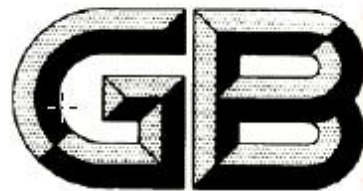


ICS 77.150.10

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# **National Standard of the People's Republic of China**

GB5237.4 - 200X  
Replaces GB 5237.4-2004

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## **Wrought aluminium alloy extruded profiles for architecture**

### **Part 4: Powder coating profiles**

Draft for approval

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**Issued by the General Administration of Quality Supervision, Inspection and  
Quarantine of the People's Republic of China and the  
Standardisation Administration of the People's Republic of China (SAC)**

## Foreword

**Sections 4.5.3.1 and 4.5.5 of this Standard are mandatory, whilst the rest are recommended.**

GB 5237, “Wrought aluminium alloy extruded profiles for architecture” is divided into six Parts:

- Part 1: Untreated profiles
- Part 2: Anodised profiles
- Part 3: Electrophoretic coating profiles
- Part 4: Powder coating profiles
- Part 5: PVDF coating profiles
- Part 6: Thermal barrier profiles

This is Part 4 of GB 5237.

This Part replaces Part 4 of GB 5237.4 – 2004 “Wrought aluminium alloy extruded profiles for architecture – Part 4: Powder coating profiles”.

This Part has been revised with reference to the following Standards: Europe Qualicoat Specification, 11<sup>th</sup> Edition, “Specifications for a Quality Label, for Paint, Lacquer and Powder Coatings on Aluminium for Architectural Applications”; the standards issued by the American Architectural Manufacturers Association: AAMA 2603-2005, “Performance requirements and test procedures for organic coatings on aluminium extrusions and panels”; AAMA 2605-2005, “Performance requirements and test procedures for high performing organic coatings on aluminium extrusions and panels”; AAMA 2605-2005, “Performance requirements and test procedures for superior performing organic coatings on aluminium extrusions and panels”; and British standard BS 6496-1984, “Specification for powder organic coating for application and stoving to aluminium alloy extrusions, sheet and performed sections for external architectural purposes.”

The main technical differences between this Part when compared to GB5237.4-2004 are:

- coating gloss has been divided into three types;
- wear resistance of the coating has been added;
- detergent resistance of the coating has been added;
- weatherability of the powder coating has been divided into two Grades, Grade I and Grade II.

Appendices A and B to this Part are normative appendices.

This Part is proposed by the China Non-ferrous Metals Industry Association.

This Part is under the jurisdiction of the National Technical Committee for Standardisation of Non-ferrous Metals.

Main organisations that participated in the drafting of this Part:

Fujian Minfa Aluminium Industry Co., Ltd;  
Guangdong Xingfa Aluminium Co., Ltd;  
Guangdong JMA Aluminium Profile Factory Co., Ltd;

Fujian Nanping Aluminium Co., Ltd;  
Chinese Industrial Standard of Non-ferrous Metal Measure Quality Research Institute;

Other units that participated in the drafting of this Part:

Non-ferrous Metal Quality Supervision and Inspection Centre of the People's Republic of China;

Non-ferrous Metal Quality Supervision and Inspection Centre of South China;

Nippon Paint Shenglianda Co., Ltd;

Sichuan Sanxing Aluminium Industrial Co., Ltd;

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ZhuYaoHui, HeYaoZu, ZhanHao, MaCunZhen.

This Part replaces the previously issued Standards:

-GB/T 5237.4-2000, GB 5237.4-2004

# Wrought aluminium alloy extruded profiles for architecture

## Part 4: Powder coating profiles

### 1 Scope

This Standard sets the requirements for the testing methods, inspection rules, packaging, marking, transportation, storage and content of contracts (or orders) of powder electrostatic spray-painted extruded aluminium alloy profiles for architecture.

This Part applies to aluminium alloy extruded profiles coated with thermosetting organic polymer powder for architecture (hereafter referred to as powder coating profiles).

Other aluminium alloy materials that carry similar applications and similar surface treatments may refer to and adopt the content of this Part.

### 2 Normative References

The provisions of the following documents become provisions of this Part after being referenced. For dated reference documents, all later amendments (excluding corrigenda) and versions do not apply to this Part; however, the parties to the agreement are encouraged to study whether the latest versions of these documents are applicable. For undated reference documents, the latest versions apply to this Part.

GB/T 228-2002 Metallic materials – Tensile testing at ambient temperature;

GB/T 1732 Determination of impact resistance of films;

GB/T 1740 Determination of resistance to heat and humidity of paint films.

GB/T 1766 Paints and varnishes – Rating schemes of degradation of coats;

GB/T 1865 – 1997 Paints and varnishes – Artificial weathering and exposure to artificial radiation – Filtered xenon-arc radiation;

GB/T 3199 Wrought aluminium and aluminium alloy products – Packing, marking, transporting and storing;

GB/T 4957 Non-conductive coatings on non-magnetic basic metals – Measurement of coating thickness – Eddy Current;

GB/T 5237.1 Wrought aluminium alloy extruded profiles for architecture - Part 1: Untreated profiles;

GB/T 6461 Methods for corrosion testing of metallic and other inorganic coating on metallic substrates – Rating of test specimens and manufactured articles subjected to corrosion tests;

GB/T 6682 Water for analytical laboratory use – specification and test methods;

GB/T 6742 Paints and varnishes – Bend test (cylindrical mandrel);

GB/T 8013.3-2007 Anodic oxide coatings and organic polymer coatings on aluminium and its alloys – Part 3: Organic polymer coating;

GB/T 9257 Paints and varnishes – Buchholz indentation test;

GB/T 9276 Methods of exposure to natural weathering of coating;

GB/T 9286 Paints and varnishes – cross-cut test for films;

GB/T 9753 Paints and varnishes – Cupping test;

GB/T 9754 Paints and varnishes – Measurement of specular gloss of non-metallic paint films at 20<sup>0</sup>, 60<sup>0</sup> and 85<sup>0</sup>;

GB/T 9761 Paints and varnishes – Visual comparison of the colour of paints;

GB/T 10125 Corrosion tests in artificial atmospheres – salt spray tests;

GB/T 11186.2, Methods for measuring the colour of paint films – Part 2: Colour measurement;

GB/T 11186.3 Methods for measuring the colour of paint films – Part 3: Calculation of colour differences;

GB/T 16585 Rubber, vulcanised – Test method of resistance to artificial weathering (Fluorescent UV lamp);

GB/T 20975 (all Parts) Chemical analysis methods of aluminium and aluminium alloys.

JC/T 480 Unslaked Lime for architecture.

### **3 Terms and definitions**

The terms and definitions set out in GB/T 8013.3-2007 apply to this Part, as well as the following:

#### **3.1 Coating**

Coating refers to the cover layer formed after the thermosetting organic polymer powder been sprayed and solidified onto the surface of the metallic base.

#### **3.2 Exposed surfaces**

Exposed surfaces refers to powder coating profiles that have been processed, manufactured and mounted onto a building; the surface of a powder coating profiles which can still be seen either in an open or shut state.

#### **3.3 Local thickness**

Measure the anodic oxide coating thickness of any one inspection area on the exposed surface

of the powder coating profile that is not larger than  $1\text{cm}^2$  several times (not less than 3 times); the local thickness is the average value of the measured coating thickness.

### **3.4 Minimum local thickness**

The smallest value of the many measured local thickness of the exposed surfaces on the powder coating profiles.

## **4 Requirements**

### **4.1 Product classification**

#### **4.1.1 Alloy grades, states, specifications**

The alloy grades, supply states and specifications of the powder coating profiles should conform to the requirements set out in GB 5237.1.

#### **4.1.2 Markings**

The arrangement of the labelling of powder coating profiles should be in the following order: product name, alloy grade, supply state, product specification (product specification consists of the product code and cut-length of the powder coating profile), colour code and serial number of this Part. An example of the label is shown below:

If the powder coating profile is made of 6063 aluminium alloy, its supply state is T5, its profile code is 421001, its cut-length is 6000mm, and its colour code number 3003, then the label should be:

Powder coating profile 6063-T5 421001x6000 Colour 3003 GB5237.4-200X

### **4.2 Preliminary treatment**

Preliminary treatments of the powder coating profiles should be carried out in accordance with the stipulations of Clause 5 of GB/T 8013.3-2007.

### **4.3 Chemical composition, mechanical properties**

The chemical composition and mechanical properties of the powder coating profiles should conform to the requirements set out in GB 5237.1.

### **4.4 Dimension deviation**

After the coatings been removed, the dimension deviations of the profiles should conform to the requirements set out in GB 5237.1. The installation and use of the powder coating profiles should not be affected by dimension deviations caused by the coatings.

### **4.5 Coating properties**

#### **4.5.1 Gloss**

The  $60^\circ$  gloss value of the coating and its allowable deviations should conform to the requirements set out in Table 1.

**Table 1 -Gloss Units**

Gloss Value Range	Allowable Deviation
3 ~ 30	± 5
31 ~ 70	± 7
71 ~ 100	± 10

#### **4.5.2 Colour and chromaticism**

The colour of the powder coatings should be primarily identical to the colour sample plate agreed between the suppliers and buyers. When using a colorimeter to take measurements, the chromaticism between a single colour coating and the colour sample plate should be  $\bullet E_{ab}^* \bullet 1.5$ , and chromaticism among the same batch of powder coating profiles (referred to as the delivery batch) should be  $\bullet E_{ab}^* \bullet 1.5$ .

#### **4.5.3 Coating thickness**

**4.5.3.1** The minimum local coating thickness on the exposed surfaces should be at least 40  $\bullet$  m.

Note: due to the complex shape of the extruded profile cross-sections, the coating thickness on certain surfaces (such as inner corners, transverse grooves) of the powder coating profiles are allowed to be smaller than the specified values.

**4.5.3.2** If paint spraying is required on non-exposed surfaces, then this request should be clearly indicated in the contract.

#### **4.5.4 Indentation hardness**

The indentation resistance of the coating should be at least 80.

#### **4.5.5 Adherence**

The dry adherence, wet adherence and boiling water adherence of the coating should all reach level 0.

#### **4.5.6 Impact resistance**

**4.5.6.1** No cracking or peeling should occur to the coating after the impact test.

**4.5.6.2** If, after consultation, the buyer and supplier decide to use certain coatings with special properties but impact resistance is slightly lower, then tiny cracks are permitted to appear on such coatings after the impact test; however if adhesive tape is used to carry out further tests, then none of the coating should peel away.

#### **4.5.7 Cupping resistance**

**4.5.7.1** No cracking or peeling should occur to the coating after the cupping test.

**4.5.7.2** If, after consultation, the buyer and supplier decide to use certain coatings with special properties but cupping resistance is slightly lower, then tiny cracks are permitted to appear on such coatings after the cupping test; however if adhesive tape is used to carry out further tests, then none of the coating should peel away.

#### **4.5.8 Bend resistance**

**4.5.8.1** No cracking or peeling should occur to the coating after the after the bend test.

**4.5.8.2** If, after consultation, the buyer and supplier decide to use certain coatings with special properties but bend resistance is slightly lower, then tiny cracks are permitted to appear on such coatings after the bend test; however if adhesive tape is used to carry out further tests, then none of the coating should peel away.

#### **4.5.9 Wear resistance**

After the Falling-sand Test, the abrasion coefficient should be at least 0.8L/• m.

#### **4.5.10 Boiling water resistance**

After the Boiling Water test, carry out a visual inspection to check the tested coating surface. Coating peeling or wrinkling should not occur, yet visible, widespread, very tiny bubbles are allowed, and small changes affecting the coating colour are permitted.

#### **4.5.11 Hydrochloric acid corrosion resistance**

After the hydrochloric acid corrosion resistance test, carry out a visual inspection to check the tested coating surface. No bubbles should appear on the surface or any other noticeable changes.

#### **4.5.12 Mortar resistance**

After the mortar resistance test, carry out a visual inspection to check the tested coating surface. There should be no peeling of the coating and no other noticeable changes should occur.

#### **4.5.13 Solvent resistance**

The result of solvent resistance test should be appropriately as Grade 3 or Grade 4.

#### **4.5.14 Detergent resistance**

After the detergent resistance test, carry out a visual inspection to check the tested coating surface. No bubbles or peeling should appear and no other noticeable changes should occur.

#### **4.5.15 Salt spray corrosion resistance**

After 1000 hours of the acetic acid salt-spray test, carry out a visual inspection to check the tested coating surface. No bubbles, peeling or any other noticeable changes should occur under either side of the coating cut line.

#### **4.5.16 heat and humidity resistance**

After 1000 hours of the heat-humidity test, carry out a visual inspection to check the tested coating surface. No bubbles, peeling or any other noticeable changes should occur.

#### **4.5.17 Weatherability**

##### **4.5.17.1 Accelerated weatherability**

Weatherability should be divided into two classes on the basis of test duration and test results of irradiation with a xenon lamp for the artificial accelerated ageing test, please see Table 2 The weatherability classification should be decided by the buyers and clearly indicated in the contract; if it is not indicated in the contract, then the profiles should be supplied as class I.

**Table 2**

Weatherability Class	Test Duration	Test Results <sup>a</sup>	
		Colour Change Degree	Gloss Retention <sup>b</sup>
I	1000 hours	• E <sub>ab</sub> * • 5	> 50%
II	1000 hours	• E <sub>ab</sub> * • 2.5	> 90%

<sup>a</sup> The test duration and test results of brightly coloured coatings such as black, yellow and orange should be decided through consultation between the buyer and supplier, and clearly indicated in the contract.

<sup>b</sup> The gloss retention is determined as the percentage difference between the gloss value after testing and the gloss value before testing.

#### 4.5.17.2 Natural weatherability

If the buyer has requests regarding the natural weatherability of the powder coatings, then the test conditions and the acceptance standard should be decided through consultations between the supplier and buyer, and should be clearly indicated in the contract.

#### 4.5.18 Others

**4.5.18.1** If the buyer has special requests regarding impact resistance, wear resistance, boiling water resistance, salt spray corrosion resistance, heat-humidity resistance, and the weatherability of the powder coatings, both the supplier and the buyer may refer to the requirements set out in GB/T 8013.3-2007 and decide upon the property requirements through consultation. The agreed testing requirements should be clearly indicated in the purchase contract.

**4.5.18.2** If the buyer requests other properties of the powder coatings, the supplier and the buyer should refer to the requirements set out in GB/T 8013.3-2007 and come to a decision through consultation.

#### 4.6 Appearance quality

The coatings on the exposed surfaces of the powder coating profiles should be smooth, even, and no faults that might affect the use of the profiles, such as flow marks, wrinkles, bubbling and coating cracking are permitted. However a slight orange-peel phenomenon is permitted and the allowable degree should be decided through consultations between the buyer and supplier.

### 5 Testing methods

#### 5.1 Chemical composition

The reference analysis of chemical composition should be carried out in accordance with the methods set out in GB/T 20957.

#### 5.2 Chemical properties

The mechanical properties reference test should be carried out in accordance with the methods set out in GB/T 228-2002. The elongation percentage after fracture should be measured in accordance with the requirements set out in Section 11.1 of GB/T 228-2002.

### **5.3 Dimension deviation**

Dimension deviation should be measured in accordance with the methods set out in GB 5237.1.

### **5.4 Coating properties**

#### **5.4.1 Gloss**

According to the procedures in GB/T 9754, use a gloss metre to determine the gloss at a 60° incident angle.

#### **5.4.2 Colour and chromaticism**

##### **5.4.2.1 Visual inspection method**

Carry out test in accordance with the rules set out in GB/T 9761.

##### **5.4.2.2 Instrumental method**

Use a colorimeter to perform the single colour coating reference test. Take the measurement according to the methods set out in GB/T 11186.2, and GB/T 11186.3.

#### **5.4.3 Coating thickness**

**5.4.3.1** The coating thickness measurement should be taken in accordance with the procedures set out in GB/T 4957.

**5.4.3.2** Choose at least 5 suitable measuring spots (each test spot should be about 1cm<sup>2</sup>) to measure the thickness of the inspection coating, then record 3 ~ 5 readings of each measuring spot. The average value of the recorded readings is regarded as the measured result of the measuring spot local thickness.

#### **5.4.4 Indentation hardness of the coating**

This measurement should be carried out in accordance with the measure procedures specified in GB/T 9275.

#### **5.4.5 Adherence**

##### **5.4.5.1 Dry adherence**

**5.4.5.1.1** Draw squares according to the procedures specified in GB/T 9286. The interval between each square should be 2mm.

**5.4.5.1.2** Cover the square drawing coating with adhesive tape<sup>1)</sup>. The adhesive force of the tape should be greater than 10N/25mm. Press the tape down tightly to remove any air from underneath the tape, then pull the tape off quickly at a vertical angle from the coating surface. Carry out the evaluation according to GB/T 9286.

##### **5.4.5.2 Wet adherence**

According to the stipulations of 5.4.5.1.1 draw squares on the sample using third grade water as specified in GB/T 6682 with a temperature of 38<sup>0</sup>C± 5<sup>0</sup>C. Soak the sample for 24 hours. Remove the sample and wipe it dry. As according to 5.4.5.1.2, carry out the testing and evaluation within 5 minutes.

### **5.4.5.3 Boiling water adherence**

**5.4.5.3.1** Draw squares on the sample according to the stipulation set out in 5.4.5.1.1.

**5.4.5.3.2** Pour around 80mm of third grade water into a beaker as specified in GB/T 6682, and then place 2 - 3 pieces of clean broken porcelain into the beaker. Heat the water from the bottom of the beaker until the water boils.

**5.4.5.3.3** Hang the sample in the water and allow to boil for 20 minutes. The sample should be 10mm under the surface of the water, without touching the bottom of the beaker. During the test, the water temperature should be maintained at least at 95<sup>0</sup>C, and whenever necessary add boiled third grade water as specified in GB/T 6682 into the beaker to maintain the depth of the water at least at 80mm.

**5.4.5.3.4** Remove the sample and wipe it dry. As according to 5.4.5.1.2, carry out the testing and evaluation within 5 minutes.

### **5.4.6 Impact resistance**

**5.4.6.1** Use a punch ball of 16mm± 0.3mm diameter to carry out the drop impact test, in accordance with the test procedures specified in GB/T 1732: place an impact hammer (1000g± 1g) at a suitable height and allow it free fall, then drop the hammer directly onto the non-coated surface of the standard sample plate, resulting in an indentation of depth of 2.5mm± 0.3mm. Carry out a visual inspection on the tested coating surface to check for changes made to the coating.

**5.4.6.2** With regard to coatings with special properties but with slightly lower impact resistance, immediately cover the impact tested coating surface with a piece of adhesive tape<sup>1)</sup>, the adherence force of which should be greater than 10N/25mm. Press the tape down tightly to remove any air from underneath the tape, then quickly pull the tape off at a vertical angle from the coating surface. Carry out a visual inspection to check whether any coating peels off from the coating surface.

(<sup>1)</sup> The suitable adhesive tapes on the market are Scotch Premium Cellophane tape 610 or Permacel P-99 adhesive tape. We list these products here for information for the convenience of those people using this Part of the standard; however this does not mean that the products will be accepted.)

### **5.4.7 Cupping resistance**

**5.4.7.1** According to the procedures set out in GB/T 9753, use a standard sample board to carry out the test, and press down to a depth of 5mm.

**5.4.7.2** With regard to coatings with special properties but with slightly lower cupping resistance, immediately cover the cupping tested coating surface with a piece of adhesive tape<sup>1)</sup>, the adherence force of which should be greater than 10N/25mm. Press the tape down tightly to remove any air from underneath the tape, then quickly pull the tape off at a vertical angle from the coating surface. Carry out a visual inspection to check whether any coating peels off from the coating surface.

### **5.4.8 Bend resistance**

**5.4.8.1** According to the procedures set out in GB/T 6742, use a standard sample board to carry

out the test.

**5.4.8.2** With regard to coatings with special properties but with slightly lower bend resistance, immediately cover the cupping tested coating surface with a piece of adhesive tape<sup>1)</sup>, the adherence force of which should be greater than 10N/25mm. Press the tape down tightly to remove any air from underneath the tape, then quickly pull the tape off at a vertical angle from the coating surface. Carry out a visual inspection to check whether any coating peels off from the coating surface.

#### **5.4.9 Wear resistance**

Carry out wear resistance test in accordance with the procedures specified in Appendix A .

#### **5.4.10 Boiling water resistance**

**5.4.10.1** Pour around 80mm of third grade water into a beaker as specified in GB/T 6682, and then place 2 - 3 pieces of clean broken porcelain into the beaker. Heat the water from the bottom of the beaker until the water boils

**5.4.10.2** Hang the sample in the water and allow it to boil for 20 minutes. The sample should be 10mm under the surface of the water, without touching the bottom of the beaker. During the test, the water temperature should be maintained at least at 95<sup>0</sup>C, and whenever necessary add boiled third grade water as specified in GB/T 6682 into the beaker to maintain the depth of the water at least at 80mm.

**5.4.10.3** Remove the sample and wipe it dry. Perform a visual inspection to check the boiling water tested coating surface (the surrounding parts of the sample are not included).

#### **5.4.11 Hydrochloric acid corrosion resistance**

Use chemical hydrochloric acid (• 1.19g/ml) and third grade water as specified in GB/T 6682 to mix the hydrochloric acid test solution (hydrochloric acid and water as 1:9). Drip 10 drops of this hydrochloric acid test solution onto the coating surface of the sample, then cover with a watch glass and leave it in an environmental temperature of 18<sup>0</sup>C ~ 27<sup>0</sup>C for 15 minutes. Rinse clean under tap water, air dry, then perform a visual investigation to check the tested coating surface.

#### **5.4.12 Mortar resistance**

**5.4.12.1** Take 75g lime powder as specified in JC/T 480 and 225g Standard Sand as specified in section A.5.2 of Appendix A, and add into about 100g third grade water as specified in GB/T 6682 to form the lime and sand paste mortar mix.

**5.4.12.2** Place the paste mortar onto the surface of the sample, pile up to a diameter of 15mm and thickness of 6mm cylinder. Leave in an environment with a temperature of 38<sup>0</sup>C± 3<sup>0</sup>C and relative humidity of 95%± 5% for 24 hours.

**5.4.12.3** Remove the paste mortar from the sample and, using a wet cloth, clean the residue off the surface and allow to air dry. Perform a visual investigation to check the tested coating surface.

### 5.4.13 Solvent resistance

The solvent resistance test should be carried out in accordance with the procedures specified in Appendix B.

### 5.4.14 Detergent resistance

**5.4.14.1** Use detergent (for composition see Table 3) and third grade water as specified in GB/T 6682 to mix up the detergent test solution to a concentration of 30g/L. Soak at least 2 samples in the detergent test solution at a temperature of 38<sup>0</sup>C for 72 hours, then remove the sample and wipe it dry. Perform a visual inspection to check the tested coating surface.

**Table 3**

Composition	Content (Weight) %
Tetrasodium Pyrophosphate	53
Sodium Sulphate Anhydrous	19
Sodium Linear alkylarylsulfonate	20
Sodium Metasilicate Hydrated	7
Sodium Carbonate Anhydrous	1
Total	100

**5.4.14.2** Immediately cover the tested coating surface with a piece of adhesive tape. The adhesive force of the tape should be greater than 10N/25mm. Press the tape down tightly to remove any air from underneath the tape, then pull the tape off quickly at a vertical angle from the coating surface. Perform a visual inspection to check the tested coating surface.

### 5.4.15 Salt spray corrosion resistance

On a piece of sample,, cut two cross lines along the diagonal as deep as the metallic base - the line segment should not run through the opposite corner and the distances from each end point of the line segments to the corresponding opposite corner should be the same. Next, carry out the acetic acid salt spray test according to the test procedures specified in GB/T 10125. When the specified test duration is completed, perform a visual inspection to check coating surface and check the unidirectional infiltration degree underneath of the coating.

### 5.4.16 Heat-humidity resistance

According to the procedures specified in GB/T 1740, carry out the heat-humidity resistance test, test temperature should be 47<sup>0</sup>C± 1<sup>0</sup>C.

### 5.4.17 Weatherability

#### 5.4.17.1 Accelerated weatherability

Carry out xenon lamp accelerated weatherability test according to method 1 specified in GB/T 1865-1997. The gloss value measuring procedure should be performed according to GB/T 9754, and evaluations for chalking degree and colour change degree should be taken according to the specifications of GB/T 1766.

#### **5.4.17.2 Natural weatherability**

Carry out the test according to the procedures specified in GB/T 9276.

Note: among the atmospheric corrosion test stations in China, the only test station with atmospheric conditions close to the specified Florida Atmospheric set out in international standards is the Qionghai Exposure Test Station.

#### **5.4.18 Others**

Tests for other properties should be carried out according to test methods specified in GB/T 8013.3 – 2007, or according to the method agreed between the suppliers and the buyers.

#### **5.5 Appearance quality**

The examination for appearance quality should be carried out under diffuse sunlight (diffuse sunlight refers to after 3 hours after sunrise to 3 hours before sunset) according to GB/T 9761. The required luminance level for artificial illumination should be above 1000lx and the light source should be a D65 standard light source. The background should be matt black or grey; a coloured background cannot be used. The viewing distance should be 3m, and the viewing angle should be 90<sup>0</sup>.

### **6 Inspection rules**

#### **6.1 Examination, checking and acceptance**

**6.1.1** Examinations to ensure that the quality of the powder coating profiles are in line with the requirements set out in this Part (or purchase contract) should be carried out by the suppliers, who should also complete a quality certificate.

**6.1.2** Buyers may carry out examinations that are specified in this Part regarding the powder coating profiles they receive. If the results of the examinations do not conform to the requirements set out in this Part or the purchase contract, the buyer can submit a disagreement in writing to the supplier, after which the supplier and the buyer should come to an agreement through consultation. If the disagreement is related to appearance quality and dimension deviation, the buyer should submit the problems within one month of the date on which they received the powder coating profiles; if the disagreement relates to other properties, then the buyer can submit the problems within three month of the date on which they receive the powder coating profiles. If the problem must be settled through further testing, sampling should be provided by the suppliers and the settling should be carried out mutually by the supplier and buyer.

#### **6.2 Batch approval**

Powder coating profiles should be submitted for approval and acceptance in batches. Powder coating profiles with the same alloy grade, same supply states, same specifications and same colour constitute a batch. The quantity of profiles in each batch of powder coating profiles is unrestricted.

#### **6.3 Inspection item**

Inspections for chemical composition, mechanical properties, dimension deviation, gloss, colour and chromaticism, coating thickness, indentation hardness, adherence, impact resistance, as well as appearance quality, should be carried out on every batch of powder coating profiles. Inspections on other properties are not usually carried out (the suppliers carries out these types

of inspections at least once in every three years), but the supplier should ensure these properties are in line with the requirements set out in this Part. If the buyer requests an inspection be carried out on these properties, then such requests should be clearly indicated in the contract.

#### 6.4 Sampling

Powder coating profile sampling procedures should be carried out in accordance with the stipulations of Table 4.

**Table 4**

<b>Test Item</b>	<b>Sampling Rules</b>	<b>Requested Clause Number</b>	<b>The Clause Number of Test Method</b>
Chemical composition, mechanics properties, dimension deviation,	Carry out according to the stipulations of GB 5237.1.	4.3 4.4	5.1 5.2 5.3
Coating colour and chromaticism	One by one inspection method.	4.5.2 4.6	5.4.2 5.5
Coating thickness	Sampling procedure to be carried out in accordance with specifications of Table 5.	4.5.3	5.4.3
Impact resistance, cupping resistance, bend resistance	Make two standard sample boards per each inspection item. Method for making standard sample board: choose two pieces pure aluminium sample boards, one with state of H24, another with state of H14, both boards with the same dimension as 150mm x 75mm x 1.0mm, adopt the same technology and same production line as the batches of profiles the samples are representing to have the paint sprayed (the coating thickness should be appropriately kept in the range of 60• m ~ 80 • m), solidified, after this leave the samples for 24 hours.	4.5.6 4.5.7 4.5.8	5.4.6 5.4.7 5.4.8
Gloss, indentation hardness, adherence, wear resistance, boiling water resistance, hydrochloric acid corrosion resistance, mortar resistance, solvent resistance, detergent resistance, salt spray corrosion resistance, heat humidity resistance, weatherability of the coating	Take 2 profiles per inspection item from each batch of powder coating profiles. After the coating has solidified and left for 24 hours, cut one sample from each of the two powder coating profiles.	4.5.1, 4.5.4, 4.5.5, 4.5.9, 4.5.10, 4.5.11, 4.5.12, 4.5.13, 4.5.14, 4.5.15, 4.5.16, 4.5.17	5.4.1, 5.4.4, 5.4.5, 5.4.9, 5.4.10, 5.4.11, 5.4.12, 5.4.13, 5.4.14, 5.4.15, 5.4.16, 5.4.17,

Others	To be carried out according to GB/T 8013.3-2007 or according to the agreement between the buyer and the supplier.	4.5.18	5.4.18
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## 6.5 Determination of the inspection results

**6.5.1** If the inspection for chemical composition does not meet the required standard, then the batch is deemed not qualified.

**6.5.2** Inspection for mechanics properties: if any one of the samples does not meet the required standard, re-sampled should be carried out using double the original number of test samples from this batch of profiles (include original unqualified sample) and a repeat test should be carried out on these samples. If the repeated test results all qualify, then this batch of powder coating profiles is deemed qualified. If any of the repeated test results is still not up to the required standard, then this batch is deemed not qualified.

**6.5.3** If the colour, chromaticism or appearance quality of the coating does not meet the required standard, then this single piece is deemed not qualified.

**6.5.4** If dimension deviation does not meet the required standard, then this batch of powder coating profiles is deemed not qualified. However, individual inspection is permitted and qualified powder coating profiles should be delivered.

**6.5.5** If the number of unqualified coating thickness exceeds the specified allowable unqualified upper limit numbers shown in Table 5, then this batch of profiles is deemed not qualified. However, individual inspection is permitted and qualified powder coating profiles should be delivered.

**Table 5**

<b>Quantity Range in Each Batch</b>	<b>Random Sampling</b>	<b>Upper Limit of Unqualified Items</b>
1 ~ 10	Entire Batch	0
11 ~ 200	10	1
201 ~ 300	15	1
301 ~ 500	20	2
501 ~ 800	30	3
Over 800	40	4

**6.5.6** The solvent resistance results should only be considered as references and should not be considered as evidence of whether the coating quality qualifies or not.

**6.5.7** If any one of the test results of other properties of the coating fails to qualify, then the whole batch of powder coating profiles is deemed unqualified.

## **7 Markings, packaging, transportation, storage**

**7.1** The label (or quality certificate) on the qualified powder coating profiles should contain the following information:

- a) the name and address of the supplier;
- b) the examination stamp from department of quality control of the supplier;
- c) alloy grade and state;
- d) the name and specification of the profile;
- e) production date or batch number;
- f) the weatherability grade, the colour or profile serial number;
- g) serial number of this Part;
- h) production license number and QS mark.

**7.2** The packaging symbols of powder coating profiles should meet the requirements of GB/T 3199.

**7.3** The profiles should be bundled up and packed in paper, and the exposed surfaces of the profiles should be protected with paper padding or bubble wrap.

**7.4** The transportation and storage of the powder coating profiles should meet the requirements specified in GB/T 3199.

## **7.5 Quality certificate**

A copy of the quality certificate should be enclosed with each batch of power coating profiles, on which the following should be clearly indicated:

- a) name of the supplier;
- b) the name and specification of the powder coating profiles;
- c) alloy grade and state;
- d) batch number or production date;
- e) weight or quantity;
- f) every analysed inspection result and the examination stamp from department of quality control of supplier;
- g) the serial number of this Part;
- h) production license number;
- i) leaving factory date (or package date).

## **8 The contents of the contract (or order list)**

The contract (or order list) to purchase listed materials in this Part should contain the following information:

- a) product names
- b) alloy grades,
- c) supply states;
- d) profiles specifications;
- e) dimension and its allowable deviations accuracy grades;
- f) coating glossiness,
- g) colour and the colour number;
- h) weight or quantity;
- i) serial number of this Part;
- j) other requests.

## **Appendix A**

### **(Normative Annex)**

#### **Falling Sand Test Procedure**

##### **A.1 Scope**

This appendix specifies the falling sand test procedures for measuring the wear resistance of powder coatings.

This appendix applies to the wear resistance measurement of the powder coating on the base of aluminium alloy profiles.

##### **A.2 Procedure summary**

Allow the standard sand to fall freely through the conduit from a specified height, scouring the coating on the sample surface, until the sample is worn down to show the base. Record the quantity of standard sand used per unit coating thickness to determine the wear resistance of this coating.

##### **A.3 Test sample**

The dimension of the test sample is 150mm x 75mm; the sample should be cut from the exposed surfaces of the products which have accepted the test. If the products which have accepted the test do not have suitable exposed surfaces to cut the required dimension samples, then a board sample with the same alloy grade, same production process and same state as the products which have accepted the test should be chosen, and should endure the same surface treatments as products which have accepted the test to represent the batch of products taking the inspection.

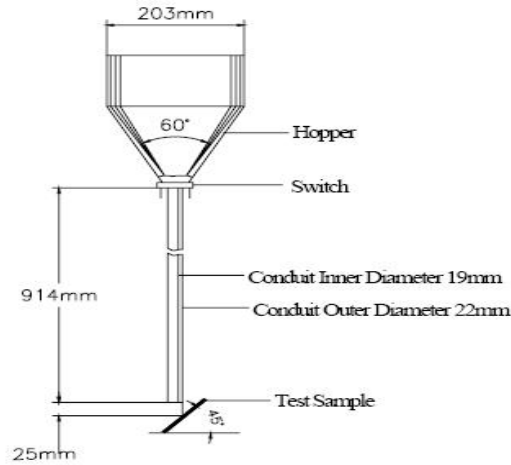
##### **A.4 Test environment**

**A.4.1** The test should be carried out in room temperature, with a relative humidity about 80% or less.

**A.4.2** During the test process, the test should be sheltered from the wind.

##### **A.5 Instruments and abrasion testing materials**

**A.5.1** The demonstration of the test instrument structure of the test as below:



**A.5.2** Use Standard Sand as the abrasion material of the test (the content of SiO<sub>2</sub> in the sand should be greater than 96%, ignition loss should not exceed 0.40%, the content of soil (including soluble salt) should not exceed 0.20%), its grain size should be in line with the requirements in Table A.1.

**Table A.1**

Hole dimension of the square hole screen, mm	Total screen residue
0.65	< 3
0.40	40 ± 5
0.25	> 94

**A.6 Test procedures**

**A.6.1** Draw three circular areas with a diameter of 25mm on each sample and, according to the procedures specified in Section 5.4.3 of this Part, measure and record the coating thickness of each area.

**A.6.2** Fix the sample to the sample support seat and adjust the sample until one of the circular areas' centres is exactly underneath the conduit. The test surface and the conduit should be at a 45° angle. Pour into the hopper the pre-measured volume of standard sand, and allow the sand to fall freely; the sand flow speed should be controlled as: the flow out sand quantity should be 2L per 16 seconds - 18 seconds. Repeat the sand falling until a 4mm diameter circle sample shows its metallic base.

**A.6.3** Repeat the wear out the rest of the other two circular areas on the sample.

**A.7 Test results**

**A.7.1** Use the following formula to calculate the abrasion coefficient (*f*) of the three circular areas on the sample:

$$f = V / h_0 \dots\dots\dots(A.1)$$

in the formula:

$f$  – abrasion coefficient, unit expressed as litre per micron (L/• m)

$V$  – the used volume of the test wear material, unit expressed as litre (L);

$h_0$  – coating thickness, unit expressed as micron (• m).

**A.7.2** The average value of the three abrasion coefficients should be determined as the test result, accuracy to 0.1L/• m.

**Appendix B**  
**(Normative Annex)**  
**Solvent Resistance Test**

**B.1 Scope**

This appendix specifies the solvent resistance test procedures of powder coatings.

This appendix applies to the solvent resistance measurement of the powder coating on the bases of aluminium alloy profiles.

**B.2 Test procedures**

Place an absorbent cotton swab in xylene liquid until it is properly soaked. Then use the absorbent cotton along the same straight line path and with a speed of one return per second wipe back and wipe the sample surfaces coating 30 times. Move the cotton swab away, rinse the sample clean under tap water, wipe dry, leave it in room temperature for 2 hours, then check the coating surfaces.

**B.3 The test results shown:**

Grade 1: the coating colour goes darker and the coating goes soft;  
Grade 2: the coating colour becomes very dark and a finger nail can cause scratch marks;  
Grade 3: the gloss of the coating changes (glossiness becomes lower than gloss unit 5);  
Grade 4: no noticeable changes to the coating; when a finger nail is scratched over the coating, no scratch marks appear.

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