



**Ergon Energy Corporation Limited**

# **Technical Specification for Non-Tension (Bolted) Connectors**

**ETS01-09-01**

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# Technical Specification for Non-Tension (Bolted) Connectors



## 1. Purpose and Scope

This specification sets out the requirements for the manufacture, supply, testing and delivery of non-tension (bolted) connectors (commonly referred to as "parallel groove" or "PG" clamps) for use on overhead electricity distribution networks in a totally exposed environment.

PG clamps are primarily used for the no-load connection/disconnection of aluminium/copper/galv steel conductor combinations.

Items covered by this technical specification, are listed as follows:

ITEM No.	CONDUCTOR SIZES		No. OF BOLTS	STOCK CODE
	MAIN	TAP		
1	16/70 mm <sup>2</sup> Al/SC-GZ	16/70 mm <sup>2</sup> Al/SC-GZ	1	0411402
2	16/120 mm <sup>2</sup> Al/SC-GZ	16/120 mm <sup>2</sup> Al/SC-GZ	2	0411344
3	25/150 mm <sup>2</sup> Al/SC-GZ	25/150 mm <sup>2</sup> Al/SC-GZ	2	0411347
4	95/240 mm <sup>2</sup> Aluminium	95/240 mm <sup>2</sup> Aluminium	"U"	0411312
5	10/70 mm <sup>2</sup> Copper	10/70 mm <sup>2</sup> Copper	1	0411420
6	16/150 mm <sup>2</sup> Copper	16/150 mm <sup>2</sup> Copper	2	0411405
7	16/70 mm <sup>2</sup> Al/SC-GZ	6/50 mm <sup>2</sup> Copper	1	0104218
8	16/70 mm <sup>2</sup> Al/SC-GZ	6/50 mm <sup>2</sup> Copper	2	0411932
9	25/150 mm <sup>2</sup> Al/SC-GZ	10/95 mm <sup>2</sup> Copper	2	0411398
10	95/240 mm <sup>2</sup> Aluminium	70/185 mm <sup>2</sup> Copper	"U"	0411401
11	35/300 mm <sup>2</sup> Aluminium	35/240 mm <sup>2</sup> Copper	2 or "U"	2403222

## 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

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STANDARD	TITLE
AS 1531	Conductors - Bare overhead - Aluminium and aluminium alloy
AS 4680	Hot-dipped galvanized coatings on ferrous articles
AS 1746	Conductors - Bare overhead - Hard-drawn copper
AS 1789	Electroplated coatings - Zinc on iron or steel
AS 2738	Copper and copper alloys - Compositions and designations
AS 2837 (withdrawn)	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
ESAA D(b)5	Current ratings of bare overhead line conductors
VDE 0212/5.62	Guidelines for insulator strings and conductor accessories for overhead power lines
DIN 48 215	Overhead power lines, clamps and connectors, technical delivery specifications
AS/NZS ISO 9001	Quality management systems -Requirements

## 3. Drawings

### 3.1 Drawings by the Purchaser

The following drawing included in **Appendix A.1** shall be read in conjunction with, and shall form part of this technical specification.

DRAWING No.	REVISION	TITLE
QESI 01-22-01	A	Typical Test Arrangements - Contact Quality Test

### 3.2 Drawings by the Tenderer

The Tenderer shall supply with the tender, detailed drawings or pamphlets of the items tendered.

## 4. Service Conditions

The connectors will be exposed to the following environmental conditions:

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<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 Conductors

The connectors shall be capable of the connection of the range of bare aluminium, hard drawn bare copper and galvanized steel conductors as defined in Clause 1 of this technical specification.

### 5.2 Main Components

The connectors shall be of a two part design and shall allow the attachment to the largest conductors without total removal of any component of the connector. Stability of contact pressure shall be maintained by the use of Belleville washers. Keeper bars or thrust plates are **NOT** acceptable.

The connector surfaces in contact with the conductors shall be grooved in a direction **transverse** to the conductor axis to penetrate the oxide layer on the surface of the conductor.

The connectors shall be supplied with either M8, M10 or M12 bolts with head dimensions in accordance with the relevant Australian Standards

Connectors of a single-bolt type shall be designed so as to prevent the clamp components from rotating out of alignment during installation (for example interlocking claws). The claws will also assist in holding the conductors captive within the clamp body during installation.

Connectors shall be suitable for installation and removal by live line techniques.

### 5.3 Connector Body Material

#### 5.3.1 General

Connectors shall be of materials which are resistant to corrosion and parts of the connector which are in direct contact with the conductor shall be of the same material in the form of an alloy or of a material which does not cause interface corrosion.

Parts of the connector which must exhibit elastic expansion and contraction to maintain design contact pressure, **MUST** be manufactured by the forging process ie. cast or extruded parts are **NOT** acceptable.

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## 5.3.2 Aluminium to Aluminium or Galv Steel and Galv Steel to Galv Steel Connectors

The connector material shall be one of the following, as defined in AS 2848, Part 1:

- Alloy 1050
- 6061-T6
- 5005
- 5454
- 3003
- AS 1874 AA603
- AS 1874 - DA401
- AS 1874 - CC401

## 5.3.3 Copper to Copper Connectors

The connector material shall be one of the following, as defined in AS 2738

- Alloy C11000
- Alloy C51800,
- AS 1565 - C90250, C92610A
- AS 1567 - C22000

## 5.3.4 Aluminium to Copper Connectors

The material of the aluminium connector shall be in accordance with Clause 5.3.2 of this technical specification and the material of the copper connection shall be in accordance with Clause 5.3.3 of this technical specification.

## 5.3.5 Grease

Connectors tendered with pre-applied grease and individually packaged shall use a greasing compound with a high stability, high viscosity, water repellent property and a minimum drop point temperature of 130oC. Further, the grease shall **NOT** contain any conducting material e.g. graphite.

## 5.4 Corrosion Protection

The junction point of the aluminium to copper connectors is to be protected against corrosion by a permanent layer or covering of insulating material applied to the exposed bi-metal interface or by other methods which from tests indicate negligible susceptibility to corrosion. Any protective material must have a service life equivalent to that of other materials used in the connector.

## 5.5 Screws, Nuts and Spring/Belleville Washers

All nuts, screws and belleville washers shall be non-corrosive, compatible with the body of the connector and meet the mechanical requirements of Clause 5.7.

Suitable materials for the screws, nuts and washers include galvanised steel in accordance with AS 1214, stainless steel in accordance with AS 2837 or copper alloy. Hexagonal head screws shall be in accordance with AS 1110 and shall have uniform threads throughout, which are free running, and of commercial tolerance 8g in accordance with AS 1275. Hexagonal head nuts shall also have free running threads of tolerance 6H in accordance with AS 1275.

Stainless steel bolts and nuts if provided shall be suitably greased to prevent binding.

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Galvanised screws, nuts and washers are not acceptable on connectors with the clamp body made out of copper or copper alloy.

The connector shall be designed so that the screw head does not bind on the surface of the connector during tightening.

## 5.6 Surface Finish

Connectors shall be designed, manufactured and finished so as to avoid sharp radii of curvature, ridges and other imperfections which may cause radio interference or harmful corona discharge or employee injury. In particular the end surfaces of the connector in contact with the clamp holding tool (refer clause 5.12 below) shall be flush.

## 5.7 Mechanical Requirements

5.7.1 The tenderer shall advise the **minimum** and **maximum** recommended tightening torques as well as the specified tightening technique/procedure.

5.7.2 The specified tightening torque shall be marked on the top surface of the connector.

## 5.8 Electrical Rating

Connectors shall have a minimum continuous current rating equivalent to the current rating of the largest conductor that can be accommodated by the fitting.

## 5.9 Operation

To allow removal of the connectors, the following features are required:

- a) The nuts of the bolted connections shall be held captive in the body of the connector; OR
- b) The body of the connector shall be tapped and the connector designed to withstand the torque strength requirements of Clause 5.7.

## 5.10 Marking

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

The manufacturer's name or trademark
The year of manufacture
The range of conductor cross sectional areas or the conductor diameters for both the main and tap connections
Installation/tightening torque

## 5.11 Technical Characteristics

Tenderers shall provide detailed drawings for all items tendered.

## 5.12 PG Clamp Holding Tool

The tenderers shall nominate the Make and Model Number of the PG clamp holding tool they recommend for holding the clamps in position while tightening the clamp bolts to the recommended torque using a standard torque wrench. Full details of the nominated tool shall be included in the tender submission.



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## 6. Performance and Testing

### 6.1 Type Tests

Type test reports carried out in accordance with one of the following alternative testing requirements shall be submitted with the tender.

#### 6.1.1 Option A

Connectors shall be tested in accordance with the requirements of AS 4325.1 for Class A "through" type connectors, or

#### 6.1.2 Option B

The connectors shall be tested to the following standards:

##### (a) Electrical Type Tests

The electrical type tests shall be in accordance with AS 1154, Part 1 for non-tension fittings

Further to this, the following tests shall be carried out in accordance with the attached **Appendix A.1** and the results summarised in **Attachment 2**:

- (1) Contact Quality Test
- (2) Ageing Test
- (3) Short Circuit Current Test

**Note** Ageing/high current tests carried out in accordance with VDE 220 or IEC 1238-1 are acceptable alternatives to tests (2) and (3) above.

##### (b) Mechanical Type Tests

The mechanical type tests shall be in accordance with AS 1154, Part 1 for non-tension fittings.

Further to this, torque strength tests shall be performed to confirm that the connector will meet the tightening and torque strength requirements of Clause 5.7. Torque values shall be measured with an accuracy of  $\pm 10$  percent and running torque values shall be recorded. The largest diameter conductor for which the connector is designed shall be used for re-useability and ultimate torque measurements.

## 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.

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## 8.2 Documentary Evidence

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

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

## 8.3 Quality Certification Program

Tenderers shall provide details of their program to upgrade their Quality Certification to meet the requirements of AS / NZS 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.

### 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 Packaged Cartons

All items are to be supplied in packaged in cardboard cartons sufficiently sturdy to enable them to be stacked on pallets for storage. The size of the packages will be negotiated between the successful Tenderer and the Purchaser. Pre-greased items shall be individually packed in sealed plastic bags.

### 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>

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## 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 audio visuals will detail the correct installation practice for all items covered by the contract.

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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. Appendix A.1 – Electrical Tests

### 16.1 Preparation of Tests Pieces

The components must be assembled together with the conductors for which they are intended.

The contact making surfaces of components and conductors must be carefully cleaned with wire brushes before assembly. Not more than 5 minutes must elapse between cleaning and assembly. The contact surfaces are not greased.

Between the clamping point of the conductors and the component, the conductor length must be at least 30 times the diameter of the conductor, but at least 300 mm. In the case of series connection of test pieces, the same distances must be observed.

In the case of stranded conductors, as uniform a current distribution as possible over the entire cross section of the conductor must be aimed at by appropriate selection of the current feed.

Screws must be greased and tightened with the torque in accordance with Clause 5.7.

### 16.2 Contact Quality Test

#### **DETERMINATION OF THE FACTOR $\delta$ (Refer Drawing 01-21-01):**

The factor  $\delta = \Delta U_1 / \Delta U_2$  is used to assess the contact quality of a clamp, a connector or a connector lug. To determine this, the voltage drop of  $\Delta U_1$  must be measured at the component and the voltage drop  $\Delta U_2$  on a conductor section of the same length as the component. The length of the component is understood to be the length between the voltage taps. In the case of components with flushy abutting conductor ends or with parallel conductor ends, the projection between the measurement points is taken as the length. In the case of T-shaped or angular components, the axial length of an imaginary conductor passing through is taken. In Figs 1 (a) to (d), the length L is shown for clamps and connectors, and in Fig 1 (e) that for connector lugs.

The components and the associated conductors should be loaded with direct current of suitable magnitude to ensure accurate measurements but not large enough to cause excessive heating of the clamps or cable.

Components for different conductor cross sections e.g. branch clamps, should be tested with the largest and the smallest conductor. In the case of clamps and connectors with conductors of different thicknesses, the test current of the weaker one should be used. The voltage drops  $\Delta U_1$  and  $\Delta U_2$  must be measured according to Fig 1 (a) to (d) in the case of clamps and connectors and according to Fig 1 (e) in the case of connector lugs. In the case of clamps and connectors with conductors of different strengths,  $\Delta U_2$  must be measured on the weaker conductor.

The connection of the voltmeter in the case of stranded conductors is effected by means of wire lashings consisting of 3 windings of copper wire of 0.7 to 0.8 mm in diameter or by means of suitable measuring clamps. In the case of solid conductors, test probes may be used for the voltage tapping. The probes on the conductors must be placed as close as

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possible to the test piece without touching it. The distance between the probe and the end face of the test piece may not be greater than 1 mm.

The values of the factor  $\delta$  given in Table 1 may not be exceeded.

**Table 1**  
**Permissible Values of the Factor  $\delta$**

Component	$\delta$
Press connector	0.60
Riveted connector, fixed	0.60
Indentor connector, fixed	0.60
Screw connector, removable	0.80
Conical connector, removable	0.80
Parallel groove clamps, removable	0.80
Clamp connector lugs, removable	0.70
Branch clamps, max. cross section/max. cross section	1.00
Branch clamps, max. cross section/25 mm <sup>2</sup>	0.80
" " /10 mm <sup>2</sup>	0.80
" " / 6 mm <sup>2</sup>	0.55

## 16.3 Ageing Test

Ageing testing has the purpose of simulating the alternating electrical loading of the components in operation and in so doing assessing the quality of the clamps.

Testing of ageing is carried out with alternating current of 50 Hz. In the case of components for different conductor thicknesses e.g. branch clamps, the ageing testing needs to be carried out only with the largest conductor cross sections.

The components assembled in accordance with Clause 1 are subjected to 1000 (one thousand) current loading tests. The current is so selected so that after a load period of about 20 minutes, a final temperature of 120°C in the conductor is obtained. After the current has been switched off, the test pieces with the conductors should be cooled to about 30°C. The experiment is carried out indoors.

At the end of the ageing test, the heating of the test piece on loading with the continuous current should not be greater than that of a free section of conductor of a length of at least 2m loaded with the same current. The temperature applying to the test piece is that in the conductor measured directly at the outlet from the clamp.

In the case of stranded conductors, the measurement must be made under the first layer of wire. The continuous current is the standardised or agreed value.

Prior to ageing testing, the resistance of the assembly shall be measured between points on the conductor either side and just clear of the fitting and this measurement recorded. At the end of the ageing test, the resistance of the assembly shall be measured again and this resistance shall **NOT** exceed 130% of the initial value.

## 16.4 Short-Circuit Current Test

The test is intended to show whether the test piece, after withstanding a thousand load cycles, is still capable of surviving a short circuit.

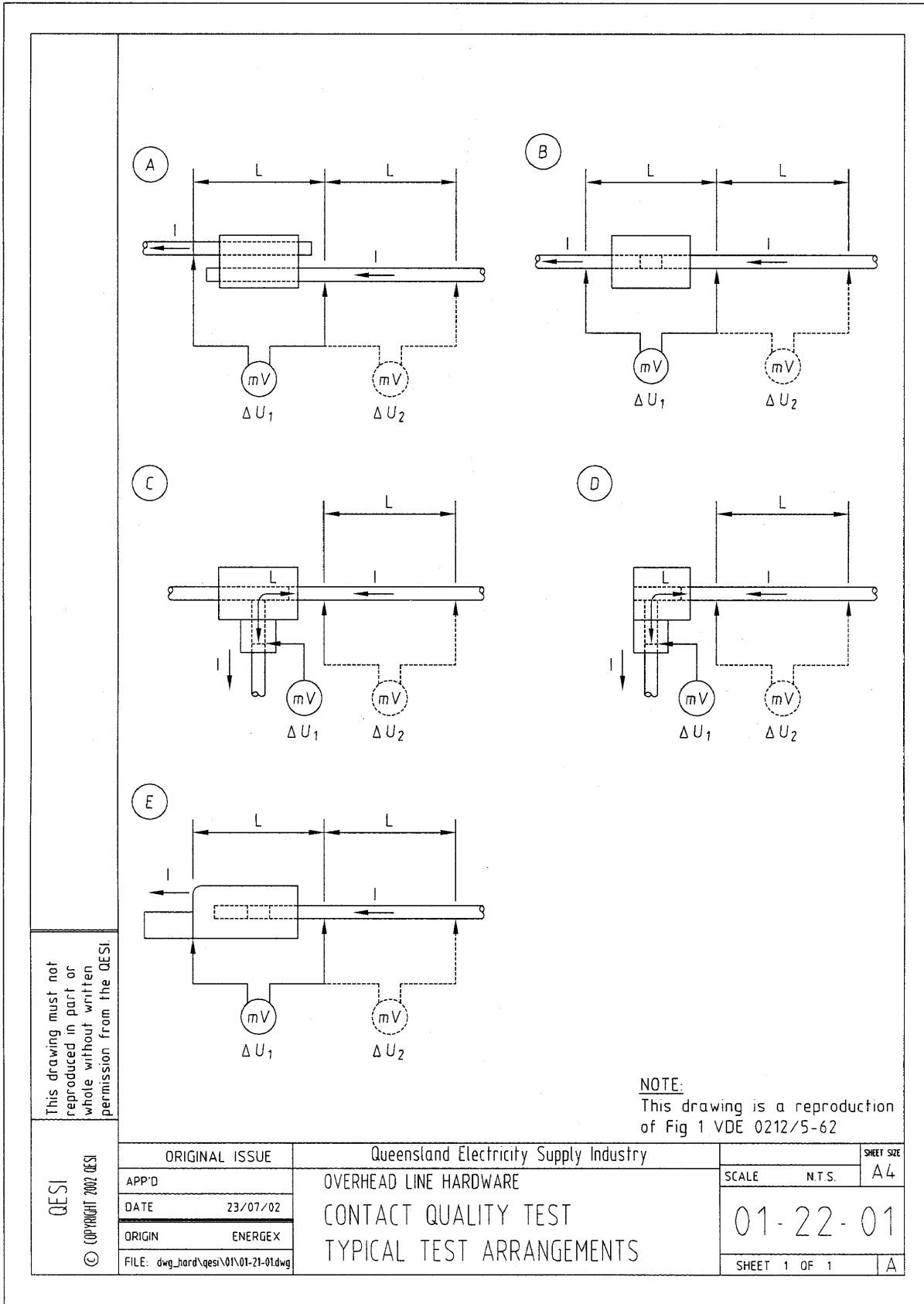
After undergoing ageing testing in accordance with Clause 3, the components with clamped conductors in the same state as that in which they are after ageing testing, are subjected to short circuit tests. Any changes of any kind e.g. the re-tightening of the screws, are impermissible. The testing of short circuit behaviour is carried out with 50 Hz alternating current of the value determined from Appendix A of AS 1154, Part 1. It remains connected until broken by the melting of the conductor.

The test pieces should not be damaged during testing. Fusions of conductors with the components are not permissible.

## 16.5 Number of Test Pieces in Type Testing

Type tests are as a rule to be made on at least 6 test pieces. If these are components which are manufactured only in batches of fewer than 100 pieces, 3 test pieces are sufficient.

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ORIGINAL ISSUE	Queensland Electricity Supply Industry
APP'D	OVERHEAD LINE HARDWARE
DATE	23/07/02
ORIGIN	ENERGEX
FILE:	dwg_hard\qesi\01\01-21-01.dwg

CONTACT QUALITY TEST	
TYPICAL TEST ARRANGEMENTS	

SCALE	N.T.S.	SHEET SIZE	A4
01-22-01			
SHEET 1 OF 1		A	

**NOTE:**  
This drawing is a reproduction of Fig 1 VDE 0212/5-62



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## 17. 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:		
Particulars	Units	Tenderer's Response
Manufacturer's Name & Address		
Place of Manufacture		
Manufacturer's Product Catalogue Number		
Manufacturer's Drawing Number		
Will Batch Test Certificates be supplied?	Yes/No	
Type Test Report/Certificate No.		
<b>Dimensions:</b>		
Body length	mm	
Body width	mm	
SPECIFICATION ITEM NO:		
Particulars	Units	Tenderer's Response
<b>MATERIAL DETAILS:</b>		
body alloy type & applicable Aust/Int Standard		
screw(s) alloy type & applicable Aust/Int Standard		
nut(s) alloy type & applicable Aust/Int Standard		
washer(s) alloy type & applicable Aust/Int Standard		
<b>Bolt/Nut Details:</b>		
Screw thread type & tolerance		
Nut type & tolerance		
Body internal thread type & tolerance		
Across flat dimension of bolt head	mm	

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Recommended installation screw torque	Nm	
Maximum installation torque	Nm	
Galvanising process & applicable Aust/Int Standard		
Details of grease used on threads		
Minimum thickness of galvanising	µm	
<b>Conductor Capacity (MAIN):</b>		
(a) Minimum conductor OD	mm	
(b) Minimum conductor sectional area	mm <sup>2</sup>	
(c) Maximum conductor OD	mm	
(c) Maximum conductor sectional area	mm <sup>2</sup>	
<b>SPECIFICATION ITEM NO:</b>		
<b>Particulars</b>	<b>Units</b>	<b>Tenderer's Response</b>
<b>Conductor Capacity (TAP):</b>		
(a) Minimum conductor OD	mm	
(b) Minimum conductor sectional area	mm <sup>2</sup>	
(c) Maximum conductor OD	mm	
(d) Maximum conductor sectional area	mm <sup>2</sup>	
<b>Groove Direction :</b>	Transverse required	
<b>Grease:</b>		
Copper:		
Type		
Minimum Drop Point Temperature	°C	
Aluminium:		
Type		
Minimum Drop Point Temperature	°C	
<b>Packaging:</b>		
Pack Size Tendered		
Pack Weight	kg	

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

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## 18. Attachment 2 – Electrical Type Test Details

SPECIFICATION ITEM NO:		
Particulars	Units	Tenderer's Response
Australian/International Standard for Type Tests		
<b>Heat cycle and contact resistance tests:</b>		
(a) Voltage drop across connector	$\mu V$	
(b) Voltage drop across equivalent length of conductor	$\mu V$	
(c) Ratio $\frac{\text{Voltage drop across connector}}{\text{Voltage drop across conductor}}$		
<b>AGEING TESTS:</b>		
Number of Cycles		
Maximum Temperature of Connector	$^{\circ}C$	
Maximum Temperature of Conductor	$^{\circ}C$	
Initial Resistance	$\Omega$	
Final Resistance	$\Omega$	
<b>SHORT CIRCUIT CURRENT TESTS:</b>		
Maximum short circuit current	kA	
Duration of maximum short circuit current	seconds	

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

# Technical Specification for Non-Tension (Bolted) Connectors



## 19. 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?		
3.2/5.11	Detailed drawings	Yes/No
5.12	Details of recommended PG clamp holding tool	Yes/No
6	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
8.3	Supplier's/Manufacturer's program for updating QA systems to ISO 9001	Yes/no
11	Service Performance	Yes/No
12	Reliability	Yes/No
13	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: \_\_\_\_\_