

The old BS970 Parts 1 & 3: 1991 standards have been replaced by a number of EN Standards, the most important of which are shown below

EN10088-3 Replaces BS970 Part 1: 1991 & BS970 Part 3: 1991 covering chemical composition & mechanical properties

EN10058 Tolerances for Hot Rolled Flat Bars

EN10059 Tolerances for Hot Rolled Square Bars

EN10060 Tolerances for Hot Rolled Round Bars

EN10061 Tolerances for Hot Rolled Hexagonal Bars

EN10278 Tolerances for Bright Bars (Drawn, Turned or Ground)

ISO186 Parts 1 & 2 Tolerance Classifications
(see page 4)

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TOLERANCES

~ The ISO tolerances shown are taken from ISO 286.

~ All other tolerances shown in this document are based upon the relevant part's of the applicable EN Standard's.

~ For tolerances on Rolled Edge Flat Bar please refer to separate Datasheet

DIAMETER - SMOOTH TURNED

(These are H10 tolerances, which are 'all minus' tolerances)

| Diameter (mm) | Tolerance (mm) |
|---------------|----------------|
| 18 to 30 | +0 / -0.084 |
| 31 to 50 | +0 / -0.100 |
| 51 to 79 | +0 / -0.120 |

DIAMETER - ROUGH TURNED

(These are 'all plus' tolerances)

| Diameter (mm) | Tolerance (mm) |
|---------------|----------------|
| 75 to 150 | -0 / +1.5 |
| 151 to 225 | -0 / +2.0 |
| 226 to 410 | -0 / +3.0 |

DIAMETER - BRIGHT DRAWN

Note

These are H9 Tolerances

H9 Tolerances are 'all minus' tolerances:

+0mm / - Figure in table

| Diameter (mm) | Tolerance (mm) |
|---------------|----------------|
| 6 to 10 | +0 / -0.036 |
| 11 to 18 | +0 / -0.043 |
| 19 to 30 | +0 / -0.052 |

WIDTH & THICKNESS - HOT ROLLED SQUARE

| Size (mm) | Tolerance (mm) + or - |
|------------|-----------------------|
| 75 to 150 | 1.5 |
| 151 to 225 | 2.0 |
| 226 to 410 | 3.0 |

THICKNESS - HOT ROLLED FLAT

| Size (mm) | Tolerance (mm) + or - |
|-----------|-----------------------|
| Up to 20 | 0.5 |
| 20 to 40 | 1.0 |
| 40 to 80 | 1.5 |

WIDTH - HOT ROLLED FLAT

| Size (mm) | Tolerance (mm) + or - |
|------------|-----------------------|
| 10 to 40 | 0.75 |
| 40 to 80 | 1.0 |
| 80 to 100 | 1.5 |
| 100 to 120 | 2.0 |
| 120 to 150 | 2.5 |

ANGLE BARS - LEG LENGTH

| Leg (mm) | Leg Length Tol (mm) + or - | Thickness (mm) + or - |
|-------------------------|----------------------------|-----------------------|
| 20 | 1.5 | 0.4 |
| 25 | 1.5 | 0.5 |
| 30 | 2.0 | 0.5 |
| 40 & 50 | 2.0 | 0.6 |
| 60, 70, 75, 80, 90, 100 | 3.0 | 0.75 |

ANGLE BARS - INTERNAL RADIUS

| Leg (mm) | Max Internal Radius (mm) |
|----------------|--------------------------|
| 20, 25, 30 | 4 |
| 40 | 5 |
| 50, 60 | 7 |
| 65, 70, 75, 80 | 9 |
| 90, 100 | 10 |

ISO 286 TOLERANCES IN MM

EXAMPLES:

H = All Minus Tolerance e.g. 45mm dia. H9 = +0 / -0.062

J = Tolerance Divided e.g. 45mm dia. J9 = +/- 0.031

K = All Plus Tolerance e.g. 45mm dia. K9 = +0.062/ -0

(The K tolerance is usually only applied to larger diameter bars - over 75mm

H8 = Precision Ground

H9 = Bright Drawn

H10 = Smooth Turned

In the following table:

TOLERANCE IN mm FOR GIVEN TOLERANCE NUMBER

| Diameter (mm) | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| >1 to 3 inc. | 0.007 | 0.009 | 0.014 | 0.025 | 0.040 | 0.060 | 0.090 | 0.140 |
| >3 to 6 inc. | 0.008 | 0.012 | 0.018 | 0.030 | 0.048 | 0.075 | 0.120 | 0.180 |
| >6 to 10 inc. | 0.009 | 0.015 | 0.022 | 0.036 | 0.058 | 0.090 | 0.150 | 0.220 |
| >10 to 18 inc. | 0.011 | 0.018 | 0.027 | 0.043 | 0.070 | 0.110 | 0.180 | 0.270 |
| >18 to 30 inc. | 0.013 | 0.021 | 0.033 | 0.052 | 0.084 | 0.130 | 0.210 | 0.330 |
| >30 to 50 inc. | 0.016 | 0.025 | 0.039 | 0.062 | 0.100 | 0.160 | 0.250 | 0.390 |
| >50 to 80 inc. | 0.019 | - | 0.046 | 0.074 | 0.120 | 0.190 | 0.300 | 0.460 |
| >80 to 120 inc. | 0.022 | - | - | 0.087 | 0.140 | 0.220 | 0.350 | 0.540 |
| >120 to 180 inc. | 0.025 | - | - | 0.100 | 0.160 | 0.250 | 0.400 | 0.630 |
| >180 to 250 inc. | - | - | - | 0.115 | 0.185 | 0.290 | 0.460 | 0.720 |
| >250 to 315 inc. | - | - | - | - | - | 0.320 | 0.520 | 0.810 |
| >315 to 400 inc. | - | - | - | - | - | 0.360 | 0.570 | 0.890 |
| >400 to 500 inc. | - | - | - | - | - | 0.400 | 0.630 | 0.970 |
| > 500 | - | - | - | - | - | 0.440 | 0.700 | 1.100 |

STRAIGHTNESS TOLERANCES FOR BRIGHT BARS

Taken from BS EN 10278:1999, applicable to Bright Bars only.

Method of measuring deviation - Preferred Method B.1 from BS EN 10278:

1. The bar shall be supported on a suitable surface so as to eliminate or minimise sagging.
2. A 1 metre long straight edge shall be placed on the surface of the bar at any position along its length. No part of the straight edge shall be within 150mm of the ends of the bar.
3. Straightness shall be determined by measuring the gap between the bar and the straight edge by suitable means such as a feeler gauge.

The following table indicates:

DEVIATION FROM STRAIGHTNESS

| Product | Dimension | Max Deviation in mm within a 1mtr length measured at least 150mm from either end of bar |
|------------------|-----------------------------|---|
| Round | | 1.0mm |
| Square & Hexagon | < or = 75mm | 1.0mm |
| Square & Hexagon | > 75mm | 1.5mm |
| Flat | Width < 120mm | On Width: 1.5mm |
| Flat | Width < 120mm | On Thickness: 2.0mm |
| Flat | Width > or = 120mm | On Width: 2.0mm |
| Flat | Width/Thickness < 10.1 | On Thickness: 2.5mm |
| Flat | Width > or = 120mm | On Width: 2.5mm |
| Flat | Width/Thickness > or = 10.1 | On Thickness: 3.0mm |

STAINLESS STEEL GRADES

The following Table lists:

Stainless Steel Grades, Compositions & Typical Mechanical Properties

Mechanical Properties apply to Rolled Products

| EN | BS | AISI | EN No. | Comp | Comp | Comp | Comp | Comp | Mech | Mech | Mech |
|--------|--------|-------|--------------|--------------|------|------|------|--------|----------------------|----------------|---------|
| | | | Obsolet e | C | Cr | Ni | Mo | Other | Proof 0.2%N mm | Tensile Nmm | Elong % |
| 1.4000 | 403S17 | 410S | - | 0.08x | 12 | - | - | - | 20-250 | 400-600 | 19 |
| 1.4002 | 405S17 | 405 | - | 0.08x | 12 | - | - | 0.2 Al | 210-250 | 400-600 | 17 |
| 1.4003 | - | - | - | 0.03x | 11 | 0.5 | - | - | 250-320 | 450-650 | 18-20 |
| 1.4016 | 430S17 | 430 | 60 | 0.08x | 17 | - | - | - | 240-280 | 430-630 | 18-20 |
| 1.4113 | 434S17 | 434 | - | 0.08x | 17 | - | 1 | - | 260-280 | 450-630 | 18 |
| 1.4509 | - | - | - | 0.015x | 18 | - | - | Nb, Ti | - | - | - |
| 1.4510 | - | 430Ti | - | 0.05x | 17 | - | - | 0.6 Ti | 230-240 | 420-600 | 23 |
| 1.4511 | - | 430Nb | - | 0.05x | 17 | - | - | 0.6 Nb | 230-240 | 420-600 | 23 |
| 1.4512 | 409S19 | 409 | - | 0.03x | 11 | - | - | 0.5 Ti | 210-220 | 380-560 | 25 |
| 1.4521 | - | (444) | - | 0.025x | 17 | - | 2 | 0.6 Ti | - | - | - |
| 1.4006 | 410S21 | 410 | 56A | .08-.15 | 12 | - | - | - | 400-450 | 550-850 | 12-20 |
| 1.4005 | 416S21 | 416 | 56AM | .08- 0.15 | 12 | - | - | .35xS | 450 | 650-850 | 12 |
| 1.4021 | 420S29 | 420 | 56B | .16-.25 | 12 | - | - | - | 450-550 | 650-950 | 10-15 |
| 1.4028 | 420S45 | 420 | 56D | .26-.35 | 12 | - | - | - | 600 | 740- 1000 | 10-15 |
| 1.4029 | 416S37 | 416 | 56CM | .25-.32 | 12 | - | - | .35xS | - | - | - |
| 1.4057 | 431S29 | 431 | 57 | .12-.22 | 15 | 2 | - | - | - | - | - |
| 1.4104 | 416S29 | 416 | 56BM | .10-.17 | 16 | - | 0.4 | .35xS | 500 | 650-850 | 10 |
| 1.4112 | - | 440B | - | .85-.95 | 17 | - | 1.0 | 0.1V | - | 900max | 12 |
| 1.4125 | - | 440C | - | .95-1.2 | 17 | - | 0.6 | - | - | 900max | 12 |
| 1.4594 | 460S52 | - | - | 0.7x | 14 | 5 | 1.5 | 1.5 Cu | 700- 1000 | 930- 1270 | 10 |
| 1.4749 | - | 446 | - | .15-.20 | 26 | - | - | 0.2N | - | - | - |
| 1.4301 | 304S31 | 304 | 58E | 0.07x | 18 | 8 | - | - | 210-260 | 520-750 | 45 |
| 1.4303 | 305S19 | 305 | - | 0.06x | 18 | 11 | - | - | 200-250 | 500-650 | 45 |
| 1.4305 | 303S31 | 303 | 58M | 0.10x | 18 | 8 | - | 0.35xS | 190-230 | 500-700 | 35 |
| 1.4306 | - | 304L | - | 0.030x | 18 | 10 | - | - | 200-250 | 500-670 | 45 |
| 1.4307 | 304S11 | 304L | - | 0.030x | 18 | 8 | - | - | 200-250 | 500-670 | 45 |
| 1.4310 | 301S21 | 301 | - | 0.05/0. 1 | 17 | 6 | - | - | 250-280 | 600-950 | 40 |

| | | | | | | | | | | | |
|--------|--------|-------|---|--------|----|-----|---|--------|---------|---------|----|
| 1.4311 | 304S61 | 304LN | - | 0.030x | 18 | 9 | - | 0.22xN | 270-320 | 550-750 | 40 |
| 1.4372 | - | 201 | - | 0.15x | 17 | 4.5 | - | 6.5Mn | 330-380 | 750-950 | 40 |

STAINLESS STEEL GRADES - CONT'D

The following Table lists:

Stainless Steel Grades, Compositions & Typical Mechanical Properties

Mechanical Properties apply to Rolled Products

| EN | BS | AISI | EN No | Comp | Comp | Comp | Comp | Comp | Mech | Mech | Mech |
|--------|--------|---------|--------------|--------|------|------|------|--------|----------------------|----------------|---------|
| | | | Obsolet e | C | Cr | Ni | Mo | Other | Proof 0.2% Nmm | Tensile Nmm | Elong % |
| 1.4401 | 316S31 | 316 | 58J | 0.07x | 17 | 11 | 2 | - | 220-270 | 520-680 | 40 |
| 1.4404 | 316S11 | 316L | - | 0.030x | 17 | 11 | 2 | - | 220-270 | 520-680 | 40 |
| 1.4406 | 316S61 | 316LN | - | 0.030x | 17 | 11 | 2 | 0.22xN | 280-330 | 580-780 | 40 |
| 1.4432 | 316S13 | 316L | - | 0.030x | 17 | 11 | 2.5 | - | 220-270 | 520-700 | 40 |
| 1.4435 | 316S13 | 316L | - | 0.030x | 17 | 13 | 2.5 | - | 220-270 | 520-700 | 40 |
| 1.4436 | 316S33 | 316 | 58J | 0.05 | 17 | 11 | 2.5 | - | 220-270 | 500-730 | 40 |
| 1.4438 | 317S12 | 317L | - | 0.030x | 18 | 13 | 3 | - | 220-270 | 520-720 | 35 |
| 1.4439 | - | - | - | 0.030x | 17 | 13 | 4 | 0.22xN | 270-320 | 580-780 | 35 |
| 1.4541 | 321S31 | 321 | 58B | 0.08x | 18 | 9 | - | 0.5Ti | 200-250 | 500-720 | 40 |
| 1.4550 | 347S31 | 347 | 58F | 0.08x | 18 | 9 | - | 0.5Nb | 200-250 | 500-720 | 40 |
| 1.4571 | 320S31 | (316Ti) | - | 0.08x | 17 | 11 | 2 | 0.5Ti | 220-270 | 520-690 | 40 |
| 1.4539 | 904S13 | - | - | 0.020x | 19 | 24 | 4 | 2xCu | 220-270 | 520-730 | 35 |
| 1.4547 | - | - | - | 0.020x | 20 | 18 | 6 | 1xCu | 300-350 | 650-850 | 35 |
| 1.4833 | 309S16 | 309 | - | 0.15x | 22 | 12 | - | - | | | |
| 1.4845 | 310S24 | 310 | - | 0.10x | 25 | 20 | - | - | | | |
| 1.4878 | 321S51 | 321H | - | 0.10x | 18 | 9 | - | 0.6Ti | | | |

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REVISION HISTORY

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|-------------------|--------------|
| Datasheet Updated | 18 July 2019 |
|-------------------|--------------|

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