

PROTECTION & CONTROL SWITCHING BOX

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PURPOSE AND SCOPE`

The switching box shall provide a standard interface between the HV equipment and the protection and control system. The protection and control system can be hardwired for legacy systems or an AS3 merging unit. It provides safety and operational isolation for both the HV equipment and the protection secondary system.

The functional requirements are detailed in Technical Specification TS3.24.89

PART 1 - GUIDANCE

1 GENERAL

The switching box shall be a combination of separate types of switching units, CT, VT and Digital Switching Units each with an output socket as shown in figures 1,2,3,6,9 of Appendix A. Secondary systems requiring outputs from the switching box are connected into each switching unit by a plug connection. The number and types of switching units required will depend on the bay configuration. Each type of switching unit is to be mounted in a "19" subrack. Interconnection of switching units and secondary systems is shown in figures 1 and 2. A typical layout of a switching box 19" cubicle is shown in figure 12.

2 ACCOMMODATION

The switching box shall principally be located as close as possible to the HV equipment. All switching units for a single circuit are to be in same location. The principle location and accommodation requirements for different types of substation are as below. Merging units for AS³ IEC61850 systems are to be installed in same cubicle as the switching box, this will minimise the copper cabling.

2.1 Centralised Relay Room AIS

The switching box shall be located in a 19" rack within a separate cubicle/blockhouse adjacent to marshalling kiosk as per TS2.19 with IP65. Connections for both legacy and AS³ IEC61850 systems are shown in figure 13. Consideration shall be given to the location in relay room if single circuit failure and separation requirements can be met.

2.2 GIS

The switching box shall be located in LCC if within switchhouse, otherwise as per the Centralised Relay Room AIS

2.3 Dispersed Relay Room AIS

As the dispersed relay room blockhouse is normally close to the HV equipment, the switching box shall be located in a 19" rack within the blockhouse as per TS2.19, otherwise as per the Centralised Relay Room AIS.

2.4 Cable Compound

All switch units shall be in a single position with accommodation as above

2.5 Legacy installations

Where the installation of the switching box is associated with an existing legacy system and all necessary wiring is brought back to marshalling fields to within centralised relay rooms,

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the switching boxes may be installed within the centralised relay room in a 19" rack as per TS2.19. Connections for both legacy and AS³ IEC61850 systems are shown in figure 13.

The location of the switching box within a centralised relay room will not provide the required saving in copper connections, but it will still may minimise the outage required for the installation/replacement. This arrangement shall only be considered for a project only after all other options are deemed to be unsuitable. (e.g. provision of separate accommodation is difficult, incurs additional costs and provides little benefit with respect to multicore cabling as necessary cabling already exists).

3 EARTHING

Switching boxes, merging units where installed and associated cubicles shall be earthed as per TS 2.19

4 SWITCHING UNITS

4.1 General

All the switching units shall comply with the following requirements

- All switching units shall be 4U high and 19" rack mounted
- All units of same type shall be in same 19" subracks
- Secondary output of switching units to be wired to the socket on rear of each unit.

4.2 Current Transformer (CT) Switching Unit

The CT switching unit shall comply with the following requirements

- Details of the CT switching unit are shown in Figures 3, 4, 5
- The CT switching unit shall be labelled with circuit name and CT secondary circuit name
- The CT unit shall be able short and disconnect one set of 1A or 5A CTs when switch in 'Shorted & Disconnected' position.
- The CT unit shall connect a CT secondary circuit from HV equipment to protection system when switch in 'Normal' position
- The CT unit switch shall have two positions labelled 'Normal' and 'Shorted & Disconnected'.
- The CT unit switch contact position shall be confirmed by indication.
- The CT unit shall be able to switch from 'Normal' to 'Short and Disconnected' position without open circuiting the CTs (Contacts Make before Break).
- Switch contacts shall provide wipe/overlap to prevent open circuit connections when switching
- The CT unit switch shall be selectable between 'Normal' and 'Short & Disconnected' and lockable in both positions on front of unit either by a unique key or padlock.
- Test sockets shall be available at front of unit for secondary system testing.
- Continuous rating of the switch, plugs and sockets to be suitable for CT rating
- Plug and sockets shall have CT warning labels as TS 2.19
- Switches shall be labelled
- A CT Unit shall be able to switch a four wire CT, star point on CT side of switching box in marshalling kiosk
- Earth Link for CT on neutral, CT side of switch.

4.3 Voltage Transformer Switching Unit

The VT switching unit shall comply with the following requirements

- Details of a VT switching unit are shown in Figures 6, 7, 8
- The VT switching unit shall be labelled with circuit name and VT secondary circuit name
- A VT switching unit shall be provided for each secondary circuit output from VT, with individual circuit MCB/Fuse in VT secondary box for protection of cabling
- Each VT switching unit shall be able to isolate one 3 phase VT secondary circuit, disconnecting each phase separately when switch in 'Secondary Supplies Isolated' position
- The VT switching unit shall connect VT secondary supplies from HV equipment to protection system when switch in 'Normal' position
- The VT unit switch shall be selectable between 'Normal' and 'Secondary Supplies Isolated' and lockable in 'Secondary Supplies Isolated' position on front of unit either by a unique key or padlock.
- The two switch positions shall be clearly labelled 'Normal' and 'Secondary Supplies Isolated'
- Test sockets shall be available at front of unit for secondary system testing.

4.4 Digital Switching Unit

The digital switching unit shall comply with the following requirements

- Details of the digital switching unit are shown in Figures 9, 10, 11
- 10 or 20 links shall be provided on front of each digital unit to isolate indications/controls/alarms.
- To enable the links to be used as points of isolation, the isolating point shall where reasonably practicable be lockable to prevent reinsertion of the link.
- Standard labels shall be provided next to each link
- Standard link allocation for each type of HV equipment
- The digital switching unit for circuit breaker unit shall have S link
- One or more digital switching units shall be provided for each trip system of circuit breaker
- One or more digital switching units shall be provided for each combination of one isolator and two earth switches to disconnect all indications/controls/alarms
- One or more digital switching units shall be provided for each transformer to disconnect all indications/controls/alarms
- One or more digital switching units shall be provided for each tap changer to disconnect all indications/controls/alarms

4.5 Switching Unit HV Equipment Connection

- HV equipment side external wiring shall be directly connected to each switching unit
- Wiring shall be terminated on rear of each unit as TS 2.19

4.6 Switching Unit Secondary Equipment Connection

- Each switching unit shall be connected to secondary system by plug and socket.
- The socket shall be on rear of each switching unit
- Continuous rating of plugs and sockets shall be suitable for CT rating

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- Plug and socket connectors shall be equipped with coding facility to avoid incorrect connections being made.
- Plugs carrying current and voltage transformer circuits shall have the plug body coloured yellow in accordance with BS5378. The associated socket need not be coloured yellow but should carry a warning label 'CAUTION CURRENT TRANSFORMER CIRCUITS'
- Electrical hazard labels shall be fitted all plugs and sockets carrying 240v AC, additionally the socket shall carry a warning label 'CAUTION 240V AC'
- Plug and sockets shall comply with TS 2.19

5 TESTING FACILITIES

- All switching units shall have 4mm shrouded test points on front for testing into secondary system.
- Digital switching unit shall have 4mm shrouded test points on HV equipment side to allow testing of HV equipment.

PART 2 DEFINITIONS AND DOCUMENT HISTORY

6 DEFINITIONS

AS ³	Architecture of Substation Secondary Systems
CB	Circuit Breaker
CT	Current Transformer
HV	High Voltage
MF	Marshalling Field
NICAP	National Integrated Control and Protection
TS	Technical Specification
VT	Voltage Transformer

7 AMENDMENT RECORD

Issue	Date	Summary of Changes / Reasons	Author(s)	Approved By (Inc. Job Title)
1	May 2012	New document	Peter Holliday MDE Delivery Support	Ursula Bryan Policy Manager

8 IMPLEMENTATION

8.1 Audience Awareness

Audience	Purpose Compliance (C) / Awareness (A)	Notification Method Memo / letter / fax / email / team brief / other (specify)
Construction	C	email
National Grid Substation Suppliers	C	email
Asset Management	C	email

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8.2 Training Requirements

Training Needs N/A / Informal / Workshop / Formal Course	Training Target Date	Implementation Manager
N/A		

8.3 Compliance

The supplier or solution provider equipment compliance with this specification will be verified and managed through the National Grid type registration process.

8.4 Procedure Review Date

3 years from publication date.

PART 3 GUIDANCE NOTES AND APPENDICES

9 REFERENCES

TS 1	Ratings and General Requirements for Plant, Equipment and Apparatus for the NGT System and Connection Points to It
TS 2.7	Specification for Substation Control Systems
TS 2.19	Ancillary Light Current Equipment
TS 3.2.4	Current Transformers for Protection and General Use
TS 3.2.5	Voltage Transformers
TS 3.24.3	Substation Facilities & Functions Common to all Bays
TS 3.24.4	Hardware Platform
TS 3.24.15	Environmental and Test Requirements for Electronic Equipment

APPENDIX A - FIGURES

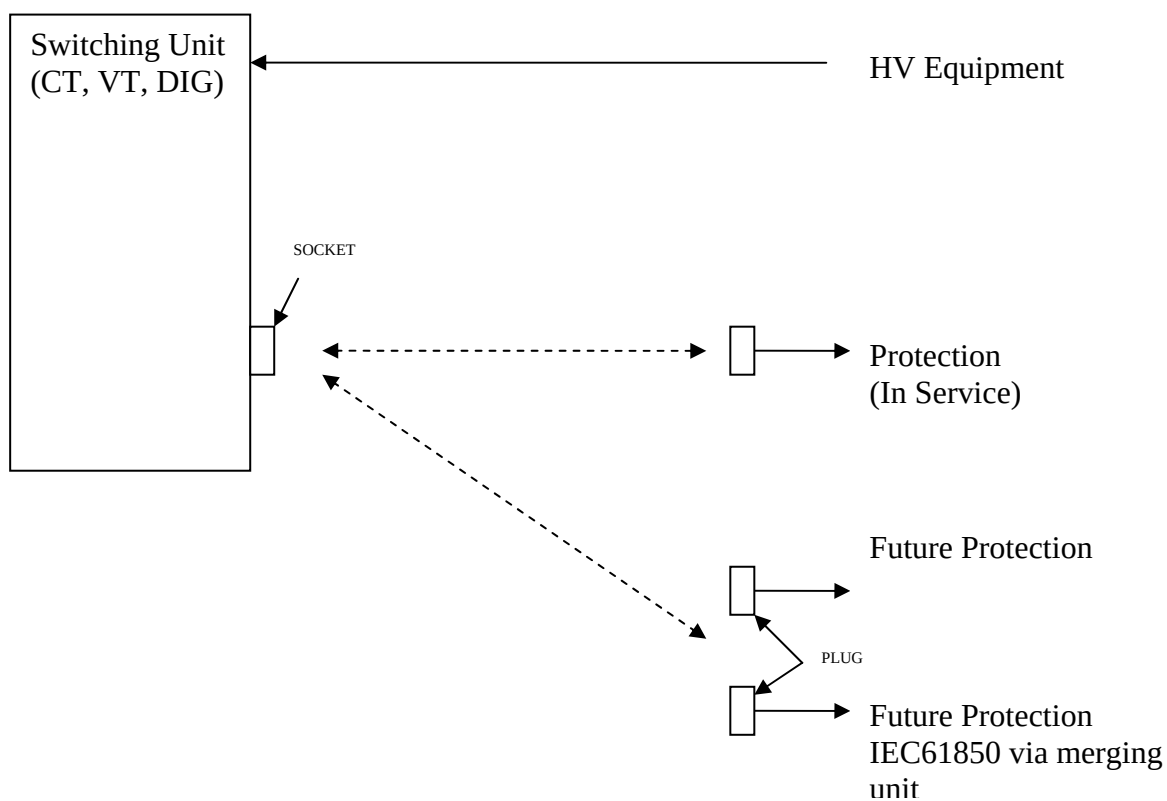


Figure 1 Switching Unit Connections