aperam
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KARA ferritic stainless steel offer

grades K30 - K30ED

Chemical composition

Grades	Elements	C	Si	Mn	Cr
K30	%	0.04	0.35	0.30	16.50
K30ED	%	0.015	0.35	0.40	16.50

Typical values

Grades	European designation	American designation
K30	1.4016 (1)	Type 430 (2)
K30ED	1.4016 (1) (*)	Type 430 (2) (*)

(1) According to EN 10088-2 (2) According to ASTM A 240 (*) Assimilated

K30	Standard grade
K30ED	Grade particularly suitable for forming and deep drawing

Our grade 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 51-2009 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.
- Italian Decree of 21th March 1973, listing the stainless steel grades which are authorised for contact with foodstuffs and the general public.

General characteristics

The principal features of our K30 and K30ED grades for applications near room temperature are:

- Corrosion resistance in moderately corrosive media,
- Good cold formability (enhanced performance for K30ED),
- An attractive surface appearance in the delivery condition, usually avoiding the need for subsequent finishing operations.
- K30 and K30ED also have good resistance to high temperature oxidation resistance.
- The Kara K30ED grade provides the client with an alternative 17% Chromium grade when the K30 variant is at the limits of its forming and drawing capabilities. Thanks to its improved forming properties, our clients are able to reduce their non-quality and internal rejection rates with K30ED when used on parts which are difficult to form.
- Producing complex formed parts in regular thicknesses enables more creativity and evolution in terms of design. It is particularly beneficial in strengthening the structure with the use of tighter radii aswell as reducing the thickness of parts which have a similar or identical geometry to those in K30. Replacing the K39M grade in more complex parts if a stabilised grade is not required for welding purposes.
  Furthermore, this grade retains the general characteristics as those described for the K30 grade.

Applications

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

Product range

Forms: sheets, blanks, coils, strips, circles.
Thicknesses: 0.30 to 8 mm.
Width: according to thickness, consult us.
Finishes: cold rolled or hot rolled, depending on the thickness.

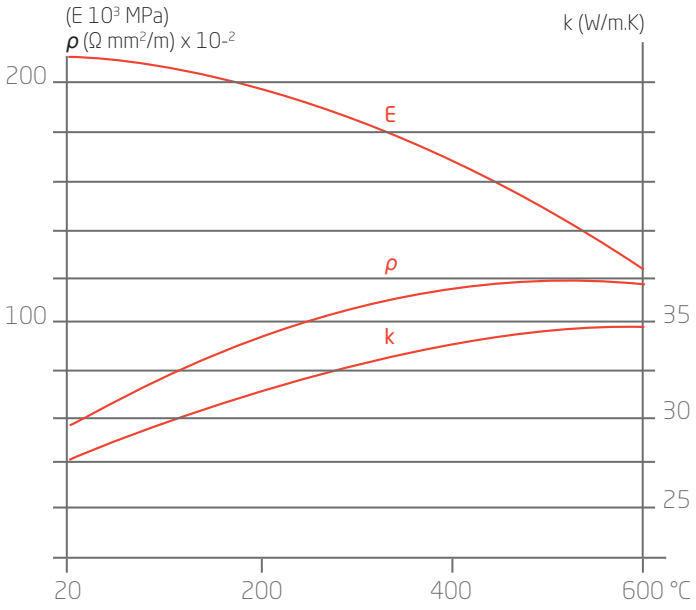
KARA
key for value

Physical properties

Cold rolled sheet - annealed.

Density	d	kg/dm³	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 20-600°C 20-600°C	10.5 11.5 11.7 12.5
Electric resistivity	ρ	Ω mm²/m	20 °C	0.60
Magnetic	μ	à 0.8 kA/m DC ou AC	20 °C	1000
Young's modulus	E	MPa.10³	20 °C	220

*Remarks: the thermal conductivity of K30 / K30ED is greater than austenitics type 304/316 (k = 15W/m.K) and the average coefficient of thermal expansion is lower (α=17x10^{-6}/K - 20°C to 200°C).
Poisson coefficient: 0.28 - Curie Point: 725°C



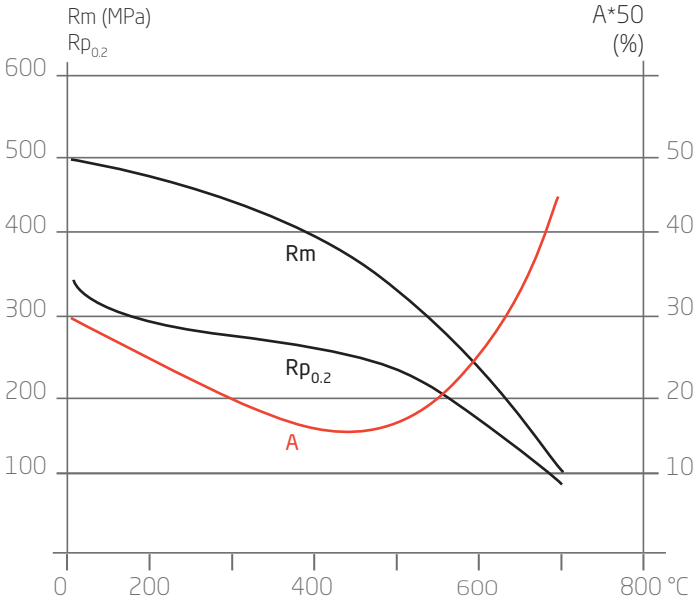
Tensile properties

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 √ So (thickness ≥ 3 mm)

Grade	Conditions	Rm(1) (MPa)	Rp0.2 (2) (MPa)	A(3) (%)	HV5
K30	Cold-rolled**	500	330	26	155
K30ED	Cold-rolled**	480	300	32	150

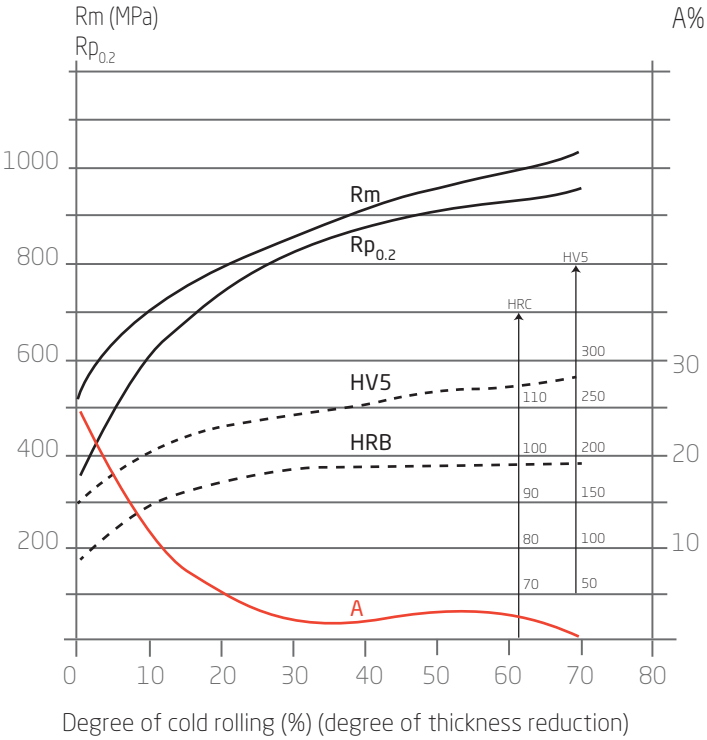
1 MPa = 1 N/mm² ** Typical values
(1) Ultimate Tensile Strength (UTS). (2) Yield Strength (YS). (3) Elongation (A).

At high temperature (K30)



Values provided for information purposes only
* based on specimen 20x50 mm

Effect of cold rolling (K30)



Degree of cold rolling (%) (degree of thickness reduction)

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 K30ED are not susceptible to stress corrosion cracking.

They 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.

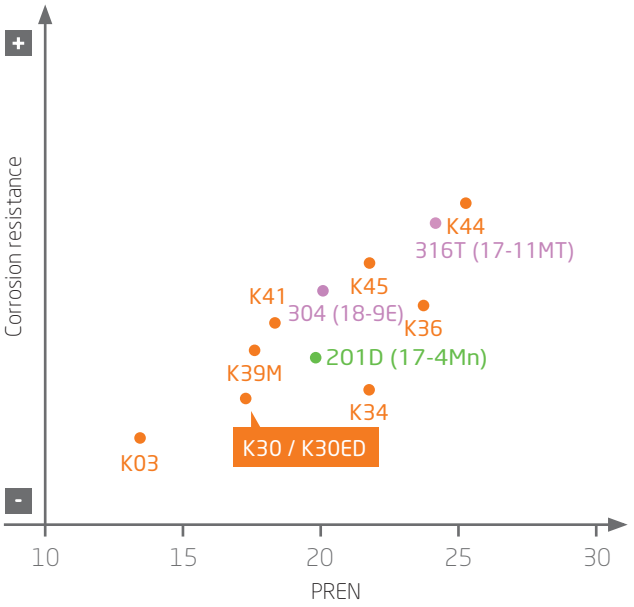
Oxidation limits the continuous service temperature of K30 and K30ED to 800 °C.

Resistance to localised corrosion

	Norms		
Grades	ASTM	UNS	EN
K30/K30ED	430	S43000	1.4016
K44	444	S44400	1.4521
K39M	430Ti	S43036	1.4510
201D (17-4Mn)	201.1	S20100[3]	1.4618[2]
304 (18-9E)	304	S30400	1.4301
316L (18-11ML)	316 316 L	S31600 S31603	1.4401 1.4404

[1] Common designation.
[2] Pending update of the standard.
[3] With copper addition and 2010.1 « 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 K30ED can be readily cold formed by all standard processes (bending, contour forming, drawing, flow turning etc.).
We recommend stamping K30 / K30ED ferritic stainless steel using the deep drawing method (performance given by the LDR value).
In order for this to succeed, the metal must flow into the die cavity by adjusting the blank-holder force to the lowest parameter at the limit of the fold in order to avoid creases.

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

Stretching (Erichsen test)

Grades	Erichsen deflection*(mm)
K30	8.7
K30ED	9.8
K39M	9.6

* 0.8 mm thick sheet

Deep drawing (Swift test)

Grades	LDR*
K30	2.05-2.10
K30ED	2.20-2.25
K39M	2.15-2.20

* Limit drawing ratio

Bending

The bending for sheets thicker less than 0.8 mm can be achieved in one operation (perpendicular to the direction of the rolling direction).
For thicknesses more than 0.8 mm, we suggest a bending radius greater or equal to half the thickness.

Welding

In general grade 1.4016, Type 430 are poorly suited to welding operations. 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.

Due to its chemical composition – low carbon – the grade K30ED will be more suitable to welding operations than K30 but is not equivalent to properties of stabilised grades.

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 (GTAW)	< 1.5 mm	> 0.5 mm	ER 308L or 430LNb	ER 308L or 430LNb	Argon or Argon + Hélium
PLASMA (PAW)	< 1.5 mm	> 0.5 mm		ER 308L or 430LNb	Argon or Argon + Hélium
MIG-MAG (GMAW)		> 0.8 mm	ER 308L or 430LNb	ER308L or 430LNb	Argon + 2%O_2 or Argon + 2.5%CO_2
SAW (powder protected)	Not recommanded				
Electrode (SMAW)			E 308L or 430LNb	E 308L or 430LNb	
Laser	< 5 mm				Argon or Helium

** Standard designations according to AWS & ISO 14343-B

Hydrogen and nitrogen are forbidden in all cases.

Pulsed MIG-MAG welding is preferred due to the lower power input. Austenitic grade welding wire ER308L Ferritic grade welding wire 430LNb, the physical properties of the molten metal are close to those of the base metal.

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
No particular difficulties.

Pickling
Nitric-hydrofluoric acid mixture (10% HNO_3 + 2% HF)
Descaling pastes for weld zones.

Passivation
20-25% HNO_3 solution at 20°C.
Passivating pastes for weld zones.

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