PERCENTAGE BIASED DIFFERENTIAL RELAY FOR 3-WINDING TRANSFORMERS

Microelettrica Scientifica

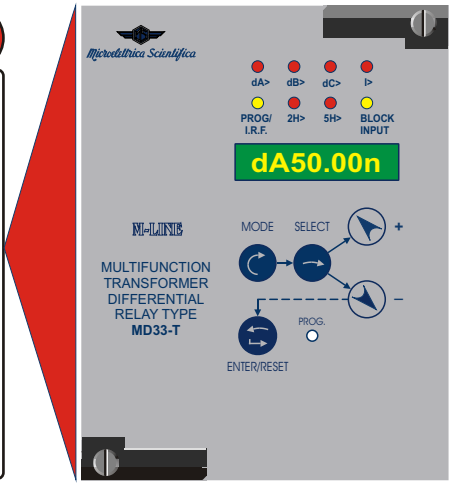
MD33-T

N26-R3

LINE M

50/51, 87

- Three-phase percentage biased differential relay for three-winding transformers.
- Two differential current levels.
- One overcurrent level.
- 2nd and 5th harmonic adjustable restraint levels.
- Programmable percentage bias curve.
- Oscillographic recording.
- Modbus Communication Protocol.
- UL / CSA listed.



Three-phase percentage biased differential relay for 3 winding transformers with two or three power sources.

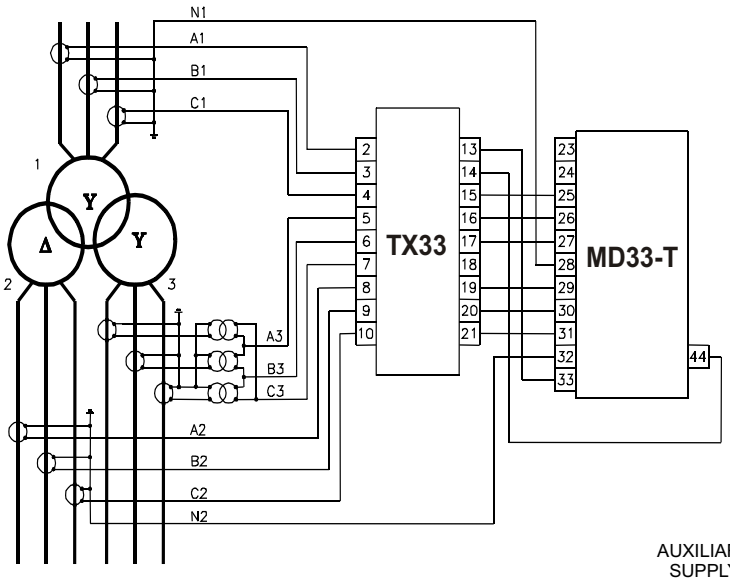
The relay measures the incoming currents and operates the CT ratio and vector group compensation with one set only the of interposing Cts.

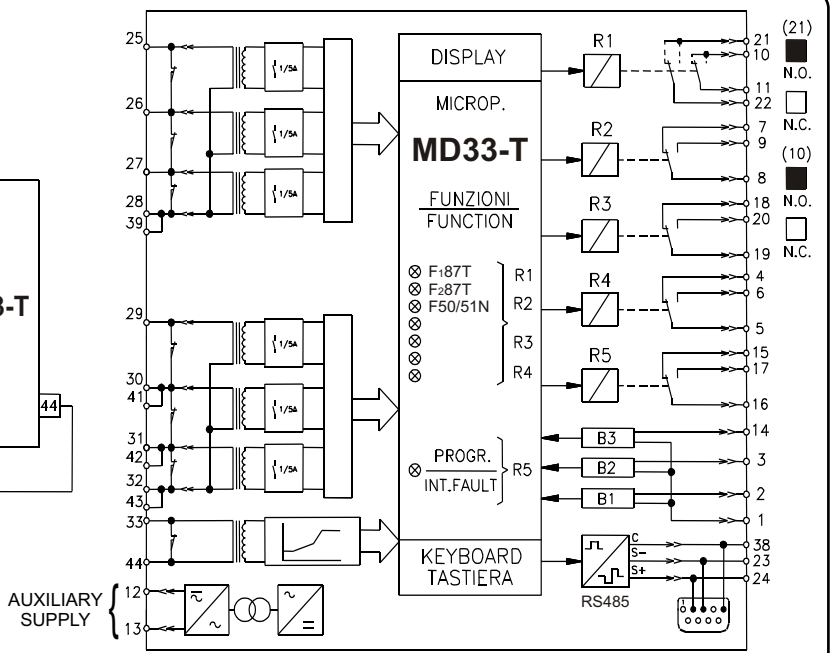
- **Real Time Measurements** = I_{dA}-I_{dB}-I_{dC}-I_{do} - I_{1A}-I_{1B}-I_{1C} - I_{2A}-I_{2B}-I_{2C} - I_{dIIA}-I_{dIIB}-I_{dIIC} - I_{dVA}-I_{dVB}-I_{dVC}
- **Maximum Demand and Inrush Recording** = I_{dA}-I_{dB}-I_{dC}-I_{do} - I_{1A}-I_{1B}-I_{1C} - I_{2A}-I_{2B}-I_{2C} - I_{dIIA}-I_{dIIB}-I_{dIIC} - I_{dVA}-I_{dVB}-I_{dVC}

Programmable Input Quantities

- **Fn** = System frequency : (50 - 60)Hz
- **1In** = Rated primary current of phase CTs HV side : (1 - 9999) A, step 1A
- **2In** = Rated primary current of phase CTs LV side : (1 - 9999) A, step 1A
- **1V** = Rated primary voltage of Transformer HV side : (0.2 - 380)kV, step 0.01kV
- **2V** = Rated primary voltage of Transformer LV side : (0.2 - 380)kV, step 0.01kV
- = Selection of Transformer's vector group.

Connection Diagram





CE

c UL us LISTED IND.CONT.EQ. 19CN

SCE1571-R1

1 - F87T : Low-set Phase Differential

- Trip level : **d> = (0.1 - 0.5)In**, step 0.01In
- Trip time : **0.03s**
- Bias percentage : **R = (10 - 50)%**, step 1%
- 2nd Harmonic restraint level : **2H = (0.1 - 0.3)Id**, step 0.01Id
- 5th Harmonic restraint level : **5H = (0.2 - 0.4)Id**, step 0.01Id
- Time during which harmonic restraint level can be lowered at transf. energisation : **tH = (0.01 - 90.00)s**, step 0.01s
- 2nd Harmonic restraint level reduction during tH : **R2H = (0.5 - 1)d**, step 0.01
- 5th Harmonic restraint level reduction during tH : **R5H = (0.5 - 1)d**, step 0.01

2 - F87T : High-set Phase Differential

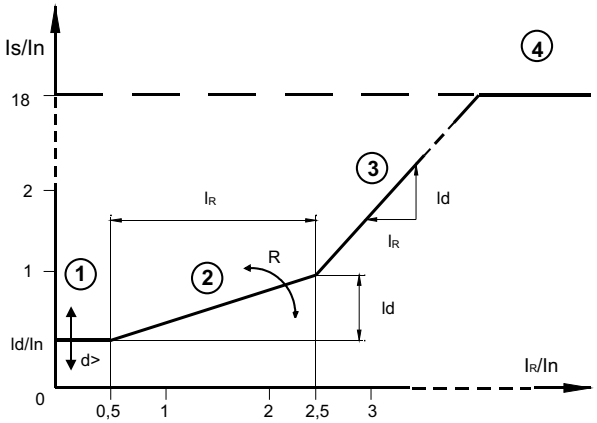
- Trip level : **d>> = (2 - 17)In**, step 0.01In
- Detection time : **6ms < t < 20ms**
- Peak current detection with DC offset restraint.

F50/51 (I>): Overcurrent Protection

- Current setting range : **I> = (0.5 - 20)In**, step 0.1In
- Instantaneous output : **0.03s**
- Trip time delayed : **tI> = (0.05 - 9.99)s**, step 0.01s

Digital Inputs

- **B1** = Operation block input
- **B2** = Harmonic restraint's reduction
- **B3** = Oscillographic record external trigger



Is= Effective relay's operation differential current
Id= Relay set differential current = [d>]
IR= Relay's through current

$$R\% = 100\,\frac{I_d}{I_R} \quad 100\,\frac{(I_1 - I_2)}{(I_1 \quad I_2):2}$$

① $\frac{Is}{In} \quad \frac{I_d}{In}$

② $\frac{Is}{In} \quad \frac{I_d}{In} \quad (\frac{I_R}{In} \quad 0{,}5) \quad \frac{R\%}{100}$

③ $\frac{Is}{In} \quad \frac{I_d}{In} \quad \frac{2R\%}{100} \quad (\frac{I_R}{In} \quad 2{,}5)$

④ $\frac{Is}{In} \quad 18$

TX33 - OVERALL DIMENSIONS