



STEULER Refractory | Linings

**BOTTOM
POURING SYSTEMS**
MADE-TO-MEASURE CONCEPTS

FOCUS ON PERFORMANCE



MATERIALS AND SHAPES **INNOVATION AND PERFORMANCE**

Steuler can follow various format concepts and customer-specific design specifications. Standard, special shapes and complex geometries for universal connection concepts - there is an almost infinite number of possible combinations. And you can benefit from this. Complete supply concepts allow the correct material to be produced in the matching format down to the last detail. Steuler manufactures on highly automated state-of-the-art systems. It also has its own mould-making shop to realise even highly complex geometries quickly, effectively and in the required quality.

With the growing variety of alloys as well as higher casting temperatures and longer casting times, the demands on refractory materials become more stringent. The development of refractory materials must keep up with this.

The right material in the right shape: Steuler formats and materials optimise the production processes and ensure the block quality - every day in every casting process.

LONG TONGUE AND GROOVE CONNECTIONS THROUGHOUT THE ENTIRE SYSTEM:

- Mortar-free connection and therefore no risk of mortar inclusions in the steel
- Fast and dry installation without moisture so that no hydrogen can be created in the runner system

DRY-PRESSED RUNNER BRICKS:

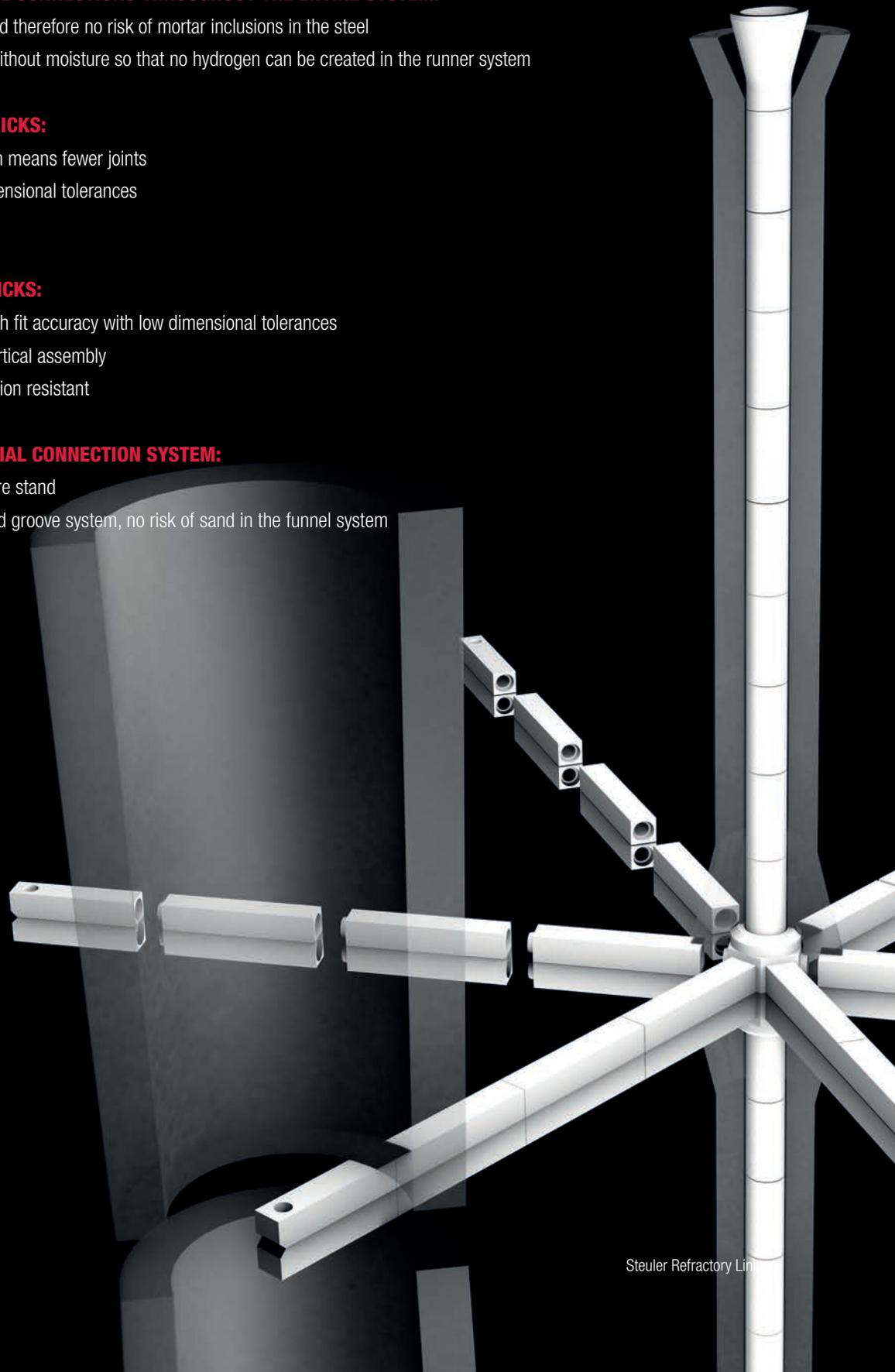
- Up to 620 mm long, which means fewer joints
- High fit accuracy, low dimensional tolerances
- No deflection

DRY-PRESSED FUNNEL BRICKS:

- High form stability and high fit accuracy with low dimensional tolerances
- Absolutely straight and vertical assembly
- Plane-parallelism and torsion resistant

FUNNEL CAP WITH A SPECIAL CONNECTION SYSTEM:

- Safe installation and secure stand
- Due to covered tongue and groove system, no risk of sand in the funnel system



ENGINEERING AND DEVELOPMENT **MADE-TO-MEASURE** **CONCEPTS**



What is the best format exactly - what refractory material can make the casting process and block quality safer and better - what impact do changes have on production processes and quality?

Experienced Steuler application engineers develop optimum concepts for the casting plates in compliance with the specific requirements. They are supported by a simulation software that projects data, static images and videos. The following are shown:

- Flow (direction and speed), temperature, solidification, shrinking and micro-porosity
- For instance, the precise moulding of the endgate brick can bring decisive product improvements
- The goal is to ensure less wash-out in the mould, no turbulence and a reliable, central steel inflow during casting

The various concepts are tested and the results are analysed together with our customers. „We measure things precisely“ beforehand and flexibly. We know exactly which complex influencing factors need to be adjusted when casting blocks.

Optimum solutions are created in dialogue and by considering all parameters and system conditions. We also examine all upstream and downstream processes to gain a more comprehensive understanding of the operating and production conditions.





The best material is not always the material of the highest quality - the best material is precisely the right type of material and classification for our customers' specifications in their production processes and product grades. Steuler offers a wide range of materials and various production methods to meet all technical requirements and budget considerations.

The more demanding the requirements, e.g. with respect to the level of purity of the steel, the higher the requirements relating to the quality of the refractory material. This can be reached by increasing the level of alumina in the ceramic; where necessary and sensible, with a content of up to 92 % combined with a reduction of the free SiO_2 content. Non-metallic inclusions must be avoided; likewise, the steel ingots should have an even chemical composition and homogenous structure.

In the case of high-quality, special alloy steel types, e.g. manganese steels, Steuler counts on Suprema B 80 UG, a material with a reactive mullite-bound matrix and low levels of free SiO_2 . In the case of steels of an even higher quality, it is also possible to use high-temperature fired corundum type Suprema KE 92 UG with a reactive mullite-bound matrix and even lower levels of free SiO_2 . Using these refractory materials will avoid expansion of the casting channel and alumina inclusions. Thanks to the special design of the tongue and groove connection, it is possible and recommended to install the bottom pour refractory without mortar, even at very high ferrostatic loads.

MATERIAL DEVELOPMENT FOCUSING ON HIGHER INGOT QUALITY

Brand			Suprema A 40 UG	Suprema A 40 UGT	Suprema B 65 UG	Suprema B 65 UGT	Suprema B 80 UG	Suprema B 80 UGT	Suprema KE 92 UG	Suprema KE 92 UGT
Shaping			Vacuum extruded	Pressed dry	Vacuum extruded	Pressed dry	Vacuum extruded	Pressed dry	Vacuum extruded	Pressed dry
Classification			FC 40	FC 40	HA 65	HA 65	HA 75	HA 80	HA 90	HA 90
Raw material base			Fire clay	Fire clay	Bauxite	Bauxite	Bauxite	Bauxite	Corundum	Corundum
Chemical analysis	Al ₂ O ₃	%	48	47	65	65	80	81	92	94
	SiO ₂		46	48	32	32	16	14	7	5
	Fe ₂ O ₃		1,2	1,2	1,2	1,3	1,2	1,3	0,3	0,2
Physical properties	Bulk density	g/cm ³	2,23	2,30	2,40	2,60	2,58	2,80	2,90	3,20
	Apparent porosity	Vol. %	20	16	23	18	25	18	22	15
	Cold crushing strength	N/mm ²	60	50	60	60	50	80	60	70
Refractoriness under load	DE (t 05)		1320 °C	1320 °C	1420 °C	1430 °C	1540 °C	1550 °C	1580 °C	1600 °C
Thermal shock resistance	Water		20	20	30	30	30	30	30	30
Thermal expansion (linear)	1000 °C	%	0,55	0,55	0,65	0,65	0,73	0,70	0,77	0,78
Thermal conductivity	400 °C	W/mK BTU (in / hr-ft ² -°F)	1,20	1,20	1,30	1,40	1,80	1,90	3,10	3,10
	800 °C		1,35	1,35	1,40	1,50	1,85	1,95	2,70	2,70
	1200 °C		1,50	1,50	1,55	1,60	2,00	2,05	2,80	2,80



CLEAN STEEL

SAFE PRODUCTION AND EFFICIENCY

If necessary, lots of things are possible. In Steuler, you have a partner that conducts research and development to enhance its own production capacities and programs to contribute to the production of 'Clean Steel' with innovative, high-tech products.

For example, Steuler optimises the production of the raw ingots thanks to its new spider brick. The continuous improvements of the Steuler-SmartCast spider brick lead to a significant calming of the casting process, less splashes in the mould and no pulsation in the casting channels. Using the simulation software, it was possible to analyse and assess the design of the casting process in the development phase. This demonstrated and visualized the differences to conventional spider bricks and the flow conditions in the mould to be examined by changing the inner geometry.

A large industrial ladle is shown pouring molten metal into a mold. The ladle is dark and has a bright red glow from the molten metal inside. In the foreground, a large, dark, cylindrical ingot lies on the ground, with a bright red glow from the molten metal inside. The background shows a complex industrial structure with metal railings and pipes.

THE DIRECT ADVANTAGES OF THE STEULER SMARTCAST DEVELOPMENT:

- Improvement of the ingot foot shape and surface of the raw ingots by reducing
- the flow speed on entry to the mould
- Reduction of turbulent flows inside the mould
- Avoidance of breaking the solid steel cover / mirror (filling height in the mould) during the casting process and consequently avoidance of undesirable chemical reactions with oxygen
- Significantly less post-treatment of ingot surface

Whatever lining concepts or production developments our customers choose – Steuler offers suitable and safe solutions.



Technical support and coordination is provided by experienced Steuler bottom pour specialists – from the first consultation through to delivery and supervision - our customers always have a strong team on hand for all production areas. This team plans and coordinates the qualified implementation, agreements and details for the production. They provide the specifications for professional control of all factors, so that quality and shapes can be installed precisely.

REFRACTORY MANAGEMENT

WE DELIVER SAFETY

Appropriate stocks of raw materials, in-house production, on-call warehousing and reliable transport logistics - this is what enables us to offer our customers the level of security they require so that they can concentrate on their production and processes without delays or failures caused by missing or faulty refractory systems. Because Steuler offers competence and performance across all supply levels and processes – it keeps the bigger picture in mind whilst also not losing sight of the special details.



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