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PUBLIC DECREE

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

I.

MEASURE OF A GENERAL NATURE

number: 0111-OOP-C089-22

laying down the metrological and technical requirements for specified measuring instruments, including testing methods for verification of the following specified measuring instruments:

'voltage instrument transformers'

1 Basic definitions

For the purposes of this Measure of a General Nature, terms and definitions according to VIM and VIML[1] and the terms and definitions below apply.

1.1

voltage instrument transformer (hereinafter 'instrument transformer' or 'VIT')

a voltage transformer that helps transmit an information signal to measuring instruments, electricity meters, etc.

1.2

primary winding

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

the winding to which the voltage to be transformed is applied

1.3
secondary winding

the winding to which voltage circuits of measuring instruments, electricity meters, breakers or similar devices are connected

1.4
nominal primary voltage

the value of the primary voltage indicated on the instrument transformer plate and on which its operation is based. The standard values of nominal voltage of a single-phase transformer connected between the phase conductor of the three-phase system and the ground, or between zero point and ground, are given by the product of the nominal system voltage multiplied by a factor of 1/√3

1.5
nominal secondary voltage

the value of the secondary voltage indicated on the instrument transformer plate and on which its operation is based. For single-phase instrument transformers connected between phase and ground in three-phase systems where the nominal value of the primary voltage is divided by √3, the secondary voltage value is divided by √3, so the resulting transformation ratio remains the same.

1.6
voltage increase factor

a factor whose product with the rated primary voltage gives the highest voltage at which the instrument transformer must meet the warming requirements for the prescribed time and accuracy requirements

1.7
voltage error (ratio error)

error caused by the instrument transformer due to the fact that the actual voltage ratio is not equal to the nominal ratio. This voltage error, expressed as a percentage, is given by the formula:

$$\varepsilon_U = \frac{\left(K_n U_s - U_p\right) 100}{U_p} \tag{1}$$

where K_n.......... is the nominal ratio,
U_p .... is the actual primary voltage,
U_s .... is the actual secondary voltage, corresponding to U_p under measurement conditions.

1.8
phase angle error

the phase difference between primary and secondary voltage phasors; the orientation of the primary and secondary voltage phasors is chosen in such a way that in an ideal instrument transformer the phase angle error is zero. The phase angle error is considered positive if the secondary current phasor precedes the primary current phasor. It is usually expressed in arc minutes or centiradians.

NOTE: This definition is correct only for the alternating sinusoidal voltage.

1.9
two-pole insulated instrument transformer

an instrument transformer for which all parts of the primary winding, including terminals, are insulated from ground to an insulation level corresponding to the nominal insulation level

1.10
single-pole insulated instrument transformer

a single-phase instrument transformer that has one end of its primary winding directly grounded or a three-phase transformer designed to connect the primary winding to a star with a directly grounded zero point

1.11
real ratio

the ratio of the actual primary voltage to the actual secondary voltage of the instrument transformer

1.12
nominal ratio

the ratio of nominal primary voltage to nominal secondary voltage

1.13
impedance

the impedance of the secondary circuit, expressed in ohms, at a given power factor (inductive or capacitive). The impedance is usually expressed as the apparent power in VA consumed at the stipulated power factor and at nominal secondary current.

1.14
nominal impedance

value of the load from which the prescribed accuracy requirements are derived

1.15
nominal load

the load value in volt-amperes at a given power factor that the instrument transformer transmits to the secondary circuit at nominal secondary voltage and connected nominal impedance

1.16
rated load

the value of the apparent power at the nominal voltage that can be taken from the secondary winding without exceeding permitted warming. The rated load must be specified in units of ‘VA’.

Its default values are: (25; 50; 100) VA and their decimal multiples, these extreme load values being determined at the rated secondary voltage and at a power factor of 1.

NOTES:
1. At the rated load, the limits of voltage errors and phase angle errors for all secondary windings may be exceeded.
2. If there is more than one secondary winding, the rated load for each winding must be indicated separately.

1.17
accuracy class

a designation assigned to an instrument transformer whose voltage error and phase angle error do not exceed permissible values under prescribed operating conditions

1.18
maximum voltage for an instrument transformer

the maximum effective value of the combined AC voltage between phases for which the instrument transformer is designed with regard to its insulation

1.19
nominal insulation level
the combination of voltage values that characterises the insulation of the instrument transformer in terms of its ability to withstand electrical stress

1.20
exposed environment
an environment in which the instrument transformer is exposed to atmospheric overvoltage

NOTE: Such a voltage instrument transformer is usually connected to an external line either directly or by a short cable.

1.21
unexposed environment
an environment in which the instrument transformer is not exposed to atmospheric overvoltage

NOTE: Such a voltage instrument transformer is usually connected with a cable grid.

1.22
nominal frequency
the value of the frequency from which the requirements of this legislation are derived

1.23
auxiliary winding
the winding of a single-phase instrument transformer that is intended, in an assembly of three single-phase instrument transformers for connection to an open triangle, for:

a) creation of the sum voltage in fault states;
b) suppression of oscillations during resonance phenomena.

2 Metrological requirements

2.1 Normal operating conditions

2.1.1 Ambient air temperature

Measuring transformers are classified in three categories as shown in Table 1.

Table 1 — Temperature category

Category	Lowest temperature (°C)	Highest temperature (°C)
-5/+40	-5	+40
-25/+40	-25	+40
-40/+40	-40	+40

NOTE: Storage and transport conditions must also be considered when selecting the temperature category.

2.1.2 Other operating conditions for an indoor instrument transformer

The other operating conditions to be taken into account are:

a) the effect of sunlight; may be neglected;

b) the influence of ambient air, if it is heavily polluted by dust, smoke, corrosive gases, steam or salt;

c) normal humidity conditions are as follows:
- the mean relative humidity value measured over a period of 24 hours does not exceed 95 %;
- the average water vapour pressure over 24 hours does not exceed 2.2 kPa;
- the average relative humidity over the course of one month does not exceed 90%;
- the average water vapour pressure over a month does not exceed 1.8 kPa.

2.1.3 Other operating conditions for outdoor instrument transformers

Other operating conditions that are considered are as follows:

a) if the average ambient air temperature measured over a period of 24 hours does not exceed 35 ° C, it can be neglected;

b) solar radiation exceeding 1000 W/m ^{2} (high noon on a clear day) must be taken into account;

b) the ambient air, if it is heavily contaminated by dust, smoke, corrosive gases, vapours or salts, must be taken into account;

d) wind pressure not exceeding 700 Pa (this value corresponds to a wind speed of 34 m/s) is not taken into account;

e) the presence of condensation or precipitation must be taken into account.

2.2 Nominal parameter values for instrument transformers

2.2.1 General requirements for nominal data

The nominal data of the voltage instrument transformers, including their accessories, must be selected according to:

a) the maximum voltage for the instrument transformer (U_m);

b) the prescribed insulation levels;

c) the nominal frequency (f_R);

d) the nominal load;

e) the nominal accuracy class;

f) the nominal voltage.

The nominal data shall be applied under normal reference atmospheric conditions (temperature (20 °C), pressure (101.3 kPa) and humidity (11 g/m ^{3})).

2.2.2 Maximum voltage for an instrument transformer

The maximum voltage values for the instrument transformer must be selected from Table 2.

The maximum voltage for the instrument transformer is selected as the nearest value of U_m that is equal to or greater than the maximum voltage of the system where it is installed.

For an instrument transformer installed under normal insulation conditions, U_m must be at least equal to U_{sys}.

For a measuring transformer installed outside the normal isolation environment range, U_m may be selected greater than the nearest U_m value equal to or greater than U_{sys} according to special needs.

NOTE: By way of example, the selection of a U_m value greater than the nearest normalized value U_m equal to or greater than U_{sys} when the voltage measuring transformer is to be installed at an altitude higher than 1000 m in order to compensate for the drop in the withstand voltage.

2.2.3 Prescribed insulation levels

The choice of insulation level of the primary winding terminals of inductive instrument transformers must be derived from the highest voltage U_m for the instrument transformer according to Table 2.

Table 2 - Prescribed primary terminal insulation levels for instrument transformers

Maximum instrument transformer voltage U_m (effective value) (kV)	**Nominal test voltage at 50 Hz (effective value)** (kV)	**Rated atmospheric pulse test voltage (peak value)** (kV)	**Rated withstand voltage at switching pulse (peak value)** (kV)
0.72	3	---	
1.2	6	---	
3.6	10	20	
		40	
7.2	20	40	
		60	
12	28	60	
		75	
17.5	38	75	
		95	
24	50	95	
		125	
36	70	145	
		170	
52	95	250	
72.5	140	325	
100	185	450	
123	185	450	
	230	550	
145	230	550	
	275	650	
170	275	650	
	325	750	
245	395	950	
	460	1,050	
300	395	950	750
	460	1,050	850
362	460	1,050	850
	510	1,175	950
420	570	1,300	950
	630	1,425	1,050
550	630	1,425	1,050
	680	1,550	1,175
800	880	1,950	1,425
	975	2,100	1,550

2.2.4 Additional requirements for primary winding insulation

2.2.4.1 Requirements for grounded primary winding terminal insulation

The primary winding terminal to be grounded and insulated from the casing and frame must pass a test using a short-term test voltage at a frequency of 50 Hz with an effective value of 3 kV for 1 minute applied between this terminal and the frame.

2.2.4.2 Partial discharges

Partial discharge requirements are applicable to instrument transformers with U_m greater than or equal to 7.2 kV. Partial discharge levels must not exceed the limits set out in Table 3.

Table 3 - Test voltages for measuring partial discharges and permissible levels

Grid ground type	**Primary winding connection**	**Test voltage for partial discharge measurement (effective value)** (kV)	**Permissible partial discharge levels** (pC) **Type of insulation:** **liquid or gas**	**solid**
Grounded centre network (ground connection factor ≤ 1.4)	Phase-ground	U_m	10	50
		$1.2U_m/\sqrt{3}$	5	20
	Phase-phase	$1.2U_m$	5	20
It network or network with inefficiently grounded centre (ground link factor	Phase-ground	$1.2U_m$	10	50
		$1.2U_m/\sqrt{3}$	5	20
	Phase-phase	$1.2U_m$	5	20

NOTES:

1. If the network midpoint is not defined, values apply to an IT network or network with an inefficiently grounded midpoint.
2. The maximum permitted levels of partial discharges are also valid for frequencies other than the nominal frequency.

2.2.5 Insulation requirements between winding sections

For interconnected terminals from each section, the test voltage of the industrial frequency between sections 3 kV must be specified.

2.2.6 Requirements for the isolation of secondary windings

The specified test voltage at 50 Hz for secondary insulation is 3 kV.

2.2.7 Values of nominal frequencies

The nominal frequencies are 16 2/3 Hz, 50 Hz.

2.2.8 Nominal load values

The nominal values of apparent load power at power factor 1 expressed in VA are:

(1; 2.5; 5; 10) VA (Load Range I).

The nominal apparent power values at an inductive power factor 0.8 expressed in VA are:

(10; 25; 50; 100) VA (Load range II).

NOTE: For a given instrument transformer that has one of the nominal load values associated with the accuracy class, the provision of nominal non-standard loads associated with another accuracy class is not ruled out.

2.2.9 Accuracy classes and permissible errors of instrument transformers

2.2.9.1 Determination of the accuracy class

For instrument transformers, the accuracy class is determined by the maximum permissible voltage error expressed as a percentage at the rated voltage prescribed for the relevant accuracy class.

2.2.9.2 Accuracy classes

The accuracy classes for single-phase inductive instrument transformers are:

0.1; 0.2; 0.5; 1.0.

2.2.9.3 Permissible current errors and angle errors for instrument transformers

The voltage error and the error of the angle at rated frequency shall not exceed the values given in Table 4 at any voltage between 80 % and 120 % of the nominal voltage and with a load in the range of:

a) any values between 0 VA and 100 % of the nominal load value for instrument transformers with a load of (1; 2.5; 5; 10) VA at Power factor 1 (Load range I);

b) between 25 % and 100 % of the nominal load for instrument transformers with a load of (10; 25; 50; 100) VA at power factor 0.8 (Load range II).

Errors in instrument transformers shall be determined at the terminals of the instrument transformer and shall include the effect of fuses, resistors and integral parts of the instrument transformer.

For instrument transformers with taps on secondary windings, the error requirements apply to the highest transformation ratio, unless otherwise specified.

Table 4 – Permissible voltage errors and phase angle errors of instrument transformers

Class of accuracy	Voltage error ε_U (%)	Phase angle error δ_U	
		Minutes	Centiradians
0.1	0.1	5	0.15
0.2	0.2	10	0.3
0.5	0.5	20	0.6
1.0	1.0	40	1.2

2.2.10 Nominal voltage values of instrument transformers

2.2.10.1 Nominal primary voltage values

The nominal values of the primary voltages of three-phase instrument transformers and single-phase instrument transformers for use in single-phase systems or for phase-to-phase measurements in three-phase systems must correspond to the nominal voltages set out in Tables 5 to 8. The nominal value of the primary voltages of the single-phase voltage transformer connected between one phase of the three-phase system and ground or between the system zero point and the country must be $1/\sqrt{3}$ of one of the values of rated voltages.

NOTE: The property of voltage instrument transformers is based on the nominal primary voltage, whereas the nominal insulation level is based on the highest voltage for the instrument transformer.

Table 5 — Three-phase systems with a rated AC voltage exceeding 1 kV and not exceeding 35 kV and related equipment [a]

Highest voltage for equipment(kV)	**Nominal system voltage** (kV)	
3.6	3.3	3
7.2	6.6	6
12	11	10
(17.5)	–	(15)
24	22	20
36	33	30
40.5	–	35

NOTE: Above are two series (columns) of nominal network voltage.

[a] These networks are generally three-wire unless specified otherwise.
These values are phase-to-phase voltages.
Values in brackets are not considered preferential.

Table 6 — AC three-phase systems with a nominal voltage above 1 kV and not exceeding 35 kV and related equipment[a] used in the Czech Republic

Highest voltage for equipment(kV)	**Nominal system voltage** (kV)
3.6	3
7.2	6
12	10
25	22
38.5	35

[a] These networks are generally three-wire unless specified otherwise.
These values are phase-to-phase voltages.

Table 7 — Three-phase systems with a rated AC voltage exceeding 35 kV and not exceeding 230 kV and related equipment[a]

Highest voltage for equipment (kV)	**Nominal system voltage** (kV)	
(52)	(45)	–
72.5	66	69
100	90	–
123	110	115
145	132	138
(170)	(150)	(154)
245	220	230

[a] Values in brackets are not considered preferential. These values are phase-to-phase voltages.

NOTE 1: Above are two series (columns) of nominal network voltage.

NOTE 2: Of the following groups, only one value may be used for the highest voltage for the device:
Group 1: 123 kV or 145 kV;
Group 2: 245 kV (see Table 7) or 300 kV or 362 kV (see Table 8)

Table 8 — Highest voltage for three-phase AC system equipment with a rated voltage above 245 kV[a]

Highest voltage for equipment (kV)
(300)
362
420
550[b]
800[c]
1,100
1,200

[a] Values in brackets are not considered preferential. Values are phase-to-phase voltages.
[b] 525 kV is also used.
[c] 765 kV is also used.

NOTE: Only one value from the following groups can be used as the highest voltage for equipment:

Group 1 245 kV (see Table 7) or 300 kV or 362 kV (see Table 8);
Group 2 362 kV or 420 kV;
Group 3 420 kV or 550 kV;
Group 4 1100 kV or 1200 kV.

2.2.10.2 Values of rated secondary voltages

The nominal value of the secondary voltage must be selected according to practice at the place of application of the instrument transformer. The values of these voltages shall be considered as values for single-phase instrument transformers that are connected in single-phase systems or between phases in three-phase systems, and for three-phase instrument transformers. The nominal values of the secondary voltage are 100 V and 110 V.

For single-phase instrument transformers that are designed for phase-to-ground connection in a three-phase system where the rated primary voltage is the selected value divided by √3, the rated secondary voltage must be one of the above values divided by √3. This will ensure the nominal ratio of the instrument transformer.

2.2.10.3 Nominal values of the voltage increase factor

The voltage increase factor is determined by the highest operating voltage, which depends on the system and the grounding conditions of the primary winding of the instrument transformer.
The values of the voltage increase factor relevant to the different grounding conditions are given in Table 9 together with the permissible duration of the maximum operating voltage (i.e. nominal duration).

Table 9 — Nominal values of voltage increase factors

Voltage increase factor	Permissible duration	Primary winding connection method and grounding conditions
1.2	Permanent	Between phases in all systems. Between the zero point of the instrument transformer and the ground in all systems.
1.2	Permanent	Between phase and ground in a system with an effectively grounded centre.
1.5	30 s	
1.2	Permanent	Between phase and ground in a compensated network with automatic disconnection of the ground connection.
1.9	30 s	
1.2	Permanent	Between phase and country in an IT network without automatic disconnect of the ground connection or in a compensated network without automatic disconnect.
1.9	8 h	

3 Technical requirements

3.1 General requirements for warming of instrument transformers

The warming of windings, magnetic circuits or any other components of instrument transformers must not exceed the relevant values given in Table 10 if operated under specified conditions. These values shall be based on the operating conditions referred to in Article 2.1.1.

The warming of the winding is limited by the lowest class of insulation, either of the winding itself or the medium surrounding it.
If the instrument transformers are in enclosures, attention must be paid to the temperature surrounding the coolant inside the housing.

If the specified ambient temperatures are higher than those referred to in Article 2.1.1, the permissible temperature increase according to Table 10 must be reduced by a value equal to the higher ambient temperature.

Table 10 — Temperature limits for different parts, materials and dielectrics of the instrument transformer

Instrument transformer parts	Greatest permissible warming (K)
Oil voltage instrument transformer:	
— oil in upper layer	50
— oil in upper layer, hermetically sealed	55
— centre of winding	60
— centre of winding, hermetically sealed	65
— other metal parts in contact with oil	as for windings
Instrument transformer with solid or gas insulation — windings in contact with insulation materials according to the following temperature classes:	
Y	45
A	60
E	75
B	85
F	110
H	135
− other metal parts in contact with the above material classes classes	as for windings
Connections, screwed or equivalent	as for windings
− Bare copper, bare copper alloy or bare aluminium alloy	
• in air	50
• in SF_6	75
• in oil	60
− Silver plated or nickel plated	
• in air	75
• in SF_6	75
• in oil	60
− Tin plated	
• in air	65
• in SF_6	65
• in oil	60

3.2 Requirements for external insulation

For inductive instrument transformers for outdoor use with a ceramic insulator sensitive to contamination, the required isolation distances measured over the surface of the insulator are shown in Table 11.

Table 11 — Insulation surface distances

Degree of contamination		Minimum nominal surface distance mm/kV [1)]	Ratio = surface distance divided by clearance
I	low	16	≤ 3.5
II	medium	20	
III	high	25	≤ 4.0
IV	very high	31	

[1)] The ratio of the surface distance between phase and ground to the effective value of the phase-to-phase voltage of the highest voltage for the equipment.

NOTES:

1. It is found that the quality of the surface insulation is greatly influenced by the shape of the insulator.
2. For very lightly contaminated surfaces, a nominal surface distance of less than 16 mm/kV may be used based on operating experience. The generally accepted lower limit is 12 mm/kV.
3. In cases of exceptional contamination, the nominal surface distance of 31 mm/kV may not be sufficient. Depending on operating experience and/or the results of laboratory tests, a higher nominal surface distance value must be used.

3.3 Short-circuit resistance

An instrument transformer must be designed and manufactured to withstand an external short circuit lasting 1 second without damage due to thermal and mechanical influences.

3.4 Software

If an instrument transformer includes software that is essential for its metrological characteristics, it must be identifiable by the manufacturer as a separate numerical version that is in conformity with the approved measuring instrument type. It must be possible to identify software during the operation of the measuring instrument in a simple manner. The installed software must be secured against accidental or unauthorised external interference. If the software needs to be reinstalled (as measuring instrument maintenance), new verification of the measuring instrument's metrological properties must be conducted.

4 Instrument markings

4.1 In general

This marking applies to single-phase instrument transformers as well as to single-phase instrument transformers assembled into one unit and connected as a three-phase instrument transformer or to a three-phase instrument transformer having a common core for three phases.

4.2 Terminal markings

Priority marking of terminals of inductive instrument transformers shall be in accordance with Figures 1 to 10. The capital letters 'A', 'B', 'C' and 'N' refer to the terminals of the primary winding, the lower-case letters 'a', 'b', and 'n' indicate the corresponding terminals of the secondary winding. The letters 'A', 'B' and 'C' refer to fully insulated terminals, and the letter 'N' indicates the end of the winding to be grounded and the insulation of which is less than that of the other terminals. The letters 'da' and 'dn' mark the terminals of the auxiliary secondary winding.

4.3 Polarity indications

Terminals marked with the same lower-case and capital letters must have the same polarity at the same time.

NOTE: The plate may contain information relating to several load combinations and accuracy classes that the instrument transformer complies with.

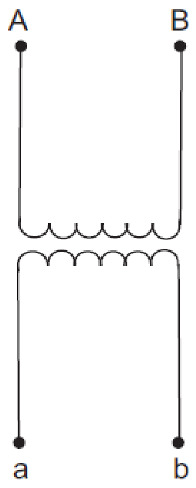


Figure 1 — Single-phase double pole insulated transformer with one secondary winding

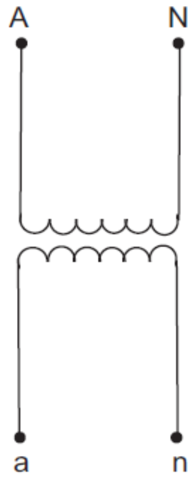


Figure 2 - Single-phase single-pole insulated transformer with reduced insulation and one secondary winding

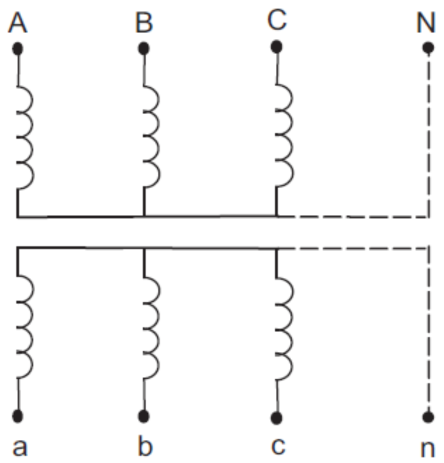


Figure 3 — Three-phase transformer with one secondary winding

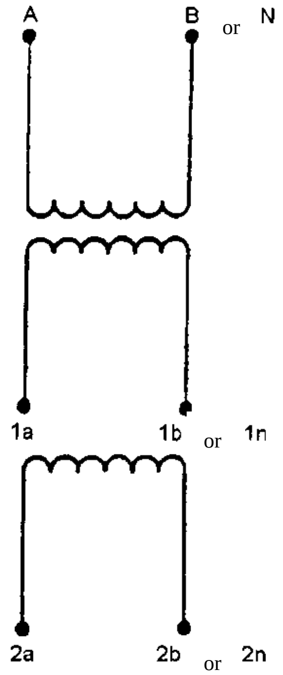


Figure 4 - Single-phase transformer with two secondary windings

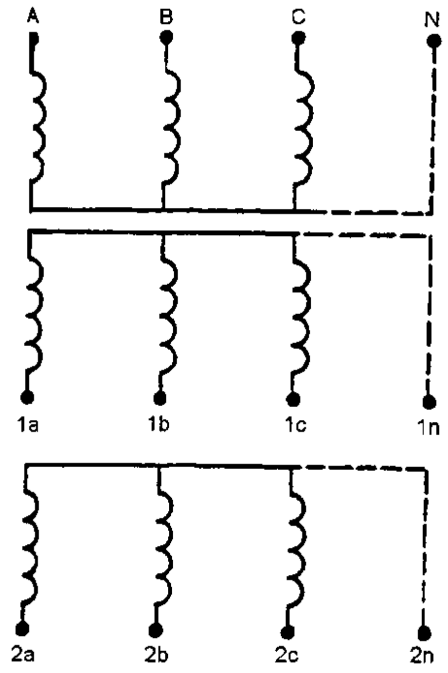


Figure 5 - Three-phase transformer with two secondary windings

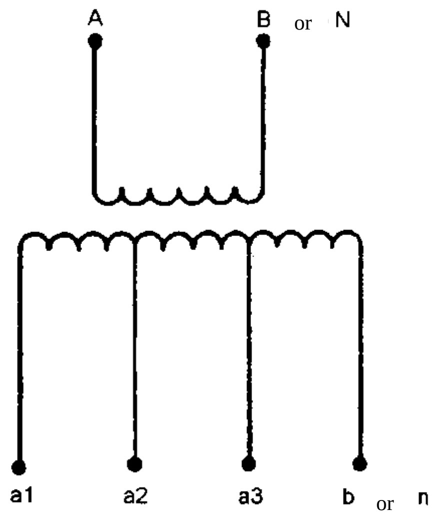


Figure 6 — Single-phase transformer with one secondary winding with a tap

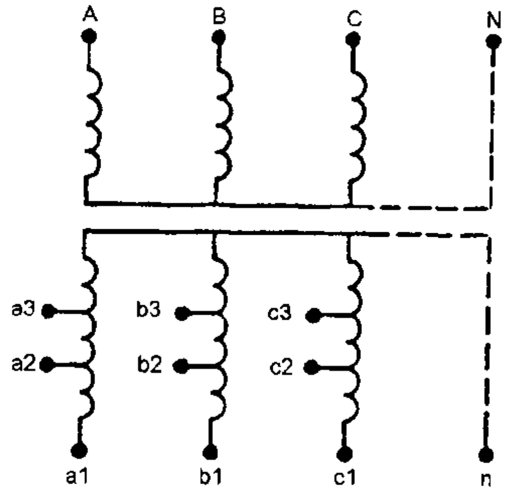


Figure 7 — Three-phase transformer with one secondary winding and tap

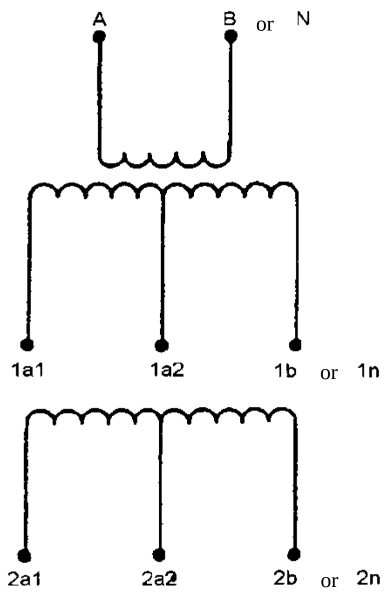


Figure 8 — Single phase transformer with two secondary windings and taps

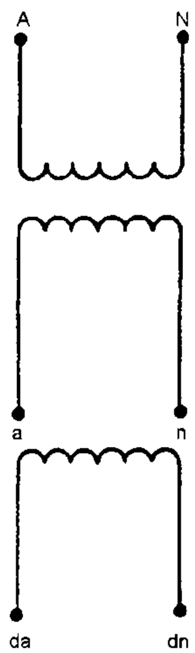


Figure 9 — Single phase transformer with one auxiliary winding

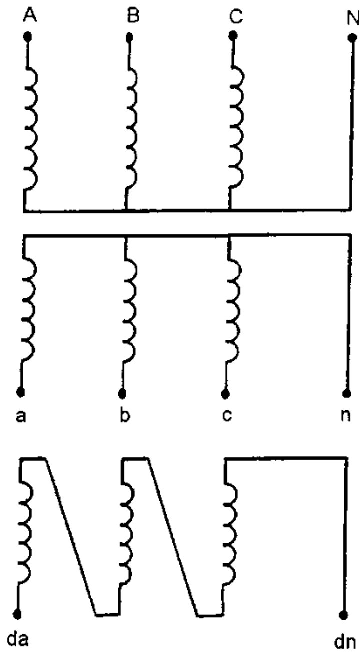


Figure 10 — Three-phase transformer with one auxiliary winding

4.4 Information on the nameplate

All voltage instrument transformers must have a nameplate containing at least the following information:

a) the manufacturer's name or brand name;
b) year of manufacture, serial number and type designation;
c) nominal frequency;
d) maximum operating voltage for equipment;
e) the prescribed level of insulation;
f) temperature category;
g) weight in kg (if ≥ 25);
h) class of mechanical requirements (for $U_m \geq 72$ kV);
i) nominal primary and secondary voltages (e.g. 66/0.11 kV);
j) nominal load plus corresponding accuracy class (e.g. 50 VA, class 1.0);

NOTE: If the instrument transformer has two separate windings, the load of each secondary winding in VA must be indicated for the corresponding accuracy classes and nominal voltage of each winding.

k) the voltage increase factor and the corresponding duration of the overvoltage;
l) where applicable, the software version may also be shown on a display;

NOTE: Points (d) and (e) can be combined into a single fraction (for example, *72.5/140/325 kV).*

All information must be indelibly marked directly on the voltage instrument transformer or on a plate firmly attached to the instrument transformer. If several thermal insulation categories are used, the temperature category that limits the warming of the winding must be provided. For gas-insulated instrument transformers, the highest operating voltage of the instrument transformer must be indicated on the type plate as the nominal voltage for the instrument transformer. For instrument transformers in load range I. this information must be provided immediately before the nominal load information (e.g. 0 VA — 10 VA class 0.2). The type plate may contain a combination of several loads and precision classes that the instrument transformer meets.

5 Measuring instrument type approval

The type-approval process for a voltage instrument transformer includes the following tests and activities:

5.1 Warming test

For this test, the instrument transformer shall be stipulated to have reached a steady-state temperature if the temperature increase per hour does not exceed 1 K. The ambient temperature must be between + 10 °C and + 30 °C. If the instrument transformer has more than one secondary winding, the test must be carried out on each secondary winding. Auxiliary or protection windings must be loaded between 0 VA and 100 % of the nominal load value of this winding. During this test, the instrument transformer must be configured as it will be configured in operation. The warming must be measured using the electrical resistance increment method. The warming of parts other than windings can be measured using thermometers or thermocouples.

The voltage to be applied to the instrument transformer during this test must comply with the following points:

a) All instrument transformers irrespective of the voltage increase factor and duration (see Table 9) shall be tested with 1.2 times the nominal primary voltage. If the value of the full load of the secondary winding is determined, the instrument transformer must be tested at the nominal primary voltage, at a load corresponding to the value of the full load of this secondary winding and at a power factor of 1. Any other secondary winding must be unloaded. If a full load value is specified for more than one secondary winding, the instrument transformer must be tested sequentially for each winding, each of which shall be loaded with the corresponding full load value at a power factor of 1. The test must continue until the temperature of the instrument transformer reaches a steady state.

b) Instrument transformers with a voltage increase coefficient of 1.5 for a duration of 30 s or 1.9 for 30 seconds shall be tested at their respective voltage factor with a duration of 30 seconds as soon as temperature of the instrument transformer reaches a steady state at 1.2 times the nominal voltage. The temperature increase must not exceed the value given in Table 10 by more than 10 K.

   NOTE: A relatively short duration of 30 seconds for overvoltage does not represent a measurable increase in temperature after measurement at nominal voltage. As a result, the negative effect caused by overvoltage on the instrument transformer can be best assessed indirectly from observed deficiencies during dielectric type tests.

c) Instrument transformers having a voltage increase factor of 1.9 for a duration of 8 hours shall be tested at 1.9 times the nominal voltage for 8 hours immediately after the instrument transformer's temperature reaches a steady state at 1.2 times the nominal voltage. The temperature increase must not exceed the values given in Table 10 by more than 10 K.

If one of the secondary windings is auxiliary or protective, the test shall be carried out in accordance with the above test procedure, starting with the test referred to in (a), at 1.2 times the nominal primary voltage and then immediately followed by the test according to 5.1(c).

In the pre-test preparatory process with 1.2 times the nominal primary voltage, the auxiliary or protective winding is unloaded. During the test with 1.9 times the rated primary voltage for 8 hours, the auxiliary or locking windings must be loaded with a load corresponding to the standard value of the full load (see 1.18), while the other windings are loaded with nominal load value.

NOTE: Voltage measurement must be carried out on the primary winding, as the value of the secondary voltage may be significantly less than the nominal value of the secondary voltage multiplied by the voltage increase factor.

5.2 Short-circuit resistance test

During this test, the initial temperature of the instrument transformer must be between + 10 °C and + 30 °C. The instrument transformer must be powered from the primary side, the secondary windings shall be short-circuited. The short-circuit duration is 1 second.

NOTE: This requirement shall also apply where fuses are an integral part of the instrument transformer.

During the short circuit, the effective value of the supplied voltage at the primary terminals must not be lower than the nominal voltage.

NOTE: For inductive instrument transformers, the test may be performed by supplying power from the secondary side, with the terminals of the primary winding short-circuited.

The instrument transformer has passed this test if, after cooling to ambient temperature, it meets the following requirements:

a) is not visibly damaged;
b) its errors do not differ from those recorded before the tests by more than half of the limit errors in its accuracy class;
c) complies with the dielectric tests referred to in Article 5.7 with test voltages reduced to 90 % of the prescribed values;
d) inspection of insulation at the surface of both primary and secondary windings shows no significant damage (e.g. carbonisation).

A check pursuant to (d) is not required if the current density in the winding does not exceed 160 A/mm ^{2} for a copper winding whose conductivity is not less than 97 % of the prescribed value. The current density shall be determined by measuring the symmetrical effective value of the short-circuit current at the secondary winding (divided by the nominal transmission in the case of primary windings).

5.3 Primary winding impulse voltage test

The test voltage must be supplied between each primary voltage mains terminal and the ground. Grounded primary winding terminals or untested terminals in the case of a two-pole insulated instrument transformer, at least one terminal of each secondary winding, frame, casing (if any) and core (if it should be grounded) must be grounded during the test. The impulse test generally consists of the introduction of reference and test impulses. The reference impulse voltage must have an amplitude between 50 % and 75 % of the nominal test voltage. The peak value and the shape of the impulse voltage must be recorded during the test. Proof of failure is a change in the shape of the pulse voltage waveform when comparing the reference and test impulse waveforms. For fault detection, a recording of current(s) in the ground circuit or voltage transferred to the secondary winding may be used, but only as additional detection to record the voltage waveform.

NOTE: Grounding can be done through a suitable shunt or current recording device.

5.3.1 Atmospheric impulses test

The test voltage must have an appropriate value pursuant to Table 2 according to the highest voltage for the device and the specified insulation level.

5.3.1.1 Winding with U_m < 300 kV

The test must be performed using both positive and negative polarity. At least 15 consecutive pulses of the same polarity must be applied, without correction for atmospheric conditions. The instrument transformer shall be considered to have passed impulse tests for each polarity if the following conditions are met:

- each series ('plus' and 'minus') has at least 15 impulses;
- non-renewable insulation is not breached, which is confirmed by five consecutive withstand impulses,

following each arc;

- the instrument transformer has passed even if there have been no more than 2 arcs in each series (this procedure leads to a maximum of 25 pulses in series), no evidence of insulation breach (e.g., a deviation of the waveform of the recorded quantity during production unit tests serving as verification tests) may be found.

If arcs have occurred and evidence cannot be provided during the test that they occurred in self-restoring insulation, the instrument transformer must be removed and inspected after the dielectric tests have been completed. If damage to non-renewable insulation is observed, the instrument transformer failed the test.

5.3.1.2 Winding with $U_m \geq 300$ kV

The test must be performed using both positive and negative polarity. Apply 3 consecutive impulses of each polarity, uncorrected for atmospheric conditions. The instrument transformer has passed the test if:

- no arcs occurred;
- there was no other evidence of insulation failure (for example, there were no changes in the waveform shape of the recorded pulsed quantities).

5.3.2 Switching impulse test

The test voltage must have the appropriate value in Table 2 according to the highest voltage for equipment and according to the specified insulation level. The test must be performed using positive polarity. Fifteen consecutive impulses, corrected for atmospheric conditions, are applied to the instrument transformer. For outdoor instrument transformers, this test must be carried out in rain (see Article 5.4).

NOTE: In order to avoid over-saturation of the core, it is permissible to adjust the magnetic state of the core in an appropriate manner between the individual impulses.

The instrument transformer has passed the test if:

- non-self-restoring internal insulation was not breached;
- no arc occurred along non-self-restoring external insulation;
- the instrument transformer has passed this test even if no more than 2 arcs occurred; this is confirmed by 5 consecutive impulses after each arc applied after the last impulse in the series;
- no other evidence of insulation breach was found (for example no changes in shape occurred during the course of recorded values).

If arcs have occurred and proof cannot be provided during the test that they occurred in self-restoring insulation, the instrument transformer must be disassembled and inspected after the dielectric tests have been completed. If damage to non-self-restoring insulation is observed, the instrument transformer must be considered to have failed the test.

NOTE: Impulses during which there are arcs to the walls or ceilings of the laboratory shall not be considered.

5.4 Rain tests of outdoor transformers

For instrument transformers with $U_m < 300$ kV the test must be carried out with AC voltage at 50 Hz and the test voltage value according to Table 2, depending on the highest voltage for the instrument transformer corrected for atmospheric conditions.

For instrument transformers with $U_m \geq 300$ kV, the test must be performed by positive polarity switching pulses with the test voltage value as specified in Table 2, depending on the highest voltage for the instrument transformer and the nominal insulation level.

5.5 Electromagnetic Compatibility Test (EMC) — measurement of radio influence voltage (RIV)

Radio influence voltage requirements apply to instrument transformers with $U_m \geq 123$ kV, designed to be installed in air insulated substations.

Because radio influence voltage may be affected by fibres or dust on insulators, it is permitted to wipe the insulator with a clean cloth prior to the start of measurement.

The following procedure must be followed:

An instrument transformer with accessories must be dry and clean and at approximately the same temperature as the laboratory where the test is being performed.

The test shall be carried out under the following atmospheric conditions:

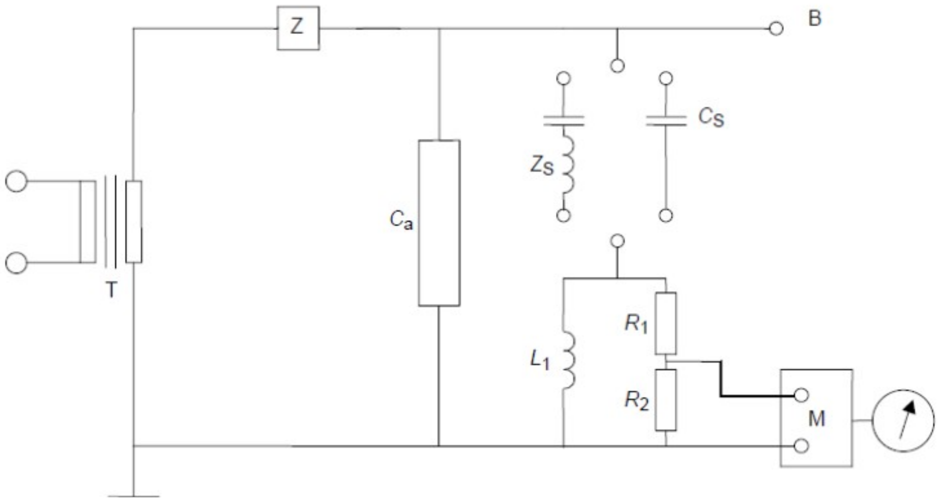
Ambient temperature: (10 to 30) °C

Atmospheric pressure: $(0.870 \cdot 10^5$ to $1.070 \cdot 10^5)$ Pa

Relative air humidity: (45 to 75) %

The test leads and their ends must not be a source of radio influence voltage.

In order to avoid interfering discharges from the primary terminals, they must be appropriately shielded by imitation service shielding. It is recommended to use a piece of pipe with spherical ends.



Legend

T test transformer

C&$_a$ tested item

Z filter

B terminal with corona formation protection

M measuring set with input resistance *R*m

$$Z_S + \left(R_1 + \frac{R_2 \cdot R_M}{R_2 + R_M} \right) = 300\ \Omega$$

Z_S, C_S, L_1, R_1, R_2 viz CISPR 18-2

Figure 11 - Electromagnetic compatibility test arrangement

The test voltage is applied between one of the terminals of the primary winding of the tested item (C_a) and the ground. The frame, cover (if any), core (if it is intended to be grounded) and one terminal of each secondary winding are grounded.

The measuring circuit must be tuned in the 0.5 MHz to 2 MHz band with measurement frequency recording. The results are expressed in microvolts.

Impedance between test conductor and ground, (Z_S + (R_1 + R_2 // R_M)) in Figure 11, must be 300 Ω ± 40 Ω with a phase angle not exceeding 20° at the measuring frequency.

A capacitor C_S can also be used instead of the filter Z_S; sufficient capacity is 1 000 pF.

The filter Z must have a large impedance at the measuring frequency in order to separate the source of the industrial frequency from the measuring circuit. An appropriate value of this impedance at the measuring frequency can be found between 10,000 Ω and 20,000 Ω.

The background noise level of background radio interference (RF interference caused by an external field and a high-voltage transformer) must be at least 6 dB (preferably 10 dB) below the given level of radio interference.

Prior to the measurement itself, a voltage of $1.5 \times U_m/\sqrt{3}$ is applied and maintained for 30 seconds. The voltage is then reduced to $1.1 \times U_m/\sqrt{3}$ for approximately 10 seconds, and is maintained at this value for 30 seconds prior to the actual RF interference measurement.

The instrument transformer shall be considered to comply with this test if the interfering RF voltage level does not exceed 2 500 µV at 1.1 Um/√3.

5.6 Accuracy tests

Type-approval tests to verify the requirements of 2.2.9.3 in the case of class 0.1 to 1 instrument transformers shall be carried out for 80 %, 100 % and 120 % of nominal voltage at nominal frequency

- for load range I at 0 % and 100 % nominal load at load factor cos β = 1;
- for load range II and at 25 % and 100 % at load factor cos β= 0.8.

5.7 Primary winding test at industrial AC frequency

During the induced voltage test, the test voltage frequency may be higher than the nominal frequency to prevent the magnetic core saturation. Test duration must be 60 seconds.

If the test voltage frequency is more than twice the rated frequency, the test time may be reduced to less than 1 minute according to the relationship:

$$Trvání\ zkoušky\,(s) = \frac{dvojnásobek\ jmenovitého\ kmitočtu}{zkušební\ kmitočet} \times 60\,s$$

Trvání zkoušky (s)	Duration of the test(s)
dvojnásobek jmenovitého kmitočtu	double the nominal frequency
zkušební kmitočet	test frequency

5.7.1 Winding with U_m < 300 kV

The test voltage for a winding with U_m < 300 kV must have the appropriate value given in Table 2 according to the highest voltage for equipment. If there is a large difference between the applicable highest voltage for equipment (U_m) and the nominal primary voltage, the induced voltage must be limited to five times the nominal primary voltage.

5.7.1.1 Two-pole insulated instrument transformers

Two-pole insulated instrument transformers must be subjected to the following tests:

a) Applied voltage test

The test voltage is applied between the ground and between all interconnected primary winding terminals. The frame, case (if present), core (if it is to be grounded) and all secondary winding terminals must be interconnected and grounded.

b) Induced voltage test

At the manufacturer's discretion, the test may be carried out either by supplying the secondary winding with a voltage of such magnitude as to induce the prescribed test voltage in the primary winding or by supplying the primary winding directly to the prescribed test voltage.

The test voltage must be measured in each case on the side of the primary winding. The frame, the case (if present), the core (if it is to be grounded) and one terminal of each secondary winding and one terminal of the primary winding must be interconnected and grounded.

The test may be carried out at the test voltage applied to each terminal of the primary winding for half the time, but not less than 15 seconds for each terminal.

5.7.1.2 Single-pole insulated instrument transformers

Single-pole insulated instrument transformers must be subjected to the following tests:

a) Applied voltage test

The test voltage must have the corresponding values according to 2.2.4.1 and must be applied between the terminal of the primary winding to be grounded and the ground.

The frame, case (if present), core (if it is to be grounded) and all secondary winding terminals must be interconnected and grounded.

b) Induced voltage test

The test must be carried out according to 5.7.1.1. The primary winding terminal that will be grounded during operation must be grounded during the test.

5.7.2 Winding with U_m ≥ 300 kV

The instrument transformer must be subjected to the following tests:

a) Applied voltage test

The test voltage must have the corresponding value according to 2.2.4.1 and the test must be performed according to 5.7.1.2.

b) Induced voltage test

The test voltage must have the corresponding value according to Table 2, depending on the nominal value of the atmospheric pulse test voltage. The test must be carried out according to 5.7.1.2.

5.8 Measurement of partial discharges

5.8.1 Test circuit and measuring equipment

The measuring equipment must measure the apparent charge Q expressed in picocoulombs (pC). It must be calibrated after being connected to the test circuit. Broadband equipment must have a minimum bandwidth of 100 kHz with an upper frequency not greater than 1.2 MHz. Narrowband equipment must have its resonant frequency within 0.15 MHz to 2 MHz. The 0.5 MHz to 2 MHz range is recommended but, where practicable, measurements shall be made at the frequency ensuring the highest sensitivity. Sensitivity must allow detection of partial discharges with an amplitude of 5 pC.

NOTES:

1. Interference must be significantly lower than the indicated sensitivity. Known impulses caused by external interference are not considered.
2. Bridge connection can be used to suppress external interference.
3. If equipment allowing electronic interference suppression is used, it must be proven by means of changes to its parameters that it allows the detection of repeated impulses.

5.8.1.1 Test procedure for single-pole insulated instrument transformers

After pre-test stress according to Methods A or B, the test is carried out at the voltage specified in Table 3 and partial discharge measurement is carried out for 30 seconds.

During this time the measured partial discharge level must not exceed the values given in Table 3.

Method A: The voltage level is obtained by reducing the voltage after the induced voltage test without interruption.

Method B: Measurements of partial discharges is carried out after the induced voltage test. Voltage is increased to 80 % of the test voltage during the induced voltage test, kept at this level for at least 60 seconds and reduced without interruption to the voltage for the measurement of partial discharges.

Unless otherwise specified, which method is chosen is at the manufacturer's discretion. The test method chosen must be specified in the test report.

5.8.1.2 Test procedure for two-pole insulated instrument transformers

The test circuit for two-pole insulated instrument transformers must be the same as for single insulated instrument transformers, but the test must be carried out twice by applying the test voltage at each terminal, the second terminal being connected to the low voltage terminal, frame and housing (if any).

5.9 AC voltage test of secondary winding and between winding parts

A 3 kV test voltage must be applied for 60 seconds between the shorted terminals of each winding section or each secondary winding and ground.

5.10 Software test

5.10 Software test

Software tests are carried out on the basis of submitted documentation and functional checks using Welmec 7.2.

5.10.1 Documentation

It shall be assessed whether the documentation contains the following information, including that referred to in subsequent paragraphs:

- a description of the software in terms of its function and instrument function;
- a description of the accuracy of the computational algorithms;
- a description of the user interface, menus and dialogs;
- unambiguous identification of the software;
- a description of the hardware components;
- operating and user manual for electricity meter software.

5.10.2 Identification

Documentation check: an assessment is performed whether the identification creation algorithm is described in the documentation and whether it is part of the dynamic part that is generated while running.

Functional check: a check is performed that the identification conforms to the manufacturer's information and whether it is possible to invoke the display of identification while the instrument is running. If the device has multiple modes in which identification can be displayed, all are tested.

5.10.3 Functionality

Documentation check: the documentation is assessed to determine whether it includes a basic description of the instrument's function and, where applicable, a description of the computational algorithms and data flow.

Functional check: the instrument is checked to determine whether it works in accordance with the documentation. A test is performed using the black box method and comparing inputs and outputs with simulated or independently read inputs and outputs. This test may be replaced by further type-approval testing.

5.10.4 Influence through the user and communication interface

Documentation check: a check is performed to determine whether the documentation contains:

- a description of the implementation of the user and communication interface;
- a description of the physical construction (where applicable, physical interface security);
- a complete list of all commands of the user and communication interface with sufficient description and assignment to functions or data operations;
- a declaration that the list of all commands is complete.

Functional check: randomly selected user interface commands (e.g., menu items on the display) are tested. The manufacturer must supply all necessary accessories to make it possible to test the selected communication instructions in laboratory conditions. Response to requirements outside the manufacturer's specifications is tested: other commands, other ranges of values, interruption of communication, replacement of the instrument during communication.

5.10.5 Protection against Changes

Documentation check: it is assessed whether the documentation includes a description of protection against accidental and intentional changes and how appropriate the design of this protection is.

Functional check: the device's response to power outages and outages of communication means (if used) is tested. A test is performed to determine whether any user interface dialogs modifying the data in the instrument are implemented in such a way that the user is required to confirm choices.

5.10.6 Protection of transmitted data*(if required)*

Documentation check: the documentation is assessed to see whether it contains:

- information needed to reconstruct the transmitted data;
- a description of the protection against accidental and deliberate changes during transmission;
- a description of the communication interfaces and communication protocols;
- proof of authenticity of transmitted data;
- a description of the detection of erroneous data generated during the transmission;

- a description of the protection in the event of delay or transmission through communication interfaces.

Functional check: data transfer is tested with regard to its possible outages — the response to communication interruptions and the response to damaged data. A test is performed to see whether data blocks contain all the data needed to identify them. If a custom protocol is created for communication, its implementation is tested. If a standard protocol is used (a routine protocol using standard libraries), its correct use is checked with respect to the data flow in the program.

5.10.7 Protection of stored data *(if required)*

Documentation check: the documentation is assessed to see whether it contains:

- a list of items to be stored;
- a description of the protection against accidental and deliberate changes to stored data;
- proof of the authenticity of the stored data;
- a description of the display of the stored data;
- a description of the operation for writing stored data;
- description of the capacity and management for data storage.

Functional check: the system’s response to power failure is tested with a view to retaining relevant data. It is tested whether memory is physically protected against substitution or reset by the user. The display of stored data is tested.

5.10.8 Software separation *(if required)*

Documentation check: the documentation is assessed to see whether it contains:

- a list of items that are part of the part of software affecting measurement results (legally relevant software — LRSW);
- a description of how the indication of legally relevant information is protected from confusion with information
- generated by the part of the software that does not affect the measurement results (legally not relevant software — LNRSW);
- a description of the protective interface and its implementation.

Functional check a test is performed whether the display of data generated from LRSW is sufficiently distinguishable from the data on the display generated from LNRSW.

6 Initial verification

Before initial verification, the number of the type-approval certificate must be indicated on the instrument transformer plate.

When verifying voltage instrument transformers, the following tests are carried out:

a) technical inspection and the check that terminals are marked correctly;

b) determination of voltage and angle errors of the instrument transformer.

Furthermore, the conformity of the software version with the version specified in the type approval certificate is checked.

6.1 Necessary aids

The following test equipment is used for the verification of instrument transformers:

6.1.1 Measuring set-up

The measuring set-up for testing in the verification of an instrument transformer consists of a reference measuring device, a reference voltage transformer or a reference voltage divider and voltage transformer load, auxiliary measuring instruments for measuring voltage, frequency, distortion and supply circuits with regulation.

6.1.2 Instrument transformer loads

Loads are used with cos β = 0.8 or cos β = 1, specified for the given frequency according to 2.2.7, allowing with the corresponding error the configuration of the nominal value given by the combination of the load itself and the impedance of the measuring device. The instrument transformer loads are given by the values in 2.2.8.

6.1.3 Power supplies

Power supplies are used with harmonic waveform voltage control over the required range with appropriate adjustment accuracy, stability and distortion of less than 5 %.

6.1.4 Distortion meter

A distortion meter is used to monitor compliance with the condition of Article 6.2 for monitoring the shape of the voltage curve.

6.2 Conditions during the tests

Instrument transformers are tested at the nominal frequency with a maximum deviation of 1 %, at a current harmonic whose distortion factor does not exceed 5 %, an ambient temperature of +15 ° C to +25 ° C, a relative air humidity of not more than 75 % and an external magnetic field up to 1 mT.

6.3 Description of tests

6.3.1 Physical damage

Instrument transformers are checked for physical damage, that nameplate information is complete, correct and legible, and that terminals are properly connected.

6.3.2 Correct marking of terminals

When checking the correctness of the marking of the terminals of the instrument transformer, the tested and reference transformer are connected in the measuring set-up in such a way that the primary voltage is connected to the corresponding terminals.
This corresponds to the parallel connection of terminal 'U' of the reference with terminal 'A' and terminal 'V' with terminal 'B' or 'N' of the instrument transformer being tested. The secondary terminals of both transformers are connected in parallel to the identically marked terminals of the measuring device. If errors can be measured by the measuring device when the primary current is set to 10 % I_{1N}, the terminals are marked correctly. Otherwise, the instrument transformer is excluded from further testing.

6.4 Determination of voltage and phase angle errors of instrument transformers

When determining an instrument transformer's voltage and angle errors, the measuring device and the instrument transformer load must be connected by separate cables to the secondary terminals of the tested transformer.

For an instrument transformer with several secondary windings, its voltage and angle errors are determined when the winding that is not being tested:

a) remains open (zero load);

b) is loaded with the nominal load Z_N.

If the voltage instrument transformer has an auxiliary winding (see Article 1.23), the auxiliary winding must not be loaded when measuring the accuracy of other secondary windings.

Current and angle errors are read on the set-up's measuring device, and if needed corrected for errors in the reference and the measuring equipment. The arrangement for determining the errors of the instrument transformer by means of a reference instrument transformer is in Figure 12, the use of a reference capacitive divider is in Figure 13. If the reference transformer errors are known, the transformer under measurement is corrected according to the relationship

$$\varepsilon_{UX} = \varepsilon_{UN} + \varepsilon_{UM}\ , \ \delta_{UX} = \delta_{UN} + \delta_{UM}\ , \qquad (2)$$

where ε_{UX} and δ_{UX} are the errors of the transformer under measurement (%; '), ε_{UN} a δ_{UN} are the errors of the reference being used (%; ') and ε_{UM} a δ_{UM} are system data for error evaluation (%; ').

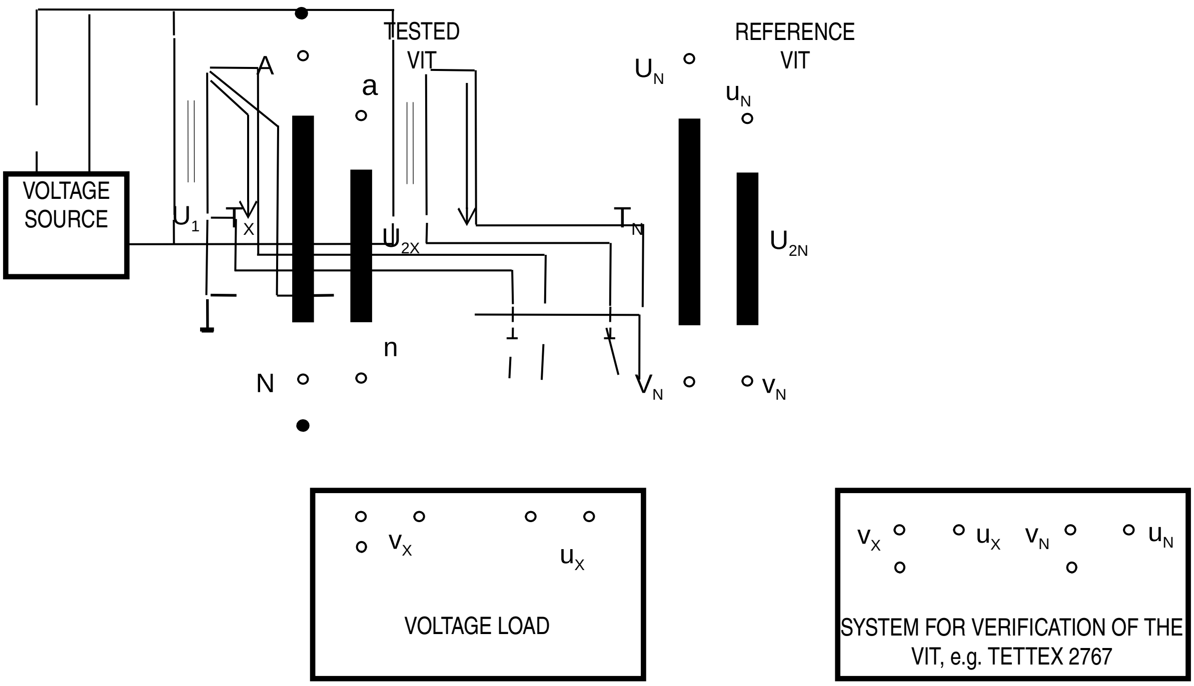


Figure 12 — Arrangement to determine errors using a reference instrument transformer

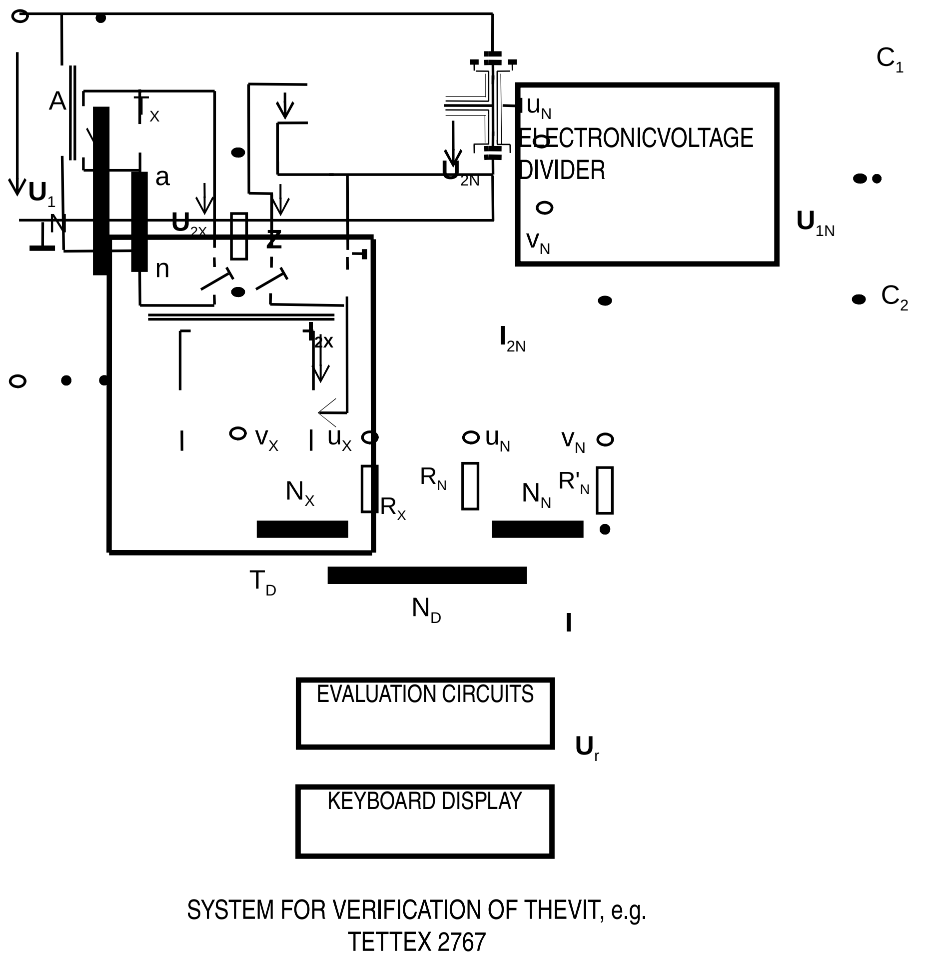


Figure 13 — Arrangement to determine errors using a capacitive divider

Voltage and phase angle errors of the instrument transformer are detected in the range between 80 % and 120 % of the nominal voltage value U_{1N}, where they must comply with the values in Table 4. For verification, it is recommended to check errors at 80 %, 100 % and 120 % of the nominal voltage value U_{1N}. For nominal loads (1; 2.5; 5; 10) VA and power factor 1 (load range I) are verified at a load of 0 VA and 100 % of the nominal load. For nominal loads (10; 25; 50; 100) VA and with an inductive power factor of 0.8 (load range II) the verification is carried out at a load of (25 and 100) % of the nominal load. Error magnitudes must not be greater than those shown in Table 4.

Maximum permissible voltage and angle errors must not be exceeded for an instrument transformer with attached accessories if they are an integral part of the transformer.

The setting of the primary voltage at each measured point must be guaranteed with a maximum permissible error of ± 0.5 % of the measured value. During the verification of the instrument transformer load impedance errors in must not be greater than ± 3 % of the required value. Errors in the real and imaginary components of a general type impedance must not exceed 3 % of the nominal values.

6.5 Determining voltage and phase angle errors in combined instrument transformers

6.5.1 For combined current and voltage instrument transformers, depending on design the current transformer must comply with the conditions specified in the regulation for current transformers and voltage transformers with those specified in Table 4, or corresponding to requirements for the current part.

6.5.2 For combined instrument transformers, the following interactions must be determined:

a) the influence of the current instrument transformer on the voltage instrument transformer;
b) the influence of the voltage instrument transformer on the current instrument transformer.

6.5.3 The influence of the tested current instrument transformer on the tested voltage instrument transformer is determined by detecting voltage and phase angle errors of the tested voltage instrument transformer:

a) when the primary terminals of the current instrument transformer are disconnected;
b) at a primary current of 120 % of I_{1N} (or at the extended range current) and at 25 % and 100 % of the nominal secondary load Z_N.

6.5.4 The influence of the tested voltage instrument transformer on the tested current instrument transformer is determined by detecting the current and phase angle errors of the tested current instrument transformer:

a) when the primary terminals of the voltage instrument transformer are disconnected;
b) at a primary voltage of 120 % U_{1N} and at 25 % and 100 % of the nominal secondary load.

6.5.5 Detected current, voltage and angle errors of the operating combined instrument transformer during interaction must comply with the conditions given in 2.2.10.3 and Table 4 for separate error detection.

7 Subsequent verification

Follow-up verification is carried out in the same way as the initial verification in chapter 6.
The verification of the measuring instruments are subject to the metrological requirements applicable at the time they were put into circulation.

8 Measuring instrument check

When checking measuring instruments pursuant to § 11a of the Metrology Act at the request of an entity that could be affected by its incorrect measurement, Chapter 6 is followed.

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 shall 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 a notified standard is one of the ways to demonstrate compliance. 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

Pursuant to § 14(1)(j) of the Metrology Act, the CMI has issued this Measure of a General Nature toward the implementation of § 6(2), § 9(1) and (9), and § 11a(3) of the Metrology Act, laying down metrological and technical requirements for specified measuring instruments and tests for type approval and verification of specified measuring instruments - 'voltage instrument transformers'.

Decree No 4.1.4 specifying measuring instruments for mandatory verification and measuring instruments subject to type approval, as amended, classifies the measuring instruments under Item 4.1.4 in the annex entitled ‘List of specified measuring instruments’ as measuring instruments subject to type approval and mandatory verification.

This legislation (Measure of a General Nature) 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 § 173(2) CAP, no remedy may be applied against a measure of a general nature.

In accordance with the provisions of § 172(5) CAP, no appeal or remonstrance may be filed against the decision on objections.

Compliance of a general measure with legal regulations may be assessed in a review procedure pursuant to § 94 to § 96 CAP. A party may instigate the conduct of a review procedure to be conducted to the administrative authority that issued the measure of a general nature. If the administrative authority does not identify grounds for the commencement of the review procedure, it shall notify the submitter to this effect, specifying the reasons therefor, within the timeline of 30 days. Pursuant to Article 174(2) CAP a resolution on the commencement of a review procedure may be issued within three years of the legal effect of the measure of a general nature.

IV.
EFFECTIVE DATE

This measure of a general nature comes into effect on the fifteenth day following the date of its posting on the official notice board (§ 24d of the Metrology Act).

Director General of the CMI

Effective date: 2.9.2022