



KARA ferritic stainless steel offer:  
grades

# K30 - K30D

## Chemical composition

Grade designations	Elements	C	Si	Mn	Cr
<b>K30</b>	%	0.05	0.35	0.40	16.5
<b>K30D</b>	%	0.035	0.35	0.40	16.5

Typical values

European designation	American designation
X6Cr17 1.4016 <sup>(1)</sup>	Type 430 <sup>(2)</sup>

<sup>(1)</sup> According to EN 10088-2

<sup>(2)</sup> According to ASTM A 240

<b>K30</b>	Standard level grade
<b>K30D</b>	Enhanced forming performance grade

This grade is complies with:

- ▶ Stainless Europe Material Safety Data Sheet no.1: stainless steels (European Directive 2001/58/EC).
- ▶ European Commission Directive 2000/53/EC for end-of-life vehicles, and Annex II dated 27 June 2002.
- ▶ Standard NFA 36 711 "Stainless steel intended for use in contact with foodstuffs, products and beverages for human and animal consumption" (non packaging steel).
- ▶ The requirements of NSF/ANSI 51 – 2007 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.
- ▶ French Decree no.92-631 dated 8 July 1992 and Regulation no.1935/2004 of the European Parliament and of 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).
- ▶ French Order 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 corrosive media,
- ▶ Good cold formability (enhanced performance for **K30D**),
- ▶ An attractive surface appearance in the delivery condition, usually avoiding the need for subsequent finishing operations.

**K30** and **K30D** also have good resistance to 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.

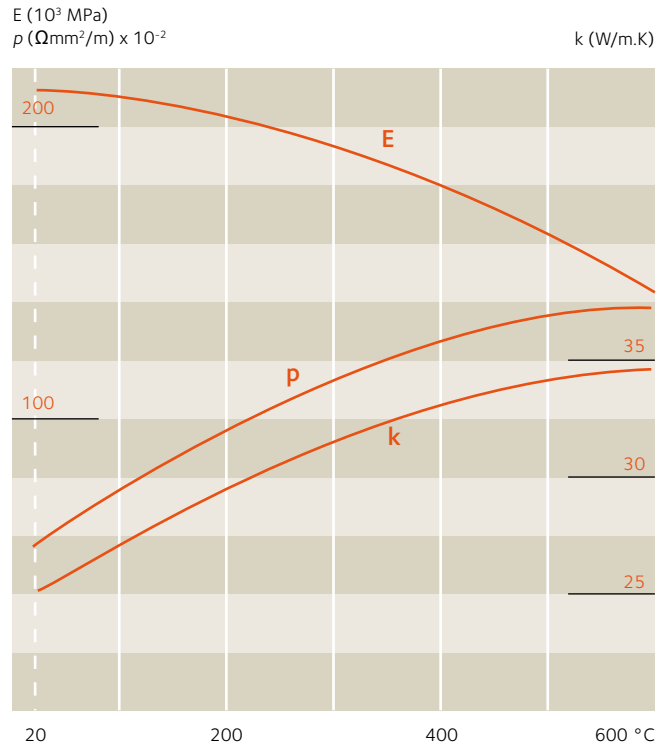


## Physical properties

Cold rolled sheet - annealed.

Density	d	kg/dm <sup>3</sup>	20 °C	7.8
Melting temperature		°C		1460
Specific heat	c	J/kg.K	20 °C	460
Thermal conductivity	k	W/m.K	20 °C	16
Mean coefficient of thermal expansion*	a	10 <sup>-6</sup> /K	20-100 °C 20-200 °C	13.0 13.5
Electric resistivity	ρ	Ω.mm <sup>2</sup> /m	20 °C	0.8
Magnetic				yes
Young's modulus	E	MPa.10 <sup>3</sup>	20 °C	200

\*Thermal expansion 25% lower than that of 316, compatible with carbon steel  
Poisson's coefficient: 0.28  
Curie point: 725 °C



## Mechanical properties

### Annealed condition

In accordance with EN 10002-1 (July 2001), specimen perpendicular to the rolling direction

Specimen

Lo = 80 mm (thickness < 3 mm)

Lo = 5,65 √ So (thickness ≥ 3 mm)

Grade Designations	Conditions	Rm <sup>(1)</sup> (MPa)	Rp <sub>0.2</sub> <sup>(2)</sup> (MPa)	A <sup>(3)</sup> (%)	HV5
<b>K30</b>	Cold rolled**	510	340	26	155
<b>K30D</b>	Cold rolled**	490	320	29	150

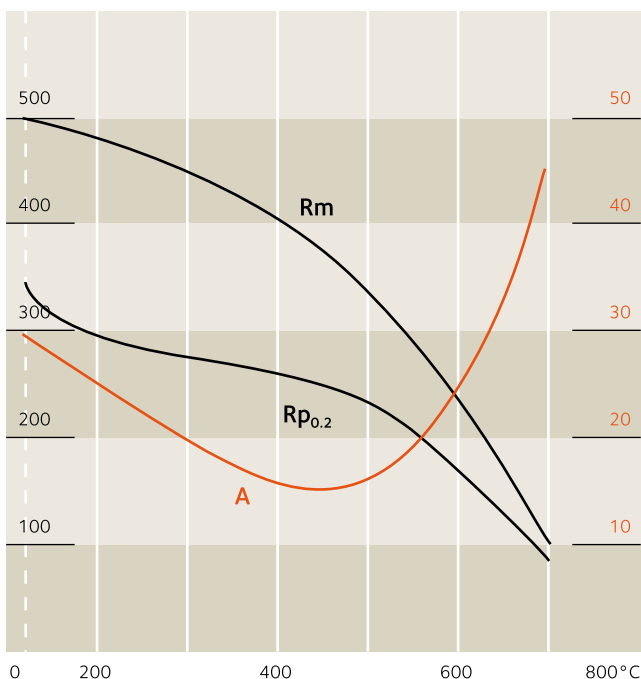
1 MPa = 1 N/mm<sup>2</sup>.

\*\* Typical values.

<sup>(1)</sup> Ultimate Tensile Strength (UTS). <sup>(2)</sup> Yield Strength (YS). <sup>(3)</sup> Elongation (A).

### At high temperature (K30)

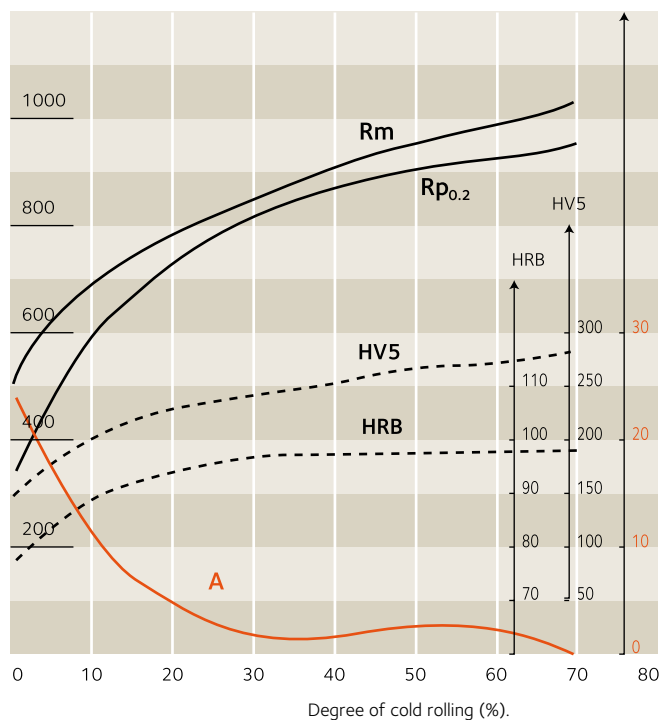
Rm (MPa) A\* 50  
Rp<sub>0.2</sub> (%)



Typical values.  
\* based on specimen 20x50 mm

### Effect of cold rolling (K30)

Rm (MPa) A  
Rp<sub>0.2</sub> (%)



## Creep properties

Mean stresses (MPa) for different rupture lives 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

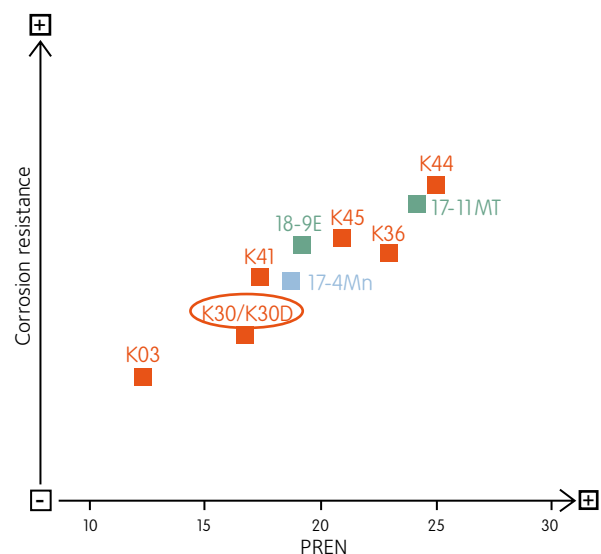
Grade designations	Standards		EN
	ASTM		
	Type	UNS	
K03		S41003	1.4003
<b>K30/K30D</b>	<b>430</b>	<b>S43000</b>	<b>1.4016</b>
K41	441 (1)	S43932	1.4509
<b>K45</b>	<b>445 (1)</b>	<b>S44500</b>	<b>1.4621 (2)</b>
K36	436	S43600	1.4526
K44	444	S44400	1.4521
17-4Mn	201.1	S20100 (3)	1.4618 (2)
18-9 E	304	S30400	1.4301
17-11 MT	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)

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

\* 0.8 mm thick sheet.

### Deep drawing (Swift test)

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

\* Limiting Drawing Ratio.

**K30D with enhanced forming performance enables reliability and consistency of good drawing behaviour.**

### 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 non-deformable 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		
			Rod	Wire	* Hydrogen and nitrogen forbidden in all cases
<b>Resistance: Spot, Seam</b>	≤ 2 mm				
<b>TIG</b>	< 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
<b>PLASMA</b>	< 1.5 mm	> 0.5 mm		W.N° 1.4370 ER 309 L (Si) ER 316 L (Si)	Argon
<b>MIG <sup>(2)</sup></b>		> 0.8 mm		W.N° 1.4370 ER 309 L Si ER 316 L Si	Argon + 2% CO <sub>2</sub> Argon + 2% O <sub>2</sub>
<b>S.A.W <sup>(1)</sup></b>		> 2 mm		ER 309 L ER 316 L	
<b>Electrode</b>		Repairs	E 309 L E 316 L		
<b>Laser</b>	< 5 mm				Helium

(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 the use of stabilised grade, such as our KARA ferritic grades **K39M/K41/K36 and K45** is recommended.

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% HNO<sub>3</sub> + 2% HF)

Descaling pastes for weld zones.

### Passivation

20-25% HNO<sub>3</sub> solution at 20 °C.

Passivating pastes for weld zones.

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