

DATA SHEET



**S O R E L
F O R G E**

SF-2050® SUPER PREHARDENED MOULD STEEL

TYPICAL APPLICATIONS

- Injection moulds of any size
- Compression moulds
- Long run moulds
- Abrasive plastic injection moulds
- Reinforced plastic injection moulds
- Dies for non corrosive plastic extrusion

GENERAL:

Delivery Condition:

Hardened and tempered

Hardness Range

	BHN	HRC	N/mm²
Super Hard	355-390	38-42	1202-1322

SF-2050® is a new prehardened mould steel grade specially designed for through hardenability, ease of machining and simple post-production mould maintenance. It has high impact strength and excellent temper resistance. The well-balanced chemistry assures homogeneous hardness and near no section hardness loss due to mass.

SF-2050® is forged on a 5000 ton press equipped with wide dies assuring maximum deformation during forging process.

SF-2050® is forged using a special densifying process which assures optimum consolidation of centers.

Typical Chemical Analysis - % weight

C	Mn	Si	Ni	Cr	Mo	Other
0.33	1.00	0.40	0.50	1.85	0.50	Micro alloying

SF-2050® is melted with a low sulphur content to enhance polishability.

SF-2050® is quenched in water. Best properties in steel are produced with the highest achievable quench severity.

SF-2050® is characterized by :

- Prehardened high strength steel
- Good polishability
- Excellent weldability
- Uniform hardness
- Superior texturing
- Improved wear resistance

SF-2050® is 100 % ultrasonic tested to very stringent acceptance levels. It is defect free.

SF-2050® high hardenability ensures hardness levels to be maintained at the working surfaces, even on large moulds with deep impressions.

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MATERIAL CHARACTERISTICS

The benefits of through high hardness are :

- Stable and continued machining can be performed with (C.N.C.) automatic machines.
- A defect free machined surface can be obtained.
- Dimensional stability of parting lines.

Structure

After hardening and tempering, the structure of SF-2050® consists of tempered martensite to fine bainite.

The benefits of the through hardness combined with a uniform and stable micro-structure are :

- For mould design, consistent properties are assured.
- The machining distortion is minimized in the finished mould.
- A uniform luster can be obtained upon surface polishing.

PROPERTIES SF-2050®

Cleanliness :

Method	A	B	C	D
ASTM E45	≤ 1.5	≤ 1.5	≤ 0.5	≤ 1.5
DIN 50602	K4 ≤ 20			

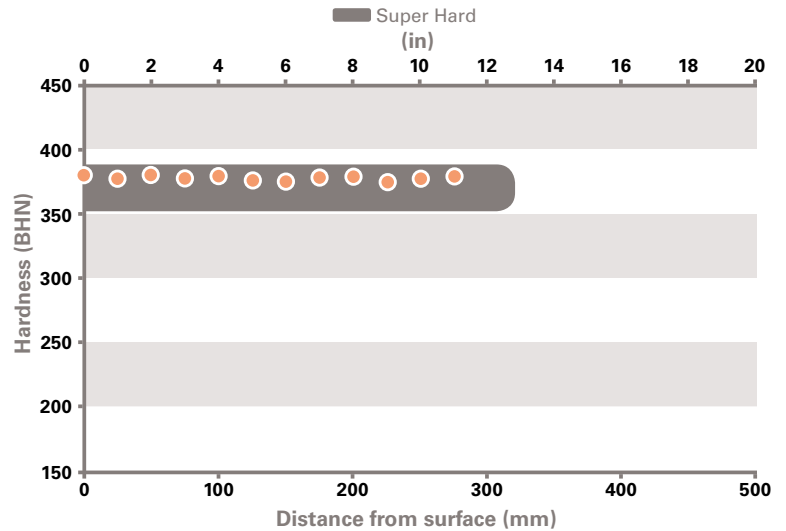
Physical Properties :

Thermal conductivity	Thermal expansion coefficient (10 ⁻⁶ K ⁻¹)			Thermal capacity	Density
(W.m ⁻¹ .K ⁻¹)	25-100 °C	25-300 °C	25-400°C	(J.Kg ⁻¹ .K ⁻¹)	-
30	12.3	13.7	14.8	384	7.85

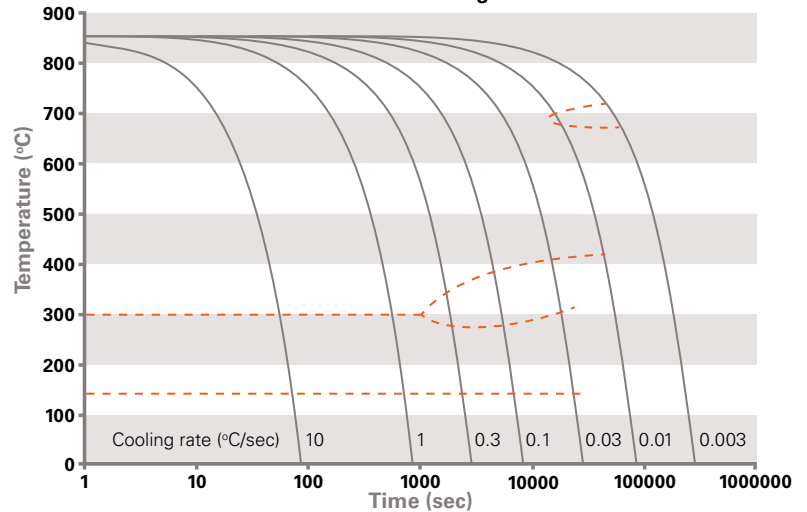
Mechanical Properties : Typical values for a 4" (101.6 mm) thick plate.

Hardness range	Hardness BHN (HRC)	Y.S. 0.2 MPa (KSI)	UTS MPa (KSI)	EI (%)	Impact@RT J (Ft-lb)	
					Long.	Trans.
355-390 BHN	363 (39)	1007 (146)	1124 (163)	> 15	34 (25)	30 (22)

Hardness profile of SF-2050®



Continuous cooling curve



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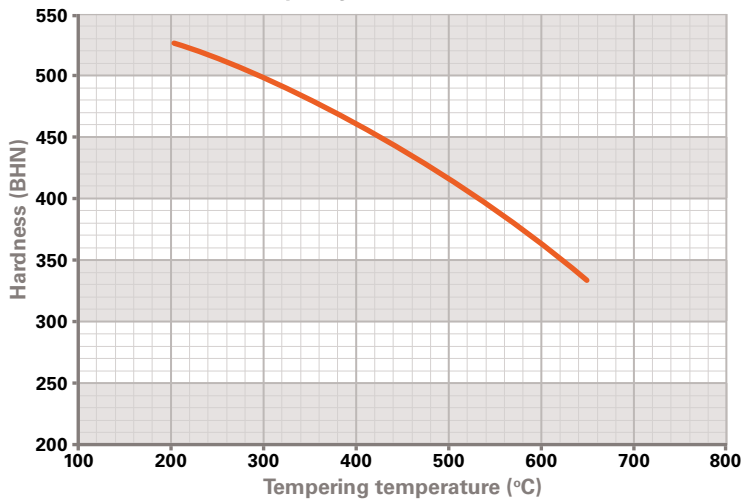
SF-2050®

HEAT TREATMENT

Attainable Hardness of SF-2050

Quenched from 1550 °F (816 °C)
and Tempered 4 hours
(Size of section – 4" X 4" (101.6 mm X 101.6 mm))

Tempering curve of SF-2050®



Stress Relieving

Mould can be finish machined to their final dimensions. Heat finished die at a rate of one hour per inch (25.4 mm) of maximum thickness to 850 to 900 °F (454-482 °C) Hold at temperature for one hour per inch (25.4 mm) and air cool.

Tempering

Tempering treatments vary for different sizes and applications. The following instructions will provide through tempering:

Heat uniformly at the selected tempering temperatures and hold at temperature for one hour per inch (25.4 mm) of total thickness.

FLAME HARDENING

SF-2050® lends itself to flame hardening of selective surfaces creating a surface hardness of up to 60-63 HRC varying in depth from skin hardness up to 0.125" (3 mm).

EDM (ELECTRIC DISCHARGE MACHINING)

This method of machining is widely used on prehardened SF-2050®. However, precaution should be taken since this method of machining leaves a rehardened surface layer (white layer) on the steel. It is advisable to remove this layer.

HARD-CHROMIUM PLATING

After hard-chromium plating, the tool should be tempered for a minimum of four (4) hours at 350 °F (180 °C) in order to avoid hydrogen embrittlement. In case of replating, the tool should be tempered after it has been acid stripped.

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TEXTURING

SF-2050® offers excellent response to texturing because of the great homogeneity of its structure.

POLISHING

The following is an example of good hardpolishing procedure :

Preparation for diamond polishing

- Step 1 • Polish with 220 – grit silicon stone
- Step 2 • Polish with 320 – grit silicon stone
- Step 3 • Polish with 520 – grit silicon stone
- Step 4 • Polish with 800 – grit silicon stone
- Step 5 • Polish with diamond paste grade 15
- Step 6 • Polish with diamond paste grade 6
- Step 7 • Polish with diamond paste grade 3

When the demands for finish are particularly high, use grade 1. Be aware that the best result is obtained after a certain optimum polishing time. Over polishing is detrimental to the surface leading to so called orange-peel appearance and pitting.

SIZE SF-2050®

(As forged / approx.)

Max weight	25 000 kg	55 000 lbs
Max section	1.55 m ²	2 400 sq in
Max width	1 900 mm	75"
Max thickness	815 mm	32"

Note: Provided technical data and information in this data sheet are typical values. Normal variations in chemistry, size and conditions of heat treatment may cause deviations from these values. We suggest that information be verified at time of enquiry or order. For additional data or metallurgical assistance, please contact us.



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