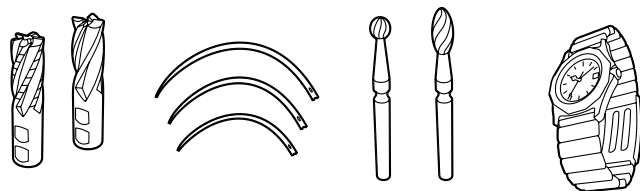


Zapp is Certified to ISO 9001



Grade Ergste® 1.4197YU

Ergste® 1.4197YU is a sulfur-alloyed martensitic stainless steel with 13 % chromium content and high corrosion resistance. Due to the addition of sulfur machinability is improved. Furthermore, the element molybdenum induces a higher corrosion resistance in comparison with Ergste® 1.4035YU. In conducting an appropriate heat treatment, a maximum hardness of 53 HRC* can be achieved.

Typical Fields of Application

- Dental Instruments, e.g. Milling Cutters, Drills
- Surgical Instruments e.g. Cutting Tools
- Surgical Needles
- Watchmaking industry

Weldability

Weldability of Ergste® 1.4197YU is possible to a limited extent.

Solderability

Soft-soldering is possible.

Magnetism

Ergste® 1.4197YU is magnetizable.

Cold Working

In the soft-annealed condition.

Machining

Best results can be achieved in a slightly cold-worked condition ($800 \leq TS \leq 950$ MPa).

* Maximum hardness achievable under ideal hardening conditions

Corresponding Standards

- X20CrNiMoS13-1
- 420F Mod acc. to ASTM F899

Typical Chemical Composition*

| C | Si | Mn | Cr | Mo | S | Ni |
|------|------|------|-------|------|------|------|
| 0.23 | 0.50 | 1.00 | 14.00 | 1.30 | 0.21 | 1.10 |

* Average in mass-%

Mechanical Properties (Soft-Annealed)

| | | |
|---------------------|-------|--------------------|
| Tensile Strength TS | [MPa] | 650 - 850 |
| Yield Strength YS | [MPa] | min. 400 |
| Elongation A5 | [%] | max. 25 |
| Hardness HB | | max. 262 |
| Structure | | Ferrite + Carbides |

Mechanical Properties (Cold-Worked)

| | | |
|---------------------|-------|-------------|
| Tensile Strength TS | [MPa] | 800 - 1,050 |
| Yield Strength YS | [MPa] | max. 800 |

Physical Properties

| | | |
|----------------------------------|--------------------------------------|------|
| Modulus of Elasticity E 20°C | [GPa] | 215 |
| Specific Gravity | [kg/dm³] | 7.7 |
| Thermal Conductivity 20°C | [W/m K] | 30 |
| Coefficient of Thermal Expansion | [10 ⁻⁶ /K ⁻¹] | |
| 20 - 100 °C | | 10.5 |
| 20 - 200 °C | | 11.0 |
| 20 - 300 °C | | 11.5 |
| 20 - 400 °C | | 12.0 |
| Specific Heat 20°C | [kJ/kg K] | 0.46 |
| Electric Resistivity 20°C | [Ω mm²/m] | 0.55 |

Hot Working

Forging temperature is 800 – 1,050 °C (1,470 – 1,920 °F).

Heat slowly and gradually to approx. 800 °C (1,470 °F).

Afterwards heat to the required forging temperature.

Cool slowly after forging (e.g. in furnace).

Heat Treatment

Soft Annealing

Temperature: approx. 700 °C (approx. 1,292 °F)

Holding time: 2 - 4 h

Cooling: furnace

Hardening

Temperature: 1,025 – 1,100 °C (1,875 – 2,010 °F)

Holding time: approx. 0.5 h (depending on cross-section)

Cooling: inert gas, oil

Tempering

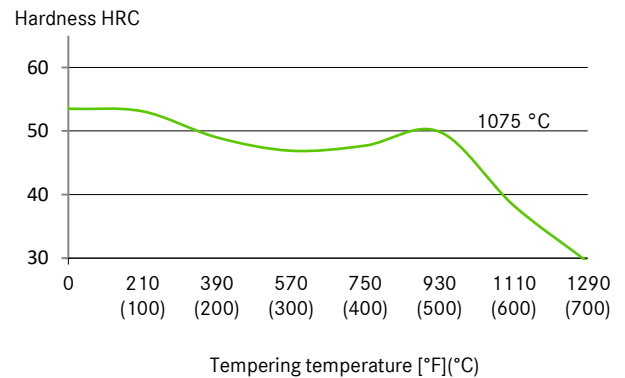
Temperature: 100 - 300 °C (210 - 570 °F)

Holding time: approx. 1 h (depending on cross-section)

Cooling: air

Due to the 475 °C (885 °F) embrittlement tempering in this range should be avoided.

Tempering Chart



According to the required hardness and the actual dimension the hardening and tempering temperature have to be selected from the respective ranges.

Corrosion Resistance

The optimum corrosion resistance can be achieved in the hardened and tempered condition. The best precondition to accomplish the optimum corrosion resistance is electronic polishing followed by passivation treatment. In this condition Ergste® 1.4197YU is resistant against water and water vapour. Due to the higher molybdenum content Ergste® 1.4197YU shows a higher corrosion resistance in comparison with Ergste® 1.4035YU.

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