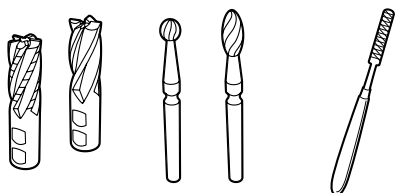


Ergste® 1.4542GE/GG Datasheet

Medical Alloys



Zapp is Certified According to ISO 9001



Grade Ergste® 1.4542GE/GG

Ergste® 1.4542GE/GG is a martensitic precipitation hardenable 17% chromium-nickel-steel. It combines high strength and toughness with excellent corrosion resistance as well as good machinability. In conducting an appropriate heat treatment a maximum hardness of 44 HRC* can be achieved.

As an alternative to the conventionally melted Ergste® 1.4542GG, Ergste® 1.4542GE is available, which is produced by the electro slag remelting (ESR) technique. Hereby the microslag inclusion rate improves significantly.

Typical Fields of Application

- Surgical Instruments
- Cutting Tools, e.g. Rasps
- Medical Screwdrivers
- Dental Instruments, e.g. Burrs

Weldability

Ergste® 1.4542GE/GG shows good weldability with all electric welding methods including resistance welding. In case high toughness is required, bare wire welding within an inert gas atmosphere (TIG) is preferable.

Polishability

Ergste® 1.4542GE/GG is polishable.

Magnetism

Ergste® 1.4542GE/GG is magnetizable.

* Maximum hardness achievable under ideal hardening conditions

Corresponding Standards

- 1.4542 (X5CrNiCuNb16-4) acc. to DIN EN 10088-3
- 1.4542 (X5CrNiCuNb16-4) acc. to NF S 94-090
- AISI 630 (UNS S17400) acc. ASTM F899 and A564

Typical Chemical Composition *

| C | Mn | Cr | Ni | Cu | Nb | S |
|-------|------|-------|------|------|------|-------|
| 0.035 | 0.35 | 17.00 | 4.00 | 4.00 | 0.23 | 0.015 |

* Average in mass-%

Mechanical Properties Acc. to ASTM A564/ A564M

| Condition | Tensile Strength TS [ksi] | Yield Strength YS [ksi] | Elongation [%] | Reduction of Area [%] | Hardness HRC/HB min. |
|-----------|---------------------------|-------------------------|----------------|-----------------------|----------------------|
| A | - | - | - | - | max. 38 / 363 |
| H900 | ≥ 190 | ≥ 170 | ≥ 10 | ≥ 40 | 40 / 388 |
| H925 | ≥ 170 | ≥ 155 | ≥ 10 | ≥ 44 | 38 / 375 |
| H1025 | ≥ 155 | ≥ 145 | ≥ 12 | ≥ 45 | 35 / 331 |
| H1075 | ≥ 145 | ≥ 125 | ≥ 13 | ≥ 45 | 32 / 311 |
| H1100 | ≥ 140 | ≥ 115 | ≥ 14 | ≥ 45 | 31 / 302 |
| H1150 | ≥ 135 | ≥ 105 | ≥ 16 | ≥ 50 | 28 / 277 |
| H1150M | ≥ 115 | ≥ 75 | ≥ 18 | ≥ 55 | 24 / 255 |
| H1150D | ≥ 125 | ≥ 105 | ≥ 16 | ≥ 50 | 24 / 255 |

Physical Properties

| | | |
|----------------------------------|--------------------------------|--------|
| Modulus of Elasticity E 70 °F | [ksi] | 29,008 |
| Specific Density | [lb/in ³] | 0.2818 |
| Thermal Conductivity 70 °F | [Btu in/hr ft ² °F] | 124.1 |
| Coefficient of Thermal Expansion | [µin/in °F] | |
| 70 - 210 °F | | 6.0 |
| 70 - 390 °F | | 6.0 |
| 70 - 570 °F | | 6.2 |
| 70 - 750 °F | | 6.3 |
| Specific Heat 70 °F | [Btu/lb °F] | 0.14 |
| Electric Resistivity 70 °F | [Ω circular-mil/ft] | 589.5 |

Cold Working

For massive cold working the solution annealed condition (Condition A) should be ordered.

Machining

Ergste® 1.4542GE/GG can be satisfactorily machined in the solution annealed as well as in the hardened condition resulting in a good surface.

Hot Working

Forging temperature is 1,650 – 2,190 °F.
Heat slowly and gradually to approx. 1,470 °F.
Afterwards heat to the required forging temperature.
Holding time is approx. 5 min. / 10 mm wall thickness.
Cool slowly after forging (e.g. in furnace or in dry ashes).

Heat Treatment

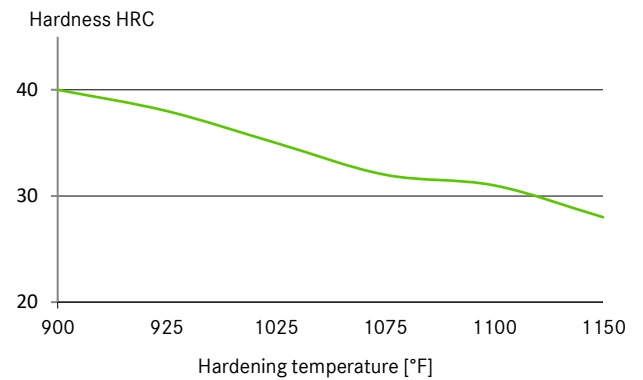
Solution Annealing

Temperature: 1,900 ± 25 °F
Cooling: rapid cooling to below 90 °F

Precipitation Hardening

Temperature: 900 – 1,150 °F
Holding time: 1 - 4 h (depending on cross-section)
Cooling : air
Precipitation hardening should be carried out under protective gas or vacuum. To reduce the risk of stress cracking the period between solution treatment and age-hardening should be short.

Hardening Chart



Corrosion Resistance

Corrosion resistance is comparable to austenitic grades (e.g. 1.4301); in some cases, due to the high copper content, even better. The special microstructure prevents the risk of intergranular corrosion. Furthermore, Ergste® 1.4542GE/GG in the precipitation hardened condition is resistant against corrosion fatigue and stress cracking corrosion. To achieve this, the precipitation hardening temperature has to be at 1150 °F. At that precipitation hardening temperature Ergste® 1.4542GE/GG is also resistant against stress cracking corrosion in sea water as well as industrial atmosphere.

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