



A200

BÖHLER A200

NICHTROSTENDER STAHL
STAINLESS STEEL

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Properties

Austenitic chromium nickel molybdenum steel with low carbon content. Resistant to intergranular corrosion in the temperature range up to 400 °C (752 °F). Does not require post-weld heat treatment. Offers better resistance than 18/8 steels without molybdenum to the attack of acids having a reducing effect, such as diluted sulphuric acid and hydrochloric acid, and to media causing pitting, crevice and stress corrosion cracking. For optimum resistance, surfaces should be pickled. Cold forming properties are good, the steel is capable of taking a mirror finish.

Application

Dyeing and sulphite wood pulp industries, chemical and rayon industries, dairy equipment.

Chemical composition

(Average %)

C	Si	Mn	Cr	Mo	Ni
max. 0,030	0,50	1,40	17,00	2,20	11,50

Standards

EN / DIN < 1.4404 > X2CrNiMo17-12-2	AISI 316L	AMS 5653	UNS S31603
SIS 2348	BS 316S11 – 316S12	UNI X2CrNiMo17-12	AFNOR Z2CND17-12
UNE F3533 X2CrNiMo17-12-03			

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Hot forming

Forging:
1200 to 900 °C (2192 to 1652 °F)
Air cooling

Heat treatment

Solution annealing / Quenching:
1020 to 1120 °C (1868 to 2048 °F)
Water, air (thickness below 2 mm)
Structure:
Austenite
(+ small ferrite percentages)

Welding

Weldability is good. TIG welding is recommended for sheet gauges from 0.7 to 4 mm, in particular for butt welds; arc welding is recommended for the thickness range above 1.5 mm, in particular for fillet welds. Thin sheets admit seam and spot welding, as well as electron beam welding. Gas welding involves the risk of carburization and should therefore be avoided. Quenching after welding is not necessary.

Filler metals
Arc Welding:
BÖHLER FOX EAS 4M
BÖHLER FOX EAS 4M-A
TIG and MIG welding:
BÖHLER EAS 4M-IG
SA welding
BÖHLER EAS 4M-UP

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Mechanische Eigenschaften bei Raumtemperatur

Mechanical properties at room temperature

Zustand: lösungsgeglüht

Condition: annealed

Produkt Product	Dimension Size mm	0,2-Grenze 0.2% proof stress N/mm ² min.	1%-Dehngrenze 1% proof stress N/mm ² min.	Zugfestigkeit Tensile strength N/mm ²	Dehnung A ₅ Elongation A ₅ % min.			Kerbschlagarbeit Impact strength (ISO-V) J min.		
					L	Q	T	L	Q	T
St, Sch	≤ 160	200	235	500 - 700	40	--	--	100	--	--
	> 160 ≤ 250				--	30	--	--	60	--
Bl	≤ 75	220	260	520 - 670	--	45 ¹⁾	--	90 ²⁾	60 ²⁾	--

St = Stab, Sch = Schmiedestücke,
Bl = Blech
L = Längs, Q = Quer
T = Tangential

St = Bars, Sch = Forgings,
Bl = Sheet or plate
L = Longitudinal, Q = Transverse,
T = Tangential

1) < 3 mm = A₈₀ mm Probe
2) > 10 mm Dicke

1) < 3mm = A₈₀ mm test specimen
2) > 10 mm thickness

Für andere Produkte oder Abmessungen
sind die Werte zu vereinbaren.

The values for other products and
dimensions shall be established by
agreement.

Warmfestigkeitseigenschaften

High temperature properties

Zustand: lösungsgeglüht

Condition: annealed

Temperatur/Temperature °C (°F)	100°C (212°F)	150°C (302°F)	200°C (392°F)	250°C (482°F)	300°C (572°F)	350°C (662°F)	400°C (752°F)	450°C (842°F)	500°C (932°F)	550°C (1022°F)
0,2-Grenze 0.2% proof stress N/mm ² min.	165	150	137	127	119	113	108	103	100	98
1%-Dehngrenze 1% proof stress N/mm ² min.	200	180	165	153	145	139	135	130	128	127

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Corrosion resistance diagrams

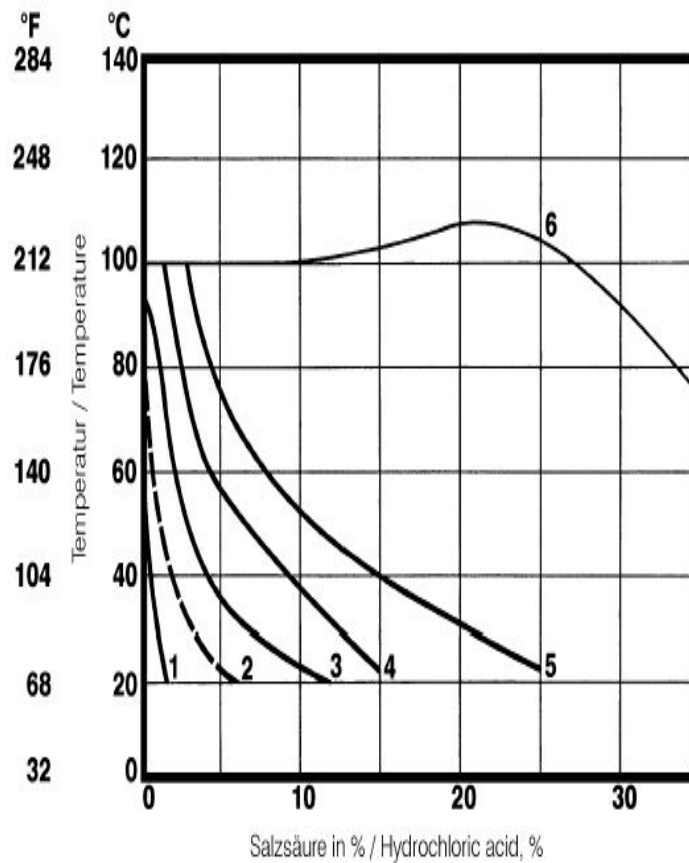
In the diagrams shown, constant weight losses determined experimentally on specimens exposed to the attack of different acids are plotted as a function of temperature and acid concentration. The curves represent constant weight losses of 0.1, 0.3, 1.0, 3.0 and 10.0 g/m² . hr. Generally, a weight loss of 0.3 g/m² . hr is considered the limit beyond which the use of the steel becomes uneconomical. This limit is represented by the dotted line.

Salzsäure HCl

Hydrochloric acid HCl

- 1 ... Gewichtsverlust, 0,1 g/m² . h
- 2 ... Gewichtsverlust, 0,3 g/m² . h
- 3 ... Gewichtsverlust, 1,0 g/m² . h
- 4 ... Gewichtsverlust, 3,0 g/m² . h
- 5 ... Gewichtsverlust, 10,0 g/m² . h
- 6 ... Siedekurve

- 1 ... Weight loss, 0.1 g/m² . hr
- 2 ... Weight loss, 0.3 g/m² . hr
- 3 ... Weight loss, 1.0 g/m² . hr
- 4 ... Weight loss, 3.0 g/m² . hr
- 5 ... Weight loss, 10.0 g/m² . hr
- 6 ... Boiling point curve



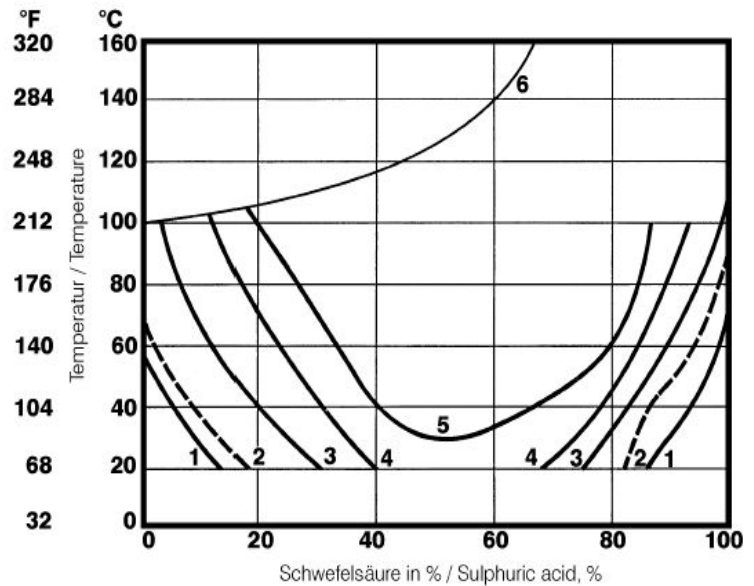
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Schwefelsäure H₂SO₄

Sulphuric acid H₂SO₄

- 1 ... Gewichtsverlust, 0,1 g/m² · h
- 2 ... Gewichtsverlust, 0,3 g/m² · h
- 3 ... Gewichtsverlust, 1,0 g/m² · h
- 4 ... Gewichtsverlust, 3,0 g/m² · h
- 5 ... Gewichtsverlust, 10,0 g/m² · h
- 6 ... Siedekurve

- 1 ... Weight loss, 0,1 g/m² · hr
- 2 ... Weight loss, 0,3 g/m² · hr
- 3 ... Weight loss, 1,0 g/m² · hr
- 4 ... Weight loss, 3,0 g/m² · hr
- 5 ... Weight loss, 10,0 g/m² · hr
- 6 ... Boiling point curve

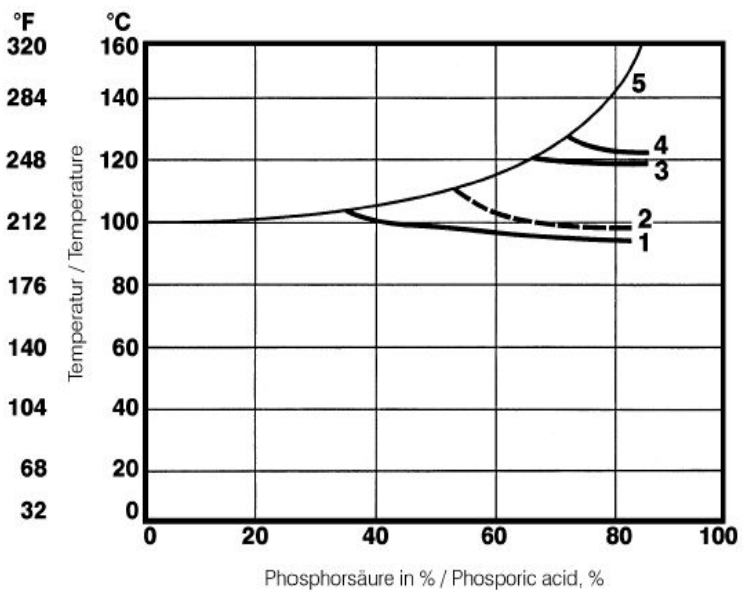


Phosphorsäure H₃PO₄

Phosphoric acid H₃PO₄

- 1 ... Gewichtsverlust, 0,1 g/m² · h
- 2 ... Gewichtsverlust, 0,3 g/m² · h
- 3 ... Gewichtsverlust, 1,0 g/m² · h
- 4 ... Gewichtsverlust, 3,0 g/m² · h
- 5 ... Siedekurve

- 1 ... Weight loss, 0,1 g/m² · hr
- 2 ... Weight loss, 0,3 g/m² · hr
- 3 ... Weight loss, 1,0 g/m² · hr
- 4 ... Weight loss, 3,0 g/m² · hr
- 5 ... Boiling point curve



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Recommendation for machining

(As quenched condition, average values)

Turning with carbide tipped tools

depth of cut mm	0,5 to 1	1 to 4	4 to 8
feed, mm/rev.	0,1 to 0,2	0,2 to 0,4	0,3 to 0,6
BÖHLERIT grade	EB10,SB20,	EB20,EB30	SB30,EB20,HB20
ISO grade	M10,P20,	M20,M30	P30,M20,K20
<i>cutting speed, m/min</i>			
indexable carbide inserts			
edge life 15 mins.	200 to 170	170 to 145	130 to 110
brazed carbide tipped tools			
edge life 30 mins.	190 to 145	160 to 105	120 to 80
hardfaced indexable carbide inserts			
edge life 15 mins.			
BÖHLERIT ROYAL 121/ISO P20	to 220	to 190	to 150
BÖHLERIT ROYAL 131/ISO P35	to 180	to 140	to 100
<i>cutting angles for brazed carbide tipped tools</i>			
clearance angle	6 to 10°	6 to 10°	6 to 10°
rake angle	12 to 25°	12 to 20°	12 to 20°
angle of inclination	0°	0°	0°

Turning with HSS tools

depth of cut, mm	0,5	3
feed, mm/rev.	0,1	0,5
HSS-grade BOHLER/DIN	S700 /S10-4-3-10	
<i>cutting speed, m/min</i>		
edge life 60 min	45 to 35	40 to 25
rake angle	14 to 18°	14 to 18°
clearance angle	8 to 10°	8 to 10°
angle of inclination	0 to 4°	0 to 4°

Milling with carbide tipped cutters

depth of cut mm	to 0,6	to 4
feed, mm/tooth	to 0,2	0,2 to 0,3
<i>cutting speed, m/min</i>		
BÖHLERIT SBF / ISO P25	155 to 100	120 to 60
BÖHLERIT SB40 / ISO P40	110 to 70	80 to 40
BÖHLERIT ROYAL 131/ISO P35	140 to 85	- -

Drilling with carbide tipped tools

drill diameter, mm	20	30	40
feed, mm/rev.	0,01	0,12	0,15
BÖHLERIT / ISO-grade	SB30/P30	SB30/P30	SB30/P30
<i>cutting speed, m/min</i>	200	200	200

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Physikalische Eigenschaften

Physical properties

Dichte bei /
Density at20°C (68°F) 8,00kg/dm³

Wärmeleitfähigkeit bei /
Thermal conductivity at20°C (68°F) 15,00W/(m.K)

Spezifische Wärme bei /
Specific heat at20°C (68°F) 500J/(kg.K)

Spez. elektr. Widerstand bei /
Electrical resistivity at20°C (68°F) 0,75Ohm.mm²/m

Elastizitätsmodul bei /
Modulus of elasticity at20°C (68°F) 200x10³ ..N/mm²

MagnetisierbarkeitKann schwach vorhanden sein
Magnetic properties.....Can be slightly magnetic

Wärmeausdehnung zwischen 20°C und ...°C, 10 ⁻⁶ m/(m.K)	Temperatur / Temperature		10 ⁻⁶ m/(m.K)
	°C	°F	
Thermal Expansion between 20°C (68°F) and ...°C (°F), 10 ⁻⁶ m/(m.K)	100°C	212°F	16,0
	200°C	392°F	16,5
	300°C	572°F	17,0
	400°C	752°F	17,5
	500°C	932°F	18,0

Elastizitätsmodul, 10 ³ N/mm ² bei Modulus of elasticity, 10 ³ N/mm ² at	Temperatur / Temperature °C / °F		10 ³ N/mm ²
	°C	°F	
	20°C	68°F	200
	100°C	212°F	194
	200°C	392°F	186
	300°C	572°F	179
	400°C	752°F	172
	500°C	932°F	165

1) Die Magnetisierbarkeit kann mit steigender Kaltumformung zunehmen.

1) Magnetic properties may increase with cold forming.

As regards applications and processing steps that are not expressly mentioned in this product description/data sheet, the customer shall in each individual case be required to consult us.

