

Recommended process and process control requirements

1. APPLICATION AREAS

1.1 Aluminium Pressings, Sheets and Extrusions for Exterior Application

- 1.1.1. The aluminium or aluminium alloy must be suitable for the pre-treatment and the coating's process. It should allow the coating properties to perform as specified in the relevant technical properties provided in the Product Data Sheets for Corro-Coat PE-SDF, as well as other properties specified for these systems. The substrate must be bare clean, free from corrosion, and not exposed beforehand to any anodic or organic coating.
- 1.1.2. There must be no sharp edges. The edges radii must allow the coating to completely cover the whole object's surface to ensure adequate film thickness and prevent holidays.
- 1.1.3. When assembling coated elements together or installing a coated object in place, it is recommended to avoid the combination of different substrates; to prevent exposure to galvanic corrosion.

2. LABORATORY EQUIPMENT

2.1. Essential Equipment for Pre-treatment Chemicals' Test, Rinsing Water Test and Final Results' Test

- 2.1.1. Pre-treatment chemicals test must be performed according to the suppliers' instructions.
- 2.1.2. Conductivity measurement gauge for final rinse evaluation.
- 2.1.3. Temperature recorder.
- 2.1.4. Coating weight equipment, DIN 50939 or equal.

2.2. Necessary Equipment for Powder Coating Test

- 2.2.1. Film thickness gauge suitable for use on aluminum EN ISO 2360.
- 2.2.2. Cross cut equipment EN ISO 2409 - 2mm including Permacel 99 tape or Scotch 610.
- 2.2.3. Bend test equipment EN ISO 1519 – 5mm Mandrel.
- 2.2.4. Indentation test equipment EN ISO 2815.
- 2.2.5. Impact test equipment ASTM D 2794 (5/8" ball) or ER ISO 6272.
- 2.2.6. Cupping test equipment EN ISO 1520.
- 2.2.7. Gloss measurement equipment ISO 2813 (60°).
- 2.2.8. Boiling water test equipment.
- 2.2.9. Temperature recorder.
- 2.2.10. Cure MEK (Methyl Ethyl Ketone) test equipment.

3. SURFACE TREATMENT PROCEDURE

3.1. Handling

- 3.1.1. Components or objects must be carefully handled. Avoid contamination with dust, oil, fat, finger marks, etc.
- 3.1.2. Care should be taken to secure a proper treatment of the total area.

3.2. Pre-treatment

3.2.1. It is recommended that the following pre-treatment is performed:

- a) Degreasing/etching – alkaline or acidic. Etching degree of at least 1 g/m².
2 g/m² when the coating is exposed to sea climate areas.
- b) Rinsing.
- c) Acid wash.
- d) Rinsing.
- e) Chromating.
- f) Rinsing.
- g) Rinsing, demineralized water (the last running water from the object should be tested at 20°C. The readings should measure below 30 micron Siemens/cm).
- h) Drying, maximum object temperatures 100°C. Perform the process according to the chemical supplier's written instructions.

3.2.2. The coating thickness of the chromate conversion layer should be:

Yellow chromate 0.6 – 1.2 g / m²

Green chromate 0.6 – 1.5 g / m²

3.3. Chrome-free pre-treatment

Suitable chrome-free pre-treatments are also recommended. Due to the variety of chrome-free pre-treatments available today, only the approved systems from Qualicoat and GSB should be used. Detailed advice should be sought from the pre-treatment supplier.

3.4. Powder Application and Cure

- 3.4.1. The pre-treated parts are to be transferred to the coating process immediately in a clean and dry state, to avoid deterioration of the pre-treatment integrity.
- 3.4.2. A single coat application should be undertaken in one operation, to a minimum film thickness of 60 microns for exposed areas. The coating thickness must not exceed 120 microns for a single coat system on details that are to be treated mechanically after coating (i.e. sawing, milling, drilling, etc.).
- 3.4.3. The powder coating must be cured as specified by Jotun Powder Coatings for the product used (see the relevant Product Data Sheet). The temperature of the object to be coated must be recorded once a week. The temperature is best obtained by measuring it at the thickest wall of the object, while the oven is fully loaded.
- 3.4.4. The air temperature in the curing zone must not deviate from the adjusted nominal temperature by more than $\pm 10^{\circ}\text{C}$.

3.5. Post-cure Handling

- 3.5.1. Coated objects or components should be cooled to below 40°C before handling.
- 3.5.2. Precaution should be taken to avoid damages on the finished coating during stacking, packaging, storing and transportation.

4. TESTING PROCEDURES

4.1. Operations and Raw Materials

- 4.1.1. Prior to a production run and at start-ups after a halt, it is essential to undertake a panel test. Test panels must be pre-treated, coated and cured, to control equipment and material (refer to Section 5.1 below for panel test). The temperature should also be recorded.
- 4.1.2. The same procedure (refer to Section 4.1.1 above) must be performed for each individual colour.
- 4.1.3. Pre-treatment chemicals test and rinsing stages test must be undertaken according to the supplier's written instructions.
- 4.1.4. Conductivity of the final rinsing stage must be constantly monitored and adjusted.
- 4.1.5. Test of the last running water from the object (refer to Section 3.2.1 g above) must be conducted at least once per shift. A test should also be run at least once per colour or per job, when the job requires less than 8-hour shift to be completed. The conductivity of the rinsing bath must be adjusted accordingly.
- 4.1.6. Drying oven test should be conducted at least once per shift. A test should also be run at least once per colour or per job, when the job requires less than 8-hour shift to be completed (refer to Section 3.2.1 h above).
- 4.1.7. The chromate conversion layer test (refer to Section 3.2.2 above) must be conducted at least once per shift. A test should also be run at least once per colour or per job, when the job requires less than 8-hour shift to be completed. The test should be run as per DIN 50939 recommended procedures or equal.

4.2. Production Control

- 4.2.1. The oven displayed temperature must be recorded when the oven is fully loaded, at least twice daily.
- 4.2.2. A stove curve should be documented at least once a week. Measure the temperature of the air inside the oven, the lower part of the oven or the lower part of the object, and the thickest wall of the object. The temperatures should be measured when the oven is fully loaded.
- 4.2.3. Test panels must be coated at least once per shift. A test should also be run at least once per colour or per job, when the job requires less than 8-hour shift to be completed. For testing purposes refer to Section 5.1 below Panels must be coated on one side and cured under current working conditions.

4.3. Coated Objects or Components

- 4.3.1. The coated objects or components should be tested at least once per shift.
A test should also be run at least once per colour or per job, when the job requires less than 8-hour shift to be completed. The test should be performed as per Section 5.2 below.
- 4.3.2. On parts with variable thickness and shape, the test should be performed on a representative selection. The test should be performed as per Section 5.2 below.

5. TEST PERFORMANCE

5.1. Panels' Test

Aluminum alloy AA 5005 H24 or H14 (AlMg1 – semihard).
Panel thickness 0.8 or 1 00 mm.

- 5.1.1. Gloss should be measured in conformity with ISO 2813 (60°). Specification: as specified for the product.
- 5.1.2. Cross cut test should be run in conformity with EN ISO 2409 - 2mm. Specification: Gt 0.
- 5.1.3. Impact test should be run in conformity with ASTM D 2794 (5/8" ball) or EN ISO 6272.

Specification: as specified for the product.

- 5.1.4. Cupping test should be run in conformity with EN ISO 1520. Specification: as specified for the product.
- 5.1.5. Bend test should be run in conformity with EN ISO 1519. Specification: as specified for the product.
- 5.1.6. Indentation test should be run in conformity with EN ISO 2815. Specification: minimum 80.
- 5.1.7. Colour must be visually controlled in line with specifications.
- 5.1.8. Pre-treatment should be controlled in distilled boiling water test for 2 hours. Specification: no blistering or loss of adhesion (refer to 5.1.2 above).
- 5.1.9. A cure test must be run by performing a chemical resistance test once the panel has cooled. Jotun Powder Coatings recommends to run the test by 30 double rubs with an ear swab soaked in Methyl Ethyl Kethon.

5.2. Finished Coated Objects or Components' Test

- 5.2.1. The surface of the coating must be continuous and damage-free. The colour must be even. The gloss must be visually controlled.
- 5.2.2. The aesthetic appearance must be visually evaluated on a distance of 5 meter (15 feet) for coated objects to be used for exterior applications, and 3 meter (9 feet) for coated objects to be used for interior applications.
- 5.2.3. The film thickness. Specification: refer to Section 3.3.2 above.
- 5.2.4. The Cross cut adhesion test must be carried on in conformity with EN ISO 2409 – 2 mm, including Permacel 99 tape or Scotch 610. Specification: Gt 0.
- 5.2.5. The indentation test should be undertaken in conformity with EN ISO 2815. Specification: minimum 80.
- 5.2.6. The cure test must be run in compliance with MEK (Methyl Ethyl Kethon) resistance. Specification: refer to 5.1.9 above.

6. REGISTRATION AND DOCUMENTATION

- 6.1.1. Documentation on the powder coating used including batch number, records on the processing data, and test panels must be kept for the duration of the warranty period.

7. MISCELLANEOUS

- 7.1.1. During the coating process, when a failure is detected, the process must be stopped and necessary steps undertaken to rectify the problem.
- 7.1.2. The powder coating must be handled and stored under dry conditions at a temperature up to 25°C maximum. Storage stability must be controlled after 6 months of receipt date.
- 7.1.3. Special care must be taken when loading and unloading the coated components and objects. Reasonable care should be exercised during handling and on-site transportation. To prevent any damage during transportation, each coated object or component should be packed individually and isolated from other objects or components by a paper tissue, plastic sheet, or foam pad. Regular adhesive tapes should never come into direct contact with the polyester coating. Should protective tape be required, then only a designed tape for the protection of coated aluminum shall be used. The Buyer or End User is responsible for compliance with these measures, and liable to ensure that no residue of any nature is left on the finished product.