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 People's Republic of China Nonferrous Metals Industry Standard

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| YS/T 730-2018 |

Replace YS/T 730-2010

Wrought aluminium alloy extruded profiles with wood grain surface for architecture

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| 建筑用铝合金木纹型材 |
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Wrought aluminium alloy extruded profiles with wood grain surface for architecture

1. Scope

This standard specifies term~~s~~,definitions,requirements,test methods,inspection rules, labelling,packaging,transporting,storage,quality certificate and contents of order(or contract)of wrought aluminium alloy extruded profiles with wood grain surface for architecture (hereinafter referred as wood grain profiles).

This standard is applicable to the wrought aluminum alloy profiles for architecture with surface coated in wood grain texture.

Wrought aluminium alloy extruded profiles processed by the same surface treatment and with other texture pattern coating but the same for architecture use may also refer to this standard.

1. 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 referenced document (including any amendments)applies.

GB/T 250 *Textile-Test for color fastness-Grey scale for assessing change in colour*

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

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

GB/T 3199  *Wrought aluminum and aluminum alloy products packing,marking,transporting and storing*

GB/T 5237.1 *Wrought aluminum alloy extruded profiles for architecture part 1：Mill finish profiles*

GB/T 5237.2  *Wrought aluminum alloy extruded profiles for architecture part 2：Anodized profiles*

GB/T 5237.3 *Wrought aluminum alloy extruded profiles for architecture part 3： Electrodeposition coating profiles*

*GB/T 5237.4 Wrought aluminum alloy extruded profiles for architecture part 4：Powder coating profiles*

GB/T 8005.3 *Aluminium and aluminium alloys-Terms and definitions part 3：surface treatment terms*

GB/T 8013 *(In whole)Aluminium and aluminium alloy anodic oxidation coating and organic polymer membranes*

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

GB/T 9754  *paints and varnishes -Measurement of specular gloss of non-metallic paint coatings at 20°,60°and 85°*

GB/T 9761 *paints and varnish-Visual comparison of the color of paints*

1. 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 Substrate profiles

Wrought aluminum alloy extruded profiles with organic polymer coating used for sublimation(heat transfer) or powder spraying with wood grain profiles texture.

3.2 Exposed surfaces

Visible surfaces of profiles after they are machined,assembled and installed in the architecture,including opened or closed products.

3.3 Crease

Traces of texture discontinuity result from folded wood grain transfer paper.

1. Requirements
	1. Classification
		1. alloy,temper and dimension

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

* + 1. Coating types,processing,coating code and characteristics

Coating types,processing,coating code and characteristics see Table 1.

Table 1 Coating types,processing,coating code and characteristics

|  |  |  |  |
| --- | --- | --- | --- |
| Coating type | processing | Coating code | Characteristics |
| Electrophoretic coating with wood grain profiles | Sublimation | electrophoretic coating profiles and sublimation  | MEA | High gloss surface |
| powder coating with wood grain profiles | powder coating profiles and sublimation  | M1GU | Colorful surface |
| Multi-layer powder coating and sublimation  | M2GU | Clear texture,embossed coating uneven |
| Multi-layer powder coating | Multi-layer powder coating | MPGU | Embossed coating |

* + 1. Coating types,weathering resistance class and corresponding profiles application environment.

Coating types,weathering resistance class and corresponding profiles application environment, see Table 2.

Table 2 coating types,weathering resistance class and corresponding profiles application environment

|  |  |  |
| --- | --- | --- |
| Coating type | Weathering resistance class  | Application environment |
| Electrophoretic coating with wood grain profiles | - |  Indoors only |
| powder coating with wood grain profiles | Ⅲ |  For Strong UV light exposure environment |
| Ⅱ |  For the relatively Strong radiation exposure environment |
| I |  For the generally Strong radiation exposure environment |

* + 1. Labelling and example

The labelling of products shall be expressed in the order of coating type, the standard number,alloy, temper, section code and length, weathering resistance class, coating code, wood grain code (named by the supplier).Example of marking is listed as follow:

Example 1:

Aluminium profiles,which are made of alloy 6063,temper T5 , section code 9006, specified length 6000 mm, weather resistance class I, coating code M1GU, wood grain code XH601-D401 powdered wood grain profile,are marked as:

Powder coating with wood grain profile YS/T 730-6063-T5-9006×6000, class I, M1GU-XH601-D401.

* 1. Quality assurance
		1. processing

 The processing of wood grain profiles, see Annex A.

* + 1. Raw materials
			1. Coating powder for wood grain profiles

 Coating powder for wood grain profiles, see Annex B.

* + - 1. Wood grain printed substrate

 Wood grain printed substrate see Annex C.

* + - 1. Substrate profiles

 Substrate profiles of electrophoretic coating shall be in accordance with the requirements given in GB/T 5237.3 and substrate profiles of powder coating shall be in accordance with the requirements given in GB/T 5237.4.

* 1. Dimension tolerance

 The dimension tolerance of electrophoretic coating with wood grain profiles shall be in accordance with the requirements given in GB/T 5237.3 and the dimension tolerance of powder coating with wood grain profiles shall be in accordance with the requirements given in GB/T 5237.4.

* 1. Coating performances

4.4.1 Coating performances

The performances of coating shall be in accordance with the requirements given in table 3.

Table 3 Coating performances requirements

|  |  |  |
| --- | --- | --- |
| Infection items | coating code | Requirements  |
| Coating thickness | MEA | The local thickness of the anodized coating on the exposed surface is not less than 9 μm, the local thickness of the electrophoretic coating is not less than 7 μm, and the local thickness of the combine coating is not less than 16 μm. |
| M1GU | The local thickness of the profiles on the exposed surface is not less than 40 μm,and the average thickness should be controlled between 60 μm to 120 μm |
| M2GU,MPGU | The local thickness of the profiles on the exposed surface is not less than 40 μm |
| Gloss | M1GU | Gloss value：3～30，permissible deviation：±5 units |
| Gloss value：31～70，permissible deviation：±7 units |
| Gloss value：71～100，permissible deviation：±10 units |
| MEA,M2GU,MPGU | According to GB/T 8013 or agreed by the purchaser and supplier. |
| Color and color difference | MEA,M1GU | The color shall be basically consistent with color samples which have been agreed between the purchaser and the supplier. If measuring with instrument method is required, the allowable color and color difference should be agreed between the purchaser and the supplier. |
| M2GU,MPGU | According to GB/T 8013 or agreed by the purchaser and supplier. |
| Baking resistance | MEA,M2GU,MPGU | After baking resistance test,the coating performance shall not show any sign of blister and cracking,The color difference is not greater than Grade 1 |
| M1GU | After baking resistance test,the coating shall not show any sign of blister and cracking,The color difference is not greater than Grade 1 and gloss retention shall be no less than 50% |
| penetration depth of printing ink | MEA | penetration depth of printing ink shall be same as the coating thickness of electrodeposition coating. |
| M1GU,M2GU | penetration depth of printing ink on the exposed surface shall be no less than 40 μm |
| Coating hardness | Pencil hardness | MEA | ≥3H |
| Indentation hardness a | M1GU | ≥90 |
| M2GU,MPGU | According to GB/T 8013 or agreed by the purchaser and supplier |
| Coating adhesion  | Dry adhesion | MEA,M1GU,M2GU,MPGU  | Grade 0 |
| Wet adhesion |
| Boiling water adhesion |
| Boiling water resistance  | MEA | After high pressure water immersion test,no wrinkle,cracking,blister,detachment or color change on the coating surface,adhesion shall meet Grade 0. |
| M1GU,M2GU,MPGU | After high pressure water immersion test,no detachment or wrinkle exist on the coating surface,but some disersive minute blister is acceptable,adhesion shall meet Grade 0. |
| Impact resistance | M1GU,M2GU,MPGU | According to GB/T 5237.4 |
| Cupping resistance |
| Bending resistance |
| Abrasion resistance b | Sand-falling test | MEA | For sand-falling test,the average sand consumption of wearing per micron of coating thickness shall not be less than 3300 g |
| M1GU | Abrasion coefficient shall be not less than 0.8 L/ μm |
| M2GU,MPGU | According to GB/T 8013 or agreed by the purchaser and supplier |
| Abrasion jet test | MEA | For abrasion jet test,the average time of wearing per micron of coating thickness shall be not less than 35 s |
| M2GU,MPGU | According to GB/T 8013 or agreed by the purchaser and supplier |
| Hydrochloric acid resistance | MEA,M1GU,M2GU,MPGU | The coating surface shall be no fall-off, and the wood grain pattern shall not change obviously. |
| Mortar resistance |
| Solvent resistance | Heavy hammer wiping | MEA | The surface of the profile does not expose the anodized coating |
| Sliver wiping | M1GU | The result of solvent resistance test should meet class 3 or class 4 |
| Resting method | M2GU,MPGU | According to GB/T 8013 or agreed by the purchaser and supplier |
| Detergent resistance | MEA,M1GU,M2GU,MPGU | The coating surface shall be free from blistering and detachment, and the wood grain pattern shall not change obviously. |
| Salt-spray corrosion resistance | CASS | MEA |  protection classification more than Grade 9.5  |
| AASS | M1GU,M2GU,MPGU | The surface of the coating shall be free of blistering, detachment or other obvious changes. The both side of the lineation,the length of any single infiltration shall not exceed 4 mm. |
| Humidity resistance | MEA,M1GU,M2GU,MPGU | The surface of the coating shall be free from blistering, detachment or other obvious changes, and the wood grain pattern is allowed to change slightly. |
| a The indentation hardness should be tested on relatively smooth area of the coating surface. b If abrasion resistance is required,it should be agreed between the purchaser and supplier and specified in the order (or contract)Otherwise,the sand-falling method is used for test. |

4.4.2 Weathering resistance

The weathering resistance of the powder coating with wood grain profiles’ shall be in accordance with Table 4;if natural exposure resistance is required, the corresponding weathering resistance class, agreed test conditions shall be selected in accordance with Table 4, and in the order (or contract) noted in the above; when weathering resistance is required for electrophoretic coating with wood grain profiles, it shall be agreed by the purchaser and supplier.

Table 4 Weathering resistance

|  |  |  |
| --- | --- | --- |
| Classification | Accelerated weathering resistance | Natural exposure resistance |
| Test time/h | Color difference  | Gloss retention a | Test time/year b | Color difference  | Gloss retention |
| Ⅲ | 4000 | ≤Grade 1 | ≥75 % | 5 years | ≤Grade 1 | ≥50 % |
| Ⅱ | 1000 | ≥90 % | 3 years |
| Ⅰ  | 1000 | ≥50 % | 1 year |
| a The gloss retention is the ratio of the gloss value measured after and before weathering resistance test,expressed by percentage.b For different atmospheric corrosion condition,the test time can be changed by both agreement of the purchaser and supplier, but not less than the time specified in the table. |

4.4.3 Others

If have any other requirements,it shall be agreed by the purchaser and supplier according to GB/T 8013 and specified in the order(or contract).

* 1. Appearance
		1. The wood grain pattern shall consistent with the specimen which have been confirmed by the purchaser and the supplier .
		2. The surface on the exposed surface of the wood grain profiles shall be clear, and no defects such as sublimation images and creases may be allowed, but at the inner angle,groove and within the 80 mm distance range of the end, creases and no pattern are allowed.
		3. The surface on the exposed surface of the multi-layer powder coating wood with grain profiles shall have embossed texture.but in the inner angle,groove and within the 80 mm distance range of the end, creases and no pattern are allowed.
		4. If the pattern on the non-exposed surface of the wood grain profile is required, it shall be specified in the order (or contract).

5 Test methods

5.1 Chemical composition

The chemical composition shall be carried out in accordance with GB/T 5237.1.Before testing ,the coating on the specimen shall be removed.

5.2 Mechanical properties

The mechanical property test methods shall be carried out in accordance with GB/T 5237.1.Before testing,the coating on the specimen shall be removed.

5.3 Dimension tolerance

Electrophoretic coating with wood grain profiles shall be in accordance with the requirements given in GB/T 5237.3;powder coating with wood grain profiles shall be in accordance with the requirements given in GB/T 5237.4.

5.4 Test methods of coating Performances

5.4.1 Standard test specimen

 The size of test specimen should be 150 mm × 75 mm × 1.0 mm and the alloy should be pure aluminum with the temper H24 or H14. The specimens should be prepared according to Annex A.

5.4.2 Test methods

Test methods shall be in accordance with table 5.

Table 5 Test methods of coating performances

|  |  |  |
| --- | --- | --- |
| Inspection items | coating codes | Test methods |
| Coating thickness | MEA | According to GB/T 5237.3 |
| M1GU | According to GB/T 5237.4 |
| M2GU,MPGU | According to GB/T 8013 or agreed by the purchaser and supplier |
| Gloss | M1GU | According to GB/T 5237.4 |
| MEA,M2GU,MPGU | According to GB/T 8013 or agreed by the purchaser and supplier |
| Color and color difference  | MEA,M1GU | According to GB/T 9761 by visual inspection |
| M2GU,MPGU | According to GB/T 8013 or agreed by the purchaser and supplier |
| Baking resistance | MEA,M1GU,M2GU,MPGU | Set up the temperature of drying oven (temperature control accuracy ± 2 °C) at 98 ℃ and maintained, place the test specimen into the oven at the temperature and keep for 168 h, then take out the specimen and cool down to room temperature. Check the surface wood grain pattern and other appearance quality changes,the result shall be evaluated according to GB/T 1766. |
| penetration depth of printing ink  | Grinding method | MEA,M1GU,M2GU | The relatively even area of the coating was selected, and the coating thickness of this area need to be measured by eddy current method. Polishing the coating with the abrasion paper, firstly use the abrasion paper with particle size 169.3 μm (150#), until the wood grain pattern almost disappeared; then change the the abrasion paper with particle size 63.5 μm (400#), continue polishing, till to the wood grain pattern disappeared completely. Clean and wipe (dry) the test surface, and then remeasure the coating thickness. The difference of the coating thickness before and after polishing is the penetration depth of the printing ink . |
| Instrument method | See Annex D |
| Coating hardness | Pencil hardness | MEA | According to GB/T 5237.3 |
| Indentation hardness | M1GU | According to GB/T 5237.4 |
| M2GU,MPGU | According to GB/T 8013 or agreed by the purchaser and supplier  |
|  Adhesion resistance | Dry adhesion | MEA | According to GB/T 5237.3 |
| M1GU | According to GB/T 5237.4 |
| M2GU,MPGU | According to GB/T 8013 or agreed by the purchaser and supplier |
| Wet adhesion | MEA | According to GB/T 5237.3 |
| M1GU | According to GB/T 5237.4 |
| M2GU,MPGU | According to GB/T 8013 or agreed by the purchaser and supplier |
| Boiling water adhesion | MEA | According to GB/T 5237.3 |
| M1GU,M2GU,MPGU | According to GB/T 5237.4 |
| Boiling water resistance  | MEA | According to GB/T 5237.3 |
| M1GU,M2GU,MPGU | According to GB/T 5237.4 |
| Impact resistance |
| Cupping resistance |
| Bend resistance |
| Abrasion resistance | Sand-falling test  | MEA | According to GB/T 5237.3 |
| M1GU | According to GB/T 5237.4 |
| M2GU,MPGU | According to GB/T 8013 or agreed by the purchaser and supplier |
| Abrasion jet test | MEA | According to GB/T 5237.3 |
| M2GU,MPGU | According to GB/T 8013 or agreed by the purchaser and supplier |
| Hydrochloric acid resistance | MEA | According to GB/T 5237.3 |
| M1GU,M2GU,MPGU | According to GB/T 5237.4 |
| Mortar resistance | MEA | According to GB/T 5237.3 |
| M1GU,M2GU,MPGU | According to GB/T 5237.4 |
| Solvent resistance  | MEA | According to GB/T 5237.3 |
| M1GU | According to GB/T 5237.4 |
| M2GU,MPGU | According to GB/T 8013 or agreed by the purchaser and supplier |
| Detergent resistance | MEA | According to GB/T 5237.3 |
| M1GU,M2GU,MPGU | According to GB/T 5237.4 |
| Salt-spray corrosion resistance | MEA | According to GB/T 5237.3 and test for 120h |
| M1G,M2GU,MPGU | According to the requirements of GB/T 5237.4, the test time is 1000 h. On both sides of the lineation，the length of any single infiltration shall be measured. The coating surface beyond 4.0mm of the lineation should be visually inspected.  |
| Heat and humidity  | MEA | According to GB/T 5237.3 |
| M1GU,M2GU,MPGU | According to GB/T 5237.4 |
| weathering resistance | accelerated weathering resistance | MEA,M1GU,M2GU,MPGU | The xenon lamp accelerated weathering test should be carried out in accordance with the cycle A of GB/T 1865-2009 Method 1. The gloss value should be measured according to GB/T 9754, and the color difference should be measured according to GB/T 250. |
| natural exposure resistance | Test should be carried out in accordance with ~~the provisions of~~ GB/T 9276. The gloss value should be measured according to GB/T 9754, and the color difference should be measured according to GB/T 250. |

5.4.3 Relative classification of different defect area ratio

The relative classification to the ratio of different defect areas after the salt spray corrosion resistance test of electrophoretic coating with wood grain profiles is shown in Table 6.

5.5 Others

According to GB/T 8013 or agreed by the purchaser and supplier.

Table 6 Defect ratio and protection grade

|  |  |  |  |
| --- | --- | --- | --- |
| Defect area ratio/% | Protection grade(R) | Defect area ratio /% | Protection grade(R) |
| absence | 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 |

5.6 Appearance quality

The appearance quality shall be in accordance with the requirements given in GB/T 5237.3 and GB/T 5237.4.

6 Inspection rules

6.1 Inspection and acceptance

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

6.1.2 The purchaser may re-check the received products according to this standard.If the re-check result is not in accordance with the specification of this standard or the 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 tolerance on dimension~~s~~ 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 preceded between supplier and purchaser.

6.2 Batch

Wood grain profiles shall be inspected for acceptance in batches,and each batch shall be consisted of the same alloy,temper,dimension specification,coating types,colors(or color code) and patterns,there is no limit for batch weight.

6.3 Inspection classification

Product inspection includes delivery inspection and routine inspection.

6.4 Inspection project and processing technology assurance items

6.4.1 Delivery inspection items,routine inspection items and processing technology assurance items are specified in table 7.

6.4.2 Routine inspection shall be carried out at least once every three years by the supplier.

Table 7 Inspection item and processing assurance

|  |  |  |  |
| --- | --- | --- | --- |
| Inspection items | Delivery inspection items | Routine inspection items | processing technology assurance items |
| Electrophoretic coating with wood grain profiles | powder coating with wood grain profiles | Electrophoretic coating with wood grain profiles | powder coating with wood grain profiles | Electrophoretic coating with wood grain profiles | powder coating with wood grain profiles |
| Dimension tolerance | √ | √ | － | － | － | － |
| Coating thickness | √ | √ | － | － | － | － |
| Gloss | a | √ | － | － | － | － |
| Color difference  | √ | √ | － | － | － | － |
| Baking resistance  | a | a | √ | √ | √ | √ |
| Penetration depth of printing ink  | a | a | √ | √ | √ | √ |
| Coating hardness | √ | √ | － | － | － | － |
| Adhesion  | √ | √ | － | － | － | － |
|  Boiling water resistance  | √ | √ | － | － | － | － |
| Impact resistance | － | √ | － | － | － | － |
| Cupping resistance | － | a | － | √ | － | √ |
| Bend resistance | － | a | － | √ | － | √ |
| Abrasion resistance | a | a | √ | √ | √ | √ |
| Hydrochloric acid resistance | √ | √ | － | － | － | － |
| Mortar resistance  | a | a | √ | √ | √ | √ |
| Solvent resistance  | a | a | √ | √ | √ | √ |
| Detergent resistance | a | a | √ | √ | √ | √ |
| Salt-spray corrosion resistance | a | a | √ | √ | √ | √ |
| Humidity resistance | a | a | √ | √ | √ | √ |
| Weathering resistance | Accelerated weathering resistance | a | a | √ | √ | √ | √ |
| Natural exposure resistance | a | a | － | － | √ | √ |
| Others | a | a | － | － | － | － |
| Appearance quality | √ | √ | － | － | － | － |
| Note ：“√”show must be checked, or processing technology assurance item；“—”show is not checked, or is not processing assurance item. |
| a When the inspection is indicated in the order (or contract), the item is listed as a must to be checked. |

6.5 Sampling

Sampling shall be in accordance with Table 8.

Table 8 sampling

|  |  |  |  |
| --- | --- | --- | --- |
| Inspection items | Specifications of sampling | Subclause of requirement | Subclause of test method |
| Electrophoretic coating with wood grain profiles | Powder coating with wood grain profiles | Electrophoretic coating with wood grain profiles | Powder coating with wood grain profiles | Electrophoretic coating with wood grain profiles | Powder coating with wood grain profiles |
| Chemical composition | According to GB/T 5237.1 | 4.2.2.3 | 4.2.2.3 | 5.1 | 5.1 |
| Mechanical property | 4.2.2.3 | 4.2.2.3 | 5.2 | 5.2 |
| Dimension tolerance | 4.3 | 4.3 | 5.3 | 5.3 |
| Coating thickness | Sampling as specified in table 9 | 4.4.1 | 4.4.1 | 5.4.2 | 5.4.2 |
| Gloss | Take 2 pieces from every batch, after the coating cured and stored 24h,get a specimen from each piece. | 4.4.1 | 4.4.1 | － | 5.4.2 |
| Color and color difference | Piece by piece | 4.4.1 | 4.4.1 | 5.4.2 | 5.4.2 |
| Baking resistance  | Take 2 pieces from every batch, after the coating cured and stored 24h,get a specimen from each piece. | 4.4.1 | 4.4.1 | 5.4.2 | 5.4.2 |
| penetration depth of printing ink | Take 2 pieces from every batch, after the coating cured and stored 24h,get a specimen from each piece. | 4.4.1 | 4.4.1 | 5.4.2 | 5.4.2 |
| Coating hardness | Take 2 pieces from every batch, after the coating cured and stored 24h,get a specimen from each piece. | 4.4.1 | 4.4.1 | 5.4.2 | 5.4.2 |
| adhesion | Dry adhesion | 4.4.1 | 4.4.1 | 5.4.2 | 5.4.2 |
| Wet adhesion  |
| Boiling water adhesion  |
| Boiling water resistance | Take 2 pieces from every batch, after the coating cured and stored 24h,get a specimen from each piece. | 4.4.1 | 4.4.1 | 5.4.2 | 5.4.2 |
| Impact resistance | － | take 2 standard test specimen from every inspection items | 4.4.1 | 4.4.1 | － | 5.4.2 |
| Cupping resistance | 4.4.1 | 4.4.1 | － | 5.4.2 |
| Bend resistance | 4.4.1 | 4.4.1 | － | 5.4.2 |
| Abrasion resistance | Take 2 pieces from every batch,after the coating cured and stored 24h,get a specimen from each piece. | 4.4.1 | 4.4.1 | 5.4.2 | 5.4.2 |
| Hydrochloric acid resistance  | 4.4.1 | 4.4.1 | 5.4.2 | 5.4.2 |
| Mortar resistance  | 4.4.1 | 4.4.1 | 5.4.2 | 5.4.2 |
| Solvent resistance  | 4.4.1 | 4.4.1 | 5.4.2 | 5.4.2 |
| Detergent resistance | 4.4.1 | 4.4.1 | 5.4.2 | 5.4.2 |
| Salt-spray corrosion resistance | 4.4.1 | 4.4.1 | 5.4.2 | 5.4.2 |
| Humidity resistance | 4.4.1 | 4.4.1 | 5.4.2 | 5.4.2 |
| Weathering resistance | Accelerated weathering resistance | 4.4.2 | 4.4.2 | 5.4.2 | 5.4.2 |
| Natural exposure resistance | Take 3 pieces in every batch,and one specimen of one piece.With the agreement of customer,the supplier can make 3 test panels instead of the profile samples which with the same thickness class,color,surface treatment method and technology.The effective surface size (length×width)of the sample(or test plate)should be suitable for 250 mm × 150 mm. | 4.4.2 | 4.4.2 | 5.4.2 | 5.4.2 |
| Others | According to GB/T 8013.2 or agreed by the purchaser and supplier | According to GB/T 8013.3 or agreed by the purchaser and supplier | 4.4.3 | 4.4.3 | 5.5 | 5.5 |
| Appearance quality | Piece by piece | 4.5 | 4.5 | 5.6 | 5.6 |

6.6 Test result conclusion

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,the other casting batch should be checked piece by piece,and only the qualified ones shall be delivered.The whole batch fails is 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 purchaser and the supplier ,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 9,specimen shall be taken from the batch in double quantity and be tested again,The whole batch qualified when in terms of the failed quantity of duplicate test don't beyond double quantity of the upper limit in table 9,otherwise,the batch is not qualified.The supplier is allowed to check piece by piece if it is agreed by the purchaser and the supplier ,and deliver the qualified ones.

 Table 9 Coating thickness sampling quantity and upper limit for failed quantity

Unit:piece

|  |  |  |
| --- | --- | --- |
| Batch quantity  | Randomly sample 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 |
| >800 | 40 | 4 |

6.6.5 The batch failed when any specimen failed in gloss.

6.6.6 The piece failed when any specimen failed in color and color difference.

6.6.7 The batch failed when any specimen failed in baking resistance,the depth of ink penetration, coating hardness,adhesion, boiling water resistance, impact resistance ,cupping resistance, bend resistance, abrasion resistance ,Hydrochloric acid resistance, mortar resistance ,solvent resistance, detergent resistance ,salt-spray corrosion resistance,humidity resistance,weathering resistance and others.

6.6.8 The piece failed when any specimen failed in appearance.

Note 1:The solvent resistance test results are for reference only and are not used as a basis for judging whether the coating quality is acceptable.

Note 2:When the routine inspection result is failed,the supplier shall re-evaluate the mill finish profiles quality,the processing technology and others,and re-check it until it is qualified.

7 Marking,packing,delivery,storage and quality certificate

7.1 Marking

7.1.1 Product marking

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

1. Name and address of supplier；
2. Name of product；
3. Inspection stamp of supplier's quality control department(or signature or seal of quality inspection personnel)；
4. Alloy ,temper and dimension specification (or section code)；
5. Weather resistance class, coating code, wood grain profiles code;
6. Batch number or production date；
7. The standard number。

7.1.2 The marking of package box

 The package box marking of profiles shall meet the requirements given in GB/T 3119.

7.2 packing

Protect the exposed surfaces of profiles shall be packed by paper,foam,etc.The other packing shall be in accordance with GB/T 3199.

7.3 Delivery and storage

 Delivery and storage of profiles shall be in accordance with GB/T 3199.The protective action of the transporting and the use processing technology shall be accordance with GB/T 5237.2.

7.4 Quality certificate

Every lot of profiles shall be attached with quality certificate by this standard,with the following content:

1. Name of supplier；
2. Name of purchaser；
3. Alloy ,temper and dimension specification (or section code)；
4. Weather resistance performance class, coating code, wood grain profiles code;
5. Batch number or production date；
6. Weight or pieces；
7. The results and inspection stamp of the supplier’s quality control department;
8. The standard number.

8 Order(or contract)content

Order the profiles of this standard that the order(or contract)content should include the following content：

1. Name of supplier ；
2. Name of product ；
3. Alloy ,temper and dimension specification(or section code)；
4. Dimensions tolerance and the accuracy level；
5. Weather resistance performance class,coating code and wood grain profile code;
6. weight and piece；
7. Special requirements for purchaser :
8. The specific requirement of coating thickness;
9. The testing requirement of baking resistance;
10. The testing requirement of the depth of ink penetration;
11. The testing requirement of cupping resistance；
12. The testing requirement of bend resistance;
13. The testing requirement of abrasion resistance;
14. The testing requirement of solvent resistance；
15. The testing requirement of detergent resistance;
16. The testing requirement of salt-spray corrosion resistance;
17. The testing requirement of humidity resistance;
18. The testing requirement of accelerated weathering resistance;
19. The specific requirement of natural exposure resistance test;
20. The specific requirement of other coating properties;
21. Other special requirements.
22. The standard number.

Annex A
（informative）
The processing of wood grain profiles

* 1. Wood grain profiles by sublimation(heat transfer)
		1. Electrophoretic wood grain profiles
			1. Flow chart of Typical process

Typical process flow chart of electrophoretic coating with wood grain profile is shown in Figure A.1:

Sublimation ~~Thermal transfer~~

Vacuum

wrapping substrate profiles with wood grain paper

remove

Product packaging

Figure A.1 Typical production process of electrophoretic coating with wood grain profile

* + - 1. Processing requirements

A.1.1.2.1 After the substrate profiles is wrapped with wood grain paper, the openings at both ends of the grain paper are sealed with high temperature adhesive tape.

A.1.1.2.2 Air pressure should be 0.03 MPa～0.08 MPa.during processing, it should be avoided crack and crease.

A.1.1.2.3 Sublimation processing temperature should be 150 ℃～180 ℃， the time should be controlled at 5 min～15 min.

* + 1. Powder coating with wood grain profiles
			1. Flow chart of typical process

Typical production process flow chart of powder coating with wood grain profiles shown in Figure A.2:

wrapped substrate with wood grain paper

Sublimation

remove

carrier

Vacuum

Product packaging

Figure A.2 Typical production process flow chart of powder coating with wood grain profiles

* + - 1. Process requirements
				1. After the substrate is wrapped with wood grain paper, the openings at both ends of the grain paper are sealed with high temperature adhesive tape.
				2. Air pressure should be 0.03 MPa～0.08 MPa, during processing, it should be avoided crack and crease.
				3. Sublimation processing temperature should be controlled 170 ℃～210 ℃,The time should be controlled at 5 min～15 min.
		1. Multi-layer powder coating with wood grain profiles
			1. Typical production process flow chart

Typical production process flow chart of multi-layer powder coating with wood grain profiles shown in Figure A.3:

per-curing

First powder coating treatment

Secondary powder coating treatment

Pattern Making

Curing

Product packaging

Thermal transfer

Vacuum

Off-print carrier

~~Cover~~ substrate with wood grain paper

Figure A.3 Typical production process flow chart of Multi-layer powder coating with wood grain profile

* + - 1. Processing requirements
				1. The substrate profiles should be in accordance with GB/T 5237.1, perform powder coating treatment on the substrate profiles for the first time as specified in YS/T 714, and the coating thickness should be 40 μm ～ 80 μm.
				2. Pre-curing temperature should be 120 ℃～160 ℃, pre-cure time should be 8 min ～ 10 min.
				3. The coating thickness increase after secondary powder coating treatment should be 20 μm ～40 μm.
				4. Pattern-making is usually carried out by rolling method.
				5. The curing temperature should be 200 ℃～220 ℃, and the curing time should be 10 min～20 min.
				6. After the substrate profiles is wrapped with wood grain paper, the openings at both ends of the grain paper are sealed with high temperature adhesive tape.
				7. Air pressure should be 0.03 MPa～0.08 MPa,during processing, it should be avoided crack and crease.
				8. Sublimation processing temperature should be controlled at 170 ℃～210 ℃,The time should be controlled at 10 min～30 min.
	1. Wood-grain profiles by multi-layer powder coating
		1. Flow chart of typical process

Typical process flow chart of wood grain profiles by multi-layer powder coating is shown in Figure A.4.

Secondary powder coating treatment

Grain pattern making

Pre-curing

First powder coating treatment

Product packaging

Grain pattern making

curing

Figure A.4 Flow chart of the production process of typical Powder-on-Powder wood grain profiles

* + 1. Process requirements
			1. The substrate profiles shall be in accordance with the requirements given in GB/T 5237.1, perform powder coating treatment on the substrate profiles for the first time as specified in YS/T 714, and the coating thickness should be 40 μm ～ 80 μm.
			2. Pre-curing temperature should be 120 ℃ ~ 160 ℃, pre-cure time should be 8 min ~ 10min.
			3. Pattern-making is usually processed by a secondary powder roll-forming treatment and dusting.
			4. The curing temperature should be 200 ℃ ~210 ℃, and the curing time should be 10 min ~ 15 min.

Annex B
（informative）
Coating powder for wood grain profiles

B.1 Composition and weathering resistance of coating powder

Composition and weathering resistance of coating powder shall be as specified in YS/T 680.

B.2 Classification

B.2.1 Coating powder is divided into outdoor coating powder and indoor coating powder according to the application environment.

B.2.2 As for indoor coating powder,see YS/T 680 for corrosion grades, corrosion severity,typical indoor application conditions and recommended coating powder types.

B.2.3 The types of coating powder,the major film former and characteristics are shown in Table B.1:

Table B.1 The types of coating powder, the major film former and characteristics

|  |  |  |
| --- | --- | --- |
| Types of coating powder  | Major film former | Characteristics |
| Polyester | Carboxyl polyester + TGIC | During the film formation, few by-products is generated, The film is not inclined to craters, pinholes or any other defects, and the film is excellent in anti-yellowing. However, the leveling is ordinary, and the definition of sublimation grain is relatively poor. In addition, TGIC can cause skin allergy. |
| Carboxyl polyester + HAA | When stoving, some small molecule weight substances such as water would be released. When the film is too thick, pinholes are likely to generate, and the film is inclined to yellowing. Since film has low hardness and therefore is easy to stick to transfer paper, this kind of coating powder is not widely used for sublimation. |
| Polyurethane | Hydroxy polyester + IPDI | Film has excellent leveling ,high fullness, high hardness, good abrasion resistance and clear sublimation patterns. |
| Modified polyurethane | Carboxyl polyester+TGIC,Hydroxy polyester+IPDI | The appearance and the sublimation effects are excellent. This kind of coating powder has both the economy efficiency of polyester and the hardness, low stickiness, clear sublimation patterns of polyurethane type, |
| Fluorocarbon | FEVE+IPDI | At present, it is the most weather resistant thermosetting coating powder with excellent chemical and corrosion resistance. However, the appearance, impact resistance, boiling water resistance and bending resistance of film are poor. |

B.2.4 According to the processing methods, coating powder is divided into 3 types: sublimation coating powder, multi-film coating powder and dusting coating powder.

The particle size distribution, storage stability and indentation hardness of the film of coating powder of different processing methods are specified in Table B.2, and other properties shall be as specified in YS/T 680.

Table B.2 Processing Methods and Coating Index

|  |  |
| --- | --- |
| Processing methods | Coating Index |
| Particle size distribution | Storage stability | Indentation hardness |
| sublimation | D50：20μm～45μm | Shall be less than grade 3 | ≥90  |
| Multi-film | According to YS/T 680 | According to YS/T 680 | ≥80 |
| Dusting |  D50：30μm～50μm，D95≤100μm | According to YS/T 680 | ≥80 |

B.3 Test methods

B.3.1 Test methods of coating powder shall be in accordance with YS/T 680.

B.3.2 Test methods of film shall be in accordance with GB/T 5237.4.

AnnAnnex C
（informative）
Wood grain printed substrate

C.1 Composition of wood grain printed substrate

Wood grain paper is mainly composed of carrier and inks,see Table C.1.

Table C.1 Compositions and Functions of wood grain paper

|  |  |
| --- | --- |
| Compositions | Functions |
| Carrier  | Paper or film that carries the ink of patterns |
| Ink | Being as a part of the wood grain pattern,showing the grain texture and color |

C.2 Classification

C.2.1 Weathering resistance classification and requirements,see Table C.2 .

Table C.2 Weathering resistance classification and requirements

|  |  |
| --- | --- |
| classification | Requirements |
| Accelerated weathering resistance | natural exposure resistance |
| Testing time(h) | Gloss retention a | Color change | Color difference | Testing time(year) | Gloss retention a | Color change | Color difference |
| Ⅲ | 4000 | ≥75 % | ≤1 | Light base ~~b~~△Eab\*≤2， dark base c △Eab\*≤3 | 5 | ≥50 % | ≤1 |  Light baseb △Eab\*≤2， Dark base c △Eab\*≤3 |
| Ⅱ | 1000 | ≥90 % | 3 |
| I | 1000 | ≥50 % | 1 |
| a The gloss retention is the ratio of the gloss value measured after and before weathering resistance test,expressed by percentage. B Light base is a test panel with thermal transferred wood grain on a standard substrate plate made according to international RAL color card and color code RAL1001 beige powder coating.C Dark base is a test panel with thermal transferred wood grain on a standard substrate plate made according to international RAL color card, color code RAL8001 brown powder coating. |

C.2.2 The measurement and calculation of color difference shall be in accordance with GB/T 11186.2 and GB/T 11186.3.

C.3 Requirements

C.3.1 The basic requirements for carrier shall be in accordance with Table C.3.

Table C.3 Basic requirements for carrier

|  |  |
| --- | --- |
| items | Printing medium  |
| paper | Test method |  film | Test method |
| appearance | Smooth surface, no cracking, no spots, holes,Clear pattern | Visual inspection | no obvious column marks or gas marks; Impurity free , no holes;Clear pattern; no serious slack, no wrinkles | Visual inspection |
| thickness | ≥30 g/m2 | GB/T 451.3 | ≥19 μm | GB/T 4957 |
| Water content | ≤0.5 % | GB/T 462 | - | - |

C.3.2 The limitations of hazardous Substances in ink see C.4.

Table C.4 The limitations of hazardous Substances in ink

|  |  |
| --- | --- |
| Hazardous Substance | limited fraction |
| Ba | ≤1000 ppm |
| Pb | ≤90 ppm |
| Se | ≤500 ppm |
| Cd | ≤75 ppm |
| Sb | ≤60 ppm |
| Cr | ≤60 ppm |
| Hg | ≤60 ppm |
| As | ≤25 ppm |
| Polybrominated biphenyl | ≤0.1 % |
| Polybrominated diphenyl ethers | ≤0.1 % |
| Phthalate | ＜0.1 % |
| Dibutyl phthalate | ＜0.1 % |
| Di(2-ethylhexyl) phthalate | ＜0.1 % |
| Butyl benzyl phthalate | ＜0.1 % |
| Diisodecyl phthalate (plasticizer) | ＜0.1 % |
| Dioctyl phthalate | ＜0.1 % |
| Diisononyl phthalate | ＜0.1 % |

Annex D
（informative）
Test methods for penetration depth of printing ink ——Instrument method

D.1 Instrument and equipment

The abrasion tester is mainly composed of a working turntable, a pressing device, a rubber grinding wheel, a support rod, auxiliary weight and an operator interface and so on. The structure diagram of abrasion tester is as shown in D.1:

 

Notes：

 1——specimen holder;

 2——specimen;

 3——Pressing device (pressure plate and compression nut);

 4——Abrading wheel;

 5——Support rod (pressing arm mounting bracket, pressing arm, mounting arm of rubber grinding wheel);

 6——Auxiliary weight；

 7——Operator interface.

Diagram D.1 The structure diagram of abrasion tester

D.2 Preparation of test panels

D.2.1 Select 6063-T5, φ100 mm ×1.0 mm or 100 mm×100 mm×1.0 mm, aluminum alloy panel with a center hole diameter of 9 mm.

D.2.2 Prepare the test plate according to the production process of the wood grain profiles to be checked.

D.2.3 On the test surface of the test panel, draw a cross line through the center point and lines should reach to the edge of the test panel.

D.3 Test conditions

The laboratory temperature was (23 ± 2) ℃ and the relative humidity was (50 ± 5)%.

D.4 Operation Procedure

D.4.1 Preparation of Abrasion tester

D.4.1.1 Check the abrasion tester according to requirements of D.1.

D.4.1.2 The rubber grinding wheel should be used within the specified validity period ( within 1 year from the date of purchase) or should be replaced when the outer diameter is worn to 44.4 mm.

D.4.2 Replacing with a new rubber wheel

D.4.2.1 Place the randomly configured pre-sandpaper on the work turntable.

D.4.2.2 Connect the external power supply, turn on the instrument power switch, and set the operating cycles of the instrument to 50 laps.

D.4.2.3 Gently lower the pressure arm so that the rubber wheel is pressed against the sandpaper and fixed.

D.4.2.4 Start the abrasion test so that the rubber wheel sand runs 50 times on the pre- abrasive paper.

D.4.2.5 Raise the rubber grinding wheel and remove the pre-abrasive paper.

D.4.3 Measurement

D.4.3.1 Hang the 1000 G auxiliary weight on the mounting arm and set the working turntable rotation speed to 70 r/min.

D.4.3.2 Fasten the test plate to the working turntable.

D.4.3.3 Start the Abrasion tester, grind for 5 to 10 laps, so that an arc print is on the test plate and raise the rubber wheel.

D.4.3.4 Select the four test points where the cross line intersects the pre-ground arc.

D.4.3.5 Measure the local film thickness *M*1-n of 4 points according to the provisions of GB/T 5237.4 with an eddy current thickness gauge.

D.4.3.6 Put down the rubber grinding wheel again and start the Abrasion tester device until on any of the test point the pattern ink just disappears.

D.4.3.7 Raise the rubber grinding wheel and use the eddy current thickness gauge to measure the local layer thickness after the wear of the pattern ink just disappeared according to GB/T 5237.4.

D.4.3.8 Continue to wear thin the test plate, one test point after another, until each of the four test points is worn to the point that the pattern ink is just disappeared, and then measure the worn local layer thickness *M*2-n

D.4.4 Calculation of results

The depth of ink penetration at each test point was calculated according to the formula(D.1).

Mi= *M*1-n－*M*2-n……………………………………………………….(D.1)

In the formula:

Mi——ink penetration depth of the test point in micrometers (μm);

*M*1——layer thickness of the test point before it is worn, in micrometers (μm);

*M*2——layer thickness of the test point after it is worn, in micrometers (μm).

The average value of the depth of ink penetration of the four test points was calculated as the ink penetration depth of the test panel, and the result is in round figure, and the rounding was performed according to the rules of GB/T 8170.

**Reference**

[1] GB/T 451.3 *paper and board-Determination of thickness*

[2] GB/T 462 *Paper, board and pulp- Determination of moisture content of analytic sample*

[3] GB/T 4957 *Non-conductive coating on non-magnetic metal substrates-Measurement of coating thickness-Eddy current method*

[4] GB/T 8170 *Rules of Rounding off numerical values & expression and judgement of limit values*

[5] GB/T 11186.2 *Methods for measuring the color of paint films-part 2:color measurement*

[6] GB/T 11186.3 *Methods for measuring the color of paint films-part 3:calculation of color differences*

[7] YS/T 680 *Powder coating for wrought aluminum alloy extruded architecture profiles*

[8] YS/T 714 *technical specification for organic polymer spraying on wrought aluminium alloy extruded profiles for architecture*

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