BRITISH STANDARD

BS EN 15711:2009

# Vitreous and porcelain enamels — Glass lined flanged steel pipes and flanged steel fittings — Quality requirements

ICS 25.220.50



BSI
British Standards

# National foreword

This British Standard is the UK implementation of EN 15711:2009.

The UK participation in its preparation was entrusted to Technical Committee STI/36, Vitreous enamel coatings.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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EUROPEAN STANDARD

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**EN 15711**

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English Version

# Vitreous and porcelain enamels - Glass lined flanged steel pipes and flanged steel fittings - Quality requirements

Emaux vitrifiés - Tubes et raccords avec brides en acier revêtus d'émail vitrifiés - Exigences de qualité

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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# Foreword

This document (EN 15711:2009) has been prepared by Technical Committee CEN/TC 262 “Metallic and other inorganic coatings”, the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 2009, and conflicting national standards shall be withdrawn at the latest by November 2009.

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## 1 Scope

This European Standard specifies the quality requirements for glass lined flanged steel pipes and flanged steel fittings.

## 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 1708-1, *Welding — Basic weld joint details in steel — Part 1: Pressurized components*

EN 10204, *Metallic products — Types of inspection documents*

EN 13480-2, *Metallic industrial piping — Part 2: Materials*

EN 13480-3:2002, *Metallic industrial piping — Part 3: Design and calculation*

EN 14430, *Vitreous and porcelain enamels — High voltage test*

EN 14483-2, *Vitreous and porcelain enamels — Determination of resistance to chemical corrosion — Part 2: Determination of resistance to chemical corrosion by boiling acids, neutral liquids and/or their vapours*

EN 14483-4, *Vitreous and porcelain enamels — Determination of resistance to chemical corrosion — Part 4: Determination of resistance to chemical corrosion by alkaline liquids using a cylindrical vessel*

EN 14483-5, *Vitreous and porcelain enamels — Determination of resistance to chemical corrosion — Part 5: Determination of resistance to chemical corrosion in closed systems*

EN ISO 5817, *Welding — Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) — Quality levels for imperfections (ISO 5817:2003, corrected version:2005, including Technical Corrigendum 1:2006)*

EN ISO 8501-1, *Preparation of steel substrates before application of paints and related products — Visual assessment of surface cleanliness — Part 1: Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings (ISO 8501-1:2007)*

EN ISO 12944-5, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 5: Protective paint systems (ISO 12944-5:2007)*

DIN 2873, *Flanged steel pipes and flanged steel fittings glass lined — PN 10 and PN 25*

## 3 Materials for steel parts

The materials to be used shall be selected by the purchaser or the manufacturer in accordance with EN 13480-2 where the material chosen shall be suitable for enamelling.

NOTE 1 An example for a material suitable for enamelling is P275NH.

NOTE 2 Materials in accordance with appropriate national regulations such as VdTÜV WB may be agreed between the interested parties.

# 4 Ordering details

In addition to the designation of the dimension standard, the order should include the desired quantity (number of pieces), the materials testing certificates in accordance with EN 10204 and, if applicable, the relevant delivery conditions (see Clause 2).

# 5 Requirements

NOTE Attention is drawn to the national requirements to be met by manufacturers.

## 5.1 Requirements for the steel parts

### 5.1.1 Welding

**5.1.1.1** The pipes and fittings with welding necks shall be welded such that the welded joint is fully penetrated. The welded joints shall conform to quality level in accordance with EN ISO 5817 and to EN 1708-1. The welding process shall be monitored to ensure its acceptability. If internal pressure is exerted, the joint coefficient shall be at least 85 % as specified in 4.5 of EN 13480-3:2002.

**5.1.1.2** Local repair of welded joints is permitted provided that the repair procedure is suitable to carry out the repair according to the required quality.

**5.1.1.3** The manufacturer shall have the necessary facilities, procedures and competent staff for welding and monitoring and testing of welds.

NOTE Attention is drawn to the relevant national technical requirements of the customer's country.

### 5.1.2 Material properties

#### 5.1.2.1 Chemical composition

The chemical composition shall be in accordance with EN 13480-2.

#### 5.1.2.2 Mechanical properties

Changes of the mechanical properties of the substrate due to the glass lining process shall not cause any degradation of the performance characteristics of the components.

#### 5.1.2.3 Weldability

Materials to be welded and welding consumables shall conform to the requirements of EN 13480-2.

### 5.1.3 Surface characteristics

Components to be provided with an exterior protection shall be blast-cleaned in accordance with EN ISO 8501-1, preparation grade Sa 2½.

Shallow surface defects may be eliminated provided the remaining wall thickness continues to conform to the requirements.

NOTE Weld repairs should only be performed with approval of the purchaser.

### 5.1.4 Exterior protection

As exterior protection, a priming coat shall be applied in accordance with EN ISO 12944-5.

## 5.2 Requirements for the glass lined components

### 5.2.1 Surfaces

The enamel coating shall show a uniform, smooth and completely melted surface.

### 5.2.2 Enamel defects

The flanged pipes and flanged fittings shall not show any of the following enamel defects:

— damaged enamel (e.g. chippings, cracks, open pores);

— collapsed lines in the cover coat;

— bubble lines i.e. fused in bubbles arranged in a distinct line fused strain lines;

— areas not properly fused (in case of vitreous enamel recognizable for the carborundum-like rough surface);

— pull-through of ground coat;

— depressions exceeding more than 25 % of the coating thickness;

— areas with weak spots or defects as detected when tested in accordance with 6.4.2;

— particles of fireclay.

### 5.2.3 Foreign matter in the enamel

Tinder particles may appear if none of their dimensions in any direction and parallel to the component part surface are greater than 3 mm and provided they are laminar in shape and melted into the enamel parallel to the surface of the steel part concerned.

### 5.2.4 Enamel coating thickness

Coating thickness shall be 0,8 mm to 2,0 mm, except:

a) if the transition to the thickened layer is gradual, the layer thickness may be exceeded by 0,2 mm, however, the enamel layer on convex areas shall not be thicker than on the surrounding areas;

b) for components which have a very small radius of curvature, the minimum coating thickness may be 0,6 mm.

### 5.2.5 Dimensions and tolerances

The dimensions and their tolerances shall be in accordance with DIN 2873.

### 5.2.6 Other requirements

The facings of the necks shall be protected by a protective cap. Thickness at the bottom of the cap shall protect the facing.

# 6 Tests and certificates

## 6.1 General

Flanged pipes and flanged fittings in accordance with this European Standard shall be supplied with a test report "type 2.2“ in accordance with EN 10204. In addition, the contracting parties may agree upon a materials testing certificate in accordance with EN 10204.

## 6.2 Place of testing

The components shall be tested at the production plant.

## 6.3 Testing of the substrate

The primary materials shall be tested in accordance with EN 13480-2.

The materials testing certificates required for the primary materials shall be specified in the order.

## 6.4 Testing of the glass lined components

**6.4.1** The exterior condition of all glass lined components shall be checked by visual inspection, for which the enamel surfaces shall be clean.

### 6.4.2 High-voltage test

High voltage tests shall be carried out in accordance with EN 14430. A preliminary test shall be carried out by the manufacturer using a test voltage of 20 kV and an acceptance test shall be carried out using a test voltage of 12 kV.

### 6.4.3 Coating thickness measurement

A device with an uncertainty of ≤ 5 % shall be used for measuring the coating thickness. The area to be tested shall be measured at spots chosen at random. In addition, critical areas, e.g. small radii of curvature at cross-sectional transitions, areas of unevenness and local swellings, shall be measured.

### 6.4.4 Chemical corrosion test

The resistance of the enamel shall be tested only once in accordance with EN 14483-2, EN 14483-4 or EN 14483-5.

# 7 Marking

All flanged pipes and flanged fittings shall be marked permanently and clearly with the following:

— manufacturer’s mark;

— inner diameter;

— EN 15711.

If delivery is made with an inspection certificate in accordance with EN 10204, the following shall also be given:

— cast number or short symbol;

— signature of the inspector.

The marking shall be permanently legible.

NOTE Suitable marking methods are for example embossing and laser marking.

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