

HEDNO S.A. SPECIFICATION	MEDIUM VOLTAGE METERING TRANSFORMERS	ND/362/ 10.01.2022
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Issued by the Metering Branch	Network Department	

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TECHNICAL SPECIFICATION HEDNO ND/362 /
10.01.2022.

M.V. METERING TRANSFORMERS

1. SCOPE

This specification determines the construction, tests, delivery inspection and packaging of voltage and current Medium Voltage Metering Transformers for outdoor installation, to be transferred and delivered at HEDNO S.A. warehouses, destined to meet the needs of the Corporation for the measurement of electrical voltage and current figures on Medium Voltage customers at the agreed power varying between AP ≥ 250 KVA to AP ≤ 10 MVA.

2. KEY WORDS

Metering Transformer, Metering Device, Operating Voltage 20 kV.

3. OPERATING CONDITIONS

3.1 GENERAL

The materials covered by this specification shall be placed at outdoor storage sites without cover.

They shall either be posted outdoors or inside covered areas.

Storage of materials prior to installation will be made in all manner of warehouses, either outdoor, sheltered or otherwise, or covered without heating or air conditioning.

Metering transformers must be suitable for use on a 3-phase system of 50 Hz with earthed neutral node (IEC 61869-1:2007 §4.4.c).

3.2 OPERATING – STORAGE TEMPERATURE

- Proper operation temperature for IT (Instrument Transformer) should range between -25 °C and +50 °C.
- Storage and transport temperature should range between -25 °C to 50°C.

3.3 HUMIDITY

The ITs should operate at an average annual relevant humidity greater than 75 %. Relevant humidity should reach 95%, though, for thirty (30) days scattered in a year. Also, relative humidity may reach 85% at random moments within a day.

3.4 TABLE OF CLIMATE AND ENVIRONMENTAL CONDITIONS

Climate and environmental conditions under which IT should be installed, and efficiently and uninterruptedly operate are shown in the following table:

Maximum altitude	1000 m
Minimum ambient temperature	- 25° C
Mean ambient temperature	≤35° C
Maximum ambient temperature	50° C
Maximum temperature on exterior surfaces due to solar radiation	75° C
Minimum relevant humidity	5 %
Maximum relevant humidity	95 %

3.5 REQUIREMENTS REGARDING OPERATING CONDITIONS AND FEATURES

1. Air temperatures for outdoor transformers – 25 °C to +50 °C
2. For installation up to 1000m above sea level
3. For 20 kV grid nominal voltage or 15/20 kV in special circumstances.
4. 24 kV maximum operating voltage (Table 2 IEC 61869-1: 2007).
5. Frequency 50 Hz
6. Insulation class 'E', so for maximum ambient temperature +50° C the maximum overheating to be 65K (corresponds to maximum overheating 75K of Table 5 IEC 61869-1:2007 that refers to +40° C, reduced by 10K according to §6.4.1) .
7. Specific creepage distance (SCD) 31 mm/kV for outdoor IT (according to standard EN 60815-3:2008, for polymeric insulators: pollution class e §6, Figure 1).
8. Partial discharge limit ≤20pC at 28,8kV, for voltage transformers, the above-mentioned measurement shall be carried out separately on each pole (IEC 61869-1:2007 Table 3 for earthed neutral system, unearthed VT, type of insulation: solid, Um=24kV).
9. Partial discharge limit ≤50pC at 24kV and ≤20pC at 16.6kV for current transformers (IEC 61869-1:2007 Table 3 for earthed neutral system, CT, type of insulation: solid, Um=24kV)
10. Resistance of secondary under industrial frequency voltage 3kV (r.m.s) for 1 min (IEC 61869-1: 2007 §5.3.5, §7.3.4)
11. Resistance to industrial frequency voltage 3kV for the primary earthed terminal (r.m.s) for 1 min (IEC 61869-1:2007 Table 2, §5.3.2 Um=0.72kV, §7.3.1)
12. Resistance of primary under industrial frequency voltage 50kV (r.m.s) for 1 min (IEC 61869-1: 2007 Table 2, §5.3.2, §7.3.1)
13. Resistance of lightning full cycle impulse voltage (1,2/50 μs) 125kV (peak value) for 1 min (IEC 61869-1: 2007 Table 2, §7.2.3.2.1)
14. Increase rate applicable to nominal voltage 1,2 continuous and 1,5 for 30 sec (IEC 61869-3:2011 Table 304, §5.302)
15. Resistance of primary under chopped lightning impulse voltage 1,15·125kV=143,75kV (IEC 61869-1: 2007 §5.3.3.2)
16. Resistance of the insulation between sections of primary under rated power-frequency 3 kV (r.m.s) for 1 min (IEC 61869-1: 2007, §5.3.4, §7.3.3)

4. STANDARDS - SPECIFICATIONS

Transformers and auxiliary components must be industrial products manufactured and tested in accordance with European and International regulations and the HEDNO S.A. Technical Specifications stated below (Annex D), in force as of the day of submission of bids.

All tests shall be performed in accordance with EN/IEC regulations (unless otherwise specified) in force as of the date of submission of bids.

International standards IEC 61869-2:2012 for current transformers, EN 61869-3:2011 for voltage transformers and EN 61869-1:2007 for both transformers types shall apply in all other aspects to the construction of the aforementioned metering transformers.

Also, the IT supplier should provide a certificate to prove compliance with the procedures provided for:

- transformer manufacturing, ISO 9001 : 2015 and
- testing / measurement, to ELOT EN ISO/IEC 17025 : 2017 standard, or as applicable to ensure traceability of tests / measurements to national standards or national / international reference materials.

5. DESCRIPTION

The present specification refers to:

Outdoor dry-type transformers.

5.1 GENERAL REQUIREMENTS – GENERAL CHARACTERISTICS

5.1.1 Materials

All materials to be used for the construction of transformers shall be of excellent quality, suitable for the purpose intended and operating conditions specified.

They shall withstand temperature and humidity specified without any shear or destruction and without affecting mechanical and electrical properties beyond the limits specified.

Excluding the terminals of the secondary (which shall be suitable for wiring to copper conductor, 4mm² cross section size), all else transformer metallic parts shall be made either from hot-dip galvanized steel or other corrosion proof metal. Metal parts which might be subject to rust must be efficiently protected.

The protective cladding to be used for this purpose should remain unaffected from wear and tear or time under the operating conditions specified, so that its protective properties are no more available.

Non-metal parts should be made of non-hydroscopic, fire and flame retardant material, providing protection against fire which could be caused inside or near the material, and meet the requirements of standard EN 61869-1:2007 Annex C.

5.1.2 Construction characteristics and finish

The ITs should be constructed so as to ensure continuous power supply, rigidity and reliability, provide satisfactory mechanical protection against impulse and stress and include cabling fixing and mounting facilities.

5.1.3 Safety requirements

IT should be constructed so as to provide full protection against touch voltages when installed, enabling earthing of all outer metal parts; the latter shall be linked together. The transformer mount shall feature a terminal (minimum cross section 4mm²) for suitably implemented earthing, to avoid inadvertent detachment of earth connection.

5.1.4 Drawings and information to be submitted

A full technical description should be submitted together with the bid, referring to the requirements under this specification one by one, and detail drawings showing the material construction in general, the finish and materials to be used for the construction.

Bids must be accompanied by performance certificates of all type tests, clearly evidencing that the specification requirements are met.

The supplier must also deliver, together with its bid, a full range of drawings presenting in detail all outer IT elements.

The supplier must also deliver, together with its bid, a full range of transformers installation manual, including e.g. how much torque on the terminals are recommended and what is the maximum torque before damages occur.

The supplier must also deliver, together with its bid, the compliance sheets listed in the annex.

All the above must be necessarily submitted and upon penalty of rejection.

5.2 SPECIAL REQUIREMENTS AND CHARACTERISTICS

5.2.1 General

This section includes the special requirements and particular characteristics of IT and accompanying components.

5.2.2 Special construction characteristics applicable to outdoor dry-type transformers.

Outdoor dry type metering transformers shall be casted with fine quality cycloaliphatic epoxy resin.

5.2.2.1 Material requirements

According to IEC 61869-1 §6.3 the properties of the insulating materials used at transformers are specified in IEC 60455 series. The mechanical and electric strength of resin used in transformers must comply with:

1. Unfilled epoxy resinous compounds must comply with the standard EN 60455.03.01: 2003, Table 2: in the cured form
2. Quartz filled epoxy resinous compounds must comply with EN 60455.03.02: 2003, Table 2: in the cured form

The transformers manufacturer is responsible to ensure that the resin used is in accordance with above mentioned standards, depending on the case. The transformers manufacturer should provide technical datasheets with the mechanical and electric strength of the resin used.

5.2.3. Secondary terminals box

Secondary terminals shall be indelibly embossed labeled according to the following regulations: EN 61869-2:2012 (§6.13) for current transformers and EN 61869-3:2011 (§6.13) for voltage transformers.

It will have a lockable enclosure, preventing access to terminals.

Waterproof entry and exit of cables to terminals will be provided for.

Potential water outflow due to steam inside the box will be provided for and the entrance of any insects inside the box will be excluded.

The box of outdoor transformers will provide a watertight degree of IP44, in accordance with EN 61869-1:2007 (§6.10.5). This shall be demonstrated through certificates issued by appropriate laboratory, authorized according to the requirements of ELOT EN ISO/IEC 17025 Standard.

5.2.4. Nameplates

Each voltage or current transformer shall have an indelibly (metallic) sign, able to withstand outdoor conditions, indicating all information necessary for transformer operation.

It shall include the following:

- Name of manufacturer
- Type of transformer
- Year and number of construction
- Primary nominal current for current transformers or voltage for voltage transformers
- Secondary nominal current for current transformers or voltage for voltage transformers
- Labelling of primary terminals
- Labelling of secondary terminals
- Rated power in VA
- Accuracy class
- Overcurrent coefficient for current transformers
- Operating and insulation voltage
 - 24 kV maximum operating voltage
 - 50 kV winding test voltage
 - 125 kV impulse voltage
- Short-circuit withstand to thermal and dynamic current for current transformers
 I_{th} , I_{dyn}
- Nominal frequency 50 Hz
- Insulation class
- HEDNO Specification
- Standard EN/IEC
- HEDNO code of material
- Lot number

5.2.5. Transformation ratio

- For Current Transformers:

Single winding primary current

10 – 20 - 30 – 50 – 100 – 200 – 300 – 400 A.

Secondary current: 5 A (according to IEC 61869-2: 2012 §5.202: standard values for rated secondary current)

- For Voltage Transformers:

Twin pole: 15.000-20.000 // 100 V ñ 20.000 // 100 V (according to IEC 61869-3: 2011 §5.301.2 rated secondary voltages a) European countries)

The transformers shall be wired in ARON configuration (two voltage transformers and two current transformers)

5.2.6 Nominal charge in VA for metering ITs

For Current Transformers: 10 VA (according to IEC 61869-2: 2012 §5.5.201 rated output values)

For twin pole voltage transformers: 25 VA (according to IEC 61869-3: 2011 §5.5.301 rated output values, burden range II)

5.2.7 Metering IT accuracy classes

For current transformers:

Standard accuracy class for measuring: 0,5S (according to IEC 61869-2:2012 §5.6.201.2 standard accuracy classes)

Security Factor (FS): 5

For twin pole voltage transformers:

Standard accuracy class for measuring: 0,5 (according to IEC 61869-3:2011 §5.6.301.2 standard accuracy classes)

5.2.8 Overcurrent coefficient

Current transformers must enable continuous operation at 1.2 multiple of their nominal current, i.e. $1.2 \times I_N$ (according to EN 61869-2 §5.203 rated continuous thermal current $I_{cth}=120\% \cdot I_N$)

5.2.9 Overvoltage coefficient

All voltage transformers shall be capable of operating under the following conditions:
a) continuously under their nominal voltage by 1,2 i.e. $1,2 \times U_N$ and b) for at least 30 seconds under their nominal voltage by 1,5 i.e. $1,5 \times U_N$ (according to EN 61869-3 Table 304 and §5.302 effectively earthed neutral systems)

5.2.10 Thermal and dynamic strain for Current Transformers

The requirement on peak current in terms of thermal strain I_{th} amounts to minimum 10 kA.

The requirement on peak current in terms of dynamic strain I_{dyn} amounts to minimum $I_{dyn} = 2,5 \cdot I_{th} = 25kA$ (EN 61869-2 §5.204.2)

5.2.11. Fixing and design

Outdoor transformers will be placed on line posts or transverse arms, under standard structures P 41 and P 43 listed in Annex C.

6. TESTING

The manufacturer will perform tests to verify that the material offered has the properties mentioned in this Technical Specification. Such tests shall be carried out by authorized laboratories or those acceptable by the Corporation.

Part of, or all tests may be repeated during line production at the discretion of the Inspection and at the Corporation's expense. In case the material fails the tests, the expenses shall be paid by the supplier.

It is forbidden to modify the material during the contract implementation.

Adequacy of production equipment and quality control:

The concerned suppliers shall specify devices, measurement instruments etc. available at their respective laboratories for the purpose of performing routing tests, to be calibrated by the competent public authority or other internationally acclaimed laboratory.

6.1 Design Tests

Not applicable

6.2. Type Tests

Bids must be accompanied by type test performance certificates (as determined in Table 4), designated according to the following:

- for current metering transformers, in paragraphs 7.2 of EN 61869-1 and EN 61869-2:2012
- for voltage metering transformers, in paragraph 7.2 of EN 61869-1 and EN 61869-3:2011

clearly evidencing that the specification requirements are met.

The certificates must include the measurements' numerical results and the standards' limits.

Also, certificates issued by the PPC Group or authorized laboratories according to the requirements of ELOT EN ISO/IEC 17025 standard shall be accepted. The authorization field of the above-mentioned laboratories shall include the relevant tests / measurements on metering transformer.

Any bids not accompanied by the aforementioned certificates shall be rejected at the stage of technical evaluation.

6.3. Routine Tests

The manufacturer must perform all routine tests designated under the following:

- for current metering transformers, in paragraphs 7.2 of EN 61869-1 and EN 61869-2:2012
- for voltage metering transformers, in paragraph 7.2 of EN 61869-1 and EN 61869-3:2011

for each individual transformer, the manufacturer **shall issue an inspection certificate**, as provided in the System Operation and Power Exchange Code (Government Gazette 793/B/30-6-2006).

The certificates must include the measurements' numerical results and the standards' limits. The routine test certificate must also include:

- the primary winding's resistance measurement
- the secondary winding's resistance measurement (even though it is not necessary for accuracy class 0,5S according to EN 61869-2 §7.3.201)

The Corporation reserves the right to repeat any routine or/and type tests. Should the specimen fail the tests, the expenses shall be paid by the manufacturer.

6.4 Tests sequence.

The Corporation reserves the right to put the Transformers through the tests described in Table 4.

Table 4: Type and Series Tests according to IEC 61869 standard series

		Current Transformers EN 61869-2: 2012	Voltage transformers EN 61869-3: 2011	EN 61869-1: 2007
Type Tests	Tests for accuracy	7.2.6 (5.6.201.3, 5.6.201.4, 5.6.201.5: Table 202 for class 0,5S)	7.2.6 (5.6.301.3: Table 301 for class 0,5)	7.2.6 See standards
	Verification of the degree of protection by enclosures	Table 10 (7.2.7 of IEC 61869-1)	Table 10 (7.2.7 of IEC 61869-1)	7.2.7 7.2.7.1 IP coding, 7.2.7.2 mechanical impact: not applicable for <72.5kV (6.7)
	Wet test for outdoor type transformers (dielectric test)	Table 10	Table 10	7.2.4

		(7.2.4 of IEC 61869-1)	(7.2.4 of IEC 61869-1)	
	Temperature rise test	7.2.2	7.2.2	7.2.2
	Impulse voltage withstand test on primary terminals (dielectric test)	7.2.3	7.2.3	7.2.3
	Short-circuit withstand capability test for voltage transformers	-	7.2.301	-
	Short-time current test for current transformers	7.2.201	-	-
Routine Tests	Verification of markings	Table 10 (7.3.6 of IEC 61869-1)	Table 10 (7.3.6 of IEC 61869-1)	7.3.6
	Inter-turn overvoltage test only for current transformers	7.3.204 (5.3.201: 4.5kV)	-	-
	Power-frequency voltage withstand tests on primary terminals	7.3.1	7.3.1	7.3.1
	Partial discharge measurement	Table 10 (7.3.2 of IEC 61869-1)	7.3.2	7.3.2
	Power-frequency voltage withstand tests between sections	Table 10 (7.3.3 of IEC 61869-1)	Table 10 (7.3.3 of IEC 61869-1)	7.3.3
	Power-frequency voltage withstand tests on secondary terminals	Table 10 (7.3.4 of IEC 61869-1)	Table 10 (7.3.4 of IEC 61869-1)	7.3.4
	Test for accuracy	7.3.5	7.3.5	7.3.5 See standards
	Determination of secondary winding resistance	7.3.201 (ζητείται στην 6.3 της προδιαγραφής)	-	-
Special Tests	Chopped impulse voltage withstand test on primary terminals	Table 10 (7.4.1 of IEC 61869-1)	Table 10 (7.4.1 of IEC 61869-1)	7.4.1

Type tests: All dielectric type tests shall be performed on the same transformer. After completion of the above-mentioned dielectric type tests on transformers, the required routine tests shall be carried out.

Routine tests: Repetitive industrial frequency tests on primary windings shall be carried out on 80% of the specified test voltage (IEC 61869-1, §7.3.1, EN 61869.03:2011 §7.3.1.301).

Regarding the partial discharge measurement:

The measurement requires a prestressing procedure (IEC 61869-1: 2007 §7.3.2.2) and thus can be performed either as a continuation of the power-frequency withstand test while decreasing the voltage (prestressing procedure A) or after the power-frequency withstand test by raising applied voltage (prestressing procedure B).

Considering procedure A, the prestressing voltage must be:

- 50kV (IEC 61869-1:2007 Table 2, for $U_m=24\text{kV}$) if it is the first power-frequency test on primary terminals
- $40\text{kV}=80\%\cdot 50\text{kV}$ (IEC 61869-1:2007 §7.3.1) if it is repeated power-frequency test on primary terminals

Considering procedure B, power-frequency tests on primary terminals should be performed at $40\text{kV}=80\%\cdot 50\text{kV}$ (IEC 61869-1:2007 §7.3.1), independently of the number or repetitions.

7. LABELS - MARKING

7.1 Nameplates

As provided in § 5.2.4.

7.2. Labelling

The following indications will be in place either indelibly or engraved, at a visible point of each IT case, to be indicated by HEDNO:

- HEDNO logo
- Number of contract and lot number
- Name or logo of manufacturer
- Code of HEDNO material
- Transformer ratio

According to the specification, the above material will have embossed or engraved or indicated on a suitable indelibly tag, the codes of HEDNO material, at a point which would not affect proper IT fitting and tightness.

8. PACKAGING

The ITs will be delivered fully assembled.

The ITs will be neatly packaged for safe transport.

They will be placed on EU palettes and delivered so that total weight per palette does not exceed 550 kg.

These boxes will have an engraving or indelibly sticker the contract number, material code and supplier information, and shall also indicate the type of IT and transformation ratio.

The above packaging will allow storage in an outdoor area, without any further protection needed against weather conditions (rain or humidity).

9. ANNEXES

«ANNEX A» COMPLIANCE SHEET FOR 20 KV VOLTAGE TRANSFORMERS

Details to be supplied by all bidders. Non-conformance will constitute sufficient grounds for bid rejection.

ITEM **UNITS**

Requirement	Specification Paragraph	Acceptance	Manufacturer compliance
1. Type and manufacturer			
2. Country of manufacture			
3. Number of secondary windings			
4. Temperature category	3.5		
5. Maximum installation altitude	3.5		
6. Grid Nominal Voltage	3.5		
7. Maximum operating voltage	3.5		
8. Nominal frequency	3.5		
9. Insulation class	3.5		
10. Minimum creep age length	3.5		
11. Permissible partial discharge level at 28,8kV for each pole separately	3.5		
12. Resistance of secondary windings under industrial frequency voltage:	3.5		
13. Resistance of primary winding under industrial frequency voltage	3.5		
14. Lightning impulse voltage withstand of primary winding	3.5		
15. Chopped lighting impulse withstand voltage	3.5		
16. Are the terminals in the box of the secondaries suitable to be wired with 4mm ² size conductors?	5.1.1		

17. Resistance against fire and flame propagation by non-metallic parts	5.1.1		
18. Earthing terminals suitable for wiring to 4mm² size conductor	5.1.3		
19. Installation manual	5.1.4		
20. Technical datasheets for the mechanical and electrical strength of the resin	5.2.2.1		
21. Embossed labelled of primary & secondary terminals	5.2.3		
22. Degree of water tightness of terminal box	5.2.3		
23. Indelibly nameplate	5.2.4		
24. Transformation ratio	5.2.5		
25. Connection	5.2.5		
26. Nominal charge in VA	5.2.6		
27. Accuracy class	5.2.7		
28. Rated voltage factors =1,2 continuous and 1,5 for 30 seconds	5.2.9		
29. Type test certificate	6.2		
30. Routine tests inspection certificate	6.3		
31. Adequacy of production equipment and quality control	6		
32. Total weight of the transformer			
33. Primary windings resistance measurement	6.3		
34. Secondary windings resistance measurement	6.3		
35. Labelling on package container	7.2		

«ANNEX B»
COMPLIANCE SHEET FOR 20 KV CURRENT TRANSFORMERS

Details to be supplied by all bidders. Non-conformance will constitute sufficient grounds for bid rejection.

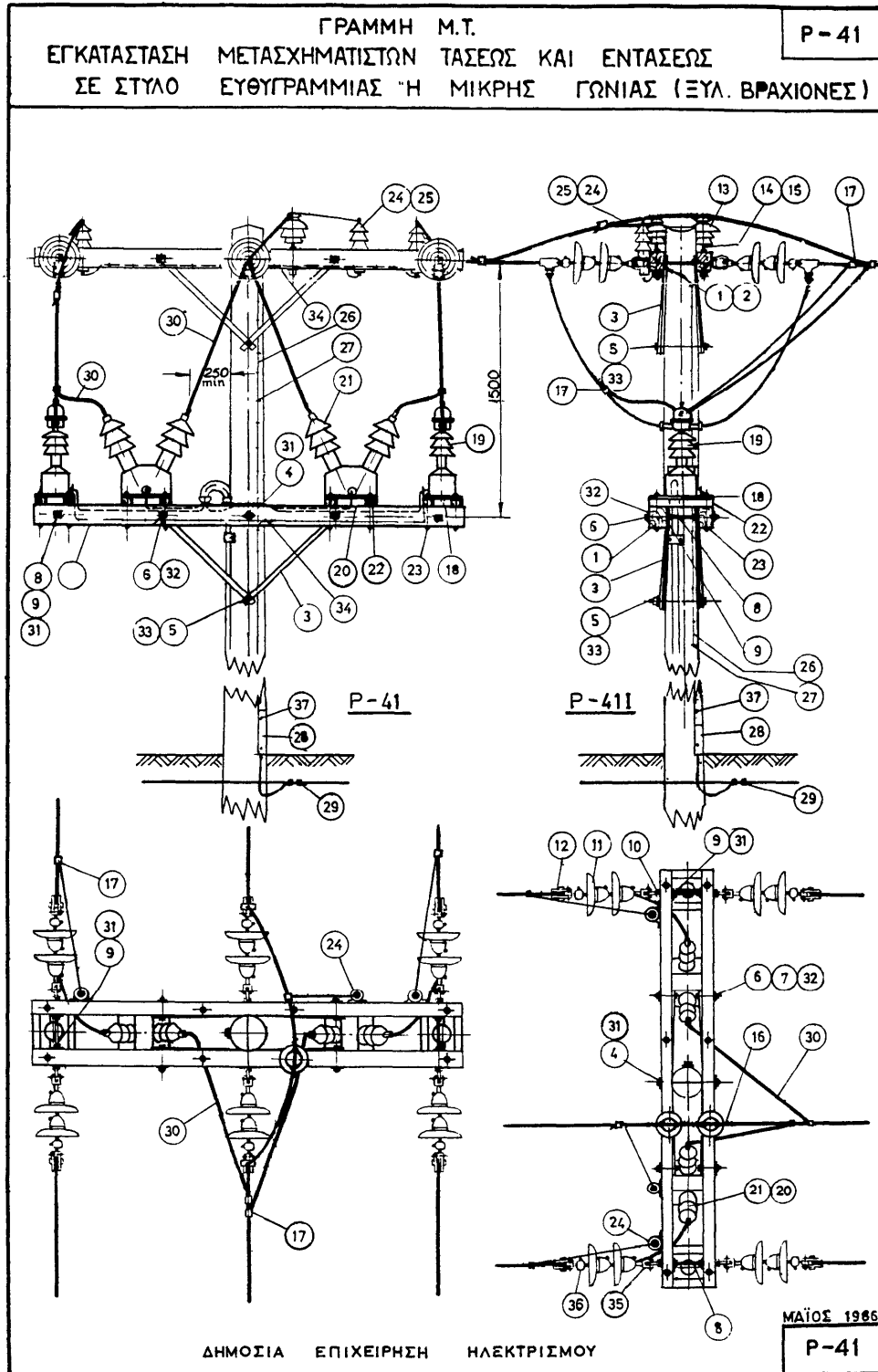
ITEM **UNITS**

Requirement	Specification	Acceptance	Manufacturer compliance
1. Type and manufacturer			
2. Country of manufacture			
3. Number of secondary windings			
4. Temperature category	3.5		
5. Maximum installation altitude	3.5		
6. Grid Nominal Voltage	3.5		
7. Maximum operating voltage	3.5		
8. Nominal frequency	3.5		
9. Insulation class	3.5		
10. Minimum creep age length	3.5		
11. Permissible partial discharge level at 24kV and at 16,6kV	3.5		
12. Resistance of secondary windings under industrial frequency voltage:	3.5		
13. Resistance of primary winding under industrial frequency voltage	3.5		
14. Lightning impulse voltage withstand of primary winding	3.5		
15. Chopped lighting impulse withstand voltage	3.5		
16. Are the terminals in the box of the secondaries suitable to be wired with 4mm ² size conductors?	5.1.1		
17. Resistance against fire and flame propagation by non-metallic parts	5.1.1		

18. Earthing terminals suitable for wiring to 4mm² size conductor	5.1.3		
19. Installation manual	5.1.4		
20. Technical datasheets for the mechanical and electrical strength of the resin	5.2.2.1		
21. Embossed labelled of primary & secondary terminals	5.2.3		
22. Degree of water tightness of terminal box	5.2.3		
23. Indelibly nameplate	5.2.4		
24. Transformation ratio	5.2.5		
25. Connection	5.2.5		
26. Nominal charge in VA	5.2.6		
27. Accuracy class	5.2.7		
28. Security factor	5.2.7		
29. Rated continuous current factor =1,2	5.2.8		
30. Rated thermal current of primary	5.2.10		
31. Rated dynamic current of primary	5.2.10		
32. Type test certificate	6.2		
33. Routine tests inspection certificate	6.3		
34. Adequacy of production equipment and quality control	6		
35. Total weight of the transformer			
36. Primary windings resistance measurement	6.3		
37. Secondary windings resistance measurement	6.3		
38. Labelling on package container	7.2		

«ANNEX C» STANDARD MOUNTING DEVICES USED BY METERING TRANSFORMERS

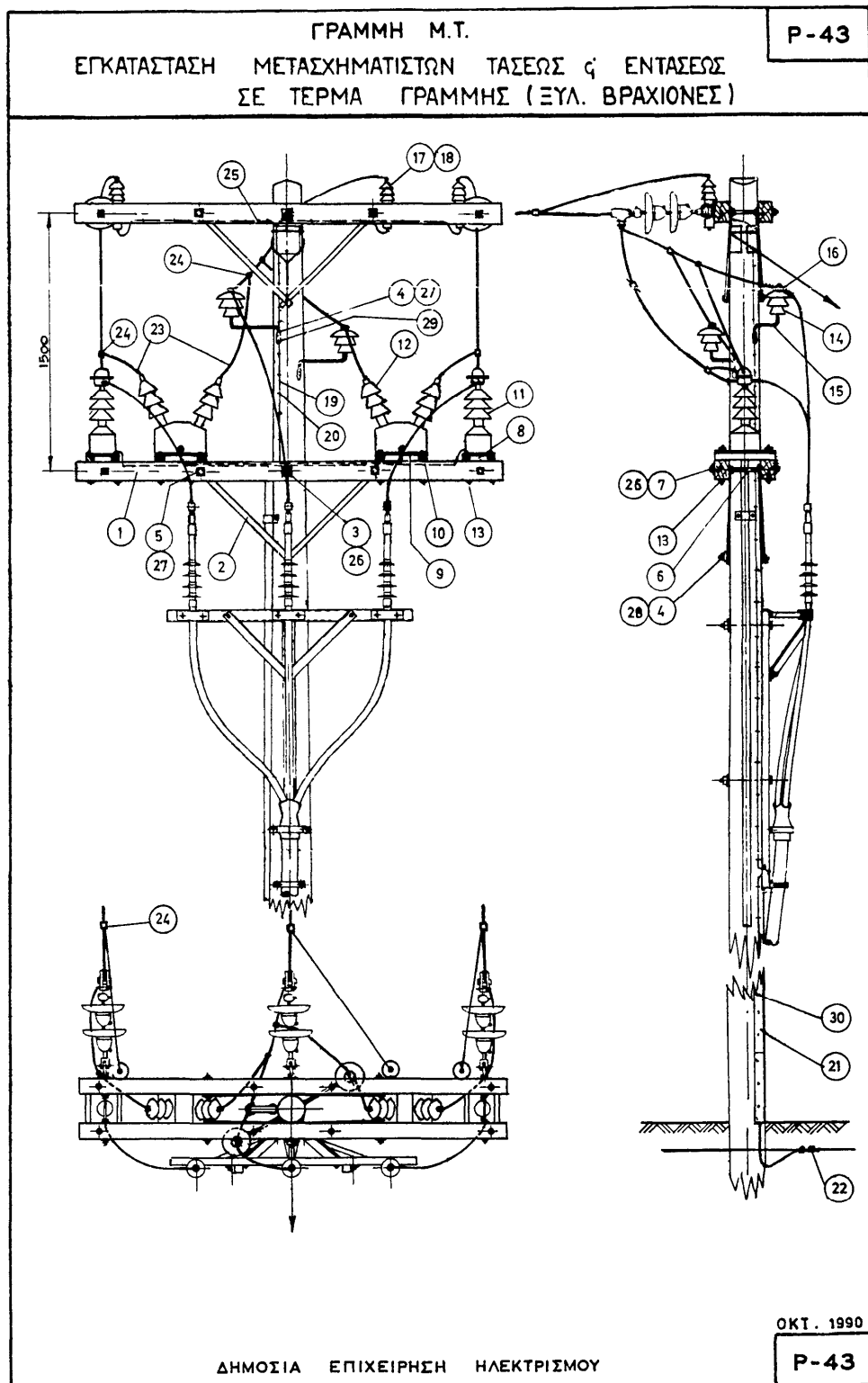
[MEDIUM VOLTAGE LINE
VOLTAGE AND CURRENT TRANSFORMER INSTALLATION
ON STRAIGHT OR SLIGHTLY OBLIQUE POSTS (WOODEN BRACES)]



[PUBLIC POWER CORPORATION

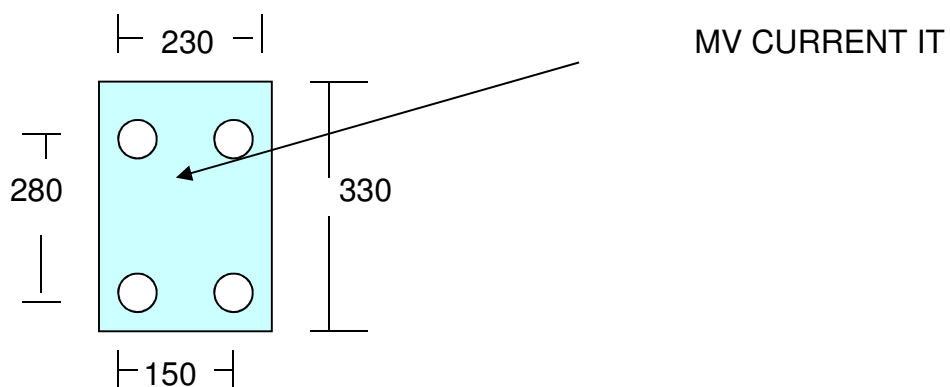
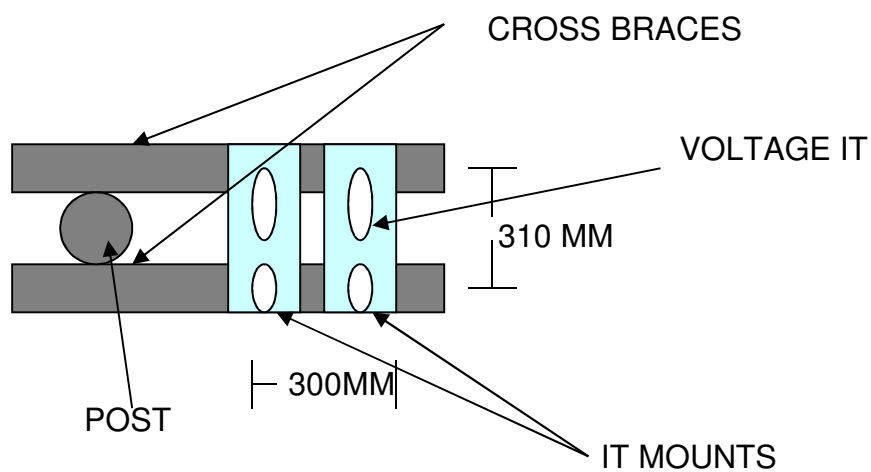
MAY 1986]

[MEDIUM VOLTAGE LINE
INSTALLATION OF CURRENT AND VOLTAGE TRANSFORMERS
AT END-OF-LINE (WOODEN BRACES)]



[PUBLIC POWER CORPORATION

OCTOBER 1990]



Dimensions are understood from the centre of each hole (in mm)
Hole diameter is 15mm; oval shaped holes are 15x80 mm

«ANNEX D» STANDARDS

The following list refers to European and International Codes in force at the date of approval of the present technical specification.

- EN 61869-1: 2007, Instrument transformers – Part 1: General requirements
- EN 61869-2: 2012, Instrument transformers – Part 2: Additional requirements for current transformers
- EN 61869-3: 2011, Instrument transformers – Part 3: Additional requirements for inductive voltage transformers
- EN ISO/IEC 17025 E3:2017, General requirements for the competence of testing and calibration laboratories.
- EN ISO 9001 E4:2015, Quality management systems – Requirements.
- ELOT EN 60529:1994 + A1:2000, Degrees of protection supplied by housings (IP CODE).

The ELOT EN/ISO remarks are similar to the relevant EN/ISO or EN/IEC and refer to their integration to the Greek standard system ELOT.

All tests shall be performed in accordance with the regulations (unless otherwise specified) in force as of the date of submission of bids.