

Specification for

Dimensional tolerances for metal and metal alloy castings

ICS 17.040.10

NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW



Document Sharing Hub

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee MTE/24, Limits and fits, upon which the following bodies were represented:

- British Cast Iron Research Association
- British Engineers Cutting Tools Association
- British Foundry Association
- Railway Industry Association
- Society of British Aerospace Companies Limited
- Zinc Development Association
- Coopted members

This British Standard, having been prepared under the direction of the Engineering Sector Board, was published under the authority of the Standards Board and comes into effect on 15 September 1996

© BSI 10-1998

First published June 1985
Second edition September 1996

The following BSI references relate to the work on this standard:
Committee reference MTE/24
Draft for comment 91/80906 DC

ISBN 0 580 26044 5

Amendments issued since publication

Amd. No.	Date	Comments

Contents

	Page
Committees responsible	Inside front cover
National foreword	ii
Introduction	1
1 Scope	1
2 Normative references	1
3 Definitions	1
4 Dimensioning	2
5 Tolerance grades	2
6 Mismatch	2
7 Wall thickness	2
8 Tapered features	2
9 Position of tolerance zone	3
10 Required machining allowances, RMA	3
11 Indication on drawings	7
Annex A (informative) Casting tolerances	10
Annex B (informative) Required machining allowance grades (RMA)	11
Annex C (informative) Bibliography	12
Figure 1 — Drawing indications	2
Figure 2 — Tolerance limits	2
Figure 3 — Maximum mismatch	3
Figure 4 — Tolerance zone on tapered features	4
Figure 5 — External machining of boss	5
Figure 6 — Internal machining	5
Figure 7 — Machining of step dimension	6
Figure 8 — Machining on one side of feature	6
Figure 9 — Largest overall dimension of the casting after final machining	6
Figure 10 — Indication of required machining allowance on individual surfaces	7
Table 1 — Casting tolerances	8
Table 2 — Required machining allowances (RMA)	9
Table A.1 — Tolerance grades for long-series production raw castings	10
Table A.2 — Tolerance grades for short-series or single-production raw castings	11
Table B.1 — Typical required machining allowance grades for raw castings	11
List of references	Inside back cover

National foreword

This British Standard has been prepared by Technical Committee MTE/24 and is identical with ISO 8062:1994 *Castings — System of dimensional tolerances and machining allowances*, prepared by the International Organization for Standardization (ISO). It supersedes BS 6615:1985 which is withdrawn.

Cross-references

Publication referred to	Corresponding British Standard
ISO 286-1:1988	BS EN 20286-1:1993 <i>ISO system of limits and fits. Bases of tolerances, deviations, and fits</i>

The Technical Committee has reviewed the provisions of ISO 1302:1992 to which normative reference is made in the text, and has decided that they are acceptable for use in conjunction with this standard.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 12, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Introduction

This International Standard relates to a system of tolerance grades and machining allowance grades for cast metals and their alloys.

The tolerance specified for a casting may determine the casting method. It is therefore recommended, before the design or the order is finalized, that the customer liaise with the foundry to discuss

- a) the proposed casting design and accuracy required;
- b) machining requirements;
- c) method of casting;
- d) the number of castings to be manufactured;
- e) the casting equipment involved;
- f) any special requirements, for instance, datum target systems, individual dimensional tolerances, geometrical tolerances, fillet radii tolerances and individual machining allowances;
- g) whether any other standard is more appropriate for the casting.

NOTE 1 Further investigation on metallic permanent moulds (gravity- and low-pressure), pressure die castings and investment castings should be carried out.

Because the dimensional accuracy of a casting is related to production factors, tolerance grades which can be achieved for various methods and metals are described in annex A for

- a) long series and mass production, where development, adjustment and maintenance of casting equipment make it possible to achieve close tolerances;
- b) short series and single production.

Information on typical required machining allowance grades is given in annex B.

1 Scope

This International Standard specifies a system of tolerance grades and required machining allowance grades for the dimensions of castings. It is applicable to the dimensions of cast metals and their alloys produced by various casting manufacturing processes [but see also Introduction g) and clause 5]. This International Standard applies both to general tolerances and/or required machining allowances given on a drawing and to individual tolerances and/or required machining allowances which are shown immediately following a specific dimension (see clause 11).

The system specified applies when the foundry provides the pattern or die equipment or accepts responsibility for proving it.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 286-1:1988, *ISO system of limits and fits — Part 1: Bases of tolerances, deviations and fits*.

ISO 1302:1992, *Technical drawings — Method of indicating surface texture*.

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1 basic dimension

dimension of a raw casting before machining (see Figure 1), the necessary machining allowance being included (see Figure 2)

3.2 dimensional tolerance

[see ISO 286-1]

3.3 required machining allowance, RMA

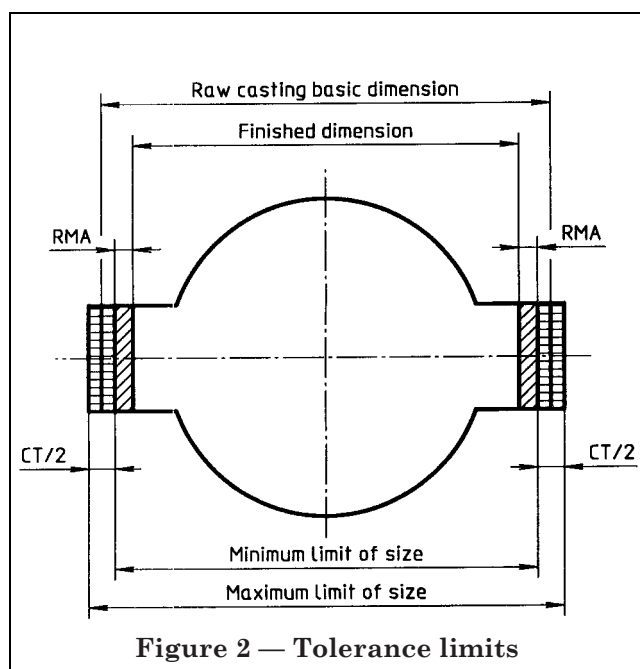
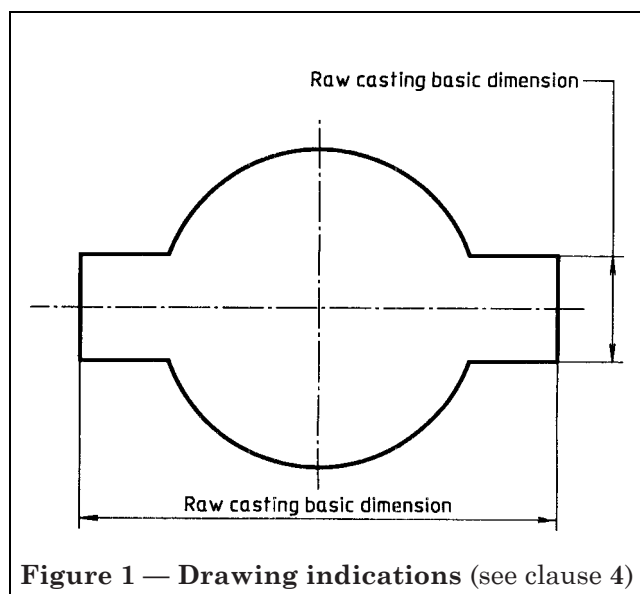
on raw castings, a material allowance to permit the removal of the effects of casting on the surface by subsequent machining and to allow the achievement of the desired surface texture and the necessary accuracy of dimension with cylindrical features or machining on both sides, the RMA is taken into account twice (see Figure 5 and Figure 6)

3.4 mismatch

relative displacement of surfaces of a casting owing to inaccuracies in the constituent parts of multipart moulds (see Figure 3)

3.5 draft angle (taper)

additional slope of shaping elements (e.g. on enveloping surfaces) necessary to facilitate the removal of a casting from a mould or die, or a pattern from a mould, or the parts of a permanent mould from each other



4 Dimensioning

With the exception of dimensioning of wall thickness (where a chain of two dimensions may exist), chain dimensioning shall be avoided.

5 Tolerance grades

There are 16 casting tolerance grades, designated CT1 to CT16 (see Table 1).

Dimensions for which general tolerances are not suitable shall be allocated individual tolerances.

While work is proceeding to obtain definite tolerance information for metallic permanent mould castings (gravity- and low-pressure), pressure die castings and investment castings, other more appropriate tolerance standards, e.g. national standards, may be employed for these particular processes.

6 Mismatch

Unless otherwise specified, mismatch shall lie within the tolerance shown in Table 1 (see Figure 3). When it is important to restrict further the value of mismatch, the maximum value shall be stated on the drawing (see 11.1).

7 Wall thickness

Unless otherwise specified, the tolerance for wall thickness in grades CT1 to CT15 shall be one grade coarser than the general tolerance for other dimensions; for example, if there is a general tolerance on a drawing of CT10, the tolerance on wall thicknesses shall be CT11.

8 Tapered features

Where a design requires a tapered feature (e.g. feature with a draft angle), the tolerance shall be applied symmetrically along the surface (see Figure 4).

The drawing shall specify generally whether the taper shall be added to, subtracted from or averaged to the material, e.g.

taper +, Figure 4 a)

taper −, Figure 4 b)

taper ±, Figure 4 c)

Tapers for particular surfaces arranged differently from the general arrangement of taper of the drawing shall be indicated individually at the surface, e.g.

+ ∇ .

For dimensions to be machined, “taper +” shall be applied, irrespective of the general drawing specification for taper, in order that the finished dimensions can be achievable.