

Stainless Steel Data

Designation System for Stainless Steel (ISO 3506 1979)

| Composition Groups | Austenitic | | | Ferritic | | Martensitic | | |
|--------------------------------|------------|-------------|---------------|----------|-------------|-------------|-----------------------|-----------------------|
| Identification of Steel Grades | A1, A2, A4 | | | F1 | | C1, C4 | | C3 |
| Property Class | 50 | 70 | 80 | 45 | 60 | 50 | 70 | 80 |
| | Soft | Cold-Worked | High-Strength | Soft | Cold-Worked | Soft | Hardened and Tempered | Hardened and Tempered |

Stainless Steel Properties

Extract from DIN 267 Part 11 - Chemical Composition of austenitic chromium-nickels steels in % by weight

| Austenitic Grade | Material No. to AISI | C | Si | Mn | P | S | Cr | Mo | Ni |
|------------------|----------------------|------|-----|-----|------|--------------|--------------|------------|--------------|
| A1 | 303 | 0.12 | 1.0 | 2.0 | 0.20 | 0.15 to 0.35 | 17.0 to 19.0 | 0.6 | 8.0 to 10.0 |
| A2 | 304 | 0.08 | 1.0 | 2.0 | 0.05 | 0.03 | 17.0 to 20.0 | - | 8.0 to 13.0 |
| A4 | 316 | 0.08 | 1.0 | 2.0 | 0.05 | 0.03 | 16.0 to 18.5 | 2.0 to 3.0 | 10.0 to 14.4 |

- Maximum values unless otherwise stated.
- Types A2 and A4 may contain up to a maximum of 4% copper.
- The selection of steel grades within a group is the prerogative of the manufacturer, unless the purchaser has specified particular steels to ISO or national standards.
- Different grades of steel may be used as long as all physical and mechanical properties and the corresponding corrosion resistance of the finished product are achieved. Only when all these conditions are fulfilled may finished articles be marked in accordance with DIN 267 Part 11.

- All information is strictly informative.
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**Mechanical Properties-Austenitic Grades
Bolts, Screws and Studs**

| Grade | Property Class | Tensile Strength Rm MPa (N/mm ²) minimum | Yield Stress R _p 0.2 Mpa (N/mm ²) minimum | Elongation A _L Minimum | Proof Load Stress Sp Mpa (N/mm ²) minimum | Diameter Range |
|-----------|----------------|--|--|-----------------------------------|---|----------------|
| A2 and A4 | 70 | 700 | 450 | 0.4d | 700 | =<M20 |
| | 80 | 800 | 600 | 0.3d | 800 | =<M20 |

**Comparison: US and ISO (DIN) Stainless Steels
Tensile Load**

| A2 and A4 as compared to 304 and 316 | Percent difference from US - Stainless Steel |
|--------------------------------------|--|
| up to M20 | 44% higher |
| M22 and over | 6% lower |

**Selection of Diameters
Tightening Torques, Loads**

Guideline values for screws in steel groups A2-70 and A4-70 with standard metric threads to DIN 13

| Diameter | Load ¹⁾ Force at 0.2% yield point N | Initial Stressing Force N | Tightening Torque Nm | Force in service N | | |
|----------|--|---------------------------|----------------------|--------------------|---------------|--------------------------|
| | | | | Axial Static | Axial Dynamic | Radial Static or Dynamic |
| M3 | 2250 | 1420 | 0.9 | 610 | 360 | 120 |
| M4 | 3960 | 2490 | 2.2 | 1070 | 640 | 210 |
| M5 | 6390 | 4030 | 4.3 | 1730 | 1040 | 350 |
| M6 | 9040 | 5700 | 7.3 | 2440 | 1470 | 490 |
| M8 | 16470 | 10380 | 17.7 | 4450 | 2670 | 890 |
| M10 | 26100 | 16440 | 35.5 | 7050 | 4230 | 1410 |
| M12 | 37930 | 23900 | 61.3 | 10240 | 6150 | 2050 |
| M16 | 70650 | 44510 | 147.1 | 19080 | 11450 | 3820 |
| M20 | 110250 | 69460 | 285.1 | 29770 | 17860 | 5950 |

1)The values correspond to 100% of the 0.2%

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Notes on application:

- When selecting the correct screw diameter it should be ensured that the total load on the screw does not exceed 90% of the standardized 0.2% yield stress. Care should be taken to ensure correct initial tensioning, with a torque wrench wherever possible.
- Experience has shown that a utilization of 70% of the total load is reasonable average for the initial stressing force to allow additional forces in service to be taken up.

The table above is only intended as an aid for quick comparison

Comparative International Stainless Steel Grades

| British | French | German | Italian | Japanese | Swedish | USA |
|------------------|-------------|------------------|----------------------------------|----------|----------------------|------|
| 304S21 | Z12CN17.08 | 1.4310 | X12CrNi 17 07 | SUS301 | 14 23 31 | 301 |
| 304S31 | | | | SUS302 | 14 23 32 | 302 |
| 304S15 304S16 | Z8CN18.09 | 1.4301 | X5CrNi 18 10 | SUS301 | 14 23 33 | 304 |
| 304S11 | Z2CN18.10 | 1.4306 | X2CrNi 18 11 | SUS304L | 14 23 52 | 304L |
| 305S19 | Z8CN18.12 | | X8CrNi 18 12 | SUS305 | | 305 |
| 309S24 | Z15CN24.13 | | X16CrNi 23 14 | SUS309 | | 309 |
| 310S24 | Z12CN25.20 | 1.4845 | Z22CrNi 25 20 | SUS310S | 14 23 61 | 310 |
| 315S16 | | | | | 14 23 40 | |
| 316S31 316S33 | Z6CND17.11 | 1.4401 1.4436 | X8CrNiMo 17 13 | SUS316 | 14 23 43 14 23 47 | 316 |
| 316S11 316S13 | Z2CND17.12 | 1.4404 1.4435 | X2CrNiMo 17 12 | SUS316L | 14 23 53 14 23 48 | 316L |
| 317S12 | Z2CND19.15 | 1.4435 | X2CrNiMo 18 16 | SUS317L | 14 23 67 | 317L |
| 317S16 | | 1.4436 | | SUS317 | 14 23 66 | 317 |
| 320S31 320S33 | Z8CND17.12 | 1.4571 1.4573 | | | 14 23 50 | |
| 321S31 | Z6CNT18.12 | 1.4541 | X6CrNiTi 18 11 | SUS321 | 14 23 37 | 321 |
| 347S31 | Z6CNNb18.11 | 1.4558 | X6CrNiNb 18 11 X8CrNiNb 18 11 | SUS347 | 14 23 38 | 347 |
| 403S17 | Z6C13 | 1.4000 | X6Cr13 | SUS403 | 14 23 01 | 403 |
| 405S17 | Z6CA13 | 1.4002 | Z6CrA1 13 | SUS405 | | 405 |
| 409S19 | | 1.4512 | | | | 409 |
| 430S17 | Z8C17 | 1.4016 | X8Cr 17 | SUS430 | 14 23 20 | 430 |
| 434S17 | Z8CD17.01 | 1.4113 | X8CrMo 17 | SUS434 | 14 23 25 | 434 |

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| | | | | | | |
|--------|--------|------------------|----------|----------|----------|-----|
| 410S21 | Z12C13 | 1.4006 1.4024 | X12Cr 13 | SUS410 | 13 23 02 | 410 |
| 410S45 | Z30C13 | | X30Cr 13 | SUS420JS | 14 23 04 | 420 |

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