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Modernization of the Curricula in sphere of smart building engineering - Green Building (GREB)

METROLOGY, STANDATIZATION END SERTIFICATION

Course title in English language

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МЕТРОЛОГИЯ, СТАНДАРТЛАШТИРИШ ВА СЕРТИФИКАТЛАШТИРИШ

Course title in national language

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МЕТРОЛОГИЯ, СТАНДАРТИЗАЦИЯ И СЕРТИФИКАЦИЯ

Course title in Russian language

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Modern information and communication technologies require the receipt of accurate reliable measurement results, wide application of measuring tools. Therefore, in the Higher State Educational Standard, discipline "Metrology, standardization and certification" is given a wide place.

The program of the discipline "Metrology, standardization and certification" consists of sections that include the initial concepts of ensuring the uniformity of measurements required for information and communication technologies, the unity of measurements, measurement errors and inaccuracies, types of standardization, categories of regulatory documents, types and schemes of certification, the quality of the product and safety and their implementation in practice.

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I. INTRODUCTION

The main goal of the discipline “Metrology standardization and certification” is the formation of appropriate sufficient knowledge, skills and qualifications for solving various tasks in metrology, standardization, quality and quality management, certification in the field of modern information and communication technologies, as well as for working with regulatory documents.

Problems of discipline-coming from preparation student in system of the unceasing formation on metrologies of the standardizations and certification is studied information on theoretical practical and normative document on standardizations metrology certificate and management quality. Here, as the main task, attention is paid to the issue of quality.

Bachelor in the process of learning the discipline “Metrology, standardization and certification “:

- Know and be able to use the recovery and comparison of measurement errors order to develop standards to own information about the metrological service about standardization and coding of products of product certification.

- Learn about the quality of product and quality management types and schemes of certification and standardization and coding of product information activities and the basic rules and be able to use this knowledge.

To the knowledge and skills qualifications of student in the discipline of the saints the following requirements the student must have and idea of the basic concepts of metrology Unity of measurement the error of measuring instruments and their methods in the processing of standardization of their

importance in the production of types and categories of standards The procedure and rules for the development and adaption of standards for the organization of the work according to the international standards of the ISO series.

- Basis of certification methods of product;

- To have a qualification in practice application of the obtain knowledge in the analysis of metrological characteristics of measuring instruments used in to field of informatization and communication of their effective use under specific conditions for assessing the accuracy of measurements based on calculation of errors in determining the quality criteria of development and practical application of the certification system for standardization and coding of products;

To have skills attracting metrological service of measuring instrument in metrology measures Determining the analysis of measurement result.

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II. THEORETICAL MATERIALS

LECTURE 1. PURPOSE AND OBJECTIVES OF DISCIPLINE "METROLOGY, STANDARDIZATION AND CERTIFICATION"

Plan:

1. Purpose and objectives of metrology
2. Basic terms and definitions of metrology

Metrology- is the science of measuring methods and means of ensuring their unite and ways to achieve the required accuracy.

The main purpose of metrology is to extract the amount of information about the properties of objects and processes with specified accuracy and reliability.

The main tasks of metrology are:

- Ensuring the uniformity of measurements;
- Establishment of units of physical quantities;
- Ensuring the uniformity of measuring instruments;
- Establishment of national (state) standards;
- Transmission of unit sizes from standards or standard measuring instruments to working measuring instruments;
- Development of optimal principles of methods and methods for processing measurement results of methods for estimating errors.

Modern metrology includes three components:

- Legislative metrology;
- Terrorist (fundamental) metrology;
- Practical (applied) metrology.

Legal metrology – the subject of which is the establishment of mandatory technical and legal requirements for the application of units of physical quantities of measurement standards and methods of measurement. The initial document of legel metrology is the law of the Republic of Uzbekistan "on metrology".

Theoretical metrology- is the subject of which is the development of the fundamental principles of metrology.

Practical (applied) metrology- the topic of this section is the practical application of the development of theoretical metrology and the provisions of legal metrology.

Physical properties and quantities

All subjects of the surrounding world are characterized by their properties.

The properties of the object of the process phenomenon determine its difference and generality with other objects and is revealed in its relation to them.

Physical quantity- the properties of physical objects are general in qualitative respect for many objects of a new quantitative ratio, individual for each of them.

Physical quantities affect the measured and evaluated.

The measured physical quantities can be expressed quantitatively by the determined numbers of the established units of measurement.

Estimated physical quantities- values for which for some reason can only be from blue frost.

The size of a physical quantity- quantitative certainty of physical magnitude inherent in a

particular material object of the system and the influence of phenomena or processes.

Unit of physical quantity- these are physical quantities of fixed size that are conventionally pressed numerical value of different units and used for quantitative expression of homogeneous physical quantities with it.

The value of physical quantity- this is an estimate of its size in the form of a certain number of units taken for it.

The numerical value of a physical quantity- this is an abstract number expressing the ratio of the value of the corresponding unit of a given physical quantity.

With the chosen evaluation of the physical quantity, it characterizes the true real and the measurement by the value.

The true value of a physical quantity calls a value that would ideally reflect in qualitative and

quantitative terms with the corresponding properties of the object. The roots value refer to the category of absolute truth and can not be obtained in practice since any measurement is accompanied by industry.

Therefore, in practice, he is replaced by a real value.

The actual value of a physical quantity-experimental way the value of the value and so close to the true value that for a specific purpose can be used together.

The system of units of physical quantities

Units of physical quantities are divide into basic and product and combine in the system of units of physical quantities. Basic units are chosen justification arbitrarily. Derivative units express through the basic on the basis of known equations the relationship between them.

The set of basic and derived units of physical quantities formed in accordance with accepted principles is the system of units of physical quantities. The unit of the basic physical quantity is the basic unit of the system.

The international system of units was with the adoption of the 9 General Conference on Measures and Weights in 1960. And refined in subsequent GKMB.

In the basic of the system are all provisions of the 7 basic physical units of a kilogram, second, ampere, kelvin, mole, and candela. In 1995, there were still additional units of a unit of a flat and solid angle-radian and steradian wear adornments to the system, this is the XX GKMB white ghost in which the category of dimensionless derivatives units of units is SI.

System units-the unit is the physical quantity entering the system of units.

Extra system unit-a unit of physical quantity is not included in the acceptance system of units. Units of the system and extrasystem units allowed to the variables in Uzbekistan rules for the formation of multiples and subunits, the name and designation of units and the rules for their application of the establishment of state standards by the association in UzDSt 012:2005.

LECTURE 2. METROLOGICAL SERVICES IN THE FIELD OF INFORMATION TECHNOLOGY IN COMMUNICATION. INTERNATIONAL ORGANIZATIONS ON METROLOGY.

Plan:

1. Metrological services in the field of information technology and communications.
2. Questions of metrological support in the field of information technologies and communication.
3. International organizations on metrology.

The system of ensuring the uniformity of measurements in euros information technology of communication is an integral part of the state system for ensuring the uniformity of measurements in the Republic of Uzbekistan.

The main objectives of the development of a system foe ensuring unity are:

1. Comprehensive promotion of economic and social development of the national economy in protecting consumer rights from the negative consequences of inaccurate measurement results.

2. Definition of the basic directions of development of metrology creation of necessary preconditions and conditions for perfection metrological bases.

3. Further improvement of the regulatory legel framework in the field of metrology.

4. Regulation of relations between business entities.

5. The sphere of communication and information and their relationship with one dream for the standard for metrological support of the process of

checking the repair of the purchase of hire by heart measurement and other works on metrology.

6. Harmonization of industry rules of the norms of the current standards in the guidelines and methodological documents in the network of apples of the state system for ensuring the uniformity of measurements.

The most important tasks of achieving these goals are to implement a unified technical policy to ensure the uniformity of measurements in the communication and information sphere affecting the quality of the service provided.

1. The main objectives of the development of the system of ensuring unity are the following provisions.

2. Further development of metrological support of the national infocommunication systems.

3. Establishment of standards norms of rules and requirements for metrology ensuring the quality of transmission and reception of information and also updating of the fund of normative documentation for metrology.

4. Creation of a rational organizational structure to ensure the unity and required accuracy of measurements in economic entities in the field of communication and information organization and coordination of work on metrological support.

5. Organization and participation in conducting mandatory certification tests of measuring instrument.

6. Participation of specialists of the metrological service of the industry in the work of the commission is the agency of the standard for accreditation of metrological services of economic

entities in the field of communication and information for the right to carry out calibration and calibration.

7. Forming and maintaining a database of measuring instruments, the methodology for performing measurements and tests as well as other normative documentation.

8. Establishment of rational nomenclature of measuring instruments necessary for application by economic entities.

9. Expansion of the metrological service network and calibration laboratories.

10. Establishment of service centers and their regional branches for the repair and calibration of measuring instruments of special purpose purchased for foreign loans.

11. The organization of metrological training of specialists in the sphere of communication

and information engaged in the maintenance of calibration and repair measuring instruments.

12. Development and expansion of international cooperation in the field of metrological support in the field of information and communication systems to attract foreign investment of sponsorship funds and grants for the development of the infrastructure for metrological support of information and communication systems.

13. Introduction of modern international standards for development and approval of national standards for metrological provision of technical conditions and requirements for new technologies in the field communication and information.

14. Study and use of the best foreign experience of international organizations of the international organization of legal metrology of the organization of state metrological institution of the

countries of Central and Eastern Europe of an international standardization organization by the international Bureau of Measures and Libra and other international organizations on metrology.

1. Questions of metrological support in the field of information technology and communications.

The existing structure of the system for ensuring unity is included: the ministry of information technologies and communications of the Repulic of Uzbekistan is a basic metrological service for the cube unicon.uz Technical Committee for Standardization in the Field of Telecommunications and Postal Communications The State Inspection of Communications of Metrological Services and responsible for the state of measuring instruments of economic entities.

The system for ensuring the uniformity of measurements in the field of information technology and communication interacts with the state system for ensuring the uniformity of measurements in the state system of standardization by industry standardization and certification systems. The infraction of the system for ensuring the uniformity of measurements in the field of information technologies and communications with systems for ensuring the uniformity of measurements of other courtiers and international bodies is regulated in accordance with the current legislation by normative documents.

The Uzstandard agency is entrusted with the functions of maintaining the state register of measuring instruments used in the sphere of state metrological control and supervision of maintaining the state registor of standards for metrological provision, the state Registor of Accredited

Metrological Services and Metrology Laboratories agreeing organizational and methodological documents on the system for ensuring the uniformity of measurements in the field of communication and informatization of interaction with state systems for ensuring unity Rhenium other countries including the issues of mutual recognition of test results and type approvel certificates of metrological certification and calibration procedure of measuring instruments of the state metrological control and supervison of the state of the measuring instruments.

The Republican Center for Metrological Services provides state metrological control over:

1. Conducting tests to approve the type of measuring instruments.

2. Metrological certification of measuring instruments verification of measuring instruments.

3. Organization and conduct of accreditation of metrological services of the centers of the laboratory for the right to test and verify measuring instruments.

4. For methods of performing measurements and other specific types of metrological activity.

The Scientific and Research Institute for Standardization of Metrology and Certification provides training (retraining) of personal in established specialties and participates in the coordination of the developed industry normative documents on legal metrology examines the documents for the accreditation of metrological services and testing laboratories.

The issues of metrological support in the sphere of communication and information are regulated and coordinated by the Ministry for the Development of

Information Technologies and Communications of the Republic of Uzbekistan.

The main functions of the Ministry of Information Technologies and Communication of the Republic of Uzbekistan:

1. Organization of work on the formation of a system for ensuring the uniformity of measurements in the field of communication and information and coordination of activities and its participants in the interaction with the agency standard on the issues of legal metrology for attention and recognition of the type of measuring instruments;

2. Interaction with the regional Commonwealth in the field of communications and other international organizations on the issues of development and harmonization of rules and norms the system for ensuring the uniformity of

measurements in the sphere of communication and information is expensive;

3. Addressing issues of a general sectoral nature and developing technical policy in ensuring the uniformity of measurements in the communications and information sector;

4. Organization of work on the development of the legislative framework for metrological support of the sphere.

The Technical Committee for Standardization in the Field of Telecommunications and Postal Communication at the Uzbek Agency for Communication and Information is developing:

1. Strategy in the field of legal metrology and metrological support of economic entities in the field of communication and information.

2. It prepares recommendations for the development of normative documents organized by

the requirements of international standards for amending the existing regulatory documents and their ablation for the use of foreign standards in order to improve the system for ensuring the uniformity of measurements in the field of communication and information.

3. Prepares recommendations on improving the organizational structure and informing metrological services in the field of communication and information.

The basic metrological service carries out scientific and technical and organizational and methodological guidance for the implementation of the task of metrological support of economic entities in the field of communication and information. In accordance with the provision the basic metrological service maintains an industry register of measuring instruments annually updates the catalog of

measuring instruments recommended for use in the communications and information industry.

The sphere of communication and information is operated by metrological services at the radio communication center of broadcasting and television and in the branch of the joint – stock company at UZBECTELECOM. The State Inspection of Communications is the body of state control to ensure compliance with the requirements of legislative and regulatory acts of state and industry standards for license terms and the quality of services provided in the sphere of communication and information. The main functions of participants in the system for ensuring the uniformity of measurements in the field of communication and information are determined in accordance with the provisions on them agreed and approved in accordance with the established prodcedure.

2. International organizations on metrology.

MEK- the international electro technical commission is developing international standards for telecommunications devices for telecommunications television electrical engineering. MEK standards are used when exporting electromechanical and electronic equipment.

The governing body is the Council of the International Electrotechnical Commission. The top position is president. It is elected every 3 years. The working languages of the MEK are Russian and English and French. Currently national committees 41 states are members of MEK. The international organization of legel metrology exists in 1956 and 50 states cooperate in this field. The main tasks is to ensure the uniformity of measurements at the international level measurement method of

measurement definition of terminology and conditions. The supreme body is the international conference which ensures the uniformity of measurements by the International Bureau of Measures and Libra.

The OIML:

1. International Convention of Legal Metrology;
2. International Committee of Legal Metrology;
3. International Bureau of Legal Metrology;

International Bureau of Legal Metrology. In to the secretariat there is a Working group that prepares recommendations and coordinates. In 1992 in the CIS countries a council on metrology of standardization and certification was created, which deals with the problem of the elimination of technical barriers. Heads of the CIS countries on March 13, 1993 signed an agreement on the conduct of unified policy of the IPU and C.A

number of agreements on a single regulatory framework for the development of the application of the results of certification of products and services between state standards and other regulatory documents have been signed. These agreements are being implemented in the CIS countries are discussed at meetings of national authorities. In the fund of interstate standards there are 19000 normative standards. Since 1992, more than 3800 interstate regulatory documents have been developed. They are coordinated by the members of the ISS taking in to account their normalization by international regional and advanced standards.

This gives cooperation trade in economic and scientific and technical direction the removal of technical barriers and whether the promotion of products to the international market of Europe.

LECTURE 3. BASICS OF THE SYSTEM FOR ENSURING THE UNIFORMITY OF MEASUREMENTS.

PLAN:

1. System for ensuring uniformity of measurements.
2. International organizations to ensure the uniformity of measurements.

Keywords and defination: Metrological organization, metrological control and supervision, international organization of legal metrology.

Ensuring the uniformity of measurements are the most important public tasks for any country in the world. The unity of measurement is achieved by the functioning of a system foe ensuring the uniformity of measurements.

Entire system is the creation of conditions ensuring the achievement of unity in the country and the required accuracy of measurements in all areas of the national economic complex.

Metrology is the scientific basis for the system of ensuring the uniformity of measurements.

Legislative main work in the field of ensuring the uniformity of measurements is the law on metrology.

The main thrust of the law is the protection of the established and legal order of the rights and interests of the state and individuals from the negative consequences of inaccurate measurement results and the regulation of relations between public authorities and economic entities and subjects in matters of metrological activity.

The state system for ensuring the uniformity of measurements is a set of interrelated international intercede and national normative and methodological documents that determine the requirements of the rules of the provision of the norm and the procedure for ensuring the uniformity of measurements in government regulated areas of approved ones and see them in effect in the country by the national metrology body.

The organizational main SOEI is the metrology service consisting of the state metrological service and metrological services of legal entities. The leading and coordinating center of the metrological service is the national metrology agency.

The technical core SOEIs are:

- The complex of national standards;

- The system that establishes the validity of the use of measuring instruments and measurements techniques;

- System of transferring the sizes of units of values from standards to all means of measurements subordinate to them;

Transfer the sizes of units of physical quantities

When making measurements it is necessary to ensure their unity. By unity of measurements mean a state of measurement in which their results are expressed in legal units and the measurement uncertainties are known with a given probability.

Unity of measurements makes it possible to ensure comparability of measurement results of the same performance parameters at different times in different places by means of different methods and means of measurement.

In order to ensure the uniformity of measurements it is necessary to identify the units in which all existing measuring instruments of the same magnitude are graduated. This is achieved by accurately reproducing and storing the specialized units of the setting units of physical quantities and transferring their sizes to the means of measurement used.

The measuring instrument intended for reproduction and storage of the verification value unit and the calibration of measuring instruments are divided into standards and standard measuring instruments.

Reference – means of measurement that ensure the reproduction or storage of a unit of physical quantity with the highest accuracy for a given level of development of the measuring technique of technology with the purpose of transferring its size to

the measuring instrument below by the calibration scheme.

Standards are presented in the High –Precision High-Voltage Device and is the foundation of work to ensure the uniformity of measurements.

The transfer of the sizes of units of physical quantities from standards to working measuring instruments is carried out by means of the formed measuring instruments.

Measuring instruments are formed for calibration of panni of other measuring instruments.

By the level of accuracy and metrology in the subordination zone, their measuring instruments are divided into digits set out for each quantity by a special document verifying scheme.

Calibration diagram-the normative document that establishes the boots is the subordination of the measuring instruments involved in the transfer of the

unit size from the standard to the working measuring instruments, indicating methods and which is approved in the established order.

The images of the measuring instrument corresponding to the higher stage by the verification circuit are considered to be the initial ones. The means of measuring the lowest discharge in comparison with initial sample are the means of measurement subordinate.

On the diagram of the indication, the metrological sequence of transferring the sizes of units of physical quantities from standards to working measuring instruments.

International organization for ensuring uniform measurement

ILAC- The International Laboratory Accreditation. ILAC assists and advises in the process

the development of its own accreditation laboratories. These states have the right to be members of ILAC.

International legal metrology organizations for the development of the technical structure of the entire reinforcement piles of their national and regional members in the installation of requirements and development for applications lycany metrology manual using measuring devices.

International associations of simple and applied physics.

In 2008 there are 48 physical associations. Organizes its activities by 20 commissions.

International association of simple and applied chemistry. All non-governmental international organizations advising knowledge of the chemistry of the world. IUPAC was organized in 1919.

Some information to the infrastructure of European American and Asian organizations.

METROLOGY EURAMET- the organization of the leadership and the search for development in the field of metrology for European metrology. In 2008, this organization includes 32 in the European National Institute of Metrology and 4 BAT.

ACCREDITATION-European Commonwealth of Accreditation. Organized as a result of the merger of the European organization for accreditation and certification of the European accreditation organization of the laboratory.

METROLOGY – SIM US Metrology SIM for America obey CIMP MRA Regional Metrology Organization. SIM divided into 5 regions: NORAMET, CARIMET, CAMET, ANDIMET AND SURAMET.

ACCREDITATION – IACC – American Accreditation Association. The main task is to

establish accreditation groups from the States of America to an international accreditation association.

METROLOGY – this organization organizes provides assistance to the necessary state to develop national institutes of metrology.

METROLOGY – APMP – The Asia Pacific Metrology Program. This organization DEC is supporting this development of national institutions if necessary helps this state metrology.

ACCREDITATION – APLAC –The Asia Pacific Accreditation Cooperation. Association of the organization for supervision installation of calibration testing and accreditation.

LEGAL METROLOGY – APLMF – Asia Pacific Legal Metrology Forum.

LECTURE 4. METHODS AND TYPES OF MEASURING INSTRUMENTS.

PLAN:

1. Methods and types of measuring instruments.
2. Criteria for the quality of measurements.
3. Verification and calibration of measuring instruments.

Keywords and definition: measuring, type approval, quality, metrological attestation, verification, calibration.

Methods and types of measuring instruments

Measuring instrument – technical means used for measurements and having normalized metrological properties.

According to the functional purpose, the measuring instruments are divided into measures, measuring converters of the measuring instrument, measuring devices and measuring systems.

MEASURE – a measuring tool intended for the reproduction and storage of a physical quantity of one or more specified sizes whose value is an expression in prescribed units and known with the required accuracy.

MEASURING TRANSDUCER – technical means with normalized metrological characteristics serving to convert the measured value into another value or a measuring signal is the more convenient for processing and storing further transformations and indication or transmission.

MEANS OF COMPARISON – a technical means by which it is impossible to compare one

another with a uniform value or the readings of measuring devices.

MEASURING DEVICE – a measuring device designed to obtain the values of the measured physical quantity within the specified range.

MEASURING UNIT – a collection functionally united measuring instruments and auxiliary devices and a function for measuring one or more physical quantities and location in one place.

MEASURING SYSTEM – a set of measuring instruments and auxiliary devices and placed in different points of the monitored object for the purpose of measuring one or more physical quantities inherent in this object and generating measurement signals in different styles.

According to the metrological purpose, the measuring instruments divide the standard and working measuring instruments on the standard.

Reference – a measuring means intended for reproducing and storing a unit of a physical quantity in order to transfer its size to other measuring means.

THE MODEL MEASURING TOOLS is intended only for transferring the size of units of units from standards to working measuring instruments.

THE WORKING INSTRUMENTS OF MEASURING INSTRUMENTS are intended for measuring non-transferring unit size to other measuring instruments.

Testa and metrological certification of measuring instruments.

According to the existing rules for measuring in the sphere of distribution of DMCN, it is allowed to use on measuring instruments registered in the state register measuring instruments of Uzbekistan. Registration is carried out according to the results of tests and subsequent approval of the type of

measuring instrument or the results of metrological certification of measuring instruments.

Approvals of the type of measuring instruments of the decision of the national metrology body on the recognition of the type of the measuring instruments legalization for application on the territory of the country.

By the term type of a means of measurement is understood a set of means of measuring the same purpose of the basic on the same principle of operation having the same design and making them according to the same technical documentation.

The test is carried out by a commission approved by the agency standard in accredited units of the state metrological service or subdivisions of enterprises and organizations.

A test for the type established is to be the means of measurement that are expected to be batch

produced or imported by parties, the application of which is possible in the field of distribution of GYCN.

The test is charged with the formation of measuring instruments intended for serial production or several copies of imported measuring instruments selected randomly from the artery.

With positive test results, the type of measuring instrument is established and the procedure for its verification is carried out by registering a type in the state register for the measuring instruments is issued a certificate of type approval.

More certification is the basis for the use of measuring instruments of this type all in the field of distribution GMCN.

Means of measurement of approved types produced are marked with the sign of the state register of measuring instruments.

The commissioning of single copies of measuring instruments is carried out based on the results of their metrological certification of comprehensive research in tasks of the characteristics of a specific of a measuring instrument.

Metrological certification are subject to measuring instruments of a single manufacture single of imported measuring instruments and also copies of measuring instruments of the approved type used not for their own purpose or under conditions of application for type approval. Metrological attestation are subject to indication of the measuring instrument only in case of their application for measurement in the field of distribution of GMKN.

With positive results, metrological certification of measuring instruments is registered in the state register of measuring instruments of Uzbekistan and a

certificate of metrological certification is thrown at him.

Such certificate is the main basis for the application of this measurement tool in the field of distribution of GMKN, but only for the purpose and under the conditions specified in the annex to the certificate. The certificate of metrological certification of the imported measuring instrument is not the basis for the re-import of such measuring instruments. The results of the tests and metrological certification of measuring instruments of other states are recognized in accordance with the concluded agreements. It should be noted that the certificate of type approval and the metrological certification of measuring instruments are the final documents establishing the legality of the use of measuring instruments on the territory in the field of distribution of GMKN.

Verification and calibration of measuring instruments

Properties of measuring are changed during operation therefore their parameters are subject to periodic determination, the result of these procedures is documented with the relevant documents confirming the suitability of the means for measurements at the time of application.

The confirmation of the parameters of the measuring means is done by verifying their calibration.

Verification of measuring instruments is called the aggregate of operations performed by the state metrological services with the purpose of determining and confirming the conformity of measuring instruments with the established technical requirements.

Verification is carried out by means of experimental determination of metrological characteristics of measuring instruments. The main metrological characteristic of the measuring instruments determined during verification. It is based on comparison of the verified means of measurement with a more accurate model means of measurement and a standard.

During verification along with the evaluation of metrological characteristics, the evaluation of the safety characteristics of measuring instruments is carried out in necessary cases.

There are primary periodic and extraordinary verification.

Initial verification shall be made for each copy of the approved type of measuring equipment when it is released from production or repair.

Mandatory periodic inspection in the process of operation are subject to childhood measurement used to measure the distribution of GMKN.

Measuring tools used outside the distribution of GMKN are presented for verification on a voluntary basis.

The stability of the parameters of measuring instruments is highly dependent on the operating conditions, therefore the calibration interval for specific isomers of measuring instruments can be corrected on the basis of an analysis of the changes in their parameters during operation.

Extraordinary verification is carried out:

When measuring instruments are used in the quality of component parts;

If the sign of the verifying stigma is damaged or the certificate of verification is lost;

When commissioning the measuring instruments after stroge, if the verification mark or document confirming the validity period has expired and the suitability of measuring instruments is applicable;

Inspection verification is carried out to determine the suitability for the use of measuring instruments in the implementation of state.

Expert verification is carried out as part of the examination of measuring instruments conducted on behalf of the prosecutor's office and other authorities.

Verification of measuring instruments affects the strict regulation of the procedure and is conducted in accordance with the verification procedures established by the agency of the standard.

The responsibility for the veracity of the verification is borne by the official who verifies.

The result of verification is:

Proof of the suitability of the measuring instrument for use. In this case an imprint of a verification stamp is placed on it and the technical documentation, and certificates of verification are issued. Verifying hallmarks marking of the form applied to the means of measuring recognition as a result of validation suitable for use;

Recognition of a measuring instrument unsuitable for.

In this case rest the master of the glue of my sits the world the check is canceled and a notice of unfitness is issued.

In the field of activity where state metrological control and supervision are not mandatory to ensure metrological service ability of measuring instruments calibration is applied.

Calibration system – the totality of subjects of activity and calibration works aimed at ensuring the

uniformity of measurements in areas not subject to state metrological control and supervision and acting on the basic established requirements for the organization and conduct of calibration work.

The calibration system is an integral part of the overall stricter for ensuring the uniformity of measurements, it provides for compliance with the norms and rules of the established state system for ensuring the uniformity of measurements when organizing and conducting metrological works out side the sphere of distribution of state metrological control and supervision.

Calibration measuring instrument – a set of operation performed by calibration laboratories in order to determine and confirm the actual values of metrological characteristics and suitabilityfor the use of measuring instruments not subject to state metrological control and supervision.

Primary calibration is subject to release from production or repair of measuring instruments not subject to type approval procedures.

Periodic calibration in the process of operation is subjected to measuring instruments used in her sphere of distribution GMKN.

Calibration of measuring instruments is carried out by calibration laboratories of metrological services of legal entities.

Metrological services of legal entities can be accredited for the right to perform calibration work.

Accredited metrological services perform calibration on behalf of the bodies that carry out.

The result of calibration of measuring instruments is issued a certificate of calibration. If under the terms of the calibration agreement, the name of the evaluation of the actual metrological characteristics is required to establish the conformity

of the measuring instruments with the requirements of the normative documents, this is corroborated by the application of a nominal calibration stamp to the means of measuring the impression.

LECTURE 5. MEASUREMENTS INACCURACY AND THEIR CLASSIFICATION.

Plan:

1. Types and methods of measurement;
2. Classification of measurement inaccuracies;

Types and methods of measurement.

A measurement is the process of finding the value of a physical quantity by experimental means with the help of special technical means.

The metrological essence of measuring the means to the basic equation of measurement:

$$A = kA_o$$

A- the value of the measured physical quantity;

A_o – the value of the value in the sample;

To content:

k - the ratio of the measured quantity to the sample;

The form of the basic equation of metrology is most convenient if the value chosen for the sample is equal to unity. In this case, the parameter k measured value depending on the adopted measurement method and unit of measurement.

The main characteristic of the measurement is the result of the exact rules we go to the bridge reproduces and the reliability.

The result of measuring a physical quantity is the value of the physical quantity obtained by measuring it.

Measuring instrument inaccuracy – the difference between the readings of the measuring instrument and the true value of the measured physical quantity.

Accuracy of measurements – the concept of reflecting the measure of proximity of measurement results to the true value of the measured physical quantity.

Correct measurement – this metrological characteristic reflects the proximity of the systematic in the measurement results.

The convergence of the measurement results characterizes the quality of measurements reflecting the closeness of each other to the results of measurements of the same magnitude performed repeatedly by the same methods and means of measurement and under the same conditions.

Reproducibility of measurement results – this is a characteristic of the quality of measurements of physical quantity reflecting the proximity to each other of the results of measurements of the same value of lectures in different places by different

methods and means of measurement by different operators but given the same conditions.

Realibility of measurements determine the degree of confidence in the result of the measurement and is characterized by the by the probability that the true value of the measured value is within the specified interval.

By common methods of obtaining the results of measurement are divided into direct and indirect joint and cumulative measurements.

Direct measurement – the measurement at which the desired valu of the physical quantity is obtained directly.

Indirect measurement – measurement at which the desired value of the value is determined on the basis of the results of direct measurements of other physical quantities functionally related to the desired quantity.

Cumulative measurement – simultaneous measurements of several identical quantities for which the desired value of the value determining by the solving the system of equations obtained by measuring these quantities in various combinations.

Joint measurement – simultaneous measurements of two or more non-identical quantities to determine the relationship between them.

Modern methods of measurement are usually divided into methods of direct evaluation and comparison methods.

Method of direct evalution – the method of measurement in which the value of a physical quantity is determined directly by indicating the means of measurement.

Method of comparison with measure – method of measurement in which the measured value is

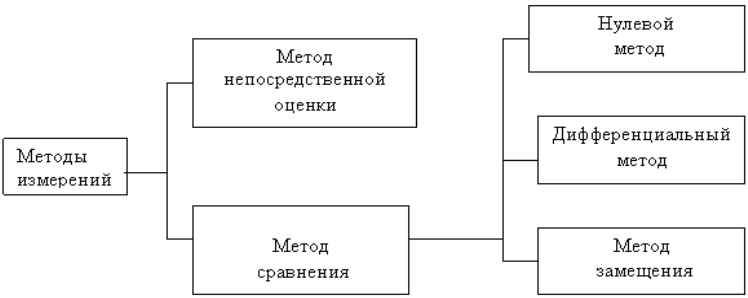
compared with the value of the measure being reproduced.

Distinguish the following varieties of the comparison method:

Zero method – the method of comparison with the measure in which the net effect of the measured quantity and measure on the comparator is adjusted to zero;

Differential method – a method of measurement in which the measured quantity is compared with a homogeneous value of a known value slightly different from the measured value;

Substitution method – the method of comparison with a measure in which the measured value is replaced by a measure with a known value.



Classification of measurement accury.

2.Classification of measurement.

The accuracy in the measurement result in called of finding the new value from the true value of the measurement physical quantity.

Measurement accuracy are classified according to a number of characteristics.

By the form of quantitative expression

The accuracy are divided into absolute relative and ghosts.

Absolute accuracy expressed in units of the measured value is the deviation of the measurement result x from the true value of the measured quantity.

x_0:

$$\Delta = x - x_0 . \quad (2)$$

Relative accuracy is the ratio of the absolute accuracy of measurement to the true value of the measured quantity:

$$\delta = \frac{\Delta}{x_0}, \qquad (3)$$

Or in percentage

$$\delta = 100\frac{\Delta}{x_0}\%. \qquad (4)$$

What time $\Delta << x_0$, is it possible to use the x values together with a sufficient degree of accuracy

Accuracy can be $\delta \approx \frac{\Delta}{x}$,

To content:

$$\text{Or } \delta \approx 100\frac{\Delta}{x}\%.$$

The accuracy given is the ratio of the absolute accuracy to a certain normalizing value.

$$\gamma = 100\frac{\Delta}{X_N}\%. \qquad (5)$$

By the nature of the manifestation of accuracy, divides into systematic random and coarse.

Systematic inaccuracy these are the components of the measurement inaccuracy that remain constant or change regularly with repeated measurements of the same value under the same conditions.

Random inaccuracy –the component inaccuracy that randomly change in value and sign with repeated measurements of the same physical quantity under the same conditions.

Gross inaccuracy – inaccuracy significantly exceeding those expected under these measurement conditions.

For reasons of origin – inaccuracy are usually divided into methodological and instrumental external and subjective.

Methodological inaccuracy – they arise because of the imperfection of the measurement method and the theoretical assumptions made when describing the measurement method.

Instrumental inaccuracy appear because of the imperfection of the means of measuring their state design scheme during operation.

Delicate inaccuracy associated with the deviation of one or more large quantities from normal values or their outlet to the outermost normal area.

Subjective are the inaccuracy a rising from imperfections in the sense organs of the experimenter

and also this negligence or lack of attention in the process of measuring and fixing their results.

According to the nature of the behavior of the measured value, static and dynamic inaccuracy are distinguished during the measurement process.

Static inaccuracy arise when measuring the steady-state time value of the measured quantity.

Dynamic inaccuracy in dynamic measurements when the measured physical quantity changes with time.

According to the conditions of operation instruments, basic and additional inaccuracy are distinguished.

The basic inaccuracy of measuring instruments takes place under normal operating conditions specified in the regulatory documents.

An additional inaccuracy in the means of measurement is due to the exit of any of the

influencing values of the outermost normal range of values.

Systematic inaccuracy and methods to reduce them.

A distinctive feature of systematic inaccuracy is that they can be predictions and detection. The sources of the systematic components of the measurement inaccuracy can be objects of the method of measuring the measuring instrument of the measurement condition and experimenter.

By the nature of the change in time of the systematic inaccuracy are divided into a constant and variable.

Constantly calls such systematic inaccuracy that remain unchanged throughout the series of measurements.

Variables are the inaccuracy that change during the measurement. The presence of an essential variable of a systematic inaccuracy and say an estimate of the characteristics of a random inaccuracy. Therefore, it must necessarily be and is excluded from the measurement results.

The state of a systematic inaccuracy can only be detected by comparing the results of measurements with other acquisitions using more accurate methods and means of measurement. In a number of cases, a systematic inaccuracy can eliminate the ways of eliminating sources of inaccuracy before the measurement begins.

Prevention the most rational way to reduce the inaccuracy is to eliminate the causes of causing systematic, for example, shielding the measuring instrument from the influence of external electric and magnetic fields eliminating the influence of

temperature by insulation. This includes the adjustment of repair and calibration of measuring instruments.

If the origin of the systematic inaccuracy is of a value can be sufficiently accurately determined, such cases a correction or correction factor is introduced. The correction the quantity of the same name from the measured addition which, to the result of the measurement, eliminates the systematic inaccuracy.

Try not to have a number that is multiplied by the result of the measurement for the same purpose.

The systematic inaccuracy can be significantly reduced by using special methods of measuring substitution and inaccuracy compensation by sign. An effective way to reduce the systematic inaccuracy is their randomization translation in the study.

For the detected and reducing the variables of systematic inaccuracy use the graphical method.

Characteristics of random inaccuracy and their estimates.

Random inaccuracy can be represented by random variables and for their quantitative analysis use the apparatus of probability theory and mathematical statistics.

In metrology, when analyzing random naccuracy the normal uniform triangle law and the law of distribution of the standard are most often used.

As the basic law of distribution in the theory of inaccuracy, a normal law is adopted. The normal distribution law has the following properties:

The inaccuracy can take a continuous series of values in the interval;

When a significant number of observations are made, the inaccuracy of the first and in magnitude but opposite in sign occur at the same frequency;

The normal distribution law is described by the probability density:

Graphs of the normal probability distribution of the random inaccuracy for different values of the ghost.

LECTURE 7. RATIONING AND ESTIMATION OF MEASUREMENT INACCURACY BASED ON ACCCURACY CLASS.

Plan:

1. The accuracy class of the measuring instruments.
2. Direct single measurements.
3. Direct multiple measurements.
4. Normalization of metrological characteristics of measuring instruments.

For the qualitative comparison between one of the measuring instruments of the same type, intended for measuring the same value and having different limits of tolerable inaccuracy, the concept of accuracy classes is used.

The accuracy class of measuring instruments is a generalized characteristic of a single type of measuring instrument reflecting the level of their accuracy expressed by the limits of the permitted basic and also by other characteristics affecting accuracy.

The limit of the permissible inaccuracy of measuring instruments is the greatest value of the inaccuracy of measuring instruments established by a normative document for a given type of measuring instrument in which it is still considered usable.

Expressions limits for the allowed inaccuracy are specified by absolute and relative and reduced values.

The choice of the form of representation depends on the nature of the change in the inaccuracy within the measuring range and also on the conditions of use and the designation of measuring instruments.

Normalized metrological characteristics of measuring instruments.

Metrological characteristics – these are characteristics of the properties of measuring instruments that effect the result of the measurement inaccuracy. Metrological characteristics of measuring instruments are subject to normalization. Norming means the establishment in normative documents for measuring instruments of nominal values and the limits of tolerable deviations of real metrological characteristics of measuring instruments from their nominal values.

The standardized metrological characteristics of measuring instruments are:

Graduating characteristics that determine the dependence of the output signal on the input nominal value of the measurement re-measure measure the

scale division price of the type and parameters of the digital code;

Dynamic characteristics reflecting inertial properties of measuring instruments and allowing to estimate dynamic inaccuracy;

Instrumental components of measurement inaccuracy;

Functions influence reflecting the dependence of the metrological characteristics of measuring instruments on the effects of influential values of informative parameters;

When normalizing metrological characteristics normal and operating conditions for the use of measuring instruments are established;

Normal conditions are those under which changes in metrological characteristics under the influence of influencing quantities can be neglected.

For normal conditions of application of measuring instruments, normative documents are provided:

Normal range of values of the influencing quantities. The normal range of the value of the influencing quantities is indicated in the standards or technical conditions for measuring instruments of this type in the form of denominations with the standardization of deviations. For example, the ambient temperature, relative humidity, practical absence of electric and magnetic fields, supply mains voltage;

The working range of the values of the influencing values and the range of values of the influencing quantities whithin which the additional inaccuracy and the change in the readings of the measuring instrument are nominated.

Operating conditions of measurements – the measurement conditions under which the values of the influencing quantities are within the limits of the working areas.

LECTURE 8. MEASUREMENT UNCERTAINTY. STAGES OF EVALUATION AND CLASSIFICATION.

Plan:

1. Manual on the expression of uncertainty of measurements.
2. Analysis of measurement uncertainty estimation.
3. Drawing up a report on the uncertainty of measurements.
4. Sources and types of uncertainty.

In 1993, on behalf of the family of authoritative international organizations.

- International committees and weights;
- International electro technical commission;
- International organization for standardization;
- International organization of legal metrology;
- International union of pure and applied physics;

- International unions and applied chemistry;
- International federation of clinical chemistry;

A guide to the expression of measurement uncertainty was published which defined a new concept for measuring the accuracy of measurements.

It can be noted immediately that the experience of applying the concept for more than 10 years has seemed that it has led to a great positive effect contributes to the reliability of quantitative representation of measurement results conducted in different countries and organization, that is, ultimately to the main objectives of metrology assurance.

What was the reason for the transition to a new concept at a time when the concept of measurement error was developed in some detail?

Some experts believe that the main reason was the semantics of incorrect terminology indicating the accuracy of the measurement. For the quantitative

indication of the error used – error miscalculation. In the light of quality assurance requirements, the production of measurement with errors and calculation is unacceptable and this term has been tried to replace sometimes using terms precision and variation. However, accuracy by definition is a qualitative evaluation of the measurement result and the variation in parameters characterizing the relative scatter of the measurement results. The concept of measurement uncertainty was previously used by measurement practice and the definitions of which are given already in 1993 in the international dictionary of the basic general terms of metrology was the most successful for characterizing the scattering of measurement results. It should be emphasized that the physical meaning of measurement uncertainty does not correspond to the concept of measurement error.

Of course, the choice of the term uncertainty is connected with the above reasons.

But the development of a new concept in my opinion is due to the current need to achieve a number of goals outlined in the manual including:

- Providing full information on how to report on uncertainties in measurements;

- Providing a basis for international comparison of measurement results;

- Providing a universal method for the expression and estimation of measurement and all types of data that are used in measurements;

- Simplification of calculations related to the processing of measurement data.

So the basis of the concept of uncertainty lies in the incomplete knowledge of the value of the measured quantity that is presented to the operator in the form of series of values obtained as a result of the

measurement experiment and somehow characterizing the measured value. When evaluating the measurement results the notion of the basic value of the PV of the actual value of the PV and the measurement error are not used. To drive all the concepts of measurement uncertainty which are treated as a parameter associated with the measurement results and characterizing the scattering of values that can reasonably be attributed to the measured quantity. Note also that the new concept together is the concept of a physical quantity used by the concept of magnitude.

As well as for the classical theory of measurement the quality of uncertainty characteristics is based on the mean square deviation and confidence interval that would be new concepts called standard uncertainty and expanded uncertainty. About them we

will dwell in more detail below at the beginning of the look, what distinguishes errors and uncertainties.

The error of single measurement is the difference between the measurement result and the actual value of the physical quantity.

X, т.е $\Delta_i=I_i-X$.

The uncertainty of a single measurement can be represented as the difference between the result of the measurement and average arithmetic value obtained as a result of measurement. e $u_i=I_i-L$.

With an increase in the number of measurements, the arithmetic mean of L tends to the true value and of course if all systematic errors are eliminated. Thus the difference between will tend to zero and consequently the mathematical patterns of behavior of aggregates will be similar. As already noted above, the main difference in concepts is what is the variance and the real value.

Basic provisions of the concept of measurement uncertainty

The measurement uncertainties as well as the measurement errors can be classified according to various characteristics; in the place of their manifestation, they are methodical and subjective; by their manifestation random and systematic groups; the absolute and relative rights of their expression.

One should dwell on the classification associated with the character of manifestation of uncertainty. In fact, the division into systematic and random uncertainties in the manual is not explicitly introduced. However at the beginning the management built postulated that the estimate of the measured value and calculate after making corrections to all known sources of uncertainty of a systematic nature.

Say the division of uncertainty by the method of evaluation into two types:

- Uncertainty is estimated by type A uncertainty – which is estimated by static methods;

- Uncertainty is estimated by type B uncertainty – which is assessed not by static methods.

Two methods of estimating uncertainty A and B are proposed:

-for type A uncertainty the use of known historical estimates is the arithmetic mean of the RMS using the result of the measurement and drawing mainly on the normal distribution law of the quantities obtained;

-for type uncertainty, the use of a priori non-static information is based mainly on the uniform law of the distribution of possible values of quantities within certain boundaries.

Thus once again the division into systematic and accidental errors due to the nature of their occurrence and manifestation in the course of performing measurement of a branch on uncertainty calculated by type a mortgage in methods of obtaining and using them in calculating general uncertainty was thus obtained once again.

The manual uses new terms that are not available in RMG 29-99:

Standard uncertainty- uncertainty expressed as a standard deviation.

Expended uncertainty- the value specifying the interval around the measurement result within which the most part of the distribution of the values that is reasonably expected to be attributed to the measured quantity is expected to occur.

Extended uncertainty is an analog of confidence limits of measurement error. And each value is

subject to uncertainty there is a probability of coverage P.

Probability of coverage – the probability that due to the fault of the operator corresponds to an expanded uncertainty of the measurement result.

The probability of coverage is determined taking into account the probability law of uncertainty distribution and analogs in the classical theory is the confidence probability.

Coverage ratio – the coefficient depending on the type of uncertainty distribution of the measurement result and the likelihood of leaving and numerically equal to the ratio is allowed uncertainty corresponding to a given coverage probability to the standard uncertainty.

Number of degrees of freedom – the static distribution parameters are equal to the number of independent links of the estimated static sample.

The method of estimating the result of measurements and its uncertainty

The evaluation of the measurement result and its uncertainty is carried out in the following sequence:

-drawing up the measurement equation;

-estimation of output values and their standard deviations;

-evaluation of the measured quantity and its uncertainty;

-budgeting of uncertainty;

-evaluation of the extended uncertainty of the measurement result;

-representation of measurement result.

Drawing up the equation of measurement.

In the concept of uncertainty, under the measurement equation, you understand the

mathematical relationship between the measured quantities X1, X2,… Xk and also other quantities influencing the measurement result Xk+1, Xk+2,…Xm and the measurement result Y

$$Y = f(X_1, X_2, ...X_k, X_{k+1}, X_{k+2}, ...X_m). \qquad \textbf{(1)}$$

Jobs in uncertainty and magnitude X1, X2,… Xm are called output values used to estimate the uncertainty of the measurement of Y- and the output value of the measurement.

As a basis for the compilation of the measurement equation, the relationship equation Y = f(X1, X2,…Xk).

Confidence as a result of analysis of measurement conditions and used SI, other factors influencing the measurement result are established. In this case, the value of Xk+1, Xk+2,… Xm, describing

these factors is included in the equation even if they are insignificant can affect the result of Y. The operator's tasks, whenever possible, most fully consider all the factors affecting the measurement result.

Estimation of output values and their standard deviations.

Let there be a result of measurements of the output quantity Xi, and i = 1… m. As is known, with normal distribution, the best estimate of this quantity

is arithmetic mean $\overline{x_i} = \frac{1}{n_i}\sum_{q=1}^{n_i} x_{iq}$ (2)

The standard type A uncertainty is defined as the standard deviation of the formula

$$u_A(x_i) = u_A(\bar{x}_i) = \sqrt{\frac{1}{n_i(n_i-1)}\sum_{q=1}^{n_i}(x_{iq} - \bar{x}_i)^2} \qquad (3)$$

To calculate the standard uncertainty of type B, use:

- Date on previous measurements of the quantities entering into the measurement equation;
- Information is available in metrological documents for calibration and the manufacturer's seat for the device;
- Information on the probability of the distribution of the values available in scientific and technical reports and evenings;
- Data, the basis on the experience of the researcher or general knowledge about the behavior and properties of the corresponding SI materials;
- Uncertainty of the constants used in the data directory;

- Norms of accuracy of measurement of indication in technical documentation for methods and CI;

- Other information on sources of uncertainties affecting the measurement result.

Uncertainties and then they usually represent in the form of bleaching boundaries the value from its estimate. The most common ways of formalizing an incomplete knowledge of the significance of the liver is to post the postulate of a uniform law of distribution of possible values of this quantity in the indicated boundaries of the output value. The standard uncertainty of type B is detrmined from the known formula for the standard deviation of the measurement results having a uniform distribution law: $u_B(x_i) = \frac{b_{i+} - b_{i-}}{2\sqrt{3}}$, (4)

But for symmetric boundaries $|b_{i+}| = |b_{i-}| = b_i$,

according to the formula $u_B(x_i) = \frac{b_i}{\sqrt{3}}$ (5)

In the case of other laws, the distribution of the formula for calculating the type B uncertainty will be the other. In particular, if one value of their value 100 is known, this value is taken as an estimate. The standard uncertainty is calculated by the formula:

$$u_B(x_i) = \frac{U_p}{k},$$

Where U_p – is widened uncertainty, k – coverage ratio.

If the coverage factor is not indicated taking into account the avaible information, assumes the probability of distributing the uncertainty of the value of X_i.

If such information is not avaible to determine the coverage factor, you can use the table data 2.

The coverage coefficient for uniform distribution is defined as follows. For symmetric boundaries of the final uniform distribution, the RMS is calculated by the formula. Then the expanded uncertainty can be written in the form $U_p = k\frac{b}{\sqrt{3}}$. With the expanded uncertainty of the corresponding probabilities P=0,95 and the boundary of the uniform distribution b=1, coefficient k=0.95 with extended uncertainty, the probability P=0.95 of the coefficient k=0.9995.

In the calculations, it was assumed that both the area and the uniform distribution correspond to unity and, accordingly,

If the boundaries of the sum are known and the systematic error distributed over a uniform law is not ruled out or the uncertainty is expanded in terms of the concept of uncertainty, only the truth of water, the

inclusion of excluded systematic errors depends on the confidence probability. Coefficient of coverage k=1.1, P=0,95; k=1,4, P=0,99 [1,3].

The uncertainty of the output quantities can be correlated. To calculate the correction factor, use the matching according to the measurement results, where w = 1, 2, …n_{ij} ; n_{ij} – the coordination numbers from the measurement results. The calculation is carried out according to a known form and statistics and probability

$$r(x_i, x_j) = \frac{\sum_{w=1}^{n_{ij}} (x_{iw} - \overline{x_i})\,(x_{qw} - \overline{x_j})}{\sqrt{\sum_{w=1}^{n_{ij}} (x_{iw} - \overline{x_i})^2 \sum_{w=1}^{n_{iq}} (x_{qw} - \overline{x_j})^2}} \qquad (7)$$

The significance of the correlation coefficient is determined by the absence criterion or the presence of a connection between the arguments.

Estimation of the measured value and uncertainties

The evaluation of the measuring X_1, X_2, ...X_m, is calculated as a function of estimating the output values of the expo- forum and previously sources of uncertainty that have a systematic character of the correction.

Calculation of the total uncertainty of the output value passes through the same formulas that are used to calculate the error of indirect measurements in the classical concept of measurement error.

In the case of uncorrelated amphibians, the total standard uncertainty is calculated by the formula

$$u_c(y) = \sqrt{\sum_{i=1}^{m} \left(\frac{\partial f}{\partial x_i} \right)^2 u^2(x_i)} \qquad (8)$$

And in the case of correlated galvanoids, formula

$$u_c(y) = \sqrt{\sum_{i=1}^{m}\left(\frac{\partial f}{\partial x_i}\right)^2 u^2(x_i) + \sum_{i=1}^{m}\sum_{j=1}^{m}\frac{\partial f}{\partial x_i}\cdot\frac{\partial f}{\partial x_j}\cdot r(x_i, x_j)u(x_i)u(x_j)}$$

(9)

Budgeting of uncertainty

Under the uncertainty budget is understood a formalized representation of the transverse sources of measurement uncertainty for each from of magnification, indicating their standard uncertainty, we contribute their total standard uncertainty of the measurement result.

Evaluation of the extended uncertainty of the measurement result

The expanded uncertainty is equal to the product of the standard uncertainty of the measurement result of the coverage factor k.

$$U(y) = k\, u(y) \quad (10)$$

Guidance on uncertainty is recommended to consider all measurement results with confidence P=0.95. With this probability of advantage to

determine the number of degrees of freedom according to the empirical formula of Welch-Satterthwaite.

$$\nu_{eff} = \frac{u_c^4}{\sum_{i=1}^{m} \frac{u^4(x_i)}{\nu_i} \left(\frac{\partial f}{\partial x} \right)^4} \qquad (11)$$

With this coverage factor determined by the pleasantness of P=0.95 by formula

$$k = t_{P=0,95}(\nu_{eff}) \qquad (12)$$

Using the table of distribution of the student

$f_{eff} = n-1$ $f_{eff} = n-1$ - number of degrees of freedom for direct measurements of the output quantity., n – number of measurements. $\hat{u}_A(y), \hat{u}_B(y)$ - estimation of standard uncertainty by type A and by type B calculations, respectively.

When evaluating the contribution of type a uncertainty, $\nu_i = n_i - 1$, is assumed to be of type B $\nu_i = \infty$. Under these conditions it is easy to show from

the formula that if an uncertainty of only one input quantity is evaluated for type A, then the formula is simplified

$$\nu_{eff} = (n_A - 1) \cdot \frac{u^4(y)}{u_A^4(y)},$$

n_{A-} The number of repeated measurements of output values estimated by type A.

Representation of measurement result

When presenting measurement results, management recommends that sufficient information be provided so that the whole process of obtaining measurement results and uncertainty calculations, namely, can be analyzed and repeated:

-algorithm for obtaining the result of measurements;

-algorithm for calculating all corrections to eliminate systematic errors and their uncertain;

-uncertainties of all used data and ways of obtaining them;

-the algorithm for calculating the total and expanded uncertainty and including the value of the coverage coefficient k.

Thus, the documentation for measurement results requires:

u_c -total uncertainty;

U_p -expanded uncertainty;

k -coverage ratio;

u_i -data on output values;

ν_{eff} -effective number of degrees of freedom.

In the measurement protocol, as a rule, the following entry is made if the measurement results is the length of the part: the length of the part is 153.2 mm. The expanded uncertainty of the measurement result is 14, the coverage factor is 2 or the measurements showed that the length of the part is in

the interval at a factor of 2. By default, assuming that this result corresponds to a coverage probability of 0.95.

EXAMPLE 1.

1. Prevision data having operator expressions whose task is to measure the current with a voltmeter and a current shunt.

Measurement equation

$$I = \frac{V}{R} = f(V, R, t^0C), \quad (1\text{-}\Pi 1)$$

I – the strength of the measured; V - the voltage on the shunt which is not represented is measured to determine the current strength; R – shunt resistance; t^0C – ambient temperature capable of affecting the result of measuring the amperage.

2. Multiple voltage measurement is performed using a voltmeter to resist the shunt at a temperature t = (23,00±0,05)^{0}C.

The boundaries are the non-excluded systematic error of the voltmeter in millivolts definition when it is calibrated in the form of the following expressions:

$$\theta_V = 3 \cdot 10^{-4} \cdot V + 0{,}02 \qquad (2\text{-П1})$$

3. The resistance of the shunt is determined when it is calibrated for the value I =10 A and temperature t=23,00^{0}C and is equal to R_0 = 0,010 088 Ом.

The relative boundaries of the non-excluded systematic error in the resistance of the shunt, established during its calibration, are equal to

Then for R = R0 we get Om (4-P1)

The boundaries of the non-excluded systematic component of the error in the resistance value of the

To content:

shunt, due to the error in measuring the temperature, are found from the formula that determines the temperature dependence of the resistance,

where R0 is the resistance value at t = t0 (t0 = 23,000C, R0 = 0.010 088 Ω); α is the temperature coefficient (□ = 6 · 10-6 K-1). In the case when the limits of the error in measuring the temperature are □t, the boundaries of the corresponding error component of the resistance value are equal to

θt, R = α · □t • R

At □t = 0.050C, we obtain:

θt, R = 3.0 · 10-9 Ω, or 3.0 × 10-5% (5-P1)

3. Finding the measurement result

As a result of a series of n = 10 measurements, a series of Vi values are obtained in millivolts:

100.68; 100.83; 100.79; 100.64; 100.63; 100.94; 100.60; 100.68; 100.76; 100.65.

The arithmetic mean is calculated by formula (2)

To content:

mV (6-P1)

The result of measuring the current is obtained from formula

$$I = \frac{V}{R_0} = 9{,}984\ Ом$$

4. Analysis of sources of error in the result of measurements

4. The standard deviation (RMS) characterizing the random component of the error in the voltage measurements is calculated from formula (3)

5. $$S(\overline{V}) = \sqrt{\frac{1}{n(n-1)}\sum_{i=1}^{n}(V_i - \overline{V})^2} = 3{,}4 \cdot 10^{-2}$$ или

$$\delta S(\overline{V}) = 0{,}034\% \qquad (7\text{-П1})$$

Notes

1. The symbol □ here and below denotes the relative value of the quantity.

2. In accordance with the recommendations of the Guidelines, symmetric intervals are not indicated by the □ symbols.

3. The boundaries of the non-excluded systematic error of the voltmeter in millivolts, in accordance $V = \overline{V} = 100{,}72 mV$ with the formula (2-P1), will be equal to.

$$\theta_V = 3 \cdot 10^{-4} \cdot \overline{V} + 0{,}02 = 5{,}0 \cdot 10^{-2} \text{ мV или}$$

$$\delta\theta_V = 0{,}05 \text{ (8-П1)}$$

3. The boundaries of the non-excluded systematic error in the resistance of the shunt, in accordance with (3-P1) and (4-P1), established during its calibration, are equal

$$\theta_R = 7 \cdot 10^{-4} \cdot R_0 = 7{,}1 \cdot 10^{-6} \text{ Ом или } \delta\theta_R = 0{,}07\,0\%$$

(9-П1)

4. The boundaries of the non-excluded systematic component of the error in the resistance

value of the shunt caused by the error in measuring the temperature in accordance with (5-P1) are equal to

$$\theta_{t,R} = 3{,}0 \cdot 10^{-9} \text{ Ом или } \delta\ \theta_{t,R} = 3{,}0 \cdot 10^{-5}\ \% \quad (10\text{-П1})$$

In the future, this component of the error due to its smallness in comparison with other components can be ignored.

4. Calculation of the error characteristics of the result of measurements

1. To calculate the resulting measurement error, consisting of a random error and the sum of non-excluded errors, the formula adopted in the ICG for indirect measurements is used [3,4]:

2. $$\Delta_p = \frac{t_p(f_{eff}) \cdot S + \theta(p)}{S + S_\theta} S_\Sigma, \quad (11\text{-П1})$$

where all components of the error are determined for the same confidence probability P. In the

numerator, the sum of the confidence limits of the random and total non-excluded error, in the denominator - the sum of the RMS random and the RMS of the total non-excluded systematic error,

$S_\Sigma = \sqrt{S^2 + S_\theta^2}$ - RMS of the total measurement error [3,4].

Note. This formula is valid for the ratio If the systematic error component is small, $\frac{\theta(p)}{S} < 0{,}8$,

We note that, for generality, the error components are represented in the form

$$S = \sqrt{\sum_{i=1}^{m} \left(\frac{\partial f}{\partial x_i} \right)^2 S^2(\overline{x_i})},$$

$$\theta(p) = k \sqrt{\sum_{i=1}^{m} \left(\frac{\partial f}{\partial x_i} \right)^2 \theta_i^2},$$

where k = 1,1 for p = 0,95 and k = 1,4 for p = 0,99 and m>4.

Below is the calculation of all the components of the errors included in the formula (11-П1).

The assumption is made of a uniform distribution of the non-excluded systematic components of the error of the measurement result within their boundaries □V and □R. Then the RMS of the total non-excluded systematic component of the error in the result of the measurements of the current intensity S□ is determined by the formula

5. $$S_\theta = \sqrt{\left(\frac{\partial f}{\partial V}\right)^2 \cdot \frac{\theta_V^2}{3} + \left(\frac{\partial f}{\partial R}\right)^2 \cdot \frac{\theta_R^2}{3}} = \sqrt{\left(\frac{1}{R}\right)^2 \cdot \frac{\theta_V^2}{3} + \left(\frac{\overline{V}}{R_0^2}\right)^2 \cdot \frac{\theta_R^2}{3}} = 5{,}0 \cdot 10^{-3}\ A,$$

(12-П1)

Or

$\delta S_\theta = 0{,}050\%$

In this formula, it is taken into account that the coefficients of influence

$$\frac{\partial f}{\partial V} = \frac{1}{R}, \quad \frac{\partial f}{\partial R} = -\frac{V}{R^2}$$

4.2. The confidence limits of the total non-excluded systematic error of the result of measurements of the current intensity □ (p) at the confidence probability P = 0,95 are estimated by the formula

5. $$\theta(\mathrm{p}) = \mathrm{k}\sqrt{\sum_{i=1}^{m}\left(\frac{\partial f}{\partial x_i}\right)^2 \theta_i^2} = \theta(0{,}95) = 1{,}1\sqrt{\left(\frac{1}{R}\right)^2 \theta_V^2 + \left(\frac{V}{R^2}\right)^2 \theta_R^2} = 9{,}5\cdot 10^{-3}\, A$$

(13-П1)

Or

$\delta\theta_{0,95}$=0,095%

4.3. The RMS random component of the error of the result of measuring the current intensity S is determined by the formula

5. $$\mathrm{S} = \frac{\partial f}{\partial V}\cdot S(\overline{V}) = 3{,}4\cdot 10^{-3}\ A, \quad \delta S = 0{,}034\%$$

(14-П1)

The RMS of the total error in the result of the current measurement will be equal to

To content:

5. $S_{\Sigma} = \sqrt{S^2 + S_{\theta}^2} = 6{,}0 \cdot 10^{-3}\ A, \quad \delta S_{\Sigma} = 0{,}060\%$

(15-П1)

The confidence limits of the error in the result of measurements of the current strength at a probability of 0.95 and the effective number of degrees of freedom $f_{eff} = n - 1 = 9$, calculated by the formula (11-П1), give the result

$\Delta_{0,95} = 0{,}012$ A or $\delta\Delta_{0,95} = 0{,}12\%$ (16-П1)

5. Calculation of measurement uncertainty

Type A shall calculate the standard uncertainty due to sources of uncertainty that are of a random nature. The formula for calculations is similar to (7-Р1)

6. $u_A(V) = \sqrt{\frac{1}{n(n-1)} \sum_{i=1}^{n} (V_i - \overline{V})^2} = 3{,}4 \cdot 10^{-2}\ мВ$

To content:

7. $\delta u_A(V) = 0{,}034\%$ (17-П1)

The standard uncertainty of the current strength, due to sources of uncertainty, having a random character, is determined by the formula

$$u_A = \frac{\partial f}{\partial V} \cdot u_A(V) = 3{,}4 \cdot 10^{-3}\ A, \quad \delta u_A = 0{,}034\%$$

(18-П1)

By type B, standard uncertainties due to sources of uncertainty that are systematic are calculated. The law of distribution of quantities within the boundaries is considered uniform.

The limits of the systematic bias in the voltage measurements, determined during the calibration of the voltmeter, are determined by the relation (2-P1). Then the corresponding standard uncertainty uB, V is calculated by the formula

$$u_{B,V} = \frac{3 \cdot 10^{-4} \cdot V + 0{,}02}{\sqrt{3}} = 2{,}9 \cdot 10^{-2}\ мВ, \quad \delta u_{B,V} = 0{,}029\,\%$$

The boundaries within which the shunt resistance value lies is determined by shunt calibration and is equal to 7□10-4□R. Then, for R = R0, the corresponding standard uncertainty is calculated by the formula

$$u_{B,R} = \frac{7 \cdot 10^{-4} \cdot R_o}{\sqrt{3}} = 4{,}0 \cdot 10^{-6}\ Ом, \quad \delta u_{B,R} = 0{,}040\%$$

(20-П1)

The limits of the change in the resistance value of the shunt caused by the change in temperature are equal. The corresponding standard uncertainty is obtained in accordance with the formula

$$u_{B,t} = \frac{\alpha \cdot \Delta t \cdot R}{\sqrt{3}} = 1{,}7 \cdot 10^{-9}\ Ом, \quad \delta u_{B,t} = 1{,}7 \cdot 10^{-5}\%$$

(21-П1)

In the future this component of uncertainty, in view of its smallness in comparison with other components, can be neglected.

The total standard uncertainty uB, calculated by type B, is determined by the formula

$$u_B = \sqrt{\left(\frac{\partial f}{\partial V}\right)^2 u_{B,V}^2 + \left(\frac{\partial f}{\partial R}\right)^2 u_{B,R}^2} = 5{,}0 \cdot 10^{-3}\ A, \quad \delta u_B = 0{,}050\%$$

(22-П1)

The total standard uncertainty uC is calculated from the formula

6. $$u_C = \sqrt{u_A^2 + u_B^2} = 6{,}0 \cdot 10^{-3}\ A, \quad \delta u_C = 0{,}060\%$$

(23-П1)

The effective number of degrees of freedom is calculated by formula (11)

$$\nu_{effr} = \frac{u_C^4}{\frac{\left(\frac{1}{R} \cdot u_A\right)^4}{n-1} + \frac{\left(\frac{1}{R} \cdot u_{B,V}\right)^4}{\infty} + \frac{\left(\frac{1}{R^2} \cdot u_{B,R}\right)^4}{\infty}} = 87$$

(24-П1)

The coverage coefficient k is found from Table 4 and is determined by the formula

6. $$k = t_{0,95}(\nu_{eff}) = 1{,}99$$ (25-П1)

The expanded uncertainty U0.95 is determined as follows

6. $$U_{0,95} = k \cdot u_C = 0{,}012A, \quad \delta U_{0,95} = 0{,}12\%$$

(26-П1)

Comparison of the result of calculations by different methods

A comparison of the result of the calculation of the measurement error in the confidence interval corresponding to the probability P = 0.95 and the expanded uncertainty with a coverage factor of two, i.e. corresponding to a confidence level of 0.95. coincide and are equal to 0.012 A.

It should be noted that this is not an accident, since the calculations are based on the same measurement data and the same approaches to the distributions of various variables. Comparisons of measurement results determined using the classical approach and the concept of uncertainty, as shown in

numerous examples in different publications, give the same final results [1,2].

However, the result obtained in the concept of uncertainty is treated differently from the result obtained with the application of the classical approach. In the concept of uncertainty, the concepts of the true and actual values of the measured quantity are not used. The result of the measurement is what is considered a reality, since nobody really knows the value of the true value. uncertainty is treated in the Guide as an interval containing a predetermined share of the distribution of values that could reasonably be attributed to the measuring.

In general, the expanded uncertainty in the concept of uncertainty does not play the role that is assigned to the concept of error. It is considered that the main result of the assessment is the total uncertainty of uC, and the expanded uncertainty

differs from it by a constant coefficient, which is necessary in a number of special cases to show the reliability of the estimate. This coefficient can take values from 2 to 3, with a confidence level of 0.95 to 0.99.

Our ignorance about the measured value is determined by uncertainty and grouped around the measurement result.

LECTURE 9. OBJECTIVES, TERMS AND METHODS OF STANDARDIZATION

Plan:

1. Purpose and objectives of standardization.
2. Basic terms and definitions.
3. Basic principles and methods

Purpose and objectives of standardization.

The goals and directions of standardization are:

• Establishment of quality requirements for finished products based on the standardization of its quality characteristics, as well as the characteristics of raw materials, materials, semi-finished products and components;

• Development and establishment of a unified system of product quality indicators, methods and means of control and testing, as well as the necessary

level of product reliability, taking into account their purpose and operating conditions;

• establishment of standards, requirements and methods in the field of design and production in order to ensure optimum quality and exclusion of irrational variety of species, brands and sizes of products;

• development of unification of industrial products, increase of the level of interchangeability, efficiency of operation and repair of products;

• ensuring the unity and reliability of measurements, creating state standards of units of physical quantities;

• establishment of unified documentation systems;

• Establishment of systems of standards in the field of labor safety, nature protection and improvement of the use of natural resources.

Basic terms and definitions

The concept of standardization covers a wide field of social activity, which includes scientific, technical, economic, economic, legal, aesthetic, and political aspects. In all countries, the development of the state economy, the increase in production efficiency, the improvement of product quality, the growth of the standard of living are connected with the wide application of various forms and methods of standardization. Correctly set standardization promotes the development of specialization and co-production.

Standardization - the establishment and application of rules to streamline activities with the participation of all stakeholders. Standardization should ensure the full satisfaction of the interests of the producer and consumer, increase labor productivity, economical use of materials, energy,

working time and ensure safety during production and operation

Since, as follows from the definition, standardization is an activity aimed at ordering in a certain area, standardization itself must be highly ordered.

This is achieved by systematization of standardization work, that is, the establishment of rules at all stages of activities in the field of standardization: planning, development of implementation, compliance with regulatory documents.

In other words, the State System for Standardization of Uzbekistan of the GSS Uz establishes the procedure for planning, developing, approving, approving, state registration of normative documents; the procedure for verification, cancellation, revision, amendment; normative

provision of production, services, transportation, storage, sale, repair, operation (consumption), disposal; methods of conducting examination and evaluation of the scientific and technical level of normative documents; ways of applying international, interstate, regional, foreign standards, etc. etc.

State standardization is a form of development and standardization carried out under the guidance of state bodies on unified state standardization plans.

National standardization is carried out on a state scale without a state form of leadership.

International standardization is carried out by special international organizations or a group of states with the aim of facilitating mutual trade, scientific, technical and cultural ties.

Standards established during standardization are formalized in the form of normative and technical

documentation on standardization - standards and technical conditions.

The standard is a normative and technical document that establishes a set of norms, rules, requirements for the standardization object and is approved by the competent authority. The standard can be developed both for objects (products, raw materials, samples of substances) and for norms, rules, requirements for objects of organizational, methodical and general technical nature of labor, the procedure for developing documents, safety standards, quality management systems, etc. Technical conditions (TU) is a normative and technical document on standardization that establishes a set of requirements for specific types, brands, products. Specifications are an integral part of the set of technical documentation for the products to which they are distributed.

Basic principles and methods of standardization

• Simplification is a form of standardization, consisting in a simple reduction in the number of semi-finished products, components, etc. used in the development of a product or in its production. up to a quantity that is technically and economically feasible, sufficient for the production of products with the required quality indicators. Being the simplest form and the initial stage of more complex forms of standardization, simplification turns out to be economically profitable, since it leads to simplification of production, facilitates material and technical supply, warehousing, reporting.

• Unification - rational reduction of the number of types, types and sizes of objects of the same functional purpose.

The objects of unification are most often individual products, their components, parts,

components, brands of materials, etc. Unification is carried out on the basis of analysis and study of constructive versions of products, their applicability by reducing the design and size of products, their components and details to a single standard (unified) design by means of close-by-purpose design.

At present, unification is the most common and effective form of standardization. The design of equipment, machines and mechanisms with the use of unified elements allows not only to shorten the development time and reduce the cost of products, but also to increase their reliability, to shorten the terms of technological preparation and production mastering.

Typification is a kind of standardization, consisting in the development and establishment of standard solutions (constructive, technological, organizational, etc.) based on the most progressive

methods and operating modes. With respect to constructs, typing consists in the fact that some constructive solution (existing or specially developed) is taken as the basic one - basic for several identical or similar in terms of functional purpose products. The required nomenclature and product versions are built on the basis of the basic design by introducing a number of minor changes and additions to it.

• Aggregation - the method of creating new machines, instruments and other equipment by arranging the final product from a limited set of standard and unified assemblies and units that have a geometric and functional interchangeability.

• Along with standardization, implemented on a national scale, the following are widely used:

• sectoral standardization, carried out in selected industries to ensure the uniformity of technical requirements and norms for the products of the

industry and to create conditions for cooperation and specialization in this industry. Under the industry is understood the totality of enterprises and organizations, regardless of their territorial location and departmental belonging, developing and manufacturing certain types of products;

• Republican standardization carried out in the Union republic in order to establish requirements and norms for products not covered by state or industry standardization;

• local standardization carried out at enterprises (in associations) and setting requirements, norms and rules applicable only to the enterprise.

Depending on the subsequent influence on the development of the national economy, there are three types of standardization that are fundamentally different in approach to setting standards in the standards:

• Standardization on the achieved level, establishing indicators reflecting the properties of the existing and developed in production products, and thus fixing the achieved level of production;

Priority standardization, which is to establish higher levels of norms relative to the level of norms already achieved in practice;

• complex standardization, in which for the optimal solution of a specific problem, a purposeful and systematic establishment and application of a system of interrelated requirements both to the object of integrated standardization as a whole and to its basic elements is carried out. Examples of integrated standardization facilities are equipment and equipment for broadcasting and television, wire communication equipment, sound recording and reproduction equipment, and the like. Based on the system approach, comprehensive standardization

creates favorable conditions for the planned development of the relevant industries.

• Depending on the method of solving the main problem, several forms of standardization are distinguished.

LECTURE 10. STATE SYSTEM OF STANDARDIZATION AND THE LAW "ON STANDARDIZATION"

Plan:

1. Law of "On Standardization".

2. State system of standardization.

The Law of "On Standardization"

The main objectives of standardization are defined by the law:

protection of interests of consumers and the state in matters of product (service) safety for life, health and property of the population, the environment;

ensuring interchangeability and compatibility of products;

improving the quality and competitiveness of products;

assistance in saving all types of resources;

implementation of socio-economic, scientific and technical programs and projects;

ensuring the safety of national economic objectives taking into account the risk of natural and man-made disasters and other emergencies;

ensuring the uniformity of measurements.

The Law "On Standardization" establishes that the state system of standardization is functioning in the republic, regulating general organizational and technical rules for standardization work, and these rules are established. Organization, coordination and provision of standardization work within the scope of their competence is carried out by Gosarkhitektstroy, Goskompriroda, Ministry of Health.

The list of normative documents used in the republic is given:

international (interstate, regional) standards;

state standards;

industry standards;

technical conditions;

administrative-territorial standards;

company standards;

national standards of foreign countries.

Prohibited production and sale of products without regulatory documents. The requirements of normative documents that ensure the safety of products for life, health, property of the population, to ensure compatibility and interchangeability of products, the unity of methods of their control and the unity of labeling are mandatory for compliance.

The bodies, objects and subjects of state supervision of standards and ensuring the uniformity of measurements, the rights and responsibility of state inspectors for the supervision of standards have been established.

The law establishes that the state guarantees economic support and stimulation of economic entities that produce products marked with a sign of conformity, including by outrunning standards.

State system of standardization (SCU)

System approach to standardization management

Development and functioning of standardization, as a scientific and technical activity, inherent cumulative (accumulative) character. At each stage of its development, standardization summarizes its previous achievements in a concentrated form. In recent years, the scale of standardization work has dramatically increased. In view of the diversity of standardization, there is no such sphere of human activity where standardization is not applied, thus ordering this activity.

The definition of standardization adopted by the International Organization for Standardization and the

International Electro technical Commission (KO / EEC 2), reads:

Standardization - Activities aimed at achieving the optimal degree of ordering in a particular area by establishing provisions for universal and repeated use in relation to actual or potential tasks.

Notes:

1. In particular, this activity manifests itself in the processes of development, publication and application of standards.

2. The most important results of standardization activities are the increase in the degree of conformity of products, processes and services to their functional purpose, the removal of barriers to trade and the promotion of scientific and technical cooperation.

From the definition it follows that the main, most important task of standardization is the streamlining in all spheres of human activity.

Standardization is aimed at solving really existing or potential tasks, and quality is aimed at satisfying established and perceived needs. At the same time, the most important results of standardization activities are to increase the degree of conformity of products (processes, services) to their functional purpose, i.e., satisfaction of established and prospective uses. The sphere of human activity, which is the object of standardization, is very extensive: science and technology; production of products for production and technical purposes and consumer goods; services - medical, education, household, tourism, transport, etc. etc. And everywhere the requirements for the quality of activity in any sphere are regulated by normative documents, meaning the solution of not only existing, but also potential tasks, that is, satisfaction of not only established but also anticipated needs.

At the same time, the fulfillment of the most important task of standardization ("ordering") requires the ordering of standardization itself through a systematic approach based on and based on the results of system analysis, that is, the totality of the methodological tools used to prepare and substantiate solutions to complex technical problems. The system approach, in the case under consideration, is provided by the development and functioning of the state system of standardization.

Fundamentals of the GSS

The system is a "definite order, the sheer number of elements that are in relationships and connections with each other, forming a certain integrity, unity, in action".

Any system, in general, in particular, GSS, is based on the following fundamental principles:

Legal basis.

Organizational fundamentals.

Terms and Definitions.

Classification of the elements of the system.

Basic provisions.

Theoretical basis.

NOTE - The above sequence of fundamental principles is only in the order of the exposition and is not required for compliance.

Proceeding from the concept that the system can only be in operation, the SSU is still at the development stage: new standards are being developed, old ones are being deleted, modifications are being made, revision is being carried out, that is, the system is updated in connection with the deepening of the market economy, the solution of new procedural and technical tasks both in the field of standardization and with the development of the country's economy.

The main goals of standardization that provide: safety for man and the environment; quality and competitiveness of domestic products, processes, services;

interchangeability, compatibility, resource-saving; improvement of technical and economic indicators of production; implementation of socio-economic and scientific-technical programs and projects;

security of economic facilities, taking into account the risk of natural and man-made disasters and other emergency situations;

complete and reliable information of consumers about the nomenclature and quality of the products;

defense capacity and mobilization readiness of the country; unity of measurements.

The law establishes that the GSS operates in the republic, which regulates the general organizational

and technical rules for the standardization work, and these rules are established.

The organization, coordination and provision of standardization work within the scope of its competence is carried out by Gosarhitektstroy (in the field of construction, construction industry, including design and construction), Goskompriroda (in the field of regulating the use of natural resources and protecting the environment from pollution and other harmful influences), the Ministry of Health (in the field of medical products, medical devices, medicines, as well as in matters of determining the content of substances harmful to humans in products, produced in the republic and supplied by import). The list of normative documents used in the republic is given:

international (interstate, regional) standards; state standards; industry standards; technical conditions;

administrative-territorial standards;

company standards;

national standards of foreign countries.

Normative documents on standardization also include rules, standards for standardization, classifiers of technical, economic and social information.

International (interstate, regional), foreign regulatory documents are applied in the order established. In the state system of unified and continuous education, educational state stan- dards are being developed, approved by the Cabinet of Ministers of the Republic.

Normative documents on standardization should be based on modern achievements of domestic and foreign science and technology and should not create unnecessary obstacles to international trade. To ensure competitiveness, leading standards can be created.

Prohibited production and sale of products without regulatory documents.

The requirements of regulatory documents that ensure the safety of products for life, health, property of the population, to ensure compatibility and interchangeability of products, the unity of methods for their control and the unity of marking are obligatory for compliance.

The bodies, objects and subjects of state supervision of standards and ensuring the uniformity of measurements, the rights and responsibilities of state inspectors exercising state supervision, as well as the responsibility of subjects of state supervision and their officials for violating the legislation on standardization are established.

The list of works financed from the state budget is defined:

-development or participation in the development of international, interstate, regional normative documents;

-development of draft acts of legislative acts on specific objects of standardization;

-development and maintenance of the functioning of the fundamental organizational-methodical and general technical normative documents;

-development of classifiers of technical and economic information, preparation and publication of official information about them, as well as distribution to all users;

-Scientific research and other works that have a general value;

- implementation of state supervision over observance of binding standards requirements;

- formation and maintenance of the state fund of normative documents.

Sources of financing can also be funds that are received in accordance with the established procedure from the implementation of standards, the catalog of products and services, as well as part of the funds received from levying fines for violation of the legislation on standardization.

When developing state programs financed from the state budget, there should be provisions for the regulatory support of product quality.

The law provides for a state guarantee of economic support and incentives for enterprises that produce products marked with a sign of conformity, as well as for the production of products with standards with requirements for the future that outstrips the possibilities of traditional technology.

The resolution states that the organization of work on standardization is carried out: "In connection with the proclamation of the independence of the Republic of Uzbekistan, proceeding from the need to create a national republican system of standardization, metrology and certification, as well as to preserve economic, commercial, scientific and technical and other relations between the states of the Commonwealth of Independent States, the removal of technical barriers in trade and economic and scientific and technical cooperation with the countries of the world".

The decree defines the list of normative documents used in the republic, the main principles of the state system of standardization (GSS) are established, establishing the main goals of standardization; the defining bodies and services of standardization and their functions; regulating

obligatory and recommended requirements in normative documents; Preventing the right of economic entities to develop and approve the standards of the enterprise.

The Statute is approved, the main task of which is to ensure the functioning and improvement of the GSS, the state system for ensuring the uniformity of measurements (GIS), the national certification system (NSS) with the aim of promoting the quality and competitiveness of domestic products.

LECTURE 11. OBJECTS OF STANDARDIZATION OF VARIOUS DEGREE.

Plan:

1. Standardization objects of various degrees.

2. Development, coordination, approval and registration of normative documents of all levels

1. Standardization objects of different degree

The SSU establishes the procedure for planning, developing, agreeing, approving, state registration of normative documents; the procedure for checking, canceling, reviewing, amending them; normative provision of production, services, transportation, storage, sale, repair, operation (consumption), disposal; methods for carrying out the examination and evaluation of the scientific and technical level of normative documents; ways of applying international, interstate, regional, foreign standards, etc.

Organizational and methodological standards establish:

goals, objectives, general organizational and technical provisions for work in a certain area;

the procedure for the development, approval and implementation of regulatory documents, technical documents (design, technology, design, software).

General technical standards establish:

scientific and technical terms and their definitions in all branches of the national economy;

conventional symbols (names, codes, symbols, etc.) for various standardization objects;

requirements for the construction, presentation, design and content of various types of documentation (regulatory, design, design, technology, software, etc.);

general technical values, requirements and norms necessary for technical, including metrological support of production.

The main provisions establish general requirements for the organization and conduct of standardization work and are fundamental in the set of regulatory documents of the SSU.

The organizational basis for standardization has been established. The functions of the national standardization body:

forms and implements the national policy in the field of standardization;

coordinates activities on standardization of state and economic management bodies;

establishes general organizational and methodological rules for conducting work on standardization;

carries out state control and supervision over observance of normative documents, including those containing compulsory requirements;

organizes and conducts professional training and retraining of personnel in the field of standardization.

To methodically guide the work on standardization and the development of draft normative documents, the relevant government bodies in conjunction create technical committees and basic organizations for standardization, on business entities - standardization services.

Legend of normative documents -

a) state level:

state standard;

the national classifier;

the leading document;

recommendations;

b) branch level:

industry standard - TSt;

industrial classifier - TT;

specifications - TSh

Guidance document - RH;

recommendations - T;

c) administrative-territorial level:

administrative and territorial standard - MHSt;

Guidance document - RH;

recommendations - T;

d) level of the enterprise:

technical specifications - TSh;

enterprise standard - KSt.

Thus, the designation of normative documents of all levels is produced by abbreviations in the state language on the basis of Latin graphics, regardless of the language of the text of the document. The abbreviation means:

O'z - O'zbekiston (Uzbekistan);

D - Davlat (state);

T - Tasniflagich (classifier), Tarmoq (industry), Tavsiyanoma (recommendation);

R - Rahbariy (governing);

N - Hujjat (document), Hududiy (regional);

Sh - Shart (condition);

K - Korxona (enterprise);

M - Mamuriy (administrative);

St - Standart (standard).

The designation of the interstate standard (GOST) in Russian remains.

2. Development, coordination, approval and registration of normative documents of all levels

For all levels of regulatory documents, a unified procedure for the development, approval, approval (adoption), registration is established.

Drafters of draft normative documents can be technical committees for standardization, basic

organizations for standardization, government bodies, associations of enterprises, enterprises, organizations. Working out of projects by working groups of experts of various organizations is allowed. Responsibility for the compliance of the requirements of regulatory documents with mandatory requirements and the current level of science, technology and production are borne by the developers and organizations that approved (accepted) the document.

Four stages of development of the normative document are established:

- development and approval of the technical assignment for the development of the project (if necessary);

- development of the first draft of the project and sending out a response;

- processing of reviews, development of the final version;

- approval and state registration of the regulatory document.

It is allowed to combine the stages of development. For the withdrawal (approval), the project is sent with an explanatory note and a plan of the main organizational and technical measures for the implementation of the normative document in the general case: the customer (the main consumer), state supervision bodies, the trade union body (in terms of labor protection), the relevant organizations of the Ministry of Health, nature, if the project establishes requirements related to their competence. When developing a normative document by the technical committees for standardization, the project is considered to be agreed upon by the member organizations of the committee if they have signed a protocol on the approval of the project.

The draft regulatory document is submitted for approval by the developer with a cover letter in the following completeness:

- Explanatory note to the final version of the project;

- draft plan of main activities;

- the draft document in four copies, two of which should be the first (in the state and Russian languages);

- originals of project approval documents;

- a summary of the feedback on the project - a certificate of disagreement (if necessary).

The following levels of approval of normative documents are established:

- state standards of Uzbekistan - the Cabinet of Ministers of the Republic of Uzbekistan (in the system of continuous education);

- state standards - agency "Uzstandard" in all branches of the economy);

- - industry standards and technical conditions - government authorities, business associations;

- administrative-territorial standards - by instructions, the relevant territorial government bodies;

- technical conditions - heads of economic entities;

- company standards - heads of economic entities;

- Guidance documents and recommendations - at all levels (no products are being developed for the products being sold).

Normative documents for products (services) are subject to revision, as a rule, every five years, unless another period is stipulated by the document. Fundamental normative documents, as a rule, are

approved without any limitation of the validity period. Approval and state registration of normative documents is carried out after carrying out scientific and technical expertise. The state registration of regulatory documents for products (services) is carried out by agencies of the agency. Without state registration, regulatory documents are not valid. Changes in normative documents are developed, agreed, approved, registered in the order established for the main documents. Before planning the development of normative documents, it is necessary to analyze the whole array of normative documents at all levels (international, interstate, regional, state and others, up to enterprise standards) in order to ensure that there are no standards for similar products (services). This is necessary, first, because not to spend money and time to develop what is already there, secondly - the relevant organizations at any

stage can reject this work if there are not sufficient grounds.

LECTURE 12. STANDARDIZATION AND CODING OF INFORMATIZATION. ABOUT PRODUCTS.

Plan:

1. Goals and objectives of the Concept of the Development of the Standardization Development System
2. Basic organization of standardization
3. Bar coding

Goals and objectives of the Concept of the Development of the Standardization Development System.

The system for ensuring the uniformity of measurements in the field of communication and information (hereinafter referred to as the System) is

an integral part of the State system for ensuring the uniformity of measurements (GIS).

The main objectives of the System development are: comprehensive assistance to the economic and social development of the national economy by protecting consumers' rights from the negative consequences of inaccurate measurement results;

- Definition of the basic directions of development of metrology, creation of necessary preconditions and conditions for perfection of metrological base in sphere of communication and information;

- further improvement of the regulatory and legal framework in the field of metrology;

- regulation of relations between business entities

sphere of communication and information and their interaction with the agency "Uzstandard" on metrological support in the process of verification,

- repair, purchase, rental of measuring instruments and other works on metrology;

harmonization of sectoral rules, norms, existing standards, guidelines and methodological documents with the requirements of the ICG,

- Recommendations and requirements of international documents.

The system is operated on the following principles:

- organization and conduct of scientific research in order to improve measuring instruments of the highest accuracy, establish rules for transferring the sizes of units of physical quantities from the standard measuring instruments to working measuring instruments;

- organization and carrying out of works on transferring the sizes of units of physical quantities from state standards (or initial model measuring instruments) to working measuring instruments;

- Planning and implementation of works to improve the regulatory and legal framework in the field of metrological support;

studying the degree of use and the need for measuring instruments;

the analysis of reliability of the control and management of technological processes, the means and methods of measurement used;

- the introduction of new methods and techniques for performing measurements that improve the degree of reliability of measurement results.

1. Basic organization of standardization.

The main objectives of the ESCC of the TESI are:

- standardization of information support for the management of the national economy on the basis of application, computer facilities;

- maintenance of information compatibility of processes of management of a national economy on the basis of application of means of computer facilities;

- providing electronic information exchange at the international level.

- classification and coding of technical, economic and social information in the system of national economy management;

- providing methodological unity in the development and maintenance of classifiers;

- Creation of a complex of interrelated classifiers;

- provision of conditions for automation of information processing;

- maintenance of information compatibility of interacting automated systems of management of a national economy;

- harmonization of the classification and coding system with international classification systems.

Bar coding.

A barcode is one way of recording information about an object or product.

Bar codes are not only a means of automated identification, accounting and intensification of commodity circulation, but also carriers of commercial information.

Goods labeled with EAN barcodes in one country can be uniquely identified and scanned on the appropriate equipment in all countries of the world.

A bar code is a sequence of black and white stripes, representing some information in a form that is convenient for reading by technical means

The information contained in the code can be printed in a readable form under the code (decryption).

Bar codes are used in trade, warehouse accounting, librarianship, security systems, postal business, assembly production, document processing.

Simplicity of their application, ease and reliability of reading, input of this information into the computer allows creating a technological base for control systems that can be used in almost all spheres of human activity.


4 7 8 1 2 3 4 5 6 7 8 9 2
Код Узбекистана (Префикс "EAN Uzbekistan")
Номер предприятия
Код товара
Контрольное число

To content:

LECTURE 13. CERTIFICATION, BASIC CONCEPTS AND TERMS FOR CERTIFICATION OF PRODUCTS AND SERVICES "

Plan:

1. General information about certification.
2. Legislative basis of certification.
3. Basic concepts.

General information about certification

Certification in Latin means "done right". In order to make sure that the product is "done right", it is necessary to know what requirements it must meet and how it is possible to obtain reliable evidence of this compliance.

What is product certification?

This is a confirmation of the compliance of products with the requirements established in the normative document.

What products are subject to certification?

To content:

Постановление Кабинета Министров Республики Узбекистан № 122 от 28 апреля 2011

"Certification" means the procedure by which a third party certifies in writing that the product, process or service meets the specified requirements. "

Certification of conformity serves as a universally recognized method of such certification. In general terms, the term "compliance" is defined as "compliance with specified requirements for products, (process, service)."

Confirmation of compliance through certification implies the mandatory participation of a third party under the rules of a certain procedure. The third party is a person or body independent of either the supplier (the first party) or the consumer (second party).

Certification is considered the most reliable way of proving the conformity of products (process, service) with specified requirements. The proof of conformity is carried out on a particular system containing its own rules of procedure and management.

The certification system generally consists of: a central authority that manages the system and oversees its activities; participants and members of the system (certification body, testing - laboratories, control bodies); normative documents for compliance with which certification is carried out; certification procedures; the order of inspection control.

Certification systems can operate at the national, regional and international levels. If the certification system is engaged in proving compliance of a certain type of product (process, services) - it is a system of certification of homogeneous products, which in its practice applies standards, rules and procedures relating specifically to this product.

Any certification system uses normative documents (NDs) that are used to assess compliance.

A certificate of conformity is a document issued according to the rules of the certification system, which confirms that it is necessary to ensure that the properly identified product (process, service) is in compliance with a specific standard or other normative document.

The certificate can refer to all requirements of the standard, as well as to individual sections or specific characteristics of the product, which is clearly stipulated in the document itself. The information presented in the certificate should provide an

opportunity to compare it with the test results, on the basis of which it was issued.

A conformity mark is a sign used in accordance with the rules of the certification system for prompt confirmation of conformity of products. The mark is placed directly on the product itself or packaging.

Recognition agreements are concluded at the national, regional and international levels. A unilateral agreement consists in the acceptance by the other party of the results of the work of the other party.

A bilateral agreement is an agreement on mutual recognition, it includes acceptance by each party of the results of the work of the other party.

A multilateral agreement is an agreement on mutual recognition of the results of the work of more than two parties.

The main organizational and methodological principles of certification are:

• ensuring the reliability of information about the object of certification;

• objectivity and independence from the manufacturer and the consumer;

• Elimination of discrimination against foreign applicants;

• the applicant's right to choose a certification body and a testing laboratory;

• responsibility of participants and certification experts;

• Openness of information on the results of certification or on the termination of the period (cancellation) of the certificate, (sign) of conformity;

• a variety of methods and professional testing, taking into account the features of the object of certification, its production and consumption;

• use in the certification activities of the recommendations and rules of ISO / IEC and other international documents;

• recognition of accreditation of foreign certification bodies and testing laboratories,

certificates and marks of conformity on the basis of various agreements in which Uzbekistan participates;

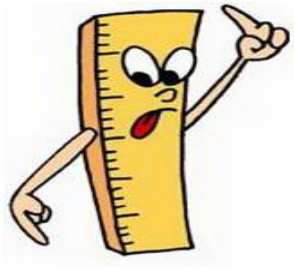
• respect for the confidentiality of information constituting a trade secret;

• Involvement in necessary cases of works on certification of consumer societies.

According to the Law, certification is carried out according to the List of products and services subject to obligatory certification, which is approved by the Cabinet of Ministers, as well as in cases provided for by other legislative acts. Organization of work on mandatory certification is entrusted to Uzstandard Agency.

Certification is carried out by the certification bodies for homogeneous products with mandatory accreditation.

The subjects of mandatory certification are Uzstandart Agency, certification bodies, testing laboratories (centers), control bodies, manufacturers (sellers) of products.



Certification bodies were granted the right to create certification systems for homogeneous products, to implement the selection of certification schemes and to grant applicants the right to apply a conformity mark to certified products.

The law defined the conditions for certification of imported and exported products. It is established

that the products subject to mandatory certification must be accompanied by a certificate and a conformity mark confirming its compliance with the established requirements. In the absence of a certificate of compliance, the customs control authorities detain the transferred products before deciding whether to issue certification according to the rules of the National Certification Scheme.

The law also provides for voluntary certification on the initiative of legal entities and individuals, which may be subject to any product to confirm its compliance with regulatory requirements.

The law regulates issues of control and supervision. State supervision of compliance by manufacturers with mandatory certification is carried out by state inspectors. Inspection bodies of certificated products, quality systems, manufactures are carried out by certification bodies, and the activity of accredited testing laboratories (centers), certification bodies and control bodies in the field of certification is controlled by Uzstandard Agency as an accrediting body.

Basic concepts.

The following basic concepts are used in this Law:

"national certification system" is a system operating at the state level, having its own rules of procedure and management for conducting certification;

"certification of products" (hereinafter referred to as "certification") - activities to confirm the compliance of products with the established requirements;

"certificate of conformity" means a document issued in accordance with the rules of the certification system to confirm compliance of certified products with the established requirements;

conformity mark" means a sign, registered in accordance with the established procedure, to mark the product or service documentation to indicate that the product or service corresponds to a specific standard or other normative document;

"Certification system for homogeneous products (works, services)" - a certification system relating to a certain product, work or service for which the same specific standards and rules apply;

"accreditation of a testing laboratory" - official recognition of the competence of a testing laboratory

(center) to carry out tests of a specific product or a specific type of test.

"expert-auditor for quality" - a specialist accredited in accordance with the procedure established by law, having the appropriate qualifications for performing work in the field of certification, accreditation and control;

"control body in the field of certification" - an accredited body in accordance with the established procedure that performs certification of certified products and quality management systems on behalf of certification bodies; (The paragraph was introduced in accordance with the Law).

"Inspection control" means the procedure for re-evaluating certified products, quality management systems or production, the activities of certification bodies, testing laboratories (centers) in order to

confirm their compliance with the requirements established during certification and accreditation.

LECTURE 14. TYPES OF CERTIFICATION. LAW "ABOUT CERTIFICATION OF PRODUCTION AND SERVICES

Plan

1. Mandatory and voluntary certification.
2. Law "On certification of products and services
3. Certification schemes

Types of certification

The national certification system provides for compulsory and voluntary certification of products.

Voluntary certification.

In the world practice, voluntary certification is an effective means of assisting consumers in choosing goods.

For the manufacturer, the certification of its products, conducted by an authoritative organization, means a greater probability that they will buy this product. Voluntary certification increases the competitiveness of products, accelerates the process of commodity circulation.

Thus, voluntary certification acts as an effective market instrument in which both consumer and manufacturer are interested, and hence society and the state.

Voluntary certification is a classic type of certification, which does not have strict legislative limitations in the rules and procedures of conducting.

Voluntary certification is carried out on the initiative of the applicant (manufacturers, sellers, executors) in order to confirm the conformity of products to the requirements of standards, technical

conditions, recipes and other documents determined by the applicant.

In many countries, with the active support of governments, powerful voluntary certification systems are being created that are highly regarded both among consumers and manufacturers.

Recently in the world economy, a huge role has been played by the voluntary certification of quality systems for compliance with the international standards of ISO 9000 series.

In the voluntary certification system, the appropriate certification schemes are applied, established based on the specific features of the functioning of the system.

Financing of works on voluntary certification in the system is carried out by applicants. The order of payment is regulated by the conditions of contracts between the customer and the contractor for the work

on voluntary certification. The cost of these works is established on the basis of the agreed price between the parties.

Mandatory certification.

Mandatory certification is carried out on the basis of laws and regulations of the Government of the Republic of Uzbekistan Legislative Acts and provides proof of the conformity of the goods (process, service) with the requirements of technical regulations, mandatory requirements of regulatory documents. Since the mandatory requirements of these documents relate to safety, protection of people's health and the environment, the main aspect of mandatory certification is safety and environmental friendliness.

Mandatory certification is carried out within the framework of the NSS in accordance with the List of products and services subject to mandatory

certification, which is approved by the Cabinet of Ministers. Obligatory certification is subject to products produced, imported and exported from the Republic.

Mandatory certification, as in foreign countries, primarily applies to consumer goods.

As criteria for the inclusion of goods in this list were selected: the potential danger to the user; availability of safety requirements in the regulatory document for products; mass consumption; the degree of threat to life and health of a person, etc.

For the organization and conduct of certification, the organizational structure of the NSS has been legislatively established.

It includes:

- National certification body of the Republic (Uzstandard Agency);

- accredited bodies for certification of homogenous products and services, certification of quality systems and productions;

- accredited testing laboratories (centers);

- Research Institute for Standardization, Metrology and Certification (NIISMS);

- methodological centers for certification of homogeneous products;

control bodies;

- experts-auditors on quality.

2. Law "On certification of products and services

In 1993, the legal basis for certification was determined - the Law of the Republic "On certification of products and services" was adopted.

In accordance with the Law, the Agency for Standardization, Metrology and Certification -

Agency is the national body for certification and accreditation.

According to the Law, certification is carried out according to the List of products and services subject to obligatory certification, which is approved by the Cabinet of Ministers, as well as in cases provided for by other legislative acts.

Organization of work on mandatory certification is entrusted to Agency. Certification is carried out by the certification bodies for homogeneous products with mandatory accreditation. The subjects of mandatory certification are Agency, certification bodies, testing laboratories (centers), control bodies, manufacturers (sellers) of products.

Certification bodies were granted the right to create certification systems for homogeneous products, to implement the selection of certification

schemes and to grant applicants the right to apply a conformity mark to certified products.

The law defined the conditions for certification of imported and exported products. It is established that the products subject to mandatory certification must be accompanied by a certificate and a conformity mark confirming its compliance with the established requirements. In the absence of a certificate of compliance, the customs control authorities detain the transferred products before deciding whether to issue certification according to the rules of the National Certification Scheme.

The law also provides for voluntary certification on the initiative of legal entities and individuals, which may be subject to any product to confirm its compliance with regulatory requirements.

The law regulates issues of control and supervision. State supervision of compliance by

manufacturers with mandatory certification is carried out by state inspectors. Inspection bodies of certificated products, quality systems, manufactures are carried out by certification bodies, and the activity of accredited testing laboratories (centers), certification bodies and control bodies in the field of certification is controlled by Agency as an accrediting body.

ЗАКОН
РЕСПУБЛИКИ УЗБЕКИСТАН
30.08.1997 г.
N 483-I

О КАЧЕСТВЕ И
БЕЗОПАСНОСТИ
ПИЩЕВОЙ ПРОДУКЦИИ

To content:

Постановление Кабинета Министров Республики Узбекистан № 318 от 6 июля 2004 года

«О дополнительных мерах по упрощению процедуры сертификации продукции»

Постановление Кабинета Министров Республики Узбекистан № 122 от 28 апреля 2011 года

«О дополнительных мерах по совершенствованию процедур сертификации и внедрения систем менеджмента качества»

Постановление Кабинета Министров Республики Узбекистан № 173 от 19 июня 2009 года

«О дополнительных мерах по расширению внедрения на предприятиях Республики систем управления качеством, соответствующих международным стандартам»

Basic normative documents of conformity assessment

Правила сертификации продукции и	Правила проведения инспекционного контроля	Положение о порядке декларирования соответствия	Правила сертификации по отдельным видам однородной

Инструкция о порядке ввоза на территорию РУз и вывоза с	

According to the certification of products and services, two types of certification can be distinguished. Mandatory and voluntary. The list of mandatory certification is approved by the Cabinet of Ministers. Mandatory certification provides proof of the conformity of the goods (process, service) with mandatory requirements of regulatory documents. Mandatory requirements include safety requirements, protection of human health and the environment,

interchangeability, compatibility, resource-saving, labeling.

Mandatory certification of products and services is carried out within the framework of the National Certification System (NSS). The NSS also provides for voluntary certification. Such certification is carried out on the voluntary initiative of the manufacturer. The purpose of creating a certification system is to establish rules of procedure and management for the implementation of conformity certification.

3. Schemes for certification of products and services

Scheme N 1 is used for certification of a standard sample and provides for the testing of products in ALI for mandatory indicators, primarily for safety. This scheme is also applied in the absence of a clearly defined ND for products.

Scheme N 2 is used for certification of a standard sample and provides for the testing of products in the AIL to check mandatory indicators. This scheme provides for inspection of products through testing of samples taken in the field of trade (the consumer).

Scheme No. 3 is used for the certification of products and provides testing of products in the AIL for verification of mandatory indicators and a survey of production. This scheme provides for the inspection of the enterprise with the testing of products taken from the manufacturer.

Scheme N 4 is used for certification of manufactured products and provides for the testing of products in AIL for verification of mandatory indicators and production survey.

This scheme provides for inspection of products through testing samples taken both from the trade (from the consumer) and from production.

Scheme No. 5 is applied for the certification of manufactured products and provides for the testing of products in AIL to check mandatory indicators, a production survey or an assessment of the quality system. This scheme provides for inspection control with product testing and production inspection (or quality system assessment).

Scheme No. 6 is applied for the certification of the quality system and provides for its evaluation and subsequent inspection.

Scheme N 7 is used for the certification of a batch of products and provides for the testing of products.

Scheme No. 8 is applied for the certification of each individual item.

Scheme N 9 is used for product certification and provides for the declaration of conformity of products to the requirements of its safety.

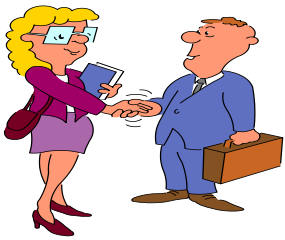
Products certified according to schemes NN 3, 4, 5, 7, 8, 9 can be marked with a conformity mark in the established order.

The certification scheme in each particular case chooses the OS taking into account the applicant's proposals, the scope and the delivery time, test methods, production characteristics and the risk of its stability, as well as the potential hazard of this product for consumers.

Certification in the framework of international systems or agreements is carried out according to the schemes envisaged in them.

In the course of certification, the products are certified for compliance with the requirements established by regulatory documents for the products

to be certified (hereinafter referred to as NDs), containing a list of characteristics (indicators) to be checked during certification, methods of control and testing.



Certification of products according to the scheme number 3.

LECTURE 15. INDICES AND QUALITY OF PRODUCTION. STANDARDS OF THE SERIES ISO 9000

Plan

1. To get acquainted with the structure of the international organization ISO, to present it in a graphic form, highlighting the main functions of the ISO and the work of its committees.

2. Get an idea and navigate in international standards ISO 9000 - ISO 9004, ISO 8402

International Organization for Standardization (ISO)

In the field of international standardization, a large number of organizations operate, among which the International Organization for Standardization (ISO) is the most representative. It was created by the decision of the UN Committee for the Coordination

of Standards in 1946, the official activity began in February 1947, after the ratification of its creation by 33 countries. ISO is a non-governmental organization and enjoys the consultative status of the United Nations. The main goal declared by the ISO Charter is defined as "promoting standardization on a global scale" (Figure 1).

The ISO Charter also defines the organizational structure (Figure 2), the functions of the main bodies and methods of work.

The main functions of ISO include the following:

1) the establishment of international standards with the consent of all members of the PCP;

2) to promote the introduction and facilitation of the application of new progressive standards;

3) organization of the exchange of information on the work of its members and technical committees;

4) cooperation with other international organizations.

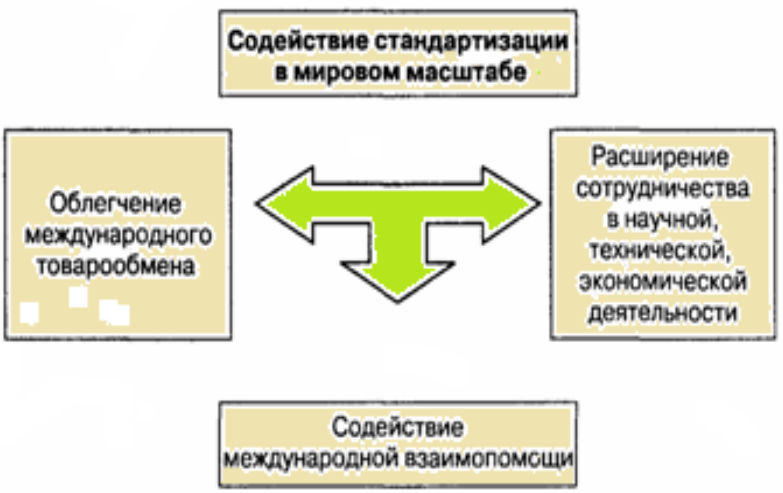


Fig.1. – Aims of ISO

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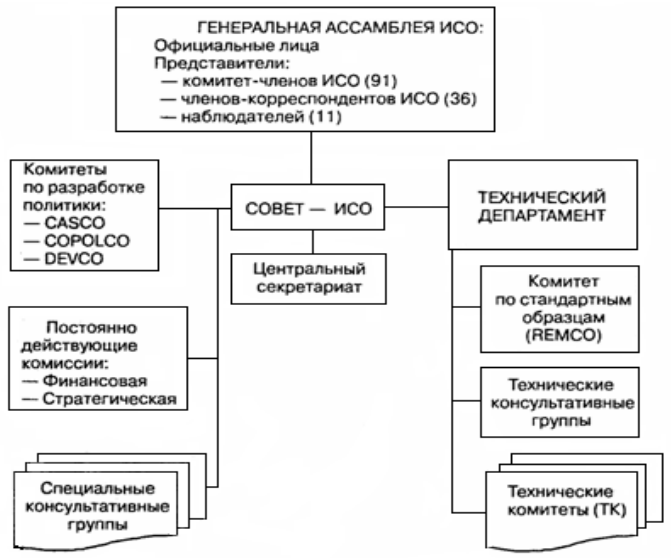

Fig. 2 - ISO organizational structure

The official languages of ISO are English and French.

The highest governing body of ISO is the General Assembly, consisting of officials and representatives of all categories of ISO members, convened at least once every three years. The General

Assembly determines the general policy of the organization, solves the main issues of its activities.

ISO officials are:

- the president;
- Vice-President;
- Treasurer;
- Secretary General.

There are three categories of membership in ISO:

- member committee (full member of ISO);
- Corresponding member;
- Observer.

ISO member-bodies are national organizations in standardization, consistent with the requirements of the Charter and the Rules of ISO. From each country, regardless of the number of standardization organizations operating in it, only one national organization can be admitted to ISO member

countries.

Since 1964, ISO has a category of correspondent members, which includes countries that do not have a national standardization organization (most often developing). Corresponding members have the right:

- to participate in TC meetings without registration;
- to receive information materials.

Between sessions of the General Assembly, ISO is headed by a Council elected for three years, consisting of the President, Vice-President, Treasurer and representatives of 18.

A number of special committees have been established under the Council to work on specific areas of ISO activities, for example, CASCO (Figure 3), DEVKO (Figure 4), KOPOLCO (Figure 5).

The results of CASCO work are guidance documents on harmonization of national certification systems on the basis of multilateral mutual

recognition of test results. Particularly important for countries that do not have their own national certification systems or have just begun to create such systems.

The result of the activities of KOPOLCO is the periodic publication of a list of international and national standards of interest to consumer unions and societies, as well as the preparation of manuals on consumer products.

A Standard Design Committee (REMCO) has been established at the Technical Department of ISO to develop guidelines for ISO technical committees that reference standard samples in international standards. In addition, the ET Committee prepared and published a handbook on standard samples. Another important function of REMCO is the coordination of ISO activities in the field of standard samples with other international organizations.

Fig. 3 - The main activities of CASCO

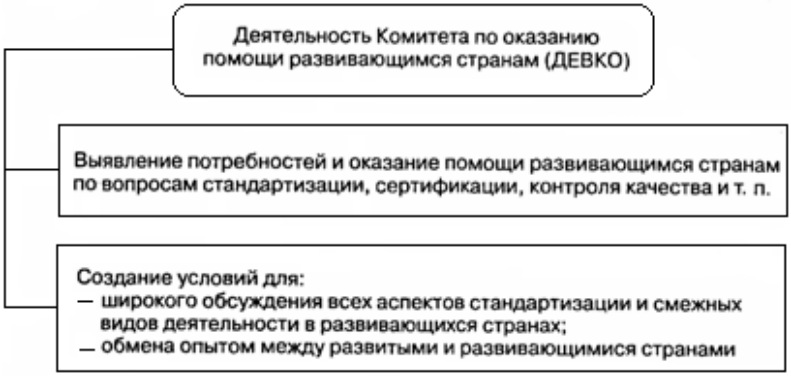

Fig. 4 - The main activities of DEVKO

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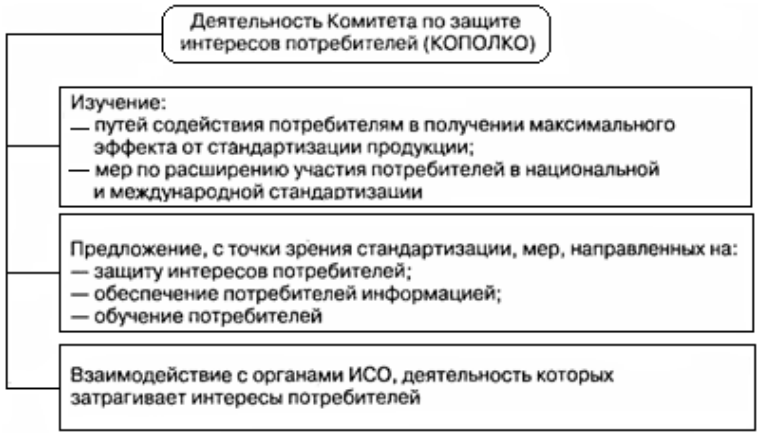

Fig. 5 - Core activities of COPOLCO

Development and coordination of draft international standards is carried out by the ISO bodies - technical committees (TC), whose structure is depicted in

Fig. 6.

The number of TCs is unlimited, a new TC can be established at the suggestion of one member committee with the support of at least five other committee members. When creating a new TC

simultaneously with the decision on its name, it is decided to maintain the secretariat of this TC by a specific country. If the scope of the TC is too broad, it creates more narrowly specialized subcommittees (PCs) that form working groups (WGs) from leading experts in certain areas of activity from different countries. Working groups are the main technical unit of ISO, which develops working draft documents. Some indicators of ISO activities (as of January 1, 2001) are given in Table. 1.

Fig. 6 - Structure of ISO technical committees

Table 1

Performance indicators of ISO (as of 01.01.2001)

No. Characteristic In 2000 Note

1 Developed international standards 986 (46998 pages) Since 1947: 13025 (391582 pages)

2 We were at work

new projects of TC

projects of international

standards 548 (registered)

1780 (registered) At 31. 12. 2000:

119

2009

3 Meetings and meetings,

including:

TC meetings

meeting of the PC

meetings of the WG and special scientific groups 1353, including:

To content:

99

352

902 Participation was accepted

representatives from 29 countries

ISO maintains contacts with many international organizations that to some extent affect the problems of standardization in their activities, which may include:

- IES / CEI - International Electronically Commission (IEC). IEC is the second most important international organization for standardization after ISO. The standardization area of the IEC is electrical engineering, radio communication, electronics, instrumentation. ISO is standardizing in all other industries;

- CEN - European Committee for Standardization - European Committee for Standardization;

- CENELEC European Committee for Electro technical Standardization - European Committee for Standardization in Electrical Engineering and Electronics;

- EOQ - European Organization for Quality - European Organization for Quality;

- ETSI - European Telecommunications Standard Institute - European Institute for Standardization in Telecommunications;

- EASC - Euro ASIA State Council for Standardization, Metrology and Certification - Eurasian Interstate Council before standardization, metrology in certification;

- IAN - International Federation of Users of Standards;

- SORAT - Pan-American Standard Commission - Pan American Commission for Standards;

- RASO - Pacific Area Standards Congress - Pacific Standardization Congress;

- WHO - World Health Organization - World Health Organization;

- TWO - World Trade Organization - World Trade Organization;

- EAST - Eurasian Council on Standardization, Metrology and Certification - Interstate Council for Standardization, Metrology and Certification of the Commonwealth of Independent States (MG-C CIS) - and others.

Standards series 1S0 9000 (1S0-9000)

The international experience of quality management is summarized in the package of international standards ISO-9000. The history of these standards goes back to the US military standards MIL-Q9858 of the late 50's. XIX century.

These standards served as a prototype for the British standards BSI 5750, approved by the British Standards Institute (BSI-British Standard Institute) in 1979. The BSI 5750 standard is the first edition of the ISO standard adopted by the International Standard Organization-ISO in March 1987 in

The ISO-9000 series is a set of quality assurance documents prepared by members of an international delegation known as ISO / Technical Committee 176 (ISO / TC 176). To date, the family (series) of ISO-9000 standards forms the basis for achieving a stable quality by any organization. The family of standards I is shown in Fig. 7.

The third edition of the ISO 2000 series contains only 5 standards. Currently, the family (series) of ISO 9000 includes:

The third edition of the ISO 2000 series contains only 5 standards. Currently, the family (series) of ISO 9000 includes:

The document ISO 9001: 2000 includes almost all the requirements of ISO 9001: 1994, while adding a number of new ones. The structure of the standard has changed - instead of "hard" division of all requirements into 20 elements, which caused many problems (especially small or service providers) with adapting the standard to their own organization, four main sections were introduced:

- responsibility of management;
- resource management;
- sales of products;
- measurement, analysis and improvement.

Fig. 8 - Relationship between ISO 9001, 9002, 9003

It should be especially noted that the content and structure of this standard are harmonized with ISO 9004: 2000, which facilitates their joint practical use.

At the same time, the ISO 9001 standard, intended for certification of the quality system, sets out the minimum requirements for the organization, which ensure the achievement of customer satisfaction, and ISO 9004 serves to improve the activities in the organization. It focuses the organization on the accounting and maximum

possible satisfaction of the requirements of all stakeholders: consumers, business owners, personnel, suppliers, society as a whole.

One of the most important features of these standards is their universality, ie, the principle applicability to all types of activity, without exception.

The ISO 9000 and ISO 9004 standards are of a reference nature.

The ISO 9000 standard "General quality management and quality assurance standards" includes 4 parts:

- Part 1: "Guidelines for selection and application". This guide is applied when deciding whether to choose a particular quality assurance model, taking into account specific contractual relationships.

- Part 2: "General guidelines for the application of ISO 9001, ISO 9002 and ISO 9003".

This manual explains to the user the interpretation of the requirements of ISO 9001, ISO 9002 and ISO 9003.

- Part 3: "Guidelines for the application of ISO 9001 in the development, delivery and maintenance of software." The instructions are intended to interpret the requirements of the ISO 9001 standard by the intellectual product manufacturers.

- Part 4: "Guide to managing the reliability program."

The ISO 9004 standard "General quality management and quality system elements" contains information and proposals for the implementation (development, installation and commissioning) of the TQM (Total Quality Management) system, which occurs after the installation and (possibly)

certification of the Quality System. The standard consists of the following parts:

Part 1: "Guidelines".

- Part 2: "Guidelines for services".

- Part 3: "Guidelines for recyclable materials".

- Part 4: "Guidelines for improving quality".

- Part 5: "Guidelines for the quality program".

- Part 6: "Quality management in project management" (draft standard).

- Part 7: "Guidelines for configuration management" (draft standard).

The ISO-900 standard also defines a fundamental concept, such as the "quality loop" (product life cycle).

In addition to the ISO-9000 standards, the package includes support standards and guidelines (process and document standards) associated with

either common ISO-9000 elements or with narrow commercial or production specifics.

Standard ISO 8402 "Quality management and quality assurance - Vocabulary". Since many words used in everyday life are used in quality management in a specific sense, this standard aims to establish terminology in the field of quality management. Terminological dictionary in the 2000 edition, contains new terms and revised outdated concepts (Table 2).

In addition, in the new edition of the standards, there has been a certain confusion in the terminology. In ISO-9000: 2000, the term "subcontractor" is replaced by "supplier", "supplier" - for "organization", "consumer" - for "customer", which means a consumer or retailer.

The supporting standards of the ISO-9000 family also include:

1 ISO 10011: "Guidelines for the verification of the quality system". this group is the normative base for the bodies that carry out the inspection of the quality system of the enterprise (including during the certification audit). However, these standards are also useful in the development of a quality system, since they allow us to foresee a scenario for its verification. ISO 10011 includes in its composition H parts:

table 2

Changes in the terminology of ISO-900 standards

Term Terminology ISO 8402: 1994 Terminology ISO 9000: 2000

1. Quality A set of object characteristics related to its ability to meet identified and perceived needs The ability of a set of characteristics inherent in the product, system, process, meet the requirements of customers and other stakeholders

2. Customer Satisfaction / Dissatisfaction - Customer's opinion as to the extent to which the transaction satisfies / does not satisfy the customer's needs and expectations:

Note 1

The transaction is a specific time and event based on shared needs and expectations, and their relationship between all stakeholders

Note 2

Customer's claims are a general indicator of the unsatisfactory

- Part 1: "Verification".

- Part 2: "Qualification criteria for audit experts to audit quality systems".

- Part 3: "Management of the audit program"

2. ISO 10012 standard 4 Requirements for quality of measuring equipment "is not mandatory for applicants of the ISO 9001, 9002 or 9003 certificate,

but it is difficult to imagine compliance with the requirements of the core ISO-9000 family standards without meeting the requirements of ISO 10012.

Guidelines from the family of standards can be grouped in three main directions (Figure 9).

3. ISO 10013 "Guidelines for the development of quality manuals contains recommendations for the compilation of a fundamental document of the quality system - the Quality Manual. However, an organization can go its own way in developing this document, since for the certification of a quality system, only the requirements of ISO 9001 (9002 or 9003) are required depending on the model chosen.

The standards of the ISO 9000 series were created as industry-independent industries. However, today ISO / TS 176 is working on the extension of the ISO 9000 family due to documents (manuals or draft

standards) reflecting industry specificity. First of all, this applies to such areas of activity as:

- processing of materials;
- services;
- development of software for intellectual products, etc.,
- Specific management activities (audit, continuous development, staff training, etc.).

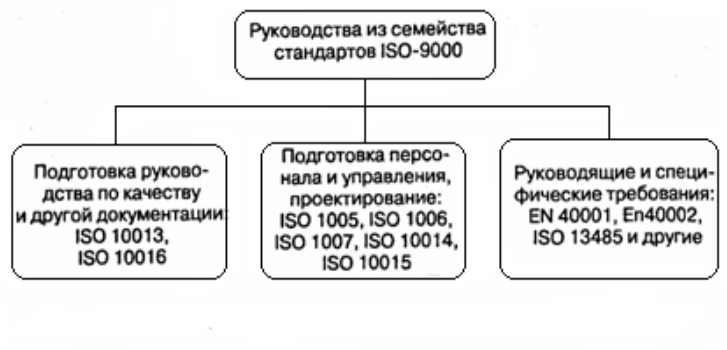

Fig. 9 - Grouping guides
ISO-9000 family of standards

To content:

The ISO 9000 family, especially the standards intended for use in contractual (contract) cases for assessment or certification (ISO 9001, ISO 9002 and ISO 9003), operates worldwide in many industries. However, the globalization of world economic ties urgently requires the compatibility of national standards. If the ISO 9000 series is only the basis for creating local standards extracted from ISO, but differing from them in content, then in the future it will become a limitation of the world standardization process due to the growth in the number of incompatible standards and incompatible requirements.

The correspondence of national quality standards, which correspond to the standards of the ISO 9000 family, on different continents and different countries.

ISO 9000 standards contain minimum requirements that must be met by the organization of work to ensure quality assurance regardless of which products the enterprise produces or what services it provides.

If the quality management system within which management processes are implemented in this organization meets the requirements of the ISO standard, then consumers perceive this as a convincing proof of the firm's ability to ensure the production of products, works or services of the required level of quality.

A distinctive feature of international standards ISO 9000 is that they establish the degree of responsibility of the organization's management for quality. The company management is responsible for the development of quality policy, for the creation, implementation and operation of the quality

management system, which should be clearly defined and documented. The responsibilities of the management include the selection of specialists and the allocation of the necessary resources for production, monitoring and testing equipment, as well as for computer software. The management must establish the required level of competence and monitor the timeliness of staff development. Also, the management of the organization is responsible for determining the goals that predetermine decisions on the production of new goods or the provision of new services to consumers. You launch new products and provide new types of services associated with the preparation of new quality programs, for which the management of the organization is also responsible.

Modern quality management system is based on standardization - activities to establish legally binding

norms, rules and characteristics, issued by regulatory documents.

The basic requirements for the quality of products (services) are established by normative and technical documents, called standards. Quality management of products (services) is carried out on the basis of international, state, industry standards and enterprise standards.

In the field of international standardization, a large number of organizations operate, among which the most representative are the International Organization for Standardization (ISO), the International Electro technical Commission (IEC).

International standards serve as a basis for expanding international trade, promote the acceleration of scientific and technological progress.

The ISO-9000 series of standards, summarizing the experience of many national quality management

organizations, is currently being considered as the basis for ensuring the stability of the quality of products of any enterprise.

GLOSSORY

Metrology - the science of measurement, methods and tools to ensure their unity and ways to achieve the required accuracy.

Traceability - a condition of measurements at which their results are expressed as permitted to be used in the legislation of the unit value, and the measurement accuracy rates do not exceed the set limits.

Measurement - set of operations to determine the ratio of one (measurable) physical quantities to another uniform value, accepted by all participants in the unit stored in the hardware (measuring tool).

Legal Metrology - Metrology section, the subject of which is the establishment of mandatory technical and legal requirements for the use of units of physical quantities, measurement standards, measurement methods and tools aimed at ensuring the

unity and the need for accurate measurements in the public interest.

Theoretical metrology - Metrology section, the subject of which is the development of fundamentals of metrology.

Practical (applied) metrology - Metrology section, the subject of which is the practical application of the theoretical development of metrology and legal metrology regulations.

Derived unit of physical units system-Units derived physical quantity measuring system formed in accordance with the equation linking it with the basic units or basic and already certain derivatives.

System unit of physical quantity-The unit of the physical quantity, a member of the adopted system of units.

Single measurement-Measurement performed once.

Multiple measurement-Measurement of the physical quantity of the same size, the result of which is obtained from several successive measurements, i.e. consisting of a series of single measurements.

Static measurement-The measurement of the physical quantity to be taken in accordance with a specific measuring task for its continued during the measurement time.

Dynamic measurement-Measurement of changing the size of the physical quantity.

Absolute measurement-Measurement is based on direct measurements of one or more key variables and (or) use of physical constants.

The relative measurement-Measuring the value to the value of the same name, playing the role of the unit, or the measurement of the amount of change in relation to the value of the same name, is taken as the original.

Direct measurement-Measurement at which the desired value of the physical quantity obtained directly.

Indirect measurement-Determination of the desired value of the physical quantity on the basis of the results of direct measurements of other physical variables that are functionally related to the desired value.

Aggregate Measurement-Conducted simultaneously measure multiple quantities of the same name, in which the values of the unknown is determined by solving the system of equations obtained in the measurements of these variables in different combinations.

Joint measurements-Conducted simultaneously measuring two or more variables to determine the relationship between them.

Monitoring when measuring-Operations carried out in the measurement and aimed at promptly and correctly to produce the count

Readout of measuring instruments-Fixing the values of the quantity or the number on the displaying device of a measuring instrument at a given time.

The measuring signal-Signal comprising quantitative information about the measured physical quantity

Measuring information-Information about the values of physical quantities.

Measuring accessories-Auxiliary means serving to provide the necessary conditions for the measurement with the required accuracy.

Measuring circuit-The set of elements of measuring instruments, forming a continuous path of the measurement signal of one physical quantity from input to output.

Measuring device-Part of the measuring device (system or systems) associated with the measurement signal and having an isolated structure and function.

Indicator-Technical means or substance intended to establish the presence of any physical quantity or excess of the level of its threshold.

The sensor element of a measuring instrument-Part of the transmitter in the measuring circuit, perceiving the input measurement signal.

The measuring mechanism measuring instruments-The set of elements of a measuring instrument that provides the necessary movement of the pointer.

Indicating device of a measuring instrument-The set of elements of a measuring instrument that provides a visual perception of the values of the measured value or related quantities.

Index measuring instruments-Part of the indicating device, whose position relative to the scale marks determine the indications of measuring instruments.

The recording device of a measuring instrument-The set of elements of a measuring instrument, which record the value of the product or its associated value.

Scale measuring instruments-Often shows a measuring instrument device, which is an ordered series of marks with the associated numbering.

Marking scale-The sign on the scale measuring instruments (dash, tooth, point, etc..), Corresponding to a certain value of a physical quantity.

MAIN LITERATURE

1. Toru Yoshizav, Handbook of optical metrology, 2008.

2. A.E.Fridman,Quality of Measurements.A Metrological Reference, 2012.

3. Дворин В.М., Абдуазизов А.А. Метрология стандартизация и управление качеством. Учебное пособие, Ташкент, 2005.

4. Клевлеев В.М. Метрология, стандартизация и сертификация. Учебник. Москва, ИМПРАМ., 2004, 422 стр.

5. Сергеев А.Г. Основы метрологии, стандартизации и сертификации. Учебник, Москва, ЛОГОС, 2001,398 стр.

6. Исаев Р.И., Каримова У.Н. Метрология, стандартлаштириш ва сертификатлаштириш. Дарслик, Т: Фан ва технология, 2011, 496б.

7. Isaev R.I., Karimova U.N. Metrologiya, standartlashtirish va sertifikatlashtirish. Darslik -T: «Aloqachi», 2017, 612 bet.

Internet sites:

1. www.lex.uz -O‘zRAdliyavazirligisayti.
2. www.ziyonet.uz –O‘zR Oliy vao‘rtamaxsus ta’limvazirligisayti.
3. www.bilim.uz - O‘zR Oliy va o‘rtamaxsus ta’limvazirligi sayti.
4. www.unicon.uz
5. www.metrolog.ru
6. www.metrology.light.com