



Stainless Steel 301

Description

SUS301 is a metastable austenitic stainless steel that cannot be strengthened by heat treatment but exhibits the strongest cold work hardening capability among stainless steels. Through cold rolling, its tensile strength can be increased from 520 MPa in the annealed state to over 1500 MPa in the SH state, with hardness rising from HV 200 to over HV 550. This unique property makes it the preferred material for manufacturing high-strength springs, elastic components, and precision instrument parts. Compared to SUS304, SUS301 has a lower nickel content, lower cost, and higher strength, but slightly inferior corrosion resistance and weldability. When using this material, it should be noted that cold working introduces magnetism, and machining can be difficult.



SUS301 Austenitic Stainless Steel Material

Data Sheet

1. Designation System and Standard

| Items | Contents |
|----------------------------|--|
| Japanese Standard | JIS G4304 (hot-rolled steel plate), JIS G4305 (cold-rolled steel plate) |
| Designation meaning | SU-Stainless Steel + S-Steel + 301-AISI designation |
| Corresponding designations | Chinese Standard: 12Cr17Ni7/U.S. Standard: 301/German Standard: 1.4310/European Standard: X5CrNi17-7 |
| Former designation | 1Cr17Ni7 (Obsolete) |
| Material type | Metastable austenitic stainless steel, readily strengthened by cold deformation |

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2. Chemical Composition (%)

| Elements | C | Si | Mn | P | S | Cr | Ni | Note |
|----------------|-----------|-----------|-------|--------|--------|-------------------|-------------|--------------------------------------|
| Content | ≤0.1 5 | ≤1.0 0 | ≤2.00 | ≤0.045 | ≤0.030 | 16.0 ~18. 0 | 6.0~ 8.0 | Low carbon, high chromium and nickel |

Key Characteristics: Nickel content of 6–8% (lower than 304 steel's 8–10.5%) and chromium content of 16–18% make SUS301 more prone to martensitic transformation during cold working, resulting in a significant increase in strength.



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3. Physical Properties

| Performance parameters | Value | Unit | Note |
|----------------------------------|--|-----------------------|--|
| Density | 7.93 | g/cm ³ | Density of standard austenitic stainless steel |
| Melting range | 1398~1420 | °C | |
| Elastic modulus | 193 | GPa | 20°C |
| Poisson's ratio | 0.29 | — | |
| Coefficient of Thermal Expansion | 16.0~18.7 | ×10 ⁻⁶ /°C | 0~100°C to 0~500°C |
| Thermal Conductivity | 12.1~21.5 | W/(m·K) | 20°C to 500°C |
| Specific heat capacity | 0.50 | kJ/(kg·K) | 0~100°C |
| Resistivity | 0.73 | μΩ·m | 20°C |
| Magnetic | Non-magnetic in the annealed state → magnetic after cold working | — | Cold working induces martensitic transformation, resulting in magnetic properties. |

4. Mechanical Properties (Annealed State)

| State | Yield strength Rp0.2 (MPa) | Tensile strength Rm (MPa) | Elongation A (%) | Hardness HV | Note |
|-------------------------|----------------------------|---------------------------|------------------|-------------|----------------------------------|
| Annealed state (O) | ≥205 | ≥520 | ≥40 | ≤200 | Fully softened, highly formable. |
| Typical measured values | 240~260 | 550~620 | 45~55 | 180~200 | Superior to standard values |

Key characteristic: Even in the annealed state, its strength is higher than that of 304 stainless steel, and it exhibits an exceptionally rapid rate of cold work hardening.



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5. Cold-Work Hardened States (Key Characteristics)

The most distinctive feature of SUS301 is its ability to achieve exceptionally high strength and hardness through cold rolling. Its hardness levels are classified as follows:

| Hardness grade | Vickers hardness HV | Tensile strength Rm (MPa) | Yield strength Rp0.2 (MPa) | Elongation A (%) | Applications |
|-----------------|---------------------|---------------------------|----------------------------|------------------|---------------------------------------|
| 1/4H | 250~300 | ≥750 | ≥450 | ≥25 | Lightly strengthened, general forming |
| 1/2H | 310~360 | ≥930 | ≥510 | ≥18 | Medium strength, spring leaf |
| 3/4H | 370~420 | ≥1130 | ≥745 | ≥12 | High strength, elastic components |
| H (full hard) | 430~480 | ≥1275 | ≥930 | ≥8 | High elasticity, precision springs |
| EH (extra hard) | 490~540 | ≥1420 | ≥1130 | ≥5 | Very high strength, special springs |



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| Hardness grade | Vickers hardness HV | Tensile strength Rm (MPa) | Yield strength Rp0.2 (MPa) | Elongation A (%) | Applications |
|-----------------|---------------------|---------------------------|----------------------------|------------------|--------------------------------------|
| SH (super hard) | ≥530~550 | ≥1500 | ≥1275 | ≥3 | Maximum strength, elastic components |

Hardening mechanism: During cold working, austenite transforms into martensite, resulting in the dual effects of phase transformation strengthening and work hardening.



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6. Process Performance

| Items | Performance classification | Description |
|------------------------------|----------------------------------|---|
| Cold formability | ★★★★★ Excellent (annealed state) | Excellent ductility in annealed state, suitable for deep drawing and bending |
| Cold work hardening capacity | ★★★★★ Excellent | Strongest hardening effect among stainless steels, strength can be increased by 3 times |
| Weldability | ★★★★☆ Good | Requires controlled heat input, annealing recommended after welding |
| Machinability | ★★☆☆☆ Poor | Severe work hardening, requires sharp cutting tools |
| Corrosion resistance | ★★★★☆ Good | Slightly lower than 304 steel, but still resistant to atmosphere and mild corrosive media |
| Heat resistance | ★★★☆☆ Moderate | Long-term service temperature $\leq 300^{\circ}\text{C}$ |
| Heat treatment | — | Not heat-treatable, only solution treatment + cold work hardening are applicable |



7. Characteristics and Applications

| Core characteristics | Typical applications |
|---|---|
| Ultra-high strength after cold working (≥ 1500 MPa at SH state) | Precision springs, power springs, elastic washers |
| High elastic modulus (193 GPa) | Spring leaves, diaphragms, bellows, pressure sensors |
| Magnetic after cold working | Electromagnetic components, relay armatures |
| Excellent fatigue resistance | Automotive seatbelt retractors, engine springs |
| High surface quality | Mobile phone antennas, electronic connectors, precision instruments |
| Lower cost compared to 304 steel | Substitute for 304 steel in high-strength applications |

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8. Cross reference of Domestic and International Designations

| Standard system | Designation | Standard No. | Note |
|-------------------|----------------------|-----------------|------------------|
| Chinese standard | 12Cr17Ni7 | GB/T 20878 | New designation |
| U.S. standard | 301 | ASTM A240 | UNS S30100 |
| Japanese standard | SUS301 | JIS G4304/G4305 | Primary standard |
| German standard | 1.4310 / X10CrNi18-8 | DIN 17440 | |
| European standard | X5CrNi17-7 / 1.4310 | EN 10088 | |