



Stainless Steel Heat Exchanger Tubes – Quality Manufacturing by Emirerri Steel



STAINLESS STEEL HEAT EXCHANGER TUBE

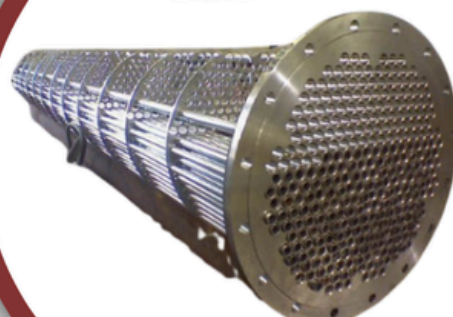
- ✓ **Key Features:** Corrosion-resistant, high thermal conductivity, durable, and versatile.
- ✓ **Grades & Standards:**
 - Grades: 304, 304L, 316, 316L, 321, 347, 317L, 904L
 - Standards: ASTM A213, A249, A269, A789
- ✓ **Sizes & Dimensions:**
 - OD: 6mm – 101.6mm
 - WT: 0.5mm – 10mm
 - Length: Up to 12m
- ✓ **Chemical Composition:**
 - **304/304L:** 18-20% Cr, 8-12% Ni, $\leq 0.08\%$ C (304), $\leq 0.03\%$ C (304L)
 - **316/316L:** 16-18% Cr, 10-14% Ni, 2-3% Mo, $\leq 0.08\%$ C (316), $\leq 0.03\%$ C (316L)
 - **321/347:** 17-19% Cr, 9-13% Ni, Ti/Nb stabilized
 - **317L:** 18-20% Cr, 11-15% Ni, 3-4% Mo, $\leq 0.03\%$ C
 - **904L:** 19-23% Cr, 23-28% Ni, 4-5% Mo, 1-2% Cu, $\leq 0.02\%$ C
- ✓ **Mechanical Properties:**
 - **304, 316, 321, 347:** Tensile ≥ 515 MPa, Yield ≥ 205 MPa
 - **317L:** Tensile ≥ 515 MPa, Yield ≥ 205 MPa
 - **904L:** Tensile ≥ 490 MPa, Yield ≥ 220 MPa
- ✓ **Applications:**
Power Plants | Petrochemical | HVAC | Food & Pharma

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[Stainless steel heat exchanger tubes](#) are critical components in industries requiring efficient heat transfer. These tubes are widely used in applications such as power plants, chemical processing, food and beverage production, pharmaceuticals, and HVAC systems. They offer **excellent resistance to corrosion, high thermal conductivity, and durability**, making them an optimal choice for demanding environments. As a leading stainless steel heat exchanger

manufacturer, **Emirerri Steel** ensures **premium quality** and **compliance** with industry standards. Their commitment to excellence guarantees high-performance tubes designed for long-lasting and efficient operation in heat exchange applications.

Properties of Stainless Steel Heat Exchanger Tubes

Stainless steel heat exchanger tubes are designed to withstand extreme temperatures and harsh operating conditions. Some key properties include:

- **Corrosion Resistance:** Stainless steel's inherent resistance to oxidation and corrosion ensures longevity and efficiency in diverse environments, especially in highly acidic or saline conditions.
- **Thermal Conductivity:** Facilitates effective heat transfer, improving overall system efficiency and reducing energy costs.
- **Mechanical Strength:** High tensile strength and resistance to stress and cracking enhance operational reliability, making them suitable for high-pressure environments.
- **Hygienic and Easy to Maintain:** Smooth surfaces prevent the accumulation of contaminants, making them suitable for food and pharmaceutical industries where sanitation is critical.
- **Oxidation Resistance:** Exceptional resistance to oxidation even at high temperatures ensures that the tubes maintain their integrity over time.

Grades and Standards

Stainless steel heat exchanger tubes are available in various grades, each offering specific advantages depending on the application:

- **304/304L:** Excellent corrosion resistance, weldability, and suitability for general-purpose heat exchanger applications in moderate environments.
- **316/316L:** Superior resistance to chlorides and acidic environments, making them ideal for marine, chemical, and industrial applications.
- **321/347:** Enhanced high-temperature strength due to titanium or niobium stabilization, commonly used in heat exchangers exposed to elevated temperatures and thermal cycling.
- **904L:** High nickel and molybdenum content provide outstanding corrosion resistance, particularly in highly acidic and chloride-rich environments, such as chemical and offshore industries.

Applicable Standards:

- **ASTM Standards:** ASTM A213, ASTM A249, ASTM A269, ASTM A789
- **ASME Standards:** ASME SA213, ASME SA249
- **European Standards:** EN 10216-5, EN 10217-7
- **Japanese Standard:** JIS G3463

These standards ensure the reliability, performance, and efficiency of stainless steel tube for heat exchanger applications, guaranteeing compliance with international safety and quality regulations.

Chemical Composition and Mechanical Properties

The chemical composition of stainless steel heat exchanger tube material varies by grade but generally includes elements that enhance performance and durability.

Chemical Composition (Typical %):

- **304/304L:** 18-20% Chromium, 8-12% Nickel, $\leq 0.08\%$ Carbon, $\leq 2.0\%$ Manganese, $\leq 0.045\%$ Phosphorus, $\leq 0.03\%$ Sulfur
- **316/316L:** 16-18% Chromium, 10-14% Nickel, 2-3% Molybdenum, $\leq 0.03\%$ Carbon, $\leq 2.0\%$ Manganese, $\leq 0.045\%$ Phosphorus, $\leq 0.03\%$ Sulfur
- **321/347:** 17-19% Chromium, 9-13% Nickel, $\leq 0.08\%$ Carbon, Titanium/Niobium Stabilized, $\leq 2.0\%$ Manganese
- **904L:** 19-23% Chromium, 23-28% Nickel, 4-5% Molybdenum, $\leq 0.02\%$ Carbon, $\leq 2.0\%$ Manganese

Mechanical Properties:

- **Tensile Strength:** Minimum 515-600 MPa (varies by grade)
- **Yield Strength:** Minimum 205-310 MPa (varies by grade)
- **Elongation:** Minimum 35-40%, ensuring flexibility and resistance to brittleness
- **Hardness:** Maximum 90 HRB (Rockwell B Scale), ensuring durability while maintaining machinability

These properties determine the tube's ability to perform under pressure and extreme temperatures, making them ideal for demanding industrial environments.

Heat Exchanger Tube Size and Length

Stainless steel tube for heat exchanger applications comes in a variety of sizes to meet different industrial needs:

- **Outer Diameter (OD):** Ranges from **6mm to 101.6mm**, ensuring compatibility with different system specifications.
- **Wall Thickness (WT):** Varies from **0.5mm to 5mm**, balancing strength and heat transfer efficiency.
- **Standard Tube Length for Heat Exchanger:** Typically available in fixed lengths of **6 meters and 12 meters**, with custom lengths available upon request.
- **Tolerance:** Precision manufacturing ensures tight dimensional tolerances, typically adhering to **ASTM, ASME, and EN** specifications.

Manufacturing Process

The production of stainless steel heat exchanger tubes involves several crucial steps to ensure high quality and performance:

1. **Tube Formation:** Stainless steel sheets are cold or hot rolled into tubular shapes with precise dimensional control.
2. **Welding or Seamless Manufacturing:** Tubes are either welded or manufactured using seamless processes to meet application requirements, ensuring strength and integrity.
3. **Heat Treatment:** Enhances mechanical properties, stress resistance, and corrosion resistance through annealing or solution treatment.
4. **Pickling and Passivation:** Removes surface impurities, scales, and oxides while enhancing corrosion resistance and passivity.
5. **Hydrostatic and Non-Destructive Testing:** Ensures structural integrity, leak-proof performance, and compliance with industry standards.
6. **Surface Finishing:** Tubes undergo polishing or electropolishing for improved aesthetics, cleanliness, and reduced fouling risk.

Advantages of Stainless Steel Heat Exchanger Tubes

- **High Durability:** Withstands high pressures, extreme temperatures, and aggressive environments without degradation.

- **Superior Corrosion Resistance:** Offers long service life with minimal maintenance, even in highly acidic or marine environments.
- **Excellent Heat Transfer Efficiency:** Enhances system performance, energy savings, and operational reliability.
- **Versatility:** Suitable for a wide range of industries, including power generation, chemical processing, food production, and HVAC.
- **Eco-Friendly:** 100% recyclable, reducing environmental impact and supporting sustainable industrial practices.
- **Low Maintenance Costs:** Stainless steel's resistance to scaling and corrosion minimizes downtime and maintenance expenses.

Applications of Stainless Steel Heat Exchanger Tubes

1. **Power Plants:** Used in condensers, boilers, and superheaters to efficiently transfer heat and optimize energy utilization, reducing fuel consumption and operational costs.
2. **Chemical and Petrochemical Industries:** Withstand aggressive chemicals, high temperatures, and corrosive substances in processing units, ensuring longevity in extreme environments.
3. **Food and Beverage Industry:** Maintain hygiene and resist contamination while ensuring optimal thermal performance in pasteurization and cooling processes.
4. **Pharmaceutical Industry:** Used in sterile environments where corrosion resistance and cleanliness are paramount to prevent contamination and ensure product integrity.
5. **HVAC Systems:** Facilitate heat exchange in refrigeration and air conditioning systems, improving energy efficiency and performance in commercial and industrial applications.
6. **Desalination Plants:** Stainless steel tubes play a crucial role in heat exchangers used in seawater desalination, where resistance to chloride-induced corrosion is essential.

Conclusion

Stainless steel heat exchanger tubes are essential in industries that require efficient and reliable heat transfer. Their **excellent corrosion resistance**, **mechanical strength**, and **thermal conductivity** make them a preferred choice for various applications. Whether in power plants, chemical industries, or food processing, these tubes ensure optimal performance and longevity. Emirerri Steel, one of the leading stainless steel heat exchanger manufacturers, provides high-quality [stainless steel pipes](#) or tubes for heat exchanger applications, ensuring durability and efficiency across diverse industries. With a focus on

precision engineering and adherence to international standards, [Emirerri Steel](#) continues to set benchmarks in the industry for **superior heat exchanger solutions**.