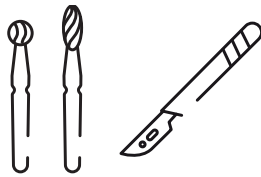


Zapp® 1.4542 GE/GG Datasheet

Medical Alloys



Zapp is certified according to ISO 9001



Grade Zapp® 1.4542 GE/GG

Zapp® 1.4542 GE/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 Zapp® 1.4542 GG, Zapp® 1.4542 GE 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

Zapp® 1.4542 GE/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

Zapp® 1.4542 GE/GG is polishable.

Magnetism

Zapp® 1.4542 GE/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]	Elonga- tion [%]	Reduc- tion 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/in³]	0.2818
Thermal Conductivity 70 °F	[Btu in/hr ft² °F]	124.1
Coefficient of Thermal Expansion 70 - 210 °F 70 - 390 °F 70 - 570 °F 70 - 750 °F	[µin/in °F]	6.0 6.0 6.2 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

Zapp® 1.4542 GE/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

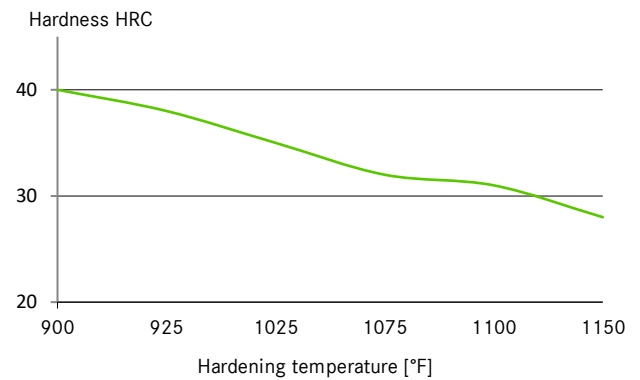
Solution Annealing

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, Zapp® 1.4542 GE/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 Zapp® 1.4542 GE/GG is also resistant against stress cracking corrosion in sea water as well as industrial atmosphere.

MEDICAL ALLOYS

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Further information regarding our products and locations are available in our image brochure and under www.zapp.com

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