

JOINT SCOPES ACTIVITY THE IMEKO AND INTERNATIONAL ORGANIZATIONS OF STANDARDIZATION TECHNICAL COMMITTEES IN FIELD OF METROLOGY

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Abstract – The main scopes activities of international organization for standardization in field of metrology are described. Correspondence of activity IMEKO, ISO and IEC TCs is analyzed. The main principles of harmonization of national standards with the international standards in field of metrology are defined. Possibility of interactions of IMEKO, ISO and IEC TCs are determined.

Keywords: international standard, national standard, harmonization, technical committee.

1. MAIN ACTIVITY OF INTERNATIONAL ORGANIZATIONS FOR STANDARDIZATION IN FIELD OF METROLOGY

International Organization for Standardization (ISO) is a non-governmental organization and one of the world's foremost developers of voluntary technical standards. The ISO Central Secretariat manages an international standardization system, prepares, produces and disseminates international standards and standards-related documents. These services include coordination of the standards development programme, administration of voting on draft standards, the final editing and publication of standards, and information, communication and public relations [1, 2].

Technical Management Board (TMB) is ISO body which developing standards or guides on all matters concerning the organization, coordination, strategic planning, and programming of the technical work of ISO including establishment and dissolution of technical committees (TC), particularly in field of metrology.

ISO standards are developed by TC, subcommittees (SC) or project committees comprising experts from the industrial, technical and business sectors which have asked for the standards, and which subsequently put them to use. These experts may be joined by representatives of government agencies, testing laboratories, consumer associations, non-governmental organizations and academic circles. Each TC and SC has a secretariat assigned to an ISO member national body (for example, AFNOR, DIN, ANSI etc.).

Stakeholders in international standardization comprise all those groups who have an interest in international standardization because they are affected by it and wish

therefore to contribute to the process of the development of international standards. Stakeholders participate in the technical work of ISO through national delegations appointed by the member national bodies of ISO or, if they are organized in international or broadly-based organizations, through liaison organizations.

In addition to international standards, ISO can also offer other forms of normative agreements (e. g. ISO Guide, ISO Publicly Available Specification (PAS), ISO Technical Specification (TS), ISO Technical Report (TR) for situations where speedy publication is important, has developed a schematic representation of the different types of deliverable available.

ISO engage introducing international standards for quantities and units which based in the International System of Units (SI) – ISO 80000 (14 parts). International standards of series ISO 9000 “Quality management systems”, ISO 10012 “Measurement management systems” is important for National Metrological Institute (NMI). International standards ISO 3435 “Continuous mechanical handling equipment” and ISO 5725 “Accuracy (trueness and precision) of measurement methods and results” (six part) extensively used for handling measurements result. ISO Guide 30 “Terms and definitions used in connection with reference materials” and ISO Guide 35 “Reference materials. – General and statistical principles for certification” too use for metrological practice for reference materials.

ISO collaborates with its two sector based, international partners, the International Electrotechnical Commission (IEC) and International Telecommunication Union (ITU), the United Nations Organization, other specialized organizations, agencies and commissions. Cooperative agreements are established between the ISO and IEC and certain institutions, such as International Bureau of Weights and Measures (BIPM), International Organization of Legal Metrology (OIML), International Laboratory Accreditation Cooperation (ILAC), etc., with the objective of avoiding contradictory requirements; consequently, manufacturers and users of measuring instruments, test laboratories, etc. may simultaneously apply ISO and IEC Publications and those of other institutions.

The IEC is the leading global organization that prepares and publishes international standards for all electrical,

electronic and related technologies. These serve as a basis for national standardization and as references when drafting international tenders and contracts. The IEC charter embraces all electrotechnologies including electronics, magnetics and electromagnetics, electroacoustics, multimedia, telecommunication, and energy production and distribution, as well as associated general disciplines such as terminology and symbols, electromagnetic compatibility, measurement and performance, dependability, design and development, safety and the environment [1, 3].

The TCs and SCs, and many project teams/maintenance teams carry out the standards work of the IEC. These working groups (WG) are composed of people from all around the world who are experts in electrotechnology. The great majority of them come from industry, while others from commerce, government, test laboratories, research laboratories, academia, and consumer groups also contribute to the work.

From 1993 Ukraine has become the ISO and IEC full member and participates in its TCs and SCs projects for preparation of international standards and other normative documents. ISO and IEC publications can be identified by their ISO or IEC number, through the International Classification for Standards (ICS) [4] system, or by the respective TC/SC responsible for that publication.

2. CORRESPONDENCE OF ACTIVITY OF IMEKO AND INTERNATIONAL ORGANIZATIONS FOR STANDARDIZATION TECHNICAL COMMITTEES IN FIELD OF METROLOGY

Correspondence of activity IMEKO, ISO and IEC TCs is given in Table 1 [2, 3, 5].

The ISO/TC 85 “Nuclear energy”, ISO/TC 15 “Laboratory equipment” and IEC/TC 45 “Nuclear instrumentation” are not analog in IMEKO TCs. The activity of IMEKO is basically carried out through the TCs which organize symposia, conferences, workshops, seminars on specific topics at regular intervals and publish proceedings of events, text-books, glossaries, studies, etc.

The IMEKO TC 1 “Education and Training in Measurement and Instrumentation”, TC 3 “Measurement of Force, Mass and Torque”, TC 5 “Hardness Measurement”, TC 7 “Measurement Science”, TC 11 “Metrological Infrastructures”, TC 12 “Temperature and Thermal Measurements”, TC 13 “Measurements in Biology and Medicine”, TC 15 “Experimental Mechanics”, TC 16 “Pressure and Vacuum Measurement”, TC 17 “Measurement in Robotics”, TC 19 “Environmental Measurements”, TC 20 “Measurement Techniques for the Construction Industry”, TC 23 “Metrology in Food and Nutrition” are not analog in ISO and IEC TCs.

Table 1. Correspondence of activity of IMEKO, ISO and IEC TCs

IMEKO TCs	ISO TCs	IEC TCs
TC 6 Vocabulary Committee	TC 37 Terminology and other language and content resources	TC 1 Terminology (for measuring instrument)
TC 8 Traceability in Metrology	TC 12 Quantities, units, symbols, conversion factors	TC 25 Quantities and units
TC 14 Measurement of Geometrical Quantities	TC 213 Dimensional and geometrical product specifications and verification	-
TC 9 Flow Measurement	TC 30 Measurement of fluid flow in closed conduits	-
TC 4 Measurement of Electrical Quantities	-	TC 13 Electrical energy measurement, tariff- and load control TC 29 Electroacoustics TC 38 Instrument transformers TC 85 Measuring equipment for electrical and electromagnetic quantities
TC 22 Vibration Measurement	TC 108 Mechanical vibration, shock and condition monitoring	-
TC 2 Photonics	TC 172 Optics and photonics	-
TC 10 Technical Diagnostics	-	TC 65 Industrial-process measurement, control and automation
TC 18 Measurement of Human Functions	TC 113 Hydrometry	-
TC 21 Mathematical Tools for Measurements	TC 69 Applications of statistical methods	-
TC 24 Chemical Measurements	TC 158 Analysis of gases	-
-	TC 85 Nuclear energy	TC 45 Nuclear instrumentation
-	TC 48 Laboratory equipment	TC 66 Safety of measuring, control and laboratory equipment -

3. HARMONIZATION OF NATIONAL STANDARDS WITH ISO AND IEC STANDARDS

Structure of the ISO standards which developed ISO TCs and national standards of Ukraine (DSTU ISO) in the field of metrology are given in Table 2 and Fig. 1 by next codes of ICS [4]: 01.060 “Quantities and units”; 17 “Metrology and measurement. Physical phenomena” and 71.040 “Analytical chemistry”. Total ISO standards in the field of metrology are 495.

Table 2. Structure of ISO standards which developed ISO TCs and national standards of Ukraine in fields of metrology

Name of ISO TC	Total of standards	
	ISO	DSTU ISO
TC 12 Quantities, units, symbols, conversion factors	25	1 (MOD)*
TC 30 Measurement of fluid flow in closed conduits	37	4
TC 48 Laboratory equipment	46	3
TC 69 Applications of statistical methods	23	5
TC 85 Nuclear energy	55	6
TC 108 Mechanical vibration, shock and condition monitoring	103	14
TC 113 Hydrometry	71	3
TC 158 Analysis of gases	22	7
TC 172 Optics and photonics	20	4
TC 213 Dimensional and geometrical product specifications and verification	93	14
Total:	495	154

* The DSTU ISO standards is modified concerning to ISO standards

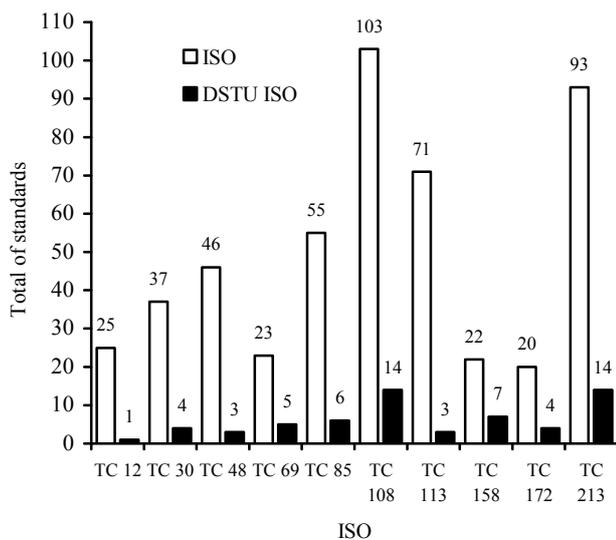


Fig. 1. Total international standards which developed ISO TCs in field of metrology

Structure of the IEC standards which developed IEC TCs and national standards of Ukraine (DSTU IEC) in the field

of metrology is given in Table 3 and Fig. 2 by next codes of ICS [4]: 01.060 “Quantities and units”; 17 “Metrology and measurement. Physical phenomena”; 25.040.040 “Industrial process measurement and control”; 71.040 “Analytical chemistry”. Total IEC standards in the field of metrology are 176.

Table 3. Structure of IEC standards which developed IEC TCs and national standards of Ukraine in fields of metrology

Name of IEC TC	Total of standards	
	IEC	DSTU IEC
TC 1 Terminology (for MI)	7	2
TC 13 Electrical energy measurement, tariff- and load control	13	1
TC 25 Quantities and units	13	-
TC 29 Electroacoustics	44	-
TC 38 Instrument transformers	7	-
TC 45 Nuclear instrumentation	30	1
TC 65 Industrial-process measurement, control and automation	6	-
TC 66 Safety of measuring, control and laboratory equipment	17	3
TC 85 Measuring equipment for electrical and electromagnetic quantities	39	13 3 (MOD)*
Total:	176	23

* The DSTU IEC standards is modified concerning to IEC standards

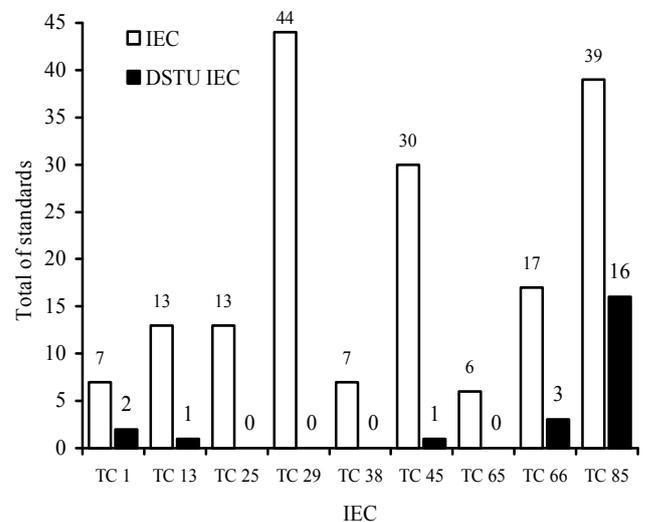


Fig. 2. Total international standards which developed IEC TCs in field of metrology

4. JOINT ISO/IEC STANDARDS AND GUIDES FOR METROLOGICAL TASKS

The ISO and IEC participate in the Joint Committee for Guides in Metrology (JCGM), and the Joint Committee on Coordination of Assistance to Developing Countries in Metrology, Accreditation and Standardization (JCDCMAS).

The JCGM has responsibility for the following two important for metrology documents: Guide to the Expression of Uncertainty in Measurement (GUM) [6]; and International Vocabulary of Metrology – Basic and General Concepts and Associated Terms (VIM) [7]. The JCGM-WG1 has recently completed its first Supplement to the GUM. The JCGM-WG2 has recently completed a revised edition of the VIM (VIM-3).

Developing and publishing joint international standards and guides are important element of activity of international organizations for standardization. International standards ISO/IEC 17025 “General requirements for the competence of testing and calibration laboratories” and international guides ISO/IEC Guide 43 “Proficiency testing by interlaboratory comparisons” (two parts), ISO/IEC Guide 2 “Standardization and related activities” are establishing requirements for quality systems, especially National Metrology Institute (NMI), and requirements for accreditation independent laboratory, especially calibration laboratories.

As shown in Table 4 the system of international standards, documents and recommendations, national standards in field of metrology includes the following main blocks of standards [8, 9]:

- units of measurement;
- measurement management systems;
- accreditation of calibration labs;
- quality management systems;
- accuracy of measurement methods and results;
- certified reference materials;
- proficiency testing by interlaboratory comparisons.

Table 4. System of general international standards, documents, recommendations and national standards of Ukraine in fields of metrology

Object of standardization	ISO, IEC	DSTU
Units of measurement	ISO 31-0...12 ISO 1000 ISO 80000	DSTU 3651.1 DSTU 3651.0 -
Measurement management systems	ISO 10012	DSTU ISO 10012
Accreditation of calibration labs	ISO/IEC 17025	DSTU ISO/IEC 17025
Quality management systems	ISO 9000 ISO 9001	DSTU ISO 9000 DSTU ISO 9001
Accuracy (trueness and precision) of measurement methods and results	ISO 5725-1...6	-
Certified reference materials	ISO Guide 30 ISO Guide 35	- DSTU-H ISO Guide 35
Proficiency testing by interlaboratory comparisons	ISO/IEC Guide 43-1...2	-

5. MODEL OF INTERACTION TECHNICAL COMMITTEES SYSTEMS OF IMEKO AND INTERNATIONAL ORGANIZATIONS FOR STANDARDIZATION IN FIELD OF METROLOGY

The TCs systems of international organization for standardization ISO and IEC in field of metrology S_{ISTTC} can be show:

$$S_{ISTTC} \equiv \langle SB_{ISOTC}, SB_{IECTC}, SR_{IMEKOTC}, R_{ISTTC}, Z_{ISTTC}, \Delta T \rangle,$$

$$SB_{ISOTC} \subseteq TC_1 \cup TC_2 \cup \dots \cup TC_{10},$$

$$SB_{IECTC} \subseteq TC_1 \cup TC_2 \cup \dots \cup TC_9,$$

$$R_{ISTTC} \subseteq SB_{ISOTC} \cap SB_{IECTC} = JCGM,$$

where:

SB_{ISOTC}, SB_{IECTC} – ISO and IEC TCs subsystems accordingly;

$SR_{IMEKOTC}$ – TK IMEKO TCs subsystems as external constraint of international organization for standardization TCs in field of metrology;

R_{ISTTC} – ISO and IEC subsystem for joint activity;

Z_{ISTTC} – ISO and IEC aims of TCs activity;

ΔT – ISO and IEC TCs aims activity period (typically 10 years).

The IMEKO TCs systems $S_{IMEKOTC}$ can be show:

$$S_{IMEKOTC} \equiv \langle SB_{IMEKOTC}, SR_{ISTTC}, Z_{IMEKOTC}, \Delta T \rangle,$$

$$SB_{IMEKOTC} \subseteq TC_1 \cup TC_2 \cup \dots \cup TC_{22},$$

where:

$SR_{IMEKOTC}$ – IMEKO TCs subsystem;

SR_{ISTTC} – ISO and IEC subsystem of external action for IMEKO TCs;

$Z_{IMEKOTC}$ – IMEKO TCs aims of activity;

ΔT – IMEKO TCs aims activity period.

Interaction of subsystems of IMEKO, ISO and IEC TCs is given in Fig. 3.

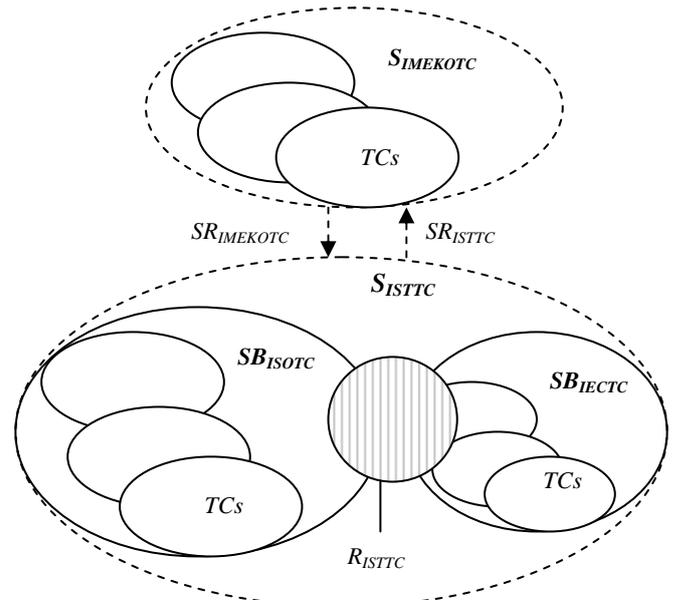


Fig. 3. Interaction of subsystems of IMEKO, ISO and IEC TCs

6. CONCLUSIONS

Analyses activity of IMEKO and international organization for standardization technical committees has shown commonness interest and aims in field of metrology (measurement and instrumentation) on different levels of works.

ISO and IEC membership enables to get regularly the international standards and guides, and other printed matters of ISO and IEC, and to use them for harmonization of the national standards in field of metrology with international standards and guides.

Many conducted studies and its results which provide of IMEKO TCs members can be basis for prepared draft of international standards and guides. Development of cooperative agreements between IMEKO and ISO/IEC for enhancement of international co-operation is recommended.

In paper analytical and schematic models of interaction of TCs subsystems of international organization are proposed. Those models are very useful for analyzing possibilities of joint activity in some technical fields.

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