

Designation	RFe80	DIN	EN	UNS (ASTM)	AISI	WCA
		-	1.1014	23000	-	96

## 1. Chemical composition

Fe	C	Mn	Si	Al	S	P
Balance	0.05 max.	0.15 - 0.35	0.10 max.	0.10 max.	0.035 max.	0.03 max.

Values (% weight). In order to achieve maximum homogeneity and consistent quality, actual manufacturing tolerances are tighter and more precise than the composition indicated.

## 2. Main technical properties and features

RFe80 is a soft ferromagnetic material, free of impurities that can impair its magnetic properties. The main characteristic of RFe80 soft iron is that it can be magnetized and demagnetized under the application of an external magnetic field. RFe80 soft iron has a low residual elements content (such as carbon) and a 100% ferritic microstructure, which gives it excellent magnetic properties. This alloy can achieve a maximum coercive field strength of 80 A/m. RFe80 soft iron has excellent cold-forming properties, doubling mechanical strength after cold work hardening. However, cold working is more detrimental to magnetic properties than hot working, and annealing is generally required to restore magnetic properties. For optimum magnetic properties, annealing at a temperature of 820 - 850°C is generally recommended.

## 3. Typical uses

RFe80 soft iron is used in the production of electromagnetic equipment such as electromagnets, electrical transformers, electrical switching systems, electric motors and generators.

## 4. Typical manufacturing range

	Thickness (mm)	Width (mm)	Length (mm)
<b>Rolled products</b> Strip in coils <sup>[1]</sup>	0.010 - 1.500	1.5 - 200.0	-
Strip as sheets <sup>[1]</sup>	0.015 - 1.500	10.0 - 200.0	100 - 3000

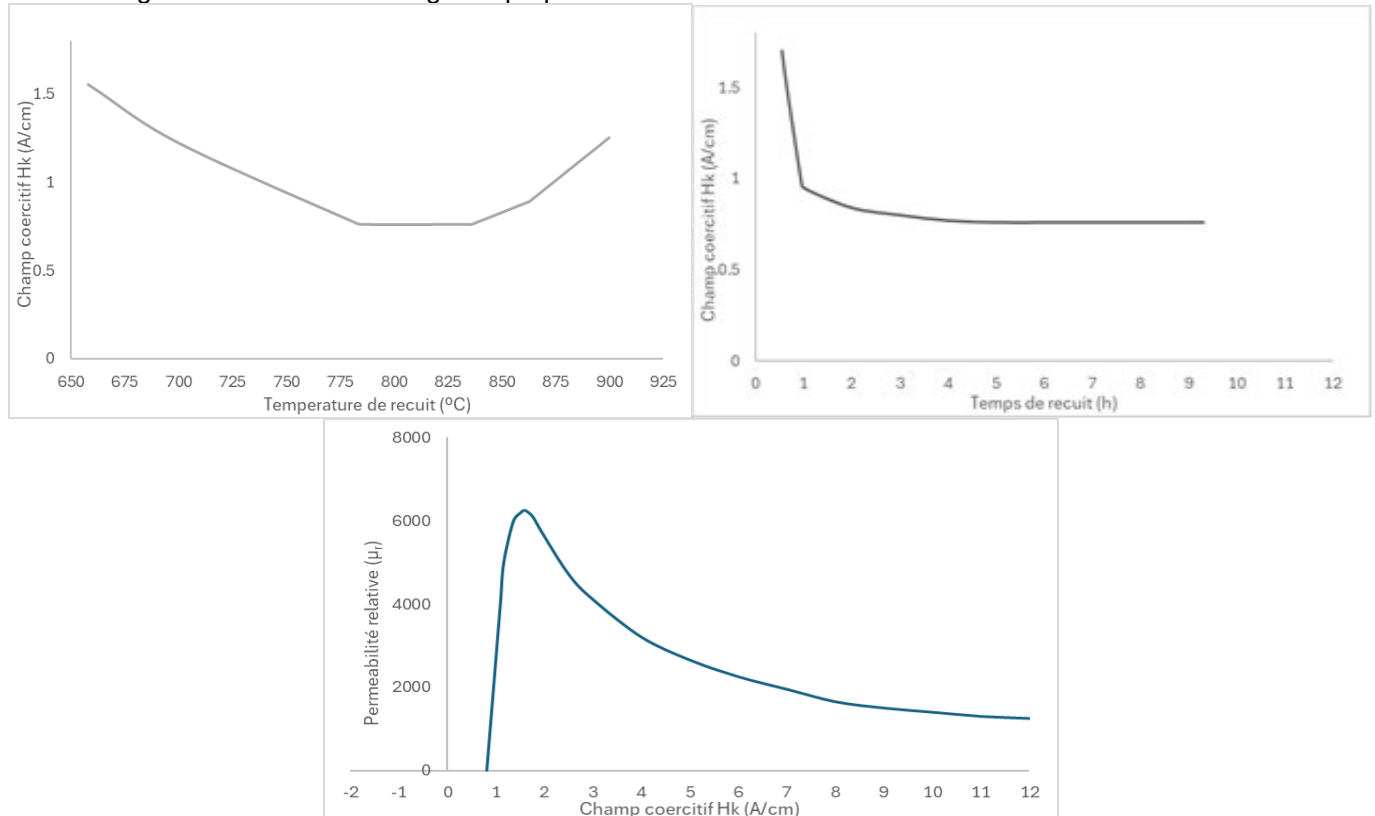
<sup>[1]</sup> Not all our production possibilities are shown here. Other dimensions or product forms are available on request. Some combinations of thicknesses and widths are not possible.

## 5. Mechanical properties of strips

Temper	R <sub>m</sub> (N/mm <sup>2</sup> )	R <sub>p02</sub> (N/mm <sup>2</sup> )	Hardness HV
soft	250 - 320	270 max.	60 - 95
¼ hard	300 - 420	-	90 - 120
½ hard	400 - 500	-	115 - 145
¾ hard	480 - 570	-	140 - 165
hard	550 - 640	-	160 - 190
extra hard	620 min.	-	185 min.

## 6. Heat treatment

To obtain the optimum magnetic properties of Rfe80, annealing is recommended at a temperature between 820 - 850°C for around 1 hour. Reducing atmospheres such as wet hydrogen or 100% dry hydrogen are commonly used. A common annealing atmosphere is 20% wet hydrogen mixed with 80% dry hydrogen by volume at a dew point of 13 - 18°C. Dissociated ammonia is considered an alternative option for the reducing atmosphere. Inert atmospheres (dry nitrogen, argon or vacuum) are also an option. The parts should remain in a protected atmosphere until their temperature is below 300°C. It is very important during processing to avoid any contamination of the furnace atmosphere by carbon; an increase of 0.01% in the carbon content of the material can lead to a significant reduction in magnetic properties.



## 7. Physical properties after magnetic annealing

Modulus of elasticity	kN/mm <sup>2</sup>	210
Density	g/cm <sup>3</sup>	7.85
Melting point	°C	1532
Linear dilatation coefficient	10 <sup>-6</sup> /°C	13.7
Thermal conductivity at 20°C	W/m K	73.2
Specific heat at 20°C	J/ (kg. K)	450
Electrical resistivity at 20°C	μΩcm	15.0
Magnetic properties		Ferromagnetic
Coercive field strength (after reference annealing)	A/m	80.0 max.
Magnetic induction at 500 A/m	Tesla	1.30 min.
Magnetic saturation	Tesla	2.15
Magnetic permeability ( $\mu_r$ )	A/cm	6000 max.

The data in this document are for information purposes only. They do not constitute a commitment or warranty of any kind.



## Tolerances (strip and foil)

Thickness	Thickness (mm)		EN Standard		WEBER + CALIBRA		
	≥	<	10140 Precision	10258 Precision	WCA Standard	WCA Precision	WCA Extreme
<p>The table shown is an outline of our typical thickness tolerances available. They are tighter than industry standards.</p> <p>Our WCA Precision and WCA Extreme tolerances are available on request.</p>	-	0.025	-	-	-	-	± 0.001
	0.025	0.050	-	-	± 0.003	± 0.002	± 0.0015
	0.050	0.065	-	± 0.003	± 0.003	± 0.0025	± 0.002
	0.065	0.100	-	± 0.004	± 0.004	± 0.0035	± 0.003
	0.100	0.125	± 0.005	± 0.006	± 0.005	± 0.004	± 0.003
	0.125	0.150	± 0.005	± 0.006	± 0.005	± 0.005	± 0.004
	0.150	0.250	± 0.010	± 0.008	± 0.008	± 0.006	± 0.004
	0.250	0.300	± 0.010	± 0.009	± 0.009	± 0.007	± 0.005
	0.300	0.400	± 0.010	± 0.010	± 0.010	± 0.007	± 0.005
	0.400	0.500	± 0.015	± 0.012	± 0.012	± 0.008	± 0.006
	0.500	0.600	± 0.015	± 0.014	± 0.014	± 0.010	± 0.007
	0.600	0.800	± 0.015	± 0.015	± 0.015	± 0.010	± 0.007
	0.800	1.000	± 0.015	± 0.018	± 0.018	± 0.012	± 0.009
	1.000	1.200	± 0.020	± 0.020	± 0.020	± 0.015	± 0.012
	1.200	1.250	± 0.020	± 0.020	± 0.020	± 0.015	± 0.012
	1.250	1.500	± 0.020	± 0.020	± 0.020	± 0.015	± 0.014
Width	Our LSMA Standard width tolerances are +0.2, -0.0 (or ± 0.1 mm on request). They are available for slit widths < 125 mm and thicknesses < 1.00 mm. Other tolerances on request.						
Camber	Width (mm)		Camber max. (mm/m)				
	>	≤	WCA Standard		WCA Extreme		
			≤ 0.5 mm	> 0.5 mm	≤ 0.5 mm	> 0.5 mm	
	3	6	12	-	6	-	
	6	10	8	10	4	5	
<p>Our WCA Standard tolerance is compliant with EN Standard 1654 (length of measurement 1000 mm). Special tolerances on request.</p>	10	20	4	6	2	3	
	20	250	2	3	1	1.5	
Surface	Special surface qualities on request						
Flatness	Special requirements for longitudinal or transversal flatness on request						

WCA-MK.040 / Edition 2024/10

