GLASS FUSED-TO-STEEL COATINGS FOR BOLTED TANKS

A Simplified Guide to ISO 28765:2016 Vitreous and Porcelain Enamel Quality and Service Requirements

Source Document - *ISO 28765 - Second Edition 2016-01-15 - International Standard - Vitreous and porcelain enamels - Design of bolted steel tanks for the storage or treatment of water or municipal or industrial effluents and sludges*

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I. Executive Summary

The ISO 28765 Standard offers a detailed guide to glass fused-to-steel (*gf2s™*) bolted tank quality requirements for glass coatings. The tables provided in Section 10 (Tables 2 and 3) provide specific information regarding quality testing and the glass quality requirements for a variety of applications. These tables, while comprehensive, become somewhat cumbersome when trying to communicate, compare and/or specify the quality offerings of various bolted steel tank suppliers. In reviewing and studying the Standard we found the information can be simplified into a format more practical to both users and producers. This paper explains our methodology and provides tables to guide the industry in selecting and specifying glass fused-to-steel coatings.

A further outcome is the resulting classification of our own *Everstore®* glass fused-to-steel bolted tank offerings into the quality classes indicated by our study. These quality classifications are:

United Industries Group - *Everstore®* Tank Glass Fused-to-Steel Bolted Tanks		
UIG *Everstore®*	**ISO 28765 Class Level**	**ISO 28765 Applications**
Everstore® Plus meets or exceeds the requirements of ISO Class AA and is used for Class AA and A applications	**AA**	• Thermophilic/ pasteurization digester – roof and rings exposed to gaseous zone
	A	• Industrial effluent process/ treatment • Biogas digester for agricultural waste - roof and rings exposed to gaseous zone • Thermophilic/ pasteurization digester - cylinders • Municipal mesophilic digester - roof and rings exposed to gaseous zone • Liquid Leachate • Municipal sludge treatment - roof and rings exposed to gaseous zone • Borehole/brackish/seawater
Everstore® meets or exceeds the requirements of ISO Class B and is used for Class B and C applications	**B**	• Municipal mesophilic digester - cylinders • Municipal sludge treatment - cylinders • Municipal sludge/sludge cake storage • Filter tanks • Storm/firewater • Potable water (DWI listed Reg 31) • Potable water (ANSI/NSF 61 listed)
	C	• Biogas digester for agricultural waste - cylinders

II. Introduction

The ISO Standard for glass fused-to-steel bolted tanks (*ISO 28765 - Second Edition 2016-01-15 - International Standard - Vitreous and porcelain enamels - Design of bolted steel tanks for the storage or treatment of water or municipal or industrial effluents and sludges)* was originally published in 2008. At the time of its initial publication, it was the only standard issued specifically to accommodate the inherent advantages of *gf2s* bolted steel tanks. The Standard addresses thoroughly the areas of applicable tank design loads, tank design elements and processes, and vitreous enamel coatings. The purpose of this article is to review the vitreous-enamel coatings information found in Section 10, specifically Tables 2 and 3, of the Standard.

III. The Challenge of the ISO 28765 Quality Requirements

Tables 2 and 3 of the ISO 28765 Standard provide a thorough, well-structured guide for the quality of glass coating as it relates to a number of common bolted steel tank applications. In these tables the specific quality requirements for the various *gf2s* tank applications are defined. The tables are structured such that one first selects the tank application and then follows the table information to note the specific performance tests and requirements. We find this approach to be effective for the purpose of the Standard, but somewhat cumbersome when trying to apply the Standard to writing design specifications. Further, the structure of the Standard's tables makes it difficult to determine whether or not a manufacturer offers glass quality levels meeting the range of applications.

IV. The Four (4) ISO 28765 Quality Classifications

Regarding the ISO 28765 Section 10 applications, our goal was to develop a way to view the information presented that would be straightforward for tank users, specifiers, and buyers. With the Standard, it is difficult for suppliers to communicate to buyers what they are offering within their range of *gf2s* products and likewise, it is difficult for buyers/specifiers/users to understand what *gf2s* quality levels various suppliers are offering. In reviewing the ISO Standard, we found there are actually only four (4) different sets of requirements. Stated another way, the sixteen (16) listed tank applications can be grouped into four categories, and within each of these categories the quality guidelines are the same for all the applications. Hence, we have reorganized the information into a format that lists the requirements for each application grouping. For ease of use, we have arbitrarily labeled the application groupings as Class AA, Class A, Class B, and Class C with Class AA representing the highest quality glass, and Class A, B and C groupings offering progressively lower quality requirements. Table 1 shows these four application groupings.

Table 1 - Glass quality and application groupings - ISO 28765

Glass Quality Requirements	Tank Applications
Class AA	• Thermophilic/ pasteurization digester – roof and rings exposed to gaseous zone
Class A	• Industrial effluent process/ treatment • Biogas digester for agricultural waste - roof and rings exposed to gaseous zone • Thermophilic/ pasteurization digester - cylinders • Municipal mesophilic digester - roof and rings exposed to gaseous zone • Liquid Leachate • Municipal sludge treatment - roof and rings exposed to gaseous zone • Borehole/brackish/seawater
Class B	• Municipal mesophilic digester - cylinders • Municipal sludge treatment - cylinders • Municipal sludge/sludge cake storage • Filter tanks • Storm/firewater • Potable water (DWI listed Reg 31) • Potable water (ANSI/NSF 61 listed)
Class C	• Biogas digester for agricultural waste - cylinders

Utilizing this "Class AA/A/B/C" approach, it becomes readily apparent which *gf2s* quality level is being specified or offered.

V. Quality Requirements of the Four ISO Quality Classifications

Each application group has a comprehensive regimen of quality control tests including chemical resistance, abrasion resistance, hardness, adhesion, thermal shock, thickness, discontinuities and so forth. Table 2 shows the ISO 28765 requirements for each coating "class" along with the notes from the Standard relevant to the testing requirements.

Table 2 - Application Grouping Quality Requirements

	Property and Test or Inspection Method	Minimum Inspection Frequency	Class AA	Class A	Class B	Class C
1	Resistance to chemical corrosion by citric acid at room temperature; ISO 28706-1:2008 Clause 9	Monthly or with each batch	Class AA	Class AA	Class A+	Class A
2	Resistance to chemical corrosion by sulphuric acid at room temperature; ISO 28706-1:2008 Clause 10	Monthly or with each batch	Class AA	Class A+	Test not required	Test not required
3	Resistance to chemical corrosion by hydrochloric acid at room temperature; ISO 28706-1:2008 Clause 11 (10% solution for 15 minutes)	Monthly or with each batch	Class AA	Class A+	Test not required	Test not required
4	Resistance to chemical corrosion by boiling citric acid; ISO 28706-2:2008 Clause 10	Annually	Max mass loss after 2.5 hours 0.75 gm/m^2	Max mass loss after 2.5 hours 1.5 gm/m^2	Max mass loss after 2.5 hours 3.0 gm/m^2	Max mass loss after 2.5 hours 5.0 gm/m^2
5	Resistance to chemical corrosion by boiling hydrochloric acid – Vapour phase; ISO 28706-2:2008 Clause 12	Annually	Max mass loss after 7 days 7.0 gm/m^2	Max mass loss after 7 days 8.0 gm/m^2	Test not required	Test not required
6a	Resistance to chemical corrosion by boiling distilled or demineralized water; ISO 28706-2:2008 Clause 13 - Liquid phase	Annually	Max mass loss after 48 hours 2.5 gm/m^2	Max mass loss after 48 hours 2.5 gm/m2	Max mass loss after 48 hours 5.0 gm/m2	Max mass loss after 48 hours 5.0 gm/m2
6b	Resistance to chemical corrosion by boiling distilled or demineralized water; ISO 28706-2:2008 Clause 13 - Vapour phase	Annually	Max mass loss after 48 hours 5.0 gm/m^2	Max mass loss after 48 hours 7.5 gm/m2	Test not required	Test not required
7	Resistance to chemical corrosion by standard detergent solutions; ISO 28706-3:2008 Clause 9	Annually	Max mass loss after 24 hours 2.5 gm/m^2	Max mass loss after 24 hours 5.0 gm/m^2	Test not required	Test not required
8	Resistance to chemical corrosion by hot sodium hydroxide; ISO 28706-4:2008 Clause 9	Annually	Max mass loss after 24 hours 6.0 gm/m^2	Max mass loss after 24 hours 6.0 gm/m^2	Max mass loss after 24 hours 7.0 gm/m^2	Max mass loss after 24 hours 7.0 gm/m^2
9	Resistance to thermal shock; ISO 28763:2008, Annex A	Annually	No damage at 350 degrees C	No damage at 350 degrees C	Test not required	Test not required
10	Resistance to impact: Pistol test; ISO 4532 – Max damage < 2 mm in diameter after 24 hours	Monthly or with each batch	40 N force	40 N force	20 N force	20 N force
11	Determination of the resistance to abrasion; ISO 6370-2	Annually	Max mass loss 45 gm/m^2	Max mass loss 45 gm/m^2	Test not required	Test not required

Table 2 - Application Grouping Quality Requirements						
	Property and Test or Inspection Method	**Minimum Inspection Frequency**	**Class AA**	**Class A**	**Class B**	**Class C**
12	Scratch hardness of surface according to Mohs; EN 15771	Monthly or with each batch	Mohs 5	Mohs 5	Mohs 5	Mohs 5
13	Adherence level; EN 10209:2013 Annex C	Monthly or with each batch	Class 2	Class 2	Class 2	Class 2
14	Enamel Thickness - Inside Surface; ISO 2178	Determined in accordance with ISO 2859-1:1999	300µm - 500µm	260µm - 460µm	200µm - 400µm	160µm - 360µm
15	Enamel Thickness - Outside Surface; ISO 2178	Determined in accordance with ISO 2859-1:1999	160µm - 500µm	160µm - 500µm	160µm - 500µm	160µm - 500µm
16	Defects – Inside Surface – No discontinuities	Every panel	ISO 2746:2015 Test A Test voltage 1500v	ISO 2746:2015 Test A Test voltage 1100v	ISO 2746:2015 Test A Test voltage 700v	ISO 8289:2000 Method A - 9v (Low voltage wet sponge test)
17a	Defects – Outside Surface, maximum visible defect size 1 mm	Every panel	Visual inspection (see Note 2)	Visual inspection (see Note 2)	Visual inspection (see Note 2)	Visual inspection (see Note 2)
17b	Defects – Outside Surface, maximum 3 visible defects per m^2 total panel area	Every panel	Visual inspection (see Note 2)	Visual inspection (see Note 2)	Visual inspection (see Note 2)	Visual inspection (see Note 2)
18	Color – Outside Surface; Color and color tolerances shall be agreed between interested parties	Determined in accordance with ISO 2859-1:1999	Inspection using a color comparator approved prior to production by the vitreous enameller	Inspection using a color comparator approved prior to production by the vitreous enameller	Inspection using a color comparator approved prior to production by the vitreous enameller	Inspection using a color comparator approved prior to production by the vitreous enameller
	Notes: 1. Consult with supplier for suitability for specific applications. All applications subject to concentration and temperature considerations of the stored liquid. 2. It is permissible, when agreed between the contracting parties, to rectify defects with a material approved by the vitreous enameller for the purpose, applied according to the rectification material manufacturer's instructions.					

We want to reinforce that the overall quality designations we have used in the above chart (Class AA, Class A, Class B, and Class C) use arbitrary nomenclature and are not related to any of the noted tests or testing protocols. They are used simply to provide a Best - Better - Good - Fair relative position comparison. Accordingly, please note the first three tests (items 1, 2 and 3 noted in the chart - resistance to citric acid, sulphuric acid and hydrochloric acid at room temperature) performed in accordance with the ISO 28706-1:2008 Standard, use a similar relative nomenclature. The ISO 28706 Standard uses a progressive decision process to classify the test results, briefly as follows:

- **Visual Inspection**
  - Pass - Class AA
  - Fail - Do **Rubbing Test (dry)**
    - Pass - Class A+
    - Fail - Do **Rubbing Test (moist)**
      - Pass - Class A
      - Fail - Unclassified

Type of Examination	Class
Visual examination - passed	AA
Rubbing test (dry) - passed	A+
Rubbing test (moist) - passed	A
Rubbing test (moist) - failed	Unclassified

Each test is less stringent than the one before, and therefore Class AA is the most resistant to the tested chemical attack, Class A+ is less resistant, Class A is even less resistant, with the Unclassified Class being the least resistant.

VI. A Comparison of ISO 28765 Quality Requirements to AWWA D103 and EEA (European Enameling Authority)

It is worth noting that ISO 28765 is certainly the most specific and stringent published standard relative to glass quality. When compared to other standards such as *ANSI/AWWA D103-19 (American Water Works Association - Factory-Coated Bolted Carbon Steel Tanks for Water Storage)* and *Quality Requirements - European Enamel Authority e.V. - 4th Edition*, the ISO Standard provides greater detail and attention to currently available testing and measuring technology. For example, in AWWA D103 Standard Section 12.4 - Glass Coatings, the only quality points mentioned are: a) that the coating thickness shall be between 150 μm and 480 μm, and b) that the interior surface be holiday tested (with no statement as to whether or not any holidays are allowed). Further, the indicated holiday testing protocol is stated to be a low voltage wet sponge test that has long been shown to be inferior to the high voltage methods specified in the ISO standard.

Curiously, as the following chart displays, the AWWA D103 Standard as it relates to *gf2s* coatings is essentially unchanged since the Standard's introduction in 1980, and the changes that were made were either for simple clarification or, with the exception of the 2009 change stipulating the interior coating wet sponge test, resulted in the Standard becoming less stringent rather than more so.

***gf2s* Coating Feature**	**AWWA D103-1980**	**AWWA D103-1989**	**AWWA D103-1997**	**AWWA D103-2009**	**AWWA D103-2019**
Interior Thickness	7 - 11 mils (178 - 280 μm)	Same as 1980	6 - 19 mils (150 - 483 μm)	Same as 1997	Same as 1997
Exterior Thickness	7 - 11 mils (178 - 280 μm)	Same as 1980	6 - 19 mils (150 - 483 μm)	Same as 1997	Same as 1997
Inspection	Visible defects - if severe conditions encountered a wet-pad test should be used	Same as 1980	Changed to apply the wet-pad test on interior surfaces only	Changed to include inspection on both interior and exterior surfaces, and the inclusion of a holiday detection test on interior coating only	Same as 2009
Holiday Test	Wet pad resistance test	Wet pad resistance test	Wet sponge test maximum 67.5 v	Same as 1997	Same as 1997

Referencing back to the AWWA D103 standard for water storage, we observe that the AWWA quality standard for the *gf2s* coating compares to ISO 28765 quality standards in the two following ways:

1. The AWWA coating thickness range corresponds to the ISO ***exterior*** requirement, and AWWA allows much thinner interior coatings than ISO 28765 Classes AA, A and B. In other words, the AWWA standard corresponds to the lowest quality class of ISO 28765
2. The AWWA holiday test compares only to the ISO ***Class C*** requirement - the lowest level and the level ISO reserves for agricultural waste slurry where the material stored effectively seals off any *gf2s* defects.

With this comparison, we see that the AWWA D103 approach to glass coating quality is casual at best and at worst is simply inadequate when one considers that the coating is the most important part of the tank apart from structural design.

In comparing ISO 28765 to the quality requirements of the European Enamel Authority (EEA), we also find the ISO 28765 requirements to be more stringent. EEA Section 7.20 addresses industrial tanks, Section 7.24 addresses silos for animal feed, and Section 7.25 addresses silos (tanks) for dung storage applications. Similar to ISO 28765, the EEA lists various tests for some of the same categories, but the EEA quality requirements overall are less demanding than ISO 28765. Still, EEA represents a significant concept advancement over AWWA D103. A summarization of the EEA quality requirements is shown in the following table:

A Comparison of European Enamel Authority (EEA) Quality Requirements to ISO 28765

EEA #	Test Description	EEA 7.20 Industrial Tanks	EEA 7.24 Animal Feed Silos	EEA 7.25 Dung Tanks	ISO 28765 Comparison to EEA 7.20
3.5	**Visual Assessment**	Internal 0 defects External max 5 defects/m^2	Same as 7.20	Same as 7.20	Visual assessment only used on external surface, on every panel, with maximum 3 defects per m^2 and maximum size 1 mm
3.9.3	**Hardness**	Mohs = or > 5	Same as 7.20	Same as 7.20	EEA and ISO use the same hardness criteria
4.3	**Thickness enamel coating**	180 - 500 µm	Same as 7.20	Same as 7.20	Exterior thickness range is the same; Interior minimum thickness varies with application. Class C minimum is 160 µm, all others thicker
4.4	**Cold citric acid**	Min. Class A	Same as 7.20	Same as 7.20	Comparable to ISO Class C. ISO Class AA, A and B are more stringent.
4.4	**Cold sulphuric acid**	Min. Class A	---	---	EEA 7.20 probably comparable to ISO Class B and C. ISO Classes AA and A are more stringent
4.4	**Cold hydrochloric acid**	Min. Class A	---	---	EEA 7.20 probably comparable to ISO Class B and C. ISO Classes AA and A are more stringent
4.5	**Boiling citric acid - weight loss in 2.5 hours**	5 g/m^2	7 g/m2	Same as 7.24	ISO Class C comparable to EEA 7.20. All other ISO classes more stringent
4.6	**Boiling water - weight loss in 48 hours**	10 g/m^2 vapour phase 5 g/m^2 liquid phase	Internal 7 g/m2 liquid phase	Same as 7.24	EEA 7.20 comparable to ISO Classes B and C. ISO Classes AA and A are more stringent
4.7	**Detergent solutions**	Weight loss 5 g/m^2 in 24 hours	---	---	EEA 7.20 comparable to ISO Class A
4.8	**Release of toxic elements**	---	Conform to national laws	---	---
4.9	**Impact resistance**	Max cracking at 20 N no damage > 2 mm dia. after 24 hours	Same as 7.20	Same as 7.20	EEA comparable to ISO Classes B and C. ISO Classes AA and A are more stringent
4.10	**Adherence**	Minimum 2 - "Good"	Same as 7.20	Same as 7.20	EEA and ISO are the same
4.12	**Porosity**	Internal 0 defects	---	---	All ISO classes are internal 0 defects, and ISO includes high voltage testing protocols
4.13	**Defects**	---	Inner max 5 defects per m^2 and no defects > 1 mm diameter - repairs allowed	Same as 7.24	All ISO classes are 0 defects on interior surfaces
4.25	**Sodium hydroxide 80° C**	Max 8 g/m2 per 24 hours	Same as 7.20	Same as 7.20	ISO classes AA and A allow 6 g/m2 loss, while classes B and C allow 7 g/m2 loss

Combining the information from the three standards reviewed in this study reveals the significant gap between the AWWA D103 requirements compared to the ISO and EEA requirements. All four classes of ISO 28765 and all three classes of EEA meet or exceed AWWA requirements, and conversely AWWA D103 requirements to not meet (let alone exceed) any of the classes of the other two standards. Once more, considering that after structural design the most critical part of the tank is the coating system, it is difficult to comprehend the lack of quality requirements included in AWWA D103 and we hope that future releases remedy this shortcoming. The following chart will allow for a simple comparison between the three standards relative to the *gf2s* coatings.

Relative Comparison of the Glass Quality Requirements of the Three Standards Reviewed
AWWA D103-19 EEA - 4th Edition ISO 28765:2016

	AWWA D103	EEA 7.20	EEA 7.24	EEA 7.25	ISO Class AA	ISO Class A	ISO Class B	ISO Class C
Does **AWWA D103** meet or exceed the glass quality requirements of:	---	No	No	No	No	No	No	No
Does **EEA 7.20** meet or exceed the glass quality requirements of:	Yes	---	Yes	Yes	No	No	No	No
Does **EEA 7.24** meet or exceed the glass quality requirements of:	Yes	No	---	Yes	No	No	No	No
Does **EEA 7.25** meet or exceed the glass quality requirements of:	Yes	No	No	---	No	No	No	No
Does **ISO Class AA** meet or exceed the glass quality requirements of:	Yes	Yes	Yes	Yes	---	Yes	Yes	Yes
Does **ISO Class A** meet or exceed the glass quality requirements of:	Yes	Yes	Yes	Yes	No	---	Yes	Yes
Does **ISO Class B** meet or exceed the glass quality requirements of:	Yes	Yes	Yes	Yes	No	No	---	Yes
Does **ISO Class C** meet or exceed the glass quality requirements of:	Yes	Probably	Yes	Yes	No	No	No	---

Using this chart, buyers and specifiers can better distinguish the glass quality levels being offered. This information also offers a reliable way to recognize and communicate the specific quality requirements of the bolted tank project. The buyer/specifier now has a simple and consistent method to request specific compliance information from vendors, and vendors have a simple and consistent way to provide conformity information to buyers.

To better define *gf2s* quality requirements when using AWWA D103, we suggest that specifiers consider referencing the ISO standard relative to the *gf2s* coatings. At a minimum a Class B coating should be considered for AWWA water storage applications, and a Class A coating would certainly offer an enhanced product for the municipal projects.

VII. United Industries Group Glass Coatings

As a result of our review of the ISO 28765 standard, United Industries Group now incorporates a more detailed reference for our glass fused-to-steel coatings. Consistent with the ISO 28765 class designations developed above, we now include specific nomenclature for our glass coatings - *Everstore® Plus* and *Everstore®*. This chart shows the correlations for our *Everstore®* tanks and the identified ISO 28765 quality classifications.

United Industries Group - *Everstore®* Tank Glass Fused-to-Steel Bolted Tanks		
UIG *Everstore®*	**ISO 28765 Class Level**	**ISO 28765 Applications**
Everstore® Plus meets or exceeds the requirements of ISO Class AA and is used for Class AA and A applications	**AA**	• Thermophilic/ pasteurization digester – roof and rings exposed to gaseous zone
	A	• Industrial effluent process/ treatment • Biogas digester for agricultural waste - roof and rings exposed to gaseous zone • Thermophilic/ pasteurization digester - cylinders • Municipal mesophilic digester - roof and rings exposed to gaseous zone • Liquid Leachate • Municipal sludge treatment - roof and rings exposed to gaseous zone • Borehole/brackish/seawater
Everstore® meets or exceeds the requirements of ISO Class B and is used for Class B and C applications	**B**	• Municipal mesophilic digester - cylinders • Municipal sludge treatment - cylinders • Municipal sludge/sludge cake storage • Filter tanks • Storm/firewater • Potable water (DWI listed Reg 31) • Potable water (ANSI/NSF 61 listed)
	C	• Biogas digester for agricultural waste - cylinders

VIII. Summary

The review of the three standards has exposed the differences in the technical approach to glass quality and the recognition in ISO and EEA of the importance of the coating system in considering the overall durability and appropriateness for service in the specification of the *gf2s* storage tank. Consequently, we feel it is important for buyers and specifiers to solicit specific glass quality information on each tank project. From the perspective United Industries Group, we feel the most comprehensive standard is ISO 28765, therefore we are identifying our *Everstore®* glass coating offerings in accordance with the classes noted above.

For the convenience of both buyers and sellers, the tables presented in this paper are available for download at the United Industries Group website (www.unitedind.com).

Release History

This document has been revised by:

Version Number	Release Date	Summary of Changes	Author(s)
v1.0	5 August 2020	Original Release	Mansour/Renich

Reference Documents

Please see the following documents for more information:

Ref	Document or Source	Version
1	*ISO 28765 - International Standard - Vitreous and porcelain enamels - Design of bolted steel tanks for the storage or treatment of water or municipal or industrial effluents and sludges*	Second Edition 2016-01-15 and First Edition 2008
2	*ANSI/AWWA D103 - American National Standard Institute, American Water Works Association Standard - Factory-Coated Bolted Carbon Steel Tanks for Water Storage*	Editions 1980, 1989, 1997, 2009 and 2019
3	*European Enamel Authority e.V. (EEA) - Quality Requirements* • *Section 7.20 - Quality Requirements for Porcelain and Vitreous Enamelled Industrial Tanks* • *Section 7.24 - Quality Requirements for Porcelain and Vitreous Enamelled Silos for Animal Feed* • *Section 7.25 - Quality Requirements for Porcelain and Vitreous Enamelled Dung Silos*	4th Edition - 2013
4	*DIN 15282 - German Standard - Deutsches Institut fur Nomung - Vitreous and porcelain enamels - Design of bolted steel tanks for the storage or treatment of water or municipal or industrial effluents and sludges*	June 2007
5	*ISO 28706 - 1 - Vitreous and porcelain enamels - Determination of resistance to chemical corrosion - Part 1: Determination of resistance to chemical corrosion by acids at room temperature*	2008
6	*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, alkaline liquids and/or their vapours*	2008
7	*ISO 28706 - 3 - Vitreous and porcelain enamels - Determination of resistance to chemical corrosion - Part 3: Determination of resistance to chemical corrosion by alkaline liquids using a hexagonal vessel or a tetragonal glass bottle*	2008
8	*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*	2008