SIST

SLOVENSKI STANDARD
SIST EN 15159-1:2006
01-september-2006

Steklasti in keramiļ ni emajli ï Emajlirane naprave za procesno opremo ï 1. del: Kakovostne zahteve za naprave, sestavne dele, aparate in pribor

Vitreous and porcelain enamels - Glass lined apparatus for process plants - Part 1: Quality requirements for apparatus, components, appliances and accessories

Emails und Emaillierungen - Emaillierte Apparate für verfahrenstechnische Anlagen - Teil 1: Qualitätsanforderungen für Apparate, Apparateteile, Einbau- und Zubehörteile

Emaux vitrifiés - Appareils émaillés pour les installations industrielles - Partie 1: Exigences de qualité relatives aux appareillages, composants, appareils et accessoires

Ta slovenski standard je istoveten z: **EN 15159-1:2006**

ICS:
25.220.50

SIST EN 15159-1:2006 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 15159-1

July 2006

ICS 25.220.50; 71.120.10

English Version

Vitreous and porcelain enamels - Glass lined apparatus for process plants - Part 1: Quality requirements for apparatus, components, appliances and accessories

Emaux vitrifiés - Appareils émaillés pour les installations industrielles - Partie 1: Conditions techniques de livraison

Emails und Emaillierungen - Emaillierte Apparate für verfahrenstechnische Anlagen - Teil 1: Qualitätsanforderungen für Apparate, Apparateteile, Einbau- und Zubehörteile

This European Standard was approved by CEN on 12 June 2006.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, 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 United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

Ref. No. EN 15159-1:2006: E

Contents

Page

Foreword

This document (EN 15159-1:2006) 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 January 2007, and conflicting national standards shall be withdrawn at the latest by January 2007.

EN 15159 is comprised of the following parts under the general heading *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*

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, 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 United Kingdom.

1 Scope

This European Standard specifies the quality requirements for apparatus, components, appliances and accessories of vitreous glass-lined steel (including semi-crystallized enamel coatings) and steel cast used for process plants. It specifies the quality requirements and the tests to be carried out by the manufacturer as well as the necessary actions for repairing defects.

This European Standard is also applicable to glass-lined pumps, pump components and fittings.

This European standard is not applicable to glass-lined flanged steel pipes and flanged steel fittings.

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

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

This European Standard applies to new apparatus and components as well as used ones that have to be re-enamelled.

This European Standard does not contain requirements regarding the chemical and 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.

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

EN 15159-2, *Vitreous and porcelain enamels — Glass-lined apparatus for process plants —* Part 2: *Designation and specification of resistance to chemical attack and thermal shock*

EN 15159-3, *Vitreous and porcelain enamels — Glass-lined apparatus for process plants — Part 3: Thermal shock resistance*

EN ISO 780, *Packaging — Pictorial marking for handling of goods (ISO 780:1997)*

EN ISO 2178, *Non-magnetic coatings on magnetic substrates — Measurement of coating thickness — Magnetic method (ISO 2178:1982)*

3 Requirements

3.1 General

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

— Prepared in accordance with EN 15159-1.

— Requirements differing from those stated in this European Standard 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 parties at the time of ordering.

The characteristic composition of individual enamel layers shall correspond with specimens submitted for laboratory testing. The quality of the enamels shall meet the requirements specified in EN 15159-2 and EN 15159-3.

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 render the components 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 recognized as lines with colours different from the surrounding enamel;

e) Areas not properly fused (a rough surface as being sandblasted);

f) Devitrified areas in vitreous enamel or over crystallized areas in semi-crystallized enamel (recognized as a dull or a rough surface);

g) Pull-through of ground coat (recognized e.g. as spot-like discolorations);

h) Cracks, detected e.g. by 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 clause 3), 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 as detected by high-voltage testing according to 4.3;

d) impurities in the enamel coating;

e) 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 more than 3 mm wide, and/or is not a flat particle or is not fused in parallel with 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 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 the different 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 plug.				

Table 2 — Table Maximum permissible number of plugged enamel defects in columns

Nominal diameter of columns mm	Maximum permissible number of defects for unit lengths		
	up to 2 000 mm	over 2 000 mm up to 5 000 mm	over 5 000 mm
up to 600	0	0	0
over 600 to 1 200	0	1	2
over 1 200	1	2	3

3.4.4 Vessels and columns

Table 1 and Table 2 list the number of reparable defects to be covered with plugs. Exceptions apply to the following cases:

a) outlet nozzles and agitator nozzles, including the complete neck area around the nozzle shall not be repaired by plugging. This also applies to other nozzles with a nominal diameter of 150 mm or less, including the neck area confined to a circle with an inner nozzle diameter plus 30 mm;

b) convex and concave surfaces with a radii of 75 mm or less shall not be repaired by plugging;

c) seal areas (gasket bearing surfaces) shall not be repaired by plugging.

3.4.5 Accessories

Accessories such as agitators, baffles, thermo pipes, probes, inlet pipes, washers, manhole covers and dip-pipes shall not be repaired by plugging (see 6.1).

3.4.6 Fittings and pump components

Fittings and pump components shall not be repaired by plugging (see 6.1).

3.5 Coating thickness

The thickness of enamel coatings on steel substrates shall range from 1,0 mm to 2,2 mm, with the following exceptions:

a) maximum values may be exceeded by 0,2 mm on concave surfaces;

b) enamel coating may be 0,2 mm thinner than the specified minimum values in limited areas and on convex surfaces;

c) coatings on small parts with very small radii ≤ 5 mm, such as valve-stems or rotors of pumps shall have a minimum thickness of 0,6 mm.

Any changes in thickness shall be smooth.

3.6 General tolerances

General tolerances and tests for the concentricity of agitators (see 4.7.1 and 4.7.2) shall be agreed upon between the parties.

NOTE Examples of tolerances for vessels, agitator vessels and columns are given in DIN 28005-2 [2], DIN 28006-2 [3] and DIN 28007-2 [4], respectively. DIN 28159 [5] gives tolerances for agitator ends and DIN 2873 [6] gives angular misalignments of flange surfaces.

3.7 Finish

Unless otherwise agreed, non-enamelled surfaces, except for those which are not to be coated, such as fitting surfaces, shall be protected by a primer.

Details shall be agreed upon between the parties at the time of ordering.

Corrosion protection of parts without primer, e.g. connecting elements, shall be agreed upon between the parties at the time of ordering.

4 Testing

4.1 General

The tests carried out in accordance with this standard shall be conducted only by skilled personnel and shall be documented.

NOTE Examples of test report formats are given in Annex A.

The surfaces to be tested shall be clean, dry, sufficiently illuminated and easily accessible.

Tested components and test reports shall be marked to allow proper identification. It is at the customer's discretion to have his or her own inspectors verify the test results by repeating the tests at the manufacturing site as described below.

Details shall be agreed upon between the parties at the time of ordering.

4.2 Visual examination

The surfaces of glass-lined apparatus and components shall be checked visually, optical instruments, such as magnifying glasses, may be used for closer examination.

4.3 High voltage test

High voltage tests shall be conducted in accordance with EN 14430. When the enamelling of a component is complete, the manufacturer shall run a high voltage test by using 20 kV. For subsequent tests, a high voltage of 12 kV may be used.

By customer request and with the agreement of the manufacturer, particular areas may be re-checked with a higher voltage. Totally glass-lined components shall be tested with a.c. or pulsed d.c. voltage.

Exceptions apply to the following cases:

a) enamelled probes shall be tested with a d.c. voltage of 7 kV;

b) components coated with conductive respectively dissipative enamel shall only be checked visually; they shall be marked by the manufacturer.

4.4 Test for cracks

Areas where cracks are presumed to have formed shall be sprayed with electrostatically charged talcum powder to make cracks more visible. Even fine cracks will then be clearly revealed.

4.5 Coating thickness measurement

Measurement of the coating thickness shall be carried out in accordance with EN ISO 2178 using a measuring device accurate to 5 % of the actual value. The thickness shall be measured by spot-checking. Extra measurements shall be taken at critical spots such as small radii, uneven surfaces and localized increases in thickness.

4.6 Dimensional test

The following dimensions shall be tested and recorded:

a) inside diameter and roundness of the vessel;

b) diameter and roundness of the assembly flange and main flange;

c) wavelike distortion of the sealing surfaces of the assembly flange and main flange;

d) out-of-plane angle of the sealing surface of the nozzles;

e) compensation thickness of the gaskets;

f) distance between the support ring, the brackets and the legs, and a reference plane;

g) variations in the distances between the various circumferential points of the support ring, between the individual brackets and legs and a reference plane;

h) agreement with the drawing of the support elements (i.e. thickness and outer diameter of the support ring);

i) ground clearance of the agitator;

j) agreement with the drawing of the jacket nozzles.

Additional dimensional tests are at the discretion of the customer.

The manufacturer shall test and document actual dimensions. The forms included in Annex A may be used for this purpose.

4.7 Testing concentricity of agitators and pump rotors

4.7.1 General

Testing the concentricity of impellers and pump rotors after assembly shall be agreed upon between the parties.

NOTE A method for testing the concentricity of impellers and pump rotors is given in DIN 28161 [7] .

4.7.2 Agitators

The maximum eccentricity of agitators that are supplied separately shall be documented; the measurements shall be performed by the manufacturer after machining and with the impellers still in the lathe.

4.7.3 Pump rotors

The concentricity of pump rotors shall be tested by the manufacturer and if requested, the manufacturer shall document the results.

4.8 Performance test

The manufacturer shall check the performance of the glass-lined components after assembly. Particular attention shall be paid to the proper performance of moving components (see also 4.7.1).

Further tests covering the performance of mechanical seals or test runs with power measurement may be agreed upon between the parties at the time of ordering.

4.9 Completeness test

A completeness test, including the outside coating, shall be carried out to ensure compliance with the order.