outokumpu
sustainable stainless steel

# Therma 4622Nb

Outokumpu Therma range datasheet


## General characteristics

Outokumpu Therma 4622Nb (EN 1.4622) dual stabilized ferritic stainless steel has enhanced high-temperature creep resistance above 1000°C due to alloying of niobium and silicon.

Thanks to its high chromium content improved corrosion resistance is achieved. That makes it ideal for a wide range of applications such as automotive exhaust systems, furnace equipment, annealing boxes, air heaters and burner nozzles. Therma 4622Nb fulfils ASTM UNS S44330.

### Therma 4622Nb has:

- **Good corrosion resistance**
  Comparable to common austenitic grades, such as 304L (EN 1.4307).
- **Competitive and stable price**
  Excellent cost stability compared to Ni-alloyed austenitic grades and Mo-alloyed acid proof grades.
- **Deep drawable**
  Ideal for deep drawing applications with high R-value and limiting drawing ratio (LDR).
- **Good weldability**
  Low risk of sensitization due to stabilization. Less distortion than in austenitic grades due to higher heat transfer.
- **Good machinability**
  Lower work hardening versus austenitic grades.

## Corrosion resistance

Outokumpu produces Therma 4622Nb, PRE 23, typically with a chromium content of about 21 wt-%.

- High chromium content improves corrosion resistance, which is similar compared to some other stainless steels, like austenitic 304L (1.4307).
- Stabilization reduces sensitivity for intergranular corrosion.
- In chloride containing environments pitting and crevice corrosion is possible depending on various parameters like chloride concentration, temperature, pH value, redox potential, crevice geometry and others.
- The best material performance is reached usually with the help of adequate design, correct post-weld treatment and regular cleaning during use (if applicable).
- Therma 4622Nb passed successfully salt spray test according to standard DIN EN ISO 9227 NSS for testing resistance to pitting corrosion in delivery condition and sensitised (MAG weld).
- At climate change test according to standard DIN EN ISO 11997-1 (formerly VDA 621-415) for testing resistance to pitting corrosion in delivery condition and sensitised (MAG weld) this material exhibited very good corrosion resistance.
- Therma 4622Nb has tested by corrosion test DIN 3651-2 (Strauss test) for testing resistance to intergranular corrosion in delivery condition and sensitised (MAG weld) and showed good corrosion behaviour.
- Long-term climate change test VDA 230-214 (Korrago test) for testing resistance to pitting, surface and intergranular corrosion in delivery condition and sensitised (MAG weld) has performed and the material was stable and without any corrosion attack in aggressive inorganic condensate (nitric acid, sulphuric acid) which is typically used at applications with high sulphur fuel.

## Typical applications

High chromium content and enhanced elevated temperature properties make the grade suitable in many applications, such as:

- Automotive exhaust systems
- Furnace equipment
- Annealing boxes
- Air heaters
- Burner nozzles

## Forming and machining

The grade can be formed using typical forming processes like folding, bending, drawing, etc.

- Grade has slightly higher proof strength than standard austenitic stainless steel grade 304L (1.4307) in combination with lower work hardening.
- Due to stabilization, its R-value is higher compared to non-stabilized ferritic stainless steel.
- These characteristics mean excellent deep drawability.

# Welding

Conventional welding methods are applicable, austenitic 316L filler metals can be used.

- Shielding gases should be Ar/He based, mixed with maximum of 2% oxygen to improve the arc stability. Hydrogen and nitrogen additions are forbidden.
- Heat input should be minimized to reduce the grain growth in the heat-affected zone.
- Stabilization prevents sensitization in the welds.
- Adequate corrosion resistance in the welds using either mechanical descaling or pickling.

# Physical properties

Crystal structure is ferritic, and therefore material is ferromagnetic as soft annealed condition.

### Physical properties

Table 1

| Outokumpu name | Density [kg/dm³] | Modulus of elasticity at 20 °C [GPa] | Coefficient of thermal expansion 20–100 °C [10⁻⁶/K] | Thermal conductivity at 20 °C [W/(m x K)] | Thermal capacity at 20 °C [J/(kg x K)] | Electrical resistivity at 20 °C [Ω x mm²/m] |
|---|---|---|---|---|---|---|
| Therma 4622Nb | 7.70 | 220 | 10 | 21 | 460 | 0.65 |

Room temperature, RT.

# Chemical composition

### Chemical composition

Table 2

| Outokumpu name | EN | C | Cr | Ni | Mo | Mn | N | Cu | Stabilization | Family |
|---|---|---|---|---|---|---|---|---|---|---|
| Therma 4622Nb | 1.4622 | 0.02 | 21 | – | – | 0.40 | 0.02 | 0.40 | Yes | F |

Room temperature, RT.

# Mechanical properties

### Mechanical properties at room temperature

Table 3

| Steel name | $R_{p0.2}$ | $R_m$ | $A_{50}/A_{80}$ | Hardness |
|---|---|---|---|---|
| Therma 4622Nb [1] | 370 | 530 | 26 | 80 HRB |
| EN 1.4622 [2] | 300 | 430–630 | 22 | – |
| UNS S44330 [3] | 205 | 390 | 22 | max. 187 HBW |

[1] Outokumpu typical values, RT.
[2] EN min. values, RT.
[3] ASTM A240 min. values, RT.

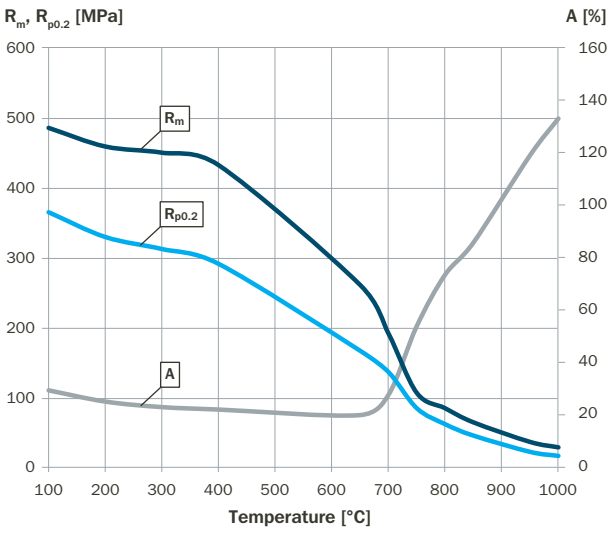


Fig. 1. Mechanical properties at elevated temperatures for Therma 4622Nb.

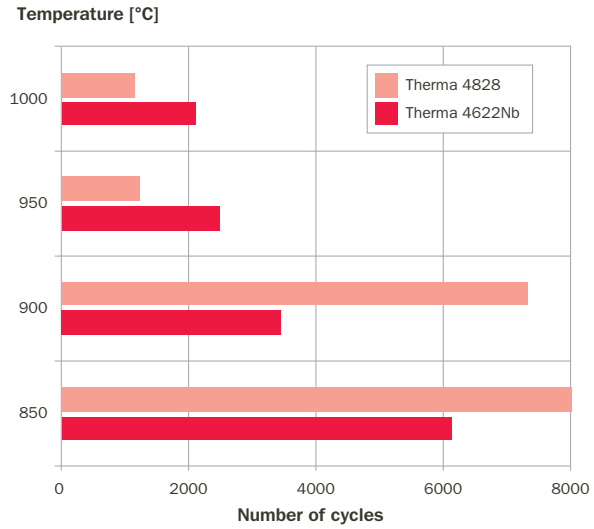


Fig. 2. Thermomechanical fatigue V-shape tests.

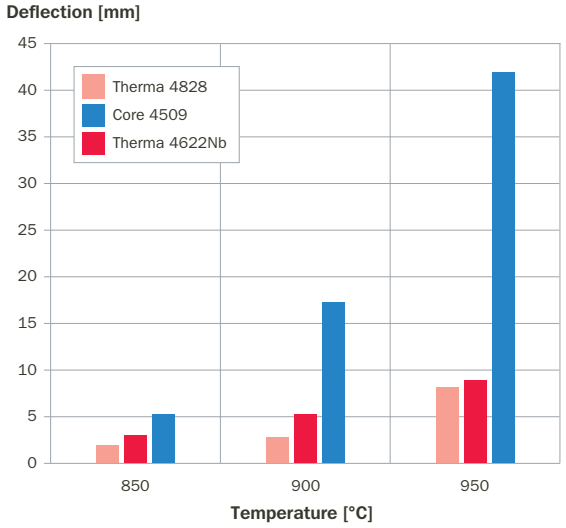


Fig. 3. Creep sag tests, material tested in 1.5 mm thickness.

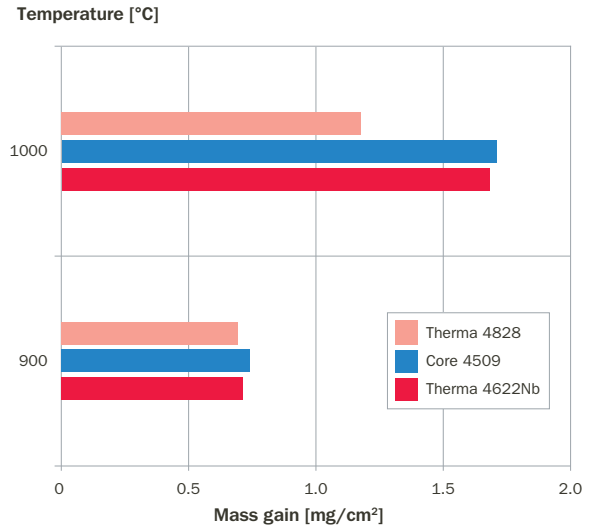


Fig. 4. Cyclic oxidation tests in 90 hours in synthetic air.

# Products

Therma 4622Nb is available as cold rolled coil and sheets and in thicknesses of 0.5 – 2 mm with widths up to 1250 mm.

# Standards and approvals

## Standards and approvals

Table 4

| | | |
|---|---|---|
| EN 10028-7: 2016 | Flat products made of steels for pressure purposes – Part 7: Stainless steels. | Available |
| PED Directive 2014/68/EU | European Pressure Equipment Directive | Available |
| ASTM A240/A240M | Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications | Available, fulfills UNS S44330 |
| ASME SA-240/SA-240M | Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessel and for General Applications | Available, fulfills UNS S44330 |

Work is in progress for further standardization.

# Contacts and enquiries

## Contact us

Our experts are ready to help you choose the best stainless steel product for your next project.

**www.outokumpu.com/contact**

Therma 4622Nb datasheet. September, 2023.

# 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.

| outokumpu classic | | | outokumpu pro | | | | | |
|---|---|---|---|---|---|---|---|---|
| Moda | Core | Supra | Forta | Ultra | Dura | Therma | Prodec | Deco |
| Mildly corrosive environments | Corrosive environments | Highly corrosive environments | Duplex & other high strength | Extremely corrosive environments | High hardness | High service temperatures | Improved machinability | Special surfaces |

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