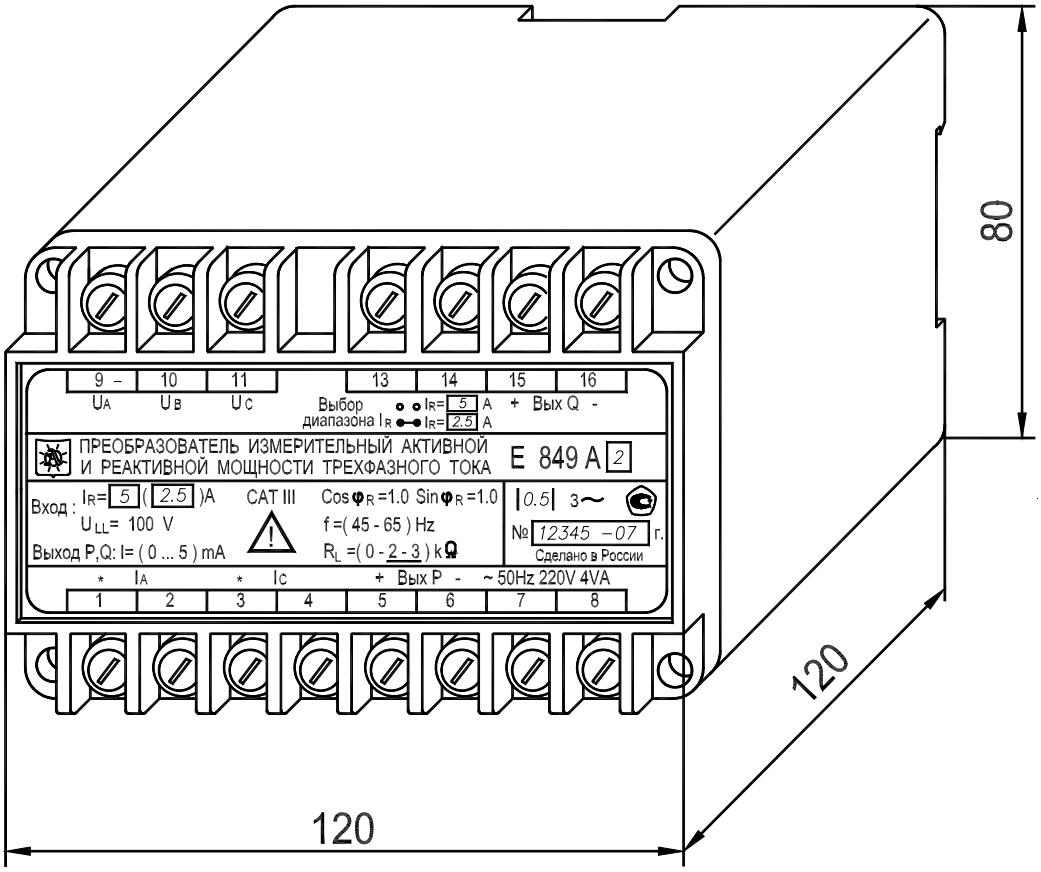


Figure A.1

Annex B
(informative)

Variants of transducer mounting

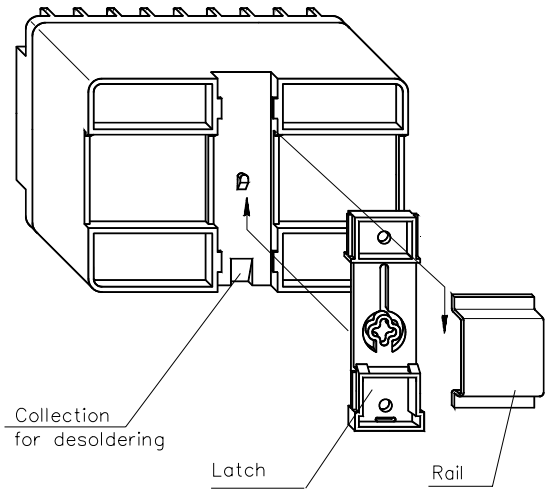


Figure B.1 Mounting on the Rail

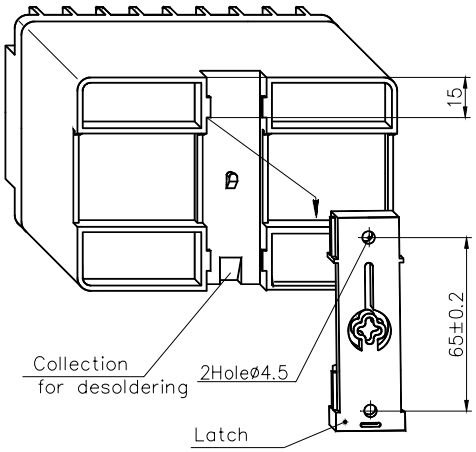


Figure B.2 Mounting on the Panel

Annex C
(informative)

Diagrams of transducers connection

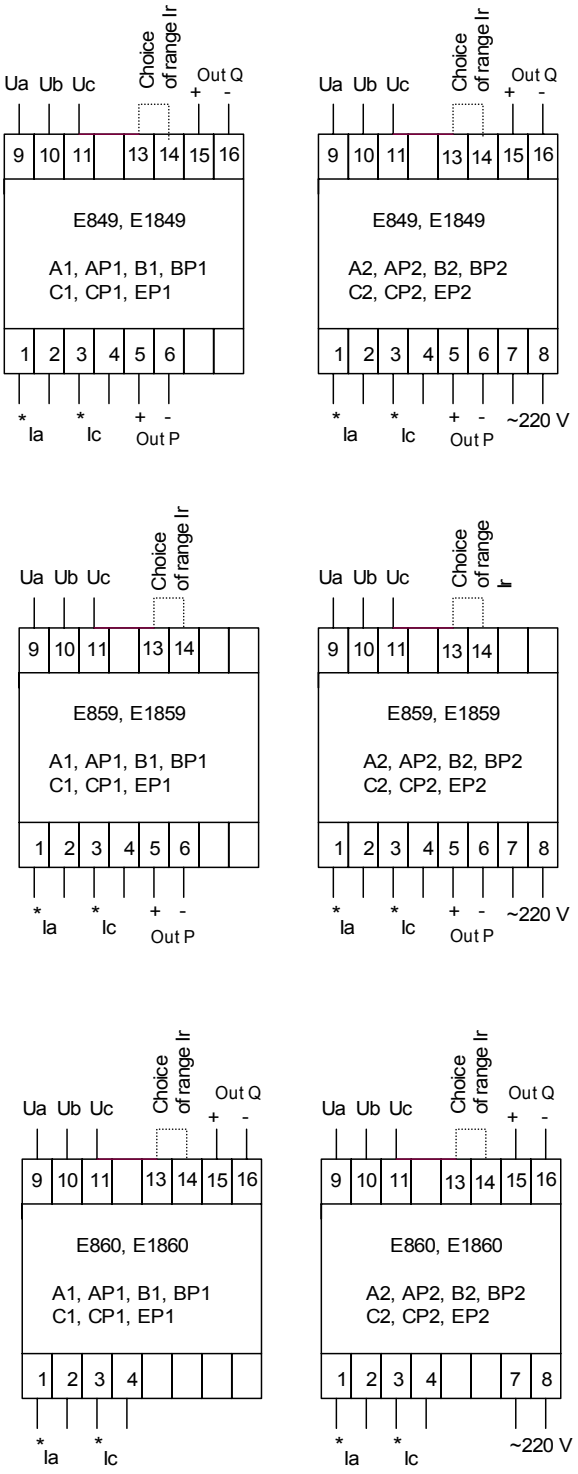


Figure C.1