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| AISI | **316 L** | DIN | **1.4435 - X 2 CrNiMo 18 14 3** | AFNOR | Z 3 CND 18 14 03 |
|---|---|---|---|---|---|

## General characteristics

Austenitic stainless steel with an excellent corrosion resistance.
The low carbon content effectively reduces the susceptibility to intergranular corrosion. The presence of molybdenum enhances the resistance to oxidizing acids as well as to pitting corrosion.
In case of complex machining operations, such as the drilling of long but narrow holes for instance, modified steel types (PM 1.4435) with the addition of chip breaking additives may be preferred.
This steel complies with the standard EN 1811 and can be used for products in direct and prolonged contact with skin.

| | |
|---|---|
| **Machinability** | - |
| **Quench hardening** | no |
| **Polishing** | + |
| **Magnetic** | no |
| **Age hardening** | no |
| **Welding** | |
| MIG,TIG,WIG | yes |
| Arc | yes |
| Resistance | yes |
| Autogenous | yes |
| Laser | yes |

## Chemical composition according to DIN (%)

| **C** | **Si** | **Mn** | **P** | **S** | **Cr** | **Mo** | **Ni** | **others** |
|---|---|---|---|---|---|---|---|---|
| < 0.03 | < 1 | < 2 | < 0.045 | < 0.015* | 17 - 19 | 2.5 - 3 | 12.5 - 15 | N < 0.11 |

*S < 0.03% for bars, wires, profiles and corresponding semi-products

## Physical properties

| **Density** $\rho$ [kg·m$^{-3}$] | **Electrical resistivity** $\rho$ [µΩ·m] | **Specific heat** $C_p$ [J·kg$^{-1}$·K$^{-1}$] | **Thermal conductivity** $\lambda$ [W·m$^{-1}$·K$^{-1}$] |
|---|---|---|---|
| 7'980 | 0.75 | 500 | 15 |

| **Coefficient of thermal expansion** $\alpha$ [10$^{-6}$·°C$^{-1}$] between 20°C and | | | | | | | **Elastic modulus** E [GPa] |
|---|---|---|---|---|---|---|---|
| 100 °C | 200 °C | 300 °C | 400 °C | 500 °C | 600 °C | 700 °C | 200 at 20°C |
| 16.5 | 17.5 | 17.5 | 18.5 | 18.5 | 19 | 19.5 | 172 at 400°C |

## Mechanical properties

| **State** | **Yield strength** $Rp_{0.2}$ [MPa] | | | | **Tensile strength** Rm [MPa] | **Elongation** $A_5$ [%] | **Vickers Hardness [HV]** |
|---|---|---|---|---|---|---|---|
| | 20°C | 100°C | 200°C | 300°C | | | |
| **Annealed** | 190 | 166 | 137 | 118 | 460 - 680 | ≥45 | 160 - 200 |
| **Full hard** | 1300 | | | | 1400 | 5 | 430 |

## Thermal treatments

| **Type** | **Temperature** [°C] | **Time** [minutes] | **Protective atmosphere** | **Cooling** |
|---|---|---|---|---|
| **Annealing** | 1020 -1080 | 15 - 60 | $H_2$ + $N_2$ or cracked $NH_3$ | Rapid |

## Surface treatments

| **Type** | **Solution** | **Remarks** |
|---|---|---|
| **Pickling** | 6 - 25 % $HNO_3$ + 0.5 - 8 % HF | Only suitable in annealed condition, hot |
| **Passivation** | 20 - 50% $HNO_3$ | Hot |

## Fabrication characteristics

This steel can easily be cold rolled, drawn and stamped. However, suitable tooling is required because of its high work hardening rate. This alloy may become slightly magnetic with increasing cold working.
This stainless steel should not be maintained for a long time between 500°C and 900°C, because of possible precipitation of chromium carbides at grain boundaries. A consecutive annealing for carbide dissolution is necessary, followed by rapid cooling to prevent a new precipitation. Quenching is only required for big cross sections.
The pure steel 1.4435 is relatively difficult to machine, but there exist special executions with improved machinability, such as the steel PX or PM.

## Welding, brazing and soldering

This steel can easily be welded by any conventional joining technique, except the oxyacetylene torch.
Depending on the welding conditions, some residual ferrite may form along the welding line.
There is no need for any post-weld heat treatment.
Welding electrodes: 1.4430, 1.4576.

## Available products

Sheets, ribbons, wires, profiles, tubes, dimensions and tolerances on request.