

TECHNICAL DESCRIPTION ND-NMID-418

CORE BALANCE CURRENT TRANSFORMER SUITABLE FOR SENSITIVE EARTH FAULT DETECTION IN OLM FEEDERS

1. SCOPE

This technical description covers the requirements about the technical and functional characteristic, as well as testing of the core balance current transformer that is used for the detection of small (sensitive) earth fault in overhead line feeder panels (OLM) of HV/MV substations.

2. KEY WORDS

Core balance current transformer (CBCT), detection of sensitive earth fault.

3. USE

The indoor type CBCT will be used for the detection of small (sensitive) earth fault currents, which by design are cannot be detected by the conventional protection schemes of the MV distribution lines. The indoor type CBCT shall be mounted around all three 12/20 kV line cables, 240 mm², aluminium with XLPE insulation, preferably inside the cable compartment of the overhead line feeder (OLM) panels (if allowed by distances).

4. 20kV NETWORK ELECTRICAL SYSTEM CHARACTERISTICS

- | | |
|------------------------------|--|
| 1. Nominal Voltage | : 20 kV |
| 2. Maximum Operating Voltage | : 24 kV |
| 3. Number of Phases | : 3 |
| 4. Nominal Frequency | : 50 Hz |
| 5. Basic Insulation Level | : 125 kV (peak) |
| 6. Short Circuit Level | : 10kA |
| 7. Method of Earthing | : The 20kV system is earthed (grounded) via a 12 Ω resistor. |

5. OPERATING CONDITIONS

Installation:

- inside the cable compartment of the metal-clad OLM panel, or
- inside the switchgear panel in a special bottom-mounted cable box, or
- separately, below and close to the switchgear panel

Temperature range : -5 °C to + 50 °C

Relative humidity
Altitude

: Not exceeding 95 %
: Up to 1000 m above
sea level

6. **REGULATIONS**

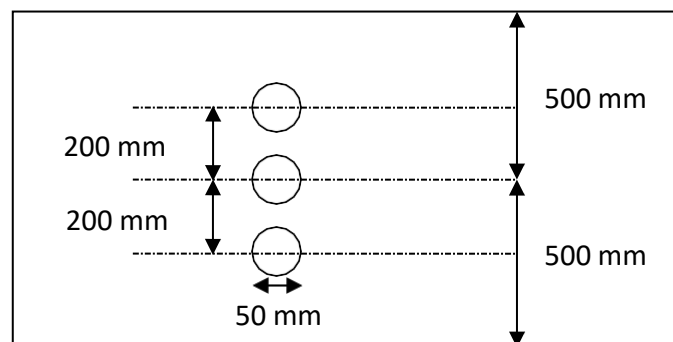
All the technical and nominal characteristics and the testing of the CBCT, must comply with the last edition of **IEC61869-1&2** standards.

7. **TECHNICAL CHARACTERISTICS OF THE CBCT**

- a. Rated insulation level: 0.72/3 kV
- b. Highest voltage of equipment U_m : 0.72 kV
- c. Rated power frequency withstand voltage (r.m.s): 3 kV
- d. Rated frequency f_n : 50 Hz
- e. Nominal turns ratio: 1/100 (i.e. 1/0.01 A current rating)
- f. Maximum primary current I_{pn} : 100 A
- g. Maximum accuracy class: 3
- h. Minimum rated burden: 0.18 Ohm
- i. Minimum knee point voltage V_k : ≤ 1 V
- k. Rated continuous thermal current: $1.2 \times I_{pn}$
- l. Minimum rated short-time thermal current I_{th} 1 s: 1250 A
- m. Rated dynamic current I_{dyn} : $2.5 \times I_{th}$ A
- n. Insulation class: E
- o. Protection: IP65
- p. Type of material of the insulating housing: casting resin (resin cast type CBCT)

8. **ADDITIONAL REQUIRED CHARACTERISTICS OF THE CBCT**

- a. The dimensions of the CBCT shall be such that the CBCT will encompass all three 12/20 kV line cables, 240 mm², aluminium with XLPE insulation, whose arrangement within the cable compartment of the metal-clad OLM panel is shown below.



MV cable bottom entrance in the cable compartment of OLM feeder panels

It is noted that termination of screen on cables will be fed back to earth connection.

b. The CBCT in combination with the current input ($I_N \leq 1A$) associated with the sensitive earth fault protection (which shall be set in the range of 0.01 to 1.00 A secondary) of the OLM feeder relay, shall be capable to effectively detect small earth fault currents experienced in the overhead line in the range of 1 to 50 A primary.

c. Alternative class (i.e. PX class) for the CBCT will become acceptable, and this is left to the Tenderer, but confirmation must be provided on how the design offered will guarantee performance at the minimum required operating level of 1A with desired accuracy of 5% at least.

d. The CBCT design shall be such so that its performance is not affected by external stray fluxes possibly generated by adjacent conductors (e.g. by utilizing special winding techniques, internal shielding etc.).

e. The secondary winding terminals of the CBCT must be suitable for connection with control cables with a cross section of at least 4 mm², while the minimum control cable cross section to be used shall be 2.5 mm².

f. The secondary leads shall be terminated with unplated copper or brass terminals.

g. A terminal box shall be added to the termination area to make the CBCT IP65 rated.

h. Polarity (both for primary and secondary leads) shall be marked.

i. Mountings (i.e. base or cable mountings) shall be provided.

9. TESTS FOR THE CBCT

Routine Tests (in accordance with IEC 61869-1&2)

a. Verification of terminal markings

b. Inter-turn over voltage test. Performed at 120% rated current or up to 4.5kV peak (whichever is first).

c. Determination of errors

10. PACKING

Each CBCT shall be delivered packaged separately inside a robust paper box suitable for this type of equipment so as to withstand rough handling during transit and storage.

11. INFORMATION WHICH MUST BE PROVIDED BY ALL BIDDERS

a. All bidders must provide all information that is required in ATTACHMENT 'A' of this hereby specification. Failure to comply with this

requirement will result in rejection of the offer.

b. Dimensional and outline drawings for the CBCT.

c. Preliminary drawings depicting front view, side view and isometric view of the current transformer and depicting how the CBCT is to be mounted. Failure to comply with this request will result in rejection of the offer.

d. Technical prospectus and any other information for the CBCT (e.g. RCT @75⁰ C, IE, excitation curve etc.).

e. Sales record of the offered equipment or equipment similar to the offered coming from Electric Utilities or Network Operators.

12. INFORMATION WHICH MUST BE PROVIDED BY THE SUCCESSFUL BIDDER

Final drawings indicating dimensions, front view, side view, isometric view and mounting supports of the CBCT.

INFORMATION BY THE SUPPLIER

Failure to answer all following questions will result in rejection of the offer.

ATTACHMENT 'A' CORE BALANCE CURRENT TRANSFORMER FOR SEF DETECTION IN OLM FEEDERS

1. Manufacturer :
.....
2. Type :
.....
3. Rated insulation level :
4. Highest voltage of the equipment :
5. Rated power frequency withstand voltage :
6. Nominal ratio :
7. Rated primary current I_{pn} :
8. Accuracy class :
9. Rated burden or power output :
10. Limiting secondary (knee-point) voltage (V_k) :
.....
11. Rated continuous thermal current :
12. Rated short-time thermal current (I_{th}) :
13. Rated dynamic current (I_{dyn}) :
14. Type of material of the insulating housing :
.....

15. Can the CBCT be mounted around all three (or six, if two in parallel per phase) 12/20 kV line cables, 240 mm², aluminium with XLPE insulation inside or below the switchgear panel? :
16. Does the CBCT class and offered design guarantee performance at the minimum required operating level of 1 A with accuracy less than 5%? :
17. Does the CBCT design guarantee that its performance will not be influenced by external fluxes possibly generated by adjacent conductors? :
18. Are the secondary terminals suitable to be connected to control cable of 4mm² in cross section? :
19. Are the secondary terminals made of unplated copper or brass? :
20. Is a terminal box added to the termination area to make the CT IP65 rated? :
21. Are the necessary mountings of the CBCT part of the supply? :
22. Weight of the CBCT :
23. Dimensions of the CBCT :
24. Insulation class as per IEC 60085 :