



# Stainless Steel

Stainless steel is defined as a steel alloy with a minimum of 10% chromium content by mass. Stainless steel does not stain, corrode, or rust as easily as ordinary steel (it stains less), but it is not stain-proof. It is also called corrosion-resistant steel. Stainless steel also contains varying amounts of Carbon, Silicon and Manganese. Other elements such as Nickel and Molybdenum may be added to impart other useful properties such as enhanced formability and increased corrosion resistance.

There are different grades and surface finishes of stainless steel to suit the environment to which the material will be subjected in its lifetime.

Stainless steel's resistance to corrosion and staining, low maintenance, relative inexpensive and familiar luster make it an ideal base material for a host of commercial applications.

## **What is stainless steel used for?**

Stainless steels of various kinds are used in thousands of applications. The following gives a flavour of the full range:

**Domestic** – cutlery, sinks, saucepans, washing machine drums, microwave oven liners, razor blades

**Architectural/Civil Engineering** – cladding, handrails, door and window fittings, street furniture, structural sections, reinforcement bar, lighting columns, lintels, masonry supports

**Transport** – exhaust systems, car trim/grilles, road tankers, ship containers, ships chemical tankers, refuse vehicles

**Chemical/Pharmaceutical** – pressure vessels, process piping.

**Oil and Gas** – platform accommodation, cable trays, sub-sea pipelines.

**Medical** – Surgical instruments, surgical implants, MRI scanners.

**Food and Drink** – Catering equipment, brewing, distilling, food processing.

**Water** – Water and sewage treatment, water tubing, hot water tanks.

**General** – springs, fasteners (bolts, nuts and washers), wire.

## ● **Reasons to Use Stainless:**

- A. Cleanliness is maintained in the product being transported.
- B. Prevention of contamination of the product from small particles or rust & scale.
- C. Resists corrosive attack from hundreds of industrial and chemical solutions or mixtures.
- D. Greater strength at elevated temperatures.  
Example: At 1000 deg. F, strength for weld fittings or pipe is based on:  
A234 Carbon Steel (WPB) has allowable stress = 2,500 PSI  
A403 Stainless (WP304) has allowable stress = 13,750 PSI  
A403 Stainless (WP316) has allowable stress = 15,300 PSI
- E. Cryogenic service (superior mechanical properties at sub-zero temperatures.)
- F. Retains lustrous appearance indefinitely


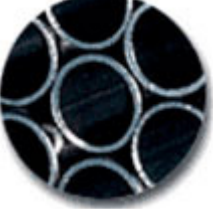





## Basics of Stainless Steel Pipe, Valves, Fittings & Flanges

**Purpose:** Pipe, valves & fittings are used for processing, transporting and storage of fluids, gasses and slurries.

**Uses:** Found in nearly every house, office building, factory, petrochemical & chemical plant refinery, process industry, brewery, food processing, marine, power generation, sewage & water treatment, pulp & paper mills, etc.

• **Definitions of Piping Products:-**

|   |  |
|---|--|
|    | <p><b>Pipe :</b> A hollow tube whose primary function is to transport material. Meets specific published size standards.</p>   |
|   | <p><b>Tubing :</b> All other tubular product sizes not shown on the standard pipe schedule.</p>  |
|  | <p><b>Fittings :</b> Connections for joining pipe, changing directions, reducing size of lines, closing lines, draining lines.</p>   |
|  | <p><b>Flanges :</b> Steel ring designed to join two sections of a piping system by bolting (to a vessel, pump, valve, fitting or pipe sections).</p>   |
|  | <p><b>Valves :</b> Mechanism to control fluid handling system.</p> <ol style="list-style-type: none"><li>1. Starting &amp; stopping flow (gate, ball, plug, butterfly)</li><li>2. Regulating flow or throttling (globe, butterfly)</li><li>3. Prevent back flow (check valves)</li><li>4. Relieving &amp; regulating pressure (relief valve)</li></ol> |



## Stainless Steel Pipes & Tubes



We offer steel pipes, which are fabricated by superior grade steel. Our range has excellent corrosion resistance even in outdoor environments. These pipes are used in various applications as of engineering and civil construction projects. Our range includes :

### **Pipes**

Range - 15 NB TO 600NB in sch 5 to XXS  
Standard - ASTM A 312, A 358

### **Tubes**

Range - 1/4" OD TO 12" OD in Gauge 30 to 10Swg & Bwg  
Standard - ASTM A 213, A 249

### **Grade**

TP 304, 304H, 304L, 316, 316H, 316L, 316Ti, 309, 310S, 317L, 321, 347, 409, 410, 202, 904L

### **Type**

Seamless, Welded, Semi welded, Fabricated.

### **Form**

Round, Square, Rectangle, Coil, 'U' Shape.

### **Special Tube**

Precision, Capillary, Hydraulic, Horn.

### **Length**

Standard length & Cut length as per requirement.

### **Value added Services**

- Polish (Electro & Commercial)
- Sand Blasting
- Draw & Expansion as per required Size & Length
- Heat Treatment
- Bending
- Annealing & Pickling
- Machining Etc.

### **Specialize In**

- Capillary Tube
- Fabricated Pipe
- Square & Rectangle
- Other Odd Size
- Heat Exchanger & Condenser Tubes

### **Test Certificate**

Mill (Manufacturer) Test Certificate as per 3.1B / Laboratory Test Certificate from Govt. Approved Lab. / Under Third Party Inspection with Excise Gate Pass to avail Modvat benefit.



## Stainless Steel Fittings

|  |  |                         |
|--|--|-------------------------|
|  |  | <b>Socket</b>           |
|  |  | <b>Socket from pipe</b> |
|  |  | <b>Half socket</b>      |

|   |  |  |                                  |
|---|--|--|----------------------------------|
|  | <b>Hexagon reducing nipple<br/>M/M</b> |  | <b>Barrel nipple from pipe</b>   |
|  | <b>Parallel nipple from pipe</b>       |   | <b>Bend 90° M/M</b>              |
|  | <b>Hexagon nipple</b>                  |   | <b>Elbow 90° F/F</b>             |
|  | <b>Reducing socket F/F</b>             |   | <b>Equal tee</b>                 |
|  | <b>Cross</b>                           |   | <b>Reducing tee F/F/F</b>        |
|  | <b>Reducing elbow 90° F/F</b>          |   | <b>Hexagon head plug tapered</b> |



|  |                                   |  |                            |
|--|-----------------------------------|--|----------------------------|
|   | <b>Hexagon head plug parallel</b> |   | <b>Square head plug</b>    |
|   | <b>Round cap</b>                  |   | <b>Hexagon cap</b>         |
|   | <b>Hexagon nut</b>                |   | <b>Hose nipple hose/M</b>  |
|   | <b>Hose nipple weld/hose</b>      |   | <b>Hose nipple F</b>       |
|  | <b>Hose nipple M</b>              |  | <b>Hexagon bushing M/F</b> |

We are one of **leading exporters of pipe fittings**. We stock butt weld stainless pipe fittings, socket weld stainless fittings and screw type stainless steel fittings in a variety of sizes. Besides the above, any special type of fittings can be manufactured as per your drawing in very short time.

**User Industries:**

Chemicals, Fats, & Fertilizers, Sugar Mills & Distilleries, Cement Industries, Ship Builders, Paper Industries, Pumps, Petrochemicals, Oil & Natural Gas Organization in terms of the specific materials, Technology, Finance & Personal.

**Product Range:**

The following table represents size range, product standards and material grades of Pipe Fittings

|                                 |   |
|---------------------------------|---|
| <b>Type</b>                     | FORGED/CASTING THREAD SOCKET-WELD.  |
| <b>Item</b>                     | 90° ELBOW ( LONG RADIUS / SHORT RADIUS ), EQUAL TEE, 45° ELBOW ( LONG RADIUS / SHORT RADIUS ), REDUCING TEE, ROUND CAP, CONCENTRIC REDUCER, ECCENTRIC REDUCER, STUB END |
| <b>Stainless Steel Material</b> | ASTM A403 WP304 / WP304L / WP316 / WP316L / 316 Ti / 321 / 310 / 347 / 904L / 202   |
| <b>Carbon Steel Material</b>    | ASTM A234 WPB, WPC ASTM A105  |
| <b>Alloy Steel Material</b>     | ASTM A234 WP1, WP5, WP9, WP11, WP22, WP91   |
| <b>Dimension</b>                | ANSI B16.9 / MSS SP- 43 / JIS B2313   |
| <b>Thickness</b>                | SCH5S / SCH10S / SCH40S / SCH80S / SCH 120S   |
| <b>Size</b>                     | 1/2" - 48"  |
| <b>Method</b>                   | SEAMLESS AND ERW  |
| <b>Make</b>                     | Manufacturer & As per design & Specification  |



## Flanges & Valves

Our pipe flanges come in a wide selection of dimensions and specification.

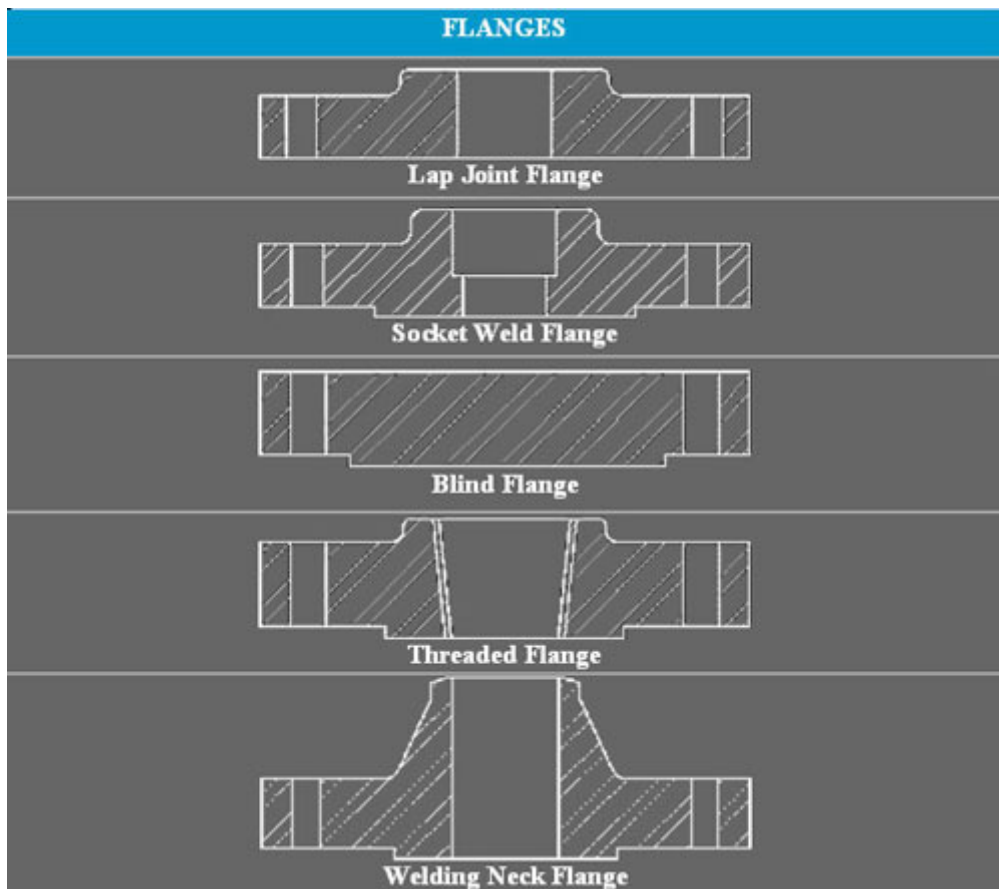
|   |  |  |
|---|--|--|
| 1 | Materials : Alloy Steel, Carbon Steel & Stainless Steel.   |  |
| 2 | STD:ANSI/DIN/JIS/BS  |  |
| 3 | American Standard Flange ANSI B16.5:<br>150#,300#,600#,900#,1500#,2500#,RF,BFF   |  |
| 4 | DIN Flange: PN6,PN10,PN25,PN40,PN64,PN100,PN160  |  |
| 5 | BS EN1092-1 Flange: PN10,PN16,PN25,PN40  |  |
| 6 | Type:<br><br>1. welding-neck<br>2. slip on<br>3. screwed<br>4. blind<br>5. lap joint<br>6. socket-welding<br>7. Size:1/2 ~ 24inches<br>DN15-DN60 |  |

If you require Flanges, contact us and one of our representatives will be happy to help you answer questions & order just what you need.

### Product Range:

The following table represents size range, product standards and material grades of Flanges.

|                                 |  |
|---------------------------------|--|
| <b>Item</b>                     | Weld Neck, Slip-On, Screwed, Socket Weld, Lap Joint, Blind, Plate.   |
| <b>Flange Facing</b>            | Raised Face, Flat Face, Lapped Joint Face, Male-Female, Tongue & Groove, Ring Joint                              |
| <b>Standard</b>                 | 150 Lb, 300 Lb, 600 Lb, 900 Lb, 1500 Lb, 2500 Lb, 3000 PSI, BS-10 Standard Table D, E, F, H & ALSO DIN Standard. |
| <b>Carbon Steel Material</b>    | ASTM A-105, IS 2002, LF2.  |
| <b>Stainless Steel Material</b> | ASTM A 240 / A-182F - 304, 304L, 310, 316, 316L, 321, 347, 904L  |
| <b>Alloy Steel Material</b>     | ASTM A182 F1, F5, F9, F11, F12, F22, F91   |
| <b>Low Temperature</b>          | ASTM A350 LF2, LF3   |
| <b>Sizes</b>                    | ½" NB to 48 "NB  |







|   |  |
|---|--|
|    | <p><b>Lap Joint Flange</b>, used with a matching stub end. Bolt holes can be aligned with pipe after welding. Useful for complex spools and rigid pipe work.</p> |
|    | <p><b>Socket Weld Flange</b>, pipe fits in to the recess to allow smooth flow through the flange. Used for small diameter applications.</p>                      |
|   | <p><b>Blind Flange</b>, normally a flat disk with raised or RTJ face to match mating flange.</p>   |
|  | <p><b>Threaded Flange</b>, can be attached to the pipe without welding. Saves time and cost. Unsuitable for large diameters and external loads.</p>              |
|  | <p><b>Welding Neck Flange</b>, characterized by its smooth hub transition from flange to weldend. Most common type of high pressure flange.</p>                  |

Check, Gate, Globe, Needle, Butterfly, Ball, Plug, Strainer ('Y') Stop, Non Return, Diaphragm, Safety etc.





## Fasteners & Washers



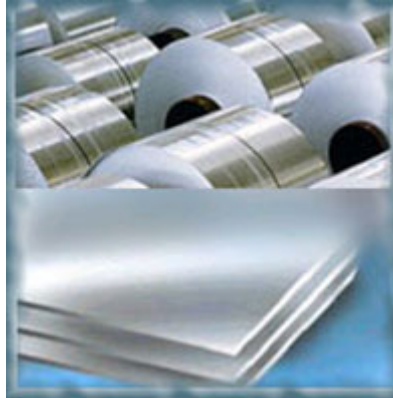
Specification:- We provide Fasteners as per DIN, ANSI, AISI, ASTM, JIS, BS, GOST, IS, Etc. as well as consumers specific requirements. We are specialist in Manufacturing of Drawing Based Fasteners.

| <b>Bolts</b>    | <b>Nuts</b>   | <b>Washers</b>            | <b>Socket Screw</b>    |
|-----------------|---------------|---------------------------|------------------------|
| Hex Bolt        | Hex Nut       | Plain Washers             | Cap Screw              |
| Round Bolt      | Thin Nut      | Spring Washers            | Button Screw           |
| Square Bolt     | Castle Nut    | Tab Washers               | Low Head Screw         |
| Dom Bolt        | Dom Nut       | Wave Washers              | Countersunk Screw      |
| Carrige Bolt    | Cap Nut       | Tapper Washers            | Grub Screw             |
| U Bolt          | Self Lock Nut | Star Washer               | (Dog /Cup / Cone/Flat) |
| J Bolt          | Flange Nut    | Circlip                   | Allen Key              |
| Slotted Bolt    | Square Nut    | E Clip                    | Plug (Bsp/Bspt/Npt)    |
| Foundation Bolt | Weld Nut      | Tapper / Cylandrical Pins |                        |
| Coupling Bolt   | Wing Nut      | Dowel Pin                 |                        |
|                 |               | Disc Washer               |                        |

| <b>Fine Fasteners &amp; Spares<br/>Foundation Fasteners:</b> | <b>Other Fasteners</b> |
|--|------------------------|
| Slotted Machine Screw  | Anchor Fasteners       |
| Philipse Machine Screw                                       | Wedge Anchor           |
| Sheet Metal Screw  | Eye Bolt               |
| Nail   | Stud Bolt              |
| Rivets   | Stud                   |
| Turnkey Parts  | Threaded Rod           |
| Square/Hex Coach Screw                                       | Cotter Pin             |
| Wood Screw   |                        |
| Plain/Twisted Nail.  |                        |



## Sheet Plate & Coil



### **Range**

0.1mm to 150mm and above

### **Standard**

ASTM A 240

### **Forms**

- Foils
- Shim Sheet
- Perforated Sheet
- Chequered Plate
- Strip
- Flats
- Blank (Circle)
- Ring (Flange)

### **Grade**

304, 304H, 304L, 316, 316H, 316L, 316Ti, 309, 310S, 317L, 321, 347, 409, 410, 420, 430, 440C, 446, 202, 904L

### **Finishing**

2B, 2D, HR, CR, BA (No. 8), Satin (Met with Plastic Coated)

### **Value added Services**

- Slitting
- Heat Treatment
- Solution Annealed
- Pickling
- Polish
- Rolling
- Cutting
- Bending
- Forging
- Minor Fabrication

### **Specialize In**

- Shim Sheet
- Perforated Sheet (Round, Square & Oblong Hole)
- Profile

### **Test Certificate**

Mill (Manufacturer) Test Certificate as per 3.1B / Laboratory Test Certificate from Govt. Approved Lab. / Under Third Party Inspection with Excise Gate Pass to avail Modvat benefit.



## Bar & Wire



### **Hardness**

Soft, Hard, Half Hard Etc

### **Value added Services**

- Machining (CNC)
- Centre less Grinding (CG)
- Solution Annealed
- Pickling
- Polish
- Rolling
- Forging
- Cutting
- Bending
- Minor Fabrication

### **Specialize In**

440C, 17-4 PH, Forging, Wire-mesh

### **Test Certificate**

Mill (Manufacturer) Test Certificate as per 3.1B / Laboratory Test Certificate from Govt. Approved Lab. / Under Third Party Inspection with Excise Gate Pass to avail Modvat benefit.

### **Supply Conditions:**

- Annealed/Solution Annealed.
- Hardened & Tempered.
- Strain Hardened.
- Centerless Ground.
- Centerless Ground & Polished.
- Cold Drawn.
- Smooth Turned & Polished.
- Forged & Rough Turned.
- Buffed (Mirror finish).

100% Ultrasonically tested.

### **Bar**

#### **Range**

5mm to 500 & Length 100mm to 6000mm

#### **Standard**

ASTM A 479, A182



**Forms**

- Round
- Square
- Hex (A/F)
- Rectangle, Wire (Coil Form), Wire mesh
- Billet
- Ingot
- Forging

**Wire**

**Range**

5mm to 500 & Length 100mm to 6000mm

**Forms**

- Coil
- Wire mesh

**Grade**

304, 304H, 304L, 316, 316H, 316L, 316Ti, 309, 310S, 317L, 321, 347, 409, 410, 420, 430, 440C, 446, 202, 904L

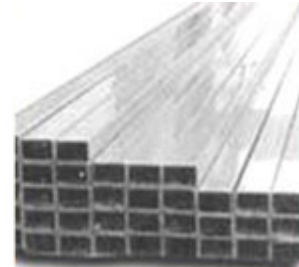
**Special Grade**

15.5 PH, 17-4 PH (630 Gr.), 17.7 PH, 4122, etc.

**Finishing**

Bright, Polish & Black

**ANGLE, BEAMS & CHANNELS**



Beams, Angle, Channel, Tees, Tray etc.

| Material        | Length       | Specification | Manufacturer |
|-----------------|--------------|---------------|--------------|
| Stainless Steel | 6 Mtrs. Max. | IS            | Sail         |

Note:-

|                        |   |   |  |
|------------------------|---|---|--|
| <b>Size of Angles</b>  | : | <ul style="list-style-type: none"> <li>• 20 mm x 20 mm x 3 mm Thk.</li> <li>• 25 mm x 25 mm x 3 mm Thk.</li> <li>• 25 mm x 25 mm x 5 mm Thk.</li> <li>• 30 mm x 30 mm x 3 mm Thk.</li> <li>• .....to.....100 mm x 100 mm x 12 mm Thk. Etc.</li> </ul> |  |
| <b>Size of Channel</b> | : | <ul style="list-style-type: none"> <li>• 75 mm x 40 mm</li> <li>• 100 mm x 50 mm</li> </ul>   | <ul style="list-style-type: none"> <li>• 225 mm x 80 mm</li> <li>• 250 mm x 80 mm</li> </ul> |



|                                 |   |  |  |
|---------------------------------|---|--|--|
|                                 |   | <ul style="list-style-type: none"> <li>• 125 mm x 65 mm</li> <li>• 150 mm x 75 mm</li> <li>• 175 mm x 75 mm</li> <li>• 200 mm x 75 mm</li> </ul>   | <ul style="list-style-type: none"> <li>• 300 mm x 90 mm</li> <li>• 350 mm x 100 mm</li> <li>• 400 mm x 100 mm Etc.</li> </ul>  |
| <b>Size of Beam</b>             | : | <ul style="list-style-type: none"> <li>• 100 mm x 70 mm</li> <li>• 120 mm x 58 mm</li> <li>• 125 mm x 70 mm</li> <li>• 125 mm x 75 mm</li> <li>• 150 mm x 75 mm</li> <li>• 175 mm x 85 mm</li> </ul> | <ul style="list-style-type: none"> <li>• 200 mm x 100 mm</li> <li>• 250 mm x 125 mm</li> <li>• 300 mm x 140 mm</li> <li>• 350 mm x 140 mm</li> <li>• 400 mm x 140 mm Etc.</li> </ul> |
| <b>Stainless Steel in Grade</b> | : | <ul style="list-style-type: none"> <li>• 202</li> <li>• 304</li> <li>• 316</li> </ul>  |  |
| <b>Form</b>                     | : | <ul style="list-style-type: none"> <li>• Rolling</li> <li>• Extruded</li> </ul>  |  |

### 317L : Chemical Composition %

| C     | Cr        | Mn   | Mo      | Ni        | P    | S    | SI   |
|-------|-----------|------|---------|-----------|------|------|------|
| Max   |           | Max  |         |           | Max  | Max  | Max  |
| 0.035 | 18.0-20.0 | 2.00 | 3.0-4.0 | 11.0-15.0 | 0.04 | 0.03 | 0.75 |

#### AVAILABILITY

Weld Pipe 1/2" - 12"  
 Seamless Pipe 1/2" - 8"  
 Butt-Weld Fittings 1/2" - 12"  
 Flanges 1/2" - 12"  
 Bar 1"- 8"

#### SPECIFICATIONS

ASTM A312, A403, A182  
 ASME SA312, SA403, SA182

#### DESCRIPTION

317L is a molybdenum bearing austenitic chromium nickel steel similar to type 316 except the alloy content in 317L is somewhat higher. It has superior corrosion resistance in special applications where it is desired to reduce contamination to a minimum. 317L was developed primarily to resist more effectively the attack of sulfurous acid compounds. However, its proven ability to combat corrosion has widened its use considerably and is now being used for many other industrial applications. The low carbon content of 317L provides immunity to intergranular corrosion in applications where heavy cross-sections cannot be annealed after welding or where low temperature stress relieving treatments are desired.

#### DESIGN FEATURES

- A molybdenum bearing austenitic chromium nickel steel with an alloy content somewhat higher than the 316 grades.
- Superior corrosion resistance in difficult environments.



- Higher creep, stress-to-rupture and tensile strengths than other stainless steels.
- Reduced intergranular precipitation of chromium carbides during welding and stress relieving as well as minimized possibility of corrosion failure from intergranular attack due to low carbon content.
- Resistance to pitting and crevice corrosion making 317L a successful life-cost product in a variety of highly corrosive environments.

#### TYPICAL APPLICATIONS

Flue gas desulfurization scrubber systems  
Chemical and petro-chemical processing equipment  
Pulp and paper plants  
Food processing equipment  
Textile equipment

#### TENSILE REQUIREMENTS

Tensile Strength (KSI) 75  
Yield Strength (KSI) 30  
KSI can be converted to MPA (Megapascals) by multiplying by 6.895.

#### 904L:

#### Chemical Composition %

| C    | Cr        | Cu      | Mn  | Mo      | Ni        | P     | S     | Si  |
|------|-----------|---------|-----|---------|-----------|-------|-------|-----|
| Max  |           |         | Max |         |           | Max   | Max   | Max |
| 0.02 | 19.0-23.0 | 1.0-2.0 | 2.0 | 4.0-5.0 | 23.0-28.0 | 0.045 | 0.035 | 1.0 |

#### AVAILABILITY

Weld Pipe 1/2" - 12"  
Seamless Pipe 1/2" - 8"  
Butt-Weld Fittings 1/2" - 12"  
Flanges 1/2" - 12"  
Bar 1"- 8"

#### SPECIFICATIONS

ASTM B677, B366  
ASME SB677, SB366

#### DESCRIPTION

904L is a high-alloy austenitic stainless steel with low carbon content. The grade is intended for use under severe corrosive conditions. It has been application proved over many years and was originally developed to resist corrosion in dilute sulfuric acid. It is standardized and approved for pressure vessel use in several countries. Structurally, 904L is fully austenitic and is less sensitive to precipitation ferrite and sigma phases than conventional austenitic grades with high molybdenum content. Characteristically, due to the combination of relatively high contents of chromium, nickel, molybdenum and copper 904L has good resistance to general corrosion, particularly in sulfuric and phosphoric conditions.

#### DESIGN FEATURES

Good resistance to pitting and crevice corrosion.  
Very good resistance to stress corrosion, cracking, etc.  
Good resistance to inter-granular corrosion.  
Good formability and weld-ability.  
Maximum service temperatures of 450 deg.C. (824 deg.F).

#### TYPICAL APPLICATIONS

Production and transport of sulfuric acid  
Metal pickling in sulfuric acid  
Production and concentration of phosphoric acid



Use in seawater, brackish water, condensers, heat exchangers and pipe work in general  
Paper and allied industries  
Gas washing  
Chemical and pharmaceutical industries

**TENSILE REQUIREMENTS**

Tensile Strength (KSI) 70  
Yield Strength (KSI) 25  
KSI can be converted to MPA (Megapascals) by multiplying by 6.895.

**321/321H:**

**Chemical Composition %**

| C    | Cr        | Mn  | Ni       | P    | S    | Si   | Ti         |
|------|-----------|-----|----------|------|------|------|------------|
| Max  |           | Max |          | Max  | Max  | Max  |            |
| 0.08 | 17.0-20.0 | 2.0 | 9.0-13.0 | 0.04 | 0.30 | 0.75 | Trace<br>* |

\* The titanium content shall not be less than 5 times the carbon content and not more than 0.60% Note: 321 H requires the titanium content to be not less than 4 times the carbon content and not more than 0.60%

**AVAILABILITY**

Seamless Pipe 1/2" - 16"  
Weld Pipe 6" - 12"  
Bar 1" - 12"  
Butt-Weld Flanges 1/2" - 8"  
Flanges 1/2" - 8"

**SPECIFICATIONS**

ASTM A312, A403, A182, A479, A276  
ASME SA312, SA403, SA182, SA479, SA276

**DESCRIPTION**

These titanium bearing stainless steels are stabilized against carbide precipitation and designed for operation within the damaging temperature range where carbide precipitation develops. In this type of steel, the carbon combines preferentially with titanium to form a harmless titanium carbide, leaving the chromium in solution to maintain full corrosion resistance. Type 321 is basic type 304 modified by adding titanium in an amount at least 5 times the carbon plus nitrogen contents.

**DESIGN FEATURES**

- Immune to inter-granular corrosion when heated within the carbide precipitation range.
- Titanium addition eliminates the formation of chromium carbides at the grain boundaries by tying up the carbon and nitrogen as titanium carbides or nitrides.
- Better high temperature properties than 304 or 304L. Generally used for parts which are intermittently heated up to 1500 deg.F. For continuous service the alloy is good to 1650 deg F
- May be susceptible to chloride stress cracking.
- Excellent weld-ability in field.
- Type 321 H has high carbon (.04 - .10) for better high temperature creep properties.

**TYPICAL APPLICATIONS**

High temperature  
Chemical process  
Heat exchanger tubes  
Refineries  
High temperature steam service

**TENSILE REQUIREMENTS**

Tensile Strength (KSI) 75  
Yield Strength (KSI) 30  
KSI can be converted to MPA (Megapascals) by multiplying by 6.895.





### 310S: Chemical Composition %

| C   | Cr        | Mn  | Mo   | Ni        | P     | S    | Si   |
|-----|-----------|-----|------|-----------|-------|------|------|
| Max |           | Max | Max  |           | Max   | Max  | Max  |
| .08 | 24.0-26.0 | 2.0 | 0.75 | 19.0-22.0 | 0.045 | 0.03 | 0.75 |

#### AVAILABILITY

Seamless Pipe 1/2" - 8"  
Weld Pipe 8" - 12"  
Butt-Weld Fittings 1/2" - 8"  
Bar 1" - 8"

#### SPECIFICATIONS

ASTM A312, A403, A182  
ASME SA312, SA403, SA182

#### DESCRIPTION

310S has excellent resistance to oxidation under constant temperatures to 2000 deg. F. Cyclic conditions reduce its oxidation resistance, and a maximum operating temperature of 1900 deg.F. is generally recommended if cycling is involved. Having a lower coefficient of expansion than most 300 stainless steels, 310S may be used in operations involving moderately severe thermal cycling, such as rapid air cooling. It is not usually recommended for liquid quenching. Although 310S has less resistance to absorption of carbon and nitrogen than the higher alloys such as 330 and 333, it is widely used in moderately carburizing atmospheres such as encountered in petroleum-chemical plants. Because of its high chromium and medium nickel contents, 310S may be used in atmospheres containing moderate amounts of sulfur.

#### DESIGN FEATURES

- Austenitic stainless steel with excellent high temperature oxidation resistance.
- Good for continuous exposure to 2100 deg F intermittent service to 1900 deg F
- Better elevated temperature creep strength than the 18-8 grades.
- Good resistance to both carburizing and reducing environments.
- General corrosion resistance better than Types 304 and 309.
- May be susceptible to chloride stress corrosion cracking.
- Availability.
- Ease of fabrication.

#### TYPICAL APPLICATIONS

Heat exchanger and heat recuperator tubing  
Molten salt applications  
Sulfur bearing gas atmospheres

#### TENSILE REQUIREMENTS

Tensile Strength (KSI) 75  
Yield Strength (KSI) 30

KSI can be converted to MPA (Megapascals) by multiplying by 6.895.

### 410: Chemical Composition %

| C    | Cr        | Mn  | Ni   | P    | S    | Si   |
|------|-----------|-----|------|------|------|------|
| Max  |           | Max |      | Max  | Max  | Max  |
| 0.15 | 11.5-13.5 | 1.0 | 0.50 | 0.04 | 0.03 | 0.75 |



**AVAILABILITY**

Seamless Pipe 1/2" - 8"  
Weld Pipe 8" - 12"  
Butt-Weld Fittings 1/2" - 8"  
Bar 1" - 8"

**SPECIFICATIONS**

ASTM A268, A815, A182

**DESCRIPTION**

Type 410 is a martensitic stainless steel which is magnetic, resists corrosion in mild environments and has fairly good ductility. 410 pipe is used where abrasion and wear resistance is needed, combined with fair resistance to general corrosion and oxidation.

**DESIGN FEATURES**

Martensitic stainless steel with high mechanical properties.  
Ferromagnetic in the annealed or hardened condition.  
Contains minimum amount of chromium to impart stainless steel properties.  
Resists oxidation and scaling up to 1200 deg.F.  
Resists abrasion and wear better than most 300 series stainless steels.  
Good sulphide stress corrosion cracking resistance  
Hardness is one of the best features

**TYPICAL APPLICATIONS**

Pipelines transporting fluids mixed with solids like coal, sand or gravel

**TENSILE REQUIREMENTS**

Tensile Strength (KSI) 60  
Yield Strength (KSI) 30  
KSI can be converted to MPA (Megapascals) by multiplying by 6.895.

**Alloy 20 :**

**Chemical Composition %**

| C    | Cb          | Cr        | Cu      | Mn  | Mo      | Ni        | P     | S     | Si  | Ta          |
|------|-------------|-----------|---------|-----|---------|-----------|-------|-------|-----|-------------|
| Max  | 8 times     |           |         | Max |         |           | Max   | Max   | Max | 8 times     |
| 0.07 | Carbon-1.00 | 19.0-21.0 | 3.0-4.0 | 2.0 | 2.0-3.0 | 32.0-38.0 | 0.045 | 0.035 | 1.0 | Carbon-1.00 |

**AVAILABILITY**

Seamless Pipe 1/2" - 8"  
Weld Pipe 1/2" - 12"  
Butt-Weld Fittings 1/2" - 12"  
Flanges 1/2" - 12"  
Pressure Fittings 1/2" - 2"  
150# Fittings 1/4" - 2"  
Tubing 1/4", 3/8", 1/2"  
Valves 1/2" - 12"  
Bar 1" - 8"

**SPECIFICATIONS**

ASTM B729, B464, B366, B473, B462  
ASME SB729, SB464, SB366, SB473, SB462

**DESCRIPTION**

Alloy 20 is one of the so-called "Super" stainless steels that was designed for maximum resistance to acid attack. It's nickel, chromium, molybdenum and copper content contribute to its overall resistance to chloride on stress corrosion cracking and general pitting attack. The alloy is stabilized with columbium to minimize carbide precipitation during welding. It has good mechanical properties and can be fabricated with comparative ease. Although the alloy was designed for use in sulfuric acid related industries, it finds wide usage throughout the chemical processing industry. It also is used for processing pharmaceuticals, food, gasoline, solvents, plastics,



explosives, synthetic fibers and many other products.

### DESIGN FEATURES

- Superior resistance to stress-corrosion cracking in boiling 20 to 40% sulfuric acid.
- Excellent general corrosion resistance to sulfuric acid.
- Excellent resistance to chloride stress corrosion cracking.
- Excellent mechanical properties and fabricability.
- Minimal carbide precipitation during welding.

### TYPICAL APPLICATIONS

Chemical and allied industries  
Food and dye production  
Heat exchangers  
SO<sub>2</sub> scrubbers and other severe environments  
Tanks  
Pickling racks  
Valves

### TENSILE REQUIREMENTS

Tensile Strength (KSI) 80  
Yield Strength (KSI) 35

KSI can be converted to MPA (Megapascals) by multiplying by 6.895.

### 17-4 Ph or Grade 630:

Before discussing 17-4 PH it would be worthwhile to give a brief description of Precipitation hardening stainless steels. Precipitation hardening stainless steels are primarily chromium and nickel containing steels which gives an optimum combination of the properties of martensitic as well as austenitic grades. Similar to martensitic grades, they are well known for their exceptional ability to gain high strength through heat treatment. Further they also display corrosion resistance of austenitic stainless steel. The high tensile strengths of precipitation hardening stainless steels develops after it passes through a heat treatment process leading to precipitation hardening of a martensitic or austenitic matrix. Among the types of precipitation hardening steel the most well known is the 17-4 PH. The name 17-4 PH is due to the additions of 17% Chromium and 4% Nickel. 17-4 PH also contains in it 4% Copper and 0.3% Niobium. 17-4 PH is also known by another name and that is stainless steel grade 630.

### Application of 17-4 PH:

Owing to the high strength of 17-4 PH (precipitation hardening stainless steels) most applications are found in aerospace and other high-technology industries. Typical applications include:

- Gears
- Valves and other engine components
- High strength shafts
- Turbine blades
- Moulding dies
- Nuclear waste cases



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|   |   |
|---|---|
| <b>Stainless Steel</b>  | Pipes & Tubes, Fittings, Flanges & Valves, Fasteners & Washers, Sheet Plate & Coil, Bar & Wire, Angle, Beams & Channels, 317L, 904L, 321/321H, 310S, 410, Alloy 20, 17-4 Ph or Grade 630  |
| <b>Mild Steel</b>   | Pipes & Tubes, Fittings & Flanges, Sheet, Plate, Strip, Flat & Blank, Tmt / Tor Bars, Ms Beam / Joist, Ms channel, Ms Angle, Ms Bars, Ms Flat Sections, Ms and g. i. Sheets And Plates, Ms Pipe & g.i. Pipe(HR/CR), Ms Hollow Sections (Square/ Rectangular), Specification & Application |
| <b>Alloy steel</b>  | Pipes & Tubes, Fittings, Flanges, Plate, Flat & Blank, Bar  |
| <b>Carbon Steel</b>   | Pipes & Tubes, Pipe & Fittings, Flanges, Sheet, Plate, Strip, Flat & Blank, Rod & Bars, Cs Anngle & Channels  |
| <b>Aluminium</b>  | Flat Bar / Bus Bar, Angle Bar / L-Bar, Square Bar, Round Bar / Rod, Hollow Section, Pipe / Tube, Wire, Shim / Foil, Sheet / Plate, Perforated (Sheet), T, L, U, I Bar, Wrought alloys, Chemical Composition   |
| <b>Copper</b>   | Flat Bars/Bus Bars, Rods (Round, Square & Hex), Pipes, Coils, Billets & Mother Tubes, Fittings, Sheets/Plates, Coils / Strips, Washers, Wires   |
| <b>Copper Alloys</b>  | Cupro Nickel Tubes/Sheets/Plates, Naval Brass, Bronze, Aluminium Bronze, Gun Metal Alloys, Phospher Bronze  |
| <b>Brass</b>  | Coils & Strips, Sheets / Plates, Wires / Rods (Square / Hex / Round), Flats, Tubes, Fittings, Fasteners   |
| <b>Titanium</b>   | Titanium  |
| <b>Nickel</b>   | Nickel  |
| <b>Nickel Alloy</b>   | Monel, Inconel, Incoloy, Hastalloy  |
| <b>Duplex Steel</b>   | Duplex, Super Duplex Stainless Steel  |
| Tool Steel, High Speed Steel, Lead, Tin & Zinc, Perforated Sheets, Wire Mesh, Miscellaneous Items |   |



**Kunthunath Exim**

## **KUNTHUNATH EXIM PRIVATE LIMITED**

### **Export Enquiry:**

Email : gm.marketing@kunthunathexim.com

### **General Information:**

info@kunthunathexim.com

### **Website:**

www.kunthunathexim.com

### **Corporate Office Address:**

B-207, Fairdeal House, Near Swastik Cross Roads  
Navrangpura, Ahmedabad, Gujarat-380009  
India

**Tel:** +91-79-2640 2281 / +91-79-4037 3563

**Fax:** +91-79-2640 2281

**M:** +91- 999 895 3542