



SLOVENSKI STANDARD

SIST EN 20286-2:2000

01-december-2000

ISO system of limits and fits - Part 2: Tables of standard tolerance grades and limit deviations for holes and shafts (ISO 286-2:1988)

ISO system of limits and fits - Part 2: Tables of standard tolerance grades and limit deviations for holes and shafts (ISO 286-2:1988)

ISO-System für Grenzabmaße und Passungen - Teil 2: Tabellen der Grundtoleranzgrade und Grenzabmaße für Bohrungen und Wellen (ISO 286-2:1988)

Systeme ISO de tolérances et d'ajustements - Partie 2: Tables des degrés de tolérance normalisés et des écarts limites des alésages et des arbres (ISO 286-2:1988)

<https://standards.iteh.ai/catalog/standards/sist/05a3a80a-d4bd-43c3-a9de-f321ba58268/sist-en-20286-2-2000>

Ta slovenski standard je istoveten z: EN 20286-2:1993

ICS:

17.040.10 Tolerance in ujemi Limits and fits

SIST EN 20286-2:2000

en

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 20286-2:2000

<https://standards.iteh.ai/catalog/standards/sist/05a3a80a-d4bd-43c3-a9de-f321ba58268/sist-en-20286-2-2000>

EUROPEAN STANDARD

EN 20286-2:1993

NORME EUROPÉENNE

EUROPÄISCHE NORM

April 1993

UDC 621.713.1/.2:621.824

Descriptors: Machine components, reaming, shafts : rotating, dimensional tolerances, standard tolerances, dimensional deviations, fundamental tolerances

English version

**ISO system of limits and fits - Part 2: Tables of
standard tolerance grades and limit deviations for
holes and shafts (ISO 286-2:1988)**

Système ISO de tolérances et d'ajustements -
Partie 2: Tables des degrés de tolérance
normalisés et des écarts limites des alésages
et des arbres (ISO 286-2:1988)

ISO-System für Grenzabmaße und Passungen - Teil
2: Tabellen der Grundtoleranzgrade und
Grenzabmaße für Bohrungen und Wellen
(ISO 286-2:1988)

<https://standards.iteh.ai/catalog/standards/sist/05a3a80a-d4bd-43c3-a9de-f321ba58268/sist-en-20286-2-2000>

This European Standard was approved by CEN on 1993-04-15. 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 Central Secretariat or to any CEN member.

The European Standards exist 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 Central Secretariat has the same status as the official versions.

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

CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

Foreword

In 1991, the International Standard ISO 286-2:1988 "ISO system of limits and fits - Part 2: Tables of standard tolerance grades and limit deviations for holes and shafts" was submitted to the CEN Primary Questionnaire procedure.

Following the positive result of the CEN/CS Proposal, ISO 286-2:1988 was submitted to the Formal Vote.

The result of the Formal Vote was positive.

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 October 1993, and conflicting national standards shall be withdrawn at the latest by October 1993.

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

Endorsement notice

The text of the International Standard ISO 286-2:1988 was approved by CEN as a European Standard without any modification.

(standards.iteh.ai)

NOTE: The European references to international publications are given in annex ZA (normative).

SIST EN 20286-2:2000
<https://standards.iteh.ai/catalog/standards/sist/05a3a80a-d4bd-43c3-a9de-f321ba58268/sist-en-20286-2-2000>

Annex ZA (normative)
Normative references to international publications
with their relevant European publications

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 (including amendments).

<u>Publication</u>	<u>Title</u>	<u>EN/HD</u>
ISO 286-1	ISO system of limits and fits - Part 1: Bases of tolerances, deviations and fits	EN 20286-1
ISO 1829	Selection of tolerance zones for general purposes	

iTech STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 20286-2:2000](https://standards.iteh.ai/catalog/standards/sist/05a3a80a-d4bd-43c3-a9de-f321ba58268/sist-en-20286-2-2000)

<https://standards.iteh.ai/catalog/standards/sist/05a3a80a-d4bd-43c3-a9de-f321ba58268/sist-en-20286-2-2000>

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 20286-2:2000

<https://standards.iteh.ai/catalog/standards/sist/05a3a80a-d4bd-43c3-a9de-f321ba58268/sist-en-20286-2-2000>

INTERNATIONAL STANDARD

ISO 286-2

First edition
1988-06-01



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

ISO system of limits and fits —

Part 2:

Tables of standard tolerance grades and limit deviations
for holes and shafts

ITeH STANDARD PREVIEW
(standards.iteh.ai)

Système ISO de tolérances et d'ajustements —

*Partie 2: Tables des degrés de tolérance normalisés et des écarts limites des alésages
et des arbres* <https://standards.iteh.ai/catalog/standards/sist/05a3a80a-d4bd-43c3-a9de-f321ba58268/sist-en-20286-2-2000>

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.

This part of ISO 286 has been prepared by ISO/TC 3, *Limits and fits*, and, together with ISO 286-1, completes the revision of ISO/R 286, *ISO system of limits and fits*. ISO/R 286 was first published in 1962 and subsequently confirmed in November 1964; it was based on ISA Bulletin 25 first published in 1940.

The major changes incorporated in this part of ISO 286 are as follows:

- a) The presentation of the information has been modified so that ISO 286 can be used directly in both the design office and the workshop. This has been achieved by separating the material dealing with the bases of the system, and the calculated values of standard tolerances and fundamental deviations, from the tables giving specific limits of the most commonly used tolerances and deviations.
- b) The new symbols j_s and J_S replace the former symbols j_s and J_S (i.e. s and S are no longer placed as subscripts) to facilitate the use of the symbols on equipment with limited character sets, e.g. computer graphics. The letters "s" and "S" stand for "symmetrical deviation".
- c) Limit deviations have been included for basic sizes from 500 to 3 150 mm as standard requirements (these were previously included on an experimental basis only).
- d) Limit deviations have been extended for holes H and J_S , for shafts h and j_s , by including tolerance grades IT17 and IT18 in all basic sizes, and, for experimental purposes only, by including tolerance grades IT1 to IT5 in basic sizes over 500 mm up to 3 150 mm.
- e) Limit deviations have been extended for some tolerance classes used in fine mechanisms and horology, in basic sizes up to 50 mm.
- f) Inch values have been deleted.
- g) The principles, terminology and symbols have been aligned with those required by contemporary technology.

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.

Contents

	Page
0 Introduction	1
1 Scope	1
2 Field of application	1
3 References	2
4 Standard tolerances	2
5 Limit deviations for holes	2
6 Limit deviations for shafts	2
7 Bibliography	3
Notes on the presentation of tables 2 to 32	7
Tables 2 to 32	8 to 38
Annex — Graphical review of tolerance zones of holes and shafts	39

iTeh STANDARD PREVIEW
(standards.iteh.ai)

<https://standards.iteh.ai/catalog/standards/sist/05a3a80a-d4bd-43c3-a9de-1521ba58206/sist-en-20286-2-2000>

iTeh STANDARD PREVIEW
This page intentionally left blank
(standards.iteh.ai)

SIST EN 20286-2:2000

<https://standards.iteh.ai/catalog/standards/sist/05a3a80a-d4bd-43c3-a9de-ff321ba58268/sist-en-20286-2-2000>

ISO system of limits and fits —

Part 2:

Tables of standard tolerance grades and limit deviations for holes and shafts

iTeh STANDARD PREVIEW (standards.iteh.ai)

0 Introduction

The need for limits and fits for machined workpieces was brought about mainly by the inherent inaccuracy of manufacturing methods, coupled with the fact that "exactness" of size was found to be unnecessary for most workpieces. In order that function could be satisfied, it was found sufficient to manufacture a given workpiece so that its size lay within two permissible limits, i.e. a tolerance, this being the variation in size acceptable in manufacture.

Similarly, where a specific fit condition is required between mating workpieces, it is necessary to ascribe an allowance, either positive or negative, to the basic size to achieve the required clearance or interference, i.e. a "deviation".

With developments in industry and international trade, it became necessary to develop formal systems of limits and fits, firstly at the industrial level, then at the national level and later at the international level.

This International Standard therefore gives the internationally accepted system of limits and fits.

A general graphical representation of the relationship between the respective tolerance classes and their deviations is given in the annex.

1 Scope

This part of ISO 286 gives values of the limit deviations for commonly used tolerance classes (zones) for holes and shafts calculated from the information given in ISO 286-1. This part of

ISO 286 covers values for the upper deviations ES (for holes) and es (for shafts), and the lower deviations EI (for holes) and ei (for shafts) (see figure 1).

NOTE — In the tables of limit deviations, the values for the upper deviation ES or es are shown above the values for the lower deviation EI or ei except for tolerance class JS and js which is symmetrical about the zero line.

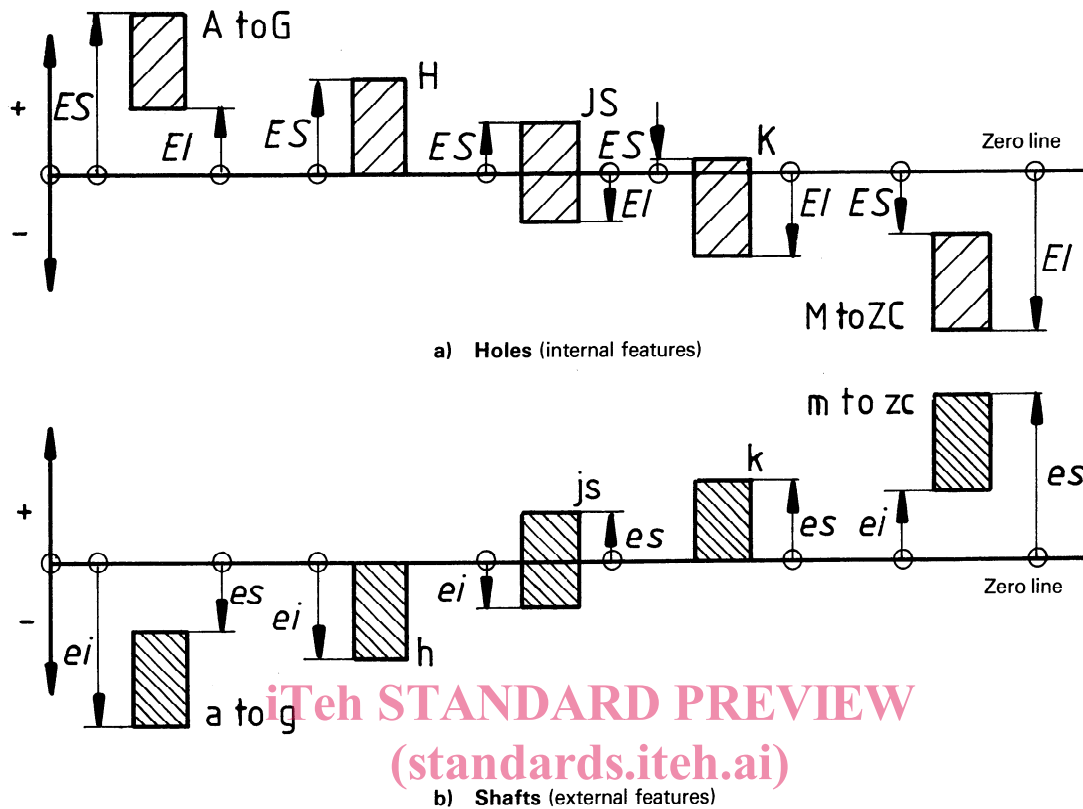
2 Field of application

The ISO system of limits and fits provides a system of tolerances and deviations suitable for plain workpieces.

It should be noted that the general term "hole" or "shaft" used in this International Standard can be taken as referring to the space contained by (or containing) the two parallel faces (or tangent planes) of any workpiece, such as the width of a slot or the thickness of a key (see also ISO 286-1). Similarly, the term "commonly used holes and shafts" shall be interpreted as providing a very wide choice of limit deviations suitable for a wide variety of requirements.

For further information on terminology, symbols, bases of the system, etc., see ISO 286-1.

Notes on the presentation of tables 2 to 32 are given on page 7.



SIST EN 20286-2:2000
 Figure 1 — Upper and lower deviations
<https://standards.iteh.ai/catalog/standards/sist/05a9a00a-d4bd-43c3-a9de-f321ba58268/sist-en-20286-2-2000>

3 References

NOTE — See also clause 7.

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

ISO 1829, *Selection of tolerance zones for general purposes.*

4 Standard tolerances

The values of standard tolerance grades IT1 to IT18 inclusive are given in table 1.

For information on the bases of the system and its application, see ISO 286-1; for values of standard tolerances IT0 and IT01, see ISO 286-1, annex A, table 5.

5 Limit deviations for holes

A synoptic representation of the tolerance classes for holes, given in this part of ISO 286, is shown in figures 2 and 3.

Attention is drawn to the fact that the tolerance classes shown in figures 2 and 3, and their limit deviations, given in tables 2 to 16, are not intended to give detailed directives on the selection of tolerance classes for any purpose. Recommendations for the selection of tolerance classes are given in ISO 1829.

NOTE — Some tolerance classes are only provided for a restricted range of basic size steps. For further information, see note 1 on page 7.

6 Limit deviations for shafts

A synoptic representation of the tolerance classes for shafts, given in this part of ISO 286, is shown in figures 4 and 5.

Attention is drawn to the fact that the tolerance classes shown in figures 4 and 5, and their limit deviations, given in tables 17 to 32, are not intended to give detailed directives on the selection of tolerance classes for any purpose. Recommendations for the selection of tolerance classes are given in ISO 1829.

NOTE — Some tolerance classes are only provided for a restricted range of basic size steps. For further information, see note 1 on page 7.

7 Bibliography

The following International Standards on tolerancing and tolerance systems will be useful with regard to the application of this part of ISO 286:

ISO 406, *Technical drawings — Linear and angular tolerancing — Indications on drawings.*

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

ISO/R 1938, *ISO system of limits and fits — Inspection of plain workpieces.*¹⁾

ISO 2692, *Technical drawings — Geometrical tolerancing — Maximum material principle.*

ISO 2768-1, *General tolerances for dimensions without tolerance indications — Part 1: Tolerances for linear and angular dimensions.*²⁾

ISO 5166, *System of cone fits for cones from C = 1 : 3 to 1 : 500, lengths from 6 to 630 mm and diameters up to 500 mm.*

ISO 8015, *Technical drawings — Fundamental tolerancing principle.*

ISO 8062, *Castings — System of dimensional tolerances.*

iTeh STANDARD PREVIEW (standards.iteh.ai)

SIST EN 20286-2:2000

<https://standards.iteh.ai/catalog/standards/sist/05a3a80a-d4bd-43c3-a9de-f321ba58268/sist-en-20286-2-2000>

1) At present under revision.

2) At present at the stage of draft. (Revision, in part, of ISO 2768 : 1973.)

ISO 286-2 : 1988 (E)

Table 1 — Numerical values of standard tolerance grades IT for basic sizes up to 3 150 mm¹⁾

NOTE — This table, taken from ISO 286-1, has been included in this part of ISO 286 to facilitate understanding and use of the system.

Basic size mm		Standard tolerance grades																	
		IT1 ²⁾	IT2 ²⁾	IT3 ²⁾	IT4 ²⁾	IT5 ²⁾	IT6	IT7	IT8	IT9	IT10	IT11	IT12	IT13	IT14 ³⁾	IT15 ³⁾	IT16 ³⁾	IT17 ³⁾	IT18 ³⁾
Above	Up to and including	Tolerances																	
		µm												mm					
—	3 ³⁾	0,8	1,2	2	3	4	6	10	14	25	40	60	0,1	0,14	0,25	0,4	0,6	1	1,4
3	6	1	1,5	2,5	4	5	8	12	18	30	48	75	0,12	0,18	0,3	0,48	0,75	1,2	1,8
6	10	1	1,5	2,5	4	6	9	15	22	36	58	90	0,15	0,22	0,36	0,58	0,9	1,5	2,2
10	18	1,2	2	3	5	8	11	18	27	43	70	110	0,18	0,27	0,43	0,7	1,1	1,8	2,7
18	30	1,5	2,5	4	6	9	13	21	33	52	84	130	0,21	0,33	0,52	0,84	1,3	2,1	3,3
30	50	1,5	2,5	4	7	11	16	25	39	62	100	160	0,25	0,39	0,62	1	1,6	2,5	3,9
50	80	2	3	5	8	13	19	30	46	74	120	190	0,3	0,46	0,74	1,2	1,9	3	4,6
80	120	2,5	4	6	10	15	22	35	54	87	140	220	0,35	0,54	0,87	1,4	2,2	3,5	5,4
120	180	3,5	5	8	12	18	25	40	63	100	160	250	0,4	0,63	1	1,6	2,5	4	6,3
180	250	4,5	7	10	14	20	29	46	72	115	185	290	0,46	0,72	1,15	1,85	2,9	4,6	7,2
250	315	6	8	12	16	23	32	52	81	130	210	320	0,52	0,81	1,3	2,1	3,2	5,2	8,1
315	400	7	9	13	18	25	36	57	89	140	230	360	0,57	0,89	1,4	2,3	3,6	5,7	8,9
400	500	8	10	15	20	27	40	63	97	155	250	400	0,63	0,97	1,55	2,5	4	6,3	9,7
500	630 ²⁾	9	11	16	22	32	44	70	110	175	280	440	0,7	1,1	1,75	2,8	4,4	7	11
630	800 ²⁾	10	13	18	25	36	50	80	125	200	320	500	0,8	1,25	2	3,2	5	8	12,5
800	1000 ²⁾	11	15	21	28	40	56	90	140	230	360	560	0,9	1,4	2,3	3,6	5,6	9	14
1000	1250 ²⁾	13	18	24	33	47	66	105	165	260	420	660	1,05	1,65	2,6	4,2	6,6	10,5	16,5
1250	1600 ²⁾	15	21	29	39	55	78	125	195	310	500	780	1,25	1,95	3,1	5	7,8	12,5	19,5
1600	2000 ²⁾	18	25	35	46	65	92	150	230	370	600	920	1,5	2,3	3,7	6	9,2	15	23
2000	2500 ²⁾	22	30	41	55	78	110	175	280	440	700	1100	1,75	2,8	4,4	7	11	17,5	28
2500	3150 ²⁾	26	36	50	68	96	135	210	330	540	860	1350	2,1	3,3	5,4	8,6	13,5	21	33

1) Values for standard tolerance grades IT01 and IT0 for basic sizes less than or equal to 500 mm are given in ISO 286-1, annex A, table 5.

2) Values for standard tolerance grades IT1 to IT5 (incl.) for basic sizes over 500 mm are included for experimental use.

3) Standard tolerance grades IT14 to IT18 (incl.) shall not be used for basic sizes less than or equal to 1 mm.

