



Monel R-405 is the free machining form of Monel 400. It is a nickel-copper alloy with a controlled measure of sulfur added to give sulfide inclusion that goes about as chip breakers during machining. Like Monel 400, alloy R-405 is resistant to sea water and steam at high temperatures and also to salt and caustic solutions. Monel R405 is a solid solution alloy that must be hardened by cold working. This nickel alloy displays qualities like great corrosion-resistance, very good weldability and high strength. A low corrosion rate in quickly streaming harsh or seawater joined with amazing resistance to stress corrosion cracking in many freshwaters, and its resistance to variety of corrosion conditions prompted its wide use in other non-oxidizing chloride solutions and marine applications. This nickel steel alloy is especially resistant to hydrofluoric acids and hydrochloric when they are de-circulated air through. As would be normal from its high copper content, alloy R-405 is quickly assaulted by nitric acid and ammonia systems.

Applications

Alloy R-405 is predominantly utilized for programmed screw-machine stock and it not for the most part recommended for different applications. Screw machine stock for fasteners and comparable high production run things:

- Meter and valve parts
- Fasteners
- Screw machine products
- Feed water and steam generator tubing
- Brine heaters, sea water scrubbers in tanker inert gas systems
- Sulfuric acid and hydrofluoric acid alkylation plants
- Pickling bat heating coils
- Heat exchangers in a variety of industries
- Transfer piping from oil refinery crude olumns
- Plant for the refining of uranium and isotope separation in the production of nuclear fuel
- Pumps and valves used in the manufacture of perchlorethylene, chlorinated plastics
- Monoethanolamine (MEA) reboiling tube
- Cladding for the upper areas of oil refinery crude columns
- Propeller and pump shafts

Characteristics

Characteristics are essentially the same as those of Monel 400 such as:

- Good machinability and is recommended for use with automatic screw machines
- Resistant to seawater and steam at high temperatures
- Excellent resistance to rapidly flowing brackish water or seawater
- Excellent resistance to stress corrosion cracking in most freshwaters
- Particularly resistant to hydrochloric and hydrofluoric acids when they are de-aerated
- Offers some resistance to hydrochloric and sulfuric acids a modest temperatures and concentrations, but is seldom the material of choice for these acids
- Excellent resistance to neutral and alkaline salt
- Resistance to chloride induced stress corrosion cracking
- High resistance to alkalis

Corrosion Resistant

Along with Alloy 400, Monel R-405 is for all intents and purposes insusceptible to chloride ion stress corrosion cracking in ordinary situations. Usually, its corrosion resistance is better at decreasing situations, however poor in oxidizing conditions. It is not valuable in oxidizing acids, for example, nitric acid and nitrous. So, it is resistant to most alkalis, salts, waters, food items, natural substances and environmental conditions at typical and high temperatures. Monel 400 and R-405 offers about the same corrosion resistance as nickel yet with higher maximum working pressure and temperatures and at a lower expense because of its better capacity than be machined.

Fabrication

Monel R-405 is fabricated, salted and heat treated by the same methods with respect to alloy 400. It is not recommended for forging. So the R-405 alloy was particularly produced for good machinability and is recommended for use with programmed screw machines. The nickel –copper sulfides coming about the sulfur in its structure act as chip breakers. This nickel alloy likewise has the same process and processes as alloy 400 and can be combined with standard welding, brazing and soldering methods. Pretty much as with alloy 400, R-405 can without much of a stretch be welded by the gas – tungsten arc, gas metal arc, or shielded metal arc forms utilizing proper filler metals. There is no requirement for post weld heat treatment; in any case, intensive cleaning after welding is basic for ideal corrosion resistance and generally there is the risk of contamination and embrittlement.

Machining

Machinability is very good. High speed tool should be utilized with oil base lubricants. Turning is done at rates of 140-160 surface feet per minute with a good rate of approximately 0.004 in. / revolution. Drilling is done at 50-65 surface feet for each min. with feed of 0.003 in. /revolution.

Forming

The alloy is particularly versatile to screw machine operations.

Welding

Standard welding techniques might be utilized.

Heat Treatment

The alloy might be annealed yet does not generally react to heat treating.

Forging

Because of the deliberate sulfur content this alloy ought not to be forged.

Hot Working

Hot working is not recommended.

Cold Working

The alloy is promptly cold worked, specifically for screw machine operations.

Annealing

Anneal at 1700 F and air cool. A stress relief anneal might be done at 1000 F for 1-1/2 hour took over after by air cool.

Hardening

Hardens are because of its cold working.

MONEL[®] R-405

Chemical Properties

C	Si	S	Cu	Mn	Fe	Ni
0.3 max	0.5 max	0.025 - 0.060	28.0 - 34.0	2.0 max	2.5 max	63.0 min

Mechanical Properties

Tensile Strength (ksi)	0.2% Yield Strength (ksi)	Elongation% in 2 inches
85	50	15

Physical Properties

Properties	Units	Temperature in °C
Density	8.80 g/cm ³	Room
Specific Heat	0.102 Kcal/kg.C	21°
Melting Range	1300-1350 °C	-
Modulus of Elasticity	179 KN/mm ²	Room
Electrical Resistivity	51.1 μΩ.cm	21°
Coefficient of Expansion	14.2 μm/m °C	21 - 100°
Thermal Conductivity	22.0 W/m -°K	21°

ASTM Specifications

Pipe / Tube(SMLS)	Pipe Welded	Tube Welded	Sheet / Plate	Bar	Forging	Fitting
B 165	B 725	B 730	B 127	B 164	B 564	B 366

Availability

MANUFACTURING
Fasteners
Custom Machining
Custom Fabrication
Piping / Spools
Stamped Parts
B/W Fittings
S/W Fittings
Flanges
Compression Fittings

RAW MATERIALS
Pipes
Tubes
Bars
Sheets
Plates
-
-
-
-

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