



NSAI
Standards

Irish Standard
I.S. EN ISO 1101:2017

Geometrical product specifications (GPS) -
Geometrical tolerancing - Tolerances of form,
orientation, location and run-out (ISO
1101:2017)

I.S. EN ISO 1101:2017

Incorporating amendments/corrigenda/National Annexes issued since publication:

The National Standards Authority of Ireland (NSAI) produces the following categories of formal documents:

I.S. xxx: Irish Standard — national specification based on the consensus of an expert panel and subject to public consultation.

S.R. xxx: Standard Recommendation — recommendation based on the consensus of an expert panel and subject to public consultation.

SWiFT xxx: A rapidly developed recommendatory document based on the consensus of the participants of an NSAI workshop.

This document replaces/revises/consolidates the NSAI adoption of the document(s) indicated on the CEN/CENELEC cover/Foreword and the following National document(s):

NOTE: The date of any NSAI previous adoption may not match the date of its original CEN/CENELEC document.

This document is based on:

EN ISO 1101:2017

Published:

2017-02-15

This document was published under the authority of the NSAI and comes into effect on:

2017-03-06

ICS number:

17.040.40

NOTE: If blank see CEN/CENELEC cover page

NSAI
1 Swift Square,
Northwood, Santry
Dublin 9

T +353 1 807 3800
F +353 1 807 3838
E standards@nsai.ie
W NSAI.ie

Sales:
T +353 1 857 6730
F +353 1 857 6729
W standards.ie

Údarás um Chaighdeáin Náisiúnta na hÉireann

National Foreword

I.S. EN ISO 1101:2017 is the adopted Irish version of the European Document EN ISO 1101:2017, Geometrical product specifications (GPS) - Geometrical tolerancing - Tolerances of form, orientation, location and run-out (ISO 1101:2017)

This document does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with this document does not of itself confer immunity from legal obligations.

In line with international standards practice the decimal point is shown as a comma (,) throughout this document.

This page is intentionally left blank

EUROPEAN STANDARD

EN ISO 1101

NORME EUROPÉENNE

EUROPÄISCHE NORM

February 2017

ICS 17.040.40

Supersedes EN ISO 1101:2013

English Version

Geometrical product specifications (GPS) - Geometrical tolerancing - Tolerances of form, orientation, location and run-out (ISO 1101:2017)

Spécification géométrique des produits (GPS) - Tolérancement géométrique - Tolérancement de forme, orientation, position et battement (ISO 1101:2017)

Geometrische Produktspezifikation (GPS) - Geometrische Tolerierung - Tolerierung von Form, Richtung, Ort und Lauf (ISO 1101:2017)

This European Standard was approved by CEN on 14 December 2016.

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 CEN-CENELEC 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 CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

EN ISO 1101:2017 (E)

Contents	Page
European foreword.....	3

European foreword

This document (EN ISO 1101-1:2017) has been prepared by Technical Committee ISO/TC 213 “Dimensional and geometrical product specifications and verification” in collaboration with Technical Committee CEN/TC 290 “Dimensional and geometrical product specification and verification” 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 August 2017 and conflicting national standards shall be withdrawn at the latest by August 2017.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN ISO 1101:2013.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Endorsement notice

The text of ISO 1101:2017 has been approved by CEN as EN ISO 1101:2017 without any modification.

This page is intentionally left blank

**INTERNATIONAL
STANDARD**

**ISO
1101**

Fourth edition
2017-02

**Geometrical product specifications
(GPS) — Geometrical tolerancing
— Tolerances of form, orientation,
location and run-out**

*Spécification géométrique des produits (GPS) — Tolérancement
géométrique — Tolérancement de forme, orientation, position et
battement*



Reference number
ISO 1101:2017(E)

© ISO 2017

ISO 1101:2017(E)



COPYRIGHT PROTECTED DOCUMENT

© ISO 2017, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

	Page
Foreword	vi
Introduction	vii
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
4 Basic concepts	4
5 Symbols	6
6 Toleranced features	9
7 Tolerance zones	12
7.1 Tolerance zone defaults.....	12
7.2 Tolerance zones of variable width.....	13
7.3 Orientation of tolerance zones for derived features.....	13
7.4 Cylindrical and spherical tolerance zones.....	13
8 Geometrical specification indication	14
8.1 General.....	14
8.2 Tolerance indicator.....	14
8.2.1 Symbol section.....	14
8.2.2 Zone, feature and characteristic section.....	14
8.2.3 Datum section.....	35
8.3 Plane and feature indicators.....	35
8.4 Indications adjacent to the tolerance indicator.....	36
8.4.1 General.....	36
8.4.2 Toleranced feature identifiers.....	36
8.4.3 Patterns.....	38
8.4.4 Adjacent indication sequence.....	38
8.5 Stacked tolerance indications.....	38
8.6 Indication of drawing defaults.....	38
9 Supplementary indications	39
9.1 Indications of a compound or restricted toleranced feature.....	39
9.1.1 General.....	39
9.1.2 All around and all over — Continuous, closed tolerance feature.....	39
9.1.3 Restricted area toleranced feature.....	42
9.1.4 Continuous, non-closed toleranced feature.....	44
9.2 Moveable assemblies.....	45
10 Theoretically exact dimensions (TED)	46
11 Restrictive specifications	46
12 Projected toleranced feature	48
13 Intersection planes	52
13.1 Role of intersection planes.....	52
13.2 Features to be used for establishing a family of intersection planes.....	52
13.3 Graphical language.....	52
13.4 Rules.....	52
14 Orientation planes	55
14.1 Role of orientation planes.....	55
14.2 Features to be used for establishing orientation planes.....	55
14.3 Graphical language.....	55
14.4 Rules.....	55
15 Direction feature	57

ISO 1101:2017(E)

15.1	Role of direction features.....	57
15.2	Features to be used for establishing direction features.....	59
15.3	Graphical language.....	59
15.4	Rules.....	59
16	Collection plane.....	60
16.1	Role of collection planes.....	60
16.2	Features to be used for establishing collection planes.....	61
16.3	Graphical language.....	61
16.4	Rules.....	61
17	Definitions of geometrical specifications.....	61
17.1	General.....	61
17.2	Straightness specification.....	61
17.3	Flatness specification.....	64
17.4	Roundness specification.....	64
17.5	Cylindricity specification.....	66
17.6	Line profile specification not related to a datum.....	67
17.7	Line profile specification related to a datum system.....	68
17.8	Surface profile specification not related to a datum.....	70
17.9	Surface profile specification related to a datum.....	70
17.10	Parallelism specification.....	71
17.10.1	General.....	71
17.10.2	Parallelism specification of a median line related to a datum system.....	72
17.10.3	Parallelism specification of a median line related to a datum straight line.....	75
17.10.4	Parallelism specification of a median line related to a datum plane.....	76
17.10.5	Parallelism specification of a set of lines in a surface related to a datum plane.....	77
17.10.6	Parallelism specification of a planar surface related to a datum straight line.....	77
17.10.7	Parallelism specification of a planar surface related to a datum plane.....	78
17.11	Perpendicularity specification.....	79
17.11.1	General.....	79
17.11.2	Perpendicularity specification of a median line related to a datum straight line.....	79
17.11.3	Perpendicularity specification of a median line related to a datum system.....	80
17.11.4	Perpendicularity specification of a median line related to a datum plane.....	82
17.11.5	Perpendicularity specification of a planar surface related to a datum straight line.....	83
17.11.6	Perpendicularity specification of a planar surface related to a datum plane.....	83
17.12	Angularity specification.....	84
17.12.1	General.....	84
17.12.2	Angularity specification of a median line related to a datum straight line.....	84
17.12.3	Angularity specification for a median line related to a datum system.....	86
17.12.4	Angularity specification for a planar surface related to a datum straight line.....	87
17.12.5	Angularity specification for a planar surface related to a datum plane.....	88
17.13	Position specification.....	89
17.13.1	General.....	89
17.13.2	Position specification of a derived point.....	89
17.13.3	Position specification of a median line.....	90
17.13.4	Position specification of a median plane.....	94
17.13.5	Position specification of a planar surface.....	96
17.14	Concentricity and coaxiality specification.....	97
17.14.1	General.....	97
17.14.2	Concentricity specification of a point.....	97
17.14.3	Coaxiality specification of an axis.....	98
17.15	Symmetry specification.....	100
17.15.1	General.....	100
17.15.2	Symmetry specification of a median plane.....	100
17.16	Circular run-out specification.....	101
17.16.1	General.....	101
17.16.2	Circular run-out specification — Radial.....	101

17.16.3	Circular run-out specification — Axial	103
17.16.4	Circular runout in any direction	104
17.16.5	Circular run-out specification in a specified direction	106
17.17	Total run-out specification	107
17.17.1	General	107
17.17.2	Total run-out specification — Radial	107
17.17.3	Total run-out specification – Axial	108
Annex A	(informative) Deprecated and former practices	110
Annex B	(informative) Explicit and implicit rules for geometrical tolerance zones	119
Annex C	(informative) Filters	125
Annex D	(normative) ISO special specification elements for form	128
Annex E	(informative) Filter details	129
Annex F	(normative) Relations and dimensions of graphical symbols	142
Annex G	(informative) Relation to the GPS matrix model	144
Bibliography		145

ISO 1101:2017(E)

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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 213, *Dimensional and geometrical product specifications and verifications*.

This fourth edition cancels and replaces the third edition (ISO 1101:2012), which has been technically revised.

It also incorporates the Technical Corrigendum ISO 1101:2012/Cor.1:2013.

The main changes are as follows.

- Tools have been added to specify the filtering of the toleranced feature and a line type has been designated for its illustration.
- Tools have been added to tolerance associated features.
- Tools have been added to specify form characteristics by specifying the reference feature association and the specified parameter.
- Tools have been added to specify the constraints to the tolerance zone.
- The rules for specifications using “all around” or “all over” modifiers have been clarified.
- The direction of the tolerance zone in the case of roundness tolerances for revolute surfaces that are neither cylindrical nor spherical, e.g. cones shall now always be indicated to avoid an exception to the general rule that specifications for integral features apply perpendicular to the surface.
- The “from-to” symbol has been retired and replaced by the “between” symbol.

Introduction

This document is a geometrical product specification (GPS) standard and is to be regarded as a general GPS standard (see ISO 14638). It influences chain links A, B and C of the chain of standards on form, orientation, location and run out.

The ISO GPS Masterplan given in ISO 14638 gives an overview of the ISO GPS system of which this document is a part. The fundamental rules of ISO GPS given in ISO 8015 apply to this document. The default decision rules given in ISO 14253-1 apply to specifications made in accordance with this document, unless otherwise stated.

For more detailed information on the relation of this document to the GPS matrix model, see [Annex G](#).

This document represents the initial basis and describes the required fundamentals for geometrical tolerancing. Nevertheless, it is advisable to consult the separate standards referenced in [Clause 2](#) and in [Tables 3](#) and [4](#) for more detailed information.

For the presentation of lettering (proportions and dimensions), see ISO 3098-2.

All figures in this document for the 2D drawing indications have been drawn in first-angle projection with dimensions and tolerances in millimetres. It should be understood that third-angle projection and other units of measurement could have been used equally well without prejudice to the principles established. For all figures giving specification examples in 3D, the dimensions and tolerances are the same as for the similar figures shown in 2D.

The figures in this document represent either 2D drawing views or 3D axonometric views on 2D drawings and are intended to illustrate how a specification can be fully indicated with visible annotation. For possibilities of illustrating a specification where elements of the specification may be available through a query function or other interrogation of information on the 3D CAD model and rules for attaching specifications to 3D CAD models, see ISO 16792.

The figures in this document illustrate the text and are not intended to reflect an actual application. Consequently, the figures are not fully dimensioned and specified, showing only the relevant general principles. Neither are the figures intended to imply a particular display requirement in terms of whether hidden detail, tangent lines or other annotations are shown or not shown. Many figures have lines or details removed for clarity, or added or extended to assist with the illustration of the text. See [Table 1](#) for the line types used in definition figures.

In order for a GPS specification to be unambiguous, the partition defining the boundary of the toleranced feature, as well as the filtering, has to be well defined. Currently, the detailed rules for partitioning and the default for filtering are not defined in GPS standards.

For a definitive presentation (proportions and dimensions) of the symbolization for geometrical tolerancing, see ISO 7083 and [Annex F](#).

[Annex A](#) has been provided for information only. It presents previous drawing indications that have been omitted here and are no longer used.

For the purposes of this document, the terms “axis” and “median plane” are used for derived features of perfect form, and the terms “median line” and “median surface” for derived features of imperfect form. Furthermore, the following line types have been used in the explanatory illustrations, i.e. those representing non-technical drawings for which the rules of ISO 128 (all parts) apply.

ISO 1101:2017(E)

Table 1

Feature level	Feature type	Details	Line type	
			Visible	Behind plane/surface
Nominal feature	integral feature	point line/axis surface/plane	wide continuous	narrow dashed
	derived feature	point line/axis surface/plane	narrow long dashed dotted	narrow dashed dotted
Real feature	integral feature	surface	wide freehand con- tinuous	narrow freehand dashed
Extracted feature	integral feature	point line surface	wide short dashed	narrow short dashed
	derived feature	point line surface	wide dotted	narrow dotted
Filtered feature	integral feature	line surface	continuous narrow	continuous narrow
Associated feature	integral feature	point straight line plane	wide doubled-dashed double-dotted	narrow dou- ble-dashed dou- ble-dotted
	derived feature	point straight line (axis) plane	narrow long dashed double-dotted	wide dashed double-dotted
	datum	point line/axis surface/plane	wide long dashed double-short dashed	narrow long dashed double-short dashed
Tolerance zone limits, tolerance planes		line surface	continuous narrow	narrow dashed
Section, illustration plane, drawing plane, aid plane		line surface	narrow long dashed short dashed	narrow dashed short dashed
Extension, dimension, leader and reference lines		line	continuous narrow	narrow dashed

Geometrical product specifications (GPS) — Geometrical tolerancing — Tolerances of form, orientation, location and run-out

IMPORTANT — The illustrations included in this document are intended to illustrate the text and/or to provide examples of the related technical drawing specification; these illustrations are not fully dimensioned and toleranced, showing only the relevant general principles. In particular, many illustrations do not contain filter specifications. As a consequence, the illustrations are not a representation of a complete workpiece, and are not of a quality that is required for use in industry (in terms of full conformity with the standards prepared by ISO/TC 10 and ISO/TC 213), and as such are not suitable for projection for teaching purposes.

1 Scope

This document defines the symbol language for geometrical specification of workpieces and the rules for its interpretation.

It provides the foundation for geometrical specification.

The illustrations in this document are intended to illustrate how a specification can be fully indicated with visible annotation (including e.g. TEDs).

NOTE 1 Other International Standards referenced in [Clause 2](#) and in [Tables 3](#) and [4](#) provide more detailed information on geometrical tolerancing.

NOTE 2 This document gives rules for explicit and direct indications of geometrical specifications. Alternatively, the same specifications can be indicated indirectly in accordance with ISO 16792 by attaching them to a 3D CAD model. In this case, it is possible that some elements of the specification are available through a query function or other interrogation of information on the model instead of being indicated using visible annotation.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

ISO 128-24:1999, *Technical drawings — General principles of presentation — Part 24: Lines on mechanical engineering drawings*

ISO 1660, *Technical drawings — Dimensioning and tolerancing of profiles*

ISO 2692:2014, *Geometrical product specifications (GPS) — Geometrical tolerancing — Maximum material requirement (MMR), least material requirement (LMR) and reciprocity requirement (RPR)*

ISO 5458, *Geometrical Product Specifications (GPS) — Geometrical tolerancing — Positional tolerancing*

ISO 5459, *Geometrical product specifications (GPS) — Geometrical tolerancing — Datums and datum systems*

ISO 8015:2011, *Geometrical product specifications (GPS) — Fundamentals — Concepts, principles and rules*

ISO 10579:2010, *Geometrical product specifications (GPS) — Dimensioning and tolerancing — Non-rigid parts*

ISO 13715, *Technical drawings — Edges of undefined shape — Vocabulary and indications*

This is a free preview. Purchase the entire publication at the link below:

[Product Page](#)

-
- [Looking for additional Standards? Visit Intertek Inform Infostore](#)
 - [Learn about LexConnect, All Jurisdictions, Standards referenced in Australian legislation](#)
-