



Ergon Energy Corporation Limited

Technical Specification for Compression Fittings for Overhead Conductors

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1. Purpose and Scope

This specification sets out the requirements for the manufacture, supply, testing and delivery of Compression Fittings for use on overhead electricity networks in a totally exposed environment. Items covered by this technical specification include the following:

- a) Full-tension Compression Sleeves
- b) Non-tension Compression Sleeves
- c) Compression Terminations

2. References

2.1 Applicable Standards

Compression fittings 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
AS1222	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 3607	Conductors - Bare overhead, aluminium and aluminium alloy - Steel reinforced
AS 4169	Electroplated coatings - Tin and tin alloys
AS/NZS 4325	Compression and mechanical connectors for power cables with copper or aluminium conductors
ISO 9001	Quality Systems – Model for quality assurance in design, development, production, installation and servicing.

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3. Drawings

3.1 Drawings by the Purchaser

There are no drawings attached to this specification.

3.2 Drawings by the Tenderer

The tenderer shall supply with the Tender, detailed drawings, sketches or pamphlets of the items tendered.

4. Service Conditions

Items supplied to this specification shall be suitable for operating under the following service conditions:

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

5. Design and Construction

5.1 General

Compression fittings shall be suitable for use on bare aluminium, aluminium alloy, steel reinforced aluminium, steel and hard drawn bare copper conductors.

Aluminium alloy sleeves shall be used for the compression jointing sleeves tendered for the aluminium based conductors.

Copper sleeves shall be used for the compression jointing sleeves tendered for the copper conductors.

Galvanised steel sleeves shall be used for the compression jointing sleeves tendered for the steel core of ACSR conductors. The sleeves for SC/AC and SC/GZ conductors shall be stainless steel.

The dimensions of the full-tension and non-tension compression sleeves should generally be in accordance with Appendix E of AS 1154.1. The manufacturer shall ensure fittings are appropriately designed to meet the performance and test requirements of AS 1154.1.

The across flat (A/F) hexagonal die sizes, in mm, for all compression fittings shall comply with the sizes nominated in the item descriptions in the tender schedule. Should no size be nominated in the schedule the supplier shall nominate the required A/F hexagonal die size.

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Compression fittings shall be suitable for operation at elevated conductor temperatures up to 900C for extended periods.

5.2 Full-tension and Non-tension Compression Sleeves

The full-tension fittings for ACSR conductors shall comprise of multiple piece fittings incorporating two separate sleeves. The inner sleeve to be applied to the galvanised steel conductor core shall be manufactured from galvanised steel with the outer sleeve for compression over the aluminium stands shall be manufactured from aluminium alloy.

It is desirable if all compression sleeves are provided with a barrier located centrally inside the sleeve to ensure that the conductors are inserted to the correct length. The sleeves shall be supplied with an anti-oxidant grease contained within the sleeve by hand-tight removable end caps.

5.3 Surface Finish

End openings of all sleeves and termination fittings shall be chamfered and rounded so that the fitting ends will not, during installation or service, score or damage the conductor rendering it susceptible to failure due to fatigue. The fittings shall be designed, manufactured and finished so as to avoid sharp radii of curvature, ridges and other imperfections that may cause radio interference or harmful corona discharge or employee injury, when installed in accordance with recommended procedure.

5.4 Markings

The following shall be stamped on the body of the fittings:

The manufacturer's name or trademark
The year of manufacture
Conductor stranding and type of alloy
Type of sleeve - NT (Non-tension sleeve) FT (Full-tension sleeve)
Recommended compression die size
Lines marking die positions, the number of compressions and the sequence required.

6. Performance and Testing

6.1 Type Tests

Type test reports as specified for Class A Type test reports carried out in accordance with AS 1154.1 shall be submitted with the tender.

In addition a Short -Time Current Test shall be carried out. The short time current for the 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. The samples for the tests shall be selected in accordance with Table 1.1 of AS 1154-1985 Part 1.

- a) Verification of dimensions

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- b) Mechanical tests as per clause 4.4.2 of AS 1154.1 with testing carried out at dimensional tolerances.
- c) Hardness tests for aluminium or aluminium alloy used in the manufacture of full tension fittings. (A certificate of compliance to the material hardness ranges nominated in the Appendix D of AS 1154.2 will be acceptable in lieu of the batch tests).
- d) Galvanising test (if applicable)
- e) The test certificates shall be submitted to the purchaser prior to the delivery of the corresponding batch.

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 materials from sources that demonstrate the ability to supply quality products.

8.2 Documentary Evidence

Documentary evidence shall be provided concerning the level of quality system certification associated with the supplier and /or the manufacturer. This documentation shall include the Capability Statement associated with the Quality System Certification.

8.3 Quality Certification Program

Tenderers shall provide details of their program to upgrade their Quality Certification to meet the requirements of ISO 9001.

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.

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9.2 Sample Delivery

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

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

10. Packaging and Marking

10.1 Individually Packed

Each fitting shall be individually packed in a sealed plastic bag.

10.2 Packaged Lots

Each packaged lot shall be marked with the following information:

Manufacturers Name
Purchase Order Number
Contract No.
Ergon Stock Code & Item Description
Pack Size
Pack Weight

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.

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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.

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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.

ITEM NUMBER:	STOCK CODE		
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.			
Dimensions:		Al/Cu	Steel
Sleeve length	mm		
Sleeve internal diameters	mm		
Sleeve external diameters	mm		
Recommended Hexagonal Die Size (A/F) and Die Width for 12Tonne Compression Tool			
Packaging:			
Pack Size			
Pack Weight	kg		

SIGNATURE OF TENDERER: _____

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17. Attachment 2 – Electrical Type Test Details

ITEM NUMBER:		
Particulars	Units	Tenderer's Response
Australian/International Standard for Type Tests		
HEAT CYCLE AND CONTACT RESISTANCE TESTS:		
(a) Voltage drop across connector	μV	
(b) Voltage drop across equivalent length of conductor	μV	
(c) Ratio $\frac{\text{Voltage drop across connector}}{\text{Voltage drop across conductor}}$		
AGEING TESTS:		
Number of Cycles		
Maximum Temperature of Connector	°C	
Maximum Temperature of Conductor	°C	
Initial Resistance	Ω	
Final Resistance	Ω	
SHORT CIRCUIT CURRENT TESTS:		
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 WITH the tender documents associated with each of the following items?		
3.2	Detailed drawings	Yes/No
6.1	Type Test Reports	Yes/No
6.2	Batch Test Reports	Yes/No
8.2	Documentary evidence of the Quality System Certification of BOTH the SUPPLIER and the MANUFACTURER (including Capability Statement)	Yes/No
8.3	Tenderer's/Manufacturer's program to upgrade QA systems to ISO 9001	
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 Attachments of Technical Details	Yes/No

NAME OF TENDERER:

ADDRESS OF TENDERER: _____

SIGNATURE: _____ FOR AND ON BEHALF OF TENDERER

DATE: _____