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Electricity Specification 311

Issue 4 February 2022

Overhead Line Air Break Switch-Disconnectors

Amendment Summary

ISSUE NO. DATE	DESCRIPTION
Issue 4 **February 2022**	Document updated to latest template and ENA TS 41-36 references updated to the new ENA TS 41-47. Clause number of ENA TS 41-37 added to section 7.6.2 title. ENA TS 41-37 added to section 11. Prepared by: Matthew Kayes Approved by: Policy Approval Panel and signed on its behalf by Steve Cox, DSO Director

Contents

1 Foreword

This specification sets out the technical requirements for the purchase of Overhead Line Air Break Switch-Disconnectors by Electricity North West Limited (Electricity North West), for connection to its network.

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2 Scope

This specification details the requirements for air break switch-disconnectors operating on the 6.6kV, 11kV and 33kV overhead line distribution system.

The specification details the range, design, constructional and technical requirements for Air Break Switch-Disconnectors (ABSD) complying with ENA Technical Specification 41-47 and with the relevant British and European Standard Specifications referred to therein.

All ABSD's with an existing Notice of Conformity Certificate compliant to ENA TS 41-36 will be accepted.

3 Definitions

ABSD	Air Break Switch-Disconnector.
Approval	Sanction by the Electricity North West Overhead Line Circuits Manager that specified criteria have been satisfied.
Contract	The agreement between Electricity North West and the Contractor for the execution of the Works including therein all documents to which reference may properly be made in order to ascertain the rights and obligations of the parties under the said agreement.
Contractor	The person or person's firm or company, including personal representatives, successors and permitted assigns, who's Tender has been accepted by Electricity North West.
Specification	The Specifications and schedules (if any) agreed by the parties for the purpose of the Contract.
Sub-Contractor	Any person (other than the Contractor) named in the Contract for any part of the Works or any person to whom any part of the Contract has been sub-let with the consent in writing of the Electricity North West Overhead Line Circuits Manager, and the legal representatives, successors and assigns of such person.
Supplier	Any person or person's firm or company who supplies goods to Electricity North West or to its Contractor.
Tender	An offer in writing to execute work or supply goods at a fixed price.

Tenderer	The person or person's firm or company, including personal representatives, successors and permitted assigns, invited by Electricity North West to submit a Tender.

4 General Requirements for Approvals and Testing

4.1 Product not to be Changed

No change in the product, packaging or labelling shall be made after Approval has been granted without prior notice to the Electricity North West Overhead Line Circuits Manager, and receipt of a written agreement to the proposed change from the Electricity North West Overhead Line Circuits Manager.

4.2 Electricity North West Technical Approval

The Tenderer shall submit, with this Tender, proposals for testing which will demonstrate, to the satisfaction of the Electricity North West Overhead Line Circuits Manager, compliance with this Specification. Such tests shall be carried out without expense to Electricity North West.

Alternatively, technical reports and other data may be submitted that the Tenderer considers will demonstrate, to the satisfaction of the Electricity North West Overhead Line Circuits Manager, compliance with this Specification. Acceptance of this evidence shall be at the discretion of the Electricity North West Overhead Line Circuits Manager but will not be unreasonably withheld.

Approval shall be 'factory specific' and is not transferable to another factory without the written Approval of the Electricity North West Overhead Line Circuits Manager.

The Supplier and product shall comply with all the relevant requirements of Electricity North West document CP311.

4.3 Quality Assurance

The Tenderer shall confirm whether or not Approval is held in accordance with a quality assurance scheme accredited under ISO 9000. If not, the Tenderer shall submit a statement of the quality assurance procedures employed to control the quality of the product, including the performance of Suppliers and Sub-Contractors.

The right is reserved for the repeat of such tests, from time to time, that the Electricity North West Overhead Line Circuits Manager may deem to be reasonably necessary to demonstrate continued compliance with the Specification.

The Tenderer shall submit, with the Tender, a list of tests and inspections which are carried out on the product prior to despatch which shall demonstrate, to the satisfaction of the Electricity North West Overhead Line Circuits Manager, fitness for installation and service.

The Tenderer shall provide free of charge to Electricity North West such samples as may, in the opinion of the Electricity North West Overhead Line Circuits Manager, be reasonably required for inspection and/or retention as quality control samples. The Electricity North West Overhead Line Circuits Manager will confirm the requirement for samples at the time of Tendering.

The right is reserved for inspections to be made of Tenderer's facilities, from time to time, as deemed reasonably necessary by the Electricity North West Overhead Line Circuits Manager to ensure compliance with this Specification and any Contract of which it forms a part.

The Tenderer shall submit, with the Tender, such details of product packaging disposal, as will enable Electricity North West to comply with the requirements of BS EN ISO 14001 - Environmental Management Systems.

4.4 Formulation

The Tenderer shall submit, with the Tender, such details of the formulation and use of the product and associated substances as will enable Electricity North West to comply with the obligations of the Health and Safety at Work Act 1974 and the Control of Substances Hazardous to Health Regulations 2002, in the use, storage and disposal of the product. The Tenderer may stipulate, prior to submission of such information, that it is to remain confidential, and the Electricity North West Overhead Line Circuits Manager will, if requested, confirm agreement to this prior to receipt of the information.

4.5 Identification Markings

The Tenderer shall submit, with the Tender, details of markings which it is proposed to apply to the product or packaging to identify manufacturing batches or items. The forms and content of such markings shall be subject to the Approval of the Electricity North West Overhead Line Circuits Manager, and shall in all cases include the Electricity North West approved description and commodity code number.

The Tenderer shall submit, with the Tender, such details of marking gross weight on components, assemblies and packages, as will enable Electricity North West to comply with the Health and Safety Manual Handling Operation Regulations 1992, for components, assemblies and packages supplied with a gross weight over 1kg. The forms and content of such markings shall be subject to the Approval of the Electricity North West Overhead Line Circuits Manager.

4.6 Minimum Life Expectancy

The minimum life expectancy of all products covered by this Specification is 40 years.

4.7 Product Conformity

Preference will be given to those Suppliers who can provide suitable product conformity certification to a recognised or specified standard, or an equivalent certification.

4.8 Confirmation of Conformance

The Tenderer shall complete the conformance declaration sheets in Appendix C Failure to complete these declaration sheets may result in an unacceptable bid.

5 Requirements for Type and Routine Testing

The Electricity North West Overhead Line Circuits Manager shall set out the requirement of the following tests to be carried out by the Supplier at the Supplier's cost.

5.1 Requirement for Type Tests at Suppliers Premises

These are a series of one-off type tests, which are carried out to ensure the satisfactory performance of the product design, under extremes of operating stresses, and of endurance, as may be appropriate, to be determined by the Electricity North West Overhead Line Circuits Manager.

These may or may not be destructive tests.

5.2 Requirement for Routine Tests at the Supplier's Premises

These tests may be required to be carried out on every individual unit or component, as specified, or at some regular frequency to be determined by the Electricity North West Overhead Line Circuits Manager.

The results of these tests may be required to be supplied to Electricity North West with each unit purchased or retained for inspection, at a period to be determined by the Electricity North West Overhead Line Circuits Manager.

5.3 Requirement for On-Site Tests

These will normally be included within the scope of on-site commissioning but may be included if appropriate.

6 General Design Features

6.1 Equipment Standards

Electricity North West welcomes innovation and alternatives to traditional designs that still meet the functional requirements of this Specification. Variations shall be clearly identified in Appendix C and prices for compliant and non-compliant equipment detailed separately.

6.2 General Requirements

The design of equipment shall meet the requirements of the Health and Safety at Work Act, the Electricity at Work Regulations and the Provision and Use of Work Equipment Regulations, for the maximum safety of all personnel.

6.3 Equipment Description

Each disconnector shall, preferably, comprise a three-phase, rocking head, gang operated load break switch with three insulators per phase. The disconnector shall also include an operating rod complete with handle and insulating insert or a mechanism to allow operation by portable insulated operating rod. The disconnector shall be suitable for use in coastal areas with high salt air pollution.

The equipment shall be designed for operation where safety in operation and continuity of supply are the first considerations and shall be maintenance free as far as reasonably practicable.

The equipment shall be suitable for operating under the conditions specified in Section 5 and shall withstand the variations of temperature and atmospheric conditions without undue distortion or deterioration, or setting up undue stress in any part. The conditions shall not affect the strength or suitability of any components for the duty which they have to perform.

All apparatus shall be designed to minimise the risk of accidental short circuit due to animals, birds, vermin and wind-borne debris.

6.4 Departures from Specification

The Tenderer shall state, in Appendix C, at the time of tendering all departures from the requirements of this Specification.

7 Technical Requirements

7.1 Operating Temperature Range

All equipment shall be capable of operation within the ambient temperature range -25°C to +40°C taking into account solar gain.

7.2 Equipment Ratings

The equipment is required for use on three-phase, 50Hz, 6.6kV, 11kV, or 33kV nominal supply systems with the neutral earthed directly or through an impedance. ABSDs for use at 6.6kV or 11kV will be rated at 12kV and those for use at 33kV, rated at 36kV.

Table 1 – Air Break Switch-Disconnector Ratings

RATED VOLTAGE (KV)	12	36
Rated Insulation Level (kV-peak value)		
Lightning Impulse Withstand Voltage		
Common Value	110	200
across the isolating distance	125	220
1 Minute Power Frequency Wet Withstand Voltage (kV rms Value)		
Common Value	45	80
across the isolating distance	50	88
1 Minute Power Frequency Dry Withstand Voltage (kV rms Value)		
Common Value	50	95
across the isolating distance	55	105
Rated Normal Current (A)	400	400
3 Second Short-time withstand Current (kA)	12.5	12.5
Short Circuit Making withstand current (kA)		
Independent Manual	10(25Pk)	10 (25Pk)
Dependent Manual	3 (7.5Pk)	3(7.5Pk)

Rated Load Breaking Current (A)	400	400

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7.3 Cable and Line Charging Currents

The rated cable and line charging current values for air break switch-disconnectors shall comply with those specified in Table 2 of ENA TS 41-47.

7.4 Special Service Conditions

In addition to Clause 4 of ENATS 41-47, the Tenderer shall specify details of the maximum thickness of ice under which the switch will operate normally and within its ratings.

7.5 Class of Switch

In accordance with Clause 5.302 of ENATS 41-47, the Tenderer shall specify details of the class of switch.

7.6 Mechanisms

Provisions shall be made to ensure that the switch can be operated by either handle or by insulated rods. Information shall be provided on the possibility of actuation and remote control and details of the types available. The Tenderer shall submit an ergonomic assessment of the operation of the switch.

7.6.1 Handle Mechanism (Clause 6.0.102.3 of ENATS 41-47)

The switch shall be of the “dependent manual” or “independent manual” type and have a low level actuation mechanism (ie an integral rod directly coupled to a handle for manual operation). Operating handles shall move, in the vertical plane, upwards to the closed (ON) position and downwards to the open (OFF) position.

The rod shall be supplied complete with an insulating insert and the lower end of the insert shall be a minimum of 4.25m above ground level when the insert is at its lowest position. The insulating insert shall be rigidly connected to the rod. The operating rods shall be adjusted or cut to final length on site. No special tapping or cutting tools shall be required to adjust the length of the rods. The minimum overall length of operating rod should be 13m for 12kV and 36kV. There should be sufficient number of guides (minimum of 3) provided to maintain positive operation at the maximum operating rod length. The guides shall be adjustable for the distance from the overhead line support, be rigid, prevent excessive lateral movement and be friction free as far as possible. Provision shall be made for two earth connection points on the fixed steelwork of the handle.

A means shall be provided to ensure the switch is automatically held open or closed and there will be provision for the application of a padlock, to lock the switch in either the open or closed positions. The padlock facility shall allow the use of a standard Electricity North West switchgear padlock as detailed in ES309.

7.6.2 Insulated Rod Operated Mechanism (Clause 6.0.102.2 of ENA TS 41-47 -Hook Stick)

The mechanism shall preferably be mounted as an integral part of the steelwork, with the option to mount it lower down the overhead line support, if required. It shall have an automatic latching pin, which is virtually friction free, with two springs to close it. There shall be at least two distinct operations to open or close the switch.

7.7 Insulators

The support insulators shall be manufactured in accordance with ENATS 41-47 and IEC 60129 and shall, preferably, be of the silicone rubber type. All insulators shall provide minimum creepage levels of 25mm/kV in accordance with BS EN 60137:2003 type 3. They may be of either cylindrical post type or the pedestal post type. There shall be the option to use anti-fogging insulators. The unit insulators and connection points should be suitably positioned and adequately spaced to facilitate connection and disconnection by Live Line Working Techniques. Before contract approval is given, Electricity North West will need to be satisfied that the unit is capable of connection by Live Line Techniques.

7.8 Contacts

The main fixed and moving contacts shall be self-aligning and shall be manufactured from a suitable high conductivity material.

Where spring loaded devices are used to maintain main contact pressure, they shall be manufactured from corrosion resistant materials which are compatible with the contact. Where separate springs are used, these shall not form part of the current carrying circuit. Shrouds may be used as necessary to maintain spring action under ice conditions but they shall not act as a trap for moisture or inhibit free air circulation.

In addition to the “over-toggle” mechanism, there shall be positive stops in both the closed and open positions, which are independent of the contacts.

The minimum isolating distance across an open switch shall be 300mm for 12kV and 430mm for 36kV and this gap shall be clearly visible from ground level.

7.9 Leads

Any flexible leads which form the main current carrying path, shall be of multi strand, high conductivity annealed copper. The leads shall be protected against abrasion and corrosion, and if covered, shall be fully sealed to prevent moisture ingress and the covering shall not reduce the flexibility of the lead. The leads, terminations and supporting apparatus shall be arranged and connected in a manner that will not cause mechanical stress at the connections.

7.10 Connections

The connections shall be double hole tinned copper NEMA lug 41mm centres (Figure 4 of ENATS 41-16). It will also be necessary to provide a means for mounting and connecting surge arrestors to all phases, both sides of the switch.

7.11 Nuts, Bolts and Studs

All nuts and pins shall be locked in position with locknuts, or with lockwashers, or other suitable devices unless the omission is proved for the application.

All bolts, nuts and washers shall be of non-rusting material and where dissimilar materials are in contact, consideration shall be given to any interactive processes between them.

Where electrical connections are involved stainless steel bolts, nuts and washers with a stainless steel spring washer shall be used.

All bolts or studs shall project through the nut. Projections exceeding four threads shall be avoided.

The components used in the disconnector will be of standard design such that no special spanners or tools shall be required.

All mounting and connecting bolts, nuts, washers etc. to be provided except pole bolts.

7.12 Mounting

The switch shall be suitable for both horizontal and vertical mounting on both single and H type overhead line supports.

Manufacturers shall provide an option for the supply of common mounting steelwork to accommodate the various mounting options listed above.

It shall be possible to offset 2 units to either side of the overhead line support.

7.13 Indication

For those switches which are handle operated a clear indication of switch position is required on the handle.

7.14 Labelling

In addition to the rating plate on the main steelwork at the top of the overhead line support the manufacturer will provide a duplicate rating plate to be mounted at low level, preferably on the handle, with each switch.

7.15 Drawings & Manuals

All drawings, Installation and O&M manuals will be provided in electronic format (PDF).

The manufacturer will also provide comprehensive details for the installation and commissioning of the switch with each switch supplied.

The manufacturer will also supply details of their recommendations for inspection and maintenance tasks and intervals. Feb 22

7.16 Testing

All units shall conform to the type tests as demonstrated in Clause 7 of ENATS 41-47 and the routine tests in Clause 8 of ENATS 41-47.

Electricity North West reserve the right to witness any of the type tests. All tests on the first of a new design from any factory will be witnessed by Electricity North West. The Contractor shall cover travelling, accommodation and other reasonable expenses incurred whilst Electricity North West representatives are witnessing the type tests. Electricity North West also reserves the rights to return at random one unit to the factory for repeat type tests where all costs shall be covered by the Contractor.

Electricity North West reserves the right to witness routine tests on any subsequent units.

An electronic copy of the test results in PDF format shall be forwarded to the Engineer and to the Electricity North West Policy & Implementation Section (for the attention of the Electricity North West Overhead Line Circuits Manager).

7.17 Failure, Modes, Effect and Cause Analysis

The Tenderer shall carry out a FMECA or equivalent study for each type of equipment offered. A copy of this study, in PDF format, shall be provided with the tender documents.

8 Protection and Packaging

To avoid damage to any of the components of each switch disconnector during transport or storage, the packaging of each shall comply with the following:

- Units, including handle, shall be supplied in three phase kits. The kit shall be attached to a returnable, reusable pallet or battens in such a way as to prevent the switch disconnector from damage during transport and storage.
- Major items of steelwork shall be firmly attached to the pallet or battens by steel bands or similar. Operating rods may be packaged separately.
- Minor items of steelwork and all loose nuts, bolts, washers, screws and fixing materials shall be suitably packaged for outdoor storage and shall be firmly attached to the pallets or battens.

All packaging and fastenings used shall not endanger or cause injury to any persons involved in its handling and unpacking.

One paper copy of the approved switch disconnector assembly drawing together with one of a full component list and mounting instructions shall be supplied with each disconnector and contained within a strong weatherproof bag. This bag shall be contained within the bag containing small items of steelwork and fastening materials.

The Tenderer shall submit, with the Tender, details of the proposed packaging arrangements and identification marking (see also Section 4.5).

It is impractical for Electricity North West to handle weights greater than 1000kg and as a result the manufacturer shall consider the gross weight of the packaged items.

9 Delivery

The Tenderer shall state on the Price Schedule (Appendix A) the lead times offered. Delivery locations will be specified with the order and may be to any stores within Electricity North West.

10 Information Required from the Tenderer

The Tenderer is required to complete the schedules attached as Appendices to this Specification, including all the appropriate information in respect of each item offered.

The Tenderer shall be compliant with the Specification except to the extent that deviations are stated.

The Tenderer shall return the following additional documentation with copies of the completed Schedules at the time of tendering:

ITEM	DESCRIPTION	SECTION
i.	Details of the air break switch-disconnector	Error! Reference source not found.
ii.	All departures from the requirements of this Specification	Error! Reference source not found.
iii.	Quality documentation.	Error! Reference source not found.
iv.	Details of proposed packaging arrangements.	Error! Reference source not found.
v.	Information requested in the Schedules.	Appendices
vi.	Any other information requested elsewhere in this Specification or specifically requested in the Enquiry documents accompanying this Specification.	

11 Documents Referenced

All references to documents listed below are to the latest versions, unless stated otherwise.

DOCUMENTS REFERENCED	
Health and Safety at Work Act 1974	
Electricity at Work Regulations	
Control of Substances Hazardous to Health Regulations 2002	
Manual Handling Operations Regulations 1992	

BS EN ISO 9000	Quality management systems
BS EN ISO 14001	Environmental management systems. Requirements with guidance for use
BS EN 60137:2003	Insulated bushings for alternating voltages above 1 000 V.
ENA TS 41-16	Apparatus Terminations, Conductor Sizes and Associated Fittings (Copper) used in Indoor and Outdoor Substations with Outdoor Equipment.
ENA TS 41-36	Distribution Switchgear for Service up to 36kV (cable and overhead conductor connected).
ENA TS 41-47	Pole Mounted, Non-Enclosed: Switch-Disconnectors, Disconnectors, Earthing Switches, Fuse Switches (Expulsion Fuses), Solid Links and Automatic Sectionalising links (ASLs)
ES309	Locks for Substations and Associated Plant.
CP311	Equipment Approval Policy and Process

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12 Keywords

6.6kV; 11kV; 33kV; Air break switch; Overhead; Switchgear.

Appendix A – Price Schedule for ABSDs to ENATS 41-47

VOLTAGE RATING (KV)	CURRENT RATING (A)	COMM CODE	ESTIMATED ANNUAL USAGE	MANUF'S REFERENCE	LEAD TIME (WEEKS)	UNIT PRICE (£)	TOTAL PRICE (£)
12							
36							

Appendix B – Schedule of Manufacturer's Technical Particulars

ITEM NO	DESCRIPTION	INFORMATION PROVIDED BY SUPPLIER	
		12kV	36kV
1.	ENA No CC Number		
2.	Place of Manufacture		
3.	Type designation		
4.	Rated voltage (kV)		
5.	Rated frequency (Hz)		
6	Rated normal current (A)		
7.	Rated short-circuit making current (kA)		
8.	Rated short-time current for 3 seconds (kA)		
9.	Rated Breaking Capacity (a) Mainly active load-breaking (A) (b) Closed loop (A) (c) Transformer Off-load (A) (d) Cable-charging (A)		
10.	Lightning Impulse Withstand Voltage (a) To earth and between poles (kVp) (b) Across terminals of open switch disconnector (kVp)		
11.	Power Frequency Withstand Voltage (kVrms)		
12.	Insulator material		

13.	**Minimum insulator creepage distance (mm)**		
14.	**Steelwork included (yes/no)**		

Appendix C – Conformance Declaration

SECTION-BY-SECTION CONFORMANCE WITH SPECIFICATION

The Tenderer shall declare conformance or otherwise for each product/service or range of products/services, section-by-section, using the following Conformance Declaration Codes.

Conformance Declaration Codes:

N/A =	Clause is not applicable/appropriate to the product/service.
C1 =	The product/service conforms fully with the requirements of this clause.
C2 =	The product/service conforms partially with the requirements of this clause.
C3 =	The product/service does not conform to the requirements of this clause.
C4 =	The product/service does not currently conform to the requirements of this clause, but the manufacturer proposes to modify and test the product in order to conform.

Manufacturer:

Product/Service Description:

Product/Service Reference:

Name:

Company:

Signature:

SECTION-BY-SECTION CONFORMANCE			
Section	**Section Topic**	**Conformance Declaration Code**	**Remarks * (must be completed if code is not C1)**
4.1	**Product not to be Changed**		
4.2	**Electricity North West Technical Approval**		
4.3	**Quality Assurance**		
4.4	**Formulation**		
4.5	**Identification Markings**		
4.6	**Minimum Life Expectancy**		
4.7	**Product Conformity**		
4.8	**Confirmation of Conformance**		
5.1	**Requirements for Type Tests at the Supplier's Premises**		
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7.3	**Cable and Line Charging Currents**		
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7.5	**Class of Switch**		
7.6	**Mechanisms**		
7.6.1	**Handle Mechanism (Clause 6.0.102.3 of ENATS 41-47)**		
7.6.2	**Insulated Rod Operated Mechanism (Clause 6.0.102.2 of ENA TS 41-47 - Hook Stick)**		
7.7	**Insulators**		
7.8	**Contacts**		
7.9	**Leads**		
7.10	**Connections**		
7.11	**Nuts, Bolts and Studs**		
7.12	**Mounting**		
7.13	**Indication**		
7.14	**Labelling**		
7.15	**Drawings and Manuals**		
7.16	**Testing**		
7.17	**Failure, Modes, Effect and Cause Analysis**		
8.	**Protection and Packaging**		
9.	**Delivery**		

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10.	**Information Required from the Tenderer**		

Additional Notes: