

## Washers

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Washers are normally used between a nut and the surface against which it bears. The purpose is to spread the load more evenly under the nut face. This is particularly important with stamped-out slotted holes as there may be raised edges to the hole. These can cause concentrated loads which, in extreme cases, could split the nut.

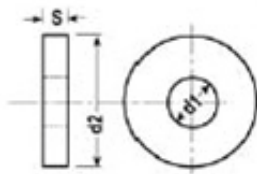
Standard washers are round, although many precasters prefer to make their own square washers, stamped out of flat steel. Doing this enables the washer to be somewhat thicker than standard which reduces dishing at slotted holes. Washers are specified in accordance with BS 4320, and even plain, flat washers come in several types.

Form A – These are ‘thick’ and the diameter is slightly greater than the size of the equivalent nut.

Form B – These are ‘thin’ and the same size as form A.

Form C – These are ‘thick’ and larger diameter than form A.

Of these, form A is the most commonly used. The nominal dimensions of this type are as below:



Dia	M12	M16	M20	M24	M30
d1 (mm)	14	18	22	26	32
d2 (mm)	24	30	37	44	56
S (mm)	2.5	3.0	3.0	4.0	4.0

The thickness of washers may vary by up to 30%

Square washer sizes will depend on the manufacturer, but the following dimensions are typical:

Dia	M12	M16	M20	M24	M30
Size (mm)	30 x 30	35 x 35	45 x 45	50 x 50	60 x 60
Hole dia (mm)	14	18	22	26	32
Thickness (mm)	4	4	4	4	5

Larger washers than these should be used with caution since there may be tolerance problems at radiused bends on cold-formed sections such as angles and channels.

The material for washers should generally match the fastening, but since the terminology is different from that for threads, it means that for grade A2-70 thread 1.4301 (304) plate is used, and for A4-80 thread 1.4401 (316) is used. For mild steel fastenings, S275 (grade 43) steel is used.