

# INTERNATIONAL STANDARD

**ISO  
887**

Second edition  
2000-06-15

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## **Plain washers for metric bolts, screws and nuts for general purposes — General plan**

*Rondelles plates pour vis et écrous métriques pour usages généraux —  
Plan général*



Reference number  
ISO 887:2000(E)

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Tel. + 41 22 749 01 11  
Fax + 41 22 734 10 79  
E-mail [copyright@iso.ch](mailto:copyright@iso.ch)  
Web [www.iso.ch](http://www.iso.ch)

Printed in Switzerland

## 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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 887 was prepared by Technical Committee ISO/TC 2, *Fasteners*.

This second edition cancels and replaces the first edition (ISO 887:1983), which has been technically revised.

Annex A of this International Standard is for information only.



# Plain washers for metric bolts, screws and nuts for general purposes — General plan

## 1 Scope

This International Standard specifies the full range of the nominal dimensions of product-grade-A and -C plain washers for general-purpose bolts, screws and nuts of nominal thread diameters ranging from 1 mm to 150 mm inclusive.

This International Standard is not applicable to washers for screw and washer assemblies in relation to hole diameters and thicknesses.

Information on the use of plain washers is given in annex A.

## 2 Normative reference

The following normative document contains provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the normative document indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 273:1979, *Fasteners — Clearance holes for bolts and screws*.

## 3 Clearance holes

The clearance hole diameters  $d_1$  for washers (see Figure 1) shall be chosen in accordance with those specified in ISO 273, as follows:

- fine series for washers of product grade A and with a nominal thickness of less than 6 mm, i.e. for nominal sizes < 39 mm;
- medium series for washers of product grade A with a nominal thickness equal to or greater than 6 mm, i.e. for nominal sizes  $\geq 39$  mm and for washers of product grade C.

NOTE The tolerances for clearance holes given in ISO 273 for information are not applicable to plain washers of product grades A and C; see clause 6.

#### 4 Outside diameters

The outside diameters  $d_2$  for washers (see Figure 1) shall be chosen from the values given in Table 1.

**Table 1 — Dimensions  $d_2$**

Values in millimetres

2,5	8	18	39	80	125	185
3	9	20	44	85	135	200
3,5	10	22	50	92	140	210
4	11	24	56	98	145	220
4,5	12	28	60	105	160	230
5	14	30	66	110	165	240
6	15	34	72	115	175	250
7	16	37	78	120	180	

#### 5 Thicknesses

The washer thicknesses  $h$  (see Figure 1) shall be chosen from the values given in Table 2.

**Table 2 — Dimensions  $h$**

Values in millimetres

0,3	1	2	4	8	14
0,5	1,2	2,5	5	10	16
0,8	1,6	3	6	12	18

#### 6 Tolerances

The tolerances for washers are specified in ISO 4759-3.

## 7 Preferred combinations of plain-washer dimensions

The preferred combinations of nominal dimensions  $d_1$ ,  $d_2$  and  $h$  for plain washers of product grades A and C (see Figure 1) are given in Table 3. The washers are divided into four series: small, normal, large and extra large. These series are related to the size of the outside diameter  $d_2$ .

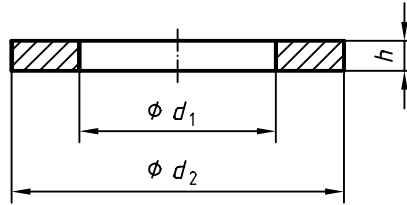


Figure 1 — Dimensions

Table 3 — Nominal dimensions of plain washers

Dimensions en millimètres

Nominal size (Thread size, d)	Series																					
	Small			Normal			Large			Extra large												
	Product grade A			Product grade A			Product grade C			Product grade C												
	$d_1$	$d_2$	$h$	ISO 7092	$d_1$	$d_2$	$h$	ISO 7089	ISO 7090	$d_1$	$d_2$	$h$	ISO 7093-1	$d_1$	$d_2$	$h$	ISO 7093-2	$d_1$	$d_2$	$h$	ISO 7094	
1	1,1	2,5	0,3	X	1,1	3	0,3			1,2	3	0,3										
1,2	1,3	3	0,3		1,3	3,5	0,3			1,4	3,5	0,3										
1,4	1,5	3	0,3		1,5	4	0,3			1,6	4	0,3										
1,6	1,7	3,5	0,3	X	1,7	4	0,3	X		1,8	4	0,3	X	1,7	5	0,3		1,8	5	0,3		
1,8	2	4	0,3		2	4,5	0,3			2,1	4,5	0,3		2	—	—		2,1	—	—		
2	2,2	4,5	0,3	X	2,2	5	0,3	X		2,4	5	0,3	X	2,2	6	0,5		2,4	6	0,5		
2,2	2,4	4,5	0,3		2,4	6	0,5			2,6	6	0,5		2,4	—	—		2,6	—	—		
2,5	2,7	5	0,5	X	2,7	6	0,5	X		2,9	7	0,5	X	2,7	8	0,5		2,9	8	0,5		
3	3,2	6	0,5	X	3,2	7	0,5	X		3,4	7	0,5	X	3,2	9	0,8		3,4	9	0,8		
3,5	3,7	7	0,5	X	3,7	8	0,5	X		3,9	8	0,5	X	3,7	11	0,8		3,9	11	0,8		
4	4,3	8	0,5	X	4,3	9	0,8	X		4,5	9	0,8	X	4,3	12	1		4,5	12	1		
4,5	4,8	9	0,8		4,8	10	0,8			5	10	0,8		4,8	15	1		5	15	1		
5	5,3	9	1	X	5,3	10	1	X	X	5,5	10	1	X	5,3	15	1,2	X	5,5	15	1,2	X	X
6	6,4	11	1,6	X	6,4	12	1,6	X	X	6,6	12	1,6	X	6,4	18	1,6	X	6,6	18	1,6	X	X
7	7,4	12	1,6		7,4	14	1,6			7,6	14	1,6		7,4	22	2		7,6	22	2		
8	8,4	15	1,6	X	8,4	16	1,6	X	X	9	16	1,6	X	8,4	24	2	X	9	24	2	X	X
10	10,5	18	1,6	X	10,5	20	2	X	X	11	20	2	X	10,5	30	2,5	X	11	30	2,5	X	X
12	13	20	2	X	13	24	2,5	X	X	13,5	24	2,5	X	13	37	3	X	13,5	37	3	X	X
14	15	24	2,5	X	15	28	2,5	X	X	15,5	28	2,5	X	15	44	3	X	15,5	44	3	X	X
16	17	28	2,5	X	17	30	3	X	X	17,5	30	3	X	17	50	3	X	17,5	50	3	X	X
18	19	30	3	X	19	34	3	X	X	20	34	3	X	19	56	4	X	20	56	4	X	X
20	21	34	3	X	21	37	3	X	X	22	37	3	X	21	60	4	X	22	60	4	X	X
22	23	37	3	X	23	39	3	X	X	24	39	3	X	23	66	5	X	24	66	5	X	X
24	25	39	4	X	25	44	4	X	X	26	44	4	X	25	72	5	X	26	72	5	X	X
27	28	44	4	X	28	50	4	X	X	30	50	4	X	30	85	6	X	30	85	6	X	X
30	31	50	4	X	31	56	4	X	X	33	56	4	X	33	92	6	X	33	92	6	X	X
33	34	56	5	X	34	60	5	X	X	36	60	5	X	36	105	6	X	36	105	6	X	X





## Annex A (informative)

### Guidance on the use of plain washers with bolts, screws and nuts

An overview of suitable combinations of plain washers and bolts, screws or nuts in respect of property (hardness) classes and product grades is given in Table A.1.

More detailed information, including washer series and bolt or screw head shape, is given in the scopes of the respective plain-washer product standards.

**Table A.1**

<b>Washers</b>	Hardness class		100 HV	200 HV	300 HV
	Product grade		C	A	A
<b>Bolts, screws, nuts</b>	Product grade	A	no	yes	yes
		B	no	yes	yes
		C	yes	no	no
<b>Bolts, screws</b>	Property class	≤ 6.8	yes	yes	yes
		8.8	no	yes	yes
		9.8, 10.9	no	no	yes
		12.9	no	no	no
<b>Nuts</b>	Property class	≤ 6	yes	yes	yes
		8	no	yes	yes
		9, 10	no	no	yes
		12	no	no	no
<b>Case-hardened thread rolling screws</b>			yes	yes	yes
<b>Stainless-steel bolts, screws and nuts</b>			—	yes	—

## Bibliography

- [1] ISO 4759-3:2000, *Tolerances for fasteners — Part 3: Plain washers for bolts, screws and nuts — Product grades A and C.*
- [2] ISO 7089:2000, *Plain washers — Normal series — Product grade A.*
- [3] ISO 7090:2000, *Plain washers, chamfered — Normal series — Product grade A.*
- [4] ISO 7091:2000, *Plain washers — Normal series — Product grade C.*
- [5] ISO 7092:2000, *Plain washers — Small series — Product grade A.*
- [6] ISO 7093-1:2000, *Plain washers — Large series — Part 1: Product grade A.*
- [7] ISO 7093-2:2000, *Plain washers — Large series — Part 2: Product grade C.*
- [8] ISO 7094:2000, *Plain washers — Extra large series — Product grade C.*

**ISO 887:2000(E)**

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**ICS 21.060.30**

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