ЭЛЕМЕР

THE RESEARCH-AND-PRODUCTION COMPANY

MULTICHANNEL TECHNOLOGICAL REGISTRATOR RMT 49D

Passport

CONTENTS

1. INTRODUCTION

1.1. The present passport is to make easy acquaintance with the system and service regulations of the multichannel registrar RMT 49D (further RMT) and contains articles of information certifying manufacturer's warranties.

2. PURPOSE OF THE ARTICLE

2.1. RMT is intended for measuring temperature and other not electrical quantities transformed into electrical signals of force and voltage of direct current or active resistance.

2.2. RMT is used in various technological processes of industry and agriculture.

2.3. RMT is an analog-digital showing, graphic recording and measuring tracer, which is configured by the type of coming input signal, by the ranges of the measured quantity and by the type of scale by consecutive interface RS 232.

2.4. RMT is intended for working with thermal converters of resistance 50М, 100М, 50П, 100П on STATE STANDARTS 6651-94 or Pt100 DIN N43760, thermoelectric converters on STATE STANDARTS P 50431-92 and converters with the unified output signals on STATE STANDARTS 26.011-80.

2.5. The dependence of registered quantity on the unified input signal for RMT can be as linear, as with a square root extraction function.

2.6. The RMT design allows its installation in the control desk

2.7. For securing from the environment effect RMT is executed in a dust and water proof performance. The degrees of protection from penetration of dust and water according to STATE STANDARTS 14254-80:

- IP52 for models with the case opening downwards
  (the door performance is designated by the letter "K");
- IP54 for models with the case opening to the side (the door performance is designated by the letter "P");
- IP20 (for terminal posts on the RMT back panel).

2.8. RMT can have from one up to three channels of measurement and record of various physical quantities.

2.9. According to the STATE STANDARTS 9999-94, RMT is:

- a secondary recording electric device;
- According to the type of the diagram carrier - with a record on a tape;
- According to the method of record - with a liquid ink pen recording ;
- According to the character of record - with a continuous record.

2.10. On stability to climatic effects at operation RMT corresponds to the 3rd group of performance on the STATE STANDARTS 22261-94.

3. SPECIFICATIONS AND CHARACTERISTICS

3.1. Number of measuring channels -

3.2. Number of recording channels -

3.3. Parameters of the device configuration:

Parameter	parameter designation	factory installation	Channel 1	channel 2	channel 3
The network address	Un	1			
Speed of exchange	SPd	9,6			
Time of indication (seconds)	tind	3			
Allowed inst. Progr	EnP	1			
The configuration password	PScF	0000			
Type of the gauge	dAt	t420			
The switching diagram	Lc	c3			
Marks after the point	UF	1			
Averaging	nS	1			
min of the indication range	dP1	0			
max of the indication range	dP2	100			
Square root	Sqr	0			
Zone of return	GSt	0,5			
Resolution of relay working	EnU	1			
Relay 1 at the gauge breakage	rL1	0			
Relay 2 at the gauge breakage	rL2	0			
Relay 3 at the gauge breakage	rL3	0			
Relay 4 at the gauge breakage	rL4	0			
min of the record range	PP1	0			
max of the record range	PP2	100			
Compensator calibration R0	Clr	---			
Line calibration R	Clc	---			
Replacement of recording devices	Pen	---	---		---

3.4. The ranges of measurements, source parameters and limits of the admitted indicated basic errors of RMT measured quantities taking into consideration their configurations conform to those ones indicated in the table 1 and table 2.

The basic indicated error on the computer channel RMT does not exceed the basic indicated error on the measuring channel.

3.5. Limit of the basic indicated error on record of measured quantity is ±1 %.

3.6. Limit of the basic relative error on time record is ± 0,05 %

3.7. The RMT tolerance zone of is in limits of ± 0,2 %.

3.8. The maximum significance of friction effect expressed in percentage of graduation length (width of a record field), does not exceed 0,3 %.

3.9. Reproducibility of the measurements results is not more than 0,2 %.

3.10. The instability of RMT indications during 10 days (long drift) is not more than ± 0,4 %.

3.11. The working mode establishment time is not more than 20 minutes.

The table 1. The multichannel technological registrars RMT with input signals from thermal converter of resistance and thermoelectric converters

Type of the primary converter	W_{100}	Range of measured temperatures, C	Input parameters			limits of the basic indicated admissible error, %
			On HCX		input resistance , KOhm	
			Resistance, Ohm	Thermo-emf., мV		
1	2	3	4	5	6	7
50М	1,4280	-50÷200	39,23÷92,78	-	-	±(0,25+*)
100М			78,45÷185,55			
50М	1,4260		39,35÷92,62			
100М			78,69÷185,23			
50П	1,3910	-100÷500	29,82÷141,95			
100П			59,64÷283,89			
Pt100	1,3850		60,26÷280,98			
ТХА ХА(К)	-	0÷1300	-	0÷52,398	not less than 30	±(0,5+*)
ТХК ХК(L)		0÷600		0÷49,098		
ТПП ПП(S)		0÷1300		0÷13,155		

The table 2. Multichannel technological registrars RMT with input electrical signals in form of the direct current voltage or of the direct current

Measured quantity	measurements range	source parameters		Limits of the basic Indicated admissible error, %
		Resistance, MOhm, - not less	voltage, мV, no more	
Current, мА	0÷5**	-	105	±(0,2 + *)
	0÷20			
	4÷20**			
	0÷5		100	
	4÷20			
voltage, мV	0÷75	0,1	-	
	0÷100			

* - one unit of the last category expressed in percentage of measurements range ;

** - for RMT with unified source signals the dependence of the measured quantity from the input signal can be either linear, or with a square root extraction function.

3.12. The RMT indications variation is within the limits of +- 0,2 %.

3.13. The limits of the admitted additional error of RMT, caused by temperature changing of surrounding air from normal (20 ± 5) C up to any other temperature in limits of (+5 - +40) C for each 10 C of temperature changing , do not exceed ± 0,5 % in the part of quantity record and 0,5 of the limits of admitted basic error measured quantities in the part of measurements

3.14. The limits of the admitted additional error of RMT, intended for working with thermoelectric converters caused by a temperature change in their free ends in a range (+5 - +40)C, do not exceed ± 1 % in the quantity record part and do not exceed the limits of the admitted basic error of measured quantities in the part of measurements.

3.15. The limits of the admitted additional error caused by changing of the supply voltage from nominal (220V) in limits (187 - 242)V, do not exceed ± 0,5 % in the art of the quantity record and 0,5 of the basic errors of measured quantities in the part of measurements.

3.16. The limits of the admitted additional error of RMT, caused by the effect of constant magnetic fields and (or) of network frequency variable fields with intensity up to 400 A/м do not exceed ± 0,5 % in the part of quantity record and 0,5 of basic errors of measured quantities in the part of measurements.

3.17. Limits of the admitted additional error of RMT, caused by influence of the transverse interference voltage of an alternating current with effective significance equal to 50 % of maximum significance of the electrical input signal of RMT, acting between any input measuring clips in consequence with a useful signal and having any phase angle, do not exceed ± 0,5 % in the part of quantity record and 0,5 of the basic errors of measured quantities in the part of measurements.

3.18. Limits of the admitted additional error of RMT, caused by an influence of the longitudinal interference voltage of a constant or alternating current with effective significance equal to 100 % of maximum significance of the electrical input signal of RMT, acting between any measuring clip and an earthen case and having any phase angle, do not exceed ± 0,5 % in the part of quantity record and 0,5 of basic errors of the measured quantities in the part of measurements.

3.19. The area of the setting task corresponds to the range of measurements.

3.20. The limit of the admitted basic error of operation of the signaling system does not exceed the limit of the admitted basic error of measured quantities.

3.21. The limit of admitted additional error of operation of the signaling system caused by a temperature change of surrounding air from a normal one up to anyone in working temperature limits for each 10C of temperature changing, does not exceed 0,5 of the admitted basic error limit of the signaling system operation.

3.22. The limit of the admitted basic error of operation of the signaling system caused by a supply voltage changing from nominal one up to any one in limits of the working conditions of using, does not exceed 0,5 of the limit of the admitted basic error of the signaling system operation.

3.23. The RMT mains supply is carried out from an alternating current source with frequency of (50 ± 1)Hz and voltage of $(220\ ^{+22}_{-33})$V.

The capacity, consumed by RMT from an alternating current source at rated voltage, does not exceed 15 A.

3.24. RMT electrical circuits isolation concerning its case withstands during 1 minutes a test voltage action of practically sinusoidal wave form of 1500V and a frequency from 45 up to 65 Hz at normal conditions and 900V and a frequency from 45 up to 65V at the temperature of (25 ± 3)C and at relative humidity of (90 ± 3) %.

3.25. Electric resistance of conductor line isolation of RMT circuits concerning its case and is not less:

- 20 M Ohm at the surrounding air temperature of (20 ± 5) C, and at the relative humidity from 30 up to 80 %;
- 5 M Ohm at the surrounding air temperature of (40 ± 3)C and at the relative humidity from 30 up to 80 %.

3.26. Chart tape:

Useful width - 100 mm, length of record - 80 mm.

3.27. The speed of moving of the diagram is chosen out from a rang: 0, 10, 20, 60, 120, 240, 600, 1200, 3600, 7200, 14400 mm / hour.

3.28. Overall dimension, mm, no more:

- Forward panel 144x144;
- Assembly depth 250;
- Cut in a board 139x139.

3.29. RMT weight is not more than 4 kg.

3.30. RMTs are resistant to the effect of surrounding air temperature from +5 up to +40C.

3.31. RMTs are resistant to effect of humidity up to 90 % at the temperature of 25C.

3.32. RMTs in transport packing withstand the temperature up to +50C.

3.33. RMTs in transport packing withstand the temperature down to –50C.

3.34. RMTs in transport packing withstand the environment air influence with relative humidity of 98 % at the temperature of 35C.

3.35. RMT in transportation packing are stable against effect of shock jolting with number of impacts per one minute - 80, with average quadratic acceleration rate of 98 м/с2 and during 1 hour.

4. COMPLETENESS

4.1. A complete set of delivery includes:

- multichannel technological registrar RMT 49D	- 1 pieces;
- corresponding part of a socket DB9	- 1 pieces;
- diskette with the software (on RMT group)	- 2 pieces;
- Key for the door	- 1 pieces;
- Complete set of writing pen units such as ZP 410- ZP 430	- 1 pieces;
- Fixing bracket	- 2 pieces;
- Rolled paper	- 8 pieces;
- multichannel technological registrars RMT 49D. The passport	- 1 pieces.

5. ARTICLE SYSTEM AND WORK

5.1. RMT set includes:

- power supply transformer unit with linear stabilizers;
- impulse power supply unit;
- analog-digital converter ADC (one for each measuring channel);
- microprocessor block;
- indication and keyboard module;
- digital-to-analog converters module,
- recording device with a linear electric motor, recording device and servo amplifiers (one for each measuring channel);
- tape driving mechanism with a speed changing system for plotting paper moving;
- twelve executive relays of the signaling system (four for a measuring channel);
- module of the interface RS 232 to connect with the computer.

5.1.1. The power supply transformer unit will transforms the mains voltage 220V in not stabilized +8V, +17V and stabilized +5V, ±5V, ±12V, supplying all electronic units, except for ADC. The switch of supplying is not stipulated, as RMT is intended for continuous mode working.

5.1.2. The impulse power unit transforms not stabilized voltage of +8V in stabilized electrically untied couple voltage of +5V, supplying ADC modules.

5.1.3. ADC transforms an input analog signal into a code arriving at the microprocessor through an optical interconnection.

5.1.4. The microprocessor block, by results of ADC interrogation, calculates the current significance of the measured quantity, displays it on the indicator, interrogates the keyboard, manages the modules of digital-to-analog converters and interface RS 232 and the executive relay.

5.1.5. The executive relays are switched on (are switched off) at the measured quantity exit out of limits of bottom I, II and top III, IV setting .

Setting values are entered by the keyboard or on COHM port and are displayed on the board panel.

The executive relays of bottom setting I, II are switched on, if T < UStI, T < UStII and are switched off, if T> UstI + GSt, T> UstII + GSt accordingly. The executive relays of top setting III, IV are switched on, if T> UStIII, T> UStIV and are switched off, if T < UStIII + GSt, T < UStIV + GSt accordingly. Here:

T - current significance of measured quantity;

UstI, UstII, UStIII, UstIV – values of setting I, II, III, IV accordingly;

GSt - the value of hysteresis or a zone of return (is entered individually for each channel).

5.1.6. All executive relays are output by complete contact groups: general(common), normally closed, normal opened contacts.

5.1.7. If during working RMT fails to measure significance of input quantity because of:

- input circuits breakage ;
- measured quantity exit out of range of measurements limits;
- ADC malfunctions,

the given relay is established in the condition determined in parameters rL1, rL2, rL3, rL4 individually for each setting of each channel.

rL1 = 0, rL2 = 0, rL3 = 0 or rL4 =0 - the appropriate relay is switched off;

rL1 = 1, rL2 = 1, rL3 = 1 or rL4 =1 - the appropriate relay is switched on.

5.1.8. The keyboard and indication module structure includes:

1) Six green round LEDs (Lighted Electric Diode) displaying the indication mode of the basic four-digit indicator; the button MODE allowing to choose one of six modes of operation:

- cyclic interrogation of channels on the measured quantity (indication time of one channel is set from 2 up to 100 seconds);
- Manual interrogation of channels on the measured quantity;

I setting indication I;
II setting indication II;
III setting indication III;
IV setting indication IV.

2) Six round green LEDs displaying the channel number; the choice of the channel is made with the button CHANNEL.

3) Six triangular LEDs displaying the relay RMT condition. ∆ LEDs display the relay setting condition III, IV, and LEDs ▼ display the relay setting condition I, II:

- The red color displays the operation of the emergency setting relay IV, I independently from the condition of the relay III, II accordingly;
- The yellow color displays the condition of the precautionary setting relay III, II.

To provide a correct logic working of indication it is necessary to establish the setting significance in the following order: UStI < UStII < UStIII < UstIV.

4) Buttons «PGM», ">", "▲", are used for the input of setting, configuration parameters and realization of calibration of the line resistance at the two-wire diagram of circuit connection of resistance thermal converters and R0 of the equalizer for thermoelectric converters. One pressing to the button of a choice of the edited category ">" provides moving of the edited (blinking) category to the right. One pressing to the button "▲" provides significance changing of the edited category per unit or it chooses the following configuration parameter.

5.1.8.1. For programming of settings:

- display into indication the edited setting value with the help of buttons MODE and CHANNEL;
- press the button "PGM" for beginning of setting value programming;
- edit the setting value with the help of buttons ">", "▲" according to article 5.1.8.4);
- finish the setting editing by pressing the button "PGM".

5.1.8.2. For configuration parameters programming:

- in the mode of cyclic or manual interrogation of channels, press the button "PGM", then on the indicator the header "PScF" will be highlighted - the password inquiry;
- enter the password with the help of buttons ">", "▲" according to article 5.1.8.4); if the entered password is correct, a mnemonic designation of the first configuration parameter will be displayed; if the password is wrong, RMT will come back to the previous mode of operation. *If the password is equal to 0, the pressing of the button "PGM" will result at once in indication of the first configuration parameter;*
- choose the necessary parameter with the button "▲";
- choose the necessary channel with the button CHANNEL;

- press the button ">" for viewing the parameter value (pressing of the button "▲" will cause returning to the indication of the parameter name and further on to a choice of the next parameter);
- edit the parameter according to article 5.1.8.4);
- press the button "▲" for returning to indication of the name of parameter;
- choose the next parameter with buttons "▲" and CHANNEL;
- The exit from the menu of the configuration programming is carried out by pressing the button "PGM" from any article of the menu.

The notes: 1. When the power supply is switched on RMT *passes to a cyclic mode of channels interrogation.*

2. If buttons are not pressed within five minutes, RMT passes to the mode of cyclic or manual interrogation of channels from any other mode of indication.

3. RMT makes measurement of input signals, the relay management and makes records on paper in any indication mode.

4. The change of any setting or configuration parameter enters into force just after its input.

5.1.8.3. Parameters of a configuration and their designation:

1) «Un» - the network number, by which RMT responds to the computer inquiry. The network number value is from 1 up to 254.

Factory setting "Un" = 1.

2) "Spd" - speed of transferring by the serial port RS 232. The speed of transferring is chosen from the row: "0,3"; "0,6"; "1,2"; "2,4"; "4,8"; "9,6" Kbit per second.

Factory setting installation(aim) "Spd" = "9,6".

3) "tind" - time of indication (seconds) 2 - 100.

4) "EnP" - sanction of setting programming;

"EnP" = 0 - programming is forbidden;

"EnP" = 1 - setting programming is authorized.

Factory setting "EnP" = 1.

5) "PScF" - password on the configuration 0 - 9999.

6) "dAt" - type of the primary converter.

Factory setting - «t420». Table 3.

7) "Lc" - circuit of connection of the THERMOCONVERTER OF RESISTANCE;

"c2" - two-wire;

"c3" –three-wire .

Factory setting - "c3".

8) "UF.n" – quantity of measuring marks after the point on indication of the channel n from 0 up to 3.

Factory installation(aim) - "1".

9) "nS.n" - amount of measurements for averaging on the channel n from 1 up to 100.

Time of one measurement 0,6 seconds.

At setting of this parameter it is necessary to take into account, that at step-by-step changing of the source signal on 10 % from the range of measurements, time of establishment of measured quantity with accuracy of 0,5 % will be equal to 2,9*nS.n*0,6 (seconds), with an accuracy of 0,25 % - will be equal to 3,5*nS.n*0,6 (seconds). Besides, when switching the RMT power supply on or after reparation of an input circuits breakage, the process of measuring and managing the relay begins after nS.n*0,6 (seconds).

Factory setting - 1.

The table 3.

Primary Converter Designation	conditional a designation HCX	W_{100}	Range of measured quantities
1	2	3	4
«Cu85»	50M	1,4280	-50÷200 °C
«Cu65»	50M	1,4260	-50÷200 °C
«Cu83»	53M	1,4280	-50÷200 °C
«Cu63»	53M	1,4260	-50÷200 °C
«Cu81»	100M	1,4280	-50÷200 °C
«Cu61»	100M	1,4260	-50÷200 °C
«PtH5»	50П	1,3910	-50÷600 °C
«PtH1»	100П	1,3910	-50÷600 °C
«Ptb1»	Pt100	1,3850	-50÷600 °C
«HA»	XA(K)	-	-50÷1300 °C
«HE»	XK(L)	-	-50÷600 °C
«ПП»	ПП(S)	-	-50÷1700 °C
«8P»	ВР(А)-1	-	-50÷2500 °C
«t05»	-	-	0÷5 мА
«t020»	-	-	0÷20 мА
«t420»	-	-	4÷20 мА
«U100»	-	-	0÷100 мV
«U075»	-	-	0÷75 мV
«rr»	-	-	0÷320 Ohm

10) "dP1.n" - minimum significance of the range of indication.

There is minimum significance of the range of transformation (significance of indications appropriate to maximum significance of the input source range) for input source signals in the form of a force or a direct current voltage

Factory installation - «0.0».

11) "dP2.n" - maximum significance of the range of indication.

For source signals in form of forces or a direct current voltage maximum significance of a range of transformation (significance of indications appropriate to minimum significance of the input source range).

Factory installation - «100.0».

12) «Sqr.n» - function of a square root extraction.

«Sqr.n» = 0 - the induced significance at measurement of current or voltage is calculated under the formula

$$\text{Value} = dP1 + (dP2 - dP1) \times \frac{(I - \text{Im}in)}{(\text{Im}ax - \text{Im}in)}, \qquad (5.1)$$

Where Value - significance, induced on the indicator;

I - measured significance of current or voltage;

Imin, Imax - limits of measurement of current or voltage;

dP2, dP1 - range of transformation according to article 4.2.9.3.11).

«Sqr.n» = 1 - the induced significance at measurement of current or voltage is calculated under the formula

$$\text{Value} = dP1 + (dP2 - dP1) \times \sqrt{\frac{(I - \text{Im}in)}{(\text{Im}ax - \text{Im}in)}} \qquad (5.2)$$

Factory installation - "Sqr.n" = 0.

13) "GSt.n" - significance of the zone of return on settings operation.

14) "EnU.n" - sanction of settings operation.

"EnU.n" = 0 - the settings operation on the channel n is forbidden;

"EnU.n" = 1 - the settings operation on the channel n is authorized.

Factory installation(aim) "EnU.n" = 1.

15) "rL1.n" - condition of the setting relay I at breakage of input source circuits of the channel n.

"rL1.n" = 0 - is switched off;

"rL1.n" = 1 - is included.

Factory installation(aim) "rL1.n" = 0.

16) "rL2.n" - condition of the setting relay II at breakage of input source circuits of the channel n.

"rL2.n" = 0 - is switched off;

"rL2.n" = 1 - is included.

Factory installation(aim) "rL2.n" = 0.

17) "rL3.n" - condition of the setting relay III at breakage of source circuits of the channel n.

"rL3.n" = 0 - is switched off;

"rL3.n" = 1 - is included.

Factory installation(aim) "rL3.n" = 0.

18) "rL4.n" - condition of the setting relay IV at breakage of source circuits of the channel n.

"rL4.n" = 0 - is switched off;

"rL4.n" = 1 - is included.

Factory installation "rL4.n" = 0.

19) "PP1.n" - minimum significance of a range of record of measured quantity.

Factory installation "PP1.n" = " 0.0".

20) "PP2.n" - maximum significance of a range of record of measured quantity.

Factory installation "PP1.n" = " 100.0".

21) "CLr.n" - line resistance calibration at measurement of the THERMOCONVERTER OF RESISTANCE on 2-circuits diagram, expressed in Ohm:

- Connect a line closed on the part of the THERMOCONVERTER OF RESISTANCE to the device or connect a resistance, equivalent to the line resistance;

- choose the appropriate channel in article "CLr.n" of the menu and press the button ">" (the installed line resistance significance will be highlighted on the indication;

- press the button ">" (indication "no");

- press the button "^" (indication "YES");

- press the button ">" (the measured significance of the line resistance will be highlighted in some seconds);

- press the button "^" for exit in the basic menu or «PGM» for exit from the menu.

22) "CLc.n" - calibration resistance of the cold seal compensator at measurement of the THERMOCONVERTER OF RESISTANCE, expressed in ohm, in 0°C:

- connect the thermocouple and the cold seal compensator to the device, according to fig. 7.2 and put the working end of the thermocouple into an ice-water mix (0°C);

- choose the appropriate channel in article of the menu "CLc.n" and press the button ">" (the installed compensator significance R0 will be highlighted on the indication);

- press the button ">" (indication "no");

- press the button "^" (indication "YES");

- press the button ">" (the measured value of the compensator resistance in 0°C will be highlighted in some seconds); (in some seconds the measured significance of the equalizer will be highlighted;

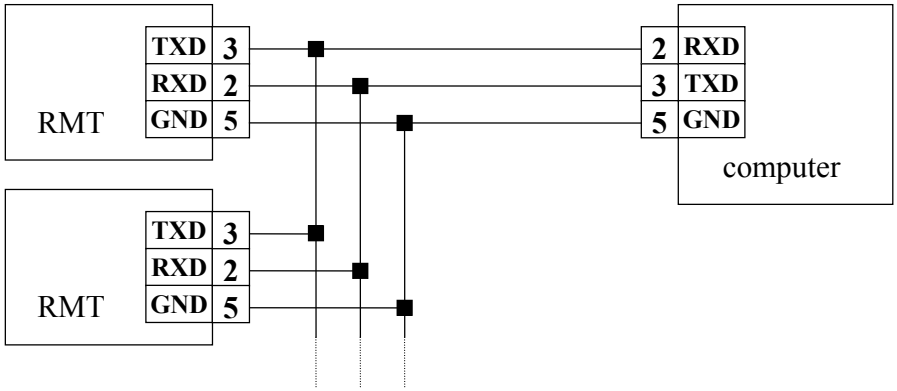
- press the button "^" for exit in the basic menu or «PGM» for exit from the menu.

5.1.9. The module of the interface is intended for an exchange of the data between RMT and computer.

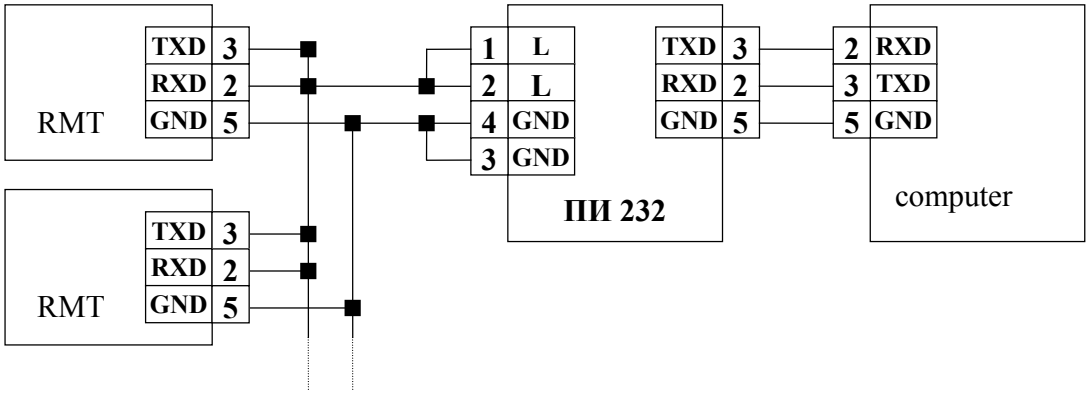
The interface allows to read out from RMT current measured significance and settings significance with the help of the program "RMT49D.exe".

Under the electrical characteristics the interface represents a modified variant of the interface RS 232. Possible variants of RMT connection to the computer are represented in fig. 5.1.

Multichannel technological registrars RMT 49D/RS.
Circuits diagrams of connections with the computer



3-wire connections. Up to 10 RMT can be connected to one computer. The communication line length is up to 15 m.



Two-wire connections. Up to 100 RMT can be connected to one computer. The communication line length is up to 1500 m

NB. Interface converter ПИ 232 and DDE exchange driver IRT1730.exe can be delivered by separate order.

Fig. 5.1

6. SAFETY REGULATIONS

6.1. Only the persons, who have made a close study of the present passport and who have passed the instructing in the SAFETY REGULATIONS can be allowed to work with RMT

6.2. RMT correspond to class 1 of STATE STANDARTS 12.2.007.0-75 by its method to protect a person from electric injuring

6.3. RMT have a clip of protective grounding according to STATE STANDARTS 12.2.007.0-75.

6.4. Before switching on it is necessary to check that RMT grounding exists and is in order. The grounding resistance should not exceed 0,1 Ohm.

6.5. When using RMT it is necessary to follow STATE STANDARTS 12.3.019-80 instructions, " ” and " Electric device using instructions of safety methods for consumers", authorized by State Energy Consuming Regulation Department (Госэнергонадзор).

6.6. Perform reparations and all preventive works at the switched - off RMT.

6.7. Connect prime transformers, signal system circuit wires according to the marking when the power supply is switched – off.

7. PRE-STARTING PROCEDURE

7.1. Unpack the RMT. Make an external examination, when the conformity to the following requests should be established:

1) RMT should be completed according to section 4 of the present passport;

2) The RMT factory number should correspond the number indicated in the passport;

3) RMT should not have any mechanical damages, when it is forbidden to perform any working.

7.2. Order of RMT installation

7.2.1. For RMT installation in a board it is necessary to have access to it from the board back side. The cut dimensions are according article 3.28.

7.2.2. RMT installation in a board is according to the assembly drawing represented in fig. 7.1. Special fixing articles – brackets (C-clamps) are used for RMT fastening, they are included in the complete delivery set.

Multichannel technological registrar RMT 49D.
Assembly drawing

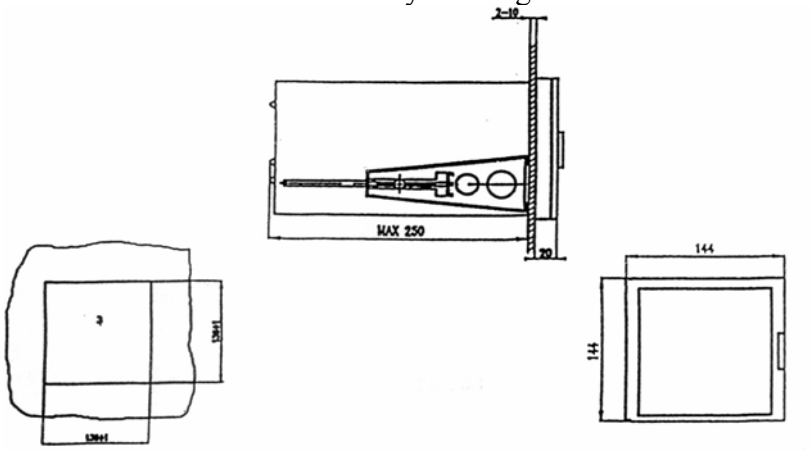


Fig. 7.1

7.2.3. RMT electrical connections with power supply net and primary converters are carried out through the connector block, located on the back panel according to fig. 7.2.

The measuring line should be laid by looped wires and enter into the screen.

Multichannel technological registrar
RMT 49D.
Back panel

Supply connection:
K19, K20 – 220 V, 50 Hz;
K21 - case grounding.

The connection table of relay contacts

Channel	Setting	Back panel plugs numbers		
		normally disconnected	general	normally connected
Channel 1	I	K22	K23	K24
	II	K25	K26	K27
	III	K1	K2	K3
	IV	K4	K5	K6
Channel 2	I	K28	K29	K30
	II	K31	K32	K33
	III	K7	K8	K9
	IV	K10	K11	K12
Channel 3	I	K34	K35	K36
	II	K37	K38	K39
	III	K13	K14	K15
	IV	K16	K17	K18

The circuits of connection of primary converters:
K40, K41, K42, K43 - channel 1
K44, K45, K46, K47 - channel 2
K48, K49, K50, K51 - channel 3

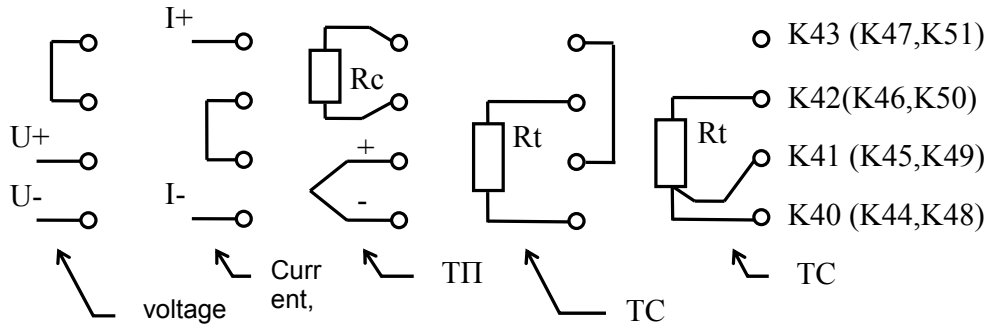


Fig. 7.2

8. OPERATING PROCEDURE

8.1. Open the RMT door and take the tape drive mechanism out, for what press simultaneously the two levers situated in the both sides of the mechanism. Released mechanism turns forward and can be easily taken out.

8.2. Installation of the recording devices

8.2.1. Switch the device on.

8.2.2. Insert the recording device for the first measuring channel in the holder. Repeat operations for two other measuring channels. The ink of recording devices has different colors for each measuring channel.

Recording devices removal during their replacement is made in the reversed order.

8.2.3. The auxiliary paper stopper for the electric motor (used during RMT storage or transportation) should be removed during the above described operations with the recording devices

8.3. The diagram moving speed is controlled by the switch located in the RMT bottom part. During this operation the tape drive mechanism should be taken out.

With the help of the switch it is possible to choose one from two numbers(lines) of speeds of the diagram moving: 10+240 mm / hour or 10+240 mm / minute (600+1400 mm / hour).

Dependence of one plotting paper roll operating time duration and of time of record presence in the field of vision is indicated in the table 4.

Table 4

plotting paper moving speed mm / hour	operating time	time of presence of record in the field of vision
10	66 days	8 hours
20	33 days	4 hours
60	11 days	80 minutes
120	5,5 days	40 minutes
240	66 hours	20 minutes.
600	26 hours	8 minutes
1200	13 hours	4 minutes
3600	260 hours	80 seconds.
7200	130 hours	40 seconds
14400	66 minutes	20 seconds.

8.4. Preparation for working with rolled plotting paper

8.4.1. Open a roll of plotting paper. Insert the giving spool into the roll and establish them in grooves located behind the top part of the tape drive mechanism.

8.4.2. Pass the beginning of plotting paper under the holding rod, then stretch the paper atop of the transporting gear rollers, pass it under the transparent transport rod, under the bottom directing bar and insert it in the slots of the reeling up (accepting) spool.

8.4.3. Turning the receiving spool approximately on 2 turnovers, roll the paper up very tightly.

8.5. Insert the tape drive mechanism into the grooves of the forepart of the put forward RMT. Establish by rotation the tape drive mechanism in its initial position.

8.6. When the primary converters are connected and endured in switched up position during 20 minutes RMT is ready for work.

8.7. Maintenance service

8.7.1. Replacement of plotting paper

1.. 2 м before ending of the tape of plotting paper there is an inclined red strip appearing on it.

Put forward the tape drive mechanism according to article 8.1 and take the accepting spool off by pulling it downwards. The spool left end face is pulled down, and the roll is kept on the remaining part of the spool.

The paper is released and can be removed by the reeled - up plotting paper rotation in the direction opposite the reeled – up one.

Insert the empty accepting spool into the initial position.

It is necessary to remove the dust from the tape drive mechanism when replacing the plotting paper.

8.7.2. Make replacement of recording device when the RMT is switched off and the tape drive mechanism is taken out, according to article 8.2.

The functional switch should be installed in position "P" (replacement of the recording device), in which the linear electric motors on right emphasis stop working. Put the top scale forward with the help of a handle and take out the recording device for the third measuring channel. Remove the recording devices of the second and first measuring channels in the same way. Insert the new recording devices in reversed way, establishing simultaneously the appropriate scales into the initial position.

9. INSTRUCTIONS ON VERIFICATION

9.1. RMT verification is carried out by the State Metrological Service or by an other authorized service, organization which has the right to verificate. The requirements to the organization, to the order of verification realization and to the form of submission of the results of the verification are determined by ПР 50.2.006-94" ГСИ. Verification of means of measurements. Organization and order of realization".

9.2. Interval between verifications - 1 year.

9.3. Safety rules

9.3.1. All works during realization of a verification should be made according to the safety rules indicated in section 6 of the present passport.

9.4. Condition of verification and preparation for it

9.4.1. When realizing the verification observe the following conditions:

Temperature of air,°C	20±5;
Relative humidity of air, %	30 ÷ 80;
Atmospheric pressure, кPa (mm of mercury column)	86,0 ÷ 106,7 (630 ÷ 800);
Supply voltage, V	220±4,4;
Frequency of supply, Hz	50±0,5;
Time lag for the switched on RMT, minutes	20.

9.4.2. Operations made with means of verification and verified RMT, according to the working instructions and to the present passport.

9.4.3. Following preparatory works should be done before proceeding to the verification

1) The RMT should be kept during 4 hours in the conditions conforming those ones fixed by article 9.4.1;

2) The means of verification prepared for working according to the operational documentation.

9.5. Verification realization

9.5.1. External survey

External survey of the verificated RMT should be done according to article 7.1 of the present passport.

9.5.2. Approbation should be carried out by connecting the RMT with the measuring circuit according to article 9.5.3, and the following must be checked:

1) conformity of the RMT indications to zero value by measured quantity and by the record of measured quantity;

2) conformity of the RMT indications to the value of the input source signal conforming to the lower value limit by the record of measured quantity (for RMTs, which have different ranges of measured quantity and of the record of measured quantity).

9.5.3. Definition of the values of the basic indicated errors of measured quantities of RMT

9.5.3.1. The basic indicated error of measured quantities of the measuring channels intended for working with thermal converters of resistance TC and thermoelectric converters of resistance ТП, and also with input source electric signals in form of direct current voltage is determined in points conforming to 5, 25, 50, 75, 95 % of the ranges of measurements, for what:

1) the measuring channel of the verified RMT is connected to the shop of resistance or to the comparator of voltage by means of scaling cable (for measuring channels designed for working with thermal converters of resistance or thermoelectric converters of resistance accordingly);

2) resistance values or т.э.д.с., conformed to the verified point of the measuring channel are installed consistently in the shop of resistance or in the comparator of voltage;

3) the nominal static characteristics NSC of the thermal converters of resistance and thermoelectric converters of resistance should conform to STATE STANDARTS 6651-94 and STATE STANDARTS P 50431-92 accordingly;

4) the difference between the indications of the RMT measuring channel and the real value of temperature in the verified point manifested in the percentage of measurements range should not exceed the appropriate value fixed in article 3.4 and the table 1 of the present passport;

5) the measuring channel is connected to the input source electrical signal in form of voltage of direct current with the source of calibrated voltages;

6) with the help of the latter the input signal value is set in the verified point;

7) the difference of the indications between the verified measuring channel and the real value of the measured quantities determined on the calibrating curve, should not exceed the values calculated by the formula (9.1)

$$| A_{изм} - A_{д} | \leq \frac{(A_{в} - A_{н}) \cdot 0{,}2}{100} + R, \qquad (9.1)$$

Where $A_{н}$ - lower limit rate of measurements;

$A_{в}$ - top limit of measurements;

Аизм - measured value of quantity in the verified point;

Hell – real value of quantity in the verified point;

R - one unit of the last mark;

0,2 - admitted basic indicated error of the measured quantity.

9.5.3.2. The basic indicated error of the measured quantities of measuring channels with input electric signals in form of direct current is determined in points corresponding to 5 and 95 % of measurements range, for what:

1) the verified measuring channel is connected to the source of the calibrated currents and the value of the input signal is set conforming to the verified point;

2) the difference between the indications of the verified measuring channel and the real value of the measured quantity in the verified point determined by the calibrating curve, should not exceed the values calculated by the formula (9.1)

9.5.4. Basic indicated error value definition by the record of the measured quantity

The basic indicated error on record of the measured quantity is defined at increasing and reducing of the measured quantity values. The measured value is defined by the record of the indications on a diagram and on the digital display board(panel).

9.5.4.1. When the diagram carrier is driven the measured quantity is transferred to the verified measuring channel consequently changing it up to achieving the chosen value so that the excess of the given level should be avoided.

For each chosen value the line is written down in the way that the effect of friction appears infinitely small, that is achieved at the diagram carrier minimum speed expense or by manual supplying of the diagram carrier

9.5.4.2. Basic indicated error on record of measured quantity is determined by the formula

$$\gamma_з = \frac{A_o - A_д}{A} \cdot 100, \qquad (9.2.)$$

Where A_o - deviation of the RMT writing system at the given value of the input source signal, mm;

$A_д$ - rating value of the writing system deviation appropriate to the real value of the measured quantity, mm;

A - nominal width of the field of record of the measuring channel, mm,

should be in the limits fixed in article 3.5 of the present passport.

NOTE. *For RMT, which measured quantity ranges and recorded measured quantity ranges do not coincide, minimum value of the range of the measured quantity record should not exceed the values designed by the formula*

$$Aв.з. - Aн.з. \geq \frac{Aв. - Aн.}{\gamma_u}, \qquad (9.3)$$

Where $Aв.з.$ - the top limit value of the measured quantity record;

$Aн.з.$ - the bottom limit value of the measured quantity record;

$A_в.$ - the top limit value of the measured quantity;

$Aн.$ - the bottom limit value of the measured quantity;

γ_u - the basic indicated error of the measured quantity for the given range of measurements conform to article 3.4 of the present passport.

The difference between the value read on the normal carrier of the diagram, and the value read on a digital display panel, expressed in percentage of graduation length (width of the field

of record), should be within the limits of the admitted basic indicated error in any verified point, including in zero, if it is present.

10. TRANSPORTATION AND STORAGE REGULATIONS

10.1. RMT can be transported by all types of roofed vehicles. Container fastening during transportation should be made according to the transport and traffic regulation rules.

10.2. The RMT transportation conditions conform to condition 5 of STATE STANDARTS 15150-69 at the temperature of air from -50 up to +50 C with observance of measures of protection from impacts and vibrations.

10.3. Conditions of the RMT storage in transport packing in the manufacturer and the consumer warehouse conform to condition 1 of STATE STANDARTS 15150-69.

11. ACCEPTANCE CERTIFICATE

11.1. The multichannel technological registrar RMT 49D factory number № ____ conforms to specifications ТУ 4211-011-13282997-99 and is recognized suitable for operation.

Date of issue _____

Seal

The controller _____

11.2. On the basis of results of the primary verification the multichannel technological Registrar RMT 49D factory number № _____ is recognized suitable and is allowed for using.

Verification seal (stamp): Next verification date

Verificator _____ _____ _____

(Signature) (initials, surname)

"_____" _____.

11.3. On the basis of periodic verification results the multichannel technological Registrar RMT 49D factory number № _____ is recognized suitable and is allowed for using.

Verification seal (stamp): Next verification date

Verificator _____ _____ _____

(Signature) (initials, surname)

"_____" _____.

On the basis of periodic verification results the multichannel technological Registrar RMT 49D factory number № _____ is recognized suitable and is allowed for using.

Verification seal (stamp): Next verification date

Verificator _____ _____ _____

(Signature) (initials, surname)

"_____" _____.

On the basis of periodic verification results the multichannel technological Registrar RMT 49D factory number № _____ is recognized suitable and is allowed for using.

Verification seal (stamp): Next verification date

Verificator _____ _____ _____

(Signature) (initials, surname)

"_____" _____.

On the basis of periodic verification results the multichannel technological Registrar RMT 49D factory number № _____ is recognized suitable and is allowed for using.

Verification seal (stamp): Next verification date

Verificator _____ _____ _____

(Signature) (initials, surname)

"_____" _____.

On the basis of periodic verification results the multichannel technological Registrar RMT 49D factory number № _____ is recognized suitable and is allowed for using.

Verification seal (stamp): Next verification date

Verificator _____ _____ _____

(Signature) (initials, surname)

"_____" _____. On the basis of periodic verification results the multichannel technological Registrar RMT 49D factory number № _____ is recognized suitable and is allowed for using.

Verification seal (stamp): Next verification date

Verificator _____ _____ _____

(Signature) (initials, surname)

"_____" _____.

On the basis of periodic verification results the multichannel technological Registrar RMT 49D factory number № _____ is recognized suitable and is allowed for using.

Verification seal (stamp): Next verification date

Verificator _____ _____ _____

(Signature) (initials, surname)

"_____" _____.

12. CERTIFICATE ON PACKING

12.1. The multichannel technological registrar RMT 49D _____ factory number № _____ is packed by the research-and-production company "ELEMER" according to the established designer documentation requests.

Date of packing _____

Seal

Packing is made by _____
(Signature)

Device acceptation after packing _____
(Signature)

13. MANUFACTURER'S WARRANTY

13.1. The manufacturer guarantees the RMT conformity to the present specification requests if the consumer follows the operating conditions, storage and transportation rules.

13.2. The working warranty period is 12 months from the moment RMT is put into action. Storage warranty period is 6 months from the moment of RMT manufacturing.

14. CLAIMS INFORMATION

14.1. In case when RMT is out of working order or when its output parameters fixed in specifications are reduced, under condition of observance of "Manufacturer's Warranty" requests, the consumer makes out the damage statement in due form and sends it to the address:

RPC "ELEMER"
Mendeleyevo
Solnechnogorsk district.
141570 Moscow region,

phone: (495) 105-5147 ,105-5102
fax: (495) 535-8443