

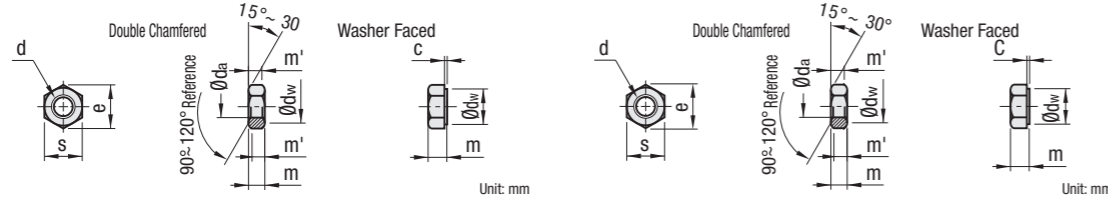
[Technical Data] Hexagon Nuts/Cotter Pins

Excerpts from JIS B 1181 (1995) Excerpts from JIS B 1351 (1987)

[Technical Data] Spring Pins/Retaining Rings E Type

Excerpts from JIS B 2808 (1995) Excerpts from JIS B 2805 (1978)

1. Shape and Dimensions of Hexagon Nuts Style I (Parts Grade A) 2. Shape and Dimensions of Hexagon Nuts Style II (Parts Grade A)

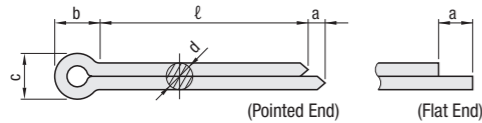


| Nominal of Thread d | M2 | M3 | M4 | M5 | M6 | M8 | M10 | M12 | (M14) | M16 |
|---------------------|----------------------------|------|------|------|------|-------|-------|-------|-------|-------|
| Pitch P | 0.4 | 0.5 | 0.7 | 0.8 | 1 | 1.25 | 1.5 | 1.75 | 2 | 2 |
| c | Max. | 0.2 | 0.4 | 0.5 | 0.5 | 0.6 | 0.6 | 0.6 | 0.6 | 0.8 |
| | Min. | 0.1 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.2 |
| da | Min. (Reference Dimension) | 2 | 3 | 4 | 5 | 6 | 8 | 10 | 12 | 14 |
| | Max. | 2.3 | 3.45 | 4.6 | 5.75 | 6.75 | 8.75 | 10.8 | 13 | 15.1 |
| dw | Max. | 3.07 | 4.6 | 5.9 | 6.9 | 8.9 | 11.6 | 14.6 | 16.6 | 19.6 |
| | Min. | 4.32 | 6.01 | 7.66 | 8.79 | 11.05 | 14.38 | 17.77 | 20.03 | 23.35 |
| e | Max. (Reference Dimension) | 1.6 | 2.4 | 3.2 | 4.7 | 5.2 | 6.8 | 8.4 | 10.8 | 12.8 |
| | Min. | 1.35 | 2.15 | 2.9 | 4.4 | 4.9 | 6.44 | 8.04 | 10.37 | 12.1 |
| m | Max. | 1.08 | 1.72 | 2.32 | 3.52 | 3.92 | 5.15 | 6.43 | 8.3 | 9.68 |
| | Min. | 4 | 5.5 | 7 | 8 | 10 | 13 | 16 | 18 | 21 |
| s | Max. (Reference Dimension) | 4 | 5.5 | 7 | 8 | 10 | 13 | 16 | 18 | 21 |
| | Min. | 3.82 | 5.32 | 6.78 | 7.78 | 9.78 | 12.73 | 15.73 | 17.73 | 20.67 |

Reference 1. Nominal of thread in brackets should not be used unless it is absolutely necessary.
 2. The shape of nuts, unless otherwise designated, shall be "double chamfered", and the "washer faced" shall be as designated by the purchaser.
 Chamfering for the "washer faced" threads shall be based on the chamfered dimensions for "double chamfered".

*With some of the hexagon bolts and hexagon nuts for M10 and M12 distributed at present, the opposite side S is based on JIS prior to the revision.

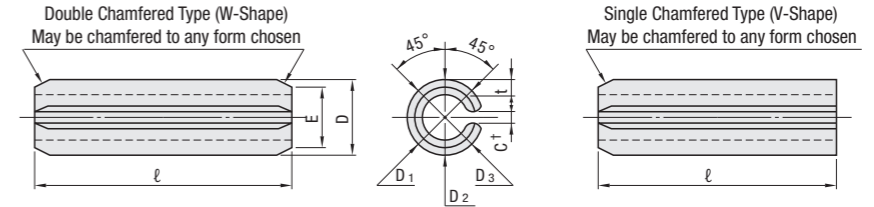
3. Shape and Dimensions of Cotter Pins



| Nominal Diameter | 0.6 | 0.8 | 1 | 1.2 | 1.6 | 2 | 2.5 | 3.2 | 4 | 5 | 6.3 | 8 | 10 | 13 | 16 | 20 | |
|------------------|---------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| d | Reference Dimension | 0.5 | 0.7 | 0.9 | 1 | 1.4 | 1.8 | 2.3 | 2.9 | 3.7 | 4.6 | 5.9 | 7.5 | 9.5 | 12.4 | 15.4 | 19.3 |
| | Tolerance | 0 | | | | | | | | | | | | | | | |
| c | Reference Dimension | 1 | 1.4 | 1.8 | 2 | 2.8 | 3.6 | 4.6 | 5.8 | 7.4 | 9.2 | 11.8 | 15 | 19 | 24.8 | 30.8 | 38.6 |
| | Tolerance | -0.1 | 0 | -0.2 | -0.3 | 0 | -0.4 | 0 | 0 | -0.6 | -0.7 | -0.9 | -1.2 | -1.5 | -1.9 | -2.4 | -3.1 |
| b | Approx. | 2 | 2.4 | 3 | 3 | 3.2 | 4 | 5 | 6.4 | 8 | 10 | 12.6 | 16 | 20 | 26 | 32 | 40 |
| | Over than or Less | 1.6 | 1.6 | 1.6 | 2.5 | 2.5 | 2.5 | 2.5 | 3.2 | 4 | 4 | 4 | 4 | 6.3 | 6.3 | 6.3 | 6.3 |
| a | Over than or Less | 2 | 2.5 | 3.5 | 4.5 | 5.5 | 7 | 9 | 11 | 14 | 20 | 27 | 39 | 56 | 80 | 120 | 170 |
| | Over than or Less | 2.5 | 3.5 | 4.5 | 5.5 | 7 | 9 | 11 | 14 | 20 | 27 | 39 | 56 | 80 | 120 | 170 | - |
| Dia. of Pin Hole | Over than or Less | 2 | 3 | 4 | 5 | 6 | 8 | 9 | 12 | 17 | 23 | 29 | 44 | 69 | 110 | 160 | - |
| | (Reference) | 0.6 | 0.8 | 1 | 1.2 | 1.6 | 2 | 2.5 | 3.2 | 4 | 5 | 6.3 | 8 | 10 | 13 | 16 | 20 |
| l | 4 | | | | | | | | | | | | | | | | |
| | 5 | | | | | | | | | | | | | | | | |
| | 6 | ±0.5 | | | | | | | | | | | | | | | |
| | 8 | | ±0.5 | | | | | | | | | | | | | | |
| | 10 | | | ±0.5 | | | | | | | | | | | | | |
| | 12 | | | | ±0.5 | | | | | | | | | | | | |
| | 14 | | | | | ±0.5 | | | | | | | | | | | |
| | 16 | | | | | | ±0.5 | | | | | | | | | | |
| | 18 | | | | | | | ±0.8 | | | | | | | | | |
| | 20 | | | | | | | | ±0.8 | | | | | | | | |
| | 22 | | | | | | | | | ±0.8 | | | | | | | |
| | 25 | | | | | | | | | | ±0.8 | | | | | | |
| | 28 | | | | | | | | | | | ±0.8 | | | | | |
| | 32 | | | | | | | | | | | | ±1.2 | | | | |
| | 36 | | | | | | | | | | | | | ±1.2 | | | |
| | 40 | | | | | | | | | | | | | | ±1.2 | | |
| | 45 | | | | | | | | | | | | | | | ±1.2 | |
| 50 | | | | | | | | | | | | | | | | ±1.2 | |
| 56 | | | | | | | | | | | | | | | | | ±2 |
| 63 | | | | | | | | | | | | | | | | | |
| 71 | | | | | | | | | | | | | | | | | |
| 80 | | | | | | | | | | | | | | | | | |
| 90 | | | | | | | | | | | | | | | | | |
| 100 | | | | | | | | | | | | | | | | | |
| 112 | | | | | | | | | | | | | | | | | |
| 125 | | | | | | | | | | | | | | | | | |
| 140 | | | | | | | | | | | | | | | | | |
| 160 | | | | | | | | | | | | | | | | | |
| 180 | | | | | | | | | | | | | | | | | |
| 200 | | | | | | | | | | | | | | | | | |
| 224 | | | | | | | | | | | | | | | | | |
| 250 | | | | | | | | | | | | | | | | | |
| 280 | | | | | | | | | | | | | | | | | |

Reference 1. The nominal diameter is dependent on the diameter of the pin hole.
 2. d is a value for a spot somewhere between the end and the l/2 spot.
 3. The end may be pointed or flat. If a pointed end or a flat one is needed, it should be specified.
 4. The length (l) should be one enclosed by thick lines. The value in an enclosed area is a tolerance. If the required r-value is not given in the table, it should be specified by the ordering side.
 5. The head must not tilt excessively from the axial center.

Shape and Dimensions of Spring Pins

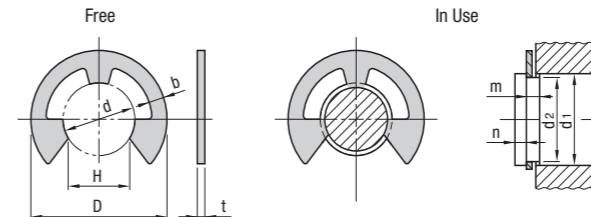


*The size of Gap C should be able to avoid the contact between the spring pin and the hole in which the pin is to be inserted. Unit: mm

| Spring Pins | Nominal Diameter | D(°) | Nominal Diameter | | | | | | | | | | | | | | |
|-------------|------------------------------|-----------------------|------------------|------|-------|-------|-------|-------|-------|-------|-------|--------|--------|--------|--------|--------|---------|
| | | | 1 | 1.2 | 1.4 | 1.5 | 1.6 | 2 | 2.5 | 3 | 4 | 5 | 6 | 8 | 10 | 13 | |
| Spring Pins | D(°) | Max. | 1.2 | 1.4 | 1.6 | 1.7 | 1.8 | 2.25 | 2.75 | 3.25 | 4.4 | 5.4 | 6.4 | 8.6 | 10.6 | 13.7 | |
| | | Min. | 1.1 | 1.3 | 1.5 | 1.6 | 1.7 | 2.15 | 2.65 | 3.15 | 4.2 | 5.2 | 6.2 | 8.3 | 10.3 | 13.4 | |
| | | For General Use | 0.2 | 0.25 | 0.28 | 0.3 | 0.3 | 0.4 | 0.5 | 0.6 | 0.8 | 1 | 1.2 | 1.6 | 2 | 2.5 | |
| | | Light Load (Max.) | 0.1 | 0.12 | 0.15 | 0.15 | 0.15 | 0.2 | 0.25 | 0.3 | 0.4 | 0.5 | 0.6 | - | - | - | |
| Spring Pins | Double Shearing Load kN(kgf) | Min. Value | For General Use | 0.69 | 1.02 | 1.35 | 1.55 | 1.68 | 2.76 | 4.31 | 6.20 | 10.80 | 17.25 | 24.83 | 44.13 | 68.94 | 112.78 |
| | | | Light Load | (70) | (104) | (138) | (158) | (171) | (281) | (440) | (633) | (1130) | (1760) | (2532) | (4500) | (7030) | (11500) |
| | | | For General Use | 0.38 | 0.56 | 0.80 | 0.87 | 0.93 | 1.55 | 2.42 | 3.49 | 6.21 | 9.70 | 13.96 | - | - | - |
| | | | Light Load | (39) | (57) | (82) | (89) | (95) | (158) | (247) | (356) | (633) | (989) | (1424) | - | - | - |
| Spring Pins | Applicable Holes | Dimensional Tolerance | +0.08 | | | +0.09 | | | +0.12 | | | +0.15 | | | +0.2 | | |
| | | | 0 | | | 0 | | | 0 | | | 0 | | 0 | | | |

Note(1): Maximum value for D is the maximum value on the pin's circumference, and the minimum value for D is the average of D1, D2 and D3.
 Reference: t is in accordance with JSMA (Japan Spring Manufacturers Association Standard) No.6.

Shape and Dimensions of Retaining Ring-E Type



Reference: Typical shape is shown.

| Nominal | d(°) | Retaining Rings | | | | | | | | | | Applicable Shaft (Reference) | | | | |
|---------|------|---------------------|-----------|---------------------|-----------|---------------------|-----------|---------------------|-----------|---------|-----------|------------------------------|---------------------|-----------|---------------------|-----------|
| | | Reference Dimension | Tolerance | Reference Dimension | Tolerance | Reference Dimension | Tolerance | Reference Dimension | Tolerance | Approx. | More than | or Less | Reference Dimension | Tolerance | Reference Dimension | Tolerance |
| 0.8 | 0.8 | -0.03 | 2 | ±0.1 | 0.7 | 0.2 | ±0.02 | 0.3 | 1 | 1.4 | 0.8 | -0.05 | 0.3 | - | - | 0.4 |
| 1.2 | 1.2 | -0.03 | 3 | ±0.1 | 1 | 0.3 | ±0.025 | 0.4 | 1.4 | 2 | 1.2 | - | 0.4 | - | - | 0.6 |
| 1.5 | 1.5 | 0 | 4 | ±0.1 | 1.3 | 0.4 | - | 0.6 | 2 | 2.5 | 1.5 | - | 0.5 | +0.05 | - | 0.8 |
| 2 | 2 | 0 | 5 | ±0.1 | 1.7 | 0.4 | ±0.03 | 0.7 | 2.5 | 3.2 | 2 | - | 0.5 | 0 | - | - |
| 2.5 | 2.5 | -0.09 | 6 | ±0.1 | 2.1 | 0.4 | - | 0.8 | 3.2 | 4 | 2.5 | - | 0.5 | 0 | - | 1 |
| 3 | 3 | - | 7 | ±0.1 | 2.6 | 0.6 | - | 0.9 | 4 | 5 | 3 | - | 0.5 | 0 | - | - |
| 4 | 4 | - | 9 | ±0.1 | 3.5 | 0.6 | - | 1.1 | 5 | 7 | 4 | - | 0.5 | 0 | - | - |
| 5 | 5 | -0.12 | 11 | ±0.1 | 4.3 | 0.6 | - | 1.2 | 6 | 8 | 5 | - | 0.5 | 0 | - | - |
| 6 | 6 | - | 12 | ±0.1 | 5.2 | 0.8 | ±0.04 | 1.4 | 7 | 9 | 6 | - | 0.5 | 0 | - | - |
| 7 | 7 | - | 14 | ±0.1 | 6.1 | 0.8 | - | 1.6 | 8 | 11 | 7 | - | 0.5 | 0 | - | - |
| 8 | 8 | - | 16 | ±0.1 | 6.9 | 0.8 | - | 1.8 | 9 | 12 | 8 | - | 0.5 | 0 | - | - |
| 9 | 9 | - | 18 | ±0.1 | 7.8 | 0.8 | - | 2.0 | 10 | 14 | 9 | - | 0.5 | 0 | - | - |
| 10 | 10 | -0.15 | 20 | ±0.1 | 8.7 | 1.0 | ±0.05 | 2.2 | 11 | 15 | 10 | - | 0.5 | 0 | - | - |
| 12 | 12 | 0 | 23 | ±0.1 | 10.4 | 1.0 | - | 2.4 | 13 | 18 | 12 | - | 0.5 | 0 | - | - |
| 15 | 15 | -0.18 | 29 | ±0.1 | 13 | 0 | ±0.06 | 2.8 | 16 | 24 | 15 | - | 0.5 | 0 | - | - |
| 19 | 19 | 0 | 37 | ±0.1 | 16.5 | -0.45 | ±0.06 | 4.0 | 20 | 31 | 19 | - | 0.5 | 0 | - | - |
| 24 | 24 | -0.21 | 44 | ±0.1 | 20.8 | -0.6 | ±0.07 | 5.0 | 25 | 38 | 24 | - | 0.5 | 0 | - | - |

Note(1): d should be measured with a limit plug gauge.
 Note(2): thickness(t)=1.6mm, may be kept at 1.5mm for the time being. m should be 1.65mm.
 Reference: The recommended dimensions of the applicable shaft are given here for reference.