



RHI MAGNESITA

STEEL / LADLE GAS PURGING

# Gas Purging Systems for Steel Casting and Treatment Ladles



# 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.

**35**  
Main production and  
raw material sites

**70**  
Sales offices

**180**  
Countries shipped  
to worldwide

North  
America

3 COUNTRIES  
1 R&D CENTER

South  
America

6 COUNTRIES  
1 R&D HUB

Europe

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

Middle East/  
Africa

2 COUNTRIES

9 COUNTRIES  
3 R&D CENTERS

Asia  
Pacific

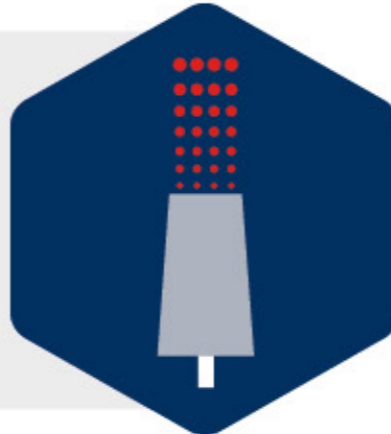


# Gas Purging Systems for Steel Casting and Treatment Ladles

More than 800 customers from the steel and foundry industries in over 60 countries worldwide rely on RHI Magnesita as a trustful partner for ladle purging ceramics. As a system and solution provider we closely cooperate with you as our customer supporting you with expertise and experience in the fields of application technology, R&D, simulations, quality management and production.

## Purging Ceramics

- Purging plugs with customized shapes in different designs
- Customized blocks and sleeves
- Prefabricated sets with easy exchange technology



## Equipment

- Safety closing systems for ladle purging plugs
- Gas control systems
- Check valves
- Testing facility for purging plug functionality tests



## Technology — Service

- Customized fact-finding
- CFD analysis for optimization of plug positioning and recommended gas volume
- Commissioning of purging facility
- After sales service



# Purging Plugs



Hybrid Plug



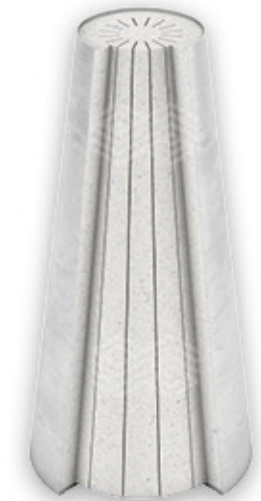
Segment Plug



Porous Plug



Star Plug



Slot Plug

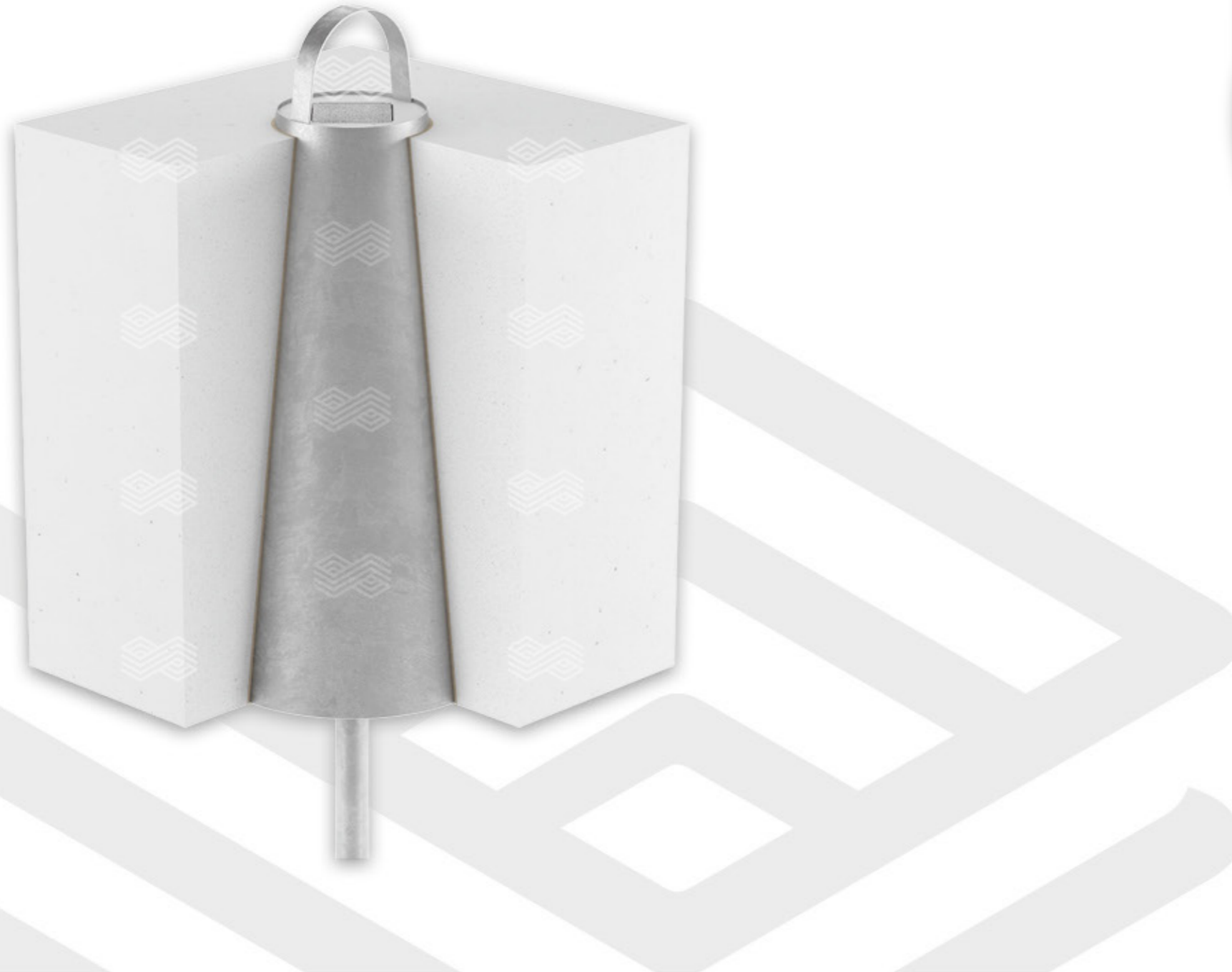
Optimum product for		High-grade steel	High-grade steel	Stainless steel & foundries	Low-alloyed steel	Low-alloyed steel
Type		Multi piece	Multi piece	Single piece	Single piece	Single piece
Structure		Pressed & fired inserts, cast	Pressed & fired inserts, cast	Pressed & fired	Cast	Cast
Suitable for application		Continuous & discontinuous	Continuous & discontinuous	Continuous & discontinuous	Continuous	Continuous
Initial opening rate		+++	+++	+++	++	+
"No maintenance plug"		Yes	Yes	Yes	No	No
Porosity		Random & direct	Random & direct	Random	Direct	Direct
Flow rate	Controllability	+++	++	+++	+	+
	Range	++	++	+++	+++	+++
Comment		Optimum soft bubbling behavior	Perfect all-rounder	Special product for special application	Optimized design of gas outlet	Up to 60 slots
Main brand		DIPERMAL	ANKERPERM	ANKERPERM & DIPERMAL	URSTAR	URBLOCK
Main raw material		Al <sub>2</sub> O <sub>3</sub>	Al <sub>2</sub> O <sub>3</sub>	MgO	Al <sub>2</sub> O <sub>3</sub>	Al <sub>2</sub> O <sub>3</sub>

# Blocks and Sets

## Preassembled Sets

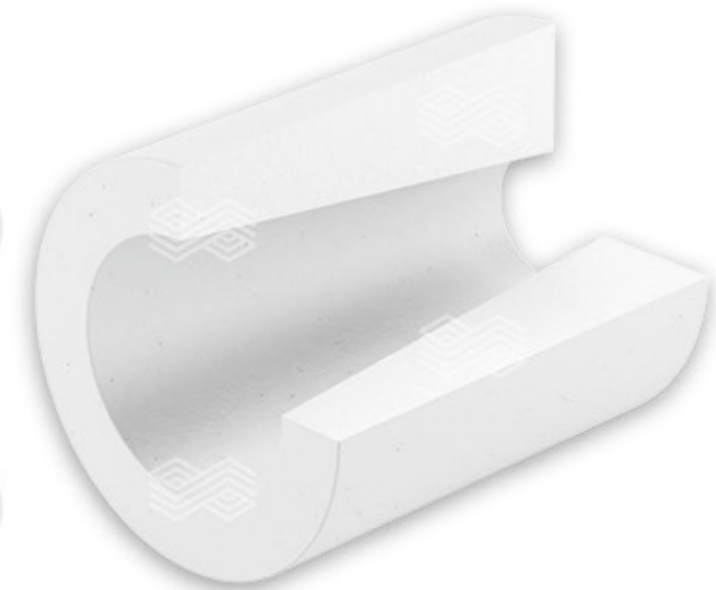
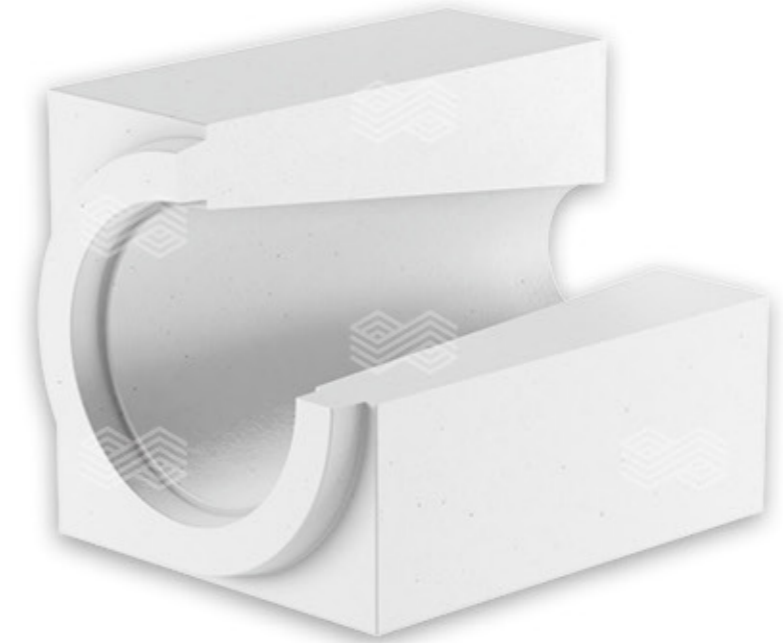
Preassembled sets consisting of purging plug and block are equipped with a transport hook as a standard and provide the following advantages:

- Easy handling
- Precise mortar joint
- Optimized lifetime of the installed purging plug



## Blocks

RHI Magnesita offers customized block shapes with adequate outer geometry for all purging plug types and shapes.



# Easy Exchange Technology

This technology supports an easier plug exchange and a tight fixation of the plug in the block. The Easy Exchange Technology comprises:

- Special graphite coating on the block inner surface
- High-performance mortar, aligned with the composite system
- Refractory coating on the plug steel cone

## Advantages

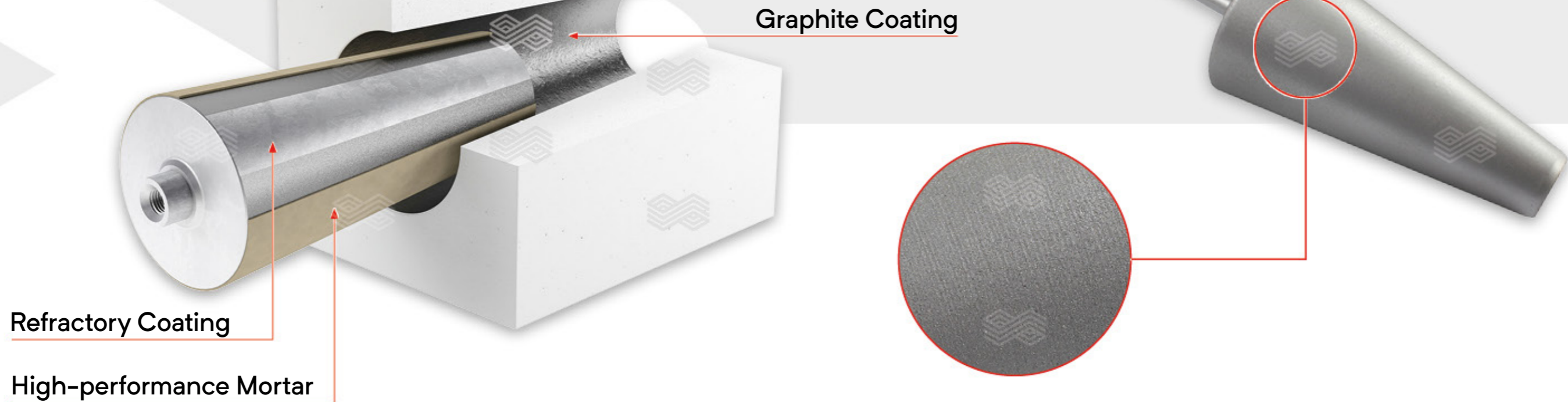
- Accurate geometry of the mortar joint
- Highly refractory mortar tailor-made for purging applications
- Perfect fixation of purging plug in block
- Protection of the mortar joint during oxygen lancing
- Precise and quick removal of residual mortar
- Fast plug exchange

## Ceramic Coating of Purging Plugs

Ladle purging plugs always come in a steel cone in order to ensure a gas tight connection between plug and purging gas supply. For installation a refractory mortar is put onto the steel cone and subsequently the plug is mounted into the block/ladle bottom.

## Advantages of Ceramic Coating

- Formation of a rough, sandpaper-like plug surface
- Mortar for installation will stick perfectly to the surface
- Optimal fixation of purging plug in block
- Increase of liquidus temperature of the mortar by reaction with the refractory coating



Content



Ceramics



Equipment



Service



# Safety Systems for Purging Ceramics

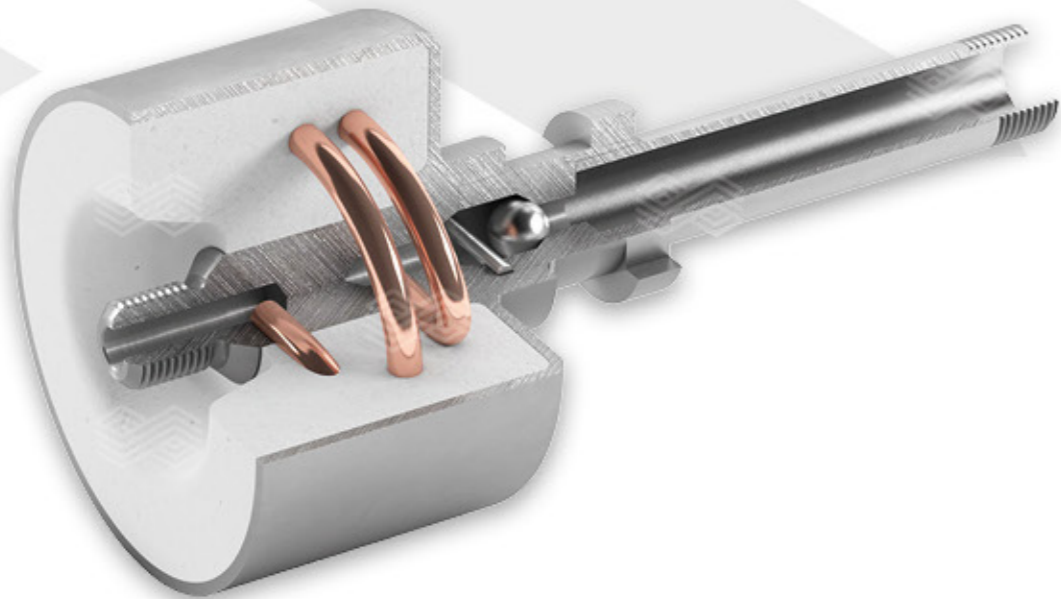
## Residual Thickness Indicator

The timely changing of the purging plug is essential for the operational safety of the gas purging system. As soon as the indicator becomes visible, the minimum purging plug height has been reached and the plug needs replacing.



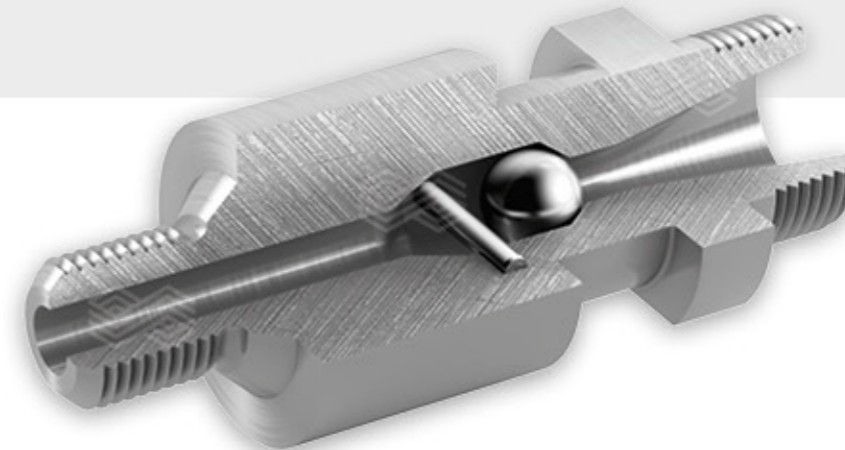
## Breakout Safety System

To enhance the level of operational safety, a breakout safety system can be attached to the ladle purging plugs. It consists of copper spirals embedded in a high alumina mix. In the unlikely event that steel should leak out of the purging plug, it is channeled into the spirals where it solidifies.



## Safety Check Valve

As an alternative to a breakthrough safety pad with a copper spiral, RHI Magnesita offers an innovative safety check valve. It increases the initial opening purging safety by the prevention of suction effects and associated infiltrations and by protection against steel leaking through the purging plug.



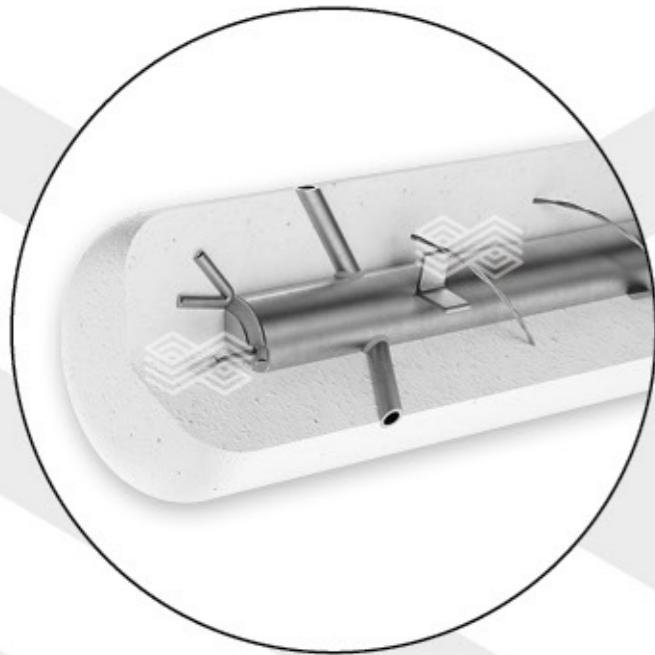
## Customized Lance Design for Each Application

- Oxygen purging
- Argon purging (LF treatment; emergency use)
- Desulfurization



### Tuyere Pipe Design Variety

Different designs of tuyere pipes for each application; variation in amount/size/position



### Reusable Design

Option for reusability of connection unit

- Adjustability
- Cost saving



### Connection Unit

Customized suspension and gas connection units



# Standard Closing and Safety Closing Systems

Closing systems contribute significantly to the safe operation of ladle purging. Depending on the requirements, we supply various systems, from a simple wedge system to the widely used bayonet system and the optimized safety closing system.

Features	Wedge Gate	Bayonet Hinged Cover	Bayonet 250	SOC System	SIG-VI System	SOC-H System
Operational safety	☆☆	☆☆	☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆
User-friendliness	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆	☆☆	☆☆
Safety against self opening	☆	☆☆	☆☆	☆☆☆	☆☆☆	☆☆☆☆
Safety against steel breakout	☆	☆	☆	☆☆☆☆	☆☆☆☆	☆☆☆☆
Multiple overlapping safety features	☆	☆☆	☆☆	☆☆☆	☆☆☆	☆☆☆☆
Full system solution (modular system for setting and extraction)	☆	☆	☆	☆☆☆☆	☆☆☆	☆☆☆☆
Suitable for all purging plug shapes	yes	yes	yes	yes	no	yes
Suitable various designs of purging plugs safety devices	no	no	no	yes	no	yes

☆☆ Appropriate ... ☆☆☆☆ Excellent

# SOC-H

## Safety Optimized Closing System — Hinged

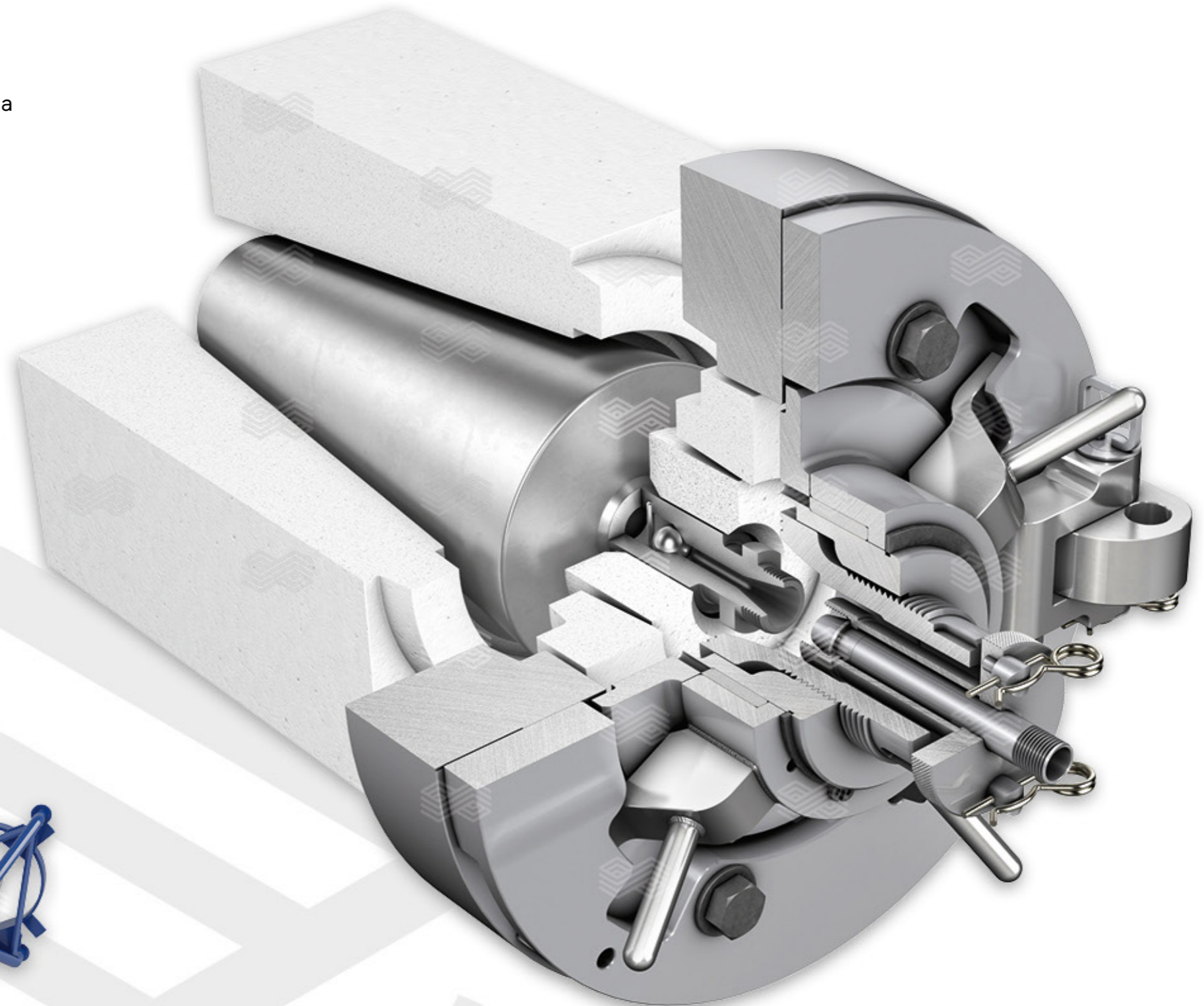
SOC-H is the latest evolution of ladle closing systems by RHI Magnesita and is a further development of the well-established SOC-system.

### Advantages

- All-in-one system solution
- 100% reliable and safe
- Compact design
- No loose parts (screws, etc.)
- Easy handling
- No heavy parts (closing plate) have to be lifted
- Easy upgrade from SOC to SOC-H

The SOC-H system can be used with every RHI Magnesita purging plug type. As entire system solution it includes:

- SOC-H purging ceramics
- SOC-H closing system
- SOC-H setting device
- SOC-H extraction device
- SOC-H tools & accessories



SOC-H setting device



SOC-H extraction device

Content



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Service



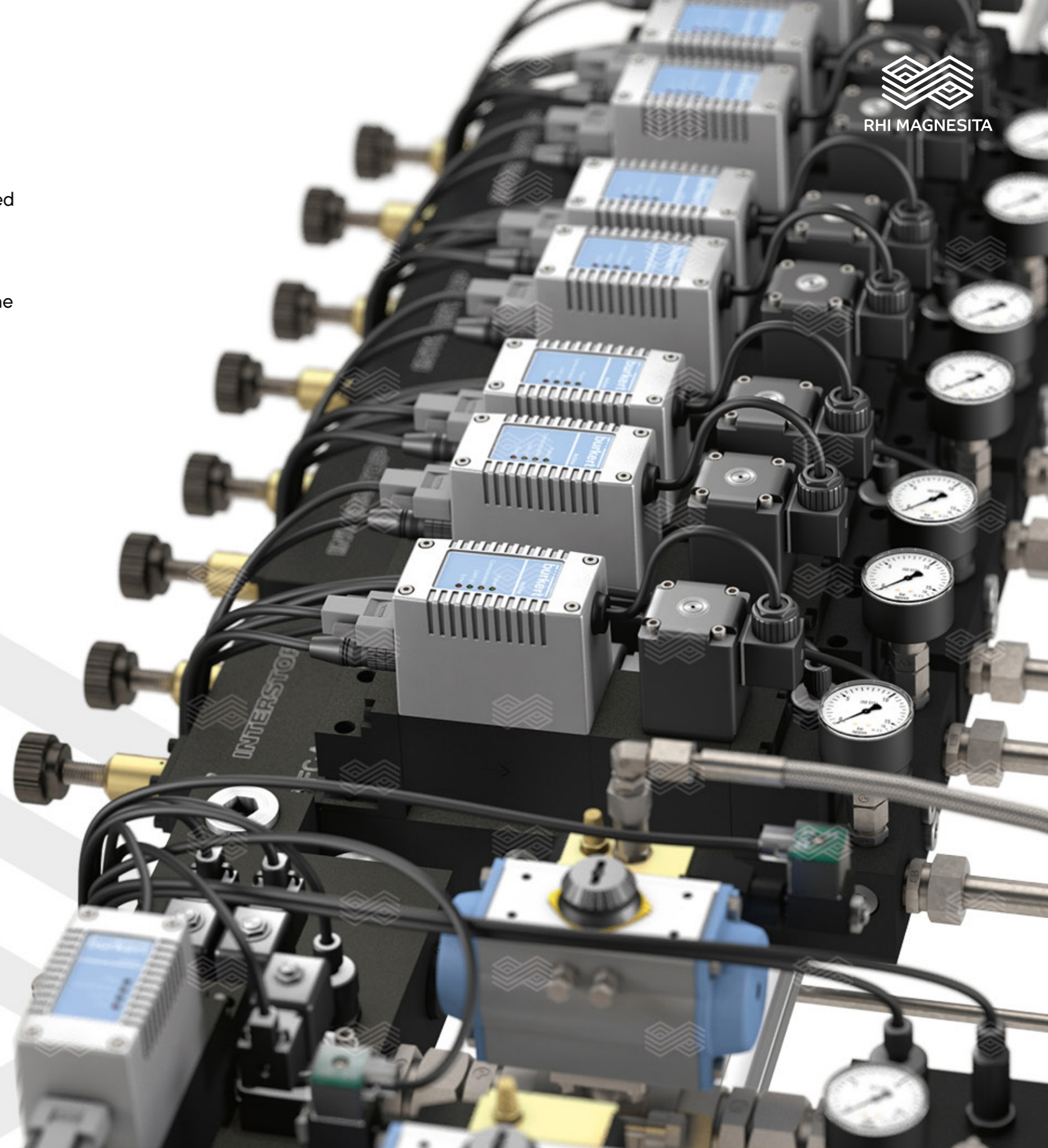
# Gas Control Systems

Accurate gas control assists optimal process management. Productivity is improved by faster homogenization, less burnout of any alloy agents, lower consumption of deoxidizing agents and shorter heat cycles.

Under the INTERSTOP® brand, RHI Magnesita offers gas control boxes which define the state of the art.

## Advantages

- Optimal integration and alignment to the customer process and purging ceramics
- Exact adjustability of purging gas amount
  - > From purging to improve steel purity to homogenization
- Intuitive operation based on clear visualization
- Compact design appropriate for steel plants
- Customer-specific software solution (optional)
- Maintenance-friendly modular design
  - > Exchange of parts during operation possible
- Complete and very detailed documentation



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# Plug Function Device — PFD

High initial opening rates as well as high service life of ladle purging plugs are important prerequisites for efficient and modern steel production.

These two parameters can be optimally achieved by a correctly performed plug service.

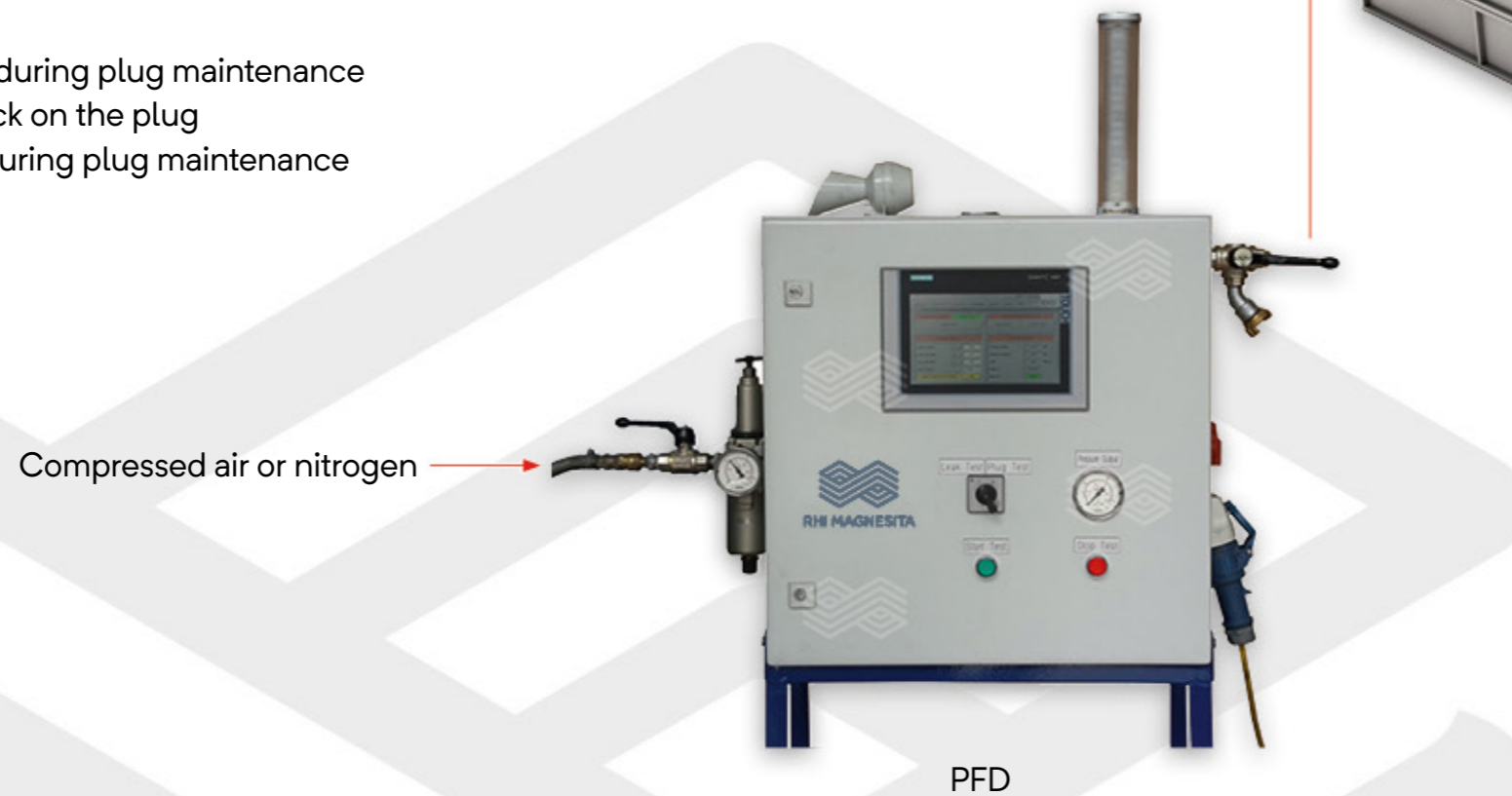
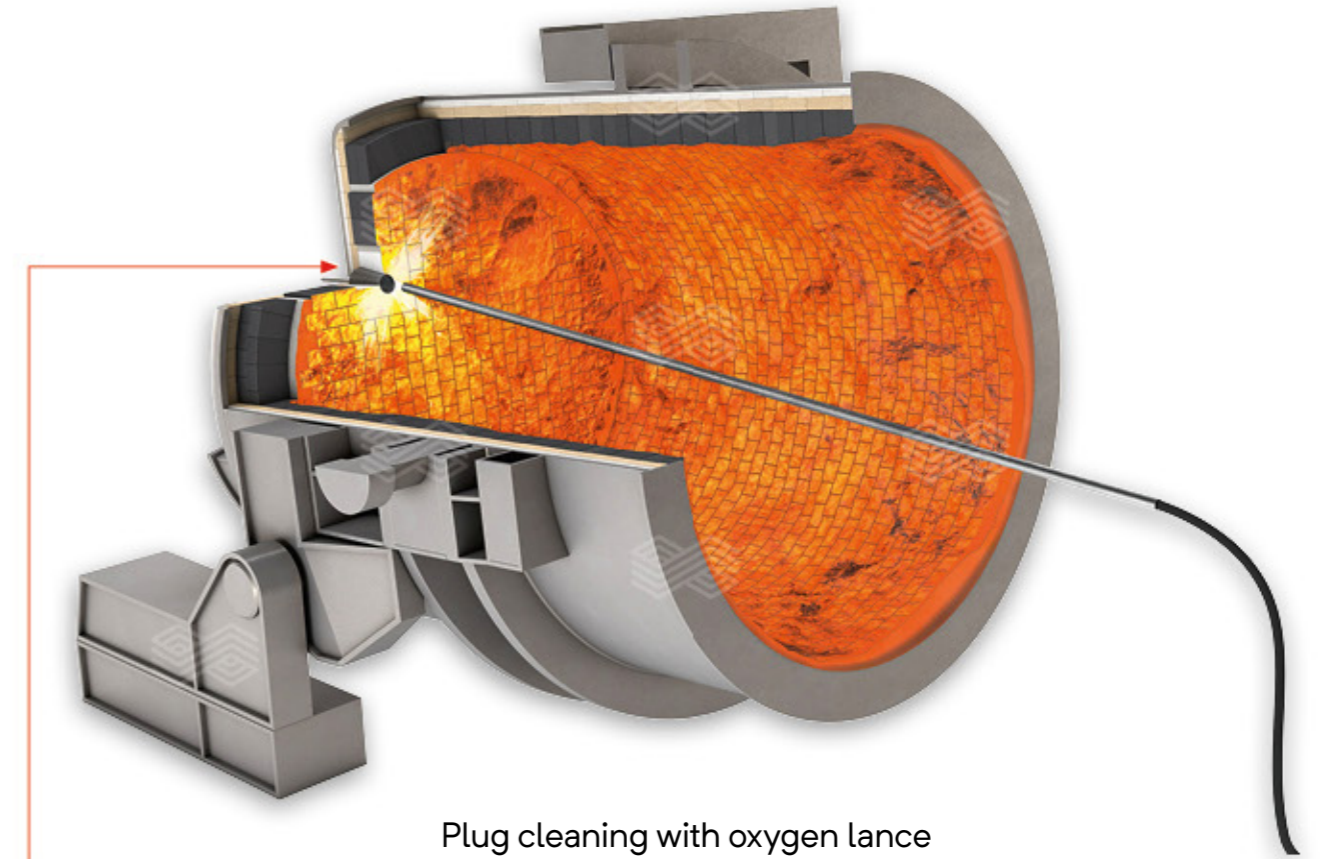
The PFD supports the ladle operators in correctly performing plug cleaning and using the oxygen lance to the required extent.

### Customer Benefits:

- Increased productivity
- Increased safety
- Increasing plug opening rate
- Increasing life time of purging ceramics

### Achieved by:

- Reduced O<sub>2</sub> cleaning during plug maintenance
- Reduced thermal shock on the plug
- Reduced manpower during plug maintenance



# Technology — Service

## Customized Fact-finding

- Get an overview of the actual process and situation
- Review existing equipment
- Definition of possible improvements

## CFD Analysis

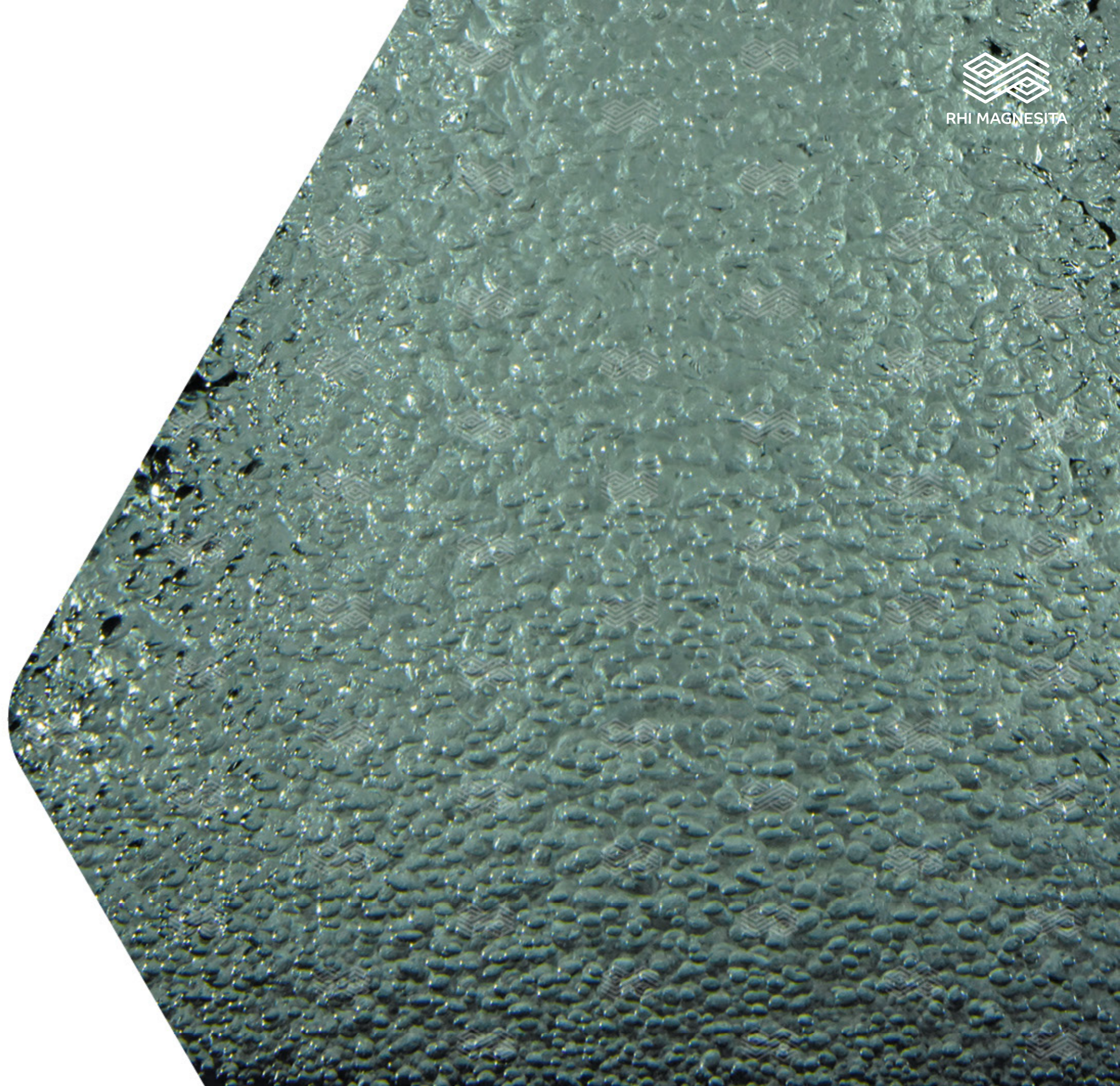
- Find out the optimum plug position
- Define the optimum number of purging plugs
- Evaluate the required gas flow rates

## Commissioning of Purging Facility

- Executed by top experienced RHIM technicians
- Comprehensive education and hands-on training for the operators

## After Sales Service

- Continuous on-site consultancy
- Support regarding any plug-related problem
- Know-how exchange on gas purging



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