

DISCONNECTORS AND EARTHING SWITCHES

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PURPOSE AND SCOPE

This document describes the technical requirements for User's equipment directly connected to the England and Wales Transmission system and located within NGET's busbar protection zone operating at nominal voltages of 400 kV, 275 kV, 132 kV and 66 kV unless otherwise agreed with the user as defined in the Bilateral agreement. The principles of this document applies to equipment connected at other voltages".

This specification for disconnectors and earth switches is by reference to BS EN 62271-102, BS EN 62271-1, BS EN 62271- 203 and associated documents. This specification defines the required enabling parameters and additional technical requirements for disconnectors and earth switches for use on, and directly connected to, the Transmission System in England and Wales, rated from 72.5 kV to 420 kV.

This document defines the functional performance requirements for disconnectors and earth switches connected to the Transmission System in England and Wales. It supports the more general conditions defined in the companion documents TS 1 (RES), TS 2.1 (RES) and TS 2.2. (RES)

PART 1 – PROCEDURAL

1 RATINGS AND PERFORMANCE REQUIREMENTS

- 1.1** In addition to the general ratings and performance requirements defined in TS 1 (RES), TS 2.1 (RES) and TS 2.2 (RES), the following ratings apply to disconnectors and earth switches.
- 1.2** Disconnectors and Earth Switches shall satisfy the requirements of BS EN 62271-102.

Disconnectors rated at 420 kV and 300 kV shall be motor/power operated.

1.3 Rated Short-Time Withstand Current

If an earth switch is combined with a disconnector as a single unit, the rated short-time withstand current of the earth switch shall be at least equal to that of the disconnector.

Divided Support Disconnectors and Earthing Switches

- 1.3.1 Divided frame disconnectors and earth switches shall be capable of operating to the limits of their rated contact zone as detailed in Tables 1 and 2 of BS EN IEC 62271-102.

1.4 Bus-transfer Duty

- 1.4.1 Disconnectors intended for bus-transfer or mesh-corner switching shall comply with the bus transfer requirements of BS EN IEC 62271-102 Annex B.
- 1.4.2 Bus transfer switching contacts fitted to disconnectors which can be operated in service from a manual mechanism, shall be designed so that their operation is independent of the speed of operation of the main contacts.
- 1.4.3 The design of the disconnector shall ensure that the operator is not endangered by arc debris during bus-transfer switching.
- 1.5.4 Disconnectors intended for bus-transfer or mesh-corner switching shall comply with the auxiliary switch requirements for disconnectors with bus-transfer duty, as per clause 3.6

1.5 Rated Values of Mechanical Endurance for Disconnectors

- 1.5.1 Disconnectors shall be rated to Class M1 as specified in BS EN IEC 62271-102.

1.6 Rated Values of Electrical Endurance for Earth Switches

- 1.6.1 Air Insulated Earth Switches shall be rated to Class E0 as specified in BS EN IEC 62271-102.

2 GENERAL REQUIREMENTS FOR DISCONNECTORS AND EARTH SWITCHES

2.1 Clearance Distances

- 2.1.1 Phase-to-phase and phase-to-earth clearance distances shall be as specified in TS 2.1 (RES) unless the disconnector or earth switch has been type tested in accordance with the relevant requirements of IEC 62271-102 for the rated dielectric performance specified in TS 1 (RES) and TS 2.1 (RES). This shall apply to all clearance distances when a disconnector is in any position, including partially operated and for phase-to-phase clearance distance of earth switches in any position including partially operated.

2.2 Simultaneous Operation of Poles

- 2.2.1 The primary contacts of all poles shall operate (open or close) simultaneously, with a maximum spread of 0.5 seconds between first pole contact to open (or close) to the last pole contact to open (or close).

Informative: This requirement is in addition to that specified in IEC 62271 – 102.

2.3 Flexibility of Design and Setting Adjustment Tolerances

- 2.3.1 The Supplier shall provide adequate instructions to ensure that the installer is aware of any restriction associated with such adjustment. These instructions shall be included in the product operating manual.

2.4 Position Indication

- 2.4.1 A clear and reliable indication shall be provided of the position of the contacts of the main circuit in case of non-visible contacts. It shall be possible to easily check the state of the position-indicating device when operating locally.
- 2.4.2 For remotely operated disconnectors and earth switches, incomplete operation of the main contacts, shall be remotely indicated by a position indicating device. The position indicating device shall be part of the disconnector or earth switch which enables a signal to be given, generally at a location remote from the disconnector or earth switch, indicating that the contacts of the main circuit are in the closed or open position and the mechanical movement is complete. This indication shall be repeated at the local control point when primary contacts are not readily visible to a local operator.
- 2.4.3 For GIS disconnectors and earthing switches, a reliable position indicating device (designed in accordance with BS EN 62271-102, Annex A) may be provided as an alternative to the visible isolating distance or gap if easily accessible viewing windows are not provided.

2.5 Mechanical Key Interlocking

- 2.5.1 Where mechanical key interlocking is fitted to disconnector and earth switch mechanisms the following requirements shall apply.
- 2.5.2 Removal of a key shall, by means of an interference device, physically prevent operation of the mechanism. The interference device shall be so constructed that it will prevent operation when a normal operating force is applied by the recommended procedures, whether of power or manual means.
- 2.5.3 On power operated mechanisms with facilities for in-service manual operation the interlocking shall be effective for both power and manual operations.
- 2.5.4 Interlock keys shall be released when the mechanism is in either the fully open or fully closed position or both, as required by the interlocking scheme. The keys shall be trapped when the mechanism is in a partially operated position.

Informative: The requirements in 2.5 are in addition to that specified in IEC 62271 – 102.

2.6 Drive System Mechanical Interference Device

- 2.6.1 Where no mechanical key interlocking is provided, the drive system shall have a mechanical interference device. This device shall be used to physically prevent operation of the mechanism when in the open or the closed position. The interference device shall be effective when any reasonable operating forces are applied by the recommended means, whether by power or manual operation. Facilities shall be provided to lock the interference device in the operated position.
- 2.6.2 On power operated mechanisms, application of the interference device shall also prevent initiation of the power operation, unless it can be demonstrated no damage will occur as a consequence of the mechanism being stalled.

2.7 'Lockout' Interlock Keys

- 2.7.1 Lockout interlock key arrangements provided shall be specific to meet Users Safety Rules.

2.8 Earthing Switch Magnetic Bolt Device

- 2.8.1 Earth switches provided with a manual push button to release an electrical magnetic bolt device within the mechanism shall employ a time delayed magnetic bolt release.

2.9 Condition Monitoring for Disconnectors

2.9.1 The User will specify whether condition/performance monitoring is required.

3 OPERATING MECHANISMS, ANCILLARY EQUIPMENT AND THEIR ENCLOSURES

3.1 General

3.1.1 The requirements of TS 2.19 (RES) shall apply to disconnector and earth switch operating mechanisms, ancillary equipment and their enclosures.

3.2 Control Switches

3.2.1 Local/Hand/Remote Close control switch shall be provided with a facility for locking in each position.

3.2.2 The Open/Neutral/Close control switch shall be provided with a facility for locking in the Neutral position.

3.3 Auxiliary Switches

3.3.1 Auxiliary switches shall comply with TS 2.2 (RES) and BS EN IEC 62271-102. Auxiliary switches for disconnectors and earth switches are required to have a variety of different timings and senses with respect to the primary contacts.

3.3.2 The number of each type (i) to (vii) will be specified on a site specific basis.

3.4 Auxiliary Switch requirements for disconnectors with bus transfer duty

3.4.1 The auxiliary switch variant (vii) is only required on disconnectors for bus transfer duty. This contact timing is used for switching busbar protection CT and tripping circuits. The contact is made available for these specific secondary circuits. The auxiliary contact must close before the primary contacts start conducting current during a normal closing operation and must open after the primary contacts have stopped conducting current during a normal opening operation.

3.4.2 The disconnector positions marked shall be established at the time of type testing and recorded in the product operating manual. The setting shall be checked during routine (factory) tests and confirmed when the disconnector is completely assembled on site.

4 TEST REQUIREMENTS

4.1 The test requirements of TS 1 (RES), TS 2.2 (RES) and BS EN IEC 62271-102 for disconnectors and earth switches are appropriate.

5 FORMS AND RECORDS

PART 2 - DEFINITIONS AND DOCUMENT HISTORY

6 DEFINITIONS

Not applicable.

7 AMENDMENTS RECORD

Issue	Date	Summary of Changes / Reasons	Author(s)	Approved By (Inc. Job Title)
1	October 2014	New document	Andrew Taylor/ Richard Poole	GCRP

5 years from publication date.

PART 3 - GUIDANCE NOTES & APPENDICES

8 REFERENCES

8.1 International, European and British Standard Documents

This document makes reference to the documents listed below. Where a British Standard (BS) has been harmonised into a Euronorm (EN) only this BS EN reference is given. The issue date of these documents shall be that current at the time of the issue of this NGTS.

IEC 62271-102 High Voltage Switchgear and Controlgear. Part 102: High Voltage Alternating Current Disconnectors and Earth switches.

IEC 62271- 203 Gas Insulated Metal Enclosed Switchgear for rated voltages above 52kV

BS EN 62271-1 High-voltage switchgear and controlgear – Part1: Common Specifications

8.2 NG Technical Specifications (RES)

The following TS (RES) documents are relevant to Disconnectors and Earth Switches and should be read in conjunction with this document as appropriate.

TS 1 (RES) Ratings and general requirements for plant, equipment, apparatus and services for the National Grid System and connection points to it.

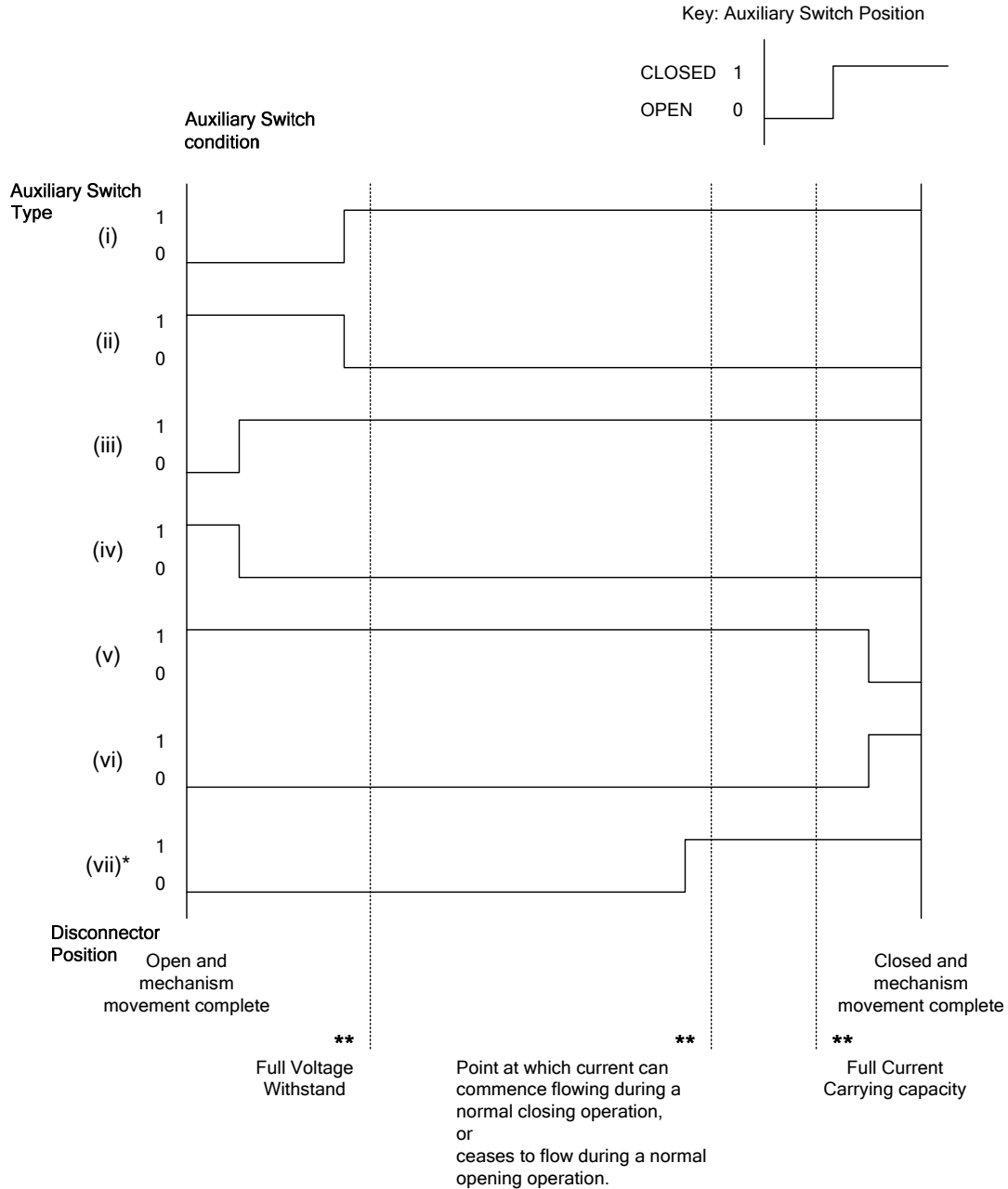
TS 2.1 (RES) Substations.

TS 2.2 (RES) Switchgear for use on, and at Connection Points to, The National Grid System.

TS 2.19 (RES) Ancillary Light Current Equipment.

Figure 1:
Auxiliary Switch Contact Positions in Relation to the Disconnector Position

Auxiliary switch variants (i) to (vii) are those appropriate to NGT applications.



Note:

* Bus transfer disconnectors only. This contact timing is used for switching Busbar Protection CT and Tripping circuits.

** These positions will be justified by the equipment manufacturer.

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