



Kenya Power

TITLE:

SPECIFICATION FOR BUSBAR CONNECTORS
Part 1: Copper Busbars

Doc. No.

KP1/3CB/TSP/06/027-1

Issue No.

1

Revision No.

0

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2014-05-09

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(to be filled and signed by the Manufacturer and submitted together with relevant copies of the Manufacturer's catalogues, brochures, drawings, technical data, sales records for past five years, four customer reference letters, details of manufacturing capacity, the manufacturer's experience, copies of complete type test reports and accreditation certificate to ISO/IEC 17025 for the testing laboratory for tender evaluation, all in English Language)

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0.1 Circulation List

COPY NO.	COPY HOLDER
1	Research & Development Manager
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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 in collaboration with Distribution Division both of The Kenya Power and Lighting Company Limited (abbreviated as KPLC) and it lays down requirements for Busbar Connectors designed to withstand service voltages of upto 245kV. It is intended for use by KPLC in purchasing the connectors.

The bidder shall submit information which demonstrates satisfactory service experience of the manufacturer with products which fall within the scope of this specification.

1. SCOPE

This specification is for busbar connectors for use with copper busbar tubes for connection of switchgear and other substation equipment. The busbar connectors shall be suitable for service voltages of upto 245kV, 50Hz system.

The specification also covers inspection and test of the connectors as well as schedule of Guaranteed Technical Particulars to be filled, signed by the manufacturer and submitted together with other required details for tender evaluation.

The specification stipulates the minimum requirements for busbar connectors acceptable for use in the company and it shall be the responsibility of the supplier to ensure adequacy of the design, good workmanship, good engineering practice and adherence to standards, specifications and applicable regulations in the manufacture of the connectors for The Kenya Power & Lighting Company Ltd.

The specification does not purport to include all the necessary provisions of a contract.

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

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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 busbar 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.

4.2 MATERIALS AND CONSTRUCTION

4.2.1 The busbar connectors shall be made from bronze by casting. The copper alloy (bronze) shall have high copper content (of at least 84%) with resistivity of 12-14 $\mu\Omega$ cm.

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 (all types) shall be supplied complete with bolts, nuts and split spring washers all in stainless steel.

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.

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(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) Tinning shall be adequate for specified service conditions and proof shall be provided in the bid. The level of tinning shall also be suitable for connection of aluminium conductor where specified.

(c) Bolts, nuts and washers shall all be in stainless steel.

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 76mmOD Cu Tubes	SK No. 08605 Sheet 7

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CODE	DESCRIPTION	DRAWING No.
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 150mm ² stranded conductor (Electro-tinned)	SK No. 08605 Sheet 11A
114829	Tee Clamp for 2" (50.8mm) copper tube and 150mm ² stranded conductor (Electro-tinned)	SK No. 08605 Sheet 11
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	Stainless steel bolts and nuts (<i>this description supersedes the drawing</i>)	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.

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4.4 RATINGS AND CHARACTERISTICS

4.4.1 Ratings

Table 3: Ratings

Description		Requirement
Rated Voltage and Frequency		245kV 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

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.

4.5. QUALITY MANAGEMENT SYSTEM

4.5.1 The bidder shall submit a quality assurance plan (QAP) that will be used to ensure that the design, material, workmanship, tests, service capability, maintenance and documentation, will fulfil the requirements stated in the contract documents, standards, specifications and regulations. The QAP shall be based on and include relevant parts to fulfil the requirements of ISO 9001:2008.

4.5.2 The Manufacturer's Declaration of Conformity to reference standards and copies of quality management certifications including copy of valid and relevant ISO 9001: 2008 certificate shall be submitted with the tender for evaluation.

4.5.3 The bidder shall indicate the delivery time of the busbar connectors, manufacturer's monthly & annual production capacity and experience in the production of the type and size of connector being offered. A detailed list & contact addresses (including e-mail) of the manufacturer's previous customers for similar connectors sold in the last five years as well as reference letters from at least four of the customers shall be submitted with the tender for evaluation.

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 supplier to perform or to have performed all the tests specified.

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5.2 Copies of previous test certificates and test reports by a third party testing laboratory that is accredited to ISO/IEC 17025 shall be submitted with the offer for evaluation. A copy of the accreditation certificate to ISO/IEC 17025 for the testing laboratory shall also be submitted. Any translations of certificates and test reports into English language shall be signed and stamped by the third party testing laboratory that carried out the tests.

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. KPLC Engineers will witness these tests at the factory before shipment.

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 Each busbar connector shall be engraved legibly and indelibly with the following information, all in English:

- The manufacturer's name or identity
- Voltage & Current Rating
- KPLC Order Number

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

7. DOCUMENTATION

7.1 The bidder shall submit its tender complete with technical documents required by Annex A (Guaranteed Technical Particulars) for tender evaluation. The information shall include the following:

- a) Schedule of Guaranteed Technical Particulars fully filled and signed by the manufacturer;
- b) Copies of the Manufacturer's catalogues, brochures, drawings and technical data;
- c) Sales records for the last five years and at least four customer reference letters;
- d) Details of manufacturing capacity and the manufacturer's experience;
- e) Copies of required test reports by a third party testing laboratory accredited to ISO/IEC 17025;

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- f) Copy of accreditation certificate to ISO/IEC 17025 for the third party testing laboratory;
- g) Manufacturer's warranty and guarantee;
- h) Manufacturers letter of authorization, ISO 9001:2008 certificate and other technical documents required in the tender.

7.2 The successful bidder (supplier) shall submit the following documents/details to The Kenya Power & Lighting Company for approval before manufacture:

- a) Schedule of Guaranteed Technical Particulars fully filled and signed by the manufacturer,
- b) Design Drawings and construction details of the connectors,
- c) Quality assurance plan (QAP) that will be used to ensure that the design, material, workmanship, tests, service capability, maintenance and documentation will fulfil the requirements stated in the contract documents, standards, specifications and regulations. The QAP shall be based on and include relevant parts to fulfil the requirements of ISO 9001:2008
- d) Test Program to be used after manufacture,
- e) Marking details and method to be used in marking the connectors,
- f) Manufacturer's undertaking to ensure adequacy of the design, good workmanship, good engineering practice and adherence to standards, specifications and applicable regulations in the manufacture of the busbar connectors for The Kenya Power & Lighting Company Ltd;
- g) Packaging details (including packaging materials and length on drum).

The drawings to be submitted by the supplier to KPLC for approval before manufacture shall be in standard format clearly indication drawing number, parts list with material details & quantities, standard of manufacture, ratings, approval details and identify of the manufacturer (as per manufacturer's authorization submitted during tendering)

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ANNEX A: SCHEDULE OF GUARANTEED TECHNICAL PARTICULARS FOR OFFERED BUSBAR CONNECTORS

(to be filled and signed by the Manufacturer and submitted together with relevant copies of the Manufacturer's catalogues, brochures, drawings, technical data, sales records for previous five years, four customer reference letters, details of manufacturing capacity, the manufacturer's experience, copies of complete type test reports and accreditation certificate to ISO/IEC 17025 for the testing laboratory for tender evaluation, all in English Language)

Tender No..... Bidder's Name & Address

Clause /Requirement	Bidder's offer (indicate full details of the offered item for each requirement of the specification)
Name and address of the Manufacturer	
Country of manufacture	
Manufacturer's Letter of Authorization	
Model/Type Reference No. of the offered busbar connectors	
Manufacturer's warranty and guarantee for the offered busbar connectors	
1 Scope: a) Design, manufacture, test, ship and deliver Busbar Connectors to KPLC store/site as per terms of contract b) Ensure adequacy of the design, good workmanship, good engineering practice and adherence to standards, specifications and applicable regulations in the manufacture of the connectors for KPLC	a)
	b)
2 Applicable Standards	
3 Terms & definitions	
4.1 Service Conditions	
4.2 Materials & Construction	
4.2.1 Material details of the Bronze used in the connector	Chemical composition
	Tensile strength, N/mm ²
	Elastic yield point, N/mm ²
	Elongation, %
	Hardness, Brinell
4.2.2 Construction & finish	Resistivity, μΩcm
	Thickness of tin coating
	Chemical composition of tin coating

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Clause /Requirement	Bidder's offer (indicate full details of the offered item for each requirement of the specification)
4.2.3 Material details of the stainless steel bolts, nuts & washers	Chemical composition
	Tensile strength, N/mm ²
	Elastic yield point, N/mm ²
	Elongation, %
	Hardness, Brinell
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	
4.5 Quality Management System	
4.5.1 Quality assurance plan	
4.5.2 Manufacturer's declaration of conformity & copy of ISO 9001:2008 certificate	
4.5.3	Manufacturer's production capacity
	Manufacture's experience
	List of previous customers in last five years
	Reference letters from four previous customers
5.1 Tests & Inspection	
5.2 Copies of test reports submitted with tender	
5.3 Test reports to be submitted by the supplier to KPLC before delivery	
5.3 Tests to be witnessed by KPLC at the factory before shipment	
5.4 Inspection & test before acceptance to stores	
6.1 Marking	
6.2 Packaging	
7.1 Documents submitted with tender for evaluation	
7.2 Documents to be submitted by supplier to KPLC for approval before manufacture	
Statement of compliance to Tender Specifications	

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

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