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THE RESEARCH AND PRODUCTION ENTERPRISE

SAFE MEANS AND SYSTEMS
OF TECHNOLOGICAL MONITORING

**THE MEASURING CONVERTERS OF
TEMPERATURE AND HUMIDITY
(Modification ИИТВ-056А-М3-04 for APS)**

Manual

НКГЖ.405541.004-85ПС



For APS

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1. Use

The measuring converters of temperature and humidity ИПТВ-056А-М3-04 (further - ИПТВ-056А) are intended for the non-stop converting of temperature and relative humidity of gaseous environments into the unified electric output signal of a direct current.

ИПТВ-056А (enhanced reliability) are used in a structure of the managing systems of the technological processes of atomic power stations (APS).

According to all-Union State Standard 12997-84:

- ИПТВ-056А correspond to the products of the third order depending on the operational completeness;
- ИПТВ-056А correspond to execution group C4 on stability against any climatic influences while operating of ИПТВ-056А;
- by quantity of the channels of the converting channels are two-channels;
- on dependence of an output signal on the temperature being converted and the relative humidity - with a linear dependence.

According to all-Union State Standard 25804.1-83, ИПТВ-056А:

- correspond to category Б on the application character – the equipment of continuous application;
- correspond to type I on the number of the quality levels of functioning – the equipment having two quality degrees of functioning – the nominal level and refusal.

According to ПНАЭ Г - 01 - 011 - 97 (ОПБ - 88/97), ИПТВ-056А concerns:

- to the elements of the normal operation – on the destination;
- to the important elements for safety – on the influencing safety;
- to the managing elements – on the character of carried out functions.

2. Specifications and characteristics

2.1. The range of the measurements and converting of the relative humidity is from 0 to 100 %.

2.2. The range of the output unified signal is 0...5 mA.

2.3. The range of the measurements and converting of the temperature is from 0 to 100 °C.

2.4. The admitted limits of the basic absolute errors of the measurements are:

- $\pm 0,4$ °C for the temperature;
- ± 3 % for the relative humidity.

2.5. A constant of time, minutes, is no more:

- 0,3 on the relative humidity;
- 8 on the temperature.

2.6. The setting time of the output signal (it is the time while the output signal of ИИТВ-056А is coming into the limit zone of the admitted basic error) is no more:

- 5 minutes for the channel of the relative humidity measurements;
- 20 minutes for the channel of the temperature measurements.

2.7. The admitted limits of the additional errors of the temperature measurements and the relative humidity, caused by changing of the air temperature in 10 °C in the interval of the working values, are no more than 0,1 °C and 1,0 % accordingly.

2.8. The admitted limits of the additional errors of the relative humidity measurements, caused by changing of the temperature of the gas being analyzed for each 10 °C of the temperature change in the measuring range of the temperatures, are no more than 1,5 %.

2.9. The limit of the admitted additional error, caused by influencing of the constant magnetic fields and (or) some variable fields of the network frequency and intensity up to 300 A/m, does not exceed 0,5 limits of the admitted basic error.

2.10. The limit of the admitted additional error, caused by some voltage influence of a cross handicap of the alternating current with an effective value, equal 50 % of the maximal value of the electric input signal, working between the input measuring clips consistently with a useful signal and having any phase corner, does not exceed 0,5 limits of the admitted basic error.

2.11. The limit of the admitted additional error caused by some voltage influence of a longitudinal handicap constant or an alternating current with an effective value, equal 100 % of the maximal value of the electric input signal, working between any measuring clip and the earthed case and having any phase corner, does not exceed 0,5 limits of the admitted basic error.

2.12. The limit of the ИИТВ-056А admitted additional error does not exceed the limit of the admitted basic error while influencing of the vibration.

2.13. The maximal resistance of loading is 2,5 kOhm. The limit of the admitted additional error, caused by a deflection of the loading resistance from the limiting value to minus 25 %, is no more than 0,2 limits of the admitted basic error.

2.14. The power of ИПТВ-056А is carried out from a direct power source by voltag ($24 \pm 2,4$) V.

The change of the power voltage does not cause changing of the absolute errors of the temperature and humidity measurements of ИПТВ-056А in the interval of the working values.

2.15. The power consumed by ИПТВ-056А does not exceed 1,2 W.

2.16. Overall dimensions, mm, are no more:

100x60x25 of the measuring block;

Ø 12 of the initial converter, the length of the assembly part is 80... 800.

2.17. Weight, kg, is no more:

0,4 kg - at the length of the assembly part of 80 mm,

0,7 kg - -//- 800 mm .

2.18. The measuring ИПТВ-056А converters are steady against influencing of the air temperature from minus 30 up to plus 50 °C.

2.19. The measuring ИПТВ-056А converters are steady against influencing of the humidity of the air temperature up to 95 % at the temperature 35 °C.

2.20. ИПТВ-056А maintain temperature up to plus 50 °C in a transport container.

2.21. ИПТВ-056А maintain temperature up to a minus 50 °C in a transport container.

2.22. ИПТВ-056А have durability to influencing of the air environment with a relative humidity of 98 % at the temperature 35 °C in a transport container.

2.23. ИПТВ-056А are steady against influencing of shock jolting with the number of impacts 80 a minute in a transport container with an average quadratic value of acceleration 98 m/sec^2 and the influencing duration equal to 1 hour.

2.24. ИПТВ-056А have durability and stability against influencing of a sine wave vibration in the frequency range from 1 up to 100 Hz at the amplitude of vibro-acceleration 20 m/sec^2 .

2.25. ИПТВ-056А have no constructive elements and units with resonant frequencies from 5 up to 25 Hz.

2.26. ИПТВ-056А have durability and stability against influencing of any mechanical impacts of a single action with a peak shock acceleration 20 m/sec^2 , a duration of a shock pulse from 2 up to 20 ms and a total of impacts 30.

2.27. ИПТВ-056А have durability and stability against influencing of any mechanical impacts of a repeated action with a peak shock acceleration 30 m/sec^2 , with a preferable action duration of the shock

acceleration 10 ms (the admitted duration is from 2 up to 20 ms) and the number of impacts in each direction 20.

2.28. ИПТВ-056А have durability at the seismic influences, equivalent to the vibration influencing with the parameters, given 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
Acceleration, m/s ²	6,0	15,0	29,0	51,0	48,0	43,0	38,0	31,0	20,0	19,0	14,0

2.29. The guarantee of the electromagnetic compatibility and noise immunity

2.29.1. ИПТВ-056А correspond to execution group III on stability to any electromagnetic handicaps in accordance with all-Union State Standard 50746-2000.

ИПТВ-056А correspond to the quality criterion of functioning A in the time of influencing of handicaps in accordance with all-Union State Standard P 50746-2000.

2.29.2. ИПТВ-056А normally function and they do not create any handicaps in conditions of teamwork with the equipment of systems and elements, for which they are intended, and also with the equipment of another use, which may be used together with data of ИПТВ-056А in a typical handicap situations.

3. Completeness

3.1. ИПТВ-056А are delivered in the complete set specified in table 3.

Table 3

Name	Designation	Quantity	Notes
The measuring converter of temperature and humidity			
ИПТВ-056А-М3-04	НКГЖ.405541.004-85	1	
Connective cable			
with connector ОНЦ-РГ-09-4/14-Р11	НКГЖ.685631.023	1	
The measuring converters of temperature and humidity			
(Modification ИПТВ-056А-М3-04 for APS). Manual	НКГЖ.405541.004-85ПС	1	
Technique of check	МИ 2409-2003	1	on a customer's demand

4. Device and its operation

4.1. ИПТВ-056А consists of a capacitor sensitive element of the relative humidity, a resistance thermo-convector, a protective filter, a case and an electronic measuring converter.

4.2. The principle of working of the sensitive element of the relative humidity based on the dependence of the dielectric permeability of the hydrosensitive layer on the humidity of the environment. The polymeric material is used as a hydrosensitive layer.

The metal thermometer of resistance is used as a sensitive element of the temperature made on the thin-film technology.

4.3. The sensitive elements of the relative humidity and temperatures are set on the end of the cylindrical probe and are closed with a metal cap, providing their protection against any mechanical damages and an easy approach of the analyzed environment.

4.4. The circuit of the signal formation of the current value of the temperature converts the initial converter signal into the scaled voltage.

The circuit of the signal formation of the current value of the relative humidity converts the initial converter capacity of the relative humidity into the scaled voltage and linearizes it.

4.5. The voltage converters in the current convert the scaled voltage, going to their inputs, into the output ИПТВ-056А current.

4.6. The ИПТВ-056А design allows to mount them in the closed channels at the pressure up to 2,5 MPa (picture 1).



Picture 1

4.7. Connecting of ИПТВ-056А to the power supply and alarm lines is executed with a tight electric socket ОИЦ-РГ-09-4/14-Р11 through the cable input.

5. Instruction of safety measures

5.1. ИПТВ-056А correspond to class 0I of all-Union State Standard 12.2.007.0-75 about a person's protection from killing by current.

5.2. The initial converters, the executive devices are connected according to the marks at the switched-off voltage of the power.

5.3. ИПТВ-056А is fireproof, the probability of a fire appearing in ИПТВ-056А does not exceed 10^{-6} per one year according to all-Union State Standard 12.1.004-91.

5.4. While operating of ИПТВ-056А, it is necessary to follow the requirements of ПНАЭ Г - 01 - 011 - 89 (ОПБ-88/97), ПНАЭ Г-1 - 024 - 90 (ПБЯ РУ АС - 89), all-Union State Standard 12.3.019-80, "The guidelines of the security measures of the electrical installation of consumers" and " The guidelines of the security measures while operating of the electrical installation of consumers", authorized by Gosenergonadzor.

6. Preparation for work

6.1. Unpack ИПТВ-056А. Make an external examination; be sure that the conformity is set according to the following requirements:

- 1) ИПТВ-056А must be completed according to chapter 3 of this manual;
- 2) The factory number of ИПТВ-056А must correspond to the number specified in the manual;
- 3) ИПТВ-056А must not have any mechanical damages when its operation is not allowable.

6.2. The order of ИПТВ-056А set.

1) Place the working part of ИПТВ-056А into the chamber with the environment being measured and fix it with the aid of union M20x1,5 through a special lining.

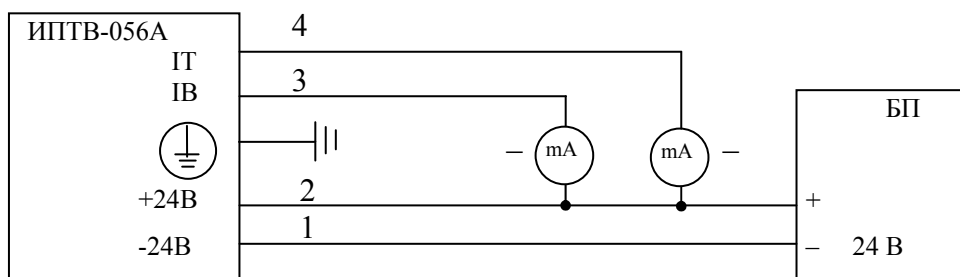
The environment being measured must not be explosive, must not contain any alkali and aggressive vapors in the concentration destroying metal.

2) Connect the electric socket with the bringing wires (picture 2).

3) While setting of the ИПТВ-056А converters, it is necessary to be guided by chapter 7.3 ПУЭ, edition 6, chapter Э.3.2 ПЭЭП and ПТБ, edition 4, the current documentation and another normative documents working in the given industry. Before setting it is necessary to examine the converters, having paid attention on the integrity of the case, the seals and marks availability.

Closing up of the cable and its connection is supposed to be executed at the switch-off voltage.

The measuring converters of temperature and humidity
ИПТВ-056А-М3-04.
The electric circuit of connections



Note. The unused current output (IT or IB) is to be connected with the plug +24 V БП.

Picture 2

7. Operating procedure

7.1. Attach the power supply of a direct current to ИПТВ-056А and milliammeters according to the electric circuit of the connections, given in picture 2.

7.2. Plug the power supply of a direct current; keep ИПТВ-056А in the switch-on condition within 30 minutes.

7.3. Measure the values of the ИПТВ-056А output currents with milliammeters.

7.4. Define the values being measured of the temperature and the relative humidity under the formulas:

$$T = \frac{I}{I_{\max}} \cdot (T_{\max} - T_{\min}) + T_{\min} , \quad (7.1)$$

I – a value of the unified output signal of ИПТВ-056А, measured on channel IT, mA;

$I_{\max} = 5$ mA - the top limit of the unified output signal;

T_{\min} , T_{\max} - the bottom and top limits of the temperature measurements.

$$\varphi = \frac{I}{I_{\max}} \cdot 100 \% \quad (7.2)$$

I – a value of the unified output signal of ИПТВ-056А, measured on channel IV, mA.

$I_{\max} = 5$ mA - the top limit of the unified output signal.

8. Technique of check

8.1. Checking of ИПТВ-056А is supposed to be done according to the technique of checking МИ 2409-2003.

8.2. The interesting interval is 2 years.

9. Maintenance service

9.1. Maintenance service is conducted during some preventive works on that equipment where ИПТВ-056А is operated, and also at any infringements in working of the devices connected to the control of the relative humidity.

9.2. Turn off the filter carefully and wash out the sensitive element with a technical ethyl rectifying spirit (a soft brush) in accordance with all-Union State Standard 18300-87.

ATTENTION! *It is forbidden to clean the sensitive element mechanically. It is impossible to use any chemical solvents.*

Clean off any dirty, wash out the metal filter and cautiously set it in its place.

10. Guidelines of transportation and keeping

10.1. ИИТБ-056A stand transporting for any distances: auto and railway means of transport (in the closed transport means), water transport (in holds of vessels), air transportation (in the hermetically sealed compartments). The fastening of the containers in the means of transport is executed according to the rules working on the appropriate means of transport.

10.2. The conditions of ИИТБ-056A transportation is to correspond to conditions 5 in accordance with all-Union State Standard 15150-69 at the air temperature from - 50 till + 50 °C with observance of protection measures from impacts and vibrations.

10.3. The conditions of ИИТБ-056A keeping in a transport container are to correspond to conditions 1 in accordance with all-Union State Standard 15150-69.

11. Acceptance certificate

11.1. The measuring converter of temperature and humidity ИИТБ-056А-М3-04 factory number № _____ made and accepted according to the obligatory requirements of the state standards, the current documentation and recognized serviceable.

11.2. 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.

Representative of State Technical Inspectors of Russia

Seal _____
personal signature signature deciphering

year, month, day

12. Certificate on packing

12.1. The measuring converter of temperature and humidity ИПТВ-056А-М3-04 with factory number № _____ is packed by the research-and-production enterprise “ЭЛЕМЕНТ” according to the requirements established by the design documentation.

Date of packing _____

Stamp

Packed by _____

(signature)

The product after packing has been accepted by _____

(signature)

13. Manufacturer's guarantees

13.1. The manufacturer guarantees the conformity of ИПТВ-056А to the requirements of specifications at the following of the consumer of conditions of operation, storage and transportation.

13.2. The warranty operation period is established in 12 months from the moment of ИПТВ-056А introducing, but not more than 6 months from the date of delivering.

14. Data on claims of replacement

14.1 In case of loss of ИПТВ-056А serviceability or reduction of the parameters given in the technique conditions, under condition of observance of requirements of the chapter of "Manufacturer's guarantees", a consumer should fill in a damage statement in the set order and dispatch it to the address:

141570

Russia,
Moscow area
Solnechnogorsk district
Mendeleyevo,

The research-and-production enterprise “ЭЛЕМЕНТ”

Phone: (495) 105-5147, 105-5102

Fax: (495) 535-8443

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