

November 2005

**SPECIFICATION SS-109/2
REVISION TMO
OUTDOOR CURRENT TRANSFORMERS 20KV**

I. SCOPE

This hereby technical description covers PPC's requirements regarding design features, technical characteristics and testing of single – phase, outdoor, 20KV current transformers.

II. KEY WORDS

Current transformers, instrument transformers, measurement transformers.

III. STANDARDS

The current transformers shall conform to the latest edition of IEC 60044-1 standard.

IV. USE

The current transformers will be used for protection and metering purposes, in 150 / 20KV air insulated substations at the 20KV side.

V. OPERATING CONDITIONS

- | | |
|---|-----------------------------------|
| 1. Installation | : Outdoors |
| 2. Limits of ambient temperature | : Maximum 45 °C
Minimum -25 °C |
| 3. Altitude | : Up to 1000m above sea level. |
| 4. Pollution level | : Moderate |
| 5. Other climatic conditions | : Snow, Ice and fog |

VI. PPC's 20KV ELECTRIC SYSTEM CHARACTERISTICS

- | | |
|--|---------------------------------------|
| 1. Nominal Voltage (phase to phase) | : 20KV |
| 2. Maximum Operating Voltage (phase to phase) | : 24KV |
| 3. Nominal frequency | : 50HZ |
| 4. Short Circuit level | : 10KA |
| 5. Basic Insulation level (Lightning Impulse) | : 150KV |
| 6. Number of phases and conductors | : 3-phase, 3-conductors, |
| 7. Earthing (grounding) Method | : Earthed neutral via a 12Ω resistor. |

VII. REQUIRED DESIGN FEATURES OF THE CURRENT TRANSFORMERS

1. Type of CT

The required type will always be indicated in the inquiry and it will be one of the following two types:

- A.** Outdoor, oil immersed current transformer with insulation housing. The insulation housing shall be mounted on top of the steel base of the CT. The base shall be provided with at least four holes for anchoring bolts.
The current transformers shall be hermetically sealed and equipped with metallic bellows, accommodating oil expansion due to temperature variations. A separate hot-dip galvanized secondary terminal box must be provided as well.
- B.** Dry type with solid cycloaliphatic epoxy resin insulation suitable for outdoor installation with no additional gas and/or oil filling.
The casting shall be homogeneous for safety reasons and the CT shall be equipped with separate hot – dip galvanized secondary terminal box.

2. Required Electrical diagram of 20KV current transformers

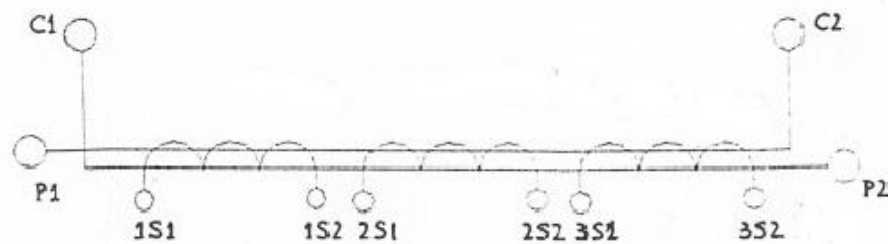


Fig. No.1

3. Ratio

As determined in the Request.

4. Secondary Windings

The CTs will be equipped with three (3) secondary windings as shown in Fig.No. 1. Two of them will be used for metering purposes and one for protections purposes. Each one of the secondary windings shall have its own magnetic core.

The rated output and accuracy class of these windings shall be as indicated in the Request.

5. Primary winding

The primary winding shall consist of two sections as indicated in Fig.No. 1 with the rating current as specified in the Request.

6. Housing (enclosure) of the CT (Applicable to type A CT)

The housing which serves as insulator shall be of high strength porcelain of one piece, free from cracks, flows or blemishes and grazed over all exposed surfaces. The porcelain housing shall comply in all relevant respects with IEC 60233.

“Test on hollow insulators for use in electrical equipment.”

7. Creepage distance of the Housing

Creepage distance of the housing shall be $\geq 600\text{mm}$, for both types of CTs.

8. Insulating Oil (Applicable to type A CT).

Only mineral oil shall be used and which must be non-toxic and biodegradable. The insulating oil shall be in accordance with the latest version of IEC publication 60296, for transformer oil. The use of toxic insulating agents such as PCBs or PCT's etc is prohibited.

9. Oil – expansion bellows and sealing (Applicable to type A CT).

The CT interior shall be filled with insulating oil and the CT shall be hermetically sealed against humidity.

Any oil volume changes due to temperature fluctuations shall be accommodate by appropriate expansion of the bellows (metallic bellows are preferred) located on the CT head.

10. Primary Terminals

The primary terminals shall be of copper, cylindrical in shape of 60mm diameter for 2000 A nominal primary current and 40mm diameter for primary current lower than 2000A. The minimum length of primary terminals is 125mm. These terminals shall be placed horizontally and diametrically opposite on the CT's head.

11. Secondary terminals box

The secondaries terminals shall be located in a weatherproof hot-dip galvanized box, which must be mounted on the metallic base of the CT.

The terminals shall consist of threaded stubs fitted with nuts and washers. The bottom plate of the box shall be furnished without holes (undrilled) but sufficiently large so as to enable the installation of one (1) cable-gland or one (1) steel conduit. The terminal box shall also be equipped with one earthing (grounding) screw.

Terminals shall be suitable to be wired with 4mm^2 size conductors.

12. Metal frame (case) parts

Apart from the primary terminals all other frame metal parts shall either be of hot – dip galvanised steel or non – corrosive metal.

13. Installation

The CT shall be suitable for installation on a outdoor steel support structure.

14. Accessories

Each CT shall be equipped with the following:

- Oil level indicator (For type “A” CT)
- Oil – filling plug (For type “A” CT)
- Oil – drain plug (For type “A” CT)
- Grounding (earthing) terminal for grounding the frame.

VIII. REQUIRED RATING CHARACTERISTICS OF THE CTs

1. Rated voltage	:20KV (r.m.s.)
2. Highest voltage	:24KV (r.m.s.)
3. Rated frequency	:50HZ
4.Primary rated current I_N	:As indicated in the Request
5. Secondaries rated current	:As indicated in the Request
6. Rated continuous thermal current	:1,2I_N
7. Rated power output of secondary windings	: As indicated in the Request
8. Characteristics of secondary windings for measurements uses.	: As indicated in the Request
9. Characteristics of secondary winding for protection use.	: As indicated in the Request
10.Minimum creepage distance of CT's housing	: $\geq 600\text{mm}$
11.Partial discharge level	:$\leq 5\text{Pc}$ at 17KV for type “A” $\leq 20\text{Pc}$ at 17KV for type “B”
12.Temperature category	: -25 / +45$^{\circ}\text{C}$
13.Limits of the temperature rise of the windings at rated current	:65$^{\circ}\text{K}$ for type “A” 75$^{\circ}\text{K}$ for type “B”
14.Rated short – time thermal current (I_{th})	:40KA
15.Rated dynamic current (I_{dyn})	:100KA
16. Power frequency withstand voltage for the secondary windings	: 3KV
17.Rated lightning impulse withstand voltage	:150KV

**18.Chopped lightning impulse withstand : 172,5
voltage**

19.Rated power – frequency withstand voltage :60KV

IX. TESTS

All testing shall be in accordance with IEC 60044-1 standard:

A. Type tests

1. Temperature rise test
2. Short – time current tests
3. Lightning impulse test
4. Wet test for outdoor type current transformers
5. Determination of errors.

B. Routine tests

1. Verification of terminal markings
2. Power – frequency withstand test on primary winding
3. Partial discharge measurement
4. Power – frequency withstand test on secondary windings
5. Power – frequency withstand tests between sections of primary and secondary windings.
6. Inter – turn overvoltage test.
7. Determination of errors (This test shall be performed after the other six (6) tests).

C. Special Tests (on one CT of the order)

1. Chopped lightning impulse test.

X. MARKINGS

A. Terminal markings

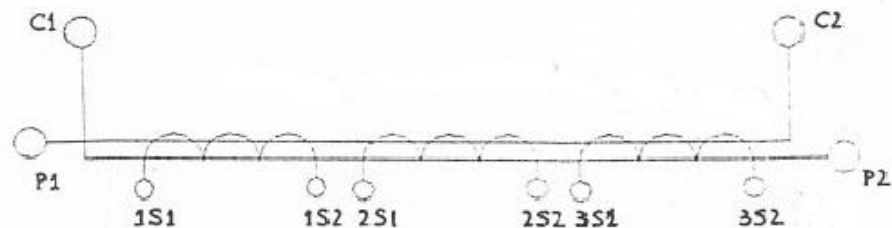


Fig. No.2

B. Rating plate markings

All CT's shall bear a rating plate of non – corrosive material with the following markings:

1. The manufacture's name.
2. Serial number, type and year of construction.
3. Rated primary and secondary current.
4. Rated frequency.
5. The rated insulation level (lightning impulse level)
6. Rated output and corresponding accuracy class for the secondary windings.
7. The highest voltage of the CT.
8. The rated short – time thermal current.
9. The rated dynamic current.

XI. DATA TO BE SUBMITTED BY BIDDERS

1. Bidders shall supply all the technical data requested in «ATTACHMENT A», attached hereto, as well as any proposed departures from the present specification and the reason therefore. Failure on bidder's part to comply with this request will be taken as sufficient reason for rejection of the offer.
2. Technical pamphlets and brochures of the offered current transformers, which will help the technical evaluation process.
3. Technical data for the oil used in the current transformers.
4. Outline drawings showing overall dimensions of the complete, CT as well as any information, sketches and data necessary for a complete description of the proposed current transformers.
5. Any type test certificates for the type and special tests specified in this hereby technical description.
Acceptance or no of these certificates lies on the judgment of PPC S.A.

XII. DATA TO BE SUPPLIED BY THE SUCCESSFUL BIDDER

After the signing of the contract, the successful bidder shall furnish three(3) sets of drawings for approval prior to the CTs construction. The drawing shall include outline dimensional drawing, detail base drawing wiring and terminal marking drawings. The outline drawing shall include all necessary information, which will enable PPC to construct the CT's support steel structure.

XIII. PACKING

The CTs shall be packed inside robust wooden boxes, three (3) CTs per box.

**«ATTACHMENT A»
20KV OUTDOOR CURRENT TRANSFORMERS (C.Ts)**

Data to be provided by all bidders. Failure to comply will constitute sufficient reason for rejection of the offer.

1. **Type and manufacture** :
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2. **Is the offered CTs type A or B;** :
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:
3. **Ratio** :
4. **Rated Output power and accuracy class of secondary windings.**
For metering purposes windings
 - Number of windings :
 - Rated current :
 - Rated output power :
 - Accuracy class :
 - Instrument security factor (FS) :**For protective purposes winding**
 - Number of windings :
 - Rated current :
 - Rated output power :
 - Accuracy class :
 - Accuracy limit factor :
5. **Type of housing of CT** :
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6. **Creepage distance of the Housing** :
7. **Type of insulating oil (only for the CTs of type «A»).** :

8. Type and material of oil – expansion bellows. (Type “A”) :
9. Description of the primary terminals :
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10. Description of secondary terminals box :
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11. Installation :
12. Location of the active part of the CT :
13. Description of accessories :
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14. Rated primary current :
15. Rated voltage :
16. Highest Voltage of CT :
17. Rated frequency :
18. Temperature category :
19. Rated continuous primary thermal current :
20. Rated short – time thermal current :
21. Rated dynamic current :
22. Limits of temperature rise of windings :
23. Rated power – frequency withstand voltage :
24. Rated lightning impulse withstands voltage :
25. Chopped lightning impulse withstand Voltage :
26. Maximum Partial Discharge level at 17 KV :

27. Power frequency withstand voltage for the secondary windings :
28. Are the offered CTs with three (3) secondary windings each one with its own magnetic core? :
29. Weight of the CT :
30. Weight of the oil (only for the CTs type «A»). :
31. Are the secondary terminals of the screw type and suitable to be wired with 4mm² size conductors :
32. Height of the CT :
33. Primary winding conductor cross - section :
34. Standards which apply :
35. Type of resin for type “B” CT. :
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36. Expected internal resistance of the CT :
37. Deviations from the present specification and the reasons thereof :