Legislative trends in the field of metrological activity and ensuring the uniformity of measurements

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Abstract. The paper analyzes the metrological support of innovative technologies and considers innovations. A number of changes will mainly enter into force in September 2020. In addition, changes are highlighted in which the effective date is only two years after the publication of the Federal Law of December 27, 2019 No. 496. The considered changes affect the entire spectrum of measurements, which is important for the entire world metrological and industrial community, as modern metrology must meet the requirements of digitalization of production, the development of cyberphysical systems, the Internet.

Legal metrology is an institution, which is a stable group of interrelated legal norms regulating public relations to ensure the uniformity of measurements. Not all lawyers will agree to give the status of a legal institution to this group of norms, which are mainly attributed by experts in the field of practical metrology to the legal institute.

In the modern economy, innovation plays a huge role, so it is not surprising that a number of standardization institutions are developing appropriate standards. In a market economy, the innovation policy of enterprises becomes a decisive competitive advantage. Innovation is becoming one of the most important factors for the sustainable operation of enterprises, which ensure economic growth and competitiveness. Only enterprises that inextricably link innovation with the production of goods, which is a single process become successful.

Law institutions can be sectoral and intersectoral, including legal norms used in various branches of law. Legal metrology should be characterized as an interdisciplinary institute of law, that is, a set of norms of various branches of law governing. It must be recognized that legal metrology as an institution of law was objectively shaped by the efforts of metrologists. Moreover, the specifics of the institute are associated with the influence of technical standards, and specialists often require special knowledge in the fields of physics, mathematics, cybernetics, medicine and other sciences. This makes scientific research relevant; it has long been known that interdisciplinary research is one of the most promising. At the same time, this area of legal science is still little studied. The encouragement of research in legal metrology should be welcomed.

It is important to indicate that institute is dominated by the norms of administrative law: issues of administrative supervision, etc. As part of legal metrology institute study, the norms of the Constitution, civil and even international law, special legislation governing the issues of ensuring product quality are analyzed.
The rules of legal metrology are mainly technical and legal, since they regulate a person’s attitude to production facilities, equipment. They received their formal legal consolidation in the Federal Law. Local regulatory acts adopted by enterprises, organizations, institutions, the norms of which are mandatory for these enterprises, should also be mentioned. As for the system of standards, recommendations and other non-normative documents that do not contain mandatory technical regulation requirements, they cannot be classified as legal metrology as a legal institution, although some of them are mentioned and studied in the framework of legal metrology. This does not detract from their significance; moreover, it should be noted the strengthening of trends in the inclusion of technical standards in the sphere of legal regulation of metrological activity. The latter requires the joint efforts of the expert community, where, along with lawyers, specialists from various fields of science are involved. Combining their efforts requires discussion of problematic issues at various expert sites, scientific forms. The foreign experience of legislative regulation of metrological activity is interesting, where there are interesting solutions suitable for implementation in the Russian legal system.

The provision of innovative technologies actualizes the appeal to the legal regulation of metrological activity. Based on international standards, the norms of Russian legislation regulating the uniformity of measurements undergo transformations caused by changing realities, as well as identified shortcomings in the practical sphere of application of legal norms.

In 1993, the law No. 4871-1 was adopted for the first time, which defined the basic concepts based on the official terminology of the International Organization of Legal Metrology (OILM). The aforementioned law was developed in the years from 1985 to 1993 on the basis of a project created in the early 1980s, it has come a difficult path of consensus and compromise. However, the 1993 law introduced a number of innovations that significantly changed the existing system of ensuring the uniformity of measurements (the system of metrological support) that existed at that time.

So, in the 1993 law there was no concept of “departmental verification of measuring instruments”, which in previous years was widely used and was provided with a regulatory framework.

The 1993 law rigidly divided the scope of metrological regulation into two parts: one that is subject to state metrological control and supervision, and one that is not subject to it. For measuring instruments not subject to state control and supervision, a calibration procedure was introduced instead of verification.

Of smutch, in the action of metrological stir in the congenital entire ground, this ordinance betrayed repugnance, defect and shortcomings. It was authorized during the change to market-place copies and, fundamentally, amalgamate the formerly enduring minute. In our conjecture, it would be appropriate enacting the joint genius of specializes: metrologists and legal practicing to distinguish the defect of the full of years ordinance and cosmetic the craved changes to it. However, a substitute, a slug advanced fed ordinance was existence progressed, which, regrettably, rattling opposed the enduring base of metrology, the experience of metrological facilitate and the constituted principles of measure similarity, not to advert the repugnance with a figure of general chronicle.

As a aftereffect, the ordinance on arranging the uniformity of measures of April 27, 1993 disoriented its aggression. From the substantiating of January 2009, the Federal Law on arranging the uniformity of measures of June 26, 2008 No 102 entered into force.

Therefore, the desire of the state to solve the problems of metrology at the legislative level (including introducing new innovations) and the legal support of metrological activity, most metrologists evaluate very positively.

Legislation is systematically subjected to more or less changes. In this regard, it is important to indicate that the Federal Law No 102 during its validity has been amended 7 times. Now it is already known that for the eighth time this law is awaiting changes that will begin to be observed from September 24, 2020.

It should be remembered that the Russian measurement system takes into account international standards, primarily in the framework of the customs union. Regardless of the technical aspects, WTO
membership requires recognition of compliance procedures. The uniformity of measurements helps to ensure the widest possible area of free trade [1].

The unity of the measurement system guarantees economic security, contributes to the development of the economy [2].

The legal basis of the unity of the measurement system includes the norms of Constitution [3]. The problem has an international character [4].

The proposed changes are aimed at transferring priorities to the electronic registration of verification results and approval of types of measuring instruments. It is electronic registration that becomes the only legally fixed result of work. Metrological work will be valid only when transmitting information to the Federal Information Fund to ensure the uniformity of measurements.

In this regard, it is important to note that the analyzed law is perhaps one of the first legal acts creating the legal basis of metrology in the framework of the national program “Digital Economy of the Russian Federation”.

State metrological supervision is carried out by authorized federal executive institutions (state supervision institutions) in accordance with their competence:

- institutions of the Federal Agency or specifically;
- territorial institutions - interregional territorial administrations of the Federal Agency, which are managed by the Department of Territorial Authorities and Regional Programs of Rosstandart.

So, for enterprises and citizens, changes mean that the received verification certificate does not comply with the law, if the verification organization did not timely transfer the information to the Federal Information Fund. The certificate is issued only at the request of the owner of the measuring instrument. However, in accordance with new amendments to the law on ensuring the uniformity of measurements, now it will be an optional document.

Consequently, paper certificates will remain possible, but optional. Paper certificates will be issued only at the request of the customer of such metrological work and be of only an additional informational nature. The effect of the proposed innovation will be felt by all citizens of our country.

Based on the foregoing, for the implementation of electronic registration of information on the results of verification of measuring instruments, an unambiguous identification of each instance of the measuring instrument is necessary. Moreover, Article 2 of the Law provides that the results of verification of measuring instruments, certified in accordance with applicable regulatory legal acts until the day this law comes into force, are valid until the end of the interval between calibrations of measuring instruments, that is, the measuring instrument will need subsequent verification in case of expiration of the verification interval, and already this verification of the measuring instrument will be carried out in the framework of the new procedure provided for by amendments to the said law.

Section 3 of the law establishes the dates for its entry into force: 1) for all the main provisions - after two hundred and seventy days after its official publication and the date of entry into force is September 24, 2020; 2) a separate period (within two years after official publication) for paragraph 1 of Article 1 of the law, after which it is provided that all measuring instruments must have an unambiguous identification of each copy.

Newly introduced changes require a reasonable need to amend such by-laws, such as:

- Decree of June 5, 2008 No 438.
- Decree of June 17, 2004 No 294.

Thus, the new law provides for the following amendments to federal law 102 dated June 28, 2008: cancellation of accreditation for the right to carry out work on metrological examination and certification of measurement methods; the right to perform mandatory metrological examination is reserved only for metrological institutes; rename type approval certificates to type approval certificates in order to harmonize Russian and foreign legislation; cancellation of the validity period of type approval of
measuring instruments, including extending the validity of certificates (certificates) of type approval to measuring instruments issued prior to their approval; legally authorize the recognition of calibration results of measuring instruments performed by accredited foreign laboratories with which the national accreditation body has an agreement on mutual recognition.

Innovative technologies in physics, medicine, engineering, economics and other areas today require common standards for change. In the context of the metrological support of innovative technologies, it can be argued that the changes under consideration will positively affect the legal regulation of information and measurement technologies, remove a number of bureaucratic obstacles, and help bring Russian and foreign standards of change closer together. The above, in turn, will facilitate the integration of international standards of changes in the Russian legal system and practice. One can also expect stimulation of the influx of innovative technologies in various fields. The integration of measurement systems, common standards will allow the development of high-tech spheres of instrumentation, medicine, mechanical engineering.

It should be emphasized that the changes under consideration affect the entire spectrum of measurements. Due to the specifics of modern society, this is extremely important for the entire world metrological and industrial community. Modern metrology must meet the requirements of cipherization of production, the development of cyberphysical systems, the Internet. Metrological activity requires the involvement of specialists from various fields [5], this is medicine [6], nanotechnology [7] and much more. The requirements for ensuring uniformity of measurements are increasing. Based on the above analysis, it can be argued that the proposed changes will simplify the work of various subjects of metrological activity, and also help protect the interests of consumers.

The legal aspects of legal metrology are also important in the context of the activities of the International Organization of Legal Metrology (OIML). This organization has long consistently dealt with issues of measurement unity, corresponding to legal regulation. The recommendations developed by the bureau should be taken into account when implementing the above-mentioned changes. An example is the use of devices to detect alcohol vapours in exhaled air. Throughout its history, OIML has consistently sought the adoption by countries at the national level of standards for legal metrology developed within the framework of the Model Draft Law on Metrology. In turn, WTO World Trade Organization has consistently defended the importance of metrological infrastructure development. Recognizing the importance of OIML’s work, WTO included it among observers.

An important milestone in the development of legal metrology was the signing in 1999 of agreements recognizing measurements made by national institutions. At the same time, the transfer of metrological functions to commercial organizations carries a number of threats.

But most of the changes will affect the space of the CIS countries. Here it is worth remembering that the Interstate Council for Standardization, Metrology and Certification is the body responsible for the policy on standardization, metrology and certification. There is a scientific and technical commission on metrology. So far, there is no even a new version of the law on the Council’s website. At the same time, huge work has been carried out to improve the system of metrological support of measurements in a variety of spheres affecting the use of innovative technologies. The reform of the national legal system analysed in this article is also part of this activity.

In the near future it is expected to react to the forthcoming changes within the framework of the activities of international and regional organizations on metrology, certification and accreditation (COOMET, ISO, CEN).

It is worth remembering the remaining problems in the legal regulation of metrological activity, including different interpretation of terms (error, calibration, measuring instrument and others) from Russian legislation, their non-compliance with a number of international standards. They are not completely solved after the changes analyzed. These problems require discussion in an expert environment with the involvement of both legal specialists and specialists from other fields of knowledge (physics, chemistry, medicine, etc.).

Often differences are related to the specifics of translation, different perception of metrological terms. This requires consideration in the development of national laws of international terminology
dictionaries. Such are developed by specialists from various spheres, including metrology. An example is the International Dictionary of Terms on Legal Metrology (VIML).

The application of uniform international standards and their implementation in national legislation will contribute to security. It is obvious that in medicine, industry, instrument-making and other knowledge-intensive areas involving the active introduction of innovative technologies, decision-making is based on measurements that, in turn, must meet all standards and be unified.

One of the priority areas of cooperation in the field of legislative metrology today becomes the practical application of legislative metrology in industry, medicine, instrument-making and other spheres. These include design strength calculations, device manufacturing processes, diagnostics, and more.

This is an example of improving the means of measuring light. Today, the quality of lighting fixtures is growing, and therefore the corresponding measurements are becoming more relevant. The quality of the product, its cost, will depend on the measurements. Namely, in this sphere a lot of nuances that need to be taken into account. For example, the technical requirements for photometric balls and much more may not be met. As a result, it is possible to note that it is necessary to face different levels of equipment of testing centers involved in certification processes.

Problems remain in controlling metrological activities outside the scope of State control. In this regard, accreditation of laboratories and organizations carrying out metrological activities becomes relevant.

In general, the adopted measurements establish a national metrological infrastructure, including legal acts in the field of metrological activity, a coordinating body, institutions on metrological policy, services of industry in the field of metrology. All this, taken together, serves the purpose of ensuring the unity of measurements.

The complex nature of the institution before us requires the continued attention of researchers. Further regulatory developments at both the international and national levels can be predicted.

It is necessary to remember the specificity of the norms applied in legal metrology, they are both legal and technical, which requires the involvement of specialists of their various spheres. Unfortunately, in modern Russia, efforts to train personnel in the field of legal regulation of metrological activities are not sufficient. Training of teachers, development and implementation of master’s programs is necessary. The authors have practical experience of carrying out such programs, in particular this course of legal metrology held in St. Petersburg (Irina Timothy, SUAI).

It seems promising to carry out joint research with the world’s leading scientific centers, introduce foreign experience. This requires the holding of conferences and seminars. At the same time, the level of integration of legal professionals into the discussion of problems of legislative regulation of measuring activities does not seem to be sufficient.

It is also necessary to develop an interdisciplinary approach in research, to involve specialists in research teams from technical sciences, physics, chemistry. As is known, new directions in science arise precisely at the junction of various spheres. In today’s world, taking into account the rapid development of a number of areas in which the problem of measurements is relevant, legislative metrology should respond to emerging challenges. Here the situation when regulatory regulation is late, does not take into account all nuances related to measurement is not permissible.

During the preparation of this article, numerous problems were identified on the basis of a survey of specialists from other, non-legal fields. The expert community should lobby more actively for the interests related to the improvement of the legal regulation of metrological activities.

Today, in the legal space of the countries that were formerly part of the USSR, including Russia, there is a tendency to commercialize measuring activities, to translate expert assessment into commercial organizations. With certain poles of such trends, a number of possible shortcomings should be pointed out, including bias against inspections, lack of technical and organizational resources, and much more.

It is obvious that such organizations during their certification should, and will certainly be subject to, sufficiently high requirements in terms of measurement standards, availability of technical equipment, qualification of specialists, experience in the relevant field of activity.
The authors see an exit in a compromise approach, which should include appropriate control by the State. On the example of Russia, such state control can include both federal and regional levels.

This will allow, on the one hand, to monitor the quality of metrological activities, compliance with world and national standards, on the other hand, to give the investigated sphere more mobility, stimulate business development, reduce the risk of excessive bureaucracy of measurement processes.

In this regard, some of the innovations related to the change in the legal regulation of metrological activities and the above are welcome. Digitalization of a number of processes is particularly successful. This reflects a number of trends of global relevance in recent years and are reflected in the legal regulation of individual countries, including Russia.

A positive point is also the understanding of the essence of metrological activity, which is evident in the step-by-step introduction of new rules into force. Logically, preparations for future changes will require technical changes, which will lead to a deadline for the entry into force of new provisions of Russian legislation.

In the near future, these changes will lead to a change in a number of legal acts, which will require attention from the legal community and specialists from other spheres.

Modern physics, other sciences should respond to the innovations of the legislation, give their expert assessment, predict the possible negative consequences of the adoption of the analyzed norms.

Further carrying out researches of an economic component of metrological activity, use of new digital technologies, implementation of the state control and other and other problems is necessary. It remains to be seen that these questions will find their researchers.

The attention of international organizations should be focused on national standards. Metrology requires unified approaches, the modern degree of integration of countries in the economic, scientific and industrial spheres requires attention to national measurement systems. In recent decades, enormous work has been done to create universal international standards in the metrological sphere. Experiences have been developed by various countries that require comprehensive study and, if necessary, implementation, both within the framework of international standards and at the national level.

Experts in engineering physics, information and measurement technologies should say their word here. Their expert position can and should be reflected in existing legal acts. The processes of improvement of the latter will continue to require the attention of specialists.

References
[1] Novikov Yu N 2013 *World of measurements* 5 47-50
[2] Kuznetsova T L and Lukashova V E 2016 *Agricultural and land law* 12(144) 12-4
[3] Sharafitdinova N V and Malafeev I A 2019 *Innovative research in the modern world* pp 216-9
[4] Bublienova O V, Bublienov A E and Maksimova I N 2019 *Vestnik of PGUAS: construction, science and education* 1(8) 56-9
[5] Beyers C 2014 *Calibration methodologies and the accuracy of acoustic data* Internaloise 2014 – 43rd Int. Congress on Noise Control Engineering: Improving the World Through Noise Control
[6] Ivkiv A, Tyukhtina M and Protsenko V 2011 *Biomedicine* 2 14-9
[7] Firsov V G 2013 *Problems of the humanities and natural sciences* 8 60-4