Acidur 4404

TECHNICAL DATA SHEET
X2CrNiMo17-12-2
1.4404

AUSTENITIC STAINLESS STEEL

CHEMICAL COMPOSITION (IN WEIGHT-% ACCORDING TO DIN EN 10088-3)

	C	Si	Mn	P	S	Cr	Mo	Ni	N
min.	-	-	-	-	-	16.5	2.0	10.0	-
max.	0.03	1.0	2.0	0.045	0.03	18.5	2.5	13.0	0.1

CHEMICAL COMPOSITION (IN WEIGHT-% ACCORDING TO ASTM A276)

	C	Si	Mn	P	S	Cr	Mo	Ni	N
min.	-	-	-	-	-	16.0	2.0	10.0	-
max.	0.03	0.75	2.0	0.045	0.03	18.0	3.0	14.0	0.1

Customer specific limitations of standard analysis are possible after consultation with the Deutsche Edelstahlwerke GmbH.

APPLICATIONS

Acidur 4404 is one of the common corrosion-resistant stainless steels. Due to its molybdenum content, it offers a high degree of resistance against non-oxidising acids and halogenated media. Furthermore, Acidur 4044 is easy to process and can be used at temperatures up to 550°C.

GENERAL PROPERTIES

Corrosion resistance	very good
Mechanical properties	average
Forgeability	good
Weldabilty	excellent
Machinability	average

STANDARDS AND DESIGNATIONS

DIN EN 10088-3	1.4404 X2CrNiMo17-12-2
AISI	316L
UNS	S31603
JIS	SUS316L
B.S.	316S11
SS	2348
AFNOR	Z3CND17-11-02

SPECIAL PROPERTIES

- Polishable
- Resistant to intergranular corrosion in continuous operation up to 300°C
- Suitable for low temperatures
- Suitable for use at temperatures up to 550°C

Acidur 4404

TECHNICAL DATA SHEET
X2CrNiMo17-12-2
1.4404

PHYSICAL PROPERTIES

Density in kg/dm³	8.0
Electrical resistivity at 20°C in (Ω mm²)/m	0.75
Magnetisability	low[1]
Thermal conductivity at 20°C in W/(m K)	15
Specific heat capacity at 20°C in J/(kg K)	500
Young's modulus in GPa at	
» 20°C	200
» 100°C	194
» 200°C	186
» 300°C	179
» 400°C	172
» 500°C	165
Thermal expansion coefficient in $10^{-6}K^{-1}$	
» 20°C - 100°C	16.0
» 20°C - 200°C	16.5
» 20°C - 300°C	17.0
» 20°C - 400°C	17.5
» 20°C - 500°C	18.0

[1]The material can be magnetised in quenched condition. With increasing cold forming the magnetisability increases, too.

TYPICAL APPLICATIONS

- Chemical and pharmaceutical industry
- Food industry
- Fittings and plant engineering
- Construction industry
- Offshore
- Petrochemistry
- Automotive industry
- Decorative items and kitchen utensils
- Electronical equipment
- Aerospace
- Mechanical engineering

Note: Delivery according to building approval Z-30.3-6 and pressure vessel standard DIN EN 10272.

PROCESSING PROPERTIES

Machining	yes
Hammer and die forging	yes
Cold forming	yes
Cold heading	yes
Polishability	yes

TEMPERATURES FOR HOT FORMING AND HEAT TREATMENT

HOT FORMING

	Temperature in °C	Cooling[1]
	1200 - 900	air, water

HEAT TREATMENT

	Temperature in °C	Cooling[1]
Solution annealing (+AT)	1020 - 1120	water, air

[1]depending on dimension

Acidur 4404

TECHNICAL DATA SHEET
X2CrNiMo17-12-2
1.4404

MECHANICAL PROPERTIES IN SOLUTION ANNEALED CONDITION (+AT) AT ROOM TEMPERATURE ACCORDING TO DIN EN 10088-3

Ø in mm	Hardness in HB	$R_{p0.2}$ in MPa	$R_{p1.0}$ in MPa	R_m in MPa	A_5 in %		AV in J		Z in %
					longitudinal	transverse	longitudinal	transverse	
≤ 160	≤ 215	≥ 200	≥ 235	500 - 700	≥ 40	-	≥ 100	-	-
160 < d ≤ 250	≤ 215	≥ 200	≥ 235	500 - 700	-	≥ 30	-	≥ 60	-

For thicker dimensions (d > 250 mm) the mechanical properties have to be agreed.

MECHANICAL PROPERTIES IN SOLUTION ANNEALED CONDITION (+AT) AT ROOM TEMPERATURE ACCORDING TO ASTM A276

Ø in mm	Hardness in HB	$R_{p0.2}$ in MPa	$R_{p1.0}$ in MPa	R_m in MPa	$A_{2''}$ in %		AV in J		Z in %
					longitudinal	transverse	longitudinal	transverse	
all	-	≥ 170	-	≥ 485	≥ 40	-	-	-	≥ 50

MECHANICAL PROPERTIES IN SOLUTION ANNEALED CONDITION (+AT) AT HIGHER TEMPERATURES ACCORDING TO DIN EN 10088-3

Temperature in °C	100	150	200	250	300	350	400	450	500	550
$R_{p0.2}$ in MPa	≥ 165	≥ 150	≥ 137	≥ 127	≥ 119	≥ 113	≥ 108	≥ 103	≥ 100	≥ 98
$R_{p1.0}$ in MPa	≥ 200	≥ 180	≥ 165	≥ 153	≥ 145	≥ 139	≥ 135	≥ 130	≥ 128	≥ 127

FORGING

Acidur 4404 is usually heated slowly to 1150°C - 1180°C. The temperature range for forging is 900°C - 1180°C. If no bending is expected, the material is cooled rapidly in water (or air) to avoid undesired phases which reduce the corrosion resistance and mechanical properties. Tempering colours and scale layers reduce the corrosion resistance and must be removed by pickling or other suitable methods.

COLD FORMING

Acidur 4404 is suitable for cold forming according to DIN EN 10263-5. Modified analysis with better cold forming behaviour are available on request.

Acidur 4404

TECHNICAL DATA SHEET
X2CrNiMo17-12-2
1.4404

CORROSION RESISTANCE (PREN = 23.1-28.5)

Due to the molybdenum content of 2% - 2.5% the corrosion resistance (especially in presence of chorides) is significantly higher than the corrosion resistance of Acidur 4301 and Acidur 4307. In most natural environmental media and industrial areas with moderate concentrations of chloride and salt as well as in the food and pharmaceutical industries, Acidur 4404 shows an excellent corrosion resistance. Due to the lower carbon content Acidur 4404 is resistant to intergranular corrosion in accordance to DIN EN ISO 3651 part 2 (also after welding). However Acidur 4404 is not resistant to sea water.

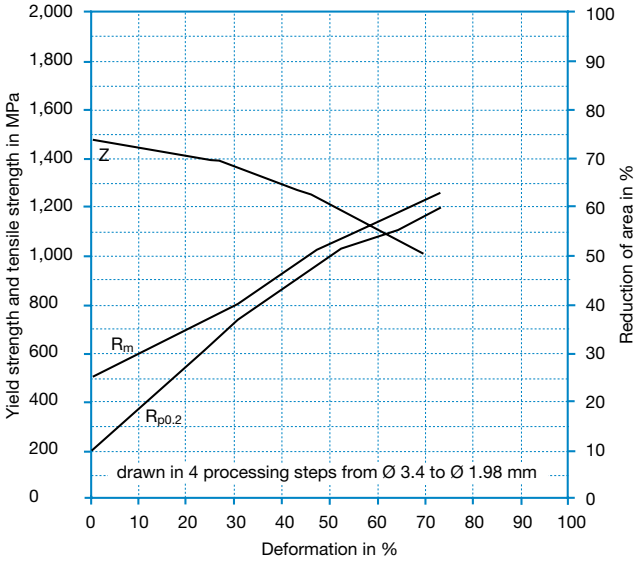
Corrosive medium	Concentration	Temperature	Resistance
NaCl	saturated	20°C	risk of pitting corrosion
Seawater	-	20°C	risk of pitting corrosion
Water varpour	-	400°C	resistant
Nitric acid	7 %	20°C	resistant
Sulphuric acid	1 %	20°C	resistant
Formic acid	10 %	20°C	resistant

Laboratory experiments with pure corrosive agent and optimal specimens are the basis of these corrosion resistance tests. Note: These results are a non-binding indication.

WELDING

Acidur 4404 is weldable with or without filler material (e.g. 1.4430). The interpass temperature should not exceed 200°C. Subsequent heat treatment is not required. The resistance to intergranular corrosion is unaffected by welding (acc. to DIN EN ISO 3651 part 2).

STRAIN HARDENING DIAGRAM



Acidur 4404

TECHNICAL DATA SHEET
X2CrNiMo17-12-2
1.4404

MACHINING

For Acidur 4404 we recommend the following cutting conditions:

CUTTING CONDITIONS

				Tool angle		
Processing type	Cutting speed in m/min	Depth of cut in mm	Feed rate in mm/U	Cutting angle	Clearance angle	Inclination angle
Drilling	40 - 100	-	0.05 - 0.16	140° Tip angle	140° Tip angle	-
Turning	70 - 175	6	0.1 - 0.5	10° - 16°	6° - 8°	-4° and 4°
Milling	125 - 260	-	0.15 - 0.3	-	-	-

Cutting data can be seen as an indication and are only for an assessment of the processing parameters.
Analysis variants to optimise the machining properties on request.

DELIVERY CONDITIONS

Wire rod	Ø 5.5 - 30.0 mm
Bars	Ø 7.0 - 250.0 mm
Bright steel in bars	Ø 2.0 - 290.0 mm
Bright steel in coils	Ø 0.8 - 20.0 mm

completion: solution annealed, pickled, drawn, forged, rolled, straightened, peeled and grounded. Dimensions > 290 mm available after consultation.

You can find our complete delivery programme in the brochure “High-tech Steel Solutions for Tomorrow’s World (Products and Services)” on www.dew-stahl.com.

Deutsche Edelstahlwerke GmbH
Auestr. 4
58452 Witten
Germany
Phone: +49 (0) 2302 29 - 0
Fax: +49 (0) 2302 29 - 4000

info@dew-stahl.com
www.dew-stahl.com