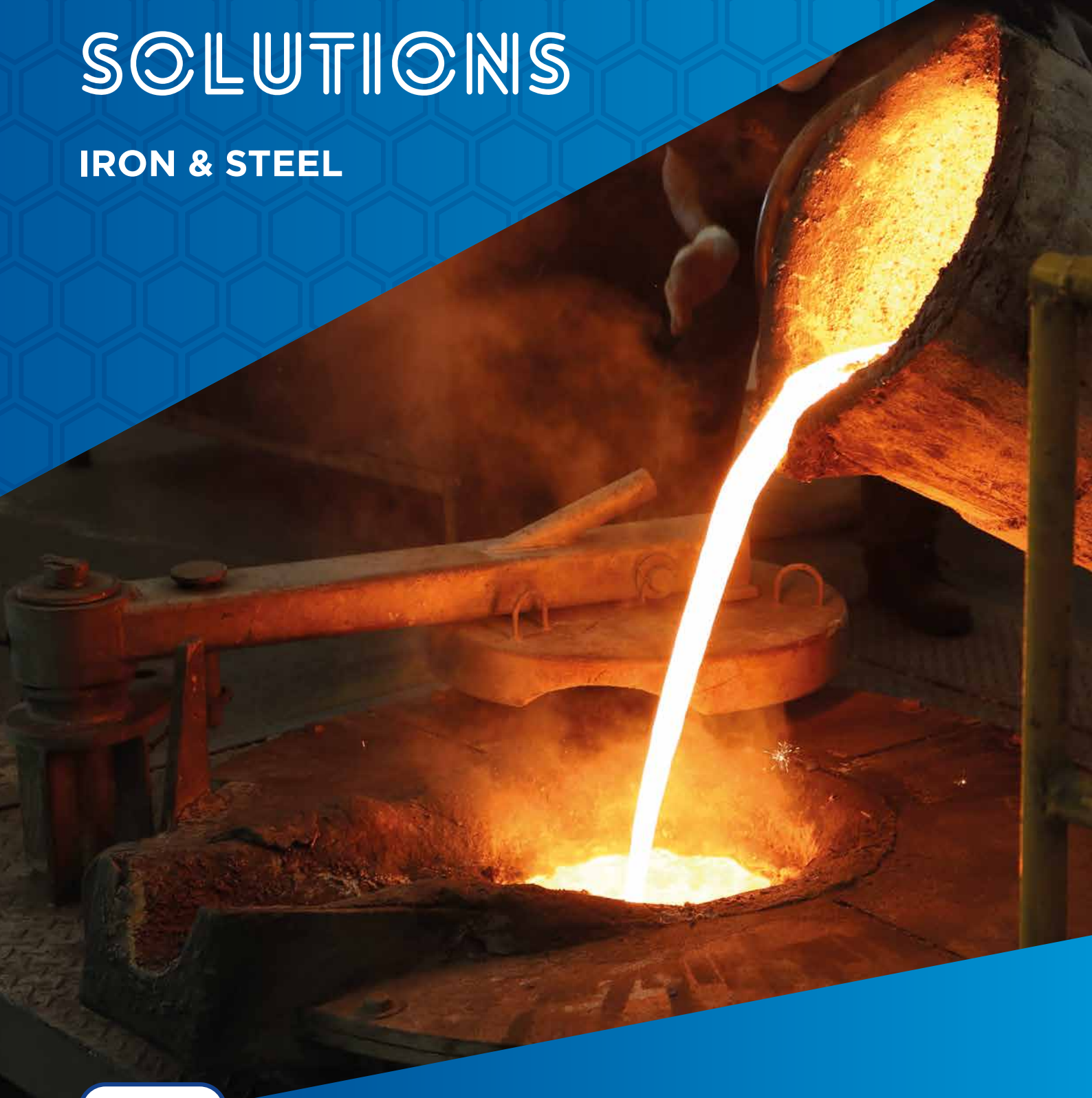


SAINT-GOBAIN PERFORMANCE CERAMICS & REFRACTORIES

FOUNDRY SOLUTIONS

IRON & STEEL



MORE EXPERTISE, MORE SAFETY

SAINT-GOBAIN

As part of the Saint-Gobain group we belong to one of the 100 biggest and most traditional companies worldwide. Saint-Gobain designs, manufactures and distributes high performance and building innovative solutions to the challenges of growth, energy efficiency and environmental protection. Excellent refractory materials, products and systems are our strengths. Our products comply with the highest economic and environmental requirements even under high thermal and complex chemical operating conditions. Together with our subsidiaries, who specialize in high performance ceramics, as well as our worldwide located R&D centers, we have established a leading team of ceramic experts. Saint-Gobain's well known NORTON® Dry Vibration Monolithics, castables and even the ramming monolithics are used with outstanding success in induction furnaces, ladles and launders in ferrous and non-ferrous foundries. The castables NORFAST® and NORFLOW® allow a much faster drying or easier casting during installation on site. It is Saint-Gobain's will, to fulfill all our customers' requirements.

IT IS KNOW-HOW AND EXPERIENCE RESULTING FROM OVER 100 YEARS DEVELOPMENT AND PRODUCTION OF REFRACTORY PRODUCTS THAT MAKES THE DIFFERENCE.

OUR PRODUCTION FACILITIES ARE CERTIFIED BY:



QUALITY
DIN EN ISO 9001



ENVIRONMENT
DIN EN ISO 14001



OCCUPATIONAL SAFETY
OHSAS 18001

PIONEERING CERAMIC SOLUTIONS FOR EXTREME INDUSTRIAL APPLICATIONS AND A GREENER WORLD.

Knowing that customers run their own melting operations in their own individual way, we provide a **wide range of products and services** for individual situations and operating conditions. Thanks to our **100+ years' experience, worldwide production facilities and skilled staff**, our customers can be confident they are getting expert support, reliable product performance and services, contributing **to sustainable growth of their business**. Using our assets and skills we offer **full-package solutions for foundry applications**, including refractory design and products, installation supervision or turnkey services.

OUR COMMITMENTS TO THE FOUNDRY INDUSTRY

SOLUTIONS TO CUSTOMERS



OUR PRODUCTS INNOVATIVE SOLUTION OUTSTANDING PERFORMANCE

Saint-Gobain Foundry Solutions provide **innovative solutions**, including refractory products and expertise regarding foundry operations, covering **iron, steel and non-ferrous metal-melting operations** (aluminium, brass, copper or zinc), and coating applications (Galvalume® coating). The **outstanding performance of our dedicated product lines**, Norton® foundry monolithics (see our track record), makes our products the leading refractories for melting equipment such as **coreless induction furnaces, vacuum furnaces, channel furnaces, inductors, autopour, launders and ladles**.



OUR SERVICES DESIGN & ENGINEERING INSTALLATION AND SUPERVISION PERFORMANCE AUDIT FULL R&D SUPPORT

Our skilled sales, application and R&D teams use their expertise to extend our **refractory offer** by providing **refractory/lining design & engineering**, plus valuable support through **refractory installation and supervision** through to implementation of foundry equipment. We also help our customers conduct **performance analyses/audits**, to facilitate selection of optimal refractory solutions in order to **achieve customers' savings targets**.

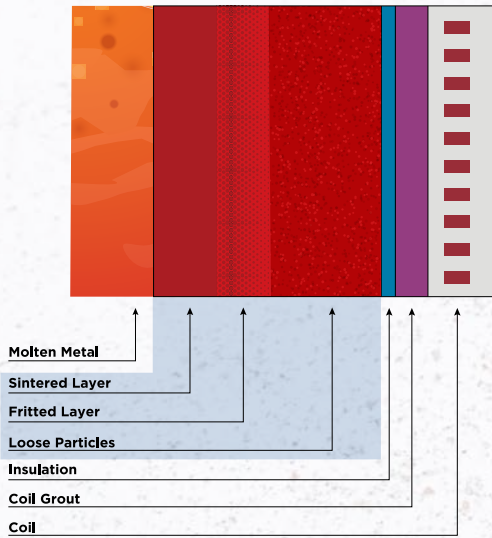


YOUR BENEFITS ENHANCED SAFETY REDUCED DOWNTIME INCREASED PRODUCTIVITY

By partnering with Saint-Gobain, our customers are promised **outstanding product performance and quality**, enhanced operational safety and products that comply with recent EHS standards, so they can concentrate on what matters: **metal production**. Our worldwide implementation allows us to quickly provide product and service solutions so as to reduce your operational downtime. Our **consistent and reliable material performance** helps our customers all over the world optimise operating conditions, reducing downtime and maintenance, saving on electricity and refractory consumption and increasing metal-melting output.

OUR PRODUCTS

OUR PRODUCTS BOOST YOUR PRODUCTIVITY AND EFFICIENCY



DRY VIBRATED CEMENTS

We offer an **optimised range of Dry-Vibrated Cements (DVC)** appropriate to customer-specific use of equipment, as well as to metal for melting and operating parameters.

We are particularly committed to use of **Neutral Ramming Mixes (NRM) based on alumina/magnesia spinel** material. Our NRM exhibit **increased lifetime** and **corrosion resistance**, and lead to **operational savings**. NRM's unique 3-layer design helps **prevent leakage**, providing additional security for melting and safety for the staff.

CASTABLES

We provide a **castable range** - from regular cement content to LCC, ULCC and cement-free castables or specialities such as self-flowing or fast-firing solutions. For different zones of the equipment we also provide **topping mixes and special coil cement**.

Product characteristics are carefully selected in **accordance with your specific needs** regarding melting, and equipment for transportation and transfer that has a long life thanks to **a high level of metal-corrosion resistance or thermal-shock behaviour**. Our refractory castables are also **optimised for quick installation**, with a reproducible structure for the finished installation.



NORFLOW® CASTABLES

The Norflow® castables range was designed to be installed without using any installation tool e.g. vibrator, as the products are self-flowing. It is sufficient to prepare the mix and pour it into the mold or area and the product will flow in all zones automatically. Main advantages brought by self-flowing castables are:

- Economic: reduced downtime, increased productivity, manpower savings (no additional or specific preparation of the installation is requested compared to conventional castables)
- EHS: better and less painful working conditions, lower noise level, better safety (no need to walk on formworks with vibrating needles)
- Technical: generally higher performance, better aspect of surfaces and edges, greater freedom in structure design



Comparison of flow properties of standard castable mix (left) and **Norflow®** (right), both samples having the same weight, grain-size distribution and water content. **Norflow®** spreads more, thus the self-flowing property is more developed.

NORFAST® CASTABLES

The Norfast® product range provides **high-performance castables** specially designed for **high-speed installation and dry-out work**, to **reduce equipment downtime**. Norfast® castables exhibit **excellent mechanical strength and performance** at high temperatures and in contact with molten metal. Their unique binder matrix allows **incredible dry-out performance**, leading to an overall installation time-saving of up to 50%.



OUR PRODUCTS

PRECAST SHAPES



Our facilities manufacture and supply preshaped and prefired products, e.g. launders, channels, filter boxes (especially for use in aluminium foundries), or any other design based on customer requests. **The consistent product quality, simple installation and reduced downtime** make these products a preferred solution for cost-sensitive production lines.

Especially for the aluminum industry, Saint-Gobain's premium partner **COREF** uses the latest production technology to provide **the optimal finished quality and product performance**. Precast shapes made using our CORSIL/Silisol® product line are used by the world's biggest aluminum producers, who have confirmed their benefits, consistent quality and shape variability.

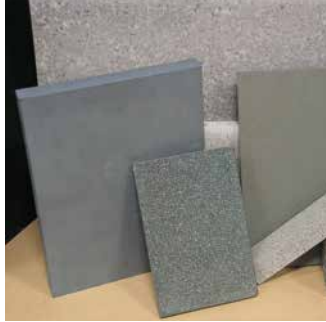


PLASTIC/RAMMING MIXES

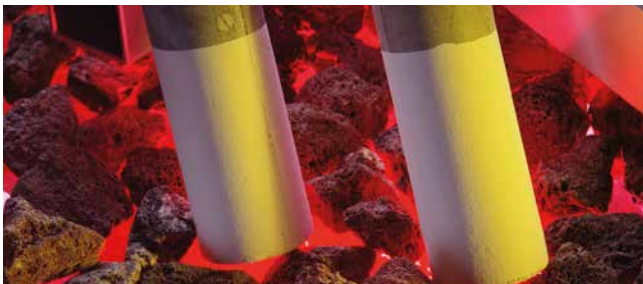
Our plastic refractory and ramming mixes are **available ready to use**, and are the first choice for many applications (spout, top, ladle launder) for quick cold or hot repair as well as full supporting refractory lining. You can apply our plastic products by hand or using a trowel (for quick repair of cracks or wear zones) or a tool, as a pneumatic hammer.



For us, **offering a complete product portfolio** is always our priority, making us a one-stop shop and simplifying your everyday work. Thanks to our activities within the Saint-Gobain group we can supply **top-quality supplementary products, to maximise your operational performance.**



- In addition to our foundry-product portfolio we also provide a wide range of **dense refractories** (SiAlON/SiC/Si₃N₄, alumina, mullite), as well as insulation materials such as **microporous, mica, slip-plane and lightweight bricks**, to match your application.



- Our premium **Boron Nitride** coatings are validated solutions for efficient reduction of metal sticking/wetting on refractory linings, and have a direct, positive impact on the process lining's life.



- **Customized precast ceramic loops** for inductors ensure competitive downtime and ease of installation in inductors by providing additional safety and lifetime in operations.



- To guarantee a state-of-the-art refractory installation result, we provide **high-quality installation equipment** such as **forks** or **pneumatic rammers** (Bosch-type vibrator, bottom vibrator or Klein-type sidewall vibrator).

THANKS TO THESE CONSTANT EFFORTS TO HELP YOU MAKE YOUR EVERYDAY ACTIVITIES EASIER, YOU CAN FOCUS YOUR ENERGY ON THESE ACTIVITIES, SO AS TO BE MORE PROFITABLE AND RELIABLE.

OUR SERVICES

OUR COMPLETE PORTFOLIO OF SERVICES COVERS EVERY STAGE OF THE METAL-MELTING PROCESS



INSTALLATION

Our worldwide applications teams provide **top-quality assistance** with or management of refractory installation. Our **on-site installation services** will focus on your individual operational constraints, adjusting refractory application for a quick installation time for your equipment, so as to **achieve outstanding lining stability** and **stable operational parameters**. We know that successful, high-quality installation actively contributes to **efficient overall melting** (high molten metal output, optimal melting-energy consumption).



SUPERVISION

As we understand your individual needs and constraints, **our experts are close at hand** and can quickly get to your production site, so as to give you and your installation staff clear, detailed guidelines on **optimal application of our refractories**. We will share our latest methods and innovative installation techniques, **ensuring the maximum service life and optimal operational safety conditions** for your installation.



DESIGN & ENGINEERING

Thanks to our design and engineering capabilities, we **provide tailor-made refractory solutions** based on your needs. We offer **customised solutions** that could help you, e.g. **reducing melting-energy consumption** (by selecting the appropriate lining material and thickness), and **adjusting the maintenance/relining frequency**. This service is an important asset for optimisation of your overall melting costs.



PERFORMANCE AUDIT

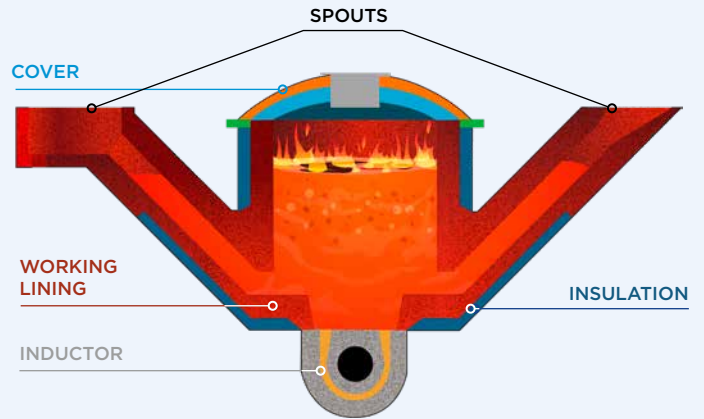
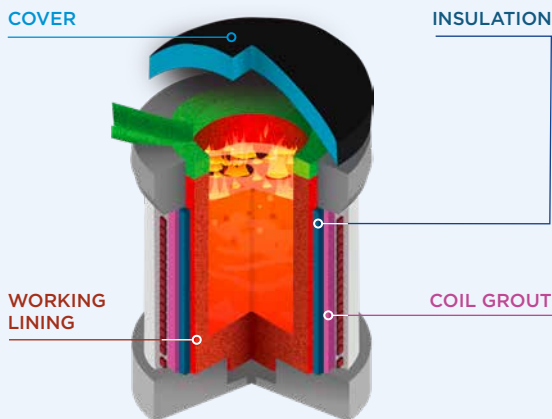
We can help you **achieve your targets** in terms of melting performance, maintenance optimisation and cost savings. Our experienced application team offers performance audits and assessments that **we review with you, to show potential saving opportunities**. Together we establish the roadmap using our refractory solutions, **leading to the agreed performance results**.

R&D SUPPORT

As we understand your operational constraints, our **R&D teams are organised globally but represented locally**, and can provide you with quick, reliable support. Based on your needs, we accompany you at all stages of refractory service life. We provide **upfront analyses** regarding our material choice, and **support you quickly with immediate technical assistance** during operations or emergencies, offering detailed post-mortem analyses for a better understanding of refractory performance. If necessary, our teams use **operational feedback to improve** our existing refractory solutions or develop new materials with better-adapted properties.



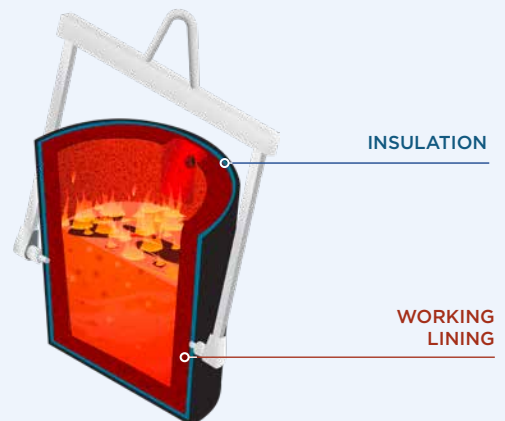
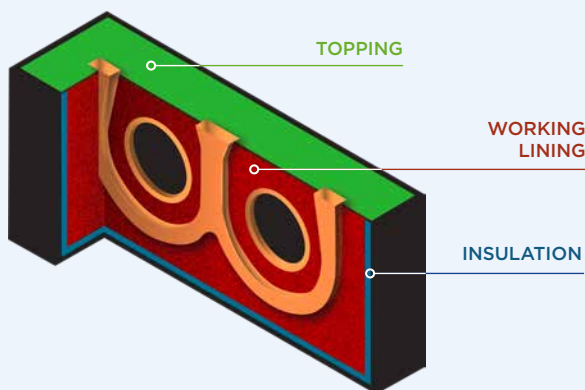
	Product name	Metal		Equipment				Chemical Analysis [%]			Max. Temperature	Material required
		Iron	Steel	Coreless induction furnace	Channel furnace / Upper case	Inductor	Ladle / Other	Al ₂ O ₃ [%]	SiO ₂ [%]	MgO [%]	[°C]	[t/m ²]
Coil Grout	Norcast A 337	X	X	I/S				92	1		1760	2,88
	Norcast A 337 F	X	X	I/S				92	1		1760	2,88
	Norcast A 339	X	X	I/S				92	1		1760	2,88
	Norflow A 337	X	X	I/S				90	1		1760	3,00
Cover	Norcast A 333	X	X	I/S	I/S		I/S	95	0,5		1815	1,60
	Norcast A 8266	X	X	I/S	I/S			54,8	38,3		1650	2,18
Working Lining	Norfast A 1007	X			I		I	78	2	16% SiC	1750	3,10
	Norfast A 1167	X	X		I		I/S	92	2		1550	2,80
	Norfast K 1031	X			I		I	70	26		1650	2,55
	Norfast K 1061	X			I		I	47	35	15% SiC	1760	2,60
	Norflow A 308	X	X		I		I/S	95	0,2		1760	2,85
	Norflow A 973	X	X		I		I/S	84	4,5	7% SiC	1760	3,25
	Norflow A 1007	X			I		I	77	5		1750	3,20
	Norflow A 1167	X	X	I	I		I/S	87	8		1760	2,80
	Norflow K 1031	X	X		I		I/S	70	26		1650	2,55
	Norflow K 1061	X	X		I		I/S	65	18		1760	2,68
	Norcast A 308	X	X		I		I/S	95	0,2		1760	2,73
	Norcast A 334	X	X				I/S	95	0,2		1800	2,80
	Norcast AF 973	X	X		I		I/S	84	4,5		1760	3,29
	Norcast A 1007 / Norcast AF 1007	X			I		I	79	2		1670	3,05
	Norcast A 1012 / Norcast AF 1012	X	X		I/S		I/S	91	6		1670	3,30
	Norcast A 1162 / Norcast AF 1162	X	X		I		I/S	90	5		1760	2,72
	Norcast A 1167 CFR	X	X				I/S	87	8		1550	2,87
	Norcast K 1031	X	X		I		I/S	62	30		1650	2,55
	Norcast K 1061	X			I		I/S	53	27		1760	2,61
	Norvibe A 100	X	X	I/S				87		12	1820	2,98
	Norvibe A 100 ES	X	X	I/S				85		12	1820	2,98
	Norvibe A 873	X			I			75	3		1815	2,72
	Magnafrax 300 C		X	S				39		57	1700	2,75
	Norvibe A 103	X	X	I/S	I/S	I		68	0,5	29	1820	2,90
	Norvibe A 108	X		I	I	I		89	7		1800	2,90
	Norvibe A 113	X	X	S		I		93	1	4	1800	2,95
	Norvibe A 113 D	X	X	S		I		89	1	7	1815	3,17
	Norvibe A 114	X	X	I/S				92	1	5	1800	2,95
	Norvibe A 114 D	X	X	I/S				90	1	7	1815	3,07
	Norvibe A 115	X	X	I/S				93	1	4	1800	2,96
	Norvibe A 115 D	X	X	I/S				90	1	4	1815	3,07
	Norvibe A 118	X			I	I		91	1	5	1820	2,96
	Norvibe A 118 D	X			I	I		88	1	7	1815	3,07
	Norvibe A 121	X			I	I		87	4		1760	2,95
	Norvibe A 121 D	X			I	I		87	4		1760	3,07
	Norvibe A 122 A	X			I	I		87	4		1650	2,96
	Norvibe A 122 D	X			I	I		87	4		1760	3,07
	Norvibe A 150	X	X	I/S	I			88	1		1815	2,88
	Norvibe A 189	X	X	S				87	0,5	11	1780	2,82
	Norvibe A 1092		X	S				85,5		14	1815	2,96
Norvibe A 1173 / S / L	X	X	I/S				87	0,5	12	1800	3,00	
Norvibe A 1201	X			I			88	4,8		1760	3,08	
Norvibe A 1205		X	S				87	0,5	12	1760	3,05	
Norvibe A 1213	X	X	I/S				87	0,5	12	1820	3,00	
Norvibe A 1235	X	X	I/S				85	0,1	14	1760	3,06	
Norvibe A 1247 SF		X	S				83		14	1800	2,80	



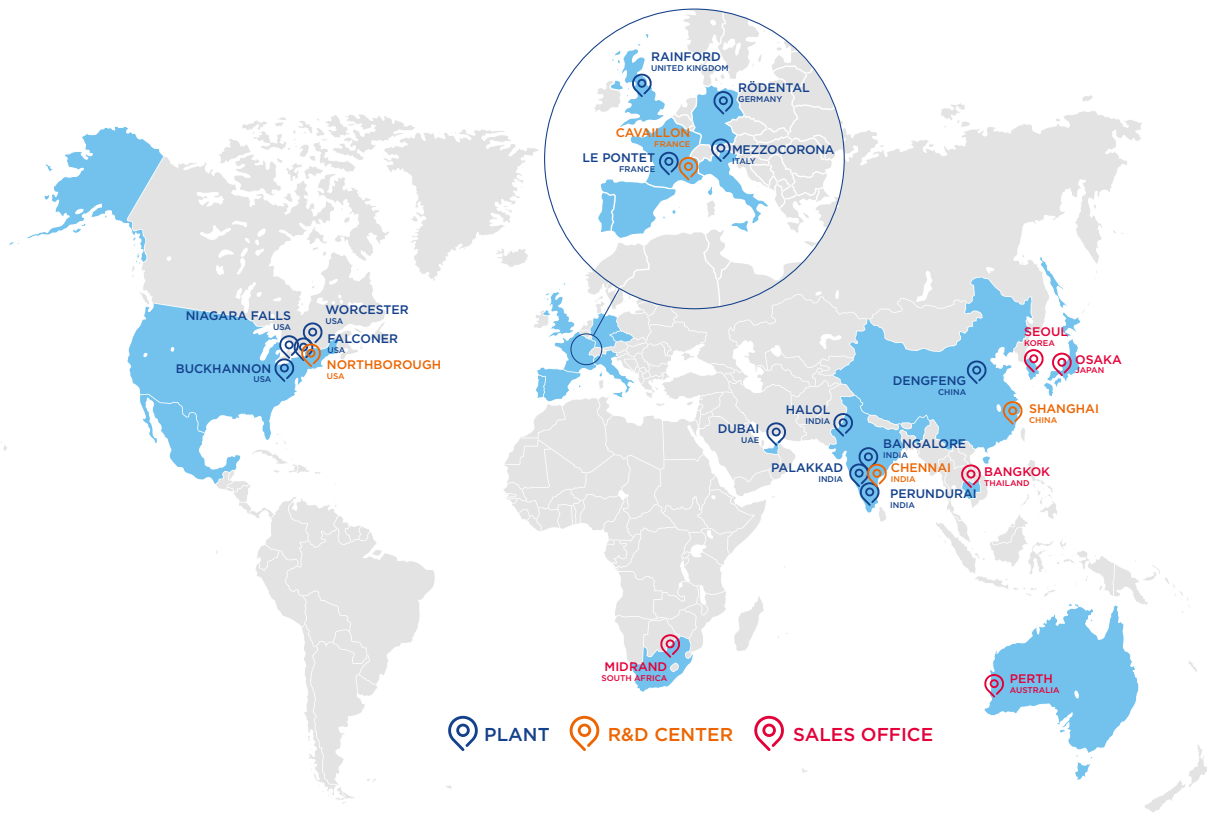
	Product name	Metal		Equipment				Chemical Analysis [%]			Max. Temperature	Material required	
		Iron	Steel	Coreless induction furnace	Channel furnace / Upper case	Inductor	Ladle / Other	Al ₂ O ₃ [%]	SiO ₂ [%]	MgO [%]	[°C]	[t/m ²]	
Working Lining	Norvibe A 1248 LG		X	S				86		12	1800	2,82	
	Norvibe A 1249		X	S				81		16	1815	3,04	
	Norvibe A 1250		X	S				79		18	1815	3,01	
	Norvibe A 1251		X	S				85		12	1800	2,82	
	Norvibe K 1087	X		I				68	22		1760	2,53	
	Norvibe K 1098	X	X	I/S			S	73	24		1760	2,40	
	Norvibe M 177	X	X	I/S		I		24	1,5	71	1750	2,50	
	Norvibe M 180	X	X	S	I	I		14	1,5	82	1870	2,72	
	Norvibe M 1210		X	S				24		73	1760	2,76	
	Norvibe S 145	X	X	I/S				69	0,5	28	1820	2,70	
	Norvibe S 149 C / M	X	X	S		I		72		27	1820	2,70	
	Norram A 106 / Norram A 206	X	X	S	I	I	S	86	11	0	1650	2,95	
	Norram A 107 / Norram A 207	X	X	S	I	I	S	83	14	0	1650	2,95	
	Norram A 111	X		I	I			81	14	1,8	1870	2,95	
	Norram M 170		X	S				25	5	67	1680	2,72	
Norram M 774		X	S			S		1	98	1870	2,75		
Norram A 861	X			I	I		90		7	1760	2,95		
Inductor	Norvibe A 103	X				I		68	0,5	29	1820	2,90	
	Norvibe A 108	X				I		89	7		1800	2,90	
	Norvibe A 113	X				I		93	1	4	1800	2,95	
	Norvibe A 114	X			I			92	1	5	1820	2,95	
	Norvibe A 118 / Norvibe A 118 D	X				I		91	1	5	1820	2,96	
	Norvibe A 157 / Norvibe A 157 D	X			I	I		93	4		1800	2,95	
	Norvibe A 157 W	X				I		89	1	9	1800	2,95	
	Norvibe M 180	X				I		14	1,5	82	1870	2,72	
	Norvibe M 929	X				I		14	1,5	82	1870	2,72	
	Norvibe S 145	X	X	I/S		I		69	0,5	28	1820	2,70	
	Norvibe S 149 C	X	X	I/S		I	I/S	72	0,5	27	1820	2,72	
	Topping	Nortop A 102 / Nortop A 402	X	X	I/S	I/S	I		91	5		1760	3,04
		Nortop A 1211	X	X	I/S		I		82	13		1760	3,04
Norpatch A 452		X	X		I/S		I	92	2		1700	3,04	
Norpatch M 172		X	X	I/S	I/S	I		63	7	27	1790	2,24	
Norpatch S 149			X	S				63	5	28	1820	2,72	
Nortop M 168			X	S				23	3	70	1650	2,72	
Nortop M 179			X	S				23	1	72	1760	2,75	
Nortop M 269		X	X	I/S		I/S		12	1	80	1870	2,72	
Nortop S 146	X	X	I/S		I	I/S	69	0,5	28	1820	2,72		
For Repair	Norpatch A 152	X	X		I/S	I		92	2		1700	3,04	
	Norpatch A 452	X	X	I/S	I/S	I		92	2		1700	3,04	
	Norpatch A 748	X	X	I/S	I/S	I/S		83	15		1760	2,56	
	Norplast A 900	X	X	I/S		I/S		83	8		1680	2,78	
	Norpatch A 1252		X	S				90	8,5		1760	2,96	
	Norpatch S 147		X	S		S		63		28	1820	2,72	
	Norgun A 187 / Norgun A 287	X			I			82	14		1650	3,05	
	Norplast A 94 P	X	X	I/S	I	I/S		94	2		1750	2,90	
	Norplast A 90 PF	X	X	I/S	I	I/S		91	5		1750	2,75	
	Norplast M 70 P	X	X	I/S	I	I/S		73	23		1700	2,65	
	Norplast M 70 PF	X	X	I/S	I	I/S		73	23		1700	2,65	
	Norplast B 85 P	X	X	I/S	I	I/S		83	9		1650	2,8	
	Norplast B 85 PF	X	X	I/S	I	I/S		85	9		1650	2,67	
	Norram A 90 PF	X	X	I/S	I	I/S		91	5		1750	2,75	

Insulation

on request / Sur demande



OUR GLOBAL PRESENCE



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ceramics.refractories@saint-gobain.com

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