



The Kenya Power &
Lighting Co. Ltd

TITLE:

**SPECIFICATION FOR BUSBAR
CONNECTORS**

Doc. No.

KPLC1/3CB/TSP/06/027

Issue No.

1

Revision No.

0

Date of Issue

2010-08-26

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Issued by: Head of Section, Technical Stds & Specs

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0.1 Circulation List

| COPY NO. | COPY HOLDER |
|----------|----------------------------------|
| 1 | Research & Development Manager |
| 2 | Procurement Manager |
| 3 | Stores & Stock Control Manager |
| 4 | Operations & Maintenance Manager |
| 5 | Deputy Manager, Technical Audit |

0.2 Amendment Record

| Rev No. | Date (YYYY-MM-DD) | Description of Change | Prepared by (Name & Signature) | Approved by (Name & Signature) |
|---------|----------------------|-----------------------|-----------------------------------|-----------------------------------|
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FOREWORD

This specification has been prepared by the Research and Development Department of The Kenya Power and Lighting Company Limited (KPLC) and it lays down requirements for Busbar Connectors. The specification is to be used by KPLC for procurement of the items.

1. SCOPE

This specification is for busbar connectors for use with busbar tubes for connection of switchgear and other substation equipment.

2. REFERENCES

The following standards contain provisions which, through reference in this text constitute provisions of this specification. Unless otherwise stated, the latest editions (including amendments) apply.

ISO 1461: Hot dip galvanized coatings on fabricated iron and steel articles – Specifications and test methods

BS 159: Busbars and Busbar Connections.

BS 1977: Specification for Copper for Electrical Purposes

3. TERMS AND DEFINITIONS

The definitions given in the reference standards apply.

4. REQUIREMENTS

4.1 SERVICE CONDITIONS

The connectors shall be suitable for continuous operation outdoors in tropical areas at altitudes of up to 2200m above sea level, humidity of up to 90%, average ambient temperature of +30°C with a minimum of -1°C and a maximum of +40°C.

Note: Busbar Connectors for use along the coast when required shall in addition, comply with galvanizing requirements of clause 4.2.6 Table 1 of this specification.

4.2 MATERIALS AND CONSTRUCTION

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4.2.1 The base material shall be manufactured from solid drawn copper of high conductivity for electrical purposes.

4.2.2 Each connector shall be electro-tinned and shall be designed to ensure full mechanical strength and adequate cross-sectional area for rated current carrying capacity.

4.2.3 Each clamp shall be supplied complete with steel bolts (whitworth thread), nuts and split spring washers.

4.2.4 Expansion Type Connectors

Expansion type connectors shall be fitted with tinned copper laminations, with ends resistant welded without filler to form a compact connector element. Each connector shall consist of clamps, busbar tube guide/support and the flexible copper strips as indicated on the general arrangement drawings attached.

4.2.5 Rigid (Fixed) Type Connectors

(a) Rigid type connector shall consist of clamps fitted on a palm.

(b) Each connector shall be supplied complete with holes drilled as per the drawings.

(c) Split clamps indicated on the drawings shall be made of copper zinc alloy of high conductivity and mechanical strength.

4.2.6 Resistance to Corrosion

(a) All parts of each connector shall be resistant to atmospheric corrosion both in storage and service.

(b) Galvanizing for steel parts shall be in accordance with ISO 1461 and as indicated in Table 1 below.

Table 1: Galvanizing

| | Busbar Connectors for Inland Application | Busbar Connectors for Coastal Application |
|-----------------------------------|---|--|
| Minimum Average Coating Weight | 610 g/m ² | 800 g/m ² |

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4.3 GENERAL ARRANGEMENT DRAWINGS

Dimensions, palm hole drilling and general arrangement for each type of connector shall be as per the attached drawings.

Table 2: General Arrangement Drawings for Bus Bar Connectors

| CODE | DESCRIPTION | DRAWING No. |
|--------|---|------------------------|
| 114836 | Fixed (Rigid) Clamp for 1" (25.4mm) OD Copper Tubes (Electro-tinned) | SK No. 08605 Sheet 1 |
| 114844 | Fixed (Rigid) Clamp for 2" (50.8mm) OD Copper Tubes (Electro-tinned) | SK No. 08605 Sheet 1 |
| 114834 | Expansion Clamp for 1" (25.4mm) OD Copper Tubes (Copper Silver Coated) | SK No. 08605 Sheet 2 |
| 114843 | Fixed (Rigid) Interspan Clamp for 2" (50.8mm) Copper Tubes (Electro-tinned) | SK No. 08605 Sheet 2 |
| 114837 | Fixed (Rigid) Clamp for 1" (25.4mm) Copper Tubes (palm: silver coated, clamp: electro-tinned) | SK No. 08605 Sheet 3 |
| 114849 | Expansion Clamp for 2" (50.8mm) OD Copper Tubes (Electro-tinned) | SK No. 08605 Sheet 4 |
| 114838 | Fixed (Rigid) Clamp for 1" (25.4mm) OD Copper Tubes (Electro-tinned) | SK No. 08605 Sheet 5 |
| 114853 | Expansion Clamp for 3" (76.2mm) OD Copper Tubes (palm: silver coated, clamp: electro-tinned) | SK No. 08605 Sheet 6 |
| 114852 | Expansion Clamp for 76mm OD Cu Tubes | SK No. 08605 Sheet 7 |
| 114832 | Fixed (Rigid) Clamp for 76mm OD Copper Tubes (Electro-tinned) | SK No. 08605 Sheet 8 |
| 114824 | Expansion Clamp for 76mm OD Copper Tubes (Electro-tinned) | SK No. 08605 Sheet 8 |
| 114846 | Bus Bar Fittings, straight clamp support | SK No. 08605 Sheet 9 |
| 114847 | Bus Bar Fittings, connector clamp | SK No. 08605 Sheet 9 |
| 114850 | Bus Bar Fittings, straight expansion support | SK No. 08605 Sheet 9 |
| | Details for 2" OD Cu Tube Clamp | SK No. 08605 Sheet 10 |
| 114830 | Tee Clamp for 1½" (38.1mm) copper tube and 150mm² stranded conductor (Electro-tinned) | SK No. 08605 Sheet 11A |
| 114829 | Tee Clamp for 2" (50.8mm) copper tube and 150mm² stranded conductor (Electro- | SK No. 08605 Sheet 11 |

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| | | |
|---|--|-----------------------|
| | tinned) | |
| 114828 | Tee Clamp for 3" (76.2mm) copper tube and 150mm ² stranded conductor (Electro-tinned) | SK No. 08605 Sheet 11 |
| 114827 | Tee Clamp for stranded conductors (U Bolt type) (Electro-tinned) | SK No. 08605 Sheet 12 |
| 180734, 180735, 180738, 180732 | Mild steel galvanized bolts and nuts (Whitworth thread) | SK No. 08605 Sheet 13 |
| 181810 | Fixed (Rigid) Bus Bar Clamp for 1½" (38.1mm) Copper Tubes (Electro-tinned) | SK No. 08605 Sheet 14 |
| 114842 | Fixed (Rigid) Bus Bar Clamp for 2" (50.8mm) Copper Tubes (Electro-tinned) | SK No. 08605 Sheet 15 |
| 124149 | Compression lug, 30mm ² , Copper | SK No. 08605 Sheet 16 |
| 114851 | 2" Dia Expansion clamp | SK No. 08605 Sheet 17 |
| 114823 | Bus Bar Angle Expansion Clamp for 2" (50.8mm) Copper Tubes | SK No. 08605 Sheet 18 |
| 114889 | 1" OD – 3"OD Tee Clamp (Electro-tinned) | SK No. 08605 Sheet 19 |
| 199160 | Rigid Clamp for 25.4mm Copper Tubes (palm: silver coated, clamp: electro-tinned) | SK No. 08605 Sheet 20 |
| 114848 | Electro-tinned Connector S/Clamp 2" | Fig 1. |

4.4 RATINGS AND CHARACTERISTICS

4.4.1 Ratings

Table 3: Ratings

| Description | | Requirement |
|---|--|---------------|
| Rated Voltage and Frequency | | 132kV 50Hz |
| Rated Current (Continuous Normal Current) | Connector for 25.4mm (1") Copper Tube | 800A |
| | Connector for 38.1mm (1½") Copper Tube | 1400A |
| | Connector for 50.8mm (2") Copper Tube | 1600A |
| | Connector for 76.2mm (3") Copper Tube | 2500A |
| Short time withstand current | | 31.5kA, 3sec. |

4.4.2 Temperature Rise

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The Temperature Rise of the busbar connector above the ambient temperature when carrying rated normal current at rated frequency shall not exceed 50°C as per BS 159.

5. TESTS AND INSPECTION

5.1 The connectors shall be inspected and tested in accordance with the requirement of BS 159 and this specification. It shall be the responsibility of the manufacturer to perform or to have performed all the tests specified.

5.2 Copies of previous Test Reports (in English Language) from the National Testing/Standards Authority or ISO/IEC 17025 accredited laboratory shall be submitted with the tender for the purpose of technical evaluation.

5.3 Routine and sample test reports (including dimensions and current carrying capacity) for the busbar connectors to be supplied shall be submitted to KPLC for approval before shipment/delivery of the goods.

5.4 On receipt of the goods KPLC may perform any of the relevant tests in order to verify compliance with this specification. The supplier shall replace without charge to KPLC busbar connectors which upon examination, test or use fail to meet any of the requirements in the specification.

6. MARKING AND PACKING

6.1 The busbar connectors shall be engraved legibly and indelibly with the following information, all in English:

- The manufacturer's name or identity
- KPLC Order Number

6.2 The busbar connectors shall be packed in a manner so as to protect them from damage during transportation and damage. Each connector shall be supplied fully assembled and marked for ease of use.

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ANNEX A: Guaranteed Technical Particulars (to be filled and signed by the Supplier and submitted together with copies of manufacturer's catalogues, brochures, drawings, technical data, sales records and copies of certificates/test reports for tender evaluation)

Tender No.

| Clause number | | Bidder's offer (indicate full details of the offered item for each requirement of the specification) |
|---|------------------------------------|--|
| 1 Scope | | |
| 2 Standards | | |
| 3 Terms & definitions | | |
| 4.1 Service Conditions | | |
| 4.2.1 Materials | | |
| 4.2.2 Construction & finish | | |
| 4.2.3 Steel bolts | | |
| 4.2.4 Expansion type connectors | | |
| 4.2.5 Rigid (fixed) type connectors | | |
| 4.2.6 Resistance to corrosion | | |
| 4.3 Drawings | | |
| 4.4.1 | Rated voltage & frequency | |
| | Rated current (continuous current) | |
| | Rated short time withstand current | |
| 4.4.2 Temperature rise | | |
| 5.1 Tests & inspection | | |
| 5.2 Copies of test reports submitted with tender | | |
| 5.3 Test reports before delivery | | |
| 5.4 Inspection & test before acceptance to stores | | |
| 6.1 Marking | | |
| 6.2 Packing | | |

.....
Supplier's Name, Signature, Stamp and Date

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