Industeel

ArcelorMittal

XC06

High Purity Ultra Low Carbon Magnet Steel

Magnet applications, such as resonance imaging (MRI) or particle accelerators, require large components with high specific magnetic properties and excellent homogeneity throughout the magnet parts.
Industeel XC06 XCarb® Recycled and renewably produced is a commercially pure iron manufactured via an electric arc furnace using recycled scrap and renewable electricity, thereby reducing carbon emissions. The production process of **XC06** ensures high chemical and metallurgical purity with homogeneous properties throughout the product. This results in superior magnetic properties with a high level of reproducibility, including high saturation polarization, high permeability, and low coercive field strength.

Available as solid plates up to 825 mm (32 1/2 inches) thick, **XC06** has already proven its quality as a soft magnetic material for high-tech industry components such as :

- particle accelerators (cyclotrons),
- magnet components (cores, yokes),
- synchrotrons,
- spectrometers.

Properties

Standards

- AISI 1006
- EN 10027 C06
- Others Soft iron

Chemical composition

Heat analysis (values in mass weight %)

	Fe	C	Mn	Si	Ni	Cr	Mo	Cu	S	P
Specification max	balanced	0.06	0.40	0.20	-	0.10	-	0.10	0.015	0.015
Typical	>99.2	0.04	0.33	0.18	0.05	0.08	0.02	0.04	0.005	0.006

Excessive carbon content and residual elements in conventional grades can negatively impact the final performance, leading to a decrease in saturation polarization and increased sensitivity to magnetic aging (an increase in coercivity over time). However, due to a specific production process that combines electric arc furnace melting and vacuum degassing, **Industeel XC06 grade** maintains consistent quality with extremely low levels of residuals, not exceeding a few hundred parts per million (ppm).

Magnetic properties

XC06 is a soft ferromagnetic material providing high saturation polarisation whatever the thickness. Induction and coercive field strength are controlled on each plate.

The magnetic polarisation tabulated and graphically represented below is measured according to IEC/EN 60404-4 and IEC/EN 60404-2 on strips of 4 x 30 x 300 mm. The values are measured, not guaranteed. Guarantees will be adjusted according to the project needs. Induction values are tabulated accordingly.

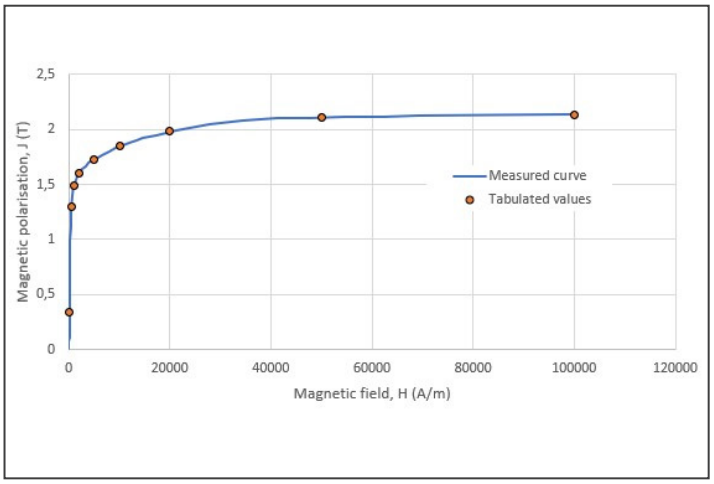
Measured values of magnetic polarisation J(T)								
J1	J5	J10	J20	J50	J100	J200	J500	J1000
0.32	1.29	1.49	1.60	1.73	1.84	1.98	2.11	2.13

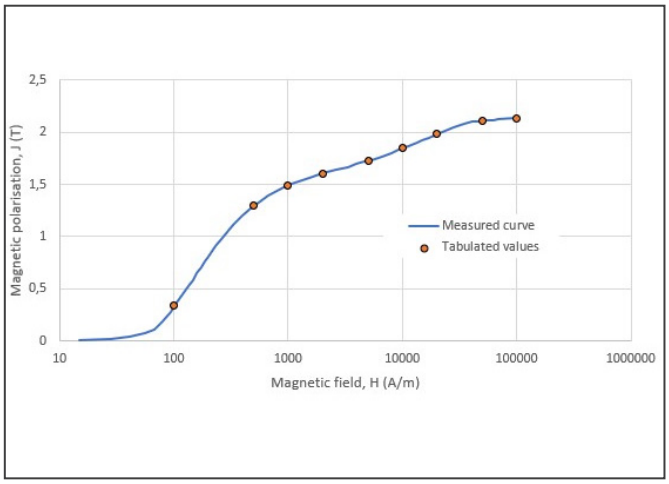
Measured values of magnetic induction B(T)								
B1	B5	B10	B20	B50	B100	B200	B500	B1000
0.32	1.29	1.49	1.61	1.73	1.85	2.00	2.17	2.25

Note : J1 to J1000 indicate the magnetic polarisation in Tesla (T) for magnetic fields from 0.1 kA/m to 100 kA/m

Note : B1 to B1000 indicate the magnetic induction in Tesla (T) for magnetic fields from 0.1 kA/m to 100 kA/m

1kA/m = 1000 A/m = 12.57 Oe





Other typical electro-magnetic properties are :

- Saturation polarisation Jsat : 2.15T
- Coercitive force Hc : ≤100 A/m after excitation at 25 KA/m
- Relative permeability at 1000 A/m : 1188
- Resistivity at room temperature : 16 µΩ/cm
- Thermal conductivity at room temperature : 50 W/mK

Delivery conditions

Plates and flame-cut pieces

XC06 is available up to 825 mm (32 1/2 ") thick products, and can be supplied in the following conditions :

- Hot rolled plates (delivered in "as-rolled" condition)
- Forged blocks (delivered as "forged")
- Cut-to-size flame cut pieces (according to specific drawings).

Depending on the size, two parts can be cut from the same mother plate to achieve the best symmetry in the magnetic properties. More information about machining possibilities available on demand.

XCarb® Recycled and Renewable Produced Certificate

XC06 products are manufactured using high levels of recycled steel and 100% renewable electricity, reducing the carbon footprint of your projects. **XC06** is delivered with third-party verified certificate that guarantees a product carbon footprint of 1.8-ton CO_2 equivalent.

Product Carbon Footprint	**1.8-ton CO_2 eq.**
Declared product	1 metric ton of plate
Carbon footprint methodology	CML2001 - Aug. 2016, Global Warming Potential (GWP 100 years)
Geographical coverage	France
Average scrap charge	99%
Production route	Electric Arc Furnace route with renewable electricity GoOs
Data collection year	2018-2022
System boundary	Cradle-to-gate
Owner of the declaration	ArcelorMittal Industeel Loire Châteauneuf site
Publication date	2024
Verification (Ugo Pretato of Studio Fieschi & soci S.r.l.):	Compliance with ISO 14040/14044 and the Worldsteel LCI methodology

XCarb®
Recycled and renewably produced

Industeel France
Châteauneuf Plant
Industeel Belgium
Charleroi Plant
industeel.arcelormittal.com

Your contact

Valéry NGOMO
Tel. +33 6 10 49 59 48
valery.ngomo@arcelormittal.com