

SILICON CORE IRON A-FM

Type analysis

Single figures are nominal except where noted.

Iron	Balance	Silicon	1.00 %	Phosphorus	0.180 %
Manganese	0.15 %	Carbon (Maximum)	0.04 %		

Forms manufactured

Bar-Rounds	Billet	Strip
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Description

Silicon Core Iron A-FM is melted in electric arc furnaces to exacting chemical specifications and carefully controlled through all manufacturing processes to produce a fine-grain, uniform quality magnetic core iron.

This alloy exhibits improved machining characteristics over Silicon Core Iron A. Improvements in machinability up to 40% can be realized on automatic screw machines.

The magnetic characteristics are of the same order exhibited by Silicon Core Iron A and are a function of the final heat treatment applied to the finish machined product.

Key Properties:

- Medium electrical resistivity
- High initial permeability
- Low hysteresis loss in AC and DC circuits

Markets:

- Aerospace
- Automotive
- Consumer
- Industrial

Applications:

- Solid cores machined in volume

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Physical properties

PROPERTY	At or From	English Units	Metric Units
SPECIFIC GRAVITY	—	7.75	7.75
DENSITY	—	0.2790 lb/in ³	7723 kg/m ³
MEAN COEFFICIENT OF THERMAL EXPANSION	77 to 750°F (25 to 399°C)	7.10×10^{-6} length/length/°F	12.78×10^{-6} length/length/°C
ELECTRICAL RESISTIVITY	70°F (21°C)	150.0 ohm-cir-mil/ft	25 microhm-cm
CURIE TEMPERATURE	—	1490°F	810°C

Magnetic properties

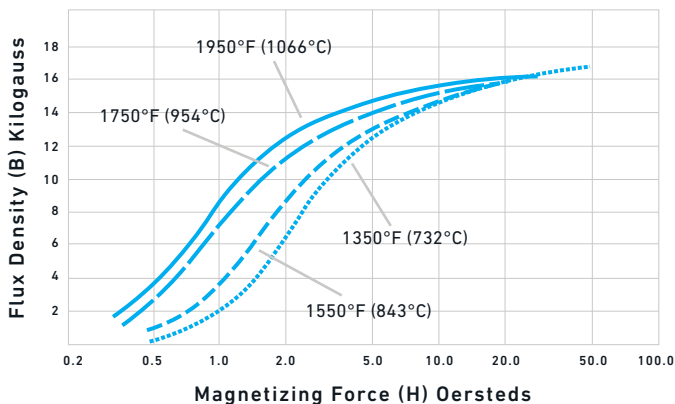
Magnetic properties are determined in accordance with ASTM A341. Diameters less than 1 in. (25.4 mm) are tested via a 10 in. (254 mm) length specimen on a Fehy permeameter. Diameters 1 in. (25.4 mm) and larger are evaluated on solid ring specimens machined from a disc.

Specimens are annealed at 1500°F (816°C) 2 hours in a wet hydrogen atmosphere and furnace cooled at a rate of 100°F (56°C) per hour down to 1000°F (538°C) and any cooling rate thereafter.

SATURATION FLUX DENSITY (Bs)	21000 G	21 kG
COERCIVITY	0.700 to 0.800 Oe	
MAXIMUM PERMEABILITY	4500	
RESIDUAL INDUCTION	6000 G	6 kG

Normal direct current DC magnetization curves

ANNEALED AT VARIOUS TEMPERATURES



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Typical direct current (DC) magnetic properties vs. heat treated temperatures

HEAT TREATED IN DRY HYDROGEN ATMOSPHERE, 2 HOURS AT TEMPERATURE AND FURNACE COOLED					
HEAT TREATING TEMPERATURE		μMAX	FLUX DENSITY AT H = 50 Oe	FROM 10 kG	
°F	°C			REMANENCE Br (G)	COERCIVITY Hc (Oe)
1350	732	3700	17,400	7900	1.1
1550	843	4300	17,000	7800	.80
1750	954	7300	17,000	7900	.50
1950	1066	8000	17,200	7900	.46

Typical mechanical properties

5/8 IN (15.87 MM) DIAMETER BAR						
HEAT TREATMENT	0.2% YIELD STRENGTH		ULTIMATE TENSILE STRENGTH		ELONGATION IN 4D	HARDNESS
	ksi	MPa	ksi	MPa	%	ROCKWELL B
Mill anneal	90	621	92	634	Not reported	95
Annealed ¹	38	262	63	434	40	70

¹ Annealed for magnetic properties — 1550°F (843°C), 4 hrs

Workability

Cold working

Cold working/cold forming properties are similar to Silicon Core Iron A.

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Typical feeds and speeds

TURNING — SINGLE-POINT AND BOX TOOLS

DEPTH OF CUT, IN	HIGH-SPEED TOOLS			CARBIDE TOOLS			
	SPEED, FPM	FEED, IPR	TOOL MATERIAL	SPEED, FPM		FEED, IPR	TOOL MATERIAL
				BRAZED	THROW AWAY		
.150	120	.015	M-2	400	485	.020	C-6
.025	160	.007	M-3	475	625	.007	C-7

TURNING — CUT-OFF AND FORM TOOLS

SPEED, FPM	FEED, IPR							TOOL MATERIAL
	CUT-OFF TOOL WIDTH, IN			FORM TOOL WIDTH, IN				
	1/16	1/8	1/4	1/2	1	1-1/2	2	
110	.002	.0025	.003	.0025	.0025	.0015	.0015	M-2
340	.004	.006	.008	.006	.005	.004	.003	C-6

DRILLING

SPEED, FPM	FEED, IPR								TOOL MATERIAL
	NOMINAL HOLE DIAMETER, IN								
	1/16	1/8	1/4	1/2	3/4	1	1-1/2	2	
80-85	.001	.003	.005	.010	.013	.016	.020	.025	M-42

TAPPING

SPEED, FPM	TOOL MATERIAL
25-30	M-1, M-7, M-10

DIE THREADING

SPEED, FPM				TOOL MATERIAL
7 OR LESS	8 TO 15	16 TO 24	25 AND UP, TPI	
10-20	15-25	20-35	25-40	M-1, M-2, M-7, M-10

MILLING — END PERIPHERAL

DEPTH OF CUT, IN	HIGH-SPEED TOOLS					CARBIDE TOOLS						
	SPEED, FPM	FEED, IN PER TOOTH				TOOL MATERIAL	SPEED, FPM	FEED, IN PER TOOTH				TOOL MATERIAL
		CUTTER DIAMETER, IN						CUTTER DIAMETER, IN				
		1/4	1/2	3/4	1-2			1/4	1/2	3/4	1-2	
.050	80	.002	.003	.005	.007	M-42	350	.0025	.005	.007	.009	C-6

> SILICON CORE IRON A-FM**Additional machinability notes**

Figures used for all metal removal operations covered are average. On certain work, the nature of the part may require adjustment of speeds and feeds. Each job has to be developed for best production results with optimum tool life. Speeds or feeds should be increased or decreased in small steps.

Other Information**Applicable specifications**

ASTM A867 Alloy 1F

**For additional information, please
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