INTERNATIONAL STANDARD

ISO 4759-3

Tolerances for fasteners —

Part 3:
Washers for bolts, screws and nuts — Product grades A, C and F

Tolérances pour fixations —

Partie 3: Rondelles pour vis et écrous — Grades A, C et F

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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 WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 2, *Fasteners*.

This fourth edition cancels and replaces the third edition (ISO 4759-3:2000), which has been technically revised.

In comparison to ISO 4759-3:2000, the following changes have been made.

a)   the scope has been amended;

b)   the normative references have been updated;

c)   a new Clause 3 "Symbols and abbreviated terms" has been added;

d)   new product grade F has been included (F for Fine tolerances);

e)   tolerances for chamfers have been included;

f)   in Table A.1 tolerances for standard tolerance grades IT11 and IT14 have been included and IT16 has been deleted;

g)   in Tables A.2 and A.3 limit deviations for tolerance classes h13 and H12 respectively have been included;

h)   the bibliography has been updated;

i)   this part of ISO 4759 has been editorially revised.

ISO 4759 consists of the following parts, under the general title *Tolerances for fasteners*:

—   *Part 1: Bolts, screws, studs and nuts — Product grades A, B and C*

—   *Part 3: Washers for bolts, screws and nuts — Product grades A, C and F*

Tolerances for fasteners —

Part 3:
Washers for bolts, screws and nuts — Product grades A, C and F

1 Scope

This part of ISO 4759 specifies tolerances for flat washers of product grades A, C and F with nominal diameters of 1 mm to 150 mm inclusive, designed to be used in bolted joints in combination with bolts, screws, studs and nuts.

This part of ISO 4759 may be applied to non-flat washers however it does not include all the tolerances related to these washers.

It applies to non-captive and captive washers, and to standard and non-standard washers.

It does not apply to dynamic disc springs.

Washers of product grades F and A are intended to be used with bolts, screws, studs and nuts of product grades A and B; washers of product grade C are intended to be used with bolts, screws, studs and nuts of product grade C.

NOTE   The product grade refers to a specific tolerance range related to dimensional and geometrical characteristics (product grade F for fine tolerances, product grade A for precise tolerances, product grade C for large tolerances).

Annex A presents tolerances taken from ISO 286-1 and ISO 286-2.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

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

3 Symbols

c_1 height of the internal chamfer, mm

c_2 height of the external chamfer, mm

d_1 clearance hole, mm

d_2 outside diameter, mm

e_1 radial difference between the clearance hole (area subject to shearing) and the end of the brittle fracture on the bearing side of the washer

e_2 radial difference between the outside diameter (area subject to shearing) and the end of the brittle fracture on the bearing side of the washer

h_{eff} effective height of the washer, mm

t nominal thickness of the washer, mm

t_{eff} effective thickness of the washer, mm

t_1 part of the clearance hole within the tolerance specified for d_1

t_2 part of the outside diameter within the tolerance specified for d_2

y coaxiality, mm

z flatness (deflection), mm

4   Tolerances

The tolerances for washers of product grades A, C and F are specified in Table 1.

Unless otherwise specified, the tolerances specified in this part of ISO 4759 apply to washers prior to coating.

Deviations from the tolerances specified in this part of ISO 4759 are permitted in product standards only for valid technical reasons. In cases where there is a difference between the tolerance requirements in this part of ISO 4759 and the product standard, the latter takes precedence.

The tolerances of form and position are specified and indicated according to the definitions of ISO 1101 and ISO 2692.

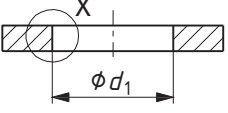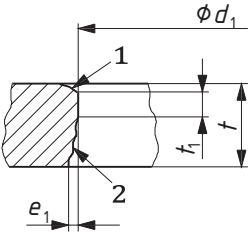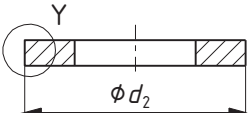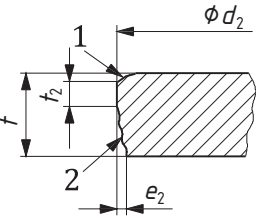**Table 1 — Tolerances for washers**

Dimensions in millimetres
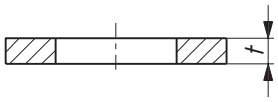
Feature	Thickness t	Tolerances — Product grade F			Tolerances — Product grade A			Tolerances — Product grade C
4.1 Clearance hole Detail X for punched hole Key 1 rollover 2 fracture		d_1 tol.	t_1 min.	e_1 max.	d_1 tol.	t_1 min.	e_1 max.	d_1 tol.
	$t < 2$	H12	$0,5\,t$	$0,10\,t$	H13	$0,3\,t$	$0,15\,t$	H14
	$2 \le t < 4$	H12	$0,3\,t$	$0,15\,t$	H13	$0,25\,t$	$0,20\,t$	H14
	$t \ge 4$	H13	$0,2\,t$	$0,20\,t$	H14	$0,2\,t$	$0,25\,t$	H15
		Rollover is undefined but allowed.						Fracture (e_1), t_1, and rollover are undefined but allowed.
		t_1 is the part of the hole within the tolerance specified for d_1.						

Feature	Thickness t	Tolerances — Product grade F		Tolerances — Product grade A		Tolerances — Product grade C
4.2 Outside diameter Detail Y for outside diameter Key 1 rollover 2 fracture		d_2 tol.	e_2 max.	d_2 tol.	e_2 max.	d_2 tol.
	$t < 2$	h13	$0,13\,t$	h14	$0,18\,t$	h16
	$2 \le t < 4$	h13	$0,15\,t$	h14	$0,20\,t$	h16
	$t \ge 4$	h14	$0,18\,t$	h15	$0,25\,t$	h16
		Rollover and t_2 are undefined but allowed.				Fracture (e_2), t_2 and rollover are undefined but allowed.
		t_2 is the part of the outside diameter within the tolerance specified for d_2.				

Table 1 — *(continued)*

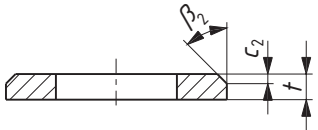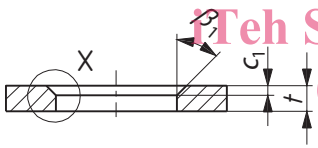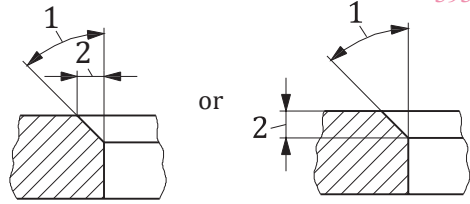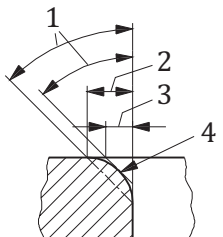| Feature	Thickness t	Tolerances		
		Product grade		
		F	A	C
4.3 Thickness	$t \le 0,5$	±0,04	±0,05	±0,10
	$0,5 < t \le 1$	±0,06	±0,10	±0,20
	$1 < t \le 2,5$	±0,12	±0,20	±0,30
	$2,5 < t \le 4$	±0,16	±0,30	±0,60
	$4 < t \le 6$	±0,20	±0,60	±1,00
Tolerance on thickness shall be measured after removal of burrs.	$6 < t \le 10$	±0,24	±1,00	±1,20
	$10 < t \le 20$	±0,28	±1,20	±1,60

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ISO 4759-3:2016
https://standards.iteh.ai/catalog/standards/sist/f293d3c5-3718-49b4-90f1-
39344a3fa831/iso-4759-3-2016

Table 1 — *(continued)*

<div align="right">Dimensions in millimetres</div>

Feature	Thickness t	Tolerances					
		Product grade					
		F		A		C	
4.4 Chamfers		c_1	c_2	c_1	c_2	c_1	c_2
	nom.	min.	min.	min.	min.	min.	min.
	$1 \leq t < 2$	$0{,}20\,t$	$0{,}25\,t$	$0{,}20\,t$	$0{,}25\,t$	$0{,}20\,t$	$0{,}25\,t$
	$2 \leq t < 4$	$0{,}18\,t$	$0{,}22\,t$	$0{,}18\,t$	$0{,}22\,t$	$0{,}18\,t$	$0{,}22\,t$
	$t \geq 4$	$0{,}15\,t$	$0{,}20\,t$	$0{,}15\,t$	$0{,}20\,t$	$0{,}15\,t$	$0{,}20\,t$

4.4.1 Outer chamfer

4.4.2 Inner chamfer

Dimension t_1 in accordance with 4.1 shall be achieved irrespective to the height of the inner chamfer.

The chamfer dimensioning shall be considered as follows:

or

$\beta_1 = 35°$ to $45°$

$\beta_2 = 35°$ to $45°$

Key – dimensioning

1 angle

2 dimension ± tolerance

Key – shape

1 angle

2 dimension + tolerance

3 dimension - tolerance

4 undefined shape