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NPS/001/024 – Technical Specification for Low Voltage Aerial Bundled Conductor Fittings

1. Purpose

The purpose of this document is to outline the technical requirements for fittings used with low voltage Aerial Bundled Conductor overhead lines on the Northern Powergrid distribution networks.

This document supersedes the following documents, all copies of which should be destroyed.

| Reference | Version | Date | Title |
|-------------|---------|-----------|---|
| NPS/001/024 | 5.0 | July 2017 | Technical Specification for Low Voltage Aerial Bundled Conductor Fittings |

2. Scope

This specification applies to ABC fittings including conductor clamps, connectors, service boxes and other accessories. The majority of items are detailed in ENA TS 43-14 Issue 3: 2013 - Insulated Aerial Bundled Conductors for Low Voltage Overhead Distribution Systems – Conductor Fittings and Associated Apparatus.

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

This specification includes the following appendices: -

- Appendix 1 – Schedule of Components
- Appendix 2 – Self Certification Conformance Declaration
- Appendix 3 – Addendum to Suppliers Requirements
- Appendix 4 – Technical Information Check List

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3. Technical Requirements

3.1. General

ENA TS 43-14 details the standard to which ABC fittings shall generally be supplied.

Appendix 2 of this specification provides a self-certification conformance declaration that shall be completed for each item offered.

All items shall be designed to meet the performance requirements of the various sections of this specification. They must be adequately rated for their intended application and retain this rating during their normal life in an outdoor environment.

The finish shall be such that outer surfaces are free from sharp edges and burrs that could result in damage to adjacent materials or personnel. Items comprising different component parts shall be so designed that they can be applied without disassembly. Materials shall be resistant to climatic stress and all insulating materials shall be UV stable as detailed in BS4892-1. Steel components shall be hot-dip galvanised to BS EN 1461 and other metallic parts shall be of a non-corrosive type. Non-metallic materials shall be fire retardant in accordance with ENA TS 43-14, Section 4.1.3.

The ABC fittings detailed within this specification shall be designed for use with the following types and sizes of ABC conductor which have been manufactured in accordance with NPS/001/007.

- 2 or 4-core 35mm²
- 4-core 50mm, 4-core 70mm, 4-core 95mm 4-core 120mm² or 4-core 120mm with an additional 25mm² self-supporting earth protective conductor.

All conductor fittings shall be durably marked with the manufacturer's identification mark. This marking shall also be applied to all major components of a fitting which are separable. Where fittings are marked by colour to indicate the size of the conductor on which they are to be used, the colour shall be in accordance with the table below. Where fittings can be used on several sizes of conductor, the largest and smallest sizes of the range shall be indicated. The colours shall be applied in a form sufficiently durable to ensure their retention during storage and application.

| | | | | | | |
|-----------------------------------|--------|-----|--------|-------|------|------|
| Conductor size (mm ²) | 25 | 35 | 50 | 70 | 95 | 120 |
| Colour | Orange | Red | Yellow | White | Grey | Pink |

3.2. Specification Requirements

3.2.1. Anchor Clamps

Anchor clamps are a fitting which transfers the tensile forces within the tensioned conductor cores to the supporting structure and shall be designed for use with 2, 4 and 5 core conductors in the range 35mm² – 120mm² as detailed in Appendix 1 descriptions. They shall be provided in two classes: Heavy duty for conductors operating at full line tension and light duty for conductors operating at a reduced tension for services attached to buildings. Full tension 4 or 5-core anchor clamps shall be range taking 35mm² – 120mm² ABC.

Anchor clamps shall be designed for attachment to hook and eye bolts as detailed in ENA TS 43-13 Section 5.

Details of the range of fittings required are listed in Appendix 1.

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3.2.2. Suspension Roller Clamp

The clamp shall be designed to allow the ABC to be erected without the use of a traditional conductor running blocks and to be clamped in place on completion. The clamp shall be suitable for angles of deviation up to 60° when using 2, 4 and 5 core 35mm² – 120mm² ABC. The clamp shall incorporate a means of securing the conductors in place. Suspension clamps shall be tested in accordance with ENA TS 43-14 Section 7.3.

The clamp shall be designed to accommodate angles of deviation of up to 30°, without the need for any additional extension rollers, however for angles between 30-60° it is expected that the clamp will need to be supplemented with removable extension rollers which are only used for the stringing process. Suppliers shall include details of any temporary extension rollers needed.

Details of the range of fittings required are listed in Appendix 1.

3.2.3. Branch and Service Connections

Insulation piercing connectors shall be designed and tested in accordance with BS EN 50483-4 and test to Class A requirements as defined in BS EN 50483-5. This includes a short-circuit current test in addition to the heat cycle testing.

The connector shall be of a type, which has been designed for application to the main conductors without the removal of the insulation (insulation piercing), and simultaneously pierce the insulation of the ABC main and tap conductors. The connector shall be waterproof in accordance with category IP68 and satisfy the degree of protection requirements as specified in BS EN 60529. The design must incorporate an end cap that shall be suitable for location on either side of the connector and which becomes integral to the body of the connector once the tap-off conductor is in place. The connectors shall be suitable for installation without any special tooling and supplied with bolts designed to shear at the required torque. The connectors shall be range taking where possible and suitable for ABC connections to ABC, ABC to service cables using bare Copper or Plain Aluminium conductors and service cables to service cables.

Multi-tap Connectors

The multi-tap connectors are specially designed for use with universal piercing connectors to facilitate the connection of between 2 - 4 service connections using service cables ranging between 6mm² - 35mm² (4.5mm to 11mm diameter). Each branch conductor can be connected with a separate screw and is insulation piercing. The multi-tap connectors are suitable for connection to the ABC Bundle with single IPC's (commodity code 242137).

Details of the range of fittings required are listed in Appendix 1.

3.2.4. Mains Earth Fitting

Shall be manufactured to the same standard as branch and service IPC connectors detailed in 3.2.3 but incorporate the facility for testing, application of earthing lead or generator connection. They shall be range taking and suitable for use on 25mm² to 120mm² ABC.

3.2.5. Cable End Cap

End caps shall be insulated and provide protection against the ingress of moisture and also ensure that the system is fully insulated. They shall maintain the degree of protection offered by IP68 in accordance with BS EN 60529. The caps shall be permanent cold applied, range taking and suitable for installation on 25mm² – 120mm² ABC. Push fit cable end caps are not suitable as accidental contact can result in them being removed and exposing live cores.

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3.2.6. Conductor Joint Insulation Sleeve

Shall be suitable for application over compression joints associated with 25mm² – 120mm² ABC. The sleeve shall be applied without the use of heat or special tooling and shall protect against the ingress of moisture whilst restoring the system insulation properties.

3.2.7. Proximity Shrouding

Wall mounted proximity shrouding shall be suitable for use on 4 or 5-core 35mm² – 120mm² ABC and supplied in 2.5 metre lengths. The material shall be non-rigid, extruded black tube with a wall thickness of 1.5mm.

3.2.8. Cleats

Wall Mounted

Wall mounted cleats shall provide 100mm of stand-off and be capable of carrying 4 or 5-core 35mm² – 120mm² ABC. They shall be designed to be secured to the fabric of the building and include an integral means of securing the cable.

Pole Mounted

Pole cleats shall be suitable for mounting on steel or wood poles. They shall be range taking and accept 4 or 5-core 35mm² – 120mm² ABC. For steel poles steel bandit tape (max 20mm wide) and buckles shall be supplied with each cleat.

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4. References

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

4.1. External Documentation

| Reference | Title |
|-----------------------------|---|
| BS 4892-1: 2016 | Methods of exposure to laboratory light sources. General |
| BS EN 50483 – 4: 2009 | Test requirements for low voltage aerial bundled cable accessories. Connectors |
| BS EN 60529: 1992 +A2: 2013 | Degrees of Protection Provided by Enclosures. (IP rating) |
| BS EN ISO 1461: 2022 | Hot dipped galvanised coating on fabricated iron or steel articles. Specification and test methods. |
| ENA TS 43-14 Issue 3 2013 | Insulated Aerial Bundled Conductors for Low Voltage Overhead Distribution Systems – Conductor Fittings and Associated Apparatus |

4.2. Internal Documentation

| Reference | Title |
|-------------|---|
| NPS/001/007 | Technical Specification for Conductors for Overhead Lines |

4.3. Amendments from Previous Version

| Clause | Subject | Amendments |
|--------|------------------------|-----------------------------|
| 4.1 | External Documentation | Document references updated |
| 6.0 | Authority for Issue | Updated |

5. Definitions

| Reference | Title |
|---|---|
| Aerial Bundled Conductor (ABC) | The term ABC in this Specification refers to the assembly of 2, 4 or 5 conductors to ENATS 43-13. |
| Anchor Clamp | A fitting which transfers the tensile forces within the tensioned conductor cores to the supporting structure |
| Insulation Piercing Compression Connector | An Insulation piercing compression connector (IPCC) is one that can be applied to an insulated conductor without prior removal of the insulation. |
| Multi-tap connector | An IPC connector that allows up to either 2 or 4 service connections per main conductor when used in conjunction a standard IPC mains connector. |
| Roller Suspension Clamp | A fitting which encloses and supports all ABC cores at an intermediate support. This type of fitting also incorporates a stringing roller. |
| Weak Link | A fitting which is designed to fail at a predetermined load, generally less than the ultimate tensile strength of the ABC or the support. |

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6. Authority for Issue

6.1. CDS Assurance

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.

| | | |
|----------|--------------------------|-------------|
| | | Date |
| Liz Beat | Governance Administrator | 20/10/2022 |

6.2. Author

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

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

| Standard CDS review of 3 years? | Non Standard Review Period & Reason | |
|---|-------------------------------------|--|
| No | Period: 5 Years | Reason: Update will be dictated by contact renewal date or any significant changes in the specification or documents referenced. |
| Should this document be displayed on the Northern Powergrid external website? | | Yes |
| | | Date |
| Steven Salkeld | Policy and Standards Engineer | 20/10/2022 |

6.3. Technical Assurance

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

| | | |
|-------------|--------------------------------------|-------------|
| | | Date |
| Ged Hammel | Senior Policy and Standards Engineer | 24/10/2022 |
| Joseph Helm | Policy and Standards Manager | 26/10/2022 |

6.4. Authorisation

Authorisation is granted for publication of this document.

| | | |
|------------|----------------------------|-------------|
| | | Date |
| Paul Black | System Engineering Manager | 08/11/2022 |

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Appendix 1 – Schedule of Components

| Commodity Code | Description | Clause |
|----------------|---|--------|
| 242359 | Anchor Clamp, Full Tension 50mm ² – 120mm ² 4/5-core | 3.2.1 |
| 220772 | Anchor Clamp, Full Tension 35mm ² 4-core | 3.2.1 |
| 221085 | Anchor Clamp, Full Tension 35mm ² 2-core | 3.2.1 |
| 221069 | Anchor Clamp, Reduced Tension 1.4KN 35mm ² 4-core | 3.2.1 |
| 221077 | Anchor Clamp, Reduced Tension 1.4KN 35mm ² 2-core | 3.2.1 |
| 242217 | Combined Running Block/Suspension Clamp 50mm ² – 120mm ² 2 and 4/5-core | 3.2.2 |
| 297173 | ABC-FIT Extension Rollers for ABC suspension/running clamp to drg 1.09.145.0021 SHT 1 | |
| 242132 | Insulation Piercing Connector, Single Bolt 50mm ² -120mm ² ABC main to 6mm ² -35 mm ² tap conductor | 3.2.3 |
| 222307 | Insulation Piercing Connector, Single Bolt 25mm ² -95 mm ² ABC main to 6mm ² -35mm ² tap conductor | 3.2.3 |
| 222323 | Insulation Piercing Connector, Double Bolt 50mm ² -120mm ² main to 6mm ² -35mm ² tap | 3.2.3 |
| 241996 | Insulation Piercing Connector, Double Bolt 25mm ² -120mm ² ABC main to 16mm ² -120mm ² tap | 3.2.3 |
| 242024 | Insulation Piercing Connector, Double Bolt for 35mm ² – 120mm ² ABC Main to bare or covered open wire conductors (32mm ² – 100mm ² Cu. or 50mm ² – 100mm ² Plain Al.) | 3.2.3 |
| 242137 | Insulation Piercing Connector, Single Bolt, 25mm - 150mm Main to 25mm - 95mm Tap | 3.2.3 |
| 242388 | Insulation Piercing Connector (services) for 4 - 35mm to 4 - 35mm Copper or Aluminium service conductor | 3.2.3 |
| 242034 | ABC Fitting: 2-Way Multi-tap IPC Connector for 4 x 6-35mm Service Connections | 3.2.3 |
| 242033 | ABC Fitting: 4-Way Multi-tap IPC Connector for 4 x 6-35mm Service Connections | 3.2.3 |
| 222364 | Insulation Piercing Connector, Earthing Fitting for 35mm ² to 120 mm ² ABC Main | 3.2.4 |
| 265524 | Cable End Cap (cold applied) for 25mm ² – 120mm ² ABC | 3.2.5 |
| 262210 | Joint Insulation Sleeve | 3.2.6 |
| 265774 | Proximity Shrouding, 2.5 metre Length | 3.2.7 |
| 262051 | Wall Mount Cleat | 3.2.8 |
| 242560 | Pole Cleat for Wood and Steel Poles | 3.2.8 |

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Appendix 2 – Self Certification Conformance Declaration

The Conductor Fittings and Associated Apparatus covered by this specification shall comply with the latest issues of the relevant International, European and British Standards. This specification is intended to amplify and/or clarify the requirements of those 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 conforms fully with the requirements of this clause

Cs2 = The product conforms partially with the requirements of this clause

Cs3 = The product 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.

Instructions for completion

- When Cs1 code is entered the supplier shall provide evidence to confirm conformance.
- When any other code is entered the reason and supporting evidence for non-conformance shall be entered
- Prefix each remark with the relevant 'BS EN,' 'IEC' or 'ENATS' as appropriate

Manufacturer:

Product Reference:

Name:

Signature:

Date:

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Aerial Bundled Conductor Fittings

| ENA TS 43-14 | | | | |
|-------------------|--|------------------|--------------------|----------|
| Clause/Sub-clause | Requirement | Conformance Code | Evidence Reference | Comments |
| Section 4.1 | General Requirements for Materials | | | |
| Section 4.2 | Tests - General | | | |
| Section 4.4 | Identification and Markings | | | |
| Section 6.1.3 | Test for Wall Mounted Cleats | | | |
| Section 7.3 | Tests for Anchor Clamps | | | |
| Section 8.3 | Tests for Suspension Clamps | | | |
| Section 9.4 | Tests for Insulation Piercing Connectors (additional Class A test required as detailed in section 3.2.3 of this specification) | | | |
| Section 12.2.3 | Tests for Proximity Shrouding and Cable End Caps | | | |
| Section 12.2.3 | Tests Applicable to Conductor Joint Insulation Sleeve | | | |

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Appendix 3 – Addendum to Supplier Requirements

Packaging and Delivery Information

Details of how this product will be packaged and delivered shall be provided.

Fittings shall be supplied in appropriate quantities within cardboard or similar boxes. The fitting and container shall be clearly labelled to allow identification of the product including the Northern Powergrid commodity code, item description and range of sizes/number of cores covered.

The weight of each package shall not exceed 25kG.

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Appendix 4 – Technical Information Check List

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

| Requirement | Provided (Y/N) |
|---|----------------|
| Full product descriptions and part number/reference | |
| Appendix 2 – Completed self-certification conformance declaration | |
| Complete set of drawings and data sheets for each variant, including any details of the extension rollers required for the suspension roller clamps | |
| Type test evidence | |
| Routine test plan or quality plan (example) | |
| Packaging/delivery information - as required in Appendix 3 | |