CONICHROME ALLOY

TECHNICAL DATASHEET

Conichrome
Alloy

UNS NUMBER: UNS R30003 / UNS R30008 • AISI NUMBER: AISI 1058 • DIN NUMBER: DIN 2.4711

TYPE ANALYSIS

Single figures are nominal except where noted.

CARBON (MAX)	0.15%	**COBALT**	39.0 to 42.0(*)%	**CHROMIUM**	18.5 to 21.5(*)%
PHOSPHORUS (MAX)	0.015%	**BERYLLIUM (MAX)**	0.001%	**MOLYBDENUM**	6.0 to 8.0(*)%
SILICON (MAX)	1.20%	**SULFUR (MAX)**	0.015%	**IRON**	Balance of %
NICKEL	14.0 to 18.0(*)%	**MANGANESE (MAX)**	1.0 to 2.5(*)%		

Type analyses of Grade 1 (R30003) and Grade 2 (R30008) differ slightly and are outlined in the Industry specifications in more detail. Combined elemental ranges are shown above, indicated by an (*), to provide a nominal type analysis.

DESCRIPTION

Conichrome Alloy is a non-magnetic, austenitic Nickel-Cobalt-Chromium-Molybdenum alloy possessing a unique combination of extremely high strength, ductility, excellent corrosion resistance, and high fatigue strength. Manufactured using premium melting and remelting operations, the alloy has extremely good cleanliness (low inclusion content) and improved homogeniety, which are vital to the performance, properties, and functionality of this alloy in its demanding applications.

APPLICATIONS

Because of its unique properties, it is used for a wide variety of medical applications such as suture wires, surgical clips, pacemaker leads, stents, vena cava filters and orthopedic nails. It is also commonly used as a precision spring material in the watchmaking industry, torsion bars, seals, and performance springs for various markets.

CARPENTER TECHNOLOGY

CONICHROME ALLOY

TECHNICAL DATASHEET

BIO-COMPATIBILITY SUMMARY

Conichrome Alloy has been deployed for various implant applications in contact with both soft tissue and bone. Precedence of acceptability within the medical market has been established and biocompatibility reports on the alloy are available within the medical community.

ELEVATED TEMPERATURE USE

Use of Conichrome Alloy has been typically used for service between room temperature and 800F (427C), but specific temperature studies have not been performed.

STABILITY AT LOW TEMPERATURE

Precedence of acceptability down to liquid helium temperatures without phase transformation temperature.

HEAT TREATMENT

Annealing

Conichrome Alloy should be annealed at 2000°F+/-25 (1093°C +/-14) and held for a time appropriate for its section thickness to ensure proper soak through entire cross section. This process should be followed by a cooling to room temperature. Typical annealed tensile is 125 KSI.

Relevant specification requirements and their dictated expected annealing results should be consulted prior to any heat treat operations.

Age

After work hardening, Conichrome Alloy can be aged in the temperature range of 850/1000°F (455/538°C) for increased strength. The alloy will respond to aging only if first work strengthened. No increase in strength will result from aging annealed material.

For optimum mechanical properties, cold worked Conichrome Alloy should be aged at 900/950°F (482/510°C), and held at the selected temperature within +/-25°F (15°C) for 5 – 5.5 hours, then air cooled (or an equivalent rate) to room temperature.

Relevant specification requirements and their dictated expected aging results should be consulted prior to any heat treat operations.

CARPENTER TECHNOLOGY

CONICHROME ALLOY

TECHNICAL DATASHEET

PROPERTIES

Physical Properties Density 0.300 lb/in3 8304 kg/m3

Magnetic Properties This material is non-magnetic in its annealed, cold worked, and aged conditions.

Typical Room Temperature Mechanical Properties

Condition	Orientation	0.2% Yield Strength		Ultimate Tensile strength		% Elongation in 4D	% Reduction of Area
		ksi	MPa	ksi	MPa		
Annealed	Long.	52	359	124	855	80	80
Cold Worked	Long.	100-250*	690-1724	150-280*	1034-1930*		
Cold Worked + Aged	Long.			250-300+*	1724-2068+*		

* The tensile values for the "Cold Worked" and "Cold Worked + Aged" conditions are typical, but dependent upon the level of cold work imparted to the material.

CORROSION RESISTANCE

Conichrome displays excellent resistance to sulfide stress corrosion cracking as evident in the alloy's acceptance into NACE MR1075 as an alloy that is acceptable for use in "any combination of temperature, pH2S, chloride concentration, and in situ pH occurring in production environments."

Conichrome Alloy exhibits excellent resistance to implantation environments as evident by its use in medical implants for decades.

Important Note: The following 4-level rating scale is intended for comparative purposes only. Corrosion testing is recommended; factors which affect corrosion resistance include temperature, concentration, pH, impurities, aeration, velocity, crevices, deposits, metallurgical condition, stress, surface finish and dissimilar metal contact.

Nitric Acid	Good	Sulfuric Acid	Good
Phosphoric Acid	Good	Acetic Acid	Excellent
Sodium Hydroxide	Good	Salt Spray (NaCl)	Excellent
Sea Water	Excellent	Sour Oil/Gas	Excellent
Humidity	Excellent		

WORKABILITY

Cold Working

Conichrome Alloy can be satisfactorily cold drawn and formed. It is somewhat stiffer than stainless steels such as Types 316 and 310, due to its higher strength and higher response to cold working. This alloy work hardens rapidly. If annealed properties are required in small section, cold forming should be followed by an anneal.

TECHNICAL DATASHEET

OTHER INFORMATION

Applicable Specifications

Note: While this material meets the following specifications, it may be capable of meeting or being manufactured to meet other general and customer-specific specifications.

- ASTM F1058: Grade 1 or Grade 2
- ISO 5832-7
- NACE MR0175
- AMS 5833 – WIRE, Annealed, then Cold Drawn
- AMS 5834 – WIRE, Annealed, then Cold Drawn VIM + Consumable remelt, anneal, cold drawn, aged.

Forms Manufactured

Bar-Rounds, *larger than 0.250"*
Wire, *larger than 0.250"*

References

- Alloy Selection for Cold Forming (Part I)
- Alloy Selection for Cold Forming (Part II)
- Trends in High Temperature Alloys
- Unique Properties Required of Alloys for the Medical and Dental Products Industry

DISCLAIMER

The information and data presented herein are typical or average values and are not a guarantee of maximum or minimum values. Applications specifically suggested for material described herein are made solely for the purpose of illustration to enable the reader to make his/her own evaluation and are not intended as warranties, either expressed or implied, of fitness for these or other purposes. There is no representation that the recipient of this literature will receive updated editions as they become available.