

Synopsis of ISO standards for anodizing

This gives the status at 18th February 2020 of the various international standards for anodizing. For those that have been revised and a new edition published recently, there is a brief description of the main changes compared to previous versions. The descriptions are not necessarily complete. If a standard is significant to a licensee, then it is strongly recommended that he purchases a copy of the new edition.

The new standard, ISO 18771:2019, on the surface abrasion test is also included and the description compares it with the method of the Qualanod specifications section 9.6.1.

ISO 2085:2018 Anodizing of aluminium and its alloys -- Check for continuity of thin anodic oxidation coatings -- Copper sulfate test

The previous edition was ISO 2085:2010 which replaced EN 12373-16:2001.

- Scope specifically includes coil-anodized aluminium.
- The test shall be applied to a significant surface of the product and not near an edge.
- The test area shall be selected so that it can be held horizontally during the test unless it is to be immersed in the test solution.
- The test area shall be clean. A method to clean it is given.
- Where a flat test area cannot be obtained from the product, the test is carried out by immersing the product in the copper sulfate solution. The surface of the product other than the test area is masked before the test for the purpose of delineating the test area.

ISO 2106:2019 Anodizing of aluminium and its alloys -- Determination of mass per unit area (surface density) of anodic oxidation coatings -- Gravimetric method

The previous edition was ISO 2106:2011 which replaced EN 12373-2:1999.

- The method includes an alternative solution: a phosphoric acid/sodium molybdate solution. It attacks aluminium to a limited extent so it is necessary to prevent dissolution of the substrate. A table gives information on the mass loss which is regarded as the end of dissolution and no further immersion is necessary.
- The test shall be applied to a significant surface of the product and not near an edge.
- Where it is impossible to test the product itself, a representative test specimen may be used. The requirements for the representative test specimen are specified.
- The test area shall be clean. A method to clean it is given.
- The standard size of the test specimen should be 50 mm in length and 50 mm in width. Where that is not possible, the surface shall be between 0,08 dm² and about 1 dm².
- The formula to estimate the average thickness of the coating from the surface density has been corrected.

ISO 2128:2010 Anodizing of aluminium and its alloys -- Determination of thickness of anodic oxidation coatings -- Non-destructive measurement by split-beam microscope

This replaced EN 12373-3:1999.

- The area to be examined should be agreed by the anodizer and the customer.

ISO 2135:2017 Anodizing of aluminium and its alloys -- Accelerated test of light fastness of coloured anodic oxidation coatings using artificial light

The previous edition was ISO 2135:2010.

- The test shall be applied to a significant surface of the product and not near an edge.
- Where it is impossible to test the product itself, a representative test specimen may be used. The requirements for the representative test specimen are specified.
- The test area shall be clean. A method to clean it is given.

- The temperature of the black panel shall be $(63 \pm 3) ^\circ\text{C}$; $(50 \pm 3) ^\circ\text{C}$ or another temperature may be used based on agreement between the interested parties.
- A method for the instrumental assessment of colour change and gloss retention has been added.
- The specification of allowed light sources (xenon-arc or carbon-arc) has been added as a new normative annex.

ISO 2143:2017 Anodizing of aluminium and its alloys -- Estimation of loss of absorptive power of anodic oxidation coatings after sealing -- Dye-spot test with prior acid treatment

The previous edition was ISO 2143:2010 which replaced EN 12373-4:1998.

- The test shall be applied to a significant surface of the product and not near an edge.
- Where it is impossible to test the product itself, a representative test specimen may be used. The requirements for the representative test specimen are specified.
- It does not allow the application of heat to dry the test specimen after washing of the acid.
- The test area shall be clean. A method to clean it is given.
- A method has been added for the immersion of test specimens in the various solutions.
- A colorimeter may be used to assess the colour difference caused by the test.

ISO 2376:2019 Anodizing of aluminium and its alloys -- Determination of breakdown voltage and withstand voltage

The previous edition was ISO 2376:2010 which replaced EN 12373-17:2001.

- The title has been changed.
- The test shall be applied to a significant surface of the product and not near an edge.
- Where it is impossible to test the product itself, a test specimen which is representative of the product may be used. The requirements for the representative test specimen are specified.
- The test area shall be clean. A method to clean it is given.
- Before the test, the test specimen shall be kept in the test environment for over 1 h.
- Unless otherwise specified, carry out the determination at room temperature and less than 65% relative humidity.
- A method is included to determine the withstand voltage.
- The test report shall include the withstand voltage, the specified voltage and the time period.

ISO 2931:2017 Anodizing of aluminium and its alloys -- Assessment of quality of sealed anodic oxidation coatings by measurement of admittance

The previous edition was ISO 2931:2010 which replaced EN 12373-5:1999.

- The test shall be applied to a significant surface and not near an edge.
- The area of the test specimen shall be sufficient to determine the thickness of the coating at the point of measurement, to apply the electrolyte-filled cell and, if necessary, to determine the surface area tested.
- Where it is impossible to test the product itself, a representative test specimen may be used. The requirements for the representative test specimen are specified.
- The test area shall be clean. A method to clean it is given.

ISO 3210:2017 Anodizing of aluminium and its alloys -- Assessment of quality of sealed anodic oxidation coatings by measurement of the loss of mass after immersion in acid solution(s)

The previous edition was ISO 3210:2010 which replaced EN 12373-6:1999 and EN 12373-7:2002.

- The title has been changed.
- If by agreement between the anodizer and the customer, special test specimens are prepared, they shall be of the same alloy as the production components and processed through the anodizing line at the same time as the production components.
- There are two methods

- Method 1 is without the prior acid treatment while method 2 is with the prior acid treatment.
- For decorative and protective applications where resistance to staining is important, method 1 is applicable.
- For architectural purposes, method 2 is applicable.
- Method 1 requires the removal of any surface bloom by rubbing with a dry cloth before the test piece is cleaned.
- The option of using a test solution that does not contain hexavalent chromium ions has been added and a new subclause specifying the use of that solution has been included in the procedure.
- The test solution should not be used after 4,5 g of anodic oxidation coating have been dissolved per litre of solution. It does not refer to the area of anodized surface.

ISO 3211:2018 Anodizing of aluminium and its alloys -- Assessment of resistance of anodic oxidation coatings to cracking by deformation

The previous edition was ISO 3211:2010 which replaced EN 12373-15:2001.

- The test shall be applied to a significant surface and not near an edge.
- Where it is impossible to test the product itself, a test specimen representative of the product may be used. The requirements for the representative test specimen are specified.
- The test area shall be clean. A method to clean it is given.
- The test report shall include: i) the extruded direction of the substrate to the bending direction (orthogonal or parallel); ii) the clamping screw to start bending (clamping screw 3 or 5).

ISO 6581:2018 Anodizing of aluminium and its alloys -- Determination of the comparative fastness to ultraviolet light and heat of coloured anodic oxidation coatings

The previous edition was ISO 6581:2010 which replaced EN 12373-8:1999.

- The test shall be applied to a significant surface of the product and not near an edge.
- Where it is impossible to test the product itself, a test specimen which is representative of the product may be used. The requirements for the representative test specimen are specified.
- The test area shall be clean. A method to clean it is given.
- The test report shall include: i) the lamp manufacturer, model name, wattage, arc length and distance from the specimens; ii) the time(s) of exposure.

ISO 6719:2010 Anodizing of aluminium and its alloys -- Measurement of reflectance characteristics of aluminium surfaces using integrating-sphere instruments

This replaced EN 12373-12:2001.

ISO 7583:2013 Anodizing of aluminium and its alloys – Terms and definitions

The previous edition was ISO 7583:1986.

ISO 7599:2018 Anodizing of aluminium and its alloys -- Method for specifying decorative and protective anodic oxidation coatings on aluminium

The previous edition was ISO 7599:2010 which replaced EN 12373-1:2001.

- The title has been changed.
- Thickness classes are designated by the letters “AA” followed by the thickness grade, eg AA 20.
 - The choice of thickness class will depend on relevant national standards.
 - For certain applications, eg where corrosion resistance is important, the anodizer and customer may agree a minimum local thickness with no restriction on the average thickness.
 - The use of some dyestuffs necessitates the specification of AA 20 or higher to get adequate dye absorption and light fastness.

- The eddy-current apparatus should be calibrated in accordance with the manufacturer's instructions before use. An annex describes standard test panels for use in calibration.
- The referee method for measuring coating thickness shall be by examination of cross-section using microscopy in accordance with ISO 1463 or ISO 9220 (optical microscopy or scanning electron microscopy).
- Assessment of the quality of hydrothermal sealing.
 - The methods of ISO 3210 (mass loss tests) are surface-specific. They test the resistance of the surface of a sealed anodic oxidation coating to attack by certain acid solutions. They are not intended to test the quality of the whole thickness of the coating.
 - The mass loss test is the referee test. In cases of dispute, the necessity of prior acid treatment and maximum accepted loss of mass shall be agreed between the anodizer and the customer.
 - The admittance method of ISO 2931 measures electrical properties of the whole thickness of a sealed anodic oxidation coating; it is sensitive to coating porosity.
 - The dye absorption test of ISO 2143 measures loss of absorptive power due to sealing
- Cold sealing
 - A two-step cold sealing treatment with a first step based on a nickel fluoride solution and a second step of hydrothermal sealing or immersion in a nickel sulfate solution at above 60 °C may be specified.
 - The mass loss test may be used as the referee test and the dye absorption test as a production control test.
- Other sealing treatments may be specified.
 - Test methods shall be agreed by the anodizer and the customer.
- Visual inspection shall be carried out under diffuse light, the source and strength of which shall be agreed by the anodizer and customer. Viewing distances are not specified; they are a matter for agreement between the interested parties.
- The AASS, CASS or NSS test may be used as agreed by the anodizer and customer. However, the AASS should be the referee test.
- If fastness to light and UV radiation are required by the customer, the test method or methods to be used and the performance requirements shall be specified by the customer. However, the method of ISO 2135 is referred to as the method of assessing coloured anodized aluminium.
- The methods of ISO 10215 or 10216 can be used to determine image clarity; the method and performance required shall be agreed by the anodizer and customer.

ISO 7668:2018 Anodizing of aluminium and its alloys -- Measurement of specular reflectance and specular gloss of anodic oxidation coatings at angles of 20 degrees, 45 degrees, 60 degrees or 85 degrees

The previous edition was ISO 7668:2010 which replaced EN 12373-11:2001.

- References to CIE spectral luminous efficiency and CIE standard illuminants C and D65 have been added.

ISO 7759:2010 Anodizing of aluminium and its alloys -- Measurement of reflectance characteristics of aluminium surfaces using a goniophotometer or an abridged goniophotometer

This replaced EN 12373-13:2001.

ISO 8251:2018 Anodizing of aluminium and its alloys -- Measurement of abrasion resistance of anodic oxidation coatings

The previous edition was ISO 8251:2011 which replaced EN 12373-9:1999 and EN 12373-10:1999.

- There are three methods
 - The abrasive wheel wear test. The force between the wheel and the test surface shall be adjusted to $3,9 \text{ N} \pm 0,1 \text{ N}$. Some procedures are in an informative annex.
 - The abrasive jet test.

- The falling sand abrasion test which is new.
- The standard does not specify methods for testing coatings produced by hard anodizing but refers to ISO 10074.
- The test shall be applied to a significant surface and not near an edge.
- Where it is impossible to test the product itself, a test specimen may be used. The requirements for the representative test specimen are specified.
- The test area shall be clean. A method to clean it is given.
- There is no requirement for the minimum test specimen size for a single determination.
- Standard specimens.
 - Procedures are given.
 - If agreed between the interested parties, a standard specimen made of poly(methyl methacrylate) (PMMA) sheet in accordance with ISO 7823-1 may be used for the abrasive wheel test.
- Use a laboratory balance with a readability of 0,1 mg.

ISO 8993:2018 Anodizing of aluminium and its alloys -- Rating system for the evaluation of pitting corrosion -- Chart method

The previous edition was ISO 8993:2010 which replaced EN 12373-18:2001.

No significant changes.

ISO 8994:2018 Anodizing of aluminium and its alloys -- Rating system for the evaluation of pitting corrosion -- Grid method

The previous edition was ISO 8994:2011 which replaced EN 12373-19:2001.

No significant changes.

ISO 10074:2017 Anodizing of aluminium and its alloys -- Specification for hard anodic oxidation coatings on aluminium and its alloys

The previous edition was ISO 10074:2010.

- The abrasive wheel wear test method assesses the resistance to abrasive wear. The abrasive jet test method assesses the resistance to erosive wear (erosion). Thus, the results are not necessarily comparable.
- For the abrasive jet test, the time between hard anodizing and abrasion testing shall be at least 24 h. During this period, the test specimens shall be stored in the test environment.
- For the Taber method, the final value shall be an average of at least three tests.
- The recommendations for the jet nozzle correspond with ISO 8251.
- Compressed air for agitation during anodizing of the standard specimen is no longer included. A large volume of low pressure air or solution circulation is specified instead.
- After anodizing and rinsing the standard specimen, it shall be dried with cold air.

ISO 10215:2018 Anodizing of aluminium and its alloys -- Visual determination of image clarity of anodic oxidation coatings -- Chart scale method

The previous edition was ISO 10215:2010 which replaced EN 12373-14:2001.

- ISO/TR 8125 has been withdrawn so Table 2, lightness scale, from ISO/TR 8125:1984 has been added.
- The test shall be applied to a significant surface of the product and not near an edge.
- Where it is impossible to test the product itself, a test specimen may be used. The requirements for the representative test specimen are specified.
- The test area shall be clean. A method to clean it is given.

ISO 10216:2017 Anodizing of aluminium and its alloys – Instrumental determination of image clarity of anodic oxidation coatings -- Instrumental method

The previous edition was ISO 10216:2010.

- The test shall be applied to a significant surface of the product and not near an edge.
- Where it is impossible to test the product itself, a test specimen which is representative of the product may be used. The requirements for the representative test specimen are specified.
- The test area shall be clean. A method to clean it is given.
- The tolerance of the width of the slit has been increased to 0.01 mm.
- Descriptions of the apparatus have been simplified. The figures have been revised and a combed sliding shutter figure has been added.
- Some of the procedure has been rewritten.

ISO 18771:2019 Anodizing of aluminium and its alloys -- Method to test the surface abrasion resistance using glass-coated abrasive paper

This is a comparison with the method of the 2019 edition of the Qualanod specifications section 9.6.1.

- There are two methods.
 - Method 1 is the same as that of 9.6.1.
 - Method 2 allows the loss of coating thickness to be considered. The procedure is given. A loss of more than 2 μm can indicate that the coating is less wear resistant than the abrasive.
- A method is included for validating glass-coated abrasive paper.