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Aerospace — Wrought aluminium and aluminium alloys — Inspection, testing and supply requirements —

Part 1: General requirements

*Aéronautique et espace — Aluminium et alliages d'aluminium corroyés — Exigences
de contrôle, d'essai et de livraison —*

Partie 1: Exigences générales



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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 8591-1 was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*.

ISO 8591 will consist of the following parts, under the general title *Aerospace — Wrought aluminium and aluminium alloys — Inspection, testing and supply requirements*:

- *Part 1: General requirements*
- *Part 2: Sheet, strip and plate*
- *Part 3: Bars and shapes*
- *Part 4: Tubes*
- *Part 5: Wire*
- *Part 6: Bars and wire for rivets*
- *Part 7: Forged and die forged parts*

NOTE — Further parts may be added to this series as and when required.

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Aerospace — Wrought aluminium and aluminium alloys — Inspection, testing and supply requirements —

Part 1 : General requirements

1 Scope

This part of ISO 8591 specifies general requirements for the inspection, testing and supply of wrought aluminium and aluminium alloys for aerospace application.

It covers requirements which are common to all forms of wrought aluminium alloys; to determine the requirements for a specific material, it is necessary to use, in conjunction with this part of ISO 8591, the material standard and the relevant part of ISO 8591 appropriate for the form of wrought aluminium alloy in question.

2 Definitions

For the purposes of ISO 8591 (and any future International Standards specifying material requirements), the following definitions apply.

2.1 General terms

2.1.1 heat: Metal from the same melt in a furnace or crucible or from several melts mixed in the same furnace or crucible before pouring.

If a continuous melting process is used, a "heat" is defined as metal taken from the furnace before the next addition to the load.

2.1.2 thickness for heat treatment: The minimum dimension of the heaviest section of the part or material to be treated.

2.1.3 lot: A quantity of material

- a) of the same form;
- b) of the same nominal dimensions;

c) from the same heat; for extruded metal stock and rivet wire, products from two heats, in conformance with the material standard, in which variations in chemical content do not exceed 60 % of the prescribed chemical composition range and in which the maximum content of impurities would remain unchanged, may be grouped to form one lot;

d) manufactured in the same production run;

e) in the same heat treatment condition;

f) from the same heat treatment furnace — if a continuous furnace is used for heat treatment, the product of 8 h max. is deemed to constitute a "lot".

A weight limit may also be specified in the relevant part of ISO 8591.

2.1.4 periodic testing: Testing at a frequency, selected by the manufacturer, sufficient to guarantee that all lots of material will meet the requirement.

It is preferable that the guarantee be based on statistical evidence, but other bases for making the guarantee may be acceptable. If testing by the purchaser establishes that the material does not meet the requirement, the material is subject to rejection.

2.1.5 sample: One or more products taken from a lot.

2.1.6 specimen: One or more pieces taken from each product in the sample for the purpose of producing test pieces.

2.1.7 test piece: A piece taken from each specimen and suitably prepared for the test.

2.1.8 supplier: The organization which supplies the product to the purchaser. It may not necessarily have made the product.

2.1.9 manufacturer: The organization which makes the material and/or the product in the form and condition in which it is delivered to the purchaser, either directly or through a supplier.

2.1.10 manufacturing schedule: Document recording the processing and production conditions finally chosen for the particular characteristics required by the purchaser, or the vital function of a part in service, and to be strictly adhered to.

The methods and processes for the manufacture of material are generally left to the discretion of the manufacturer.

The manufacturing schedule is and remains the property of the manufacturer, but the purchaser may have access to and refer to it, subject to the requirements of commercial secrecy.

2.1.11 inspection schedule: Document and/or drawing, approved by both parties, specifying special requirements or purchaser's requirements additional to those specified in the various parts of ISO 8591.

2.1.12 wrought product: A general term for products obtained by hot and/or cold plastic deformation processes, such as extruding, forging, hot rolling, cold rolling or drawing, either exclusively or in combination. Examples of wrought products are bar, wire, tube, shape, sheet, strip, forging.

2.2 Forms of material

2.2.1 bar: A solid wrought product of uniform cross-section along its whole length, supplied in straight lengths. The cross-sections are in the shape of circles, ovals, rectangles, equilateral triangles or regular polygons. Products with a square, rectangular, triangular or polygonal cross-section may have corners rounded along their whole length.

2.2.1.1 rectangular bar: Bar, the thickness of which exceeds one-tenth of the width.

The term includes "flattened circles" and "modified rectangles", of which two opposite sides are convex arcs, the other two sides being straight, of equal length and parallel.

2.2.2 foil: A flat, rolled product of rectangular cross-section with uniform thickness. Foil is thinner than sheet or strip.

2.2.3 ingot: A cast form suitable for forging, rolling or extruding.

2.2.4 plate: A flat, rolled product of rectangular cross-section, of uniform thickness greater than 6 mm and supplied in straight lengths with sheared or sawn edges.

2.2.5 shape: A product of irregular cross-section, other than that of bars, tubes, sheet or strips, uniform along its whole length, and supplied in straight lengths.

2.2.6 sheet: A flat, rolled product of rectangular cross-section, of uniform thickness and supplied in straight lengths with sheared or sawn edges. Sheet is thicker than foil, with a maximum thickness of 6 mm.

2.2.7 strip: A flat, rolled product of rectangular cross-section, of uniform thickness and supplied in coils with slit edges. Strip is thicker than foil, with a maximum thickness of 6 mm.

2.2.8 tube: A hollow, wrought product of uniform cross-section with only one enclosed void along its whole length, of uniform wall thickness and supplied either in straight lengths or in coiled form. The cross-sections are in the shape of circles, ovals, squares, rectangles, equilateral triangles or regular polygons. Hollow products with a square, rectangular, equilateral triangular or regular polygonal cross-section, which may have corners rounded along their whole length, are also to be considered as tubes, provided that the inner and outer cross-sections are concentric and have the same form and orientation.

Bent, threaded, drilled, waisted, expanded and cone-shaped hollow products in this general form when derived from tubes as defined above are classified as tubes.

2.2.9 wire: A solid, wrought product, generally supplied in coils, that is long in relation to its cross-section; the diameter or greatest perpendicular distance between parallel faces (except for flattened wire) of a wire is less than 10 mm.

3 Requirements

3.1 Purchase orders

Purchase orders shall clearly indicate the following technical information:

- the material standard and date of publication;
- a description of the wrought product;
- the material dimensions;
- a reference to the drawing and/or inspection schedule and/or manufacturing schedule where applicable;
- the nature and type of packaging, if special packaging is required.

3.2 Responsibility for inspection

3.2.1 The manufacturer is responsible for ensuring that the inspection and tests specified are carried out in accordance with requirements.

3.2.2 The manufacturer may use his own or other facilities for carrying out the inspection and tests specified, unless disapproved by the purchaser.

3.2.3 The manufacturer is responsible for verifying the competence of a third party to whom any inspection or test operations may be sub-contracted.

3.2.4 The purchaser has the right to carry out any of the inspections or tests in order to ensure that the material conforms to the specified requirements.

3.3 Manufacture

3.3.1 If required by the purchaser, the manufacturer shall inform the purchaser before implementing any modification to the manufacturing process which may affect the properties or quality of the product.

3.3.2 If a specified temperature is stated in the material standard, that temperature shall be mandatory. If a temperature range is stated, a temperature within that range shall be selected to give the required properties. The furnace load shall be maintained at the selected temperature within a tolerance of $\pm 5^\circ\text{C}$, unless otherwise specified in the material standard or the relevant part of ISO 8591, for the time specified.

3.4 Sampling

3.4.1 Each lot shall be given a reference number by which its processing, testing and inspection can be traced for at least five years. Records shall be available to the purchaser on request.

3.4.2 The units constituting a sample shall be selected at random, except as specified in 3.6.2 or in the relevant part of ISO 8591.

3.4.3 Except for the requirements of 3.4.6 and non-destructive testing, and unless otherwise specified in the material standard or the relevant part of ISO 8591, each lot shall be tested for conformance with each requirement in the material standard at a frequency of once per lot.

3.4.4 Specimens and the test pieces taken from them shall be marked in such a manner that the lot identity and the orientation with respect to the product are maintained.

3.4.5 Neither specimens nor test pieces shall be deformed or thermally treated after removal from the product they represent, except as required by the material standard.

3.4.6 At least one specimen shall be taken for chemical analysis to represent the composition of each heat. Any ingots not conforming to the requirements of the material standard shall be rejected.

3.5 Testing

3.5.1 Tests shall be carried out as required by the material standard, and, if there is one, the inspection schedule.

3.5.2 Methods of chemical analysis shall be selected by the manufacturer, but in cases of dispute, the method specified in the relevant International Standard shall be used.

3.5.3 The method of non-destructive testing used to verify the quality of the product, and the standard of acceptance, shall be left to the discretion of the manufacturer, unless specified in the appropriate material standard or in the relevant part of ISO 8591, or stated on the order or inspection schedule.

3.6 Re-testing

3.6.1 Failure of any specimen to conform to specified requirements shall cause material represented by such specimens to be rejected or re-tested.

3.6.2 Unless more extensive re-testing is specified in the relevant part of ISO 8591, a re-test sample of at least two specimens shall be selected to replace each failed test piece. One of the two specimens shall be taken from a location as close as possible to that of the failed test piece.

3.6.3 If all re-test results are satisfactory, the lot shall be accepted. If one or more re-test results are unsatisfactory, the lot shall be either

- a) rejected, or
- b) reprocessed and tested as a new lot.

3.7 Workmanship

The material, as received by the purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and from internal and external imperfections detrimental to usage of the product.

NOTE — Additional requirements may be specified in the relevant part of ISO 8591.

3.8 Identification

3.8.1 A product, at all stages of production, shall be traceable to its lot.

3.8.2 All finished product which is continuously marked shall bear the following identification markings :

- a) the reference of the material standard;
- b) the identity of manufacturer and plant;
- c) the lot number.

3.8.3 Marking shall be by ink, impression stamp or tag, as required by the relevant part of ISO 8591.

3.8.4 If it is not possible to mark the product continuously, each piece shall be marked individually with the information specified in 3.8.2, plus the inspector's stamp.

If it is not possible to mark the material, the required marking shall appear on an attached tag which is sufficiently strong to resist damage from normal handling, packaging and shipping.

3.8.5 Except for strip, which may be identified on the outside end of the coil, and forgings, the direction of marking shall be parallel to the direction of final rolling, extrusion or drawing.

3.8.6 The marking ink or other product shall not give rise to corrosion and shall remain legible after handling and contact with packaging and protective materials.

3.8.7 Marking products shall be removable by conventional cleaning methods which do not cause corrosion.

3.9 Packaging

3.9.1 The material shall be prepared for shipment in compliance with applicable rules and regulations pertaining to the handling, packaging and transportation of the material to ensure carrier acceptance.

3.9.2 All necessary precautions shall be taken to prevent damage or corrosion of the material during transportation.

3.10 Certificate of conformance

The supplier shall supply, with each delivery, a report which includes the following information:

- a) the name and address of manufacturer;
- b) the contract and/or order number;
- c) the material standard and description of the wrought product;
- d) the quantity;
- e) the lot number;
- f) the results of all tests carried out on the lot;
- g) the inspector's stamp;
- h) a statement, signed on behalf of the manufacturer, certifying that the material conforms to the requirements of the material standard.

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