

**TECHNICAL DESCRIPTION TD-49**  
**OVERCURRENT RELAYS TO BE USED FOR**  
**AUTOTRANSFORMER MASS PROTECTION**

**I. SCOPE**

This hereby technical description covers PPC's requirements regarding functional features, technical characteristics and testing of single phase overcurrent relays.

**II. KEY WORDS**

Relays, overcurrent relays.

**III. STANDARDS**

The relays shall conform to IEC standards. Relays as per ANSI/IEEE can be offered, subject, however to PPC approval.

**IV. USE**

The relays will be used to protect against short circuit currents which can be developed between autotransformer mass(tank) and earth.

The protected autotransformer is of ratio of 400/150/30KV, of apparent power of 280MVA and of connection of star-grounded/star-grounded/delta .

The relays are to be used in conjunction with CTs of ratio 200/5A.

## **V. OPERATING CONDITIONS**

1. Installation : Indoors, inside a relay kiosk or the control building, on metallic panel.
2. Limits of ambient temperature during service : -5°C to +45°C
3. Altitude : Up to 1000 m above sea level

## **VI. ELECTRICAL CHARACTERISTICS OF PPC's 400KV, 150KV and 30KV SYSTEM**

1. Nominal Voltage (phase-to-phase) : 400/150/30KV
2. Maximum Operating Voltage (phase to phase) : 420/170/36KV
3. Number of phases : 3
4. Nominal frequency : 50Hz
5. Short Circuit level : 40/30/20kA
6. Basic Insulation level : 1550/750/250KV
7. Available auxiliary D.C. supply voltage : 220V D.C.
8. The system is solidly grounded (earthed).

## **VII. REQUIRED PROTECTION FUNCTION OF THE RELAYS**

Earth overcurrent Protection with definite time with two levels of overcurrent ( $I_E >$  and  $I_E \gg$ ).

## **VIII. REQUIRED TECHNICAL CHARACTERISTICS OF THE RELAYS**

1. Rated frequency : 50Hz
2. Rated input ( $I_n$ ) : 5A
3. Setting range  
Stage 1  
 $I_E > (time\ delay)$  : (0.5-4) x  $I_n$  in steps of 0.1A,  
where  $I_n=5A$   
delay time : 0 to 20sec  
Stage 2  
 $I_E \gg (instantaneous)$  : (0.1-10) x  $I_n$

delay time	: 0-20 sec
4. Rated auxiliary supply voltage	: 220V D.C. $\pm$ 10%
5. Number of output contacts for tripping	: Two (2) CO or NO for stage $I_E >$ and for stage $I_E >>$ .
6. Continuous current rating of the output tripping contacts	: 5A
7. Current rating of the output tripping contacts for 0,5sec.	: 30A
8. Switching breaking capacity of the output tripping contacts at 220V D.C.	: 0,15A
9. Number of output contacts for alarm	: 2 NO associated one with $I_E >$ and one with $I_E >>$
10. Continuous current rating of the output contacts for alarm	: 1A
11. Switching breaking capacity of the output contacts for alarm at 220V DC	: 0,15A

## **IX. ADDITIONAL REQUIRED FEATURES OF THE RELAYS**

1. Type : Digital
2. Single-phase. A three phase relay can be accepted providing that it can be wired so as to be excited by a phase to earth current.
3. The relay must be of reduced sensitivity for frequencies other than the fundamental so as to prevent undesired operations.
4. The relay shall be suitable for flush panel mounting.
5. The relay terminals shall be suitable to be wired with 2,5mm<sup>2</sup> size conductors.

## **X. COMMUNICATIONS**

- a. The relay shall be capable for communicating with an automated substation control and protection system, via IEC protocol 60870-5-103, and also preferably via one of the following protocols : Profibus-fms, Lon, Modbus/RTU or DNP.3 .
- b. The relay shall be equipped with a port for PC connection.

- c. The relay shall be capable of being connected either with fiber optic cable or special communication cable for the purposes of communication with an automated substation control and protection system.

## **XI. FAULT RECORDING**

The function of the fault recording shall be used for recording of phase and ground (earth) currents during fault conditions.

The recording will be initiated either by tripping signal or by pick up.

Total recording time : 3sec at least

## **XII. TESTS**

### **A. Routine Tests**

1. Power frequency voltage withstand test: 2KV rms, 50Hz, 1 minute as per IEC 60255-5

### **B. Type Tests**

1. Impulse voltage withstand test  
5KV, 1,2/50 $\mu$ s, 0,5J, 3 positive and 3 negative impulses at intervals of 5sec as per IEC 60255-5.
2. High frequency test:  
2,5KV peak, 1MHz,  $\tau$ =15ms, 400 pulses/sec, duration=2sec as per IEC 60255-22-1, Class III.
3. Fast transient interference test:  
4KV, 5/50ns, 5kHz, burst length=15ms, repetition rate=300ms, both polarities, duration=1minute as per IEC-60255-22-4, class IV.

## **XI. DATA TO BE SUBMITTED BY ALL BIDDERS**

1. Bidders must provide all information requested in "ATTACHMENT A" of this hereby technical description. Failure on the bidder's part to comply with this request will be taken as sufficient reason for rejection of the offer.
2. Technical pamphlets and brochures that will help the evaluation process.

3. Outline and wiring drawings of the offered relay including mounting instructions.
4. If a three phase relay is offered (phase + earth), a connection diagram must be provided indicating as how the relay is going to be connected so that it can be excited by the phase to earth current.
5. Any type test certificates for the type test specified in this hereby technical description. Acceptance or not of these certificates lies on PPC's judgment.

## **XII. PACKING**

The relays shall be delivered packed properly inside robust paper boxes, proper for this type of equipment.

One relay per box.

“ATTACHMENT A”  
OVERCURRENT RELAYS TO BE USED FOR AUTOTRANSFORMER MASS  
PROTECTION

1. Type and manufacturer of the relay : .....
2. Is the relay overcurrent of definite time? : .....
3. Temperature operating limits of the relay : .....
4. Setting range  
    A. stage 1,  $I_E >$  : .....  
        In steps of : .....  
        Delay time : .....  
    B. stage 2,  $I_E >>$  : .....  
        In steps of : .....  
        Delay time : .....- 5. Rated Input : .....
- 6. Rated auxiliary supply voltage : .....
- 7. Number of output contacts for tripping : .....
- 8. Continuous current rating of the output tripping contacts : .....
- 9. Current rating of the output tripping contacts for 0,5 second : .....
- 10. Switching breaking capacity of the output tripping contacts at 220V D.C. : .....
- 11. Number of output contacts for alarm : .....
- 12. Continuous current rating of the output contacts for alarm : .....
- 13. Switching breaking capacity of the output contacts for alarm at 220V D.C. : .....
- 14. Rated frequency : .....
- 15. Power consumption of the relay in VA : .....
- 16. Is the offered relay of reduced sensitivity for frequencies other than the fundamental so as to prevent undesired operations? : .....

17. Is the relay suitable for surface panel mounting? : .....
18. Are the relay terminals suitable to be wired with 2,5mm<sup>2</sup> size conductors? : .....
19. Weight of the relay : .....
20. Dimensions of the relay : .....
21. Is the relay single phase or three-phase (phase + earth)? : .....