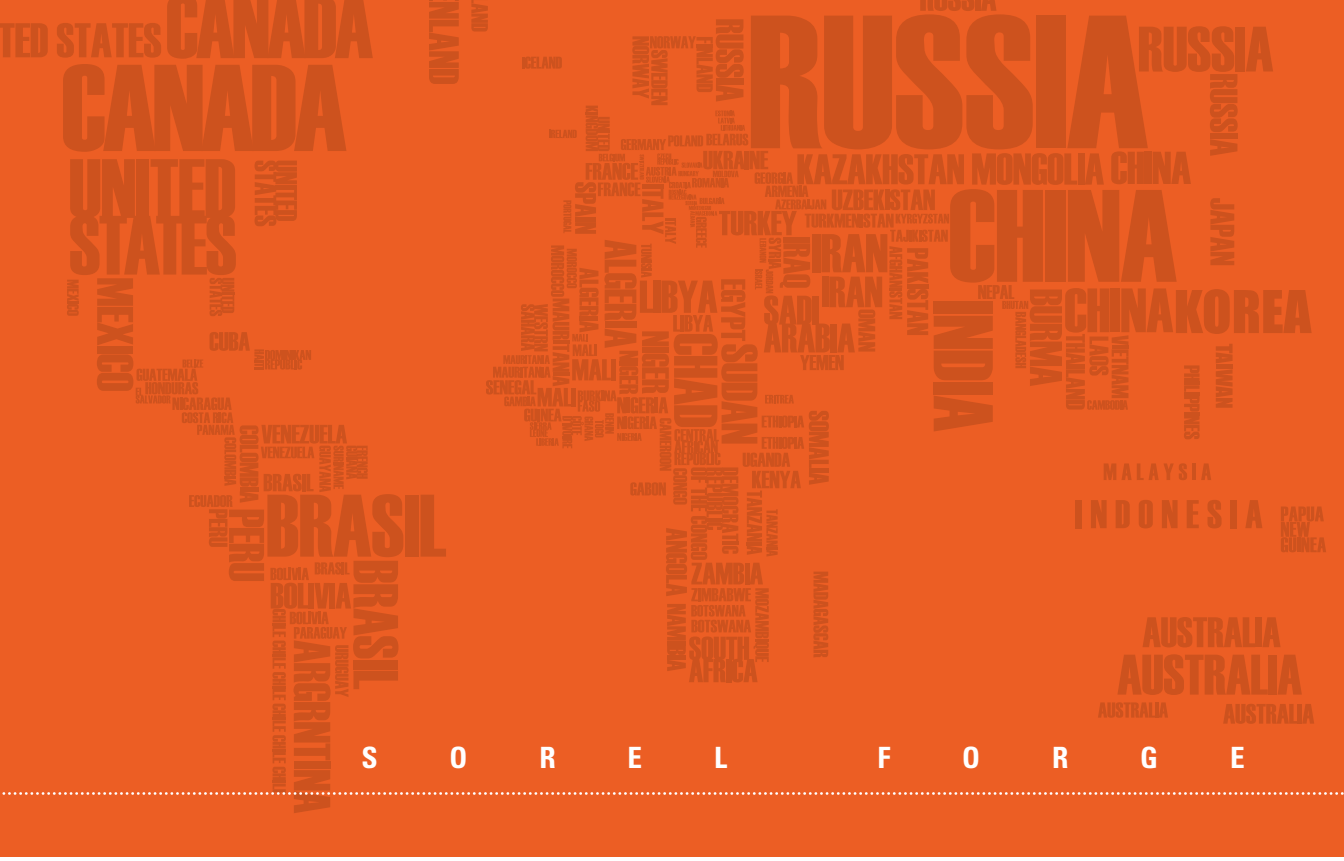


LOOKING AHEAD

02
PROCESS FLOW CHART
Today's ultra sophisticated equipments require materials that provide optimal efficiency.

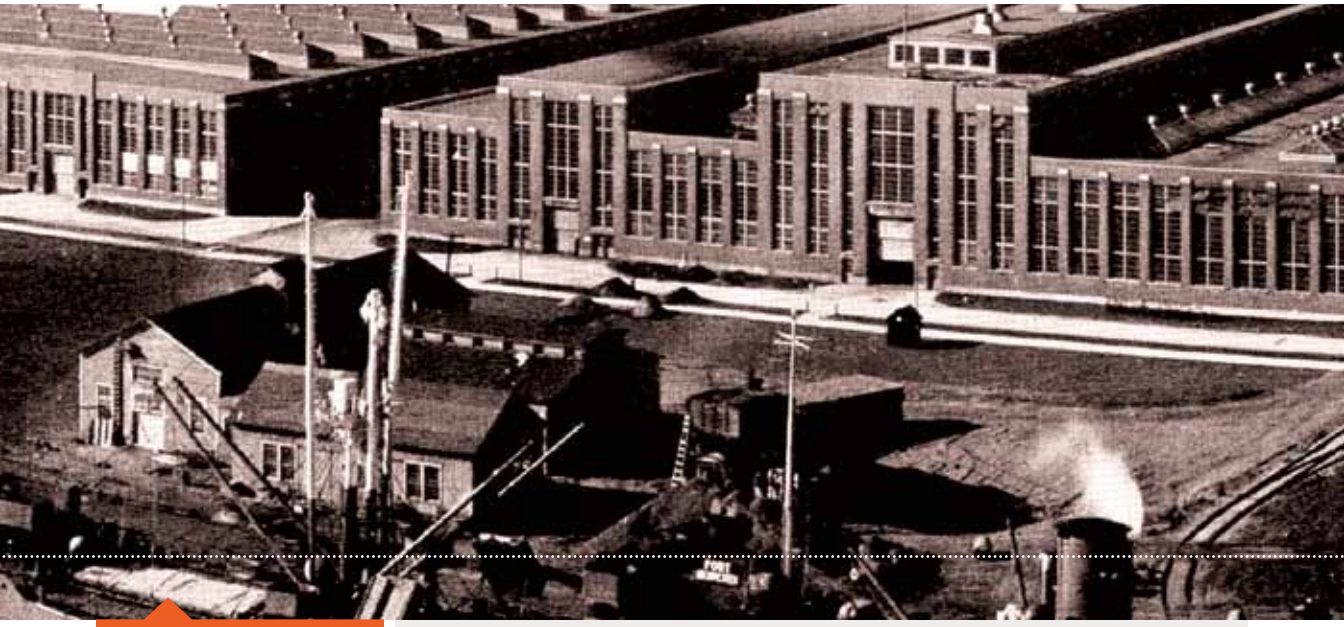
01
COMPANY HISTORY
History of a company that took over the evolution of the economy for more than 70 years

03
STUDY CASE
In the last 25 years, the place of plastics in the automotive industry and electronics as grown tremendously

04
DATA SHEET
Prehardened mould steel : SF-2000, SF-2000 LQ, SF-2050 and news...

SOREL FORGE

01 COMPANY HISTORY



1940
Grand opening
of the factory.

HISTORY OF A COMPANY THAT TOOK OVER THE EVOLUTION OF THE ECONOMY **FOR MORE THAN 70 YEARS**

1939
Start construction of « Sorel Industries ».

1940
Grand opening of the factory.

1941
Sorel Industries presented its first « 25 pounder cannon »
to the government of Canada.

1957
Sorel Industries reached the milestone of 1000 workers.

1959
Sorel Industries was acquired by Crucible Steel.

1968
The steel plant became Colt Industries,
a division of Crucible Steel.

1983
Colt Industries was acquired by Slater Steel.

2007
Sorel Forge was acquired by Schmolz + Bickenbach.

Sorel Forge SF-2000 family is recognized for its excellence in steel grades used in the manufacture of moulds for the industry of plastic injection.

1 RAW MATERIAL (SCRAP)
Premium quality raw materials only:
- Busheling
- Shredded scrap
- Structural plates

2 MELTING AND TAPPING
3 42 tons (38 000 kg)
Electric Arc Furnace

4 REFINING
Addition of alloying elements for precise chemical composition

5 DEGASSING
Argon bubbling degassing station to remove hydrogen, nitrogen and oxygen

6 BOTTOM POURING AND CAST INGOTS
7 REMELTING ESR/VAR
Ingots of variable volume from 5 to 42 tons (4 600 kg to 38 000 kg) and dimension of 25" (457 mm) square to 63" (1 600 mm) round

8 HEATING
Heating to reach 2 300°F (1 260°C) to 2 400°F (1315°C) before forging operation

9 FORGING
- 5 000 ton press with a rail-mounted computer assisted manipulator of 100 tons/meter; capable of forging ingot up to 42 tons
- 2 000 ton press with a rail-mounted computer assisted manipulator of 40 tons/meter; capable of forging ingot up to 13 tons

10 HEAT TREATMENT
11 Gas and electric furnaces for annealing, normalizing, austenitizing, tempering and stress relieving

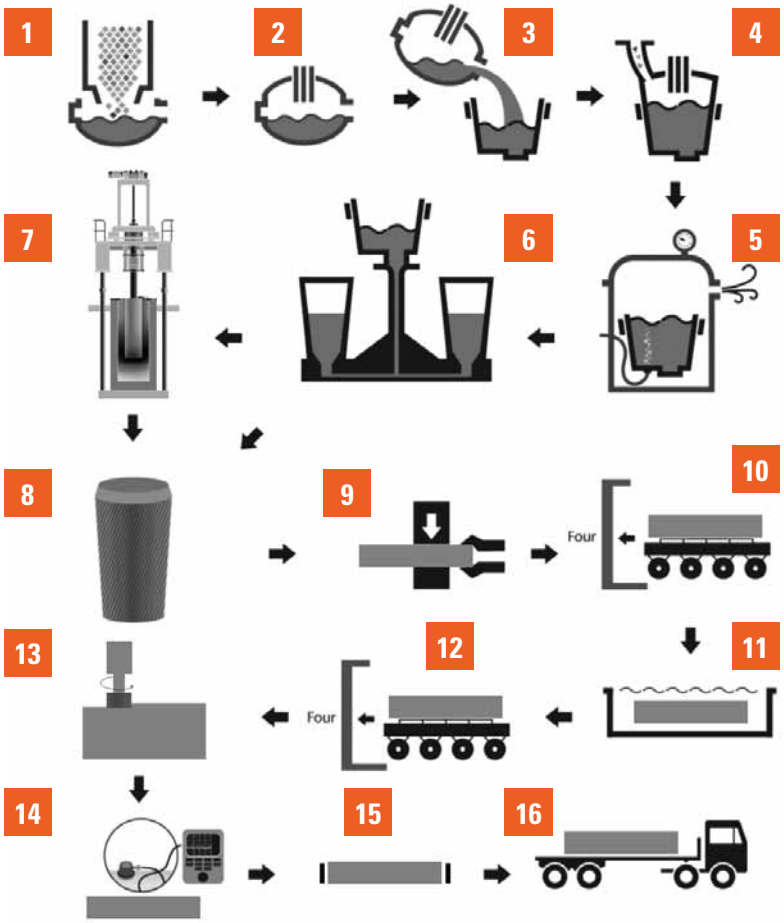
12 QUENCHING
Quench tanks (water and polymer)

13 MACHINING
Machine shop includes a vast array of equipment to machine pieces up to 70" diameter (1 778 mm) and up to 40 feet long (12 192 mm):
- Conventional and CNC lathes
- Boring and vertical lathes
- Milling machines
- Trepanning lathe

14 INSPECTIONS
- Ultrasonic inspection
- Dimensional inspection
- Hardness testing
- Other tests also available on request

15 SAW CUTTING
Saw cutting up to 79" (2 006 mm)

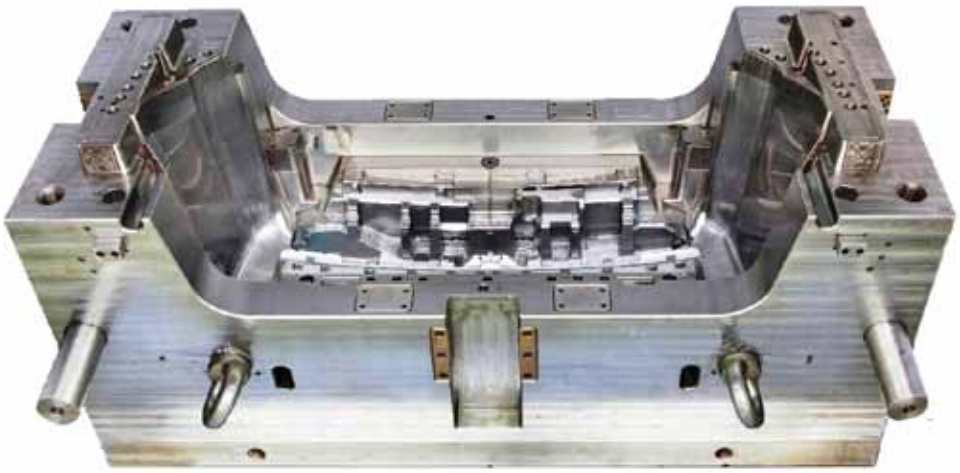
16 SHIPPING
Shipment available by truck, rail and container



2011
Teeming car for best bottom pouring practice

STATE-OF-THE-ART METALLURGY TO PROVIDE **OPTIMUM QUALITY**

03 STUDY CASE



Bumper mould
One of many applications of SF-2000

SF-2000 – DEVELOPMENT OF THE NEXT LEVEL QUALITY MOULD STEEL

In the last 25 years, the place of plastics in the automotive industry and electronics as grown tremendously as it is the key to future high-performance, more fuel-efficient vehicles. Plastics offer designers multiple advantages in many applications by providing lightweight and versatile designs as well as lower manufacturing costs. The versatility of plastics can be expressed by the wide range of shapes and surface finishes now possible. However, this versatility would not be possible without quality mould steels.

The increasing demand for fuel-efficient vehicles is pushing designers to create more aerodynamic cars, in turn asking for larger complex plastic parts like bumpers, dashboards and door panels. Plastic injection moulding is used for a fast pace production and tool steels are used for this application. North American mouldmakers prefer using quenched and tempered steel for multiple reasons. The properties of a quality mould steel vary from the mouldmaker to the end-user. Good machinability as well as the ability to provide a good surface finish are the most important aspects for the mouldmaker. Uniform hardness is the key for the end-user to produce parts without shape distortion throughout the tool life. As parts increase in size, moulds have to be larger and still display these properties across the entire section. This is the challenge for the steelmakers.

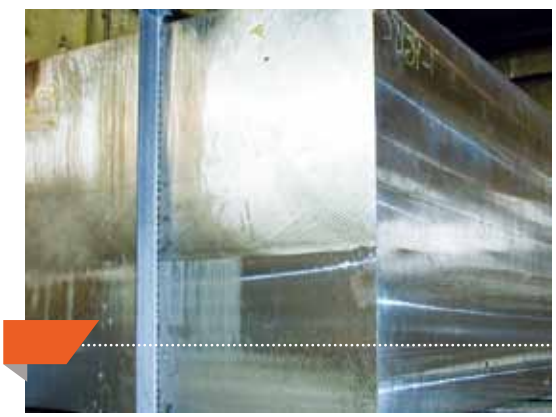
In an effort to provide our clients with the best possible products, the **SF-2000** family is continuously evolving. Being able to push the limits with knowledge-based products has become one of Sorel Forge's main objective making us a leader in plastic moulding tool steels.

State-of-the-art metallurgy is a large part of Sorel Forge's success in improving the cleanliness of the steel and providing a low segregation product. The **SF-2000** family is characterized by its high homogeneity in hardness and mechanical properties, its machinability and its improved polishability. This family of products is an answer to the needs of mould makers and end-users. Optimization of alloy composition and heat treatment of **SF-2000** steel according to application allows for a uniform microstructure thus, uniform hardness across the section. In combination with low sulfur content and increased cleanliness of the steel provided by recent improvements in meltshop operations, this uniform microstructure is critical for good polishability and texture capability. High and uniform hardness can only be obtained through control of microstructure during quenching and tempering operations. Recent developments of the **SF-2000** family have led to a high hardenability steel allowing Sorel Forge to provide high thickness blocks for deep cavity moulds.

As plastics evolve and occupy more space in the automotive industry, mould steel will have to follow. By continuous efforts in improving the quality and capability of the **SF-2000** family, Sorel Forge is ready to provide solutions for the green vision of the transportation industry.

ELECTROSLAG REMELTING FOR LENS QUALITY MOULD STEEL EXCEEDING THE REQUIREMENTS

Special applications involving clear plastics in replacement of glass in lenses and windshields for example require very high quality steel to insure a flawless surface on the final product. **SF-2000 LQ40 ESR** is the latest development in the **SF-2000** family at Sorel Forge. It is an electroslag remelted lens quality mould steel with cross section hardness of 40 HRC showcasing optimal cleanliness for mirror polishing capability giving the mouldmakers the possibility to manufacture the vision of designers.



Having an electroslag remelted product in the available product line was of upmost importance for Sorel Forge in order to offer A1 finish capability steel. The development of this specific grade with special microalloying resulted in improving hardenability and machinability.

With this grade, it is possible to obtain a hardness of 40 HRC throughout the block without any secondary heat treatment or surface treatment other than the delivered quenched and temped condition, which insures improved machinability and dimension stability during mouldmaking and service operations.

The electroslag remelting process allows reaching very high cleanliness which is the key factor in mouldmaking with economical advantages over other refining methods. Ingots are obtained with purity levels that were unknown a few years ago leaving behind prejudices as the process is evolving. Also, in efforts to cutting lead times, ESR process eliminates any conditioning of ingots prior to remelting steps and following forging steps.

Introduced in Asia, and now with over 10 000 tons sold all over the planet, the **SF-2000 LQ40** rapidly found users in the electronics industry for multiple applications. With all its capabilities, the **SF-2000 LQ40** represents a good solution for the production of deep cavity moulds for headlights and tail lights of future cars or any large and complex clear part.

SF-2000®
PREMIUM PREHARDENED MOULD STEEL

TYPICAL APPLICATIONS
- Injection moulds of any size
- High polish moulds
- Compression moulds
- Dies for plastic extrusion
- Blow-moulding moulds
- Die-casting prototype insert dies for tin, lead, zinc, aluminium and magnesium alloys
- High strength holder/die shoe
- Structural components

GENERAL:
Delivery Condition:
Hardened and tempered
Hardness Range

	BHN	HRC	N/mm²
Regular	285-320	30-34	963-1082
High Hard	320-355	34-38	1082-1202

SF-2000® is a premium prehardened mould steel grade specially designed for through hardenability, ease of machining and simple post-production mould maintenance. It has good impact strength and good temper resistance. The well-balanced chemistry assures homogeneous hardness and minimal section hardness loss due to mass.

TYPICAL CHEMICAL ANALYSIS - % WEIGHT

C	Mn	Si	Mo	Cr	Ni	Other
0.35	0.85	0.40	0.45	1.85	Added	Micro alloying

SF-2000® is characterized by :
- Excellent machinability
- Excellent polishability
- Excellent weldability
- Uniform hardness
- Good wear resistance
- Improved conductivity
- Superior texturizing

SF-2050®
SUPER PREHARDENED MOULD STEEL

TYPICAL APPLICATIONS
- Injection moulds of any size
- High polish moulds
- Compression moulds
- Long run moulds
- Abrasive plastic injection moulds
- Reinforced plastic injection moulds
- Dies for 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.

Typical Chemical Analysis - % weight

C	Mn	Si	Ni	Cr	Mo	Other
0.35	1.00	0.40	0.50	1.85	0.50	Micro alloying

SF-2050® is characterized by :
- High hardness
- Excellent machinability
- Excellent polishability
- Excellent weldability
- Very uniform hardness
- High purity and homogeneity
- Superior texturizing
- Improved wear resistance

SF-2000 LQ®
LENS QUALITY PREHARDENED MOULD STEEL

TYPICAL APPLICATIONS
- Clear lens moulds
- Mirror surface finish moulds (SPI A-1)
- Long run moulds
- Abrasive plastic injection moulds
- Reinforced plastic injection moulds
- Dies for plastic extrusion

GENERAL:
Delivery Condition:
Pre-Hardened Mould Steel
Electroslag Remelted (E.S.R.)

	BHN	HRC	N/mm²
LQ 36	320-355	34-38	1082-1202
LQ 40	355-390	38-42	1202-1322

SF-2000 LQ® is the finest and most reliable Sorel Forge mould steel.

Typical Chemical Analysis - % weight

C	Mn	Si	Ni	Cr	Mo	Other
0.35	1.00	0.40	0.50	1.85	0.50	Micro alloying

SF-2000 LQ® is characterized by :
- Super polishability
- Good machinability
- Great hardness uniformity
- High purity and homogeneity

SF-5
SMALL MOULD AND HOLDER

SF-420
STAINLESS MOULD

SF-2738
EURO STANDARD FOR LARGE SIZE MOULD

SF-GH50
ECONOMICAL MOULD STEEL FOR MEDIUM SIZE MOULD

SF-2311
EURO STANDARD FOR SMALL SIZE AND MEDIUM SIZE MOULD

SF-2312
EURO STANDARD FOR HOLDER

NEWS

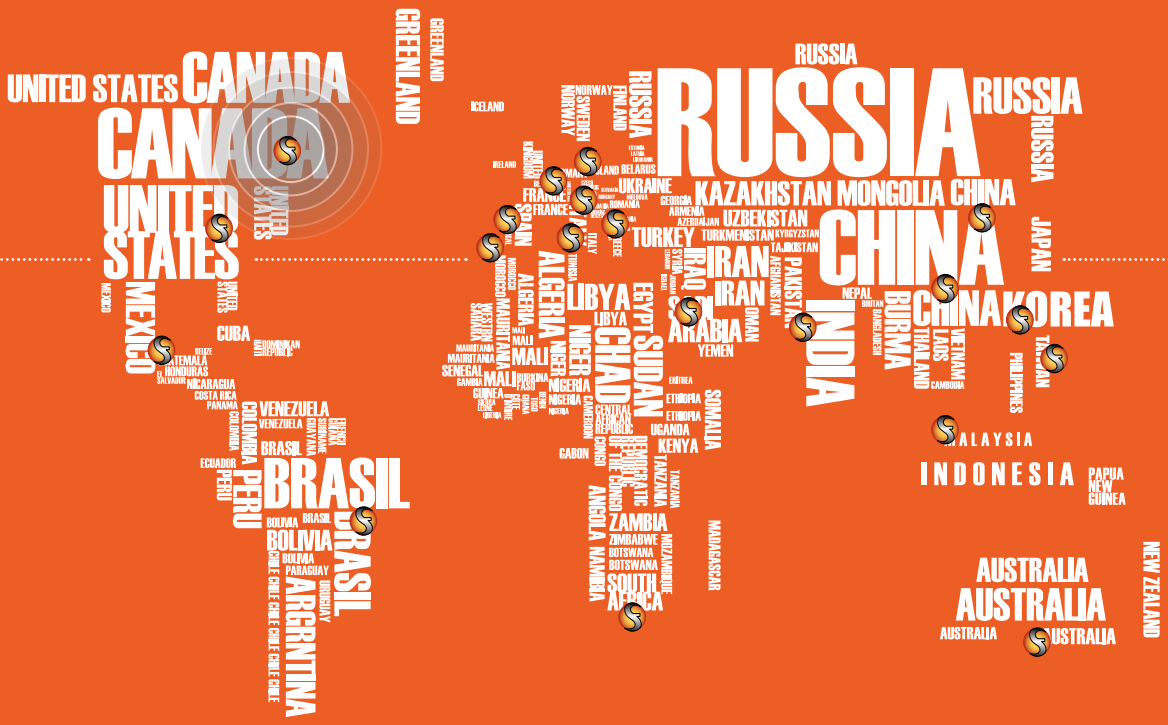
Sorel Forge is proud to announce its participation in a long term relationship with l'École de Technologie Supérieur, an Engineering University in Montreal, QC, through a research chair. The team at the Industrial Research Chair in Forming Technologies of High Strength Alloys, also called CM2P, will study the industrial challenges of steelmaking in a comprehensive manner while considering the influence of manufacturing parameters on microstructure evolution and the resulting impact on service properties. This partnership will allow optimization of current manufacturing processes, improvement of current line of products and development of new alloys for Sorel Forge's clients.

ÉTS
Engineering for Industry

SOREL FORGE

S O R E L F O R G E

GLOBAL NETWORK



Sorel Forge Co. has been well known for decades for their great diversity of special steels in different types of industries. A mix of tremendous quality products, outstanding customer service and efficient production process is what brings us to be recognized worldwide. We have well qualified agents all over the planet to ensure a tight support to the customers and to follow up very closely on the market.

Our quality steel is also used in the; hydroelectricity, petroleum, heavy machinery, power generation, pulp and paper, steel processing, mining and petrochemical industries. Our innovative group of engineers always find a way to provide customers a better product than what the market can offer. Sorel Forge: A name that stands out for quality.

Printed in Canada • May 2013

SOREL FORGE

ISO 9001-2008

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.

CONTACT

SOREL FORGE CO.
100 McCarthy, Sorel Quebec
Canada J3R 3M8
1 450 746-4030 ▪ **sorelforge**.com