

USER MANUAL

CURRENT AND VOLTAGE INSTRUMENT TRANSFORMERS



Laboratorio Electrotécnico

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1. TECHNICAL CHARACTERISTICS

Unless the customer specifies other features and/or requests to those stipulated in the manufacturing standards, the technical characteristics that must be established to correctly define the equipment are given below:

Voltage transformer

- Transformation ratio. (Example: 27500:√3 / 110:√3 V)
- Insulation level. (Example: 36 kV)
- Burden and class of all secondary circuits. (e.g.: 1st sec. 10 VA Class 0.2; 2nd sec. 25 VA Class 3P)
- Voltage factor. (Example: 1.2 in permanence, 1.9 during 8 hours, etc.)
- Rated frequency: 50 Hz, unless otherwise specified.
- Manufacturing standard or customer specification: IEC 61869.
- Simultaneous burden: NO, unless otherwise specified.
- Indoor or outdoor service.

Current transformer

- Transformation ratio. (Example: 15-30 / 5-5 A)
- Insulation level. (Example: 36 kV)
- Burden and class of all secondary circuits. (e.g.: 1st sec. 15 VA Class 0.2S; 2nd sec. 30 VA Class 5P10)
- Surge factor in permanence or extended range. (Example: 150% of I_n)
- Rated frequency: 50 Hz, unless otherwise specified.
- Manufacturing standard or customer specification: IEC 61869.
- Thermal short-circuit current. (e.g.: $I_{th} = 3 \text{ kA}$ or $200 \times I_n \text{ A}$, in 1 sec)
- Dynamic short-circuit current: $2.5 I_{th}$, unless otherwise specified.
- Safety factor (Fs), for measurement transformers: ≤ 5 , unless otherwise specified.
- Protection limit factor (Flp) for protection transformers.
- Indoor or outdoor service.

The use of this equipment is limited to the following conditions:

- Maximum installation altitude: **1000 metres above sea level.**
- Maximum variation of service temperature between +40°C and -25°C.
- Not very contaminated atmosphere.

When service and/or transport conditions differ to those reflected, this must be notified and expressly indicated when requesting the offer of the material, and in the order acceptance. Possible damage caused to the equipment due to lack of information given to the manufacturer in this regard will not be attributable to him or to his representatives.

2. REGULATION

The manufacture of our equipment is based on compliance with the following regulations:

- IEC 61869-1:2010. Instrument transformers. P1: General requirements.
- IEC 61869-2:2013. Instrument transformers. P2: Additional requirements for current transformers.
- IEC 61869-3:2012. Instrument transformers. P3: Additional requirements for inductive transformers.

3. INSTALLATION

3.1 Assembly

Indoor equipment can be mounted in any position, taking all the precautions and abiding by legal or regulatory provisions.

Outdoor equipment must only be mounted in upright position.

VKE type models must be handled correctly in order not to damage the outer metal coating. The transformer must be repaired if there is visible deterioration.

3.2 Installation

The equipment is intended to be installed in networks with neutral to earth (earth fault factor ≤ 1.4). In the event that the neutral system was not effectively grounded, consult Laboratorio Electrotécnico for the possibility of installing the equipment.

Instrument transformers must be installed in appropriate places such as fenced substations, buildings, modules with enclosures or similar, that do not allow access to dangerous parts by people and that protect the equipment against foreign objects.

They must also be installed so that no person can access them without first disconnecting the line that feeds them to access safely by controlled means (blockages, operating procedures, etc.).

3.3 Connection

All the terminals corresponding to the transformation ratios requested are properly and indelibly marked on the transformed surface, and reference is made to the necessary connection for each ratio on the equipment name plate.

The equipment is supplied with all the necessary connection elements.

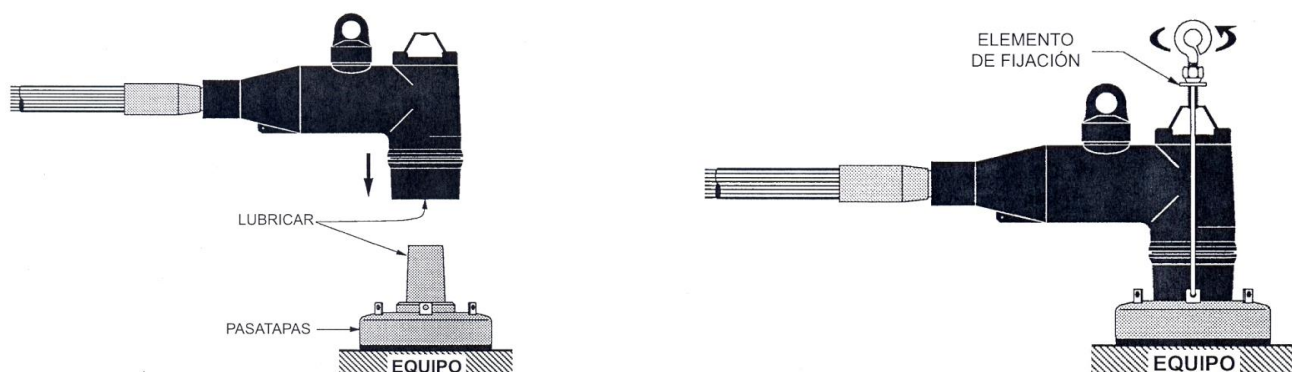
The connections will be made as indicated on the name plate, taking special care when tightening the terminals, and in the provision of the ratio change connections for those current transformers that have them.

The tightening torque of these terminals, depending on the metrics used, is given below:

- | | | | |
|---------------------|---------|---------------------|--------|
| - For M6 terminals | 2.5 N.m | - For M12 terminals | 20 N.m |
| - For M10 terminals | 11 N.m | - For M16 terminals | 45 N.m |

Models VKE-24 and VKE-36 must be connected via the specific bushing.

The connection between the bushing and the transformer is made by pressure, keeping the contact parts as clean as possible and lubricated with non-conductive silicone. The bushing will be secured to the transformer via the hook or the screws supplied with it:



Recommendations:

- The secondary winding/s of the transformer must be connected to earth via any of its terminals.
- All the transformers have an earth tap in the base, and all of them must be connected to earth via an appropriate terminal.
- Check all connections before putting the installation into operation, or connecting it to the mains, to make sure that they have been tightened properly and there is no element in short-circuit or with a connection that might cause a defect.
- Clean the parts close to all the terminals before commissioning.

WARNING!

- **In current transformers, never leave the secondary in open circuit**, as this could cause irreparable damage to the equipment.
- **In voltage transformers, never leave the secondary in short-circuit**, as this could cause irreparable damage to the equipment. Furthermore, **the n terminals must always be earthed**.

4. HANDING AND TRANSPORTATION

4.1 Models and weights

The weights of standardised appliances are shown in the table below:

CURRENT				VOLTAGE			
Model	Kg	Model	Kg	Model	Kg	Model	Kg
AEP-7	5	AED-36	55	VKPE-12	20	VKE-24	28
AED-12	16	AKWF-24/36	58	VKPE-24	25	VKE-36	40
AER-24	13	AFP-52	225	VKPE-36	30		
AEB-24	16	AKBF-0.6(1)	10	VCB-7	26	VKEF-24	99
AEC-24P	25	AKBF-0.6(2)	20	VCB-12	26	VKEF-36	99
AED-24	38	AKBF-0.6(3)	25	VCF-12	33	VFP-52	127
AER-36	18	AKBF-0.6(4)	30	VCF-24	33		
AEB-36	27	AKH-01	5				
AEC-36	37	AKH-02	4,5				

The weights indicated correspond to the maximum weights of each model, with approximately 10% tolerance.

The weights indicated do not include packaging. Different types of packaging can be used: cardboard box for transformers weighing less than 40 kg, without box on stretch-wrapped pallet, wooden cage when they weigh 40 kg or more, etc.

4.2 Elevation and transportation means

Outdoor appliances that require a mechanical elevation system due to their weight, incorporate adequate elements. Eyebolts that adapt to the metrics of the equipment terminals in question can be used to lift all other appliances, using the actual transformer terminals as the fastening base to elevate them.

Given the construction characteristics of these appliances, precautions must be taken with respect to the possibility of the blows being received by the fragile parts of the bobbins and of the primary terminals.

Model AFP-52 is packed in wooden cages, which protect the porcelain from any impact. Do not take the transformer out of the cage until it is absolutely necessary. The appliance comes with transport anchor points on the base, which must be used to secure the transformer. The appliance must be secured with a flexible transport element that does not harm the porcelain and that is sufficiently resistant (refer to weight table). Some eyebolts are placed in the transformer terminals. The fastening element must be passed through these eyebolts to prevent the transformer from swaying during transportation and location. Once in the definite location the eyebolts must be removed.

WARNING! Never transport the appliance via the eyebolts in the terminals.

5. MAINTENANCE

These appliances do not require maintenance, unless installation conditions, such as the accumulation of damp, dust, ice, chemical residues, etc. on the surface can cause a reduction of the electrical distance of the equipment, and therefore represent an operating danger. In this case, the surface must be periodically cleaned.

It is advisable to verify the correct state of the contacts of the primary and secondary terminals from time to time as well as their grip quality.

The equipment must be totally disconnected, with all the supply-free terminals earthed, to carry out any maintenance operations.

6. GUARANTEE

Provided that the conditions indicated above are respected and against any manufacturing defect:

- 2-year guarantee from the moment the appliance leaves the factory.

7. ENVIRONMENT INFORMATION

Electric and electronic appliances are contaminating material controlled by the Regional Ministry for the Environment of each Community. At the end of the working life of the transformers, they must be managed as indicated in the European Waste Catalogue for the CER corresponding to the group of "Waste electrical and electronic equipment".

8. ELECTRIC RISK

This electrical device is connected to dangerous voltages and contains moving parts that act at high speed. Contact with these risks can result in death, serious injury or damage to the equipment.



Only qualified personnel can install, operate and maintain this equipment. Always comply with the "5 golden rules" for electrical work: disconnect; prevent any possible feedback; verify the absence of tension; ground and short; and protect against live elements and signal the area. The use of unspecified or unauthorized parts to repair the equipment or the trapping of safety devices may result in dangerous conditions that can cause death, serious personal injury or damage to the equipment. Follow all safety instructions contained in this manual.

9. CONNECTION DIAGRAM CURRENT Transformers

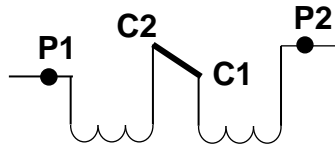
PRIMARY

SINGLE PRIMARY RATIO

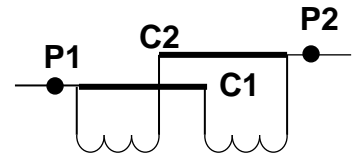


DOUBLE PRIMARY RATIO

Series

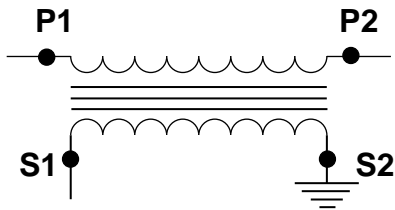


Parallel

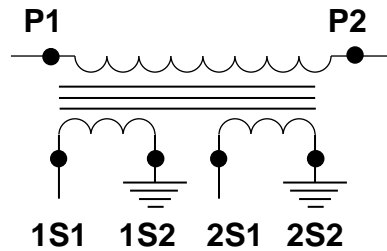


SECONDARY

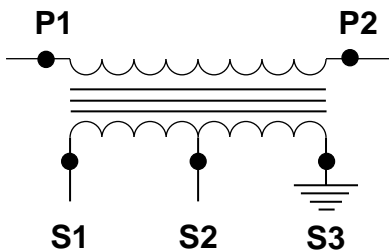
1 SECONDARY



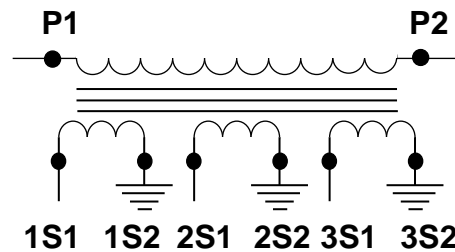
2 SECONDARIES



1 SECONDARY WITH TAP (*)



3 SECONDARIES (**)



(*) When S1 -S3 is connected, S2 must remain on air.

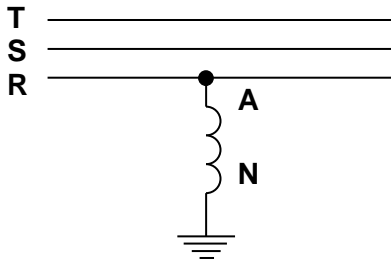
Short-circuit those secondaries not in use.

10. CONNECTION DIAGRAM

VOLTAGE Transformers

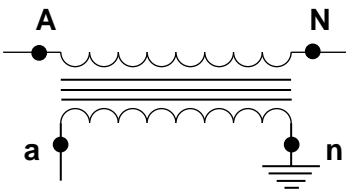
ONE INSULATED POLE

PRIMARY

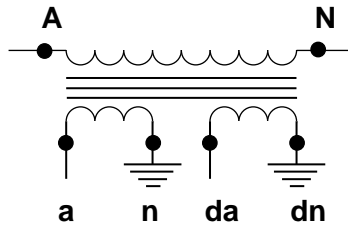


SECONDARY

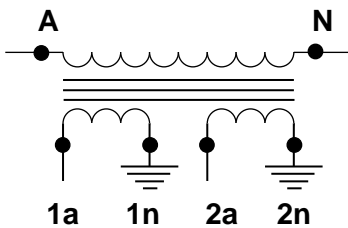
1 SECONDARY



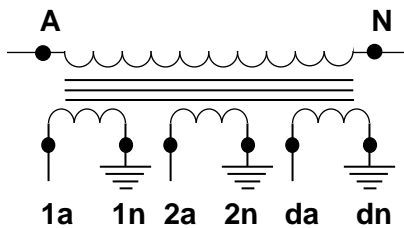
**1 SECONDARY +
1 SEC for RESIDUAL VOLTAGE**



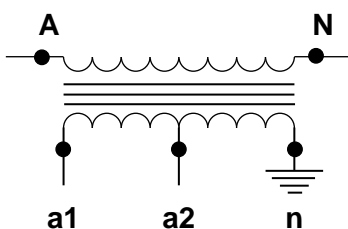
2 SECONDARIES



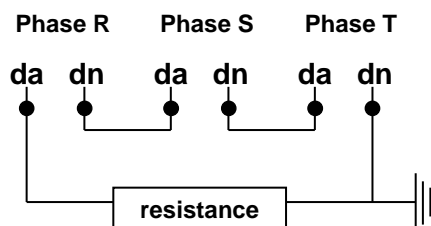
**2 SECONDARIES +
1 SEC for RESIDUAL VOLTAGE**



1 SECONDARY WITH TAP



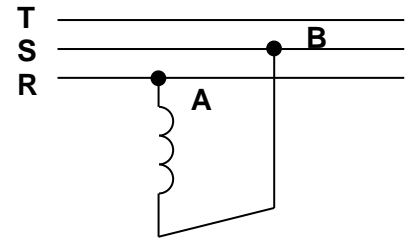
**RESIDUAL VOLTAGE
SECONDARY CONNECTION**



In voltage transformers, never short-circuit the secondaries.

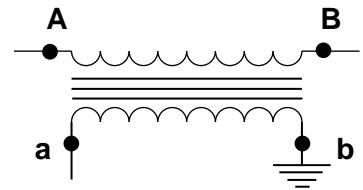
TWO INSULATED POLES

PRIMARY

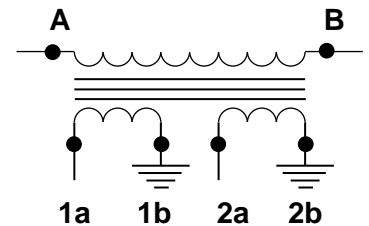


SECONDARY

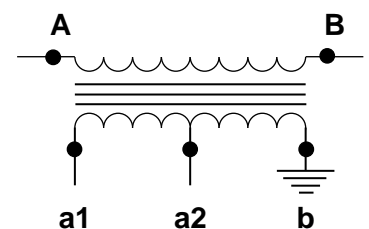
1 SECONDARY



2 SECONDARIES



1 SECONDARY WITH TAP



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TRANSFORMERS DIVISION

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