Electricity Distribution

nationalgrid

Company Directive

ENGINEERING SPECIFICATION
EE SPEC : 13/4

12kV and 36 kV Pole Mounted Circuit Breakers
and
12kV and 36kV Pole Mounted Enclosed Switch Disconnectors

Summary:

This specification details the requirements for 12kV and 36kV pole mounted circuit breakers and pole mounted enclosed switch disconnectors for installation and use on the Western Power Distribution (WPD) 11kV and 33kV electricity distribution networks.

Author: **Stephen Hennell / Anthony Smith**

Implementation Date: **July 2020**

Approved by

Carl Ketley-Lowe

Engineering Policy Manager

Date: **16th July 2020**

Target Staff Group	**Anyone involved with the addition, or alteration of, the 11/33kV overhead network inclusive of but not limited to Planners, Project Engineers, Technicians, EDS, PSD and Purchasing**
Impact of Change	**Green – No impact on current working practices**
Planned Assurance checks	**Continuous product conformity checks at Plant Workshops**

All references to Western Power Distribution or WPD must be read as National Grid Electricity Distribution or NGED

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IMPLEMENTATION PLAN

Introduction

Revised version /3 of this EESPEC provided for a general update in specification prior to use for future tender and contracts.

Version /4 corrects some minor technical errors and adds clarity on a few points.

Main Changes

Changes to recognise the possibility of gas filled equipment using other than SF6.

Details required of manufacturer tests and performance of equipment in the event of an internal arcing failure.

Auto-recloser protection requirements expanded.

Supplier declaration Schedules added.

Impact of Changes

Any new contract will be based on this updated specification.

This specification is not retrospective for current contracts.

Implementation Actions

Procurement Team to use this specification for future Tenders.

Implementation Timetable

On issue this specification may be used as required for new tenders and contracts.

Equipment ordered from the current Framework Contract shall continue to meet EESPEC 13/2.

REVISION HISTORY

Document Revision & Review Table		
Date	**Comments**	**Author**
July 2020	• Minor technical corrections to kA rating • Additional clarity of a few points	Stephen Hennell
April 2020	• Changes to recognise the possibility of gas filled equipment using other than SF6. • Pole mounted auto-reclosers to be non-gas with vacuum interrupters. • Loss of phase detection, indication and trip requirements included. • Requirements for internal arcing performance added. • Clarification on mounting and provision of surge arrestors. • Auto-recloser protection requirements expanded. • Supplier declaration sheets added.	Stephen Hennell / Anthony Smith
September 2014	• Specification generally updated to reflect revisions to EATS 41-36.	Bob Lang

CONTENTS

1.0 SCOPE

This specification details the requirements for 12kV and 36kV pole mounted circuit breakers and pole mounted enclosed switch disconnectors for installation and use on the Western Power Distribution (WPD) 11kV and 33kV electricity distribution networks.

Circuit-breakers are required to be suitable to provide auto-reclosing facilities and any associated control cubicle shall provide this facility.

Equipment is to have a rated voltage of up to 36kV three-phase 50Hz for use on systems with the neutral point earthed solidly, or through a resistor or reactor of low impedance, or through an arc suppression coil.

Pole mounted voltage transformers used to provide secondary supplies to the equipment are not included in this specification and are covered in separate WPD EESPEC documents.

2.0 INTRODUCTION

All equipment supplied under this specification shall meet the relevant technical requirements of Energy Networks Association (ENA) Technical Specification 41-36, Issue 3, 2012 “Switchgear for service up to 36kV Cable and Overhead Conductor Connected”.

Additional clauses contained within this specification are in addition to the requirements of the standards outlined in ENA Technical Specification 41-36. Where there is any conflict between ENA Technical Specification 41-36 and this document, then this specification shall take precedence.

The requirements of this document are not intended to restrict or inhibit the introduction of new forms of switchgear, provided that such designs comply with those requirements in respect of safety, security and operation which are generally understood by manufacturers and United Kingdom users.

WPD has distinct preference for pole mounted circuit breakers to be non-gas containing equipment utilising vacuum interrupters.

WPD recognises that the technology is evolving for pole mounted enclosed switches and that SF6 gas may be the only reliable and proven option currently available, however consideration will be given to any non-SF6 equipment offered.
Equipment shall be of a “non-oil” type.

3.0 SCHEDULE OF EQUIPMENT

This specification covers pole mounted circuit breakers and pole mounted enclosed switch disconnectors. Ideally the equipment offered will have ENA Notice of Conformity against ENATS 41-36 (Issue 3), or be in the process of being assessed.

Any control and protection cabinet offered shall have been included in the ENA Assessment process. In addition any control and protection cabinet will need to be assessed by WPD before acceptance for use on the WPD distribution network.

The technical requirements and ratings for pole mounted circuit breakers are given in Schedule 1 of this specification. Circuit breakers shall be suitable and tested/certified for auto-reclosing duty.

The technical requirements and ratings for pole mounted enclosed switch disconnectors are given in Schedule 2 of this specification.

Ideally the equipment offered will have a current ENA (TS 41-36) Assessment Certificate or be undergoing ENA Assessment, however if that is not the case then the following self-certification conformance declaration sheets from ENA TS 41-36 shall be completed:

- Annexes D1, D2, D7 and D10 – Self Certification Conformance Declaration Sheets and Type Test Declaration Tables of ENA TS 41-36
- *[Note: These Annexes shall be made available by WPD on request.]*

These self-certification conformance declaration sheets shall be fully completed and returned to WPD at the time of tender. A separate set shall be supplied for <u>each</u> type/model of switchgear offered.

Supplier declarations as in Schedule 3 shall be provided for <u>each</u> type/model of switchgear offered at time of tender.

Any other non-conformity with the requirements of this WPD specification shall also be stated at the time of tender.

4.0 QUALITY ASSURANCE

Quality assurance shall be in accordance with ISO 9000 standards.

Details of failure analysis studies for the products being offered shall be included with the tender.

5.0 GUARANTEE

The supplier of the plant / equipment covered by this specification shall provide a guarantee for that equipment.

The guarantee period that the supplier warrants will be a minimum of five (5) years from the date of delivery to WPD of the relevant plant / equipment.

Note this requirement applies equally to equipment purchased directly by WPD as well as any plant / equipment to be adopted by WPD and purchased/provided by Independent Connection Providers.

6.0 TRAINING

Current versions of the operational and maintenance manuals relevant to the equipment to be supplied shall be provided at the start of contract.

If deemed necessary by WPD then the manufacturer (or their UK supplier or agent) shall provide suitable training on installation and operational procedures with the first units supplied.

7.0 COMMUNICATION MEDIUM

Control signals, indications and alarms are relayed from/to the WPD SCADA system using WPD owned and operated licenced/unlicensed radio.

8.0 PADLOCKING

Wherever padlocking facilities are provided, provision shall be made for a padlock with 38mm square body and with a 7mm diameter shackle having a clear inside width of 20mm and an inside length of 16mm to 30mm. The holes provided for the shackle shall not be less than 8mm diameter.

9.0 LIVE LINE INSTALLATION

Manufacturers shall state what special requirements, if any, apply to erection of the equipment supplied, by live line techniques e.g. sequence of making main connections, earthing, battery, switch on, etc.

10.0 CURRENT TRANSFORMERS

Switchgear equipped with current transformers shall be provided with means of shorting the secondary connections, located in the control / communication cabinet. When the umbilical is unplugged (from either end) any CTs fitted shall have their secondary's automatically shorted to prevent dangerous and damaging high voltages.

11.0 CONTROL CABINET

11.1 The control cabinet must be suitable for mounting mid or down pole (clause 7.1.2 of ENATS 41-36 refers). The umbilical shall be 7m long and be suitable for coiling up and attaching to the pole for when it is mounted mid pole.

11.2 To prevent the need for two control cabinets, the control cabinet supplied shall be large enough to house the radio equipment (supplied by others). A minimum space of 300mm (width) x 200mm (depth) x 100mm (height) shall be provided.

11.3 A 12Vdc regulated supply at 2A shall be provided for the radio/outstation. This shall not be provided from a tapping off the battery. The radio will earth the negative of this supply.

11.4 The control cabinet shall be vented and provided with a thermostatically controlled heater fed from the 110Vac supply to prevent condensation within the cabinet.

11.5 The 'degree of protection by enclosures' rating for the control cabinet shall be the same as for the pole mounted enclosed switchgear as detailed in clause 1.5.13 of ENATS 41-36.

11.6 External connections to the control cabinet shall preferably be on the base of the box and preferably recessed, but with sufficient access to easily make of the cables. The following connections are needed:-

a) External supply to the control cabinet shall be 110Vac and via a gland.

b) A 16mm diameter hole shall be provided to mount an N type bulkhead aerial fitting.

c) The umbilical cable to the switch. This umbilical shall be fitted with a plug and socket arrangement on both ends and must be secured to prevent removal by vandals.

12.0 INSULATING AND/OR INTERRUPTING GAS PRESSURE

When an insulating and/or interrupting gas medium is used then as an alternative to a continuously visible gas pressure gauge, the gas pressure (or density) shall be measurable from the control cabinet when requested without breaking the integrity of the gas filled chamber.

A visual indication on the device shall clearly show when the gas pressure is below the minimum functional pressure for the safe operation of the device.

13.0 MATERIAL

The material used for the construction of the tank of a pole mounted circuit breaker, pole mounted enclosed switch and pole mounted control cubicle shall be inherently corrosion resistant. Stainless steel is the WPD preferred option for fabricated enclosures.

Tenderers shall demonstrate that what is offered has suitable properties so as to provide a maintenance free operating life with the environmental conditions that can be experienced within WPD at coastal and near coastal locations.

14.0 BATTERY

Any rechargeable battery supplied (Clause 7.1.4 of ENATS 41-36) shall have a programmable automatic load test carried out periodically which will include disconnecting the charging supply and applying a known load for a known time and measuring the voltage drop across the battery.

It is preferred that only one battery is used for all functions e.g. radio, protective relay and power closing.

Detail shall be provided in the supplier declaration (3a or 3b) as to the capacity (Ah) of the battery and the maximum time this will support the device in the event of a prolonged loss of the power to the charger.

Detail shall also be provided in the supplier declaration as to what means is included in the equipment to prevent deep discharge damage to the battery in the event of a prolonged loss of the power to the charger.

15.0 PARTICULAR REQUIREMENTS FOR POLE MOUNTED CIRCUIT BREAKERS

15.1 SCADA Requirements

Pole mounted circuit breakers shall be provided with the following SCADA functions.

Operation:

- Open, Close
- Auto reclose In/Out
- Protection Enable/Disable
- SEF protection Enable/Disable
- Instantaneous Protection Enable/Disable

Indication:

- Local/Supervisory
- Open/Closed
- Auto Reclose In/Out
- Protection In/Out
- SEF Protection In/Out

- Instantaneous Protection In/Out
- Successful reclosure completed
- SEF Trip
- Voltage monitoring on both sides of the unit
- Loss of phase
- Loss of phase trip
- Low gas pressure alarm
- Low battery alarm
- Battery test failure

The system shall be capable of responding to an Integrity Poll on demand which will check the availability of the controls (Binary output status reporting) and the status of the indications.

15.2 Loss of Source Voltage

As outlined in ENATS 41-36(issue 3) clause 7.2.4 the circuit breaker shall be "latched to close" when supplies are restored, if the unit is left in a closed position.

15.3 Protection

15.3.1 Auto-reclosers shall be provided with a WPD assessed multi-characteristic protection and control relay that satisfies the requirements of ENATS 48-5, ENATS 48-6-6 and ENATS 48-6-5, as applicable, and includes the following functions and characteristics:

- Instantaneous phase fault protection (3 elements)
- Instantaneous earth fault protection (1 element)
- IDMTL phase fault protection with IEC standard Inverse, very inverse, extremely inverse and definite time characteristics (3 elements)
- IDMTL earth fault protection with IEC standard Inverse, very inverse, extremely inverse and definite time characteristics (1 element)
- Sensitive earth fault (SEF) protection (1 element)
- Loss of phase protection and loss of phase alarm functions
- Auto-reclose configurable for up to 4 shots
- Auto-sectionalising settings configurable for 1, 2 and 3 passages of fault current
- Sequence coordination (for connecting auto-reclosers and automatic sectionalisers in series)
- Configurable dead times and reclaim/reset times
- Optional voltage check facility (may be configured to block reclosure if volts are present on both sides of the recloser)
- 1 shot to lock out setting options
- Cold load pick up setting options

15.3.2 A list of WPD assessed relays is included in EE SPEC: 98. Alternative relays may be submitted to WPD for assessment.

15.3.3 Instantaneous and IDMTL / Definite Time phase fault and earth fault protection and the SEF protection shall be adjustable and independent from each other. It shall be possible for the instantaneous earth fault protection to be set with a lower pick-up current than the IDMT earth fault pick up current. Configurable minimum trip/response time settings shall be provided for both phase fault and earth fault elements.

15.3.4 The minimum range of settings shall be:

- Instantaneous Phase Fault = 50 to 960A
- IDMT Earth Fault = 30 to 480A
- IDMTL Phase Fault = 50 to 960A
- Instantaneous Earth Fault = 30 to 480A
- Sensitive Earth Fault = 4 to 48A

15.3.5 With auto reclose sequence selected out (i.e. selection of "one trip to lockout") it must be possible to set overcurrent and earth fault protection to instantaneous and SEF protection to a delayed operation.

15.3.6 A control to lock the auto recloser in the closed state shall be provided.

15.3.7 Auto recloser dead time settings shall be selectable from at least 1 to 30 seconds.

15.3.8 Reclaim times shall be selectable from at least 5 to 30 seconds.

15.3.9 Loss of phase tripping and loss of phase alarm facilities shall be capable of being switched in and out via discrete tele-control functions (e.g. loss of phase tripping in/out and loss of phase alarm in/out) and capable of being switched in/out by the local operator.

15.4 DNP 3 Protocol

15.4.1 In addition to the telecontrol methods detailed in ENATS 41-36 Clause 7.1.6 the facility to use DNP3 protocol (minimum Level 2 device) via an RS 232 serial port shall be provided.

16.0 PARTICULAR REQUIREMENTS FOR POLE MOUNTED ENCLOSED SWITCH DISCONNECTORS

16.1 SCADA Requirements

Pole mounted enclosed switches shall be provided with the following SCADA functions:-

Operation:

- Open, Close

Indication:

- Local / Supervisory
- Open, Closed
- Voltage monitoring on both sides of the unit
- Loss of phase
- Fault Passage Indicator operated
- Low gas pressure alarm
- Low battery alarm
- Battery test failure

16.2 It shall be possible to physically render pole mounted enclosed switch disconnectors into an inoperative state when open. This shall be achievable from ground level by the use of WPD standard insulated operating rods.

16.3 The means of rendering the pole mounted enclosed switch disconnector inoperative shall be achieved by mechanical interference in the device operating mechanism, and shall make the operation of the device by electrical actuation or physical operation of the normal manual means of operation not possible.

16.4 Preferably the means of rendering a pole mounted switch disconnector inoperative, as above, shall be physically separate from the normal manual operating lever/s.

16.5 There shall be clear visual indication on the means of rendering the device inoperative that it is in the “locked open” state.

17.0 ALARMS, STATUSES AND CONTROLS

Where the protection and control cubicle or the equipment has accessible contacts to provide alarms, statuses and controls then these shall be provided as volt free contacts.

18.0 PERFORMANCE IN THE EVENT OF INTERNAL ARCING FAILURE

Suppliers shall provide details on how the enclosure of a gas filled pole mounted circuit breaker and pole mounted switch disconnector performs in the event of an internal arcing failure so as to prevent or reduce the potential for any injury to an operator or the public in the vicinity of the device.

Ideally equipment will be able to demonstrate compliance with the requirements of IEC 62271-200 Annex AA and be Internal Arc Classified (IAC) Accessibility Type C.

Where the equipment has a higher rated short-circuit withstand current or short-circuit breaking current than the tested IAC value, then the supplier shall provide detail of both values in the Supplier Declaration.

19.0 SURGE ARRESTORS

Equipment shall be provided with mounting brackets such that Approved WPD specification surge arrestors can be connected to the bushings on both sides of the device.

Additional mounting steelwork separate to the device is not a WPD preferred option as WPD prefer the unit to be capable of being installed utilising live line techniques as a "single and complete" unit.

Surge arrestors will be provided and installed by others unless agreed in writing at the time of tender.

20.0 TENDER INFORMATION

When tendering the following schedules of this WPD specification apply:

Pole mounted circuit breakers	12kV	Schedules 1a and 1b
	36kV	Schedules 1a and 1c

Pole mounted enclosed switch disconnectors	12kV	Schedules 2a and 2b
	36kV	Schedules 2a and 2c

21.0 INFORMATION TO BE PROVIDED AT TIME OF TENDER

The manufacturer shall complete and submit with their tender completed Schedules 3a or 3b as appropriate for each device offered.

They shall also complete a comparison version of the other schedules showing their offer for <u>each</u> device offered against the WPD requested values.

In following additional items shall be provided by the manufacturer at time of tender:-

a) Outline drawing of unit and control cabinet.
b) Details of pole mounting and earthing arrangements, including mountings for surge arresters.
c) Details of current counting arrangements.
d) A copy of the Operation and Maintenance manual including details of protection and control, and recommended maintenance intervals.
e) Type of operating mechanism.
f) Facilities for sampling and refilling any gas filled chambers.
g) List of recommended, priced spares.
h) Numbers of permitted operations at various fault levels before maintenance is required.
i) Materials and surface coating systems, including surface preparation, coating system and dry film thickness.
j) Surface coating type tests.

k) Electrical type tests.

l) The delay from receiving a signal to open or close at the control box (via DNP3 unlicensed/licenced radio, supplied by others) to the switch actually opening or closing.

m) The delay from the switch opening or closing to the open/closed status being available at the control box for further relay via DNP3 unlicensed/licenced radio.

n) The capacity and type of battery/batteries, together with an estimate of the standby time available if AC supplies were lost.

o) Any non-conformity with this specification.

Schedule 1a - Type tests required for pole mounted circuit-breakers with auto-reclosing duty

Test Requirement	Specifications and Standards
Dielectric. Partial discharge. ≤ 10pC	IEC 62271-1. Sub-clause 6.2, IEC 62271-100. Sub-clause 6.2, IEC 62271-200. Sub-clause 6.2. Tables 1a and 1b of this specification. IEC 62271-200. Sub-clause 6.2.9 and annex BB, ENATS 41-18 Sub-clause 7.1.1 of this specification
Measurement of the resistance of main circuit.	IEC 62271-1. Sub-clause 6.4, IEC 62271-100. Sub-clause 6.4, IEC 62271-200. Sub-clause 6.4
Temperature Rise.	IEC 62271-1. Sub-clause 6.5, IEC 62271-100. Sub-clause 6.5, IEC 62271-200. Sub-clause 6.5
Short-time withstand current and peak withstand current tests -	IEC 62271-1.Sub-clause 6.6, IEC 62271-100. Sub-clause 6.6, IEC 62271-200. Sub-clause 6.6.
Verification of protection- Minimum of IP44D for control box & IP34 for pole top mounted equipment Mechanical impact. (outdoor – IK10 (20J)).	IEC 62271-1.Sub-clause 6.7, IEC 62271-100. Sub-clause 6.7, IEC 62271-200. Sub-clause 6.7. IEC 60529 Sub-clause 1.5.13 of this specification.
Tightness test.	IEC 62271-1.Sub-clause 6.8, IEC 62271-100. Sub-clause 6.8, IEC 62271-200. Sub-clause 6.8.
EMC tests.	IEC 62271-1.Sub-clause 6.9, IEC 62271-100. Sub-clause 6.9.
Mechanical operations - Circuit-breaker and interlocks. a) Auto-reclosing circuit-breaker - class M2 - 10,000 operating cycles, auto-reclosing sequences - Table 8, IEC 62271-100). 50 operating cycles with manual handle If disconnector incorporated - interlocks (mechanical - 50 ops).	IEC 62271-100. Sub-clause 6.101.2.4, IEC 62271-200. Sub-clause 6.102. Sub-clause 1.6 of this specification
If disconnector incorporated -mechanical operations - Disconnectors operating in conjunction with circuit-breaker - 10,000 operating cycles. 50 operating cycles with manual handle Mechanical strength of kinematic chain between movable contacts and the position indicating device.	IEC 62271-102. Sub-clause 6.102. IEC 62271-200. Sub-clause 6.102. Sub-clause 1.6 of this specification IEC 62271-102. Sub-clause 6.105 and Annex A.
Low temperature tests.	IEC 62271-100. Sub-clause 6.101.3.
High temperature tests-subject to design.	IEC 62271-100. Sub-clause 6.101.3, Clause 1.6 of this specification.
Operation under severe ice conditions (10mm thickness).	IEC 62271-100. Sub-clause 6.101.5. IEC 62271-102. Sub-clause 6.103.
Short-circuit making and breaking tests.	IEC 62271-111 Sub-clauses 6.3, 6.4 [ANSI / IEEE C37.60 - Table 4 - line 6 (12kV), line 9 (24kV), line 10 (36kV)].
Cable-charging breaking current tests.	IEC 62271-100. Sub-clause 6.111.
Line-charging breaking current tests.	IEC 62271-100. Sub-clause 6.111.
Simulated surge arrestor operation	Sub-clause 6.13.2 of IEC 62271-111 [ANSI / IEEE C37.60]
Internal Arc -	IEC62271-200.Sub-clause 6.106 and Annex A. Sub-clause 1.5.101 of this specification.
Gas-filled Compartment. Pressure Withstand.	IEC 62271-200. Sub-clause 6.103.
Ageing test for outdoor composite bushings and insulation materials – minimum of 5,000 hours duration	IEC 61109 Sub-clause
Operation at extremes of voltage of auxiliary and control circuits specified in sub-clause 1.4.8	
Finish.	Performance to ENATS 98-1.
Process Control.	ISO 9001.

Schedule 1b - WPD REQUIREMENTS -: 12kV Pole Mounted Circuit Breaker

Table of technical requirements and ratings for pole-mounted auto reclosing circuit-breaker for use on WPD 11kV distribution network and based on ENATS 41-36 Issue 3.

Information	Sub-clause of ENATS 41-36 Issue 3	WPD requirement
Particulars of system		
Voltage kV		11
Frequency Hz		50
Number of phases		3
Neutral earthing		LER, ASC or Solid
Circuit-breaker characteristics		
Number of poles		3
Class	1.2	Outdoor
Equipped with disconnector Yes/No	7.2.1	No
Mounting arrangements a) Pole-top, b) Mid pole, c) Down poles	7.1.2	b) Mid Pole
Auxiliary power supply	7.1.4	110Vac
Rated voltage (U_r) 7.2kV/12kV, 24kV, 36kV	1.4.1	12kV
Rated insulation level (lightning impulse withstand voltage) (U_p) 75kV, 95kV, 125kV, 170kV	1.4.2	125kV
Rated frequency (f_r)	1.4.3	50Hz
Rated normal current (I_r) 400, 630A, 800A,	1.4.4	630A
Rated short-time withstand current (I_k) 12.5kA / 16kA / 20kA	1.4.5	≥12.5kA
Rated duration of short circuit (t_k)	1.4.7	3sec
Rated supply voltage of closing and opening devices and auxiliary and control circuits (U_a) 24V, 30V, 48V, 110V d.c, 110V a.c. a) Closing and Tripping b) Indication c) Control	1.4.8	24Vdc
Rated supply frequency of closing and opening and of auxiliary circuits d.c. or 50Hz	1.4.9	dc
Rated short-circuit breaking current (I_{sc}) - Equal to rated short-time withstand current	2.4.101	45ms or 120ms Time constant
Rated short-circuit making current (I_p)	2.4.103	2.5 times rated short-circuit breaking current
Rated operating sequence	2.4.104	Supplier to declare
Rated capacitive switching currents (Class C1) (I_c) - Rated cable-charge breaking current		≥10A
Rated capacitive switching currents (Class C1) (I_l) - Rated line-charging breaking current		≥2A
Classification of mechanical operations	2.4.110	Class M2-10000ops
Gas monitoring a) Pressure / density gauge / indicator b) Single stage pressure switch c) Two stage pressure switch d) Other monitoring device	1.5.9	c) Two stage pressure switch Alarm Lock out
Mechanism type	2.5.5 to 2.5.7	Stored energy or solenoid
Insulation medium		Solid
Arc extinction medium		Vacuum
Colour of paint		Dark Admiralty Grey or Colour agreed at tender
Additional information		

Schedule 1c - WPD REQUIREMENTS -: 36kV Pole Mounted Circuit Breaker

Table of technical requirements and ratings for pole-mounted auto reclosing circuit-breaker for use on WPD 33kV distribution network and based on ENATS 41-36 Issue 3.

Information	Sub-clause of ENATS 41-36 Issue 3	WPD requirement
Particulars of system		
Voltage kV		33
Frequency Hz		50
Number of phases		3
Neutral earthing		LER, ASC or Solid
Circuit-breaker characteristics		
Number of poles		3
Class	1.2	Outdoor
Equipped with disconnector Yes/No	7.2.1	No
Mounting arrangements a) Pole-top, b) Mid pole, c) Down poles	7.1.2	b) Mid Pole
Auxiliary power supply	7.1.4	110Vac
Rated voltage (U_r) 7.2kV/12kV, 24kV, 36kV	1.4.1	36kV
Rated insulation level (lightning impulse withstand voltage) 75kV, 95kV,125kV, 170kV	1.4.2	170kV
Rated frequency (f_r)	1.4.3	50Hz
Rated normal current (I_r) 400, 630A, 800A,	1.4.4	800A
Rated short-time withstand current (I_k) 12.5kA / 16kA / 20kA	1.4.5	≥12.5kA
Rated duration of short circuit (t_k)	1.4.7	3sec
Rated supply voltage of closing and opening devices and auxiliary and control circuits (U_a) 24V, 30V, 48V, 110V d.c, 110V a.c. a) Closing and Tripping b) Indication c) Control	1.4.8	24Vdc
Rated supply frequency of closing and opening and of auxiliary circuits d.c. or 50Hz	1.4.9	dc
Rated short-circuit breaking current (I_{sc}) - Equal to rated short-time withstand current	2.4.101	45ms or 120ms Time constant
Rated short-circuit making current (I_p)	2.4.103	2.5 times rated short-circuit breaking current
Rated operating sequence	2.4.104	Supplier to declare
Rated capacitive switching currents (Class C1) (I_c) - Rated cable-charge breaking current		≥25A
Rated capacitive switching currents (Class C1) (I_l) - Rated line-charging breaking current		≥5A
Classification of mechanical operations	2.4.110	Class M2-10000ops
Gas monitoring a) Pressure / density gauge / indicator b) Single stage pressure switch c) Two stage pressure switch d) Other monitoring device	1.5.9	b) Two stage pressure switch Alarm Lock out
Mechanism type	2.5.5 to 2.5.7	Stored energy or solenoid
Insulation medium		Solid
Arc extinction medium		Vacuum
Colour of paint		Dark Admiralty Grey or Colour agreed at tender
Additional information		

Schedule 2a - Type tests for pole mounted enclosed switches and switch-disconnectors

Test Requirement	Specifications and Standards
Dielectric. Partial discharge. ≤ 10pC	IEC 62271-1. Sub-clause 6.2, IEC 62271-103. Sub-clause 6.2, IEC 62271-200. Sub-clause 6.2. IEC 62271-102. Sub-clause 6.2 Tables 1a and 1b of this specification. Sub-clause 7.1.1 of this specification IEC 62271-200. Sub-clause 6.2.9 and Annex BB ENATS 41-18
Insulation level - electrically stressed gap due to possible movement of earthing switch contacts.	Sub-clause 1.5.6 of this specification
Measurement of the resistance of main circuit.	IEC 62271-1. Sub-clause 6.4, IEC 62271-103. Sub-clause 6.4, IEC 62271-200. Sub-clause 6.4
Temperature Rise.	IEC 62271-1. Sub-clause 6.5, IEC 62271-103. Sub-clause 6.5, IEC 62271-200. Sub-clause 6.5
Short-time withstand current and peak withstand current tests.	IEC 62271-1.Sub-clause 6.6, IEC 62271-103. Sub-clause 6.6, IEC 62271-200. Sub-clause 6.6.
Verification of protection- Minimum of IP44D for control box & IP34 for pole top mounted equipment Mechanical impact. (Outdoor – IK10 (20J)).	IEC 62271-1.Sub-clause 6.7, IEC 62271-103. Sub-clause 6.7, IEC 62271-200. Sub-clause 6.7. IEC 60529 Sub-clause 1.5.13 of this specification.
Tightness test	IEC 62271-1.Sub-clause 6.8, IEC 62271-103. Sub-clause 6.8, IEC 62271-200. Sub-clause 6.8.
EMC tests	IEC 62271-1.Sub-clause 6.9, IEC 62271-10362271-103. Sub-clause 6.9,
Mechanical operations - (Class M2 General purpose switch - 5,000 operations). 50 operating cycles with manual handle Including mechanical strength of kinematic chain between moveable contacts and position indicating device. If earthing switch incorporated - interlocks (mechanical -50 ops).	IEC 62271-103. Sub-clause 6.102, IEC 62271-200. Sub-clause 6.102 Sub-clause 1.6 of this specification IEC 62271-102. Sub-clause 6.105 and Annex A
If earthing switch incorporated -Mechanical operations - Earthing switch. 50 operating cycles with manual handle (Including mechanical strength of kinematic chain between movable contacts and the position indicating device).	IEC 62271-102. Sub-clause 6.102 IEC 62271-200. Sub-clause 6.102 Sub-clause 1.6 of this specification IEC 62271-102. Sub-clause 6.105 and Annex A
Low temperature tests.	IEC 62271-100. Sub-clause 6.101.3
High temperature tests-subject to design.	IEC 62271-100. Sub-clause 6.101.3, Clause 1.6 of this specification
Operation under severe ice conditions (10mm thickness).	IEC 62271-103. Sub-clause 6.103. IEC 62271-102. Sub-clause 6.103
Short-circuit making and breaking tests (Switch class E3) For 7.2kV, 12kV, 24kV switch test duty 5 = 5 operations. For 36kV switch test duty 5 = 5 operations.	IEC 62271-103. Sub-clauses 6.101.1, (TD_{load}, TD_{loop}, TD_{cc}, TD_{lc}, & TD_{ma},, Table 3) IEC 62271-200. Sub-clause 6.101 Sub-clause 7.3.1 of this specification
If earthing switch incorporated - Short-circuit making tests - Earthing switch - class E2. Test duty 5 of IEC 62271-103 sub-clause 6.101.10 - 5 making operations.	IEC 62271-102. Sub-clause 6.101, IEC 62271-103. Sub-clause 6.101.1.2 Sub-clause 7.3.1 of this specification
Cable-charging breaking current tests.	IEC 62271-103. Sub-clause 6.101.7.3
Line-charging breaking current tests.	IEC 62271-103. Sub-clause 6.101.7.3
Simulated surge arrestor operation	Sub-clause 6.13.2 of IEC 62271-111 [ANSI / IEEE C37.60]
Internal Arc --	IEC 62271-200. Sub-clause 6.106 and Annex A Sub-clause 1.5.101 of this specification
Gas-filled Compartment. Pressure Withstand.	IEC 62271-200. Sub-clause 6.103
Ageing test for outdoor composite bushings and insulation materials – minimum of 5,000 hours duration	IEC 61109 Sub-clause
Operation at extremes of voltage of auxiliary and control circuits specified in sub-clause 1.4.8	
Finish.	Performance to ENATS 98-1
Process Control.	ISO 9001

Schedule 2b - WPD REQUIREMENTS -: 12kV Pole Mounted Enclosed Switch Disconnector

Table of technical requirements and ratings for pole-mounted enclosed switch disconnector for use on WPD 11kV distribution network and based on ENATS 41-36 Issue 3.

Information	Sub-clause of ENATS 41-36 Issue 3	WPD requirement
Particulars of system		
Voltage kV		11
Frequency Hz		50
Number of phases		3
Neutral earthing		LER, ASC or Solid
Switch characteristics		
Number of poles		3
Class	7.3.1	Class E3, TD5=10 operations Class M1, 1000 mechanical operations.
Outdoor	1.2	
Equipped with earthing switch Yes/No	7.3.1	No
Mounting arrangements a) Pole-top, b) Mid pole, c) Down poles	7.1.2	Mid Pole
Auxiliary power supply	7.1.4	110Vac
Rated voltage (U_r) 7.2kV/12kV, 24kV, 36kV	1.4.1	12kV
Rated insulation level (lightning impulse withstand voltage) (U_p) 75kV, 95kV,125kV, 170kV	1.4.2	125kV
Rated frequency (f_r)	1.4.3	50Hz
Rated normal current (I_r) 400A, 630A, 800A	1.4.4	630A
Rated short-time withstand current (I_k) 12.5kA / 16kA / 20kA	1.4.5	≥12.5kA
Rated duration of short circuit (t_k)	1.4.7	3sec
Rated supply voltage of closing and opening devices. (U_a) 24V, 30V, 48V, 110V d.c., 110V ac	1.4.8	24Vdc
Rated supply frequency of closing and opening and of auxiliary circuits d.c. or 50Hz	1.4.9	dc
Rated mainly active load-breaking current	3.4.101	630A (Load Current)
Rated closed-loop breaking current	3.4.102	2.5 times rated short circuit current
Rated cable-charge breaking current (I_c) 10A, 16A,20A	3.4.104	≥20A
Rated line-charging breaking current (I_l) 1A, 1.5A, 2A	3.4.105	≥1A
Rated short-circuit making current (I_p)	3.4.112 and 1.4.6	Equal to 2.5 times rated short-time withstand current
Gas monitoring a) Pressure / density gauge / indicator b) Single stage pressure switch c) Two stage pressure switch d) Other monitoring device	1.5.9	Two stage pressure switch Alarm Lock out
Mechanism type	3.5.6	Stored Energy or Solenoid
Colour of paint		Dark Admiralty Grey or Colour agreed at tender
Insulation medium		Gas / SF_6
Additional information		

Schedule 2c - WPD REQUIREMENTS -: 36kV Pole Mounted Enclosed Switch Disconnector

Table of technical requirements and ratings for pole-mounted enclosed switch disconnector for use on WPD 33kV distribution network and based on ENATS 41-36 Issue 3.

Information	Sub-clause of ENATS 41-36 Issue 3	WPD requirement
Particulars of system		
Voltage kV		33
Frequency Hz		50
Number of phases		3
Neutral earthing		LER, ASC or Solid
Switch characteristics		
Number of poles		3
Class	7.3.1	Class E3, TD5=10 operations Class M1, 1000 mechanical operations.
Outdoor	1.2	
Equipped with earthing switch Yes/No	7.3.1	No
Mounting arrangements a) Pole-top, b) Mid pole, c) Down poles	7.1.2	Mid Pole
Auxiliary power supply	7.1.4	110Vac
Rated voltage (U_r) 7.2kV/12kV, 24kV, 36kV	1.4.1	36kV
Rated insulation level (lightning impulse withstand voltage) 75kV, 95kV,125kV, 170kV	1.4.2	170kV
Rated frequency (f_r)	1.4.3	50Hz
Rated normal current (I_r) 400A, 630A, 800A	1.4.4	≥630A
Rated short-time withstand current (I_k) 12kA/16kA/20kA	1.4.5	≥12.5kA
Rated duration of short circuit (t_k)	1.4.7	3sec
Rated supply voltage of closing and opening devices. (U_a) 24V, 30V, 48V, 110V d.c., 110V ac	1.4.8	24Vdc
Rated supply frequency of closing and opening and of auxiliary circuits d.c. or 50Hz	1.4.9	dc
Rated mainly active load-breaking current	3.4.101	≥630A (Load Current)
Rated closed-loop breaking current	3.4.102	2.5 times rated short circuit current
Rated cable-charge breaking current (I_c) 10A, 16A,20A	3.4.104	≥20A
Rated line-charging breaking current (I_l) 1A, 1.5A, 2A	3.4.105	≥1A
Rated short-circuit making current (I_p)	3.4.112 and 1.4.6	Equal to 2.5 times rated short-time withstand current
Gas monitoring a) Pressure / density gauge / indicator b) Single stage pressure switch c) Two stage pressure switch d) Other monitoring device	1.5.9	Two stage pressure switch Alarm Lock out
Mechanism type	3.5.6	Stored Energy or Solenoid
Colour of paint		Dark Admiralty Grey or Colour agreed at tender
Insulation medium		Gas / SF_6
Additional information		

Schedule 3a - Supplier Declaration – Non Gas Filled Equipment

Supplier To Declare		
		Sub-clause of ENATS 41-36 Issue 3
Mechanism type (give details)		2.5.5 to 2.5.7
Closing mechanism power consumption (mA) and duration of consumption (s)		
Operating time – Close operation (ms)		
Operating Time – Open operation (ms)		
Rated operating sequence		
Noise (during operation and/or activity) (dB)		
Arc interruption medium		
Insulation medium		
Mass of complete unit (kg)		
Dimensions (m)		
AIS bushing details		
Tank material		
Controller enclosure material		
Colour of paint		
Internal battery capacity (Ah)		
Battery maximum functioning period (hrs)		
Means to prevent battery deep discharge damage		

Schedule 3b - Supplier Declaration -: Gas Filled Equipment

Supplier To Declare		
		Sub-clause of ENATS 41-36 Issue 3
Mechanism type (give details)		2.5.5 to 2.5.7
Closing mechanism power consumption (mA) and duration of consumption (s)		
Operating time – Close operation (ms)		
Operating Time – Open operation (ms)		
Rated operating sequence		
Noise (during operation and/or activity) (dB)		
Arc interruption medium		
Insulation medium		
Type of gas		
Mass of Gas (kg)		
Volume of Compartment (m^3)		
Mass of gas (kg) that would be lost if gas leaked until compartment pressure equals the standard atmospheric conditions (+20°C and 101,3 kPa), without air entering the chamber.		
Method(s) of monitoring pressure and achieving temperature compensation		
Gas monitoring indicator		1.5.9
Rated filling pressure p_{re} (or density ρ_{re}) for insulation and/or switching [kPa and BAR(G)]		
Alarm pressure p_{ae} (or density ρ_{ae}) for insulation and/or switching [kPa and BAR(G)]		
Minimum functional pressure pme (or density ρme) for insulation and/or switching [kPa and BAR(G)]		
Alarm pressure for operation p_{am} (or density ρ_{am}) [kPa AND Bar(g)]		
Minimum functional pressure for operation p_{mm} (or density ρ_{mm}) [kPa AND Bar(g)]		
Mass of complete unit (kg)		
Dimensions (m)		
AIS bushing details		
Tank material		
Controller enclosure material		
Colour of paint		
Internal battery capacity (Ah)		
Battery maximum functioning period (hrs)		
Means to prevent battery deep discharge damage		

APPENDIX A

SUPERSEEDED DOCUMENTATION

This document supersedes: EE SPEC: 13/3 dated April 2020 which has now been withdrawn.

The specification is based on ENATS 41-36 (Issue 3) dated 2012.

APPENDIX B

ASSOCIATED DOCUMENTATION

None

APPENDIX C

IMPACT ON COMPANY POLICY

The updates to this specification have no impact on company policy.

APPENDIX D

IMPLEMENTATION OF POLICY

This document may be implemented on issue for new tenders and contracts.
This specification is not retrospective for current contracts based on EEPSEC 13/2.

APPENDIX E

RECORD OF COMMENTS DURING CONSULATION

Link:
\\exodcs01\ttcdata\Policy\Policy_comments\EESPEC_13\Comments_EESPEC_13_2020_04_01.xlsx

APPENDIX F

KEYWORDS

Pole mounted, circuit breaker, PMAR, switchgear, load switches, switch disconnector, gas, SF6, GBSD