

Grade Zapp® 1.4028Mo

Technical Information

ZAPP

Zapp is certified to ISO 9001

Grade Zapp® 1.4028Mo

Zapp® 1.4028MO is a martensitic stainless steel. The corrosion resistance is enhanced by adding molybdenum and is better than most of the commercially available martensitic chromium steels. In the annealed condition the alloy can be formed easily at room temperature. After forming the properties of the material can be adjusted by hardening and tempering. In this condition the material exhibits high strength, hardness, and at the same time relative high formability. Furthermore, Zapp® 1.4028MO has a very high fatigue limit and very good wear resistance. Compared to austenitic stainless steels used for various springs, Zapp® 1.4028MO exhibits a higher modulus of elasticity. Therefore, most of users achieve better spring properties with this grade.

Zapp® former Westig®

Application

- Doctor blades
- Encoder scales
- Etched parts
- Flapper valves
- Scalpel and other surgical instruments
- Shaver and epilators
- Textile parts (reeds)

Finish

- Cold-rolled
- Cold-rolled and bright annealed
- Cold-rolled, hardened and tempered
- Cold-rolled, hardened and tempered, polished

Standards

- 1.4419 according to EN 10088-2
- UNS42026 according to ASTM F899

Edges

Slit/sheared, deburred, rounded

Surface finish

- Bright
- Polished
- Fine polished

Surface roughness

Depending on requirements

- $0.05\mu\text{m} \leq \text{Ra} \leq 0.30\mu\text{m}$
- $1.0\mu\text{m} \leq \text{Rt} \leq 3.0\mu\text{m}$

Dimensions

Thickness

- 0.08 mm to 1.5 mm

Width

- Cold-rolled or annealed from 4 mm to 750 mm
- Hardened and tempered from 4 mm to 400 mm

Delivery form

- Coil
- Sheet
- Spool

Cross bow

Deviation from flatness in the transverse direction

- Cold-rolled and tension-levelled: maximum of 0.4 % of the coil width
- Hardened and tempered: maximum of 0.2 % of the coil width

Flatness

- Flatness in rolling direction (waviness): maximum of 3 I-Units

Straightness

- Cold-rolled and tension-levelled: maximum of 1.5 mm per metre
- Hardened and tempered: maximum of 1 mm per metre

Fatigue properties

Zapp® 1.4028Mo is suitable for applications with dynamic mechanical load during operation. Due to the tailored microstructure and metallurgy, the bending and tensile fatigue limit are very high even in corrosive atmospheres. In the polished condition the fatigue limit is further increased, due compressive stresses in the material surface.

Corrosion resistance

Due to molybdenum addition Zapp® 1.4028MO has a superior corrosion resistance compared to standard 1.4028 and most of the martensitic chromium steels. The superior corrosion resistance in diluted solutions of salts and acids is observed in the hardened and tempered condition. The molybdenum addition not only improves the corrosion but also the wear resistance. This improvement results in better fatigue and impact properties during cyclic loading in corrosive atmospheres. The corrosion resistance is further improved by fine-polishing.

Operational temperatures

Zapp® 1.4028MO can be used at elevated temperatures up to 250 °C and for shorter periods of time even at 300 °C.

Processing recommendations

In the hardened, tempered, and polished condition Zapp® 1.4028MO can be readily bent or bevelled like alloy 1.4310 (AISI 301). Stamping should be performed with sharp edged tools. If the cutting tools are not correctly prepared, edge defects may be observed, which are difficult to remove.

Tighter tolerances or specific combinations of properties can be agreed upon. Please refer to tolerance tables.

Chemical composition (%)

C	Mn	Si	P	S	Cr	Mo
0.36	0.45	0.40	max. 0.030	max. 0.020	13.50	1.00

Mechanical properties

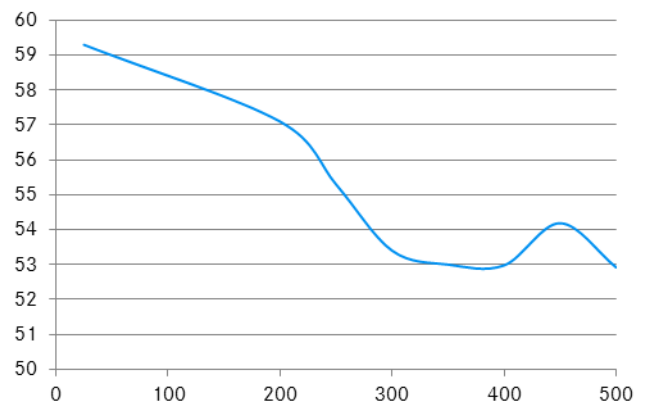
Finish	Typical Tensile Properties			
	Yield Strength [MPa]	Ultimate Tensile Strength [MPa]	Elongation [%]	
Cold-rolled, bright annealed	400	630	20.5	
Cold-rolled	+ C850	850	925	5.0
	+ C1000	980	1080	2.5
Hardened, tempered	Standard	1425	1800	5.5

Physical properties

Density	[g/cm ³]	7.7
Modulus of elasticity	20 °C	215
	100 °C	212
	200 °C	205
	300 °C	200
	400 °C	190
Thermal expansion coefficient between 20 °C and	[10 ⁻⁶ K ⁻¹]	
	20 - 100 °C	10.5
	20 - 200 °C	11.0
	20 - 300 °C	11.5
	20 - 400 °C	12.0
Thermal conductivity at 20 °C	[W/ (m K)]	30.0
Specific heat capacity 20 °C	[J/ (kg K)]	460
Electrical resistance 20 °C	[Ω mm ² / m]	0.65
Magnetic permeability in all conditions		

Guidance for tempering 1.4028MO

Hardness Rockwell [HRC]



Tempering temperature in °C
t= 30 min const.

Tolerances

width tolerances (according to B1, b2 and b3)

Thickness [mm]	Width [mm]	Tolerance [mm] ±		
		B1 [mm]	B2 [mm]	B3 [mm]
< 0.250	< 20	0.07	0.05	0.03
	20 - < 50	0.10	0.07	0.05
	50 - < 125	0.15	0.11	0.07
	125 - < 250	0.20	0.15	0.10
	250 - < 400	0.30	0.20	0.15
0.250 - < 0.500	< 20	0.10	0.07	0.05
	20 - < 50	0.15	0.11	0.07
	50 - < 125	0.20	0.15	0.10
	125 - < 250	0.25	0.20	0.15
	250 - < 400	0.35	0.30	0.20
0.500 - < 1.000	< 20	0.15	0.11	0.07
	20 - < 50	0.20	0.15	0.10
	50 - < 125	0.25	0.20	0.15
	125 - < 250	0.30	0.25	0.15
	250 - < 400	0.40	0.30	0.20
1.000 - < 1.500	< 20	0.20	0.15	0.10
	20 - < 50	0.25	0.20	0.15
	50 - < 125	0.30	0.25	0.15
	125 - < 250	0.35	0.25	0.20
	250 - < 400	0.45	0.35	0.25

Thickness tolerances ± 1/1000 mm

Thickness [mm]	Width [mm]	T1	T2	T3	T4	T5
0.08 - 0.099	- 250	6	5	4	3	2
	251 - 400	7	6	5	4	3
0.100 - 0.124	- 250	7	5	4	3	2
	251 - 400	9	6	5	4	3
0.125 - 0.159	- 250	9	6	5	4	3
	251 - 400	10	7	6	5	4
0.160 - 0.199	- 250	10	7	5	4	3
	251 - 400	11	8	6	5	4
0.200 - 0.249	- 250	11	8	6	4	3
	251 - 400	13	9	7	6	5
0.250 - 0.314	- 250	13	9	7	5	4
	251 - 400	15	11	8	6	5
0.315 - 0.399	- 250	15	11	8	6	4
	251 - 400	17	12	9	6	5
0.400 - 0.499	- 250	17	12	9	6	4
	251 - 400	20	14	10	7	5
0.500 - 0.629	- 250	20	14	10	7	5
	251 - 400	24	17	12	9	6
0.630 - 0.799	- 250	23	17	12	8	6
	251 - 400	27	20	14	10	7
0.800 - 0.999	- 250	27	19	13	9	7
	251 - 400	32	23	16	12	8
1.000 - 1.249	- 250	34	24	17	12	8
	251 - 400	36	26	18	13	9
1.250 - 1.500	- 250	36	28	20	14	9
	251 - 400	44	32	22	16	11

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