KARA Ferritic Stainless Steel

K30-K30ED 17% Chromium

KARA key for value

Chemical Composition

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

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

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

The K30ED grade is particularly suitable for forming and deep drawing.

These grades comply 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 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, dated 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 21 March 1973, listing the stainless steel grades authorised for contact with foodstuffs and the general public

Key Features

- Corrosion resistance in moderately corrosive environments
- Good cold formability (enhanced performance for K30ED)
- An attractive surface appearance in delivery condition, without subsequent finishing operations
- Good resistance to high temperature oxidation
- K30ED grade serves as 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 can reduce their non-quality and internal rejection rates when K30ED is used on parts that 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, as well as reducing the thickness of parts that have a similar or identical geometry to those of K30. Can replace the K39M grade in more complex parts if a stabilised grade is not required for welding purposes.
- This grade retains the general characteristics of our K30 grade

Applications

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

Product Range

	Coils	Sheets / Blanks	Discs	Precision Strip	Precision Sheet	Flat Bars
Thickness (mm)	0.40 up to 6	0.40 up to 2	0.38 up to 2.50	0.06 up to 2.5	0.20 up to 2.5	2 up to 20
Width (mm)	up to 1,500	up to 1,500	Ø 15 up to 1,000	3 up to 700	40 up to 670	10 up to 300
Finish	1D /2R / 2B / 2D / 2M	1D /2R / 2B / 2D / 2M	1D /2R / 2B / 2D / 2M	2R / 2B / 2D / 2H / 2F	2R / 2B / 2D / 2H / 2F	1D / Polished

Please contact us regarding all other dimensions, forms and finishes.

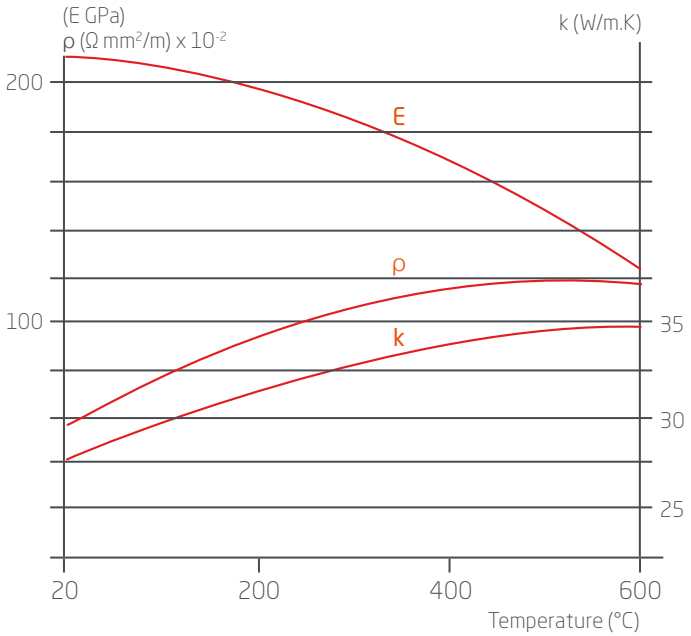
Physical Properties

Cold rolled and annealed sheet

Density	d	kg/dm³	20°C	7.7
Melting temperature		°C		1,500
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 thermal expansion coefficient*	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 resistivity	μ	at 0.8 kA/m DC or AC	20°C	1,000
Young's modulus	E	GPa	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



Mechanical Properties

Test piece

Length = 80 mm (thickness < 3 mm)

Length = 5.65 √ S_o (thickness ≥ 3 mm)

In the annealed condition

In accordance with ISO 6892-1, part 1

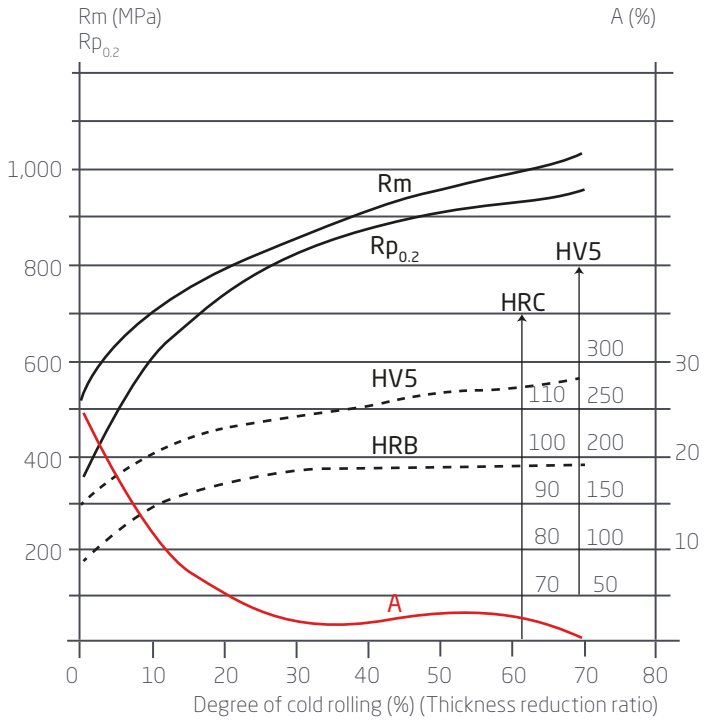
Test piece perpendicular to rolling direction

Grade	Condition	Rm(1) (MPa)	$Rp_{0.2}$(2) (MPa)	A(3) %	HV5
K30	Hot-rolled	500	330	26	155
K30ED	Cold- rolled	480	300	32	150

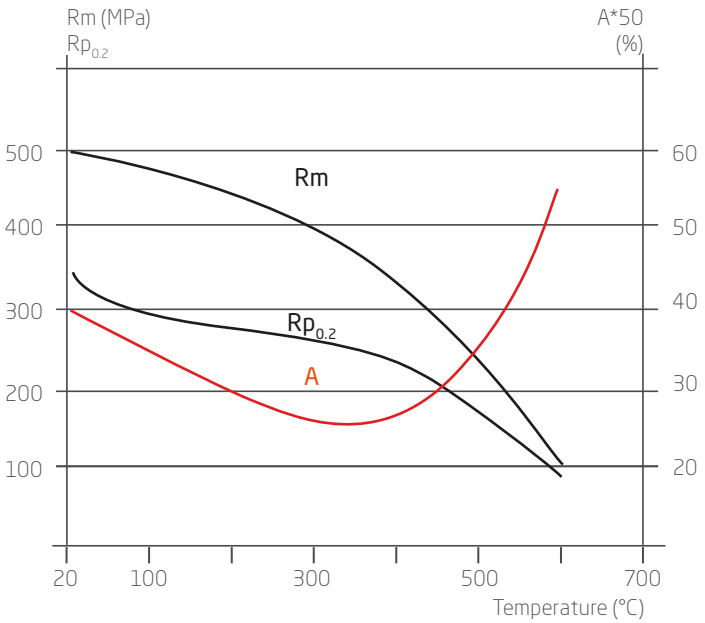
1 MPa = 1 N/mm² - Typical values

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

Effect of cold rolling (K30 - Typical values)



At high temperatures (K30 -Typical values)



Values provided for information purposes only.

* based on specimen 20 x 50 mm

Creep Properties (typical values)

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

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

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

Corrosion Resistance

Our K30 and K30ED grades are not susceptible to stress corrosion cracking.
Both offer good corrosion resistance in a wide range 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 temperatures
- Certain dilute organic acids at ambient temperatures
- 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

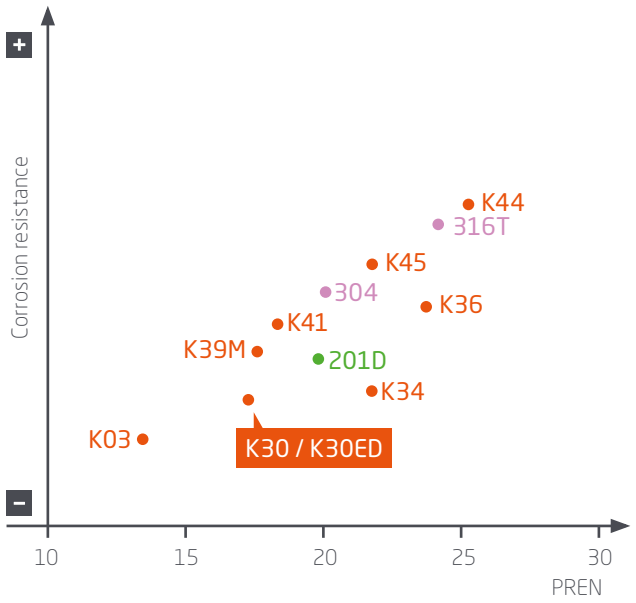
Resistance to localised corrosion

Grades	Norms		
	ASTM	UNS	EN
K30/K30ED	430	S43000	1.4016
K44	444	S44400	1.4521
K39M	430Ti	S43036	1.4510
201D	201.1	S20100 [3]	1.4618 [2]
304	304	S30400	1.4301
316L	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

Pitting corrosion

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 K30 and K30ED grades can be readily cold formed using 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).
For this to succeed and to avoid creases, the metal must flow into the die cavity by adjusting the blank-holder force to the lowest parameter at the limit of the fold.

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

Grades	Stretching: Erichsen height* (mm)	Limiting Drawing Ratio* (LDR)
K30	8.7	2.05-2.10
K30ED	9.8	2.20-2.25
K39M	9.6	2.15-2.20

* Typical values - Erichsen test: hemispherical punch (diam. 20 mm), LDR: cylindrical punch (diam. 33 mm)

Bending

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

Welding

In general, grade 1.4016 (Type 430) is poorly suited to welding operations. However, satisfactory results can be obtained without effecting post-weld treatments, so long as the welding process being used forges the weld sufficiently and that the welding power is not too high.

Welding process	No filler material	With filler metal			Shielding gas*
	Typical thicknesses	Thicknesses	Filler material **		* Hydrogen and nitrogen forbidden in all cases
			Rod	Wire	
Resistance: spot, seam	≤ 2 mm				
TIG	< 1.5 mm	> 0.5 mm	ER 308Lor 430LNb	ER 308L or 430LNb	Ar or Ar + He
PLASMA	< 1.5 mm	> 0.5 mm		ER 308L or 430LNb	Ar or Ar + He
MIG (2)		> 0.8 mm	ER 308L or 430LNb	ER308L or 430LNb	Ar + 2%O_2 or Ar + 2.5%CO_2
SAW	Not recommended				
Electrode		Repairs	E 308L or 430LNb	E 308L or 430LNb	
Laser	< 5 mm				Ar or He

** 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.
For 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.
If there is a risk of intergranular corrosion, we recommend using a stabilised grade like 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

No difficulties encountered

Pickling

- Nitric-hydrofluoric acid mixture (10% HNO_3 + 2% HF)
- Use descaling pastes for weld zones

Passivation

- Nitric acid bath (10 – 25%) at 20°C
- Use passivating pastes for welds