ЭЛЕМЕР
SCIENCE AND PRODUCTION COMPANY

RELIABLE DEVICES AND SYSTEMS
OF TECHNOLOGICAL MONITORING

TECHNOLOGICAL MEASURING CONTROL
(GENERAL PURPOSE MILLIVOLTMETER)

(Modification ИРТ 1730У/А for APP)

Certificate

НКГЖ.411618.003-02ПС

For APP

CONTENT

1. PURPOSE

Technological measuring converter (general purpose millivoltmeter) ИРТ 1730У/А (hereinafter ИРТ 1730У/А) is designed for measuring and control of temperature and other non-electric values, transformed into electrical signals of current strength and voltage of direct current.

ИРТ 1730У/А (with increased reliability) is used as a component of control system of operational processes of atomic power plants (APP), and it is specially designed for its possible operation in «Busher» APP in IRI and other recently projected APPs.

ИРТ 1730У/А has an alphanumeric display of current value of a measured parameter, of values of upper and lower settings, as well as a bar indicator showing in colour and graphically measured value.

ИРТ 1730У/А is reconfigured according to the type of input signal, ranges of measured value and the type of the scale via serial interface.

Dependence of the measured value on the input signal may be linear or with the square rooting function.

Individual point relays of signalling channels support commutation:

- of alternating current system frequency :
  - at the voltage of 250 V till 5 A on resistive load,
  - at the voltage of 250 V till 2 A on inductive load ($cos\,\varphi \geq 0,4$);

- of direct current :
  - at the voltage of 250 V till 0,1 A on resistive and inductive loads,
  - at the voltage of 30 V till 2 A on resistive and inductive loads.

Notes. On inductive load it is recommended to install spark suppression circuits to the clamps of the instrument or to the inductive load itself Spark suppression circuit should consist of series connected peresistor 50...100 Ohm, 0,5 W and a capacitor 10...100 nF at the voltage not less than 630 V.

As to protection from environmental attack in accordance with:

- All-Union State Standard 15150-69 ИРТ 1730У/А is produced as the corrosion-resistant version T III;
- All-Union State Standard 4254-96 the degree of protection against penetrating of any firm bodies, and water inside of ИРТ 1730У/А is IP40.

In accordance with all-Union State Standard 25804.1-83 ИРТ 1730У/А belongs to:

- category B as to the operation mode – the equipment of continuous application;
- the type I as to the number of levels of operation quality – the equipment with two quality degrees of functioning – the nominal level and refusal.

According to НП-001-97 (ОПБ – 88/97) ИРТ 1730У/А   belongs to safety categories 2, 3:

- by its purpose – to the elements of normal operation;
- by influencing safety - to the elements important for safety;
- by the nature of performed functions – to the controlling elements.

Example of classification designations 2НУ or 3НУ.

According to stability to mechanical effects during operation ИРТ 1730У/А belongs to the execution group М6 by State Standards 17516.1-90.

According to seismic impact stability

- ИРТ 1730У/А   belongs to the Ist category of the seismic stability according to НП-031-01 and to the Б group of execution 3 according to РД 25 818-87;
- ИРТ 1730У/А of 4Н category is designed for operation at the АPP «Busher» and belongs to the IIIst category of the seismic stability according to ПНАЭГ -5-006-97 and no demands as to seismic stability are made to it.

ИРТ 1730У/А is durable, steady and resistant to the impact of earthquakes with the level of seismicity of 8 points on the MSK-64 scale at the setting level up to 40 meters according to State Standards 28504.3-80.

By stability to electromagnetic disturbances:

- ИРТ 1730У/А corresponds to the execution group III, the criteria of the functioning quality – A in accordance with State Standards Р 50746-2000;
- ИРТ 1730У/А of 4Н category designed for operation at the АPP «Busher» corresponds to the execution group III in accordance with State Standards Р 50746-2000.

2. TECHNICAL SPECIFICATION

2.2.1. The ranges of conversion and measurements of unified signal, input resistance and limits of the tolerable basic reduced error with respect to measured value correspond to the ones provided in the table 1.

Table 1 - ИРТ 1730У/А for configurations with input electrical signals in the form of direct current strength and voltage

Input signal	Range of conversion	Range of measurements		Input resistance, kOhm,		Limits of tolerable basic reduced error by measured value, %
		for dependence of measured value from the input signal :		not less	not more	
		linear	with the function of square root extraction			
Current	0…5 мА	0…5 мА	0,1…5 мА	-	0,01	±(0,2 + *)
	-5…0…5 мА	-5…0…5 мА	-4,8…+5 мА			
	4…20 мА	4…20 мА	4,32…20 мА			
	0…20 мА	0…20 мА	0,4…20 мА			
	-20…0…20 мА	-20…0…20 мА	-19,2…+20 мА			
	0…1 мА**	0…1 мА**	0,02…1 мА**		0,1	
	-1..0..1 мА**	-1..0..1 мА**	-0,96…+1 мА**			
Voltage	0…75 мV	0…75 мV	1,5…75 мV	100	-	±(0,2 + *)
	0…100 мV	0…100 мV	2…100 мV			
	-100..0..100 мV	-100..0..100 мV	-96…+100 мV			
	0…10 V	0…10	0…10 V			
	-10…0…10 V	-10…0…10 V	-9,6…+10 V			

    * - one unit of the last category, expressed in percentage of the range of measurements;
    ** - by special order.

2.2. The limit of permissible variation does not exceed the limit of tolerated basic errors.

2.3. The time of setting the operational mode (preliminary warm-up) is not more than 30 min.

2.4. The limit of tolerable additional error caused by a temperature variation of ambient air from the normal temperature (20 ± 5) °C up to any temperature within the limits (-10 … +50) °C for every 10 °C of a temperature variation, does not exceed 0,5 of the limit of the tolerable error.

2.5. The limit of tolerable additional error caused by heightened humidity (up to 95 % at 35 °C), does not exceed 0,5 of the limit of tolerable basic error.

2.6. The limit of tolerable additional error caused by voltage supply variation from the nominal 6,3; 12,6 or 220 V within the limits (5,4…6,9), (10,7…13,9) or (187…242) V correspondingly, does not exceed 0.5 of the limit of tolerable basic error.

2.7. The limit of tolerable additional error caused by constant magnetic fields influence and (or) variation fields of network frequency with the voltage of up to 400 A/m does not exceed 0,5 of the limit of tolerable basic error.

2.8. The limit of tolerable additional error caused by the influence of the voltage of cross-cut clutter of alternating-current with a virtual value, equal to 50 % of the maximum value of an electric input signal, acting between input gagging clamps sequentially with a useful signal and having any phase angle, does not exceed 0,5 of the limit of tolerable basic error.

2.9. The limit of tolerable additional error, caused by influence of voltage of longitudinal clutter of direct or alternating current with virtual value, equal 100 % of the maximum value of an electric input signal, acting between any gagging clamp and grounded case and having any phase angle, does not exceed 0,5 of the limit of the tolerable basic error.

2.10. The limit of the tolerable additional error of ИРТ 1730У/А during influence of vibration does not exceed the limit of tolerable basic error.

2.11. The area of assigning settings corresponds to measuring range.

2.12. The limit of tolerable basic error of signalling system operation does not exceed a limit of the tolerable basic error of measured values.

2.13. The limit of tolerable additional error of operation of the signaling system caused by a temperature of ambient air variation from normal up to any within the limits of operational temperatures for every 10 °C of temperature variations, does not exceed 0,5 of the limit of the tolerable basic error of the signaling system operation.

2.14. The limit of tolerable additional error of signaling operation caused by variation of supply voltage from nominal up to any within the limits of service conditions of operation, not exceeding 0,5 of the limit of tolerable basic error signalling operation.

2.15. Zone of return of by signalling operation is programmed within the limits from 0 till 100 % of the measuring range.

2.16. The power supply of ИРТ 1730У/А should be carried out from an alternating current circuit with frequency (50±1) Hz and voltage ($6{,}3^{+0,6}_{-0,9}$) and ($12{,}6^{+1,3}_{-1,9}$) or (220^{+22}_{-33})V.

2.17. The power consumed by ИРТ 1730У/А from alternating current circuit at rated voltage of the circuit does not exceed 14 V A.

2.18. Electric resistance of insulation of current-conducting circuits of ИРТ 1730У/А relative to its case and among themselves is not less than:

- 20 MOhm at the temperature of ambient air (20±5) °C and relative humidity from 30 up to 80 %;
- 5 MOhm at the temperature of ambient air (50±3) °C and relative humidity from 30 up to 80 %;
- 1 MOhm at relative humidity (95±3) % and temperature of ambient air (35±3) °C.

2.19. Overall dimensions, mm, not more than:

- the length   231;
- the width   160;
- the height   32;
- the front panel 160 x 32   (in DIN 43700);
- slit in the board 158 x 29 (for one ИРТ 1730У/А);
                  158 x 60 (for two ИРТ 1730У/А);
                  158 x [60+30,5 · (n-2)] (for n- ИРТ 1730У/А, where
                            n=3,4...8 – the number of ИРТ 1730У/А
                            in the group);
- assembly depth   250.

2.20. Mass of ИРТ 1730У/А is not more than 1,3 kg. ИРТ 1730У/А with a cramp – not more than 1,8 kg.

2.21. ИРТ 1730У/А is tolerable and durable to influence of temperature of ambient air from minus 10 up to + 50 °C and from minus 50 up to + 50 °C correspondingly.

2.22. ИРТ 1730У/А is tolerable and durable to influence of humidity up to 95 % at the temperature of 35 °C and up to 98 % at the temperature of ambient air 35 °C correspondingly.

2.23 ИРТ 1730У/А is tolerable and durable to influence of sinusoidal vibration within the frequency range from 1 to 100 Hz at the amplitude of vibratory acceleration of 20 m/sec^2.

2.24. ИРТ 1730У/А has no constructive elements or units with a resonance frequency from 5 to 25 Hz.

2.25. ИРТ 1730У/А is tolerable and durable to influence of single mechanical shocks with a peak shock acceleration of 20 m/sec^2, with a duration of shock impulse from 2 to 20 msec and a total number of shocks – 30.

2.26. ИРТ 1730У/А is tolerable and durable to influence of multiple mechanical shocks with a peak shock acceleration of 30 m/sec^2, with a preferable duration of shock impulse 10 msec (permissible durability – from 2 to 20 msec) and a total number of shocks in every direction – 30.

2.26.1. ИРТ 1730У/А is durable to influence of shock jolting with the number of shocks per -one minute 80, mean quadratic value of speed-up of 98 m/sec² and time of action about 1 hours.

2.27. ИРТ 1730У/А is durable to seismic impact, equivalent to an impact of vibration with parameters indicated in table 3.

Table 3

Frequency Hz.	1,0	2,0	3,0	4,0	5,0	6,0	8,0	10,0	15,0	20,0	30,0
Axiliration , м/s^2	6,0	15,0	29,0	51,0	48,0	43,0	38,0	31,0	20,0	19,0	14,0

2.28. Provision of electromagnetic compatibility and disturbance immunity

2.28.1. By tolerance to electromagnetic disturbances:

- ИРТ 1730У/А corresponds to execution group III, functioning criterion- A according to State Standards P 50746-2000;
- ИРТ 1730У/А of 4H category designed for operation in «Busher» APP corresponds to the execution group III according to State Standards P 50746-2000.

2.28.2. ИРТ 1730У/А functions normally and does not create any disturbances in conditions of joint operation with equipment of systems and components for that they are designed as well as with equipment for other purposes, which may be used together with this ИРТ 1730У/А in a typical disturbance situation.

3. COMPLETE SET

3.1. ИРТ 1730У/А is supplied in complete set, provided in the table 4.

Table 4 – Complete set of delivery ИРТ 1730У/А

Name	Designation	Number	Power supply, V	Notes
1. Technological measuring control (general purpose millivoltmeter) ИРТ 1730У/А				Variant of execution modification and a number in correspondence with the order
	НКГЖ.411618.003-02	1	12,6	
	НКГЖ.411618.003-02.01	1	6,3	
	НКГЖ.411618.003-02.02	1	220	
2. Complete set of mounting components 1 including:	НКГЖ.411961.001	1 set.		
2.1. Plug DB-9M with the body		1		
2.2. Socket ЭЛ 24.00.02 with an adopter and a bracing		1		
3. Complete set of mounting components 2 including:	НКГЖ.411961.002	1 set.		
3.1. Slide	НКГЖ.734442.001	2		
3.2. Strap	НКГЖ.741134.006	4		
3.3. Strap	НКГЖ.745322.001	1		
3.4. Bracing		1 set.		
4. Block of stickers o units of measured values		1	12,6 6,3 220	
5. Complete set of software on a compact disc (in a cassette)	НКГЖ.411969.001	1		One complete set for the group of instruments according to the order
.6 Technological measuring control (general purpose millivoltmeter) ИРТ 1730У/А Certificate	НКГЖ.411618.003-02ПС	1		

4. DESIGN AND OPERATION OF THE DEVICE

4.1. ИРТ 1730У/A is composed of:

- transformer power supply unit with switching regulator;

- two-element, RC filter;

- the microwave interference rejection filter by input signal;

- analog-digital converter (ADC);

- microprocessor unit;

- module of indication and keyboard;

- two individual point relay of signalling system;

- the module of the interface RS 232 or RS 485;

- receipting key.

4.1.1. The power supply unit of ИРТ 1730У/A converts circuit voltage of 6,3, 12,6 or 220 V into stabilized +24 V, +5V, ± 5 V, and ± 12 V, feeding the microprocessor, interface, analog-digital converter correspondingly. The mains supply switch is not stipulated, ИРТ 1730У/A is intended for operation in continuous mode.

4.1.2. Two-element RC filter ensures a high interference immunity of ИРТ 1730У/A.

4.1.3. The microwave interference filter ensures electromagnetic compatibility of ИРТ 1730У/A with intercoms.

4.1.4. The analog-digital converter converts an input analogue current signal into the code arriving to the microprocessor.

4.1.5. The microprocessor unit performs the following functions:

- calculates the current value of a measured value by results of interrogation of an analog-digital converter;

- controls the module of indication, i.e. displays a current value or an edited parameter on the indicator;

- interrogates the keyboard;

- controls bar LED indicator;

- controls the module of the interface.

4.1.6. The module of indication and keyboard contains the following (in accordance with the picture 4.1):

1 - the LED four-digit indicator of measured value;

2 - the LED four-digit indicator of lower setting 1;

3 - the LED four-digit indicator of upper setting 2;

4 - bar indicator of the position of the measured value relative to settings;

5 - the push button of a reconfiguring of ИРТ 1730У/А;

6 - the push button «>» of an edited discharge selection;

7 - the push button «^» of variation of the selected discharge and selection of the following parameter.

4.1.7. The individual point relays are controlled by the microprocessor and are switched on in case of exit of measured value beyond the bounds of lower or upper settings.

4.1.8. The module of the interface is intended for connection to the computer.

4.1.9. Receipting key is designed for switch over of light indication from blinking mode into permanent glow mode. It is activated when voltage is fed on this terminal.

4.2. In the picture 4.1 there is the front panel of ИРТ 1730У/А represented.

TECHNOLOGICAL
MEASURING CONTROL
(GENERAL PURPOSE MILLIVOLTMEETER)
ИРТ 1730У/А
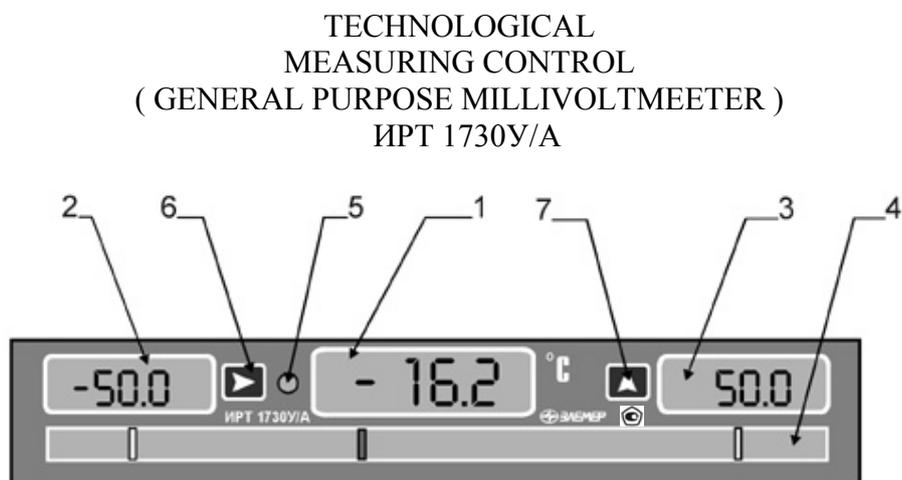
Picture 4.1

4.3. On the front panel of ИРТ 1730У/А the organs of indication and control are located corresponding to section 4.1.6.

4.3.1. Design and operation of the bar indicator.

The bar indicator is presented in the picture 4.2 and is subdivided into three zones:

1) first - seven positions of red colour;
2) second – forty or forty one positions of green colour depending on symmetry of the scale;
3) third - seven positions of red colour.

The first, second and third zones are separated among themselves by continuously luminous yellow single indicators.

The position of the spot of reflected light in the second zone (green colour) corresponds to the non- emergency value of a measured value.

The exit into the first and third (zones of red colour) corresponds to emergency on the lower and upper settings accordingly, that is when the measured value is less then the lower setting and more then the upper setting.

At the moment of an exit of the measured parameter from the zone of normal operation (green colour) into the zone of emergency (the red colour) starts to flash the applicable digital setting indicator (with frequency of 2Hz). After 20 seconds flashing of the digital setting indicator is stopped. If during this time interval there is a voltage from 5 to 25 V fed on the receipting terminal between the clamps, flashing will stop ahead of time.

Bar indicator

| Red | Yellow | Green | Yellow | Red |

Zone 1   Zone 2   Zone 3
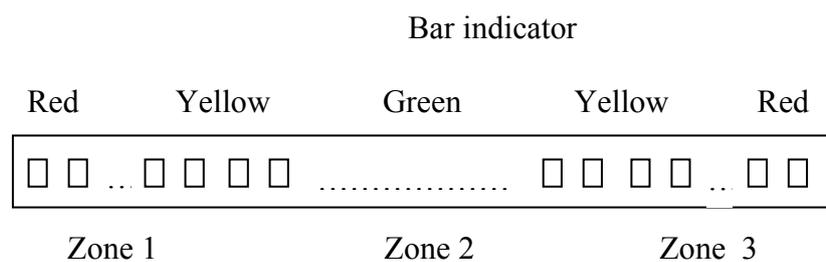
Picture 4.2

In case if the measured value oversteps the boundary of the bar indicator, the applicable extreme LED of the scale with the frequency of 2 Hz starts flashing.

4.3.2. The push button of reconfiguring enables the user to enter in the menu of configuration setting of ИРТ 1730У/А and to make one-time variation.

To enter the menu it is necessary to keep the indicated push button pressed until on the lower indicator there will light the word PASS. If the push buttn is not pressed within 1 mine, ИРТ 1730У/А automatically passes into measuring mode.

4.3.3. Input of any parameters, including passwords is performed in the following way:

4.3.3.1. One-time clicking of the push button «>» of an edited discharge selection moves a flashing discharge of the indicator to the right. One-time clicking of the push button «^» changes an edited discharge for one unit or selects the following parameter, if there are no flashing discharges.

Before selection of the configuration parameter it is necessary to enter the password with the aid of indicated push buttons. Changing of a password is possible only with the aid of the computer. As a password the digits from 0 up to 9 and characters A, b, C, d, E, F may be used.

Factory setting of the passwords - 0000.

4.3.3.2. Parameters of the configuration and their identification

1) «Un» – circuit number, using which ИРТ 1730У/А responds to request of the computer. Values of circuit numbers are from 1 up to 254. If a number is set that does not corresponds to indicated range, on the display the message «Err3» will flash demonstrating an error when setting the parameter value. On expiration of 2 seconds it is possible to repeat input of a number.

The editing of parameters of is executed by pushing buttons «>» and «^», the value is flashed in the right indicator.

Factory setting «Un» = 1.

2) «SPd» - transfer rate on a serial port RS 232.

The transfer rate is selected from a series: 0,3; 0,6; 1,2; 2,4; 4,8; 9,6 kB/sec.

Factory setting «SPd» = 9,6.

3) «ind» – indication of settings. This parameter ensures two operation modes:

«1» - the values of settings are always flashed on the indicator;

«0» - if not a single settings has operated, the values of settings are cancelled.

Factory setting «ind» = 1.

4) «ind2» – indication mode of measured value. The present parameter provides for two modes of operation of indicator of measured value:

«1» - a measured value is always flashed on the indicator;

«0» - if not a single setting has operated, the indicator of the measured value is extinguished.

Factory setting «ind2» =1.

5) «AErr» – parameter determining the state of the relay in case of an error in measuring (breakaway of an input circuit, improper connection of the primary transducer etc.).

Table 5

Value AErr	Relay	
	Setting I	setting II
0	out	out
1	on	out
2	out	on
3	on	on

Factory setting «AErr» = 0.

6) «OUEr» - parameter, determining operation of ИРТ 1730У/А outside measuring (only for the unified input signals in the form of voltage or direct current force);

«OUEr» = 0 - on the LED of the measured value the flashing placard «-AL-» is flashed, and the state of the relay is determined by the parameter «AErr»;

«OUEr» = 1 - on the basic display unit the flashing placard «-OU-» is flashed, and the state of the relay is determined by measured value;

Factory setting «OUEr» = 0.

7) «tY» – settings operation mode:

«tY» = 0 – setting I – lower setting II - upper;

«tY» = 1 - both settings are lower;

«tY» = 2 - both settings are upper.

Factory setting «tY» = 0.

8) «dАt» – designation of the input signal (of the identifications of primary transducer with unified output signal).

Depending on the selected type of primary converter micro switches, located in the aperture of the lower cover, should be installed in the position corresponding to the selected type of the primary converter.

Table 6

Designation in the right window	Corresponding conversion ranges	Position of micro switches *
t55	-5…0…5 мА	1, 2, 4
t05	0…5 мА	1, 2, 4
t220	-20…0…20 мА	1, 2, 4
t020	0…20 мА	1, 2, 4
t420	4…20 мА	1, 2, 4
t01	0…1 мА	1, 2, 5
t11	- 1…0…1 мА	1, 2, 5
U110	-100…0…100 мV	1, 3
U010	0…100 мV	1, 3
U075	0…75 мV	1, 3
U11	-10…0…10 V	1, 2, 6
U01	0…10 V	1, 2, 6

* - above mentioned micro switches should be in a position «ON» and others in the opposite position.

9) «Sqrt» - function of square rooting.

«Sqrt» = 0 - the displayed value when measuring current or voltage is calculated from the formula

$$\text{Value} = \left(\frac{I - I_{min}}{I_{max} - I_{min}} \right) \times (dP2 - dP1) + dP1, \qquad (4.1)$$

where Value – is the value, displayed on the indicator;
I – measured value of current or voltage;
I_{min}, I_{max} – limits of conversion of input signal according to tables 1 and 6;
dP2, dP1 – the range of conversion pursuant to section 13.

«Sqrt» = 1 - the displayed value when measuring current or voltage is calculated according to the formula

$$\text{Value} = \sqrt{\frac{I - I_{min}}{I_{max} - I_{min}}} \times (dP2 - dP1) + dP1 \qquad (4.2)$$

Factory setting «Sqrt» = 0.

10) «Sil» - linearization function of a square root near zero. It is used for reduction of noises, bit it increases ah error. The value of the parameter are provided as a percentage of input (measured) range. It is possible to choose from the following fixed values: 0,0 %, 0,5 %, 1 %, 2 %, 3 %.

In the range of input signal from 0 till the selected value the function will be linear.

The value 0,0 %- denotes that this function is switched off, that is the function of the square root will be extracted in the whole range of input signals.
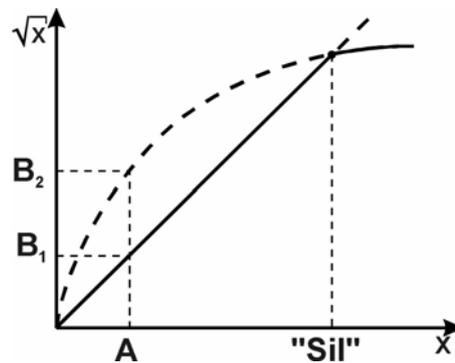
Table 7

Parameter value Sil, %	Input signal in the point of maximal error A, %	Maximal error $(B_2 - B_1)$, %
0,5	0,125	1,77
1,0	0,25	2,5
2,0	0,5	3,54
3,0	0,75	4,33

Factory setting – 0,0 %.

11) «UF» - amount of symbols after a comma.

Amount of symbols after a comma from 0 up to 3.

The range if indicated values at «UF» equal to:

3 - 0…+9,999;

2 - minus 9,99 … 99,99;

1 - minus 99,9 … 999,9;

0 - minus 999 … 9999.

The value is flashed in the right indicator.

Factory setting – «1».

12) «GISt» - the value of hysteresis. The value of hysteresis is expressed in the same units as the measured value.

For upper setting:

- when the measured value is increased, the relay is switched on when the setting value is attained;
- when the measured value is decreased, the relay is switched off at the measured value equal to the setting minus hysteresis.

For lower setting:

- when the measured value is decreased, the relay is switched on when the setting value is attained;
- when the measured value is increased, the relay is switched off at the measured value equal to the setting minus hysteresis.

Factory setting «GISt» - «0».

13) «dP» - range of transformation.

For input signals as direct current voltage: in the left-hand display window the minimum value of range of transformation value is indicated (value of indication corresponding to the minimum of input range) in the right display window the maximum value of transformation range is displayed.

Factory setting - min – «0.0»; max. – «100.0».

14) «dt» – the magnitude of linear offset of a scale. To the computed value by the results of measuring the parameter value «dt» is added, and the result is displayed on the indicator. The relay and bar indicator are set pursuant to the new value.

Factory setting – «0.0».

15) «AL4» – is the minimal measured value for the range 4….20 mA. The value of the parameter is set in millimetres. In case of input signal, the smallest value of this parameter there will be produced a report on sensor breakdown.

Factory setting - 2.5.

> **The notice**: *Parameters and their graphical symbols are provided in tables 5-7.*
> *When menu is dropped down, some parameters may be not indicated, if they are not used with a definite type of the sensor.*

4.3.3.3. Error reporting

In case of any failures or errors of ИРТ 1730У/А or any faults of the main display (position 1, picture 4.1) the report of error is indicated.

Possible error reports:

«Err0», «Err1», «Err4» - error of the internal memory of the instrument, this error is eliminated only in factory conditions.

«Err2» - one of the parameters of the instrument configuration is set in the wrong way, or discrepancies of the parameter «UF» (number of digits after a comma) and some digital parameter.

In case of any of the above errors, the instrument receives automatically: Number of the instrument -0, rate of exchange – 9600 baud.

After elimination of the causes of the errors, the values of these parameters are restored.

«-AL» - break of the sensor, or spillover the measurement ranges.

«-0U» - spillover the measurement ranges.

«----» - number, that may be displayed on the 4-digit indicator. It is recommended to reduce the parameter «UF» (number of digits after a comer).

4.4. On the rear panel of ИРТ 1730У/А the are the following:

- plug of the socket connector for connection of ИРТ 1730У/А to the circuit, execution units and primary converters;
- connector for the interface.

5. SAFETY MEASURES INDICATIONS

5.1. ИРТ 1730У/А in accordance with НП-001-97 (ОПБ – 88/97) belongs to safety grades 2, 3:

- as to its purpose - to the elements of normal operation;
- as to its influence on safety – to the elements important for safety;
- as to the nature of functions performed – to the controlling elements.

An example of classification designations 2 НУ or 3НУ.

5.2. As to its method of a human being protection form an electric current shock ИРТ 1730У/А corresponds to the class I by State Standards 12.2.007 -75 and meets all safety requirements in accordance with State Standards Р 51350-99.

5.3. ИРТ 1730У/А has got a clamp of protective grounding by State Standards 12.2.007-75.

5.4. Primary converters, executive devices, are connected according to marking when power supply is switched off.

5.5. ИРТ 1730У/А is a fire-safe device, a possibility of fire starting in ИРТ 1730У/А does not exceed 10_{-6} during the year in accordance with State Standards 12.1.004-85, that is in case of any failures happening in ИРТ 1730У/А itself as well as external electrical circuits connected to it, the instrument may not be the cause of fire.

5.6. During operation of ИРТ 1730У/А it is necessary to meet all requirements of НП -001-97 (ОПБ – 88/97), ПНАЭ Г – 1-024-90 (ПБЯ РУ АС-89), State Standards 12.3.019-80, « Rules of technical operation of electrical devices of consumers», «Regulations of safety measures during operation of electrical devices of consumers», and « Regulations of electrical installations design», approved by Gosenergonadzor.

6. PREPARATION FOR OPERATION

6.1. Unpack ИРТ 1730У/А. Make an external examination, during which the correspondence to the following requirements should be verified:

1) ИРТ 1730У/А should be completed with completed in accordance with the section 3 of the present certificate.

2) Factory number of ИРТ 1730У/А should correspond to the one indicated in the certificate;

3) ИРТ 1730У/А should not have any mechanical damages, otherwise its operation is not permissible.

6.2. ИРТ 1730У/А installation procedure

6.2.1. Prior to installation of ИРТ 1730У/А into the panel it is required:

1) to remove the plate, situated on the lover cover of ИРТ 1730У/А;

2) install micro switches, situated in the aperture of the lower cover in accordance with the table 6;

3) install the plate in its place.

6.2.2. In order to install ИРТ 1730У/Аinto the panel it is necessary to have an access to it from the rear of the panel.

6.2.3. In order to fixate ИРТ 1730У/А a special fastening bracket is used, that is included into the complete supply kit. Using this fastening bracket it would be possible to slide ИРТ 1730У/А into the panel and pull it out it. When pulling ИРТ 1730У/А out of the panel it is required to use a handle as it is shown in picture 6.1.
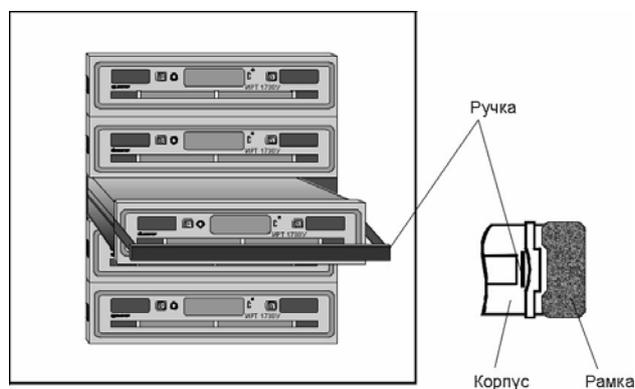
Picture 6.1

On the surface of the of the panel it will be possible to install ИРТ 1730У/А close to each other. The dimensions of the slots in the panel are made in accordance with the section 2.20.

In the picture 6.2 there is an assembly drawing of the bracket provided for installation of ИРТ 1730У/А.

The bracket for installation of ИРТ 1730У/А on the surface of the panel.
Assembly drawing

Picture 6.2

The rare strap 3 with the plug of the socket connector is fixed to the slides 1.2 of the bracket with the aid of four screws. The slides are fixed with the aid of the screws 4 to the keeper straps of 5 and 6. Smoothness of travel of ИРТ 1730У/А in the bracket is ensured due to change of the position of the slides with the aid of the screws 4. The strap 3 is not included into the complete supply set. On the picture 6.3 there is the recommended drawing of the strap.

Keeper strap

Picture 6.3

6.2.4. Electrical communication chart of ИРТ 1730У/А with the power supply system, primary converter, executive signaling units, that is operating via socket connector situated at the rare panel, is represented on the picture 6.4.

Technological measuring control
(general purpose millivoltmeter) ИРТ 1730У/А
Electrical communication chart
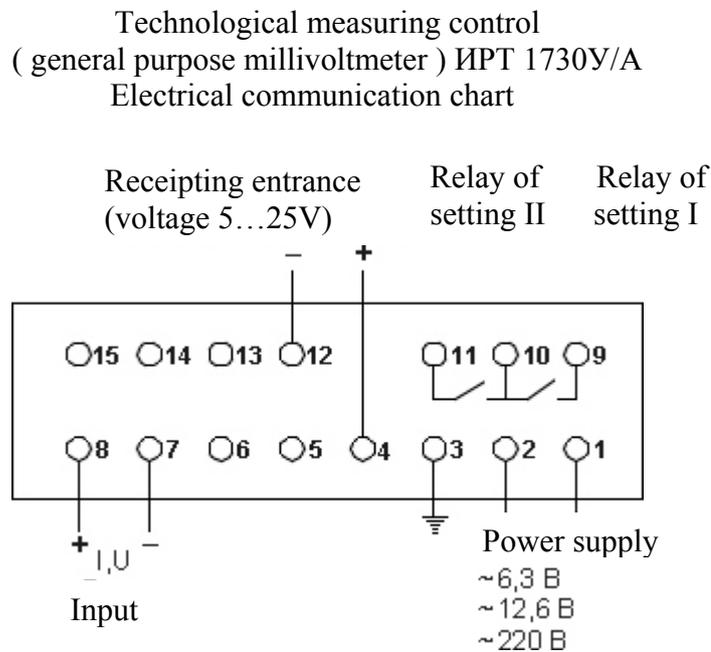
Picture 6.4

6.2.5. The housing of the ИРТ 1730У/А is grounded, ИРТ 1730У/А should be switched on and warmed up during 30 minutes.

6.3. Trial running

6.3.1. For configurations of ИРТ 1730У/А with output electrical signals in the form of strength of current and direct current voltage, to the incoming terminals it is necessary to connect sources of calibrating currents and voltages correspondingly.

Install the values of output signals corresponding to upper limits of measured value.

6.4. In case of need ИРТ 1730У/А may be reconfigured following instructions of the clauses 4.3.2 and 4.3.3.

6.5. If another type of primary converter is used it is required to:

1) switch off power supply;
2) slide ИРТ 1730У/А out of the panel;
3) install micro switches at the corresponding incoming signal according to instructions in the section 6.2.1;
4) connect the primary converter to the plug of the socket connector;
5) slide ИРТ 1730У/А back into the panel;
6) switch on power supply;
7) configure ИРТ 1730У/А in accordance with sections 4.3.2, 4.3.3.

7. OPERATION PROCEDURE

7.1. Connect a primary converter to ИРТ 1730У/А, control devices according to the circuit, provided at the picture 6.4.

7.2. Connect ИРТ to the power supply source. After 30 minutes ИРТ 1730У/А is ready for operation.

7.3. Using push buttons at the front panel you should set setting values, for this purpose:

- push the button «>», thus on the extreme indicators the word «PASS» is flashed (if the password is not equal to 0000);

- enter the password of access to settings, using directions of the section 4; if the password is correct a single change of settings is authorized.

8. VERIFICATION PROCEDURE

8.1. ИРТ 1730У/А verification should be carried out by the State Metrological Service of metrological department of the customer, which has the right to verify. Requirements to verification, its procedure and the main steps are defined by regulations 50.2.006-94 of the State Service of Measurements «Measuring facilities verification. Preparation and procedure».

8.2. Interval between verifications is two (2) years.

8.3. Operation and verification means

8.3.1. During verification, operations specified in Table 8.1 are to be carried out.

Table 8.1

Item	Verification operation	Point No.	Operation conduction necessity	
			at initial verification	at periodical verification
1.	Surface inspection	p. 8.6.1	+	+
2.	Testing	p. 8.6.2	+	+
3.	Insulation resistance checkup	p. 8.6.3	+	-
4.	Insulation electric strength checkup	p. 8.6.4	+	-
5.	Determination of measuring channel main error values	p.p. 8.6.5	+	+

8.3.2. During verification, main and auxiliary verification means specified in Table 8.2 are used.

Table 8.2

Verification means name and Standard Technical Documentation designation	Main metrological and technical characteristics of verification means
Multipurpose signal standard calibrator-meter IKSU-2000 Specification 4381-031-13282997-00	Voltage reproduction range Minus 10…100 mV, 0…12 V. Basic error ±0,005 mV ± 3 mV
	Current reproduction range 0…25 mA. Basic error ±0,003 mA
Electric safety checkup unit GPI-745A	Output voltage range up to 1500 V
	Measured resistance range at voltage 500V and 1000V from 1 to 9999 MOhm
Megaohmmeter F4102/1-1M Specification 25-7534.005-87	Measurement range 0…20000 MOhm.

Note:.It Is acceptable to use individual, newly developed or being used verification means and equipment, which are not lower on their characteristics than the ones specified in this verification methods.

8.4. Safety requirements

8.4.1. During verification, safety requirements should be satisfied, which are specified in documentation for the used means of verification and equipment.

8.5. Verification conditions and preparation for verification

8.5.1. During verification, the following conditions are to be satisfied:

1)	ambient air temperature, °C	20 ± 5;
2)	air relative humidity, %	$30 \div 80$;
3)	atmospheric pressure, kPa (mmHg.)	$84,0 \div 106,7$;
		$(630 - 800)$;
4)	supply voltage, V	$220 \pm 4,4$;
5)	feed network frequency, Hz	$50 \pm 0,5$.

8.5.2. Operations carried out using verification means and checked ИРТ 1730У/А are to be done according to the instructions given in operating documents.

8.5.3. Before verification, the following preparation work should be done:

8.5.3.1. ИРТ 1730У/А should be held under conditions specified in point 8.5.1 for 4 hours.

8.5.3.2. Verification means should be prepared for work according to operation documents.

8.6. Verification conduction

8.6.1. The tested ИРТ 1730У/А surface inspection should be conducted according to section 6.1 of this Certificate.

8.6.2. The checked ИРТ 1730У/А testing consists of its workability checkup according to section 6.3 of this Certificate.

8.6.3. Insulation resistance checkup

8.6.3.1. ИРТ 1730У/А circuits insulation resistance should be checked using megaohmmeter F 4102/1-1M or using the other device to measure resistance with operating voltage not more than 500 V and with error not more than 20 %.

Readout should be carried out 1 min. after voltage application between the tested circuit contacts and the body connected with each other (by a clamp of protective ground) or connected together with contacts of the other circuit according to Table 8.3.

Table 8.3

Testing voltage, V	Checked circuits	Numbers of contacts combined in groups according to picture 6.4 and A.1, A.3 of Appendix A	
		first	second
500	AC supply circuit, measuring input, receipting input, signaling circuits, RS232/485, relative to: body (protective ground clamp);	cont. 1, 2; 7, 8; 4, 12; 9, 10, 11 cont. 1-9 of joint DB-9	cont. 3
	AC supply circuit, signaling circuits, relative to: receipting input measuring channel input interface RS232/485	cont. 1, 2; 9, 10, 11	cont. 4, 12 cont. 7, 8 cont.1-9 of joint DB-9

Insulation resistance should not be lower than 20 MOhm.

8.6.4. Insulation electric strength checkup

8.6.4.1. Insulation electric strength checkup should be carried out according to the instructions given in operating documents for GPI-745A. Testing voltage should be lowered smoothly, starting from zero to testing value for 5-7 s. Voltage decrease to zero should be carried out with the same rate.

Testing voltage values for different circuits of ИРТ 1730У/А are given in Table 8.4.

Table 8.4

Testing voltage, V	Checked circuits	Numbers of contacts combined in groups according to picture 6.4 and A.1, A.3 of Appendix A	
		first	second
1500	AC supply circuit, measuring input, receipting input, signaling circuits, RS232/485, relative to: body (protective ground clamp);	cont. 1, 2; 7, 8; 4, 12; 9, 10, 11 cont. 1-9 of joint DB-9	cont. 3
	AC supply circuit, signaling circuits, relative to: receipting input measuring channel input interface RS232/485	cont. 1, 2; 9, 10, 11	cont. 4, 12 cont. 7, 8 cont. 1-9 of joint DB-9
500	Interface RS232/485 relative to: measuring channel input	cont. 1-9 of joint DB-9	cont. 7, 8
	Receipting input relative to: measuring channel input	cont. 4, 12	cont. 7, 8

ИРТ 1730У/А should be held under testing voltage for 1 min, then voltage is decreased to zero according to the instructions given in operating documents for GPI-745A.

During checkup, no breakdowns and insulation surface overlap should take place.

8.6.5. Determination of the values of main errors of measuring channel

8.6.5.1. Determination of ИРТ 1730У/А measuring channel error values may be carried out as autonomously (using ИРТ 1730У/А keyboard for its configuration and ИРТ 1730У/А indicators for readout) as using computer (with the help of computer keyboard for ИРТ 1730У/А configuration and computer display for readout).

8.6.5.2. To determine the values of ИРТ 1730У/А basic error with output signals in the form of DC voltage in the range –100…100mV, the following operations should be carried out:

1) ИРТ 1730У/А micro-swithes should be set in the following position: 1, 3 – (ON); 2, 4, 5, 6 – (OFF). Calibrator IKSU-2000 (hereinafter – IKSU) should be prepared for operation in the mode of generation of constant voltage of millivolt range, and connected to ИРТ 1730У/А input; here, ИРТ 1730У/А connection polarity should be changed to opposite one;

2) the following parameters of ИРТ 1730У/А configurations should be set (configuration parameters and their designations correspond to pp. 4.3.3.2):

- setting I = 0,0;
- setting II = 1,0;
- setting indication   «ind1» = 1;
- measured value indication   «ind2» = 1;
- input signal conventional symbol
  (of primary converter with standardized
  output signal)   «dAt» = "U110"
  (Voltage –<u>100…+100 mV</u>);
- number of characters after comma   «UF» = 2;
- square root taking function   «Sqrt» = 0;
- conversion range   «dP» = 0.00; 50.00;
- scale linear drift value   «dt» = 0.00.

The rest parameters may be of any value.

3) Using IKSU, value of emulated (actual) voltage equal to + 100 mV is set; appropriate measurements are conducted by verified ИРТ 1730У/А (actual value of the measured magnitude is determined according to formula (4.1));

4) absolute error value ΔA is determined as difference between measured and actual values of the measured magnitude according to formula

$$\Delta A = A_{изм} - A_{\partial} ,\qquad\qquad\qquad (8.1)$$

where $A_{изм}$ – measured value in the verified point;
       $A_{\partial.}$ – emulated (actual) value in the verified point;

5) IKSU connection polarity is to be changed;

6) ИРТ 1730У/А following configuration is set:

- conventional designation of input signal
  (of primary converter with standardized
  output signal)   «dAt» = "U010"
  (Voltage <u>0…+100mV</u>).

The rest parameters values should correspond to 8.6.5.2.2).

7) Operations specified in pp. 8.6.5.2.3), 8.6.5.2.4) should be repeated; in turn, IKSU values of emulated (actual) voltage are set, which are equal to 0, 25, 50, 75 and 100 mV; appropriate measurements by verified ИРТ 1730У/А are carried out (actual value of the measured magnitude is determined according to formula (4.1)).

8.6.5.3. To determine the values of the main error during ИРТ 1730У/А operation with output signals in the form of DC voltage in the range −10…10 V, the following operations are carried out:

1) ИРТ 1730У/А micro switches are set in the following position: 1, 2, 6 – (ON); 3, 4, 5 – (OFF). IKSU is prepared for operation in the mode of generation of constant voltage of volt range, and is connected to ИРТ 1730У/А input; here, ИРТ 1730У/А connection polarity should be changed to opposite one;

2) the following parameters of ИРТ 1730У/А configurations should be set (configuration parameters and their designations correspond to pp. 4.3.3.2):

- conventional designation of input signal
  (of primary converter with standardized
  output signal)   «dAt» = "U011"
                                                     (Voltage -10…+10V).

The rest parameters values should correspond to pp. 8.6.5.2.2).

3) Using IKSU, value of emulated (actual) voltage equal to + 10V is set (actual value of the measured magnitude is determined according to formula (4.1));

4) absolute error value is determined as difference between measured and actual values of the measured magnitude according to formula (8.1);

5) IKSU connection polarity is to be changed;

6) ИРТ 1730У/А following configuration is set:

- conventional designation of input signal
  (of primary converter with standardized
  output signal)   «dAt» = "U01"
                                                     (Voltage 0…+10V).

The rest parameters values should correspond to pp. 8.6.5.2.2).

7) in turn, IKSU values of emulated (actual) voltage are set, which are equal to 0 and 10V; appropriate measurements using verified ИРТ 1730У/А are carried out; absolute error value is determined as difference between measured and actual values of the measured magnitude according to formula (8.1).

8.6.5.4. To determine the values of the main error during ИРТ 1730У/А operation with DC input signals, the following operations are carried out:

1) ИРТ 1730У/А micro switches are set in the following position: 1, 2, 4 – (ON); 3, 5, 6 – (OFF). IKSU is prepared for operation in the mode of DC generation, and is connected to ИРТ 1730У/А input; here, ИРТ 1730У/А connection polarity should be changed to opposite one;

2) the following parameters of ИРТ 1730У/А configurations should be set :

- conventional designation of input signal (of primary converter with standardized output signal

«dAt» = "t220" (Current -20…+20mA).

The rest parameters values should correspond to pp. 8.6.5.2.2).

3) Using IKSU, value of emulated (actual) current equal to + 20mA is set (actual value of the measured magnitude is determined according to formula (4.1));

4) absolute error value is determined as difference between measured and actual values of the measured magnitude according to formula (8.1);

5) IKSU connection polarity is to be changed;

6) ИРТ 1730У/А following configuration is set:

- conventional designation of input signal (of primary converter with standardized output signal)

«dAt» = "t020" (Current 0…+20mA).

The rest parameters values should correspond to pp. 8.6.5.2.2.

7) In turn, IKSU values of emulated (actual) current are set by calibrator-meter, which are equal to 0 and 20 mA; appropriate measurements using verified ИРТ 1730У/А are carried out (actual value of the measured magnitude is determined according to formula (4.1)).

30

8) the following parameters of ИРТ 1730У/А configurations should be set:

- setting I = 0,0;
- setting II = 1,0;
- setting indication   «ind1» = 1;
- measured value indication   «ind2» = 1;
- input signal conventional symbol
  (of primary converter with standardized
  output signal)   «dAt» = "t05"
  (Current <u>0…+ 5 mA</u>);
- number of characters after comma   «UF» = 3;
- square root taking function   «Sqrt» = 0;
- conversion range for output signal
  in the form of DC   «Crn» = 0.000; 5.000;
- conversion range   «dP» = 0.000; 5.000;
- scale linear drift value   «dt» = 0.000.

The rest parameters are not changed.

9) In turn, IKSU values of emulated (actual) current are set, which are equal to 0 and 5 mA; appropriate measurements using verified ИРТ 1730У/А are carried out.

8.7. Verification results processing

8.7.1. Absolute error values for input signals in the form of DC voltage in the range −100…+100 mV for the verified point −100 mV should not exceed:

±0,4 mV (0n input signal);
±0,1 (on indicator readings in
    values of the measured magnitude).

8.7.1.1. Absolute error values for input signals in the form of DC voltage in the range 0…+100 mV for the verified point 0, 25, 50, 75 and 100 mV should not exceed:

±0,15 mV (on input signal);
±0,07 (on indicator readings in
    values of the measured magnitude).

8.7.2. Absolute error values for input signals in the form of DC voltage in the range -10…+10 V for the verified point −10 V should not exceed:

±40 mV (on input signal);
±0,1 (on indicator readings in
    values of the measured magnitude).

8.7.2.1. Absolute error values for input signals in the form of DC voltage in the range 0...+10 V for the verified points 0, 10 V should not exceed:

±20 mV (on input signal);
±0,1 (on indicator readings in
    values of the measured magnitude).

8.7.3. Absolute error values for input signals in the form of DC voltage in the range −20...+20 mA for the verified points −20 mA should not exceed:

±0,08 mA (on input signal);
±0,10 (on indicator readings in
    values of the measured magnitude).

8.7.3.1. Absolute error values for input signals in the form of DC voltage in the range 0...+20 mA for the verified points 0, 20 mA should not exceed:

±0,032 mA (on input signal);
±0,08 (on indicator readings in
    values of the measured magnitude).

8.7.4. Absolute error values for input signals in the form of DC voltage in the range 0...+5 mA for the verified points 0, 5 mA should not exceed:

±0,01 мА (on input signal);
±0,010 (on indicator readings in
    values of the measured magnitude).

8.7.5. ИРТ 1730У/А is considered as successfully verified with positive results in sections. 8.6.5.1...8.6.5.4 if the corresponding absolute errors are within the limits specified in sections 8.7.1....8.7.4 (i.e. the values of the main normalized errors do not exceed permissible ones).

8.8. Determination of measuring channel main errors configured for certain type of input signal.

8.8.1. ИРТ 1730У/А measuring channel main error for configurations with input electric signals in the form of DC force and voltage (p. 2.1, Table 1) is determined in verified points corresponding to 5, 25, 50, 75, 95 % of input standardized signal range.

Measurements for determination of the main errors of ИРТ 1730У/А measuring channel with the mentioned configurations are to be carried out according to methods specified in pp. 8.6.5.1…8.6.5.4.

The main error γ_1 is calculated using formula (8.2) in each point which is expressed in the form of normalized error in percents of standardizing value.

As standardizing value, difference between upper and lower ultimate values of the measured magnitude is accepted.

$$\gamma_1 = \frac{A_{изм.} - A_{\partial}}{A_{в} - A_{н}} \cdot 100\% \, , \qquad (8.2)$$

where $A_{н}, A_{в}$ - lower and upper ultimate values of measurement range;

$\quad\quad A_{\partial}$ - actual value of the magnitude in verified point;

$\quad\quad A_{изм.}$ - measured value.

Actual values of the measured magnitudes A_{∂} corresponding to values of input signal in verified points are calculated using formulae (8.3), …(8.6). For measured value/input signal relation:

- linear

$$A_{\partial} = \frac{A_{в} - A_{н}}{I_{в} - I_{н}} \cdot (I_{вх.i} - I_{н}) + A_{н}, \qquad (8.3)$$

$$A_{\partial} = \frac{A_{в} - A_{н}}{U_{в} - U_{н}} \cdot (U_{вх.i} - U_{н}) + A_{н} \qquad (8.4)$$

- with root square taking function

$$A_{\partial} = \frac{A_{\scriptscriptstyle\textit{в}} - A_{\scriptscriptstyle\textit{н}}}{\sqrt{I_{\scriptscriptstyle\textit{в}} - I_{\scriptscriptstyle\textit{н}}}} \cdot \sqrt{I_{\scriptscriptstyle\textit{вх.i}} - I_{\scriptscriptstyle\textit{н}}} + A_{\scriptscriptstyle\textit{н}},$$ (8.5)

$$A_{\partial} = \frac{A_{\scriptscriptstyle\textit{в}} - A_{\scriptscriptstyle\textit{н}}}{\sqrt{U_{\scriptscriptstyle\textit{в}} - U_{\scriptscriptstyle\textit{н}}}} \cdot \sqrt{U_{\scriptscriptstyle\textit{вх.i}} - U_{\scriptscriptstyle\textit{н}}} + A_{\scriptscriptstyle\textit{н}},$$ (8.6)

where $I_{\scriptscriptstyle\textit{н}}, I_{\scriptscriptstyle\textit{в}}, U_{\scriptscriptstyle\textit{н}}, U_{\scriptscriptstyle\textit{в}}$ - lower and upper ultimate values of the ranges of DC force and voltage, respectively;

$I_{\scriptscriptstyle\textit{вх.i}}, U_{\scriptscriptstyle\textit{вх.i}}$ - input signal values in the form of DC force and voltage in verified point, respectively.

The main normalized error of the measuring channel is calculated using formula (8.2).

The highest of the calculated values of the main error should not exceed the value specified in Table 1.

8.9. Verification results issuance

8.9.1. ИРТ 1730У/А verification positive results are issued by Certificate of the State verification of standard form according to regulations 50.2.006-94.

8.9.1.1. Verification results for ИРТ 1730У/А configured for certain input signal are issued by Certificate of the State Verification of standard form with indication of verification results overleaf (or by protocol of arbitrary form).

Attention! In this case it is not allowed to use ИРТ 1730У/А with the other configurations.

8.9.2. In case of negative results of ИРТ 1730У/А verification it is not allowed to use it till the revealing the reason for malfunction and such malfunction removal.

8.9.3. After removal of the revealed malfunction, repeated verification is to be carried out; the results of such repeated verifications are considered as final.

9. RULES OF TRANSPORTATION AND STORAGE

9.1. ИРТ 1730У/А is transportable by all kinds of transport in covered transport facilities. Strapping of package in a transport facility should be carried out according to the current regulations of the corresponding transport facilities.

9.2. ИРТ 1730У/А transportation conditions should meet requirements 5 according to State Standards 15150-69 at the ambient temperature from minus 50 to +50 ^{o}C, and should comply with anti-shock and anti-vibration measures.

9.3. ИРТ 1730У/А storage conditions in transportation containers at the stores of the manufacturer and consumer should meet condition 1 according to State Standards 15150-69.

10. ACCEPTANCE CERTIFICATE

10.1. The technological measuring control (general purpose millivoltmeter) ИРТ 1730У/А/_____/_____ factory number № _____ was manufactured and accepted in accordance with mandatory requirement of State Standards, of actual technical documentation and recognized suitable for operation.

10.2. Technological testing during 72 hours has been carried out.

Head of the quality control department

Seal _____   _____

personal signature   signature deciphering

_____

year, month, day

Equipment was manufactured under monitoring.

State Technical Inspectors of Russia

Seal _____   _____

personal signature   signature deciphering

_____

year, month, day

11. PACKAGING CERTIFICATE

11.1. The technological measuring control (general purpose millivoltmeter) ИРТ 1730У/А factory number № _____ was packed by the Research and production incorporation «ELEMER» according to the established designer documentation requests.

Date of packing _____

Seal.

Packing was made by _____
                           (signature)

Device was accepted after packing _____
                                           (signature)

12. RESOURCES, SERVICE LIFE AND SHELF LIFE
MANUFACTURER'S GUARANTIES (SUPPLIER'S GUARANTIES)

12.1. The resource of the technological measuring control (general purpose millivoltmeter ИРТ 1730У/А makes up 25000 hours within the 10 years service life. The above mentioned resource, service life and shelf life are valid only if a consumer follows the requirements of the operating in-line documentation.

12.2. Guaranties of the manufacturer (supplier).

12.2.1. The manufacturer guarantees correspondence of ИРТ 1730У/А to the requirements of technical specifications, if only a consumer follows requirements of operation, storage, and transportation.

12.2.2. Warranty period of operation is determined to be 24 months from the selling date of ИРТ 1730У/А.

13. INFORMATION ON RECLAMATIONS

13.1. In case of loss of effectiveness of ИРТ 1730У/А, or decreased performance, determined in technical specifications, under condition that all requirements of the section «Guarantees of Manufacturer» would be observed, the client should issue a certificate of compliance and send it to the address:

<div align="center">

141570 Moskovskaya district, Solnechnogorskiy district,

Mendeleevo, RPI «ELEMER»

Tel./fax: (495) 925-5147
(495) 925-5102
(495) 535-8443

</div>

Three wire connection circuit of ИРТ 1730У/А to a Computer

(up to 10 ИРТ 1730У/А with the connection line up to 15 m long)
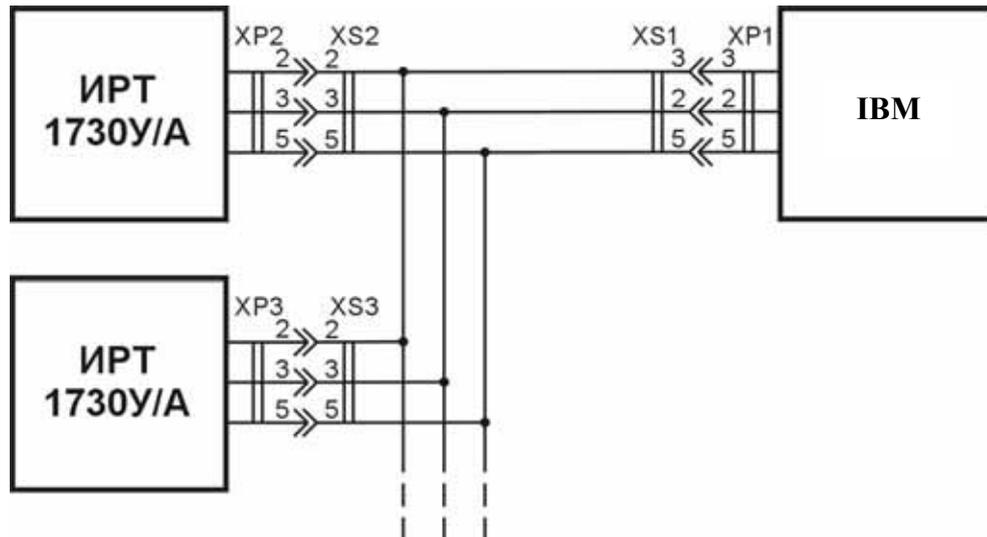
XP1, XP2, …   - plugs DB-9M;
XS1, XS2, …   - sockets DB-9F;   IBM –   computer

Picture A.1

Double wire connection circuit of ИРТ 1730У/А to a Computer

(up to 100 ИРТ 1730У/А with the connection line up to 1000 m long)
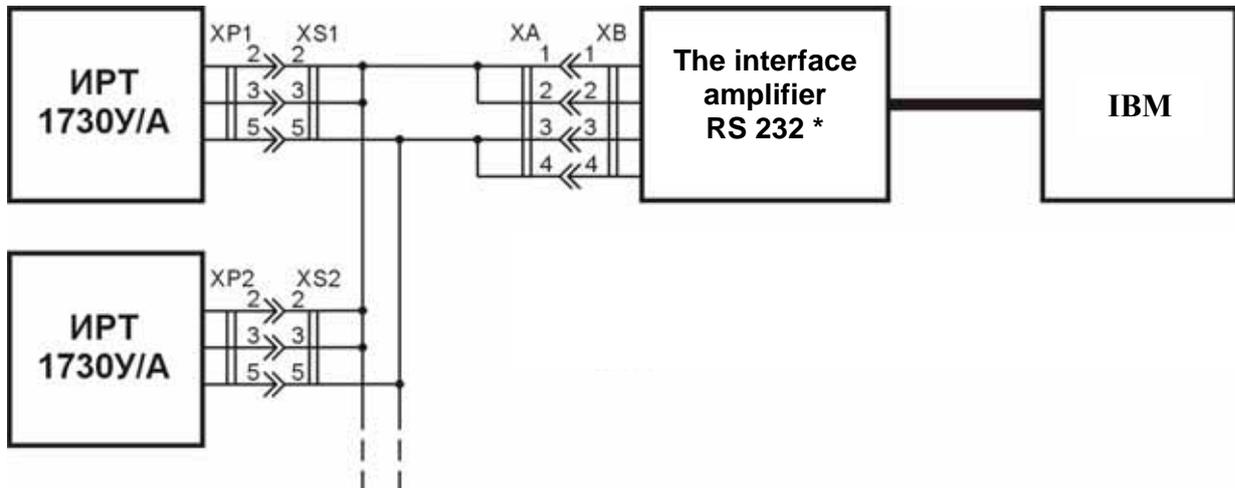
XP1, XP2, …   - plugs DB-9M;
XS1, XS2, …   - sockets DB-9F.

Picture A.2

_____

 * *As an interface booster of RS 232 it is possible to employ*
   ПИ 232/485 manufactured by SRC «ELEMER»

Double wire connection circuit of ИРТ 1730У/А to a Computer
using interface converter RS 485/RS232
(up to 100 ИРТ 1730У/А with the connection line up to 1000 m long)

In ИРТ 1730У/А for interface RS-485 the connector DB9 (socket) is installed with the following functional purpose of the contacts:

output 6 - R+; output 7 - A;

output 8 - B; output 9- R-;

where: A and B - signaling outputs ;

R+ -resistor 4,7 kOhm, connected by one terminal to the connector, and by the other terminal - to another power supply source +5V;

R- - resistor 4,7 kOhm, connected by one terminal to the connector, and by the other terminal to the common leg (-) of interface power supply source.

In order to improve noise immunity of the communication line, it is recommended to connect outputs R+ with A, and R- with B on two the most distant form each other ИРТ 1730У/А, connected into one network, and on other instruments - contacts R+ and R- should not be connected anywhere.
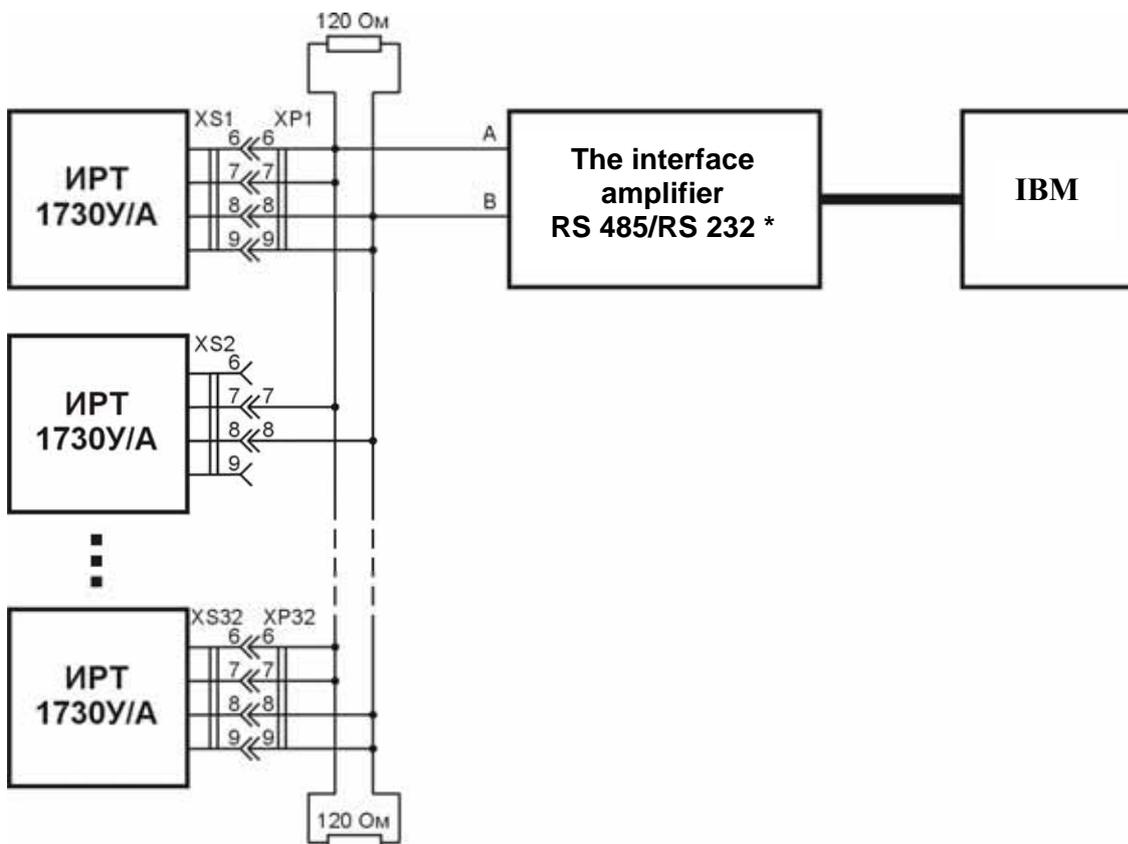
XP1,XP2,…XP32   - plugs DB-9M;   ИРТ 1730У/А – measuring instruments
XS1,XS2,…XS32   - sockets DB-9F;   with an interface RS 485.

Picture A.3

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Converter should be with an automatic switch of direction of signal transfer

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List of changes registration

Changes	Number of pages				Total number of pages in the document	№ document	Reg. number of the accompanying document and date	Signature	Date
	changed	replaced	new	annulled					