BRITISH STANDARD

BS EN
546-1:2006

Aluminium and aluminium alloys — Foil —

Part 1: Technical conditions for inspection and delivery

The European Standard EN 546-1:2006 has the status of a British Standard

ICS 77.150.10

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National foreword

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A list of organizations represented on NFE/35 can be obtained on request to its secretary.

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Management Centre: rue de Stassart, 36 B-1050 Brussels

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Foreword

This document (EN 546-1:2006) has been prepared by Technical Committee CEN/TC 132 “Aluminium and aluminium alloys”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2007, and conflicting national standards shall be withdrawn at the latest by June 2007.

This document supersedes EN 546-1:1996.

Within its programme of work, Technical Committee CEN/TC 132 entrusted CEN/TC 132/WG 6 "Foil and finstock" to revise EN 546-1:1996.

The following modifications have been made:

— Clause 3: deletion of subclauses 3.1 to 3.6. Reference to EN 12258-1, and definition of converter foil, consumer/household foil and container foil added;

— Clause 4: title is changed, and wording is clarified;

— subclauses 5.2, 6.1.1 and 6.2.1: text amended.

EN 546 comprises the following parts under the general title *"Aluminium and aluminium alloys – Foil":*

— *Part 1: Technical conditions for inspection and delivery*

— *Part 2: Mechanical properties*

— *Part 3: Tolerances on dimensions*

— *Part 4: Special property requirements*

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1 Scope

This document specifies the technical conditions for inspection and delivery of wrought aluminium and aluminium alloy foil. The gauge range covered is 6 μm to 200 μm.

It does not apply to lacquered, painted, embossed or laminated products.

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.

EN 515, *Aluminium and aluminium alloys — Wrought products — Temper designations*

EN 546-2, *Aluminium and aluminium alloys — Foil —Part 2: Mechanical properties*

EN 546-3, *Aluminium and aluminium alloys — Foil — Part 3: Tolerances on dimensions*

EN 546-4, *Aluminium and aluminium alloys — Foil — Part 4: Special property requirements*

EN 573-3, *Aluminium and aluminium alloys — Chemical composition and form of wrought products — Part 3: Chemical composition*

EN 12258-1:1998, *Aluminium and aluminium alloys — Terms and definitions — Part 1: General terms*

EN 14242, *Aluminium and aluminium alloys — Chemical analysis — Inductively coupled plasma optical emission spectral analysis*

EN 14361, *Aluminium and aluminium alloys — Chemical analysis — Sampling from metal melts*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 12258-1:1998 and the following apply.

3.1
converter foil
rolled aluminium in the gauge range of 6 μm to 200 μm, produced either by double rolling or single rolling, typically soft annealed and supplied for further processing such as lacquering or laminating

3.2
consumer/household foil
foil in the gauge range of 10 μm to 24 μm, intended for general use, principally for use in culinary applications such as cooking and storage

3.3
container foil
single rolled material in the gauge range 35 μm to 200 μm, produced at soft or intermediate temper and often involving alloys of the 3xxx and 8xxx series. The foil can be coloured/printed, and is usually supplied lubricated for press forming into smooth or wrinkled walled containers for foodstuffs and the like

4 Ordering information

The order shall specify the product required and shall contain the following information :

a) description of the product:

- type of converting and intended use;
- alloy designation;
- form of the product, i.e. single-rolled or double-rolled;

b) temper designation of the material to be delivered as defined in EN 515;

c) number of this European Standard EN 546-1, or separate specification, if any;

d) dimensions of the product:

- thickness;
- width and type of specified tolerance on width as defined in EN 546-3 (symmetrical, only plus, only minus);
- internal and external diameter of the coil/reel;
- core size and type;

e) quantity (mass);

f) type of lubrication, if specific;

g) any special requirements agreed between purchaser and supplier, e.g:

- test certificates and inspection reports;
- marking of the products, e.g. identification, flagging of joints, etc;
- reference to drawings, e.g. for packaging, cores, etc;
- wettability;
- bright or matt outer surface of coil/reel (if double rolled).

If special requirements are specified, the application shall be stated.

5 Requirements

5.1 Production and manufacturing processes

Unless otherwise specified in the order, the production and manufacturing processes shall be left to the discretion of the supplier. Unless it is explicitly stated in the order, no obligation shall be placed on the supplier to use the same process for subsequent and similar orders.

5.2 Quality control

The manufacturer shall establish and maintain a quality management system, which should be at least equivalent to EN ISO 9001.

The manufacturer shall establish and maintain inspection plans defining all inspections and tests to be performed on the product to fulfil the requirements of this standard and any other requirement agreed according to Clause 6 of the present standard, their frequency and the type of record to be established. The inspection plan shall specify for each inspection or test whether it is to be performed per cast, per heat treatment batch, per inspection lot as defined in EN 12258-1 or per any other lot of importance. The inspection plan shall conform as a minimum to the test procedures and test requirements stipulated in this standard. The inspection plan shall include additional schemes for appropriate process control. If required the inspection plan shall be submitted to the purchaser for approval before start of production.

The manufacturer shall be responsible for carrying out all inspections and tests required by this standard, prior to the shipment of the product. If the purchaser wishes to inspect the product at the manufacturer's site of production, he shall stipulate this at the time of placing the order.

The extent of inspections shall be in accordance with Clause 6 of the present standard. Unless explicitly stated quality controls and inspections shall be performed on inspection lots. Products included in one inspection lot shall be manufactured in the same production unit.

5.3 Chemical composition

The chemical composition shall be in conformity with the requirements specified in EN 573-3.

5.4 Mechanical properties

The mechanical properties shall be in conformity with EN 546-2.

5.5 Freedom from defects

The product shall be free from defects prejudicial to its suitable and proper use.

5.6 Tolerances on dimensions

The tolerances on dimensions shall be in conformity with EN 546-3.

5.7 Special properties

Special property requirements shall be agreed between purchaser and supplier.

6 Test procedure

6.1 Sampling

6.1.1 Samples for chemical analysis

Sampling shall be carried out at the time of casting according to EN 14361. The average content of each sample shall be within the specification for the chemical composition.

NOTE EN 14361 includes criteria how to determine number, volume and shape of samples, about time and location of sampling and about the design and maintenance of the tools, in order to make sure that the average chemical composition of the sample is representative of the average chemical composition of the whole melt.

6.1.2 Specimens for mechanical testing

6.1.2.1 Location and size

Specimens shall be taken from samples in such a way that it is possible to orientate the test pieces in relation to the product, as specified in 6.1.2.2. The specimens shall be large enough to allow manufacture of the test pieces necessary to carry out the required tests and shall include sufficient metal to allow manufacture of test pieces for any retests required.

6.1.2.2 Orientation

Specimens shall be taken in such a manner that the test pieces can be prepared in the longitudinal direction.

6.1.2.3 Identification

Each specimen shall be identified in such a way that after removal, it is still possible to identify the product from which it was taken and its location and orientation. If during the course of subsequent operations removal of the markings cannot be avoided, new markings shall be made before the originals are removed.

6.1.2.4 Preparation

Specimens shall be taken from the sample after completion of all the mechanical and heat treatment operations that the product has to undergo before delivery and which can influence the mechanical properties of the metal. In cases where this is not possible, the sample or specimens may be taken at an earlier stage, but they shall be subjected to the same treatment as that to which it is intended to submit the product concerned.

Cutting shall be carried out in such a manner that it does not change the characteristics of the part of the specimen from which the test pieces are to be prepared. Thus, the dimensions of the specimens shall provide an adequate allowance to permit removal of the zone affected by cutting.

Specimens shall not be treated in any way that alters their mechanical properties.

6.1.2.5 Number

The number of specimens taken shall be sufficient to provide statistical evidence of long-term product conformity to the relevant properties specified in EN 546-2.

When specific testing has been agreed between purchaser and supplier, the sampling frequency shall be increased to one specimen from each inspection lot of 10 000 kg or part thereof. For single coils weighing more than 10 000 kg each, only one specimen per coil shall be taken.

6.1.3 Test pieces for tensile test

6.1.3.1 Identification

Each test piece shall be marked in such a manner that it is possible to identify the inspection lot from which it was taken and, if required, its location and orientation in the product.

If a test piece is identified by stamping, this shall not be in a place or manner which can interfere with subsequent testing. Where it is not convenient to mark a test piece, an identification tag may be attached.

6.1.3.2 Number

One test piece shall be taken from each specimen.

6.1.3.3 Type

Flat test pieces shall be used for all thicknesses covered by EN 546-2. The test piece shall be prepared so that both surfaces are included undisturbed.

6.1.4 Other tests

For any other tests the procedures shall be as specified in EN 546-4.

6.2 Methods of testing

6.2.1 Analysis of chemical composition

The ranges of application and the accuracy of the test procedure used shall be validated and proved by the supplier.

In case of dispute concerning the chemical composition, referee analysis shall be carried out in accordance with EN 14242.

NOTE For the rapid determination of the chemical composition different spectral analysis methods are used (e.g. S-OES, XRF, GDOES). For S-OES see EN 14726.

6.2.2 Mechanical and physical tests

The tensile test shall be carried out in accordance with EN 546-2.

Other tests are specified in EN 546-4.

6.2.3 Measurement of dimensions

The dimensions shall be measured by means of measuring instruments which are capable of measuring to the accuracy required by the dimensions and the tolerances on dimensions specified in EN 546-3. All dimensions shall be checked at the ambient temperature of the workshop or laboratory, and, in case of dispute, at a temperature between 15 °C and 25 °C.

6.2.4 Surface finish

Unless otherwise specified, examination of surface appearance shall be carried out without the assistance of magnifying apparatus on products before delivery.

6.3 Retests

6.3.1 Chemical composition

If the analysis does not meet the chemical composition requirements specified in EN 573-3 or those agreed between purchaser and supplier, the cast shall be rejected.

6.3.2 Mechanical properties

If any one of the test pieces first selected fails to meet the requirements for the mechanical properties specified in EN 546-2, the following procedure shall be applied:

— if an error is clearly identified, in either the test piece preparation or the test procedure, then the corresponding result shall be disregarded and the test resumed as initially required;

— if an error is not identified, then two further specimens shall be taken from the same lot, at least one being from the same coil from which the original specimen was taken, unless that coil has been withdrawn by the supplier.

  If both these specimens meet the requirement for mechanical properties, the lot which they represent shall be deemed to comply with the requirements of EN 546-2. If either or both of these specimens fail to meet the requirements for mechanical properties, the lot shall be deemed not to comply with EN 546-2.

6.3.3 Other properties

The retests of other properties shall be agreed between purchaser and supplier.

7 Conformity with standards

If requested by the purchaser on the order, the supplier shall provide a statement certifying that the products for delivery are in conformity with the relevant parts of EN 546 and with the additional requirements on the order as agreed with the supplier.

8 Marking of products

Marking of products shall only be undertaken when agreed between purchaser and supplier and stated on the order. This marking shall not adversely affect the final use of the product.

9 Packaging

Unless otherwise specified on the order, the method of packing shall be determined by the supplier who shall take all necessary precautions to ensure that, under the usual conditions of transportation, the products shall be delivered in a condition suitable for use.

10 Complaints of non-conformity

In cases of dispute concerning conformity with the requirements of this European Standard or specification cited on the order, before rejecting the products, testing and examination shall be carried out by an arbitrator chosen by mutual agreement between purchaser and supplier.

The arbitrator's decision shall be final.

Bibliography

EN ISO 9001, *Quality management systems — Requirements (ISO 9001*:2000).

EN 14726, *Aluminium and aluminium alloys — Chemical analysis — Guideline for spark optical emission spectrometric analysis*.

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