INTERNATIONAL STANDARD

ISO 28721-4

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Vitreous and porcelain enamels — Glass-lined apparatus for process plants —

Part 4: Quality requirements for glass-lined flanged steel pipes and flanged steel fittings

Émaux vitrifiés — Appareils émaillés pour les installations industrielles —

Partie 4: Exigences de qualité pour les tubes et raccords à brides en acier émaillé

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 28721-4 was prepared by Technical Committee ISO/TC 107, *Metallic and other inorganic coatings*.

ISO 28721 consists of the following parts, under the general title *Vitreous and porcelain enamels — Glass-lined apparatus for process plants*:

— *Part 1: Quality requirements for apparatus, components, appliances and accessories*

— *Part 2: Designation and specification of resistance to chemical attack and thermal shock*

— *Part 3: Thermal shock resistance*

— *Part 4: Quality requirements for glass-lined flanged steel pipes and flanged steel fittings*

Vitreous and porcelain enamels — Glass-lined apparatus for process plants —

Part 4: Quality requirements for glass-lined flanged steel pipes and flanged steel fittings

WARNING — This part of ISO 28721 calls for the use of substances and/or procedures that may be injurious to health if adequate safety measures are not taken. This part of ISO 28721 does not address any health hazards, safety or environmental matters associated with its use. It is the responsibility of the user of this part of ISO 28721 to establish appropriate health, safety and environmentally acceptable practices and take suitable actions for any national and international regulations. Compliance with this part of ISO 28721 does not in itself confer immunity from legal obligations.

1 Scope

This part of ISO 28721 specifies the quality requirements for glass-lined flanged steel pipes and flanged steel fittings used for process plants.

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.

ISO 5817, *Welding — Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) — Quality levels for imperfections*

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

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

ISO 28706-2, *Vitreous and porcelain enamels — Determination of resistance to chemical corrosion — Part 2: Determination of resistance to chemical corrosion by boiling acids, boiling neutral liquids and/or their vapours*

ISO 28706-4, *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*

ISO 28706-5, *Vitreous and porcelain enamels — Determination of resistance to chemical corrosion — Part 5: Determination of resistance to chemical corrosion in closed systems*

EN 1708-1, *Welding — Basic welded 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 15826, *Vitreous and porcelain enamels — Terminology*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 15826 apply.

4 Materials for steel parts

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

Material selections, technical and all other requirements shall be in accordance with national rules and regulations of the user country and shall be agreed between the interested parties.

5 Information to be supplied by the purchaser

When ordering articles in accordance with this part of ISO 28721, the purchaser shall provide the following information in writing, in, for example, the contract or purchase order, or on engineering drawings:

a) a reference to this part of ISO 28721 (ISO 28721-4:2010);

b) designation of the dimension standard;

c) quantity (number of items);

d) materials testing certificates, in accordance with EN 10204 (see 7.1 and 7.3);

e) relevant delivery conditions (if applicable).

6 Requirements

6.1 Requirements for the steel parts

6.1.1 Welding

6.1.1.1 The pipes and fittings with welding necks shall be welded such that the welded joint is fully penetrated. The welded joints shall conform to a quality level in accordance with ISO 5817 and 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 EN 13480-3:2002, 4.5.

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

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

6.1.2 Material properties

6.1.2.1 Chemical composition

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

6.1.2.2 Mechanical properties

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

6.1.2.3 Weldability

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

6.1.3 Surface characteristics

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

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

Weld repairs shall only be performed with the approval of the purchaser.

6.1.4 Exterior protection

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

6.2 Requirements for the glass-lined components

6.2.1 Surfaces

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

6.2.2 Enamel defects

The flanged pipes and flanged fittings shall not show any of the following enamel defects (see EN 15826):

— 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 for fused strain lines;

— areas not properly fused (in the case of vitreous enamel, recognizable by 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 7.4.2;

— particles of fireclay.

6.2.3 Foreign matter in the enamel

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

6.2.4 Enamel coating thickness

The coating thickness shall be 0,8 mm to 2,0 mm, except for the following:

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.

6.2.5 Dimensions and tolerances

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

6.2.6 Other requirements

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

7 Tests and certificates

7.1 General

Flanged pipes and flanged fittings in accordance with this part of ISO 28721 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 [see 5 d)].

7.2 Place of testing

The components shall be tested at the production plant.

7.3 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 [see 5 d)].

7.4 Testing of the glass-lined components

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