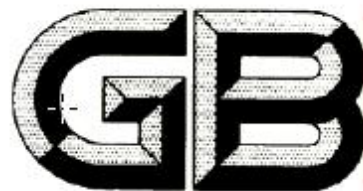


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National Standard of the People's Republic of China

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Wrought aluminium alloy extruded profiles for architecture

Part 2: Anodised Profiles

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Quarantine of the People's Republic of China and the
Standardisation Administration of the People's Republic of China (SAC)**

Foreword

Sections 4.4.1 and 4.4.2 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 2 of GB 5237.

This Part replaces Part 2 of GB 5237.2 – 2004 “Wrought aluminium alloy extruded profiles for architecture-Part 2: Anodised coloured profiles”.

This Part has been revised with reference to JIS H 8601-1999, “Anodic oxide coatings on aluminium and aluminium alloys”.

The main technical differences between this Part when compared to GB5237.2-2004 are:

- phosphoric acid/chromic acid test with nitric acid preliminary-dip method to assess sealed anodic oxide coatings quality has been added;
- alkali spot test requirements and test method for anodic oxide coating have been withdrawn.

Appendices A and B to this part are informative annexes.

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:

Guangdong Xingfa Aluminium Co., Ltd;

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

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This Part replaces the previously issued Standards:

-GB/T 5237-1985, GB/T 5237-1993 (the Part concerning anodised coloured profiles), GB/T 5237.2-2000, GB 5237.2-2004.

Wrought aluminium alloy extruded profiles for architecture

Part 2: Anodised profiles

1 Scope

This Part sets the requirements for the testing methods, inspection rules, packaging, marking, transportation, storage and content of contracts (or orders) of wrought aluminium alloy extruded profiles coated with anodic oxide for architecture.

This Part applies to anodised and electrolysed or organic painted aluminium alloy extruded profiles for architecture (hereafter referred to as anodised 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 1766 Paints and varnishes - Rating schemes for degradation of coats;

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 6462 Metallic and oxide coating – Measurement of coating thickness - Microscopical method;

GB/T 8013.1-2007 Anodic oxide coatings and organic polymer coatings on aluminium and its alloys – Part 1: Anodic oxide coatings;

GB/T 8014.1 Anodising of aluminium and its alloys – The measuring method of thickness of anodic oxide coatings – Part 1: The measuring principle;

GB/T 8753.2 Anodising of aluminium and aluminium alloys – Assessment of quality of sealed anodic oxide coatings – Part 2: Phosphoric acid/chromic acid test with nitric acid pre dip;

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

GB/T 12967.3 Anodising of aluminium alloys – Copper accelerated acetic acid salt spray test for anodic oxide coating (CASS test);

GB/T 12967.4 Anodising of aluminium and aluminium alloys – Determination of fastness to ultraviolet light of coloured anodic oxide coatings;

GB/T 14952.3 Anodising of aluminium and its alloys. Determination of colour differences and appearance of coloured anodic oxide films – Viewing method;

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

3 Terms and definitions

The terms and definitions set out in GB/T 8013.1-2007 apply to this Part, as well as the following:

3.1 Exposed surfaces

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

3.2 Local thickness

Measure the anodic oxide coating thickness of any one inspection area on the exposed surface of the anodised profile that is not larger than 1cm² several times (not less than 3 times); the local thickness is the average value of the measured coating thickness.

3.3 Average thickness

The average thickness is the average value of several (not less than 5 different places) local anodic oxide coating thickness of the exposed surface of the anodised profile.

4 Requirements

4.1 Product classification

4.1.1 Alloy grades, states, specifications

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

4.1.2 Thickness grades, typical applications and surface treatment methods of the anodic oxide coatings

The thickness grades, typical applications and surface treatment methods of the anodic oxide coatings should conform to the provisions set out in Table 1. The thickness grade of the anodic oxide coating should be clearly indicated in the contract; if the thickness grade of the anodic oxide coating is not indicated in the contract, then the anodised profile should be delivered in accordance with AA10 products.

Table 1

Coating Thickness Grade	Typical Application	Surface Treatment Method
AA10	Indoor, outdoor constructions or vehicle components	Anode oxidation; Anode oxidation and electrolytic colouring; Anode oxidation and organic colouration
AA15	Outdoor constructions or vehicle components	
AA20	Outdoor construction parts under harsh environment	
AA25		

4.1.3 Markings

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

If the anodised profile is made of 6063 aluminium alloy, its supply state is T5, its profile code is 421001, its cut-length is 3000 mm, its surface treatment uses anode oxidation and electrolytic colouring, it is bronze coloured, and its anodic oxide coating thickness grade is AA15, then the label should be:

Anodised profile 6063-T5 421001x3000 Bronze AA15 GB5237.2-200X.

4.2 Chemical composition, mechanical properties

The chemical composition and mechanical properties of the anodised profile should conform to the requirements set out in GB 5237.1.

4.3 Dimension deviation

The dimension deviations of the anodised profiles (including anodic oxide coatings) should conform to the requirements set out in GB 5237.1.

4.4 Properties of the anodic oxide coating

4.4.1 Coating thickness

The average thickness, local thickness of the anodic oxide coating should conform to the requirements set out in Table 2.

Table 2

Coating Thickness Grade	Average Thickness/ • m, not thinner than	Local Thickness/ • m, not thinner than
AA10	10	8
AA15	15	12
AA20	20	16
AA25	25	20

4.4.2 Quality of the sealed anodic oxide coatings

After the phosphoric acid/chromic acid test with nitric acid pre-dip, the mass loss of the anodic oxide coating should not be more than 30mg/dm².

4.4.3 Colour and chromaticism

The colour of the anodic oxide coatings should be primarily identical to the colour plate agreed between the suppliers and buyers, or within the restricted colour range of upper limit and lower limit decided through consultation between the suppliers and buyers.

If the buyers request the Instrumental Method be carried out to test the colours of the anodic oxide coatings, the allowable chromaticism value should be decided through consultation between the suppliers and the buyers.

4.4.4 Properties of salt spray corrosion resistance

The test results of the CASS (copper accelerated acetic acid salt spray test) for the anodic oxide coatings should conform to the requirements set out in Table 3.

4.4.5 Wear resistance

The results of the Falling-sand Abrasion Test for anodic oxide coatings should conform to the requirements set out in Table 3.

Table 3

Coating Thickness Grade	Salt Spray Corrosion Resistance Property		Wear Resistance
	CASS Test Result		Falling-sand Abrasion Test Result
	Time/Hour	Grade	Abrasion Coefficient (<i>f</i>), g/• m
AA10	16	• 9	• 300
AA15	24	• 9	• 300
AA20	48	• 9	• 300
AA25	48	• 9	• 300

4.4.6 Weatherability

4.4.6.1 Accelerated weatherability

After the 313B Fluorescent Ultraviolet Lamp Artificial Accelerated Ageing test, the colour changing degree of the electrolytic colouring processed coatings should reach Level 1 as a minimum. The colour changing degree of the organic colouration processed coatings should reach at least Level 2. The exact chromaticism levels should be agreed through consultations between suppliers and buyers on the basis of different colours.

4.4.6.2 Natural weatherability

If the buyer requests the natural weatherability test be carried out, then the test conditions, checking and acceptance standard should be decided through consultations between the supplier and buyer, and should be clearly indicated in the contract.

4.4.7 Others

4.4.7.1 If the buyer has special requests regarding the salt-spray corrosion resistance, wear resistance and weatherability of the anodic oxide coating, both the supplier and buyer may consult each other whilst referring to the requirements set out in GB/T 8013.1-2007 in order to decide on the specific property requirements. The agreed test requirements should be clearly indicated in the contract.

4.4.7.2 If the buyer requests further tests be carried out on other properties, the supplier and the buyer should refer to the requirements set out in GB/T 8013.1-2007 and come to a decision through mutual consultation.

4.5 Appearance quality

No faults such as electrical burns, anodic oxide coating falling off, or other problems that may affect the use of the anodised profiles should be apparent on the surface of the anodised profiles. On anodised profiles within 80mm from its end, no coating should be made on locality areas.

5 Test methods

5.1 Chemical composition

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

5.2 Mechanical 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 rules in Section 11.1 of GB/T 228-2002.

5.3 Dimension deviation

Dimension deviation should be measured according to the methods set out in GB 5237.1.

5.4 Properties of anodic oxide coatings

5.4.1 Coating thickness

5.4.1.1 According to the measuring principles specified in GB/T 8014.1, adopt the Eddy Current Test specified in GB/T 4957 or the Microscopical Method – Measurement of Coating Thickness specified in GB/T 6462. Arbitration determination should be performed according to GB/T 6462.

5.4.1.2 For an explanation of the average thickness measurements and local thickness measurements of the anodic oxide coatings see also Appendix D to GB/T 8013.1-2007.

5.4.2 Quality of sealed anodic oxide coatings

Adopt the phosphoric acid/chromic acid test with nitric acid pre-dip and carry out testing according to the test methods specified in GB/T 8753.2.

5.4.3 Colour and chromaticism

5.4.3.1 When comparing the test samples for colouring, all of the test samples should be placed on the same surface area. Test for the colour from the position at which it is vertical to the test samples, under scattered sunlight, along the anodised profile processing direction.

5.4.3.2 The scattering light source for the illumination should be located above and behind the observer carrying out the test. The direction of the light shining should be as follows: on the North of the equator, the light should be from North; on the South of the equator, the light should be from South.

5.4.3.3 Other examination methods should be carried out according to the provisions stipulated in GB/T 14952.3.

5.4.4 Properties of salt-spray corrosion resistance

Carry out the CASS (copper accelerated acetic acid salt spray test) test according to the methods specified in GB/T 12967.3. The grade of the corrosion results should be evaluated according to GB/T 6461. The protection level should correspond to one of the percentages of different total defect areas shown in Table 4.

Table 4

Defect Area Ratio after Test, %	Protection Level (R)	Defect Area Ratio after Test, %	Protection Level (R)
None	10	>0.05 ~ 0.07	9.3
• 0.02	9.8	>0.07 ~ 0.10	9
>0.02 ~ 0.05	9.5	>0.10 ~ 0.25	8

5.4.5 Wear resistance

Carry out the Falling-sand Abrasion Test according to the method specified in Appendix A to GB/T 8013.1 – 2007.

5.4.6 Weatherability

5.4.6.1 Accelerated weatherability

Carry out 313B Fluorescent Ultraviolet Lamp Artificial Accelerated Ageing tests according to the method specified in GB/T 12967.4. Continuous shining light time should be 300 hours; the evaluation of the colour change degree of the anodic oxide coating should conform to the provisions of GB/T 1766.

5.4.6.2 Natural weatherability

The test for natural weatherability should be carried out according to the provisions of GB/T 9276.

Note: among the atmospheric corrosion test stations in China, the only test station in which the atmospheric conditions are very near to the specified Florida Atmospheric in international Standards is the Qionghai Exposure Test Station.

5.4.7 Others

Tests on other properties should be performed according to test methods specified in GB/T 8013.1 – 2007, or in accordance with the method agreed between the suppliers and the buyers.

5.5 Appearance quality

The examination for appearance quality should be carried out according to the methods specified in GB/T 14952.3.

6 Inspection rules

6.1 Examination and checking acceptance

6.1.1 An examination of the anodised profiles should be carried out by the suppliers so as to ensure that the quality of the anodised profiles conform to the requirements set out in this Part, and the quality certificate should also be completed by them.

6.1.2 Buyers may carry out examinations that are specified in this Part regarding the anodised profiles they receive. If the examination results do not conform to the requirements set out in this Part or in the contract, and result in a disagreement related to appearance quality and dimension deviation, the buyer should submit the problems within one month of the date on which the anodised profiles were received. If the disagreement is related to other properties, then the buyer may submit the problems within three months of receiving the anodised profiles, and both supplier and buyer should come to an agreement through consultation. If a negotiation is required, the suppliers should provide the agreed samples and the problem should be resolved between the supplier and buyer together.

6.2 Batch approval

Anodised profiles should be submitted for approval and acceptance in batches. Anodised profiles with the same alloy grades, same supply states, same specifications, same grades of

coating thickness and the same surface treatments may constitute a batch. The quantity of each batch of anodised profiles is unrestricted.

6.3 Inspection item

Inspections for chemical composition, mechanical properties, dimension deviation, coating thickness, quality of the sealed anodic oxide coating, colour and chromaticism, as well as appearance quality should be carried out on every batch of anodised profiles. The inspection for salt-spray corrosion resistance properties, wear resistance and weatherability are not usually carried out (the suppliers carry out these types of tests at least once a year), but the supplier should ensure these properties conform to the requirements set out in this Part. If the buyer requests that tests be carried out for salt-spray corrosion resistance properties, wear resistance and weatherability, then these requests should be clearly indicated in the contract.

6.4 Sampling

Anodised profile sampling procedures should be carried out in accordance with the provisions set out in Table 5.

Table 5

Test Item	Sampling Rules	Requested Clause Number	The Clause Number of Test Method
Chemical composition, mechanics properties, dimension deviation, appearance quality	According to the provisions of GB 5237.1	4.2, 4.3, 4.5	5.1, 5.2, 5.3, 5.5
Coating thickness	Sampling procedures according to Table 6	4.4.1	5.4.1
Quality of sealed anodic oxide coating	Take 2 sample pieces from each batch of anodised profiles, cut one test sample from each of the sample piece after 120 hours from the finished anodic oxide coating sealing	4.4.2	5.4.2
Colour, chromaticism	According to provisions of GB/T 14952.3	4.4.3	5.4.3
Salt-spray corrosion resistance properties, wear resistance	Take 2 sample pieces per test item from each batch of anodised profiles, take one test sample from each of the sample piece after 120 hours from the finished anodic oxide coating sealing	4.4.4, 4.4.5	5.4.4, 5.4.5

Weatherability	Take 2 sample pieces from each batch of anodised profiles, take one test sample from each of the sample piece after 120 hours from the finished anodic oxide coating sealing	4.4.6	5.4.6
Others	According to the stipulations of GB/T 8013.1-2007 or according to the provisions agreed between the supplier and buyer	4.4.7	5.4.7

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 of anodised profiles is deemed as not qualified.

6.5.2 If any one of the samples fails to meet the required standard during the inspection for mechanical properties, re-sampling should take place using double the original number of test samples from this batch of profiles (including the original unqualified sample). If the repeated test results qualify, then this batch of anodised profiles is deemed as qualified. If any of the repeated test results continues to fail to meet the required standard, then this batch of anodised profiles is deemed as not qualified.

6.5.3 If dimension deviation does not meet the required standard, then the batch of anodised profiles is deemed as not qualified. Individual testing is permitted, however, and the qualified pieces should be delivered.

6.5.4 If the number of unqualified coating thickness exceeds the specified allowable unqualified upper limit numbers, as set out in Table 6, then the profiles should be re-sampled and a repeat test should be carried out using double the original number of test samples. If the test results of the repeated tests show the number of unqualified profiles to be less than double of the specified allowable unqualified upper limit number of profiles, then the entire batch of anodised profiles is deemed to be qualified; otherwise, they are deemed to be unqualified. The supplier may, however, carry out individual testing and the qualified pieces should be delivered.

Table 6

Quantity Range in Each Batch	Random Sampling	Upper Limit of Unqualified Items
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

6.5.5 If the quality of either the sealed anodic oxide coating, the property of salt-spray corrosion resistance, wear resistance, or weatherability fail to qualified, then the batch of anodised profiles is deemed as not qualified.

6.5.6 If the colour and chromaticism do not meet the required standard, then the batch of anodised profiles should be deemed as not qualified. However, the suppliers may carry out individual testing, and the qualified pieces should be delivered.

6.5.7 If the appearance of the samples does not meet the required standard, then the anodised profile is deemed as not qualified.

6.5.8 If any other properties fail to qualify, then the suppliers and the buyers must come to a mutual decision through consultations.

7 Markings, packaging, transportation and storage

7.1 With regard to the safeguarding of the anodic oxide coating, refer to Appendix A.

7.2 The coating thickness grade, colour, corresponding tests results and corresponding contents should be indicated in the quality certificate, as specified in GB 5237.1.

7.3 With regard to the temporary protective measures and transport during the transportation and installation of anodised profiles, refer to the corresponding provisions set out in Appendix B; for packaging boxes, markings, packages, transportation, storage and other contents, see the regulations specified in GB 5237.1.

7.4 The label (or quality certificate) on the qualified anodised profiles should contain the following information:

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

8 The contents of the contract (or order list)

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

- a) product names
- b) alloy grades, supply states;
- c) specifications;
- d) surface treatment methods, colours and coating thickness grades;
- e) accuracy grades of dimension allowable deviation;

- f) serial number of this Part;
- g) other special requests.

Appendix A
(Information Annex)
Safeguard of the Anodic Oxide Coatings

A1 If dirt sedimentation occurs on the surface of the profile, the anodic oxide coatings will absorb the moisture content, which can cause the anodic oxide coatings to corrode, especially when the air contains sulphide. When the architecture anodised profiles are intended for long-term use, the surface of the anodic oxide coatings must be cleaned occasionally, so as to extend the service life of the anodised profiles.

A2 The cleaning cycle for regular anodic oxide coatings is generally every six months. The interval between cleaning may be decided on the basis of the contamination levels of the environment in which the profile is used. When cleaning, attention should be paid not only to cleaning surface dirt, but also not to damage the anodic oxide coatings.

A3 The cleaning methods for anodic oxide coatings may be decided on the basis of the possible level of damage and scope of the anodic oxide coatings. Small work-pieces may be gently wiped clean using the hands, whereas for larger work-pieces, a method must be used to dissolve the sticky sediment. Dirt can generally be cleaned off using a suitable lubricant or warm, mild soapy water, and a fibre brush may be used to clean any dust that may also stick to the surface. Sandpaper, steel wire brushes or other friction articles, or acid and alkali may not be used to clean anodic oxide coatings, as they may damage the coatings. After cleaning treatments, the anodised profiles should be rinsed with clear water, especially places in which there are cracks or dirt, and a soft cloth moistened with ethyl alcohol should be used to wipe the profile clean. Finally, use a high-quality wax to polish the anodic oxide coatings.

Appendix B
(Information Appendix)

Temporary Safeguard Measures and Handling during the
Transportation and Installation of Anodised Profiles

B1 To prevent the anodic oxide coatings from being damaged during the transportation and installation of wrought aluminium alloy extruded profiles for architectural use, avoid friction and sliding between the anodised profiles.

B2 To prevent polluted water, condensates, cement and other dirt from coming into contact with the surfaces of the anodised profiles and causing corrosion during the transportation and storage of anodised profiles, a suitable container protecting the profiles should be used; certain varnishes or easily removable wax or plastic films may also be used to protect the anodised profiles.

B3 The installation of wrought aluminium alloy architecture anodised profiles should be carried out at a later stage of the building construction, and a label should be attached to those which are delivered to the construction site, containing the following information: “To prevent the anodic oxide coatings of the anodised profiles from being damaged, special attention should be paid during transportation. When storing the anodised profiles, do not allow the profiles to come into contact with contaminants such as cement or mortar, which will cause damage to the anodic oxide coatings”.