# Monel R405 Pipe & Tube – UNS N04405

**Monel R405** is also known as "Alloy 450" is a nickel-copper alloy of the 70-30 type that exhibits excellent corrosion resistance, high strength, and good weldability. It is resistant to sea water and steam at high temperatures, salt, caustic solutions, alkalis, and sulfuric, hydrofluoric, hydrochloric and acids and bio-fouling in seawater. It has good fatigue strength, and has relatively high thermal conductivity. It is widely used for condenser plates, distiller tubes, evaporator tubes, seawater condensers, heat exchanger tubes and saltwater piping. **Monel 450 Alloys** welding process usually includes gas tungsten arc welding(GTAW), gas metal arc welding(GMAW), and submerged-arc welding(SAW) with the Monel filler metal 67.It is very similar to Monel 400 but with greater sulfur content added to produce sulfide inclusions, which act as chip breakers during machining processes. It can be fabricated, heat treated, pickled and can be joined by standard welding, brazing and soldering techniques via the same procedures used for Monel 400.

## Monel R405 Specifications

It meets a variety of industrial and international specifications, including:

- UNS N04405
- ASME SB-164
- AMS 4674
- QQ-N-281

## Monel R405 Features

- Great mechanical properties across a broad temperature range
- Provides good machinability
- Excellent resistance to chloride ion stress corrosion cracking
- It can be hardened only via cold working
- Resistant to seawater and steam at high temperatures
- High resistance to alkalis
- Excellent resistance to rapidly flowing brackish water or seawater

## Monel R405 Applications

Some popular applications for Monel alloy R-405 include:

- Heat exchangers
- Oil refinery piping
- Sulfuric Acid Plants
- Nuclear Fuel production
- Pump shafts

## Monel R405 Corrosion Resistance

It is virtually immune to chloride ion stress corrosion cracking in typical environments. It has very good corrosion resistance in reducing environments, but poor in oxidizing environments. It is not used in oxidizing acids, such as nitrousand nitric acid. It is resistant to most alkalis, food products, salts, waters, organic substances and atmospheric conditions at normal and elevated temperatures. Due to its superior ability to be machined it offers about the same corrosion resistance as nickel but with higher maximum working pressures and temperatures and at a lower cost.

## Monel R405 Fabrication

It is fabricated, pickled and heat-treated by the same procedures as for Monel 400. It is not suggested for forging. However, it was especially developed for good machinability and is suggested to be use with automatic screw machines. The nickel copper sulfides resulting from the sulfur in its composition behaves as chip breakers. It also has the same procedures and processes as alloy 400 and can be joined by conventional welding, brazing and soldering methods just as with alloy 400. It can easily be welded by gas metal arc, gas – tungsten arc or shielded metal arc processes by using appropriate filler metals. There is no requirement for post weld heat treatment, but deep cleaning after welding is important for optimum corrosion resistance, otherwise there is the risk of embrittlement and contamination.

## Monel R405 Chemical Composition

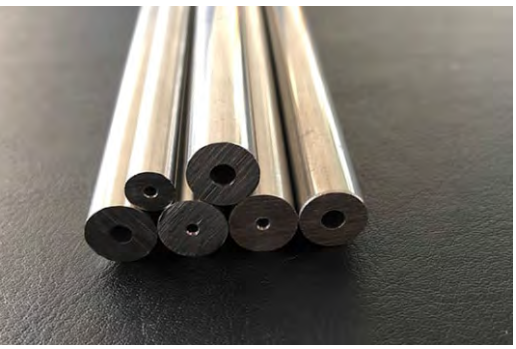
| Element | % |
|---|---|
| Phosphorus | 0.020max |
| Manganese | 1.00max |
| Sulphur | 0.020max |
| Zinc | 1.00max |
| Lead | 0.05max |
| Nickel | 29.0-33.0 |
| Iron | 0.4-1.0 |
| Copper | Balance |

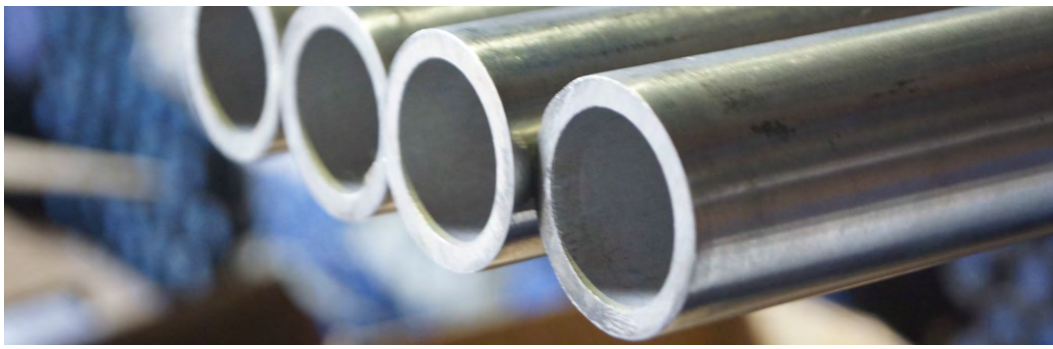
## Monel R405 Mechanical Properties

| Tensile Strength, min. | | Yield Strength, min. | | Elongation, min% |
|---|---|---|---|---|
| 385Mpa | 56ksi | 165Mpa | 24ksi | 46 |

## Monel R405 Physical Properties

| Density | Melting Range | | Thermal Conductivity | Electrical Resistivity |
|---|---|---|---|---|
| g/cm$^3$ | °C | °F | W/m.k | μΩ·m |
| 8.91 | 1170-1240 | 2140-2260 | 29.4 | 412 |





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