



# **STEEL**

# **INDUSTRY**

**SECONDARY METALLURGY**

# CALDERYS PERFORMANCE YOU CAN TRUST



For all industries with extreme temperatures and working conditions, Caldeyrys is there for you. Combining a global network with local expertise, we offer customised solutions wherever you are: from monolithic refractory to bricks and precast shapes to a full range of engineering and installation services.

## KEY POINTS

Over 100 years of refractory experience

Over 2 300 employees across 33 countries

19 plants in 16 countries totaling 600 000 tons capacity

Annual revenue of over € 500 million

1 Global Technology Centre and 15 Customisation Labs

150 major projects implemented every year

Wholly-owned subsidiary of Imerys Group



# END-TO-END PRODUCTS AND SERVICES

Our end-to-end products and services dedicated to the steel industry encompass:

## Product Portfolio

Our comprehensive product portfolio for the steel industry includes both alumina and basic products and covers complete application requirements - Converters, AOD Furnaces, Electric Arc Furnaces, Steel Ladles, RH Degasser Units, Purging plugs, Lances and Tundish Technologies. We also provide installation services for cast-in-situ applications, dry mixes, standard gunning, low-porosity dense gunning, shotcreting and spray solutions.

## Design

In addition to product selection considerations, there are considerable benefits to be gained by optimizing the design aspects of the steel vessel. Overall, the selection of products and vessel designs should:

- Meet the metallurgical targets set by the end user, in order to prevent the chosen lining being a potential contaminant in the steelmaking process.
- Provide the best value in use with regards to cost considerations.

Thanks to close working relationship between the steelmakers and Calderys refractory engineers, we are able to meet the design and product selection targets.

## Installation

We carry out high-quality installation services by using in-house equipment and through use of optimal installation techniques. This ensures the best installation and dry-out of the refractory so that the customer gets maximum performance.

## Maintenance

We offer permanent on-site refractory services including regular and predictive maintenance and repairs. Our comprehensive range of repair products, in co-operation with state of the art measurement techniques, allow for systematic repairs to extend vessel lifetime with minimum vessel downtime.

## Project Management

We provide complete project management services including consultation, planning, delivery scheduling, supervision, site management and also direct training for customer personnel.

# OUR VALUE TO THE STEELMAKING INDUSTRY

The world leader in monolithic refractory solutions, Calderys has a full product and service portfolio to adapt to the refractory needs of steelmakers. We ensure that we propose products most suitable for your process requirements and deliver to you superior refractory performance and reliable services. We are able to do so by combining our innovative product range and modern installation techniques with end-to-end project management.

## Value Optimisation



Offering tailor-made solutions that meet the commercial and technical requirements for optimal performance.

## Complete Refractory Solutions



We offer a full range of refractory products to meet the process needs of modern Steelmaking.

## Technology Expertise



Ensuring the best possible equipment availability and productivity at the lowest total refractory cost per ton of steel produced, whilst adhering to strict environmental and safety regulations in operations.



# SOLUTIONS FOR LF & LF / DV and VOD Roofs RH / DH & RH-OB Upper Parts

Secondary refining processes are performed at atmospheric pressure or under a vacuum, with or without heating, solids and/or gas injection and stirring. The main stresses are corrosion (during metallurgical treatment), hot abrasion in circulation devices (RH, DH), high temperature (during reheating treatment) and thermal shock. Calderys solutions consist in using tailor made materials for the critical areas of the main devices like covers (VD, VTD, LF), snorkels (RH, DH) or bells (CAS).

## Solutions for: LF & LF/DV and VOD Roofs

### Roofs

#### Standard

- V** CALDE® CAST UB 85 D3
- V** CALDE® CAST UB 86 G8

#### Optimum

- V** CALDE® CAST LB 84
- V** CALDE® CAST UC 80
- V** CALDE® CAST UC 90 D

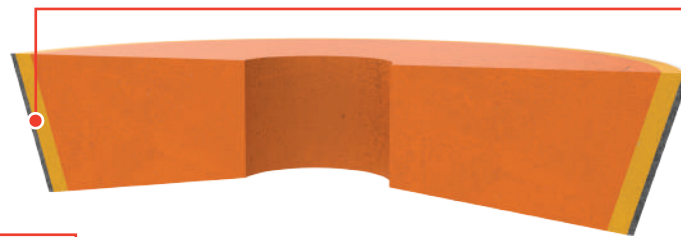
### Roofs Blocking

#### Standard

CALDE® FLOW UB 80 **SF**

#### Optimum

CALDE® FLOW MA 92 **SF**



## Solutions for: RH/DH & RH-OB Upper Part

### Roof

#### Casting

- V** CALDE® CAST T 95 G3

#### Gunning

- G** CALDE® GUN T 95 G3

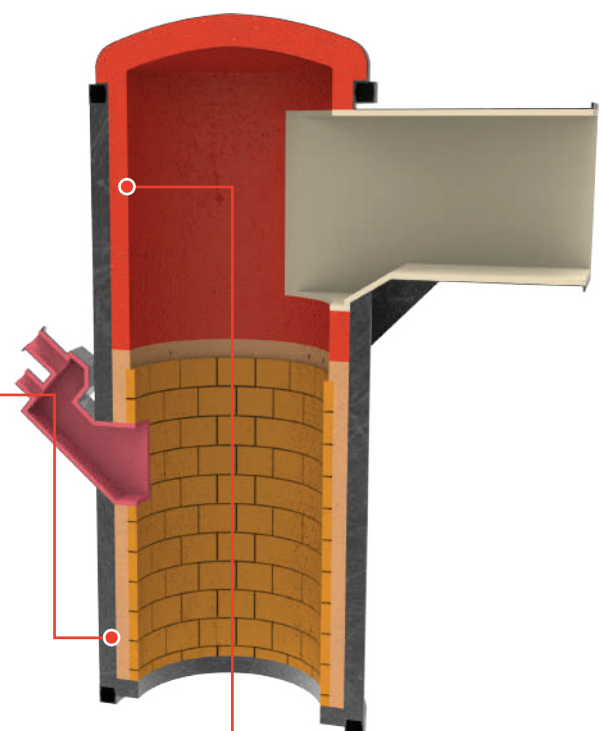
#### Repair

- G** CALDE® MAG GUN S 80
- G** CALDE® MAG GUN G 80

### Lower Part

#### Repair

- G** CALDE® GUN LT 90 D



# CAS OB PROCESS

## Solutions for the: CAS-OB Bell / Snorkel

**V** Vibrated **G** Gunned



### Upper Part

Standard  
CALDE® CAST F 50 G10 **V**

Optimum  
CALDE® CAST LM 60 **V**

### Lower Part

Standard  
**V** CALDE® CAST T 96 HT

Optimum  
**V** CALDE® CAST LT 94 SP  
**V** CALDE® MAG CAST K 90

### Repair

CALDE® MAG GUN S 80 **G**  
CALDE® MAG GUN G 80 **G**

# RH SNORKEL



What factors affect refractories in the RH Degasser?

- ▶ **EROSION**  
Process conditions
- ▶ **CORROSION**  
Thermal shock
- ▶ **IMPREGNATION**  
Material & Microstructure

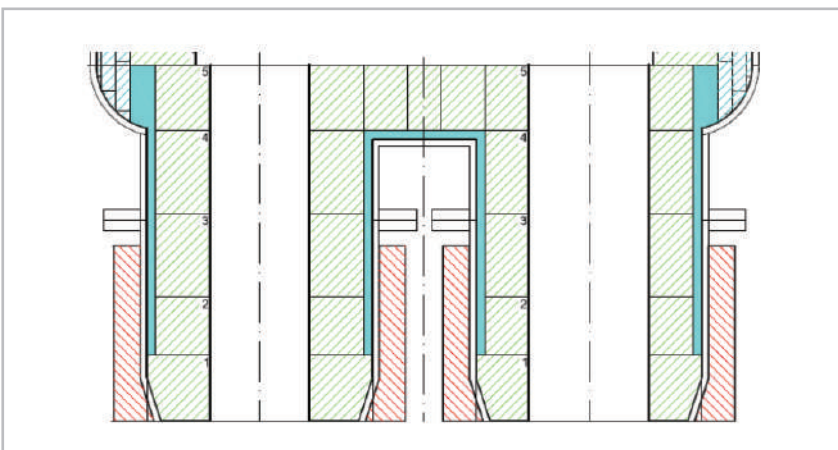
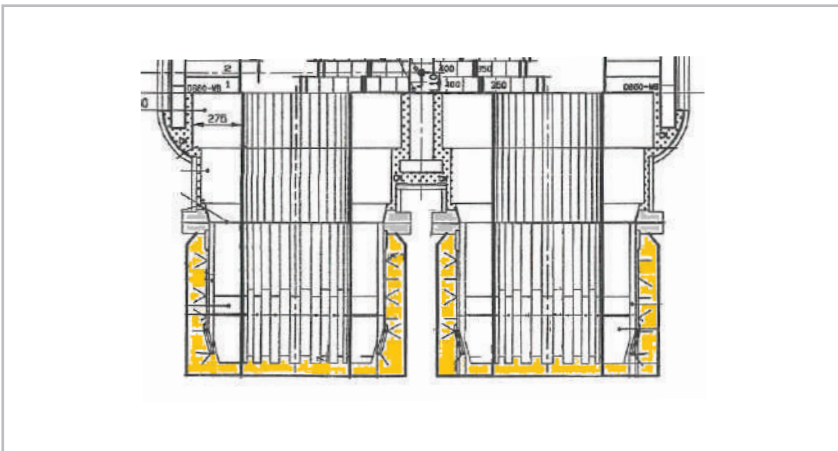


# RH DEGASSER TECHNOLOGY

Calderys' solutions are based on:

- Decades of global presence and local expertise
- A full range of shaped and unshaped refractory products
- High Quality Material selection
- Customization to specific customer requirements
- "Ready Shape" range for snorkels

High grade steels are more in demand than ever before. To produce such high grade steels the RH process is key and places considerable demands on the refractory lining and components. By closely linking the design aspects, product selections, key assembly and fabrications precision, programmed repair cycles, as well as years of application process know how, we are perfectly placed to provide the high grade products and services required.





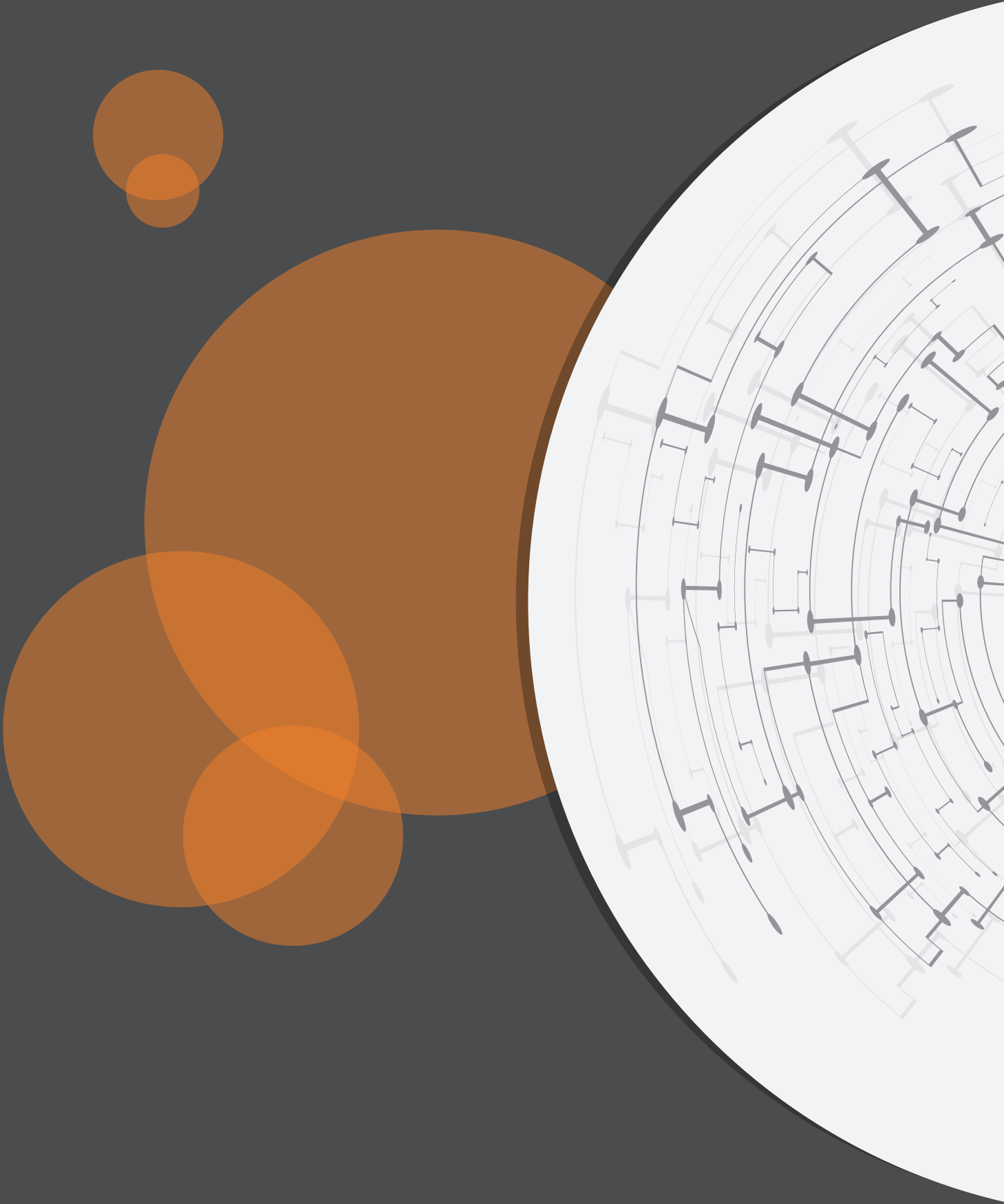
# TECHNICAL DATA

Product Name	Main Component	Biding System	Max recomm. temp (°C)	Max grain size (mm)	Chemical analysis (wt %)				Material required (t/m <sup>2</sup> )	Water required for mixing on site (litres/100kg)	Permanent linear change (%)		CCS (N/mm <sup>2</sup> )	
					Al <sub>2</sub> O <sub>3</sub>	MgO	SiO <sub>2</sub>	CaO						
<b>REFRACTORY MASSES</b>														
CALDE® MAG CAST K 90	Magnesia	Hydraulic	1750	5	-	89	4.5	0.8	2.8	4.5 - 6	-0.1 (1000°C)	n.a.	50 (1000°C)	n.a.
CALDE® MAG CAST K 94	Magnesia	Hydraulic	1850	5	-	93.3	4.6	0.9	3	3.5 - 4.5	n.a.	-0.8 (1600°C)	n.a.	70 (1600°C)
CALDE® CAST LT 97	Tabular Alumina	Hydraulic	1800	6	98.0	-	01	1.2	3.20	3.6 - 4.0	-0.0 (800°C)	+0.0 (1400°C)	80 (800°C)	100 (1400°C)
CALDE® MAG GUN G 89	Magnesia	Chemical Sulphate	1750	3.5	1.0	86.0	9.3	3.1	2.10	added at the nozzle	n.a.	n.a.	0.8 (1000°C)	n.a.
CALDE® MAG GUN GS 82	Magnesia	Chemical	1700	4	-	82	9.3	4	2.05	added at the nozzle	-0.3 (1000°C)	n.a.	n.a.	n.a.
CALDE® MAG GUN S 65	Magnesia	Chemical Silicate	n.a.	3.15	-	65.0	12.0	20.0	2.15	added at the nozzle	n.a.	-0.3 (1500°C)	5 (110°C)	16 (1500°C)
CALDE® MAG GUN S 89	Magnesia	Chemical Silicate	>1750	3.5	1.1	87.1	6.9	2.5	2.02	added at the nozzle	n.a.	n.a.	n.a.	n.a.
CALDE® MAG GUN S 80	Magnesia	Chemical	1750	3.5	0.6	80.9	12.7	4.5	1.95	15 - 20	n.a.	n.a.	n.a.	n.a.
CALDE® MAG GUN G 80	Magnesia	Chemical	1750	3.5	0.6	81.3	12.7	4.5	2.05	15 - 20	n.a.	n.a.	n.a.	n.a.

n.a.: non applicable

Product Name	Main Component	Chemical analysis (wt %)						Bulk Density (g/cm <sup>3</sup> )	Apparent Porosity (%)	CCS (MPa)
		Al <sub>2</sub> O <sub>3</sub>	MgO	SiO <sub>2</sub>	CaO	Fe <sub>2</sub> O <sub>3</sub>	Cr <sub>2</sub> O <sub>3</sub>			
<b>MAGNESIA CHROME BRICKS</b>										
CALDE® MAG BRICK MD 50 RB	Fused Magnesia and Chromite	-	>=50	<=1.5	-	-	>=24	3.20	13 - 16	45
CALDE® MAG BRICK MD 55 RB	Fused Magnesia and Chromite	-	>=55	<=1.5	-	-	>=20	3.20	13 - 16	45
CALDE® MAG BRICK MD 55 SRB	Sintered and Fused Magnesia blend and Chromite	-	>=55	<=1.5	-	-	>=20	3.15	14 - 18	45
CALDE® MAG BRICK MD 58 RB	Fused Magnesia and Chromite	4.8	56.3	1.2	1.3	11.8	24.5	3.28	15.0	60
CALDE® MAG BRICK MD 61 SRB	Sintered and Fused Magnesia blend and Chromite	70	>=60	<=1.5	0.6	11.7	>=16	3.15	14 - 18	45
CALDE® MAG BRICK MD 62 RB	Fused Magnesia and Chromite	-	>=60	<=1.5	-	-	>=16	3.20	13 - 16	45

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