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## Electrodeposited Coatings of Zinc with Passivation on Steel

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### **1 SCOPE AND FIELD OF APPLICATION**


This standard describes electro-deposited zinc coatings on iron and steel parts with an additional passivation in order to retard the formation of corrosion products on the surface. It does not yet cover the corrosion protection of nuts and bolts.

The common use of this standard is important for:

- Technology offices for the selection of coating parameters and indication on drawings
- Supply management and purchasing offices for the first ordering of parts from suppliers
- Coating suppliers for the implementation of all posted requirements
- Quality offices for checking incoming goods.

The main standard referred to in this document is **EN 12329**. Equivalent information can be found distributed in the international standards ISO 2081 and ISO 4520. This ABB standard gives a more detailed definition of coating thickness in dependence of the application, control and acceptance tests and the designations to be included in drawings.

**EN 12329** is specifically intended for a chromate conversion treatment with hexavalent Chromium. Until the standard is modified, it is used here to describe a treatment free of hexavalent Chromium. The classification **/C** or **/D** as defined in EN 12329 is used here to indicate the relevant corrosion protection resistance of a surface containing trivalent chromium.

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## 2 NORMATIVE REFERENCES


This standard has been derived from an instruction existing for Low and Medium Voltage Power Products under the numbers RH 0387002 and 1VC 601189. It references the following international standards:

- EN 12329** *Corrosion protection of metals – Electrodeposited coatings of Zinc with supplementary treatment on Iron and steel.*
- ISO 2081** *Metallic coatings – Electrodeposited coatings of Zinc on iron or steel*
- ISO 2178** *Non-magnetic coatings on magnetic substrates– Measurement of coating thickness – Magnetic method*
- ISO 3497** *Metallic coatings – Measurement of coating thickness – X-ray spectrometric methods*
- ISO 4520** *Chromate conversion coatings on electroplated Zinc and Cadmium coatings*
- ISO 9227** *Corrosion tests in artificial atmosphere – Salt spray tests*
- ISO 4519** *Electrodeposited metallic coatings and related finishes: - Sampling procedures for inspection by attributes.*

## 3 TERMS AND DEFINITIONS

For the purpose of this document the following definitions are used:

- **Passivation:** The protection of the Zinc coating by a sheath containing chromium compounds, but no hexavalent chromium.
- **White rust:** The occurrence of zinc corrosion on the surface in a salt spray test.
- **Red rust:** The occurrence of iron corrosion on the surface in a salt spray test
- **Static process (ST):** Electro-plating with parts fixed on a rack, which is dipped into the coating bath.
- **Rotary-drum process (RT):** Electro-plating with parts contained in a drum rotating in the coating bath
- **Minimum thickness:** Lowest minimum thickness of coating allowed
- **Upgrade thickness:** Recommended thickness fit to a certain application

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## 4 ELECTRO-DEPOSITED COATINGS OF ZINC WITH PASSIVATION ON STEEL


### 4.1 General requirements

- a. The coatings of this class assure good protection against corrosion in indoor environments under occasional condensation and in outdoor environments under moderate conditions in accordance with **EN 12329**. The deposit consists of an electro-deposited zinc coating passivated with a conversion coating based on trivalent chromium compounds.
- b. The zinc coating shall comply with **EN 12329**. It must not contain any cadmium.
- c. The base material must be free of surface oxide layers, oils or greases which jeopardise the normal deposition.
- d. The passivation coating shall be carried out using products based on trivalent chromium compounds, free from hexavalent chromium. The products and the treatment parameters have to be chosen such as to guarantee resistance to white and red rust corrosion as specified below.
- e. Because of the known sensitivity of the passivating process using trivalent chromium, the coater needs to check the PH value and concentration of iron and zinc ions in the baths periodically and to recondition the baths according to the instructions of the supplier of chromates. Documentation has to be provided on request.
- f. The finish shall be iridescent silver or light yellow in colour.
- g. No organic or organic-metallic sealings must be applied on top of the passivation coating. Other sealings, which do not reduce the surface conductivity, may be applied in order to achieve higher corrosion resistance.
- h. The coated parts shall be free from clearly visible plating defects such as blisters, pits, roughness, cracks and unplated areas. Where a contact mark is unavoidable, its position shall be agreed on by ABB.
- i. Surface defects due to chemicals leaking out of holes and narrow gaps have to be agreed on by ABB.
- j. Any rework of the surface has to be agreed on by ABB.
- k. The optimum coating process i.e. static (ST) or rotary-drum (RT) is selected by the coater, if not specifically indicated on drawings. When selecting RT, some surface damage and a reduced white rust corrosion time has to be anticipated in accordance with **EN 12329**.
- l. Thickness and adherence shall be checked using one of the measures described below in accordance with ISO 4519. Documentation has to be provided on request.

### 4.2 Specific characteristics

<p><b>BASE MATERIAL</b> Steel and ferrous materials with the exception of fasteners and springs</p>
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MINIMUM THICKNESS	INDICATION ON DRAWINGS	UPGRADE THICKNESS
8 µm	Fe / Zn x / C or / D acc. to this ABB standard	12 µm
Fe / Zn 8 / C recommended for indoor conditions under occasional condensation	Fe indicates the base material Zn indicates the zinc coating x indicates the thickness in µm C or D is the protection class acc. to EN 12329 (RT) or (ST) is only added, if required	Fe / Zn 12 / D recommended for moderate outdoor conditions. Note: for severe outdoor climates Fe / Zn 25 / D might be appropriate

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### 4.3 Control methods

<b>THICKNESS:</b>	<b>ADHERENCE:</b>	<b>PASSIVATION RESISTANCE:</b>
<p><b>Acc. to ISO 2178</b> Magnetic method</p> <p><b>Acc. to ISO 3497</b> Spectrometric x-ray method β-scope is also allowed</p> <p>The mean thickness must not be less than <math>x + 4 \mu\text{m}</math> and the individual thickness not less than <math>x \mu\text{m}</math> measured on 6 points on a sample for every batch</p>	<p><b>Acc. to ISO 2081 cl. 10.2</b> Burnishing test (Rub an area not exceeding 6 cm<sup>2</sup> for 15 seconds with a steel rod of Ø 6 mm with a smooth hemisphere).</p> <p><b>On request:</b> Thermal test of the Zn coating with 210°C for 2h and subsequent cooling in water.</p>	<p><b>Acc. to ISO 9227 (DIN 50021)</b> Salt-spray test. Procedures and concentrations as described.</p> <p><b>Fe / Zn8/C:</b> 96 h till white rust appearance 192 h till red rust appearance</p> <p><b>Fe / Zn12/D:</b> 120 h till white rust appearance 360 h till red rust appearance</p>

## 5 REVISION HISTORY

Rev.ind	Page(P) Chapt.(C)	Description	Date / Responsible
-	ALL	Release of standard	2007-10-02/ E.Dullni
A	Page 3, 4	Introduction of comments from SCB	2007-12-14/ E.Dullni