
**Screw and washer assemblies with plain
washers — Washer hardness classes
200 HV and 300 HV**

*Vis à rondelle plate incorporée — Rondelles de classes de dureté 200 HV
et 300 HV*

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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.

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.

International Standard ISO 10644 was prepared by Technical Committee ISO/TC 2, *Fasteners*.

Annex A of this International Standard is for information only.

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Screw and washer assemblies with plain washers — Washer hardness classes 200 HV and 300 HV

1 Scope

This International Standard specifies the requirements for metric screw and plain washer assemblies with coarse thread M2 to M12 inclusive, flat seating heads, property classes up to and including 10.9 and washer hardness classes 200 HV and 300 HV.

The plain washers are captive, i. e. prevented from disassembly and free to rotate.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 898-1:1998, *Mechanical properties of fasteners made of carbon steel and alloy steel — Part 1: Bolts, screws and studs.*

ISO 1207:1992, *Slotted cheese head screws — Product grade A.*

ISO 1580:1994, *Slotted pan head screws — Product grade A.*

ISO 4014:—¹⁾, *Hexagon head bolts — Product grades A and B.*

ISO 4017:—²⁾, *Hexagon head screws — Product grades A and B.*

ISO 4042:—³⁾, *Fasteners — Electroplated coatings.*

ISO 4762:1997, *Hexagon socket head cap screws.*

ISO 7045:1994, *Pan head screws with type H or type Z cross recess — Product grade A.*

ISO 10673:1998, *Plain washers for screw and washer assemblies — Small, normal and large series — Product grade A.*

1) To be published. (Revision of ISO 4014:1988)
2) To be published. (Revision of ISO 4017:1988)
3) To be published. (Revision of ISO 4042:1989)

3 Dimensions

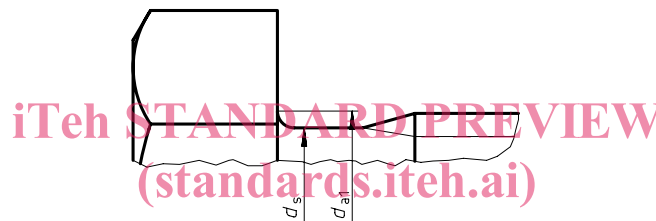
The dimensions for the assembled screws shall conform to those in the ISO standards for loose parts with the following exceptions:

- Bolts and screws shall have a reduced shank of such diameter (d_s) that the washer with dimensions according to ISO 10673 is free to rotate.

NOTE — $d_s \approx$ pitch diameter.

- The maximum distance from the underside of the head to the commencement of full thread is increased by an amount necessary to accommodate the washer thickness for those products which are approximately threaded to the washer.
- The transition diameter d_a as specified in the reference standards (see table 3) shall be reduced by an amount equivalent to the difference between the nominal and pitch diameter to create the transition diameter d_{a1} (see figure 1 and table 1). The curvature under head, as specified in the ISO standards for loose parts, shall not be changed.

The dimensions for plain washers shall be in accordance with ISO 10673.



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Figure 1 — Transition diameter d_{a1} and shank diameter d_s

Table 1 — Dimensions

Dimensions in millimetres

Thread ¹⁾	$a^2)$ max.	d_{a1} max.	Dimensions of plain washers ³⁾					
			Small series		Normal series		Large series	
			Type S		Type N		Type L	
(d)			h nom.	d_2 max.	h nom.	d_2 max.	h nom.	d_2 max.
M2	2P ⁴⁾	2,4	0,6	4,5	0,6	5	0,6	6
M2,5		2,8	0,6	5	0,6	6	0,6	8
M3		3,3	0,6	6	0,6	7	0,8	9
(M3,5)		3,7	0,8	7	0,8	8	0,8	11
M4		4,3	0,8	8	0,8	9	1	12
M5		5,2	1	9	1	10	1	15
M6		6,2	1,6	11	1,6	12	1,6	18
M8		8,4	1,6	15	1,6	16	2	24
M10		10,2	2	18	2	20	2,5	30
M12		12,6	2	20	2,5	24	3	37

1) Size in brackets should be avoided.

2) Maximum distance from the underside of the washer to the commencement of the first full thread with the washer in contact with the screw bearing face or underhead radius, when measured using a faced-off, i. e. unchamfered, ring gauge.

3) Dimensions extracted from ISO 10673 for information only.

4) P is the pitch of the thread.

For examples of screw and washer assemblies see figures 2 and 3.

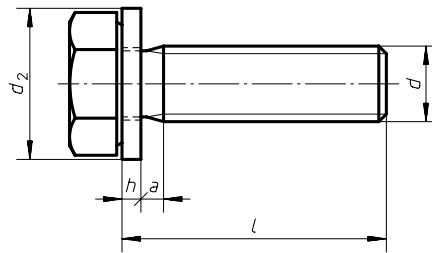
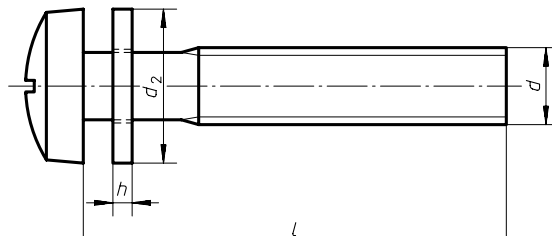


Figure 2 — Screw threaded up to the washer



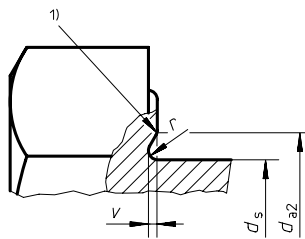
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Figure 3 — Screw with shank

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In the case of hexagon head screws the alternative underhead configuration with undercut (type U) may be used by agreement between supplier and purchaser, see figure 4 and table 2.



1) Smooth transition

Figure 4 — Alternative underhead configuration, type U

Table 2 — Type U dimensions

Dimensions in millimetres

Thread (<i>d</i>)		M3	M4	M5	M6	M8	M10	M12
d_{a2}	max.	3,6	4,7	5,7	6,8	9,2	11,2	13,7
r	min.	0,1	0,2	0,2	0,25	0,4	0,4	0,6
v	max.	0,20	0,25	0,25	0,30	0,4	0,4	0,5
	min.	0,05	0,05	0,05	0,05	0,1	0,1	0,1
NOTE — For other dimensions see table 1.								

4 Specifications and reference standards

The components of screw and washer assemblies shall satisfy the material and mechanical property requirements specified in the respective product standards in the finished condition.

The requirements for electroplating are covered in ISO 4042.

For referee purposes, in case of dispute, testing in accordance with ISO 898-1 shall be carried out with the washer component removed.

The hardness classes of the washers used for screw and washer assemblies shall be as follows:

- property class of screw ≤ 8.8 : hardness class of washer 200 HV according to ISO 10673;
- property class of screw 9.8 and 10.9: hardness class of washer 300 HV according to ISO 10673.

5 Screw and washer combinations

The standardized combinations of screws and washers and the symbols to be used for the components are given in table 3.

Table 3 — Combinations of screws and washers – Symbols

Screw		Washer ¹⁾		
		Type		
		S	N	L
Reference standard	Symbol	Symbol S	Symbol N	Symbol L
ISO 4017:—	S1		×	×
ISO 4014:— ²⁾	S2		×	×
ISO 7045:1994	S3		×	×
ISO 4762:1997	S4	×	×	×
ISO 1580:1994	S5		×	×
ISO 1207:1992	S6	×	×	×

1) In accordance with ISO 10673

2) Bolts in accordance with ISO 4014 with reduced shank according to clause 3 will be similar to bolts in accordance with ISO 4015.

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6 Designation

The designation of a screw and washer assembly shall consist of

- the description of the component,
- reference to this International Standard,
- the characteristics of the screw component,
- the screw symbol indicating the type of screw (see table 3), and
- the washer symbol indicating the type of washer (see table 3).

EXAMPLE 1

A hexagon head screw and washer assembly consisting of a screw M6 × 30 – 8.8 according to ISO 4017 (symbol S1) and a washer, normal series, according to ISO 10673 (symbol N) is designated as follows:

Screw and washer assembly ISO 10644 – M6 × 30 – 8.8 – S1 – N

EXAMPLE 2

A hexagon head screw and washer assembly of a screw M6 × 30 – 8.8 according to ISO 4017 (symbol S1) with undercut (type U) and a washer, normal series, according to ISO 10673 (symbol N) is designated as follows:

Screw and washer assembly ISO 10644 – M6 × 30 – 8.8 – U – S1 – N

Annex A (informative)

Bibliography

[1] ISO 4015:1979, *Hexagon head bolts – Product grade B – Reduced shank (shank diameter approximately equal to pitch diameter)*.

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