NPS/003/029 – Technical Specification for Retrofit 11kV & 20kV Circuit Breakers

1. Purpose

The purpose of this document is to specify the technical requirements for retrofit circuit breakers for use at ground mounted substations operating on the Northern Powergrid 11kV and 20kV networks.

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

Reference	Version	Date	Title
NPS/003/029	1.3	Feb 2016	Technical Specification for Retrofit 11kV & 20kV Circuit Breakers

2. Scope

Except where varied by this specification; retrofit withdrawable circuit breaker moving portions shall comply with all relevant clauses of ENATS 41-36 - Distribution Switchgear For Service Up To 36kV (Issue 3) or in the process of being complainant with ENATS 41-43 - Withdrawable Retrofit Ground Mounted 12 kV to 36 kV Rated Indoor Circuit-breakers.

This specification seeks to be functional and to clarify, or vary, existing national specifications and requirements only where necessary.

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3. Technical Requirements

3.1. Overall

Except where varied by this specification the switchgear shall comply fully with, and meet all the requirements of issue 3 of ENATS 41-36 - Distribution Switchgear For Service Up To 36kV or ENATS 41-43 - Withdrawable Retrofit Ground Mounted 12 kV to 36 kV Rated Indoor Circuit-breakers.

The switchgear shall, preferably, have been assessed by the Energy Networks Association and granted a Notice of Conformance against ENATS 41-36 or in the process of being assessed against ENATS 41-43.

Where a circuit breaker is used as an earthing switch (including transfer earthing and accessory earthing) the equipment shall, in addition, be rated as Class E2 in accordance with IEC 62271-102: High-voltage alternating current disconnectors and earthing switches.

The equipment shall be designed and manufactured to ensure that the electrical stresses on the surfaces of the bushings, and within the air gaps between the moving and fixed portions do not exceed the equivalent stresses on the original manufacturer's equipment.

The supplier shall provide evidence to justify compliance with this requirement.

Site specific compatibility checks shall be carried out, as per Appendix 1 - Associated pre and post commissioning requirements.

3.2. Physical Environment

Switchgear is required for Indoor use, in two general substation types:

At a primary substation; typically a brick building which is heated to maintain the lower temperature limit for indoor switchgear. The building has small vents which will not exclude dust, or humid air from the building.

At a distribution substation; here an enclosure provides protection from the direct effects of the weather, but has large louvered air vents which are unlikely to prevent dust or humid air, etc. entering the housing. The housing is not temperature maintained, except by the heating effect of the local transformer in the housing.

3.3. Basic Functionality

Replacement circuit breakers shall be equipped to provide, at least, the same functionality as the original moving portions including:

a) Control of the primary circuit.

b) Isolation and earthing of the primary circuit.

c) Remote control and indication via Northern Powergrid SCADA system.

The replacement circuit breaker shall be rated for auto-reclosing duties.

3.4. Remote Control

All primary circuits on all switchgear types shall be supplied equipped with the capability of being remotely controlled and operated. Details of the required available relay connections are shown below

1.	CB Open	7NC
2.	CB Closed	7NO
3.	CB Spring Charged	3NO

4.	CB Spring Charged	3NC
5.	CB In Service	5NO
6.	CB Out of Service	5NC
7.	CB Selector in Earth	3NO
8.	CB Selector Not Earthed	3NC

These contacts will be direct from the CB/Selector mechanism and not be in use for the Circuit Breaker/Selector control scheme.

- Telecontrol interposing open/close relay with self-reset contacts, test button and no operation indicator, this being operated from the Northern Powergrid SCADA system. Both relays should be equipped with 4 CO contacts, all with heavy duty rating. These relays will be internally mounted.
- If the switchgear utilises gas in the scheme, suitable relays should be provided to provide alarms to SCADA and the local alarm scheme, typically 3 CO contacts would be required from each stage.

Manually operated circuit breakers shall have the capability for Remote TRIP and CLOSE. Switch disconnectors shall have the option to be supplied with the capability for Remote OPEN and CLOSE.

Manually operated switch disconnectors shall be supplied equipped with all necessary internal wiring and connections to facilitate the future installation of an actuator mechanism.

3.5. Variances from ENATS 41-36 issue 3 and ENATS 41-43

This Section is numbered to reflect the clause numbers of ENATS 41-36 issue 3 and ENATS 41-43 to which the variances apply.

1.4 Ratings/5 Ratings

1.4.2.1 Table 1.1a Normal Rated Insulation Levels/5.3 Rated Insulation Level Table 1

The Rated Lightning Impulse Withstand Voltage of the replacement circuit breaker shall not be less than that of the fixed portion. For 12kV rated units this will preferably be 95kV common value and 110kV across the isolating distance.

1.4.4.1 Table 1.3 Rated Normal Current/5.5 Rated Continuous Current

Replacement circuit breakers shall have the minimum current rating required for the specific circuit in which they are to be used, which shall normally be 200A and 630A for distribution and 400A, 630A, 800A or 1250A for primary.

1.4.4.1 Table 1.3 Rated Short-Time Withstand Current/5.6 Rated Short-Time Withstand Current

Replacement circuit breakers shall have a rated short time withstand current rating as required in the project specification; but, in any case shall be at least equal to the existing fixed portions and the moving portions they replace. and preferably shall be for distribution substation units 20kA for 12kV and 16kA for 24kV and for primary substation units 25kA for 12kV and 20kV for 24kV.

1.4.8 Rated Supply Voltage of Closing and Opening Devices and of Auxiliary and Control Circuits/5.9 Rated supply voltage of auxiliary and control circuits.

Rated supply voltage and frequency of closing and opening devices and of auxiliary circuits shall be as required for the site or as required by the project specification. These are typically: 30V DC, or 110V DC for trip and close coils and 110V DC for spring charging motors.

1.5 Design and Construction/6 Design and Construction

1.5.1 Requirements for Liquids/6.1 Requirements for liquids in Switchgear and control gear

Oil filled switchgear will not normally be acceptable.

1.5.2 Requirements for Gases in Switchgear and Controlgear/6.1 Requirements for liquids in Switchgear and control gear

The manufacturer shall state whether 'topping up' can be carried out with the switchgear live and shall provide instructions for carrying out this operation.

1.5.9 Low and High Pressure Interlocking and Monitoring devices

A gauge or indicator (option a) shall always be provided for each gas pressure system.

1.5.15 Gas and Vacuum Tightness

The leakage rate shall not exceed 0.5% per year at 20°C

1.5.101 Internal Fault/6.101

The moving portion does not require testing to prove a formal internal arc classification; but it shall be designed, so far as is reasonably practicable, to minimise the effects of a disruptive failure on the moving and/or fixed portions.

Details of any options available for avoiding, restricting, or diverting the venting of arc products shall be provided (e.g.: ducting to divert arc products, arc quenchers/filters, etc).

1.6 Type Tests/7 Type Tests

The equipment shall be designed and manufactured to ensure that the electrical stresses on the surfaces of the bushings, and within the air gaps between the moving and fixed portions do not exceed the equivalent stresses on the original manufacturer's equipment. The supplier shall provide test evidence to justify compliance with this requirement.

1.7 Routine Tests/8 Routine Tests

In addition to the production routine tests the moving portion shall be tested for partial discharge when installed in the fixed portion; see also Appendix 1

1.10 Rules for Transport, Storage, Installation, Operation, Maintenance and Disposal/11 Rules for Transport, Storage, Installation, Operation, Maintenance and Disposal

The circuit breaker shall be designed to minimise maintenance requirements.

The installation, testing, commissioning, operating, maintaining and removal procedures for the switchgear shall take into account the requirements of UK safety legislation and requirements, including legislation governing working at heights, and shall be able to demonstrate compliance with all of these. The switchgear must be able to be installed in existing substations or third party buildings which preclude the use of mechanical lifting devices. It shall be possible to manually move and locate the switchgear in a safe and ergonomically acceptable manner.

2.4 Ratings/5.300.100 General Circuit Breaker Requirements.

All Circuit Breakers shall be rated for 'line-charging breaking current'

(2.4.101 Rated short-circuit breaking current (Isc) / 5.300.101 Rated short-circuit breaking current (I_{sc}) [BS EN 62271-100]

For 12kV rated primary substation switchgear, units shall have current ratings of at least 25kA @ time constant 45 ms (X/R ratio of 14.14) or 16kA at 120ms (X/R ratio of 37.7). For 12kV distribution substation switchgear shall have current ratings of at least 20kA @ time constant 45 ms (X/R ratio of 14.14) or 12.5kA at 120ms (X/R ratio of 37.7).

For 24kV rated primary substation switchgear, units shall have current ratings of at least 20kA @ time constant 45 ms (X/R ratio of 14.14) or 12.5kA at 120ms. (X/R ratio of 37.7). For 24kV rated distribution substation switchgear, units shall have current ratings of at least 16kA @ time constant 45 ms (X/R ratio of 14.14) or 10kA at 120ms. (X/R ratio of 37.7).

2.4.103 Rated Short-Circuit Making Current / 5.300.103 Rated short-circuit making current (Ima) [BS EN 62271-100]

The rated short circuit making current shall be 2.5 times the r.m.s. value of the rated short-circuit breaking current.

4. References

4.1. External Documentation

Reference	Title
ENATS 41-36	Energy Networks Association; Distribution Switchgear For Service Up To 36kV (Cable And Overhead Connected)
ENATS 41-43	Withdrawable Retrofit Ground Mounted 12 kV to 36 kV Rated Indoor Circuit-breakers
IEC 62271-102	High-voltage switchgear and controlgear – Part 102: Alternating current disconnectors and earthing switches

4.2. Internal Documentation

Reference	Title
IMP/001/909	Code of Practice for Distribution System Parameters
OPM	Northern Powergrid Operational Practice Manual

4.3. Amendments from Previous Version

Reference	Description
Throughout	References made to ENATS 41-43 alongside ENATS 41-36
3.4	Remote control section added
3.5	Ratings added for both primary and secondary switchgear and also short circuit making current

5. Definitions

Term	Definition
NONE	

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	31/07/2023

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.

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.

		Date
Paul McAdoo	Lead Policy & Standards Engineer	31/07/2023

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
Alan MacDonald	Policy and Standards Engineer	04/08/2023
Joseph Helm	Lead Policy & Standards Engineer	15/08/2023

6.4. Authorisation

Authorisation is granted for publication of this document

		Date
Paul Black	Head of System Engineering	03/10/2023

Appendix 1 - Associated Pre and Post Commissioning Requirements

Before each and every retrofit moving portion is installed for the first time into a designated fixed portion the following shall be carried out and recorded:

(a) Compatibility survey

As a minimum this shall include:

(i) A comparison of the operational & electrical characteristics and the control & indication characteristics of the designated fixed portion, the existing fixed portion (if any) and the proposed retrofit moving portion.

(ii) An assessment and report on the condition of the designated fixed portion of the switchboard.

(iii) Detailed measurement of the alignment of the designated fixed portion and associated floor/rails, with reference to the existing and proposed moving portions.

(iii) An assessment and report on the environmental condition within the substation with reference to the proposed moving portion.

(b) Partial discharge survey.

As a minimum this shall include detailed measurements of partial discharge activity associated with the switchboard fixed portions, existing moving portions and proposed moving portion:

(i) One month before the moving portion is installed

(ii) Immediately before after the moving portion is installed

(iii) Immediately after the moving portion is installed

(iv) One month after the moving portion is installed

Appendix 2 - Information to be Provided for each Retrofit Moving Portion Design/Variation

1. Declaration and details of compliance with this specification.
2. Declaration and details of compliance with ENA TS 41-36.
3. Manuals, drawings and instructions to cover the whole lifecycle, including:
   - Installation
   - Commissioning
   - Operation
   - Maintenance
   - Repair
   - Definition of end of life
   - De-commissioning
   - Disposal.
4. Details of the compatibility criteria, including:
   - Operational & electrical characteristics
   - Control & indication characteristics
   - Requirements and tolerances for the alignment of the designated fixed portion and associated floor/rails.
5. Lessons learnt hints and tips from experience of previous installations of retrofit moving portions.

These requirements for information are in addition to the requirements in Appendices: 4, 5 and 6.

Appendix 3 - Testing

Site Commissioning Tests

The supplier shall propose to Northern Powergrid test arrangements and combinations, test values, test pass/fail criteria, tolerances applicable and associated test record content and layout for site commissioning tests.

Power frequency tests shall prove all combinations of operational condition: between each phase, between phase and earth and across all isolation gaps. All secondary wiring shall be insulation resistance tested.

Power frequency tests shall, as default, use the criteria specified in the Northern Powergrid Operational Practice Manual, as copied below.

Production Tests

With every switch panel the supplier shall provide: copies of the production tests, test arrangements and test values applied, test results and associated test records for these tests.
A complete set of printed, hard copies of these records shall be shipped in the associated LV control cabinet and electronic copies of these records shall also be supplied to Northern Powergrid.

Standard Test Voltages applied by Northern Powergrid

Standard test voltages are defined in the 'WE TESTING' section of the Northern Powergrid Operational Practice Manual. The table below is an extract from table WE.2 Switchgear Test Voltages in the current version of the OPM.

Working Voltage (kV)	Test voltage and duration	
	1	2
	DC 1 min	AC 1 min
11kV	20	16
20kV	37	30

Appendix 4 - Declaration of Compliance with NPS/003/029

Switchgear Range Name and Voltage Range:				
NPS/003/029 Clause			Compliance (Yes or No)	Details/Remarks/Description ***For all clauses; please write a short summary in this column***
3.1.1		ENA TS 41-36 Compliant		
3.1.1		ENA TS 41-43 Compliant		
3.1.1		Class E2 per IEC 62271-102		
3.1.1		Electrical stress levels		
3.1.1		Site specific compatibility survey		
3.1.2		Suitable for use in primary substations		
3.1.2		Suitable for use in distribution substations		
3.3		Basic functionality		
3.3		Suitable for auto reclose duty		
3.4		Variations from ENATS 41-36 and ENATS 41-43:		
ENATS 41-36	ENATS 41-43			
1.4.2.1	5.3 Table 1	95kV BIL for 12kV eqpt		
1.4.4.1		Rated normal current		
1.4.4.1		Rated short-time withstand current		
1.4.8	5.9	Closing, opening and auxiliary supplies		
1.5.1	6.1	Oil insulated items		
1.5.2	6.2	SF6 topping up		
1.5.9		Gas pressure gauge as standard		
1.5.15		Gas leakage <=0.5% p.a.		
1.6	7	Type tests – electrical stresses on surfaces		
1.7	8	Routine tests – emphasis on electrical stresses and partial		

		discharge and to include tests when installed in fixed portion.		
1.10	11	EU & UK legislation including: Manual Handling, Work at Heights, etc.		
2.4		Rated for line charging breaking current		
For Primary Substation Switchgear				
2.4.101	*5.300.101*	Isc for 12kV: 25kA@45ms (X/R of 14.14) 16kA@120ms (X/R of 37.7)		
2.4.101	*5.300.101*	Isc for 24kV: 20kA@45ms (X/R of 14.14) or 12.5kA@120ms (X/R of 37.7)		
For Distribution Substation Switchgear				
2.4.101	*5.300.101*	Isc for 12kV: 16kA@45ms (X/R of 14.14) 12.5kA@120ms (X/R of 37.7)		
2.4.101	*5.300.101*	Isc for 24kV: 16kA@45ms (X/R of 14.14) or 10kA@120ms (X/R of 37.7)		
Appendix 1		Pre-commissioning and Post-commissioning measurements, checks and tests		
Appendix 2		Information provision		
Appendix 3		Site testing arrangements & values & record provision		
Appendix 3		Production testing arrangements & values & record provision		
Appendix 3		Compatibility with Northern Powergrid standard test voltages		

Appendix 5- Individual Unit Summary Technical Details

To be completed for each design/variant

	NOTE: This column contains example entries only		
Manufacturers Type Reference	ABC-3a MkII		
Rated Voltage	12kV		
Rated Normal Current for circuit breaker	630 A		
Rated Normal Current for moving portion	630A		
Rated Short time Current for circuit breaker & moving portion	20 kA (1s)		
Impulse Withstand Voltage (BIL)	95kV		
Assigned number of fault-make operations, at full rating, before maintenance of circuit breaker	100		
Assigned number of fault-break operations before maintenance of circuit breaker	10		
Physical Aspects			
Width of Unit	1100 mm		
Depth of Unit	1100 mm		
Height of Unit	1500 mm		
Weight (complete with filling medium)	400 kg		
Height of Centre of Gravity	850 mm		
Environmental			
Switching medium	vacuum		
Insulation medium	SF_6		
Weight of SF_6 per moving portion	2.5 kg SF_6		
Weight of SF_6 per chamber	CB tank 2 kg SF_6 Bushings 0.5 kg SF_6		

Continued…

IEC Pressure (or density) significant values	NOTE: This column contains example entries only		
Rated Filling Pressure, or density, for Insulation and/or Switching P_{re} – IEC62271-1 3.6.5.1 (assembly) *Declaration Required for EACH gas zone/chamber*	CB chamber = 0.75 barG Busbars = 0.75 barG Bushings – 0.5 barG		
Rated Filling Pressure, or density, for Operation P_m – IEC62271-1 3.6.5.2 (control device) *Declaration Required for EACH gas zone/chamber*			
Alarm Pressure, or density, for Operation P_{am} – IEC62271-1 3.6.5.4 - pressure at which a monitoring signal may be provided. P_{am} – IEC60694 3.6.4.4 - pressure at which a monitoring signal may be provided to indicate that replenishment may be necessary in a relatively short time. *Declaration Required for EACH gas zone/chamber*			
Minimum Functional Pressure, or density, for Operation P_{mm} – IEC62271-1 3.6.5.6 *Declaration Required for EACH gas zone/chamber*			
Alarm Pressure, or density, for Insulation and/or Switching P_{ae} – IEC62271-1 3.6.5.3 - pressure at which a monitoring signal may be provided. P_{ae} – IEC60694 3.6.4.3 - pressure at which a monitoring signal may be provided to indicate that replenishment may be necessary in a relatively short time. *Declaration Required for EACH gas zone/chamber*			
Minimum Functional Pressure, or density, for Operation and/or Switching P_{me} – IEC62271-1 3.6.5.5 - pressure at which and above which rated characteristics of switchgear and controlgear are maintained *Declaration Required for EACH gas zone/chamber and function.*			

Continued…

Practical Statement of Significant Pressures & Consequences	NOTE: This column contains example entries only		
Normal operating pressure (or density)	CB chamber = 0.75 barG Bushings – 0.5 barG		
First Alarm Level and details of any associated alarm contacts and details of implications for serviceability	CB chamber = 0.50 barG Indicated on green/red zoned pressure gauge. When in gauge needle is in red area; switchgear cannot be guaranteed to provide rated characteristics. If has positive pressure then …. 1 set N/O contacts & 1 set N/C contacts.		
Second Alarm Level and details of any associated alarm contacts and details of implications for serviceability.	CB chamber = 0.40 barG Indicated on green/red zoned pressure gauge. When in gauge needle is in red area; switchgear cannot be guaranteed to provide... If has positive pressure then …. 1 set N/O contacts & 1 set N/C contacts.		
Pressure (or density) at, or above which, rated characteristics for use as a Point of Isolation are maintained. Minimum Functional Pressure; I.e. disconnector duty.	a bar G		
Pressure (or density) at or above which, rated characteristics for Breaking Fault Current are maintained. I.e. CB duty.	b bar G		
Pressure (or density) at or above which, rated characteristics for Making/Breaking Normal Load Current and Making Fault Current are maintained. I.e. Switch duty.	c bar G		
Pressure (or density) at or above which, rated characteristics for BIL are maintained.	d bar G		
Pressure (or density) at or above which, rated characteristics, except BIL, are maintained; allowing the units to remain in service, without carrying out switching duties. I.e. Busbar duty.	e bar G		
Under what operational conditions is it safe to top up the gas?			

Appendix 6 - Compliance with ENA TS 41-36 Part 1 Common Clauses

ENATS 41-36 ISSUE 3: SWITCHGEAR FOR SERVICE UP TO 36kV
(CABLE AND OVERHEAD CONDUCTOR CONNECTED)

ANNEX D SELF CERTIFICATION CONFORMANCE DECLARATION SHEETS

ANNEX D1 Common Clauses

PART 1 – COMMON CLAUSES

CLAUSE BY CLAUSE CONFORMANCE WITH ENATS 41-36 ISSUE 3 SWITCHGEAR FOR SERVICE UP TO 36KV (CABLE AND OVERHEAD CONDUCTOR CONNECTED – Part 1, ' COMMON CLAUSES '

Switchgear covered by ENATS 41-36 shall comply with the latest issues of the relevant International and British Standards. ENATS 41-36 is intended to amplify and/or clarify the requirements of those Standards.

This check sheet identifies the clauses in ENATS 41-36 - Part 1 and the clauses of the aforementioned Standards relevant to common specifications for high-voltage switchgear and control gear standards. The manufacturer shall declare conformance or otherwise, clause by clause, using the following levels of conformance declaration codes.

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

Instructions for Completion

- When Cs1 code is entered no remark is necessary
- When any other code is entered the reason for non-conformance shall be entered
- Prefix each remark with the relevant 'IEC' or 'ENATS' as appropriate

NOTE: On the following pages the letter 'R' in the column headed 'Retrofit' indicates where a sub-clause applies

Manufacturer: **Ratings:**

Product Reference:

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

* 'R' indicates where a sub-clause applies to a retrofit circuit breaker

Manufacturer:					Product Reference:				Ratings:
IEC 6227-1, IEC 62271-200					ENATS 41-36				
Clause / Sub-clause		Requirement	Retrofit*	Conformance code	ENATS 41-36 - Part 1 Clause / Sub- clause	Requirement	Retrofit*	Conformance code	Remarks
IEC 62271-1	IEC 62271-200								
1	1	General	R		1.1	General	R		
					1.1.101	Quality assurance schemes	R		
2	2	Normal and special service conditions	R		1.2	Normal and special service conditions	R		
					1.2.1.1	Class minus 5 indoor	R		
					1.2.1.1	Environmental conditions	R		
					1.2.1.2	Class minus 25 outdoor			
					1.2.1.2	Class 10 – ice coating			
					1.2.1.2	Class III – pollution level			
					1.2.1.2	Influence of solar radiation			
3	3	Definitions	R		1.3	Definitions	R		
4	4	Ratings	R		1.4	Ratings	R		
4.1	4.1	Rated voltage	R		1.4.1	Rated voltage	R		
4.2	4.2	Rated insulation level	R		1.4.2	Rated insulation level	R		
					1.4.2.1	Disconnectors (0 bar gauge)	R		
					1.4.2.2.	Provision for cable tests			
4.3	4.3	Rated frequency	R		1.4.3	Rated frequency	R		
4.4	4.4	Rated normal current and temperature rise	R		1.4.4	Rated normal current and temperature rise	R		
			R		1.4.4.1	Rated normal current	R		
4.5	4.5	Rated short-time withstand	R		1.4.5	Rated short-time withstand	R		
	4.5.102	Rated short-time withstand current of the earthing circuit	R		1.4.5.102	Rated short-time withstand current of the earthing circuit	R		
4.6	4.6	Rated peak withstand current	R		1.4.6	Rated peak withstand current	R		
	4.6.102	Rated short-time withstand current of the earthing circuit	R		1.4.6.102	Rated short-time withstand current of the earthing circuit	R		
4.7	4.7	Rated duration of short circuit	R		1.4.7	Rated duration of short circuit	R		

Manufacturer:					Product Reference:				Ratings:
IEC 6227-1, IEC 62271-200					ENATS 41-36				
Clause / Sub-clause		Requirement	Retrofit*	Conformance code	ENATS 41-36 - Part 1 Clause / Sub- clause	Requirement	Retrofit*	Conformance code	Remarks
IEC 62271-1	IEC 62271-200								
	4.7.102	Rated duration of short circuit of the earthing circuit	R		1.4.7.102	Rated duration of short circuit of the earthing circuit	R		
4.8	4.8	Rated supply voltage of closing and opening devices and of auxiliary and control circuits	R		1.4.8	Rated supply voltage of closing and opening devices and of auxiliary and control circuits	R		
4.9	4.9	Rated supply frequency of closing and opening devices and of auxiliary circuits	R		1.4.9	Rated supply frequency of closing and opening devices and of auxiliary circuits	R		
4.10	4.10	Rated pressure of compressed gas supply for insulation and/or operation	R		1.4.10	Rated pressure of compressed gas supply for insulation and/or operation	R		
	4.10.1	Rated filling level (of fluid-filled compartments	R						
	4.101	Ratings of internal arc classification			1.4.101	Ratings of internal arc classification			
	4.101.2	Types of accessibility			1.4.101.2	Types of accessibility Type A; Type C (pole mounted)			
	4.101.3	Classified sides			1.4.101.3	Classified sides F			
	4.101.4	Rated arc fault currents			1.4.101.4	Rated arc fault currents			
	4.101.5	Rated arc fault duration			1.4.101.5	Rated arc fault duration 1s			
	4.102.2	Rated power-frequency cable test voltage			1.4.102.2	Rated power-frequency cable test voltage			
	4.102.3	Rated d.c. cable test voltage			1.4.102.3	Rated d.c. cable test voltage			
					1.5.0	Design requirements	R		
					1.5.0.1	CDM Regs	R		
					1.5.0.1	Min. expected 30 yr. operating life	R		
					1.5.0.2	Functions for devices	R		
					1.5.0.3	Design arrangements	R		

Manufacturer:					Product Reference:				Ratings:
IEC 6227-1, IEC 62271-200					ENATS 41-36				
Clause / Sub-clause		Requirement	Retrofit*	Conformance code	ENATS 41-36 - Part 1 Clause / Sub- clause	Requirement	Retrofit*	Conformance code	Remarks
IEC 62271-1	IEC 62271-200								
					1.5.0.3.1	Open terminal equipment – conductor connected			
					1.5.0.3.2	Ground mounted equipment - cable connected			
					1.5.0.3.2.1	Fixed switching devices			
					1.5.0.3.2.2	Withdrawable switching devices	R		
					1.5.0.4	Requirements for devices	R		
					1.5.0.4.1	Class for mech./elec. endurance	R		
					1.5.0.4.1	No maintenance	R		
					1.5.0.4.1	Associated disconnector	R		
					1.5.0.4.2	Facilities for disconnecting the circuit			
					1.5.0.4.2	Voltage withstand of isolating distance			
					1.5.0.4.2	Padlockable DP disconnector			
					1.5.0.4.3.1	Facility for earthing circuits – short circuit making ability			
					1.5.0.4.3.1 a	Using a fixed CB or switch			
					1.5.0.4.3.1 a	Using an earthing switch			
					1.5.0.4.3.1 a	Using a withdrawable CB	R		
					1.5.0.4.3.1 a & c	Tripping inoperative whilst in earth	R		
					1.5.0.4.3.1	FMEA of kinematic chain	R		
					1.5.0.4.3.2	Facility for earthing busbars			
					1.5.0.4.3.2 a	Using an earthing switch			
					1.5.0.4.3.2 b	Using a fixed CB or switch			
					1.5.0.4.3.2 c	Using a withdrawable CB	R		

Manufacturer:					Product Reference:				Ratings:
IEC 6227-1, IEC 62271-200					ENATS 41-36				
Clause / Sub-clause		Requirement	Retrofit*	Conformance code	ENATS 41-36 - Part 1 Clause / Sub- clause	Requirement	Retrofit*	Conformance code	Remarks
IEC 62271-1	IEC 62271-200								
					1.5.0.4.3.2 a b c	FMEA of kinematic chain	R		
					1.5.0.4.3.2 c	Short circuit CTs	R		
					1.5.0.4.3.2 c	Electrical tripping inoperative	R		
					1.5.0.4.4	Facilities for testing primary circuits and busbars			
					1.5.0.4.5	Facilities for checking and testing			
					1.5.0.4.6	Facility for testing primary circuits – d.c. withstand			
					1.5.0.4.6	Maximum contact resistance			
					1.5.0.4.6	Design of integral test contacts			
					1.5.0.4.6	Test point on mimic			
					1.5.0.4.7	Facilities for checking voltage and phase identification			
					1.5.0.4.8	Facilities for measuring voltage			
					1.5.0.5	Operation of equipment - human factors			
					1.5.0.5.1	Height for operation and inspection	R		
					1.5.0.5.2	Force for operation	R		
					1.5.0.5.3	Direction of movement	R		
					1.5.0.5.4	Location of operation	R		
5.1	5.1	Requirements for liquids	R		1.5.1	Requirements for liquids	R		
					1.5.1	Oil level indication	R		
					1.5.1	Drain plugs, indicators, valves	R		
					1.5.1	Controlled gasket compression	R		
					1.5.1	No communicating bolts	R		

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IEC 6227-1, IEC 62271-200					ENATS 41-36				
Clause / Sub-clause		Requirement	Retrofit*	Conformance code	ENATS 41-36 - Part 1 Clause / Sub- clause	Requirement	Retrofit*	Conformance code	Remarks
IEC 62271-1	IEC 62271-200								
					1.5.1	BS 148	R		
					1.5.1	Bolt strength and access	R		
					1.5.1	Breather design/ position (IP3XDW)	R		
5.2	5.2	Requirements for gases	R		1.5.2	Requirements for gases	R		
					1.5.2	Pressure system	R		
					1.5.2	Gas filling valve; gas filling	R		
					1.5.2	Recycled SF6	R		
					1.5.2	Sealed system label	R		
					1.5.2	Gas identification label	R		
5.3	5.3	Earthing of switchgear and control gear	R		1.5.3	Earthing of switchgear and control gear	R		
					1.5.3	Earthing conductor	R		
					1.5.3	Earthing terminals	R		
					1.5.3	Earthing conductor coupling	R		
					1.5.3	Withdrawable /removable parts earth connection.	R		
					1.5.3	Cable sheath earth connection			
					1.5.3	Specific means for earthing	R		
					1.5.3.101	Frame-earth busbar protection	R		
5.4	5.4	Auxiliary and control equipment	R		1.5.4	Auxiliary and control equipment	R		
					1.5.4	Local/ remote selector			
					1.5.4.1.3	Degrees of protection – LV terminals	R		
					1.5.4.4.4.4	ENATS 50-19	R		
					1.5.4.4.4.4	Identification	R		
					1.5.4.4.5.1	Segregation (>125V); IPXXB	R		
					1.5.4.4.5.1	Interchangeable - identical	R		

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IEC 62271-1	IEC 62271-200								
					1.5.4.4.5.1	Conductor material/ size.	R		
					1.5.4.4.5.1	HV compartment segregation.	R		
					1.5.4.4.5.1	Actuator control/ indication	R		
					1.5.4.4.5.1	Micro switches	R		
					1.5.4.4.5.1	Insulation shrink back	R		
					1.5.4.4.5.2	Terminals/ terminations reliability 50 breaks	R		
					1.5.4.4.5.2	CT terminal blocks – screw clamp with spring (ENATS 50-18 type B)	R		
5.5	5.5	Dependent power operation	R		1.5.5	Dependent power operation	R		
					1.5.5	Indicate movements	R		
					1.5.5	Interlocking schemes	R		
					1.5.5	Indicate equipment position	R		
					1.5.5	Positively driven contacts	R		
					1.5.5	Repeated close attempts	R		
					1.5.5	Movement gap withstand voltage	R		
					1.5.5	Maintenance / slow operation	R		
					1.5.5	Labelled - maintenance	R		
					1.5.5	Operation height/ force	R		
5.6	5.6	Stored energy operation	R		1.5.6	Stored energy operation	R		
					1.5.6	Sub-clause 1.5.5 applicable plus the following	R		
					1.5.6	Main contact movement	R		
					1.5.6	Dedicated handle	R		
					1.5.6	Handle direction indication	R		
					1.5.6	Handle release and stowed	R		
					1.5.6	Motor actuator fitting	R		

Manufacturer:					Product Reference:				Ratings:
IEC 6227-1, IEC 62271-200					ENATS 41-36				
Clause / Sub-clause		Requirement	Retrofit*	Conformance code	ENATS 41-36 - Part 1 Clause / Sub- clause	Requirement	Retrofit*	Conformance code	Remarks
IEC 62271-1	IEC 62271-200								
					1.5.6	Motor actuator retrofitting easily & economically	R		
					1.5.6	Motor actuator disconnection	R		
					1.5.6	Actuator 'in step' (methods a or b)	R		
					1.5.6	Manual charging motor-charge	R		
					1.5.6	Re-charge closing springs	R		
					1.5.6	Spring charge indication	R		
					1.5.6	Information remote display	R		
5.7	5.7	Independent manual operation	R		1.5.7	Manual operation	R		
5.7		Anti-reflex =>3 secs (manual)	R						
					1.5.7	Handles and padlocking accessible from front	R		
					1.5.7	Handle storage facilities	R		
					1.5.7.1	Independent manual operation	R		
					1.5.7.1	Sub-clause 1.5.6 applicable plus the following	R		
					1.5.7.1	Inhibit closing spring charge in closed position	R		
					1.5.7.1	No stored energy from Incomplete operation	R		
					1.5.7.1	Anti-reflex =>3 secs (actuator)	R		
					1.5.7.2	Dependent manual operation. - as 1.5.7.1 plus: Inhibit op handle removal	R		
5.8	5.8	Operation of releases	R		1.5.8	Operation of releases	R		
					1.5.8	Local manual release	R		

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Clause / Sub-clause		Requirement	Retrofit*	Conformance code	ENATS 41-36 - Part 1 Clause / Sub- clause	Requirement	Retrofit*	Conformance code	Remarks
IEC 62271-1	IEC 62271-200								
					1.5.8	Operation outside switchroom	R		
					1.5.8	No movement of spring charge handle.	R		
5.9	5.9	Low and high-pressure interlocking and monitoring devices	R		1.5.9	Low and high-pressure interlocking and monitoring devices	R		
					1.5.9	36kV - interruption: Pressure/ density gauge/ indicator/ switch	R		
					1.5.9	36kV - insulation: Pressure/ density gauge/ indicator/ switch	R		
					1.5.9	Pressure gauge/ indicator for each compartment			
					1.5.9	Temperature compensated	R		
					1.5.9	20°C filling mark	R		
					1.5.9	Indicate green/ red	R		
					1.5.9	Single/ two stage pressure switch	R		
					1.5.9	Remote indication of pressure switch operations	R		
					1.5.9	Temperature fluctuations	R		
					1.5.9	Pole top equipment			
5.10	5.10	Nameplates	R		1.5.10.1	Nameplates	R		
					1.5.10.1	Internal arc test Fig	R		
					1.5.10.1	Filling pressure	R		
					1.5.10.1	Rating for forced ventilated equipment	R		
					1.5.10.101	Labelling	R		

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IEC 6227-1, IEC 62271-200					ENATS 41-36				
Clause / Sub-clause		Requirement	Retrofit*	Conformance code	ENATS 41-36 - Part 1 Clause / Sub- clause	Requirement	Retrofit*	Conformance code	Remarks
IEC 62271-1	IEC 62271-200								
					1.5.10.101.1	Safety signs BS 5499	R		
					1.5.10.101.1	Durable/non-fading	R		
					1.5.10.101.1	Contrast with background	R		
					1.5.10.101.1	In accordance with Table 1.8	R		
					1.5.10.101.1	Symbols to Annex C	R		
					1.5.10.101.1	BS381C or RAL colours	R		
					1.5.10.101.1	Fixed: Mimic to Annex C			
					1.5.10.101.1	Fixed: Pictogram to Annex C3			
					1.5.10.101.1	Letter M to denote motorised			
					1.5.10.101.1	Fixed: VT compartment label			
					1.5.10.101.1	Fixed: VT conns. Not on mimic			
					1.5.10.101.1	Fixed: VT identify disconnector			
					1.5.10.101.1	Fixed: busbar earthing mimic			
					1.5.10.101.1	Weight label			
					1.5.10.101.1	Centre of gravity labels			
					1.5.10.101.1	Motorised device caution label	R		
					1.5.10.101.1	Motorised device information label	R		
					1.5.10.101.1	Not interlocked caution label			
					1.5.10.101.1	Gas filled compartment warning label	R		
					1.5.10.101.2	Phase identification			
					1.5.10.101.3	Circuit labels to Fig 1.10			
					1.5.10.101.3	Additional labels to Fig 1.11	R		
					1.5.10.101.3	Repeat labels			
					1.5.10.101.3	Safely detachable	R		
5.11	5.11	Interlocking devices	R		1.5.11	Interlocking devices and padlocking facilities	R		

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IEC 6227-1, IEC 62271-200					ENATS 41-36				
Clause / Sub-clause		Requirement	Retrofit*	Conformance code	ENATS 41-36 - Part 1 Clause / Sub- clause	Requirement	Retrofit*	Conformance code	Remarks
IEC 62271-1	IEC 62271-200								
					1.5.11	No removal of covers when part of interlock/padlock facility	R		
					1.5.11.101	Interlocking devices	R		
					1.5.11.101.1	General	R		
					1.5.11.101.1	Prevent operations	R		
					1.5.11.101.1	Allow operations	R		
					1.5.11.101.1	Bi-directional interlocking	R		
					1.5.11.101.1	Schemes using latched signals	R		
					1.5.11.101.2	3-position device – interlocks a) to d)	R		
					1.5.11.101.2	Bolted cover if not fully interlocked	R		
					1.5.11.101.3	Test access – 'interlock controlled accessible' type			
					1.5.11.101.3	Test access – interlocks a) to e)			
					1.5.11.102	Padlocking facilities	R		
					1.5.11.102	Size of padlock	R		
					1.5.11.102.1	Safety padlocks – facilities a) to d)	R (c)		
					1.5.11.102.1	Single padlock for electrical and mechanical			
					1.5.11.102.1	Labelling for 2 padlocks			
					1.5.11.102.1	Padlockable interference device			
					1.5.11.102.1	Padlockable DP disconnector			
					1.5.11.102.1	Secure without use of a tool			
					1.5.11.102.1	Electrical/Electro-mechanical 'FMEA'			

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Clause / Sub-clause		Requirement	Retrofit*	Conformance code	ENATS 41-36 - Part 1 Clause / Sub- clause	Requirement	Retrofit*	Conformance code	Remarks
IEC 62271-1	IEC 62271-200								
					1.5.11.102.1	Cannot invalidate padlocking	R		
					1.5.11.102.1	Warning label	R		
					1.5.11.102.2	Operational padlocking			
					1.5.11.102.2	Facilities (a) to (e)			
5.12	5.12	Position indication	R		1.5.12	Position indication			
					1.5.12	Positively driven mechanical	R		
					1.5.12	Output side of mechanism	R		
					1.5.12	One indicator visible	R		
					1.5.12	Inscribed as Table 1.6	R		
					1.5.12	Mimic diagram symbols–Annex C	R		
					1.5.12	Reliable indication for earthing device	R		
					1.5.12	Test of kinematic chain	R		
5.13	5.13	Degrees of protection by enclosures	R		1.5.13	Degrees of protection by enclosures	R		
					1.5.13.1	Hazardous parts / solid foreign objects to Table 1.7	R		
					1.5.13.1	Design to avoid injury	R		
					1.5.13.2	Ingress of water			
					1.5.13.2	IPXXXW			
					1.5.13.2	Protection for outdoor equipment			
					1.5.13.2	Weather proofing test			
					1.5.13.2	IP34D - pole mounted			
					1.5.13.2	Material/ water lodging			
					1.5.13.3	Mechanical impact - indoor	R		
					1.5.13.3	Mechanical impact - outdoor			

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Clause / Sub-clause		Requirement	Retrofit*	Conformance code	ENATS 41-36 - Part 1 Clause / Sub- clause	Requirement	Retrofit*	Conformance code	Remarks
IEC 62271-1	IEC 62271-200								
5.14	5.14	Creepage distances	R		1.5.14	Creepage distances and environmental considerations	R		
					1.5.14	Outdoor - class 3 –IEC 60815			
					1.5.14	Insulating system design	R		
					1.5.14	30 year life	R		
					1.5.14	Condensation/ heaters	R		
					1.5.14	Shrouding in air filled cable box			
5.15	5.15	Gas and vacuum tightness	R		1.5.15	Gas and vacuum tightness	R		
					1.5.15	No gas replenishment in 30 year life expected (closed pressure)	R		
					1.5.15	30 year life expected (sealed pressure)	R		
					1.5.15	Leakage rate =< 0.5% per year	R		
5.16	5.16	Liquid tightness	R		1.5.16	Liquid tightness	R		
5.17	5.17	Flammability	R		1.5.17	Flammability	R		
5.18	5.18	EMC	R		1.5.18	EMC	R		
5.19		X-ray emission	R		1.5.19	X-ray emission	R		
5.20		Corrosion	R		1.5.20	Corrosion	R		
	5.101	Internal fault	R		1.5.101	Internal fault	R		
					1.5.101	Class IAC			
					1.5.101 1.5.101	a) Metal enclosed – class IAC AF Pole mounted – class IAC C			
					1.5.101	b) Air			
					1.5.101	c) Criteria of acceptance			
					1.5.101	d) Test arrangement			
					1.5.101	e) Compartments tested			
					1.5.101	Cable box prospective current			

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Clause / Sub-clause		Requirement	Retrofit*	Conformance code	ENATS 41-36 - Part 1 Clause / Sub- clause	Requirement	Retrofit*	Conformance code	Remarks
IEC 62271-1	IEC 62271-200								
					1.5.101	Inclusion of cables, VTs & CTs			
					1.5.101	Test of retrofit circuit breakers	R		
	5.102	Enclosure			1.5.102	Enclosure	R		
					1.5.102.1	Risk of touch injury	R		
					1.5.102.1	Additional protective measures	R		
					1.5.102.1	General	R		
					1.5.102.1	Support weight of personnel			
					1.5.102.1	Identify areas not safe to stand			
					1.5.102.1	Lifting facilities/ labelled	R		
					1.5.102.1	Integral step (150kg)			
					1.5.102.1	No communicating holes	R		
					1.5.102.2	Covers and doors	R		
					1.5.102.2	Controlled compression gaskets			
					1.5.102.2	No communicating holes	R		
					1.5.102.101	Surface preparation and coatings -> ENATS 98-1	R		
					1.5.102.101	Colour	R		
					1.5.102.102	Foundation arrangements			
					1.5.102.102	Removable threshold			
					1.5.102.102	Cable gland positions			
					1.5.102.102	Floor fixing (M12 bolts)			
					1.5.102.103	Transformer mounting			
					1.5.102.103	Access (fig 16 ENATS 35-1)			
					1.5.102.103	Transformer circuit flange as fig 1.12			
					1.5.102.103	Dimensional limitations a) to g)			
					1.5.102.103	600mm max projection			

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Clause / Sub-clause		Requirement	Retrofit* / Conformance code	ENATS 41-36 - Part 1 Clause / Sub- clause	Requirement	Retrofit*	Conformance code	Remarks
IEC 62271-1	IEC 62271-200							
				1.5.102.103	Adjustable support			
				1.5.102.103	Load distribution			
				1.5.102.103	Assembly instructions			
				1.5.102.104	Heater	R		
				1.5.102.104	Easily accessible	R		
	5.103	Compartments		1.5.103	High voltage compartments			
				1.5.103.1	Service continuity class LSC2 (except RME)			
				1.5.103.1	Prevent interchanging covers			
				1.5.103.1	Interlocked HV compartments			
				1.5.103.1.101	Cable compartments			
				1.5.103.1.101	Separate cable compartment			
				1.5.103.1.101	Cable compartment-ENATS 12-11			
				1.5.103.1.101	Compartment/ termination design - manufacturers			
				1.5.103.1.101	Min of two propriety cable terminations systems			
				1.5.103.1.101	Accommodation / compatibility			
				1.5.103.1.101	Method statement			
				1.5.103.1.101	Cable lug accommodation			
				1.5.103.2	Fluid filled compartments	R		
				1.5.103.2.2	Design for design pressures above 300kPa	R		
				1.5.103.2.2	Solar radiation influences	R		
				1.5.103.2.3	Tightness	R		
				1.5.103.2.4	Pressure relief to be provided	R		
				1.5.103.2.4	No burn-through	R		

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Clause / Sub-clause		Requirement	Retrofit* / Conformance code	ENATS 41-36 - Part 1 Clause / Sub- clause	Requirement	Retrofit*	Conformance code	Remarks
IEC 62271-1	IEC 62271-200							
				1.5.103.2.4	Satisfactory performance in Outdoor environment			
				1.5.103.3	Partitions and shutters	R		
				1.5.103.3.1	Partitions metallic – class PM	R		
				1.5.103.3.1	Shutters metallic - class PM	R		
				1.5.103.3.1	Shutters – degree of protection	R		
				1.5.103.3.1	Individually operated shutters	R		
				1.5.103.3.1	Independently padlockable closed	R		
				1.5.103.3.1	Open/close automatically	R		
				1.5.103.3.1	Provision for retaining open	R		
				1.5.103.3.1	Re-engagement of removable part Restores automatic operation	R		
				1.5.103.3.1	Colour to table 1.6	R		
	5.104	Removable parts	R					
	5.105	Provisions for dielectric tests on cables		1.5.105	Provisions for dielectric tests on cables			
				1.5.201.4	Test access cover – 1.5.102.2	R		
				1.5.201	“EARTH ON” for test access			
				1.5.201	Min. access 60mm dia.			
				1.5.201	Interlock on cable compartment			
				1.5.201	Test access at front			
				1.5.201	Physical indication of test access open (amber lamp for open, white lamp for closed)			
				1.5.201	Single lamp push to test facility			
				1.5.201	“EARTH ON” indication			

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IEC 62271-1	IEC 62271-200								
					1.5.201	No access to compartment containing live HV conductors.			
					1.5.201	Position to avoid water/debris ingress			
					1.5.201	Force on bushings limited			
					1.5.201	Inhibit close of test access with test device inserted			
					1.5.201	Inhibit closing of disconnector or compromise POI with test access open			
					1.5.201	Different fastenings			
					1.5.202	Secured positively in position			
					1.5.202	Test device security a) to c)			
					1.5.202	100 connections/disconnections			
					1.5.202	Test device identification			
					1.5.202	Test device container			
					1.5.203	Busbars - same current rating			
					1.5.203	Extension busbar trunking			
					1.5.203	Standard length			
					1.5.203	Type tests			
					1.5.203	Extension panels			
					1.5.203	Valid technical justifications			
					1.5.203	Routine tests			
					1.5.204	Clearances for overhead conductor connected equipment			
					1.5.204	BS 7354 clearances			
					1.5.204	BS 7354 clearances + 300mm			

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IEC 62271-1	IEC 62271-200								
6	6	Type tests	R		1.6	Type tests	R		
					1.6	Short circuit testing liaison (STL)	R		
					1.6	Dielectric test in most unfavourable arrangement	R		
					1.6	Criteria to pass lightning impulse	R		
					1.6	Partial discharge (ENATS 41-18 levels)	R		
					1.6	Interlock checks using production handle – most onerous in-service condition. Kinematic chain test			
					1.6	Mech. or elec. endurance tests	R		
					1.6	Bus transfer tests			
					1.6	Busbar adapter tests			
					1.6.2	Dielectric (arrangement representative of cable termination systems in 1.5.103.1.101)			
					1.6.2	Dielectric test in most unfavourable arrangement			
					1.6.3	d.c. test	R		
					1.6.3	p.f. test	R		
					1.6.3	All valid position combinations	R		
					1.6.3	Temperature rise test	R		
					1.6.3	Contact resistance test	R		
					1.6.201	Influence of solar radiation			
					1.6.201	No damage or impair performance			
					1.6.202	No lubrication	R		

Manufacturer:					Product Reference:				Ratings:
IEC 6227-1, IEC 62271-200					ENATS 41-36				
Clause / Sub-clause		Requirement	Retrofit*	Conformance code	ENATS 41-36 - Part 1 Clause / Sub- clause	Requirement	Retrofit*	Conformance code	Remarks
IEC 62271-1	IEC 62271-200								
					1.6.202	Mechanical operations test	R		
					1.6.202	Test of emergency operating handle	R		
					1.6.202	Operating force test	R		
						Operations test – operations in wrong direction	R		
					1.6.203	Aging tests	R		
7	7	Routine tests	R		1.7	Routine tests	R		
					1.7	Partial discharge (ENATS 41-18 Levels	R		
8	8	Guide to the selection of switchgear and controlgear	R		1.8	Guide to the selection of switchgear and controlgear	R		
9	9	Information to be given with enquiries, tenders and orders	R		1.9	Information to be given with enquiries, tenders and orders	R		
10	10	Rules for Transport, Storage, installation, operation and maintenance	R		1.10	Rules for Transport, Storage, installation, operation, maintenance and disposal	R		
					1.10	Safe methods for extending and/or replacement			
					1.10	Extension of corresponding types			
					1.10	Non projection of end cover			
					1.10	Stable during storage/transport	R		
					1.10	Adequate lifting facilities			
					1.10	Label showing lifting method			
					1.10	Prevent water ingress	R		
					1.10	Temporary labels	R		
					1.10	Protect exposed bushings	R		
					1.10	Maintenance design (BS 6626)	R		

Manufacturer:					Product Reference:				Ratings:
IEC 6227-1, IEC 62271-200					ENATS 41-36				
Clause / Sub-clause		Requirement	Retrofit*	Conformance code	ENATS 41-36 - Part 1 Clause / Sub- clause	Requirement	Retrofit*	Conformance code	Remarks
IEC 62271-1	IEC 62271-200								
					1.10	Handbook contents + storage	R		
					1.10	Storage for handbook	R		
					1.10	Separate operations handbook	R		
					1.10	Handling/disposal of SF6	R		
					1.10	Method statements	R		
					1.10	End of life statement	R		
11	11	Safety	R		1.11	Safety	R		
12		Influence of the product on the environment	R		1.12	Influence of the product on the environment	R		
					1.12	Means to recover gas	R		

Appendix 7 - Compliance with ENA TS 41-36 Part 2 Metal Enclosed Circuit Breakers

ENATS 41-36 ISSUE 3: SWITCHGEAR FOR SERVICE UP TO 36kV
(CABLE AND OVERHEAD CONDUCTOR CONNECTED)

ANNEX D SELF CERTIFICATION CONFORMANCE DECLARATION SHEETS AND TYPE TEST DECLARATION TABLES

ANNEX D2 Metal Enclosed Circuit-Breakers

PART 2 – METAL ENCLOSED CIRCUIT-BREAKERS

CLAUSE BY CLAUSE CONFORMANCE WITH ENATS 41-36 ISSUE 3 SWITCHGEAR FOR SERVICE UP TO 36KV (CABLE AND OVERHEAD CONDUCTOR CONNECTED – Part 2, ' METAL ENCLOSED CIRCUIT-BREAKERS '

Switchgear covered by ENATS 41-36 shall comply with the latest issues of the relevant International and British Standards. ENATS 41-36 is intended to amplify and/or clarify the requirements of those Standards.

This check sheet identifies the clauses in ENATS 41-36 - Part 2 and the clauses of the aforementioned Standards relevant to metal enclosed circuit-breakers. The manufacturer shall declare conformance or otherwise, clause by clause, using the following levels of conformance declaration codes.

This conformance declaration is to be completed in addition to the ENATS 41-36 – ANNEX D1– Self Certification Conformance Declaration Part 1, 'Common Clauses'.

For associated protection, instrumentation and metering equipment ENATS 41-36 – ANNEX D10 - Self Certification Conformance Declaration Part 10 is to be completed.

Conformance Declaration Codes
N/A = Clause is not applicable/appropriate to the product
Cs1 = The product/ test conforms fully with the requirements of this clause
Cs2 = The product/ test conforms partially with the requirements of this clause
Cs3 = The product/ test does not conform to the requirements of this clause
Cs4 = The product does not currently conform to the requirements of this clause, but the manufacturer proposes to modify and test the product in order to conform / test not performed, but alternative evidence/ technical case offered

Instructions for Completion

- When Cs1 code is entered no remark is necessary
- When any other code is entered the reason for non-conformance shall be entered
- Prefix each remark with the relevant 'IEC' or 'ENATS' as appropriate

NOTE: On the following pages the letter 'R' in the column headed 'Retrofit' indicates where a sub-clause applies

Manufacturer: **Ratings:**

Product Reference :

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

* 'R' indicates where a sub-clause applies to a retrofit circuit breaker

Manufacturer:				Product Reference:				Ratings:
IEC62271-100				ENATS 41-36 - Part 2				
Clause / Sub-clause	Requirement	Retrofit*	Conformance code	Clause / Sub- clause	Requirement	Retrofit*	Conformance code	Remarks
1	General	R		2.1	General	R		
2	Normal and special service conditions	R		2.2	Service conditions	R		
3	Terms and definitions	R		2.3	Terms and definitions	R		
4	Ratings	R		2.4	Ratings	R		
4.101	Rated short-circuit breaking current	R		2.4.101	Rated short-circuit breaking current	R		
4.101.1	AC component of the rated short-circuit breaking current	R		2.4.101	Time constant (45ms)	R		
4.101.2	DC time constant of the rated short-circuit breaking current	R		2.4.101	Time constant (120ms)	R		
				2.4.101	Rated at both values of TC	R		
				2.4.101	Minimum values of rated short-circuit breaking current	R		
4.102	Transient recovery voltage related to the rated short-circuit breaking current	R		2.4.102	Transient recovery voltage related to the rated short-circuit breaking current	R		
4.102.1	Representation of TRV waves	R						
4.102.2	Representation of TRV	R						

Manufacturer:				Product Reference:				Ratings:
IEC62271-100				ENATS 41-36 - Part 2				
Clause / Sub-clause	Requirement	Retrofit*	Conformance code	Clause / Sub- clause	Requirement	Retrofit*	Conformance code	Remarks
4.102.3	Standard values of TRV related to the rated short-circuit breaking current	R		2.4.102	Table 2 of IEC 62271-100 Table 25 of IEC 62271-100	R		
4.103	Rated short-circuit making current	R		2.4.103	Rated short-circuit making current	R		
4.104	Rated operating sequence	R		2.4.104	Rated operating sequence	R		
				2.4.104	O-0.3s-CO-15s-CO intended for auto-reclose	R		
				2.4.104	O-3min-CO-3min-CO not intended for auto-reclose	R		
4.105	Characteristics for short-line faults			2.4.105	Characteristics for short-line faults	R		
4.106	Rated out-of-phase making and breaking current	R		2.4.106	Rated out-of-phase making and breaking current	R		
4.107	Rated capacitive switching currents	R		2.4.107	Rated capacitive switching currents	R		
				2.4.107	Class C2	R		
4.107.1	Rated line-charging breaking current	R		2.4.107	Line-charging breaking current – Table 2.3 ENATS 41-36	R		
4.107.2	Rated cable-charging breaking current	R		2.4.107	Cable-charging breaking current - Table 2.3 ENATS 41-36	R		
				2.4.107	Cap. switching – single 2 phase earth faults	R		

Manufacturer:				Product Reference:				Ratings:
IEC62271-100				ENATS 41-36 - Part 2				
Clause / Sub-clause	Requirement	Retrofit*	Conformance code	Clause / Sub- clause	Requirement	Retrofit*	Conformance code	Remarks
4.108	Inductive load switching	R		2.4.107	Single capacitor bank breaking	R		
4.109	Rated time quantities	R		2.4.109	Rated time quantities	R		
4.109.1	Rated break time	R		2.4.109	Rated break time	R		
4.110	Number of mechanical operations	R		2.4.110	Number of mechanical operations	R		
				2.4.110	Class M2 (10000 Ops) (5000 Ops)	R		
				2.4.110	Class M1 (2000 Ops)	R		
4.111	Classification of circuit-breakers as a function of electrical endurance	R		2.4.111	Classification of circuit-breakers as a function of electrical endurance	R		
				2.4.111	Class E2	R		
				2.4.111	Auto-reclosing duty	R		
				2.4.111	Pole mounted auto-reclosing circuit breakers			
				2.4.111	Non-auto-reclosing	R		
5.1	Requirements for liquids in circuit-breakers	R		2.5.1	Requirements for liquids in circuit-breakers	R		
				2.5.1	Correct tank mounting.	R		
				2.5.1	Inhibit service/earth position without tank.	R		
				2.5.1	Correct contact/arc device positions	R		

Manufacturer:				Product Reference:				Ratings:
IEC62271-100				ENATS 41-36 - Part 2				
Clause / Sub-clause	Requirement	Retrofit*	Conformance code	Clause / Sub- clause	Requirement	Retrofit*	Conformance code	Remarks
5.2	Requirements for gasses in circuit-breakers	R		2.5.2	Requirements for gasses	R		
5.3	Earthing of circuit-breakers	R		2.5.3	Earthing of circuit-breakers	R		
5.4	Auxiliary equipment	R		2.5.4	Auxiliary equipment	R		
				2.5.4	Isolating features	R		
				2.5.4	Secondary connections	R		
				2.5.4	Secondary circuit coupling for maintenance	R		
				2.5.4	Contact location/screening	R		
				2.5.4	Distribution transformer protection	R		
5.5	Dependent power closing	R		2.5.5	Dependent power closing	R		
5.6	Stored energy closing	R		2.5.6	Stored energy closing	R		
5.7	Independent manual operation	R		2.5.7	Independent manual	R		
5.8	Operation of releases	R		2.5.8	Operation of releases	R		
				2.5.8	Inhibit continuous open/close	R		
				2.5.8	Padlockable device - RED	R		
				2.5.8	Closing facility - BLACK	R		
				2.5.8	Push buttons RED/BLACK	R		
				2.5.8	Remote operation socket	R		

Manufacturer:				Product Reference:				Ratings:
IEC62271-100				ENATS 41-36 - Part 2				
Clause / Sub-clause	Requirement	Retrofit*	Conformance code	Clause / Sub- clause	Requirement	Retrofit*	Conformance code	Remarks
5.9	Low and high-pressure interlocking devices	R		2.5.9	Low and high-pressure interlocking and monitoring devices	R		
5.10	Nameplates	R		2.5.10.1	Nameplates	R		
				2.5.10.1	Supplementary (a to d)	R		
				2.5.10.101	Labelling	R		
				2.5.10.101	GIS motorised disconnectors – label a) to c)			
				2.5.10.101	Caution label			
5.11	Interlocking devices	R		2.5.11	Interlocking / padlocking	R		
				2.5.11.101	Interlocking devices	R		
				2.5.11.101	Permissive interlock			
				2.5.11.101	Close circuit breaker			
				2.5.11.101	Key is trapped/released			
				2.5.11.101	Proof of earth interlock			
				2.5.11.101	Wall mounted notice			
				2.5.11.101.1	Circuit-breakers (except open-terminal)			
				2.5.11.101.1	Interlocking a 3-position switch			
				2.5.11.101.1	Inhibit close of disconnector with test access open			

Manufacturer:				Product Reference:				Ratings:
IEC62271-100				ENATS 41-36 - Part 2				
Clause / Sub-clause	Requirement	Retrofit*	Conformance code	Clause / Sub- clause	Requirement	Retrofit*	Conformance code	Remarks
				2.5.11.101.1	Prevent opening of circuit breaker unless disconnector is fully open or closed			
				2.5.11.101.1	No CB trip on attempted isolation / disconnector selection			
				2.5.11.101.1	No main circuit access	R		
				2.5.11.101.1	Safety shutters remain closed	R		
				2.5.11.101.1	Earthing device located	R		
				2.5.11.101.1	Inhibit disconnector closure			
				2.5.11.101.1	Move before BB earthing device			
				2.5.11.101.1	Inhibit circuit breaker trip	R		
				2.5.11.101.2	Key interlock for earthing switches			
				2.5.11.102.1	Secure POI a) or b)			
				2.5.11.102.1	Stall type test			
5.12	Position indication	R		5.12	Position indication	R		
5.13	Degrees of protection by enclosures	R		2.5.13	Degrees of protection	R		
5.14	Creepage distances	R		2.5.14	Creepage distances	R		
5.15	Gas and vacuum tightness	R		2.5.15	Gas and vacuum tightness	R		
5.16	Liquid tightness	R		2.5.16	Liquid tightness	R		
5.17	Fire hazard (flammability)	R		2.5.17	Flammability	R		

Manufacturer:				Product Reference:				Ratings:
IEC62271-100				ENATS 41-36 - Part 2				
Clause / Sub-clause	Requirement	Retrofit*	Conformance code	Clause / Sub- clause	Requirement	Retrofit*	Conformance code	Remarks
5.18	Electromagnetic compatibility	R		2.5.18	Electromagnetic compatibility	R		
5.19	X-ray emission	R						
5.20	Corrosion	R						
5.101	Requirements for simultaneity of poles during single closing and single opening operations.	R						
5.102	General requirement for operation	R						
5.103	Pressure limits of fluids for operation	R						
5.104	Vent outlets	R						
				2.5.201	Test facilities			
				2.5.202	Open-terminal circuit-breaker bushings			
				2.5.202	Prismatic gauge			
				2.5.202	Terminals (ENATS 41-16) BS 7354 design			
				2.5.203	Outdoor open-terminal circuit-breaker control facilities			
				2.5.203	Operation facilities			
				2.5.203	Selector switch			
				2.5.203	Close/open control switch			

Manufacturer:				Product Reference:				Ratings:
IEC62271-100				ENATS 41-36 - Part 2				
Clause / Sub-clause	Requirement	Retrofit*	Conformance code	Clause / Sub- clause	Requirement	Retrofit*	Conformance code	Remarks
				2.5.204	Outdoor open-terminal circuit-breaker mech. cabinet			
				2.5.204	Integral padlockable cabinet			
				2.5.204	Accessible from ground level			
				2.5.204	Comply with ENATS 50-18			
				2.5.204	Fitted with heater(s)			
				2.5.204	ON/OFF indicator			
				2.5.204	At front, one inscription visible			
				2.5.204	Inside and outside labels			
				2.5.204	Multicore terminal blocks			
				2.5.204	Power socket +RCD			
				2.5.205	Transformer mounting			
6	Type tests	R		2.6	Type Tests - Table 2.4	R		
				2.6	Test values	R		
				2.6	E2 for main switching device	R		
				2.6	Stop/stall test of interference device	R		
				2.6	Magnetic actuator breaking current	R		
6.1	General	R						
6.2	Dielectric tests	R						
6.3	Radio interference voltage (r.i.v.) tests	R						

Manufacturer:				Product Reference:				Ratings:
IEC62271-100				ENATS 41-36 - Part 2				
Clause / Sub-clause	Requirement	Retrofit*	Conformance code	Clause / Sub- clause	Requirement	Retrofit*	Conformance code	Remarks
6.4	Measurement of resistance of the main circuit	R						
6.5	Temperature-rise tests	R						
6.6	Short-time withstand current and peak withstand current tests	R						
6.7	Verification of the degree of protection	R						
6.8	Tightness test	R						
6.9	Electromagnetic compatibility (EMC) tests	R						
6.10	Additional tests on auxiliary and control circuits	R						
6.101	Mechanical and environmental tests	R						
6.102	Miscellaneous provisions for making and breaking tests	R						
6.103	Test circuits for short-circuit making and breaking tests	R						

Manufacturer:				Product Reference:				Ratings:
IEC62271-100				ENATS 41-36 - Part 2				
Clause / Sub-clause	Requirement	Retrofit*	Conformance code	Clause / Sub- clause	Requirement	Retrofit*	Conformance code	Remarks
6.104	Short-circuit test quantities	R						
6.105	Short-circuit test procedure	R						
6.106	Basic short-circuit test duties	R						
6.107	Critical current tests	R						
6.108	Single phase and double earth fault tests	R						
6.109	Short-line fault tests	R						
6.110	Out of phase making and breaking tests	R						
6.111	Capacitive current switching tests	R		2.6	Capacitive voltage factor 1.7	R		
6.112	Special requirements for making and breaking tests on class E2 circuit-breakers.	R						
7	Routine Tests	R		2.7	Routine Tests	R		
7.1	Dielectric test on the main circuit	R						
7.2	Dielectric test on auxiliary and control circuits	R						

Manufacturer:				Product Reference:				Ratings:
IEC62271-100				ENATS 41-36 - Part 2				
Clause / Sub-clause	Requirement	Retrofit*	Conformance code	Clause / Sub- clause	Requirement	Retrofit*	Conformance code	Remarks
7.3	Measurement of resistance of the main circuit	R						
7.4	Tightness test	R						
7.5	Design and visual checks	R						
7.101	Mechanical operating tests	R						
8	Guidance to the selection of circuit-breakers for service	R		2.8	Guide to the selection of circuit-breakers for service	R		
9	Information to be given with enquiries, tenders and orders	R		2.9	Information to be given with enquiries, tenders and orders- schedule 2.1	R		
10	Rules for transport, storage, Installation and maintenance	R		2.10	Rules for transport, storage, installation and maintenance	R		
				2.10	Contact erosion	R		
				2.10	Operation counter	R		
11	Safety	R		2.11	Safety	R		
12	Influence of the product on the environment	R		2.12	Influence of the product on the environment	R		

Appendix 8 - Compliance with ENA TS 41-36 Part 2 – Declaration D2

ANNEX D2 Metal Enclosed Circuit-Breakers

PART 2 – METAL ENCLOSED CIRCUIT-BREAKERS -TYPE TEST CONFORMANCE DECLARATION D2

Type tests for feeder or bus-section circuit-breaker including enclosure, disconnector, VT, CTs and earthing switch as appropriate.

Manufacturer: **Ratings**

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
- When test report also covers another rating insert 'Relies on test of ???A unit' in the Remarks column

Tests not requested may be shown as 'Additional tests' at the bottom of the table

Type test reports table based on ENATS 41-36 Table 2.3
*See bottom of table for conformance declaration codes
** I = Independent; M= Manufacturer; ENA= Energy Networks Association

Manufacturer:	Product Reference:	Ratings:

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
	Test Requirement	**Specification & Standards**	**Rated value**	**Test required Y or N**	**Conformance ***	**Test value**	**Date of test (Date of rep.)**	**Test station Report / Cert No.**	**Witness I, M or ENA ****	**Remarks**
1.	Dielectric. – with VT connections Partial discharge ≤ 10pC For cable connected circuit-breakers, tests to be representative of two cable termination systems, in addition to switchgear manufacturer's own system if any.	IEC62271-1. Sub-clause 6.2, IEC62271-100. Sub-clause 6.2, IEC62271-200. Sub-clause 6.2. Tables 1.1a and 1.1b of ENATS 41-36. IEC 62271-200. Sub-clause 6.2.9 and annex BB, ENATS 41-18 Sub-clauses 1.5.103.1 and 1.6 of ENATS 41- 36.								
2.	" - Busbars	"								
3.	Voltage withstand - isolating gap (provision for dielectric tests on cables).	IEC62271-200. Sub-clause 5.105. and 6.2.101 Sub-clause 1.4.2.2 and 1.6.3 of ENATS 41-36.								
4.	d.c. withstand test on test connections/ devices, including all parts of main circuit which cannot be disconnected from the test connections. X-ray emission test on open vacuum interrupters (for d.c. test with earthing switch closed) a.c. test on test connections/ devices	IEC62271-200. Sub-clause 5.105. Sub-clause 1.5.201.1 and 1.6.3 of ENATS 41-36. IEC 62271-1. Sub-clause 6.11 Sub-clause 1.5.19 of ENATS 41-36. Sub-clause 1.6.3 of ENATS 41-36.								
5.	Insulation level - electrically stressed gap due to possible movement of earthing switch contacts	Sub-clause 1.5.6 of ENATS 41-36								
6.	Measurement of the resistance of main circuit – Panel	IEC 62271-1. Sub-clause 6.4, IEC62271-100. Sub-clause 6.4, IEC62271-200. Sub-clause 6.4. Sub-clause 1.6.3 of ENATS 41-36.								
7.	" -Busbars	"								

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
	Test Requirement	**Specification & Standards**	**Rated value**	**Test required Y or N**	**Conformance ***	**Test value**	**Date of test (Date of rep.)**	**Test station Report / Cert No.**	**Witness I, M or ENA ****	**Remarks**
8.	Temperature Rise - panel Influence of solar radiation (outdoor only)	IEC 62271-1. Sub-clause 6.5, IEC62271-100. Sub-clause 6.5, IEC62271-200. Sub-clause 6.5 Sub-clause 1.6.201 of ENATS 41-36.								
9.	" - Busbars	"								
10	Short-time withstand current and peak withstand current tests - Circuit-breaker and Enclosure.(3sec short time)	IEC62271-1.Sub-clause 6.6, IEC62271-100. Sub-clause 6.6, IEC62271-200. Sub-clause 6.6.								
11	" -Busbars	"								
12.	" - Earthing switch	IEC62271-1.Sub-clause 6.6, IEC62271-102. Sub-clause 6.6, IEC62271-200. Sub-clause 6.5.								
13.	" - Single phase test of earth circuit (sub-clause 1.4.5 of ENATS 41-36)	IEC62271-1.Sub-clause 6.6, IEC62271-100. Sub-clause 6.6, IEC62271-200. Sub-clause 6.6.								
14.	Verification of protection. - Verification of IP coding (Indoor – IP4X min) (indoor – operational fascia IP3X) (Enclosure doors open IPXXB) (Partitions of HV compartment IP3XD) (Mechanism IP2X) Weatherproofing for outdoor equipment (IP4XDW min) - Verification of IK coding Mechanical impact (indoor – IK07 (2J), outdoor – IK10 (20J))	IEC62271-1.Sub-clause 6.7, IEC62271-100. Sub-clause 6.7, IEC62271-200. Sub-clause 6.7. IEC 529 Sub-clause 1.5.13.1 of ENATS 41-36. Sub-clause 1.5.13.2 of ENATS 41-36. IEC 62271-1Sub-clause 5.13.3. Sub-clause 1.5.13.3 of ENATS 41-36.								
15.	Tightness test	IEC62271-1.Sub-clause 6.8, IEC62271-100. Sub-clause 6.8, IEC62271-200. Sub-clause 6.8.								
16.	EMC tests	IEC62271-1.Sub-clause 6.9, IEC62271-100. Sub-clause 6.9,								

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
	Test Requirement	**Specification & Standards**	**Rated value**	**Test required Y or N**	**Conformance ***	**Test value**	**Date of test (Date of rep.)**	**Test station Report / Cert No.**	**Witness I, M or ENA ****	**Remarks**
17.	Mechanical operations - circuit-breaker. a) Auto-reclosing circuit-breaker - min 5000 ops, preferably class M2 - 10,000 operating cycles, auto-reclosing sequences without lubrication - Table 8, IEC 62271-100) b) Non-auto-reclosing circuit-breaker - class M1 - 2000 operating cycles without lubrication 10% specified operating cycles with manual (production) handle 50 manual operating cycles – emergency handle If used as earthing device - mechanical strength of kinematic chain between movable contacts and the position indicating device Force for manual operations (normal and emergency)	IEC62271-100. Sub-clause 6.101.2. IEC62271-200. Sub-clause 6.102 Sub-clause 2.4.110 of ENATS 41-36 Sub-clause 1.6 of ENATS 41-36 Sub-clause 1.6.202 of ENATS 41-36 IEC62271-102. Sub-clause 6.105 and Annex A. Sub-clause 1.6 of ENATS 41-36 Sub-clause 1.6.202 of ENATS 41-36								
18.	Mechanical operations - earthing switch and disconnector - Manual - 1000 operating cycles without lubrication Disconnectors operating in conjunction with circuit -breaker – 2000, (5000) or 10,000 operating cycles depending on class of circuit-breaker without lubrication 10% specified operating cycles with manual (production) handle 50 manual operating cycles – emergency handle	IEC62271-102. Sub-clause 6.102 IEC62271-200. Sub-clause 6.102 Sub-clause 1.6 of ENATS 41-36 Sub-clause 1.6.202 of ENATS 41-36								

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
	Test Requirement	**Specification & Standards**	**Rated value**	**Test required Y or N**	**Conformance ***	**Test value**	**Date of test (Date of rep.)**	**Test station Report / Cert No.**	**Witness I, M or ENA ****	**Remarks**
	Mechanical strength of kinematic chain between movable contacts and the position indicating device. Force for manual operations (normal and emergency) Test of interference device (inhibit elec. ops)	IEC62271-102. Sub-clause 6.105 and Annex A. Sub-clause 1.6 of ENATS 41-36 Sub-clause 1.6.202 of ENATS 41-36 Sub-clause 2.6 of ENATS 41-36								
19.	Mechanical operations- switching devices and removable parts- 50ops - interlocks (mechanical and electro-mechanical - 50 ops (150% normal force against interlock–dependent manual) - 10 ops (in wrong direction)	IEC62271-200. Sub-clause 6.102 Sub-clause 1.6.1 of ENATS 41-36 Sub-clause 1.6.202 of ENATS 41-36								
20.	Low temperature tests	IEC 62271-100. Sub-clause 6.101.3								
21.	High temperature tests - subject to design	IEC 62271-100. Sub-clause 6.101.3. Clause 1.6 of ENATS 41-36								
22.	Short-circuit making and breaking tests - circuit-breaker class E2 Auto-reclosing circuit-breaker - tested for duty as specified in IEC62271-100. Table 33, list 1. Non-auto-reclosing circuit-breaker - tested in accordance with sub-clauses 6.112.1 and 6.106 of IEC 62271-100	IEC62271-100. Sub-clauses 6.102 to 6.106, and 6.112 IEC62271-200. Sub-clause 6.101 Sub-clause 2.4.111 of ENATS 41-36								
23.	Short-circuit making tests - earthing switch (class E2 - Test duty 5 of IEC 62271-103 sub-clause 6.101.1.2 - 5 making ops). Earthing function performed by main switching device	IEC62271-102. Sub-clause 6.101, IEC62271-103. Sub-clause 6.101.1.2 Sub-clause 2.6 of ENATS 41-36								
24	Out of phase making and breaking current	IEC62271-100. Sub-clause 6.110, Sub-clause 2.4.106 of ENATS 41-36								

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
	Test Requirement	**Specification & Standards**	**Rated value**	**Test required Y or N**	**Conformance ***	**Test value**	**Date of test (Date of rep.)**	**Test station Report / Cert No.**	**Witness I, M or ENA ****	**Remarks**
25.	Line-charging breaking current tests	IEC62271-100. Sub-clause 6.111 Sub-clause 2.4.107 of ENATS 41-36								
26.	Cable-charging breaking current tests	IEC62271-100. Sub-clause 6.111 Sub-clause 2.4.107 of ENATS 41-36								
27.	Single and double earth fault tests.	IEC62271-100. Sub-clause 6.108 Sub-clause 2.4.108 and 2.6 of ENATS 41-36								
28.	Bus transfer current tests (double BB only)	Sub-clause 1.6.1 of ENATS 41-36								
29.	Internal arc -- C B chamber, C T chamber, BB chamber, cable box. (36kV cable boxes using separable connectors – min 5kA).	IEC62271-200. Sub-clause 6.106. and Annex A Sub-clause 1.5.101 of ENATS 41-36								
30.	Gas-filled compartment – pressure withstand	IEC62271-200. Sub-clause 6.103								
31.	Voltage presence indicating system (VPIS)	IEC 61958. Clause 6								
32.	Tests on auxiliary and control circuits/ equipment									
33.	- Dielectric	IEC 62271-1 Sub-clause 6.10.6								
34.	- Measurement of resistance	IEC 62271-1 Sub-clause 6.4.2								
35.	- Temperature rise	IEC 62271-1 Sub-clause 6.5.5								
36.	- Functional	IEC 62271-1 Sub-clause 6.10.2								
37.	- Electrical continuity or earthed metallic parts	IEC 62271-1 Sub-clause 6.10.3								
38.	- Verification of operational characteristics (Auxiliary contacts)	IEC 62271-1 Sub-clause 6.10.4								
39.	- Environmental (cold; dry heat; damp heat, steady state; cyclic humidity; Vibration response & seismic; Final condition check)	IEC 62271-1 Sub-clause 6.10.5								
40.	Ageing test for outdoor composite bushings and insulation materials – minimum of 5,000 hours duration	Annex C of IEC 61109								
41	Finish	Performance to ENATS 98-1								

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
	Test Requirement	**Specification & Standards**	**Rated value**	**Test required Y or N**	**Conformance ***	**Test value**	**Date of test (Date of rep.)**	**Test station Report / Cert No.**	**Witness I, M or ENA ****	**Remarks**
42	Process Control	ISO 9001 ER G79								Subject to surveillance checks at 36 monthly intervals to maintain validity of the Notice

*** 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 9 – Compliance with ENA TS 41-43

CLAUSE BY CLAUSE CONFORMANCE WITH ENA TS 41-43

This check sheet identifies the clauses in ENA TS 41-43 and relevant national standards. The supplier/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 is fully conforming 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 supplier/manufacturer proposes to modify and test the product in order to comply

Instructions for completion

When Cs1 code is entered then details of how conformance is achieved shall be provided in the Remarks column. This shall include details of type tests, where appropriate/applicable.

When any other code is entered, an explanation of the reason for non-conformance shall be included.

Supplier/Manufacturer:		
Product Reference:		
Name:	Signature:	Date:

Clause	Requirement	ENA TS 41-43 code	BS EN Code	Remarks
1	Scope [BS EN 62271-1]			
2	Normative references			
3	Terms and definitions [BS EN 62271-1]			
4	Normal and special service conditions [BS EN 62271-1]			
4.1.2	Indoor switchgear and controlgear [BS EN 62271-1]			
4.1.3	Outdoor switchgear and controlgear [BS EN 62271-1]			
5	Ratings [BS EN 62271-1]			
5.3	Rated insulation level (U_p & U_d) [BS EN 62271-1]			
5.4	Rated frequency (f_r) [BS EN 62271-1]			
5.5	Rated continuous current (I_r) [BS EN 62271-1]			
5.6	Rated short-time withstand current (I_k) [BS EN 62271-1]			
5.6.201	Rated short-time withstand current of the earthing circuit (I_{ke})			
5.7	Rated peak withstand current (I_p) [BS EN 62271-1]			
5.8	Rated duration of short-circuit (t_k) [BS EN 62271-1]			
5.8.201	Rated duration of short-circuit of the earthing circuit (t_{ke})			
5.9	Rated supply voltage of auxiliary and control circuits (U_a) [BS EN 62271-1]			
5.10	Rated supply frequency of auxiliary and control circuits [BS EN 62271-1]			
5.11	Rated pressure of compressed gas supply for controlled pressure systems [BS EN 62271-1]			
5.300	Circuit-breaker requirements [BS EN 62271-100]			

Clause	Requirement	ENA TS 41-43 code	BS EN Code	Remarks
5.300.100	General circuit-breaker requirements			
5.300.101	Rated short-circuit breaking current (I_{sc}) [BS EN 62271-100]			
5.300.102	Transient recovery voltage related to the rated short-circuit breaking current [BS EN 62271-100]			
5.300.103	Rated short-circuit making current (I_{ma}) [BS EN 62271-100]			
5.300.104	Rated operating sequence [BS EN 62271-100]			
5.300.105	Characteristics for short-line faults [BS EN 62271-100]			
5.300.106	Rated out-of-phase making and breaking currents [BS EN 62271-100]			
5.300.107	Rated capacitive switching currents [BS EN 62271-100]			
5.300.108	Inductive load switching [BS EN 62271-100]			
5.300.110	Number of mechanical operations [BS EN 62271-100]			
5.300.111	Classification of circuit-breakers as a function of electrical endurance [BS EN 62271-100]			
6	Design and construction			
6.0	Design and construction requirements			
6.1	Requirements for liquids in switchgear and controlgear [BS EN 62271-1]			

Clause	Requirement	ENA TS 41-43 code	BS EN Code	Remarks
6.3	Earthing of switchgear and controlgear [BS EN 62271-1]			
6.4	Auxiliary and control equipment and circuits [BS EN 62271-1]			
6.4.201	Wiring			
6.4.300.4	Auxiliary circuit-breaker requirements for removable types [BS EN 62271-100]			
6.5	Dependent power operation [BS EN 62271-1]			
6.6	Stored energy operation [BS EN 62271-1]			
6.8	Manually operated actuators [BS EN 62271-1]			
6.9	Operation of releases [BS EN 62271-1]			
6.9.300	Operation of releases – circuit-breaker [BS EN 62271-100]			
6.11	Nameplates [BS EN 62271-1]			
6.11.201	Labelling			
6.11.201.1	General			
6.11.201.2	Circuit labels			
6.12	Locking devices [BS EN 62271-1]			
6.12.201	Interlocking devices			
6.12.201.1	General			

Clause	Requirement	ENA TS 41-43 code	BS EN Code	Remarks
6.12.201.	3-position device			
6.12.202	Padlocking facilities			
6.12.202.1	Safety padlocking			
6.12.202.2	Operational padlocking			
6.13	Position indication [BS EN 62271-1]			
6.14	Degrees of protection provided by enclosures [BS EN 62271-1]			
6.14.1	General [BS EN 62271-1]			
6.14.2	Protection of persons against access to hazardous parts and protection of the equipment against ingress of solid foreign objects (IP coding) [BS EN 62271-1]			
6.14.4	Protection of equipment against mechanical impact under normal service conditions (IK coding) [BS EN 62271-1]			
6.20	X-ray emission [BS EN 62271-1]			
6.101	Internal arc fault [BS EN 62271-200]			
6.102	Enclosure [BS EN 62271-200]			
6.102.1	General [BS EN 62271-200]			
6.102.2	Covers and doors [BS EN 62271-200]			
6.102.2.201	Surface preparation and coating			

Clause	Requirement	ENA TS 41-43 code	BS EN Code	Remarks
6.102.2.202	Heater			
6.102.3	Ventilating openings, vent outlets [BS EN 62271-200]			
6.103	High voltage compartments [BS EN 62271-200]			
6.103.3	Partitions and shutters [BS EN 62271-200]			
7	Type tests [BS EN 62271-1]			
7.2	Dielectric tests [BS EN 62271-1] (including tests on 2 cable systems)			Declare cable systems tested:-
7.11	X-radiation test procedures for vacuum interrupters [BS EN 62271-1]			
7.101	Verification of making and breaking capacities [BS EN 62271-200]			
7.102	Mechanical operation tests [BS EN 62271-200]			
7.102.0	General mechanical operation tests			
7.102.2	Mechanical operation type test for interlocks [BS EN 62271-200]			
7.300	Circuit-breaker requirements [BS EN 62271-100]			
7.300.111	Capacitive switching type tests [BS EN 62271-100]			
8	Routine tests [BS EN 62271-1]			
8.101	Partial discharge measurement [BS EN 62271-200]			
8.300.101	Circuit-breaker mechanical operating tests routine test [BS EN 62271-100]			

Clause	Requirement	ENA TS 41-43 code	BS EN Code	Remarks
11	Transport, storage, installation, operating instructions and maintenance [BS EN 62271-1]			
11.2	Conditions during transport, storage and installation [BS EN 62271-1]			
11.5	Maintenance [BS EN 62271-1]			
11.201	Replacement & disposal			
12	Safety [BS EN 62271-1]			
12.1	General safety			
12.101	Procedures [BS EN 62271-200]			
12.102	Internal arc aspects [BS EN 62271-200]			
Annex A (informative)	Explanatory notes			
A.1	Test devices			
A.2	Small inductive breaking current			
A.2.1	Circuit-breakers			
A.2.1.1	General			
A.2.1.2	Transformer magnetising current for circuit-breakers with rated voltage (U_r) of 100kV and above			
A.2.1.3	Transformer magnetising current for circuit-breakers with rated voltage (U_r) below 100kV			
A.3	Mimic diagrams and symbols			
Annex B	Self-Certification Conformance Declaration			
Annex C	Symbols for mimic diagrams			

Clause	Requirement	ENA TS 41-43 code	BS EN Code	Remarks
C.1	Position indication			
C.1.1	Position indication for circuit-breaker, disconnector and earthing switch			
C.1.2	Position indication for switch-disconnector / earthing switch			
C.1.3	Position indication of earthing switch when integral earth star point is removed for testing purposes			
C.2	Graphical symbols for equipment			
C.2.1	Primary test point			
C.2.2	Capacitively coupled test point			
C.3	Typical pictogram for busbar earthing			
Annex D	Standard labels			