Technical Bulletin

TB 0295 - Distribution substation low voltage circuit breaker settings application, validation and commissioning

Purpose

The purpose of this bulletin is to reduce errors associated with the commissioning of low voltage circuit breakers (LVCB) located within distribution substations. This shall be achieved by ensuring protection settings are correctly applied through revised commissioning and validation processes.

Background

Recently, incorrect settings applications have been identified post commissioning, leading to maloperation of LVCB's, triggering a review of commissioning practices. This review has identified uncertainty around the settings application of LVCB's and the accountability of the Responsible Officer when commissioning LVCB relays as per FNV1043.

Currently, commissioning records are to be stored within the project file and uploaded to contents server according to GNV 1044. These records do not provide auditability or traceability of applied LVCB settings.

Furthermore, minor amendments to standard LVCB settings have been identified for inclusion in MCI 0006 and MCI 0005 for some LVCB relays.

Actions

Substation Assets

- Revise SDI 120 to include additional responsibilities of a Responsible Officer.
- Revise MCI006 and MCI0005 to reflect the updated standard LVCB settings table as per Appendix 1.

Transformer Workshop / Accredited Service Provider (ASP)

- Ensure LVCB settings are applied according to the standard LVCB settings table in MCI006 and MCI005 before dispatching the LV switchgear unit.

Responsible Officer

In addition to responsibilities in SDI 120 the Responsible Officer shall do the following:

- Prior to energising, verify the application of standard LVCB settings in accordance to setting table in MCI006 and MCI005.
- Email a Photo of the as left LVCB settings, including substation number, address, LVCB Type and Transformer kVA to SPD.Settings@endeavourenergy.com.au.

Protection Design

- Review and enforce the standard LVCB settings table in MCI 0006 and MCI005.
- Validate the photos of as left LVCB settings
- Archive the as left LVCB setting photos.

Impacted Standards

The contents of this technical bulletin will be included in the next update of the following standard(s):

- MCI 0006 - Underground distribution construction standards manual.
- MCI 0005 – Overhead construction standards manual.
- FNV 1043 - Certificate of Availability for Service for Network Electrical Assets.
- GNV 1044 – Commissioning Network Distribution Electrical Assets).
- SDI 120 – Testing and commissioning for distribution systems.

Appendix

1. Table - Standard LVCB Settings (Revision P)
2. Sample Standard LVCB Settings photos

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Appendix 1 – Table - Standard LVCB Settings (Revision P)

Transformer Rating	LVCB Type	LVCB Setting	
300kVA & 315kVA (4.0%)	Merlin Gerin CM1250	Ir = 0.5, Im = 4, t = B	Pickup= 625 A Short Time = 2,500A
	Merlin Gerin C1251N	Io= 0.5, Ir = 1.0, Im = 4, tm = 0.2, I^2t = OFF	Pickup= 625 A Short Time = 2,500A
	Terasaki XS1250NE	Io=0.63, I_1=0.8, I_2=4.00, T_1= 5sec I_3=12, T_2= 0.2sec, I^2t Ramp = OFF	Pickup= 630 A Short Time = 2520A Instant.= 9450
	ABB PR232 T7 1250	In = 1250A, 50Hz, I1 = 0.52 x In, t1 = 6s I2 = 1.8 x In, t2 = 0.25s, ∟ I3 = 7.5 x In, InN = OFF	Pickup= 650 A Short Time = 2250A Instant.= 9375A
	Schneider NS1250N Micrologic 5.0 Rating 1250A	Ir = 0.5, tr = 4, Isd = 4, tsd = 0.2, Ii = 6, I2t = OFF	Pickup = 625 A Short Time = 2,500A Instant. = 7,500A
400kVA (4%)	Terasaki XS1250SE	Io=0.8, I_1=0.8, I_2=4.00, T_1= 5sec I_3=12, T_2= 0.2sec, I^2t Ramp = OFF	Pickup= 800 A Short Time = 4000A Instant.= 12,000A
	ABB PR232 T7 1250	In = 1250A, 50Hz, I1 = 0.64 x In, t1 = 6s I2 = 3 x In, t2 = 0.25s, ∟ I3 = 9.5 x In, InN = OFF	Pickup= 800 A Short Time = 3750A Instant.= 11875A
	Schneider NS1250N Micrologic 5.0 Rating 1250A	Ir = 0.7, tr = 4, Isd = 4, tsd = 0.2, Ii = 8, I2t = OFF	Pickup = 875 A Short Time = 3,500A Instant. = 10,000
500kVA (4.3%)	Merlin Gerin CM1250	Ir = 0.8, Im = 4, t = B	Pickup= 1000A Short Time = 4,000A
	Merlin Gerin C1251N	Io = 1, Ir = 0.8, Im = 4, tm = 0.2, I^2t = OFF	Pickup= 1000A Short Time = 4,000A
	Terasaki XS1250NE	Io=1, I_1=0.8, I_2=4.00, T_1= 5sec I_3=12, T_2= 0.2sec, I^2t Ramp = OFF	Pickup= 1000 A Short Time = 4,000A Instant.= 12,000
	Merlin Gerin CM1600	Ir = 0.6, Im = 4, t = B	Pickup= 960 A Short Time = 3,840A
	ABB PR232 T7 1250	In = 1250A, 50Hz, I1 = 0.8 x In, t1 = 6s I2 = 3 x In, t2 = 0.25s, ∟ I3 = 9.5 x In, InN = OFF	Pickup= 1000 A Short Time = 3750A Instant.= 11875A
	Schneider NS1250N Micrologic 5.0 Rating 1250A	Ir = 0.8, tr = 4, Isd = 4, tsd = 0.2, Ii = 10, I2t = OFF	Pickup = 1000 A Short Time = 4000A Instant. = 12,500
750kVA (5.0%)	Merlin Gerin CM1600	Ir = 0.8, Im = 4, t = B	Pickup= 1280A Short Time = 5,120A
	Merlin Gerin CM2500	Ir = 0.5, Im = 4, t = B	Pickup= 1250A Short Time = 5000A
	Terasaki XS2500	Io=0.63, I_1=0.8, I_2=4.00, T_1= 5sec I_3=12, T_2= 0.2sec, I^2t Ramp = OFF	Pickup= 1,260A Short Time = 6,300A Instant.= 18,900A
1000kVA (5.3%)	Merlin Gerin CM2500	Ir = 0.6, Im = 4, t = B	Pickup= 1,500A Short Time = 6,000A
	Terasaki XS2500	Io=0.63, I_1=1.0, I_2=4.00, T_1= 5sec I_3=12, T_2= 0.2sec, I^2t Ramp = OFF	Pickup = 1,575A Short Time = 6,300A Instant.= 18,900A
	Schneider NS3200N Micrologic 5.0 Rating 2000A	Ir = 0.8, tr = 8, Isd = 4, tsd = 0.2, Inst = 10	Pickup = 1,600A Short Time = 6,400A Instant.= 20,000A
1500kVA (6.25%)	Merlin Gerin CM3200	Ir = 0.8, Im = 4, t = B	Pickup= 2,560A Short Time = 10,240A
	Schneider NS3200N Micrologic 5.0 Rating 3200A	Ir = 0.8, tr = 1, Isd = 2.5, tsd = 0.2, Inst = 10	Pickup= 2,560A Short Time = 6,400A Instant = 3200A
	ABB SACE S8H PR212 3200A	I1 = 0.8, t1 = A (3s), I2 = 2 t2 = C (0.25s), ∟, I3 = 10	Pickup= 2,560A Short Time = 6,400A Instant = 32000A
	ABB SACE T8L PR331/P 3200A	In = 3200 A, Hz = 50, In N = OFF L: I1 = 0.80 x In, t1 = 3s S: I2 = 2.4 x In, t2 = 0.2s, ∟ I: I3 = 9 x In G: I4 = OFF, T4= 0.1s	Pickup = 2,560A Short Time = 7,680A Instant. = 28,800A

	Terasaki XS3200	Io=1.0, I_1=0.8, T_1= 5sec, I_2=2.00, T_2= 0.2sec, I_3=10, I^2t Ramp = OFF	Pickup= 2,560A Short Time = 6,400A Instant.= 32000A

Appendix 2 – Sample Standard LVCB Settings

ABB PR232 T7 1250 for 315kVA Transformer

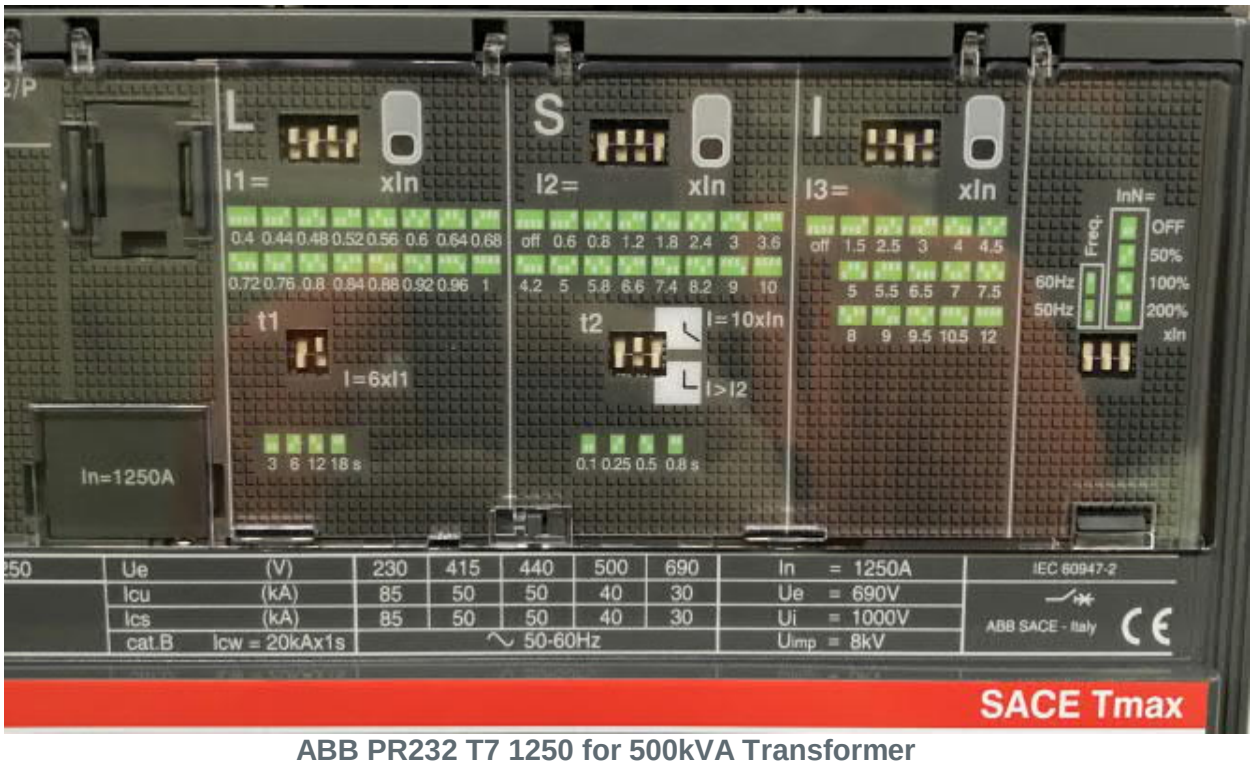
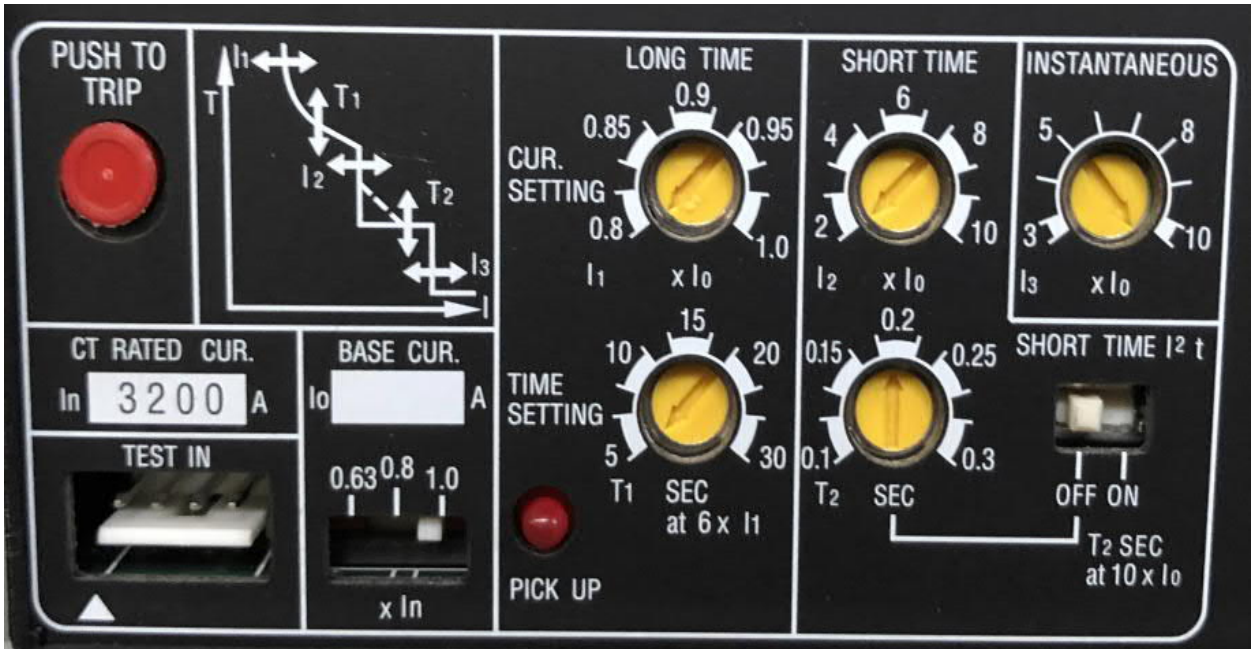


ABB PR232 T7 1250 for 500kVA Transformer

TERASAKI XS2500 for 1000kVA Transformer



TERASAKI XS3200 for 1500kVA Transformer