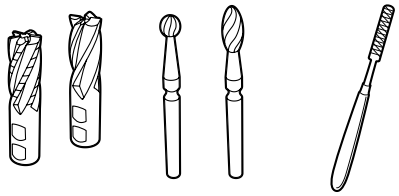
Ergste® 1.4542GE/GG Data Sheet
Medical Alloys

Zapp is certified according to ISO 9001



Grade Ergste® 1.4542GE/GG

Ergste® 1.4542GE/GG is a martensitic precipitation hardenable 16% 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	16.00	4.00	4.00	0.23	**0.015**

* Average in mass-%

Mechanical Properties acc. to ASTM A564/ A564M

Condition	Tensile Strength TS [MPa]	Yield Strength YS [MPa]	Elongation [%]	Reduction of Area [%]	Hardness HRC/HB min.
A	-	-	-	-	max. 38 / 363
H900	≥ 1310	≥ 1170	≥ 10	≥ 40	40 / 388
H925	≥ 1170	≥ 1070	≥ 10	≥ 44	38 / 375
H1025	≥ 1070	≥ 1000	≥ 12	≥ 45	35 / 331
H1075	≥ 1000	≥ 860	≥ 13	≥ 45	32/ 311
H1100	≥ 965	≥ 795	≥ 14	≥ 45	31 /302
H1150	≥ 930	≥ 725	≥ 16	≥ 50	28 / 277
H1150M	≥ 795	≥ 520	≥ 18	≥ 55	24 / 255
H1150D	≥ 860	≥ 725	≥ 16	≥ 50	24 / 255

Physical Properties

Modulus of Elasticity E 20°C	[GPa]	200
Specific Gravity	[kg/dm³]	7.8
Thermal Conductivity 20°C	[W/m K]	17.9
Mean Coefficient of Thermal Expansion	[10^{-6}/K^{-1}]	
20 - 100 °C		10.8
20 - 200 °C		10.8
20 - 300 °C		11.2
20 - 400 °C		11.3
Specific Heat 20°C	[kJ/kg K]	0.46
Electric Resistivity 20°C	[Ω mm²/m]	0.98

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.

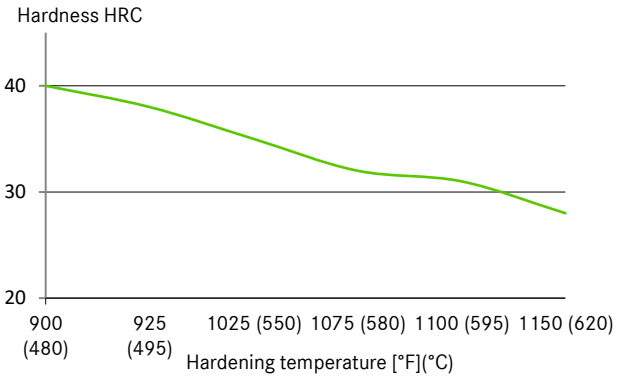
Hot working
Forging temperature is 1650 - 2190 °F (900 - 1200 °C). Heat slowly and gradually to approx. 1470 °F (800 °C). Afterwards heat to the required forging temperature. Holding time is approx. 5 min. / 10 mm wall thickness. Cool slowly after forging (e.g. in furnace or in dry ashes).

Heat treatment

Solution annealing
Temperature: 1900 ± 25 °F (1040 ± 15 °C)
Cooling: rapid cooling to below 90 °F (32 °C)

Precipitation hardening
Temperature: 900 - 1150 °F (480 - 620 °C)
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 (620 °C). 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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