

Guide to

the CENTRAL OFFICE OF MEASURES POLAND

GŁÓWNY
URZĄD
MIAR



www.gum.gov.pl



national measurement standards
calibration laboratories
legal metrological control
prepackaged goods
hallmarking

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POLAND



Population	- 38 533 000
Area	- 312 679 km ²
Political system	- republic, two-chamber parliament, president
Capital city	- Warsaw (Warszawa), population 1 724 404
Currency	- Polish zloty (PLN), 1 EUR = ca 4 PLN
Membership	- CE, NATO, EU
Time zone	- UTC + 1 h (CET), daylight saving time UTC + 2 h (CEST)
Measurement units	- SI

TIMELINE OF HISTORY OF THE POLISH METROLOGY AND HALLMARKING

- 1919** **8 February** – Józef Piłsudski, Polish Head of State signs the Decree on Measures which creates the Central Office of Measures (Główny Urząd Miar, GUM) and introduces the metric system in Poland.
1 April – establishment of the Central Office of Measures (Główny Urząd Miar, GUM) in Warszawa, nomination of **Zdzisław Erazm Rauszer** as its first director.
- 1920** Establishment of the **Central Assay Office** and **Assay Offices in Kraków, Warszawa** and **Lwów** and introduction of the Polish hallmarking law.
- 1922** Adoption the Law on Time-keeping. Establishment of the **Assay Office in Wilno**.
- 1925** Poland's accession to the **Metric Convention**.
- 1928** Amendment of the Decree on Measures.
- 1931** Introduction of new images of hallmarks.
- 1939–1944** War damage of the GUM and the regional and local offices of measures.
- 1945–1947** Reactivation of the GUM; at first in Katowice and then in Bytom. Reconstruction of the building at No. 2 Elektoralna Street in Warszawa. Relaunch of the regional and local offices of measures.
- 1947** **11 April** – adoption of the Decree on hallmarking.
- 1949** Return of the GUM from Bytom to Warszawa, to its seat at No. 2 Elektoralna Street.
- 1951** Decree on the bodies of administration of measures and on the measures and measuring tools.
- 1955** Poland signs the convention on establishment of the **International Organisation of Legal Metrology (OIML)**. 23 May 1957 – Poland ratifies the Convention.
- 1958** Assay offices get subordinated to the Central Office of Measures.
- 1963** Adoption of the Law of 29 June 1962 on Hallmarking and secondary legislation.
- 1966–1979** Introduction of the **International System of Units (SI)** as legal in Poland.
- 1966** Law on measures and measuring tools. Establishment of the Central Office of Quality and Measures in the place of the Central Office of Measures.
- 1972** Establishment of the Polish Committee for Standardisation and Measures in place of the Central Office of Quality and Measures and the Polish Committee for Standardisation.
- 1979** Transformation of the Polish Committee for Standardisation and Measures into the Polish Committee for Standardisation, Measures and Quality.
- 1986** Amendments to the Hallmarking Law. Comprehensive amendment of the images of hallmarks.
- 1991** Establishment of Euro-Asian co-operation of National Metrological Institutions (COOMET). The vice-president of GUM gets elected the COOMET chairman.



TIMELINE OF HISTORY OF THE POLISH METROLOGY AND HALLMARKING

1993	Act on Establishment of the Central Office of Measures, the Law on Measures and the Hallmarking Law adopted by the Parliament.
1994	Transformation of the Polish Committee for Standardisation, Measures and Quality into the Central Office of Measures and the Polish Committee for Standardisation. Restitution of the Central Office of Measures and the Polish Committee for Standardisation. Establishment of the Polish Centre for Testing and Certification. Polish Regional Assay Offices (in Warszawa and Kraków) are granted membership in the Association of European Assay Offices (AEAO) which later got transformed into the International Association of Assay Offices (IAAO). Polish Regional Assay Offices join the GV4 group (This group consociates assay offices of Visegrad Group countries).
1996–1998	Process of accession of GUM to the European Collaboration in Measurement Standards (EUROMET).
1999	14 October – GUM’s accession to “Mutual recognition arrangement of national measurement standards and of calibration and measurement certificates issued by national metrology institutes” (CIPM MRA).
2001	11 May – the Parliament adopts the new Law on Measures.
2003–2004	Adoption of the Law on Legal Time in the Republic of Poland.
2004	7 May – GUM is conferred the status of Notified Body No. 1440 . 13 May – GUM’s accession to the European Co-operation in the Field of Legal Metrology (WELMEC).
2005–2007	Accreditation of the Group of 21 Calibrating Laboratories in the GUM.
2005	22 November – Poland is granted membership in the Convention on the Control and Marking Articles of Precious Metals (adopted in 1972).
2007	Central Office of Measures joins the European Association of National Metrology Institutes (EURAMET).
2008	August – GUM accedes to the European Metrology Research Programme (EMRP).
2011	The new Hallmarking Law comes into force. Introduction of two-tier structure of hallmarking administration bodies.
2012	GUM accedes to the European platform of Notified Bodies working in legal metrology (NoBoMet).
2013	GUM’s accession to the European Metrology Programme for Innovation and Research (EMPIR).
2016	Appointments of Consultative Metrology and Assay Teams.



LOOKING BACK



On 8 February 1919, the Decree on Measures (Dz. U. [Journal of Laws] item 211), was signed by Józef Piłsudski, the Polish head of state. The decree was one of the first legal acts of the Republic of Poland which regained sovereignty after 123 years of enemy occupation.

On 1 April 1919, the Central Office of Measures (GUM) began to operate. From 1922 to the present day its seat is the landmarked building at No. 2 Elektoralna Street in Warszawa.

Simultaneously with the establishment of GUM, regional and local offices of measures were created. This structure of the administration of measures exists till now. Unification of the system of measures in Poland was an urgent and difficult task that the new institution had to cope with, since after a century, when Poland had been partitioned between three neighbouring enemy states, there were three different systems of measures in each of three sectors and different institutions ensured observance of law and order in the field of measurement.

After the Second World War the administration of measures underwent a series of organisational changes. For many years the GUM has been merged with the Polish Committee for Standardisation and that institution was known as the Polish Committee for Standardisation and Measures (PKNiM). The tasks of the PKNiM in the field of metrology were the same as those of the GUM. Also in the international cooperation the GUM was present under the name of PKNiM.

By virtue of the Law on the formation of the Central Office of Measures of April 3, 1993 (Dz. U. [Journal of Laws] item 247, item 202 of 1998, item 1268 of 2000) the original name and the scope of competence of the Central Office of Measures were restored on 1st January 1994, short before the 75th anniversary of its establishment.

In connection with preparations for the Polish membership in the European Union, in 2001 a new law on measures was adopted which introduced legal and organisational changes to metrology in Poland. In 2004, Poland became a member of the European Union. GUM obtained the status of Notified Body No. 1440. In 2007, GUM entered EURAMET (the Association of National Metrology Institutes), after long lasting cooperation with its predecessor – EUROMET.



MISSION AND TASKS OF GUM



Central Office of Measures (GUM) acts as a national metrology institute (NMI), ensuring traceability to the SI units.

The Central Office of Measures performs tasks in the scope of scientific, industrial and legal metrology. It makes possible to ensure the uniformity of measures and the required accuracy of measurement in Poland by realization and maintenance of measurement standards and dissemination of units of measurement (this regards the SI units and other legal units of measurement). GUM performs calibrations and expert assessments of measuring instruments, conformity assessment of measuring instruments and type approval and verification of measuring instruments. GUM participates in the activities of international and regional (European) metrological organisations.

President of the Central Office of Measures is a central authority of the government administration, competent for measures and hallmarking in Poland.

The objective of the Central Office of Measures as the National Metrology Institute (NMI) is to provide the sources of traceability of measurement on the highest possible level for measurements in the area of economy, science and social life.

The most important tasks of the Central Office of Measures are the following:

- 1) establishment, maintenance and modernisation of national measurement standards;
- 2) providing, by way of comparison, the traceability of national measurement standards to international measurement standards or to such standards in other countries;
- 3) dissemination of legal measure units from national measurement standards to measuring instruments;
- 4) performance of legal metrological control and metrological supervision.

Metrology
is the science of measurements
and its application.

OUR LABORATORIES AND DEPARTMENTS

1919-
2017



Quality above all!

The Central Office of Measures has implemented, maintains and develops the management system supporting execution of the tasks being performed currently under the Law on Measures and the Law on conformity assessment. It implements provisions of the arrangement on mutual recognition of national measurement standards and of calibration and measurement certificates issued by national metrology institutes (CIPM MRA).

Integrated Management System of the Central Office of Measures:

- ▶ is compliant with Polish standards PN-EN ISO/IEC 17025, PN-EN ISO 9001 and PN-EN ISO/IEC 17065;
- ▶ is documented in the Management System Manual, in procedures and instructions; the quality management system is applicable to the tasks done in the laboratories of the GUM and at the client's premises;
- ▶ ensures implementation of the Quality Declaration established by the management of GUM.

GUM's structure

The President of the Central Office of Measures manages the institution with the help of the vice presidents, the general director and the chiefs of organizational sections.

The structure of the Central Office of Measures includes the following laboratories: Acoustics and Vibration, Time and Frequency, Chemistry, Length, Electricity and Magnetism, Photometry and Radiometry, Mass, Ionising Radiation, Flow, Thermometry.

There are other organizational sections in the GUM's structure: Interdisciplinary Metrology Department, Strategy Department, Service of Measures Department, General Director Department.

In 2016, the President of the Central Office of Measures set up Consultative Group on Metrology, which are involved in the creation of a new strategy for the development of Polish metrology. There are 8 bodies were set up: health, energy, technology and industrial processes, infrastructure and special applications, environment and climate change, dual use, market regulation and hallmarking.

The modern quality management system has been established in GUM in order to perform statutory tasks resulting from the following acts:

- ♦ of 11 May 2011 – Law on Measures (Dz. U. [Journal of Laws] of 2016, item 884 and 1948)
- ♦ of 13 April 2016 – on the conformity assessment system and market surveillance system (Dz. U. [Journal of Laws] item 542 and 1579)
- ♦ of 7 May 2009 – on prepackaged goods (Dz. U. [Journal of Laws] of 2015, item 1161)
- ♦ of 29 July 2006 – on the digital tachographs system (Dz. U. [Journal of Laws] item 1494, of 2007, item 661, of 2011, item 622 and 1016, of 2015, item 1893, of 2016, item 1579)
- ♦ of 10 December 2003 – on the official time of the Republic of Poland (Dz. U. [Journal of Laws] of 2004, item 144)

ORGANISATIONAL STRUCTURE OF POLISH ADMINISTRATION OF MEASURES

The administration of measures in Poland has three-level structure and consists of:

- the Central Office of Measures (located in Warszawa)
- 9 Regional Offices of Measures (located in Warszawa, Kraków, Wrocław, Poznań, Katowice, Gdańsk, Łódź, Bydgoszcz and Szczecin)
- 58 Local Offices of Measures located in selected larger towns of Poland



President of the Central Office of Measures supervises

also the hallmarking administration which consists of:

- 2 Regional Assay Offices: in Warszawa and Kraków, which have 8 branch departments.



The President of GUM is the central authority of the government administration, both for measures and hallmarking

Administration of measures and hallmarking
are approx. 1600 persons who i.a. care about safety of economic turnover and protection of consumers' interests.

OUR MEASUREMENT STANDARDS



GUM is not only the office, as it might seem considering the name, but most of all laboratories and metrologists working there.

The administration of measures has been established to assure uniformity of measures and the required accuracy of measurements of physical and chemical quantities in Poland and traceability of national measurement system to the international system as well. Key tasks in this scope are performed in laboratories in which measurement standards of the top level in Poland are established and maintained. These standards are traceable to analogical standards of other countries. It is achieved by systematic participation in international comparisons. From the GUM's measurement standards, the units of measure of respective quantities are disseminated to measuring instruments used in all areas of economy, health protection or public safety.

GUM maintains

- **19 national measurement standards** (for length, plane angle, temperature, mass, resistance, capacitance, density, pH, refractive index, optical rotation, luminous flux, luminous intensity, time and frequency, inductance, DC voltage, alternating voltage ratio at frequency of 50 Hz, alternating voltage, alternating current ratio at frequency of 50 Hz, electrolytic conductivity);
- **reference measurement standards of the following quantities:** mass per storage volume of grain, force, pressure, static volume, kinematic viscosity, Rockwell hardness scales, Vickers hardness scales, Brinell hardness scales, high frequency power, impedance at high frequencies, magnetic induction, magnitude of electric field, energy of AC electricity, resistance, flatness, roundness, surface roughness, temperature, dew/frost point temperature, relative humidity, air kerma for X-rays, air kerma for gamma-rays of ^{137}Cs and ^{60}Co nuclides, absorbed dose to water of gamma-rays of ^{60}Co nuclide, spectral sensitivity, colour temperature, IR wavenumber, high gloss,

National measurement standard is

a measurement standard adopted officially in the Republic of Poland as a reference for attributing quantity value to other measurement standards of that quantity.

VIM 3: reference measurement standard

reference standard

measurement standard designated for the **calibration** of other measurement standards for **quantities** of a given **kind** in a given organization or at a given location.

OUR MEASUREMENT STANDARDS



International System of Units (SI)

is a uniform system of units adopted and recommended by the General Conference on Weights and Measures. It consists of 7 basic units: metre, kilogram, second, ampere, kelvin, mole, candela.

GUM is not only an office

it is most of all laboratories and metrologists working in them.

spectral reflectance factor, spectral radiance factor in $0^\circ/45^\circ$ geometry, colorimetric parameters, spectral transmittance, volume and volume flow rate of gas, volume and volume flow rate of water, sound pressure, vibration acceleration, amount of substance – gas standards containing: CO, CO₂, H₂, CH₄, C₂H₄, C₂H₆, C₃H₈, O₂, NO, NO₂, SO₂ in nitrogen and natural gas.

Some of them are the primary standards participating in international key comparisons, others are calibrated in the International Bureau of Weights and Measures (BIPM) and abroad in national metrology institutes. The above provides links between the national measurement system and the international measurement system.

In laboratories of GUM, the research is performed that is necessary to establish and modernise measurement standards and to develop certified reference materials. Metrologists of GUM closely cooperate with national research centres engaged in metrology, however, they also do research projects within the european research programmes in domain of metrology (EMRP/EMPIR) which are co-financed by the European Union. This cooperation provides Polish metrology with the access to the latest metrological knowledge. This is indispensable in the era of a dynamic development of civilisation which constantly brings new challenges. They are so complicated that none of the national metrology institutes is currently capable to solve those new, more and more complex metrological issues on its own.

Laboratories of GUM perform the research by themselves, however, they do it also in cooperation with national and foreign research centres. The research is related to national standards, reference standards of GUM and to measurement facilities contributing to disseminate units of measurement. They also include development and implementation of new measuring methods.

We invite you to become acquainted with the work of our laboratories.



NATIONAL MEASUREMENT STANDARDS

National mass standard – prototype No. 51 of the kilogram



The basis for dissemination of a mass unit is the national standard – prototype No. 51 of the kilogram, made of an alloy of platinum and iridium (90 % Pt, 10 % Ir) in the shape of a cylinder with the diameter of the base equal to its height (approx. 39 mm), compared periodically to the international standard of kilogram (IPK). The standard has been utilized in GUM since 1952. International comparisons of the national standards of the mass unit 1 kg were performed in the International Bureau of Weights and Measures (BIPM) in 1988–1992. The mass of the Polish prototype, determined in 1990, amounted to $1 \text{ kg} + 227 \cdot 10^{-9} \text{ kg}$ with the combined standard uncertainty of $2,3 \cdot 10^{-9} \text{ kg}$.

Dissemination of a unit of measurement takes place through the calibration. It is required that the chain of traceability remain unbroken. Calibrations are of the hierarchic nature, starting from the prototype of the kilogram, through the copies of the kilogram and the mass standards of E_1 , E_2 , F_1 , F_2 and M_1 classes of accuracy, down to utility instruments (non-automatic weighing instruments). Dependent upon the use and technical parameters, weighing instruments are divided into accuracy classes: ordinary (III), medium (II), high (I) and special (I). Weighing instruments of high and special classes are used in research laboratories for precise mass measurements of tested samples. Weighing measurements of the medium class are most frequently met in everyday life as commonly used in sales. However, weighing instruments of the ordinary class are of industrial use, e.g. in technological production lines. In each of the above uses, the result of measuring a unit in any field is related to the national standard – the prototype No. 51 of the kilogram.

National length standard

The national length standard was established for the first time on 15 March 1980. Currently the standard is recognised by the decision of the President of the Central Office of Measures No. 1/2003 of 24 April 2003. The national length standard is a measurement facility reproducing standard laser radiation wavelengths, consisting of:

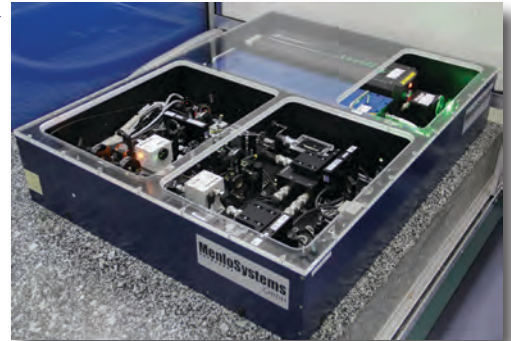
- He-Ne laser stabilised with iodine, ➤



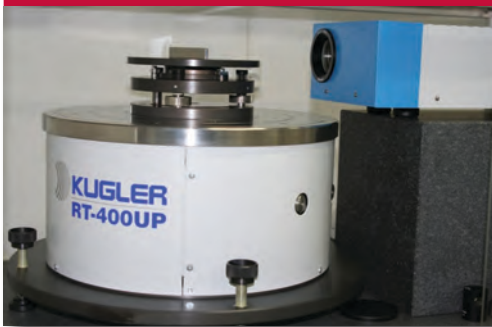
NATIONAL MEASUREMENT STANDARDS

– optical frequency synthesizer. ➤

The facility is used to provide traceability in the field of length measurements through calibrations of stabilised metrological lasers, heads of laser interferometers and of He-Ne iodine stabilised lasers in (532 ÷ 1064) nm radiation wavelength range, using the optical frequency beat method with relative expanded uncertainty equal to 10^{-13} .



National plane angle standard



The national standard was established for the first time on 12 July 1979. The recent certificate of recognising the standard as the national standard was issued on 28 July 2003.

Currently, after few modernisations, the national plane angle standard consists of two facilities: the facility for reproducing the unit by division of the full circle and the small angle generator, reproducing the unit by determining the ratio of two lengths, in the range of 40 arcminutes.

Optical polygons ($U = 0,07''$), wringing angle blocks ($U = 0,07''$), autocollimators, angle encoders and precision electronic levels (value of expanded uncertainty is dependent on the resolution of the instrument) are calibrated on these stations.

National standard of refractive index

Measurement facility of the refractive index standard was recognised as the national standard on 28 July 2003. It consists of a goniometer-spectrometer and standard prisms.

Values of the refractive index of solid refractive index standards in the range of $n = (1,2 \div 2,2)$ with expanded uncertainty $3 \cdot 10^{-6}$ are determined on the measurement facility. Refractive index standards are used for calibration of refractometers.



National standard of optical rotation

The national standard of optical rotation is the set of 5 quartz plates of the measurement range of: $(-10 \div 40)^\circ$ in angular scale and $(-25 \div 100)^\circ Z$ in sugar scale, in $20^\circ C$ temperature and in 546,3 nm wavelength. The measurement facility of the standard was recognised as the national standard on 28 July 2003.

Quartz plates are used for calibration of photoelectric and visual polarimeters.



National resistance standard



The national resistance standard is a measuring system of primary standard based on quantum Hall effect, which reproduces a resistance values $12,906,4035 \Omega$ and $6435,20175 \Omega$.

The measurement standard was established by the decision of the President of the GUM on 31 August 2016.

National DC voltage standard

The national DC voltage standard is a measuring system which consists of the original intrinsic standard based on the Josephson effect with 10 V rated junction and the measurement system for verification of the characteristics and calibrations.

This measurement standard has been working since 20 January 2004. Earlier it had been working (since 28 August 1979) as the national etalon containing eleven measurement elements – Weston 4305 saturated cells.



NATIONAL MEASUREMENT STANDARDS

National inductance standard

The national inductance standard is a measurement system consisting of the group of four standard induction coils, of 10 mH nominal value of inductance and precision comparators and bridges.

This measurement standard has been working since 29 August 2003.



National capacitance standard



The national capacitance standard is the measurement system consisting of the group of thermostated capacitors with a quartz dielectric of 10 pF nominal values and precision transformer bridges.

This measurement standard has been working since 24 April 2003. Earlier it had been working as the national etalon since 29 June 1989.

National time and frequency standard

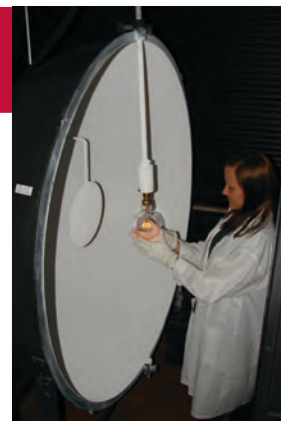
The national time and frequency standard is the measurement system consisting of the group of cesium frequency standards, UTC (PL) generation and control system and of the systems of their internal and remote comparisons.

This measurement standard has been working since 29 August 2003. Earlier it had been working for more than twenty years (since 21 December 1981) as the national etalon.



National luminous flux standard

It was recognized by the President of GUM in 2001. The standard consists of the group of five photometric Toshiba lamps (PS type, of 100 V nominal value of DC voltage and of 200 W). The national luminous flux standard provides traceability for the light sources industry, research institutes of electrotechnical industry and of automotive industry.



National luminous intensity standard



It was established by the President of GUM in 2001. The standard consists of the group of five photometric Toshiba lamps (T 64 type, of 100 V nominal value of DC voltage and of 200 W). The national luminous intensity standard provides traceability for the majority of measurements in the scope of photometry performed for light sources industry, automotive industry, aviation industry, manufacturers of measuring equipment, petrochemical industry, ironworks, sanitary-epidemiological stations, research institutes of electrotechnical and automotive industry, and also calibration and research laboratories performing photometric measurements. The reference luminous intensity standards are used for calibrating luxmeters, luminance meters, luminance standards, tristimulus colorimeters, white light NDT meters, photometric calibrators and utility standards of luminous intensity, utilized in research institutes of electrotechnical and automotive industry.

National pH standard

The measurement standard, operational since the beginning of 1970's, used for reproduction of a unit of pH and ensuring traceability for pH measurements, was established as the national standard for pH unit in 1980. In 1999, and subsequently in 2003, the original decision was confirmed by successive decisions resulting from legal changes.

The measurement standard of the pH, which is recognized as a national standard, is a system consisting of thermostated hydrogen – silver chloride cells without transference (so-called Harned cells), a set of instruments for measuring electromotive force, temperature and pressure, and a data acquisition and processing device for calculation of the measurement result.

NATIONAL MEASUREMENT STANDARDS

The primary method of pH measurement is based on measurement of the electromotive force of hydrogen – silver / silver chloride cells without liquid junction, containing the pH standard with addition of a small amount of chloride ions.

The pH measurements are probably the most frequently performed determinations in chemical and physico-chemical laboratories. Results of these measurements are widely used in many fields, most of all in health protection (e.g. pH measurements of physiological liquids) and environment protection (e.g. monitoring purity of rivers, lakes, drinking water, quality of wastewater). In industry, pH measurements are used to control technological processes and quality of products (e.g. in chemical, food, pharmaceutical, cosmetic, fermentation and paper industry). In agriculture, pH measurements are used to i.a. determine properties of soils and fertilisers. pH of environment is the important parameter having an impact on materials' susceptibility to corrosion.



National temperature standard

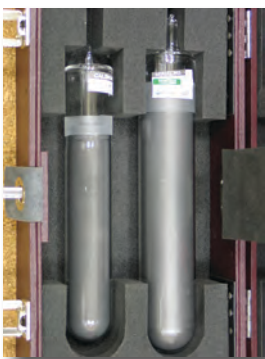


Measuring facility of the national temperature standard

The standard is intended for reproducing and transferring the unit of temperature in Poland in the range from $-189,3442\text{ }^{\circ}\text{C}$ to $961,78\text{ }^{\circ}\text{C}$.

The temperature standard is the measurement system which consists of several components. The most important components are: fixed point cells Ar, Hg, H_2O , Ga, In, Sn, Zn, Al, Ag, which realise the definitional fixed points (corresponding to the physical transformations of pure substances), in accordance with the International Temperature Scale of 1990 (MST-90); standard platinum resistance thermometers (SPRT); resistance bridges; thermostating devices and standard resistors.

This standard constitutes the source of traceability for national calibration and testing laboratories and also for direct users of instruments. It means that any user of the temperature measuring instrument, either for the needs of a production process (most frequently in food, chemical, engineering, iron and steel industry) or during the implementation of services (i.a. medical, transport, technical, catering services), has the possibility to review the credibility of such instrument's indications, by calibrating it in a competent laboratory, maintaining relation (traceability) to the temperature standard in GUM.



Temperature fixed point cells

National density standard



Density standards, made from single-crystal silicon: SILO2 sphere and WASO 9.2 rectangular prism



WASO 9.2 standard (on the right) and SILO 2 standard (on the left) while hydrostatic weighing, on their supports in the vessels immersed in the thermostats

It has been established officially more than 30 years ago. In 1983, by the decision of the President of the Polish Committee for Standardisation, Measures and Quality, two facilities – for unit of liquid density and for unit of solid density – obtained the certificate of the national etalon. In 1990's, these standards were replaced with WASO 9.2 single-crystal silicon in the shape of a rectangular prism of approx. 153 g. Its density was determined twice in comparison with PTB (the German National Metrology Institute) standards: by hydrostatic weighing against C1 and C2 Zerodur cubes (1985) and by pressure flotation against Si-1 silicon sphere (primary standard) (1998). WASO 9.2 was recognised as the national standard by the President of GUM in 1999.

In 2003, GUM purchased the 1 kg SILO2 sphere made of the single-crystal silicon, of approx. 93.6 mm diameter. It was calibrated two times against PTB primary standards, by means of the pressure of flotation method: in 2003 and in 2013.

NATIONAL MEASUREMENT STANDARDS

National standard of alternating voltage ratio at frequency of 50 Hz

The national standard of AC voltage ratio at frequency 50 Hz consists of one gas capacitor, two air capacitors and auxiliary devices. It reproduces voltage ratio in range 100 V to 400 kV.

The measurement standard was established by the decision of the President of the GUM on 19 December 2014.



National standard of alternating voltage



The national alternating voltage standard is the set of thermal voltage converters with range resistors. Thanks to reference to dc voltage standards is possibility of designation value of alternating voltage in range 2 mV to 1000 V and in frequency range 10 Hz to 1 MHz by comparison of them effective values.

The measurement standard was established by the decision of the President of the GUM on 19 December 2014.

National standard of alternating current ratio at frequency of 50 Hz

The national standard of AC current ratio at frequency 50 Hz consists of current comparator, standard current transformer and auxiliary devices. It reproduces current ratio in range 0,1 A to 10 kA.

The measurement standard was established by the decision of the President of the GUM on 30 January 2015.



National standard of electrolytic conductivity



Primary conductivity piston type cell is the main part of the National Standard of Electrolytic Conductivity. The piston type cell consists of two platinum electrodes placed in a geometrically calibrated glass cylinder. One electrode is fixed at the bottom of the cell and the second is displaceable. The distance between electrodes is changed by a micropositioning system and the displacement of the electrode is measured. The temperature of the cell is controlled with a thermostat and measured with the precise system for measuring temperature. The impedance of the solution is measured with RLC bridge.

Certified reference materials for electrolytic conductivity are calibrated with the National Standard and are traceable to SI units S and m.

LEGAL METROLOGY

Legal metrological control is an activity aiming to prove that a measuring instrument meets requirements specified in law.

In order to provide the uniformity of measures and the required accuracy of measurements the President of GUM performs also the legal metrological control of measuring instruments used in special areas.

To protect the special interests (defined in the Law on Measures) of the state, society and individuals, measuring instruments must fulfil the requirements, determined by law. So they are subject to legal metrological control before being placed on the market and during their use. Proper legal acts determine the measuring instruments subject to legal metrological control.

The subject of protection are most of all: health and life of individuals, consumer's rights, environment, safety and public order, economic turnover and interests of the state, i.a. in the scope of taxation and collection of other budget receivables and also when performing customs control.

Legal metrological control

Service of Measures Department is responsible for the performance of tasks **in the scope of legal metrology control**.

Legal metrological control is the activity of proper bodies, **aiming to prove that a measuring instrument fulfils requirements determined** by the law.

The fundamental purpose of the legal metrological control is the protection of interests of the state, society and individuals defined by the Law on Measures of 11 May 2011.

Legal control of measuring instruments is performed in three ways:

- 1) **type approval** of a measuring instrument basing on the examination of the type – before placing the type of the measuring instrument on the market
or
- 2) **initial verification** or **unit verification** – before placing the given measuring instrument on the market or introducing it for use, and also
- 3) **subsequent verification** – in relation to measuring instruments placed on the market or introduced for use.

The scope of the legal control is dependent upon kind of a measuring instrument. It may include all the aforementioned forms of legal control, two of them or only one (e.g. approval of the type or subsequent verification).



The detailed list of measuring instruments which are subject to legal control are available on the GUM's website in the "Certification" tab.

Legal control of measuring instruments is performed by the entities of administration of measures.

Legal control of measuring instruments is also carried out in entities known as verification points which are authorised specialized test labs where officers of the administration of measures perform activities related to verification of a large number of specified kinds of measuring instruments at the manufacturer's, importer's or entrepreneur's premises.

Except for the bodies of administration of measures, the specific activities in the scope of legal control of measuring instruments are performed by **the entities which were granted authorisation by the President of the Central Office of Measures to perform the initial verification or the subsequent verification of specified kinds of measuring instruments.**

Conformity assessment

The term "conformity assessment" ought to be understood as the procedure applicable when placing products (specified in the relevant legislation) on the market or introducing them for use. The conformity assessment procedure is performed upon the request of **a manufacturer** or its **authorised representative**.

The Central Office of Measures performs the conformity assessment of measuring instruments on the basis of the authorisation granted by the Minister of Economic Development in the scope of following directives:

- ❖ DIRECTIVE 2014/31/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of non-automatic weighing instruments;
- ❖ DIRECTIVE 2014/32/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of measuring instruments.

As the consequence of the above authorisation, the European Commission granted the Central Office of Measures the status of a notified body and assigned it number 1440.

Verification points are locations where bodies of the administration of measures perform activities related to the verification of a large number of defined kinds of measuring instruments at the premises of manufacturers, importers or entrepreneurs conducting repairs or installations.

Conformity assessment is a procedure applicable when placing on the market or introducing for use products determined by the proper law.

KINDS OF LEGAL METROLOGICAL CONTROL OF MEASURING INSTRUMENTS

GUM is the body notified to perform the conformity assessment of measuring instruments in accordance with the following procedures:

- ❖ MID Directive – type examination (module B) and declaration of conformity based on unit verification (module G),
- ❖ NAWI Directive – type examination (module B) and declaration of conformity based on unit verification (module G).

The detailed information on the scope of the notification is available on the GUM's website in the "Certification" tab.

The above directives were transferred to the Polish legislation by the Act of 13 April 2016 (Dz. U. [Journal of Laws] item 542) on the Conformity Assessment and market supervision systems and by the respective implementing regulations.

Kinds of legal metrological control of measuring instruments

Measuring Instrument*	National Legal Metrological Control			Legal Metrological Control according to the Old Approach Directives			Legal Metrological Control according to the New Approach Directives	
	Type approval	Initial verification	Subsequent verification	EEC type approval	EEC Initial verification	Subsequent verification	Conformity Assessment	Subsequent verification
1. Instruments for measuring electrical quantities								
AC active electrical energy meters	✓	✓	✓	✓	✓	✓	✓	✓
2. Instruments for measuring volume and flow of liquids and for measuring heat								
Gas meters	✓	✓	✓	✓	✓	✓	✓	✓
Volume conversion devices for gas meters	✓	✓					✓	
Water meters	✓	✓	✓	✓	✓	✓	✓	✓
Measuring systems for liquids other than water (including fuel dispensers)	✓	✓	✓	✓	✓	✓	✓	✓
Fixed storage tanks	✓	✓	✓					
Road measuring tankers	✓	✓	✓					
Metal barrels	✓	✓						

Measuring Instrument*	National Legal Metrological Control			Legal Metrological Control according to the Old Approach Directives			Legal Metrological Control according to the New Approach Directives	
	Type approval	Initial verification	Subsequent verification	EEC type approval	EEC Initial verification	Subsequent verification	Conformity Assessment	Subsequent verification
Heat meters	✓	✓	✓				✓	✓
Calculators – sub-assemblies of water heat meters	✓	✓	✓				✓	✓
Temperature sensor pairs – sub-assemblies for water heat meters	✓	✓	✓				✓	✓
Flow sensors – sub-assemblies for water heat meters	✓	✓	✓				✓	✓
3. Instruments for measuring length and associated quantities								
Instruments for measuring the length of a line, wire, cable, tape, piece of cloth, strip, sheet or any developable piece	✓	✓	✓				✓	
Material measures of length	✓	✓	✓	✓	✓	✓	✓	
Instruments for measuring the areas of leathers	✓	✓	✓				✓	✓
Recording equipment used in road transport – analogue tachographs	✓	✓	✓					
Record sheets for recording equipment used in road transport – analogue and digital tachographs	✓							
Electronic taximeters	✓	✓	✓	✓	✓	✓	✓	✓
Instruments for the measurement of the speed of vehicles in road traffic	✓	✓	✓					
4. Instruments for measuring mass								
Weights		✓	✓		✓	✓		
Automatic weighing instruments:								
– automatic gravimetric filling instruments	✓	✓	✓				✓	✓
– continuous totalisers	✓	✓	✓	✓	✓	✓	✓	✓
– discontinues totalisers	✓	✓	✓				✓	✓
– automatic catchweigher	✓	✓	✓				✓	✓

KINDS OF LEGAL METROLOGICAL CONTROL OF MEASURING INSTRUMENTS

Measuring Instrument*	National Legal Metrological Control			Legal Metrological Control according to the Old Approach Directives			Legal Metrological Control according to the New Approach Directives	
	Type approval	Initial verification	Subsequent verification	EEC type approval	EEC Initial verification	Subsequent verification	Conformity Assessment	Subsequent verification
– weighing instruments for weighing rakes of wagons in motion	✓	✓	✓					
– rail-weighbridges							✓	✓
Weighbridges for weighing vehicles in motion	✓	✓	✓					
Non-automatic weighing instruments	✓	✓	✓				✓	✓
5. Instruments for measuring density								
Glass hydrometers - alcoholometers and alcohol hydrometers	✓	✓		✓	✓			
Glass hydrometers – densimeters for liquids other than alcohol		✓						
20 L, 1 L and 1/4 L utility instruments to measure mass per storage volume of grain	✓	✓	✓	✓	✓	✓		
20 L standard instruments to measure mass per storage volume of grain	✓							
Oscillatory-type density meters for measuring liquid density (from 450 kg/m ³ do 2000 kg/m ³)	✓							
6. Instruments for measuring pressure								
Tyre pressure gauges for motor vehicles	✓	✓	✓	✓	✓	✓		
7. Instruments for measuring chemical and physico-chemical quantities								
Exhaust gas analyser	✓	✓	✓				✓	✓
8. Instruments for measuring acoustic quantities								
Sound level meters	✓							
Caption:								
✓	– measuring instrument of this kind is subject to relevant form of legal metrological control.							
	– this form of legal metrological control for the given type of a measuring instrument is not performed anymore, however, they still might be introduced for use on this basis (for the specified term).							
* The detailed list of measuring instruments with determination of their parameters, use and classification is contained in the ordinance of the Minister of Economy of 27 December 2007 on kinds of measuring instruments subject to legal metrological control and on the scope of this control (Dz. U. [Journal of Laws] of 2014, item 1066).								



METROLOGICAL AND HALLMARKING SUPERVISION

Metrological and hallmarking supervision

The **Service of Measures Department** is responsible for implementation of the statutory tasks of the President related to supervising observance of the Law on Measures, the Hallmarking Law, the Law on Prepackaged Goods, the Act on the System of Digital Tachographs and the secondary legislation. The Department, on behalf of the President of the Central Office of Measures, controls and supervises the Regional Offices of Measures, Local Offices of Measures and Regional Assay Offices.

Metrological supervision is exercised i.a. by means of:

- inspection of measuring instruments currently in use and subject to legal metrological control,
- inspection of entities and entrepreneurs operating under the permit or authorisation granted by the President of GUM as far as activities resulting from these permits or authorisations are concerned,
- reporting from the area of supervision and preparation of analyses in order to identify positive and/or negative trends, and thus providing guidance as far as supervisory actions are concerned,
- keeping the register of identification marks of measuring bottles' manufacturers and supervising observance with the Law on Prepackaged Products – in accordance with the area of its competence,
- analysis of the results of conducted inspections as well as collecting and analysing information that can be used during inspections, investigations and improving everyday work of supervision inspectors,



Assay is a ratio of mass of pure precious metal contained in the alloy to the whole mass of the alloy expressed in parts per thousand.

Hallmarking

The President of GUM supervises Regional Assay Offices. Testing and hallmarking of articles of precious metals submitted to regional assay offices are the fundamental tasks of the offices.

Hallmarking administration bodies supervise the observance of the Law on Hallmarking of 1 April 2011. Within the aforementioned supervision, empowered officers of regional assay offices perform inspections of manufacturing, repairing or selling articles of precious metals sites.

Articles of precious metals which are not hallmarked or have no certificate of testing are withdrawn from the market (by an administrative decision) by the persons/entities responsible for inspection, with the simultaneous order to deliver these articles to the competent regional assay office where testing and hallmarking are carried out or certificate of testing is issued.



METROLOGICAL AND HALLMARKING SUPERVISION

In case when authenticity of hallmarks or of certificate of testing raises doubts, the persons/entities responsible for inspection secure the products by giving a relevant order with the simultaneous written notice to deliver them to the competent regional assay office in order to perform evaluation.

Inspection of sales ensures that on the territory of Poland there are articles of precious metals in which the content of precious metal is confirmed by an authentic hallmark or with an examination certificate. It contributes to the protection of consumer interest. Regional assay offices keep records of registered names. Registers are open, allowing consumers to identify the characters placed on the products.

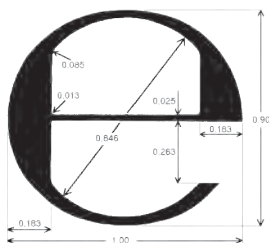


Inspections performed by the administration of measures in the scope of **prepackaged goods** are to ensure that the purchased prepackaged goods are compliant with the nominal quantity declared by the manufacturer.

Prepackaged goods

The Act on Prepackaged Goods defines i.a. the rules of packaging products intended for being placed on the market in packages and the rules of marking prepackaged goods with the “e”-mark. GUM participates in the system of supervision of packaging of products in Poland, i.a. by coordinating works related to prepackaged goods. This provides uniformity of decisions issued within the performed inspections (planned and ad-hoc). Within a framework of this supervision, the tasks of regional offices’ directors are the following: registration of notifications of packaging entities and performance of ad-hoc or planned inspections. However, heads of local offices of measures perform exclusively ad-hoc controls. We constantly cooperate with other bodies of public administration, especially with Trading Standards Authority, Main Inspectorate of Agricultural and Food Quality Inspection and Main Pharmaceutical Inspectorate.

The importer who imports prepackaged goods or entrusts packaging to other companies is liable for the prepackaged goods to fulfil requirements determined by the aforementioned Act. In particular, the importer is liable for ensuring that the actual quantity contained in a package is equal to the nominal quantity declared on a single package.



In accordance with the definition contained in Article 2, section 1 of the Act of 7 May 2009 on Prepackaged Goods (Dz. U. [Journal of Laws] item 1161 of 2015), **all goods put in a single package of any kind, in which the nominal amount, the same for the whole batch, measured without participation of the buyer, not exceeding 50 kg or 50 l, must not be changed without deranging the package.**

Inspections performed by the administration of measures, in the scope of prepackaged goods, are to ensure that the prepackages comply with the quantitative declaration of the manufacturer.

Metrological software and cash registers

In the Central Office of Measures was established the Laboratory for testing a metrological software. Tasks of laboratory are connected with testing of software and data safety requirements for measuring instruments and cash registers, development of metrological software for measurement automation and data analysis, digital data analysis and mathematical modeling and simulation methods. Laboratory also can verify metrological software of measurement devices in type approval and conformity assessment processes.

The Laboratory also verifies data acquisition, processing and storage in fiscal cash registers due to polish law regulations. Our experts are engaged in preparation technical specifications for introduction of online cash registers in Poland.

The other task of Laboratory is development of metrological software and digital data analysis methods. There are prepared software for measurement system automation and advanced mathematical modeling methods. This software helps other Central Office of Measures laboratories to make their measurements better, obtain more reliable and accurate results. Such task helps to implement metrological software and data protection standards in daily work of laboratories. Laboratory also develops and connects metrological (included in WELMEC Guide 7.2) and ICT (such as Common Criteria) standards to improve quality of software used in measuring instruments, metrological laboratories and fiscal cash registers.



Digital tachographs

The President of GUM also performs the tasks resulting from the Act of 29 July 2005 on the System of Digital Tachographs (Dz. U. [Journal of Laws] item 1494, of 2007, item 661, of 2011, item 622 and 1016, of 2015, item 1893, of 2016, item 1579). Activity of the administration of measures within the system of digital tachographs includes:

- supervision of observance of the law,
- conducting proceedings on type approval of digital tachographs,
- issuing and withdrawing permits for conducting training within the scope of installation, including activation, repairs and inspection on digital tachographs, including their periodic inspection,
- issuing of certificates proving the entitlement to inspect digital tachographs.



DOMESTIC COOPERATION

Domestic cooperation

GUM co-operates with domestic institutions and organisations, such as:

- Polish Centre for Accreditation (Polskie Centrum Akredytacji – PCA),
- Polish Committee for Standardisation (Polski Komitet Normalizacyjny – PKN),
- scientific institutes and universities.

In the last 8 years, the Central Office of Measures has entered into more than 30 agreements with universities, institutes and institutions, related to cooperation in the following areas:

- ❖ joint scientific undertakings, including development and submission of joint research subjects, financed by domestic and European framework funds (EMRP or EMPIR),
- ❖ preparation of diploma theses, Ph.D. dissertations and habilitation theses, training programmes for students,
- ❖ joint research projects related to establishment, maintenance and modernisation of national standards,
- ❖ specialist metrological training and lectures for postgraduate studies,
- ❖ mutual sharing of the measurement infrastructure used for research and development,
- ❖ mutual initiatives for disseminating metrological knowledge,
- ❖ conformity assessment.

Co-operation agreements concluded by GUM in 2013–2015:

- ❖ Co-operation agreement between GUM and the University of Zielona Góra;
- ❖ Co-operation arrangement between GUM and the Club of Polish Research Laboratories POLLAB;
- ❖ Co-operation agreement between GUM and Cracow University of Technology;
- ❖ Co-operation arrangement in the field of chemistry in metrology between Ministry of Economy, GUM and University of Warsaw;
- ❖ Co-operation arrangement between GUM and the Institute of Geodesy and Cartography;
- ❖ Framework cooperation agreement between the Wrocław University of Technology and the GUM;
- ❖ Scientific cooperation agreement between the Institute of Low Temperature and Structure Research of the Polish Academy of Sciences and the GUM.

Representatives of GUM participate in the work of Technical Committees of the Polish Committee for Standardisation.



In the last 8 years GUM entered into more than 30 co-operation agreements with national institutions.

INTERNATIONAL COOPERATION

International cooperation

The Central Office of Measures is active on the international level. Objectives of this co-operation focus on providing the high level of measurements and traceability in the framework of the international measurement system. The essential part of the cooperation is the harmonisation of international provisions related to metrology and the developing of new legislation (e.g. compliant with to the recommendations of OIML). International activity also allows for enhancement of capacity of the Central Office of Measures by the current exchange of information in the field of metrology and hallmarking, participation in international comparisons and in *peer reviews*.

GUM takes part in the work of following organisations:

- **International Bureau for Weights and Measures (BIPM)**, established under the Metric Convention. The president of GUM represents Poland during the General Conference on Weights and Measures. A representative of GUM participates in the terminology works of the BIPM Joint Committees for Guides in Metrology as a member of the Working Group 2. Employees of the GUM's laboratories work under a secondment in the BIPM's laboratories.
- **International Committee for Weights and Measures (CIPM)**, established also under the provisions of the Metric Convention. Representatives of GUM take part as members in the work of Consultative Committees of CIPM (CIPM CC) of Ionising Radiation, Mass and Related Quantities and Acoustics, Ultrasound and Vibration, Time and Frequency. The representative of GUM is an observer in the Consultative Committee for Amount of Substance.
- **International Organisation of Legal Metrology (OIML)**. Poland participates in the work of all Technical Committees of the OIML and also in the vast majority of Subcommittees and Project Groups. Moreover, GUM (since 1961) has been running the secretariat of the Technical Committee Terminology 1 (OIML TC1) which prepares essential international metrological publications (i.a. the International Vocabulary of Terms in Legal Metrology; the recent edition was in 2013). In connection with the revision of the rules of operation of technical committees of the OIML, the Vice-President of the GUM (a member of the CIML) participated in the work of the Working Group for amendment of the OIML Directives for Technical Work.
- **European Association of National Metrology Institutes (EURAMET)**. GUM has representatives in all its technical committees. The representa-



INTERNATIONAL COOPERATION

NoBoMet



ISO/REMCO

COMAR



GUM's representatives participate in the work of approx. 150 working teams of international organisations (committees, subcommittees, working groups, project groups).

tive of GUM takes part in the work of the Joint Group for Metrological Infrastructure Development. Representatives of the GUM participate in peer reviews of the quality systems of other NMIs.

- **European Cooperation in Legal Metrology (WELMEC).** GUM participates in the work of all work groups of WELMEC which mainly deal with issues related to measuring instruments covered by MID and NAWI directives.

GUM through its employees co-operates also with other international organisations which are the following:

- European platform of Notified Bodies working in legal Metrology (**NoBoMet**);
- Committee on Reference Materials (**REMCO**) of the International Organization for Standardisation (**ISO**);
- International Database for Certified Reference Materials (**COMAR**).

GUM takes part in international key and supplementary comparisons performed under CIPM MRA (signed on 14 October 1999) and arranged by Consultative Committees (CC) CIPM or regional metrological organisations.

European Metrology Programs (EMRP, EMPIR)

Together with several Polish universities (University of Wrocław, Silesian University of Technology, University of Zielona Góra) and the Designated Institutes (Institute of Low Temperature and Structure Research – INTIBS, National Centre for Nuclear Research – NCBJ / Radioisotope Centre – POLATOM) GUM participates in 11 joint research projects (JRP).

The work is performed within the EMRP programme and it is related to such areas as: environment, industry, SI units and new technologies. Over the 7 past years of the programme, the Polish participants has obtained the EU funding in the amount of EUR 533,000 which means nearly ten-fold return on investment.

The activity of GUM within the EMRP programme is listed below:

- Metrology for pressure, temperature, humidity and airspeed in the atmosphere;
- Electromagnetic characterisation of materials for industrial applications up to microwave frequencies;
- Large volume metrology in industry;



- Automated impedance metrology extending the quantum toolbox for electricity;
- Angle metrology;
- Force traceability within the meganewton;
- Metrology for III-V materials based high efficiency multi-junction solar cells;

And in the implementation of the following research grants:

- Effects of impurities on the triple point of Mercury;
- Construction, Characterisation and Determination of the Reference Function of Gold/Platinum Thermocouples;
- An accurate re-determination of A180 and A170 isotopic depression constants (Kiyosawa's coefficients) for the water of TPW cell;
- Traceability for computationally-intensive metrology.

Due to the very good effectiveness of EMRP, EURAMET, as the entity implementing the programme, took actions to develop guidelines for the successor programme of EMRP – EMPIR (European Metrology Programme for Innovation and Research).

GUM participates in the following EMPIR programs:

- Towards the propagation of ac quantum voltage standards;
- Traceable calibration of automatic weighing instruments operating in the dynamic mode;
- Matrix reference materials for environmental analysis;
- Absorbed dose in water and air;
- Development of RF and microwave metrology capability.

In 2017 two new projects started to be develop:

- Certified forensic alcohol reference materials;
- Developing research capabilities for traceable intraocular pressure measurements (inTENSE).

Poland has received the financing from the EU for metrological testing in the amount of EUR 533,000.



METROLOGICAL SERVICES



In GUM you can order i.a. calibrations of measuring instruments, examinations and expertises.

Hallmarking

In this field Regional Assay Offices in Warszawa and Kraków take part in the work of i.a.:

- ❖ **International Association of Assay Offices (IAAO),**
- ❖ **Standing Committee of the Convention on the Control and Marking of Articles of Precious Metals.** The Polish representative is its vice-president,
- ❖ **Visegrad Group (GV4).**

Laboratories of Polish Assay Offices participate in “**Round Robin**” and “**Labtest**” testing programmes.

Metrological services

Irrespective of administrative activities performed by GUM in the scope of legal metrological control, it – like the regional and local offices of measures – provides the following services:

- ❖ calibration and expert assessment of measuring instruments and reference materials,
- ❖ manufacturing of the certified reference materials,
- ❖ providing consultation and technical advice on the selection and use of measuring instruments,
- ❖ specialist training in the field of measures,
- ❖ conformity assessment of measuring instruments,
- ❖ testing measuring instruments and issuing conformity assessment certificates of conformity with OIML recommendation, within the OIML system.

HISTORIC COLLECTION



Historic collection

The idea to create a collection of historic measuring instruments in the Central Office of Measures arose in 1920's. The current collection consists of approximately 3500 material objects and archives from which circa 1000 items are exhibited at the permanent exhibition located in the main hall on the ground floor and in the corridors of the first and second floor of the GUM's building.

In the collection of historic measuring instruments there are valuable exhibits such as: the brass container of the volume of the Warszawa half bushel from 1797, the Lithuanian weight marked with the Kościeszka blazon from 1677, gauges calibrated in old length units (inches, feet, vershoks or cubits), electricity meters, including one of the first meters by Aron company from 19th century, wooden roman balances from 18th century, pocket sundials from the mid-19th century and many other extraordinary measuring instruments used to measure time, volume, mass, force length and physico-chemical quantities.

The rich collection make weights and scales, which shows the development of the weights and scales industry in 19th and 20th century. Among the Polish, German (Prussian), Russian or Austrian weights, made most frequently of iron or steel, there are also glass and porcelain weights. The set of pharmaceutical weights from 1898 or the Nuremberg 4-pound folding pharmaceutical weight from 18th century are particularly valuable.

Among the scales, bench scales (Roberval or Beranger type), equal-arm pillar scales, pendulum scales, Chinese stators (steelyards) and roman balances are worth mentioning too.

The taximeters for hansom cabs from the end of 19th and the beginning of 20th century are unique in Europe. The collection also contains the rich documentation of development of instruments for measuring electrical quantities. Among the exhibits there are one of the first: galvanometers, ammeters, voltmeters, resistors and also AC and DC electricity meters.

The exhibition includes as well utility meters, i.a. industrial and domestic gas meters and water meters, and liquid fuel meters.

The exhibits collected in GUM are not only instruments older than 200, 100 or 50 years. You can also see there the most precise modern devices – caesium atomic clocks.

To see our interesting exhibits you only need to call us and arrange a visit to see the collection of historic measuring instruments at No.2 Elektoralna Street. More information can be found on the GUM's website (www.gum.gov.pl) but also in the guide to museums of Warszawa.

GUM'S PUBLICATIONS



The monograph entitled “Uncertainty of Measurements in Theory and Practice” was published in 2011. This publication is an example of the collaboration in the area of metrology between universities and administration of measures.

“Metrology” – bulletin of the Central Office of Measures – was published in 2007–2012 (earlier, since 2005, under the name of the Information Bulletin of the Scientific Secretariat of Metrology of GUM). “Metrology” constituted the information forum for academic and economic circles cooperating with the Central Office of Measures for development of the Polish metrology. The main objective of “Metrology” was presentation of the results achieved by the Central Office of Measures in the scope of research conducted in the area of national standards, reference standards and issues related to transferring of units of measure.

“Metrology and Hallmarking” – the Bulletin of the Central Office of Measures – has been issued since June 2013. The Bulletin presents the activity of the Polish administration of measures and of the hallmarking administration. It depicts in an interesting manner the research output of laboratories in the field of measurements. In the Bulletin, the issues are presented related to presence of metrology and measurement in everyday life, cooperation in the scope of international research programmes and those based on the agreements with universities in Poland. The review of the most significant events in the world of metrology is also to be found in this quarterly bulletin.

The book by dr. Andrzej Barański (retired employee of GUM) entitled “Główny Urząd Miar na Elektoralnej” (“Central Office of Measures at Elektoralna”) is an interesting publication. The book was published in 1994 to celebrate the 75th anniversary of establishment of the GUM. It presents the history of the building at No 2 Elektoralna Street in Warszawa and the history of the Polish administration of measures.

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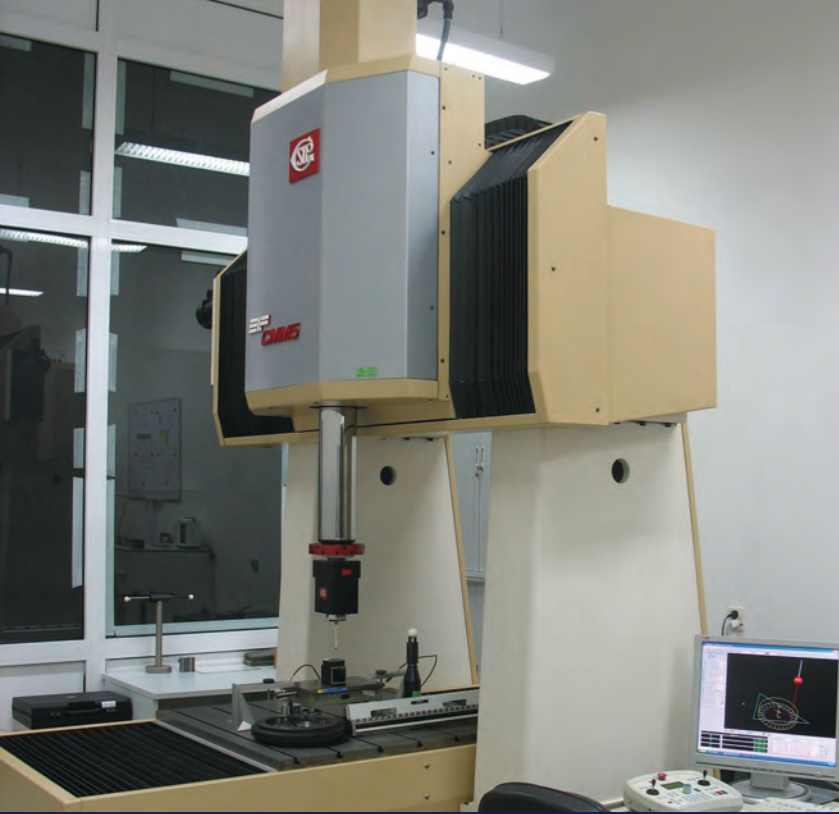
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GŁÓWNY
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Description: Department of Strategy
2017