



**Ergon Energy Corporation Limited**

# **Technical Specification for Helical Fittings for Overhead Power Lines**

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# Technical Specification for Helical Fittings for Overhead Powerlines



## 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.

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

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STANDARD	TITLE
AS 4169	Electroplated coatings - Tin and tin alloys
AS/NZS 4680	Hot-dip galvanised (zinc) coatings on fabricated ferrous articles
AS/NZS ISO 9001	Quality management systems - Requirements

## 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:

<b>Temperatures</b>	45°C summer day time -5°C winter night time
<b>Solar Radiation Level</b>	1 000 W/m <sup>2</sup> with high ultraviolet content
<b>Precipitation</b>	Tropical summer storms with gust wind speeds above 160 km/h, and an annual rainfall in excess of 1 500mm
<b>Humidity</b>	Extended periods of relative humidity in excess of 90%
<b>Pollution</b>	Areas of coastal salt spray and/or industrial pollution with equivalent salt deposit densities in the range 2.0 to 3.0 g/m <sup>2</sup>

## 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 50C to 900C without permanent loss of essential properties and shall have adequate resistance to ozone, UV radiation, mineral oils and grease and other atmospheric contaminants.

- Nominal holding tension (withstand slip) of the fittings shall be, 15% of the MCBL of the conductor or 3.5kN, whichever is lower.
- Be suitable for line deviations up to and including 30 degrees.
- AGSU housing shall be suitable for attachment to a socket tongue rated 70kN and be supplied complete with a clevis bolt in accordance with superseded AS 1154.2 Reference 16/B , figure 44. The suspension assembly shall have a minimum failing load equivalent to 60% of the conductor MCBL.

## 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 50C to 900C 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 0

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- Shall have a nominal holding tension (withstand slip) of 15% of the MCBL of the conductor or 3.5kN, whichever is lower.
- Shall have a minimum failing load of 20% MCBL of conductor when tested in accordance with clause 3.2.2.2 of AS 1154.3
- The neck diameter of the insulator shall be specified in the item description of the schedule.

## 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:

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

## 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.



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Tenderer's attention is drawn to MP000801F100: Management Systems Information Schedule (Form) which forms an integral part of this specification.

## 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:

<b>Name of Supplier and this Contract No.</b>
<b>Contract Item Numbers</b>
<b>Any supporting data on features or characteristics</b>

## 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:

<b>Manufacturers Name</b>
<b>Purchase Order Number</b>
<b>Contract No.</b>
<b>Ergon Stock Code</b>
<b>Item Description</b>
<b>Pack Size</b>
<b>Pack Weight</b>

## 11. Service Performance

Suppliers shall state:

- (a) the period of service achieved by the items tendered within Australian service conditions;

- (b) Australian electricity supply authorities who have a service history of the items tendered; AND
- (c) Contact names and phone numbers of relevant employees of those supply authorities who can verify the service performance claimed.

## 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

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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.

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## 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.

SPECIFICATION ITEM NO: STOCK CODE:	DESCRIPTION:	
Particulars	Units	Tenderer's Response
Manufacturer's Name & Address		
Place of Manufacture		
Manufacturer's Product Catalogue Number		
Manufacturer's Drawing Number		
Product Material: Alloy type & Australian Standard		
Will Batch Test Certificates be supplied?	Yes/No	
Type Test Report/Certificate No		
<b>Packaging:</b>		
Pack Size		
Pack Weight	kg	

**SIGNATURE OF TENDERER:** \_\_\_\_\_

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## 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.

SPECIFICATION ITEM NO: STOCK CODE:	DESCRIPTION:	
Particulars	Units	Tenderer's Response
Australian/International Standard for Type Tests		
<b>Resistance tests:</b>		
(a) Voltage drop across fitting	$\mu\text{V}$	
(b) Voltage drop across equivalent length of conductor	$\mu\text{V}$	
(c) Ratio Voltage drop across connector Voltage drop across conductor		
<b>Heat-cycling tests:</b>		
Number of Cycles		
Maximum Temperature of Connector	$^{\circ}\text{C}$	
Maximum Temperature of Conductor	$^{\circ}\text{C}$	
Initial Resistance	$\Omega$	
Final Resistance	$\Omega$	
<b>Short-time current test:</b>		
Maximum short circuit current	kA	
Duration of maximum short circuit current	seconds	

**SIGNATURE OF TENDERER:** \_\_\_\_\_

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## 18. Attachment 3 – Technical Document Checklist

Clause Ref.	Particulars	Tenderer's Response
Have full and comprehensive details been submitted <b>WITH</b> the tender documents associated with each of the following items?		
5.8	Detailed drawings	Yes/No
6.1	Type Test Reports	Yes/No
8.2	Documentary evidence of the Quality System Certification of <b>BOTH</b> the <b>SUPPLIER</b> and the <b>MANUFACTURER</b> (including <b>Capability Statement</b> )	Yes/No
11	Service Performance	Yes/No
12	Reliability	Yes/No
13.1 13.2	Availability of Training Materials	Yes/No
14	Environmental Considerations	Yes/No
15	Completed Attachment of Technical Details	Yes/No

NAME OF TENDERER:

ADDRESS OF TENDERER: \_\_\_\_\_

SIGNATURE: \_\_\_\_\_ FOR AND ON BEHALF OF TENDERER

DATE: \_\_\_\_\_