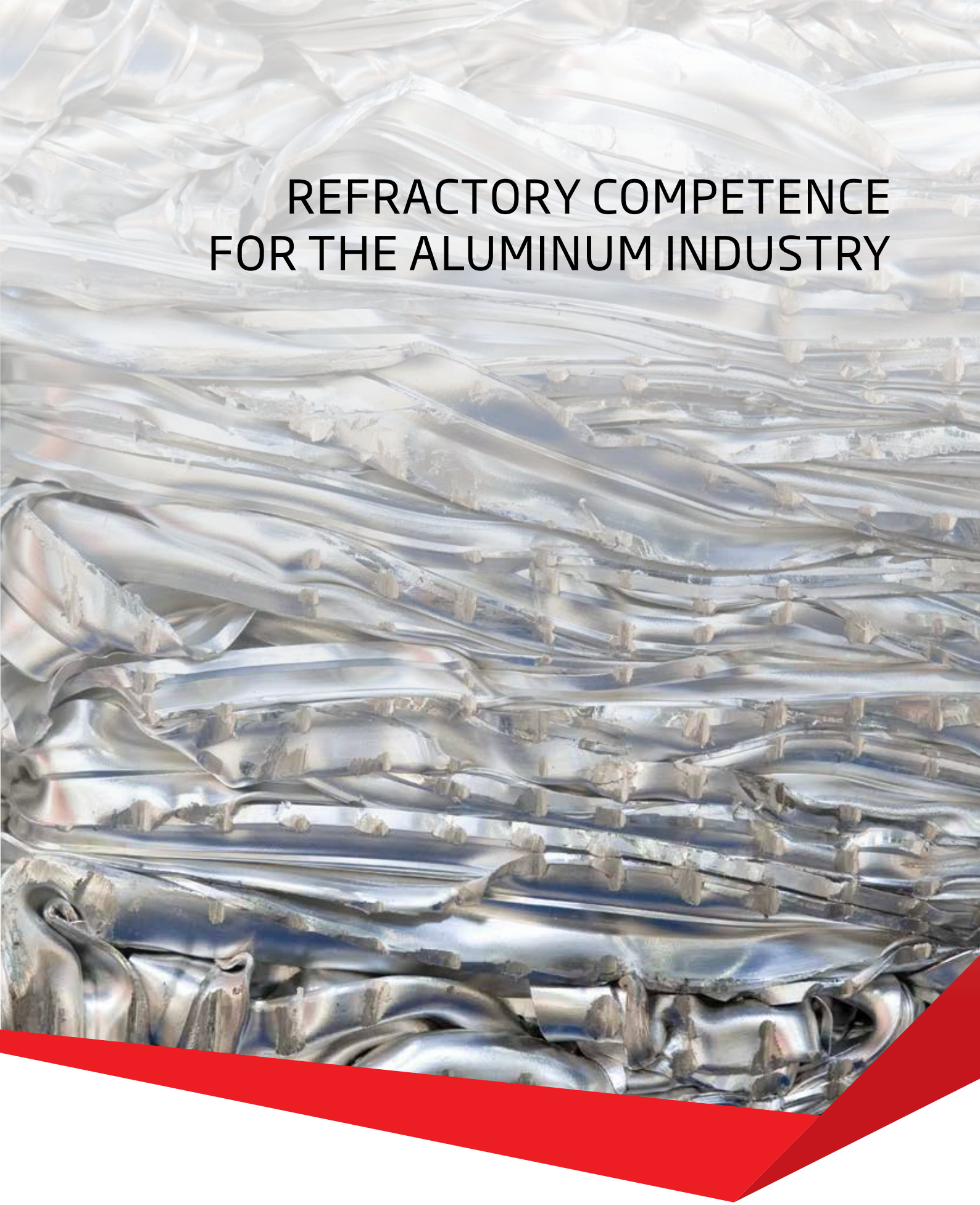
REFRACTORY COMPETENCE FOR THE ALUMINUM INDUSTRY



M METALS | C CERAMICS | G GLASS | S SPECIAL FURNACES | E FUELS CHEMICALS ENERGY

top technology
creates confidence

RATH

www.rath-group.at

WELCOME TO RATH

YOUR SPECIALISTS FOR FIREPROOF TECHNOLOGY

RATH develops, produces and sells the full spectrum of fireproof materials such as fireproof bricks, refractory materials, concrete molded parts and high-temperature wool. Our fireproof liners are always the best technical and cost-effective solution.
We deliver systems with high-quality incombustible liners all over the world. Whenever customers need safety and reliability, they choose RATH products and services.

WITH ITS ALUMINUM EXPERTISE, RATH COVERS THE FULL SPECTRUM OF UNITS FOR PRIMARY AND SECONDARY ALUMINUM PRODUCTION:

A FULL SPECTRUM OF UNITS

- Anode furnaces
- Electrolytic cells
- Smelting furnaces
- Holding and casting furnaces
- Rotary drum and tilt rotary furnaces
- Induction, channel-type and crucible furnaces
- Shaft melting furnaces, dosing furnaces
- Transport ladles
- Channels
- Care and maintenance

ALUMINUM EXPERTISE IN FOUR STEPS

Optimal lining for your aluminum furnace begins with planning and development by our specialists. They know the process and the requirements of the furnace, and will use that information to create the optimal fireproof liner. Whether you're in the primary or the secondary aluminum industry, our process is divided up into four steps:

ENGINEERING

Every liner design is based on the heat transition calculation in order to determine an ideal wall structure. The goal is optimal thermal insulation combined with ideal positioning of the solidification point. This relies on comprehensive knowledge of various alloys and thermodynamic processes. It is also especially important to design the necessary elongation for particularly large furnaces. As a manufacturer, we have access to all the data needed to make the calculations.

INSTALLATION

Alongside the technical design of your system, the installation of the fireproof liner is a vital element in a well-functioning furnace with a maximum service life. For this reason, our foremen are trained regularly on both technical and practical matters.

COMMISSIONING

Drying and sintering an aluminum furnace is just as important as the material design and assembly. For this reason, we offer a full external heating for your system. During this process, both the heating with thermal elements and the temperature distribution in the furnace is thermographically analyzed.

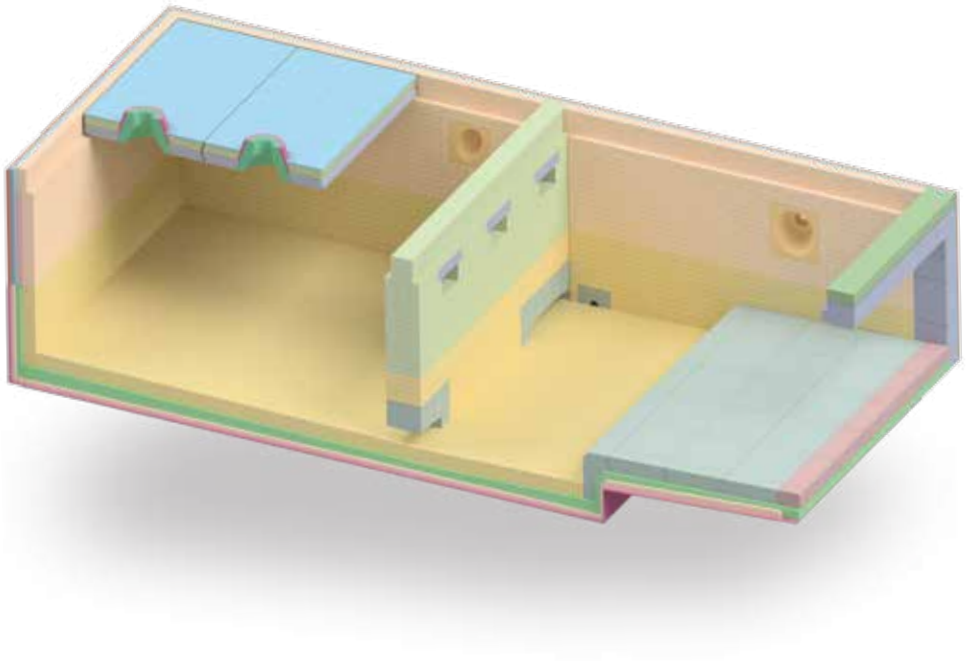
CARE & MAINTENANCE

Regular care and maintenance of your system guarantees optimal operating conditions and increases the service life. There's nothing worse than unplanned downtime. We're happy to take care of your system's maintenance and servicing.

TWO-CHAMBER SMELTING FURNACES

Two-chamber smelting furnaces

RATH provides the appropriate design for your smelting furnace with two or more chambers. We will always adapt it to the scrap used and the primary material, the type of coating and the cleaning method, as well as the use of pumps, electromagnetic stirrers or sinks.



MATERIAL	QUALITIES
Ramming mixture	CARATHPLAST 1-180
Lightweight refractory bricks	PORRATH FL 24-06
	PORRATH FL 24-10
	PORRATH FL 25-08
	PORRATH FL 26-08
	PORRATH FL RG 0.75
Dense bricks	SUPRATH A 403 T
	SILRATH AK 60 SiC

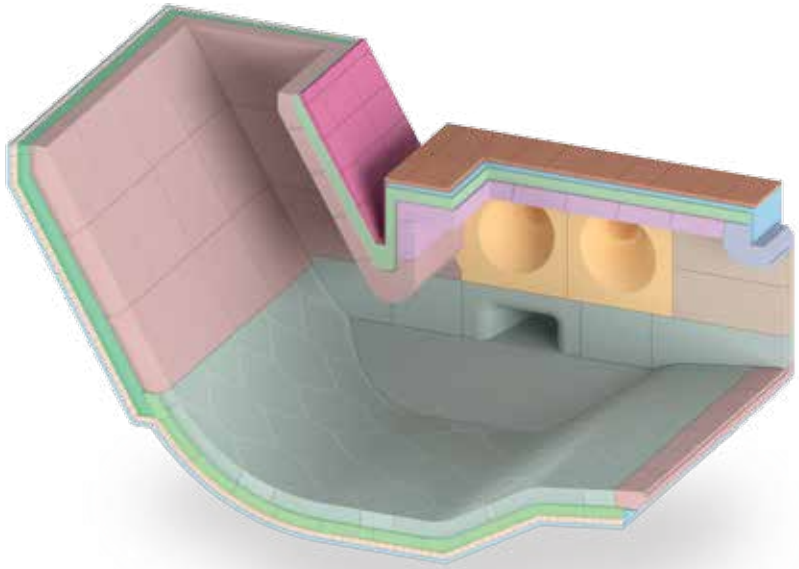
MATERIAL	QUALITIES
Rear insulation	CAS 1000
	CAS 1100
	EVAC
	KERFORM KVF 121
	SILCAPAN 850

MATERIAL	QUALITIES
Concretes	CARATH 1800 D
	CARATH A 58 LC
	CARATH B 76 LC AL
	CARATH COR 38 D AL
	CARATH FL 106
	CARATH FL 124
	CARATH FL 130
	CARATH FL 1300
	CARATH K 89 LC AL
	CARATH T 86 M ULC
	CARATH T 93 LC AL

SINGLE CHAMBER SMELTING FURNACES

Single chamber smelting furnaces

As a manufacturer of both dense bricks and monolithic products and components, RATH can ideally combine the respective benefits to create the best design for your smelting furnace. Even at higher upper furnace temperatures, we provide solutions in which the infiltration resistance is retained even above 1,100 °C.



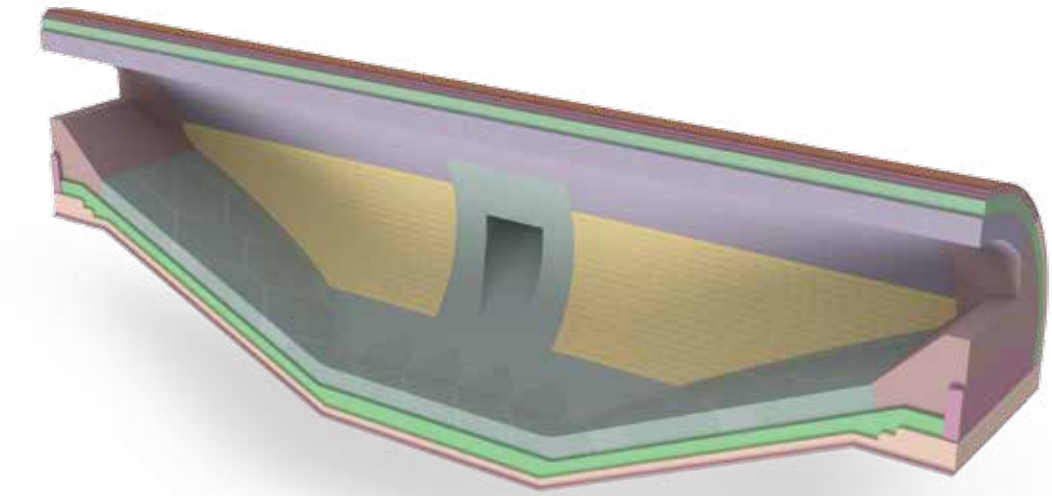
MATERIAL	QUALITIES
Ramming mixture	CARATHPLAST 1-180
Lightweight refractory bricks	PORRATH FL 24-06
	PORRATH FL 24-10
	PORRATH FL 26-08
Rear insulation	CAS 1100
	EVAC
	KERFORM KVF 121

MATERIAL	QUALITIES
Concretes	CARATH 76 LC AL
	CARATH 1460 D
	CARATH A 58 LC
	CARATH COR 38 D AL
	CARATH FL 1250 GUN
	CARATH FL 1300
	CARATH FL 1300 AL
	CARATH GUN A 60
	CARATH K 89 LC AL
	CARATH T 91 MC AL

HOLDING AND CASTING FURNACES

Holding furnace

Thanks our broad portfolio, RATH delivers the appropriate fireproofing solution for your holding and casting furnace. And it will always be adjusted for the associated manufacturing processes such as continuous casting of rolled ingots, profiles, bolts, plates, wire, etc.



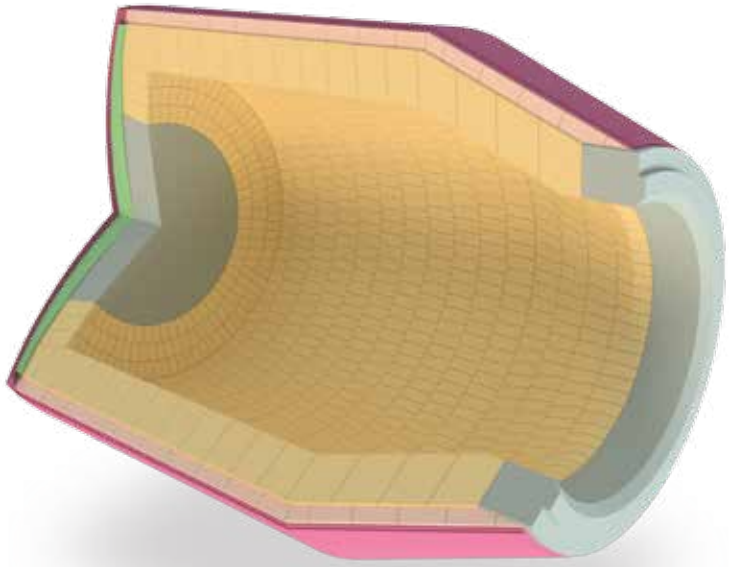
MATERIAL	QUALITIES
Lightweight refractory bricks	PORRATH FL 24-10
	PORRATH FL 25-08
Dense bricks	ALURATH B 86 C AL
Rear insulation	ALSITRA MAT
	EVAC
	KERFORM KVF 121

MATERIAL	QUALITIES
Concretes	CARATH B 76 LC AL
	CARATH COR 38 D AL
	CARATH FL 1250 GUN
	CARATH FL 1300 AL
	CARATH GUN K 80 AL
	CARATH GUN 52
	CARATH K 89 LC AL
	CARATH T 93 LC AL

ROTARY DRUM AND TILT ROTARY FURNACES

Rotary drum furnace

RATH delivers the complete solution comprising dense bricks and monolithic products for both types of furnaces. This is where our broad product range of specially-shaped bricks comes into its own. Highly dense and abrasion-resistant brick qualities with good thermal resistance properties guarantee a long system service life.



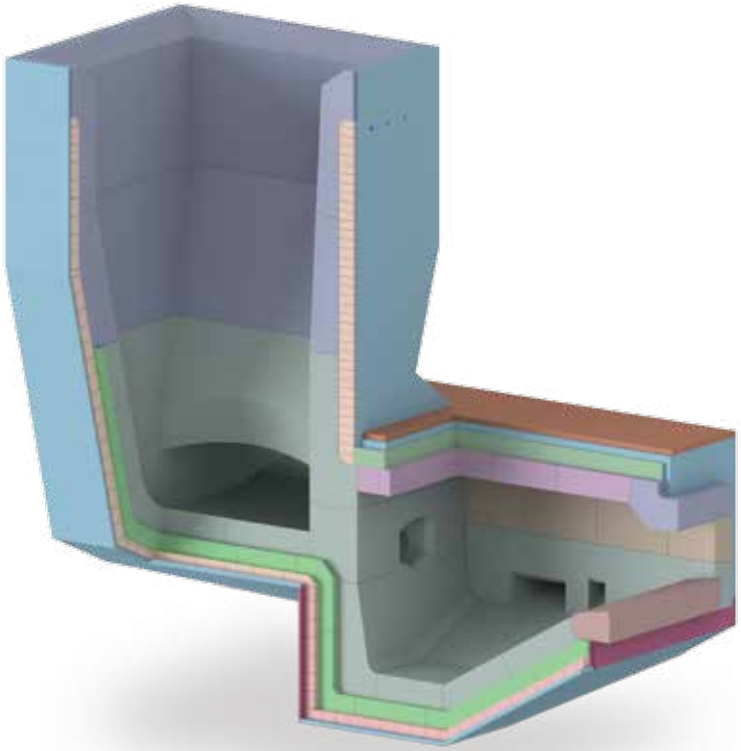
MATERIAL	QUALITIES
Lightweight refractory bricks	PORRATH FL 24-10
	PORRATH FL 25-10
Dense bricks	DURRATH HS-E
	SILRATH AK 60 C
	SILRATH AK 60 C SD
	SILRATH AK 60 SiC
Rear insulation	MILLBOARD 120K

MATERIAL	QUALITIES
Concretes	CARATH COR 38 D AL
	CARATH FL 1300 AL
	CARATH T 93 AL

SHAFT SMELTING FURNACES

Shaft smelting furnace

We offer our CARATH® concrete product group for these types of furnaces, with high impact resistance for the shaft area and infiltration-protected materials for the bath and melting area. The excellent processing has also proved its worth in the often complex geometries.



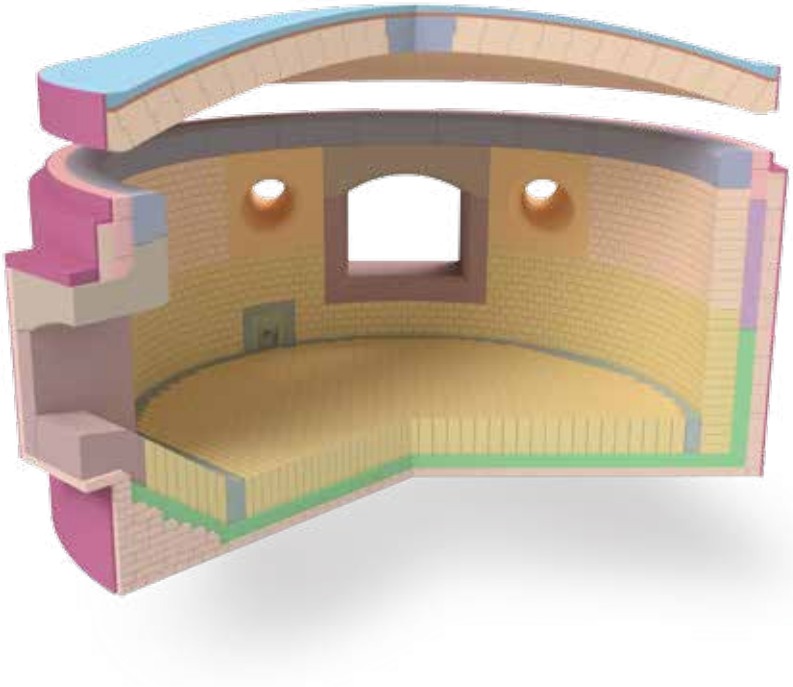
MATERIAL	QUALITIES
Lightweight refractory bricks	PORRATH FL 24-06
	PORRATH FL 24-10
	PORRATH FL 25-08
	POROS 500
Rear insulation	ALSITRA MAT
	CAS 1000
	CAS M 1100
	EVAC EVF
	KERFORM 121

MATERIAL	QUALITIES
Concretes	CARATH 45 MC AL STR
	CARATH 1400 LC AL
	CARATH B 76 LC AL
	CARATH COR 38 D AL
	CARATH FL 1100 GUN
	CARATH FL 1300
	CARATH FL 1300 AL
	CARATH GUN 52

ROUND CHAMBER SMELTING FURNACES

Round chamber smelting furnace

The fireproof liner has been successfully designed with aluminum-resistant bauxite bricks in the bath area, and with high-alumina bricks and refractory concretes in the upper furnace area. Due to the geometry, the side wall is mainly lined with dense bricks containing aluminum. The roof is designed with shaped bricks offering excellent thermal resistance.



MATERIAL	QUALITIES
Ramming mixture	CARATHPLAST 1-180
Lightweight refractory bricks	PORRATH FL 24-10
	PORRATH FL 26-08
	PORRATH RG 0.75
Dense bricks	ALURATH B86 C AL
	SILRATH AK 60

MATERIAL	QUALITIES
Rear insulation	ALSITRA
	ALTRAFORM KVF 121
	CARATH FL 124
	CAS 1000
	EVAC EVF
	MILLBOARD K120
	SILCAPAN 850

MATERIAL	QUALITIES
Concretes	CARATH 1550 LC
	CARATH B 76 LC AL
	CARATH COR 38 D AL
	CARATH FL 1301
	CARATH SIC 80 LC
	CARATH T 93 LC AL

DOSING FURNACES

Dosing furnace–Top view

As a manufacturer of high-quality insulation materials, and in combination with our CARATH® product line, we cover the entire range of dosing and low-pressure furnaces. And naturally, we also provide all the necessary parts for these systems.

Dosing furnace–bath area with anodes

Dosing furnace–bath area

CHANNELS

Transport channel

We have the right solution for every type of channel –from the manufactured part solution to delivery of complete channel systems.
In doing so, we provide you with solutions that offer the lowest amount of heat loss coupled with excellent non-wetting properties and a high level of mechanical reliability.

TRANSPORT LADLES

Transport ladles

The requirements for the incombustible liner in transport ladles are clear: reduced wall strength with the same level of safety and the highest possible level of thermal insulation. Here, concretes are the best choice.

CARE & MAINTENANCE

A smelting system must run and function at peak effectiveness if it is to operate in a cost-effective manner.
The key to a long service life for an aluminum smelting system is proper maintenance, overhauls and repairs.

Chiseling out the old liner

IMPROVEMENT

If maintenance is planned, then the incombustible liner must also be carefully inspected. When recognized early, spalling, cracks or even major damage can still be easily repaired.

OVERHAUL

Because of the enormous strain, a smelting furnace doesn't last forever. But a complete overhaul isn't always necessary. In some cases section-by-section replacement of the incombustible liner is an efficient method of returning a system back to full functionality.

REPLACEMENT

Sometimes it is necessary to replace the entire liner. Just as when handling a new order, here our Engineering department takes over the task of considering all the necessary properties and then selecting and shaping the fireproof materials and developing a custom liner. The customers receive a completely new furnace based on the existing structure.

Before and after: shaft smelting furnace–maintenance spraying

PRODUCTS

Very dense fireclay brick, sillimanite brick or chemically bound bauxite brick with a high abrasion resistance, as well as fireproof concretes and concrete molded parts, are used in aluminum smelting furnaces.

The lining with fireproof bricks is also increasingly supplemented with concrete molded parts, because concretes can be poured into individual shapes as well as larger components or sections.

Almost all of our refractory concretes can be cast in nearly any geometric shape in one of the most modern production facilities for finished concrete parts. Depending on their intended use, these parts can be tempered and pre-fired up to 1,750 °C, which allows them to be offered in a ceramized form. Sprayed concretes are used in the maintenance and repair of existing systems.

CONCRETES

CONCRETES

	Low-cement concretes			Heat-resistant light-weight concretes		Dense concretes	
DESIGNATION	**CARATH B 76 LC AL**	**CARATH 1400 LC AL**	**CARATH 47 A LC**	**CARATH FL 1300 AL**	**CARATH FL 85 R**	**CARATH 1800 D**	**CARATH 1460 D**
Raw material base	Bauxite	Corundum	Fireclay/andalusite	Lightweight fireclay	Synthetic raw materials	Corundum	Raw materials with a high-alumina clay content
Al_2O_3	75–78	85–88	45–50	33–37	84–88	>95	50–54
SiO_2	7–9	<4	45–50	37–41	<0.5	<0.2	36–40
Fe_2O_3	1–1.5	<0.2	1–1.5	2.5–3.5	<0.5	<0.2	0.8–1.2
Material requirement t/m³	2.9	3.2	2.4	1.6	1.3	3	2.25
CCS 800 °C N/mm²	120	100	80	10	8	50	30

	Average cement content		Infiltration protection	Sprayed concretes			Plastic refractory materials
DESIGNATION	**CARATH 48 MC str**	**CARATH 44 MC str AL**	**CARATH MIX 44 AL**	**CARATH GUN 52**	**CARATH GUN A 60**	**CARATH GUN K 80 AL**	**CARATH-PLAST 1-180**
Raw material base	Fireclay	Fireclay	Fireclay	Low-iron fireclay	Andalusite	Corundum	Corundum
Al_2O_3	48–52	44–48	42–46	50–54	58–62	79–82	88–92
SiO_2	40–44	40–44	30–35	36–39	29–33	<3	5–8
Fe_2O_3	1–1.5	1–1.5	1–1.6	0.8–1.1	1–1.5	<0.5	<0.5
Material requirement t/m³	2.35	2.35	2	2.2	2.3	2.6	3
CCS 800 °C N/mm²	110	100	15	60	30	40	

INSULATING MATERIALS

INSULATING MATERIALS

	Lightweight refractory bricks			Vacuum molded parts			High-temperature wool	
DESIGNATION	**PORRATH 900**	**PORRATH FL 24-06**	**PORRATH FL 25-10**	**CALCIUM SILICATE PLATES CAS 1000**	**EVAC CS 136**	**KERFORM KVS 121**	**CALSITRA MAT CMS 1100**	**ALSITRA MAT 1300**
Raw material base	Calcium/ aluminum silicate	Aluminum silicate	Aluminum silicate	Calcium silicate	Alkaline earth silicate wool	Aluminum silicate	Alkaline earth silicate	Aluminum silicate
Classification temperature [°C]	900	1,350	1,400	1,000	1,300	1,250	1,100	1,300
Apparent density [g/cm³]	0.45	0.64	1.0	0.24	0.8	0.30	0.96-1.28	0.96-1.28
Cold compression strength [MPa]	1	1.2	8	1.3	0.8	0.3	-	-
Chemical analysis [%] Al_2O_3	15	37	38	-	-	50	1	48
SiO_2	60	56	56	50	65	49	64	52
CaO	11.5	-	-	49	12	-	28	-

DENSE BRICKS

DENSE BRICKS

	High-alumina bricks				Dense fireclay bricks			
DESIGNATION	**ALURATH B 80 C**	**ALURATH B 80 AC**	**ALURATH B 85 C**	**ALURATH B 85 C AL**	**DURRATH HS**	**DURRATH HS E**	**DURRATH MA 44**	**DURRATH P 38**
Raw material base	Bauxite	Bauxite	Bauxite	Bauxite	Fireclay	Low-iron fireclay	Fireclay	Aluminum silicate
Apparent density [g/cm³]	2.85	2.9	2.85	2.78	2.3	2.35	2.37	2.35
Cold compression resistance [MPa]	200	100	> 100	180	70	80	65	80
Porosity [Vol. %]	12	≤ 18	18	14	14	16	18	10
Thermal resistance [n]	≥ 25	50	> 100	> 100	25	> 30	> 15	-
Chemical analysis [%] Al_2O_3	83	79	85	75	40	47	58	44

	Andalusite bricks				Standard fireclay bricks					
DESIGNATION	**SILRATH A 60**	**SILRATH AK 60**	**SILRATH AK 60 C SD**	**SILRATH AK 60 SIC**	**SUPRATH A 40 T**	**SUPRATH A 403 T**	**SUPRATH EC 1100**	**SUPRATH T 45**	**SUPRATH T 46**	**SUPRATH T 52**
Raw material base	Andalusite	Andalusite	Andalusite	Andalusite, SiC	Fireclay	Fireclay	Porcelain	Mullite-rich fireclay	Mullite-rich fireclay	Mullite-rich fireclay
Apparent density [g/cm³]	2.65	2.58	2.65	2.6	2.35	2.3	2.2	2.3	2.2	2.34
Cold compression resistance [MPa]	100	100	120	100	≥ 60	50	65	60	60	72
Porosity [Vol. %]	13	14	12	12	≤ 15	18	14	15	16	15,2
Thermal resistance [n]	> 95	120	120	120	18	25	-	≥ 30	-	30
Chemical analysis [%] Al_2O_3	60	60	60	45	≥ 42	40	40	43	46	52.1

INDUSTRIES AND APPLICATIONS

Forging furnace

Glass production

Aluminum smelting furnaces

Thanks to their many successfully completed projects, RATH employees can draw on a huge wealth of experience and expertise when developing and planning fireproof liners.

RATH HAS EXPERIENCE AND KNOW-HOW IN SPECIFIC INDUSTRIAL APPLICATIONS

Metal industry

- Metallurgic heating furnaces
- Thermal treatment furnaces
- Aluminum smelting furnaces
- Direct reduction systems
- Hot-gas filtration

Petrochemical industry, chemistry

- Carbon reactors
- Reformers and cracking furnaces
- Chlorine reactors
- Sulfur recovery systems
- Hot-gas filtration

Energy & environmental technology

- Biomass furnaces
- Wood gasifiers, grate furnaces
- Hot gas production
- Fluidized bed reactors
- Rotary kilns
- Waste incinerators
- Heat exchangers
- Hot-gas filtration

Tiled stoves and domestic fireplaces

- Complete furnace systems
- Biological combustion chamber plus
- Exhaust systems
- Combustion chamber liners
- Doors with view pane
- Refractory mortar and adhesives

Ceramic industry

- Technical ceramics, sanitary ceramics, ceramic tableware, fireproof ceramics
- Tunnel furnaces
- Rotary furnaces
- Bell furnaces

Special furnace construction

- Laboratory furnaces
- Dental furnaces
- Analysis devices

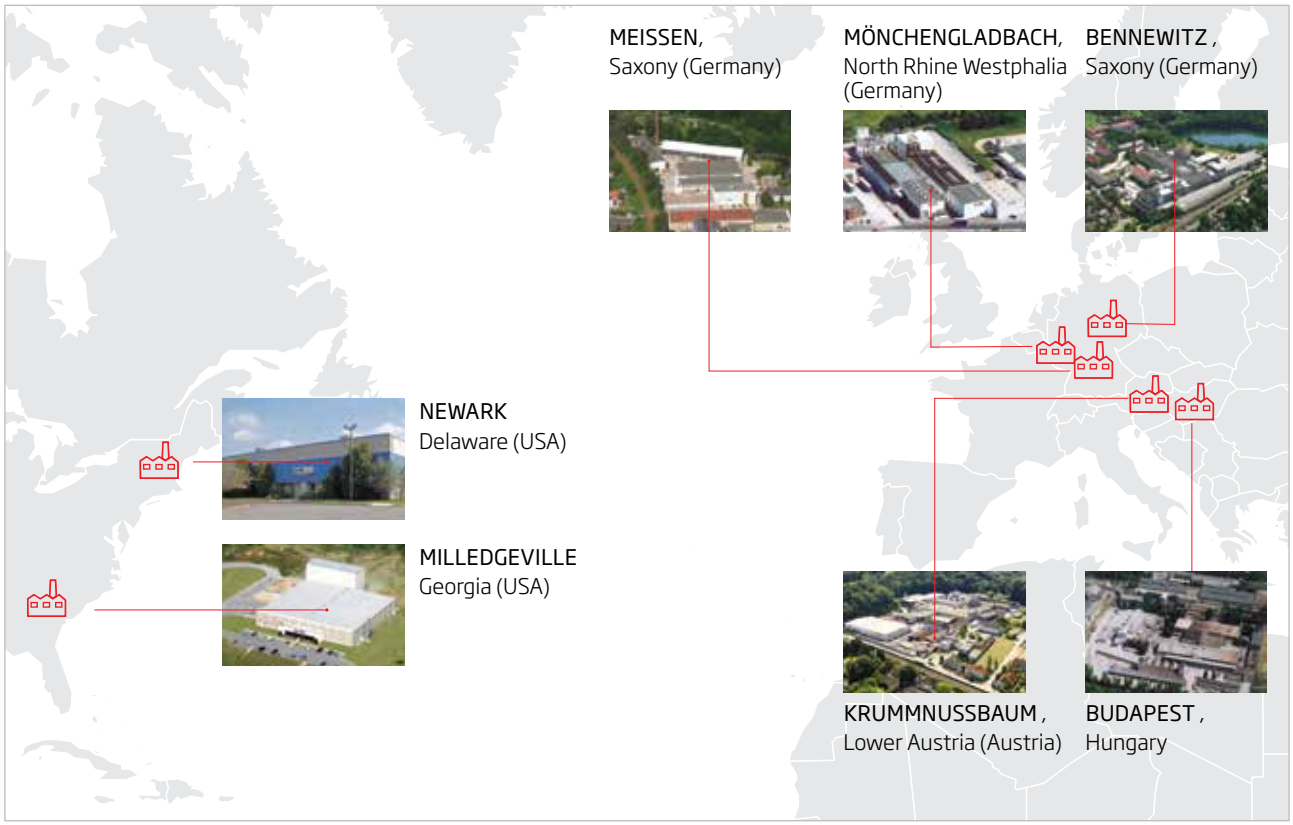
Glass industry

- Regenerator chambers
- Melting tanks
- Work tanks
- Forehearth
- Basin for glass work

IN-HOUSE PRODUCTION AT THE HIGHEST LEVEL OF QUALITY

Seven production locations in Europe and America are in constant communication in order to sustainably optimize production processes and create the best-possible products.

At RATH, quality isn't just a buzzword; it's our corporate culture. Every employee at RATH strives to achieve the best solution–and is only satisfied when they've done so.



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