

BUSBAR CLAMPS AND COMPONENTS

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PURPOSE AND SCOPE

This document forms part of a suite of documents, which define National Grid's (NG) functional and performance requirements for new plant and equipment for the use on the NG UK Electricity Transmission system.

This Specification covers the requirements, which are applicable to all components of busbar systems defined in TS 3.1.4 and procured for use on Air Insulated Substations (AIS) owned by or directly connected to the NG UK Electricity Transmission system.

PART 1 – PROCEDURAL

1 GENERAL REQUIREMENTS

All components of an AIS busbar system shall meet the requirements of the relevant IEC, BS EN Standards and the additional requirements stated in this specification.

The supplier shall produce installation, maintenance and replacement procedures for each component, taking into consideration NG maintenance requirements.

1.1 Drawing

Drawings of each busbar component shall be supplied which must comply with the requirements of UK BP TP183 – Type Registration Equipment Procedural Requirements and the following specific requirements.

The drawing shall confirm that the busbar components are to the specified tolerance and shall include other dimensions and data which significantly affect the functional and performance characteristics of the busbar components including:

- 1.1.1 All relevant dimensions, such as tube/conductor size and terminal palm drilling.
- 1.1.2 The maximum working voltage, mechanical strength, rated continuous current and short circuit rating.
- 1.1.3 Recommended installation torque(s) in Newton metres (e.g. "50 Nm").
- 1.1.4 All component materials with reference to the applicable standard/specification, grade (including bolts) and heat treatment condition (if any). Alternative materials shall not be given on the same drawing. If the specification does not identify the minimum value of a critical design parameter this should be specified on the drawing, i.e. minimum tensile strength of the material to be offered for type testing or used in a previous test.
- 1.1.5 The safety factor for castings/forged materials.
- 1.1.6 The maximum rotation of fittings where applicable.
- 1.1.7 The ultimate failing load of the fitting.

- 1.1.8 Where applicable, compliance with the galvanising requirements of the relevant TS shall be noted.
- 1.1.9 Compliance with the applicable welding specification, if any, shall be noted.
- 1.1.10 In the case of a drawing covering a range of components, the title shall include the description of each component and the applicable reference numbers.

1.2 Materials

- 1.2.1 Where different materials are used in a fitting, the design shall ensure that neither electro-chemical action nor other adverse effects associated with dissimilar materials can occur.
- 1.2.2 Galvanising requirements shall be in accordance with BS EN ISO 1461.
- 1.2.3 Busbars shall be in accordance with BS 2898, TS 3.1.4 and this specification.
- 1.2.4 Castings shall be in accordance with BS EN 1706 (LM25) and the requirements of this specification.

1.3 Markings

- 1.3.1 All fittings shall be marked according to BS EN 61284 with permanent and clearly legible lettering which does not generate corona discharge. The following additional marking is required:

Recommended installation torque(s) in Newton metres (e.g. "50 Nm") shall be marked adjacent to threaded fasteners tightened during spacer installation.

For compression fittings (OHL droppers), the metric 'across flats' dimension of the die to be used for fitting installation (e.g. "40.21") and also the longitudinal limits and direction of compression.

The grade of bolt shall be marked on the bolt head.

- 1.3.2 Any marking additional to the above will be allowed provided it does not result in any ambiguity in interpretation of the required marking specified above.

1.4 Packaging

- 1.4.1 Fittings shall be packaged to provide adequate mechanical and corrosion protection of components in transit and for reasonable storage periods.

2 PERFORMANCE REQUIREMENTS

2.1 Mechanical Strength

The mechanical strength of the System and its components shall comply with the requirements of the relevant level TS.

2.2 Busbar Clamps

- 2.2.1 The design of clamps shall be such as to minimise the number of parts and the possibility of incorrect assembly or installation. The need for special tools for installation or removal of clamps shall be avoided if possible but where required they shall be submitted to NG for assessment.

- 2.2.2 The busbar clamp joint interface shall be designed with a minimum of two bolts. Alternative designs utilising a single bolt clamp arrangement may also be considered at the discretion of NG.
- 2.2.3 All busbar clamp designs shall include disc spring washers ('Belleville'). These shall be designed so that they are not completely flattened with the clamp bolt or screw tightened to the specified torque level.
- 2.2.4 All bolts shall be of a stainless steel design.
- 2.2.5 All threaded fasteners shall be locked to ensure that slackening does not occur due to vibration in service.

2.3 Strain Sets

- 2.3.1 Insulators for strain sets shall be of composite design in accordance with TS 3.4.18. Rated insulation levels, withstand voltages and creepage distances shall comply with the requirements in TS 1.
- 2.3.2 Individual components used in the assembly of strain sets shall comply with the requirements of TS 3.4.5.

2.4 Earth Spigots

- 2.4.1 TS 2.1 requires a primary attachment point for the application of portable primary earths to rigid aluminium busbars with diameters in excess of 90mm.

Where earthing stubs or spigots are used for this purpose they shall be designed in such a manner as to ensure the safe and secure attachment up to four portable earth clamps and associated leads.

Spigots shall be suitable for either horizontal or inclined busbars up to a maximum angle of 60 degrees and for diameters between 140mm and 250mm.

The portion of the stub used to accept the portable earth clamps shall be manufactured from round bar of diameter 38mm with a minimum length of 550mm.

Spigots shall have a continuous current rating of 900A and shall be capable of meeting the short circuit ratings as detailed in TS 2.1.

Type tests shall be performed on each design in accordance with the relevant standards and specifications.

2.5 Line Termination Fittings

Line termination fittings shall be designed in accordance with TS 3.4.6.

2.6 Radio Noise

The overall design shall be such that radio noise field strengths measured in service shall not exceed the recommended levels in BS EN 60694.

2.7 Corona

- 2.7.1 Visible corona extinction voltage of components in service shall be determined with the aid of binoculars.