1.4362

X2CrNiN23-4

Austenitic-ferritic chromium-nickel stainless steel

C max. 0.03 **Cr** 22.00 – 24.00 **Ni** 3.50 – 5.50 **Mo** 0.10 – 0.60 **Cu** 0.10 – 0.60 **N** 0.12 – 0.20

General comments

1.4362 is part of the family of DUPLEX steels. To a limited extent it can be used as a low-cost substitute for austenitic chromium-nickel or chromium-nickel-molybdenum steels, possibly also for the DUPLEX material 1.4460. It has a significantly higher yield strength than the austenitic steels. DUPLEX stainless steels have become popular as a result of their unique combination of corrosion resistance, resistance to stress corrosion cracking and high tensile and yield strength. Its high strength makes this steel ideal for the construction industry. With a relatively low nickel content compared with conventional austenitics, 1.4362 is also attractive in terms of cost.

Relevant current and obsolete standards

EN 10088-3	1.4362	X2CrNiN23-4
AFNOR	Z2CN23-04AZ	
SIS	2327	
UNS	S32304	

General properties

corrosion resistance	outstanding
mechanical properties	outstanding
forgeability	average
weldability	good
machinability	limited

Special properties

ferromagnetic grade
suitable for applications up to 300 °C
suitable for low-temperature applications down to -50 °C

Physical properties

density (kg/dm^3)	7.80
electrical resistivity at 20 °C (Ω mm^2/m)	0.80
magnetizability	yes
thermal conductivity at 20 °C (W/m K)	15
specific heat capacity at 20 °C (J/kg K)	500
thermal expansion (K^{-1})	20 – 100 °C: 13.0 x 10^{-6}
	20 – 200 °C: 13.5 x 10^{-6}
	20 – 300 °C: 14.0 x 10^{-6}

Typical applications

construction
chemical industry
oil industry
electronic equipment
mechanical engineering
shipbuilding sectors

Note: cannot yet be supplied with approval for general building work in accordance with Z-30.3-6, individual approvals may be possible
dimensional limits can be agreed on

Processing properties

automated machining	no
machinable	yes
hammer and die forging	limited
cold forming	yes
cold heading	limited
suited to polishing	no

Conditions

solution annealed and quenched

Demand tendency

rising strongly

Corrosion resistance (PRE = 23.13 – 29.13)

1.4362 displays excellent corrosion resistance in acid environments, particularly in phosphoric and organic acids, also in environments with a low chloride content. It has higher corrosion resistance compared with 1.4404. Thanks to its dual-phase structure, the steel is greatly superior to austenitic grades as it is insensitive to intergranular corrosion and particularly resistant to stress corrosion cracking.

Heat treatment and mechanical properties

Optimum processing and service properties are achieved by solution annealing at 950 °C to 1050 °C followed by rapid cooling in air or water. The following mechanical properties apply to this condition:

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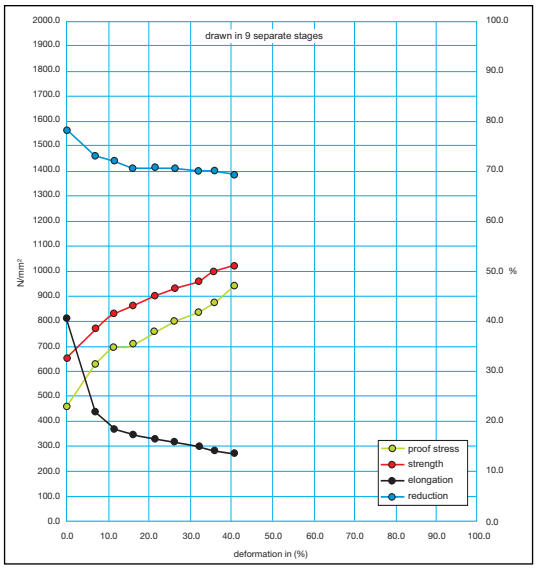
Property		Specification	Typical
yield strength (N/mm²)	R_{p02}	≥ 400	420
tensile strength (N/mm²)	R_m	600 – 830	630
tensile elongation (%)	A_5	≥ 25	40
hardness	HB	≤ 260	
impact energy (J) 25 °C	ISO-V	≥100	

The mechanical properties (d ≥ 160 mm) have to be agreed on for thicker dimensions, or the delivered product is based on the values given.



Typical graph for cold forming.

Elevated temperature properties

Due to its susceptibility to both 475 °C and sigma phase embrittlement, use of this material is restricted to temperatures below 300 °C.

Welding

The DUPLEX steel 1.4362 is readily weldable using all welding methods, both with and without the use of filler metals. If a filler metal is required, we recommend Novonit® 1.4462. No heat treatment is required after welding. Thanks to its dual-phase structure, the material displays low susceptibility to heat cracking. Welding parameters must be optimally selected for a controlled ferrite content. The use of higher energies (10 – 25 kJ/mm) is recommended for welding, as this results in a better phase distribution in the weld zone. The maximum interpass temperature is 150 °C.

Forging

1.4362 is sensitive to thermal shock. For this reason, slow heating up to temperatures of 1150 °C is required to allow forging in the 1150 °C – 900 °C temperature range. Subsequent cooling must be carried out rapidly in air.

Machining

Like all DUPLEX steels, 1.4362 can only be machined with difficulty. This is because of its dual-phase microstructure and associated strength properties. Ideal cutting conditions are more restricted than for austenitics. Within the possibilities available, it is always recommendable to use coated carbide inserts or cermets. We propose the following cutting conditions for 1.4362 (m/min with coated carbide):

	Depth of cut (mm)	6	3	1
	Feed rate (mm/r)	0.5	0.4	0.2
Solution annealed R_m approx. 750 N/mm²	Cutting speed (m/min)	110	140	175

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