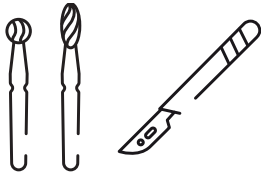


Zapp is certified according to ISO 9001



Grade Zapp® 9.9440 YA

Zapp® 9.9440 YA is a martensitic stainless steel with 17 % chromium content and a high wear resistance. In conducting an appropriate heat treatment a maximum hardness of 58 HRC* can be achieved. The best corrosion resistance is achieved in the hardened condition with a metallic bright surface.

Typical Fields of Application

- Surgical Instruments
- Dental Instruments, e.g. Curettes, Probes
- Cutting Tools

Wear Resistance

In addition to the base wear resistance in the hardened condition due to the martensitic structure, special Cr- and Mo-Carbides increase the wear resistance even further.

Weldability

Usually, Zapp® 9.9440 YA is not used for welding. In exceptional cases, welding method and component preparation are decisive.

Polishability

Zapp® 9.9440 YA is conditionally polishable.

Magnetism

Zapp® 9.9440 YA is magnetizable.

Cold Working

Zapp® 9.9440 YA can be moderately cold worked in the soft-annealed condition.

* Maximum hardness achievable under ideal hardening conditions

Corresponding Standards

- AISI 440A (UNS S44002) acc. to ASTM F 899
- Reference letter S acc. to EN ISO 7153-1

Typical Chemical Composition *

C	Si	Mn	Cr	P	S
0.68	0.50	0.50	17.00	0.02	0.015

* Average in mass-%

Mechanical Properties (Soft-Annealed)

Tensile Strength TS	[ksi]	108.8 – 130.5
Yield Strength YS	[ksi]	min. 43.5
Elongation A5	[%]	min. 15
Hardness HB		max. 280
Structure		Ferrite + Carbides

Mechanical Properties (Cold-Worked)

Tensile Strength TS	[ksi]	116 – 166.8
Yield Strength YS	[ksi]	max. 130.5

Physical Properties

Modulus of Elasticity E 70 °F	[ksi]	31,183
Specific Density	[lb/in³]	0.2781
Thermal Conductivity 70 °F	[Btu in/hr ft² °F]	104.0
Coefficient of Thermal Expansion	[µin/in °F]	
70 - 210 °F		5.83
70 - 390 °F		6.11
70 - 570 °F		6.11
70 - 750 °F		6.39
70 - 930 °F		6.67
Specific Heat 70 °F	[Btu/lb °F]	102.7
Electric Resistivity 70 °F	[Ω circular-mil/ft]	481.2

Machining

Best results can be achieved in the soft-annealed condition. Cutting speeds and feed rates need to be kept on a lower level compared to martensites with lower carbon content.

Hot Working

Forging temperature is 1,920 – 2,100 °F.
Heat slowly and gradually to approx. 1,380 °F.
Afterwards heat to the required forging temperature.
Cool slowly after forging (e.g. in furnace).

Heat Treatment

Soft-Annealing

Temperature: 1,420 – 1,560 °F
Holding time: approx. 4 h (depending on cross-section)
Cooling: furnace, air

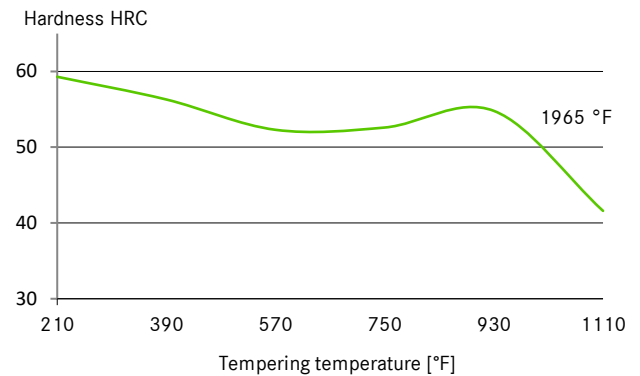
Hardening

Temperature: 1,885 – 2,010 °F
Holding time: approx. 0.5 h (depending on cross-section)
Cooling: oil
Hardened structure: martensite + carbides

Tempering

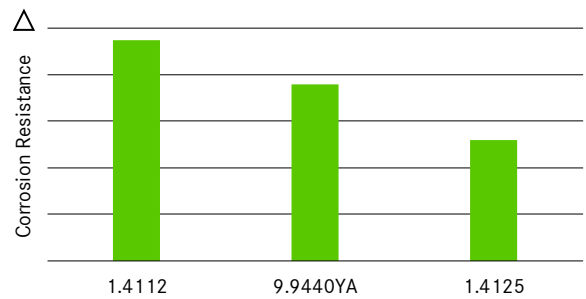
Temperature: see tempering chart
Holding time: approx. 1 h (depending on cross-section)
Cooling: Air

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



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