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**National Grid
Technical
Specification**

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Issue 1
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**Disconnectors and
Earthing Switches**

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A handwritten signature in black ink, appearing to read "M B Humphries".

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DISCONNECTORS AND EARTHING SWITCHES

FOREWORD

This document defines the technical requirements for disconnectors and earthing switches connected to the National Grid Company (NGC) Transmission System and rated at 145, 300 and 420 kV.

1 SCOPE

This Specification defines the functional performance and test requirements for disconnectors and earthing switches connected to the National Grid Company Transmission System. It supports the more general conditions defined in the companion documents NGTS 1 and NGTS 2.2.

2 REFERENCES

2.1 National/International Standards

This document makes references to, and should be read in conjunction with the documents listed below. Where a British Standard is equivalent or identical to an IEC Standard both references are given. The most recent issue is applicable unless a specifically dated issue is identified.

IEC 129 (BS 5253)	Specification for A.C. Disconnectors (Isolators) and Earthing Switches of Rated Voltage above 1 kV
IEC 517 (BS 5524)	Specification for Gas Insulated Metal-Enclosed Switchgear for Rated Voltages of 72.5 kV and Above
IEC 529 (BS 5490)	Specification for Classification of Degrees of Protection Provided by Enclosure
IEC 694 (BS 6581)	Specification for Common requirements for High Voltage Switchgear and Control Gear
IEC 1128	Alternating Current Disconnectors Bus-transfer Current Switching by Disconnectors
IEC 1129	Alternating Current Earthing Switches Induced Current Switching
BS 7354	Code of Practice for Design of High-Voltage Open-Terminal Stations

2.2 National Grid Technical Specifications

The following NGTS documentation is relevant to Switchgear and should be read in conjunction with this document as appropriate.

NGTS 1	Overview
NGTS 3.1.1	Substation Interlocking Schemes
NGTS 2.2	Switchgear for the National Grid System
NGTS 2.6	Protection
NGTS 2.7	Substation Control System

NGTS 2.12	Substation Auxiliary Supplies
NGTS 2.13	Electronic Equipment
NGTS 3.7.19	Local Control Point Facilities
NGTS 3.12.1	48 V D.C. Supplies
NGTS 3.12.2	110 V D.C. Supplies

3 GENERAL REQUIREMENTS

In addition to the requirements of NGTS Level 2 documentation the following clauses apply to the disconnectors, earthing switches, their operating mechanisms, auxiliary equipment and enclosures.

3.1 The primary contacts of all phases shall operate, (open or close), simultaneously unless otherwise agreed with NGC. A failure to operate by any one phase shall be shown by a "don't believe it" indication at the remote and standby control positions and, where the primary contacts are not readily viewed, at the local control position.

3.2 A position indicating device shall be fitted so that the operator can clearly identify the status of the primary contacts. The device shall be labelled OPEN/CLOSED unless otherwise agreed with NGC, in all cases the meaning of the label shall be clear and unambiguous.

3.3 Where phase-to-phase or phase-to-earth clearances have not been type tested in accordance with IEC 129 for the rated dielectric performance of the equipment then the clearances specified in NGTS 2.1 shall apply. This shall apply to clearances with the equipment in any position, including partially operated.

3.4 The requirements for interlocking schemes are specified in NGTS 3.1.1.

Where mechanical key interlocking is fitted to disconnector and earthing switch mechanisms the following requirements shall apply (although primarily the responsibility of the installation Contractor the Manufacturer shall demonstrate that these facilities can be provided):

3.4.1 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 any reasonable operating force is applied by power or manual means.

3.4.2 On power operated mechanisms with facilities for in-service manual operation the interlocking shall be effective for both power and manual operations.

3.4.3 Interlock keys shall be released when the mechanism is in either the open or closed position or both, as required by the interlocking scheme. The keys shall be trapped when the mechanism is in a partially operated position.

3.4.4 'Lockout' interlock keys shall be provided on all 400, 275 and 132 kV disconnectors and shall only be released when the disconnector is open. 'Lockout' interlock keys shall be provided on all 400 and 275 kV earthing switches and shall only be released when the earthing switch is closed. Lockout keys shall be distinctively labelled and shall each have a different differ to other keys in use on the substation site. The differ shall also be different from the other keys associated with the mechanism.

Note: Differ is the term for the difference in a key which prevents it being interchangeable with another.

3.5 Where no mechanical key interlocking facility is provided, a mechanical interference device shall be fitted. This device shall physically prevent operation of the mechanism when in either the open or closed position. The interference device shall be effective when any reasonable operating forces are applied by power or manual operation. Facilities shall be provided to lock the interference device in the operated position by means of NGC's standard padlock type.

On power operated mechanisms, application of the interference device shall also prevent initiation of a power operation unless it can be demonstrated that no damage will occur as a consequence of the mechanism being stalled.

3.6 Where manually operated mechanisms are fitted with electrical solenoid-operated bolt interlocks the push-button switch provided for energisation of the solenoid shall employ a time delayed release.

3.7 Divided Frame Disconnectors and Earthing Switches shall be able to operate within the limits of their rated contact zone. Rated contact zones shall be as specified in Tables 11A and 11B of IEC 129 unless otherwise agreed with NGC.

3.8 Disconnectors intended for use on the 400 or 275 kV system shall be fitted with power operated mechanisms. Disconnectors intended for use on the 132 kV system and earthing switches may be fitted with either power or manual mechanisms unless otherwise specified.

3.9 Auxiliary bus-transfer switching contacts fitted to disconnectors with manual mechanisms shall be designed so that their operation is independent of the speed of operation of the main contacts. The design of the disconnector shall ensure that the operator is not endangered by arc debris produced by the bus-transfer contacts during bus-transfer switching.

3.10 In addition to the requirements of NGTS 2.2 Clause 3.3, the following requirements shall apply to the operating mechanisms of disconnectors and earthing switches:

3.10.1 The local control apparatus shall be accommodated adjacent to the equipment it controls. It shall be clearly labelled to associate it with the equipment it controls.

3.10.2 Power operated mechanisms shall be designed so that failure of the mechanism limit switches will not result in damage to either the mechanism, drive linkages (with the exception of shear pins or mechanical protective device) or the primary current path.

3.10.3 All circuits with a rated supply voltage exceeding 125 V A.C./D.C. shall be provided with isolation facilities within the mechanism box. Terminals on the 'live' side of these isolation facilities shall be adequately shrouded to prevent accidental contact.

3.10.4 Control switches, Local/Remote and Open/Hand/Close, shall be provided with a facility for locking. The method of locking shall be agreed with NGC.

3.10.5 The maximum operating force required for manual operation (measured at the operating handle) shall not exceed 200 N.

4 PERFORMANCE REQUIREMENTS

4.1 Disconnectors

4.1.1 Busbar selector disconnectors for use in multiple-busbar substations shall be rated for bus-transfer switching in accordance with IEC 1128.

4.1.2 Disconnectors to be used for sequential isolation duty in conjunction with a Circuit Breaker shall be subject to an enhanced mechanical endurance test of 2000 operations in accordance with IEC 129.

4.2 Earthing Switches

4.2.1 Earthing Switches mounted on the same frame as a Disconnecter shall have a short-time rating at least equal to that of the Disconnecter.

4.2.2 Earthing switches for application as line earthing switches on overhead line circuits shall be rated Class B in accordance with IEC 1129 unless otherwise agreed by NGC.

4.3 Metal Enclosed Disconnectors and Earthing Switches

4.3.1 Where the primary contacts of metal-enclosed disconnectors and earthing switches cannot be viewed to confirm their position then the position indicating devices shall meet the requirements of the current draft amendment to IEC 129 (current issue 17A(Sec.)419 Jul 1993).

5 TEST REQUIREMENTS

5.1 Test requirements shall be in accordance with the appropriate Standards listed in References and NGTS 2.2.

5.2 Where the primary contacts of metal-enclosed disconnectors and earthing switches cannot be viewed to confirm their position then the position indicating devices shall be tested in accordance with the current draft amendment to IEC 129 (current issue 17A(Sec.)419 Jul 1993).

6 APPROVAL PROCEDURE

In addition to the requirements of NGTS 2.2 the supplier shall complete a copy of the relevant NGC data sheets attached to this Level 3 document as Appendix A. The completed document shall form part of the overall approved Data Pack and be used to identify the equipment approved. Any change in the details contained in the data shall invalidate the approval unless NGC has approved the change.

APPENDIX A

**NGC TYPE APPROVAL DATA SHEET: DISCONNECTORS AND EARTHING SWITCHES
(FORMING APPENDIX A TO NGTS 3.2.2)**

**A1 MANUFACTURER, DESIGNATION, PRODUCTION PERIOD AND RATING -
DISCONNECTOR**

DATA SHEET NO:

1.1	MANUFACTURER:	-	-
1.2	DISCONNECTOR DESIGNATION Model Reference:	-	-
1.3	DATE PRODUCTION COMMENCED	Month Year	
1.4	DISCONNECTOR RATINGS Rated Voltage Rated Normal Current Rated Short-time Withstand Current Rated Short-time Current Duration Rated Bus-transfer Switching Capability Capacitive Switching Capability Inductive Switching Capability	kV A kA sec V A A A	
1.5	MECHANISMS Type Reference: Number per Three-Phase Assembly	- -	- -
1.6	INSULATION Manufacturer of Support Insulation: Support Insulation Type Reference: Manufacturer of Drive Insulation: Drive Insulation Type Reference:	- - - -	- - - -

**A2 MANUFACTURER, DESIGNATION, PRODUCTION PERIOD AND RATING -
 EARTHING SWITCH**

DATA SHEET NO:

2.1	MANUFACTURER:	-	-
2.2	EARTHING SWITCH DESIGNATION Model Reference:	-
2.3	DATE PRODUCTION COMMENCED	Month Year	
2.4	EARTHING SWITCH RATINGS Rated Voltage Rated Short-time Withstand Current Rated Short-time Current Duration Rated Induced Current Switching Capability (IEC 1129).	kV A sec V A	
2.5	MECHANISMS Type Reference: Number per Three-Phase Assembly	- -	-
2.6	INSULATION Manufacturer of Support Insulation: Support Insulation Type Reference:	- -	- -

A3 GENERAL TECHNICAL DATA - DISCONNECTOR

DATA SHEET NO:

3.1	Number of Poles	-	-
3.2	Type of Disconnecter: Centre Rotating Post	-	
	(tick as appropriate) Centre Break	-	
	Pantograph	-	
	Knee Type	-	
	Chopper		
	Other (please specify)	-	
3.3	Permissible Mechanical Terminal Load	kN	
3.4	Method of Operation (Hand/Power)	-	
3.5	Motor Rating	W	
3.6	Motor Supply Voltage	V	
3.7	Operating Time open/close.	sec/sec	
3.8	Motor Protection Operating Time (Stalled)	sec	
3.9	Manual Operation: Max Force Required OPEN	N	
	Max Force Required CLOSED	N	
3.10	Weight of Disconnecter Head (single phase)	kg	
3.11	Weight of Support Insulator (single phase)	kg	
3.12	Weight of Drive Insulator (single phase)	kg	
3.13	Weight of Base Unit (three/single phase)	kg	
3.14	Weight of Mechanism	kg	
3.15	Foundation Detail (Drawing No)	-	
3.16	Foundation Loading (Drawing No)	-	
3.17	Three Phase Arrangement (Drawing No)	-	
3.18	Control Schematic (Drawing No)	-	

A4 GENERAL TECHNICAL DATA - EARTHING SWITCH

DATA SHEET NO:

4.1	Number of Poles	-	-
4.2	Type of Earthing Switch: Chopper	-	
	(tick as appropriate) Semi-Pantograph	-	
4.3	Applications (tick as appropriate)	-	-
	Separately Mounted	-	
	Disconnecter Mounted (specify type references)	-	
	Other (please specify)	-	
4.4	Permissible Mechanical Terminal Load (separately mounted)	kN	
4.5	Method of Operation (Hand/Power)	-	
4.6	Motor Rating	W	
4.7	Motor Supply Voltage	V	
4.8	Operating Time open/close.	sec/sec	
4.9	Motor Protection Operating Time (Stalled)	sec	
4.10	Manual Operation: Max Force Required OPEN	N	
	Max Force Required CLOSED	N	
4.11	Weight of Earthing Switch Arm (single phase)	kg	
4.12	Weight of Fixed Contact Assembly	kg	
4.13	Weight of Support Insulator (single phase)	kg	
4.14	Weight of Mechanism	kg	
4.15	Foundation Detail (Drawing No)	-	
4.16	Foundation Loading (Drawing No)	-	
4.17	Three Phase Arrangement (Drawing No)	-	
4.18	Control Schematic (Drawing No)	-	