cunova

OSNA® 400 / OSNA® K-500

Rods & Bars

MARITIME
APPLICATIONS

CONTENT

The Company

As a pioneer in numerous key areas of industry, cunova offers a wide range of products and solutions that meet the highest standards. From mould tubes and plates to other casting moulds – our products in the field of continuous casting of ferrous and non-ferrous metals set standards worldwide. We are also specialists in extruded and drawn copper products and a high-performance partner for finished components that are developed together with our customers.
cunova's expertise also extends to developing highly corrosion-resistant copper-nickel products and coatings that are specially designed for applications in shipbuilding and on offshore platforms in the oil and gas industry.
Our portfolio is complemented by our service division, which optimally addresses individual customer needs with advanced services and technical support.

Our corporate philosophy is based on the core value of customer centricity: we are committed to providing our business partners with tailored solutions and superior service exactly where they need it. We have a global network of experts that fosters direct and immediate communication with our customers to understand their specific requirements and guarantee customised results. This collaboration enables us to offer not only efficient products, but also complete solutions that deliver real added value and convince in the long term.

Maritime Applications

For more than a century now, production of copper and its alloys has strengthened cunova's reputation as one of the world's leading metal manufacturers. cunova offers not only high quality products for corrosive environments, but also a wide range of project packages tailored to individual performance requirements. Production of seamless and welded pipes, as well as fittings and flanges, made from copper-nickel and other copper alloys are part of the company's solid investment for the future.

In addition to our standard copper nickel alloys OSNA® 10 and OSNA® 30, cunova with its long-term expert knowledge and experience is now producing and offering the nickel-copper alloys OSNA® 400 and OSNA® K-500.

Optimised Materials for Critical Environments

OSNA® 400

Nickel-Copper Alloys

OSNA® 400 (UNS N04400) is a nickel-copper with a single phased structure and an outstanding resistance against a wide range of corrosive media.

The chemical composition of OSNA® 400-Alloy is modified to ensure the compliance with all international specifications. Controlled content of alloying elements and minimised concentration of impurities ensure reliable service and fabrication properties of the alloy.

Main Advantages of OSNA® 400-Alloy

- Simple alloying system with simple workability/weldability
- Excellent corrosion resistance in many applications of offshore engineering and the chemical process industry (e.g. valve and pump components)
- Low general corrosion rates in high-velocity seawater
- Excellent resistance to neutral and alkaline salt
- Highly resistant to hydrofluoric acid, and resistant to sulphuric and hydrochloric acids under reducing conditions
- Virtual immunity to chloride stress corrosion cracking (SCC)
- Excellent mechanical properties from sub-zero to elevated temperatures

Comparison of Standard Specifications for OSNA® 400-Alloy

	cunova Alloy OSNA® 400	QQ-N-281D Class A UNS N04400	ASTM B164 UNS N04400	BS 3076:1989[c] NA 13	SAE AMS 4731 UNS N04400	DIN 17743 NiCu30Fe/2.4360
Ni %	≥ 63.0	≥ 63.0	≥ 63.0	≥ 63.0[a]	≥ 63.0	≥ 63.0[b]
Al %	≤ 0.5	≤ 0.5	≤ 0.5	–	≤ 0.5	≤ 0.5
C %	≤ 0.15	≤ 0.2	≤ 0.2	≤ 0.3	≤ 0.2	≤ 0.15
Fe %	≤ 2.0	≤ 2.5	≤ 2.5	≤ 2.5	≤ 2.5	1.0 - 2.5
Mn %	≤ 2.0	≤ 2.0	≤ 2.0	≤ 2.0	≤ 2.0	≤ 2.0
Si %	≤ 0.5	≤ 0.5	≤ 0.5	≤ 0.5	≤ 0.5	≤ 0.5
Co %	Counting as Ni	Counting as Ni	–	–	–	–
S %	≤ 0.015	≤ 0.015	≤ 0.015	≤ 0.024	≤ 0.015	≤ 0.02
Cu %	28.0 – 34.0	Remainder	28.0 – 34.0	28.0 – 34.0	28.0 – 34.0	28.0 – 34.0
Sn	≤ 0.006	≤ 0.006	≤ 0.006	–	≤ 0.006	–
P %	≤ 0.02	≤ 0.02	≤ 0.02	–	≤ 0.02	–
Zn	≤ 0.02	≤ 0.02	≤ 0.02	–	≤ 0.02	–
Pb	≤ 0.006	≤ 0.006	≤ 0.006	–	≤ 0.006	–

[a] including not more than 2 % cobalt. [b] including not more than 1 % cobalt. [c] withdrawn.

OSNA® K-500

Nickel-Copper Alloys

OSNA® K-500 (UNS N05500) is a high-strength variant of OSNA® 400 (UNS N04400) with small amounts of aluminum and titanium added to the basic formula. It has all the advantages of standard OSNA® 400, but with increased hardness and strength from precipitation hardening heat treatments. OSNA® K-500 and OSNA® 400 are the main nickel-copper alloys commonly used in marine services.

The chemical composition of OSNA® K-500-Alloy is modified to ensure the compliance with all international specifications. Controlled content of alloying elements and minimised concentration of impurities ensure reliable service and fabrication properties of the alloy.

Main Advantages of OSNA® K-500-Alloy

- Excellent corrosion resistance in many applications of offshore engineering (for pump shafts, instruments, and impellers) and the chemical process industry (for valve and pump components)
- Resistant to a sour-gas environment
- Very high resistance to chloride stress corrosion cracking
- Very low general corrosion rates in high-velocity seawater (e.g. particularly well suited for centrifugal pumps)
- High strength and hardness from sub-zero to elevated temperatures
- Non-magnetic for temperature as low as -150 °F

Comparison of Standard Specifications for OSNA® K-500-Alloy

	cunova Alloy OSNA® K-500	QQ-N-286G Form 1, 2 UNS N05500	ASTM B865-20 UNS N05500	BS 3076:1989[c] NA 18	SAE AMS 4676 UNS N05500	DIN 17743 NiCu30Al/ 2.4375
Ni %	≥ 63.0	≥ 63.0	≥ 63.0	≥ 63.0[a]	≥ 63.0	≥ 63.0[b]
Al %	2.30 – 3.15	2.30 – 3.15	2.30 – 3.15	2.30 – 3.20	2.00 – 4.00	2.20 – 3.50
C %	≤ 0.18	≤ 0.18	≤ 0.18	≤ 0.25	≤ 0.25	≤ 0.20
Fe %	≤ 2.0	≤ 2.0	≤ 2.0	≤ 2.0	≤ 2.0	0.5 – 2.0
Mn %	≤ 1.5	≤ 1.5	≤ 1.5	≤ 1.5	≤ 1.5	≤ 1.5
Si %	≤ 0.50	≤ 0.50	≤ 0.50	≤ 0.50	≤ 1.0	≤ 1.0
Ti %	0.35 – 0.85	0.35 – 0.85	0.35 – 0.85	0.35 – 0.85	0.25 – 1.0	0.30 – 1.0
Co %	≤ 0.25	≤ 0.25	≤ 0.25	-	-	-
S %	≤ 0.006	≤ 0.006	≤ 0.010	≤ 0.010	≤ 0.010	≤ 0.015
Cu	27.0 – 33.0	27.0 – 33.0	27.0 – 33.0	27.0 – 33.0	27.0 – 33.0	27.0 – 34.0
Sn %	≤ 0.006	≤ 0.006	-	-	≤ 0.006	≤ 0.006
P	≤ 0.02	≤ 0.02	-	-	≤ 0.02	≤ 0.02
Zn	≤ 0.02	≤ 0.02	-	-	≤ 0.02	≤ 0.02
Pb	≤ 0.006	≤ 0.006	-	-	≤ 0.006	≤ 0.006

[a] including not more than 2 % cobalt. [b] including not more than 1 % cobalt. [c] withdrawn.

RODS & BARS

Meeting Your Demands – in Every Dimension

OSNA® 400

Condition and Form

OSNA® 400 is available in hot-worked or cold-worked condition, or with subsequent heat treatment in annealed or stress-relieved condition as round bar.

Mechanical Properties

The mechanical properties of OSNA® 400-Alloy comply with all international specifications.

	Condition	Diameter Ø in. mm	Tensile strength R_m psi MPa	Yield strength $R_{p0,1}$ psi MPa	Yield strength $R_{p0,2}$ psi MPa	Elongation A_{4D} %
Rounds	Hot-worked (annealed)	$^1/_2$ to 14 12,7 – 356	≥ 70000 ≥ 480	– –	≥ 25000 ≥ 170	≥ 35
	Cold-worked (stress-relieved)	$^1/_2$ to 3 $^1/_2$ 12,7 – 88,9	≥ 87000 ≥ 600	≥ 45000 ≥ 310	≥ 60000 ≥ 415	≥ 20
		> 3 $^1/_2$ to 4 > 88,9 – 101,6	≥ 84000 ≥ 580	≥ 42000 ≥ 290	≥ 55000 ≥ 380	≥ 22
	Hot-worked (as worked or stress-relieved)	$^1/_2$ to 12 12,7 – 305	≥ 80000 ≥ 552	≥ 30000 ≥ 207	≥ 40000 ≥ 276	≥ 30
		> 12 to 14 > 305 – 356	≥ 75000 ≥ 517	≥ 30000 ≥ 207	≥ 40000 ≥ 276	≥ 30

OSNA® K-500

Condition and Form

OSNA® K-500 is available in hot-worked condition or with subsequent heat treatment in solution-annealed or age-hardened condition as round bar.

Mechanical Properties

The mechanical properties of OSNA® K-500-Alloy comply with all international specifications.

	Condition	Diameter Ø in. mm	Tensile strength R_m psi MPa	Yield strength $R_{p0,2}$ psi MPa	Elongation A_{4D} %
Rounds	Hot-worked and age-hardened	4 to 14 101,6-356	≥ 140000 ≥ 965	≥ 100000 ≥ 690	≥ 20
	Annealed (hot worked) and age-hardened	4 to 14 101,6-356	≥ 130000 ≥ 895	≥ 85000 ≥ 585	≥ 20

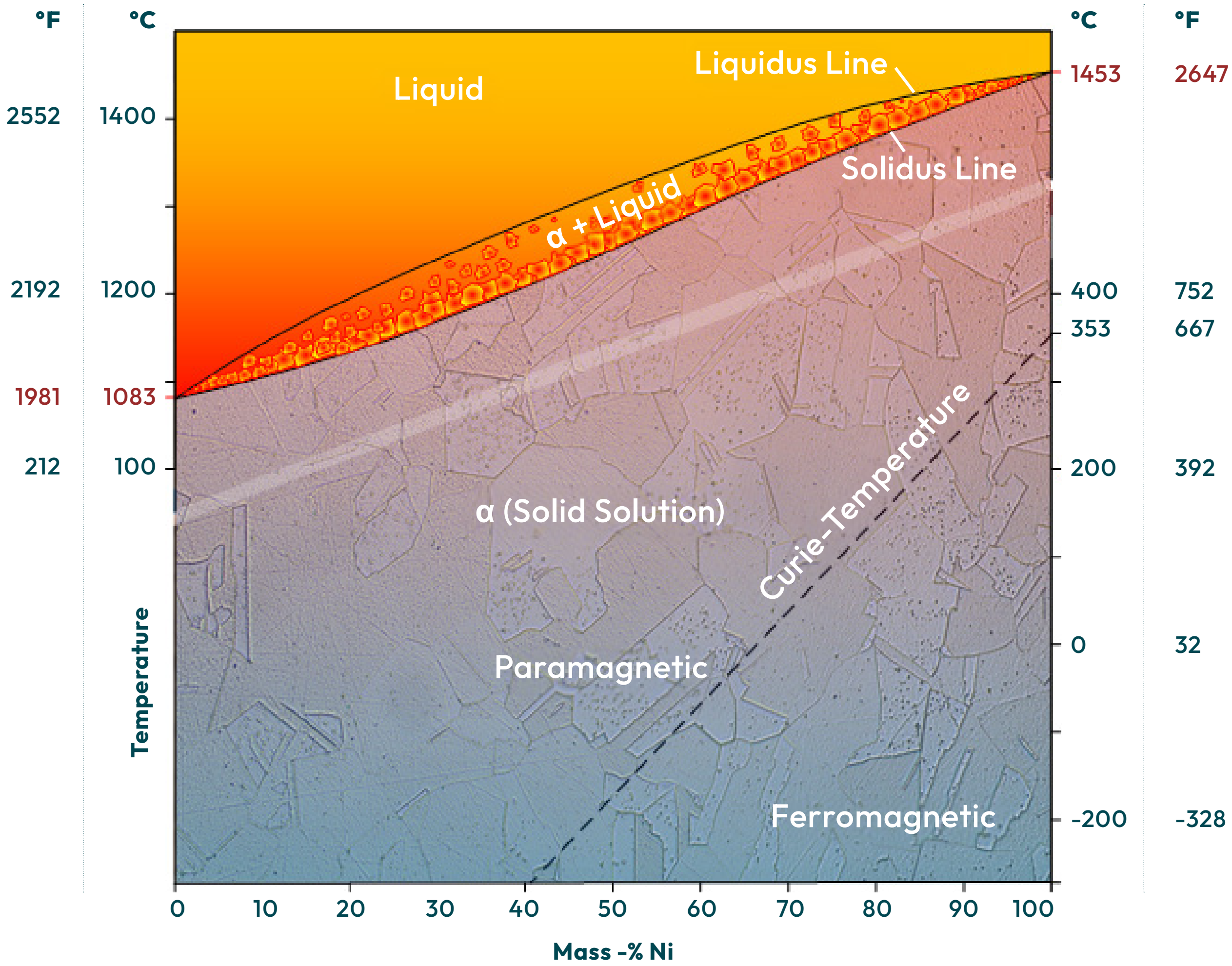
Smaller diameters are available upon request.

METALLURGICAL CONSIDERATIONS

Phase Diagram for Nickel-Copper Alloys

Copper and nickel have similar atomic radii and lattice parameters, and so the phase diagram is relatively simple. At all temperatures, copper-nickel alloys are represented by a single phase face centred cubic structure. This crystallographic structure reveals very good ductility and impact strength even at temperatures well below freezing point.

The absence of phase transformation during thermal cycles reduces the effect of welding on mechanical characteristics and the corrosion resistance of the OSNA® 400 material.
This does not apply to OSNA® K-500, which must only be welded in the solution-annealed condition.



Further Information on OSNA® 400 and OSNA® K-500

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