



FROSIO-GuiD-CP

FROSIO guideline for companies providing corrosion protection

Quality management guideline for companies in the area of corrosion protection

Certification of companies providing corrosion protection

Criteria for selection of the quality level
– Certification procedure and quality requirements

Preamble

FROSIO-GuiD-CP defines the quality requirements for companies that want to be recognised by FROSIO for the execution of corrosion protection processes and corrosion protection work.

It gives reference to and supplements the general regulations of ISO 9001 for the area of corrosion protection.

The guideline covers corrosion protection work on components and other products (e.g. made from steel, aluminium, etc.) through organic coatings, thermal spraying, hot-dip galvanising as well as duplex coating systems.

It describes the conditions that a company providing corrosion protection must satisfy in order to meet the requirements according to **FROSIO-GuiD-CP**.

The scope of the guideline is an increase in productivity and, implicitly, in product quality.

At the same time, it makes it possible for the company to have the quality of its activities competently assessed and certified.

The guideline contains detailed information and recommendations for companies for meeting the requirements for **FROSIO-Guid-CP certification**.

Endorsement notice:

The text of this guideline edition 2026 was approved by FROSIO BOARD as **FROSIO-GuiD-CP** without any amendments.

Legal note:

Reference to this guideline for the purpose of certification and/or validation of companies is permitted solely by FROSIO.

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Applicable documents

- Application for the issue of a FROSIO-CP certificate for the execution of corrosion protection work
- FROSIO-CP checklist for carrying out the audit

Referenced standards:

ISO 12944:	Paints and varnishes – Corrosion protection of steel structures by protective paint systems (<i>all parts</i>)
ISO 2063:	Thermal spraying – Zinc, aluminium and their alloys (<i>all parts</i>)
ISO 1461:	Hot dip galvanized coatings on fabricated iron and steel articles – Specifications and test methods
ISO 14713:	Zinc coatings – Guidelines and recommendations for the protection against corrosion of iron and steel in structures
ISO 14918:	Thermal spraying – Qualification testing of thermal sprayers
ISO 12690:	Metallic and other inorganic coatings – Thermal spray coordination – Tasks and responsibilities
ISO 9712:	Non-destructive testing – Qualification and certification of NDT personnel
ISO 9001:	Quality management systems – Requirements
ISO/IEC 17025:	General requirements for the competence of testing and calibration laboratories
DIN 55633:	Paints and varnishes – Corrosion protection of steel structures by powder coating systems (<i>all parts</i>)

Terms and definitions

The following definitions are applicable in the context of using this guideline:

Term of protection: The expected service life of a coating until the first partial renewal.

Note: The term of protection is not a "warranty period", but a technical term that can help the client to define a repair programme.

Contract: Binding agreement, a memorandum of understanding between the manufacturer (contractor/business providing corrosion protection) and the customer (client).

Customer (client): Organisation or person that receives a product or service in the area of corrosion protection.

Manufacturer (contractor/business providing corrosion protection/supplier of corrosion protection): Organisation or person that provides and supplies a corrosion protection product (corrosion protection coating) and is responsible for the corrosion protection process.

Subcontractor/sub-supplier: Supplier of products, services and/or activities to a manufacturer in a contractual situation.

Subcontracting: The transfer of all agreed work (or part thereof) to a third party. The original contracting parties remain responsible for performance of the original contract.

Design instruction: Product requirements defined by the customer, taking into account customer requirements or statutory provisions.

Note: Requirements for products (and in some cases for associated processes) can be included in, for example, technical specifications, product and process standards, contractual agreements and statutory provisions.

Requirement: Need or expectation that is defined, usually a prerequisite or mandatory (ISO 9000).

Note: **Quality requirement:** *Requirement* with respect to *quality*

Conformity: Fulfilment of a *requirement* (ISO 9000)

Qualified operator: Person who has acquired and demonstrated their skills, ability and expertise in the area of corrosion protection through instruction, training and/or specific practical experience. Person that executes manually operated processes in the area of corrosion protection.

Qualified setter: Person that executes fully mechanised or fully automated processes in the area of corrosion protection.

Process manager (CP-supervisor): Person that is responsible for the corrosion protection technology and associated activities and has demonstrated their proficiency and expert knowledge through training, qualification and appropriate production experience.

Components: Supports, products, structures or other parts applied to corrosion protection.

Component specification: Document(s) in which all necessary details and technical requirements for the manufacture of the components are listed.

Initial test/initial audit (during first-time certification): Examination of the company providing corrosion protection to determine the extent to which the QM system according to this guideline for corrosion protection is introduced and implemented.

Audit: Systematic and independent review to determine whether the quality assurance measures during corrosion protection work and the results are suitable for achieving the desired product quality and are implemented effectively.

Certification: Confirmation by a third party in relation to products, processes, systems or persons (acc. to EN ISO 17000)

Note: Confirmation by FROSIO takes place exclusively in accordance with this guideline.

Inspector/ quality inspector: Person who is responsible for the monitoring and testing of the execution of corrosion protection work in accordance with the specifications.

Inspection: Monitoring and testing of the execution of corrosion protection work in accordance with the specifications.

Defect/error/non-conformity: Non-fulfilment of the agreed/required properties with respect to intended use.

Thermal spraying: Manufacture of coatings made from Zn, Al and their alloys. All processes or "process in which spray materials are heated to the plastic or molten state, inside or outside of the spray gun/torch, and then propelled onto a prepared surface" (to EN ISO 14917) (*including TS-coating*).

Coat/overcoat (with organic or inorganic paint material: All types of application of a coating material on a substrate, e.g. through dipping, spraying, rolling, painting, etc. (*including the paint coating/ CO*)).

Hot-dip galvanising: Manufacture of coatings made from zinc or zinc alloys by dipping pre-treated steel or cast iron in molten zinc (*including HDG-coating*).

Specification: Standards, contract, customer requirements.

Other terms and definitions: See ISO 9000 <Quality management systems – Fundamentals and vocabulary>.

Passive fire protection Coating PFP: Systems that prevent constructions from reaching critical temperatures and keep smoke and flames away for a period of time in a fire cell.

In **FROSIO-GuiD-CP** the following definitions also apply:

Topic <Personnel qualification>

- **Qualification:** Demonstrated education, training, professional experience and passed test
- **Examination:** Mechanism that is part of the assessment which measures a candidate's competence by one or more means, such as written, oral, practical and observational, as defined in the certification scheme (acc. to ISO 17024);

Abbreviations

The following terms are abbreviated as follows in the text:

- Corrosion protection: **CP**
- Thermal spraying/ thermal sprayed coating: **TS**
- Coating with organic/inorganic paint material (Paints and varnishes): **CO**
- Powder coating: **PCO**
- Hot-dip galvanising / coating: **HDG**
- Passive fire protection coating **PFP**

1. Area of application

FROSIO-GuiD-CP applies to corrosion protection work through thermal spraying, hot-dip galvanising, organic coatings and duplex systems. It applies to all CP-work in new buildings, renovations and repairs for the preservation or execution of corrosion protection. It also applies to the inspection and testing activities to be carried out.

The specifications contained in **FROSIO-GuiD-CP** can in turn also be applied to structures and components other than those referred to above, e.g. for applications and application areas such as mechanical engineering, pressure equipment, automotive manufacture, rail-vehicle construction, offshore, etc.

FROSIO-GuiD-CP is aimed at companies providing corrosion protection, planners and designers and defines regulations for the planning, execution and monitoring of corrosion protection and repair work.

It supplements the standards ISO 9001, ISO 12944, NORSOK M-501 and other comparable standards and defines the basic principles for quality requirements for corrosion protection process in workshops and on construction sites.

FROSIO-GuiD-CP can be used for the following purposes:

- To demonstrate that the specified product requirements can meet the process quality confirmed by FROSIO,
- To define CP quality requirements in contract negotiations,
- For companies providing corrosion protection wishing to earn the confidence of their client and of other involved parties through recognition from FROSIO (FROSIO-CP certificate),
- For companies providing corrosion protection: For the definition and maintenance of CP quality requirements and application of the CP quality management system,
- For partners including clients, users of products or services of the corrosion protection manufacturer, independent examining bodies, authorities: for the assessment of companies and their implementation of the quality requirements for CP work (processes).

The guideline regulates:

- The definition of quality requirements for CP work, as the quality assurance system according to ISO 9001 does not completely cover this area
- The part of the QM system that refers to the monitoring of the corrosion protection processes.

Legal note: FROSIO-GuiD-CP may only be used by FROSIO-approved audit organisations.

2. Selection of the appropriate quality level for corrosion protection

Selection of the suitable **FROSIO-CP- level**, should be performed taking into account the applicable product standards, specifications, statutory provisions or the contract.

The manufacturer of the corrosion protection should select a FROSIO-CP-level with which the different quality requirements can be defined on the basis of different criteria taking the product into account (including the complexity of production, of the manufactured products and/or of the area of the different coating materials used and/or the determined term of protection, etc.).

A functioning quality management system is an important prerequisite for problem-free production.

The FROSIO-CP levels **<C/ S/ E>**, which serve as the basis for the use and definition of the quality management system for corrosion protection processes, are:

- **FROSIO-CP-C:** Comprehensive quality requirements,
- **FROSIO-CP-S:** Standard quality requirements and
- **FROSIO-CP-E:** Elementary quality requirements for the CP processes.

The criteria listed below can be used for classification by quality level:

- Classification on the basis of the term of protection of the CP and
- Classification on the basis of the complexity of the CP work.

Further information:

(a) Term of protection:

According to the EN ISO 12944 series there are four time spans for describing the term of protection or:

- L < 7 years
- M: 7–15 years
- H: 15 to 25 years
- VH > 25 years

(b) Complexity of the CP work:

With regard to classification on the basis of the complexity (or *versatility*) of the CP processes performed in a company, the following structure can be used:

Complexity 1: Individual CP processes are carried out in the company (only TS, only CO, only PCO, only HDG).

Complexity 2: Different CP processes are carried out in the company (e.g. duplex systems in the form of TS+CO or PCO; HDG+CO or PCO).

Complexity 3:

- Different CP processes or complete production are carried out in the company (e.g. TS and CO or PCO and HDG).
- Application of passive fire protection coatings.

A guide for selection of the quality requirement level according to **FROSIO-Guid-CP** is provided in **Table 1**.

A manufacturer who can demonstrate conformity with a specific quality requirement level is evaluated so as to be able to achieve conformity with all lower levels without further verification.

Table 1: Recommendation for selection of the FROSIO-CP quality requirement level

Versatility of CP processes	Term of protection			
	<u>L</u>	<u>M</u>	<u>H</u>	<u>VH</u>
Complexity 1	E	E	S	C
Complexity 2	E	S	S	C
Complexity 3	S	S	C	C

Key: C: Comprehensive; S: Standard; E: Elementary quality requirements

3. Certification according to FROSIO-GuiD-CP

3.1. General

Companies wishing to execute CP-work in connection with **FROSIO-GuiD-CP** must be certified by **FROSIO** for this purpose.

To initiate the certification procedure, the company must submit a written application (Application for granting of an FROSIO-CP- certificate for the execution of corrosion protection work). The application form is provided together with the necessary documents (including template for FROSIO-CP checklist) and information by FROSIO.

The checklist takes into account the general quality requirements as well as the specified CP processes (including TS, HDG, CO). This must be submitted following self-assessment by the company for the definitive CP processes.

Completing the checklist makes it easier for the company to identify and rectify possible weak points before the certification procedure.

The FROSIO-CP application as well as the checklist with the self-assessment serve as the basis for the audit.

The certification audit determines the extent to which the quality management system was introduced for the execution of processes in the company and the requirements of this guideline are met.

3.2. Requirements for certification

3.2.1. Requirements for companies

Companies must have suitable processes, equipment (including all production facilities and test equipment) and qualified personnel (including operator, process manager, inspector/examiner, etc.) to the extent required for the execution of CP-work.

The detailed requirements for companies can be found in **Appendices 1.1 and 1.2** and in particular **Part 2** of **FROSIO-GuiD-CP**.

3.2.2 Requirements on the QM-system and the documentation

The documentation must contain the following elements:

- Documented management and CP-processes (according to selected quality requirement level);
- Documents, which the company has introduced to ensure the effective planning, execution and control of its processes and for the handling of conformity defects (e.g. process/test/inspection instructions, etc.).

Information and explanations for the **FROSIO-GuiD-CP** documentation requirements can be found in **Appendix 1.3**.

Appendix 1.4 contains QM elements based on ISO 9001, which are to be taken into account during the **FROSIO-CP** certification procedure.

3.3. Certification procedure

The steps of the certification procedure are:

- Advance information to the company (e.g. according to the CP area of activity, support for selection of the certification level) if required by the company;
- Application for granting of an FROSIO-CP-certificate for the execution of corrosion protection work;
- Self-assessment by the company using the FROSIO-CP checklist in preparation of the audit;
- Execution of the audit¹⁾ in the manufacturing company;
- Evaluation of the audit results and certification recommendation by the auditor;
- Certification of the CP-company by FROSIO.

Notes:

The FROSIO-CP certificate applies exclusively to the audited divisions of the company.

- ¹⁾ A CP process audit also takes place as part of the audit. This involves checking all CP-processes during initial and recertification. This check takes place in broad terms in the surveillance audits. For further information, see **Items 3.4** and **3.5**.

3.4. Test steps during initial certification

The following elements are checked as part of the audit:

- Organisation, competence, responsibility, staffing, evidence of qualification, etc.;
- Review of implementation of the quality management system for the execution of CP-work and the related processes;
- Production and test equipment;
- Status of monitoring/inspection/testing (documentation, including internal instructions, results, reports, maintenance of test equipment, etc.);
- Review of CP work documents (including process instructions, work reports, maintenance of CP equipment, etc.);
- Execution of CP-work (in accordance with the required regulations and/or ISO 12944 all parts), including incoming inspection, process planning, surface preparation, used coating materials, CP-processes and process parameters, post-treatment of protective coatings, final inspection and testing, etc.;
- Conducting of a technical expert discussion throughout the entire audit procedure.

Note:

The expert discussion takes place with the process manager (and with his/her representative, if applicable) as well as the personnel performing the work during every audit. The expert discussion serves as verification of the required technical knowledge on the part of the responsible personnel.

The scope of the expert discussion depends on the audit type, the CP level and the CP processes used.

During the audit, all documents required for the interpretation and evaluation of quality assurance and production must be submitted (cf. aforementioned audit steps).

4. Issue and period of validity of the FROSIO-CP certificate

If the company satisfies the requirements described in **FROSIO-GuiD-CP** and the certification audit is successfully completed, **FROSIO** issues the certificate and creates the entry in the FROSIO online register.

4.1. Initial certification

The **period of validity** of initial certification, which has been carried out in accordance with **FROSIO-GuiD-CP**, is 1 year, unless any significant changes occur.

Examples of significant changes include:

- Changes in the production processes;
- Personnel change for the position of process manager;
- Relocation or change of production site;
- Fundamental changes in the requirements of **FROSIO-GuiD-CP**, etc.

4.2. first and second surveillance audit

The surveillance audit is carried out one year after the initial audit.

A new certificate will be issued with the validity of 2 years, unless any significant changes according to 4.1 occur.

In the surveillance audit, the previously specified requirements as well as the CP process audit are checked in broad terms.

The second surveillance audit is carried out two years after the first surveillance audit.

4.3. Recertification

Every 3 years, a recertification is carried out. The scope and procedure for recertification correspond to those of initial certification (see **Items 4.1. and 4.2.**).

4.4. Renewal and revocation of the certificate

At least three months before the validity of the certificate expires, renewal of the certification (if required) must be applied at FROSIO.

FROSIO must be informed immediately of any significant changes so that it can be checked whether the certification requirements are still met.

During the period without auditing, a written questionnaire is sent out to verify compliance with the fundamental principles of certification.

The **FROSIO- CP certificate** is **invalid** if:

The fundamental principles of certification like changes in production processes, personnel, etc. are no longer satisfied.

Appendix A

Comparative overview of quality requirements for corrosion protection work acc. to FROSIO-GuiD-CP

No.	Element acc. to FROSIO-GuiD-CP – Part 2	FROSIO-CP-C	FROSIO-CP-S	FROSIO-CP-E
1.	Contract review	The manufacturer should review the contractual requirements and all other requirements with the technical data provided by the customer or with the in-house data if the components are produced by the manufacturer. It should be ensured that all information required for execution of the production process is available before work starts. The manufacturer should review and document feasibility, taking into account the options available. Before acceptance of the contract, the manufacturer should ensure that they meet all requirements and can ensure reasonable planning of all work steps for quality assurance. The review of contractual requirements includes technical and scheduling feasibility. It should be ensured that all possible deviations between the contract and offer are documented, and all changes communicated to the customer. The contractual requirements to be taken into account should also include: - The product standards to be applied, together with any additional requirements; - Statutory requirements; - Any additional requirements from the manufacturer; - The ability of the manufacturer to meet the prescribed requirements.		
		The examination of the requirements should be documented.	The examination of the requirements can be documented.	Documentation is not necessary.

2.	Design review	The technical and design requirements to be taken into account should include the following: a. Specifications for the product base metal and its properties: The product base metals should conform to the permitted steel grade (according to the regulations for load bearing steel structures); In the case of hot-dip galvanised load bearing steel parts, additional national regulations (e.g. DAST- 022) must be observed with reference to the material, residual stress condition, etc.; b. Specification of requirements concerning the expected term of protection (depending on the corrosion stress or corrosivity category); c. Specification of the protective coatings and CP- methods depending on the expected term of protection and coating properties, for example; quality and acceptance test requirements for CP- end products, etc. d. Position, accessibility and sequence of all corrosion protection work; specification concerning CP-compliant design and manufacture (see ISO 12944-3); e. Details of CP- methods, accessibility and attainability (see ISO 12944-3); f. Preparation and pre-treatment of products. Component dimensions, component weight, the lifting and transport capacities, the storage options, etc. must essentially be considered here; g. Surface condition of the finished product; h. Subcontracting; i. Ambient conditions that are significant for the CP-work in the workshop and/or on the construction site; j. Incoming test and final test of the products; k. Monitoring and testing during CP-work; l. Handling in the event of non-conformity, rework and repair options; m. Qualification and approval of personnel (e.g. operator, CP process manager, examiner/inspector); n. Method used for approval of corrosion protection methods; o. Regulations regarding CP- methods, non-destructive and destructive testing, heat and post-treatment methods, etc. p. Specification of the type of marking and traceability; q. Type of quality control; r. Other technical requirements for corrosion protection processes, if applicable.		
		The examination of the requirements should be documented.	The examination of the requirements can be documented.	Documentation is not necessary.

3.	Sub-supplier/subcontract	If a manufacturer intends to subcontract, they should provide the sub-supplier with all regulations and requirements (including specifications for contract and design review) to be taken into account. If CP-specific processes (e.g. part of CP-work, post-treatment, post-processing) are to be subcontracted, the proficiency of the sub-supplier must be determined before the awarding of the contract by the manufacturer. The requirements of FROSIO-Guid-CP should be taken into account. The subcontractor should work on behalf of and under the responsibility of the manufacturer and meet the specified requirements of the manufacturer. The manufacturer should ensure that the sub-supplier can meet all intended quality and work requirements in the contract. If the subcontractor has a Frosio-Guid-CP certification, conformity can be assumed.
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4.	Qualified personnel for corrosion protection work – Operator	If CP is to be executed by the manufacturer, sufficient and competent personnel should be available for the execution of corrosion protection work in accordance with the prescribed requirements. CP- work should be carried out by specially trained personnel. The qualification should primarily take place internally under the following conditions: • The requirements for content and duration should be the same as those for the corresponding procedures below. • A written description of the training and examination should be provided. • Personnel for testing and training must be named. • Qualification for the examiners must be appropriate. • Practical tests should be documented with pictures, which should be presented at each audit. Surface preparation: The qualification should include a theoretical and a practical training component. The time required for the training should be based on the state of the art. A practical examination should be carried out at the end. Painter: Painter should be qualified in accordance with the Frosio guideline for painters or equivalent. Powder coater: Powder coaters should be qualified based on recognized industry standards. Thermal sprayer: Qualification of thermal sprayer should be carried out according to ISO 14918. Hot-dip galvaniser: A recognised profession or a comparable qualification in this field of application is required as a qualification for the hot-dip galvaniser. The qualification mentioned above can also be provided by a body independent of the manufacturer instead of internally.
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5.	Qualified personnel for corrosion protection work – Process manager	The manufacturer should have qualified personnel for the supervision of all CP-work. The process manager (CP-supervisor) should be able to coordinate all activities associated with corrosion protection and is responsible for planning, execution, coordination, monitoring and inspection. The process manager should have appropriate technical knowledge for all the processes in his area of responsibility. This should be verified through corresponding qualification and training measures. The process manager should have sufficient authorisation to be able to initiate all required actions. The obligations, duties and limits of the areas of responsibility should be clearly defined by management. If this activity is performed by several persons, the duties, responsibility and activities should be defined and assigned for each person. A representative should be appointed. The requirement for the process manager is valid certification according to FROSIO Level II, AMPP Level II or equivalent certification. In addition, the process manager should have qualification (depending on the existing CP-Processes in the company) for: • Surface preparation. • Coating with organic/ inorganic paint material (CO). • Established technical rules for handling powder coatings (PCO). • Application of passive fire protection coating (PFP) in accordance with the applicable national or international regulations if applicable. • Hot-dip galvanising (HDG). • Thermal spraying (TS): The process manager or another person designated by the organisation should be responsible for the process according to ISO 12690.
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6.	Personnel for quality inspections	The manufacturer should have sufficient and qualified personnel (inspector, examiner) for the monitoring and examination of CP-production processes in accordance with the specified requirements. Quality inspections should be carried out by specially trained personnel. The personnel should be approved through suitable testing and the corresponding evidence should be available. The quality inspector should have sufficient authorisation to be able to initiate all required actions. The obligations, duties and limits of the areas of responsibility should be clearly defined by the process manager. If this activity is performed by several persons, the duties, responsibility and activities should be defined and assigned for each person. The quality inspector can be supported in his activity by a qualified examiner (e.g. assistant inspector). Responsibility remains with the quality inspector. The personnel for quality inspections should be able to demonstrate satisfactory vision. Satisfactory vision means that the individual should have a vision as follows: - Near vision acuity should permit reading a minimum of Jaeger number 1 or Times Roman N4.5 or equivalent letters at not less than 30 cm with one or both eyes, either corrected or uncorrected. - A color vision and/or grey scale perception should be sufficient for the individual to be able to distinguish and differentiate between the colors and shade of grey used on the actual components. This evidence must be renewed annually. The examiner for non-destructive material testing must at least have the following qualification: The requirement for non-destructive material testing is valid certification according to Level 2 of ISO 9712 for the procedure used (e.g. MT tests after HDG). The qualification for the specified CP-level should be as followed:		
		FROSIO Level III, AMPP Level III or equivalent certification	FROSIO Level II, AMPP Level II or equivalent certification	FROSIO Level II, AMPP Level II or equivalent certification

7.	Production and test equipment	The equipment should be suitable for the intended purpose. The following equipment should be available for specific processes, if required: Workshops, normally covered; • Storage capacities for the proper storage of the products to be machined, the coating materials, the additives and other auxiliary materials for corrosion protection work; • Equipment and machines for preparing and handling the components for corrosion protection work; • Equipment for specific processes or CP-work, including equipment for supply, adjustment, control (e.g. power sources, gas, fuel and water supply, gas flow meters, PC, control units, thermocouples, temperature control unit, oil control unit); • Equipment for the thermal treatment of components, e.g. for preheating, for heat treatment (if applicable); • Cranes, transport facilities and handling systems, frames, traverses and auxiliary devices (e.g. spray bank, turntables, robot systems, linear drives, lifting platforms); • Extraction system, dust filters, protection against noise, radiation (e.g. sound-proofed chamber, spray chamber), enclosures (e.g. pickling plant enclosure, zinc bath enclosure); • Cooling systems (if applicable). • Machines, tools, devices for the post-treatment of the components to be processed (e.g. grinding, turning, sealing, water bath); • Equipment and materials for tests (destructive and non-destructive tests); • For CP-work on construction sites, suitable conditions must be provided. Examples of production equipment 7.2.1. Coatings with organic/inorganic paint material (CO) • Equipment for surface preparation with hand tools and/or power tools (grinding), equipment for degreasing and pickling, blast chamber, blast system, etc. • Equipment for coating by, brush, roller, airless spraying, compressed air spraying, etc., mixing equipment for PFP, as required 7.2.2. Powder coating (PCO) • Equipment for surface preparation with hand tools and/or power tools (grinding), equipment for degreasing and pickling, blast chamber, blast system, etc. • Spraying system, equipment for baking powder coating. 7.2.3. Thermal spraying (TS) • Equipment for surface preparation with hand tools and/or power tools (grinding), equipment for degreasing and pickling, blast chamber, blast system, etc. • Spraying system, torch, gun, etc. 7.2.4. Hot-dip galvanising (HDG) • Equipment such as pre-treatment baths for degreasing, pickling, (hot water) flushing, fluxing (flux bath), blast system (if required), drying oven, etc. • Galvanising bath, galvanising oven with suitable heating systems (depending on type), etc.
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8.	Equipment maintenance	The manufacturer should have documented plans for maintenance of the equipment. The equipment should have operating and maintenance instructions and must be installed so that the procedures cannot be impaired by other systems or ambient conditions. The maintenance plan (service plan) should include maintenance checks for checking the parameters of the respective process instructions. The maintenance plans can be limited to the equipment components that are necessary for ensuring component and structure quality. Defective equipment should not be used. It should be possible to monitor the parameters set for the corrosion protection processes by means of instruments. Examples for the inspection and maintenance of equipment: • Condition of guideways for fastenings for mechanised processes; • Condition of flow meters, pressure gauges, ammeters, voltmeters; • Condition of hoses, connecting elements, connections, lines; • Condition of heating systems, thermocouples and thermometers; • Condition of monitoring of mechanised and/or automated systems (e.g. spraying system, blast system, control units, galvanising and drying ovens), etc. The necessary equipment for occupational safety and environmental protection should be available and used.		
		Maintenance should be documented.	Maintenance can be documented.	Maintenance can be documented.
9.	Description of items of equipment	The manufacturer should have a list of the equipment that is used for the CP-work. The list should contain details of the important equipment used for production, which are essential for determining the capacity and suitability of production areas. It should contain, where applicable: • Capacity of transport options through cranes, traverses, lifting platforms, etc.; • Capacity and dimensions of pre-treatment baths, galvanising baths (HDG), etc.; • Capacity of equipment (for blasting, spraying, etc.); • Dimensions and maximum temperatures of ovens (e.g. drying oven, oven for heat treatment); • Maximum dimensions and weights of components and structures that can be machined. The systems should have operating and maintenance instructions.		
		Description should be documented.	Description can be documented.	Documentation is not necessary.

10.	Production plan	The manufacturer should execute a suitable documented production plan, which is adapted for the equipment or production site. The CP- work should be carried out according to the corresponding process or work instructions, stating all essential process parameters, coating materials and auxiliary materials as well as constraints and scopes. These documents should be released by the responsible process manager after an appropriate check and should be available at the respective workplace. A production plan should contain at least the specified process and production sequence, including testing time points, taking into account: • The individual processes for production or coating of the components; • The environmental influences during CP-work (workshops); • Monitoring and test activities, if applicable including the involvement of an independent examining body where specified; • The appointment of personnel for corrosion protection work; • The type of traceability of parts and part groups, etc.; • The type of traceability of coating materials, taking into account different coating systems and batches, etc.		
		Documentation should be done.	Documentation can be done.	Documentation is not necessary.
11.	Documented instructions for corrosion protection processes	The manufacturer should have documented instructions for all CP-processes such as surface preparation, CP-methods, post-treatment, including monitoring and testing activities, and ensure that these are used correctly in production. The documented instructions should, if applicable, at least contain the following: General information: application and/or processing area, base metal (including rust grade, edge and joint preparation, areas to be covered), construction class, handling of temporary intermediate storage points/attachment points, qualification of operators, etc.; • General preparation: e.g. equipment, auxiliary materials, component requirements (base metal designation, dimensions), preparation of coating materials; • Surface preparation: preparation type (blasting, degreasing, pickling, fluxing, etc.), ambient conditions and surface condition (roughness, purity, etc.); • Coating (CO, PCO, TS, HDG, PFP): coating type, ambient conditions, setting parameters/machine settings (current, voltage, control parameters, pressure of gases/consumption, nozzle diameter, heating values, etc.), requirements for the molten zinc or the chemical composition of the zinc bath, etc.; • Post-treatment: e.g. sealing, drying/curing, handling of required repairs, baking etc.; • Packaging and transport: required safety precautions, marking of components; • Other information: e.g. logging of work and test procedures to be used.		
		Processes should be documented.	Processes can be documented.	Documentation is not necessary.

12.	Qualification of corrosion protection processes	Qualification of the corrosion protection processes is required. This qualification should cover new products as well as repairs and maintenance. Qualification of the corrosion protection processes should prove that the information/requirement in the procedures/ instructions lead to the expected results. The corrosion protection processes should be qualified before the start of production. The qualification method should match the required specifications. Qualification should be documented.		
		Qualification should be done.	Qualification should be done.	Qualification can be done.
13.	Control of documents and quality records	The manufacturer should define and maintain procedures for creating and monitoring the quality-related documents. Examples of documents to be controlled: • Documented instructions for the specific processes and allied processes including testing and monitoring; • Work/test reports (accompanying form in which all steps, data and measured values must be entered during CP-work); • Evidence of qualification (operator, process manager, inspector, etc.); • Records, e.g. data sheets, material certificates, etc.; • Customer documents, etc.		
		Documentation should be done.	Documentation should be done.	Documentation can be done.

14.	Procurement, supply, inspection, storage and handling of materials used	General aspects An important task for the manufacturer and/or the responsible manager for CP-technology is selection of the suitable corrosion protection coating for the application. Responsibility and procedures, which are used to check the spray material used, should be defined by the CP-manufacturer. Only coating materials that have technical data sheets of the substance manufacturer should be used. These should contain all details required for correct use of the substances. Additional requirements can be imposed by the customer. The data sheets should be available for all coating materials at the respective place of performance (plant, construction site). Notes: Coating with organic/inorganic paint material (CO): Examples of coating materials and coating types are listed in ISO 12944-5 according to the corrosivity category. The permitted coating materials and coating types must be considered: trade name and designation of the coating material according to national/international regulations including sheet no., material no. or certificate of conformity of substances, if required. Coating with powder coatings (PCO): Systems should be in accordance with customers' requirements and in accordance with the applicable national regulations. Examples for coating systems and assessment are given in e.g. DIN 55633. Coating with passive fire protection coating (PFP): Systems should be in accordance with customers' requirements and in accordance with the applicable national regulations. Thermal spraying (TS) The spray materials are standardised. ISO 2063-1 applies. Hot-dip galvanising (HDG) The requirements for the zinc bath or permitted zinc bath composition are described ISO 1461. Furthermore, the national/international regulations should be considered, if required. 14.2. Processing instructions Some coating materials require additional processing instructions. These can describe the mixture ratios, temperature conditions and other requirements for a functioning application. These processing instructions should be available for all coating materials at the respective place of performance (plant, construction site). Note: Equipment for correct mixing and processing must be available (e.g. suitable mixers, measuring devices, scales, etc.).
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		14.3. Storage and handling of coating materials used The quality-compatible storage, handling and use of coating materials should be regulated in a documented instruction. The manufacturer should organise all required measures for protecting the coating materials (such as coating materials, solvents, thinners, flux, etc.). Protection is understood as all measures that prevent harmful mechanical, chemical or climatic effects. Opened products should be stored and marked in agreement with the manufacturer. Climatic data for the storage facilities must be documented. The minimum scope of the documentation is the relative humidity and the ambient temperature. 14.4. Storage and handling of base materials used The base materials should be stored in such a way that there is no adverse effect on the products supplied by the customer. This applies from the time of goods acceptance to the finished product. Marking of products supplied by customers should be retained during storage to delivery.		
		Processes should be documented.	Processes should be documented.	Processes can be documented.

15.	Monitoring and testing before, during and after corrosion protection work	General aspects Product-based measurements and tests make it possible to compare the target/actual state. The test is used to determine whether all quality requirements are met and includes: • Test planning; • Test order; • Test execution with the corresponding test records and test data acquisition; • Test data evaluation. Monitoring and testing should be scheduled at suitable time points during the manufacturing process to ensure conformity with the requirements of the contract. The location and frequency of monitoring/ testing depend on the requirements in the contract or the usage standard. The manufacturer should define process instructions for monitoring and testing (e.g. incoming test, inspection activities, test instructions etc.). The test instructions should describe the test processes, test procedures and the checking of test equipment at operational level and define the responsibilities. 15.2. Tests before starting corrosion protection work a) Incoming inspection of supplied materials All incoming materials, products, semi-finished products, etc. should undergo documented testing before the start of the CP-processes. Conformity of the type, quantity and condition of the supplied goods with the order specifications should be documented. The following should be checked, if required, before the start of CP-work: • Type, marking, condition (e.g. damage, defects, preparation grades according to ISO 8501-3) of the components to be coated; • Type, marking, condition of the coating materials, work materials and auxiliary materials, etc. b) Processes, process conditions and personnel All CP-processes to be used, process conditions as well as the intended personnel should be suitable. The following should be checked and documented or determined before the start of CP-work: • Suitability and validity of personnel qualification; • Suitability of process instructions; • Work card (with the requirements on product such as dimensions, tolerances, etc.) with suitable CP-work report; • Coating materials to be used (including number and type of protective coatings, suitability and validity of zinc batch composition check. etc.); • Suitability of work and ambient conditions; • Time sequence and order of CP-work (e.g. surface preparation and coating sequence, etc.); • Time sequence and order of inspection and testing activities, type and scope of tests can be specified in a test plan; • Handling of component contact surfaces during the application. The following must be considered: Component supports, bearings and their correct subsequent coating; • Handling of damage and repairs; • Any other requirements in the process instructions for the CP-work (e.g. avoiding distortion and cracking, specification regarding welding work before/after CP-work, etc.).
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		15.3 Tests and checks during corrosion protection work Defects and deviations from the target state should be detected as early as possible through tests during CP-work. The intermediate tests/ checks should take place in every production stage that the product goes through. The test results should be documented in the work reports or test reports. • The following should be checked, if specified, during CP-work: • The essential CP-process parameters (e.g. current values, voltage values, injection speed, temperature values, nozzle diameter, pressures/gas pressures etc.); • The ambient conditions; • The correct use and handling of the coating materials used; • The surfaces before and during coating; • The carrying out of repairs (if required), etc. 15.4 Tests after execution of corrosion protection work The final test of the coated components and products should ensure that the product meets all defined specifications at the time of transfer to the customer. After production, all machined components and products should undergo a visual and metrological test. After the CP- work, conformity of execution with the definitive acceptance test criteria should be documented. The following assessments are taken into consideration: • Visual evaluation (surface quality or uniformity, colour, covering power, defects etc.); • Other non-destructive testing (including measurement of the coating thickness, MT tests, e.g. for HDG, etc.); • Destructive testing, if required (e.g. x-cut, cross-cut, pull-off, etc.); • Form, shape and dimensions of products, if required; • Results of pre-treatment and post-treatment (if applicable). In the event of non-conformity (e.g. spalling, flaking or other impermissible signs such as blowholes, cracks, etc.), the process manager should be informed and must initiate suitable measures (see also Section 17: Non-conformity and corrective action).		
		Processes should be documented.	Processes should be documented.	Processes can be documented.
16.	Status of monitoring and testing	The status of the production and test steps should be documented and identifiable for each individual component where necessary and appropriate. The auxiliary materials for documentation can be markings, accompanying documents (work card, report) and test records.		
		Processes should be documented.	Processes should be documented.	Processes can be documented.

17.	Non-conformity and corrective action	The basic procedure for non-conformity including complaints and their corrective action should be defined in writing. When a nonconformity occurs, including any arising from complaints, the organization should as far as applicable and reasonable: • react to the nonconformity and, as applicable: - o take action to control and correct it; - o deal with the consequences; • evaluate the need for action to eliminate the cause(s) of the nonconformity, in order that it does not recur or occur elsewhere, by: - o reviewing and analysing the nonconformity; - o determining the causes of the nonconformity; - o determining if similar nonconformities exist, or could potentially occur; • implement any action needed; • review the effectiveness of any corrective action taken; • update risks and opportunities determined during planning, if necessary; • make changes to the quality management system, if necessary. Corrective actions should be appropriate to the effects of the nonconformities encountered.		
		Should be reported.	Should be reported.	Can be reported.
18.	Calibration and validation of monitoring and test equipment	The manufacturer is responsible for suitable calibration and validation of the measuring/ testing and monitoring equipment. The manufacturer should define the procedure for monitoring the test equipment in a process instruction. This should regulate the marking, handling, storage and regular calibration. The results of calibration and maintenance of the monitoring and test equipment must be recorded and stored. Calibration should comply with the requirements of ISO/IEC 17025 as far as technically possible and reasonable. The calibration certificates should contain information on measurement uncertainty if technically feasible.		
		Calibration should be reported.	Calibration should be reported.	Documentation not necessary.

19.	Marking and traceability	The marking and traceability should be retained throughout the entire production process. The documentation systems that ensure the marking and traceability of coating materials should, if required, contain: • Production plans, specifications, accompanying work documents (including work card, process instruction, test reports, etc.); • Information on base metal; • Coating materials used (e.g. manufacturer, designation, type, batch, chemical composition); • CP-methods used, verification of personnel performing the work; • Position and type of coatings on the components; • Procedures for non-destructive testing and verification of test personnel, etc.		
		Should be reported.	Can be reported.	Documentation not necessary.

20.	Quality reports	Quality records as well as operating data are used to verify functioning in-house production control and are part of the quality management process. The quality records should, if applicable, contain: • Report on the review of requirements and technical inspection; • Verification of the base metals; • Certificates, technical data sheets for the coating materials used; • Reports on the approval of process instructions or specifications for the execution of CP-work; • Evidence of qualification of personnel (operator, process manager, personnel for quality inspections); • Measurement and test reports, reports on destructive/non-destructive tests and monitoring; • Traceability of all measuring devices like DFT gauges, probes, shims, comparators etc. • Reports on repairs; • Daily log, other documents, if required.		
		Should be reported.	Should be reported.	Can be reported.
21.	Occupational safety and environmental protection	To avoid a possible risk to persons and the environment as a result of CP-processes, specific safety precautions should be taken. Safety precautions can include: • Measures to prevent the process-related generation and transmission of noise (due to mechanical processing, transport, during TS procedures), radiation such as glare, thermal radiation and UV radiation; • Measures to prevent substances that are injurious to health such as air-polluting, toxic and carcinogenic substances; • Measures to prevent harmful gases, fumes, dusts, vapours that are produced as a result of processes; • Measures for protection in the workplace, protection against fire and explosion hazard, protection against mechanical, electrical, thermal hazards, protection of water, etc.; • Use of personal protective equipment (body, skin, eye, hearing, respiratory protection, etc.); • Measures for the recycling and disposal of waste and residues. Note: The employees who are involved in CP-work should undergo health preventive check-ups in order to be able to identify and prevent adverse health effects at an early stage. All necessary measures for compliance with national health and safety regulations and emissions directives should be taken.		

Appendix B

Documentation requirements acc. to FROSIO-Guid-CP Example for FROSIO-CP-level C

(Informative)

- o **Introduction, company profile, management responsibility**
 - Examination of requirements
 - Technical inspection
 - Control of documents and data
 - Control of supplied products
 - Subcontracting/purchasing
 - Process control
 - Marking and traceability of products
 - Testing and test status
 - Monitoring of inspection/test equipment
 - Control of defective products/non-conformity
 - Corrective and preventive action
 - Transport, storage, preservation
 - Training
 - QM
- o **Performance of work**
 - Production preparation
 - Corrosion protection processes, pre- and post-processing
 - Initial, intermediate and final test
- o **Accompanying documentation**
 - Description of systems
 - Maintenance plans
 - Procedure
 - CP work instructions
 - Process instructions/process parameters
 - Work card/report
 - Test instructions
 - Test reports
 - Calibration planning
 - Calibration report
 - Post-processing instructions
 - Post-processing report
 - Coating materials data sheets
 - Processing instructions
 - Qualification reports
 - Quality reports
 - Release report
 - Report on non-conformity