

CHRONIFER® M-15 KL

1.4123/AISI 420Mod - Martensitic stainless steel

Features This steel is alloyed with Mo, V und N, and has a low S-content. It is ESR remelted. Its good corrosion resistance, which is better than these of the 1.4112 and 1.4125 grades, characterizes it. It features good wear and bluntness resistances as well. This steel is amenable to high quality mirror polishing.

Uses This steel is most suitable for the production of bearings, drills, taps, milling cutters and other tools, as well as for medical, surgical and dental instruments and general-purpose instruments in the medical field.

Standards	Material Nr.	1.4123
	EN 10088-3	X40CrMoVN16-2
	DIN	X40CrMoVN16-2
	AFNOR	X40CrMoVN16.02 (formerly Z40 CDV 16.02)
	ASTM	ASTM F899
	AISI/SAE	420 Mod, AMS5925 (chemical composition)
	NF	S 94-090 (chemical composition)
	UNS	S42025 (chemical composition)

Chemical composition (%wt)	C	Si	Mn	P	S	Cr	Mo	Ni	V	N	Fe
	0.37	max.	max.	max.	max.	15.0	1.50	max.	0.20	0.15	balance
	0.45	0.60	0.60	0.02	0.005	16.0	1.90	0.50	0.40	0.25	

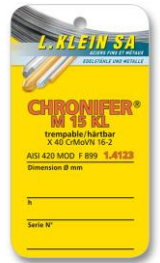
Dimensions and tolerances		
	● Bars Ø < 2.00 mm:	ISO h8
	● Bars Ø ≥ 2.00 mm:	ISO h6
	● Wires Ø ≥ 0.80 mm:	ISO fg7, coils for Escomatic
	● Out of roundness:	max ½ of tolerance
	Other tolerances on request	

Executions and Delivery conditions	
	Standard: in bars 3 m (+50/0 mm), coils for Escomatic
	● Bars Ø ≥ 2.00 mm: annealed, ground polished, max Ra 0.4 µm (N5) eddy-current check according to EN10277-1, Table 1 pointed and chamfered
	● Bars < 2.00 mm: surface condition: cold drawn execution
	● Wires Ø ≤ 6.00 mm: surface condition: cold drawn, coils for Escomatic
	Other executions on request

Availability Current dimensions on stock, see: [Delivery program](#)

Mechanical properties	Delivery condition:	annealed ground polished
	● Ø < 14.0 mm:	UTS/Rm ≈ 900 MPa
	● Ø > 14.0 mm:	265 HB, (converted to UTS ≈ 865 MPa)
	Hardening capability:	up to 58 HRc

Cutting conditions	Machinability:	difficult to acceptable build long chips
	Cutting speed:	V _c ≈ 20 - 30 m/min.
	Lubricant-coolant:	individual choice
	● The optimal cutting conditions depend on the machine tool, the cutting tools, the chip dimensions, the lubricant-cooling fluid, as well as the tolerances and surface the roughness to be achieved.	



CHRONIFER® M-15 KL

1.4123/AISI 420Mod - Martensitic stainless steel

Machining	Parameter	Turning	Fine turning	Milling	Fine milling
	Cutting speed Vc (m/min)	65	70	65	70
	Feed rate (mm/rev.)	0.50	0.10 – 0.30		
	Feed rate (mm/tooth)			0.15	0.12
	Depth (mm)	2 – 5	0.3 – 0.5	2 – 5	0.3 – 1.5

Forming Warm: forging: 1000 – 1100 °C / slow cooling
 Slow heating up to 800°C, then fast up to the forming temperature

- Microstructure at the forming temperature: Austenite + carbides

Cold: Difficult.

- Feasible after annealing at 740 – 840°C / slow cooling.

Welding Difficult, not recommended

Annealing Soft anneal: 740 – 840°C / 2 - 4h / slow furnace cooling down to 600°C
 UTS/Rm after annealing: ≈ 865 MPa, about 265 HB or Hv

- Intermediary annealing during cold forming: < 740°C, air cooling
- Take care to either pickup or loose N content during the heat treatment procedures.
- The recommended minimum amount of cold work before anneal is ≥ 10-15%, this to prevent an excessive grain growth.

Quenching Primary quenching: 950 – 1050°C / oil, or fast air cooling or gas

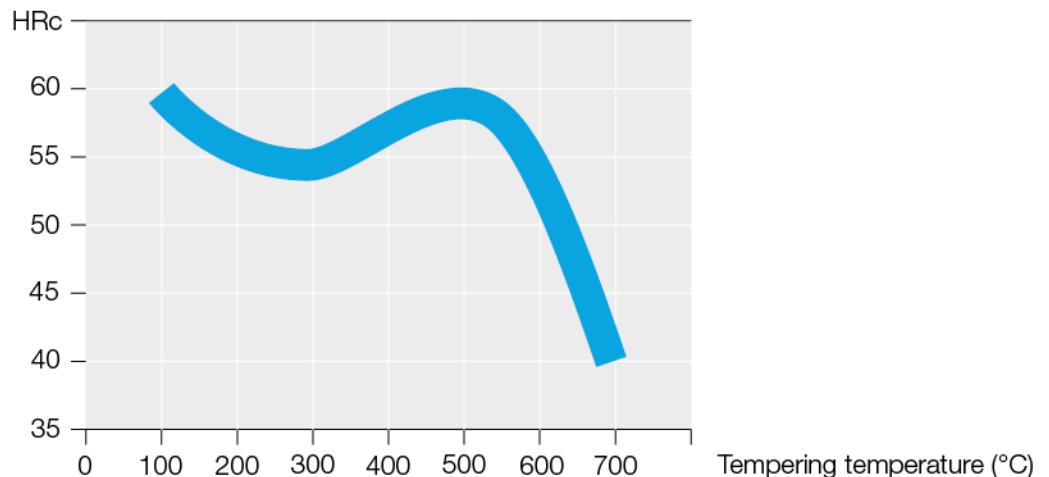
Subzero treatment Options: Secondary quenching by sub-zero treatment:
 -20°C/12 up to 48h, preferably -80°C/12h
 or Cryo-treatment (deep cooling):
 -196°C/6 – 12h, progressive or step-by-step cooling to prevent any cracking.

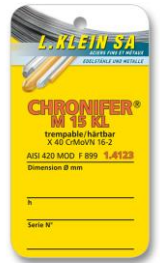
- The sub-zero treatment should always be made as quickly as feasible after the primary quenching. [More Info](#)
- A sub-zero treatment can lead to an additional hardening. It equalizes the internal stresses of the quenched martensite.

Tempering Tempering: according to requirements, see Tempering diagram

- Not recommended temperature range: 400 – 580°C
 Tempering in this temperature range can lead to brittleness, and to a reduction of the corrosion resistance.

Tempering diagram





CHRONIFER® M-15 KL

1.4123/AISI 420Mod - Martensitic stainless steel

Microstructures Microstructure in the cold worked condition: Ferrite + carbides
 Microstructure for machining: Cold worked ferrite + carbides
 Microstructure for hard machining: Martensite or Tempered martensite
 Optimal condition for mirror polishing: Stress relieved martensite
 Condition for polishing: Stress relieved martensite or Tempered martensite

Polishing Well adapted to mirror polishing
 • Optimal when tempered at temperature < 200°C

Laser marking • The heating of the Heat Affected Zone (HAZ) can locally affect the microstructure by depleting partially its N content, and thereby reduce its corrosion resistance and strength. [More info.](#)

Pickling Passivation It is strongly recommended to select adequate pickling and passivation procedures, and products, adapted to the treatment of martensitic stainless steels.
 • In order to avoid any “flash back” phenomena, it is strongly recommended to always pickle the surface prior to its passivation. [More info.](#)

Corrosion resistance Optimal: Clean surface in the heat treated condition + fine polished + passivized

Superficial oxidation • The formation of a colored oxidation or scaling on the surface during heat treatment can significantly reduce the corrosion resistance.
 • These oxidations or scales must always be eliminated, is it mechanically, or chemically by pickling. [More info.](#)

Elementary precautions • The simplest and elementary precautions is to always keep the parts clean, free of working residues, polished, and correctly dried.
 • Use only chlorine free disinfection, cleaning and washing solutions and products.

Property	Unit	Temperature (°C)				
		20	200	300	400	500
Density	g cm ⁻³	7.7				
Young modulus E	GPa	195				
Electrical resistance	Ω mm ² m ⁻¹	0.8				
Thermal expansion	m m ⁻¹ K ⁻¹	20–100°C	20–200°C	20–300°C	20–400°C	20–500°C
	10 ⁻⁶	10.4		10.5		10.8
Thermal conductivity	W m ⁻¹ K ⁻¹	30				
Specific heat	J kg ⁻¹ K ⁻¹	460				
Melting range						
Magnetism	Ferromagnetic, can be magnetized. More info.					

Disclaimer: The information and data of this informative “Data sheet” are indicative only. They are not use instructions. The users must define and endorse them in each case.