Ergon Energy Corporation Limited

Technical Specification for Helical Fittings for Overhead Power Lines

ETS01-09-03
## Contents

1. **Purpose and Scope** .............................................................................................................. 4  
2. **References** .......................................................................................................................... 4  
   2.1 Applicable Standards ........................................................................................................ 4  
3. **Drawings** ............................................................................................................................ 5  
   3.1 Drawings by the Purchaser .............................................................................................. 5  
4. **Service Conditions** ............................................................................................................. 5  
5. **Design and Construction** .................................................................................................... 5  
   5.1 Armour Grip Suspension Units (AGSU) ........................................................................... 5  
   5.2 Helical Armour Rods and Conductor Repair Rods .......................................................... 6  
   5.3 Helical Full Tension Splices and Termination Fittings ...................................................... 6  
   5.4 Helical Insulator Ties ......................................................................................................... 6  
   5.5 Pre-formed Dead Ends for Service Cables ...................................................................... 7  
   5.6 Finish ................................................................................................................................ 7  
   5.7 Markings ............................................................................................................................. 7  
   5.8 Technical Characteristics .................................................................................................... 7  
6. **Performance and Testing** ................................................................................................... 8  
   6.1 Type Tests .......................................................................................................................... 8  
   6.2 Batch Tests ......................................................................................................................... 8  
   6.3 Witnessing of Tests ............................................................................................................ 8  
7. **Risk Assessment** .................................................................................................................. 8  
8. **Quality Assurance** ............................................................................................................. 8  
   8.1 Purchasers Policy ............................................................................................................... 8  
   8.2 Documentary Evidence ...................................................................................................... 8  
9. **Samples** ............................................................................................................................... 9  
   9.1 Production Samples ............................................................................................................ 9  
   9.2 Sample Delivery .................................................................................................................. 9
10. Packaging and Marking ........................................................................................................9
  10.1 Packaging ...................................................................................................................9
  10.2 Packaged Lots ..........................................................................................................9
11. Service Performance ........................................................................................................9
12. Reliability ........................................................................................................................10
  12.1 Service Life ...............................................................................................................10
  12.2 Evidence in Support of Reliability ............................................................................10
13. Training ..........................................................................................................................10
  13.1 Training Material .......................................................................................................10
  13.2 Training Audio Visuals ............................................................................................10
14. Environmental Considerations .......................................................................................11
15. Information to be Provided ............................................................................................11
  15.1 Specific Technical Requirements .............................................................................11
  15.2 Checklist of Supporting Documentation .................................................................11
16. Attachment 1 – Technical Details .................................................................................12
17. Attachment 2 – Electrical Type Test Details .................................................................13
1. **Purpose and Scope**

This specification sets out the requirements for the manufacture, supply, testing and delivery of Helical Fittings for use on overhead electricity networks in a totally exposed environment.

2. **References**

2.1 **Applicable Standards**

The connectors shall be designed, manufactured and tested in accordance with the relevant parts of the following Standards and all amendments issued from time to time except where varied by this specification.

<table>
<thead>
<tr>
<th>STANDARD</th>
<th>TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS 1110</td>
<td>ISO metric precision hexagon bolts and screws</td>
</tr>
<tr>
<td>AS 1111</td>
<td>ISO metric commercial hexagon bolts and screws</td>
</tr>
<tr>
<td>AS 1154</td>
<td>Insulator and conductor fittings for overhead power lines</td>
</tr>
<tr>
<td>AS 1214</td>
<td>Hot-dip galvanized coatings on threaded fasteners</td>
</tr>
<tr>
<td>AS 1275</td>
<td>Metric screw threads for fasteners</td>
</tr>
<tr>
<td>AS 1444</td>
<td>Wrought alloy steels - Standard, hardenability (H) series and hardened and tempered to designated mechanical properties</td>
</tr>
<tr>
<td>AS 1531</td>
<td>Conductors - Bare overhead - Aluminium and aluminium alloy</td>
</tr>
<tr>
<td>AS 1746</td>
<td>Conductors - Bare overhead - Hard-drawn copper</td>
</tr>
<tr>
<td>AS 1789</td>
<td>Electroplated coatings - Zinc on iron or steel</td>
</tr>
<tr>
<td>AS 1222</td>
<td>Steel conductors and stays- Bare overhead</td>
</tr>
<tr>
<td>AS 2738</td>
<td>Copper and copper alloys - Compositions and designations</td>
</tr>
<tr>
<td>AS 2837</td>
<td>Wrought alloy steels - Stainless steel bars and semi-finished products</td>
</tr>
<tr>
<td>AS 2848</td>
<td>Aluminium and aluminium alloys - Compositions and designations</td>
</tr>
<tr>
<td>AS/NZS 2947</td>
<td>Insulators - Porcelain and glass for overhead power lines- Voltages greater than 1000 V ac</td>
</tr>
<tr>
<td>AS 3607</td>
<td>Conductors - Bare overhead, aluminium and aluminium alloy - Steel reinforced</td>
</tr>
<tr>
<td>AS 3608</td>
<td>Insulators - Porcelain and glass, pin and shackle type-Voltages not exceeding 1000 V ac</td>
</tr>
<tr>
<td>AS 3609</td>
<td>Insulators - Porcelain stay type-Voltages greater than 1000V ac</td>
</tr>
</tbody>
</table>
3. **Drawings**

3.1 **Drawings by the Purchaser**
There are no drawings attached to this specification.

4. **Service Conditions**

The connectors will be exposed to the following environmental conditions:

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temperatures</strong></td>
<td>45°C summer day time -5°C winter night time</td>
</tr>
<tr>
<td><strong>Solar Radiation Level</strong></td>
<td>1 000 W/m² with high ultraviolet content</td>
</tr>
<tr>
<td><strong>Precipitation</strong></td>
<td>Tropical summer storms with gust wind speeds above 160 km/h, and an annual rainfall in excess of 1 500mm</td>
</tr>
<tr>
<td><strong>Humidity</strong></td>
<td>Extended periods of relative humidity in excess of 90%</td>
</tr>
<tr>
<td><strong>Pollution</strong></td>
<td>Areas of coastal salt spray and/or industrial pollution with equivalent salt deposit densities in the range 2.0 to 3.0 g/m²</td>
</tr>
</tbody>
</table>

5. **Design and Construction**

5.1 **Armour Grip Suspension Units (AGSU)**

The helically formed conductor fittings and the accessories of the AGSU shall meet the requirements of the Section 3 of AS 1154.3 and the following:

- Suit conductor types as detailed in the tender schedules. The conductors will be fully greased.
- The armour rod ends shall be appropriately shaped to prevent conductor damage.
- Neoprene inserts shall be capable of withstanding conductor temperatures of 50°C to 900°C without permanent loss of essential properties and shall have adequate resistance to ozone, UV radiation, mineral oils and grease and other atmospheric contaminants.
5.2 Helical Armour Rods and Conductor Repair Rods
The helically formed armour rods and repair rods shall meet the requirements of Section 4 of AS 1154.3 and the following:

- Suit the conductors as detailed in the tender schedules. The conductors will be fully greased.
- Be designed to minimise the mechanical stresses in the conductor and protect the conductor from damage due to electrical arcing at the support.
- The rod ends shall be appropriately shaped to prevent conductor damage.
- Each rod of the set shall be “centre-marked” in accordance with the colour code specified in clause 1.8 of AS 1154.3.

5.3 Helical Full Tension Splices and Termination Fittings
The helically formed full tension splices and termination fittings shall meet the requirements of Section 2 of AS 1154.3 and the following:

- Suit the conductors as detailed in tender schedules. The conductors will be fully greased.
- The ends of the individual helically formed rods comprising splice/termination fitting shall be appropriately shaped to prevent conductor damage.
- Be supplied as a unit. Each subset of splices shall be “centre-marked”. Each termination fitting shall have distinct “cross-over” marks. The colour coding shall be in accordance with clause 1.8 of AS 1154.3.

5.4 Helical Insulator Ties
The helically formed insulator ties shall meet the requirements of Section 3 of AS 1154.3 and the following:

- Suit conductor/insulator and insulator/conductor with armour rods combinations detailed in the tender schedules. Insulator top ties and side ties will be required.
- Shall incorporate a neoprene moulding or similar to prevent abrasive wear on conductor/insulator interface. Preference will be given to ties with a neoprene pad moulded onto the tie. Neoprene (or similar material) shall be capable of withstanding conductor temperatures of 50°C to 900°C without permanent loss of essential properties and shall have adequate resistance to ozone, UV radiation, mineral oils and grease and other atmospheric contaminants.
- The ends of the individual helically formed rods comprising the fitting shall be appropriately shaped to prevent conductor damage.
- Shall be able to accommodate line deviations up to 10°.
5.5 Pre-formed Dead Ends for Service Cables

The pre-formed dead ends for service cables shall meet the requirements of Section 5 of AS 1154.3 and the following:

- Shall be suitable for use with 0.6/1kV PVC insulated hard drawn copper aerial service cables complying with AS 3147 and PVC insulated copper neutral screened aerial service cables to AS 3155 as nominated in the tender schedules.
- Shall be double insulated type comprising of neoprene sleeve and a set of gritted helically formed galvanised steel (or stainless steel) wires to suit the application. The ends of the steel wires shall be appropriately protected to prevent damage to the service cable during or after installation.
- Nominated holding tensions for the fitting shall comply with Appendix A of AS 1154.3.

5.6 Finish

The fittings shall be designed, manufactured and finished so as to avoid sharp radii of curvature, ridges and imperfections that may cause radio interference or harmful corona discharge or employee injury, when installed in accordance with recommended procedure.

Materials used in the manufacture of fittings shall be compatible with the conductor with which they will be contact.

All ferrous metal parts, except those made of stainless steel shall be hot dipped galvanised in accordance with AS/NZS 4680.

5.7 Markings

Each fitting shall be provided with an identification tag marked with the following information:

<table>
<thead>
<tr>
<th>The manufacturer’s name or trademark</th>
</tr>
</thead>
<tbody>
<tr>
<td>The year of manufacture</td>
</tr>
<tr>
<td>Ergon Stock Code</td>
</tr>
<tr>
<td>Manufacturer’s part number</td>
</tr>
<tr>
<td>Conductor type and stranding (if fitting is suitable for more than one conductor all sizes shall be listed on the tag)</td>
</tr>
</tbody>
</table>

5.8 Technical Characteristics

Tenderers shall provide detailed drawings for all items tendered.
6. Performance and Testing

6.1 Type Tests
Type test reports carried out in accordance with AS 1154.3 shall be submitted with the tender.

Short - time current for the Short - Time Current Test shall be the two second short time current rating of the highest rated conductor associated with the fitting.

6.2 Batch Tests
The following batch tests shall be carried out prior to the delivery of fittings.
   a) Verification of dimensions.
   b) Mechanical tests as per clauses 2.4.2 and 2.2.1 of AS 1154.3 (for termination fittings and full-tension splices) and Clauses 3.3.2 and 3.2.2 of AS 1154.3 (for AGSUs and insulator ties).
   c) Galvanising test (if applicable) Each delivery shall be accompanied with a certificate of compliance. The test certificates shall be held by the Supplier and be submitted to the purchaser on request within 24 working hours.

6.3 Witnessing of Tests
The Purchaser reserves the right to witness all or any type or batch test and to select the fittings for type of batch testing. The Purchaser also reserves the right to appoint or nominate an Inspecting Engineer to act on its behalf.
The Supplier shall provide a minimum of two weeks advance notice to the Purchaser of any intention to carry out this testing.
The Purchaser reserves the right to test all equipment in accordance with the specified Australian Standards or the requirements of this specification.

7. Risk Assessment
There is no requirement for manufacturer provided safety risk assessments for the items covered in this specification.

8. Quality Assurance

8.1 Purchasers Policy
It is the Purchaser’s policy to procure goods, equipment and services from sources that demonstrate the ability to supply quality products.

8.2 Documentary Evidence
Tenderers are required to submit documentary evidence that the design and manufacture of the fuses offered is in accordance with AS/NZS/ISO 9001. This documentation shall include the Capability Statement associated with the Quality System Certification.
9. **Samples**

9.1 **Production Samples**
When requested, production samples of each item tendered shall be submitted to assist in the evaluation of the tender.

9.2 **Sample Delivery**
Each sample shall be delivered freight free, suitably crated and packaged and labelled with the following information:

<table>
<thead>
<tr>
<th>Name of Supplier and this Contract No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contract Item Numbers</td>
</tr>
<tr>
<td>Any supporting data on features or characteristics</td>
</tr>
</tbody>
</table>

10. **Packaging and Marking**

10.1 **Packaging**
Each fitting shall be supplied separately packed in cartons. Gross weight of the carton shall not exceed 20kg. The cartons should be sufficiently sturdy to allow for storage on shelves by stacking on a pallet.

All components of the fittings with more than one component shall be packed in the same carton.

10.2 **Packaged Lots**
Each packaged lot shall be marked with the following information:

<table>
<thead>
<tr>
<th>Manufacturers Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchase Order Number</td>
</tr>
<tr>
<td>Contract No.</td>
</tr>
<tr>
<td>Ergon Stock Code</td>
</tr>
<tr>
<td>Item Description</td>
</tr>
<tr>
<td>Pack Size</td>
</tr>
<tr>
<td>Pack Weight</td>
</tr>
</tbody>
</table>

11. **Service Performance**

Suppliers shall state:

(a) the period of service achieved by the items tendered within Australian service conditions;
12. Reliability

12.1 Service Life
Suppliers are required to comment on the reliability of the equipment and the performance of the materials tendered for a service life of 35 years under the specified system and environmental conditions.

12.2 Evidence in Support of Reliability
Such comments shall include evidence in support of the reliability and performance claimed including information on Failure Mode and Effect Analysis.

13. Training

13.1 Training Material
Training material in the form of drawings, instructions and/or audio visuals (in CD format) are required to be provided for the items accepted under the tender. The Tenderers shall allow the cost of production and delivery of training material in the tendered prices. The training materials should include but not be limited to the following topics:

- Handling
- Storage
- Application (particularly in areas of heavy coastal pollution)
- Installation
- Maintenance
- Environmental performance
- Electrical performance
- Mechanical performance
- Disposal

13.2 Training Audio Visuals
The successful Tenderer is required to provide training audio visuals for the Purchaser's staff/contractors in the correct use of all items to be supplied under the contract. Training audio visuals are to be supplied BEFORE the 1st deliveries are made under the contract.

The format and content of the audio visuals will be subject to negotiation between the Purchaser and the successful tenderer concerned. It is expected that as a minimum, the
audio visuals will detail the correct installation practice for all items covered by the contract.
The number of audio visuals required, in CD format, is thirty (30). Permission shall be given to the Purchaser to make additional copies if required.

In the production of the audio visuals, the Purchaser will make available suitable staff and equipment to demonstrate the recommended installation techniques.

14. Environmental Considerations

Suppliers are required to comment on the environmental soundness of the design and the materials used in the manufacture of the items tendered. In particular, comments should address such issues as recycling and disposal at the end of service life.

15. Information to be Provided

15.1 Specific Technical Requirements
The specific technical requirements for the items tendered shall be as stated in Attachments 1 and 2 of this specification. The supplier shall provide all details requested by Attachments 1 and 2 and shall guarantee such data.

15.2 Checklist of Supporting Documentation
Attachment 3 details a checklist of supporting technical documentation which is required to be submitted with the tender.
16. Attachment 1 – Technical Details

NOTE: A separate schedule is to be provided for each item tendered except where information common to all items which only needs to be provided once.

<table>
<thead>
<tr>
<th>SPECIFICATION ITEM NO: STOCK CODE:</th>
<th>DESCRIPTION:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Particulars</strong></td>
<td><strong>Units</strong></td>
</tr>
<tr>
<td>Manufacturer’s Name &amp; Address</td>
<td></td>
</tr>
<tr>
<td>Place of Manufacture</td>
<td></td>
</tr>
<tr>
<td>Manufacturer’s Product Catalogue Number</td>
<td></td>
</tr>
<tr>
<td>Manufacturer’s Drawing Number</td>
<td></td>
</tr>
<tr>
<td>Product Material: Alloy type &amp; Australian Standard</td>
<td></td>
</tr>
<tr>
<td>Will Batch Test Certificates be supplied?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Type Test Report/Certificate No</td>
<td></td>
</tr>
<tr>
<td><strong>Packaging:</strong></td>
<td></td>
</tr>
<tr>
<td>Pack Size</td>
<td></td>
</tr>
<tr>
<td>Pack Weight</td>
<td>kg</td>
</tr>
</tbody>
</table>

SIGNATURE OF TENDERER: _______________________________
17. **Attachment 2 – Electrical Type Test Details**

A separate schedule is to be provided for each item tendered except where information common to all items, which only needs to be provided once. This information is NOT required for the support fittings.

<table>
<thead>
<tr>
<th>SPECIFICATION ITEM NO:</th>
<th>DESCRIPTION:</th>
</tr>
</thead>
<tbody>
<tr>
<td>STOCK CODE:</td>
<td></td>
</tr>
<tr>
<td><strong>Particulars</strong></td>
<td><strong>Units</strong></td>
</tr>
<tr>
<td>Australian/International Standard for Type Tests</td>
<td></td>
</tr>
</tbody>
</table>

**Resistance tests:**

- (a) Voltage drop across fitting \(\mu V\)
- (b) Voltage drop across equivalent length of conductor \(\mu V\)
- (c) Ratio Voltage drop across connector:
  - Voltage drop across conductor |

**Heat-cycling tests:**

- Number of Cycles
- Maximum Temperature of Connector \(^\circ C\)
- Maximum Temperature of Conductor \(^\circ C\)
- Initial Resistance \(\Omega\)
- Final Resistance \(\Omega\)

**Short-time current test:**

- Maximum short circuit current \(kA\)
- Duration of maximum short circuit current seconds

**Signature of Tenderer:**

____________________________________

<table>
<thead>
<tr>
<th>Clause Ref.</th>
<th>Particulars</th>
<th>Tenderer’s Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.8</td>
<td>Detailed drawings</td>
<td>Yes/No</td>
</tr>
<tr>
<td>6.1</td>
<td>Type Test Reports</td>
<td>Yes/No</td>
</tr>
<tr>
<td>8.2</td>
<td>Documentary evidence of the Quality System Certification of BOTH the SUPPLIER and the MANUFACTURER (including Capability Statement)</td>
<td>Yes/No</td>
</tr>
<tr>
<td>11</td>
<td>Service Performance</td>
<td>Yes/No</td>
</tr>
<tr>
<td>12</td>
<td>Reliability</td>
<td>Yes/No</td>
</tr>
<tr>
<td>13.1</td>
<td>Availability of Training Materials</td>
<td>Yes/No</td>
</tr>
<tr>
<td>13.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Environmental Considerations</td>
<td>Yes/No</td>
</tr>
<tr>
<td>15</td>
<td>Completed Attachment of Technical Details</td>
<td>Yes/No</td>
</tr>
</tbody>
</table>

NAME OF TENDERER: __________________________

ADDRESS OF TENDERER: __________________________

SIGNATURE: __________________________ FOR AND ON BEHALF OF TENDERER

DATE: __________________________