Traction Installation Directorate

सत्यमेव जयते

Government of India
Ministry of Railways

Instruction No. TI/IN/0036

For
Relay setting guideline for protection scheme for 25 kV a.c. Traction System low density routes

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ISSUED BY

Traction Installation Directorate

Research Designs and Standards Organization (Ministry of Railways) Manak Nagar, Lucknow – 226011

1. Introduction:

Railway Board has deduced scheme for traction power supply with increased TSS spacing & provision of traction transformer single / double alternatively for low density route. The following has been advised by Railway Board vide their letter No.2017/RE/161/29 FTS-3241642 dated 24.01.2018.

a. The TSS spacing shall be kept approximately 100 Km.

b. No. of Traction transformer shall be single and double at alternate TSS. The TSS having Single Traction Transformer shall be provided with capacity of 21.6 MVA while TSS adjacent to it there shall be two transformers each having capacity of 13.5 MVA.

2. Description of 25 kV traction power supply as proposed.

It is presumed that TSS having double traction transformer of 13.5 MVA capacity will feed individually to one end only in normal condition. The parallel operation of the transformers is not allowed due to increase of fault level. In case of failure of one transformer, the healthy transformer will feed both end OHE through designated feeder circuit breakers. This will require neutral section in front of TSS to avoid shorting of two separate feed causing any eventuality. TSS having single transformer of capacity 21.6 MVA shall feed in existing manner through Feeder CBs.

3. Protection scheme for low density route having TSS spacing approximately 100Km:

a. Transformer & Shunt Capacitor Bank protection

Control and Relay panel for 25 kV ac TSS including specification for numerical type protection relays for traction transformer, 25 kV shunt capacitor bank and transmission line for 25 kV ac TSS shall be as per the existing latest specification No. TI/SPC/PSI/PROTCT/6071 with Amendment No.1. For transformer protection and its relay setting, the existing RDSO instruction no. TI/IN/0022 with Amendment 1 and setting of Delta I relay for High resistive fault, the instruction no. TI/IN/0029 & TI/Report/35 with amendment shall be applicable

b. Feeder protection

(i) Numerical integrated feeder protection module shall be used for the protection of 25 kV AC traction overhead equipment as per the RDSO Specification No. TI/SPC/PSI/PROTCT/5070 (Rev.1) with Amendment No.1 or latest.

(ii) The methodology of relay calculation shall be as per RDSO Report No. TI/Report/35 with amendment. The setting of two stage OCR protection elements in feeder protection module has not been mentioned in the report. The setting of the two stage OCR elements of the feeder protection module has been detailed below along with settings.

Relay Element	Recommended setting
Over Current Relay: There is a provision of two stages over current relay i.e.	**Stage1: Instantaneous OCR setting.** Current setting shall be 150% of the rated secondary current of the traction power transformer.

Stage 1- instantaneous and Stage 2- definite time. The relay as per Para 6.3 of RDSO specification No. TI/SPC/PSI/PROTCT/5070(Rev.1), the over current relay is settable from 20% to 1000% in steps of 1%.

MVA	I_{SEC}	$1.5*I_{SEC}$ (CTR: 150 in case of 21.6MVA and 100 for 13.5 MVA)
21.6	800	1200A Current setting in Relay =1200/150 = 8A Setting in % = 8*100/5 =160%
13.5	500	750A Current setting in Relay =750/100 =7.5A Setting in % =7.5*100/5 = 150%

As per para 6.3 of the specification, operating time of instantaneous OCR is within 25 ms.

Stage2: Definite time OCR setting.

The setting may be done as high as it may not affect the physical property of the conductor. This setting is done to protect the OHE from parting due to softening of conductor caused by high current for longer period. However, it may be set below the current setting done for stage 1 OCR element and the setting may be done for 125% of the rated current ($I_{SEC)}$.

MVA	I_{SEC}	125%	Period
21.6	800	1.25*800	5 minutes
13.5	500	1.25*500	5 minutes

(iii) Minimum operating current setting of the Distance Protection relay 0.5 A.

(iv) The relay shall be blocked for operation in case 2nd harmonic component in current exceeds more than set value '15%'. The percentage of second harmonic for block the operation shall be settable from 5 to 20 % in steps of 1%.

c. **Delta I Protection Relay:** The report no TI/Report/35 with Amendment and instruction no. IN/TI/0029 may be referred. Nos. of loco may be 2 or more in case of starting loco on restoration power supply. Hence current setting of 2A shall be appropriate.

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