outokumpu
high performance stainless steel

# Ultra 317L

## EN 1.4438, ASTM TYPE 317L / UNS S31703

## General characteristics

Mo alloyed austenitic grade with higher corrosion resistance than “316L”, e.g. used in the chemical processing industry.

## Typical applications

- Chemical tankers
- Pulp and Paper equipment
- Condenser tubes and heat exchanger tubes
- Equipment for the petrochemical industry
- Flue-gas desulfurization equipment

## Products & dimensions

### Cold rolled products, available dimensions (mm)

| Surface finish | | Coil / Strip | | Plate / Sheet | |
|---|---|---|---|---|---|
| | | Thickness | Width | Thickness | Width |
| 2E | Cold rolled, heat treated, mech. desc. pickled | 0.50-4.99 | 36-2070 | 0.50-4.99 | 300-2070 |
| 2H | Work hardened | 0.50-2.50 | 36-1350 | | |

### Continous hot rolled products, available dimensions (mm)

| Surface finish | | Coil / Strip | | Plate / Sheet | |
|---|---|---|---|---|---|
| | | Thickness | Width | Thickness | Width |
| 1D | Hot rolled, heat treated, pickled | 5.00-10.00 | 96-2070 | 5.00-10.00 | 300-2070 |
| 1E | Hot rolled, heat treated, mech. desc. | 3.00-4.76 | 80-1390 | 3.00-4.76 | 400-1350 |

### Quarto plate products, available dimensions (mm)

| Surface finish | | Coil / Strip | | Plate / Sheet | |
|---|---|---|---|---|---|
| | | Thickness | Width | Thickness | Width |
| 1D | Hot rolled, heat treated, pickled | | | 5.00-50.00 | 400-3200 |

## Chemical composition

The chemical composition may vary slightly between different product standards. The required standard will be fully met as specified on

the order.

The chemical composition is given as % by weight.

| | C | Mn | Cr | Ni | Mo | N | Other |
|---|---|---|---|---|---|---|---|
| **Typical** | **0.02** | | **18.2** | **13.7** | **3.1** | | |
| ASME II A SA-240 | ≤0.030 | ≤2.00 | 18.0-20.0 | 11.0-15.0 | 3.0-4.0 | ≤0.10 | |
| ASTM A240 | ≤0.030 | ≤2.00 | 18.0-20.0 | 11.0-15.0 | 3.0-4.0 | ≤0.10 | |
| EN 10028-7 | ≤0.030 | ≤2.00 | 17.5-19.5 | 13.0-16.0 | 3.0-4.0 | ≤0.10 | |
| EN 10088-2 | ≤0.030 | ≤2.0 | 17.5-19.5 | 13.0-16.0 | 3.0-4.0 | ≤0.10 | |
| EN 10088-3 | ≤0.030 | ≤2.00 | 17.5-19.5 | 13.0-16.0 | 3.0-4.0 | ≤0.10 | |
| EN 10088-4 | ≤0.030 | ≤2.0 | 17.5-19.5 | 13.0-16.0 | 3.0-4.0 | ≤0.10 | |
| IS 6911 | ≤0.030 | ≤2.00 | 18.0-20.0 | 11.0-15.0 | 3.0-4.0 | ≤0.10 | |

# Corrosion resistance

For more information, see Outokumpu Corrosion Handbook.

| Pitting corrosion resistance | | Crevice corrosion resistance |
|---|---|---|
| PRE | CPT | CCT |
| 28 | 33±3 | <0 |

PRE Pitting Resistant Equivalent calculated using the formula: PRE = %Cr + 3.3 x %Mo + 16 x %N
CPT Corrosion Pitting Temperature as measured in the Avesta Cell (ASTM G 150), in a 1M NaCl solution (35,000 ppm or mg/l chloride ions).
CCT Critical Crevice Corrosion Temperature is the critical crevice corrosion temperature which is obtained by laboratory tests according to ASTM G 48 Method F

# Mechanical properties

The mechanical properties of the available products are given in the table below.

| Cold rolled coil and sheet | $R_{p0.2}$ MPa | $R_{p1.0}$ MPa | $R_m$ MPa | Elongation[1)] % | Impact strength J | Rockwell | HB | HV |
|---|---|---|---|---|---|---|---|---|
| **Typical (thickness 1 mm)** | | | | | | | | |
| ASME II A SA-240 | ≥ 205 | | ≥ 515 | | | | ≤ 217 | |
| ASTM A240 | ≥ 205 | | ≥ 515 | | | ≤ 95HRB | ≤ 217 | |
| IS 6911 | ≥ 205 | | ≥ 515 | | | ≤ 95HRB | ≤ 217 | |

| Hot rolled coil and sheet | $R_{p0.2}$ MPa | $R_{p1.0}$ MPa | $R_m$ MPa | Elongation[1)] % | Impact strength J | Rockwell | HB | HV |
|---|---|---|---|---|---|---|---|---|
| **Typical (thickness 4 mm)** | | | | | | | | |
| ASME II A SA-240 | ≥ 205 | | ≥ 515 | | | | ≤ 217 | |
| ASTM A240 | ≥ 205 | | ≥ 515 | | | | ≤ 217 | |
| IS 6911 | ≥ 205 | | ≥ 515 | | | ≤ 95HRB | ≤ 217 | |

| Hot rolled quarto plate | $R_{p0.2}$ MPa | $R_{p1.0}$ MPa | $R_m$ MPa | Elongation[1)] % | Impact strength J | Rockwell | HB | HV |
|---|---|---|---|---|---|---|---|---|
| **Typical (thickness 15 mm)** | **300** | **340** | **610** | **50** | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ASME II A SA-240 | ≥ 205 | | ≥ 515 | | | ≤ 95HRB | ≤ 217 | |
| ASTM A240 | ≥ 205 | | ≥ 515 | | | ≤ 95HRB | ≤ 217 | |
| EN 10028-7 | ≥ 220 | ≥ 260 | 520 - 720 | ≥ 40 | | | | |
| EN 10088-2 | ≥ 220 | ≥ 260 | 520 - 720 | ≥ 40 | | | | |
| EN 10088-4 | ≥ 220 | ≥ 260 | 520 - 720 | ≥ 40 | | | | |
| IS 6911 | ≥ 205 | | ≥ 515 | | | ≤ 95HRB | ≤ 217 | |

| Wire rod | $R_{p0.2}$ MPa | $R_{p1.0}$ MPa | $R_m$ MPa | Elongation[1)] % | Impact strength J | Rockwell | HB | HV |
|---|---|---|---|---|---|---|---|---|
| **Typical** | **260** | **280** | **580** | **50** | | | | |

[1)]Elongation according to EN standard:
$A_{80}$ for thickness below 3 mm.
A for thickness = 3 mm.
Elongation according to ASTM standard $A_{2"}$ or $A_{50}$.

# Physical properties

Data according to EN 10088, EN 10095 or typical values.

| Density kg/dm$^3$ | Modulus of elasticity GPa | Thermal exp. at 100 °C $10^{-6}$/°C | Thermal conductivity W/m°C | Thermal capacity J/kg°C | Electrical resistance µΩm | Magnetizable |
|---|---|---|---|---|---|---|
| 8.0 | 200 | 16,0 | 14 | 500 | 0.85 | |

# Fabrication

## Cold forming

4438 can be readily formed and fabricated by a full range of cold working operations. It can be used in heading, drawing and bending. Any cold working operations will increase the strength and hardness of the material and may leave it slightly magnetic. Work hardening is aaccentuated by the partial transformation of the austenite phase of the material to hard martensite. For more information contact Avesta Research Centre.

## Welding

4438 can be readily welded by a full range of conventional welding methods such as:
Shielded metal arc welding (SMAW)
Gas tungsten arc welding, TIG (GTAW)
Gas metal arc welding, MIG (GMAW)
Flux-cored arc welding (FCAW)
Plasma arc welding (PAW)
Submerged arc welding (SAW)

Subsequent passes may cause precipitates of secondary phases in the weld metal. For this reason a low heat input and a maximum interpass temperature of 100ºC should be used.

# Standards & approvals

The most commonly used international product standards are given in the table below.

| Standard | Designation |
|---|---|
| ASME SA-240M Code Sect. II. Part A | TYPE 317L / UNS S31703 |
| ASTM A240/A240M | TYPE 317L / UNS S31703 |
| EN 10028-7, PED 2014/68/EU | 1.4438 |
| EN 10088-2 | 1.4438 |
| EN 10088-3 | 1.4438 |
| EN 10088-4 | 1.4438 |
| IS 6911, AMENDMENT NO. 2 | ISS 317 L |

# Contacts & Enquiries

## Contact your nearest sales office

www.outokumpu.com/contacts

# Working towards forever.

We work with our customers and partners to create long lasting solutions for the tools of modern life and the world's most critical problems: Clean energy, clean water and efficient infrastructure. Because we believe in a world that lasts forever.



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