BRITISH STANDARD

BS ISO 8015:1985

Technical drawings — Fundamental tolerancing principle

ICS 01.100.01

British Standards

National foreword

This British Standard reproduces verbatim ISO 8015:1985 and implements it as the UK national standard.

The UK participation in its preparation was entrusted by Technical Committee TDW/4, Engineering drawing, metrology, precision measurement and all related documentation, to Subcommittee TDW/4/-/1, General drawing principles, conventions and related documents, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible international/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.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

Cross-references

The British Standards which implement international publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled "International Standards Correspondence Index", or by using the "Find" facility of the BSI Standards Electronic Catalogue.

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.

This British Standard, having been prepared under the direction of the Consumer Products and Services Sector Committee, was published under the authority of the Standards Committee and comes into effect on
15 September 2001

Summary of pages

This document comprises a front cover, an inside front cover, the ISO title page, page ii, pages 1 to 6, an inside back cover and a back cover.

The BSI copyright date displayed in this document indicates when the document was last issued.

Amendments issued since publication

Amd. No.	Date	Comments

ISBN 0 580 38246 X

International Standard 8015

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Technical drawings — Fundamental tolerancing principle

Dessins techniques — Principe de tolérancement de base

First edition — 1985-12-15

UDC 744.4 : 621.753.1 **Ref. No. ISO 8015-1985 (E)**

Descriptors: drawings, technical drawings, dimensional tolerances, angular tolerances, form tolerances, tolerances of position.

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.

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 8015 was prepared by Technical Committee ISO/TC 10, *Technical drawings*.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

1 Scope

This International Standard specifies the principle of the relationship between dimensional (linear and angular) tolerances and geometrical tolerances.

2 Field of application

The specified principle shall be applied on technical drawings and related technical documents to

— linear dimensions and their tolerances;

— angular dimensions and their tolerances;

— geometrical tolerances;

which define the following four aspects for each feature of the part:

— size;

— form;

— orientation;

— location.

3 References

ISO 286/1, *ISO system of limits and fits — Part 1: Bases of tolerances, deviations and fits.*[1)]

ISO 1101, *Technical drawings — Geometrical tolerancing — Tolerancing of form, orientation, location and run-out — Generalities, definitions, symbols, indications on drawings.*

ISO 2692, *Technical drawings — Geometrical tolerancing — Maximum material principle.*[2)]

4 Principle of independency

Each specified dimensional or geometrical requirement on a drawing shall be met independently, unless a particular relationship is specified.

Therefore, where no relationship is specified, the geometrical tolerance applies regardless of feature size, and the two requirements are treated as being unrelated.

Consequently, if a particular relationship of

— size and form, or

— size and orientation, or

— size and location

is required, it shall be specified on the drawing (see clause **6**).

5 Tolerances

5.1 Dimensional tolerances

5.1.1 *Linear tolerances*

A linear tolerance controls only the actual local sizes (two-point measurements) of a feature, but not its form deviations (for example circularity and straightness deviations of a cylindrical feature or flatness deviations of two parallel plane surfaces). (See ISO 286/1.)

Form deviations shall, however, be controlled by the following:

— individually indicated form tolerances;

— general geometrical tolerances;

— envelope requirement.

[1)] At present at the stage of draft. (Revision of ISO/R 286-1962.)

[2)] At present at the stage of draft. (Revision of ISO 1101/2-1974.)

NOTE For the purposes of this International Standard, a single feature consists of a cylindrical surface or two parallel plane surfaces.

There is no control of the geometrical interrelationship of individual features by the linear tolerances. For example, the perpendicularity of the sides of a cube is not controlled and, therefore, it requires a perpendicularity tolerance dictated by the design requirement.

5.1.2 *Angular tolerances*

An angular tolerance, specified in angular units, controls only the general orientation of lines or line elements of surfaces, but not their form deviations (see Figure 1).

The general orientation of the line derived from the actual surface is the orientation of the contacting line of ideal geometrical form (see Figure 1). The maximum distance between the contacting line and the actual line shall be the least possible value.

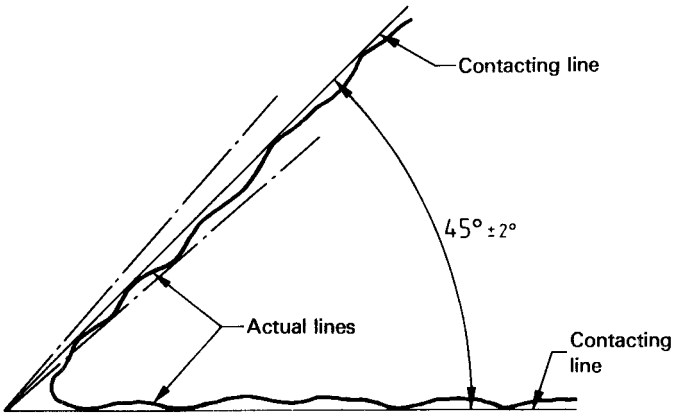


Figure 1

Form deviations shall, however, be controlled by the following:

— individually indicated form tolerances;

— general geometrical tolerances.

5.2 Geometrical tolerances

Geometrical tolerances control the deviation of the feature from its theoretically exact

— form, or

— orientation, or

— location

regardless of the feature size.

The geometrical tolerances will, therefore, apply independently of the actual local sizes of individual features (see clause **4**). The geometrical deviations may be at a maximum whether or not the cross-sections of the respective features are at maximum material size.

For instance, a shaft with maximum material size at any cross-section may have a lobed form deviation within the circularity tolerance, and may also be bent by the amount of the straightness tolerance [see Figure 2a) and Figure 2b)].

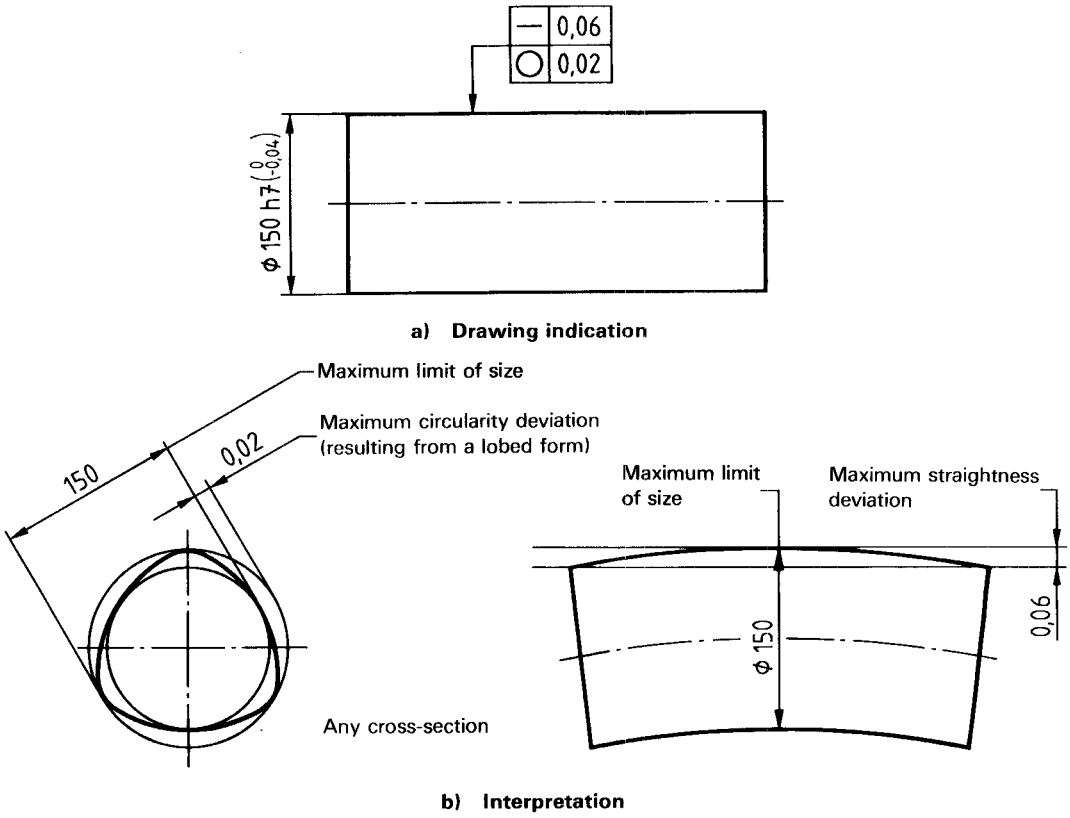


Figure 2

6 Mutual dependency of size and geometry

Mutual dependency of size and geometry may be called for by

— the envelope requirement (see **6.1**);

— the maximum material principle (see **6.2**).

6.1 Envelope requirement

For a single feature, either a cylindrical surface or a feature established by two parallel plane surfaces (feature of size), the envelope requirement may be applied. The requirement means that the envelope of perfect form at maximum material size of the feature shall not be violated.

The envelope requirement may be indicated either

— by the symbol Ⓔ placed after the linear tolerance [see Figure 3a)], or

— by reference to an appropriate standard which invokes the envelope requirement.

Example: Envelope requirement applied to a cylindrical feature

a) Drawing indication

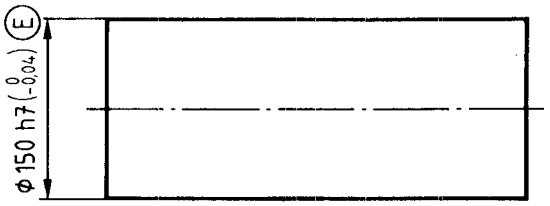


Figure 3a)

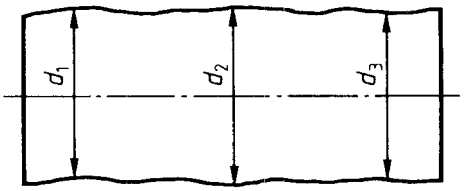
b) Functional requirements:

— The surface of the cylindrical feature shall not extend beyond the envelope of perfect form at maximum material size of ϕ 150.

— No actual local size shall be less than ϕ 149,96.

This means that the actual part shall meet the following requirements:

— each actual local diameter of the shaft shall remain within the size tolerance of 0,04 and, therefore, may vary between ϕ 150 and ϕ 149,96 [see Figure 3b)];



d_1, d_2, d_3: actual local diameters

Figure 3b)

— the entire shaft shall remain within the boundary of the envelope cylinder of perfect form and of ϕ 150 [see Figure 3c) and Figure 3d)].

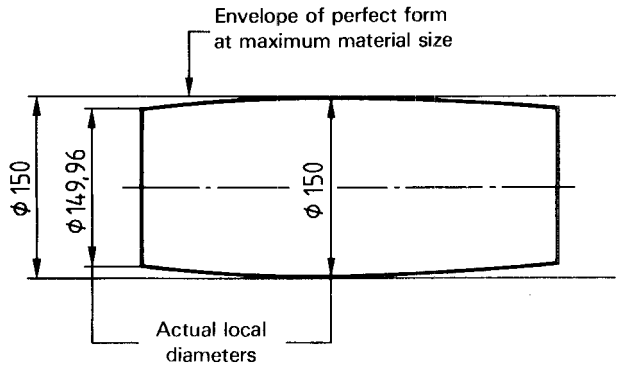


Figure 3c)

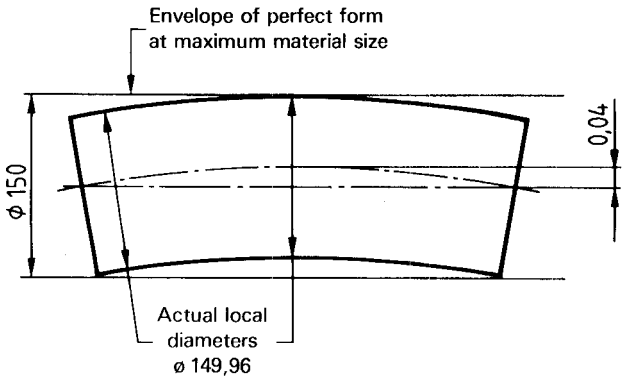


Figure 3d)

Hence it follows that the shaft shall be exactly cylindrical when all actual local diameters are at the maximum material size of ϕ 150 [see Figure 3e)].

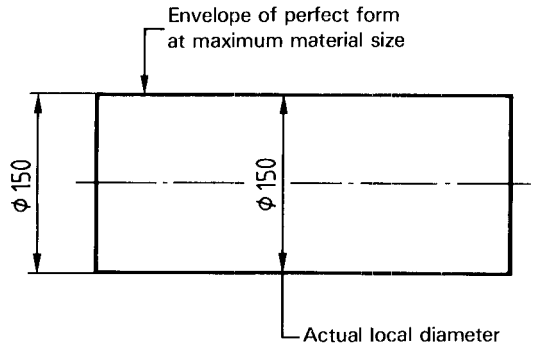


Figure 3e)

6.2 Maximum material principle

If for functional and economic reasons there is a requirement for the mutual dependency of the size and orientation or location of the feature(s), then the maximum material principle Ⓜ may be applied (see ISO 2692).

7 Application on drawings

7.1 Completeness of drawings

The drawing should specify dimensional and geometrical tolerances necessary to check the part completely for its function.

7.2 Designation

Drawings to which the principle of independency applies shall be identified by being marked in or close to the drawing title block as follows:

Tolerancing ISO 8015

This indication shall be supplemented by a reference to the appropriate standard for general geometrical tolerances or to other related documents.

Some national standards (which should be referred to on the drawing) lay down that the envelope requirement for single features is the norm and is, therefore, not separately specified on the drawing.

blank

BSI — British Standards Institution

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

Revisions

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using this British Standard would inform the Secretary of the technical committee responsible, the identity of which can be found on the inside front cover. Tel: +44 (0)20 8996 9000. Fax: +44 (0)20 8996 7400.

BSI offers members an individual updating service called PLUS which ensures that subscribers automatically receive the latest editions of standards.

Buying standards

Orders for all BSI, international and foreign standards publications should be addressed to Customer Services. Tel: +44 (0)20 8996 9001. Fax: +44 (0)20 8996 7001. Email: orders@bsi-global.com. Standards are also available from the BSI website at http://www.bsi-global.com.

In response to orders for international standards, it is BSI policy to supply the BSI implementation of those that have been published as British Standards, unless otherwise requested.

Information on standards

BSI provides a wide range of information on national, European and international standards through its Library and its Technical Help to Exporters Service. Various BSI electronic information services are also available which give details on all its products and services. Contact the Information Centre. Tel: +44 (0)20 8996 7111. Fax: +44 (0)20 8996 7048. Email: info@bsi-global.com.

Subscribing members of BSI are kept up to date with standards developments and receive substantial discounts on the purchase price of standards. For details of these and other benefits contact Membership Administration. Tel: +44 (0)20 8996 7002. Fax: +44 (0)20 8996 7001. Email: membership@bsi-global.com.

Information regarding online access to British Standards via British Standards Online can be found at http://www.bsi-global.com/bsonline.

Further information about BSI is available on the BSI website at http://www.bsi-global.com.

Copyright

BSI
389 Chiswick High Road
London
W4 4AL