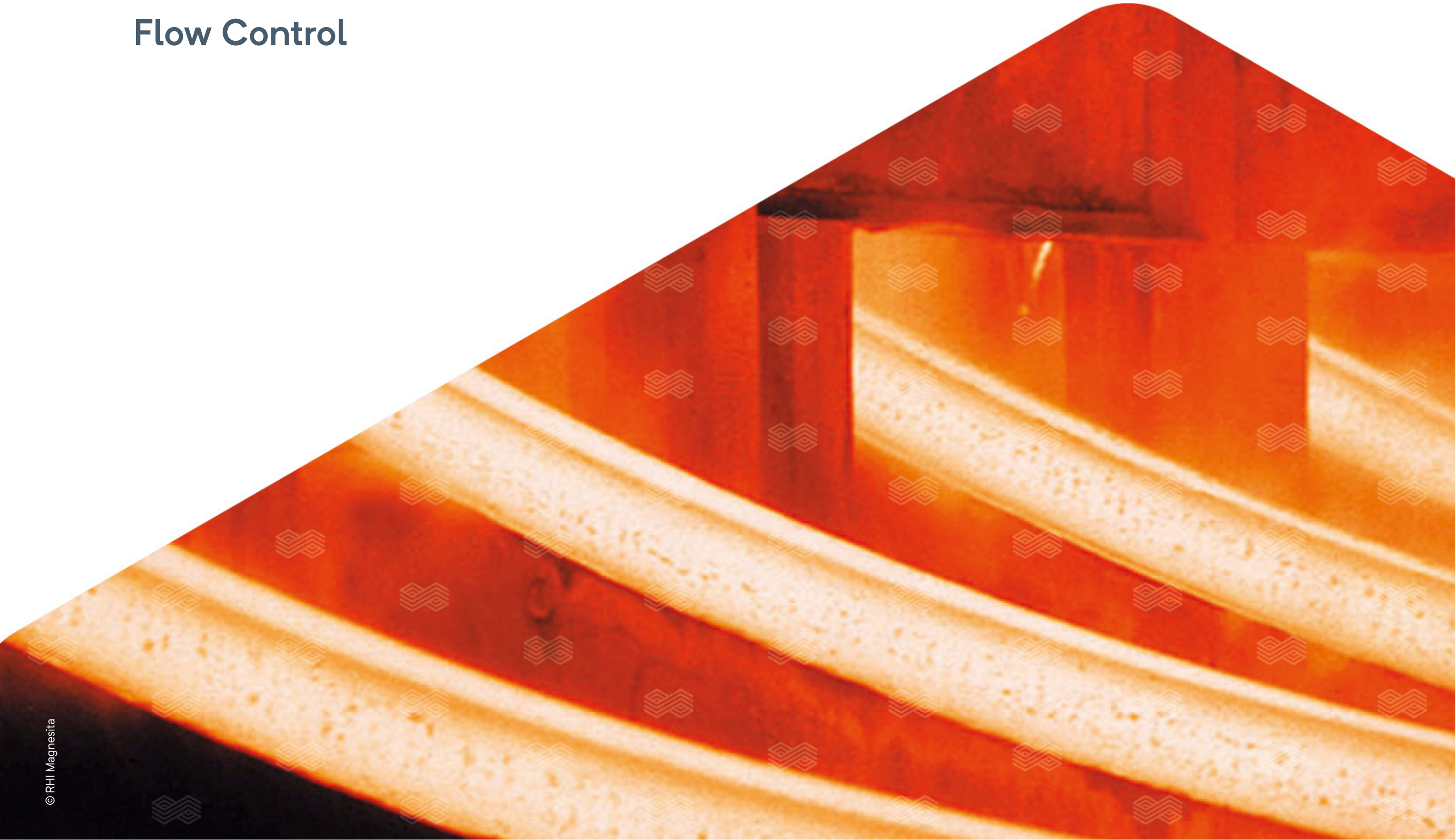


STEEL

Flow Control



There for you, wherever you need us



The more closely we work with our customers, the greater the impact we can make for them. So a global network of offices, research centers, and production sites is important to us, and to them. We are continuously extending our global reach to be closer to even more customers.

Being closer to customers doesn't just mean we can be more responsive to their needs. It also helps us to listen better — to understand their concerns, cultures and ways of working. It makes us alert to new ways of thinking and ideas that enable us to deliver even better advice, services, and solutions.

Our exceptional resources and expertise extend far beyond making and selling products. We provide solutions to customers worldwide for cover projects, material specifications, thermal studies, numerical simulations, follow-ups and technical support in application of minerals, and maintenance and electromechanical services for refractory equipment.

**North
America**

3 COUNTRIES
1 R&D CENTER

35
Main production and
raw material sites

70
Sales offices

180
Countries shipped
to worldwide

6 COUNTRIES
1 R&D HUB

**South
America**

Europe

17 COUNTRIES
1 R&D HUB
1 R&D CENTER

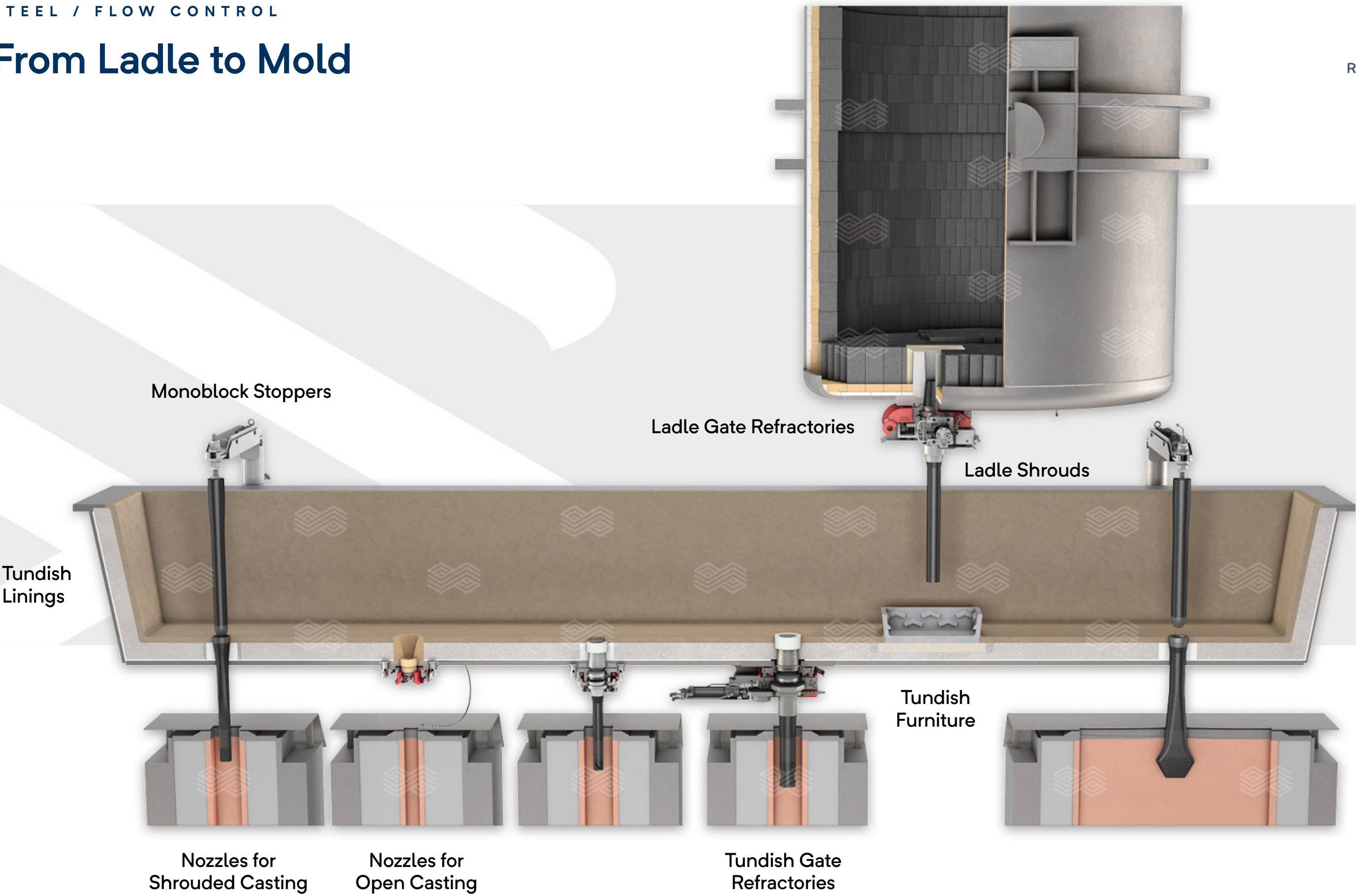
**Middle East/
Africa**

2 COUNTRIES

9 COUNTRIES
3 R&D CENTERS

**Asia
Pacific**

From Ladle to Mold



Ladle Gate Refractories

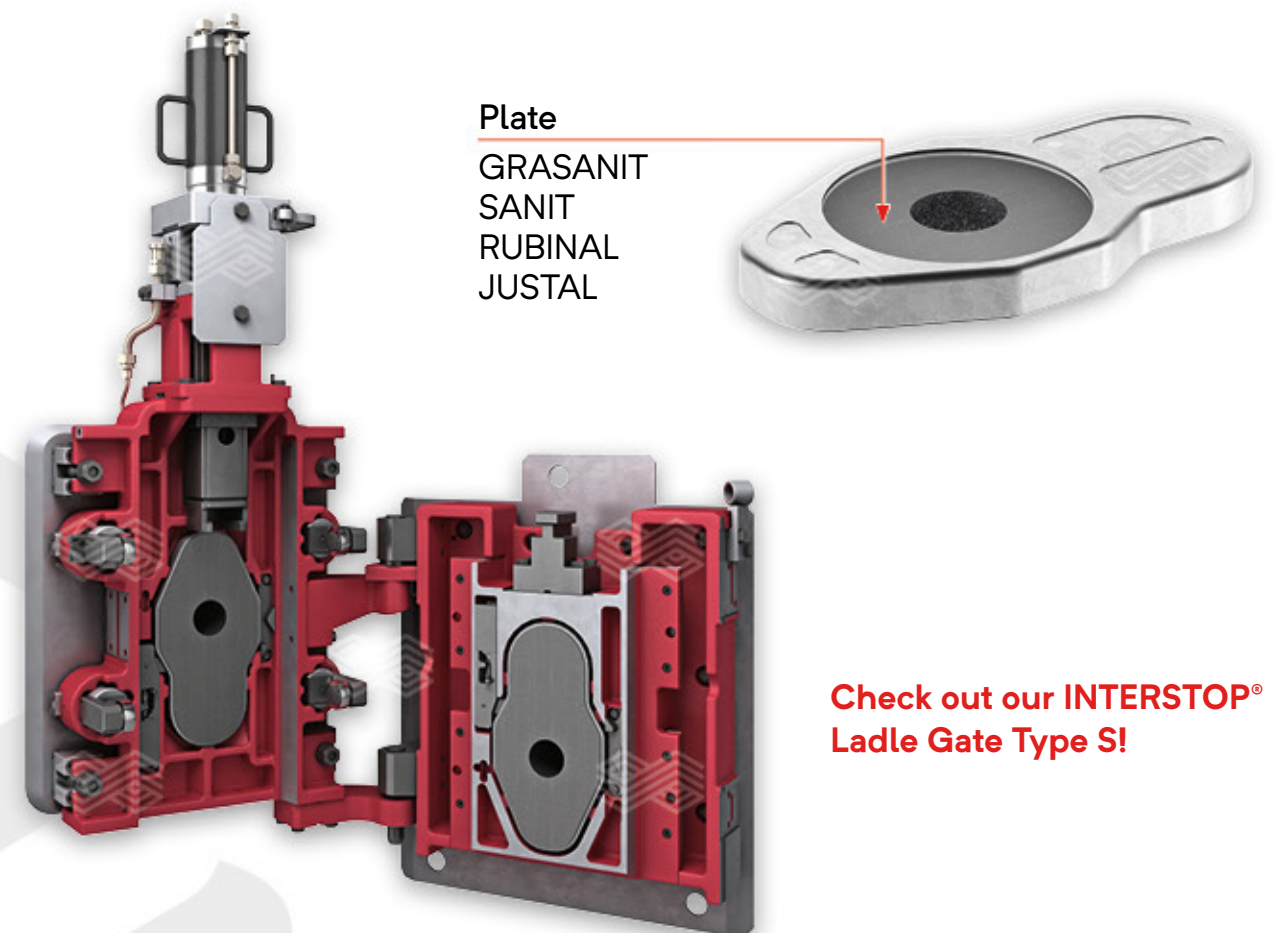


High-end Refractory Solutions Customized for:

- Steel grade
- Casting time
- Slag carryover
- Ladle cycle time
- Slide gate control
- Easy installation

In addition to the produced steel grades, geometrical characteristics of slide gate components have a decisive influence on the performance of a slide gate.

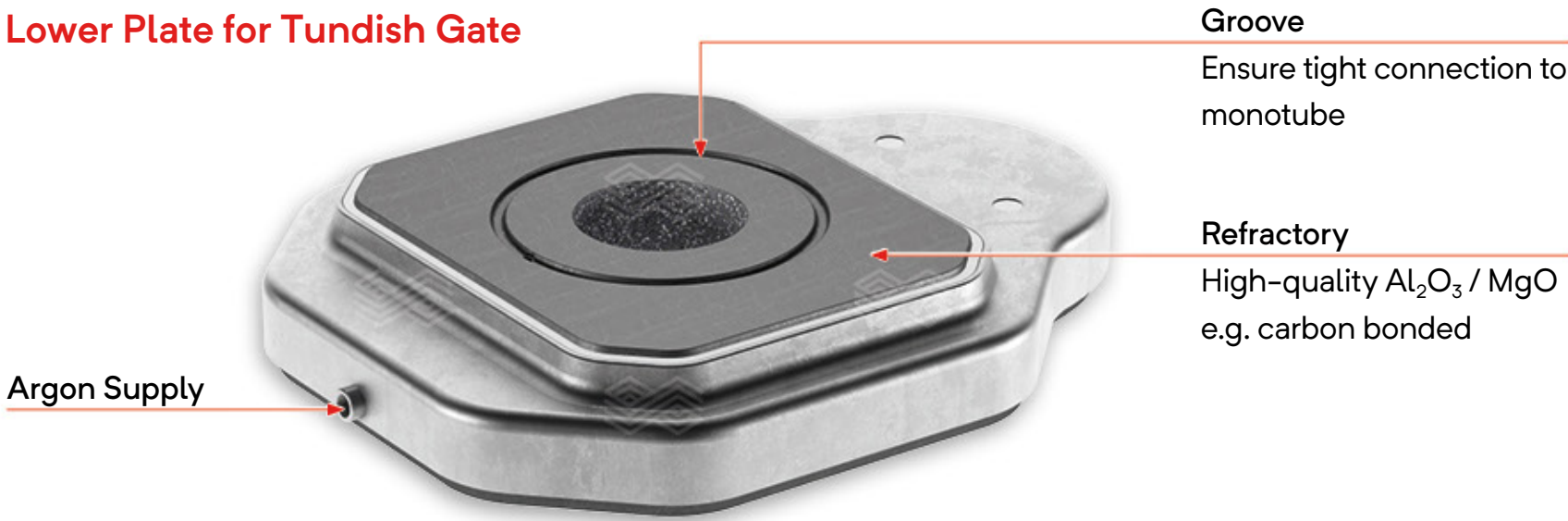
RHI Magnesita's innovative materials and technologies contribute significantly to the enhancement of the steel grade and operational safety of the slide gate system.



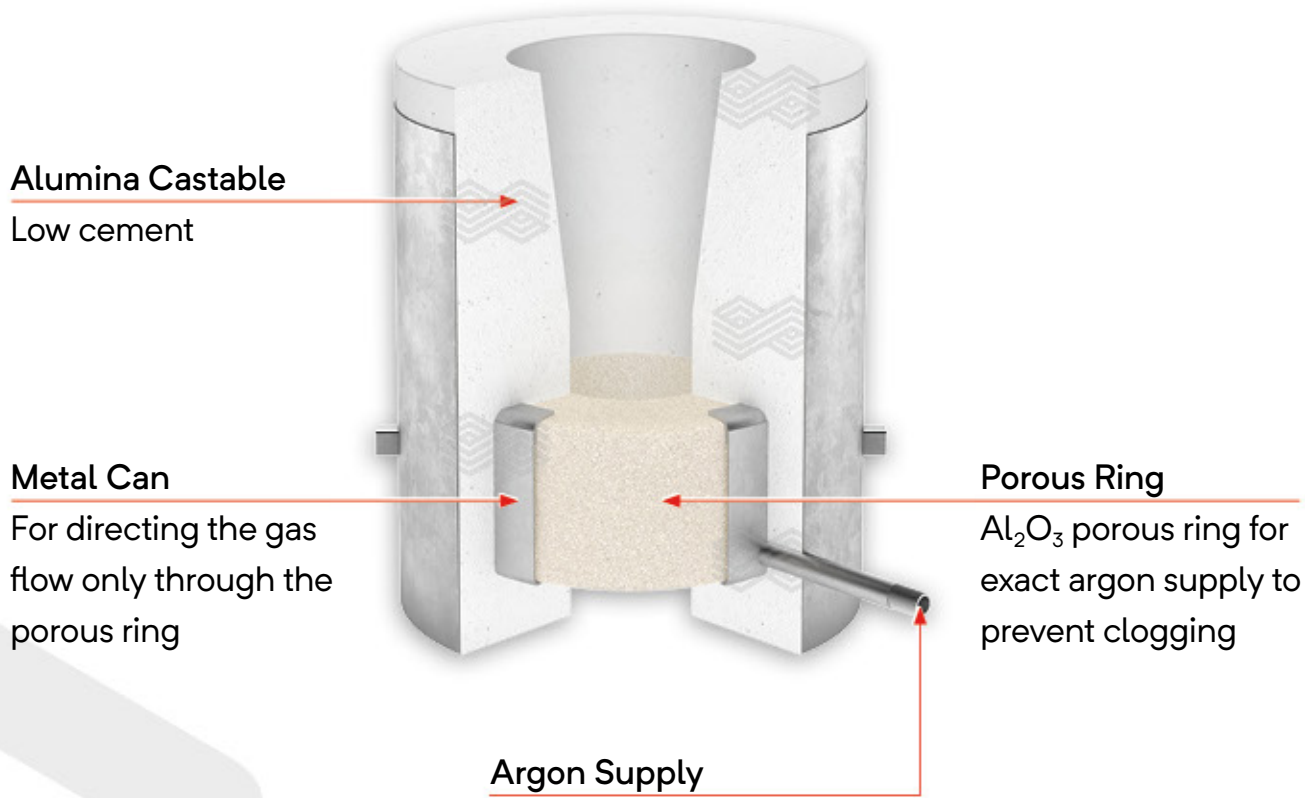
**Check out our INTERSTOP®
Ladle Gate Type S!**

Argon Supply for Slide Gate Refractories

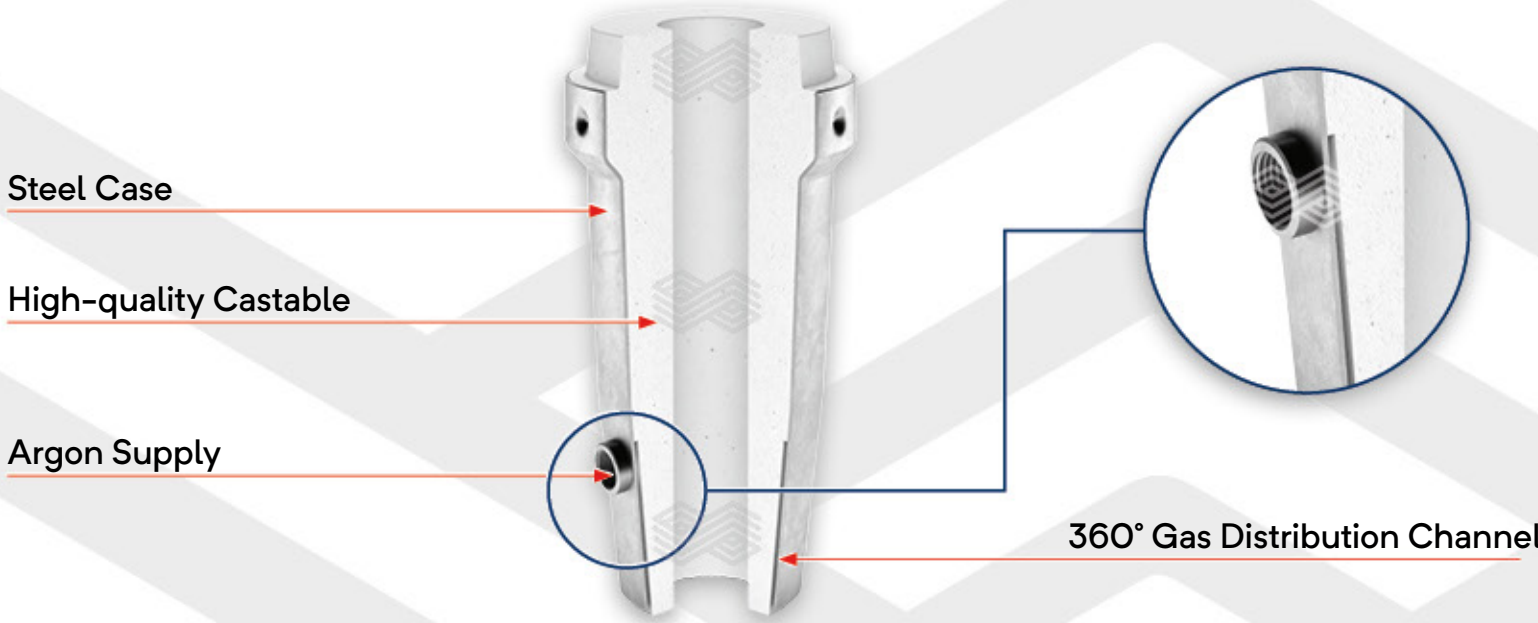
Lower Plate for Tundish Gate



Inner Nozzle for Tundish Gate



Lower Nozzle for Ladle Gate

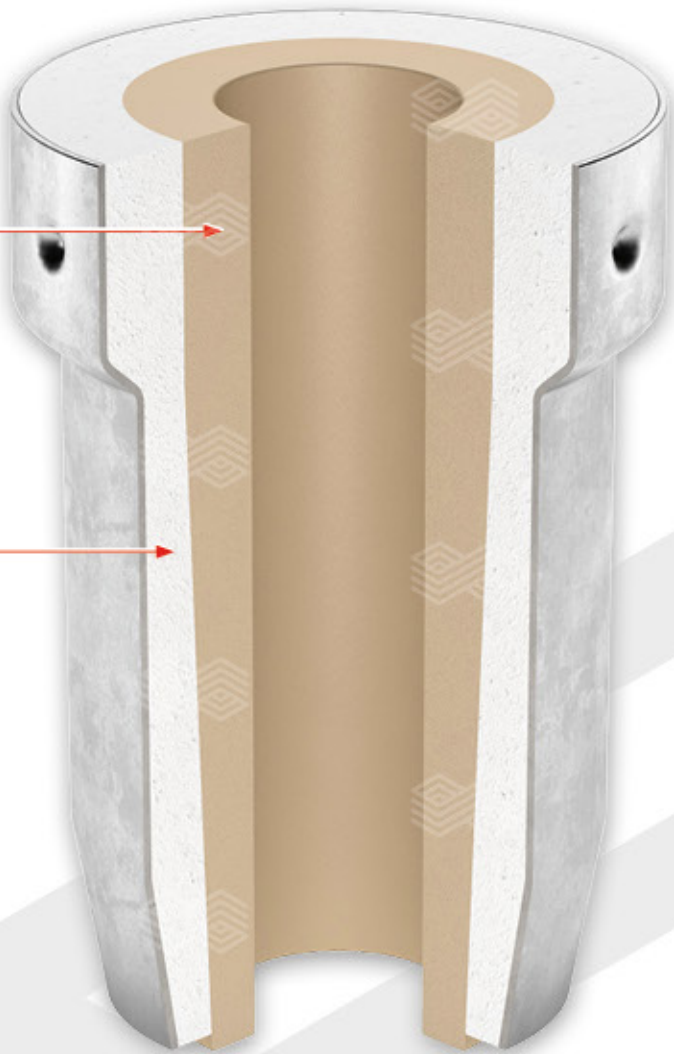


JUSTAL / Complex Assemblies

Collector Nozzle for Ladle Gate

Inner Liner
Pressed material for
highest wear resistance

Carrier Material
Cast for higher mechanical
resistance, avoiding
rathole propagation



Collector Nozzle for Ladle Gate

Extra Can Profile
Prevention of air ingress and cavitation

High-quality Al_2O_3 Castable

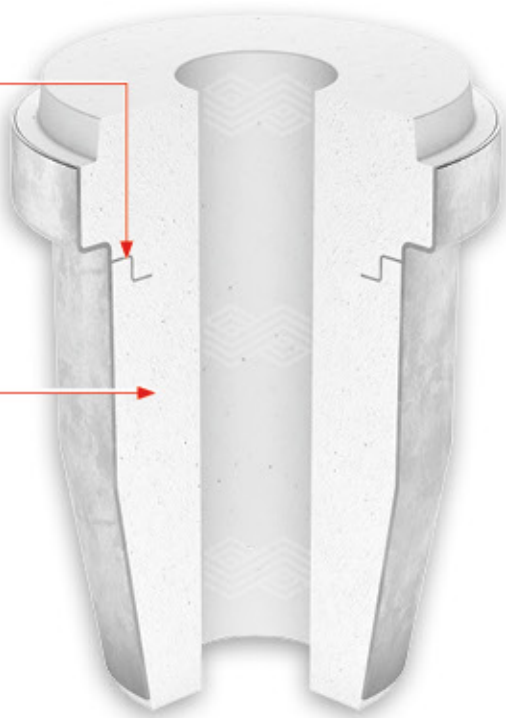
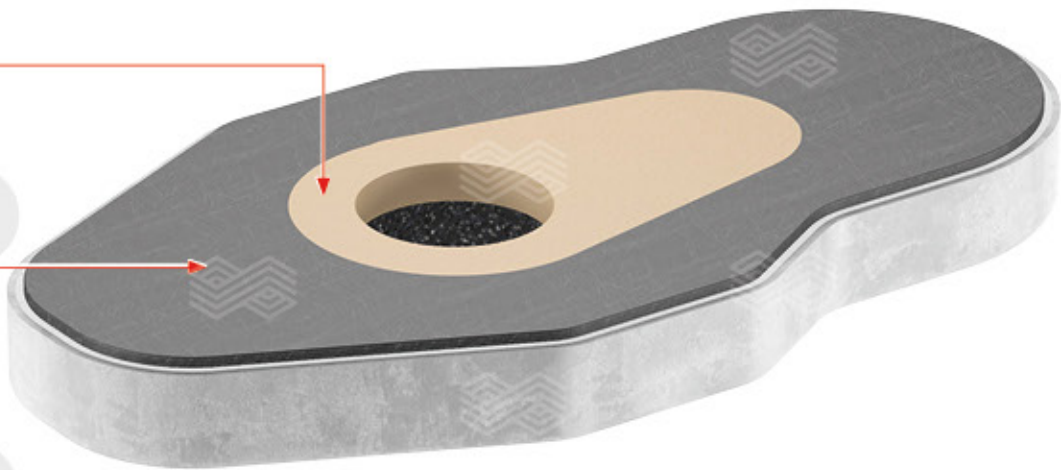


Plate for Ladle Gate

Insert
High-quality ZrO_2 for
aggressive steels

Carrier Material
Increased thermal
shock resistance



Nozzles for Open Casting

From mechanics and nozzles for safe and controlled casting to fixed metering nozzles, RHI Magnesita offers the complete tundish nozzle portfolio for the continuous casting of steel, with nozzles available in a broad range of properties. Encompassing diverse raw materials and production methods, RHI Magnesita's tundish nozzle portfolio serves all casting demands.

More Information



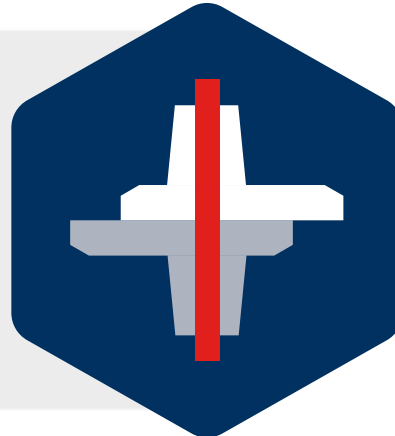
Tundish nozzles adapted to all systems and customer requirements.

Slide Gate Systems for Steel Casting Ladles

More than 600 customers from the steel and foundry industries in over 70 countries worldwide rely on RHI Magnesita as a trustful partner for INTERSTOP® flow control systems. The latest generation of the INTERSTOP® S gate series offers extra features in terms of safety, ease of operation and low operational costs. As a system and solution provider we support our customers with expertise and experience in the fields of application technology, R&D, simulations, quality management and production.

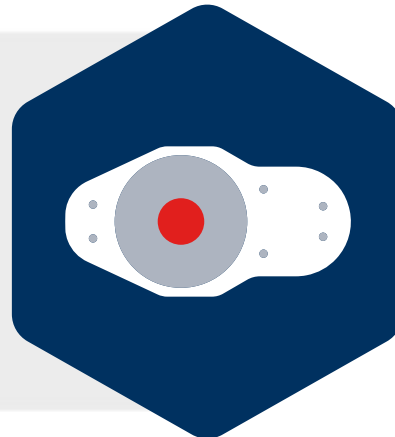
Ladle Gate Systems

- Size selection according to specific customer requirement — 2-plate or 3-plate systems available
- User-friendly design for safe, fast and simple operation
- Minimal maintenance work required
- Support of clean steel production and automation



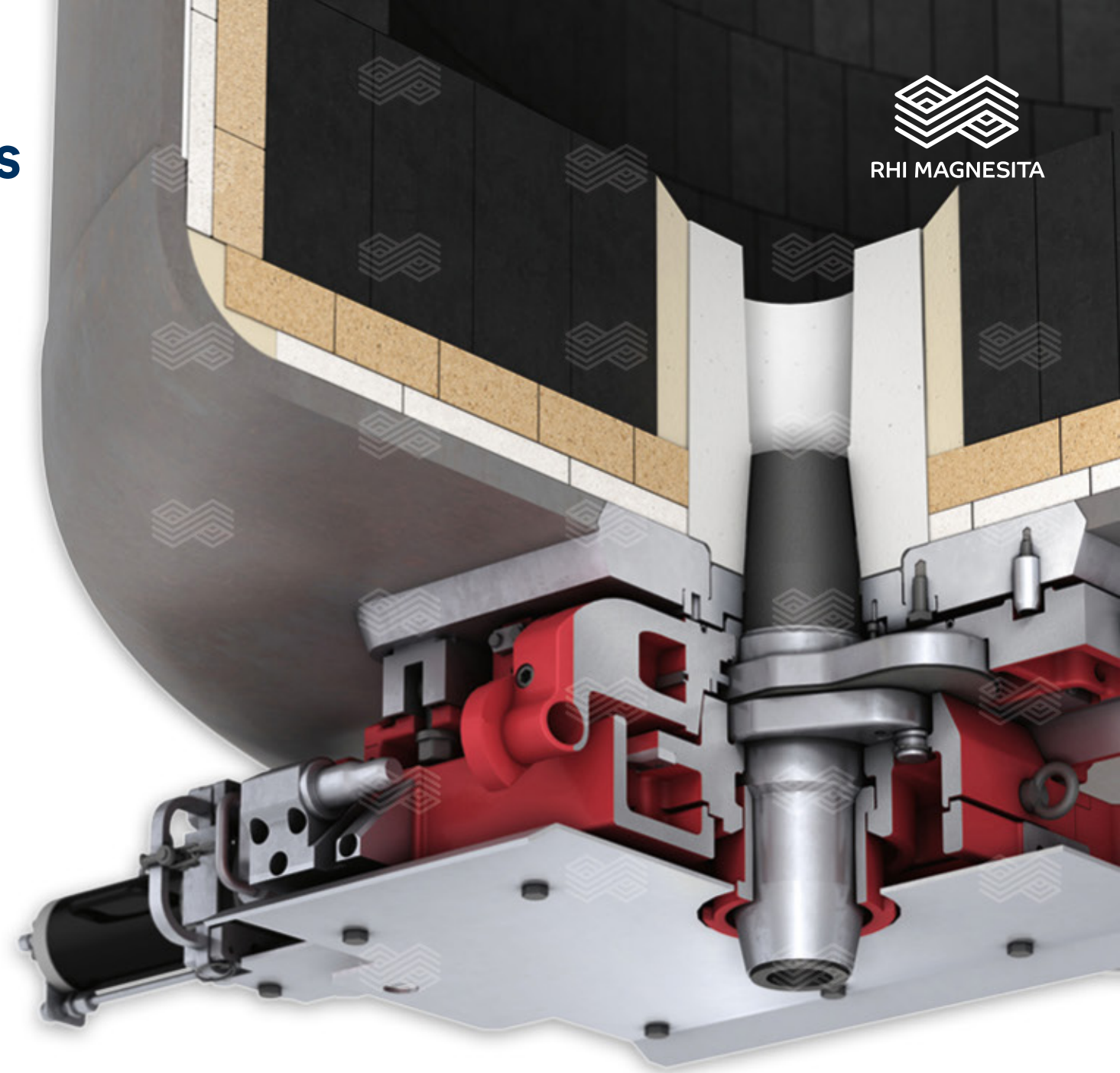
Ladle Gates Refractories

- Flexible plate sizes
- Clamping and self-centering of plates
- Positive effect to plate wear zone
- Controlled crack pattern of plates
- Wide refractory portfolio

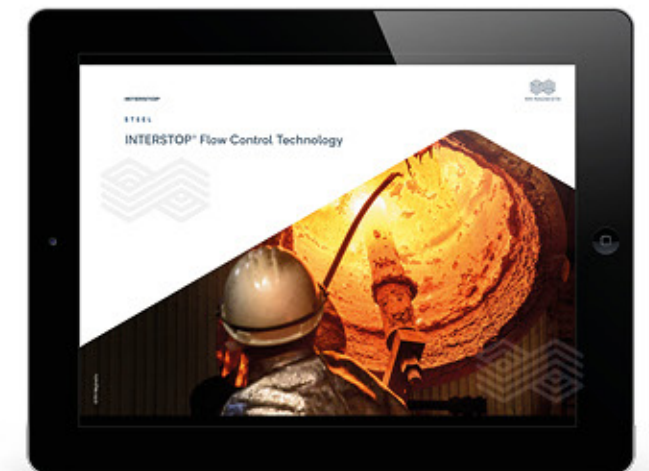


Technology — Service

- Customized fact-finding
- Proactive optimization of engineering solution
- Commissioning support and application training on site
- INTERSTOP® after sales service



More Information



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Plates & Nozzles



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Mixes Overview

Permanent Linings

DIDURIT

Non-basic Mixes

- Hydraulic-bonded thixotropic castables
- Based on bauxite and andalusite
- High strength, density and high abrasion resistance
- Sol-bonded castables alternative is available for a faster dry-out

Wear Linings

ANKERTUN

Basic Mixes

- Slurry gunning mixes that require water addition for the spray application
- Dry setting mixes for no-water, less waste applications
- Cold setting mixes for fast lining and reduced energy consumption

Mortars

DIRAM

Ramming Mixes

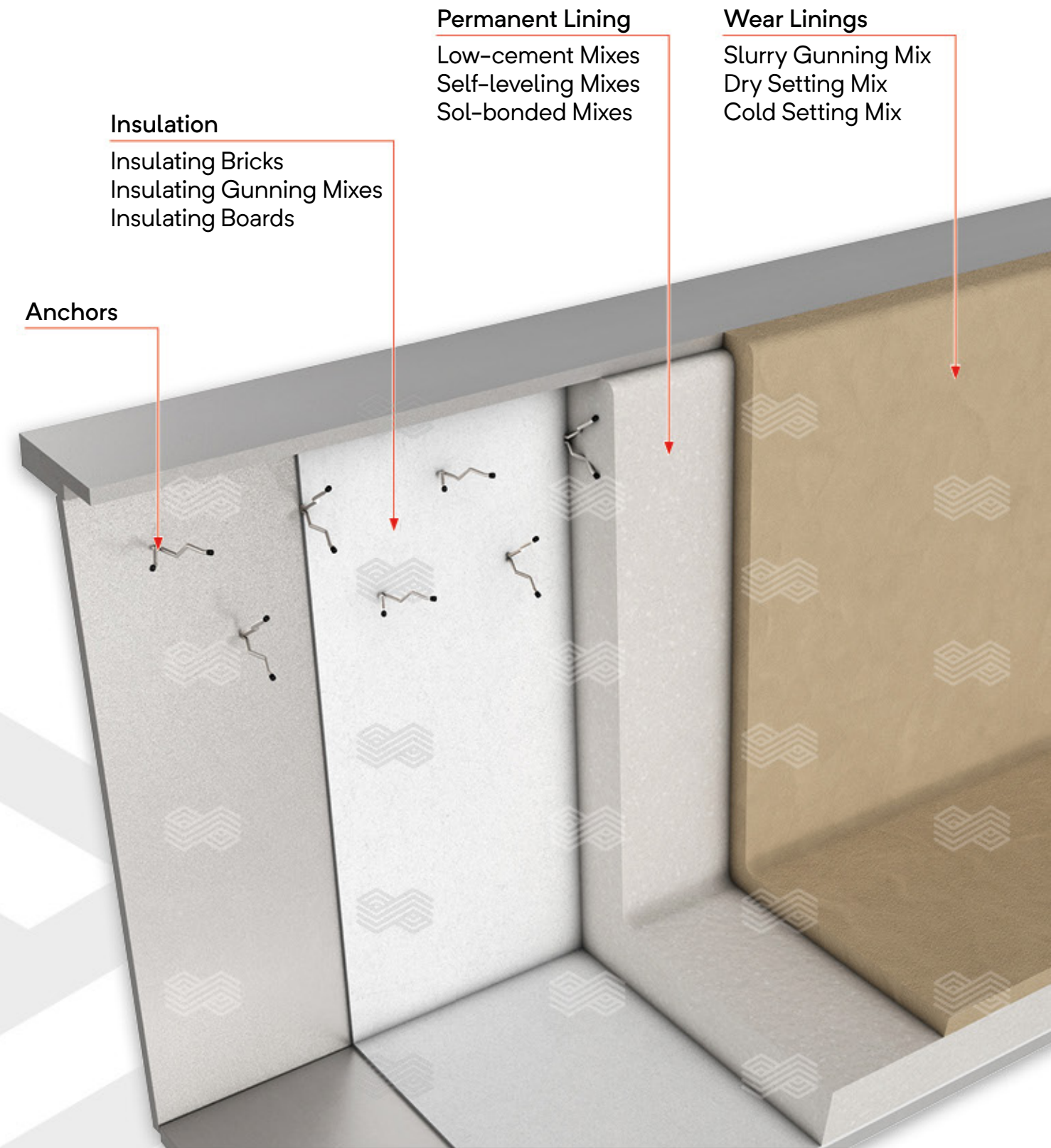
- Non-basic mixes for a wide variety of applications
- Ankermix basic mixes are also available in ramming form

Tundish Linings



Requirements for Refractories in the Tundish

- High thermal shock resistance
- High abrasion resistance to the turbulent flow of molten steel
- High chemical resistance to molten steel & cover agents
- Simple handling and installation
- Fast lining and low-energy drying
- Service life in line with the requested sequence duration



Cold Setting System

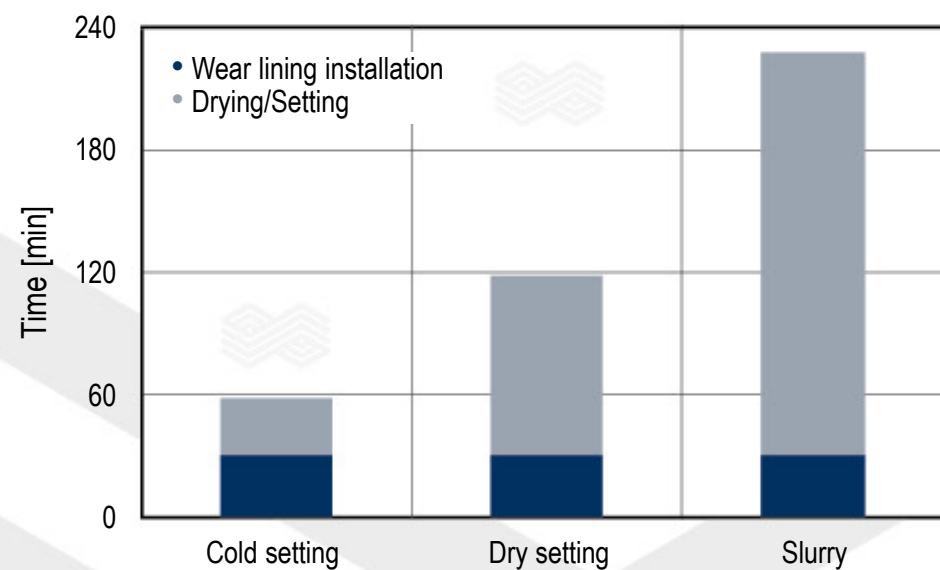
In addition to slurry gunning mixes and dry setting mixes that require thermal treatment before service, the Cold Setting System is the latest generation of tundish wear lining materials.

The term “Cold Setting System” stands for the tailored combination of three essential components:

- The ANKERTUN SH mix
- The ANKERTUN CS machine
- The adjustable tundish template

The right combination of these three components allows to obtain the best performance results of this innovative lining material.

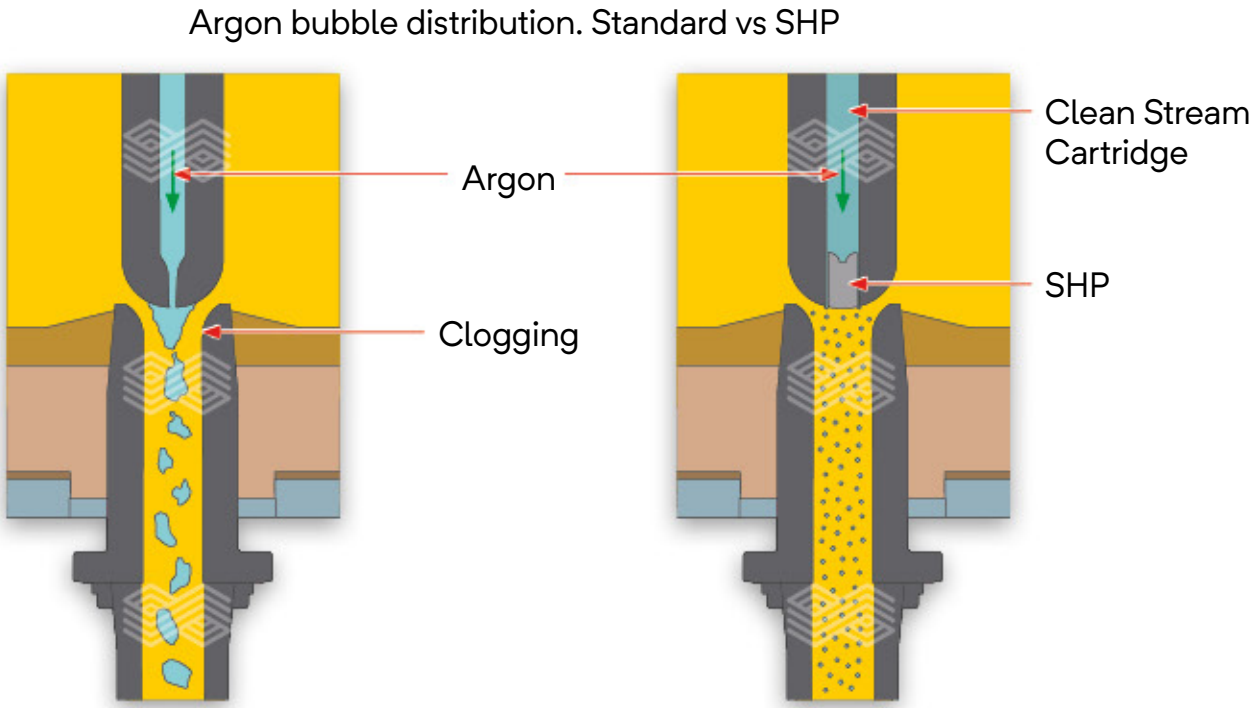
Ready-to-use wear lining in only 60 mins



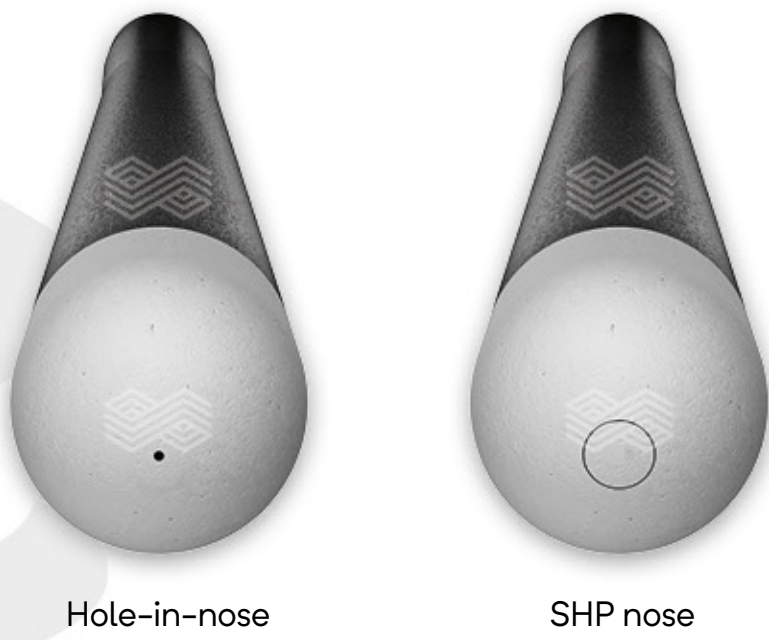


SHP Argon Purging Stoppers

RHI Magnesita's SHP stoppers for Ar purging are designed with a ring-shaped slot to improve gas bubble distribution in the casting channel to the mold. This results in reduced clogging, fewer flow perturbations and less mold slag entrapment.



- Big bubbles
 - Unstable detachment
 - Irregular bubble distribution
- Fine bubbles
 - Stable detachment
 - Even bubble distribution





High-Performance Liners

High-performance liners have been developed for RHI Magnesita's isostatically-pressed products to help prevent alumina clogging and reduce heat losses during long sequence casting in ladle-to-tundish and tundish-to-mold shrouding applications.

Tailored materials can be applied to meet highest customer demands.



Clogged standard product



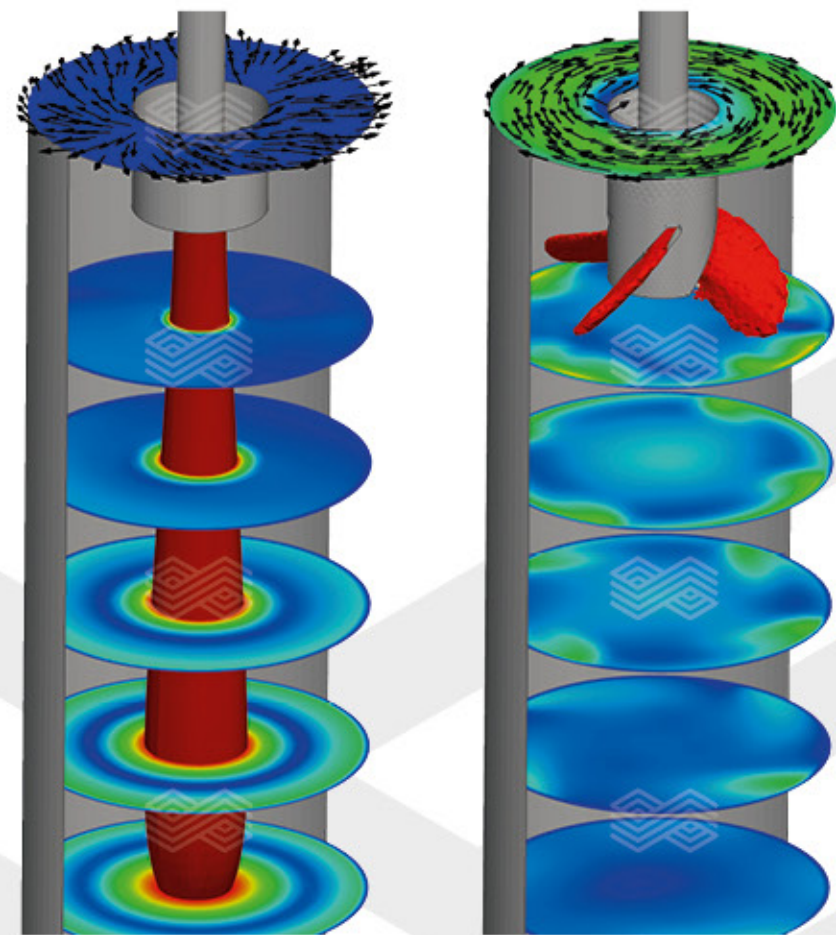
Clogging-free high-performance liner

GYRONOZZLE®

The unique design of the GYRONOZZLE® provides a significant improvement of the steel flow in the mold for billets and blooms compared to traditional single-port designs.

By creating a downwards-directed swirling flow in the mold, the heat transfer and meniscus behavior are optimized leading to improvements in the solidification of the strand shell as well as in the internal solidified structure of the cast product.

Steel jet comparison



Through-bore nozzle

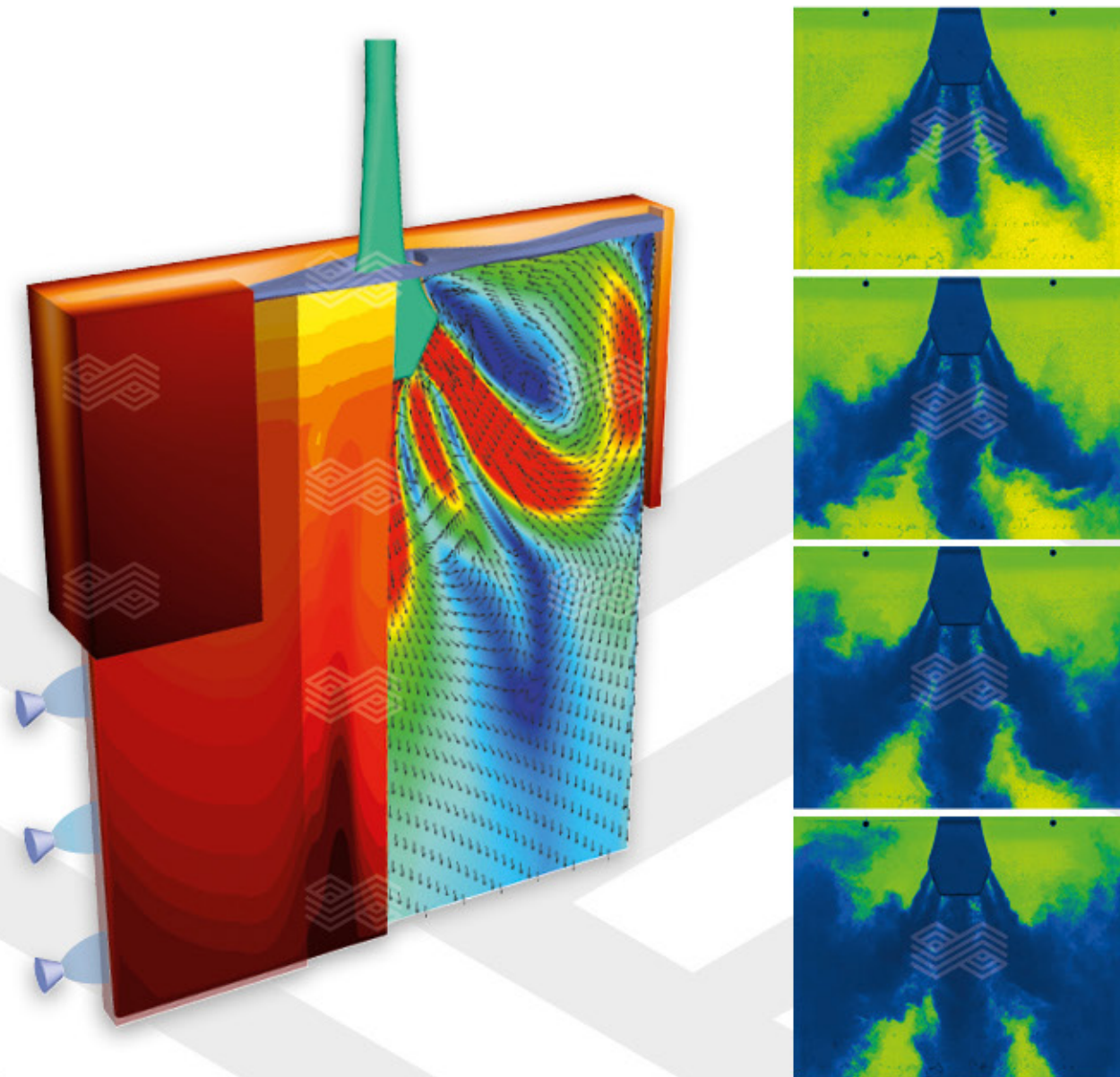
GYRONOZZLE®



Thin Slab Submerged Nozzles

Nozzles for thin slab casting are designed to maintain a stable flow with high throughput over long sequence casting.

The narrow funnel-shaped molds require a flat section of the immersed part of the nozzle. Modern simulation methods such as water modeling in combination with computational flow simulations are used to design the refractory to achieve the required flow performance.



Our Services

- Standard OEM concepts
- Tailor-designed solutions
- Computer fluid dynamics (CFD)
- Finite elements stress analysis
- Water dye-injection modeling
- High-end refractory concept
- Long-life product offer

Long life slag-band material

S-PORT nozzle design



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DELTEK® Ladle Shrouds

Flange Materials

High mechanical strength to withstand manipulation of big shrouds

Head Material

High-strength materials resistant to lancing

High-Performance Liner

Gouging-resistant inner liner for aggressive steel impingement

Body Material

Resilient alumina-graphite material to endure sequences

Slag Reinforcement

Slag resistant material

Shroud Taper

Reverse-tapered or bell-shaped shrouds for submerged opening



Shielded Shrouded Connection by INTERSTOP®

Interstop's high-end argon flow-control solution guarantees improved sealing of the steel stream minimizing oxidation and maintaining the steel's cleanliness.

Argon Shielding

Top-blown Ar, Ar-groove, porous ring

Gaskets

For tight sealing of the casting channel

Ladle Shroud Canning

Reinforced LS head and adaptation to the gimbal ring

DELTEK® Nozzles for Shrouded Casting

RHI Magnesita offers a complete range of isostatically-pressed refractories for tundish-to-mold shrouding, comprising tundish nozzles and submerged entry shrouds, submerged entry nozzles, mononozzle and monotube designs for tubechanger systems and high-technology submerged entry nozzles for thin slab casters. These are available in a wide range of material and design options with product enhancements customized to the application.

For billet & bloom casters



For slab & thin slab casters



More Information



Tundish Furniture

Pre-fabricated basic and non-basic pieces specially designed and placed to modify the flow pattern in the tundish reducing turbulence, dead volumes and increasing residence times. These provide better steel cleanliness, homogenization and overall improvement of the operating conditions at the continuous caster.



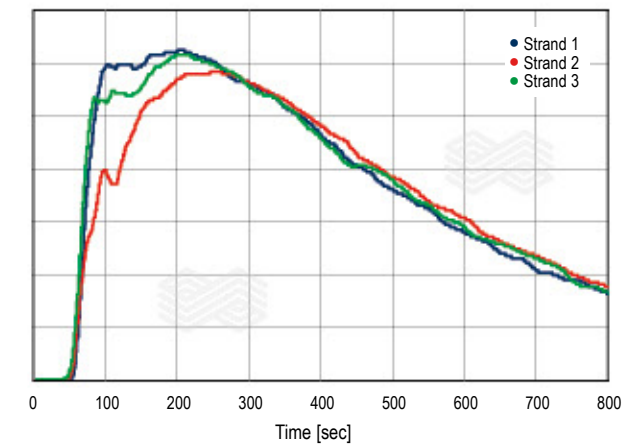
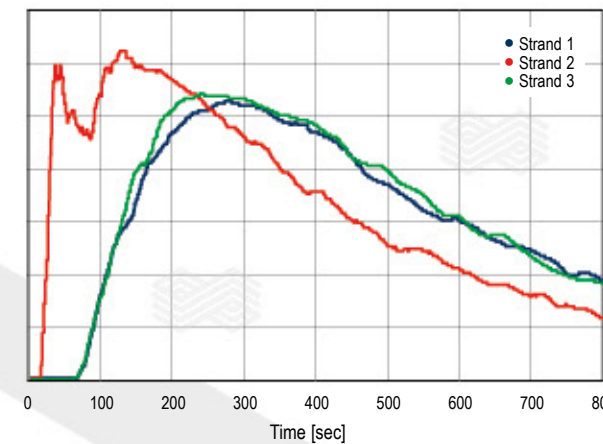
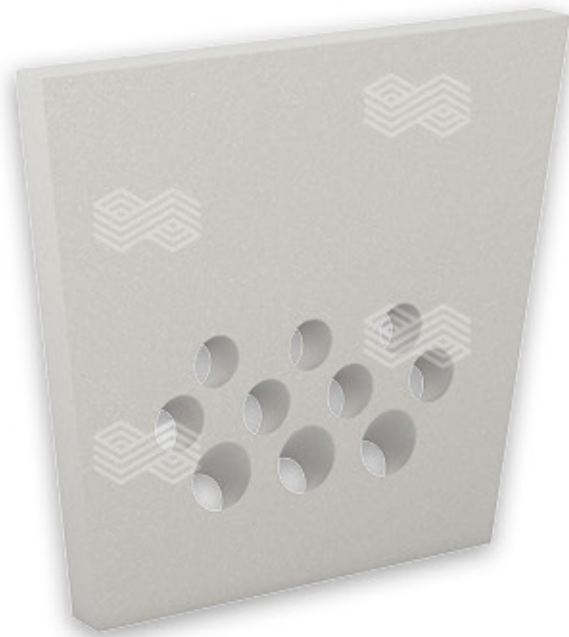
Risa Impact



TUNFLOW™ Chevron



Purging Beam



Simulation Tools for Optimization of the Tundish Configuration

RHI Magnesita tundish furniture offer

- Impact plates & impact pots
- Dams and weirs
- Argon purging beams

Furniture Benefits

- Increased residence time for the flotation of inclusions
- Improved steel bath homogenization
- Minimized dead volumes in the tundish
- Minimizing mixed volume when changing grades

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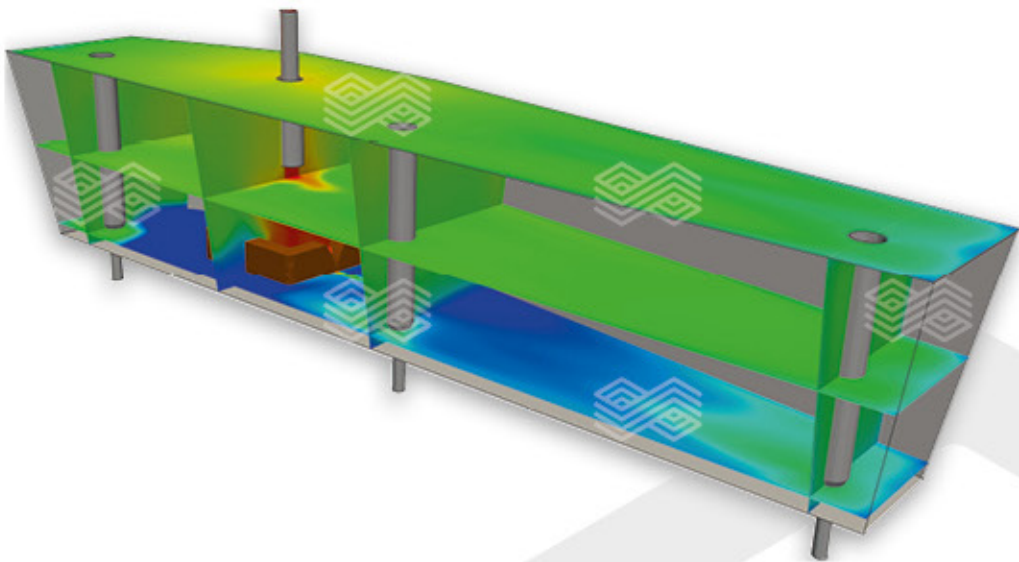


TUNFLOW™ Impact Pots

RHI Magnesita provides our customers with a line of tundish steel flow modifiers, especially developed for each individual tundish geometry to achieve optimized steel flow by means of simulation methods, namely CFD and water modeling.

Shape design features have been developed to guarantee safety and support efficiency of the casting process.

Each TUNFLOW® design is a specific customer project adapted to process requirements, from anti-splashing to reduced dead volumes, turbulences and downgrading at grade change.



TUNFLOW™ steel flow optimization through CFD/water model

TUNFLOW™ Push

TUNFLOW™ Meander

TUNFLOW™ Hybrid

TUNFLOW™

Strand Lubricants

DELTEK® IF — Mold Fluxes Made-to-Measure

Thanks to the partnership with PROSIMET, specific knowledge is available in both managing raw material properties and understanding end user needs. DELTEK® IF is the perfect solution for your casting process:

- Gives chemical protection of liquid steel from oxidation
- Provides thermal insulation avoiding solidification of steel surface
- Lubricates the strand-mold system by ensuring a uniform heat transfer at the interface
- Non-metallic inclusion (NMI) absorption potential, without losing material properties



Selective Adjustment of:

- Flux basicity
- Flux viscosity
- Melting rate
- Melting behavior
- Crystallizing behavior



PROIL — The Revolution

PROIL is the next innovation in the open continuous casting environment. This new product is a solid-liquid dispersion, now offering the possibility to use the advantages of mold fluxes in billet casting, while at the same time avoiding the existing drawbacks of oil as mold flux.



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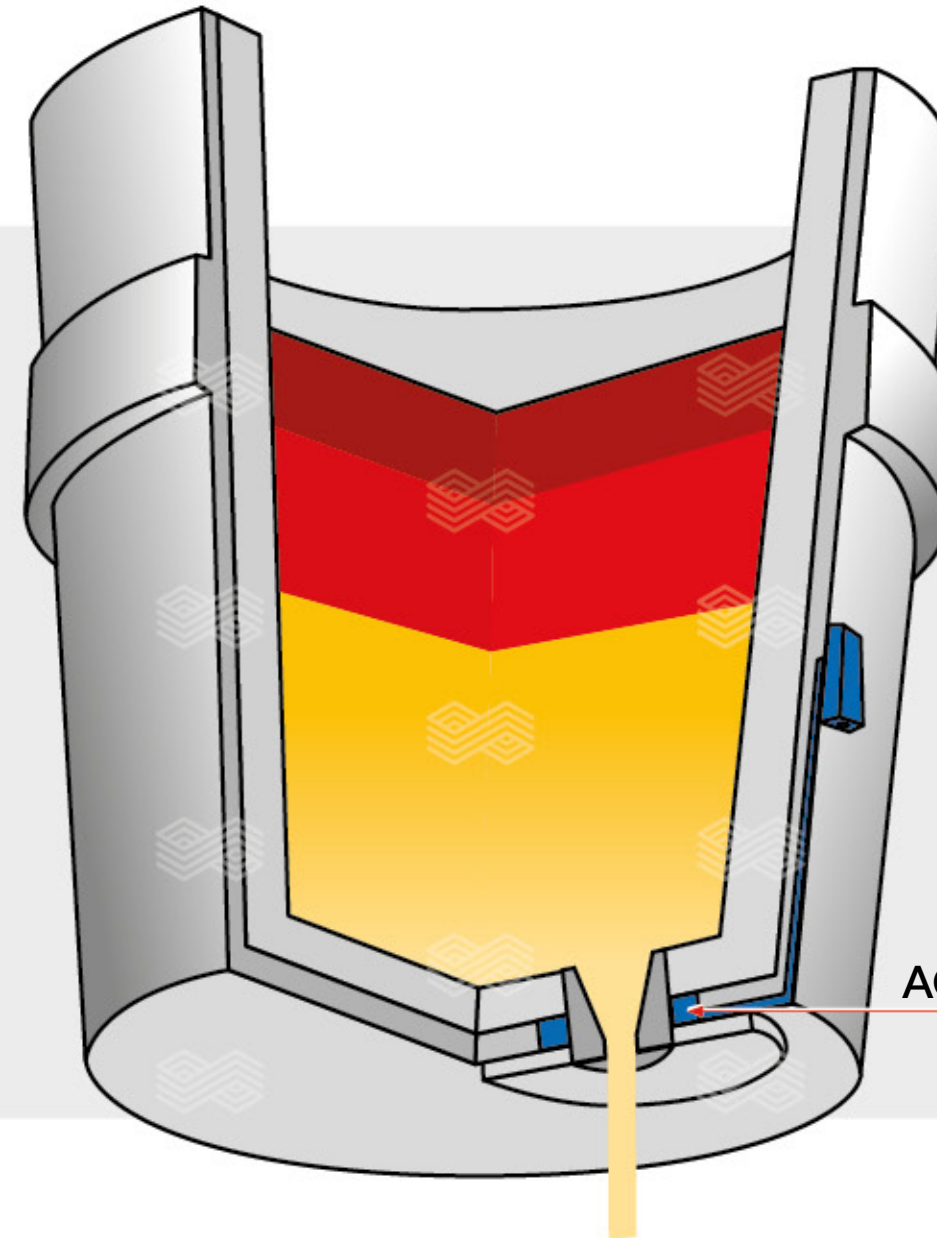
EMLI-LadleSlag

Electromagnetic slag detection for ladles

User Benefits & Advantages

- Control slag carryover precisely with a fast response time
- Increase yield by leaving minimal amounts of steel in the ladle
- Can handle any steel grades. No additional calibration necessary

More Information



AGELLIS® EMLI Sensors

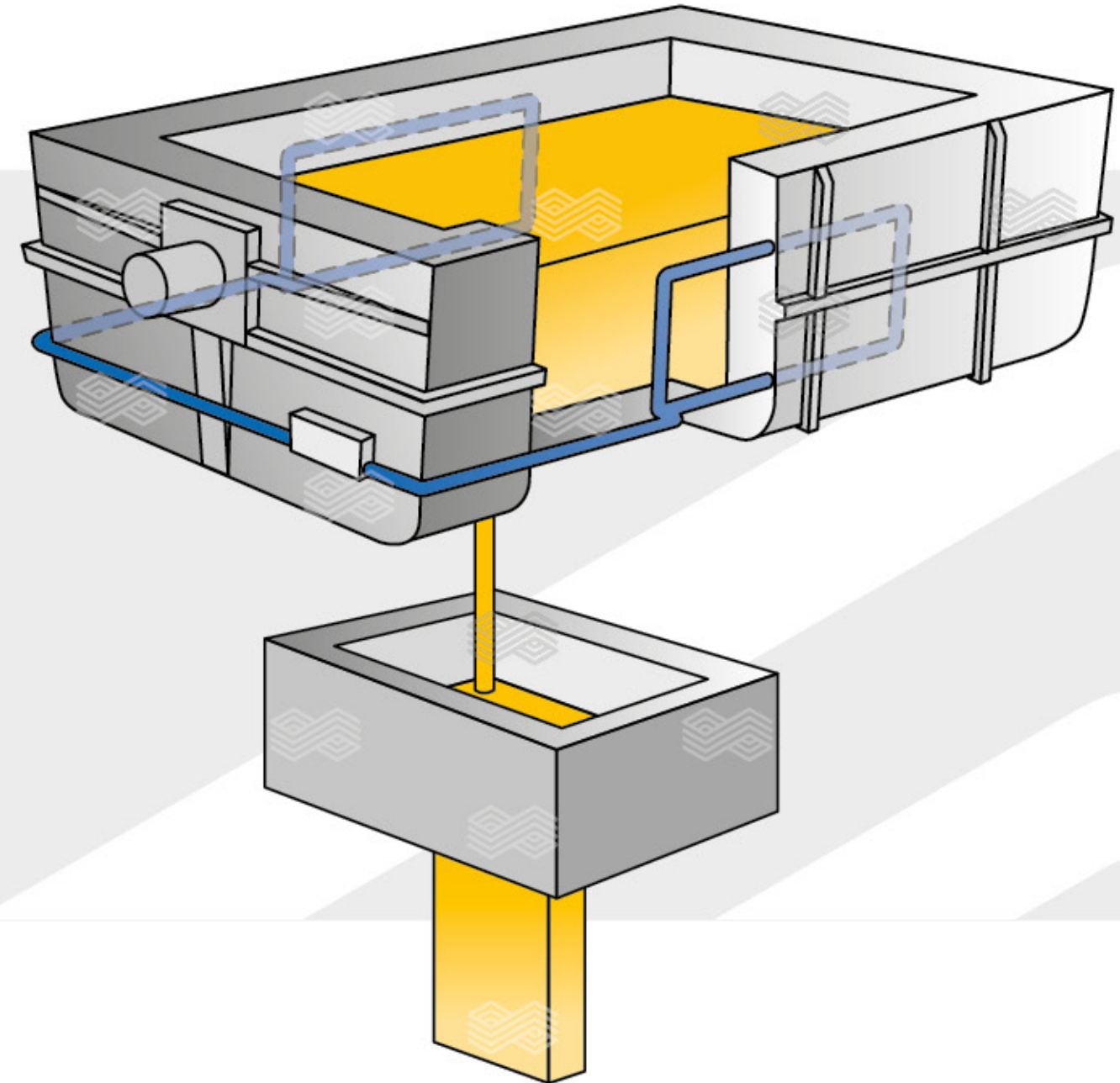
EMLI-TundishLevel

Continuous Tundish Steel Level Measurement

User Benefits & Advantages

- Continuous true steel level measurement
- Optimize yield at every drain
- Avoid slag in mold & breakouts
- Minimized intermixed area
- More constant casting speeds

More Information



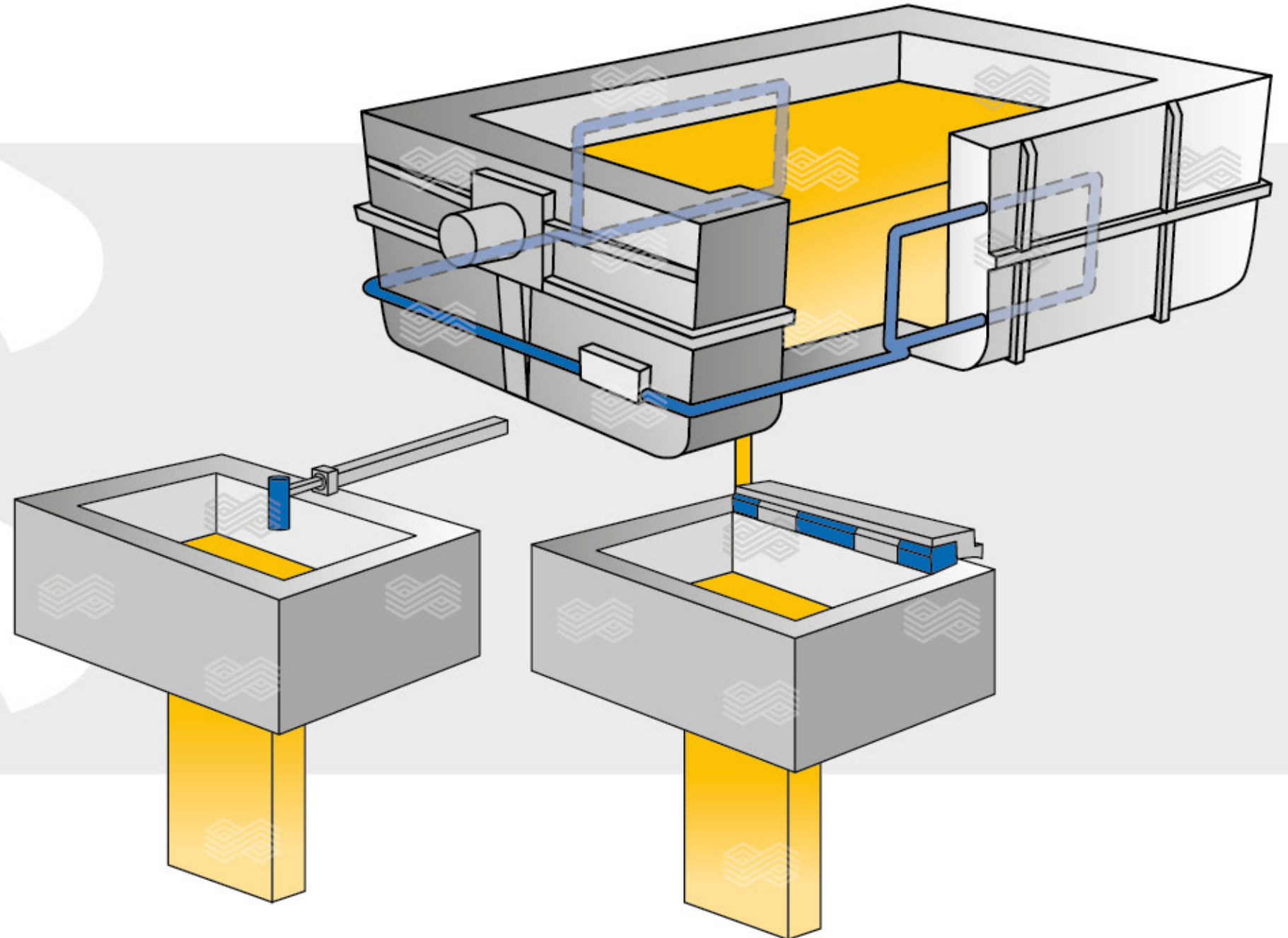
EMLI-MouldLevel

Electromagnetic Mould Level Measurement

User Benefits & Advantages

- True steel meniscus level independently of powder thickness
- Fast true response time
- Automatic and fast calibration
- Can be used with EMS, EMBr and mold coatings

More Information



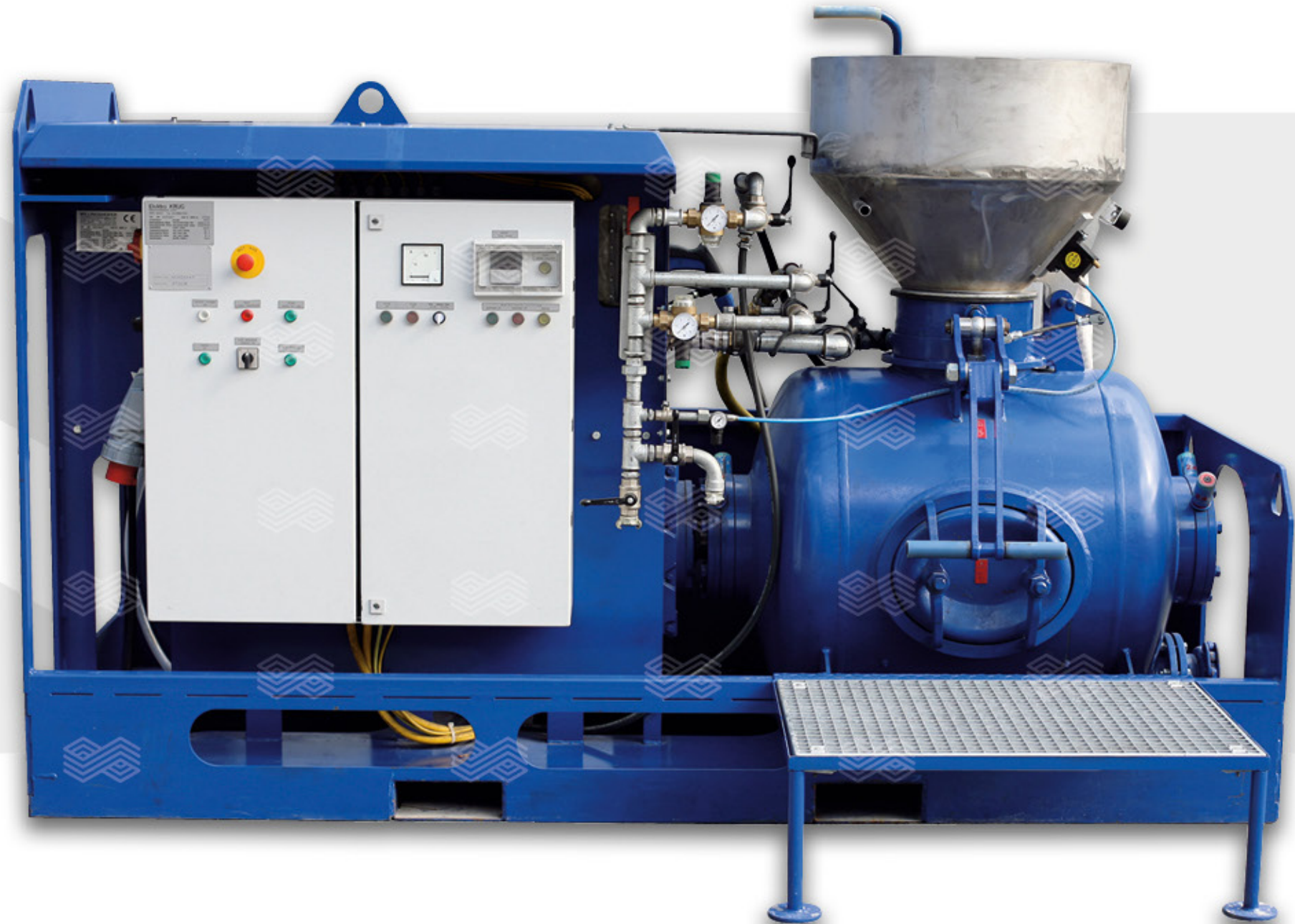
MIXOMAT

Application:

Mixing and pumping unit for monolithic refractory linings

Advantages:

- Useable in a variety of aggregates
- Precise water addition
- High mixing quality
- Transportable by crane and forklift



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E402L

Application:

Continuous mixer for monolithic refractory linings

Advantages:

- Useable in a variety of aggregates
- Easy to use and install
- Continuous lining



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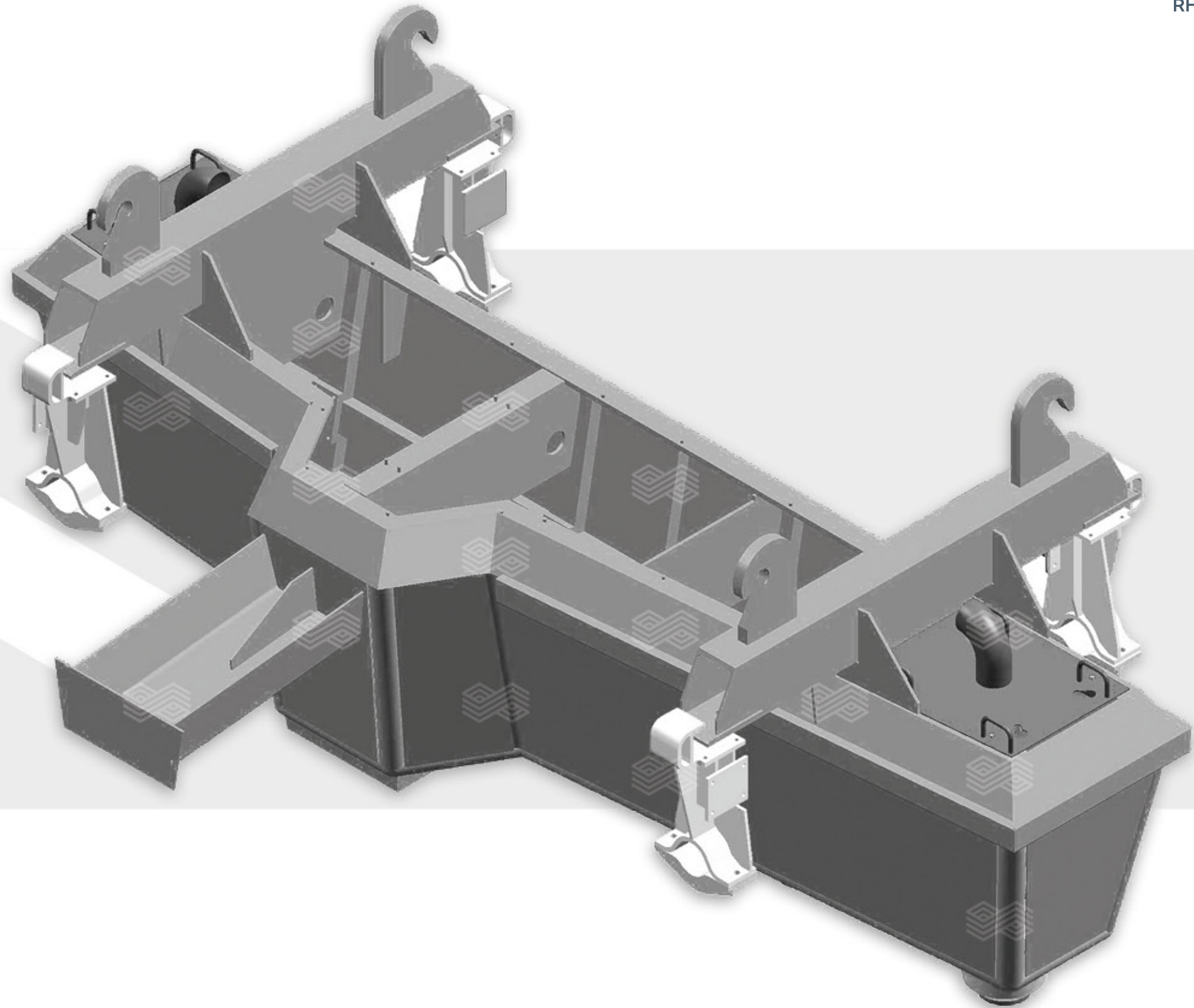
Tundish Template

Application:

Template for tundish permanent lining

Advantages:

- Stable steel frame design
- Round shaped edges
- Self-centering template
- Shock absorbers
- Fix mounted vibrators
- Vibration density infinitely variable



ANKERTUN

Application:

For tundish slurry gunning

Advantages:

- Robust frame design
- Open mix pumping system
- Quick pump changing system
- Easy-to-use automatic and manual operation
- Transportable by crane and forklift



ANKERTUN CS

Application:

For tundish wear lining with cold setting mixes

Advantages:

- No lose of material at the beginning and end of lining
- Consistent mixing quality
- Consistent material and water flow
- Template vibrators controlled by the mixer control panel
- Mixer cleaning program
- Easy to use
- Less physical strain on operating personnel
- Safe working conditions



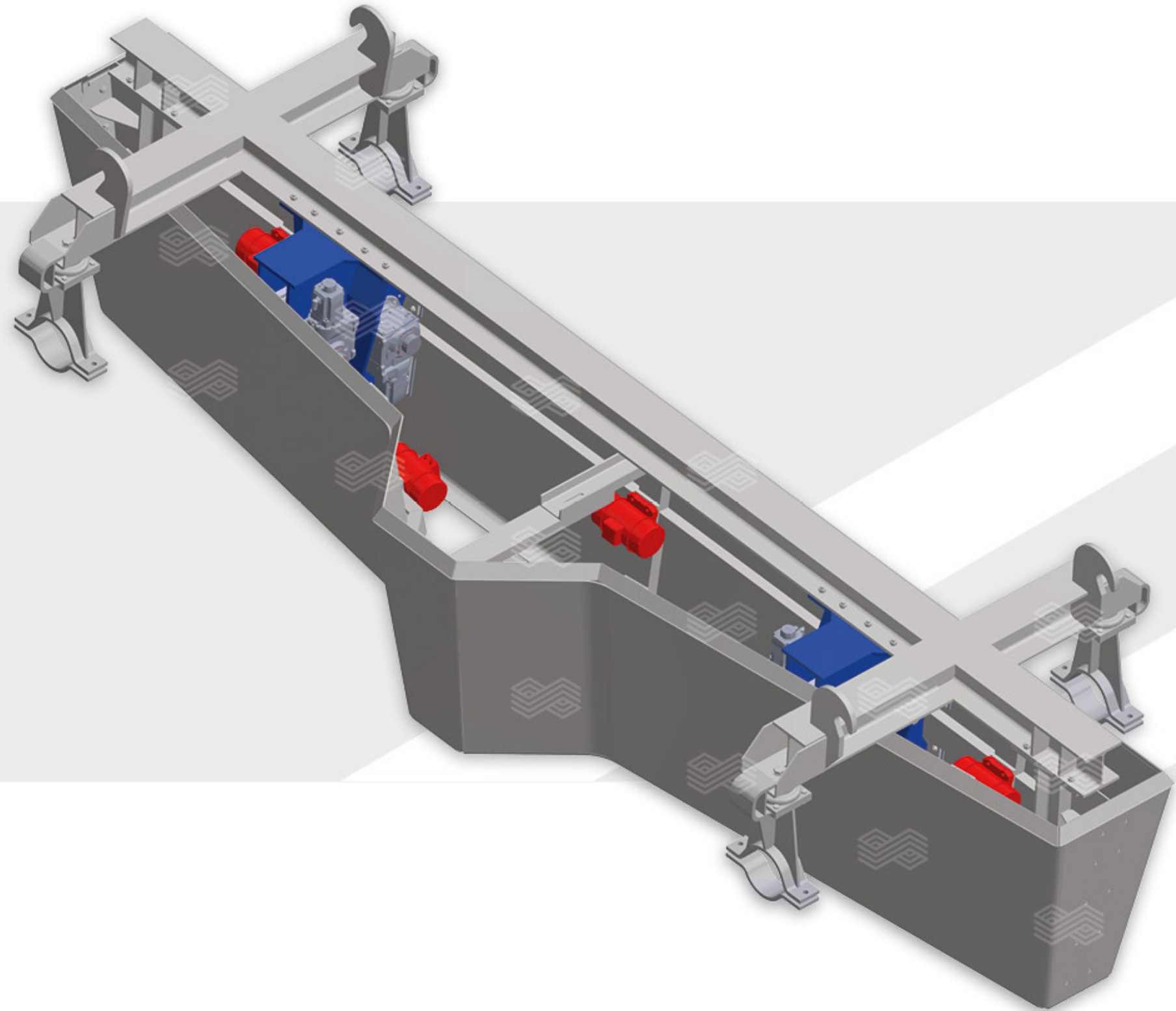
Tundish Template for Cold Setting Mixes

Application:

Template for tundish wear lining

Advantages:

- Self-centering template
- Template with adjustable lining thickness available
- Fix mounted vibrators
- Vibration density infinitely variable
- Installation of dams and weirs also possible
- Easy to use

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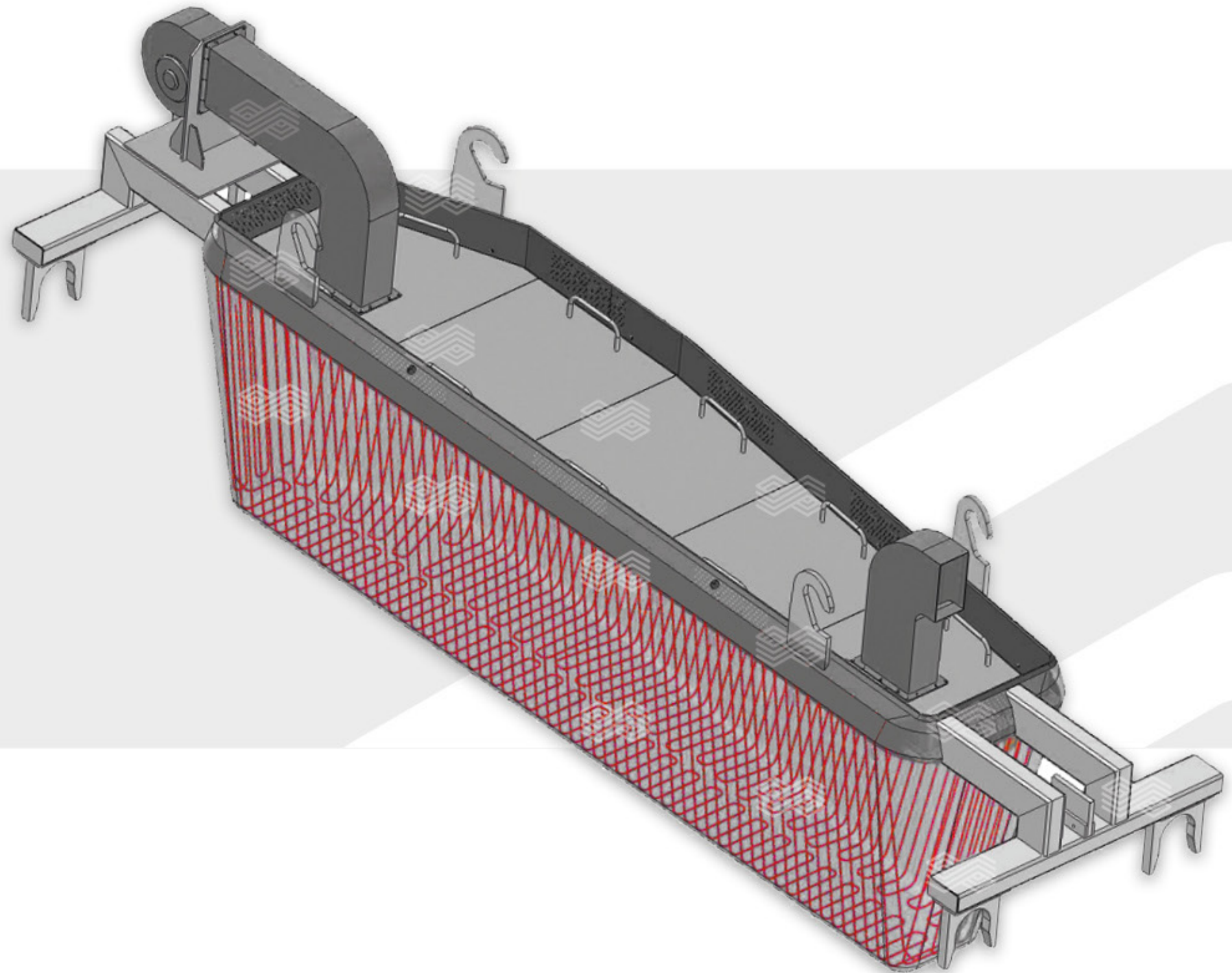
Tundish Template for Dry Setting Mixes

Application:

Template for tundish wear lining

Advantages:

- 2 types available
 - > Template with integrated electrical heating
 - > Template for existing gas heating systems
- Self-centering template
- Easy to use



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