

# Standard Cr-Ni-Mo Austenitic Stainless Steel

## EN 1.4404/ 1.4401 - ASTM 316 /316 L

### MAXIVAL®

#### A stainless austenitic steel

Typical analysis %	C	Cr	Ni	Mo
EN 1.4404	0,03	17	11	2,2
Delivery condition	Solution annealed			

#### Mechanical properties

Values for solution annealed condition acc. to EN 10272 at room temperature

Tensile strength Rm	N/mm <sup>2</sup>	520 - 700
Proof strength Rp <sub>02</sub>	N/mm <sup>2</sup>	min 210
Elongation A <sub>5</sub>	%	min 45
Impact energy KV	J/cm <sup>2</sup>	Min 100
Hardness	HB	Max 215

Cold-worked material:

The maximum HB-values may be raised by 100 HB or the Tensile strength value may be raised by 200 N/mm<sup>2</sup> and the Elongation value lowered to 20 % for bars ≤ 35 mm.

#### Physical properties acc. to EN 10088

Temperature ° C	20	100	200	300	400	500
Density kg/dm <sup>3</sup>	8					
Modulus of elasticity E GPa	200	194	186	179	172	165
Mean coeff. of thermal expansion 20° C –Temp. x10 <sup>-6</sup> · K <sup>-1</sup>	-	16,0	16,5	17,0	17,5	18,0
Specific Thermal Capacity W/m · K	15					
Electrical Resistivity Ω · mm <sup>2</sup> / m	0,75					
Specific heat J/kg · K	500					

**EN 1.4404 MAXIVAL®** is a molybdenium-containing austenitic stainless steel intended to provide improved corrosion resistance relative to the standard Cr-Ni steel. The addition of molybdenium provides improved resistance to pitting and crevice corrosion in environments containing chlorides or other halides.

It is non-magnetic in the annealed condition but may become slightly magnetic as a result of cold-working or welding.

MAXIVAL® indicates that the steel has been modified in order to obtain good machinability.

#### Design features

- ⇒ Enhanced corrosion resistance compared to standard Cr-Ni grades
- ⇒ Very good machinability
- ⇒ Excellent formability and weldability
- ⇒ Excellent impact strength

#### Corrosion resistance

**EN 1.4404** have a versatile corrosion resistance and is suitable for a wide range of applications. The grades with higher molybdenium content (1.4432,1.4436) have somewhat enhanced corrosion resistance compared with grades with lower Molybdenium content (1.4404). Also the grades have a good resistance to many organic and inorganic chemicals.

Austenitic stainless steels are sensitive to intergranular corrosion due to grain boundary precipitation of chromium carbides, which can occur in the temperature range 550 - 850°C.

It is not a common problem for modern stainless steels since the carbon content is generally kept at a low level. Steels with low carbon content (0,02%) have good resistance to intergranular corrosion.

The resistance to pitting and crevice corrosion can be enhanced by increasing the content of chromium. Molybdenium and nitrogen. These grades have a significantly better resistance to these types of localised corrosion than the standard Cr-Ni grades.

The grade EN 1.4404 and like the standard Cr-Ni steels are susceptible to stress corrosion cracking. Critical service conditions, i. e. applications subjected to combinations of tensile stresses, temperatures above about 50°C and solutions containing chlorides, should be avoided.

## Heat treatment

**Solution annealing** 1050 - 1100° C. Holding time at solution annealing temperature approx. 30 min., followed by rapid cooling in water.

## Hardening

These grades cannot be hardened by heat treatment. But they can be hardened by cold working.

## Machining

Austenitic stainless steel are more difficult to machine than ordinary carbon steels. They require higher cutting forces than carbon steels, show resistance to chip breaking and a high tendency to built-up edge formation. Generally the machinability decreases with higher contents of alloying elements.

The best machining results are obtained by using high-power equipment, sharp tooling and a rigid set-up.

Also the machining properties can be improved through modifications in the metallurgical practice. This is the case in the Acciaierie Valbruna MAXIVAL®.

**EN 1.4404 MAXIVAL®** as such is not " a stainless free cutting steel " but a high class norm steel.

The machinability have been improved through modifications in the metallurgical practice.

It is an " easy to machine steel", considered for parts where extensive machining is required, and still basically the same corrosion properties are maintained.

For more information, contact Valbruna Nordic.

## Welding

These grades can be readily welded by a full range of conventional welding methods.

## Surface finish

**EN 1.4404** is available with ground, peeled and machined surface.

## Stock standard

Please refer to our stock standard leaflet.

## Technical support

**VALBRUNA NORDIC AB** will be helpful in giving further advice and recommendations concerning choice of materials, welding, heat treatment, etc.

## MATERIAL STANDARDS

<b>EN 10088-3</b>	Stainless steels-Semi-finished products, bars, rods, sections for general purposes
<b>EN 10028-7</b>	Flat products for pressure purposes-Stainless steels
<b>EN 10272</b>	Stainless steel bars for pressure purposes
<b>ASTM A 276/ ASME SA-276</b>	Stainless steel bars for general purposes
<b>ASTM A 479/ ASME SA-479</b>	Stainless steel bars for pressure boilers/pressure vessels