

# Tailor-made solutions for the liquid steel industry.

Top quality refractory materials.



**RATH**

# Specialist for top technology in high temperature.

**Quality with an optimum price-performance ratio.**



*The Rath sales team*

Rath's product range incorporates the latest technology. The advice we give our customers when it comes to selecting the right products for their specific requirements ensures that they get ideal solutions for their refractory applications. Thus we help to increase productivity, improve the purity of steel, achieve higher efficiency and reduce costs, all of which are decisive factors, particularly for the steel industry.

We constantly face and overcome new challenges allowing us to live up to this high standard. Our goal is to find innovative refractory solutions meeting your expectations.

**Production with enhanced efficiency and cost-effectiveness.**



*Liquid steel in ladle*

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## We live up to your high expectations.

The continuous work process inherent to the iron and steel industry requires top performances. Modern refractory materials and optimally calculated lining concepts guarantee a smooth, profitable production even with high temperature requirements, aggressive chemical reactions and under particularly unfavourable conditions.

Rath is a reliable partner in this sector supplying thermal insulation and refractory materials as well as special lining



*Porrath insulating fire brick*

products for many different and complex systems.

## Innovative thinking has been the key to our success.

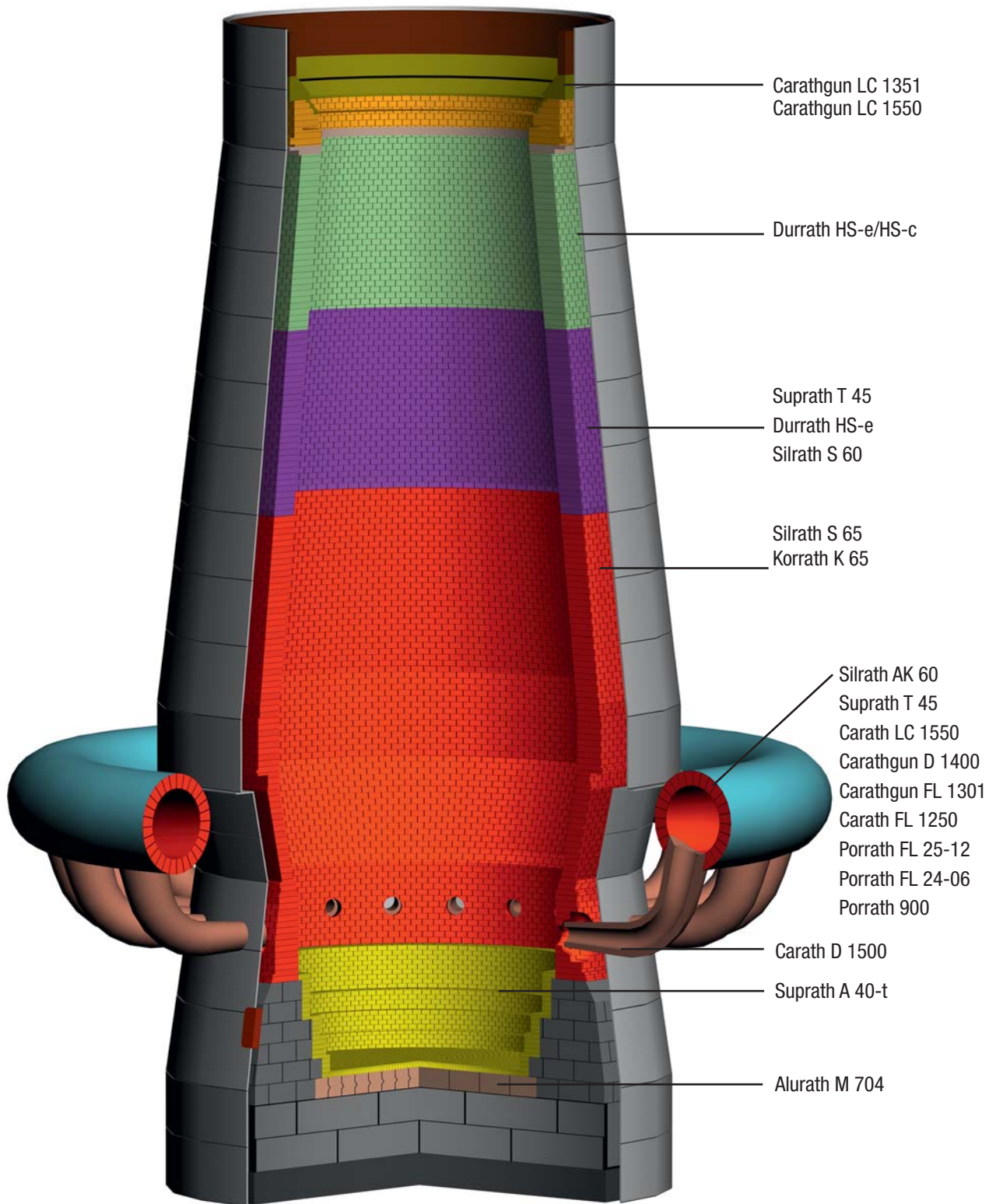


*Sintering furnace*

Rath as partner for the global iron and steel industry provides total solutions and innovative lining concepts. Our product range includes dense refractory bricks, refractory castables and masses, prefabricated concrete units, insulating fire bricks, high temperature wool products and vacuum-formed products, all ensuring efficiency, reliability and operational safety for the following applications and units:

- Ironore sinterfurnace
- Direct reduction equipment
- Blast furnace
- Tube ladle, torpedo ladle
- Cowper
- Hot blast duct
- Transport ladle
- Slide gate system
- Roof insulation

**Always expect us to be one step ahead.**



*3D drawing shaft furnace with hot blast circulating duct*

## Blast furnace linings

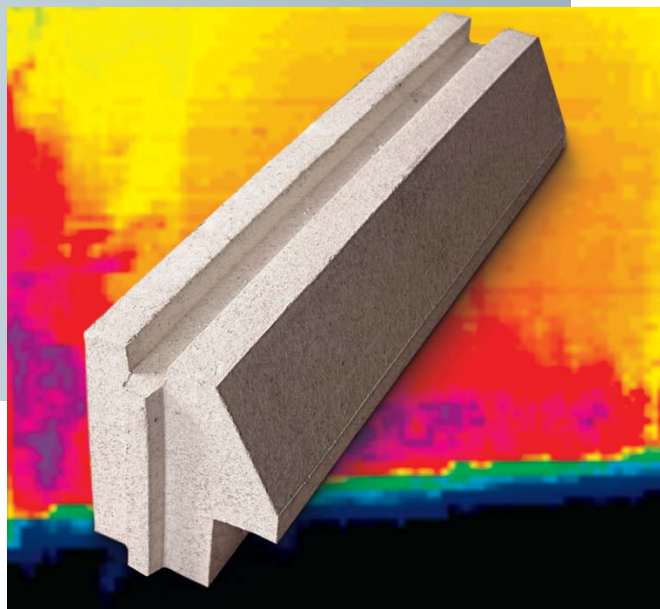
A modern blast furnace without high performance bricks containing aluminium oxide is virtually inconceivable.

- High quality fireclay bricks Suprath /Durrath
  - low-ferrous sillimanite bricks – Silrath
  - high alumina bricks (mullite and corundum) -Alurath, Korrath®
  - dense or low cement and ultra low cement castables, gunning castables – Carath®
  - insulating fire bricks - Porrath®
  - high temperature wool - Alsitra/Altra®
- are used for this purpose.

Our special range of refractory with low iron oxide content fired bricks distinguishes itself with high CO resistance and cold crushing strength guaranteeing the long durability of blast furnaces.



Initial pass of steel



Silrath tongue and groove brick



Blast furnace relining

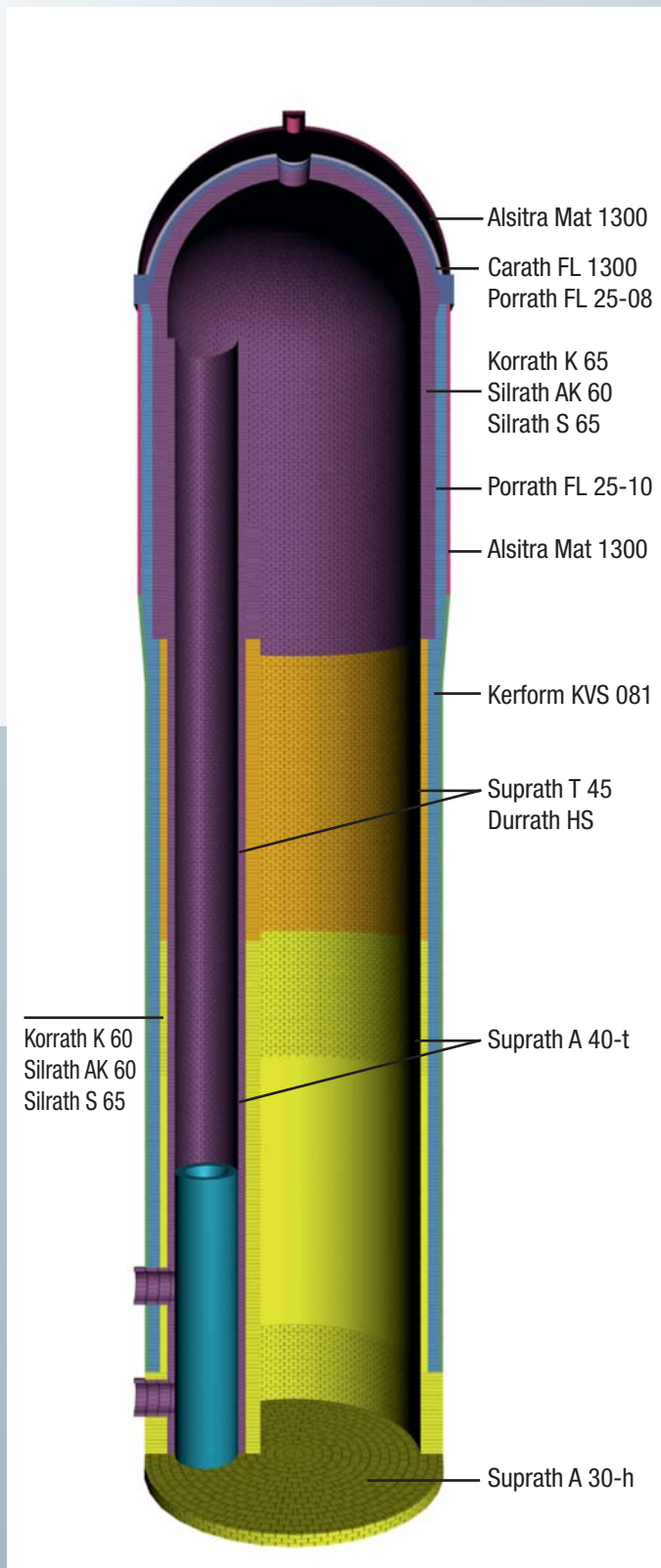
## Dense bricks \*

Name	Suprath T 45	Durrath HS-e	Silrath AK 60	Silrath S 65	Korrath® K 65	Alurath B 80 C
Raw material	Fireclay mullite	Lowferrous fireclay	Andalusite	Sillimanite	Corundum fireclay	Bauxite
Bulk density [g/cm <sup>3</sup> ]	2,30	2,35	2,60	2,65	2,55	2,85
Thermal shock resistance [n]	30	30	120	120	15	25
Cold crushing strength [MPa]	60	80	100	100	80	200
Chemical analysis [%]						
Al <sub>2</sub> O <sub>3</sub>	43	47	60	65	64	83
Fe <sub>2</sub> O <sub>3</sub>	2	1,4	1,0	0,8	1,2	1,4

\* This and the following tables contain only an extract of the wide Rath product range.



# Top performance under the most extreme conditions.



3D drawing cowper

## Cowpers.

New cowper designs result in higher temperatures in the furnaces, especially in the area of the dome and, therefore, more demanding standards in terms of the refractory lining quality and high performance chequer bricks have to be met.

Our high quality Suprath, Silrath and Korrath bricks as well as the fired precast refractory shapes are an ideal solution, ensuring a very high heat storage capacity, good resistance to alkalis and abrasion as well as lower expansion. Many of our partners have confirmed a durability of Rath products of 18 to 22 years.

Thanks to the Rath Quality Assurance programme, the most important parameters for these requirements such as the refractoriness under load, thermal expansion behaviour, creep in compression and hot bending strength are continuously monitored.



New lining of a hot blast duct

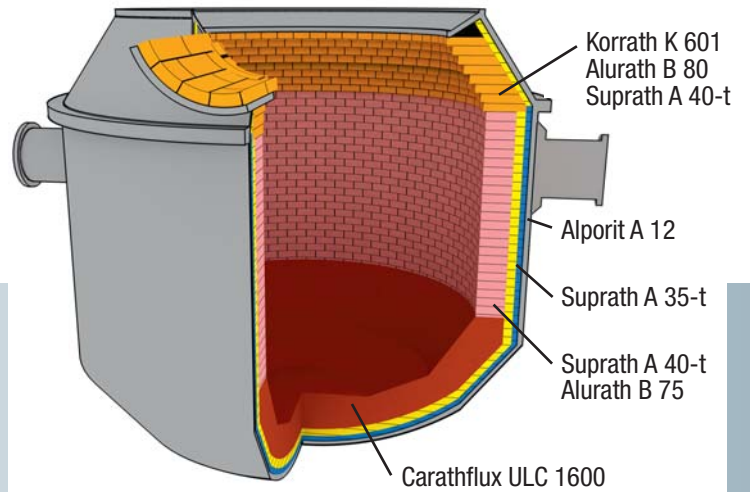
## Hot blast duct.

Our insulating refractory solution for hot blast duct systems offers long operating times with low temperature losses. Carath refractory and gunning castables allow simple and efficient installations as well as easy maintenance of the entire duct system.

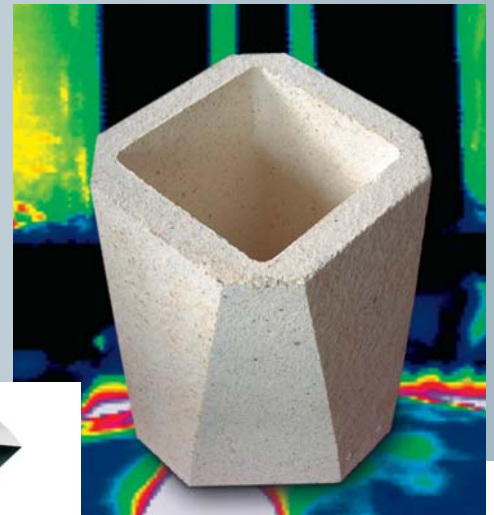
## Transport of hot iron and crude steel.

A profitable and safe transport of molten iron from the blast furnace to the steelplant with torpedo, tube or transfer ladles is virtually inconceivable without an optimal refractory lining concept.

Rath's offer includes a wide range of refractory dense fireclay bricks, sillimanite, andalusite and corundum bricks as well as refractory castables, light weight refractory castables, ramming masses and gunning materials, withstanding the erosion of molten iron and blast furnace slag during aeration and deaeration. The heat loss is minimised by insulating materials such as insulating fire bricks and products from high temperature wool range.

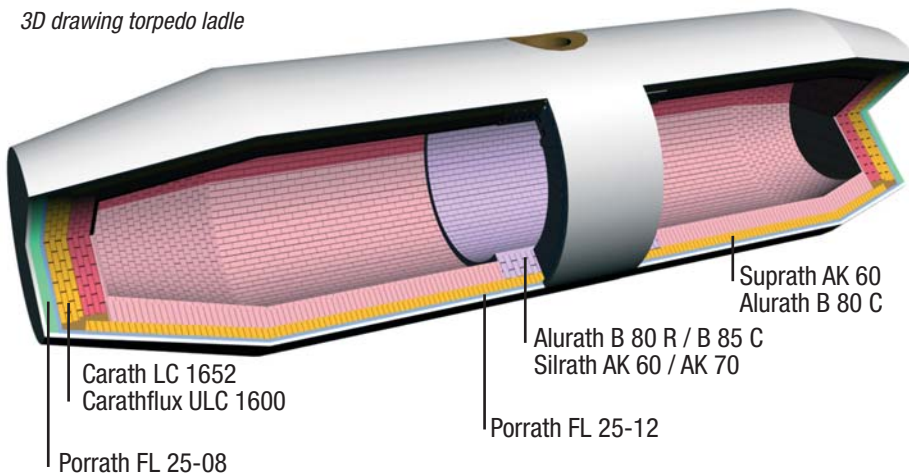


3D drawing hot iron ladle



Carathform precast shape

3D drawing torpedo ladle



## Carath® – unshaped refractories

Name	Vibrating castables			Shot castables		Selfflowing castables
	Carath® FL 1250	Carath® LC 1550	Carath® LC 1652	Carathgun FL 1301	Carathgun D 1400	Carathflux ULC 1600
Raw material	Lightweight fireclay	Fireclay Bauxite	Bauxite	Lightweight fireclay	Fireclay	Bauxite
Application temperature [°C]	1250	1550	1650	1300	1400	1600
Material required [kg/m³]	1620	2400	2850	1300	2040	2800
Cold crushing strength [MPa]	20	100	85	12	30	35
Chemical analysis [%]						
Al <sub>2</sub> O <sub>3</sub>	40	60	85	47	46	80
Fe <sub>2</sub> O <sub>3</sub>	6,0	1,5	1,0	1,9	1,5	1,7

# We think about cost-effectiveness. In your interest.

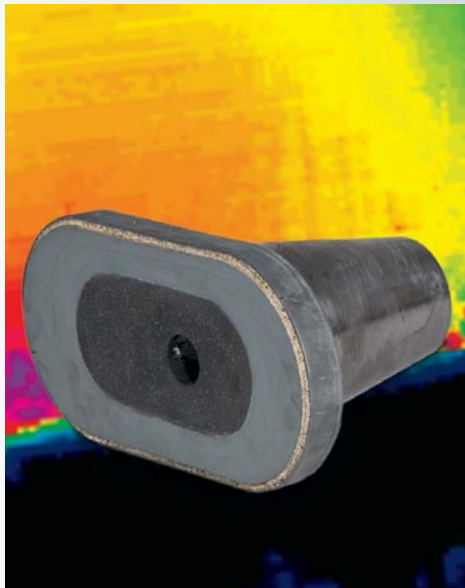
## Low-priced sliding gate alternatives.

A ladle's locking area is very sensitive. An imprecise design of the ladle can have serious consequences. That is why the primary focus of our work is on material quality and on zero fault tolerance.

Thanks to our longstanding experience, we are able to select the optimal raw material components (alumina, magnesite, zirconium oxide) for the customer. Furthermore, different alternatives – pre-fired, unfired, impregnated or carbon-bound - allow for an optimal cost-benefit relation. With our flexible production method, we can easily produce the most diverse locking systems.

As supplementary service, we offer the remanufacturing of used slide plates with wear inserts. Based on this expertise, we have developed a new, patented sliding gate ceramic, the sandwich construction of which can be a low-priced alternative despite high quality materials and more elaborate production method.

To ensure a good service for our customers is one of Rath's top priorities. Our aim is to recommend and supply products with optimal usage properties.



*Patented slide gate ceramics*



*Ladle casing, insert, nozzle brick*



*Laboratory Test*





Slide gate in action



Ceramic products for different ladle slide gate systems

## Sliding gates

Name	Korrath® K 91S	Zirraath Z 95S	Perrath P 91S	Carborath K 80	Carath®* LC 1651S	Carath® 1651ULC
Raw material	Corundum	Zirconium oxide	Periklas	Korund	Periklas	Spinell
Bulk density [g/cm <sup>3</sup> ]	3,10	4,75	2,95	3,15	2,75	2,85
Open porosity [Vol.-%]	14	16	15	6	18	16
Chemical analysis [%]						
Al <sub>2</sub> O <sub>3</sub>	90	-	5	80	8	85
MgO	-	3	92	-	89	10
Zr <sub>2</sub> O <sub>3</sub>	3,5	95	-	8	-	-

\* unfired

# All from one single source. Everything OK.



Altra® Mod corner module

## Roof insulation.

Rath realises comfortable and cost-effective solutions, among others in the areas of ladle preheater roofs, tundish drier roofs and electric arc furnace roofs, using our modern insulating materials such as e.g. the Rath Alsitra and Altra modules, the Alsitra and Altra blankets and also our insulating castables.



Roof of a melting furnace



Heating of a steel casting ladle



Roof of a tundish

## Insulating materials

Name	Insulating fire bricks				Alumina silica wool		VFT*
	Porrath® FL 24-06	Porrath® FL 25-08	Porrath® FL 25-12	Porrath® FL 26-08	Alsitra Mat 1300	Alsitra Mat 1400	Kerform KVS 121
Raw material	Aluminium silicate	Aluminium silicate	Aluminium silicate	Aluminium silicate	Aluminium silicate	Aluminium silicate	Aluminium silicate wool
Classification temperature [°C]	1350	1380	1420	1430	1300	1400	1250
Bulk density [g/cm³]	640	800	1200	800	96-160	96-160	300
Cold crushing strength [MPa]	1,2	4	9	3,5	-	-	0,3
Chemical analysis [%]							
Al <sub>2</sub> O <sub>3</sub>	37	36	45	52	48	54	50
SiO <sub>2</sub>	56	57	49	44	52	46	49

\* Vacuum-formed shape

# Production in our own factories.

There is one very special feature of Rath: we can always fully guarantee the quality of our highly refractory products, as we manufacture them all ourselves.

State-of-the-art production processes are used in our plants in Europe and the USA. We constantly adapt these processes in line with technical and technological developments as we strive to provide you with top quality.

Our approach benefits our customers: high quality products ensure operational safety and reliability over a long period of time. This means less repairs, less breaks in production and lower costs.



*Budapest*



*Meißen*



*Bennewitz*

## Rath meets all ISO criteria.

Quality in production can be measured – with ISO 9001/9002. All companies in the Rath Group are certified according to the strict criteria for this standard. We are doing everything to build constantly on this quality standard.

Our products undergo rigorous testing in our own company laboratories. We also regularly have externally government-authorized recognised test centres check material characteristics.

Our customers can rest assured that all our products are up to date – and provide, in practice, everything that we have promised.



# The Rath Group.

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