CURRENT STATE OF STANDARDIZATION IN THE FIELD OF METROLOGICAL SUPPORT OF INFORMATION AND MEASUREMENT SYSTEMS

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Abstract:
The article provides an in-depth analysis of the requirements of existing national and international standards for the metrological support of information and measurement systems. In particular, the results of a comparative analysis between GOST R 8.596-2002 and the first draft of its initial edition are presented. These standards encompass the fundamental rules and recommendations aimed at ensuring measurement accuracy, reliability, and metrological consistency within the system.

Keywords: metrological support, information and measurement systems, measurement channels.

Introduction:

At the present stage of industrial development, the volume and complexity of measurement and control processes are constantly increasing. In many cases, the objects of research are characterized by a large number of parameters, and it is necessary to perform complex measurements and calculations to obtain the values of the measured values. These tasks are successfully solved with the help of information and measurement systems (IMS), which are widely used. It should be noted that the basic concept is "measurement system" (MS).
All other concepts (information, diagnostic, etc.) are related to the individual characteristics of the system and its purpose. In general, metrological assurance (MA) for measurements is understood as a systematized, strictly defined set of tools and methods aimed at obtaining measurement information that has the properties necessary to develop solutions for bringing the control object to the target state. The presence of a number of specific features of IMS determines the specifics of their metrological assurance.

It is difficult, and often impossible, to distinguish between measuring and non-measuring information functions implemented by the system within the framework of an IMS. This leads to the need to expand the boundaries of the concept of "MA of IMS". So, the MA of IMS is a system of scientific, technical, legal and organizational activities aimed at achieving the unity of information transformation processes carried out in the IMS, and the required accuracy of the results of its functioning. At the moment, the MA of IMS is regulated by GOST R 8.596-2002 "(State System of Measurement (SSM). Metrological assurance of measurement systems. Basic provisions" and other regulatory documents. In October 2019, the text of the first edition of GOST R 8.596 was published. The draft standard reflects the following changes:

1. MS classification into batch and single production systems has been changed;
2. The definitions have been corrected: the emphasis is shifted from the measurement system to the measurement channel.

- item 3.1 measurement channel (MC): a set of technical means, including measuring instruments, that performs a complete function from the perception of the measured value to the receipt of the measurement result expressed by a number or corresponding code, or to the receipt of an analog signal, one of the parameters of which is a function of the measured value;
- item 3.3 measurement system: a set of measurement channels, computing and auxiliary components that function as a single unit designed for...;

3. An attempt is made to clarify the procedure and rules for testing software development MS software, based on the degree of its autonomy in relation to the MS and the object of operation;
4. Sections 8 "Testing for type approval" and 9 "Verification and calibration" have been updated and revised in accordance with the relevant legislation and regulations;
5. Section 10 "Operation" was introduced, which tried to reflect the possibility of changes in the MS and corelated documentation, including the type description within the framework established by current legislation.
6. Metrological support of MC and MS began to include the following types of activities:

– normalization and calculation of metrological characteristics of MC;
– metrological examination of technical documentation for MC (MS);
– MS (MC) tests for type approval purposes;
– verification and (or) calibration of MC (MS);
– metrological supervision of compliance with the requirements for ensuring the uniformity of measurements, including in the field of state regulation at all stages of the MC and MS life cycle.

At the same time, we received comments, feedback and suggestions to the text of the first edition of the draft national standard. For example, who should (and should) normalize the metrological characteristics of measurement components of an unapproved type for a complete

method of testing and checking the metrological characteristics of MC (clause 3.2.1); explanations (definitions) are required, what is meant by the "type" of MS (MC) (clause 6.1), etc. In order to ensure the quality of various types of measuring equipment and measurement processes, the international standard ISO 10012:2003 "Measurement management systems. Requirements for measurement processes and measuring equipment".

ISO 10012 is used by organizations whose activities involve measurement, and describes the Measurement management system (MMS) as part of the quality management system used by it. MMS composition: 1) metrological confirmation of measuring equipment; 2) management of dedicated measurement processes; 3) auxiliary processes. All measuring equipment used under the ISO 10012 system must be validated. Metrological confirmation of suitability includes calibration, verification and verification of measuring equipment. Measurement processes that are part of the MMS must be planned, validated, implemented, documented, and managed. In turn, measurement processes must be managed in accordance with documented procedures.

Each measurement process must contain:

1. Identification of all associated equipment;
2. Software;
3. Terms of use;
4. Measurement procedures;

Factors that affect the reliability of the final measurement result. The ISO 5725 standards also make significant adjustments to the procedures for ensuring the accuracy (quality) of measurements (tests) ISO.

The main directions of implementation of ISO 5725 standards in the practice of metrological support are:

– direct application of international regulations for quality assessment of measurement (test) methods);
– resolution of disputes between the supplier and the recipient of products;
– intra-laboratory quality control (accuracy) of measurement (test) results;
– determination of the laboratory's systematic error and control of its stability under conditions of intermediate precision;
– participation of laboratories in interlaboratory experiments to assess the accuracy (correctness and precision) of measurement methods in their development;
– development of measurement methods based on ISO 5725. Thus, pacthe requirements of existing foreign standards in the field of metrological support of measurements and measuring equipment, including information and measurement systems, were considered. Comparative analysis of GOST R 8.596-2002 "SSM. Metrological support of measuring

systems. Basic provisions" and its draft showed that there are some comments that need to be discussed. Received feedback and suggestions are subject to processing. The second edition of the draft standard is scheduled to be published by the end of January 2020.

Conclusion

The ongoing evolution in the field of metrological support highlights the growing need for robust standards and systems to ensure the accuracy and reliability of measurements, particularly within information and measurement systems (IMS). Comparative analyses of standards such as GOST R 8.596-2002 and its draft updates underscore the necessity to adapt to modern technological requirements, including refined classifications, definitions, and procedural updates. These advancements aim to harmonize metrological processes with international standards like ISO 10012:2003 and ISO 5725, which emphasize structured measurement management systems, the validation of equipment, and the management of measurement processes. The integration of metrological support within quality management frameworks ensures not only measurement consistency but also enhances decision-making processes across industries. The feedback and suggestions received during the standard's development process signify the collaborative efforts required to refine these standards, aligning them with both technical advancements and practical needs. The forthcoming iterations of GOST R 8.596 are expected to address existing gaps and provide clearer definitions and methodologies, reinforcing the importance of metrological assurance as a cornerstone of industrial and scientific progress. This comprehensive approach ensures that metrological support remains a critical enabler of accuracy, reliability, and international compliance.

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