

BS EN ISO 28721-1:2011



BSI Standards Publication

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

Part 1: Quality requirements for apparatus,
components, appliances and accessories
(ISO 28721-1:2008)

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National foreword

This British Standard is the UK implementation of EN ISO 28721-1:2011. It is identical to ISO 28721-1:2008. It supersedes BS EN 15159-1:2006, which is withdrawn.

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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Compliance with a British Standard cannot confer immunity from legal obligations.

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components, appliances and accessories (ISO 28721-1:2008)

Émaux vitrifiés - Appareils émaillés pour les installations
industrielles - Partie 1: Exigences de qualité relatives aux
appareillages, composants, appareils et accessoires (ISO
28721-1:2008)

Emails und Emaillierungen - Emaillierte Apparate für
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Qualitätsanforderungen für Apparate, Apparateteile,
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Foreword

The text of ISO 28721-1:2008 has been prepared by Technical Committee ISO/TC 107 “Metallic and other inorganic coatings” of the International Organization for Standardization (ISO) and has been taken over as EN ISO 28721-1:2011 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of an identical text or by endorsement, at the latest by October 2011, and conflicting national standards shall be withdrawn at the latest by October 2011.

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

This document supersedes EN 15159-1:2006.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

Endorsement notice

The text of ISO 28721-1:2008 has been approved by CEN as a EN ISO 28721-1:2011 without any modification.

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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.

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ISO 28721-1 was prepared by the European Committee for Standardization (CEN) (as EN 15159-1) and was adopted, under a special “fast-track procedure”, by Technical Committee ISO/TC 107, *Metallic and other inorganic coatings*, in parallel with its approval by the ISO member bodies.

ISO 28721-1 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*

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

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

1 Scope

This part of ISO 28721 specifies the quality requirements for apparatus, components, appliances and accessories of glass-lined steel (including semi-crystallized enamel coatings) and glass-lined steel castings used for process plants. It specifies the quality requirements and the tests to be carried out by the manufacturer as well as the action to be taken to repair defects.

It is also applicable to glass-lined pumps, pump components and fittings.

It is not applicable to glass-lined flanged steel pipes or glass-lined flanged steel fittings.

NOTE 1 Provisions for glass-lined flanged steel pipes and glass-lined flanged steel fittings are given in DIN 2876 ^[1].

The test methods specified cover checking the enamel, the dimensional accuracy and the performance of apparatus and components.

This part of ISO 28721 applies to new apparatus and components as well as used items that have been re-enamelled.

It does not contain requirements regarding the chemical or physical properties of vitreous and porcelain enamels.

NOTE 2 Examples of test reports are given in Annex A.

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 780, *Packaging — Pictorial marking for handling of goods*

ISO 2178, *Non-magnetic coatings on magnetic substrates — Measurement of coating thickness — Magnetic method*

ISO 28721-2, *Vitreous and porcelain enamels — Glass-lined apparatus for process plants — Part 2: Designation and specification of resistance to chemical attack and thermal shock*

ISO 28721-3, *Vitreous and porcelain enamels — Glass-lined apparatus for process plants — Part 3: Thermal shock resistance*

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

3 Requirements

3.1 General

If the requirements given in this part of ISO 28721 are to be applied to glass-lined apparatus and components, this shall be stated as follows when ordering:

Prepared in accordance with ISO 28721-1.

Requirements differing from those stated in this part of ISO 28721 may be agreed upon between the parties at the time of ordering.

3.2 Design and quality of enamel finish

The manufacturer shall be responsible for the appropriate design and construction.

The enamel quality (i.e. the type of enamel and, where relevant, the colour) shall be agreed upon between the interested parties at the time of ordering.

The characteristic composition of individual enamel layers shall correspond to that of specimens submitted for laboratory testing. The quality of the enamel shall meet the requirements specified in ISO 28721-2 and ISO 28721-3.

3.3 Surface

The enamel coating shall have a uniform, smooth, fully-fused surface free from impurities.

3.4 Defects

3.4.1 General

Defects shall be examined visually (see 4.2).

3.4.2 Defects unacceptable in the finished product

Defects unacceptable in the finished product are those which would render a component unusable. Such defects are typically as follows:

- a) defects which cannot be repaired by the means described in Clause 6, such as:
 - defects extending over an area with a diameter > 8 mm,
 - defects on inaccessible spots,
 - defects concerning vessels and columns as described in 3.4.4;
- b) collapsed lines in the cover coat;
- c) bubble lines, i.e. fused-in bubbles arranged in a distinct line;
- d) fused strain lines (recognizable as lines with colours different from that of the surrounding enamel);
- e) areas not properly fused (a rough surface similar to a sandblasted one);
- f) devitrified areas in vitreous enamel or over crystallized areas in semi-crystallized enamel (recognizable as a dull or a rough surface);

- g) pull-through of ground coat (recognizable as e.g. spot-like discolorations);
- h) cracks detectable by e.g. a statiflux test;
- i) spots with a diameter > 30 mm caused by grinding and polishing during the removal of impurities (see also 3.4.3 and 6.2).

3.4.3 Repairable defects

Repairable defects are imperfections in the enamel coating which allow, under certain circumstances (see below), further use of glass-lined equipment after repair. Common repairable defects are:

- a) depressions with a depth exceeding 25 % of the coating thickness;
- b) blisters, such as circular holes in the coating exposing the ground coat;
- c) areas with weak spots or defects detectable by high-voltage testing in accordance with 4.3;
- d) impurities in the enamel coating.

Isolated impurities, such as fire clay particles, shall be removed. Dust-like impurities on the surface may be accepted. Scale fused into the surface shall be removed where it extends parallel to the surface over a distance of more than 3 mm and/or is not a flat particle or is not fused parallel to the surface.

The maximum permissible number of defects repaired by plugging shall be as given in Tables 1 and 2.

Further requirements, such as the maximum level of pores or use without plugging, shall be agreed upon between the interested parties at the time of ordering.

Defects as defined in 3.4.3 a) and 3.4.3 b) shall be repaired as described in 6.1.

Specifications regarding defects in various types of apparatus and components are given in 3.4.4 to 3.4.6.

Table 1 — Maximum permissible number of plugged enamel defects in vessels

Nominal volume m ³	Maximum permissible number of defects			
	Agitator vessels			Other vessels
	Type AE		Types BE and CE ^a	
	Lower part of vessel	Main cover		
up to 4	0	0	0	0
over 4 to 10	1	1	1	1
over 10 to 20	—	—	2	3
over 20 to 32	—	—	3	4
over 32 to 40	—	—	4	5
over 40 to 80	—	—	—	6
over 80	—	—	—	7

^a Assembly covers shall be delivered without any plugs.