



Description of control tests

related to organic coated steels

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| Standard for continuously organic coated (coil coated) flat steel products | EN 10169 | This standard specifies the performance requirements for coil coated flat steel products. |
| Coating thickness | EN 13523-1 | To determine coating thickness, an electrical probe is placed on the coating and develops an electromagnetic field in the base metal. The potential variation of this field is measured to estimate the film thickness. |
| Gloss | ISO 2813 EN 13523-2 | The specular reflection (gloss) of the coil coated surface is measured using a glossmeter and usually at an angle of 60°. For specific products with gloss < 30 GU, equipment with other angles can be used. |
| Colour conformity | ISO 7724 EN 13523-3 | The colour conformity of a coil coated material is checked using a colorimetric device, which measures the colour deviation of a sample compared with a colour standard sample. |
| Paint hardness | Pencil hardness ASTM D3363 EN 13523-4 ISO 15184 | Surface hardness of the paint is assessed by using a range of pencils with increasing hardness: 6B, 5B, 4B, 3B, 2B, B, HB, F, H, 2H, 3H, 4H, 5H, 6H. The pencil is applied to the paint surface at an angle of 45° under a constant load. The measurement is given by the hardness of the last pencil that does not scratch the paint surface. |
| | Scratch resistance (Clemen) ISO 1518 EN 13523-12 | The coating's resistance to scratches is assessed using a tool with a spherical tip (1 mm diameter), which is dragged along the coating surface under an increasing load. The Clemen value corresponds to the highest load that does not scratch the whole organic coating right down to the metallic substrate. |
| Paint flexibility and adhesion | Impact resistance ISO 6272 EN 13523-5 | Impact resistance is determined by the paint's resistance to cracking and/or peel-off after rapid deformation of the organic coated product. A 2 kg dropped weight impacts the coated sample on the back side. The drop height can be adjusted between 1 cm and 150 cm so as to obtain a given impact energy. The adherence of the coating on the top side is checked using adhesive tape. |
| | Formability (T-bend test) Adhesion of the coating Resistance to cracking on bending ISO 1519 EN 13523-7 | Organic coated product formability is determined by the resistance to cracking and degree of adhesion of the coating while bending the product through 135° to 180°. Resistance to cracking by bending (coating flexibility) is determined by the minimum bending radius at which no cracks are visible on the coating under 10 times magnification. The coating adhesion is indicated by the minimum bending radius at which there is no paint peeling using adhesive tape. |
| Corrosion resistance | Salt spray test ISO 7253 EN ISO 4628-2 EN ISO 9227 EN 13523-8 | Corrosion resistance is evaluated by exposing a test specimen to a salt fog at 35°C for a given time. Evaluation criteria after the exposure time: blistering (in accordance with EN ISO 4628-2) should not exceed 2(S2) and delamination should not exceed 2 mm (either side) at the vertical scribed mark for coil coated products used in outdoor building applications, and 5 mm for products used in indoor building applications or appliances. |
| | Natural weathering EN 13523-19 EN 13523-21 | Outdoor exposure tests are carried out at natural exposure sites (classified in accordance with EN ISO 12944-2) to monitor the behaviour of organic coated steel products for outdoor building applications. These products are exposed for 2 years, in accordance with the requirements of the EN 10169 standard. |
| | Condensation resistance (QCT) ISO 6270 EN 13523-26 | Condensation resistance is evaluated by continuously exposing the organic coated product to a saturated atmosphere. The samples are exposed at an angle of 60° above a tank of water at 40°C. The tested side is oriented towards the water in order to condense the water vapour on the surface. Evaluation is based on blistering in accordance with ISO 4628/2. |
| Resistance to accelerated UV weathering (QUV) | ISO 4892-3 EN 13523-10 ASTM D4587 | UV weathering is evaluated by exposing an organic coated sample to accelerated weathering (UV, humidity and temperature) for 2,000 hours. Each cycle consists of 4 hours of dry UVA exposure at 60°C, followed by 4 hours of condensation exposure at 40°C without UV radiation. Evaluation is based on colour change and gloss retention. |



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| Temperature resistance | EN 13523-13 | Temperature resistance is assessed by evaluating the behaviour of organic coatings on flat or bent samples, subjected to accelerated ageing by temperature. The samples are maintained continuously in a dry atmosphere at a defined temperature. Evaluation is based on colour change and gloss retention. |
| Resistance to various substances | Acids and bases Immersion test Spot test EN 13523-18 ISO 2812-1 ISO 2812-4 | The effect of chemical substances on the characteristics of a coating applied to a steel substrate can be evaluated using two methods: Immersion test: samples with protected edges are partly immersed for 24 hours in a chemical substance at a temperature of 25°C. Spot test: about 1 ml of a chemical substance is placed on the sample and covered by a watch glass at room temperature for 24 hours. Evaluation is based on colour change, blistering and gloss retention. Values are set in accordance with technical requirements. |
| | Solvents Rub test ISO 2812-1 method 2 EN 13523-11 | Resistance to solvents is checked by rubbing the coil coated surface with a tissue impregnated with a solvent – usually a ketonic one is used (methyl ethyl ketone). Evaluation is based on colour change, blistering, gloss retention etc. Values are set in accordance with technical requirements. |
| Resistance of paints to severe deformations | Marciniak deformation test | The Marciniak test enables the paint's resistance to severe deformations to be assessed. Marciniak deformation is performed on organic coated products and is followed by ageing in a climatic chamber (cyclic dry and humid atmosphere). Paint resistance is evaluated on the deformed part and expressed as xCy according to defect density x and size y. For instance, 1C1 means a few micro-cracks visible under 10 times magnification. A complete description of the test and evaluation method can be obtained on request. |
| Reaction to fire | EN 13501-1 EN ISO 11925-2 EN 13823 EN ISO 1716 | Reaction-to-fire tests are used to evaluate the contribution of a material to fire propagation. The tests are carried out in accordance with the EN 13501-1 standard. The performance of materials is classified from A1 (non-combustible products) to F (highly combustible products). The official Euroclass classification is determined by a certified laboratory. |
| Comments | <ol style="list-style-type: none"> The characteristics defined in the ArcelorMittal organic coated technical data sheets are obtained by means of normalised procedures. For each of the qualities specified, results are given for standard thickness and substrates. The information given in this document has no contractual restrictions; only the original texts of the standards are valid. | |

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