On Approval of Technical Regulations Regarding Basic Requirements for Measuring Instruments

Pursuant to Article 14 of the Law of Ukraine “On Standards, Technical Regulations and Compliance Evaluation Requirements,” the Cabinet of Ministers of Ukraine decrees:

1. To approve the Technical Regulations Regarding Basic Requirements for Measuring Instruments and plan for its implementation, that are attached hereinto.

2. To give the State Committee on Issues of Technical Regulation and Consumer Policy the responsibility for implementation of the Technical Regulations approved by this Decree and the performance of state metrological control and monitoring of compliance.

Prime-Minister of Ukraine

YU. TYMOSHENKO

Ind. 33

APPROVED
by the Decree of the Cabinet of Ministers of Ukraine
dated 8 April 2009 No 332

TECHNICAL REGULATIONS
Regarding Basic Requirements for Measuring Instruments

General Part

1. These Technical Regulations specify the basic requirements for measuring instruments and the performance of compliance evaluation of such instruments and its parts.

2. Requirements specified in these Technical Regulations are mandatory for implementation by:

- businesses, organizations and individuals – subjects of economic activity that conduct economic activity in development, production, repair, sale and lease of measuring instruments;
- authorized foreign manufacturers, individuals-residents or authorized entities that are responsible for introduction of measuring instruments;
- agencies that have documented proof of necessary qualifications (received authorization in the state metrological system to conduct state tests and verification of measuring instruments) and are appointed, pursuant to requirements of the laws;
- state inspectors of metrological monitoring.

3. Requirements of these Technical Regulations cover the following:

- water meters;
- gas meters and instruments for volume conversion;
- active electric power meters;
- heat meters;
- measuring systems for uninterrupted and dynamic measuring of liquid amount, with the exception of water;
- automatic weighing instruments;
- taximeters;
- material scales;
- coordinate (linear) measuring instruments;
- exhaust gas analyzers.

4. In these Technical Regulations the terms are used in the following meaning:

- automatic discrete weighing dispenser – a weighing device in which a container is filled with material of pre-set and constant mass;
- automatic weighing device – a device that measures a product’s mass without an operator’s intervention based on a previously set program;
- automatic scale for weighing of separated loads – a weighing device that measures the mass of previously separated loads, such as, packed products or singular loads of loose material;
- automatic checkweigher – a weigher for weighing of separate loads, by which the loads of different mass are separated into two or more sub-groups accounting for the value of the difference between their mass and the specified nominal mass;
- exhaust gas analyzer – a measuring instrument that is used for measuring a volume ratio of certain components of exhausted gases of vehicle spark ignition engines, where known water content based on the volume ratio of such components equals the water content in the analyzed sample;
- multi-coordinate measuring device – a measuring instrument designed for coordinate measuring of length, height, and width of the smallest rectangular parallelepiped around an object;
weigher of continuous action for cumulative reporting – an automatic weighing device that continuously measures the mass of material that moves on a conveyor belt, not accounting for systematic separation of specified material and break in belt movement;

discrete weigher for cumulative reporting (weigh hopper for cumulative reporting) – an automatic weighing device, with which loose material is weighed by its separation onto discrete loads, and the successive measuring of the mass of each such load, and the results of measuring and the discrete loads are placed in a container;

weigher with mass labeling – an automatic weigher for weighing of separated loads by means of devices of which a label indicating mass is placed on an object of measuring;

weigher with mass/price labeling – an automatic weigher for measuring of separated loads by means of devices of which a label indicating mass, price and value is placed on a n object of measuring;

reproducibility – degree of proximity of results of successive measurements of the same measurable value that were taken in different places or by different administrators, under the condition that all other requirements for measuring stay constant;

railroad platform scales – an automatic weighing device, equipped with load platform with tracks for moving of railway transport;

length measuring device – a measuring instrument that is used to measure the length of material of a longitudinal nature during its supply in compliance with a technological process;

area measuring device – a measuring instrument designed for the measuring of an area of irregularly shaped material;

conjunction – degree of proximity of the results of successive measurements of the same measurable value that are taken in the same measuring conditions;

value of influence quantity – value at which a received measurement result is considered incorrect;

climate conditions – conditions under which a measuring device can be used;

utilities – services of electrical power, gas, heat and water supply;

coordinate (linear) measuring instrument – a device for length or area measuring or multi-coordinate measuring device;

active electrical power meter – a measuring instrument which measures quantity of used active electrical power;

water meter – an instrument that measures, retains, and reproduces parameters of the water that runs through it;

gas meter – an instrument that measures, retains, and reproduces parameters of the gas that runs through it;

material measure – a measuring instrument that is designed for continuous reproduction and/or retention of one or more values of physical quantity during its use;

material measure of length – a measuring instrument with markings on a scale, the distance between which is specified in actual units of length;

standardized work conditions – value of measurable units and obstacles that if complied with provide normal work conditions for the use of measuring instruments;

obstacle – influence quantity with a value that exceeds the restrictions of the standardized work conditions. The specified quantity is an obstacle if its value in the standardized work conditions is not specified;
taximeter – a measuring instrument that is designed for measurement of travel duration, the calculation and presentation of covered distance and cost of travel taking into account calculated covered distance and/or measured travel duration;

heat meter – a measuring instrument designed for measuring the heat amount that is emitted within a heat-transfer circuit by a heating agent.

Other terms in these Technical Regulations are used in their meaning provided in the Laws of Ukraine “On Standards, Technical Regulations and Procedures of Compliance Assessment,” “On Metrology and Metrological Activity,” and State Standard of Ukraine (DSTU) 2681 “Metrology, Terms and Definitions.”

5. Measuring instruments in the event of their implementation in the sphere of state metrological monitoring are introduced when the following is conducted:

- state testing and approval of a type of measuring instruments designed for serial production in Ukraine or import into the territory of Ukraine in batches, and verification during their production;
- procedures of recognition of test results and approval of a type of measuring instruments – for measuring instruments manufactured in countries that are members of the Agreement on mutual recognition of national references, certificates for calibration and measuring that are issued by national metrological institutes;
- state metrological certification of measuring instruments that are not designated for serial production in Ukraine or their importing into the territory of Ukraine in batches.

Periodic verification, installation, maintenance and repair, particularly dismantling, transportation, and assembly, of measuring instruments, requirements for which are specified in Addendums 1-4 hereto, are carried out at the expense of businesses, organizations and institutions that provide services in supply of power, heat, gas and water.

6. Introduction of measuring instruments is permitted in the legislatively regulated sphere which are compliant with requirements of normative documents that were effective prior to the effective date of these Technical Regulations, prior to the expiration of the certificate for approval of the type of a measuring instrument, or prior to exclusion from the State Registry of the measuring instruments, and in the event of an unlimited effective period of these Technical Regulations, during ten years from the effective date.

   **Requirements for metrological specifications of measuring instruments**

7. When standardized work conditions are complied with and obstacles are absent, measurement error shall not exceed the value of maximum acceptable error that is specified in Addendums 1-10 to these Technical Regulations.

If not stated otherwise in the specified Addendums to these Technical Regulations, the maximum acceptable error is expressed as bilateral value of deviation from conditionally true value of a measured quantity, and is standardized as margins of acceptable error.

8. When standardized work conditions are complied with and obstacles are present, requirements for metrological specifications shall comply with requirements for corresponding measuring instrument that are specified pursuant to Addendums 1-10 to these Technical Regulations.

If a measuring instrument is designed for use in conditions of permanent exposure to an electromagnetic field, the value of its error shall not exceed the value of maximum acceptable error during testing for exposure to an emitted amplitude-modulated electromagnetic field.
9. Manufacturer specifies climate, mechanical and electromagnetic conditions for the use of a measuring instrument, requirements for power supply, and other factors that influence the accuracy of such device, taking into account requirements in Addendums 1-10 to these Technical Regulations.

**Climate, mechanical and electromagnetic conditions**

10. Manufacturer specifies upper and lower margins for temperature in order to account for changes in climate conditions, and, pursuant to items 24 and 25 herein, in compliance with Table 1 if they are not specified in Addendums to these Technical Regulations and conditions under which a measuring instrument can be used, in particular humidity level, the feasibility of condensation, and whether it will be in an open or enclosed area.

<table>
<thead>
<tr>
<th>Temperature Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper margin</td>
</tr>
<tr>
<td>Lower margin</td>
</tr>
</tbody>
</table>

11. Measuring instruments are divided into three types, based on the operating conditions and possibility of vibrations and mechanical shock.

A measuring instrument that is used in conditions of:

- vibrations and insignificant shocks, in particular a measuring instrument assembled with light supporting structure that only receives impact from low level vibrations and shocks from gusts of wind or blows connected to explosions, is type M1;
- vibrations and shocks of significant level, in particular near a motor road or next to heavy machinery, is type M2;
- vibrations and shocks of high or very high levels, for example, when a measuring instrument is installed directly on the mechanism, is type M3.

12. Measuring instruments are divided into three types, based on the external electromagnetic operating conditions: E1, E2, E3, unless otherwise is specified in Addendums 1-10 to these Technical Regulations.

Measuring instruments that are used in:

- residential, commercial and industrial buildings, and production processes that do not create significant electromagnetic obstacles, are type E1;
- industrial buildings, production processes that create significant electromagnetic obstacles, are type E2.

Measuring instruments that are powered by vehicle battery are type E3.

Regarding measuring instruments that are type E3 and also comply with the requirements for the instruments of type E2, additional requirements are:

- reduction of voltage level as a result of connection to the starter motor circuit of an internal combustion engine;
- transient processes that occur due to load reduction in the event of a discharged battery that is disconnected while the engine is operating.
The following external electromagnetic conditions shall be taken into account:

- power supply drop;
- short-term drops of power supply;
- significant fluctuations of voltage and current in power lines and/or signal circuits;
- transient processes in power lines and/or signal circuits;
- electrostatic discharges;
- electromagnetic fields (including those in power lines and/or signal circuits);
- any other values that can significantly influence the accuracy of a measuring instrument.

**Main Rules for the Conduct of Testing and Error Evaluation**

13. If other requirements are not specified in Addendums 1-10 to these Technical Regulations, each influence quantity shall comply with requirements specified in items 7 and 8 herein, under the condition that each such quantity acts, and its effect is estimated, separately, and all other influence quantities remain constant at their nominal value level.

Metrological testing is conducted during or after the influence quantity's impact.

During an influence quantity's act a measuring instrument shall be in its normal working position.

14. If a measuring instrument is designed for use in conditions of damp heat (without condensation) or cyclic damp heat (with condensation), appropriate tests can be conducted.

15. During reproducibility tests and convergence of measurement results, deviations between separate measurement results shall be less than the maximum acceptable error.

16. A measuring instrument shall:

- be sensitive enough, and its threshold sensitivity shall be low enough, to complete the task at hand;
- have a reliable design that prevents hidden defects on measurement results and ensures the stability of its metrological characteristics during the period specified by the manufacturer, under condition that such device is correctly installed, maintained and used, and taking into account requirements of the supporting documentation;
- have features that do not promote its use for illegal purposes;
- be suitable for use for its intended purpose, taking into account working conditions, and shall not need to satisfy unjustified consumer needs.

**Requirements for usability**

17. A measuring instrument designed for measuring time constant quantities, shall take into account possible insignificant changes in value of the measured quantity or be insensitive to such changes.

18. A measuring instrument shall be made of materials that comply with specified conditions for its use, shall have a design that provides for the possibility of compliance assessment and enables monitoring of measuring capacity after introducing such instrument on the market and/or putting it into operation. If necessary, special hardware or a programming product shall be a part of the measuring instrument to perform such monitoring. The test procedure is specified in the supporting documentation.
If a measuring instrument has supporting software that performs functions other than measuring, the software which is critical for metrological specifications is identified and is not influenced by the supplemental software.

**Tamper Protection**

19. The metrological specifications of a measuring instrument shall not be impacted by a connection to it of another device due to the availability of additional features of the other device or any other remote device that is connected by such means.

20. A component of a measuring instrument that affects the instrument’s metrological specifications shall have a design that ensures tamper protection of such component. If necessary, a measuring instrument may be sealed in a manner which would indicate if tampering had occurred.

21. Software that affects metrological specifications, as well as important metrological parameters that are stored or transferred, shall be properly protected from accidental or intentional tampering.

Software identification is performed by means of measuring instrument. Evidence of tampering with software shall be accessible during a period of time identified in technical documentation.

22. Resetting of measurement readings reference to which serves as grounds for payment for utilities, or readings regarding certain supplied quantity of products, or readings in which such quantity is identified and whose reference to which serves as grounds for payment, shall not be permitted during the operation of a measuring instrument.

**Requirements for information that is applied to a measuring instrument or is in the supporting documentation**

23. A trademark, manufacturer’s name and information about the accuracy of a measuring instrument must be applied to the device.

If necessary, terms of use, measuring capacity, measuring range, identification marks, type approval mark, and information about compliance (non-compliance) of supplemental devices that ensure metrological results with these Technical Regulations.

24. If a measuring device is small in size and/or is manufactured from brittle material, applicable information is applied instead to packaging and also specified in supporting documentation.

25. Instructions must accompany a measuring instrument, where the following is specified:

- standardized work conditions;
- type of a specified instrument based on mechanical and electromagnetic conditions;
- conditions of appropriate use and special terms of use;
- rules for assembly, maintenance, repairs and justifiable monitoring;
- conditions for compatibility with interface, parts, joints or other measuring instruments;
- possible ways of incorrect application of the measuring instrument.

If a measuring instrument is introduced into the domestic market, the specified instructions shall be provided in Ukrainian.

Only one copy of the specified instructions shall be provided for a group of identical measuring instruments that are used in the same place or whose results are used for payment for utilities.
26. Value of one graduation of a measuring instrument has value of $1 \cdot 10^n$, $2 \cdot 10^n$ or $5 \cdot 10^n$, where $n$ is any integer or zero, unless otherwise specified in Addendums 1-10 to these Technical Regulations. Unit of measurement or its marking is specified next to a numeric value of a price point.

27. Material measure is marked with a nominal value, or has a scale with applicable unit of measurement.

28. Applied units of measurements and their markings shall comply with applicable legal requirements.

29. Markings and captions that are applied on a measuring instrument in compliance with requirements in items 23 and 24 herein, shall be clear, explicit, and without any corrections.

Requirements for presentation of measurement results

30. Under standardized work conditions for a measuring instrument application, measurement results shall be clearly presented on a displaying device and accompanied by markings and relevant information.

Supplemental readings of a measuring instrument are used when they cannot be accepted as measurement results.

31. Printed copy of measurement results shall be clear and not erasable.

32. When a measurement result is the ground for determination of a commercial transaction value, and one or more parties that participate in such transaction are a consumer or any other party interested in measurement results, and all transaction participants obtain measurement results simultaneously in the same place, a measuring instrument designated for direct commercial transactions shall be used.

33. Measuring instruments designated for direct commercial transactions shall have such design that both parties simultaneously have access to measurement results, under condition of correct installation of the specified instrument. In the event of direct sale, the receipt issued to a consumer by a supplemental device that does not comply with requirements of these Technical Regulations, shall contain relevant restrictive information.

34. Measuring instruments with or without remote reading systems, whose measurement results are used for payments for utilities and metrological monitoring, shall be equipped with an indication system accessible by consumers without any special tools. Data that is read from a displaying device is a measurement result, based on which the price of the provided service is specified.

Requirements for data processing for entering into a trade agreement

35. A measuring instrument that is not a device that is used for payments for utilities shall register by means of a registering device of continuous action a measurement result along with information that provides for the identification of a specific trade agreement in the event when:

- repeated measurement is not conducted;
- measuring instrument is not a device that is used for payments for utilities when one trading party is absent.

36. Additionally, registered measurement results and information concerning the agreement identification shall be accessible on request following measurement completion.

Compliance evaluation procedure

37. Evaluation of compliance of measuring instruments with requirements of these Technical Regulations is performed by businesses and organizations or their individual units that, pursuant to the Law of Ukraine “On metrology and metrological activity,” have documented verification of appropriate level of competence (have received authorization in state metrological system for conducting state testing and verification of measuring
instruments) and are assigned, pursuant to requirements of the Law of Ukraine “On standards, technical regulations and compliance evaluation procedures,” with use of procedures of compliance evaluation modules that are specified in the Technical Regulations for compliance evaluation modules and requirements regarding marking with a national mark of compliance that is used in technical regulations, approved by the decree of the Cabinet of Ministers of Ukraine dated 7 October 2003, No 1585 “On approval of Technical regulations for compliance evaluation modules and requirements regarding marking with national mark of compliance that are used in technical regulations” (Oficійный Вісник України, 2003, No 41, p. 2175; 2007, No 1, p. 31).

38. To conduct evaluation of compliance of measuring instruments with requirements of these Technical regulations and Addendums 1-10 to these Technical Regulations, at a manufacturer’s or his authorized representative’s discretion one of the following module combinations shall be applied: B and F, G and F, or module G.

39. Combination of modules B and F shall be applied by means of state entrance testing and approval of a type of measuring instrument, timely conduct of control tests pursuant to the State Standard of Ukraine DSTU 3400 “Metrology. State testing of measuring instruments. Main provisions, organization, guidelines for conduct and evaluation of results” (module B), and primary check during production pursuant to the DSTU 2708 “Metrology. Verification of measuring instruments. Organization and guidelines for conduct,” as well as when applicable, pursuant to the legislature on periodical verification (module F).

40. When applying combination of modules B and F, the type of measuring instrument shall be included in the State Registry of measuring instruments, have a certificate of type approval (if applicable, a certificate of compliance of measuring instrument with approved type pursuant to requirements of DSTU 3400), certificate of verification pursuant to DSTU 2708, or print of verification brand mark pursuant to DSTU 3968 “Metrology. Verification and calibration brand marks. Rules for manufacturing, application and storage.”

41. Module G is applied by means of state metrological certification of measuring instruments pursuant to DSTU 3215 “Metrology. Metrological certification of measuring instruments. Organization and guidelines for conduct.”

42. During application of module G each measuring instrument shall receive a certificate based on the results of state metrological certification, pursuant to DSTU 3215.

43. A combination of modules G and F shall be applied by means of state metrological certification of measuring instruments pursuant to DSTU 3215 (module G) and if applicable, pursuant to the legislature on periodical verification pursuant to DSTU 2708 (module F).

44. When combining modules G and F, each measuring instrument shall undergo state metrological certification pursuant to items 40 and 41, and a verification certificate issued pursuant to DSTU 2708, or print of a brand mark shall be applied pursuant to DSTU 3968, in the case of sale that exceeds half of the inter-verification interval.

45. Module B is applied when intergovernmental agreements with other countries exist, and after recognition of results of state entrance testing and approval of a type of measuring instrument which is entered into the State Registry of measuring instruments, and when a certificate of recognition of type of measuring instrument is received by a manufacturer or his authorized representative.

46. In the event positive evaluation results of compliance with these Technical Regulations and Addendums 1-10 are received, the manufacturer or its authorized representative shall draft a declaration of compliance pursuant with Addendum 11, mark each measuring instrument and/or its supporting documents with a measuring instrument approval mark pursuant to DSTU 3400 and a national mark of compliance.
The procedure for a national mark of compliance application is used pursuant to the decree of the Cabinet of Ministers of Ukraine dated 29 November 2001, No 1599, “On approval of description and rules of a national mark of approval application.”

47. Evaluation compliance of measuring instruments’ parts that are supplied or can be purchased separately shall be conducted independently from the measuring instrument.

48. During operation, a measuring instrument shall have a verification certificate or a print of a verification mark.

49. Manufacturers shall retain a certificate of type verification and certificate of type compliance for a measuring instrument for ten years after date of issue of its last model.

50. Records and correspondence regarding questions of compliance evaluation shall be in the official language of the country where the authority that performs such evaluation is located, or in a language adopted by such authority.

Requirements for technical documentation

51. To evaluate a measuring instrument’s compliance with the requirements of these Technical Regulations, a manufacturer submits technical documentation for a specified instrument or its type to businesses and organizations specified in item 37 herein.

52. Technical documentation for a measuring instrument contains the following:

- information about the specifics of design, manufacturing and functioning of the device;
- general description of such device;
- working drafts and drafts of parts, accessories, principal and electrical charts;
- requirements for manufacturing process;
- check-list of standards and/or other normative documents, requirements of which are partially or fully applied to the measuring instrument;
- calculation results for design of a measuring device and performance of tests;
- records of tests or other documents for measuring instruments that are components of its design;
- information on operating life of a measuring instrument pursuant to item 1 herein;
- test results needed to confirm compliance of a type and/or a measuring instrument with requirements of these Technical Regulations under normal work conditions and specified environmental effects.

A space shall be provided in the technical documentation for placing a brand mark print and a marking, as well as for descriptions of electronic devices for measuring instrument with drafts and diagrams of processes with explanations, if applicable.

53. If applicable, a manufacturer specifies compatibility conditions of measuring instruments, and methods of interaction between elements and components of individual devices.

Addendum 1

to the Technical Regulations
REQUIREMENTS
for water meters

1. Water meters that are designated for measurement of volume of clean cold or hot water (hereinafter referred to as meters) shall function with the water temperature from 0.1° C to 30° C and/or from 30° C to 90° C inclusively, with relative range of water pressure from 0.03 MPa to 1 MPa (from 0.3 bar to 10 bar) with nominal expenditure with preservation of their metrological specifications, specified in this Addendum.

2. Meters are introduced when marking is applied to them, pursuant to item 13 of this Addendum.

3. For meters that have power sources, pursuant to items 23 and 24 of the Technical Regulations, the nominal value of alternating current voltage and/or ranges of values of voltage source of direct current shall be specified.

4. Values of expenditure range correspond with the following conditions:

   - ratio of nominal expenditure \( Q_3 \) to minimal expenditure \( Q_1 \) is more than or equal 10;
   - ratio of transient expenditure \( Q_2 \) to minimal expenditure \( Q_1 \) is equal 1.6;
   - ratio of excessive expenditure \( Q_4 \) to nominal expenditure \( Q_3 \) is equal 1.25;
   - minimal expenditure \( Q_1 \) is the smallest expenditure of water above which a meter error does not exceed the maximum acceptable error;
   - transient expenditure \( Q_2 \) is the expenditure value between nominal and minimal expenditures that divides expenditures into two sub-ranges: upper and lower. Each band has value of a maximum acceptable error;
   - nominal expenditure \( Q_3 \) is the biggest water expenditure with which the meter functions normally in its continuous or cyclical working regimes while meter error does not exceed acceptable errors;
   - excessive expenditure \( Q_4 \) is the biggest water expenditure with which the meter shall function normally during a short period of time without deterioration;
   - ratio of transient expenditure \( Q_2 \) to minimal expenditure \( Q_1 \) can be 1.5; 2.5; 4 or 6.3 times within five years after the Technical Regulations become effective.

5. Margins of acceptable relative errors in lower sub-range from minimal expenditure \( Q_1 \) (inclusive) to transient expenditure \( Q_2 \) (not inclusive) shall constitute ±5 percent for water temperature levels, specified in item 1 of this Addendum.

6. Margin of acceptable relative error in upper sub-range from transient expenditure \( Q_2 \) (inclusive) to excessive expenditure \( Q_4 \) (inclusive) for water with temperature up to 30° C shall not exceed 2 percent, and for water with temperature over 30° C shall not exceed 3 percent.

7. Response threshold of meters shall constitute no more than half of the minimal expenditure \( Q_1 \).

8. Meter design ensures compliance of the meter with requirements of this Addendum in standardized work conditions.

9. Manufacturer shall specify on measuring instruments or in supporting documentation, pursuant to items 23 and 24 of these Technical Regulations, information on the possibility of measuring with a reverse flow meter, the volume of which is deducted from the volume that was measured during the direct flow of water, or is registered separately. Margins of acceptable error for direct and reverse flow shall be the same. Meters that do not provide for measurement of reverse flow shall have a design that prevents it, or be able to withstand accidental reverse flow without damage or changes of metrological specifications.
10. Design of meter shall ensure:

protection from tampering that can impede functioning of a meter or its metrological specifications;

provision of volume in cubic meters by a meter;

compliance of a meter with requirements of this Addendum after impact of electromagnetic fields. Changes of its metrological characteristics shall not exceed half of acceptable error margin while measuring in upper subrange (pursuant to item 6 herein), and while measuring the nominal expenditure \( Q_3 \), it shall not exceed half of error value during 1 minute;

functioning after impact of electromagnetic fields with metrological specifications, specified in items 5 and 6 herein, and renewal of information, displayed on the meter immediately before such impact;

mean life until failure no less than 10,000 hours;

average mechanical life no less than 12 years.

11. Meter measurement results after testing for durability, taking into account manufacturer specifications, pursuant to item 10 herein, shall not differ from measurement results provided by the meter prior to testing for durability by more than 3 percent of measured volume between minimal expenditure \( Q_1 \) (inclusive) and transient expenditure \( Q_2 \) (not inclusive), and no more than by 1.5 percent of measured volume between transient expenditure \( Q_2 \) (inclusive) and excessive expenditure \( Q_4 \) (not inclusive).

12. Margins of acceptable relative error after testing for durability shall not exceed the following:

±6 percent between minimal expenditure \( Q_1 \) (inclusive) and transient expenditure \( Q_2 \) (not inclusive) for meters designed for measuring of volume of water of any temperature;

±2.5 percent between transient expenditure \( Q_2 \) (inclusive) and excessive expenditure \( Q_4 \) (inclusive) for meters designed for measuring of volume of water with temperature from 0.1°C to 30°C;

±3.5 percent between transient expenditure \( Q_2 \) (inclusive) and excessive expenditure \( Q_4 \) (inclusive) for meters designed for measuring of volume of water with temperature from 30°C to 90°C.

13. On a frame or scale of a displaying device, marking tablet, or permanent meter lid, a marking shall be applied clearly and legibly, shall not wash off, and shall consist of the following:

name or trademark of a manufacturer;

meter reading or meter reading and value of nominal expenditure \( Q_3 \) in the event the nominal expenditure of the meter does not correspond to the numeral value of meter reading;

information regarding loss of pressure in Pa (bar);

information about nominal pressure in Pa (bar) when pressure can exceed 10^6 Pa (10 bar);

one or two arrows on a meter frame to identify the flow direction;

letter "V" if the meter can work appropriately only in the vertical position, or letter "H" if it can work in horizontal position;

year of issue of serial number;

mark of type approval;

state mark of compliance.
14. Meters are equipped with a safety device (seal or lid) which after correct installation of the meter ensures that it is impossible to disassemble or readjust the meter and regulating device without damaging it.

Addendum 2
to the Technical Regulations

**REQUIREMENTS**
for gas meters and volume conversion devices

1. In this Addendum the terms are used in their following meaning:

conversion device - a device that is connected to gas meter, which automatically converts the value measured under conditions of measuring, into a value measured under standard conditions;

minimum expenditure \(Q_{\text{min}}\) - a minimum value of cubical gas expenditure at which the value of maximum acceptable error of a meter does not exceed the acceptable value;

maximum expenditure \(Q_{\text{max}}\) - a maximum value of cubical gas expenditure at which the value of maximum acceptable error and pressure loss of a meter does not exceed the acceptable value;

surplus expenditure \(Q_r\) - the greatest value of cubical gas expenditure at which the meter works without deterioration of specifications during very short periods of time;

transient expenditure \(Q_t\) - a value of cubical gas expenditure at which a change of standardization of maximum acceptable error of a meter takes place;

standard conditions - set conditions for expression of gas volume, independent from measurement conditions, in particular, temperature of 293.15 K, and atmospheric pressure of 101.325 kPa.

2. Manufacturer of gas meters and volume conversion devices (hereinafter referred to as meters and conversion devices) specifies in operation documentation the standardized work conditions of the meter, taking into account the following:

range of measured gas expenditures that corresponds to the values provided in Table 1;

<table>
<thead>
<tr>
<th>Category</th>
<th>(Q_{\text{max}}/Q_{\text{min}})</th>
<th>(Q_{\text{max}}/Q_t)</th>
<th>(Q_r/Q_{\text{max}})</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5</td>
<td>(\geq 150)</td>
<td>(\geq 10)</td>
<td>1.2</td>
</tr>
<tr>
<td>1</td>
<td>(\geq 20)</td>
<td>(\geq 5)</td>
<td>1.2</td>
</tr>
</tbody>
</table>

range of temperature of measured environment should be no less than 40°C.

3. Meter design, expenditure range and maximum working pressure shall comply with requirements of normative documents of the country of destination. Manufacturer shall refer in service documentation to a normative document that contains requirements for physical and chemical indicators of natural gas and information about maximum working pressure.

4. Range of environment temperature change is no less than 50°C.
5. Manufacturer shall specify in service documentation the reference work conditions for meters taking into account nominal value of supply voltage of alternating current and/or the limit value of supply voltage of direct current.

6. Meter errors are determined in accordance with Table 2.

<table>
<thead>
<tr>
<th>Category</th>
<th>1.5</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>$Q_{min} \leq Q &lt; Q_t$</td>
<td>3 percent</td>
<td>2 percent</td>
</tr>
<tr>
<td>$Q_t \leq Q \leq Q_{max}$</td>
<td>1.5 percent</td>
<td>1 percent</td>
</tr>
</tbody>
</table>

Table 2

In the event the error between $Q_t$ and $Q_{max}$ has the same sign, their value shall not exceed 1 percent for category 1.5, and 0.5 percent for category 1.

7. For a meter with built-in temperature conversion device that only displays a volume value modified for reference conditions, the maximum acceptable error of a meter shall increase by 0.5 percent within the temperature range from $+5^\circ C$ to $+35^\circ C$. Beyond this interval, additional errors increase by 0.5 percent for each $10^\circ C$ shall be acceptable.

8. Electromagnetic impact on a meter and a conversion device shall be such that change of a measurement result does not exceed the value of critical change, specified in item 10 herein.

After electromagnetic field impact, a meter and a conversion device shall:
- renew its work with an error no higher than the maximum acceptable error;
- perform all measuring functions;
- ensure updating (saving) of all information that was displayed before electromagnetic impact.

9. Value of critical change of error equals the smallest of the following two values:
- value that corresponds to half the maximum acceptable error within the expenditure range between $Q_t$ and $Q_{max}$;
- value of appropriate maximum acceptable error that relates to measurable volume per one minute at maximum expenditure.

10. Level of impact of fogging of stream during installation of a meter shall not exceed one third of maximum acceptable error.

11. After periodic meter durability testing specified by the manufacturer, the following requirements shall be complied with:

   regarding category 1.5 meters

   value of critical change of error shall not exceed 2 percent relative to initial measurement result for expenditure within the range from $Q_t$ to $Q_{max}$;

   error of reading shall not exceed double the value of maximum acceptable error in the entire range of measurement, pursuant to item 6 herein;
regarding category 1 meter

value of critical change of error shall not exceed one third the value of maximum acceptable error, pursuant to item 6 herein, relative to the initial measurement result;

error of reading shall not exceed maximum acceptable error, pursuant to item 6 herein.

12. A meter that is primarily powered by direct or alternating current is packaged with an emergency power source or other devices that ensure performance of all measuring functions in the event of damage to the main power source.

13. Life span of a meter power source shall be no less than five years. After completion of 90 percent of life span of such a source, adequate warning shall appear.

14. Indicating device of a meter shall have sufficient digits that ensures passing of certain amount of gas through this meter during 8,000 hours for $Q_{\text{max}}$, without readings’ return to its original (zero) value.

15. A meter shall:

function in the event of its installation in compliance with performance manual, pursuant to items 8, 9 and 10 of the Technical Regulations;

be equipped with a device by means of which testing of a meter’s condition is performed;

be hermetic during action of excessive pressure;

satisfy requirements for maximum acceptable error for any of stream directions, or only for the one that is clearly specified on a meter;

be resistant to action of excessive pressure, the value of which is specified in operating documentation for appropriate types of meters.

16. Measured value is expressed in cubic meters.

17. Materials used for a meter and protective coating shall not emit hazardous substances during operation.

18. A meter that has electric coils shall be equipped with an anti-explosion device.

19. For a volume conversion device the same technical requirements are applied as the ones applied to a gas meter. Additionally, the following requirements shall be complied with:

1) a manufacturer specifies standard conditions for value conversion in operating documentation;

2) value of maximum acceptable error * shall be:

* When value of maximum acceptable error of a volume conversion device is calculated, maximum acceptable error of a meter shall not be taken into account.

0.5 percent at environmental temperature 20 ±3° C, humidity 60 ±15 percent, nominal values of power source;

0.7 percent for temperature conversion devices under reference work conditions;

1 percent for other conversion devices under reference work conditions.

20. Electronic conversion device identifies the state when a meter operates beyond its working range (ranges), which is installed by a manufacturer for accuracy measurement parameters. In such case, a conversion device
shall stop integration of a value that is being converted, and separately sum up the value that is being separately converted for the period when such device has been working beyond working range bounds.

Electronic conversion device shall have the possibility to display all necessary measurement data without additional equipment.

21. When bringing into operation, the following requirements shall be complied with:

gas metering in housing and public utilities sphere shall be performed by means of category 1.5 and 1 meters, that have ratios of maximum expenditure to minimum expenditure that equal or are greater than 150 units;
gas metering in commercial organizations and in industrial facilities is performed by category 1 gas meters;
at the discretion of an organization or individual at whose expense a meter is installed, a meter of higher category than the one indicated herein may be used.

Addendum 3
to the Technical Regulations

REQUIREMENTS
for active electric power meter

1. Active electric power meters (hereinafter referred to as meters), designated for use in residential buildings, commercial organizations, and consumer goods industrial facilities, shall be used with external measuring transformers.

2. The following symbols are used herein:

I – current flow that runs through a meter;

I_n – value of current strength that is initial in order to specify meter requirements (hereinafter referred to as nominal current strength);

I_{st} – minimal value of current strength at which a meter registers active electric power with power factor 1 (for multiphase meters, under condition of symmetric load);

I_{min} – value of current strength, above which the value of meter error shall be within margins of values of maximum acceptable errors (for multiphase meters, under condition of symmetric load);

I_{tr} – value of current strength, above which the value of meter error shall be within margins of the lowest maximum acceptable error that corresponds to a meter accuracy category;

I_{max} – the highest value of current strength for which error shall be within the margins of maximum acceptable errors (hereinafter referred to as maximum current strength);

U – voltage that is supplied to a meter;

U_n – value of voltage that is initial for setting meter requirements (hereinafter referred to as nominal voltage);

f – voltage frequency that is supplied to a meter;

f_n – value of frequency that is initial for setting meter requirements (hereinafter referred to as nominal frequency);

PF – power factor that is defined as cosines of difference of phases ϕ between voltage and current (cos ϕ);
ΔE. – value of critical change of meter readings in kW/h.

3. A manufacturer specifies the following:

- meter accuracy category that is designated by letters A, B, or C;
- reference work conditions for meter application n;
- values that designate a meter, in particular the nominal current strength $I_n$, maximum current strength $I_{max}$, nominal frequency $f_n$, and nominal voltage $U_n$. Furthermore, a meter shall comply with conditions specified in Table 1.

<table>
<thead>
<tr>
<th>Current strength</th>
<th>Value of current strength for meters of accuracy category</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td>For meters of direct connection</td>
<td></td>
</tr>
<tr>
<td>$I_{st}$</td>
<td>$\leq 0.05 \cdot I_{tr}$</td>
</tr>
<tr>
<td>$I_{min}$</td>
<td>$\leq 0.5 \cdot I_{tr}$</td>
</tr>
<tr>
<td>$I_{max}$</td>
<td>$\geq 50 \cdot I_{tr}$</td>
</tr>
<tr>
<td>For meters of transformer connection</td>
<td></td>
</tr>
<tr>
<td>$I_{st}$</td>
<td>$\leq 0.06 \cdot I_{tr}$</td>
</tr>
<tr>
<td>$I_{min}$</td>
<td>$\leq 0.4 \cdot I_{tr}$</td>
</tr>
<tr>
<td>$I_n$</td>
<td>$20 \cdot I_{tr}$</td>
</tr>
<tr>
<td>$I_{max}$</td>
<td>$\geq 1.2 \cdot I_n$</td>
</tr>
</tbody>
</table>

Indicators of power quality that are supplied to power consumers, correspond with the following ranges:

- voltage – from $0.9 \cdot U_n$ to $1.1 \cdot U_n$;
- frequency – from $0.98 \cdot f_n$ to $1.02 \cdot f_n$;
- power factor – from $\cos \phi = 0.5$ (inductive) to $\cos \phi = 0.8$ (capacity).

Climate conditions are determined, pursuant to the Technical Regulations.

4. Evaluation of changes of measurable and influence quantities (a, b, c...) is performed separately. Other influence quantities correspond with their nominal values. Measurement error shall not exceed the value of maximum acceptable errors specified in Table 2, and is calculated by formula:
where \( a, b, c \) are components of error of corresponding influence quantities.

Under reference work conditions of use and absence of obstacles during measuring of error value in percentages shall not exceed maximum acceptable error value, in compliance with Table 2.

<table>
<thead>
<tr>
<th>Temperature range</th>
<th>from (+5,^\circ\text{C}) to (+30,^\circ\text{C})</th>
<th>from (-10,^\circ\text{C}) to (+5,^\circ\text{C}) or from (+30,^\circ\text{C}) to (+40,^\circ\text{C})</th>
<th>from (-25,^\circ\text{C}) to (-10,^\circ\text{C}) or from (+40,^\circ\text{C}) to (+55,^\circ\text{C})</th>
<th>from (-40,^\circ\text{C}) to (-25,^\circ\text{C}) or from (+55,^\circ\text{C}) to (+70,^\circ\text{C})</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Meter accuracy class</strong></td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>A</td>
</tr>
<tr>
<td><strong>Single phase meter, multiphase meter under work condition of symmetrical load</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current strength ( I_{\text{min}} \leq I &lt; I_{\text{tr}} )</td>
<td>3.5</td>
<td>2</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Current strength ( I_{\text{tr}} \leq I \leq I_{\text{max}} )</td>
<td>3.5</td>
<td>2</td>
<td>0.7</td>
<td>4.5</td>
</tr>
<tr>
<td><strong>Multiphase meter under work condition of single phase load</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current strength ( I_{\text{tr}} \leq I \leq I_{\text{max}} )</td>
<td>4</td>
<td>2.5</td>
<td>1</td>
<td>5</td>
</tr>
</tbody>
</table>

In the event a meter works in different temperature ranges, the appropriate maximum acceptable error value shall be used.

5. A meter conforms to electromagnetic operation conditions E2 and additional requirements of items 6, 7 and 8 herein.

There are two kinds of obstacles, in particular:

obstacles that act over extended periods of time, and impact the accuracy of meters no more than the value of critical change;
short-term obstacles that can cause temporary deterioration or suspension of meter functioning, and after impact of which a meter resumes its functioning, when error change of a meter is no more than the value of critical change.

If risks of lightning impact are elevated, or power lines are designed as air lines, metrological characteristics of a meter shall be protected.

6. Value of critical changes for obstacles that act over extended period of time are specified in Table 3.

<table>
<thead>
<tr>
<th>Obstacle that impacts a meter</th>
<th>Value of critical change for meters of accuracy categories, percent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td>Reverse sequence of phases</td>
<td>1.5</td>
</tr>
<tr>
<td>Voltage asymmetry (only for multiphase meters)</td>
<td>4</td>
</tr>
<tr>
<td>Harmonic components in current circuits</td>
<td>1</td>
</tr>
<tr>
<td>Constant component and dual harmonic components in alternating current circuits</td>
<td>6</td>
</tr>
<tr>
<td>Rapid transition processes</td>
<td>6</td>
</tr>
<tr>
<td>Magnetic fields; high-frequency electromagnetic field; obstacles that are created by radio-frequency fields</td>
<td>3</td>
</tr>
</tbody>
</table>

7. During and after impact of short-term obstacles, the reference device designated for testing of meter accuracy does not generate impulses or signals that correspond with value of active electrical power more than the value of critical change $\Delta E_{cr}$.

After an obstacle impact a meter shall:
resume operation with an error that corresponds with its maximum acceptable value;
save all measurement functions;
ensure recovery of all measurement information available immediately before obstacle occurrence;
value of change of meter readings shall not exceed value of critical change $\Delta E_{cr}$, that is calculated in kW/h by formula:

$$\Delta E_{cr} = m \cdot U_n \cdot I_{max} \cdot 10^{-6},$$

where $m$ is quantity of measured meter elements.

8. For short-term overload current, the value of critical change shall be 1.5 percent.
9. The largest absolute value of relative error shall not exceed 10 percent, under the condition that voltage level is less compared to lower value of its working range.

10. To present full value of electric power, sufficient number of digits shall be displayed on a meter display in order to prevent return of meter readings to initial value over no less than 4,000 hours, under the condition of a full meter load \((I = I_{\text{max}}, U = U_n\text{ and } PF = 1)\). Display design shall prevent resetting of readings during meter operation.

11. In the event of power shut off, a meter shall save measured value of active electric power for no less than four months.

12. After power connection with no current in current circuit, a meter shall not register electric power with voltage value from \(0.8 \cdot U_n\) to \(1.1 \cdot U_n\).

13. A meter shall register electric power under nominal voltage \(U_{\text{nr}}\), power factor \(PF = 1\) (for multiphase meter, under condition of symmetric load), and current strength that equals \(I_{\text{st}}\).

14. Main unit for value measurements is kW/h or MW/h.

15. For measurements for housing and public utilities sphere, meters of accuracy category A, and in special cases meters of accuracy category B, shall be used.

16. For measurements for commercial sphere and consumer goods industry, meters of accuracy category B, and in special cases meters of accuracy category C, shall be used.

17. Range of current strength of meters shall be specified by the organization that is an electric power supplier.

   1. For electromechanical meters of accuracy category B \(I_{\text{min}} \leq 0.4 \cdot I_{\text{tr}}\).

   2. For electromechanical multiphase meters, range of current strength and for single-phase load is limited by the following values: \(5 \cdot I_{\text{tr}} \leq I \leq I_{\text{max}}\).

Notes.

3. For electromechanical meters, values of critical change shall not be specified for harmonic components in current circuits and constant component and dual harmonic components in alternating current circuits.

---

**REQUIREMENTS**

for heat meters

1. A heat meter is a device that consists of an expenditure converter, a pair of temperature converters, and an evaluator, and is designated for use in administrative or residential buildings, commercial organizations or companies in the consumer goods industry (hereinafter referred to as a heat meter). In the event such parts are integrally connected during their manufacturing, a heat meter is called unitary. In the event the specified parts are connected at an operation site, a heat meter is called aggregate.

2. Value of standardized work conditions shall be specified by a manufacturer.
3. Lower and upper temperature margins shall be specified for a heat conducting medium, within which a heat meter operates with error within its acceptable value.

4. Temperature difference is defined as a difference between the value of temperature of a heat conducting medium at its entry into a heat-transfer loop and the value of temperature of a heat conducting medium at its exit from such loop, under condition that the specified difference is no less than 0° C.

Lower and upper margins for temperature difference shall be specified, within which a heat meter operates with error within its acceptable value, if:

- ratio of upper margin of temperature difference to its lower margin is equal or more than 10;
- value of lower margin of temperature difference equals 3 K, or 5 K, or 10 K.

5. To ensure pressure of a heat conducting medium, maximum excessive internal pressure shall be specified, which a heat meter can constantly maintain under upper temperature margin.

6. The highest expenditure value that is acceptable for long and short periods of time, and the lowest expenditure value under which a heat meter operates in compliance with technical documentation, are specified for a heat conducting medium expenditure. Moreover, the ratio of the highest expenditure value that is acceptable during a long period of time to the lowest expenditure value shall equal or be more than 10 K.

7. Upper margin for heat current shall be specified, under which a meter functions properly.

8. Accuracy categories 1, 2, and 3 shall be established for heat meters.

9. Margins for acceptable error value for simple and complex heat meters that are expressed in percentages of real value, with $E_f$, $E_t$, $E_c$, for the following accuracy categories equal:

   1. $E = E_f + E_t + E_c$;
   2. $E = E_f + E_t + E_c$;
   3. $E = E_f + E_t + E_c$.

10. The following impact of electromagnetic obstacles is specified for heat meters:

    - a heat meter shall not be under the impact of a constant magnetic and electromagnetic frequency field of an electrical grid;
    - impact of electromagnetic obstacles shall be such that change of measurement result is no more than the value of critical change, pursuant to item 11 of this Addendum.

11. Value of critical change for unitary heat meter equals the absolute value of margins of acceptable error, applied to a heat meter.

12. After durability testing a unitary heat meter or components of aggregate heat meter shall meet the following criteria:

    - for expenditure converters, change of measurement result after durability testing, compared to initial measurement result shall not exceed the value of critical change;
    - for temperature converters, change of measurements result after durability testing, compared to initial measurement result, shall not exceed 0.1° C.
13. A heat meter shall be marked with information about accuracy category, expenditure margins, temperature margins, margins of temperature difference, place for installation of expenditure converter (direct or reverse flow), as well as indicator of flow direction.

14. Requirements of these Technical Regulations shall be applied to components manufactured by the same manufacturer or different manufacturers. In the event a heat meter consists of component parts, essential requirements for a heat meter shall be also applied to the specified parts. Additionally, requirements of items 15-25 of this Addendum shall be applied.

15. Relative margins of value of maximum acceptable error for expenditure transformer of the following accuracy category:

1 - \( E_f = \pm (1 + 0.01 \cdot q_p / q) \), but no more than \( \pm 5 \) percent;
2 - \( E_f = \pm (2 + 0.02 \cdot q_p / q) \), but no more than \( \pm 5 \) percent;
3 - \( E_f = \pm (3 + 0.05 \cdot q_p / q) \), but no more than \( \pm 5 \) percent,

where \( E_f \) is an error, by means of which ratio between initial expenditure converter signal and mass or volume is established;

\( q_p \) is the highest value of expenditure that is acceptable during a long period of time under which a meter functions correctly (cubic meters per hour);

\( q \) is expenditure level within expenditure measurement range (cubic meters per hour).

16. Relative margins of value of maximum acceptable error of a pair of temperature converters, expressed in percentages, are calculated by the following formula:

\[ E_t = \pm (0.5 + 3 \cdot \Delta \Theta_{\text{min}} / \Delta \Theta), \]

where \( E_t \) is an error between measured value and real value of the ratio between initial signal of a pair of temperature converters and temperature difference;

\( \Delta \Theta_{\text{min}} \) is a lower margin of temperature difference, above which a heat meter functions with an error within acceptable value margins (K);

\( \Delta \Theta \) is a value of temperature difference within the measurement range of temperature difference (K).

17. Relative margins of value of maximum acceptable error of an evaluator, expressed in percentages, are calculated by the following formula:

\[ E_c = \pm (0.5 + \Delta Q_{\text{min}} / \Delta \Theta), \]

where \( E_c \) is an error, by means of which a connection between measured value and real value of heat amount is established.

18. Value of critical change for a component part of a heat meter equals its corresponding absolute maximum acceptable value of error, applied to the specified component part, pursuant to items 15, 16 and 17 of this Addendum.

19. An expenditure converter shall be marked with information about accuracy category, expenditure and temperature margins, nominal coefficient of a meter (for example, liter per impulse), or corresponding initial signal, as well as indication of a flow direction.

20. A temperature converter shall be marked with information about nominal static characteristics (for example, Pt100), temperature margins, margins of temperature differences.
21. An evaluator shall be marked with information about nominal static characteristic of temperature converters, temperature margins, temperature difference margins, no minal meter coefficient (for example, liter per impulse), or the corresponding initial signal that comes from the expenditure converter, location of expenditure converter (direct or reverse flow direction).

22. A heat meter of accuracy category 3 is used for measurement of heat amount consumed in public and residential buildings, apartments in particular.

23. A heat meter of accuracy category 2 is used for measurement of heat amount consumed in commercial organizations and companies in consumer goods industry.

24. At the discretion of an organization or individual, at the expense of which a heat meter is installed, a heat meter of accuracy category 1 or 2 shall be used when pursuant to item 22 of this Addendum, and a heat meter of accuracy category 1 shall be used when pursuant to item 23 of this Addendum.

25. To measure heat amount that was consumed at a particular site with accuracy specified in items 22 -24 of this Addendum, a supplier or individual that is officially appointed to install a heat meter, shall select heat meters with specifications pursuant to items 3 -7 of this Addendum, that comply with operation requirements on a specific site.

**Addendum 5**

**to the Technical Regulations**

**REQUIREMENTS**

for measuring systems for continuous and dynamic measurement of amounts of liquids, except water

1. A system for continuous and dynamic measurement of liquids except water (hereinafter referred to as measuring system), shall consist of the following:

- meters;
- secondary converters;
- measurements result indication devices;
- additional measuring devices;
- secondary devices for recording of parameters of influence quantity.

2. Herein, the terms are used in their following meaning:

- expenditure range is a range between the smallest expenditure value ($Q_{min}$) at which a meter ensures a reading that is compliant with requirements for maximum acceptable error value and the largest expenditure value ($Q_{max}$) at which a meter functions properly without deterioration of specifications during a short period of time;
- additional measuring device is a device that is connected to an evaluator for measuring of values that determine properties of liquids in order to enter correction and/or conversion;
- meter is a device designated for continuous measuring, storing, and reproduction of liquid quantity that runs through a measuring converter in closed and fully filled ducts, under conditions of measurement;
- minimum measured quantity is a minimum quantity of liquid, for which measurement is metrologically appropriate for measuring system;
evaluator is a meter part that receives an initial signal from the measuring converter and/or connected measuring devices, and reproduces their results;

continuity/discontinuity – a measuring system is considered continuous/discontinuous if liquid flow can/cannot be promptly stopped, respectively;

converting device is a part of an evaluator that consists of necessary measuring devices and automatically converts results of volume measurement and/or mass of liquid into volume and/or mass of such liquid under reference conditions. When this happens, the properties of the liquid shall be taken into account;

self-service device is a special device that is a part of self-service system and lets a measuring system function in the self-service system;

direct reading is a reading of volume or mass that corresponds with the measurement that a meter can measure;

fuel distributor is a measuring system that is designated for fueling of motorized devices, small ships and planes;

self-service system is a provision of services in provision to consumers for use of a measuring system by them in order to receive liquid for their own needs;

standard conditions are specified conditions in which an amount of liquid is converted under conditions of measurement.

3. Manufacturer specifies the following work conditions for a measuring system 1:

expenditure range of such system shall be within expenditure ranges of each of its elements, a meter in particular, and ratio of expenditure margins of a meter and measuring system shall correspond with Table 1;

<table>
<thead>
<tr>
<th>Special measuring systems</th>
<th>Liquid Name</th>
<th>Minimum ratio of the smallest and the biggest expenditure values, $Q_{\text{max}}/Q_{\text{min}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel distributor</td>
<td>droplet gas</td>
<td>10/1</td>
</tr>
<tr>
<td></td>
<td>droplet gas</td>
<td>5/1</td>
</tr>
<tr>
<td>Measuring system for cryogenic liquids</td>
<td>cryogenic liquid</td>
<td>5/1</td>
</tr>
<tr>
<td>Measuring system that is used on pipelines for ship loading</td>
<td>all liquids</td>
<td>as applicable under terms of use</td>
</tr>
<tr>
<td>Other measuring systems</td>
<td>all liquids</td>
<td>4/1</td>
</tr>
</tbody>
</table>

properties of liquid, that are measured using the specified system, specifying name or type of liquid or its specifications, in particular range of temperatures, pressure, density, viscosity, nominal value of voltage of an alternating current source and/or value margin of voltage of direct current, standard conditions for convertible values.
4. Measuring systems for use in pipelines shall have accuracy category 0.3.

Distributor of liquid fuel (except columns for droplet gas), systems that are used in tank trucks for measuring of the amount of low-viscosity liquid, systems of measuring of amount of liquid that are used during unloading of tankers (ships), railway tank wagons and tank cars, measuring systems of milk amount, systems of measuring of amount of liquid that are used during loading of ships, and systems of measuring of amount of liquid that are used during fueling of planes shall be accuracy category 0.5.

Systems of measuring of amount of droplet gas under pressure with temperature that equals or is higher than \(-10^\circ\) C, shall have accuracy category 1.

Systems of measuring of amount of liquids of usual accuracy categories 0.3 or 0.5 that are used for the following liquids:

- with temperature below \(-10^\circ\) C or above \(+50^\circ\) C;
- dynamic viscosity of which is not more than 1000 MPa/sec;
- maximum volume velocity of the flow of which does not exceed 20 liters per hour, also belong to the accuracy category 1.

Systems of measuring of amount of droplet carbon dioxide, droplet gases under pressure with temperature below \(-10^\circ\) C, except cryogenic liquids, shall be accuracy category 1.5.

Systems of measuring of amount of cryogenic liquids with temperature below \(-153^\circ\) C shall be accuracy category 2.5.

For volumes of liquid above 2 liters, values of maximum acceptable error are presented in Table 2.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Accuracy category</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.3</td>
</tr>
<tr>
<td>Measuring systems</td>
<td>0.3 percent</td>
</tr>
<tr>
<td>Meters</td>
<td>0.2 percent</td>
</tr>
</tbody>
</table>

For volumes of liquid not exceeding 2 liters, values of maximum acceptable relative error are presented in Table 3.

<table>
<thead>
<tr>
<th>Volume of liquid that is being measured (V)</th>
<th>Value of maximum acceptable relative error</th>
</tr>
</thead>
<tbody>
<tr>
<td>V &lt; 0.1 l</td>
<td>4, multiplied by value specified in Table 2 and brought to 0.1 l</td>
</tr>
<tr>
<td>0.1 l ≤ V ≤ 0.2 l</td>
<td>4, multiplied by value specified in Table 2</td>
</tr>
<tr>
<td>0.2 l ≤ V &lt; 0.4 l</td>
<td>2, multiplied by value specified in Table 2 and brought to 0.4 l</td>
</tr>
<tr>
<td>Volume Range</td>
<td>Relative Error Calculation</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>$0.4 \leq V &lt; 1$ l</td>
<td>$2$, multiplied by value specified in Table 2</td>
</tr>
<tr>
<td>$1 \leq V &lt; 2$ l</td>
<td>Value specified in Table 2 and brought to $2$ l</td>
</tr>
</tbody>
</table>

Independently from a type of measured value, value of maximum acceptable relative error is selected from the highest from the following:

- Absolute value of maximum acceptable relative error specified in tables 2 or 3, or
- Absolute value of maximum acceptable relative error for minimum measured amount of liquid ($E_{min}$).

For minimum volume of measured liquid that comprises 2 or more liters, the following conditions are applied:

- $E_{min}$ is determined by formula:
  \[ E_{min} \geq 2 R, \]
  where $R$ is the lowest value of a point of referencing device,
  or by formula:
  \[ E_{min} = (2MMA) \cdot (A/100), \]
  where $MMA$ is the minimum measured amount of liquid;
  $A = 0.3; 0.5; 1; 1.5$ and $2.5$ percent, in compliance with Table 1.

For minimum volume of measured liquid that equals $2$ liters, condition 1 is applied, where $E_{min}$ equals a double value of maximum acceptable relative error, specified in Table 3, taking into account the value of the “Measuring system” position of Table 2.

In the event a converted reading is received, values of maximum acceptable relative error are presented in the “Measuring system” position” of Table 2.

Value of maximum acceptable relative error of converted readings that are evaluated by converting device, shall equal the difference between the values of error of system and meter, specified in Table 2.

Component parts of converting devices may be tested separately.

Values of maximum acceptable relative errors of values that are used for calculation, equal $0.1$ of value of maximum acceptable relative error, specified in the “Measuring system” position of Table 2.

Accuracy of additional measuring devices is determined in compliance with Table 4.

Table 4

<table>
<thead>
<tr>
<th>Type of physical value</th>
<th>Accuracy categories of measuring system</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.3</td>
</tr>
<tr>
<td>Temperature</td>
<td>$\pm 0.3^\circ C$</td>
</tr>
</tbody>
</table>
Pressure

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>lower than 1 MPa ± 50 KPa</td>
<td></td>
</tr>
<tr>
<td>from 1 to 4 • Pa ± 5 percent</td>
<td></td>
</tr>
<tr>
<td>more than 4 • P • ± 200 KPa</td>
<td></td>
</tr>
</tbody>
</table>

Density

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Values specified in the table are used for reproduction of amounts of liquids by transforming devices.

Value of maximum acceptable relative error of calculation of each value of liquid shall equal 0.4 of the value specified in Table 3.

Requirements for accuracy of an evaluator shall be applied to all calculations.

5. As a result of electromagnetic impact on a measuring system, the measurement result shall not exceed the critical value specified in item 6, or such result shall not be not recorded, stored or transferred as a measurement result in the event of its momentary change. For a measuring system with an interrupted flow of liquid, this means that it is impossible to conduct measurement or surpass the critical value by measurement result. In such case, the measuring system ensures receipt of measurement results immediately prior to emergence of critical value of measurement result, and automatically shuts off the flow of liquid.

6. Critical value of change is the value that exceeds one fifth the value of maximum acceptable error for certain measured amount of liquid or for minimum measured amount of liquid ($E_{\text{min}}$).

7. After testing for durability by the specified deadline, deviation of measurement result relative to initial measurement result shall not exceed the values for meters specified in the “Meters” position of Table 2.

8. For any amount of liquid of the same measurement, readings received by means of various converting devices shall not differ from each other by more than value of one point, under the condition that converting devices have the same value of a point.

In the event the specified converting devices have different values of a point, the difference of readings shall not exceed the highest value of a point.

For self-service systems, value of a point of a primary converting device of a measuring system and the value of a point of a self-service device are the same, and measurements results shall not differ.

9. It is impossible to reject a measured value under normal operation conditions, if it is not obvious.

10. Presence of air or gas in the liquid does not lead to changes of error value by more than 0.5 percent for liquids, except the drinking ones, and for liquids with viscosity density no higher than 1 MPa/sec, or by 1 percent for drinking liquids or for liquids with density over 1 MPa/sec.

A change of error value that is not less than 1 percent of the minimum measured amount of liquid, which is used when air or gas inclusions are present in the liquid, shall be acceptable.

11. A measuring system that is used for direct sale is equipped with a device that resets reproduced readings down to zero.

12. Reproduction of the specified amount of measured liquid if an agreement for direct sale is in effect shall be maintained as constant until all parties to the agreement are notified of the measurement result.

A measuring system that is used for direct sale shall be discontinuous.
13. Presence of air or gas in the liquid shall not lead to a change of error value, specified in item 10 herein.

14. During measuring, reproduction devices of fuel distributors shall not reset readings down to zero.

Prior to resetting of a preceding reading down to zero, the next measurement shall not be performed.

15. In the event a measuring system is equipped with a display showing the cost, differences between displayed and calculated costs with allowance for price per unit of displayed amount of liquid shall not exceed the cost that corresponds with the minimum measured amount of liquid $E_{\text{min}}$.

Difference between displayed and calculated cost equals the rated value of the smallest coin of a state where a measuring system is used.

16. A measuring system is equipped with a source of electrical power that provides for performance of all measuring functions in the event of an accident or interruption of supply from the network, or is equipped with devices for storage or reproduction of current data by means of which transaction may be completed, and devices for interruption of flow at the moment of interruption of electrical power supply from network.

17. Volume and amount of liquid are measured in milliliters, cubic centimeters, liters, cubic meters, grams, kilograms, or tons.

$^1$ Manufacturer may specify the highest accuracy category for a particular type of measuring system.

Notes.

$^2$ Use of measuring system of accuracy category 0.3 or 0.5 is acceptable during unloading (loading) of ships and railroad or truck tanks with mineral oil.

Addendum 6 to the Technical Regulations

**REQUIREMENTS**

for automatic weighing devices

1. Manufacturer of automatic weighing devices (hereinafter referred to as devices) that are designated for determining body mass by means of using force of gravity affecting such body, shall specify standardized work conditions for such device.

2. A range of measurement of a device shall be specified for the measured value: the highest (max) and the lowest (min) margins of weighing (batching).

3. The following is specified for electrical influence quantities when electrical power is supplied from a circuit:
   - alternating current - is a nominal value of voltage of alternating current or marginal values of such voltage;
   - direct current is a nominal and minimum value of voltage of direct current or marginal values of such voltage.

4. For mechanical and climate conditions:
   - minimum value of the range between working temperature margins shall be $30^\circ\text{C}$, if not otherwise specified in other items herein;
categories of external mechanical impacts specified in item 11 of the Technical Regulations shall not be applied to automatic weighing devices. For devices that are used in especially strenuous conditions (for instance, devices that are built into a vehicle), a manufacturer shall specify mechanical conditions for application.

5. For other influence quantities, if any, a manufacturer shall specify the following:

productive efficiency;

properties of material that is to be weighed (batched).

6. Acceptable values of reading change of automatic weighing devices as a result of impact of obstacles, in particular electromagnetic impact, are specified for each type of devices in items 25, 35, 45, 53 and 63 herein.

7. Limitation of impact of incline, load and productive efficiency shall be provided, with which in the event of normal performance of a device the value of maximum acceptable error shall not exceed the specified values.

8. A device is equipped with power devices that, under conditions of normal performance of a device, prevent excess of maximum acceptable error and design of which suits properties of material that is being measured (batched).

9. Interface of a device shall be simple and effective.

10. Possibility of testing for accuracy of readings and setting of readings to zero by an operator shall be provided, so that under conditions of normal performance of a device, value of maximum acceptable error is not exceeded.

11. In the event the result that is beyond measuring range can be sent to a printing device, the specified result shall be appropriately identified.

**Automatic weigher for weighing separated loads**

12. Automatic weigher is divided into main categories that are marked with the letter “X” or “Y”, and are specified by a manufacturer.

13. Main categories are divided into four accuracy categories: XI, XII, XIII, XIV - Y(I), Y(II), Y(a), Y(b), that are specified by a manufacturer.


Accuracy categories are supplemented with coefficient (x), by means of which the maximum acceptable mean value of quadratic deviation, specified in item 17 herein, is determined.

A manufacturer shall specify coefficient (x), which shall be \( \leq 2 \) and is specified by formula:

\[
1 \cdot 10^k, 2 \cdot 10^k \text{ or } 5 \cdot 10^k,
\]

where \( k \) is any negative integer or zero.

15. Category Y is applied to all other automatic weighers that are used for weighing of separated loads.

16. Maximum acceptable mean value of error of category X devices and value of maximum acceptable error of category Y devices are presented in Table 1.
<table>
<thead>
<tr>
<th>Net load (m), specified by price of a check unit of a scale (e)</th>
<th>Maximum acceptable mean error value</th>
<th>Value of maximum acceptable error</th>
</tr>
</thead>
<tbody>
<tr>
<td>XI</td>
<td>Y(I)</td>
<td>XII</td>
</tr>
<tr>
<td>0 &lt; m ≤ 50000</td>
<td>0 &lt; m ≤ 5000</td>
<td>±0.5 e</td>
</tr>
<tr>
<td>50000 &lt; m ≤ 200000</td>
<td>5000 &lt; m ≤ 200000</td>
<td>±1 e</td>
</tr>
<tr>
<td>20000 &lt; m</td>
<td>20000 &lt; m ≤ 100000</td>
<td>±1.5 e</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>XIII</th>
<th>Y(a)</th>
<th>XIV</th>
<th>Y(b)</th>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 &lt; m ≤ 500</td>
<td>0 &lt; m ≤ 50</td>
<td>±0.5 e</td>
<td>±1 e</td>
<td></td>
<td></td>
</tr>
<tr>
<td>500 &lt; m ≤ 2000</td>
<td>50 &lt; m ≤ 200</td>
<td>±1 e</td>
<td>±1.5 e</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000 &lt; m ≤ 10000</td>
<td>200 &lt; m ≤ 1000</td>
<td>±1.5 e</td>
<td>±2 e</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

17. Maximum acceptable value of mean quadratic deviation for automatic weighers of accuracy category X (x) corresponds with multiplication of coefficient (x) by value, presented in Table 2 for coefficient (x) = 1.

<table>
<thead>
<tr>
<th>Net load (m)</th>
<th>Maximum acceptable value of mean quadratic deviation for accuracy category X(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>m ≤ 50 g</td>
<td>0.48 percent</td>
</tr>
<tr>
<td>50 g &lt; m ≤ 100 g</td>
<td>0.24 gram</td>
</tr>
<tr>
<td>100 g &lt; m ≤ 200 g</td>
<td>0.24 percent</td>
</tr>
<tr>
<td>200 g &lt; m ≤ 300 g</td>
<td>0.48 gram</td>
</tr>
<tr>
<td>300 g &lt; m ≤ 500 g</td>
<td>0.16 percent</td>
</tr>
<tr>
<td>500 g &lt; m ≤ 1,000 g</td>
<td>0.8 grams</td>
</tr>
<tr>
<td>1,000 g &lt; m ≤ 10,000 g</td>
<td>0.08 percent</td>
</tr>
<tr>
<td>10,000 g &lt; m ≤ 15,000 g</td>
<td>8 gram</td>
</tr>
</tbody>
</table>
Coefficient (x) shall be:
less than 1 for accuracy categories XI and XII;
no more than 1 for accuracy category XIII;
more than 1 for accuracy category XIV.

18. Value of a price check scale graduation (e) and number of check scale graduations (n) for single-interval devices are specified in Table 3.

<table>
<thead>
<tr>
<th>Accuracy categories</th>
<th>Value of a check scale graduation for single-interval devices, e</th>
<th>Number of check scale graduations, n</th>
</tr>
</thead>
<tbody>
<tr>
<td>XI Y(I)</td>
<td>0.001 g ≤ e</td>
<td>50,000</td>
</tr>
<tr>
<td>XII Y(II)</td>
<td>0.001 g ≤ e ≤ 0.05 g</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>0.1 g ≤ e</td>
<td>5,000</td>
</tr>
<tr>
<td>XIII Y(a)</td>
<td>0.1 g ≤ e ≤ 2 g</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>5 g ≤ e</td>
<td>500</td>
</tr>
<tr>
<td>XIV Y(b)</td>
<td>5 g ≤ e</td>
<td>100</td>
</tr>
</tbody>
</table>

19. Value of a check scale graduation (e) and number of check scale graduations (n) for multi-interval devices are specified in Table 4.

<table>
<thead>
<tr>
<th>Accuracy categories</th>
<th>Value of a check scale graduation for multi-interval devices, e_i</th>
<th>Number of check scale graduations, n</th>
</tr>
</thead>
</table>

Minimum and maximum values are calculated by for mulas

\[ \text{minimum value}^3 \quad \text{maximum value} \]

<table>
<thead>
<tr>
<th></th>
<th>minimum value</th>
<th>maximum value</th>
</tr>
</thead>
<tbody>
<tr>
<td>XI Y(I)</td>
<td>0.001 g &lt; e_i</td>
<td>50,000</td>
</tr>
<tr>
<td>XII Y(II)</td>
<td>0.001 g ≤ e_i ≤ 0.05 g</td>
<td>5,000</td>
</tr>
<tr>
<td></td>
<td>0.1 g ≤ e_i</td>
<td>5,000</td>
</tr>
<tr>
<td>XIII Y(a)</td>
<td>0.1 g ≤ e_i</td>
<td>500</td>
</tr>
<tr>
<td>XIV Y(b)</td>
<td>5 g ≤ e_i</td>
<td>50</td>
</tr>
</tbody>
</table>

where i is a partial weighing range (1, 2........r);

r is total number of partial weighing ranges.

20. While determining the measuring range for category Y devices, a manufacturer shall take into account the smallest measuring margin that is no less than:

- 100 e, for accuracy category Y(I);
- 20 e (with 0.001 g ≤ e ≤ 0.05 g) and 50 e (with 0.1 g ≤ e) for accuracy category Y(II);
- 20 e, for accuracy category Y(a);
- 10 e, for accuracy category Y(b);
- 5 e, for sorting weighers (for instance, mail weighers and weighers for weighing trash).

21. A device of dynamic regulation operates within the weighing range specified by the manufacturer.

22. Protection of a device of dynamic regulation, which neutralizes dynamic impacts from load movement and operates within specified weighing range, shall be provided.

23. In the event of influence quantities’ impact on category X devices, the values of maximum acceptable errors are specified:

For automatic operation, in Tables 1 and 2;

For static weighing during non-automatic operation, in Table 1.
24. In the event of influence quantities’ impact on category Y devices, the values of maximum acceptable errors are specified:

for each load in automatic regime, in Table 1;

for static weighing in non-automatic regime, in Table 1 for category X.

25. The acceptable value of change of readings as a result of obstacle impact shall be the value of one check scale graduation.

26. Minimum value of temperature range shall be for the following accuracy category: XI and Y(I) -5°C; XII and Y(II) -15°C.

**Automatic discrete weighing dispensers**

27. A manufacturer specifies a nominal accuracy category and performance accuracy category X (x) of a device.

28. For each type of dispenser a nominal accuracy category shall be specified which corresponds with the highest accuracy for a device of that specific type. After assembly, each device shall be classified based on one or several performance accuracy categories X (x), taking into account properties of material that are being dispensed. Coefficient (x) that characterizes an accuracy category, shall be ≤2 and expressed as $1 \times 10^k$, $2 \times 10^k$ or $5 \times 10^k$, where k is any integer, negative, positive, or zero.

29. Nominal accuracy category is applied to static loads.

30. For performance accuracy category X (x), letter X means a regime of accurate weighing of a load, (x) is a multiplicator for calculation of values of maximum acceptable errors, specified for accuracy category X (a) in item 32.

31. When statically weighing under standard work conditions, value of maximum acceptable error for nominal accuracy category shall be 0.312 of acceptable deviation of mass of each dose from the arithmetic mean value that is specified in Table 5, which is multiplied by coefficient (x) of a corresponding accuracy category.

For devices in which a dose can be made from more than one portion, in particular, an accumulative or selective dose, the value of maximum acceptable error of static weighing shall meet the requirements for accuracy for value of dose mass, specified in Table 5.

32. Maximum acceptable deviations of mass of each dose from mean value of dose is presented in Table 5.

| Dose mass (m), grams | Maximum acceptable deviations of mass of each dose from mean value of dose mass for accuracy category X (1)\
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$m \leq 50$</td>
<td>7.2 percent</td>
</tr>
<tr>
<td>$50 &lt; m \leq 100$</td>
<td>3.6 grams</td>
</tr>
<tr>
<td>$100 &lt; m \leq 200$</td>
<td>3.6 percent</td>
</tr>
<tr>
<td>$200 &lt; m \leq 300$</td>
<td>7.2 grams</td>
</tr>
<tr>
<td>$300 &lt; m \leq 500$</td>
<td>2.4 percent</td>
</tr>
<tr>
<td>-------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>$500 &lt; m \leq 1,000$</td>
<td>12 grams</td>
</tr>
<tr>
<td>$1,000 &lt; m \leq 10,000$</td>
<td>1.2 percent</td>
</tr>
<tr>
<td>$10,000 &lt; m \leq 15,000$</td>
<td>120 grams</td>
</tr>
<tr>
<td>$15,000 &lt; m$</td>
<td>0.8 percent</td>
</tr>
</tbody>
</table>

33. In devices by means of which a value of dose mass can be preset, the largest difference between preset value and the value of mean dose mass does not exceed 0.312 of maximum acceptable deviation of mass of each dose from the mean value of dose mass, presented in Table 5.

34. Value of maximum acceptable error in the event of influence quantities’ impact shall meet the requirements of item 31.

35. Acceptable value of change of readings, received as a result of obstacles’ impact, shall be the value of the device during static load that equals the error specified in item 31, calculated for minimum value of standard dose mass, or reading that can equally impact the value of dose mass for devices in which dose is made from several portions. Calculated acceptable value of change of readings shall be approximated to the closest larger value that is divisible by the value of scale graduation (d).

36. A manufacturer shall specify in technical documentation the minimum value of standard dose mass.

**Discrete weigher for cumulative accounting (hopper weigher for cumulative accounting)**

37. Devices are divided into four accuracy categories: 0.2; 0.5; 1; 2.

38. Value of maximum acceptable error of cumulative load shall be for the following accuracy category:

- 0.2 - ±0.1 percent;
- 0.5 - ±0.25 percent;
- 1 - ±0.5 percent;
- 2 - ±1 percent.

39. Value of a scale graduation ($d_t$) shall be from 0.01 percent to 0.2 percent of the smallest margin of loading (dosage).

40. Minimum cumulative capacity is such that value of maximum acceptable error equals value of scale graduation and constitutes no less than minimum capacity, specified by a manufacturer.

41. A device in which readings are not reset to zero after each load, shall have a mechanism for resetting of readings to zero. Automatic regime of work shall stop if readings differ from zero by:

- $1 \, d_t$, for devices with mechanism for automatic resetting to zero;
- $0.5 \, d_t$, for devices with mechanism of half-automatic or non-automatic resetting to zero.
42. It shall be technically impossible for an operator to reset readings to zero during automatic work of a device.

43. In devices, equipped with printing mechanism, a nulment of a summary occurs only after such summary is printed out, in particular under condition of interruption of the automatic regime.

44. Value of maximum acceptable error in the event of impact of intervening values shall be for the following loads:

- from 0 \( d_i \) to 500 \( d_i \) - \( \pm 0.5 \ d_i \);
- from 500 \( d_i \) to 2,000 \( d_i \) - \( \pm 1 \ d_i \);
- from 2,000 \( d_i \) to 10,000 \( d_i \) - \( \pm 1.5 \ d_i \).

45. The acceptable value of change of readings received as a result of an obstacle’s impact, shall be one value of scale graduation for any value of mass and any accumulated cumulative value.

**Continuous weigher for cumulative accounting**

46. Devices are divided into the following accuracy categories: 0.5; 1; 2.

47. A manufacturer shall specify a measuring range, a ratio between minimum useful load for load node and maximum acceptable load, as well as the minimum cumulative load.

48. The minimum cumulative loads shall be for the following accuracy categories:

- 0.5 \( \geq \) 800 \( d \);
- 1 \( \geq \) 400 \( d \);
- 2 \( \geq \) 200 \( d \),

where \( d \) is a value of the scale graduation of the main cumulative accounting device.

49. The value of the maximum acceptable error of cumulative load shall be for the following accuracy category:

- 0.5 \( \pm 0.25 \) percent;
- 1 \( \pm 0.5 \) percent;
- 2 \( \pm 1 \) percent.

50. A manufacturer shall specify motion speed for a conveyor belt. For single-speed conveyor weighers and conveyor weighers with changing speeds that have manual controls, speed does not differ by more than 5 percent of its nominal value. Speed of motion of material shall not differ from motion speed of a conveyor belt.

51. Repeated resetting of readings of the main device of cumulative accounting to zero shall be technically impossible.

52. The value of maximum acceptable error in the event of influence quantities’ impact for load, shall be 0.7 of the corresponding value, specified in item 49 and approximated to the closest value, that is divisible by a value of scale graduation.

53. The acceptable value of change of readings, received as a result of obstacles’ impact, shall be 0.7 of the corresponding value, specified in item 49 for load, the value of which corresponds with the minimum cumulative load for the corresponding accuracy category that is approximated to the closest value that is divisible by a value of scale graduation.
Railroad platform weighers

54. Devices are divided into four accuracy categories: 0.2; 0.5; 1; 2.

55. The value of maximum acceptable error during weighing during movement of one wagon or train in general shall be for the following accuracy categories:

- 0.2 - ±0.1 percent;
- 0.5 - ±0.25 percent;
- 1 - ±0.5 percent;
- 2 - ±1 percent.

56. The value of maximum acceptable error during weighing during movement of connected or disconnected wagons shall correspond with the highest value of the following values:

- The value that is calculated in compliance with item 55 herein and is approximated to the closest value that is divisible by a value of scale graduation;
- The value that is calculated in compliance with item 55 herein for mass of an individual wagon that comprises 53 percent of maximum mass of a wagon, in compliance with marking, and is approximated to the closest value that is divisible by value of scale graduation;
- One value of scale graduation (d).

57. The value of maximum acceptable error during weighing of a train shall be corresponding with the highest such value:

- Value that is calculated in compliance with item 55 herein and is approximated to the closest value that is divisible by scale graduation;
- Value that is calculated in compliance with item 55 herein for mass of an individual wagon that constitutes 35 percent of maximum mass of a wagon, in compliance with marking, multiplied by a number of check train wagons (no more than 10) and approximated to the closest value that is divisible by a value of scale graduation;
- One value of scale graduation for each train wagon, but no more than 10 d.

58. During weighing of connected wagons, standardized errors that do not exceed 10 percent of total number of weighing results received during one or several train rides, can exceed a corresponding value of maximum acceptable error, specified in item 55 herein, but shall not exceed a double value of the specified error.

59. Value of scale graduation shall be for the following accuracy category, in kilograms:

- 0.2 - ≤ 50;
- 0.5 - ≤ 100;
- 1 - ≤ 200;
- 2 - ≤ 500.

60. The smallest mass of weighing by railroad platform weigher shall be no less than 1 ton and no more than the value received during the division of minimum mass of a wagon into the number of weighings in parts (by axles, or carts).
61. Minimum mass of empty or loaded wagon that is being weighed shall be no less than 50 d.

62. The value of maximum acceptable error in the event of influence quantities’ impact shall be for loading:
from 0 to 500 d - ±0.5 d;
from 500 d to 2,000 d - ±1 d;
from 2,000 d to 10,000 d - ±1.5 d.

63. The acceptable value of change of readings received as a result of an obstacles’ impact, shall be one value of scale graduation.


3 For \( i = r \) the corresponding column in Table 3 is applied, where all \( e \) are changed into \( e_r \).

4 Calculated deviation of mass of each dose from mean value of dose mass can be corrected, taking into account mass of particles of a material.

Notes.

Addendum 7
to the Technical Regulations

REQUIREMENTS
for taximeters

1. Taximeters that perform fiscal functions as electronic registers shall comply with the Law of Ukraine dated 6 July 1995 No 265 “On Use of Registers of Payment Transactions in Sales, Catering and Services” and the Technical Regulations for electronic taximeters, approved by the decision of the Head of State Commission on Introduction of Electronic Systems and Control Devices and Management of Goods and Money Turnover attached to the Cabinet of Ministers of Ukraine, dated 17 May 2004, No 3. Requirements of this Addendum shall not apply to a remote control signal generator.

2. The terms herein shall be used in the following meaning:

fare is a sum that needs to be paid for travel and depends on fixed payment and/or distance and/or duration of travel. Additional services are not included in the fare;

normal calculation method S (single use of rate) is the calculation of fare using the time rate for a speed that is lower than the transitional speed and the distance rate for a speed that is higher than transitional speed;

normal calculation method D (double use of rate) is the calculation of a fare simultaneously using the time rate and the distance rate for an entire trip;

transitional speed is the speed determined by dividing the time rate value by the distance rate value;
operation mode is the mode in which the taximeter performs its appropriate functions.

In operation mode “Vacant”, the fare calculation function is turned off.

In operation mode “Occupied” the fare calculation is based on the rate for the distance covered and/or time of travel with possible prepayment.

In operation mode “Stop” the fare is shown on the display, while the fare calculation function based on the time rate is turned off.

3. A taximeter provides:

calculation of distance and measurement of travel duration;
calculation and display of fare, which increases in operation mode “Occupied”;
display of total fare in operation mode “Stop”; 

maintenance of maximum acceptable error without additional regulation during one year of reliable operation.

4. A taximeter provides calculation with single (S) and double (D) use of rate and a choice between specified methods by reliably switching the rate and display:

by means of protected interfaces of operation modes “Vacant,” “Occupied” or “Stop;”

information in compliance with item 17 herein;

general information, including information about the remote signal generator, sealing date, identification number of a taxi, actual time and rate identification;

information on entering a payment for travel, including information about full payment, fare, calculation of fare, additional payment, date, time of start and end of travel, distance covered by taxi and rate.

Additional devices may be connected to taximeters by means of an interface. In the absence of such devices or their improper performance, it is possible to block the connection of additional devices by means of the automatic operation of a taximeter.

It is also possible to install system regulation of taximeter by means of a remote signal generator that is tamper resistant.

5. External mechanical performance conditions class M3 shall be applied to taximeters.

6. Manufacturers shall specify standard working conditions for a taximeter, in particular:

minimum temperature range of ambient climatic conditions from $-25^\circ \text{C}$ to $+55^\circ \text{C}$;
marginal values of direct current supply voltage under which a taximeter operates.

7. Value of maximum acceptable error, except for any errors as a result of adaptation of a taximeter in a taxi:

for time taken, the maximum acceptable relative error shall be $\pm 0.1$ percent;

minimum value of maximum acceptable error – 0.2 seconds;

for distance covered, the maximum acceptable relative error shall be $\pm 0.2$ percent;

minimum value of maximum acceptable error - 4 m;
to calculate the fare, the value of maximum acceptable relative error shall be ±0.1 percent, while the minimum value (in particular, including rounding) shall correspond to the smallest significant number of the payment indicator.

8. Electromagnetic influence class E3 shall apply.

9. The value of maximum acceptable error specified in item 7 herein continues to apply in the event of influence from electromagnetic obstacles.

10. If the power supply drops to the lowest value of its working margin specified by the manufacturer, a taximeter shall:

function normally or resume normal operation without losing data determined prior to the break in the power supply if such a break is of a temporary nature;

stop the performance of measuring functions and return to operation mode “Vacant” if the break in the power supply is permanent.

11. A taximeter manufacturer shall establish compatibility conditions for a taximeter and remote signal generator.

12. Payment for additional services shall not be included in the fare. In such an event, a taximeter display shall only temporarily display information about the specified fare together with information about the additional payment.

13. With the normal method of calculation D in additional mode, a taximeter display can display information about total distance covered and duration of travel in real time.

14. All the values displayed shall be available for a passenger and be easily legible by day and night.

15. If the payment of the fare depends on a choice between preset data and freely set data, the adjustment of the taximeter and data entry shall be arranged in such a way as to prevent illegal actions.

16. A taximeter’s protective capabilities shall ensure protection of the taximeter settings.

17. A taximeter shall be equipped with devices that summarize and prevent resetting of the following general values to their initial state:

distance covered by a taxi;

distance covered with passengers;

number of passenger boardings;

amount of money paid for additional services;

amount of money received for a ride.

Summed values shall be stored in a taximeter’s memory in the event of a break in the power supply, in compliance with the requirements of item 3 herein.

18. In the event of a break in the power supply, a taximeter shall store summed up values for up to a year, to permit retrieval of the readings by other means.

19. If necessary, measures shall be taken to ensure that passengers are protected from fraud as a result of the display of incorrect values.
20. Travel rates may change depending on the distance and duration of travel, time of day, date and day of the week.

21. A taximeter shall be equipped with devices that ensure its safe connection.

22. During a taximeter installation, it shall be possible to check the accuracy of measurement of time and distance, and calculation accuracy.

23. A taximeter design and compliance with manufacturer’s instructions shall prevent unauthorized alteration of the measuring signal corresponding to the distance covered.

24. During the use of a taximeter, the interests of the consumer, driver, seller and fiscal authorities shall be protected.

25. A taximeter shall be equipped with a clock by means of which time and date are set, one or both of which can be used for the automatic change of rates.

The following requirements are specified for the clock:

time deviation of the clock shall not exceed 0.02 percent for a 24-hour period of time;
ability to correct time is limited to two minutes per week;
conversion to summer time (or its reversal) shall be performed automatically;
during travel, automatic or manual correction of hours is prohibited.

26. Distance covered and time taken values shown on a display or printed out shall be expressed as follows:
distance covered during travel – in kilometres;
time taken by travel – in seconds, minutes, or hours.

Readings shall be displayed in such a way as to be unambiguous.

Addendum 8
to the Technical Regulations

**REQUIREMENTS**
to material weighers

1. In this Addendum the terms are used in their following meaning:

service capacity measuring device is a measuring device of capacity (drinking glass, jar or measuring cap) that is used for measuring of volume of liquid (except pharmaceutical products) that are being sold for immediate use;

measuring device for capacity transfer is a measuring device that is used for transfer of a certain volume of liquid before its consumption;

measuring device of full capacity is a service measuring device of capacity, internal volume of which equals the full capacity;

marked measuring vessel is a service measuring device of capacity that has a mark to identify nominal capacity;
capacity is internal volume for measuring devices of full capacity or internal volume limited by a mark of filling for marked measuring vessels.

2. Standard requirements for measuring tape, length of which equals or is more than 5 meters for determination of value of maximum acceptable error shall be:

stretch force of the tape 50H or other values of such force, specified by a manufacturer and appropriately marked on a measuring tape. For hard or semi-hard material measuring devices of length value of stretch force is not specified;

air temperature ±20° C. A manufacturer can specify other value, specified on a measuring tape.

3. Maximum acceptable error for length, limited by two non-adjacent scale graduations, is calculated by formula:

$$\pm(a + b \cdot L)$$, in millimeters,

where $L$ is value of length, approximated to the closest integer number of meters;

$a$ and $b$ are values specified in Table 1.

In the event the beginning of the scale corresponds with the end of the tape, the maximum acceptable error of any length, beginning from such point, increases by value $c$, the value of which is presented in Table 1.

<table>
<thead>
<tr>
<th>Accuracy category of tape measures</th>
<th>a (mm)</th>
<th>b</th>
<th>c (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>II</td>
<td>0.3</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>III</td>
<td>0.6</td>
<td>0.4</td>
<td>0.3</td>
</tr>
<tr>
<td>D – a special category of measuring tapes that immerse, and are ≤ 30 meters in length</td>
<td>1.5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>S – a special category of measuring tapes for tanks for each 30 meters, that are used when tape is attached on flat surface</td>
<td>1.5</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Measuring tapes that immerse can have accuracy category I or II in the event when distance between two scale cursors, one of which is placed on a weigher, and the other on the measuring tape, that provides a value of less than 0.6 millimeters when using the formula. In such case, the maximum acceptable error constitutes ±0.6 millimeters.

4. Length of measuring tapes is determined, taking into account their length under temperature of +20° C and working value of stretch force, specified by a manufacturer of material measuring devices, after which appropriate marking is applied to such tapes.

In the event a manufacturer does not specify a working value of stretch force of a tape, a maximum acceptable error is provided for tapes that are 5 or more meters in length, under condition that the value of stretch force of tape is 50 H.
5. The value of maximum acceptable error for a distance between two scale cursors and a maximum acceptable difference between two consecutive intervals shall not exceed the corresponding value presented in Table 2.

<table>
<thead>
<tr>
<th>Nominal length of scale interval (i)</th>
<th>Value of maximum acceptable error or acceptable difference between length of consecutive intervals (in millimeters) based on accuracy category</th>
</tr>
</thead>
</table>
| i ≤ 1 mm                            | I  0.1  
| 1 mm < i ≤ 1 cm                     | II  0.2  
|                                     | III 0.3  |

In the event a tape is a telescoping material measuring device, the value of errors due to joints that add to values specified in Table 2 shall not exceed 0.3 millimeters for category II and 0.5 millimeters for category III.

6. Material length measuring devices shall be produced from material that ensures changes of the length of a measuring device that does not exceed the value of maximum acceptable error with deviation of temperature by ±8° C from nominal temperature (+20° C).

Specified requirements shall not cover the measuring devices of categories D and S for which a manufacturer may make corrections regarding temperature level.

7. Material length measuring devices whose size changes under the influence of humidity belong exclusively to accuracy categories II and III.

8. The following marking shall be applied to a material measuring device:

- value of nominal length of a measuring device;
- for all scales with millimeter cursors, numeric marks for each centimeter;
- numeric marks for all line marks with a scale over 2 centimeters.

9. Line marks of material length measuring device shall be clear and non-erasable, background of the scale shall be light, and line marks and numberings shall be in dark color, or vice versa.

10. Service capacity measuring devices shall comply with the following requirements:

- a value of maximum acceptable error of service capacity measuring devices shall correspond with the value specified in Table 3;

<table>
<thead>
<tr>
<th>Type of measuring device and capacity in milliliters</th>
<th>Measuring device with marking</th>
<th>Full capacity measuring device</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity transfer measuring device</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 100</td>
<td>±2 milliliters</td>
<td>from 0 to +4 milliliters</td>
</tr>
</tbody>
</table>
### REQUIREMENTS for coordinate measuring devices

1. Coordinate measuring devices and their parts include the following:
   - length measuring devices;
   - area measuring devices;
   - multi-coordinate measuring devices.

2. In the event of impact of electromagnetic obstacle on a coordinate measuring equipment:
change of measurement result shall not exceed the value of critical change, pursuant to item 3 herein;
measuring is impossible, and momentary changes of measurement results cannot be explained;
measurement results shall not be entered into such device’s memory or transferred as measurement result;
significant changes of measurement results are recorded by all parties that are interested in the measurement result;
the value of critical change shall not exceed one scale graduation.

3. Length measuring devices shall comply with the following requirements:
be able to measure textile fabrics that have stretch coefficient $K$, with which a stretch force is calculated depending on applied force per area unit of material, and which is calculated by formula:

$$
\epsilon = \frac{F}{GA}
$$

where $\epsilon$ is a relative lengthening of a material sample that is 1 meter wide with stretch force 10 H,

$G_A$ is force per area unit of a material sample.

A manufacturing company specifies the value of stretch force coefficient $K$, with which such device can be used. Range of coefficient $K$ values are presented in Table 1;

<table>
<thead>
<tr>
<th>Group</th>
<th>Range $K$,</th>
<th>Product specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>$0 &lt; K &lt; 2 \times 10^{-2}$</td>
<td>weak stretch</td>
</tr>
<tr>
<td>II</td>
<td>$2 \times 10^{-2} &lt; K &lt; 8 \times 10^{-2}$</td>
<td>medium stretch</td>
</tr>
<tr>
<td>III</td>
<td>$8 \times 10^{-2} &lt; K &lt; 24 \times 10^{-2}$</td>
<td>strong stretch</td>
</tr>
<tr>
<td>IV</td>
<td>$24 \times 10^{-2} &lt; K$</td>
<td>very strong stretch</td>
</tr>
</tbody>
</table>

in the event the object of measurement is not transferred by coordinate length measuring device, the manufacturing company shall specify the acceptable speed of transfer of the object of measurement;

if measurement results depend on depth, surface condition and delivery form (for example, a big roll), the manufacturing company shall specify the appropriate limitations;

the value of maximum acceptable error of a length measuring device is specified by its accuracy category, taking into account the relevant value specified in Table 2;
the length of different types of materials shall be measured by means of appropriate measuring devices. Material designated for measurement shall be placed on an even surface in a folded and unfolded form;

length measuring device shall ensure measurement of material without stretching relative to its expected lengthening for which such device is designated.

4. Area measuring devices shall comply with the following requirements:

the manufacturing company shall specify a range of coordinates that are measured by such devices;

if needed, the manufacturing company shall specify limitations for an area measuring device that relate to speed and depth, and product surface condition parameters of which are being measured;

the value of maximum acceptable relative error shall not exceed ±1 percent, and shall be no more than 1 square decimeter;

during submission of products for measuring in case of their reverse stretching additional errors of measuring shall not appear, and a device that displays a measurement result shall not indicate any readings;

the value of a graduation of an area measuring device shall be 1 square decimeter. To test an area measuring device it shall be possible to use the value of a scale graduation of 0.1 square decimeter.

5. Multi-coordinate measuring devices shall comply with the following requirements:

a manufacturing company shall specify the range of coordinates that are measured by such device;

the value of the minimum object size regarding which measurements are performed depending on value of a scale graduation value, presented in Table 3;

<table>
<thead>
<tr>
<th>Accuracy category</th>
<th>Value of maximum acceptable error</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>0.125 percent, but no less than 0.005 L_m*</td>
</tr>
<tr>
<td>II</td>
<td>0.25 percent, but no less than 0.01 L_m</td>
</tr>
<tr>
<td>III</td>
<td>0.5 percent, but no less than 0.02 L_m</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Value of a scale graduation (d), centimeters</th>
<th>Value of minimum object size</th>
</tr>
</thead>
<tbody>
<tr>
<td>d ≤ 2</td>
<td>10 d</td>
</tr>
<tr>
<td>2 &lt; d ≤ 10</td>
<td>20 d</td>
</tr>
<tr>
<td>d &gt; 10</td>
<td>50 d</td>
</tr>
</tbody>
</table>
if needed, a manufacturing company specifies the limitations for a specified device regarding transfer speed of the object that is being measured;

the value of maximum acceptable error of a multi-coordinate measuring device shall not exceed ±d.

**Note.** *Lₘ* is the smallest length specified by a manufacturing company for measurement of which a measuring device shall be designated.

---

**REQUIREMENTS for analyzers of vehicle exhaust gases**

1. Analyzers of exhaust gases (hereinafter referred to as gas analyzers) shall be used for measuring the proportions by volume of carbon monoxide (CO), carbon dioxide (CO₂), oxygen (O₂) and hydrocarbons (HC).

Hydrocarbon content shall be specified as proportion by volume of n-hexane (C₆H₁₄), measured by the infrared absorption method.

The proportion by volume of CO, CO₂ and O₂ shall be specified as a percentage and of HC as cubic centimetres per cubic metre (parts per million).

Based on the proportion by volume of components of exhaust gases, a gas analyzer shall calculate the lambda (λ) value that defines efficiency of combustion in an engine by means of the air–fuel ratio in exhaust gases, and shall be determined by a standardized formula.

2. Two categories are established for gas analyzers – 0 and I. Corresponding minimum measurement ranges for specified categories are shown in Table 1.

<table>
<thead>
<tr>
<th>Name of unit</th>
<th>Measurement range for categories 0 and I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportion by volume of CO</td>
<td>up to 5 percent</td>
</tr>
<tr>
<td>Proportion by volume CO₂</td>
<td>up to 16 percent</td>
</tr>
<tr>
<td>Proportion by volume of HC</td>
<td>up to 2 000</td>
</tr>
<tr>
<td>Proportion by volume of O₂</td>
<td>up to 21 percent</td>
</tr>
<tr>
<td>Lambda (λ)</td>
<td>0.8 to 1.2</td>
</tr>
</tbody>
</table>
3. A manufacturer shall specify the following working conditions in technical documentation:

- minimum temperature range up to 35°C for climatic conditions;
- mechanical impacts belonging to class M1 pursuant to item 11 of the Technical Regulation;
- voltage and frequency ranges for alternating current power supply;
- marginal values of voltage for direct current power supply;
- minimum and maximum values of atmospheric pressure of \( P_{\text{min}} \leq 860 \text{ GPa} \), \( P_{\text{max}} \geq 1,060 \text{ GPa} \).

4. For each proportion by volume figure measured, a maximum acceptable error under standard work conditions pursuant to item 7 of the Technical Regulations shall correspond to one of the two values (absolute or relative error) specified in Table 2.

The error value that corresponds to the higher absolute error for the given proportion by volume figure shall be chosen out of the two values provided for each component. Absolute error is expressed in units of proportion by volume, as a percentage or in cubic centimetres by cubic metre (parts per million), while relative error is calculated as a fraction by dividing the absolute error by a real value, and is expressed as a percentage.

<table>
<thead>
<tr>
<th>Category</th>
<th>Error type</th>
<th>Value of maximum acceptable error for proportions by volume of components</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>CO</td>
</tr>
<tr>
<td></td>
<td>percent</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>absolute</td>
<td>±0.03</td>
</tr>
<tr>
<td></td>
<td>relative</td>
<td>±5</td>
</tr>
<tr>
<td>I</td>
<td>absolute</td>
<td>±0.06</td>
</tr>
<tr>
<td></td>
<td>relative</td>
<td>±5</td>
</tr>
</tbody>
</table>

5. The value of maximum acceptable relative error during lambda (\( \lambda \)) value calculation shall be 0.3 percent.

6. The marginally acceptable change of measurement results that occur as a result of obstacle influence shall equal the value of maximum acceptable error for each specified component pursuant to item 4 herein.

7. If a gas analyzer reacts to the influence of electromagnetic obstacles, the change in the measurement results shall not exceed the marginal value pursuant to item 6 herein, or the indication of measurement results shall show the deviation from normal operation mode of the gas analyzer and the invalidity of such results.
8. The smallest division of a counting device of a gas analyzer shall be less than or equal to the value specified in Table 3.

<table>
<thead>
<tr>
<th></th>
<th>CO</th>
<th>CO₂</th>
<th>O₂</th>
<th>HC,</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value of a smallest charge for components</td>
<td>0.01</td>
<td>0.1</td>
<td>0.1</td>
<td>1</td>
</tr>
<tr>
<td>percent</td>
<td>(for measured proportion by volume that is no greater than 4 percent)</td>
<td>(for measured proportion by volume greater than 4 percent)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The smallest division of a counting device of gas analyzer for lambda (λ) value shall be 0.001.

9. The mean quadratic deviation of twenty measurement results shall not exceed one third of an absolute unit of value of a maximum acceptable error for the proportion by volume of each component.

10. The time period for taking readings of a gas analyzer to which its sample selection and preparation system are connected at a level of 95 percent of confirmed value shall be no more than 15 seconds for CO, CO₂ and HC. The time period is specified for a continuous supply of gas that does not contain any of the components that are being determined, in particular pure air and a test gas mixture. Under similar conditions, the readings of a gas analyzer based on proportion by volume of O₂ shall not differ from zero by more than 0.1 percent within 60 seconds after air is switched to a test gas mixture that does not contain oxygen at the latest.

11. Additional error of a gas analyzer during measurement of the content of each component that occurs as a result of the influence of other components of exhaust gases shall be no more than one half of the absolute value of the maximum acceptable error pursuant to item 4 herein, with the following maximum proportions by volume of components:

- carbon dioxide (CO₂) – 16 percent;
- carbon monoxide (CO) – 6;
- oxygen (O₂) – 10;
- hydrogen (H₂) – 5;
- nitric oxide (NO) – 0.3 percent;
- hydrocarbons (HC) – 2,000 (based on proportion by volume of n-hexane);
- water vapour (H₂O) – until saturation.

12. The main requirements for a gas analyzer shall be the availability of the following:
regulating devices for resetting readings to zero and graduation of a gas analyzer by means of test gas mixtures and internal regulation. Devices for resetting readings to zero and internal regulation shall be automatic. The design of a gas analyzer shall prevent measurement if the regulation of readings that equal zero is carried out by means of automatic or semi-automatic devices;

a device for detecting carbon residue in a sample selection and preparation system. A gas analyzer shall be designed in such a way as to prevent measurement if the proportion by volume of hydrocarbon residues prior to measurement exceeds 20;

a device for the automatic detection of disruption in the operation of a measuring converter of oxygen content as a result of its wear and tear or breakage of a connecting line.

13. If a gas analyzer is used to analyze the exhaust gases of vehicles that operate on different types of fuel, in particular, petroleum or droplet gas, an accurate choice of appropriate coefficients for calculating the lambda (\( \lambda \)) value must be possible.

Addendum 11

to the Technical Regulations

DECLARATION

of compliance

________________________________________ (full name of a manufacturer or authorized representative, their location, code pursuant to the State Registry of Companies and Organizations of Ukraine (if applicable) represented by __________________________ (title, first name, patronymic name, last name of an authorized person)

certifies that __________________________ (full name of a measuring device, type, make, model) that is manufactured pursuant to __________________________ (name of normative documents, that confirm compliance with the Technical Regulations) complies with the Technical Regulations regarding basic requirements for measuring equipment.

Document that confirms compliance evaluation __________________________

________________________________________ (number of a document, date of its registration, effective period, name and location of an authorized agency)

Declaration was drafted under the responsibility of __________________________ (a manufacturer

________________________________________ or an authorized representative (enter the one that applies)

_________________________ (title of a person that drafted the declaration) __________________________ (signature) __________________________ (initials and last name)
**ACTION PLAN**

for application of the Technical Regulations regarding basic requirements to measuring instruments

<table>
<thead>
<tr>
<th>Name of Action</th>
<th>Responsible for Implementation</th>
<th>Implementation Period</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Preparation Phase</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Create a counseling and tutoring center for the Technical Regulations application</td>
<td>State Committee of Ukraine on Issues of Technical Regulation and Consumer Policy (Derzhspozhyvstandard) the Ministry of Industrial Policy</td>
<td>2009</td>
</tr>
<tr>
<td>2. Provide counseling and tutoring assistance for application of the Technical Regulations using mass media and conducting seminars and conferences</td>
<td>- &quot;&quot; -</td>
<td>2009 - 2013</td>
</tr>
<tr>
<td>3. Develop pursuant to annual plan of state standardization and implement on a step-by-step basis the national standards that are harmonized with European standards that confirm compliance of measuring equipment with mandatory requirements of the Technical Regulations; finish and amend national standards pursuant to annual plans of state standardization</td>
<td>State Committee of Ukraine on Issues of Technical Regulation and Consumer Policy (Derzhspozhyvstandard) the Ministry of Industrial Policy Ministry of Fuel and Energy Ministry of Housing Maintenance and Utilities of Ukraine</td>
<td>annually</td>
</tr>
<tr>
<td>4. Coordinate with interested central authorities the list of national standards that confirm compliance with the Technical Regulations in the event of voluntary implementation, and publish it</td>
<td>- &quot;&quot; -</td>
<td>- &quot;&quot; -</td>
</tr>
<tr>
<td>5. Ensure that authorities are trained for compliance</td>
<td>Ministry of Industrial Policy</td>
<td>- &quot;&quot; -</td>
</tr>
</tbody>
</table>

**APPROVED**
by the Decree of the Cabinet of Ministers of Ukraine dated 8 April 2009, No 332
<table>
<thead>
<tr>
<th>Evaluation prior to their appointment to evaluate compliance with requirements of the Technical Regulations</th>
<th>State Committee of Ukraine on Issues of Technical Regulation and Consumer Policy (Derzhspozhyvstandard)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Prepare domestic companies for manufacturing of products taking into consideration requirements of the Technical Regulations</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Transitional Phase of the Technical Regulations Implementation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Create conditions for voluntary implementation of the Technical Regulations by companies with implementation of a procedure for evaluation of compliance with requirements of normative documents that confirm compliance of products with mandatory requirements of a normative legal document</td>
<td>Ministry of Industrial Policy State Committee of Ukraine on Issues of Technical Regulation and Consumer Policy (Derzhspozhyvstandard)</td>
<td>2013 - 2018</td>
</tr>
<tr>
<td>9. Organize supervision activities for products that are covered by requirements of the Technical Regulations</td>
<td>State Committee of Ukraine on Issues of Technical</td>
<td>Annually beginning in</td>
</tr>
<tr>
<td>Regulations</td>
<td>Regulation and Consumer Policy (Derzhspozhyvstandard)</td>
<td>2018</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>-------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Phase of Final Implementation of the Technical Regulations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Introduce changes to the Technical Regulations based on the results of its implementation during transitional phase, if needed</td>
<td>- &quot; &quot; -</td>
<td>- &quot; &quot; -</td>
</tr>
<tr>
<td>11. Fully implement the Technical Regulations</td>
<td>Ministry of Industrial Policy State Committee of Ukraine on Issues of Technical Regulation and Consumer Policy (Derzhspozhyvstandard)</td>
<td>- &quot; &quot; -</td>
</tr>
</tbody>
</table>