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KARA ferritic stainless steel offer
grade K39M

Chemical composition

Elements	C	Si	Mn	Cr	Ti
%	0.02	0.40	0.30	16.50	0.40

Typical values

European designation		American designation	IMDS n°
X3CrTi17	1.4510[1]	Type 430 Ti[2] - UNS S43036	336832646

[1] In accordance with EN 10088-2 [2] In accordance with ASTM A 959

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 to Annex II dated 27 June 2002.
- French standard NFA 36 711 " - Stainless steel intended for use in contact with foodstuffs, products and beverages for human and animal consumption (excluding packaging)".
- NSF/ANSI 51–2009 edition international standard for "Food Equipment Materials" and the requirements of the FDA (United States Food and Drug Administration) regarding materials used in contact with foodstuffs
- French decree No. 92-631 dated 8 July 1992 and European Regulation (EC) No. 1935/2004 of 27 October 2004 on materials and articles intended to come into contact with food (and brogative Directives 80/590/EEC and 89/109/EEC).
- French Ministerial Order dated 13 January 1976 relating to materials and articles made of stainless steel in contact with foodstuffs.
- Standard EN 10028-7 "Flat products made of steels for pressure purposes, Stainless steels". Steel flat products for pressurised applications (AD 2000 W2 TUV W494).

General characteristics

Our K39M is a variant of K30 with the addition of titanium.
This grade is excellent weldable, with a good toughness and ductility properties. The titanium stabilisation gives to the grade a good inter-granular and pitting corrosion resistance.
The K39M also has good drawing characteristics.

Applications

- Appliances: washing machine vat and drum, dishwasher vat
- Automotive exhaust systems: tubes, silence mufflers, fixing parts

Product range

Forms: sheets, blanks, coils, strips, circles
Thicknesses: 0.3 to 3 mm
Width: according to thicknesses
Finishes: cold rolled

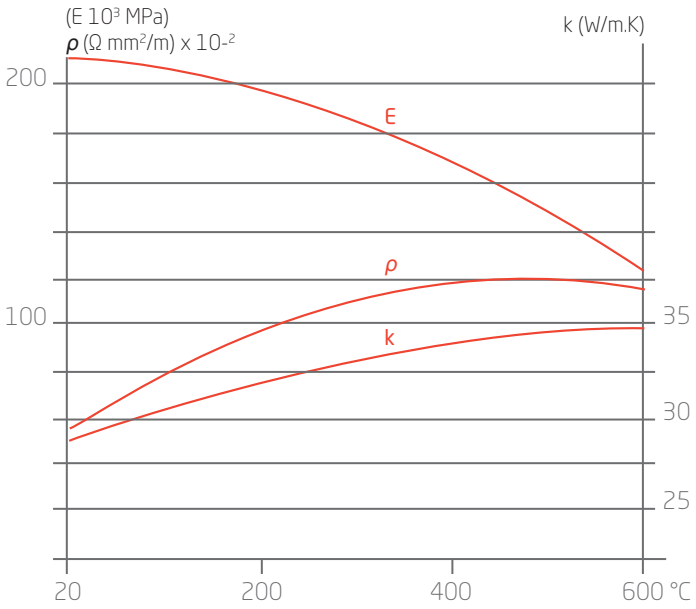
KARA
key for value

Physical properties

On cold-rolled sheet.
In the annealed condition.*

Density	d		4 °C	7.7
Melting temperature		°C		1460
Specific heat	c	J/kg.K	20 °C	460
Thermal conductivity	k	W/m.K	20 °C	22.5 (±1)
Mean coefficient of linear expansion	α	10^{-6}/K	20-100 °C 20-200 °C 20-400 °C	10.0 10.0 10.5
Electric resistivity	ρ	Ω mm²/m	20 °C	0.60
Modulus of elasticity	E	10^3 MPa	20 °C	220

* Typical values



Tensile properties

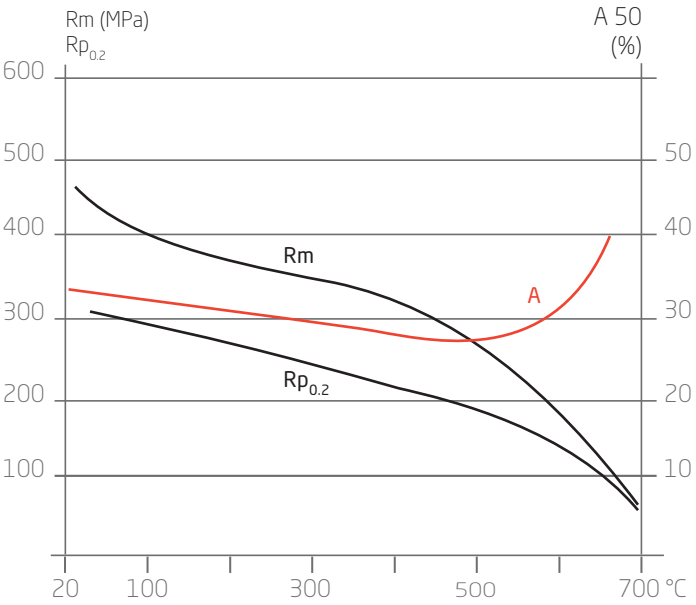
In the annealed condition
In accordance with ISO 6892-1,
test specimen perpendicular to the rolling direction.

Test specimen
Lo = 80 mm (thickness < 3 mm)
Lo = 5,65 √ So (thickness ≥ 3 mm)

Condition	Rm(1) (MPa)	Rp0.2 (2) (MPa)	A(3) (%)	HRB
Cold-rolled*	450	290	31	70

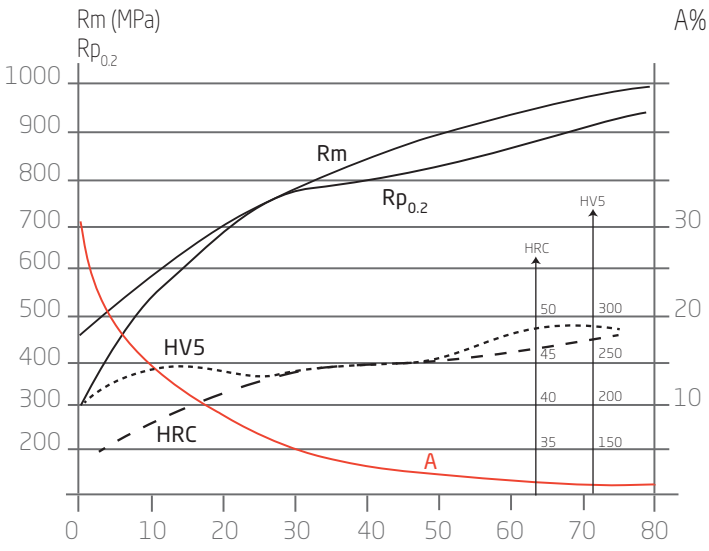
1 MPa = 1 N/mm² * Typical values
(1) Ultimate tensile strength (UTS). (2) Yield strength (YS) (3) Elongation (A).

At high temperatures



Values provided for information purposes only

Effect of cold rolling



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

Corrosion resistance

K39M has a broader application domain compared to K30 as the titanium stabilisation allows the grade to obtain good intergranular corrosion resistance. The stabilisation of the sulphur by the titanium enhances the resistance to pitting corrosion.

Like all ferritic grades, **K39M** is not susceptible to stress corrosion.

Resistance to welded seam corrosion is similar to that of the parent metal. **K39M** shows a good resistance to mineral acid (HNO_3) and cold diluted organic, oxidizing saline solution and cold alkaline. Its resistance to atmospheric corrosion, hot oxidation and hot water is good.

Resistance to localised corrosion

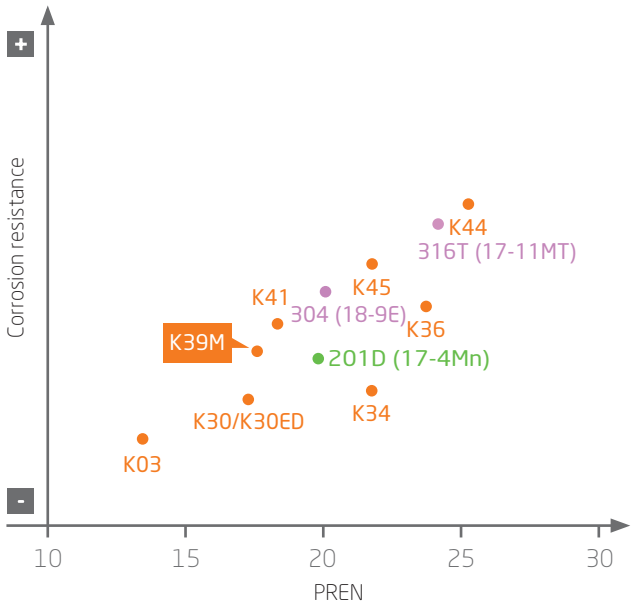
	Norms		
Grades[1]	ASTM	UNS	EN
K30/K30D	430	S43000	1.4016
K44	444	S44400	1.4521
K39M	430Ti	S43036	1.4510
201D (17-4Mn)	201.1	S20100[3]	1.4618[2]
304 (18-9E)	304	S30400	1.4301
316L (18-11ML)	316 316 L	S31600 S31603	1.4401 1.4404

[1] Common designation.

[2] Pending. revision of standard

[3] With copper addition and "rich side" mechanical properties of 201.1 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 **K39M** grade can be cold formed using all common processes (folding, drawing, and bending) in the annealed condition. The bloc bending (bending at 180 degrees) for thickness below 0, 8 mm is possible.

For all other thicknesses, the bending radius will be : r >= 0.5t (thickness). We recommend forming ferritic grades, and especially **K39M**, by applying a deep drawing mode, and minimizing the tightening force to the necessary level in order to avoid fold appearance. For very deep drawing operations, which may lead to stretching solicitations, the operation may be made easier by making an intermediate shape with a bigger radius.

Swift Test (restraining mode)

Grades	AISI	EN	LDR* (mm)
K30	430	1.4016	2.05-2.10
K39M	430Ti	1.4510	2.15-2.20
304 (18-9E)	304	1.4301	1.95-2.00

Tests performed on typical values using 0.8 mm thickness.

*Limiting drawing ratio

Erichsen (cupping) test

Grades	European designation	AISI	Erichsen test (mm)
K30	1.4016	430	8.7
K39M	1.4510	430Ti	9.6
304 (18-9E)	1.4301	304	11.6

Tests performed on typical values using 0.8 mm thickness.

Welding

Our **K39M** grade can be welded by spot or seam welding techniques. Good results are obtained without post treatment provided that the weld is sufficiently forged.

Welding process	Without 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	G 19 9 L [1] or 18LNb [1] ER 308L [2] or 430LNb n° 1.4316 or 1.4511 [5]		Argon Argon + Helium
PLASMA	< 1.5 mm	> 0.5 mm		G19 9 LSi [1] or 18LNb [1] ER 308 L Si [2] or 430LNb n° 1.4316 or 1.4511 [5]	Argon Argon + Helium
MIG		> 0.8 mm		G 19 9 LSi [1] or 18LNb [1] ER 308 L Si [2] or 430LNb n° 1.4316 or 1.4511 [5]	Argon + 2 % CO_2 Argon + 2 % O_2 Argon + 2 % CO_2 + Helium
Electrode		Repairs	E 19 9 L [3] E 308 L [4]		
Laser	< 5 mm				Helium Under certain conditions: Argon

[1] In accordance with EN ISO 14343, [2] In accordance with AWS A5.9, [3] In accordance with EN 1600, [4] In accordance with AWS A5.4, [5] In accordance with VDEH.

The addition of hydrogen or nitrogen to the argon should be avoided as this reduces weld ductility.
For similar reasons, the use of nitrogen is forbidden and use of CO_2 is restricted to 3%.
In order to restrict grain growth in the HAZ(heat affected zone), the use of excessive welding power must be avoided.
For example, in automatic TIG welding, the power should not exceed 2.5 kJ/cm for a sheet thickness of 1.5 mm.
As a further example, pulsed MIG/MAG welding has a lower power input than conventional MIG welding and enables better control of both bead geometry and grain size.

Post-weld heat treatment is generally not necessary. Welds must be mechanically or chemically descaled and then passivated and decontaminated.
Oxyacetylene torch welding must be avoided.

Heat treatment and finishing

Polishing aptitudes

The ferritic stainless steels are suitable for abrasive strip polishing. However, because of the presence of stabilizer Nb or Ti as in the **K39M**, the mirror polishing cannot be of high quality. Polishing with abrasives containing iron salt is forbidden. If the stainless steel is polluted by iron or iron salts, a final decontamination treatment will have to be done.

Annealing

Annealing at 825°C after cold forming.

Pickling

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

Passivation

20-25% cold nitric acid bath at 20°C.
Passivating pastes for weld beads.

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