



International Quality Regulations for the Coating of Building Components

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Measuring and Testing Methods Standards and Guidelines

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Measuring and Testing Methods Standards and Guidelines



Modifications compared to previous version:

Ser. No.	Section	Chapter	Page	Kind of change	Modification
	n.a.			editorial	General correction of wording for "tape tear-off" (before "adhesive tape removal")
1	Appendix 1	2.2	4	technical	Reference to the number of samples to be tested for material and coating tests
2	Appendix 1	2.2.3	4	technical	Note on evaluation using the two-out-of-three method
3	Appendix 1	2.2.3	4	technical	Note on the rounding of the measured value when determining the factor F in filiform corrosion tests.
4	Appendix 1	5.3	6	technical	In future, an addition to the time requirement for carrying out the cupping test after leaving the curing furnace will apply to institutions in order to ensure consistency with the arbitration procedure
5	Appendix 1	5.4	6	technical	In future, an addition to the time requirement for carrying out the cupping test after leaving the curing furnace will apply to institutions in order to ensure consistency with the arbitration procedure
6	Appendix 1	7.1	7	editorial	Note on evaluation of color and effect change according to chapter 10
7	Appendix 1	7.2	7	editorial	Note on evaluation of color and effect change according to chapter 10
8	Appendix 1	7.3.1	8	technical	Change in the evaluation method for neutral salt spray test
9	Appendix 1	7.4.2	8	technical	The requirement for the number of samples to be tested does not apply

*editorial Stylistic adjustments without changing the factual content (including punctuation), correction or addition of references to other tables, paragraphs, chapters or documents
- Information for the quality committees

*normative Adaptation or supplementation of existing data and established procedures by inserting or changing content that refers directly to standards
- Informing the quality committees
Normative changes are shown in bold

*technical Technical, factual or linguistic changes that change the meaning, have an impact on specifications, procedures, processes or audits and reviews, as well as changes of any kind that are not covered by the definition of editorial or normative change
- Resolution by general meeting
Technical changes are shown in bold

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1 General

In this section, all of the measuring and testing methods set out for testing the technical requirements for pre-treatments, coating materials, as well as for quality assessment and monitoring of coating companies are defined.

When taking measurements, the operating instructions of the manufacturer of the equipment must be observed.

All tests are conducted based on the standards and guidelines referred to in this section.

2 Sampling

2.1 Number of samples by batch size

The number of samples is determined by the number of parts in a batch:

Size of delivery	Number of samples (random selection)	Limit of acceptability that does not correspond to the standard
1 to 10	All	0
11 to 200	10	1
201 to 300	15	1
301 to 500	20	2
501 to 800	30	3
801 to 1300	40	3
1301 to 3200	55	4
3201 to 8000	75	6
8001 to 22000	115	8
22001 to 110000	150	11

A batch is a complete customer order or a part of the order that is in production.

Guidance on the selection of appropriate sampling methods is given in ISO 2859-1.

2.2 Number of test panels for material tests and coater inspections

The specified number of tests relates exclusively to material and coating tests as well as corrosion tests carried out by the company itself and does not affect the factory production control FPC.

2.2.1 Number of test panels for material tests

For material tests, three measurements are carried out for each test.

2.2.2 Number of test panels for coater inspections

Coating tests are used for

- Acetic acid salt spray test
- Filiform corrosion test
- Neutral salt spray test

3 tests are carried out in each case

2.3 Evaluation of test panels for material tests and coater inspections

A test is deemed to have been passed if at least two of the three samples deliver results within the specification:

Number of samples	Number OK	Number NOK	Test result
3	3	0	OK
3	2	1	OK
3	1	2	NOK
3	0	3	NOK

When evaluating filiform corrosion tests, the value for the factor F is truncated after the first decimal place in the results display without rounding. Interim results are not rounded or capped.

3 Rounding of measured values

The following rounding rule applies to all results of the measuring and testing procedures prescribed in these quality guidelines:

All measured values must be rounded to the last digit of the specified limit value - the rounding digit.

Decisive for the rounding is the digit following the rounding digit.

The rounding rule is that for values of the next digit from ≥ 5 is rounded up and for values of the next digit of < 5 , it is rounded down.

For example, if the setpoint is 2.0, the first digit after the decimal point must be considered when rounding the measured value. In this case this is the 0.

Examples (rounding digit, following digit)

Limit value	Measured value	Evaluation value
2,0	2,08	2,1
7,15	7,184	7,18
5	5,4	5

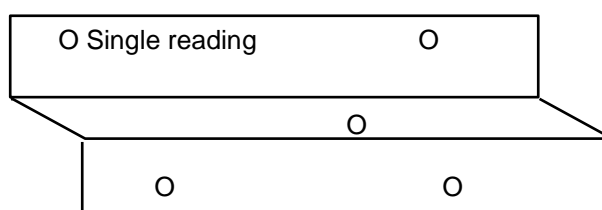
This rounding rule should only be applied to final results. Values used in formulae to calculate final results must not be rounded.

4 Coating thickness ISO 2360

When calculating the coating thickness, the effects on the measuring device of the alloy from the carrier material must be taken into account.

4.1 Evaluation at the coating company

When testing any sample, a measurement should be taken from at least 5 measuring points (1 cm²) spread across the surface in question.



If a measuring point displays less than 80% of the prescribed coating thickness, then the sample must be rejected and assigned to column 3 in the table in XYZ.

The mean average value of the 5 measuring points on a sample must at least correspond to the prescribed coating thickness. If this mean average value is below the prescribed coating thickness but still above the 80% threshold, the sample must be rejected and assigned to column 3 in the above table in Section XYZ.

The test is marked as failed if the average value of a sample is < 80% of the prescribed coating thickness. In addition, the number of samples below the prescribed coating thickness, but still above the 80% threshold, must not exceed the limit of acceptability.

Assessment using 4 typical examples with 50 µm:

Example 1:	Measured values in µm:	58 64 70 64 60
	Assessment	This sample is perfect.
Example 2:	Measured values in µm:	58 52 54 50 48
	Assessment	This sample is good because the average coating thickness is over 50 µm and none of the measured values are under 40 µm (80% of 50 µm).
Example 3	Measured values in µm:	48 42 44 46 48
	Assessment	This sample is unsatisfactory and falls under the category of "non-corresponding samples" in the table in Section XYZ.
Example 4:	Measured values in µm:	58 52 54 50 48
	Assessment	This sample is unsatisfactory although the average coating thickness is over 50 µm. Since the measured value of 38 µm is below the tolerance threshold of 80% (40 µm), the test is marked as failed.

The specifications cited do not apply to parts that place special demands on the coating company due to their geometry.

Customer requirements that depart from these specifications are excluded, provided that there is a verifiable written agreement to this effect.

5 Mechanical testing

5.1 Cross-cut test ISO 2409

The distance between cuts depends on the dry coating thickness measured.

Following the test, an adhesive tape tear-off must be performed, according to section 5.5.

5.2 Mandrel bending test ISO 1519

The mandrel bending test shall be performed in accordance with ISO 1519.

5.3 Cupping test ISO 1520

Following the test, an adhesive tape tear-off shall be performed, according to section 5.5.

The cupping test shall be performed at least one hour after leaving the curing oven and at room / laboratory conditions of 20 °C to 25 °C.

In the case of arbitration, the test must be performed within 24 hours after leaving the curing oven and under room / laboratory conditions of 20 °C to 25 °C.

If this test is carried out in the course of factory production control in a coating company, it must be carried out at the earliest possible time.

Institutes carrying out this test must comply with the conditions of the arbitration case and carry out the test within 24 hours of leaving the curing oven.

5.4 Ball impact test (powder coatings) extruding according to ASTM D 2794

The test shall be carried out with a ball diameter of 15.9 mm and with a film thickness of $70 \mu\text{m} \pm 10$.

The test shall be performed at least one hour after leaving the curing oven and at room / laboratory conditions of 20 °C to 25 °C.

In the case of arbitration, the test must be performed within 24 hours after leaving the curing oven and under room / laboratory conditions of 20 °C to 25 °C.

If this test is carried out in the course of factory production control in a coating company, it must be carried out at the earliest possible time.

Institutes carrying out this test must comply with the conditions of the arbitration case and carry out the test within 24 hours of leaving the curing oven.

The visual assessment is carried out without aids.

Following the test, an adhesive tape tear-off shall be performed, according to section 5.5.

5.5 Scratch resistance ISO 1518-1

Scratch resistance is tested using a load of 20 N on a scribe needle A with a carbide hemispherical tip with a radius of 0.50 ± 0.01 mm.

5.6 Adhesive tape tear ISO 2409

Adhesive tape is affixed as per ISO 2409 on the coated side of the sample metal sheet after mechanical deformation. Press down firmly on the coating in order to avoid cavities or air bubbles. After one minute, quickly remove the adhesive tape at a right angle to the surface of the metal sheet. No equipment is used for the visual inspection.

5.7 Behaviour when drilled or sawed

It must be possible to work on the coated components with standard tools and cutting devices without visually disruptive spalling appearing on the coating. These tests must be carried out on suitable materials (e.g. profile sections) following appropriate pre-treatment and application of paint.

6 Crosslinking tests (for thermally cured and two-component liquid paints)

6.1 MEK test

A square, four-ply cheese cloth measuring 5 cm in length along its edge must be laid flush on the area to be tested, soaked with 1 ml of MEK (methyl ethyl ketone) and covered immediately with a watch glass. Exposure time: 2 minutes

After removing the damp cloth, the remaining solvent must be wiped away immediately.

Prior to hardness testing, artificial ageing must be carried out for 60 minutes at a minimum of 120 °C. The subsequent Buchholz hardness measurement must be at least 80 (indentation length \cong 1.25 mm). There must not be any surface flaws (lines, reduction of gloss, removal of supporting surface etc.).

6.2 Acetone test

A square, four-ply cheese cloth measuring 5 cm in length along its edge must be laid flush on the surface to be tested, soaked with 1 ml of acetone and covered immediately with a watch glass. Exposure time: 2 minutes

After removing the damp cloth, the remaining solvent must be wiped away immediately.

Prior to hardness testing, artificial ageing must be carried out for 60 minutes at a minimum of 120 °C. The subsequent Buchholz hardness measurement must be at least 80 (indentation length \cong 1.25 mm). There must not be any surface flaws (lines, reduction of gloss, removal of supporting surface etc.).

7 Corrosion tests

7.1 Condensation constant atmosphere ISO 6270-2

Prior to the test, a T-cut must be made in the samples to be tested down to the metal using a Sikkens scribe needle (1 mm).

Evaluation: Degree of blistering in accordance with ISO 4628-2

Maximum, one-sided delamination at the scribe (d_{max}) based on ISO 4628-8

The evaluation of the colour and effect change is carried out in accordance with chapter 10 of this document.

7.2 Condensation variable atmosphere ISO 22479 (0.2 l SO₂ – Method B)

Prior to the test, a T-cut must be made in the samples to be tested down to the metal using a Sikkens scribe needle (1 mm).

Evaluation: Degree of blistering in accordance with ISO 4628-2

Maximum, one-sided delamination at the scribe (d_{max}) based on ISO 4628-8

7.3 Salt spray test

7.3.1 Neutral salt spray test ISO 9227 (NSS=SS)

Prior to the test, a T-cut must be made in the samples to be tested down to the metal using a Sikkens scribe needle (1 mm).

Evaluation: Degree of blistering in accordance with ISO 4628-2

Average width of delamination d at the scribe according to ISO 4628-8 with six measuring points

7.3.2 Acetic acid salt spray test ISO 9227 (AASS=ESS)

Depending on the profile cross section, the cuts are applied with a Sikkens scribe needle (1 mm) in longitudinal and transverse direction

Evaluation: Degree of blistering in accordance with ISO 4628-2

Maximum, one-sided delamination at the scribe (dmax) based on ISO 4628-8.

7.4 Filiform corrosion test ISO 4623-2

7.4.1 Method

Depending on the profile cross section, the scratches are made using a Sikkens scribe needle (1 mm) in vertical and horizontal directions.

7.4.2 Evaluation

The evaluation is made on coated aluminium samples. With this evaluation method, only filaments that can be identified without tools* are taken into consideration. In general, 5 mm at both the head and tail of the scratch are not considered. The filament length is calculated using the distance between the mechanical damage (scratch) and the head of the filament. When measuring, the measuring tool (scale: 0.1 mm) is at an angle of 90° to the scratch. The curvature of the filament is ignored in the measurement.

Both sides along both scratches must be considered prior to evaluation. In each case, the evaluation is made on the side of the scratch that shows the greatest corrosion. In cases of doubt, the side of the scratch that does not fulfil the requirements of the specification must be evaluated. The filament frequency (H) is calculated by counting the individual filaments along the more heavily corroded side of the scratch. The mean average value for the average filament length (I) is calculated by adding the individual lengths of the filaments on the scratch side to be evaluated and then dividing the total length by the number of filaments measured.

The average filament length (I) multiplied by the filament frequency (H) produces the coefficient of filiform corrosion (F).

$$H = Z/L \quad F = I * H$$

I_{\max} = maximum filament length (mm)

I = average filament length (mm)

Z = number of filaments

L = length of scratch (mm)

H = filament frequency

F = index for filiform corrosion

All calculated values must be specified in the test report

*(excluding medical visual aids)

7.5 GSB boil test or pressure cooker test

If blistering occurs during the boil test or pressure cooker test, another sample must be coated on commercially available chromated sheet aluminium and the boil test or pressure cooker test carried out. If blisters also appear in the paint film here, then the test is deemed as failed.

7.5.1 GSB boil test with cross-cut test and adhesive tape tear

Two-hour boil test in deionised water. The surface is visually inspected immediately.

The sample is then stored at room temperature for one hour. This is then followed by the cross-cut test or the cross-cut test with adhesive tape tear (see 5.1 and 5.6).

7.5.2 Pressure cooker test EN 12206-1 with cross-cut test and adhesive tape tear

After cooling, a visual inspection is conducted.

The sample is then stored at room temperature for one hour. This is then followed by the cross-cut test or the cross-cut test with adhesive tape tear (see 5.1 and 5.6).

8 Resistance tests

8.1 Resistance to the effects of moisture

8.1.1 Application and purpose

Here the shelf life of coated aluminium building components subjected to condensation and temperature in sealed plastic film packaging should be tested.

A process is described that involves less moisture than a condensation constant atmosphere, a boil test or exposure to an average temperature.

8.1.2 Method

Five round filters, category no. 1001-055 from Whatman, are laid on top of one another on the correctly coated sample and soaked with 1.5 ml + 0.1 ml of deionised water. The moist sheets of filter paper are pressed down lightly and covered with a watch glass. In order that no moisture can escape, the watch glass is bonded to the sample with insulating tape (Scotch Super 33+ from 3M).

The test metal sheet prepared in this way is stored for 4 hours \pm 5 minutes in the drying cabinet at a sample temperature (object temperature) of $T_{BProbeB} = 58 \pm 2$ °C. After the sample has been cooled for 15 minutes, the watch glass and sheets of filter paper are then removed. The sample is conditioned at room temperature ($T = 23 \pm 2$ °C) for a period of $t = 20 \pm 2$ h.

8.1.3 Evaluation

To calculate the colour change, 3 colour measurements excluding gloss are taken on the tested and untested reference sample 3. The average value is evaluated. The samples are also subject to a visual inspection by the quality committee.

8.2 Alkali resistance

8.2.1 Mortar test

Adapting EN 12206-1 (5.10), the mortar consists of 15 g slaked lime, 41 g cement, 244 g sand and 60-65 g tap water.

The wet mortar mass is applied to the specimen to be tested with a diameter of approx. 4 cm and a height of approx. 6 mm using a template. The specimens are exposed for 24 h at $T = 40$ °C and 100% relative humidity according to the specifications of GSB AL 631. After a test time of 24 h, the mortar must be removed easily and without residues.

Note: When testing GSB paint systems, an acid dip will be performed in accordance with AAMA 2603 - 21 to remove any remaining lime scale after the mortar test. On the tested sample area a round filter cat. No. 1001-055, Wathman Company, \varnothing 55 mm, is placed and soaked with 10 % hydrochloric acid. After 15 min, the specimen is cleaned with deionized water and dried. After a test time of 24 h, the mortar must be removed easily and without residues.

Leave to dry and examine the coating by means of normal or corrected eyesight.

The change in colour and effect is assessed in accordance with Section 10.3. Mechanical damage to the coating caused by grains of sand must not be taken in consideration here.

If effect paints are to be used, which show a change in effect ≥ 3 (see Section 23) after the mortar test, a written confirmation of acceptance for this must be issued by the client. A binding submission of the tested sample in the mortar test must be signed by all the contract partners.

8.2.2 GSB sodium hydroxide test (alternative)

Approx. 1 ml of NaOH solution (2N) is dropped onto the painted surface to be tested and covered with a watch glass. After 60 minutes, the watch glass is removed, the excess NaOH solution sponged off with a soft cloth, the surface cleaned under running tap water and dried again with a towel.

The evaluation is made in accordance with Section 10.3.

Note: This test is not suitable for liquid paints with haematite pigmentation (e.g. DB colours)

9 Adhesion of sealing compounds

Materials needed

- Sealant: DC791 Dow Corning or sealant recommended by paint manufacturer (note expiration date)
- Cartridge gun
- Isopropyl alcohol
- Cutter knife or scalpel
- Pipette
- Paper towels

Implementation

1. cleaning

- o Apply 2.5 ml isopropanol to the surface to be tested (approx. 15 x 20 cm) and clean it with a soft paper towel by performing 5 double strokes in the longitudinal direction and 5 double strokes in the transverse direction.
- o After wiping in longitudinal and transverse direction, no paint must remain on the cloth and the paint surface must not show any damage.
- o Allow the surface to flash off for at least 5 min before applying the sealant.

2. application of the sealing compound

- o The unscrewed nozzle of the applicator is cut to 8 mm inside diameter (approx. 35 mm from the tip). An adhesive tape should be applied so that it runs across the caterpillar on the lower part of the test sheet. The caterpillar should end on the tape so that later removal of the caterpillar is facilitated.
- o After flash-off, apply two approx. 100 mm long caterpillars of the sealant "to the previously cleaned surface using the cartridge gun.
- o The caterpillar should have approximately the following dimensions: 100 mm long, 10 mm wide and 5-7mm high.
- o The sample is then stored for 7 days at room temperature ($23\pm 2^{\circ}\text{C}$) and 50% relative humidity. stored.

3. pull off the caterpillar

- o Detach the caterpillar from the adhesive tape and pull it off by hand until the sealant caterpillar itself cracks (cohesive fracture) or completely detaches from the surface (adhesive fracture).
- o If the caterpillar tears itself, use a cutter knife or scalpel at a 90° angle (to the sheet metal) to and pulled again until the caterpillar threatens to tear again. This is repeated until the caterpillar is completely removed.

Evaluation

The result of the test is considered "OK" if there is a cohesive fracture. Adhesion fracture is not permissible.

10 Colour measurement

10.1 General

3 colour measurements are made at different places on the exposed, cleaned sample and the unexposed reference sample, with the measuring points always at least 50 mm apart.

The arithmetical mean value is taken from the colorimetric values of the measurements.

The conditions for measurement and colorimetric evaluation are:

- A spectral photometer or a colorimeter must be used in accordance with the tristimulus method as per ISO 11664-3;
- The measuring geometry is d8/Spex. excluding gloss or 45/0
- The colorimetric evaluation must be for the standard illuminant type D65 and the 10° standard observer in accordance with ISO 11664-2 and DIN 5033 Part 7;
- The coordinates must be calculated in accordance with the CIELAB colour difference formula in accordance with ISO 11664-4 for the sample and reference sample; the differences ΔL^* and ΔC_{ab}^* must be specified.

The measured differences, rounded to whole numbers, must not exceed the limit values (basic measurement geometry 45/0). If the limit values in the following table are exceeded, a visual inspection is made by the quality committee. If no RAL colour is available, the limit values for the nearest RAL colour apply.

Upon request, an arbitration test can be carried out at the Federal Institute for Materials Research and Testing (BAM) in Berlin using a spectral photometer for measurement geometry 45/0.

10.2 Colour differences ΔL^* , ΔC^* after weathering

The colour is measured in accordance with ISO 11664-4, illuminant type: D65/10° standard observer; measurement geometry 45/0.

10.3 Assessment of the change in colour and effect (in accordance with GSB standard)

The change in effect for metallics is carried out as per the following assessment system in accordance with ISO 4628 Part 1.

Key value for intensity of change

0	Unchanged, i.e. no perceptible change
1	Very low, i.e. change only just perceptible
2	Low, i.e. clear perceptible change
3	Medium, i.e. very clear perceptible change
4	High, i.e. pronounced change
5	Very strong change

The assessment is made using a reference plate (to be obtained from the GSB International head office).

11 Measurement of gloss (reflectometer value)

The reflectometer value must be measured in accordance with ISO 2813 using an angle of radiation of 60° for all tests. The reflectometer value must be specified in gloss units (GU).

Exception: Matt painted surfaces with an initial gloss ≥ 40 GU (measured with 60°) can be measured, where agreed, with the 85° geometry.

12 Weathering

12.1 Accelerated UV-B weathering (313 nm)

This test is carried out in accordance with ISO 16474-3. The QUV/SE accelerated weathering tester with Solar Eye radiation control must be used.

Radiation source:	UVB-313 nm
Cycle:	4 h condensation, $T = 40\text{ °C} \pm 2\text{ °C}$ 4 h solar radiation, $T = 50\text{ °C} \pm 2\text{ °C}$
Intensity of solar radiation:	0.75 W/m ² /nm

Alternatively, the accelerated weathering tester from Atlas ("UVTest – Fluorescent / UV Instrument") can be used.

12.2 Natural weathering in Florida

For assessment, the gloss and colour limit values used are those defined in the quality guidelines valid at the time when the external test was started. Dimensions of samples: 100 x 300 x 0.7-0.8 (mm) (sample thickness is not binding). For assessment, the gloss and colour limit values used are those defined at the time when the external test was started.

The samples must be subjected to the external test from approx. April with the total UV radiation and angles specified in the table. The samples must be cleaned in a one-percent aqueous wetting solution using slight pressure with a soft sponge and then rinsed with deionised water. The surface should be kept as free as possible from dirt and impurities. Cleaning is carried out prior to determining the measurement of gloss and colour, as well as at the intervals specified in the table.

Coating class	Standard	Master	Premium
Southern orientation angle / °	5	45	45
Approx. duration / months	Approx. 12	Approx. 36	Approx. 60
Total UV radiation / (MJ/ m ²)	300	840	1400
Cleaning	Once prior to evaluation	Every 6 months	Every 6 months

12.3 Natural weathering in Hook of Holland

Geometry of samples:	Metal sheets:	approx. 10 x 20 cm
	Profiles:	Dependent on the profile material used in the field test, length approx. 10-30 cm

The samples are usually subjected to external tests and evaluated once per year. External testing takes place between April and May. External testing runs for 10 years in total. The samples are orientated southwards at an angle of 45°. Interim evaluations are made once per year. The sample is washed down with water prior to evaluation.

The levels of infiltration, filament length and frequency are evaluated.

After 3, 5 and 10 years, an interim report must be produced for the pre-treatment manufacturers and GSB International.

13 Measurement of conductivity

The measurement is used to calculate the conductivity of the water that drips off the visible surfaces of the pre-treated and rinsed parts after the final rinsing with deionised water. In addition, conductivity is measured at the spray nozzles and in the container used for the final rinse.

The water that has dripped off is caught in a suitable container (e.g. a beaker). The collecting vessel must be clean.

Prior to taking measurements, the conductivity measuring equipment must be tested using a calibration solution and set to the corresponding measuring range. In the case of equipment without temperature compensation, the water temperature must be monitored and the measuring device adjusted accordingly.

14 Calculation of the etch rate

The sample material must have a minimum length of 10 cm and must only be used once.

- **Preparation of samples**

Wipe the surface clean using acetone or isopropanol
Weigh the samples using an analytical balance (accuracy ± 0.1 mg)

- **Treatment of samples**

The samples must be treated under production conditions. Depending on the pre-treatment system, the samples should be removed from the production process as follows:

- Acceptance of the sample prior to chromating / chromium-free pre-treatment
- Acceptance of the sample prior to the residual water dryer, removal of the passivation layer / conversion layer by etching.

The bath parameters must correspond to the specifications of the chemical supplier.

- **Calculation of the etch rate**

- a. Dry the sample at 80 °C
- b. Weigh the sample using an analytical balance (accuracy ± 0.1 mg)
- c. Calculate the erosion (loss of weight / sample surface)

15 Calculation of the surface-based loss of mass

The coating layer for the chemical pre-treatment layer (chromating or chromium-free / chromium(VI)-free pre-treatment) is calculated according to the specifications of the pre-treatment chemical manufacturer. If no relevant test specification is available, you can proceed as follows. To do this, it must be possible for the relevant chemical pre-treatment with 65% nitric acid to be removed at 25 °C. This regulation can only be carried out for freshly generated pre-treatment layers.

The sample material must only be used once.

- **Treatment of samples**

- a. The samples must be pre-treated under production conditions.
- b. Acceptance of the sample after chromating / chromium-free pre-treatment after the residual water dryer. Cool to 20 – 23 °C.
- c. Weigh the sample using an analytical balance (accuracy ± 0.1 mg).
- d. Remove the passivation layer / conversion layer by etching the chemical pre-treatment layer (with 65 % nitric acid, density 1.4 g / cm³, for 5 to 10 minutes at a temperature 25 °C).

- **Calculation of the layer weight of the chemical pre-treatment**
 - a. Dry the sample at 80 °C. Cool to 20 – 23 °C.
 - b. Weigh the sample using an analytical balance (accuracy ± 0.1 mg).
 - c. Calculate the eroded layer weight (loss of weight / sample surface). Specified in mg / m².

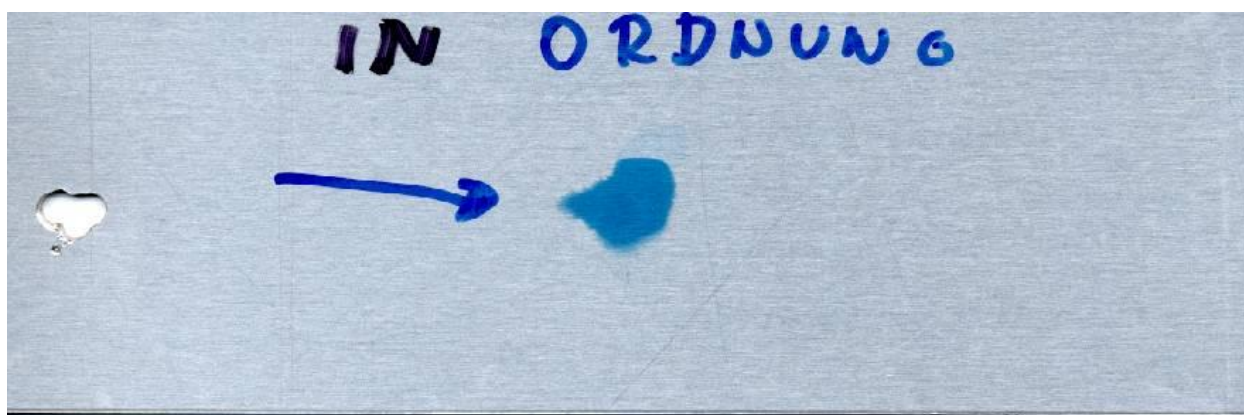
16 Colour drop test to prove “open porosity” of the oxide layer (in accordance with ISO 2143)

Prior to coating, a colour drop test must be carried out using Sanodye Blue 2 LW on five different profile sections of the batch with “pre-anodising” to be coated.

Dry and clean gloves must be worn at all times to handle the sections.

The test solution (= 5 g / l Sanodye Blue 2 LW pH 5.7 ± 0.5) is left to act upon the pre-anodised and carefully rinsed surface of the sample section for 1 minute and then wiped dry with a soft towel.

If the first test is negative, it should be repeated immediately.



A sample section, which has been treated with a drop of the acid solution before being subjected to the test solution and carefully rinsed with deionised water, can be used as a reference for an “openly porous” oxide layer.

(Acid solution: 25 ml / l H₂SO₄ (density 1.84 g / ml) and 10 g / l KF).

17 Visual inspection of the surface for finished products

Assessing the decorative appearance of the industrially produced surface in terms of uniformity of colour, gloss and structure must be carried out without aids in diffuse daylight, at a distance of ≥ 3 m for external components and ≥ 2 m for internal components. All of the samples must match in terms of gloss, colour and structure.

When assessing the uniformity of the façade, it is recommended to use larger viewing distances – refer to the following information sheets:

VFF Information Sheet AL.02 Visual assessment of organically coated (lacquered) aluminium surfaces

VFF Information Sheet ST.02 Visual assessment of organically coated (lacquered) steel surfaces
VFF, Verband Fenster + Fassade (German Window and Façade Association), Frankfurt (www.window.de)

When assessing the coating quality, irregularities in the supporting surface, such as scratches, streaks, corrosion scars and weld seams are not important.

Alternative viewing distances and criteria can also be agreed between the contract partners.

18 Distribution list

- GSB-CERT
- GSB Office
- Members
- Inspector

Normen und Richtlinien (informativ)

AAMA 2603-02	Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panel - 2021
ASTM D 2794	Prüfung von organischen Beschichtungen auf Beständigkeit gegen schnelle Verformung; Schlagbeanspruchung, 2019 Standard test method for resistance of organic coatings to the effects of rapid deformation (impact), 2019
DIN 5033-7	Farbmessung; Messbedingungen für Körperfarben, Ausgabe: 2014-10 Colorimetry; Measuring conditions for object colors, edition: 2014-10
DIN 55633	Beschichtungsstoffe - Korrosionsschutz von Stahlbauten durch Pulverbeschichtungssysteme - Bewertung der Pulverbeschichtungssysteme und Ausführung der Beschichtung, Ausgabe: 2009-04 Paints and varnishes - Corrosion protection of steel structures by powder coating systems - Assessment of powder coating systems and execution of coating, edition 2009-04
E DIN 55633-1	Beschichtungsstoffe - Korrosionsschutz von Stahlbauten durch Pulver-Beschichtungssysteme - Teil 1: Bewertung der Pulver-Beschichtungssysteme und Ausführung der Beschichtung, 2020-07 Paints and varnishes - Corrosion protection of steel structures by powder coating systems - Part 1: Assessment of powder coating systems and execution of coating, 2020-07
DIN 55634	Beschichtungsstoffe und Überzüge - Korrosionsschutz von tragenden dünnwandigen Bauteilen aus Stahl, Ausgabe: 2010-04 Paints, varnishes and coatings - Corrosion protection of supporting thin-walled building components made of steel, edition: 2010-04 Nachfolge DIN 55928-8 Succession DIN 55928-8
EN 1090-3	Ausführung von Stahltragwerken und Aluminiumtragwerken - Teil 3: Technische Regeln für die Ausführung von Aluminiumtragwerken; Deutsche Fassung EN 1090-3:2019 Execution of steel structures and aluminium structures - Part 3: Technical requirements for aluminium structures; German version EN 1090-3:2019
EN 1999-1-1	Eurocode 9: Bemessung und Konstruktion von Aluminiumtragwerken - Teil 1-1: Allgemeine Bemessungsregeln; Deutsche Fassung EN 1999-1-1:2007 + A1:2009 + A2:2013 Eurocode 9: Design of aluminium structures - Part 1-1: General structural rules; German version EN 1999-1-1:2007 + A1:2009 + A2:2013
EN 10130	Kaltgewalzte Flacherzeugnisse aus weichen Stählen zum Kaltumformen - Technische Lieferbedingungen; Deutsche Fassung EN 10130, Berichtigung zu DIN EN 10130: 2007 Cold rolled low carbon steel flat products for cold forming Technical delivery conditions; German version EN 10130, correction to Din EN 10130: 2007
EN 10143	Kontinuierlich schmelztauchveredeltes Blech und Band aus Stahl - Grenzabmaße und Formtoleranzen; Deutsche Fassung EN 10143, Berichtigung zu DIN EN 10143: 2006 Continuously hot-dip coated steel sheet and strip - Tolerances on dimensions and shape; German version EN 10143, correction to DIN EN 10143: 2006

EN 10346	Kontinuierlich schmelztauchveredelte Flacherzeugnisse aus Stahl zum Kaltumformen - Technische Lieferbedingungen; Deutsche Fassung EN 10346:2015 Continuously hot-dip coated steel flat products for cold forming - Technical delivery conditions; German version EN 10346:2015
EN 12206-1	Beschichtungsstoffe - Beschichtungen auf Aluminium und Aluminiumlegierungen für Bauzwecke – Teil 1: Beschichtungen aus Beschichtungspulvern; Deutsche Fassung EN 12206-1:2021 Paints and varnishes - Coating of aluminium and aluminium alloys for architectural purposes – Part 1: Coatings prepared from coating powder; German version EN 12206-1:2021
EN 12487	Korrosionsschutz von Metallen - Gespülte und no-rinse Chromatierüberzüge auf Aluminium und Aluminiumlegierungen; Deutsche Fassung EN 12487:2007 Corrosion protection of metals - Rinsed and non-rinsed chromate conversion coatings on aluminium and aluminium alloys; German version EN 12487:2007
EN 13438	Beschichtungsstoffe - Pulverbeschichtungen für feuerverzinkte oder sherardisierte Stahlerzeugnisse für Bauzwecke, 2013 Paints and varnishes - Powder organic coatings for hot dip galvanised or sherardised steel products for construction purposes, 2013
EN 15773	Industrielle Pulverbeschichtung von feuerverzinkten und sherardisierten Gegenständen aus Stahl [Duplex-Systeme] - Spezifikationen, Empfehlungen und Leitlinien; Deutsche Fassung EN 15773:2018 Industrial application of powder organic coatings to hot dip galvanized and sherardized steel articles [duplex systems] - Specifications, recommendations and guidelines; German version EN 15773:2018
ISO 1518-1	Beschichtungsstoffe - Bestimmung der Kratzfestigkeit - Teil 1: Verfahren mit konstanter Last, Ausgabe: 2019-10 Paints and varnishes - Determination of scratch resistance - Part 1: Constant-loading method, edition: 2019-10
ISO 1520	Beschichtungsstoffe – Tiefungsprüfung (ISO 1520:2006); Deutsche Fassung EN ISO 1520:2007-11 Paints and varnishes – Cupping test (ISO 1520:2006); German version EN ISO 1520:2007-11
ISO 1461	Durch Feuerverzinken auf Stahl aufgebraute Zinküberzüge (Stückverzinken) – Anforderungen und Prüfungen (ISO 1461:2009); Deutsche Fassung EN ISO 1461:2009 Hot dip galvanized coatings on fabricated iron and steel articles – Specifications and test methods (ISO 1461:2009); German version EN ISO 1461:2009
ISO 1463	Metall- und Oxidschichten - Schichtdickenmessung - Mikroskopisches Verfahren (ISO 1463:2003); Deutsche Fassung EN ISO 1463:2004, Ausgabe 2004-08 Metallic and oxide coatings - Coating thickness measurement - Microscopical method (ISO 1463:2003); German version EN ISO 1463:2004, edition 2004-08
ISO 1519	Beschichtungsstoffe - Dornbiegeversuch (zylindrischer Dorn) (ISO 1519:2011); Deutsche Fassung EN ISO 1519:2011 Paints and varnishes - Bend test (cylindrical mandrel) (ISO 1519:2011); German version EN ISO 1519:2011

ISO 2143	Anodisieren von Aluminium und Aluminiumlegierungen - Abschätzung der Anfärbbbarkeit von anodisch erzeugten Oxidschichten nach dem Verdichten - Farbtropfentest mit vorheriger Säurebehandlung, 2017-10 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, 2017-10
ISO 2178	Nichtmagnetische Überzüge auf magnetischen Grundmetallen - Messen der Schichtdicke – Magnetverfahren, 2016-10 Non-magnetic coatings on magnetic substrates - Measurement of coating thickness - Magnetic method, 2016-10
ISO 2360	Nichtleitende Überzüge auf nichtmagnetischen metallischen Grundwerkstoffen - Messen der Schichtdicke – Wirbelstromverfahren, 2017-07 (ISO 2360:2003); Deutsche Fassung EN ISO 2360:2004 Non-conductive coatings on non-magnetic electrically conductive basis materials - Measurement of coating thickness - Amplitude-sensitive eddy current method, 2017-07
ISO 2409	Beschichtungsstoffe - Gitterschnittprüfung (ISO 2409:2013); Deutsche Fassung EN ISO 2409:2020-12 Paints and varnishes - Cross-cut test (ISO 2409:2013); German version EN ISO 2409:2020-12
ISO 2808	Beschichtungsstoffe - Bestimmung der Schichtdicke, 2019-07 Paints and varnishes - Determination of film thickness, 2019-07
ISO 2810	Beschichtungsstoffe - Freibewitterung von Beschichtungen - Bewitterung und Bewertung (ISO 2810:2004); Deutsche Fassung EN ISO 2810:2004 Paints and varnishes - Natural weathering of coatings - Exposure and assessment (ISO 2810:2004); German version EN ISO 2810:2004
ISO 2813	Beschichtungsstoffe - Bestimmung des Glanzwertes unter 20°, 60° und 85°, Ausgabedatum: 2014-10, Deutsche Fassung DIN EN ISO 2813: 2015 Paints and varnishes - Determination of gloss value at 20 degrees, 60 degrees and 85 degrees, edition: 2014-10, german version DIN EN ISO 2813: 2015
ISO 3231	Beschichtungsstoffe - Bestimmung der Beständigkeit gegen feuchte, Schwefeldioxid enthaltende Atmosphären (ISO 3231:1993); Deutsche Fassung EN ISO 3231:1997 Paints and varnishes - Determination of resistance to humid atmospheres containing sulfur dioxide (ISO 3231:1993); German version EN ISO 3231:1997 Ersetzt durch/replaced by ISO 22479
ISO 4623-2	Beschichtungsstoffe - Bestimmung der Beständigkeit gegen Filiformkorrosion Teil 2: Aluminium als Substrat, 2016-08 Paints and varnishes - Determination of resistance to filiform corrosion - Part 2: Aluminium substrates, 2016-08
ISO 4628-1	Beschichtungsstoffe - Beurteilung von Beschichtungsschäden - Bewertung der Menge und der Größe von Schäden und der Intensität von gleichmäßigen Veränderungen im Aussehen - Teil 1: Allgemeine Einführung und Bewertungssystem, 2016-10 Paints and varnishes - Evaluation of degradation of coatings - Designation of quantity and size of defects, and of intensity of uniform changes in appearance - Part 1: General introduction and designation system, 2016-10

ISO 4628-2	<p>Beschichtungsstoffe - Beurteilung von Beschichtungsschäden - Bewertung der Menge und der Größe von Schäden und der Intensität von gleichmäßigen Veränderungen im Aussehen – Teil 2: Bewertung des Blasengrades 206-01</p> <p>Paints and varnishes - Evaluation of degradation of coatings - Designation of quantity and size of defects and of intensity of uniform changes in appearance – Part 2: Assessment of degree of blistering (ISO 4628-2:2016); 2016-01</p>
ISO 4628-8	<p>Beschichtungsstoffe - Beurteilung von Beschichtungsschäden - Beurteilung der Menge und der Größe von Schäden und der Intensität von gleichmäßigen Veränderungen im Aussehen – Teil 8: Bewertung der von einem Ritz oder einer anderen künstlichen Verletzung ausgehenden Enthaftung und Korrosion (ISO 4628-8:2012); Deutsche Fassung EN ISO 4628-8:2012-11</p> <p>Paints and varnishes - Evaluation of degradation of coatings - Designation of quantity and size of defects and of intensity of uniform changes in appearance – Part 8: Assessment of degree of delamination and corrosion around a scribe or other artificial defect (ISO 4628-8:2012); German version EN ISO 4628-8:2012-11</p>
ISO 6270-1	<p>Beschichtungsstoffe - Bestimmung der Beständigkeit gegen Feuchtigkeit – Teil 1: Kontinuierliche Kondensation, 2017-11</p> <p>Paints and varnishes - Determination of resistance to humidity – Part 1: Continuous condensation, 2017-11</p>
ISO 6270-2	<p>Beschichtungsstoffe - Bestimmung der Beständigkeit gegen Feuchtigkeit – Teil 2: Verfahren zur Beanspruchung von Proben in Kondenswasserklimate, 2017-11</p> <p>Paints and varnishes - Determination of resistance to humidity – Part 2: Procedure for exposing test specimens in condensation-water atmospheres, 2017-11</p>
ISO 9001	<p>Qualitätsmanagementsysteme - Anforderungen (ISO 9001:2008); Dreisprachige Fassung EN ISO 9001:2008, Berichtigung zu DIN EN ISO 9001, Ausgabe 2015-09</p> <p>Quality management systems - Requirements (ISO 9001:2008); Trilingual version EN ISO 9001:2008, corrigendum to DIN EN ISO 9001, edition 2015-09</p>
ISO 9223	<p>Korrosion von Metallen und Legierungen - Korrosivität von Atmosphären - Klassifizierung, Bestimmung und Abschätzung (ISO 9223:2012); Deutsche Fassung EN ISO 9223:2012</p> <p>Corrosion of metals and alloys - Corrosivity of atmospheres - Classification, determination and estimation (ISO 9223:2012); German version EN ISO 9223:2012</p>
ISO 9227	<p>Korrosionsprüfungen in künstlichen Atmosphären – Salzsprühnebelprüfungen, 2017-03 (ISO 9227:2012); Deutsche Fassung EN ISO 9227:2023-03</p> <p>Corrosion tests in artificial atmospheres - Salt spray tests, 2023-03</p>
ISO 9717	<p>Metallische und andere anorganische Überzüge - Phosphatierüberzüge auf Metallen , 2017-03</p> <p>Metallic and other inorganic coatings - Phosphate conversion coating of metals, edition: 2017-03</p>
ISO 11124-1	<p>Vorbereitung von Stahloberflächen vor dem Auftragen von Beschichtungsstoffen - Anforderungen an metallische Strahlmittel – Teil 1: Allgemeine Einleitung und Einteilung, 2018-08</p> <p>Preparation of steel substrates before application of paints and related products - Specifications for metallic blast-cleaning abrasives – Part 1: General introduction and classification, 2018-08</p>

ISO 11126-1	<p>Vorbereitung von Stahloberflächen vor dem Auftragen von Beschichtungsstoffen – Anforderungen an nichtmetallische Strahlmittel – Teil 1: Allgemeine Einleitung und Einteilung, 2018-08</p> <p>Preparation of steel substrates before application of paints and related products – Specifications for non-metallic blast-cleaning abrasives – Part 1: General introduction and classification, 2018-08</p>
ISO 11664-2	<p>Farbmessung - Teil 2: CIE Normlichtarten, Ausgabe: 2007-10, Deutsche Fassung EN ISO 11664-2: 2011</p> <p>Colorimetry - Part 2: CIE standard illuminants, edition: 2007-10, german version EN ISO 11664-2: 2011</p>
ISO 11664-3	<p>Farbmetrik - Teil 3: CIE-Farbwerte, 2019-06</p> <p>Colorimetry - Part 3: CIE tristimulus values, 2019-06</p>
ISO 11664-4	<p>Farbmetrik - Teil 4: CIE 1976 L*a*b* Farbenraum, 2019</p> <p>Colorimetry - Part 4: CIE 1976 L * a * b * color space, 2019</p>
ISO 12944-1	<p>Beschichtungsstoffe - Korrosionsschutz von Stahlbauten durch Beschichtungssysteme – Teil 1: Allgemeine Einleitung, 2017-11</p> <p>Paints and varnishes - Corrosion protection of steel structures by protective paint systems – Part 1: General introduction, 2017-11</p>
ISO 12944-4	<p>Beschichtungsstoffe - Korrosionsschutz von Stahlbauten durch Beschichtungssysteme – Teil 4: Arten von Oberflächen und Oberflächenvorbereitung, 2017-11</p> <p>Paints and varnishes - Corrosion protection of steel structures by protective paint systems – Part 4: Types of surface and surface preparation, 2017-11</p>
ISO 12944-5	<p>Beschichtungsstoffe - Korrosionsschutz von Stahlbauten durch Beschichtungssysteme – Teil 5: Beschichtungssysteme 2019-09</p> <p>Paints and varnishes - Corrosion protection of steel structures by protective paint systems – Part 5: Protective paint systems 2019-09</p>
ISO 14713-1	<p>Zinküberzüge - Leitfäden und Empfehlungen zum Schutz von Eisen- und Stahlkonstruktionen vor Korrosion – Teil 1: Allgemeine Konstruktionsgrundsätze und Korrosionsbeständigkeit, 2017-04</p> <p>Zinc coatings - Guidelines and recommendations for the protection against corrosion of iron and steel in structures – Part 1: General principles of design and corrosion resistance, 2017-04</p>
ISO 16276-2	<p>Korrosionsschutz von Stahlbauten durch Beschichtungssysteme - Beurteilung der Adhäsion / Kohäsion (Haftfestigkeit) einer Beschichtung und Kriterien für deren Annahme – Teil 2: Gitterschnitt- und Kreuzschnittprüfung (ISO 16276-2:2007); Deutsche Fassung EN ISO 16276-2:2007</p> <p>Corrosion protection of steel structures by protective paint systems - Assessment of, and acceptance criteria for, the adhesion / cohesion (fracture strength) of a coating – Part 2: Cross-cut testing and X-cut testing (ISO 16276-2:2007); German version EN ISO 16276-2:2007</p>
ISO 16474-3	<p>Beschichtungsstoffe - Künstliches Bestrahlen oder Bewittern in Geräten - Teil 3: UV-Fluoreszenzlampen, Ausgabe: 2013-11, Deutsche Fassung EN ISO 16474-3; 2021-04</p> <p>Paints and varnishes - Methods of exposure to laboratory light sources - Part 3: Fluorescent UV lamps, edition: 2013-11, german version EN ISO 16474-3, 2021-04</p>
ISO 22479	<p>Korrosion von Metallen und Legierungen - Prüfung mit Schwefeldioxid in feuchter Atmosphäre (Verfahren mit festem Gasvolumen) (ISO 22479:2019); Deutsche Fassung EN ISO 22479:2022</p> <p>Corrosion of metals and alloys - Sulfur dioxide test in a humid atmosphere (fixed gas method) (ISO 22479:2019); German version EN ISO 22479:2022</p>

ISO/IEC 17025	Allgemeine Anforderungen an die Kompetenz von Prüf- und Kalibrierlaboratorien, 2017-11 General requirements for the competence of testing and calibration laboratories, 2017-11
Qualanod	Vorschriften für die Anodisierung von Aluminium auf Schwefelsäure-Basis zum Führen des Qualanod Gütezeichens Specification for the Qualanod Quality Label for Sulphuric Acid based anodizing of Aluminium
VdL-RL 10	Richtlinie zulässige Farbtoleranzen für unifarbene Pulverlacke bei Architekturanwendung, Ausgabe 2013-06 Guidance document permitted colour tolerances of plain-coloured powder coatings in architectural applications, edition 2013-06
VFF Merkblatt AL.02	Visuelle Beurteilung von organisch beschichteten (lackierten) Oberflächen auf Aluminium, August 2016
VFF Merkblatt ST.02	Visuelle Beurteilung von organisch beschichteten (lackierten) Oberflächen auf Stahl, August 2016