

# Metallic materials — Rules for the drafting and presentation of dimensional standards for metallic semi-finished products

The European Standard EN 4000:2001 has the status of a  
British Standard

ICS 49.025.01; 01.110

# National foreword

This British Standard is the official English language version of EN 4000:2001. The UK participation in its preparation was entrusted to Technical Committee ACE/61, Inspection and testing requirements for aerospace metallic materials, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

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This British Standard, having been prepared under the direction of the Engineering Sector Policy and Strategy Committee, was published under the authority of the Standards Policy and Strategy Committee on  
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English version

**Aerospace series - Metallic materials - Rules for the drafting and presentation of dimensional standards for metallic semi-finished products**

Série aérospatiale - Matériaux métalliques - Règles pour la rédaction et la présentation des normes dimensionnelles des demi-produits métalliques

Luft- und Raumfahrt - Metallische Werkstoffe - Regeln für die Abfassung und Gestaltung von Maßnormen für metallisches Halbzeug

This European Standard was approved by CEN on 2 May 2001.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

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

Foreword

This European Standard has been prepared by the European Association of Aerospace Manufacturers (AECMA).

After inquiries and votes carried out in accordance with the rules of this Association, this Standard has received the approval of the National Associations and the Official Services of the member countries of AECMA, prior to its presentation to CEN.

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 2002, and conflicting national standards shall be withdrawn at the latest by June 2002.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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## 0 Introduction

This standard is part of the series of EN metallic material standards for aerospace applications. The general organization of this series is described in EN 4258.

## 1 Scope

This standard specifies the rules for the drafting and presentation of metallic semi-finished dimensional standards for aerospace applications.

This standard applies to wrought semi-finished metallic products (such as sheets, plates, bars, tubes, etc.) characterized by their form within a range of standardized dimensions.

## 2 Normative references

This European Standard incorporates by dated or undated reference provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

|            |                                                                                                                                     |
|------------|-------------------------------------------------------------------------------------------------------------------------------------|
| ISO 406    | Technical drawings – Tolerancing of linear and angular dimensions                                                                   |
| EN 20286-2 | ISO system of limits and fits – Part 2: Tables of standard tolerance grades and limit deviations for holes and shafts               |
| EN 4258    | Aerospace series – Metallic materials – General organization of standardization – Links between types of EN standards and their use |
| EN 4259    | Aerospace series – Metallic materials – Definitions of general terms <sup>1)</sup>                                                  |

## 3 Definitions

For the purposes of this standard, the definitions given in EN 4259 apply.

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1) Published as AECMA Prestandard at the date of publication of this standard

## 4 Indication of dimensional tolerances

### 4.1 Case of one tolerance for a dimensional range

This shall be indicated as follows:

| Dimensions in millimetres                                     |                                                               |
|---------------------------------------------------------------|---------------------------------------------------------------|
| <span style="border: 1px solid black; padding: 2px;">1</span> | <span style="border: 1px solid black; padding: 2px;">2</span> |
| <span style="border: 1px solid black; padding: 2px;">3</span> | <span style="border: 1px solid black; padding: 2px;">4</span> |

- 1 Indicate the dimension concerned (e.g. diameter).
- 2 Indicate "tolerance" or "class of tolerance".
- 3 Indicate the dimensional range or "All".
- 4 Indicate the tolerance class in accordance with EN 20286-2 or tolerance according to ISO 406.

#### EXAMPLE 1:

| Dimensions in millimetres |                 |
|---------------------------|-----------------|
| Diameter                  | Tolerance class |
| $5 \leq D \leq 150$       | h 11            |

#### EXAMPLE 2:

| Dimensions in millimetres |           |
|---------------------------|-----------|
| Width                     | Tolerance |
| All                       | + 10<br>0 |

### 4.2 Case of several tolerances for a dimensional range

These shall be indicated as follows:

| Dimensions in millimetres                                     |                                                               |
|---------------------------------------------------------------|---------------------------------------------------------------|
| <span style="border: 1px solid black; padding: 2px;">1</span> | <span style="border: 1px solid black; padding: 2px;">2</span> |
| <span style="border: 1px solid black; padding: 2px;">3</span> | <span style="border: 1px solid black; padding: 2px;">4</span> |
| <span style="border: 1px solid black; padding: 2px;">3</span> | <span style="border: 1px solid black; padding: 2px;">4</span> |
| <span style="border: 1px solid black; padding: 2px;">3</span> | <span style="border: 1px solid black; padding: 2px;">4</span> |

- 1 Indicate the dimension concerned (e.g. diameter).
- 2 Indicate "tolerances" or "tolerance classes".
- 3 Indicate the part of the dimensional range.
- 4 Indicate the tolerance class in accordance with EN 20286-2 or tolerance according to ISO 406.

**EXAMPLE 1:**

Dimensions in millimetres

| Diameter           | Tolerance classes |
|--------------------|-------------------|
| $3 \leq D \leq 65$ | h 11              |
| $65 < D \leq 80$   | h 12              |

**EXAMPLE 2:**

Dimensions in millimetres

| Thickness              | Tolerances |
|------------------------|------------|
| $0,25 \leq a \leq 0,4$ | $\pm 0,03$ |
| $0,4 < a \leq 0,6$     | $\pm 0,04$ |
| $0,6 < a \leq 1,2$     | $\pm 0,05$ |

**4.3 Case of several tolerances for a dimensional range associated with one or more dimensional ranges**

These shall be indicated as follows:

Dimensions in millimetres

| 1 | Tolerances for 2: |   |   |
|---|-------------------|---|---|
|   | 3                 | 3 | 3 |
| 4 | 5                 | 5 | 5 |
| 4 | 5                 | 5 | 5 |
| 4 | 5                 | 5 | 5 |

- 1 Indicate the dimension concerned.
- 2 Indicate the associated dimension(s).
- 3 Indicate for each associated dimension:
- either the dimensional range or part of it;
  - or "All", repeating the associated dimension, if necessary.
- 4 Indicate the part of the dimensional range or "All".
- 5 Indicate the tolerance in accordance with ISO 406.

**EXAMPLE 1:**

Dimensions in millimetres

| Thickness             | Tolerances for width:<br>$b \leq 1\,000$ |
|-----------------------|------------------------------------------|
| $0,3 \leq a \leq 0,4$ | $\pm 0,03$                               |
| $0,4 < a \leq 0,6$    | $\pm 0,04$                               |
| $0,6 < a \leq 1,2$    | $\pm 0,05$                               |

**EXAMPLE 2:**

Dimensions in millimetres

| Thickness         | Tolerances for width: |                          |                          |
|-------------------|-----------------------|--------------------------|--------------------------|
|                   | $b \leq 1\,250$       | $1\,250 < b \leq 1\,600$ | $1\,600 < b \leq 2\,000$ |
| $6 \leq a \leq 8$ | $\pm 0,30$            | $\pm 0,35$               | $\pm 0,40$               |
| $8 < a \leq 10$   | $\pm 0,35$            | $\pm 0,35$               | $\pm 0,40$               |
| $10 < a \leq 12$  | $\pm 0,40$            | $\pm 0,45$               | $\pm 0,50$               |

**EXAMPLE 3:**

Dimensions in millimetres

| Thickness         | Tolerances for length and width:        |                                            |                                            |
|-------------------|-----------------------------------------|--------------------------------------------|--------------------------------------------|
|                   | all lengths<br>$600 \leq b \leq 1\,250$ | all lengths<br>$1\,250 \leq b \leq 1\,600$ | all lengths<br>$1\,600 \leq b \leq 2\,000$ |
| $6 \leq a \leq 8$ | $\pm 0,30$                              | $\pm 0,35$                                 | $\pm 0,40$                                 |
| $8 < a \leq 12$   | $\pm 0,40$                              | $\pm 0,45$                                 | $\pm 0,50$                                 |

**EXAMPLE 4:**

Dimensions in millimetres

| Length                      | Tolerances for thickness:<br>All |
|-----------------------------|----------------------------------|
| $\ell \leq 2\,000$          | $+8$<br>$0$                      |
| $2\,000 < \ell \leq 5\,000$ | $+10$<br>$0$                     |
| $\ell > 5\,000$             | $+0,002 \times \ell$<br>$0$      |

**4.4 Case of tolerances not specified**

This shall be indicated as in the following sentence: "To be agreed between manufacturer and purchaser".

**5 Arrangement**

The general arrangement of metallic semi-finished dimensional standards is as follows:

- 0 Introduction
- 1 Scope
- 2 Normative references
- 3 Form
- 4 Recommended dimensions and mass
- 5 Tolerances
  - 5.1 Dimensional tolerances
  - 5.2 Geometric tolerances

The rules for the drafting and presentation of standards specific to the commonest form of semi-finished metallic products are given in the following clauses of this standard:

- 6 Rules common to all forms of metallic semi-finished products
- 7 Rules applicable to sheet and plate
- 8 Rules applicable to strip
- 9 Rules applicable to round bar
- 10 Rules applicable to hexagonal bar
- 11 Rules applicable to square bar
- 12 Rules applicable to rectangular bar
- 13 Rules applicable to circular tube

They define the minimum information to be shown in the relevant dimensional standard. Additional information may be given, if necessary.

NOTE: For semi-finished products not covered by this standard, it is recommended that the arrangement and the rules relevant to the form of the nearest semi-finished product be followed. For example, for wires, the arrangement and rules applicable to round bars should be adapted.

## 6 Rules common to all forms of metallic semi-finished products

### 6.1 Title

The title shall be written in the following order:

- "Aerospace series";
- form of semi-finished metallic product and, if necessary, manufacturing process;
- material family;
- tolerance(s) or tolerance class, if necessary;
- main dimension(s) and relevant limit(s) if appropriate;
- "Dimensions"

and presented as following examples:

#### EXAMPLE 1:

**Aerospace series**  
Sheet, hot rolled  
in titanium and titanium alloys  
Thickness  $0,8 \text{ mm} \leq a \leq 6 \text{ mm}$   
Dimensions

#### EXAMPLE 2:

**Aerospace series**  
Capillary tube, seamless  
in heat resisting alloys  
Diameter  $0,6 \text{ mm} \leq D \leq 2 \text{ mm}$   
Dimensions

#### EXAMPLE 3:

**Aerospace series**  
Round bar, drawn  
in steel  
Tolerance class h 9  
Diameter  $1 \text{ mm} \leq D \leq 150 \text{ mm}$   
Dimensions

## 6.2 Clauses 0, 1 and 2

### 0 Introduction

This standard is part of the series of EN metallic material standards for aerospace applications. The general organization of this series is described in EN 4258.

### 1 Scope

This standard specifies the dimensions and tolerances of:

[1]

for aerospace applications.

### 2 Normative references

This European Standard incorporates by dated or undated reference provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 3848 Aerospace series - Semi-finished metallic products - Method of measuring form deviations [2]

EN 4258 Aerospace series - Metallic materials - General organization of standardization - Links between types of EN standards and their use

[3]

- [1] Repeat all information given in the title, except the first and last lines presented in the same format. If necessary, further information may be added to clarify the scope.
- [2] If referred to in the text.
- [3] Other standards referred to in the text, if any.

## 7 Rules applicable to sheet and plate

### 3 Form

See figure 1.

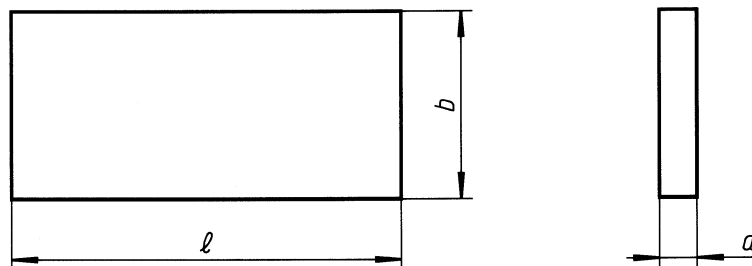


Figure 1

### 4 Recommended dimensions and mass

See table 1.

Table 1

| Nominal<br>$a$<br>mm                                                                                                                          | <span style="border: 1px solid black; padding: 0 5px;">1</span> | Mass per unit area <sup>a</sup><br>kg/m <sup>2</sup> |
|-----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|------------------------------------------------------|
| ...                                                                                                                                           | ...                                                             | ...                                                  |
| ...                                                                                                                                           | ...                                                             | ...                                                  |
| ...                                                                                                                                           | ...                                                             | ...                                                  |
| <sup>a</sup> For information, calculated with a density of <span style="border: 1px solid black; padding: 0 5px;">2</span> kg/dm <sup>3</sup> |                                                                 |                                                      |

1 If necessary, one or more columns may be introduced to indicate one or more of the following:

a) Typical format

$b \times \ell$   
mm × mm

b) Typical width

$b$   
mm

c) Maximum width

$b$   
mm

d) Typical length

$\ell$   
mm

e) Maximum length

$\ell$   
mm

2 The values to be used are:

- aluminium and aluminium alloys: 2,8 (except for aluminium-lithium alloys)
- steels: 7,85
- titanium and titanium alloys: 4,5
- heat resisting alloys: 8,1