Alleima

# Alleima® 5R75
## Tube and pipe, seamless
## Datasheet

Alleima® 5R75 is an austenitic, titanium-stabilized stainless chromium–nickel–molybdenum steel.

## Standards

- ASTM: TP316Ti
- UNS: S31635
- EN Number: 1.4571
- EN Name: X6CrNiMoTi17-12-2
- W.Nr.: 1.4571
- DIN: X 6 CrNiMoTi 17 12 2
- SS: 2350
- AFNOR: Z6CNDT17-12

### Product standards

### Seamless tube and pipe:

- ASTM A312
- EN 10216-5
- DIN 17456, 17458
- SS 14 23 50
- NFA 49-117
- ASTM A213, A269 and A312

## Chemical composition (nominal)

**Chemical composition (nominal) %**

| C | Si | Mn | P | S | Cr | Ni | Mo |
|---|---|---|---|---|---|---|---|
| 0.05 | 0.5 | 1.3 | ≤0.030 | ≤0.030 | 17 | 12 | 2.1 |

Ti=>5xC

## Applications

Alleima® 5R75 is used for a variety of industrial applications. Typical examples are heat exchangers, condensers,

Datasheet last updated 5/9/2025 6:38:14 AM (supersedes all previous editions)

pipelines, cooling and heating coils in the chemical, petrochemical and pulp and paper industries.

## Corrosion resistance

### General corrosion

Alleima® 5R75 has good resistance to

- Organic acids at high concentrations and temperatures
- Inorganic acids, e.g. phosphoric and sulfuric acids, at moderate concentrations and temperatures. The steels can also be used in sulfuric acid of concentrations above 90% at low temperature.
- Salt solutions, e.g. sulfates, sulfides and sulfites
- Caustic environments

### Intergranular corrosion

Alleima® 5R75 has better resistance to intergranular corrosion than unstabilized steels. The addition of titanium prevents precipitation of chromium carbides in the grain boundaries after prolonged heating in the temperature range 450- 850°C (840-1560°F).

### Pitting and crevice corrosion

Resistance to these types of corrosion improves with increasing molybdenum content and Alleima® 5R75 with about 2.1% Mo has substantially higher resistance than steels of type AISI 304/304L.

### Stress corrosion cracking

Austenitic stainless steels are susceptible to stress corrosion cracking. This may occur at temperatures above about 60°C (140°F), if the steel is subjected to tensile stresses and at the same time comes into contact with certain solutions, particularly those containing chlorides. Such service conditions should therefore be avoided. Conditions when plants are shut down must also be considered as the condensates which are then formed can develop a chloride content that leads to both stress corrosion cracking and pitting.

In applications demanding high resistance to stress corrosion cracking, austenitic- ferritic steels, e.g. SAF™ 2304 or SAF™ 2205, are recommended. See data sheets S-1871-ENG and S-1874-ENG.

### Gas corrosion

Alleima® 5R75 can be used in

- Air up to 850°C (1560°F)
- Steam up to 750°C (1380°F)

Creep behavior should also be taken into account when using the steel in the creep range. In flue gases containing sulfur, the corrosion resistance is reduced. In such environments these steels can be used at temperatures up to 600-750°C (1110-1380°F) depending on service conditions. Factors to consider are whether the atmosphere is oxidizing or reducing, i.e. the oxygen content, and whether impurities such as sodium and vanadium are present.

## Bending

Annealing after cold bending is not normally necessary, but this point must be decided with regard to the degree of bending and the operating conditions. Heat treatment, if any, should take the form of stress-relieving or solution-annealing, see under "Heat treatment".

Hot bending is carried out at 1100-850°C (2010-1560°F) and should be followed by solution-annealing.

Datasheet last updated 5/9/2025 6:38:14 AM (supersedes all previous editions)



Tel: +45 63 12 83 00 | Email: ps@hymatik.com | www.hymatik.com | Hvidkaervej 27a, DK-5250 Odense SV, Denmark

## Forms of supply

### Seamless tube and pipe

Tube and pipe are normally delivered in the solution-annealed and white-pickled condition. Smaller sizes may be bright-annealed. The size range can be seen from the principal size range can be seen from Fig. 1.

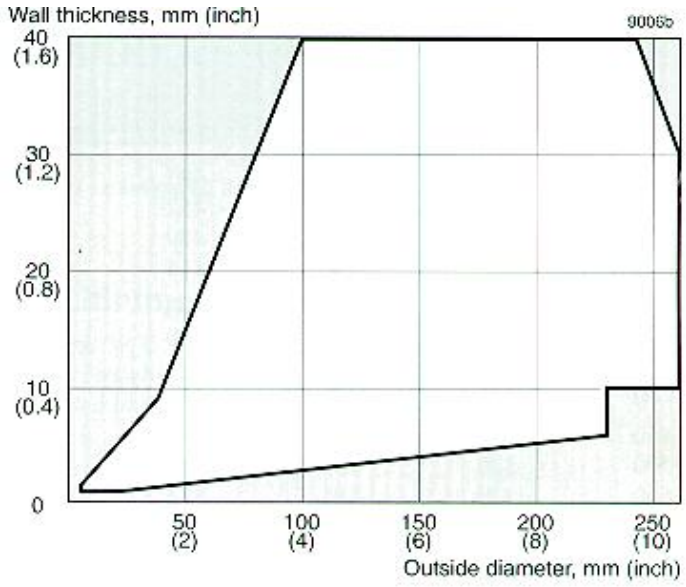


Figure 1. Principal size range for seamless tube and pipe.

### Hollow bar

Hollow bar is supplied solution-annealed and white-pickled.

## Sizes in stock

### Seamless tube and pipe

Seamless tube and pipe are stocked in the solution-annealed and white-pickled condition in a wide range of sizes according to ISO and ANSI. Details of our manufacturing and stock programme are given in catalogue S-110-ENG.

### Hollow bar

Hollow bar is stocked in a large number of sizes. Our standard size range for stock comprises 32-250 mm (1.3-9.8 inch) O.D. See catalogue S-110-ENG or S-1462-ENG.

### Also available from stock are:

- Welded tube and pipe
- Fittings
- Bar steel

## Heat treatment

The tubes are normally delivered in heat treated condition. If additional heat treatment is needed after further processing the following is recommended.

Datasheet last updated 5/9/2025 6:38:14 AM (supersedes all previous editions)



Tel: +45 63 12 83 00 | Email: ps@hymatik.com | www.hymatik.com | Hvidkaervej 27a, DK-5250 Odense SV, Denmark

**Stress relieving**
850-950°C (1560-1740°F), 10-15 minutes, cooling in air.

**Solution annealing**
1000-1100°C (1830-2010°F), 5-20 minutes, rapid cooling in air or water.

## Mechanical properties

**At 20°C (68°F)**

| Proof strength | | | | Tensile strength | | Elong | Hardness |
|---|---|---|---|---|---|---|---|
| $R_{p0.2}$ [a) c)] | | $R_{p1.0}$ [a) c)] | | $R_m$ [c)] | | A [b)] | Vickers |
| MPa | ksi | MPa | ksi | MPa | ksi | % | |
| | | | | | | | approx. |
| ≥220 | ≥32 | ≥250 | ≥36 | 510-710 | 74-103 | ≥35 [d)] | 155 |

1 MPa = 1 N/mm²
a) $R_{p0.2}$ and $R_{p1.0}$ correspond to 0.2% offset and 1.0% offset yield strength, respectively.
b) Based on $L_0 = 5.65 \sqrt{S_0}$ where $L_0$ is the original gauge length and $S_0$ the original cross-section area.
c) For hot finished tube and pipe with wall thickness greater than 10 mm (0.4 in.) the minimum values for proof strength may fall short of the stated values by 20 MPa (2.9 ksi) and the range for the tensile strength is 490-690 MPa.
d) NFA 49-117 with min 45% can be fulfilled.

### Impact strength

Due to its austenitic microstructure, Alleima® 5R75 has very good impact strength both at room temperature and at cryogenic temperatures.

Tests have demonstrated that the steel fulfils the requirements (60 J (44 ft-lb) at -196 °C (-320 °F)) according to the European standards EN 13445-2 (UFPV-2) and EN 10216-5.

### At high temperatures

**Metric units**

| Temperature | Proof strength | |
|---|---|---|
| | $R_{p0.2}$ [c)] | $R_{p1.0}$ [c)] |
| °C | MPa | MPa |
| | min | min |
| 50 | 202 | 234 |
| 100 | 185 | 218 |
| 150 | 177 | 206 |
| 200 | 167 | 196 |
| 250 | 157 | 186 |
| 300 | 145 | 180 |

Datasheet last updated 5/9/2025 6:38:14 AM (supersedes all previous editions)



Tel: +45 63 12 83 00 | Email: ps@hymatik.com | www.hymatik.com | Hvidkaervej 27a, DK-5250 Odense SV, Denmark

| | | |
|---|---|---|
| 350 | 140 | 175 |
| 400 | 136 | 171 |
| 450 | 132 | 167 |
| 500 | 129 | 164 |
| 550 | 127 | 157 |

**Imperial units**

| Temperature | Proof strength | |
|---|---|---|
| | $R_{p0.2}$ [d] | $R_{p1.0}$ [d] |
| °F | ksi | ksi |
| | min | min |
| 200 | 27.0 | 32.0 |
| 400 | 24.0 | 28.5 |
| 600 | 21.0 | 26.0 |
| 800 | 19.5 | 24.5 |
| 1000 | 18.5 | 23.5 |

d) For hot finished tube and pipe with wall thicknesses greater than 10 mm (0.4 in.) the proof strength values may be slightly lower but still fulfill the requirements according to DIN 17458 and SS 14 23 50.

## Physical properties

Density: 8.0 g/cm$^3$, 0.29 lb/in$^3$

**Thermal conductivity**

| Temperature, °C | W/m °C | Temperature, °F | Btu/ft h °F |
|---|---|---|---|
| 20 | 14 | 68 | 8 |
| 100 | 15 | 200 | 8.5 |
| 200 | 17 | 400 | 10 |
| 300 | 18 | 600 | 10.5 |
| 400 | 20 | 800 | 11.5 |
| 500 | 21 | 1000 | 12.5 |
| 600 | 23 | 1100 | 13 |

**Specific heat capacity**

| Temperature, °C | J/kg °C | Temperature, °F | Btu/lb °F |
|---|---|---|---|



Datasheet last updated 5/9/2025 6:38:14 AM (supersedes all previous editions)

| | | | |
|---|---|---|---|
| 20 | 485 | 68 | 0.11 |
| 100 | 500 | 200 | 0.12 |
| 200 | 515 | 400 | 0.12 |
| 300 | 525 | 600 | 0.13 |
| 400 | 540 | 800 | 0.13 |
| 500 | 555 | 1000 | 0.13 |
| 600 | 575 | 1100 | 0.14 |

**Thermal expansion** [1)]

| Temperature, °C | Per °C | Temperature, °F | Per °F |
|---|---|---|---|
| 30-100 | 16.5 | 86-200 | 9.5 |
| 30-200 | 17 | 86-400 | 9.5 |
| 30-300 | 17.5 | 86-600 | 10 |
| 30-400 | 18 | 86-800 | 10 |
| 30-500 | 18.5 | 86-1000 | 10 |
| 30-600 | 18.5 | 86-1200 | 10.5 |
| 30-700 | 19 | 86-1400 | 10.5 |

1) Mean values in temperature ranges ($x10^{-6}$)

**Modulus of elasticity** [1)]

| Temperature, °C | MPa | Temperature, °F | ksi |
|---|---|---|---|
| 20 | 200 | 68 | 29.0 |
| 100 | 194 | 200 | 28.2 |
| 200 | 186 | 400 | 26.9 |
| 300 | 179 | 600 | 25.8 |
| 400 | 172 | 800 | 24.7 |
| 500 | 165 | 1000 | 23.5 |

1) ($x10^{3}$)

## Welding

The weldability of Alleima® 5R75 is good. Welding must be carried out without preheating and subsequent heat treatment is normally not required. Suitable methods of fusion welding are manual metal-arc welding (MMA/SMAW) and gas-shielded arc welding, with the TIG/GTAW method as first choice.

For Sandvik 5R75, heat input of <1.5 kJ/mm and interpass temperature of <150°C (300°F) are recommended.



Datasheet last updated 5/9/2025 6:38:14 AM (supersedes all previous editions)

Tel: +45 63 12 83 00 | Email: ps@hymatik.com | www.hymatik.com | Hvidkaervej 27a, DK-5250 Odense SV, Denmark

### Recommended filler metals

TIG/GTAW or MIG/GMAW welding

ISO 14343 S 19 12 3 Nb / AWS A5.9 ER318 (e.g. Exaton 19.12.3.Nb )

MMA/SMAW welding

ISO 3581 E 19 12 3 Nb R / AWS A5.4 E318-17

## Machining

Alleima® 5R75 has good machining properties. Detailed recommendations for the choice of tools and cutting data are provided in brochures S-0291-ENG and S-1492-ENG.

Disclaimer:

Recommendations are for guidance only, and the suitability of a material for a specific application can be confirmed only when we know the actual service conditions. Continuous development may necessitate changes in technical data without notice. This datasheet is only valid for Alleima materials.

Datasheet last updated 5/9/2025 6:38:14 AM (supersedes all previous editions)