NPS/003/007 – Technical Specification for 66kV and 132kV Disconnectors and Earth Switches

1. Purpose

This purpose of this document is to define the technical requirements of disconnectors and earth switches for use on the Northern Powergrid 66kV and 132kV networks.

This document supersedes the following documents, all copies of which should be removed from circulation.

Reference	Version	Date	Title
NPS/003/007	5.0	Dec 2017	Technical Specification For 66kV And 132kV Disconnectors and Earth Switches

2. Scope

The scope of this specification covers 66kV and 132kV disconnectors for use in Northern Powergrid open terminal substations. The specification includes a number of options that may be selected in Appendix 2 depending upon the application of the disconnector or earth switch:

- Manual or motor drive mechanisms;
- Bus transfer duty and associated electrical interlocking for use at double-busbar substations, or
- Reactive switching duty for earth switches required for use on circuits containing long overhead lines.

Technical documents referenced within this specification refer to the latest versions of the relevant International Standards, British Standard Specifications and all relevant Energy Networks Association Technical Specifications (ENA TS) current at the time.

The following appendices form part of this technical specification:

- Appendix 1 details the values, options or amendments selected within ENATS 41-37
- Appendix 2 details project specific options
- Appendix 3 contains a schedule of technical specification to be completed by the manufacturer
- Appendix 4 contains a self-certification conformance declaration of compliance with ENATS 41-37
- Appendix 5 contains a self-certification conformance declaration of type test evidence
- Appendix 6 contains a declaration sheet of places of manufacture, testing and inspection
- Appendix 7 contains a schedule of items
- Appendix 8 contains a technical information check list

2.1. Table of Contents

3. Technical Requirements

3.1. Technical Specification

Disconnectors provide electrical isolation of systems and equipment within substation outdoor compounds designed in accordance with NSP/007/005 - Guidance on Substation Design: Electrical Design Clearances. Units have the optional earth switches providing a rated means of earthing the equipment or circuit. Operation of the disconnectors is provided manually or by means of a motorised mechanism; operation of the earth switch is always manual.

Disconnectors and earth switches shall comply with the latest versions of Parts 1 and 4 of the Energy Networks Association Technical Specification (ENATS) 41-37– Disconnectors and Earthing Switches for use on 66kV to 132kV Distribution Systems, as varied in Section 3.2 and Appendices 1 and 2 of this document, and shall preferably have been assessed by the ENA Switchgear Assessment Panel and have a current Notice Of Conformance or Approval Notice.

Insulators may be manufactured from porcelain or composite silicon except for applications at sites with a high risk of vandalism where composite silicon insulators shall be specified. Insulators shall meet the requirements of Northern Powergrid technical specification NPS/003/015 - Technical Specification for 33kV, 66kV and 132kV Post Insulators. In the case of composite silicon insulators, the material shall have a composition as described in NPS/001/006 Section 3.2.1.

Appendix 7 contains the schedule of items required as part of the bulk purchase contract. Within the schedule there is an option for double break disconnectors that are required as an additional option for compounds where space is restricted. The centre break disconnector is the standard option within Northern Powergrid.

3.2. Requirements in Addition to ENATS 41-37 Part 4

The following variations/options selected from ENATS 41-37 Part 4 shall be read in conjunction with Appendices 1 and 2 of this document:

General: Internal Wiring

Internal 230V AC wiring shall meet the requirements of BS7671; single phase wire colours shall be brown and blue for phase and neutral respectively. 110V AC/110V DC wiring shall be white in colour.

Terminals shall be spring loaded (as a minimum) e.g. Weidmueller WDU6SL/WDU10SL or equivalent in accordance with ENATS 50-18.

Wiring for CT circuits shall have a cross-sectional area of 2.5mm^2.

Hooked blade crimps shall be used for all internal wiring; the use of bootlace crimps is not acceptable.

Multiple wires connected by a single crimp are not acceptable.

4.0 Ratings

Rated values of primary and secondary voltage, insulation level, frequency and normal and short circuit currents shall be as specified in Appendices 1 and 2.

4.104 Rated values of the bus-transfer current switching capabilities of disconnectors

Bus transfer duty and associated electrical interlocking will be specified where disconnectors are to be used as bus bar disconnectors at double bus bar substations. For all other applications bus bar transfer duty is not required.

4.105 Rated values of the induced current switching capabilities of earthing switches

Earth switches for use on circuits containing long sections of overhead line shall be rated Class B in accordance with Annex C of IEC 62271-102. Earth switches for use on circuits not containing long sections of overhead line shall be rated Class A.

5.4.100 Auxiliary Switches

To mitigate the risk associated with open circuit CTs, auxiliary contacts for CT connections shall be equipped with a wiring locking mechanism such as a captive spade lug, ring connection or a positive lock receptacle. Auxiliary switch wiring shall be wired to spring loaded terminal blocks e.g. Weidmueller WDU6SL/WDU10SL or equivalent in accordance with ENA TS 50-18.

Disconnectors shall have provision for the full range of auxiliary contact types I to VII as described in ENATS 41-37 – Part 4: Clause 5.4.100.

The rating of auxiliary contacts (for both 66kV and 132kV) shall at least meet the requirement of Class 2, but preferably meet the requirements of Class 1 in accordance with BS EN 62271-1: Clause 6.4.3.4.5 – Table 8.

The type and rating of contacts required for each specific application will be specified at the ordering stage. The preferred number of auxiliary contacts is stated in the table below.

Number of Auxiliary Contact	N/O	N/C
66kV Disconnector (Motorised/Manual)	16	16
66kV Earth Switch (Manual)	10	10
132kV Disconnector (Motorised/Manual)	20	20
132kV Earth Switch (Manual)	10	10

5.11 Interlocking devices and padlocking facilities

Disconnector and Earth Switch Interlocking: Interlocking arrangements should comply with CEGB Standard 993315 (TPS) 3/9: Interlocking Principles for Transmission Substations and CEGB Standard 993335 (TPS) 3/85: Control Schemes for Open Type 420,300 and 145kV Power Operated Isolators.

Where electrical interlocking inhibits operation of the disconnector it shall inhibit both electrical and mechanical operation unless the mechanical operation is purely for maintenance purposes and locked and labelled as such.

5.11.109 Key operated interlocking

Key Operated Interlocking: Key interlocks shall be provided as described in (TPS) 3/9. Key interlocks locking off motor drive mechanisms shall also interrupt the motor operating circuit.

5.13.2 Protection against ingress of water

The disconnector and earth switch mechanism boxes shall be rated IP65.

6.6 Short-time withstand current and peak withstand current tests

Where X/R < 37 (DC time constant < 120ms) the peak withstand current shall be 2.5 x the short time rated current (78.75kA).

Where X/R => 37 (DC time constant => 120ms) the peak withstand current shall be 2.7 x the short time rated current (85.05kA).

4. References

The products described within this specification shall comply with all current versions of the relevant International Standards, British Standard Specifications and all relevant Energy Networks Association Technical Specifications (ENATS) current at the time of supply.

4.1. External Documentation

Reference	Title
BS EN 50522:2010	Earthing of Power Installations Exceeding 1kV a.c
BS EN 61936-1	Power Installations Exceeding 1kV a.c
CEGB Standard 993315 (TPS) 3/9	Interlocking Principles for Transmission Substations
CEGB Standard 993335 (TPS) 3/8	Control Schemes for Open Type 420,300 and 145kV Power Operated Isolators
ENATS 41-37 Part 1 Issue 2 2015	Switchgear for use on 66kV to 132kV Distribution Systems Part 1 Common clauses
ENATS 41-37 Part 4 Issue 2 2015	Switchgear for use on 66kV to 132kV Distribution Systems Part 4 Disconnectors and earthing switches
ENATS 41-24: Issue 2, 2018	Guidelines for Design, Installation, Testing and Maintenance of Main Earthing Systems in Substations
ENATS 50-18 Issue 4, 2013	Application of Ancillary Electrical Equipment
IEC 62271 – 1: 2017+A1:2021	High-Voltage Switchgear and Controlgear – Part 1: Common Specification for Alternating Current Disconnectors and Earthing Switches
IEC 62271 – 102: 2018	High-Voltage Switchgear and Controlgear – Part 102 Alternating Current Disconnectors and Earthing Switches

4.2. Internal Documentation

Reference	Title
NPS/001/006	Technical Specification for Insulators for Overhead Lines Up to And Including 132kV
NPS/003/015	Technical Specification for 33kV, 66kV and 132kV Post Insulators
NSP/007/001	Guidance on Substation Design: Key Design Parameters.
NSP/007/005	Guidance on Substation Design: Electrical Design Clearances

4.3. Amendments from Previous Version

Reference	Description
3.2	Inclusion of internal wiring requirements.
3.2	Inclusion of auxiliary switch requirements, particularly for CT connections.
3.2	Table stating the number of N/O and N/C auxiliary contacts required for each product.
Appendix 1	Updated to reflect the above changes. In addition, rated short-time withstand current increased from 25kA to 31.5kA to reflect the network fault level and corresponding increase in rated peak withstand current.
Appendix 2	Updated to reflect the above changes. In addition, rated short-time withstand current increased from 25kA to 31.5kA to reflect the network fault level and corresponding increase in rated peak withstand current.
Throughout document	Clause numbers updated to reflect IEC 62271 – 102: 2018

5. Definitions

Term	Definition
n/a	n/a

6. Authority for Issue

6.1. CDS Assurance

I sign to confirm that this document has been assured for issue on to the CDS system

		Date
Liz Beat	Governance Administrator	13/04/2022

6.2. Author

I sign to confirm that I have completed and checked this document and I am satisfied with its content and submit it for approval and authorisation.

Review Period - This document should be reviewed within the following time period.

Standard CDS review of 3 years	Non Standard Review Period & Reason	
No	Period: 5 Years	Reason: Update will be dictated by contact renewal date or any significant changes in the specification or documents referenced.
Should this document be displayed on the Northern Powergrid external website?		Yes

		Date
Joe Helm	Policy & Standards Manager	19/04/2022

6.3. Technical Assurance

I sign to confirm that I am satisfied with all aspects of the content and preparation of this document and submit it for approval and authorisation.

		Date
Sunil Shrestha	Design and Specification Engineer	13/04/2022

6.4. Authorisation

Authorisation is granted for publication of this document.

		Date
Paul Black	System Engineering Manager	14/04/2022

Appendix 1 – Specified Electrical Ratings and Variations within ENATS 41-37

66kV Disconnector and Earth Switch

	ENATS 41-37 Reference	72.5kV Disconnector Requirement
General: Internal Wiring		
Internal wiring		Internal 230V AC/110V AC /110V DC wiring shall meet the requirements of BS7671
Wiring Terminals		Terminals shall be spring loaded (as a minimum) in accordance with ENATS 50-18.
CT Wiring		Wiring for CT circuits shall have a cross-sectional area of 2.5mm^2.
Crimping of multiple wires		Multiple wires connected by a single crimp is not acceptable
Particulars of system		
Nominal System Voltage		66kV
Frequency		50Hz
Number of phases		3
Disconnector/earth switch characteristics		
Number of poles		3
Class: Indoor, outdoor		Outdoor
Rated voltage	Part 1, 4.1	72.5 kV
Rated insulation level: Lightning Impulse Power Frequency	Part 1, 4.2 (Table 1)	325kV 140kV
Rated Frequency	Part 1, 4.3	50Hz
Rated normal current	Part 1, 4.4	1250A: Feeder cct 2000A: TX, BS and BC cct
Rated short-time withstand current	Part 1, 4.5	31.5kA
Rated Peak Withstand Current	Part 1, 4.6 IEC 62271-1 5.7	78.75kA X/R<37 85.05kA X/R=>37
Rated duration of short circuit	Part 1, 4.7	3 sec
Rated supply voltage of closing and opening devices and control circuits – see table 1.2	Part 1, 4.8	Nominal 110V Max 137.5V Min 87.5V
Rated supply frequency of closing and opening and of auxiliary circuits.	Part 1, 4.8	DC
Classification of mechanical operations Class M0-1000 or M1-2000	Part 4, 4.106	M1-2000
Rated mechanical terminal load	IEC 62271-102 sub clause 5.104	Minimum Vertical Force 500N
Rated bus transfer switching	Part 4, 4.104 IEC 62271-102 5.108	80% normal rated current (1600A max) @ 100V bus transfer voltage
Rated induced current switching of Earthing Switches	Part 4, 4.105 IEC 62271-102 5.109	Class A: Short OHL lengths and cable connected Class B: Long OHL lengths

	ENATS 41-37 Reference	72.5kV Disconnector Requirement
Rated short circuit making current	Part 4, 4.108	Class E2
Mechanism type: disconnector	Part 4, Clause 5.5 5.7	Dependent manual/dependent power
Mechanism type: earth switch	Part 4, Clause 5.5 5.7	Dependent manual
Auxiliary Switches		
Auxiliary contacts for CT connections		CT connections shall be equipped with a wiring locking mechanism
The early make / late break auxiliary switch wiring	ENA TS 50-18	Wiring shall be wired to spring loaded terminal blocks.
Auxiliary contact type	Part 4, Clause 5.4.100.	Disconnectors shall have provision for the full range of auxiliary contact types I to VII
Auxiliary contact rating	BS EN 62271-1: Clause 6.4.3.4.5 – Table 8.	At least meet the requirement of Class 2, but preferably meet the requirements of Class 1.
No. of auxiliary contacts	Part 4, 5.4.100	Disconnector: 16 N/O, 16 N/C Earth Switch: 10 N/O, 10 N/C
Key Interlock type	Part 4, 5.11 as expanded by this document	Castell FS Type (inscription to be confirmed at the order stage)
Key Interlocks	Part 4, 5.11 and BS 61936	On motorised mechanisms key interlocks shall also interrupt motor control circuits.
Electrical Interlock	CEGB Standard 993315 (TPS) 3/9 Standard 993335 (TPS) 3/85	Should prevent motor and manual operation.
Padlocking facilities	Part 1, 5.11	Supplier to state locking arrangements.
Mechanism Degree of Protection	Part 1, 5.13	IP65
Surface preparation	Part 1, 5.108	Supplier to state
Mechanism box heater voltage		110V AC/230V AC (to be confirmed at the order stage)

132kV Disconnector and Earth Switch

	ENATS 41-37 Reference	132kV disconnector
General: Internal Wiring		
Internal wiring		Internal 230V AC/110V AC/110V DC wiring shall meet the requirements of BS7671
Wiring Terminals		Terminals shall be spring loaded (as a minimum) in accordance with ENATS 50-18.
CT Wiring		Wiring for CT circuits shall have a cross-sectional area of 2.5mm^2.
Crimping of multiple wires		Multiple wires connected by a single crimp are not acceptable.
Particulars of system		
Nominal System Voltage		132kV
Frequency		50Hz
Number of phases		3
Disconnector/earth switch characteristics		
Number of poles		3
Class: Indoor, outdoor		Outdoor
Rated voltage	Part 1, 4.1	145 kV
Rated insulation level: Lightning Impulse Power Frequency	Part 1, 4.2 (Table 1)	650kV 275kV
Rated Frequency	Part 1, 4.3	50Hz
Rated normal current	Part 1, 4.5	1250A: Feeder cct 2000A: TX, BS and BC cct
Rated short-time withstand current	Part 1, 4.5	31.5kA
Rated Peak Withstand Current	Part 1, 4.6 (IEC 62271-1 5.7)	78.75kA X/R<37 85.05kA X/R=>37
Rated duration of short circuit	Part 1, 4.7	3 sec
Rated supply voltage of closing and opening devices and control circuits	Part 1, 4.8	Nominal 110V Max 137.5V Min 87.5V
Rated supply frequency of closing and opening and of auxiliary circuits.	Part 1, 4.8	DC
Classification of mechanical operations Class M0-1000 or M1-2000	Part 4, 4.106	M1-2000
Rated mechanical terminal load	(IEC 62271-102 sub clause 5.104)	Minimum Vertical Force 1000N
Rated bus transfer switching IEC 62271 102 sub clause 4.104	Part 4, 4.104	80% normal rated current (1600A max) @ 100V bus transfer voltage
Rated induced current switching of Earthing Switches	Part 4, 4.105 IEC 62271-102 5.109	Class A: Short OHL lengths and cable connected. Class B: Long OHL lengths
Rated short circuit making current	Part 4, 4.108	Class E2
Mechanism type: disconnector	Part 4, Clause 5.5- 5.7	Dependent manual/dependent power

	ENATS 41-37 Reference	132kV disconnector
Mechanism type: earth switch	Part 4, Clause 5.5- 5.7	Dependent manual
Auxiliary Switches		
Auxiliary contacts for CT connections		CT connections shall be equipped with a wiring locking mechanism
The early make / late break auxiliary switch wiring	ENA TS 50-18	Wiring shall be wired to spring loaded terminal blocks.
Auxiliary contact type	Part 4, Clause 5.4.100.	Disconnectors shall have provision for the full range of auxiliary contact types I to VII
Auxiliary contact rating	BS EN 62271-1: Clause 6.4.3.4.5 – Table 8.	At least meet the requirement of Class 2, but preferably meet the requirements of Class 1.
No of auxiliary contacts	Part 4, 5.4.101	Disconnector: 20 N/O, 20 N/C Earth Switch: 10 N/O, 10 N/C
Key Interlock type	Part 4, 5.11 as expanded by this document.	Supplier to state Castell FS Type (inscription to be confirmed at the order stage)
Key Interlock	Part 4, 5.11 and BS 61936	On motorised mechanisms key interlocks shall also interrupt motor control circuits.
Electrical Interlock	CEGB Standard 993315 (TPS) 3/9 Standard 993335 (TPS) 3/85	Should prevent motor and hand operation.
Padlocking facilities	Part 1,5.11	Supplier to state locking arrangements
Mechanism Degree of Protection	Part 1, 5.13	IP65
Surface preparation	Part 1, 5.108	Supplier to state
Mechanism box heater voltage		110V AC/230V AC (to be confirmed at the order stage)

Appendix 2 – Project Specific Technical Requirements

Summary of project specific technical requirements within the context of Section 3.2 and Appendix 1

Information	ENATS 41-37 Reference	Enquirer to indicate requirement as appropriate
Rated Voltage. See Appendix 1.	Part 1, 4.1	72.5kV / 145kV
Normal rated current. See Appendix 1.	Part 1, 4.5	1250A / 2000A
Bus-transfer and associated electrical interlocking (TPS 3/9). Refer section 3.2 and Appendix 1.	Part 4, 4.104	Yes / No
Rated induced current switching of earth switch see Section 3.2 and Appendix 1.	Part 4, 4.105	Class A / Class B
X/R (DC time constant) of network	Part 1, 4.6	X/R < 37 / X/R => 37
Disconnector operating mechanism: Motor or manual		Motor / Manual
Earth switch operating mechanism: Motor or manual		Motor / Manual
Key interlocks		State requirement
Electrical Interlocking		State any special requirements requirement:

Appendix 3 – Technical Schedule to be completed by the Manufacturer

	ENATS 41-37 Ref	
Disconnector		
Manufacturer		
Manufacturer's Designation		
Type (e.g RCP, ROP, Pantograph etc)		
ENA Notice of Conformity	Number	
Number of poles		
Class: Indoor, outdoor		
Rated voltage	Part 1, 4.1	
Rated insulation level (lightning impulse withstand voltage) see table 1a IEC 60694	Part 1, 4.2	
Rated Frequency	Part 1, 4.3	
Rated normal current	Part 1, 4.5	
Rated short-time withstand current	Part 1, 4.6	
Rated duration of short circuit	Part 1, 4.7	
Classification of mechanical operations Class M0-1000 or M1-2000	Part 4, 4.106	
Rated mechanical terminal load	IEC 62271-102 clause 5.104	
Rated bus transfer switching	Part 4, 4.104	
Rated short circuit making current	Part 4, 4.108	
Disconnector Mechanism		
Manufacturer's Designation		
Mechanism type: Dependent manual/dependent power		
Rated supply voltage of closing and opening devices and control circuits		
Rated supply voltage of control circuits		
Motor rating (W)		
Operating time of opening and closing (s)		
Motor protection		
Manual operation: method of interlock with motor mechanism		
Manual operation: method of interlock with substation electrical interlock circuits.		
No of auxiliary contacts	Part 4, 5.4.101	
Key Interlock type	Part 4, 5.11 as expanded in this document	
Key Interlock: Method of interlock with motor control circuits.		
Electrical Interlocking	TPS 3/85	
Padlocking facilities	Part 1, 5.11	
Mechanism Degree of Protection	Part 1, 5.13	
Surface preparation		
Mechanism box heater voltage		
Disconnector Weights		
Mass of disconnector (minus mechanism) (kg)		
Mass of Mechanism (kg)		

	ENATS 41-37 Ref	
Disconnector Drawings		
Disconnector General Arrangement		
Operating mechanism layout		
Control Schematic		
Earth Switch		
Manufacturer		
Manufacturer's Designation		
Type (e.g chopper, pantograph etc)		
Number of poles		
Class: Indoor, outdoor		
Rated voltage	Part 1, 4.1	
Rated insulation level (lightning impulse withstand voltage) see table 1a IEC 60694	Part 1, 4.2	
Rated Frequency	Part 1, 4.3	
Rated short-time withstand current	Part 1, 4.4	
Rated induced current switching of Earthing	Part 4, 4.105	
Rated duration of short circuit	Part 1, 4.7	
Classification of mechanical operations Class M0-1000 or M1-2000	Part 4, 4.110	
Earth Switch Mechanism		
Manufacturer's Designation		
Mechanism type: Dependent manual/dependent power		
No of auxiliary contacts	Part 4, 5.4.101	
Key Interlock type	Part 4, 5.11 as expanded in this document	
Padlocking facilities	Part 1, 5.11	
Mechanism Degree of Protection	Part 1, 5.13	
Surface preparation		
Mechanism box heater voltage		
Earth Switch Weights		
Mass of earth (minus mechanism) (kg)		
Mass of Mechanism		
Earth Switch Drawings		
Earth Switch General Arrangement		
Operating mechanism layout		

Appendix 4 – Self-certification declaration of conformance to ENATS 41 – 37 Part 4 Additional Clauses

Switchgear covered by ENA TS 41-37 shall comply with the latest issues of the relevant International and British Standards. ENA TS 41-37 is intended to amplify and/or clarify the requirements of those Standards.

This check sheet identifies the clauses in ENA TS 41-37 - Part 4 and the clauses of the aforementioned Standards relevant to high voltage disconnectors and earthing switches.

The manufacturer shall declare conformance or otherwise, clause by clause, using the following levels of conformance declaration codes.

Conformance declaration codes

NA	Clause is not applicable or appropriate to the product
Cs1	the product fully conforms with the requirements of this clause
Cs2	the product partially conforms with the requirements of this clause
Cs3	the product does not conform with the requirements of this clause
Cs4	the product does not currently conform with the requirements of this clause, but the manufacturer proposes to modify and test the product in order to comply.

Instructions for completion

In the case of products with a valid ENA NOC, when Cs1 is entered no remark is necessary. Products offered without a valid ENA NOC shall be supported with evidence to demonstrate conformity.

When any other code is entered the reason for non-conformance shall be entered.

Manufacturer:		
Product Reference:		
Name:	**Signature:**	**Date:**

Check sheet follows….

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Table A.1 — Self Certification Conformance Declaration

ENA TS 41-37 Part 1 & IEC 62271-102			ENA TS 41-37 Part 4			
Clause/sub-clause IEC 62271-102	**Clause title**	**Conformance Code**	**ENA TS 41-37 - Part 4 Clause/sub-clause**	**Clause title**	**Conformance code**	**Remarks**
	General		1	General		
1	Scope		1.1	Scope		
2	Normative references		1.2	Normative references		
4	Normal and special service conditions		2 to 2.1.2	Normal and special service conditions		
			2.2	Special service conditions		
			2.2.1	Altitude		
			2.2.2	Pollution level		
			2.2.3	Temperature and humidity		
			2.2.4	Vibrations, shock or tilting		
			2.2.5	Wind speed		
			2.2.6	Other parameters		
			2.2.100	Flood resilience		
3	Terms and definitions		3	Terms and definitions		
5	Ratings		4	Ratings		

ENA TS 41-37 Part 1 & IEC 62271-102			ENA TS 41-37 Part 4			
Clause/sub-clause IEC 62271-102	**Clause title**	**Conformance Code**	**ENA TS 41-37 - Part 4 Clause/sub-clause**	**Clause title**	**Conformance code**	**Remarks**
5.2	Rated voltage (U_r)		4.1	Rated voltage (U_r)		
			4.1.2	Range II, for rated voltages above 245 kV		
5.3	Rated insulation level (U_p)		4.2	Rated insulation level (U_p)		
5.4	Rated frequency (f_r)		4.3	Rated frequency (f_r)		
5.5	Rated continuous current					
5.6	Rated short-time withstand current (I_k)		4.5	Rated short-time withstand current (I_k)		
5.7	Rated peak withstand current (I_p)					
5.8	Rated duration of short-time withstand circuit (t_k)					
5.9	Rated supply voltage of auxiliary and control circuits (U_a)		4.8	Rated supply voltage of closing and opening devices and of auxiliary and control circuits (U_a)		
5.10	Supply frequency of closing and opening devices and of auxiliary circuits					
5.11	Rated pressure of compressed gas supply for					

ENA TS 41-37 Part 1 & IEC 62271-102			ENA TS 41-37 Part 4			
Clause/sub-clause IEC 62271-102	**Clause title**	**Conformance Code**	**ENA TS 41-37 - Part 4 Clause/sub-clause**	**Clause title**	**Conformance code**	**Remarks**
	controlled pressure systems					
5.11	Rated filling levels for insulation and/or operation					
5.101	Rated short-circuit making current					
5.103	Rated contact zone					
5.105	Rated mechanical terminal load					
5.108	Rated values of the bus-transfer current switching capability of disconnectors		4.104	Rated values of the bus-transfer current switching capability of disconnectors		
5.109	Rated values of the induced current switching capability of earthing switches		4.105	Rated values of the induced current switching capability earthing switches		
			4.105.1	Induced current switching		
			4.105.2	Temperature rise		
5.105	Rated values of mechanical endurance		4.106	Rated values of mechanical endurance for disconnectors		
5.106	Rated values of electrical					

ENA TS 41-37 Part 1 & IEC 62271-102			ENA TS 41-37 Part 4			
Clause/sub-clause IEC 62271-102	**Clause title**	**Conformance Code**	**ENA TS 41-37 - Part 4 Clause/sub-clause**	**Clause title**	**Conformance code**	**Remarks**
	endurance for earthing switches					
			4.201	Voltage drop and supply interruption		
6	Design and construction		5	Design and construction		
6.1	Requirement for liquids in switchgear and control gear		5.1	Requirement for liquids in disconnectors and earthing switches		
	Liquid level					
	Liquid quality					
6.2	Requirements for gases in switchgear and control gear		5.2	Requirement for gases in disconnectors and earthing switches		
6.3	Earthing of switchgear and control gear		5.3	Earthing of switchgear and control gear		
6.4	Auxiliary and control equipment		to 5.4.4.5.106			
6.5	Dependent power operation		5.5	Dependent power operation		
6.6	Stored energy operation		5.6	Stored energy operation		

ENA TS 41-37 Part 1 & IEC 62271-102			ENA TS 41-37 Part 4			
Clause/sub-clause IEC 62271-102	**Clause title**	**Conformance Code**	**ENA TS 41-37 - Part 4 Clause/sub-clause**	**Clause title**	**Conformance code**	**Remarks**
6.7	Independent manual operation		5.7	Independent manual operation		
6.9	Operation of releases		5.8 to 5.8.101	Operation of releases		
6.10	Low- and high-pressure interlocking and monitoring devices		to 5.9.105			
6.11	Nameplates		5.10 to 5.10.105	Nameplates		
6.12	Interlocking devices and padlocking facilities		5.11 to 5.11.106	Interlocking devices and padlocking facilities		
			5.11.107	AIS disconnector and earthing switch interlocking		
			5.11.108	Key operated interlocking		
			5.11.109	Mechanical interference device withstand force		
			5.11.110	Drive system mechanical interference device		
			5.11.112	Interlock key release position		

ENA TS 41-37 Part 1 & IEC 62271-102			ENA TS 41-37 Part 4			
Clause/sub-clause IEC 62271-102	**Clause title**	**Conformance Code**	**ENA TS 41-37 - Part 4 Clause/sub-clause**	**Clause title**	**Conformance code**	**Remarks**
			5.11.113	Lockout' interlocks keys AIS disconnectors		
			5.11.114	Time delay for magnetic bolts		
6.13	Position indication		5.12 to 5.12.102	Position indication		
6.14	Degree of protection of enclosures		5.13	Degree of protection of enclosures		
	Protection of persons against access to hazardous parts and protection of the equipment against ingress of solid foreign objects		5.13.1 to 5.13.3	Protection of persons against access to hazardous parts and protection of the equipment against ingress of solid foreign objects		
6.15	Creepage distances		5.14	Creepage distances		
	Pollution performance		5.14.100	Pollution performance		
6.16	Gas and vacuum tightness		to 5.15.2			
6.17	Liquid tightness		5.16	Liquid tightness		
6.18	Fire hazard (Flammability)		5.17	Fire hazard (Flammability)		
6.19	Electromagnetic		5.18	Electromagnetic		

ENA TS 41-37 Part 1 & IEC 62271-102			ENA TS 41-37 Part 4			
Clause/sub-clause IEC 62271-102	**Clause title**	**Conformance Code**	**ENA TS 41-37 - Part 4 Clause/sub-clause**	**Clause title**	**Conformance code**	**Remarks**
	compatibility (EMC)			compatibility (EMC)		
	X-ray emission		5.19	X-ray emission		
6.21	Corrosion		5.20	Corrosion		
	Ergonomics and access					
	Height for operation and inspection		5.101	Height for operation and inspection		
6.101	Special requirements for earthing switches					
6.102	Requirements in respect of the isolating distance					
			5.102	Force for operation		
6.103	Mechanical strength					
	Direction of movement		5.103	Direction of movement		
6.104	Operation of disconnectors and earthing switches – Position of the movable contact system and its indicating and signalling devices					
Single person operation			5.104	Single person operation		
6.105	Maximum force required for					

ENA TS 41-37 Part 1 & IEC 62271-102			ENA TS 41-37 Part 4			
Clause/sub-clause IEC 62271-102	Clause title	Conformance Code	ENA TS 41-37 - Part 4 Clause/sub-clause	Clause title	Conformance code	Remarks
	manual operation					
6.106	Dimensional tolerances					
			5.106	Lifting points		
			5.107	Surface preparation and coatings		
			5.108	Clearances and personal reach		
			5.109	Air insulated bushings		
			5.110	Bushing terminals		
			5.111	Moving parts		
			5.112	Outdoor terminals		
			5.113	Surface temperature		
			5.114	Foundation arrangements		
			5.115	Height for operation		
			5.115	Height for operation		
			5.201	Requirements in respect of the		

ENA TS 41-37 Part 1 & IEC 62271-102			ENA TS 41-37 Part 4			
Clause/sub-clause IEC 62271-102	Clause title	Conformance Code	ENA TS 41-37 - Part 4 Clause/sub-clause	Clause title	Conformance code	Remarks
				isolating distance of disconnectors		
			5.202	Mechanical strength		
			5.203	Operation of disconnectors and earthing switches- Position of the movable contact system and its indicating and signalling device		
			5.204	Maximum force required for manual operation		
			5.205	Dimensional tolerances		
			5.206	Pole operation		
			5.207	Operations counter		
			5.208	Manual operation of motor operated disconnectors with bus- transfer capability,		
			5.209	Support structure		

ENA TS 41-37 Part 1 & IEC 62271-102			ENA TS 41-37 Part 4			
Clause/sub-clause IEC 62271-102	**Clause title**	**Conformance Code**	**ENA TS 41-37 - Part 4 Clause/sub-clause**	**Clause title**	**Conformance code**	**Remarks**
7	Type tests		6	Type tests		
7.1	General		6.1	General		
7.1.1	Grouping of tests					
7.1.2	Information for identification of specimens		6.1.2	Information for identification of specimens		
7.1.3	Information to be included in type-test reports		6.1.3	Information to be included in type-test reports		
7.2	Dielectric tests		6.2	Dielectric tests		
7.2.7	Tests of switchgear and control gear of U_r > 245 kV		6.2.7	Tests of switchgear and control gear of Ur > 245 kV		
76.2.8	Artificial pollution tests		6.2.8	Artificial pollution tests		
7.2.9	Partial discharge tests					
7.2.10	Dielectric tests on auxiliary and control circuits					
7.2.11	Voltage test as condition check		6.2.11	Voltage test as condition check		
7.3	Radio interference voltage (riv) test		6.3	Radio interference voltage (riv) test		

ENA TS 41-37 Part 1 & IEC 62271-102			ENA TS 41-37 Part 4			
Clause/sub-clause IEC 62271-102	**Clause title**	**Conformance Code**	**ENA TS 41-37 - Part 4 Clause/sub-clause**	**Clause title**	**Conformance code**	**Remarks**
7.4	Measurement of the resistance of circuits		6.4	Measurement of the resistance of circuits		
7.5	Temperature-rise tests		6.5	Temperature-rise tests		
7.6	Short-time withstand current and peak withstand current tests		6.6	Short-time withstand current and peak withstand current tests		
7.6.1	Arrangement of the disconnectors and earthing switches and of the test circuit		6.6.1	Arrangement of the disconnectors and earthing switches and of the test circuit		
7.6.2.101	General test conditions		6.6.1.101	General test conditions		
7.6.2.102	Disconnectors and earthing switches with rated voltages below 52 kV		6.6.1.102	Disconnectors and earthing switches with rated voltages below 52 kV		
7.6.2.103	Disconnectors and earthing switches with rated voltages of 52 kV and above		6.6.1.103	Disconnectors and earthing switches with rated voltages of 52 kV and above		
7.6.3	Test current and duration		6.6.2	Test current and duration		
7.6.3	Behaviour of disconnectors		6.6.3	Behaviour of		

ENA TS 41-37 Part 1 & IEC 62271-102			ENA TS 41-37 Part 4			
Clause/sub-clause IEC 62271-102	Clause title	Conformance Code	ENA TS 41-37 - Part 4 Clause/sub-clause	Clause title	Conformance code	Remarks
	and earthing switches during test			disconnectors and earthing switches during test		
7.6.4	Conditions of disconnectors and earthing switches after test		6.6.4	Conditions of disconnectors and earthing switches after test		
7.7	Verification of the protection		6.7	Verification of the protection		
7.8	Tightness tests		6.8	Tightness tests		
7.9	Electromagnetic compatibility tests (EMC)		6.9	Electromagnetic compatibility tests (EMC)		
7.10	Additional tests on auxiliary and control circuits					
7.101	Test to prove the short-circuit making performance of earthing switches					
7.102	Operating and mechanical endurance tests					
7.103	Operation under severe ice conditions		6.103	Operation under severe ice conditions		
7.104	Operation at the temperature limits		6.104	Operation at the temperature limits		

ENA TS 41-37 Part 1 & IEC 62271-102			ENA TS 41-37 Part 4			
Clause/sub-clause IEC 62271-102	**Clause title**	**Conformance Code**	**ENA TS 41-37 - Part 4 Clause/sub-clause**	**Clause title**	**Conformance code**	**Remarks**
	Tests on composite bushings					
7.105	Test to verify the proper functioning of the position-indicating device		6.105	Test to verify the proper functioning of the position-indicating device		
			6.105	Tests on composite bushings		
7.106	Bus-transfer current switching tests		6.106	Bus-transfer current switching tests		
7.107	Induced current switching tests		6.107	Induced current switching tests		
7.108	Bus-charging switching tests		6.108	Bus-charging switching tests		
			6.200 to 6.204	Solar radiation		
			6.205	Mechanical endurance tests		
			6.206	Verification of the operational characteristics of auxiliary contacts		
8	Routine tests		7	Routine tests		
8.2	Dielectric test on the main circuit		7.1	Dielectric test on the main circuit		

ENA TS 41-37 Part 1 & IEC 62271-102			ENA TS 41-37 Part 4			
Clause/sub-clause IEC 62271-102	**Clause title**	**Conformance Code**	**ENA TS 41-37 - Part 4 Clause/sub-clause**	**Clause title**	**Conformance code**	**Remarks**
8.3	Dielectric test on auxiliary and control circuits		7.2 to 7.2.4	Dielectric test on auxiliary and control circuits		
8.4	Measurement of the resistance of the main circuit		7.3	Measurement of the resistance of the main circuit		
8.5	Tightness test		7.4 to 7.4.4	Tightness test		
8.6	Design and visual checks		7.5	Design and visual checks		
8.101	Mechanical operating tests		7.101	Mechanical operating tests		
9	Guide to the selection of disconnectors and earthing switches		8	Guide to the selection of disconnectors and earthing switches		
10	Information to be given with Enquires, Tenders and orders		9	Information to be given with Enquires, Tenders and orders		
11	Rules for transport, storage, installation, operation and maintenance		10 to 10.4.3	Rules for transport, storage, installation, operation, maintenance and disposal		
12	Safety		11	Safety		
13	Influence of the product on		12	Environmental		

ENA TS 41-37 Part 1 & IEC 62271-102			ENA TS 41-37 Part 4			
Clause/sub-clause IEC 62271-102	Clause title	Conformance Code	ENA TS 41-37 - Part 4 Clause/sub-clause	Clause title	Conformance code	Remarks
	the environment			Aspects		
			13	Commissioning		

Appendix 5 – ENA TS 41-37 Type test self-certification conformance declaration

High Voltage Disconnectors and Earthing Switches

Manufacturer: **Rating:**

Product reference:

Name: **Signature:** **Date:**

Instructions for completion:
- Complete a separate table for each variant and rating
- ENA/SAP to complete columns 1 to 4
- Manufacturer to complete columns 5 to 10
- Tests not requested may be provided as 'Additional tests'

*See bottom of table for conformance declaration codes
** I = Independent; M= Manufacturer; ENA= Energy Networks Association

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
	Test Requirement	**Specification and Standards**	**Rated value**	**Test req'd Y or N**	**Conformance**	**Test value**	**Date of test**	**Test station Report / Cert No**	**Witness I, M or ENA****	**Remarks**
1	Dielectric	Sub clause 7.2. IEC 62271-102.								
2	Radio interference test	Sub clause 6.3 IEC 60694								
3	Measurement of the resistance of main circuit -	Sub clause 6.4 IEC 60694								
4	Temperature Rise	Sub clause 6.5, IEC 60694								

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
	Test Requirement	**Specification and Standards**	**Rated value**	**Test req'd Y or N**	**Conformance**	**Test value**	**Date of test**	**Test station Report / Cert No**	**Witness I, M or ENA****	**Remarks**
5	Short-time withstand current and peak withstand current tests -	Sub clause 7.6 IEC 62271-102 and IEC 60694 Subclause6.6.1								
6	Verification of protection	Sub clause 6.7 IEC 60694								
7	Tightness test	Sub clause 6.8 IEC 60694								
8	EMC tests	Sub clause 6.9 IEC 60694								
9	Tests to prove the short circuit making performance of earthing switches.	Sub clause 7.101 IEC 62271-102								
10	Operating and mechanical endurance test	Sub clause 7.102 IEC 62271-102								
11	Operation under sever ice conditions	Sub clause 7.103 IEC 62271-102								
12	Operation at the temperature limits	Sub clause 7.104 IEC 62271-102								
13	Tests to prove the proper function of the position –indicating device	Sub clause 7.105 IEC 62271-102								
14	Bus-transfer current switching test	Sub clause 7.106 IEC 62271-102								
15	Induced current switching tests	Sub clause 7.107 IEC 62271-102.								
16	Bus-charging switching tests	Sub clause 7.108 IEC 62271-102								
17	Additional tests on auxiliary and control circuits	Sub clause 8.3 IEC 60694								

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
	Test Requirement	**Specification and Standards**	**Rated value**	**Test req'd Y or N**	**Conformance**	**Test value**	**Date of test**	**Test station Report / Cert No**	**Witness I, M or ENA****	**Remarks**
18	Routine tests	Clause 8 IEC 62271-102								
19	Finish	Performance to ENA TS 98-1								
20	Process Control	ISO 9000 ERG79 Parts 1 & 2a								
Note; All type tests carried out using the number of test samples specified in I 6.1.1 of IEC 60694. Disconnectors and earthing switches with a rated voltage of 72.5kV and above tests marked by * an additional test sample is allowed for the marked test.										

***Conformance declaration codes**

N/A = Clause is not applicable/appropriate to the product
Cs1 = the test conforms fully with the requirements of this clause
Cs2 = the test conforms partially with the requirements of this clause
Cs3 = the test does not conform to the requirements of this clause
Cs4 = Test not performed, but alternative evidence/ technical case offered

Ct1 = Independent witnessed tests
Ct2 = Not fully independent witnessed tests
Ct3 = Self verified tests
Ct4 = Alternative tests / evidence offered
Ct5 = Manufacturer has underwritten that the product meets the functional and performance requirements without further testing.
Ct6 = Not tested

Appendix 6 – Manufacturer, places of manufacture, testing and inspection

Item	Manufacturer's Drawing Number and/or Type Designation	Manufacturer	Place of Manufacture	Place of Testing and Inspection
Disconnector primary components				
HV Insulators				
Operating mechanism				
Support Steelwork				

Appendix 7 – Schedule of Items

Centre Break Units

Northern Powergrid Code	Description
206470	Disconnector 66kV Three Phase Centre Break, 1250A Rated, 31.5kA (3s) with Motor Operated Mechanism.
206471	Disconnector 66kV Three Phase Centre Break, 1250A Rated, 31.5kA (3s) with Hand Operated Mechanism
206472	Disconnector 66kV Three Phase Centre Break, 2000A Rated, 31.5kA (3s) with Motor Operated Mechanism
206473	Disconnector 66kV Three Phase Centre Break, 2000A Rated, 31.5kA (3s) with Hand Operated Mechanism
206475	Disconnector 132kV Three Phase Centre Break, 1250A Rated, 31.5kA (3s) with Motor Operated Mechanism
206476	Disconnector 132kV Three Phase Centre Break, 1250A Rated, 31.5kA (3s) with Hand Operated Mechanism
206477	Disconnector 132kV Three Phase Centre Break, 2000A Rated, 31.5kA (3s) with Motor Operated Mechanism
206478	Disconnector 132kV Three Phase Centre Break, 2000A Rated, 31.5kA (3s) with Hand Operated Mechanism
206480	Components and Wiring to Provide Bus-transfer Capability for Centre Break 66kV and 132kV Disconnectors
206481	Components and Wiring to Provide Class B Induced Current Rating for Disconnector Earth Switches in Accordance with Annex C of IEC 62271-102. Suitable for Single and Double Break Types.

Earth Switches

Northern Powergrid Code	Description
206474	Earth Switch 66kV Three Phase, 31.5kA (3s). Hand Operated, Mechanically Interlockable and Suitable for Mounting Either Side of the Disconnector (to Provide a Class B rating commodity Code 206481 is required)
206479	Earth Switch 132kV Three Phase, 31.5kA (3s). Hand Operated, Mechanically Interlockable and Suitable for Mounting Either Side of the Disconnector (to Provide a Class B rating commodity Code 206481 is required)

Double Side Break Units (alternative option for installations with restricted space)

Northern Powergrid Option	Description
1	Disconnector 66kV Three Phase Double Side Break, 1250A Rated, 31.5kA (3s) with Motor Operated Mechanism
2	Disconnector 66kV Three Phase Double Side Break, 1250A Rated, 31.5kA (3s) with Hand Operated Mechanism
3	Disconnector 66kV Three Phase Double Side Break, 2000A Rated, 31.5kA (3s) with Motor Operated Mechanism
4	Disconnector 66kV Three Phase Double Side Break, 2000A Rated, 31.5kA (3s) with Hand Operated Mechanism
5	Disconnector 132kV Three Phase Double Side Break, 1250A Rated, 31.5kA (3s) with Motor Operated Mechanism
6	Disconnector 132kV Three Phase Double Side Break, 1250A Rated, 31.5kA (3s) with Hand Operated Mechanism
7	Disconnector 132kV Three Phase Double Side Break, 2000A Rated, 31.5kA (3s) with Motor Operated Mechanism
8	Disconnector 132kV Three Phase Double Side Break, 2000A Rated, 31.5kA (3s) with Hand Operated Mechanism
9	Components and Wiring to Provide Bus-transfer Capability for Double Side Break 66kV and 132kV Disconnectors.

Key Interlocks

Northern Powergrid Option	Description
10	Disconnector Key Interlock - Supplied and Fitted as required by the Interlock Schedule placed at the time of order.

Appendix 8 – Information Return Check List

The following information shall be provided by the supplier for review by Northern Powergrid. Additional information shall be provided if requested.

Requirement	Provided (Y/N)
Full product descriptions and part number/reference	
Appendix 3 – completed technical schedule (for each variant offered)	
Appendix 4 – completed self-certification conformance declaration against ENATS 41-37 (for each variant offered)	
Appendix 5 – completed type test self-certification conformance declaration (for each variant offered)	
Appendix 6 – completed declaration for the manufacture and routine testing locations of key component parts	
Complete set of mechanical and electrical drawings for each variant (including motor drive control schematics)	
Type test evidence	
Manufacturing routine test plan	
Periodic inspection, test and maintenance requirements - including details of: replacement parts and consumables, measurement and testing involved (with pass/fail criteria)	
Packaging information and stage of assembly when delivered	
Instructions/Manuals for: transportation & handling, storage, installation, commissioning, operation & maintenance, de-commissioning and disposal.	
Spares availability list and recommended stockholding	
COSHH data sheets	
ISO:9001, ISO:14001 and ISO:18001 certification and manuals	