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Replace GB/T 5237.3—2008

Wrought aluminium alloy extruded profiles for architecture—Part 3: Electrodeposition coating profiles

铝合金建筑型材 第3部分:电泳涂漆型材

(*English Translation*)

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Foreword

SAC/TC 243 is in charge of this English translation. In case of any doubt about the contents of English translation, the Chinese original shall be considered authoritative.

GB/T 5237 *Wrought aluminium alloy extruded profiles for architecture* consists of the following six parts under the general title:

—*Part 1: Mill finish profiles*;

—*Part 2: Anodized profiles*;

—*Part 3: Electrodeposition coating profiles*;

—*Part 4: Powder coating profiles*;

—*Part 5: Paint coating profiles*;

—*Part 6: Thermal barrier profiles*.

This is the third part of GB/T 5237.

This part is drafted in accordance with the rules given in the GB/T 1.1—2009.

This part replaces the GB/T 5237.3—2008 *Wrought aluminium alloy extruded profiles for architecture—Part 3: Electrodeposition coating profiles* in whole. In addition to a number of editorial changes, the follows technical deviations have been made with respect to the GB/T 5237.3—2008:

—Deleted the statement in the foreword "In this part, subclause 4.4.4 and the local thickness requirement of combine film in Table 2 are compulsory, other contents are recommended" (See the foreword of 2008 edition);

—Modified the of application of this part (See clause 1, clause 1 of 2008 edition);

—Deleted the normative references GB/T 228—2002 (See clause 2 and subclause 5.2 of 2008 edition);

—Deleted the normative references GB/T 8013.1 (See clause 2 and subclause 5.4.6 of 2008 edition);

—Deleted the normative references GB/T 9761 (See clause 2 and subclause 5.5 of 2008 edition);

—Deleted the normative references GB/T 9789(See clause 2 of 2008 edition);

—Deleted the normative references GB/T 14952.3(See clause 2 and subclause 5.4.1 of 2008 edition);

—Deleted the normative references GB/T 20975(See clause 2 and subclause 5.1 of 2008 edition);

—Deleted the normative references JC/T 480(See clause 2 and subclause 5.4.9 of 2008 edition);

—Added the normative references GB/T 8005.3(See clause 2 and clause 3);

—Added the normative references GB/T 12967.6(See clause 2, subclause 5.4.2 and subclause 5.5);

—Added the normative references GB/T 14684(See clause 2 and subclause 5.4.9);

—Added the normative references JC/T 479(See clause 2 and subclause 5.4.9);

—Modified the guide language of "terms and definitions"(See clause 3, clause 3 of 2008 edition);

—Modified the definition of "exposed surfaces"(See subclause 3.1, subclause 3 .1 of 2008 edition);

—Deleted the definition of "local thickness"(See subclause 3.2 of 2008 edition);

—Added the regulations of "paint film type and paint film feature"(See subclause 4.1.2);

—In classification, the contents of the each coating thickness of typical applications was modified to remarks of coating thickness of each class, and the film code is also specified(See subclause 4.1.3, subclause 4.1.2 of 2008 edition);

—In classification, add the combined coating performance type and recommended application environment (See subclause 4.1.4);

—Added the content of "quality assurance" (See subclause 4.2);

—In coating thickness, add the film thickness requirement of inner angle, fillister etc.profile surface (See subclause 4.6.1,subclause 4.4.2 of 2008 edition);

—Modified the requirement of the paint film hardness of class S(See subclause 4.6.3, subclause 4.4.3 of 2008 edition);

—Modified the requirement of the Boiling water resistance(See subclause 4.6.5, subclause 4.4.5 of 2008 edition);

—Modified the requirement of the abrasion resistance(See subclause 4.6.6, subclause 4.4.6 of 2008

edition);

—Modified the requirement of the solvent resistance(See subclause 4.6.10, subclause 4.4.10 of 2008 edition);

—Modified the requirement of the salt-spray corrosion resistance(See subclause 4.6.13, subclause 4.4.12 of 2008 edition);

—Added the requirement of the resistance to cyclic corrosion/UV light (See subclause 4.6.14);

—In the requirement of accelerated weathering resistance testing result, modify the requirement of the gloss retention(See subclause 4.6.15.1, subclause 4.4.14.1 of 2008 edition);

—In the requirement of accelerated weathering resistance testing result, "Degree of discoloration $\leqslant$1" is modified to "colour change $\Delta E^*_{ab} \leqslant 3.0$" (See subclause 4.6.15.1, subclause 4.4.14.1 of 2008 edition);

—Modified the requirement of the "other" coating properties(See subclause 4.6.16, subclause 4.4.15 of 2008 edition);

—Modified the requirement of the analysis method for chemical composition (See subclause 5.1, subclause 5.1 of 2008 edition);

—Modified the requirement of the mechanical properties test methods(See subclause 5.2, subclause 5.2 of 2008 edition);

—Modified the requirement of Boiling water resistance test methods(See subclause 5.4.5, subclause 5.4.5 of 2008 edition);

—Modified the requirement of abrasion resistance test methods(See subclause 5.4.6, subclause 5.4.6 of 2008 edition);

—In acid resistance test methods, "chemically pure hydrochloric acid " is modified to "Analytically pure hydrochloric acid" (See subclause 5.4.7, subclause 5.4.7 of 2008 edition);

—In mortar resistance test methods, modify the pulverized lime to Architectural quicklime specified in JC/T 479, modify the standard sand to construction sand specified in GB/T 14684(See subclause 5.4.9, subclause 5.4.9 of 2008 edition);

—Modified the requirement of solvent resistance test methods (See subclause 5.4.10, subclause 5.4.10 of 2008 edition);

—Added the requirement of resistance to cyclic corrosion/UV light test methods (See subclause

5.4.14);

—Modified the requirement of accelerated weathering resistance test methods (See subclause 5.4.15.1, subclause 5.4.14.1 of 2008 edition);

—In natural exposure resistance, the note is modified to "Many countries choose Florida atmospheric corrosion test station for natural exposure resistance.In the Stations for atmospheric corrosion test in China, Atmospheric conditions and Florida is closer to the atmospheric corrosion test station in Qionghai, Hainan Province, but there are some differences between the test results in the atmospheric corrosion test station in Qionghai, Hainan Province and Florida." (See subclause 5.4.15.2, subclause 5.4.14.2 of 2008 edition);

—Modified the requirement of appearance test methods(See subclause 5.5, subclause 5.5 of 2008 edition);

—Modified the regulations of inspection and acceptance(See subclause 6.1, subclause 6.1 of 2008 edition);

—Modified the requirement of batch(See subclause 6.2, subclause 6.2 of 2008 edition);

—Modified the regulations of inspection items(See subclause 6.4, subclause 6.3 of 2008 edition);

—Modified the regulations of the sampling(See subclause 6.5, subclause 6.4 of 2008 edition);

—Modified the requirement of the judgment for test result(See subclause 6.6, subclause 6.5 of 2008 edition);

—Modified the regulations of the products marking(See subclause 7.1.1, subclause 7.1 of 2008 edition);

—Modified the regulations of the packaging(See subclause 7.2, subclause 7.3 of 2008 edition);

—Modified the regulations of the transporting and storing(See subclause 7.3, subclause 7.4 of 2008 edition);

—Modified the contents of the quality certificate(See subclause 7.4, subclause 7.5 of 2008 edition);

—Modified the regulations of the order (or contract) content(See clause 8, clause 8 of 2008 edition);

—Added the contents of the raw material quality assurance(See Annex A);

—Added the contents of the bibliography (See bibliography).

This part was proposed by China Nonferrous Metals Industry Association.

This part was prepared by SAC/TC 243 State Administration of China for Standardization of Nonferrous Metals .

The previous editions of GB/T 5237.3 are as follows:

—GB/T 5237.3—2000, GB 5237.3—2004, GB/T 5237.3—2008.

Wrought aluminium alloy extruded profiles for architecture—Part 3: Electrodeposition coating profiles

1 Scope

This part of GB/T 5237 specifies the terms, definitions, requirements, testing methods, conformity with standards, marking, packaging, transporting, storing, quality certificate and order (or contract) content of wrought aluminium alloy extruded profiles with electrodeposition coating for architecture.

This part is applicable to wrought aluminium alloy extruded profiles for architecture with the combined coatings of anodic oxide, dye and electrodeposition paint (water-solubility paint or color paint) on the surface (hereafter referred to as the profiles).

Wrought aluminium alloy extruded profiles with the same surface treatment and of the same use for other industries may also refer to this part.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB/T 629, *Chemical reagent Sodium hydroxide*

GB/T 1740, *Determination of resistance to humidity*

GB/T 1766, *Paint and varnish—Rating schemes of degradation of coats*

GB/T 1865—2009, *Paints varnishes—Artificial weathering and exposure to artificial radiation—Filtered xenon-arc radiation*

GB/T 3199, *Wrought aluminium and aluminium alloy products—Packaging, marking, transportinging and storing*

GB/T 4957, *Non-conductive coatings on non-magnetic metal substrates—Measurement of coating thickness—Eddy current method*

GB/T 5237.1, *Wrought aluminium alloy extruded profiles for architecture—Part 1: Mill finish profiles*

GB/T 5237.2, *Wrought aluminium alloy extruded profiles for architecture—Part 2: Anodized profiles*

GB/T 6461, *Metals and other inorganic coatings on metal substrates—Rating of specimens and test pieces after the corrosion tests*

GB/T 6462, *Metallic and oxide coatings—Measurement of coating thickness—Microscopical method*

GB/T 6682, *Water for analytical laboratory use—Specification and test methods*

GB/T 6739, *Determination of film hardness by pencil test*

GB/T 8005.3, *Aluminium and aluminiumalloys—Terms and definitions—Part 3: Surface treatment*

GB/T 8013.2, *Anodic oxide coatings and organic polymer coatings on aluminium and its alloys—Part 2: Combined anodic oxide coating*

GB/T 8014.1, *Anodizing of aluminium and its alloys—The measuring method of thickness of anodic oxide coatings—Part 1: The measuring principle*

GB/T 9276, *Methods of exposure to natural weathering of coating*

GB/T 9286, *Paints and varnishes—Cross cut test for films*

GB/T 9754, *Paints and varnishes—Determination of specular gloss of non-metallic paint films at 20° 60° and 85°*

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 12967.6, *Test Methods for anodic oxidation coatings of aluminium and aluminium alloys—Part 6: Determination of color differences and appearance of colored anodic oxide films by viewing method*

GB/T 14684, *Sand for construction*

GB/T 16585, *Rubber, vulcanized—Test method of resistance to artificial weathering (Fluorescent*

UV lamp)

JC/T 479, *Architectural quicklime*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in GB/T 8005.3 and the following apply.

3.1
exposed surfaces

visible surfaces of profiles after they are machined, assembled and installed in the architecture, including opened or closed status

4 Requirements

4.1 Classification

4.1.1 Alloy, temper and dimension

The alloy, temper and dimensions shall be in accordance with the requirements given in GB/T 5237.1.

4.1.2 Paint coating type and characteristics

Paint film type and ther characteristics are shown in Table 1.

Table 1—Paint film type and characteristics

paint film types		paint film characteristics
classification by clear of paint film	gloss Paint film	bright surface with high specular reflectivity
	matt paint film	soft gloss surface with low specular reflectivity
classification by color of paint film	clear paint film	colorless clear,no pigment is added in the electrodeposition paint
	colored paint film	color diversity, but compared with transparent paint film, there are some differences in weathering resistance and corrosion resistance due to the pigment performance

4.1.3 Film thickness class

Film thickness class is shown in Table 2.

Table 2—Combined coating film thickness class

film thickness class	film code	paint film type	note
A	EA21	gloss or matt clear paint	The class of thickness of combined coating film is divided into 3 classes: A, B and S, the classification is based on the film thickness and the color category of electrodeposition coating, rather than the performance. In one factory, for the combined coating formed by the same production process with the same electrodeposition paint, the weather resistance and corrosion resistance of the high thickness film is usually better than the low thickness film
B	EB16		
S	ES21	gloss or matt colored paint	

4.1.4 Combined coating film performance class and corresponding profile application environment

According to the result of salt-spray corrosion resistance, accelerated weathering resistance, resistance to cyclic corrosion/UV light, combined coating film performance classes are divided into Ⅱ, Ⅲ and Ⅳ. The performance class shall be agreed between the supplier and the purchaser, and specified in the order (or contract). If not specified, it shall be supplied in accordance with class Ⅱ. Combined coating film performance class and corresponding profile application environment shall be in conformity with the requirements specified in Table 3.

Table 3—Combined coating film performance class and corresponding application environment

combined coating film performance class	profiles application environment
Ⅳ	strong UV light exposure and severe atmosphere corrosion
Ⅲ	comparatively strong UV light exposure and severe atmosphere corrosion
Ⅱ	common UV light exposure and light atmosphere corrosion

4.1.5 Marking and example

The marking of products shall be expressed in the order of product name, the standard number of this part, alloy, temper, section code and length, color, combined coating film performance class, coating code. Examples of marking are listed as follows:

EXAMPLE 1

Aluminium profiles, which are made of alloy 6063, temper T5, section code 421001, specified length 6 000 mm bronze,

coating code EA21, class Ⅱ, film performance class Ⅱ, are marked as:

Electrodeposition coating profiles GB/T 5237.3-6063T5-421001×6000 Bronze class Ⅱ EA21

EXAMPLE 2

Aluminium profiles, which are made of alloy 6063, temper T5, section code 421001, specified length 6 000 mm White, coating code ES21, class Ⅱ, film performance class Ⅱ, are marked as:

Electrodeposition coating profiles GB/T 5237.3-6063T5-421001×6 000 White class Ⅱ ES21

4.2 Quality assurance

4.2.1 Process

Process assurance sees A.1.

4.2.2 Raw material

The quality requirements of mill finish and chemical reagents, additives quality and electrodeposition coating quality used in anodic oxidation treatment see A.2.

4.3 Chemical composition

The chemical composition shall be in accordance with the requirements given in GB/T 5237.1.

4.4 Mechanical properties

The mechanical properties shall be in accordance with the requirements given in GB/T 5237.1.

4.5 Dimension tolerance

The dimension tolerance (including combined coating) shall be in accordance with the requirements given in GB/T 5237.1.

4.6 Performances of coating

4.6.1 Coating thickness

The coating thickness on exposed surfaces shall be in accordance with the requirements given in Table 4. The film thickness class shall be specified in the order (or contract), if not, the profiles with clear coating shall be supplied in accordance with class B.

Table 4—Combined coating film thickness

film thickness class	coating thickness [a] μm		
	local thickness of anodic oxide coating	local thickness of paint coating	local thickness of combined coating
A	≥9	≥12	≥21
B	≥9	≥7	≥16
S	≥6	≥15	≥21

[a] Due to the complexity of the cross section shape, it is allowable that the local film thickness of some surface (such as inner angle, fillister, etc.) is less than the specified value.

4.6.2 Colour difference

The colour shall be basically consistent with colour samples which have been agreed between the supplier and the purchaser, or between the upper and lower limit of the standard sample agreed between the supplier and the purchaser. When the purchaser demand to carry out instrumental test, the allowable colour difference shall be agreed between the supplier and the purchaser.

4.6.3 Paint film hardness

After the pencil scratch test, the paint film hardness shall not be less than 3H.

4.6.4 Paint film adhesion

The dry adhesion and the wet adhesion of the paint film shall be grade 0.

4.6.5 Boiling water resistance

After the boiling water immersion test, the combined coatings surface can not have wrinkle, crackle, blister, detachment and colour difference, the adhesion shall be grade 0.

4.6.6 Abrasion resistance

Sand-falling test or abrasive jet test can be adopted for abrasion resistance. For sand-falling test, the average sand consumption of wearing per micron of coating thickness shall not be less than 3 300 g. For abrasive jet test, the average time of wearing per micron of film thickness shall not be less than 35s. Test methods for abrasion resistance shall be agreed between the supplier and the purchaser, and indicated in the order (or contract). If not indicated, the sand-falling test should be adopted.

4.6.7 Acid resistance

After the acid resistance test, the combined coating surface shall not have any blister and other obvious changes.

4.6.8 Hydrochloric alkali resistance

After the hydrochloric alkali resistance test, the protective rate shall be not less than grade 9.5.

4.6.9 Mortar resistance

After the mortar resistance test, the combined coating surface shall not have any detachment and other obvious changes.

4.6.10 Solvent resistance

After the solvent resistance test, the anodic oxidation coating shall not be exposed.

4.6.11 Detergent resistance

After the detergent resistance test, the combined coating surface shall not have any blister, detachment and other obvious changes.

4.6.12 Humidity resistance

After the humidity resistance test, the comprehensive damage grade of combined coating surface shall meet grade 1.

4.6.13 Salt-spray corrosion resistance

The result of CASS test and AASS test shall meet the specification shown in Table 5. The testing method of salt-spray corrosion resistance shall be subject to agreement between the supplier and the purchaser, and specified in the order (or contract). If not specified, it shall be supplied in accordance with CASS test. If the customer required, it can also carry out NSS test, the testing time and testing result of NSS test shall be agreed between the supplier and the purchaser in accordance with GB/T 8013.2.

Table 5—Result of salt-spray corrosion resistance, accelerated weathering resistance, UV light and salt spray combined testing

combined coating film performance class	salt-spray corrosion resistance				accelerated weathering resistance		UV light and salt spray combined testing					
	AASS test		CASS test		the accelerated weathering test by exposure to xenon-arc lamp		method A			method B		
	testing time h	protection grade	testing time h	protection grade	testing time h	test result	UV test testing time h	CASS test testing time h	protection grade	UV test testing time h	AASS test testing time h	protection grade
Ⅳ	1 500	≥Grade 9.5	120	≥Grade 9.5	4 000	chalk-like shall meet class 0, gloss retention [a] ≥75%, colour change $\Delta E^*_{ab} \leq 3.0$	240	120	≥Grade 9	240	1 500	≥Grade 9
Ⅲ	1 500	≥Grade 9.5	120	≥Grade 9.5	2 000		240	120	≥Grade 9	240	1 500	≥Grade 9
Ⅱ	1 000	≥Grade 9.5	72	≥Grade 9.5	1 000		240	72	≥Grade 9	240	1 000	≥Grade 9

[a] The gloss retention is the percentage of the gloss value of paint film coating after test relative to that before test.

4.6.14 UV light and salt spray combined testing

UV light and salt spray combined testing shall be in accordance with the requirements given in Table 5. UV light and salt spray combined testing shall be carried out in accordance with method A or method B in Table 5, and specified in the order (or contract). If not specified, it shall be supplied in accordance with method A in Table 5.

4.6.15 Weathering resistance

4.6.15.1 Accelerated weathering resistance

The accelerated weathering resistance shall be in conformity with the requirements specified in Table 5.

4.6.15.2 Natural exposure resistance

If natural exposure resistance is required by the purchaser, the test conditions and the acceptance standard shall be agreed between the supplier and the purchaser, and it shall be specified in the order (or contract).

4.6.16 Other

If other performance is required by the purchaser, it shall be subject to agreement between the supplier and the purchaser according to GB/T 8013.2, and it shall be specified in the order (or contract).

4.7 Appearance

Before electrodeposition coating, the appearance quality of the profiles shall be in conformity with the relevant specifications in GB/T 5237.2. After electrodeposition paint, the film shall be even and clean, and it is not allow defects affecting the use such as wrinkle, cracking, blister, run, inclusion, attachment and detachment. But no coating locally within the 80 mm end of profile is permitted.

5 Test methods

5.1 Chemical composition

The analysis method for chemical composition shall be in accordance with GB/T 5237.1, and the combined coating shall be removed of the sample before test.

5.2 Mechanical properties

The mechanical properties test shall be in accordance with GB/T 5237.1.

5.3 Dimension tolerance

The dimension tolerance shall be in accordance with GB/T 5237.1.

5.4 Performance of coating

5.4.1 Coating thickness

5.4.1.1 Local thickness of combined coating film of anodizing film

According to the measurement principle in GB/T 8014.1, coating thickness shall be measured by eddy current method as in GB/T 4957 or microscopical method as in GB/T 6462. Refree measurement shall be in accordance with GB/T 6462.

5.4.1.2 Local thickness of pint film

According to the measurement principle in GB/T 8014.1, coating thickness shall be measured by eddy current method as in GB/T 4957 or microscopical method as in GB/T 6462. Referee measurement shall be in accordance with GB/T 6462. If apply the eddy current type measuring method, it shall be carried

out by any method shown below:

a) measure the local thickness of combined coating on measuring part, and then minus the thickness of anodic coatings which have measured according to 5.4.1.1 and obtain the local thickness value of paint films;

b) measure the local thickness of combined coating, remove the paint films using peeling agent or related instrument, then measure the thickness of anodic coatings, and the difference between the two thickness of above test is the local thickness of paint films.

5.4.2 Colour difference

5.4.2.1 Visual measurement method

It shall be in accordance with GB/T 12967.6.

5.4.2.2 Instrumental measurement

It shall be in accordance with GB/T 11186.2 and GB/T 11186.3.

5.4.3 Paint film hardness

Pencil test of paint film hardness shall be in accordance with GB/T 6739, and the result shall be assessed according to scratch situation of the surface coatings.

5.4.4 Paint film adhesion

5.4.4.1 Dry adhesion

5.4.4.1.1 Make cross-cut in accordance with GB/T 9286, the cross-cut parallel spacing is 1 mm.

5.4.4.1.2 Cover the cut area of the specimen surface with adhesive tape[1)] which has adhesive power of 10 N/25 mm (or more). Press the tape firmly with finger to eliminate air bubbles, and take the tape off perpendicularly from the specimen immediately. Then evaluate the adhesion of paint films according to GB/T 9286.

5.4.4.2 Wet adhesion

Make cross-cut in accordance with 5.4.4.1.1, and immerse specimen in 38 ℃±5 ℃ Class 3 water specified in GB/T 6682 for 24 h. Take the specimen out and wipe it dry. Then test and evaluate the

1) Scotch 610 tape and Permacel 99 tape are suitable examples of market sales. To supply this information is for the convenience of the consumers, but not indicating approval of these products.

specimen in 5 min according to 5.4.4.1.2.

5.4.5 Boiling water resistance

Use the boiling water immersion test, add Class 3 water specified in GB/T 6682 to a depth of about 80 mm in the beaker, and add 2 or 3 clean ceramic chips, then heat at the bottom of beaker until the water boils. Immerse specimen in the water for 5 h, keeping it at a position of 10 mm below the surface of water, but not contacting the bottom of beaker. During the test, the temperature of water shall not be below 95 ℃ and it shall be maintain the depth of water not less than 80 mm by pouring boiling Class 3 water specified in GB/T 6682 at any moment. Take the specimen out and wipe it dry after immersion, inspect visually the surface of paint film after boiling test (except edges of the specimen), then take out the sample, carry out adhesion test and evaluate the specimen in 5 min according to 5.4.4.1.

5.4.6 Abrasion resistance

It shall be in accordance with GB/T 8013.2.

5.4.7 Hydrochloric acid resistance

Prepare hydrochloric solution mixed with analytically pure hydrochloric acid (ρ = 1.19 g/mL) and Class 3 water specified in GB/T 6682 with the volume proportion of 1 : 9. Drop ten drops of hydrochloric solution on the paint film surface of specimen and cover it with watch glass. Keep it at 18 ℃—27 ℃ for 15 min. At the end of test, rinse the specimen with tap water and dry it. Then visual inspect the coating surface.

5.4.8 Alkaline resistance

5.4.8.1 Slightly erase the dirt on the surface of the specimen with alcohol. Use vaseline or wax to fix a glass (or synthetic resin) ring that the internal diameter is 32 mm and the height is 30 mm on the significant surface, and seal up the outer circumference.

5.4.8.2 Prepare 5 g/L NaOH solution mixed with NaOH specified in GB/T 629 and Class 3 water specified in GB/T 6682.

5.4.8.3 Keep the specimen horizontal, fill NaOH solution up to a half of the ring and cover the top of the ring with glass or synthetic resin and keep it at 20 ℃ ± 2 ℃ during the test. After 24 h, remove the glass ring from the specimen and rinse with clean water and put it indoor for 1 h. Then draw a concentric circle with ring and the diameter is 30 mm. Examine the degree of corrosion with magnifying lens (the magnification is 10 times—15 times), and the evaluation shall be in accordance with GB/T 6461, the total defect area percentage shall be accordance with Table 6.

Table 6—Relative classification of different defect area

defect area after testing %	protection grade	defect area after testing %	protection grade
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

5.4.9 Mortar resistance

5.4.9.1 Mix 75 g architectural quicklime specified in JC/T 479 and 225 g construction sand specified in GB/T 14684, then add 100 g Class 3 water specified in GB/T 6682 to make pasty mortar.

5.4.9.2 Put the pasty mortar on the specimen surface, heap it up to cylindrical shape with the size of 15 mm ϕ × 6 mm *H*. Then keep it at 38 ℃ ± 3 ℃ and relative moisture 95% ± 5% for 24 h.

5.4.9.3 Remove the mortar and erase the residues on the surface with wet cloth and dry it. Inspect visually the surface of paint films after the test.

5.4.10 Solvent resistance

At room temperature, wipe on the sample surface along a straight path 100 times back and forth, wipe once per second (one back and forth is defined as once) with a 1 kg heavy hammer which wrapped with six layers of medical gauze at least, the medical gauze absorbed full of xylene (contact area of the head and the sample surface is about 150 mm^2). Keep the gauze wet during the test. Inspect visually on the surface of paint films after test.

5.4.11 Detergent resistance

5.4.11.1 Prepare test solution (30 g/L) with detergent whose compositions are shown in Table 7 and Class 3 water specified in GB/T 6682. Place the specimen in the detergent solution at 38 ℃ ± 1 ℃ for 72 h, and then take the specimen out and wipe them dry.

Table 7—Detergent composition

composition	mass fraction %
tetrasodium pyrophosphate	53
sodium sulphate anhydrous	19
sodium linear alkylarylsulfonate	20
sodium metasilicate hydrated	7
sodium carbonate anhydrous	1
total	100

5.4.11.2 Cover the cut area of the specimen surface with adhesive tape which has adhesive power of 10 N/25 mm (or more).Press the tape firmly eliminate air bubbles, and take the tape off perpendicularly from the specimen immediately, inspect visually the surface of paint films after the test.

5.4.12 Humidity resistance

It shall be in accordance with GB/T 1740.The test temperature is 47 ℃ ± 1 ℃ , and the testing time is 4 000 h.

5.4.13 Salt-spray corrosion resistance

CASS test shall be carried out according to GB/T 10125, after the specified test time, the test result shall be evaluated according to GB/T 6461, and the total defect area percentage shall be related to the class respectively in Table 6.

5.4.14 UV light and salt spraying combined test

UV light and salt spraying combined test contains first UV radiation test and then salt-spray corrosion resistance test.The UV radiation test is set according to the parameters of Table 8, the other tests shall be carried out according to GB/T 16585, the salt-spray corrosion test shall be carried out according to GB/T 10125, after the specified test time, the test result shall be evaluated according to GB/T 6461, and the total defect area percentage shall be related to the class respectively in Table 6.

Table 8—UV radiation test conditions

item	test condition
light type	UVB-313
illumination cycle	4 h
condensation cycle	4 h
irradiance	30 W/m^2
the black panel temperature of the Light cycle	60 ℃ ± 3 ℃
the black panel temperature of the condensation cycle	50 ℃ ± 3 ℃

5.4.15 Weathering resistance

5.4.15.1 Accelerated weathering resistance

Xenon-Arc exposure test shall be in accordance with circle A of method 1 given in GB/T 1865—2009. Measure the gloss retention according to GB/T 9754, and the color change of the test before and after the test according to GB/T 11186.2 and GB/T 11186.3, assess the chalking grade according to GB/T 1766.

5.4.15.2 Natural exposure resistance

The test shall be in accordance with GB/T 9276.

NOTE Many countries choose Florida atmospheric corrosion test station for natural exposure resistance. In the Stations for atmospheric corrosion test in China, Atmospheric conditions and Florida is closer to the atmospheric corrosion test station in Qionghai, Hainan Province, but there are some differences between the test results in the atmospheric corrosion test station in Qionghai, Hainan Province and Florida.

5.4.16 Other

The tests of other properties shall be in accordance with GB/T 8013.2 or shall be agreed between the supplier and the purchaser.

5.5 Appearance

The test of appearance shall be in accordance with GB/T 12967.6.

6 Conformity with standards

6.1 Inspection and acceptance

6.1.1 The profiles shall be inspected by the supplier, ensuring the product quality in accordance with the specification of this part or order (or contract) and filling in the product quality assurance certificate.

6.1.2 The purchaser may re-check the received products according to this part. If the result is not in accordance with the specification of this part or order (or contract), purchaser may inform supplier in written form, and the problem may be solved through consultation by both sides. The disapproval of the appearance quality and dimension tolerance shall be informed within 1 month after products are received. The disapproval of other properties may be informed within 6 months after products are received. If arbitration is required, the arbitration specimens will be supplied by purchaser and the arbitration will be proceeded between supplier and purchaser.

6.2 Batch

The profiles shall be inspected for acceptance in batches, and each batch shall be consisted of profiles with the same alloy, temper, specification (or section code), colour, paint film type, film thickness class, combined coating film performance class and the profiles with the same surface treatment, no limit for batch weight.

6.3 Inspection classification

Product inspection includes delivery inspection and routine inspection.

6.4 Inspection item and process assurance item

6.4.1 Delivery inspection item, routine inspection item and process assurance item shall be in accordance with Table 9.

Table 9—Inspection item and process assurance item

inspection item		delivery inspection item	routine inspection item	process assurance item
chemical composition		√	—	—
mechanical properties		√	—	—
dimensions tolerance		√	—	—
coating thickness		√	—	—
color difference		√	—	—
paint film hardness		√	—	—
paint film adhesion		√	—	—
boiling water resistance		√	—	—
abrasion resistance		[a]	√	√
acid resistance		√	—	—
alkali resistance		√	—	—
mortar resistance		√	—	—
solvent resistance		√	—	—
detergent resistance		[a]	√	√
humidity resistance		[a]	√	√
salt-spray corrosion resistance		[a]	√	√
resistance to cyclic corrosion/UV light		[a]	√	√
weathering resistance	accelerated weathering resistance	[a]	√	√
	natural exposure resistance	[a]	—	√
other coating properties		[a]	—	—
appearance		√	—	—

"√"show must be checked,or process assurance item; "—"show is not checked,or is not process assurance item.

[a] When the Inspection is indicated in the order(or contract), this item is listed as a must to be checked.

6.4.2 The supplier carry out a routine inspection at least once every three years.

6.5 Sampling

Sampling shall be in accordance with Table 10.

Table 10—Inspection item and sampling specification

inspection item		sampling specification	required clause	inspection clause
chemical composition		According to GB/T 5237.1	4.3	5.1
mechanical properties			4.4	5.2
dimensions tolerance			4.5	5.3
coating thickness		Sampling quantity according to table 11. Taking one test sample in each piece	4.6.1	5.4.1
colour difference		Piece by piece	4.6.2	5.4.2
paint film hardness		Taking 2 pieces / inspection item in every batch, after the paint film is solidified and place for 24 h, Taking 1 test sample in each piece	4.6.3	5.4.3
paint film adhesion	dry adhesion		4.6.4	5.4.4
	wet adhesion			
boiling water resistance			4.6.5	5.4.5
abrasion resistance		Taking 2 pieces in every batch, after the paint film is solidified and place for 24 h, Taking 1 test sample in each piece	4.6.6	5.4.6
acid resistance		Taking 2 pieces / inspection item in every batch, after the paint film is solidified and place for 24 h; Taking 1 test sample in each piece	4.6.7	5.4.7
alkali resistance			4.6.8	5.4.8
mortar resistance			4.6.9	5.4.9
solvent resistance		Taking 2 pieces / inspection item in every batch, after the paint film is solidified and place for 24 h; Taking 1 test sample in each piece.	4.6.10	5.4.10
detergent resistance			4.6.11	5.4.11
humidity resistance			4.6.12	5.4.12
salt-spray corrosion resistance			4.6.13	5.4.13
resistance to cyclic corrosion/UV light			4.6.14	5.4.14
weathering resistance	accelerated weathering resistance		4.6.15.1	5.4.15.1
	natural exposure resistance	Taking 3 pieces in this batch, Taking one test sample in each piece. If the purchaser agrees, the supplier should making 3 pieces that the color, film type, film thickness class, combined coating film performance class, and the surface treatment process are the same as the profiles to replace the profiles samples. The effective surface size (length × width) of the sample (or panel) film should be 250 mm × 150 mm	4.6.15.2	5.4.15.2
other coating properties		According to GB/T 8013.2 or it shall be agreed between the supplier and the purchaser	4.6.16	5.4.16
appearance		Piece by piece	4.7	5.5

Table 11—Coating thickness sampling quantity and upper limit for failed quantity

In piece

batch quantity	randomly sampling quantity	upper limit for failed quantity
1—10	All	0
11—200	10	1
201—300	15	1
301—500	20	2
501—800	30	3
Above 800	40	4

6.6 Rejection and retest

6.6.1 When any specimen fails in terms of chemical composition and the casting batch can be distinguished, the casting batch represented by the specimen is unqualified, Then, the other casting batch should be checked piece by piece, and only the qualified ones shall be delivered. The whole batch fails when the casting batch cannot be distinguished.

6.6.2 When any specimen fails in terms of mechanical property, specimens in double quantity shall be taken from the same batch and be tested again. If the retest result is qualified, then the whole batch is qualified. If any specimen fails in the second test, then the whole batch fails. The supplier is allowed to check piece by piece if it is agreed by the supplier and the purchaser, and deliver the qualified ones.

6.6.3 The whole batch is failed when the specimen fails in terms of dimension tolerance. But it allows to test piece by piece, and deliver the qualified ones.

6.6.4 When the failed quantity is beyond the upper limit in terms of coating thickness according to Table 11, specimens shall be taken from the same batch in double quantity and be tested again. When the failed quantity in the retest doesn't go beyond double quantity of failed upper limit, this batch is qualified, otherwise, the batch is not qualified. The supplier is allowed to check piece by piece if it is agreed by the supplier and the purchaser, and deliver the qualified ones.

6.6.5 The piece is unqualified when the specimen fails in terms of coating color, color difference.

6.6.6 The batch is unqualified when the specimen fails in terms of paint film hardness.

6.6.7 The batch is unqualified when the specimen fails in terms of paint film adhesion.

6.6.8 The batch is unqualified when the specimen failed in terms of boiling water resistance.

6.6.9 The batch is unqualified when the specimen failed in terms of abrasion resistance.

6.6.10 The batch is unqualified when the specimen failed in terms of muriatic acid resistance.

6.6.11 The batch is unqualified when the specimen failed in terms of alkali resistance.

6.6.12 The batch is unqualified when the specimen failed in terms of mortar resistance.

6.6.13 The batch is unqualified when the specimen failed in terms of polymerisation resistance.

6.6.14 The batch is unqualified when the specimen failed in terms of detergent resistance.

6.6.15 The batch is unqualified when the specimen failed in terms of humidity resistance.

6.6.16 The batch is unqualified when the specimen failed in terms of salt-spray corrosion resistance.

6.6.17 The batch is unqualified when the specimen failed in terms of combined testing result of ultraviolet salt spray.

6.6.18 The batch is unqualified when the specimen failed in terms of weathering resistance.

6.6.19 The batch is unqualified when the specimen failed in terms of other coating properties.

6.6.20 The piece is unqualified when the specimen failed in terms of appearance.

6.6.21 When the regular inspection result is unqualified, the supplier shall re-evaluate the mill finish profiles quality, the electrodeposition coating, process and so on, and re-check it until it is qualified.

7 Marking, packaging, transporting, storing, and quality certificate

7.1 Marking

7.1.1 Product marking

The qualified profiles shall be marked with the following content (or labeled with the following contents):

a) name and address of supplier;

b) product name;

c) inspection stamp of supplier's quality control department (or signature or seal of quality inspection personnel);

d) alloy, temper, dimension specification (or section code);

e) performance class, coating thickness code and color;

f) batch number or production date;

g) the standard number of this part;

h) production license number and QS mark.

7.1.2 Package box marking

The package box marking of profiles shall meet the requirements specified in GB/T 3199.

7.2 Packaging

The exposed surface of profiles shall be protected by material such as paper and foam, and other packaging shall be in accordance with GB/T 3199.

7.3 Transporting and storing

The transporting and storing of profiles shall be in accordance with GB/T 3199. The protective action of the transporting and the use process shall be in accordance with GB/T 5237.2.

7.4 Quality certificate

Every batch of profiles shall be attached with product quality certificate, with the following content:

a) supplier name;

b) product name;

c) alloy, temper, dimension specification (or section code);

d) performance class, coating thickness code and color;

e) batch number or production date;

f) weight or pieces;

g) test results and inspection stamp of the supplier's quality control department;

h) the standard number of this part;

i) production license number.

8 Order (or contract) content

Order the profiles of this part that the order (or contract) content shall include the following content:

a) supplier name;

b) product name;

c) alloy, temper, dimension specification (or section code);

d) dimension tolerance, accuracy class;

e) performance class, coating thickness code and color;

f) weight or pieces;

g) special requirements for purchaser:

—the requirement of coating thickness;

—the testing requirement of abrasion resistance;

—the testing requirement of detergent resistance;

—the testing requirement of humidity resistance;

—the specific requirement of salt-spray corrosion resistance;

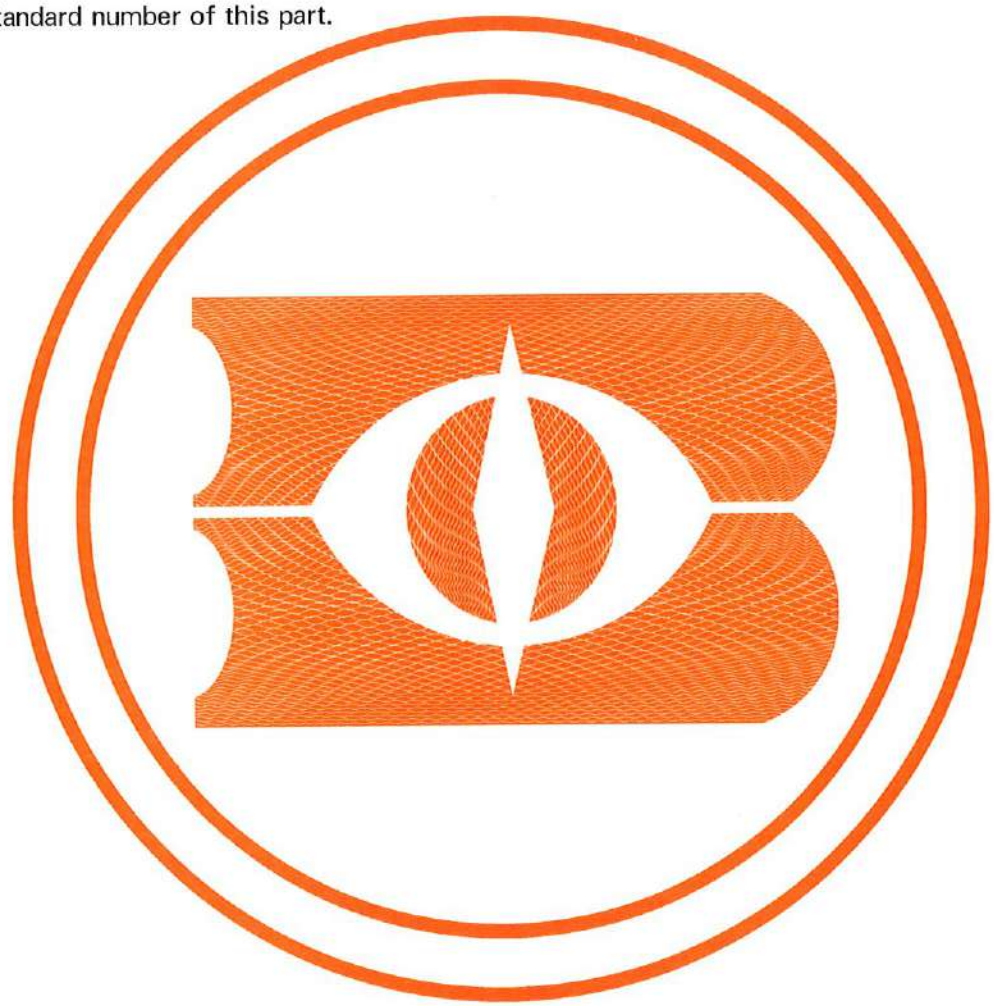
—the specific requirement of combined testing result of ultraviolet salt spray;

—the requirement of weathering resistance;

—the specific requirement of other coating properties;

—other special requirement;

h) the standard number of this part.



Annex A
(informative)
Quality assurance

A.1 Process assurance

The performance of combined coating depends on the process of anodizing and electrodeposition painting.To ensure the quality of combined coating, the process of anodized and electrodeposition painting should meet the requirements GB/T 23612.

A.2 Quality assurance of raw materials

A.2.1 Mill finish profiles

The quality of mill finish profiles shall be in accordance with GB/T 5237.1.

A.2.2 Chemical reagents and additives for surface treatment of anodic oxidation

The quality of the chemical reagents and additives for surface treatment of anodic oxidation shall be in accordance with GB/T 5237.2.

A.2.3 Electrodeposition paint

A.2.3.1 Types and features of electrodeposition paint

Electrodeposition paint is the main material for combined coating of aluminum alloy profile, whose performance have significant effect on the quality of combined coating.Electrodepostion paint shall meet the requirements of YS/T 728.According to YS/T 728, electrodeposition paint is classified into four levels.All electrodeposion paint above can be applied in the production of combined coating of aluminum alloy profile's Performance Level Ⅱ.All electrodeposion paint except Level 1 can be applied in the production of combined coating of aluminum alloy profile's Performance Level Ⅲ.Electrodeposition paint Level Ⅳ can be applied in the production of combined coating of aluminum alloy profile's Performance Level Ⅳ.Ordinarily, the higher level is the electrodeposition paint, the better is the weather resistance performance.The types and features of electrodeposition paint are listed in Table A.1.

Table A.1—Types and features of electrodeposition coating

coating types		coating features
state of coating	liquid style	The solvent style paint specified in YS/T 728, made of polymerized poly acrylic resin and amino resin as its main components. Non-volatile content is usually not more than 70%
	emulsion style	Formed after the emulsification. Non-volatile content is usually not more than 40%

A.2.3.2 Compositions, features and control requirements of electrodeposition paint

Compositions, features and control requirements of electrodeposition paint see Table A.2.

Table A.2—Compositions, features and control requirements of electrodeposition paint

main components	features	control requirements
poly (acrylic acid)	Poly acrylic acid resin is polymerized by acrylic monomer and is the main component in producing paint film and a key factor to affect the performance of paint film	Molecular weight is the main factor to affect the performance of poly acrylic acid resin. In order to produce poly acrylic acid resin for paint, an appropriate molecular weight should be measured in considering NV content, physical features, process requirements and etc. Generally speaking, a molecular weight of about 20 000 to 40 000 is needed. However, if high NV paint must be needed, the molecular weight maybe below 10 000. In respect of paint requirements, the narrower distribution of molecular weight the better, because the molecular weight of polymer is more even and more steady
amino resin	Amino resin is a kind of multi-functional group polymer, which will cause cross-linking action in curing process. The types of amino resin and the ratio of poly acrylic acid resin to amino resin would affect the result of cross linking and curing, further affect the performance of paint film	An appropriate type and ratio of amino resin should be considered according to the paint requirements and the feature of poly acrylic acid resin. Generally speaking, most liquid electrodeposition paint use high ratio of methyl/etherified mixed etherifying amino resin, while most emulsion electrodeposition paint use low ratio of methyl/etherified mixed etherifying amino resin. The proportion of amino resin in total resin is usually 17%—45%
organic solvent	They are mostly alcohol or ether hydrophilic organic solvent. Organic solvent is used to keep the interface steady between waterborne paint and water. Some organic solvents participate into the reaction. Different types of organic solvent will affect the performance of paint, the total emission of volatile organic compounds in aluminum production	Generally speaking, the content of organic solvent in liquid raw paint is 11%—40%, while in emulsion raw paint is 10%—20%

A.2.3.3 Hazardous substances

The limitations of hazardous substances are listed in YS/T 728 and in Table A.3.

Table A.3—The limitations of hazardous substances in electrodeposition paint

hazardous substances	mass fraction %
(PBB)polybrominated biphenyls	≤0.1
(PBDE)polybrominated diphenyl ethers	≤0.1
(DEHP)dioctyl phthalate	≤0.1
(BBP)phthalic acid methyl butyl benzene	≤0.1
(DBP)dibutyl phthalate	≤0.1
(DIBP)diisobutyl phthalate	≤0.1

A.2.3.4 Material safety data sheet

Electrodeposition paint supplier should provide the Material Safety Data Sheet (MSDS).

A.2.3.5 Quality certification of electrodeposition paint

The quality of electrodeposition paint plays a key role in the performance of combined coating, especially in weather resistance performance and corrosion resistance performance. Therefore, the producer of aluminum shall discuss with the supplier of electrodeposition coating about the content of quality certification. The quality certification should cover the following items at least:

a) the content of hazardous substances in electrodeposition paint;

b) the non-volatile content (NV) in electrodeposition paint;

c) the viscosity of electrodeposition paint;

d) the density of electrodeposition paint;

e) the content of volatile organic compounds (VOC) in electrodeposition paint;

f) the performance level of electrodeposition paint;

g) the result of natural exposure resistance (including colour difference, gloss retention rate and chalking degree).

Bibliography

[1] GB/T 23612, *Anodizing and electrophoretic painting technical specification on wrought aluminium alloy extruded profiles for architecture*

[2] YS/T 728, *Acrilic electrodeposition paint for aluminium alloy extruded profiles for architecture*

National Standard of the People's Republic of China

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GB/T 5237.3—2017

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