Czech Metrology Institute
Okružní 31, 638 00 Brno

1. ------IND- 2018 0592 CZ- EN- ------ 20181224 --- --- PROJET

Executive summary for the EC (not part of this legislation)

'Electricity meters' may be placed on the market and put into use in the Czech Republic either pursuant to Directive 2014/32/EU (MID) or, in areas outside the MID's scope, as legally controlled measuring instruments pursuant to Act No 505/1990 on metrology, as amended. Pursuant to the Act, legally controlled measuring instruments are instruments that are included in the list of the types of legally controlled measuring instruments (Implementing Decree No 345/2002) and, at the same time, intended (by the manufacturer/importer) for measurements of relevance to the protection of public interests in areas of *consumer protection, contractual relations, imposition of sanctions, fees, tariffs and taxes, health protection, environmental protection, occupational safety, or the protection of other public interests protected by special legislation*. This means that their purpose is similar to that used for defining regally controlled products – measuring instruments and non-automatic weighing instruments – under Directives 2014/31/EU and 2014/32/EU. The requirements of this regulation do not apply to measuring instruments placed on the market in the Czech Republic for purposes other than the above purposes defined by Act No 505/1990 on metrology.

The purpose of this notified legislation is to lay down:

1) metrological and technical requirements for legally controlled measuring instruments and tests for the purposes of type approval, in the case of instruments placed on the market without conformity assessment pursuant to the MID, and
2) tests for the purposes of verifying legally controlled measuring instruments (after they have been placed on the market), regardless of whether they have been placed on the market pursuant to Act No 505/1990 on metrology or pursuant to the MID, with conformity assessment.

(End of executive summary.)

Contact person:Mgr.Tomáš Hendrych

Telephone:+420 545 555 414

PUBLIC DECREE

As the authority with substantive and territorial jurisdiction in the matter of laying down metrological and technical requirements for legally controlled measuring instruments and laying down the methods for type approval and verification of legally controlled measuring instruments under § 14(1) of Act No 505/1990 on metrology, as amended (hereinafter the 'Metrology Act'), and in accordance with the provisions of § 172 et seq. of Act No 500/2004, the Administrative Procedure Code (hereinafter the 'APC'), the Czech Metrology Institute (hereinafter the 'CMI') commenced ex officio proceedings on 15 March 2017 pursuant to § 46 of the APC, and, based on the supporting documents, issues the following:

I.

D R A F T G E N E R A L M E A S U R E

number:0111-OOP-C022-18

laying down metrological and technical requirements for legally controlled measuring instruments, including the testing methods for type approval and verification of legally controlled measuring instruments:

‘electricity meters’

With a view to the relevant EU legislation and Czech national legislation, electricity meters are a type of measuring instrument whose placement on the market and into circulation, in terms of applicability of this legislation, is classified into three groups, namely:

a) class A, B and C active energy meters intended for use in commercial, residential and light industrial environments;

b) active energy meters intended for applications other than residential, commercial and light industry environments, and the functions that the electricity meters referred to in this paragraph and in paragraph (a) possess in addition to measuring active electrical energy, e.g. measurement of reactive energy

c) class 2 induction active energy meters bearing the EEC mark.

In the case of the electricity meters referred to in (a), the process of placing them on the market and into operation, including the metrological requirements and testing methods for the meters, is covered by Government Regulation No 464/2005 and 120/2016 laying down the technical requirements for measuring instruments[1] (hereinafter ‘Government Regulation’).For these electricity meters, this General Measure lays down only the metrological and technical requirements and testing methods to be applied when these measuring instruments are being verified after they have been placed on the market and into circulation, i.e. when undergoing subsequent verification according to Chapter 7.Nevertheless, these requirements and methods comply with the Government Regulation and the relevant requirements of harmonised standards.

In the case of the electricity meters and electricity meter functions referred to in points (b) and (c) that are not covered by the aforementioned Government Regulation, this regulation lays down the metrological and technical requirements and the test methods to be applied when placing them on the market, i.e. when the instruments undergo type approval pursuant to Chapter 5 and initial verification pursuant to Chapter 6, as well as the metrological and technical requirements and testing methods for subsequent verification pursuant to Chapter 7 carried out after they have been put into circulationThese activities are not covered by European legislation and are governed by Act No 505/1990 on metrology, as amended.

[1] The above Government Regulations implement the following into Czech legislation: Directive 2004/22/EC of the European Parliament and of the Council of 31 March 2004 on measuring instruments and Directive 2014/32/EU of 26 February 2014, which concerns conformity assessment and the making available on the market of measuring instruments.

1 Basic definitions

For the purposes of this General Measure, terms and definitions pursuant to VIM and VIML[2] and the following must apply:

1.1
electricity meter for measuring energy
an instrument intended to measure electrical energy by integrating power over time

1.1.1
active energy meter, watt-hour electricity meter
an instrument intended to measure active electrical energy by integrating active output over time

1.1.2
reactive energy meter, var-hour electricity meter
an instrument intended to measure reactive electrical energy by integrating reactive output over time

1.2
electromechanical electricity meter, induction electricity meter
an electricity meter in which currents in fixed coils react with currents induced in the conductive moving rotor(s), which causes its (their) movement proportional to the energy to be measured

1.3
static electricity meter
an electricity meter in which current and voltage act on solid state (electronic) elements to produce an output signal proportional to the energy to be measured

1.4
direct connected electricity meter
an electricity meter intended for use by direct connection to electrical grid

1.5
transformer operated electricity meter
an electricity meter intended to be used while connected to the electrical grid via one or more external instrument transformers

1.6
multi-tariff electricity meter
an electricity meter equipped with multiple registers, each of which operates during specified intervals corresponding to different tariffs

1.7
electricity meter class
designation of the quality of electricity meters that satisfy the technical and metrological requirements specified for a given class of electricity meters

[2] TNI 01 0115 International Vocabulary of Metrology – Basic and General Concepts and Associated Terms (VIM) and International Vocabulary of Legal Metrology (VIML) are part of the technical harmonisation compendium 'Terminology in the field of metrology', which is publicly available at www.unmz.cz.

1.7.1
accuracy classes of electricity meters – 0.5; 1; 2; 3; 0.2 S; 0.5 S and 1 S
designation of the quality of electricity meters that satisfy the technical and metrological requirements specified by the relevant technical standards and whose type has been approved pursuant to the Metrology Act;the number in the class designation represents the electricity meter's accuracy class

1.7.2
class A, B and C electricity meters
designation of the quality of electricity meters that satisfy the technical and metrological requirements specified by Government Regulation No 464/2005 laying down the technical requirements for measuring instruments[1] and that have been placed on the market and put into use through the conformity assessment process

1.8
current, I
electrical current flowing through the electricity meter

1.8.1
starting current, I_{st}
the lowest declared value of current at which the electricity meter registers electrical energy at unity power factor (for three-phase electricity meters, with balanced load)

1.8.2
minimum current, I_{min}
the lowest value of current for which accuracy requirements are specified by this regulation;less strict accuracy requirements apply at I_{min} and between I_{min} and I_{tr}

1.8.3
transitional current, I_{tr}
the value of current at and above which the accuracy requirements under this regulation fully apply **up to** $\boldsymbol{I_{max}}$

1.8.4
maximum current, I_{max}
the highest value of current at which the electricity meter still meets the accuracy requirements laid down by this regulation

1.8.5
base current, I_b
the value of current used as reference for the decisive properties of a direct connected electricity meter

1.8.6
nominal current, I_n
in the case of a transformer operated electricity meter, this is the value of current for which the electricity meter was designed

1.8.7
reference current, I_{ref}
for direct connected electricity meters, this is 10 times the transitional current
NOTE 1 This value is the same as base current I_b.

for transformer operated electricity meters, this is 20 times the transitional current
NOTE 2 This value is the same as nominal current I_n.

1.9
reference voltage, U_n

the voltage value used as reference for the decisive properties of the electricity meter

NOTE More than one value may be used as reference voltage.

1.10
reference frequency, f_n

the frequency value used as reference for the decisive properties of the electricity meter

1.11
maximum permissible error

relative error limits in % given by the following formula:

$$\text{relative error (in \%)} = \frac{\text{energy registered by the electricity meter – actual energy}}{\text{actual energy}} \times 100$$

2 Metrological requirements

The metrological requirements for active energy meters intended for use in residential, commercial and light industrial environments are based on the requirements of the Government Regulation[1], while applying the relevant requirements under harmonised standards.

The metrological requirements for active energy meters intended for use in other than residential, commercial and light industrial environments are either the same as those under the Government Regulation or, where this is not the case, the requirements under European standards have been adopted.

The metrological requirements for reactive energy meters have been adopted from European standards.

The metrological requirements for active energy meters bearing the EEC mark are based on the requirements applied during EEC type approval.

The verification of electricity meters type approved pursuant to Act No 505/1990 on metrology, as amended, is subject to the metrological requirements applicable at the time they were put into circulation.

2.1 Rated operating conditions

2.1.1 Voltage range

Electricity meters must measure electrical energy within the limits of the maximum permissible errors across a range of voltages within ±10 % of the rated voltage.

2.1.2 Frequency range

Electricity meters must measure electrical energy within the limits of the maximum permissible errors across a range of frequencies within ±2 % of the rated frequency.

2.1.3 Current range

Electricity meters smut measure electrical energy within the limits of the maximum permissible errors across a range of currents from I_{min} to I_{max} at $\cos \varphi = 0.5$ inductive to $\cos \varphi = 0.8$ capacitive, or $\sin \varphi = 0.5$ inductive to $\sin \varphi = 0.8$ capacitive.

2.1.4 Ambient temperature range

Electricity meters must measure electrical energy within the limits of the maximum permissible errors across a range of ambient temperatures specified by the manufacturer.

2.2 Maximum permissible errors

2.2.1 Maximum permissible errors for electromechanical active energy meters of accuracy class 0.5 at the time of type approval

The maximum permissible errors for type approval given below apply only to electromechanical active energy meters of accuracy class 0.5 (these electricity meters are not covered by the Government Regulation as they are not intended for use in residential, commercial and light industrial environments).

Under reference conditions, the relative errors of the electricity meters must not exceed the maximum permissible errors given in Tables 1 and 2.

If the electricity meter is designed for bi-directional measurement of electrical energy, the values given in Tables 1 and 2 apply to both directions.

Table 1 – Maximum permissible errors for single-phase and three-phase electricity meters of accuracy class 0.5 with symmetrical load

Current		Power factor	Relative error limits in %
for direct connected electricity meters	for transformer operated electricity meters		
$0.05I_b \le I < 0.1I_b$	$0.02I_n \le I < 0.05I_n$	1	±1.0
$0.1I_b \le I \le I_{max}$	$0.05I_n \le I \le I_{max}$	1	±0.5
$0.1I_b \le I < 0.2I_b$	$0.05I_n \le I < 0.1I_n$	0.5 inductive 0.8 capacitive	±1.3 ±1.3
$0.2I_b \le I \le I_{max}$	$0.1I_n \le I \le I_{max}$	0.5 inductive 0.8 capacitive	±0.8 ±0.8

Table 2 – Maximum permissible errors for three-phase electricity meters of accuracy class 0.5 with single-phase load, but with voltage circuits energised with symmetrical three-phase voltage

Current		Power factor	Relative error limits in %
for direct connected electricity meters	for transformer operated electricity meters		
$0.2I_b \le I < I_b$	$0.1I_n \le I \le I_n$	1	±1.5
$0.5\ I_b$	$0.2\ I_n$	0.5 inductive	±1.5
I_b	I_n	0.5 inductive	±1.5
$I_b \le I \le I_{max}$	$I_n \le I \le I_{max}$	1	–

2.2.2 Maximum permissible errors for static active energy meters of accuracy class 0.2 S and 0.5 S at the time of type approval

The maximum permissible errors for type approval given below apply only to static active energy meters of accuracy class 0.2 S and 0.5 S (these electricity meters are not covered by the Government Regulation as they are not intended for use in residential, commercial and light industrial environments).

Under reference conditions, the relative errors of the electricity meters must not exceed the maximum permissible errors given in Tables 3 and 4.

If the electricity meter is designed for bi-directional measurement of electrical energy, the values given in Tables 3 and 4 apply to both directions.

Table 3 – Maximum permissible errors for single-phase and three-phase active energy meters of accuracy class 0.2 S and 0.5 S with symmetrical load

Current	Power factor	Relative error limits in % for electricity meters of accuracy class	
		0.2 S	0.5 S
$0.01I_n \le I < 0.05I_n$	1	±0.4	±1.0
$0.05I_n \le I \le I_{max}$	1	±0.2	±0.5
$0.02I_n \le I < 0.1I_n$	0.5 inductive 0.8 capacitive	±0.5 ±0.5	±1.0 ±1.0
$0.1I_n \le I \le I_{max}$	0.5 inductive 0.8 capacitive	±0.3 ±0.3	±0.6 ±0.6

Table 4 – Maximum permissible errors for three-phase active energy meters of accuracy class 0.2 S and 0.5 S with single-phase load, but with voltage circuits energised with symmetrical three-phase voltage

Current	Power factor	Relative error limits in % for electricity meters of accuracy class	
		0.2 S	0.5 S
$0.05I_n \le I \le I_{max}$	1	±0.3	±0.6
$0.1I_n \le I \le I_{max}$	0.5 inductive	±0.4	±1.0

2.2.3 Maximum permissible errors for static electricity meters when measuring reactive energy

The maximum permissible errors when measuring reactive energy apply only to accuracy tests performed when type approving static electricity meters intended for measurement of this type of energy, which is not covered by the Government Regulation.

Under reference conditions, the relative errors of the electricity meter must not exceed the maximum permissible errors given in Tables 5 and 6.

Table 5 – Maximum permissible errors for single-phase and three-phase reactive energy meters with symmetrical load

Current		sin φ (inductive or capacitive)	Relative error limits in % for electricity meters of accuracy class			
for direct connected electricity meters	for transformer operated electricity meters		0.5 S	1 and 1 S	2	3
$0.05I_b \le I < 0.1I_b$	$0.02I_n \le I < 0.05I_n$	1	±1.0	±1.5	±2.5	±4.0
$0.1I_b \le I \le I_{max}$	$0.05I_n \le I \le I_{max}$	1	±0.5	±1.0	±2.0	±3.0
$0.1I_b \le I < 0.2\ I_b$	$0.05I_n \le I < 0.1I_n$	0.5	±1.0	±1.5	±2.5	±4.0
$0.2I_b \le I \le I_{max}$	$0.1I_n \le I \le I_{max}$	0.5	±0.5	±1.0	±2.0	±3.0

Table 6 – Maximum permissible errors for three-phase electricity meters with single-phase load, but with voltage circuits energised with symmetrical three-phase voltage

Current		sin φ (inductive or capacitive)	Relative error limits in % for electricity meters of accuracy class			
for direct connected electricity meters	for transformer operated electricity meters		0.5 S	1 and 1 S	2	3
$0.1I_b \le I \le I_{max}$	$0.05I_n \le I \le I_{max}$	1	±0.7	±1.5	±3.0	±4.0
$0.2I_b \le I \le I_{max}$	$0.1I_n \le I \le I_{max}$	0.5	±1.0	±2.0	±3.0	±4.0

2.2.4 Maximum permissible errors at the time of verification

When verified under reference conditions, electricity meters must not exceed the error limits for the individual types of electricity meters and the currents used given in Tables 25 to 31.

2.3 No-load condition

When there is no current flowing through the electricity meter, it must not register any energy.

2.4 Electricity meter start-up

2.4.1 Start-up of active energy meters

The electricity meter must start to measure and continue to register active energy at reference voltage U_n, power factor = 1 and the current given in Table 7 or 8, as applicable.

Table 7 – Inrush currents for accuracy classes 0.2 S; 0.5 S; 0.5; 1 and 2

Electricity meter	Accuracy class				
	0.2 S	0.5 S	0.5	1 and 1 S	2
Electromechanical, direct connected	–	–	$0.003I_b$	$0.004I_b$	$0.005I_b$
Electromechanical, transformer operated	–	–	$0.002I_n$	$0.002I_n$	$0.003I_n$
Static, direct connected	–	$0.001I_b$	–	$0.004I_b$	$0.005I_b$
Static, transformer operated	$0.001I_n$	$0.001I_n$	–	$0.002I_n$	$0.003I_n$

Table 8 – Inrush currents for classes A, B and C

Electricity meter	Class		
	A	B	C
Electromechanical, direct connected	$0.05I_{tr}$	$0.04I_{tr}$	–
Electromechanical, transformer operated	$0.06I_{tr}$	$0.04I_{tr}$	–
Static, direct connected	$0.05I_{tr}$	$0.04I_{tr}$	$0.04I_{tr}$
Static, transformer operated	$0.06I_{tr}$	$0.04I_{tr}$	$0.02I_{tr}$

2.4.2 Start-up of reactive energy meters

The electricity meter must start to measure and continue to register reactive energy at rated voltage U_n, power factor = 1 and the current given in Table 9.

Table 9 – Inrush currents for accuracy classes 0.5 S; 1; 1 S; 2 and 3

Electricity meters for	Accuracy class			
	0.5 S	1 and 1 S	2	3
Direct connected	$0.002I_b$	$0.004I_b$	$0.005I_b$	$0.010I_b$
Transformer operated	$0.001I_n$	$0.002I_n$	$0.003I_n$	$0.005I_n$

3 Technical requirements

The technical requirements for active energy meters intended for use in residential, commercial and light industrial environments are based on the requirements of the Government Regulation[1], while applying the relevant requirements under harmonised standards.

The technical requirements for active energy meters intended for use in other than residential, commercial and light industrial environments are either the same as those under the Government Regulation or, where this is not the case, the requirements under European standards have been adopted.

The technical requirements for reactive energy meters have been adopted from European standards.

The verification of electricity meters type approved pursuant to Act No 505/1990 on metrology, as amended, is subject to the metrological requirements applicable at the time they were put into circulation.

3.1 Electricity meter design

Electricity meters must be designed to maintain adequate stability of their metrological characteristics throughout the intended period of use (this period is estimated by the manufacturer), provided that they are properly installed, maintained and used according to the manufacturer’s instructions when in the environmental conditions for which they are intended.

3.2 Housing

Electricity meters must have a housing that can be sealed so that the internal parts of the meter cannot be accessed without damaging the seal(s).

The outer housing must not be removable without using a tool.

The mechanical strength of the electricity meter's housing must be such that any temporary deformation does not prevent the meter from operating correctly.

3.3 Counter

Electricity meters must be equipped with a metrologically controlled counter.This may be a mechanical device in the form of cylinders or an electronic display.

Electricity meters intended for measuring multiple types of energy must indicate which energy is currently being measured.

Multi-tariff electricity meters must indicate which rate is currently in effect.

The counter's indications must correspond to rotor revolutions, the number of test diode pulses or the number of remote measurement pulses.This relationship is given by a constant indicated on the electricity meter's label.

The total energy counter must have a sufficient number of digits to ensure that when the electricity meter is operated at full load ($I = I_{max}$, $U = U_n$ and cos φ (or sin φ) = 1) for 4 000 hours, the indication does not return to its initial value.It must not be possible to zero the total counter or the tariff counter without removing the seals.

In the event of a power outage, the amount of electrical energy measured must remain identifiable for at least four months.

Software

Software critical for metrological characteristics must be identifiable and must be secure.The software must be easy to identify directly through the electricity meter.Evidence of any unauthorised intervention must be available.During the service life of the electricity meter, the software can be replaced by other approved type of software, but only by the manufacturer.

In the case of electricity meters where the software version cannot be read electronically (they have no LCD display or communication interface), the software version must be indicated on the electricity meter.

3.5 Ancillary devices

The metrological characteristics of the meter may not be affected in any way by connecting an ancillary device to it, by a property of the connected ancillary device or a remotely connected ancillary device that communicates with the meter.

3.6 Mechanical requirements

The mechanical environment for which the electricity meter is intended must be specified by the manufacturer.

Electricity meters must be designed and built to prevent any danger in normal use and under normal conditions; particularly the following must be ensured:

- safety of persons from electric shock;
- safety of persons from the effects of excessive heat;
- protection against propagation of fire;
- protection against the ingress of solid objects, dust and water.

3.7 Climatic conditions

The manufacturer must specify the upper and lower temperature limits for the rated operating range, limit operating range and for storage and transport.

3.8 Electrical requirements

3.8.1 Temperature rise

Under nominal operating conditions, the electrical circuits and insulation must not reach a temperature that could negatively affect the operation of the electricity meter.

3.8.2 Insulation

The electricity meter and its built-in ancillary devices, if any, must maintain adequate insulation properties under normal conditions, taking into account the influences of the external environment and the different voltages that they are subjected to under normal conditions.

3.8.3 Influence of short-circuit overcurrents

Short-circuit overcurrents must not damage the electricity meter.Once the original working conditions have been restored, the electricity meter must operate correctly and the error shift at reference current and unity power factor must not exceed the values given in Table 10.

3.9 Electromagnetic compatibility

The electricity meter must conform to class E2 electromagnetic environment and also meet the following requirements.

During and immediately after an electromagnetic disturbance

a) any output intended for testing the accuracy of the electricity meter must not produce pulses or signals corresponding to an energy of more than the critical change value;

b) and within reasonable time after the effects of the fault the electricity meter must:

- recover to operate within the limits of the maximum permissible error (MPE),
- provide all measurement functions,
- allow recovery of all measurement data present before the effects of the fault started,
- not indicate a change in the registered electrical energy of more than the critical change value.

The critical change value x, in kWh, is given by the equation:

$$x = m \cdot U_{\mathrm{n}} \cdot I_{\mathrm{max}} \cdot 10^{-6} \qquad (1)$$

where m is the number of measuring elements of the electricity meter, U_{n} is in volts and I_{max} is in amperes).

3.10 Resistance to unauthorised tampering

The electricity meter must be designed so that any mechanical tampering with the housing, window or terminal cover that can affect measurement accuracy causes visible permanent damage to the meter or the official or security markings, thus providing evidence of unauthorised tampering.

Software, unauthorised modification of which over a communication interface is possible, must be protected.

Software is distinguished as legally relevant software (LRS – formerly the metrological core of the software) and legally non-relevant software (LNRS – formerly application software).LNRS may be modified without damaging seals as long as the modification does not affect the CRC value.

LRS:For example, the transformation ratio of the measuring transformers, the tariff tables, time, constants, method of counting energy (e.g. as a sum of absolute values or division according to demand and supply) may only be modified after breaking the seals and changing the position of a switch.Password protection alone is not sufficient.

LRNS:For example, display brightness, inversion of lines on the LCD panel, removal of certain lines on the LCD panel.

4 Marking of electricity meters

At least the following information must be provided on the electricity meter:

a) the manufacturer's name or trademark;

b) in the case of electricity meters manufactured pursuant to Government Regulation No 464/2005 and No 120/2016, the manufacturer's address must be included;

c) type designation;

d) serial number and year of manufacture;

e) designation of the electricity meter's class;

f) reference voltage;

g) reference (or base or nominal) current;

h) maximum current;

i) minimum current (not required for electricity meters approved before the Government Regulation entered into force);

j) reference frequency;

k) the electricity meter's constant;

l) rated operating temperature range (not required for electricity meters approved before the Government Regulation entered into force);

m) type of transmission grid (graphic symbol);

n) a square-in-square symbol for fully insulated protective class II electricity meters (if applicable);

o) a circuit diagram for connecting the electricity meter to the grid (it need not be provided on the identification label, but can for example be on the terminal cover).

In addition, electricity meters must bear a mark demonstrating how they were placed on the market:

a) the type-approval mark according to Act No 505/1990 on metrology, as amended, or the EEC type-examination certificate according to the Government Regulation;also, the approval mark according to the MID;

b) the 'CE' conformity mark for electricity meters approved prior to the entry into force of the Government Regulation;

c) the 'CE' conformity mark and additional metrological markings for electricity meters approved according to the Government Regulation.

4.2 Placement of the official mark

The placement of official marks is specified in the type approval certificate or the EC type-examination certificate, or other document used in the context of conformity assessment when placing the meter on the market and putting it into use.

5 Type approval of measuring instruments

Pursuant to Act No 505/1990 on metrology, as amended, class A, B and C active energy meters intended for use in residential, commercial and light industrial environments are not subject to type

approval.These measuring instruments are placed on the market and put into use with conformity assessment in accordance with the Government Regulation[1].

Only the following meters are subject to type approval pursuant to Act No 505/1990 on metrology, as amended:

a) active energy meters intended for use other than in residential, commercial and light industrial environments

b) reactive energy meters of class 0.5 S, 1, 1 S, 2 and 3, or the reactive energy measurement functions of electricity meters intended for measuring multiple types of energy.

5.1 In general

The process of type approval of electricity meters comprises the following tests:

a) external inspection;

b) tests of resistance of the electricity meter to mechanical influences;

c) tests of resistance to environmental influences;

d) tests of the effects of electrical properties;

e) electromagnetic compatibility (EMC) tests;

f) functional tests.

5.2 External inspection

The following is assessed by external inspection of the electricity meter:

- the completeness of the required technical documentation;
- conformity of the metrological and technical characteristics specified by the manufacturer in the documentation with the requirements of this regulation as specified in Articles 2 and 3;
- the completeness and condition of the electricity meter according to the prescribed technical documentation;
- conformity of the software version of the electricity meter with the version specified by the manufacturer.

5.3 Performance of tests at the time of type approval

5.3.1 Requirements for test equipment

A measurement stations for testing electricity meters must be equipped with a reference electricity meter that has valid metrological traceability.The measurement station as a whole must have been verified by means of a 'station functional test'.

The test equipment must allow for electricity meter errors to be determined with an uncertainty of no more than **1/5** of the relative error limits given in Tables 1 to 6.When testing Class 0.2 S electricity meters, **1/4** of these error limits is sufficient.

5.3.2 Reference conditions for testing

The tests must be performed under reference conditions with the electricity meter cover in place and the meter connected to test equipment according to the schematic diagram provided by the manufacturer.

The reference conditions are subject to the values given in Tables 21 to 23.

In addition to the conditions specified above, there must be no disruptive mechanical vibrations in the laboratory.

5.3.3 Preparation of electricity meters for testing

Prior to testing, electricity meters must be allowed to thermally stabilise for a period of at least 6 hours in a room with a temperature of (23 ±5) °C.

In order to reach operating temperature, prior to the performance of individual tests, the electricity meter's electrical circuitry must first be connected to reference voltage for at least:

30 minutes, in the case electromechanical electricity meters;

5 minutes, in the case of static electricity meters.

5.4 Tests of resistance of the electricity meter to mechanical influences

5.4.1 Spring hammer test

The test of mechanical strength of the electricity meter's housing must be performed using a spring-actuated hammer on the electricity meter, which is mounted in its normal operating position.

The spring hammer must exert a kinetic energy of 0.2 J ±0.02 J on the external surface of the electricity meter's outer housing (including windows) and on the terminal cover.

The meter will pass this test if its housing and terminal cover is not damaged to an extent that could affect the functionality of the electricity meter and allow contact with live parts.Minor damage that does not reduce the meter's protection from indirect contact or from ingress of solid objects, dust and water is permitted.

5.4.2 Shock test

The shock resistance test must be performed using half-sine pulses with a peak acceleration of $30g_n$ (300 m/s^2) and pulse duration of 18 ms with the electricity meter in a non-operating state.The shocks must be applied to the electricity meter fastened to the test device in all three axes and in both directions.

After the test, the electricity meter must not exhibit any damage or changes in data, and must operate correctly in accordance with requirements.

5.4.3 Vibration (sinusoidal) test

The test of resistance to sinusoidal vibrations must be performed by subjecting an electricity meter in a non-operating state to sinusoidal vibrations at a frequency of 10 Hz to 150 Hz with a transient frequency of 60 Hz, where for:

f < 60 Hz, the constant movement amplitude is 0.075 mm;

f > 60 Hz, constant acceleration is 9.8 m/s^2.

The test is performed at a single check point using 10 repeating cycles per axis.

After the test, the electricity meter must not exhibit any damage or changes in data, and must operate correctly in accordance with requirements.

5.4.4 Heat and fire resistance test

The electricity meter's terminal block, terminal cover and housing must provide sufficient protection against propagation of fire.They should not ignite if the live parts that are in contact with them become excessively hot.

The heat and fire resistance test must be performed by applying a hot loop to the terminal block at a temperature of 960 °C ±15 °C, and to the terminal cover and housing of the electricity meter at a temperature of 650 °C ±10 °C.The hot loop is applied for 30 s ±1 s.

The contact with the hot loop may occur at an arbitrary location.If the terminal block is an integral part of the housing of the electricity meter, it is sufficient to perform this test only on the terminal block.

5.4.5 Test of resistance to ingress of dust and water

The tests of resistance to ingress of dust and water must be performed with the electricity meter in a non-operating state, mounted on an artificial wall.The supply cables are attached to the electricity meter's terminals and the terminal cover is in place.

The electricity meter must meet protection grade IP51 for indoor use and protection grade IP54 for outdoor use.

5.4.5.1 Test of resistance to ingress of dust

For indoor electricity meters, the same atmospheric pressure is maintained both inside and outside the electricity meter (neither negative nor positive pressure).

Dust may enter the electricity meter only in quantities that do not compromise its operation.The electricity meter must subsequently pass the electrical insulation strength test referred to in Article 5.6.2.

5.4.5.2 Test of resistance to ingress of water

Water may enter the electricity meter only in quantities that do not compromise its operation.The electricity meter must subsequently pass the electrical insulation strength test referred to in Article 5.6.2.

5.5 Tests of resistance to climatic influences

5.5.1 Dry heat test

The dry heat test must be performed with the electricity meter in a non-operating state by gradually changing the ambient temperature to +70 °C ±2°C and exposing the meter to this temperature for 72 hours.

After the test is completed, the electricity meter must not exhibit any damage or changes in data and must function properly.

5.5.2 Cold test

The cold test must be performed with the electricity meter in a non-operating state using the Ab method according to ČSN EN 60068-2-1 by gradually changing the temperature.

Indoor electricity meters are exposed to an ambient temperature of −25 °C ±3 °C for 72 hours; outdoor electricity meters are exposed to an ambient temperature of −40 °C ±3 °C for 16 hours.

After the test is completed, the electricity meter must not exhibit any damage or changes in data and must function properly.

5.5.3 Cyclic damp heat test

The cyclic damp heat test must be performed on an electricity meter without current, but with voltage and auxiliary circuits connected to a reference voltage.

Indoor electricity meters are exposed to an ambient temperature of +40 °C ±2 °C and outdoor electricity meters are exposed to an ambient temperature of +55 °C ±2 °C, for 12 hours.Subsequently, they are exposed to an ambient temperature of +25 °C ± 3 °C, also for 12 hours (12 h + 12 h cycle).In both cases, relative humidity is 95 %.The test duration is six cycles.

After 24 hours of completing the test, the electricity meter must be subjected to the following tests:

a) the test of electrical insulation strength referred to in Article 5.6.2, with impulse voltage multiplied by a factor of 0.8;
b) functional test; the electricity meter must not exhibit any damage or changes in data, and must operate properly.

The damp heat test also serves as a corrosion test.The result is assessed visually.There must be no visible signs of corrosion that could affect the functional characteristics of the electricity meter.

5.5.4 Test of resistance to sunlight

The sunlight resistance test is performed only on outdoor electricity meters in a non-operating state.The electricity meter is exposed to light for 8 hours and then kept in the dark for 16 hours (8 h + 16 h cycle).The upper ambient temperature is kept at +55 °C.The duration of the test is three cycles.

After the test, the external appearance and, in particular, the legibility of markings must not be changed.The operation of the electricity meter must not be compromised.

5.6 Tests of the effects of electrical characteristics

5.6.1 Temperature rise tests

The temperature rise test must be performed by loading every current circuit with the maximum current I_{max} and every voltage circuit with $1.15U_n$, for 2 hours.During the test, the temperature of the outer surface may not rise by more than 25 K at an ambient temperature of +40 °C.

After the test, the electricity meter must not exhibit any damage and must pass the electrical insulation strength tests referred to in Article 5.6.2.

5.6.2 Electrical insulation strength tests

5.6.2.1 In general

The tests are performed on complete electricity meters, with the top cover of the terminal block in place and with terminal screws screwed into the core of a conductor with the maximum usable diameter.

During the voltage impulse tests and alternating voltage tests, circuits not under test must be connected to earth.

No penetration or flashover may occur during the test.After this test, an accuracy test must not reveal any error shift.

5.6.2.2 Impulse voltage test

Electrical insulation strength tests are performed using impulse voltage in individual circuits, between circuits and relative to earth.

The impulse source must be capable of generating a normalised voltage impulse of 1.2/50 μs with a rise time of ±30 %, a fall time of ±20 % , energy of 0.5 J ±0.05 J, and an impedance of 500 Ω ±50 Ω.

The test voltages must be as follows:

- for protective class I electricity meters: 4 kV (for $U_n \leq 300$ V) and 1.5 kV (for $U_n \leq 100$ V);
- for protective class II electricity meters: 6 kV (for $U_n \leq 300$ V) and 2.5 kV (for $U_n \leq 100$ V).

For each test, the impulse voltage is always applied ten times with one polarity and then ten times for the other polarity.The minimum time between impulses must be 3 seconds.

5.6.2.3 AC voltage test

The AC voltage test is performed using voltage at a frequency of 45 Hz to 65 Hz for one minute.The voltage is applied between

a) all voltage, current and auxiliary circuits connected together and the ground;
b) circuits that are not interconnected while the electricity meter is in use.

The test voltages must be as follows:

- for protective class I electricity meters: 2 kV;
- for protective class II electricity meters: 4 kV (test a), 2 kV (test b).

5.6.3 Short-circuit test

The short-circuit test must be performed using the currents pursuant to Table 10, applied for the specified period.

Table 10 – Short-circuit currents

Electricity meter	Accuracy class	Short-circuit current	Period of application	Permissible error shift
Electromechanical transformer operated active energy meter	0.5	$20I_{max}$	0.5 s	±0.3 %
Static direct connected active energy meter	1 and 2	$30I_{max}$	½ cycle	±1.5 %
Static transformer operated active energy meter	1 and 2	$20I_{max}$	0.5 s	±0.5 %
Static transformer operated active energy meter	0.2 S, 0.5 S	$20I_{max}$	0.5 s	±0.05 %
Static direct connected reactive energy meter	1, 2 and 3	$30I_{max}$	½ cycle	±1.5 %
Static reactive transformer operated energy meter	2 and 3	$20I_{max}$	0.5 s	±1.5 %
Static reactive transformer operated energy meter	1 S	$20I_{max}$	0.5 s	±0.5 %
Static reactive transformer operated energy meter	0.5 s	$20I_{max}$	0.5 s	±0.05 %

After short-term application of short-circuit overcurrents and thermal stabilisation, the error at nominal current and unity power factor is measured.The error shift compared to its value before the test must be less than the values given in the table.

5.7 Electromagnetic compatibility tests

5.7.1 Tests of immunity to voltage dips and short interruptions

The tests of immunity to voltage dips and short interruptions must be performed on the electricity meter with voltage and auxiliary circuits connected to reference voltage and without any current in the current circuits.

The following tests are performed:

a) three voltage interruptions ΔU = 100 % U_n for one second with a recovery time of 50 ms between the interruptions;

b) one voltage interruption ΔU = 100 % U_n for the period of one cycle at the reference frequency;

c) one voltage dip ΔU = 50 % U_n for one minute.

The application of voltage dips and short interruptions must not cause a change in the counter greater than *x* units and the test output must not send a signal corresponding to more than *x* units.

5.7.2 Electrostatic discharge immunity tests

The tests of immunity to electrostatic discharges must be performed on the electricity meter with voltage and auxiliary circuits connected to reference voltage and without any current in the current circuits.The meter is tested as a table-top instrument.

Ten contact discharges of 8 kV are applied to the metal part of the housing or ten air discharges of 15 kV are applied to a part of the housing made of insulating material (for protective class II electricity meters).

The application of the electrostatic discharges must not cause a change in the counter greater than *x* units and the test output must not send a signal corresponding to more than *x* units.

Temporary deterioration or loss of functionality or performance is allowed during the test.

5.7.3 Tests of immunity to radiated, radio-frequency electromagnetic fields

This test must not be performed on electromechanical electricity meters.

The test must be performed for interference in the frequency range of 80 MHz to 2 000 MHz with 80 % AM modulation at 1 kHz sine wave.The meter is tested as a table-top instrument.

5.7.3.1 Current test

Voltage and auxiliary circuits are connected to reference voltage, current circuits are connected to a reference (or nominal, base) current, cos φ (or sin φ) = 1.The strength of the non-modulated test field is 10 V/m.

During the test, the operation of the electricity meter must not be subject to any disturbance.Additional error must not exceed the permissible values in Table 11.

Table 11 – Critical change values for tests of immunity to radio-frequency electromagnetic fields

Electricity meter	Accuracy class	Critical change value
Active static	2	±3 %
Active static	1	±2 %
Active static	0.5 S	±1 %
Active static	0.2 S	±1 %
Reactive static	2 and 3	±3 %
Reactive static	1 and 1 S	±2 %
Reactive static	0.5 s	±2 %

5.7.3.2 No-current test

Voltage and auxiliary circuits are connected to reference voltage, current circuits are without current (open circuit).The strength of the non-modulated test field is 30 V/m.

The application of the radio-frequency field must not cause a change in the counter greater than *x* units and the test output must not send a signal corresponding to more than *x* units.

Temporary deterioration or loss of functionality or performance is allowed during the test.

5.7.4 Tests of immunity to electrical fast transient/burst disturbances

The tests of immunity to electrical fast transient/burst disturbances must be performed on the electricity meter with voltage and auxiliary circuits connected to reference voltage.Current circuits are connected to reference current, cos φ (or sin φ) = 1.The meter is tested as a table-top instrument.

The cable length between the coupling device and the electricity meter is 1 metre.The repetition frequency is 5 kHz and the duration of the test is 60 seconds for each polarity.

A test voltage of 4 kV must be applied to voltage circuits and current circuits, if separated from the voltage circuits in normal operation.A test voltage of 2 kV must be applied to auxiliary circuits with a reference voltage over 40 V.

Temporary deterioration or loss of functionality or performance is allowed during the test.Additional error must not exceed the permissible critical change values in Table 12.

Table 12 – Critical change values for tests of immunity to electrical fast transient/burst disturbances

Electricity meter	Accuracy class	Critical change value
Active static	2	±6 %
Active static	1	±4 %
Active static	0.5 S	±2 %
Active static	0.2 S	±1 %
Reactive static	2 and 3	±4 %
Reactive static	1 and 1 S	±3 %
Reactive static	0.5 s	±2 %

5.7.5 Tests of immunity to conducted disturbances induced by radio-frequency fields

The tests of immunity to conducted disturbances induced by radio-frequency fields must be performed on the electricity meter with voltage and auxiliary circuits connected to reference voltage.Current circuits are connected to reference current, $\cos \varphi$ (or $\sin \varphi$) = 1.The meter is tested as a table-top instrument.The frequency range of the disturbances is 150 kHz to 80 MHz and the disturbance voltage is 10 V.

During the test, the function of the electricity meter must not be perturbed and the additional relative error must not exceed the critical change values in Table 13.

Table 13 – Critical change value for the test of immunity to conducted disturbances induced by radio-frequency fields

Electricity meter	Accuracy class	Critical change value
Active static	2	±3 %
Active static	1	±2 %
Active static	0.5 S	±2 %
Active static	0.2 S	±1 %
Reactive static	2 and 3	±3 %
Reactive static	1 and 1 S	±2.5 %
Reactive static	0.5 s	±1.5 %

5.7.6 Tests of immunity to surges

The tests of immunity to surges must be performed on the electricity meter with voltage and auxiliary circuits connected to reference voltage and without any current in the current circuits.

The cable length between the surge generator and the electricity meter is 1 metre and it is tested in differential mode (phase–phase).

Surges with a phase shift of 60° and 240° relative to the AC zero crossing point are applied.A test voltage of 4 kV is used to test current and voltage circuits, and 1 kV is used to test auxiliary circuits with a reference voltage over 40 V.

Five positive and five negative impulses are applied at a repetition rate of not more than 1/min.

The application of the surge impulse must not cause a change in the counter greater than *x* units and the test output must not send a signal corresponding to more than *x* units.

Temporary deterioration or loss of functionality or performance is allowed during the test.

5.7.7 Tests of immunity to damped oscillatory waves

The tests of immunity to damped oscillatory waves must be performed only for transformer operated electricity meters intended for use in electrical power plants and high-voltage substations.

The tests must be performed on the electricity meter with voltage and auxiliary circuits connected to a reference voltage of >40 V.Current circuits are connected to reference current, cos φ (or sin φ) = 1.The meter is tested as a table-top instrument.

Damped oscillatory waves with a frequency of 100 kHz (repetition rate of 40 Hz) and 1 MHz (repetition rate of 400 Hz) are applied to voltage and auxiliary circuits with a common-mode voltage of 2.5 kV and a differential voltage of 1.0 kV.

The test duration is 60 seconds (15 cycles with 2 s on, 2 s off, for each frequency).

During the test, the function of the electricity meter must not be perturbed and the additional relative error must not exceed the critical change values in Table 14.

Table 14 – Critical change value during test of resistance to damped oscillatory wave

Electricity meter	Accuracy class	Critical change value
Active static	2	±3 %
Active static	1	±2 %
Active static	0.5 S	±2 %
Active static	0.2 S	±1 %
Reactive static	2 and 3	±4 %
Reactive static	1 and 1 S	±3 %
Reactive static	0.5 s	±2 %

5.7.8 Tests of immunity to alternating magnetic fields of external origin

The tests of immunity to alternating magnetic fields of external origin must be performed on the electricity meter connected to a reference voltage and reference current, cos φ (or sin φ) = 1.The meter is tested as a table-top instrument.

An alternating magnetic field of 0.5 mT at the reference frequency is applied to the electricity meter in three perpendicular planes.

During the test, the function of the electricity meter must not be perturbed and the additional relative error must not exceed the critical change values in Table 15.

Table 15 – Critical change value during the test of immunity to alternating magnetic fields of external origin

Electricity meter	Accuracy class	Critical change value
Active static	2	±3 %
Active static	1	±2 %
Active static	0.5 S	±1 %
Active static	0.2 S	±0.5 %
Reactive static	2 and 3	±3 %
Reactive static	1 and 1 S	±2 %

Reactive static	0.5 s	±1 %

5.7.9 Immunity to direct magnetic fields of external origin

The tests of immunity to direct magnetic fields of external origin must be performed on the electricity meter connected to a reference voltage and reference current, cos φ (or sin φ) = 1.A direct magnetic field with a magnetomotive force of F_m = 1 000 A is gradually applied to all accessible surfaces of the electricity meter.

During the test, the function of the electricity meter must not be perturbed and the additional relative error must not exceed the critical change values specified in Table 16.

Table 16 – Critical change value during the test of immunity to direct magnetic fields of external origin

Electricity meter	Accuracy class	Critical change value
Active static	2	±3 %
Active static	1	±2 %
Active static	0.5 S and 0.2 S	±2 %
Reactive static	2 and 3	±3 %
Reactive static	1; 1 S and 0.5 S	±2 %

5.7.10 Suppression of RF interference

The tests of suppression of RF interference must be performed on the electricity meter with voltage and auxiliary terminals connected to reference voltage and with a current of $0.1I_{ref}$ and $0.2I_{ref}$ (or nominal, base), cos φ (or sin φ) = 1.The meter is tested as a class B table-top instrument.A 1-m long unshielded cable must be used for each terminal to connect the voltage circuits.

The emissions of radio-frequency interference conducted in the 0.15 MHz to 30 MHz frequency range and radiated in the 30 MHz to 1 GHz frequency range is measured.

The test results must not exceed the limits for electromagnetic interference specified in the relevant technical standard.

5.7.11 Test of immunity to conducted disturbances in the 2 kHz to 150 kHz band

The tests of immunity to these disturbances must be performed on the electricity meter connected to reference voltage and with reference current I_{ref} at 50 Hz.The interference current (2–150) kHz of a magnitude according to Table 17 must be supplied from a separate source.The additional error of the electricity meter caused by the disturbance is measured.This error must be less than the permissible errors in Table 17.

Table 17 – Maximum permissible additional errors for direct and indirect connected electricity meters

Maximum permissible additional errors for direct connected electricity meters						
Frequency range	**Interference current value**	**current 50 Hz**	**cos φ; 50 Hz**	**Class A**	**Class B**	**Class C**
2 kHz to 30 kHz	2 A	I_{ref}	>0.9	±6 %	±4 %	±2 %
30 kHz to 150 kHz	1 A	I_{ref}	>0.9	±6 %	±4 %	±2 %

continued

Table 17 – continued

Maximum permissible additional errors for indirect connected electricity meters						
Frequency range	**Interference current value**	**current 50 Hz**	**cos φ; 50 Hz**	**Class A**	**Class B**	**Class C**
2 kHz to 30 kHz	2 %·I_{max}	I_{ref}	>0.9	±6 %	±4 %	±2 %
30 kHz to 150 kHz	1 %·I_{max}	I_{ref}	>0.9	±6 %	±4 %	±2 %

5.8 Functional tests

5.8.1 Test of no-load operation

The test of no-load operation is performed in accordance with Article 7.4.

5.8.2 Start-up test

The start-up test is performed in accordance with Article 7.5.

5.8.3 Accuracy test

The accuracy test is performed in accordance with Article 7.6.

5.8.4 Test of ambient temperature influence

The additional error due to temperature change (within the rated operating range of the electricity meter) relative to the error under reference conditions must not exceed the limits for the given accuracy class.These limits are given in Table 18 in the form of thermal coefficient limits in %/K.

Table 18 – Thermal coefficient limits in %/K for the tests of ambient temperature influence on the electricity meter

Grid connection	**Load**		**Active energy meters – Static**			
	Current	**Power factor**	**Accuracy class**			
			2	**1**	**0.5 S**	**0.2 S**
direct	0.1I_n to I_{max}	1	±0.10	±0.05	±0.03	–
	0.2I_n to I_{max}	0.5 ind.	±0.15	±0.07	±0.05	–
transformer operated	0.05I_n to I_{max}	1	±0.10	±0.05	±0.03	±0.01
	0.1I_n to I_{max}	0.5 ind.	±0.15	±0.07	±0.05	±0.02

Grid connection	**Load**		**Active energy meters – Electromechanical**		
	Current	**Power factor**	**Accuracy class**		
			2	**1**	**0.5**
direct	0.1I_b to I_{max}	1	±0.10	±0.05	±0.03
	0.2I_b to I_{max}	0.5 ind.	±0.15	±0.07	±0.05
transformer operated	0.05I_n to I_{max}	1	±1.5	±1.0	±0.8
	0.1I_n to I_{max}	0.5 ind.	±1.0	±0.7	±0.5

continued

Table 18 – continued

Grid connection	Load		Reactive energy meters (static)			
	Current	Power factor	Accuracy class			
			3	2	1 and 1 S	0.5 S
direct	$0.05I_n$ to I_{max}	1	±0.15	±0.10	±0.05	–
	$0.10I_n$ to I_{max}	0.5 ind.	±0.25	±0.15	±0.10	–
transformer operated	$0.02I_n$ to I_{max}	1	±0.15	±0.10	±0.05	±0.03
	$0.05I_n$ to I_{max}	0.5 ind.	±0.25	0.15	±0.10	±0.05

5.8.5 Voltage change test

The additional error due to a voltage change of ±10 %·U_n relative to the error under reference conditions must not exceed the limits for the given accuracy class in Table 19.

Table 19 – Additional error limits in % for the test with a voltage change of ±10 %·U_n

Grid connection	Load		Active energy meters – Static			
	Current	Power factor	Accuracy class			
			2	1	0.5 S	0.2 S
direct	$0.05I_n$ to I_{max}	1	±1.0	±0.7	±0.2	–
	$0.10I_n$ to I_{max}	0.5 ind.	±1.5	±1.0	±0.4	–
transformer operated	$0.02I_n$ to I_{max}	1	±1.0	±0.7	±0.2	±0.1
	$0.05I_n$ to I_{max}	0.5 ind.	±1.5	±1.0	±0.4	±0.2

Grid connection	Load		Active energy meters – Electromechanical		
	Current	Power factor	Accuracy class		
			2	1	0.5
direct	$0.1I_b$	1	±1.5	±1.0	±0.8
	$0.5I_{max}$	1	±1.0	±0.7	±0.5
	$0.5I_{max}$	0.5 ind.	±1.5	±1.0	±0.7
transformer operated	$0.1I_n$	1	±1.5	±1.0	±0.8
	$0.5I_{max}$	1	±1.0	±0.7	±0.5
	$0.5I_{max}$	0.5 ind.	±1.5	±1.0	±0.7

Grid connection	Load		Reactive energy meters (static)			
	Current	Power factor	Accuracy class			
			3	2	1 and 1 S	0.5 S
direct	$0.05I_n$ to I_{max}	1	±2.0	±1.0	±0.5	–
	$0.10I_n$ to I_{max}	0.5 ind.	±3.0	±1.5	±1.0	–
transformer operated	$0.02I_n$ to I_{max}	1	±2.0	±1.0	±0.5	±0.25
	$0.05I_n$ to I_{max}	0.5 ind.	±3.0	±1.5	±1.0	±0.5

5.8.6 Frequency change test

The additional error due to a frequency change of ±2 %·f_n relative to the error under reference conditions must not exceed the limits for the given accuracy class in Table 20.

Table 20 – Additional error limits in % for the test with a frequency change of ±2 %·f_n

Grid connection	Load		Active energy meters – Static			
	Current	Power factor	Accuracy class			
			2	1	0.5 S	0.2 S
direct	0.05I_n to I_{max}	1	±0.8	±0.5	±0.2	–
	0.10I_n to I_{max}	0.5 ind.	±1.0	±0.7	±0.2	–
transformer operated	0.02I_n to I_{max}	1	±0.8	±0.5	±0.2	±0.1
	0.05I_n to I_{max}	0.5 ind.	±1.0	±0.7	±0.2	±0.1

Grid connection	Load		Active energy meters – Electromechanical		
	Current	Power factor	Accuracy class		
			2	1	0.5
direct	0.1I_b	1	±1.5	±1.0	±0.7
	0.5I_{max}	1	±1.3	±0.8	±0.6
	0.5I_{max}	0.5 ind.	±1.5	±1.0	±0.8
transformer operated	0.1I_n	1	±1.5	±1.0	±0.7
	0.5I_{max}	1	±1.3	±0.8	±0.6
	0.5I_{max}	0.5 ind.	±1.5	±1.0	±0.8

Grid connection	Load		Reactive energy meters (static)			
	Current	Power factor	Accuracy class			
			3	2	1 and 1 S	0.5 S
direct	0.05I_n to I_{max}	1	±2.5	±2.5	±0.5	±0.25
	0.10I_n to I_{max}	0.5 ind.	±2.5	±2.5	±1.0	±0.5
transformer operated	0.02I_n to I_{max}	1	±2.5	±2.5	±0.5	±0.25
	0.05I_n to I_{max}	0.5 ind.	±2.5	±2.5	±1.0	±0.5

5.8.7 Counter test

The counter test is performed in accordance with Article 7.7.

6 Initial verification

Pursuant to Act No 505/1990 on metrology, as amended, class A, B and C active energy meters intended for use in residential, commercial and light industrial environments are not subject to initial verification.These measuring instruments are placed on the market and put into use with conformity assessment in accordance with the Government Regulation[1].

Only the following meters are subject to initial verification pursuant to Act No 505/1990 on metrology, as amended:

a) class 0.2 S; 0.5 S; 0.5; 1 and 2 active energy meters;

b) electricity meters intended for use other than in residential, commercial and light industrial environments;
c) class 0.5 S, 1, 1 S, 2 and 3 reactive energy meters or the reactive energy measurement functions of electricity meters intended for measuring multiple types of energy;
d) class 2 active energy meters bearing the EEC mark;
e) electricity meters which, at the given time, have a valid type approval certificate under the transitional provisions in § 9 of the Government Regulation;
f) electricity meters after repair.

Initial verification follows a procedure identical to that used for subsequent verification referred to in Chapter 7.

7 Subsequent verification

Pursuant to Act No 505/1990 on metrology, as amended, all types and classes of electricity meters specified in this regulation are subject to subsequent verification.The manner in which the electricity meter was placed on the market and put into use is taken into account by specifying the accuracy requirements applied in verification according to the individual classes of electricity meters.

7.1. In general

Subsequent verification of electricity meters must comprise the following tests:

a) visual inspection;
b) no-load operation test;
c) start-up test;
d) accuracy test;
e) counter test.

7.2 Visual inspection

The purpose of visual inspection is to check that the electricity meter submitted for verification, including the software version, conforms to the approved type or design of the meter for which conformity was declared when it was placed on the market.Attention must be paid to verifying the correctness of markings within the meaning of Article 4.1 and its legibility.

The electricity meter is also inspected for mechanical damage; meters with an electronic display are checked to verify that all characters on the display are visible after the device is connected to the grid.

Electricity meters which do not conform to the approved type or to the design for which conformity was declared when placing them on the market and electricity meters that are damaged are not tested further.

7.3 Test conditions

7.3.1 Requirements for test equipment

Measurement stations for testing electricity meters must be equipped with a reference electricity meter that has a valid calibration record.The measurement station as a whole must have been verified via a station functional test.

The test equipment must allow electricity meter errors to be determined with an uncertainty less than or equal to 1/4 of the error limits in Tables 25 to 31.When testing class 0.2 S electricity meters, 1/3 of the error limit is sufficient.

The equipment must also allow for clear verification of compliance with the requirements under 2.2, 2.3 and 2.4.

7.3.2 Reference test conditions

The tests must be performed under reference conditions with the electricity meter cover in place and the meter connected to test equipment according to the schematic diagram provided by the manufacturer.

The reference conditions specified in Tables 20 to 22 apply to the verification of electricity meters.

In addition to the conditions specified above, there must be no disruptive mechanical vibrations in the laboratory.

Table 21 – Reference conditions for electromechanical active energy meters

Influence factor	Reference value	Permissible tolerances for electricity meters of accuracy class			Permissible tolerances for electricity meters of class	
		0.5	1	2	A	B
Ambient temperature	Reference temperature or, if not given, 23 °C	±1 °C	±2 °C	±2 °C	±2 °C	±2 °C
Voltage	Reference voltage	±0.5 %	±1.0 %	±1.0 %	±1.0 %	±1.0 %
Frequency	Reference frequency	±0.2 %	±0.3 %	±0.5 %	±0.5 %	±0.3 %
Phase sequence	L1 – L2 – L3	–	–	–	–	–
Voltage asymmetry	All phases connected	–	–	–	–	–
Waveform	Sine voltage and currents	Distortion factor less than:				
		2 %	2 %	3 %	3 %	2 %
Direct magnetic field of external origin	Equal to zero	–	–	–	–	–
Alternating magnetic field of external origin at grid frequency	Equal to zero	Induction value causing an error shift not greater than:				
		±0.1 %	±0.2 %	±0.3 %	±0.3 %	±0.2 %
Operation of ancillary devices	Ancillary device not in operation	–	–	–	–	–
Operating position	Vertical operating position [c]	±0.5º	±0.5º	±0.5º	±0.5°	±0.5°
Conducted interference induced by radio-frequency electromagnetic fields, 150 kHz to 80 MHz	Equal to zero	<1 V	<1 V	<1 V	<1 V	<1 V

Table 22 – Reference conditions for static active energy meters

Influence factor	Reference value	Permissible tolerances for electricity meters of accuracy class				Permissible tolerances for electricity meters of class		
		0.2 S	0.5 S	1	2	A	B	C
Ambient temperature	Reference temperature or, if not specified, 23 °C	±2 °C	±2 °C	±2 °C	±2 °C	±2 °C	±2 °C	±2 °C

Voltage	Reference voltage	±1.0 %	±1.0 %	±1 %	±1 %	±1.0 %	±1.0 %	±1.0 %
Frequency	Reference frequency	±0.3 %	±0.3 %	±0.3 %	±0.5 %	±0.5 %	±0.3 %	±0.3 %
Phase sequence	L1 – L2 – L3	–	–	–	–	–	–	–
Voltage asymmetry	All phases connected	–	–	–	–	–	–	–
Waveform	Sine voltages and currents	Distortion factor less than:						
		2 %	2 %	2 %	3 %	3 %	2 %	2 %
Direct magnetic field of external origin	Equal to zero	–	–	–	–	–	–	–
Alternating magnetic field of external origin at grid frequency	Equal to zero	Induction value causing an error shift not greater than:						
		± 0.1 % or <0.05 mT	± 0.1 % or <0.05 mT	±0.2 %	±3 %	±0.3 %	±0.2 %	±0.1 %
Electromagnetic radio-frequency fields, 30 kHz to 2 GHz	Equal to zero	<1 V/m	<1 V/m	<1 V/m	<1 V/m	<1 V/m	<1 V/m	<1 V/m
Operation of ancillary devices	Ancillary device not in operation	–	–	–	–	–	–	–
Conducted interference induced by radio-frequency electromagnetic fields, 150 kHz to 80 MHz	Equal to zero	<1 V	<1 V	<1 V	<1 V	<1 V	<1 V	<1 V

Table 23 – Reference conditions for static reactive energy meters

Influence factor	**Reference value**	**Permissible tolerances for electricity meters of accuracy class**			
		0.5 S	**1 and 1 S**	**2**	**3**
Ambient temperature	Reference temperature or, if not specified, 23 °C	±2 °C	±2 °C	±2 °C	±2 °C
Voltage	Reference voltage	±1.0 %	±1.0 %	±1.0 %	±1.0 %
Frequency	Reference frequency	±0.3 %	±0.3 %	±0.5 %	±0.5 %
Phase sequence	L1 – L2 – L3	–	–	–	–
Voltage asymmetry	All phases connected	–	–	–	–
Waveform	Sine voltage	Non-linear distortion factor less than			
		2 %	2 %	2 %	3 %

Direct magnetic induction of external origin	Equal to zero	–	–	–	–
Alternating magnetic induction of external origin at reference frequency	Magnetic induction equal to zero	Induction value causing an error shift not greater than:			
		±0.3 %	±0.3 %	±0.3 %	±0.3 %
Electromagnetic radio-frequency fields, 30 kHz to 2 GHz	Equal to zero	<1 V/m	<1 V/m	<1 V/m	<1 V/m
Operation of accessories	Accessories not in operation	–	–	–	–
Conducted faults induced by electromagnetic fields, 150 kHz to 80 MHz	Equal to zero	<1 V	<1 V	<1 V	<1 V

7.3.3 Preparation of electricity meters for testing

Prior to performing the metrological tests, the electricity meters must be allowed to thermally stabilise for at least 6 hours in a room with a temperature of (23 ±5) °C.

In order to reach operating temperature, prior to performing the individual verification tests, the voltage circuits of the electricity meter must first be connected to reference voltage for at least:

30 minutes, in the case electromechanical electricity meters;

5 minutes, in the case of static electricity meters.

7.4 Test of no-load operation

7.4.1 Test of no-load operation for electromechanical electricity meters

For electricity meters with a mechanical counter, only the lowest-order cylinder may be engaged.Prior to testing, electromechanical electricity meters are set so that the mark on the rotor is visible in the window.

During the test, the voltage circuits are sequentially connected to the following voltages:

80 % of the reference voltage;

110 % of the reference voltage;

while the current circuits of the electricity meter are not energised.

The test duration is at least 15 minutes for every voltage.

The meter passes the test if the mark on the rotor does not leave the window.

7.4.2 Test of no-load operation for static electricity meters

In the case of static electricity meters, the voltage circuits are connected to 115 % of the reference voltage, while the current circuits of the electricity meter are not connected to power.The minimum test period is calculated using the equation:

$$t = \frac{K_0 \cdot 10^6}{k \cdot P_{max}} \quad (2)$$

where .....k is the electricity meter constant (imp/kWh or imp/kvarh),

P_{max} is the maximum output that can be measured by the electricity meter in W or var,

the values of constant K_0 are given in Table 24.

Table 24 – Values of constantK_0

Accuracy class	Active energy meters				Reactive energy meter			
	2	1	0.5 S	0.2 S	3	2	1 and 1 S	0.5 S
K_0	480	600	600	900	300	480	600	600

The minimum test period for class A, B and C electricity meters is calculated using the formula:

$$t = \frac{240 \cdot 10^3}{k \cdot m \cdot U_{\text{test}} \cdot I_{\text{st}}} \quad (3)$$

where .....k is the electricity meter constant (imp/kWh),

m is the number of measuring elements,

U_{test} is the test voltage in volts,

I_{st} is the inrush current according to Table 8 in amperes.

The test period for static electricity meters must be at least 15 minutes, even if the calculated time t is shorter.

The meter passes the test if the test LED or pulse output for remote measurement has sent no pulse or no more than one pulse.

7.5 Start-up test

During the start-up test, the electricity meter must start measuring energy after being connected to reference voltage U_n, at cos φ (or sin φ) = 1 and energising the current circuits according to Table 7, 8 or 9.The revolution of the rotor or the pulses sent to the test output are observed.

Different types of electricity meters are tested under additional conditions:

- electromechanical electricity meters with a mechanical counter: no more than two cylinders may be engaged;
- electromechanical electricity meters with a mechanical maximum meter: the maximum indicator may not be engaged;
- electricity meter with multiple reference voltages: for electricity meters with multiple reference voltages or with the full range of reference voltages, the start-up test is performed at the maximum and minimum voltages specified on the label;
- electricity meters with two base currents: the start-up test is performed at a starting current calculated from the smaller base current.

Electromechanical electricity meters pass the test if the rotor has started rotating and made at least one revolution.The test is performed until the described conditions are met, but for no longer than the period it would theoretically take the rotor of the tested electricity meter to make three revolutions (provided that it measures without errors at the starting current).

Static electricity meters pass the test if the test LED or the pulse output for remote measurement has sent at least two pulsesThe test is performed until the described conditions are met, but for no longer than the period it would theoretically take the test LED of the tested electricity meter or the pulse output for remote measurement to send at least three pulses (provided that it measures without errors at the starting current).This period is calculated in minutes using the equation

$$\Delta t = 3 \cdot \frac{6 \cdot 10^4}{k \cdot m \cdot U_n \cdot I_{st}} \quad (4)$$

7.6 Accuracy test

7.6.1 In general

During the accuracy test, the electricity meter's errors at the currents given in Tables 25 to 31 are established.The accuracy test must be performed using either:

a) the method of recording the number of disc revolutions or pulses of the tested electricity meter, or
b) the method of reading the data from the counter of the tested electricity meter.

Prior to measuring the error at the given current settings, it is necessary to wait for at least 5 seconds.

7.6.2 Measurement uncertainty

The measurement error of electricity meters must be established with uncertainties smaller than 1/4 of the permissible error limits given in Tables 25 to 31.One exception are static electricity meters of accuracy class 0.2 S, for which the measurement uncertainties must be less than 1/3 of the permissible error limits given in Table 27.

7.6.3 Specific test requirements

For electricity meters with a mechanical counter, only the lowest-order cylinder may be engaged during tests performed using the method of recording disc revolutions or pulses of the tested electricity meter.When using the method of reading data from the counter, no more than the last two cylinders may be engaged.

Electricity meters with and without ancillary devices are subject to the same test conditions and the same error limits.One exception are electricity meters with a mechanical ancillary device for measuring maximum values, where the driver may not drive the maximum indicator directly.

For special design electricity meters, the accuracy tests must be performed under the following conditions:

- electricity meter with multiple reference voltages: for electricity meters with multiple reference voltages or with the full range of reference voltages, the test is performed at the maximum and minimum voltages specified on the label;
- electricity meters with two base currents: the test is performed at the lowest test point, at the smaller base current.At all other test points, the test is performed at the higher base current;
- electricity meters with a data interface: instead of reading data visually, a device may be used to read the contents of the appropriate registers.However, the values read by the device and those indicated on the display must be identical (at least to the extent of the digits visible on the display).This comparison must be made at least once during the accuracy test;
- transmitting electricity meters: for meters equipped with terminals with a pulse output for remote energy measurement, in addition to the tests referred to above, this pulse output must be tested.The test station used must be equipped with an electronic device capable of receiving the type of pulses that are transmitted by the electricity meter.The test of the pulse output for remote measurement is performed at reference voltage, base current and unity power factor.
- electricity meters with a maximum value meter are tested only on stations equipped for this measurement.The test is performed at reference voltage, base current and power factor = 1.A measurement period of 15 minutes is used.Before starting the test, the 15-minute maximum register is zeroed.The output register is read at the beginning and end of the measurement period.The error of the maximum output measured during the measurement period must be less than the maximum permissible errors in Tables 1 to 6.The test must be performed for active and reactive energy, both for demand and supply.

7.6.4 Assessment of the accuracy test

The electricity meter passes the test if the meter's measurement errors are less than the error limits given in Tables 25 to 31 (the measurement uncertainty of the test equipment is not taken into consideration when establishing meter error).

Table 25 – Error limits for single-phase electromechanical and static active energy meters of accuracy class 0.5, 1 and 2 (also applies to electricity meters bearing the EEC mark)

Measurement number	Current	cos φ	Accuracy class for direct connected meters			Accuracy class for transformer operated meters		
			0.5	1	2	0.5	1	2
1 [1)]	5 (10) % I_b	1	±1.0 %	±1.5 %	±2.5 %	±1.0 %	±1.5 %	±2.5 %
2	100 % I_b	1	±0.5 %	±1.0 %	±2.0 %	±0.5 %	±1.0 %	±2.0 %
3	100 % I_b	0.5 ind.	±0.8 %	±1.0 %	±2.0 %	±0.8 %	±1.0 %	±2.0 %
4	$I_{max.}$	1	±0.5 %	±1.0 %	±2.0 %	±0.5 %	±1.0 %	±2.0 %

[*)] The value of current in the brackets apply to electromechanical electricity meters manufactured before the end of 1993.

Table 26 – Error limits for three-phase electromechanical and static active energy meters of accuracy class 0.5, 1 and 2 (also applies to electricity meters bearing the EEC mark)

Measurement number	Current	Current in phases	cos φ	Accuracy class for direct connected meters		Accuracy class for transformer operated meters		
				1	2	0.5 [1)]	1 and 1 S	2
1 [2)]	5 (10) % I_b	L1-L2-L3	1	±1.5 %	±2.5 %	±1.0 %	±1.5 %	±2.5 %
2	50 % I_b	L1	1	±2.0 %	±3.0 %	±1.5 %	±2.0 %	±3.0 %
3 [3)]	50 % I_b	L2	1	±2.0 %	±3.0 %	±1.5 %	±2.0 %	±3.0 %
4	50 % I_b	L3	1	±2.0 %	±3.0 %	±1.5 %	±2.0 %	±3.0 %
5	50 % I_b	L1	0.5 ind.	–	–	±1.5 %	±2.0 %	–
6 [3)]	50 % I_b	L2	0.5 ind.	–	–	±1.5 %	±2.0 %	–
7	50 % I_b	L3	0.5 ind.	–	–	±1.5 %	±2.0 %	–
8	100 % I_b	L1-L2-L3	1	±1.0 %	±2.0 %	±0.5 %	±1.0 %	±2.0 %
9	100 % I_b	L1-L2-L3	0.5 ind.	±1.0 %	±2.0 %	±0.8 %	±1.0 %	±2.0 %
10	$I_{max.}$	L1-L2-L3	1	±1.0 %	±2.0 %	±0.5 %	±1.0 %	±2.0 %

[1)] Accuracy class 0.5 applies only to electromechanical electricity meters.

[2)] The value of current in the brackets apply to electromechanical electricity meters manufactured before the end of 1993.

[3)] Measurements no 3 and 6 are omitted for three-wire electricity meters.

Table 27 – Error limits for three-phase static active energy meters of accuracy class 0.2 S and 0.5 S

Measurement number	Current	Current in phases	cos φ	Accuracy class for direct connected meters	Accuracy class for transformer operated meters	
				0.5 S	0.2 S	0.5 S
1	2 % I_b	L1-L2-L3	1	–	±0.4 %	±1.0 %
2	5 % I_b	L1-L2-L3	1	±0.5 %	±0.2 %	±0.5 %

3	5 % I_b	L1-L2-L3	0.5 ind.	±1.0 %	±0.5 %	±1.0 %
4	5 % I_b	L1-L2-L3	0.8 cap.	±1.0 %	±0.5 %	±1.0 %
5	5 % I_b	L1	1	±0.6 %	±0.3 %	±0.6 %
6 [1)]	5 % I_b	L2	1	±0.6 %	±0.3 %	±0.6 %
7	5 % I_b	L3	1	±0.6 %	±0.3 %	±0.6 %
8	10 % I_b	L1-L2-L3	1	±0.5 %	±0.2 %	±0.5 %
9	50 % I_b	L1	1	±0.6 %	±0.3 %	±0.6 %
10 [1)]	50 % I_b	L2	1	±0.6 %	±0.3 %	±0.6 %
11	50 % I_b	L3	1	±0.6 %	±0.3 %	±0.6 %
12	50 % I_b	L1	0.5 ind.	–	±0.4 %	±1.0 %
13 [1)]	50 % I_b	L2	0.5 ind.	–	±0.4 %	±1.0 %
14	50 % I_b	L3	0.5 ind.	–	±0.4 %	±1.0 %
15	100 % I_b	L1-L2-L3	1	±0.5 %	±0.2 %	±0.5 %
16	100 % I_b	L1-L2-L3	0.5 ind.	±0.6 %	±0.3 %	±0.6 %
17	100 % I_b	L1-L2-L3	0.8 cap.	±0.6 %	±0.3 %	±0.6 %
18	$I_{max.}$	L1-L2-L3	1	±0.5 %	±0.2 %	±0.5 %

[1)] Measurements no 6, 10 and 13 are omitted for three-wire electricity meters.

Table 28 – Error limits for single-phase electromechanical and static active energy meters of accuracy class A, B and C

Measurement number	Current	cos φ	Class A	Class B	Class C [1)]
1	I_{min}	1	±2.5 %	±1.5 %	±1.0 %
2	I_{tr}	1	±2.0 %	±1.0 %	±0.5 %
3	I_{tr}	0.5 ind.	±2.0 %	±1.0 %	±0.5 %
4	I_{ref}	1	±2.0 %	±1.0 %	±0.5 %
5	I_{ref}	0.5 ind.	±2.0 %	±1.0 %	±0.5 %
6	I_{ref}	0.8 cap.	±2.0 %	±1.0 %	±0.5 %
7	I_{max}	1	±2.0 %	±1.0 %	±0.5 %

[1)] Class C applies only to static electricity meters.

NOTE I_{tr} = 10 % I_{ref} for direct connected electricity meters;
I_{tr} = 5 % $I_n$for transformer operated electricity meters.

Table 29 – Error limits for three-phase electromechanical and static active energy meters of accuracy class A, B and C

Measurement number	Current	cos φ	Current in phases	Class A	Class B	Class C [1)]
1	I_{min}	1	L1-L2-L3	±2.5 %	±1.5 %	±1.0 %
2	I_{tr}	1	L1-L2-L3	±2.0 %	±1.0 %	±0.5 %
3	I_{tr}	0.5 ind.	L1-L2-L3	±2.0 %	±1.0 %	±0.5 %
4	50 % I_{ref}	1	L1	±3.0 %	±2.0 %	±1.0 %
5	50 % I_{ref}	1	L2	±3.0 %	±2.0 %	±1.0 %
6	50 % I_{ref}	1	L3	±3.0 %	±2.0 %	±1.0 %
7	50 % I_{ref}	0.5 ind.	L1	–	±2.0 %	±1.0 %
8	50 % I_{ref}	0.5 ind.	L2	–	±2.0 %	±1.0 %
9	50 % I_{ref}	0.5 ind.	L3	–	±2.0 %	±1.0 %
10	I_{ref}	1	L1-L2-L3	±2.0 %	±1.0 %	±0.5 %
11	I_{ref}	0.5 ind.	L1-L2-L3	±2.0 %	±1.0 %	±0.5 %
12	I_{ref}	0.8 cap.	L1-L2-L3	±2.0 %	±1.0 %	±0.5 %
13	I_{max}	1	L1-L2-L3	±2.0 %	±1.0 %	±0.5 %

[1)] Class C applies only to static electricity meters.

NOTE I_{tr} = 10 % I_{ref} for direct connected electricity meters;
I_{tr} = 5 % $I_n$for transformer operated electricity meters.

Table 30 – Error limits for three-phase static reactive energy meters of accuracy class 0.5 S, 1 and 1 S

Measurement number	Current in phases	sin φ	Value of current for electricity meters that are		Accuracy class	
			direct connected	transformer operated	0.5 S	1 and 1 S
1	L1-L2-L3	1	5 % I_b	2 % I_n	±1.0 %	±1.5 %
2	L1-L2-L3	1	10 % I_b	5 % I_n	±0.5 %	±1.0 %
3	L1-L2-L3	0.5 ind.	10 % I_b	5 % I_n	±1.0 %	±1.5 %
4	L1-L2-L3	0.8 cap.	10 % I_b	5 % I_n	±1.0 %	±1.5 %
5	L1	1	50 % I_b	50 % I_n	±0.7 %	±1.5 %
6 [1)]	L2	1	50 % I_b	50 % I_n	±0.7 %	±1.5 %
7	L3	1	50 % I_b	50 % I_n	±0.7 %	±1.5 %
8	L1-L2-L3	1	100 % I_b	100 % I_n	±0.5 %	±1.0 %
9	L1-L2-L3	0.5 ind.	100 % I_b	100 % I_n	±0.5 %	±1.0 %
10	L1-L2-L3	0.5 cap.	100 % I_b	100 % I_n	±0.5 %	±1.0 %
11	L1-L2-L3	1	I_{max}	I_{max}	±0.5 %	±1.0 %

[1)] Measurement no 6 is omitted for three-wire electricity meters.

Table 31 – Error limits for three-phase static reactive energy meters of accuracy class 2 and 3

Measurement number	Current in phases	sin φ	Value of current for electricity meters that are		Error limit	
			direct connected	transformer operated	2	3
1	L1-L2-L3	1	5 % I_b	2 % I_n	±2.5 %	±4.0 %
2	L1-L2-L3	1	10 % I_b	5 % I_n	±2.0 %	±3.0 %
3	L1-L2-L3	0.5 ind.	10 % I_b	5 % I_n	±2.5 %	±4.0 %
4	L1-L2-L3	0.8 cap.	-	5 % I_n	±2.0 %	±3.0 %
5	L1	1	50 % I_b	50 % I_n	±3.0 %	±4.0 %
6 [1)]	L2	1	50 % I_b	50 % I_n	±3.0 %	±4.0 %
7	L3	1	50 % I_b	50 % I_n	±3.0 %	±4.0 %
8	L1-L2-L3	1	100 % I_b	100 % I_n	±2.0 %	±3.0 %
9	L1-L2-L3	0.5 ind.	100 % I_b	100 % I_n	±2.0 %	±3.0 %
10	L1-L2-L3	0.8 cap.	100 % I_b	100 % I_n	±2.0 %	±3.0 %
11	L1-L2-L3	1	I_{max}	I_{max}	±2.0 %	±3.0 %

[1)] Measurement no 6 is omitted for three-wire electricity meters.

7.7 Counter test

The counter test is performed only if the accuracy test was performed according to Article 7.6.1, paragraph (a), using the method of recording rotor revolutions or pulses from the tested electricity meter.

The counter test is performed at power factor = 1 and at a single current between the base and maximum currents.

NOTE If maximum current I_{max} is not indicated on the label of the electricity meter, for the purposes of this regulation, it is equal to 1.2 times the nominal (base) current indicated on the label.

The electricity meter passes the test if the observed difference between the error when using the method of recording rotor revolutions or pulses from the tested electricity meter and that when using the method of reading data on the counter of the tested meter at the same current is less than 1/10 of the error limit

at reference conditions.In the case of electricity meters with a mechanical counter, this ratio is increased to 1/4 of the error limit.

In the case of electricity meters of accuracy class 0.2 S, this ratio is increased to 1/4 of the error limit.

7.8 Subsequent verification of electricity meters using the statistical sampling test

For subsequent verification of electricity meters installed in the distribution grid, a statistical sampling test of a specified lot of electricity meters may be performed upon request.

7.8.1 Lot for a statistical sampling test

The lot may only comprise electricity meters from a single manufacturer that are of the same type and have the same reference voltage and reference and maximum currents.Once created, this lot may not be changed and the included electricity meters may not be included in another lot for another subsequent verification using the statistical sampling test.

The most recent valid verification of the electricity meters in the lot or conformity assessment of the electricity meters in the lot when put into use must have been performed at a time interval no longer than two consecutive years.

7.8.2 Statistical method used

The statistical sampling test may be performed by making one or two selections from the lot of the electricity meters according to recognised statistical methods.The selection made may include a specified lot of substitute electricity meters to be added to the tested sample during the tests.

Logistical and other details of performing the statistical sampling test, including sampling plans, are specified in an internal regulation of the metrological body performing the verification.

7.8.3 Tests to be performed

All electricity meters in the submitted sample are subjected to the full tests prescribed for subsequent verification of electricity meters under Articles 7.2 and 7.4 to 7.7.If an electricity meter from the sample fails to pass the visual inspection referred to in Article 7.2, it may be substituted by an electricity meter from the lot of substitute meters.

An electricity meter is classified as non-complaint if it does not pass the no-load condition test referred to in Article 7.4 and the start-up test referred to in Article 7.5, and if the error established during the accuracy test referred to in Article 7.6 is greater than the error limits given for the individual types of meters in Tables 25 to 31.

7.8.4 Assessment of the results of the statistical sampling test

The control sample of electricity meters is assessed as compliant if the acceptance requirements under the sampling plan for the selective check agreed to in advance have been met.Otherwise, the result is ‘non-compliant’.

If the result of the selective check is ‘non-compliant’, all electricity meters in the lot are assessed as non-compliant.

8 Measuring instrument examination

When examining measuring instruments pursuant to § 11a of the Metrology Act at the request of a person who may be affected by incorrect measurement, all the relevant tests under Chapter 7 that are technically feasible will be performed; the last sentence of Article 7.2 does not apply.

The maximum permissible error applied will be double the maximum permissible errors given for the individual types of electricity meters in Tables 25 to 31.The requirements for start-up, no-load operation and the counter remain unchanged when carrying out this examination.

9 Notified standards

For the purposes of specifying the metrological and technical requirements for measuring instruments and specifying the testing methods for their type approval and verification arising from this general measure, the CMI must notify Czech technical standards, other technical standards or technical documents of international or foreign organisations, or other technical documents containing more detailed technical requirements (hereinafter 'notified standards').The CMI shall publish a list of these notified standards attached to the relevant measures, together with the general measure, in a manner accessible to the public (at www.cmi.cz).

Compliance with notified standards or parts thereof is considered, to the extent and under the conditions stipulated by a general measure, to be compliance with the requirements stipulated by this measure to which these standards or parts thereof apply.

Compliance with notified standards is one way of demonstrating compliance with the requirements.These requirements may also be met by using another technical solution guaranteeing an equivalent or higher level of protection of legitimate interests.

II.

G R O U N D S

The CMI has issued this general measure laying down metrological and technical requirements for legally controlled measuring instruments and tests for the type approval and verification of legally controlled measuring instruments – 'electricity meters' – in accordance with § 14(1)(j) of the Metrology Act to implement § 6(2), § 9(1) and (9), and § 11a(3) of the Metrology Act.

Under items 4.1.1, 4.1.2 and 4.1.3 in the Annex 'List of the Types of Legally Controlled Measuring Instruments' to Implementing Decree No 345/2002 specifying the measuring instruments whose verification is mandatory and measuring instruments subject to type approval, as amended, this type of measuring instruments is classified as instruments subject to type approval and mandatory verification.

This legislation (general measure) will be notified in accordance with Directive (EU) 2015/1535 of the European Parliament and of the Council of 9 September 2015 laying down a procedure for the provision of information in the field of technical regulations and of rules on Information Society services.

III.

I N S T R U C T I O N S

In accordance with § 172(1) APC, in conjunction with § 39(1) APC, the CMI has stipulated a time limit for comments of 30 days from the date of posting the draft on the official notice board.Comments submitted after this time limit will not be considered.

The persons concerned are hereby invited to comment on this draft general measure.With a view to the provisions of § 172(4) APC, the comments are to be submitted in writing.

Pursuant to the provisions of § 174(1) APC, in conjunction with the provisions of § 37(1) APC, it must be clearly stated who is submitting the comments, which general measure the comments concern, how the draft contradicts legislation or how the general measure is inaccurate. The comments must also contain the signature of the person making the comments.

The supporting documents for this draft general measure may be consulted at the Czech Metrology Institute, Legal Metrology Department, Okružní 31, 638 00 Brno, after making arrangements by telephone.

This draft general measure shall be posted for 15 days.

.....

RNDr.Pavel Klenovský m.p.

Director General

Person responsible for accuracy:Mgr.Tomáš Hendrych

Posted on:1 June 2018

Signature of the authorised person confirming posting:Mgr.Tomáš Hendrych m.p.

Removed on:

Signature of the authorised person confirming removal: