

KARA ferritic stainless steel offer grades **K30 - K30D**



Chemical composition

Grades	Elements	C	Si	Mn	Cr
K30	%	0.04	0.35	0.30	16.50
K30D	%	0.03	0.35	0.40	16.50

Typical values

European designation

X6Cr17 1. 4016⁽¹⁾

American designation

Type 430⁽²⁾

⁽¹⁾ According to EN 10088-2

⁽²⁾ According to ASTM A 240.

K30	Standard level grade
K30D	Enhanced forming performance grade

This grade complies with:

- > The Stainless Europe Material Safety Data Sheet n°1: stainless steels (European Directive 2001/58/EC).
- > The European Commission Directive 2000/53/EC for end-of-life vehicles, and to Annex II dated 27 June 2002.
- > The NFA 36 711 Standard "Stainless steel intended for use in contact with foodstuffs, products and beverages for human and animal consumption" (non packaging steel).
- > The requirements of the NSF/ANSI 51-2009e edition International Standard for "Food Equipment Materials" and of the F.D.A. (United States Food and Drug Administration) regarding materials used for food contact.
- > The French Decret No.92-631 dated 8 July 1992 and the Regulation No.1935/2004 of the European Parliament and of the council of 27 October 2004 on materials and articles intended to come into contact with food (and repealing Directives 80/590/EEC and 89/109/EEC).

- > The French Arrêté dated 13 January 1976 relating to materials and articles made of stainless steel in contact with foodstuffs.

General characteristics

The principal features of our K30 and K30D grades for applications near room temperature are:

- > corrosion resistance in moderately aggressive media,
- > good cold formability (enhanced performance for K30D),
- > attractive surface appearance in the delivery condition, usually avoiding the need for subsequent finishing operations.

K30 and K30D also have good high temperature oxidation resistance.

Applications

- > Domestic appliances.
- > Platters and cutlery.
- > Flue ducts.
- > Dairy equipment.
- > Decorative components.

Product range

Forms: sheets, blanks, coils, strips, circles.

Thicknesses: 0.30 to 6.5 mm (K30D range from 0.4 to 2 mm).

Width: according to thickness, consult us.

Finishes: cold rolled or hot rolled, depending on the thickness.

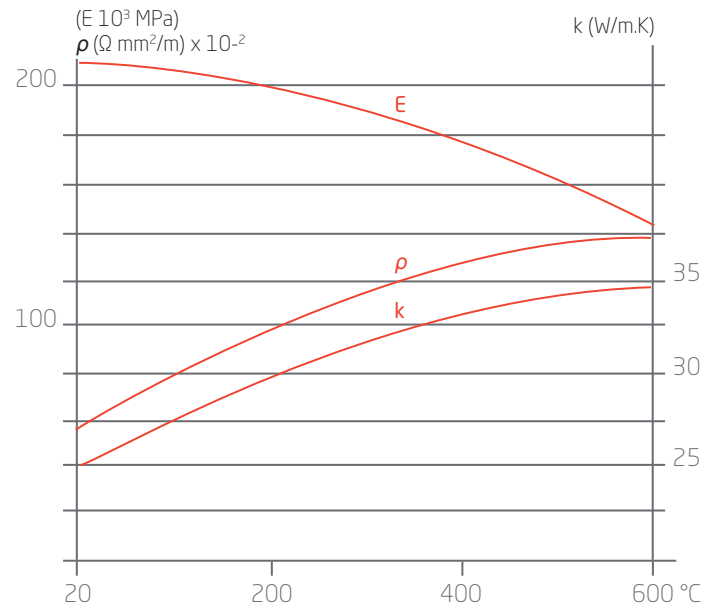
Physical properties

Cold rolled sheet - annealed.

Density	d	kg/dm ³	20 °C	7.7
Melting temperature		°C		1500
Specific heat	c	J/kg.K	20°C 400°C 800°C	460 600 800
Thermal conductivity	k	W/m.K	20 °C	25
Mean coefficient of thermal expansion	α	10 ⁻⁶ /K	20-200°C 20-400°C 20-500°C 20-600°C	10.5 11.5 11.7 12.5
Electric resistivity	ρ	Ω mm ² /m	20 °C	0.60
Magnetic permeability	μ	\approx 0.8 kA/m DC ou AC	20 °C	1000
Young's modulus	E	MPa.10 ³	20 °C	220

Poisson's coefficient: 0.28

Curie point: 725°C



Tensile properties

Annealed condition

In accordance with ISO 6892-1, part 1,
specimen perpendicular to the rolling direction.

Specimen

Lo = 80 mm (thickness < 3 mm)

Lo = 5.65 $\sqrt{S_0}$ (thickness \geq 3 mm)

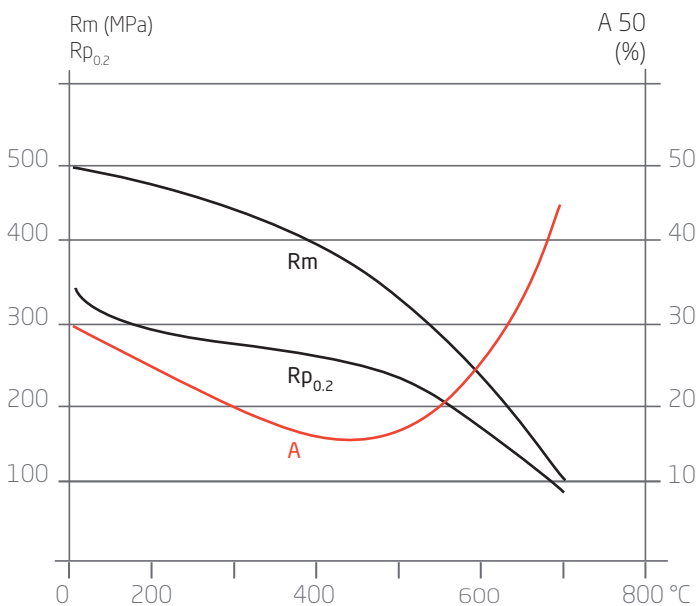
Grade	Conditions	R _m ⁽¹⁾ (MPa)	R _{p0.2} ⁽²⁾ (MPa)	A ⁽³⁾ (%)	HV5
K30	Cold-rolled**	500	330	26	155
K30D	Cold-rolled**	480	320	29	150

1 MPa = 1 N/mm²

** Typical values

⁽¹⁾ Ultimate Tensile Strength (UTS), ⁽²⁾ Yield Strength (YS), ⁽³⁾ Elongation (A).

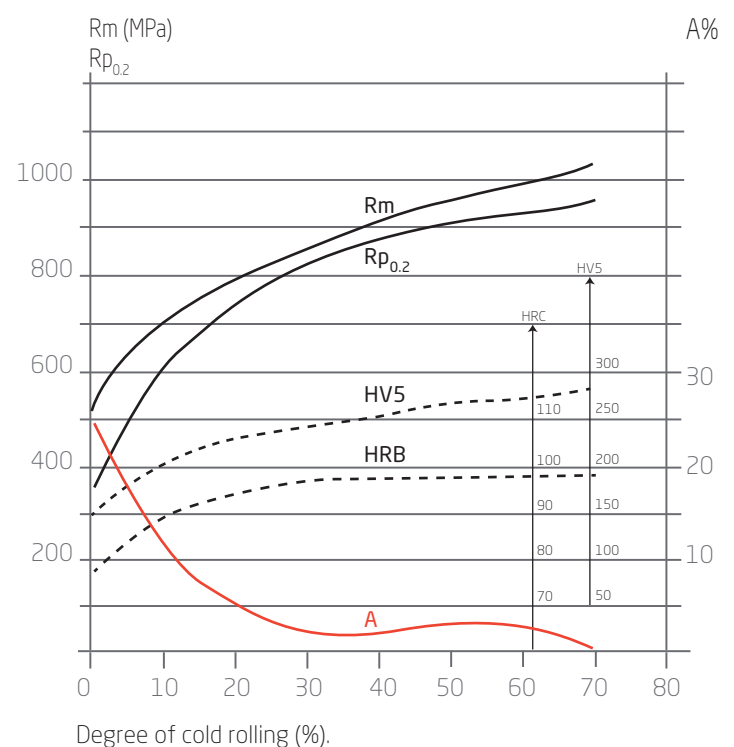
At high temperature (K30)



Typical values.

* based from specimen 20x50 mm

Effect of cold rolling (K30)



Creep properties

Mean stresses (MPa) for different rupture rates as a function of temperature (K30)

Temperature (°C)	100 h	10 000 h	100 000 h
400	400	340	300
500	180	140	120
600	60	45	30
700	20	13	7

Typical values

Mean stresses (MPa) for 1% elongation in different times as a function of temperature (K30).

Temperature (°C)	1 000 h	10 000 h	100 000 h
400	340	280	210
500	130	90	60
600	50	35	20

Typical values

Corrosion resistance

Our grades K30 and K30D are not susceptible to stress corrosion cracking.

K30 and K30D have good corrosion resistance in a large number of applications:

- > domestic environments; regular cleaning is always necessary to maintain the original appearance,
- > domestic handling of foodstuffs,

- > soaps and detergents,
 - > alkaline solutions at ambient temperature,
 - > certain dilute organic acids at ambient temperature,
 - > neutral and alkaline salt solutions other than those containing halides (chlorides, fluorides, bromides, iodides),
 - > numerous organic substances.
- Oxidation limits the continuous service temperature of K30 and K30D to 800 °C.

Localised corrosion resistance

Grades	Norms		
	ASTM	UNS	EN
K03		S41003	1.4003
K30/K30D	430	S43000	1.4016
K41	441 ⁽¹⁾	S43932	1.4509
K45	445 ⁽¹⁾	S44500	1.4621 ⁽²⁾
K36	436	S43600	1.4526
K44	444	S44400	1.4521
17-4Mn	201.1	S20100 ⁽³⁾	1.4618 ⁽²⁾
18-9E	304	S30400	1.4301
17-11MT	316Ti	S31635	1.4571

⁽¹⁾ Common designation.

⁽²⁾ Pending update of the standard.

⁽³⁾ With copper addition and 201.1 «rich side» properties per ASTM A240

Typical values of pitting corrosion potential in NaCl 0.02M, 23 °C, pH6.6 as a function of PREN (%Cr+3.3%Mo+16%N).



Forming

Our grades K30 and K30D can be readily cold formed by all standard processes (bending, contour forming, drawing, flow turning etc.).

Deep drawing operations involving considerable stretching can be facilitated by initial forming to produce blanks with large radii of curvature.

Stretching (Erichsen test)

Grades	European designation	ASTM A 240	Erichsen deflection* (mm)
K30	1.4016	Type 430	8.7

* 0.8 mm thick sheet

Deep drawing (Swift test)

Grades	European designation	ASTM A 240	LDR* (mm)
K30	1.4016	Type 430	2.05-2.10

* Limiting Drawing Ratio.

K30D with an enhanced forming performance enables reliability and constancy on good drawing behavior.

Bending

Good 180°C bendability, with very small bending radii for thicknesses less than 0.8 mm (longitudinal and transverse directions), whereas a radius not less than half the thickness is recommended for sheets thicker than 0.8 mm.

Welding

In general grade 1.4016, Type 430 are poorly suited to welding operations, since they readily form martensite in the weld, leading to brittle and relatively undeformable joints. However, satisfactory results can be obtained without recourse to post-weld treatments, providing that the welding process employed forges the weld sufficiently and that the welding power is not too high.

Our grade K30 is not recommended for heavy gage welded structures, due to the brittleness of the non-forged weld joints.

Welding process	No filler metal	With filler metal		Shielding gas*	
	Typical thicknesses	Thicknesses	Filler metal**		*Hydrogen and nitrogen forbidden in all cases
			Rod	Wire	
Resistance: spot, seam	≤ 2 mm				
TIG	< 1.5 mm	> 0.5 mm	W.N° 1.4370 ER 309 L (Si) ER 316 L (Si)	W.N° 1.4370 ER 309 L (Si) ER 316 L (Si)	Argon
PLASMA	< 1.5 mm	> 0.5 mm		W.N° 1.4370 ER 309 L (Si) ER 316 L (Si)	Argon
MIG ⁽²⁾		> 0.8 mm		W.N° 1.4370 ER 309 L Si ER 316 L Si	Argon + 2% CO ₂ Argon + 2% O ₂
SAW ⁽¹⁾		> 2 mm		ER 309 L ER 316 L	
Electrode		Repairs	E 309 L E 316 L		
Laser	< 5 mm				Hélium

⁽¹⁾ The S.A.W. process is not recommended, due to the high power input.

⁽²⁾ Pulsed MIG welding preferred, due to the lower power input.

No heat treatment is necessary after welding.

Where there is a risk of intergranular corrosion, then it is recommended to use a stabilized grade, such as our KARA ferritic grades K39M/K41/K36 and K45. The welds must be mechanically or chemically descaled, then passivated.

Heat treatment and finishing

Annealing

At 800°C after cold working.

Polishing - brushing - buffing - satin finishing

No particular difficulties.

Pickling

Nitric-hydrofluoric acid mixture (10% HNO₃ + 2% HF).

Descaling pastes for weld zones.

Passivation

20-25% HNO₃ solution at 20 °C. Passivating pastes for weld zones.