

## Introduction

Standards make dialogue between suppliers, customers and authorities possible. They provide a common language for certifying performance and for securing conformity with legislation.

The present document introduces more than 120 European standards (ENs) for aluminium and its alloys in various forms, developed and published by the Technical Committee 132 of the European Committee for Standardization (CEN).

Several standards for products where aluminium is used in combination with other materials, e.g. construction products, or related to greenhouse gases emissions from industry, do also exist, but are not detailed in this document. An introduction to such standards is given on European Aluminium website <https://www.european-aluminium.eu/policy-areas/standards/>.

## Contents

Introduction .....	1
1. General Information.....	2
1.1 Terms and conditions.....	2
1.2 Designation systems, chemical composition and environmental aspects .....	2
1.3 Aluminium semi-products for general application.....	3
1.4 Aluminium semi-products with particular requirements .....	4
1.5 Aluminium semi-products for special end-uses .....	4
2. Ordering rolled products .....	5
2.1 Ordering flat rolled products according to EN 485-1.....	5
2.2 Instructions for ordering rolled products .....	8
3. Ordering extruded and drawn products.....	13
4. Ordering castings and forgings.....	17
5. Ordering aluminium ingots and aluminium scrap .....	19
6. Catalogue of standards .....	20
Disclaimer.....	21

## 1. General Information

### 1.1 Terms and conditions

The first step in understanding aluminium products is to define general terms related to products of aluminium and its alloys. This is done into details in EN 12258-1 to 4.

For the sake of simplifying the understanding of the present document, a few descriptions are given below<sup>1</sup> :

- Aluminium: unalloyed aluminium or aluminium alloy;
- Unalloyed aluminium: aluminium without alloying elements where the minimum aluminium content is specified to be greater than 99,00 %
- Aluminium alloy: aluminium which contains alloying elements, where aluminium predominates by mass over each of the other elements and where the aluminium content is not greater than 99,00 %
- Hardener: alloy containing at least some aluminium and one or more additional elements, intended to be added to molten aluminium to adjust the chemical composition and/or to control the structure as cast
- Temper: condition of the metal produced by mechanical and/or thermal processing, typically characterized by a certain structure and specified properties
- Unwrought product:
  - o product obtained by casting without further hot or cold working;
  - o examples: ingots for rolling, extruding, forging, remelting, cast plate or castings;
- Casting alloy: alloy primarily intended for the production of castings
- Wrought product:
  - o product that has been subjected to hot working and/or cold working
  - o examples: rod/bar, wire, tube, profile, sheet, strip, plate and forging.
- Wrought alloy: alloy primarily intended for the production of wrought products by hot and/or cold working
- Semi-finished product:
  - o product that has undergone some processing and is supplied for further processing before it is ready for use
  - o examples: wrought products and castings

### 1.2 Designation systems, chemical composition and environmental aspects

The second step in understanding aluminium products is having a look at designation systems, chemical composition and product's environmental aspects.

- Temper designations for wrought products: EN 515;
- Chemical composition and form of wrought products: EN 573-1 to 3, and 5<sup>2</sup>;

<sup>1</sup> Please refer to EN 12258 for full details

<sup>2</sup> EN 573-4 has been withdrawn in 2007

- Designation of alloyed aluminium ingots for re-melting, master alloys<sup>3</sup> and castings: EN 1780-1 to 3;
- Environmental aspects of aluminium products: EN 15530.

## 1.3 Aluminium semi-products for general application

Aluminium products for general application usually have the form of sheet, plate, foil, rod/bar, tube, profile or wire. For each of these forms, European standards "for general applications" are published each of them consisting of different parts:

Part 1 of each standard contains technical conditions for inspection and delivery which indicate

- Which information should be included in an "order document", i.e. a document or set of documents on which supplier and purchaser agreed at the time of ordering;
- Which are the requirements on the products, including references to the other parts of the standards;
- How the manufacturer should produce and assess the performance of the product;
- How the product should be shipped, and which information should be submitted to the customer;
- How arbitration should happen, if necessary.

Part 2 specifies the mechanical properties of the relevant alloys and tempers.

Part 3 and additional ones specify the tolerances of form and dimensions, and in specific cases additional properties.

Forms covered are:

- Sheet, strip and plate: EN 485-1 to -4;
- Foil and fin stock: EN 546-1 to 4 and EN 683-1 to 3;
- Extruded rod/bar, tube and profiles: EN 755-1 to 9;
- Forgings, wrought and cast forging stock: EN 586-1 to 3, EN 603-1 to 3 and EN 604-1 to 2;
- Cold drawn rod/bar and tube: EN 754-1 to 8;
- Drawn wire and drawing stock: EN 1301-1 to 3 and EN 1715-1 to 4.

Customers who need such standard products in small quantities usually buy them from stockists which have ordered the product from the manufacturer according to the relevant European standard. By the appropriate process control, inspection and testing, the manufacturer has made sure that the properties of the product are in conformance with the requirements of these standards.

Customers who need the standard products in larger quantities typically buy them directly from the manufacturer.

---

<sup>3</sup> In Europe, the term 'master alloy' refers to hardeners obtained from melting. Although still used in EN 1780 series, this term should be avoided in the future, because it has a different meaning in the USA and may lead to confusion.

## 1.4 Aluminium semi-products with particular requirements

Many customers need special products with requirements which differ from those of the standard products or additional requirements. In such cases, it is normally advantageous to order according to European standards and include the special requirements in the order, because, in most cases, such special requirements are only related to a limited number of properties and tests. In this case the special reference to the standard means that for all those properties, test methods and delivery specifications which are not covered by the special requirements, the requirements of the relevant European standard are valid.

If, as an example, a customer wants to order sheet with closer dimensional tolerances than indicated in the European standard, then he can indicate these special tolerances in his order and, nevertheless, refer to EN 485-1. In this case, the requirements of the standard related to dimensional tolerances will be replaced by the closer requirements laid down in the order and the other requirements are unchanged.

However, it can be difficult to get such special products in small quantities from a stockist. If a special product is ordered from a manufacturer, then the latter has to produce special lots under special conditions which may mean higher production costs and as a result higher selling price.

In some cases, special requirements can be relevant for products being sold in important quantities. In this case, dedicated standards may exist, e.g.:

- Impact extrusion slugs: EN 570;
- Circle and circle stock: EN 941;
- HF seam welded tubes: EN 1592-1 to 4;
- Reroll stock for general applications: EN 12482-1 & 2;
- Tread plate: EN 1386;
- Armour plates: EN 16914;
- Extruded precision profiles in alloys EN AW-6060 and EN AW-6063: EN 12020-1 & 2;
- Extruded round, coiled tube for general applications: EN 13957;
- Cold drawn, round, coiled tube for general applications: EN 13958.

Finally, for some products such as lithographic sheet or car body sheet, only a few suppliers and customers exist. In such cases often customer specifications exist and EN standards are disregarded.

## 1.5 Aluminium semi-products for special end-uses

As special requirements usually refer to specific end-uses and as standards may be legally connected to EU legislations or supporting them, dedicated European standards have been created for such end-uses:

- Packaging and articles in contact with foodstuff: EN 14287, EN 601, EN 602, EN 14392;
- Electrotechnical applications: EN 14121;
- Marine applications: EN 13195;
- Railway cars: EN 13981;

- Structural applications: semi-finished products hEN 15088 and finished products hEN 1090-1<sup>4</sup> in collaboration with EN 1090-3<sup>3</sup>, legally connected to Construction Products Regulation (EU) No 305/2011;
- Pressure equipment: hEN 12392, legally connected to Pressure Equipment Directive 2014/68/EU
- Tanks for the transport of dangerous goods: EN 14286, recommended products for building tanks according to EN 13094 and EN 14025 supporting the objectives of Directive 2008/68/EC, ADR<sup>5</sup> and RID<sup>6</sup>.

In such standards, specific alloys for the relevant application are recommended and additional or stricter requirements (than standards for general applications) on mechanical properties, dimensional tolerances and other properties are specified.

In many cases, a standard for specific end-use allows to unify the additional requirements necessary for it, which allows a cost reduction for production and testing.

It is the decision and the responsibility of the purchaser to define out of which standard to order aluminium products for a special end-use according to an EN standard for general application or according to an EN standard for a special end-use.

Standards for special end-uses have also been worked out by large customers, of associations and classification societies. They are not considered in this document.

## 2. Ordering rolled products

### 2.1 Ordering flat rolled products according to EN 485-1

EN 485-1 specifies which information should be part of the order document – agreed between supplier and purchaser – to make sure that the supplied product really meets the expectations of the purchaser. The information is given below:

- a) form and type of product:
  - form of the product (sheet, strip, plate, etc.);
  - designation of the aluminium alloy;
- b) temper of the material for delivery according to EN 515 and, if different, the temper for use and reference to this European Standard;
- c) specification of mechanical properties, if additional to or different than of EN 485-2;
- d) reference to the standard for tolerances of form and dimensions (EN 485-3 or EN 485-4);
- e) dimensions and shape of the product:
  - thickness;
  - width;

<sup>4</sup> Falling under CEN TC 135 'Execution of steel and aluminium structures'

<sup>5</sup> ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) <https://www.unece.org/trans/danger/danger.html>

<sup>6</sup> RID: Regulation concerning the International Carriage of Dangerous Goods by Rail. [www.otif.org](http://www.otif.org)

- length<sup>7</sup> of sheet and plate, as applicable (in the rolling direction);
  - internal and external diameters of the coil, or dimension and type of the core, as applicable.
- f) specification or tolerances, if additional to or different from EN 485-3 or EN 485-4;
- g) quantity:
- mass or number of pieces;
  - quantity tolerances if required;
- h) any requirements for inspection documents;
- i) any other test, in addition to chemical analysis and tensile testing;
- j) any additional requirements, such as:
- quality assurance;
  - specific inspection schemes;
  - marking of products;
  - references of drawing;
  - special packaging requirements;
- k) for products intended for anodizing by the purchaser, the order document shall also contain the following:
- statement that the product is intended to be anodized;
  - intended particular surface treatment (according to the relevant European Standard);
  - whether anodizing is required on both sides and, if only one side, its position with respect to the strip (inside or outside of the coil) or the sheet or plate (upside or downside).

Products intended to form a specific area after anodizing (such as a façade on a particular building) should be ordered in a single batch.

The order document should indicate the intended application.

Table 1 below gives some examples and additional explanations.

**Table 1 General instructions, applied to the example of rolled products**

Indication	Example	Explanations
a) form and type of product	Sheet, alloy EN AW-5052	The material designations and the limits of the chemical analysis are laid down in EN 573-3. Reference to this standard is not necessary, as such a reference is already made in EN 485-1.
	<b>Example b)</b> alloy Pe-253 according to actual prospectus	In this example a special requirement related to chemical analysis is given by which the reference to EN 573-3 in EN 485-1 becomes invalid. Special requirements in the order document supersede requirements of a standard

<sup>7</sup> Unless otherwise agreed, the length is the largest dimension of the sheet or plate and corresponds to the rolling direction.

b) temper of the material for delivery according to EN 515 and, if different, the temper for use	Temper H18	The temper designation is defined in EN 515. Reference to this standard is not necessary, as such a reference is already made in EN 485- 1.
c) reference to this European Standard	...according to EN 485-1	This reference means that all requirements of EN 485-1 are part of the order document. This statement also means that the requirements of other standards to which reference is made in this standard, e.g. EN 573-3 for chemical composition, EN 485-2 for mechanical properties and different standards for testing procedures are part of the order document, as well. Such references need not be repeated in the order document. However, if references to other standards are made in the purchase order, then these references apply.
d) specification of mechanical properties, if additional to or different from prEN 485-2	-	No indication means that specifications of EN 485-2 apply
e) reference to the standard for tolerances of form and dimensions (EN 485-3 or EN 485-4)	Tolerances according to EN 485-4	This reference is necessary because two possible tolerance standards for rolled products exist, namely EN 485-3 and EN 485-4.
f) dimensions and shape of the product	Length: 1500 mm; Width: 1050 mm; Thickness: 1,2 mm	It is essential that no misunderstandings are possible. It is not sufficient to write "1500 x 1050 x 1,2", if no reference is made to a document where it is clearly stated what these figures mean.
g) specification or tolerances, if additional to or different from EN 485-3 or EN 485-4	Thickness tolerance 50 % of value as specified in EN 485-4	For a width of 1050 mm and a thickness of 1,2 mm, EN 485-4 requires a thickness tolerance of $\pm 0,09$ mm. For this order, a thickness tolerance of $\pm 0.45$ mm applies
h) quantity: - mass or number of pieces; quantity tolerances if required	20 tonnes; Maximum deviations from ordered quantity: + 2 %	Narrow tolerances cause additional costs, e. g. production scrap at the supplier's rolling mill and should be specified only if really necessary
i) any requirements for inspection documents	Inspection certificate type 3.1 to be included	Details about this document are described in EN 10204:2004, clause 4.1.
j) any other test, in addition to chemical analysis and tensile testing	Anodizing test and bend test to be included	Further details can be exchanged by separate documents
k) any additional requirements	Special requirements on planity according to enclosure.	As elsewhere, special requirements replace conflicting requirements of the relevant standard.

l) additional information for products intended for decorative anodizing by the purchaser	Sheet will be used for anodized facade panels; please supply anodizing quality for top side	
---	---	--

## 2.2 Instructions for ordering rolled products

The following table gives an overview over the different forms of flat rolled products, according to their definitions which are laid down in EN 12258-1:2012. For each of these products, recommendations are given about the standards to be considered when ordering.

**Table 2 Forms of flat rolled products and EN standards to be considered when ordering**

Definition of Product	EN-Standard for Generalities	Other EN Standards, comments
<p><b>sheet:</b> rolled product with a rectangular cross-section and a nominal thickness less than 6 mm (in USA less than 0,250 inches) but not less than 0,20 mm (in USA not less than 0,006 inches) and with slit, sheared or sawed edges</p> <p>NOTE 1: A sheet can be supplied in a corrugated, embossed, coated, edge conditioned or perforated form.</p> <p>NOTE 2: Sheet between 3 mm and 6 mm is sometimes called „shate“.</p> <p>NOTE 3: In Europe, the term "sheet" is only used for rolled products supplied in straight length, for coiled sheet the term "strip" is used.</p>	EN 485-1	<p><i>Mechanical properties:</i> EN 485-2</p> <p><i>Tolerances on dimensions and form:</i></p> <ul style="list-style-type: none"> <li>- <i>hot-rolled products:</i> EN 485-3</li> <li>- <i>cold-rolled:</i> EN 485-4</li> </ul> <p>EN 485-1 only refers to sheet for general application</p>
<p><b>plate</b> rolled product with a rectangular in cross-section and a thickness not less than 6 mm (in USA not less than 0.250 inch) with sheared or sawn edges</p>	EN 485-1	<p><i>Mechanical properties:</i> EN 485-2</p> <p><i>Tolerances on dimensions and form:</i></p> <ul style="list-style-type: none"> <li>- <i>hot-rolled products:</i> EN 485-3</li> <li>- <i>cold-rolled:</i> EN 485-4</li> </ul> <p>EN 485-1 only refers to plate for general application</p>
<p><b>hot rolled sheet/hot rolled plate</b> sheet or plate whose final thickness is obtained by hot rolling</p> <p>NOTE 1: A reroll plate is often called "slab".</p>	EN 485-1	for hot rolled re-roll stock see EN 12482-1
<p><b>cold rolled sheet/cold rolled plate</b> sheet or plate whose final thickness is obtained by cold rolling</p>	EN 485-1	for cold rolled re-roll stock see EN 12482-2

<p><b>reroll stock</b> coiled sheet suitable and intended for further rolling</p>	<p>EN 12482-1 (hot rolled) EN 12482-2 (cold rolled)</p>	
<p><b>anodizing sheet</b> sheet with metallurgical characteristics and surface quality suitable for the development of protective and decorative films by anodic oxidation processes</p>	<p>EN 485-1</p>	<p>see Table 1</p>
<p><b>brazing sheet</b> sheet of a low melting point alloy or clad with a low melting point alloy, used for brazing</p>	<p>EN 485-1 with special requirements</p>	<p>normally, a close co-operation between supplier and customer is necessary which includes qualification procedures</p>
<p><b>can stock</b> sheet or strip used for the fabrication of rigid cans including ends (lids) and tabs by drawing/ironing, pressing or forming operations. Can stock includes can body stock, end (lid) stock and tab stock</p>	<p>EN 541</p>	<p>EN 541 contains also dimensional tolerances and mechanical properties</p>
<p><b>circle stock</b> sheet, strip or plate intended to be sawn, sheared or blanked into circles to be subsequently formed, drawn, etc.</p>	<p>EN 485-1</p>	<p>special requirements on circles according EN 941 (general applications) and EN 851 (culinary utensils) to be considered</p>
<p><b>foil stock</b> reroll stock suitable for further rolling to foil</p>	<p>EN 12482-1 EN 12482-2</p>	<p>foil stock is considered as a special form of re-roll stock</p>
<p><b>fin stock</b> coiled sheet or foil suitable and intended for manufacture of fins for heat-exchanger applications</p>	<p>EN 683-1</p>	<p>mechanical properties: EN 683-2 tolerances on dimensions and form: EN 683-3</p>
<p><b>lithographic sheet</b> sheet having a superior finish on one side with respect to freedom from surface imperfections and supplied with a maximum degree of flatness for use as a plate in offset printing</p>	<p>EN 485-1 with special requirements</p>	<p>normally, a close co-operation between supplier and customer are necessary which includes qualification procedures</p>
<p><b>reflector sheet</b> sheet with special requirements related to the surface quality intended and suitable for the manufacture of reflectors</p>	<p>EN 485-1 with special requirements</p>	<p>normally, a close co-operation between supplier and customer are necessary which includes qualification procedures</p>
<p><b>roofing sheet</b> sheet intended and suitable for roofing application</p>	<p>EN 485-1</p>	<p>special requirements according EN 507 and EN 508-2 to be considered</p>

<p><b>painted sheet</b></p> <p>sheet, one or both sides of which has a factory-applied paint coating of controlled thickness</p>	EN 1396	EN 1396 applies to coil coated sheet, otherwise additional requirements
<p><b>mill finish sheet/plate</b></p> <p>sheet/plate having a finish defined by the actual roll grinding and rolling conditions, without further specification from a customer or a standard.</p> <p>NOTE: The finish of mill finish sheet/plate can vary from sheet to sheet or even within one sheet</p>	EN 485-1	
<p><b>satin-finish sheet</b></p> <p>sheet with a fine-textured matt finish on one or both surfaces</p>	EN 485-1	special requirements to be clearly specified
<p><b>corrugated sheet, profiled sheet</b></p> <p>roll-formed sheet of symmetric or asymmetric profile</p>	EN 485-1	profile and special requirements to be clearly specified. For coil-coated material see EN 1396.
<p><b>patterned sheet; embossed sheet</b></p> <p>sheet on which a raised or indented pattern has been impressed or embossed on either one or both faces</p>	EN 485-1 EN 1386 in case of tread plates	additional requirements and mechanical values of EN 1386 should be considered
<p><b>tread plate</b></p> <p>sheet or plate upon which a pattern has been impressed on one side by rolling using a specially prepared roll with an appropriate pattern, to provide improved traction</p>	EN 1386	EN 1386 contains special mechanical properties
<p><b>armour plate<sup>8</sup></b></p> <p>plate to be used to provide protection against various threats, covering a military vehicle or ship, to defend it from attack</p>	EN 16914, for thickness between 10 mm and 70 mm	for thickness below 10 mm or above 70 mm, product properties have to be agreed between customer and supplier
<p><b>machined plate</b></p> <p>semi-finished product produced from a plate completely machined over one or two sides</p>	EN 485-1	special requirements to be clearly specified

<sup>8</sup> EN 16914 being more recent than EN 12258-1:2012, the latter does not contain a definition for 'armour plate' yet.

<p><b>tooling plate</b></p> <p>cast or rolled product with a rectangular cross-section over 6 mm (in USA 0,250 inches) in thickness and edges either as-cast, sheared or sawn; and with internal stress levels controlled to achieve maximum stability for machining purposes in tool and jig applications</p>	<p>EN 485-1</p>	<p>special requirements to be clearly specified, because the provisions of EN 485-1 usually are not sufficient for this product</p> <p>Cast products not covered by EN 485-1</p>
<p><b>blank</b></p> <p>piece of metal of regular or irregular shape, taken from a flat wrought product intended for subsequent processing, such as bending, stamping or deep drawing</p>	<p>EN 485-1</p>	<p>EN 851 and EN 941 to be considered; special requirements to be clearly specified</p>
<p><b>circle</b></p> <p>circular blank, fabricated from plate, sheet, or foil</p>	<p>EN 941 (general applications) EN 851 (culinary utensils)</p>	
<p><b>disc</b></p> <p>circle from which a central concentric area has been removed</p>	<p>EN 941 (general applications) EN 851 (culinary utensils)</p>	
<p><b>slug</b></p> <p>piece of metal of uniform thickness and of regular or irregular shape, taken from a wrought product, typically for impact extrusion, with or without a centre hole</p> <p>NOTE: This term is also used for cast or thixocast pieces to be formed in semi-solid condition (thixoforming).</p>	<p>EN 570</p>	
<p><b>tube</b></p> <p>hollow, wrought product with a uniform cross-section, with only one enclosed void and with a uniform wall thickness, supplied in straight lengths or in coiled form. Cross-sections are in the shape of circles, ovals, squares, rectangles, equilateral triangles or regular polygons and can have rounded corners, provided the inner and outer cross-sections are concentric and have the same form and orientation</p>		

<p><b>welded tube</b></p> <p>tube produced by longitudinal seam-welding, typically of formed sheet</p> <p>NOTE: Welded tubes can be fabricated by arc-welding with or without welding wire, high frequency seam welding, or any other type of welding.</p>	-	EN standards only for H.F. seam welded tube, see below
<p><b>H.F. seam welded tube<sup>9</sup></b></p> <p>welded tube fabricated from strip by use of high frequency current without filler wire</p>	EN 1592-1	<p>mechanical properties: EN 1592-2;</p> <p>tolerances on dimensions and form:</p> <ul style="list-style-type: none"> <li>- EN 1592-3 for circular tubes</li> <li>- EN 1592-4 for other tubes</li> </ul>
<p><b>foil</b></p> <p>flat rolled product with a rectangular cross-section and uniform thickness equal to or less than 0,20 mm (200 microns)</p> <p>NOTE: In USA the maximum thickness of a foil is less than 0,006 inch</p>	EN 546-1	<p>mechanical properties: EN 546-2</p> <p>tolerances on dimensions and form: EN 546-3</p> <p>special properties EN 546-4</p>
<p><b>converter foil</b></p> <p>foil, typically soft annealed, supplied for further processing such as colouring, printing, embossing or laminating</p>	EN 546-1	see "foil", furthermore, special requirements related to surface appearance and porosity are to be fulfilled.
<p><b>container foil</b></p> <p>single rolled foil with a gauge above approximately 35 µm, produced at soft or intermediate temper and often involving alloys of the 3xxx and 8xxx series, intended for press forming into smooth or wrinkled walled containers for food- stuffs and the like</p>	EN 546-1	see "foil", furthermore, special requirements related to formability are to be fulfilled
<p><b>consumer foil; household foil</b></p> <p>foil intended for public use, principally for use in culinary applications such as cooking and storage</p>	EN 546-1	see "foil".
<p><b>embossed foil; patterned foil</b></p> <p>foil on which a pattern has been impressed or embossed on either one or both faces</p>	EN 546-1	see "foil".
<p><b>printed foil</b></p> <p>foil printed with a design or on all-over colour</p>	EN 546-1	see "foil".
<p><b>rolled aluminium products for structural construction applications</b></p>	EN 15088	

<sup>9</sup> No definition given in EN 12258-1:2012

<b>rolled aluminium products for pressure vessels</b>	EN 12392	<p>see also chapter 1.5.</p> <p>The special standards mentioned here formulate recommendations and specific requirements reflecting the intended application, in addition or alternatively to the basic standards of the EN 485 and EN 546 series, which are referenced for the remaining properties.</p> <p>By ordering according to the special standard, the basic standards apply by reference.</p> <p>Alternatively, the product can be ordered according to the basic standard, together with the special requirements</p>
<b>rolled aluminium products for tanks for the transport of dangerous goods</b>	EN 14286	
<b>rolled aluminium products for electro- technical applications</b>	EN 14121	
<b>rolled aluminium products for packaging applications</b>	EN 14287	
<b>rolled aluminium products for structural railway application</b>	EN 13981-2	
<b>rolled aluminium products in contact with food</b>	EN 602, EN 14392, if anodised	
<b>foilstock in the field of semi rigid foodstuff containers – production guideline</b>	EN 16773	
<b>rolled aluminium products for marine applications</b>	EN 13195	

## 3. Ordering extruded and drawn products

The following tables give an overview over the different forms of extruded and drawn products, according to their definitions which are laid down in EN 12258-1:2012. For each of these products, recommendations are given about the standards to be considered when ordering.

**Table 3: Forms of extruded and cold-drawn products and EN standards to be considered when ordering**

Definition of Product	EN-Standard for Generalities	Other EN Standards, comments
<p><b>profile</b></p> <p>wrought product that is long in relation to its cross-sectional dimensions, and which is of a form other than that of sheet, plate, rod, bar, tube, wire or foil</p> <p>NOTE 1: For profiles, sometimes the term "shape" or "section" is used.</p>		

<p><b>rod</b></p> <p>solid, wrought product with a circular cross-section that is long in relation to its diameter, typically supplied in straight length</p> <p>NOTE 1: In North America, the minimum diameter of a rod is 10 mm; below this limit, the product is called "wire".</p> <p>NOTE 2: In Europe, a rod is supplied in straight length; if supplied in coiled form, the product is called "wire".</p> <p>NOTE 3: In Europe, a rod is often called a "round bar".</p>		
<p><b>bar</b></p> <p>solid, wrought product that is long in relation to its cross-section which is circle, square or rectangular (excluding plate and flattened wire) with sharp or rounded corners or edges, or is a regular hexagon or octagon, typically supplied in straight length</p> <p>NOTE 1: In North America, the minimum perpendicular distance between parallel faces of a bar is 10 mm; below this limit the product is called "wire".</p> <p>NOTE 2: In Europe, a bar is supplied in straight length; if supplied in coiled form, the product is called "wire".</p>		
<p><b>extruded profile</b></p> <p>profile brought to final dimensions by extruding</p>	<p>EN 755-1 for general application,</p> <p>EN 12020-1 for precision profiles in alloys AW-6060 and AW-6063</p>	<p><i>mechanical properties:</i> EN 755-2;</p> <p><i>tolerances on dimensions and form for:</i></p> <ul style="list-style-type: none"> <li>- general applications: EN 755-9</li> <li>- precision profiles in alloys AW-6060 and AW-6063: EN 12020-2.</li> </ul>
<p><b>extruded rod/bar</b></p> <p>rod/bar brought to final dimensions by extruding.</p>	<p>EN 755-1</p>	<p><i>mechanical properties:</i> EN 755-2</p> <p><i>tolerances on dimensions and form</i> depending on cross-section:</p> <ul style="list-style-type: none"> <li>- Round: EN 755-3</li> <li>- Square: EN 755-4</li> <li>- Rectangular: EN 755-5</li> <li>- Hexagonal: EN 755-6</li> </ul>
<p><b>cold-drawn rod/bar</b></p> <p>Rod or bar brought to final dimensions by cold-drawing through a die</p>	<p>EN 754-1</p>	<p><i>mechanical properties:</i> EN 754-2;</p> <p><i>tolerances on dimensions and form</i> depending on cross-section:</p> <ul style="list-style-type: none"> <li>- Round: EN 754-3</li> <li>- Square: EN 754-4</li> <li>- Rectangular: EN 754-5</li> <li>- Hexagonal: EN 754-6</li> </ul>

<p><b>forging stock</b></p> <p>solid product, typically ingot, rod or bar of profile, intended and suitable for forging</p> <p>Note: Forging stock is typically a cast product or an extruded product</p>	<p>EN 603-1</p>	<p><i>mechanical properties: EN 603-2</i></p> <p><i>tolerances on dimensions and form: EN 603-3;</i></p> <p>can also be ordered according to EN 755-1</p>
<p><b>machining stock</b></p> <p>bar or wire typically supplied to close tolerances and suitable for repetition machining operations</p> <p>NOTE: This product is sometimes referred to as "screw machine stock" (SMS)</p>	<p>no specific European Standard</p>	<p><i>related semi-finished product standard together with special requirements to be used.</i></p>
<p><b>wire</b></p> <p>solid, wrought product that is long in relation to its cross-section, with a section with sharp or rounded edges (square, rectangular, hexagonal, octagonal or other shapes)</p> <p>NOTE 1: In North America, the maximum diameter or perpendicular distance between parallel faces of a wire is 0,375 inches; above this limit the product is called "rod" or "bar".</p> <p>NOTE 2: In Europe, a wire is supplied in coiled form; if supplied in straight length, the product is called "rod" or "bar".</p>		
<p><b>drawn wire</b></p> <p>wire brought to final dimension by drawing through a die</p>	<p>EN 1301-1</p>	<p><i>mechanical properties: EN 1301-2</i></p> <p><i>tolerances on dimensions and form: EN 1301-3</i></p> <p><i>Definitions of alternative products (strip, profiles, tube, rod/bar) should be considered.</i></p>
<p><b>drawing stock</b></p> <p>semi-finished, solid, wrought product with a uniform cross-section along its whole length, supplied in coils and of a quality intended and suitable for drawing into wire</p>	<p>EN 1715-1</p>	<p><i>special requirements for...</i></p> <ul style="list-style-type: none"> <li>- <i>electrotechnical applications: EN 1715-2</i></li> <li>- <i>mechanical applications: EN 1715-3</i></li> <li>- <i>welding applications: EN 1715-4</i></li> </ul>
<p><b>forging stock</b></p> <p>solid product, typically ingot, rod or bar of profile, intended and suitable for forging</p> <p>NOTE: Forging stock is typically a cast product or an extruded product</p>	<p>EN 604-1</p>	<p><i>tolerances on dimensions and form: EN 604-2</i></p>
<p><b>conductor wire (or electric wire)</b></p> <p>wire possessing the requisite electrical and mechanical properties for use as an electrical conductor</p>	<p>see CENELEC</p>	

<p><b>welding wire</b> wire for use as filler metal in joining by welding</p>	<p>EN 1715-4 ISO 18273</p>	
<p><b>tube</b> hollow, wrought product with a uniform cross-section, with only one enclosed void and with a uniform wall thickness, supplied in straight lengths or in coiled form. Cross-sections are in the shape of circles, ovals, squares, rectangles, equilateral triangles or regular polygons and can have rounded corners, provided the inner and outer cross-sections are concentric and have the same form and orientation</p>		
<p><b>extruded tube</b> tube brought to final dimensions by extruding</p>	<p>EN 755-1</p>	<p><i>mechanical properties: EN 755-2;</i> <i>tolerances on dimensions and form:</i> - <i>seamless tubes: EN 755-7</i> - <i>porthole/bridge tubes: EN 755-8</i></p>
<p><b>drawn tube</b> tube brought to final dimensions by drawing through a die</p>	<p>EN 754-1</p>	<p><i>mechanical properties: EN 754-2;</i> <i>tolerances on dimensions and form: EN 754-7 for seamless tube and EN 754-8 for porthole/bridge tube</i></p>
<p><b>porthole tube/bridge tube</b> tube produced by extrusion of a solid billet through a porthole or bridge die.  NOTE: The product is characterised by one or more longitudinal extrusion seams</p>	<p>EN 754-1, EN 755-1</p>	<p><i>mechanical properties:</i> <i>EN 754-2 for drawn product and EN 755-2 for extruded product;</i> <i>tolerances on dimensions and form: EN 754-8 for drawn product and EN 755-8 for extruded product</i></p>
<p><b>coiled tube</b></p>	<p>EN 13957 (extruded) EN 13958 (cold drawn)</p>	
<p><b>tube stock</b> semi-finished tube suitable for the production of drawn tube  NOTE: Tube stock is also referred to as tube bloom.</p>	<p>no specific EN Standard</p>	
<p><b>extruded aluminium products for structural construction applications</b></p>	<p>EN 15088</p>	<p><i>see also chapter 1.5.</i></p> <p><i>The special standards mentioned here formulate recommendations and specific requirements reflecting the intended application, in addition or alternatively to the basic standards of the EN 754 and EN 755 series, which are referenced for the remaining properties.</i></p>
<p><b>extruded and drawn aluminium products for pressure vessels</b></p>	<p>EN 12392</p>	
<p><b>extruded aluminium products for structural railway applications</b></p>	<p>EN 13981-1</p>	

<b>extruded and drawn aluminium products in contact with food</b>	EN 602, EN 14392, if anodised	By ordering according to the special standard, the basic standards apply by reference. Alternatively, the product can be ordered according to the basic standard, together with the special requirements.
<b>extruded and drawn aluminium products for marine applications</b>	EN 13195	

## 4. Ordering castings and forgings

The following table gives an overview over the different forms of castings and forgings, according to their definitions which are laid down in EN 12258-1:2012. For each of these products, recommendations are given about the standards to be considered when ordering.

**Table 4: Forms of castings and forgings and EN standards to be considered when ordering**

Definition of Product	EN-Standard for Generalities	Other EN Standards, comments
<b>Casting</b> product at or near finished shape, formed by solidification of the metal in a mould or a die	EN 1559-1, -4	<i>EN 1706 for alloy and product specification; EN 1676 for casting ingots</i>
<b>sand casting</b> casting produced by pouring molten metal into a sand mould and allowing it to solidify	EN 1559-1, -4	<i>EN 1706 for alloy and product specification; EN 1676 for casting ingots</i>
<b>(high pressure) die casting</b> casting produced by the injection and solidification of molten metal under substantial pressure, typically above 70 bars, into a metal die  NOTE 1: The term "pressure die casting" or "high pressure die casting" is often used for this concept.  NOTE 2: Die castings are characterized by a high degree of fidelity to the die cavity.	EN 1559-1, -4	<i>EN 1706 for alloy and product specification; EN 1676 for casting ingots</i>
<b>permanent mould casting</b> casting produced by introducing molten metal by gravity or low pressure into a mould constructed of durable material, typically iron or steel, and allowing it to solidify  NOTE 1: permanent mould casting where the metal solidifies in a metal mould under low pressure (typically less than 1 bar above atmospheric pressure) is also referred to as "low pressure die casting".  NOTE 2: Permanent mould casting, which is made using an expendable core such as sand, is often (mainly in the USA) termed "semi-permanent mould casting".	EN 1559-1, -4	<i>EN 1706 for alloy and product specification; EN 1676 for casting ingots</i>

<p><b>precision casting</b></p> <p>casting which fulfils special requirements concerning tolerances on form and dimensions</p> <p>NOTE: Precision castings can be produced by different casting processes.</p>	EN 1559-1, -4	<i>EN 1706 for alloy and product specification; EN 1676 for casting ingots; special requirements to be specified</i>
<p><b>investment casting</b></p> <p>precision casting formed by a three-step process comprising:</p> <p>a) fabrication of a ceramic mould around a wax or thermoplastic pattern with a refractory slurry that sets at room temperature</p> <p>b) removal of the pattern through the use of heat</p> <p>c) pouring of metal into this mould and allowing it to solidify</p>	EN 1559-1, -4	<i>EN 1706 for alloy product specification; EN 1676 for casting ingots; special requirements to be specified</i>
<p><b>Forging</b></p> <p>wrought product formed by hammering or pressing, typically when hot, between open dies (hand forging) or closed dies (drop or die forging)</p>	EN 586-1	<i>mechanical properties: EN 586-2 tolerances on dimensions and form: EN 586-3</i>
<p><b>forging stock</b></p> <p>solid product, typically ingot, rod or bar of profile, intended and suitable for forging</p> <p>NOTE: Forging stock is typically a cast product or an extruded product</p>	EN 604-1	<i>tolerances on dimensions and form: EN 604-2</i>
<p><b>precision forging</b></p> <p>forging produced to tolerances closer than standard</p>	EN 586-1	<i>mechanical properties: EN 586-2 tolerances on dimensions and form: EN 586-3 special requirements are to be specified</i>
<b>Castings for structural construction application</b>	EN 15088	<i>see also chapter 1.5. The special standards mentioned here formulate recommendations and specific requirements reflecting the intended application, in addition or alternatively to the basic standards of the EN 1559-1 &amp; 4 and EN 586-1, which are referenced for the remaining properties. By ordering according to the special standard, the basic standards apply by reference. Alternatively, the product can be ordered according to the basic standard, together with the special requirements.</i>
<b>Castings for pressure vessels</b>	EN 12392	
<b>Castings for marine applications</b>	EN 13195	
<b>Castings for structural railway application</b>	EN 13981-3	
<b>Forgings for structural railway application</b>	EN 13981-4	
<b>Castings and forgings in contact with food</b>	EN 601 <sup>10</sup> (castings) EN 602 (forgings)	

<sup>10</sup> EN 601 only for alloy composition, other properties see product specific standards

## 5. Ordering aluminium ingots and aluminium scrap

The following tables give an overview over the different forms of aluminium ingots and aluminium scrap, according to their definitions which are laid down in EN 12258-1:2012. For each of these products, recommendations are given about the standards to be considered when ordering.

**Table 5: Forms of aluminium ingots and aluminium scrap and EN standards to be considered when ordering**

Definition of Product	EN-Standard	Other EN Standards, comments
<b>Ingot</b> cast product intended and suitable for remelting or forming by hot or cold working		
<b>ingot for remelting; remelt ingot</b> ingot intended and suitable for remelting NOTE 1: Large ingots for remelting, typically having a mass of about 500 kg, are often called "sows". NOTE 2: Small ingots for remelting typically having a mass of less than 25 kg, are often called "pigs".	EN 576, if unalloyed aluminium EN 1676, if casting alloy	
<b>primary aluminium ingot</b> ingot of unalloyed or alloyed aluminium cast from primary aluminium and possibly a small amount of run-around scrap	EN 576, if unalloyed aluminium	<i>EN Standards refer to properties of the product and these standards don't differ between primary and recycled aluminium.</i>
<b>recycled aluminium ingot</b> aluminium ingot obtained by recycling of scrap NOTE 1: The term "secondary aluminium" should be avoided for this concept. NOTE 2: The terms "recycled aluminium strip", "recycled aluminium casting", "recycled aluminium profile" are defined accordingly	EN 1676, if casting alloy	
<b>casting alloy</b> alloy primarily intended for the production of castings	EN 1676; EN 577, if liquid metal	<i>Requirements for chemical compositions of castings are slightly different, see EN 1706</i>
<b>refined aluminium alloy</b> casting alloy obtained after metallurgical treatment of molten metal obtained from aluminium scrap	EN 1676; EN 577, if liquid metal	<i>Requirements for chemical compositions of castings are slightly different, see EN 1706</i>
<b>ingot for casting</b> ingot for remelting, intended and suitable for the production of castings	EN 1676	<i>Requirements for chemical compositions of castings are slightly different, see EN 1706</i>

<p><b>hardener</b></p> <p>alloy containing at least some aluminium and one or more additional elements intended to be added to molten aluminium to adjust the chemical composition and /or to control the structure as cast.</p> <p>NOTE 1: The term “master alloy” is used for different concepts and for different reasons, and therefore should be avoided. In Europe the term refers to hardeners obtained from melting. In the US the term refers to a hardener which combines several metallic elements in a fixed ratio and which is intended to be added to pure aluminum to provide a finished alloy composition.</p> <p>NOTE 2: Hardeners can have various forms including waffles (obtained by casting the melt into an adequate mould), briquettes (obtained by compacting a powder), granules and wire.</p>	<p>EN 575</p>	
<p><b>extrusion ingot</b></p> <p>ingot, intended and suitable for extruding, typically with a solid, circular cross-section, but sometimes with a central hollow or a flattened cross-section</p>	<p>EN 486</p>	
<p><b>extrusion billet</b></p> <p>extrusion ingot cut to length</p>		
<p><b>rolling ingot</b></p> <p>ingot intended or suitable for rolling</p>	<p>EN 487</p>	
<p><b>forging ingot</b></p> <p>ingot intended and suitable for forging</p>	<p>EN 604-1</p>	<p><i>Tolerances: EN 604-2</i></p>
<p><b>(aluminium) scrap</b></p> <p>raw material, destined for trade and industry, mainly consisting of aluminium resulting from the collection and/or recovery of</p> <ul style="list-style-type: none"> <li>• metal that arises as by-product at various production stages; or</li> <li>• products after use</li> </ul> <p>to be used for the production of wrought and cast alloys and for other production processes</p>	<p>EN 13920-1</p>	<p><i>EN 13920-2 ... EN 13920-16 are dealing with different scrap categories</i></p>

## 6. Catalogue of standards

The full ‘Catalogue of European standards in the aluminium and aluminium alloys field’, updated on a yearly basis, as well as an introduction to standards dealing with products whose composition includes aluminium combined with other materials and standards dealing with industrial emissions, are available here: <https://www.european-aluminium.eu/policy-areas/standards>.

## Disclaimer

This document is provided for informational and/or educational purposes only.

European Aluminium has compiled this document very carefully, and the information it contains is offered in utmost good faith. This information is believed to be correct. Nevertheless, European Aluminium makes no representations or warranties as to the completeness or accuracy of any of this information.

This information is made available to the readers on the condition that each of them will make his/her own determination whether the information is suitable prior to make any appropriate use of it.

European Aluminium will in no event be responsible for damages of any nature whatsoever resulting from the use or reliance to the information contained in this document.