



ZG 240

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Technical Approval (ZG) of OFI CERT

Zinc coatings on steel applied by hot-dip galvanization with additional coatings – Batch galvanized, coated hollow bars

General requirements and tests
for the label OFI CERT

Allgemeine Anforderungen und Prüfungen
für die Zuerkennung des Zeichens OFI CERT

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This technical specification is constantly reviewed by OFI CERT and its' stakeholders.
Written remarks and improvements are appreciated

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1 Scope

This Technical Approval (ZG) applies to zinc coatings applied onto rock bolts, soil nails and micropiles by hot-dip galvanization of steel (batch galvanizing) with an additional top coat based on epoxy resin.

Hollow bars are construction elements used e.g. in mining and tunnelling to keep underground cavities open. They are installed into the surrounding medium (rock) and consist of an anchor head and a load-bearing element (bar, hollow bar or cable) extended using couplers and anchored within the rock mass using mechanical anchorages or grout. Additional application fields for these products are slope stabilizations and micropiles e.g. for foundations.

This Technical Approval (ZG) specifies quality requirements for batch galvanizing with additional top coating of hollow bars that enhance the corrosion resistance of the products and thus their service life.

2 Requirements for the base products

The control measures listed in Table 1 shall be carried out on the base products and recorded. In addition, the storage and transport conditions specified in Table 1 shall be complied with.

Table 1: Controls to be carried out on the base products, storage and transport

	Control measures	Control frequencies
Tubes	Control of inspection certificate to ensure that the specifications defined in the QM system are met	Each delivery
Thread rolling	Tensile testing of rolled parts	3x per batch (for the CE scope)
Storage	Roof covered storage providing protection from the elements	100 %
Transport	Transport to galvanizer or coater in bundles	100 %

3 Requirements for batch galvanization

For batch galvanization at the hot-dip galvanizing factory the control measures listed in Table 2 shall be carried out and recorded.

Table 2: Requirements and control frequencies for batch galvanizing

	Control measures	Control frequencies
Delivery	Control of galvanizing capacity by visual inspection	Each delivery
Galvanized coating	Measurement to ensure the galvanized coating thickness of > 85 µm	At least 10 individual measurements per delivery with determination of mean value / minimum / maximum / standard deviation and number of measurements
	Control of connecting elements as to the smooth running of the thread parts (screw-in test with nut on anchor end, 100 mm)	100 % control per delivery
Inspection certificate	Galvanizing was carried out according to EN ISO 1461	Per delivery one inspection certificate according to ISO 10474. Enclosed with the inspection certificate shall be the records on the visual inspection of the galvanizing ability, on the galvanized coating thickness and on the control of the connecting elements regarding the smooth running of the thread parts.

4 Requirements for the coating

The control measures listed in Table 3 shall be carried out on the coating (primer and top coating) and recorded.

Table 3: Coating requirements and control frequencies

	Control measures	Control frequencies
Storage conditions	Control regarding the appropriate storage as specified by the coating material manufacturer and control of expiry date	1x daily
Documents	Control of the up-to-datedness of the coating materials' technical data sheets (TDS) Control of the up-to-datedness of the material safety data sheets (MSDS) TDS and MSDS of the coating materials shall be available in writing at the coater's	1x per year
Substrate preparation	Temperature of the ammoniacal wetting solution lies between 20 °C and 35 ° C	2x per shift
	Minimum wetting agent consumption meets the specifications defined in the QM system (70 to 100) g/m ² with a dwell time of approx. 5 minutes	2x per shift
	Control with magnifying glass whether the areas / components to be coated have been completely mechanically prepared using a brush	1x per bundle
	Control of the cleanliness of the substrate (immediately prior to the application of the primer) by wipe test: During the wipe test only a slight greying typical of zinc-according to the specifications defined in the work instructions is permissible	3x per bundle
Coating and drying conditions	Control of air temperature	3 times per day per coating job
	Control of relative humidity	
	Control of dew point	
	Control of object temperature = anchor (min. 3° C above dew point)	
Primer and top coating	Documentation of the packaging units with the batch numbers of primer and top coating	Per packaging unit of primer and top coating
	Control of the wet layer thickness of the primer (required: 150 µm to 160 µm wet)	4x per shift

	Control measures	Control frequencies
Primer and top coating	Control intermediate drying: > 8 h at room temperature according to the specifications of the coating manufacturer	100 %
	Control of the wet layer thickness of the top coating (required: 140 µm to 150µ m)	4x per shift
	Control of the smooth running of the thread parts (screw-in test with plastic nut on anchor end, 100 mm)	2 bars per order
	Control of end hardening: at least 24 hours before packing	100 %
Application	Wearing of gloves after the mechanical surface preparation until top coating	100 %
	Appropriate PPE must be available	100 %
Packaging	Control of bundling and presence of padding between the anchor bars	100 %

5 Assessment of conformity / Quality assurance

5.1 General

Quality assurance comprises initial type testing (section 5.2) and quality control, including factory production control and external monitoring (sections 5.3 and 5.4)

5.2 Initial type testing

Data sheets shall be available for each coating system to be certified and one sample of each shall be tested according to Table 4.

In addition, a certification contract shall be entered into between the manufacturer and the certification body as well as the testing and inspection body, regulating external monitoring.

5.3 Factory production control

The scope and frequency of factory production control to be carried out by the manufacturer resp. his supplier shall be such that a consistent, high quality of the certified products is ensured so that the requirements in Table 1 to Table 3 of this Technical Approval (ZG) are met.

The tests to be carried out within the scope of factory production control shall be specified in appropriate test plans. The test results shall be recorded and be kept available for at least 10 years.

In particular, the manufacturer resp. his supplier shall have available the technical equipment, appropriately qualified personnel as well as the devices resp. testing equipment required for factory production control. The testing equipment shall be maintained and calibrated at regular intervals to ensure the correctness of the determined test results.

The observance of the factory production control measures as well as the functionality of the equipment required for carrying out these measures shall be tested in the course of the annual EN ISO 9001 audit and be confirmed accordingly by the certification body.

5.4 External monitoring

On the basis of the concluded certification contract (section 5.2), an unannounced external monitoring at the manufacturer resp. his supplier shall be carried out 2x per year. External monitoring includes the tests listed in Table 4. A test protocol shall be supplied.

Table 4: External monitoring

Characteristic	Test and requirement	Frequency
Layer thickness of the primer	EN ISO 2178: Mean value: (60 – 70) µm dry	2 times per year
Total layer thickness	EN ISO 2178: Mean value: >110 µm	2 times per year
Visual inspection of the coated surface	EN ISO 4628-2: 0(S0) EN ISO 4628-3: Ri0 EN ISO 4628-4: 0(S0) EN ISO 4628-5: 0S(0)	2 times per year
Fracture strength 1	EN ISO 2409: Parameter ≤ 1 A distance of 10 cm from each anchor bar end is disregarded in the test	2 times per year
Chemical resistance to organic solutions	Following EN ISO 2812-3 (wipe test: 5x wiping to and fro with cotton cloth soaked with acetone or n-butyl acetate): no significant softening, no swelling	2 times per year
FTIR spectroscopy of coating materials used	Identity testing and compliance with manufacturer specifications: Degree of compliance > 90	Once per year
Salt spray test ¹	EN ISO 9227 (NSS); 1440 h EN ISO 4628-2: 0(S0) EN ISO 4628-3: Ri0 EN ISO 4628-4: 0(S0) EN ISO 4628-5: 0S(0) ÖNORM EN ISO 16276-2 (X-cut); Parameter ≤ 1 (Modification dated 8 September 2017)	Once per year on sample sheets coated under production conditions

Characteristic	Test and requirement	Frequency
Factory production control	Control of records according to Table 1 to Table 3	2 times per year

¹ The test is carried out on parallel-coated sample sheets

6 Marking

Following certification and the granting of the "OFI CERT" certification label, the user of the label has the right to mark the certified product and the corresponding product documents with the label of the OFI CERT certification body and the number of the certificate.

By affixing the label or by any other reference to this Technical Approval, the user of the label confirms that all requirements specified in this Technical Approval have been met.

7 Modifications

This Technical Approval is continually adapted to be up to date with the state of the art. Modification requests and comments may be addressed at any time to the OFI CERT certification body, where they will be collected and discussed in the committees.

8 Referenced standards

EN ISO 1461	Hot dip galvanized coatings on fabricated irons and steel articles (batch galvanizing) – Specifications and test methods
EN ISO 2178	Non-magnetic coatings on magnetic substrates – Measurement of coating thickness – Magnetic method
EN ISO 2409	Paints and varnishes – Cross cut test
EN ISO 2812-3	Paints and varnishes – Determination of resistance to liquids – Part 3: Method using an absorbent medium
EN ISO 4628-2	Paints and varnishes – Evaluation of degradation of coating – Designation of quantity and size of defects and intensity of intensity of uniform changes in appearance – Part 2: Assessment of degree of blistering
EN ISO 4628-3	Paints and varnishes - Evaluation of degradation of coating - Designation of quantity and size of defects and intensity of intensity of uniform changes in appearance – Part 3: Assessment of degree of rusting
EN ISO 4628-4	Paints and varnishes - Evaluation of degradation of coating - Designation of quantity and size of defects and intensity of intensity of uniform changes in appearance – Part 4: Assessment of degree of cracking
EN ISO 4628-5	Paints and varnishes - Evaluation of degradation of coating - Designation of quantity and size of defects and intensity of intensity of uniform changes in appearance- Part 5: Assessment of degree of flaking
EN ISO 9001	Quality management systems – Requirements
EN ISO 9227	Corrosion tests in artificial atmospheres – Salt spray tests
ISO 10474	Steel and steel products – Inspection documents

ÖNORM EN ISO 16276-2 Corrosion protection of steel structure by protective paint systems - Assessment of. and acceptance criteria for. the adhesion/cohesion (fracture strength) of a coating – Part 2: Cross cut testing and X-cut testing