

# REFRACTORY SOLUTIONS FOR IRON AND STEEL PRODUCTION

Effective. Robust. Reliable.



METALS



CERAMICS



GLASS



SPECIAL  
FURNACES



FUELS  
CHEMICALS  
ENERGY

top technology |  
creates confidence

**RATH**

[www.rath-group.at](http://www.rath-group.at)



# WELCOME TO RATH - YOUR REFRACTORY SPECIALIST

RATH develops and produces refractory products and supplies plants all over the world with high quality refractory lining. When customers need reliability and quality, they choose RATH products and services.

## **DETAILED PLANNING - PERFECT INSTALLATION**

We provide solutions for specific requirements by precisely planning, drawing and calculating the equipment in our planning offices. RATH customers receive a standardized construction plan for the equipment, after which the equipment can be installed either by RATH staff or by third-party companies. In many cases, RATH also handles the supervision of installment by third-party staff so that the construction is guaranteed according to RATH's strict quality requirements.

## **WELL-DESIGNED PRODUCTS THAT COMPLEMENT EACH OTHER**

We keep the later assembly capability of the product in mind right from the start of product development. A good example is Rathloc®, a system in which bricks can be mounted in the simplest way using a standardized push-fit system and always fit perfectly.

## **RESEARCH, DEVELOPMENT, MANUFACTURING - ALL FROM A SINGLE CAST**

Our speciality is refractory materials for temperatures up to 1800°C and for hot gas filtration up to 1000°C. We do all research and development in our own laboratories and produce everything from the base materials to the finished component in our own production facility.

### **A COMPREHENSIVE PORTFOLIO**

- Dense fire bricks
- Monolithics
- Pre-cast blocks
- Insulating fire bricks
- High-temperature insulation wool
- Vacuum-formed shapes




### **CUSTOMIZED SOLUTIONS ARE OUR SPECIALTY**

We make no compromises in adapting the refractory lining to the plant design. We can do this because we focus on customized planning and production. Each part is pre-engineered in the CAD system and checked for fit so everything runs smoothly on the construction site.

#### **RATH COVERS A WIDE RANGE OF PLANTS FOR IRON AND STEEL PRODUCTION.**

- Blast furnaces
- Hot-air blast system
  - Supply lines
  - Ring line
  - Hot air distribution lines
- Cowper
- Torpedo ladle
- Ladle and distributor lids

# THE FULL-RANGE PROVIDER FOR THE METAL INDUSTRY



Provision of a solid refractory lining does not start with ordering material and does not end with delivery of the material to the plant manufacturer or user. A complete solution includes professional selection of materials, solid construction, quality-focused delivery and efficient project management.

With expertise and years of hands-on experience, our project managers worldwide ensure the execution and coordination of refractory linings for iron and steel smelting. This means RATH customers have a reliable partner for refractory plants with a comprehensive service portfolio.

## **ENGINEERING**

The basis of every lining concept is the heat transfer, which will determine the optimum wall structure. Extensive knowledge of thermal and corrosive loads is required. We use modern heat transfer calculation programs and software systems to calculate thermodynamic equilibriums and phase diagrams. We, as a manufacturer, have access to extensive databases, which are required for the calculations.

Upon request, we are also able to carry out economic calculations of refractory linings, taking material and energy costs into account, which provides customers with the support they need to make decisions.

## **MATERIAL SUPPLY**

RATH material is made to order for customers and according to the agreement, with experienced shipping companies delivering directly to the construction site. No matter where in the world the construction site is, our logistics experts ensure reliable and punctual delivery.

## **ASSEMBLY MONITORING / SUPERVISION**

In many cases, RATH also handles assembly supervision with regard to assembly by third-party companies so that the construction is guaranteed according to RATH'S strict quality requirements.

## **ASSEMBLY**

Refractory linings of liquid steel plants require expert on-site assembly. Our highly trained assembly staff ensure reliable installation and attach great importance to high safety standards. This includes continuous monitoring of construction sites by experienced installation directors.

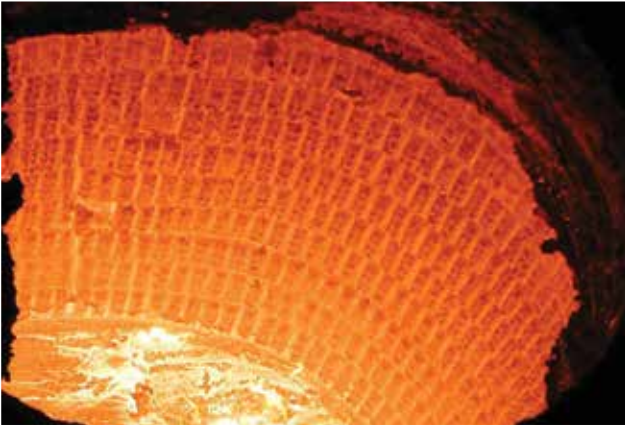
We attach great importance to high quality assembly equipment and assembly aids to ensure effective and quality delivery.

## **MAINTENANCE AND REPAIR**

We monitor the performance of your refractory lining and provide the necessary maintenance to ensure safe operation of the equipment.

We also offer ongoing predictive maintenance and repair.

# BLAST FURNACES



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Our special range of refractory materials with low iron oxide bricks, highly abrasion-resistant andalusite and mullite bricks are characterized by high CO resistance and cold pressure resistance. This ensures the long life of blast furnaces above the liquid area.

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## CONCRETES

CARATH GUN 40  
CARATH GUN 52 R

## DENSE FIRE BRICKS

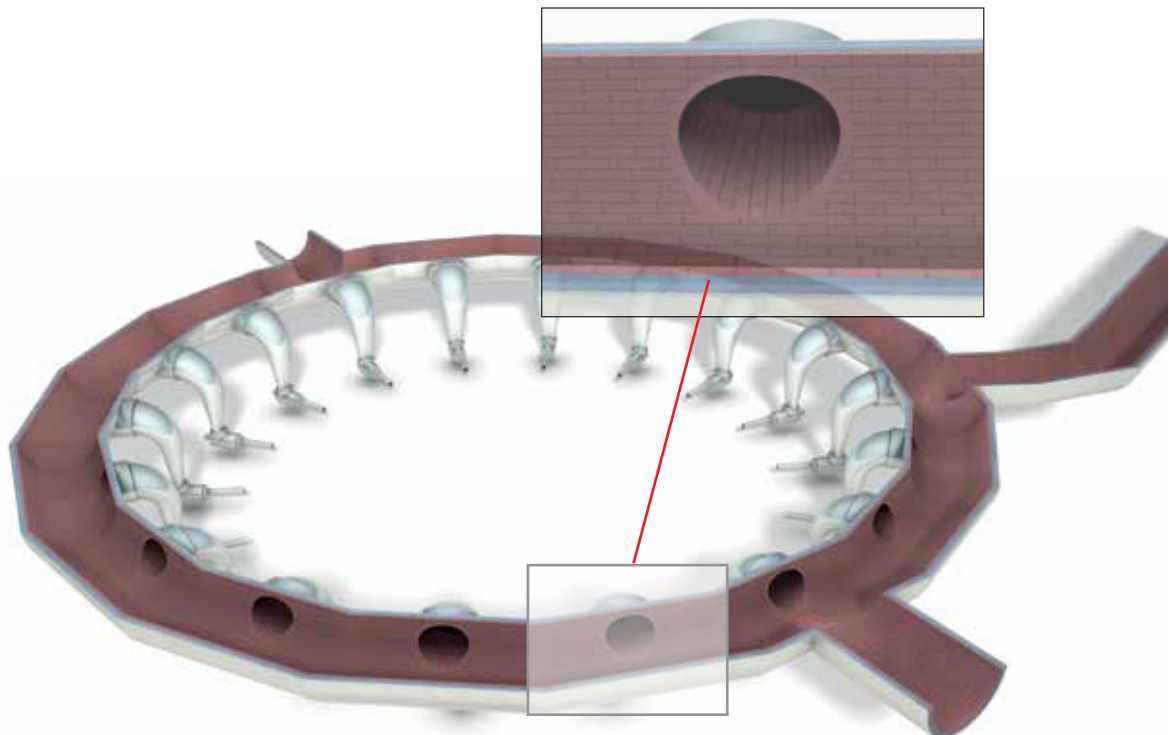
ALURATH M 704  
ALURATH M 704  
DURRATH HS-E  
SILRATH AK 60 C  
SILRATH AK 60 C SD  
SILRATH S 65

# HOT-AIR BLAST SYSTEM



Hot-air blast systems primarily consist of SILRATH and SUPRATH grades. For this purpose, we offer tongue and groove systems for better durability and optimal fit. Our insulating fire bricks for hot-air blast systems provide a long service life with low temperature losses.

In order to create complex geometries, such as outlets from the blast furnace, the CARATH vibrating concretes and gunned concretes complete the comprehensive portfolio in this area.



## CONCRETES

CARATH 52 MC R/10  
CARATH A 58 LC  
CARATH GUN 1452

## DENSE BRICKS

SILRATH AK 60  
SUPRATH T 45

## INSULATING FIRE BRICKS

PORRATH FL 24-06  
PORRATH FL 25-08

## HIGH TEMPERATURE INSULATION WOOL

ALSITRA MAT 1400

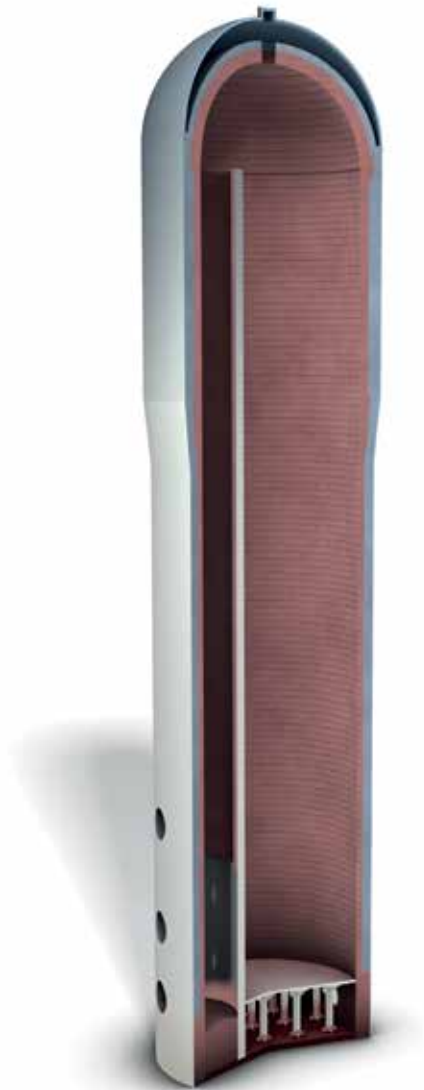
# COWPER

© Dietmar Rabich



New Cowper concepts lead to higher temperatures in the area of the hot blast stoves, especially in the dome area. This increases the demands on the quality of the refractory lining and the extremely stressed grate bricks. The solution is our SUPRATH, SILRATH and KORRATH grades, as well as pre-fired concrete parts.

They ensure very good heat storage, good resistance to alkalis and abrasion, and a smaller change in length.



**DENSE FIRE BRICKS**

- DURRATH HS
- KORRATH K 65 (grate brick)
- SILRATH AK 60
- SILRATH S 65
- SUPRATH A 40-T

**INSULATING FIRE BRICKS**

- PORRATH FL 25-08
- PORRATH FL 25-10

**HIGH TEMPERATURE INSULATION WOOL**

- ALSITRA MAT 1400

**VACUUM FORMED SHAPES**

- KERFORM KVS

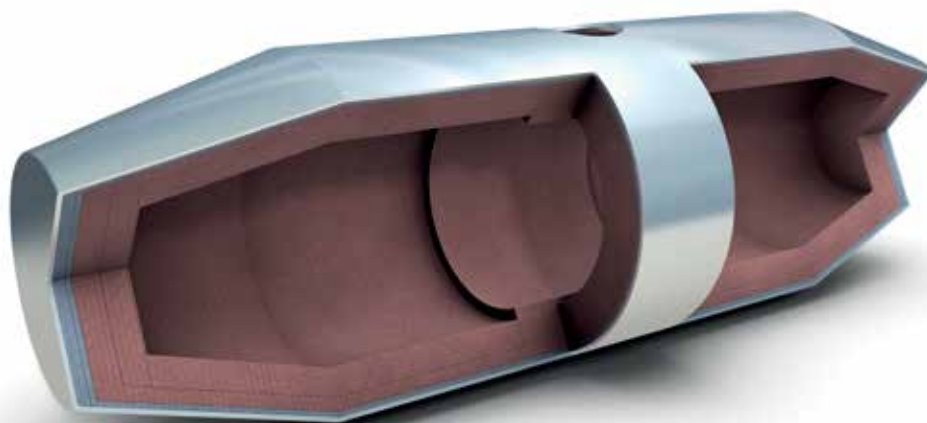


# TORPEDO LADLE



Safe transport of molten iron from the smelting furnace area to the steelworks with torpedo ladle, pipe ladle or transport ladle is unimaginable without an optimum refractory lining concept. For this purpose, RATH offers a wide range of refractory dense andalusite and bauxite bricks.

We also offer refractory concretes that resist the erosion from molten iron or smelting furnace slag during loading and filling. Heat loss is minimized by insulating materials such as insulating fire bricks.



## CONCRETES

CARATH B1652LC  
CARATH T 90 M 7 LC

## DENSE FIRE BRICKS

ALURATH B 80  
ALURATH B 85 C  
SILRATH AK 60  
SILRATH AK 60 C SD

## INSULATING FIRE BRICKS

PORRATH FL 25-12

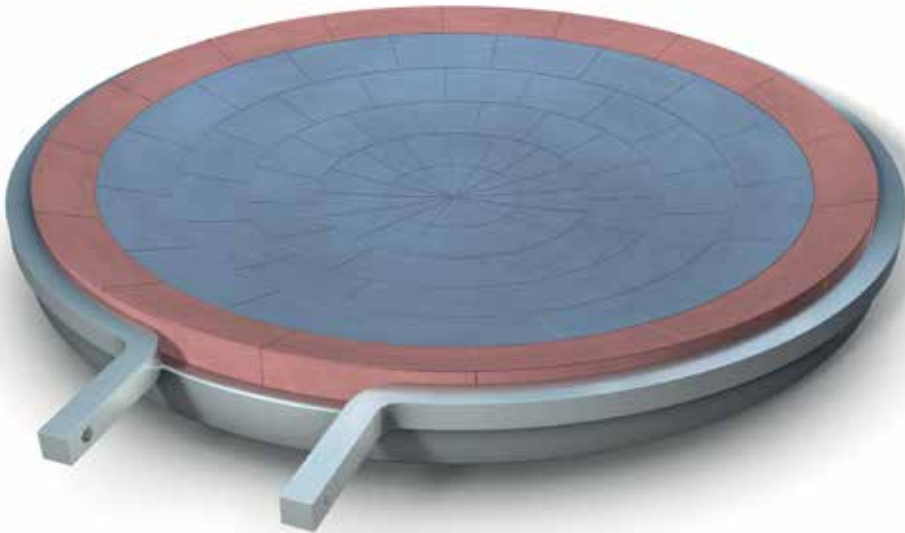
# LADLE LIDS



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RATH provides long-lasting and energy-efficient solutions for distributor lids and ladle lids of various designs. State-of-the-art insulation materials are used, e.g. ALTRA or ALSITRA high-temperature insulation wool in the form of modules or mats. The edge area can be provided, as an alternative, with an abrasion-resistant, low iron mullite refractory clay concrete.

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## CONCRETES

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CARATH 52 MCR/10

## HIGH TEMPERATURE INSULATION WOOL

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ALSITRA MOD 14/200

COMBO MOD 72/14



# PRODUCTS

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Robust and proven refractory products such as dense fire bricks and concretes play a key role in the provision for liquid metal plants. Insulating fire bricks and high-temperature insulation wool are used for insulation. The individual shape of each brick, such as in ring loops or the tapered geometries in torpedo ladles, complement the excellent product quality of RATH refractory materials.

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RATH strongly supports its customers in selecting the right products. Decades of practical experience help and ultimately lead to the optimum solution based on our customers' requirements. Collaboration partners are also key for success in product selection.



# MONOLITHICS



## CONCRETES

NAME	CARATH GUN 52 R	CARATH 52 MC R/10	CARATH A 58 LC	CARATH B1652LC	CARATH GUN 1452	CARATH GUN 40	CARATH T 90 M 7 LC
Raw material base	Low iron refractory clay	Low iron mulliterefractory clay	Andalusite	Bauxite	Clay rich raw materials	Refractory clay	Tabular clay spinel
Max. operating temperature [°C]	1400	1500	1650	1620	1400	1320	1800
Material requirements [kg/m <sup>3</sup> ]	2210	2440	2590	2950	2120	2050	3200
Cold pressure resistance at 110 °C [in N/mm <sup>2</sup> ]	70	100	60	115	20	55	50
Grain size [mm]	0-3	0-10	0-6	0-6	0-3; 0-5	0-3	0-6
Chemical analysis [%]							
Al <sub>2</sub> O <sub>3</sub>	54	52	58	84	53	41	91
SiO <sub>2</sub>	35	42	38	10	36	44	0.1
Fe <sub>2</sub> O <sub>3</sub>	0.7	0.8	0.9	1	1.5	2.4	0.15
CaO	7	3.1	1.9	1.5	5.6	8.8	1.1
MgO	-	-	-	-	-	-	6.5

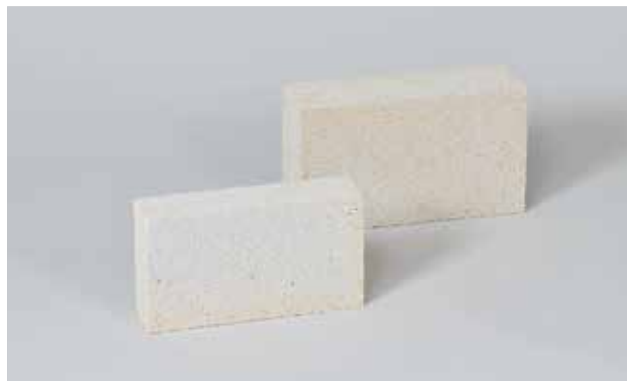
# DENSE FIRE BRICKS

## DENSE FIRE BRICKS

NAME		ALURATH B 80	ALURATH B 85 C	ALURATH M 704	DURRATH HS	DURRATH HS-E	KORRATH K 65 (grate brick)
Raw material base		Bauxite	Bauxite	Mullite	Refractory clay	Low iron mullite refractory clay	Corundum, mullite, mullite-rich refractory clay
Raw density [g/cm <sup>3</sup> ]		2.75	3.00	2.50	2.30	2.35	2.55
Open porosity [%]		18	17	17	14	16	17
Cold compression strength [MPa]		100	105	55	70	80	80
Thermal shock resistance [number of deterrents]		100	50	6	25	30	15
Refractoriness under load T <sub>05</sub> [0.20 MPa]		1510 °C	1230 °C	>1600 °C	1390 °C	1490 °C	1530 °C
Chemical analysis [%]	Al <sub>2</sub> O <sub>3</sub>	80	79	74	40	47	64
	SiO <sub>2</sub>	12	9	22	-	48	-
	Fe <sub>2</sub> O <sub>3</sub>	1.6	1	0.5	1.6	1.4	1.2
	BaO	-	5	-	-	-	-
	P <sub>2</sub> O <sub>5</sub>	-	1.9	-	-	-	-
Hot bending strength [MPa]	1000 °C	-	11.0	-	-	-	-
	1200 °C	-	-	23.0	11.0	-	-
	1400 °C	3.0	-	11.0	3.0	3.1	-
Thermal conductivity [W/mK]	800 °C	1.92	3.34	1.86	1.30	1.75	-
	1000 °C	2.00	2.71	1.90	1.37	1.85	-
	1200 °C	2.11	3.15	1.95	1.46	2.02	-
	1400 °C	2.23	-	2.01	1.54	2.10	-

NAME		SILRATH AK 60	SILRATH AK 60 C SD	SILRATH S 65	SUPRATH A 40-T	SUPRATH T 45
Raw material base		Andalusite	Andalusite	Andalusite, corundum	Refractory clay	Mullite rich refractory clay
Raw density [g/cm <sup>3</sup> ]		2.58	2.65	2.50	2.25	2.30
Open porosity [%]		13	13	17	16	15
Cold compression strength [MPa]		110	150	55	50	60
Thermal shock resistance [number of deterrents]		100	120	6	30	30
Refractoriness under load T <sub>05</sub> [0.20 MPa]		1600 °C	1620 °C	>1600 °C	1420 °C	1400 °C
Chemical analysis [%]	Al <sub>2</sub> O <sub>3</sub>	60	60	65	40	43
	SiO <sub>2</sub>	37	35	28	50	-
	Fe <sub>2</sub> O <sub>3</sub>	1	0.8	0.8	1.9	2
Hot bending strength [MPa]	1000 °C	-	-	-	-	-
	1200 °C	-	-	23.0	-	-
	1400 °C	2.5	2.0	11.0	1.8	1.9
Thermal conductivity [W/mK]	800 °C	2.02	1.43	1.86	-	1.50
	1000 °C	2.12	1.72	1.90	-	1.60
	1200 °C	2.32	2.20	1.95	-	1.80
	1400 °C	2.64	2.66	2.01	-	2.00

# INSULATING FIRE BRICKS



## INSULATING FIRE BRICKS

NAME		PORRATH FL 24-06	PORRATH FL 25-08	PORRATH FL 25-10	PORRATH FL 25-12
Raw material base		Aluminum silicate	Aluminum silicate	Aluminum silicate	Aluminum silicate
Classification temperature [°C]		1350	1380	1400	1400
ASTM group		-	-	-	-
Raw density [g/cm <sup>3</sup> ]		0.64	0.8	1	1.15
Cold compression strength [MPa]		1.2	4	8	8
Permanent length change [%]		1320 °C/ 12 h -0.7	1320 °C/ 12 h -0.9	1320 °C/ 12 h -0.9	1370 °C/ 12 h -0.5
Refractoriness under load T <sub>05</sub> [0.20 MPa]		1180 °C	1280 °C	1330 °C	1335 °C
Chemical analysis [%]	Al <sub>2</sub> O <sub>3</sub>	37	38	40	48
	SiO <sub>2</sub>	56	55	54	47
	Fe <sub>2</sub> O <sub>3</sub>	1.9	2.2	2.3	1.8
Thermal conductivity [W/mK]	600 °C	0.28	0.36	0.42	0.46
	800 °C	0.32	0.41	0.46	0.50
	1000 °C	0.38	0.47	0.50	0.55
	1200 °C	0.43	0.50	0.54	0.60
	1400 °C	-	-	-	-

# HIGH-TEMPERATURE INSULATION WOOL



## HIGH-TEMPERATURE INSULATION WOOL

NAME		ALSITRA Mat 1400
Raw material base		Aluminum silicate
Classification temperature [°C]		1400
Continuous application temperature [°C]		< 1250
Permanent length change [%]	1100 °C	-
	1200 °C	-2
	1300 °C	-3
	1400 °C	-4
	1500 °C	-
	1600 °C	-
Chemical analysis [%]	Al <sub>2</sub> O <sub>3</sub>	54
	SiO <sub>2</sub>	46
	CaO / MgO	-
	ZrO <sub>2</sub>	-
Thermal conductivity [W/mK] (Hot wire procedure) DIN EN 993-14	400 °C	0.11
	600 °C	0.15
	800 °C	0.21
	1000 °C	0.31
	1200 °C	0.44
	1400 °C	0.64





# INDUSTRIES AND APPLICATIONS



Forging furnace



Glass production



Aluminum melting furnace

Thanks to their many projects, RATH employees have a great deal of experience and knowledge that they contribute to the development and planning of refractory systems.

## RATH HAS EXPERIENCE AND EXPERTISE IN SPECIFIC INDUSTRIAL APPLICATIONS

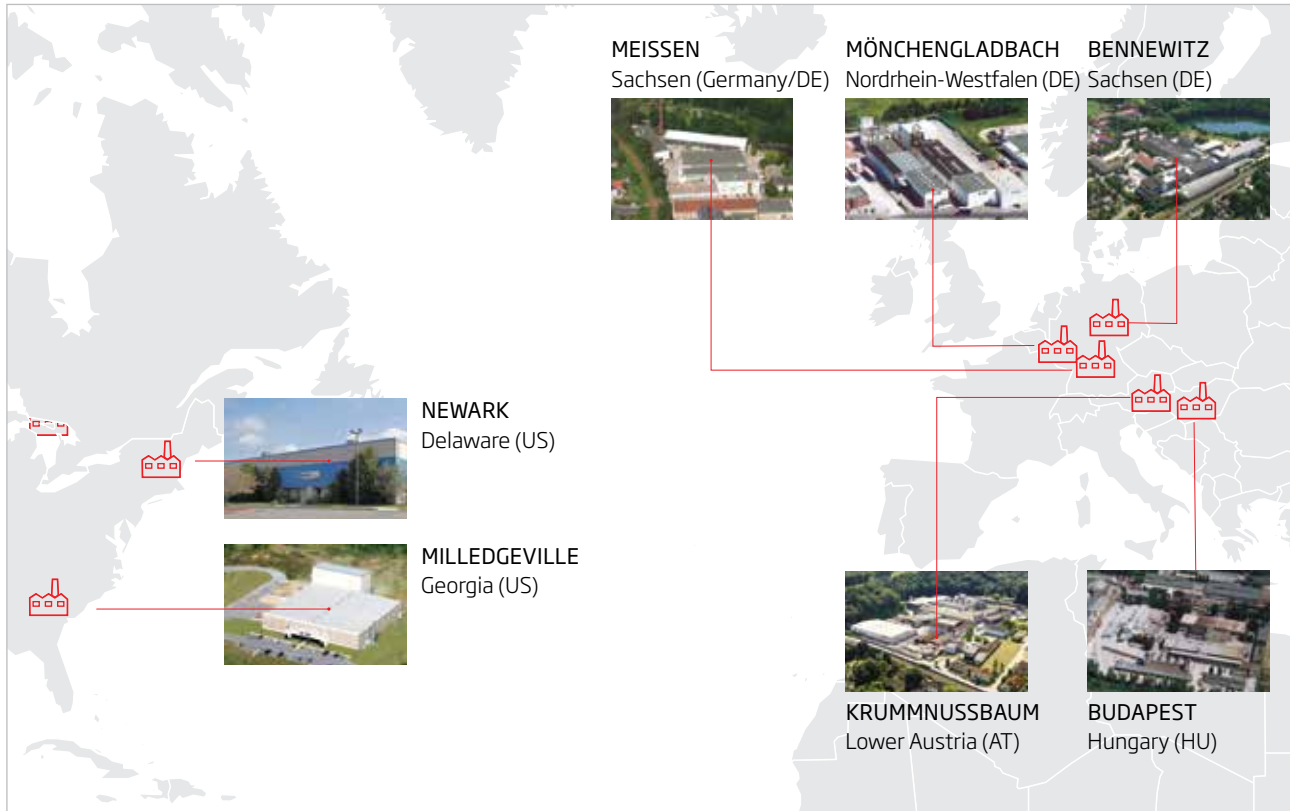
<p><b>Metal-processing industry</b></p> <ul style="list-style-type: none"> <li>- Metallurgical heating furnaces</li> <li>- Heat treatment furnaces</li> <li>- Aluminum smelting furnaces</li> <li>- Direct reduction plants</li> <li>- Hot-gas filtration</li> </ul>	<p><b>Petrochemistry, chemistry</b></p> <ul style="list-style-type: none"> <li>- Carbon black reactors</li> <li>- Reformers and cracking furnaces</li> <li>- Chlorine reactors</li> <li>- Sulfur extraction plants</li> <li>- Hot-gas filtration</li> </ul>	<p><b>Energy &amp; environmental engineering</b></p> <ul style="list-style-type: none"> <li>- Biomass firing systems</li> <li>- Wood distillation, grate stoker furnaces</li> <li>- Hot-gas generation</li> <li>- Fluidized bed reactors</li> <li>- Rotary kilns</li> <li>- Waste incineration plants</li> <li>- Heat exchangers</li> <li>- Hot-gas filtration</li> </ul>	<p><b>Tiled stoves and domestic fireplaces</b></p> <ul style="list-style-type: none"> <li>- Complete oven systems</li> <li>- Biological combustion chamber plus</li> <li>- Flue systems</li> <li>- Combustion chamber linings</li> <li>- Inspection window doors</li> <li>- Mortars and adhesives</li> </ul>
<p><b>Ceramic industry</b></p> <ul style="list-style-type: none"> <li>- Technical ceramics, sanitary ceramics, pottery ceramics, refractory ceramics</li> <li>- Tunnel kilns</li> <li>- Rotary furnaces</li> <li>- Hood-type furnaces</li> </ul>	<p><b>Special furnace construction</b></p> <ul style="list-style-type: none"> <li>- Laboratory furnaces</li> <li>- Dental furnaces</li> <li>- Analytic devices</li> </ul>	<p><b>Glass industry</b></p> <ul style="list-style-type: none"> <li>- Regenerator chambers</li> <li>- Melting ends</li> <li>- Working ends</li> <li>- Forehearths</li> <li>- Basins for glass processing</li> </ul>	

# IN-HOUSE MANUFACTURING AT HIGHEST QUALITY LEVEL



Seven production sites in Europe and America are constantly exchanging information about manufacturing procedures to guarantee best products.

Quality at Rath is not just a buzz-word but a vivid corporate culture. Each individual employee strives for the best solution and does not give up until it is achieved.



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