| Abbreviation | EN Norm | ASTM / AISI | AFNOR | DIN Abbreviation | ISO | Other |
|---|---|---|---|---|---|---|
| X12CrS13 | 1.4005 | 416 | Z11CF13 | 1.4005 | | |

## 1.4005 Wire

Chemical analysis by European norm EN 10088-1, in mass percent.

| C | Si | Mn | P | S | Cr | Mo | Fe |
|---|---|---|---|---|---|---|---|
| 0.08-0.15 | ≤ 1.00 | ≤ 1.50 | 0.040 | 0.15-0.35 | 12.0-14.0 | ≤ 0.60 | Remainder |

**Diameter** 0.02 – 4.00 mm

**Application**
1.4005 is categorized as stainless, martensitic steel. Due to its high sulfur content, it is particularly suitable for machining. The material is usually processed into wire after annealing and cold-twisting. 1.4005 is mainly used in turbine, motor and pump manufacture, in the form of screws, bolts, shafts, and valves, etc.

**Resistance to Corrosion**
Out of all stainless steels, 1.4005 is the least resistant to corrosion. It possesses corrosion resistance to humidity, but the large sulfur content lowers its resistance to pitting in halogen-containing mediums.

**Weldability**
Welding should be avoided, as with all martensitic steels, due to the danger of hardening cracks forming.

**Thermal Treatment**
Soft annealing is carried out at 750 – 820°C, followed by slow cooling. 1.4005 is tempered at 950 – 1000°C and subsequently quenched in oil, polymer or air. After being hardened, the steel is tempered at 660 – 680°C. Stress-relief heat treatment is performed at 210 – 250°C.

**Surface Finish**

| | | |
|---|---|---|
| Drawn | Chemically purged | 0.020 – 3.499 mm |
| Surface Ground | Chemically purged | 3.500 – 4.000 mm |

**Delivery mode**

As a ring

On assorted spools

Straightened

Axles

---

**Diameter tolerances**

| Diameter (mm) | Tolerance (%) | Tolerance (µ) |
|---|---|---|
| 0.020 – 0.249 | | ± 1.0 |
| 0.250 – 0.399 | | ± 1.5 |
| 0.400 – 1.500 | | ± 2.0 |
| 1.500 – 4.000 | | ± 2.5 |

---

**Mechanical Properties**

| Condition at delivery (mm) | Ultimate Tensile Strength in cold-twisted delivery condition ($N/mm^2$) |
|---|---|
| 0.005 – 0.019 | |
| 0.020 – 0.199 | |
| 0.200 – 0.499 | Max. 1100 (depends on diameter) |
| 0.500 – 0.999 | |
| 1.000 – 1.999 | |
| 2.000 – 4.000 | |

---

**Physical Properties**

| | | | |
|---|---|---|---|
| Density | | 7.70 | $g/cm^3$ |
| Coefficient of Thermal Expansion | 20 ºC – 200 ºC | 11.50 | $10^{-6}/K$ |
| Specific Heat Capacity | 20 ºC | 460.00 | J/kgK |
| Thermal Conductivity | 20 ºC | 30.00 | W/mK |
| Specific Electric Resistance | 20 ºC | 0.60 | $\Omega\ mm^2/m$ |
| Young's Modulus | 20 ºC | 215.00 | GPa |