International Quality Regulations for the Coating of Building Components

GSB ST 663-6

Coater Steel + Galvanised Steel

Edition: **January 2026**
Status: **08. April 2025**
Replaces: **December 2023, 07.12.2023**

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Modifications compared to previous version:

Ser. No.	Section	Chapter	Page	Kind of change	Modification
1	n.a.	n.a.	3	editorial	Implementation of modification history
2	**1**	**2.2**	**3**	**technical**	**Implementation of note to layer structure for corrosion tests while E2 inspection.**
3	**1**	**3.1**	**4**	**technical**	**Implementation of note to layer structure for corrosion tests while tests for monitoring of certification.**
4	**1**	**4**	**5**	**technical**	**Implementation of definition of "standrd coating thickness"**
5	**2**	**3.1**	**4**	**technical**	**Addition to the graphic on the pretreatment and preparation of surfaces**
6	**2**	**4**	**6**	**technical**	**Implementation of note on the possibility of using coating systems approved for application on aluminum substrates in single-layer systems**
7	**2**	**9.1**	**8**	**technical**	**Change in sheet metal specification for corrosion and technological testing for steel and galvanized steel**
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11	**3**	**3.1**	**4**	**technical**	**Addition to the graphic on the pretreatment and preparation of surfaces**
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13	**3**	**9.1**	**7**	**technical**	**Change in sheet metal specification for corrosion and technological testing for steel and galvanized steel**
14	**3**	**9.2.3**	**11**	**technical**	**Degree of crosslinking extended by "liquid paint only"**
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23	**4**	**11**	**17**	**technical**	**Clarification of the definition of a production journal**

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

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

*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
- Resulotion by general meeting
Technical changes are shown in bold

1 Certification for coaters of steel and galvanised steel

1.1 Purpose

The content of this section covers the granting and confirmation of the certification for coaters (ST).

GSB-CERT certifies the coating in accordance with the requirements of quality guideline GSB ST 663-6.

1.2 Scope of application

The regulations set out in this section apply to the granting and confirmation of the certification for coating by GSB-CERT.

1.3 Responsibilities

The GSB-CERT is responsible for providing quality guideline GSB ST 663-6 to the inspector and the named test institutes.

The inspector and the named test institutes are responsible for carrying out and documenting the tests. Information is exchanged exclusively with GSB-CERT.

Documents and statements must be treated as confidential.

1.4 Area of certification

On application, GSB-CERT issues a certificate if the requirements are met. The certificates can be awarded with the following quality seals:

2 Certification process

2.1 Stage 1 – Application

The application for certification must be made in written form to GSB-CERT. The application is checked by GSB-CERT.

2.2 Stage 2 – Provisional certification

For certification, the following aspects are tested:

- Production facility
- Laboratory equipment
- Factory Production Control (FPC)
- Coated components

Only the coated parts which the coater (ST) has already checked and approved are tested. Sufficient material must be made available for the test.

The coater (ST) must allow the inspector access to any coated components that are stored, ready for dispatch or being prepared for dispatch at the time of the test.

The certification process has two stages:

Test E1:

The inspector carries out a test with the coater (ST) following prior notification.

If the requirements of quality guideline GSB ST 663-6 are met, test E2 will be carried out.

If the requirements of the quality guideline are not met, the coater (ST) will be informed of the discrepancies. Test E2 is carried out once these discrepancies are corrected. The coater (ST) informs GSB-CERT.

Test E2:

The inspector carries out a test unannounced.

Samples for the corrosion tests are taken from production and sent away for corrosion testing. A single layer coating will be tested here.

The corrosion tests are carried out in a test institute named by GSB-CERT.

If the requirements of the quality guideline GSB ST 663-6 are fulfilled except for the corrosion tests, GSB-CERT issues a provisional certificate.

2.3 Stage 3 – Certification

The following requirements must be met for the certification:

The corrosion protection test is complete and the requirements of quality guideline GSB ST 663-6 have been met.

If the coater (ST) applies for certification with higher requirements, the required tests are conducted during the next monitoring test.

GSB-CERT issues a certificate with quality seal.

2.4 Upgrade Standard -> Master respectively Master -> Premium

In order to be able to change from standard to master, the inspector determines at the next company inspection whether the coater meets the requirements of a master coater. If this is the case, the upgrade to Master Coater takes place after a positive assessment of the test.

When upgrading from Master to Premium, the coater must meet the FPC according to the requirements of a Premium coater from the time of application. During the next audit, the inspector checks whether the coater meets the requirements of a premium coater. If this is the case, the upgrade to Premium Coater takes place after a positive assessment of the test.

A new member has the possibility to become a Premium Coater from the beginning. The prerequisite is that all criteria of a Premium Coater are fulfilled without any gaps and that the GSB-CERT agrees.

3 Monitoring the certification

3.1 Prolongation test

Adherence to quality guideline GSB ST 663-6 is monitored by means of unannounced prolongation tests every six months.

The samples are taken from production. The coater provides the sample material.

The tests are carried out in the first half of the year in an external test laboratory selected by the coater and in the second half of the year in a test institute designated by GSB-CERT. In both cases, the inspector draws the samples.

In the first half of the year, a single-layer system will be tested; in the second half of the year, a dual system with an approved primer is tested.

If the requirements of quality guideline GSB ST 663-6 are met, the period of validity of the certificate is extended up to the end of the following year.

If the coater (ST) applies for certification with higher requirements (for example, from Standard to Master), the required tests are conducted during the next prolongation test.

If the prolongation test is passed, the Board will grant the applicant the desired quality seal on the GSB-CERT's recommendation.

A certificate is issued. If only one part of the prolongation test fails, then the test is assessed as a prolongation test based on the requirements of the existing quality seal.

3.2 Negative result for prolongation test

If part of the prolongation test fails, GSB-CERT stipulates the following measures:

1. Additional requirements for the Factory Production Control
2. Repeat test
3. Downgrade of the quality seal
4. Temporary or permanent withdrawal of the certificate

Measures 1 to 4 above can be combined with one another.

The coater (ST) can make an appeal in writing against the decision of GSB-CERT within 4 weeks.

4 Definitions

4.1 Technical terms

4.1.1 Standard coating thickness

In order to achieve a uniform surface appearance, the opacity of the powder coating must be taken into account. It depends on the colour shade and pigmentation. In order to achieve sufficient coverage and a uniform appearance, it is necessary to apply a layer thickness that is often considerably higher than the minimum layer thickness specified in GSB AL 631-5 or in the relevant standards, depending on the colour shade and pigmentation.

Due to the electrostatic application of the powder coating, there is a higher accumulation of powder on sharp edges and narrow surfaces. Even with careful adjustment of the coating parameters, layer thicknesses that exceed the maximum layer thickness specified in GSB AL 631-5 may be unavoidable, depending on the colour-specific opacity and the geometry of the profile.

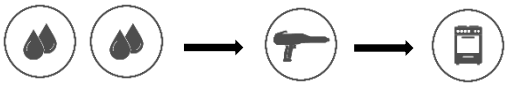
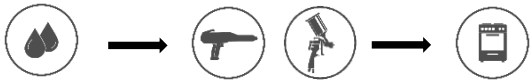
For this reason, the GSB has introduced the term “standard coating thickness”.

5 Distribution list

- GSB-CERT
- GSB Office
- Members
- Inspector

1 Definition: Classification of one or more plants

A coating plant consists of a multi-stage pre-treatment process including a residual water dryer, application unit and furnace. The number of coating plants is determined by the number of pre-treatment lines, furnaces and different coating technologies.

Defined as one plant:	Defined as two plants:
	
	
	
	

Key

- Surface pre-treatment or preparation
- Application of powder coating
- Application of liquid paint
- Furnace

A similar classification applies to more than two coating plants.

If a coating company has several plants, all of them are tested during the initial test. The inspector will decide which plant is to be tested in the monitoring test.

2 Cleanliness and handling

The components must be suspended, positioned and taken down as well as transported during the various manufacturing processes in such a way that ensures there can be no contamination with dust, sweat from hands, grease, electrolyte residue, condensation and damage. Only touch the pre-treated components with suitable clean gloves.

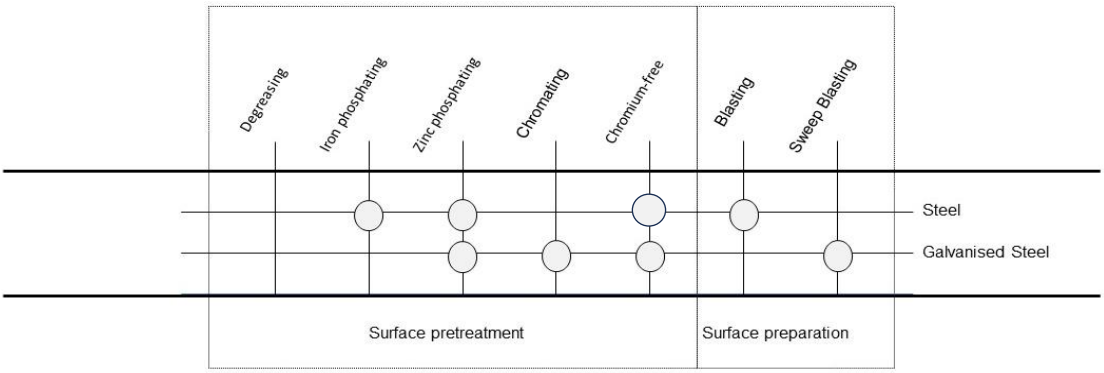
3 Surface pre-treatment and preparation

3.1 General

Only the following chemical surface pre-treatment processes can be used in line with the legal guidelines.

- Iron and zinc phosphating
- GSB-approved chromium-free or chromium(VI)-free process
- Yellow and green chromating based on EN 12487

Alternative processes for mechanical surface pre-treatment can be used if they are approved by GSB-CERT.



Galvanised components with a chromate layer as temporary corrosion protection are pre-treated based on EN 12487. In this case, ensure that the temporary corrosion protection is removed without any residue. This might have to be coordinated with the pre-treatment manufacturer.

3.2 Contact points

The components that are to be coated must be suspended in such a way that avoids contact points on the main visible surfaces. If this is not possible, contact points of ≤ 2 mm in diameter are permitted on the main visible surfaces. The customer must be informed of contact points on the main visible surfaces.

3.3 Mechanical surface preparation

Steel surfaces without a coating are prepared by blasting them with metallic abrasives (ISO 11124-1) or non-metallic abrasives (ISO 11126-1). The degree of preparation must correspond to SA 2 ½ in accordance with ISO 12944-4. When blasting thin-walled components ≤ 3 mm thick, be aware that deformation may occur.

Ungalvanised areas (e.g. weld seams) must be pre-treated mechanically. The degree of preparation must correspond to SA 2 ½, P St 3 or P Ma in accordance with DIN ISO 12944-4 or conform to the coating system and corrosion class.

Recommendation: In the blasting process, a roughness Rz of 30 µm to 40 µm has proven to be effective. It is recommended to verify this with mechanical or electrically supported, certified testing equipment or visual comparison samples and to document it accordingly.

Galvanised components are prepared by means of sweep blasting (ISO 12944-1) with non-metallic, non-ferrous abrasives and must have an even, matt surface after the surface preparation. Coatings must not be blasted down to the substrate. Punctures at points from the abrasive down to the substrate must be primed too.

3.4 Iron and zinc phosphating

Phosphating on steel, galvanised steel and mixed constructions is carried out in accordance with ISO 9717. Surfaces with temporary chromating cannot be given a phosphate coating.

The weight of the iron phosphating layer must be between 0.5 and 1.5 g/m² for the closed layer.

The weight of the zinc phosphating layer must be between 1.0 and 5.0 g/m² for the closed layer.

The components must be dried in a residual water dryer immediately following chemical pre-treatment.

3.5 Chromium-free and chromium (VI)-free pre-treatment procedures

If a coater (ST) uses a chromium-free or chromium (VI)-free pre-treatment system for production, they must inform the offices of GSB of this in written form so that a monitoring test can be performed. The same applies if a test operation is going to exceed four weeks.

3.6 Chromating

Chromating on galvanised surfaces is carried out based on EN 12487. Mixed constructions made of ungalvanised and galvanised steel are not suitable for chromating. This does not apply to weld areas of galvanised steel profiles such as mitre cuts.

Ungalvanised areas (e.g. weld seams) must be pre-treated mechanically. The degree of preparation must correspond to SA 2 ½, P St 3 or P Ma in accordance with ISO 12944-4 or conform to the coating system and corrosion class.

3.7 Monitoring the rinse

There must be an option to remove the run-off water (inspection flap for spray systems).

Rinse passivation (final rinse)

Rinsing after passivation with fully demineralized water (deionized water) must be carried out in such a way that the last rinsing water to drip off has a conductivity of ≤ 30.0 µS/cm.

No-rinse passivation (last rinse cycle)

Rinsing with fully demineralized water (DI water) prior to passivation must be carried out in such a way that the last rinsing water to drip off has a conductivity of ≤ 30.0 µS/cm. Fogging of the passivated surface: The conductivity of the water used must be ≤ 30.0 µS/cm.

3.8 Drying of residual water

Immediately following chemical pre-treatment, the components must be dried in a residual water dryer. If the manufacturer of the pre-treatment chemicals does not provide any information on the object temperature in its technical data sheet, the object temperature must not exceed 100°C for the process in which chromium (III) and chromium (VI) are used.

4 Coating

The coating must be applied within 24 hours of pre-treatment.

If the components to be coated need to be stored within these 24 hours, then they must be stored in a way that prevents them from being contaminated (e.g. by dust, fingerprints and moisture).

The coater may only use GSB-approved material for GSB-compliant coating.

Coating on steel and galvanized steel usually takes place in a single- or two-layer structure. Two-layer structures are designed as a dual system with a certified primer, on which a certified paint is applied. The paint system can be certified for a single- or two-layer structure on aluminium, steel or galvanized steel. The primer and top coat should come from the same manufacturer. When using cross-manufacturer systems, the coater is responsible for checking the intermediate adhesion (see GSB ST 663-4, Section 3, Chapter 3).

Alternatively, topcoats can also be used as a single-layer system if the system is approved for aluminium substrates and the paint manufacturer approves the use on steel or galvanized steel in the product documentation or upon request. In this case, the coater is responsible for verifying the suitability for use, taking into account their individual mechanical surface preparation and/or chemical surface treatment, by means of technological tests and corrosion tests for the desired seal, in accordance with the requirements of the quality guidelines.

The coater must adhere to the prescribed periods of permitted use, irrespective of the weathering category of the material.

5 Furnace

Integrated gauges must constantly measure and record the circulating air temperature of the furnace for **three stationary points** at least. The measuring points must be chosen so that an accurate circulating air temperature distribution in the furnace can be ascertained (e.g. top, centre and lower area). The measurement sensors must be read individually.

6 Laboratory equipment

6.1 General

There must be a laboratory which is in a separate room to the production facilities. It must be possible to carry out all of the tests for the Factory Production Control (FPC) in this laboratory.

Devices in every production site must be functional and calibrated (adherence to test periods).

Device failures and the failure dates must be documented. Replacement devices must be obtained.

Repair and maintenance jobs must be shown to the inspector on request.

6.2 Obligatory laboratory equipment

The following testing and measuring equipment must be in use at the laboratory of each production site and must be functional and calibrated.

- 2 layer thickness measuring devices which work in accordance with the magnetic process as per ISO 2178 and/or in accordance with the magnetic-induction process and eddy current process as per ISO 2808.

- Cutting devices and accessories for the cross-cut test in accordance with ISO 2409.
- Mandrel bend test in accordance with ISO 1519.
- Ball impact test in accordance with ASTM D 2794 (only required for powder coatings).
- A device for measuring the gloss in accordance with ISO 2813.
- A measuring device for recording the object and circulating air temperature with at least 3 measurement points (only for thermally cured coating systems).
- A conductivity measuring device for chemical surface pre-treatment.
- Devices for the boil test.

6.3 Recommended laboratory equipment

The following testing and measuring equipment is recommended.

- Test of adhesion and elasticity in the case of deformation (cupping test) in accordance with ISO 1520.
- Scales to determine the weight of the conversion/passivation layer and/or the etch rate with a measurement accuracy of 0.1 mg for the process check.
- Devices for the rest potential analysis (RPA test)
- Colorimeter
- pH measuring device
- Roughness measuring device

7 Storage

7.1 Components to be coated

The components to be coated must be stored in a way that prevents any changes to the surface (e.g. corrosion, mechanical damage) which impair the quality of the coatings.

7.2 Coating material

The coating materials must be stored in accordance with the information in the manufacturer's technical data sheet. Different storage conditions must be arranged in writing with the manufacturer.

8 Technical material safety data sheets

The latest technical material safety data sheets (MSDS) for all pre-treatment chemicals and coating materials used must be made freely available for viewing at the relevant stages of the process.

9 Quality assurance

9.1 Test sheets

The member company is free to choose the test panels used in terms of thickness and composition. The coater must ensure that these panels provide comparable results to the panels listed below.

The specified material thickness must be adhered to for panels that are to be used for technical-mechanical tests.

The following sample panels are recommended for corrosion and technological tests:

- Technological and corrosion protection properties of steel:
  - Steel sheets,
  - approx. 100x200, material thickness 0.8 mm,
  - untreated with rolling mill grease,
  - material designation according to DIN EN 10130/10131: 1.0312 - HC220LC
  - suitable for spray application
- technological and anti-corrosion properties of galvanized steel:
  - steel sheets,
  - approx. 100x200 mm, material thickness 0.8 mm,
  - galvanized (coating at least 140 g/m² per side, corresponding to approx. 20 µm)
  - untreated with mill scale,
  - material designation according to DIN EN 10346: DX54D + Z275 MC
  - suitable for spray application

For testing the corrosion protection properties of coating processes with mechanical surface preparation (blasting/sweeping), sheets of a comparable specification but with a material thickness of 2.5 to 3.5 mm shall be used. For galvanized sheets, a zinc coating in accordance with DIN EN 1461 (corresponding to 55 or 70 µm) must be guaranteed.

In the event of a dispute, the tests according to the test methods specified in GSB QR AL 631-7 ST 663-7 and the specifications specified in GSB QR ST 663-6 shall be decisive.

It is recommended that only sheets within the shelf life specified by the manufacturer be used. All sheets should be stored separately and vacuum-sealed or protected against air circulation with dry beads.

9.2 Factory Production Control (FPC)

9.2.1 General

The coater (steel) must continuously monitor its production and processes. The results must be documented and the test logs and accompanying samples (which have been appropriately marked) must be retained in accordance with statutory provisions, but for at least 5 years. (This applies to production batches of over 100 m² or at a time interval of 2 hours).

These documents must be kept available to be viewed by the inspector. Where possible, profile sections or other real products should be used instead of test sheets.

9.2.2 Mandatory Factory Production Control (FPC)

The following process and results checks are mandatory. The documentation and samples must be shown to the inspector on request.

9.2.2.1 Goods inwards and issue inspection

Process step	Test	Minimum scope of the test	Documentation
Goods inwards check			
Components	Delivery corresponds with delivery note	Every delivery	On delivery note
Coating materials	Delivery corresponds with delivery note	Every delivery	On delivery note
Pre-treatment chemicals	Delivery corresponds with delivery note	Every delivery	On delivery note
Goods issue check			
Components	Order corresponds with delivery	Every delivery	FPC
Components	Delivery corresponds with delivery note	Every delivery	On delivery note / on order confirmation

9.2.2.2 Surface pre-treatment

Process step	Test	Minimum scope of the test	Documentation
Iron and zinc phosphating			
Dipping and spray pre-treatment with automatic dosing	Bath analysis (temperature, concentration) in accordance with information provided by the manufacturer	1 x per day	Yes
Dipping and spray pre-treatment with manual dosing	Bath analysis (temperature, concentration) in accordance with information provided by the manufacturer	1 x per shift	Yes
Conversion layer baths for chromating			
Dipping and spray pre-treatment with automatic dosing	Bath analysis (temperature, concentration) in accordance with information provided by the manufacturer	1 x per day	Yes
Dipping and spray pre-treatment with manual dosing	Bath analysis (temperature, concentration) in accordance with information provided by the manufacturer	1 x per shift	Yes
Conversion layer	Coating layer in accordance with manufacturer's specifications	1 x per week	Yes
Dripping water from final rinse	Conductivity	1 x per shift	Yes
Passive layer baths / CR(VI)-free/CR-free pre-treatment			
Dipping and spray pre-treatment with automatic dosing	Bath analysis (temperature, concentration)	1 x per shift	Yes
Dipping and spray pre-treatment with manual dosing	Bath analysis (temperature, concentration)	1 x per shift	Yes
Passivation layer	Coating layer in accordance with manufacturer's specifications	At least once per day	Yes
Dripping water from final rinse or mist	Conductivity	1 x per shift	Yes
Residual water dryer			
Object temperature in accordance with manufacturer of pre-treatment chemical	Temperature measurement with measuring strips or furnace measuring device	1 x per week	Yes

9.2.2.3 Coating

Process step	Test	Minimum scope of the test	Documentation
Coating result			
Coating thickness	Coating thickness	2 x per hour	Min. and max. value
Gloss	Gloss measurement (60° measurement angle)	4 x per day or with every change of colour > 100 m²	Min. and max. value
Colour	Visual comparison with mandatory template	With every change of colour > 100 m²	Yes
Adhesive strength	Cross cut	2 x per shift	Yes
Quality of the pre-treatment	Boil test	2 x per shift	Yes
Mechanical values	Mandrel bending test and ball impact test	2 x per shift	Yes
Furnace			
Object temperature and dwell times in accordance with manufacturer's specifications (Alternative: Evaluation of thermal equivalence)	Temperature with measuring device with at least 3 object sensors	1 x per week	Yes with temperature record as proof

9.2.3 Recommended process check

The following supplementary process and results checks are recommended.

Process step	Test	Scope of the test	Documentation
Passive layer baths / CR(VI)-free/CR-free pre-treatment			
Rest potential analysis (optional)	Rest potential	2 x per week	Yes
Coating			
Mechanical values	Cupping test	2 x per shift	Yes
Degree of crosslinking (liquid paint only)	Acetone / methyl ethyl ketone (MEK)	1 x per shift	Yes
Gloss	Gloss measurement (20°/60°/85° measuring angle)	Colour change > 100 m²	Min. and max. value
Colour (no metallics)	Measurement with colorimeter	With every change of colour > 100 m²	Yes

10 Characteristic values for tests on finished parts and test sheets

10.1 Powder coating

10.1.1 Technical values for single-layer system on steel

Test	Coating material Florida 1	Coating material Florida 3	Coating material Florida 5, 10
Coating thickness			
Single layer	≥ 60 µm - ≤ 120 µm	≥ 60 µm - ≤ 120 µm	≥ 60 µm - ≤ 120 µm
Surface finish			
Gloss 60 Delivery tolerance for approval range >15 GU and fine structure	± 5 GU	± 5 GU	± 5 GU
Gloss 60° Delivery tolerance for smooth systems with an approval range of 2-15 GU	± 3 GU	± 3 GU	± 3 GU
Colour evaluation Visual comparison with template	No visual differences	No visual differences	No visual differences
Adhesive strength			
Cross-cut and adhesive tape removal	GT0	GT0	GT0
Boil test Degree of blistering Cross-cut and adhesive tape removal	 0 (S0) GT 0 / GT 1	 0 (S0) GT 0 / GT 1	 0 (S0) GT 0 / GT 1
Mechanical values			
Mandrel bend test Cracking of coating Adhesive tape removal	≤ 5 mm Not permitted -	≤ 5 mm Permitted No removal of coating	≤ 5 mm Permitted No removal of coating
Ball impact test Cracking of coating Adhesive tape removal	20 inch/pound Not permitted -	20 inch/pound Permitted No removal of coating	20 inch/pound Permitted No removal of coating
Corrosion protection			
Neutral salt spray mist test Test period Delamination at the T-cut Degree of blistering	NSS 480 h d ≤ 3 mm 0 (S0)	NSS 480 h d ≤ 3 mm 0 (S0)	NSS 480 h d ≤ 3 mm 0 (S0)

Note: Depending on the construction, the maximum layer thickness can also be exceeded during application.

10.1.2 Technical values for single-layer system on galvanized steel

Test	Coating material Florida 1	Coating material Florida 3	Coating material Florida 5, 10
Coating thickness			
Single layer	≥ 60 µm - ≤ 120 µm	≥ 60 µm - ≤ 120 µm	≥ 60 µm - ≤ 120 µm
Surface finish			
Gloss 60 Delivery tolerance for approval range >15 GU and fine structure	± 5 GU	± 5 GU	± 5 GU
Gloss 60° Delivery tolerance for smooth systems with an approval range of 2-15 GU	± 3 GU	± 3 GU	± 3 GU
Colour evaluation Visual comparison with template	No visual differences	No visual differences	No visual differences
Adhesive strength			
Cross-cut and adhesive tape removal	GT0	GT0	GT0
Boil test Degree of blistering Cross-cut and adhesive tape removal	 0 (S0) GT 0 / GT 1	 0 (S0) GT 0 / GT 1	 0 (S0) GT 0 / GT 1
Mechanical values			
Mandrel bend test Cracking of coating Adhesive tape removal	≤ 5 mm Not permitted -	≤ 5 mm Permitted No removal of coating	≤ 5 mm Permitted No removal of coating
Ball impact test Cracking of coating Adhesive tape removal	20 inch/pound Not permitted -	20 inch/pound Permitted No removal of coating	20 inch/pound Permitted No removal of coating

Corrosion protection			
Neutral salt spray mist test Test period Delamination at the T-cut Degree of blistering	NSS 480 h d ≤ 8 mm 0 (S0)	NSS 480 h d ≤ 8 mm 0 (S0)	NSS 480 h d ≤ 8 mm 0 (S0)

Note: Depending on the construction, the maximum layer thickness can also be exceeded during application.

10.1.3 Technical values for double-layer systems on steel

Test	Coating material Florida 1	Coating material Florida 3	Coating material Florida 5, 10
Coating thickness			
Double layer	≥ 130 µm	≥ 130 µm	≥ 130 µm
Surface finish			
Gloss 60 Delivery tolerance for approval range >15 GU and fine structure	± 5 GU	± 5 GU	± 5 GU
Gloss 60° Delivery tolerance for smooth systems with an approval range of 2-15 GU	± 3 GU	± 3 GU	± 3 GU
Colour evaluation Visual comparison with template	No visual differences	No visual differences	No visual differences
Adhesive strength			
Cross-cut and adhesive tape removal	GT0	GT0	GT0
Boil test Degree of blistering Cross-cut and adhesive tape removal	0 (S0) GT 0 / GT 1	0 (S0) GT 0 / GT 1	0 (S0) GT 0 / GT 1
Mechanical values			
Mandrel bend test Cracking of coating Adhesive tape removal	≤ 8 mm Not permitted -	≤ 8 mm Permitted No removal of coating	≤ 8 mm Permitted No removal of coating

Test	Coating material Florida 1	Coating material Florida 3	Coating material Florida 5, 10
Ball impact test Cracking of coating Adhesive tape removal	10 inch/pound Not permitted -	10 inch/pound Permitted No removal of coating	10 inch/pound Permitted No removal of coating

Corrosion protection			
Neutral salt spray mist test (double-layer) Test period Delamination at the T-cut Degree of blistering	NSS 480 h d ≤ 1 mm 0 (S0)	NSS 480 h d ≤ 1 mm 0 (S0)	NSS 480 h d ≤ 1 mm 0 (S0)

10.1.4 Technical values for double-layer systems on galvanised steel

Test	Coating material Florida 1	Coating material Florida 3	Coating material Florida 5, 10
Coating thickness			
Double layer	≥ 130 µm	≥ 130 µm	≥ 130 µm
Surface finish			
Gloss 60 Delivery tolerance for approval range >15 GU and fine structure	± 5 GU	± 5 GU	± 5 GU
Gloss 60° Delivery tolerance for smooth systems with an approval range of 2-15 GU	± 3 GU	± 3 GU	± 3 GU
Colour evaluation Visual comparison with template	No visual differences	No visual differences	No visual differences
Adhesive strength			
Cross-cut and adhesive tape removal	GT0	GT0	GT0
Boil test Degree of blistering Cross-cut and adhesive tape removal	 0 (S0) GT 0 / GT 1	 0 (S0) GT 0 / GT 1	 0 (S0) GT 0 / GT 1
Mechanical values			
Mandrel bend test Cracking of coating Adhesive tape removal	≤ 8 mm Not permitted -	≤ 8 mm Permitted No removal of coating	≤ 8 mm Permitted No removal of coating
Ball impact test Cracking of coating Adhesive tape removal	10 inch/pound Not permitted -	10 inch/pound Permitted No removal of coating	10 inch/pound Permitted No removal of coating
Corrosion protection			
Neutral salt spray mist test (double-layer) Test period Delamination at the cross section Degree of blistering	NSS 480 h d ≤ 8 mm 0 (S0)	NSS 480 h d ≤ 8 mm 0 (S0)	NSS 480 h d ≤ 8 mm 0 (S0)

11 Corrosion tests

Test	Minimum scope of the test	Documentation
Neutral salt spray test	1 x per half year	Yes

The NSS tests in the first half of the year are carried out as part of the first monitoring test. For this, the inspector takes the samples and labels them. The coater can carry out the test on their own initiative.

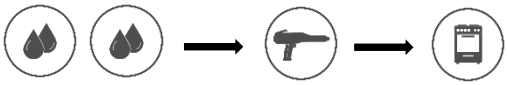
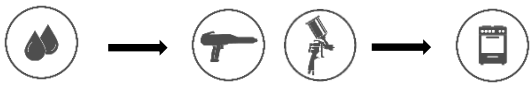
The NSS test is carried out as part of the second monitoring test. The inspector takes samples for them. The tests are carried out in a test laboratory commissioned by GSB.

12 Customer complaints

The inspector must be granted access to the list of customer complaints.

1 Definition: Classification of one or more plants

A coating plant consists of a multi-stage pre-treatment process including a residual water dryer, application unit and furnace. The number of coating plants is determined by the number of pre-treatment lines, furnaces and different coating technologies.

Defined as one plant:	Defined as two plants:
g 	
	
	
	

Key

- Surface pre-treatment or preparation
- Application of powder coating
- Application of liquid paint
- Furnace

A similar classification applies to more than two coating plants.

If a coating company has several plants, all of them are tested during the initial test. The inspector will decide which plant is to be tested in the monitoring test.

2 Cleanliness and handling

The components must be suspended, positioned and taken down as well as transported during the various manufacturing processes in such a way that ensures there can be no contamination with dust, sweat from hands, grease, electrolyte residue, condensation and damage. Only touch the pre-treated components with suitable clean gloves.

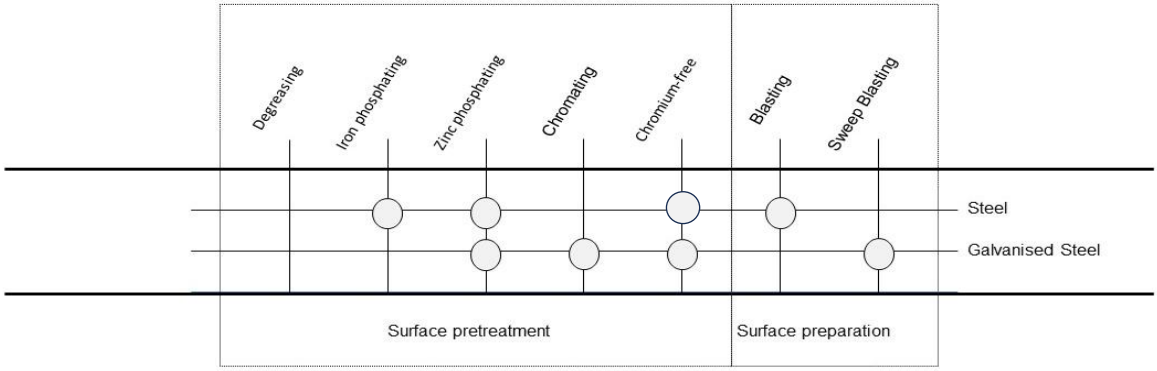
3 Surface pre-treatment and preparation

3.1 General

Only the following chemical surface pre-treatment processes can be used in line with these guidelines.

- Iron and zinc phosphating
- GSB-approved chromium-free or chromium(VI)-free process
- Yellow and green chromating based on EN 12487

Alternative processes for mechanical surface pre-treatment can be used if they are approved by GSB-CERT.



Galvanised components with a chromate layer as temporary corrosion protection are pre-treated based on EN 12487. In this case, ensure that the temporary corrosion protection is removed without any residue. This might have to be coordinated with the pre-treatment manufacturer.

3.2 Contact points

The parts to be coated must be suspended or positioned in such a way that there are no contact points on a main surface that will later be visible. Contact points are only permitted when they cannot be avoided and only if they are marked on the respective component or on drawings (sketches). The customer must be notified of this.

3.3 Mechanical surface preparation

Steel surfaces without a coating are prepared by blasting them with metallic abrasives (ISO 11124-1) or non-metallic abrasives (ISO 11126-1). The degree of preparation must correspond to SA 2 ½ in accordance with ISO 12944-4. When blasting thin-walled components ≤ 3 mm thick, be aware that deformation may occur.

Ungalvanised areas (e.g. weld seams) must be pre-treated mechanically. The degree of preparation must correspond to SA 2 ½, P St 3 or P Ma in accordance with DIN ISO 12944-4 or conform to the coating system and corrosion class.

Recommendation: In the blasting process, a roughness Rz of 30 µm to 40 µm has proven to be effective. It is recommended to verify this with mechanical or electrically supported, certified testing equipment or visual comparison samples and to document it accordingly.

Galvanised components are prepared by means of sweep blasting (ISO 12944-1) with non-metallic, non-ferrous abrasives and must have an even, matt surface after the surface preparation. Coatings must not be blasted down to the substrate. Punctures at points from the abrasive down to the substrate must be primed too.

3.4 Iron and zinc phosphating

Phosphating on steel, galvanised steel and mixed constructions is carried out in accordance with ISO 9717. Surfaces with temporary chromating cannot be given a phosphate coating.

The weight of the iron phosphating layer must be between 0.5 and 1.5 g/m² for the closed layer.

The weight of the zinc phosphating layer must be between 1.0 and 5.0 g/m² for the closed layer.

The components must be dried in a residual water dryer immediately following chemical pre-treatment.

3.5 Chromium-free and chromium (VI)-free pre-treatment procedures

If a coater (steel) uses a chromium-free or chromium (VI)-free pre-treatment system for production, they must inform the offices of GSB of this in writing so that a monitoring test can be performed. The same applies if a test operation is going to exceed four weeks.

3.6 Chromating

Chromating on galvanised surfaces is carried out based on EN 12487. Mixed constructions made of ungalvanised and galvanised steel are not suitable for chromating. This does not apply to weld areas of galvanised steel profiles such as mitre cuts.

Ungalvanised areas (e.g. weld seams) must be pre-treated mechanically. The degree of preparation must correspond to SA 2 ½, P St 3 or P Ma in accordance with ISO 12944-4 or conform to the coating system and corrosion class.

3.7 Monitoring the rinse

There must be an option to remove the run-off water (inspection flap for spray systems).

Rinse passivation (final rinse)

Rinsing after passivation with fully demineralized water (deionized water) must be carried out in such a way that the last rinsing water to drip off has a conductivity of ≤ 30.0 µS/cm.

No-rinse passivation (last rinse cycle)

Rinsing with fully demineralized water (DI water) prior to passivation must be carried out in such a way that the last rinsing water to drip off has a conductivity of ≤ 30.0 µS/cm. Fogging of the passivated surface: The conductivity of the water used must be ≤ 30.0 µS/cm.

3.8 Drying of residual water

Immediately following chemical pre-treatment, the components must be dried in a residual water dryer. If the manufacturer of the pre-treatment chemicals does not provide any information on the object temperature in its technical data sheet, the object temperature must not exceed 100°C for the process in which chromium (III) and chromium (VI) are used.

4 Coating

The coating must be applied within 24 hours of pre-treatment. The pre-treated components must be clean and dry when coated.

If the components to be coated need to be stored within these 24 hours, then they must be stored in a way that prevents them from being contaminated (e.g. by dust, fingerprints and moisture).

The coater may only use GSB-approved material for GSB-compliant coating.

Coating on steel and galvanized steel usually takes place in a single- or two-layer structure. Two-layer structures are designed as a dual system with a certified primer, on which a certified paint is applied. The paint system can be certified for a single- or two-layer structure on aluminium, steel or galvanized steel. The primer and top coat should come from the same manufacturer. When using cross-manufacturer systems, the coater is responsible for checking the intermediate adhesion (see GSB ST 663-4, Section 3, Chapter 3).

Alternatively, topcoats can also be used as a single-layer system if the system is approved for aluminium substrates and the paint manufacturer approves the use on steel or galvanized steel in the product documentation or upon request. In this case, the coater is responsible for verifying the suitability for use, taking into account their individual mechanical surface preparation and/or chemical surface treatment, by means of technological tests and corrosion tests for the desired seal, in accordance with the requirements of the quality guidelines.

The coater must adhere to the prescribed periods of permitted use, irrespective of the weathering category of the material.

5 Furnace

Integrated gauges must constantly measure and record the circulating air temperature of the furnace for three stationary points at least. The measuring points must be chosen so that an accurate circulating air temperature distribution in the furnace can be ascertained (e.g. top, centre and lower area). The measurement sensors must be read individually.

6 Laboratory equipment

6.1 General

There must be a laboratory which is in a separate room to the production facilities. It must be possible to carry out all of the tests for the Factory Production Control (FPC) in this laboratory.

Devices in every production site must be functional and calibrated (adherence to test periods).

Device failures and the failure dates must be documented. Replacement devices must be obtained.

Repair and maintenance jobs must be shown to the inspector on request.

6.2 Obligatory laboratory equipment

The following testing and measuring equipment must be in use at the laboratory of each production site and must be functional and calibrated.

- 2 layer thickness measuring devices which work in accordance with the magnetic process as per ISO 2178 and/or in accordance with the magnetic-induction process and eddy current process as per ISO 2808.
- Cutting devices and accessories for the cross-cut test in accordance with ISO 2409.
- Mandrel bend test in accordance with ISO 1519.
- Ball impact test in accordance with ASTM D 2794 (only required for powder coatings).

- A device for measuring the gloss in accordance with ISO 2813.
- A measuring device for recording the object and circulating air temperature with at least 3 measurement points (only for thermally cured coating systems).
- A conductivity measuring device for chemical surface pre-treatment.
- Devices for the boil test.

6.3 Recommended laboratory equipment

The following testing and measuring equipment is recommended.

- Test of adhesion and elasticity in the case of deformation (cupping test) in accordance with ISO 1520.
- Scales to determine the weight of the conversion/passivation layer and/or the etch rate with a measurement accuracy of 0.1 mg for the process check.
- Devices for the rest potential analysis (RPA test)
- Colorimeter
- pH measuring device
- Roughness measuring device

7 Storage

7.1 Components to be coated

The components to be coated must be stored in a way that prevents any changes to the surface (e.g. corrosion, mechanical damage) which impair the quality of the coatings.

7.2 Coating material

The coating materials must be stored in accordance with the information in the manufacturer's technical data sheet. Different storage conditions must be arranged in writing with the manufacturer.

8 Technical material safety data sheets

The latest technical material safety data sheets (MSDS) for all pre-treatment chemicals and coating materials used must be made freely available for viewing at the relevant stages of the process.

9 Quality assurance

9.1 Test sheets

The member company is free to choose the test panels used in terms of thickness and composition. The coater must ensure that these panels provide comparable results to the panels listed below.

The specified material thickness must be adhered to for panels that are to be used for technical-mechanical tests.

The following sample panels are recommended for corrosion and technological tests:

- Technological and corrosion protection properties of steel:
  - Steel sheets,

  - approx. 100x200, material thickness 0.8 mm,
  - untreated with rolling mill grease,
  - material designation according to DIN EN 10130/10131: 1.0312 - HC220LC
  - suitable for spray application
- technological and anti-corrosion properties of galvanized steel:
  - steel sheets,
  - approx. 100x200 mm, material thickness 0.8 mm,
  - galvanized (coating at least 140 g/m² per side, corresponding to approx. 20 µm)
  - untreated with mill scale,
  - material designation according to DIN EN 10346: DX54D + Z275 MC
  - suitable for spray application

For testing the corrosion protection properties of coating processes with mechanical surface preparation (blasting/sweeping), sheets of a comparable specification but with a material thickness of 2.5 to 3.5 mm shall be used. For galvanized sheets, a zinc coating in accordance with DIN EN 1461 (corresponding to 55 or 70 µm) must be guaranteed.

In the event of a dispute, the tests according to the test methods specified in GSB QR AL 631-7 ST 663-7 and the specifications specified in GSB QR ST 663-6 shall be decisive.

It is recommended that only sheets within the shelf life specified by the manufacturer be used. All sheets should be stored separately and vacuum-sealed or protected against air circulation with dry beads.

9.2 Factory Production Control (FPC)

9.2.1 General

The coater (steel) must continuously monitor its production and processes. The results must be documented and the test logs and accompanying samples (which have been appropriately marked) must be retained in accordance with statutory provisions, but for at least 5 years. (This applies to production batches of over 100 m² or at a time interval of 2 hours).

These documents must be kept available to be viewed by the inspector. Where possible, profile sections or other real products should be used instead of test sheets.

9.2.2 Mandatory Factory Production Control (FPC)

The following process and results checks are mandatory. The documentation and samples must be shown to the inspector on request.

9.2.2.1 Goods inwards and issue inspection

Process step	Test	Minimum scope of the test	Documentation
Goods inwards check			
Components	Delivery corresponds with delivery note	Every delivery	On delivery note
Coating materials	Delivery corresponds with delivery note	Every delivery	On delivery note
Pre-treatment chemicals	Delivery corresponds with delivery note	Every delivery	On delivery note
Goods issue check			
Components	Order corresponds with delivery	Every delivery	FPC
Components	Delivery corresponds with delivery note	Every delivery	On delivery note / on order confirmation

9.2.2.2 Surface pre-treatment

Process step	Test	Minimum scope of the test	Documentation
Iron and zinc phosphating			
Dipping and spray pre-treatment with automatic dosing	Bath analysis (temperature, concentration) in accordance with information provided by the manufacturer	1 x per day	Yes
Dipping and spray pre-treatment with manual dosing	Bath analysis (temperature, concentration) in accordance with information provided by the manufacturer	1 x per shift	Yes
Conversion layer baths for chromating			
Dipping and spray pre-treatment with automatic dosing	Bath analysis (temperature, concentration) in accordance with information provided by the manufacturer	1 x per day	Yes
Dipping and spray pre-treatment with manual dosing	Bath analysis (temperature, concentration) in accordance with information provided by the manufacturer	1 x per shift	Yes
Conversion layer	Coating layer in accordance with manufacturer's specifications	1 x per week	Yes
Dripping water from final rinse	Conductivity	1 x per shift	Yes
Passive layer baths / CR(VI)-free/CR-free pre-treatment			
Dipping and spray pre-treatment with automatic dosing	Bath analysis (temperature, concentration)	1 x per shift	Yes
Dipping and spray pre-treatment with manual dosing	Bath analysis (temperature, concentration)	1 x per shift	Yes
Passivation layer	Coating layer in accordance with manufacturer's specifications	At least once per day	Yes
Dripping water from final rinse or mist	Conductivity	1 x per shift	Yes
Residual water dryer			
Object temperature in accordance with manufacturer of pre-treatment chemical	Temperature measurement with measuring strips or furnace measuring device	1 x per week	Yes

9.2.2.3 Coating (testing finished parts and test sheets)

Process step	Test	Minimum scope of the test	Documentation
Coating result			
Coating thickness	Coating thickness	2 x per hour	Min. and max. value
Gloss	Gloss measurement (60° measurement angle)	4 x per day or with every change of colour > 100 m²	Min. and max. value
Colour	Visual comparison with mandatory template	With every change of colour > 100 m²	Yes
Adhesive strength	Cross cut	2 x per shift	Yes
Quality of the pre-treatment	Boil test	2 x per shift	Yes
Mechanical values	Mandrel bending test and ball impact test	2 x per shift	Yes
Furnace			
Object temperature and dwell times in accordance with manufacturer's specifications	Temperature with measuring device with at least 3 object sensors	1 x per week	Yes with temperature record as proof

9.2.3 Voluntary process check

The following supplementary process and results checks are recommended.

Process step	Test	Scope of the test	Documentation
Passive layer baths / CR(VI)-free/CR-free pre-treatment			
Rest potential analysis (optional)	Rest potential	2 x per week	Yes
Coating			
Mechanical values	Cupping test	2 x per shift	Yes
Degree of crosslinking (liquid paint only)	Acetone / methyl ethyl ketone (MEK)	1 x per shift	Yes
Gloss	Gloss measurement (20°/60°/85° measurement angle)	Colour change	Min. and max. value
Colour (no metallics)	Measurement with colorimeter	With every change of colour	Yes

10 Characteristic values for tests on finished parts and test sheets

10.1 Powder coating

10.1.1 Technical values for single-layer systems for steel

Test	Coating material Florida 1	Coating material Florida 3	Coating material Florida 5, 10
Coating thickness			
Single layer	≥ 60 µm - ≤ 120 µm	≥ 60 µm - ≤ 120 µm	≥ 60 µm - ≤ 120 µm
Surface finish			
Gloss 60 Delivery tolerance for approval range >15 GU and fine structure	± 5 GU	± 5 GU	± 5 GU
Gloss 60° Delivery tolerance for smooth systems with an approval range of 2-15 GU	± 3 GU	± 3 GU	± 3 GU
Colour evaluation Visual comparison with template	No visual differences	No visual differences	No visual differences
Adhesive strength			
Cross-cut and adhesive tape removal	GT0	GT0	GT0
Boil test Degree of blistering Cross-cut and adhesive tape removal	0 (S0) GT 0 / GT 1	0 (S0) GT 0 / GT 1	0 (S0) GT 0 / GT 1
Mechanical values			
Mandrel bend test Cracking of coating Adhesive tape removal	≤ 5 mm Not permitted -	≤ 5 mm Permitted No removal of coating	≤ 5 mm Permitted No removal of coating
Ball impact test Cracking of coating Adhesive tape removal	20 inch/pound Not permitted -	20 inch/pound permitted No removal of coating	20 inch/pound permitted No removal of coating
Corrosion protection			
Neutral salt spray mist test Test period Delamination at the cross section Degree of blistering	NSS 480 h d ≤ 3 mm 0 (S0)	NSS 480 h d ≤ 3 mm 0 (S0)	NSS 480 h d ≤ 3 mm 0 (S0)

Note: Depending on the construction, the maximum layer thickness can also be exceeded during application.

10.1.2 Technical values for single-layer systems for galvanised steel

Test	Coating material Florida 1	Coating material Florida 3	Coating material Florida 5, 10
Coating thickness			
Single layer	≥ 60 µm - ≤ 120 µm	≥ 60 µm - ≤ 120 µm	≥ 60 µm - ≤ 120 µm
Surface finish			
Gloss 60 Delivery tolerance for approval range >15 GU and fine structure	± 5 GU	± 5 GU	± 5 GU
Gloss 60° Delivery tolerance for smooth systems with an approval range of 2-15 GU	± 3 GU	± 3 GU	± 3 GU
Colour evaluation Visual comparison with template	No visual differences	No visual differences	No visual differences
Adhesive strength			
Cross-cut and adhesive tape removal	GT0	GT0	GT0
Boil test Degree of blistering Cross-cut and adhesive tape removal	 0 (S0) GT 0 / GT 1	 0 (S0) GT 0 / GT 1	 0 (S0) GT 0 / GT 1
Mechanical values			
Mandrel bend test Cracking of coating Adhesive tape removal	≤ 5 mm Not permitted -	≤ 5 mm Permitted No removal of coating	≤ 5 mm Permitted No removal of coating
Ball impact test Cracking of coating Adhesive tape removal	20 inch/pound Not permitted -	20 inch/pound permitted No removal of coating	20 inch/pound permitted No removal of coating
Corrosion protection			
Neutral salt spray mist test Test period Delamination at the cross section Degree of blistering	NSS 480 h d ≤ 5 mm 0 (S0)	NSS 480 h d ≤ 5 mm 0 (S0)	NSS 480 h d ≤ 5 mm 0 (S0)

Note: Depending on the construction, the maximum layer thickness can also be exceeded during application.

10.1.3 Technical values for double-layer systems for steel

Test	Coating material Florida 1	Coating material Florida 3	Coating material Florida 5, 10
Coating thickness			
Double layer	≥ 130 µm	≥ 130 µm	≥ 130 µm
Surface finish			
Gloss 60 Delivery tolerance for approval range >15 GU and fine structure	± 5 GU	± 5 GU	± 5 GU
Gloss 60° Delivery tolerance for smooth systems with an approval range of 2-15 GU	± 3 GU	± 3 GU	± 3 GU
Colour evaluation Visual comparison with template	No visual differences	No visual differences	No visual differences
Adhesive strength			
Cross-cut and adhesive tape removal	GT0	GT0	GT0
Boil test Degree of blistering Cross-cut and adhesive tape removal	 0 (S0) GT 0 / GT 1	 0 (S0) GT 0 / GT 1	 0 (S0) GT 0 / GT 1
Mechanical values			
Mandrel bend test Cracking of coating Adhesive tape removal	≤ 8 mm Not permitted -	≤ 8 mm Permitted No removal of coating	≤ 8 mm Permitted No removal of coating
Ball impact test Cracking of coating Adhesive tape removal	10 inch/pound Not permitted -	10 inch/pound Permitted No removal of coating	10 inch/pound Permitted No removal of coating
Corrosion protection			
Neutral salt spray mist test (double-layer) Test period Delamination at the cross section Degree of blistering	NSS 720 h d ≤ 1 mm 0 (S0)	NSS 720 h d ≤ 1 mm 0 (S0)	NSS 720 h d ≤ 1 mm 0 (S0)

10.1.4 Technical values for double-layer systems for galvanised steel

Test	Coating material Florida 1	Coating material Florida 3	Coating material Florida 5, 10
Coating thickness			
Double layer	≥ 130 µm	≥ 130 µm	≥ 130 µm
Surface finish			
Gloss 60 Delivery tolerance for approval range >15 GU and fine structure	± 5 GU	± 5 GU	± 5 GU
Gloss 60° Delivery tolerance for smooth systems with an approval range of 2-15 GU	± 3 GU	± 3 GU	± 3 GU
Colour evaluation Visual comparison with template	No visual differences	No visual differences	No visual differences
Adhesive strength			
Cross-cut and adhesive tape removal	GT0	GT0	GT0
Boil test Degree of blistering Cross-cut and adhesive tape removal	 0 (S0) GT 0 / GT 1	 0 (S0) GT 0 / GT 1	 0 (S0) GT 0 / GT 1
Mechanical values			
Mandrel bend test Cracking of coating Adhesive tape removal	≤ 8 mm Not permitted -	≤ 8 mm Permitted No removal of coating	≤ 8 mm Permitted No removal of coating
Ball impact test Cracking of coating Adhesive tape removal	10 inch/pound Not permitted -	10 inch/pound Permitted No removal of coating	10 inch/pound Permitted No removal of coating
Corrosion protection			
Neutral salt spray mist test (double-layer) Test period Delamination at the cross section Degree of blistering	NSS 720 h d ≤ 8 mm 0 (S0)	NSS 720 h d ≤ 8 mm 0 (S0)	NSS 720 h d ≤ 8 mm 0 (S0)

11 Corrosion tests

Test	Minimum scope of the test	Documentation
Neutral salt spray test	1 x per half year	Yes

The NSS tests in the first half of the year are carried out as part of the first monitoring test. For this, the inspector takes the samples and labels them. The coater can carry out the test on their own initiative.

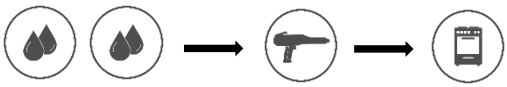
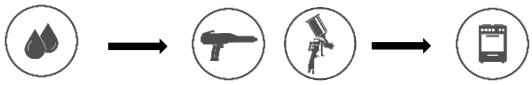
The NSS test is carried out as part of the second monitoring test. The inspector takes samples for them. The tests are carried out in a test laboratory commissioned by GSB.

12 Customer complaints

The inspector must be granted access to the list of customer complaints.

1 Definition: Classification of one or more plants

A coating plant consists of a multi-stage pre-treatment process including a residual water dryer, application unit and furnace. The number of coating plants is determined by the number of pre-treatment lines, furnaces and different coating technologies.

Defined as one plant:	Defined as two plants:
	
	
	
	

Key

- Surface pre-treatment or preparation
- Application of powder coating
- Application of liquid paint
- Furnace

A similar classification applies to more than two coating plants.

If a coating company has several plants, all of them are tested during the initial test. The inspector will decide which plant is to be tested in the monitoring test.

GSB International must be informed of the number of coating plants and provided with information on which ones are to be used for GSB Premium coating.

If the coater has a vertical coating plant, at least one horizontal coating plant must be named which must comply with the requirements of a Premium Coater. The appointed plants are tested regularly.

2 Cleanliness and handling

The components must be suspended, positioned and taken down as well as transported during the various manufacturing processes in such a way that ensures there can be no contamination with dust, sweat from hands, grease, electrolyte residue, condensation and damage. Only touch the pre-treated components with suitable clean gloves.

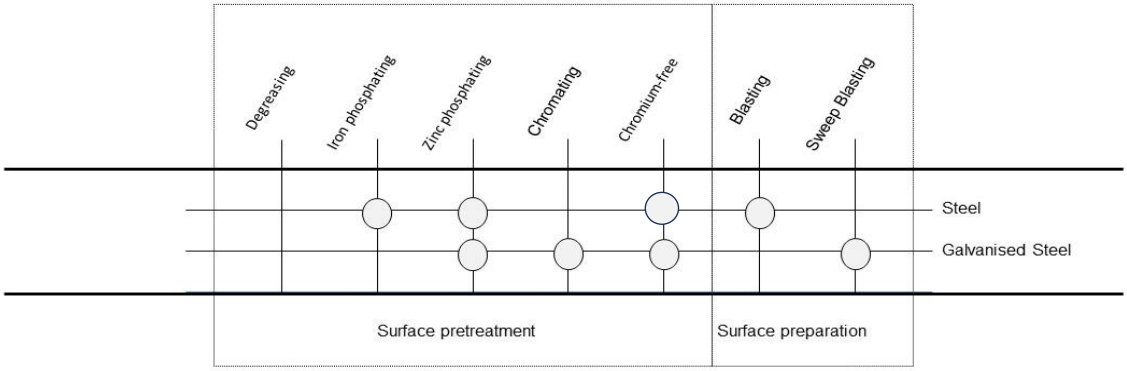
3 Surface pre-treatment and preparation

3.1 General

Only the following chemical surface pre-treatment processes can be used in line with these l guidelines.

- Iron and zinc phosphating
- GSB-approved chromium-free or chromium(VI)-free process
- Yellow and green chromating based on EN 12487

Alternative processes for mechanical surface pre-treatment can be used if they are approved by GSB-CERT.



Galvanised components with a chromate layer as temporary corrosion protection are pre-treated based on EN 12487. In this case, ensure that the temporary corrosion protection is removed without any residue. This might have to be coordinated with the pre-treatment manufacturer.

The process sequence for pre-treatment must be documented independently of the procedure and stored at the GSB offices.

An analysis certificate for the pre-treatment chemicals must be requested from the manufacturer and documented for every order.

The process sequence of every pre-treatment plant is approved separately by taking one coated product section during a monitoring test and having it tested by an accredited test institute.

If different metals are regularly pre-treated in the same pre-treatment plant, the respective process steps must be performed strictly separately. The maximum content of foreign ions must be defined together with the pre-treatment supplier and documented when storing the process sequence. The concentration of these ions must be determined and documented after every pre-treatment of foreign substrates (Production log book).

3.2 Contact points

The parts to be coated must be suspended or positioned in such a way that there are no contact points on a main surface that will later be visible. Contact points are only permitted when they cannot be avoided and only if they are marked on the respective component or on drawings (sketches). The customer must be notified of this.

3.3 Mechanical surface preparation

Steel surfaces without a coating are prepared by blasting them with metallic abrasives (ISO 11124-1) or non-metallic abrasives (ISO 11126-1). The degree of preparation must correspond to SA 2 ½ in accordance

with ISO 12944-4. When blasting thin-walled components ≤ 3 mm thick, be aware that deformation may occur.

Ungalvanised areas (e.g. weld seams) must be pre-treated mechanically. The degree of preparation must correspond to SA 2 ½, P St 3 or P Ma in accordance with DIN ISO 12944-4 or conform to the coating system and corrosion class.

Recommendation: In the blasting process, a roughness Rz of 30 µm to 40 µm has proven to be effective. It is recommended to verify this with mechanical or electrically supported, certified testing equipment or visual comparison samples and to document it accordingly.

Galvanised components are prepared by means of sweep blasting (ISO 12944-1)) with non-metallic, non-ferrous abrasives and must have an even, matt surface after the surface preparation. Coatings must not be blasted down to the substrate. Punctures at points from the abrasive down to the substrate must be primed too.

3.4 Iron and zinc phosphating

Phosphating on steel, galvanised steel and mixed constructions is carried out in accordance with ISO 9717. Surfaces with temporary chromating cannot be given a phosphate coating.

The weight of the iron phosphating layer must be between 0.5 and 1.5 g/m² for the closed layer.

The weight of the zinc phosphating layer must be between 1.0 and 5.0 g/m² for the closed layer.

The components must be dried in a residual water dryer immediately following chemical pre-treatment.

3.5 Chromium-free and chromium (VI)-free pre-treatment procedures

If a coater (steel) uses a chromium-free or chromium (VI)-free pre-treatment system for production, they must inform the offices of GSB of this in writing so that a monitoring test can be performed. The same applies if a test operation is going to exceed four weeks.

3.6 Chromating

Chromating on galvanised surfaces is carried out based on EN 12487. Mixed constructions made of ungalvanised and galvanised steel are not suitable for chromating. This does not apply to weld areas of galvanised steel profiles such as mitre cuts.

Ungalvanised areas (e.g. weld seams) must be pre-treated mechanically. The degree of preparation must correspond to SA 2 ½, P St 3 or P Ma in accordance with ISO 12944-4 or conform to the coating system and corrosion class.

3.7 Monitoring the rinse

There must be an option to remove the run-off water (inspection flap for spray systems).

Rinse passivation (final rinse)

Rinsing after passivation with fully demineralized water (deionized water) must be carried out in such a way that the last rinsing water to drip off has a conductivity of ≤ 30.0 µS/cm.

No-rinse passivation (last rinse cycle)

Rinsing with fully demineralized water (DI water) prior to passivation must be carried out in such a way that the last rinsing water to drip off has a conductivity of ≤ 30.0 µS/cm. Fogging of the passivated surface: The conductivity of the water used must be ≤ 30.0 µS/cm.

3.8 Drying of residual water

Immediately following chemical pre-treatment, the components must be dried in a residual water dryer. If the manufacturer of the pre-treatment chemicals does not provide any information on the object temperature in its technical data sheet, the object temperature must not exceed 100°C for the process in which chromium (III) and chromium (VI) are used.

4 Coating

The coating must be applied within 12 hours of pre-treatment. The pre-treated components must be clean and dry when coated.

If the components to be coated need to be stored within these 12 hours, then they must be stored in a way that prevents them from being contaminated (e.g. by dust, fingerprints and moisture).

The coater may only use GSB-approved material for GSB-compliant coating.

Coating on steel and galvanized steel usually takes place in a single- or two-layer structure. Two-layer structures are designed as a dual system with a certified primer, on which a certified paint is applied. The paint system can be certified for a single- or two-layer structure on aluminium, steel or galvanized steel. The primer and top coat should come from the same manufacturer. When using cross-manufacturer systems, the coater is responsible for checking the intermediate adhesion (see GSB ST 663-4, Section 3, Chapter 3).

Alternatively, topcoats can also be used as a single-layer system if the system is approved for aluminium substrates and the paint manufacturer approves the use on steel or galvanized steel in the product documentation or upon request. In this case, the coater is responsible for verifying the suitability for use, taking into account their individual mechanical surface preparation and/or chemical surface treatment, by means of technological tests and corrosion tests for the desired seal, in accordance with the requirements of the quality guidelines.

The coater must adhere to the prescribed periods of permitted use, irrespective of the weathering category of the material.

5 Furnace

Integrated gauges must constantly measure and record the circulating air temperature of the furnace for three stationary points at least. The measuring points must be chosen so that an accurate circulating air temperature distribution in the furnace can be ascertained (e.g. top, centre and lower area). The measurement sensors must be read individually.

6 Laboratory equipment

6.1 General

There must be a laboratory which is in a separate room to the production facilities. It must be possible to carry out all of the tests for the Factory Production Control (FPC) in this laboratory.

Devices in every production site must be functional and calibrated (adherence to test periods).

Device failures and the failure dates must be documented. Replacement devices must be obtained.

Repair and maintenance jobs must be shown to the inspector on request.

6.2 Obligatory laboratory equipment

The following testing and measuring equipment must be in use at the laboratory of each production site and must be functional and calibrated.

- 2 layer thickness measuring devices which work in accordance with the magnetic process as per ISO 2178 and/or in accordance with the magnetic-induction process and eddy current process as per ISO 2808.

- Cutting devices and accessories for the cross-cut test in accordance with ISO 2409.
- Mandrel bend test in accordance with ISO 1519.
- Ball impact test in accordance with ASTM D 2794 (only required for powder coatings).
- A device for measuring the gloss in accordance with ISO 2813.
- A measuring device for recording the object and circulating air temperature with at least 3 measurement points (only for thermally cured coating systems).
- A conductivity measuring device for chemical surface pre-treatment.
- Devices for the boil test.
- Colorimeter

6.3 Recommended laboratory equipment

The following testing and measuring equipment is recommended.

- Test of adhesion and elasticity in the case of deformation (cupping test) in accordance with ISO 1520.
- Scales to determine the weight of the conversion/passivation layer and/or the etch rate with a measurement accuracy of 0.1 mg for the process check.
- Devices for the rest potential analysis (RPA test)
- pH measuring device
- Roughness measuring device

7 Storage

7.1 Components to be coated

The components to be coated must be stored in a way that prevents any changes to the surface (e.g. corrosion, mechanical damage) which impair the quality of the coatings.

7.2 Coating material

The coating materials must be stored in accordance with the information in the manufacturer's technical data sheet. Different storage conditions must be arranged in writing with the manufacturer.

8 Technical material safety data sheets

The latest technical material safety data sheets (MSDS) for all pre-treatment chemicals and coating materials used must be made freely available for viewing at the relevant stages of the process.

9 Quality assurance

9.1 Test sheets

The member company is free to choose the test panels used in terms of thickness and composition. The coater must ensure that these panels provide comparable results to the panels listed below.

The specified material thickness must be adhered to for panels that are to be used for technical-mechanical tests.

The following sample panels are recommended for corrosion and technological tests:

- Technological and corrosion protection properties of steel:
  - Steel sheets,
  - approx. 100x200, material thickness 0.8 mm,
  - untreated with rolling mill grease,
  - material designation according to DIN EN 10130/10131: 1.0312 - HC220LC
  - suitable for spray application
- technological and anti-corrosion properties of galvanized steel:
  - steel sheets,
  - approx. 100x200 mm, material thickness 0.8 mm,
  - galvanized (coating at least 140 g/m² per side, corresponding to approx. 20 µm)
  - untreated with mill scale,

- material designation according to DIN EN 10346: DX54D + Z275 MC
- suitable for spray application

For testing the corrosion protection properties of coating processes with mechanical surface preparation (blasting/sweeping), sheets of a comparable specification but with a material thickness of 2.5 to 3.5 mm shall be used. For galvanized sheets, a zinc coating in accordance with DIN EN 1461 (corresponding to 55 or 70 µm) must be guaranteed.

In the event of a dispute, the tests according to the test methods specified in GSB QR AL 631-7 ST 663-7 and the specifications specified in GSB QR ST 663-6 shall be decisive.

It is recommended that only sheets within the shelf life specified by the manufacturer be used. All sheets should be stored separately and vacuum-sealed or protected against air circulation with dry beads.

9.2 Factory Production Control (FPC)

9.2.1 General

The coater (ST) must continuously monitor its production and processes. The results must be documented and the test logs and accompanying samples (which have been appropriately marked) must be retained in accordance with statutory provisions, but for at least 5 years. (This applies to production batches of over 100 m² or at a time interval of 2 hours).

These documents must be kept available to be viewed by the inspector. Where possible, profile sections or other real products should be used instead of test sheets.

9.2.2 Mandatory Factory Production Control (FPC)

The following process and results checks are mandatory. The documentation and samples must be shown to the inspector on request.

9.2.2.1 Goods inwards and issue inspection

Process step	Test	Minimum scope of the test	Documentation
Goods inwards check			
Components	Delivery corresponds with delivery note	Every delivery	On delivery note
Coating materials	Delivery corresponds with delivery note	Every delivery	On delivery note
Pre-treatment chemicals	Delivery corresponds with delivery note	Every delivery	On delivery note
Goods issue check			
Components	Order corresponds with delivery	Every delivery	FPC
Components	Delivery corresponds with delivery note	Every delivery	On delivery note / on order confirmation

9.2.2.2 Surface pre-treatment

Process step	Test	Minimum scope of the test	Documentation
Iron and zinc phosphating			
Dipping and spray pre-treatment with automatic dosing	Bath analysis (temperature, concentration) in accordance with information provided by the manufacturer	1 x per day	Yes
Dipping and spray pre-treatment with manual dosing	Bath analysis (temperature, concentration) in accordance with information provided by the manufacturer	1 x per shift	Yes
Conversion layer baths for chromating			
Dipping and spray pre-treatment with automatic dosing	Bath analysis (temperature, concentration) in accordance with information provided by the manufacturer	1 x per day	Yes
Dipping and spray pre-treatment with manual dosing	Bath analysis (temperature, concentration) in accordance with information provided by the manufacturer	1 x per shift	Yes
Conversion layer	Coating layer in accordance with manufacturer's specifications	1 x per day	Yes
Dripping water from final rinse	Conductivity	1 x per shift	Yes
Passive layer baths / CR(VI)-free/CR-free pre-treatment			
Dipping and spray pre-treatment with automatic dosing	Bath analysis (temperature, concentration)	1 x per shift	Yes
Dipping and spray pre-treatment with manual dosing	Bath analysis (temperature, concentration)	1 x per shift	Yes
Passivation layer	Coating layer in accordance with manufacturer's specifications	At least once per day	Yes
Dripping water from final rinse or mist	Conductivity	1 x per shift	Yes
Residual water dryer			
Object temperature in accordance with manufacturer of pre-treatment chemical	Temperature measurement with measuring strips or furnace measuring device	3 x per week	Yes

9.2.2.3 Coating (testing finished parts and test sheets)

Process step	Test	Minimum scope of the test	Documentation
Coating result			
Coating thickness	Coating thickness	2 x per hour	Min. and max. value
Gloss	Gloss measurement (60° measurement angle)	4 x per day or upon every change of colour > 100 m²	Min. and max. value
Colour (no metallics)	Measurement with colorimeter	With every change of colour > 100 m²	Yes
Colour (metallics)	Visual comparison with mandatory template	With every change of colour > 100 m²	Yes
Adhesive strength	Cross cut	2 x per shift, on finished products	Yes
Quality of the pre-treatment	Boil test	2 x per shift	Yes
Mechanical values	Mandrel bending test and ball impact test	2 x per shift	Yes
Furnace			
Object temperature and dwell times in accordance with manufacturer's specifications	Temperature with measuring device with at least 3 object sensors	3 x per week	Yes

9.2.3 Recommended process check

The following supplementary process and results checks are recommended.

Process step	Test	Scope of the test	Documentation
Coating			
Mechanical values	Cupping test	2 x per shift	Yes
Degree of crosslinking (liquid paint only)	Acetone / methyl ethyl ketone (MEK)	2 x per shift	Yes
Passive layer baths / CR(VI)-free/CR-free pre-treatment			
Rest potential analysis (optional)	Rest potential	2 x per week	Yes

10 Characteristic values for tests on finished parts and test sheets

10.1 Powder coating

10.1.1 Technical values for single-layer systems on steel

Test	Coating material Florida 1	Coating material Florida 3	Coating material Florida 5, 10
Coating thickness			
Single layer	≥ 60 µm - ≤ 120 µm	≥ 60 µm - ≤ 120 µm	≥ 60 µm - ≤ 120 µm
Surface finish			
Gloss 60 Delivery tolerance for approval range >15 GU and fine structure Gloss 60° Delivery tolerance for smooth systems with an approval range of 2-15 GU	 ± 5 GU ± 3 GU	 ± 5 GU ± 3 GU	 ± 5 GU ± 3 GU
Colour evaluation Visual comparison with template	 No visual differences	 No visual differences	 No visual differences
Adhesive strength			
Cross-cut and adhesive tape removal	GT0	GT0	GT0
Boil test Degree of blistering Cross-cut and adhesive tape removal	 0 (S0) GT 0 / GT 1	 0 (S0) GT 0 / GT 1	 0 (S0) GT 0 / GT 1
Mechanical values			
Mandrel bend test Cracking of coating Adhesive tape removal	≤ 5 mm Not permitted -	≤ 5 mm Permitted No removal of coating	≤ 5 mm Permitted No removal of coating
Ball impact test Cracking of coating Adhesive tape removal	20 inch/pound Not permitted -	20 inch/pound Permitted No removal of coating	20 inch/pound Permitted No removal of coating
Corrosion protection			

Test	Coating material Florida 1	Coating material Florida 3	Coating material Florida 5, 10
Salt spray mist test Test period Delamination at the cross section Degree of blistering	NSS 480 h d ≤ 1mm 0 (S0)	NSS 480 h d ≤ 1 mm 0 (S0)	NSS 480 h d ≤ 1 mm 0 (S0)

Note: Depending on the construction, the maximum layer thickness can also be exceeded during application.

10.1.2 Technical values for single-layer system on galvanised steel

Test	Coating material Florida 1	Coating material Florida 3	Coating material Florida 5, 10
Coating thickness			
Single layer	≥ 60 µm - ≤ 120 µm	≥ 60 µm - ≤ 120 µm	≥ 60 µm - ≤ 120 µm
Surface finish			
Gloss 60 Delivery tolerance for approval range >15 GU and fine structure	± 5 GU	± 5 GU	± 5 GU
Gloss 60° Delivery tolerance for smooth systems with an approval range of 2-15 GU	± 3 GU	± 3 GU	± 3 GU
Colour evaluation Visual comparison with template	No visual differences	No visual differences	No visual differences
Adhesive strength			
Cross-cut and adhesive tape removal	GT0	GT0	GT0
Boil test Degree of blistering Cross-cut and adhesive tape removal	0 (S0) GT 0 / GT 1	0 (S0) GT 0 / GT 1	0 (S0) GT 0 / GT 1
Mechanical values			
Mandrel bend test Cracking of coating Adhesive tape removal	≤ 5 mm Not permitted -	≤ 5 mm Permitted No removal of coating	≤ 5 mm Permitted No removal of coating
Ball impact test Cracking of coating Adhesive tape removal	20 inch/pound Not permitted -	20 inch/pound Permitted No removal of coating	20 inch/pound Permitted No removal of coating
Corrosion protection			

Test	Coating material Florida 1	Coating material Florida 3	Coating material Florida 5, 10
Salt spray mist test Test period Delamination at the cross section Degree of blistering	NSS 480 h d ≤ 3 mm 0 (S0)	NSS 480 h d ≤ 3 mm 0 (S0)	NSS 480 h d ≤ 3 mm 0 (S0)

Note: Depending on the construction, the maximum layer thickness can also be exceeded during application.

10.1.3 Technical values for double-layer systems on steel

Test	Coating material Florida 1	Coating material Florida 3	Coating material Florida 5, 10
Coating thickness			
Double layer	≥ 130 µm	≥ 130 µm	≥ 130 µm
Surface finish			
Gloss 60 Delivery tolerance for approval range >15 GU and fine structure	± 5 GU	± 5 GU	± 5 GU
Gloss 60° Delivery tolerance for smooth systems with an approval range of 2-15 GU	± 3 GU	± 3 GU	± 3 GU
Colour evaluation Visual comparison with template	No visual differences	No visual differences	No visual differences
Adhesive strength			
Cross-cut and adhesive tape removal	GT0	GT0	GT0
Boil test Degree of blistering Cross-cut and adhesive tape removal	 0 (S0) GT 0 / GT 1	 0 (S0) GT 0 / GT 1	 0 (S0) GT 0 / GT 1
Mechanical values			
Mandrel bend test Cracking of coating Adhesive tape removal	≤ 8 mm Not permitted -	≤ 8 mm Permitted No removal of coating	≤ 8 mm Permitted No removal of coating
Ball impact test Cracking of coating Adhesive tape removal	10 inch/pound Not permitted -	10 inch/pound Permitted No removal of coating	10 inch/pound Permitted No removal of coating
Corrosion protection			

Test	Coating material Florida 1	Coating material Florida 3	Coating material Florida 5, 10
Salt spray mist test (double-layer) Test period Delamination at the cross section Degree of blistering	NSS 1440 h d ≤ 3 mm 0 (S0)	NSS 1440 h d ≤ 3 mm 0 (S0)	NSS 1440 h d ≤ 3 mm 0 (S0)

10.1.4 Technical values for double-layer systems on galvanised steel

Test	Coating material Florida 1	Coating material Florida 3	Coating material Florida 5, 10
Coating thickness			
Double layer	≥ 130 µm	≥ 130 µm	≥ 130 µm
Surface finish			
Gloss 60 Delivery tolerance for approval range >15 GU and fine structure	± 5 GU	± 5 GU	± 5 GU
Gloss 60° Delivery tolerance for smooth systems with an approval range of 2-15 GU	± 3 GU	± 3 GU	± 3 GU
Colour evaluation Visual comparison with template	No visual differences	No visual differences	No visual differences
Adhesive strength			
Cross-cut and adhesive tape removal	GT0	GT0	GT0
Boil test Degree of blistering Cross-cut and adhesive tape removal	0 (S0) GT 0 / GT 1	0 (S0) GT 0 / GT 1	0 (S0) GT 0 / GT 1
Mechanical values			
Mandrel bend test Cracking of coating Adhesive tape removal	≤ 8 mm Not permitted -	≤ 8 mm Permitted No removal of coating	≤ 8 mm Permitted No removal of coating
Ball impact test Cracking of coating Adhesive tape removal	10 inch/pound Not permitted -	10 inch/pound Permitted No removal of coating	10 inch/pound Permitted No removal of coating
Corrosion protection			

Test	Coating material Florida 1	Coating material Florida 3	Coating material Florida 5, 10
Salt spray mist test (double-layer)	NSS	NSS	NSS
Test period Delamination at the cross section Degree of blistering	1440 h d ≤ 8 mm 0 (S0)	1440 h d ≤ 8 mm 0 (S0)	1440 h d ≤ 8 mm 0 (S0)

11 Production journal

Coating companies with the Premium quality seal are obliged to provide extended documentation as part of the factory production control.

This allows for seamlessly traceable and order-related documentation of the chemicals and coating materials used and their batches, the machines and units used, and the employees involved. A coating company with the “Premium” seal must be able to trace the complete path of a workpiece from delivery through all process steps to delivery. The coater must ensure that the storage conditions specified by the manufacturer for workpieces, chemicals and coating materials are adhered to and documented.

Companies that use a modern ERP system usually already have the most important data. In this case, it is only necessary to describe (e.g. by means of an internal instruction) where this data is stored, how it can be accessed and how it is to be interpreted.

12 Corrosion tests

Test	Minimum scope of the test	Documentation
Salt spray test	1 x per half year	Yes

The NSS tests in the first half of the year are carried out as part of the first monitoring test. For this, the inspector takes the samples and labels them. The coater can carry out the test on their own initiative.

The NSS test is carried out as part of the second monitoring test. The inspector takes samples for them. The tests are carried out in a test laboratory commissioned by GSB.

13 Customer complaints

The inspector must be granted access to the list of customer complaints.

Application for certification

The Coater _____ hereby applies for GSB-CERT certification for GSB Coaters (steel and/or galvanised steel) as a:*

	Approved Coater Galvanized Steel **STANDARD**
	Approved Coater Galvanized Steel **MASTER**
	Approved Coater Galvanized Steel **PREMIUM**
	Approved Coater Steel **STANDARD**
	Approved Coater Steel **MASTER**
	Approved Coater Steel **PREMIUM**

*Please tick as appropriate.

Name, Firstname _____

Phone _____

Mobile _____

Email _____

Contact person and contact details

_____ _____

Place, date Signature and company stamp

By registering as a contact person, I acknowledge that personal data is stored and used internally by GSB in connection with all matters relating to GSB quality regulations. The data will be subject to the provisions of the General Data Protection Regulation (Datenschutz-Grundverordnung VO (EU) 2016/679).

(PROVISIONAL)

Certificate GSB coaters (steel)

Certification number:	123g
Class:	Master
Substrate:	Galvanised steel
Company:	Sample Company Sample Street Sample Town
Coating Plant:	
Confirmation:	This certificate confirms that the requirements of GSB AL 663 – 06 for steel coating companies have been met.
Validity start date:	12/3/2001 (Date of first issue or date of last monitoring test)
Monitoring:	Annual
Valid until:	31/07/2019
Date of issue:	12/4/2015 Rev: 0.0

GSB International
Fritz-Vomfelde-Straße 30, 40547 Düsseldorf, Germany

GSB-CERT