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Abstract: The article analyzes the metrological certification and test conditions for verification equipment. The main tasks of metrological certification, test conditions, accuracy characteristics of verification equipment, primary, repeated and periodic, expert and inspection certification of verification equipment are considered in the article. Besides, the major tasks of the testing equipment certification are considered as well. They are: establishing the current testing equipment eligibility in accordance with its purpose, establishing the actual reproducibility values of test conditions implemented by testing equipment and assessing the technical characteristics compliance of testing equipment with the safety, hygienic and other special requirements.

Key words: metrological certification, testing, certification, verification equipment, measuring instruments, metrological characteristics, conformity assessment.

Effective cooperation with other countries, joint development of scientific and technical programs, further development of trade relations require growing mutual trust in measurement information, etc. The development of a unified approach to measurements guarantees mutual understanding, the possibility for unification and standardization of methods and measuring instruments, mutual recognition of the measurement results and product testing in accordance with the international system of commodity exchange. The Law of the Republic of Uzbekistan "On Metrology" has created the necessary legal basis for introducing significant innovations in the metrological service organization in the Republic of Uzbekistan [1].

Metrological certification of measuring instruments - is the recognition of a measuring instrument (MI) legalized for use.
The main tasks pursued in the framework of such certification include:

1. determination of metrological characteristics of measuring instruments and establishment of their compliance / non-compliance with regulatory requirements;
2. establishment of those metrological characteristics (MH), which are subject to control in the process of verification of this MI [2,3].

The main purpose of qualification of test equipment - is to confirm that the test conditions can be reproduced within the permissible deviations and to establish the suitability of this equipment for its intended use [4].
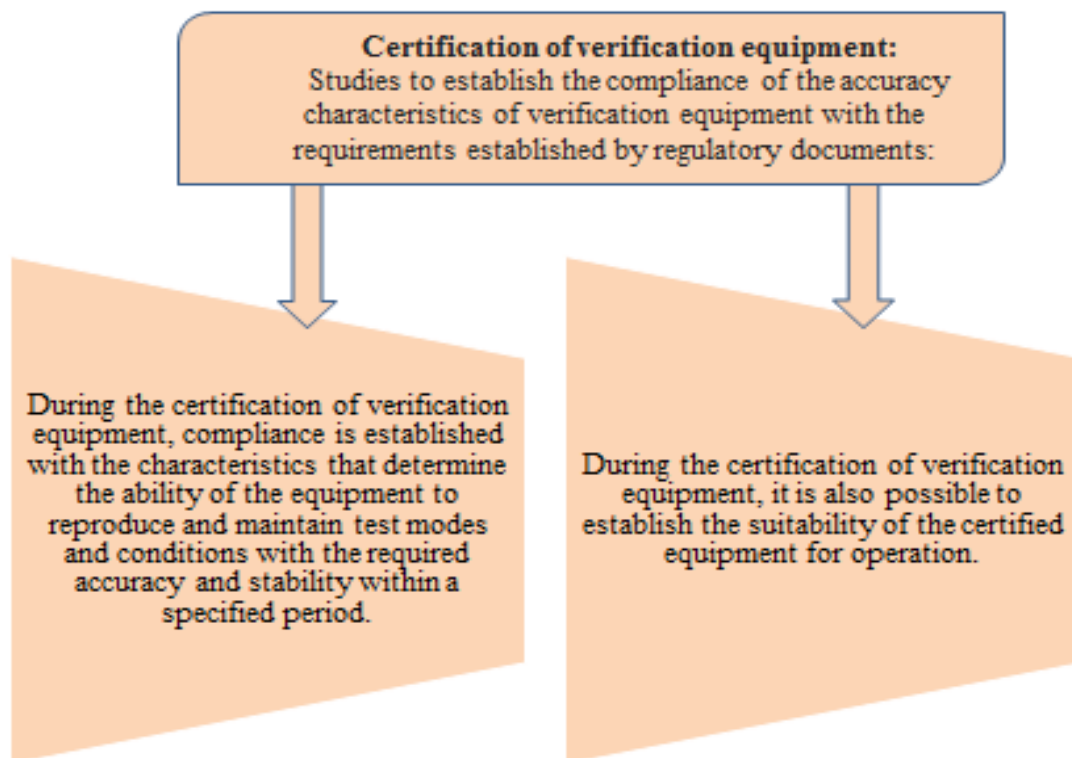
Certification of verification equipment:
Studies to establish the compliance of the accuracy characteristics of verification equipment with the requirements established by regulatory documents:

During the certification of verification equipment, compliance is established with the characteristics that determine the ability of the equipment to reproduce and maintain test modes and conditions with the required accuracy and stability within a specified period.

During the certification of verification equipment, it is also possible to establish the suitability of the certified equipment for operation.

Fig. 1. Verification equipment certification

Test conditions: A set of influencing factors and (or) modes of operation of an object during testing.

Verification method - a document containing a set of specifically described operations, the implementation of which allows you to confirm the compliance of a measuring instrument with metrological requirements [5-7].

Accuracy characteristics of verification equipment: reproducibility characteristics of test conditions. Reproducibility of test conditions is characterized by standard root-mean-square deviations of measurements of standardized parameters of verification equipment or permissible discrepancies between the results of measurements of these parameters.

Initial certification of verification equipment: Certification carried out after installation of verification equipment and (or) when it is put into operation, as well as after its repair or modernization [8-11].

Re-qualification of verification equipment: Any qualification carried out after the initial qualification. Distinguish between periodic, inspection and expert re-certification.

Periodic certification of verification equipment: Certification carried out at specified intervals.   The nomenclature of the verified characteristics of the verification equipment

and the volume of operations during its periodic certification are established during the initial certification of the equipment, based on the standardized technical characteristics of the equipment and the parameters of specific products determined during its measurements. Periodic certification of verification equipment, regardless of its scope, is organized by the metrological services of legal entities using verification equipment.

Inspection certification of calibration equipment: is carried out, if necessary, by the bodies of inspection control and supervision over the activities of the testing organization using such equipment [9-12].

The scope and terms of performance of inspection certifications are determined by the inspection control body on the basis of the norms established by the Uzstandart Agency.

Certification of verification equipment is carried out in order to confirm the possibility of reproducing test conditions within the limits of permissible deviations of the technical characteristics specified in the documents for it, and to establish the suitability of verification equipment for use in accordance with its purpose [13].

Expert certification of verification equipment - is carried out when disputable questions arise regarding the values of assessments of the technical characteristics of verification equipment or assessment of the suitability of such equipment for use.

Fig. 2 Expert approval of verification equipment

The main tasks of certification of verification equipment are:
1. Establishment of the competence to use the verification equipment in accordance with its purpose;
2. Establishment of the actual values of the reproducibility of the test conditions implemented by the test equipment;

3. Establishment of compliance of the accuracy characteristics of verification equipment with the requirements of regulatory documents for this equipment or test methods;

4. Assessment of the compliance of the technical characteristics of the verification equipment with safety, hygiene and other special requirements [14].
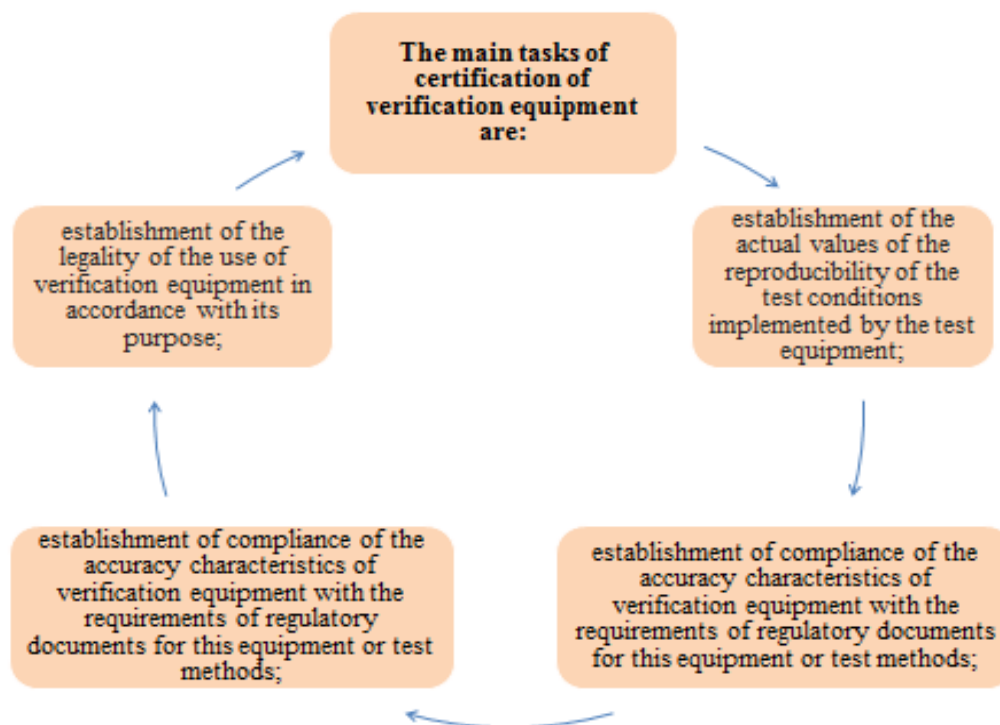
Fig. 3. The main tasks of certification of verification equipment

All verification equipment is subject to certification, regardless of its complexity and scope.

The assignment of a technical device to verification equipment is carried out in accordance with the purpose of the device.

One and the same technical device can be attributed to measuring instruments, calibration or auxiliary equipment.

Verification equipment is subject to initial and subsequent certification. The primary certification of the verification equipment is carried out during its commissioning and preparation for operation after installation.

Verification equipment that has passed the primary certification is subject to periodic, and, if necessary, inspection or expert certification [15-17].

The time interval between the periodic certification of the verification equipment is set in the operating documents or during its primary certification:

1. The time interval between the periodic certification can be established based on the results of monitoring the state of the verification equipment during its operation.

2. For different parts of the verification equipment, the time interval between the periodic certification can be different.

After repair or modernization of verification equipment, work with the foundation on which it is installed, movement of stationary verification equipment and other actions that can cause a change in the characteristics of reproduction of test conditions, verification equipment is subject to primary certification.

For certification of verification equipment used in the field of state metrological control and supervision, measuring instruments of an approved type in accordance with O'z DSt 8.009 or certified in accordance with O'z DSt 8.011 and verified in accordance with O'z DSt 8.002 must be used, 8.003, reference materials corresponding to O'z DSt 8.004, and measurement procedures corresponding to O'z DSt 8.016.

For certification of calibration equipment used outside the scope of state metrological control and supervision, calibrated measuring instruments can be used.

If the design features of the verification equipment do not allow removing the built-in measuring instrument for verification (calibration), then the developer of such equipment should provide for the possibility of its verification (calibration) during operation without dismantling, for example, using portable verification (calibration) means.

Certification of verification equipment, depending on the scope of its application, is carried out by bodies of the state metrological service, metrological services of legal entities or legal entities accredited for the technical competence of certification of verification equipment. Certification of verification equipment is carried out in order to confirm the possibility of reproducing test conditions within the limits of permissible deviations of the technical characteristics specified in the documents for it, and to establish the suitability of verification equipment for use in accordance with its purpose [18-20].

Recognition of test results and type approval, certification of measuring instruments is carried out in the manner prescribed by agreements or normative documents developed in their development. The procedure for assessing technical competence and accreditation for the certification of verification equipment is established by the Agency «Uzstandart».

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SYNERGETIC FUZZY CONTROL OF MULTIDIMENSIONAL NONLINEAR OBJECTS WITH DISCRETE TIME

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Abstract: In this article, the fuzzy synergistic controller is developed for a class of indefinite nonlinear dynamic systems a discrete-time. Synergetic control scheme is proposed to deal with the problem of controlling non-linear systems. Non-linear systems with configurations and parameters that change over time require a fully non-linear model and discrete-time adaptive control scheme for a practical operating environment. Control laws were designed by the method of analytical design of aggregated regulators (ADAR).

Fuzzy logic systems are used to estimate the unknown nonlinear behaviours of the system, and a novel adaptive fuzzy controller is designed via synergetic control theory. It's formed of a fuzzy system to approximate the unknown system dynamics with an adaptive synergetic control to archive the desired performances. A simulation results of a real world example are indicated, to show the effectiveness of the proposed method.

Keywords: fuzzy synergetic controller, fuzzy logic system, discrete-time nonlinear object, synergetic control theory, ADAR method.

Introduction

In recent decades, significant efforts have been directed to improving nonlinear systems, their stability and nonlinear phenomena. The advent of powerful computers has revolutionized our understanding of nonlinear systems. Indeed, many of the most important analytical methods today drew inspiration from early computer studies of nonlinear systems. The indicated super systems are nonlinear, multidimensional, and multiply connected, in which complex transient processes occur and critical and chaotic regimes arise [2]. The control problems of such dynamic systems are very relevant, difficult and practically inaccessible to the existing control theory [1]. Most systems are non-linear with characteristics that change over time because, in a dynamic operating model, we cannot guarantee the high performance of controllers of non-